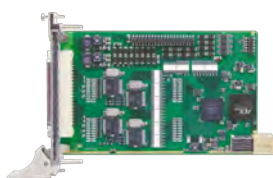
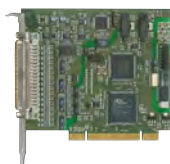


# Industrial Measurement and Automation

Distributed systems



Interference free PC boards



## 30 years ADDI-DATA – a brief review

Do you remember how it was back in the year 1984?

Richard von Weizsäcker is elected President of the federal Republic of Germany, and Ronald Reagan is re-elected in the USA.

Apple revolutionizes the young IT sector with the first Macintosh.

It is also the beginnings of ADDI-DATA. The company develops ISA boards, which are then the industrial standard. Intelligent industrial networks are still a long way off.

The next 30 years will see many innovations. Technology in general and industrial measurement technology in particular are evolving very fast. The internet is introduced and its significance for the industry increases. New hardware and software allow faster processes and open up new possibilities.

What sounds like science fiction soon becomes reality.

We have taken these changes into account with our **“Spirit of Excellence”** mindset and our values: Since 1984 we have been developing highly precise, reliable solutions especially for the harsh industrial environment. While doing so, we have kept a focus on industrial developments and constantly adapted our product range.

It all began with ISA PC boards, but over time we have been adding many board types and distributed solutions.

And the changes go on: we are eagerly looking forward to the next challenges such as Industry 4.0, which we will follow and master with our **Mechatrology\*** concept.

We look forward to mastering these challenges with you and to supporting you with your future projects.

Your

René Ohlmann  
Managing Director, ADDI-DATA GmbH

## Our values

1. **Quality:** Developed and manufactured in Germany
2. **Adaptability:** Offering customized solutions fast and in a flexible way
3. **Reliability:** The basis for a successful partnership
4. **Long-term availability:** for investment protection
5. **Spirit of Innovation** with passion and rationality

\* **Mechatrology®** [www.addi-data.com/mechatrology/](http://www.addi-data.com/mechatrology/)

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- 20 PAC systems: MSX-Box / Embedded System
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## PC boards

- |                              |  |  |   |   |   |
|------------------------------|--|--|---|---|---|
| 116 PCI-Express boards       | <span style="color: #e91e63;">■</span> Digital | <span style="color: #3949ab;">■</span> Counter | <span style="color: #4caf50;">■</span> Analog | <span style="color: #9c27b0;">■</span> Serial |   |
| 156 PCI boards               | <span style="color: #e91e63;">■</span> Digital | <span style="color: #3949ab;">■</span> Counter | <span style="color: #4caf50;">■</span> Analog | <span style="color: #9c27b0;">■</span> Serial | <span style="color: #ffeb3b;">■</span> Motion control |
| 226 PC/104-PLUS boards       | <span style="color: #e91e63;">■</span> Digital |  |   |   |   |
| 228 CompactPCI Serial boards | <span style="color: #e91e63;">■</span> Digital | <span style="color: #3949ab;">■</span> Counter | <span style="color: #4caf50;">■</span> Analog | <span style="color: #9c27b0;">■</span> Serial | <span style="color: #ffeb3b;">■</span> Motion control |
| 240 CompactPCI boards        | <span style="color: #e91e63;">■</span> Digital | <span style="color: #3949ab;">■</span> Counter | <span style="color: #4caf50;">■</span> Analog | <span style="color: #9c27b0;">■</span> Serial | <span style="color: #ffeb3b;">■</span> Motion control |

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**CompactPCI® Serial**

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**CompactPCI™**

## Connection

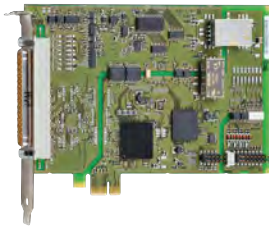
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# CONTROL TECHNOLOGY

## Fast processing of high data volumes



PCI  
EXPRESS®

PCI

CompactPCI™

CompactPCI® Serial

With ADDI-DATA measurement boards, you can precisely acquire numerous types of signals and sensor and thus control processes reliably. The extremely interference-resistant measurement boards are especially designed for the harsh industrial environment.

- DMA for more speed
- FPGA: onboard calculation of the measurement
- RTX real-time drivers for time-critical applications with Windows
- Measurement boards for the following signal types: digital, counter, analog, temperature, pressure, vibrations, length, motion control, serial interfaces

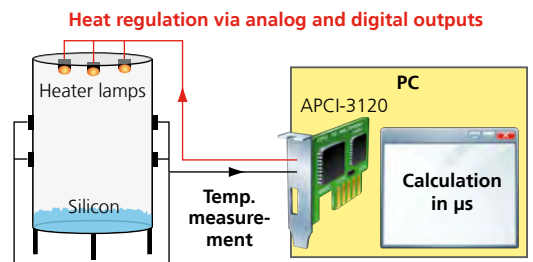
### Temperature regulation for wafer production

#### Challenge

- PC-based solution
- Acquisition cycle 1 ms
- FPGA technology for taking load off the external software (algorithm)

#### Solution

- Analog I/O board APCI-3120 for the PCI bus for temperature measurement and PWM regulation
- Satisfies all requirements: Speed, precision and long-term availability
- Numerous protective circuits for the use in an environment with interferences



See also data sheet APCI-3120, page 192

## Time-critical applications



PCI

CompactPCI™

The Programmable Automation Controller system (PAC) MSX-Box has been especially developed for industrial measurement, control and automation applications in real time where processes have to be carried out within a defined time.

- Based on established standard technologies like PCI backplane or CompactPCI backplane
- Programmable, free programming tools
- Working with Linux operating system with RTAI extension
- No update obligations, no licence costs
- I/O PCI boards or CompactPCI boards from other manufacturers can be used

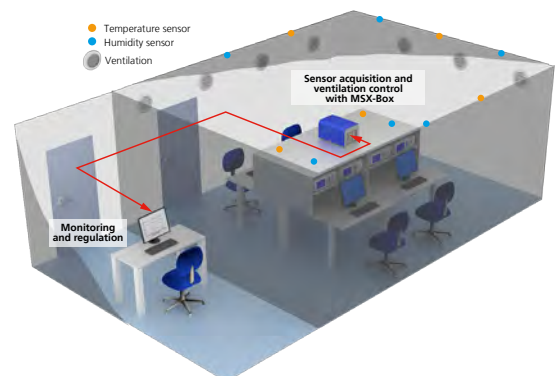
### Intelligent monitoring of temperature and air humidity in clean rooms, laboratories and calibration rooms

#### Challenge

- Monitoring of the room atmospheric environment in real time
- Ensure constant values

#### Solution

- Definition of reference values for the room temperature and air humidity
- Real-time PAC system MSX-Box with temperature measurement and analog input board for the acquisition of sensor data
- Digital output board APCI-2032 for ventilation control



See also data sheet PAC system MSX-Box, page 22

## Measurement and control in the field



Relieve your PLC and expand its range of functionality with useful measurement tasks close to the sensor or the machine: the intelligent Ethernet systems of the MSX-E series are perfect for this!

- Robust metal housings, degree of protection IP 65/ IP 67
- Easy connection to PLCs and to the company network through Ethernet
- Integrated Modbus TCP/IP server – Modbus library in preparation
- High accuracy for precise control commands
- Onboard data calculation
- Synchronisation of several (same or different type) Ethernet systems in the  $\mu$ s range

**NEW! MSX-E3121 as a substitute for a small PLC or in addition to a PLC**

Analog and digital I/O for measurement and control tasks in one device!

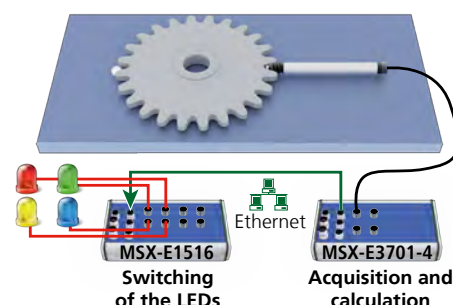
### Precise and error-free diameter detection of gear wheels

#### Challenge

- Automation / replacement of a manual test station
- Improve the measurement accuracy
- Avoid measurement errors

#### Solution

- Real-time Ethernet system MSX-Box with counter-, analog I/O boards and serial interfaces
- Onboard data calculation, time stamp
- Several sensor transmission protocols: CAN, serial, etc



See also data sheet MSX-E3121, page 72

## Measurement and control with EtherCAT and PROFINET



EtherCAT

PROFINET



The x-ARTS real-time systems are I/O slave systems for EtherCAT and PROFINET for measurement and control tasks.

- Highly precise inputs
- Data acquisition faster than the bus clock, data buffering
- Starts the acquisition independently from the bus by using the 24 V trigger input
- Can be combined with external devices which are not connected to the bus

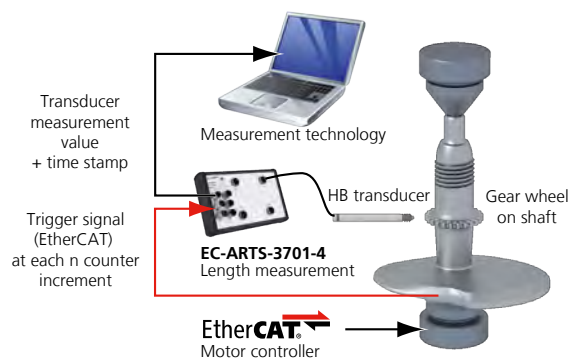
### Extension of an optical shaft measurement machine with a tactile measurement device

#### Challenge

- Clear assignment of the measured values to the axis position
- Autonomous data transmission to the measurement machine
- High precision and interference-resistance

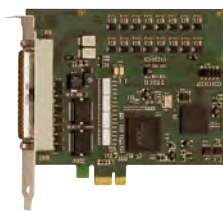
#### Solution

- EtherCAT system for the connection of half-bridge transducers to an optical shaft measurement machine
- 24-bit high resolution and numerous protective circuits
- Data package for the measurement system with measured data incl. time stamp



See also data sheet EC-ARTS-3701-4, page 19

# PRODUCTS – HIGHLIGHTS 2015



## New PCI Express boards

Our range of PCI Express boards, especially for digital signal acquisition and output, is growing continuously: the digital I/O board APCle-1500 is connector and software compatible to the bestseller APCI-1500. Thus, applications can be easily ported from PCI to PCI Express.

Furthermore, there are two new digital input boards, APCle-1016 and APCle-1032, with 16 or 32 inputs, 24 V. 16 of the 32 inputs of the APCle-1032 are interruptible.

For digital signal output, an output board with 32 outputs and a voltage range from 10 V to 36 V is available in 24 V or 5 V version.

For device security, all outputs are set to "0" at power-on. The programmable watchdog can also set the outputs to "0".

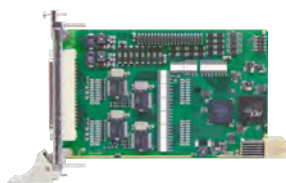
With the noise and vibration measurement board APCle-3660, a PCI Express board with 24 bit resolution is available for condition monitoring. It has 4 analog inputs – Single-Ended or differential – and one A/D converter per channel, to acquire measurement values on all channels simultaneously.

The measurement frequency can be set between 125 kHz and 4 MHz.

The power for the ICP sensors that can be directly connected through BNC connector is provided by the board.

Four RS422 counter inputs and an SDRAM module with 1 GB are available as option. All new PCI Express boards come with 64-bit and 32-bit drivers for Windows 8/7/XP and Linux, real-time drivers are available on request.

PCI-Express boards from page 118



## New CompactPCI serial boards

In addition to the digital I/O boards CPCIs-1564 and CPCIs-1532, the multifunction counter board CPCIs-1711 with 4 reprogrammable FPGA modules has been added to our product range. Each module can be equipped with one of the following functions: incremental counter, SSI, PWM, sin/cos, EnDat 2.2, BiSS Master, etc.

Two new analog I/O boards are now part of our portfolio: the CPCIs-3121 has 16/8 inputs (SE or diff.) and 4/8 outputs with a 16-bit resolution.

Also new: The CPCIs-3131 is a fast high-precision analog board with 8 inputs, 24 bit. Each input has its own A/D converter. Thanks to DMA, the outputs can be set simultaneously. Both analog boards have several trigger options and 24 V digital I/O.

All CompactPCI serial boards are suited for the extended temperature range from – 40° C to +85° C.

CompactPCI-Serial boards from page 228



## Resolver/Digital converter MSX-RDC-17

The resolver/digital converter MSX-RDC-17 converts the values of a resolver into a digital, incremental output signal. Unlike comparable products, the resolution of the incremental encoder output can be adjusted after purchase. The resolution steps 10, 12, 14 and 16 bit can be selected through a switch. The MSX-RDC-17 can be used with our counter boards as well as with our Ethernet counter systems.

MSX-RDC-17 see page 264

## 64-bit RTX drivers and ADDIPACK 64-bit version

For users who design their applications with a 64-bit operating systems we have 2 new features:

- Real-time applications with Windows and RTX64 are now possible!
- For an easy administration of PC boards in a computer, ADDIPACK for 64-bit drivers is available. With the tried and tested software concept, board functions are administrated like resources. For your application, you only have to choose the function you need without having to consider which board it comes from.



ADDIPACK concept – see page 117

# DISTRIBUTED SYSTEMS

## Product overview

The distributed systems by ADDI-DATA have been developed especially for the harsh industrial environment and can be used directly in the field. They have high-precision inputs as an outstanding feature, save space and reduce the wiring significantly. All systems are available in the long term in order to safeguard your investment. You will find in our product range systems for the well-proven network buses Ethernet, EtherCAT and PROFINET – also in real-time versions.

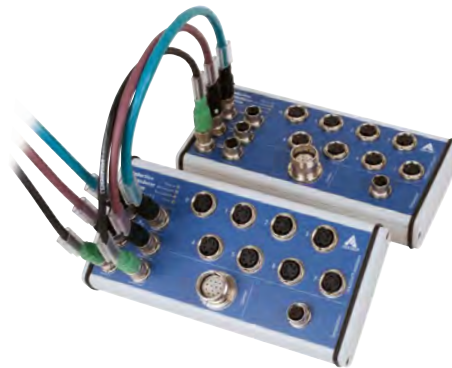
Many different types of distributed solutions can be found on the market. However, on closer examination there are not many systems which can actually cope with the high requirements of production facilities. Technology which may work perfectly in the laboratory is not intended for the use in an environment submitted to current or voltage peaks or electromagnetic disturbances. The distributed systems from ADDI-DATA are robust because they have been developed especially for the use in the field.

### 1. Industrial data loggers



The industrial data loggers of the MSX-iLog series are used for continual data acquisition and storage over longer periods of time. Diverse physical measurements can be acquired and shown. Data storage and visualisation take place parallel to one another. The data loggers from ADDI-DATA need no installation, are platform-independent and save expensive licence costs.

### 2. Intelligent Ethernet systems



Precision, autonomy and flexibility are key features of the intelligent Ethernet systems of the MSX-E series. Measurement and control tasks can be effected reliably directly at the machine. If necessary, the signals can be processed onboard. This saves resources from external PCs or PLCs.

### 3. Real-time open source PAC systems



The MSX-Box product range is used for measuring and controlling tasks in real time. Versions for PCI and for CompactPCI backplanes are available. The user defines the functions of the Ethernet-based systems by selecting the corresponding PC boards. In addition to flexibility, the systems offer another advantage: you save licence costs.

### 4. Real-time Ethernet systems



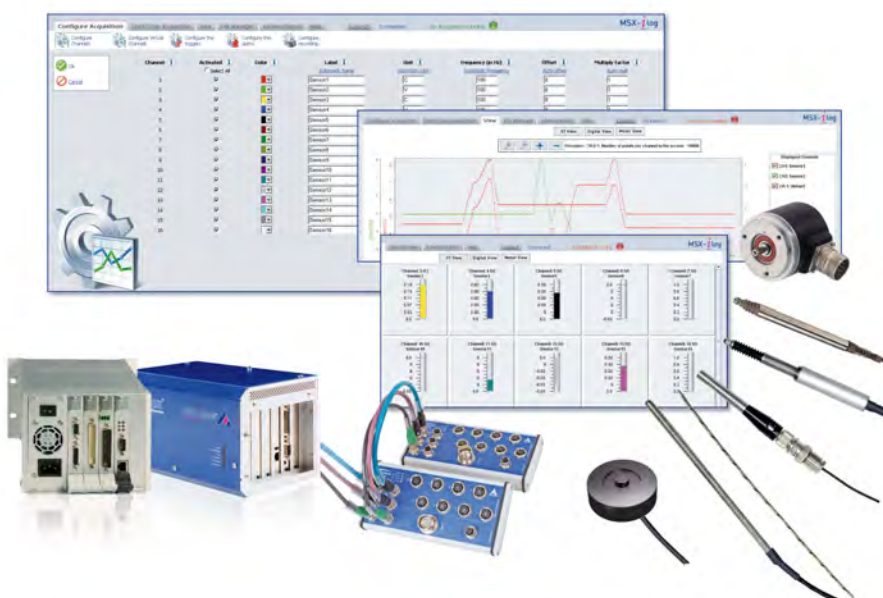
ADDI-DATA offers I/O slave systems for EtherCAT and PROFINET. They feature highly-precise inputs. The systems can measure faster than the bus cycle and buffer the acquired data. Moreover, the measurement can be started independently from the bus, since by using the 24 V trigger input, the x-ARTS can be combined with hardware that is not connected to the bus.



# ETHERNET DATA LOGGERS

*i*ndustrial + *i*nternet technology + *i*ntelligent + *i*ntuitive + *i*ntegrated  
= *i*nnovative data loggers from ADDI-DATA

## Data recording and visualisation made easy



MSX-*i*log

### BENEFITS

- Industry standard solutions
- One-time acquisition costs (no additional license costs)
- Independent from operating systems
- Software integrated in the hardware – no installation necessary
- Simple operation via the web-based user interface
- Recording of a number of signal types as physical measurement data
- Fast acquisition

MSX-ilog data loggers from ADDI-DATA are used for continual data acquisition and storage over long periods of time. Diverse physical measurements can be acquired and shown in different display modes. Data storage and visualisation take place parallel to one another.

### Different hardware versions

Different hardware versions are available to meet the various application requirements: Ethernet systems, PCI and CompactPCI solutions. The version with Ethernet systems is primarily designed for use in the field: the systems have numerous protective circuits and IP 65 protection levels and they can be used with an operating temperature from -40 °C to +85 °C. In order to safeguard your investments, MSX-ilog data loggers can be supplied by ADDI-DATA over many years.

### Application areas

- Environmental technology
- Aviation
- Research and development
- Engineering
- Building services
- Monitoring of infrastructure
- Energy industry
- Transport monitoring
- Stock control
- Chemicals







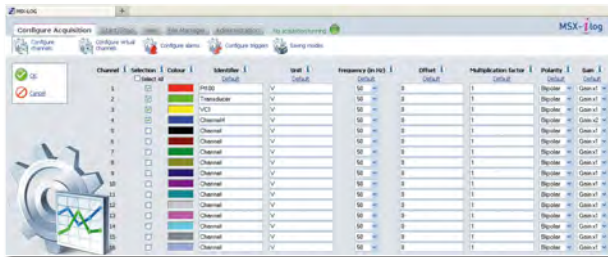
## Functions

- Long-term recording of many signal types
- Visualisation: Live or recorded data using a curve diagram, display of value
- Setup of the test point without programming knowledge
- Web-based user interfaces without installation of programs
- Can be used as a stand-alone system

## Configuration

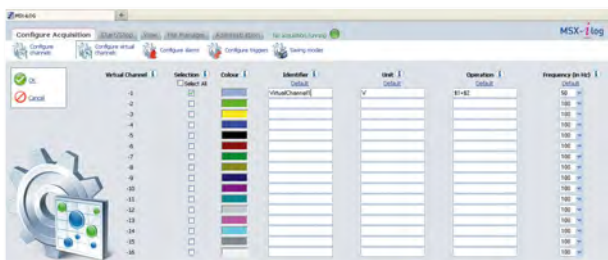
### Real channels

- Channel selection • Colour • Identifier • Unit • Frequency • Offset • Multiplication factor
- Polarity • Gain



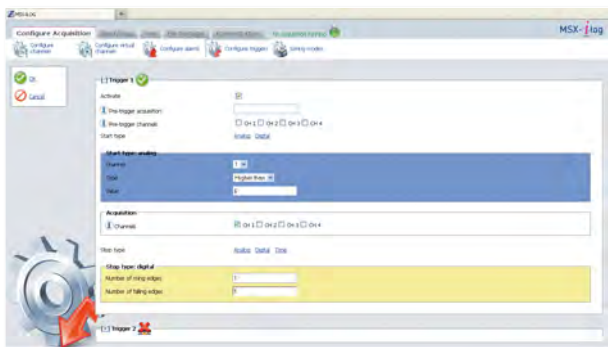
### Virtual channels

- Channel selection • Colour • Identifier • Unit • Operation • Frequency



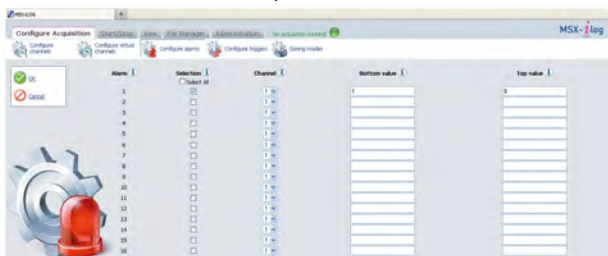
### Triggers

- Activate trigger • Pre-trigger acquisition • Pre-trigger channels
- Start/Stop type (digital, analog, stop time) • Channel selection



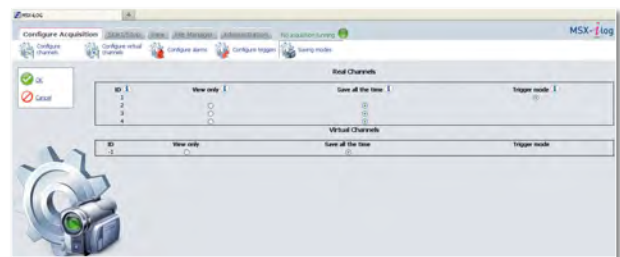
### Alarms

- Channel selection • Bottom value • Top value



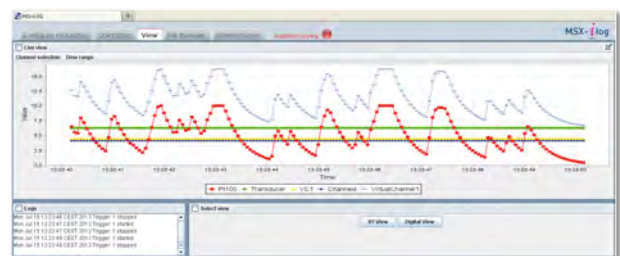
## Saving modes

- View only • Save all the time • Trigger mode



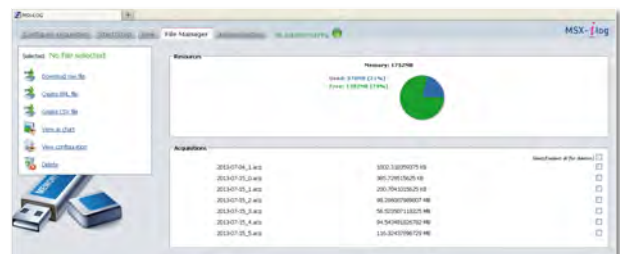
## Live view

- XY view • Digital view



## Exporting data

- CSV • XML • View as chart • View/load acquisition configuration • Delete acquisition files



## Administration

- Software download • Auto start • System configuration • System reboot/shutdown
- NTP/Time configuration



## Bespoke solutions

In order to make the data recording as efficient as possible, it is important to adapt the measurement system as closely to your requirements as possible. This is not always possible with standard products. We are happy to advise on finding the optimum solution for your applications and perform the necessary adaptations for you. **Just ask us!**

### Advice needed?

Then just call us at +49 7229 1847-0  
 or send an e-mail to: [info@addi-data.com](mailto:info@addi-data.com)

# Ethernet data logger

## 16 differential analog inputs, 16-bit



**MSX-ilog**

### MSX-ilog-AI-16

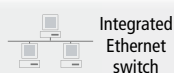
16 analog inputs, differential, 16-bit

Voltage or current inputs

Acquisition, visualisation and analysis  
in one device

No software installation needed

Automatic storing of measured values  
(4 GB build-in Flash memory)



Integrated  
Ethernet  
switch



\*Operating temperature



On  
request



IP 65



ARM9  
Technology



4 GB  
Flash memory,  
real-time clock



More information at  
[www.addi-data.com](http://www.addi-data.com)

The intelligent Ethernet data logger MSX-ilog-AI-16 has 16 differential analog inputs, 16-bit, with a transfer rate of 1 kHz/channel. The parametering and visualisation of the measured values are carried out via an integrated web site. Thus no additional software installation is needed. The acquisition, visualisation and data storage take place automatically.

### Features

- Onboard ARM9 32-bit processor
- 4 GB memory, data remains stored at power loss
- The buffered real-time clock keeps the system time even without supply voltage
- Robust metal housing
- Power Save Mode: Reduced power consumption when no acquisition runs
- 24 V digital trigger input

### Analog inputs

- 16 diff. inputs, 16-bit, 5-pin M12 female connectors
- Sampling frequency max. 1 kHz, up to 4 simultaneous channels
- Input ranges:  $\pm 5 \text{ V}$ ,  $\pm 10 \text{ V}$  (16-bit)  
 $0-5 \text{ V}$ ,  $0-10 \text{ V}$  (15-bit)
- Current inputs optional

### Acquisition

- Automatic acquisition and recording of measured data
- Conversion of measured data into real values e. g. mm, bar, temperature, etc.
- Acquisition of virtual channels

### Trigger

- Acquisition triggered via hardware or software
- 24 V hardware trigger
- Threshold trigger (when the defined level of the analog inputs is exceeded)

- Optional pre-trigger (records events which have occurred before the trigger event)
- Triggers from external hardware, e. g. MSX-E systems, are possible

### Alarm functions

- Upper and lower limits of channels
- Data storage depending on alarms
- Can be combined with the pre-trigger

### Analysis

- Online graphical analysis of measured data
- Data export (xml, csv)

### Safety features

- LED status display for fast error diagnostics
- Optical isolation • Input filters
- Overvoltage protection  $\pm 40 \text{ V}$
- Internal temperature monitoring

### Applications

- Data logger • Long-term data recording
- Monitoring of infrastructure

### Interfaces

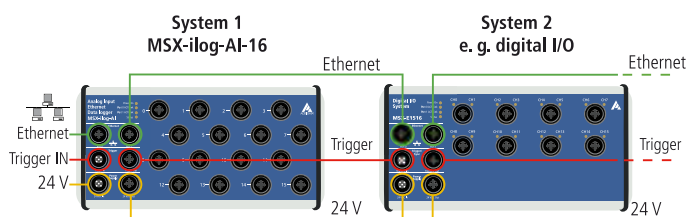
- Fast 24 V trigger input
- Ethernet switch with 2 ports
- Trigger In/Out
- 24 V supply and cascading

### Communication interfaces

- Web server (configuration and monitoring)
- Data server (TCP/IP or UDP socket) for sending acquisition data

### Combination with external hardware

Ethernet and supply signals can be looped e.g. from the MSX-ilog-AI-16 to MSX-E systems. These can then react to the values measured by the MSX-ilog-AI-16 (e.g. via alarm or trigger) and acquire and switch distributed I/O signals. Monitoring or regulation tasks can be realised.



\* Preliminary  
product information

## Specifications\*

## Analog inputs

|  |   |
|--|---|
| Number/type:   | 16 differential inputs  |
| Architecture:  | 4 groups with 4 channels each<br>4-port simultaneous converter with one 4-channel multiplexer per converter |
| Resolution:  | 16-bit, SAR ADC   |
| Accuracy:  | $\pm 1.221$ mV typ. ( $\pm 4$ LSB)<br>$\pm 2.442$ mV max.   |
| Relative precision (INL):  | $\pm 3$ LSB max. (ADC)  |
| Optical isolation:   | 1000 V  |
| Input ranges:  | $\pm 5$ V, $\pm 10$ V software-programmable   |
| Input frequency:   | 1 kHz per channel   |
| Gain:  | x1, x2, software-programmable   |
| Common mode rejection:   | 80 dB min. DC up to 60 Hz (diff. amplifier)   |
| Input impedance (PGA):   | $10^9 \Omega // 10$ nF against GND  |
| Bandwidth (-3 dB):   | 160 kHz limited through TP filters<br>16 Hz version with differential filter                                |
| Trigger:   | Digital input, software-programmable  |
| Offset error:  | $\pm 1$ LSB ( $\pm 305 \mu$ V)  |
| Gain error:  | $\pm 2.5$ LSB   |
| Temperature drift :<br>$V_{in}$ : input voltage in Volts<br>(-10 V $\leq V_{in} \leq +10$ V)<br>In the temperature range:<br>from -40 °C to +85 °C | $2.3 \times V_{in} + 22.5$ ( $\mu$ V / °C) typ.<br>4.5 ppm/°C FSR   |
| <b>Connectors for sensors</b>  | 8 x 5-pin female M12 connector  |

## Data storage

|                           |                               |
|---------------------------|-------------------------------|
| RAM:                      | 64 MB                         |
| FLASH:                    | 4 MB for system data          |
| Extended FLASH memory:    | 4 GB (2 GB for measured data) |
| Buffered real-time clock: | approx. 4 weeks at 20 °C      |

## Voltage supply

|                             |                                |
|-----------------------------|--------------------------------|
| Nominal voltage :           | 24 V ===                       |
| Supply voltage:             | 18-30 V                        |
| Optical isolation:          | 1000 V                         |
| Reverse voltage protection: | 1 A max.                       |
| <b>Connectors</b>           |                                |
| 24 VDC input                | 1 x 5-pin male M12 connector   |
| 24 VDC output               | 1 x 5-pin female M12 connector |

## Ethernet

|                    |   |
|--------------------|---|
| Interface:         | Ethernet acc. to IEEE802.3 specification                        |
| Number of ports:   | 2   |
| Cable length:      | 150 m max. at CAT5E UTP   |
| Bandwidth:         | 10 Mbps auto-negotiation<br>100 Mbps auto-negotiation           |
| Protocol:          | 10Base-T IEEE802.3 compliant<br>100Base-TX IEEE802.3 compliant  |
| Optical isolation: | 1000 V  |
| MAC address:       | 00:0F:6C:##:##:##, unique for each device                       |
| <b>Connectors</b>  | 2 x 4-pin flange-type socket, D-coded M12 for Port 0 and Port 1 |

## Trigger

|                             |                                  |
|-----------------------------|----------------------------------|
| Number of inputs:           | 1 trigger input                  |
| Number of outputs:          | 1 trigger output                 |
| Filters/protective circuit: | Low-pass/transorb diode          |
| Optical isolation:          | 1000 V                           |
| Nominal voltage:            | 24 V external                    |
| Input voltage:              | 0 to 30 V                        |
| Input current:              | 11 mA at 24 VDC, typical         |
| Input frequency (max.):     | 2 MHz at 24 V                    |
| <b>Connectors</b>           |                                  |
| Trigger input :             | 1 x 5-pin flange connector M12   |
| Trigger output:             | 1 x 5-pin flange-type socket M12 |

## EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

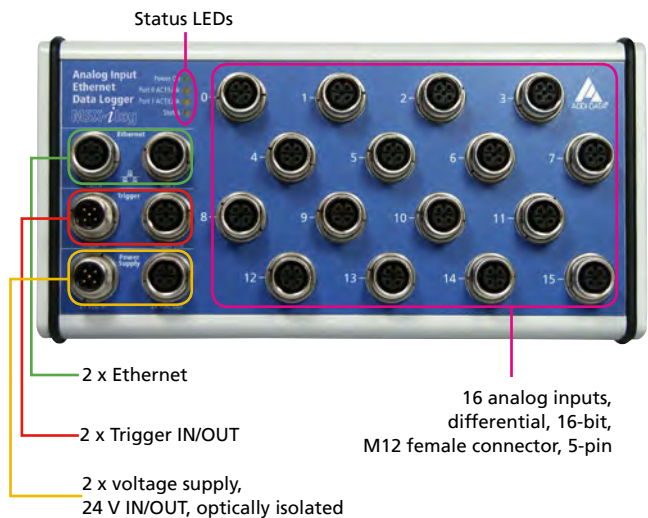
## System features

|                              |  |
|------------------------------|--|
| Interface:                   | Ethernet acc. to specification IEEE802.3       |
| Dimensions:                  | 215 x 110 mm x 50 mm                           |
| Weight:                      | 850 g  |
| Degree of protection:        | IP 65  |
| Current consumption at 24 V: | 160 mA   |
| Operating temperature:       | -25 °C to +85 °C (-40 °C to +85 °C on request) |

## System requirements

Standard browser (Internet Explorer, Firefox) with Java from version 1.6.x

## Features



## Ordering information

## MSX-ilog-AI-16

Ethernet data logger, 16 analog inputs, differential, 16-bit. Incl. technical description.

## Connection cables

## Voltage supply

**CMX-2x:** Shielded cable, M12 5-pin female connector/open end, IP 65

**CMX-3x:** For cascading, shielded cable, M12 5-pin female connector/male connector IP 65

## Trigger

**CMX-4x:** Shielded cable, M12 5-pin female connector/open end, IP 65

**CMX-5x:** For cascading, shielded cable, M12 5-pin female connector/male connector IP 65

## Ethernet

**CMX-6x:** CAT5E cable, M12 D-coded male connector/RJ45 connector

**CMX-7x:** For cascading: CAT5E cable, 2 x M12 D-coded male connector

## Connection to peripherals

**CMX-8x:** Shielded cable, M12 5-pin male connector/open end, IP 65

## Options

**PC-Diff:** Current input 0(4)-20 mA for 1 input, diff. (please indicate the number of channels)

**MSX-E 5V-Trigger:** Level change of the trigger inputs and outputs to 5 V

**MX-Clip, MX-Rail** (Please specify when ordering!), **MX-Screw, PCMX-1x**

\* Preliminary product information



# Ethernet data logger for temperature measurement

## 16/8 channels for thermocouples or RTD, 24-bit



### MSX-ilog-RTD / MSX-ilog-TC

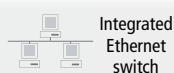
16/8 differential inputs

For thermocouples or RTD (Pt 100, Pt 1000)

Acquisition, visualisation and analysis  
in one device

No software installation needed

Automatic storing of measured values  
(4 GB build-in Flash memory)



Integrated  
Ethernet  
switch



\*Operating temperature



On  
request



IP 65



ARM9  
Technology



4 GB  
Flash memory,  
real-time clock



More information at  
[www.addi-data.com](http://www.addi-data.com)

The intelligent Ethernet data logger MSX-ilog-RTD/TC has 8 or 16 differential inputs for thermocouples or resistance temperature detectors (RTD, Pt100/Pt1000). The parametering and visualisation of the measured values are carried out via an integrated web site. Thus no additional software installation is needed.

The acquisition, visualisation and data storage take place automatically.

### Features

- Onboard ARM<sup>9</sup> 32-bit processor
- 4 GB memory, data remains stored at power loss
- The buffered real-time clock keeps the system time even without supply voltage
- Robust metal housing
- Power Save Mode: Reduced power consumption when no acquisition runs
- 24 V digital trigger input

### Analog inputs

- 8-pin M12 female connectors
- 16/8 differential inputs for thermocouples or RTD, 24-bit
- Max. sampling frequency 1 kHz

### Acquisition

- Automatic acquisition and recording of measured data
- Conversion into temperature (°C)
- Acquisition of virtual channels

### Trigger

- Acquisition triggered via hardware or software
- 24 V hardware trigger
- Threshold trigger (when the defined level of the analog inputs is exceeded)
- Optional pre-trigger (records events which have occurred before the trigger event)

- Triggers from external hardware, e. g. MSX-E systems, are possible

### Alarm functions

- Upper and lower limits of channels
- Data storage depending on alarms
- Can be combined with the pre-trigger

### Analysis

- Online graphical analysis of measured data
- Data export (xml, csv)

### Safety features

- LED status display for fast error diagnostics
- Optical isolation • Input filters
- Overvoltage protection  $\pm 40$  V
- Internal temperature monitoring

### Applications

- Data logger • Long-term data recording
- Monitoring of infrastructure

### Interfaces

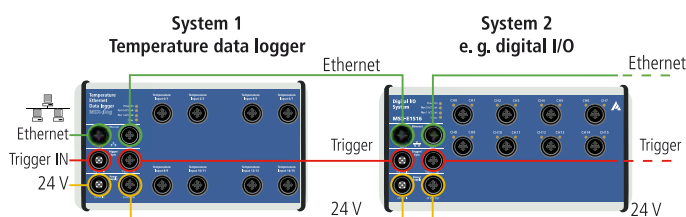
- Fast 24 V trigger input
- Ethernet switch with 2 ports
- Trigger In/Out
- 24 V supply and cascading

### Communication interfaces

- Web server (configuration and monitoring)
- Data server (TCP/IP or UDP socket) for sending acquisition data

### Combination with external hardware

Ethernet and supply signals can be looped e.g. from the MSX-ilog-RTD/TC to MSX-E systems. These can then react to the values measured by the MSX-ilog-RTD/TC (e.g. via alarm or trigger) and acquire and switch distributed I/O signals. Monitoring or regulation tasks can be realised.



\*Preliminary  
product information

## Specifications\*


### Analog inputs

|                    |  |
|--------------------|--|
| Number of inputs:  | 16 or 8 differential inputs for thermocouples or RTD |
| Resolution:        | 24-bit   |
| Optical isolation: | 1000 V   |
| Throughput:        | max. 1000 Hz   |

### Data storage

|                           |                                 |
|---------------------------|---------------------------------|
| RAM:                      | 64 MB                           |
| FLASH:                    | 4 MB for system data            |
| Extended FLASH memory:    | 4 GB (3.7 GB for measured data) |
| Buffered real-time clock: | approx. 4 weeks at 20 °C        |

### Voltage supply

|                             |  |
|-----------------------------|--|
| Nominal voltage :           | 24 V  |
| Supply voltage:             | 18-30 V  |
| Optical isolation:          | 1000 V   |
| Reverse voltage protection: | 1 A max.   |

### Connectors

|               |                                |
|---------------|--------------------------------|
| 24 VDC input  | 1 x 5-pin male M12 connector   |
| 24 VDC output | 1 x 5-pin female M12 connector |

### Ethernet

|                    |   |
|--------------------|---|
| Interface:         | Ethernet acc. to IEEE802.3 specification  |
| Number of ports:   | 2   |
| Cable length:      | 150 m max. at CAT5E UTP                   |
| Bandwidth:         | 10 Mbps auto-negotiation                  |
|                    | 100 Mbps auto-negotiation                 |
| Protocol:          | 10Base-T IEEE802.3 compliant              |
|                    | 100Base-TX IEEE802.3 compliant            |
| Optical isolation: | 1000 V                                    |
| MAC address:       | 00:0F:6C:##:##:##, unique for each device |

|                   |   |
|-------------------|---|
| <b>Connectors</b> | 2 x 4-pin flange-type socket, D-coded M12 for Port 0 and Port 1 |
|-------------------|---|

### Trigger

|                             |                          |
|-----------------------------|--------------------------|
| Number of inputs:           | 1 trigger input          |
| Number of outputs:          | 1 trigger output         |
| Filters/protective circuit: | Low-pass/transorb diode  |
| Optical isolation:          | 1000 V                   |
| Nominal voltage:            | 24 V external            |
| Input voltage:              | 0 to 30 V                |
| Input current:              | 11 mA at 24 VDC, typical |
| Input frequency (max.):     | 2 MHz at 24 V            |

### Connectors

|                 |                                  |
|-----------------|----------------------------------|
| Trigger input : | 1 x 5-pin flange connector M12   |
| Trigger output: | 1 x 5-pin flange-type socket M12 |

### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### System features

|                              |  |
|------------------------------|--|
| Interface:                   | Ethernet acc. to specification IEEE802.3       |
| Dimensions:                  | 220 x 140 mm x 50 mm                           |
| Weight:                      | 620 g  |
| Degree of protection:        | IP 65  |
| Current consumption at 24 V: | 150 mA ± 10 % typ. in Idle/Powersave           |
| Operating temperature:       | -25 °C to +85 °C (-40 °C to +85 °C on request) |

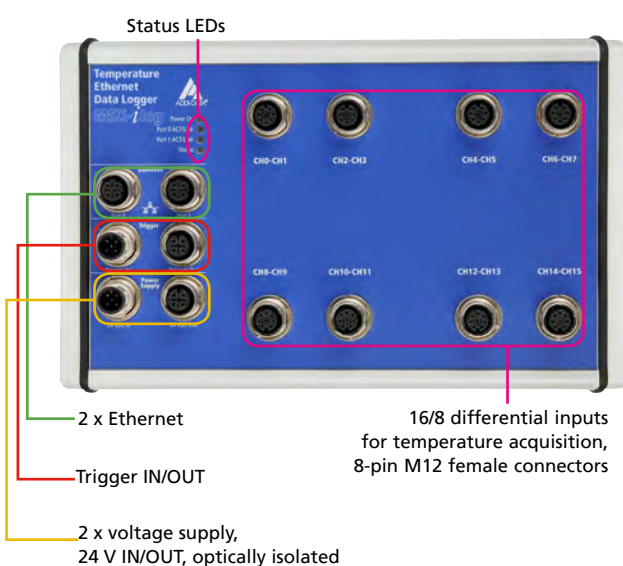
### Sensor connectors

|                |                                  |
|----------------|----------------------------------|
| Analog inputs: | 8 x 8-pin female connectors, M12 |
|----------------|----------------------------------|

### System requirements

Standard browser (Internet Explorer, Firefox) with Java from version 1.6.x

### Features



### SC-M12-8-TC

M12 8-pin connector for connecting thermocouples with integrated cold junction compensation (CJC) is included in delivery.



## Ordering information

### MSX-ilog-RTD / MSX-ilog-TC

Ethernet data logger for temperature measurement, 16/8 channels for thermocouples or RTD, 24-bit. Incl. technical description.

### Versions

|                         |                      |
|-------------------------|----------------------|
| <b>MSX-ilog-RTD-16:</b> | for 16 RTD           |
| <b>MSX-ilog-RTD-8:</b>  | for 8 RTD            |
| <b>MSX-ilog-TC-16:</b>  | for 16 thermocouples |
| <b>MSX-ilog-TC-8:</b>   | for 8 thermocouples  |

### Connection cables

#### Voltage supply

|                |  |
|----------------|--|
| <b>CMX-2x:</b> | Shielded cable, M12 5-pin female connector/open end, IP 65                     |
| <b>CMX-3x:</b> | For cascading, shielded cable, M12 5-pin female connector/male connector IP 65 |

#### Trigger

|                |  |
|----------------|--|
| <b>CMX-4x:</b> | Shielded cable, M12 5-pin female connector/open end, IP 65                     |
| <b>CMX-5x:</b> | For cascading, shielded cable, M12 5-pin female connector/male connector IP 65 |

### Ethernet

|                |  |
|----------------|--|
| <b>CMX-6x:</b> | CAT5E cable, M12 D-coded male connector/RJ45 connector     |
| <b>CMX-7x:</b> | For cascading: CAT5E cable, 2 x M12 D-coded male connector |

### Cold junction compensation

|                     |   |
|---------------------|---|
| <b>SC-M12-8-TC:</b> | M12 8-pin connector for connecting thermocouples with integrated CJC. (Included in delivery!) |
|---------------------|---|

### Options

**MSX-E 5V-Trigger:** Level change of the trigger inputs and outputs to 5 V  
**MX-Clip, MX-Rail** (Please specify when ordering!), **MX-Screw, PCMX-1x**

\* Preliminary product information

# Ethernet data logger

## 16 analog inputs, 16-bit, diff., 40 dig. I/O



More information at  
[www.addi-data.com](http://www.addi-data.com)

The intelligent Ethernet data logger MSX-ilog-AI16-DI40 has 16 differential analog inputs, 16-bit, with a transfer rate of 200 kHz as well as 36 digital inputs, 24 V. Four additional 24 V digital outputs are available for the switching of actuators and the transfer of signals.

The parametering and visualisation of the measured values are carried out via an integrated web site which is accessible over a standard browser (Internet Explorer, Firefox) with Java from version 1.6x. Thus no additional software installation is needed.

The acquisition, visualisation and data storage take place automatically.

### Features

- 64-bit MIPS processor
- 128 GB memory (SSD hard disk), data remains stored at power loss
- The buffered real-time clock keeps the system time even without supply voltage
- Robust metal housing
- Power Save Mode: Reduced power consumption when no acquisition runs

### Analog inputs

- 16 diff. inputs, 16-bit, 37-pin D-Sub connector
- Sampling frequency max. 200 kHz
- Input ranges: 0-10 V,  $\pm 10$  V, 0-5 V,  $\pm 5$  V, 0-2 V,  $\pm 2$  V, 0-1 V,  $\pm 1$  V
- Current inputs: 0-20 mA (option) can be combined freely with voltage inputs

### Digital inputs and outputs

- 36 opto-isolated digital inputs, 24 V
- 4 opto-isolated digital outputs, 5 V to 30 V, open collector
- Output current for each channel max. 50 mA typ.
- 2x 37-pin D-Sub connector (1x 32 digital inputs, 1x 8 digital I/O)

### Acquisition

- Automatic acquisition and recording of measured data
- Conversion of measured data into real values e. g. mm, bar, temperature, etc.
- Acquisition of virtual channels

## MSX-ilog-AI16-DI040

16 analog inputs, differential, 16-bit

Voltage or current inputs

36 dig. inputs, 4 dig. outputs, 24 V

Acquisition, visualisation and analysis  
in one device

No software installation needed

Automatic storing of measured values  
(internal SSD hard disk)

### Trigger

- Acquisition triggered via hardware or software
- 24 V hardware trigger (external)
- Trigger through timer (internal)
- Threshold trigger (when the defined level of the analog inputs is exceeded)
- Trigger from external software (Software trigger)
- Manual trigger (web interface)
- Optional pre-trigger (records events which have occurred before the trigger event)

### Alarm functions

- Upper and lower limits of channels
- Data storage depending on alarms
- Can be combined with the pre-trigger

### Analysis

- Online graphical analysis of measured data
- Data export (xml, csv)

### Safety features

- Optical isolation 1000 V
- Input filters
- Overvoltage protection  $\pm 40$  V
- Internal temperature monitoring

### Applications

- Data logger • Long-term data recording
- Monitoring of infrastructure

### Interfaces

- Fast 24 V trigger input
- Fast Ethernet (100 MBit/s)

### Communication interfaces

- Web server (configuration and monitoring)
- Data server (TCP/IP or UDP socket) for sending acquisition data

\*Preliminary  
product information



## Specifications\*

### Analog inputs

|                        |   |
|------------------------|---|
| Number/type:           | 16 differential inputs  |
| Resolution:            | 16-bit  |
| Input ranges:          | 0-10 V, $\pm 10$ V, 0-5 V, $\pm 5$ V, 0-2 V,<br>$\pm 2$ V, 0-1 V, $\pm 1$ V<br>0-20 mA optional |
| Input frequency:       | 200 kHz   |
| Connector for sensors: | 37-pin D-Sub connector  |

### Digital inputs

|                    |   |
|--------------------|---|
| Number:            | 36  |
| Optical isolation: | Over opto-couplers, 1000 V                        |
| Nominal voltage:   | 24 V  |
| Connectors:        | 2x 37-pin D-Sub connector (inputs 1-32 and 33-36) |

### Digital outputs

|                         |  |
|-------------------------|--|
| Number:                 | 4  |
| Output type:            | Open collector   |
| Optical isolation:      | Over opto-couplers, 1000 V   |
| Max. switching current: | 50 mA typ.   |
| Nominal voltage:        | 24 V   |
| Connectors:             | 1 x 37-pin D-Sub connector<br>(together with digital inputs 33-36) |

### Data storage

|                           |                                    |
|---------------------------|------------------------------------|
| RAM:                      | 128 MB                             |
| FLASH:                    | 16 MB for system data              |
| SSD hard disk:            | 128 GB (127 GB for measuring data) |
| Buffered real-time clock: | approx. 2 years at 20 °C           |

### Voltage supply

|                |  |
|----------------|--|
| Input voltage: | 100 V - 240 V, AC, 47-63 Hz (other on request) |
|----------------|--|

### Ethernet

|                  |  |
|------------------|--|
| Interface:       | Ethernet acc. to IEEE802.3 specification                       |
| Number of ports: | 1  |
| Cable length:    | 150 m max. at CAT5E UTP  |
| Bandwidth:       | 10 Mbps auto-negotiation<br>100 Mbps auto-negotiation          |
| Protocol:        | 10Base-T IEEE802.3 compliant<br>100Base-TX IEEE802.3 compliant |
| MAC address:     | unique for each device   |
| Connector:       | RJ45   |

### Trigger

|                            |                                    |
|----------------------------|------------------------------------|
| Number of inputs:          | 1 trigger input (digital input 33) |
| Filter/protective circuit: | Low-pass/transorb diode            |
| Optical isolation:         | 1000 V                             |
| Nominal voltage:           | 24 V external                      |

### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### System features

|                     |  |
|---------------------|--|
| Housing:            | Chromated aluminium, colour RAL 5010, "Enzianblau" |
| Heat dissipation:   | Through programmable fan                           |
| Interface:          | Ethernet acc. to IEEE802.3 specification           |
| Housing dimensions: | 278 x 170 x 165 mm                                 |
| Temperature range:  | 0 – 50 °C  |

### System requirements

Standard browser (Internet Explorer, Firefox) with Java from version 1.6.x

## Ordering information

### MSX-ilog-AI16-DI040

Ethernet data logger, 16 analog inputs, 16-bit, diff., 40 dig. I/O. Incl. technical description.

#### Terminal panels / Connection cables

|                  |   |
|------------------|---|
| <b>PX901-AG:</b> | Screw terminal panel with transorb diodes with housing for DIN rail for connecting the analog I/O |
| <b>PX901-ZG:</b> | Screw terminal panel for connecting the digital inputs (channel 33-36) and outputs, for DIN rail  |
| <b>PX901-DG:</b> | Screw terminal panel with LED status display for DIN rail   |
| <b>ST011:</b>    | Standard round cable, shielded, twisted pairs, 5 m  |
| <b>ST010:</b>    | Standard round cable, shielded, twisted pairs, 2 m  |

#### Options

**Option PC-Diff:** Current input for 1 diff. channel 0(4)-20 mA  
**Option DF:** Precision filter for 1 channel

**MSX-SCREW:** Assembly equipment for direct mounting on machines  
**MSX-RAILDIN:** Assembly equipment for DIN-rail mounting

**Additional analog inputs:** on request

**Additional digital I/O:** on request

**SSD hard disk with more storage space:** on request

\* Preliminary product information

# REAL-TIME ETHERNET



EtherCAT®



## YOUR BENEFITS

- Precise, fast, robust, reliable
- Hot-plug enabled
- Long-term availability of the product

## x-ARTS: ADDI-DATA Realtime Slave System

Real-time Ethernet systems for the field: precise, robust and reliable

The real-time component plays an important role in distributed control and regulation tasks. That's why ADDI-DATA has developed a new product family of real-time Ethernet systems: x-ARTS. These robust systems are designed for measurement, control and automation applications with various real-time requirements.

## High level of protection

The x-ARTS are available for EtherCAT (EC-ARTS) and PROFINET (PN-ARTS). They are particularly suited for use in the field, where interferences are an everyday event. In order to assure reliable operation, many protective mechanisms are built-in.

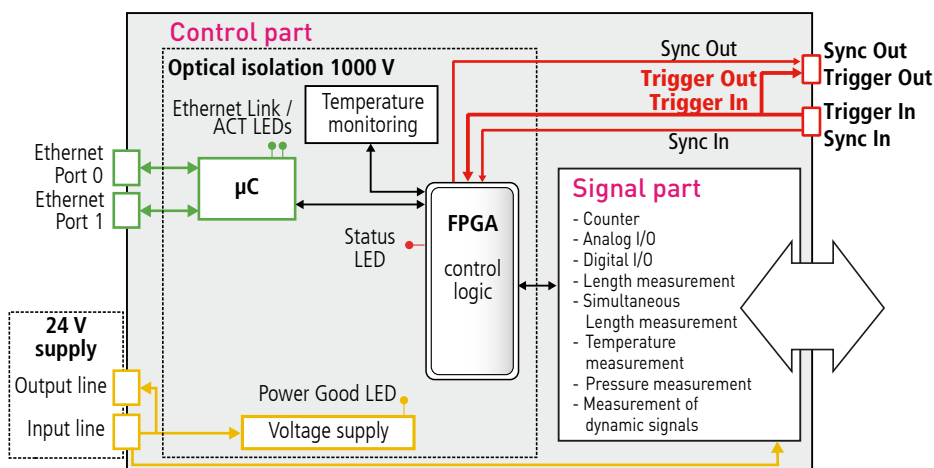
- Protective circuits such as optical isolation, etc.
- Robust metal housing
- IP 65 degree of protection
- Extended temperature range from -40 °C to +85 °C (oper. temperature)

The x-ARTS stand for quality and reliability. Like all other ADDI-DATA products, they are available for years. So for you, they make an all-around safe investment.

## The optimal solution

The real-time Ethernet systems from ADDI-DATA in many respects make an optimal choice for measurement and automation tasks. They are characterised by highly precise inputs. The systems can measure faster than the bus cycle and buffer the acquired data. Moreover, the measurement can be started independently from the bus, since by using the 24 V trigger input, the x-ARTS may be combined with hardware that is not connected to the bus. For example, a light barrier can serve as a trigger signal.

In addition, several systems or signals can be synchronised with one another using the synchro line, all in a period of less than 1 µs. The x-ARTS can also tie together signals from various external devices, such as encoders and analog inputs, and in this way acquire values faster than the bus cycle. This increases the efficiency of your application. Various diagnosis possibilities, retrievable via Ethernet, can be set to work in the real-time Ethernet systems from ADDI-DATA.



The x-ARTS consist of a signal part and a control part with optical isolation. The real-time connection can be accomplished through EtherCAT and PROFINET. Real-time Ethernet can be used looped-through or as a point-to-point connection.

\* Preliminary product information

# EtherCAT®



More information:  
[www.addi-data.com](http://www.addi-data.com)

## ETHERCAT

EtherCAT is appropriate for both hard and soft real-time requirements. It makes possible a large variety of topologies, such as lines, trees, rings, stars and combinations of these. Switches are thus made superfluous. In order to optimise the speed, processing the frame begins immediately, even if the frame still has not been entirely received. Sending follows the same principle. In order to assure precise synchronisation, even for widely separated network participants, the master clock is always compared to the slave clocks.

### EC-ARTS-Systeme

The EC-ARTS are slave systems that are entirely compatible with EtherCAT. Programming of the systems is done through SDO (Service Data Objects).

### Available functions

EC-ARTS-3011: Analog inputs (16-bit),  
EC-ARTS-3701-4: 4 inputs (24-bit) for inductive transducers, LVDT, half-bridge, Mahr  
Further systems in preparation: Temperature (RTD/TC, 24-bit), pressure (24-bit)

### Examples of EC-ARTS applications

Various signals are acquired or output in a test bench in the automobile industry. In order to reduce cable complexity, distributed systems are used. The acquisition runs in real time in order to regulate precisely.

Advantage of EC-ARTS: can be mounted directly on the machine, precise data acquisition

## PROFINET



PROFINET supports both standard Ethernet and real-time connections. It is based on the provider-consumer model, which envisages granting equal rights to the network participants. This model stands in contrast to the standard master-slave process. Not only are process data transferred via PROFINET, but functions such as web server, e-mail and FTP data transfer are also supported.

Basically, PROFINET is divided into two function classes: PROFINET CBA and PROFINET IO. These are in turn broken down into three "performance classes". Classes RT and IRT are relevant to real-time requirements. RT is used for real-time I/O data traffic in automation technology. IRT is an asynchronous real-time communication that was developed especially for motion control applications.

### PN-ARTS systems

The PN-ARTS systems from ADDI-DATA are suitable for the RT and IRT performance classes. That means that transfer rates of less than 1 ms (IRT) to 10 ms (RT) can be supported, depending on requirements.

### Available functions

PN-ARTS-AI-16: Analog inputs (16-bit),  
Further systems in preparation: Temperature (RTD/TC, 24-bit), pressure (24-bit)

### Examples of PN-ARTS applications

Profi-Net is very well suited to support PLCs. Since it was in part developed by Siemens, the interaction of a PLC and PROFINET devices is quite smooth. In this way, the PN-ARTS real-time systems can take on tasks that must be completed within a defined time period. They thus relieve the load on the PLCs.

The x-ARTS real-time systems are I/O slave systems for EtherCAT and PROFINET for measurement and control tasks.

- Highly precise inputs
- Data acquisition faster than the bus clock, data buffering
- Starts the acquisition independently from the bus by using the 24 V trigger input
- Can be combined with external devices which are not connected to the bus

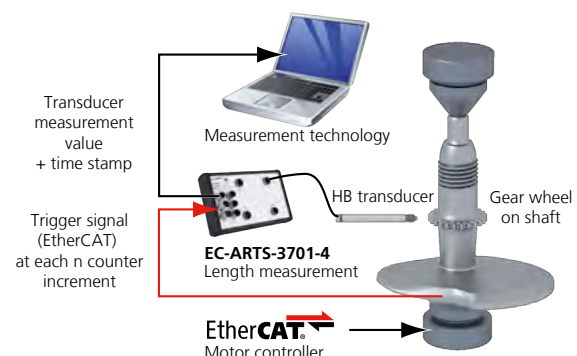
### Extension of an optical shaft measurement machine with a tactile measurement device

#### Challenge

- Clear assignment of the measured values to the axis position
- Autonomous data transmission to the measurement machine
- High precision and interference-resistance

#### Solution

- EtherCAT system for the connection of half-bridge transducers to an optical shaft measurement machine
- 24-bit high resolution and numerous protective circuits
- Data package for the measurement system with measured data incl. time stamp



# EtherCAT analog input system

## 16 analog inputs, diff., 16-bit

**New!**



### EC-ARTS-3011

16 analog inputs, differential, 16-bit

Voltage or current inputs

Simultaneous acquisition of 4 channels

Fast distributed data acquisition

M12 connector



EtherCAT



\*Betriebstemperatur



TWINCAT

### Features

- 64 MB onboard SDRAM for storing data
- Robust normed metal housing
- Power Save Mode: Reduced power consumption when no acquisition runs

#### Analog inputs

- 16 diff. inputs 16-bit, M12 5-pin female connector
- Sampling frequency max. 100 kHz, up to 4 simultaneous channels
- Input ranges:
  - $\pm 5$  V,  $\pm 10$  V (16-bit)
  - 0-5 V, 0-10 V (15-bit)
- Current inputs optional

#### Acquisition modes:

- Untriggered live signal
- Acquisition triggered through external motor controller
- Average mode

### Applications

- Industrial process control and measurement
- Industrial measurement and monitoring
- Process monitoring
- Remote diagnosis
- Control of chemical processes
- Factory automation

### Interfaces

- EtherCAT interface
- RS422 trigger interfaces
- 24 V supply

## Specifications\*

### Analog inputs

|  |   |
|--|---|
| Number/input type:   | 16 differential inputs  |
| Architecture:  | 4 groups with 4 channels each<br>4-port simultaneous converter with one 4-channel multiplexer per converter |
| Resolution:  | 16-bit, SAR ADC   |
| Accuracy:  | $\pm 1.221$ mV typ. ( $\pm 4$ LSB)<br>$\pm 2.442$ mV max.   |
| Relative precision (INL):  | $\pm 3$ LSB max (ADC)   |
| Optical isolation:   | 1000 V  |
| Input ranges:  | $\pm 5$ V, $\pm 10$ V (16-bit), 0-5 V, 0-10 V (15-bit)<br>software-programmable, current inputs optional    |
| Input frequency:   | 25 kHz per channel / 100 kHz max.   |
| Gain:  | x1, x2, software-programmable   |
| Common mode rejection:   | 80 dB min. DC up to 60 Hz (diff. amplifier)   |
| Input impedance (PGA):   | $10^3 \Omega$ // 10nF against GND   |
| Band width (-3dB):   | 160 kHz limited through TP filters<br>16 Hz version with differential filter                                |
| Trigger:   | digital input, synchro, software-programmable   |
| Offset error:  | $\pm 1$ LSB ( $\pm 305 \mu$ V)  |
| Gain error:  | $\pm 2,5$ LSB   |
| Temperature drift  | $2.3 \times V_{in} + 22.5 (\mu$ V / $^{\circ}$ C) typ.  |
| $V_{in}$ : input voltage in Volts<br>( $-10$ V $\leq V_{in} \leq +10$ V)<br>in the temperature range<br>from $-40^{\circ}$ C to $+85^{\circ}$ C: | 4.5 ppm/ $^{\circ}$ C FSR   |

### Power Supply

|                    |         |
|--------------------|---------|
| Nominal voltage:   | 24 V    |
| Supply voltage:    | 18-30 V |
| Optical isolation: | 1000 V  |

Current consumption at 24 V: to be defined  
Reverse voltage protection:

### Trigger

|                    |                 |
|--------------------|-----------------|
| Number of inputs:  | 1 trigger input |
| Optical isolation: | 1000 V          |
| Signal type:       | RS422           |

### EMC - Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### System features

|                        |                                   |
|------------------------|-----------------------------------|
| Interface:             | EtherCAT                          |
| Dimensions (mm):       | 215 x 110 x 50                    |
| Weight:                | 850 g                             |
| Degree of protection:  | IP 65                             |
| Operating temperature: | $40^{\circ}$ C to $+85^{\circ}$ C |

### EC-ARTS-3011 interface connectors

|                  |   |
|------------------|---|
| EtherCAT:        | 2 x 4-pin M12 female connector, D-coded for port 0 and port 1   |
| RS422 interface: | 1 x 5-pin M12 male connector,<br>1 x 5-pin M12 female connector |

### Voltage supply

|                |                                |
|----------------|--------------------------------|
| 24 VDC input:  | 1 x 5-pin M12 male connector   |
| 24 VDC output: | 1 x 5-pin M12 female connector |

### Sensor connectors for analog inputs

16 x 5-pin M12 female connector

## Ordering information

### EC-ARTS-3011

EtherCAT analog input system, 16 analog inputs, diff., 16-bit.  
Incl. technical description and software drivers

\*Preliminary product information

# EtherCAT system for length measurement, 24-bit 4 inductive transducers, LVDT, Half-Bridge, Mahr

**New!**

Real-time-Ethernet



## EC-ARTS-3701-4

Simultaneous acquisition of up to 4 inductive transducers

For Half-Bridge, LVDT or Mahr transducers

24 V and RS422 trigger interface



EtherCAT



\*Betriebstemperatur



## Features

- Connection of all commercially available transducers (Half-Bridge, LVDT, Mahr)
- 4 channels
- 24-bit resolution
- Fast distributed data acquisition
- 16 MB onboard SDRAM for storing data
- Diagnostic possibility at short-circuits or line break of the transducers
- Robust metal housing
- Power Save Mode: Reduction of the power consumption when no acquisition runs
- 24 V and RS422 trigger interface

### Acquisition modes:

- Untriggered live signal
- Acquisition triggered by external motor controller
- Average mode

## Transducer precision: Measurement example

Type TESA GT21, range  $\pm 2$  mm ( $\Delta 4$  mm),

16-bit precision

$$\frac{4 \text{ mm}}{2^{16}} = \pm 61 \text{ nm} = 0.061 \mu\text{m}$$

## Applications

- Gear wheel measurement • Gauge block measurement
- Sensor data acquisition
- Quality assurance, automatic component testing
- Industrial process control • Profile and surface measurement

## Interfaces

- EtherCAT
- 24 V and RS422 trigger interfaces
- 24 V supply

## Specifications\*

### Inputs for inductive transducers

#### Channel features

|                            |                               |
|----------------------------|-------------------------------|
| Number:                    | 4 simultaneous                |
| Input type:                | single ended                  |
| Coupling:                  | DC                            |
| Resolution:                | 24-bit                        |
| Sampling frequency $f_s$ : | At primary frequency $f_p$ of |
|                            | 5 kHz                         |
|                            | 7.69 kHz                      |
|                            | 10 kHz                        |
|                            | 12.5 kHz                      |
|                            | 20 kHz                        |

Example with TESA GT21:  $f_s = f_p = 12.5 \text{ kHz}$

#### Input level

|                  |   |
|------------------|---|
| Input impedance: | 2 k $\Omega$ for HB                                 |
|                  | 10 k $\Omega$ for LVDT                              |
|                  | 100 k $\Omega$ on request, 10 M $\Omega$ on request |

#### Sensor supply (sine generator)

|  |  |
|--|--|
| Type:                                      | Sine differential (180° phase-shift)                       |
| Coupling:                                  | AC   |
| Programmed signals:                        |  |
| Output frequency $f_p$ (primary frequency) | 2-20 kHz depending on the transducer                       |
| Output impedance:                          | < 0.1 $\Omega$ typ., > 30 k $\Omega$ typ. in shutdown mode |
| Short-circuit current:                     | 0.7 A typ. at 25 °C with thermal protection                |

### Voltage Supply

|                    |         |
|--------------------|---------|
| Nominal voltage:   | 24 V    |
| Voltage supply:    | 18-30 V |
| Optical isolation: | 1000 V  |

Current consumption at 24 V: 0,25 A

Reverse voltage protection:

### Trigger

|                    |                  |
|--------------------|------------------|
| Number of inputs:  | 2 trigger inputs |
| Optical isolation: | 1000 V           |
| Signal type:       | 24 V, RS422      |

### EMC - Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### System features

|                        |                   |
|------------------------|-------------------|
| Interface:             | EtherCAT          |
| Dimensions (mm):       | 165 x 140 x 40    |
| Weight:                | 775 g             |
| Degree of protection:  | IP 65             |
| Operating temperature: | -25 °C to + 85 °C |

### EC-ARTS-3701 interface connectors

|                     |   |
|---------------------|---|
| EtherCAT:           | 2 x 4-pin M12 female connector, D-coded for port 0 and port 1   |
| Trigger interfaces: | 1 x 5-pin M12 male connector,<br>1 x 5-pin M12 female connector |

#### Voltage supply

|                |                                |
|----------------|--------------------------------|
| 24 VDC input:  | 1 x 5-pin M12 male connector   |
| 24 VDC output: | 1 x 5-pin M12 female connector |

### Connectors for connecting inductive transducers

4 x 5-pin M18 female connectors

## Ordering information

### EC-ARTS-3701-4

EtherCAT system for length measurement, 24-bit, 4 inductive transducers, LVDT, Half-Bridge, Mahr-compatible. Incl. technical description and software drivers

### Versions

**EC-ARTS-3701-HB-4:** for 4 HB inductive transducers

\*Preliminary product information

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# PAC SYSTEMS MSX-BOX

## Distributed data acquisition and control in real time

The MSX-Box is an open Programmable Automation Controller system (PAC). It has been specially developed for industrial measurement, control and automation applications in real time where processes have to be carried out within a defined time.



### The concept

- Modular platform for distributed measurement, control and regulation applications in real time
- Based on established standard technologies like PCI backplane or CompactPCI backplane
- Non-proprietary system: I/O PCI boards or CompactPCI boards from other producers can be used.
- Low maintenance: Linux operating system with RTAI extension – no update obligations
- Reduced costs: no software licence costs
- No unnecessary multimedia features: Full machine time only for your application
- Optimise your system: Free access to the software down to the kernel source code for extensive adaptations of your measuring system
- Real-time development tools without additional costs
- Investment security: Long-term availability of the products thanks to the ADDI-DATA supply philosophy

### PAC systems

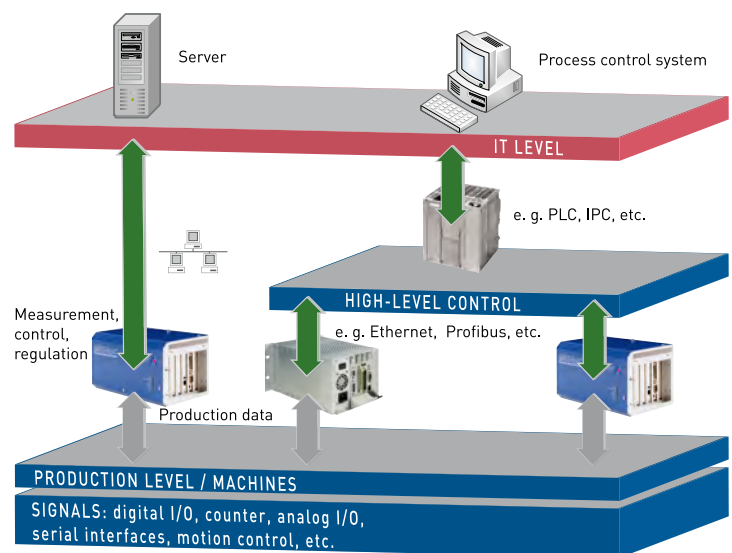
#### Programmable Automation Controller

PAC systems are mainly used for industrial measurement and control or regulation tasks as well as for motion control.

They execute several tasks simultaneously and in a deterministic way.

#### Core features of a PAC system:

- Compact and robust design
- Programmable
- Standard Ethernet (TCP/IP)
- CPU board as system controller
- Different I/O modules



## Between the production and IT level

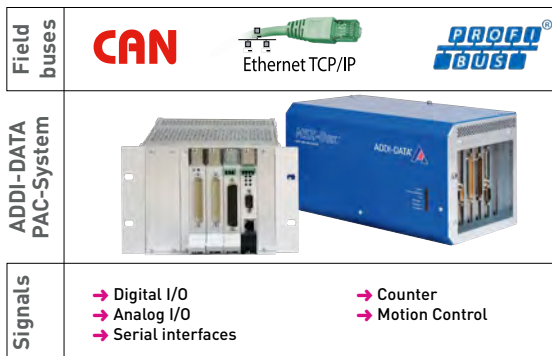
The MSX-Box acquires sensor and machine data, processes them, and controls or regulates the corresponding terminals.

The MSX-Box can be integrated into a higher-level control system via Ethernet or Profibus. By integrating the MSX-Box into the company network via Ethernet, data can be forwarded to software packages on the IT level for use in statistics or process optimisation.



## Integrated into the field level

Measurement and control systems that monitor entire processes and interact with machines or hardware must be capable of working with data of different origins.



### Field buses and signals

With the MSX-Box, you can acquire signals from different field buses: CAN, Profibus, Ethernet, or signals from serial lines such as ultrasound sensors or scales.

The PAC system can also process the following signals:

- Digital I/O
- Counter: Incremental, SSI etc.
- Analog I/O
- Serial interfaces
- Motion control
- etc.

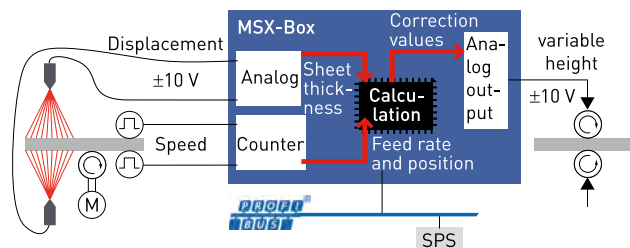
### Good for retrofits, too

→ The MSX-Box is suitable both for setting up a new automation project and for optimising existing installations. That means you continue to benefit from your familiar hardware, while still equipping your installation with the latest technology for more efficiency where it counts.

## Application examples

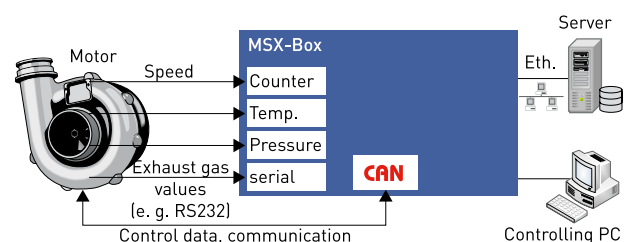
### Example 1

In a steel plant, the MSX-Box is used to measure the thickness of sheets. Laser sensors ( $\pm 10$  V) are used to measure the sheet thickness. Simultaneously with the thickness measurement, incremental counters are used to determine the position of the sheet and the feed rate. The deviation in sheet thickness is calculated in real time. The result of the calculation is used to control the position of the rollers in the next process step and thus to produce sheets of a uniform thickness. This information is then provided to higher-level control systems through a Profibus interface, e.g. for statistics, process analysis, or as specification values for downstream processes.



### Example 2

During inspection of engines, different metrics are acquired based on different signal types: speeds, temperatures, pressures, exhaust gas values, etc. Using the integrated CAN interface, messages from the CAN bus can also be recorded. To obtain a meaningful measurement result, all metrics must be acquired at defined points in time. The value of all metrics is then measured at time  $t$ . To use the data for later evaluation, the MSX-Box stores the measured values in a database.



# PAC system MSX-Box for the PCI bus



- Open and transparent Programmable Automation Controller system
- With free development tools
- Live DVD based on open source programs
- Real-time measurement system

## PAC systems

### Programmable Automation Controller

PAC systems are mainly used for industrial measurement and control or regulation tasks as well as for motion control.

They execute several tasks simultaneously and in a deterministic way.

#### Core features of a PAC system:

- Compact and robust design
- Programmable
- Standard Ethernet (TCP/IP)
- CPU board as system controller
- Different I/O modules

## Set course for freedom

Experience with the MSX-Box what freedom of decision-making really means:

- You select the components of your PAC system: The MSX-Box is based only on reliable standard technologies like for example PCI backplane. Freedom also means that you can use any of the numerous standard PCI I/O boards.
- You decide, whether and when to update your operating system: Using the real-time operating system Linux with RTAI extension, no need to take care of updates. Save time and money!
- You have free access to the software down to the kernel source code: You can make extensive system adaptations and realize your own optimized measurement system.

## Boost your applications

Working with the MSX-Box that fits to your needs will boost your measurement and control applications. The MSX-Box is supplied with development tools: You can realize even very complex tasks quite easily.

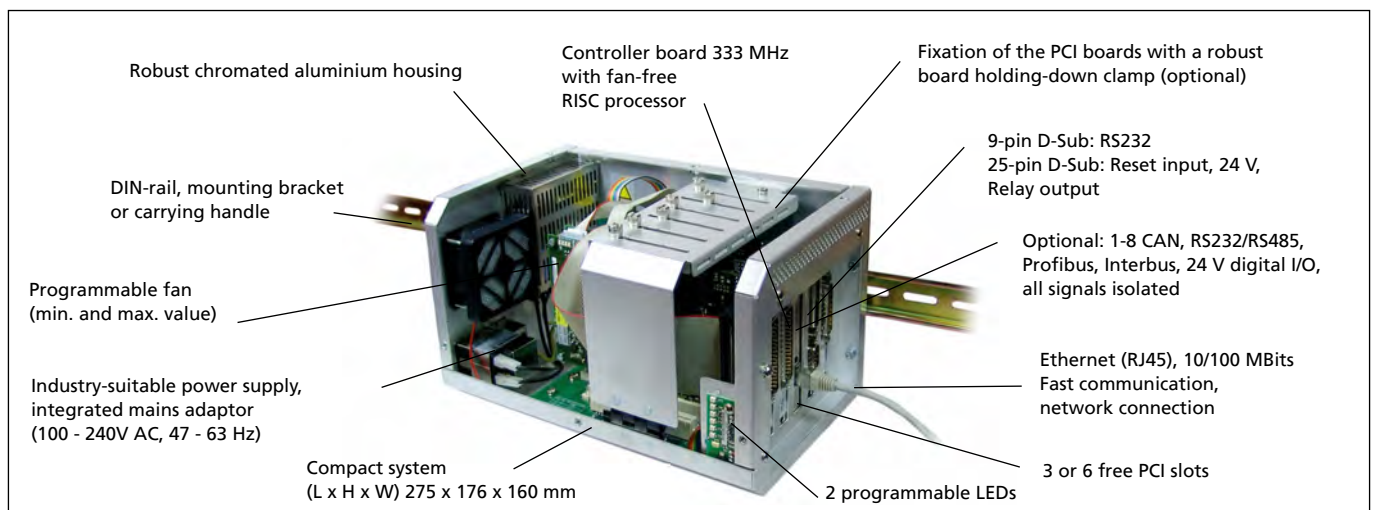
The most important advantage of a PAC system with such a transparent structure is that in case of emergency, you can react fast and efficiently.

Thanks to the long-term ADDI-DATA supply philosophy, you secure your investments for a long time.

Furthermore, the fact that the MSX-Box is supplied with free development tools limits the purchase price for serial equipment.

**Experience today how to realize your applications of tomorrow:**

[www.msx-box.com](http://www.msx-box.com)



## MSX-Box-500

### PCI controller board

|                      |   |
|----------------------|---|
| RISC processor:      | 64-bit MIPS, no fan   |
| Clock:               | 333 MHz   |
| Memory:              | 16 MB flash, 128 MB SDRAM, Option up to 256 MB  |
| Installed OS:        | Embedded RTAI Linux   |
| Standard interfaces: | D-Sub 9-pin: 1 x RS232<br>D-Sub 25-pin: Reset input 24 V; „H“ active<br>1 x relay output, free prog.,<br>closing contact  |
| Optional:            | D-Sub 25-pin.: 1-8 CAN, Master/Slave, isolated<br>1 x RS232/RS485, isolated<br>additional bracket:<br>1 x Profibus/Slave, isolated<br>2 x Interbus/Master, isolated<br>4 x dig. input, 24 V/10 mA, isolated<br>3 x dig. output, 24 V/200 mA, isolated |
| Dimensions:          | PCI half-size board   |

### Mains supply unit

|                     |  |
|---------------------|--|
| Input voltage:      | 100 V - 240 V, AC, 47-63 Hz (other voltage on request) |
| Output voltage:     | 5 VDC-40 W (max. 6 A) (other voltage on request)       |
| Protection against: | Short circuit; overload, overvoltage                   |
| Connection:         | 2 m power cable  |

### ATX backplane with 5 PCI slots

|             |  |
|-------------|--|
| PCI slots:  | Total amount: 5<br>Reserved: 1 x PCI controller board<br>1 x PCI Ethernet board<br>Free: for 3 additional PCI half-size boards |
| Compliance: | PCI specification PICMG rev. 2.1.  |

## MSX-Box-800

Same as MSX-Box-500 with 8 PCI slots on the ATX backplane, incl. 6 free slots for PCI I/O boards

### Mains supply unit

|                     |  |
|---------------------|--|
| Input voltage:      | 100 V - 240 V, AC, 47-63 Hz (other voltage on request) |
| Output voltage:     | 5 VDC/12 VDC/60 W (max. 6A)                            |
| Protection against: | Short circuit; overload, overvoltage                   |
| Connection:         | 2 m power cable  |

### ATX backplane with 8 PCI slots

|             |  |
|-------------|--|
| PCI slots:  | Total amount: 8<br>Reserved: 1 x PCI controller board<br>1 x PCI Ethernet board<br>Free: for 6 additional PCI half-size boards |
| Compliance: | PCI specification PICMG rev. 2.1.  |

## For MSX-Box-500 and MSX-Box-800

### PCI Ethernet board (RJ45)

|                     |              |
|---------------------|--------------|
| Data transfer rate: | 10/100 MBits |
|---------------------|--------------|

### Extensive software support

Free development tools (GNU Compiler, Cygwin, samples in source code), Knoppix Live DVD development environment

### Housing

|                                 |  |
|---------------------------------|--|
| Material:                       | Chromated aluminium, colour RAL 5010 blue „Enzianblau“   |
| Heat dissipation:               | Through programmable fan   |
| Temperature range:              | 0 - 50°C   |
| Temperature monitoring:         | Configuration at delivery 5 °C to 45 °C, min. and max. value programmable through software. The temperature value can be monitored. Resolution: 0.5 °C |
| Front openings:                 | For 5 PCI-boards and 1 bracket (MSX-Box-500)<br>For 8 PCI-boards and 3 brackets (MSX-Box-800)  |
| Housing dimensions (L x H x W): | 278 x 170 x 165 mm (MSX-Box-500)<br>292 x 170 x 292 mm (MSX-Box-800)   |
| Weight:                         | approx. 2 kg (standard MSX-Box system) MSX-Box-500<br>approx. 3 kg (standard MSX-Box system) MSX-Box-800   |
| Status display:                 | 5 LEDs, incl. 2 freely programmable  |

### Optional accessories

|  |   |
|--|---|
| Board fixation:                          | Board holding-down clamp  |
| Mounting possibilities:                  | <ul style="list-style-type: none"> <li>DIN rail</li> <li>Removable mounting bracket</li> <li>Carrying handle</li> </ul>   |
| Cable:                                   | 2 m Ethernet patch cable, shielded, RJ45 connector (PC ↔ MSX-Box)   |
| Network card:                            | <ul style="list-style-type: none"> <li>2 x PCI FireWire IEEE 1394, 1 x internal, 1 x ext. connection, data transfer rate up to 400 Mbps</li> </ul>  |
| MSX-ComboCard with additional functions: | <ul style="list-style-type: none"> <li>2 x PCI USB 2.0, 2 external, 1 x internal connection,</li> <li>1 x RJ-45 LAN, 10/100 Mbps connection</li> <li>1 x 5-pin female connector, 12 V</li> <li>Network card PCI 10/100 Mbps, 10Base-T, 100Base-TX, IEEE802.3, 802.3 u protocol, recognition of data transfer rate 10 Mbps or 100 Mbps, data transfer rate 10 Mbps and 100 Mbps, Chipset Realtek RTL8139,</li> <li>32-bit PCI system</li> <li>5 V voltage</li> </ul> |
| Colours:                                 | Other housing colours (according to RAL scale) and inscriptions (on request)  |

## Ordering information

**MSX-Box:** PAC system, incl. development tools (GNU compiler, Cygwin, source code samples, ...) and technical description

### Versions

**MSX-Box 500:** 5 PCI slots (incl. 2 slots reserved for controller and Ethernet board; 3 free PCI slots for half-size boards)

**MSX-Box 800:** 8 PCI slots (incl. 2 slots reserved for controller and Ethernet board; 6 free PCI slots for half-size boards)

### Options

**MSX-256MB:** Memory extension up to 256 MB

**MSX-485/ MSX-232:** 1-port serial interface, RS485 or RS232, optically isolated

**MSX-Basis:** Basic equipment for options MSX-CAN, MSX-Profibus, MSX-IBS and MSX-DIO-IO

**MSX-CAN-x:** 1/2/4/8 x CAN bus, master/slave, optically isolated

**MSX-Profibus:** 1 x Profibus, slave

**FB-Profibus:** 9-pin D-Sub female connector for the option MSX-Box Profibus (please order separately)

**MSX-IBS-x:** 1/2 x Interbus-S, master

**MSX-DIG-IO:** 4 digital inputs and 3 digital outputs, 24 V.

All extensions are isolated and include a ribbon cable with a 9-pin D-Sub male connector with bracket

**MSX-RTSYNC:** for the synchronisation of several MSX-boxes (with time stamp)

### Accessories

**MSX-CLAMP-500/800:** Board holding-down clamp for board fixation

**MSX-SCREW:** Wall mounting for MSX-Box-500

**MSX-SCREW-800:** Wall mounting for MSX-Box-800

**MSX-RAILDIN:** DIN rail mounting

**MSX-GRIP:** Carrying handle

**MSX-COMBOCARD:** Network card LAN / USB / Firewire connection

**MSX-COMBOGIGA:** Network card Giga LAN / USB / Firewire connection

**MSX-500-PS-12V/-24V:** Mains power supply unit 12 V DC or 24 V DC

**ST ETH-2:** Ethernet patch cable 2 m, shielded, RJ45, between PC and MSX-Box

**MSX-CBLRS232:** RS232 cable, 1.5 m – 9-pin.

**On request:** Other housing colour or inscriptions on the front side

# PAC system MSX-Box for the CompactPCI bus



- Open and transparent Programmable Automation Controller system
- With free development tools
- Live DVD based on open source programs
- Real-time measurement system

## PAC systems

### Programmable Automation Controller

PAC systems are mainly used for industrial measurement and control or regulation tasks as well as for motion control.

They execute several tasks simultaneously and in a deterministic way.

#### Core features of a PAC system:

- Compact and robust design
- Programmable
- Standard Ethernet (TCP/IP)
- CPU board as system controller
- Different I/O modules

## Set course for freedom

Experience with the MSX-Box-CPCI what freedom of decision-making really means:

- You select the components of your PAC system: The MSX-Box-CPCI is based only on reliable standard technologies like for example CompactPCI backplane. Freedom also means that you can use any of the numerous standard CompactPCI I/O boards.
- You decide, whether and when to update your operating system: Using the real-time operating system Linux with RTAI extension, no need to take care of updates. Save time and money!
- You have free access to the software down to the kernel source code: You can make extensive system adaptations and realize your own optimized measurement system.

## Boost your applications

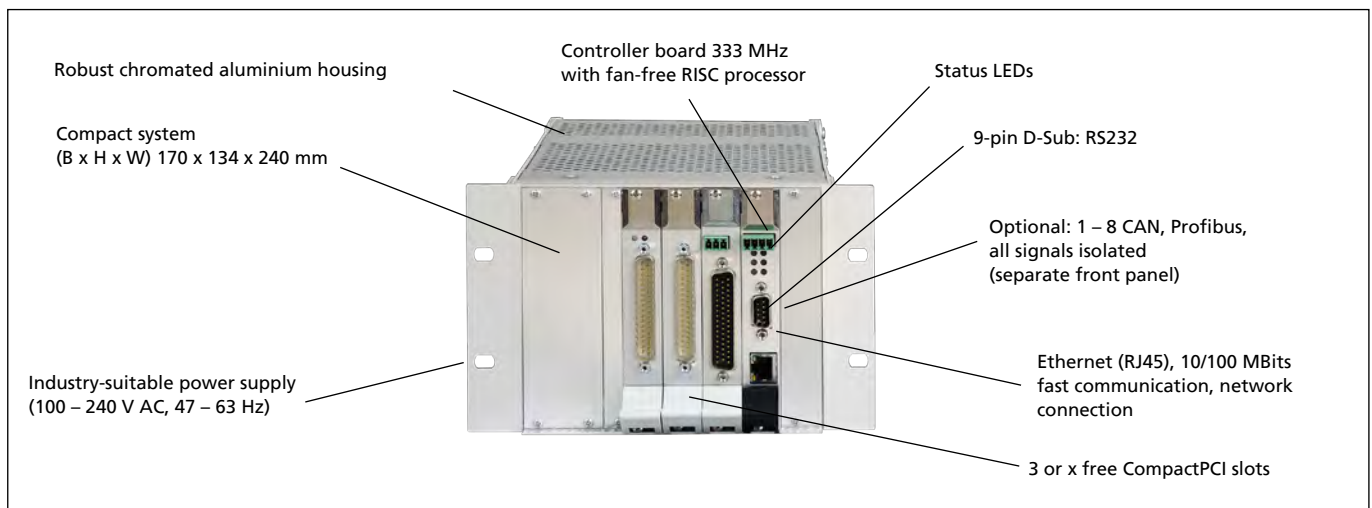
Working with the MSX-Box-CPCI that fits to your needs will boost your measurement and control applications. The MSX-Box-CPCI is supplied with development tools: You can realize even very complex tasks quite easily.

The most important advantage of a PAC system with such a transparent structure is that in case of emergency, you can react fast and efficiently.

Thanks to the long-term ADDI-DATA supply philosophy, you secure your investments for a long time. Furthermore, the fact that the MSX-Box-CPCI is supplied with free development tools limits the purchase price for serial equipment.

**Experience today how to realize your applications of tomorrow:**

[www.msx-box.com](http://www.msx-box.com)



**MSX-Box-CPCI-400****CompactPCI controller board**

|                     |   |
|---------------------|---|
| RISC processor:     | 64-bit MIPS, no fan   |
| Clock:              | 333 MHz   |
| Memory:             | 16 MB Flash, 128 MB SDRAM, option up to 256 MB  |
| Installed OS:       | Embedded RTAI Linux   |
| Standard interface: | D-Sub 9-pin: 1 x RS232  |
| Safety features:    | 24 V reset input, H-active;<br>Relay output, freely programmable, closing contact                                       |
| Optional:           | Additional front panel:<br>D-Sub 25-pin: 1 – 8 CAN, Master/Slave, isolated<br>D-Sub 9-pin: 1 x Profibus/Slave, isolated |
| Transfer rate:      | 10/100 MBits  |

**Mains supply unit**

|                 |  |
|-----------------|--|
| Input voltage:  | 100 V – 240 V, AC, 47 – 63 Hz (other voltage on request) |
| Output voltage: | 5 V (depending on the system)                            |
| Noise immunity: | Short circuit, overload, overvoltage                     |
| Connection:     | Power cable, 2 m   |

**CompactPCI backplane with 4 CompactPCI slots**

|                   |  |
|-------------------|--|
| CompactPCI slots: | Total amount: 4<br>Reserved: 1 x CompactPCI controller board<br>Free: for 3 additional CompactPCI boards |
| Specification:    | PCI specification PICMG rev. 2.1.<br>PICMG2.0 R3.0 CPCI Core Specification<br>V I/O +5V                  |

**MSX-Box-CPCI-xxxx**

Same as MSX-Box-CPCI-400, but with a CompactPCI-Backplane with x slots, incl. x-1 free slots for CompactPCI boards

**Mains supply unit**

|                 |  |
|-----------------|--|
| Input voltage:  | 100 V – 240 V, AC, 47 – 63 Hz (other voltage on request) |
| Output voltage: | 5 V, 3,3 V, ±12 V (depending on the system)              |
| Noise immunity: | Short circuit, overload, overvoltage                     |
| Connection:     | Power cable, 2 m   |

**CompactPCI backplane with x CompactPCI slots**

|  |   |
|--|---|
| Number of the CompactPCI slots according to requirements | Reserved: 1 x CompactPCI controller board,<br>further slots free for CompactPCI boards  |
| Specification:   | PCI specification PICMG rev. 2.1.<br>PICMG2.0 R3.0 CPCI Core Specification<br>PICMG 2.6 Bridging Specification (according to requirements)<br>V I/O +5V |

**For MSX-Box-CPCI-400 and -xxxx****Extensive software support**

Free development tools (GNU compiler, Cygwin, samples in source code ...), Knoppix Live-DVD development environment.

**Housing**

|                                 |   |
|---------------------------------|---|
| Material:                       | Chromated aluminium   |
| Heat dissipation:               | Through programmable fan  |
| Temperature range:              | 0 – 60 °C   |
| Temperature monitoring:         | Configuration at delivery: 5 °C to 45 °C, min. and max. value programmable through software. The temperature value can be monitored. Resolution: 1 °C |
| Front openings:                 | for 3 CompactPCI boards and 1 bracket (MSX-Box-CPCI-400)<br>for x CompactPCI boards and 1 bracket (MSX-Box-CPCI-xxxx)                                 |
| Housing dimensions: (L x H x W) | 170 x 134 x 240 mm (without fan) (MSX-Box-CPCI-400)   |
| Weight:                         | approx. 2.5 kg (standard MSX-Box-CPCI-400 system)   |
| Status display:                 | 6 LEDs, incl. 4 freely programmable   |

**Optional accessories**

|        |   |
|--------|---|
| Cable: | Ethernet patch cable 2 m, shielded,<br>RJ45 connector (PC ↔ MSX-Box-CPCI) |
|--------|---|



You will find a large range of adapted CompactPCI boards on page 240

**Ordering information**

**MSX-Box-CPCI:** PAC system, incl. development tools (GNU compiler, Cygwin, source code samples, ...) and technical description

**Versions**

**MSX-Box-CPCI-400:** 4 CompactPCI slots (incl. 1 slot reserved for the controller board; 3 free slots)

**MSX-Box-CPCI-xxxx:** x CompactPCI slots (incl. 1 slot reserved for the controller board; x-1 free slot)

**Options**

**MSX-256MB:** Memory extension up to 256 MB

**MSX-Basis:** Basic equipment for the options **MSX-CAN**, **MSX-Profibus**, **MSX RTSync**

**MSX-CAN-x:** 1/2/4/8 x CAN bus, master/slave, optically isolated, incl. FB-CPCI-CAN

**MSX-Profibus:** 1 x Profibus, slave

**FB-Profibus:** FB-CPCI-Profi (please order separately)

**MSX-RTSYNC:** for the synchronisation of several MSX-Boxes (with time stamp), incl. FB-CPCI-RTSync

**On request:** further housing dimensions



# INTELLIGENT ETHERNET SYSTEMS

## Measurement and control directly in the field



The intelligent Ethernet systems of the MSX-E series are especially suited for industrial measurement, control and regulation tasks directly at the measuring point. They are mounted in robust metal housings and comply with the degrees of protection IP67/IP 65/IP 40. Furthermore, they can be used in a temperature range from -40 °C to +85 °C as they are equipped with many protective circuits. The Ethernet systems can be freely cascaded and synchronised in the µs range. Sensors can be connected directly to the measurement systems through screw connectors.

### HIGHLIGHTS

- Designed for use in the field
- ARM®9 processor for intelligent systems
- Stand-alone operating
- Easy configuration

### Driverless installation

The installation of the MSX-E systems is fast and easy: After connecting the systems just click on „import web services“ in your compiler and enter the IP address of your MSX-E system. Then open the WSDL file, where all functionalities are described. After that you can access all system functionalities without driver installation. To get remote access to the system from a distant PC, each system has a SOAP server. The data transfer is realised with the network protocol HTTP.

### Direct administration via PLC

The MSX-E systems can relieve PLCs by taking over fast measurement tasks. To administrate the systems from a PLC, the Modbus TCP Client library is available which enables a direct parameterisation of the systems, the installation of the measurement processes like for example the choice of the acquisition mode, start and stop commands or trigger functionalities and the administration and reading-out of system information.

### Easy administration with ConfigTools

ConfigTools is a user-friendly tool with which all MSX-E systems in a network can be scanned and administrated and their status visualised. It is available for 32-bit and 64-bit Windows and Linux operating systems in German, English, French and Chinese.



### ConfigTools features

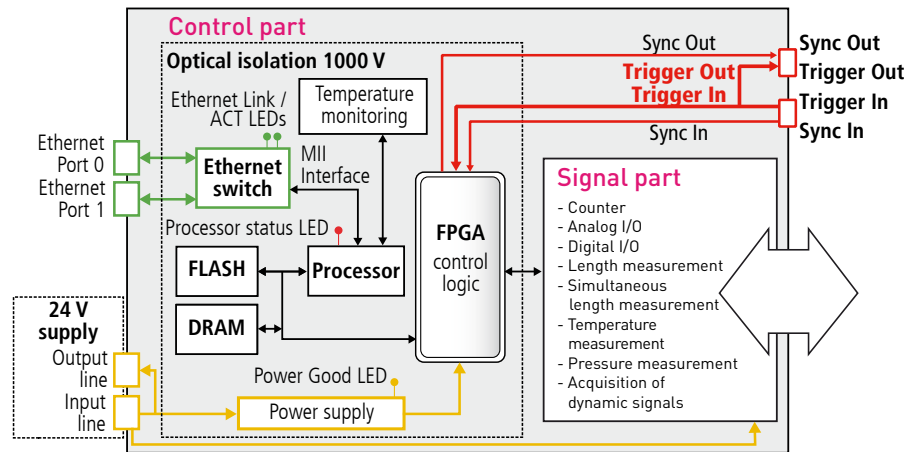
- Automatic scan of all MSX-E systems in a network
- Administration of the MSX-E systems: IP address, firmware version
- System-specific plug-ins: for example sensor calibration and visualisation
- Plug-Ins clickable / selectable via buttons: for example upload / save configuration, firmware update
- Possibility of customised plug-ins
- Changes that are made are logged
- A direct access to the website of the MSX-E systems is possible



## Measurement and control directly in the field

The MSX-E systems are organised in two parts:

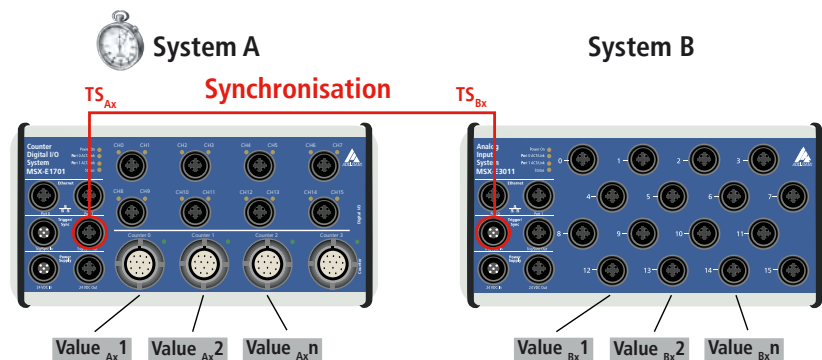
- The **control part** is common to all system types and allows a fast and reliable communication as well as signal processing.
- The **signal part** features the specific function of each system type: counter, digital I/O, analog I/O, length measurement etc.



### Time stamp

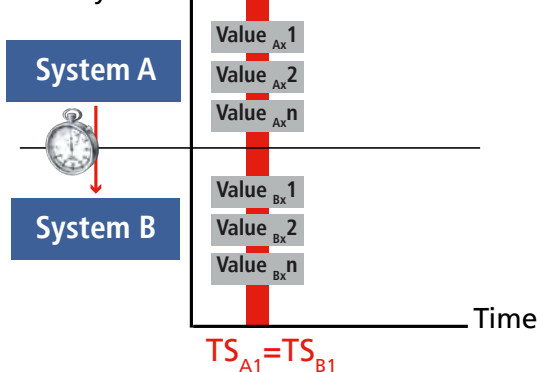
Several MSX-E systems can be synchronised with one another through a synchro connection. This allows to start a synchronous data acquisition, to generate trigger events and to synchronise the time on several MSX-E systems. Furthermore, the systems have a time stamp that logs the point in time at which the data was acquired by the system.

The combination of the **synchronisation** and **time stamp** allows a clear allocation of signals that were captured by several systems.

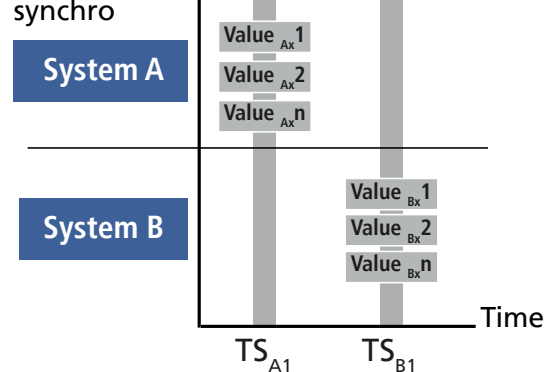


Without synchro:  $TS_{Ax} \neq TS_{Bx}$   
With synchro:  $TS_{Ax} = TS_{Bx}$

Acquisition with synchro



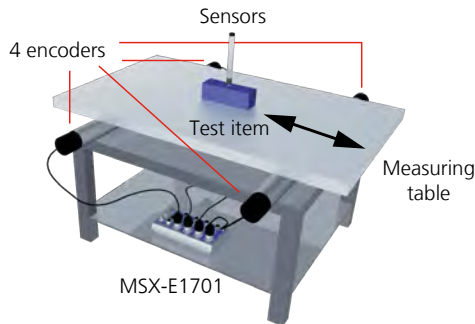
Acquisition without synchro



## Intelligent Ethernet systems: Special functions

### Synchro timer

With the „synchro timer function“ you can choose whether a synchro trigger signal shall be generated and if yes define the frequency at which it shall be generated.



During the measurement of a test item the measuring table must move. To guarantee the parallelism of the axis there are two incremental encoders placed at each side of the table and connected to the counter system MSX-E1701. The cycle for the trigger which starts the acquisition is defined in the FPGA of the system. All counters are acquired simultaneously.

### Synchro trigger

With the synchro trigger line a MSX-E system that serves as a Master can start a simultaneous acquisition on several other MSX-E systems, generate trigger events and synchronise the time.

### Event logic for digital I/O

With the event logic of the digital I/O Ethernet system MSX-E1516 status changes of the inputs and outputs can be detected and logged.

Advantages:

- The generated data set contains the time stamp as well as the event mask, i.e. which input or output has generated the event, and the status of all inputs and outputs.
- The data set can be read out for example in databases for statistical purposes or in operating and machine data logging for process control.
- The “polling” on the inputs is not necessary anymore.
- Status changes are also registered when there is no Ethernet connection. The according data sets (events) can be read out as soon as the Ethernet connection is available again.

See more examples on [www.addi-data.com](http://www.addi-data.com)

### Function generator with analog outputs

The analog output system MSX-E3511 can generate up to 8 different analog signal curves like for example trapezoid signals, sine curves or sawtooth curves. Thus for example real processes or measuring processes can be simulated and automatic test processes can be realised at test benches.

## Customisation

### Hardware combination

Each Ethernet system has its specific functionality and can be freely combined with the other system types. Through synchronisation and cascading the systems work together fast and reliably. Create your own system combination according to your requirements!

### Development mode

With the Development mode of the MSX-E systems you can customise your measurement, control and regulation applications to fit your requirements. The programs run directly on the MSX-E systems, which has two advantages: external PCs are relieved and you can process data freely according to your requirements. This helps you to improve the efficiency of your processes and to secure your investments.

### Software tools

The MSX-E Ethernet systems come with a CD with samples for .NET, C, LabVIEW, etc. and technical descriptions. For applications that run in the development mode we provide you with a Live-DVD including numerous free development tools and a cross compiler for ARM. The Live-DVD is based on the Eclipse development environment and the Ubuntu distribution.

### Firmware adaptations

The functionalities of the MSX-E systems can be extended through a change in the firmware. Calculations like for example calculation of the average value, data conversion or digital filter etc. can be implemented.

### Our service: We develop your applications

Save time and resources without forgoing the advantages of a customised solution.

Describe us your requirements and we will take care of the programming..

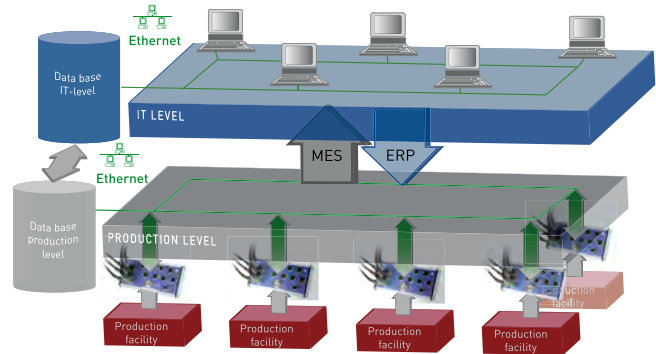
# Measurement, Control, Regulation.

Discover the wide range of applications of the intelligent Ethernet systems!

## Process optimisation and monitoring

The intelligent Ethernet systems MSX-E allow the direct connection to MES and ERP systems. The MSX-E systems acquire data directly at the measuring point, convert raw data into physical values and transfer them via the company network into the MES systems on the IT level.

Thanks to their integrated intelligence, the MSX-E systems can, in stand-alone operating mode, transfer measurement values, i.e. „meaningful” data and not raw data, directly to the MES.

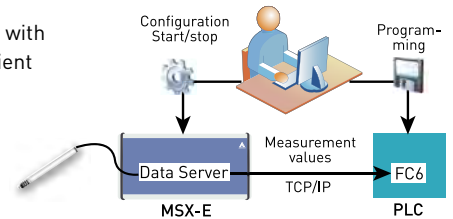


## Extend the functionality range of PLCs with MSX-E systems

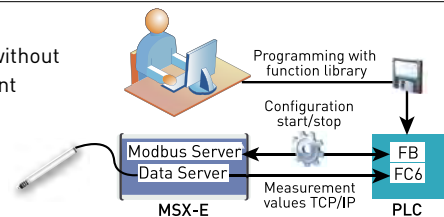
The MSX-E systems can be connected via Ethernet directly to a PLC and thus significantly extend its functionality. The actual measurement task is parameterised and stored on the systems via the website. With the autostart function, the systems load the measurement settings after booting and execute them independently, which makes additional programming unnecessary. The PLC accesses the data and stores it in a data block.

**New!** The Ethernet systems of the MSX-E series can now be managed directly from a PLC by means of a library. Frames enable the PLC to directly parameterise the MSX-E systems, to read system information and to start or stop measurements.

PLC connection with Modbus TCP Client Library

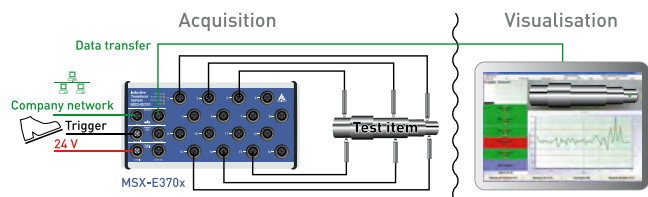


**New!** PLC connection without Modbus TCP Client Library (option)



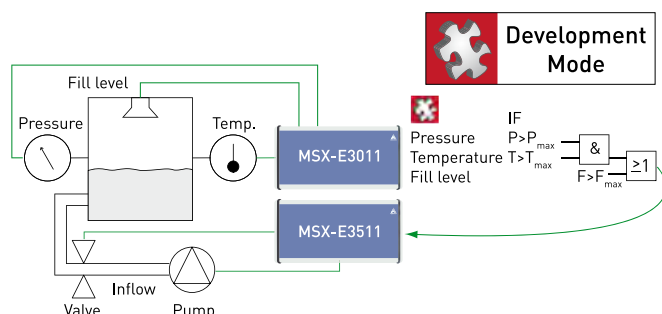
## Data measurement and visualisation

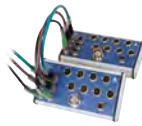
For the visualisation of data acquired via the intelligent Ethernet systems MSX-E, ADDI-DATA offers two solutions: the software procella® by Q-DAS and SPC.kompakt by ProNES. There is no need for programming a connection to the hardware. The values acquired are directly recorded and displayed by procella® or SPC.kompakt. The graphical display allows the operator to distinguish fast and reliably between „good” and „incorrect” parts.



## Stand-alone applications

The MSX-E systems feature a Development Mode which allows to realise and execute applications directly on the MSX-E systems. The MSX-E systems can access other MSX-E systems or any other Ethernet hardware through the Ethernet switch. The connection via standard Ethernet allows to realise complex distributed measurement and control tasks on site, close to the test item. Such stand-alone applications would be suitable for fill level monitoring and regulation tasks.





## Overview of the Ethernet systems

| Overview<br>of the Ethernet<br>systems  | Digital<br>I/O, 24 V   |                | Multifunction counter |                                    |                                     |                        |   | Analog<br>I/O   |                   | Analog<br>input                 |                |           | Analog<br>output |                     | Tempera-<br>ture meas-<br>urement |
|---|--|----------------|-----------------------|------------------------------------|-------------------------------------|------------------------|---|---|-------------------|---------------------------------|----------------|-----------|------------------|---------------------|-----------------------------------|
|   | MSX-E1516  | MSX-E1516- NPN | MSX-E1701             | MSX-E1711                          | MSX-E1721                           | New!<br>MSX-E1731      | New!<br>MSX-E1741-1VPP  | MSX-E3121   | New!<br>MSX-E3122 | MSX-E3011                       | MSX-E3021      | MSX-E3027 | MSX-E3511        | New!<br>MSX-E3511-C |                                   |
| Intelligent through ARM®9 technology  | ✓  |                | ✓                     | ✓                                  |                                     | ✓                      | ✓   | ✓   | New!              | ✓                               | ✓              |           | ✓                |                     | ✓                                 |
| Ethernet  | ✓  |                | ✓                     | ✓                                  |                                     | ✓                      | ✓   | ✓   |                   | ✓                               | ✓              |           | ✓                |                     | ✓                                 |
| Optical isolation 1000 V  | ✓  |                | ✓                     | ✓                                  |                                     | ✓                      | ✓   | ✓   |                   | ✓                               | ✓              |           | ✓                |                     | ✓                                 |
| 1 x trigger input / 1 x synchro input /<br>time synchronisation                 | ✓  |                | ✓                     | ✓                                  |                                     | ✓                      | ✓   | ✓   |                   | ✓                               | ✓              |           | ✓                |                     | ✓                                 |
| Compare logic generates synchro trigger signal                                  |  |                | ✓                     | ✓                                  |                                     | on request             | on request  | on request  |                   | on request                      | ✓              |           |                  |                     | on request                        |
| Timer function generates synchro trigger signal                                 | ✓  |                | ✓                     | ✓                                  |                                     | ✓                      | ✓   | ✓   |                   | ✓                               | ✓              |           | ✓                |                     | ✓                                 |
| Cascading   | ✓  |                | ✓                     | ✓                                  |                                     | ✓                      | ✓   | ✓   |                   | ✓                               | ✓              |           | ✓                |                     | ✓                                 |
| Degree of protection  | IP 65  |                | IP 65                 | IP 65                              |                                     | IP 65                  | IP 65   | IP 65   |                   | IP 65                           | IP 65          | IP 67     | IP 65            |                     | IP 65                             |
| Temperature range from –40 °C to +85 °C<br>(Internal temperature of the system) | ✓  |                | ✓                     | ✓                                  |                                     | ✓                      | ✓   | ✓   |                   | ✓                               | ✓              |           | ✓                |                     | ✓                                 |
| Dimensions (mm)   | 215 x 110 x 50   |                | 215 x 110 x 54        | 215 x 110 x 54                     |                                     | 215 x 110 x 50         | 215 x 110 x 54  | 260 x 140 x 50  |                   | 215 x 110 x 50                  | 215 x 110 x 50 |           | 154 x 110 x 54   |                     | 215 x 138 x 50                    |
| Digital I/O, 24 V / 5 V, status LEDs  | 16 / 5   |                | 16                    | 16                                 |                                     | 16                     |   | 32  |                   |                                 |                |           |                  |                     |                                   |
| Event logic   | ✓  |                |                       |                                    |                                     |                        |   |   |                   |                                 |                |           |                  |                     |                                   |
| Input filter configuration through software                                     | ✓  |                |                       |                                    |                                     |                        |   |   |                   |                                 |                |           |                  |                     |                                   |
| M12 female connector,<br>5-pin (for 2 inputs or outputs)                        | 8  |                | 8                     | 8                                  |                                     | 8                      |   | 1 x 37-pin,<br>D-Sub  |                   |                                 |                |           |                  |                     |                                   |
| Multifunction counter   |  |                | ✓                     | ✓                                  |                                     | ✓                      | ✓   |   |                   |                                 |                |           |                  |                     |                                   |
| Incremental counter inputs<br>(A, B, C, D Signals) M23 female connector         |  |                | 4 x 12-pin            |                                    |                                     |                        |   |   |                   |                                 |                |           |                  |                     |                                   |
| Sin/Cos counter inputs (A, B, C signals),<br>M23 female connector               |  |                |                       | 4 x<br>12-pin<br>1 V <sub>pp</sub> | 4 x<br>9-pin<br>11 µA <sub>pp</sub> |                        | ✓   |   |                   |                                 |                |           |                  |                     |                                   |
| EnDat 2.2-inputs, M12 female connector  |  |                |                       |                                    |                                     | 4 x 8-pin              |   |   |                   |                                 |                |           |                  |                     |                                   |
| 5 V inputs, RS422, 24 V inputs (opt.)   |  |                | ✓                     |                                    |                                     | ✓                      |   |   |                   |                                 |                |           |                  |                     |                                   |
| Max. input frequency  |  |                | 5 MHz                 | 250 kHz                            |                                     | 4.5 MHz<br>clock speed | 250 kHz   |   |                   |                                 |                |           |                  |                     |                                   |
| Analog input (channels)   |  |                |                       |                                    |                                     |                        | 3 diff.   | 6 diff.   |                   | 4 x 4, diff.                    |                |           |                  |                     | 16/8 diff.                        |
| Resolution  |  |                |                       |                                    |                                     |                        | 24-bit  | 24-bit  |                   | 16-bit                          |                |           |                  |                     | 24-bit                            |
| Type  |  |                |                       |                                    |                                     |                        | V / A   | V / A   |                   | V / A                           |                |           |                  |                     | Thermo cou-<br>ples / RTD         |
| Connector   |  |                |                       |                                    |                                     |                        | 63 x M12<br>female<br>5-pin   | 6 x M12<br>female<br>5-pin  |                   | 16 x M12<br>female<br>5-pin     |                |           |                  |                     | 8 x M12<br>female<br>8-pin        |
| Simultaneous acquisition  |  |                |                       |                                    |                                     |                        |   |   |                   | up to 4 channels                |                |           |                  |                     | 8 channels                        |
| Throughput  |  |                |                       |                                    |                                     |                        |   | up to 100 kHz   |                   | up to 100 kHz                   |                |           |                  |                     | up to 788 Hz                      |
| Input ranges  |  |                |                       |                                    |                                     |                        | ± 10 V, ± 1 V,<br>± 100 mV,<br>± 10 mV,<br>0-10 V, 0-1 V,<br>0-100 mV,<br>0-10 mV | ± 10 V, ± 1 V,<br>± 100 mV,<br>± 10 mV,<br>0-10 V, 0-1 V,<br>0-100 mV,<br>0-10 mV |                   | ± 5 V, ± 10 V,<br>0-5 V, 0-10 V |                |           |                  |                     |                                   |
| Current inputs (PC-Diff option): 0(4)-20 mA                                     |  |                |                       |                                    |                                     |                        | ✓   | ✓   |                   | ✓                               |                |           |                  |                     |                                   |
| Analog output, 16-Bit   |  |                |                       |                                    |                                     |                        |   | 4   |                   |                                 |                |           | 8                |                     |                                   |
| M12 female connector  |  |                |                       |                                    |                                     |                        |   | 2 x 4-pin   |                   |                                 |                |           | 8 x 5-pin        |                     |                                   |
| Output voltage: 0-10 V, ± 10 V  |  |                |                       |                                    |                                     |                        |   | ✓   |                   |                                 |                |           | ✓                |                     |                                   |
| Current outputs: 0-20 mA  |  |                |                       |                                    |                                     |                        |   | ✓   |                   |                                 |                |           | ✓                |                     |                                   |
| Length measurement  |  |                |                       |                                    |                                     |                        |   |   |                   |                                 |                |           |                  |                     |                                   |
| Number of transducers<br>(Half-Bridge, LVDT, Mahr)                              |  |                |                       |                                    |                                     |                        |   |   |                   |                                 |                |           |                  |                     |                                   |
| 5-pin M18 female connector  |  |                |                       |                                    |                                     |                        |   |   |                   |                                 |                |           |                  |                     |                                   |
| Simultaneous acquisition  |  |                |                       |                                    |                                     |                        |   |   |                   |                                 |                |           |                  |                     |                                   |
| Temperature input for Pt100   |  |                |                       |                                    |                                     |                        |   |   |                   |                                 |                |           |                  |                     |                                   |
| Page  | 36   |                | 40                    | 40                                 |                                     | 44                     | 48  | 72  | 76                | 52                              | 64             | 68        | 80               |                     | 84                                |
| Software  | Current driver list on the web: <a href="http://www.addi-data.com">www.addi-data.com</a> |                |                       |                                    |                                     |                        |   |   |                   |                                 |                |           |                  |                     |                                   |



| Pressure measurement | Force distance measurement            |                      | Acquisition of dynamic signals | Length measurement |                |                |                     | Protocol interpreter                              |
|----------------------|---------------------------------------|----------------------|--------------------------------|--------------------|----------------|----------------|---------------------|---|
| MSX-E3311            | New! MSX-E3017                        | New! MSX-E3317       | MSX-E3601                      | MSX-E3711          | MSX-E3701      | MSX-E3700      | MSX-E3701-DIO       | MSX-E7511   |
| ✓                    | ✓                                     | ✓                    | ✓                              | ✓                  | ✓              | ✓              | ✓                   | ✓   |
| ✓                    | ✓                                     | ✓                    | ✓                              | ✓                  | ✓              | ✓              | ✓                   | ✓   |
| ✓                    | ✓                                     | ✓                    | ✓                              | ✓                  | ✓              | ✓              | ✓                   | ✓   |
| ✓                    | ✓                                     |                      | ✓                              | ✓                  | ✓              | ✓              | ✓                   | ✓   |
| on request           | on request                            | on request           |                                | ✓                  |                |                | on request          | on request  |
| ✓                    | ✓                                     | ✓                    |                                | ✓                  | ✓              | ✓              | ✓                   |   |
| ✓                    | ✓                                     | ✓                    | ✓                              | ✓                  | ✓              | ✓              | ✓                   | ✓   |
| IP 65                | IP 65                                 | IP 65                | IP 65                          | IP 65              | IP 65          | IP 40          | IP 65               | IP 65   |
| ✓                    | ✓                                     | ✓                    | ✓                              | ✓                  | ✓              | ✓              | ✓                   | ✓   |
| 215 x 138 x 50       | on request                            | on request           | 215 x 110 x 50                 | 215 x 110 x 54     | 215 x 110 x 50 | 215 x 110 x 39 | 260 x 110 x 50      | 215 x 138 x 50                                    |
|                      |                                       |                      |                                |                    |                |                | 32                  |   |
|                      |                                       |                      |                                |                    |                |                |                     |   |
|                      |                                       |                      |                                |                    |                |                | ✓                   |   |
|                      |                                       |                      |                                |                    |                |                | 1 x 37-pin, D-Sub   |   |
|                      | ✓                                     | ✓                    |                                |                    |                |                |                     | Serial:<br>RS232,<br>RS422,<br>RS485,<br>20 mA CL |
|                      | ✓                                     | ✓                    |                                | 1 x 12-pin         |                |                |                     |   |
|                      | ✓                                     | ✓                    |                                |                    |                |                |                     |   |
|                      |                                       |                      |                                |                    |                |                |                     |   |
|                      |                                       |                      |                                | ✓                  |                |                |                     |   |
|                      | on request                            | on request           |                                | 5 MHz              |                |                |                     |   |
| 16/8 diff.           |                                       |                      | 8 SE, diff., ICP               |                    |                |                |                     |   |
| 24-bit               | 16-bit                                | 24-bit               | 24-bit                         |                    |                |                |                     |   |
| Strain gauges        | V / A                                 | Strain gauges        | V / A / ICP                    |                    |                |                |                     |   |
| 8 x M12 female 8-pin | 3 x M12 female 5-pin                  | 3 x M12 female 8-pin | 8 x BNC                        |                    |                |                |                     |   |
| 8 channels           | 3 channels                            | 8 channels           | up to 8 channels               |                    |                |                |                     |   |
| up to 1 kHz          | up to 100 kHz                         | up to 788 kHz        | up to 128 kHz                  |                    |                |                |                     |   |
|                      | ± 5 V,<br>± 10 V,<br>0-5 V,<br>0-10 V |                      | ± 5 V,<br>± 10 V               |                    |                |                |                     |   |
|                      | ✓                                     |                      | ✓                              |                    |                |                |                     |   |
|                      |                                       |                      |                                |                    |                |                |                     |   |
|                      |                                       |                      |                                |                    |                |                |                     |   |
|                      |                                       |                      |                                |                    |                |                |                     |   |
|                      |                                       |                      |                                | 24-bit             | 24-bit         | 24-bit         | 24-bit              |   |
|                      |                                       |                      |                                | 8                  | 4 / 8 / 16     | 4 / 8 / 16     | 16 only HB and LVDT |   |
|                      |                                       |                      |                                | 8                  | 4 / 8 / 16     | 4 / 8 / 16     | 16                  |   |
|                      |                                       |                      |                                | ✓                  |                |                |                     |   |
|                      |                                       |                      |                                | ✓                  |                |                |                     |   |
| 88                   | 56                                    | 60                   | 92                             | 96                 | 100            | 100            | 106                 | 110   |

## Common specifications for all MSX-E systems

### Voltage supply

|                             |                             |
|-----------------------------|-----------------------------|
| Nominal voltage:            | 24 V $\overline{=}$         |
| Supply voltage:             | 18-30 V                     |
| Optical isolation:          | 1000 V                      |
| Reverse voltage protection: | 1 A max. (except MSX-E3711) |

### Connectors

|               |   |
|---------------|---|
| 24 VDC input  | 1 x 5-pin M12 male connector (except MSX-E3700)   |
| 24 VDC output | 1 x 5-pin M12 female connector (except MSX-E3700) |

### Ethernet

|                    |   |                     |
|--------------------|---|---------------------|
| Interface:         | Ethernet acc. to IEEE802.3 specification  |                     |
| Number of ports:   | 2   |                     |
| Cable length:      | 150 m                                     | max. at CAT5E UTP   |
| Bandwidth:         | 10 Mbps                                   | auto-negotiation    |
|                    | 100 Mbps                                  | auto-negotiation    |
| Protocol:          | 10Base-T                                  | IEEE802.3 compliant |
|                    | 100Base-TX                                | IEEE802.3 compliant |
| Optical isolation: | 1000 V                                    |                     |
| MAC address:       | 00:0F:6C:##:##:##, unique for each device |                     |

### Connectors

|           |  |
|-----------|--|
| Ethernet: | 2 x 4-pin female connector, D-coded M12 for Port 0 and Port 1 (except MSX-E3700) |
|-----------|--|

### Trigger

|                             |                          |
|-----------------------------|--------------------------|
| Number of inputs:           | 1 trigger input          |
| Number of outputs:          | 1 trigger output         |
| Filters/protective circuit: | Low-pass/transorb diode  |
| Optical isolation:          | 1000 V                   |
| Nominal voltage:            | 24 V external            |
| Input voltage:              | 0 to 30 V                |
| Input current:              | 11 mA at 24 VDC, typical |
| Input frequency (max.):     | 2 MHz at 24 V            |

### Connectors, common with synchro

|                 |   |
|-----------------|---|
| Trigger input:  | 1 x 5-pin M12 male connector (except MSX-E3700)   |
| Trigger output: | 1 x 5-pin M12 female connector (except MSX-E3700) |

### Synchro

|                    |        |
|--------------------|--------|
| Number of inputs:  | 1      |
| Number of outputs: | 1      |
| Max. cable length: | 20 m   |
| Optical isolation: | 1000 V |
| Signal type:       | RS422  |

### Connectors, common with trigger

|                 |   |
|-----------------|---|
| Synchro input:  | 1 x 5-pin M12 male connector (except MSX-E3700)   |
| Synchro output: | 1 x 5-pin M12 female connector (except MSX-E3700) |

### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### DatabaseConnect

#### Database connection

**DatabaseConnect** is an easy-to-use database interface software which does not require any programming skills. DatabaseConnect stores measurement data which has been acquired through MSX-E Ethernet systems directly into databases via standard Ethernet. System requirements and other important product information see the datasheet on page 114.



## Accessories for the Ethernet systems

### Cables and connectors





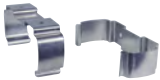






|   |  | Digital I/O, 24 V          | Multifunction counter               |                   |                   |  |
|---|--|----------------------------|-------------------------------------|-------------------|-------------------|--|
|   |  | MSX-E1516<br>MSX-E1516-NPN | MSX-E1701<br>MSX-E1711<br>MSX-E1721 | New!<br>MSX-E1731 | New!<br>MSX-E1741 |  |
| <b>Cables: Temperature range from –25 °C to +80 °C, bent cables and special length on request</b> |  |                            |                                     |                   |                   |  |
|                  | <b>Voltage supply:</b> Shielded cable, M12 5-pin female connector/open end, IP 65<br><b>CMX-20</b> (1.5 m), <b>CMX-21</b> (3 m), <b>CMX-22</b> (5 m), <b>CMX-23</b> (10 m),<br><b>CMX-29</b> (length on request)   | ✓                          | ✓                                   | ✓                 | ✓                 |  |
|                  | <b>Voltage supply – Cascading:</b><br>Shielded cable, M12 5-pin female connector/male connector, IP 65<br><b>CMX-38</b> (0.6 m), <b>CMX-30</b> (1 m), <b>CMX-31</b> (3 m), <b>CMX-32</b> (5 m), <b>CMX-39_0,3</b> (0.3 m),<br><b>CMX-39</b> (length on request)  | ✓                          | ✓                                   | ✓                 | ✓                 |  |
|                  | <b>Trigger/Synchro:</b> Shielded cable, M12 5-pin female connector/open end, IP 65<br><b>CMX-40</b> (1.5 m), <b>CMX-41</b> (3 m), <b>CMX-42</b> (5 m), <b>CMX-43</b> (10 m), <b>CMX-49</b> (length on request)   | ✓                          | ✓                                   | ✓                 | ✓                 |  |
|                  | <b>Trigger/Synchro – Cascading:</b><br>Shielded cable, M12 5-pin female connector/male connector, IP 65<br><b>CMX-58</b> (0.6 m), <b>CMX-50</b> (1 m), <b>CMX-51</b> (3 m), <b>CMX-52</b> (5 m), <b>CMX-59_0,3</b> (0.3 m),<br><b>CMX-59</b> (length on request) | ✓                          | ✓                                   | ✓                 | ✓                 |  |
|                  | <b>Ethernet:</b> CAT5E cable, M12 D-coded male connector/RJ45 connector<br><b>CMX-60</b> (2 m), <b>CMX-61</b> (5 m), <b>CMX-62</b> (10 m), <b>CMX-69</b> (length on request)   | ✓                          | ✓                                   | ✓                 | ✓                 |  |
|                | <b>Ethernet – Cascading:</b> CAT5E cable, 2 x M12 D-coded male connector<br><b>CMX-78</b> (1 m), <b>CMX-70</b> (2 m), <b>CMX-71</b> (5 m), <b>CMX-72</b> (10 m), <b>CMX-79_0,3</b> (0,3 m),<br><b>CMX-79</b> (length on request)                                 | ✓                          | ✓                                   | ✓                 | ✓                 |  |
|                | <b>Connecting peripheral equipment:</b><br>Shielded cable, M12 5-pin male connector/open end, IP 65<br><b>CMX-80</b> (1.5 m), <b>CMX-81</b> (3 m), <b>CMX-83</b> (10 m), <b>CMX-89</b> (length on request)   | ✓                          | ✓                                   | ✓                 | ✓                 |  |
|                | <b>Connecting peripheral equipment:</b><br>Shielded cable, M12 8-pin male connector/open end, IP 65<br><b>CMX-9x</b> (length on request)   |                            |                                     | ✓                 | ✓                 |  |
| <b>Connectors</b>   |  |                            |                                     |                   |                   |  |
|                | <b>SC-M12:</b><br>M12 5-pin connector for connecting open end cables   | ✓                          | ✓                                   | ✓                 | ✓                 |  |
|                | <b>SC-M12-8:</b><br>M12 8-pin connector for connecting open end cables   |                            |                                     |                   |                   |  |
|                | <b>SC-M12-8-TC:</b><br>M12 8-pin connector for connecting thermocouples with integrated cold junction compensation (CJC)   |                            |                                     |                   |                   |  |
|                | <b>SC-M12-ABGW:</b><br>M12 5-pin 90° bent connector for connecting open end cables   | ✓                          | ✓                                   | ✓                 | ✓                 |  |
|                | <b>SC-M12-BU-ABGW:</b><br>M12 5-pin 90° bent female connector for connecting open end cables   | ✓                          | ✓                                   | ✓                 | ✓                 |  |
|                | <b>SC-M12-8-ABGW:</b><br>M12 8-pin 90° bent connector for connecting open end cables   |                            |                                     |                   |                   |  |
|                | <b>SC-M12-Y-M12:</b><br>5-pin Y-splitter cable with M12 connector to 2 x M12 female connectors   | ✓                          | ✓                                   | ✓                 | ✓                 |  |
|                | <b>SC-M23:</b><br>M23 12-pin connector for the direct connection of shaft encoders, gauges, and digital transducers  |                            | ✓<br>not for<br>MSX-E1721           |                   | ✓                 |  |



| Analog I/O |                | Analog input           |           | Analog output |                  | Force distance measurement |                | Temperature measurement | Pressure measurement | Acquisition of dynamic signals | Length measurement |           |           |               | Protocol interpreter |
|------------|----------------|------------------------|-----------|---------------|------------------|----------------------------|----------------|-------------------------|----------------------|--------------------------------|--------------------|-----------|-----------|---------------|----------------------|
| MSX-E3121  | New! MSX-E3122 | MSX-E3011<br>MSX-E3021 | MSX-E3027 | MSX-E3511     | New! MSX-E3511-C | New! MSX-E3017             | New! MSX-E3317 | MSX-E3211               | MSX-E3311            | MSX-E3601                      | MSX-E3711          | MSX-E3701 | MSX-E3700 | MSX-E3701-DIO | MSX-E7511            |
| ✓          | ✓              | ✓                      | ✓         | ✓             | ✓                | ✓                          | ✓              | ✓                       | ✓                    | ✓                              | ✓                  | ✓         |           | ✓             | ✓                    |
| ✓          | ✓              | ✓                      | ✓         | ✓             | ✓                | ✓                          | ✓              | ✓                       | ✓                    | ✓                              | ✓                  | ✓         |           | ✓             | ✓                    |
| ✓          | ✓              | ✓                      | ✓         | ✓             | ✓                | ✓                          | ✓              | ✓                       | ✓                    | ✓                              | ✓                  | ✓         |           | ✓             | ✓                    |
| ✓          | ✓              | ✓                      | ✓         | ✓             | ✓                | ✓                          | ✓              | ✓                       | ✓                    | ✓                              | ✓                  | ✓         |           | ✓             | ✓                    |
| ✓          | ✓              | ✓                      | ✓         | ✓             | ✓                | ✓                          | ✓              | ✓                       | ✓                    | ✓                              | ✓                  | ✓         |           | ✓             | ✓                    |
| ✓          | ✓              | ✓                      | ✓         | ✓             | ✓                | ✓                          | ✓              | ✓                       | ✓                    | ✓                              | ✓                  | ✓         |           | ✓             | ✓                    |
| ✓          | ✓              | ✓                      | ✓         | ✓             | ✓                | ✓                          |                |                         |                      |                                |                    |           |           | ✓             |                      |
| ✓          | ✓              |                        |           |               |                  |                            | ✓              | ✓                       | ✓                    |                                |                    |           |           |               |                      |
| ✓          | ✓              | ✓                      | ✓         | ✓             | ✓                | ✓                          | ✓              | ✓                       | ✓                    | ✓                              | ✓                  | ✓         |           | ✓             | ✓                    |
|            |                |                        |           |               |                  |                            | ✓              | ✓ (RTD)                 | ✓                    |                                |                    |           |           |               |                      |
|            |                |                        |           |               |                  |                            |                | ✓ (TC)                  |                      |                                | ✓ MSX-E-3711-TC    |           |           |               |                      |
| ✓          | ✓              | ✓                      | ✓         | ✓             | ✓                | ✓                          | ✓              | ✓                       | ✓                    | ✓                              | ✓                  | ✓         |           | ✓             | ✓                    |
| ✓          | ✓              | ✓                      | ✓         | ✓             | ✓                | ✓                          | ✓              | ✓                       | ✓                    |                                |                    |           |           |               |                      |
|            |                |                        |           |               |                  | ✓                          | ✓              | not suitable for TC     | ✓                    |                                |                    |           |           |               |                      |
| ✓          | ✓              |                        |           |               |                  |                            |                |                         |                      |                                |                    |           |           |               |                      |
|            |                |                        |           |               |                  | ✓                          | ✓              |                         |                      |                                | ✓                  |           |           |               |                      |

## Accessories for the Ethernet systems

### Clips and mounting components

|   |   | Digital<br>I/O, 24 V       | Multifunction counter               |                   |                   |  |
|---|---|----------------------------|-------------------------------------|-------------------|-------------------|--|
|   |   | MSX-E1516<br>MSX-E1516-NPN | MSX-E1701<br>MSX-E1711<br>MSX-E1721 | New!<br>MSX-E1731 | New!<br>MSX-E1741 |  |
| <b>Screw connector binders for voltage supply: 3-pin binder, 5.08 mm grid</b>       |   |                            |                                     |                   |                   |  |
|    | <b>SMX-10</b><br>1-row screw connector, included in the delivery content                            |                            |                                     |                   |                   |  |
|    | <b>SMX-11</b><br>2-row screw connector  |                            |                                     |                   |                   |  |
|    | <b>SMX-12</b><br>2-row spring-cage connector with double link                                       |                            |                                     |                   |                   |  |
| <b>Screw connector binders for trigger/synchro</b>                                  |   |                            |                                     |                   |                   |  |
|    | <b>SMX-20</b><br>3-pin binders, 5.08 mm grid, included in the delivery content                      |                            |                                     |                   |                   |  |
| <b>Options / Mounting</b>   |   |                            |                                     |                   |                   |  |
|    | <b>MX-Clip</b><br>2 clips for DIN-rail mounting or for direct mounting on units                     | ✓                          | ✓                                   | ✓                 | ✓                 |  |
|   | <b>MX-Rail</b><br>Assembly equipment for DIN-rail mounting.<br><i>Please specify when ordering!</i> | ✓                          | ✓                                   | ✓                 | ✓                 |  |
|  | <b>MX-Screw</b><br>Assembly equipment for direct mounting on machines                               | ✓                          | ✓                                   | ✓                 | ✓                 |  |
| <b>Options / Protection caps</b>  |   |                            |                                     |                   |                   |  |
|  | <b>PCM-X-10:</b> 5 x protection caps for M12 connector (4 x female, 1 x male)                       | ✓                          | ✓                                   | ✓                 | ✓                 |  |
|  | <b>PCM-X-11:</b> 10 x protection caps for M18 connector   |                            |                                     |                   |                   |  |
|  | <b>PCM-X-12:</b> 1 protection cap for M23 connector   |                            | ✓                                   |                   | ✓                 |  |
|  | <b>PCM-X-13:</b> 10 x protection caps for M12 connector   | ✓                          | ✓                                   | ✓                 | ✓                 |  |

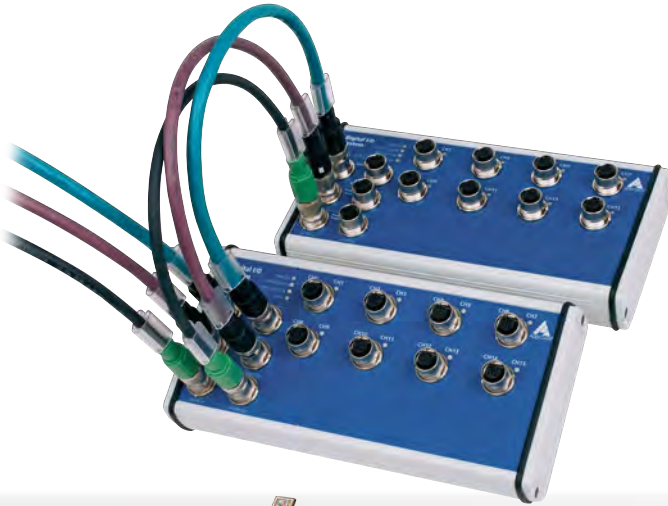


| Analog I/O |                | Analog input           |           | Analog output |                  | Force distance measurement |                | Temperature measurement | Pressure measurement | Acquisition of dynamic signals | Length measurement |           |           |               | Protocol interpreter |
|------------|----------------|------------------------|-----------|---------------|------------------|----------------------------|----------------|-------------------------|----------------------|--------------------------------|--------------------|-----------|-----------|---------------|----------------------|
| MSX-E3121  | New! MSX-E3122 | MSX-E3011<br>MSX-E3021 | MSX-E3027 | MSX-E3511     | New! MSX-E3511-C | New! MSX-E3017             | New! MSX-E3317 | MSX-E3211               | MSX-E3311            | MSX-E3601                      | MSX-E3711          | MSX-E3701 | MSX-E3700 | MSX-E3701-DIO | MSX-E7511            |
|            |                |                        |           |               |                  |                            |                |                         |                      |                                |                    |           | ✓         |               |                      |
|            |                |                        |           |               |                  |                            |                |                         |                      |                                |                    |           | ✓         |               |                      |
|            |                |                        |           |               |                  |                            |                |                         |                      |                                |                    |           | ✓         |               |                      |
|            |                |                        |           |               |                  |                            |                |                         |                      |                                |                    |           | ✓         |               |                      |
|            |                |                        |           |               |                  |                            |                |                         |                      |                                |                    |           | ✓         |               |                      |
|            |                | ✓                      | ✓         | ✓             | ✓                |                            |                |                         |                      | ✓                              | ✓                  | ✓         | ✓         | ✓             |                      |
| ✓          | ✓              | ✓                      | ✓         | ✓             | ✓                | ✓                          | ✓              | ✓                       | ✓                    | ✓                              | ✓                  | ✓         | ✓         | ✓             | ✓                    |
| ✓          | ✓              | ✓                      | ✓         | ✓             | ✓                | ✓                          | ✓              | ✓                       | ✓                    | ✓                              | ✓                  | ✓         | ✓         | ✓             | ✓                    |
| ✓          | ✓              | ✓                      | ✓         | ✓             | ✓                | ✓                          | ✓              | ✓                       | ✓                    | ✓                              | ✓                  | ✓         | ✓         | ✓             | ✓                    |
|            |                |                        |           |               |                  |                            |                |                         |                      |                                | ✓                  | ✓         | ✓         | ✓             |                      |
|            |                |                        |           |               |                  | ✓                          | ✓              |                         |                      |                                | ✓                  |           |           |               |                      |
| ✓          | ✓              | ✓                      | ✓         | ✓             | ✓                | ✓                          | ✓              | ✓                       | ✓                    |                                |                    |           |           |               |                      |

# Ethernet digital I/O system

## 16 digital I/O, 24 V, with event logic

**New!\***  
MSX-E 1516-NPN



### MSX-E1516 / MSX-E1516-NPN

16 digital I/O, 24 V, status LEDs

Configurable inputs and outputs

Event logic for the inputs and outputs

24 V digital trigger input

M12 connectors



Integrated  
Ethernet  
switch



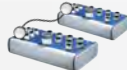
\*Operating temperature



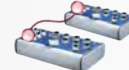
IP 65



ARM9  
Technology



Cascadable,  
can be synchronised  
in the  $\mu$ s range



Timer function for  
synchro trigger signal



on request



DatabaseConnect  
see page 114



More information on  
[www.addi-data.com](http://www.addi-data.com)

### Features

- 24 V digital trigger input
- ARM®9 32-bit processor
- 64 MB onboard SDRAM for storing data
- Robust standardized metal housing
- Power Save Mode: Reduced power consumption when no acquisition runs

### Safety features

- Status LEDs for fast error diagnostics
- Optical isolation 1000 V
- Overtemperature and reverse voltage protection
- Internal temperature monitoring
- Filters on all inputs (software-programmable)
- Short-circuit protection
- Overvoltage protection 30 V
- Electronic fuse

### Digital I/O

- 8 x 2 digital lines, 24 V, which can be parameterised as pairs of inputs or outputs
- Shutdown logic
- Watchdog for resetting the outputs to "0"
- At Power-On the outputs are set to "0"
- Electronic fuse
- Dual LED for each 24 V digital I/O with direction indication

### Interfaces

- Fast 24 V trigger input
- Ethernet switch with 2 ports
- Synchronisation/trigger In/Out
- Line in for 24 V supply and cascading

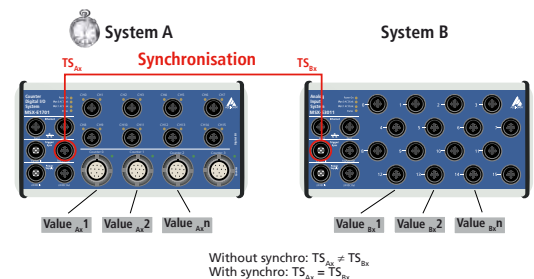
### Communication interfaces

- Web server (configuration and monitoring)
- Command server SOAP for transferring commands
- Data server (TCP/IP or UDP socket) for sending acquisition data
- Event server (TCP/IP socket) for sending system events (Diagnostics such as temperature, short-circuits ...)
- Command server Modbus TCP and Modbus (UDP) for sending commands

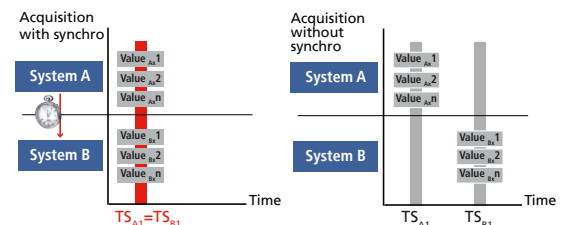
### Synchronisation/time stamp

#### Time stamp

Several MSX-E systems can be synchronised with one another in the  $\mu$ s range through a synchro connection. This allows to start a synchronous data acquisition, to generate trigger events and to synchronise the time on several MSX-E systems. Furthermore, the systems have a time stamp that logs the point in time at which the data was acquired by the system.



The combination of synchronisation and time stamp (TS) allows the clear allocation of signals that were captured by several systems.



### NOTE

#### NPN

While most sensors when activated will output a 24V signal (PNP sensors), a NPN sensor when activated switches to ground.

The switching to ground of NPN sensors can be read by the MSX-E1516-NPN system.

\* Preliminary  
Product information



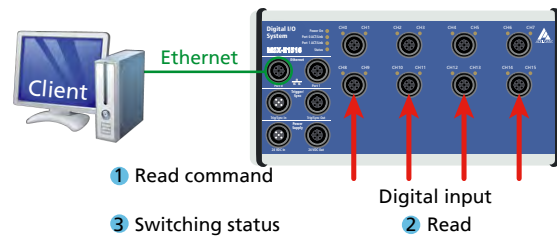


## Acquisition modes

**Acquisition modes** – There are 2 different possibilities for reading the digital inputs.

### 1. Asynchronous acquisition

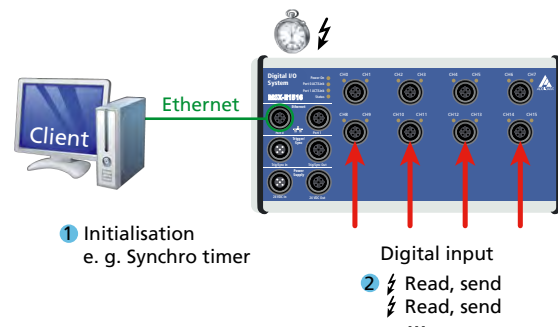
With the asynchronous acquisition, the digital inputs can be read out via SOAP or Modbus function. For each function call, the values of one channel are transmitted.



### 2. Synchronous acquisition

With the synchronous acquisition, the inputs are first initialised and then the acquisition is parameterised. The acquisition runs automatically depending from a trigger source.

Either the 24V trigger input or a synchro trigger can be used as trigger source.



### Synchro latch

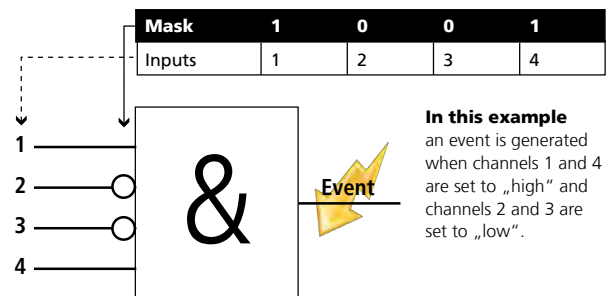
A periodic acquisition of the digital inputs is possible using the synchro timer (synchro latch). Several MSX-E systems (of same or different types) can be combined through synchro trigger. With the synchronous acquisition, as soon as there are measurement values available, they are sent to the clients via socket connection.

### Event logic

The event logic of the MSX-E1516 can be used to detect a change of edge on the digital inputs (e.g. to show that 1 unit has been produced, or that the machine runs or stands still).

This information (time stamp + event mask) is stored on the data server of the MSX-E1516 and can be read through a socket connection.

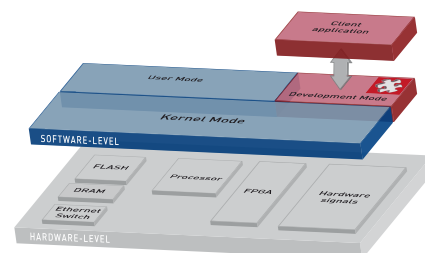
The information can be read either through an application written for this purpose or by using the DatabaseConnect software. DatabaseConnect writes the information in a database and can then evaluate it.



## Onboard programming / stand-alone operation

### Development mode

With the Development mode of the MSX-E systems you can customise your measurement, control and regulation applications to fit your requirements. The programs run directly on the MSX-E systems, which has two advantages: external PCs are relieved and you can process data freely according to your requirements. This helps you to improve the efficiency of your processes and to secure your investments.



## Safety

### Watchdog

The MSX-E1516 Ethernet system has a 16-bit watchdog which can be programmed in 3 time units ( $\mu$ s, ms, s). The watchdog is used for automatically resetting the digital outputs to 0 V after a defined time in order e. g. to switch off actuators if an error has occurred.

**\* Preliminary product information**

## ConfigTools

The **ConfigTools** program allows an easy administration of the MSX-E systems. These are automatically detected in the network. **ConfigTools** consists of common and specific functions.

In addition, with **ConfigTools**, the complete configuration of a MSX-E system can be saved and transferred to another system of the same type (clone function).

**ConfigTools** is included in the delivery.

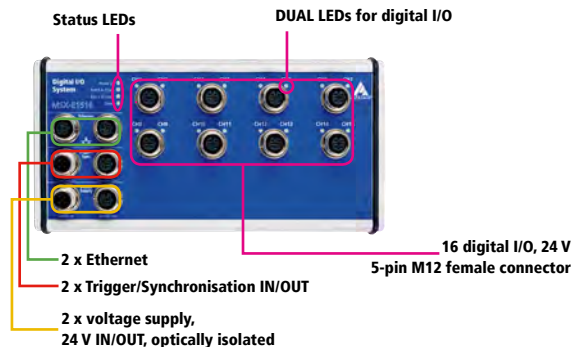
### ConfigTools functions for MSX-E1516 / MSX-E1516-NPN:

- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration
- Save/load channel configuration

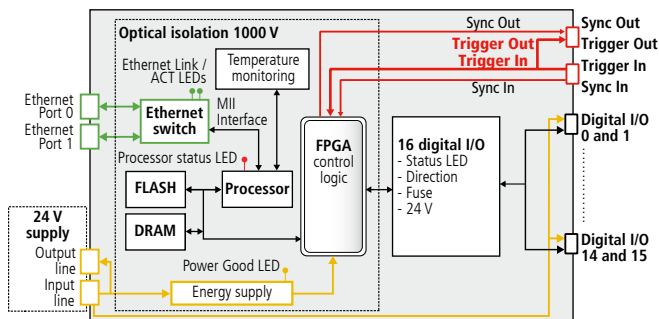
Very easy use through the „ConfigTools“ program; The MSX-E system is automatically detected in the network.



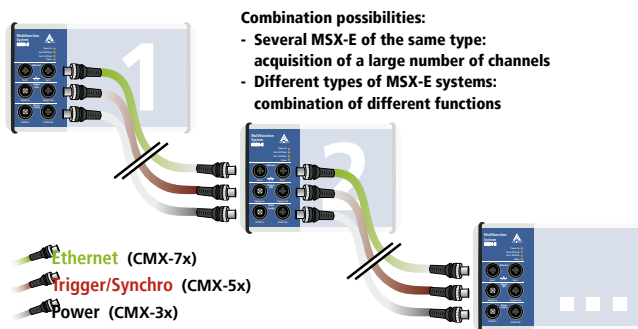
## Features



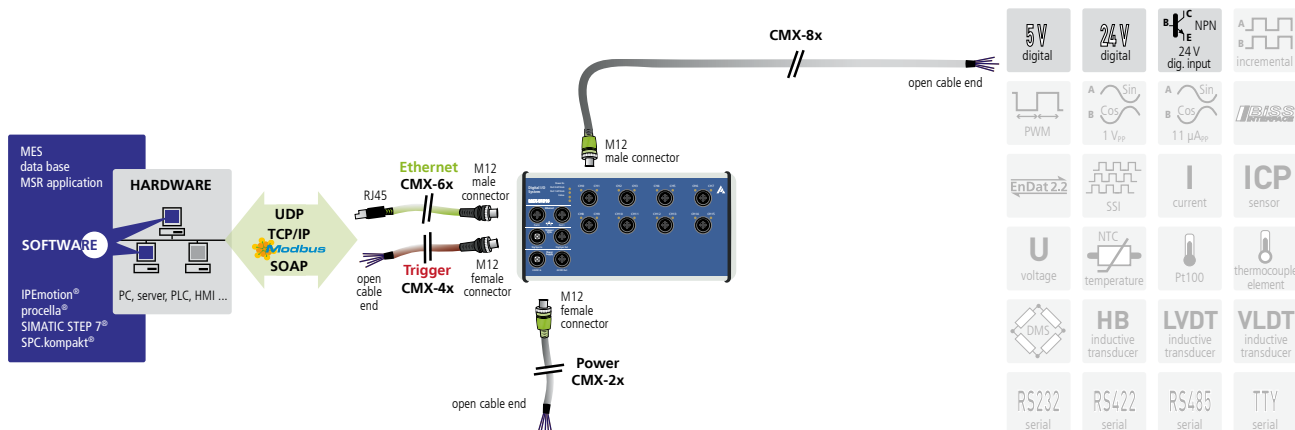
## Simplified block diagram



## Cascading



## ADDI-DATA connection technology



\* Preliminary product information



## Specifications\*

### Digital inputs

|                         |   |
|-------------------------|---|
| Number of inputs:       | 16, 2 per M12 female connector<br>Common ground acc. to IEC 1131-2                  |
| Overvoltage protection: | 30 V  |
| Optical isolation:      | 1000 V through opto-couplers  |
| Nominal voltage:        | 24 VDC  |
| Input voltage:          | 0 to 30 V   |
| Input impedance:        | > 1 MΩ  |
| Logic input levels:     | UH (max) 30 V typ.<br>UH (min) 18 V typ.<br>UL (max) 16 V typ.<br>UL (min) 0 V typ. |

### Digital outputs

|                             |  |
|-----------------------------|--|
| Number of outputs:          | 16, 2 per M12 female connector   |
| Optical isolation:          | 1000 V through opto-couplers   |
| Output type:                | High-side, load to ground acc. to IEC 1131-2   |
| Nominal voltage:            | 24 V   |
| Voltage supply:             | 18 V-30 V  |
| Current (max.):             | 1.85 A typ. for 8 channels through PTC at 20°C   |
| Output current per channel: | 500 mA max.<br>Short-circuit current per output 1.7 A max<br>Shut-down logic at 24 V, $R_{load} = 10\text{ m}\Omega$ |
| RDS ON Resistance:          | 280 mΩ max.  |
| Switch-on time:             | 100 μs max RL = 48 Ω of 80 % $V_{out}$   |
| Switch-off time:            | 150 μs max RL = 48 Ω of 10 % $V_{out}$   |
| Overtemperature (shutdown): | 135°C max. (output driver)   |
| Temperature hysteresis:     | 15°C typ. (output driver)  |
| Diagnostics:                | Common diagnostics bit for all 16 channels at<br>overtemperature of one channel                                      |

### Voltage supply, Ethernet, Trigger, Synchro

The specifications for the voltage supply, Ethernet, Trigger, Synchronisation and Electromagnetic Compatibility apply to all MSX-E systems. See page 31.

### System features

|                               |  |
|-------------------------------|--|
| Interface:                    | Ethernet acc. to specification IEEE802.3 |
| Dimensions:                   | 215 mm x 110 mm x 50 mm                  |
| Weight:                       | 900 g                                    |
| Degree of protection:         | IP 65                                    |
| Current consumption at 24 V:  | 160 mA                                   |
| Operating temperature:        | -40 °C to +85 °C                         |
| <b>Connectors for sensors</b> |  |
| For digital I/O:              | 8 x 5-pin M12 female connector           |

## Ordering information

### MSX-E1516 / MSX-E1516-NPN

Ethernet digital I/O system, 16 digital I/O, 24 V, with event logic. Incl. technical description, software drivers and ConfigTools.

#### Versions

|                       |                               |
|-----------------------|-------------------------------|
| <b>MSX-E1516:</b>     | 16 digital I/O, 24 V          |
| <b>MSX-E1516-NPN:</b> | 16 digital inputs, 24 V (NPN) |

#### Connection cables

##### Voltage supply

**CMX-2x:** Shielded cable, M12 5-pin female connector/open end, IP 65

**CMX-3x:** For cascading, shielded cable, M12 5-pin  
female connector/male connector IP 65

##### Trigger/Synchro

**CMX-4x:** Shielded cable, M12 5-pin female connector/open end, IP 65

**CMX-5x:** For cascading, shielded cable, M12 5-pin  
female connector/male connector IP 65

##### Ethernet

**CMX-6x:** CAT5E cable, M12 D-coded male connector/RJ45 connector

**CMX-7x:** For cascading, CAT5E cable, 2 x M12 D-coded male connector

##### Connection to peripherals

**CMX-8x:** Shielded cable, M12 5-pin male connector/open end, IP 65

#### Options

**S7 Modbus TCP Client Library for S7:** Easy use of the Ethernet systems  
MSX-E with PLCs

**MSX-E 5V-Trigger:** Level change of the trigger inputs and outputs to 5 V

**MX-Clip, MX-Rail** (please specify when ordering!),

**MX-Screw, PCMX-1x**

\* Preliminary product information

# Ethernet multifunction counter system

## 4 counter inputs (incremental, sin/cos), 16 digital I/O, 24 V



MSX-E1701 / MSX-E1711 / MSX-E1721

4 incremental counter inputs  
or 8 PWM outputs (MSX-E1701)

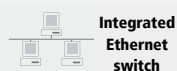
4 sin/cos counter inputs  $1 V_{pp}$  (MSX-E1711),  
 $11 \mu A_{pp}$  (MSX-E1721) with A, B, C (index) signals

16 digital I/O, 24 V, status LEDs

Configurable inputs and outputs

24 V digital trigger input

M12 and M23 connectors



Integrated  
Ethernet  
switch



\*Operating temperature



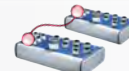
IP 65



ARM9  
Technology



Cascadable, can be  
synchronised  
in the  $\mu s$  range



Timer function or  
compare logic for  
synchro trigger signal



on request



DatabaseConnect  
see page 114



More information on  
[www.addi-data.com](http://www.addi-data.com)

### Features

- 24 V digital trigger input
- ARM9 32-bit processor
- 64 MB onboard SDRAM for storing data
- Robust standardized metal housing
- Power Save Mode: Reduced power consumption when no acquisition runs

### Safety features

- Status LEDs for fast error diagnostics
- Optical isolation • Input filters

### Counter

- 4 x 32-bit incremental counter inputs (MSX-E1701), max. 5 MHz, or 8 x PWM outputs, can be configured through firmware
- 4 x 32-bit sin/cos counter inputs with  $1 V_{pp}$  (MSX-E1711) or  $11 \mu A_{pp}$  (MSX-E1721), 250 kHz
- Voltage supply of the sensors through M23 female connector (24 V or 5 V)
- Single, double, quadruple edge analysis (MSX-E1701)
- Compare logic
- Status LEDs for incremental counter inputs

### Digital I/O

- 8 x 2 digital lines, 24 V, which can be parameterised as pairs of inputs or outputs
- Shutdown logic
- Watchdog for resetting the outputs to "0"
- At Power-On the outputs are set to "0"
- Electronic fuse
- Dual LED for each 24 V digital I/O with direction indication

### Interfaces

- Fast 24 V trigger input
- Ethernet switch with 2 ports
- Synchronisation/trigger In/Out
- Line in for 24 V supply and cascading

### Communication interfaces

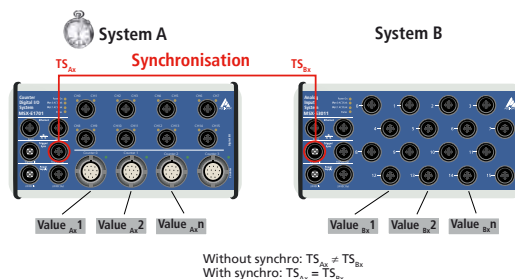
- Web server (configuration and monitoring)
- Command server SOAP for transferring commands
- Data server (TCP/IP or UDP socket) for sending acquisition data
- Event server (TCP/IP socket) for sending system events (Diagnostics such as temperature, short-circuits ...)

- Command server Modbus TCP and Modbus (UDP) for sending commands

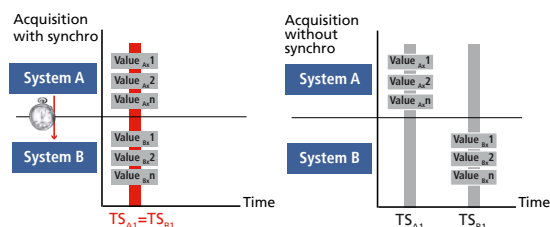
### Synchronisation/time stamp

#### Time stamp

Several MSX-E systems can be synchronised with one another in the  $\mu s$  range through a synchro connection. This allows to start a synchronous data acquisition, to generate trigger events and to synchronise the time on several MSX-E systems. Furthermore, the systems have a time stamp that logs the point in time at which the data was acquired by the system.



The combination of synchronisation and time stamp (TS) allows the clear allocation of signals that were captured by several systems.



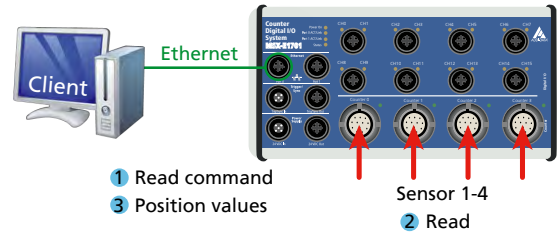


## Acquisition modes

**Acquisition modes** – There are 2 different possibilities for reading the counter inputs.

### 1. Asynchronous acquisition

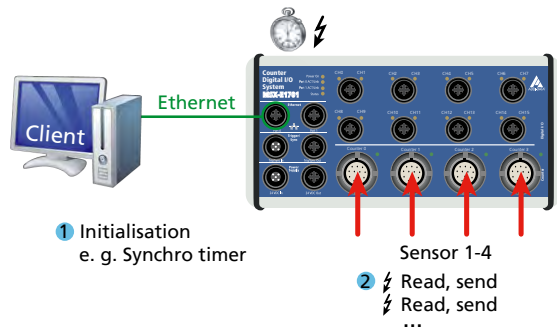
With the asynchronous acquisition, the counter inputs can be read out via SOAP or Modbus function. For each function call, the values of one channel are transmitted.



### 2. Synchronous acquisition

With the synchronous acquisition, the inputs are first initialised and then the acquisition is parameterised. The acquisition runs automatically depending from a trigger source.

Either the 24V trigger input or a synchro trigger can be used as trigger source.



### Synchro latch

A periodic acquisition of the counter inputs is possible using the synchro timer (synchro latch). Several MSX-E systems (of same or different types) can be combined through synchro trigger. With the synchronous acquisition, as soon as there are measurement values available, they are sent to the clients via socket connection.

### Compare logic

With the compare logic, a synchro-trigger signal can be generated in order to latch the counter value as soon as the counter value is equal to the compare value.

With the additional „Modulo-Mode“ (Modulo Compare), a trigger can also be generated at the n value of the compare value.

Thus it is possible, e. g. when using an encoder with 3,600 steps / revolution to obtain each degree of a measurement value (Modulo Compare = 10).

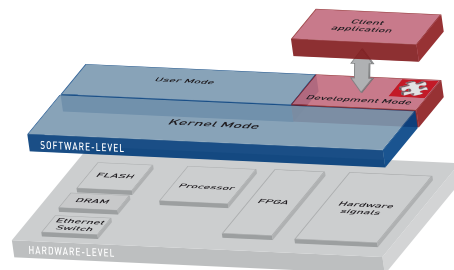
The thus generated synchro-trigger can also be used for data acquisition on further MSX-E systems.



## Onboard programming / stand-alone operation

### Development mode

With the Development mode of the MSX-E systems you can customise your measurement, control and regulation applications to fit your requirements. The programs run directly on the MSX-E systems, which has two advantages: external PCs are relieved and you can process data freely according to your requirements. This helps you to improve the efficiency of your processes and to secure your investments.



## Safety

### Watchdog

The MSX-E17x1 Ethernet system has a 16-bit watchdog which can be programmed in 3 time units ( $\mu$ s, ms, s). The watchdog is used for automatically resetting the digital outputs to 0 V after a defined time in order e. g. to switch off actuators if an error has occurred.



## ConfigTools

The **ConfigTools** program allows an easy administration of the MSX-E systems. These are automatically detected in the network. **ConfigTools** consists of common and specific functions.

In addition, with **ConfigTools**, the complete configuration of a MSX-E system can be saved and transferred to another system of the same type (clone function).

**ConfigTools** is included in the delivery.

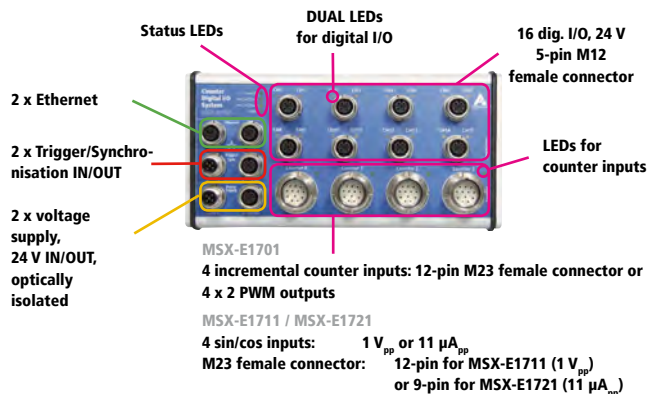
### ConfigTools functions for MSX-E1701 / MSX-E1711 / MSX-E1721:

- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration
- Save/load channel configuration

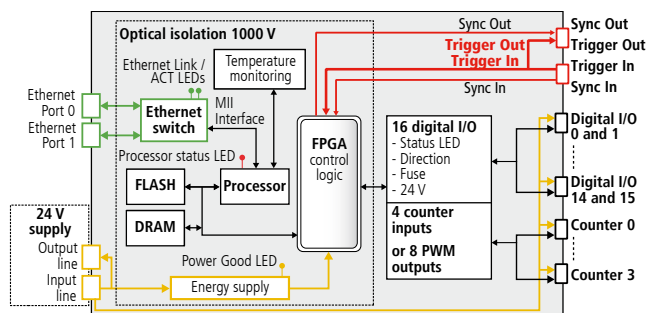
Very easy use through the „ConfigTools“ program;  
The MSX-E system is automatically detected in the network.



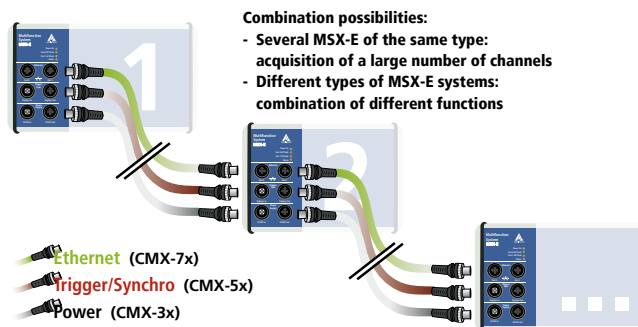
## Features



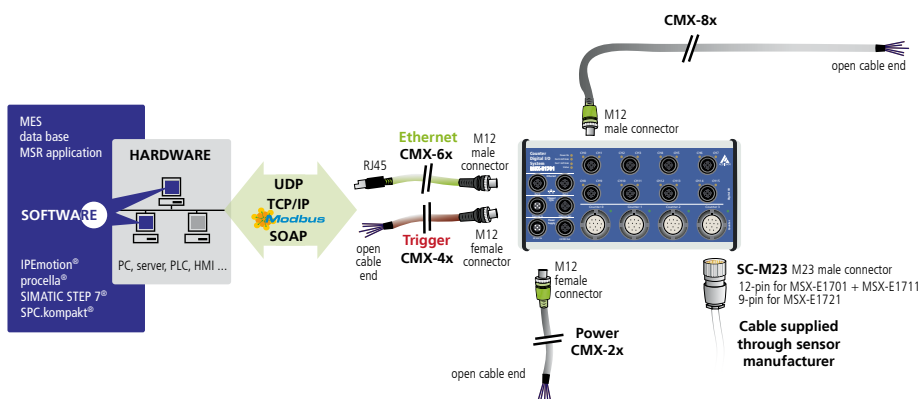
## Simplified block diagram



## Cascading



## ADDI-DATA connection technology



|              |                           |                             |                           |
|--------------|---------------------------|-----------------------------|---------------------------|
| 5V digital   | 24V digital               | NPN 24V dig. input          | incremental               |
| PWM          | Sin Cos 1 V <sub>pp</sub> | Sin Cos 11 μA <sub>pp</sub> | IMC                       |
| EnDat 2.2    | SSI                       | current                     | ICP sensor                |
| voltage      | NTC temperature           | Pt100                       | thermocouple element      |
| DMS          | HB inductive transducer   | LVDT inductive transducer   | VLDT inductive transducer |
| RS232 serial | RS422 serial              | RS485 serial                | TTY serial                |



## Specifications

### Incremental counter inputs (MSX-E1701)

Number of inputs: 4 x incremental counters each with A, B, C and D signals

#### 5 V inputs (MSX-E1701 version)

Differential inputs: Complies with the EIA standards RS422A  
 Input type: Differential or TTL (with reference voltage)  
 Common mode range: +12 / -7 V  
 Input sensitivity:  $\pm 200$  mV  
 Input hysteresis: 50 mV typ.  
 Input impedance: 12 k $\Omega$  min.  
 Max. input frequency: 5 MHz  
 „Open Circuit Fail Safe Receiver Design“  
 ESD protection: Up to  $\pm 15$  kV

#### 24 V inputs (MSX-E1701-24 version)

For 24 V encoders. Only 24 V signals can be connected.  
 Nominal voltage: 24 VDC  
 Max. input frequency: 1 MHz at nominal voltage  
 Input impedance: > 1 M $\Omega$   
 Logic input levels:  
   UH (max): 30 V typ.  
   UH (min): 18 V typ.  
   UL (max): 16 V typ.  
   UL (min): 0 V typ.  
 Voltage supply: Incremental encoder selectable, 5 V or 24 V, max. 500 mA

### PWM outputs (MSX-E1701)

Number of outputs: 8  
 Differential I/O: Complies with the EIA standards RS422A  
 Output type: Differential  
 Common mode range: +12 / -7 V  
 Input sensitivity:  $\pm 200$  mV  
 Input hysteresis: 50 mV typ.  
 Input impedance: 12 k $\Omega$  min.  
 Time base: 250 ns, 1  $\mu$ s, 1 ms, 1 s  
 Min. pulse duration: 250 ns  
 Max. output rate:  $n$ : number of pulses (Duty Cycle),  $n \geq 2$   

$$f = \frac{1}{n \cdot \text{time base}}$$

**Examples** (time base = 250 ns):

#### Duty Cycle 50%

1 high pulse, 1 low pulse,  $n=2$

$$f = \frac{1}{2 \cdot 250 \text{ ns}} = 2 \text{ MHz}$$

#### Duty Cycle 66%

2 high pulses, 1 low pulse,  $n=3$

$$f = \frac{1}{3 \cdot 250 \text{ ns}} = 1.33 \text{ MHz}$$

Voltage supply: 5 V or 24 V, max. 500 mA

### Sin/cos counter inputs (MSX-E1711, MSX-E1721)

Number of inputs: 4 x sin/cos counter inputs each with A, B, C and D signals  
 Resolution: 32-bit  
 Differential inputs:  
   - 1 V<sub>pp</sub> (MSX-E1711)  
   - 11  $\mu$ A<sub>pp</sub> (MSX-E1721)

Interpolation factor: Up to 8192  
 Max. input frequency: max. 250 kHz (at min. interpolation), on request  
 ESD protection: 2 kV

### Digital inputs

Number of inputs: max. 16, 2 per M12 female connector, common ground acc. to IEC 1131-2  
 Overvoltage protection: 30 V  
 Optical isolation: 1000 V through opto-couplers  
 Nominal voltage: 24 VDC  
 Input voltage: 0 to 30 V  
 Input impedance: > 1 M $\Omega$   
 Logic input levels:  
   UH (max): 30 V typ.   UH (min): 18 V typ.  
   UL (max): 16 V typ.   UL (min): 0 V typ.

### Digital outputs

Number of outputs: max. 16, 2 per M12 female connector  
 Optical isolation: 1000 V through opto-couplers  
 Output type: High-side, load to ground acc. to IEC 1131-2  
 Nominal voltage: 24 V  
 Voltage supply: 18 V-30 V  
 Current (max.): 1.85 A typ. for 8 channels through PTC  
 Output current / output: 500 mA max.  
 Short-circuit current / output: 1.7 A max., shut-down logic at 24 V,  $R_{load} = 10 \text{ m}\Omega$   
 RDS ON resistance: 280 m $\Omega$  max.  
 Switch-on time: 100  $\mu$ s, max.  $RL = 48 \Omega$  from 80 % V<sub>out</sub>  
 Switch-off time: 150  $\mu$ s, max.  $RL = 48 \Omega$  from 10 % V<sub>out</sub>  
 Overtemperature (shutdown): 135°C max. (output driver)  
 Temperature hysteresis: 15°C typ. (output driver)  
 Diagnostics: Common diagnostics bit for all 16 channels at overtemperature of one channel

### Voltage supply, Ethernet, Trigger, Synchro

The specifications for the voltage supply, Ethernet, Trigger, Synchronisation and Electromagnetic Compatibility apply to all MSX-E systems. See page 31.

### System features

Interface: Ethernet acc. to specification IEEE802.3  
 Dimensions (mm): 215 x 110 x 54  
 Weight: 900 g  
 Degree of protection: IP 65  
 Current consumption at 24 V: 150 mA without load  
 Operating temperature: -40 °C to +85 °C

#### Connectors for sensors

Digital I/O: 8 x 5-pin M12 female connector  
 Incremental counter inputs: 4 x 12-pin M23 female connector  
 Sin/cos counter input 1 V<sub>ss</sub>: 4 x 12-pin M23 female connector  
 Sin/cos counter input 11  $\mu$ A<sub>ss</sub>: 4 x 9-pin M23 female connector

## Ordering information

### MSX-E1701 / MSX-E1711 / MSX-E1721

Ethernet multifunction counter system, 4 counter inputs (incremental, sin/cos), 16 digital I/O, 24 V.  
 Incl. technical description, software drivers and ConfigTools.

#### Versions

**MSX-E1701:** 5 V RS422 incremental counter inputs

**MSX-E1701-24V:** 24 V incremental counter inputs

**MSX-E1711:** Sin/cos inputs, 1 V<sub>pp</sub>

**MSX-E1721:** Sin/cos inputs, 11  $\mu$ A<sub>pp</sub>

#### Connection cables

##### Voltage supply

**CMX-2x:** Shielded cable, M12 5-pin female connector/open end, IP 65

**CMX-3x:** For cascading, shielded cable, M12 5-pin female connector/male connector IP 65

##### Trigger/Synchro

**CMX-4x:** Shielded cable, M12 5-pin female connector/open end, IP 65

**CMX-5x:** For cascading, shielded cable, M12 5-pin female connector/male connector IP 65

##### Ethernet

**CMX-6x:** CAT5E cable, M12 D-coded male connector/RJ45 connector

**CMX-7x:** For cascading: CAT5E cable, 2 x M12 D-coded male connector

#### Connection to peripherals

**CMX-8x:** Shielded cable, M12 5-pin male connector/open end, IP 65

#### Options

##### S7 Modbus TCP Client Library for S7:

Easy use of the Ethernet systems MSX-E with PLCs

**MSX-E 5V-Trigger:** Level change of the trigger inputs and outputs to 5 V

**MX-Clip, MX-Rail** (Please specify when ordering!), **MX-Screw, PCM-X1x**

# Ethernet multifunction counter system

## 4 EnDat counter inputs, 16 digital I/O, 24 V

EnDat 2.2



### MSX-E1731

4 EnDat 2.2 inputs

16 digital I/O, 24 V, with status LEDs

24 V digital trigger input

M12 connectors



Integrated  
Ethernet  
switch



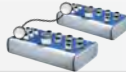
\*Operating temperature



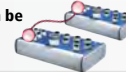
IP 65



ARM9  
Technology



Cascadable, can be  
synchronised  
in the  $\mu$ s range



On request:  
Compare logic for  
synchro trigger signal



on request



DatabaseConnect  
on request



More information at  
[www.addi-data.com](http://www.addi-data.com)

### Features

- 24 V digital trigger input
- ARM9 32-bit processor
- 64 MB onboard SDRAM for storing data
- Robust standardized metal housing
- Power Save Mode: Reduced power consumption when no acquisition runs

### Safety features

- Status LEDs for fast error diagnostics
- Optical isolation 1000 V
- Input filters

### Sensor inputs

- 8-pin M12 female connectors
- 4 x EnDat counter inputs for the acquisition of EnDat encoders
- Max. clock frequency 4.5 MHz
- Voltage supply of the EnDat encoders via M12 female connectors: 5 V  $\pm$  10%
- Output of the values as raw value or position value (mm or  $^{\circ}$ )
- Communication LED for each EnDat input

### Interfaces

- Fast 24 V trigger input
- Ethernet switch with 2 ports
- Synchronisation/trigger In/Out
- Line in for 24 V supply and cascading

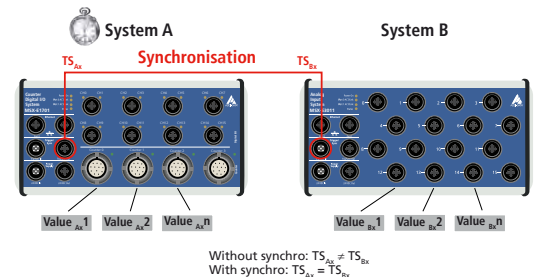
### Communication interfaces

- Web server (configuration and monitoring)
- Command server SOAP for transferring commands
- Data server (TCP/IP or UDP socket) for sending acquisition data
- Event server (TCP/IP socket) for sending system events (Diagnostics such as temperature, short-circuits ...)
- Command server Modbus TCP and Modbus (UDP) for sending commands

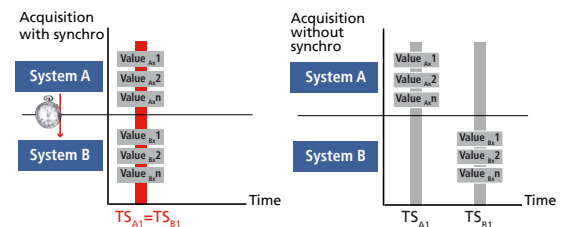
### Synchronisation/time stamp

#### Time stamp

Several MSX-E systems can be synchronised with one another in the  $\mu$ s range through a synchro connection. This allows to start a synchronous data acquisition, to generate trigger events and to synchronise the time on several MSX-E systems. Furthermore, the systems have a time stamp that logs the point in time at which the data was acquired by the system.



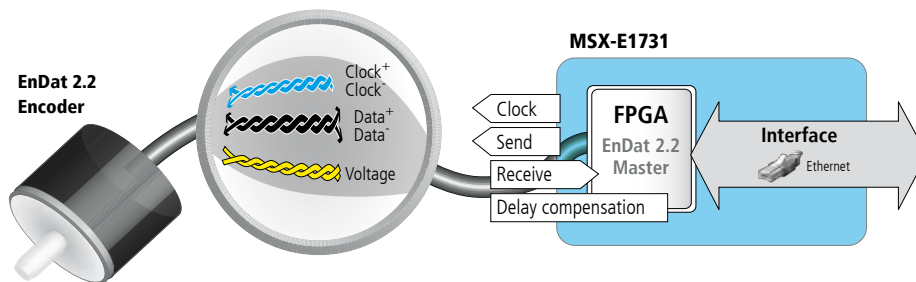
The combination of synchronisation and time stamp (TS) allows the clear allocation of signals that were captured by several systems.



## EnDat

EnDat is a bidirectional synchronous-serial interface for position measurement devices. This interface allows to read out absolute position values and parameters, to write status and initialisation registers and to transfer additional information about the position value. In addition, ADDI-DATA EnDat 2.2 solutions support the evaluation of diagnostic values and access to the OEM memory. Data is transferred serially.

- Fast data transfer
- Signal delay time compensation
- High contour accuracy
- High transmission safety
- No need for additional sensors: Evaluation (temperature, limit switch, etc.)
- Serial transmission: only 4 lines necessary (EnDat 2.2)
- Single-line wiring (M12, 8-pin)
- Automatic parameterisation through electronic type plate



## Acquisition modes

There are two different acquisition modes for EnDat sensors:

### Asynchronous acquisition

With the asynchronous acquisition, the EnDat sensors can be read out after initialisation via SOAP or Modbus function.

For each function call, one position value is transmitted.

EnDat 2.2 also allows to read out additional sensor-specific values (e. g. temperature,...)

### Synchronous acquisition

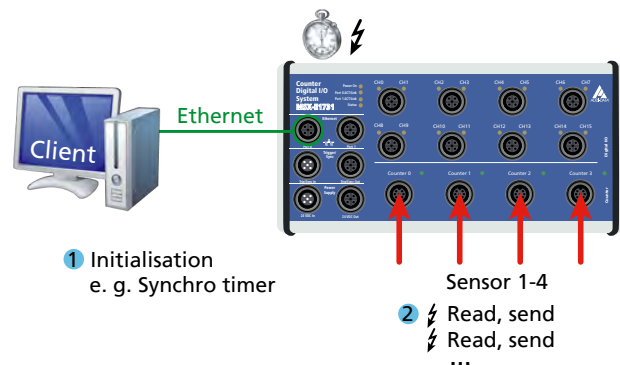
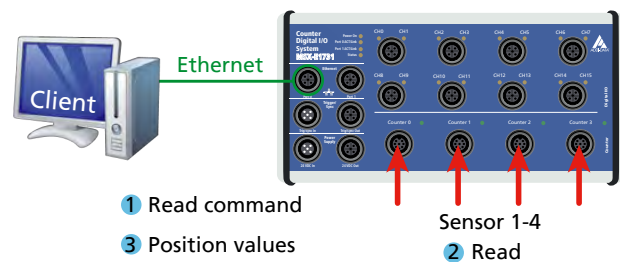
With the synchronous acquisition, at first the sensors are initialised and then the acquisition is parameterised. The acquisition runs automatically in relation to a trigger source.

Either the 24 V trigger input or a Synchro timer can be used as a trigger source.

When using the Synchro timer, a periodical acquisition of the EnDat inputs is also possible.

With the synchronous acquisition, it is possible to acquire all 4 sensor inputs of the MSX-E1731 simultaneously.

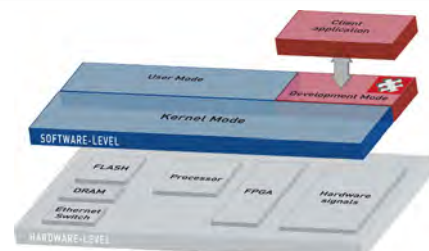
It is also possible to combine several MSX-E systems (even of different types) through the Synchro trigger. In synchronous acquisition mode, measurement data is sent to the clients as soon as it is available via a socket connection.



## Onboard programming / stand-alone operation

### Development mode

With the Development mode of the MSX-E systems you can customise your measurement, control and regulation applications to fit your requirements. The programs run directly on the MSX-E systems, which has two advantages: external PCs are relieved and you can process data freely according to your requirements. This helps you to improve the efficiency of your processes and to secure your investments.



## ConfigTools

The **ConfigTools** program allows an easy administration of the MSX-E systems. These are automatically detected in the network. **ConfigTools** consists of common and specific functions. In addition, with **ConfigTools**, the complete configuration of a MSX-E system can be saved and transferred to another system of the same type (clone function).

**ConfigTools** is included in the delivery.

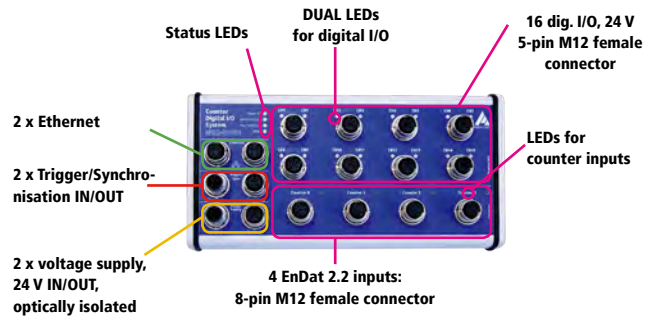
### ConfigTools functions for MSX-E1731:

- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration
- Save/load channel configuration

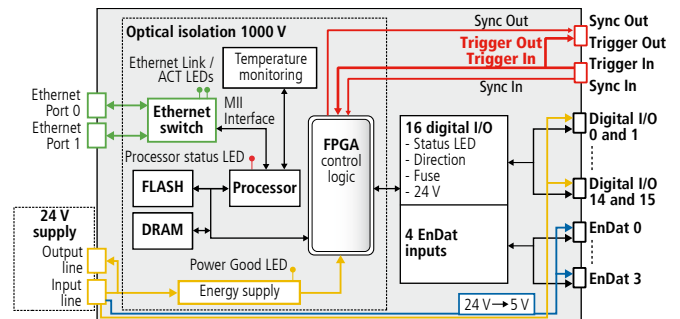
Very easy use through the „ConfigTools“ program; The MSX-E system is automatically detected in the network.



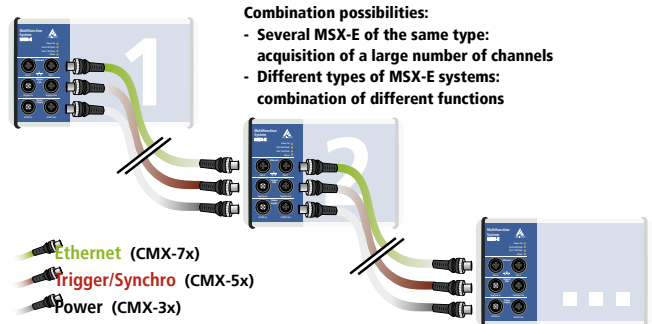
## Features



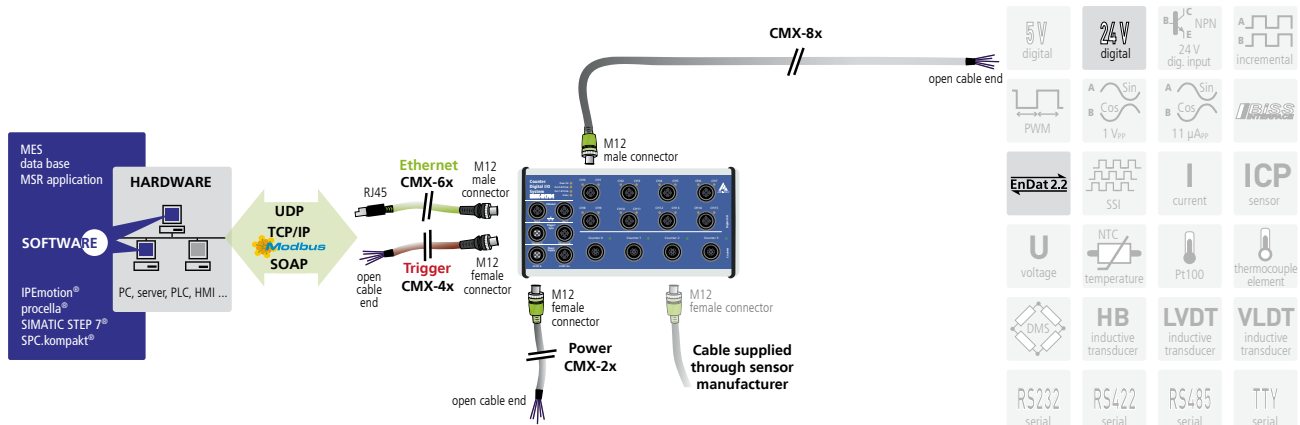
## Simplified block diagram



## Cascading



## ADDI-DATA connection technology







## Specifications

### Counter inputs

|                       |  |
|-----------------------|--|
| Input type:           | EnDat 2.2  |
| Differential inputs:  | Complies with the EIA standards RS422A                 |
| Input type:           | Differential   |
| Common mode range:    | +12 / -7 V   |
| Input sensitivity:    | ± 200 mV   |
| Input hysteresis:     | 50 mV typ.   |
| Input impedance:      | 12 kΩ min.   |
| Max. input frequency: | 5 MHz  |
| ESD protection:       | Up to ±15 kV   |
| Clock frequencies:    | 4500 kHz<br>2500 kHz<br>1500 kHz<br>900 kHz<br>500 kHz |

### Digital inputs

|                         |   |
|-------------------------|---|
| Number of inputs:       | max. 16, 2 per M12 female connector, common ground acc. to IEC 1131-2                   |
| Overvoltage protection: | 30 V  |
| Optical isolation:      | 1000 V through opto-couplers  |
| Nominal voltage:        | 24 VDC  |
| Input voltage:          | from 0 to 30 V  |
| Input impedance:        | > 1 MΩ  |
| Logic input levels:     | UH (max): 30 V typ.<br>UH (min): 18 V typ.<br>UL (max): 16 V typ.<br>UL (min): 0 V typ. |

### Digital outputs

|                          |  |
|--------------------------|--|
| Number of outputs:       | max. 16, 2 per M12 female connector          |
| Optical isolation:       | 1000 V through opto-couplers                 |
| Output type:             | High-side, load to ground acc. to IEC 1131-2 |
| Nominal voltage:         | 24 V   |
| Voltage supply:          | 18 V-30 V                                    |
| Current (max.):          | 1.85 A typical for 8 channels through PTC    |
| Output current / output: | 500 mA max.                                  |

|                                 |  |
|---------------------------------|--|
| Short-circuit current / output: | 1.7 A max.<br>Shut-down logic at 24 V,<br>Rload=10 mΩ          |
| RDS ON resistance:              | 280 mΩ max.  |
| Switch-on time:                 | 100 μs<br>max RL=48 Ω from 80 % Vout                           |
| Switch-off time:                | 150 μs<br>max RL=48 Ω from 10 % Vout                           |
| Overtemperature (shutdown):     | 135°C max. (output driver)                                     |
| Temperature hysteresis:         | 15°C typ. (output driver)                                      |
| Diagnostics:                    | Common diagnostics bits for all 16 channels at overtemperature |

### Watchdog

|                   |                          |
|-------------------|--------------------------|
| Number:           | 1                        |
| Resolution:       | 16-bit                   |
| Time base:        | μs, ms, s (programmable) |
| Time value range: | 1 to 65535               |

### Voltage supply, Ethernet, Trigger, Synchro

The specifications for the voltage supply, Ethernet, Trigger, Synchronisation and Electromagnetic Compatibility apply to all MSX-E systems. See page 31.

### System features

|                              |  |
|------------------------------|--|
| Interface:                   | Ethernet acc. to specification IEEE802.3 |
| Dimensions (mm):             | 215 x 110 x 54 mm                        |
| Weight:                      | approx. 900 g                            |
| Degree of protection:        | IP 65                                    |
| Current consumption at 24 V: | 150 mA without load                      |
| Operating temperature:       | -40 °C to +85 °C                         |

#### Connectors for sensors

|                 |                                |
|-----------------|--------------------------------|
| Digital I/O:    | 8 x 5-pin M12 female connector |
| Counter inputs: | 4 x 8-pin M12 female connector |

## Ordering information

### MSX-E1731

Ethernet multifunction counter system, 4 EnDat counter inputs, 16 digital I/O. Incl. technical description, software drivers and ConfigTools.

### Connection cables

#### Voltage supply

**CMX-2x:** Shielded cable, M12 5-pin female connector/open end, IP 65

**CMX-3x:** For cascading, shielded cable, M12 5-pin female connector/male connector IP 65

#### Trigger/Synchro

**CMX-4x:** Shielded cable, M12 5-pin female connector/open end, IP 65

**CMX-5x:** For cascading, shielded cable, M12 5-pin female connector/male connector IP 65

#### Ethernet

**CMX-6x:** CAT5E cable, M12 D-coded male connector/RJ45 connector

**CMX-7x:** For cascading: CAT5E cable, 2 x M12 D-coded male connector

### Connection to peripherals

**CMX-8x:** For the digital I/O, shielded cable, M12 5-pin male connector/open end, IP 65

### Options

#### S7 Modbus TCP Client Library for S7:

Easy use of the Ethernet systems MSX-E with PLCs

**MSX-E 5V-Trigger:** Level change of the trigger inputs and outputs to 5 V

**MX-Clip, MX-Rail** (Please specify when ordering!), **MX-Screw, PCMX-1x**

# Ethernet counter system

## 3 sin/cos counter inputs 1 V<sub>pp</sub>, 1 analog input, 24-bit

**New!\***



MSX-E1741-1VPP

3 sin/cos counter inputs 1 V<sub>pp</sub>

1 analog input

24 V digital trigger input

M12 and M23 connectors



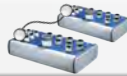
Integrated  
Ethernet  
switch



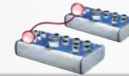
\*Operating temperature



ARM<sup>®</sup>9  
Technology



Cascadable, can be  
synchronised  
in the µs range



Timer function or  
compare logic for  
synchro trigger signal



on request



DatabaseConnect  
see page 114



More information on  
[www.addi-data.com](http://www.addi-data.com)

### Features

- 24 V digital trigger input
- ARM<sup>®</sup>9 32-bit processor
- 64 MB onboard SDRAM for storing data
- Robust standardized metal housing
- Power Save Mode: Reduced power consumption when no acquisition runs

### Safety features

- Status LEDs for fast error diagnostics
- Optical isolation 1000 V
- Input filters

### Counter

- 3 x 32 bit sin/cos counter inputs 1 V<sub>pp</sub>, 250 kHz
- Voltage supply of the sensors via M23 female connectors (5 V)
- Compare logic
- Status LED for counter inputs

### Analog input

- 1 diff./SE inputs, 24-bit, 4-pin M12 female connector
- Sampling frequency 100 kHz/channel max.

### Interfaces

- Fast 24 V trigger input
- Ethernet switch with 2 ports
- Synchronisation/trigger In/Out
- Line in for 24 V supply and cascading

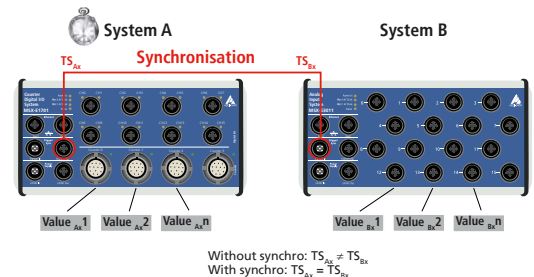
### Communication interfaces

- Web server (configuration and monitoring)
- Command server SOAP for transferring commands
- Data server (TCP/IP or UDP socket) for sending acquisition data
- Event server (TCP/IP socket) for sending system events (Diagnostics such as temperature, short-circuits ...)
- Command server Modbus TCP and Modbus (UDP) for sending commands

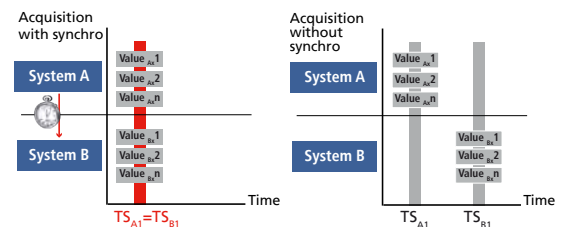
### Synchronisation/time stamp

#### Time stamp

Several MSX-E systems can be synchronised with one another in the µs range through a synchro connection. This allows to start a synchronous data acquisition, to generate trigger events and to synchronise the time on several MSX-E systems. Furthermore, the systems have a time stamp that logs the point in time at which the data was acquired by the system.



The combination of synchronisation and time stamp (TS) allows the clear allocation of signals that were captured by several systems.



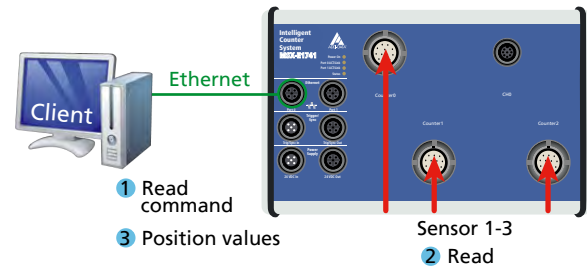
\* Preliminary product  
information

## Acquisition modes

**Acquisition modes** – There are 2 different possibilities for reading the counter inputs.

### 1. Asynchronous acquisition

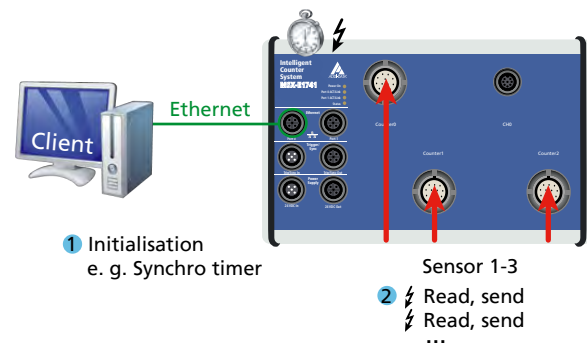
With the asynchronous acquisition, the counter inputs can be read out via SOAP or Modbus function. For each function call, the values of one channel are transmitted.



### 2. Synchronous acquisition

With the synchronous acquisition, the inputs are first initialised and then the acquisition is parameterised. The acquisition runs automatically depending from a trigger source.

Either the 24V trigger input or a synchro trigger can be used as trigger source.



### Synchro latch

A periodic acquisition of the counter inputs is possible using the synchro timer (synchro latch). Several MSX-E systems (of same or different types) can be combined through synchro trigger. With the synchronous acquisition, as soon as there are measurement values available, they are sent to the clients via socket connection.

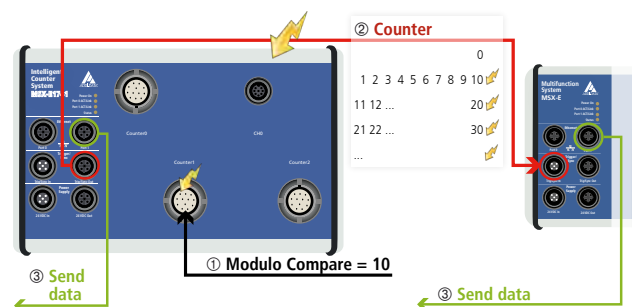
### Compare logic

With the compare logic, a synchro-trigger signal can be generated in order to latch the counter value as soon as the counter value is equal to the compare value.

With the additional „Modulo-Mode“ (Modulo Compare), a trigger can also be generated at the n value of the compare value.

Thus it is possible, e. g. when using an encoder with 3,600 steps / revolution to obtain each degree of a measurement value (Modulo Compare = 10).

The thus generated synchro-trigger can also be used for data acquisition on further MSX-E systems.



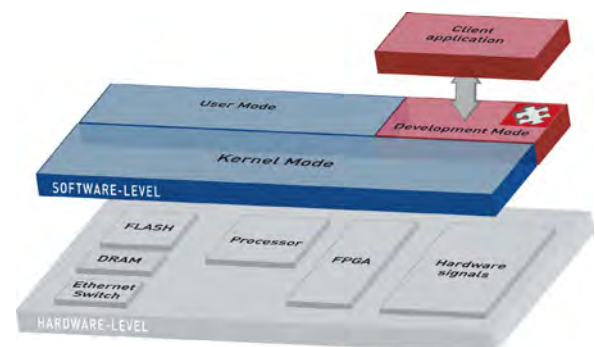
### Index logic

The Index track of the encoder can also be used as trigger source. Either the selected edge of the index signal can directly start the acquisition or a synchro-trigger can be generated and then used on further MSX-E systems. Furthermore, the index signal can be used to delete the counter channel.

## Onboard programming / stand-alone operation

### Development mode

With the Development mode of the MSX-E systems you can customise your measurement, control and regulation applications to fit your requirements. The programs run directly on the MSX-E systems, which has two advantages: external PCs are relieved and you can process data freely according to your requirements. This helps you to improve the efficiency of your processes and to secure your investments.



\* Preliminary product information

## ConfigTools

The **ConfigTools** program allows an easy administration of the MSX-E systems. These are automatically detected in the network. **ConfigTools** consists of common and specific functions.

In addition, with **ConfigTools**, the complete configuration of a MSX-E system can be saved and transferred to another system of the same type (clone function).

**ConfigTools** is included in the delivery.

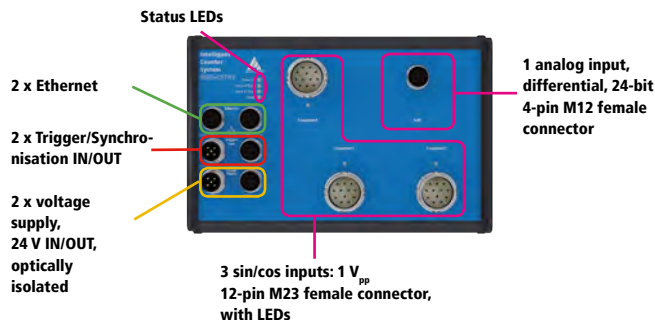
### ConfigTools functions for MSX-E1741-1VPP:

- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration

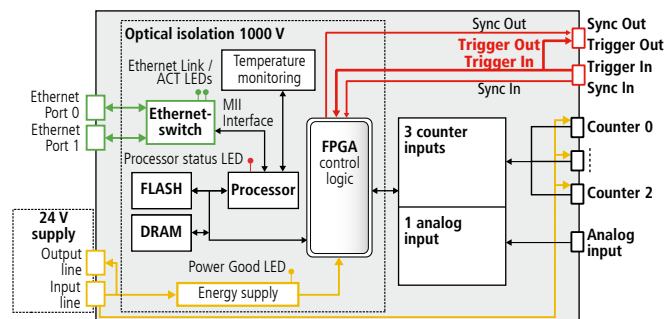
Very easy use through the „ConfigTools“ program; The MSX-E system is automatically detected in the network.



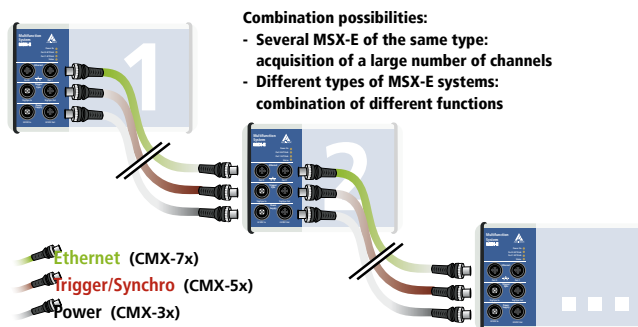
## Features



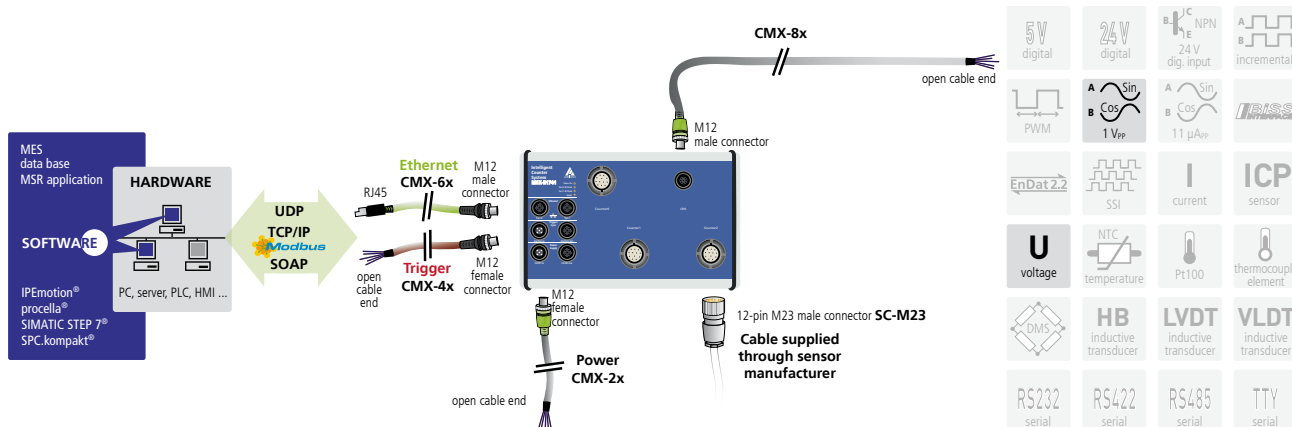
## Simplified block diagram



## Cascading



## ADDI-DATA connection technology



\* Preliminary product information



## Specifications\*

### Sin/cos counter inputs

|                       |   |
|-----------------------|---|
| Number of inputs:     | 3 x sin/cos counter inputs, each with A, B, C signals |
| Resolution:           | 32-bit  |
| Differential inputs:  | 1 V <sub>pp</sub>                                     |
| Interpolation factor: | up to 8192  |
| Max. input frequency: | max. 250 kHz (at min. interpolation)                  |
| ESD protection:       | 2 kV  |

### Analog input

|                     |  |
|---------------------|--|
| Number/type:        | 1 differential / single-ended input (software-selectable)  |
| Resolution:         | 24-bit   |
| Optical isolation:  | 1000 V   |
| Input ranges:       | ± 10 V, ± 1 V, ± 100 mV, ± 10 mV (24-bit), 0-10 V, 0-1 V, 0-100 mV, 0-10 mV (23-bit), software-programmable, current input 0(4) – 20 mA optional |
| Sampling frequency: | 100 kHz  |
| Gain:               | x1, x10, x100, software-programmable   |
| Trigger:            | digital input, synchro, software-programmable  |

### Voltage supply, Ethernet, Trigger, Synchro

The specifications for the voltage supply, Ethernet, Trigger, Synchronisation and Electromagnetic Compatibility apply to all MSX-E systems. See page 31.

### System features

|   |  |
|---|--|
| Interface:                                | Ethernet acc. to specification IEEE802.3 |
| Dimensions (mm):                          | 215 x 110 x 54                           |
| Weight:                                   | in preparation                           |
| Degree of protection:                     | IP 65                                    |
| Current consumption at 24 V:              | in preparation                           |
| Operation temperature:                    | -40 °C to +85 °C                         |
| <b>Connectors for sensors</b>             |  |
| Sin/cos counter input 1 V <sub>pp</sub> : | 3 x 12-pin M23 female connector          |
| Analog input:                             | 1 x 4-pin M12 female connector           |

## Ordering information

### MSX-E1741-1VPP

Ethernet counter system, 3 sin/cos counter inputs 1 V<sub>pp</sub>, 1 analog input, 24-bit. Incl. technical description, software drivers and ConfigTools.

#### Connection cables

##### Voltage supply

**CMX-2x:** Shielded cable, M12 5-pin female connector/open end, IP 65

**CMX-3x:** For cascading, shielded cable, M12 5-pin female connector/male connector IP 65

##### Trigger/Synchro

**CMX-4x:** Shielded cable, M12 5-pin female connector/open end, IP 65

**CMX-5x:** For cascading, shielded cable, M12 5-pin female connector/male connector IP 65

##### Ethernet

**CMX-6x:** CAT5E cable, M12 D-coded male connector/RJ45 connector

**CMX-7x:** For cascading: CAT5E cable, 2 x M12 D-coded male connector

#### Connection to peripherals

**CMX-8x:** For the analog input, shielded cable, M12 5-pin male connector/open end, IP 65

#### Options

##### S7 Modbus TCP Client Library for S7:

Easy use of the Ethernet systems MSX-E with PLCs

**MSX-E 5V-Trigger:** Level change of the trigger inputs and outputs to 5 V  
**MX-Clip, MX-Rail** (Please specify when ordering!), **MX-Screw, PCMX-1x**

\* Preliminary product information



# Ethernet analog input system

## 16 analog inputs, diff., 16-bit



### MSX-E3011

16 analog inputs, differential, 16-bit

Voltage or current inputs

Simultaneous acquisition of 4 channels  
with 100 kHz each

M12 connector

24 V trigger input



Integrated  
Ethernet  
switch



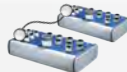
\*Operating temperature



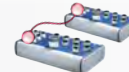
IP 65



ARM9  
Technology



Cascadable,  
can be synchronised  
in the  $\mu$ s range



On request:  
Compare logic for  
synchro trigger signal



on request



DatabaseConnect  
see page 114



More information on  
[www.addi-data.com](http://www.addi-data.com)

### Features

- 24 V digital trigger input
- ARM®9 32-bit processor
- 64 MB onboard SDRAM for storing data
- Robust standardized metal housing
- Power Save Mode: Reduced power consumption when no acquisition runs

### Analog inputs

- 16 diff. inputs, 16-bit, 5-pin M12 female connector
- Sampling frequency max. 100 kHz, up to 4 simultaneous channels
- Input ranges:  $\pm 5$  V,  $\pm 10$  V (16-bit)  
 $0-5$  V,  $0-10$  V (15-bit)
- Current inputs optional

### Safety features

- Status LEDs for fast error diagnostics
- Optical isolation • Input filters
- Overvoltage protection  $\pm 40$  V
- Internal temperature monitoring

### Interfaces

- Fast 24 V trigger input
- Ethernet switch with 2 ports
- Synchronisation/trigger In/Out
- Line in for 24 V supply and cascading

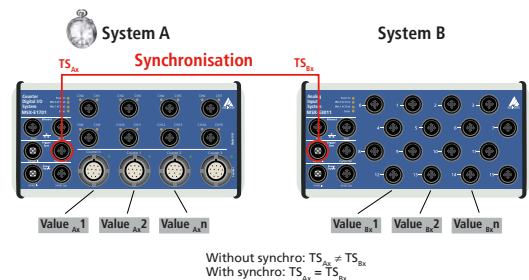
### Communication interfaces

- Web server (configuration and monitoring)
- Command server SOAP for transferring commands
- Data server (TCP/IP or UDP socket) for sending acquisition data
- Event server (TCP/IP socket) for sending system events (Diagnostics such as temperature, short-circuits ...)
- Command server Modbus TCP and Modbus (UDP) for sending commands

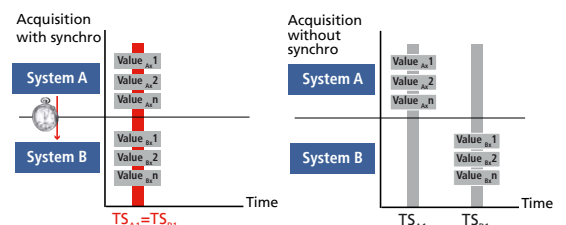
### Synchronisation/time stamp

#### Time stamp

Several MSX-E systems can be synchronised with one another in the  $\mu$ s range through a synchro connection. This allows to start a synchronous data acquisition, to generate trigger events and to synchronise the time on several MSX-E systems. Furthermore, the systems have a time stamp that logs the point in time at which the data was acquired by the system.



The combination of synchronisation and time stamp (TS) allows the clear allocation of signals that were captured by several systems.

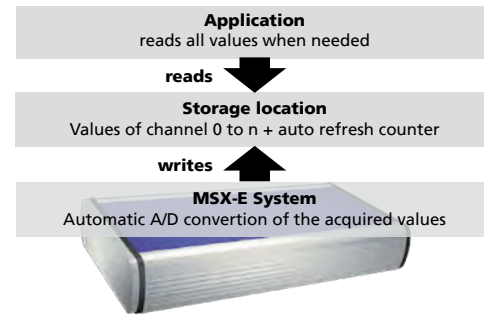




## Acquisition modes

### Auto-refresh mode

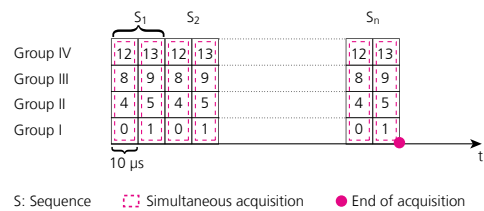
In auto-refresh mode, the measurement values are updated automatically after each acquisition. The acquisition is initialised once and the values of the channels are stored in the memory of the MSX-E Ethernet system. The client (e.g. PC, server, PLC, ...) reads the acquired values asynchronously to the acquisition through socket connection, SOAP or Modbus function. Thereby, the new value is read and the old values are overwritten. In addition to the measurement values, the auto-refresh counter can also be read, which allows to sort the measurement values chronologically. The auto-refresh mode can be combined with a hardware or synchro trigger and also allows the automatic averaging of values.



### Sequence mode

In sequence mode, a list of channels is acquired. Thereby, the single measurement rows are stored one after another. The client receives the acquired values asynchronously to the acquisition through a socket connection. In the sequence mode, the measurement values are read in chronological order, this means the oldest values are read first. The acquisition can be effected continuously, with or without delay or in combination with a hardware or synchro trigger.

Example: 8 channels, each with 10  $\mu$ s

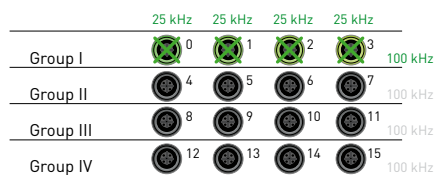


### Acquisition speed

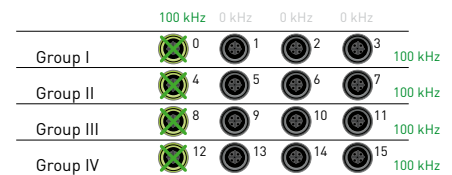
#### Different wiring

for 25 kHz/channel and 100 kHz/groups

#### Horizontal wiring (with 4 gauges/sensors)

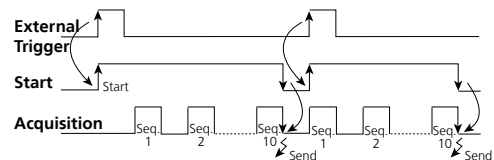


#### Vertical wiring (with 4 gauges/sensors)



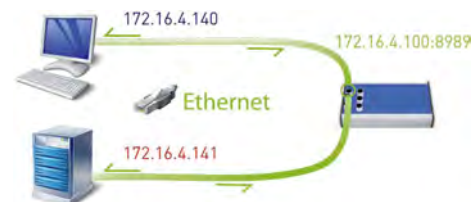
### Acquisition triggered through trigger or synchro input

**Example:** A measurement process is to be started through an external trigger impulse. For each trigger, 10 sequences are to be acquired. After the acquisition of the 10 sequences they are to be sent to the client.



### Reading data from a MSX-E system

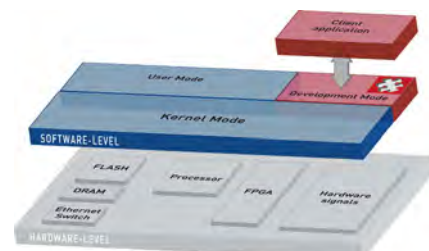
MSX-E systems are multi-client capable, this means several clients (e. g. PC, server, PLC, ...) can read the measurement values of one MSX-E system at the same time. For this, each client establishes a socket connection to the data server of the MSX-E system (port 8989). As soon as the measurement values are available on the data server, the MSX-E system transfers them to the clients.



## Onboard programming / stand-alone operation

### Development mode

With the Development mode of the MSX-E systems you can customise your measurement, control and regulation applications to fit your requirements. The programs run directly on the MSX-E systems, which has two advantages: external PCs are relieved and you can process data freely according to your requirements. This helps you to improve the efficiency of your processes and to secure your investments.



## ConfigTools

The **ConfigTools** program allows an easy administration of the MSX-E systems. These are automatically detected in the network. **ConfigTools** consists of common and specific functions.

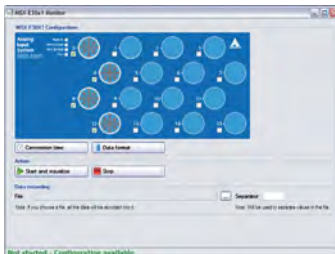
In addition, with **ConfigTools**, the complete configuration of a MSX-E system can be saved and transferred to another system of the same type (clone function).

**ConfigTools** is included in the delivery.

### ConfigTools functions for MSX-E3011:

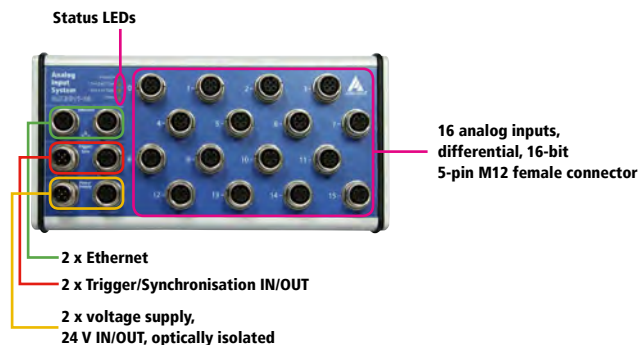
- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration
- Save/load channel configuration
- Monitor for analog inputs

Very easy use through the „ConfigTools“ program; The MSX-E system is automatically detected in the network.

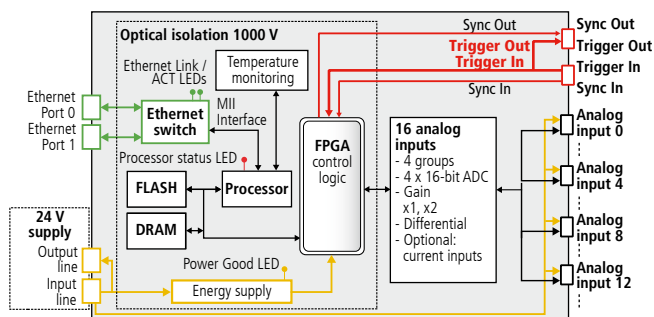


Example of monitor function: Testing the analog inputs.

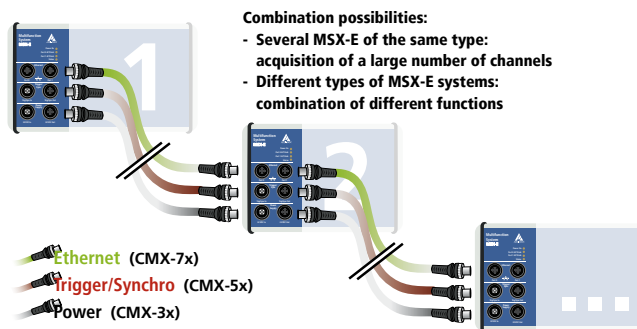
## Features



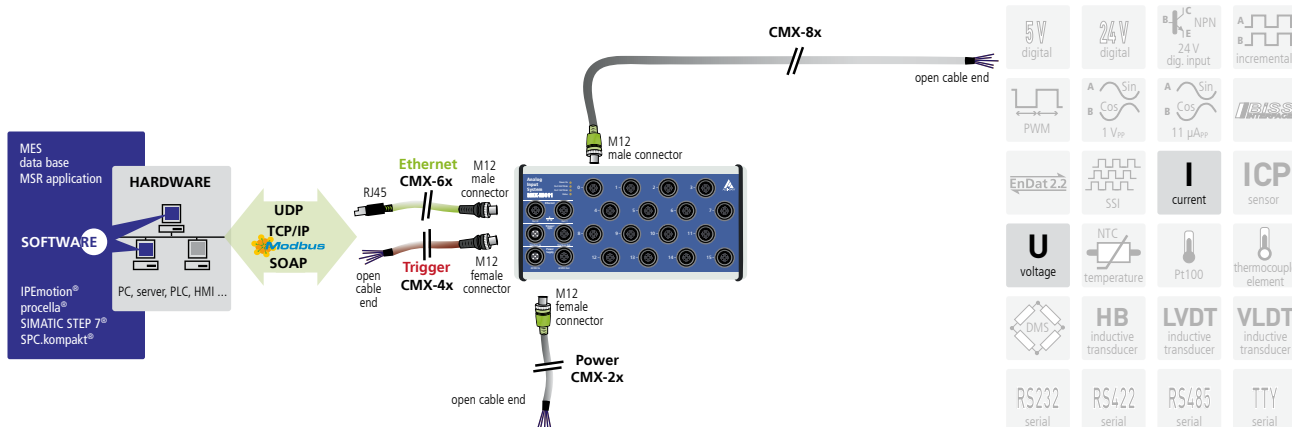
## Simplified block diagram



## Cascading



## ADDI-DATA connection technology





## Specifications

### Analog inputs

|   |   |
|---|---|
| Number/type:  | 16 differential inputs  |
| Architecture:   | 4 groups of 4 channels each<br>4-port simultaneous converter with one 4-channel multiplexer per converter |
| Resolution:   | 16-bit, SAR ADC   |
| Accuracy:   | $\pm 1.221$ mV typ. ( $\pm 4$ LSB)<br>$\pm 2.442$ mV max.   |
| Relative Accuracy (INL):  | $\pm 3$ LSB max (ADC)   |
| Optical isolation:  | 1000 V  |
| Input ranges:   | $\pm 5$ V, $\pm 10$ V (16-bit), 0-5 V, 0-10 V (15-bit)<br>software-programmable, current inputs optional  |
| Sampling frequency:   | 25 kHz per channel / 100 kHz max.   |
| Gain:   | x1, x2, software-programmable   |
| Common mode rejection:  | 80 dB min. DC up to 60 Hz (diff. amplifier)   |
| Input impedance (PGA):  | $10^9 \Omega$ // 10nF against GND   |
| Bandwidth (-3dB):   | 160 kHz limited through TP filters<br>16 Hz version<br>with differential filter                           |
| Trigger:  | digital input, synchro,<br>software-programmable  |
| Offset error:   | $\pm 1$ LSB ( $\pm 305 \mu\text{V}$ )   |
| Gain error:   | $\pm 2.5$ LSB   |
| Temperature drift:  | $2.3 \times V_{in} + 22.5 (\mu\text{V}/^\circ\text{C})$ typ.  |
| $V_{in}$ : input voltage in Volts<br>( $-10 \text{ V} \leq V_{in} \leq +10 \text{ V}$ )<br>In the temperature range:<br>from $-40^\circ\text{C}$ to $+85^\circ\text{C}$ |   |
|   | 4.5 ppm/ $^\circ\text{C}$ FSR   |

### Voltage supply, Ethernet, Trigger, Synchro

The specifications for the voltage supply, Ethernet, Trigger, Synchronisation and Electromagnetic Compatibility apply to all MSX-E systems. See page 31.

### System features

|                               |  |
|-------------------------------|--|
| Interface:                    | Ethernet acc. to specification IEEE802.3   |
| Dimensions:                   | 215 x 110 mm x 50 mm                       |
| Weight:                       | 850 g                                      |
| Degree of protection:         | IP 65                                      |
| Current consumption at 24 V:  | 180 mA                                     |
| Operating temperature:        | $-40^\circ\text{C}$ to $+85^\circ\text{C}$ |
| <b>Connectors for sensors</b> |  |
| For analog inputs             | 16 x 5-pin M12 female connector            |

## Ordering information

### MSX-E3011

Ethernet analog input system, 16 analog inputs, diff., 16-bit. Incl. technical description, software drivers and ConfigTools.

#### Connection cables

##### Voltage supply

**CMX-2x:** Shielded cable, M12 5-pin female connector/open end, IP 65

**CMX-3x:** For cascading, shielded cable, M12 5-pin female connector/male connector IP 65

##### Trigger/Synchro

**CMX-4x:** Shielded cable, M12 5-pin female connector/open end, IP 65

**CMX-5x:** For cascading, shielded cable, M12 5-pin female connector/male connector IP 65

##### Ethernet

**CMX-6x:** CAT5E cable, M12 D-coded male connector/RJ45 connector

**CMX-7x:** For cascading, CAT5E cable, 2 x M12 D-coded male connector

#### Connection to peripherals

**CMX-8x:** Shielded cable, M12 5-pin male connector/open end, IP 65

#### Options

**PC-Diff:** Current input 0(4)-20 mA for 1 input, diff.  
(please indicate the number of channels)

**S7 Modbus TCP Client Library for S7:** Easy use of the Ethernet systems MSX-E with PLCs

**MSX-E 5V-Trigger:** Level change of the trigger inputs and outputs to 5 V  
**MX-Clip, MX-Rail** (please specify when ordering!),

**MX-Screw, PCMX-1x**

# Ethernet force-distance measurement system, 1 counter input, 4 analog inputs, 24-bit, 2 dig. I/O, 24 V

**New!\***



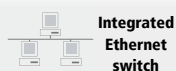
## MSX-E3017

1 counter input

4 analog inputs, diff, 24-bit

2 digital I/O, 24 V

Easy configuration: Easy mode



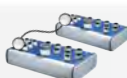
Integrated  
Ethernet  
switch



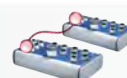
\*Operating temperature



ARM®9  
Technology



Cascadable,  
can be synchronised  
in the  $\mu$ s range



On request:  
Compare logic for  
synchro trigger signal



on request



DatabaseConnect  
on request, see page 114



More information on  
[www.addi-data.com](http://www.addi-data.com)

## Features

- 24 V digital trigger input
- ARM®9 32-bit processor
- 64 MB onboard SDRAM for storing data
- Robust standardized metal housing
- Power Save Mode: Reduced power consumption when no acquisition runs

## Safety features

- Status LEDs for fast error diagnostics
- Optical isolation • Input filters

## Counter input

- 1 incremental counter input, 32-bit,  
(on request: Sin/Cos 1 V<sub>pp</sub> or Sin/Cos 11  $\mu$ A<sub>pp</sub>)  
12-pin M23 female connector
- Max. input frequency 5 MHz

## Analog inputs

- 4 diff. inputs, 24-bit, 4-pin M12 female connector
- Sampling frequency max. 100 kHz/channel  
simultaneous on 4 channels

## Digital I/O

- 1 x 2 digital lines, 24 V, which can be parameterised as  
pairs of inputs or outputs
- Shutdown logic
- Watchdog for resetting the outputs to "0"
- At Power-On the outputs are set to "0"
- Electronic fuse
- Dual LED for each 24 V digital I/O with direction  
indication

## Interfaces

- Fast 24 V trigger input
- Ethernet switch with 2 ports
- Synchronisation/trigger In/Out
- Line in for 24 V supply and cascading

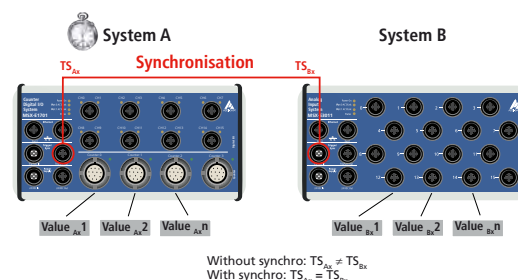
## Communication interfaces

- Web server (configuration and monitoring)
- Command server SOAP for transferring commands
- Data server (TCP/IP or UDP socket) for sending  
acquisition data
- Event server (TCP/IP socket) for sending system events  
(Diagnostics such as temperature, short-circuits ...)
- Command server Modbus TCP and Modbus (UDP) for  
sending commands

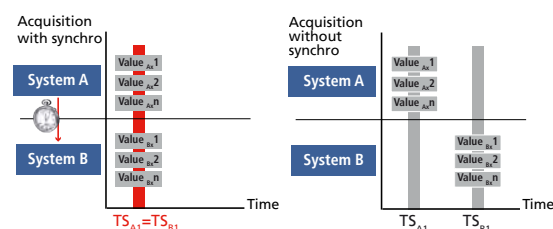
## Synchronisation/time stamp

### Time stamp

Several MSX-E systems can be synchronised with one another in the  $\mu$ s range through a synchro connection. This allows to start a synchronous data acquisition, to generate trigger events and to synchronise the time on several MSX-E systems. Furthermore, the systems have a time stamp that logs the point in time at which the data was acquired by the system.



The combination of synchronisation and time stamp (TS) allows the clear allocation of signals that were captured by several systems.



\*Preliminary  
Product information



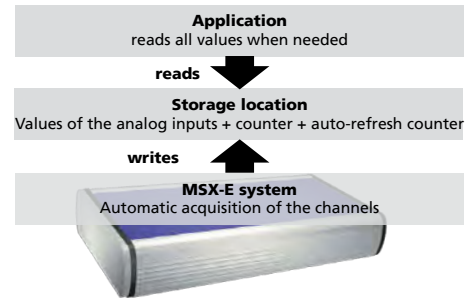


## Acquisition modes

With the MSX-E3017 system, you can effect force-distance measurements in 2 different ways: in auto-refresh mode or sequence mode. The acquisition can be done depending on a position or on time.

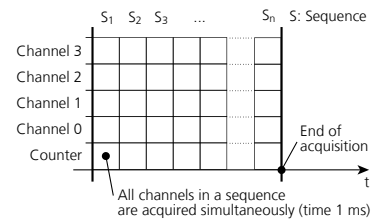
### Auto-refresh mode

In auto-refresh mode, the measurement values are updated automatically after each acquisition. The acquisition is initialised once and the values of the channels are stored in the memory of the MSX-E Ethernet system. The client (e.g. PC, server, PLC, ...) reads the acquired values asynchronously to the acquisition through socket connection, SOAP or Modbus function. Thereby, the new value is read and the old values are overwritten. In addition to the measurement values, the auto-refresh counter can also be read, which allows to sort the measurement values chronologically. The auto-refresh mode can be combined with a hardware or a synchro trigger and also allows the automatic averaging of values.



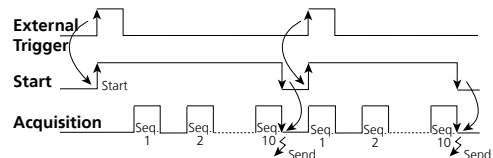
### Sequence mode

In sequence mode, a list of channels is acquired. Thereby, the single measurement rows are stored one after another. The client receives the acquired values asynchronously to the acquisition through a socket connection. In the sequence mode, the measurement values are read in chronological order, this means the oldest values are read first. The acquisition can be effected continuously, with or without delay or in combination with a hardware or synchro trigger.



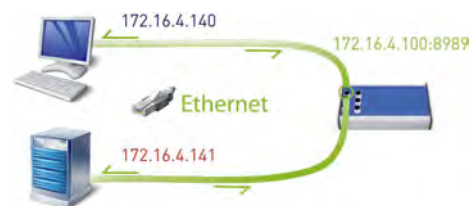
### Acquisition triggered through trigger or synchro input

**Example:** A measurement process is to be started through an external trigger impulse. For each trigger, 10 sequences are to be acquired. After the acquisition of the 10 sequences they are to be sent to the client.



### Reading data from a MSX-E system

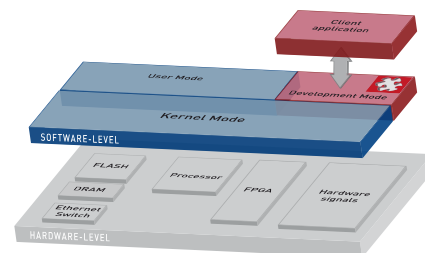
MSX-E systems are multi-client capable, this means several clients (e. g. PC, server, PLC, ...) can read the measurement values of one MSX-E system at the same time. For this, each client establishes a socket connection to the data server of the MSX-E system (port 8989). As soon as the measurement values are available on the data server, the MSX-E system transfers them to the clients.



## Onboard programming

### Development mode

With the Development mode of the MSX-E systems you can customise your measurement, control and regulation applications to fit your requirements. The programs run directly on the MSX-E systems, which has two advantages: external PCs are relieved and you can process data freely according to your requirements. This helps you to improve the efficiency of your processes and to secure your investments.



\* Preliminary product information

## ConfigTools

The **ConfigTools** program allows an easy administration of the MSX-E systems. These are automatically detected in the network. **ConfigTools** consists of common and specific functions.

In addition, with **ConfigTools**, the complete configuration of a MSX-E system can be saved and transferred to another system of the same type (clone function).

**ConfigTools** is included in the delivery.

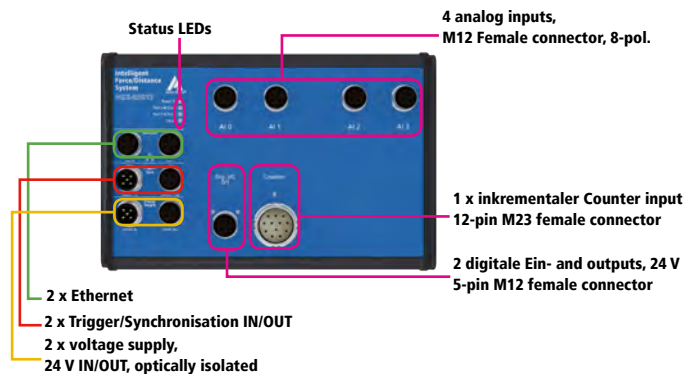
### ConfigTools functions for MSX-E3017:

- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration
- Save/load channel configuration
- Monitor for analog inputs
- Visualisation of the force-distance measurement (Easy mode)

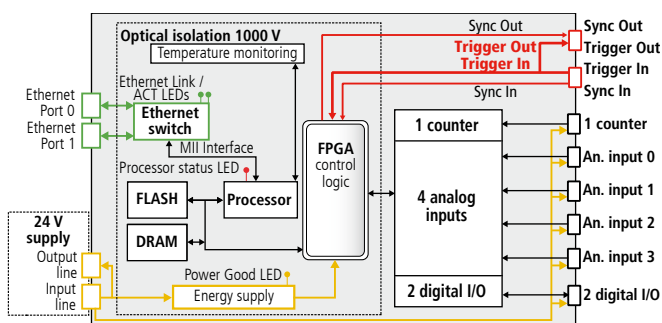
Very easy use through the „ConfigTools“ program; The MSX-E system is automatically detected in the network.



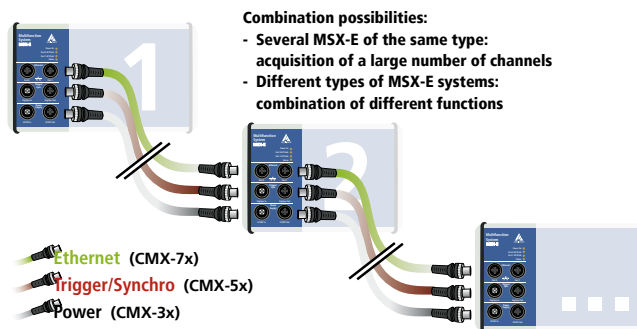
## Features



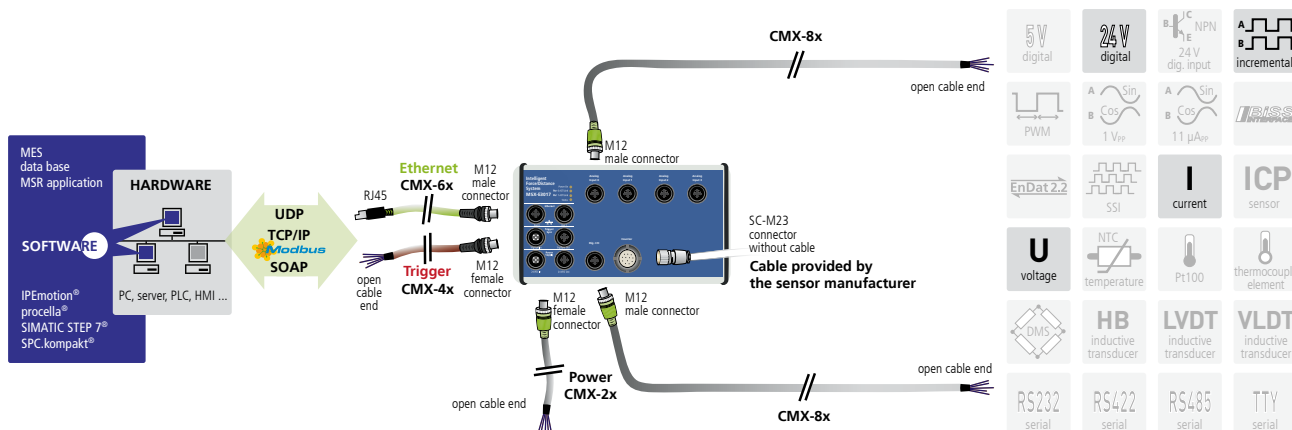
## Simplified block diagram



## Cascading



## ADDI-DATA connection technology



\* Preliminary product information



## Specifications\*

### Incremental counter

|                           |  |
|---------------------------|--|
| Number of counter inputs: | 1                                      |
| Input type:               | Differential or TTL inputs             |
| Differential inputs:      | Complies with the EIA standards RS422A |
| Common mode range:        | +12 V / -7 V                           |
| Input sensitivity:        | ± 200 mV                               |
| Input hysteresis:         | 50 mV typ.                             |
| Input impedance:          | 12 kΩ min.                             |
| Max. input frequency:     | 5 MHz at nominal voltage               |
| "Open Circuit Fail Safe   |  |
| Receiver Design"          | "1" = inputs open                      |
| ESD protection:           | Up to ±15 kV                           |
| Voltage supply            |  |
| Incremental encoder:      | 5 V or 24 V, max. 500 mA               |

### Analog inputs

|                     |  |
|---------------------|--|
| Number/type:        | 4 differential inputs, 1 A/D converter per channel   |
| Resolution:         | 24-bit, SAR ADC  |
| Optical isolation:  | 1000 V   |
| Input ranges:       | ± 10 V, ± 5 V (24-bit), 0-10 V, 0-5 V (23-Bit), software-programmable, current inputs optional |
| Sampling frequency: | 100 kHz per channel  |
| Gain:               | x1, x10, x100, x1000, software-programmable  |
| Trigger:            | digital input, synchro, software-programmable  |

### Digital inputs

|                         |   |
|-------------------------|---|
| Number of inputs:       | 2, on 1 M12 female connector<br>Common ground acc. to IEC 1131-2              |
| Overvoltage protection: | 30 V  |
| Optical isolation:      | 1000 V through opto-couplers  |
| Nominal voltage:        | 24 VDC  |
| Input voltage:          | 0 to 30 V   |
| Input impedance:        | > 1 MΩ  |
| Logic input levels:     | UH (max) 30 V typ. UH (min) 18 V typ.<br>UL (max) 16 V typ. UL (min) 0 V typ. |

### Digital outputs

|                                 |   |
|---------------------------------|---|
| Number of outputs:              | 2, on 1 M12 female connector                                |
| Optical isolation:              | 1000 V through opto-couplers                                |
| Output type:                    | High-side, load to ground acc. to IEC 1131-2                |
| Nominal voltage:                | 24 V  |
| Voltage supply:                 | 18 V-30 V   |
| Current (max.):                 | 1.85 A typical for 2 channels through PTC                   |
| Output current / output:        | 500 mA max.   |
| Short-circuit current / output: | 1.7 A max.<br>Shut-down logic at 24 V, $R_{load}=10m\Omega$ |
| RDS ON Resistance:              | 280 mΩ max.   |
| Switch-on time:                 | 100 μs<br>max RL=48 Ω at 80 % $V_{out}$                     |
| Switch-off time:                | 150 μs<br>max RL=48 Ω at 10 % $V_{out}$                     |
| Overtemperature (shutdown):     | 135°C max. (output driver)                                  |
| Temperature hysteresis:         | 15°C typ. (output driver)                                   |
| Diagnostics:                    | Common diagnostic bit at overtemperature                    |

### Watchdog:

|                   |                          |
|-------------------|--------------------------|
| Number:           | 1                        |
| Resolution:       | 16-bit                   |
| Time base:        | μs, ms, s (programmable) |
| Time value range: | 1 to 65535               |

### Voltage supply, Ethernet, Trigger, Synchro

The specifications for the voltage supply, Ethernet, Trigger, Synchronisation and Electromagnetic Compatibility apply to all MSX-E systems. See page 31.

### System features

|                               |  |
|-------------------------------|--|
| Interface:                    | Ethernet acc. to specification IEEE802.3 |
| Dimensions:                   | 220 x 140 x 50 mm                        |
| Weight:                       | ca. 900 g                                |
| Degree of protection:         | IP 65                                    |
| Current consumption at 24 V:  | 150 mA without load                      |
| Operating temperature:        | -40 °C to +85 °C                         |
| <b>Connectors for sensors</b> |  |
| For analog inputs:            | 4 x 4-pin M12 female connector           |
| For digital I/O:              | 1 x 5-pin M12 female connector           |
| For the counter input:        | 1 x 12-pin M23 female connector          |

## Ordering information

### MSX-E3017

Ethernet force-distance measurement system, 1 counter input, 4 analog inputs, 24-bit, 2 digital I/O, 24 V.  
Incl. technical description, software drivers and ConfigTools.

#### Connection cables

##### Voltage supply

**CMX-2x:** Shielded cable, M12 5-pin female connector/open end, IP 65

**CMX-3x:** For cascading, shielded cable, M12 5-pin female connector/male connector IP 65

##### Trigger/Synchro

**CMX-4x:** Shielded cable, M12 5-pin female connector/open end, IP 65

**CMX-5x:** For cascading, shielded cable, M12 5-pin female connector/male connector IP 65

##### Ethernet

**CMX-6x:** CAT5E cable, M12 D-coded male connector/RJ45 connector

**CMX-7x:** For cascading, CAT5E cable, 2 x M12 D-coded male connector

#### Connection to peripherals

**CMX-8x:** Shielded cable, M12 5-pin male connector/open end, IP 65

#### Options

**PC-Diff:** Current input 0(4)-20 mA for 1 input, diff.  
(please indicate the number of channels)

**S7 Modbus TCP Client Library for S7:** Easy use of the Ethernet systems MSX-E with PLCs

**MSX-E 5V-Trigger:** Level change of the trigger inputs and outputs to 5 V

**MX-Clip, MX-Rail** (please specify when ordering!),

**MX-Screw, PCMX-1x**

\* Preliminary product information

# Ethernet force-distance measurement system, 1 counter input, 4 inputs for strain gauges, 24-bit, 2 digital I/O, 24 V

**New!\***



## MSX-E3317

1 counter input

4 inputs for strain gauges, diff, 24-bit

2 digital I/O, 24 V

Easy configuration: Easy mode



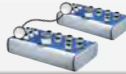
Integrated Ethernet switch



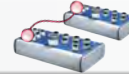
\*Operating temperature



ARM<sup>®</sup>9 Technology



Cascadable, can be synchronised in the  $\mu$ s range



On request: Compare logic for synchro trigger signal



on request



DatabaseConnect  
on request, see page 114



More information on  
[www.addi-data.com](http://www.addi-data.com)

## Features

- 24 V digital trigger input
- ARM<sup>®</sup>9 32-bit processor
- 64 MB onboard SDRAM for storing data
- Robust standardized metal housing
- Power Save Mode: Reduced power consumption when no acquisition runs

## Safety features

- Status LEDs for fast error diagnostics
- Optical isolation • Input filters

## Counter input

- 1 incremental counter input, 32-bit, (on request: Sin/Cos 1 V<sub>pp</sub> or Sin/Cos 11  $\mu$ App) 12-pin M23 female connector
- Max. input frequency 5 MHz

## Inputs for strain gauges

- 4 inputs for strain gauges, 24-bit, M12 female connector, 8-pin
- Sampling frequency max. 788 Hz/channel (max. 2 channels simultaneously)

## Digital I/O

- 1 x 2 digital lines, 24 V, which can be parameterised as pairs of inputs or outputs
- Shutdown logic
- At Power-On the outputs are set to „0“
- Electronic fuse
- Dual LED for each 24 V dig. I/O with direction indication

## Interfaces

- Fast 24 V trigger input
- Ethernet switch with 2 ports
- Synchronisation/trigger In/Out
- Line in for 24 V supply and cascading

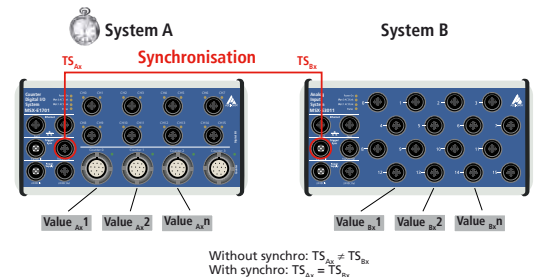
## Communication interfaces

- Web server (configuration and monitoring)
- Command server SOAP for transferring commands
- Data server (TCP/IP or UDP socket) for sending acquisition data
- Event server (TCP/IP socket) for sending system events (Diagnostics such as temperature, short-circuits ...)
- Command server Modbus TCP and Modbus (UDP) for sending commands

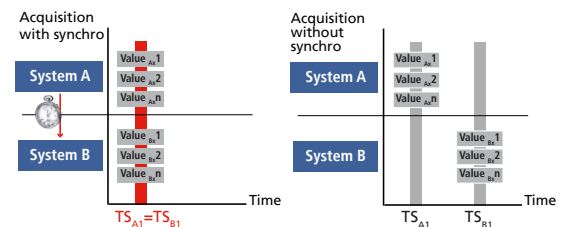
## Synchronisation/time stamp

### Time stamp

Several MSX-E systems can be synchronised with one another in the  $\mu$ s range through a synchro connection. This allows to start a synchronous data acquisition, to generate trigger events and to synchronise the time on several MSX-E systems. Furthermore, the systems have a time stamp that logs the point in time at which the data was acquired by the system.



The combination of synchronisation and time stamp (TS) allows the clear allocation of signals that were captured by several systems.



\*Preliminary  
Product information

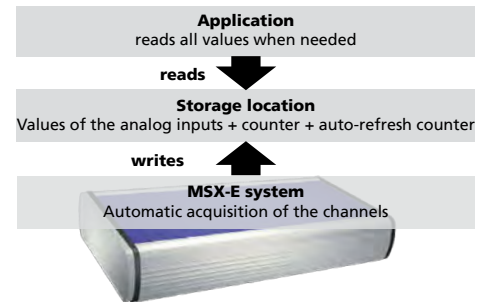


## Acquisition modes

With the MSX-E3317 system, you can effect force-distance measurements in 2 different ways: in auto-refresh mode or sequence mode. The acquisition can be done depending on a position or on time.

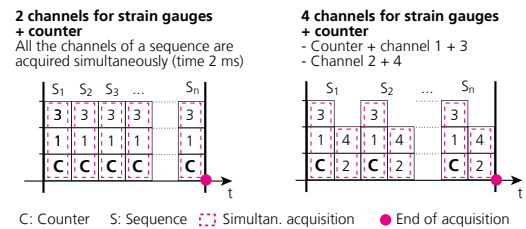
### Auto-refresh mode

In the auto-refresh mode, the measurement values are updated automatically after each acquisition. The acquisition is initialised once and the values of the channels are stored in the memory of the MSX-E Ethernet system. The client (e.g. PC, server, PLC, ...) reads the acquired values asynchronously to the acquisition through socket connection, SOAP or Modbus function. Thereby, the new value is read and the old values are overwritten. In addition to the measurement values, the auto-refresh counter can also be read, which allows to sort the measurement values chronologically. The auto-refresh mode can be combined with a hardware or a synchro trigger and also allows the automatic averaging of values.



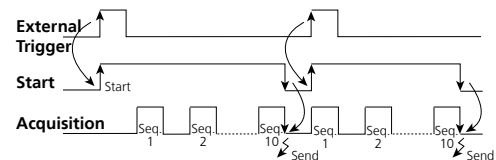
### Sequence mode

In the sequence mode, a list of channels is acquired. Thereby, the single measurement rows are stored one after another. The client receives the acquired values asynchronously to the acquisition through a socket connection. In the sequence mode, the measurement values are read in chronological order, this means the oldest values are read first. The acquisition can be effected continuously, with or without delay or in combination with a hardware or synchro trigger.



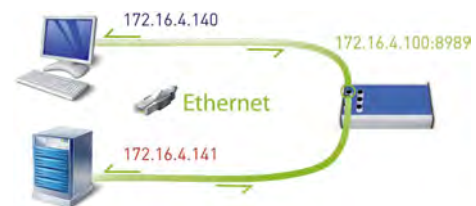
### Acquisition triggered through trigger or synchro input

**Example:** A measurement process is to be started through an external trigger impulse. For each trigger, 10 sequences are to be acquired. After the acquisition of the 10 sequences they are to be sent to the client.



### Reading data from a MSX-E system

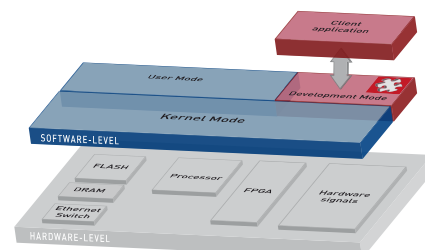
MSX-E systems are multi-client capable, this means several clients (e. g. PC, server, PLC, ...) can read the measurement values of one MSX-E system at the same time. For this, each client establishes a socket connection to the data server of the MSX-E system (port 8989). As soon as the measurement values are available on the data server, the MSX-E system transfers them to the clients.



## Onboard programming

### Development mode

With the Development mode of the MSX-E systems you can customise your measurement, control and regulation applications to fit your requirements. The programs run directly on the MSX-E systems, which has two advantages: external PCs are relieved and you can process data freely according to your requirements. This helps you to improve the efficiency of your processes and to secure your investments.



\* Preliminary product information



## ConfigTools

The **ConfigTools** program allows an easy administration of the MSX-E systems. These are automatically detected in the network. **ConfigTools** consists of common and specific functions.

In addition, with **ConfigTools**, the complete configuration of a MSX-E system can be saved and transferred to another system of the same type (clone function).

**ConfigTools** is included in the delivery.

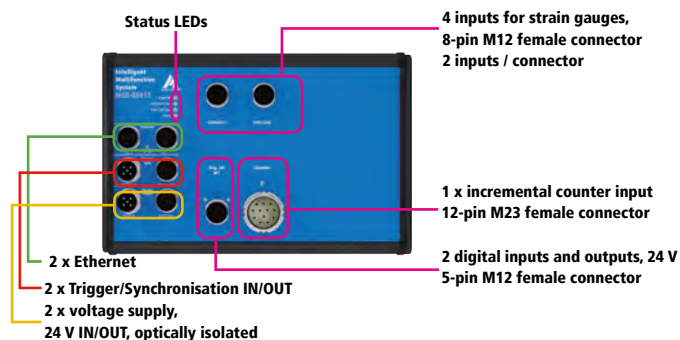
### ConfigTools functions for MSX-E3317:

- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration
- Save/load channel configuration
- Monitor for Inputs for strain gauges
- Visualisation of the force-distance measurement (Easy mode)

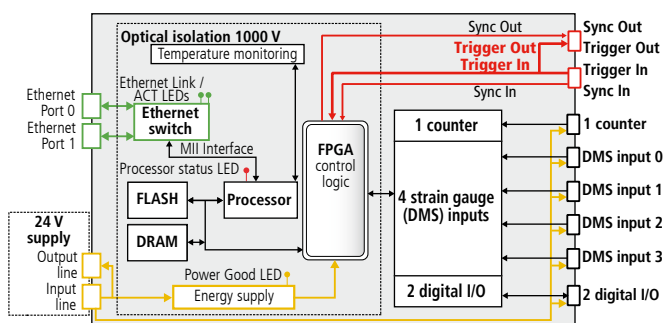
Very easy use through the „ConfigTools“ program; The MSX-E system is automatically detected in the network.



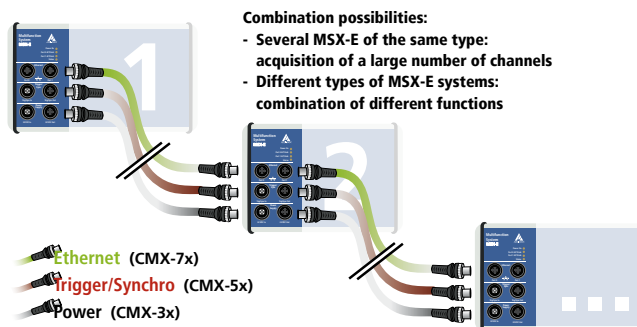
## Features



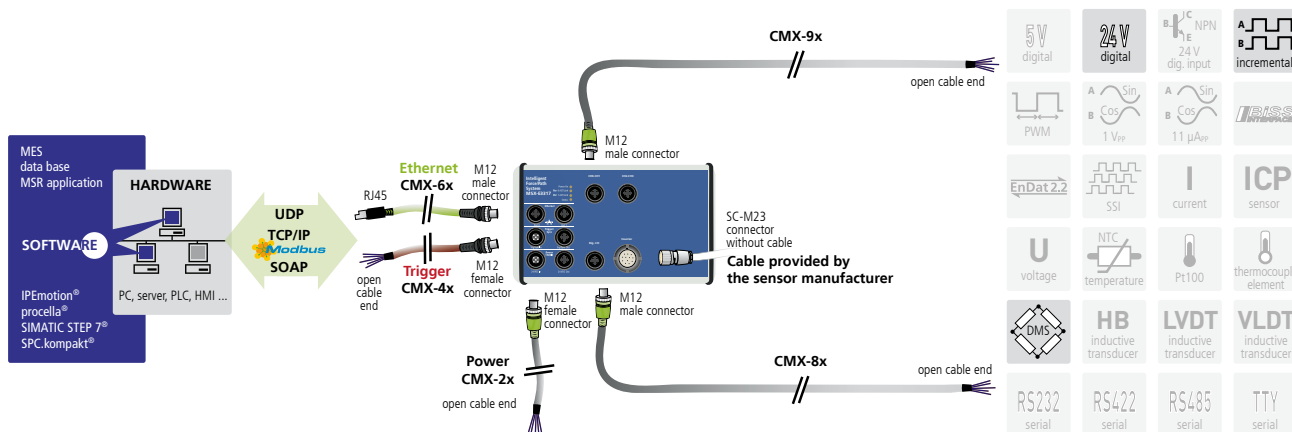
## Simplified block diagram



## Cascading



## ADDI-DATA connection technology



\* Preliminary product information



## Specifications\*

### Incremental counter

|                           |  |
|---------------------------|--|
| Number of counter inputs: | 1                                      |
| Input type:               | Differential or TTL inputs             |
| Differential inputs:      | Complies with the EIA standards RS422A |
| Common mode range:        | +12 / -7 V                             |
| Input sensitivity:        | ± 200 mV                               |
| Input hysteresis:         | 50 mV typ.                             |
| Input impedance:          | 12 kΩ min.                             |
| Max. input frequency:     | 5 MHz at nominal voltage               |
| "Open Circuit Fail Safe   |  |
| Receiver Design"          | "1" = inputs open                      |
| ESD protection:           | Up to ±15 kV                           |
| Voltage supply            |  |
| Incremental encoder:      | 5 V or 24 V, max. 500 mA               |

### Inputs for strain gauges

|                                 |   |
|---------------------------------|---|
| Number of inputs:               | 4 differential inputs for strain gauges<br>2 inputs per M12 connector |
| Resolution:                     | 24-bit  |
| Optical isolation:              | 1000 V  |
| Throughput per M12 connector:   | max. 788 Hz for 1 channel, max. 528 Hz for 2 channels                 |
| Voltage supply for the sensors: | 10 V, 50 mA   |
| Trigger:                        | Digital input, synchro, software-programmable                         |

### Digital inputs

|                         |   |
|-------------------------|---|
| Number of inputs:       | 2, on 1 M12 female connector,<br>Common ground acc. to IEC 1131-2             |
| Overvoltage protection: | 30 V  |
| Optical isolation:      | 1000 V through opto-couplers  |
| Nominal voltage:        | 24 VDC  |
| Input voltage:          | 0 to 30 V   |
| Input impedance:        | > 1 MΩ  |
| Logic input levels:     | UH (max) 30 V typ. UH (min) 18 V typ.<br>UL (max) 16 V typ. UL (min) 0 V typ. |

### Digital outputs

|                                 |   |
|---------------------------------|---|
| Number of outputs:              | 2, on 1 M12 female connector                                |
| Optical isolation:              | 1000 V through opto-couplers                                |
| Output type:                    | High-side, load to ground acc. to IEC 1131-2                |
| Nominal voltage:                | 24 V  |
| Voltage supply:                 | 18 V-30 V   |
| Current (max.):                 | 1.85 A typical for 2 channels through PTC                   |
| Output current / output:        | 500 mA max.   |
| Short-circuit current / output: | 1.7 A max.<br>Shut-down logic at 24 V, $R_{load}=10m\Omega$ |
| RDS ON Resistance:              | 280 mΩ max.   |
| Switch-on time:                 | 100 μs<br>max RL=48 Ω at 80 % $V_{out}$                     |
| Switch-off time:                | 150 μs<br>max RL=48 Ω at 10 % $V_{out}$                     |
| Overtemperature (shutdown):     | 135°C max. (output driver)                                  |
| Temperature hysteresis:         | 15°C typ. (output driver)                                   |
| Diagnostics:                    | Common diagnostic bit at overtemperature                    |

### Voltage supply, Ethernet, Trigger, Synchro

The specifications for the voltage supply, Ethernet, Trigger, Synchronisation and Electromagnetic Compatibility apply to all MSX-E systems. See page 31.

### System features

|                              |  |
|------------------------------|--|
| Interface:                   | Ethernet acc. to specification IEEE802.3 |
| Dimensions:                  | 220 x 140 x 50 mm                        |
| Weight:                      | ca. 900 g                                |
| Degree of protection:        | IP 65                                    |
| Current consumption at 24 V: | 150 mA without load                      |
| Operating temperature:       | -40 °C to +85 °C                         |

#### Connectors for sensors

|                               |                                 |
|-------------------------------|---------------------------------|
| For inputs for strain gauges: | 2 x 8-pin female connector M12  |
| For digital I/O:              | 1 x 5-pin M12 female connector  |
| For the counter input:        | 1 x 12-pin M23 female connector |

## Ordering information

### MSX-E3317

Ethernet force-distance measurement system, 1 counter input, 4 inputs for strain gauges, 24-bit, 2 digital I/O, 24 V.  
Incl. technical description, software drivers and ConfigTools.

### Connection cables

#### Voltage supply

**CMX-2x:** Shielded cable, M12 5-pin female connector/open end, IP 65

**CMX-3x:** For cascading, shielded cable, M12 5-pin female connector/male connector IP 65

#### Trigger/Synchro

**CMX-4x:** Shielded cable, M12 5-pin female connector/open end, IP 65

**CMX-5x:** For cascading, shielded cable, M12 5-pin female connector/male connector IP 65

#### Ethernet

**CMX-6x:** CAT5E cable, M12 D-coded male connector/RJ45 connector

**CMX-7x:** For cascading, CAT5E cable, 2 x M12 D-coded male connector

### Connection to peripherals

**CMX-8x:** Shielded cable, M12 5-pin male connector/open end, IP 65

**CMX-9x:** Shielded cable, M12 8-pin male connector/open end, IP 65

### Options

**S7 Modbus TCP Client Library for S7:** Easy use of the Ethernet systems MSX-E with PLCs

**MSX-E 5V-Trigger:** Level change of the trigger inputs and outputs to 5 V

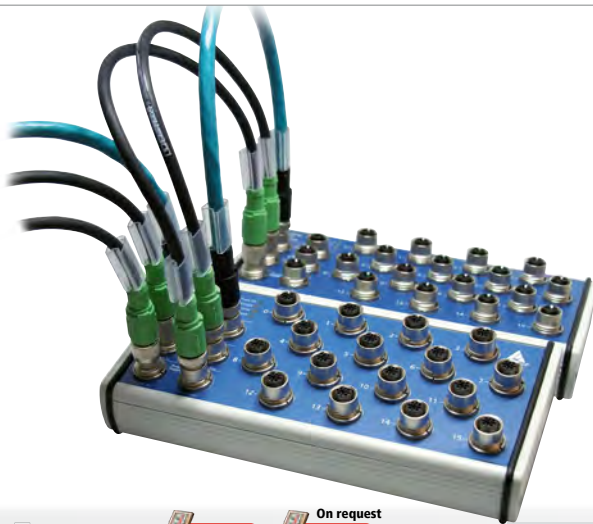
**MX-Clip, MX-Rail** (please specify when ordering!),

**MX-Screw, PCMX-1x**

\*Preliminary product information

# Ethernet analog input system

## 16 analog inputs, diff., 16-bit



### MSX-E3021

16 analog inputs, differential, 16-bit

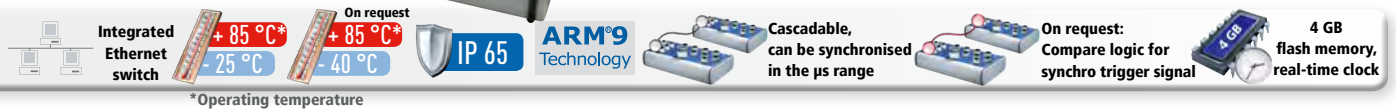
Voltage or current inputs

Simultaneous acquisition of 4 channels  
with 100 kHz per channel

4 GB extended memory

Buffered real-time clock

24 V digital trigger input



on request



DatabaseConnect  
see page 114



More information on  
[www.addi-data.com](http://www.addi-data.com)

### Features

- 24 V digital trigger input
- ARM®9 32-bit processor
- 64 MB onboard SDRAM for storing data
- Robust standardized metal housing
- Power Save Mode: Reduced power consumption when no acquisition runs

### Analog inputs

- 16 diff. inputs, 16-bit, 5-pin M12 female connector
- Sampling frequency max. 100 kHz, up to 4 simultaneous channels
- Input ranges:  $\pm 5$  V,  $\pm 10$  V (16-bit), 0-5 V, 0-10 V (15-bit)
- Gain PGA x1, x2, x10, x20, x100, x200, x1000, x2000 software-programmable, signals up to  $\pm 5$  mV (16-bit) are possible
- Current inputs optional

### Safety features

- Status LEDs for fast error diagnostics
- Optical isolation • Input filters
- Overvoltage protection  $\pm 40$  V
- Internal temperature monitoring

### Interfaces

- Fast 24 V trigger input
- Ethernet switch with 2 ports
- Synchronisation/trigger In/Out
- Line in for 24 V supply and cascading

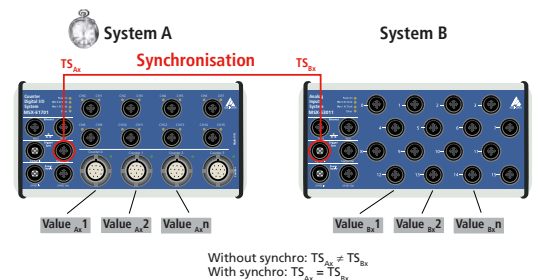
### Communication interfaces

- Web server (configuration and monitoring)
- Command server SOAP for transferring commands
- Data server (TCP/IP or UDP socket) for sending acquisition data
- Event server (TCP/IP socket) for sending system events (Diagnostics such as temperature, short-circuits ...)
- Command server Modbus TCP and Modbus (UDP) for sending commands

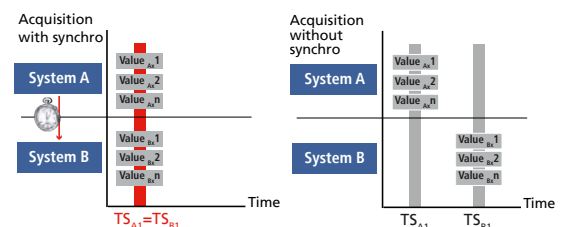
### Synchronisation/time stamp

#### Time stamp

Several MSX-E systems can be synchronised with one another in the  $\mu$ s range through a synchro connection. This allows to start a synchronous data acquisition, to generate trigger events and to synchronise the time on several MSX-E systems. Furthermore, the systems have a time stamp that logs the point in time at which the data was acquired by the system.



The combination of synchronisation and time stamp (TS) allows the clear allocation of signals that were captured by several systems.



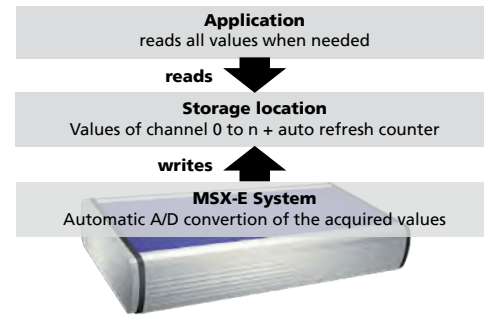
\*Preliminary  
Product information



## Acquisition modes

### Auto-refresh mode

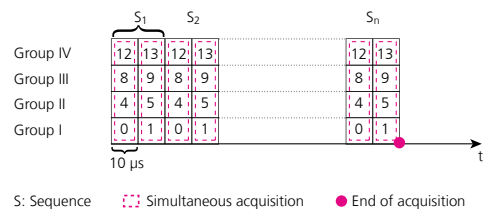
In auto-refresh mode, the measurement values are updated automatically after each acquisition. The acquisition is initialised once and the values of the channels are stored in the memory of the MSX-E Ethernet system. The client (e.g. PC, server, PLC, ...) reads the acquired values asynchronously to the acquisition through socket connection, SOAP or Modbus function. Thereby, the new value is read and the old values are overwritten. In addition to the measurement values, the auto-refresh counter can also be read, which allows to sort the measurement values chronologically. The auto-refresh mode can be combined with a hardware or synchro trigger and also allows the automatic averaging of values.



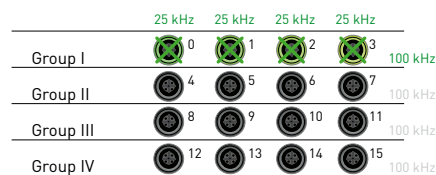
### Sequence mode

In sequence mode, a list of channels is acquired. Thereby, the single measurement rows are stored one after another. The client receives the acquired values asynchronously to the acquisition through a socket connection. In the sequence mode, the measurement values are read in chronological order, this means the oldest values are read first. The acquisition can be effected continuously, with or without delay or in combination with a hardware or synchro trigger.

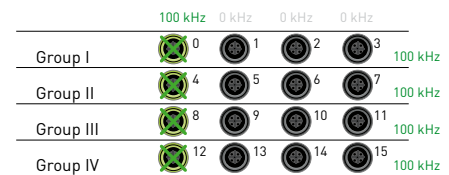
Example: 8 channels, each with 10  $\mu$ s



### Horizontal wiring (with 4 gauges/sensors)



### Vertical wiring (with 4 gauges/sensors)



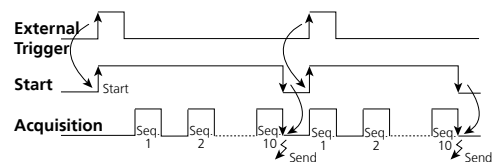
### Acquisition speed

#### Different wiring

for 25 kHz/channel and 100 kHz/groups

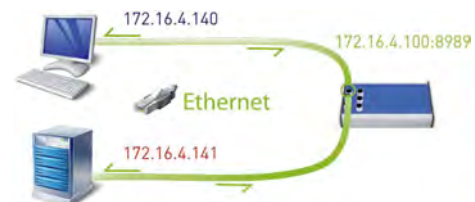
### Acquisition triggered through trigger or synchro input

**Example:** A measurement process is to be started through an external trigger impulse. For each trigger, 10 sequences are to be acquired. After the acquisition of the 10 sequences they are to be sent to the client.



### Reading data from a MSX-E system

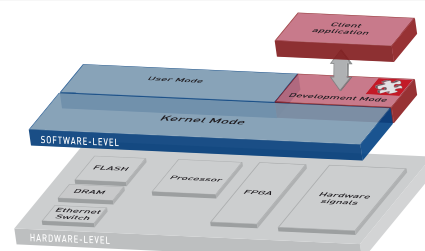
MSX-E systems are multi-client capable, this means several clients (e. g. PC, server, PLC, ...) can read the measurement values of one MSX-E system at the same time. For this, each client establishes a socket connection to the data server of the MSX-E system (port 8989). As soon as the measurement values are available on the data server, the MSX-E system transfers them to the clients.



## Onboard programming / stand-alone operation

### Development mode

With the Development mode of the MSX-E systems you can customise your measurement, control and regulation applications to fit your requirements. The programs run directly on the MSX-E systems, which has two advantages: external PCs are relieved and you can process data freely according to your requirements. This helps you to improve the efficiency of your processes and to secure your investments.



\* Preliminary product information

## ConfigTools

The **ConfigTools** program allows an easy administration of the MSX-E systems. These are automatically detected in the network. **ConfigTools** consists of common and specific functions.

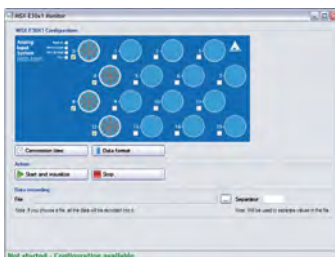
In addition, with **ConfigTools**, the complete configuration of a MSX-E system can be saved and transferred to another system of the same type (clone function).

**ConfigTools** is included in the delivery.

### ConfigTools functions for MSX-E3021:

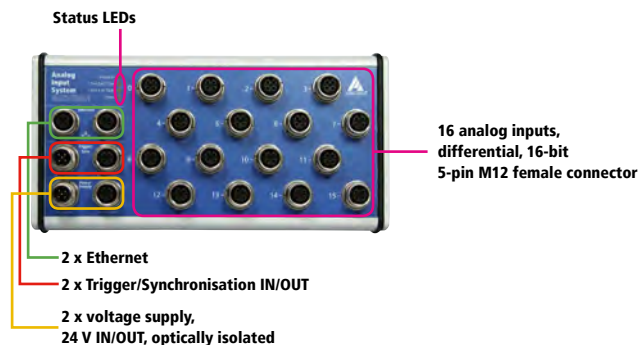
- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration
- Save/load channel configuration
- Monitor for analog inputs

Very easy use through the „ConfigTools“ program; The MSX-E system is automatically detected in the network.

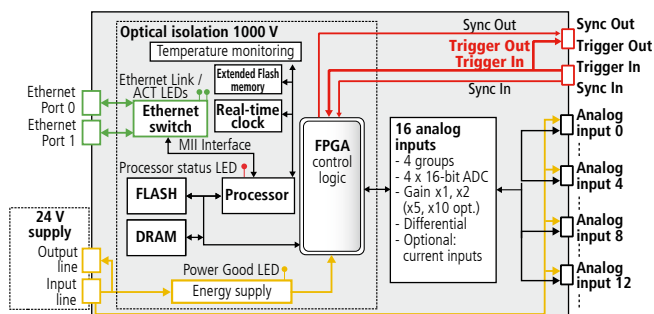


Example of monitor function: Testing the analog inputs.

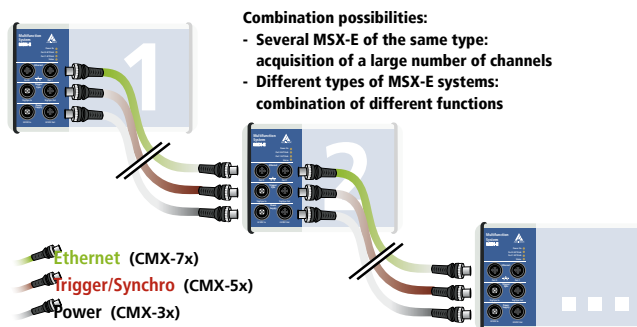
## Features



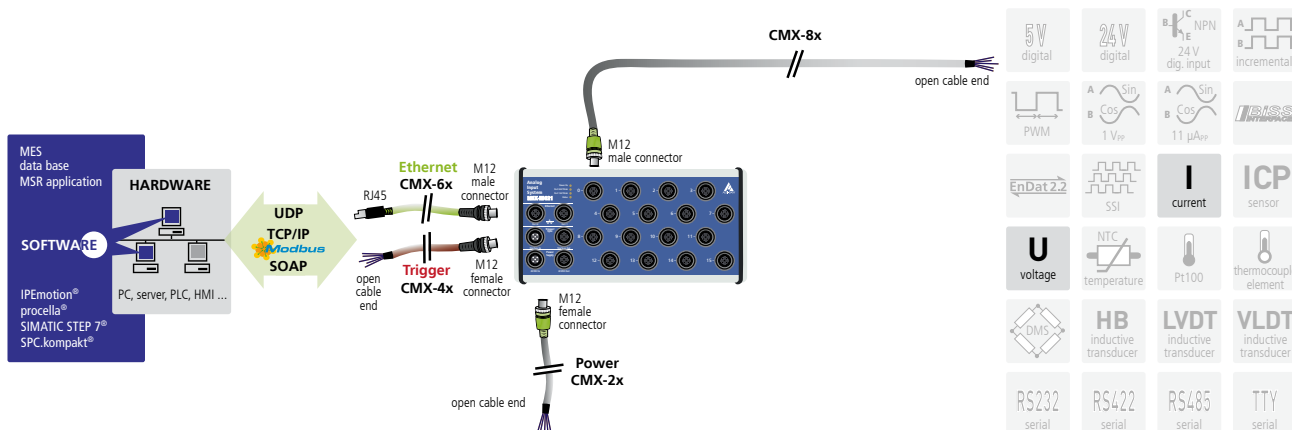
## Simplified block diagram



## Cascading



## ADDI-DATA connection technology



\* Preliminary product information





## Specifications\*

### Analog inputs

|                          |  |
|--------------------------|--|
| Number/type:             | 16 differential inputs   |
| Architecture:            | 4 groups of 4 channels each<br>4-port simultaneous converter with one 4-channel multiplexer per converter  |
| Resolution:              | 16-bit, SAR ADC  |
| Accuracy:                | ± 1.221 mV typ. (± 4 LSB)<br>± 2.442 mV max.   |
| Relative Accuracy (INL): | ± 3 LSB max (ADC)  |
| Optical isolation:       | 1000 V   |
| Input ranges:            | ± 5 V, ± 10 V (16-bit), 0-5 V, 0-10 V (15-bit)<br>current inputs optional  |
| Sampling frequency:      | 25 kHz per channel / 100 kHz max.  |
| Gain:                    | x1, x2, x10, x20, x100, x200, x1000, x2000<br>software-programmable  |
| Common mode rejection:   | 80 dB min. DC up to 60 Hz (diff. amplifier)  |
| Input impedance (PGA):   | 10 <sup>9</sup> Ω // 10nF against GND  |
| Bandwidth (-3dB):        | 160 kHz limited through TP filters<br>16 Hz version<br>with differential filter  |
| Trigger:                 | digital input, synchro,<br>software-programmable   |
| Offset error:            | ± 1 LSB (± 305 µV)   |
| Gain error:              | ± 2.5 LSB  |
| Temperature drift :      | 2.3 x V <sub>in</sub> + 22.5 (µV/°C) typ.<br>V <sub>in</sub> : input voltage in Volts (-10 V ≤ V <sub>in</sub> ≤ +10 V)<br>In the temperature range<br>from -40°C to +85°C: 4.5 ppm/°C FSR |

### Data storage

|                           |                                 |
|---------------------------|---------------------------------|
| RAM:                      | 64 MB                           |
| FLASH:                    | 4 MB for system data            |
| Extended FLASH memory:    | 4 GB (3.7 GB for measured data) |
| Buffered real-time clock: | approx. 4 weeks at 20 °C        |

### Voltage supply, Ethernet, Trigger, Synchro

The specifications for the voltage supply, Ethernet, Trigger, Synchronisation and Electromagnetic Compatibility apply to all MSX-E systems. See page 31.

### System features

|                              |   |
|------------------------------|---|
| Interface:                   | Ethernet acc. to specification IEEE802.3        |
| Dimensions:                  | 215 x 110 x 50 mm                               |
| Weight:                      | 850 g   |
| Degree of protection:        | IP 65   |
| Current consumption at 24 V: | 180 mA  |
| Operating temperature:       | -25 °C to +85 °C<br>-40 °C to +85 °C on request |

### Connectors for sensors

For analog inputs: 8 x 5-pin M12 female connector

## Ordering information

### MSX-E3021

Ethernet analog input system, 16 analog inputs, diff., 16-bit. Incl. technical description, software drivers and ConfigTools.

#### Connection cables

##### Voltage supply

**CMX-2x:** Shielded cable, M12 5-pin female connector/open end, IP 65

**CMX-3x:** For cascading, shielded cable, M12 5-pin female connector/male connector IP 65

##### Trigger/Synchro

**CMX-4x:** Shielded cable, M12 5-pin female connector/open end, IP 65

**CMX-5x:** For cascading, shielded cable, M12 5-pin female connector/male connector IP 65

##### Ethernet

**CMX-6x:** CAT5E cable, M12 D-coded male connector/RJ45 connector

**CMX-7x:** For cascading, CAT5E cable, 2 x M12 D-coded male connector

#### Connection to peripherals

**CMX-8x:** Shielded cable, M12 5-pin male connector/open end, IP 65

#### Options

**PC-Diff:** Current input 0(4)-20 mA for 1 input, diff.  
(please indicate the number of channels)

**S7 Modbus TCP Client Library for S7:** Easy use of the Ethernet systems MSX-E with PLCs

**MSX-E 5V-Trigger:** Level change of the trigger inputs and outputs to 5 V

**MX-Clip, MX-Rail** (please specify when ordering!),

**MX-Screw, PCMX-1x**

\* Preliminary product information

# Ethernet analog input system

## 16 analog inputs, differential, 16-bit



### MSX-E3027

16 analog inputs, differential, 16-bit

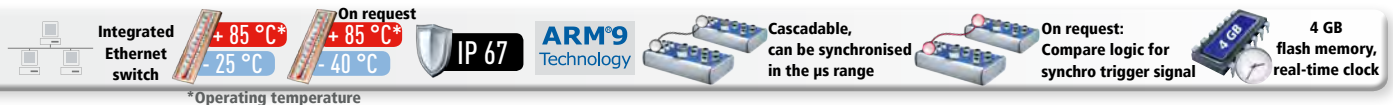
Voltage or current inputs

4 GB extended memory

Buffered real-time clock

Stainless steel housing – IP 67

Fast distributed data acquisition



on request



DatabaseConnect  
see page 114



More information on  
[www.addi-data.com](http://www.addi-data.com)

### Features

- 24 V digital trigger input
- ARM®9 32-bit processor
- 64 MB onboard SDRAM for storing data
- Robust standardized metal housing
- Power Save Mode: Reduced power consumption when no acquisition runs

### Analog inputs

- 16 diff. inputs, 16-bit, 5-pin M12 female connector
- Sampling frequency max. 100 kHz, up to 4 simultaneous channels
- Input ranges:  $\pm 5$  V,  $\pm 10$  V (16-bit), 0-5 V, 0-10 V (15-bit)
- Gain PGA x1, x2, x10, x20, x100, x200, x1000, x2000 software-programmable, signals up to  $\pm 5$  mV (16-bit) are possible
- Current inputs 0(4) to 20 mA optional

### Safety features

- Status LEDs for fast error diagnostics
- Optical isolation
- Input filters
- Overvoltage protection  $\pm 40$  V
- Internal temperature monitoring

### Interfaces

- Fast 24 V trigger input
- Ethernet switch with 2 ports
- Synchronisation/trigger In/Out
- Line in for 24 V supply and cascading

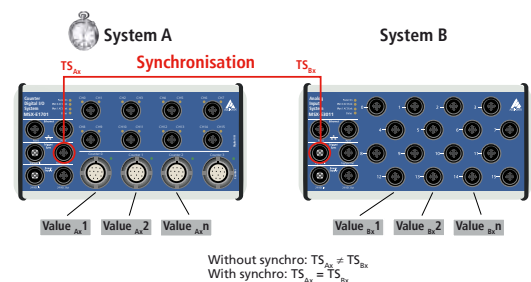
### Communication interfaces

- Web server (configuration and monitoring)
- Command server SOAP for transferring commands
- Data server (TCP/IP or UDP socket) for sending acquisition data
- Event server (TCP/IP socket) for sending system events (Diagnostics such as temperature, short-circuits ...)
- Command server Modbus TCP and Modbus (UDP) for sending commands

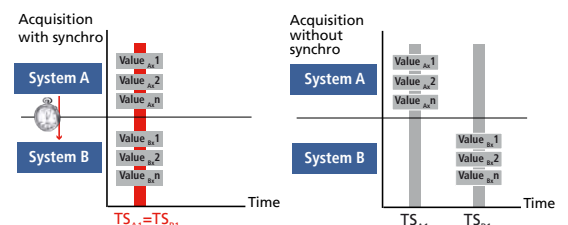
### Synchronisation/time stamp

#### Time stamp

Several MSX-E systems can be synchronised with one another in the  $\mu$ s range through a synchro connection. This allows to start a synchronous data acquisition, to generate trigger events and to synchronise the time on several MSX-E systems. Furthermore, the systems have a time stamp that logs the point in time at which the data was acquired by the system.



The combination of synchronisation and time stamp (TS) allows the clear allocation of signals that were captured by several systems.

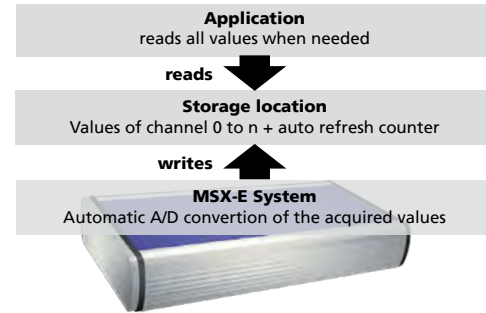




## Acquisition modes

### Auto-refresh mode

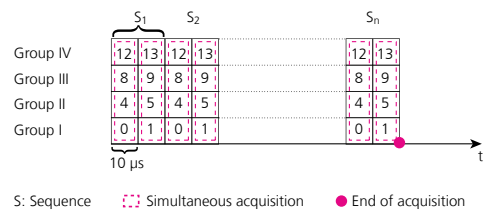
In auto-refresh mode, the measurement values are updated automatically after each acquisition. The acquisition is initialised once and the values of the channels are stored in the memory of the MSX-E Ethernet system. The client (e.g. PC, server, PLC, ...) reads the acquired values asynchronously to the acquisition through socket connection, SOAP or Modbus function. Thereby, the new value is read and the old values are overwritten. In addition to the measurement values, the auto-refresh counter can also be read, which allows to sort the measurement values chronologically. The auto-refresh mode can be combined with a hardware or synchro trigger and also allows the automatic averaging of values.



### Sequence mode

In sequence mode, a list of channels is acquired. Thereby, the single measurement rows are stored one after another. The client receives the acquired values asynchronously to the acquisition through a socket connection. In the sequence mode, the measurement values are read in chronological order, this means the oldest values are read first. The acquisition can be effected continuously, with or without delay or in combination with a hardware or synchro trigger.

Example: 8 channels, each with 10  $\mu$ s

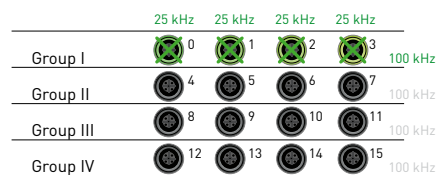


### Acquisition speed

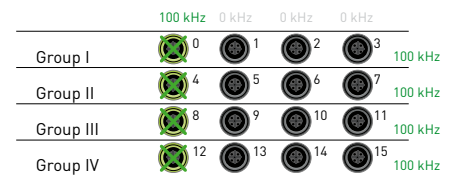
#### Different wiring

for 25 kHz/channel and 100 kHz/groups

#### Horizontal wiring (with 4 gauges/sensors)



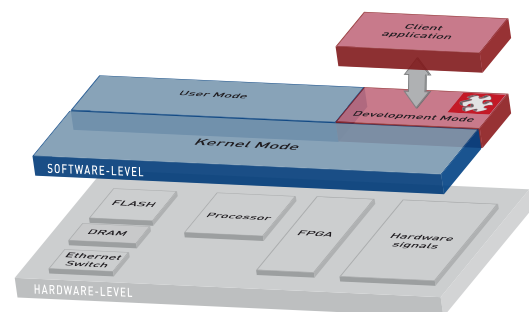
#### Vertical wiring (with 4 gauges/sensors)



## Onboard programming / stand-alone operation

### Development mode

With the Development mode of the MSX-E systems you can customise your measurement, control and regulation applications to fit your requirements. The programs run directly on the MSX-E systems, which has two advantages: external PCs are relieved and you can process data freely according to your requirements. This helps you to improve the efficiency of your processes and to secure your investments.



### Buffered real-time clock

The MSX-E3027 system features a buffered real-time clock (SuperCap). This clock keeps on running 4 weeks after the MSX-E system has been switched off. After a new start, the system time is still the current time.

\* Preliminary product information

## ConfigTools

The **ConfigTools** program allows an easy administration of the MSX-E systems. These are automatically detected in the network. **ConfigTools** consists of common and specific functions.

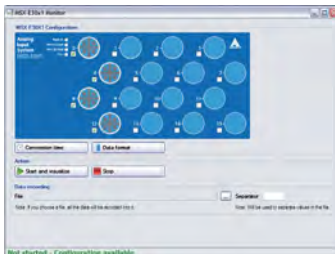
In addition, with **ConfigTools**, the complete configuration of a MSX-E system can be saved and transferred to another system of the same type (clone function).

**ConfigTools** is included in the delivery.

### ConfigTools functions for MSX-E3027:

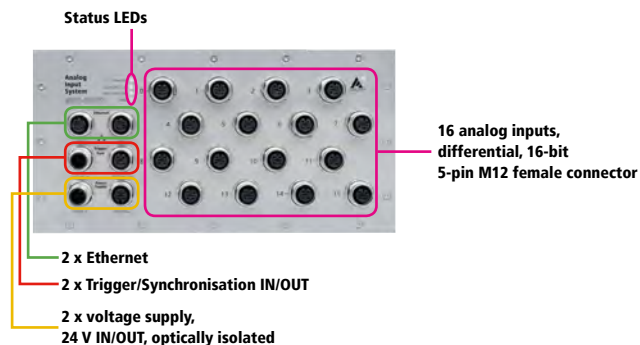
- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration
- Save/load channel configuration
- Monitor for analog inputs

Very easy use through the „ConfigTools“ program; The MSX-E system is automatically detected in the network.

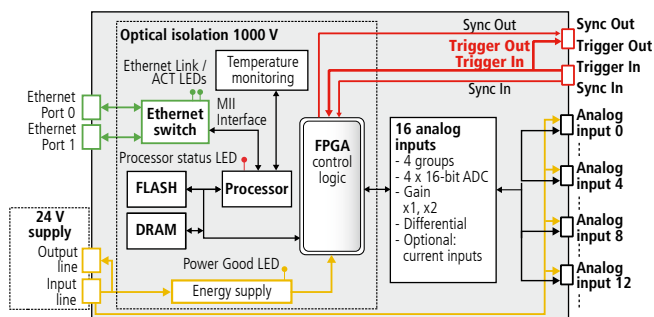


Example of monitor function: Testing the analog inputs.

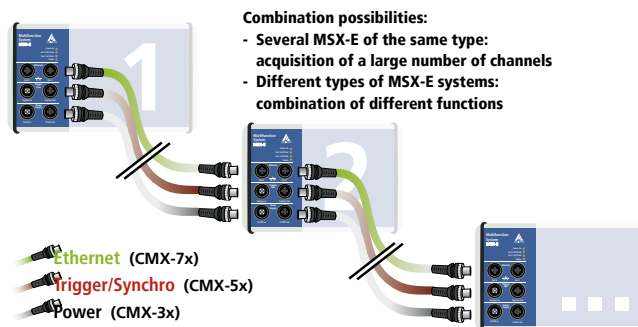
## Features



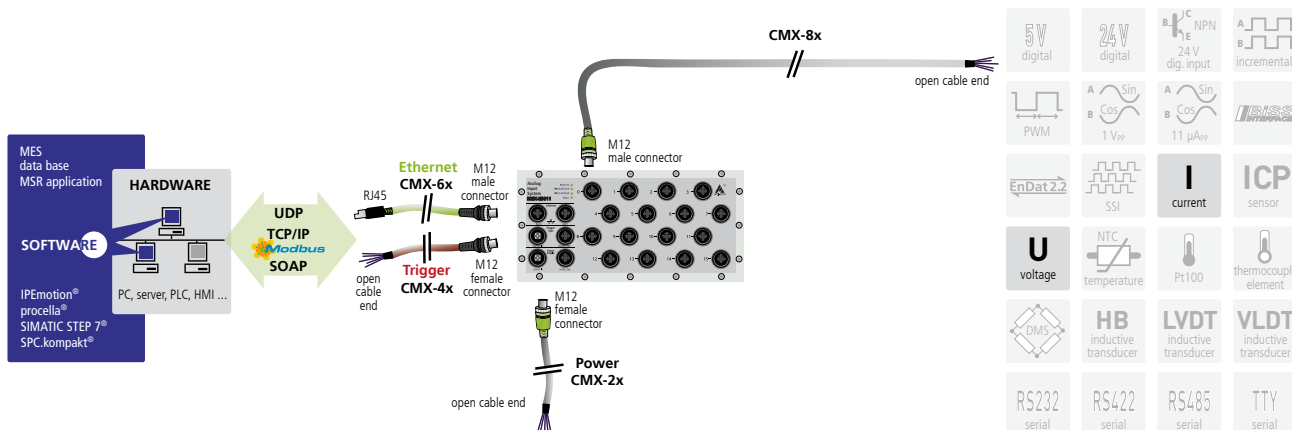
## Simplified block diagram



## Cascading



## ADDI-DATA connection technology



\* Preliminary product information



## Specifications\*

### Analog inputs

|   |   |
|---|---|
| Number/type:  | 16 differential inputs  |
| Architecture:   | 4 groups of 4 channels each<br>4-port simultaneous converter with one 4-channel multiplexer per converter |
| Resolution:   | 16-bit, SAR ADC   |
| Accuracy:   | ± 1.221 mV typ. (± 4 LSB)<br>± 2.442 mV max.  |
| Relative Accuracy (INL):  | ± 3 LSB max (ADC)   |
| Optical isolation:  | 1000 V  |
| Input ranges  | ± 5 V, ± 10 V (16-bit), 0-5 V, 0-10 V (15-bit)<br>current inputs optional                                 |
| Sampling frequency:   | 25 kHz per channel / 100 kHz max.   |
| Gain:   | x1, x2, x10, x20, x100, x200, x1000, x2000<br>software-programmable                                       |
| Common mode rejection:  | 80 dB min. DC up to 60 Hz (diff. amplifier)   |
| Input impedance (PGA):  | 10 <sup>9</sup> Ω / 10nF against GND  |
| Bandwidth (-3dB):   | 160 kHz limited through TP filters<br>16 Hz version<br>with differential filter                           |
| Trigger:  | digital input, synchro,<br>software-programmable  |
| Offset error:   | ± 1 LSB (± 305 µV)  |
| Gain error:   | ± 2.5 LSB   |
| Temperature drift:  | 2.3 x V <sub>in</sub> + 22.5 (µV/°C) typ.   |
| V <sub>in</sub> : input voltage in Volts<br>(-10 V ≤ V <sub>in</sub> ≤ +10 V)<br>In the temperature range<br>from -40°C to +85°C: | 4.5 ppm/°C FSR  |

### Data storage

|                           |                                 |
|---------------------------|---------------------------------|
| RAM:                      | 64 MB                           |
| FLASH:                    | 4 MB for system data            |
| Extended FLASH memory:    | 4 GB (3.7 GB for measured data) |
| Buffered real-time clock: | approx. 4 weeks at 20 °C        |

### Voltage supply, Ethernet, Trigger, Synchro

The specifications for the voltage supply, Ethernet, Trigger, Synchronisation and Electromagnetic Compatibility apply to all MSX-E systems. See page 31.

### System features

|                               |   |
|-------------------------------|---|
| Interface:                    | Ethernet acc. to specification IEEE802.3        |
| Degree of protection:         | IP 67   |
| Current consumption at 24 V:  | 160 mA  |
| Operating temperature:        | -25 °C to +85 °C<br>-40 °C to +85 °C on request |
| <b>Connectors for sensors</b> |   |
| For analog inputs:            | 8 x 5-pin M12 female connector                  |

## Ordering information

### MSX-E3027

Ethernet analog input system, 16 analog inputs, differential, 16-bit. Incl. technical description, software drivers and ConfigTools.

#### Connection cables

##### Voltage supply

**CMX-2x:** Shielded cable, M12 5-pin female connector/open end, IP 67

**CMX-3x:** For cascading, shielded cable, M12 5-pin  
female connector/male connector IP 67

##### Trigger/Synchro

**CMX-4x:** Shielded cable, M12 5-pin female connector/open end, IP 67

**CMX-5x:** For cascading, shielded cable, M12 5-pin  
female connector/male connector IP 67

##### Ethernet

**CMX-6x:** CAT5E cable, M12 D-coded male connector/RJ45 connector

**CMX-7x:** For cascading, CAT5E cable, 2 x M12 D-coded male connector

#### Connection to peripherals

**CMX-8x:** Shielded cable, M12 5-pin male connector/open end, IP 67

#### Options

**PC-Diff:** Current input 0(4)-20 mA for 1 input, diff.  
(please indicate the number of channels)

**S7 Modbus TCP Client Library for S7:** Easy use of the Ethernet systems  
MSX-E with PLCs

**MSX-E 5V-Trigger:** Level change of the trigger inputs and outputs to 5 V

**MX-Rail** (please specify when ordering!), **PCMX-1x**

\* Preliminary product information



# Ethernet multifunction system

## 6 diff./SE inputs, 4 analog outputs, 32 digital I/O

**New!\***



### MSX-E3121

6 analog inputs, differential/single-ended, 24-bit

Voltage or current inputs

4 analog outputs, 16-bit

32 digital I/O

24 V digital trigger input



Integrated  
Ethernet  
switch



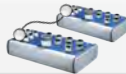
\*Operating temperature



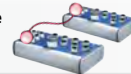
IP 65



ARM9  
Technology



Cascadable, can be  
synchronised  
in the  $\mu$ s range



On request:  
Compare logic for  
synchro trigger signal



on request



DatabaseConnect  
see page 114



More information at  
[www.addi-data.com](http://www.addi-data.com)

### Features

- 24 V digital trigger input
- ARM9 32-bit processor
- 64 MB onboard SDRAM for storing data
- Robust standardized metal housing
- Power Save Mode: Reduced power consumption when no acquisition runs

### Safety features

- Status LEDs for fast error diagnostics
- Optical isolation 1000 V
- Input filters

### Analog inputs

- 6 diff./SE inputs, 24-bit, 4-pin M12 female connector
- Sampling frequency max. 100 kHz/channel

### Analog outputs

- 4 voltage outputs or  
2 voltage outputs and 2 current outputs

### Digital input and output

- 16 digital inputs, 24 V, optically isolated
- 16 digital outputs, 24 V, optically isolated

### Interfaces

- Fast 24 V trigger input
- Ethernet switch with 2 ports
- Synchronisation/trigger In/Out
- Line in for 24 V supply and cascading

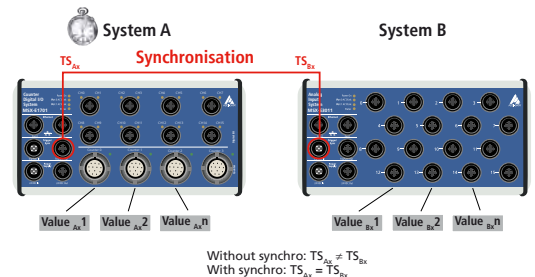
### Communication interfaces

- Web server (configuration and monitoring)
- Command server SOAP for transferring commands
- Data server (TCP/IP or UDP socket) for sending acquisition data
- Event server (TCP/IP socket) for sending system events (Diagnostics such as temperature, short-circuits ...)
- Command server Modbus TCP and Modbus (UDP) for sending commands

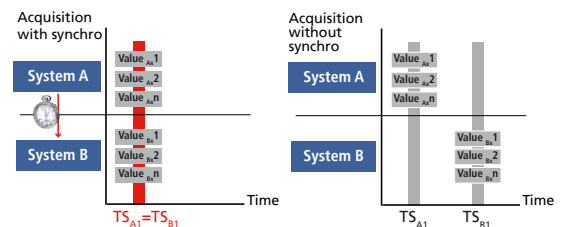
### Synchronisation/time stamp

#### Time stamp

Several MSX-E systems can be synchronised with one another in the  $\mu$ s range through a synchro connection. This allows to start a synchronous data acquisition, to generate trigger events and to synchronise the time on several MSX-E systems. Furthermore, the systems have a time stamp that logs the point in time at which the data was acquired by the system.



The combination of synchronisation and time stamp (TS) allows the clear allocation of signals that were captured by several systems.

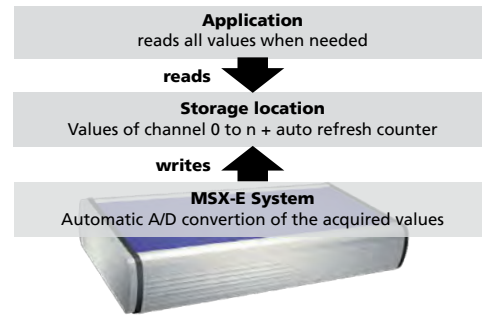


\*Preliminary  
product information

## Acquisition modes

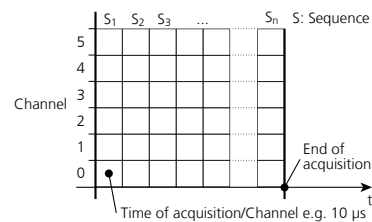
### Auto-refresh mode

In auto-refresh mode, the measurement values are updated automatically after each acquisition. The acquisition is initialised once and the values of the channels are stored in the memory of the MSX-E Ethernet system. The client (e.g. PC, server, PLC, ...) reads the acquired values asynchronously to the acquisition through socket connection, SOAP or Modbus function. Thereby, the new value is read and the old values are overwritten. In addition to the measurement values, the auto-refresh counter can also be read, which allows to sort the measurement values chronologically. The auto-refresh mode can be combined with a hardware or a synchro trigger and also allows the automatic averaging of values.



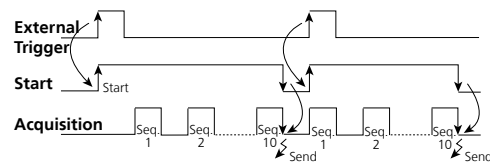
### Sequence mode

In sequence mode, a list of channels is acquired. Thereby, the single measurement rows are stored one after another. The client receives the acquired values asynchronously to the acquisition through a socket connection. In the sequence mode, the measurement values are read in chronological order, this means the oldest values are read first. The acquisition can be effected continuously, with or without delay or in combination with a hardware or synchro trigger.



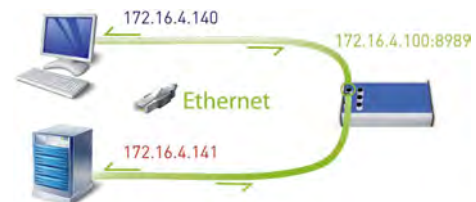
### Acquisition triggered through trigger or synchro input

**Example:** A measurement process is to be started through an external trigger impulse. For each trigger, 10 sequences are to be acquired. After the acquisition of the 10 sequences they are to be sent to the client.



### Reading data from a MSX-E system

MSX-E systems are multi-client capable, this means several clients (e. g. PC, server, PLC, ...) can read the measurement values of one MSX-E system at the same time. For this, each client establishes a socket connection to the data server of the MSX-E system (port 8989). As soon as the measurement values are available on the data server, the MSX-E system transfers them to the clients.



## Onboard programming / stand-alone operation

### New: Cycle mode

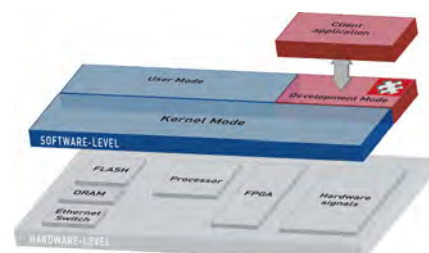
MSX-E systems which are used in stand-alone operation can be controlled through the cycle mode. The cycle mode is a cyclic processing of a program written by the user – the inputs are acquired and the values calculated, if required. At the same time a digital or analog output is possible. Measurement values are read in the auto-refresh mode, thus the current value is always available. A selectable clock pulse (1 ms up to 65535 ms) is available. The programming is executed onboard according to IEC 61131-3.

```
GLOBAL
END

(*Task1 with 10ms pulse*)
TASK Task1 10
  HEADER
    VAR REAL Sensor1Volt 0
    VAR DWORD Sensor1 16#0
  END
  BODY
    (* Reading of Sensor1 as digital value *)
    LD %I0.0.0
    ST Sensor1
    (* Reading of Sensor1 as float value*)
    LD %I0.0.0
    ST Sensor1Volt
  END
END
```

### Development mode

With the Development mode of the MSX-E systems you can customise your measurement, control and regulation applications to fit your requirements. The programs run directly on the MSX-E systems, which has two advantages: external PCs are relieved and you can process data freely according to your requirements. This helps you to improve the efficiency of your processes and to secure your investments.



\* Preliminary product information

## ConfigTools

The **ConfigTools** program allows an easy administration of the MSX-E systems. These are recognised automatically in the network. **ConfigTools** consists of common and specific functions.

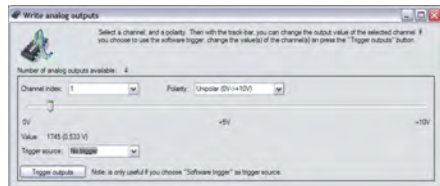
In addition, with **ConfigTools**, the complete configuration of a MSX-E system can be saved and transferred to another system of the same type (clone function).

**ConfigTools** is included in the delivery.

### ConfigTools functions for MSX-E3121:

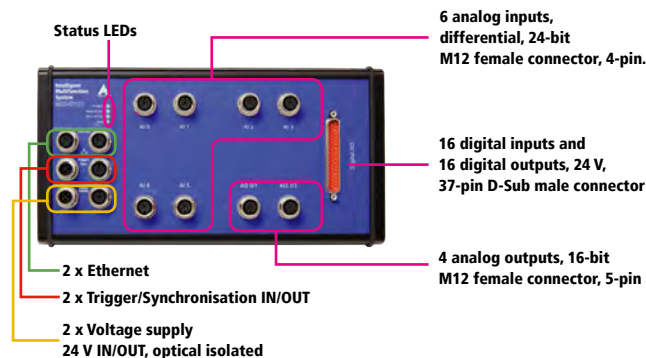
- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration
- Save/load channel configuration
- Monitoring the analog inputs/outputs

Very easy use through the „ConfigTools“ program; The MSX-E system is automatically detected in the network.

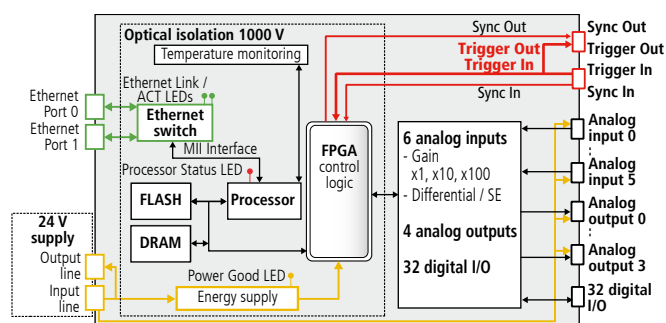


**Monitor function example:**  
Check of the analog outputs – value display without programming.

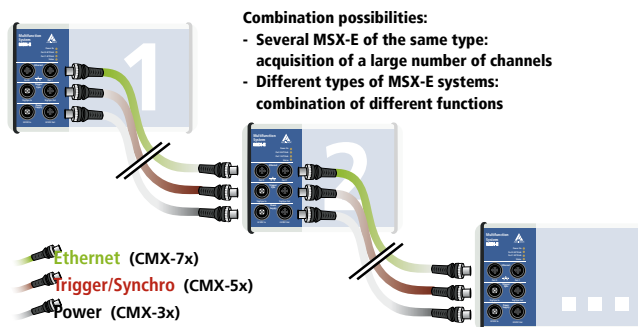
## Features



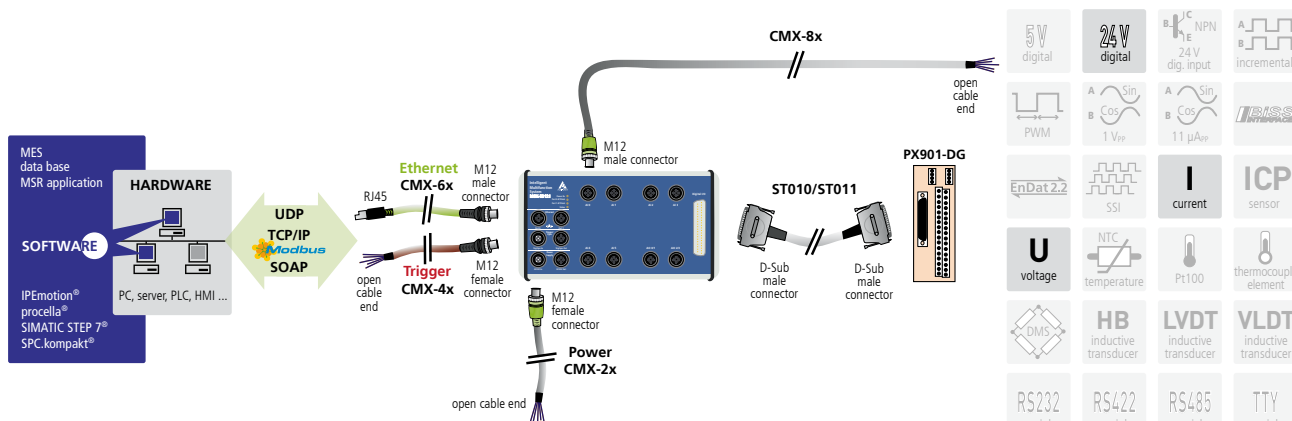
## Simplified block diagram



## Cascading



## ADDI-DATA connection technology



\* Preliminary product information

## Specifications\*

## Analog inputs

|                    |  |
|--------------------|--|
| Number/type:       | 6 differential inputs, 1 A/D converter per channel   |
| Resolution:        | 24-bit   |
| Optical isolation: | 1000 V   |
| Input ranges:      | $\pm 10\text{ V}$ , $\pm 1\text{ V}$ , $\pm 100\text{ mV}$ , $\pm 10\text{ mV}$ (24-bit), 0-10 V, 0-1 V, 0-100 mV, 0-10 mV (23-bit), software-programmable, current input optional |
| Input frequency:   | 100 kHz per channel  |
| Gain:              | x1, x10, x100 software-programmable  |
| Trigger:           | digital input, synchro, software-programmable  |

## Analog outputs

|                           |   |
|---------------------------|---|
| Number of outputs:        | 4   |
| Resolution:               | 16-bit (bipolar) / 15-bit (unipolar)                                    |
| Optical isolation:        | 1000 V  |
| Output range:             | Voltage output: 0-10 V ( $\pm 10\text{ V}$ )<br>Current output: 0-20 mA |
| Output value after reset: | 0 V voltage output, not calibrated                                      |

## Digital inputs

|                     |   |
|---------------------|---|
| Number of inputs:   | 16, common ground acc. to IEC 1131-2  |
| Optical isolation:  | 1000 V through opto-couplers  |
| Nominal voltage:    | 24 VDC  |
| Input voltage:      | 0 – 30 V  |
| Logic input levels: | UH (max) 30 V typ.      UH (min) 19 V typ.<br>UL (max) 14 V typ.      UL (min) 0 V typ. |

## Digital outputs

|                            |   |
|----------------------------|---|
| Number of outputs:         | 16  |
| Optical isolation:         | 1000 V through opto-couplers  |
| Output type:               | High-side, load to ground acc. IEC 1131-2                               |
| Nominal voltage:           | 24 V  |
| Voltage supply:            | 11 – 36 V   |
| Output current per output: | 150 mA max.   |
| Diagnostics:               | Common diagnostic bit for 16 channels at overtemperature of one channel |

## Voltage supply, Ethernet, Trigger, Synchro

The specifications for the voltage supply, Ethernet, Trigger, Synchronisation and Electromagnetic Compatibility apply to all MSX-E systems. See page 31.

## System features

|                              |  |
|------------------------------|--|
| Interface:                   | Ethernet acc. to specification IEEE802.3 |
| Dimensions (mm):             | 270 x 140 x 35                           |
| Weight:                      | approx. 1200 g                           |
| Degree of protection:        | IP 65                                    |
| Current consumption at 24 V: | 390 mA typ. $\pm 10\%$                   |
| Operating temperature:       | -40 °C to +85 °C                         |

## Connectors for sensors

|                     |                                 |
|---------------------|---------------------------------|
| For analog inputs:  | 6 x 4-pin female connector M12  |
| For analog outputs: | 2 x 5-pin female connector M12  |
| For digital I/O:    | 1 x 37-pin D-Sub male connector |

## Ordering information

## MSX-E3121

Ethernet multifunction system, 6 diff./SE inputs, 4 analog outputs, 32 digital I/O. Incl. technical description, software drivers and ConfigTools.

## Versions

|                        |                                      |
|------------------------|--------------------------------------|
| <b>MSX-E3121-6-4:</b>  | 4 voltage outputs                    |
| <b>MSX-E3121-6-4C:</b> | 2 voltage outputs, 2 current outputs |

## Connection cables

## Voltage supply

|                |  |
|----------------|--|
| <b>CMX-2x:</b> | Shielded cable, M12 5-pin female connector/open end, IP 65                     |
| <b>CMX-3x:</b> | For cascading, shielded cable, M12 5-pin female connector/male connector IP 65 |

## Trigger/Synchro

|                |  |
|----------------|--|
| <b>CMX-4x:</b> | Shielded cable, M12 5-pin female connector/open end, IP 65                     |
| <b>CMX-5x:</b> | For cascading, shielded cable, M12 5-pin female connector/male connector IP 65 |

## Ethernet

|                |  |
|----------------|--|
| <b>CMX-6x:</b> | CAT5E cable, M12 D-coded male connector/RJ45 connector     |
| <b>CMX-7x:</b> | For cascading: CAT5E cable, 2 x M12 D-coded male connector |

## Connection to peripherals

|                  |  |
|------------------|--|
| <b>CMX-8x:</b>   | Shielded cable, M12 5-pin male connector/open end, IP 65 |
| <b>ST010:</b>    | Standard round cable, shielded, twisted pairs, 2m        |
| <b>PX901-DG:</b> | Screw terminal panel LED status display for DIN rail     |

## Options

|                 |  |
|-----------------|--|
| <b>PC-Diff:</b> | Current input 0(4)-20 mA for 1 input, diff. (please indicate the number of channels) |
|-----------------|--|

## S7 Modbus TCP Client Library for S7:

Easy use of the Ethernet systems MSX-E with PLCs  
**MSX-E 5V-Trigger:** Level change of the trigger inputs and outputs to 5 V  
**MX-Clip, MX-Rail** (Please specify when ordering!), **MX-Screw, PCMX-1x**

\* Preliminary product information

# Ethernet multifunction system

## 6 diff./SE inputs, 4 analog outputs, 64 dig. I/O

**New!\***



### MSX-E3122

6 analog inputs,  
differential/Single-Ended, 24-bit

Voltage or current inputs

4 analog outputs, 16-bit, voltage outputs,  
current outputs

64 digital I/O, 24 V

24 V digital trigger input



Integrated  
Ethernet  
switch



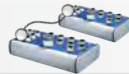
\*Operating temperature



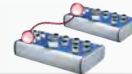
IP 65



ARM9  
Technology



Cascadable,  
can be synchronised  
in the  $\mu$ s range



On request:  
Compare logic for  
synchro trigger signal



on request



DatabaseConnect  
see page 114



More information on  
[www.addi-data.com](http://www.addi-data.com)

### Features

- 24 V digital trigger input
- ARM9 32-bit processor
- 64 MB onboard SDRAM for storing data
- Robust standardized metal housing
- Power Save Mode: Reduced power consumption when no acquisition runs

### Safety features

- Status LEDs for fast error diagnostics
- Optical isolation • Input filters

### Analog inputs

- 6 diff./SE inputs, 24-bit, 4-pin M12 female connector
- Sampling frequency max. 100 kHz/channel

### Analog outputs

- 4 voltage outputs or  
2 voltage and 2 current outputs

### Digital I/O

- 32 optically isolated digital inputs, 24 V
- 32 optically isolated digital outputs, 24 V

### Interfaces

- Fast 24 V trigger input
- Ethernet switch with 2 ports
- Synchronisation/trigger In/Out
- Line in for 24 V supply and cascading

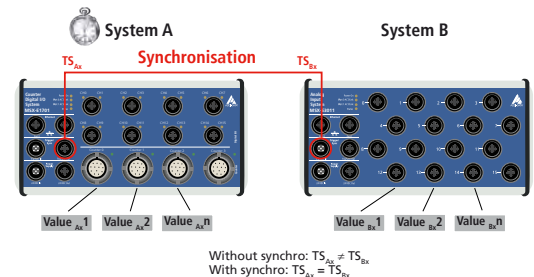
### Communication interfaces

- Web server (configuration and monitoring)
- Command server SOAP for transferring commands
- Data server (TCP/IP or UDP socket) for sending acquisition data
- Event server (TCP/IP socket) for sending system events (Diagnostics such as temperature, short-circuits ...)
- Command server Modbus TCP and Modbus (UDP) for sending commands

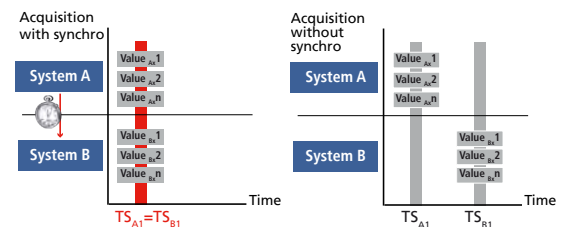
### Synchronisation/time stamp

#### Time stamp

Several MSX-E systems can be synchronised with one another in the  $\mu$ s range through a synchro connection. This allows to start a synchronous data acquisition, to generate trigger events and to synchronise the time on several MSX-E systems. Furthermore, the systems have a time stamp that logs the point in time at which the data was acquired by the system.



The combination of synchronisation and time stamp (TS) allows the clear allocation of signals that were captured by several systems.



\*Preliminary  
Product information

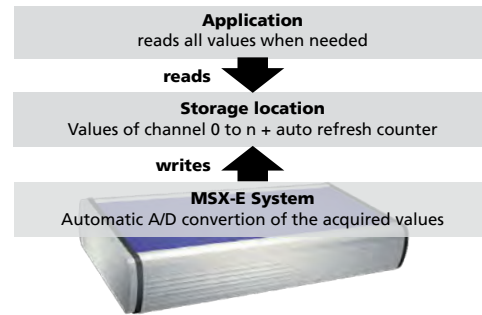




## Acquisition modes

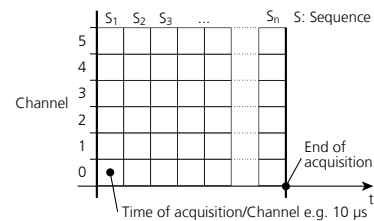
### Auto-refresh mode

In auto-refresh mode, the measurement values are updated automatically after each acquisition. The acquisition is initialised once and the values of the channels are stored in the memory of the MSX-E Ethernet system. The client (e.g. PC, server, PLC, ...) reads the acquired values asynchronously to the acquisition through socket connection, SOAP or Modbus function. Thereby, the new value is read and the old values are overwritten. In addition to the measurement values, the auto-refresh counter can also be read, which allows to sort the measurement values chronologically. The auto-refresh mode can be combined with a hardware or synchro trigger and also allows the automatic averaging of values.



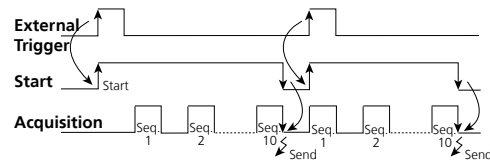
### Sequence mode

In sequence mode, a list of channels is acquired. Thereby, the single measurement rows are stored one after another. The client receives the acquired values asynchronously to the acquisition through a socket connection. In the sequence mode, the measurement values are read in chronological order, this means the oldest values are read first. The acquisition can be effected continuously, with or without delay or in combination with a hardware or synchro trigger.



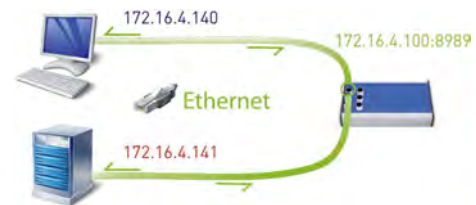
### Acquisition triggered through trigger or synchro input

**Example:** A measurement process is to be started through an external trigger impulse. For each trigger, 10 sequences are to be acquired. After the acquisition of the 10 sequences they are to be sent to the client.



### Reading data from a MSX-E system

MSX-E systems are multi-client capable, this means several clients (e. g. PC, server, PLC, ...) can read the measurement values of one MSX-E system at the same time. For this, each client establishes a socket connection to the data server of the MSX-E system (port 8989). As soon as the measurement values are available on the data server, the MSX-E system transfers them to the clients.



## Onboard programming / stand-alone operation

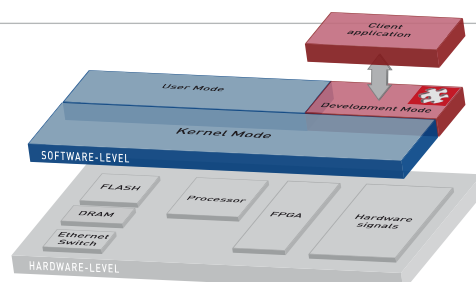
### New: Cycle mode

MSX-E systems which are used in stand-alone operation can be controlled through the cycle mode. The cycle mode is a cyclic processing of a program written by the user – the inputs are acquired and the values calculated, if required. At the same time a digital or analog output is possible. Measurement values are read in the auto-refresh mode, thus the current value is always available. A selectable clock pulse (1 ms up to 65535 ms) is available. The programming is executed onboard according to IEC 61131-3.

```
GLOBAL
END
(*Task1 with 10ms pulse*)
TASK Task1 10
  HEADER
    VAR REAL Sensor1volt 0
    VAR DWORD Sensor1 16#0
  END
  BODY
    (* Reading of Sensor1 as digital value *)
    LD %ID0.0.0
    ST Sensor1
    (* Reading of Sensor1 as float value*)
    LD %IF0.0.0
    ST Sensor1volt
  END
END
```

### Development mode

With the Development mode of the MSX-E systems you can customise your measurement, control and regulation applications to fit your requirements. The programs run directly on the MSX-E systems, which has two advantages: external PCs are relieved and you can process data freely according to your requirements. This helps you to improve the efficiency of your processes and to secure your investments.



\* Preliminary product information

## ConfigTools

The **ConfigTools** program allows an easy administration of the MSX-E systems. These are automatically detected in the network. **ConfigTools** consists of common and specific functions. In addition, with **ConfigTools**, the complete configuration of a MSX-E system can be saved and transferred to another system of the same type (clone function).

**ConfigTools** is included in the delivery.

### ConfigTools functions for MSX-E3122:

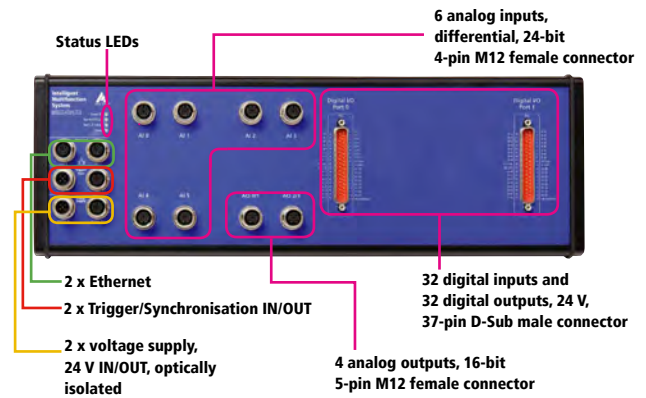
- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration
- Save/load channel configuration
- Monitor for analog inputs and outputs

Very easy use through the „ConfigTools“ program; The MSX-E system is automatically detected in the network.

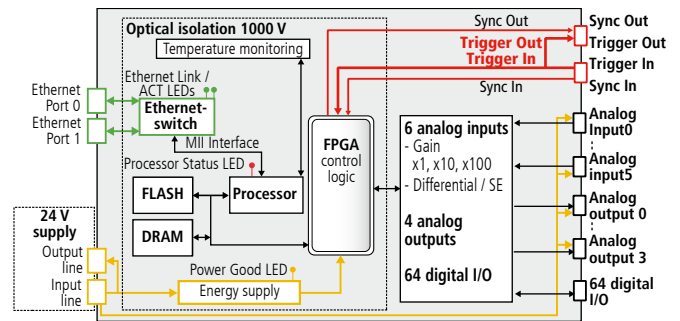


Example of monitor function:  
Testing the analog outputs  
– Value output without programming.

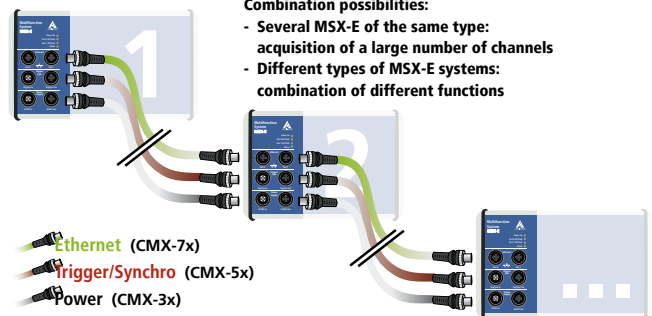
## Features



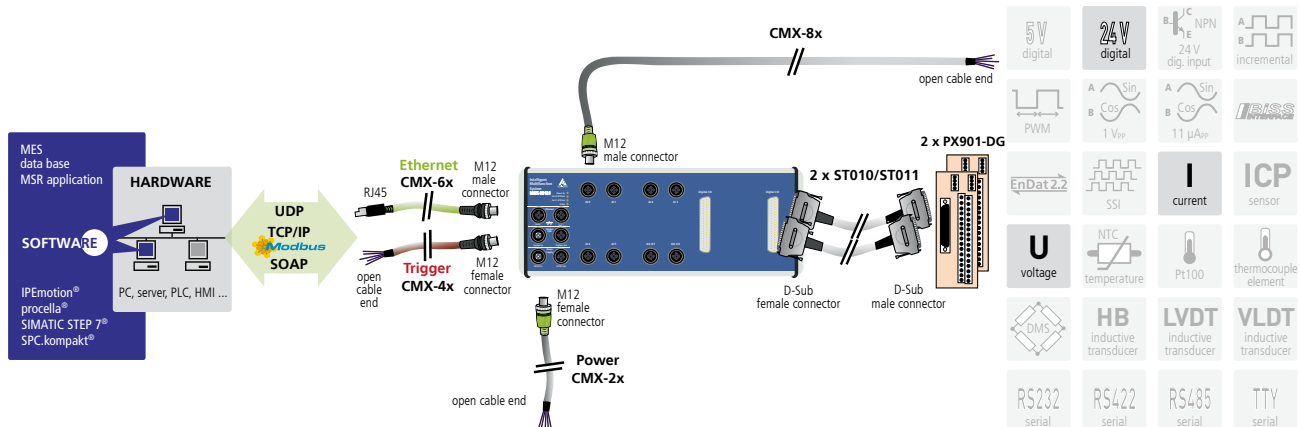
## Simplified block diagram



## Cascading



## ADDI-DATA connection technology



\* Preliminary product information



## Specifications\*

### Analog inputs

|                     |  |
|---------------------|--|
| Number/type:        | 6 differential/Single-Ended inputs (software-configurable), 1 A/D converter per channel  |
| Resolution:         | 24-bit   |
| Optical isolation:  | 1000 V   |
| Input ranges:       | $\pm 10\text{ V}$ , $\pm 1\text{ V}$ , $\pm 100\text{ mV}$ , $\pm 10\text{ mV}$ (24-bit), 0-10 V, 0-1 V, 0-100 mV, 0-10 mV (23-Bit), software-programmable, current inputs 0(4) – 20 mA optional |
| Sampling frequency: | 100 kHz per channel  |
| Gain:               | x1, x10, x100, software-programmable   |
| Trigger:            | Digital input, synchro, software-programmable  |

### Analog outputs

|                           |   |
|---------------------------|---|
| Number of outputs:        | 4   |
| Resolution:               | 16-bit (bipolar) / 15-bit (unipolar)                                    |
| Optical isolation:        | 1000 V  |
| Output range:             | Voltage output: 0-10 V ( $\pm 10\text{ V}$ )<br>Current output: 0-20 mA |
| Output value after reset: | 0 V voltage output, not calibrated                                      |

### Digital inputs

|                     |   |
|---------------------|---|
| Number of inputs:   | 32, common ground acc. to IEC 1131-2  |
| Optical isolation:  | 1000 V through opto-couplers  |
| Nominal voltage:    | 24 VDC  |
| Input voltage:      | 0 – 30 V  |
| Logic input levels: | UH (max) 30 V typ. UH (min) 19 V typ.<br>UL (max) 14 V typ. UL (min) 0 V typ. |

### Digital outputs

|                                   |   |
|-----------------------------------|---|
| Number of outputs:                | 32  |
| Optical isolation:                | 1000 V through opto-couplers  |
| Output type:                      | High-side, load to ground acc. to IEC 1131-2                                    |
| Nominal voltage:                  | 24 V  |
| Voltage supply:                   | 11 – 30 V   |
| Output current per channel:       | 500 mA max.   |
| Max. total current of 16 outputs: | 2 A   |
| Diagnostics:                      | Common diagnostics bit for all 16 channels at<br>Overtemperature of one channel |

### Voltage supply, Ethernet, Trigger, Synchro

The specifications for the voltage supply, Ethernet, Trigger, Synchronisation and Electromagnetic Compatibility apply to all MSX-E systems. See page 31.

### System features

|                               |  |
|-------------------------------|--|
| Interface:                    | Ethernet acc. to specification IEEE802.3 |
| Dimensions:                   | 380 x 130 x 50 mm                        |
| Weight:                       | in preparation                           |
| Degree of protection:         | IP 65                                    |
| Current consumption at 24 V:  | 390 mA typ. $\pm 10\%$                   |
| Operating temperature:        | -40 °C to +85 °C                         |
| <b>Connectors for sensors</b> |  |
| For analog inputs:            | 6 x 4-pin M12 female connector           |
| For analog outputs:           | 2 x 5-pin M12 female connector           |
| For digital I/O:              | 2 x 37-pin D-Sub male connector          |

## Ordering information

### MSX-E3122

Ethernet multifunction system, 6 diff./SE inputs, 4 analog outputs, 64 digital I/O. Incl. technical description, software drivers and ConfigTools.

### Versions

|                     |                                      |
|---------------------|--------------------------------------|
| <b>MSX-E3122:</b>   | 4 voltage outputs                    |
| <b>MSX-E3122-C:</b> | 2 voltage outputs, 2 current outputs |

### Connection cables

#### Voltage supply

**CMX-2x:** Shielded cable, M12 5-pin female connector/open end, IP 65

**CMX-3x:** For cascading, shielded cable, M12 5-pin female connector/male connector IP 65

#### Trigger/Synchro

**CMX-4x:** Shielded cable, M12 5-pin female connector/open end, IP 65

**CMX-5x:** For cascading, shielded cable, M12 5-pin female connector/male connector IP 65

#### Ethernet

**CMX-6x:** CAT5E cable, M12 D-coded male connector/RJ45 connector

**CMX-7x:** For cascading, CAT5E cable, 2 x M12 D-coded male connector

### Connection to peripherals

**CMX-8x:** Shielded cable, M12 5-pin male connector/open end, IP 65

**ST010:** Standard round cable, shielded, twisted pairs, 2 m

**PX901-DG:** Screw terminal board, LED Status display, for DIN rail

### Options

**PC-Diff:** Current input 0(4)-20 mA for 1 input, diff.  
(please indicate the number of channels)

**S7 Modbus TCP Client Library for S7:** Easy use of the Ethernet systems MSX-E with PLCs

**MSX-E 5V-Trigger:** Level change of the trigger inputs and outputs to 5 V

**MX-Clip, MX-Rail** (please specify when ordering!),

**MX-Screw, PCMX-1x**

\* Preliminary product information

# Ethernet analog output system

## 8 analog outputs (voltage and/or current), 16-bit



### MSX-E3511 / MSX-E3511-C

8 analog outputs, 16-bit

Voltage or current outputs

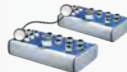
Function generator for the output of any signal type, e. g. sine curves, sawtooth curves etc. – can be configured separately for each channel

M12 connector

24 V trigger input



\*Operating temperature



Cascadable,  
can be synchronised  
in the µs range



on request



More information on  
[www.addi-data.com](http://www.addi-data.com)

### Features

- 24 V digital trigger input
- ARM®9 32-bit processor
- 64 MB onboard SDRAM for storing data
- Robust standardized metal housing
- Power Save Mode: Reduced power consumption when no acquisition runs

### Safety features

- Status LEDs for fast error diagnostics
- Optical isolation
- Diagnostics in case of short-circuits (voltage mode) or line break (current mode)
- Internal temperature monitoring

### Analog outputs

- 8 analog outputs, 16-bit:  
MSX-E3511: voltage outputs 0-10 V,  $\pm 10$  V  
MSX-E3511-C: each output can be configured as voltage or current output 0-20 mA
- Output voltage after reset 0 V
- 5-pin M12 female connector
- Output mode/operation mode: Data output per software function, trigger input or synchro output

### Function generator

- Output of any signal type, e. g. sine curves, sawtooth curves etc.
- Maximal 8 channels (each channel independently)
- Can be used without programming skills, e. g. via .csv-file or mathematic functions such as  $f(x) = \sin(x)$

### Interfaces

- Fast 24 V trigger input
- Ethernet switch with 2 ports
- Synchronisation/trigger In/Out
- Line in for 24 V supply and cascading

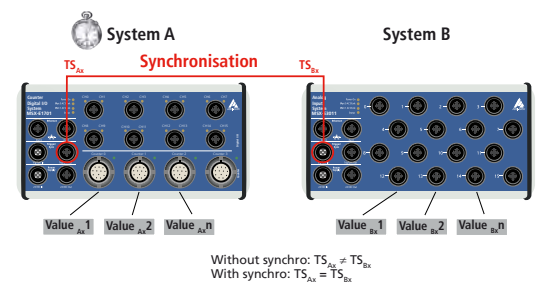
### Communication interfaces

- Web server (configuration and monitoring)
- Command server SOAP for transferring commands
- Data server (TCP/IP or UDP socket) for sending acquisition data
- Event server (TCP/IP socket) for sending system events (Diagnostics such as temperature, short-circuits ...)
- Command server Modbus TCP and Modbus (UDP) for sending commands

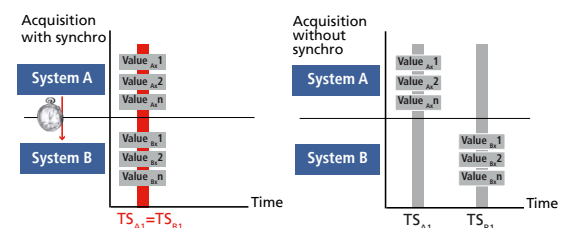
### Synchronisation/time stamp

#### Time stamp

Several MSX-E systems can be synchronised with one another in the  $\mu$ s range through a synchro connection. This allows to start a synchronous data acquisition, to generate trigger events and to synchronise the time on several MSX-E systems. Furthermore, the systems have a time stamp that logs the point in time at which the data was acquired by the system.



The combination of synchronisation and time stamp (TS) allows the clear allocation of signals that were captured by several systems.





## Output modes

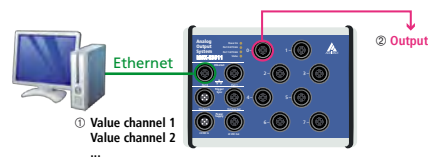
**Output modes** – Analog output values can be generated either via direct access or through function generator:

### 1. Direct access

In direct access, the values of the outputs are transmitted via SOAP or Modbus function.

For each function call, 1 value (for one or several outputs) is sent.

The value output is triggered per software, 24V hardware or synchro trigger.

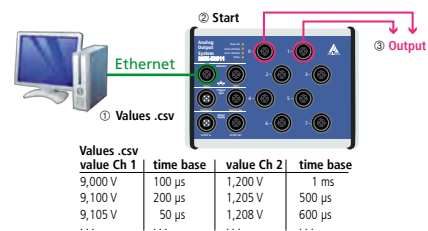


### 2. Function generator

The MSX-E3511 system features a function generator for each analog output. The values are sent either automatically at a defined rate or using a trigger. The 24V trigger input or the synchro trigger can be used, included those issued by another MSX-E system.

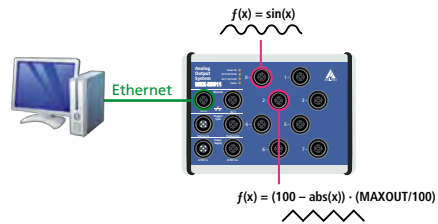
#### Generator with CSV file

The value are transmitted to the function generator via a CSV file which contains both the values and the number of cycles for each value.



#### Generator with mathematical formula

The values are generated through a formula, e.g.  $f(x) = \sin(x)$ .

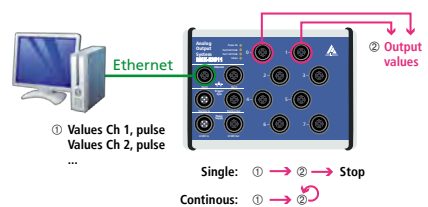


#### „Single Mode“ Generator

In „Single Mode“, an array with values is sent to the respective generator via SOAP function. After all values have been transmitted, the generator stops automatically (outputs = 0V).

#### „Continuous Mode“ Generator

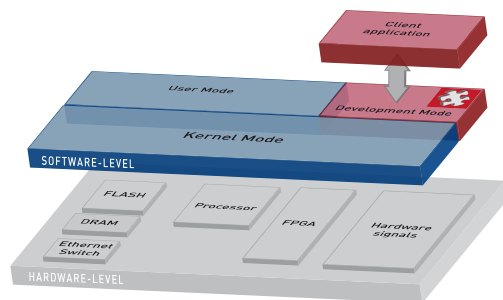
In „Continuous Mode“, an array with values is sent to the respective generator via SOAP function. After all values have been transmitted, the generator automatically starts again at the first value.



## Onboard programming / stand-alone operation

### Development mode

With the Development mode of the MSX-E systems you can customise your measurement, control and regulation applications to fit your requirements. The programs run directly on the MSX-E systems, which has two advantages: external PCs are relieved and you can process data freely according to your requirements. This helps you to improve the efficiency of your processes and to secure your investments.



## Safety

### Watchdog

The MSX-E3511 Ethernet system has a 16-bit watchdog which can be programmed in 3 time units (µs, ms, s). The watchdog is used for automatically resetting the digital outputs to 0 V after a defined time in order e. g. to switch off actuators if an error has occurred.



## ConfigTools

The **ConfigTools** program allows an easy administration of the MSX-E systems. These are automatically detected in the network. **ConfigTools** consists of common and specific functions.

In addition, with **ConfigTools**, the complete configuration of a MSX-E system can be saved and transferred to another system of the same type (clone function).

**ConfigTools** is included in the delivery.

### ConfigTools functions for MSX-E3511 / MSX-E3511-C:

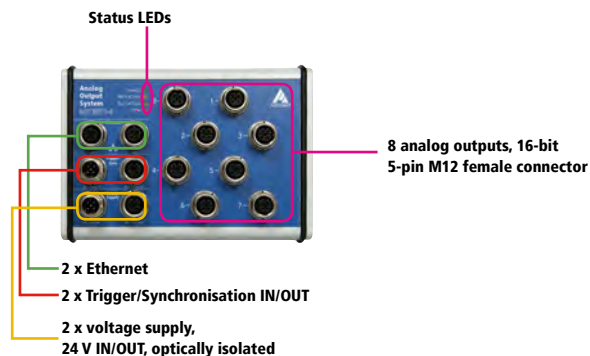
- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration

Very easy use through the „ConfigTools“ program; The MSX-E system is automatically detected in the network.

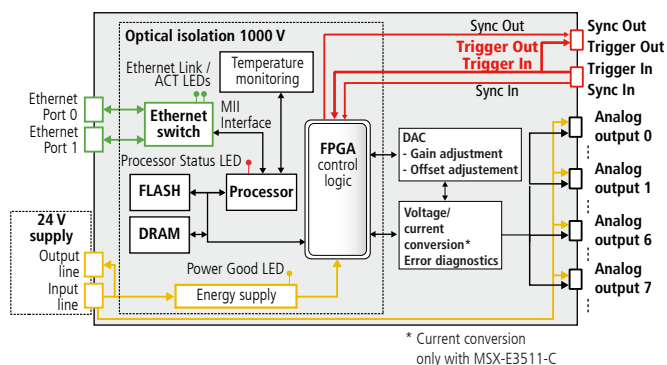


**Example of monitor function:**  
Testing the analog outputs  
– Value output without programming.

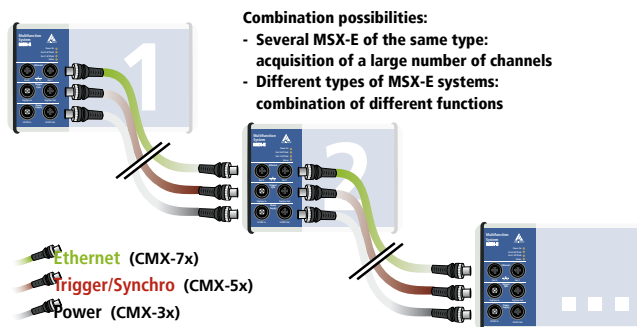
## Features



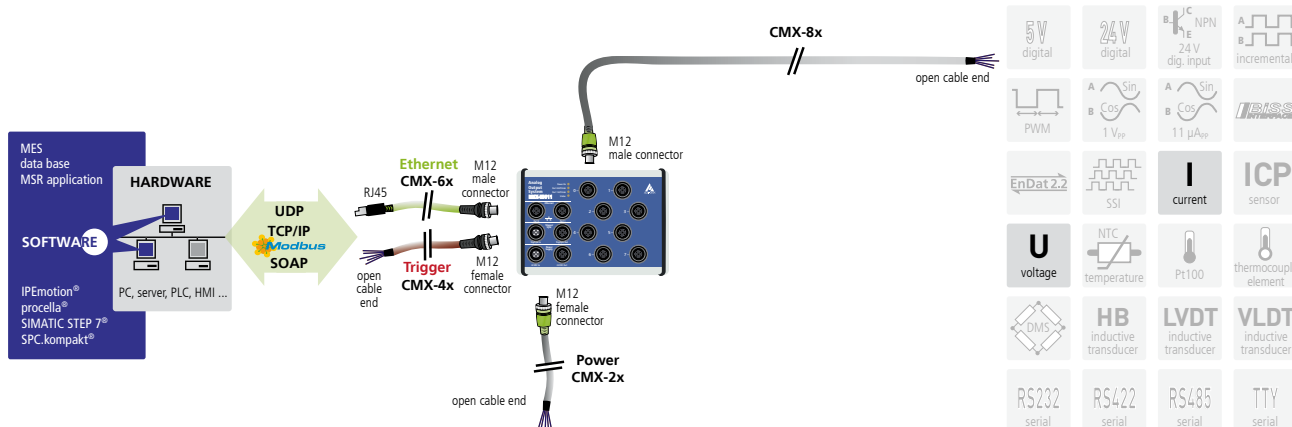
## Simplified block diagram



## Cascading



## ADDI-DATA connection technology





## Specifications

### Analog outputs

|                          |   |
|--------------------------|---|
| Number of outputs:       | 8   |
| Resolution:              | 16-bit (bipolar)<br>15-bit (unipolar)   |
| Optical isolation:       | 1000 V  |
| Output range:            | voltage output: 0-10 V ( $\pm 10$ V)<br>current output: 0-20 mA   |
| Output velocity:         | Voltage version: max. 40 kHz<br>Voltage version: max. 25 kHz FSR (Full Scale Range)<br>Current version: depending on load |
| Overvoltage protection:  | $\pm 14$ V  |
| Output current/Last:     | voltage output: 15 mA, min. 680 $\Omega$<br>current output: 20 mA, max. 550 $\Omega$                                      |
| Short-circuit current:   | Voltage output: $\pm 20$ mA<br>Current output: $\pm 32$ mA  |
| Output value after reset | 0 V voltage output, not calibrated  |
| Watchdog (programmable): | 16-bit, 1 $\mu$ s to 65535 s  |

### Voltage supply, Ethernet, Trigger, Synchro

The specifications for the voltage supply, Ethernet, Trigger, Synchronisation and Electromagnetic Compatibility apply to all MSX-E systems. See page 31.

### System features

|                              |   |
|------------------------------|---|
| Interface:                   | Ethernet acc. to specification IEEE802.3  |
| Dimensions:                  | 154 mm x 110 mm x 50 mm   |
| Weight:                      | 620 g   |
| Degree of protection:        | IP 65   |
| Current consumption at 24 V: | 150 mA without load<br>310 mA current outputs switched on<br>410 mA voltage outputs switched on |
| Operating temperature:       | - 40°C to + 85°C  |

### Connectors for sensors

|                       |                                |
|-----------------------|--------------------------------|
| <b>Analog outputs</b> | 8 x 5-pin M12 female connector |
|-----------------------|--------------------------------|

## Ordering information

### MSX-E3511 / MSX-E3511-C

Ethernet analog output system, 8 analog outputs (voltage and/or current), 16-bit. Incl. technical description, software drivers and ConfigTools.

### Versions

**MSX-E3511-C:** Ethernet analog output system, 8 analog outputs (voltage and/or current), 16-bit

**MSX-E3511:** Ethernet analog output system, 8 analog outputs, only voltage for fast signal output, 16-bit

### Connection cables

#### Voltage supply

**CMX-2x:** Shielded cable, M12 5-pin female connector/open end, IP 65

**CMX-3x:** For cascading, shielded cable, M12 5-pin female connector/male connector IP 65

#### Trigger/Synchro

**CMX-4x:** Shielded cable, M12 5-pin female connector/open end, IP 65

**CMX-5x:** For cascading, shielded cable, M12 5-pin female connector/male connector IP 65

### Ethernet

**CMX-6x:** CAT5E cable, M12 D-coded male connector/RJ45 connector

**CMX-7x:** For cascading, CAT5E cable, 2 x M12 D-coded male connector

### Connection to peripherals

**CMX-8x:** Shielded cable, M12 5-pin male connector/open end, IP 65

### Options

**S7 Modbus TCP Client Library for S7:** Easy use of the Ethernet systems MSX-E with PLCs

**MSX-E 5V-Trigger:** Level change of the trigger inputs and outputs to 5 V

**MX-Clip, MX-Rail** (please specify when ordering!),

**MX-Screw, PCMX-1x**

# Ethernet system for temperature measurement

## 16/8/4 channels for thermocouples or RTD, 24-bit



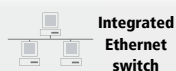
### MSX-E3211

16/8/4 differential inputs, 24-bit

For thermocouples or RTD (Pt100, Pt1000)

Simultaneous data acquisition up to 8 channels

24 V digital trigger input



Integrated  
Ethernet  
switch



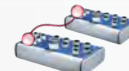
\*Operating temperature



ARM<sup>®</sup>9  
Technology



Cascadable, can be  
synchronised  
in the  $\mu$ s range



On request:  
Compare logic for  
synchro trigger signal



on request



DatabaseConnect  
see page 114



More information at  
[www.addi-data.com](http://www.addi-data.com)

### Features

- 24 V digital trigger input
- ARM<sup>®</sup>9 32-bit processor
- 64 MB onboard SDRAM for storing data
- Robust standardized metal housing
- Power Save Mode: Reduced power consumption when no acquisition runs

### Safety features

- Status LEDs for fast error diagnostics
- Optical isolation
- Input filters

### Temperature inputs

- 16/8/4 differential inputs for thermocouples or RTD, 24-bit
- Sampling frequency max. 788 Hz/channel (max. 8/4/2 channels simultaneously)
- Auto gain: Optimal adjustment of the gain to the measuring range
- Integrated cold junction compensation (CJC) for thermocouples
- NTC sensors optional

### Interfaces

- Fast 24 V trigger input
- Ethernet switch with 2 ports
- Synchronisation/trigger In/Out
- 24 V supply and cascading

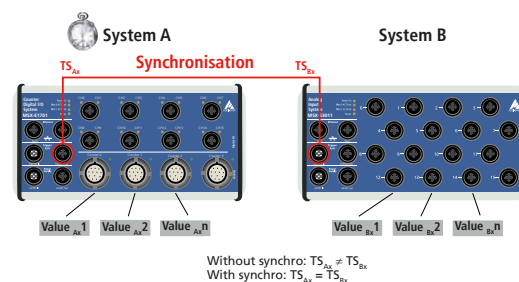
### Communication interface

- Web server (configuration and monitoring)
- Command server SOAP for transferring commands
- Data server (TCP/IP or UDP socket) for sending acquisition data
- Event server (TCP/IP socket) for sending system events (Diagnostics such as temperature, short-circuits ...)
- Command server Modbus TCP and Modbus (UDP) for sending commands

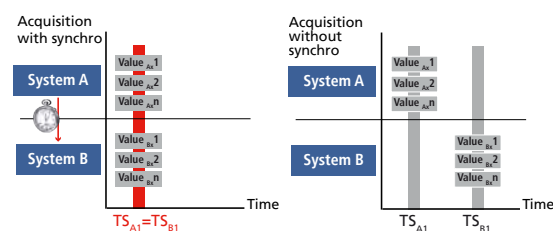
### Synchronisation/time stamp

#### Time stamp

Several MSX-E systems can be synchronised with one another in the  $\mu$ s range through a synchro connection. This allows to start a synchronous data acquisition, to generate trigger events and to synchronise the time on several MSX-E systems. Furthermore, the systems have a time stamp that logs the point in time at which the data was acquired by the system.



The combination of synchronisation and time stamp (TS) allows the clear allocation of signals that were captured by several systems.

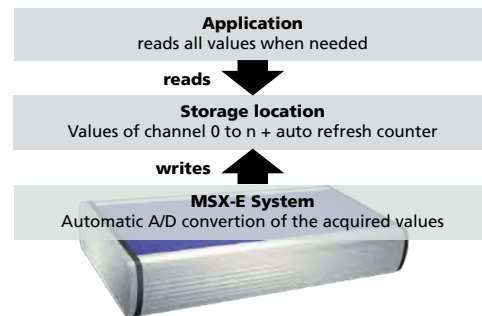




## Acquisition modes

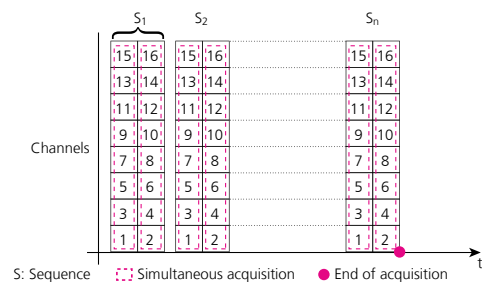
### Auto-refresh mode

In auto-refresh mode, the measurement values are updated automatically after each acquisition. The acquisition is initialised once and the values of the channels are stored in the memory of the MSX-E Ethernet system. The client (e.g. PC, server, PLC, ...) reads the acquired values asynchronously to the acquisition through socket connection, SOAP or Modbus function. Thereby, the new value is read and the old values are overwritten. In addition to the measurement values, the auto-refresh counter can also be read, which allows to sort the measurement values chronologically. The auto-refresh mode can be combined with a hardware or a synchro trigger and also allows the automatic averaging of values.



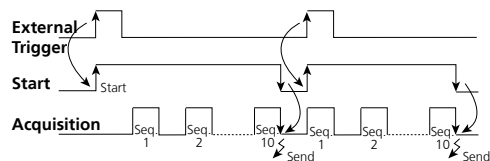
### Sequence mode

In sequence mode, a list of channels is acquired. Thereby, the single measurement rows are stored one after another. The client receives the acquired values asynchronously to the acquisition through a socket connection. In the sequence mode, the measurement values are read in chronological order, this means the oldest values are read first. The acquisition can be effected continuously, with or without delay or in combination with a hardware or synchro trigger.



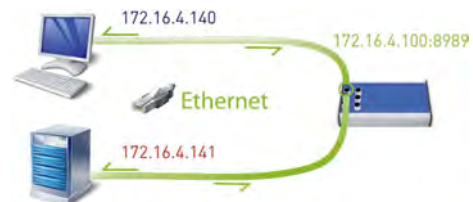
### Acquisition triggered through trigger or synchro input

**Example:** A measurement process is to be started through an external trigger impulse. For each trigger, 10 sequences are to be acquired. After the acquisition of the 10 sequences they are to be sent to the client.



### Reading data from a MSX-E system

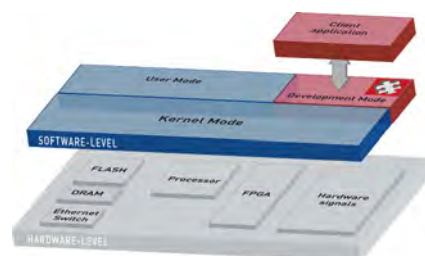
MSX-E systems are multi-client capable, this means several clients (e. g. PC, server, PLC, ...) can read the measurement values of one MSX-E system at the same time. For this, each client establishes a socket connection to the data server of the MSX-E system (port 8989). As soon as the measurement values are available on the data server, the MSX-E system transfers them to the clients.



## Onboard programming / stand-alone operation

### Development mode

With the Development mode of the MSX-E systems you can customise your measurement, control and regulation applications to fit your requirements. The programs run directly on the MSX-E systems, which has two advantages: external PCs are relieved and you can process data freely according to your requirements. This helps you to improve the efficiency of your processes and to secure your investments.



### NOTE

With thermocouples, it is only possible to capture the relative temperature between the terminal to which the thermocouple is connected and the welding spot. For this reason, in order to calculate the actual temperature at the measuring point, it is necessary to capture an absolute temperature on a second sensor (PTC). This is called cold junction compensation (CJC) and is included on the MSX-E3211-TC system.

## ConfigTools

The **ConfigTools** program allows an easy administration of the MSX-E systems. These are recognised automatically in the network. **ConfigTools** consists of common and specific functions.

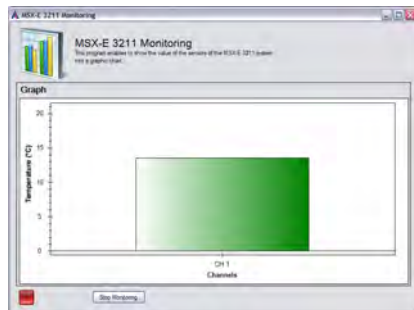
In addition, with **ConfigTools**, the complete configuration of a MSX-E system can be saved and transferred to another system of the same type (clone function).

**ConfigTools** is included in the delivery.

### ConfigTools functions for MSX-E3211:

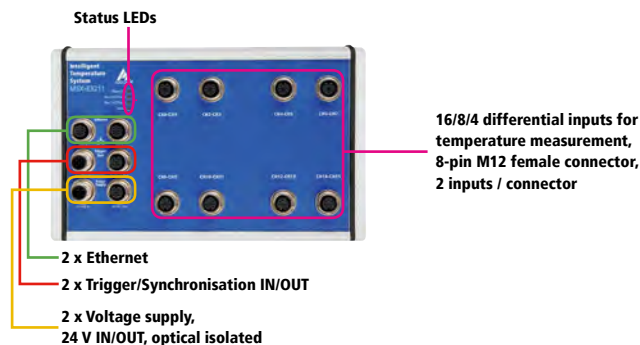
- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration
- Save/load channel configuration
- Monitoring the temperature inputs

Very easy use through the „ConfigTools“ program; The MSX-E system is automatically detected in the network.

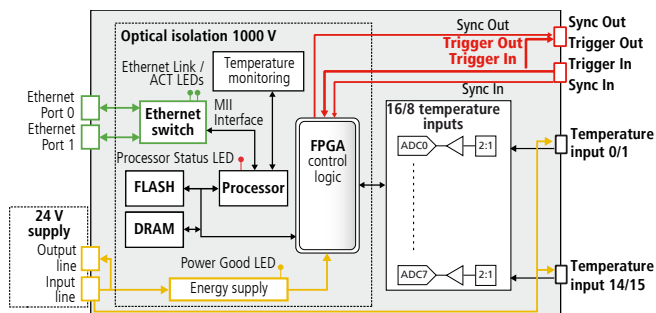


Monitor function example for temperature inputs

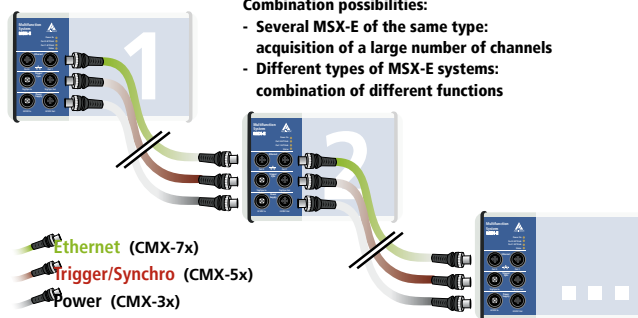
## Features



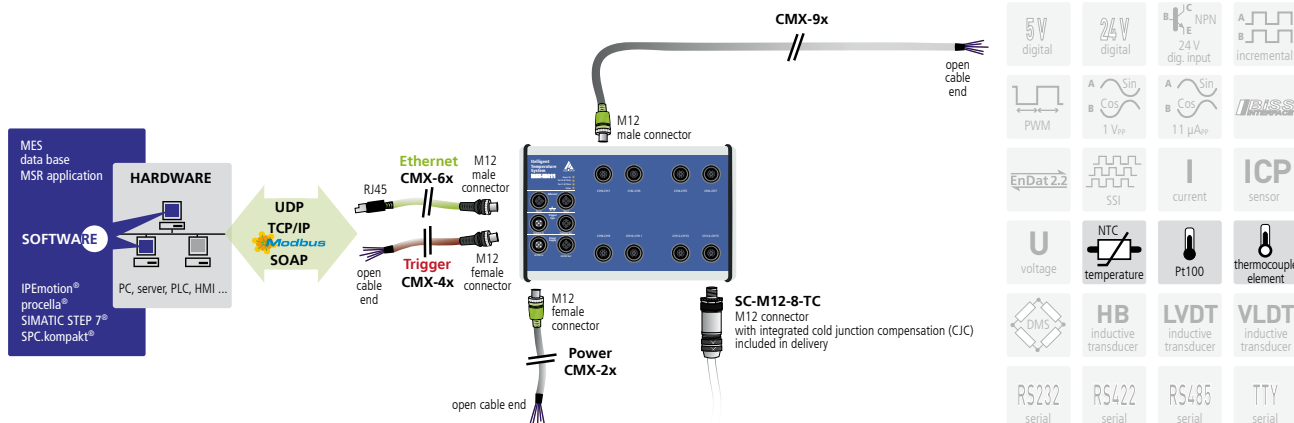
## Simplified block diagram



## Cascading



## ADDI-DATA connection technology







## Specifications

### Analog inputs

|                             |  |                  |   |
|-----------------------------|--|------------------|---|
| Number of inputs:           | 16, 8 or 4 differential inputs<br>for thermocouples or RTD<br>2 outputs for each M12 connector |                  |   |
| Resolution:                 | 24-bit   |                  |   |
| Optical isolation:          | 1000 V   |                  |   |
| Throughput:                 | max. 788 Hz for 1 channel, max. 528 Hz for 2 channels  |                  |   |
| Current source:             | ~200 µA (intern kalibriert)  |                  |   |
| Real acquisition frequency: | at<br>1 channel  | at<br>2 channels | Sampling frequency<br>(software programmable) |
|                             | 2.37 Hz  | 1.585 Hz         | 5 Hz  |
|                             | 4.73 Hz  | 3.154 Hz         | 10 Hz   |
|                             | 9.37 Hz  | 6.243 Hz         | 20 Hz   |
|                             | 18.9 Hz  | 12.6 Hz          | 40 Hz   |
|                             | 37.35 Hz   | 24.89 Hz         | 80 Hz   |
|                             | 73 Hz  | 48.65 Hz         | 160 Hz  |
|                             | 145 Hz   | 96.8 Hz          | 320 Hz  |
|                             | 276.4 Hz   | 184.26 Hz        | 640 Hz  |
|                             | 407.83 Hz  | 271.96 Hz        | 1 kHz   |
|                             | 788 Hz   | 525.48 Hz        | 2 kHz   |

### Voltage supply, Ethernet, Trigger, Synchro

The specifications for the voltage supply, Ethernet, Trigger, Synchronisation and Electromagnetic Compatibility apply to all MSX-E systems. See page 31.

### System features

|                        |  |
|------------------------|--|
| Interface:             | Ethernet acc. to specification IEEE802.3 |
| Dimensions (mm):       | 220 x 140 x 50                           |
| Weight:                | 620 g                                    |
| Degree of protection:  | IP 65                                    |
| Current consumption:   | 150 mA ± 10 % typ. in idle/power save    |
| Operating temperature: | -40 °C to +85 °C                         |

#### Connectors for sensors

Analog inputs: 8, 4 or 2 x 8-pin M12 female connector

## Ordering information

### MSX-E3211

Ethernet system for temperature measurement, 16/8/4 channels for thermocouples or RTD, 24-bit. Incl. technical description and software drivers.

#### Versions

|                          |                      |
|--------------------------|----------------------|
| <b>MSX-E3211-TC-16:</b>  | for 16 thermocouples |
| <b>MSX-E3211-TC-8:</b>   | for 8 thermocouples  |
| <b>MSX-E3211-TC-16:</b>  | for 4 thermocouples  |
| <b>MSX-E3211-RTD-16:</b> | for 16 RTD           |
| <b>MSX-E3211-RTD-8:</b>  | for 8 RTD            |
| <b>MSX-E3211-RTD-4:</b>  | for 4 RTD            |

#### Connection cables

##### Voltage supply

|                |  |
|----------------|--|
| <b>CMX-2x:</b> | Shielded cable, M12 5-pin female connector/open end, IP 65                     |
| <b>CMX-3x:</b> | For cascading, shielded cable, M12 5-pin female connector/male connector IP 65 |

##### Trigger/Synchro

|                |  |
|----------------|--|
| <b>CMX-4x:</b> | Shielded cable, M12 5-pin female connector/open end, IP 65                     |
| <b>CMX-5x:</b> | For cascading, shielded cable, M12 5-pin female connector/male connector IP 65 |

#### Ethernet

|                |  |
|----------------|--|
| <b>CMX-6x:</b> | CAT5E cable, M12 D-coded male connector/RJ45 connector     |
| <b>CMX-7x:</b> | For cascading: CAT5E cable, 2 x M12 D-coded male connector |

#### Cold junction compensation

|                     |   |
|---------------------|---|
| <b>SC-M12-8-TC:</b> | M12 8-pin connector for connecting thermocouples with integrated CJC. (Included in delivery!) |
|---------------------|---|

#### Options

|   |   |
|---|---|
| <b>S7 Modbus TCP Client Library for S7:</b> | Easy use of the Ethernet systems MSX-E with PLCs      |
| <b>MSX-E 5V-Trigger:</b>                    | Level change of the trigger inputs and outputs to 5 V |
| <b>MSX-E-Filter-20Hz:</b>                   | 20 Hz input filter                                    |
| <b>MSX-E-NTC-100µA:</b>                     | for NTC sensors with 0-20 kΩ                          |
| <b>MSX-E-NTC-50µA:</b>                      | for NTC sensors with 0-40 kΩ                          |
| <b>MX-Rail</b>                              | (Please specify when ordering!)                       |
| <b>MX-Screw, PCMX-1x</b>                    |   |

# Ethernet system for pressure/force measurement

## 16/8 channels for strain gauges, 24-bit



### MSX-E3311

16/8 differential inputs, 24-bit

For strain gauges

Simultaneous acquisition of up to 8 channels

24 V digital trigger input



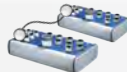
Integrated  
Ethernet  
switch



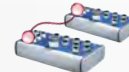
\*Operating temperature



ARM<sup>®</sup>9  
Technology



Cascadable,  
can be synchronised  
in the  $\mu$ s range



On request:  
Compare logic for  
synchro trigger signal



on request



DatabaseConnect  
see page 114



More information on  
[www.addi-data.com](http://www.addi-data.com)

### Features

- 24 V digital trigger input
- ARM<sup>®</sup>9 32-bit processor
- 64 MB onboard SDRAM for storing data
- Robust standardized metal housing
- Power Save Mode: Reduced power consumption when no acquisition runs

### Safety features

- Status LEDs for fast error diagnostics
- Optical isolation
- Input filters

### Inputs for strain gauges

- 16/8 differential inputs for strain gauges, 24-bit
- Sampling frequency max. 788 Hz/channel (max. 8/4 channels simultaneously)
- Autogain: Optimal adjustment of the gain to the measuring range
- Integrated sensor supply: 10 V, 50 mA (5 V optional)

### Interfaces

- Fast 24 V trigger input
- Ethernet switch with 2 ports
- Synchronisation/trigger In/Out
- Line in for 24 V supply and cascading

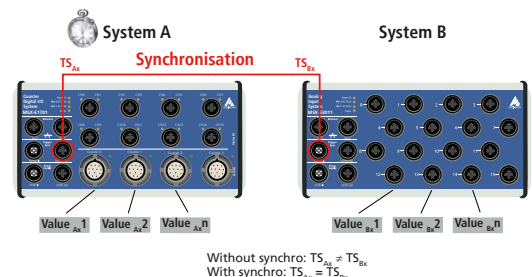
### Communication interfaces

- Web server (configuration and monitoring)
- Command server SOAP for transferring commands
- Data server (TCP/IP or UDP socket) for sending acquisition data
- Event server (TCP/IP socket) for sending system events (Diagnostics such as temperature, short-circuits ...)
- Command server Modbus TCP and Modbus (UDP) for sending commands

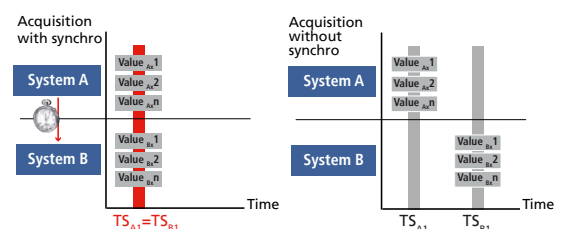
### Synchronisation/time stamp

#### Time stamp

Several MSX-E systems can be synchronised with one another in the  $\mu$ s range through a synchro connection. This allows to start a synchronous data acquisition, to generate trigger events and to synchronise the time on several MSX-E systems. Furthermore, the systems have a time stamp that logs the point in time at which the data was acquired by the system.



The combination of synchronisation and time stamp (TS) allows the clear allocation of signals that were captured by several systems.

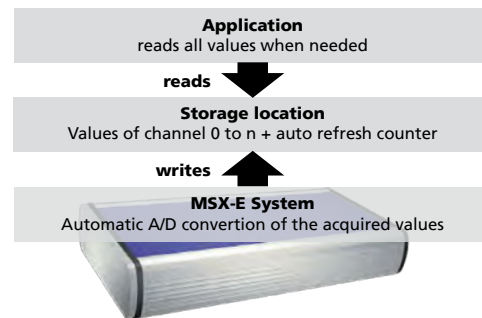




## Acquisition modes

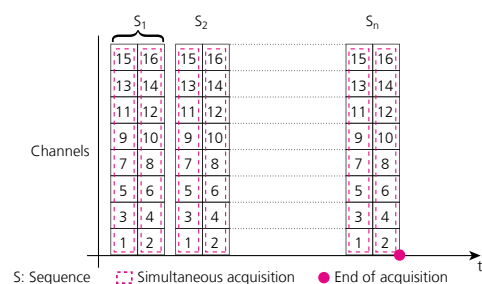
### Auto-refresh mode

In auto-refresh mode, the measurement values are updated automatically after each acquisition. The acquisition is initialised once and the values of the channels are stored in the memory of the MSX-E Ethernet system. The client (e.g. PC, server, PLC, ...) reads the acquired values asynchronously to the acquisition through socket connection, SOAP or Modbus function. Thereby, the new value is read and the old values are overwritten. In addition to the measurement values, the auto-refresh counter can also be read, which allows to sort the measurement values chronologically. The auto-refresh mode can be combined with a hardware or a synchro trigger and also allows the automatic averaging of values.



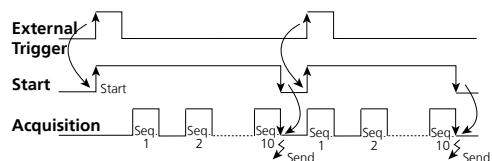
### Sequence mode

In sequence mode, a list of channels is acquired. Thereby, the single measurement rows are stored one after another. The client receives the acquired values asynchronously to the acquisition through a socket connection. In the sequence mode, the measurement values are read in chronological order, this means the oldest values are read first. The acquisition can be effected continuously, with or without delay or in combination with a hardware or synchro trigger.



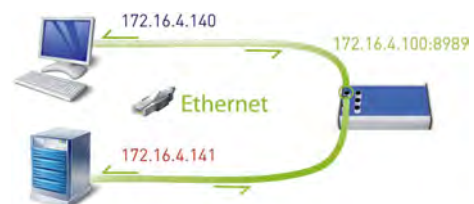
### Acquisition triggered through trigger or synchro input

**Example:** A measurement process is to be started through an external trigger impulse. For each trigger, 10 sequences are to be acquired. After the acquisition of the 10 sequences they are to be sent to the client.



### Reading data from a MSX-E system

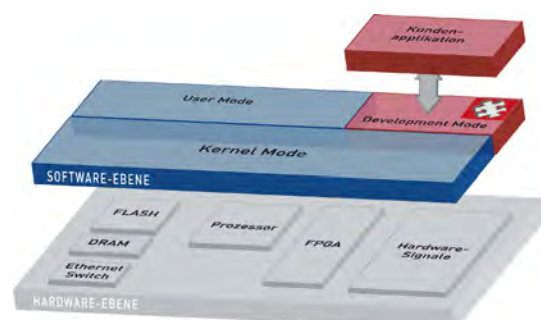
MSX-E systems are multi-client capable, this means several clients (e. g. PC, server, PLC, ...) can read the measurement values of one MSX-E system at the same time. For this, each client establishes a socket connection to the data server of the MSX-E system (port 8989). As soon as the measurement values are available on the data server, the MSX-E system transfers them to the clients.



## Onboard programming / stand-alone operation

### Development mode

With the Development mode of the MSX-E systems you can customise your measurement, control and regulation applications to fit your requirements. The programs run directly on the MSX-E systems, which has two advantages: external PCs are relieved and you can process data freely according to your requirements. This helps you to improve the efficiency of your processes and to secure your investments.



## ConfigTools

The **ConfigTools** program allows an easy administration of the MSX-E systems. These are automatically detected in the network. **ConfigTools** consists of common and specific functions.

In addition, with **ConfigTools**, the complete configuration of a MSX-E system can be saved and transferred to another system of the same type (clone function).

**ConfigTools** is included in the delivery.

### ConfigTools functions for MSX-E3311:

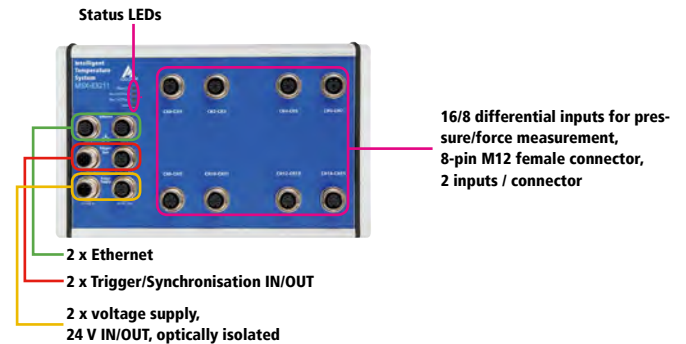
- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration
- Save/load channel configuration
- Monitor for Inputs for strain gauges

Very easy use through the „ConfigTools“ program; The MSX-E system is automatically detected in the network.

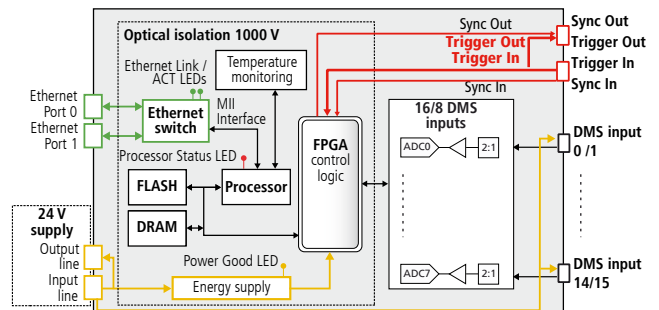


Example of monitor function for Inputs for strain gauges

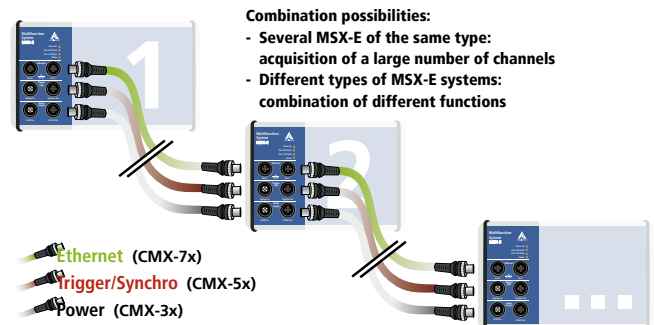
## Features



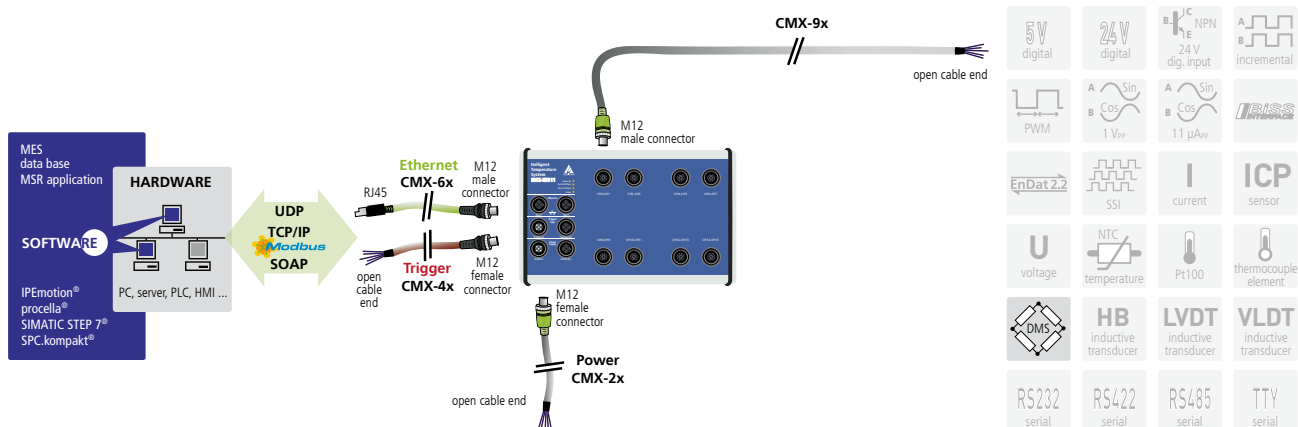
## Simplified block diagram



## Cascading



## ADDI-DATA connection technology





## Specifications

### Inputs for strain gauges

|                                 |   |                  |   |
|---------------------------------|---|------------------|---|
| Number of inputs:               | 16 or 8 differential inputs for strain gauges<br>2 inputs per M12 connector |                  |   |
| Resolution:                     | 24-bit  |                  |   |
| Optical isolation:              | 1000 V  |                  |   |
| Throughput per M12 connector:   | max. 788 Hz for 1 channel, max. 528 Hz for 2 channels                       |                  |   |
| Voltage supply for the sensors: | 10 V, 50 mA   |                  |   |
| Voltage supply:                 | ~10 V / optional 5 V (onboard calibration) 100 mA max.                      |                  |   |
| Real Sampling frequency:        | on<br>1 channel   | on<br>2 channels | Sampling frequency<br>(software-configurable) |
|                                 | 2.37 Hz   | 1.585 Hz         | 5 Hz  |
|                                 | 4.73 Hz   | 3.154 Hz         | 10 Hz   |
|                                 | 9.37 Hz   | 6.243 Hz         | 20 Hz   |
|                                 | 18.9 Hz   | 12.6 Hz          | 40 Hz   |
|                                 | 37.35 Hz  | 24.89 Hz         | 80 Hz   |
|                                 | 73 Hz   | 48.65 Hz         | 160 Hz  |
|                                 | 145 Hz  | 96.8 Hz          | 320 Hz  |
|                                 | 276.4 Hz  | 184.26 Hz        | 640 Hz  |
|                                 | 407.83 Hz   | 271.96 Hz        | 1 kHz   |
|                                 | 788 Hz  | 525.48 Hz        | 2 kHz   |

### Voltage supply, Ethernet, Trigger, Synchro

The specifications for the voltage supply, Ethernet, Trigger, Synchronisation and Electromagnetic Compatibility apply to all MSX-E systems. See page 31.

### System features

|                               |  |
|-------------------------------|--|
| Interface:                    | Ethernet acc. to specification IEEE802.3       |
| Dimensions:                   | 220 mm x 140 mm x 50 mm                        |
| Weight:                       | 620 g  |
| Degree of protection:         | IP 65  |
| Current consumption:          | 150 mA $\pm$ 10 % typ. in idle/power save mode |
| Operating temperature:        | -40 °C to +85 °C                               |
| <b>Connectors for sensors</b> |  |
| Analog inputs:                | 8 or 4 x 8-pin female connector, M12           |

## Ordering information

### MSX-E3311

Ethernet system for pressure/force measurement, 16/8 channels for strain gauges, 24-bit. Incl. technical description, software drivers and ConfigTools.

### Versions

**MSX-E3311-16:** for 16 strain gauges

**MSX-E3311-8:** for 8 strain gauges

**Opt.MSX-E-5Vss:** Bridge supply voltage adjustment to 5 V (**optional**)

### Connection cables

#### Voltage supply

**CMX-2x:** Shielded cable, M12 5-pin female connector/open end, IP 65

**CMX-3x:** For cascading, shielded cable, M12 5-pin female connector/male connector IP 65

#### Trigger/Synchro

**CMX-4x:** Shielded cable, M12 5-pin female connector/open end, IP 65

**CMX-5x:** For cascading, shielded cable, M12 5-pin female connector/male connector IP 65

#### Ethernet

**CMX-6x:** CAT5E cable, M12 D-coded male connector/RJ45 connector

**CMX-7x:** For cascading, CAT5E cable, 2 x M12 D-coded male connector

#### Options

**S7 Modbus TCP Client Library for S7:** Easy use of the Ethernet systems MSX-E with PLCs

**MSX-E 5V-Trigger:** Level change of the trigger inputs and outputs to 5 V

**MX-Rail** (please specify when ordering!), **MX-Screw**, **PCMX-1x**



# Ethernet system for the acquisition of dynamic signals

## 8 or 2 SE/diff. inputs, 24-bit, simultaneous acquisition



### MSX-E3601 / MSX-E3601-2

8 or 2 SE/diff. inputs, 24-bit

Simultaneous acquisition

8 or 2 current sources for ICP® or IEPE sensors

Onboard calibration

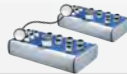
24 V digital trigger input



Integrated  
Ethernet  
switch



\*Operating temperature



Cascadable,  
can be synchronised  
in the  $\mu$ s range



on request



DatabaseConnect  
see page 114



More information on  
[www.addi-data.com](http://www.addi-data.com)

### Features

- 24 V digital trigger input
- ARM®9 32-bit processor
- 64 MB onboard SDRAM for storing data
- Robust standardized metal housing
- Power Save Mode: Reduced power consumption when no acquisition runs

#### Analog inputs

- 8 or 2 SE or diff. inputs, 24-bit, AC/DC coupling
- One A/D converter per channel: simultaneous acquisition on all analog inputs
- Sampling rate up to 128 kHz
- Antialiasing filter
- BNC female connector:
  - inner conductor for positive input
  - outer conductor for negative input (diff) or GND (SE)
- Gain x1, x10, x100

#### Current sources

- 8 or 2 current sources for the direct connection of ICP® sensors (integrated circuit piezoelectric) or IEPE sensors (integrated electronics piezoelectric)
- 4 mA typ., 24 V max.

#### Safety features

- Status LEDs for fast error diagnostics
- Optical isolation
- Input filters
- Overvoltage protection  $\pm 40$  V
- Internal temperature monitoring

### Interfaces

- Fast 24 V trigger input
- Ethernet switch with 2 ports
- Synchronisation/trigger In/Out
- Line in for 24 V supply and cascading

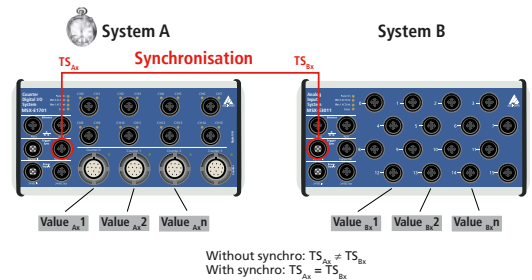
#### Communication interfaces

- Web server (configuration and monitoring)
- Command server SOAP for transferring commands
- Data server (TCP/IP or UDP socket) for sending acquisition data
- Event server (TCP/IP socket) for sending system events (Diagnostics such as temperature, short-circuits ...)

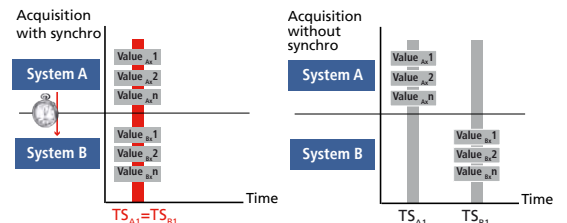
### Synchronisation/time stamp

#### Time stamp

Several MSX-E systems can be synchronised with one another in the  $\mu$ s range through a synchro connection. This allows to start a synchronous data acquisition, to generate trigger events and to synchronise the time on several MSX-E systems. Furthermore, the systems have a time stamp that logs the point in time at which the data was acquired by the system.



The combination of synchronisation and time stamp (TS) allows the clear allocation of signals that were captured by several systems.



### MSX-E3601-2

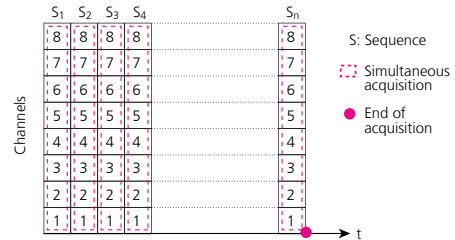




## Acquisition modes

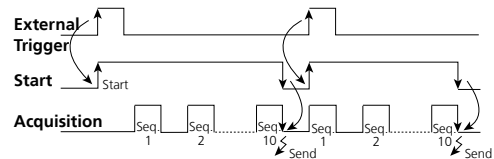
### Sequence mode

In sequence mode, a list of channels is acquired. Thereby, the single measurement rows are stored one after another. The client receives the acquired values asynchronously to the acquisition through a socket connection. In the sequence mode, the measurement values are read in chronological order, this means the oldest values are read first. The acquisition can be effected continuously, with or without delay or in combination with a hardware or synchro trigger.



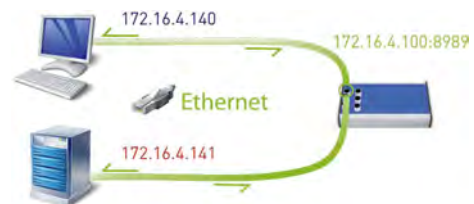
### Acquisition triggered through trigger or synchro input

**Example:** A measurement process is to be started through an external trigger impulse. For each trigger, 10 sequences are to be acquired. After the acquisition of the 10 sequences they are to be sent to the client.



### Reading data from a MSX-E system

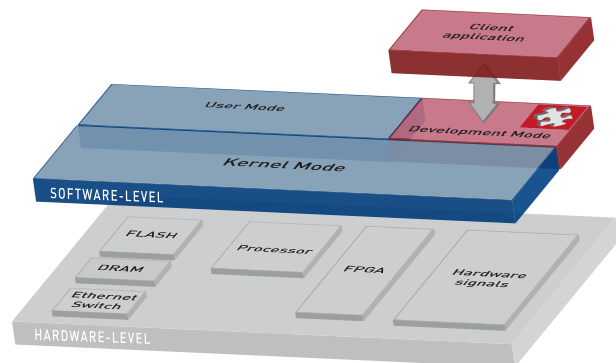
MSX-E systems are multi-client capable, this means several clients (e. g. PC, server, PLC, ...) can read the measurement values of one MSX-E system at the same time. For this, each client establishes a socket connection to the data server of the MSX-E system (port 8989). As soon as the measurement values are available on the data server, the MSX-E system transfers them to the clients.



## Onboard programming / stand-alone operation

### Development mode

With the Development mode of the MSX-E systems you can customise your measurement, control and regulation applications to fit your requirements. The programs run directly on the MSX-E systems, which has two advantages: external PCs are relieved and you can process data freely according to your requirements. This helps you to improve the efficiency of your processes and to secure your investments.

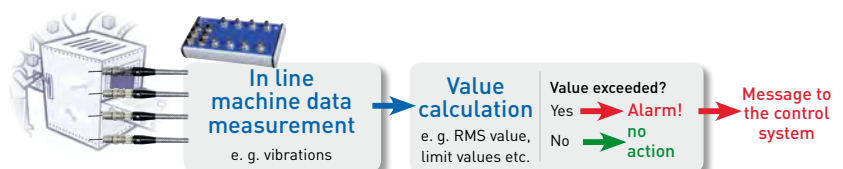


### Anti-aliasing filter

Low-pass filters are used before or during digitising in order to remove all frequency components which are higher than the Nyquist frequency. This is to make sure that the digitised value or result does not contain any unwanted frequencies (aliasing frequencies). According to the Nyquist criterion, in order to obtain the full signal information, the sampling rate must be at least 2 x the signal band width.

### Firmware and software adaptation

Because MSX-E systems are very flexible, the MSX-E3601 firmware can be easily extended. Thus, calculations such as RMS or limit values etc. can be integrated. Using the Development Mode, it is possible to create self-sufficient intelligent nodes.



## ConfigTools

The **ConfigTools** program allows an easy administration of the MSX-E systems. These are automatically detected in the network. **ConfigTools** consists of common and specific functions.

In addition, with **ConfigTools**, the complete configuration of a MSX-E system can be saved and transferred to another system of the same type (clone function).

**ConfigTools** is included in the delivery.

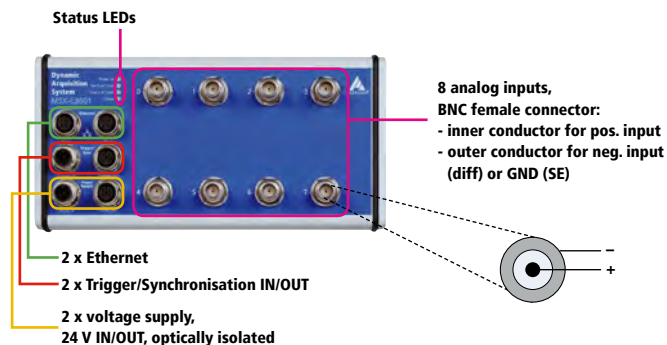
### ConfigTools functions for MSX-E3601 / MSX-E3601-2:

- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration
- Save/load channel configuration

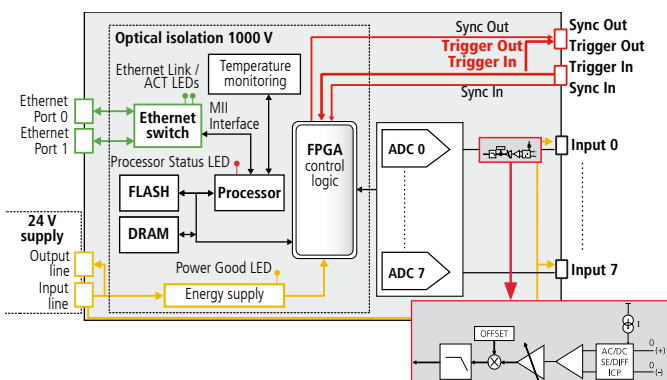
Very easy use through the „ConfigTools“ program;  
The MSX-E system is automatically detected in the network.



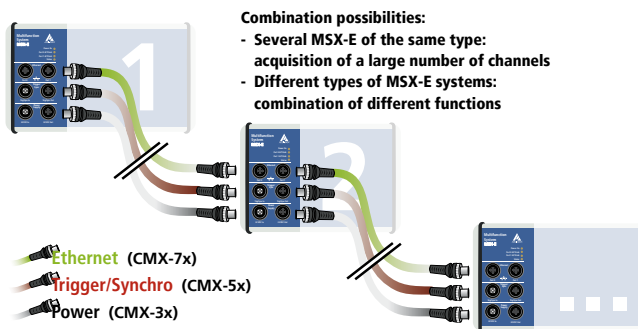
## Features



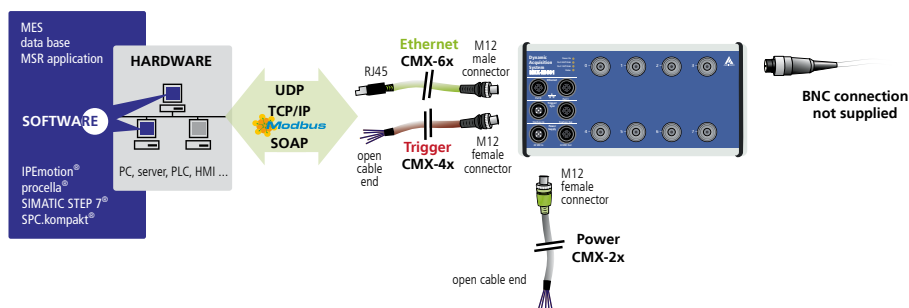
## Simplified block diagram



## Cascading



## ADDI-DATA connection technology



|            |                   |                                   |                           |
|------------|-------------------|-----------------------------------|---------------------------|
| 5V digital | 24V digital       | B <sup>+</sup> NPN 24V dig. input | A B incremental           |
| A Sin      | B Cos             | 11 $\mu$ A <sub>typ</sub>         | RS485                     |
| PWM        | 1 V <sub>pp</sub> | SS1                               | ICP sensor                |
| EnDat 2.2  | U voltage         | NTC temperature                   | Pt100                     |
|            |                   |                                   | thermocouple element      |
|            |                   |                                   | LVDT inductive transducer |
|            |                   |                                   | VLDT inductive transducer |
|            |                   |                                   | TTY serial                |



## Specifications

### Analog inputs

|                                    |  |
|------------------------------------|--|
| Number of inputs:                  | <b>MSX-E3601:</b> 8, 1 AD converter per channel<br><b>MSX-E3601-2:</b> 2, simultaneous acquisition, 1 AD converter per channel   |
| Coupling:                          | DC, AC (software-configurable)   |
| Input type:                        | single-ended or differential (software-configurable)   |
| <b>Input ranges</b>                | <b>SE</b> <b>Diff.</b>   |
| Gain x1:                           | ± 10 V single-ended      ± 5 V differential  |
| Gain x10:                          | ± 1 V single-ended      ± 0.5 V differential   |
| Gain x100:                         | ± 0.1 V single-ended      ± 0.05 V differential  |
| ADC-Type:                          | Oversampled SAR with linear phase FIR antialiasing digital filter  |
| Resolution:                        | 24-bit   |
| Sampling rate $f_s$ :              | up to 128 kHz  |
| Selectable frequencies $f_s$ :     | 128000.00 100000.00 80000.00 66666.67<br>64000.00 50000.00 40000.00 33333.33<br>32000.00 25000.00 20000.00 16666.67<br>16000.00 13333.33 12800.00 12500.00<br>10000.00 8000.00 6666.67 6400.00<br>6250.00 5000.00 4000.00 3333.33<br>3200.00 3125.00 2500.00 2000.00<br>1666.67 1600.00 1562.50 1280.00<br>1000.00 |
| Oversampling:                      | 8 x $f_s$  |
| Frequency accuracy:                | ± 50 ppm   |
| <b>Input stage characteristics</b> |  |
| Input impedance:                   | 1 M $\Omega$ // 300 pF typ., DC coupled  |
| AC cutoff frequency (-3 dB):       | 0.48 Hz typ.   |
| Overvoltage protection:            | Positive input      +27 V/-14 V, ± 100 mA<br>Max. continuous current<br>Negative input      ± 14 V, ± 100 mA<br>Max. continuous current  |
| <b>Filter response</b>             |  |
| Passband:                          | DC up to 0.453 x $f_s$ typ.  |
| Passband ripple:                   | +/-0.01 dB max. DC up to 0.453 x $f_s$   |
| Bandwidth (-3 dB):                 | 0.49 x $f_s$ typ.  |
| Stop band:                         | 0.547 x $f_s$ typ.   |
| Stop band attenuation:             | 100 dB min.  |
| Group delay:                       | 37/ $f_s$ ( $\mu$ s) typ.  |
| Settling time (latency):           | 74/ $f_s$ ( $\mu$ s) complete settling   |
| <b>Dynamic characteristics</b>     |  |
| Signal-to-noise ration (SNR):      | FSR, $f_{in}$ = 1 kHz<br>≥ 95 dB      Gain x1<br>≥ 94 dB      Gain x10<br>≥ 75 dB      Gain x100   |
| Total Harmonic Distortion (THD):   | FSR, $f_{in}$ = 1 kHz<br>≥ 100 dB      Gain x1<br>≥ 100 dB      Gain x10<br>≥ 90 dB      Gain x100   |
| Dynamic range:                     | Shorted inputs<br>≥ 105 dB      Gain x1<br>≥ 100 dB      Gain x10<br>≥ 85 dB      Gain x100  |

|                                |   |
|--------------------------------|---|
| Crosstalk:                     | Between channels 0-1, 2-3, 4-5, 6-7, with gain x1<br>≥ 104 dB      short input, $f_{in}$ = 100 Hz<br>≥ 100 dB      short input, $f_{in}$ = 1 kHz<br>≥ 104 dB      50 $\Omega$ input, $f_{in}$ = 100 Hz<br>≥ 100 dB      50 $\Omega$ input, $f_{in}$ = 1 kHz |
| Phase mismatch:                | Between channels 1-2, 3-4, 5-6, 7-8, with gain x1<br>± 0.001° $f_{in}$ < 100 Hz<br>± 0.01° $f_{in}$ < 1 kHz<br>± 0.1° $f_{in}$ < 10 kHz   |
| Amplitude accuracy:            | ± 0.009 dB max. at $f_{in}$ = 1 kHz sine signal, Gain x1, x10, x100   |
| CMRR:                          | > 110 dB typ. at DC<br>> 90 dB typ. at $f_{in}$ < 1000 Hz   |
| Offset error:                  | ± 90 $\mu$ V after calibration at 25 °C   |
| <b>Onboard DC calibration:</b> | Software-configurable   |
| Calibration voltage:           | 5 V typ. Gain x1<br>900 mV typ. Gain x10<br>90 mV typ. Gain x100  |
| Temperature drift:             | ± 8 ppm/°C typ.   |
| <b>Sensor supply voltage</b>   |   |
| Number of channels:            | 8 (MSXE-3601) or 2 (MSX-E3601-2) positive input   |
| Current source:                | 4 mA typ. to 24 V max.  |
| Coupling:                      | AC (positive input)<br>GND (negative input)   |
| <b>Recording duration:</b>     | TBD max. at 128 kHz sampling rate on 8 channels   |

### Current sources

|         |  |
|---------|--|
| Number: | 8 or 2 constant current sources for the supply of the ICP® or IEPE sensors, 4 mA typ., 24 V max. |
|---------|--|

### Voltage supply, Ethernet, Trigger, Synchro

The specifications for the voltage supply, Ethernet, Trigger, Synchronisation and Electromagnetic Compatibility apply to all MSX-E systems. See page 31.

### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### System features

|                               |  |
|-------------------------------|--|
| Interface:                    | Ethernet acc. to specification IEEE802.3                                       |
| Dimensions:                   | 215 x 110 x 52 mm  |
| Weight:                       | 860 g  |
| Degree of protection:         | IP 65  |
| Current consumption at 24 V:  | 350 mA typ.  |
| Operating temperature:        | -40 °C to +85 °C   |
| <b>Connectors for sensors</b> |  |
| for analog inputs:            | 8 x BNC female connector (MSX-E3601)<br>2 x BNC female connector (MSX-E3601-2) |

## Ordering information

### MSX-E3601 / MSX-E3601-2

Ethernet system for the acquisition of dynamic signals, 8 or 2 SE/diff. inputs, 24-bit, simultaneous acquisition. Incl. technical description, software drivers and ConfigTools.

### Versions

|                     |                   |
|---------------------|-------------------|
| <b>MSX-E3601:</b>   | 8 SE/diff. inputs |
| <b>MSX-E3601-2:</b> | 2 SE/diff. inputs |

### Connection cables

#### Voltage supply

|                |  |
|----------------|--|
| <b>CMX-2x:</b> | Shielded cable, M12 5-pin female connector/open end, IP 65                     |
| <b>CMX-3x:</b> | For cascading, shielded cable, M12 5-pin female connector/male connector IP 65 |

#### Trigger/Synchro

|                |  |
|----------------|--|
| <b>CMX-4x:</b> | Shielded cable, M12 5-pin female connector/open end, IP 65                     |
| <b>CMX-5x:</b> | For cascading, shielded cable, M12 5-pin female connector/male connector IP 65 |

### Ethernet

|                |  |
|----------------|--|
| <b>CMX-6x:</b> | CAT5E cable, M12 D-coded male connector/RJ45 connector     |
| <b>CMX-7x:</b> | For cascading, CAT5E cable, 2 x M12 D-coded male connector |

### Options

**S7 Modbus TCP Client Library for S7:** Easy use of the Ethernet systems MSX-E with PLCs

**MSX-E 5V-Trigger:** Level change of the trigger inputs and outputs to 5 V

**MX-Clip, MX-Rail** (please specify when ordering!),

**MX-Screw, PCMX-1x**

# Ethernet system for length measurement, 24-bit, simultaneous, 8 transducers, counter and temperature inputs

## MSX-E3711

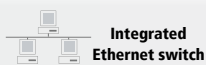
Simultaneous acquisition of  
up to 8 inductive displacement transducers

For half-bridge, LVDT, Mahr or Knaebel transducers

1 incremental counter input (32-bit)

1 input for temperature measurement (Pt100)  
or for thermocouples (TC)

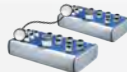
24 V digital trigger input



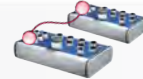
Integrated  
Ethernet switch



\*Operating temperature



Cascadable, can be  
synchronised  
in the  $\mu$ s range



On request:  
Compare logic for  
synchro trigger signal



on request



DatabaseConnect  
see page 114



More information at  
[www.addi-data.com](http://www.addi-data.com)

## Features

- ARM®9 32-bit processor
- Robust standardized metal housing
- Power Save Mode: Reduced power consumption when no acquisition runs

### Transducer inputs

- 8 transducer inputs, 24-bit, 5-pin M18 female connector
- Half-bridge (HB), LVDT, Mahr-compatible, Knaebel
- Simultaneous acquisition
- Diagnostic option (short-circuit, line break)

### Counter input

- 1 x 32-bit incremental counter input, max. 5 MHz
- Voltage supply of sensors with M23 female connector (24 V or 5 V)
- Single, double, quadruple edge analysis
- Compare logic

### Temperature input

- 1 x RTD input, 16-bit, 5-pin M12 female connector
- $\pm 0,01$  °C resolution
- Thermocouple input, optional (MSX-E3711-TC)

### Safety features

- Status LEDs for fast error diagnostics
- Optical isolation
- Input filters
- Overvoltage protection  $\pm 40$  V
- Internal temperature monitoring

## Interfaces

- Fast 24 V trigger input
- Ethernet switch with 2 ports
- Synchronisation/trigger In/Out
- Line in for 24 V supply and cascading

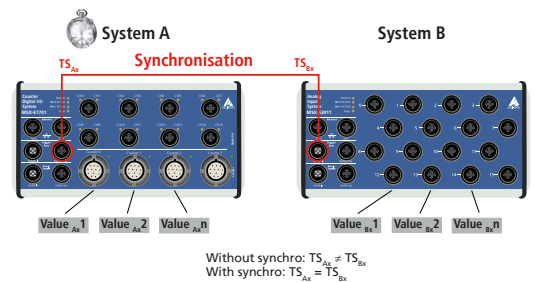
### Communication interfaces

- Web server (configuration and monitoring)
- Command server SOAP for transferring commands
- Data server (TCP/IP or UDP socket) for sending acquisition data
- Event server (TCP/IP socket) for sending system events (Diagnostics such as temperature, short-circuits ...)
- Command server Modbus TCP and Modbus (UDP) for sending commands

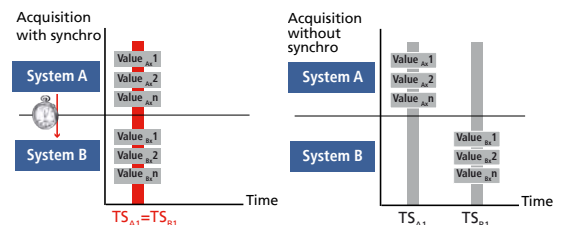
## Synchronisation/time stamp

### Time stamp

Several MSX-E systems can be synchronised with one another in the  $\mu$ s range through a synchro connection. This allows to start a synchronous data acquisition, to generate trigger events and to synchronise the time on several MSX-E systems. Furthermore, the systems have a time stamp that logs the point in time at which the data was acquired by the system.



The combination of synchronisation and time stamp (TS) allows the clear allocation of signals that were captured by several systems.



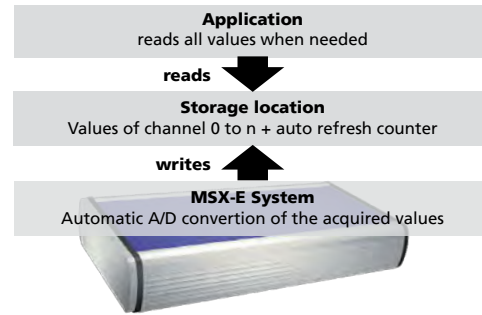




## Acquisition modes

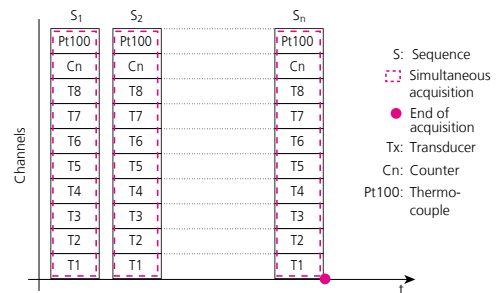
### Auto-refresh mode

In the auto-refresh mode, the measurement values are updated automatically after each acquisition. The acquisition is initialised once and the values of the channels are stored in the memory of the MSX-E Ethernet system. The client (e.g. PC, server, PLC, ...) reads the acquired values asynchronously to the acquisition through socket connection, SOAP or Modbus function. Thereby, the new value is read and the old values are overwritten. In addition to the measurement values, the auto-refresh counter can also be read, which allows to sort the measurement values chronologically. The auto-refresh mode can be combined with a hardware or a synchro trigger and also allows the automatic averaging of values.



### Sequence mode

In the sequence mode, a list of channels is acquired. Thereby, the single measurement rows are stored one after another. The client receives the acquired values asynchronously to the acquisition through a socket connection. In the sequence mode, the measurement values are read in chronological order, this means the oldest values are read first. The acquisition can be effected continuously, with or without delay or in combination with a hardware or synchro trigger.



### Compare logic

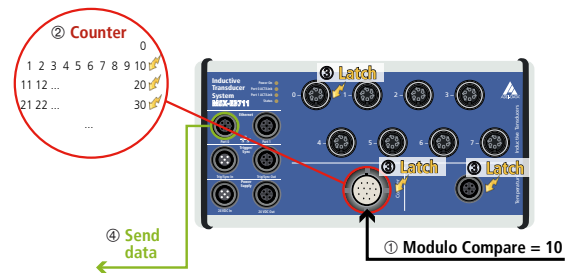
With the compare logic of the incremental counter, a synchro-trigger signal can be generated in order to latch the counter value, the transducers and the temperature input as soon as the counter value is equal to the compare value.

Thus all the inputs of the MSX-E3711 system can be acquired simultaneously.

With the additional „Modulo-Mode“ (Modulo Compare), a trigger can also be generated at the n value of the compare value.

Thus it is possible, e. g. when using an encoder with 3,600 steps / revolution to obtain each degree of a measurement value (Modulo Compare = 10).

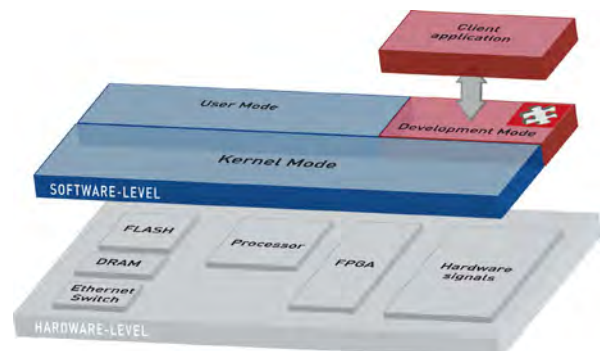
The thus generated synchro-trigger can also be used for data acquisition on further MSX-E systems.



## Onboard programming / stand-alone operation

### Development mode

With the Development mode of the MSX-E systems you can customise your measurement, control and regulation applications to fit your requirements. The programs run directly on the MSX-E systems, which has two advantages: external PCs are relieved and you can process data freely according to your requirements. This helps you to improve the efficiency of your processes and to secure your investments.



## ConfigTools

The **ConfigTools** program allows an easy administration of the MSX-E systems. These are recognised automatically in the network. **ConfigTools** consists of common and specific functions.

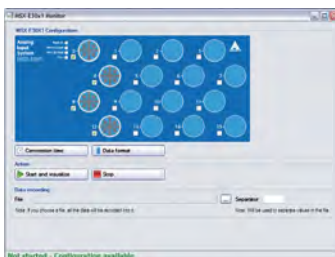
In addition, with **ConfigTools**, the complete configuration of a MSX-E system can be saved and transferred to another system of the same type (clone function).

**ConfigTools** is included in the delivery.

### ConfigTools functions for MSX-E3711:

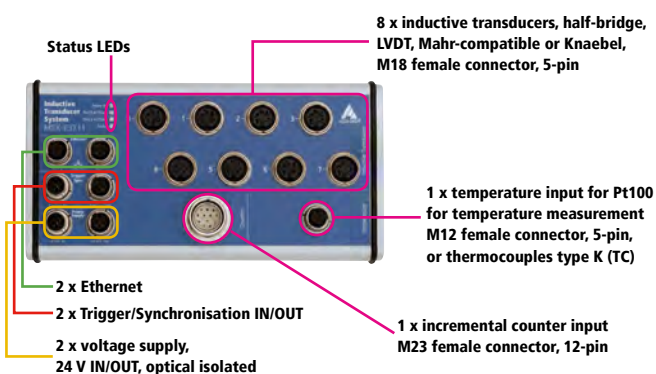
- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration
- Save/load channel configuration
- Calibration of transducers
- Data base of transducers
- Monitoring of transducers
- Diagnostics of transducers

Very easy use through the „ConfigTools“ program; The MSX-E system is automatically detected in the network.

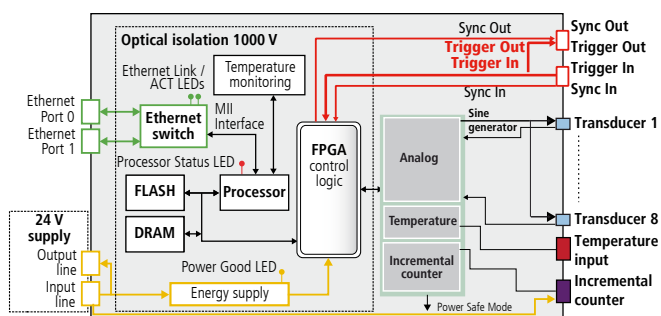


Monitor function example:  
Check of the analog inputs.

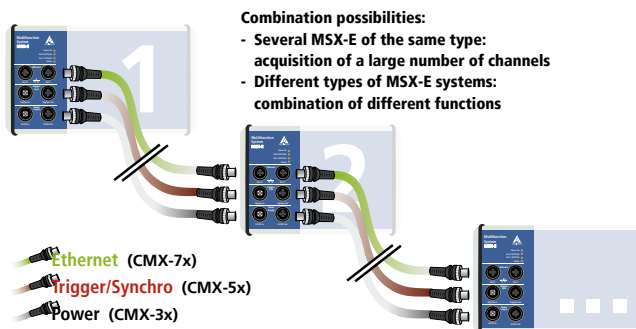
## Features



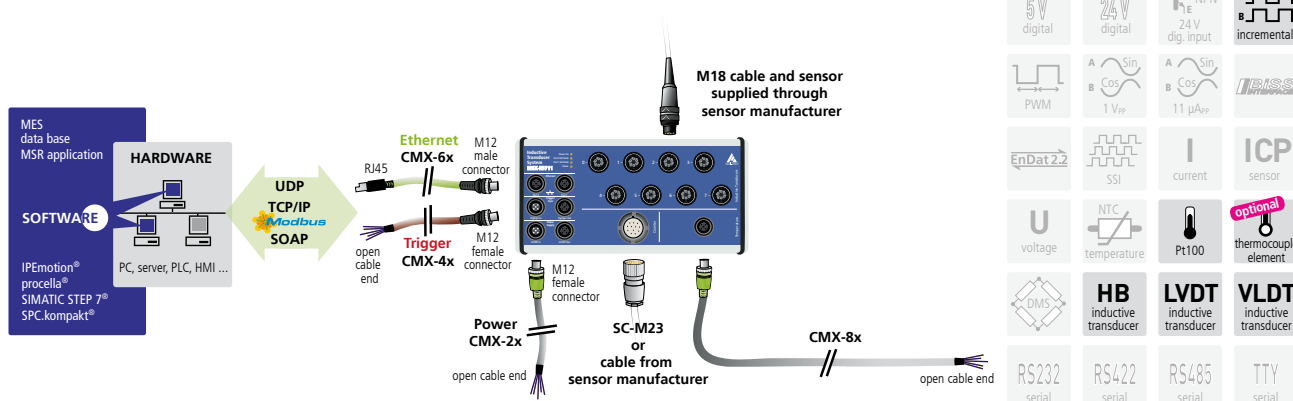
## Simplified block diagram



## Cascading



## ADDI-DATA connection technology





## Specifications

### Connection of inductive transducers

#### Inputs for inductive transducers

|                       |                           |                               |
|-----------------------|---------------------------|-------------------------------|
| Channel features:     |                           |                               |
| Number:               | 8 x ADC (not multiplexed) |                               |
| Input type:           | Single-ended              |                               |
| Coupling:             | DC                        |                               |
| Resolution:           | 24-bit                    |                               |
| Sampling rate $f_s$ : | On 8 channels             | At primary frequency $f_p$ of |
|                       |                           | 5 kHz                         |
|                       | $f_s = f_p$               | 7.69 kHz                      |
|                       |                           | 10 kHz                        |
|                       |                           | 12.5 kHz                      |
|                       |                           | 20 kHz                        |
|                       |                           | 50 kHz                        |

Example with TESA GT21:  $f_s = f_p = 12.5$  kHz on all 8 channels

#### Input level

|                  |                |                       |
|------------------|----------------|-----------------------|
| Input impedance: | 2 k $\Omega$   | software-programmable |
|                  | 10 k $\Omega$  |                       |
|                  | 100 k $\Omega$ |                       |
|                  | 10 M $\Omega$  |                       |

Transducer accuracy:  $\pm 61$  nm (Tesa GT21)

#### Sensor supply (Sine generator)

|  |   |  |
|--|---|--|
| Type:                                      | Sine differential (180° phase-shift)                  |  |
| Coupling:                                  | AC  |  |
| Programmed signals:                        |   |  |
| Output frequency $f_p$ (primary frequency) | 2-20 kHz depending on the transducer (50 kHz Knaebel) |  |
| Output impedance:                          | < 0.1 $\Omega$ typ.                                   |  |
|  | > 30 k $\Omega$ typ. in shutdown mode                 |  |
| Short-circuit current:                     | 0.7 A typ. at 25 °C with thermal protection           |  |

### Counter

|                                |                                      |
|--------------------------------|--------------------------------------|
| Number of counter inputs:      | 1                                    |
| Input type:                    | Differential inputs or TTL           |
| Differential inputs:           | Comply with the EIA standards RS422A |
| Common mode range:             | +12 V / - 7 V                        |
| Input sensitivity:             | $\pm 200$ mV                         |
| Input hysteresis:              | 50 mV typ.                           |
| Input impedance:               | 12 k $\Omega$ min.                   |
| Max. input frequency:          | 5 MHz at nominal voltage             |
| "Open Circuit Fail Safe        |                                      |
| Receiver Design"               | "1" = inputs open                    |
| ESD protection:                | Up to $\pm 15$ kV                    |
| Voltage supply of the encoder: | 5 or 24 V/500 mA max.                |

#### 24 V version

This version is designed for the connection of 24 V encoders.

Only 24 V signals can be connected to the inputs.

|                       |                           |
|-----------------------|---------------------------|
| Nominal voltage:      | 24 V <sub>DC</sub>        |
| Max. input frequency: | 1 MHz at nominal voltage  |
| Input impedance:      | 1 M $\Omega$ typ.         |
| Logic input levels:   |                           |
| UH (max.)             | 30 V typ.                 |
| UH (min)              | 18 V typical (on request) |
| UL (max.)             | 16 V typical (on request) |
| UL (min)              | 0 V typical               |

### Temperature measurement

|                    |                                   |
|--------------------|-----------------------------------|
| Number of inputs:  | 1                                 |
| Type:              | RTD Pt100 or TC type K (optional) |
| Connection:        | 4-wire                            |
| Temperature range: | -200 to 850 °C                    |
| Resolution:        | $\pm 0.01$ °C                     |

### System features

|                              |  |
|------------------------------|--|
| Interface:                   | Ethernet acc. to specification IEEE802.3 |
| Dimensions (mm):             | 215 x 110 x 54                           |
| Weight:                      | 760 g                                    |
| Degree of protection:        | IP 65                                    |
| Operating temperature:       | - 40 to + 85°C                           |
| Current consumption at 24 V: | 400 mA                                   |

#### Voltage Supply

|            |                                |
|------------|--------------------------------|
| 24 VDC IN  | 1 x 5-pin M12 male connector   |
| 24 VDC OUT | 1 x 5-pin M12 female connector |

#### Connectors for sensors

|                            |                                 |
|----------------------------|---------------------------------|
| For inductive transducers: | 8 x 5-pin M18 female connector  |
| For temperature sensors:   | 1 x 5-pin M12 female connector  |
|                            | 1-, 2-, 4-wire Pt100            |
| For the counter function:  | 1 x 12-pin M23 female connector |

## Ordering information

### MSX-E3711

Ethernet system for length measurement, 24-bit, simultaneous, 8 transducers, counter and temperature input.

Incl. technical description, software drivers and ConfigTools.

#### Versions

|                            |   |
|----------------------------|---|
| <b>MSX-E3711-HB:</b>       | for 8 HB inductive transducers, 5 V counter input                       |
| <b>MSX-E3711-LVDT:</b>     | for 8 LVDT inductive transducers, 5 V counter input                     |
| <b>MSX-E3711-M:</b>        | for 8 Mahr-comp. transducers, 5 V counter input                         |
| <b>MSX-E3711-K:</b>        | for 8 Knaebel transducers, 5 V counter input                            |
| <b>MSX-E3711-HB-24V:</b>   | for 8 HB inductive transducers, 24 V counter input                      |
| <b>MSX-E3711-LVDT-24V:</b> | for 8 LVDT inductive transducers, 24 V counter input                    |
| <b>MSX-E3711-TC:</b>       | Type K thermocouple in place of the Pt100 input, other types on request |

#### Connection cables

##### Voltage supply

|                |  |
|----------------|--|
| <b>CMX-2x:</b> | Shielded cable, M12 5-pin female connector/open end, IP 65                     |
| <b>CMX-3x:</b> | For cascading, shielded cable, M12 5-pin female connector/male connector IP 65 |

#### Trigger/Synchro

|                |  |
|----------------|--|
| <b>CMX-4x:</b> | Shielded cable, M12 5-pin female connector/open end, IP 65                     |
| <b>CMX-5x:</b> | For cascading, shielded cable, M12 5-pin female connector/male connector IP 65 |

#### Ethernet

|                |  |
|----------------|--|
| <b>CMX-6x:</b> | CAT5E cable, M12 D-coded male connector/RJ45 connector     |
| <b>CMX-7x:</b> | For cascading: CAT5E cable, 2 x M12 D-coded male connector |

#### Options

**S7 Modbus TCP Client Library for S7:** Easy use of the Ethernet systems MSX-E with PLCs

**MSX-E 5V-Trigger:** Level change of the trigger inputs and outputs to 5 V

**MX-Clip, MX-Rail** (Please specify when ordering!), **MX-Screw, PCMX-1x**

# Ethernet system for length measurement, 24-bit 16/8/4 inductive transducers, LVDT, Half-Bridge, Mahr

**New!**  
32 digital I/O  
(Option)



MSX-E3701 / MSX-E3701-x /  
MSX-E3700

Acquisition of 4, 8 or 16 inductive transducers

For Half-Bridge, LVDT, Mahr or Knaebel  
transducers

Digital output 24 V with compare logic

24 V digital trigger input



Integrated  
Ethernet  
switch



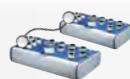
\*Operating temperature



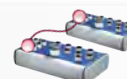
IP 65 IP 40



ARM9  
Technology



Cascadable, can be  
synchronised  
in the  $\mu$ s range



Timer function for  
synchro trigger signal



on request



DatabaseConnect  
see page 114



Q - D A S<sup>®</sup>  
procella<sup>®</sup>



More information on  
[www.addi-data.com](http://www.addi-data.com)

## Features

- ARM<sup>®</sup>9 32-bit processor
- Robust standardized metal housing
- Power Save Mode: Reduced power consumption when no acquisition runs

### Inputs for transducers

- 4, 8 or 16 inputs for transducers, 24-bit, 5-pin M18 female connector
- Half-bridge (HB), LVDT, Mahr compatible, Knaebel
- Diagnostics (short-circuits, line break)
- 16-bit accuracy, example of a measurement:  
Typ TESA GT21, range  $\pm 2$  mm ( $\Delta 4$  mm),  
 $\frac{4 \text{ mm}}{2^{16}} = \pm 61 \text{ nm} = 0.061 \mu\text{m}$

### Safety features

- Status LEDs for fast error diagnostics
- Optical isolation
- Input filters
- Overvoltage protection  $\pm 40$  V
- Internal temperature monitoring

## Interfaces

- Fast 24 V trigger input
- Ethernet switch with 2 ports
- Synchronisation/trigger In/Out
- Line in for 24 V supply and cascading

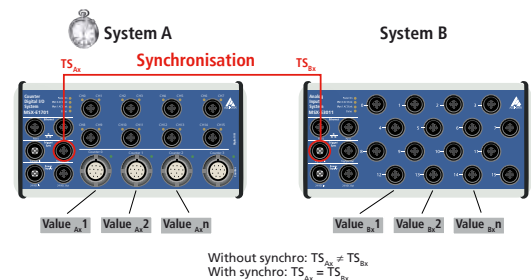
### Communication interfaces

- Web server (configuration and monitoring)
- Command server SOAP for transferring commands
- Data server (TCP/IP or UDP socket) for sending acquisition data
- Event server (TCP/IP socket) for sending system events (Diagnostics such as temperature, short-circuits ...)
- Command server Modbus TCP and Modbus (UDP) for sending commands

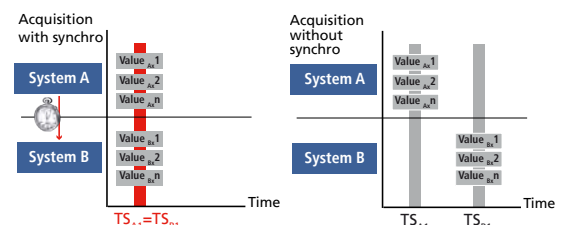
## Synchronisation/time stamp

### Time stamp

Several MSX-E systems can be synchronised with one another in the  $\mu$ s range through a synchro connection. This allows to start a synchronous data acquisition, to generate trigger events and to synchronise the time on several MSX-E systems. Furthermore, the systems have a time stamp that logs the point in time at which the data was acquired by the system.



The combination of synchronisation and time stamp (TS) allows the clear allocation of signals that were captured by several systems.

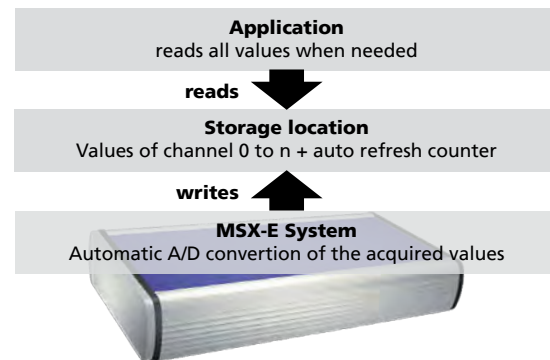




## Acquisition modes

### Auto-refresh mode

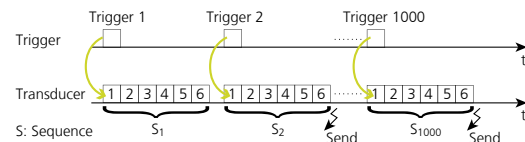
In the auto-refresh mode, the measurement values are updated automatically after each acquisition. The acquisition is initialised once and the values of the channels are stored in the memory of the MSX-E Ethernet system. The client (e.g. PC, server, PLC, ...) reads the acquired values asynchronously to the acquisition through socket connection, SOAP or Modbus function. Thereby, the new value is read and the old values are overwritten. In addition to the measurement values, the auto-refresh counter can also be read, which allows to sort the measurement values chronologically. The auto-refresh mode can be combined with a hardware or a synchro trigger and also allows the automatic averaging of values.



### Sequence Mode

In the sequence mode, a list of channels is acquired. Thereby, the single measurement rows are stored one after another. The client receives the acquired values asynchronously to the acquisition through a socket connection. In the sequence mode, the measurement values are read in chronological order, this means the oldest values are read first. The acquisition can be effected continuously, with or without delay or in combination with a hardware or synchro trigger.

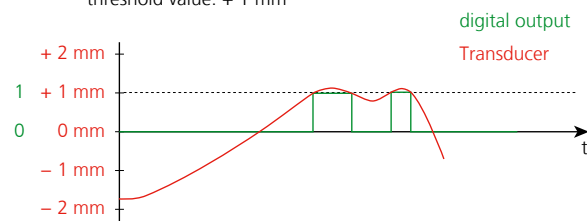
**Example:** Sequence acquisition of 6 channels, 1 Trigger for each sequence sending data after 2 sequences – a total of 1000 sequences



### Digital output with Compare logic

The MSX-3701-x-4 system can optionally be equipped with a digital 24 V output with Compare logic (OPT. MSX-E Dig. Out). This output can be set either manually or through a transducer. This allows easy threshold value monitoring, e.g. probing a workpiece and then automatically sending an message to a PLC.

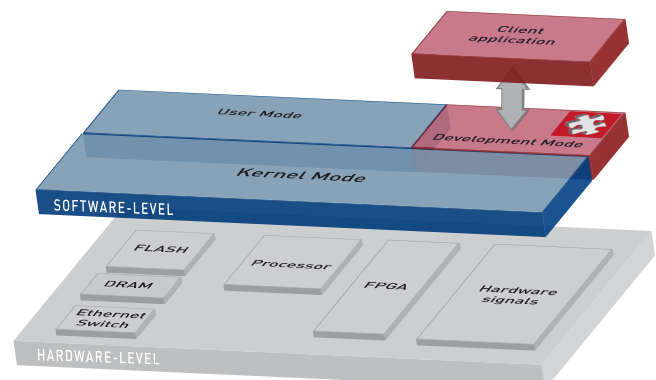
**Example:** Transducer channel 0, TESA GT21, range  $\pm 2$  mm, threshold value: + 1 mm



## Onboard programming / stand-alone operation

### Development mode

With the Development mode of the MSX-E systems you can customise your measurement, control and regulation applications to fit your requirements. The programs run directly on the MSX-E systems, which has two advantages: external PCs are relieved and you can process data freely according to your requirements. This helps you to improve the efficiency of your processes and to secure your investments.



\* Preliminary product information



## ConfigTools

The **ConfigTools** program allows an easy administration of the MSX-E systems. These are automatically detected in the network. **ConfigTools** consists of common and specific functions.

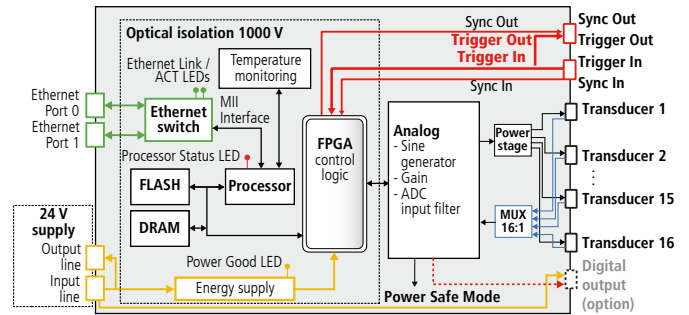
In addition, with **ConfigTools**, the complete configuration of a MSX-E system can be saved and transferred to another system of the same type (clone function).

**ConfigTools** is included in the delivery.

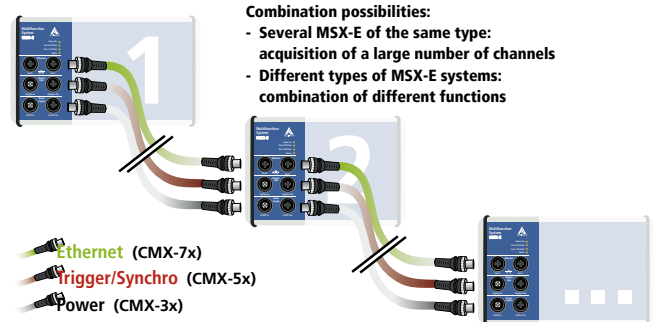
### ConfigTools functions for MSX-E3701 / MSX-E3701-x / MSX-E3700:

- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration
- Save/load channel configuration
- Transducer calibration
- Transducer database
- Transducer monitoring
- Transducer diagnostics

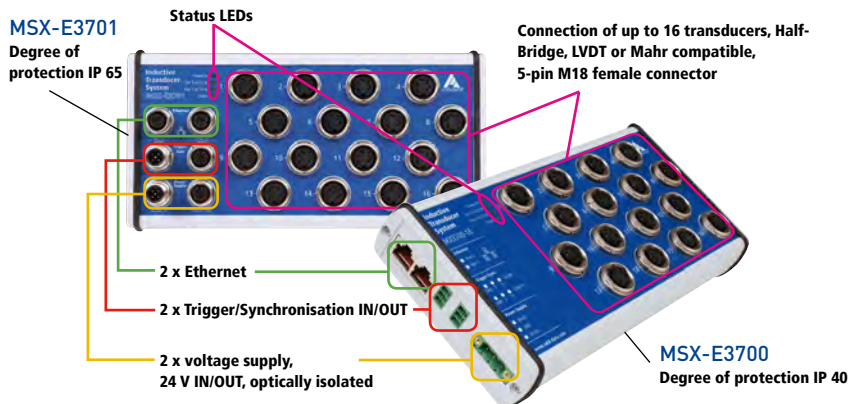
## Simplified block diagram



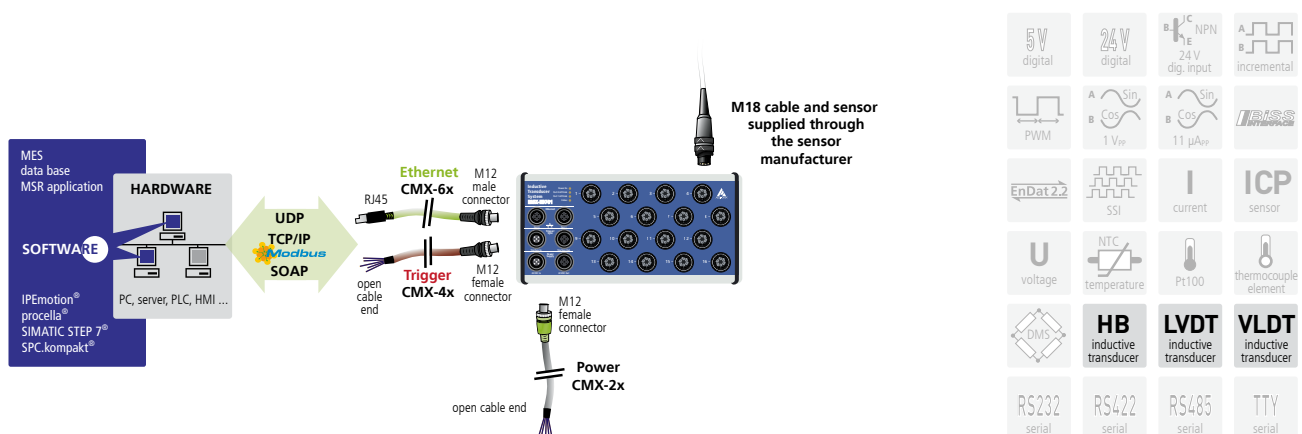
## Cascading



## Features



## ADDI-DATA connection technology





## Specifications

### Inputs for inductive transducers

#### Channel features

|                            |                          |  |
|----------------------------|--------------------------|--|
| Number:                    | -4/-8/-16/               | multiplexed  |
| Input type:                | single-ended             |  |
| Coupling:                  | DC                       |  |
| Resolution:                | 24-bit                   |  |
| Sampling frequency $f_s$ : | On 1 channel             | At primary frequency $f_p$ of<br>5 kHz<br>7.69 kHz<br>10 kHz<br>12.5 kHz<br>20 kHz<br>50 kHz   |
|                            | $f_s = f_p$              |  |
|                            | Ab $n \geq 2$ channels   | $f_p$ = primary frequency<br>SP . Settling period $5 \leq SP \leq 255$<br>$f_s = \frac{f_p}{SP \times n}$ $f_s$ concerns here all n channels   |
| Example with TESA GT21:    | On 1 channel             | $f_s = f_p = 12.5$ kHz   |
|                            | From $n \geq 2$ channels | $f_s = \frac{12.5 \text{ kHz}}{5 \times 4} = 625$ Hz for 4 channels<br>$f_s = \frac{12.5 \text{ kHz}}{5 \times 8} = 312.5$ Hz for 8 channels<br>$f_s = \frac{12.5 \text{ kHz}}{5 \times 16} = 156.25$ Hz for 16 channels |

#### Input level

|                  |  |
|------------------|--|
| Input impedance: | 2 k $\Omega$ software-programmable<br>10 k $\Omega$<br>100 k $\Omega$<br>10 M $\Omega$ |
|------------------|--|

#### Sensor supply (sine generator)

|   |  |
|---|--|
| Type:   | Sine differential (180° phase-shift)                         |
| Coupling:                                     | AC   |
| Programmed signals:                           |  |
| output frequency $f_p$<br>(primary frequency) | 2-20 kHz depending on the transducer<br>(50 kHz Knaebel)     |
| Output impedance:                             | < 0.1 $\Omega$ typ.<br>> 30 k $\Omega$ typ. in shutdown mode |
| Short-circuit current:                        | 0.7 A typ. at 25 °C with thermal protection                  |

### Voltage supply

|                              |         |  |
|------------------------------|---------|--|
| Nominal voltage:             | 24 V    | ===  |
| Voltage supply:              | 18-30 V |  |
| Optical isolation:           | 1000 V  |  |
| Current consumption at 24 V: | 90 mA   | typ. in power safe mode / idle   |
|                              | 120 mA  | Power on   |
|                              | 150 mA  | DAC init, sine on, Buffer off  |
|                              | 200 mA  | typ. without load (transducers) at $\pm 9$ V power (Buffer on)                           |
|                              | 320 mA  | typ. with 16 Solartron AX15 transducers at $\pm 7$ V power, 5 kHz and 3 V <sub>rms</sub> |
|                              | 330 mA  | typ. with 8 Knaebel IET0200 transducers at 5 V power, 50 kHz and 1 V <sub>rms</sub>      |

Reverse voltage protection

### Digital output (option for MSX-E3701-x-4)

|                                 |  |
|---------------------------------|--|
| Number of outputs:              | 1, M12 female connector                      |
| Optical isolation:              | 1000 V through opto-couplers                 |
| Output type:                    | High Side, load to ground acc. to IEC 1131-2 |
| Nominal voltage:                | 24 V   |
| Voltage supply:                 | 18 V-30 V                                    |
| Output current:                 | 0.8 A  |
| Short-circuit current / output: | 0.8 A max.                                   |
| RDS ON resistance:              | 1 m $\Omega$ max.                            |
| Switch-on time:                 | 21 $\mu$ s<br>typ. RL = 270 $\Omega$         |
| Switch-off time:                | 11 $\mu$ s<br>typ. RL = 270 $\Omega$         |
| Overttemperature (shutdown):    | 150°C max. (output driver)                   |
| Temperature hysteresis:         | 10°C typ. (output driver)                    |

### Ethernet

|                    |  |
|--------------------|--|
| Number of ports:   | 2  |
| Cable length:      | 150 m max. at CAT5E UTP  |
| Bandwidth:         | 10 Mbps auto-negotiation<br>100 Mbps auto-negotiation          |
| Protocol:          | 10Base-T IEEE802.3 compliant<br>100Base-TX IEEE802.3 compliant |
| Optical isolation: | 1000 V   |
| MAC address:       | 00:0F:6C:##:##:##, unique for each device                      |

### Trigger

|                             |                          |
|-----------------------------|--------------------------|
| Number of inputs:           | 1 trigger input          |
| Number of outputs:          | 1 trigger output         |
| Filters/protective circuit: | Low-pass/transorb diode  |
| Optical isolation:          | 1000 V                   |
| Nominal voltage:            | 24 V external            |
| Input voltage:              | 0 to 30 V                |
| Input current:              | 11 mA at 24 VDC, typical |
| Input frequency (max.):     | 2 MHz at 24 V            |

#### Connector, common with Synchro

|                 |                                |
|-----------------|--------------------------------|
| Trigger input:  | 1 x 5-pin male connector M12   |
| Trigger output: | 1 x 5-pin female connector M12 |

### Synchro

|                    |        |
|--------------------|--------|
| Number of inputs:  | 1      |
| Number of outputs: | 1      |
| Max. cable length: | 20 m   |
| Optical isolation: | 1000 V |
| Signal type:       | RS485  |

#### Connector, common with Trigger

|                 |                                |
|-----------------|--------------------------------|
| Trigger input:  | 1 x 5-pin male connector M12   |
| Trigger output: | 1 x 5-pin female connector M12 |

### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### System features

|                        |  |                   |
|------------------------|--|-------------------|
| Interface:             | Ethernet acc. to specification IEEE802.3 |                   |
| Dimensions:            | MSX-E3700-16                             | 215 x 110 x 39 mm |
|                        | MSX-E3700-4/8                            | 154 x 110 x 39 mm |
|                        | MSX-E3701-16                             | 215 x 110 x 50 mm |
|                        | MSX-E3701-4/8                            | 154 x 110 x 50 mm |
| Weight:                | MSX-E370x-16:                            | 760 g             |
|                        | MSX-E370x-8:                             | 560 g             |
|                        | MSX-E370x-4:                             | 530 g             |
| Degree of protection:  | MSX-E3701-4/-8/-16:                      | IP 65             |
|                        | MSX-E3700-4/-8/-16:                      | IP 40             |
| Operating temperature: | MSX-E370x:                               | -40 °C to + 85°C  |

### MSX-E3701 interface connectors

|                      |   |
|----------------------|---|
| Ethernet:            | 2 x 4-pin M12 female connector, D-coded for port 0 and port 1 |
| Trigger/Synchro IN:  | 1 x 5-pin male connector M12                                  |
| Trigger/Synchro OUT: | 1 x 5-pin female connector M12                                |

#### Voltage supply

|             |                                |
|-------------|--------------------------------|
| 24 VDC IN:  | 1 x 5-pin male connector M12   |
| 24 VDC OUT: | 1 x 5-pin female connector M12 |

### MSX-E3700 interface connectors

|                   |                                |
|-------------------|--------------------------------|
| Ethernet:         | RJ45 for Port 0 and 1          |
| External trigger: | 1 x 3-pin binder, 3.81 mm grid |
| Synchro signal:   | 1x 3-pin binder, 3.81 mm grid  |

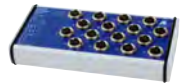
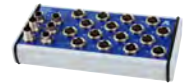
#### Voltage supply

|         |                            |
|---------|----------------------------|
| 24 VDC: | 3-pin binder, 5.08 mm grid |
|---------|----------------------------|

### Connectors for connecting inductive transducers

|               |                                 |
|---------------|---------------------------------|
| MSX-E370x-4:  | 4 x 5-pin M18 female connector  |
| MSX-E370x-8:  | 8 x 5-pin M18 female connector  |
| MSX-E370x-16: | 16 x 5-pin M18 female connector |

| Versions          | Temperature range  | Number of transducers | Type of transducer | Digital output 24 V (option) | Degrees of protection   |
|-------------------|--------------------|-----------------------|--------------------|------------------------------|---|
|                   | - 40 °C to + 85 °C |                       |                    |                              |   |
| MSX-E3701-HB-16   | ✓                  | 16                    | Half-Bridge        |                              | <b>MSX-E3701: Degree of protection IP 65</b><br>Protection against a water jet directed at the housing from any direction. Protection against the penetration of dust. Total protection against contact (dust-proof). |
| MSX-E3701-HB-8    |                    | 8                     |                    |                              |   |
| MSX-E3701-HB-4    |                    | 4                     |                    | ✓                            |   |
| MSX-E3701-LVDT-16 | ✓                  | 16                    | LVDT               |                              |   |
| MSX-E3701-LVDT-8  |                    | 8                     |                    |                              |   |
| MSX-E3701-LVDT-4  |                    | 4                     |                    | ✓                            |   |
| MSX-E3701-K-8     | ✓                  |                       | Knaebel            |                              |   |
| MSX-E3701-M-8     | ✓                  | 8                     | Mahr compatible    |                              |   |
| MSX-E3701-M-4     |                    | 4                     |                    | ✓                            |   |
| MSX-E3700-HB-16   | ✓                  | 16                    | Half-Bridge        |                              | <b>MSX-E3700: Degree of protection IP 40</b><br>Protection against the penetration of foreign bodies with a diameter greater than 1 mm.   |
| MSX-E3700-HB-8    |                    | 8                     |                    |                              |   |
| MSX-E3700-HB-4    |                    | 4                     |                    |                              |   |
| MSX-E3700-LVDT-16 | ✓                  | 16                    | LVDT               |                              |   |
| MSX-E3700-LVDT-8  |                    | 8                     |                    |                              |   |
| MSX-E3700-LVDT-4  |                    | 4                     |                    |                              |   |



## Ordering information

### MSX-E3701 / MSX-E3701-x / MSX-E3700

Ethernet system for length measurement, 24-bit, 16/8/4 inductive displacement transducers, LVDT, half-bridge, Mahr-compatible, Knaebel. Incl. technical description, software drivers and ConfigTools.

#### MSX-E3701: IP 65, standard system

**MSX-E3701-HB-16:** For 16 HB inductive displacement transducers  
**MSX-E3701-LVDT-16:** For 16 LVDT inductive displacement transducers  
**MSX-E3701-HB-8:** For 8 HB inductive displacement transducers  
**MSX-E3701-K-8:** For 8 Knaebel induct. displacement transducers  
**MSX-E3701-LVDT-8:** For 8 LVDT inductive displacement transducers  
**MSX-E3701-HB-4:** For 4 HB inductive displacement transducers  
**MSX-E3701-M-8:** for 8 Mahr-compatible displacement transducers  
**MSX-E3701-LVDT-4:** For 4 LVDT inductive displacement transducers  
**MSX-E3701-M-4:** for 4 Mahr-compatible displacement transducers

#### Options

**MSX-E 5V-Trigger:** Level change of the trigger inputs and outputs to 5 V  
**Opt. MSX-E Dig. Out:** additional dig. output with compare logic for transducer 0 (only available for MSX-E3701-x-4)

#### MSX-E3700 (degree of protection IP 40)

##### Incl. standard binders SMX-10 and SMX-20

**MSX-E3700-HB-16:** For 16 HB inductive transducers  
**MSX-E3700-LVDT-16:** For 16 LVDT inductive transducers  
**MSX-E3700-HB-8:** For 8 HB inductive transducers  
**MSX-E3700-LVDT-8:** For 8 LVDT inductive transducers  
**MSX-E3700-HB-4:** For 4 HB inductive transducers  
**MSX-E3700-LVDT-4:** For 4 LVDT inductive transducers

#### Binders for MSX-E3700:

##### Power Supply

**SMX-10:** Standard 3-pin binder, 5.08 mm grid, screw connector (included in delivery)  
**SMX-11:** 3-pin binder, 5.08 mm grid, 2-row screw connector  
**SMX-12:** 3-pin binder, 5.08 mm grid, 2-row spring-cage connector

##### Trigger

**SMX-20:** Standard 3-pin binder, 5.08 mm grid

#### Options for MSX-E3701 and MSX-E3700

**S7 Modbus TCP Client Library for S7:** Easy use of the Ethernet systems MSX-E with PLCs

#### Connection cables

##### Voltage supply

**CMX-2x:** Shielded cable, M12 5-pin female connector/open end, IP 65  
**CMX-3x:** For cascading, shielded cable, M12 5-pin female connector/male connector IP 65

##### Trigger/Synchro

**CMX-4x:** Shielded cable, M12 5-pin female connector/open end, IP 65  
**CMX-5x:** For cascading, shielded cable, M12 5-pin female connector/male connector IP 65

##### Ethernet

**CMX-6x:** CAT5E cable, M12 D-coded male connector/RJ45 connector  
**CMX-7x:** For cascading: CAT5E cable, 2 x M12 D-coded male connector  
**MSX-E 5V-Trigger:** Level change of the trigger inputs and outputs to 5 V  
**MX-Clip, MX-Rail** (Please specify when ordering!), **MX-Screw, PCMX-1x**

# Applications

## Practical Examples



### Machinery

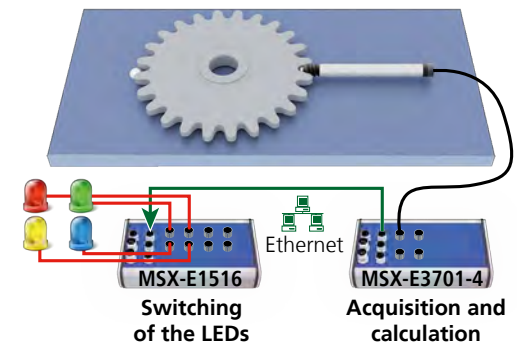
## Precise and error-free diameter detection of gear wheels

### Challenge

A manual test station shall be replaced by a modern and easy-to-use measuring system. The goal is to improve the accuracy of the measurement and to avoid errors which occur when measurement values are entered manually.

### Solution

The diameter between the gear teeth shall be measured. Therefore the gear wheel is put on a measurement table with a ball for stopping. On the opposite side, a spring-loaded ball and an inductive measurement sensor are installed. The diameter between the fixed ball and the sensor is detected by the Ethernet length measurement system MSX-E3701. Then the measured values are calculated through an integrated logic and classified in 4 predefined categories (tolerance range). The measurement result is displayed with an LED on the digital Ethernet system MSX-E1516.



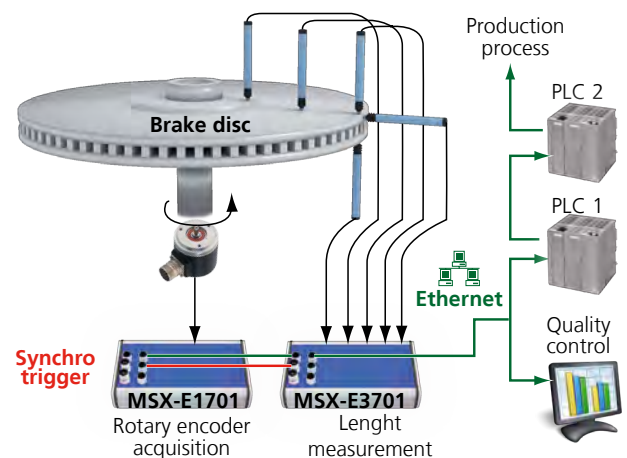
## Consistent data for parameter corrections and precise rework of brake discs

### Challenge

A manufacturer of car parts wants to test the surface of his produced brake discs as exactly as possible for roundness, radius and surface quality. In order to allow precise rework and corrections of the process parameters, the measurement device must be able to transfer a consistent data set of the position value and the measured value to the control unit.

### Solution

For this application, two intelligent Ethernet systems are used: The MSX-E1701 counter system for the position acquisition and the MSX-E3701 length measurement system for the detection of the measurement values through the connected displacement transducers. For each measurement point, the MSX-E1701 system triggers the MSX-E3701 system angle-dependently. For a precise matching of position and measurement values at each measurement point, both systems are synchronised and have a time stamp. The acquired data is then transferred through Ethernet to a PC or a PLC for evaluation and regulation purposes. Exceeded tolerance values are forwarded to the super-ordinate machine in order to adjust process parameters or to effect corrections on the measured brake disc.



# Ethernet system for length measurement, 24-bit 16 inductive transducers, LVDT, half-bridge



Integrated  
Ethernet  
switch



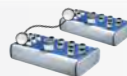
\*Operating temperature



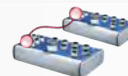
IP 65



ARM9  
Technology



Cascadable,  
can be synchronised  
in the  $\mu$ s range



Timer function for  
synchro trigger signal

## MSX-E3701-DIO

Acquisition of 16 inductive transducers

For half-bridge and LVDT transducers

24 V digital trigger input

32 digital I/O, 24 V



on request



DatabaseConnect  
see page 114



More information on  
[www.addi-data.com](http://www.addi-data.com)

## Features

- ARM®9 32-bit processor
- Robust standardized metal housing
- Power Save Mode: Reduced power consumption when no acquisition runs

### Inputs for transducers

- 16 inputs for transducers, 24-bit, 5-pin M18 female connector
- Half-bridge (HB), LVDT
- Diagnostics at short-circuits or line break
- 16-bit accuracy

### Transducer precision: example of a measurement

Typ TESA GT21, range  $\pm 2$  mm ( $\Delta 4$  mm),  
16-bit accuracy

$$\frac{4 \text{ mm}}{2^{16}} = \pm 61 \text{ nm} = 0,061 \mu\text{m}$$

### Digital I/O

- 16 inputs for transducers, 24-bit, 5-pin M18 female connector
- 32 digital I/O, 24 V:  
16 opt. isolated inputs, 24 V, optional filter  
16 opt. isolated outputs, 11 V to 36 V,  
output current per channel 150 mA

### Safety features

- Status LEDs for fast error diagnostics
- Optical isolation • Input filters
- Overvoltage protection  $\pm 40$  V
- Internal temperature monitoring

## Interfaces

- Fast 24 V trigger input
- Ethernet switch with 2 ports
- Synchronisation/trigger In/Out
- Line in for 24 V supply and cascading

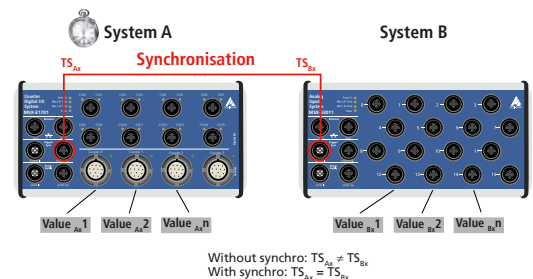
### Communication interfaces

- Web server (configuration and monitoring)
- Command server SOAP for transferring commands
- Data server (TCP/IP or UDP socket) for sending acquisition data
- Event server (TCP/IP socket) for sending system events (Diagnostics such as temperature, short-circuits ...)
- Command server Modbus TCP and Modbus (UDP) for sending commands

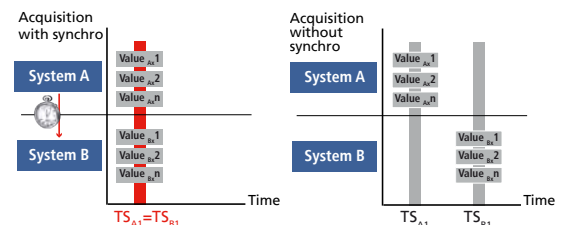
## Synchronisation/time stamp

### Time stamp

Several MSX-E systems can be synchronised with one another in the  $\mu$ s range through a synchro connection. This allows to start a synchronous data acquisition, to generate trigger events and to synchronise the time on several MSX-E systems. Furthermore, the systems have a time stamp that logs the point in time at which the data was acquired by the system.



The combination of synchronisation and time stamp (TS) allows the clear allocation of signals that were captured by several systems.



\*Preliminary  
Product information

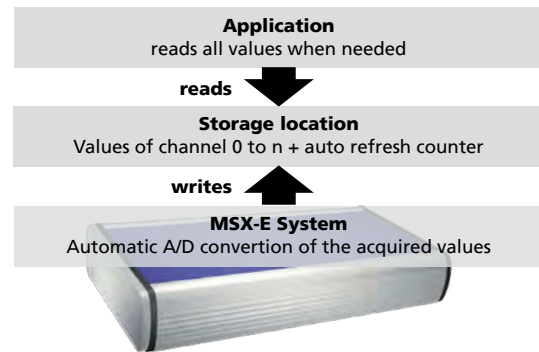




## Acquisition modes

### Auto-refresh mode

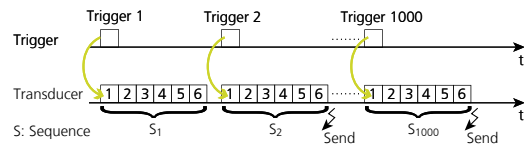
In the auto-refresh mode, the measurement values are updated automatically after each acquisition. The acquisition is initialised once and the values of the channels are stored in the memory of the MSX-E Ethernet system. The client (e.g. PC, server, PLC, ...) reads the acquired values asynchronously to the acquisition through socket connection, SOAP or Modbus function. Thereby, the new value is read and the old values are overwritten. In addition to the measurement values, the auto-refresh counter can also be read, which allows to sort the measurement values chronologically. The auto-refresh mode can be combined with a hardware or a synchro trigger and also allows the automatic averaging of values.



### Sequence Mode

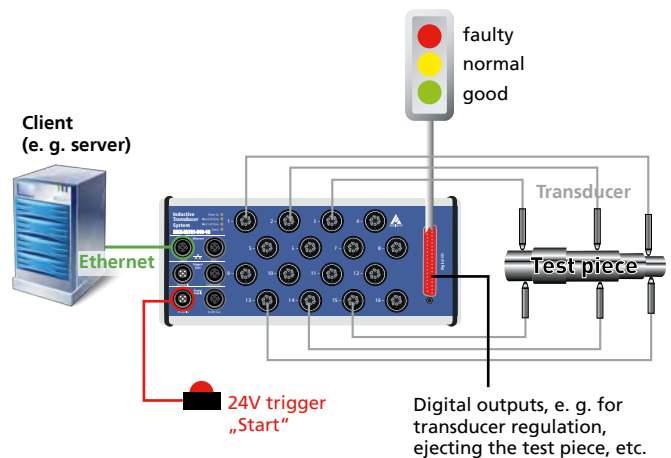
In the sequence mode, a list of channels is acquired. Thereby, the single measurement rows are stored one after another. The client receives the acquired values asynchronously to the acquisition through a socket connection. In the sequence mode, the measurement values are read in chronological order, this means the oldest values are read first. The acquisition can be effected continuously, with or without delay or in combination with a hardware or synchro trigger.

**Example:** Sequence acquisition of 6 channels, 1 trigger per sequence  
Send data after 2 sequences – 1000 sequences in total



### Digital I/O

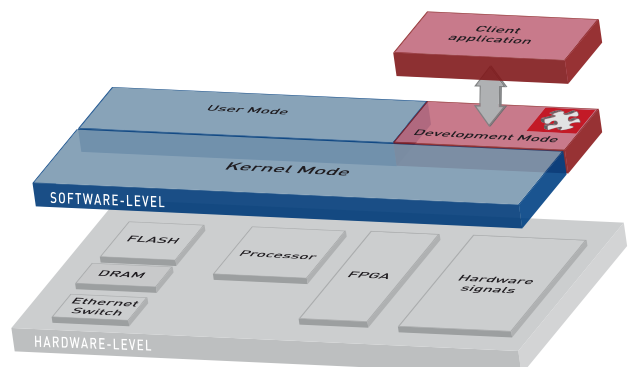
In addition to the transducer channels, the MSX-3701-DIO system has 32 digital 24 V I/O channels (16 inputs, 16 outputs). The system is therefore very flexible and can manage complete measurement and test applications. Example: Test bench for cylindrical parts, probing the workpieces, automatic regulation of the transducers and visualisation of the results via LED traffic light. The measurement data is at the same time stored in a database.



## Onboard programming / stand-alone operation

### Development mode

With the Development mode of the MSX-E systems you can customise your measurement, control and regulation applications to fit your requirements. The programs run directly on the MSX-E systems, which has two advantages: external PCs are relieved and you can process data freely according to your requirements. This helps you to improve the efficiency of your processes and to secure your investments.



\*Preliminary product information

## ConfigTools

The **ConfigTools** program allows an easy administration of the MSX-E systems. These are automatically detected in the network. **ConfigTools** consists of common and specific functions.

In addition, with **ConfigTools**, the complete configuration of a MSX-E system can be saved and transferred to another system of the same type (clone function).

**ConfigTools** is included in the delivery.

### ConfigTools functions for MSX-E3701-DIO:

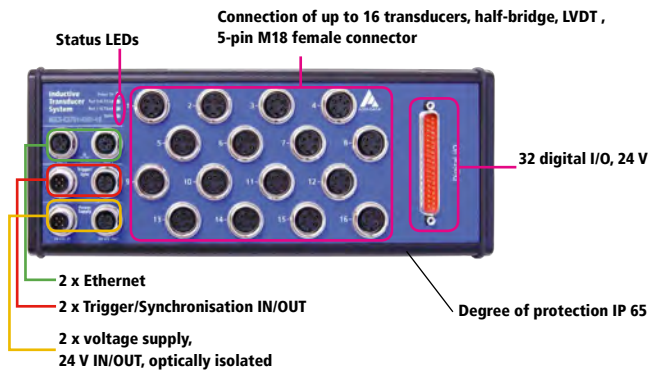
- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration
- Save/load channel configuration
- Transducer calibration
- Transducer database
- Transducer monitoring
- Transducer diagnostics

Very easy use through the „ConfigTools“ program; The MSX-E system is automatically detected in the network.

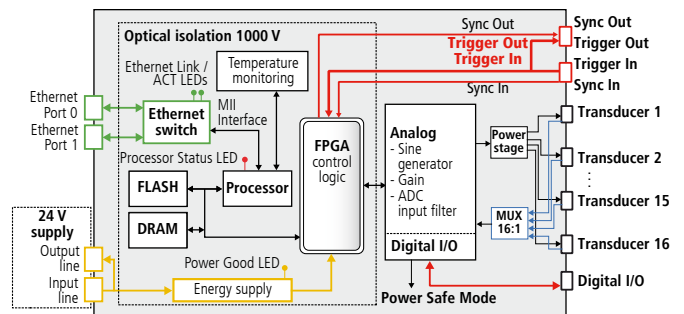


... and can then be calibrated.

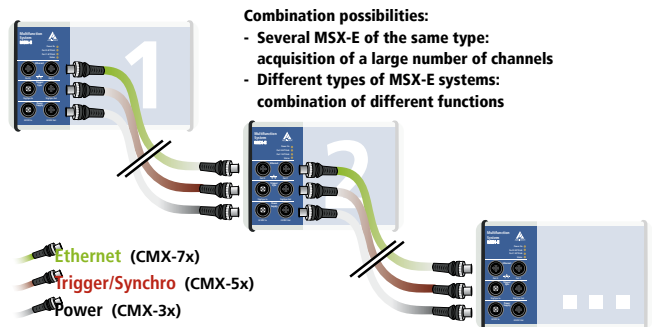
## Features



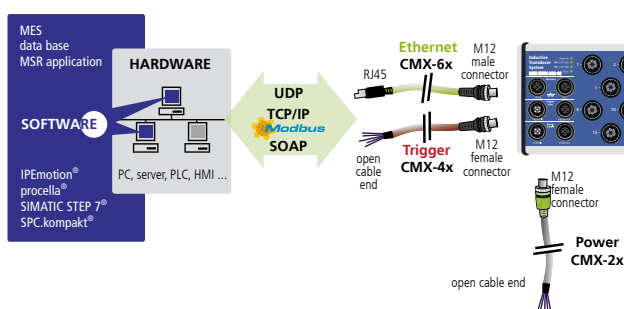
## Simplified block diagram



## Cascading



## ADDI-DATA connection technology



\* Preliminary product information



## Specifications\*

## Inputs for inductive transducers

## Channel features

|                            |  |
|----------------------------|--|
| Number:                    | 16 multiplexed   |
| Input type:                | Single-Ended   |
| Coupling:                  | DC   |
| Resolution:                | 24-bit   |
| Sampling frequency $f_s$ : | on 1 channel at primary frequency $f_p$ of                         |
|                            | 5 kHz  |
|                            | 7.69 kHz   |
|                            | 10 kHz   |
|                            | 12.5 kHz   |
|                            | 20 kHz   |
|                            | 50 kHz   |
|                            | From $n \geq 2$ channels $f_p$ = primary frequency                 |
|                            | SP = settling period ( $5 \leq SP \leq 255$ )                      |
|                            | $f_s = \frac{f_p}{SP \times n}$ $f_s$ concerns here all n channels |

|                         |  |
|-------------------------|--|
| Example with TESA GT21: | On one channel $f_s = f_p = 12.5$ kHz  |
|                         | From $n \geq 2$ channels $f_s = \frac{12.5 \text{ kHz}}{5 \times 4} = 625$ Hz for 4 channels |
|                         | $f_s = \frac{12.5 \text{ kHz}}{5 \times 8} = 312.5$ Hz for 8 channels                        |
|                         | $f_s = \frac{12.5 \text{ kHz}}{5 \times 16} = 156.25$ Hz for 16 channels                     |

## Input level

|                  |  |
|------------------|--|
| Input impedance: | 2 k $\Omega$ software-configurable             |
|                  | 10 k $\Omega$ , 100 k $\Omega$ , 10 M $\Omega$ |

## Sensor supply (sine generator)

|                          |  |
|--------------------------|--|
| Type:                    | Differential sine (180° phase shift)               |
| Coupling:                | AC   |
| Programmed signals:      | 5 kHz; 7.69 kHz; 10 kHz; 12.5 kHz; 20 kHz; 50 kHz, |
| Output frequency $f_p$ : | depending on the transducer                        |
| Output impedance:        | < 0,1 $\Omega$ typ.                                |
|                          | > 30 k $\Omega$ typ. in shutdown mode              |
| Short-circuit current:   | 0.7 A typ. at 25°C with thermal protection         |

## Power Supply

|                              |         |  |
|------------------------------|---------|--|
| Nominal voltage:             | 24 V    | ===  |
| Voltage supply:              | 18-30 V |  |
| Optical isolation:           | 1000 V  |  |
| Current consumption at 24 V: | 90 mA   | typ. in power safe mode / idle                   |
|                              | 120 mA  | Power on   |
|                              | 150 mA  | DAC init, sinus on, buffer off                   |
|                              | 200 mA  | typ. without load (transducer) at $\pm 9$ V      |
|                              |         | power (buffer on)                                |
|                              | 320 mA  | typ. with 16 Solartron AX15 transducers          |
|                              |         | at $\pm 7$ V power, 5 kHz and 3 V <sub>rms</sub> |

Reverse voltage protection

## Digital inputs

|                     |                                       |
|---------------------|---------------------------------------|
| Number of inputs:   | 16, common ground acc. to IEC 1131-2  |
| Optical isolation:  | 1000 V through opto-couplers          |
| Nominal voltage:    | 24 VDC                                |
| Input voltage:      | 0 to 30 V                             |
| Logic input levels: | UH (max) 30 V typ. UH (min) 19 V typ. |
|                     | UL (max) 14 V typ. UL (min) 0 V typ.  |

## Digital outputs

|                    |  |
|--------------------|--|
| Number of outputs: | 16   |
| Optical isolation: | 1000 V through opto-couplers                 |
| Output type:       | High-side, load to ground acc. to IEC 1131-2 |
| Nominal voltage:   | 24 V   |

|                             |  |
|-----------------------------|--|
| Voltage supply:             | 11 V-36 V  |
| Output current per channel: | 150 mA max.  |
| Diagnostics:                | Common diagnostics bit for all 16 channels at overtemperature of one channel |

## Ethernet

|                    |   |
|--------------------|---|
| Number of ports:   | 2   |
| Cable length:      | 150 m max. at CAT5E UTP                   |
| Bandwidth:         | 10 Mbps auto-negotiation                  |
|                    | 100 Mbps auto-negotiation                 |
| Protocol:          | 10Base-T IEEE802.3 compliant              |
|                    | 100Base-TX IEEE802.3 compliant            |
| Optical isolation: | 1000 V                                    |
| MAC address:       | 00:0F:6C:##:##:##, unique for each device |

## Trigger

|                             |                          |
|-----------------------------|--------------------------|
| Number of inputs:           | 1 trigger input          |
| Number of outputs:          | 1 trigger output         |
| Filters/protective circuit: | Low-pass/transorb diode  |
| Optical isolation:          | 1000 V                   |
| Nominal voltage:            | 24 V external            |
| Input voltage:              | 0 to 30 V                |
| Input current:              | 11 mA at 24 VDC, typical |
| Input frequency (max.):     | 2 MHz at 24 V            |

## Connector, common with Synchro

|                 |                                |
|-----------------|--------------------------------|
| Trigger input:  | 1 x 5-pin male connector M12   |
| Trigger output: | 1 x 5-pin female connector M12 |

## Synchro

|                    |        |
|--------------------|--------|
| Number of inputs:  | 1      |
| Number of outputs: | 1      |
| Max. cable length: | 20 m   |
| Optical isolation: | 1000 V |
| Signal type:       | RS485  |

## Connector, common with Trigger

|                 |                                |
|-----------------|--------------------------------|
| Trigger input:  | 1 x 5-pin male connector M12   |
| Trigger output: | 1 x 5-pin female connector M12 |

## EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

## System features

|                        |  |
|------------------------|--|
| Interface:             | Ethernet acc. to specification IEEE802.3 |
| Dimensions:            | 260 x 110 x 50 mm                        |
| Weight:                | 965 g                                    |
| Degree of protection:  | IP 65                                    |
| Operating temperature: | -40 °C to + 85°C                         |

## Interface connectors

|                         |  |
|-------------------------|--|
| Ethernet:               | 2 x 4-pin female connector, D-coded M12 for port 0 and port1 |
| Trigger/Synchro input:  | 1 x 5-pin M12 male connector                                 |
| Trigger/Synchro output: | 1 x 5-pin M12 female connector                               |
| Voltage supply          |  |
| 24 VDC input:           | 1 x 5-pin M12 male connector                                 |
| 24 VDC output:          | 1 x 5-pin M12 female connector                               |

## Ordering information

## MSX-E3701-DIO

Ethernet system for length measurement, 24-bit, 16 inductive transducers, LVDT, half-bridge. Incl. technical description, software drivers and ConfigTools.

## Versions

**MSX-E3701-DIO-HB-16:** for 16 HB inductive transducers

**MSX-E3701-DIO-LVDT-16:** for 16 LVDT inductive transducers

**Connection cables** for 32 dig. I/O, 24 V auf 37-pol. D-Sub-Connector

**ST010:** Standard round cable, shielded twisted pairs, 2m

**PX901-DG:** Screw terminal board with Schraubklemmen, LED Status display, for DIN rail

## Voltage supply

**CMX-2x:** Shielded cable, M12 5-pin female connector/open end, IP 65

**CMX-3x:** For cascading, shielded cable, M12 5-pin female connector/male connector IP 65

## Trigger/Synchro

**CMX-4x:** Shielded cable, M12 5-pin female connector/open end, IP 65

**CMX-5x:** For cascading, shielded cable, M12 5-pin female connector/male connector IP 65

## Ethernet

**CMX-6x:** CAT5E cable, M12 D-coded male connector/RJ45 connector

**CMX-7x:** For cascading, CAT5E cable, 2 x M12 D-coded male connector

## Options

**MX-Clip, MX-Rail** (please specify when ordering!)

**MX-Screw, PCMX-1x**

\*Preliminary product information

# Ethernet system for serial interfaces

## 4 ports for RS232, RS422, RS485 or 20 mA CL



### MSX-E7511

4 serial interfaces

RS232, RS422, RS485, 20 mA Current Loop

128-byte FIFO buffer for each port

16C950 compatible UART

Optical isolation

Onboard evaluation of user data



Integrated  
Ethernet  
switch



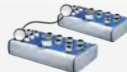
\*Operating temperature



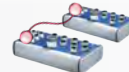
IP 65



ARM9  
Technology



Cascadable,  
can be synchronised  
in the  $\mu$ s range



On request:  
Compare logic for  
synchro trigger signal



on request



More information on  
[www.addi-data.com](http://www.addi-data.com)

### Features

- 24 V digital trigger input
- ARM9 32-bit processor
- 64 MB onboard SDRAM for storing data
- Robust standardized metal housing
- Power Save Mode: Reduced power consumption when no acquisition runs

### Safety features

- Status LEDs for fast error diagnostics
- Optical isolation • Input filters

### Serial interfaces

- 4 serial interfaces
- RS232, RS422, RS485 and TTY (20 mA Current Loop)
- The port modes can be mixed
- The channels are optically isolated from each other

### Interfaces

- Fast 24 V trigger input
- Ethernet switch with 2 ports
- Synchronisation/trigger In/Out
- Line in for 24 V supply and cascading

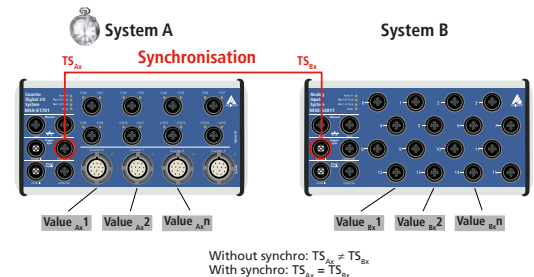
### Communication interfaces

- Web server (configuration and monitoring)
- Command server SOAP for transferring commands
- Data server (TCP/IP or UDP socket) for sending acquisition data
- Event server (TCP/IP socket) for sending system events (Diagnostics such as temperature, short-circuits ...)
- Command server Modbus TCP and Modbus (UDP) for sending commands

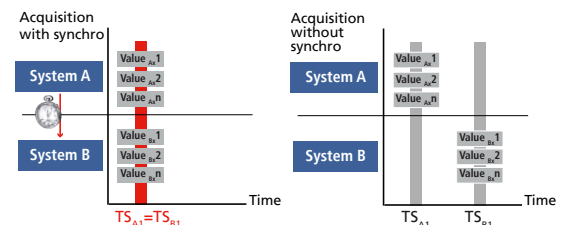
### Synchronisation/time stamp

#### Time stamp

Several MSX-E systems can be synchronised with one another in the  $\mu$ s range through a synchro connection. This allows to start a synchronous data acquisition, to generate trigger events and to synchronise the time on several MSX-E systems. Furthermore, the systems have a time stamp that logs the point in time at which the data was acquired by the system.



The combination of synchronisation and time stamp (TS) allows the clear allocation of signals that were captured by several systems.





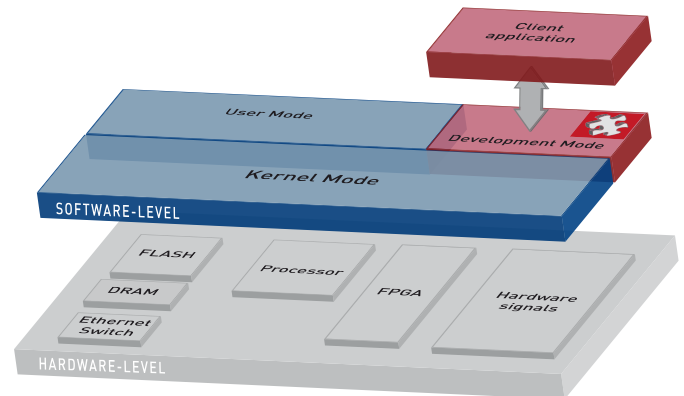
## Onboard programming / stand-alone operation

### Development mode

With the Development mode of the MSX-E systems you can customise your measurement, control and regulation applications to fit your requirements. The programs run directly on the MSX-E systems, which has two advantages: external PCs are relieved and you can process data freely according to your requirements. This helps you to improve the efficiency of your processes and to secure your investments.

### Flexibility through firmware and software adaptation

Thanks to the flexibility of the MSX-E product range, the MSX-E7511 system can be easily extended via firmware, e. g. to install additional protocols on the serial interfaces.



### Fields of application

The MSX-E7511 Ethernet system features 4 serial interfaces. Depending on the version, the interface standards are RS232, RS422, RS485 and TTY (20 mA Current Loop). Any application can be programmed either through a firmware adaptation or using the Development mode.

### Data collector

Via the RS485 interface, the Modbus RTU protocol can be used. For example, temperature sensors featuring an integrated Modbus RTU interface can be read and the complete protocol interpretation can be made on the MSX-E7511 system.

It is thus possible to filter the actual user data - in this case temperature data - and to transmit only this data or to store it in a database.

### Onboard calculation

As the system can be programmed, it is possible to effect calculations with the different ports.

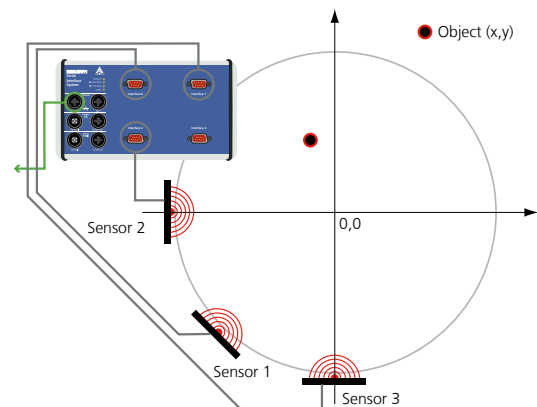
#### Example:

Using a radar sensor, the position of an object is to be displayed. The sensors indicate the distance via RS422.

Three sensors are used:

- Sensor 1 as a reference to control whether there is an object or not.
- Sensor 2 and 3 for establishing the position of the object.

On the MSX-E7511 system, the interface data is read and interpreted. The position of the object is obtained through calculation of the values of sensor 2 and 3 (e.g. as x/y value). Sensor 1 is used to validate the result. The MSX-E7511 system transmits then only the position data to the Client.



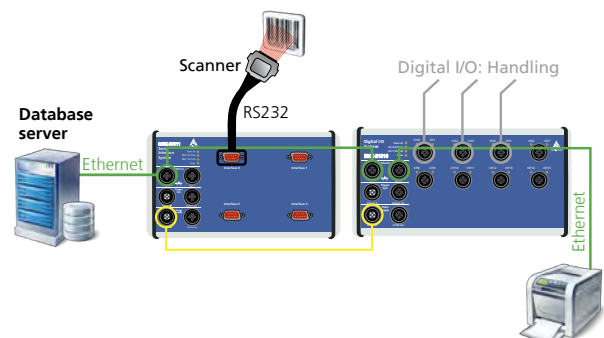
### Self-sufficient unit

Using further systems from the MSX-E product range, the MSX-E7511 system can also be used as a self-sufficient unit.

#### Example:

Components are acquired via a scanner (RS232). The MSX-E7511 system reads the barcode and sends the corresponding commands for the processing of the components to a MSX-E1516 Ethernet digital I/O system (handling) and a printer (marking).

There is thus no need for an additional PLC or PC.





## ConfigTools

The **ConfigTools** program allows an easy administration of the MSX-E systems. These are automatically detected in the network. **ConfigTools** consists of common and specific functions.

In addition, with **ConfigTools**, the complete configuration of a MSX-E system can be saved and transferred to another system of the same type (clone function).

**ConfigTools** is included in the delivery.

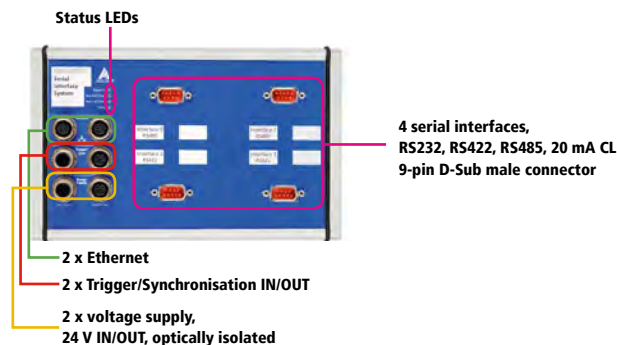
### ConfigTools functions for MSX-E7511:

- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration

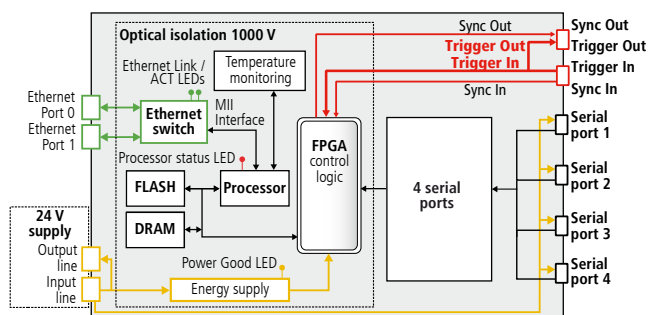
Very easy use through the „ConfigTools“ program;  
The MSX-E system is automatically detected in the network.



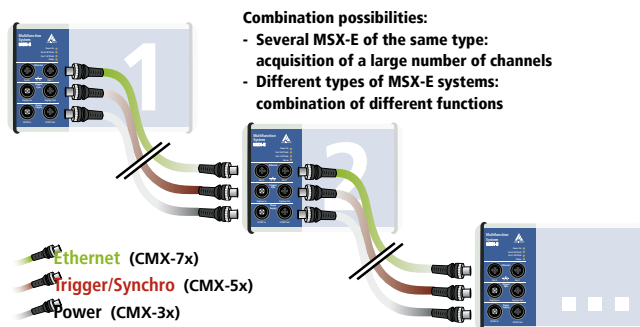
## Features



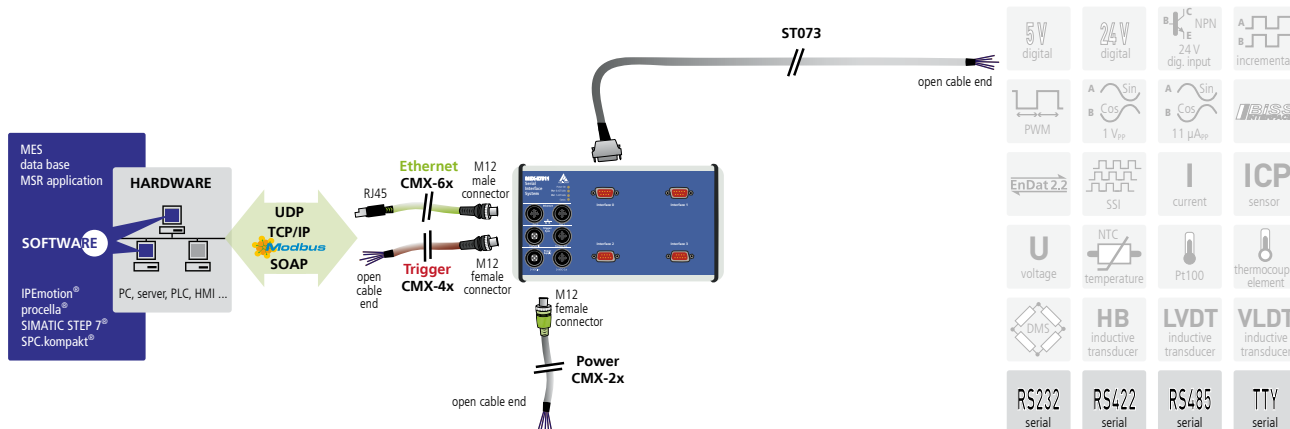
## Simplified block diagram

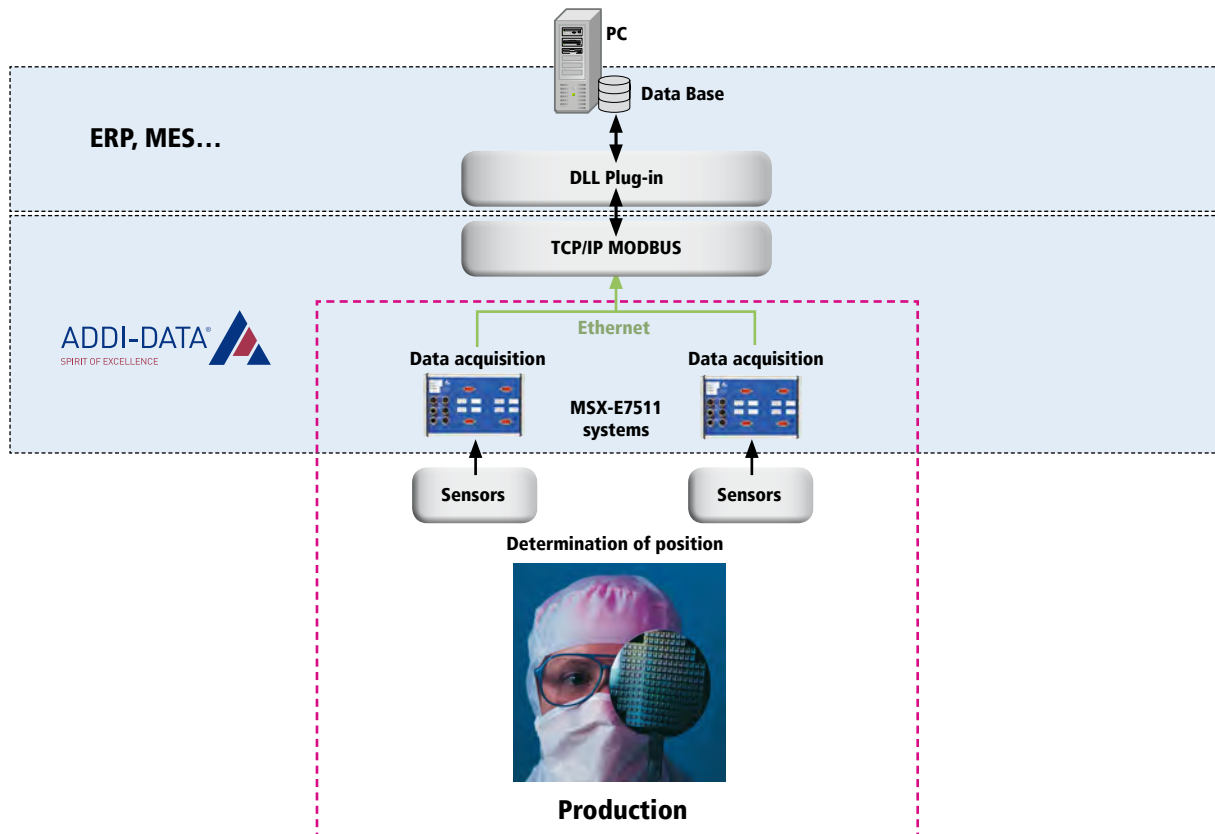


## Cascading



## ADDI-DATA connection technology





## Specifications

### Serial interfaces

|                    |  |
|--------------------|--|
| Number of ports:   | 4  |
| Mode:              | RS232, RS422, RS485, 20 mA Current Loop (active, passive) with optical isolation |
| Configuration:     | at ordering  |
| Optical isolation: | 1000 V   |
| Transmission mode: | Asynchronous, full or half duplex  |
| Addressing:        | Automatic  |
| Memory:            | 128-byte FIFO memory for sender and receiver                                     |
| Transfer rate:     | Programmable up to 115.2 kBaud<br>Any Baud rate up to 1 MBaud on request         |
| Protocol:          | 5-, 6-, 7- or 8-bit character 1, 1½ or 2 stop bits                               |
| Parity:            | Even, odd, none, mark, space   |
| <b>Connectors:</b> | 4 x 9-pin D-Sub male connector   |

### Voltage supply, Ethernet, Trigger, Synchro

The specifications for the voltage supply, Ethernet, Trigger, Synchronisation and Electromagnetic Compatibility apply to all MSX-E systems. See page 31.

### System features

|                        |  |
|------------------------|--|
| Interface:             | Ethernet acc. to specification IEEE802.3 |
| Dimensions:            | 220 mm x 140 mm x 50 mm                  |
| Weight:                | 620 g                                    |
| Degree of protection:  | IP 65                                    |
| Current consumption:   | 150 mA ± 10 % typ. in idle/power save    |
| Operating temperature: | -40 °C to +85 °C                         |

## Ordering information

### MSX-E7511

Ethernet system for serial interfaces, 4 ports for RS232, RS422, RS485 or 20 mA CL. Incl. technical description, software drivers and ConfigTools.

### Versions

#### MSX-E7511-XXXX

- A:** RS232, optically isolated
- B:** RS422, optically isolated
- C:** RS485, optically isolated
- D:** 20mA CL

#### Example: MSX-E7511-AACC

Port 1 = RS232, Port 2 = RS232, Port 3 = RS485, Port 4 = RS485

### Connection cables

#### For serial interfaces

#### Open cable end, 9-pin D-Sub female connector

**ST073-RS232 (A):** RS232 cable

**ST073-RS422 (B):** RS422 cable

**ST073-RS485 (C):** RS485 cable

**ST073-CL (D):** 20mA CL cable

### Voltage supply

**CMX-2x:** Shielded cable, M12 5-pin female connector/open end, IP 65

**CMX-3x:** For cascading, shielded cable, M12 5-pin female connector/male connector IP 65

### Trigger/Synchro

**CMX-4x:** Shielded cable, M12 5-pin female connector/open end, IP 65

**CMX-5x:** For cascading, shielded cable, M12 5-pin female connector/male connector IP 65

### Ethernet

**CMX-6x:** CAT5E cable, M12 D-coded male connector/RJ45 connector

**CMX-7x:** For cascading, CAT5E cable, 2 x M12 D-coded male connector

### Options

**S7 Modbus TCP Client Library for S7:** Easy use of the Ethernet systems MSX-E with PLCs

**MSX-E 5V-Trigger:** Level change of the trigger inputs and outputs to 5 V

**MX-Rail** (please specify when ordering!), **MX-Screw**

# Database interface software

## Ethernet-based, no programming needed



### DatabaseConnect

Measurement data stored in databases

Standard Ethernet for easy integration

Ease of use: No programming needed

Processing of measurement data

Filtering of measurement values

Easy parameterising of MSX-E systems  
via website



on request



### Features

#### Description

- Program for storing measurement data in databases
- Easy to use
- Based on the latest technology (XML, SOAP, etc.)
- Ideal addition to the MSX-E systems as interface between field and IT levels
- Data transfer via standard Ethernet
- No programming needed
- Raw data is converted into real values
- Optional filtering of values

#### Functions

- **First Steps**  
DatabaseConnect First Steps are easy-to-follow instructions for creating a project
- **Storage function**  
for storing DatabaseConnect projects
- **Parameterisation function**  
Measurement parameterisation and system configuration via the website of the MSX-E systems
- **Calculation function**  
Measurement data is converted into "real values," e.g. a 0..10 V standardised signal into fill level [%], pressure [bar], etc.
- **Scan function**  
Easy detection and selection of MSX-E systems present in the network
- **Database function**  
for creating and configuring databases
- **Data monitoring** (Live values)
- **Error analysis** (Log files)
- **Export** as .txt, .csv or .xml files
- **Direct connection of databases:**  
MS SQL Server®, MySQL, MS Access®

#### Licence conditions

- 1 PC
- a maximum of 20 MSX-E systems

#### Extras

- Language versions on request
- Multi-user/server licence on request

### Examples of use

- Acquisition of machine data, e.g. number of produced pieces, downtime, etc.
- Temperature data logger, e.g. in server rooms
- Documentation of production data and quality parameters in databases
- Company-wide availability of measurement data

### Scope of delivery

The program is supplied on a CD-ROM including a quick installation manual and an online tutorial.

#### First Aid Functions

Online help, tutorial, First Steps

Read further information about the current software version on the internet at [www.addi-data.com](http://www.addi-data.com)



## Specifications

### Program features

|                  |  |
|------------------|--|
| DatabaseConnect: | Single-user licence  |
| Data processing: | Measurement data is read, converted, calculated and stored |
| Language:        | English<br>Other languages on request                      |

### Database connection

|              |   |
|--------------|---|
| File format: | .txt, .csv, .xml  |
| Databases:   | Microsoft SQL-Server, MySQL, MS Access®<br>Other databases on request |

### System features

|                            |   |
|----------------------------|---|
| Memory space:              | min. RAM of 512 MB, 1 GB recommended  |
| Processor:                 | min. CPU of 700 MHz, 2 GHz recommended  |
| Hard drive:                | min. HDD of 350 MB<br>(300 MB for .Net and 50 MB for DatabaseConnect)   |
| Operating system:          | Microsoft Windows 2000<br>Microsoft Windows XP (32-bit)<br>Microsoft Vista (32-bit)<br>Microsoft Windows 7 (32-bit)<br>Linux on request |
| Monitor screen resolution: | min. 1024 x 768 pixels  |

### MSX-E system compatibility

| Ethernet systems       |   | DatabaseConnect compatible |
|------------------------|---|----------------------------|
| <b>MSX-E1516:</b>      | Digital I/O system, 16 digital I/O                  | yes                        |
| <b>MSX-E1516-NPN:</b>  | Digital I/O system, 16 digital I/O                  | on request                 |
| <b>MSX-E1701:</b>      | Multifunction counter system, digital I/O           | on request                 |
| <b>MSX-E1711:</b>      | Multifunction counter system, sin/cos, digital I/O  | on request                 |
| <b>MSX-E1721:</b>      | Multifunction counter system, sin/cos, digital I/O  | on request                 |
| <b>MSX-E1731:</b>      | Multifunction counter system, digital               | on request                 |
| <b>MSX-E1741-1VPP:</b> | Multifunction counter system, digital               | on request                 |
| <b>MSX-E3121:</b>      | Analog input system                                 | yes, max.<br>1 kHz/channel |
| <b>MSX-E3122:</b>      | Multifunction system, analog I/O                    | on request                 |
| <b>MSX-E3011:</b>      | Analog input system                                 | yes, max.<br>1 kHz/channel |
| <b>MSX-E3021:</b>      | Analog input system                                 | yes, max.<br>1 kHz/channel |
| <b>MSX-E3027:</b>      | Analog input system                                 | yes, max.<br>1 kHz/channel |
| <b>MSX-E3017:</b>      | Force distance measurement system                   | on request                 |
| <b>MSX-E3317:</b>      | Force distance measurement system                   | on request                 |
| <b>MSX-E3211:</b>      | System for temperature acquisition                  | on request                 |
| <b>MSX-E3311:</b>      | System for pressure acquisition                     | on request                 |
| <b>MSX-E3601:</b>      | System for the acquisition of dynamic signals       | on request                 |
| <b>MSX-E3601-2:</b>    | System for the acquisition of dynamic signals       | on request                 |
| <b>MSX-E3711:</b>      | System for length measurement, 24-bit, simultaneous | on request                 |
| <b>MSX-E3701-x:</b>    | System for length measurement                       | on request                 |
| <b>MSX-E3700:</b>      | System for length measurement                       | on request                 |
| <b>MSX-E7511:</b>      | System for length measurement                       | on request                 |

### DatabaseConnect

Database interface software, Ethernet-based, no programming needed

#### Versions

##### DatabaseConnect

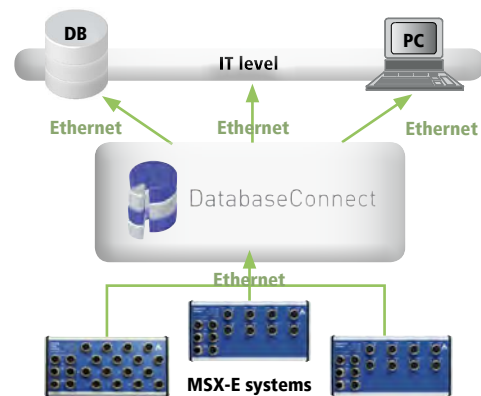
**Version 1.1:** CD-ROM incl. Quick Installation and online manual

## DatabaseConnect

### Use cases

- Use Case 1:** ▶ If no database is used and none is to be generated, DatabaseConnect can store the measurement data in files like for example .txt, .csv or .xml format.
- Use Case 2:** ▶ If a database which already exists is to be used (SQL®, MySQL, etc.), DatabaseConnect stores the measurement data directly into it.
- Use Case 3:** ▶ If a database is not yet available, but the data is to be stored in one, DatabaseConnect can generate an (open source) MySQL database and use it.

### Data flow with DatabaseConnect



### How DatabaseConnect works

| Field level<br>MSX-E systems   | DatabaseConnect  | IT level   |
|--|--|--|
| Raw data<br>(on data server)<br>for example<br>Channel 1: 0...10 V<br>Channel 2: ± 10 V<br>...<br>Channel 20: off<br>Channel 21: on<br>...<br>Channel n: 4...20 mA | Parameterisation of<br>the acquisition<br>Monitoring<br><br>Database management<br>Processing the measure-<br>ment data<br>Storing the configuration<br>(backup) | Time stamp<br>Channel 1: Fill level in %<br>Channel 2: Pressure in bar<br>...<br>Channel 20: Fan 1 off<br>Channel 21: Door A open<br>...<br>Channel n: humidity in % |

## Ordering information

# INTERFERENCE FREE PC BOARDS

## Performance and reliability in the industrial environment



With the sophisticated and reliable ADDI-DATA PC boards, your measurement and automation tasks will be a success! High quality products, well thought-out design concepts and robust constitution guarantee a reliable function of ADDI-DATA PC boards in a harsh industrial environment.

For more than 25 years ADDI-DATA has been developing interference-free PC boards for industrial measurement and automation and offers a wide range of solutions for PCI-Express, PCI, CompactPCI Serial and CompactPCI-bus:

- Digital I/O
- Analog I/O or multifunction boards
- Serial interfaces
- Multifunction counter boards
- Motion control boards

For a safe and reliable use in your application, ADDI-DATA PC boards are protected by numerous protective circuits like optical isolation, filters, protection against short-circuits etc.

### Unique applications due to FPGA technology

A FPGA component has a programmable logic on which you can save your own algorithms in order to adapt the functionality of the PC board to your requirements. This adaptation makes your PC board unique and improves the performance of your applications. The onboard algorithms reduce the cycle time of signal acquisition and of regulation tasks.

Many ADDI-DATA boards come with a FPGA component. Use the full potential of your PC board hardware and software resources and thus accelerate your processes.

### Bespoke solutions

Benefit from our know-how and our experience and improve the efficiency of your application with our customised solutions. We will be glad to help you – from a small adaptation of a standard product to the complete development of a new product.

Examples:

- Adaptation of the signal type, for example 12 V instead of 24 V
- Firmware adaptation
- Drivers for specific operating systems

## MORE PERFORMANCE WITH ADDI-DATA PC BOARDS

- Simplified application design
- Faster processes through FPGA technology
- High-precision measurement results
- Individual customisation
- Safe investments through long-term availability





## Fast and easy application design

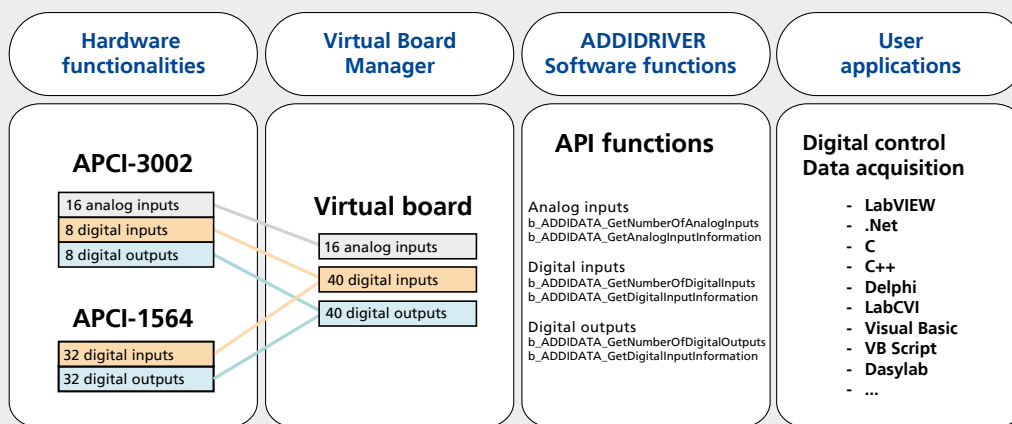
ADDI-DATA PC boards are supplied with an extensive software package for a fast and convenient integration into your application: the clever driver concept ADDIPACK, a wide range of drivers and samples and a configuration tool assist you from the beginning.

### ADDIPACK: Easy board handling - now available as 64-bit version!

For an easy administration of the boards installed in the PC ADDI-DATA has developed a convenient driver system that lists the functionalities of all boards inside your PC on a virtual board. This means that you do not administrate PC boards but functionalities, in principle like a resource.

Thus you can easily exchange or add new boards.

Changes in the functionalities due to exchanges are immediately visible. An installation of new drivers, for example in case of replacement of PCI boards by PCI-Express boards, is not necessary.



### The ADDIPACK concept

The ADDIPACK software is organised in two parts: ADDIDRIVER (ADDIDATA.DLL): The library contains all API functions for the control of ADDI-DATA boards.

Virtual Board Manager: With this program, you can administrate the functionalities of the virtual board. The program helps you by showing a clear visualisation of the virtual board.

These two parts are the interface between ADDI-DATA boards and your application.

### Supported functionalities

- Digital inputs and outputs
- Analog inputs and outputs
- Temperature measurement
- Pressure measurement
- Resistance measurement
- Inductive sensors
- Timer/ watchdog/ counter

### Numerous drivers and samples

ADDI-DATA offers 64-bit drivers for Windows 8/7 and XP for numerous PCI-Express, PCI, CompactPCI-Serial and CompactPCI boards. 64-bit .NET assemblies (for C#.Net and VB.Net) are also available. The 64-bit drivers can be used either in 64-bit or in 32-bit systems. Drivers for older operating systems are of course also available. Contact us: Phone: +49 7229 1847-0.

### Drivers for real-time applications

For time-critical tasks, ADDI-DATA offers real-time drivers for Linux (RTAI extension) and for Windows 32-/64-bit (RTX, VxWorks). With these drivers, the boards can be easily integrated in real-time systems.

### Linux drivers

In the of automation sector, Linux allows an easy and cost-effective realisation of highly efficient systems. Depending on the board type, our Linux drivers are available for Kernel 2.4, 2.6 or 3.0.

### Practical simulation

In order to simplify the initiation of our boards the drivers come with numerous programming examples. They allow you to parameterise the inputs and outputs of your process and to simulate it practically. Complete measurement, control and regulation processes can be developed fast and easily.

### Fast integration in LabVIEW

LabVIEW drivers are available for numerous ADDI-DATA PC boards. They enable a fast and convenient parameterisation of your measurement boards with LabVIEW.

### Individual driver adaptations

You cannot find the drivers you need on our website? You need a driver adaptation for your application? Our experts will be glad to advise you. Contact us: Phone: +49 7229 1847-0.

# PCI EXPRESS BOARDS



| PCI EXPRESS®  | Digital  |                     |                                     |                |               |                                     |                                     |                 |                 |                    |            | Watchdog   |
|---|--|---------------------|-------------------------------------|----------------|---------------|-------------------------------------|-------------------------------------|-----------------|-----------------|--------------------|------------|------------|
|   | New! APCle-1500  | New! APCle-1500-12V | APCle-1532                          | APCle-1532-12V | APCle-1516    | APCle-1564                          | APCle-1564-5V / APCle-1564-5V-HS    | New! APCle-1016 | New! APCle-1032 | New! APCle-2032    | APCle-2200 | APCle-040  |
| PCI Express bus   | ✓  |                     | ✓                                   |                | ✓             | ✓                                   | ✓                                   | ✓               | ✓               | ✓                  | ✓          | ✓          |
| FPGA  | ✓  |                     | ✓                                   |                | ✓             | ✓                                   | ✓                                   | ✓               | ✓               | ✓                  | ✓          | ✓          |
| Filter and protective circuits  | ✓  |                     | ✓                                   |                | ✓             | ✓                                   | ✓                                   | ✓               | ✓               | ✓                  | ✓          | ✓          |
| Optical isolation   | 1000 V   |                     | 1000 V                              |                | 1000 V        | 1000 V                              | 1000 V                              | 1000 V          | 1000 V          | 1000 V             | 1000 V     | 1000 V     |
| Digital, 24 V / 12 V / 5 V  |  |                     |                                     |                |               |                                     |                                     |                 |                 |                    |            |            |
| Input channels, incl. interruptible   | 16<br>15   |                     | 16<br>15                            |                | 8             | 32<br>16                            | 32<br>16                            | 16              | 32<br>16        |                    | 16<br>15   | 8          |
| 24 V / 12 V / 5 V   | 24 V   | 12 V                | 24 V                                | 12 V           | 24 V          | 24 V                                | 5 V                                 | 24 V            | 24 V            | 24 V               | 24 V       | 24 V       |
| Output channels, 24 V / 5 V   | 16, 24 V   |                     | 16, 24 V                            |                | 8, 24 V       | 32, 24 V                            | 32, 5 V                             |                 |                 | 32                 |            |            |
| Output current per channel  | 500 mA (typ.)  |                     | 500 mA (typ.)                       |                | 500 mA (typ.) | 500 mA (typ.)                       | 50 mA                               |                 |                 | 500 mA (typ.)      | Relays 2A  | Relays 2 A |
| Relays  |  |                     |                                     |                |               |                                     |                                     |                 |                 |                    | 16         | 8          |
| Watchdog / Timer  | 1 watchdog/timer + 1 timer (12-bit)  |                     | 1 watchdog/timer + 1 timer (12-bit) |                | 1 watchdog    | 1 watchdog/timer + 1 timer (12-bit) | 1 watchdog/timer + 1 timer (12-bit) |                 |                 | 1 watchdog (8-bit) | 1 watchdog | 7          |
| Counter   | 2 x 16-bit   | 1 x 16-bit          | 2 x 16-bit                          |                |               | 3 x 32-bit                          | 3 x 32-bit                          |                 |                 |                    |            |            |
| Reprogrammable function modules   |  |                     |                                     |                |               |                                     |                                     |                 |                 |                    |            |            |
| – Incremental counter,<br>– SSI synchronous serial interface,<br>– Counter/timer,<br>– Pulse acquisition,<br>– Frequency, pulse width, period duration measurement, PWM<br>– dig. in- and outputs<br>– BiSS-B, BiSS-C<br>– Parallel interface<br>– New: EnDat 2.2<br>– New: Sin/Cos ... |  |                     |                                     |                |               |                                     |                                     |                 |                 |                    |            |            |
| Input frequency   |  |                     |                                     |                |               |                                     |                                     |                 |                 |                    |            |            |
| Signals   |  |                     |                                     |                |               |                                     |                                     |                 |                 |                    |            |            |
| Analog  |  |                     |                                     |                |               |                                     |                                     |                 |                 |                    |            |            |
| Analog inputs, 16-bit   |  |                     |                                     |                |               |                                     |                                     |                 |                 |                    |            |            |
| Throughput (kHz)  |  |                     |                                     |                |               |                                     |                                     |                 |                 |                    |            |            |
| Voltage range   |  |                     |                                     |                |               |                                     |                                     |                 |                 |                    |            |            |
| Current inputs (option)   |  |                     |                                     |                |               |                                     |                                     |                 |                 |                    |            |            |
| Gain 1, 2, 5, 10  |  |                     |                                     |                |               |                                     |                                     |                 |                 |                    |            |            |
| Trigger (software / 24 V)   |  |                     |                                     |                |               |                                     |                                     |                 |                 |                    |            |            |
| Analog outputs, 16-bit  |  |                     |                                     |                |               |                                     |                                     |                 |                 |                    |            |            |
| 0-10 V / ± 10 V   |  |                     |                                     |                |               |                                     |                                     |                 |                 |                    |            |            |
| Current outputs   |  |                     |                                     |                |               |                                     |                                     |                 |                 |                    |            |            |
| Serial interfaces (base boards)   |  |                     |                                     |                |               |                                     |                                     |                 |                 |                    |            |            |
| Operating mode configuration through SI modules   |  |                     |                                     |                |               |                                     |                                     |                 |                 |                    |            |            |
| Software  | Current driver list on the web: <a href="http://www.addi-data.com">www.addi-data.com</a> |                     |                                     |                |               |                                     |                                     |                 |                 |                    |            |            |
| Page  | 120  |                     | 122                                 |                | 124           | 126                                 | 128                                 | 130             | 132             | 134                | 136        | 138        |



| Counter    | Analog                             |            |            | Noise and vibration measurement | Serial Interfaces* |
|------------|------------------------------------|------------|------------|---------------------------------|--------------------|
| APCLe-1711 | New!<br>APCLe-3121 /<br>APCLe-3123 | APCLe-3021 | APCLe-3521 | New!<br>APCLe-3660-4            | APCLe-7xxx         |
| ✓          | ✓                                  | ✓          | ✓          | ✓                               | ✓                  |
| ✓          | ✓                                  | ✓          | ✓          | ✓                               |                    |
| ✓          | ✓                                  | ✓          |            | ✓                               | ✓                  |
| 1000 V     | 500 V                              | 500 V      | 500 V      | 1000 V                          | optional           |

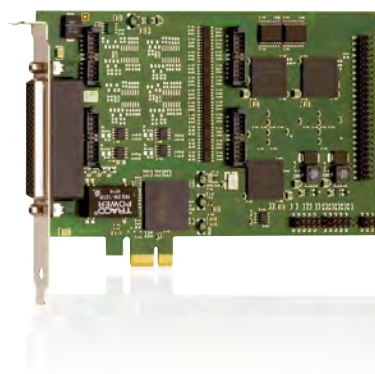
|      |  |                   |  |  |  |
|------|--|-------------------|--|--|--|
|      | 4<br>1                                     | 4<br>1            | 4<br>1                                     |  |  |
| 24 V | 24 V                                       | 24 V              | 24 V                                       |  |  |
|      | 4, 24 V                                    | 4, 24 V           | 4, 24 V                                    |  |  |
|      | 65 mA (typ.)                               | 65 mA (typ.)      | 65 mA (typ.)                               |  |  |
|      |  |                   |  |  |  |
|      | 1 watchdog/<br>timer +<br>1 timer (16-bit) | 1 timer<br>16-bit | 1 watchdog/<br>timer +<br>1 timer (16-bit) |  |  |
|      |  |                   |  |  |  |

|                               |  |  |  |  |  |
|-------------------------------|--|--|--|--|--|
| 4                             |  |  |  |  |  |
| up to 5 MHz<br>new:<br>10 MHz |  |  |  |  |  |
| TTL, RS422,<br>24 V           |  |  |  |  |  |

|  |                             |                             |         |  |  |
|--|-----------------------------|-----------------------------|---------|--|--|
|  | 16 / 8 SE or<br>8 / 4 diff. | 16 / 8 SE or<br>8 / 4 diff. |         |  |  |
|  | 100                         | 100                         |         |  |  |
|  | 0-10 V<br>± 10 V            | 0-10 V<br>± 10 V            |         |  |  |
|  | 0(4)-20 mA                  | 0(4)-20 mA                  |         |  |  |
|  | 1, 2, 5, 10                 | 1, 2, 5, 10                 |         |  |  |
|  | ✓                           | ✓                           |         |  |  |
|  | 8 or 4                      |                             | 8 or 4  |  |  |
|  | ✓                           |                             | ✓       |  |  |
|  | 0-20 mA                     |                             | 0-20 mA |  |  |
|  |                             |                             |         |  | 1 / 2 / 4 / 8<br>ports                 |
|  |                             |                             |         |  | RS232,<br>RS422,<br>RS485, 20<br>mA CL |

|     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|
| 140 | 146 | 148 | 150 | 152 | 154 |
|-----|-----|-----|-----|-----|-----|

\*Base Boards



## Prepared for the future

Realise your future PC-based applications with efficient and robust PCI Express boards by ADDI-DATA.

The boards of the APCLe-xxxx series are intended for use in an industrial environment: They are equipped with numerous protective circuits like filters, optical isolation, protection against overvoltage and short-circuits, etc. Thus they ensure a reliable and smooth operation, particularly in case of dangerous interferences like voltage peaks or high currents. With the ADDI-DATA PCI Express boards, you secure your investments in the long term.

### Simplified application design

ADDI-DATA PCI Express boards come with useful software tools for a fast and convenient integration into your application:

The ingenious driver concept ADDIPACK (see page 117), a wide range of drivers and samples and a configuration tool assist you from the beginning.

### Shorter cycle times through FPGA technology

PCI Express boards with FPGA components reduce the cycle time of signal acquisition and regulation tasks. Use the full hardware and software capacity of your board and accelerate your processes. In the product overview, PCI Express boards with FPGA component are indicated.

### Upgrade from PCI to PCI Express

Your application is running with ADDI-DATA PCI boards and you would like to upgrade to PCI Express boards? Our PCI Express follow-up models are functionally compatible with our PCI boards. Benefit from the new technologies and the new efficient FPGA components that we have added to our PCI Express boards.

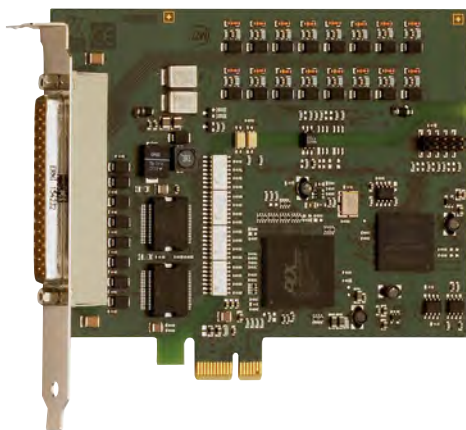
Any questions on compatibility?

**Contact us!** +49 7229 1847-0 or per e-mail at [info@addi-data.com](mailto:info@addi-data.com).

# Digital I/O board, optically isolated, 32 digital inputs and outputs, 24 V / 12 V, for PCI Express

**New!\***

PCI  
EXPRESS®



Also for **PCI**  
See APCI-1500, page 158

Also for **PC/104-PLUS**  
see PC104-PLUS1500, page 226



LabVIEW™



LabWindows/CVI™

DASYLab10  
Data Acquisition System Laboratory



\*Preliminary  
product information

## Features

- 3 programmable timers/counters
- Connector and software compatible to the digital I/O board APCI-1500 for the PCI bus.
- Monitoring program for testing and setting the board functions

## Inputs

- 16 optically isolated digital inputs, 24 V or 12 V (APCLe-1500-12V), including 14 interruptible inputs
- Reverse voltage protection
- All inputs are filtered

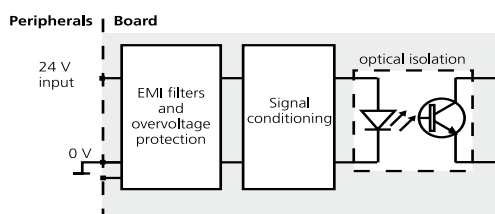
## Outputs

- 16 optically isolated digital outputs, 11 V to 36 V
- Output current per channel 500 mA
- Timer programmable as a watchdog for resetting the outputs to "0"
- Diagnostic report through status register at short-circuits, overtemperature, voltage drop or watchdog
- Interrupt triggered through watchdog, timer, error
- At Power-On, reset of the outputs to "0"
- Current limit for 16 outputs ~ 3 A typ.
- Short-circuit current per output ~ 1.5 A typ.
- Self-resetting fuse (electronic fuse)
- Overtemperature and overvoltage protection
- 24 V power outputs with protective diodes and filters
- Output capacitors against electromagnetic emissions
- External 24 V voltage supply screened and filtered
- Shutdown logic, when the external supply voltage drops below 7 V

## Timer / Watchdog / Counter

- 3 timers respectively counters (16-bit resolution)
- 1 timer can be used as a watchdog

## Protective circuit for the input channels



## APCLe-1500 / APCLe-1500-12V

16 digital inputs, 24 V or 12 V,  
including 14 interruptible inputs

16 digital outputs, 11-36 V, 500 mA/channel

Optical isolation 1000 V

Input and output filters

1 watchdog, 3 timers/counters

At Power-On, the outputs are reset to "0"

## Safety features

- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Protection against fast transients (burst), overvoltage, electrostatic discharge and high-frequency EMI
- Separate ground lines for inputs and outputs

## Applications

- Industrial I/O control
- PLC coupling
- Reading of encoder values for process control
- Signal switching
- Interface to electromechanical relays
- ON/OFF monitoring of motors, lights...
- Watchdog/timer • Interface to machines...

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

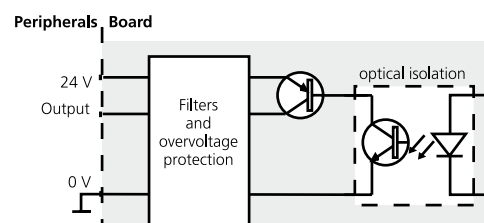
- .NET
- Microsoft VC++ • Microsoft C
- Borland C++ • Borland C
- Visual Basic • Delphi
- .NET on request
- LabVIEW • LabWindows/CVI • DASYLab • DIAdem

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)

## Protective circuit for the output channels



## Specifications\*

### Digital inputs

|                                 |   |
|---------------------------------|---|
| Number of inputs:               | 16 (common ground acc. to IEC 1131-2)                 |
| Including interruptible inputs: | 14 (inputs 1–14)                                      |
| Optical isolation:              | Through opto-couplers, 1000 V from PC to peripheral   |
| Nominal voltage:                | <b>24 V (APCLe-1500)</b> <b>12 V (APCLe-1500-12V)</b> |
| Input current at 24 V:          | <b>at 24 V</b> <b>at 12 V</b>                         |
|                                 | 2 mA typ.      1.5 mA typ.                            |
| Logic input levels:             | <b>at 24 V</b> <b>at 12 V</b>                         |
| UH max.:                        | 30 V      16 V  |
| UH min.:                        | 19 V      9 V   |
| UL max.:                        | 14 V      6 V   |
| UL min.:                        | 0 V      0 V  |
| Maximum input frequency:        | 5 kHz (at 24 V version and 12 V version)              |

### Digital outputs

|  |   |
|--|---|
| Number of outputs:   | 16, optically isolated up to 1000 V through opto-couplers |
| Output type:   | High-side (load to ground) acc. to IEC 1131-2             |
| Nominal voltage:   | 24 V (APCLe-1500) / 12 V (APCLe-1500-12V)                 |
| Supply voltage:  | 11 V to 36 V, min. 7 V (via front connector)              |
| Max. current for 16 outputs:   | 3 A typ.  |
| Output current/output:   | 500 mA typ.   |
| Short-circuit current/output shutdown at 24 V, $R_{load} < 0.1 \Omega$ : | 1.5 A typ. (pulse current)                                |
| RDS ON resistance:   | 0.2 $\Omega$ max.   |
| Switch-on time:  | $I_{out} = 0.5 A$ , load = resistance: 50 $\mu s$         |
| Switch-off time:   | $I_{out} = 0.5 A$ , load = resistance: 75 $\mu s$         |
| Overtemperature (shutdown):  | 135 °C (output driver)                                    |
| Temperature hysteresis:  | 15 °C (output driver)                                     |

### Timer/watchdog

|           |   |
|-----------|---|
| Timer:    | 3 x 16-bit timer, 1 timer can be used as a watchdog |
| Watchdog: | For resetting the outputs to "0"                    |

### Safety

|                 |  |
|-----------------|--|
| Shutdown logic: | When the ext. 24 V voltage drops below 7 V:<br>The outputs are switched off. |
| Diagnostics:    | Status bit or interrupt to the PC  |

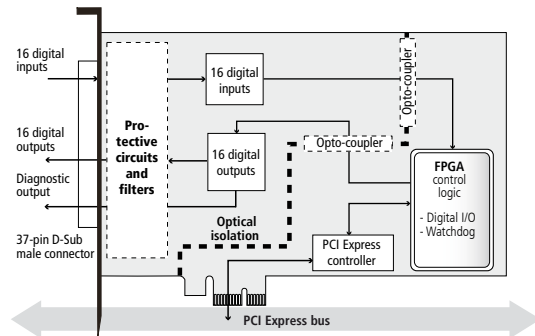
### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

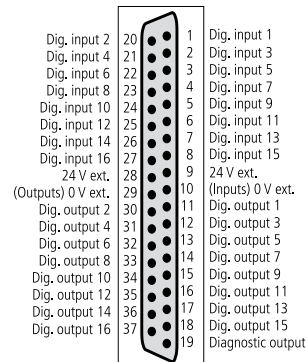
### Physical and environmental conditions

|                      |  |
|----------------------|--|
| Dimensions:          | 149 x 99 mm  |
| System bus:          | Acc. to PCI Express base specification, Revision 1.0a (PCI Express 1.0a)   |
| Space required:      | 1-/4-/8-/16-lane PCI Express slot  |
| Operating voltage:   | + 3.3 V from PC  |
| Current consumption: | Inputs and outputs inactive 320 mA $\pm 10\%$ , typical<br>8 inputs/outputs active 400 mA $\pm 10\%$ , typical<br>16 inputs/outputs active 470 mA $\pm 10\%$ , typical |
| Front connector:     | 37-pin D-Sub male connector  |
| Temperature range:   | 0 to 60 °C (with forced cooling)   |

### Simplified block diagram



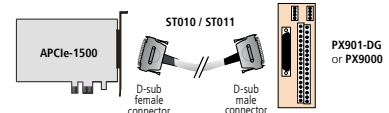
### Pin assignment – 37-pin D-Sub male connector



### ADDI-DATA connection

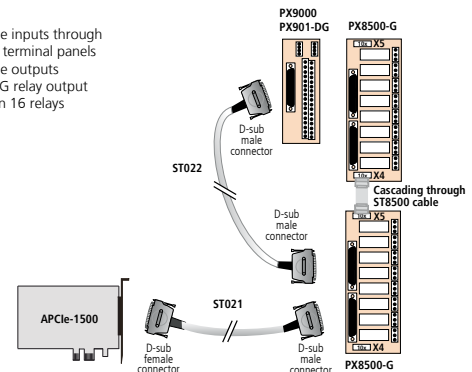
#### Example 1

Connection of the inputs and outputs through screw terminal panels



#### Example 2

- Connection of the inputs through PX901-DG screw terminal panels  
- Connection of the outputs through PX8500-G relay output board cascaded in 16 relays



### Ordering information

#### APCLe-1500 / APCLe-1500-12V

Digital I/O board, optically isolated, 32 digital inputs and outputs, 24 V / 12 V, for PCI Express. Incl. technical description and software drivers.

#### Versions

**APCLe-1500:** Digital I/O board, opt. isolated, 32 dig. I/O, 24 V inputs, outputs 11–36 V

**APCLe-1500-12V:** Digital I/O board, opt. isolated, 32 dig. I/O, 12 V inputs, outputs 11–36 V

#### Accessories

|                  |   |
|------------------|---|
| <b>PX901-D:</b>  | Screw terminal panel, LED status display                    |
| <b>PX901-DG:</b> | Screw terminal panel, LED status display, for DIN rail      |
| <b>PX9000:</b>   | 3-row screw terminal panel for DIN rail, LED status display |

#### PX8500-G:

Relay output board for DIN rail, cascable

#### ST010:

Standard round cable, shielded, twisted pairs, 2 m

#### ST011:

Standard round cable, shielded, twisted pairs, 5 m

#### ST010-S:

Same as ST010, for high currents (separate 24 V supply)

#### ST021:

Round cable between APCLe-1500 and PX8500-G, shielded, twisted pairs, 2 m

#### ST022:

Cable between PX8500-G and PX901-DG or PX9000, shielded, 2 m

#### ST8500:

Ribbon cable for cascading two PX8500

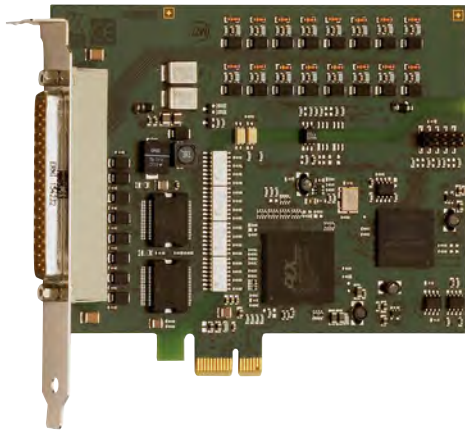
\* Preliminary product information



# Digital I/O board, optically isolated, 32 digital inputs and outputs, 24 V / 12 V, for PCI Express

**New!\***  
12 V version

PCI  
EXPRESS®



Also for **PCI**

See APC-1500, page 158

Also for **CompactPCI™**

See CPC-1500, page 242

Also for **CompactPCI® Serial**

See CPC-1532, page 230

Also for **PC/104-PLUS**

see PC104-PLUS1500, page 226



Windows

64/32-bit drivers



LabVIEW™



LabWindows/CVI™

\* Preliminary  
product information

## Features

### Inputs

- 16 optically isolated inputs, 24 V (APCLe-1532) or 12 V (APCLe-1532-12V) incl. 15 interruptible inputs
- Channel 0 can be used as a 16-bit counter input (up to 100 kHz)
- Reverse voltage protection
- All inputs are filtered

### Outputs

- 16 optically isolated outputs, 11 to 36 V
- Output current per channel 500 mA
- Total current: 3 A typ. (fused through PTC resistor)
- Watchdog for resetting the outputs to "0"
- At Power-On, reset of the outputs to "0"
- Current limit: ~1.5 A per 8 channels (through PTC)
- Short-circuit current per output ~1.5 A typ.
- Self-resetting fuse (electronic fuse)
- Overtemperature and overvoltage protection
- 24 V power outputs with protection diodes and filters
- Ext. 24 V voltage supply screened and filtered
- Shutdown logic, when the external supply voltage drops below 7 V

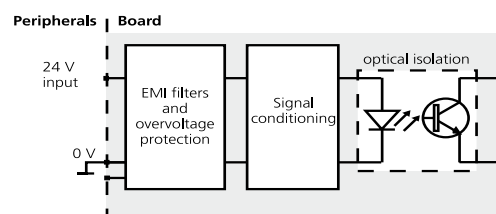
### Timer / Counter

- 2 timers (12-bit resolution)
- 1 timer can be used as watchdog
- 1 counter

### Safety features

- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Protection against fast transients (burst), overvoltage, electrostatic discharge and high-frequency EMI
- Separate ground line for inputs and outputs

## Protective circuit for the input channels



## APCLe-1532 / APCLe-1532-12V

### PCI Express interface

16 digital inputs, 24 V / 12 V,  
including 15 interruptible inputs

16 digital outputs, 24 V, 500 mA/channel

Optical isolation 1000 V

Input and output filters

Connection through industry-standard  
D-Sub connector

## Applications

- Industrial I/O control
- PLC coupling
- Reading of encoder values for process control
- Signal switching
- Interface to electromechanical relays
- ON/OFF monitoring of motors, lights...
- Watchdog timer
- Interface to machines

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- .NET
- Microsoft VC++ • Borland C++
- Visual Basic • Delphi
- LabVIEW • LabWindows/CVI

### ADDIPACK functions:

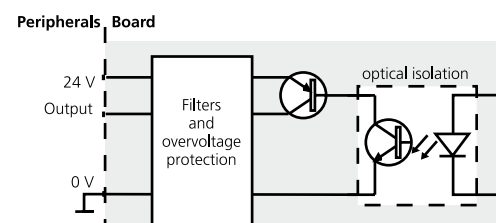
- Digital input • Digital output • Watchdog
- Timer • Counter

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)

## Protective circuit for the output channels



## Specifications\*

### Digital inputs

|                         |  |
|-------------------------|--|
| Number of inputs:       | 16 digital inputs, channel 0 can be used as a 16-bit counter input (up to 100 kHz) |
| Interruptible inputs:   | 15 channels (channel 1 to 15)  |
| Optical isolation:      | 1000 V through opto-couplers, from PC to peripheral                                |
| Nominal voltage:        | 24 V (APCLe-1532) 12 V (APCLe-1532-12V)  |
| Input current:          | <b>at 24 V</b> <b>at 12 V (APCLe-1532-12V)</b>                                     |
| Channel 0 or 0-1:       | 6.6 mA typ. 3.2 mA typ.  |
| Channel 1-15 or 2-16:   | 2 mA typ. 1.5 mA typ.  |
| Input frequency (max.): | <b>at 24 V</b> <b>at 12 V (APCLe-1532-12V)</b>                                     |
| Channel 0 or 0-1:       | 100 kHz 100 kHz  |
| Channel 1-15 or 2-16:   | 5 kHz 5 kHz  |
| Logic input levels:     | <b>at 24 V</b> <b>at 12 V (APCLe-1532-12V)</b>                                     |
| UH (max.):              | 30 V 16 V  |
| UH (min.):              | 19 V 9 V   |
| UL (max.):              | 14 V 6 V   |
| UL (min.):              | 0 V 0 V  |

Filters/protective circuit: Input filters, transil diode, RC filters, Z diode, opto-couplers

### Digital outputs

|                                   |  |
|-----------------------------------|--|
| Number of outputs:                | 16 digital outputs   |
| Output type:                      | High-side (load to ground) acc. to IEC 1131-2                        |
| Optical isolation:                | 1000 V (through opto-couplers), from PC to peripheral                |
| Nominal voltage:                  | 24 V   |
| Supply voltage range:             | 11 to 36 V   |
| Current limit:                    | 1.5 A per 8 channels (through PTC)                                   |
| Output current per output:        | 500 mA (typical)   |
| Short-circuit current per output: | 1.5 A (typ.) pulse current shutdown at 24 V, $R_{load} < 0.1 \Omega$ |
| RDS ON resistance:                | max. $0.2 \Omega$ at 25 °C   |
| Switch-on time:                   | $t_{out}=0.5 A$ , load = resistance: 50 $\mu s$                      |
| Switch-off time:                  | $t_{out}=0.5 A$ , load = resistance: 75 $\mu s$                      |
| Overttemperature (shutdown):      | 135 °C (output driver)   |
| Temperature hysteresis:           | 15 °C (output driver)  |

### Timer/watchdog

Timer: 2 x 12-bit timers, 1 up to 4095  $\mu s$ , ms, s  
1 timer can be used as watchdog.

### Safety

Shutdown logic ( $V_{CC}$  diagnostic): When the ext. 24 V voltage drops below 7 V:  
The outputs are switched off.  
Watchdog: For resetting the outputs to "0"  
Common diagnostics: For all 16 channels at overtemperature of one channel

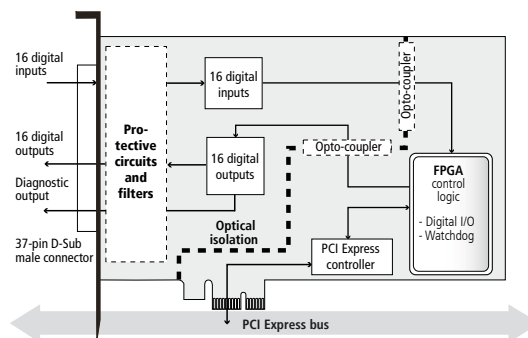
### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### Physical and environmental conditions

|                      |   |
|----------------------|---|
| Dimensions:          | 149 x 99 mm   |
| System bus:          | Acc. to PCI Express base specification, Revision 1.0a (PCI Express 1.0a)  |
| Space required:      | 1-/4-/8-/16-lane PCI Express slot   |
| Operating voltage:   | + 3.3 V from PC   |
| Current consumption: | Inputs and outputs inactive 320 mA $\pm$ 10 %, typical<br>8 inputs and outputs active 400 mA $\pm$ 10 %, typical<br>16 inputs and outputs active 470 mA $\pm$ 10 %, typical |
| Front connector:     | 37-pin D-Sub male connector   |
| Temperature range:   | 0 to 60 °C (with forced cooling)  |

### Simplified block diagram



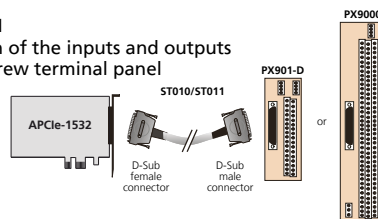
### Pin assignment – 37-pin D-Sub male connector

|                    |    |    |                   |
|--------------------|----|----|-------------------|
| Dig. input 1       | 20 | 1  | Dig. input 0      |
| Dig. input 3       | 21 | 2  | Dig. input 2      |
| Dig. input 5       | 22 | 3  | Dig. input 4      |
| Dig. input 7       | 23 | 4  | Dig. input 6      |
| Dig. input 9       | 24 | 5  | Dig. input 8      |
| Dig. input 11      | 25 | 6  | Dig. input 10     |
| Dig. input 13      | 26 | 7  | Dig. input 12     |
| Dig. input 15      | 27 | 8  | Dig. input 14     |
| 24 V ext.          | 28 | 9  | 24 V ext.         |
| (Outputs) 0 V ext. | 29 | 10 | (Inputs) 0 V ext. |
| Dig. output 1      | 30 | 11 | Dig. output 0     |
| Dig. output 3      | 31 | 12 | Dig. output 2     |
| Dig. output 5      | 32 | 13 | Dig. output 4     |
| Dig. output 7      | 33 | 14 | Dig. output 6     |
| Dig. output 9      | 34 | 15 | Dig. output 8     |
| Dig. output 11     | 35 | 16 | Dig. output 10    |
| Dig. output 13     | 36 | 17 | Dig. output 12    |
| Dig. output 15     | 37 | 18 | Dig. output 14    |
|                    |    | 19 | Diagnostic output |

### ADDI-DATA connection

#### Example 1

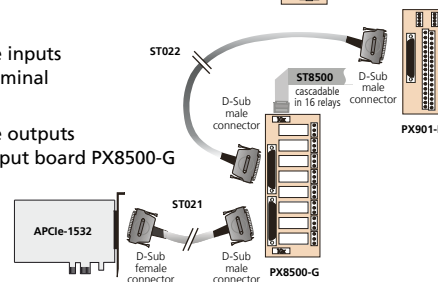
Connection of the inputs and outputs through screw terminal panel



#### Example 2

Connection of the inputs through screw terminal panel PX901-DG

Connection of the outputs through relay output board PX8500-G



### Ordering information

#### APCLe-1532 / APCLe-1532-12V

Digital I/O board, optically isolated, 32 digital inputs and outputs, 24 V / 12 V, for PCI Express. Incl. technical description and software drivers.

**APCLe-1532:** 16 inputs, 24 V, 16 outputs, 11-36 V, 1 counter  
**APCLe-1532-12V:** 16 inputs, 12 V, 16 outputs, 11-36 V, 1 counter

#### Accessories

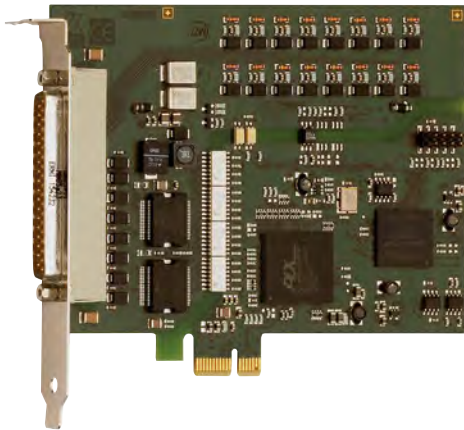
**PX901-D:** Screw terminal panel, LED status display  
**PX901-DG:** Screw terminal panel, LED status display, for DIN rail  
**PX9000:** 3-row screw terminal panel for DIN rail, with LED status display  
**PX8500-G:** Relay output board for DIN rail, cascable

**ST010:** Standard round cable, shielded, twisted pairs, 2 m  
**ST011:** Standard round cable, shielded, twisted pairs, 5 m  
**ST010-S:** Same as ST010, for high currents  
**ST021:** Round cable between APCLe-1532 and PX8500-G, shielded, twisted pairs, 2 m  
**ST022:** Round cable between PX8500-G and PX901 or PX9000, shielded, 2 m  
**ST8500:** Ribbon cable for cascading two PX8500-G

\*Preliminary product information

# Digital I/O board, optically isolated, 16 digital inputs and outputs, 24 V, for PCI Express

PCI  
EXPRESS®



## APCle-1516

PCI Express interface

8 digital inputs, 24 V

8 digital outputs, 24 V, 500 mA/channel

Optical isolation 1000 V

Input and output filters

Connection through industry standard

D-Sub connector

## Features

### Inputs

- 8 optically isolated inputs, 24 V
- Reverse voltage protection
- All inputs are filtered

### Outputs

- 8 optically isolated outputs, 11 to 36 V
- Output current per channel 500 mA
- Total current: 1.5 A typ. (fused through PTC resistor)
- Watchdog for resetting the outputs to "0"
- At Power-On, reset of the outputs to "0"
- Current limit: ~ 1.5 A per 8 channels (through PTC)
- Short-circuit current per output ~1.5 A typ.
- Self-resetting fuse (electronic fuse)
- Overtemperature and overvoltage protection
- 24 V power outputs with protection diodes and filters
- External 24 V voltage supply screened and filtered
- Shutdown logic, when the external supply voltage drops below 7 V

### Safety features

- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Separate ground line for inputs and outputs
- Protection against fast transients (burst), overvoltage, electrostatic discharge and high-frequency EMI
- Watchdog for the outputs

## Applications

- Industrial I/O control
- PLC coupling
- Signal switching
- Interface to electromechanical relays

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- .NET
- Microsoft VC++ • Borland C++
- Visual Basic • Delphi
- LabVIEW • LabWindows/CVI

### ADDIPACK functions:

- Digital input • Digital output • Watchdog

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)



Also for **PCI**  
See APCle-1516, page 160



Windows®  
64/32-bit drivers

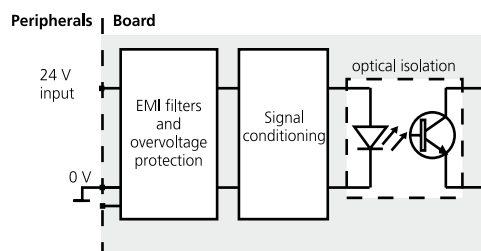


LabVIEW™

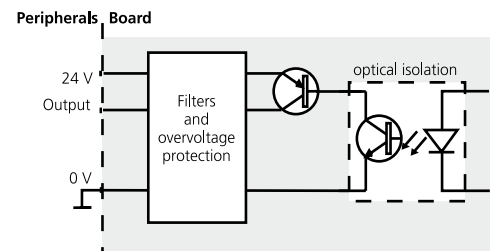


LabWindows/CVI™

## Protective circuit for the input channels



## Protective circuit for the output channels



## Specifications

### Digital inputs

|   |   |
|---|---|
| Number of inputs:<br>(common ground acc. to IEC 1131-2) | 8 digital inputs  |
| Optical isolation:                                      | 1000 V through opto-couplers, from PC to peripheral                     |
| Nominal voltage:  | 24 V  |
| Input current:  | Channel 0-7: 2 mA at 24 V, typical                                      |
| Input frequency (max.):                                 | Channel 0-7: 5 kHz at 24 V  |
| Logic input levels:                                     | UH (max.): 30 V<br>UH (min.): 19 V<br>UL (max.): 14 V<br>UL (min.): 0 V |
| Filters/protective circuit:                             | Input filters, transil diode, RC filters, Z diode, opto-couplers        |

### Digital outputs

|                                  |  |
|----------------------------------|--|
| Number of outputs:               | 8 digital outputs  |
| Output type:                     | High-side (load to ground) acc. to IEC 1131-2                        |
| Optical isolation:               | 1000 V (through opto-couplers), from PC to peripheral                |
| Nominal voltage:                 | 24 V   |
| Supply voltage range:            | 11 to 36 V   |
| Current limit:                   | 1.5 A for all channels (through PTC)                                 |
| Output current per output:       | 500 mA (typical)   |
| Short-circuit current per output | 1.5 A (typ.) pulse current shutdown at 24 V, $R_{load} < 0.1 \Omega$ |
| RDS ON resistance:               | max. 0.2 $\Omega$ at 25 °C   |
| Switch-on time:                  | $t_{out}=0.5$ A, load = resistance: 50 $\mu$ s                       |
| Switch-off time:                 | $t_{out}=0.5$ A, load = resistance: 75 $\mu$ s                       |
| Overttemperature (shutdown):     | 135 °C (output driver)   |
| Temperature hysteresis:          | 15 °C (output driver)  |

### Safety

|  |  |
|--|--|
| Shutdown logic ( $V_{CC}$ diagnostic): | When the ext. 24 V voltage drops below 7 V:<br>The outputs are switched off. |
| Watchdog:                              | For resetting the outputs to "0"<br>Time units: 1 up to 4095 $\mu$ s, ms, s  |
| Diagnostics:                           | Common Diagnostics for all 8 channels at overtemperature of one channel      |

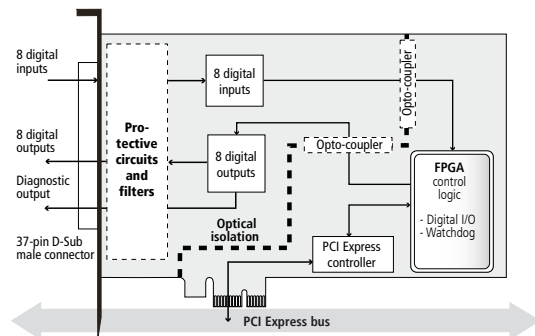
### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

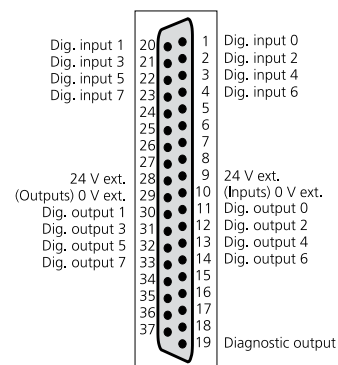
### Physical and environmental conditions

|                      |  |
|----------------------|--|
| Dimensions:          | 149 x 99 mm  |
| System bus:          | Acc. to PCI Express base specification, Revision 1.0a (PCI Express 1.0a)   |
| Space required:      | 1-/4-/8-/16-lane PCI Express slot  |
| Operating voltage:   | + 3.3 V from PC  |
| Current consumption: | Inputs and outputs inactive 320 mA $\pm$ 10 %, typical<br>8 inputs and outputs active 400 mA $\pm$ 10 %, typical |
| Front connector:     | 37-pin D-Sub male connector  |
| Temperature range:   | 0 to 60 °C (with forced cooling)   |

### Simplified block diagram

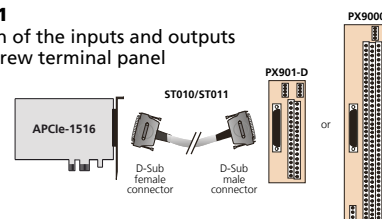


### Pin assignment – 37-pin D-Sub male connector

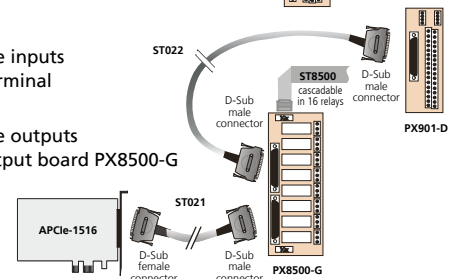


### ADDI-DATA connection

**Example 1**  
Connection of the inputs and outputs through screw terminal panel



**Example 2**  
Connection of the inputs through screw terminal panel PX901-DG  
Connection of the outputs through relay output board PX8500-G



### Ordering information

#### APCle-1516

Digital I/O board, optically isolated, 16 digital inputs and outputs, 24 V, for PCI Express. Incl. technical description and software drivers.

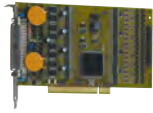
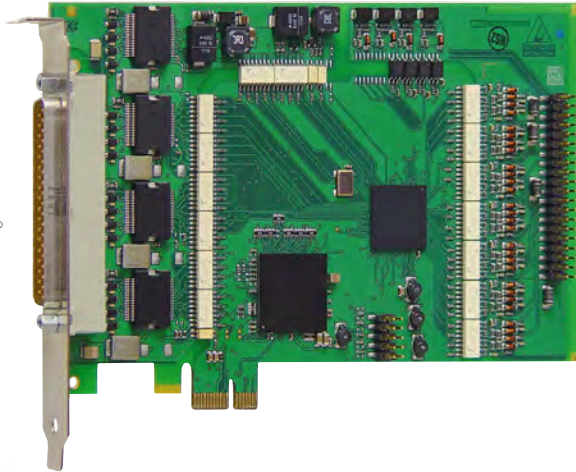
#### Accessories

|                  |  |
|------------------|--|
| <b>PX901-D:</b>  | Screw terminal panel, LED status display                         |
| <b>PX901-DG:</b> | Screw terminal panel, LED status display, for DIN rail           |
| <b>PX9000:</b>   | 3-row screw terminal panel for DIN rail, with LED status display |
| <b>PX8500-G:</b> | Relay output board for DIN rail, cascable                        |

|                 |   |
|-----------------|---|
| <b>ST010:</b>   | Standard round cable, shielded, twisted pairs, 2 m                        |
| <b>ST011:</b>   | Standard round cable, shielded, twisted pairs, 5 m                        |
| <b>ST010-S:</b> | Same as ST010, for high currents  |
| <b>ST021:</b>   | Round cable between APCle-1516 and PX8500-G, shielded, twisted pairs, 2 m |
| <b>ST022:</b>   | Round cable between PX8500-G and PX901 or PX9000, shielded, 2 m           |
| <b>ST8500:</b>  | Ribbon cable for cascading two PX8500-G                                   |

# Digital I/O board, optically isolated, 64 digital inputs and outputs, 24 V, for PCI Express

PCI  
EXPRESS®



Also for **PCI**  
See APCI-1564, page 162



on request



LabVIEW™  
on request

## Features

### Inputs

- 32 optically isolated inputs, 24 V, incl. 16 interruptible inputs
- Channels 0–2 can be used as 32-bit counter inputs (up to 500 kHz)
- Reverse voltage protection
- All inputs are filtered

### Outputs

- 32 optically isolated outputs, 11 to 36 V
- Output current per channel 500 mA
- Total current: 3 A typ. (fused through PTC resistor)
- Watchdog for resetting the outputs to "0"
- At Power-On, reset of the outputs to "0"
- Current limit: ~1.5 A per 8 channels (through PTC)
- Short-circuit current per output ~1.5 A typ.
- Self-resetting fuse (electronic fuse)
- Overtemperature and overvoltage protection
- 24 V power outputs with protection diodes and filters
- Ext. 24 V voltage supply screened and filtered
- Shutdown logic, when the external supply voltage drops below 7 V

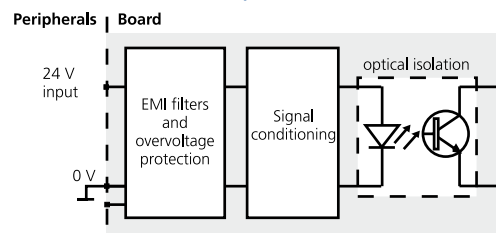
### Timer / Watchdog / Counter

- 2 timers (12-bit), of which one can be used as a watchdog
- 3 counter (32-bit)

### Safety features

- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Protection against fast transients (burst), overvoltage, electrostatic discharge and high-frequency EMI
- Separate ground line for inputs and outputs

### Protective circuit for the input channels



## APCLe-1564

### PCI Express interface

32 digital inputs, 24 V,  
including 16 interruptible inputs

32 digital outputs, 24 V, 500 mA/channel

Optical isolation 1000 V

Input and output filters

Connection through industry-standard  
D-Sub connector

## Applications

- Industrial I/O control
- PLC coupling
- Signal switching
- Interface to electromechanical relays
- Automatic test equipment
- ON/OFF monitoring of motors, lights...
- Watchdog timer
- ...

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

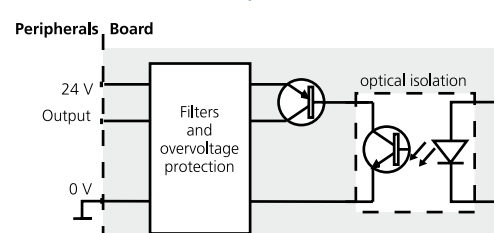
- C#.NET, C

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)

### Protective circuit for the output channels



\* Preliminary  
product information



## Specifications\*

### Digital inputs

|                             |  |
|-----------------------------|--|
| Number of inputs:           | 32 digital inputs, channel 0-2 can be used as 32-bit counter inputs (up to 500 kHz)  |
| Interruptible inputs:       | 16 channels (channel 4 to 19)  |
| Optical isolation:          | 1000 V through opto-couplers, from PC to peripheral  |
| Nominal voltage:            | 24 V   |
| Input current:              | Channel 0-3: 6.6 mA at 24 V, typical<br>Channel 4-31: 2 mA at 24 V, typical  |
| Input frequency (max.):     | Channel 0-2: 500 kHz at 24 V<br>Channel 3-31: 5 kHz at 24 V  |
| Logic input levels:         | UH (max.): 30 V / 3.1 mA, typical (channel 4-31)<br>UH (min.): 19 V / 1 mA, typical (channel 4-31)<br>UH (max.): 30 V / 11 mA, typical (channel 0-3)<br>UH (min.): 19 V / 3.4 mA, typical (channel 0-3)<br>UL (max.): 14 V / 0.1 mA, typical<br>UL (min.): 0 V / 0 mA, typical |
| Filters/protective circuit: | Input filters, transil diode, RC filters, Z diode, opto-couplers   |

### Digital outputs

|                                   |  |
|-----------------------------------|--|
| Number of outputs:                | 32 digital outputs   |
| Output type:                      | High-side (load to ground) acc. to IEC 1131-2                        |
| Optical isolation:                | 1000 V (through opto-couplers), from PC to peripheral                |
| Nominal voltage:                  | 24 V   |
| Supply voltage range:             | 11 to 36 V   |
| Current limit:                    | 1.5 A per 8 channels (through PTC)                                   |
| Output current per output:        | 500 mA (typical)   |
| Short-circuit current per output: | 1.5 A (typ.) pulse current shutdown at 24 V, $R_{load} < 0.1 \Omega$ |
| RDS ON resistance:                | 0.2 $\Omega$ at 25 °C  |
| Switch-on time:                   | $t_{out} = 0.5$ A, load = resistance: 50 $\mu$ s                     |
| Switch-off time:                  | $t_{out} = 0.5$ A, load = resistance: 75 $\mu$ s                     |
| Overtemperature (shutdown):       | 135 °C (output driver)   |
| Temperature hysteresis:           | 15 °C (output driver)  |

### Timer/watchdog

|        |   |
|--------|---|
| Timer: | 2 x 12-bit, 1 x programmable as watchdog from 1 $\mu$ s to 4095 s |
|--------|---|

### Safety

Shutdown logic ( $V_{CC}$  diagnostic): When the ext. 24 V voltage drops below 7 V, the outputs are switched off.

Watchdog: For resetting the outputs to "0"

Common diagnostics: For all 16 channels at overtemperature of one channel

### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### Physical and environmental conditions

|                      |  |
|----------------------|--|
| Dimensions:          | 168 x 99 mm  |
| System bus:          | Acc. to PCI Express base specification, Revision 1.0a (PCI Express 1.0a)                                       |
| Space required:      | 1-/4-/8-/16-lane PCI Express slot  |
| Operating voltage:   | + 3.3 V from PC  |
| Current consumption: | Inputs and outputs inactive 340 mA $\pm$ 10 %, typical<br>Inputs and outputs active 590 mA $\pm$ 10 %, typical |
| Front connector:     | 37-pin D-Sub male connector  |
| Temperature range:   | 0 to 60 °C (with forced cooling)   |

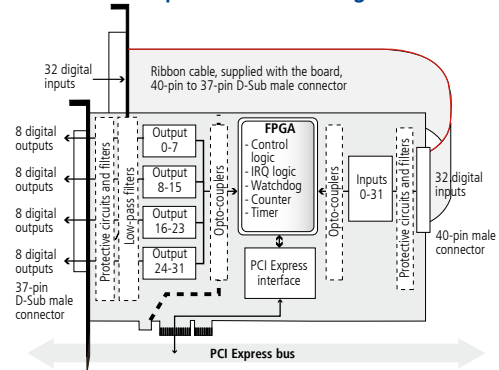
### APCle-1564

Digital I/O board, optically isolated, 64 digital inputs and outputs, 24 V, for PCI Express. Incl. technical description and software drivers.

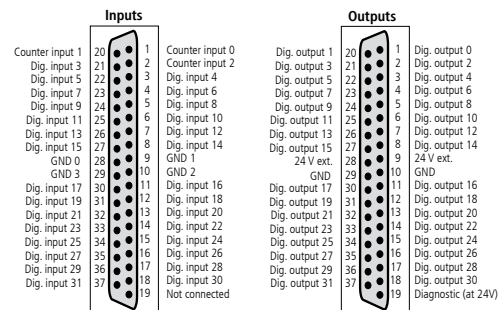
### Accessories

|                  |  |
|------------------|--|
| <b>PX901-D:</b>  | Screw terminal panel, LED status display                         |
| <b>PX901-DG:</b> | Screw terminal panel, LED status display, for DIN rail           |
| <b>PX9000:</b>   | 3-row screw terminal panel for DIN rail, with LED status display |
| <b>PX8500-G:</b> | Relay output board for DIN rail, cascable                        |

### Simplified block diagram



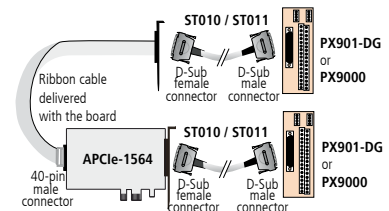
### Pin assignment – 37-pin D-Sub male connector



### ADDI-DATA connection

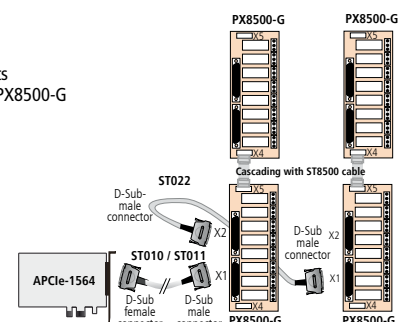
#### Example 1:

- Connection of the inputs (Ribbon cable)
- Connection of the outputs through screw terminal panel PX901-DG or PX9000



#### Example 2:

- Connection of the outputs with relay output board PX8500-G cascaded in 32 relays



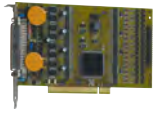
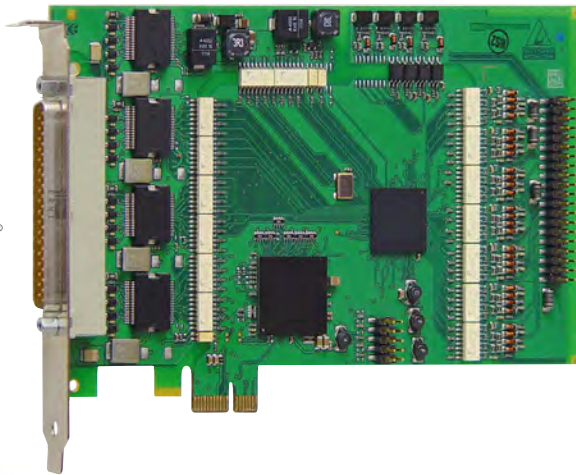
### Ordering information

|                 |   |
|-----------------|---|
| <b>ST010:</b>   | Standard round cable, shielded, twisted pairs, 2 m              |
| <b>ST011:</b>   | Standard round cable, shielded, twisted pairs, 5 m              |
| <b>ST010-S:</b> | Same as ST010, for high currents                                |
| <b>ST022:</b>   | Round cable between PX8500-G and PX901 or PX9000, shielded, 2 m |
| <b>ST8500:</b>  | Ribbon cable for cascading two PX8500-G                         |

\*Preliminary product information

# Digital I/O board, optically isolated, 64 digital inputs and outputs, 5 V, for PCI Express

PCI  
EXPRESS®



Also for **PCI**  
See APCI-1564, page 164



## Features

### Inputs

- 32 optically isolated inputs, 5 V, incl. 16 interruptible inputs
- Channels 0–2 can be used as 32-bit counter inputs (up to 500 kHz)
- Reverse voltage protection
- All inputs are filtered

### Outputs

- 32 optically isolated outputs, 5 V
- APCI-e1564-5V: Open Collector outputs
- APCle-1564-5V-HS: High-Side outputs
- Output current per channel 50 mA
- Watchdog for resetting the outputs to "0"
- At Power-On, reset of the outputs to "0"
- Current limit: ~0.5 A per 8 channels (through PTC)
- Short-circuit current per output ~0.5 A typ.
- Self-resetting fuse (electronic fuse)
- Overtemperature and overvoltage protection
- External voltage supply screened and filtered

### Timer / Watchdog / Counter

- 2 timers (12-bit), of which one can be used as a watchdog
- 3 counter (32-bit)

### Safety features

- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Protection against fast transients (burst), overvoltage, electrostatic discharge and high-frequency EMI
- Separate ground line for inputs and outputs

## APCLe-1564-5V / APCle-1564-5V-HS

### PCI Express interface

32 digital inputs, 5 V,  
including 16 interruptible inputs

32 digital outputs, 5 V, 50 mA/channel,  
Open Collector (5V) or High-Side (5V-HS)

Optical isolation 1000 V

Input and output filters

Connection through industry-standard  
D-Sub connector

## Applications

- Industrial I/O control
- PLC coupling
- Signal switching
- Interface to electromechanical relays
- Automatic test equipment
- ON/OFF monitoring of motors, lights...
- Watchdog timer
- ...

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

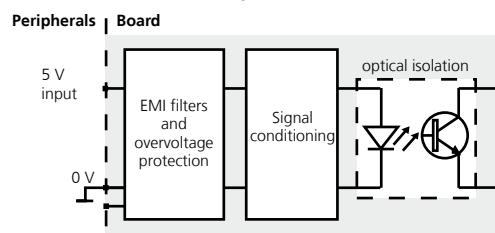
- C#.NET, C

### On request:

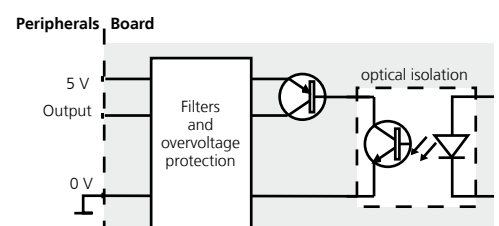
Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)

### Protective circuit for the input channels



### Protective circuit for the output channels



\*Preliminary  
product information

## Specifications\*

### Digital inputs

|   |  |
|---|--|
| Number of inputs:<br>(common ground acc. to IEC 1131-2) | 32 digital inputs,<br>channel 0-2 can be used as 32-bit counter inputs<br>(up to 500 kHz)  |
| Interruptible inputs:                                   | 16 channels (channel 4 to 19)  |
| Optical isolation:                                      | 1000 V through opto-couplers, from PC to peripheral  |
| Nominal voltage:  | 5 V  |
| Input current:  | Channel 0-3: 8.5 mA at 5 V, typ.<br>Channel 4-31: 5.9 mA at 5 V, typ.  |
| Input frequency (max.):                                 | Channel 0-3: 500 kHz at 5 V<br>Channel 4-31: 5 kHz at 5 V  |
| Logic input levels:                                     | UH (max.): 6 V / 7.8 mA typ. (channel 4-31)<br>UH (min.): 4 V / 4.1 mA typ. (channel 4-31)<br>UL (max.): 6 V / 11.5 mA typ. (channel 0-3)<br>UL (min.): 4 V / 5.6 mA typ. (channel 0-3)<br>UL (max.): 2 V / 0.8 mA typ. (channel 4-31)<br>UL (min.): 2 V / 1.1 mA typ. (channel 0-3)<br>UL (min.): 0 V / 0 mA typ. |
| Filters/protective circuit:                             | Input filters, transil diode,<br>RC filters, Z diode, opto-couplers  |

### Digital outputs

|                                   |   |
|-----------------------------------|---|
| Number of outputs:                | 32 digital outputs  |
| Output type:                      | APCLe-1564-5V: Open Collector<br>APCLe-1564-5V-HS: High-Side (load to ground)<br>acc. to IEC 1131-2 |
| Optical isolation:                | 1000 V (through opto-couplers), from PC to peripheral   |
| Nominal voltage:                  | 5 V   |
| Supply voltage range:             | 5 to 12 V (5V-Version)<br>5 to 35 V (5V-HS-Version)   |
| Current limit:                    | 0.5 A (typ.) per 8 channels (through PTC)   |
| Output current per output:        | 50 mA (typical)   |
| Short-circuit current per output: | 0.5 A (typ.)  |

### Timer/watchdog

|        |  |
|--------|--|
| Timer: | 2 x 12-bit, 1 x programmable as watchdog from 1 µs to 4095 s |
|--------|--|

### Safety

|                     |   |
|---------------------|---|
| Watchdog:           | For resetting the outputs to "0"                      |
| Common diagnostics: | For all 16 channels at overtemperature of one channel |

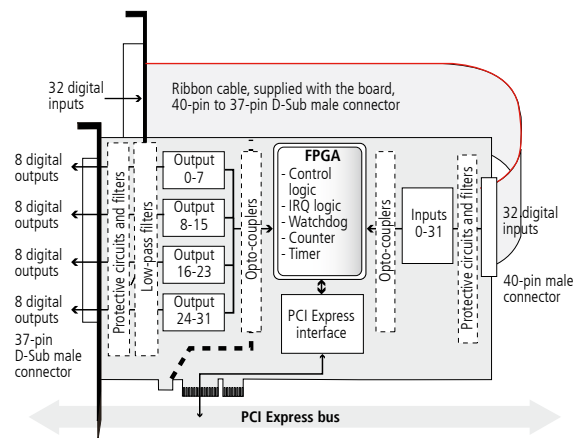
### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

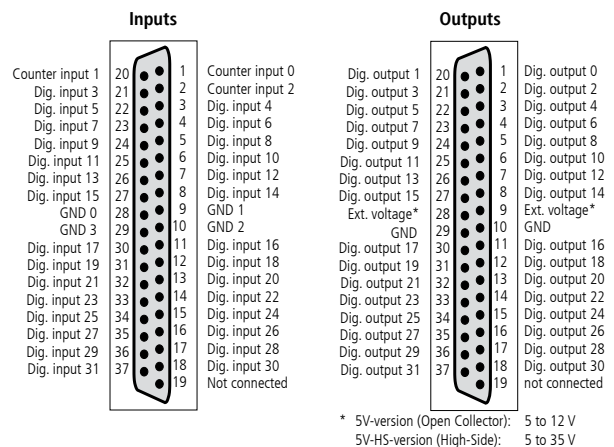
### Physical and environmental conditions

|                      |  |
|----------------------|--|
| Dimensions:          | 168 x 99 mm  |
| System bus:          | Acc. to PCI Express base specification,<br>Revision 1.0a (PCI Express 1.0a)                            |
| Space required:      | 1-/4-/8-/16-lane PCI Express slot  |
| Operating voltage:   | + 3.3 V from PC  |
| Current consumption: | Inputs and outputs inactive 340 mA ± 10 %, typical<br>inputs and outputs active 590 mA ± 10 %, typical |
| Front connector:     | 37-pin D-Sub male connector  |
| Temperature range:   | 0 to 60 °C (with forced cooling)   |

### Simplified block diagram

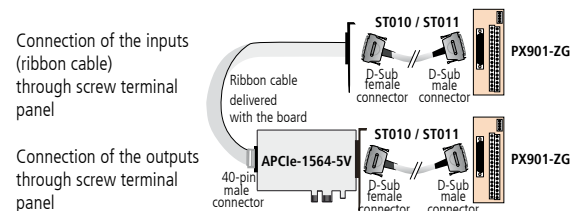


### Pin assignment – 37-pin D-Sub male connector



\* 5V-version (Open Collector): 5 to 12 V  
5V-HS-version (High-Side): 5 to 35 V

### ADDI-DATA connection



## Ordering information

### APCLe-1564-5V / APCLe-1564-5V-HS

Digital I/O board, optically isolated, 64 digital inputs and outputs, 5 V, for PCI Express.  
Incl. ribbon cable, technical description and software drivers.

#### Versions

|                          |   |
|--------------------------|---|
| <b>APCLe-1564-5V:</b>    | 64 digital I/O, 5 V, Open Collector outputs |
| <b>APCLe-1564-5V-HS:</b> | 64 digital I/O, 5 V, High-Side outputs      |

#### Accessories

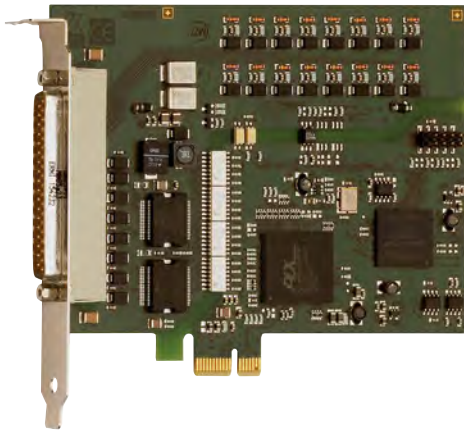
|                  |  |
|------------------|--|
| <b>PX901-ZG:</b> | Screw terminal panel for DIN rail                  |
| <b>ST010:</b>    | Standard round cable, shielded, twisted pairs, 2 m |
| <b>ST011:</b>    | Standard round cable, shielded, twisted pairs, 5 m |

\* Preliminary product information

# Digital I/O board, optically isolated, 16 digital inputs, 24 V, for PCI Express

**Preliminary!\***

PCI  
EXPRESS®



Also for **PCI**  
See APCI-1016, page 168

Windows  
64/32-bit drivers



on request

## Features

- Connector and software compatible to the digital I/O board APCI-1016 for the PCI bus.

### Inputs

- 16 optically isolated digital inputs, 24 V
- Reverse voltage protection
- All inputs are filtered

### Safety features

- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Protection against fast transients (burst), overvoltage, electrostatic discharge and high-frequency EMI

## Applications

- Industrial I/O control
- PLC coupling
- Signal switching
- Interface to electromechanical relays
- ON/OFF monitoring of motors, lights...
- Interface to machines

## APCle-1016

PCI-Express interface

16 digital inputs, 24 V

Optical isolation 1000 V

Input filters

Reverse voltage protection

Connection through industry-standard  
D-Sub connector

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

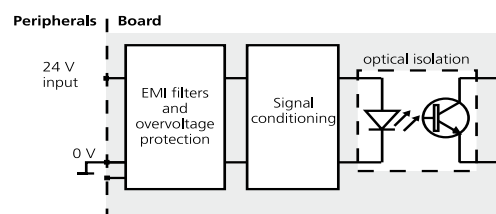
- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)

## Protective circuit for the input channels



\*Preliminary  
product information

## Specifications\*

### Digital inputs

|  |   |
|--|---|
| Number of inputs:<br>(common ground<br>acc. to IEC 1131-2) | 16  |
| Optical isolation:   | Through opto-couplers, 1000 V from PC to peripheral                   |
| Nominal voltage:   | 24 V  |
| Input current at 24 V:                                     | 2 mA typ.   |
| Maximal input frequency:                                   | 5 kHz at 24 V   |
| Logic input levels:  | U nominal: 24 V   |
| UH max.:   | 30 V/current 9 mA typ.  |
| UH min.:   | 19 V/current 2 mA typ.  |
| UL max.:   | 14 V/current 0.7 mA typ.  |
| UL min.:   | 0 V/current 0 mA typ.   |
| Filters/protective circuits                                | Input filters, transil diodes, RC filters, Z diodes,<br>opto-couplers |

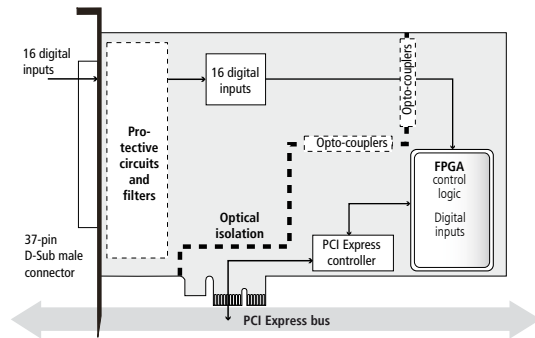
### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

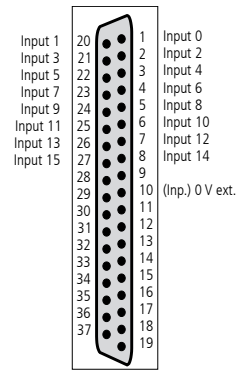
### Physical and environmental conditions

|                      |  |
|----------------------|--|
| Dimensions:          | 149 x 99 mm  |
| System bus:          | Acc. to PCI Express base specification,<br>Revision 1.0a (PCI Express 1.0a)      |
| Space required:      | 1-/4-/8-/16-lane PCI Express slot  |
| Operating voltage:   | + 3.3 V from PC  |
| Current consumption: | Inactive inputs 320 mA ± 10 %, typical<br>8 active inputs 400 mA ± 10 %, typical |
| Front connector:     | 37-pin D-Sub male connector  |
| Temperature range:   | 0 to 60 °C (with forced cooling)   |

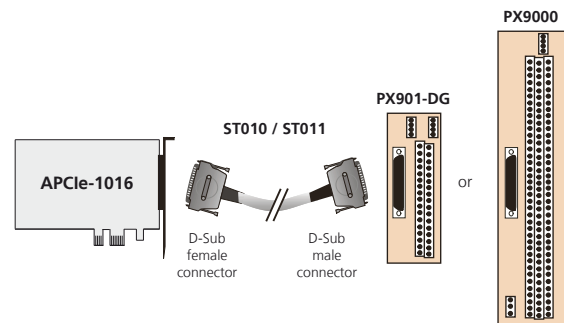
### Simplified block diagram



### Pin assignment – 37-pin D-Sub male connector



### ADDI-DATA connection



## Ordering information

### APCle-1016

Digital input board, optically isolated, 16 digital inputs, 24 V, for PCI Express. Incl. technical description and software drivers.

### Accessories

|                  |   |
|------------------|---|
| <b>PX901-D:</b>  | Screw terminal panel, LED status display                    |
| <b>PX901-DG:</b> | Screw terminal panel, LED status display, for DIN rail      |
| <b>PX9000:</b>   | 3-row screw terminal panel for DIN rail, LED status display |
| <b>ST010:</b>    | Standard round cable, shielded, twisted pairs, 2 m          |
| <b>ST011:</b>    | Standard round cable, shielded, twisted pairs, 5 m          |
| <b>ST010-S:</b>  | Same as ST010, for high currents (separate 24 V supply)     |

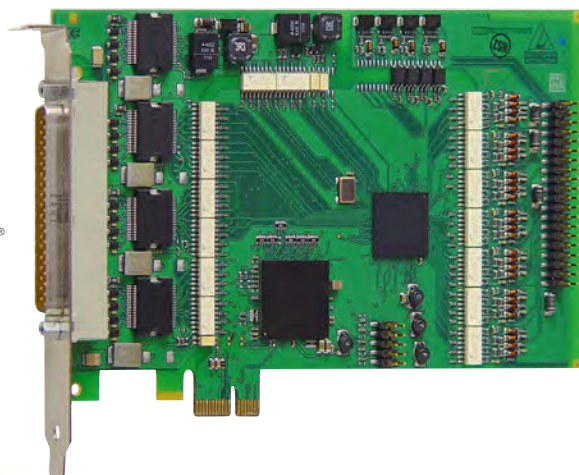
\* Preliminary product information



# Digital input board, optically isolated, 32 digital inputs, 24 V, for PCI Express

**New!\***

PCI  
EXPRESS®



Also for **PCI**  
See APCI-1032, page 166



Windows  
64/32-bit drivers



LabVIEW™



LabWindows/CVI™  
**DASYLab10**  
Data Acquisition System Laboratory



\*Preliminary  
product information

## Features

- Connector and software compatible to the digital input board APCI-1032 for the PCI bus
- Monitoring program for testing and setting the board functions

## Inputs

- 32 optically isolated digital inputs, 24 V, including 16 interruptible inputs
- Reverse voltage protection
- All inputs are filtered

## Safety features

- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Protection against fast transients (burst), overvoltage, electrostatic discharge and high-frequency EMI

## Applications

- Industrial I/O control
- Signal switching
- Interface to electromechanical relays
- Automatic test equipment
- ON/OFF monitoring of motors, lights...
- Machine interfacing
- ...

## APC1e-1032

PCI Express interface

32 digital inputs, 24 V,  
including 16 interruptible inputs

Optical isolation 1000 V

Input filters

Reverse voltage protection

Connection through industry-standard  
D-Sub connector

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

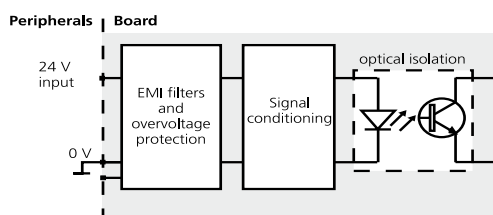
- .NET
- Microsoft VC++ • Borland C++
- Visual Basic • Delphi
- LabVIEW • LabWindows/CVI • DIAdem

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)

## Protective circuit for the input channels



## Specifications\*

### Digital inputs

|                                 |  |
|---------------------------------|--|
| Number of inputs:               | 32 (common ground acc. to IEC 1131-2)  |
| Including interruptible inputs: | 16 (input 0 to 15)   |
| Optical isolation:              | Through opto-couplers, 1000 V from PC to peripheral  |
| Compare logic:                  | AND and OR mode  |
| Nominal voltage:                | 24 V   |
| Input current at 24 V:          | 6 mA typ.  |
| Maximum input frequency:        | 5 kHz (at nominal voltage)   |
| Signal delay:                   | 70 µs (at nominal voltage)   |
| Logic input levels:             | U nominal: 24 V<br>UH (max.): 30 V<br>UH (min.): 19 V<br>UL (max.): 14 V<br>UL (min.): 0 V |
| Filters/protective circuits     | Input filters, transil diodes, RC filters, Z diodes, opto-couplers                         |

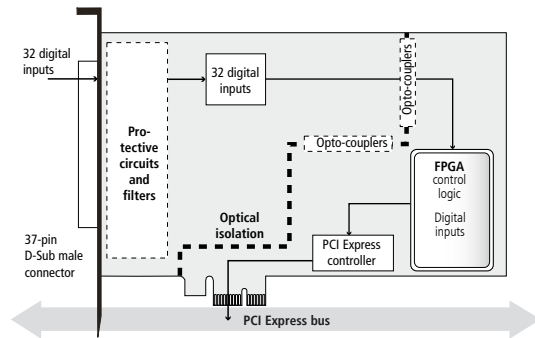
### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### Physical and environmental conditions

|                      |  |
|----------------------|--|
| Dimensions:          | 149 x 99 mm  |
| System bus:          | Acc. to PCI Express base specification, Revision 1.0a (PCI Express 1.0a)         |
| Space required:      | 1-/4-/8-/16-lane PCI Express slot  |
| Operating voltage:   | + 3.3 V from PC  |
| Current consumption: | Inactive inputs 320 mA ± 10 %, typical<br>8 active inputs 400 mA ± 10 %, typical |
| Front connector:     | 37-pin D-Sub male connector  |
| Temperature range:   | 0 to 60 °C (with forced cooling)   |

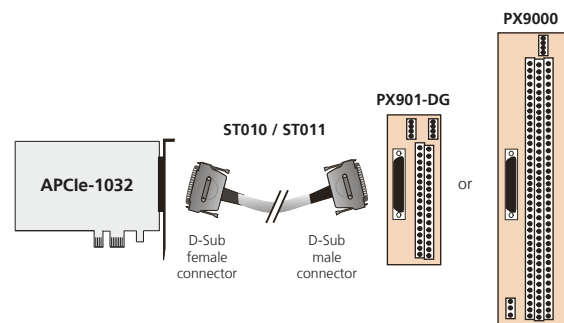
### Simplified block diagram



### Pin assignment – 37-pin D-Sub male connector

|               |    |    |               |
|---------------|----|----|---------------|
| Dig. input 1  | 20 | 1  | Dig. input 0  |
| Dig. input 3  | 21 | 2  | Dig. input 2  |
| Dig. input 5  | 22 | 3  | Dig. input 4  |
| Dig. input 7  | 23 | 4  | Dig. input 6  |
| Dig. input 9  | 24 | 5  | Dig. input 8  |
| Dig. input 11 | 25 | 6  | Dig. input 10 |
| Dig. input 13 | 26 | 7  | Dig. input 12 |
| Dig. input 15 | 27 | 8  | Dig. input 14 |
| GND 1         | 28 | 9  | GND 0         |
| GND 3         | 29 | 10 | GND 2         |
| Dig. input 17 | 30 | 11 | Dig. input 16 |
| Dig. input 19 | 31 | 12 | Dig. input 18 |
| Dig. input 21 | 32 | 13 | Dig. input 20 |
| Dig. input 23 | 33 | 14 | Dig. input 22 |
| Dig. input 25 | 34 | 15 | Dig. input 24 |
| Dig. input 27 | 35 | 16 | Dig. input 26 |
| Dig. input 29 | 36 | 17 | Dig. input 28 |
| Dig. input 31 | 37 | 18 | Dig. input 30 |
|               |    | 19 | Not connected |

### ADDI-DATA connection



## Ordering information

### APCle-1032

Digital Input board, optically isolated, 32 digital inputs, 24 V, for PCI Express. Incl. technical description and software drivers.

### Accessories

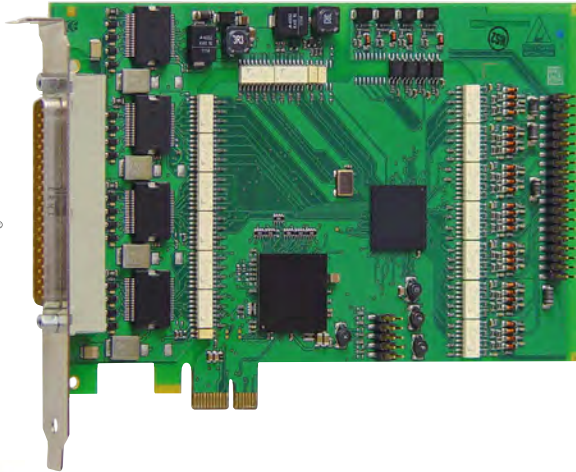
|                  |   |
|------------------|---|
| <b>PX901-D:</b>  | Screw terminal panel, LED status display                    |
| <b>PX901-DG:</b> | Screw terminal panel, LED status display, for DIN rail      |
| <b>PX9000:</b>   | 3-row screw terminal panel for DIN rail, LED status display |
| <b>ST010:</b>    | Standard round cable, shielded, twisted pairs, 2 m          |
| <b>ST011:</b>    | Standard round cable, shielded, twisted pairs, 5 m          |

\* Preliminary product information

# Digital output board, optically isolated, 32 digital outputs, 24 V / 5 V, for PCI Express

**New!\***

PCI  
EXPRESS®



Also for **PCI**  
See APCle-2032, page 170



LabVIEW™



LabWindows/CVI™



\*Preliminary  
product information

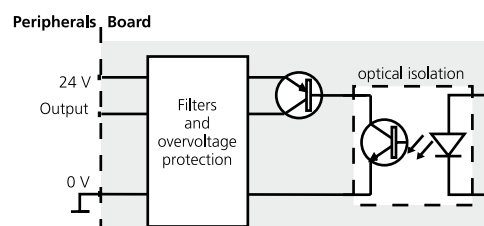
## Features

- Connector and software compatible to the digital output board APCle-2032 for the PCI bus.
- 32 digital outputs, 24 V (APCle-2032) or as 5 V version (APCle-2032-5), optically isolated
- Output current per channel: 500 mA
- Voltage range: 10 V to 36 V
- Diagnostic report, through status register at short-circuits, overtemperature, voltage drop or watchdog
- Programmable watchdog for resetting the outputs to "0", function release through software
- Interrupt triggered through error
- At Power-On the outputs are reset to "0"

## Safety features

- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Protection against fast transients (burst), overvoltage, electrostatic discharge and high-frequency EMI
- Maximum output current for 32 outputs 6 A typ. (2 x 3 A)
- 24 V power outputs with protection diodes and filters
- Self-resetting fuse (electronic fuse)
- Short-circuit current per output 1.5 A typ.
- Output capacitors against electromagnetic emissions
- Fast demagnetisation in case of inductive loads
- External 24 V voltage supply screened and filtered
- Shutdown logic: If the external 24 V voltage drops below 5 V, then the outputs are switched off.

## Protective circuit for the 24 V output channels (APCle-2032)



## APCle-2032 / APCle-2032-5

PCI Express interface

32 digital outputs, 24 V or 5 V,  
500 mA/channel

Optical isolation 1000 V

Output filters, short-circuit protection

Watchdog

The outputs are reset to "0" at Power-On

## Applications

- Signal switching
- Interface to electromechanical relays
- Automatic test equipment
- ON/OFF monitoring of motors, lights...
- Watchdog timer • Machine interfacing

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- .NET
- Microsoft VC++ • Borland C++
- Visual Basic • Delphi
- LabVIEW • LabWindows/CVI • DiAdem

### ADDIPACK functions:

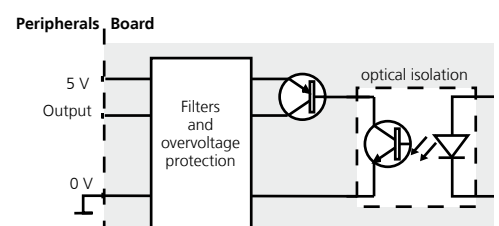
Digital output • Watchdog

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)

## Protective circuit for the 5 V output channels (APCle-2032-5)



## Specifications

### Digital outputs

|  |  |
|--|--|
| Outputs:   | 32   |
| Output type:   | High-side (load to ground) acc. to IEC 1131-2  |
| Optical isolation:   | through opto-couplers, 1000 V from PC to peripheral  |
| Nominal voltage:   | 24 V (APCLe-2032); or 5 V (APCLe-2032-5)   |
| Supply voltage:  | for 24 V version: 10 V to 36 V<br>for 5 V version: 5 V to 12 V via front connector   |
| Max. current for 32 outputs:   | 6 A typ. (2x3 A)   |
| Output current:  | 500 mA max./channel  |
| Short-circuit current/output shutdown at 24 V, $R_{load} < 0.1 \Omega$ : | 1.5 A  |
| RDS ON resistance:   | 0.4 $\Omega$ max.  |
| Switch-on time:  | I <sub>out</sub> =0.5 A, load = resistance: 94 $\mu$ s typ. (APCLe-2032)<br>I <sub>out</sub> =50 mA, load = resistance: 250 $\mu$ s typ. (APCLe-2032-5V) |
| Switch-off time:   | I <sub>out</sub> =0.5 A, load = resistance: 8 $\mu$ s typ. (APCLe-2032)<br>I <sub>out</sub> =50 mA, load = resistance: 3 $\mu$ s typ. (APCLe-2032-5V)    |
| Overtemperature (shutdown):  | 170 °C (output driver)   |
| Temperature hysteresis:  | 20 °C (output driver)  |

### Safety

Shutdown logic ( $V_{CC}$  diagnostic): If the ext. 24 V voltage drops below 5 V, then the outputs are switched off.

CC-Diagnostics (short circuit): Pin 19: status bit or interrupt to the PC

Watchdog: 8-bit, programmable, 20 ms up to 5 s in steps of 20 ms

### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

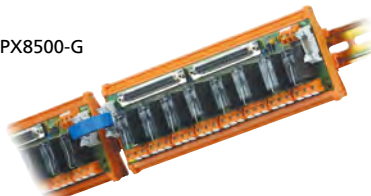
### Physical and environmental conditions

|                      |  |
|----------------------|--|
| Dimensions:          | 168 x 99 mm  |
| System bus:          | Acc. to PCI Express base specification, Revision 1.0a (PCI Express 1.0a) |
| Space required:      | 1-/4-/8-/16-lane PCI Express slot  |
| Operating voltage:   | + 3.3 V from PC  |
| Current consumption: | 230 mA $\pm$ 10 % typ.   |
| Front connector:     | 37-pin D-Sub male connector  |
| Temperature range:   | 0 to 60 °C (with forced cooling)   |

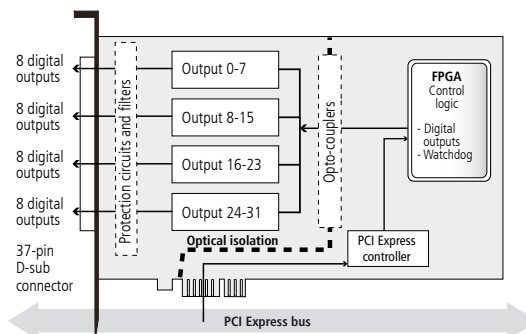
Screw terminal panel PX901-DG with cable ST010



Relay output board PX8500-G



### Simplified block diagram



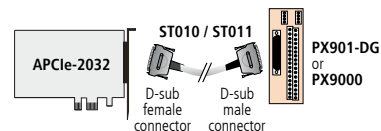
### Pin assignment – 37-pin D-Sub male connector

|                   |    |    |                   |
|-------------------|----|----|-------------------|
| Dig. output 1     | 20 | 1  | Dig. output 0     |
| Dig. output 3     | 21 | 2  | Dig. output 2     |
| Dig. output 5     | 22 | 3  | Dig. output 4     |
| Dig. output 7     | 23 | 4  | Dig. output 6     |
| Dig. output 9     | 24 | 5  | Dig. output 8     |
| Dig. output 11    | 25 | 6  | Dig. output 10    |
| Dig. output 13    | 26 | 7  | Dig. output 12    |
| Dig. output 15    | 27 | 8  | Dig. output 14    |
| Nom. voltage ext. | 28 | 9  | Nom. voltage ext. |
| GND               | 29 | 10 | GND               |
| Dig. output 17    | 30 | 11 | Dig. output 16    |
| Dig. output 19    | 31 | 12 | Dig. output 18    |
| Dig. output 21    | 32 | 13 | Dig. output 20    |
| Dig. output 23    | 33 | 14 | Dig. output 22    |
| Dig. output 25    | 34 | 15 | Dig. output 24    |
| Dig. output 27    | 35 | 16 | Dig. output 26    |
| Dig. output 29    | 36 | 17 | Dig. output 28    |
| Dig. output 31    | 37 | 18 | Dig. output 30    |
|                   |    | 19 | Dig. output 32    |

### ADDI-DATA connection

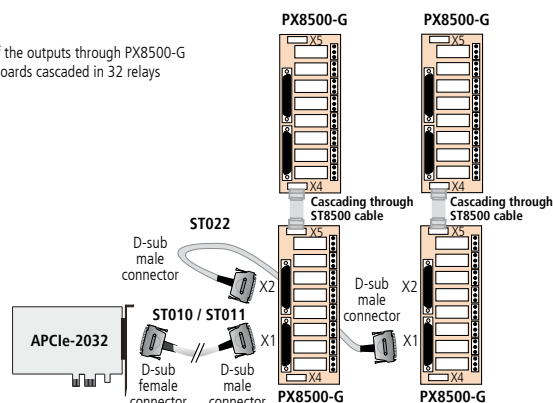
#### Example 1

Connection of the outputs through screw terminal panels



#### Example 2

Connection of the outputs through PX8500-G relay output boards cascaded in 32 relays



### Ordering information

#### APCLe-2032 / APCLe-2032-5

**APCLe-2032:** Digital output board, optically isolated, 32 digital outputs, 24 V. Incl. technical description and software drivers  
**APCLe-2032-5:** Digital output board, optically isolated, 32 digital outputs, 5 V. Incl. technical description and software drivers

#### Accessories

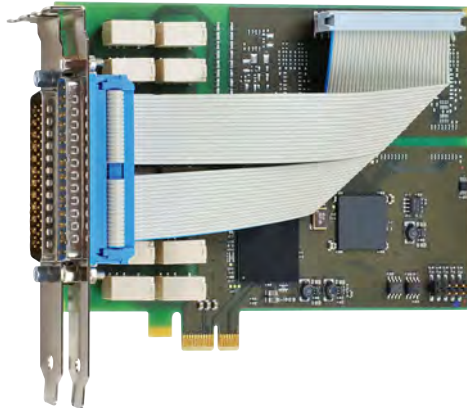
**PX901-D:** Screw terminal panel, LED status display  
**PX901-DG:** Same as PX901-D, for DIN rail  
**PX 901-ZG:** Screw terminal panel (only APCLe-2032-5)  
**PX9000:** 3-row screw terminal panel for DIN rail, LED status display  
**PX8500-G:** Relay output board for DIN rail, cascable

**ST010:** Standard round cable, shielded, twisted pairs, 2 m  
**ST011:** Standard round cable, shielded, twisted pairs, 5 m  
**ST010-S:** Same as ST010, for high currents (24 V supply separate)  
**ST022:** Round cable between two PX8500-G, shielded, 2 m  
**ST8500:** Ribbon cable for cascading two PX8500-G

\* Preliminary product information

# Relay board, optically isolated, 8/16 relays, 8/16 digital inputs, 24 V

PCI  
EXPRESS®



Also for **PCI**  
see APCI-2200, page 174



Windows  
64/32-bit drivers



on request



LabVIEW™



LabWindows/CVI™

## Features

### Relays

- 8 or 16 electromechanical relays with change-over contacts
- Max. switching voltage for the relays: 200 VDC, 200 VAC
- Max. switching capacity: 60 W, max. 2 A
- Short response time
- Watchdog: switched on/off through software

### Digital inputs

- 8 or 16 inputs, optically isolated, incl. 7 or 15 interruptible inputs
- Input voltage 24 V

### Safety features

- EMC tested
- Watchdog activity can be read back
- Optical isolation of the relays
- Creeping distance IEC 61010-1

## Applications

- Industrial digital I/O controlling
- Automatic test equipment
- Signal switching
- Interface to electromechanical relays
- ON/OFF monitoring of motors, lights...
- Alarm monitoring
- Machine interfacing
- ...

## APCLe-2200

8 or 16 relay output channels

Max. switching voltage 200 VDC, 200 VAC

max. switching current 2 A

8/16 digital inputs 24 V,

incl. 7/15 interruptible inputs

Optical isolation 1000 V

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- .NET
- Microsoft VC++ • Borland C++
- Visual Basic • Delphi
- LabVIEW • LabWindows/CVI

### ADDIPACK functions:

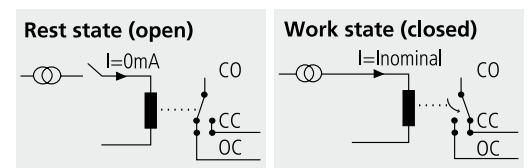
- Digital input • Digital output
- Watchdog • Timer

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)

## Function principle of the relays



CO: Change-over contact  
CC: Closing contact  
OC: Opening contact



## Specifications

### Relays

|                          |  |
|--------------------------|--|
| Type of contacts:        | 8/16 change-over                         |
| Max. switching voltage:  | 200 VDC, 200 VAC                         |
| Max. switching current:  | 2 A                                      |
| Max. switching capacity: | 60 W                                     |
| Contact resistance:      | < 100 mΩ                                 |
| Contact material:        | Ag and Au plated                         |
| Response time:           | Max. 4 ms, typ. 2.5 ms                   |
| Release time:            | Max. 4 ms, typ. 0.9 ms                   |
| Mechanical life:         | 10 <sup>8</sup> operations               |
| Electrical life:         | 10 <sup>5</sup> operations at rated load |

### Digital inputs

|                          |   |
|--------------------------|---|
| Number of inputs:        | 8/16<br>incl. 7/15 interruptible inputs |
| Optical isolation:       | Through opto-couplers, 1000 V           |
| Nominal voltage:         | 24 V                                    |
| Input current:           | 5 – 8 mA                                |
| Signal delay:            | 70 μs (at 24 V)                         |
| Maximal input frequency: | 10 kHz (at 24 V)                        |

### Timer

|                |                                       |
|----------------|---------------------------------------|
| Time settings: | 16-bit, programmable, 1 μs to 65535 s |
|----------------|---------------------------------------|

### Safety

|               |   |
|---------------|---|
| Test voltage: | 1000 V  |
| Watchdog:     | For resetting the outputs to "0":<br>12-bit, programmable, 1 μs to 4095 s |

### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

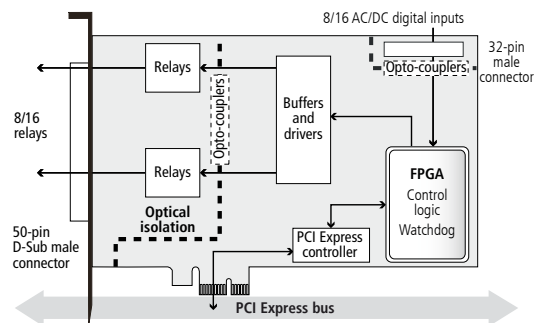
### Physical and environmental conditions

|                           |  |
|---------------------------|--|
| Dimensions:               | 149 x 99 mm  |
| System bus:               | Acc. to PCI Express base specification,<br>Revision 1.0a (PCI Express 1.0a)  |
| Space required:           | 1-/4-/8-/16-lane PCI Express slot  |
| Operating voltage:        | +3.3 V from the PC   |
| Max. current consumption: | 1 A ± 10 % (typ. APCle-2200-16-16)   |
| Front connector:          | 50-pin D-Sub male connector  |
| Additional connector:     | 32-pin male connector.<br>APCle-2200-16-8/APCle-2200-16-16:<br>Connection with delivered ribbon cable.<br>Connects the board to a bracket<br>with a 37-pin D-Sub male connector.<br>For connecting the PX901-ZG. |
| Temperature range:        | 0 up to 60 °C (with forced cooling)  |

Screw terminal panel PX8001  
with cable ST370-16



### Simplified block diagram



### Pin assignment – 50-pin D-Sub connector APCle-2200-16-8/APCle-2200-16-16

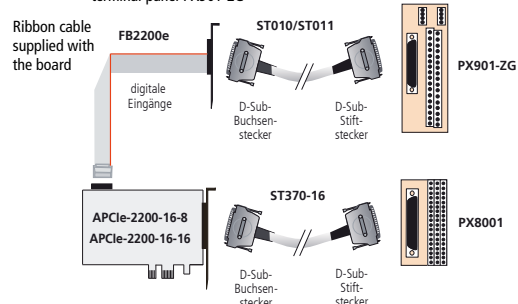
| Pin               | Pin               | Pin | Pin               |
|-------------------|-------------------|-----|-------------------|
| 34 OC of relay 0  | 18 CC of relay 0  | 34  | 1 CO of relay 0   |
| 35 OC of relay 1  | 19 CC of relay 1  | 35  | 2 CO of relay 1   |
| 36 OC of relay 2  | 20 CC of relay 2  | 36  | 3 CO of relay 2   |
| 37 OC of relay 3  | 21 CC of relay 3  | 37  | 4 CO of relay 3   |
| 38 OC of relay 4  | 22 CC of relay 4  | 38  | 5 CO of relay 4   |
| 39 OC of relay 5  | 23 CC of relay 5  | 39  | 6 CO of relay 5   |
| 40 OC of relay 6  | 24 CC of relay 6  | 40  | 7 CO of relay 6   |
| 41 OC of relay 7  | 25 CC of relay 7  | 41  | 8 CO of relay 7   |
| 42 OC of relay 8  | 26 CC of relay 8  | 42  | 9 CO of relay 8   |
| 43 OC of relay 9  | 27 CC of relay 9  | 43  | 10 CO of relay 9  |
| 44 OC of relay 10 | 28 CC of relay 10 | 44  | 11 CO of relay 10 |
| 45 OC of relay 11 | 29 CC of relay 11 | 45  | 12 CO of relay 11 |
| 46 OC of relay 12 | 30 CC of relay 12 | 46  | 13 CO of relay 12 |
| 47 OC of relay 13 | 31 CC of relay 13 | 47  | 14 CO of relay 13 |
| 48 OC of relay 14 | 32 CC of relay 14 | 48  | 15 CO of relay 14 |
| 49 OC of relay 15 | 33 CC of relay 15 | 49  | 16 CO of relay 15 |
| 50 -              |                   | 50  | 17 -              |

OC: Opening contact CC: Closing contact CO: Change-over contact

### ADDI-DATA connection

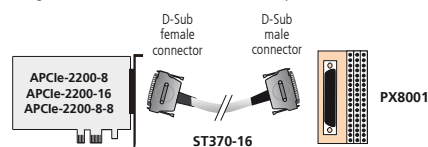
#### Example 1: APCle-2200-16-8/ APCle-2200-16-16

- Connection of the relay outputs through screw terminal panel PX8001
- Connection of the digital inputs through ribbon cable to the screw terminal panel PX901-ZG



#### Example 2: APCle-2200-8/APCle-2200-8-8/ APCle-2200-16

- Connection of the relay outputs and the digital inputs through front connector to the screw terminal panel



## Ordering information

### APCle-2200

Relay board, optically isolated, 8/16 relays, 8/16 digital inputs, 24 V. Incl. technical description and software drivers.

**APCle-2200-16-16:** 16 relays, 16 dig. inputs, with ribbon cable

**APCle-2200-16-8:** 16 relays, 8 dig. inputs, with ribbon cable for the connection of the digital inputs

**APCle-2200-8-8:** 8 relays, 8 digital inputs, 24 V

**APCle-2200-16:** 16 relays

**APCle-2200-8:** 8 relays

### Accessories

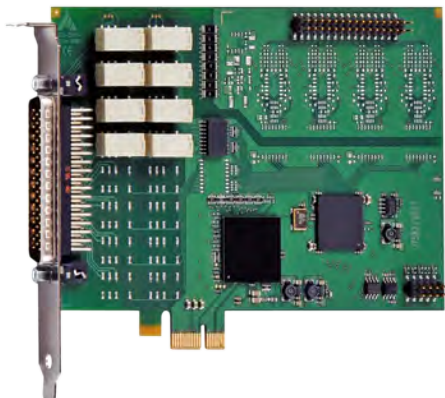
**PX8001:** 3-row screw terminal panel for DIN rail

**ST370-16:** Shielded round cable, 2 m

**PX901-ZG:** Screw terminal panel for DIN rail

# Watchdog board, optically isolated, 7 watchdogs/timer

PCI  
EXPRESS®



on request



LabVIEW™  
on request

## Features

Maximise the reliability of your telecom, ISP, Voice Mail, File Server or industrial systems under Windows operating systems with the APCLe-040 PCI Express watchdog board. The board is equipped with 7 watchdogs for simultaneous software and hardware monitoring. External devices can thus be monitored (e. g. alarm systems, PLCs) and controlled (e. g. modems, dialing devices).

In addition, the PCI Express watchdog board APCLe-040 has a two-level alarm system and can initiate a hardware reset in case of emergency. The principle is based on the computer software having to send signals to the board at regular intervals.

If the board does not receive an expected signal within a certain period of time, the first alarm level is activated. The emergency program is started which determines the cause and tries to remove the error. If this fails, the operating system and, if necessary, external devices are prepared for the hardware reset. The second alarm level is automatically triggered after a defined timeout. The internal PC temperature can be monitored through the onboard temperature sensor.

### Watchdog / Timer

- 7 watchdogs/timers
- 7 trigger channels/Gate inputs (24 V)
- Activation through software
- Configuration through software, readable
- Can be triggered through software or digital input
- Time base for the watchdog/timer:  $\mu$ s, ms, s, min
- Several alarm levels are possible for each watchdog
- Level 1 generates an interrupt or switches the warning relay, level 2 switches the reset relay (only watchdog 0 has 2 relays)
- With the two-level alarm, the operating system can be warned through an interrupt that a hardware reset is going to take place. There is then enough time to close the active tasks or to reset the warning relay.
- The alarm time can be read back at any time, so that the time remaining for further tasks can be established.
- Switching time of the reset relay: 2 s

### Defined state after booting

- The watchdogs are switched off through the system reset

## APCLe-040

7 watchdogs/timers

8 electromechanical relays  
with change-over contacts

7 digital inputs 24 V

2 alarm levels

Temperature monitoring from -35 °C to + 85 °C

Optical isolation 1000 V

### Diagnostic

- The status of the 7 watchdogs is readable
- 7 digital inputs (watchdog trigger or timer gate)

### Safety

- Optical isolation 1000 V

### Temperature measurement

- 1 temperature onboard sensor
- Alarm function when a programmable limit value is exceeded

### Digital inputs

- 7 inputs, optically isolated
- Input voltage 24 V

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- C#.NET, C

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)

\*Preliminary  
product information

## Specifications\*

### Relays

|                          |  |
|--------------------------|--|
| Type of contacts:        | 8 change-over                            |
| Max. switching voltage:  | 200 VDC, 200 VAC                         |
| Max. switching current:  | 2 A                                      |
| Max. switching capacity: | 60 W                                     |
| Contact resistance:      | < 100 mΩ                                 |
| Contact material:        | Ag and Au plated                         |
| Response time:           | Max. 4 ms, typ. 2.5 ms                   |
| Release time:            | Max. 4 ms, typ. 0.9 ms                   |
| Mechanical life:         | 5 x 10 <sup>6</sup> operations           |
| Electrical life:         | 10 <sup>5</sup> operations at rated load |

### Watchdogs/timers

|  |                                  |
|--|----------------------------------|
| Depth:                                       | 8-bit                            |
| Switching time of the reset relay:           | 2 s                              |
| Programmable time of the 7 watchdogs/timers: | Can be set from 2 μs to 255 min. |
| Time units:                                  | μs, ms, s, min                   |

### Digital inputs

|                          |                               |
|--------------------------|-------------------------------|
| Number of inputs:        | 7                             |
| Optical isolation:       | Through opto-couplers, 1000 V |
| Nominal voltage:         | 24 V                          |
| Input current:           | 5 – 8 mA                      |
| Signal delay:            | 70 μs (at 24 V)               |
| Maximal input frequency: | 10 kHz (at 24 V)              |

### Temperature monitoring

|                    |  |
|--------------------|--|
| Accuracy:          | ± 1 °C   |
| Measurement range: | -35 °C to 85 °C<br>(real range of application 0-60 °C) |
| Resolution:        | 8-bit  |

### Safety

|               |        |
|---------------|--------|
| Test voltage: | 1000 V |
|---------------|--------|

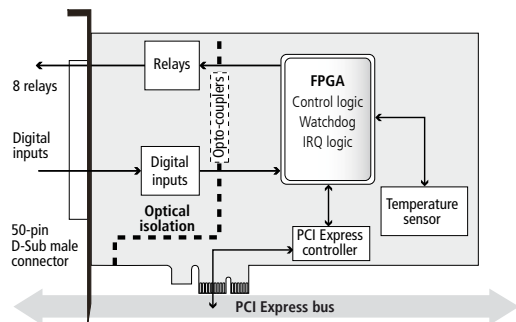
### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### Physical and environmental conditions

|                           |  |
|---------------------------|--|
| Dimensions:               | 149 x 99 mm  |
| System bus:               | Acc. to PCI Express base specification, Revision 1.0a (PCI Express 1.0a) |
| Space required:           | 1-/4-/8-/16-lane PCI Express slot  |
| Operating voltage:        | +3.3 V from the PC   |
| Max. current consumption: | 0,67 A ±10 %   |
| Front connector:          | 50-pin D-Sub male connector  |
| Temperature range:        | 0 to 60 °C (with forced cooling)   |

### Simplified block diagram

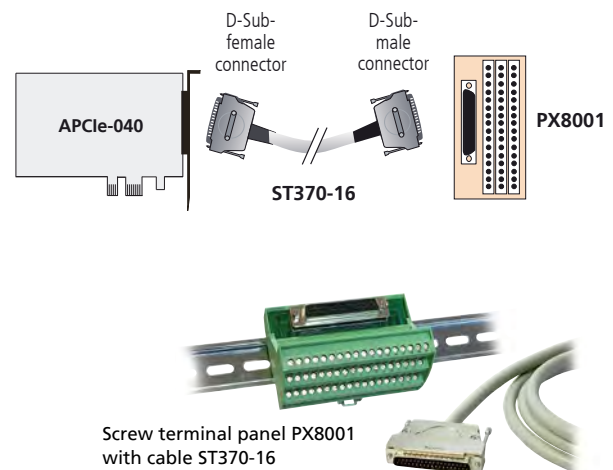


### Pin assignment

| Pin                    | Pin               | Pin   | Pin                 |
|------------------------|-------------------|-------|---------------------|
| 34 OC of relay 0       | 18 CC of relay 0  | 34 1  | CO of relay 0       |
| 35 OC of relay 1*      | 19 CC of relay 1* | 35 2  | CO of relay 1*      |
| 36 OC of relay 2       | 20 CC of relay 2  | 36 3  | CO of relay 2       |
| 37 OC of relay 3       | 21 CC of relay 3  | 37 4  | CO of relay 3       |
| 38 OC of relay 4       | 22 CC of relay 4  | 38 5  | CO of relay 4       |
| 39 OC of relay 5       | 23 CC of relay 5  | 39 6  | CO of relay 5       |
| 40 OC of relay 6       | 24 CC of relay 6  | 40 7  | CO of relay 6       |
| 41 OC of relay 7       | 25 CC of relay 7  | 41 8  | CO of relay 7       |
| 42 Digital input 0 (+) | 26 -              | 42 9  | Digital input 0 (-) |
| 43 Digital input 1 (+) | 27 -              | 43 10 | Digital input 1 (-) |
| 44 Digital input 2 (+) | 28 -              | 44 11 | Digital input 2 (-) |
| 45 Digital input 3 (+) | 29 -              | 45 12 | Digital input 3 (-) |
| 46 Digital input 4 (+) | 30 -              | 46 13 | Digital input 4 (-) |
| 47 Digital input 5 (+) | 31 -              | 47 14 | Digital input 5 (-) |
| 48 Digital input 6 (+) | 32 -              | 48 15 | Digital input 6 (-) |
| 49 -                   | 33 -              | 49 16 | -                   |
| 50 -                   | -                 | 50 17 | -                   |

OC: opening contact CC: closing contact CO: change-over contact \* = reset relay

### ADDI-DATA connection



## Ordering information

### APCle-040

Watchdog board, optically isolated, 7 watchdogs/timer. Incl. technical description and software drivers.

**APCle-040:** 7 watchdogs, 8 relays, 7 digital inputs, 24 V

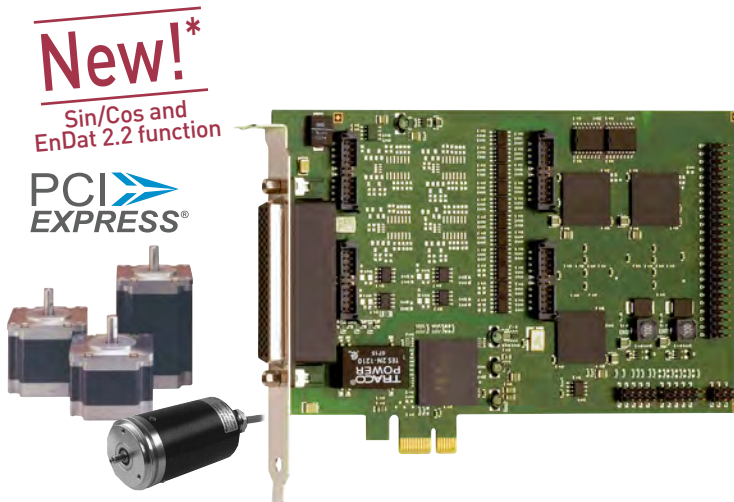
### Accessories

**PX8001:** 3-row screw terminal panel, 50-pin, for DIN-rail mounting

**ST370-16:** Shielded round cable, 2 m

\* Preliminary product information

# Multifunction counter board, optically isolated, fast counter inputs – programmable functions, for PCI Express



Also for **PCI**  
see APCI-1710  
page 178

Also for **CompactPCI™**  
see CPCI-1710  
page 246

Also for **CompactPCI™ Serial**  
see CPCIs-1711  
page 234



\*Preliminary  
product information

The board APCLe-1711 is a fast multifunction and multi-channel counter board for the PCI Express bus. The strengths of this board are its wide range of applications and high precision and reliability in harsh industrial environment.

With this board you can realise many different applications on the same hardware base. The board is supplied with a pool of functions which provides the user with maximum efficiency yet minimum space and parts requirement. The functions are individually configured for each channel through the supplied software. The flexible programming facilities on this board allow many different user applications to be quickly and easily developed and reconfigured as further requirements arise. Thanks to the FPGA board structure, further counting applications can be realised through software adaptation. Contact us!

## Features

- 32-bit data access
- RS422 driver with 5 MHz max. (10 MHz for the APCLe-1711-10MHz – without ESD protection)
- With RS422/TTL input/output signals (APCLe-1711) or 24 V input signals (APCLe-1711-24V)
- Four onboard programmable function modules

## Functions

- Incremental counter for the acquisition of incremental encoders (90° phase-shifted signals)
- BiSS-Master (B and C mode)
- SSI Synchronous Serial Interface. The SSI function is an interface for systems which allow an absolute position information via serial data transfer.
- Counter/timer (82C54)
- Pulse acquisition
- Frequency measurement
- Pulse width modulation (PWM)
- Period duration measurement
- Velocity measurement
- Digital inputs and outputs
- Edge time measurement (ETM)
- Parallel interface
- Sin/Cos (1 V<sub>pp</sub>, 11 μA<sub>pp</sub>)
- EnDat 2.2
- Customised functions

## Available channels on one function module

- 4 channels, programmable either as digital inputs or outputs, optically isolated, RS422
- 3 channels, digital inputs, optically isolated, 24 V
- 1 digital power output, optically isolated, 24 V

## APCLe-1711

Available functions:

Incremental counter, SSI Synchronous Serial Interface, counter/timer, pulse acquisition, frequency, pulse width, period duration, velocity measurement, PWM, BiSS-Master, digital inputs and outputs, Sin/Cos, EnDat 2.2 ...

Function selection through software

Optical isolation

Inputs and outputs: RS422, TTL, 24 V

Customised functions

## Additional channels

- 28 TTL I/O, without optical isolation

## Versions

|                  | RS422/<br>TTL-<br>I/O | 24 V<br>inputs | 5 V<br>inputs | 24 V<br>outputs | TTL<br>I/O |
|------------------|-----------------------|----------------|---------------|-----------------|------------|
| APCLe-1711       | 16                    | 12             | –             | 4               | 28         |
| APCLe-1711-24V   | –                     | 28             | –             | 4               | 28         |
| APCLe-1711-5V-I  | 16                    | –              | 12            | 4               | 28         |
| APCLe-1711-10MHz | 16                    | 12             | –             | 4               | 28         |

## Safety features

- Creeping distance IEC 61010-1
- Optical isolation 1000 V
- Noise neutralisation of the PC supply

## Applications

- Event counting
- Position acquisition
- Motion control
- Batch counting
- ...

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

## Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

## Drivers and samples for the following compilers and software packages:

- Microsoft VC++ • Borland C++ 5.01

## On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)

## Wide range of applications through the free combination of functions

### 4 function modules quickly and easily programmable with numerous functions

Each of the four modules is programmed with one function. You can program 4 times the same function or freely combine 4 different functions.

| Configuration example 1 |                     |                   |                   |
|-------------------------|---------------------|-------------------|-------------------|
| Function module 0       | Function module 1   | Function module 2 | Function module 3 |
| Incremental counter     | Incremental counter | Pulse acquisition | Counter/Timer     |

| Configuration example 2 |                   |                     |                   |
|-------------------------|-------------------|---------------------|-------------------|
| Function module 0       | Function module 1 | Function module 2   | Function module 3 |
| SSI                     | SSI               | Incremental counter | digital I/O       |

### Programmable onboard modules

Each module can be programmed with the function of your choice. You can operate simultaneously up to 4 different functions on one board. If your application must be modified, you can load a new function quickly and easily.

### Overview of signal generators resp. functions

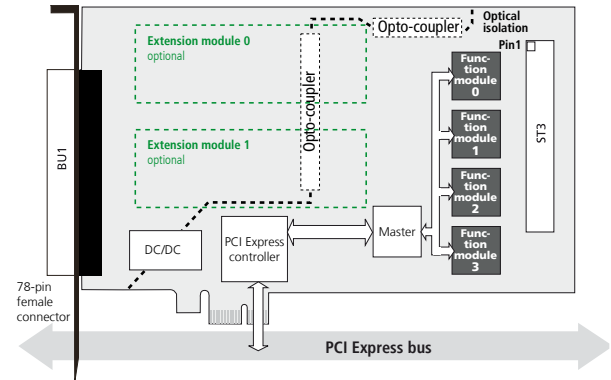
| Application         | Max. number of signal generators or functions for each function module | Max. number of function modules for each APCle-1711 | Max. number of signal generators or functions of each APCle-1711 | Page |
|---------------------|--|---|--|------|
| Incremental counter | 1 (32-bit) or 2 (16-bit)   | 4   | 4 or 8   | 180  |
| SSI                 | 3  | 4   | 12   | 180  |
| Chronos             | 1  | 4   | 4  | 181  |
| BiSS-Master         | 6  | 4   | 24   | 142  |
| Counter/Timer       | 3  | 4   | 12   | 182  |
| TOR                 | 2  | 4   | 8  | 183  |
| Pulse acquisition   | 4  | 4   | 16   | 184  |
| PWM                 | 2  | 4   | 8  | 184  |
| ETM                 | 2  | 4   | 8  | 185  |
| Digital I/O         | 8  | 4   | 32   | 185  |
| TTL                 | 24   | 1   | 24   | –    |
| Parallel Interface  | 1  | 4   | 1  | 142  |
| Sin/Cos*            | 2  | 2   | 4  | 144  |
| EnDat 2.2           | 2  | 4   | 8  | 143  |

\*Extension module (EM) is required



**Customer-tailored modifications,**  
designed to suit your needs.  
Hardware and software,  
firmware, PLDs, ...  
Contact us!

## Simplified block diagram

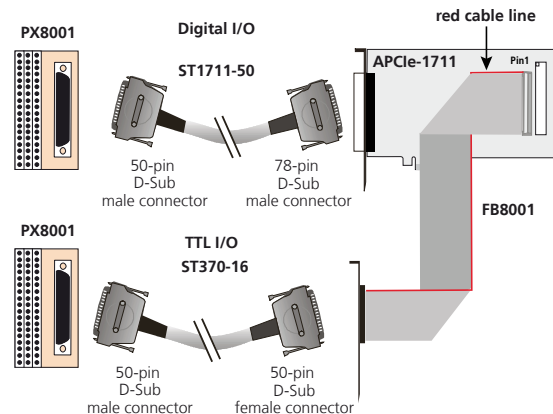


## Pin assignment – 78-pin D-Sub female connector

| Pin                              | Pin                 | Pin    | Pin       |
|----------------------------------|---------------------|--------|-----------|
| 78 EMO[12]                       | 59 EMO[9]           | EMO[5] | 39 EMO[2] |
| 77 EMO[11]                       | 58 EMO[8]           | EMO[4] | 38 EMO[1] |
| 76 EMO[10]                       | 57 EMO[7]           | EMO[3] | 37 EMO[0] |
| 75 EM1[12]                       | 56 EMO[6]           | EM1[6] | 36 EM1[2] |
| 74 EM1[11]                       | 55 EM1[9]           | EM1[5] | 35 EM1[1] |
| 73 EM1[10]                       | 54 EM1[8]           | EM1[4] | 34 EM1[0] |
| 72 U <sub>ref</sub> +24 V supply | 53 EM1[7]           | GND    | 33 E3     |
| 71 H3                            | 52 U <sub>ref</sub> | F3     | 32 A3-    |
| 70 D3-                           | 51 G3               | B3-    | 31 A3+    |
| 69 D3+                           | 50 C3-              | B3+    | 30 E2     |
| 68 H2                            | 49 C3+              | F2     | 29 A2-    |
| 67 D2-                           | 48 G2               | B2-    | 28 A2+    |
| 66 D2+                           | 47 C2-              | B2+    | 27 E1     |
| 65 H1                            | 46 C2+              | F1     | 26 A1-    |
| 64 D1-                           | 45 G1               | B1-    | 25 A1+    |
| 63 D1+                           | 44 C1-              | B1+    | 24 E0     |
| 62 H0                            | 43 C1+              | F0     | 23 A0-    |
| 61 D0-                           | 42 G0               | B0-    | 22 A0+    |
| 60 D0+                           | 41 C0-              | B0+    | 21 GND    |
|                                  | 40 C0+              |        |           |

EM = Extension module

## ADDI-DATA connection





## Function Parallel Interface

**On request**

With the **Parallel Interface** function, the digital inputs of the APCle-1711 are acquired in parallel. Up to 28 digital inputs, 24 V, can be acquired with the APCle-1711-24 V. Up to 16 RS422 and 12 digital 24 V inputs can be acquired with the APCle-1711.

There are different methods for the acquisition of the inputs:

- Timer controlled (max. resolution 1  $\mu$ s = 1 MHz)
- Digital input (by masking the digital inputs, rising or falling edge)
- Software

This function can be loaded up to 4 times for each APCle-1711, i.e. it is possible to acquire 8-bit (7 inputs), 16-bit (14 inputs), 24-bit (21 inputs) or 32-bit (28 inputs) in parallel. If an external trigger signal is used (maskable, rising or falling edge), there is no need to use one of the inputs for triggering.

The data is transferred directly via DMA into the RAM of the PC.

If the **Parallel Interface** function is loaded on all function modules up to 28 digital inputs (RS422 / 24 V) are available.

### Used signals

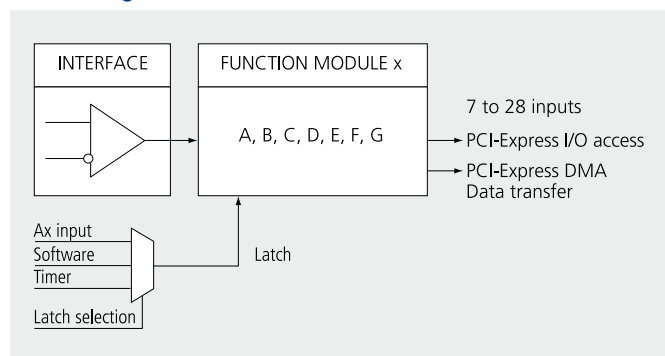
| Pin name | Signal type   | Function      |
|----------|---------------|---------------|
| Ax +/-   | 24 V* / RS422 | Digital input |
| Bx +/-   | 24 V* / RS422 | Digital input |
| Cx +/-   | 24 V* / RS422 | Digital input |
| Dx +/-   | 24 V* / RS422 | Digital input |
| Ex       | 24 V          | Digital input |
| Fx       | 24 V          | Digital input |
| Gx       | 24 V          | Digital input |

The 24 V switching level can be adjusted optionally down to 1 V

x: Number of the function module (See pin assignment page 141)

\* 24 V for the APCle-1711-24 V

### Block diagram Parallel Interface



## Function BiSS-Master

The **BiSS-Master** function is a bidirectional sensor interface for the communication with up to 6 sensors. BiSS B and C are supported.

### Features of the BiSS-Master function:

- 1 function module with a maximum amount of 6 sensors (3 per channel) for cascading the sensors it is necessary that each sensor has a data input and data output
- Read sensor data
- Read/write register data

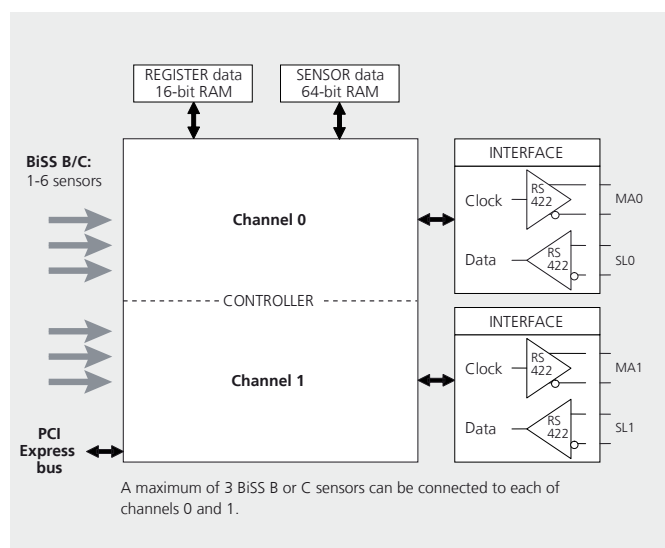
Get more information about the function range of the BiSS interface at [www.biss-interface.com](http://www.biss-interface.com).

### Used signals

| Signal name  | Pin name | Signal type | Function  |
|--------------|----------|-------------|---|
| Output_Ch0_x | Ax +/-   | RS422       | Dig. output 0 (clock line from master to slave) MA0 |
| Input_Ch0_x  | Bx +/-   | RS422       | Dig. input 0 (data line from slave to master) SL0   |
| Output_Ch1_x | Cx +/-   | RS422       | Dig. output 1 (clock line from master to slave) MA1 |
| Input_Ch1_x  | Dx +/-   | RS422       | Dig. input 1 (data line from slave to master) SL1   |

x: Number of the function module (See pin assignment page 141)

### Block diagram BiSS-Master



## Function EnDat 2.2

**New!**

**EnDat 2.2** is a bidirectional synchronous-serial interface for position measurement devices. This interface allows the reading out of absolute position values and parameters, the writing of status and initialisation registers and the transfer of additional information about the position value. Furthermore, the **EnDat 2.2** function modules support the analysis of diagnostic values and access to the OEM memory. Data transfer is effected serially.

On one board you can use up to 8 **EnDat 2.2** sensors (2 sensors per function module). Each function module has its own clock pulse line (B or D) and data line (A or C).

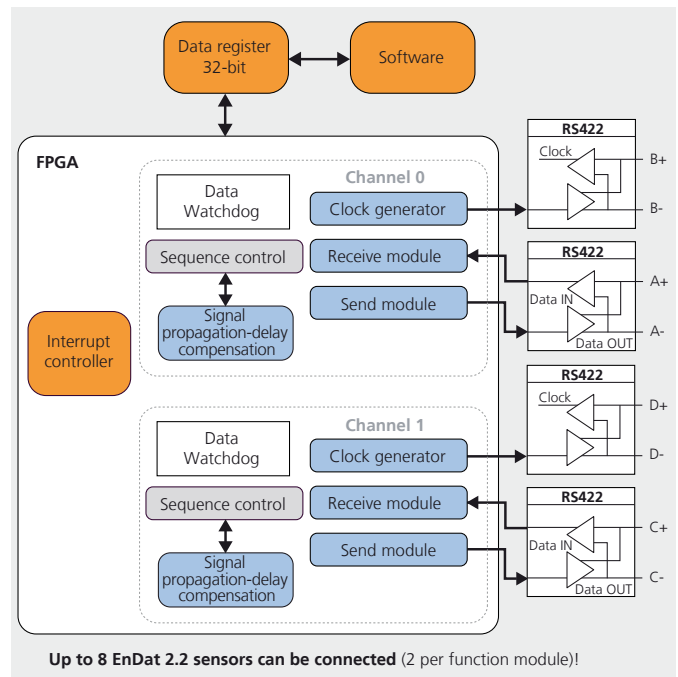
**The function EnDat 2.2 is only available for the APCle-1711!**  
(not for the APCle-1711-24V and APCle-1711-5V-I)

### Used signals

| Channel  | Signal name | I/O      | Pin name | Function                             |
|----------|-------------|----------|----------|--------------------------------------|
| 0        | CLK_0+      | O        | Bx +     | Clock pulse line                     |
| 0        | CLK_0-      | O        | Bx -     | Clock pulse line                     |
| 0        | DATA_0+     | I/O      | Ax +     | Data line                            |
| 0        | DATA_0-     | O        | Ax -     | Data line                            |
| 1        | CLK_1+      | O        | Dx +     | Clock pulse line                     |
| 1        | CLK_1-      | O        | Dx -     | Clock pulse line                     |
| 1        | DATA_1+     | I/O      | Cx +     | Data line                            |
| 1        | DATA_1-     | O        | Cx -     | Data line                            |
| Dig. I/O | DigIn0_x    | I (24 V) | Ex       | Digital channel for unrestricted use |
| Dig. I/O | DigIn1_x    | I (24 V) | Fx       | Digital channel for unrestricted use |
| Dig. I/O | DigIn2_x    | I (24 V) | Gx       | Digital channel for unrestricted use |
| Dig. I/O | DigOut_x    | O (24 V) | Hx       | Digital channel for unrestricted use |

x: Number of the module (See pin assignment page 141)

### Block diagram EnDat 2.2



## Application example

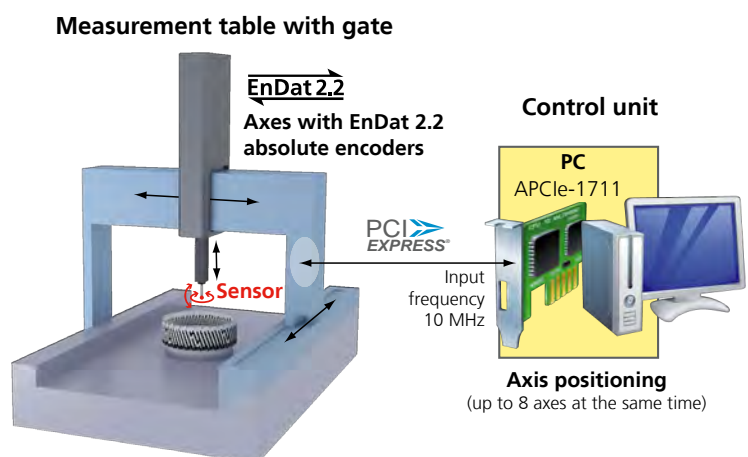
**Exact positioning of axes for the regulation of surface measurement devices for rotationally symmetric parts (e.g. gear wheels)**

### Challenge

For the measurement of the surfaces of rotationally symmetric parts numerous axes must be positioned. Furthermore the signals must be fastly transferred in order to detect the position as exactly as possible. To save time, absolute encoders are used because they do not need any reference runs when started.

### Solution

The measurement device consists of a measurement table with a gate. The rotationally symmetric parts are fixed on the measurement table and their surface is tested with a sensor connected to the gate. To move the sensor around the parts the gate has several axes equipped with EnDat 2.2 absolute encoders. The precision of the axis position is assured by the PCI Express counter board APCle-1711: Thanks to its high input speed of 10 MHz (optional APCle-1711-10MHZ version) and its resistance to interferences, the board is able to move the axes precisely even at high speed.



**EnDat 2.2**

## Function Sin/Cos New!

With the function **Sin/Cos**, up to 4 Sin/Cos sensors can be used on one board (function module 0 or 1 as well as 2 or 3). The extension module EM-SINCOS-1V<sub>pp</sub> is meant for the connection of signals with 1 V<sub>pp</sub>, the EM-SINCOS-11μA<sub>pp</sub> is able to acquire 11 μA<sub>pp</sub> signals. A signal period of the Sin/Cos signal is divided in a predefined number of steps, depending on the chosen resolution. The maximum input frequency of the counter input also depends on the chosen resolution.

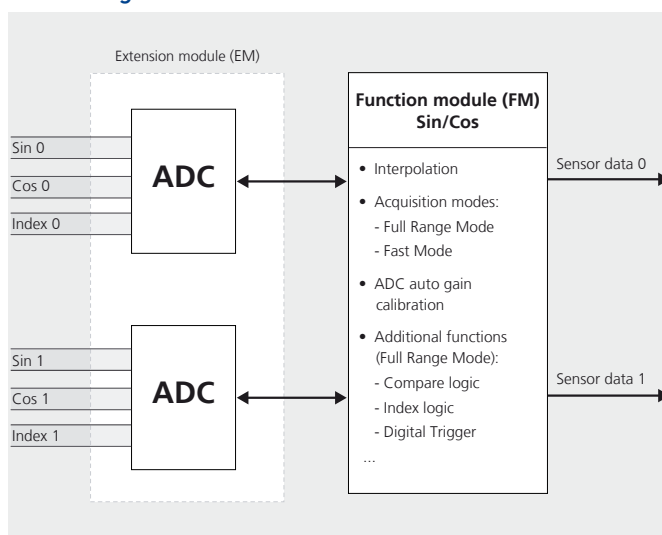
**Please note:** The function **Sin/Cos** can only be used with the extension module EM-SINCOS.

### Used signals

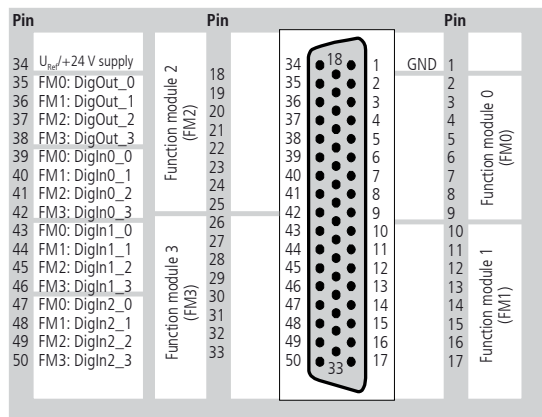
| Signal name | Signal type                                  | Function  |
|-------------|--|---|
| EMx_Sin0+   | 1 V <sub>pp</sub> /11 μA <sub>pp</sub> diff. | Trace A+ (Sinus) of Sin/Cos sensor 0                                |
| EMx_Sin0-   | 1 V <sub>pp</sub> /11 μA <sub>pp</sub> diff. | Trace A- (Sinus) of Sin/Cos sensor 0                                |
| EMx_Cos0+   | 1 V <sub>pp</sub> /11 μA <sub>pp</sub> diff. | Trace B+ (Cosinus) of Sin/Cos sensor 0                              |
| EMx_Cos0-   | 1 V <sub>pp</sub> /11 μA <sub>pp</sub> diff. | Trace B- (Cosinus) of Sin/Cos sensor 0                              |
| EMx_Index0+ | differential                                 | Trace C+ (Index) of Sin/Cos sensor 0                                |
| EMx_Index0- | differential                                 | Trace C- (Index) of Sin/Cos sensor 0                                |
| EMx_Sin1+   | 1 V <sub>pp</sub> /11 μA <sub>pp</sub> diff. | Trace A+ (Sinus) of Sin/Cos sensor 1                                |
| EMx_Sin1-   | 1 V <sub>pp</sub> /11 μA <sub>pp</sub> diff. | Trace A- (Sinus) of Sin/Cos sensor 1                                |
| EMx_Cos1+   | 1 V <sub>pp</sub> /11 μA <sub>pp</sub> diff. | Trace B+ (Cosinus) of Sin/Cos sensor 1                              |
| EMx_Cos1-   | 1 V <sub>pp</sub> /11 μA <sub>pp</sub> diff. | Trace B- (Cosinus) of Sin/Cos sensor 1                              |
| EMx_Index1+ | differential                                 | Trace C+ (Index) of Sin/Cos sensor 1                                |
| EMx_Index1- | differential                                 | Trace C- (Index) of Sin/Cos sensor 1                                |
| EMx_DIG_IN  | 24 V / optional 5 V                          | Digital trigger input (can be used for latch resp. interrupt logic) |
| DigIn0_y    | 24 V / optional 5 V                          | Digital input for unrestricted use                                  |
| DigIn1_y    | 24 V / optional 5 V                          | Digital input for unrestricted use                                  |
| DigIn2_y    | 24 V / optional 5 V                          | Digital input for unrestricted use                                  |
| DigOut_y    | 24 V   | Digital output for unrestricted use                                 |

x: Number of the extension module (0 resp. 1); y: Number of the function module (0 to 3)

### Block diagram Sin/Cos

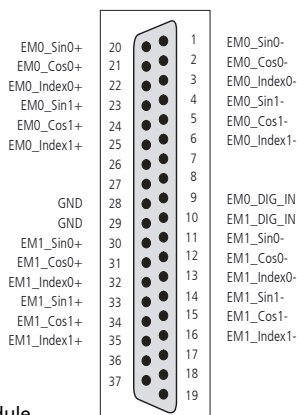


### Pin assignment – 50-pin D-Sub male connector



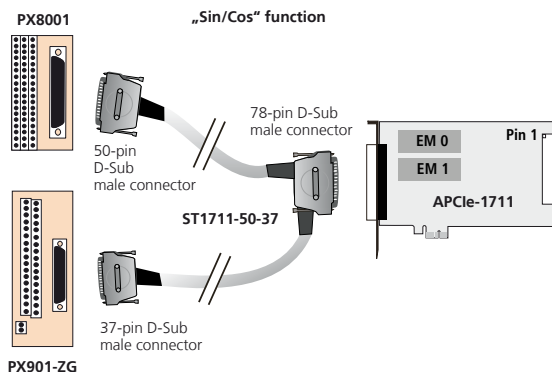
FM = Function module

### Pin assignment – 37-pin D-Sub male connector

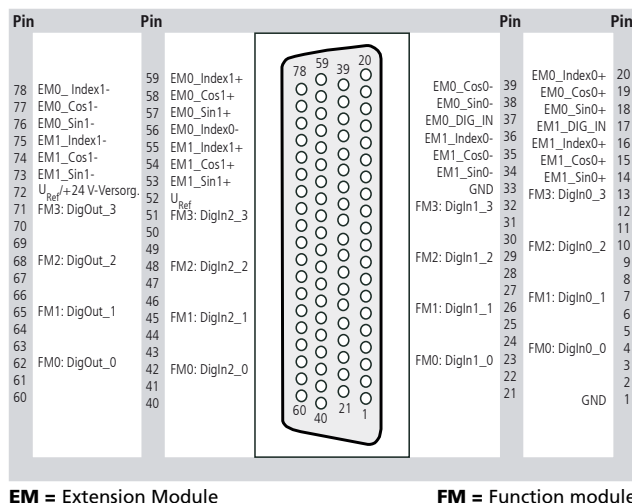


EM = Extension Module

### ADDI-DATA connection



### Pin assignment – 78-pin D-Sub female connector



EM = Extension Module

FM = Function module

## Specifications\*

### Free programming of the functions

- Acquisition of incremental encoders (1 x 32-bit or 2 x 16-bit)
- SSI (max. 3 encoders per module)
- Counter/Timer (3 counters similar to 82C54)
- Pulse counter (4 x 32-bit counters per module)
- Chronos (chronometer)
- TOR (pulse counter with time slices, ...)
- Digital I/O (8 I/O, 24 V, TTL, RS422)
- PWM (pulse width modulation, 2 x per module)
- BiSS-Master (B and C mode)
- ETM (Timer interface for period duration measurement, edge time, ...)
- TTL (TTL I/O without isolation)
- Parallel Interface
- EnDat 2.2
- Sin/Cos
- Customised functions

### Signals

Digital I/O signals, TTL or RS422, 24 V

### Inputs

#### Differential inputs or outputs (A, B, C, D)

|                             |   |
|-----------------------------|---|
| Differential inputs, RS422: | 16 (can be used as inputs or outputs)   |
| Nominal voltage:            | 3.3 VDC   |
| Common mode range:          | +12 / -7 V  |
| Input sensitivity:          | 200 mV  |
| Input hysteresis:           | 50 mV   |
| Input impedance:            | 12 kΩ   |
| Terminal resistor:          | 120 Ω (not supplied)  |
| Max. input frequency:       | APCLe-1711: 5 MHz (at nominal voltage)<br>APCLe-1711-10MHz: 10 MHz (at nominal voltage) |

#### Mass-related inputs, 24 V (E, F, G):

|                     |   |
|---------------------|---|
| Number of inputs:   | 12  |
| Nominal voltage:    | 24 VDC  |
| Logic input levels: | Unominal: 24 V<br>UH max.: 30 V<br>UH min.: 19 V<br>UL max.: 14 V<br>UL min.: 0 V |

Maximal input frequency: 1 MHz (at nominal voltage) depending on the function

### Outputs

|                           |   |
|---------------------------|---|
| Nominal voltage:          | 3.3 VDC                                   |
| Maximum output frequency: | 5 MHz (diff. outputs)                     |
| Max. number of outputs:   | 16 (if they are not used as diff. inputs) |

#### Digital outputs, 24 V (H)

|                       |   |
|-----------------------|---|
| Output type:          | High-side (load to ground)                      |
| Number of outputs:    | 4   |
| Nominal voltage:      | 24 VDC  |
| Supply voltage range: | 4.75 V to 35 VDC (via 24 V ext. pin)            |
| Maximum current:      | 90 mA per output / 270 mA for all outputs (PTC) |
| Overttemperature:     | 165 °C (all outputs switch off)                 |

### Technical data APCle-1711-24V version

24 V inputs (channels A to G).  
This board version is intended for the connection of 24 V encoders.  
Only 24 V signals can be connected to the inputs.

|                                    |   |
|------------------------------------|---|
| Nominal voltage:                   | 24 VDC  |
| Max. input frequency:              | 1 MHz (at nominal voltage) depending on the function                              |
| Logic input levels :<br>(Standard) | Unominal: 24 V<br>UH max.: 30 V<br>UH min.: 18 V<br>UL max.: 16 V<br>UL min.: 0 V |

#### Functions

On the board APCle-1711-24V Ax, Bx, Cx and Dx are only available as 24 V inputs and not as outputs. Therefore not any function can be used on any version of the board.

Available functions:

- Incremental counter

- Sin/Cos

Partially available:

- PWM

Please find more detailed information in the respective function manual.

### Safety

Optical isolation: 1000 V

### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### PC system requirements and environmental conditions

|                                 |   |
|---------------------------------|---|
| Dimensions:                     | 168 x 98 mm   |
| System bus:                     | Acc. to PCI Express base specification,<br>Revision 1.0a (PCI Express 1.0a) |
| Space required:                 | 1-/4-/8-/16-lane PCI Express slot   |
| Operating voltage:              | + 3.3 V / + 12 V from the PC<br>+24 V ext.                                  |
| Current consumption APCle-1711: | 3.3 V / 341 mA<br>12 V / 76 mA<br>typ.                                      |
| Front connector:                | 78-pin D-Sub female connector   |
| Additional connector:           | 50-pin D-Sub male connector   |
| Temperature range:              | 0 to 60 °C (with forced cooling)  |

## Ordering information

### APCLe-1711

Multifunction counter board, optically isolated, fast counter inputs – programmable functionality, for PCI Express.  
Incl. technical description and software drivers.

|                          |  |
|--------------------------|--|
| <b>APCLe-1711:</b>       | Isolated counter board with programmable functionality |
| <b>APCLe-1711-24V:</b>   | 24 V instead of RS422 (A, B, C, D)                     |
| <b>APCLe-1711-5V-I:</b>  | 5 V inputs instead of 24 V (E, F, G)                   |
| <b>APCLe-1711-10MHz:</b> | Input frequency 10 MHz, Inputs (A, B, C, D)            |

### Option

**Opt. 5V:** 3.3 V outputs instead of 24 V (H0, H1, H2, H3)

### Accessories

|                   |   |
|-------------------|---|
| <b>PX8001:</b>    | 3-row screw terminal panel with housing for DIN rail  |
| <b>ST1711-50:</b> | Standard round cable, shielded, twisted pairs, 2 m,<br>78-pin male connector to 50-pin male connector |

### For the TTL I/O function

|                  |  |
|------------------|--|
| <b>ST370-16:</b> | Standard round cable, shielded, twisted pairs, 2 m |
| <b>FB8001:</b>   | Ribbon cable                                       |

### For the Sin/Cos function

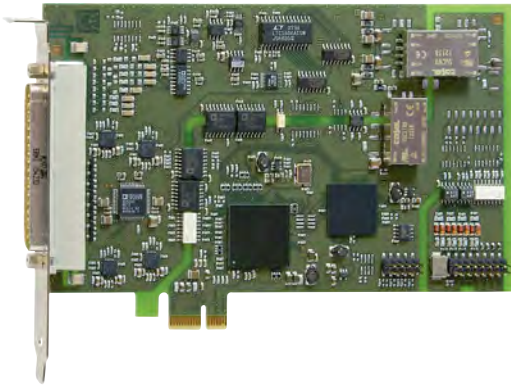
|                          |   |
|--------------------------|---|
| <b>EM-SINCOS-11μAPP:</b> | Extension module,<br>2 x 11 μA <sub>pp</sub> inputs, 1 dig. output, 24 V  |
| <b>EM-SINCOS-1VPP:</b>   | Extension module,<br>2 x 1 V <sub>pp</sub> inputs, 1 dig. output, 24 V  |
| <b>ST1711-50-37:</b>     | Y-cable, round, shielded, twisted pairs,<br>78-pin D-Sub male connector to 50-pin D-Sub male<br>connector and 37-pin D-Sub male connector |
| <b>PX901-ZG:</b>         | Screw terminal panel for DIN rail   |

\*Preliminary product information

# Multifunction board, optically isolated, 16 SE / 8 differential inputs, 4/8 analog outputs, 16-bit

**New!**  
APCLe-3123

PCI  
EXPRESS®



Also for **PCI**  
see APCI-3120, page 192

Also for **CompactPCI™**  
see CPCI-3120, page 250

Also for **CompactPCI™ Serial**  
see CPCI-3121, page 236



LabVIEW™



LabWindows/CVI™

## Features

### Analog inputs

- 16 single-ended / 8 differential inputs
- 16-bit resolution
- Optical isolation 500 V
- Throughput: 100 kHz
- Input ranges: 0-10 V,  $\pm 10$  V, 0-5 V,  $\pm 5$  V, 0-2 V,  $\pm 2$  V, 0-1 V,  $\pm 1$  V, 0-20 mA (option) freely programmable through software for each channel
- Gain PGA x1, x2, x5, x10 freely programmable through software for each channel
- PCI Express DMA for analog data acquisition
- Overvoltage protection
- Input filters: 159 kHz

### Analog acquisition

- One single channel, several channels, several channels through scan list
- Automatic analog acquisition through cyclic timer control
- Acquisition through scan list: up to 16 entries with gain, channel, unipolar/bipolar
- Acquisition triggered through software, timer, external event
- Trigger functions:  
Software trigger or external trigger: the analog acquisition (single or sequence) is started through signal switching from 0 V to 24 V at the digital input 0.
- Interrupt: end of single channel, end of multichannel, end of scan list

### Analog outputs

- 8 or 4 analog outputs, optically isolated 500 V
- Voltage or current outputs
- 16-bit resolution (15-bit for 0-10 V)
- Output voltage:  $\pm 10$  V, 0-10 V (through software)
- Output voltage after reset: 0 V
- Each output has its own ground line (without optical isolation)
- Output current  $\pm 5$  mA max. for voltage outputs
- Current outputs: 0-20 mA, min. load 10  $\Omega$ , max. load 560  $\Omega$ , at 20 mA
- EMI filters

### Digital

- 4 dig. inputs including 1 interruptible input
- 4 dig. outputs, 24 V, optically isolated

### Timer / Watchdog

- 2 timers, incl. 1 which can be used as a watchdog

## APCLe-3121 / APCLe-3123

### PCI Express interface

16 single-ended / 8 differential inputs, 16-bit

8/4 analog outputs, 16-bit

Optical isolation of inputs and outputs, 500 V

PCI Express DMA, programmable gain

Trigger functions

8 digital I/O, 24 V, optically isolated, timer, watchdog

## Safety features

- Optical isolation 500 V min.
- Creeping distance IEC 61010-1
- Overvoltage protection  $\pm 40$  V, analog inputs
- Protection against high-frequency EMI
- Input filters: 159 kHz
- Noise neutralisation of the PC supply

## Applications

- Industrial process control
- Industrial measurement and monitoring
- Multichannel data acquisition
- Control of chemical processes
- Factory automation
- Acquisition of sensor data, current measurement
- Laboratory equipment, instrumentation

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- .NET
- Microsoft VC++ • Borland C++
- Visual Basic • Delphi
- LabVIEW • LabWindows/CVI

### ADDIPACK functions

- Analog input • Analog output • Digital input
- Digital output • Watchdog • Timer

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)



## Specifications

### Analog inputs

|                            |   |
|----------------------------|---|
| Number of inputs:          | 16 single-ended / 8 differential inputs or 8 single-ended / 4 differential inputs   |
| Resolution:                | 16-bit  |
| Optical isolation:         | 500 V through opto-couplers from PC to peripheral   |
| Input ranges:              | 0-10 V, $\pm 10$ V, 0-5 V, $\pm 5$ V, 0-2 V, $\pm 2$ V, 0-1 V, $\pm 1$ V, 0(4)-20 mA (optional), software-programmable for each channel |
| Throughput:                | 100 kHz   |
| Gain:                      | Software programmable (x1, x2, x5, x10)   |
| Relative precision (INL):  | $\pm 2$ LSB max. (A/D converter)  |
| Diff. non-linearity (DNL): | $\pm 1$ LSB max. (A/D converter)  |
| Bandwidth (-3 dB):         | Limited to 159 kHz with low-pass filter   |
| Trigger:                   | Through software, timer, external event (24 V input)  |
| Data transfer:             | Data to the PC through FIFO memory, I/O commands, interrupt at EOC (End Of Conversion) and EOS (End of Scan), DMA transfer at EOC       |
| Interrupts:                | End of conversion, at timer overrun, End of scan  |

### Analog outputs

|                             |   |
|-----------------------------|---|
| Number of outputs:          | 8 or 4  |
| Resolution:                 | 16-bit  |
| Optical isolation:          | 500 V through opto-couplers                                       |
| Output range:               | 0-10 V, $\pm 10$ V switchable through software (0-20 mA optional) |
| Overvoltage protection:     | $\pm 15$ V  |
| Max. output current / load: | $\pm 5$ mA, 2 k $\Omega$  |
| Short-circuit current:      | $\pm 35$ mA (short time)  |
| Output voltage after reset: | 0 V   |
| <b>Current outputs</b>      |   |
| Resolution:                 | 15-bit  |
| Output range:               | 0-20 mA   |
| LSB:                        | 610.35 nA   |
| Load (at 20 mA):            | 10 $\Omega$ min., 560 $\Omega$ max.                               |
| Output current after reset: | 0 mA  |

### Digital I/O

|                         |   |
|-------------------------|---|
| Number of I/O channels: | 4 digital inputs, 4 digital high-side outputs, 24 V |
| Optical isolation:      | 1000 V through opto-couplers                        |
| Input current at 24 V:  | 10 mA typ.  |
| Input range:            | 0-30 V  |
| Supply voltage:         | 8-32 V  |
| Max. switching current: | 65 mA typ.  |

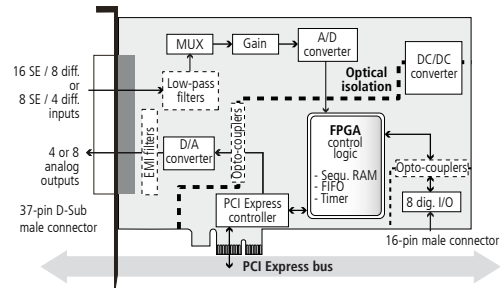
### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### Physical and environmental conditions

|                    |  |
|--------------------|--|
| Dimensions:        | 168 x 99 mm  |
| System bus:        | Acc. to PCI Express base specification, Revision 1.0a (PCI Express 1.0a) |
| Space required:    | 1-4-/8-/16-lane PCI Express slot   |
| Operating voltage: | +3.3 V, +12 V from PC  |
| Front connector:   | 37-pin D-Sub male connector  |
| Temperature range: | 0 to 60 °C (with forced cooling)   |

### Simplified block diagram



### Pin assignment – 37-pin D-Sub male connector

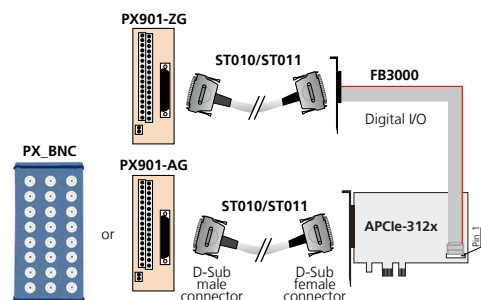
| DIFF             | SE              | SE               | DIFF            |
|------------------|-----------------|------------------|-----------------|
| (+) An. input 0  | (+) An. input 0 | (+) An. input 8  | (+) An. input 4 |
| (+) An. input 1  | (+) An. input 1 | (+) An. input 9  | (+) An. input 5 |
| (+) An. input 2  | (+) An. input 2 | (+) An. input 10 | (+) An. input 6 |
| (+) An. input 3  | (+) An. input 3 | (+) An. input 11 | (+) An. input 7 |
| (-) An. input 3  | (+) An. input 7 | (+) An. input 15 | (-) An. input 7 |
| (-) An. input 2  | (+) An. input 6 | (+) An. input 14 | (-) An. input 6 |
| (-) An. input 1  | (+) An. input 5 | (+) An. input 13 | (-) An. input 5 |
| (-) An. input 0  | (+) An. input 4 | (+) An. input 12 | (-) An. input 4 |
| Analog input GND |                 | Analog input GND |                 |
| Analog input GND |                 | Analog input GND |                 |
| An. output 0 GND |                 | An. output 0     |                 |
| An. output 1 GND |                 | An. output 1     |                 |
| An. output 2 GND |                 | An. output 2     |                 |
| An. output 3 GND |                 | An. output 3     |                 |
| An. output 4 GND |                 | An. output 4     |                 |
| An. output 5 GND |                 | An. output 5     |                 |
| An. output 6 GND |                 | An. output 6     |                 |
| An. output 7 GND |                 | An. output 7     |                 |

1: The analog inputs have a common ground line  
2: Each analog output has its own ground line

### Pin assignment – 16-pin male connector

|                     |    |                           |
|---------------------|----|---------------------------|
| Dig. input 3-       | 16 | Dig. input 3+             |
| Dig. input 2-       | 14 | Dig. input 2+             |
| Dig. input 1-       | 12 | Dig. input 1+             |
| Dig. input 0-       | 10 | Dig. input 0+             |
| 24 V voltage supply | 8  | High-side output 3 (24 V) |
| 24 V voltage supply | 6  | High-side output 2 (24 V) |
| GND (dig. output)   | 4  | High-side output 1 (24 V) |
| GND (dig. output)   | 2  | High-side output 0 (24 V) |

### ADDI-DATA connection



## Ordering information

### APCle-3121 / APCle-3123

Multifunction board, optically isolated, 16 SE/8 differential inputs, 4/8 analog outputs, 16-bit, for PCI Express. Incl. techn. description and software drivers.

#### Versions

##### Voltage

|                        |   |
|------------------------|---|
| <b>APCle-312x-16-8</b> | Version with 16 SE / 8 diff. inputs, 8 analog outputs |
| <b>APCle-312x-16-4</b> | Version with 16 SE / 8 diff. inputs, 4 analog outputs |
| <b>APCle-312x-8-8</b>  | Version with 8 SE / 4 diff. inputs, 8 analog outputs  |
| <b>APCle-312x-8-4</b>  | Version with 8 SE / 4 diff. inputs, 4 analog outputs  |

##### Current

|                         |   |
|-------------------------|---|
| <b>APCle-3121-16-8C</b> | Version with 16 SE / 8 diff. inputs, 8 analog outputs |
| <b>APCle-3121-16-4C</b> | Version with 16 SE / 8 diff. inputs, 4 analog outputs |
| <b>APCle-3121-8-8C</b>  | Version with 8 SE / 4 diff. inputs, 8 analog outputs  |
| <b>APCle-3121-8-4C</b>  | Version with 8 SE / 4 diff. inputs, 4 analog outputs  |

#### Options

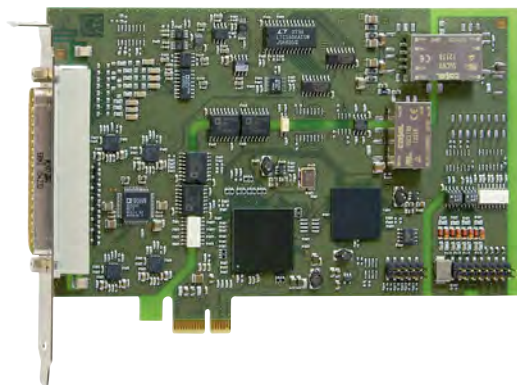
Please indicate the number of channels

|                   |   |
|-------------------|---|
| <b>Option SF:</b> | Precision filter for 1 single-ended channel |
| <b>Option DF:</b> | Precision filter for 1 diff. channel        |
| <b>Option PC:</b> | Current input 0(4)-20 mA for 1 channel      |
| <b>PC-SE:</b>     | for single-ended                            |
| <b>PC-Diff:</b>   | for differential                            |

#### Accessories

|                  |  |
|------------------|--|
| <b>PX901-A:</b>  | Screw terminal panel for connecting the analog I/O |
| <b>PX901-AG:</b> | Same as PX901-A with housing for DIN rail          |
| <b>PX_BNC:</b>   | BNC connection box for connecting the analog I/O   |
| <b>PX901-ZG:</b> | Screw terminal panel for connecting the dig. I/O   |
| <b>ST010:</b>    | Standard round cable, shielded, twisted pairs, 2 m |
| <b>ST011:</b>    | Standard round cable, shielded, twisted pairs, 5 m |
| <b>FB3000:</b>   | Ribbon cable for digital I/O                       |

# Analog input board, optically isolated, 16 SE / 8 differential inputs, 16-bit



Also for **PCI**  
see APCI-3001, page 202  
and APCI-3010 / APCI-3016,  
page 196

Also for **CompactPCI™**  
see CPCI-3001, page 252



on request



LabVIEW™



LabWindows/CVI™

## Features

### Analog inputs

- 16 single-ended/8 differential inputs
- 16-bit resolution
- Optical isolation 500 V
- Throughput: 100 kHz
- Input ranges: 0-10 V,  $\pm 10$  V, 0-5 V,  $\pm 5$  V, 0-2 V,  $\pm 2$  V, 0-1 V,  $\pm 1$  V, 0-20 mA (option) freely programmable through software for each channel
- Gain PGA x1, x2, x5, x10 freely programmable through software for each channel
- PCI Express DMA for analog data acquisition
- Overvoltage protection
- Input filters: 159 kHz

### Analog acquisition

- One single channel, several channels, several channels through scan list
- Automatic analog acquisition through cyclic timer control
- Acquisition through scan list: up to 16 entries with gain, channel, unipolar/bipolar
- Acquisition triggered through software, timer, external event
- Trigger functions:  
Software trigger or  
external trigger: the analog acquisition (single or sequence) is started through signal switching from 0 V to 24 V at the digital input 0.
- Interrupt: end of single channel, end of multichannel, end of scan list

### Digital

- 4 dig. inputs including 1 interruptible input
- 4 dig. outputs, 24 V, optically isolated

### Timer

- 1 timer

## APCLe-3021

### PCI Express interface

- 16 single-ended/  
8 differential inputs, 16-bit

### Optical isolation 500 V

### PCI Express DMA, programmable gain

### Trigger functions

- 8 digital I/O, 24 V, optically isolated, timer

## Safety features

- Optical isolation 500 V min.
- Creeping distance IEC 61010-1
- Overvoltage protection  $\pm 40$  V, analog inputs
- Protection against high-frequency EMI
- Input filters: 159 kHz
- Noise neutralisation of the PC supply

## Applications

- Industrial process control
- Industrial measurement and monitoring
- Multichannel data acquisition
- Control of chemical processes
- Factory automation
- Acquisition of sensor data, current measurement
- Laboratory equipment, instrumentation

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- .NET
- Microsoft VC++ • Borland C++
- Visual Basic • Delphi
- LabVIEW • LabWindows/CVI

### ADDIPACK functions

- Analog input • Digital input
- Digital output • Watchdog • Timer

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)

## Specifications

### Analog inputs

|                            |  |
|----------------------------|--|
| Number of inputs:          | 16 single-ended / 8 differential inputs or<br>8 single-ended / 4 differential inputs   |
| Resolution:                | 16-bit   |
| Optical isolation:         | 500 V through opto-couplers from PC to peripheral  |
| Input ranges:              | 0-10 V, $\pm 10$ V, 0-5 V, $\pm 5$ V, 0-2 V, $\pm 2$ V, 0-1 V, $\pm 1$ V,<br>0(4)-20 mA (optional)<br>software-programmable for each channel |
| Throughput:                | 100 kHz  |
| Gain:                      | Software programmable (x1, x2, x5, x10)  |
| Relative precision (INL):  | $\pm 2$ LSB max. (A/D converter)   |
| Diff. non-linearity (DNL): | $\pm 1$ LSB max. (A/D converter)   |
| Bandwidth (-3 dB):         | Limited to 159 kHz with low-pass filter  |
| Trigger:                   | Through software, timer, external event (24 V input)   |
| Data transfer:             | Data to the PC through FIFO memory,<br>I/O commands, interrupt at EOC (End Of Conversion)<br>and EOS (End of Scan), DMA transfer at EOC      |
| Interrupts:                | End of conversion, at timer overrun, End of scan   |

### Digital I/O

|                         |   |
|-------------------------|---|
| Number of I/O channels: | 4 digital inputs, 4 digital high-side outputs, 24 V |
| Optical isolation:      | 1000 V through opto-couplers                        |
| Input current at 24 V:  | 10 mA typ.  |
| Input range:            | 0-30 V  |
| Supply voltage:         | 8-32 V  |
| Max. switching current: | 65 mA typ.  |

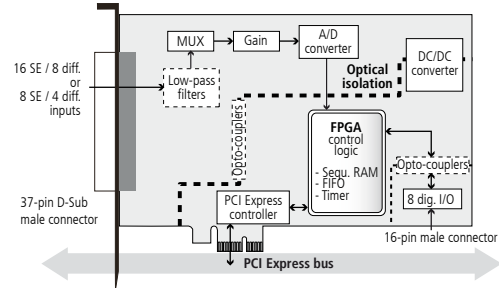
### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### Physical and environmental conditions

|                    |   |
|--------------------|---|
| Dimensions:        | 168 x 99 mm   |
| System bus:        | Acc. to PCI Express base specification,<br>Revision 1.0a (PCI Express 1.0a) |
| Space required:    | 1-/4-/8-/16-lane PCI Express slot   |
| Operating voltage: | + 3.3 V, + 12 V from PC   |
| Front connector:   | 37-pin D-Sub male connector   |
| Temperature range: | 0 to 60 °C (with forced cooling)  |

### Simplified block diagram

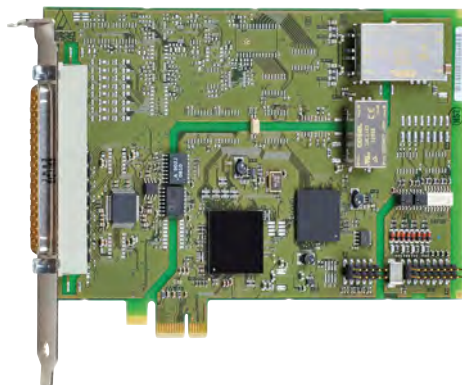


### Pin assignment – 37-pin D-Sub male connector

| DIFF            | SE                | SE                | DIFF              |
|-----------------|-------------------|-------------------|-------------------|
| (+) An. input 0 | (+) An. input 0   | (+) An. input 8   | (+) An. input 4   |
| (+) An. input 1 | (+) An. input 1   | (+) An. input 9   | (+) An. input 5   |
| (+) An. input 2 | (+) An. input 2   | (+) An. input 10  | (+) An. input 6   |
| (+) An. input 3 | (+) An. input 3   | (+) An. input 11  | (+) An. input 7   |
| (-) An. input 3 | (+) An. input 4   | (+) An. input 12  | (-) An. input 4   |
| (-) An. input 2 | (+) An. input 5   | (+) An. input 13  | (-) An. input 5   |
| (-) An. input 1 | (+) An. input 6   | (+) An. input 14  | (-) An. input 6   |
| (-) An. input 0 | (+) An. input 7   | (+) An. input 15  | (-) An. input 7   |
|                 | (+) An. input 8   | (+) An. input 16  | (-) An. input 8   |
|                 | (+) An. input 9   | (+) An. input 17  | (-) An. input 9   |
|                 | (+) An. input 10  | (+) An. input 18  | (-) An. input 10  |
|                 | (+) An. input 11  | (+) An. input 19  | (-) An. input 11  |
|                 | (+) An. input 12  | (+) An. input 20  | (-) An. input 12  |
|                 | (+) An. input 13  | (+) An. input 21  | (-) An. input 13  |
|                 | (+) An. input 14  | (+) An. input 22  | (-) An. input 14  |
|                 | (+) An. input 15  | (+) An. input 23  | (-) An. input 15  |
|                 | (+) An. input 16  | (+) An. input 24  | (-) An. input 16  |
|                 | (+) An. input 17  | (+) An. input 25  | (-) An. input 17  |
|                 | (+) An. input 18  | (+) An. input 26  | (-) An. input 18  |
|                 | (+) An. input 19  | (+) An. input 27  | (-) An. input 19  |
|                 | (+) An. input 20  | (+) An. input 28  | (-) An. input 20  |
|                 | (+) An. input 21  | (+) An. input 29  | (-) An. input 21  |
|                 | (+) An. input 22  | (+) An. input 30  | (-) An. input 22  |
|                 | (+) An. input 23  | (+) An. input 31  | (-) An. input 23  |
|                 | (+) An. input 24  | (+) An. input 32  | (-) An. input 24  |
|                 | (+) An. input 25  | (+) An. input 33  | (-) An. input 25  |
|                 | (+) An. input 26  | (+) An. input 34  | (-) An. input 26  |
|                 | (+) An. input 27  | (+) An. input 35  | (-) An. input 27  |
|                 | (+) An. input 28  | (+) An. input 36  | (-) An. input 28  |
|                 | (+) An. input 29  | (+) An. input 37  | (-) An. input 29  |
|                 | (+) An. input 30  | (+) An. input 38  | (-) An. input 30  |
|                 | (+) An. input 31  | (+) An. input 39  | (-) An. input 31  |
|                 | (+) An. input 32  | (+) An. input 40  | (-) An. input 32  |
|                 | (+) An. input 33  | (+) An. input 41  | (-) An. input 33  |
|                 | (+) An. input 34  | (+) An. input 42  | (-) An. input 34  |
|                 | (+) An. input 35  | (+) An. input 43  | (-) An. input 35  |
|                 | (+) An. input 36  | (+) An. input 44  | (-) An. input 36  |
|                 | (+) An. input 37  | (+) An. input 45  | (-) An. input 37  |
|                 | (+) An. input 38  | (+) An. input 46  | (-) An. input 38  |
|                 | (+) An. input 39  | (+) An. input 47  | (-) An. input 39  |
|                 | (+) An. input 40  | (+) An. input 48  | (-) An. input 40  |
|                 | (+) An. input 41  | (+) An. input 49  | (-) An. input 41  |
|                 | (+) An. input 42  | (+) An. input 50  | (-) An. input 42  |
|                 | (+) An. input 43  | (+) An. input 51  | (-) An. input 43  |
|                 | (+) An. input 44  | (+) An. input 52  | (-) An. input 44  |
|                 | (+) An. input 45  | (+) An. input 53  | (-) An. input 45  |
|                 | (+) An. input 46  | (+) An. input 54  | (-) An. input 46  |
|                 | (+) An. input 47  | (+) An. input 55  | (-) An. input 47  |
|                 | (+) An. input 48  | (+) An. input 56  | (-) An. input 48  |
|                 | (+) An. input 49  | (+) An. input 57  | (-) An. input 49  |
|                 | (+) An. input 50  | (+) An. input 58  | (-) An. input 50  |
|                 | (+) An. input 51  | (+) An. input 59  | (-) An. input 51  |
|                 | (+) An. input 52  | (+) An. input 60  | (-) An. input 52  |
|                 | (+) An. input 53  | (+) An. input 61  | (-) An. input 53  |
|                 | (+) An. input 54  | (+) An. input 62  | (-) An. input 54  |
|                 | (+) An. input 55  | (+) An. input 63  | (-) An. input 55  |
|                 | (+) An. input 56  | (+) An. input 64  | (-) An. input 56  |
|                 | (+) An. input 57  | (+) An. input 65  | (-) An. input 57  |
|                 | (+) An. input 58  | (+) An. input 66  | (-) An. input 58  |
|                 | (+) An. input 59  | (+) An. input 67  | (-) An. input 59  |
|                 | (+) An. input 60  | (+) An. input 68  | (-) An. input 60  |
|                 | (+) An. input 61  | (+) An. input 69  | (-) An. input 61  |
|                 | (+) An. input 62  | (+) An. input 70  | (-) An. input 62  |
|                 | (+) An. input 63  | (+) An. input 71  | (-) An. input 63  |
|                 | (+) An. input 64  | (+) An. input 72  | (-) An. input 64  |
|                 | (+) An. input 65  | (+) An. input 73  | (-) An. input 65  |
|                 | (+) An. input 66  | (+) An. input 74  | (-) An. input 66  |
|                 | (+) An. input 67  | (+) An. input 75  | (-) An. input 67  |
|                 | (+) An. input 68  | (+) An. input 76  | (-) An. input 68  |
|                 | (+) An. input 69  | (+) An. input 77  | (-) An. input 69  |
|                 | (+) An. input 70  | (+) An. input 78  | (-) An. input 70  |
|                 | (+) An. input 71  | (+) An. input 79  | (-) An. input 71  |
|                 | (+) An. input 72  | (+) An. input 80  | (-) An. input 72  |
|                 | (+) An. input 73  | (+) An. input 81  | (-) An. input 73  |
|                 | (+) An. input 74  | (+) An. input 82  | (-) An. input 74  |
|                 | (+) An. input 75  | (+) An. input 83  | (-) An. input 75  |
|                 | (+) An. input 76  | (+) An. input 84  | (-) An. input 76  |
|                 | (+) An. input 77  | (+) An. input 85  | (-) An. input 77  |
|                 | (+) An. input 78  | (+) An. input 86  | (-) An. input 78  |
|                 | (+) An. input 79  | (+) An. input 87  | (-) An. input 79  |
|                 | (+) An. input 80  | (+) An. input 88  | (-) An. input 80  |
|                 | (+) An. input 81  | (+) An. input 89  | (-) An. input 81  |
|                 | (+) An. input 82  | (+) An. input 90  | (-) An. input 82  |
|                 | (+) An. input 83  | (+) An. input 91  | (-) An. input 83  |
|                 | (+) An. input 84  | (+) An. input 92  | (-) An. input 84  |
|                 | (+) An. input 85  | (+) An. input 93  | (-) An. input 85  |
|                 | (+) An. input 86  | (+) An. input 94  | (-) An. input 86  |
|                 | (+) An. input 87  | (+) An. input 95  | (-) An. input 87  |
|                 | (+) An. input 88  | (+) An. input 96  | (-) An. input 88  |
|                 | (+) An. input 89  | (+) An. input 97  | (-) An. input 89  |
|                 | (+) An. input 90  | (+) An. input 98  | (-) An. input 90  |
|                 | (+) An. input 91  | (+) An. input 99  | (-) An. input 91  |
|                 | (+) An. input 92  | (+) An. input 100 | (-) An. input 92  |
|                 | (+) An. input 93  | (+) An. input 101 | (-) An. input 93  |
|                 | (+) An. input 94  | (+) An. input 102 | (-) An. input 94  |
|                 | (+) An. input 95  | (+) An. input 103 | (-) An. input 95  |
|                 | (+) An. input 96  | (+) An. input 104 | (-) An. input 96  |
|                 | (+) An. input 97  | (+) An. input 105 | (-) An. input 97  |
|                 | (+) An. input 98  | (+) An. input 106 | (-) An. input 98  |
|                 | (+) An. input 99  | (+) An. input 107 | (-) An. input 99  |
|                 | (+) An. input 100 | (+) An. input 108 | (-) An. input 100 |
|                 | (+) An. input 101 | (+) An. input 109 | (-) An. input 101 |
|                 | (+) An. input 102 | (+) An. input 110 | (-) An. input 102 |
|                 | (+) An. input 103 | (+) An. input 111 | (-) An. input 103 |
|                 | (+) An. input 104 | (+) An. input 112 | (-) An. input 104 |
|                 | (+) An. input 105 | (+) An. input 113 | (-) An. input 105 |
|                 | (+) An. input 106 | (+) An. input 114 | (-) An. input 106 |
|                 | (+) An. input 107 | (+) An. input 115 | (-) An. input 107 |
|                 | (+) An. input 108 | (+) An. input 116 | (-) An. input 108 |
|                 | (+) An. input 109 | (+) An. input 117 | (-) An. input 109 |
|                 | (+) An. input 110 | (+) An. input 118 | (-) An. input 110 |
|                 | (+) An. input 111 | (+) An. input 119 | (-) An. input 111 |
|                 | (+) An. input 112 | (+) An. input 120 | (-) An. input 112 |
|                 | (+) An. input 113 | (+) An. input 121 | (-) An. input 113 |
|                 | (+) An. input 114 | (+) An. input 122 | (-) An. input 114 |
|                 | (+) An. input 115 | (+) An. input 123 | (-) An. input 115 |
|                 | (+) An. input 116 | (+) An. input 124 | (-) An. input 116 |
|                 | (+) An. input 117 | (+) An. input 125 | (-) An. input 117 |
|                 | (+) An. input 118 | (+) An. input 126 | (-) An. input 118 |
|                 | (+) An. input 119 | (+) An. input 127 | (-) An. input 119 |
|                 | (+) An. input 120 | (+) An. input 128 | (-) An. input 120 |
|                 | (+) An. input 121 | (+) An. input 129 | (-) An. input 121 |
|                 | (+) An. input 122 | (+) An. input 130 | (-) An. input 122 |
|                 | (+) An. input 123 | (+) An. input 131 | (-) An. input 123 |
|                 | (+) An. input 124 | (+) An. input 132 | (-) An. input 124 |
|                 | (+) An. input 125 | (+) An. input 133 | (-) An. input 125 |
|                 | (+) An. input 126 | (+) An. input 134 | (-) An. input 126 |
|                 | (+) An. input 127 | (+) An. input 135 | (-) An. input 127 |
|                 | (+) An. input 128 | (+) An. input 136 | (-) An. input 128 |
|                 | (+) An. input 129 | (+) An. input 137 | (-) An. input 129 |
|                 | (+) An. input 130 | (+) An. input 138 | (-) An. input 130 |
|                 | (+) An. input 131 | (+) An. input 139 | (-) An. input 131 |
|                 | (+) An. input 132 | (+) An. input 140 | (-) An. input 132 |
|                 | (+) An. input 133 | (+) An. input 141 | (-) An. input 133 |
|                 | (+) An. input 134 | (+) An. input 142 | (-) An. input 134 |
|                 | (+) An. input 135 | (+) An. input 143 | (-) An. input 135 |
|                 | (+) An. input 136 | (+) An. input 144 | (-) An. input 136 |
|                 | (+) An. input 137 | (+) An. input 145 | (-) An. input 137 |
|                 | (+) An. input 138 | (+) An. input 146 | (-) An. input 138 |
|                 | (+) An. input 139 | (+) An. input 147 | (-) An. input 139 |
|                 | (+) An. input 140 | (+) An. input 148 | (-) An. input 140 |
|                 | (+) An. input 141 | (+) An. input 149 | (-) An. input 141 |
|                 | (+) An. input 142 | (+) An. input 150 | (-) An. input 142 |
|                 | (+) An. input 143 | (+) An. input 151 | (-) An. input 143 |
|                 | (+) An. input 144 | (+) An. input 152 | (-) An. input 144 |
|                 | (+) An. input 145 | (+) An. input 153 | (-) An. input 145 |
|                 | (+) An. input 146 | (+) An. input 154 | (-) An. input 146 |
|                 | (+) An. input 147 | (+) An. input 155 | (-) An. input 147 |
|                 | (+) An. input 148 | (+) An. input 156 | (-) An. input 148 |
|                 | (+) An. input 149 | (+) An. input 157 | (-) An. input 149 |
|                 | (+) An. input 150 | (+) An. input 158 | (-) An. input 150 |
|                 | (+) An. input 151 | (+) An. input 159 | (-) An. input 151 |
|                 | (+) An. input 152 | (+) An. input 160 | (-) An. input 152 |
|                 | (+) An. input 153 | (+) An. input 161 | (-) An. input 153 |
|                 | (+) An. input 154 | (+) An. input 162 | (-) An. input 154 |
|                 | (+) An. input 155 | (+) An. input 163 | (-) An. input 155 |
|                 | (+) An. input 156 | (+) An. input 164 | (-) An. input 156 |
|                 | (+) An. input 157 | (+) An. input 165 | (-) An. input 157 |
|                 | (+) An. input 158 | (+) An. input 166 | (-) An. input 158 |
|                 | (+) An. input 159 | (+) An. input 167 | (-) An. input 159 |
|                 | (+) An. input 160 | (+) An. input 168 | (-) An. input 160 |
|                 | (+) An. input 161 | (+) An. input 169 | (-) An. input 161 |
|                 | (+) An. input 162 | (+) An. input 170 | (-) An. input 162 |
|                 | (+) An. input 163 | (+) An. input 171 | (-) An. input 163 |
|                 | (+) An. input 164 | (+) An. input 172 | (-) An. input 164 |
|                 | (+) An. input 165 | (+) An. input 173 | (-) An. input 165 |
|                 | (+) An. input 166 | (+) An. input 174 | (-) An. input 166 |
|                 | (+) An. input 167 | (+) An. input 175 | (-) An. input 167 |
|                 | (+) An. input 168 | (+) An. input 176 | (-) An. input 168 |
|                 | (+) An. input 169 | (+) An. input 177 | (-) An. input 169 |
|                 | (+) An. input 170 | (+) An. input 178 | (-) An. input 170 |
|                 | (+) An. input 171 | (+) An. input 179 | (-) An. input 171 |
|                 | (+) An. input 172 | (+) An. input 180 | (-) An. input 172 |
|                 | (+) An. input 173 | (+) An. input 181 | (-) An. input 173 |
|                 | (+) An. input 174 | (+) An. input 182 | (-) An. input 174 |
|                 | (+) An. input 175 | (+) An. input 183 | (-) An. input 175 |
|                 | (+) An. input 176 | (+) An. input 184 | (-) An. input 176 |
|                 | (+) An. input 177 | (+) An. input 185 | (-) An. input 177 |
|                 | (+) An. input 178 | (+) An. input 186 | (-) An. input 178 |
|                 | (+) An. input 179 | (+) An. input 187 | (-) An. input 179 |
|                 | (+) An. input 180 | (+) An. input 188 | (-) An. input 180 |
|                 | (+) An. input 181 | (+) An. input 189 | (-) An. input 181 |
|                 | (+) An. input 182 | (+) An. input 190 | (-) An. input 182 |
|                 | (+) An. input 183 | (+) An. input 191 | (-) An. input 183 |
|                 | (+) An. input 184 | (+) An. input 192 | (-) An. input 184 |
|                 | (+) An. input 185 | (+) An. input 193 | (-) An. input 185 |
|                 | (+) An. input 186 | (+) An. input 194 | (-) An. input 186 |
|                 | (+) An. input 187 | (+) An. input 195 | (-) An. input 187 |
|                 | (+) An. input 188 | (+) An. input 196 | (-) An. input 188 |
|                 | (+) An. input 189 | (+) An. input 197 | (-) An. input 189 |
|                 | (+) An. input 190 | (+) An. input 198 | (-) An. input 190 |
|                 | (+) An. input 191 | (+) An. input 199 | (-) An. input 191 |
|                 | (+) An. input 192 | (+) An. input 200 | (-) An. input 192 |
|                 | (+) An. input 193 | (+) An. input 201 | (-) An. input 193 |
|                 | (+) An. input 194 | (+) An. input 202 | (-) An. input 194 |
|                 | (+) An. input 195 | (+) An. input 203 | (-) An. input 195 |
|                 | (+) An. input 196 | (+) An. input 204 | (-) An. input 196 |
|                 | (+) An. input 197 | (+) An. input 205 | (-) An. input 197 |
|                 | (+) An. input 198 | (+) An. input 206 | (-) An. input 198 |
|                 | (+) An. input 199 | (+) An. input 207 | (-) An. input 199 |
|                 | (+) An. input 200 | (+) An. input 208 | (-) An. input 200 |
|                 | (+) An. input 201 | (+) An. input 209 | (-) An. input 201 |
|                 | (+) An. input 202 | (+) An. input 210 | (-) An. input 202 |
|                 | (+) An. input 203 | (+) An. input 211 | (-) An. input 203 |
|                 | (+) An. input 204 | (+) An. input 212 | (-) An. input 204 |
|                 | (+) An. input 205 | (+) An. input 213 | (-) An. input 205 |
|                 | (+) An. input 206 | (+) An. input 214 | (-) An. input 206 |
|                 | (+) An. input 207 | (+) An. input 215 | (-) An. input 207 |
|                 | (+) An. input 208 | (+) An. input 216 | (-) An. input 208 |
|                 | (+) An. input 209 | (+) An. input 217 | (-) An. input 209 |
|                 | (+) An. input 210 | (+) An. input 218 | (-) An. input 210 |
|                 | (+) An. input 211 | (+) An. input 219 | (-) An. input 211 |
|                 | (+) An. input 212 | (+) An. input 220 | (-) An. input 212 |
|                 | (+) An. input 213 | (+) An. input 221 | (-) An. input 213 |
|                 | (+) An. input 214 | (+) An. input 222 | (-) An. input 214 |
|                 | (+) An. input 215 | (+) An. input 223 | (-) An. input 215 |
|                 | (+) An. input 216 | (+) An. input 224 | (-) An. input 216 |
|                 | (+) An. input 217 | (+) An. input 225 | (-) An. input 217 |
|                 | (+) An. input 218 | (+) An. input 226 | (-) An. input 218 |
|                 | (+) An. input 219 | (+) An. input 227 | (-) An. input 219 |
|                 | (+) An. input 220 | (+) An. input 228 | (-) An. input 220 |
|                 | (+) An. input 221 | (+) An. input 229 | (-) An. input 221 |
|                 | (+) An. input 222 | (+) An. input 230 | (-) An. input 222 |
|                 | (+) An. input 223 | (+) An. input 231 | (-) An            |

# Analog output board, optically isolated, 8/4 analog outputs, 16-bit

PCI  
EXPRESS®



Also for **PCI**  
and APCI-3501, page 204



Windows  
64/32-bit drivers



on request



LabVIEW™



LabWindows/CVI™

## Features

### Analog outputs

- 8 or 4 analog outputs, optically isolated 500 V
- Voltage or current outputs
- 16-bit resolution (15-bit for 0-10 V)
- Output ranges:  $\pm 10$  V, 0-10 V (through software)
- Output voltage after reset: 0 V
- Each output has its own ground line (without optical isolation)
- Output current  $\pm 5$  mA max. for voltage outputs
- Current outputs: 0-20 mA, min. load 10  $\Omega$ , max. load 560  $\Omega$ , at 20 mA
- EMI filters

### Digital

- 4 dig. inputs including 1 interruptible input
- 4 dig. outputs, 24 V, optically isolated

### Timer / Watchdog

- 2 timers, incl. 1 which can be used as a watchdog

## APCLe-3521

PCI Express interface

8/4 analog outputs, 16-bit

Optical isolation 500 V

8 digital I/O, 24 V, optically isolated, timer, watchdog

## Safety features

- Optical isolation 500 V min.
- Creeping distance IEC 61010-1
- Protection against high-frequency EMI
- Noise neutralisation of the PC supply

## Applications

- Industrial process control
- Industrial measurement and monitoring
- Control of chemical processes
- Factory automation
- Laboratory equipment, instrumentation

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- .NET
- Microsoft VC++ • Borland C++
- Visual Basic • Delphi
- LabVIEW • LabWindows/CVI

### ADDIPACK functions

- Analog input • Analog output • Digital input
- Digital output • Watchdog • Timer

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)

## Specifications

### Analog outputs

|                             |   |
|-----------------------------|---|
| Number of outputs:          | 8 or 4  |
| Resolution:                 | 16-bit resolution   |
| Optical isolation:          | 500 V through opto-couplers                                       |
| Output range:               | 0-10 V, $\pm 10$ V switchable through software (0-20 mA optional) |
| Overvoltage protection:     | $\pm 15$ V  |
| Max. output current / load: | $\pm 5$ mA, 2 k $\Omega$  |
| Short-circuit current:      | $\pm 35$ mA (short time)  |
| Output voltage after reset: | 0 V   |

### Current outputs

|                             |                                     |
|-----------------------------|-------------------------------------|
| Resolution:                 | 15-bit                              |
| Output range:               | 0-20 mA                             |
| LSB:                        | 610.35 nA                           |
| Load (at 20 mA):            | 10 $\Omega$ min., 560 $\Omega$ max. |
| Output current after reset: | 0 mA                                |

### Digital I/O

|                         |   |
|-------------------------|---|
| Number of I/O channels: | 4 dig. inputs, 4 dig. high-side outputs, 24 V |
| Optical isolation:      | 1000 V through opto-couplers                  |
| Input current at 24 V:  | 10 mA typ.                                    |
| Input range:            | 0-30 V  |
| Supply voltage:         | 8-32 V  |
| Max. switching current: | 65 mA typ.                                    |

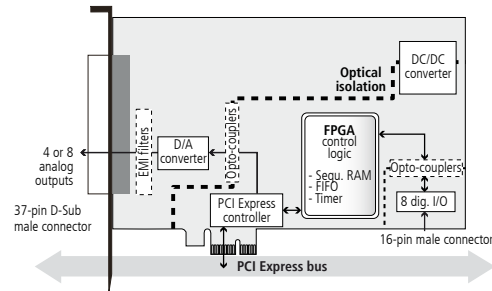
### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

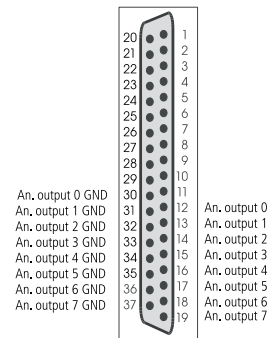
### Physical and environmental conditions

|                    |  |
|--------------------|--|
| Dimensions:        | 168 x 99 mm  |
| System bus:        | Acc. to PCI Express base specification, Revision 1.0a (PCI Express 1.0a) |
| Space required:    | 1-/4-/8-/16-lane PCI Express slot  |
| Operating voltage: | + 3.3 V, + 12 V from PC  |
| Front connector:   | 37-pin D-Sub male connector  |
| Temperature range: | 0 to 60 °C (with forced cooling)   |

### Simplified block diagram



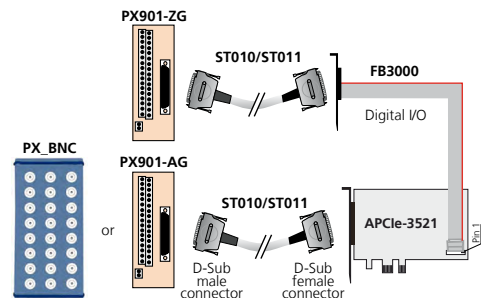
### Pin assignment – 37-pin D-Sub male connector



### Pin assignment – 16-pin male connector

|                     |    |    |                           |
|---------------------|----|----|---------------------------|
| Dig. input 3-       | 16 | 15 | Dig. input 3+             |
| Dig. input 2-       | 14 | 13 | Dig. input 2+             |
| Dig. input 1-       | 12 | 11 | Dig. input 1+             |
| Dig. input 0-       | 10 | 9  | Dig. input 0+             |
| 24 V voltage supply | 8  | 7  | High-side output 3 (24 V) |
| 24 V voltage supply | 6  | 5  | High-side output 2 (24 V) |
| GND (dig. output)   | 4  | 3  | High-side output 1 (24 V) |
| GND (dig. output)   | 2  | 1  | High-side output 0 (24 V) |

### ADDI-DATA connection



## Ordering information

### APCLe-3521

Analog output board, optically isolated, 8/4 analog outputs, 16-bit, for PCI Express. Incl. technical description and software drivers.

#### Versions

##### Voltage

|                     |                                       |
|---------------------|---------------------------------------|
| <b>APCLe-3521-8</b> | Version with 8 analog voltage outputs |
| <b>APCLe-3521-4</b> | Version with 4 analog voltage outputs |

##### Current

|                      |                                       |
|----------------------|---------------------------------------|
| <b>APCLe-3521-8C</b> | Version with 8 analog current outputs |
| <b>APCLe-3521-4C</b> | Version with 4 analog current outputs |

#### Accessories

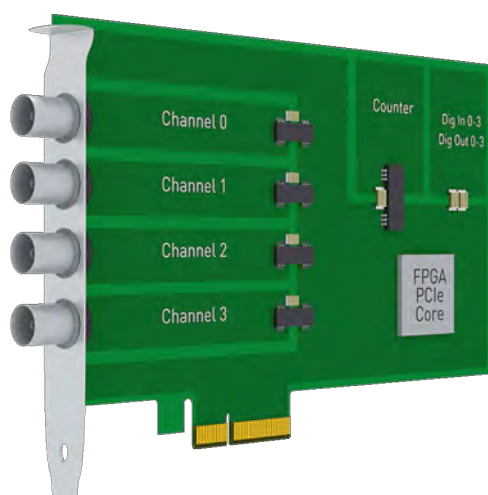
|                  |  |
|------------------|--|
| <b>PX901-A:</b>  | Screw terminal panel for connecting the analog I/O |
| <b>PX901-AG:</b> | Same as PX901-A with housing for DIN rail          |
| <b>PX_BNC:</b>   | BNC connection box for connecting the analog I/O   |
| <b>PX901-ZG:</b> | Screw terminal panel for connecting the dig. I/O   |
| <b>ST010:</b>    | Standard round cable, shielded, twisted pairs, 2 m |
| <b>ST011:</b>    | Standard round cable, shielded, twisted pairs, 5 m |
| <b>FB3000:</b>   | Ribbon cable for digital I/O                       |



# Noise and vibration measurement board, optically isolated, 4 analog inputs, 24-bit, for PCI-Express

**Preliminary\***

PCI  
EXPRESS®



## APCle-3660-4

4 SE/diff. (+/-) inputs, simultaneous sampling

Sampling frequency up to 4 MHz

Connection through BNC connectors

Onboard power supply for ICP™ sensors

4 digital inputs, 4 digital outputs, 24 V

Optical isolation between the channels

Onboard SDRAM module (option)

## Features

- 4-lane PCI-Express board

### Analog inputs

- 4 SE or diff. (+/-) inputs
- One A/D converter per channel: simultaneous acquisition on all analog channels
- Sampling frequency between 125 kHz and 4 MHz
- 24-bit resolution
- Input range  $\pm 10$  V
- Gain 1 to 10, software-programmable
- Input coupling AC, DC, GND, software-programmable for each channel
- Anti-aliasing filter
- 1000 V optical isolation between the channels
- Overvoltage protection

### Current sources

- 4 current sources for the direct connection of ICP™ sensors (integrated circuit piezoelectric)
- 4 mA typ., 24 V max.

### Counter inputs (option)

- 4 counter inputs, RS422

### Digital

- 4 digital inputs, 24 V, optoisolated
- 4 digital outputs, 24 V, optoisolated

### Onboard SDRAM module (option)

- 1 GB

## Software

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Samples for the following compilers:

- Visual C++
- Borland C

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)



on request

## Ordering information

### APCle-3660-4

Noise and vibration measurement board, optically isolated, 4 analog inputs, 24-bit, 4 current sources, anti aliasing filter, for PCI-Express. Incl. technical description and software drivers.

### Versions

**APCle-3660-4:** 4 analog inputs,  
4 current sources for connecting ICP™ sensors,,  
4 digital inputs, 4 digital outputs

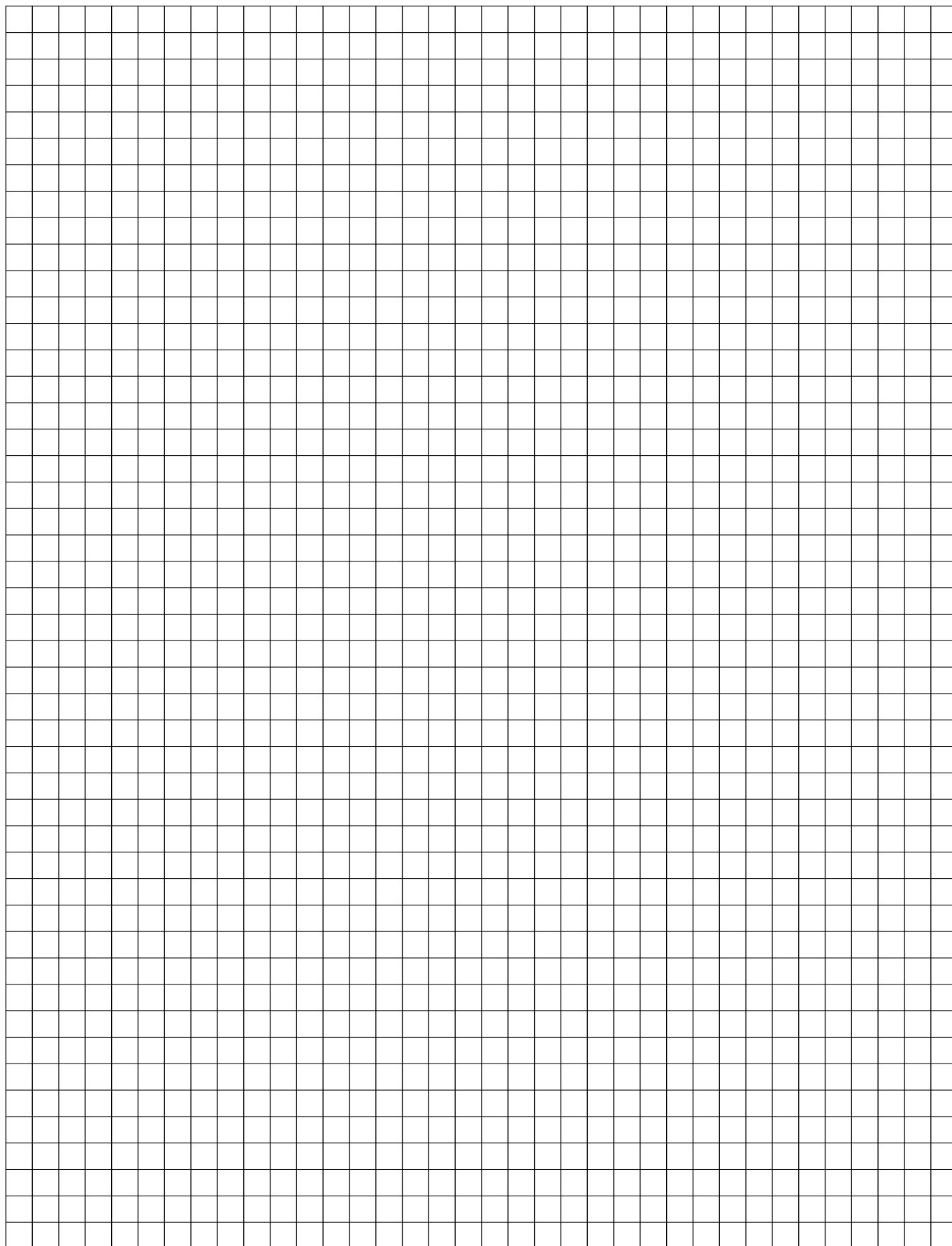
### Options

- 4 counter inputs
- 1 GByte SDRAM

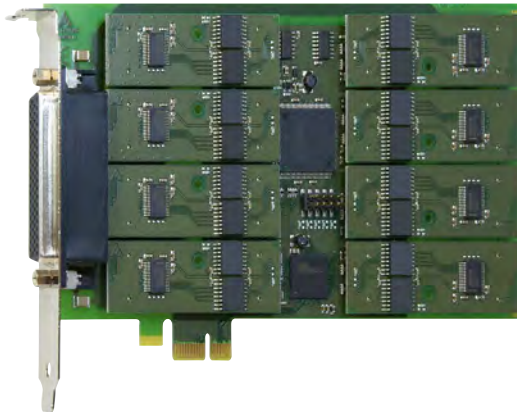
### Accessories

**FB3660-D:** Ribbon cable for connecting the digital I/O  
on separate bracket, 30 cm

\* Preliminary product information



# 1 to 8-port serial interface, RS232, RS422, RS485, 20 mA CL, modular mounting through modules



Also for **PCI**  
see APCI-7xxx-3, page 222  
Also for **CompactPCI™**  
see CPCI-7500, page 254



The APCle-7xxx communication boards are configured by inserting SI modules which the board identifies automatically. The serial interfaces can be configured through modules in the following modes: RS232, RS422, RS485 (with or without optical isolation) and current loop (with optical isolation).

The SI modules with optical isolation allow a protection of up to 1000 V for the use in noisy environments where earth loops can occur.

The I/O lines are protected against short-circuits, fast transients, electrostatic discharge and high-frequency EMI. The interface is supported through a 128-byte FIFO buffer for sending and receiving data and guarantees reliable operation at high transfer rates.

## Features

- Asynchronous communication adapter
- Modular mounting through SI modules
  - 1 socket for 1-port serial interface (APCle-7300)
  - 2 sockets for 2-port serial interface (APCle-7420)
  - 4 sockets for 4-port serial interface (APCle-7500, APCle-7500/4C)
  - 8 sockets for 8-port serial interface (APCle-7800)
- Can be configured as RS232, RS422, RS485 with/without optical isolation, 20 mA Current Loop (active, passive), with optical isolation through separate SI modules
- Automatic addressing through BIOS
- Automatic module identification
- UART 16C950, downwards compatible until 16C450
- 128-byte FIFO buffer for sending and receiving data
- Programmable transfer rate
- 5, 6, 7 or 8-bit character
- 1, 1½ or 2 stop bits
- Parity: even, odd or none
- Automatic transmitter control for RS485 and transmitter control through FIFO level
- Common interrupt

## Safety features

- SI modules available with optical isolation 1000 V
- Creeping distance IEC 61010-1 (VDE411-1)
- Protection against fast transients (Burst)
- Short-circuit protection for RS422 and RS485
- Internal diagnostic possibility, break, parity, overrun and framing error

APCle-7300 – 1-port serial interface  
APCle-7420 – 2-port serial interface  
APCle-7500 – 4-port serial interface  
APCle-7800 – 8-port serial interface

RS232, RS422, RS485, 20 mA Current Loop

Free mode configuration for each port  
through SI modules

With/without optical isolation 1000 V

128-byte FIFO buffer for each port

16C950-compatible UART

## Applications

- Industrial serial communication
- Data acquisition
- Multi-user systems
- PLC interface
- Multidrop applications
- Modem and printer control, etc.

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:








- Microsoft VC++
- Visual Basic • Delphi

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)

## SI modules

| Operating mode             | RS232   |   | RS422   |   | RS485   |   | 20 mA CL  |
|----------------------------|---|---|---|---|---|---|---|
|                            |  |  |  |  |  |  |  |
|                            | SI232-G   | SI232   | SI422-G   | SI422   | SI485-G   | SI485   | SITTY   |
| Optical isolation 1000 V   | ✓   |   | ✓   |   | ✓   |   | ✓   |
| Creeping distance 3.2 mm   | ✓   |   | ✓   |   | ✓   |   | ✓   |
| Short-circuit protection   |   |   | ✓   | ✓   | ✓   | ✓   |   |
| ESD protection             | ✓   | ✓   | ✓   |   | ✓   |   |   |
| Burst protection           | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |
| Duplex                     | Full  | Full  | Full  | Full  | Half  | Half  | Full  |
| Max. Baud rate             | 1 MBaud   | 1 MBaud   | 1 MBaud   | 1 MBaud   | 1 MBaud   | 1 MBaud   | 19.2 kBaud  |
| Modem control signals      | ✓   | ✓   | Optional RTS/CTS (SI-422-PEP)   |   |   |   |   |
| Autom. transmitter control |   |   |   |   | ✓   | ✓   |   |
| Current consumption        | 16 mA   | 1 mA  | 15 mA   | 5 mA  | 15 mA   | 5 mA  | 82 mA   |

## Specifications

## APCLe-7300 / APCLe-7420 / APCLe-7500 / APCLe-7800

### Serial interface – 1-port, 2-port, 4-port, 8-port

|                    |   |
|--------------------|---|
| Mode:              | RS232, RS422, RS485, 20 mA Current Loop (active, passive) with or without optical isolation through separate SI modules |
| Transmission mode: | Asynchronous, full or half duplex (SI modules)  |
| Addressing:        | Automatic through BIOS  |
| Memory:            | 128-byte FIFO buffer for transmitter and receiver   |
| Transfer rate:     | Programmable up to 1 MBaud  |
| Protocol:          | 5-, 6-, 7- or 8-bit character 1,1½ or 2 stop bits   |
| Parity:            | Even, odd, none, mark, space  |
| Interrupt lines:   | Automatic configuration through BIOS  |

### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### Safety features

Optical isolation: 1000 V (SI modules)

### Physical and environmental conditions

|                    |  |
|--------------------|--|
| Dimensions:        | 168 x 99 mm  |
| System bus:        | Acc. to PCI Express base specification, Revision 1.0a (PCI Express 1.0a)   |
| Space required:    | 1-/4-/8-/16-lane PCI Express slot  |
| Operating voltage: | + 3,3 V from the PC  |
| Front connector:   | 9-pin D-Sub male connector (APCLe-7300)<br>2 x 9-pin D-Sub male connector (APCLe-7420)<br>37-pin D-Sub male connector (APCLe-7500)<br>78-pin D-Sub female connector (APCLe-7800) |
| Temperature range: | 0 to 60 °C (with forced cooling)   |

## Ordering information

### APCLe-7300 / APCLe-7420 / APCLe-7500 / APCLe-7800

- APCLe-7300:** 1-port serial interface (1 x 9-pin D-Sub)
  - APCLe-7420:** 2-port serial interface (2 x 9-pin D-Sub)
  - APCLe-7500:** 4-port serial interface (1 x 37-pin D-Sub)
  - APCLe-7500/4C:** 4-port serial interface (4 x 9-pin D-Sub)
  - APCLe-7800:** 8-port serial interface (1 x 78-pin D-Sub)
- Each incl. technical description and software drivers.

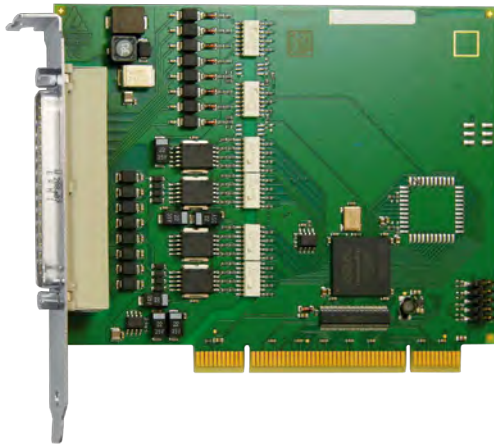
### SI modules: Please order the modules separately!

- SI232-G:** RS232 mode, isolated
- SI232:** RS232 mode
- SI422-G:** RS422 mode, isolated
- SI422-PEP:** RS422 mode, isolated, with RTS/CTS
- SI422:** RS422 mode
- SI485-G:** RS485 mode, isolated
- SI485:** RS485 mode
- SITTY:** 20 mA Current Loop mode (active, passive), isolated

### Accessories

- ST075:** Shielded round cable, 37 to 4 x 9-pin (for APCLe-7500)
- ST074:** Shielded round cable, 37 to 4 x 25-pin (for APCLe-7500)
- ST7809:** Shielded round cable, 78 to 8 x 9-pin (for APCLe-7800)
- ST7825:** Shielded round cable, 78 to 8 x 25-pin (for APCLe-7800)

# PCI BOARDS, DIGITAL I/O



Digital boards are used for industrial I/O regulation, signal switching, as interface to automatic test devices, for the on/off monitoring of electrical consumers or as interfaces to machines. They can activate e.g. ventilation, valves, pumps and electromechanical relays.

## A large product range

Our product range of digital input and output boards for the PCI bus is as varied as their possibilities of use. In our product range you will find:

- Digital input boards, 5 V, 24 V
- Digital I/O boards, 5 V, 12 V, 24 V, TTL
- Digital output boards, 24 V
- Relay boards, 8 to 16 relays

All PCI boards can be used in 5 V systems.

Some of the boards have been developed for use in 5 V systems as well as in 3.3 V systems.

## More performance through CPU relief

The interruptible inputs of the digital I/O boards make continuous cyclic scan processes (polling) for routine monitoring and analysis tasks unnecessary, which relieves the processor and the software. At a status change of the digital inputs, a corresponding interrupt is generated, enabling the system to react to the event through the interrupt routine and thus meet the defined real-time criteria.

## Safe machine start

Until the current supply provides its nominal voltage in the initialisation phase, the logic components on electronic devices run through different undefined intermediate states.

Without special measures the state of the digital outputs cannot be ascertained. Thus the I/O and output boards reset all outputs to „0“ at power-on or reset. This allows straight solutions for machine starts or the start of measurement processes.

## Correct state identification

With the digital boards by ADDI-DATA, you can reliably find out the state (0 or 1) of the connected devices or sensors. There is thus no undefined range that could lead to switching errors.

## Real-time complete system MSX-Box

Combination of the MSX-Box PAC system and PCI boards

- Compact and flexible
- Stand-alone system (own CPU)
- Long-term availability

MSX-Box product information see page 20




## HIGH DEGREE OF PROTECTION

- Optical isolation from 500 V to 1000 V
- Protection against short-circuits, overtemperature, overvoltage
- Filters for the inputs and outputs
- Industry-standard D-Sub connectors





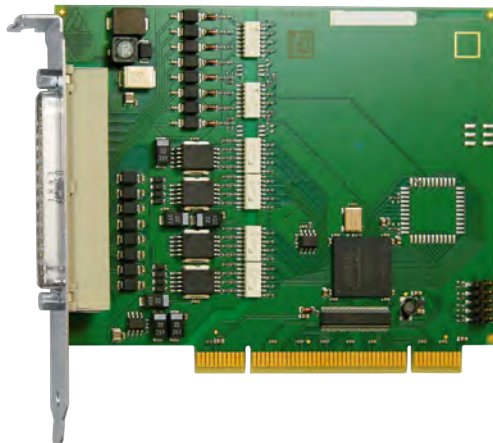
## Product overview

|  | Digital I/O, 24 V   |                    |                                       |                |                                 | Digital input, 24 V               |              | Digital output, 24 V                 |                    | Relay board                 | Digital I/O, TTL                         |
|--|---|--------------------|---------------------------------------|----------------|---------------------------------|-----------------------------------|--------------|--------------------------------------|--------------------|-----------------------------|--|
|  | APCI-1500<br>APCI-1500-12V  | APCI-1516          | APCI-1564                             | APCI-1564_3.3V | APCI-1564-5V<br>APCI-1564-5V-HS | APCI-1032<br>APCI-1032-5          | APCI-1016    | APCI-2032<br>APCI-2032-5             | APCI-2016          | APCI-2200_3.3V<br>APCI-2200 | APCI-1648<br>APCI-1696                   |
|  32-bit PCI bus | PCI 5 V   | 5 V                | 5 V                                   | 3.3 V          | 5 V                             | 5 V                               | 5 V          | 5 V                                  | 5 V                | 3.3 V / 5 V                 | 3.3 V / 5 V                              |
| FPGA   |   |                    | ✓                                     |                | ✓                               |                                   |              |                                      |                    | ✓                           |  |
| Filters and protective circuits  | ✓   | ✓                  | ✓                                     |                | ✓                               | ✓                                 | ✓            | ✓                                    | ✓                  | ✓                           | ✓  |
| Input channels   | 16  | 8                  | 32                                    |                | 32                              | 32                                | 16           |                                      |                    |                             | 48 TTL (APCI-1648)<br>96 TTL (APCI-1696) |
| Optical isolation 1000 V   | ✓   | ✓                  | ✓                                     |                | ✓                               | ✓                                 | ✓            |                                      |                    |                             |  |
| Interruptible input channels   | 14  |                    | 16                                    |                | 16                              | 16                                |              |                                      |                    |                             |  |
| Nominal voltage (V)<br>DC (V)  | 24 V (19-30)<br>12 V (APCI-1500-12V)  | 24 V (19-30)       | 24 V (19-26)                          |                | 5 V                             | 24 V (19-30)<br>5 V (APCI-1032-5) | 24 V (19-30) |                                      |                    |                             | TTL                                      |
| Input current at 24 VDC  | 6 mA  | 6 mA               | 5 mA                                  |                |                                 | 5 mA                              | 6 mA         |                                      |                    |                             |  |
| Output channels<br>(24 V high-side drivers)  | 16  | 8                  | 32                                    |                |                                 |                                   |              | 32                                   | 16                 |                             | 48 TTL (APCI-1648)<br>96 TTL (APCI-1696) |
| Output channels<br>(5 V high-side drivers)   |   |                    |                                       |                | 32 (APCI-1564-5V-HS)            |                                   |              |                                      |                    |                             |  |
| Output channels<br>Open Collector  |   |                    |                                       |                | 32 (APCI-1564-5V)               |                                   |              |                                      |                    |                             |  |
| Relays   |   |                    |                                       |                |                                 |                                   |              |                                      |                    | 8/16 relays                 |  |
| Optical isolation 1000 V   | ✓   | ✓                  | ✓                                     |                | ✓                               | ✓                                 | ✓            | ✓                                    | ✓                  | ✓                           |  |
| Nominal voltage (V)  | 24 V DC (10-36)   | 24 V DC (10-36)    | 24 V DC (10-36)<br>5 V (APCI-1564-5V) |                | 5 V                             |                                   |              | 24 V DC (10-36)<br>5 V (APCI-2032-5) | 24 V DC (10-36)    | 60 V DC<br>48 V AC          | TTL                                      |
| Output current (A)<br>for one channel  | 0.5 <sup>(1)</sup>  | 0.5 <sup>(1)</sup> | 0.5 <sup>(1)</sup>                    |                | 50 mA                           |                                   |              | 0.5 <sup>(2)</sup>                   | 0.5 <sup>(2)</sup> | 1                           | 12 LS TTL Loads                          |
| Watchdog (depth)   | ✓ (16-bit)  | ✓ (8-bit)          | ✓ (8-bit)                             |                | ✓ (8-bit)                       |                                   |              | ✓ (8-bit)                            | ✓ (8-bit)          | ✓ (8-bit)                   |  |
| Timer / Counter (depth)  | 3/<br>(16-bit)  |                    | 1/3<br>(32-bit)                       |                | 1/3<br>(32-bit)                 |                                   |              |                                      |                    |                             |  |
| Page   | 158   | 160                | 162                                   |                | 164                             | 166                               | 168          | 170                                  | 172                | 174                         | 176                                      |
| Software   | Driver download: <a href="http://www.addi-data.com/downloads">www.addi-data.com/downloads</a> |                    |                                       |                |                                 |                                   |              |                                      |                    |                             |  |

(1) Limited to 3 A for all outputs, self-resetting fuse against short-circuits

(2) Limited to 2x3 A for all outputs, self-resetting fuse against short-circuits

# Digital I/O board, optically isolated, 32 digital inputs and outputs, 24 V / 12 V



**PCI** 32-bit

**Also for**  
**PCI EXPRESS** See APCle-1500  
page 120

**Also for** *CompactPCI<sup>®</sup> Serial*  
See CPCIs-1500, page 230

**Also for** *CompactPCI<sup>™</sup>*  
See CPCIs-1500, page 242

**Also for** **PC104-PLUS**  
See PC104-PLUS1500, page 226



**LabVIEW<sup>™</sup>**



**LabWindows/CVI<sup>™</sup>**

**DASYLab10**  
Data Acquisition System Laboratory



## Features

- 3 programmable timers
- Connector compatible to the ISA board PA 1500. Connector and software compatible to the digital I/O boards APCle-1532 for the PCI Express bus and CPCI-1500 for the CompactPCI bus.
- Monitoring program for testing and setting the board functions

### Inputs

- 16 optically isolated digital inputs, 24 V or 12 V (APCI-1500-12V), including 14 interruptible inputs
- Reverse voltage protection
- All inputs are filtered

### Outputs

- 16 optically isolated digital outputs, 10 V to 36 V
- Output current per channel 500 mA
- Timer programmable watchdog for resetting the outputs to „0“
- Diagnostic report through status register at short-circuits, overtemperature, voltage drop or watchdog
- Interrupt triggered through watchdog, timer, error
- At Power-On, reset of the outputs to „0“
- Short-circuit current for 16 outputs ~ 3 A typ.
- Short-circuit current per output ~1.5 A typ.
- Self-resetting fuse (electronic fuse)
- Overtemperature and overvoltage protection
- 24 V power outputs with protection diodes and filters
- Output capacitors against electromagnetic emissions
- External 24 V voltage supply screened and filtered
- Shutdown logic, when the external supply voltage drops below 5 V

### Safety features

- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Protection against fast transients (burst), overvoltage, electrostatic discharge and high-frequency EMI
- Separate ground lines for inputs and outputs

## APCI-1500 / APCI-1500-12V

16 digital inputs, 24 V or 12 V,  
including 14 interruptible inputs

16 digital outputs, 10-36 V, 500 mA/channel

Optical isolation 1000 V

Input and output filters

Watchdog, timer

At Power-On the outputs are reset to “0”

## Applications

- Industrial I/O control
- PLC coupling
- Reading of encoder values for process control
- Signal switching
- Interface to electromechanical relays
- ON/OFF monitoring of motors, lights...
- Watchdog / Timer
- Machine interfacing, ....

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- Microsoft VC++ • Microsoft C
- Borland C++ • Borland C
- Visual Basic • Delphi
- .NET on request
- LabVIEW • LabWindows/CVI • DASYLab • DIAdem

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)

## Specifications

### Digital inputs

|                                 |   |
|---------------------------------|---|
| Number of inputs:               | 16 (common ground acc. to IEC 1131-2)               |
| Including interruptible inputs: | 14, IRQ line selected through BIOS                  |
| Optical isolation:              | Through opto-couplers, 1000 V from PC to peripheral |
| Compare logic:                  | AND and OR mode; OR priority                        |

#### 24 V version (APCI-1500)

|                          |                            |
|--------------------------|----------------------------|
| Nominal voltage:         | 24 V                       |
| Input current at 24 V:   | 6 mA typ.                  |
| Logic input levels:      | U nominal: 24 V            |
| UH max.:                 | 30 V/current 9 mA typ.     |
| UH min.:                 | 19 V/current 2 mA typ.     |
| UL max.:                 | 14 V/current 0.7 mA typ.   |
| UL min.:                 | 0 V/current 0 mA typ.      |
| Signal delay:            | 70 µs (at nominal voltage) |
| Maximum input frequency: | 5 kHz (at nominal voltage) |

#### 12 V version (APCI-1500-12V)

|                          |                            |
|--------------------------|----------------------------|
| Nominal voltage:         | 12 V                       |
| Input current at 12 V:   | 4.2 mA typ.                |
| Logic input levels:      | U nominal: 12 V            |
| UH max.:                 | 16 V/current 6.3 mA typ.   |
| UH min.:                 | 9 V/current 2.7 mA typ.    |
| UL max.:                 | 6 V/current 1.2 mA typ.    |
| UL min.:                 | 0 V/current 0 mA typ.      |
| Signal delay:            | 70 µs (at nominal voltage) |
| Maximum input frequency: | 5 kHz (at nominal voltage) |

### Digital outputs

|  |   |
|--|---|
| Number of outputs:   | 16, optically isolated up to 1000 V through opto-couplers |
| Output type:   | High-side (load to ground) acc. to IEC 1131-2             |
| Nominal voltage:   | 24 V / 12 V (APCI-1500-12V)                               |
| Supply voltage:  | 10 V to 36 V, min. 5 V (via front connector)              |
| Max. current for 16 outputs:   | 3 A typ.  |
| Output current/output:   | 500 mA max.   |
| Short-circuit current/output shutdown at 24 V, $R_{load} < 0.1 \Omega$ : | 1.5 A   |
| RDS ON resistance:   | 0.4 $\Omega$ max.   |
| Switch-on time:  | I out=0.5 A, load = resistance: 100 µs                    |
| Switch-off time:   | I out=0.5 A, load = resistance: 60 µs                     |
| Overttemperature (shutdown):   | 170 °C (output driver)                                    |
| Temperature hysteresis:  | 20 °C (output driver)                                     |

### Safety

|                 |  |
|-----------------|--|
| Shutdown logic: | When the ext. 24 V voltage drops below 5 V:<br>The outputs are switched off. |
| Diagnostics:    | Status bit or interrupt to the PC  |
| Timer:          | 3  |
| Watchdog:       | Timer-programmable, 10 µs to 37 s  |

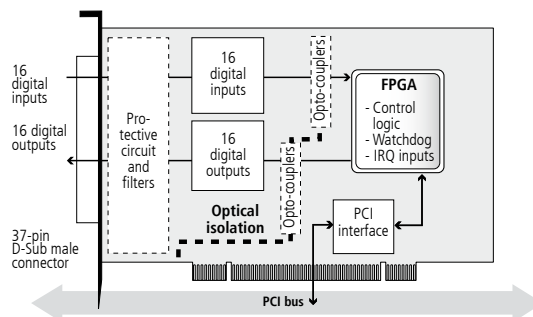
### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### Physical and environmental conditions

|                      |   |
|----------------------|---|
| Dimensions:          | 131 x 99 mm   |
| System bus:          | PCI 32-bit 3.3/5 V acc. to specification 2.1 (PCISIG) |
| Space required:      | 1 PCI slot  |
| Operating voltage:   | +5 V, $\pm 5\%$ from the PC                           |
| Current consumption: | 400 mA typ. $\pm 10\%$                                |
| Front connector:     | 37-pin D-Sub male connector                           |
| Temperature range:   | 0 to 60 °C (with forced cooling)                      |

### Simplified block diagram



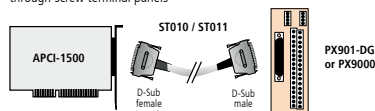
### Pin assignment – 37-pin D-Sub male connector

|                    |    |    |                   |
|--------------------|----|----|-------------------|
| Dig. input 2       | 20 | 1  | Dig. input 1      |
| Dig. input 4       | 21 | 2  | Dig. input 3      |
| Dig. input 6       | 22 | 3  | Dig. input 5      |
| Dig. input 8       | 23 | 4  | Dig. input 7      |
| Dig. input 10      | 24 | 5  | Dig. input 9      |
| Dig. input 12      | 25 | 6  | Dig. input 11     |
| Dig. input 14      | 26 | 7  | Dig. input 13     |
| Dig. input 16      | 27 | 8  | Dig. input 15     |
| 24 V ext.          | 28 | 9  | 24 V ext.         |
| (Outputs) 0 V ext. | 29 | 10 | (Inputs) 0 V ext. |
| Dig. output 2      | 30 | 11 | Dig. output 1     |
| Dig. output 4      | 31 | 12 | Dig. output 3     |
| Dig. output 6      | 32 | 13 | Dig. output 5     |
| Dig. output 8      | 33 | 14 | Dig. output 7     |
| Dig. output 10     | 34 | 15 | Dig. output 9     |
| Dig. output 12     | 35 | 16 | Dig. output 11    |
| Dig. output 14     | 36 | 17 | Dig. output 13    |
| Dig. output 16     | 37 | 18 | Dig. output 15    |
|                    |    | 19 | Diagnostic output |

### ADDI-DATA connection

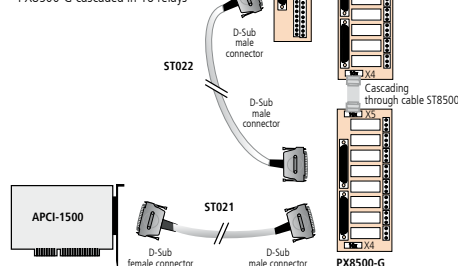
#### Example 1

Connection of the inputs and outputs through screw terminal panels



#### Example 2

- Connection of the inputs through screw terminal panel PX901-DG  
- Connection of the outputs through relay output board PX8500-G cascaded in 16 relays



### Ordering information

#### APCI-1500 / APCI-1500-12V

Digital I/O board, optically isolated, 32 digital inputs and outputs, 24 V / 12 V. Incl. technical description, software drivers and monitoring program.

#### Versions

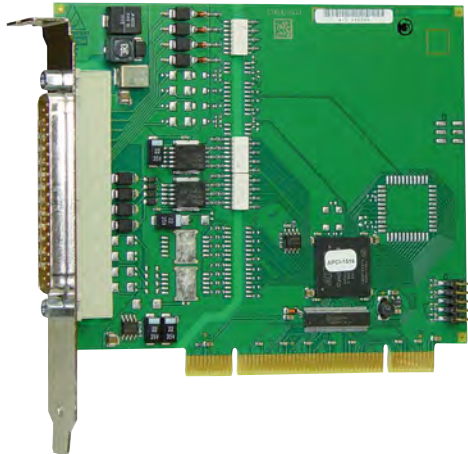
|                       |  |
|-----------------------|--|
| <b>APCI-1500:</b>     | Digital I/O board, opt. isolated, 32 dig. I/O, 24 V inputs, outputs 10 to 36 V |
| <b>APCI-1500-12V:</b> | Digital I/O board, opt. isolated, 32 dig. I/O, 12 V inputs, outputs 10 to 36 V |

#### Accessories

|                  |  |
|------------------|--|
| <b>PX901-D:</b>  | Screw terminal panel, LED status display               |
| <b>PX901-DG:</b> | Screw terminal panel, LED status display, for DIN rail |

|                  |  |
|------------------|--|
| <b>PX9000:</b>   | 3-row screw terminal panel for DIN rail, LED status display              |
| <b>PX8500-G:</b> | Relay output board for DIN rail, cascable                                |
| <b>ST010:</b>    | Standard round cable, shielded, twisted pairs, 2 m                       |
| <b>ST011:</b>    | Standard round cable, shielded, twisted pairs, 5 m                       |
| <b>ST010-S:</b>  | Same as ST010, for high currents (separate 24 V supply)                  |
| <b>ST021:</b>    | Round cable between APCI-1500 and PX8500-G, shielded, twisted pairs, 2 m |
| <b>ST022:</b>    | Cable between PX8500-G and PX901-DG, shielded, 2 m                       |
| <b>ST8500:</b>   | Ribbon cable for cascading two PX 8500                                   |

# Digital I/O board, optically isolated, 16 digital inputs and outputs, 24 V



PCI 32-bit

Also for  
PCI EXPRESS See APCle-1516  
page 124



LabVIEW™



LabWindows/CVI™



## Features

### Inputs

- 8 optically isolated inputs, 24 V
- Reverse voltage protection
- All inputs are filtered

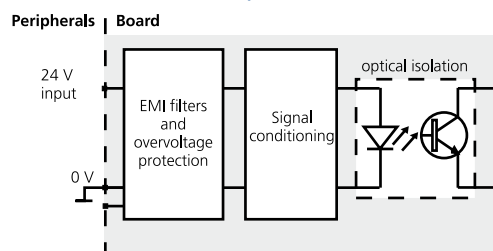
### Outputs

- 8 optically isolated outputs, 10 V to 36 V
- Output current per channel 500 mA
- Total current: 3 A typ. (fused through PTC resistor)
- Watchdog for resetting the outputs to "0"
- At Power-On, reset of the outputs to "0"
- Short-circuit current for 8 outputs ~ 3 A typ.
- Short-circuit current per output ~1.5 A typ.
- Self-resetting fuse (electronic fuse)
- Overtemperature and overvoltage protection
- 24 V power outputs with protection diodes and filters
- Output capacitors against electromagnetic emissions
- External 24 V voltage supply screened and filtered
- Shutdown logic, when the external supply voltage drops below 5 V
- Diagnostic function for detecting short-circuits and overtemperature

### Safety features

- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Separate ground lines for inputs and outputs
- Protection against fast transients (burst), overvoltage, electrostatic discharge and high-frequency EMI

### Protective circuit for the input channels



## APCI-1516

8 digital inputs, 24 V

8 digital outputs, 24 V, 500 mA/channel

Optical isolation 1000 V

Input and output filters

Watchdog

## Applications

- Industrial I/O control
- PLC coupling
- Signal switching
- Interface to electromechanical relays
- Automatic test equipment
- ON/OFF monitoring of motors, lights...
- Watchdog
- Machine interfacing

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- .NET
- Microsoft VC++ • Borland C++
- Visual Basic • Delphi
- LabVIEW • LabWindows/CVI • DiAdem

### ADDIPACK functions:

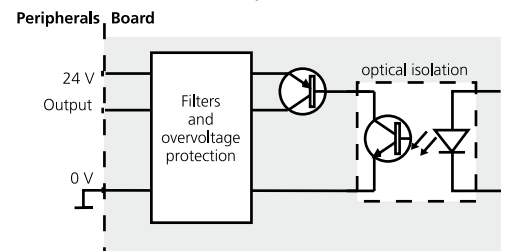
- Digital input • Digital output • Watchdog

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)

### Protective circuit for the output channels



## Specifications

### Digital inputs

|                          |   |
|--------------------------|---|
| Number of inputs:        | 8 (common ground acc. to IEC 1131-2)                |
| Nominal voltage:         | 24 V  |
| Input current at 24 V:   | 6 mA typ.   |
| Logic input levels:      |   |
| U nominal:               | 24 V  |
| UH max.:                 | 30 V/current 9 mA typ.                              |
| UH min.:                 | 19 V/current 2 mA typ.                              |
| UL max.:                 | 14 V/current 0.6 mA typ.                            |
| UL min.:                 | 0 V/current 0 mA typ.                               |
| Optical isolation:       | Through opto-couplers, 1000 V from PC to peripheral |
| Signal delay:            | 70 µs (at 24 V)                                     |
| Maximal input frequency: | 5 kHz (at 24 V)                                     |

### Digital outputs

|  |  |
|--|--|
| Number of outputs:   | 8, optically isolated up to 1000 V through opto-couplers |
| Output type:   | High side (load to ground) acc. to IEC 1131-2            |
| Nominal voltage:   | 24 V   |
| Supply voltage:  | 10 V to 36 V, min. 5 V (via front connector)             |
| Max. current for 8 outputs:  | 3 A typ.   |
| Output current/output:   | 500 mA max.  |
| Short-circuit current/output shutdown at 24 V, $R_{load} < 0.1 \Omega$ : | 1.5 A  |
| RDS ON resistance:   | 0.4 $\Omega$ max.  |
| Switch-on time:  | I out=0.5 A, load = resistance: 100 µs                   |
| Switch-off time:   | I out=0.5 A, load = resistance: 60 µs                    |
| Overttemperature (shutdown):   | 170 °C (output driver)                                   |
| Temperature hysteresis:  | 20 °C (output driver)                                    |

### Safety

|                      |  |
|----------------------|--|
| Shutdown logic:      | When the ext. 24 V voltage drops below 5 V:<br>The outputs are switched off. |
| Diagnostics (pin 19) | Diagnostics at output overload and overtemperature                           |
| Watchdog:            | Timer-programmable<br>20 ms to 5 s in steps of 20 ms                         |

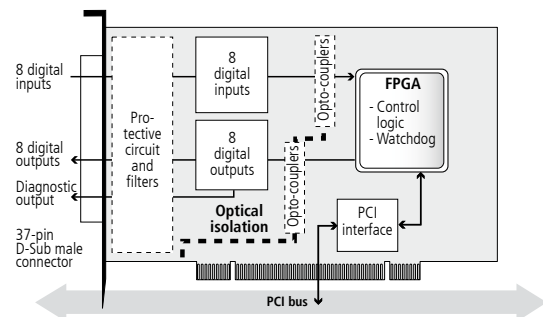
### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

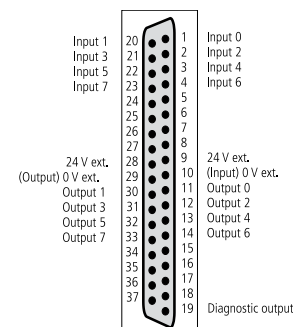
### Physical and environmental conditions

|                      |   |
|----------------------|---|
| Dimensions:          | 131x 99 mm  |
| System bus:          | PCI 32-bit 3.3/5 V acc. to specification 2.1 (PCISIG) |
| Space required:      | 1 PCI slot  |
| Operating voltage:   | +5 V, $\pm 5\%$ from the PC                           |
| Current consumption: | 210 mA $\pm 10\%$ typ.                                |
| Front connector:     | 37-pin D-Sub male connector                           |
| Temperature range:   | 0 to 60 °C (with forced cooling)                      |

### Simplified block diagram



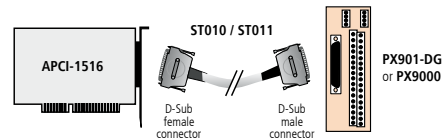
### Pin assignment – 37-pin D-Sub male connector



### ADDI-DATA connection

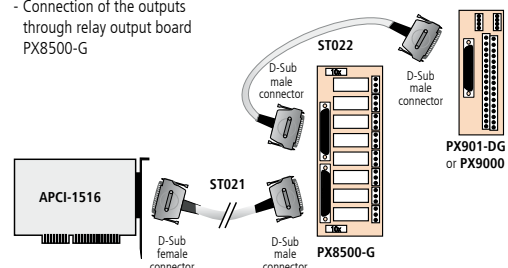
#### Example 1

Connection of the inputs and outputs through screw terminal panels



#### Example 2

- Connection of the inputs through screw terminal panel PX901-DG
- Connection of the outputs through relay output board PX8500-G



### Ordering information

#### APCI-1516

Digital I/O board, optically isolated, 16 digital inputs and outputs, 24 V. Incl. technical description, software drivers

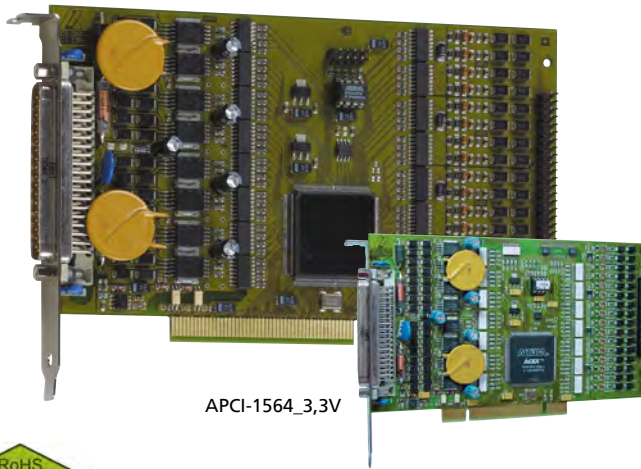
#### Accessories

|                  |  |
|------------------|--|
| <b>PX901-D:</b>  | Screw terminal panel, LED status display                         |
| <b>PX901-DG:</b> | Screw terminal panel, LED status display, for DIN rail           |
| <b>PX9000:</b>   | 3-row screw terminal panel for DIN rail, with LED status display |
| <b>PX8500-G:</b> | Relay output board for DIN rail, cascable                        |

|                 |  |
|-----------------|--|
| <b>ST010:</b>   | Standard round cable, shielded, twisted pairs, 2 m                       |
| <b>ST011:</b>   | Standard round cable, shielded, twisted pairs, 5 m                       |
| <b>ST010-S:</b> | Same as ST010, for high currents   |
| <b>ST021:</b>   | Round cable between APCI-1516 and PX8500-G, shielded, twisted pairs, 2 m |
| <b>ST022:</b>   | Round cable between PX8500-G and PX 901 or PX9000, shielded, 2 m         |
| <b>ST8500:</b>  | Ribbon cable for cascading two PX 8500                                   |



# Digital I/O board, optically isolated, 64 digital inputs and outputs, 24 V



APCI-1564\_3,3V



PCI 32-bit

Also for  
**PCI EXPRESS** See APCle-1564  
page 126

Also for *CompactPCI® Serial*  
See CPCIs-1564, page 232

Also for *CompactPCI™*  
See CPCIs-1564, page 244



LabVIEW™



LabWindows/CVI™



## Features

- 32-bit, 33 MHz, PCI interface
- PCI 5 V (APCI-1564)
- PCI 3.3 V (APCI-1564\_3,3V)

### Inputs

- 32 optically isolated digital inputs, 24 V, including 16 interruptible and 3 counter inputs
- Inputs organised in 4 groups of 8 channels, each group has its own ground line
- Reverse voltage protection
- All inputs are filtered

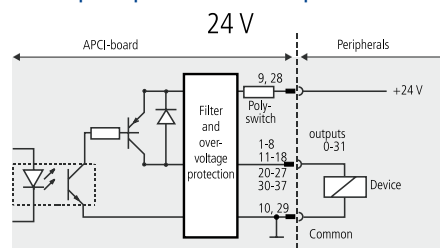
### Outputs

- 32 optically isolated digital outputs, 10 V to 36 V
- Output current per channel 500 mA
- Watchdog for resetting the outputs to "0"
- At Power-On, the outputs are reset to "0"
- Total current for 16 outputs ~ 3 A
- Total current for 32 outputs ~ 6 A
- Electronic fuse
- Short-circuit current per output ~1.5 A
- Overtemperature and overvoltage protection
- 24 V power outputs with protection diodes and filters
- Output capacitors against electromagnetic emissions
- Ext. 24 V voltage supply screened and filtered
- Shutdown logic, when the external supply voltage drops below 5 V

### Safety features

- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Protection against fast transients (burst), overvoltage, electrostatic discharge and high-frequency EMI

### Connection principle of the 24 V outputs



## APCI-1564 / APCI-1564\_3,3V

PCI 5 V (APCI-1564)

PCI 3.3 V (APCI-1564\_3,3V)

32 digital inputs, 24 V,  
including 16 interruptible, filtered

32 digital outputs, 24 V, 500 mA/channel, filtered

Optical isolation 1000 V

Watchdog, timer,  
3 x 32-bit counters up to 500 kHz

The outputs are reset to "0" at Power-On

- Interrupt started through counter, timer
- Separate ground lines for inputs and outputs

## Applications

- Industrial I/O control • PLC coupling • Signal switching
- Interface to electromechanical relays
- Automatic test equipment
- ON/OFF monitoring of motors, lights...
- Watchdog • Machine interfacing
- ...

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- .NET
- Microsoft VC++ • Borland C++
- Visual Basic • Delphi
- LabVIEW • LabWindows/CVI

### ADDIPACK functions:

Digital input • Digital output  
Watchdog • Timer • Counter

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)

## Specifications

### Digital inputs

Number of inputs: 32; 4 groups of channels with common ground:  
Input: 0-7, 8-15, 16-23, 24-31  
- 0-2: fast counter inputs, 500 kHz  
- 4-19: interruptible inputs

Optical isolation: Through opto-couplers, 1000 V

|                        | Channel 0-3  | Channel 4-31 |
|------------------------|--------------|--------------|
| Input current at 24 V: | 10.5 mA typ. | 5 mA typ.    |

Logic input levels:

|           | 24 V                | 24 V               |
|-----------|---------------------|--------------------|
| U nominal | 24 V                | 24 V               |
| UH max.   | 26 V / 12.3 mA typ. | 26 V / 5 mA typ.   |
| UH min.   | 19 V / 5.5 mA typ.  | 19 V / 3.2 mA typ. |
| UL max.   | 14 V / 0.7 mA typ.  | 14 V / 1.3 mA typ. |
| UL min.   | 0 V / 0 mA typ.     | 0 V / 0 mA typ.    |

Signal delay:

|      |       |
|------|-------|
| 1 µs | 70 µs |
|------|-------|

|                          |         |       |
|--------------------------|---------|-------|
| Maximal input frequency: | 500 kHz | 5 kHz |
|--------------------------|---------|-------|

### Digital outputs

Number of outputs: 32, optically isolated up to 1000 V

Output type: High side (load to ground) acc. to IEC 1131-2

Nominal voltage: 24 V

Supply voltage: 10 V to 36 V

Max. current for 16 / 32 outputs: 3 A typ./6 A typ.

Output current/output: 500 mA max.

Short-circuit current/output shutdown at 24 V,  $R_{load} < 0.1 \Omega$ : 1.5 A

RDS ON resistance: 0.4 Ω max.

Switch-on time:  $I_{out}=0.5 A$ , load = resistance: 94 µs typ.

Switch-off time:  $I_{out}=0.5 A$ , load = resistance: 8 µs typ.

Overttemperature (shutdown): 170 °C (output driver)

Temperature hysteresis: 20 °C (output driver)

### Safety

Shutdown logic: When the ext. 24 V voltage drops below 5 V:  
The outputs are switched off.

Diagnostics: Pin 19: status bit or interrupt to the PC

Timer: 12-bit

Watchdog: 8-bit, timer-programmable from 20 ms to 5 s  
in steps of 20 ms

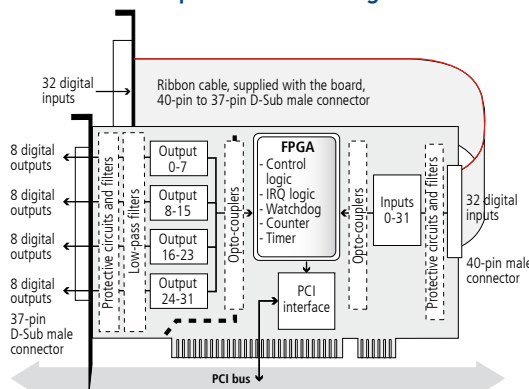
### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

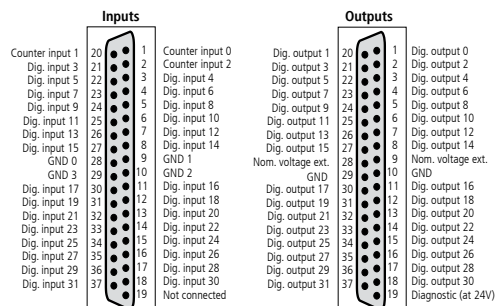
### Physical and environmental conditions

|                       |   |
|-----------------------|---|
| Dimensions:           | 171 x 99 mm   |
| System bus:           | PCI 32-bit 5 V acc. to specification 2.1 (PCISIG) or 3.3 V            |
| Space required:       | 1 PCI slot + 1 additional slot opening                                |
| Operating voltage:    | +5 V, ± 5 % from the PC   |
| Current consumption:  | 410 mA ± 10 % typ.  |
| Front connector:      | 37-pin D-Sub male connector for 32 digital outputs                    |
| Additional connector: | 37-pin D-Sub male connector on separate bracket for 32 digital inputs |
| Temperature range:    | 0 to 60 °C (with forced cooling)                                      |

### Simplified block diagram



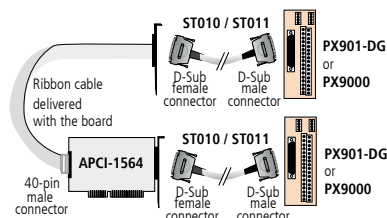
### Pin assignment – 37-pin D-Sub male connector



### ADDI-DATA connection

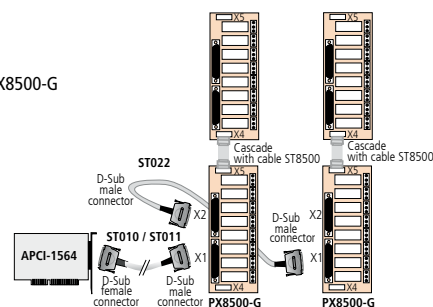
#### Example 1:

- Connection of the inputs (Ribbon cable)
- Connection of the outputs through screw terminal panel PX901-DG or PX9000



#### Example 2:

Connection of the outputs with relay output board PX8500-G cascaded in 32 relays



### Ordering information

#### APCI-1564/APCI-1564\_3,3V

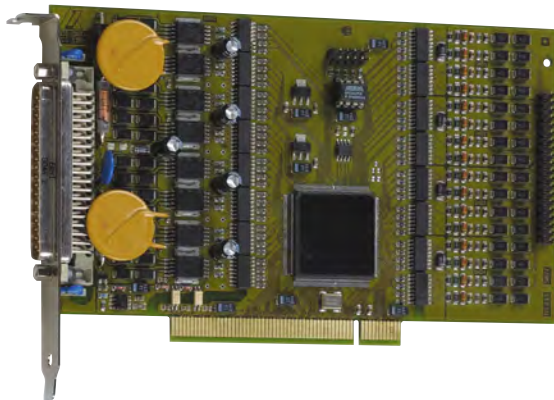
**APCI-1564:** Digital I/O board, optically isolated, 64 digital inputs and outputs, 24 V. Incl. ribbon cable, technical description, software drivers  
**APCI-1564\_3,3V:** Same as APCI-1564, for PCI 3.3 V

#### Accessories

**PX901-D:** Screw terminal panel  
**PX901-DG:** Screw terminal panel for DIN rail  
**PX9000:** 3-row screw terminal panel  
**PX8500-G:** Relay output board for DIN rail, cascable  
**ST010:** Standard round cable, shielded, twisted pairs, 2 m

**ST011:** Standard round cable, shielded, twisted pairs, 5 m  
**ST010-S:** Same as ST010, for high currents (24 V supply separate)  
**ST022:** Between 2 relay output boards PX8500-G  
**ST8500:** Ribbon cable for cascading two PX8500-G

# Digital I/O board, optically isolated, 64 digital inputs and outputs, 5 V



PCI 32-bit

Also for  
PCI EXPRESS® See APCle-1564-5V  
page 128



Windows  
64/32-bit drivers



LabVIEW™



LabWindows/CVI™



## Features

- 32-bit, 33 MHz, PCI interface
- PCI 5 V
- Inputs
- 32 optically isolated digital inputs, 5 V, including 16 interruptible and 3 counter inputs
- Inputs organised in 4 groups of 8 channels, each group has its own ground line
- Reverse voltage protection
- All inputs are filtered

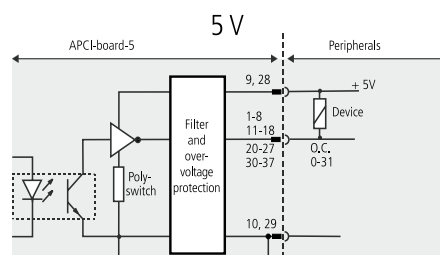
## Outputs

- 32 optically isolated digital outputs, 5 V
- APCI-1564-5V: Open Collector outputs
- APCI-1564-5V-HS: High-side outputs
- Output current per channel 50 mA
- Watchdog for resetting the outputs to "0"
- At Power-On, the outputs are reset to "0"
- Total current for 8 outputs ~ 0.5 A (via PTC)
- Electronic fuse
- Short-circuit current per output ~1.5 A
- Overtemperature and overvoltage protection
- Output capacitors against electromagnetic emissions
- Ext. 24 V voltage supply screened and filtered
- Shutdown logic, when the external supply voltage drops below 5 V

## Safety features

- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Protection against fast transients (burst), overvoltage, electrostatic discharge and high-frequency EMI

## Connection principle of the 5 V outputs



## APCI-1564-5V / APCI-1564-5V-HS

32 digital inputs, 5 V,  
including 16 interruptible, filtered

32 digital outputs, 5 V, 500 mA/channel, filtered  
open collector (5V) or high side (5V-HS)

Optical isolation 1000 V

Watchdog, timer, 3 x 32-bit counters  
up to 500 kHz

The outputs are reset to "0" at Power-On

- Interrupt started through counter, timer
- Separate ground lines for inputs and outputs

## Applications

- Industrial I/O control • PLC coupling • Signal switching
- Interface to electromechanical relays
- Automatic test equipment
- ON/OFF monitoring of motors, lights...
- Watchdog • Machine interfacing
- ...

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- .NET
- Microsoft VC++ • Borland C++
- Visual Basic • Delphi
- LabVIEW • LabWindows/CVI

### ADDIPACK functions:

Digital input • Digital output  
Watchdog • Timer • Counter

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)

## Specifications

### Digital inputs

|                          |   |                     |
|--------------------------|---|---------------------|
| Number of inputs:        | 32; 4 groups of channels with common ground:<br>Input: 0-7, 8-15, 16-23, 24-31<br>- 0-2: fast counter inputs, 500 kHz<br>- 4-19: interruptible inputs |                     |
| Optical isolation:       | Through opto-couplers, 1000 V   |                     |
|                          | <b>Channel 0-3</b>  | <b>Channel 4-31</b> |
| Input current at 5 V:    | 8,5 mA typ.   | 6 mA typ.           |
| Logic input levels:      |   |                     |
| U nominal                | 5 V   | 5 V                 |
| UH max.                  | 6 V / 11.3 mA typ.  | 6 V / 8.4 mA typ.   |
| UH min.                  | 4 V / 5.5 mA typ.   | 4 V / 4 mA typ.     |
| UL max.                  | 2 V / 1 mA typ.   | 2 V / 0.8 mA typ.   |
| UL min.                  | 0 V / 0 mA typ.   | 0 V / 0 mA typ.     |
| Signal delay:            | 1 µs  | 70 µs               |
| Maximal input frequency: | 500 kHz   | 5 kHz               |

### Digital outputs

|  |   |
|--|---|
| Number of outputs:   | 32, optically isolated up to 1000 V   |
| Output type:   | High side (load to ground) acc. to IEC 1131-2<br>Open collector (only APCI-1564-5V) |
| Nominal voltage:   | 5 V   |
| Supply voltage:  | 5 V to 35 V (APCI-1564-5V-HS)<br>5 V to 12 V (APCI-1564-5V)                         |
| Max. current for 16 / 32 outputs:  | 0.8 A typ./1.6 A typ.   |
| Output current/output:   | 50 mA max.  |
| Short-circuit current/output shutdown at 24 V, $R_{load} < 0.1 \Omega$ : | 1.5 A   |
| RDS ON resistance:   | 0.4 Ω max.  |
| Switch-on time:  | I <sub>out</sub> =50 mA, load = resistance: 250 µs typ.                             |
| Switch-off time:   | I <sub>out</sub> =50 mA, load = resistance: 3 µs typ.                               |
| Overtemperature (shutdown):  | 170 °C (output driver)  |
| Temperature hysteresis:  | 20 °C (output driver)   |

### Safety

|              |  |
|--------------|--|
| Diagnostics: | Pin 19: status bit or interrupt to the PC                        |
| Timer:       | 12-bit   |
| Watchdog:    | 8-bit, timer-programmable from 20 ms to 5 s<br>in steps of 20 ms |

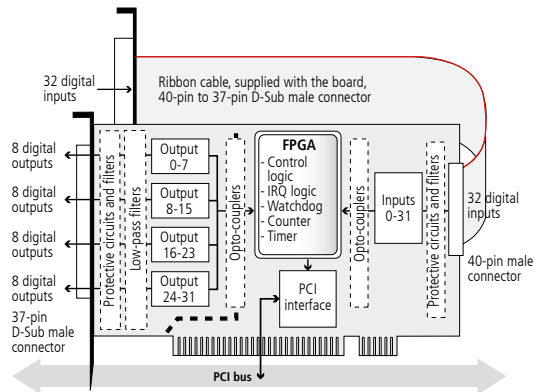
### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### Physical and environmental conditions

|                       |   |
|-----------------------|---|
| Dimensions:           | 171 x 99 mm   |
| System bus:           | PCI 32-bit 5 V acc. to specification 2.1 (PCISIG) or 3.3 V            |
| Space required:       | 1 PCI slot + 1 additional slot opening                                |
| Operating voltage:    | +5 V, ± 5 % from the PC   |
| Current consumption:  | 410 mA ± 10 % typ.  |
| Front connector:      | 37-pin D-Sub male connector for 32 digital outputs                    |
| Additional connector: | 37-pin D-Sub male connector on separate bracket for 32 digital inputs |
| Temperature range:    | 0 to 60 °C (with forced cooling)                                      |

### Simplified block diagram

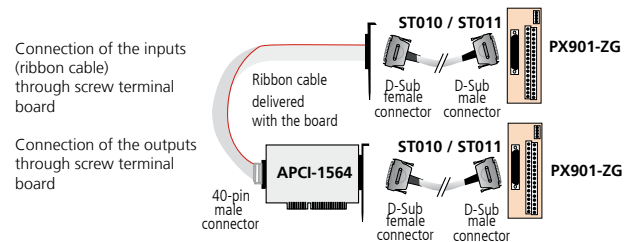


### Pin assignment – 37-pin D-Sub male connector

| Inputs          |    | Outputs        |    |
|-----------------|----|----------------|----|
| Counter input 1 | 20 | Dig. output 1  | 20 |
| Dig. input 3    | 21 | Dig. output 3  | 21 |
| Dig. input 5    | 22 | Dig. output 5  | 22 |
| Dig. input 7    | 23 | Dig. output 7  | 23 |
| Dig. input 9    | 24 | Dig. output 9  | 24 |
| Dig. input 11   | 25 | Dig. output 11 | 25 |
| Dig. input 13   | 26 | Dig. output 13 | 26 |
| Dig. input 15   | 27 | Dig. output 15 | 27 |
| GND 0           | 28 | Ext. voltage*  | 28 |
| GND 3           | 29 | GND 2          | 29 |
| Dig. input 17   | 30 | Dig. output 17 | 30 |
| Dig. input 19   | 31 | Dig. output 19 | 31 |
| Dig. input 21   | 32 | Dig. output 21 | 32 |
| Dig. input 23   | 33 | Dig. output 23 | 33 |
| Dig. input 25   | 34 | Dig. output 25 | 34 |
| Dig. input 27   | 35 | Dig. output 27 | 35 |
| Dig. input 29   | 36 | Dig. output 29 | 36 |
| Dig. input 31   | 37 | Dig. output 31 | 37 |
|                 | 19 |                | 19 |
| Counter input 0 | 1  | Dig. output 0  | 1  |
| Counter input 2 | 2  | Dig. output 2  | 2  |
| Dig. input 4    | 3  | Dig. output 4  | 3  |
| Dig. input 6    | 4  | Dig. output 6  | 4  |
| Dig. input 8    | 5  | Dig. output 8  | 5  |
| Dig. input 10   | 6  | Dig. output 10 | 6  |
| Dig. input 12   | 7  | Dig. output 12 | 7  |
| Dig. input 14   | 8  | Dig. output 14 | 8  |
| GND 1           | 9  | Ext. voltage*  | 9  |
| GND 2           | 10 | GND            | 10 |
| Dig. input 16   | 11 | Dig. output 16 | 11 |
| Dig. input 18   | 12 | Dig. output 18 | 12 |
| Dig. input 20   | 13 | Dig. output 20 | 13 |
| Dig. input 22   | 14 | Dig. output 22 | 14 |
| Dig. input 24   | 15 | Dig. output 24 | 15 |
| Dig. input 26   | 16 | Dig. output 26 | 16 |
| Dig. input 28   | 17 | Dig. output 28 | 17 |
| Dig. input 30   | 18 | Dig. output 30 | 18 |
| Not connected   |    | not connected  |    |

\* 5V-version (Open Collector): 5 to 12 V  
5V-HS-version (High-Side): 5 to 35 V

### ADDI-DATA connection



## Ordering information

### APCI-1564-5V/APCI-1564-5V-HS

Digital I/O board, optically isolated, 64 digital inputs and outputs, 5 V. Incl. ribbon cable, technical description, software drivers

**APCI-1564-5V:** open collector outputs

**APCI-1564-5V-HS:** high-side outputs

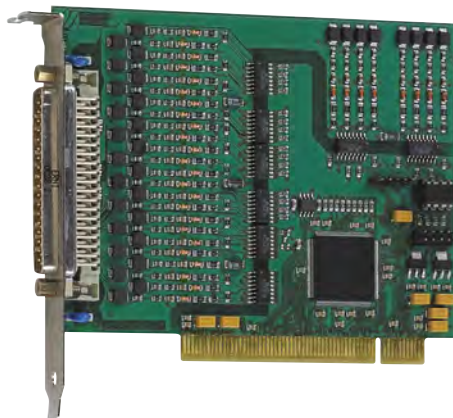
### Accessories

**PX 901-ZG:** Screw terminal panel (only for APCI-1564-5V)

**ST010:** Standard round cable, shielded, twisted pairs, 2 m

**ST011:** Standard round cable, shielded, twisted pairs, 5 m

# Digital input board, optically isolated, 32 digital inputs, 24 V / 5 V



PCI 32-bit

Also for  
PCI EXPRESS See APCle-1032  
page 132



Windows  
64/32-bit drivers



LabVIEW™



LabWindows/CVI™



## Features

- 32 optically isolated digital inputs, 24 V (APCI-1032) or as 5 V version (APCI-1032-5) including 16 interruptible inputs

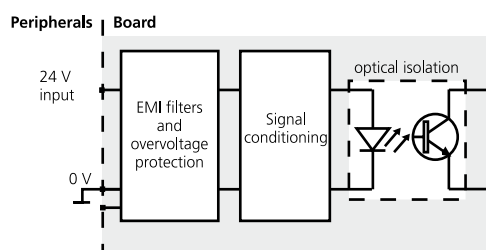
## Safety features

- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Reverse voltage protection
- All inputs are filtered
- Protection against fast transients (burst), overvoltage, electrostatic discharge and high-frequency EMI
- Additional noise suppression on the interrupt lines

## Applications

- Industrial I/O control
- Signal switching
- Interface to electromechanical relays
- Automatic test equipment
- ON/OFF monitoring of motors, lights...
- Machine interfacing
- ...

## Protective circuit for the input channels



## APCI-1032 / APCI-1032-5

32 digital inputs, 24 V or 5 V,  
including 16 interruptible inputs

Optical isolation 1000 V

Input filters

Reverse voltage protection

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- .NET
- Microsoft VC++ • Borland C++
- Visual Basic • Delphi
- LabVIEW • LabWindows/CVI • DIAdem

### ADDIPACK functions:

Digital input

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)



## Specifications

### Digital inputs

|                             |  |
|-----------------------------|--|
| Number of inputs:           | 32   |
| Optical isolation:          | through opto-couplers, 1000 V from PC to peripherals |
| Interruptible inputs:       | 16 (input 0 to 15)                                   |
| Interrupt compare logic:    | AND and OR mode                                      |
| Nominal voltage:            | 24 V (APCI-1032); 5 V (APCI-1032-5)                  |
| Input current at U nominal: | 5 mA (24 V), 6 mA typ. (5 V)                         |
| Logic input levels:         | U nominal: 24 V U nominal: 5 V                       |
| UH max.:                    | 30 V/current 7.3 mA typ. 6 V/8.4 mA typ              |
| UH min.:                    | 19 V/current 3.2 mA typ. 4 V/4 mA typ.               |
| UL max.:                    | 14 V/current 1.3 mA typ. 2 V/0.7 mA typ.             |
| UL min. at nominal voltage: | 0 V/current 0 mA typ.                                |
| Signal delay:               | 70 µs  |
| Maximal input frequency:    | 5 kHz at nominal voltage                             |

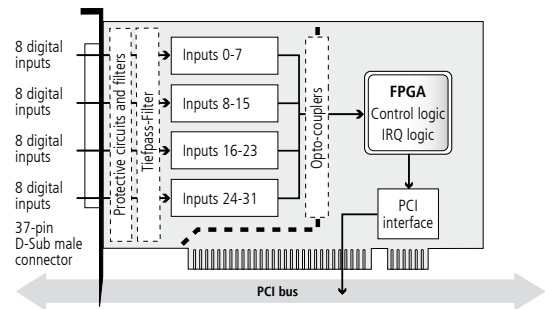
### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### Physical and environmental conditions

|                           |   |
|---------------------------|---|
| Dimensions:               | 131 x 99 mm                                       |
| System bus:               | PCI 32-bit 5 V acc. to specification 2.1 (PCISIG) |
| Space required:           | 1 PCI slot  |
| Operating voltage:        | +5 V <sub>s</sub> ± 5 % from the PC               |
| Max. current consumption: | (+5 V from the PC) 140 mA ± 10 %                  |
| Front connector:          | 37-pin D-Sub male connector                       |
| Temperature range:        | 0 to 60 °C (with forced cooling)                  |

### Simplified block diagram



### Pin assignment – 37-pin D-Sub male connector

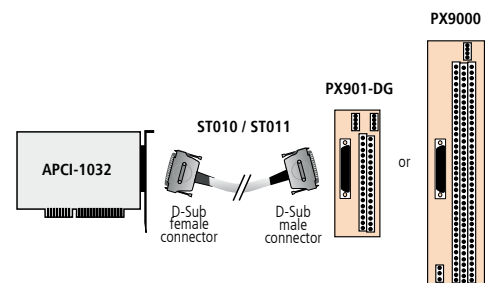
|               |    |    |               |
|---------------|----|----|---------------|
| Dig. input 1  | 20 | 1  | Dig. input 0  |
| Dig. input 3  | 21 | 2  | Dig. input 2  |
| Dig. input 5  | 22 | 3  | Dig. input 4  |
| Dig. input 7  | 23 | 4  | Dig. input 6  |
| Dig. input 9  | 24 | 5  | Dig. input 8  |
| Dig. input 11 | 25 | 6  | Dig. input 10 |
| Dig. input 13 | 26 | 7  | Dig. input 12 |
| Dig. input 15 | 27 | 8  | Dig. input 14 |
| GND 1         | 28 | 9  | GND 0         |
| GND 3         | 29 | 10 | GND 2         |
| Dig. input 17 | 30 | 11 | Dig. input 16 |
| Dig. input 19 | 31 | 12 | Dig. input 18 |
| Dig. input 21 | 32 | 13 | Dig. input 20 |
| Dig. input 23 | 33 | 14 | Dig. input 22 |
| Dig. input 25 | 34 | 15 | Dig. input 24 |
| Dig. input 27 | 35 | 16 | Dig. input 26 |
| Dig. input 29 | 36 | 17 | Dig. input 28 |
| Dig. input 31 | 37 | 18 | Dig. input 30 |
|               |    | 19 | Not connected |

### APCI-1032

Screw terminal panels PX9000 and PX901-DG with cable ST010



### ADDI-DATA connection for the APCI-1032



(without illustration: The APCI-1032-5 can only be connected to the PX901-ZG)

## Ordering information

### APCI-1032 / APCI-1032-5

- APCI-1032:** Digital input board, optically isolated, 32 digital inputs, 24 V. Incl. technical description and software drivers  
**APCI-1032-5:** Digital input board, optically isolated, 32 digital inputs, 5 V. Incl. technical description and software drivers

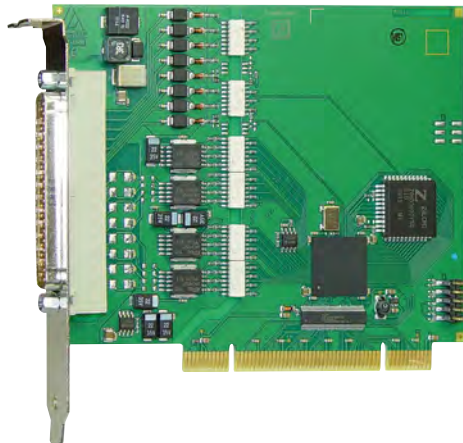
### Accessories for the APCI-1032

- PX901-D:** Screw terminal panel, LED status display  
**PX901-DG:** Screw terminal panel, LED status display, for DIN rail  
**PX9000:** 3-row screw terminal panel for DIN rail, LED status display  
**ST010:** Standard round cable, shielded, twisted pairs, 2 m  
**ST011:** Standard round cable, shielded, twisted pairs, 5 m

### Accessories for the APCI-1032-5

- PX 901-ZG:** Screw terminal panel, for DIN rail  
**ST010:** Standard round cable, shielded, twisted pairs, 2 m  
**ST011:** Standard round cable, shielded, twisted pairs, 5 m

# Digital input board, optically isolated, 16 digital inputs, 24 V



PCI 32-bit

Also for  
PCI EXPRESS See APCle-1016  
page 130



LabVIEW™



LabWindows/CVI™



## Features

- 16 optically isolated digital inputs, 24 V

### Safety features

- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Reverse voltage protection
- All inputs are filtered
- Protection against fast transients (burst), overvoltage, electrostatic discharge and high-frequency EMI

## Applications

- Industrial I/O control
- Signal switching
- Interface to electromechanical relays
- Automatic test equipment
- ON/OFF monitoring of motors, lights...
- Machine interfacing
- ...

## APCI-1016

16 digital inputs, 24 V

Optical isolation 1000 V

Input filters

Reverse voltage protection

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- .NET
- Microsoft VC++ • Borland C++
- Visual Basic • Delphi
- LabVIEW • LabWindows/CVI • DIAdem

### ADDIPACK functions:

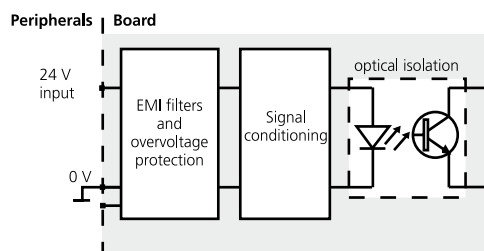
Digital input

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)

## Protective circuit for the input channels



## Specifications

### Digital inputs

|                             |   |
|-----------------------------|---|
| Number of inputs:           | 16  |
| Optical isolation:          | Through opto-couplers, 1000 V from PC to peripheral |
| Nominal voltage:            | 24 V  |
| Input current at U nominal: | 6 mA typ.   |
| Logic input levels:         | U nominal: 24 V                                     |
| UH max.:                    | 30 V/current 9 mA typ.                              |
| UH min.:                    | 19 V/current 2 mA typ.                              |
| UL max.:                    | 14 V/current 0.7 mA typ.                            |
| UL min. at nominal voltage: | 0 V/current 0 mA typ.                               |
| Signal delay:               | 70 µs   |
| Maximal input frequency:    | 5 kHz at nominal voltage                            |

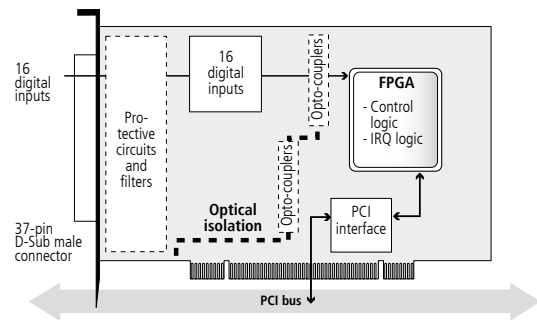
### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

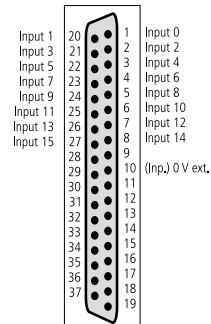
### Physical and environmental conditions

|                           |   |
|---------------------------|---|
| Dimensions:               | 131 x 99 mm (PCI short)                               |
| System bus:               | PCI 32-bit 3.3/5 V acc. to specification 2.1 (PCISIG) |
| Space required:           | 1 PCI slot  |
| Operating voltage:        | +5 V, ± 5 % from the PC                               |
| Max. current consumption: | (+5 V from the PC) 190 mA ± 10 mA typ.                |
| Front connector:          | 37-pin D-Sub male connector                           |
| Temperature range:        | 0 to 60 °C (with forced cooling)                      |

### Simplified block diagram



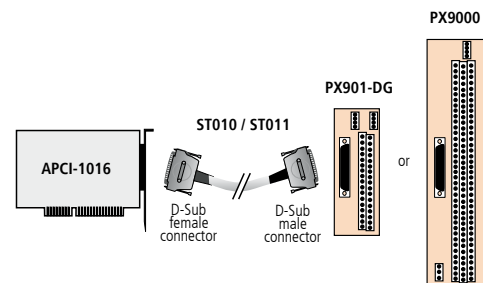
### Pin assignment – 37-pin D-Sub male connector



### ADDI-DATA connection

#### APCI-1016

Screw terminal panels PX9000 and PX901-DG with cable ST010



## Ordering information

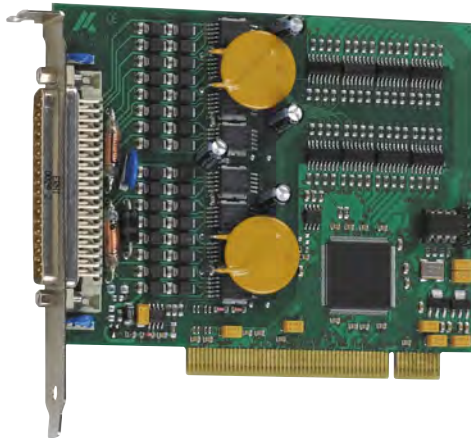
### APCI-1016

Digital input board, optically isolated, 16 digital inputs, 24 V. Incl. technical description and software drivers

### Accessories

|                  |   |
|------------------|---|
| <b>PX901-D:</b>  | Screw terminal panel, LED status display                    |
| <b>PX901-DG:</b> | Screw terminal panel, LED status display, for DIN rail      |
| <b>PX9000:</b>   | 3-row screw terminal panel for DIN rail, LED status display |
| <b>ST010:</b>    | Standard round cable, shielded, twisted pairs, 2 m          |
| <b>ST011:</b>    | Standard round cable, shielded, twisted pairs, 5 m          |

# Digital output board, optically isolated, 32 digital outputs, 24 V / 5 V



PCI 32-bit

Also for  
PCI EXPRESS See APCle-2032  
page 134



LabVIEW™



LabWindows/CVI™



## Features

- 32 digital outputs, 24 V (APCI-2032) or as 5 V version (APCI-2032-5), optically isolated
- Output current per channel: 500 mA
- Voltage range: 10 V to 36 V
- Diagnostic report, through status register at short-circuits, overtemperature, voltage drop or watchdog
- Programmable watchdog for resetting the outputs to "0", function release through software
- Interrupt triggered through error
- At Power-On the outputs are reset to „0“

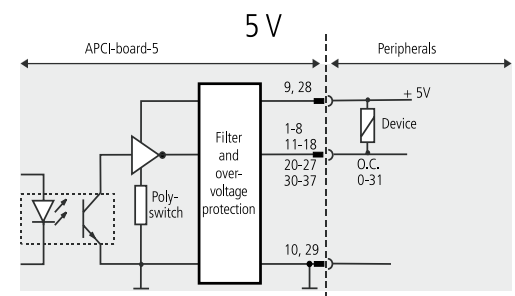
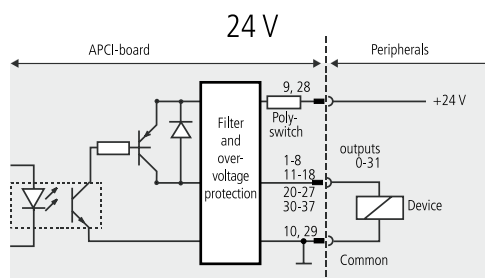
## Safety features

- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Protection against fast transients (burst), overvoltage, electrostatic discharge and high-frequency EMI
- Maximum output current for 32 outputs 6 A typ. (2 x 3 A)
- 24 V power outputs with protection diodes and filters
- Self-resetting fuse (electronic fuse)
- Short-circuit current per output 1.5 A typ.
- Output capacitors against electromagnetic emissions
- Fast demagnetisation in case of inductive loads
- External 24 V voltage supply screened and filtered

## Applications

- Signal switching
- Interface to electromechanical relays
- Automatic test equipment
- ON/OFF monitoring of motors, lights...
- Watchdog timer • Machine interfacing

## Connection principle of the outputs at 24 V (APCI-2032) and 5 V (APCI-2032-5)



## APCI-2032 /APCI-2032-5

32 digital outputs, 24 V or 5 V,  
500 mA/channel

Optical isolation 1000 V

Output filters, short-circuit protection

Watchdog

The outputs are reset to "0"  
at Power-On

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- .NET
- Microsoft VC++ • Borland C++
- Visual Basic • Delphi
- LabVIEW • LabWindows/CVI • DIAdem

### ADDIPACK functions:

Digital output • Watchdog

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)

## Specifications

### Digital outputs

|  |  |
|--|--|
| Outputs:   | 32   |
| Output type:   | High-side (load to ground) acc. to IEC 1131-2  |
| Optical isolation:   | through opto-couplers, 1000 V from PC to peripheral  |
| Nominal voltage:   | 24 V (APCI-2032); or 5 V (APCI-2032-5)   |
| Supply voltage:  | for 24 V version: 10 V to 36 V<br>for 5 V version: 5 V to 12 V via front connector   |
| Max. current for 32 outputs:   | 6 A typ. (2x3 A)   |
| Output current:  | 500 mA max./channel  |
| Short-circuit current/output shutdown at 24 V, $R_{load} < 0.1 \Omega$ : | 1.5 A  |
| RDS ON resistance:   | 0.4 $\Omega$ max.  |
| Switch-on time:  | $I_{out}=0.5 \text{ A}$ , load = resistance: 94 $\mu\text{s}$ typ. (APCI-2032)<br>$I_{out}=50 \text{ mA}$ , load = resistance: 250 $\mu\text{s}$ typ. (APCI-2032-5V) |
| Switch-off time:   | $I_{out}=0.5 \text{ A}$ , load = resistance: 8 $\mu\text{s}$ typ. (APCI-2032)<br>$I_{out}=50 \text{ mA}$ , load = resistance: 3 $\mu\text{s}$ typ. (APCI-2032-5V)    |
| Overtemperature (shutdown):  | 170 °C (output driver)   |
| Temperature hysteresis:  | 20 °C (output driver)  |

### Safety

Shut-down logic ( $V_{CC}$  diagnostic): If the ext. 24 V voltage drops below 5 V, then the outputs are switched off.

CC-Diagnostics: Pin 19: status bit or interrupt to the PC

Watchdog: 8-bit, programmable, 20 ms up to 5 s in steps of 20 ms

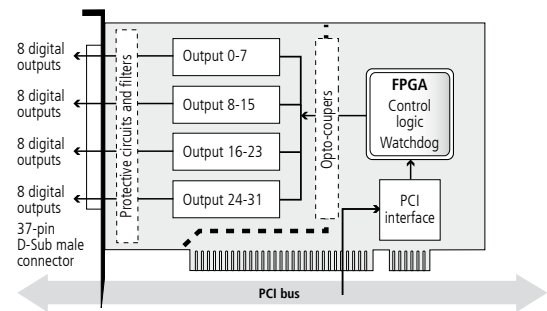
### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### Physical and environmental conditions

|                      |   |
|----------------------|---|
| Dimensions:          | 131 x 99 mm                                       |
| System bus:          | PCI 32-bit 5 V acc. to specification 2.1 (PCISIG) |
| Space required:      | 1 PCI slot  |
| Operating voltage:   | +5 V, $\pm 5 \%$ from the PC                      |
| Current consumption: | 230 mA $\pm 10 \%$ typ.                           |
| Front connector:     | 37-pin D-Sub male connector                       |
| Temperature range:   | 0 to 60 °C (with forced cooling)                  |

### Simplified block diagram



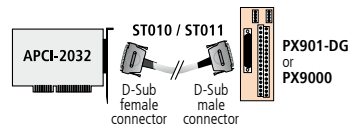
### Pin assignment – 37-pin D-Sub male connector

|    |    |                     |
|----|----|---------------------|
| 20 | 1  | Dig. output 0       |
| 21 | 2  | Dig. output 2       |
| 22 | 3  | Dig. output 4       |
| 23 | 4  | Dig. output 6       |
| 24 | 5  | Dig. output 8       |
| 25 | 6  | Dig. output 10      |
| 26 | 7  | Dig. output 12      |
| 27 | 8  | Dig. output 14      |
| 28 | 9  | Nom. voltage ext.   |
| 29 | 10 | GND                 |
| 30 | 11 | Dig. output 16      |
| 31 | 12 | Dig. output 18      |
| 32 | 13 | Dig. output 20      |
| 33 | 14 | Dig. output 22      |
| 34 | 15 | Dig. output 24      |
| 35 | 16 | Dig. output 26      |
| 36 | 17 | Dig. output 28      |
| 37 | 18 | Dig. output 30      |
|    | 19 | Diagnostic (at 24V) |

### ADDI-DATA connection

#### Example 1

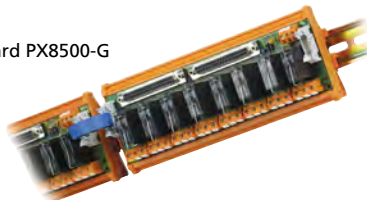
Connection of the outputs through screw terminal panels



Screw terminal panel PX901-DG with cable ST010

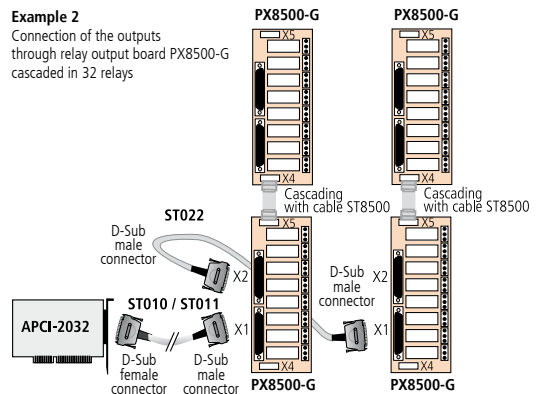


Relay output board PX8500-G



#### Example 2

Connection of the outputs through relay output board PX8500-G cascaded in 32 relays



## Ordering information

### APCI-2032 /APCI-2032-5

**APCI-2032:** Digital output board, optically isolated, 32 digital outputs, 24 V. Incl. technical description and software drivers

**APCI-2032-5:** Digital output board, optically isolated, 32 digital outputs, 5 V. Incl. technical description and software drivers

### Accessories

**PX901-D:** Screw terminal panel, LED status display

**PX901-DG:** Same as PX901-D, for DIN rail

**PX 901-ZG:** Screw terminal panel (only APCI-2032-5)

**PX9000:** 3-row screw terminal panel for DIN rail, LED status display

**PX8500-G:** Relay output board for DIN rail, cascable

**ST010:** Standard round cable, shielded, twisted pairs, 2 m

**ST011:** Standard round cable, shielded, twisted pairs, 5 m

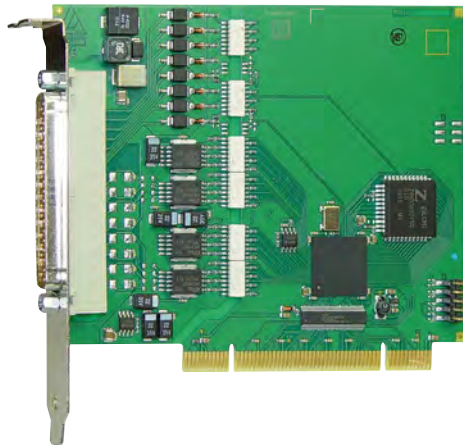
**ST010-5:** Same as ST010, for high currents (24 V supply separate)

**ST022:** Round cable between two PX8500-G, shielded, 2 m

**ST8500:** Ribbon cable for cascading two PX8500-G



# Digital output board, optically isolated, 16 digital outputs, 24 V



PCI 32-bit



Windows  
64/32-bit drivers



LabVIEW™



LabWindows/CVI™



## Features

- 16 optically isolated digital outputs, 10 V to 36 V
- Output current per channel 500 mA
- Watchdog for resetting the outputs to "0"
- One ground line for all outputs
- At Power-On, the outputs are reset to "0"

## Safety features

- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Protection against fast transients (burst), overvoltage, electrostatic discharge and high-frequency EMI
- Short-circuit current for 16 outputs ~ 3 A typ.
- Short-circuit current per output ~ 1.5 A typ.
- Self-resetting fuse (electronic fuse)
- Overtemperature and overvoltage protection
- 24 V power outputs with protection diodes and filters
- Output capacitors against electromagnetic emissions
- External 24 V voltage supply screened and filtered
- Shutdown logic, when the external supply voltage drops below 5 V
- Diagnostic function for detecting short-circuits and overtemperature

## APCI-2016

16 digital outputs, 24 V, 500 mA/channel

Optical isolation 1000 V

Output filter, short-circuit protection

Watchdog

The outputs are reset to "0"

at Power-On

## Applications

- Control of industrial PC-based processes
- Signal switching
- Interface to electromechanical relays
- Automatic test equipment
- ON/OFF monitoring of motors, lights...
- Watchdog timer
- Machine interfacing, ...

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

## Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

## Drivers and samples for the following compilers and software packages:

- .NET
- Microsoft VC++ • Borland C++
- Visual Basic • Delphi
- LabVIEW • LabWindows/CVI • DIAdem

## ADDIPACK functions:

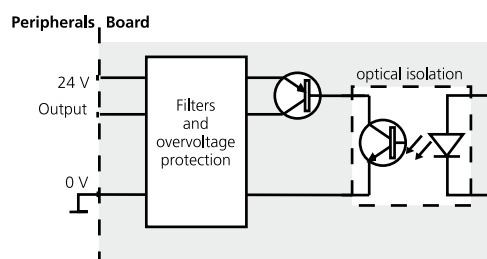
Digital output • Watchdog

## On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)

## Protective circuit for the output channels



## Specifications

### Digital outputs

|  |   |
|--|---|
| Number of outputs:   | 16  |
| Optical isolation:   | Through opto-couplers, 1000 V from PC to peripheral |
| Output type:   | High-side (load to ground) acc. to IEC 1131-2       |
| Nominal voltage:   | 24 V  |
| Supply voltage:  | 10 V to 36 V, min. 5 V (via front connector)        |
| Max. current for 16 outputs:   | 3 A typ.  |
| Output current/output:   | 500 mA max.   |
| Short-circuit current/output shutdown at 24 V, $R_{load} < 0.1 \Omega$ : | 1.5 A   |
| RDS ON resistance:   | 0.4 $\Omega$ max.                                   |
| Switch-on time:  | $I_{out}=0.5$ A, load = resistance: 100 $\mu$ s     |
| Switch-off time:   | $I_{out}=0.5$ A, load = resistance: 60 $\mu$ s      |
| Overttemperature (shutdown):   | 170 °C (output driver)                              |
| Temperature hysteresis:  | 20 °C (output driver)                               |

### Safety

|                 |  |
|-----------------|--|
| Shutdown logic: | When the ext. 24 V voltage drops below 5 V:<br>The outputs are switched off. |
| Watchdog:       | 8-bit, programmable, 20 ms up to 5 s<br>in steps of 20 ms                    |

### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

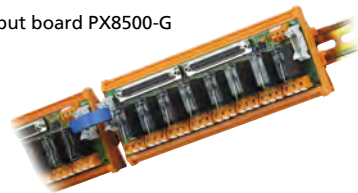
### Physical and environmental conditions

|                      |   |
|----------------------|---|
| Dimensions:          | 131 x 99 mm   |
| System bus:          | PCI 32-bit 3.3/5 V acc. to specification 2.1 (PCISIG) |
| Space required:      | 1 PCI slot  |
| Operating voltage:   | +5 V, $\pm 5$ % from the PC                           |
| Current consumption: | 233 mA $\pm 10$ % typ.                                |
| Front connector:     | 37-pin D-Sub male connector                           |
| Temperature range:   | 0 to 60 °C (with forced cooling)                      |

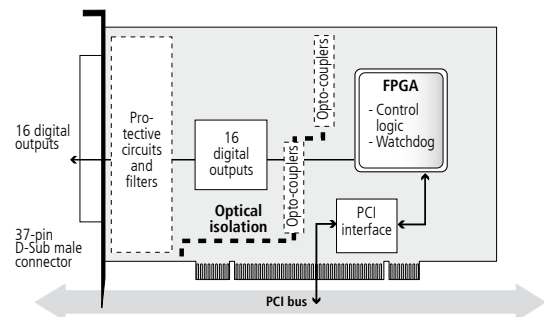
Screw terminal panel PX901-DG  
with cable ST010



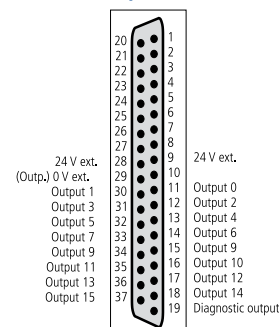
Relay output board PX8500-G



### Simplified block diagram



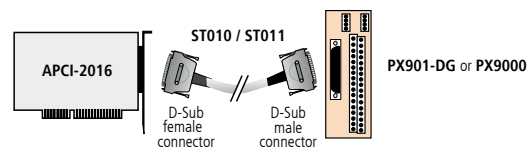
### Pin assignment – 37-pin D-Sub male connector



### ADDI-DATA connection

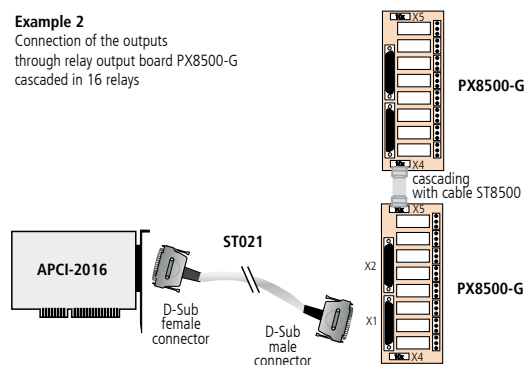
#### Example 1

Connection of the outputs through screw terminal panels



#### Example 2

Connection of the outputs through relay output board PX8500-G cascaded in 16 relays



## Ordering information

### APCI-2016

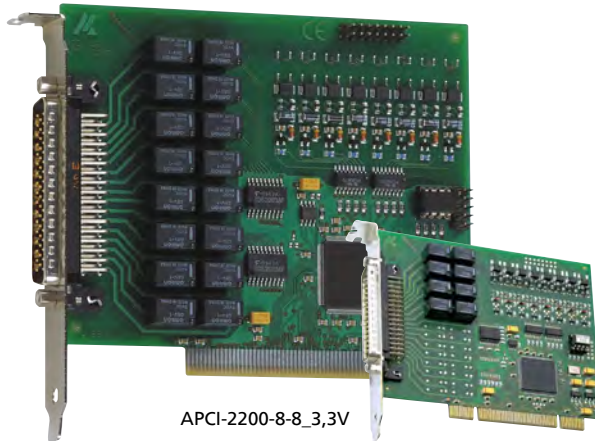
Digital output board, optically isolated, 16 digital outputs, 24 V. Incl. technical description and software drivers

### Accessories

|                  |   |
|------------------|---|
| <b>PX901-D:</b>  | Screw terminal panel, LED status display                    |
| <b>PX901-DG:</b> | Screw terminal panel, LED status display, for DIN rail      |
| <b>PX9000:</b>   | 3-row screw terminal panel for DIN rail, LED status display |
| <b>PX8500-G:</b> | Relay output board for DIN rail, cascable                   |

|                 |  |
|-----------------|--|
| <b>ST010:</b>   | Standard round cable, shielded, twisted pairs, 2 m                       |
| <b>ST011:</b>   | Standard round cable, shielded, twisted pairs, 5 m                       |
| <b>ST010-S:</b> | Same as ST010, for high currents (separate 24 V supply)                  |
| <b>ST021:</b>   | Round cable between APCI-2016 and PX8500-G, shielded, twisted pairs, 2 m |
| <b>ST8500:</b>  | Ribbon cable for cascading two PX8500-G                                  |

# Relay board, optically isolated, 8/16 relays, 8 digital inputs, 24 V



APCI-2200-8-8\_3,3V



PCI 32-bit

Also for  
**PCI EXPRESS** See APCle-2200  
page 136



Windows  
64/32-bit drivers



LabVIEW™



LabWindows/CVI™



## Features

- PCI 5 V (APCI-2200)
- PCI 3.3 V (APCI-2200-8-8\_3,3V)

### Relays

- 8 or 16 electromechanical relays with change-over contacts
- Max. switching voltage for the relays: 60 VDC, 48 VAC
- Max. switching capacity: 30 W, max. 1 A
- Short response time
- Watchdog: switched on/off through software

### Digital inputs

- 8 inputs, optically isolated
- Input voltage: 12-24 V (DC)

### Safety features

- EMC tested
- Watchdog activity can be read back
- Optical isolation of the relays
- Creeping distance IEC 61010-1

## Applications

- Industrial digital I/O controlling
- Automatic test equipment
- Signal switching
- Interface to electromechanical relays
- ON/OFF monitoring of motors, lights...
- Alarm monitoring
- Machine interfacing
- ...

## APCI-2200 /APCI-2200-8-8\_3,3V

PCI 5 V (APCI-2200)

PCI 3.3 V (APCI-2200-8-8\_3,3V)

8 or 16 relay output channels

Max. switching voltage 60 VDC, 48 VAC

max. switching current 1 A

8 digital inputs 24 V

Optical isolation 1000 V

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- .NET
- Microsoft VC++ • Borland C++
- Visual Basic • Delphi
- LabVIEW • LabWindows/CVI • DIAdem

### ADDIPACK functions:

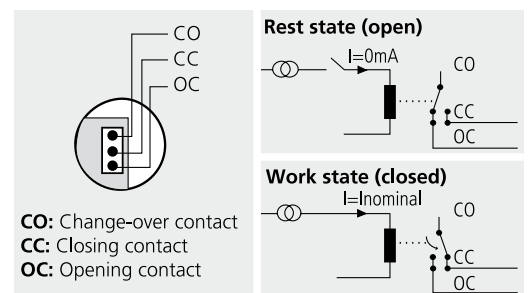
Digital output • Watchdog

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)

## Function principle of the relays



## Specifications

### Relays

|                          |  |
|--------------------------|--|
| Type of contacts:        | 8/16 change-over                         |
| Max. switching voltage:  | 60 VDC, 48 VAC                           |
| Max. switching current:  | 1 A                                      |
| Max. switching capacity: | 30 W                                     |
| Contact resistance:      | < 100 mΩ                                 |
| Contact material:        | Ag and Au plated                         |
| Response time:           | Max. 5 ms, typ. 2.5 ms                   |
| Release time:            | Max. 5 ms, typ. 0.9 ms                   |
| Mechanical life:         | 5 x 10 <sup>6</sup> operations           |
| Electrical life:         | 10 <sup>5</sup> operations at rated load |

### Digital inputs

|  |                               |
|--|-------------------------------|
| Number of inputs:                        | 8                             |
| Optical isolation:                       | Through opto-couplers, 1000 V |
| Nominal voltage:                         | 12 - 24 V (DC)                |
| Nominal input current at 12 - 24 V (DC): | 5 - 8 mA                      |
| Signal delay:                            | 70 μs (at 24 V)               |
| Maximal input frequency:                 | 5 kHz (at 24 V)               |

### Watchdog

|                |                                |
|----------------|--------------------------------|
| Watchdog time: | 20 ms to 5 s in steps of 20 ms |
|----------------|--------------------------------|

### Safety

|               |   |
|---------------|---|
| Test voltage: | 1000 V  |
| Watchdog:     | 8-bit, programmable, 20 ms to 5 s in steps of 20 ms |

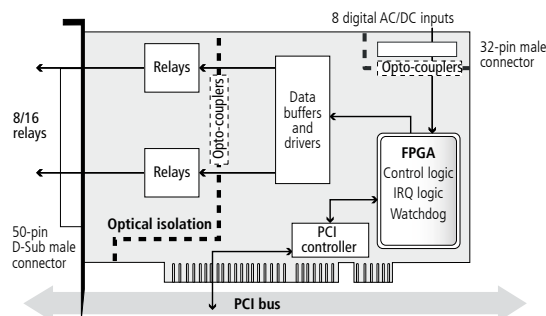
### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### Physical and environmental conditions

|                       |  |
|-----------------------|--|
| Dimensions:           | 131 x 99 mm  |
| System bus:           | PCI 32-bit 5 V acc. to specification 2.1 (PCISIG) or 3.3 V   |
| Space required:       | 1 PCI slot   |
| Operating voltage:    | +5 V ± 5 % from the PC   |
| Current consumption:  | 550 mA ± 10 % typ. (APCI-2200-16-8)  |
| Front connector:      | 50-pin D-Sub male connector  |
| Additional connector: | 16-pin male connector.<br>APCI-2200-16-8: Connection with delivered ribbon cable FB2200-3.<br>Connects the board to a bracket with a 37-pin D-Sub male connector.<br>For connecting the PX 901-ZG. |
| Temperature range:    | 0 up to 60 °C (with forced cooling)  |

### Simplified block diagram



### Pin assignment – 50-pin D-Sub connector APCI-2200-16-8

| Pin |  | Pin |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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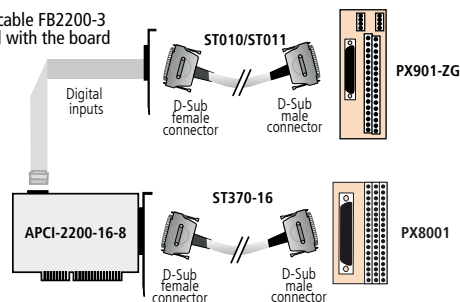
OC: Opening contact CC: Closing contact CO: Change-over contact

### ADDI-DATA connection

#### Example 1: APCI-2200-16-8

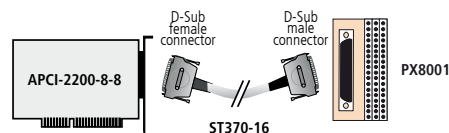
- Connection of the relay outputs through screw terminal panel PX8001
- Connection of the digital inputs through ribbon cable to the screw terminal panel PX901-ZG

Ribbon cable FB2200-3 supplied with the board



#### Example 2: APCI-2200-8-8, APCI-2200-8, APCI-2200-16

Connection of the relay outputs and the digital inputs through the front connector to the screw terminal panel



Screw terminal panel PX8001 with cable ST370-16

## Ordering information

### APCI-2200 /APCI-2200-8-8\_3,3V

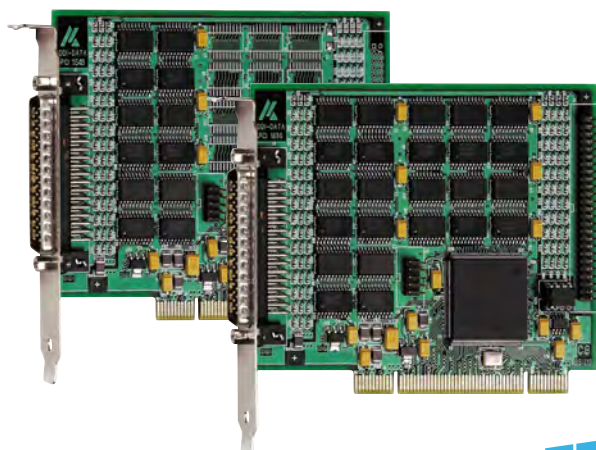
Relay board, optically isolated, 8/16 relays output channels, 8 digital inputs, 24 V. Incl. technical description and software drivers.

|                            |  |
|----------------------------|--|
| <b>APCI-2200-16-8:</b>     | 16 relays, 8 dig. inputs, with ribbon cable for the connection of the dig. inputs, PCI 5 V |
| <b>APCI-2200-8-8:</b>      | 8 relays, 8 digital inputs, 24 V, PCI 5 V  |
| <b>APCI-2200-8-8_3,3V:</b> | 8 relays, 8 digital inputs, 24 V, PCI 3.3 V  |
| <b>APCI-2200-16:</b>       | 16 relays, PCI 5 V   |
| <b>APCI-2200-8:</b>        | 8 relays, PCI 5 V  |

### Accessories

|                   |   |
|-------------------|---|
| <b>PX8001:</b>    | 3-row screw terminal panel, 50-pin, for DIN-rail mounting |
| <b>ST370-16:</b>  | Shielded round cable, 2 m                                 |
| <b>PX 901-ZG:</b> | Screw terminal panel for DIN rail                         |

# TTL I/O board, 48 or 96 digital TTL inputs and outputs



PCI 32-bit



## Features

- PCI 3.3 V or 5 V
- 48 digital TTL inputs/outputs (APCI-1648)
- 96 digital TTL inputs/outputs (APCI-1696)
- Each group of 8 lines (1 port) can be configured as input or output.
- All I/Os are driven through pull-up resistors to 5 V
- Easy programming through I/O read/write commands

## Connection

- APCI-1648: 50-pin D-Sub male connector
- APCI-1696: 50-pin D-Sub male connector and I/O 49 - 96 to 50-pin male connector

## Software drivers

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- .NET
- Microsoft VC++ • Borland C++
- Visual Basic • Delphi
- LabVIEW • LabWindows/CVI

### ADDIPACK functions:

Digital input • Digital output

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)

APCI-1696 – 96 digital TTL I/O

APCI-1648 – 48 digital TTL I/O

Driver capacity up to 15 TTL loads

Can be configured as inputs

or outputs in groups of 8 channels

Filters on each I/O line

## Specifications

### 48 TTL I/O channels - 96 TTL I/O channels

|                                |  |
|--------------------------------|--|
| Inputs and outputs:            | 48 digital TTL I/O (APCI-1648)<br>96 digital TTL I/O (APCI-1696) |
| I/O address range:             | 128 byte   |
| Addressing:                    | 32-bit   |
| Programming:                   | Through write/read commands                                      |
| Driver type:                   | 74 HC 574  |
| Max. input and output voltage: | TTL Level  |
| Output current:                | DC $\pm$ 35 mA   |

### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### Physical and environmental conditions

|                      |   |
|----------------------|---|
| Dimensions:          | 131 x 99 mm   |
| System bus:          | universal PCI 32-bit 3.3/5V<br>acc. to spec. 2.2 (PCISIG)   |
| Space required:      | 1 PCI slot<br>+ 1 slot opening for bracket (APCI-1696)  |
| Operating voltage:   | +5 V $\pm$ 5 % from the PC  |
| Current consumption: | 124 mA $\pm$ 10 %<br>(APCI-1696: all channels as output without load)   |
| Connectors:          | APCI-1648: 50-pin D-Sub male connector<br>APCI-1696: 50-pin D-Sub male connector<br>50-pin D-Sub male connector and<br>I/O 49 - 96 to 50-pin male connector |
| Temperature range:   | 0 to 60 °C (with forced cooling)  |

## Ordering information

**APCI-1648:** TTL I/O board, 48 digital TTL inputs and outputs. Incl. technical description and software drivers.

**APCI-1696:** TTL I/O board, 96 digital TTL inputs and outputs.

Incl. ribbon cable FB1696, technical description and software drivers.

### Accessories

**PX8001:** 3-row screw terminal panel, 50-pin, for DIN-rail mounting

**ST370-16:** Shielded round cable, 2 m

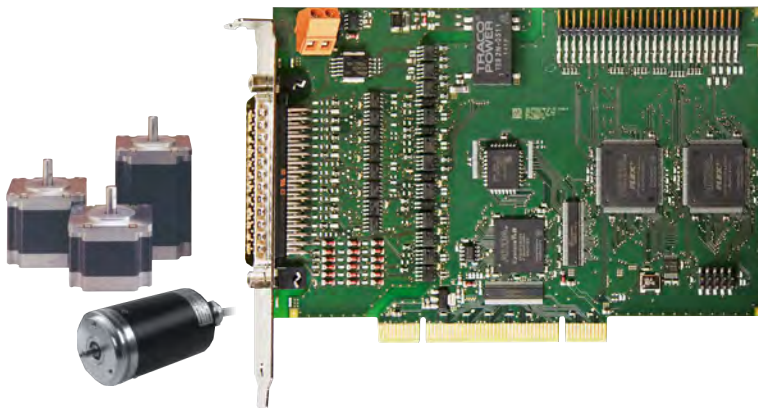
**Accessories for the APCI-1696: Please order 2 x PX8001 and 2 x ST370-16**





This image shows a full page of blank graph paper. The grid consists of small, equal-sized squares formed by thin black lines. There are no margins, text, or other markings on the page.

# Multifunction counter board, optically isolated, encoder, incremental counter, timer/counter, SSI, PWM, ...



**Also for** CompactPCI™  
See CPCI-1710, page 246

**Also for** PCI EXPRESS™  
see APCle-1711  
page 140

**Also for** CompactPCI™ Serial  
See CPCI-1711, page 234



for SSI, incremental  
counter, digital I/O

The board APCI-1710 is a fast multifunction and multi-channel counter board for the PCI bus. The strengths of this board are its wide range of applications and high precision and reliability for rough industrial applications. With this board you can realise many different applications on the same hardware base. The board is supplied with a pool of functions which provides the user with maximum efficiency yet minimum space and parts requirement. The functions are individually configured for each channel through the supplied software. The flexible programming facilities on this board allow many different user applications to be quickly and easily developed and reconfigured as further requirements arise. Thanks to the FPGA board structure, further counting applications can be realised through software adaptation. Contact us!

## Features

- 32-bit data access
- Up to 5 MHz input frequency
- Signals in TTL or RS422 mode (APCI-1710), 24 V signals (APCI-1710-24V)
- Four onboard function modules
- Reprogrammable functions

## Functions

- Incremental counter for the acquisition of incremental encoders (90° phase-shifted signals)
- SSI synchronous serial interface. The SSI function is an interface for systems which allow an absolute position information via serial data transfer.
- Counter/timer (82C54)
- Pulse acquisition
- Frequency measurement
- Pulse width modulation (PWM)
- Period duration measurement
- Velocity measurement
- Digital inputs and outputs
- Edge time measurement (ETM)
- Customised functions

## Available channels for all four function modules

- 20 channels for digital inputs, optically isolated
- 8 channels, programmable either as digital inputs or outputs, optically isolated
- 4 digital power outputs, optically isolated

## Available lines for each function module

8 lines are available for each function module

## APCI-1710

### Available functions:

incremental counter, SSI synchronous serial interface, counter/timer, pulse acquisition, frequency/pulse width/period duration/velocity measurement, PWM, digital inputs and outputs, ...

### Function selection through software

### Optical isolation

TTL, RS422, 24 V

## Versions

|                         | RS422/<br>TTL I/O | 24 V<br>inputs | 5 V<br>inputs | 24 V<br>outputs | 5 V<br>outputs | TTL I/O |
|-------------------------|-------------------|----------------|---------------|-----------------|----------------|---------|
| <b>APCI-1710</b>        | 16                | 12             | –             | 4               | –              | 28      |
| <b>APCI-1710-24V</b>    | –                 | 28             | –             | 4               | –              | 28      |
| <b>APCI-1710-5V-I</b>   | 16                | –              | 12            | 4               | –              | 28      |
| <b>APCI-1710-5V-I-O</b> | 16                | –              | 12            | 4               | 4              | 28      |

## Safety features

- Creeping distance IEC 61010-1
- Optical isolation 1000 V
- Noise neutralisation of the PC supply

## Applications

- Event counting • Position acquisition
- Motion control • Batch counting
- ...

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- .NET
- Microsoft VC++ • Microsoft C
- Borland C++ • Borland C
- Visual Basic • Delphi
- LabVIEW

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads) menu  
The software functions can be adapted to your applications on request. The board can also be implemented for other software applications.

Each of the four modules is programmed with one function. You can program 4 times the same function or freely combine 4 different functions.

| Function module 0 | Function module 1 | Function module 2                 | Function module 3     |
|-------------------|-------------------|-----------------------------------|-----------------------|
| 3 x SSI           | 3 x SSI           | 1 x 32-bit<br>Incremental counter | 8 x Digital I/O, 24 V |

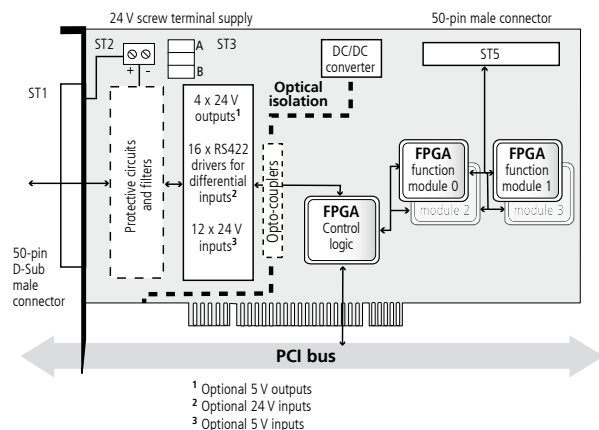
Each onboard module can be programmed with the function of your choice. You can simultaneously operate up to 4 different functions on one board. If your application must be modified, you can load a new function quickly and easily per mouse click in the SET1710 configuration program which is delivered with the board.

| Application                        | Max. number of signal generators or functions for each function module | Max. number of function modules for each APCI-1710 | Max. number of signal generators or functions of each APCI-1710 | Page |
|------------------------------------|--|--|---|------|
| <b>Incremental counter</b>         | 1 (32-bit)<br>or 2 (16-bit)  | 4  | 4 or 8  | 180  |
| <b>SSI<sup>[1]</sup></b>           | 3  | 4  | 12  | 180  |
| <b>Chronos</b>                     | 1  | 4  | 4   | 181  |
| <b>Counter/Timer<sup>[2]</sup></b> | 3  | 4  | 12  | 182  |
| <b>TOR</b>                         | 2  | 4  | 8   | 183  |
| <b>Pulse acquisition</b>           | 4  | 4  | 16  | 184  |
| <b>PWM<sup>[2]</sup></b>           | 2  | 4  | 8   | 184  |
| <b>ETM</b>                         | 2  | 4  | 8   | 185  |
| <b>Digital I/O</b>                 | 8  | 4  | 32  | 185  |
| <b>TTL</b>                         | 24   | 1  | 24  | –    |

<sup>[2]</sup> Can be used only to a limited extent for the APCI-1710-24V

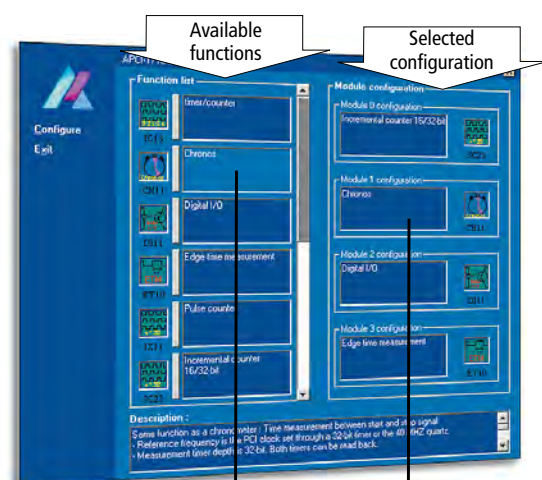


**Customer-tailored modifications,**  
designed to suit your needs.  
Hardware and software, firmware, PLDs, ...  
**Contact us!**



| Pin |       | Pin |     |    |    | Pin |        |
|-----|-------|-----|-----|----|----|-----|--------|
| 34  | +UREF | 18  | A2+ | 34 | 18 | 1   | EXTGND |
| 35  | H0*   | 19  | A2- | 35 |    | 2   | A0+    |
| 36  | H1*   | 20  | B2+ | 36 |    | 3   | A0-    |
| 37  | H2*   | 21  | B2- | 37 |    | 4   | B0+    |
| 38  | H3*   | 22  | C2+ | 38 |    | 5   | B0-    |
| 39  | E0*   | 23  | C2- | 39 |    | 6   | C0+    |
| 40  | E1*   | 24  | D2+ | 40 |    | 7   | C0-    |
| 41  | E2*   | 25  | D2- | 41 |    | 8   | D0+    |
| 42  | E3*   | 26  | A3+ | 42 |    | 9   | D0-    |
| 43  | F0*   | 27  | A3- | 43 |    | 10  | A1+    |
| 44  | F1*   | 28  | B3+ | 44 |    | 11  | A1-    |
| 45  | F2*   | 29  | B3- | 45 |    | 12  | B1+    |
| 46  | F3*   | 30  | C3+ | 46 |    | 13  | B1-    |
| 47  | G0*   | 31  | C3- | 47 |    | 14  | C1+    |
| 48  | G1*   | 32  | D3+ | 48 |    | 15  | C1-    |
| 49  | G2*   | 33  | D3- | 49 |    | 16  | D1+    |
| 50  | G3*   |     |     | 50 | 33 | 17  | D1-    |

\*Each number corresponds to the number of the function module



Click the function you want to load. Hold the mouse key pressed ...

... and drag the function to the selected function module

## Function Incremental counter

Up to 2 incremental encoders can be connected to a module programmed with the function **Incremental counter**.

- 90° phase-shifted input signals (displacement measurement systems)
- Motion control
- Pulse width and frequency measurement
- Incremental encoder acquisition
- Tolerance measurement
- Velocity measurement
- Rotation measurement
- Electronic “mouse”

### Function range of the counter component

- Simple, double, quadruple analysis of 2 phase-shifted clock signals (A, B)
- Direction detection for upwards or downwards counting
- Hysteresis circuit for the suppression of the first pulse after a change in rotation; can be switched off
- 2 x 32-bit data latches, individually programmable for internal / external strobe, latch strobe synchronised with internal clock
- Operating mode is defined by an internal mode register, loadable and readable through the data bus
- Strobe inputs which can be triggered either through 2 external pins (24 V input) or by writing in a register
- Interrupt indication triggered through the external strobe inputs
- Compare logic, interrupt logic and reference point logic

### Used signals

| Signal name | Pin name | Signal type                        | Function   |
|-------------|----------|------------------------------------|--|
| A_x         | Ax +/-   | Diff./TTL/24 V*                    | Trace A of the incremental encoder (32-bit) or Trace A of the incremental encoder 0 (16-bit) |
| B_x         | Bx +/-   | Diff./TTL/24 V*                    | Trace B of the incremental encoder (32-bit) or Trace B of the incremental encoder 0 (16-bit) |
| INDEX_x     | Cx +/-   | Diff./TTL/24 V*                    | Index trace of the incremental encoder (32-bit)  |
| C_x         | Cx +/-   | Diff./TTL/24 V*                    | Trace A of the incremental encoder 1 (2x16-bit)  |
| UAS_x       | Dx +/-   | Diff./TTL/24 V*                    | Error signal input (32-bit)  |
| D_x         | Dx +/-   | Diff./TTL/24 V*                    | B signal of the incremental encoder 1 (2x16-bit)   |
| REF_x       | Ex       | 24 V / optional 5 V                | Digital input<br>(can also control the reference point logic)                                |
| ExtStrb_a_x | Fx       | 24 V / optional 5 V<br>Active High | Digital input<br>(can be used for the latch logic or interrupt logic)                        |
| ExtStrb_b_x | Gx       | 24 V / optional 5 V<br>Active High | Digital input<br>(can be used for latch logic or interrupt logic)                            |
| DIG_OUT_x   | Hx       | 24 V / optional 5 V                | Digital output   |

x: Number of the function module (See pin assignment page 179)

\* 24 V for the APCI-1710-24V

## Function Synchronous serial interface (SSI)

The function module is programmed as a synchronous serial interface. The **SSI** function is an interface for systems which an absolute position output through serial data transfer.

### Typical application examples:

- Acquisition of displacement measurement systems
- Axis control (X, Y and Z)
- Tolerance measurement ...



### Properties

- 4 function modules for each board, up to 3 SSI sensors per function module
- Optical isolation of the inputs and outputs through opto-couplers to prevent ground loops
- Serial data transfer
- Common clock for all 3 sensor interfaces of one function module
- Clock frequency and number of data bits are software suitable
- GRAY to BINARY conversion possible
- For each function module, there are 3 digital inputs and 1 digital output for an additional function (no effect on SSI function)

### The interface includes:

- Three independent 32-bit SHIFT registers, which can be read through the data bus
- Clock and pulse generator
- Function and control logic

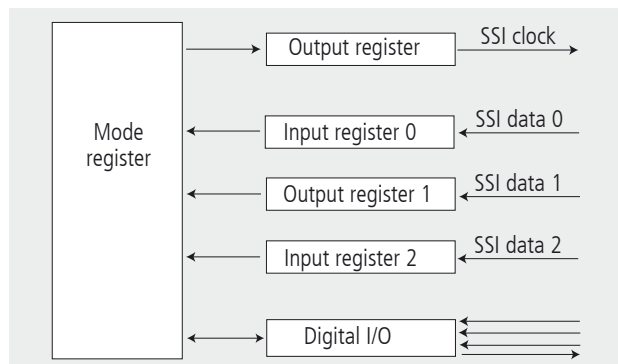
### Used signals

| Signal name | Pin name | Signal type         | Function                         |
|-------------|----------|---------------------|----------------------------------|
| Clock_x     | Ax +/-   | RS422               | Clock output for the SSI sensors |
| DATA1_x     | Bx +/-   | RS422/TTL           | Data input of SSI sensor 0       |
| DATA2_x     | Cx +/-   | RS422/TTL           | Data input of SSI sensor 1       |
| DATA3_x     | Dx +/-   | RS422/TTL           | Data input of SSI sensor 2       |
| Input1_x    | Ex       | 24 V / 5 V optional | Digital input 0                  |
| Input2_x    | Fx       | 24 V / 5 V optional | Digital input 1                  |
| Input3_x    | Gx       | 24 V / 5 V optional | Digital input 2                  |
| Output_x    | Hx       | 24 V / 5 V optional | Digital output                   |

x: Number of the function module (See pin assignment page 179)

The SSI function cannot be programmed on the APCI-1710-24V.

### Block diagram SSI



## Function Chronos

The function **Chronos** is a timer interface which allows to measure the time between two "events" like a chronometer.

3 functions are available:

- a 32-bit timer to create a time reference,
- a 32-bit measuring timer to determinate and measure the time between start and stop pulse.
- 3 digital inputs and 3 digital outputs

### Properties

- Optical isolation of the inputs and outputs through opto-couplers to prevent ground loops
- Interrupt status at the end of the measuring time
- Timer readable
- Input and output channels can be inverted through software, Software GATE possible

### Function description

The pulse signals from Timer 0 are counted between the start pulse signal and the stop pulse signal. The number of pulses is then stored in the measuring timer and can be read through I/O read commands. The timer 0 is used as a time reference generator. The divider factor is written in timer 0

and determines the output frequency.

The input frequency is set according to the PCI clock pulse or to the 10 MHz onboard clock generator. Timer 0 is synchronised with the start event or with the 40 MHz quartz of the board.

Timer 0 can be read at any time. The **Chronos** function can be used in 8 different modes.

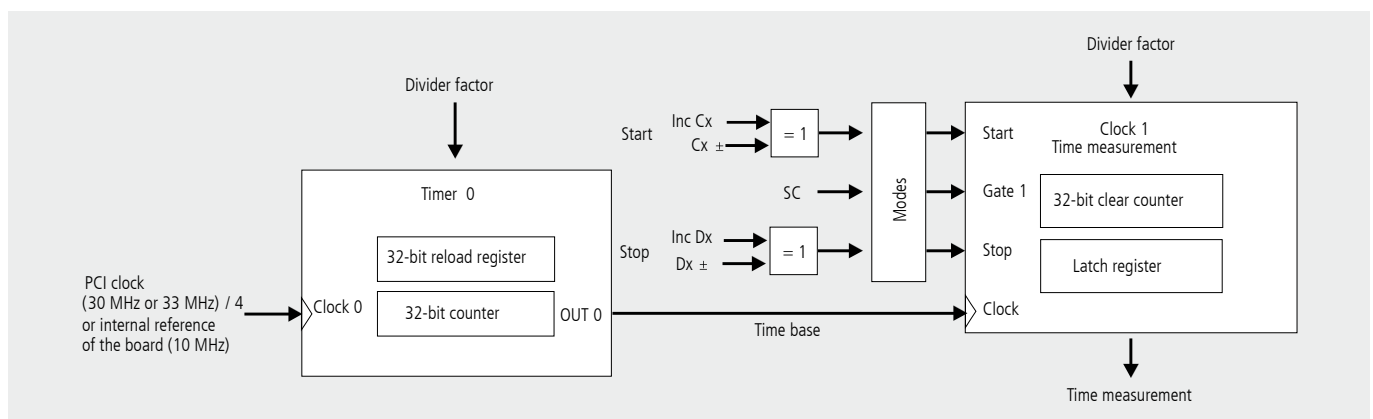
### Used signals

| Pin name | Signal type         | Function                                 |
|----------|---------------------|--|
| Ax +/-   | Diff./TTL, 24 V*    | Digital output 1; set to "0" after reset |
| Bx +/-   | Diff./TTL, 24 V*    | Digital output 2; set to "0" after reset |
| Cx +/-   | Diff./TTL/24 V*     | Start pulse for measuring                |
| Dx +/-   | Diff./TTL/24 V*     | Stop pulse for measuring                 |
| Ex       | 24 V / 5 V optional | Digital input 0, inverting               |
| Fx       | 24 V / 5 V optional | Digital input 1, inverting               |
| Gx       | 24 V / 5 V optional | Digital input 2, inverting               |
| Hx       | 24 V / 5 V optional | Digital output 0; set to "0" after reset |

x: Number of the function module (See pin assignment page 179)

\*24 V for the APCI-1710-24V

## Block diagram Chronos





## Function Counter/Timer

### Function equivalent to Intel 82C54

The module **Counter/Timer** can be used as a programmable interval counter/timer (similar to Intel 82C54) with 3 x 32-bit per module.

It generates time delays through software control. Instead of setting up timing loops in software, the user programs the module for the desired delays. After this delay, the module will interrupt the PC.

- Optical isolation of the inputs and outputs through opto-couplers to prevent ground loops
- 3 x 32-bit counters/timers, binary counting only
- 6 programmable modes
- Status readback and latch command
- Inputs and outputs can be inverted through software
- Hardware and software gate possible, readable
- Simple interface: no multiple assignment of the addresses
- Interrupt enabled with an individual release bit per counter/timer and interrupt status register
- Available clock: PCI clock divided by four (APCI-1710 only) or 10 MHz of the onboard quartz oscillator, selectable through software

#### Typical applications:

- Event counter
- Programmable rate generator
- Binary rate multiplier
- Square-wave generator
- Complex motor controller / signal generator

### Programmable modes

For each counter/timer (3 x 32-bit) there are 6 modes available: mode 0 to mode 5, which can be programmed independently.

#### Mode 0: Interrupt on terminal count

Mode 0 is particularly suitable for event counting. The output is initially set to "Low" and remains "Low" until the counter reaches 0.

The output then goes "High" and holds this state until a new count or a new counter value is written into the counter.

#### Mode 1: Hardware retriggerable one-shot

This mode is identical to mode 0 except for the GATE input. The GATE input is not used to activate or deactivate the timer, but to trigger it.

#### Mode 2: Pulse generator

In this mode the counter is dividing the choosed input clock through the start value "ul\_ReloadValue". Mode 2 is used for generating a real-time clock interrupt.

After initialization the output is set to "High". When the initial count has decremented to 1, the output goes "Low". For only one clock pulse the output is setted on "Low" then it goes back to "High". The counter reloads the start value ("ul\_ReloadValue") and the counter sequence is repeated. The number of sequences is unlimited. An interrupt can be generated at the end of the cycle. Calculation of time:  $(ul\_ReloadValue + 2) \times \text{input clock}$

#### Mode 3: Square wave mode

Mode 3 is used for baud rate generation. It is similar to mode 2 except for the duty cycle of the output. The output is initially set to "High". When half the initial count has expired, the output is set to "Low" for the remainder of the count. Mode 3 is periodic; the same sequence is repeated indefinitely. Calculation of time:  $(ul\_ReloadValue + 2) \times \text{input clock}$

#### Mode 4: Software-triggered strobe

The output is initially set to "High". When the initial count expires, the output goes "Low" for one clock pulse and then goes "High" again. The counting sequence is triggered by writing the initial count. If a new count is written during counting, it will be loaded on the next clock pulse and counting will continue from the new count.

#### Mode 5: Hardware-triggered strobe (retriggerable)

This mode is identical to mode 4 except for the GATE input. The GATE input is not used to activate or deactivate the timer, but to trigger it.

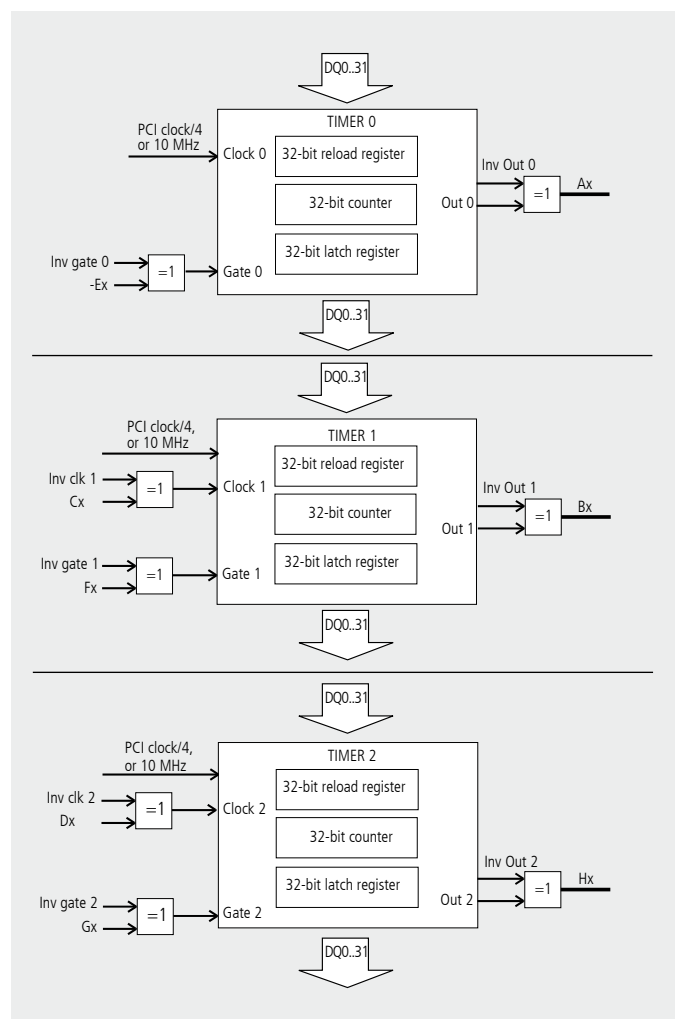
### Used signals

| Signal name | Pin name | Signal type           | Function                               |
|-------------|----------|-----------------------|--|
| OUT1_x      | Ax +/-   | Diff./TTL             | Output of counter/timer 0              |
| OUT2_x      | Bx +/-   | Diff./TTL             | Output of counter/timer 1              |
| OUT3_x      | Hx       | 24 V / 5 V opt.       | Output of counter/timer 2              |
| GATE1_x     | Ex       | 24 V / 5 V opt.       | GATE Input of counter/timer 0          |
| GATE2_x     | Fx       | 24 V / 5 V opt.       | GATE Input of counter/timer 1          |
| GATE3_x     | Gx       | 24 V / 5 V opt.       | GATE Input of counter/timer 2          |
| CLK1_x      | -        | -                     | Internal clock                         |
| CLK2_x      | Cx +/-   | Diff./TTL/ 24 V opt.  | Clock counter input of counter/timer 1 |
| CLK3_x      | Dx +/-   | Diff./ TTL/ 24 V opt. | Clock counter input of counter/timer 2 |

x: Number of the function module (See pin assignment page 179)

The Counter/Timer function is suited only to a limited extent for the APCI-1710-24V.

### Block diagram Counter/Timer



## Function TOR

The **TOR** function is a counter interface which allows counting input signals in a defined time interval.

2 TOR counters are available on each function module. Each TOR counter includes 2 x 32-bit timers.

The TOR function is a scaled-down version of the Counter/Timer function.

The pulse signal of Timer 1 gives the start and stop pulse signal to Timer 0. Timer 0 counts the input signals. After the stop signal from Timer 0 the number of pulses is stored and can be read through I/O read commands.

The timer 1 is used as a time reference generator.

The divider factor is written in timer 1 and determines the output frequency. The input frequency is set according to the PCI clock pulse or the 40 MHz on-board quartz clock. Timer 0 is synchronised with the start event.

### Pulse measurement

As soon as a start signal occurs from Timer 1, the Timer 0 is reset.

It counts the pulse signals of the channel A<sub>x</sub>(B<sub>x</sub>).

During the process the status bit "Counter in Progress" is set.

As soon as a stop signal occurs from Timer 1, the Timer 0 is stopped and the status bit "Counter in Progress" is reset.

An interrupt can also be generated. The value can then be read. The latest measured value is read in the counter measurement register.

### Properties

- Optical isolation of the inputs and outputs through opto-couplers to prevent ground loops
- Interrupt status at the end of the measuring period
- Inputs and output can be inverted through software
- Software GATE

The function **TOR** occupies 4 inputs (A to D) of the corresponding function module of the APCI-1710 or CPCI-1710.

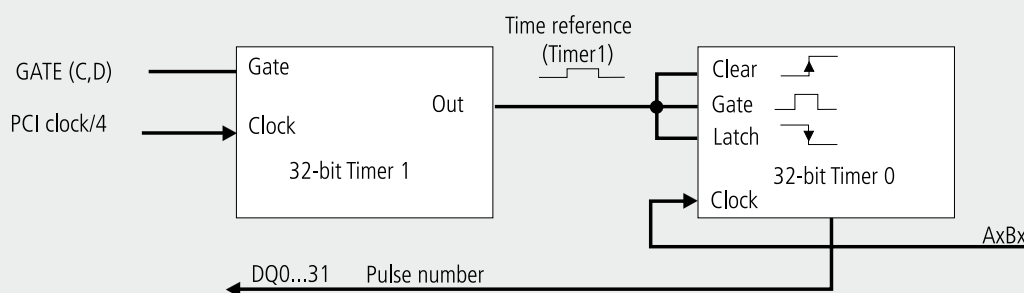
### Used signals

| Pin name | Signal type     | Function               |
|----------|-----------------|------------------------|
| Ax +/-   | Diff./TTL/24 V* | Digital input 1 (TOR1) |
| Bx +/-   | Diff./TTL/24 V* | Digital input 2 (TOR2) |
| Cx +/-   | Diff./TTL/24 V* | External Gate (TOR1)   |
| Dx +/-   | Diff./TTL/24 V* | External Gate (TOR2)   |

x: Number of the function module (see pin assignment page 179)

\*24 V for the APCI-1710-24V

### Block diagram TOR



## Function Pulse counter

The **Pulse counter** is an interface for the acquisition of external digital pulses. Each rising or falling edge on the counter input starts decrementing from the initially set counter value. An interrupt is generated at logical "0", i.e. the digital output is set or reset.

- 4 x 32-bit downward counters
- Optical isolation of the inputs and outputs through opto-couplers to prevent ground loops
- Each counter can be loaded with a predefined counter value
- Interrupt at overflow
- Output can be set or reset at overflow
- Polarity of the inputs selectable through software

The interface includes:

- 4 x 32-bit counters
- 4 independent 32-bit registers, readable through the data bus
- a function and control logic.

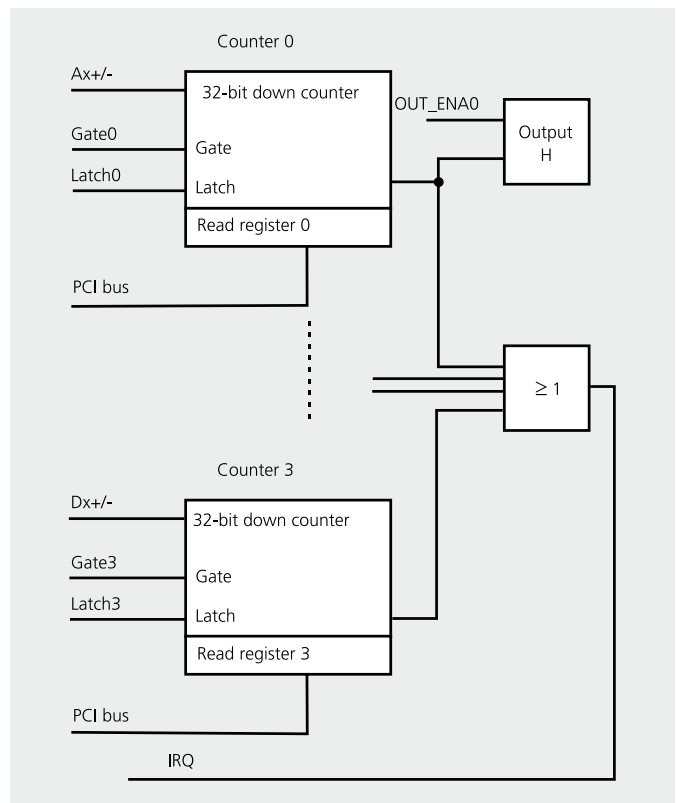
### Used signals

| Pin name | Signal type       | Function                             |
|----------|-------------------|--------------------------------------|
| Ax +/-   | Diff./TTL/24 V*   | Input of the 1st counter             |
| Bx +/-   | Diff./TTL/24 V*   | Input of the 2nd counter             |
| Cx +/-   | Diff./TTL/24 V*   | Input of the 3rd counter             |
| Dx +/-   | Diff./TTL/24 V*   | Input of the 4th counter             |
| H        | 24 V/5 V optional | Common digital output of the counter |

x: Number of the function module (see pin assignment page 179)

\* 24 V for the APCI-1710-24V

### Block diagram Pulse counter



## Function PWM (Pulse width modulation)

The function **PWM** is an interface for pulse width modulation. It generates a frequency and defines the time duration (pulse width) of the "Low" and "High" level. The function generates rectangle signals. The output pulses from the timer generate the pulse width modulation.

### PWM generator

The "Low/High" time-divider factor is written in the timer and determines the output frequency. The input frequency is set according to the PCI clock or the 40 MHz quartz of the board.

The function includes:

- a 32-bit frequency generator for setting the "Low" and "High" levels
- 2 digital inputs as start or stop trigger
- 2 digital frequency outputs

### Properties

- Optical isolation of the inputs and outputs through opto-couplers to prevent ground loops
- Interrupt status at the end of a period
- Selection of the start level
- Selection of the stop level
- Hardware gate
- Software gate

### Typical applications

- Frequency generation
- Pulse width modulation
- Drive technology

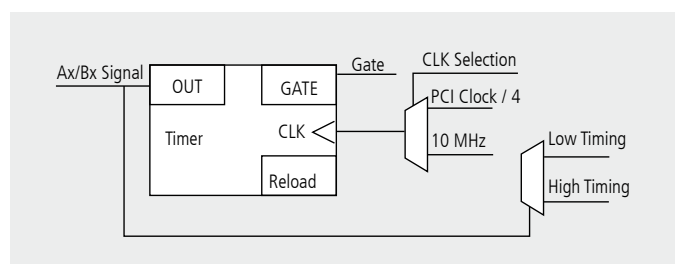
### Used signals

| Signal name   | Pin name | Signal type      | Function                                    |
|---------------|----------|------------------|---|
| PWM_OUT_Ch0_x | Ax +/-   | Diff./TTL output | digital output PWM 0                        |
| PWM_OUT_Ch1_x | Bx +/-   | Diff./TTL output | digital output PWM 1                        |
| GATE_Ch0_x    | Cx +/-   | Diff./TTL input  | Gate input PWM 0                            |
| GATE_Ch1_x    | Dx +/-   | Diff./TTL input  | Gate input PWM 1                            |
| DIG_IN_E_x    | Ex       | 24 V input       | digital input                               |
| DIG_IN_F_x    | Fx       | 24 V input       | digital input                               |
| DIG_IN_G_x    | Gx       | 24 V input       | digital input                               |
| DIG_OUT_H_x   | Hx       | 24 V output      | digital output PWM 0 or freely controllable |

x: Number of the function module (See pin assignment page 179)

The PWM function only can be used restricted to the 24 V version. Only PWM0 is available for the DIG\_OUT\_H\_x 24 V output.

### Block diagram PWM



## Function ETM (Edge Time Measurement)

The **ETM** function is a timer interface which allows measuring the duration of a period, and simultaneously, the "High" or "Low" level time of this period. A function module with the ETM function has

- 1 timer to create a time base
- 2 counters to measure the period duration
- 2 counters to measure the "High" or "Low" level time
- 2 gate inputs

The ETM function uses 4 inputs (A to D) with each function module of the APCI-1710 or CPCI-1710. Up to 8 ETM (2 per module) can be operated on one board.

### Properties

- Optical isolation of the inputs and outputs through opto-couplers to prevent ground loops
- Interrupt status at the end of a period
- Timer can be read back
- Inputs and outputs can be inverted through software
- Software gate

### Typical applications

- Period duration measurement
- Level duration measurement

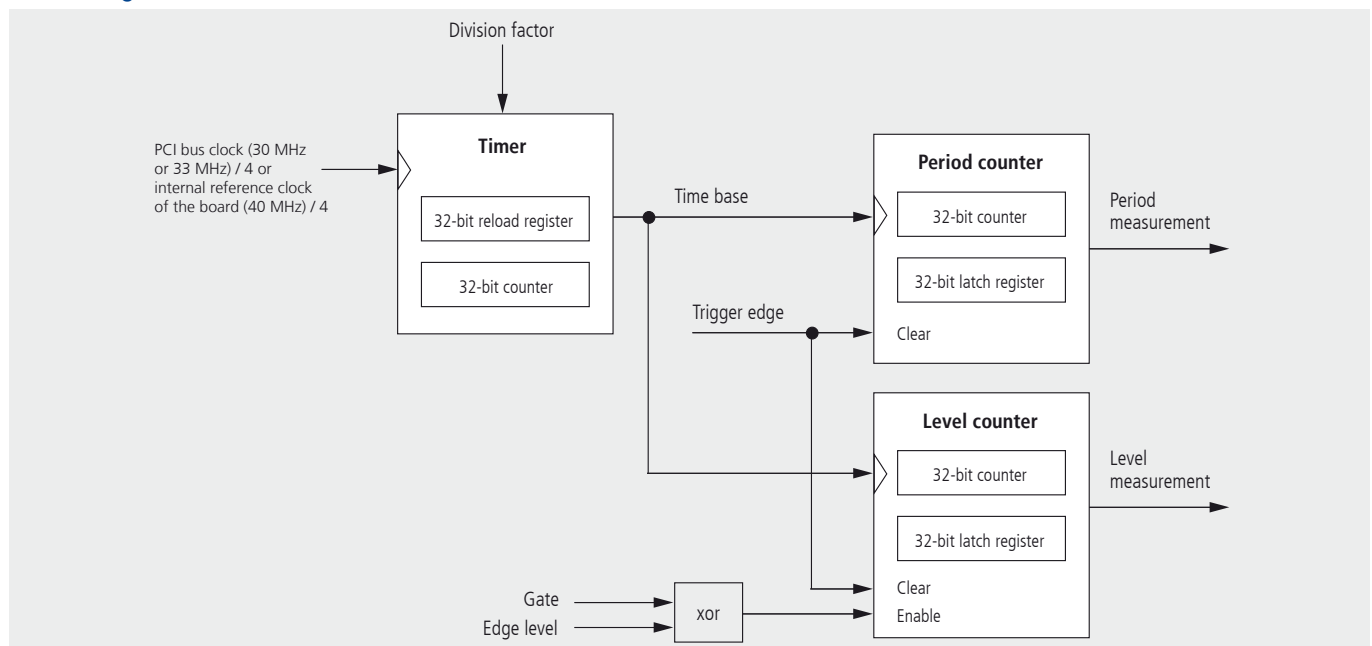
### Used signals

| Signal name | Pin name | Signal type          | Function                    |
|-------------|----------|----------------------|-----------------------------|
| Gate0_x     | Ax +/-   | Diff./TTL/opt. 24 V* | Gate input of ETM counter 0 |
| Input0_x    | Bx +/-   | Diff./TTL/opt. 24 V* | Input of ETM counter 0      |
| Gate1_x     | Cx +/-   | Diff./TTL/opt. 24 V* | Gate input of ETM counter 1 |
| Input1_x    | Dx +/-   | Diff./TTL/opt. 24 V* | Input of ETM counter 1      |

x: Number of the function module (see pin assignment page 179)

\*24 V for the APCI-1710-24V

### Block diagram ETM



## Function Digital input and output

The **Digital input and output** function allows an easy access to the digital I/O available on the function modules. The I/O level of the input and output channels are read and set or reset through read/write commands. The digital I/O have no logical connection to each other. The connection can only be made through software. The complete isolation through opto-couplers avoids earth circuits.

### Available channels

- 3 x 24 V mass-related input channels, optional 5 V
- 2 x differential input channels (RS422/485), can also be used as TTL input channels
- 1 digital output, 24 V, load to ground (10 to 36 V / 500mA)
- 2 differential inputs or outputs (RS485), can also be used as TTL input or output channels. Software configuration.

When the digital I/O function is programmed on all function modules, up to 28 digital input and 12 digital output channels are available

### Used signals

| Pin name | Signal type         | Function                                      |
|----------|---------------------|---|
| Ax +/-   | Diff./TTL/24 V*     | Dig. input and output (with 24 V* only input) |
| Bx +/-   | Diff./TTL/24 V*     | Dig. input and output (with 24 V* only input) |
| Cx +/-   | Diff./TTL/24 V*     | Digital input                                 |
| Dx +/-   | Diff./TTL/24 V*     | Digital input                                 |
| Ex       | 24 V / 5 V optional | Digital input                                 |
| Fx       | 24 V / 5 V optional | Digital input                                 |
| Gx       | 24 V / 5 V optional | Digital input                                 |
| Hx       | 24 V / 500 mA       | Digital output                                |
|          | (10 – 36 V)         |   |

x: Number of the function module (see pin assignment page 179)

\*with the APCI-1710-24V

## Specifications

### Counter components

Counting depth: 32-bit, Counting frequency: up to 5 MHz

### Free programming of the functions

32-bit or 16-bit acquisition of incremental encoders  
Acquisition of absolute encoders/SSI  
Counter/timer  
Chronos/TOR for frequency measurement  
Pulse acquisition  
Chronos for pulse width modulation  
Chronos for period duration measurement  
TOR for velocity measurement  
Digital I/O, 24 V, TTL, RS422  
PWM  
ETM  
Customised functions

### Signals

Digital I/O signals, TTL or RS422

### Inputs

Number of inputs: 20

#### Differential inputs or outputs

5 V inputs: 8/16 (8 can be used as inputs or outputs)

Nominal voltage: 5 VDC

Common mode range: +12 / -7 V

Max. differential voltage: ±12 V

Input sensitivity: 200 mV

Input hysteresis: 50 mV

Input impedance: 12 kΩ

Terminal resistor: 150 Ω serial with 10 nF (typ.)

Signal delay: 120 ns (at nominal voltage)

Max. input frequency: 2.5 MHz (at nominal voltage)

#### Mass-related inputs, 24 V (channels E, F, G):

Number of inputs: 12

Nominal voltage: 24 VDC

Input current: 11 mA (typical) at nominal voltage

Logic input levels:

Unominal: 24 V

UH max.: 30 V

UH min.: 19 V

UL max.: 15 V

UL min.: 0 V

Signal delay: 120 ns (at nominal voltage)

Maximal input frequency: 1 MHz

### Outputs

Nominal voltage: 5 VDC

Maximum output frequency: 2.5 MHz (diff. outputs)

Max. number of outputs: 8 (if they are not used as diff. inputs)

#### Digital outputs, 24 V:

Output type: High-side (load to ground)

Number of outputs: 4

Nominal voltage: 24 VDC

Range of the supply voltage: 10 V to 36 VDC (via 24 V ext. pin)

Maximum current for 4 outputs: 2 A typ. (limited to the voltage supply)

Maximum output current: 500 mA short-circuit current/

output at 24 V,  $R_{load} < 0.1 \Omega$ : 1.5 A max. (output switches off)

ON-resistance of the output

(RDS ON resistance): 0.4 Ω max.

Overtemperature: 170 °C (all outputs switch off)

#### Overtemperature protection (24 V outputs)

Activated: From approx. 150-170 °C (chip temperature)

Deactivated (automatically): From approx. 125-140 °C (chip temperature)

Outputs (at overtemperature): Outputs switch off

#### Protection against undervoltage (effective at V ext. < 5 V):

Outputs (at undervoltage): All outputs switch off

#### Switching characteristics of the 24 V outputs

(V ext. = 24 V, T=25 °C, ohmic load: 500 mA):

Switch ON time: 200 µs

Switch OFF time: 15 µs

#### Digital outputs, 5 V (option):

Output type: TTL

Number of outputs: 4

Nominal voltage: 5 VDC

#### Switching characteristics of the 5 V outputs (T=25 °C, TTL load):

Switch ON time: 0.06 µs

Switch OFF time: 0.02 µs

#### Technical data for the APCI-1710-24 V board version

24 V inputs (channels A to G). This board version is exclusively used for connecting 24 V encoders. Only 24 V signals can be connected to the input channels.

Nominal voltage: 24 VDC / 10 mA

Max. input frequency: 1 MHz (at nominal voltage)

Logic input levels:

U nominal: 24 V

UH max.: 30 V

UH min.: 19 V

UL max.: 15 V

UL min.: 0 V

### Safety

Optical isolation: 1000 V

### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### Physical and environmental conditions

Dimensions: 179 x 99 mm

System bus: PCI 32-bit 5 V acc. to specification 2.1 (PCISIG)

Space required: 1 slot

Operating voltage: +5 V, ± 5 % from the PC

+24 V ext. /10 mA

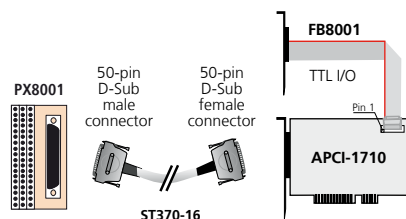
Current consumption: APCI-1710-x: 1.15 A typ. ± 10 %

Front connector: 50-pin D-Sub male connector

Additional connector: Male connector for the TTL I/O function

Temperature range: 0 to 60 °C (with forced cooling)

### ADDI-DATA connection



## Ordering information

### APCI-1710

Multifunction counter board, optically isolated, encoder, incremental counter, timer/counter, SSI, PWM,...  
Incl. technical description and software drivers.

**APCI-1710:** Multifunction counter board, optically isolated

**APCI-1710-24V:** 24 V for differential input signals (A and B for counter, I (Index) and UAS (error) signals)

**APCI-1710-5V-I:** 5 V inputs instead of 24 V (E, F, G)

**APCI-1710-5V-I-0:** 5 V inputs instead of 24 V (E, F, G), 5 V outputs instead of 24 V (H0, H1, H2, H3)

### Option

**Opt. 5V:** 5 V outputs instead of 24 V (H0, H1, H2, H3)

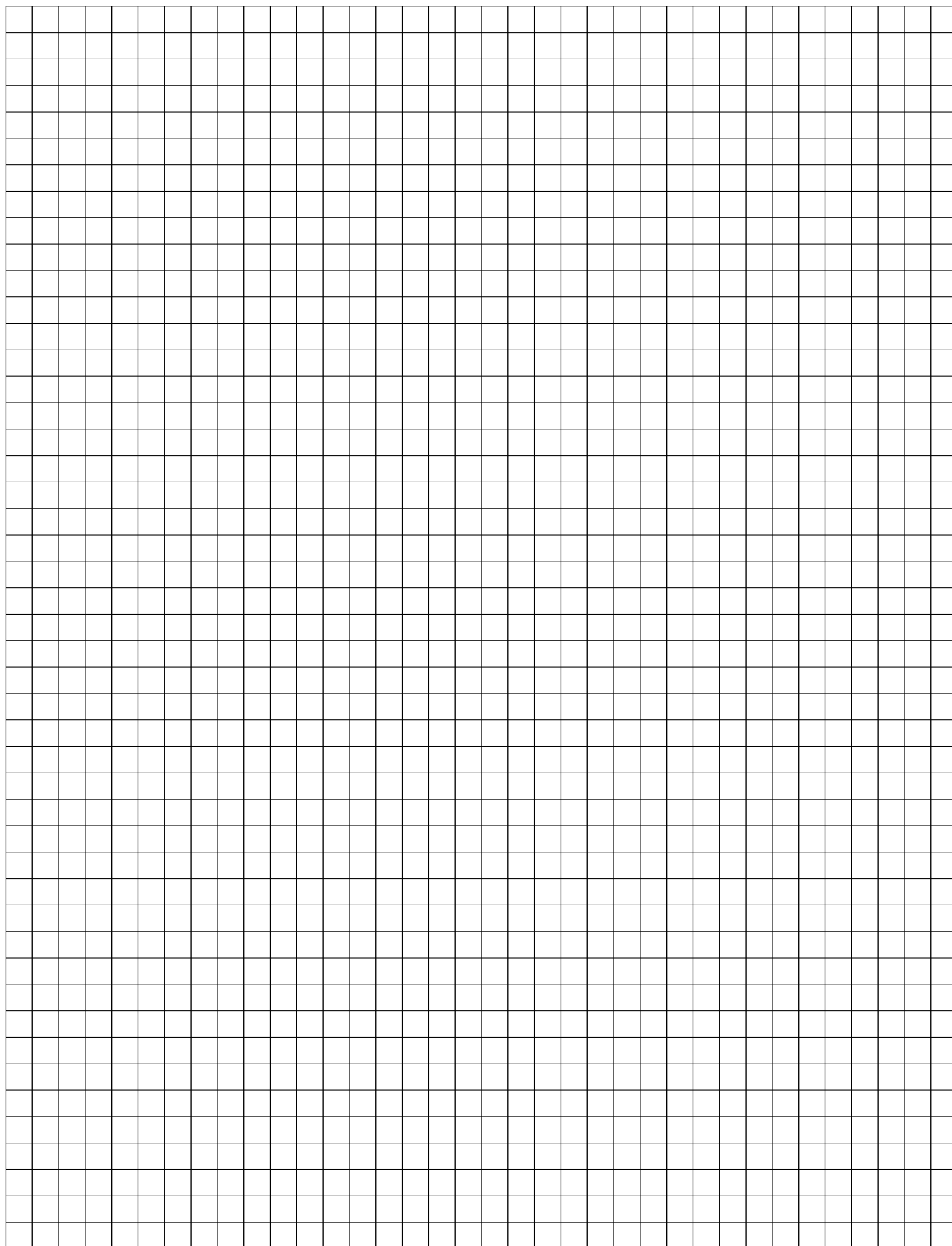
### Accessories

**ST370-16:** Shielded round cable, 2 m

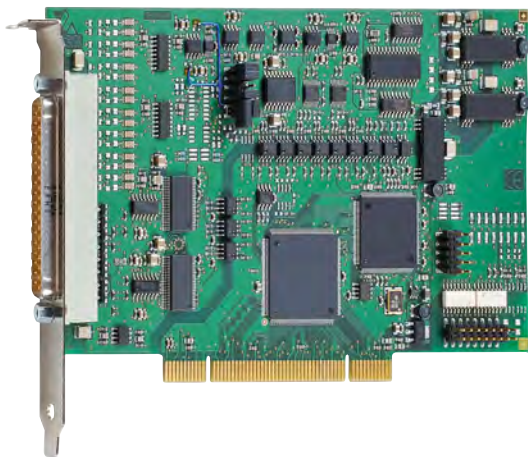
**PX8001:** 3-row terminal panel for DIN rail

**FB8001:** Ribbon cable for connecting the TTL I/O function



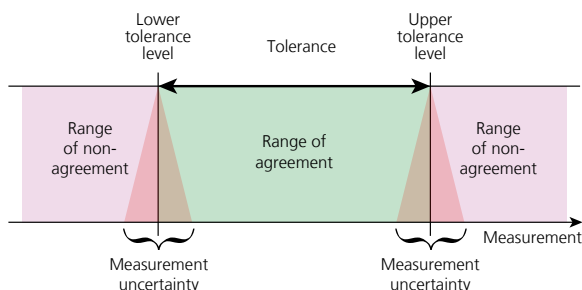


# PCI BOARDS, ANALOG I/O



## High-precision measurement in the field

There are numerous measurement systems that provide precise data under laboratory conditions. This is different in the production or in outdoor areas, where the conditions are considerably more demanding. There the measurement results play a central role. Rework and defective goods can only be effectively reduced if the tolerance testing during the production process is precise enough to sort products reliably as being within or without the tolerance range. The importance of accuracy appears even clearer in cases where the measurement is used for regulation.



### Precise even in case of temperature drift

Temperature drift can be caused by the surrounding temperature as well as by the board itself. To ensure the accuracy of the measurement, on the one hand we are careful to use only high-quality components with little drift. On the other hand we pay a lot of attention to the board layout. For example, components that generate heat are placed where they will not heat up the other components unnecessarily.

### Precision through interference resistance

Not only the quality of the A/D converter is important but the interference resistance of the whole chain of acquisition has to be analysed, from the sensors to the acquisition board. Therefore in addition to our PC boards we offer robust cables and screw terminal panels that are intended for the use in a harsh industrial environment.

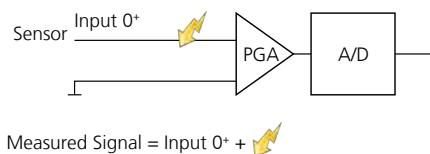
## High-precision measurement

Measurement technology is the basis of every automation process. Therefore the accuracy of the sensor acquisition is highly important. The environment of a production line with a lot of interference requires peak performance from the measurement technology. For more than 25 years, ADDI-DATA has been developing analog boards for data acquisition intended for an industrial environment: they are robust, precise and fast.

## Single-ended or differential inputs

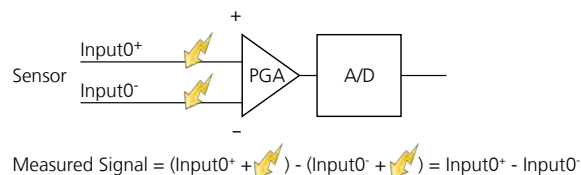
When measuring input voltage you can choose between 2 modes with important differences:

**Single-ended mode – One-wire inputs connected to the system ground.**



When acquiring analog signals in the single-ended mode, interfering signals are acquired with the signal. Therefore this mode is only advisable in case of high voltage levels and short lines.

### Differential mode – Two-wire inputs



Interference signals affecting both lines are not included in the measurement because of the difference on the input. This is the optimal mode for measurement lines with a lot of interferences and long lines.

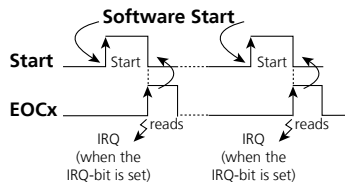
# Acquisition modes of the analog inputs

There are four modes available for analog inputs.

The following is a short overview of the settings available for data acquisition:

## A. Simple mode

The software initiates and starts the A/D conversion and reads out the digital values of one or more channels after the end of conversion.



## B. Sequence modes

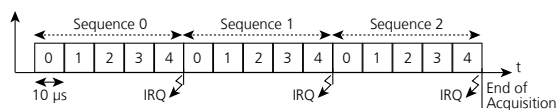
With the DMA function (Direct Memory Access) for a direct data exchange with the PC memory

There are 2 available sequence modes:

### 1. Simple sequence mode

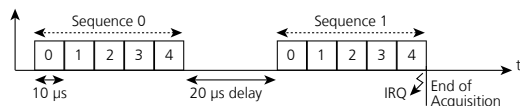
In this example the interrupt is generated at the end of each sequence after 5 acquisitions.

The complete acquisition process ends after 3 sequences.



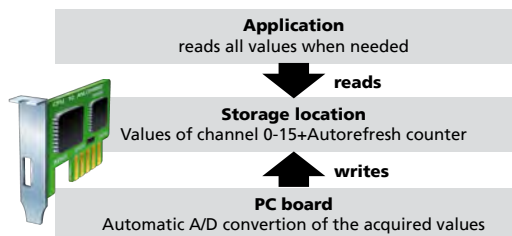
### 2. Sequence mode with delay

In this example the delay time between the end of one sequence and the start of the next sequence is 20 µs.



## C. Auto refresh mode

The analog acquisition is initialised and the values of the channels are written in a buffer on an analog board. The PC reads the data asynchronously to the acquisition.

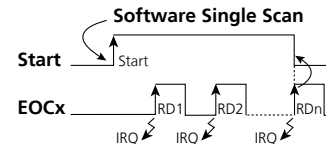


## D. Scan mode

There are 6 different scan modes:

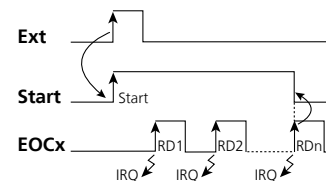
### 1. Software single scan

The interrupt routine of the user is called up after the last IRQ.

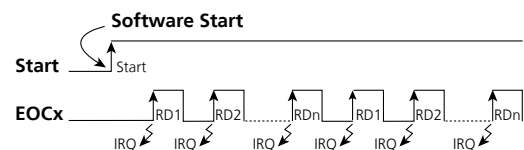


### 2. Hardware triggered single scan

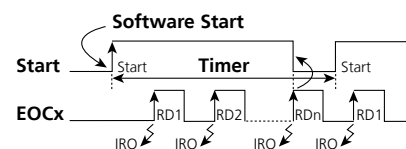
This scan can be triggered with increasing or decreasing edge. The hardware trigger allows to start the acquisition independently from the software or to start the acquisition of more than one board at the same time.



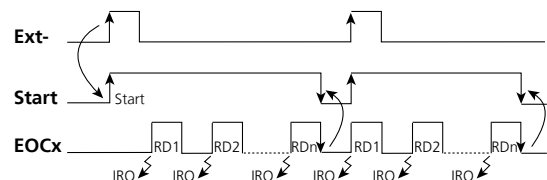
### 3. Continuous scan (software)



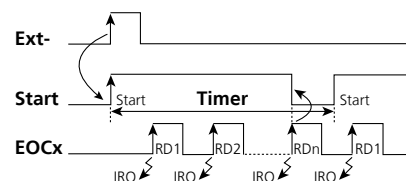
### 4. Continuous scan with timer delay (software)



### 5. Continuous scan (hardware)



### 6. Continuous scan with timer delay (hardware)








# PCI BOARDS, ANALOG I/O

Multifunction, analog input and analog output boards for 3.3 V or 5 V PCI

|  | Multifunction boards   |                     |                     | Analog input boards |                     |                     |                     |                     | Analog output boards |
|---|--|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|----------------------|
|   | APCI-3120  | APCI-3110           | APCI-3116           | APCI-3010           | APCI-3016           | APCI-3002           | APCI-3003           | APCI-3001           | APCI-3501            |
| <b>32-bit PCI bus</b>   | <b>3.3/5 V</b>   | <b>3.3/5 V</b>      | <b>3.3/5 V</b>      | <b>3.3/5 V</b>      | <b>3.3/5 V</b>      | <b>3.3/5 V</b>      | <b>3.3/5 V</b>      | <b>3.3/5 V</b>      | <b>3.3/5 V</b>       |
| <b>FPGA</b>   | ✓  | ✓                   | ✓                   | ✓                   | ✓                   | ✓                   | ✓                   | ✓                   | ✓                    |
| Simultaneous acquisition  |  |                     |                     |                     |                     |                     | ✓                   |                     |                      |
| <b>Analog inputs</b>  |  |                     |                     |                     |                     |                     |                     |                     |                      |
| Single Ended  | 16/8   | 16/8                | 16/8                | 16/8/4              | 16/8/4              |                     |                     | 16/8/4              |                      |
| Differential  | 8/4  | 8/4                 | 8/4                 | 8/4/2               | 8/4/2               | 16                  |                     | 8/4                 |                      |
| Diff. separated from each other   |  |                     |                     |                     |                     |                     | 4                   |                     |                      |
| Resolution (-bit)   | 16   | 12                  | 16                  | 12                  | 16                  | 16                  | 16                  | 12                  |                      |
| Optical isolation   | 500 V  | ✓                   | ✓                   | ✓                   | ✓                   | ✓                   | ✓                   | ✓                   |                      |
| Throughput (kHz)  | 100  | 200                 | 200                 | 200                 | 200                 | 200                 | 400/<br>channel     | 100                 |                      |
| Voltage range   |  |                     |                     |                     |                     |                     |                     |                     |                      |
| 0-10 V; ± 10 V / 0-5 V; ± 5 V<br>0-2 V; ± 2 V / 0-1 V; ± 1 V                      | ✓  | ✓                   | ✓                   | ✓                   | ✓                   | ✓                   | ✓                   | ✓                   |                      |
| Other ranges (optional)   | 0-20 mA  | 0-20 mA             | 0-20 mA             | 0-20 mA             | 0-20 mA             | 0-20 mA             | 0-20 mA             | 0-20 mA             |                      |
| Gain 1, 2, 5, 10  | ✓  | ✓                   | ✓                   | ✓                   | ✓                   | ✓                   | ✓                   | ✓                   |                      |
| FIFO (value)  | 256  | 512                 | 512                 | 512                 | 512                 | 512                 | 512                 | 256                 |                      |
| <b>Functions of the analog inputs</b>   |  |                     |                     |                     |                     |                     |                     |                     |                      |
| DMA<br>(scatter gather, single, continuous, Sequence)                             |  | ✓                   | ✓                   | ✓                   | ✓                   | ✓                   | ✓                   |                     |                      |
| DMA (single, continuous, Sequence)  | ✓  |                     |                     |                     |                     |                     |                     | ✓                   |                      |
| Auto Refresh  |  | ✓                   | ✓                   | ✓                   | ✓                   | ✓                   | ✓                   |                     |                      |
| Interrupt   | ✓  | ✓                   | ✓                   | ✓                   | ✓                   | ✓                   | ✓                   | ✓                   |                      |
| Programmed I/O  | ✓  | ✓                   | ✓                   | ✓                   | ✓                   | ✓                   | ✓                   | ✓                   |                      |
| <b>Trigger:</b>   |  |                     |                     |                     |                     |                     |                     |                     |                      |
| Software  | ✓  | ✓                   | ✓                   | ✓                   | ✓                   | ✓                   | ✓                   | ✓                   |                      |
| TTL input   | -  | -                   | -                   | -                   | -                   | -                   | -                   | -                   |                      |
| 24 V input  | ✓  | ✓                   | ✓                   | ✓                   | ✓                   | ✓                   | ✓                   | ✓                   |                      |
| Sequence RAM  | ✓  | ✓                   | ✓                   | ✓                   | ✓                   | ✓                   | ✓                   | ✓                   |                      |
| <b>Analog outputs</b>   | 4 or 8   | 4                   | 4                   |                     |                     |                     |                     |                     | 4 or 8               |
| Resolution (-bit)   | 14   | 12                  | 12                  |                     |                     |                     |                     |                     | 14                   |
| Optical isolation   | ✓  | ✓                   | ✓                   |                     |                     |                     |                     |                     | ✓                    |
| 0-10 V ± 10 V   | ✓  | ✓                   | ✓                   |                     |                     |                     |                     |                     | ✓                    |
| Current outputs   |  |                     |                     |                     |                     |                     |                     |                     |                      |
| Setup time  | 30 µs  | 15 µs               | 15 µs               |                     |                     |                     |                     |                     | 30 µs                |
| <b>Digital I/O</b>  |  |                     |                     |                     |                     |                     |                     |                     |                      |
| 24 V inputs, optically isolated   | 4  | 4                   | 4                   | 4                   | 4                   | 4                   | 4                   | 4                   | 2                    |
| 24 V outputs, optically isolated  | 4 (OpenC)  | 4 (50mA)            | 4 (50mA)            | 4 (50mA)            | 4 (50mA)            | 4 (50mA)            | 4 (50mA)            | 4 (OpenC)           | 2 (OpenC)            |
| TTL I/O   |  | 24                  | 24                  | 24                  | 24                  |                     |                     |                     |                      |
| <b>Timer/Counter/Watchdog</b><br>(depth) and/or                                   | 1 / - / 1<br>24-bit  | 3 / 3 / 2<br>16-bit | 3 / 3 / 2<br>16-bit | 3 / 3 / 1<br>16-bit | 3 / 3 / 1<br>16-bit | 1 / - / -<br>16-bit | 1 / - / -<br>16-bit | 1 / - / -<br>16-bit | 1 / - / -<br>12-bit  |
| Page  | 192  | 194                 | 194                 | 196                 | 196                 | 198                 | 200                 | 202                 | 204                  |
| Software  | Current driver list on the web: <a href="http://www.addi-data.com">www.addi-data.com</a> |                     |                     |                     |                     |                     |                     |                     |                      |

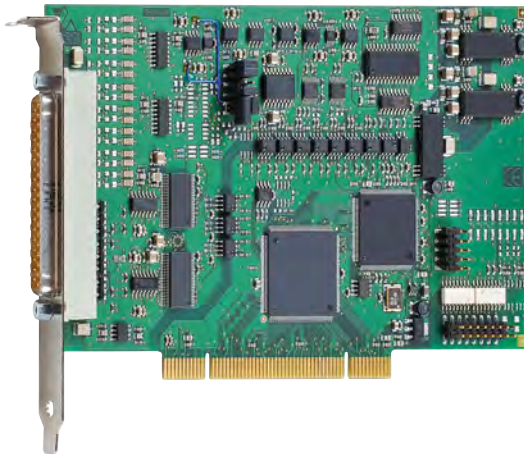
## Temperature, pressure, noise, vibration and length measurement

New!

|   | Temperature measurement  | Pressure measurement  | Noise and vibration measurement   | Length measurement  |   |
|---|--|---|---|---|---|
|   |         |  |  |  |  |
|   | APCI-3200  | APCI-3300   | APCI-3600   | APCI-3702   | APCI-3701   |
| <b>64-bit or 32-bit PCI-Bus</b>   | <b>3.3 V / 5 V</b>   | <b>3.3 V / 5 V</b>  | <b>3,3 V / 5 V</b>  | <b>3.3 V / 5 V</b>  | <b>3.3 V / 5 V</b>  |
| <b>FPGA</b>   |  |   | ✓   |   |   |
| Noise and vibration   |  |   | ✓   |   |   |
| Thermocouples J,K,T,E,R,S,B,N Pt100, Pt1000   | ✓  |   |   |   |   |
| Strain gauges   |  | ✓   |   |   |   |
| Inductive transducers   |  |   |   | Half Bridge, LVDT   | Half Bridge, LVDT   |
| Signal conditioning   |  |   | 8 current sources for connecting ICP™ sensors                                     |   |   |
| Analog inputs   | 4 groups<br>4 channels   | 4 groups<br>4 channels  |   |   |   |
| Single Ended (SE)/ differential (diff.)   | 16 thermo/8 RTDs<br>8 thermo/4 RTDs<br>4 thermo/2 RTDs                                   | 8/4 inputs for strain gauges  | 8/8   | 5 channels<br>simultaneous acquisition for induct. displacement transducers         | 16/8/1 channels for inductive displacement transducers                              |
| Resolution (-bit)   | 18   | 18  | 24  | 16  | 16  |
| Optical isolation   | ✓  | ✓   |   |   |   |
| Throughput  | 20-160 Hz  | 20-160 Hz   | 2-200 kHz (through software)  | depends on transducer type  | depends on transducer type<br>2-20 kHz (50 kHz opt.)                                |
| Voltage ranges  | + 1.25 V   | + 1.25 V  | ± 10 V  |   |   |
| Gain  | 1, 2, 4, 8, 16, 32, 64, 128  | 1, 2, 4, 8, 16, 32, 64, 128   |   | depends on transducer type  | depends on transducer type  |
| FIFO (Values)   |  |   | 128 DWORD   |   |   |
| <b>Functions of the analog inputs</b>   |  |   |   |   |   |
| DMA (scatter gather; single; continuous; Sequence)  |  |   | scatter gather<br>free run, ring buffer   | ✓   | ✓   |
| Auto Refresh  |  |   |   | ✓   | ✓   |
| Interrupt   | ✓  | ✓   | ✓   | ✓   | ✓   |
| Programmed I/O  | ✓  | ✓   | ✓   | ✓   | ✓   |
| <b>Trigger:</b><br>Software<br>24 V input   | ✓<br>✓   | ✓<br>✓  | ✓<br>✓  | ✓<br>✓  | ✓<br>✓  |
| Sequence RAM  |  |   |   | ✓   | ✓   |
| <b>Analog outputs</b>   |  |   |   |   |   |
|   |  |   | 2   |   |   |
| Resolution (-bit)   |  |   | 16  |   |   |
| Optical isolation   |  |   |   |   |   |
| 0-10 V ± 10 V   |  |   | ± 10 V  |   |   |
| Chronometer inputs<br>Gate inputs   |  |   | 4<br>2  |   |   |
| <b>Timer/Watchdog</b> (depth) in combination, and/or                                      | - / -  | - / -   | - / -   | 1 / -<br>16-bit   | 1 / -<br>16-bit   |
| <b>Digital I/O</b><br>Inputs 24 V, optically isolated<br>Outputs 24 V, optically isolated | 4<br>3 (Open Collector )   | 4<br>3 (Open Collector )  | 8<br>8 (50 mA)  | 8<br>8 (125 mA)   | 8<br>8 (125 mA)   |
| Page  | 206  | 210   | 212   | 216   | 218   |
| Software  | Current driver list on the web: <a href="http://www.addi-data.com">www.addi-data.com</a> |   |   |   |   |



# Multifunction board, optically isolated, 16/8 SE or 8/4 diff. inputs, 4/8 analog outputs, 16-bit



## APCI-3120

16 Single-ended/8 differential inputs, 16-bit

8/4 analog outputs, 14-bit

Optical isolation of inputs and outputs, 500 V

PCI DMA, programmable gain

Trigger functions

8 digital I/O, 24 V, optically isolated, timer

On-site calibration with the CAL3120 option

## Features

### Analog inputs

- 16 single-ended/8 differential inputs or 8 single-ended/4 differential inputs
- 16-bit resolution
- Optical isolation 500 V
- Throughput: 100 kHz
- Input voltage: 0-10 V,  $\pm 10$  V, 0-5 V,  $\pm 5$  V, 0-2 V,  $\pm 2$  V, 0-1 V,  $\pm 1$  V, 0-20 mA (option) freely programmable through software for each channel
- Gain PGA x1, x2, x5, x10 freely programmable through software for each channel
- PCI DMA for analog data acquisition
- Overvoltage protection
- Input filters: 159 kHz

### Analog acquisition

- One single channel, several channels, several channels through scan list
- Automatic analog acquisition through cyclic timer control
- Acquisition through scan list: up to 16 entries with gain, channel, unipolar/bipolar
- Acquisition triggered through software, timer, external event
- Trigger functions: Software trigger or external trigger: the analog acquisition (single or sequence) is started through signal switching from 0 V to 24 V at the digital input 0.
- Interrupt: end of single channel, end of multichannel, end of scan list

### Analog outputs

- 4 or 8 analog outputs, optically isolated 500 V
- Setup time 10  $\mu$ s typ.
- 14-bit resolution (13-bit for 0-10 V)
- Output voltage:  $\pm 10$  V, 0-10 V (through software)
- Output voltage after reset: 0 V
- Each output has its own ground line (without optical isolation)
- Driver capacity: 5 mA/500 pF
- Short-circuit protection, EMI filters

### Digital

- 4 dig. inputs, 4 dig. outputs, 24 V, optically isolated

### Timer

- As cyclic time counter or as watchdog

## Safety features

- Optical isolation 500 V min.
- Creeping distance IEC 61010-1
- Overvoltage protection  $\pm 40$  V
- Protection against high-frequency EMI
- Input filters: 160 kHz
- Noise neutralisation of the PC supply

## Applications

- Industrial process control
- Industrial measurement and monitoring
- Multichannel data acquisition
- Control of chemical processes
- Factory automation
- Acquisition of sensor data, current measurement
- Laboratory equipment, instrumentation

## Software

Calibration tool (**Option CAL3120**): Do the fine adjustment fast and reliably and save the generated calibration report file. All you need is a highly precise calibration source and a precise digital multimeter (not included in the delivery content).

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- .NET on request
- Microsoft VC++ • Microsoft C
- Borland C++ • Borland C
- Visual Basic • Delphi
- LabVIEW • LabWindows/CVI • DASYLab • DIAdem

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com](http://www.addi-data.com), download menu



PCI 32-bit

Also for CompactPCI™  
See CPCI-3121, page 250

Also for PCI EXPRESS®  
see APCL-3121, page 146



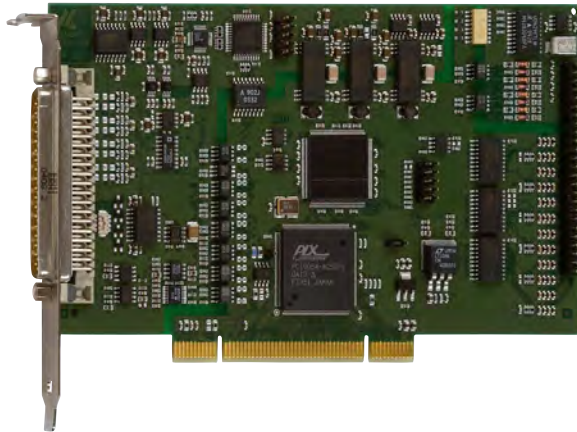
LabWindows/CVI™

DASYLab10  
Data Acquisition System Laboratory





# Multifunction board, optically isolated, 16/8 SE or 8/4 diff. inputs, 4 analog outputs, 12-/16-bit



## APCI-3110 / APCI-3116

PCI 3.3 V or 5 V

Optical isolation 1000 V

16/8 SE or 8/4 diff. inputs

12-bit or 16-bit resolution, 200 kHz

PCI DMA, programmable gain

4 analog outputs, 12-bit

Timer/counter/watchdog

8 optically isolated dig. I/O, 24 V, 24 TTL I/O

### Features

- PCI 3.3 V or 5 V

#### Analog inputs

- 16/8 SE or 8/4 diff. inputs, optically isolated
- Resolution: 12-bit (APCI-3110) or 16-bit (APCI-3116)
- Throughput: 200 kHz
- Input voltage: 0-10 V,  $\pm 10$  V, 0-5 V,  $\pm 5$  V, 0-2 V,  $\pm 2$  V, 0-1 V,  $\pm 1$  V, 0-20 mA (option), freely programmable through software for each channel
- Current inputs: 0-20 mA (Option) can be combined freely with voltage inputs
- Gain PGA x1, x2, x5, x10 freely programmable through software for each channel

#### Analog acquisition

- Different input modes:
  - 1) Simple mode
  - 2) Scan modes
  - 3) Sequence modes
  - 4) Auto Refresh mode
- Onboard FIFO (for 512 analog values)
- PCI-DMA for analog data acquisition

#### Analog outputs

- 4 analog outputs, optically isolated
- 12-bit resolution
- Setup time 15  $\mu$ s typ
- Output voltage after reset: 0 V
- Each output has its own ground line (without optical isolation)
- Output voltage range: -10 V up to + 10 V
- Output current:  $\pm 5$  mA
- Short-circuit current:  $\pm 20$  mA

#### 24 V digital I/O

- 24 V digital I/O enable a high interference distance and a long distance between signal transmitter and data acquisition
- 4 digital inputs, 24 V, optically isolated
- 4 digital outputs, 24 V, optically isolated

#### TTL I/O

- 24 digital TTL inputs/outputs
- Port0: outputs / Port1: inputs / Port2: I/O
- All I/O are at 5 V through pull-up resistors
- Easy programming through I/O read and write commands

#### Timer/counter

- 3 / 3, 16-bit

#### Watchdog

- 2, 16-bit

### Safety features

- Optical isolation 1000 V min.
- Creeping distance IEC 61010-1
- Circuit part of the analog acquisition is separated from the circuit part of the digital function
- Overvoltage protection  $\pm 40$  V
- Protection against high-frequency EMI
- Input filters
- Noise neutralisation of the PC supply
- Connection of the I/O signals through robust industry-standard D-Sub connector

### Applications

- Industrial process control
- Industrial measurement and monitoring
- Multichannel data acquisition
- Control of chemical processes
- Factory automation
- Acquisition of sensor data
- Laboratory equipment
- Current measurement
- Instrumentation

### Software

#### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

#### Drivers and samples for the following compilers and software packages:

- .NET
- Microsoft VC++ • Borland C++ • Visual Basic
- Delphi • LabVIEW • LabWindows/CVI

#### ADDITIONAL functions:

Analog input • Analog output • Digital input  
Digital output • Watchdog • Timer • Counter

#### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com](http://www.addi-data.com), download menu



PCI 32-bit



Windows  
64/32-bit drivers



LabVIEW™



LabWindows/CVI™



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to suit your needs.

Hardware and software,

firmware, PLDs, ...

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## Specifications

### Analog inputs

|                    |  |
|--------------------|--|
| Number of inputs:  | 16/8 SE or 8/4 differential inputs   |
| Resolution:        | 12-bit (APCI-3110) or 16-bit (APCI-3116)   |
| Optical isolation: | 1000 V through opto-couplers from PC to peripheral   |
| Input ranges:      | Software-programmable for each channel<br>0-10 V, $\pm 10$ V, 0-5 V, $\pm 5$ V, 0-2 V, $\pm 2$ V, 0-1 V, $\pm 1$ V<br>0-20 mA optional |
| Gain:              | Software programmable (x1, x2, x5, x10)  |
| Throughput:        | 200 kHz  |
| Trigger:           | through software, timer, external event (24 V input)   |
| Data transfer:     | Data to the PC through FIFO memory, Interrupt at EOC (End Of Conversion), DMA transfer at EOC  |
| Interrupts:        | End of conversion, at timer overrun, End of scan   |

### Analog outputs

|                             |                               |
|-----------------------------|-------------------------------|
| Number of outputs:          | 4                             |
| Optical isolation:          | 1000 V through opto-couplers  |
| Resolution:                 | 12-bit                        |
| <b>Voltage outputs</b>      |                               |
| Output range:               | -10 V to +10 V (-1 LSB)       |
| LSB:                        | 4.8828 mV                     |
| Accuracy:                   | 11-bit                        |
| Time to Ready:              | typ. 4.5 $\mu$ s              |
| Setup time:                 | typ 15 $\mu$ s (at 10 V step) |
| Max. output current:        | $\pm 5$ mA                    |
| Short-circuit current:      | $\pm 20$ mA                   |
| Output voltage after reset: | 0 V                           |

### Digital I/O

|                         |  |
|-------------------------|--|
| Number of I/O channels: | 4 digital inputs, 24 V<br>4 digital outputs, 24 V  |
| Logical "0" level:      | 0-14 V   |
| Logical "1" level:      | 19-30 V  |
| Optical isolation:      | 1000 V through opto-couplers from PC to peripheral |

### TTL I/O

|                             |                               |
|-----------------------------|-------------------------------|
| Number of TTL I/O channels: | 24                            |
| I/O Address range:          | 128 Byte, addressing : 32-bit |
| Programming:                | Through write/read commands   |

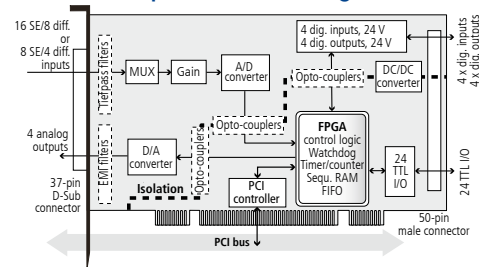
### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### Physical and environmental conditions

|                        |  |
|------------------------|--|
| Dimensions:            | 175 x 99 mm  |
| System bus:            | PCI 32-bit 3.3/5V acc. to spec. 2.2 (PCISig)                             |
| Space required:        | 1 PCI slot for analog I/O,<br>1 slot opening for digital I/O with FB8001 |
| Operating voltage:     | +5 V, $\pm 5$ % from the PC  |
| Front connector:       | 37-pin D-Sub male connector  |
| Additional connector : | 50-pin male connector for connecting the dig. I/O                        |
| Temperature range:     | 0 to 60 °C (with forced cooling)   |

### Simplified block diagram



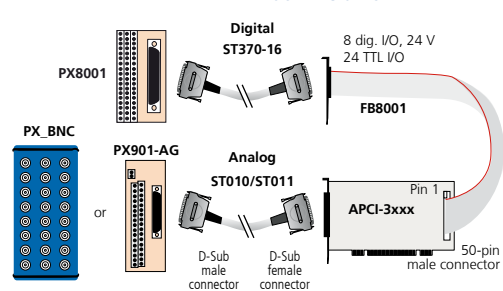
### Pin assignment – 37-pin D-Sub male connector

| DIFF             | SE         | SE           | DIFF          |
|------------------|------------|--------------|---------------|
| Channel 0 (+)    | Channel 0  | Channel 8    | Channel 4 (+) |
| Channel 1 (+)    | Channel 1  | Channel 9    | Channel 5 (+) |
| Channel 2 (+)    | Channel 2  | Channel 10   | Channel 6 (+) |
| Channel 3 (+)    | Channel 3  | Channel 11   | Channel 7 (+) |
| Channel 3 (-)    | Channel 7  | Channel 15   | Channel 7 (-) |
| Channel 2 (-)    | Channel 6  | Channel 14   | Channel 6 (-) |
| Channel 1 (-)    | Channel 5  | Channel 13   | Channel 5 (-) |
| Channel 0 (-)    | Channel 4  | Channel 12   | Channel 4 (-) |
|                  | Signal GND | Signal GND   |               |
|                  | Signal GND | Signal GND   |               |
|                  | Signal GND | Signal GND   |               |
|                  | Signal GND | Signal GND   |               |
| An, output 0 GND |            | An, output 0 |               |
| An, output 1 GND |            | An, output 1 |               |
| An, output 2 GND |            | An, output 2 |               |
| An, output 3 GND |            | An, output 3 |               |
|                  | Signal GND | Signal GND   |               |
|                  | Signal GND | Signal GND   |               |
|                  | Signal GND | Signal GND   |               |
|                  | Signal GND | Signal GND   |               |

### Pin assignment – 50-pin male connector

| Assignment    | Pin | Assignment    | Pin | Assignment | Pin |
|---------------|-----|---------------|-----|------------|-----|
| Output 3      | 1   | Input 3+      | 31  | TTL 22     | 32  |
| Output 3-     | 2   | Input 3-      | 32  | TTL 13     | 33  |
| Input 2+      | 3   | Input 2+      | 33  | TTL 5      | 34  |
| Input 2-      | 4   | Input 2-      | 34  | TTL 36     | 35  |
| Output 1      | 5   | Input 1+      | 35  | TTL 20     | 36  |
| Input 1-      | 6   | Input 1-      | 36  | TTL 37     | 37  |
| Input 0+      | 7   | Input 0+      | 37  | TTL 11     | 38  |
| Input 0-      | 8   | Input 0-      | 38  | TTL 3      | 39  |
| +24 V         | 9   | +24 V         | 39  | TTL 41     | 40  |
| GND           | 10  | GND           | 40  | TTL 18     | 41  |
| Not connected | 11  | Not connected | 41  | TTL 9      | 42  |
| Not connected | 12  | Not connected | 42  | TTL 43     | 43  |
| GND           | 13  | GND           | 43  | TTL 45     | 44  |
| GND           | 14  | GND           | 44  | TTL 1      | 45  |
| GND           | 15  | GND           | 45  | TTL 47     | 46  |
| GND           | 16  | GND           | 46  | TTL 16     | 47  |
| GND           | 17  | GND           | 47  | TTL 49     | 48  |
| GND           | 18  | GND           | 48  | TTL 0      | 49  |
| GND           | 19  | GND           | 49  | TTL 0      | 50  |

### ADDI-DATA connection



## Ordering information

### APCI-3110 / APCI-3116

Multifunction board, optically isolated, 16/8 SE or 8/4 diff. inputs, 4 analog outputs, 12-/16-bit. Incl. technical description and software drivers.

#### Versions

|                      |  |
|----------------------|--|
| <b>APCI-3110-16:</b> | 16 SE/8 diff. inputs, 4 analog outputs, 12-bit |
| <b>APCI-3110-8:</b>  | 8 SE/4 diff. inputs, 4 analog outputs, 12-bit  |
| <b>APCI-3116-16:</b> | 16 SE/8 diff. inputs, 4 analog outputs, 16-bit |
| <b>APCI-3116-8:</b>  | 8 SE/4 diff. inputs, 4 analog outputs, 16-bit  |

#### Options

Please indicate the number of channels

**Option SF:** Precision filter for 1 single-ended channel

**Option DF:** Precision filter for 1 diff. channel

**Option PC:** Current input 0(4)-20 mA for 1 channel

**PC-SE:** for Single-ended **PC-Diff:** for differential

#### Accessories

**PX901-A:** Screw terminal panel with transorb diodes for connecting the analog I/O

**PX901-AG:** Same as PX901-A with housing for DIN rail

**PX\_BNC:** BNC connection box for connecting the analog I/O

**ST010:** Standard round cable, shielded, twisted pairs, 2 m

**ST011:** Standard round cable, shielded, twisted pairs, 5 m

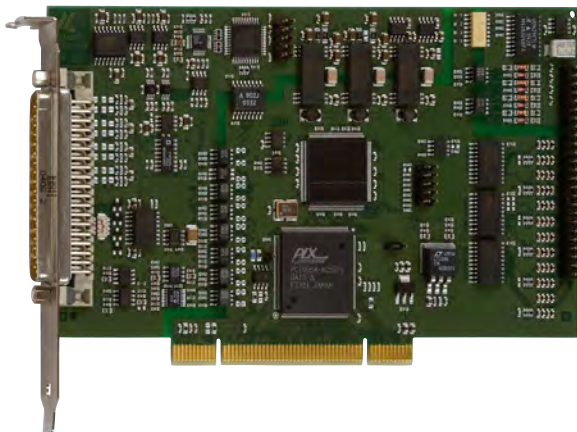
**PX8001:** 3-row screw terminal panel, 50-pin, for DIN-rail mounting

**FB8001:** Ribbon cable for digital I/O

**ST370-16:** Standard round cable, shielded, twisted pairs, 2 m



# Analog input board, optically isolated, 16/8/4 SE or 8/4/2 diff. inputs, 12-/16-bit



PCI 32-bit



Windows  
64/32-bit drivers



LabVIEW™



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## Customer-tailored modifications

designed  
to suit your needs.  
Hardware and software,  
firmware, PLDs, ...  
Contact us!

## Features

- PCI 3.3 V or 5 V

### Analog inputs

- 16/8/4 SE or 8/4/2 diff. inputs, optically isolated
- Resolution: 12-bit (APCI-3010) or 16-bit (APCI-3016)
- Throughput: 200 kHz
- Voltage inputs: 0-10 V,  $\pm 10$  V, 0-5 V,  $\pm 5$  V, 0-2 V,  $\pm 2$  V, 0-1 V,  $\pm 1$  V, freely programmable through software for each channel
- Current inputs: 0-20 mA (option) can be combined freely with voltage inputs
- Gain PGA x1, x2, x5, x10 freely programmable through software for each channel

### Analog acquisition

- Different input modes:
  - 1) Simple mode
  - 2) Scan modes
  - 3) Sequence modes
  - 4) Auto Refresh mode
- Trigger functions:
  - Software trigger or
  - external trigger: the analog acquisition (single or sequence) is started through the signal on digital input 0 from 0 V to 24 V
- Onboard FIFO (for 512 Analog values)
- PCI-DMA for analog data acquisition

### 24 V digital I/O

- 24 V digital I/O enable a high interference distance and a long distance between signal transmitter and data acquisition
- 4 digital inputs, 24 V, optically isolated
- 4 digital outputs, 24 V, optically isolated

### TTL I/O

- 24 digital TTL inputs/outputs
- Port1: inputs / Port2: outputs / Port3: I/O
- All I/O are at 5 V through pull-up resistors
- Easy programming through I/O read and write commands

### Timer/Counter

- 3 / 3, 16-bit

### Watchdog

- 1, 16-bit

## APCI-3010 / APCI-3016

PCI 3.3 V or 5 V

Optical isolation 1000 V

16/8/4 SE or 8/4/2 diff. inputs

12- or 16-bit resolution, 200 kHz

PCI DMA, programmable gain

Trigger functions

Timer/counter/watchdog

8 optically isolated dig. I/O, 24 V, 24 TTL I/O

## Safety features

- For more protection in noisy industrial environment
- Optical isolation 1000 V min.
- Creeping distance IEC 61010-1
- Circuit part of the analog acquisition is separated from the circuit part of the digital function
- Overvoltage protection  $\pm 40$  V (analog inputs)
- Protection against high-frequency EMI
- Input filters
- Noise neutralisation of the PC supply
- Connection of the I/O-signals through robust industry-standard 37-pin D-Sub connector

## Applications

- Industrial process control
- Industrial measurement and monitoring
- Multichannel data acquisition
- Control of chemical processes
- Factory automation
- Acquisition of sensor data
- Laboratory equipment
- Current measurement
- Instrumentation

## Software

A CD-ROM with the following software and programming examples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- .NET
- Microsoft VC++ • Borland C++
- Visual Basic • Delphi • LabVIEW • LabWindows/CVI

### ADDIPACK functions:

Analog input • Digital input • Digital output  
Watchdog • Timer • Counter

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com](http://www.addi-data.com), download menu



## Specifications

### Analog inputs

|                    |  |
|--------------------|--|
| Number of inputs:  | 16/8/4 SE or 8/4/2 differential inputs   |
| Resolution:        | 12-bit (APCI-3010) or 16-bit (APCI-3016)   |
| Optical isolation: | 1000 V through opto-couplers from PC to peripheral   |
| Input ranges:      | Software-programmable for each channel<br>0-10 V, $\pm 10$ V, 0-5 V, $\pm 5$ V, 0-2 V, $\pm 2$ V, 0-1 V, $\pm 1$ V<br>0-20 mA optional |
| Gain:              | Software programmable (x1, x2, x5, x10)  |
| Throughput:        | 200 kHz  |
| Trigger:           | Through software, timer, external event (24 V input)   |
| Data transfer:     | Data to the PC through FIFO memory, Interrupt at EOC (End Of Conversion), DMA transfer at EOC  |
| Interrupts:        | End of conversion, at timer overrun, End of scan   |

### Digital I/O

|                         |  |
|-------------------------|--|
| Number of I/O channels: | 4 digital inputs, 24 V<br>4 digital outputs, 24 V  |
| Logical "0" Level:      | 0-14 V   |
| Logical "1" Level:      | 19-30 V  |
| Optical isolation:      | 1000 V through opto-couplers from PC to peripheral |
| Outputs:                | High Side, 50 mA                                   |

### TTL I/O

|                             |                             |
|-----------------------------|-----------------------------|
| Number of TTL I/O channels: | 24                          |
| Programming:                | Through write/read commands |

### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### Physical and environmental conditions

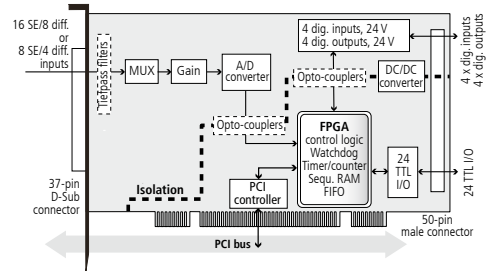
|                       |   |
|-----------------------|---|
| Dimensions:           | 175 x 99 mm   |
| System bus:           | PCI 32-bit 3.3/5V acc. to spec. 2.2 (PCISig)                                |
| Space required:       | 1 PCI slot for analog inputs,<br>1 slot opening for digital I/O with FB8001 |
| Operating voltage:    | +5 V, $\pm 5$ % from the PC   |
| Front connector:      | 37-pin D-Sub male connector   |
| Additional connector: | 50-pin male connector for connecting the dig. I/O                           |
| Temperature range:    | 0 to 60 °C (with forced cooling)  |

Screw terminal panel PX901-AG  
with cable ST010

Connection box PX\_BNC  
with cable ST010



### Simplified block diagram



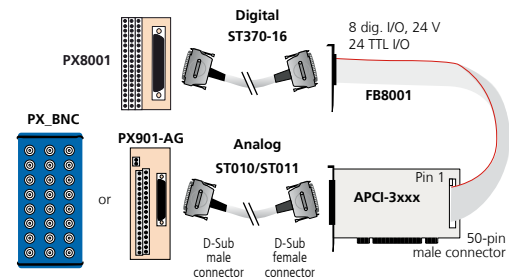
### Pin assignment – 37-pin D-Sub male connector

| DIFF            | SE             | SE             | DIFF            |
|-----------------|----------------|----------------|-----------------|
| An. input 0 (+) | An. input 0    | An. input 8    | An. input 4 (+) |
| An. input 1 (+) | An. input 1    | An. input 9    | An. input 5 (+) |
| An. input 2 (+) | An. input 2    | An. input 10   | An. input 6 (+) |
| An. input 3 (+) | An. input 3    | An. input 11   | An. input 7 (+) |
| An. input 3 (-) | An. input 7    | An. input 15   | An. input 7 (-) |
| An. input 2 (-) | An. input 6    | An. input 14   | An. input 6 (-) |
| An. input 1 (-) | An. input 5    | An. input 13   | An. input 5 (-) |
| An. input 0 (-) | An. input 4    | An. input 12   | An. input 4 (-) |
|                 | An. signal GND | An. signal GND |                 |
|                 | An. signal GND | An. signal GND |                 |
|                 | An. signal GND | An. signal GND |                 |
|                 | An. signal GND | An. signal GND |                 |

### Pin assignment – 50-pin male connector

| Assignment    | Pin      | Assignment    | Pin | Assignment | Pin |
|---------------|----------|---------------|-----|------------|-----|
| Output 3      | 1        | Input 3+      | 2   | TTL 22     | 31  |
| Input 3-      | 3        | Output 2      | 4   | TTL 33     | 34  |
| Input 2+      | 5        | Input 2-      | 6   | TTL 15     | 35  |
| Output 1      | 7        | Input 1+      | 8   | TTL 20     | 37  |
| Input 1-      | 9        | Output 0      | 10  | TTL 11     | 39  |
| Input 0+      | 11       | Input 0-      | 12  | TTL 3      | 41  |
| GND 0         | 13       | +24 V         | 14  | TTL 18     | 43  |
| Not connected | 15 to 24 | Not connected |     | TTL 9      | 45  |
| GND           | 25       | GND           | 26  | TTL 1      | 47  |
| TTL 15        | 27       | TTL 23        | 28  | TTL 16     | 49  |
| TTL 7         | 29       | TTL 14        | 30  |            |     |

### ADDI-DATA connection



## Ordering information

### APCI-3010 / APCI-3016

Analog input board, optically isolated, 16/8/4 SE or 8/4/2 diff. inputs, 12-/16-bit. Incl. technical description and software drivers.

#### Versions

|                      |                              |
|----------------------|------------------------------|
| <b>APCI-3010-16:</b> | 16 SE/8 diff. inputs, 12-bit |
| <b>APCI-3010-8:</b>  | 8 SE/4 diff. inputs, 12-bit  |
| <b>APCI-3010-4:</b>  | 4 SE/2 diff. inputs, 12-bit  |
| <b>APCI-3016-16:</b> | 16 SE/8 diff. inputs, 16-bit |
| <b>APCI-3016-8:</b>  | 8 SE/4 diff. inputs, 16-bit  |
| <b>APCI-3016-4:</b>  | 4 SE/2 diff. inputs, 16-bit  |

#### Options

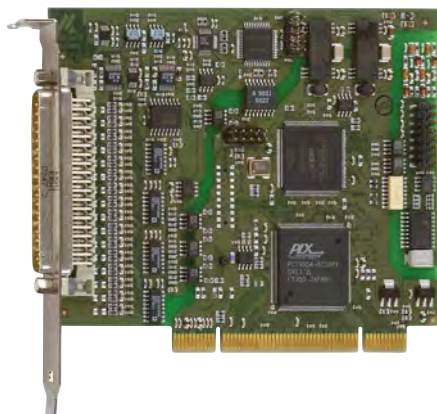
Please indicate the number of channels

|                   |   |
|-------------------|---|
| <b>Option SF:</b> | Precision filter for 1 single-ended channel |
| <b>Option DF:</b> | Precision filter for 1 diff. channel        |
| <b>Option PC:</b> | Current input 0(4)-20 mA for 1 channel      |
| <b>PC-SE:</b>     | for Single-ended                            |
| <b>PC-DIFF:</b>   | for differential                            |

### Accessories

|                  |   |
|------------------|---|
| <b>PX901-A:</b>  | Screw terminal panel with transorb diodes, for connecting the analog inputs |
| <b>PX901-AG:</b> | Same as PX901-A with housing for DIN rail                                   |
| <b>PX_BNC:</b>   | BNC connection box for connecting the analog inputs                         |
| <b>ST010:</b>    | Standard round cable, shielded, twisted pairs, 2 m                          |
| <b>ST011:</b>    | Standard round cable, shielded, twisted pairs, 5 m                          |
| <b>PX8001:</b>   | Screw terminal panel for connecting the digital I/O, for DIN rail           |
| <b>FB8001:</b>   | Ribbon cable for digital I/O  |
| <b>ST370-16:</b> | Standard round cable, shielded, twisted pairs, 2 m                          |

# Analog input board, optically isolated, 16 differential inputs, 16-bit



## APCI-3002

PCI 3.3 V or 5 V

Optical isolation 1000 V

16 differential inputs,  
200 kHz throughput

16-bit resolution

PCI DMA, programmable gain

Trigger functions, timer

8 optically isolated digital I/O, 24 V

### Features

- PCI 3.3 V or 5 V

#### Analog inputs

- 16 differential inputs
- 16-bit resolution
- Throughput: 200 kHz
- Voltage inputs: 0-10 V,  $\pm 10$  V, 0-5 V,  $\pm 5$  V, 0-2 V,  $\pm 2$  V, 0-1 V,  $\pm 1$  V, freely programmable through software for each channel
- Current inputs: 0-20 mA (option) can be combined freely with voltage inputs
- Gain PGA x1, x2, x5, x10 freely programmable through software for each channel

#### Analog acquisition

- Different input modes for the analog acquisition:
  - 1) Simple mode
  - 2) Scan modes
  - 3) Sequence modes
  - 4) Auto Refresh mode
- Trigger functions:
  - software trigger or
  - external trigger: the analog acquisition (single or sequence) is started through the signal on digital input 0 from 0 V to 24 V
- Onboard FIFO
- PCI-DMA

#### 24 V digital

- 24 V digital I/O enable a high interference distance and a long distance between signal transmitter and data acquisition
- 4 digital inputs, 24 V, optically isolated
- 4 digital outputs, 24 V, optically isolated

#### Timer

- 1, 12-bit

#### Safety features

- For more protection in noisy industrial environment
- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Overvoltage protection  $\pm 40$  V
- Protection against high-frequency EMI
- Input filters
- Noise neutralisation of the PC supply

### Applications

- Industrial process control
- Industrial measurement and monitoring
- Multichannel data acquisition
- Control of chemical processes
- Factory automation
- Acquisition of sensors
- Laboratory equipment
- Current measurement
- Instrumentation

### Software drivers

A CD-ROM with the following software and programming examples is supplied with the board.

#### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

#### Drivers and samples for the following compilers and software packages:

- .NET
- Microsoft VC++ • Borland C++
- Visual Basic • Delphi
- LabVIEW • LabWindows/CVI

#### ADDIPACK functions:

Analog input • Digital input • Digital output • Timer

#### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com](http://www.addi-data.com), download menu



PCI 32-bit



Windows  
64/32-bit drivers



LabVIEW™



LabWindows/CVI™



#### Customer-tailored

##### modifications

designed

to suit your needs.

Hardware and software,

firmware, PLDs, ...

Contact us!

## Specifications

### Analog inputs

|                    |  |
|--------------------|--|
| Number of inputs:  | 16 differential inputs   |
| Resolution:        | 16-bit   |
| Optical isolation: | 1000 V through opto-couplers from PC to peripheral   |
| Input ranges:      | Software-programmable for each channel<br>0-10 V, $\pm 10$ V, 0-5 V, $\pm 5$ V, 0-2 V, $\pm 2$ V, 0-1 V, $\pm 1$ V<br>0-20 mA optional |
| Gain:              | Software programmable (x1, x2, x5, x10)  |
| Throughput:        | 200 kHz  |
| Trigger:           | Through software, timer, external event<br>(24 V input)  |
| Data transfer:     | Data to the PC through FIFO memory,<br>Interrupt at EOC (End Of Conversion),<br>DMA transfer at EOC                                    |
| Interrupts:        | End of conversion, at timer overrun,<br>End of scan  |

### Digital I/O

|                         |   |
|-------------------------|---|
| Number of I/O channels: | 4 digital inputs, 24 V,<br>4 digital outputs, 24 V,<br>50 mA typ., Open Collector |
| Logical "0" Level:      | 0-14 V  |
| Logical "1" Level:      | 19-30 V   |
| Optical isolation:      | 1000 V through opto-couplers from PC to peripheral                                |

### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

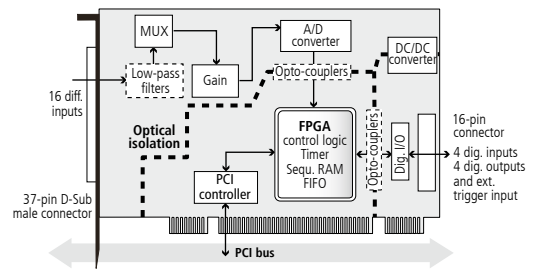
### Physical and environmental conditions

|                       |   |
|-----------------------|---|
| Dimensions:           | 175 x 99 mm   |
| System bus:           | PCI 32-bit 3.3/5V acc. to specification 2.2<br>(PCISiG)                                 |
| Space required:       | 1 PCI slot for analog inputs,<br>1 slot opening for digital I/O                         |
| Operating voltage:    | + 5 V, $\pm 5$ % from the PC  |
| Current consumption:  | 814 mA $\pm 10$ mA  |
| Front connector:      | 37-pin D-Sub male connector   |
| Additional connector: | 16-pin male connector for ribbon cable<br>for connecting the digital inputs and outputs |
| Temperature range:    | 0 to 60 °C (with forced cooling)  |

Screw terminal panel PX901-AG  
with cable ST010



### Simplified block diagram



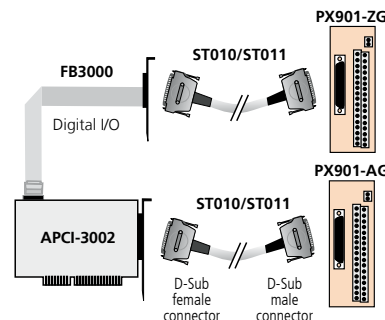
### Pin assignment – 37-pin D-Sub male connector

|                      |    |    |                      |
|----------------------|----|----|----------------------|
| Analog input 0+      | 20 | 1  | Analog input 0-      |
| Analog input 1+      | 21 | 2  | Analog input 1-      |
| Analog input 2+      | 22 | 3  | Analog input 2-      |
| Analog input 3+      | 23 | 4  | Analog input 3-      |
| Analog input 4+      | 24 | 5  | Analog input 4-      |
| Analog input 5+      | 25 | 6  | Analog input 5-      |
| Analog input 6+      | 26 | 7  | Analog input 6-      |
| Analog input 7+      | 27 | 8  | Analog input 7-      |
| Analog signal ground | 28 | 9  | Analog signal ground |
| Analog signal ground | 29 | 10 | Analog signal ground |
| Analog input 8+      | 30 | 11 | Analog input 8-      |
| Analog input 9+      | 31 | 12 | Analog input 9-      |
| Analog input 10+     | 32 | 13 | Analog input 10-     |
| Analog input 11+     | 33 | 14 | Analog input 11-     |
| Analog input 12+     | 34 | 15 | Analog input 12-     |
| Analog input 13+     | 35 | 16 | Analog input 13-     |
| Analog input 14+     | 36 | 17 | Analog input 14-     |
| Analog input 15+     | 37 | 18 | Analog input 15-     |
|                      |    | 19 | not connected        |

### Pin assignment – 16-pin male connector

|                       |    |    |                    |
|-----------------------|----|----|--------------------|
| Digital input 3 -     | 16 | 15 | Digital input 3 +  |
| Digital input 2 -     | 14 | 13 | Digital input 2 +  |
| Digital input 1 -     | 12 | 11 | Digital input 1 +  |
| Digital input 0 -     | 10 | 9  | Digital input 0 +  |
| 24 V ext.             | 8  | 7  | OC output 3 (24 V) |
| 24 V ext.             | 6  | 5  | OC output 2 (24 V) |
| Ground (dig. outputs) | 4  | 3  | OC output 1 (24 V) |
| Ground (dig. outputs) | 2  | 1  | OC output 0 (24 V) |

### ADDI-DATA connection



## Ordering information

### APCI-3002

Analog input board, optically isolated, 16 diff. inputs, 8 digital I/O, 16-bit. Incl. technical description and software drivers.

### Options

Please indicate the number of channels

**Option PC-diff:** Current input for 1 differential channel 0(4)-20 mA

**Option DF:** Precision filter for 1 channel

### Accessories

**PX901-AG:** Screw terminal panel with transorb diodes, with housing for DIN rail for connecting the analog inputs

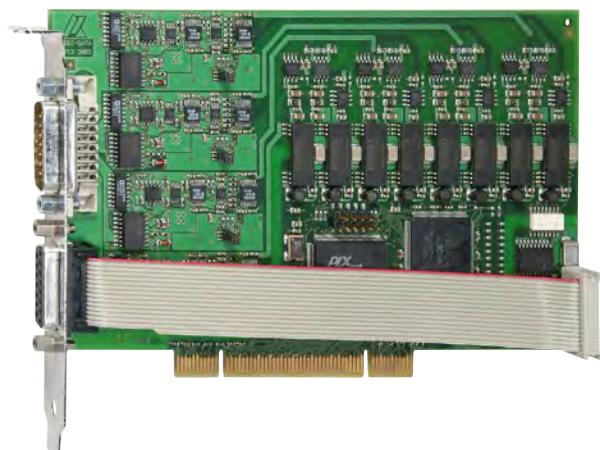
**PX901-ZG:** Screw terminal panel for connecting the digital I/O, for DIN rail

**ST010:** Standard round cable, shielded, twisted pairs, 2 m

**ST011:** Standard round cable, shielded, twisted pairs, 5 m

**FB3000:** Ribbon cable for digital I/O

# Analog input board, optically isolated, 4 differential inputs, 16-bit



PCI 32-bit



Windows  
64/32-bit drivers



LabVIEW™



LabWindows/CVI™



## Customer-tailored

### modifications

designed  
to suit your needs.  
Hardware and software,  
firmware, PLDs, ...  
Contact us!

With the fast analog input board APCI-3003 you can achieve high transfer rates with a simultaneous conversion of 4 channels.

The board has 4 differential inputs, each channel has its own A/D converter.

All 4 inputs are optically isolated from each other up to 1000 V.

## Features

- PCI 3.3 V or 5 V
- Data acquisition independent from PCI clock

### Analog inputs

- 4 differential inputs
- 16-bit resolution
- Throughput: 400 kHz per input
- Simultaneous conversion of 4 channels
- Input voltage: 0-10 V,  $\pm 10$  V, 0-5 V,  $\pm 5$  V, 0-2 V,  $\pm 2$  V, 0-1 V,  $\pm 1$  V, freely programmable through software for each channel
- Current inputs: 0-20 mA (option) can be combined freely with voltage inputs
- Gain PGA x1, x2, x5, x10 freely programmable through software for each channel

### Analog acquisition

- Different input modes for the analog acquisition:
  - 1) Simple mode
  - 2) Scan modes
  - 3) Sequence modes
  - 4) Auto Refresh mode
- Trigger functions:
  - software trigger or
  - external trigger: the analog acquisition (single or sequence) is started through the signal on digital input 0 from 0 V to 24 V
- Onboard FIFO (for 512 analog values)
- PCI-DMA

### Digital

- 24 V digital I/O enable a high interference distance and a long distance between signal transmitter and data acquisition
- 4 digital inputs, 24 V, optically isolated
- 4 digital outputs, 24 V, optically isolated

## APCI-3003

PCI 3.3 V or 5 V

Optical isolation between all channels

4 differential inputs, 16-bit resolution

Simultaneous acquisition on all channels

400 kHz throughput per channel

PCI DMA, programmable gain

Trigger functions

8 optically isolated digital I/O, 24 V

### Timer

- 1, 12-bit
- Timer as cyclic time counter

### Safety features

- For more protection in noisy industrial environment
- Optical isolation 1000 V min.
- Creeping distance IEC 61010-1
- Overvoltage protection  $\pm 40$  V
- Protection against high-frequency EMI
- Input filters
- Noise neutralisation of the PC supply

## Applications

- Industrial process control
- Industrial Measurement and monitoring
- Multichannel data acquisition
- Control of chemical processes
- Factory automation
- Acquisition of sensors
- Laboratory equipment
- Current measurement
- Instrumentation

## Software drivers

A CD-ROM with the following software and programming examples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- .NET
- Microsoft VC++ • Borland C++
- Visual Basic • Delphi
- LabVIEW • LabWindows/CVI

### ADDIPACK functions:

Analog input • Digital input • Digital output • Timer

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com](http://www.addi-data.com), download menu

## Specifications

### Analog inputs

|                    |  |
|--------------------|--|
| Number of inputs:  | 4 differential inputs  |
| resolution:        | 16-bit   |
| Optical isolation: | 1000 V through opto-couplers from PC to peripheral   |
| Input ranges:      | Software-programmable for each channel<br>0-10 V, $\pm 10$ V, 0-5 V, $\pm 5$ V, 0-2 V, $\pm 2$ V, 0-1 V, $\pm 1$ V<br>0-20 mA optional |
| Gain:              | Software programmable (x1, x2, x5, x10)  |
| Throughput:        | 400 kHz per input  |
| Trigger:           | Through software, timer, external event<br>(24 V input)  |
| Data transfer:     | Data to the PC through FIFO memory,<br>Interrupt at EOC (End Of Conversion),<br>DMA transfer at EOC                                    |
| Interrupts:        | End of conversion, at timer overrun,<br>End of scan  |

### Digital I/O

|                         |   |
|-------------------------|---|
| Number of I/O channels: | 4 digital inputs, 24 V,<br>4 digital outputs, 24 V,<br>50 mA typ., Open Collector |
| Logical "0" level:      | 0-13 V  |
| Logical "1" level:      | 16-30 V   |
| Optical isolation:      | 1000 V through opto-couplers from PC to peripheral                                |

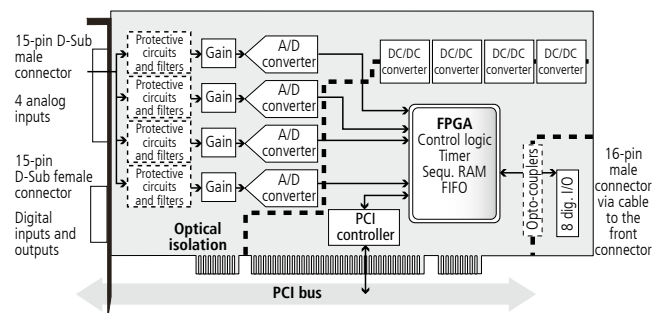
### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### Physical and environmental conditions

|                      |  |
|----------------------|--|
| Dimensions:          | 175 x 99 mm  |
| System bus:          | PCI 32-bit 3.3/5V acc. to specification 2.2<br>(PCISiG)                                  |
| Space required:      | 1 PCI slot for analog inputs,<br>1 slot opening for digital I/O                          |
| Operating voltage:   | +5 V, $\pm 5$ % from the PC  |
| Current consumption: | 1.55 A typ.  |
| Front connector:     | 15-pin D-Sub male connector for analog inputs<br>15-pin female connector for digital I/O |
| Temperature range:   | 0 to 60 °C (with forced cooling)   |

### Simplified block diagram



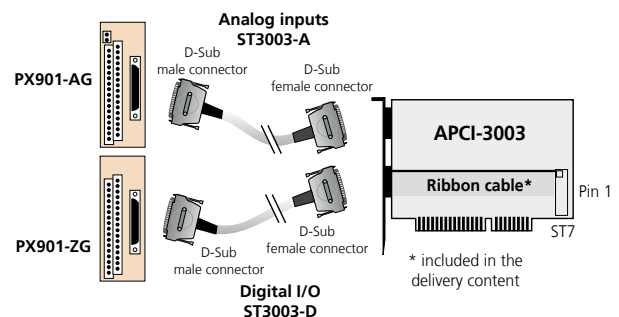
### Pin assignment analog – 15-pin D-Sub male connector

|                                 |    |   |                                 |
|---------------------------------|----|---|---------------------------------|
| Analog input 0 (-)              | 9  | 1 | Analog input 0 (+)              |
| Analog signal ground (module 0) | 10 | 2 | Analog signal ground (module 0) |
| Analog input 1 (-)              | 11 | 3 | Analog input 1 (+)              |
| Analog signal ground (module 1) | 12 | 4 | Analog signal ground (module 1) |
| Analog input 2 (-)              | 13 | 5 | Analog input 2 (+)              |
| Analog signal ground (module 3) | 14 | 6 | Analog signal ground (module 2) |
| Analog input 3 (-)              | 15 | 7 | Analog input 3 (+)              |
|                                 |    | 8 | Analog signal ground (module 3) |

### Pin assignment digital – 15-pin D-Sub female connector

|                                    |    |   |                     |
|------------------------------------|----|---|---------------------|
| Ground (dig. outputs)              | 15 | 8 | 24 V OC output 0    |
| 24 V voltage supply (dig. outputs) | 14 | 7 | 24 V OC output 1    |
| 24 V voltage supply (dig. outputs) | 13 | 6 | 24 V OC output 2    |
| Digital input 0 (-)                | 12 | 5 | 24 V OC output 3    |
| Digital input 1 (-)                | 11 | 4 | Digital input 0 (+) |
| Digital input 2 (-)                | 10 | 3 | Digital input 1 (+) |
| Digital input 3 (-)                | 9  | 2 | Digital input 2 (+) |
|                                    |    | 1 | Digital input 3 (+) |

### ADDI-DATA connection



## Ordering information

### APCI-3003

Analog input board, optically isolated, 4 differential inputs, 16-bit.  
Incl. technical description and software drivers

### Versions

**APCI-3003:** 4 differential inputs, simultaneous acquisition,  
8 digital inputs and outputs, 24 V

### Options

**Please indicate the number of channels**

**Option PC-Diff:** Current input for 1 differential channel 0(4)-20 mA

**Option DF:** Precision filter for 1 channel

### Accessories

**PX901-AG:** Screw terminal panel with transorb diodes,  
with housing for DIN rail  
for connecting the analog inputs

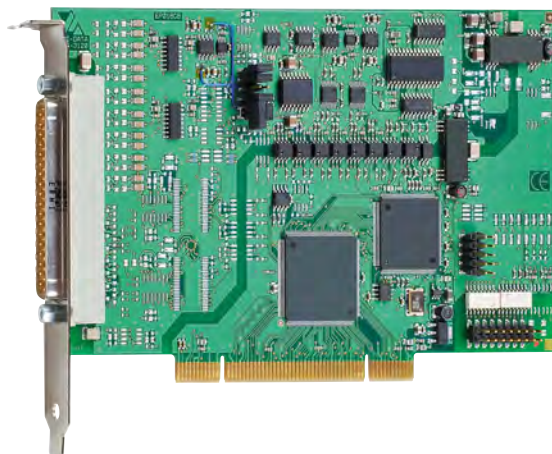
**ST3003-A:** Shielded round cable, connection to PX-901-AG

**PX901-ZG:** Screw terminal panel for connecting  
the digital I/O, for DIN rail

**ST3003-D:** Shielded round cable, connection to PX-901-ZG



# Analog input board, optically isolated, 16/8/4 SE or 8/4 differential inputs, 12-bit



Also for  
**PCI EXPRESS**

see APCle-3121, page 146

**Compatible version  
for CompactPCI™**  
See CPCI-3001, page 252



LabVIEW™



LabWindows/CVI™



**DASYLab10**  
Data Acquisition System Laboratory

## Features

### Analog inputs

- 16 single-ended / 8 differential inputs or 8 single-ended / 4 differential inputs or 4 single-ended inputs
- 12-bit resolution
- Throughput: 100 kHz
- Input voltage: 0-10 V,  $\pm 10$  V, 0-5 V,  $\pm 5$  V, 0-2 V,  $\pm 2$  V, 0-1 V,  $\pm 1$  V, 0-20 mA (option), freely programmable through software for each channel
- Gain PGA x1, x2, x5, x10 freely programmable through software for each channel
- PCI-DMA for analog data acquisition

### Analog acquisition

- Single channel, several channels, several channels through scan list
- Automatic analog acquisition through cyclic timer control
- Acquisition through scan list: up to 16 entries with gain, channel, unipolar/bipolar
- Acquisition triggered through software, timer, external event
- Trigger functions:
  - Software trigger or
  - External trigger: the analog acquisition (single or scan) is started through signal switching from 0 V to 24 V at the digital input 0.
- Interrupt: End of single channel, end of multichannel, end of scan list

### Digital

- 4 digital inputs, 24 V, optically isolated
- 4 digital outputs, 24 V, optically isolated

### Timer

- 24-bit, can be used as cyclic time counter

### Safety features

- Optical isolation 500 V min.
- Creeping distance IEC 61010-1
- Overvoltage protection  $\pm 40$  V
- Protection against high-frequency EMI
- Input filters: 159 kHz
- Noise neutralisation of the PC supply

## APCI-3001

16/8/4 single-ended or  
8/4 differential inputs

12-bit resolution

Optical isolation 500 V

100 kHz throughput

PCI DMA, programmable gain

8 digital I/O, 24 V, optically isolated, timer

Trigger functions

## Applications

- Industrial process control
- Industrial measurement and monitoring
- Multichannel data acquisition
- Control of chemical processes
- Factory automation
- Acquisition of sensors
- Laboratory equipment
- Current measurement
- Instrumentation

## Software drivers

A CD-ROM with the following software and programming examples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- Visual C++ • Microsoft C
- Borland C++ • Borland C
- Visual Basic • Delphi
- LabVIEW • DASYLab • DIAdem

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com](http://www.addi-data.com), download menu

## Specifications

### Analog inputs

|                            |  |
|----------------------------|--|
| Number of inputs:          | 16 single-ended/8 differential inputs<br>8 single-ended/4 differential inputs or<br>4 single-ended inputs                                  |
| Resolution:                | 12-bit   |
| Optical isolation:         | 500 V through opto-couplers from PC to peripheral  |
| Input ranges:              | Software-programmable for each channel<br>0-10 V, $\pm 10$ V, 0-5 V, $\pm 5$ V, 0-2 V, $\pm 2$ V, 0-1 V, $\pm 1$ V<br>0-20 mA optional     |
| Throughput:                | 100 kHz  |
| Gain:                      | Software programmable (x1, x2, x5, x10)  |
| Common mode rejection:     | DC at 10 Hz, 90 dB minimum   |
| Relative precision (INL):  | $\pm 1$ LSB (ADC)  |
| Diff. non-linearity (DNL): | $\pm 0.5$ LSB (ADC)  |
| Input impedance (PGA):     | $10^{12} \Omega // 10$ nF single-ended,<br>$10^{12} \Omega // 20$ nF differential against GND  |
| Bandwidth (-3 dB):         | Limited to 159 kHz with low-pass filter  |
| Trigger:                   | Through software, timer, external event<br>(24 V input)  |
| Data transfer:             | Data to the PC through FIFO memory,<br>I/O commands, interrupt at EOC<br>(End Of Conversion) and EOS (End of Scan),<br>DMA transfer at EOC |
| Interrupts:                | End of conversion, at timer overrun,<br>End of scan  |

### Timer

|                    |  |
|--------------------|--|
| Time base timer 2: | 50 $\mu$ s; smallest programmable value: 100 $\mu$ s |
|--------------------|--|

### Digital I/O

|                         |  |
|-------------------------|--|
| Number of I/O channels: | 4 digital inputs, 4 digital outputs, 24 V                |
| Optical isolation:      | 500 V through opto-couplers from PC to peripheral        |
| Input range:            | 0-30 V<br>- Logical "0": 0-5 V<br>- Logical "1": 10-30 V |
| Input current at 24 V:  | 3 mA typ.  |
| Output range:           | 5-30 V   |
| Max. switching current: | 10 mA typ.   |
| Output type:            | Open Collector   |

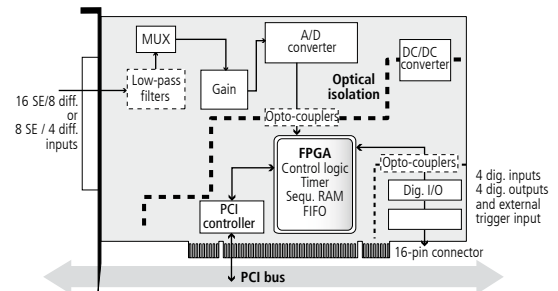
### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### Physical and environmental conditions

|                       |   |
|-----------------------|---|
| Dimensions:           | 169 x 99 mm   |
| System bus:           | PCI 32-bit 3.3 / 5 V acc. to specification 2.1 (PCISiG)                                 |
| Space required:       | 1 PCI slot for analog inputs,<br>1 slot opening for digital I/O                         |
| Operating voltage:    | +5 V, $\pm 5$ % from the PC   |
| Current consumption:  | 496 mA typ. $\pm 10$ %  |
| Front connector:      | 37-pin D-Sub male connector   |
| Additional connector: | 16-pin male connector for ribbon cable<br>for connecting the digital inputs and outputs |
| Temperature range:    | 0 to 60 °C (with forced cooling)  |

### Simplified block diagram



### Pin assignment – 37-pin D-Sub male connector

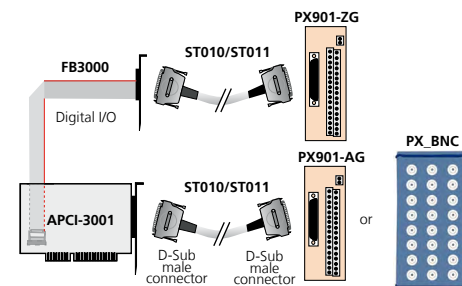
| DIFF             | SE              |    | SE               | DIFF            |
|------------------|-----------------|----|------------------|-----------------|
| (+) An. input 0  | (+) An. input 0 | 20 | (+) An. input 8  | (+) An. input 4 |
| (+) An. input 1  | (+) An. input 1 | 21 | (+) An. input 9  | (+) An. input 5 |
| (+) An. input 2  | (+) An. input 2 | 22 | (+) An. input 10 | (+) An. input 6 |
| (+) An. input 3  | (+) An. input 3 | 23 | (+) An. input 11 | (+) An. input 7 |
| (-) An. input 3  | (+) An. input 7 | 24 | (+) An. input 15 | (-) An. input 7 |
| (-) An. input 2  | (+) An. input 6 | 25 | (+) An. input 14 | (-) An. input 6 |
| (-) An. input 1  | (+) An. input 5 | 26 | (+) An. input 13 | (-) An. input 5 |
| (-) An. input 0  | (+) An. input 4 | 27 | (+) An. input 12 | (-) An. input 4 |
| Analog input GND |                 | 28 | Analog input GND |                 |
| Analog input GND |                 | 29 | Analog input GND |                 |
|                  |                 | 30 | Analog input GND |                 |
|                  |                 | 31 |                  |                 |
|                  |                 | 32 |                  |                 |
|                  |                 | 33 |                  |                 |
|                  |                 | 34 |                  |                 |
|                  |                 | 35 |                  |                 |
|                  |                 | 36 |                  |                 |
|                  |                 | 37 |                  |                 |

1: The analog inputs have a common ground line

### Pin assignment – 16-pin male connector

|                          |    |    |                          |
|--------------------------|----|----|--------------------------|
| Dig. output 0 (+)        | 1  | 2  | Dig. output 0 (-)        |
| Dig. output 1 (+)        | 3  | 4  | Dig. output 1 (-)        |
| Dig. output 2 (+)        | 5  | 6  | Dig. output 2 (-)        |
| Dig. output 3 (+)        | 7  | 8  | Dig. output 3 (-)        |
| Trigger/dig. input 0 (+) | 9  | 10 | Trigger/dig. input 0 (-) |
| Dig. input 1 (+)         | 11 | 12 | Dig. input 1 (-)         |
| Dig. input 2 (+)         | 13 | 14 | Dig. input 2 (-)         |
| Dig. input 3 (+)         | 15 | 16 | Dig. input 3 (-)         |

### ADDI-DATA connection



## Ordering information

### APCI-3001

Analog input board, optically isolated, 16/8/4 SE or 8/4 diff. inputs, 12-bit. Incl. technical description and software drivers.

### Versions

|                      |                                  |
|----------------------|----------------------------------|
| <b>APCI-3001-16:</b> | 16 SE/8 diff. inputs, 8 dig. I/O |
| <b>APCI-3001-8:</b>  | 8 SE/4 diff. inputs, 8 dig. I/O  |
| <b>APCI-3001-4:</b>  | 4 SE inputs, 8 dig. I/O          |

### Options

|                   |   |
|-------------------|---|
| <b>Option SF:</b> | Please indicate the number of channels<br>Precision filter for 1 single-ended channel |
| <b>Option DF:</b> | Precision filter for 1 differential channel   |
| <b>Option SC:</b> | Current input for 1 single-ended channel 0(4)-20 mA                                   |
| <b>Option DC:</b> | Current input for 1 diff. channel, 0(4)-20 mA   |

### Accessories

|                  |  |
|------------------|--|
| <b>PX901-A:</b>  | Screw terminal panel with transorb diodes,<br>for connecting the analog inputs |
| <b>PX901-AG:</b> | Same as PX901-A with housing for DIN rail                                      |
| <b>PX_BNC:</b>   | BNC connection box for connecting the analog I/O                               |
| <b>PX901-ZG:</b> | Screw terminal panel for connecting<br>the digital I/O, for DIN rail           |
| <b>ST010:</b>    | Standard round cable, shielded, twisted pairs, 2 m                             |
| <b>ST011:</b>    | Standard round cable, shielded, twisted pairs, 5 m                             |
| <b>FB3000:</b>   | Ribbon cable for digital I/O   |

# Analog output board, optically isolated, 8 analog outputs, 14-bit



## APCI-3501

8/4 analog outputs, 14-bit

Optical isolation 500 V

4 digital I/O, 24 V, optically isolated

Watchdog, timer



PCI 32-bit

Also for  
PCI  
EXPRESS®

see APCL-3521, page 150



Windows  
64/32-bit drivers



LabVIEW™



LabWindows/CVI™

## Features

- 8 or 4 analog outputs
- Optical isolation 500 V
- Setup time 30  $\mu$ s typ.
- 14-bit resolution (13-bit for 0-10 V)
- Output voltage:  $\pm 10$  V, 0-10 V (switchable through software)
- Output voltage after reset: 0 V
- Each output has its own ground line (without optical isolation from each other)
- Driver capacity: 5 mA/500 pF
- Short-circuit protection, EMI filters
- Noise neutralisation of the PC supply
- Creeping distance IEC 61010-1
- Watchdog for resetting the analog outputs (4 different time bases:  $\mu$ s, ms, s, min) or as 12-bit timer (with interrupt possibility), when the watchdog function is not necessary.

## Digital

- 2 digital inputs, 24 V, optically isolated
- 2 digital outputs, 24 V, optically isolated

## Applications

- Industrial process control
- Industrial measurement and monitoring
- Control of chemical processes
- Factory automation
- Laboratory equipment
- Programmable voltage source
- Instrumentation
- ...

## Software drivers

A CD-ROM with the following software and programming examples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- .NET
- Microsoft VC++ • Borland C++
- Visual Basic • Delphi
- LabVIEW • LabWindows/CVI

### ADDIPACK functions

- Analog output • Digital input • Digital output • Timer
- Watchdog

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com](http://www.addi-data.com), download menu

## Specifications

### Analog outputs

|                                       |   |
|---------------------------------------|---|
| Number of outputs:                    | 8 or 4  |
| Resolution:                           | 14-bit resolution, 12-bit accuracy                                    |
| Monotony:                             | 12-bit  |
| Optical isolation:                    | 500 V through opto-couplers   |
| Output range:                         | 0-10 V, $\pm 10$ V switchable through software                        |
| Setup time at 2 k $\Omega$ , 1000 pF: | 30 $\mu$ s  |
| Overvoltage protection:               | $\pm 12$ V  |
| Max. output current/load:             | $\pm 5$ mA / 500 pF, 2 k $\Omega$                                     |
| Short-circuit current:                | $\pm 25$ mA   |
| Output voltage after reset:           | 0 V   |
| Watchdog:                             | software-programmable<br>4 different time bases: $\mu$ s, ms, s, min. |

### Digital I/O

|                         |  |
|-------------------------|--|
| Number of I/O channels: | 2 digital inputs, 2 digital outputs, 24 V                |
| Optical isolation:      | 500 V through opto-couplers from PC to peripheral        |
| Input current at 24 V:  | 3 mA typ.  |
| Input range:            | 0-30 V<br>- Logical "0": 0-5 V<br>- Logical "1": 10-30 V |
| Max. switching current: | 10 mA typ.   |
| Output range:           | 5-30 V   |
| Output type:            | Open Collector   |

### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

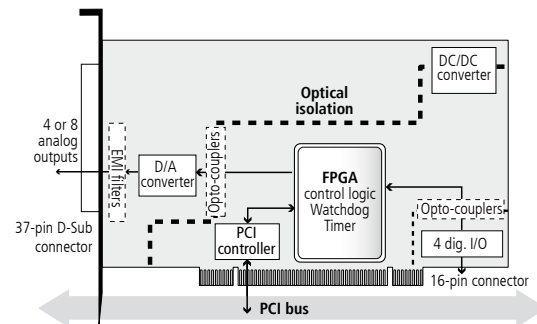
### Physical and environmental conditions

|                        |   |
|------------------------|---|
| Dimensions:            | 175 x 99 mm   |
| System bus:            | PCI 32-bit 3.3/5 V acc. to specification 2.1 (PCISIG)                                   |
| Space required:        | 1 PCI slot for analog outputs,<br>1 slot opening for digital I/O with FB3000            |
| Operating voltage:     | +5 V, $\pm 5$ % from the PC   |
| Current consumption:   | 440 mA $\pm 10$ % typ.  |
| Front connector:       | 37-pin D-Sub male connector   |
| Additional connector : | 16-pin male connector for ribbon cable<br>for connecting the digital inputs and outputs |
| Temperature range:     | 0 to 60 °C (with forced cooling)  |

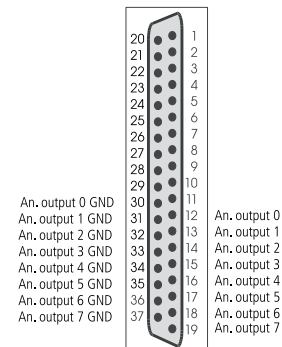
Screw terminal panel PX901-AG  
with cable ST010



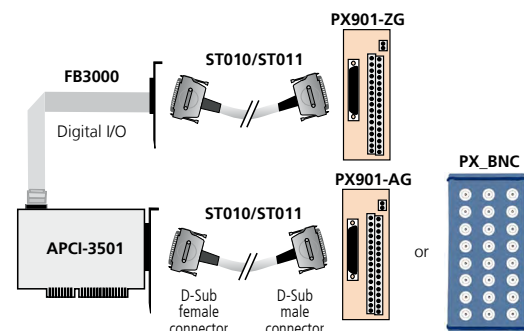
### Simplified block diagram



### Pin assignment – 37-pin D-Sub male connector



### ADDI-DATA connection



## Ordering information

### APCI-3501

Analog output board, optically isolated, 8/4 analog outputs, 14-bit. Incl. technical description and software drivers.

### Versions

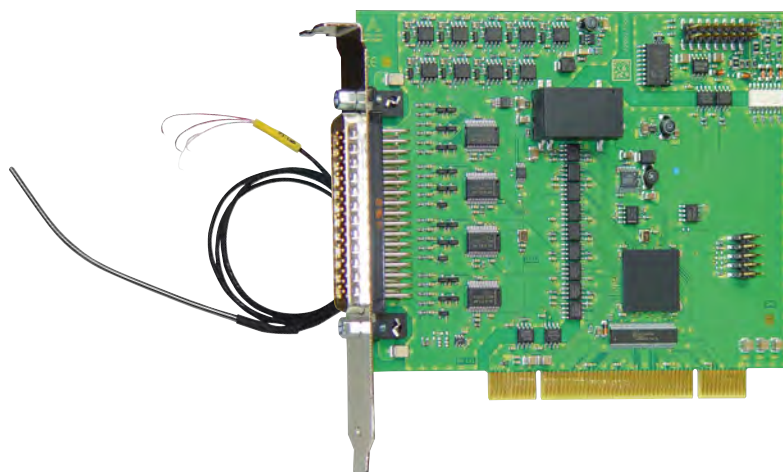
- APCI-3501-8** Version with 8 analog voltage outputs
- APCI-3501-4** Version with 4 analog voltage outputs

### Accessories

- PX901-A:** Screw terminal panel with transorb diodes, for connecting the analog outputs
- PX901-AG:** Same as PX901-A with housing for DIN rail
- PX\_BNC:** BNC connection box for connecting the analog I/O

- ST010:** Standard round cable, shielded, twisted pairs, 2 m
- ST011:** Standard round cable, shielded, twisted pairs, 5 m
- PX901-ZG:** Screw terminal panel for connecting the digital I/O, for DIN rail
- FB3000:** Ribbon cable for digital I/O

# Temperature measurement board, optically isolated, 16/8/4 channels for thermocouples, Pt100, RTD, 18-bit



**PCI** 32-bit



**Windows**  
64/32-bit drivers



LabVIEW™



LabWindows/CVI™



**DASYLab10**  
Data Acquisition System Laboratory

## Features

- PCI 3.3 V or 5 V
- 18-bit resolution, 16-bit accuracy
- Each channel can be configured either to thermocouples, RTD or as an analog voltage input channel
  - 16 analog inputs for thermocouple types J, K, T, E, R, S, B, N
  - or 8 diff. analog inputs for the acquisition of the resistance temperature detectors (Pt100)
  - or 16 SE/8 differential analog voltage inputs,  $\pm 1.25$  V
- 8 independent current sources for resistance temperature detectors (RTD) and one current source for the cold junction compensation
- Cold junction compensation (on separate screw terminal panel)
- Gain and offset calibration
- Linearisation through table and calculation for thermocouple types J, K, T, E, R, S, B, N and RTDs
- Programmable gain
- 16-bit accuracy with converter sample rate of 20, 40, 80 or 160 Hz (higher sample rate on request)
- 4 digital inputs, 24 V and 3 digital outputs, open collector, optically isolated
- Base address and IRQ channels set through BIOS

## Safety features

- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Diagnostic: Short-circuits- and line break detection, depending on the type of sensor used
- Protection against overvoltage ( $\pm 30$  V) and high-frequency EMI

## APCI-3200

Up to 16 channels for thermocouples or 8 inputs for resistance temperature detectors (RTD)

Mixed configuration of the channels

18-bit resolution

Optical isolation 1000 V

Cold junction compensation on screw terminal panel PX3200

Software linearisation

## Software drivers

A CD-ROM with the following software and programming examples is supplied with the board:

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- .NET
- Microsoft VC++ • Borland C++
- Visual Basic • Delphi
- LabVIEW • LabWindows/CVI • DIAdem

### ADDIPACK functions

- Analog input
- Temperature
- Resistance
- Digital input
- Digital output

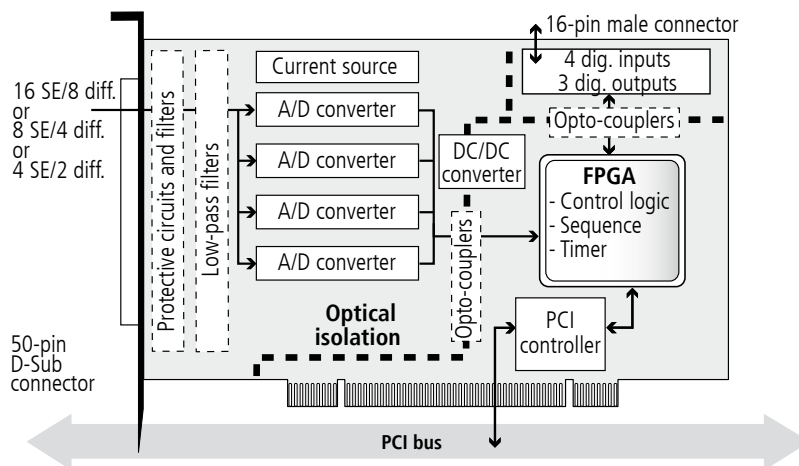
### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com](http://www.addi-data.com), download menu



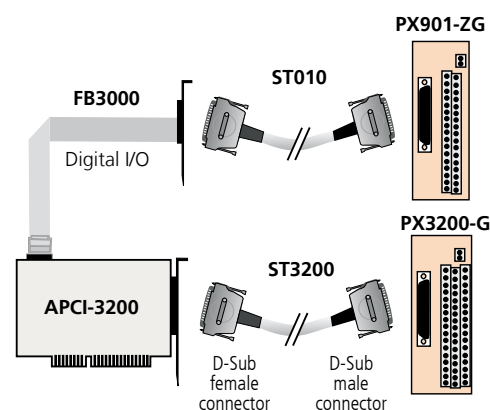
### Simplified block diagram



### Pin assignment – 50-pin D-Sub male connector

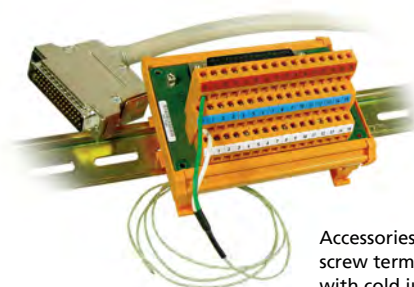
| Pin |         | Pin |    | Pin |        |
|-----|---------|-----|----|-----|--------|
| 34  | EXC CJC | 34  | 18 | 1   | CJC IN |
| 35  | EXC 0   | 35  | 19 | 2   | CH0+   |
| 36  | GND 0   | 36  | 20 | 3   | CH1+   |
| 37  | EXC 1   | 37  | 21 | 4   | CH2+   |
| 38  | GND 1   | 38  | 22 | 5   | CH3+   |
| 39  | EXC 2   | 39  | 23 | 6   | CH4+   |
| 40  | GND 2   | 40  | 24 | 7   | CH5+   |
| 41  | EXC 3   | 41  | 25 | 8   | CH6+   |
| 42  | GND 3   | 42  | 26 | 9   | CH7+   |
| 43  | EXC 4   | 43  | 27 | 10  | CH8+   |
| 44  | GND 4   | 44  | 28 | 11  | CH9+   |
| 45  | EXC 5   | 45  | 29 | 12  | CH10+  |
| 46  | GND 5   | 46  | 30 | 13  | CH11+  |
| 47  | EXC 6   | 47  | 31 | 14  | CH12+  |
| 48  | GND 6   | 48  | 32 | 15  | CH13+  |
| 49  | EXC 7   | 49  | 33 | 16  | CH14+  |
| 50  | CH15-   | 50  | 33 | 17  | CH15+  |

### ADDI-DATA connection



### Pin assignment – 16-pin male connector

|                   |         |                   |
|-------------------|---------|-------------------|
| 24 V              | 1 ■ 2   | GND               |
| Dig. output 0 (+) | 3 ■ 4   | Dig. output 0 (-) |
| Dig. output 1 (+) | 5 ■ 6   | Dig. output 1 (-) |
| Dig. output 2 (+) | 7 ■ 8   | Dig. output 2 (-) |
| Dig. input 0 (+)  | 9 ■ 10  | Dig. input 0 (-)  |
| Dig. input 1 (+)  | 11 ■ 12 | Dig. input 1 (-)  |
| Dig. input 2 (+)  | 13 ■ 14 | Dig. input 2 (-)  |
| Dig. input 3 (+)  | 15 ■ 16 | Dig. input 3 (-)  |



Accessories:  
screw terminal panel PX3200-G  
with cold junction compensation,  
ST3200 cable, see page 209.

## Specifications

### Analog inputs

|                |   |
|----------------|---|
| Analog inputs: | <ul style="list-style-type: none"> <li>16 x thermocouples or</li> <li>8 x RTD with 2 or 4 wire connection or</li> <li>4 x RTD with 3 wire connection or 16 SE/8 diff. inputs, <math>\pm 2.5</math> V</li> </ul> |
|----------------|---|

|                   |                                      |
|-------------------|--------------------------------------|
| Resolution:       | 18-bit                               |
| Accuracy:         | 16-bit                               |
| Input amplifier:  | 1, 2, 4, 8, 16, 32, 64, 128          |
| Conversion start: | Through software or external trigger |

### Digital I/O

|                         |  |
|-------------------------|--|
| Number of I/O channels: | 4 digital inputs, 24 V,<br>3 digital outputs, 24 V,<br>125 mA typ., open collector |
| Logical "0" level:      | 0-5 V  |
| Logical "1" level:      | 12-30 V  |
| Optical isolation:      | 1000 V through opto-couplers for analog and digital channels                       |

### Sampling frequencies

|                                |   |
|--------------------------------|---|
| Selectable                     |   |
| Sampling frequencies $f_{ADC}$ | $f_{ADC} = 160$ Hz, 80 Hz, 40 Hz or 20 Hz   |
| Various sampling rates $F_s$   | in „Read 1“ and in „Scan“ mode depending on the type of transducer RTD or thermocouple (TC) |

| Sensor         | Selectable sampling frequencies $f_{ADC}$ | Sampling frequencies in „Read 1“ mode | Sampling frequencies in „Scan“ mode |                                 |
|----------------|---|---------------------------------------|-------------------------------------|---------------------------------|
| RTD (Pt100...) | 160 Hz                                    | 53 Hz / channel                       | 32 Hz                               | for 2, 4, 6 and/or 8 channels   |
|                | 80 Hz                                     | 26 Hz / channel                       | 16 Hz                               |                                 |
|                | 40 Hz                                     | 13 Hz / channel                       | 8 Hz                                |                                 |
|                | 20 Hz                                     | 6 Hz / channel                        | 4 Hz                                |                                 |
| Thermo-couples | 160 Hz                                    | 26 Hz / channel                       | 23 Hz                               | for 4, 8, 12 and/or 16 channels |
|                | 80 Hz                                     | 16 Hz / channel                       | 11 Hz                               |                                 |
|                | 40 Hz                                     | 6 Hz / channel                        | 6 Hz                                |                                 |
|                | 20 Hz                                     | 3 Hz / channel                        | 3 Hz                                |                                 |

#### Four cases are possible:

- „Read 1“ mode with RTD**  

$$F_s = \frac{f_{ADC}}{3}$$

With RTD (Pt100...) 3 values are acquired at each measurement:

  - the measured value,
  - the offset,
  - the reference voltage.

$F_s = 53$  Hz, 26 Hz, 13 Hz, 6 Hz
- „Read 1“ mode with thermocouples (TC)**  

$$F_s = \frac{f_{ADC}}{6}$$

With TC 2 x 3 values are acquired at each measurement:

  - the measured value,
  - the offset,
  - the reference voltage.

One time for the acquisition value and one time for the cold junction compensation.

$F_s = 26$  Hz, 13 Hz, 6 Hz, 3 Hz
- „Scan“ Mode with RTD**  

$$F_s = \frac{f_{ADC}}{5}$$

With RTD (Pt100...) 5 values (unipolar, diff.) are acquired per scan measurement to sample 2 channels: for 2 values for 1, 2, 3 and/or 4 modules

$F_s = 32$  Hz, 16 Hz, 8 Hz, 4 Hz
- „Scan“ Mode with thermocouples (TC)**  

$$F_s = \frac{f_{ADC}}{7}$$

With TC 7 values (bipolar, SE) are acquired, per scan measurement to sample 4 channels: for 4 values for 1, 2, 3 and/or 4 modules

$F_s = 23$  Hz, 11 Hz, 6 Hz, 3 Hz

### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### Physical and environmental conditions

|                                    |   |
|------------------------------------|---|
| Dimensions:                        | 131 x 99 mm   |
| System bus:                        | PCI 32-bit 3.3/5 V acc. to spec. 2.2 (PCISIG)   |
| Space required:                    | 1 PCI slot and<br>1 slot opening for the digital I/O  |
| Operating voltage:                 | +5 V, $\pm 5$ % from the PC   |
| Current consumption (typ.):        | 550 to 600 mA depending on the version  |
| Front connector (analog channels): | 50-pin D-Sub male connector   |
| Additional connector:              | 16-pin male connector for connecting the digital I/O via ribbon cable with 37-pin D-Sub connector |
| Operating temperature:             | 0 to 60 °C (with forced cooling)  |

### Thermocouples accuracy

| Type                | Range                   | Accuracy (+/-)  |
|---------------------|-------------------------|---|
| <b>DIN EN 60584</b> |                         |   |
| Type J              | -200.0 °C to +600.0 °C  | -0.1 °C to +1200.0 °C<br>$\pm 0.6$ °C<br>$\pm 0.2$ °C<br>$\pm 0.6$ °C |
| Type T              | -200.0 °C to -79.9 °C   | -80.0 °C to +400.0 °C<br>$\pm 0.7$ °C<br>$\pm 0.3$ °C                 |
| Type K              | -200.0 °C to +1000.0 °C | -0.1 °C to +1300.0 °C<br>$\pm 0.8$ °C<br>$\pm 0.4$ °C<br>$\pm 0.6$ °C |
| Type E              | -200.0 °C to +400.0 °C  | +1000.0 °C to $\pm 0.5$ °C  |
| Type N              | -200.0 °C to +800.0 °C  | -0.1 °C to +1300.0 °C<br>$\pm 1.0$ °C<br>$\pm 0.2$ °C<br>$\pm 0.5$ °C |
| Type S              | 0.0 °C to +400.0 °C     | +399.9 °C to +1768.0 °C<br>$\pm 1.6$ °C<br>$\pm 0.7$ °C               |
| Type R              | 0.0 °C to +400.0 °C     | +399.9 °C to +1768.0 °C<br>$\pm 1.6$ °C<br>$\pm 0.6$ °C               |
| Type B              | +400.0 °C to +800.0 °C  | +799.9 °C to +1820.0 °C<br>$\pm 2.0$ °C<br>$\pm 1.0$ °C               |

### Accuracy of the reference cold junction temperature

| Type   | Range          | Accuracy (+/-)  |
|--------|----------------|---|
| Pt1000 | 0° C to +60° C | $\pm (0.30 \text{ °C} + 0.0050 \times  T )$<br>(T: Temperature in °C) |

### Accuracy of the resistance thermometer (RTD)

| Type                | Range                  | Accuracy (+/-)                      |
|---------------------|------------------------|-------------------------------------|
| <b>DIN EN 60751</b> |                        | <b>Worst Case (Gain=1 unipolar)</b> |
| Pt100               | -200.0 °C to +850.0 °C | $\pm 0.4$ °C                        |
| Pt200               | -200.0 °C to +850.0 °C | $\pm 0.4$ °C                        |
| Pt500               | -200.0 °C to +850.0 °C | $\pm 0.3$ °C                        |
| Pt1000              | -200.0 °C to +500.0 °C | $\pm 0.2$ °C                        |
| Ni100               | +500.0 °C to -60.0 °C  | $\pm 1.0$ °C<br>$\pm 0.3$ °C        |

### Accuracy in the temperature range of -20 °C to +40 °C with Pt100

| Gain | Accuracy      |
|------|---------------|
| 1    | $\pm 0.40$ °C |
| 2    | $\pm 0.20$ °C |
| 4    | $\pm 0.15$ °C |
| 8    | $\pm 0.10$ °C |
| 16   | $\pm 0.08$ °C |
| 32   | $\pm 0.08$ °C |
| 64   | $\pm 0.08$ °C |

### Sensor short-circuit / line break detection

| Type                           | short-circuits | line break   |
|--------------------------------|----------------|--------------|
| Thermocouple (SE)              | no detection   | no detection |
| Resistance thermometer (diff.) | detection      | detection    |
| Potentiometer (diff.)          | detection      | detection    |

## Screw terminal panel for thermocouples/RTDs with cold junction compensation



### PX3200

Screw terminal panel with housing (PX3200-G)  
for DIN rail

Screw terminal panel without housing (PX3200)  
with 4 mounting holes

Cold junction compensation for APCI-3200

The PX3200-G screw terminal panel is used for connecting thermocouples/RTDs. It is connected to the APCI-3200 through the ST3200 cable. The housing of the female connector is connected to two ground terminals so that the board is additionally earthed for more security. All components of the board are enclosed in an earthing strip also connected to the ground terminals.

Each terminal is directly connected to one pin of the 50-pin D-Sub female connector. The designations on the terminals indicate the respective connections for the 50-pin D-Sub female connector.

The PX3200-G features an integrated CJC<sup>[1]</sup>.

The voltage ( $V_{CJC}$ ) is measured through an RTD (Pt1000) at the cold junction and used as reference voltage for the temperature measurement of the thermocouples connected to the panel.

After each acquisition, a new measurement of the cold junction compensation is made for each channel and processed through software.

<sup>[1]</sup> CJC: Cold Junction Compensation

### Specifications

#### Possible connections

| Versions                            | Number of thermocouples (SE inputs) | Number of RTDs (diff. inputs) |                   |                   |
|-------------------------------------|-------------------------------------|-------------------------------|-------------------|-------------------|
|                                     |                                     | 2-wire connection             | 3-wire connection | 4-wire connection |
| APCI-3200-4                         | 4                                   | 2                             | 1                 | 2                 |
| APCI-3200-8                         | 8                                   | 4                             | 2                 | 4                 |
| APCI-3200-16                        | 16                                  | 8                             | 4                 | 8                 |
| Safety features:                    |                                     | Ground terminals              |                   |                   |
| Connector:                          |                                     | 50-pin D-Sub female connector |                   |                   |
| Dimensions of the board (PX3200):   |                                     | (L x W x H) 110 x 70 x 45 mm  |                   |                   |
| Dimensions with housing (PX3200-G): |                                     | (L x W x H) 113 x 87 x 80 mm  |                   |                   |
| Temperature range:                  |                                     | 0-70 °C                       |                   |                   |

### Ordering information

#### APCI-3200

Temperature measurement board, optically isolated, 16/8/4 channels for thermocouples, Pt100, RTD, 18-bit.  
Incl. technical description, software drivers

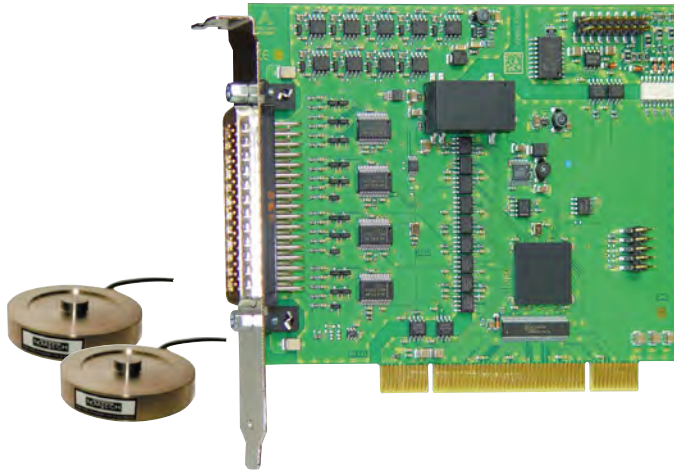
#### Versions

- APCI-3200-16:** 16 analog inputs:  
16 thermocouples  
or 8 RTDs or 16 single-ended  
or 8 diff. voltage inputs
- APCI-3200-8:** 8 analog inputs: 8 thermocouples  
or 4 RTDs or 8 single-ended  
or 4 diff. voltage inputs
- APCI-3200-4:** 4 analog inputs: 4 thermocouples  
or 2 RTDs or 4 single-ended  
or 2 diff. voltage inputs

#### Accessories

- PX3200-G:** Screw terminal panel with cold junction compensation and housing for DIN rail.
- PX3200:** Screw terminal panel with cold junction compensation and 4 mounting holes for wall mounting.
- ST3200:** Standard round cable, shielded, twisted pairs, 2 m
- FB3000:** Ribbon cable for digital I/O on separate bracket
- PX901-ZG:** Screw terminal panel for connecting the digital I/O, for DIN rail
- ST010:** Standard round cable, shielded, twisted pairs, 2 m
- ST011:** Standard round cable, shielded, twisted pairs, 5 m

# Pressure measurement board, optically isolated, up to 8 channels for strain gauges, 18-bit



## APCI-3300

Up to 8 channels for strain gauges

Up to 8 onboard voltage sources

18-bit resolution

Optical isolation 1000 V

Software linearisation

Direct connection of the pressure sensors to the screw terminal panel PX3200-G



PCI 32-bit



Windows  
64/32-bit drivers



LabVIEW™ \*



LabWindows/CVI™ \*

\* On request

## Features

- PCI 3.3 V or 5 V

### Analog inputs

- 18-bit resolution, unipolar, 16-bit accuracy
- 8 or 4 differential inputs for strain gauges
- Voltage range from 0 to + 1.25 V
- 4 or 8 voltage sources for the connected pressure sensors
- Output voltage for the voltage sources 5 V, 30 mA
- Gain and offset calibration
- Calculation of the pressure value through software
- Programmable gain
- 16-bit accuracy with a sample rate of 20, 40, 80 or 160 Hz

### Analog acquisition

- Acquisition triggered through software, timer, external event
- Trigger functions:
  - Software trigger or
  - External trigger: the analog acquisition (single or sequence) is started through signal switching from 0 V to 24 V at the digital input 0.
- Connection of linear sensors (Wheatstone Bridge)

### Digital

- 4 digital inputs, 24 V and 3 digital outputs, open collector, optically isolated

## Safety features

- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Protection against overvoltage ( $\pm 30$  V) and high-frequency EMI

## Software

A CD-ROM with the following software and programming examples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- .NET
- Microsoft VC++ • Borland C++
- Visual Basic • Delphi
- LabVIEW

### ADDIPACK functions

Pressure • Digital input • Digital output

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com](http://www.addi-data.com), download menu

## Specifications

### Analog inputs

|  |  |
|--|--|
| Resolution:                                | 18-bit, unipolar   |
| Number of inputs:                          | 8 or 4 analog inputs<br>for strain gauges,<br>one voltage source per channel |
| Input type:                                | Differential channels  |
| Optical isolation:                         | 1000 V through opto-couplers from PC to peripheral                           |
| Accuracy:                                  | 16-bit   |
| Overvoltage protection:                    | ± 30 V   |
| Input voltage range:                       | 0 to 1.25 V / PGA  |
| Input amplifier (PGA):                     | 1, 2, 4, 8, 16, 32, 64, 128  |
| Conversion start:                          | Through software or<br>external trigger, with or without timer               |
| Voltage sources:                           | 4 or 8   |
| Output voltage for the<br>voltage sources: | 5 V, 30 mA (other values on request)   |

### Digital I/O

|   |  |
|---|--|
| Number of I/O channels:                   | 4 digital inputs, 24 V,<br>3 digital outputs, 24 V,<br>125 mA typ., open collector |
| Logical "0" level:                        | 0-5 V  |
| Logical "1" level:                        | 12-30 V  |
| Input current at 24 V:                    | 2 mA   |
| Max. switching current<br>of the outputs: | 125 mA   |
| Optical isolation:                        | 1000 V through opto-couplers<br>for analog and digital channels                    |

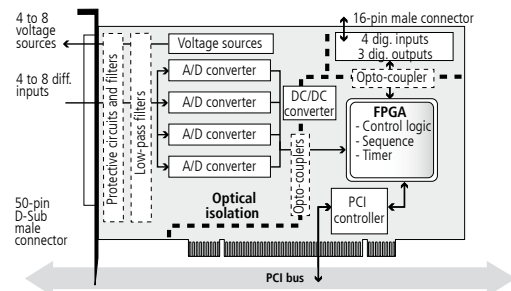
### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### Physical and environmental conditions

|                                       |  |
|---------------------------------------|--|
| Dimensions:                           | 131 x 99 mm  |
| System bus:                           | PCI 32-bit 3.3 / 5 V acc. to spec. 2.2 (PCISiG)  |
| Space required:                       | 1 PCI slot and<br>1 slot opening for<br>the digital I/O  |
| Operating voltage:                    | +5 V, ± 5 % from the PC, +3.3 V  |
| Current consumption (typ.):           | 570 to 600 mA depending on the version   |
| Front connector<br>(analog channels): | 50-pin D-Sub male connector  |
| Additional connector:                 | 16-pin male connector for connecting<br>of the digital I/O via ribbon cable<br>with 37-pin D-Sub connector |
| Operating temperature:                | 0 to 60 °C (with forced cooling)   |

### Simplified block diagram



### Pin assignment – 50-pin D-Sub male connector

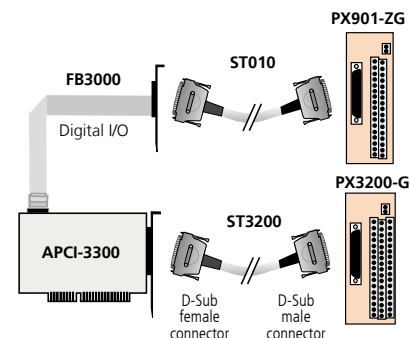
| Pin |       | Pin |    | Pin  |    | Pin |    |
|-----|-------|-----|----|------|----|-----|----|
| 34  | NC    | 34  | 18 | 1    | NC | 1   | NC |
| 35  | EXC 0 | 35  | 2  | CH0+ | 2  | NC  | 19 |
| 36  | GND 0 | 36  | 3  | CH0- | 3  | NC  | 20 |
| 37  | EXC 1 | 37  | 4  | CH1+ | 4  | NC  | 21 |
| 38  | GND 1 | 38  | 5  | CH1- | 5  | NC  | 22 |
| 39  | EXC 2 | 39  | 6  | CH2+ | 6  | NC  | 23 |
| 40  | GND 2 | 40  | 7  | CH2- | 7  | NC  | 24 |
| 41  | EXC 3 | 41  | 8  | CH3+ | 8  | NC  | 25 |
| 42  | GND 3 | 42  | 9  | CH3- | 9  | NC  | 26 |
| 43  | EXC 4 | 43  | 10 | CH4+ | 10 | NC  | 27 |
| 44  | GND 4 | 44  | 11 | CH4- | 11 | NC  | 28 |
| 45  | EXC 5 | 45  | 12 | CH5+ | 12 | NC  | 29 |
| 46  | GND 5 | 46  | 13 | CH5- | 13 | NC  | 30 |
| 47  | EXC 6 | 47  | 14 | CH6+ | 14 | NC  | 31 |
| 48  | GND 6 | 48  | 15 | CH6- | 15 | NC  | 32 |
| 49  | EXC 7 | 49  | 16 | CH7+ | 16 | NC  | 33 |
| 50  | NC    | 50  | 17 | CH7- | 17 | NC  |    |

NC: not connected  
EXC: Voltage source

### Pin assignment – 16-pin male connector

|                   |          |                   |
|-------------------|----------|-------------------|
| 24 V              | 1 ■■ 2   | GND               |
| Dig. output 0 (+) | 3 ■■ 4   | Dig. output 0 (-) |
| Dig. output 1 (+) | 5 ■■ 6   | Dig. output 1 (-) |
| Dig. output 2 (+) | 7 ■■ 8   | Dig. output 2 (-) |
| Dig. input 0 (+)  | 9 ■■ 10  | Dig. input 0 (-)  |
| Dig. input 1 (+)  | 11 ■■ 12 | Dig. input 1 (-)  |
| Dig. input 2 (+)  | 13 ■■ 14 | Dig. input 2 (-)  |
| Dig. input 3 (+)  | 15 ■■ 16 | Dig. input 3 (-)  |

### ADDI-DATA connection



## Ordering information

### APCI-3300

Pressure measurement board, optically isolated, up to 8 channels for strain gauges, 18-bit. Incl. technical description and software drivers.

#### Versions

|                     |                                      |
|---------------------|--------------------------------------|
| <b>APCI-3300-4:</b> | 4 analog inputs for pressure signals |
| <b>APCI-3300-8:</b> | 8 analog inputs for pressure signals |

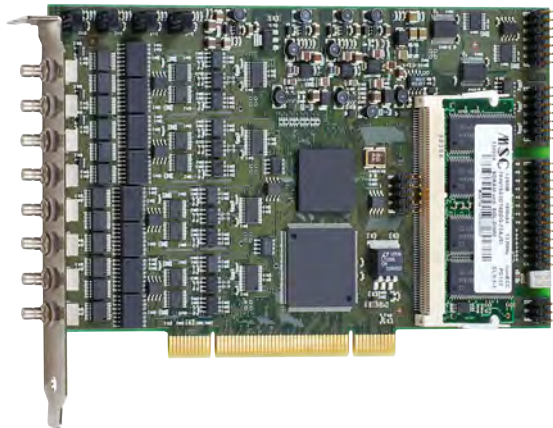
#### Accessories

|                  |  |
|------------------|--|
| <b>PX3200-G:</b> | Screw terminal panel with housing for DIN rail |
| <b>PX3200:</b>   | Screw terminal panel with 4 mounting holes     |

|                  |  |
|------------------|--|
| <b>ST3200:</b>   | Standard round cable, shielded, twisted pairs, 2 m |
| <b>FB3000:</b>   | Ribbon cable for dig. I/O on separate bracket      |
| <b>PX901-ZG:</b> | Screw terminal panel for digital I/O for DIN rail  |
| <b>ST010:</b>    | Standard round cable, shielded, twisted pairs, 2 m |
| <b>ST011:</b>    | Standard round cable, shielded, twisted pairs, 5 m |



# Noise and vibration measurement board, optically isolated, multifunction board, 8 analog inputs, 24-bit



**PCI** 32-bit



## Customer-tailored modifications

designed to suit your needs.  
Hardware and software, firmware, PLDs, ...  
**Contact us!**

Acoustic processes in test applications are not limited to simple noise and vibration measurements.

The multifunction PCI board APCI-3600 by ADDI-DATA offers a PC-based solution to almost all additional measuring tasks which may arise thanks to its many functions.

- 8 analog input channels through SMB co-axial connectors
- Counter function: 4 chronometer inputs (up to 1 MHz 32-bit depth) allow applications in which precise coordinates must be determined.
- Current supply of the ICP™ sensors
- Synchronous mode (cascading) of several APCI-3600 through Master/Trigger
- Digital I/O
- SDRAM memory module allows transfer rates up to 24 MByte/s.

For a fast integration of the board in special test devices, the board is supplied with drivers and samples.

## Features

### Analog inputs (for all versions)

- 8 SE or diff. (+/-) inputs
- Sampling rate can be set between 2 and 200 kHz
- SNR (signal/noise ration) > 105 dB
- 24-bit resolution
- One A/D converter per channel: simultaneous acquisition on all analog inputs
- Gain 1 to 10, software-programmable
- Input coupling AC, DC, GND, software-programmable for each channel
- Antialiasing filter to avoid sampling errors
- Overvoltage protection

### Current sources

- 8 current sources for the direct connection of ICP™ sensors (integrated circuit piezoelectric)
- 4 mA typ., 24 V max.

### Chronometer inputs (only for version APCI-3600)

- 4 chronometer inputs, RS485, 32-bit for revolution counting
- 2 gate inputs

## APCI-3600, APCI-3600-L

8 SE/diff. (+/-) inputs,  
simultaneous sampling

Connection through SMB co-axial connectors

Onboard power supply for ICP™ sensors

4 chronometer inputs (RS485)

2 analog outputs

8 digital inputs, 8 digital outputs

Onboard SDRAM module

### Analog outputs (only for version APCI-3600)

- 2 analog outputs: both outputs are started synchronously with the A/D converter. Arbitrary function generators can be programmed.
- Settling time: 5  $\mu$ s
- 16-bit resolution
- Simultaneous sampling on both channels
- 13-bit accuracy
- DAC type: R-2R
- Output range:  $\pm 10$  V

### Digital (only for version APCI-3600)

- 8 digital inputs, 24 V, optically isolated
- 8 digital outputs, 24 V, optically isolated

### Onboard SDRAM module

- 128 MB (256 MB or 512 MB on request)

## Applications

The following applications can be realised with the

### APCI-3600:

- Noise measurement with fault diagnosis on gear and drive over FFT:  
Encoders are connected to the chronometer inputs and microphones are connected to the analog inputs. Encoders measure the position of the drive and the analog inputs measure the noise of the system at a specific position. For this purpose the analog inputs and the chronometer inputs are controlled synchronously. To each analog sample belongs a position of the chronometer. The synchronisation results from a FFT.
- Measurement of the transfer function of a DUT ("Device Under Test").
- Noise analysis: Evaluation of a washing machine, measurements in the automotive field, etc.

## Software

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

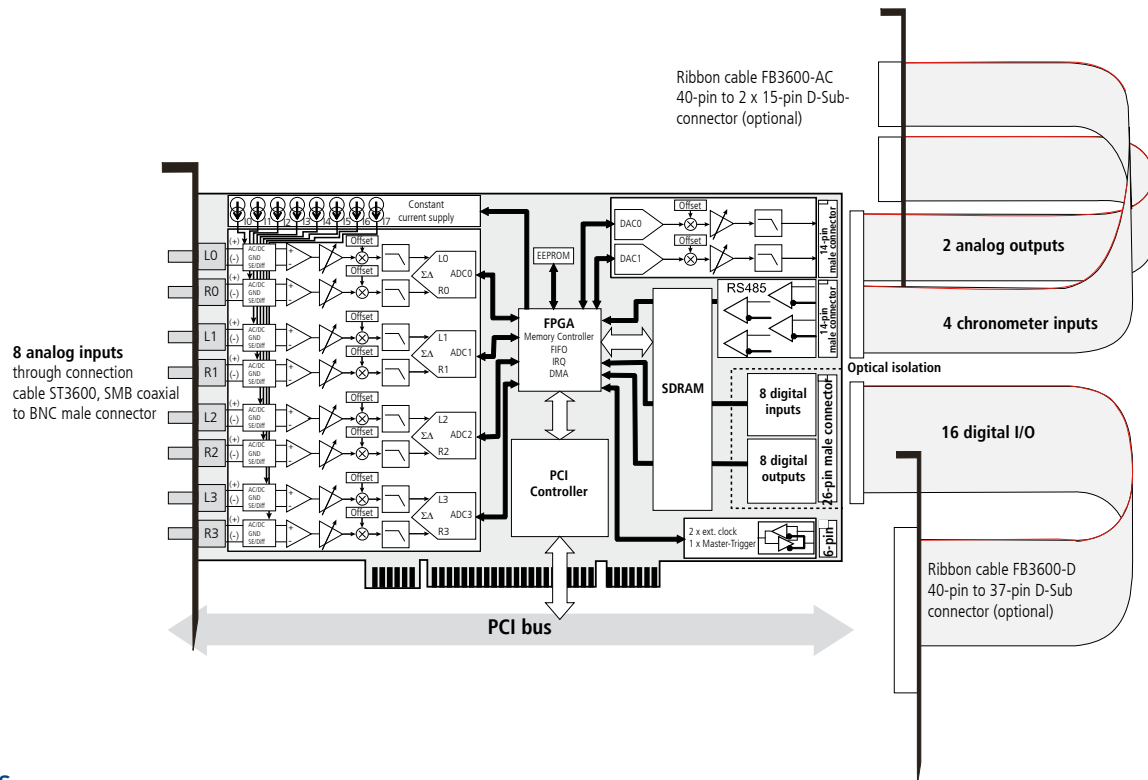
### Samples for the following compilers:

Visual C++ • Borland C

Driver download: [www.addi-data.com](http://www.addi-data.com), download menu

\*Preliminary  
product information

## Simplified block diagram



## Versions

|             | 8 analog inputs | 8 ICP power supply (current sources) | 4 chronometer inputs | 2 analog outputs | 8 digital inputs, 24 V, optically isolated | 8 digital outputs, 24 V, optically isolated | Onboard SD RAM |
|-------------|-----------------|--------------------------------------|----------------------|------------------|--|---|----------------|
| APCI-3600   | ✓               | ✓                                    | ✓                    | ✓                | ✓  | ✓   | ✓              |
| APCI-3600-L | ✓               | ✓                                    |                      |                  |  |   | ✓              |

## Specifications\*

## Analog inputs

|                         |   |                          |                           |
|-------------------------|---|--------------------------|---------------------------|
| Number:                 | 8   |                          |                           |
| Input type:             | Single-ended or differential through software             |                          |                           |
| resolution:             | 24-bit  |                          |                           |
| A/D Converter:          | Delta-Sigma, 5th order, multibit<br>Delta-Sigma modulator |                          |                           |
| Gain:                   | x1, x10 software programmable                             |                          |                           |
| Input ranges:           | Gain x1   | ± 10 V single-ended      |                           |
|                         | Gain x1   | ± 5 V differential       |                           |
|                         | Gain x10  | ± 1 V single-ended       |                           |
|                         | Gain x10  | ± 0.5 V differential     |                           |
| Sampling rate $f_s$ :   | 2 kHz ≤ $f_s$ ≤ 200 kHz selectable through software       |                          |                           |
| Selectable frequencies: | 2 kHz ≤ $f_s$ ≤ 50 kHz                                    | 50 kHz ≤ $f_s$ ≤ 100 kHz | 100 kHz ≤ $f_s$ ≤ 200 kHz |
|                         | 50000 Hz  | 100000 Hz                | 200000 Hz                 |
|                         | 40000 Hz  | 80000 Hz                 | 160000 Hz                 |
|                         | 33333 Hz  | 66667 Hz                 | 133333 Hz                 |
|                         | 25000 Hz  | 50000 Hz                 | 100000 Hz                 |
|                         | 20000 Hz  |                          |                           |
|                         | 16667 Hz  |                          |                           |
|                         | 12500 Hz  |                          |                           |
|                         | 10000 Hz  |                          |                           |
|                         | 8000 Hz   |                          |                           |
|                         | 5000 Hz   |                          |                           |
|                         | 4000 Hz   |                          |                           |
|                         | 3333 Hz   |                          |                           |
|                         | 2500 Hz   |                          |                           |
|                         | 2000 Hz   |                          |                           |

|  |   |
|--|---|
| Oversampling:  | $64 \times f_s$ (for sampling rate $f_s$ )                    |
| Frequency precision:                                   | $\pm 50$ ppm  |
| FIFO depth:  | 128 DWORD, for the right and the left channel of the same ADC |
| Data transfer:   | DMA, I/O, IRQ   |
| Transmission ripple (rel. to 1 kHz), max., DC-coupled: |   |
| $2 \text{ kHz} \leq f_s \leq 50 \text{ kHz}$ :         | -0.1dB, DC to $0.47 \times f_s$                               |
| $50 \text{ kHz} \leq f_s \leq 100 \text{ kHz}$ :       | -0.1dB, DC to $0.45 \times f_s$                               |
| $100 \text{ kHz} \leq f_s \leq 200 \text{ kHz}$ :      | -0.1dB, DC to $0.24 \times f_s$                               |
| -3 dB bandwidth:                                       |   |
| $2 \text{ kHz} \leq f_s \leq 50 \text{ kHz}$ :         | $0.5 \times f_s$  |
| $50 \text{ kHz} \leq f_s \leq 100 \text{ kHz}$ :       | $0.5 \times f_s$  |
| $100 \text{ kHz} \leq f_s \leq 200 \text{ kHz}$ :      | $0.358 \times f_s$  |
| Input coupling:  | AC, DC, GND, selectable through software                      |
| AC -3dB limit frequency:                               | 1.6 Hz  |
| Overvoltage protection:                                |   |

**R1-, L1-, R2-, L2-, L/R3+-, L/R4+-**

|   |   |
|---|---|
| Max. direct current:                                | $\pm 12 \text{ V}$ , $\pm 200 \text{ mA}$ |
| Max. peak current (Impuls at 1 ms, 10% duty cycle): | $\pm 12 \text{ V}$ , $\pm 300 \text{ mA}$ |

**R1+, L1+, R2+, L2+**

|  |  |
|--|--|
| Max. direct current:                               | $\pm 36 \text{ V}$ , $\pm 30 \text{ mA}$ |
| Max. peak current (pulse at 1 ms, 10% duty cycle): | $\pm 36 \text{ V}$ , $\pm 70 \text{ mA}$ |

ESD protection:  $> 2 \text{ kV}$ , ESD protection through method 3015.17

\* Preliminary product information

## Specifications\*

### Analog inputs (continued)

#### Dynamic properties

##### 2 kHz ≤ f<sub>s</sub> ≤ 50 kHz:

|                       |   |
|-----------------------|---|
| Passband:             | DC (0Hz) up to 0.47 x f <sub>s</sub> , min. to max. |
| Stopband:             | 0.58 x f <sub>s</sub> min                           |
| Stopband attenuation: | -95 dB min  |
| Total group delay:    | 12/f <sub>s</sub> s typical                         |

##### 50 kHz ≤ f<sub>s</sub> ≤ 100 kHz:

|                       |   |
|-----------------------|---|
| Passband:             | DC (0Hz) up to 0.45 x f <sub>s</sub> , min. to max. |
| Stopband:             | 0.68 x f <sub>s</sub> min                           |
| Stopband attenuation: | -92 dB min  |
| Total group delay:    | 9/f <sub>s</sub> s typical                          |

##### 100 kHz ≤ f<sub>s</sub> ≤ 200 kHz:

|                       |   |
|-----------------------|---|
| Passband:             | DC (0Hz) up to 0.24 x f <sub>s</sub> , min. to max. |
| Stopband:             | 0.78 x f <sub>s</sub> min                           |
| Stopband attenuation: | -97 dB min  |
| Total group delay:    | 5/f <sub>s</sub> s typical                          |

#### Dynamic range SNR

|                                     |  |
|-------------------------------------|--|
| 2 kHz ≤ f <sub>s</sub> ≤ 50 kHz:    | < -105 dB (short input gain x1)<br>< -100 dB (short input gain x10)<br>< -80 dB (open input gain x1)<br>< -60 dB (open input gain x10) |
| 50 kHz ≤ f <sub>s</sub> ≤ 100 kHz:  | < -105 dB (short input gain x1)<br>< -100 dB (short input gain x10)<br>< -80 dB (open input gain x1)<br>< -60 dB (open input gain x10) |
| 100 kHz ≤ f <sub>s</sub> ≤ 200 kHz: | < -75 dB (short input gain x1)<br>< -75 dB (short input gain x10)<br>< -75 dB (open input gain x1)<br>< -60 dB (open input gain x10)   |

#### Crosstalk

Between channel R0 and L0, R1 and L1, R2 and L2, R3 and L3, Gain x1:

##### Short input at f<sub>m</sub> = 100 kHz

|                                     |          |
|-------------------------------------|----------|
| 2 kHz ≤ f <sub>s</sub> ≤ 50 kHz:    | < -95 dB |
| 50 kHz ≤ f <sub>s</sub> ≤ 100 kHz:  | < -95 dB |
| 100 kHz ≤ f <sub>s</sub> ≤ 200 kHz: | < -70 dB |

##### Short input at f<sub>m</sub> = 1 kHz

|                                     |          |
|-------------------------------------|----------|
| 2 kHz ≤ f <sub>s</sub> ≤ 50 kHz:    | < -95 dB |
| 50 kHz ≤ f <sub>s</sub> ≤ 100 kHz:  | < -95 dB |
| 100 kHz ≤ f <sub>s</sub> ≤ 200 kHz: | < -70 dB |

##### 1 kΩ load at f<sub>m</sub> = 100 kHz

|                                     |          |
|-------------------------------------|----------|
| 2 kHz ≤ f <sub>s</sub> ≤ 50 kHz:    | < -95 dB |
| 50 kHz ≤ f <sub>s</sub> ≤ 100 kHz:  | < -95 dB |
| 100 kHz ≤ f <sub>s</sub> ≤ 200 kHz: | < -70 dB |

##### 1 kΩ load at f<sub>m</sub> = 1 kHz

|                                     |          |
|-------------------------------------|----------|
| 2 kHz ≤ f <sub>s</sub> ≤ 50 kHz:    | < -95 dB |
| 50 kHz ≤ f <sub>s</sub> ≤ 100 kHz:  | < -95 dB |
| 100 kHz ≤ f <sub>s</sub> ≤ 200 kHz: | < -70 dB |

#### Phase error

between channel R0 and L0, R1 and L1, R2 and L2, R3 and L3

|                             |  |
|-----------------------------|--|
| At f <sub>s</sub> = 200 kHz | 0.3° max.                                    |
|                             | 0.2° at f <sub>m</sub> = 10 kHz sinus signal |
|                             | 0.02° at f <sub>m</sub> = 1 kHz sinus signal |

#### Amplitude error

± 0,02 dB max., at f<sub>m</sub> = 1 kHz sinus signal  
(Gain x1 and x10)

#### Offset error

± 200 µV, max. at f<sub>s</sub> = 2 kHz

### Analog outputs

|  |   |
|--|---|
| Number of outputs:                               | 2   |
| Resolution / accuracy:                           | 16-bit / 13-bit                                 |
| DAC type:  | R-2R  |
| Output range:                                    | ± 10 V  |
| Settling time: 10 V step, RL = 2 k, CL = 1500 pF | ± 0.1%: 5 µs typical<br>± 0.01%: 5.6 µs typical |
| Overvoltage protection:                          | ± 12 V, 100 mA max. direct current              |
| Short-circuit current:                           | ± 45 mA typical                                 |
| Output voltage after reset:                      | 0 V   |
| FIFO depth:                                      | 256 Word  |
| Data transfer:                                   | DMA, I/O, IRQ                                   |

### Digital inputs

|                             |  |
|-----------------------------|--|
| Number of inputs:           | 8  |
| Filters/protective circuit: | Low-pass/transorb diode  |
| Optical isolation:          | 1000 V   |
| Nominal voltage:            | 24 V external  |
| Input voltage:              | 0 up to 30 V   |
| Input current:              | 7 mA at 24 VDC, typical  |
| Logic input levels:         | UH (max.): 30 V<br>UH (min): 19 V<br>UL (max.): 14 V<br>UL (min): 0V |
| Input frequency (max.):     | 5 kHz at 24 V  |
| Trigger input:              | Digital input 0  |

### Digital outputs

|                            |                            |
|----------------------------|----------------------------|
| Number outputs:            | 8, open collector          |
| Optical isolation:         | 1000 V                     |
| Nominal voltage:           | 24 V                       |
| Supply voltage:            | 5-30 V                     |
| Output current per output: | 50 mA max.                 |
| Total current:             | 300 mA limited through PTC |
| Switch-on time:            | 0.25 µs typical            |
| Switch-off time:           | 0.25 µs typical            |

### Current sources

|         |  |
|---------|--|
| Number: | 8 constant current sources for the power supply of the ICP™ sensors, 4 mA typical, 24 V max. |
|---------|--|

### Chronometer

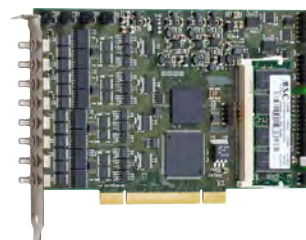
|                                 |  |
|---------------------------------|--|
| Number:                         | 4 x chronometer, 2 x gate on chronos 1+2               |
| Input type:                     | RS485  |
| Max. speed:                     | 1 MHz max.   |
| Counting depth:                 | 32-bit   |
| Divisor:                        | From 2 <sup>0</sup> to 2 <sup>15</sup> per chronometer |
| FIFO depth:                     | 256 DWORD  |
| Data transfer:                  | DMA, I/O, IRQ  |
| Differential threshold voltage: | -200 mV min -50 mV max.                                |
| Input resistance:               | 120 differential                                       |
| ESD protection:                 | ±15 kV Human Body Model                                |

### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

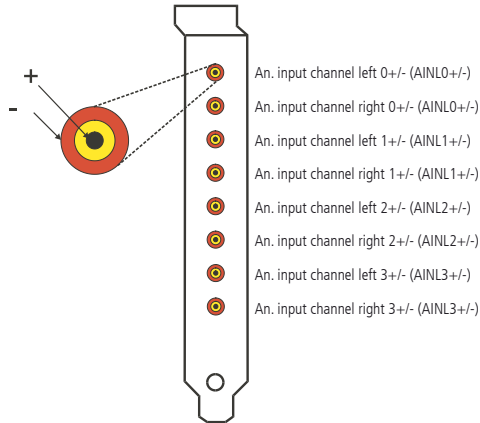
### Physical and environmental conditions

|                       |  |
|-----------------------|--|
| Dimensions:           | 175 x 99 mm  |
| System bus:           | PCI 32-bit 3.3/5 V acc. to spec. 2.2 (PCISIG)  |
| Space required:       | 1 PCI slot for the analog inputs<br>1 slot opening for digital inputs and outputs<br>1 slot opening for chronometer and analog outputs     |
| Operating voltage:    | +5 V, ±5 % from the PC   |
| Front connector:      | 8 SMB co-axial connector on bracket  |
| Additional connector: | • 37-pin D-Sub connector for digital I/O<br>• 15-pin D-Sub connector for chronometer inputs<br>• 15-pin D-Sub connector for analog outputs |
| Temperature range:    | 0 to 60 °C (with forced cooling)   |



\* Preliminary product information

### Connection of 8 analog inputs on front connector



### Pin assignment of the chronometer and analog outputs (ribbon cable FB3600-AC)

#### Male connector analog outputs

|               |    |    |               |
|---------------|----|----|---------------|
| DAC0          | 1  | 2  | GND 0         |
| GND0          | 3  | 4  | GND 0         |
| DAC1          | 5  | 6  | GND 1         |
| GND1          | 7  | 8  | GND 1         |
| Not connected | 9  | 10 | Not connected |
| Not connected | 11 | 12 | Not connected |
| Not connected | 13 | 14 | Not connected |

#### Ribbon cable FB3600-AC

|           |    |    |           |
|-----------|----|----|-----------|
| Chrono 0+ | 1  | 2  | Chrono 0- |
| Chrono 1+ | 3  | 4  | Chrono 1- |
| Chrono 2+ | 5  | 6  | Chrono 2- |
| Chrono 3+ | 7  | 8  | Chrono 3- |
| Gate 0+   | 9  | 10 | Gate 0-   |
| Gate 1+   | 11 | 12 | Gate 1-   |
| GND       | 13 | 14 | GND       |

#### Male connector Chronometer

#### Bracket ribbon cable FB3600-AC

##### 15-pin female connector

|               |    |   |               |
|---------------|----|---|---------------|
| GND 0         | 15 | 8 | DAC0          |
| GND 0         | 14 | 7 | GND0          |
| GND 1         | 13 | 6 | DAC1          |
| GND 1         | 12 | 5 | GND1          |
| Not connected | 11 | 4 | Not connected |
| Not connected | 10 | 3 | Not connected |
| Not connected | 9  | 2 | Not connected |
| Not connected | 1  | 1 | Not connected |

##### 15-pin male connector

|           |    |   |               |
|-----------|----|---|---------------|
| Chrono 0- | 9  | 1 | Chrono 0+     |
| Chrono 1- | 10 | 2 | Chrono 1+     |
| Chrono 2- | 11 | 3 | Chrono 2+     |
| Chrono 3- | 12 | 4 | Chrono 3+     |
| Gate 0-   | 13 | 5 | Gate 0+       |
| Gate 1-   | 14 | 6 | Gate 1+       |
| GND       | 15 | 7 | GND           |
|           |    | 8 | Not connected |

### Pin assignment of the digital inputs and outputs

#### 26-pin male connector on separate 37-pin D-Sub-male connector (ribbon cable FB3600-D)

|                  |    |    |                  |
|------------------|----|----|------------------|
| Digital input 0+ | 1  | 2  | Digital input 0- |
| Digital input 1+ | 3  | 4  | Digital input 1- |
| Digital input 2+ | 5  | 6  | Digital input 2- |
| Digital input 3+ | 7  | 8  | Digital input 3- |
| Digital input 4+ | 9  | 10 | Digital input 4- |
| Digital input 5+ | 11 | 12 | Digital input 5- |
| Digital input 6+ | 13 | 14 | Digital input 6- |
| Digital input 7+ | 15 | 16 | Digital input 7- |
| Digital output 0 | 17 | 18 | Digital output 1 |
| Digital output 2 | 19 | 20 | Digital output 3 |
| Digital output 4 | 21 | 22 | Digital output 5 |
| Digital output 6 | 23 | 24 | Digital output 7 |
| GND              | 25 | 26 | 24 V             |

#### Ribbon cable FB3600-D

|                  |    |    |                  |
|------------------|----|----|------------------|
| Digital input 0- | 20 | 1  | Digital input 0+ |
| Digital input 1- | 21 | 2  | Digital input 1+ |
| Digital input 2- | 22 | 3  | Digital input 2+ |
| Digital input 3- | 23 | 4  | Digital input 3+ |
| Digital input 4- | 24 | 5  | Digital input 4+ |
| Digital input 5- | 25 | 6  | Digital input 5+ |
| Digital input 6- | 26 | 7  | Digital input 6+ |
| Digital input 7- | 27 | 8  | Digital input 7+ |
| Digital output 1 | 28 | 9  | Digital output 0 |
| Digital output 3 | 29 | 10 | Digital output 2 |
| Digital output 5 | 30 | 11 | Digital output 4 |
| Digital output 7 | 31 | 12 | Digital output 6 |
| 24 V             | 32 | 13 | GND              |
| Not connected    | 33 | 14 | Not connected    |
| Not connected    | 34 | 15 | Not connected    |
| Not connected    | 35 | 16 | Not connected    |
| Not connected    | 36 | 17 | Not connected    |
| Not connected    | 37 | 18 | Not connected    |
|                  |    | 19 | Not connected    |

#### 37-pin D-Sub connector

### Ordering information

#### APCI-3600, APCI-3600-L

Noise and vibration measurement board, optically isolated, 24-bit, multifunction board, 8 analog inputs, 8 current sources..., antialiasing filter. Incl. technical description and software drivers.

#### Versions

**APCI-3600:** 8 analog inputs, 8 current sources for connecting ICP™ sensors, 2 analog outputs, 4 chronometer inputs, 8 digital inputs, 8 digital outputs, 128 MBytes SDRAM

**APCI-3600-L:** 8 analog inputs, 8 current sources for connecting ICP™ sensors, 128 MBytes SDRAM

#### Accessories

**ST3601:** Connection cable, 2 m  
SMB co-axial female connector on  
BNC male connector

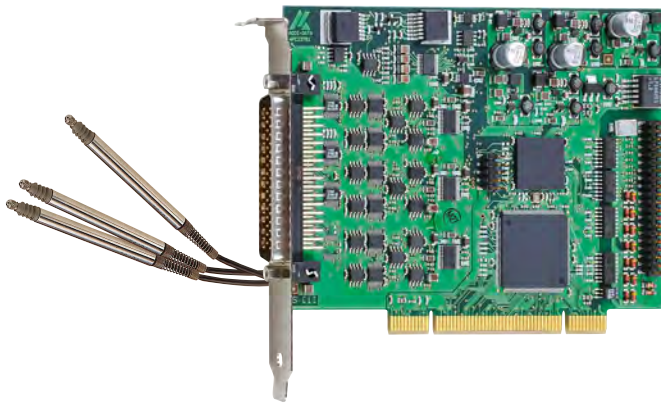
**ST3600:** Connection cable, 2 m (ST3600 = 8 x ST3601)

**FB3600-D:** Ribbon cable for connecting the digital I/O on separate bracket, 30 cm

**FB3600-AC:** Ribbon cable for connecting the chronometer and analog outputs on separate bracket, 30 cm

\* Preliminary product information

# Length measurement board, 16-bit, simultaneous acquisition of 5 inductive transducers, LVDT, half-bridge



PCI 32-bit



Windows  
64/32-bit drivers



LabVIEW™

The PCI length measurement board APCI-3702 is designed for the simultaneous acquisition of 5 half-bridge or LVDT transducers.

It operates with a 16-bit resolution.

It is suited for dynamic measurement, e.g. for measuring moving parts or applications with time-critical measurement cycles – especially in test equipment with several sensors.

The calibration tool SET3701 includes a data base with pre-calibrated transducers. It guides you through each step of the installation beginning with the selection of a transducer up to testing the channels.

## Features

- PCI interface to the 32-bit data bus, 3.3 V or 5 V
  - Acquisition of 5 inductive transducers (half-bridge, LVDT)
  - 16-bit resolution
  - Sampling rate depending on the transducer: 2-20 kHz
  - Example for TESA transducers GT21:  
13.951 kHz per channel,  
0.072 ms for one sequence of up to 5 channels
  - Measuring frequency through software programmable: 2-20 kHz
  - Conversion triggered through software, digital input or timer
  - End of conversion through software and/or interrupt
  - PCI-DMA access
  - Onboard FIFO
  - Sequence RAM
  - 16 digital inputs and outputs, optically isolated, 24 V
  - Connection of the transducer through external box PX3701-8. The box type depends on the transducers used.  
Please order separately.
  - Software operation
  - Automatic setting of the input levels (gain and offset) according to the transducer sensitivity
  - Tool for individual database-managed calibration of the transducers
  - Database for connecting/calibrating a large range of industry-standard transducers:
    - Solartron • Tesa • Marposs • Schlumberger
    - Peter & Hirt • Mahr • RDP • Schaevitz
    - SMPR Controle
- Further transducers like for example Horst Knäbel can be calibrated on request.

## APCI-3702

Simultaneous acquisition of 5 inductive transducers

Half-bridge, LVDT

16-bit resolution

16 digital inputs and outputs, optically isolated

## Safety features

- Input filters
- Diagnostic function in case of short-circuits or line break

## Applications

- Gear wheel control
- Gauge block
- Acquisition of sensor data
- Quality control
- Industrial process control
- Automatic parts control
- R&D instrumentation

## Software

### Calibration tool SET3701 (supplied with the board)

- Easy transducer calibration
- Step by step from the transducer selection up to testing each single channel.
- Database with more than 50 pre-calibrated transducers
- Update of the APCI-3702 firmware

### Standard drivers for:

- Linux
  - 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
  - Signed 64-bit drivers for Windows 8 / 7 / XP
  - Real-time use with Linux and Windows on request
- Drivers for the following compilers and software packages:**
- .NET
  - Microsoft VC++ • Borland C++ • Visual Basic • Delphi
  - LabVIEW • LabWindows/CVI

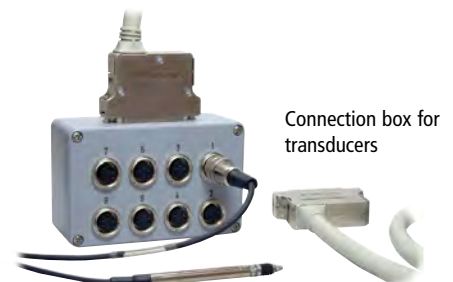
### ADDIPACK functions:

Transducer • Timer • Digital input • Digital output

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com](http://www.addi-data.com), download menu





## Specifications

### Connection of inductive transducers

#### Inputs for inductive transducers

|  |   |
|--|---|
| Number   | 5 (simultaneous)  |
| Input type   | Single ended  |
| Coupling   | DC  |
| Resolution / Accuracy:                                     | 16-bit / 13-bit   |
| Sampling rate $f_s$ on 5 channels selectable per software: | Depending on the transducer<br>4.883 kHz (typ.)<br>6.975 kHz (typ.)<br>9.768 kHz (typ.)<br>13.951 kHz (typ.)<br>19.531 kHz (typ.) |
| Example with TESA GT21                                     | 13.951kHz (on 5 channels)   |

#### Input level

|                 |  |
|-----------------|--|
| Input impedance | 2 k $\Omega$ software-programmable<br>10 k $\Omega$<br>100 k $\Omega$<br>10 M $\Omega$ |
|-----------------|--|

#### Sensor supply (sinus generator)

|  |  |
|--|--|
| Type                                       | Sinus differential (180° phase-shift)                |
| Number of outputs:                         | 2  |
| Coupling                                   | AC   |
| Programmed signals:                        |  |
| output frequency $f_p$ (primary frequency) | 2-20 kHz depending on the transducer (50 kHz Knäbel) |

#### Output level

|                       |  |
|-----------------------|--|
| Output impedance      | < 0.1 $\Omega$ typ.<br>> 30 k $\Omega$ typ. in shutdown mode |
| Short-circuit current | 0.7 A typ. at 25°C with thermal protection                   |

### Digital I/O

|                                 |                                     |
|---------------------------------|-------------------------------------|
| Number of I/O channels:         | 8 dig. inputs, 8 dig. outputs, 24 V |
| Optical isolation:              | 1000 V through opto-couplers        |
| Input current at 24 V:          | 11 mA typ.                          |
| Max. input frequency:           | 5 kHz (inputs 1 to 7)               |
| Max. switching current at 24 V: | 50 mA typ.                          |
| Input voltage:                  | 0-30 V                              |
| Output voltage:                 | 5-30 V                              |

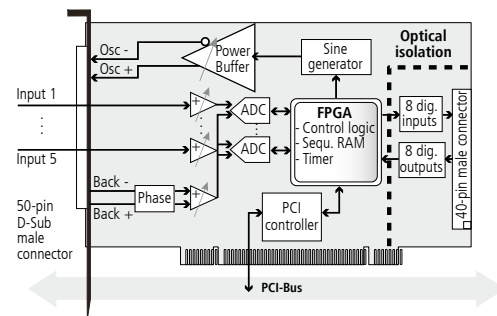
### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### Physical and environmental conditions

|  |   |
|--|---|
| Dimensions:                              | 109 x 138 mm  |
| System bus:                              | PCI 32-bit 3.3/5 V acc. to spec. 2.2 (PCISiG)                               |
| Space required:                          | 1 PCI slot for analog inputs,<br>1 slot opening for digital I/O with FB3702 |
| Operating voltage:                       | +5 V $\pm$ 5 % from the PC; 24 V external                                   |
| Current consumption (+ 5 V from the PC): | 990 mA typ. without load  |
| Front connector:                         | 50-pin D-Sub male connector   |
| Additional connector:                    | 16-pin male connector for connecting the dig. I/O                           |
| Temperature range:                       | 0 to 60 °C (with forced cooling)  |

### Simplified block diagram



### Pin assignment 50-pin D-Sub male connector

| Pin       | Pin       | Pin | Pin | Pin    |
|-----------|-----------|-----|-----|--------|
| 34 BACK+  | 18 BACK+  | 34  | 1   | BACK+  |
| 35 BACK-  | 19 BACK-  | 35  | 2   | BACK-  |
| 36 OSC+   | 20 OSC+   | 36  | 3   | OSC+   |
| 37 OSC+   | 21 OSC+   | 37  | 4   | OSC+   |
| 38 OSC-   | 22 OSC-   | 38  | 5   | OSC-   |
| 39 PWRGND | 23 PWRGND | 39  | 6   | OSC-   |
| 40 CH0    | 24 CH0    | 40  | 7   | PWRGND |
| 41 PWRGND | 25 PWRGND | 41  | 8   | CH1    |
| 42 CH3    | 26 CH3    | 42  | 9   | PWRGND |
| 43 PWRGND | 27 PWRGND | 43  | 10  | CH4    |
| 44 NC     | 28 NC     | 44  | 11  | PWRGND |
| 45 PWRGND | 29 PWRGND | 45  | 12  | NC     |
| 46 NC     | 30 NC     | 46  | 13  | PWRGND |
| 47 PWRGND | 31 PWRGND | 47  | 14  | NC     |
| 48 NC     | 32 NC     | 48  | 15  | PWRGND |
| 49 PWRGND | 33 PWRGND | 49  | 16  | NC     |
| 50 NC     |           | 50  | 17  | PWRGND |

Osc+/-: Phase-shifted supply signal of the inductive transducers

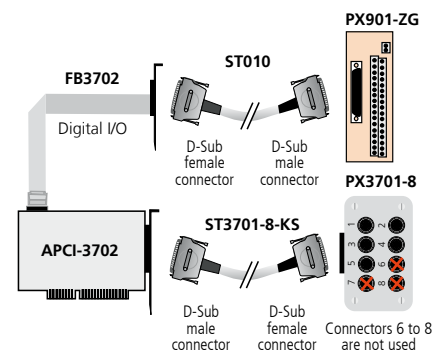
Back+/-: Return lines of the supply voltage for measuring the amplitude.

Actual value signal of the oscillator for the supply voltage.

CHx: Transducer input and input number

PWRGND: Ground

### ADDI-DATA connection



## Ordering information

### APCI-3702

Length measurement board, 16-bit, simultaneous acquisition 5 inductive transducers, LVDT, half-bridge. Incl. technical description and software drivers.

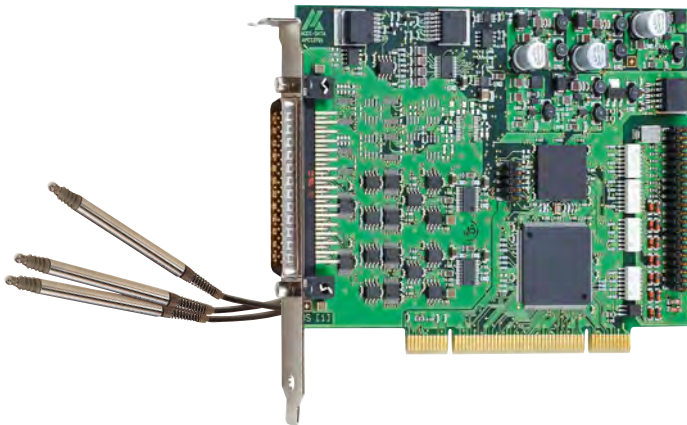
#### Accessories for HB and LVDT transducer:

|                      |  |
|----------------------|--|
| <b>PX3701HB-8:</b>   | Connection box of the APCI-3702                                      |
| <b>PX3701LVDT-8:</b> | Connection box of the APCI-3702                                      |
| <b>ST3701-8-KS:</b>  | Shielded coaxial cable between APCI-3702 and connection box PX3701-8 |

#### Accessories:

|                  |  |
|------------------|--|
| <b>FB3702:</b>   | Ribbon cable for digital I/O                       |
| <b>PX901-ZG:</b> | Screw terminal panel for digital I/O, for DIN rail |
| <b>ST010:</b>    | Standard round cable, shielded, twisted pairs, 2 m |

# Length measurement board, 16-bit, 16 or 8 inductive transducers, LVDT, half-bridge



PCI 32-bit



Windows  
64/32-bit drivers



LabVIEW™

With the length measurement board APCI-3701, you can connect directly and acquire up to 16 half-bridge or LVDT transducers. The calibration software "ConfigTools" guides you through each step of the installation, beginning with the selection of a transducer from a database including more than 50 pre-calibrated transducers up to testing each single channel.

## Features

- PCI interface to the 32-bit data bus, 3.3 V or 5 V
- Acquisition of 8 or 16 inductive transducers (half-bridge, LVDT, Knäbel)
- 16-bit resolution
- Sampling rate depending on the transducer:  
APCI-3701-8/-16: from 2 to 20 kHz
- Measuring frequency programmable through software:  
Standard version APCI-3701-8/-16: from 2 to 20 kHz  
(50 kHz on request)
- Conversion triggered through software, digital input or timer
- End of conversion through software and/or interrupt
- PCI-DMA access
- Onboard FIFO
- Sequence RAM
- 16 digital inputs and outputs, optically isolated, 24 V
- Connection of the transducer through an external box PX3701-8 or -16. The box type depends on the transducer, please order separately.
- Software operation
- Automatic setting of the input levels (gain and offset) acc. to the transducer sensitivity
- Tool for the individual calibration of the transducers with transducer database
- Database for connecting/calibrating a large range of industry-standard transducers (APCI-3701-8, or -16):
  - Solartron • Tesa • Marposs • Schlumberger
  - Peter & Hirt • Mahr • RDP • Schaevitz
  - SMPR Controle • Knäbel

## Safety features

- Input filters
- Diagnostic function in case of short-circuits or line break

## APCI-3701

Acquisition of 16 or 8 inductive transducers

Half-bridge, LVDT, Knäbel

16-bit resolution

16 digital inputs and outputs, optically isolated

Measurement of different transducer types with the same board!

## Applications

- Gear wheel control
- Gauge block
- Acquisition of sensor data
- Quality control
- Industrial process control
- Automatic parts control
- R&D Instrumentation

## Software

### ConfigTools (supplied with the board)

- Easy transducer calibration
- Step by step from the transducer selection up to testing each single channel.
- Database with more than 50 pre-calibrated transducers
- Update of the APCI-3701 firmware

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers for the following compilers and software packages:

- Microsoft VC++ • Borland C++ • Visual Basic • Delphi
- LabVIEW • LabWindows/CVI

### ADDPACK functions:

Transducer • Timer • Digital input • Digital output

### On request:

Further operating systems, compilers and samples

Driver download: [www.addi-data.com](http://www.addi-data.com), download menu



Connection box  
for transducers

## Specifications

### Inputs for inductive transducers

|                        |  |
|------------------------|--|
| Channel features       |  |
| Number                 | -4/-8/-16/ multiplexed   |
| Input type             | Single ended   |
| Coupling               | DC   |
| Resolution             | 24-bit   |
| Sampling rate $f_s$    | On 1 channel At primary frequency $f_p$ of   |
|                        | 4.883 kHz  |
|                        | 6.975 kHz  |
|                        | 9.768 kHz  |
|                        | 13.951 kHz   |
|                        | 19.531 kHz   |
|                        | $f_s = f_p$  |
|                        | Ab $n \geq 2$ channels $f_p$ = primary frequency   |
|                        | $f_s = \frac{f_p}{SP \times n}$ SP . Settling period $5 \leq SP \leq 255$                      |
|                        | $f_s$ here concerns all n channels   |
| Example with TESA GT21 | On one channel $f_s = f_p = 13.951$ kHz  |
|                        | Ab $n \geq 2$ channels $f_s = \frac{13.951 \text{ kHz}}{5 \times 4} = 697.5$ Hz for 4 channels |
|                        | $f_s = \frac{13.951 \text{ kHz}}{5 \times 8} = 348.7$ Hz for 8 channels                        |
|                        | $f_s = \frac{13.951 \text{ kHz}}{5 \times 16} = 174.4$ Hz for 16 channels                      |

### Input level

|                 |  |
|-----------------|--|
| Input impedance | 2 k $\Omega$ software-programmable             |
|                 | 10 k $\Omega$ , 100 k $\Omega$ , 10 M $\Omega$ |
| Input ranges    | $\pm 3$ V single ended                         |

### Sensor supply (sinus generator)

|                        |  |
|------------------------|--|
| Type                   | Sinus differential (180° phase-shift)                      |
| Coupling               | AC   |
| Programmed signals:    |  |
| Output frequency $f_p$ | 2-20 kHz depending on the transducer                       |
| (primary frequency)    | (50 kHz Knäbel)  |
| Output impedance       | < 0.1 $\Omega$ typ., > 30 k $\Omega$ typ. in shutdown mode |
| Short-circuit current  | 0.7 A typ. at 25°C with thermal protection                 |

### Digital I/O

|                         |                                     |
|-------------------------|-------------------------------------|
| Number of I/O channels: | 8 dig. inputs, 8 dig. outputs, 24 V |
| Optical isolation:      | 1000 V through opto-couplers        |
| Input current at 24 V:  | 3 mA typ.                           |
| Max. input frequency:   | 5 kHz                               |
| Max. switching current: | 50 mA typ.                          |
| Input range:            | 0-30 V                              |
| Output range:           | 5-30 V                              |

### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### Physical and environmental conditions

|                       |   |
|-----------------------|---|
| Dimensions:           | 140 x 99 mm   |
| System bus:           | PCI 32-bit 3.3/5 V acc. to spec. 2.2 (PCISIG)                               |
| Space required:       | 1 PCI slot for analog inputs,<br>1 slot opening for digital I/O with FB3701 |
| Operating voltage:    | +5 V, $\pm 5\%$ from the PC; 24 V external                                  |
| Current consumption   | APCI-3701-8: typ. 630 mA  |
| (+ 5 V from the PC):  | APCI-3701-16: typ. 800 mA   |
| Front connector:      | 50-pin D-Sub male connector   |
| Additional connector: | 16-pin male connector for connecting the dig. I/O                           |
| Temperature range:    | 0 to 60 °C (with forced cooling)  |

### APCI-3701

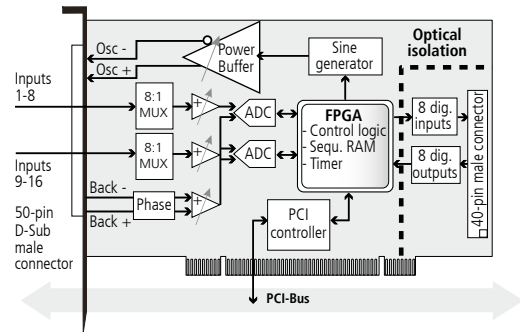
Length measurement board, 16-bit, 16 or 8 inductive transducers, LVDT, half-bridge, Knäbel.  
Incl. technical description and software drivers.

|                        |                                     |
|------------------------|-------------------------------------|
| <b>APCI-3701-8:</b>    | For 8 inductive transducers         |
| <b>APCI-3701-16:</b>   | For 16 inductive transducers        |
| <b>APCI-3701-8-K:</b>  | For 8 Knäbel inductive transducers  |
| <b>APCI-3701-16-K:</b> | For 16 Knäbel inductive transducers |

### Accessories:

|                  |  |
|------------------|--|
| <b>FB3702:</b>   | Ribbon cable for digital I/O                       |
| <b>PX901-ZG:</b> | Screw terminal panel for digital I/O, for DIN rail |
| <b>ST010:</b>    | Standard round cable, shielded, twisted pairs, 2 m |

### Simplified block diagram



### Pin assignment

#### 50-pin D-Sub male connector (APCI-3701-16)

| Pin |        | Pin |        | Pin |
|-----|--------|-----|--------|-----|
| 34  | BACK+  | 18  | BACK+  | 34  |
| 35  | BACK-  | 19  | BACK-  | 35  |
| 36  | OSC+   | 20  | OSC+   | 36  |
| 37  | OSC+   | 21  | OSC+   | 37  |
| 38  | OSC-   | 22  | OSC-   | 38  |
| 39  | PWRGND | 23  | OSC-   | 39  |
| 40  | CH0    | 24  | PWRGND | 40  |
| 41  | PWRGND | 25  | CH2    | 41  |
| 42  | CH3    | 26  | PWRGND | 42  |
| 43  | PWRGND | 27  | CH5    | 43  |
| 44  | CH6    | 28  | PWRGND | 44  |
| 45  | PWRGND | 29  | CH8    | 45  |
| 46  | CH9    | 30  | PWRGND | 46  |
| 47  | PWRGND | 31  | CH11   | 47  |
| 48  | CH12   | 32  | PWRGND | 48  |
| 49  | PWRGND | 33  | CH14   | 49  |
| 50  | CH15   |     |        | 50  |

Osc+/-: Phase-shifted supply signal of the inductive transducers

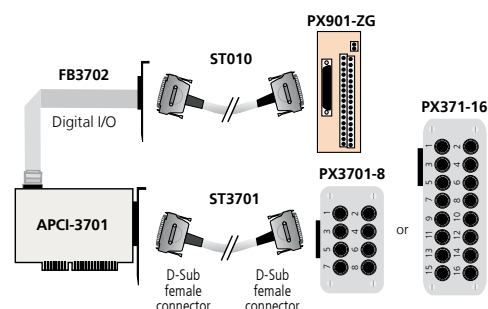
Back+/-: Return lines of the supply voltage for measuring the amplitude.

Actual value signal of the oscillator for the supply voltage.

CHx: Transducer input and input number

PWRGND: Ground

### ADDI-DATA connection



### Ordering information

#### Accessories for half-bridge and LVDT transducer:

|                       |  |
|-----------------------|--|
| <b>PX3701HB-8:</b>    | Connection box of the APCI-3701-8, 8 x half-bridge           |
| <b>PX3701HB-16:</b>   | Connection box of the APCI-3701-16, 16 x half-bridge         |
| <b>PX3701LVDT-8:</b>  | Connection box of the APCI-3701-8, 8 x LVDT                  |
| <b>PX3701LVDT-16:</b> | Connection box of the APCI-3701-16, 16 x LVDT                |
| <b>ST3701:</b>        | Connection cable between APCI-3701 and Connection box PX3701 |

# PCI BOARDS: SERIAL COMMUNICATION

## Modular serial interfaces

### Large field of application

Serial products are still very popular and thus widespread in measurement technology. They are mainly used for the parameterising of machines or for data acquisition of measurement instruments or sensors. Examples are barcode scanners, magnetic card readers, various types of sensors, counter modules, speedometer modules, weighting devices, displays, CNC machines, robots, PLC systems etc.

### Flexible mode configuration

ADDI-DATA serial interfaces are based on a concept of a basic circuit board and modules. For the 1-port, 2-port, 4-port or 8-port interfaces, the following modules are available in standard or 20 mA current loop (TTY) version: RS323, RS422 and RS485. The modules can be freely combined. Due to the modular structure, each interface can be configured as required. Thus the hardware can be adapted optimally to your requirements.

### No data loss

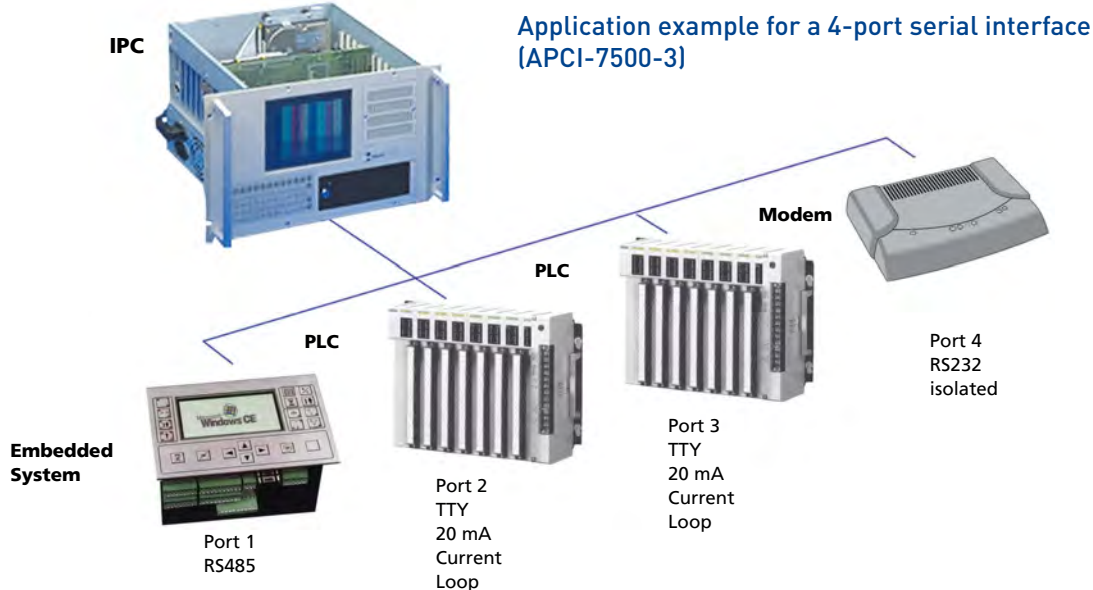
To guarantee a reliable data transfer, the baud rate (max. 1 Mbaud) can be adapted to the required frequency and, for higher transfer rates, a 128-byte FIFO buffer is available.

### Robust for a safe data transfer

In the industrial environment, potential differences can occur. Therefore, each port of the ADDI-DATA serial interfaces is optically isolated from the other ports. There is also an optical isolation on the PC side. For a reliable data transfer, further protective measures have been implemented: EMC protection such as ESD, burst and short-circuit protection.

### Saving money with serial interfaces through retrofit

The serial interfaces of the APCI-7xxx-3 series are available over years in order to secure your investment. They are suitable for retrofit projects with sensors or devices with serial interfaces. You can thus keep on using your sensors for a long time which means huge cost savings.





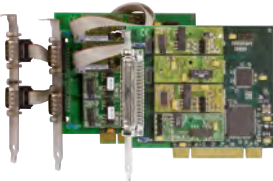

## YOUR ADVANTAGES

- Flexible through modular set-up
- Identified as COM port
- Optical isolation between the ports
- Long-term availability



**PRECISE  
ADJUSTMENT OF THE  
BAUD RATE –  
NO DATA LOSS**






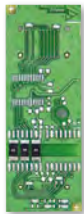

## Serial interfaces (base boards)

|   |   |   |  |   |
|---|---|---|--|---|
|   |  |  |  |  |
| Serial interfaces                               | 1-port  | 2-port  | 4-port   | 8-port  |
| Boards  | <b>APCI-7300-3</b>  | <b>APCI-7420-3</b>  | <b>APCI-7500-3, APCI-7500-3/4C</b>   | <b>APCI-7800-3</b>  |
| 32-bit data bus                                 | PCI 5 V / 3.3 V   | PCI 5 V / 3.3 V   | PCI 5 V / 3.3 V  | PCI 5 V / 3.3 V   |
| Operating mode, configurable through MX modules | RS232, RS485, RS422, 20 mA CL   | RS232, RS485, RS422, 20 mA CL   | RS232, RS485, RS422, 20 mA CL  | RS232, RS485, RS422, 20 mA CL   |
| Optical isolation                               | 1000 V , optional   | 1000 V , optional   | 1000 V , optional  | 1000 V , optional   |
| Can be configured as standard interface         | ✓   | ✓   | ✓  | ✓   |
| Interrupts                                      | BIOS  | BIOS  | BIOS   | BIOS  |
| FIFO memory                                     | 128-byte  | 128-byte  | 128-byte   | 128-byte  |
| Remarks   |   | Common interrupt  | Common interrupt   | Common interrupt  |
| <b>Addressing</b>                               |   |   |  |   |
| Through software                                | BIOS  | BIOS  | BIOS   | BIOS  |
| COM   | Free configuration  | Free configuration  | Free configuration   | Free configuration  |
| Connection cable                                |   |   | For APCI-7500-3<br>ST075: 4 x 9 pin ,ST074: 4 x 25 pin                             | ST7809: 8 x 9 pin<br>ST7825: 8 x 25 pin   |
| Page  | 222   | 222   | 222  | 222   |

## Mode selectable through modules

For each interface, modules are available in the RS232, RS422, RS485 or 20 mA CL mode.  
Please order the modules additionally to the selected base boards.

## Modules for APCI-7300-3, APCI-7420-3, APCI-7500-3, APCI-7800-3 and CPCI-7500

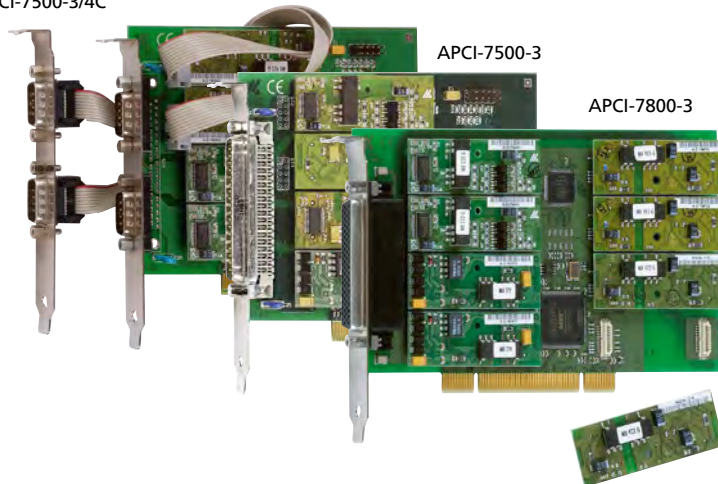
| Operating mode             | RS232   |   | RS422   |   | RS485   |   | 20 mA CL  |
|----------------------------|---|---|---|---|---|---|---|
|                            |  |  |  |  |  |  |  |
|                            | MX232-G   | MX232   | MX422-G   | MX422   | MX485-G   | MX485   | MXTTY   |
| Optical isolation 1000 V   | ✓   |   | ✓   |   | ✓   |   | ✓   |
| Creeping distance 3.2 mm   | ✓   |   | ✓   |   | ✓   |   | ✓   |
| Short-circuit protection   |   |   | ✓   | ✓   | ✓   | ✓   |   |
| ESD protection             | ✓   | ✓   | ✓   |   | ✓   |   |   |
| Burst protection           | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |
| Duplex                     | Full  | Full  | Full  | Full  | Half  | Half  | Full  |
| Max. Baud rate*            | 1MBaud  | 1MBaud  | 1MBaud  | 1MBaud  | 1MBaud  | 1MBaud  | 19.2 kBaud  |
| Modem control signals      | ✓   | ✓   | Optional RTS/CTS (MX-422-PEP)   |   |   |   |   |
| Autom. transmitter control |   |   |   |   | ✓   | ✓   |   |
| Current consumption        | 16 mA   | 1 mA  | 15 mA   | 5 mA  | 15 mA   | 5 mA  | 82 mA   |

\* max 115.2 kBaud, optional up to 1 MBaud with crystal quartz adjustment (Quarz option)



# 1 to 8-port serial interface, RS232, RS422, RS485, 20 mA CL, modular mounting through modules

APCI-7500-3/4C



PCI 32-bit

Also for  
PCI EXPRESS®

see APCL-7xxx, page 154



Also for CompactPCI™  
See CPCI-7500, page 254



Windows  
64/32-bit drivers



The APCI-7xxx-3 communication boards are configured by inserting MX modules which the board identifies automatically. The 1- to 8-port serial interfaces APCI-7xxx-3 can be used as universal PCI boards in 3.3 V or in 5 V systems, and in PCI or PCI-X systems. The serial interfaces can be configured through modules in the following modes: RS232, RS422, RS485 (with or without optical isolation) and 20 mA current loop (with optical isolation). The MX modules with optical isolation allow a protection up to 1000 V for the use in noisy environments where earth loops can occur. The I/O lines are protected against short-circuits, fast transients, electrostatic discharge and high-frequency EMI. The interface is supported through a 128-byte FIFO buffer for sending and receiving data and guarantees reliable operation at high transfer rates.

## Features

- Asynchronous serial interfaces
- PCI 3.3 V or 5 V
- Modular mounting through MX modules
  - 1 socket for 1-port serial interface (APCI-7300-3)
  - 2 sockets for 2-port serial interface (APCI-7420-3)
  - 4 sockets for 4-port serial interface (APCI-7500-3 and APCI-7500-3/4C)
  - 8 sockets for 8-port serial interface (APCI-7800-3)
- Can be configured as RS232, RS422, RS485 with/without optical isolation, 20 mA Current Loop (active, passive), with optical isolation through separate MX modules
- Automatic addressing through BIOS
- Automatic module identification
- 128-byte FIFO buffer for sending and receiving data
- Programmable transfer rate
- 5, 6, 7 or 8-bit character
- 1, 1½ or 2 stop bits
- Parity: even, odd or none
- Automatic transmitter control for RS485 and transmitter control through FIFO level
- Common interrupt

## Safety features

- MX modules available with optical isolation 1000 V
- Creeping distance IEC 61010-1 (VDE411-1)
- Protection against fast transients (Burst)
- Short-circuit protection for RS422 and RS485
- Detection of false start bits
- Internal diagnostic possibility, break, parity, overrun and framing error

APCI-7300-3 – 1-port serial interface  
APCI-7420-3 – 2-port serial interface  
APCI-7500-3 – 4-port serial interface  
APCI-7800-3 – 8-port serial interface

RS232, RS422, RS485, 20 mA Current Loop

Free mode configuration for each port  
through MX modules

With/without optical isolation 1000 V

128-byte FIFO buffer for each port

16C950 UART downward compatible

PCI 3.3 V or 5 V

## Applications

- Data acquisition • Industrial process control
- Direct connection to sensors
- Multi-user systems
- PLC interface
- Multidrop applications
- Weighing devices, modem and printer control, etc.

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

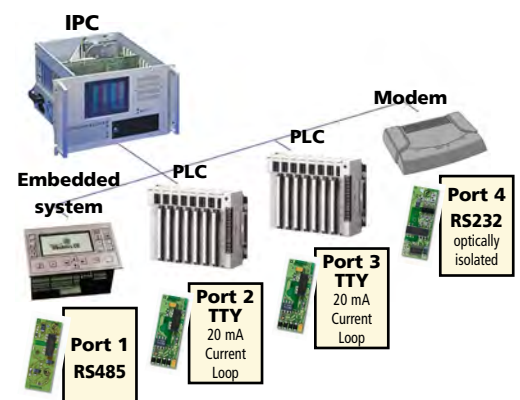
- Microsoft VC++
- Visual Basic • Delphi

### On request:








Further operating systems, compilers and samples.

Driver download: [www.addi-data.com](http://www.addi-data.com), download menu

## Application example for APCI-7500-3



## MX modules

| Operating mode             | RS232   |   | RS422   |   | RS485   |   | 20 mA CL  |
|----------------------------|---|---|---|---|---|---|---|
|                            |  |  |  |  |  |  |  |
|                            | MX232-G   | MX232   | MX422-G   | MX422   | MX485-G   | MX485   | MXTTY   |
| Optical isolation 1000 V   | ✓   |   | ✓   |   | ✓   |   | ✓   |
| Creeping distance 3.2 mm   | ✓   |   | ✓   |   | ✓   |   | ✓   |
| Short-circuit protection   |   |   | ✓   | ✓   | ✓   | ✓   |   |
| ESD protection             | ✓   | ✓   | ✓   |   | ✓   |   |   |
| Burst protection           | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |
| Duplex                     | Full  | Full  | Full  | Full  | Half  | Half  | Full  |
| Max. Baud rate             | 1MBaud  | 1MBaud  | 1MBaud  | 1MBaud  | 1MBaud  | 1MBaud  | 19.2 kBaud  |
| Modem control signals      | ✓   | ✓   | Optional RTS/CTS (MX-422-PEP)   |   |   |   |   |
| Autom. transmitter control |   |   |   |   | ✓   | ✓   |   |
| Current consumption        | 16 mA   | 1 mA  | 15 mA   | 5 mA  | 15 mA   | 5 mA  | 82 mA   |

## Specifications

## APCI-7300-3 / APCI-7420-3 / APCI-7500-3/4C / APCI-7500-3 / APCI-7800-3

## Serial interface – 1-port, 2-port, 4-port, 8-port

|                    |   |
|--------------------|---|
| Mode:              | RS232, RS422, RS485, 20 mA Current Loop (active, passive) with or without optical isolation through separate MX modules |
| Transmission mode: | Asynchronous, full or half duplex (MX modules)  |
| Addressing:        | Automatic through BIOS  |
| Memory:            | 128-byte FIFO buffer for transmitter and receiver   |
| Transfer rate:     | Programmable up to 115.2 kBaud<br>Baud rate up to 1 MBaud on request  |
| Protocol:          | 5-, 6-, 7- or 8-bit character 1,1½ or 2 stop bits   |
| Parity:            | Even, odd, none, mark, space  |
| Interrupt lines:   | Automatic configuration through BIOS  |

## EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

## Safety features

Optical isolation: 1000 V (MX modules)

## Physical and environmental conditions

|  |   |
|--|---|
| Dimensions:                            | 151 x 99 mm / APCI-7800-3: 175 x 99 mm  |
| System bus:                            | PCI 32-bit,<br>3.3 V/5V acc. to spec. 2.2 (PCISIG)  |
| Space required:                        | 1 PCI slot  |
| Operating voltage:                     | +5 V, ± 5 % from the PC   |
| Current consumption (without modules): | 160 mA typ. / APCI-7800: 220 mA   |
| Front connector:                       | 9-pin D-Sub male connector (APCI-7300-3)<br>2 x 9-pin D-Sub male connector (APCI-7420-3)<br>4 x 9-pin D-Sub male connector on separate bracket (APCI-7500-3/4C)<br>37-pin D-Sub male connector (APCI-7500-3)<br>78-pin D-Sub female connector (APCI-7800-3) |
| Temperature range:                     | 0 to 60 °C (with forced cooling)  |

## Ordering information

## APCI-7300-3 / APCI-7420-3 / APCI-7500-3 / APCI-7800-3

**APCI-7300-3:** 1-port serial interface (1 x 9-pin D-Sub)

**APCI-7420-3:** 2-port serial interface (2 x 9-pin D-Sub)

**APCI-7500-3:** 4-port serial interface (1 x 37-pin D-Sub)

**APCI-7500-3/4C:** 4-port serial interface incl. 4 x 9-pin D-Sub male connector on separate bracket (incl. ribbon cable)

**APCI-7800-3:** 8-port serial interface (1 x 78-pin D-Sub)

Each incl. technical description and software drivers.

## MX modules: Please order the modules separately!

**MX232-G:** RS232 mode, optically isolated

**MX232:** RS232 mode

**MX422-G:** RS422 mode, optically isolated

**MX422-PEP:** RS422 mode, optically isolated, with RTS/CTS

**MX422:** RS422 mode

**MX485-G:** RS485 mode, optically isolated

**MX485:** RS485 mode

**MXTTY:** 20 mA Current Loop mode (active, passive), optically isolated

## Option

**Quarz:** <1 MBaud transfer rate for RS232, RS422, RS485, TTY

## Accessories

**ST075:** Shielded round cable, 37 to 4 x 9-pin (for APCI-7500-3)

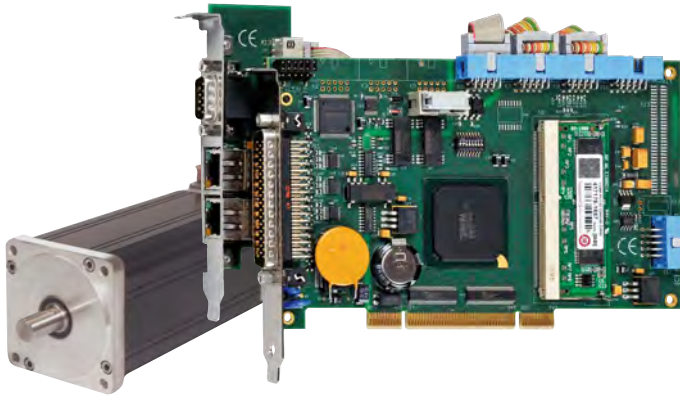
**ST074:** Shielded round cable, 37 to 4 x 25-pin (for APCI-7500-3)

**ST7809:** Shielded round cable, 78 to 8 x 9-pin (for APCI-7800-3)

**ST7825:** Shielded round cable, 78 to 8 x 25-pin (for APCI-7800-3)

# Motion control for servo or stepper motors

**New!\***



**PCI** 32-bit



**Windows**  
64/32-bit drivers



**Customer-tailored  
modifications**  
designed to suit your needs.  
Hardware and software,  
firmware, PLDs, ...  
**Contact us!**

The board APCI-8008 for the PCI bus is used for the control of up to 8 servo or stepper motor axes through a PC. With this intelligent and flexible board, many control tasks from simple to complicated can be realised.

The board has three stepping/direction output channels (D/A channels, 16-bit). They are optically isolated from the digital current supply and are used for the control of commercially available power amplifiers connected as speed controlling devices or current regulators.

Incremental encoders, SSI encoders and EnDat encoders as well as end and reference switches can be connected to each axis channel.

Digital PID filters with forward compensation and optional Notch filters are also involved in the axis control.

The "open" controlling concept of the APCI-8008 is intended in the first place for manufacturers of special-purpose machines and users who need a flexible integration as well as a CNC solution.

## Features

### Hardware/properties

- Intelligent board based on a 64-bit RISC processor
- Positioning of up to 3 axes either with servo or stepper motors. Mixed operating of servo and stepper motors possible. Up to 8 axes with slave board
- Interface for commercially available power amplifiers
- All input and output channels are optically isolated
- A multiple-axis system can be realised by inserting several APCI-8008 in the same PC.
- 2 Ethernet interfaces incl. one which can be used as an EtherCAT interface.

### Software

- Linear, circular, helical, spline and CAD interpolation
- Point-to-point movement with independent control of each axis
- Function library for .NET, Pascal, C-Basic, Borland Delphi, Borland C++, Visual Basic, Visual C++, LabVIEW
- Programming through a PC application software or stand-alone (a compiler similar to pascal is supplied with the board)
- The operating program can be easily adapted to specific requirements using program modules supplied with the board (e.g. GEAR, SCANNER, ELCAM)

## APCI-8008

For 3 servo or stepper motors

Onboard 64-bit RISC processor

Ethernet/EtherCAT interfaces

Incremental encoder, SSI or EnDat 2.2

16-bit analog output channels

Can be extended to a total of 8 axes

- User programs created with the compiler can be processed automatically
- Multitasking: the board can simultaneously process up to 4 user programs.

## Applications

- Motion control and position measurement (e.g. optical component measurement)
- Laser processing machines
- Bonding robots
- Water-jet cutting machines
- Tube bending machines
- Tube welding machines
- Component mounting machines (SMD)
- Fibreglass wrapping devices
- Handling systems for analysis technology
- Machines for contact lens production
- Stud welding machines
- Machines for processing dental prostheses
- Production quality control
- Cutting-to-length devices with flying saw

## Software

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- Microsoft C Lib. • Borland C Lib.
- Visual Basic • Visual C++ • Delphi
- LabVIEW

Supplied with the board: McuWIN user interface

### On request:

Other operating systems, compilers and samples

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)

\*Preliminary  
product information

## Specifications\*

### APCI-8008

|                                  |   |
|----------------------------------|---|
| CPU system:                      | 64-bit-RISC processor 333 MHz   |
| RAM:                             | 64 MB / Flash 32 MB (1 GB optional)   |
| Data exchange with the PC:       | Through PCI bus   |
| Controller software:             | PIDF (PID filters with forward compensation)  |
| Interpolation:                   | 2D .. 3D linear, 2D circular, 3D circular, 3D helix, spline, asynchronous and synchronous interpolation with secondary axes.<br>With OPMF-8008 all interpolations<br>2D .. 8D depending on the number of axes |
| Inputs for incremental encoders: | Diff. or TTL max. 16 MHz<br>Word length: 32-bit with sign<br>Short-circuit and line break protection  |
| Inputs for SSI encoders:         | Up to 32-bit, Gray / binary code, variable frequency 30 kHz to 2 MHz  |
| Inputs for EnDat:                | EnDat 2.2 up to 4 MHz   |
| Setpoint value outputs (servo):  | 4 D/A converters, 16-bit resolution, $\pm 10$ V   |
| Pulse outputs (stepper motors):  | 1 stepper signal (RS422) and 1 directional signal (RS422) for each channel, pulse frequency up to 2 MHz   |
| Isolated digital inputs:         | 16 inputs, 24 V, as end, reference switch or freely programmable  |
| Isolated digital outputs:        | 8 channels, 24 V / 500 mA, for releasing the power amplifiers or freely programmable  |
| Ethernet (option):               | 2 x Ethernet, 10/100 MBit   |
| Interrupts:                      | Through PCI BIOS  |
| DMA:                             | Bus master  |
| Auxiliary voltage:               | 24 V external for digital I/O, 5 V, 1.1 A   |

### Safety

Optical isolation: 1000 V

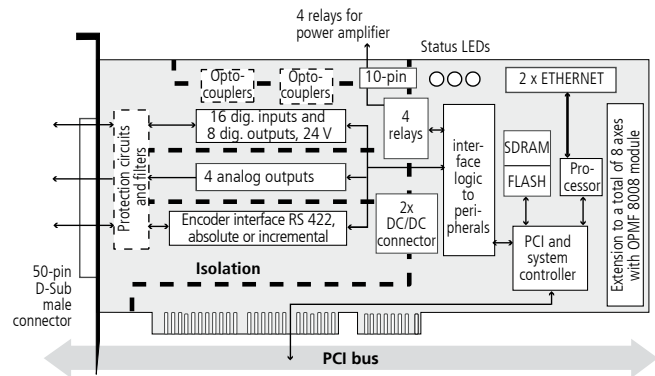
### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### Physical and environmental conditions

|                            |   |
|----------------------------|---|
| Dimensions:                | 175 x 106 mm  |
| System bus:                | PCI 32-bit 3.3/5 V acc. to spec. 2.2 (PCISIG)   |
| Space required:            | Board APCI-8008: 1 PCI slot<br>Slave board OPMF: 1 PCI slot<br>Cable FB8008: 1 slot opening |
| Operating voltage:         | + 5 V $\pm$ 5 % from the PC   |
| Front connector APCI-8008: | Axis 1, 2, 3: 50-pin D-Sub male connector   |
| Front connector OPMF-8008: | Axis 4, 5, 6: 50-pin D-Sub male connector   |
| Ribbon cable FB8008:       | Axis 7, 8: 50-pin D-Sub male connector  |
| Temperature range:         | 0 to 60 °C (with forced cooling)  |

### Simplified block diagram



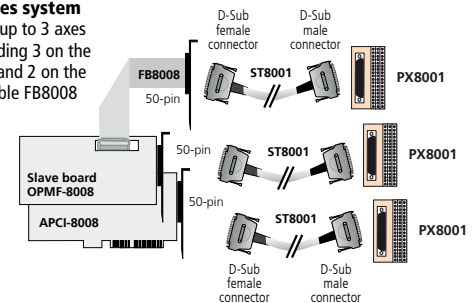
### Pin assignment – 50-pin D-Sub male connector

| Pin                          | Pin                          | Pin                               | Pin |
|------------------------------|------------------------------|-----------------------------------|-----|
| 34 Setpoint value 3 / step 3 | 18 Setpoint value 2 / step 2 | 34 18 1 Setpoint value 1 / step 1 | 1   |
| 35 Setpoint value 3 / step 3 | 19 Setpoint value 2 / step 2 | 35 19 2 Setpoint value 1 / step 1 | 2   |
| 36 True value 3              | 20 True value 2              | 36 20 3 True value 1              | 3   |
| 37 True value 3              | 21 True value 2              | 37 21 4 True value 1              | 4   |
| 38 True value 3              | 22 True value 2              | 38 22 5 True value 1              | 5   |
| 39 True value 3              | 23 True value 2              | 39 23 6 True value 1              | 6   |
| 40 True value 3 / step 3     | 24 True value 2 / step 2     | 40 24 7 True value 1 / step 1     | 7   |
| 41 True value 3 / step 3     | 25 True value 2 / step 2     | 41 25 8 True value 1 / step 1     | 8   |
| 42 Dig. input 9              | 26 Dig. output 1             | 42 26 9 Dig. input 1              | 9   |
| 43 Dig. input 10             | 27 Dig. output 2             | 43 27 10 Dig. input 2             | 10  |
| 44 Dig. input 11             | 28 Dig. output 3             | 44 28 11 Dig. input 3             | 11  |
| 45 Dig. input 12             | 29 Dig. output 4             | 45 29 12 Dig. input 4             | 12  |
| 46 Dig. input 13             | 30 Dig. output 5             | 46 30 13 Dig. input 5             | 13  |
| 47 Dig. input 14             | 31 Dig. output 6             | 47 31 14 Dig. input 6             | 14  |
| 48 Dig. input 15             | 32 Dig. output 7             | 48 32 15 Dig. input 7             | 15  |
| 49 Dig. input 16             | 33 Dig. output 8             | 49 33 16 Dig. input 8             | 16  |
| 50 0 V ext. for dig. I/O     |                              | 50 33 17 + 24 V                   | 17  |

### ADDI-DATA connection

#### Example for an 8-axes system

APCI-8008: Standard 1 up to 3 axes OPMF/8A: 5 axes, including 3 on the 50-pin front connector and 2 on the connector for ribbon cable FB8008



### Ordering information

**APCI-8008:** Motion control board for servo or stepper motors. 16 dig. inputs and 8 dig. outputs, 24 V, optically isolated.

Incl. technical description, software drivers.

**APCI-8008-STP:** same as APCI-8008, only for stepper motors

**Options:** All options begin with OPMF-8008. Please complete with the following option name:

- Basis:** Mezzanine board for the extension with -AI16-4, -AO and -DIO (only up to 3 axes)
- 4A-SRV/-4A-STP:** 4th axis – 8 inputs and 4 dig. outputs in addition
- 5A-SRV/-5A-STP:** 5th axis – 16 inputs and 8 dig. outputs in addition
- 6A-SRV/-6A-STP:** 6th axis – 16 inputs and 8 dig. outputs in addition  
For the option -7A and more the FB8008 cable is required
- 7A-SRV/-7A-STP:** 7th axis – 24 inputs and 12 dig. outputs in addition
- 8A-SRV/-8A-STP:** 8th axis – 24 inputs and 12 dig. outputs in addition
- AI16-4:** 4 analog inputs (option available in single or double, max. 8 analog inputs), 16-bit resolution.
- ETH:** Mezzanine board for the connection of 2 Ethernet interfaces (Standard Ethernet / EtherCAT)
- DIO:** 8 digital inputs and 4 dig. outputs, opt. isolated (option available up to 3 times, max. 24 inputs and 12 outputs)
- AO:** 1 analog output, option available up to 5 times (max. 8 analog outputs)  
(output is only free when the axis is not used)
- OPT.CAN-8008:** CAN bus connection of the APCI-8008 (not CAN Open).

#### Accessories:

- FB-CAN:** Ribbon cable between OPMF and 9-pin D-Sub male connector with bracket for connecting the CAN bus.
- FB-INTERBUS:** Ribbon cable between OPMF and 9-pin D-Sub male connector with bracket for connecting the INTERBUS.
- FB8008:** From the 1st axis on for connecting the analog inputs (option OPMF-8008-AI-16-4). Ribbon cable between OPMF and a 50-pin D-Sub male connector with bracket.  
On request with female connector.
- FB8008\_50\_25:** From the 4th axis on for connecting the analog inputs (OPMF-8008-AI16-4) or from the 7th axis on (OPMF/7; OPMF/8) for connecting additional axes. Ribbon cable between OPMF and D-Sub male connector on bracket and the 25-pin D-Sub for the connecting the relays.
- FBRELAY:** For releasing the relays  
**FBRELAY\_9:** Standard, 9-pin cable with bracket  
**FBRELAY\_25:** more than 3 axes: 25-pin cable.
- PX8001:** 3-row terminal panel for DIN rail
- ST8001:** Cable for connecting APCI-8008 and OPMF, 50-pin.

\*Preliminary product information



# Digital I/O board, optically isolated, 32 digital inputs and outputs, 24 V, for PC/104-Plus



\*PC104-PLUS1500-EXT



LabVIEW™



LabWindows/CVI™

## PC104-PLUS1500

16 digital inputs, 24 V,  
including 2 interruptible inputs

16 digital outputs, 24 V, 150 mA/channel

Optical isolation 1000 V

Input and output filters

Watchdog, timer, counter

The outputs are reset to "0" at Power-On

## Features

- 2 programmable timers

### Inputs

- 16 optically isolated digital inputs, 24 V, including 2 interruptible inputs
- Reverse voltage protection
- All inputs are filtered

### Outputs

- 16 optically isolated digital outputs, 11 V to 36 V
- Output current per channel 150 mA
- Timer-programmable watchdog for resetting the outputs to "0"
- Diagnostic report through status register at short-circuits, overtemperature, voltage drop or watchdog
- Interrupt triggered through watchdog, timer, error
- At Power-On, the outputs are reset to "0"
- Short-circuit current for 16 outputs ~ 2 A typ.
- Short-circuit current per output ~ 1.1 A peak
- Self-resetting fuse (electronic fuse)
- Overtemperature and overvoltage protection
- 24 V power outputs with protection diodes and filters
- Output capacitors against electromagnetic emissions
- Ext. 24 V voltage supply screened and filtered
- Shutdown logic, when the external supply voltage drops under 7 V

## Safety features

- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Protection against fast transients (burst), overvoltage, electrostatic discharge and high-frequency EMI
- Separate ground line for inputs and outputs

## Applications

- Industrial I/O control
- PLC coupling
- Signal switching
- Interface to electromechanical relays
- Automatic test equipment
- ON/OFF monitoring of motors, lights...
- ...

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- Microsoft CVC++ • Borland C++
- Visual Basic • Delphi
- LabVIEW • LabWindows/CVI

### ADDIPACK functions

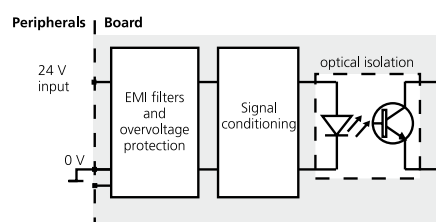
- Digital input • Digital output
- Watchdog • Timer • Counter

### On request:

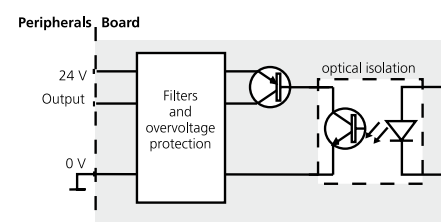
Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)

### Protective circuit for the input channels



### Protective circuit for the output channels





## Specifications

### Digital inputs

|                                   |   |
|-----------------------------------|---|
| Number of inputs:                 | 16 (common ground acc. to IEC 1131-2) including one input used as a counter input (channel 0) |
| Interruptible inputs:             | 2 (channel 2 and 3)   |
| Optical isolation:                | through opto-couplers, 1000 V, from PC to peripheral  |
| Interrupt compare logic:          | OR mode (with fixed filter times)   |
| Filters for interruptible inputs: | 40 µs   |
| Nominal voltage:                  | 24 V  |
| Input current at 24 V:            | Channel 0: 6 mA typ.<br>Channel 1-15: 3.9 mA typ.   |
| Logic input levels:               | U nominal: 24 V   |
| UH max.:                          | 30 V/current 6 mA typ.  |
| UH min.:                          | 19 V/current 2 mA typ.  |
| UL max.:                          | 14 V/current 0.7 mA typ.  |
| UL min.:                          | 0 V/current 0 mA typ.   |
| Maximal input frequency:          | Channel 0: 100 kHz (at 24 V)<br>Channel 1-15: 5 kHz (at 24 V)                                 |

### Digital outputs

|  |   |
|--|---|
| Number of outputs:   | 16, optically isolated up to 1000 V through opto-couplers |
| Output type:   | High-side (load to ground) acc. to IEC 1131-2             |
| Nominal voltage:   | 24 V  |
| Supply voltage:  | 11 V up to 36 V   |
| Current limit:   | 1.5 A typ. per 8 channels                                 |
| Output current/output:   | 150 mA typ.   |
| Short-circuit current/output shutdown at 24 V, $R_{load} < 0.1 \Omega$ : | 1.1 A (typ.) pulse current                                |
| RDS ON resistance:   | 0.2 $\Omega$ at 25 °C max.                                |
| Switch-on time (typ.):   | 50 µs   |
| Switch-off time (typ.):  | 75 µs   |
| Overttemperature (shutdown):   | 135 °C (output driver)                                    |
| Temperature hysteresis:  | 10 °C (output driver)                                     |

### Safety

|                  |  |
|------------------|--|
| Shutdown logic:  | When the ext. 24 V voltage drops below 7 V:<br>The outputs are switched off. |
| Diagnostics:     | Status bit or interrupt to the PC  |
| Timer1/Watchdog: | 1, 12-bit, time bases µs, ms, s  |
| Timer2:          | 1, 12-bit, time bases µs, ms, s  |
| Counter:         | 1, 16-bit, signal channel 0, Limit frequency 100 kHz                         |

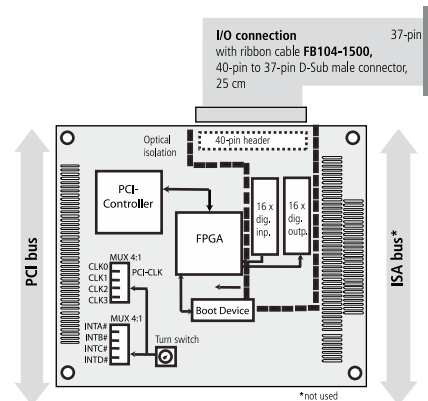
### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

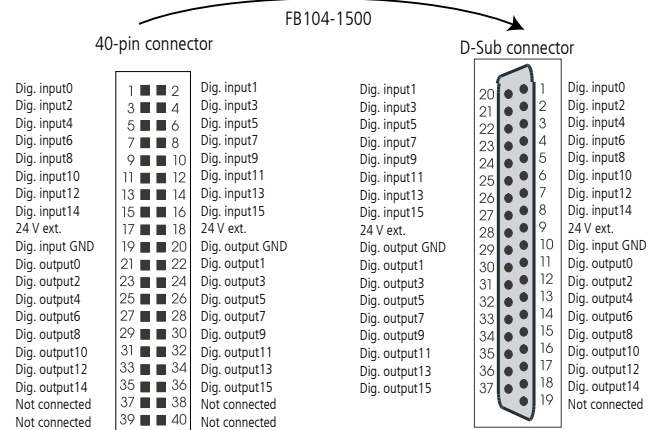
### Physical and environmental conditions

|                      |   |
|----------------------|---|
| Dimensions:          | 90 x 96 mm  |
| System bus:          | PCI 32-bit 5 V acc. to specification 2.1 (PCISIG)   |
| Mounting in:         | PC104-Plus system   |
| Operating voltage:   | +5 V or +3.3 V, $\pm 5\%$ from the PC   |
| Current consumption: |   |
| + 3.3 V from PC      | 95 mA   |
| + 5 V from the PC    | 45 mA   |
| I/O-connector:       | 40-pin male connector (2-row, 2.54 mm grid)   |
| Temperature range:   | 0 to 60 °C (with forced cooling)<br>-40 to +85 °C (with forced cooling), PC104-PLUS1500-EXT |

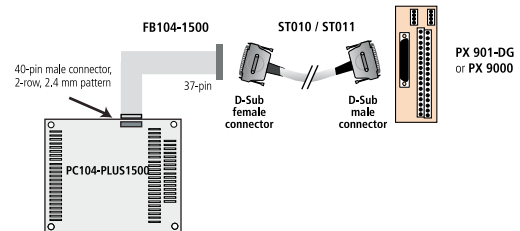
### Simplified block diagram



### Pin assignment – 40-pin to 37-pin male connector



### ADDI-DATA connection



## Ordering information

### PC104-PLUS1500

**PC104-PLUS1500:** Digital I/O board, optically isolated, 32 digital inputs and outputs, 24 V. Incl. technical description and software drivers.

**PC104-PLUS1500-EXT:** Digital I/O board, optically isolated, 32 digital inputs and outputs, 24 V, extended temperature range. Incl. technical description and software drivers.

### Accessories

**FB104-1500:** Ribbon cable, 40-pin to 37-pin D-Sub male connector, 25 cm

**PX901-D:** Screw terminal panel, LED status display

**PX901-DG:** Screw terminal panel, LED status display, for DIN rail

**PX9000:** 3-row screw terminal panel, for DIN rail, LED status display

**PX8500-G:** Relay output board for DIN rail, cascable

**ST010:** Standard round cable, shielded, twisted pairs, 2 m

**ST011:** Standard round cable, shielded, twisted pairs, 5 m

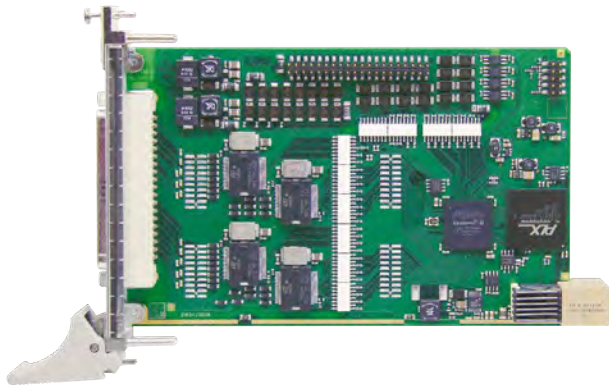
**ST010-S:** Same as ST010, for high currents (24 V supply separate)

**ST021:** Round cable between FB104-1500 and PX 8500-G, shielded, twisted pairs, 2 m

**ST022:** Round cable between PX 8500-G and PX 901-DG, shielded, 2m

**ST8500:** Ribbon cable for cascading two PX 8500-G

# COMPACT PCI SERIAL BOARDS



## ***CompactPCI® Serial***

### YOUR BENEFITS

- Fast data transmission rate: up to 12 GB/s
- Star topology
- Standardized 19" technology (IEEE 1101)
- All protocols available on the connector
- Hybrid systems

## More data – simply faster!

With its new serial data transfer, the new CompactPCI Serial bus is especially interesting for developing new high-performance systems in industrial environment. It also opens up new fields of application. ADDI-DATA now offers digital, analog and counter boards for the new CompactPCI Serial bus technology, in the tried-and-tested quality we always deliver.

### Multiple data transfer options

What was not possible with the CompactPCI bus is now possible: the extension boards can now be accessed via Ethernet, PCI Express, SATA or USB. All protocols are available on the connector with equal priority.

### High immunity to interferences

The well-thought concept of design and protective circuitry is the key for the high immunity to interferences featured by the CompactPCI Serial boards by ADDI-DATA. These boards are thus especially suited for use in extreme industrial environment. They are resistant to vibration, acceleration and dirt while supplying reliable data.

### Faster through FPGA

A FPGA component has a programmable logic on which you can save your own algorithms in order to adapt the functionality of the PC board to your requirements. This adaptation makes your PC board unique and improves the performance of your applications. The onboard algorithms reduce the cycle time of signal acquisition and regulation tasks.

Most ADDI-DATA CompactPCI Serial boards are equipped with a FPGA component. Use the full potential of your PC board hardware and software resources and thus accelerate your processes.

## Hybrid systems

Some housing manufacturers offer hybrid systems in which existing applications can run with CompactPCI while new functions can be added using CompactPCI serial. This saves time and money and allows for a smooth transition between these two technologies.

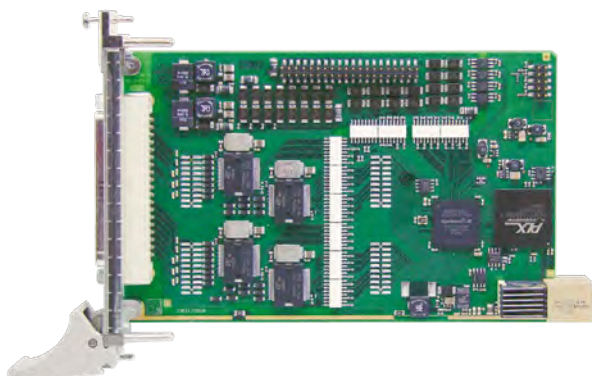


**READY FOR  
HARSH INDUSTRIAL  
ENVIRONMENT**

|   | Digital  |  | Counter                    | Analog  |  |
|---|--|--|----------------------------|---|--|
|   | New!<br>CPCIs-1532   | New!<br>CPCIs-1564   | New!<br>CPCIs-1711         | New!<br>CPCIs-3121                                | New!<br>CPCIs-3131   |
| CompactPCI Serial bus   | ✓  | ✓  | ✓                          | ✓   | ✓  |
| FPGA  | ✓  | ✓  | ✓                          | ✓   | ✓  |
| Filter and protective circuits  | ✓  | ✓  | ✓                          | ✓   | ✓  |
| Optical isolation   | 1000 V   | 1000 V   | 1000 V                     | 500 V   | 1000 V   |
| Digital, 24 V   |  |  |                            |   |  |
| Input channels, 24 V  | 16   | 32   | 12 (dependent on function) | 4   | 4  |
| Output channels, 24 V   | 16   | 32   | 4                          | 4   | 4  |
| Output current per channel  | 500 mA (typ.)  | 500 mA (typ.)  | 500 mA (typ.)              |   |  |
| Timer / Counter / Watchdog  | 2 x 12 bit timer,<br>1 can be used as a<br>watchdog.                                     | 2 x 12 bit timer,<br>1 can be used as a<br>watchdog.<br>3 x 32 bit counter |                            | 1 x 24 bit timer<br>can be used as a<br>watchdog. | 3 x 16 bit timer,<br>3 x 16 bit counter,<br>2 x 16 bit<br>watchdog |
| Counter   |  |  |                            |   |  |
| Function modules  |  |  | 4                          |   |  |
| Functions<br>Incremental counter, SSI synchronous serial interface,<br>Counter/timer, Pulse acquisition, Frequency, Pulse width,<br>Period duration measurement, velocity measurement, PWM,<br>BiSS-Master, digital inputs and outputs, ... |  |  | Reprogrammable             |   |  |
| Input frequency   |  |  | up to 5 MHz                |   |  |
| Signals   |  |  | TTL, RS422, 24 V           |   |  |
| Analog  |  |  |                            |   |  |
| Analog inputs, 16 bit   |  |  |                            | 16 SE or<br>8 diff.                               | 8 SE or<br>8 diff.   |
| Throughput (kHz)  |  |  |                            | 100   | 100  |
| Voltage range   |  |  |                            | 0-10 V<br>± 10 V                                  | 0-10 V<br>± 10 V   |
| Gain PGA  |  |  |                            | x1, x2, x5, x10                                   | x1, x10, x100,<br>x1000  |
| Trigger (software or 24 V)  |  |  |                            | ✓   | ✓  |
| Sequence RAM  |  |  |                            | ✓   |  |
| Analog outputs  |  |  |                            | 8 or 4, 16 bit                                    | 4, 16 bit  |
| 0-10 V ± 10 V   |  |  |                            | ✓   | ✓  |
| Software  | Current driver list on the web: <a href="http://www.addi-data.com">www.addi-data.com</a> |  |                            |   |  |
| Page  | 230  | 232  | 234                        | 236   | 238  |

# Digital I/O board, optically isolated, 32 digital inputs and outputs, 24 V, for CompactPCI Serial

**NEW\***



**Also for**   
See APCL-1532, page 118

**Also for**   
See APCI-1500, page 146

**Also for** *CompactPCI™*  
See CPCI-1500, page 230

**Also for** *PC/104-PLUS*  
see PC104-PLUS1500  
page 214



\* Preliminary  
product information

## Features

### Inputs

- 16 optically isolated inputs, 24 V incl. 15 interruptible inputs
- Channel 0 can be used as a 16-bit counter input (up to 100 kHz)
- Reverse voltage protection
- All inputs are filtered

### Outputs

- 16 optically isolated outputs, 11 to 36 V
- Output current per channel 500 mA
- Total current: 3 A typ. (fused through PTC resistor)
- Watchdog for resetting the outputs to "0"
- At Power-On, reset of the outputs to "0"
- Current limit: ~1.5 A per 8 channels (through PTC)
- Short-circuit current per output ~1.5 A typ.
- Self-resetting fuse (electronic fuse)
- Overtemperature and overvoltage protection
- 24 V power outputs with protection diodes and filters
- Ext. 24 V voltage supply screened and filtered
- Shutdown logic, when the external supply voltage drops below 7 V

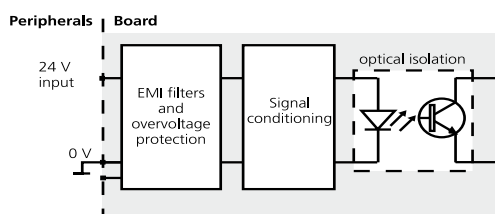
### Timer / Counter

- 2 timers (12-bit resolution)
- 1 timer can be used as watchdog

### Safety features

- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Protection against fast transients (burst), overvoltage, electrostatic discharge and high-frequency EMI
- Separate ground line for inputs and outputs

### Protective circuit for the input channels



## CPCIs-1532

### CompactPCI Serial interface

16 digital inputs, 24 V,  
including 15 interruptible inputs

16 digital outputs, 24 V, 500 mA/channel

Optical isolation 1000 V

Input and output filters

Connection through industry-standard  
D-Sub connector

Extended temperature range -40 °C to +85 °C

## Applications

- Industrial I/O control
- PLC coupling
- Reading of encoder values for process control
- Signal switching
- Interface to electromechanical relays
- ON/OFF monitoring of motors, lights...
- Watchdog / timer
- Interface to machines

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

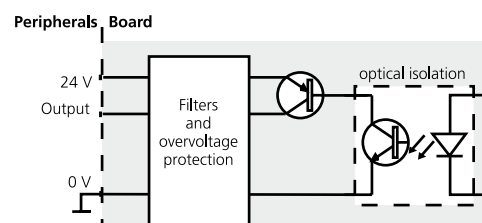
- MC.NET, C

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)

### Protective circuit for the output channels



## Specifications\*

### Digital inputs

|                             |  |
|-----------------------------|--|
| Number of inputs:           | 16 digital inputs, channel 0 can be used as a 16-bit counter input (up to 100 kHz) |
| Interruptible inputs:       | 15 channels (channel 1 to 15)  |
| Optical isolation:          | 1000 V through opto-couplers, from PC to peripheral                                |
| Nominal voltage:            | 24 V (CPCIs-1532), 12 V (CPCIs-1532-12V)   |
| Input current:              | <b>at 24 V</b> <b>at 12 V (CPCIs-1532-12V)</b>                                     |
| Channel 0 or 0-1:           | 6.6 mA typ. 3.2 mA typ.  |
| Channel 1-15 or 2-16:       | 2 mA typ. 1.5 mA typ.  |
| Input frequency (max.):     | <b>at 24 V</b> <b>at 12 V (CPCIs-1532-12V)</b>                                     |
| Channel 0 or 0-1:           | 100 kHz 100 kHz  |
| Channel 1-15 or 2-16:       | 5 kHz 5 kHz  |
| Logic input levels:         | <b>at 24 V</b> <b>at 12 V (CPCIs-1532-12V)</b>                                     |
| UH (max.):                  | 30 V 16 V  |
| UH (min.):                  | 19 V 9 V   |
| UL (max.):                  | 14 V 6 V   |
| UL (min.):                  | 0 V 0 V  |
| Filters/protective circuit: | Input filters, transil diode, RC filters, Z diode, opto-couplers                   |

### Digital outputs

|                                   |  |
|-----------------------------------|--|
| Number of outputs:                | 16 digital outputs   |
| Output type:                      | High-side (load to ground) acc. to IEC 1131-2                        |
| Optical isolation:                | 1000 V (through opto-couplers), from PC to peripheral                |
| Nominal voltage:                  | 24 V   |
| Supply voltage range:             | 11 to 36 V   |
| Current limit:                    | 1.5 A per 8 channels (through PTC)                                   |
| Output current per output:        | 500 mA (typical)   |
| Short-circuit current per output: | 1.5 A (typ.) pulse current shutdown at 24 V, $R_{load} < 0.1 \Omega$ |
| RDS ON resistance:                | max. $0.2 \Omega$ at 25 °C   |
| Switch-on time:                   | $t_{out} = 0.5 \text{ A}$ , load = resistance: 50 $\mu\text{s}$      |
| Switch-off time:                  | $t_{out} = 0.5 \text{ A}$ , load = resistance: 75 $\mu\text{s}$      |
| Overtemperature (shutdown):       | 135 °C (output driver)   |
| Temperature hysteresis:           | 15 °C (output driver)  |

### Timer/watchdog

|        |   |
|--------|---|
| Timer: | 2 x 12-bit timers, 1 up to 4095 $\mu\text{s}$ , ms, s<br>1 timer can be used as watchdog. |
|--------|---|

### Safety

|  |  |
|--|--|
| Shutdown logic ( $V_{CC}$ diagnostic): | When the ext. 24 V voltage drops below 7 V:<br>The outputs are switched off. |
| Watchdog:                              | For resetting the outputs to "0"   |
| Common diagnostics:                    | For all 16 channels at overtemperature of one channel                        |

### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### Physical and environmental conditions

|                      |  |
|----------------------|--|
| Dimensions:          | 149 x 99 mm  |
| System bus:          | PCI Express according CompactPCI Serial specification PICMG CPCI-S.0 R1.0  |
| Space required:      | 1 x CompactPCI Serial slot   |
| Operating voltage:   | +3.3 V from PC   |
| Current consumption: | Inputs/outputs inactive 320 mA $\pm 10 \%$ , typ.<br>8 inputs/outputs active 400 mA $\pm 10 \%$ , typ.<br>16 inputs/outputs active 470 mA $\pm 10 \%$ , typ. |
| Front connector:     | 37-pin D-Sub male connector  |
| Temperature range:   | from -40 °C to +85 °C  |

### CPCIs-1532

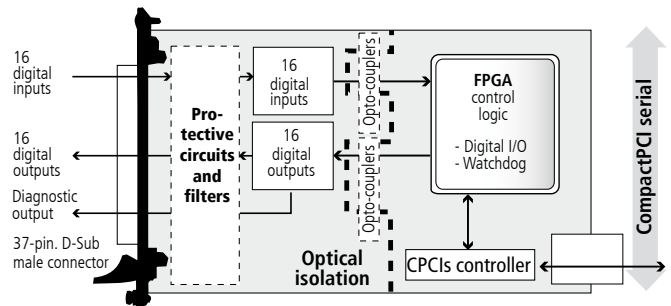
Digital I/O board, optically isolated, 32 digital inputs and outputs, 24 V, for CompactPCI Serial. Incl. technical description and software drivers.

**CPCIs-1532:** 16 inputs, 24 V, 16 outputs, 11-36 V, 1 counter

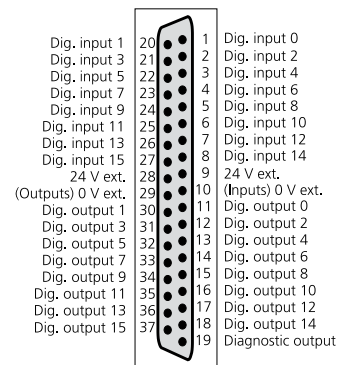
### Accessories

|                  |  |
|------------------|--|
| <b>PX901-D:</b>  | Screw terminal panel, LED status display                         |
| <b>PX901-DG:</b> | Screw terminal panel, LED status display, for DIN rail           |
| <b>PX9000:</b>   | 3-row screw terminal panel for DIN rail, with LED status display |
| <b>PX8500-G:</b> | Relay output board for DIN rail, cascable                        |

### Simplified block diagram



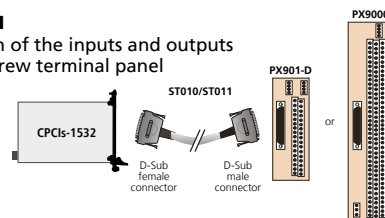
### Pin assignment – 37-pin D-Sub male connector



### ADDI-DATA connection

#### Example 1

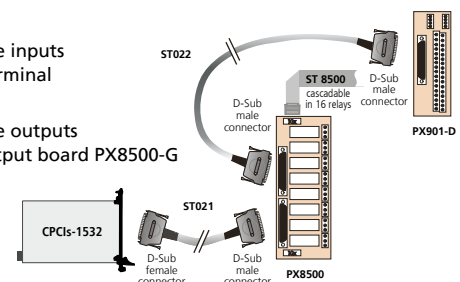
Connection of the inputs and outputs through screw terminal panel



#### Example 2

Connection of the inputs through screw terminal panel PX901-DG

Connection of the outputs through relay output board PX8500-G



### Ordering information

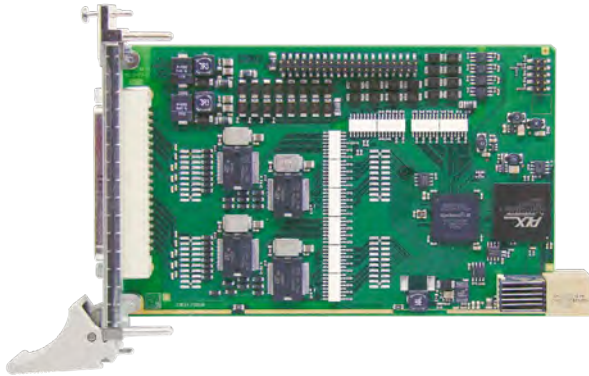
|                 |   |
|-----------------|---|
| <b>ST010:</b>   | Standard round cable, shielded, twisted pairs, 2 m                        |
| <b>ST011:</b>   | Standard round cable, shielded, twisted pairs, 5 m                        |
| <b>ST010-S:</b> | Same as ST010, for high currents  |
| <b>ST021:</b>   | Round cable between APCle-15x2 and PX8500-G, shielded, twisted pairs, 2 m |
| <b>ST022:</b>   | Round cable between PX8500-G and PX901 or PX9000, shielded, 2 m           |
| <b>ST8500:</b>  | Ribbon cable for cascading two PX8500-G                                   |

\*Preliminary product information



# Digital I/O board, optically isolated, 64 digital inputs and outputs, 24 V, for CompactPCI Serial

**NEW\***



## CPCIs-1564

### CompactPCI Serial interface

32 digital inputs, 24 V,  
including 16 interruptible inputs

32 digital outputs, 24 V, 500 mA/channel

Optical isolation 1000 V

Input and output filters

Connection through industry-standard  
D-Sub connector

Extended temperature range  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$



**Also for**   
See APCL-1564, page 124

**Also for**   
See APCI-1564, page 150

**Also for** *CompactPCI™*  
See CPCIs-1564, page 232

## Features

### Inputs

- 32 optically isolated inputs, 24 V, incl. 16 interruptible inputs
- Channels 0–2 can be used as 32-bit counter inputs (up to 500 kHz)
- Reverse voltage protection
- All inputs are filtered

### Outputs

- 32 optically isolated outputs, 11 to 36 V
- Output current per channel 500 mA
- Total current: 3 A typ. (fused through PTC resistor)
- Watchdog for resetting the outputs to "0"
- At Power-On, reset of the outputs to "0"
- Current limit:  $\sim 1.5$  A per 8 channels (through PTC)
- Short-circuit current per output  $\sim 1.5$  A typ.
- Self-resetting fuse (electronic fuse)
- Overtemperature and overvoltage protection
- 24 V power outputs with protection diodes and filters
- Ext. 24 V voltage supply screened and filtered
- Shutdown logic, when the external supply voltage drops below 7 V

### Timer / Watchdog / Counter

- 2 timers (12-bit), of which one can be used as a watchdog
- 3 counter (32-bit)

### Safety features

- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Protection against fast transients (burst), overvoltage, electrostatic discharge and high-frequency EMI
- Separate ground line for inputs and outputs

## Applications

- Industrial I/O control
- PLC coupling
- Signal switching
- Interface to electromechanical relays
- Automatic test equipment
- ON/OFF monitoring of motors, lights...
- Watchdog/timer
- ...

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- C#.NET, C

### On request:

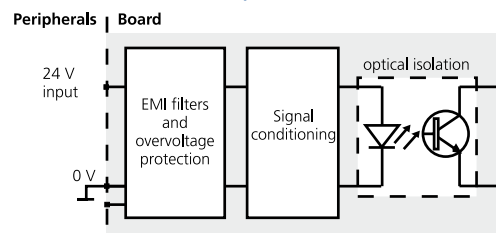
Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)

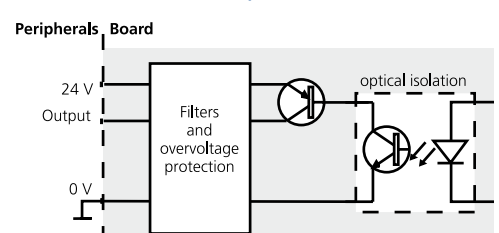


\* Preliminary  
product information

### Protective circuit for the input channels



### Protective circuit for the output channels



## Specifications\*

### Digital inputs

|  |  |
|--|--|
| Number of inputs:<br>(common ground<br>acc. to IEC 1131-2) | 32 digital inputs,<br>channel 0-2 can be used as 32-bit counter inputs<br>(up to 500 kHz)  |
| Interruptible inputs:                                      | 16 channels (channel 4 to 19)  |
| Optical isolation:   | 1000 V through opto-couplers, from PC to peripheral  |
| Nominal voltage:   | 24 V   |
| Input current:   | Channel 0-3: 6.6 mA at 24 V, typical<br>Channel 4-31: 2 mA at 24 V, typical  |
| Input frequency (max.):                                    | Channel 0-2: 500 kHz at 24 V<br>Channel 3-31: 5 kHz at 24 V  |
| Logic input levels:  | UH (max.): 30 V / 3.1 mA, typical (channel 4-31)<br>UH (min.): 19 V / 1 mA, typical (channel 4-31)<br>UH (max.): 30 V / 11 mA, typical (channel 0-3)<br>UH (min.): 19 V / 3.4 mA, typical (channel 0-3)<br>UL (max.): 14 V / 0.1 mA, typical<br>UL (min.): 0 V / 0 mA, typical |
| Filters/protective circuit:                                | Input filters, transil diode,<br>RC filters, Z diode, opto-couplers  |

### Digital outputs

|                                   |   |
|-----------------------------------|---|
| Number of outputs:                | 32 digital outputs  |
| Output type:                      | High-side (load to ground) acc. to IEC 1131-2                           |
| Optical isolation:                | 1000 V (through opto-couplers), from PC to peripheral                   |
| Nominal voltage:                  | 24 V  |
| Supply voltage range:             | 11 to 36 V  |
| Current limit:                    | 1.5 A per 8 channels (through PTC)                                      |
| Output current per output:        | 500 mA (typical)  |
| Short-circuit current per output: | 1.5 A (typ.) pulse current<br>shutdown at 24 V, $R_{load} < 0.1 \Omega$ |
| RDS ON resistance:                | 0.2 $\Omega$ at 25 °C   |
| Switch-on time:                   | $t_{out} = 0.5 A$ , load = resistance: 50 $\mu s$                       |
| Switch-off time:                  | $t_{out} = 0.5 A$ , load = resistance: 75 $\mu s$                       |
| Overttemperature (shutdown):      | 135 °C (output driver)  |
| Temperature hysteresis:           | 15 °C (output driver)   |

### Timer/watchdog

|        |   |
|--------|---|
| Timer: | 2 x 12-bit, 1 x programmable as watchdog from 1 $\mu s$ to 4095 s |
|--------|---|

### Safety

|  |  |
|--|--|
| Shutdown logic ( $V_{CC}$ diagnostic): | When the ext. 24 V voltage drops below 7 V,<br>the outputs are switched off. |
| Watchdog:                              | For resetting the outputs to "0"   |
| Common diagnostics:                    | For all 16 channels at overtemperature of one channel                        |

### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### Physical and environmental conditions

|                      |  |
|----------------------|--|
| Dimensions:          | 160 x 100 mm   |
| System bus:          | PCI Express according<br>CompactPCI Serial specification PICMG CPCI-S.0 R1.0 |
| Space required:      | 1 x CompactPCI Serial slot   |
| Operating voltage:   | +12 V, $\pm 5 \%$  |
| Current consumption: | in preparation   |
| Front connector:     | 37-pin D-Sub male connector  |
| Temperature range:   | from -40 °C to +85 °C  |
| MTBF                 | in preparation   |

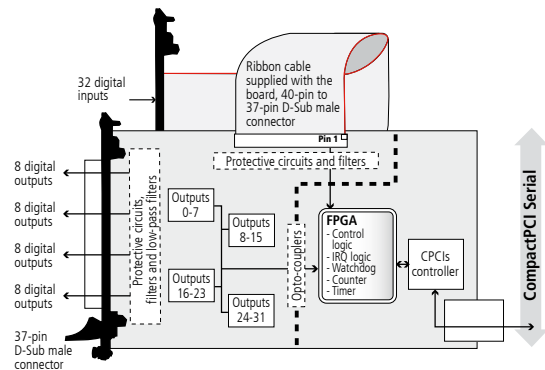
### CPCIs-1564

Digital I/O board, optically isolated, 64 digital inputs and outputs, 24 V, for CompactPCI Serial. Incl. technical description and software drivers.

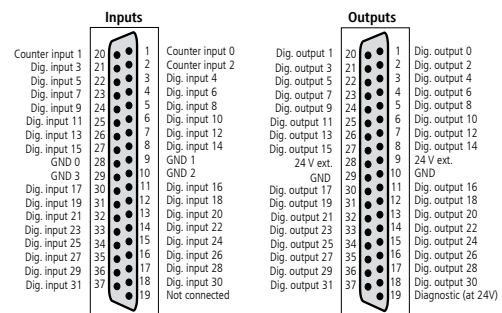
### Accessories

|                  |   |
|------------------|---|
| <b>PX901-D:</b>  | Screw terminal panel, LED status display                            |
| <b>PX901-DG:</b> | Screw terminal panel,<br>LED status display, for DIN rail           |
| <b>PX9000:</b>   | 3-row screw terminal panel<br>for DIN rail, with LED status display |
| <b>PX8500-G:</b> | Relay output board for DIN rail, cascadable                         |

### Simplified block diagram



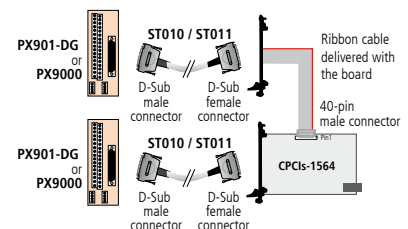
### Pin assignment – 37-pin D-Sub male connector



### ADDI-DATA connection

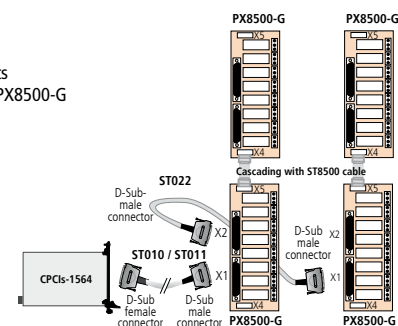
#### Example 1:

- Connection of the inputs (ribbon cable)
- Connection of the outputs through screw terminal panel PX901-DG or PX9000



#### Example 2:

- Connection of the outputs with relay output board PX8500-G cascaded in 32 relays



## Ordering information

|                 |   |
|-----------------|---|
| <b>ST010:</b>   | Standard round cable, shielded, twisted pairs, 2 m              |
| <b>ST011:</b>   | Standard round cable, shielded, twisted pairs, 5 m              |
| <b>ST010-S:</b> | Same as ST010, for high currents                                |
| <b>ST022:</b>   | Round cable between PX8500-G and PX901 or PX9000, shielded, 2 m |
| <b>ST8500:</b>  | Ribbon cable for cascading two PX8500-G                         |

\* Preliminary product information

# Multifunction counter board, optically isolated, fast counter inputs – programmable functions, for CompactPCI Serial

**NEW\***



## CPCIs-1711

Available functions: incremental counter, SSI Synchronous Serial Interface, counter/timer, pulse acquisition, frequency, pulse width, period duration, velocity measurement, PWM, BiSS-Master, digital I/O, Sin/Cos, EnDat 2.2 ...

Function selection through software

Optical isolation

Inputs and outputs: RS422, TTL, 24 V

Customised functions

Extended temperature range –40 °C to +85 °C



Also for **PCI EXPRESS**  
See APCI-1711, page 128

Also for **PCI**  
see APCI-1710  
page 166

Also for **CompactPCI™**  
see CPCI-1710  
page 234

The board CPCIs-1711 is a fast multifunction and multi-channel counter board for CompactPCI Serial. The strengths of this board are its wide range of applications and high precision and reliability in harsh industrial environment.

With this board you can realise many different applications on the same hardware base. The board is supplied with a pool of functions which provides the user with maximum efficiency yet minimum space and parts requirement. The functions are individually configured for each channel through the supplied software. The flexible programming facilities on this board allow many different user applications to be quickly and easily developed and reconfigured as further requirements arise. Thanks to the FPGA board structure, further counting applications can be realised through software adaptation. Contact us!

## Features

- 32-bit data access
- RS422 driver 5 MHz (up to 20 MHz on request)
- With RS422/TTL input/output signals (CPCIs-1711) or 24 V input signals (CPCIs-1711-24V)
- Four onboard function modules

## Functions

- Incremental counter for the acquisition of incremental encoders (90° phase-shifted signals)
- BiSS-Master (B and C mode)
- SSI Synchronous Serial Interface. The SSI function is an interface for systems which allow an absolute position information via serial data transfer.
- Counter/timer (82C54)
- Pulse acquisition
- Frequency measurement
- Pulse width modulation (PWM)
- Period duration measurement
- Velocity measurement
- Digital inputs and outputs
- Edge time measurement (ETM)
- Parallel interface
- Sin/Cos (1 V<sub>SS</sub>, 11 μA<sub>SS</sub>)
- EnDat 2.2
- Customised functions

## Available channels on one function module

- 4 channels, programmable either as digital inputs or outputs, optically isolated, RS422
- 3 channels, digital inputs, optically isolated, 24 V
- 1 digital power outputs, optically isolated, 24 V

## Additional channels

- 28 TTL I/O, without optical isolation

## Versions

|                        | RS422/<br>TTL-<br>I/O | 24 V<br>inputs | 5 V<br>inputs | 24 V<br>outputs | TTL<br>I/O |
|------------------------|-----------------------|----------------|---------------|-----------------|------------|
| <b>CPCIs-1711</b>      | 16                    | 12             | –             | 4               | 28         |
| <b>CPCIs-1711-24V</b>  | –                     | 28             | –             | 4               | 28         |
| <b>CPCIs-1711-5V-I</b> | 16                    |                | 12            | 4               | 28         |

## Safety features

- Creeping distance IEC 61010-1
- Optical isolation 1000 V
- Noise neutralisation of the PC supply

## Applications

- Event counting
- Position acquisition
- Motion control
- Batch counting
- ...

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

## Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

## Drivers and samples for the following compilers and software packages:

- Microsoft VC++ • Borland C++ 5.01

## On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)



\*Preliminary  
product information

## Specifications\*

## Free programming of the functions

- Acquisition of incremental encoders (1 x 32-bit or 2 x 16-bit)
- SSI (max. 3 encoders per module)
- Counter/Timer (3 counters similar to 82C54)
- Pulse counter (4 x 32-bit counters per module)
- Chronos (chronometer)
- TOR (pulse counter with time slices, ...)
- Digital I/O (8 I/O, 24 V, TTL, RS422)
- PWM (pulse width modulation, 2 x per module)
- BiSS-Master (B and C mode)
- ETM (Timer interface for period duration measurement, edge time, ...)
- TTL (TTL I/O without isolation)
- Parallel Interface
- EnDat 2.2
- Sin/Cos
- Customised functions

## Signals

Digital I/O signals, TTL or RS422, 24 V

## Inputs

## Differential inputs or outputs (A, B, C, D)

|                             |  |
|-----------------------------|--|
| Differential inputs, RS422: | 16 (can be used as inputs or outputs)                              |
| Nominal voltage:            | 3.3 VDC  |
| Common mode range:          | +12 V / -7 V   |
| Input sensitivity:          | 200 mV   |
| Input hysteresis:           | 50 mV  |
| Input impedance:            | 12 kΩ  |
| Terminal resistor:          | 120 Ω (not supplied)   |
| Max. input frequency:       | CPCIs-1711: 5 MHz (at nominal voltage)<br>up to 20 MHz on request! |

## Mass-related inputs, 24 V (E, F, G):

|                     |   |
|---------------------|---|
| Number of inputs:   | 12  |
| Nominal voltage:    | 24 VDC  |
| Logic input levels: | Unominal: 24 V<br>UH max.: 30 V<br>UH min.: 19 V<br>UL max.: 14 V<br>UL min.: 0 V |

Maximal input frequency: 1 MHz (at nominal voltage) depending on the function

## Outputs

|                           |   |
|---------------------------|---|
| Nominal voltage:          | 3.3 VDC                                   |
| Maximum output frequency: | 5 MHz (diff. outputs)                     |
| Max. number of outputs:   | 16 (if they are not used as diff. inputs) |

## Digital outputs, 24 V (H)

|                       |  |
|-----------------------|--|
| Output type:          | High-side (load to ground)                             |
| Number of outputs:    | 4  |
| Nominal voltage:      | 24 VDC   |
| Supply voltage range: | 4.75 V to 30 VDC (via 24 V ext. pin)                   |
| Maximum current:      | 90 mA per output /<br>270 mA total current limit (PTC) |
| Overttemperature:     | 165 °C (all outputs switch off)                        |

## Technical data CPCIs-1711-24 V version

|                                    |   |
|------------------------------------|---|
|                                    | 24 V inputs (channels A to G).<br>This board version is intended for the<br>connection of 24 V encoders.<br>Only 24 V signals can be connected to the inputs. |
| Nominal voltage:                   | 24 VDC  |
| Max. input frequency:              | 1 MHz (at nominal voltage) depending on the function  |
| Logic input levels :<br>(Standard) | Unominal: 24 V<br>UH max.: 30 V<br>UH min.: 18 V<br>UL max.: 16 V<br>UL min.: 0 V   |

All functions using channels A, B, C, D as outputs cannot be used.  
See the manuals of the functions!

## Safety

Optical isolation: 1000 V

## EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

## PC system requirements and environmental conditions

|                       |  |
|-----------------------|--|
| Dimensions:           | 160 x 100 mm   |
| System bus:           | PCI Express according<br>CompactPCI Serial specification PICMG CPCI-S.0 R1.0           |
| Space required:       | 1 x CompactPCI Serial slot for digital I/O<br>1 x slot opening for TTL I/O with FB1711 |
| Operating voltage:    | +12 V, ± 5 %   |
| Current consumption:  | 230 mA, ± 10 %   |
| Front connector:      | 78-pin D-Sub female connector  |
| Additional connector: | 50-pin D-Sub male connector  |
| Temperature range:    | from -40 °C to +85 °C  |
| MTBF                  | in preparation   |

## Ordering information

## CPCIs-1711

Multifunction counter board, optically isolated, fast counter inputs – programmable functionality, for CompactPCI Serial.  
Incl. technical description and software drivers.

|                         |   |
|-------------------------|---|
| <b>CPCIs-1711:</b>      | Multifunction counter board, optical isolated |
| <b>CPCIs-1711-24V:</b>  | 24 V instead of RS422 / TTL I/O (A, B, C, D)  |
| <b>CPCIs-1711-5V-I:</b> | 5 V inputs instead of 24 V (E, F, G)          |

## Option

**Opt. 5V:** Outputs 3.3 V instead of 24 V (H0, H1, H2, H3)

## Accessories

|                   |   |
|-------------------|---|
| <b>PX8001:</b>    | 3-row screw terminal panel with housing for DIN rail  |
| <b>ST1711-50:</b> | Standard round cable, shielded, twisted pairs, 2 m,<br>78-pin male connector to 50-pin male connector |

## For the TTL I/O function

|                  |  |
|------------------|--|
| <b>ST370-16:</b> | Standard round cable, shielded, twisted pairs, 2 m |
| <b>FB1711:</b>   | Ribbon cable (included in delivery)                |

## For the Sin/Cos function

|                          |   |
|--------------------------|---|
| <b>EM-SINCOS-11μAPP:</b> | Extension module,<br>2 x 11 μA <sub>pp</sub> inputs, 1 dig. output, 24 V  |
| <b>EM-SINCOS-1VPP:</b>   | Extension module,<br>2 x 1 V <sub>pp</sub> inputs, 1 dig. output, 24 V  |
| <b>ST1711-50-37:</b>     | Y-cable, round, shielded, twisted pairs,<br>78-pin D-Sub male connector to 50-pin D-Sub male<br>connector and 37-pin D-Sub male connector |
| <b>PX901-ZG:</b>         | Screw terminal panel for DIN rail   |

\*Preliminary product information

# Multifunction board, optically isolated, 16 SE / 8 differential inputs, 4/8 analog outputs, 16-bit

**NEW\***



## CPCIs-3121

### CompactPCI Serial interface

16 single-ended / 8 differential inputs, 16-bit

8/4 analog outputs, 16-bit

Optical isolation of inputs and outputs, 500 V

PCI-Express DMA, programmable gain

Trigger functions

8 digital I/O, 24 V, isolated, timer, watchdog

Extended temperature range -40 °C to +85 °C

## Features

### Analog inputs

- 16 single-ended / 8 differential inputs
- 16-bit resolution
- Optical isolation 500 V
- Throughput: 100 kHz
- Input ranges: 0-10 V,  $\pm 10$  V, 0-5 V,  $\pm 5$  V, 0-2 V,  $\pm 2$  V, 0-1 V,  $\pm 1$  V, 0-20 mA (option) freely programmable through software for each channel
- Gain PGA x1, x2, x5, x10 freely programmable through software for each channel
- DMA for analog data acquisition
- Overvoltage protection
- Input filters: 159 kHz

### Analog acquisition

- One single channel, several channels, several channels through scan list
- Automatic analog acquisition through cyclic timer control
- Acquisition through scan list: up to 16 entries with gain, channel, unipolar/bipolar
- Acquisition triggered through software, timer, external event
- Trigger functions:  
Software trigger or external trigger: the analog acquisition (single or sequence) is started through signal switching from 0 V to 24 V at the digital input 0.
- Interrupt: end of single channel, end of multichannel, end of scan list

### Analog outputs

- 4 or 8 analog outputs, optically isolated 500 V
- Voltage or current outputs
- 16-bit resolution (15-bit for 0-10 V)
- Output voltage:  $\pm 10$  V, 0-10 V (through software)
- Output voltage after reset: 0 V
- Each output has its own ground line (without optical isolation)
- Output current  $\pm 5$  mA max. for voltage outputs
- Current outputs: 0-20 mA, min. load 10  $\Omega$ , max. load 560  $\Omega$ , at 20 mA
- EMI filters

### Digital

- 4 digital inputs including 1 interruptible input
- 4 digital outputs, 24 V, optically isolated

### Timer

- 2 timers, incl. 1 which can be used as a watchdog

## Safety features

- Optical isolation 500 V min.
- Creeping distance IEC 61010-1
- Overvoltage protection  $\pm 40$  V, analog inputs
- Protection against high-frequency EMI
- Input filters: 159 kHz
- Noise neutralisation of the PC supply

## Applications

- Industrial process control
- Industrial measurement and monitoring
- Multichannel data acquisition
- Control of chemical processes
- Factory automation
- Acquisition of sensor data, current measurement
- Laboratory equipment, instrumentation

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- .NET
- Microsoft VC++ • Borland C++
- Visual Basic • Delphi
- LabVIEW • LabWindows/CVI

### ADDIPACK functions

- Analog input • Analog output • Digital input
- Digital output • Watchdog • Timer

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)



Also for **PCI EXPRESS**  
See APCle-3121, page 134

Also for **PCI**  
see APCI-3120, page 180

Also for **CompactPCI™**  
see CPCI-3120, page 238



on request



LabVIEW™



LabWindows/CVI™

\* Preliminary  
product information



## Specifications\*

### Analog inputs

|                            |   |
|----------------------------|---|
| Number of inputs:          | 16 single-ended / 8 differential inputs or 8 single-ended / 4 differential inputs   |
| Resolution:                | 16-bit  |
| Optical isolation:         | 500 V through opto-couplers from PC to peripheral   |
| Input ranges:              | software-programmable for each channel<br>0-10 V, $\pm 10$ V, 0-5 V, $\pm 5$ V, 0-2 V, $\pm 2$ V, 0-1 V, $\pm 1$ V, (0-20 mA optional), freely programmable through software for each channel |
| Throughput:                | 100 kHz   |
| Gain:                      | Software programmable (x1, x2, x5, x10)   |
| Relative precision (INL):  | $\pm 2$ LSB max. (A/D converter)  |
| Diff. non-linearity (DNL): | $\pm 1$ LSB max. (A/D converter)  |
| Bandwidth (-3 dB):         | Limited to 159 kHz with low-pass filter   |
| Trigger:                   | Through software, timer, external event (24 V input)  |
| Data transfer:             | Data to the PC through FIFO memory, I/O commands, interrupt at EOC (End Of Conversion) and EOS (End Of Sequence), DMA transfer at EOC   |
| Interrupts:                | End of conversion, at timer overrun, End of sequence  |

### Analog outputs

|                             |   |
|-----------------------------|---|
| Number of outputs:          | 8 or 4  |
| Resolution:                 | 16-bit  |
| Optical isolation:          | 500 V through opto-couplers                                       |
| Output range:               | 0-10 V, $\pm 10$ V switchable through software (0-20 mA optional) |
| Overvoltage protection:     | $\pm 15$ V  |
| Max. output current / load: | $\pm 5$ mA, 2 k $\Omega$  |
| Short-circuit current:      | $\pm 35$ mA (short time)  |
| Output voltage after reset: | 0 V   |

### Digital I/O

|                         |   |
|-------------------------|---|
| Number of I/O channels: | 4 digital inputs, 4 digital high-side outputs, 24 V |
| Optical isolation:      | 1000 V through opto-couplers                        |
| Input current at 24 V:  | 10 mA typ.  |
| Input range:            | 0-30 V  |
| Supply voltage:         | 8-32 V  |
| Max. switching current: | 65 mA typ.  |

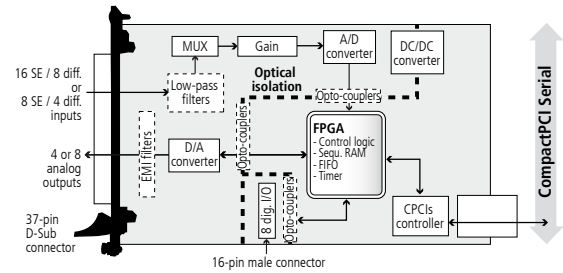
### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### Physical and environmental conditions

|                      |  |
|----------------------|--|
| Dimensions:          | 160 x 100 mm   |
| System bus:          | PICMG CPCI-S.0 R1.0  |
| Space required:      | 1 x CompactPCI slot for analog I/O<br>1 x slot opening for digital I/O with FB3001 |
| Operating voltage:   | +12 V, $\pm 5$ %   |
| Current consumption: | 201 mA, $\pm 10$ %   |
| Front connector:     | 37-pin D-Sub male connector  |
| Temperature range:   | -40 °C to +85 °C   |
| MTBF:                | in preparation   |

### Simplified block diagram



### Pin assignment – 37-pin D-Sub male connector

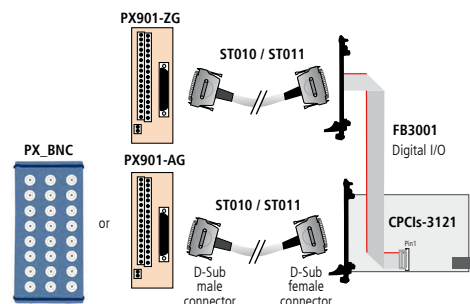
| DIFF             | SE               | SE               | DIFF             |
|------------------|------------------|------------------|------------------|
| (+) An. input 0  | (+) An. input 1  | (+) An. input 8  | (+) An. input 4  |
| (+) An. input 1  | (+) An. input 2  | (+) An. input 9  | (+) An. input 5  |
| (+) An. input 2  | (+) An. input 3  | (+) An. input 10 | (+) An. input 6  |
| (+) An. input 3  | (+) An. input 4  | (+) An. input 11 | (+) An. input 7  |
| (-) An. input 3  | (-) An. input 7  | (+) An. input 15 | (-) An. input 7  |
| (-) An. input 2  | (-) An. input 6  | (+) An. input 14 | (-) An. input 6  |
| (-) An. input 1  | (-) An. input 5  | (+) An. input 13 | (-) An. input 5  |
| (-) An. input 0  | (-) An. input 4  | (+) An. input 12 | (-) An. input 4  |
| Analog input GND | Analog input GND | Analog input GND | Analog input GND |
| An. output 0 GND | An. output 0 GND | An. output 0     | An. output 0     |
| An. output 1 GND | An. output 1 GND | An. output 1     | An. output 1     |
| An. output 2 GND | An. output 2 GND | An. output 2     | An. output 2     |
| An. output 3 GND | An. output 3 GND | An. output 3     | An. output 3     |
| An. output 4 GND | An. output 4 GND | An. output 4     | An. output 4     |
| An. output 5 GND | An. output 5 GND | An. output 5     | An. output 5     |
| An. output 6 GND | An. output 6 GND | An. output 6     | An. output 6     |
| An. output 7 GND | An. output 7 GND | An. output 7     | An. output 7     |

1: The analog inputs have a common ground line  
2: Each analog output has its own ground line

### Pin assignment – 16-pin male connector

|                     |    |                           |
|---------------------|----|---------------------------|
| Dig. input 3-       | 16 | Dig. input 3+             |
| Dig. input 2-       | 14 | Dig. input 2+             |
| Dig. input 1-       | 12 | Dig. input 1+             |
| Dig. input 0-       | 10 | Dig. input 0+             |
| 24 V voltage supply | 8  | High-side output 3 (24 V) |
| 24 V voltage supply | 6  | High-side output 2 (24 V) |
| Masse (dig. output) | 4  | High-side output 1 (24 V) |
| Masse (dig. output) | 2  | High-side output 0 (24 V) |

### ADDI-DATA connection



## Ordering information

### CPCIs-3121

Multifunction board, opt. isolated, 16 SE / 8 diff. inputs, 4/8 analog outputs, 16-bit, for CompactPCI Serial. Incl. techn. description and software drivers.

### Versions

|                        |   |
|------------------------|---|
| <b>CPCIs-3121-16-8</b> | Version with 16 SE / 8 diff. inputs, 8 analog outputs |
| <b>CPCIs-3121-16-4</b> | Version with 16 SE / 8 diff. inputs, 4 analog outputs |
| <b>CPCIs-3121-8-8</b>  | Version with 8 SE / 4 diff. inputs, 8 analog outputs  |
| <b>CPCIs-3121-8-4</b>  | Version with 8 SE / 4 diff. inputs, 4 analog outputs  |

### Options

Please indicate the number of channels

|                   |   |
|-------------------|---|
| <b>Option SF:</b> | Precision filter for 1 single-ended channel       |
| <b>Option DF:</b> | Precision filter for 1 diff. channel              |
| <b>Option PC:</b> | Current input 0(4)-20 mA for 1 channel            |
| <b>PC-SE:</b>     | for single-ended <b>PC-Diff:</b> for differential |

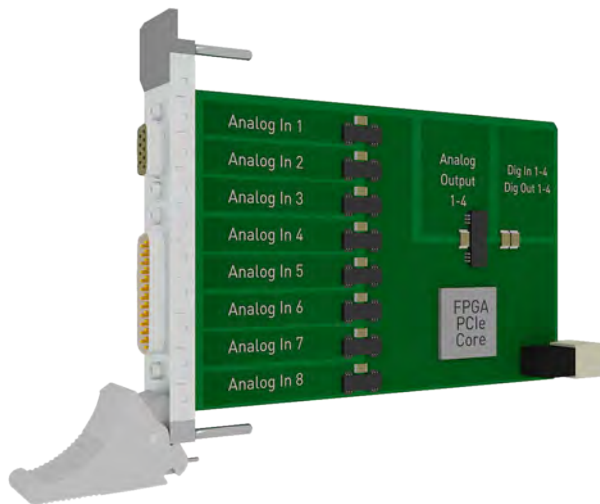
### Accessories

|                  |   |
|------------------|---|
| <b>PX901-A:</b>  | Screw terminal panel for connecting the analog I/O  |
| <b>PX901-AG:</b> | Same as PX901-A with housing for DIN rail           |
| <b>PX_BNC:</b>   | BNC connection box for connecting the analog I/O    |
| <b>PX901-ZG:</b> | Screw terminal panel for connecting the digital I/O |
| <b>ST010:</b>    | Standard round cable, shielded, twisted pairs, 2 m  |
| <b>ST011:</b>    | Standard round cable, shielded, twisted pairs, 5 m  |
| <b>FB3001:</b>   | Ribbon cable for digital I/O with 3U bracket        |

\* Preliminary product information

# Multifunction board, optically isolated, 8 SE or 8 diff. inputs, 4 analog outputs, 24-bit

**IN DEVELOPMENT\***



The CompactPCI Serial board CPCIs-3131 is a fast and highly-precise multifunction board. Each of the 8 inputs has an own A/D converter, the resolution is 24-bit. On the CPCIs-3131, not only the analog and digital part are optically isolated but also all analog channels are separated from each other.

Further protective circuits complete the interference resistance of the board and offer an excellent protection for your application in the harsh industrial environment. Please contact us for further information!



## Features

- CompactPCI Serial (PICMG CPCI-S.0 R1.0)

### Analog inputs

- 8 SE/diff. inputs, optically isolated 1000 V
- Optical isolation between channels 500 V
- 24-bit resolution
- Throughput: max. 100 kHz, programmable for each channel
- Input voltage:

| PGA  | unipolar | bipolar |
|------|----------|---------|
| 1    | 0-10 V   | ±10 V   |
| 10   | 0-1 V    | ±1 V    |
| 100  | 0-0.1 V  | ±0.1 V  |
| 1000 | 0-0.01 V | ±0.01 V |

- Current inputs: 0-20 mA, software-programmable for each channel
- Gain PGA x1, x10, x100, x1000 software-programmable for each channel

### Analog acquisition

- Different acquisition modes are available:
  - 1) Simple Mode,
  - 2) Scan Mode
  - 3) Sequence Mode
  - 4) Auto Refresh Mode
- Onboard FIFO
- PCI-Express DMA for analog data acquisition
- MSI interrupt

### Analog outputs

- Simultaneous output through DMA
- 4 analog outputs, optically isolated
- 16-bit resolution, setup time 18 µs max. (voltage in 10 V steps)
- Output voltage after reset: 0 V
- Each output has its own ground line (without optical isolation)

## CPCIs-3131-8-4

### CompactPCI Serial interface

8 SE or 8 differential inputs

24-bit resolution, 250 kHz

4 analog outputs, 16-bit

8 digital I/O, optically isolated, 24 V

Extended temperature range

- Output voltage range:
  - 0-10 V, ± 10 V,
  - 0-5 V, ± 5 V
  - 0-20 mA, 4-20 mA, 0-24 mA
- Output current: ± 20 mA
- Short-circuit current: in preparation

### 24 V digital I/O

- 4 digital inputs, 24 V, optically isolated
- 4 digital outputs, 24 V, optically isolated

### Timer / Counter / Watchdog

- 3 / 3 / 2, 16-bit

### Safety features

- Optical isolation 1000 V min.
- Optical isolation between analog inputs: 500 V
- Creeping distance IEC 61010-1
- Circuit part of the analog acquisition is separated from the circuit part of the digital function
- Overvoltage protection
- Protection against high-frequency EMI
- Input filters
- Noise neutralisation of the PC supply
- Connection of the I/O signals via robust industry-standard D-Sub connector

## Software

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

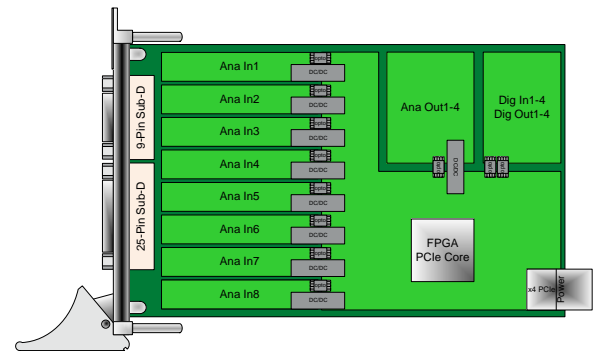
### On request:

Further operating systems, compilers and samples

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)

\*Preliminary  
product information

## Simplified block diagram



## Specifications\*

## Analog inputs

|                    |  |
|--------------------|--|
| Number of inputs:  | 8 differential inputs  |
| Resolution:        | 24-bit   |
| Optical isolation: | 1000 V through opto-couplers from PC to peripheral<br>500 V between channels |
| Voltage inputs:    | Each channel is freely programmable through software                         |

| PGA  | unipolar | bipolar |
|------|----------|---------|
| 1    | 0-10 V   | ±10 V   |
| 10   | 0-1 V    | ±1 V    |
| 100  | 0-0,1 V  | ±0,1 V  |
| 1000 | 0-0.01 V | ±0.01 V |

|                 |  |
|-----------------|--|
| Current inputs: | 0–20 mA (option)   |
| Throughput:     | max. 250 kHz, software-programmable for each channel   |
| Trigger:        | through software, timer, ext. event (24 V input)   |
| Data transfer:  | Data to the PC through FIFO memory,<br>Interrupt at EOC (End Of Conversion)<br>DMA transfer at EOC |
| Interrupts:     | End of conversion, end of timer, end of sequence   |

## Analog outputs

|                                    |   |
|------------------------------------|---|
| Number of outputs:                 | 4   |
| Resolution:                        | 16-bit  |
| Optical isolation:                 | 1000 V through opto-couplers  |
| <b>Voltage and current outputs</b> |   |
| Output range:                      | 0-10 V, ±10 V, 0-5 V, ±5 V,<br>Option: 0-20 mA, 4-20 mA, 0-24 mA                        |
| LSB:                               | in preparation  |
| Accuracy:                          | 13,6-bit for voltage outputs<br>14-bit for current outputs                              |
| Read time:                         | in preparation  |
| Setup time:                        | Output voltage, max. 18 µs (in 10 V steps)<br>Output current, typ. 15 µs (0 mA - 24 mA) |
| Max. output current:               | in preparation  |
| Short-circuit current:             | in preparation  |
| Output-voltage after reset:        | 0 V   |

## Digital I/O

|                    |  |
|--------------------|--|
| Number of inputs:  | 4 digital inputs, 24 V<br>1 input is programmable as counter input |
| Number of outputs: | 4 digital outputs (50 mA), 24 V                                    |
| Input range:       | 0-30 V – logic „0“: 0-14 V; logic „1“: 19-30 V                     |
| Optical isolation: | 1000 V through opto-couplers from PC to peripheral                 |

## EMC - Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

## Physical and environmental conditions

|                       |   |
|-----------------------|---|
| Dimensions:           | 3U/4TE  |
| System bus:           | PCI Express nach CompactPCI Serial Specification<br>PICMG CPCI-S.0 R1.0                   |
| Space required:       | 1 CompactPCI Serial slot for analog inputs,<br>1 slot opening for digital I/O with FB300x |
| Operating voltage:    | +12 V, ± 5 %  |
| Current consumption:  | in preparation  |
| Front connector:      | 25-pin D-Sub male connector (analog input)<br>9-pin D-Sub male connector (analog output)  |
| Additional connector: | 50-pin D-Sub male connector for 8 digital I/O through<br>ribbon cable FB300x              |
| Temperature range:    | from –40 °C to +85 °C   |
| MTBF:                 | in preparation  |

## Ordering information

## CPCIs-3131-8-4

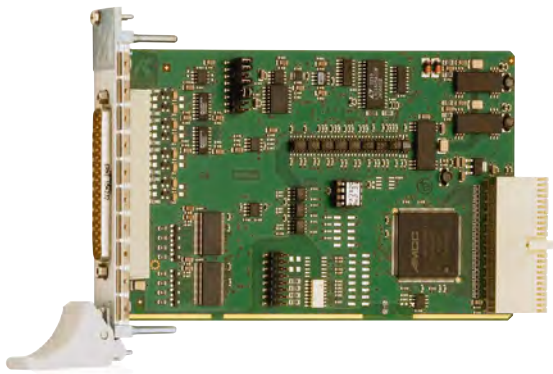
Multifunction board, optically isolated, 8 SE or 8 diff. inputs, 4 analog outputs, 24-bit. Technical description, software drivers and monitoring program included.

## Accessories

**FB300x:** Ribbon cable for digital I/O

\* Preliminary product information

# COMPACT PCI BOARDS



**CompactPCI™**



**READY FOR  
HARSH INDUSTRIAL  
ENVIRONMENT**

## HIGH PROTECTION

- Optical isolation from 500 V to 1000 V
- Separation of analog and digital signals
- Protection against short-circuits, overtemperature, overvoltage
- Filters for the inputs and outputs
- Industry-standard D-Sub connectors

## Reliable and available in the long term!

The CompactPCI bus is used particularly in applications with vibrations and shocks. To assure the reliability and longevity of a CompactPCI system it is important to use interference-free CompactPCI boards which are available in the long term – like the CompactPCI boards by ADDI-DATA.

### High interference resistance

The key to the high interference resistance of the ADDI-DATA CompactPCI boards is the well thought-out concept of design and protective circuits. Therefore our boards are predestined for tasks in harsh industrial environments. They are resistant to vibrations, accelerations or dirt and provide reliable and accurate data.

### 3 U version

ADDI-DATA CompactPCI boards are available in 3 U version. 6 U brackets enable an installation in a 6 U rack. The 3 U version has been chosen because it is much more stable than longer boards. Thus the CompactPCI boards are more resistant to shocks and vibrations.

### Faster through FPGA

A FPGA component has a programmable logic on which you can save your own algorithms in order to adapt the functionality of the PC board to your requirements. This adaptation makes your PC board unique and improves the performance of your applications. The on-board algorithms reduce the cycle time of signal acquisition and regulation tasks. Most ADDI-DATA CompactPCI boards are equipped with a FPGA component. Use the full potential of your PC board hardware and software resources and thus accelerate your processes.

### Complete real-time system

- Combination of the PAC-system MSX-Box-CPCI and CompactPCI boards
- Compact and flexible
- Stand-alone system (own CPU)
- Long-term availability

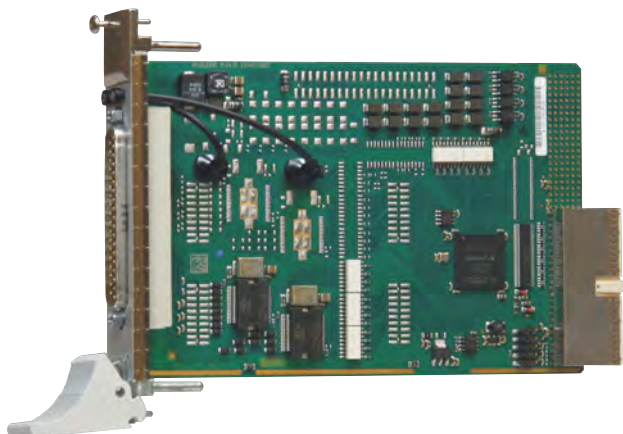
Information about the MSX-Box-CPCI on page 20



|  | Digital  |                                  | Counter                    | Analog           |  |  | Serial interfaces<br>(base board)    | Motion control                 |
|--|--|----------------------------------|----------------------------|------------------|--|--|--------------------------------------|--------------------------------|
|  | CPCI-1500  | CPCI-1564                        | CPCI-1710                  | CPCI-3009        | CPCI-3120  | CPCI-3001<br><i>New!</i><br>CPCI-3001-30V        | CPCI-7500                            | CPCI-8004                      |
| 32-bit CompactPCI bus  | 5 V  | 3,3 V / 5 V                      | 5 V                        | 3,3 V / 5 V      | 3,3 V / 5 V                                      | 3,3 V / 5 V                                      | 5 V                                  | 3,3 V / 5 V                    |
| FPGA   |  | ✓                                | ✓                          | ✓                | ✓  | ✓  |                                      |                                |
| Filters and protective circuits  | ✓  | ✓                                | ✓                          | ✓                | ✓  | ✓  | ✓                                    | ✓                              |
| Optical isolation 1000 V   | ✓  | ✓                                | ✓                          | ✓                | ✓  | ✓  | optional                             | ✓                              |
| Digital, 24 V  |  |                                  |                            |                  |  |  |                                      |                                |
| Input channels, 24 V   | 16   | 32                               | 12 (depending on function) | 4                | 4  | 4  |                                      | 24                             |
| Output channels, 24 V  | 16   | 32                               | 4                          | 4                | 4  | 4  |                                      | 12                             |
| Output current per output  | 500 mA (typ.)  | 500 mA (typ.)                    | 500 mA (typ.)              |                  |  |  |                                      |                                |
| Watchdog / Timer / Counter   | 2 x 12-bit timer, incl. 1 which can be used as a watchdog                                | Timer (12-Bit)/ Watchdog (8-Bit) |                            | 16-bit 3/3/2     | 1 x 24-bit timer which can be used as a watchdog | 1 x 24-bit timer which can be used as a watchdog |                                      |                                |
| Counter  |  |                                  |                            |                  |  |  |                                      |                                |
| Function modules   |  |                                  | 4                          | 1                |  |  |                                      |                                |
| Functions<br>Incremental counter, SSI synchronous serial interface, counter/timer, pulse acquisition, frequency, pulse width, Period duration, velocity measurement, PWM, BiSS master, digital inputs and outputs, ... |  |                                  | reprogrammable             | reprogrammable   |  |  |                                      | 4 incremental counters or SSI  |
| Input frequency  |  |                                  | up to 5 MHz                | up to 5 MHz      |  |  |                                      |                                |
| Signals  |  |                                  | TTL, RS422, 24 V           | TTL, RS422, 24 V |  |  |                                      |                                |
| Analog   |  |                                  |                            |                  |  |  |                                      |                                |
| Analog inputs, 16-bit  |  |                                  |                            | 16 SE / 8 diff.  | 16/8 SE or 8/4 diff.                             | 16/8 SE or 8/4 diff.                             |                                      |                                |
| Throughput (kHz)   |  |                                  |                            | 100              | 100  | 100  |                                      |                                |
| Voltage range  |  |                                  |                            | 0-10 V ± 10 V    | 0-10 V ± 10 V                                    | 0-10 V ± 10 V                                    |                                      |                                |
| Gain 1, 2, 5, 10   |  |                                  |                            | ✓                | ✓  | ✓  |                                      |                                |
| FIFO (value)   |  |                                  |                            |                  |  |  |                                      |                                |
| Trigger (software or 24 V)   |  |                                  |                            | ✓                | ✓  | ✓  |                                      |                                |
| Sequence RAM   |  |                                  |                            | ✓                | ✓  | ✓  |                                      |                                |
| Analog outputs   |  |                                  |                            | 4, 12-bit        | 8 or 4, 14-bit                                   |  |                                      | 4, 16-bit                      |
| 0-10 V ± 10 V  |  |                                  |                            | ✓                | ✓  |  |                                      |                                |
| Settling time  |  |                                  |                            | 15 µs            | 30 µs  |  |                                      |                                |
| Serial interfaces<br>(base board)  |  |                                  |                            |                  |  |  | 4-port                               |                                |
| Configuration of the operation mode through MX modules   |  |                                  |                            |                  |  |  | RS232, RS422, RS485, RS485, 20 mA CL |                                |
| Motion Control   |  |                                  |                            |                  |  |  |                                      | 1 to 4 servo or stepper motors |
| Software   | Current driver list on the web: <a href="http://www.addi-data.com">www.addi-data.com</a> |                                  |                            |                  |  |  |                                      |                                |
| Page   | 242  | 244                              | 246                        | 248              | 250  | 252  | 254                                  | 256                            |



# Digital I/O board, optically isolated, 32 digital inputs and outputs, 24 V



CompactPCI™ 32-bit

Also for  
**PCI EXPRESS** see APCLe-1532  
page 118

Also for **PCI**  
See APCI-1500  
page 146



**URS-1500-6U**  
6U bracket



**Windows**  
64/32-bit drivers



LabVIEW™



LabWindows/CVI™



**DASYLab10**  
Data Acquisition System Laboratory

## Features

- Can be inserted in PXI systems, with restricted functionality
- 3 software-programmable timers
- Connector and software compatible to digital I/O boards APCI-1500/PA 1500
- Monitoring program for testing and setting the board functions

## Inputs

- 16 optically isolated digital inputs, 24 V, including 14 interruptible inputs
- Reverse voltage protection
- All inputs are filtered

## Outputs

- 16 optically isolated digital outputs, 10 V to 36 V
- Output current per channel 500 mA
- Timer programmable watchdog for resetting the outputs to "0"
- Diagnostic report through status register at short-circuits, overtemperature, voltage drop or watchdog
- Interrupt triggered through watchdog, timer, error
- At Power-On, the outputs are reset to "0"
- Short-circuit current for 16 outputs ~ 3 A typ.
- Short-circuit current per output ~1.5 A typ.
- Self-resetting fuse (electronic fuse)
- Overtemperature and overvoltage protection
- 24 V power outputs with protection diodes and filters
- Output capacitors against electromagnetic emissions
- Ext. 24 V voltage supply screened and filtered
- Shutdown logic, when the external supply voltage drops below 5 V
- Programmable watchdog for resetting the outputs in case of error

## Safety features

- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Protection against fast transients (burst), overvoltage, electrostatic discharge and high-frequency EMI
- Separate ground line for inputs and outputs

## CPCI-1500

16 digital inputs, 24 V,  
including 14 interruptible

16 digital outputs, 24 V, 500 mA/channel

Optical isolation 1000 V

Input and output filters

The outputs are reset to "0" at Power-On

MTBF: 85 150 hours at 45 °C

Timer, watchdog

## Applications

- Industrial I/O control
- PLC coupling
- Acquisition of encoder data for process control
- Signal switching
- Interface to electromechanical relays
- ON/OFF monitoring of motors, lights...
- Watchdog / timer
- Machine interfacing
- ...

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- Microsoft VC++ • Microsoft C
- Borland C++ • Borland C
- Visual Basic • Delphi
- LabVIEW • LabWindows/CVI • DASYLab • DIAdem

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)

## Specifications

### Digital inputs

|                          |   |
|--------------------------|---|
| Number of inputs:        | 16 (common ground acc. to IEC 1131-2)                         |
| Interruptible inputs:    | 14 out of 16 digital inputs<br>IRQ line selected through BIOS |
| Optical isolation:       | Through opto-couplers, 1000 V<br>from PC to peripheral        |
| Interrupt compare logic: | AND and OR mode; OR priority                                  |
| Nominal voltage:         | 24 V  |
| Input current at 24 V:   | 6 mA typ.   |
| Logic input levels:      |   |
| U nominal:               | 24 V  |
| UH max.:                 | 30 V/current 9 mA typ.  |
| UH min.:                 | 19 V/current 2 mA typ.  |
| UL max.:                 | 14 V/current 0.7 mA typ.                                      |
| UL min.:                 | 0 V/current 0 mA typ.   |
| Signal delay:            | 70 µs (at 24 V)   |
| Maximal input frequency: | 5 kHz (at 24 V)   |

### Digital outputs

|   |   |
|---|---|
| Number of outputs:  | 16  |
| Optical isolation:  | Through opto-couplers, 1000 V                 |
| Output type:  | High-side (load to ground) acc. to IEC 1131-2 |
| Nominal voltage:  | 24 V  |
| Supply voltage:   | 10 V to 36 V, min. 5 V (via front connector)  |
| Max. current for 16 outputs:  | 3 A typ.                                      |
| Output current/output:  | 500 mA typ.                                   |
| Short-circuit current/output shutdown at 24 V, $R_{\text{load}} < 0.1 \Omega$ : | 1.5 A   |
| RDS ON resistance:  | 0.4 $\Omega$ m1ax.                            |
| Switch-on time:   | I out = 0.5 A, load = resistance: 120 µs      |
| Switch-off time:  | I out = 0.5 A, load = resistance: 60 µs       |
| Overtemperature:  | 170 °C (output driver)                        |
| Temperature hysteresis:   | 20 °C (output driver)                         |

### Safety

|                 |  |
|-----------------|--|
| Shutdown logic: | When the ext. 24 V voltage drops below 5 V:<br>The outputs are switched off. |
| Diagnostics:    | Short-circuits, overtemperature, status bit<br>or interrupt to the PC.       |
| Timer:          | 3 (max. 10 kHz, 24 V)  |
| Watchdog:       | Timer programmable, 17 µs up to 36 s<br>for switching off the outputs        |

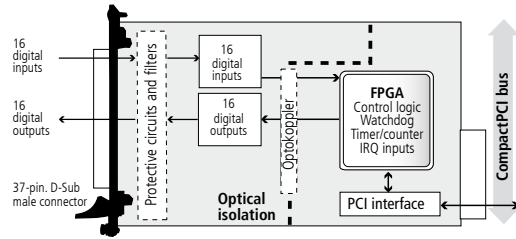
### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

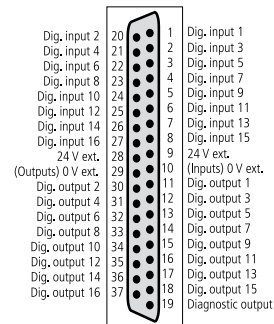
### Physical and environmental conditions

|                      |  |
|----------------------|--|
| Dimensions:          | 3U/4TE                                 |
| System bus:          | CompactPCI 32-bit (5 V signal voltage) |
| Space required:      | 1 CompactPCI slot 3U                   |
| Operating voltage:   | +5 V, $\pm 5\%$ , from the PC          |
| Current consumption: | 220 mA typ. $\pm 10\%$                 |
| Front connector:     | 37-pin D-Sub male connector            |
| Temperature range:   | 0 to 60 °C (with forced cooling)       |
| MTBF:                | 85 150 hours at 45 °C                  |

### Simplified block diagram



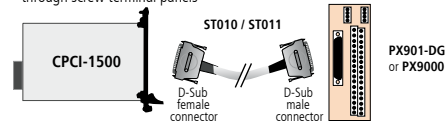
### Pin assignment – 37-pin D-Sub male connector



### ADDI-DATA connection

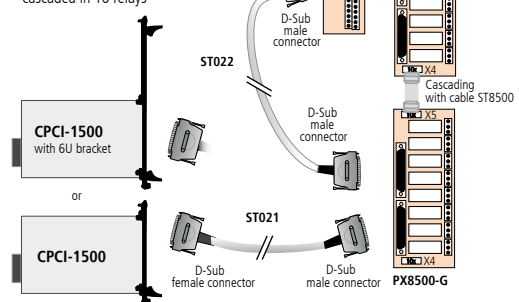
#### Example 1

Connection of the inputs and outputs through screw terminal panels



#### Example 2

- Connection of the inputs through screw terminal panel PX901-DG  
- Connection of the outputs through relay output board PX8500-G cascaded in 16 relays



### Ordering information

#### CPCI-1500

Digital I/O board, 32 digital inputs and outputs, optically isolated, 24 V. Incl. technical description, software drivers and monitoring program.

#### Option

**URS-1500-6U:** 6U bracket for mounting in 6U housing

#### Accessories

**PX901-D:** Screw terminal panel,  
LED status display

**PX901-DG:** Screw terminal panel,  
LED status display, for DIN rail

**PX9000:** 3-row screw terminal panel,  
for DIN rail, LED status display

**PX8500-G:** Relay output board for DIN rail, cascable

**ST010:** Standard round cable, shielded, twisted pairs, 2 m

**ST011:** Standard round cable, shielded, twisted pairs, 5 m

**ST010-S:** Same as ST010, for high currents (24 V supply separate)

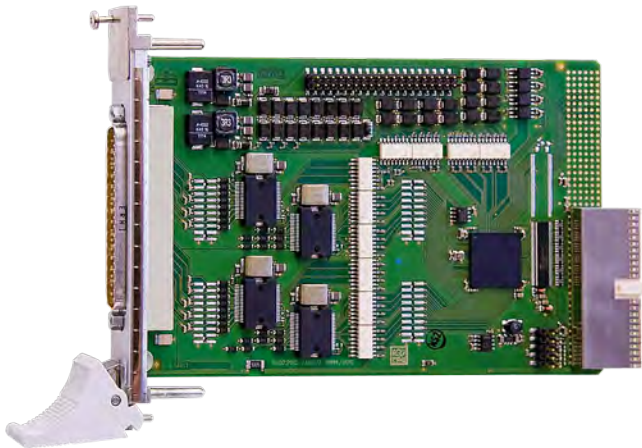
**ST021:** Round cable between CPCI-1500 and PX8500, shielded,  
twisted pairs, 2 m

**ST022:** Round cable between PX8500 and PX901, shielded, 2 m

**ST8500:** Ribbon cable for cascading two PX8500

# Digital I/O board, optically isolated, 64 digital inputs and outputs, 24 V

**New!\***



CompactPCI™ 32-bit

Also for  
PCI EXPRESS® see  
page 122

Also for **PCI**  
See page 150



**URS-1500-6U**  
6U bracket



## Features

- CompactPCI 3,3 V or 5V

### Inputs

- 32 optically isolated digital inputs, 24 V, including 16 interruptible and 3 counter inputs
- Inputs organised in 4 groups of 8 channels, each group has its own ground line
- Reverse voltage protection
- All inputs are filtered

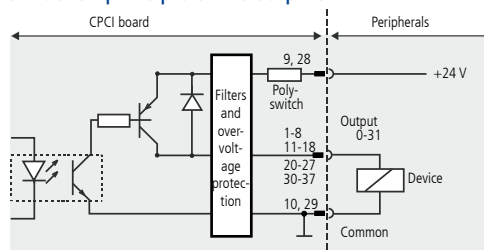
### Outputs

- 32 optically isolated digital outputs, 11 V to 36 V  
Output current per channel 500 mA
- Watchdog for resetting the outputs to "0"
- At Power-On, the outputs are reset to "0"
- Total current for 8 outputs 1.85 A
- Electronic fuse
- Short-circuit current per output max. 1.7 A
- Overtemperature and overvoltage protection
- 24 V power outputs with protection diodes and filters
- Output capacitors against electromagnetic emissions
- Ext. 24 V voltage supply screened and filtered
- Shutdown logic, when the external supply voltage drops below 5 V

### Safety features

- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Protection against fast transients (burst), overvoltage, electrostatic discharge and high-frequency EMI
- Interrupt started through counter, timer
- Separate ground lines for inputs and outputs

### Connection principle of the outputs



## CPCI-1564

32 digital inputs, 24 V,

including 16 interruptible inputs, filtered

32 digital outputs, 24 V, 500 mA/channel, filtered

Optical isolation 1000 V

Watchdog, timer, 3 x 32-bit counter up to 500 kHz

The outputs are reset to "0" at Power-On

## Applications

- Industrial I/O control • PLC coupling
- Signal switching
- Interface to electromechanical relays
- Automatic test equipment
- ON/OFF monitoring of motors, lights...
- Watchdog • Machine interfacing
- ...

## Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- C#.NET, C

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)

\* Preliminary  
product information

## Specifications\*

## Digital inputs

|                                   |  |                |
|-----------------------------------|--|----------------|
| Number of inputs:                 | 32; 4 groups of channels with common ground:<br>Input: 0-7, 8-15, 16-23, 24-31<br>- 0-3: fast counter input, 500 kHz<br>- 4-19: interruptible inputs |                |
| Optical isolation:                | Through opto-couplers, 1000 V  |                |
| Nominal voltage 24 V (CPCI-1564): | Digital inputs   | Counter inputs |
| Input current at 24 V:            | 4 mA typ.  | 10,5 mA typ.   |
| Logic input levels:               |  |                |
| UH max.:                          | 30 V   |                |
| UH min.:                          | 19 V   |                |
| UL max.:                          | 14 V   |                |
| UL min.:                          | 0 V  |                |

## Digital outputs

|   |   |
|---|---|
| Number of outputs:  | 32, optically isolated up to 1000 V           |
| Output type:  | High side (load to ground) acc. to IEC 1131-2 |
| Nominal voltage:  | 24 V (CPCI-1564); or 5 V (CPCI-1564-5V)       |
| Supply voltage:   | 11 V to 36 V, min. 5 V (via front connector)  |
| Max. current for 8 outputs:   | 1.85 A typ.                                   |
| Output current/output:  | 500 mA max.                                   |
| Short-circuit current/output shutdown at 24 V, $R_{load} = 10\text{ m}\Omega$ : | max. 1.7 A                                    |
| RDS ON resistance:  | 150 m $\Omega$ typ.                           |
| Switch-on time:   | 40 $\mu$ s typ.                               |
| Switch-off time:  | 470 $\mu$ s typ.                              |
| Overtemperature (shutdown):   | 130 °C (output driver)                        |
| Temperature hysteresis:   | 15 °C (output driver)                         |

## Safety

|                 |  |
|-----------------|--|
| Shutdown logic: | When the ext. 24 V voltage drops below 5 V:<br>The outputs are switched off. |
| Diagnostics:    | Pin 19: status bit or interrupt to the PC                                    |
| Timer:          | 12-bit   |
| Watchdog:       | 8-bit, timer-programmable from 20 ms to 5 s<br>in steps of 20 ms             |

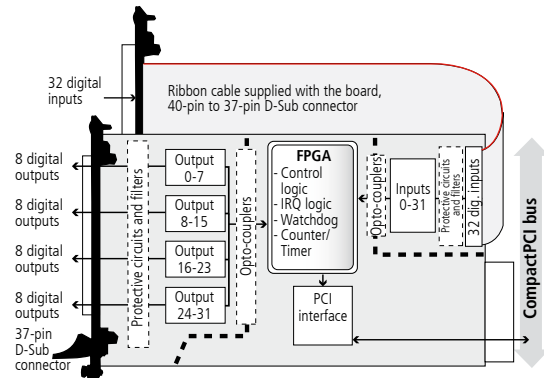
## EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

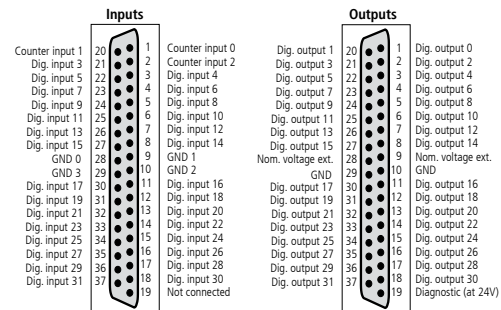
## Physical and environmental conditions

|                       |  |
|-----------------------|--|
| Dimensions:           | 160 x 100 mm   |
| System bus:           | CompactPCI 32-bit  |
| Space required:       | 1 CompactPCI slot 3U (only at 3HE)   |
| Operating voltage:    | +5 V, $\pm 5\%$ , 3.3 V from CompactPCI system   |
| Current consumption:  | 395 mA $\pm 15$ mA typ.  |
| Front connector:      | 37-pin D-Sub male connector for 32 dig. outputs<br>37-pin D-Sub male connector for 32 dig. inputs (only 6HE) |
| Additional connector: | 37-pin D-Sub male connector on separate bracket for 32 digital inputs (only 3HE)                             |
| Temperature range:    | -40 °C to +85 °C (with forced cooling)   |

## Simplified block diagram



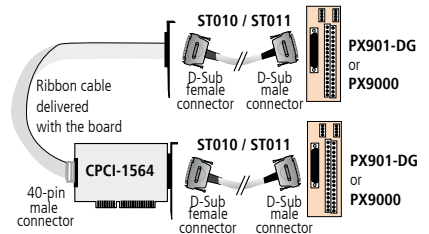
## Pin assignment – 37-pin D-Sub male connector



## ADDI-DATA connection

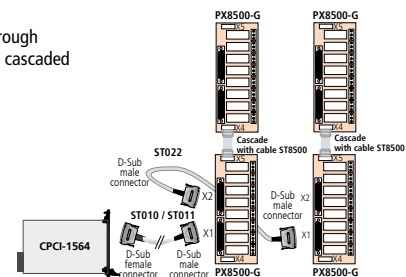
## Example 1:

- Connection of the inputs (ribbon cable)
- Connection of the outputs through screw terminal panel PX901-DG or PX9000



## Example 2:

- Connection of the outputs through relay output board PX8500-G cascaded in 32 relays



## Ordering information

## CPCI-1564

Digital I/O board, 64 digital I/O, optically isolated, 24 V. Incl. technical description, software drivers

## Accessories

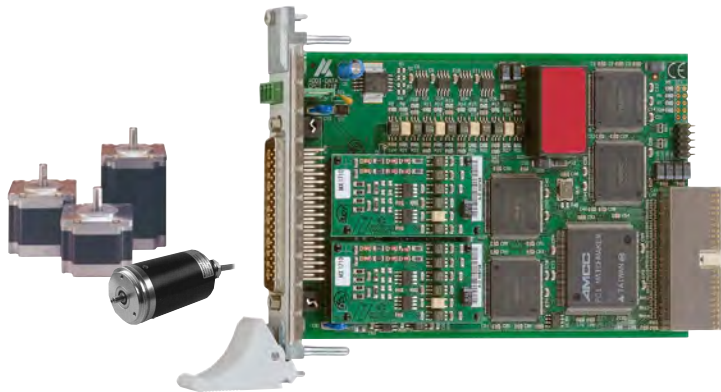
|                     |  |
|---------------------|--|
| <b>URS-1564-6U:</b> | 6U bracket for mounting in 6U housing              |
| <b>PX901-D:</b>     | Screw terminal panel                               |
| <b>PX901-DG:</b>    | Screw terminal panel for DIN rail                  |
| <b>PX9000:</b>      | 3-row screw terminal panel                         |
| <b>PX8500-G:</b>    | Relay output board for DIN rail, cascable          |
| <b>ST010:</b>       | Standard round cable, shielded, twisted pairs, 2 m |

|                 |  |
|-----------------|--|
| <b>ST011:</b>   | Standard round cable, shielded, twisted pairs, 5 m           |
| <b>ST010-S:</b> | Same as ST010, for high currents (24 V supply separate)      |
| <b>ST022:</b>   | Standard round cable between PX8500 and PX901, shielded, 2 m |
| <b>ST8500:</b>  | Ribbon cable for cascading two PX8500                        |

\* Preliminary product information



# Multifunction counter board, optically isolated, encoder, incremental counter, timer/counter, SSI, PWM, ...



CompactPCI™ 32-bit

Also for  
PCI EXPRESS™ see  
page 128

Also for **PCI**  
see page 166



**URS-1710-6U**  
6U bracket

Description of the  
**functions**  
see datasheet of the  
**APCI-1710** page 166



LabVIEW™

**DASYLab10**  
Data Acquisition System Laboratory



The board CPCI-1710 is a fast multifunction and multi-channel counter board for the CompactPCI bus. The strengths of this board are its wide range of applications and high precision, speed and reliability for tough industrial applications. With this board you can realise many different applications on the same hardware base. The board is supplied with a pool of functions which are individually configured for each channel through the supplied software. The flexible programming facilities on this board allow many different user applications to be quickly and easily developed or reconfigured as further requirements arise. Thanks to the FPGA board structure, further counting applications can be realised through software adaptation. Contact us!

## Features

- Can be inserted in PXI systems, with restricted functionality
- 32-bit data access
- Counter component with 32-bit counting depth and 5 MHz counting frequency
- Signals in TTL or RS422 mode, 24 V signals optional
- Four onboard function modules
- Reprogrammable functions

## Functions (detailed description see APCI-1710)

- Acquisition of incremental encoders (90° phase-shifted signals)
- Synchronous serial interface for systems allowing an absolute position information through serial data transfer
- Counter/timer (82C54)
- Pulse acquisition
- Frequency measurement
- Pulse width modulation / PWM
- Period duration measurement
- Velocity measurement
- Digital inputs and outputs
- Customised functions

## Available channels for all four function modules

- 20 channels for digital inputs, optically isolated
- 8 channels, programmable either as digital inputs or outputs, optically isolated
- 4 digital power outputs, optically isolated

## CPCI-1710

Incremental counter, SSI synchronous serial interfaces, counter/timer, pulse acquisition, frequency, pulse width, period duration, velocity measurement, PWM, digital inputs and outputs, ...

Function selection through software

Optical isolation, MTBF: 54 287 hours at 45 °C

TTL, RS422, 24 V

Customised functions

## Available lines for each function module

8 lines are available for each function module

### Versionen

|                         | RS422/<br>TTL I/O | 24 V<br>inputs | 5 V<br>inputs | 24 V<br>outputs | 5 V<br>outputs |
|-------------------------|-------------------|----------------|---------------|-----------------|----------------|
| <b>APCI-1710</b>        | 16                | 12             | –             | 4               | –              |
| <b>APCI-1710-24V</b>    | –                 | 28             | –             | 4               | –              |
| <b>APCI-1710-5V-I</b>   | 16                | –              | 12            | 4               | –              |
| <b>APCI-1710-5V-I-O</b> | 16                | –              | 12            | 4               | 4              |

## Safety features

- Creeping distance IEC 61010-1
- Optical isolation 1000 V
- Noise neutralisation of the PC supply

## Applications

- Event counting • Position acquisition
- Motion control • Batch counting • ...

## Software

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- .NET
- Microsoft VC++ • Microsoft C
- Borland C++ • Borland C
- Visual Basic • Delphi
- LabVIEW • DIAdem

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)



## Specifications

### Free programming of the functions

|  |
|--|
| 32-bit or 16-bit acquisition of incremental encoders |
| Acquisition of absolute encoders/SSI                 |
| Counter/timer  |
| Chronos/TOR for frequency measurement                |
| Pulse acquisition                                    |
| Chronos for pulse width modulation                   |
| Chronos for period duration measurement              |
| TOR for velocity measurement                         |
| Digital I/O, 24 V, TTL, RS422                        |
| PWM  |
| Customised functions                                 |

### Signals

Digital I/O signals, TTL or RS422

### Inputs

|  |   |
|--|---|
| Number of inputs:                                    | 20  |
| <b>Differential inputs or outputs</b>                |   |
| Differential inputs, 5 V:                            | 8/16 (8 can be used as inputs or outputs)   |
| Nominal voltage:                                     | 5 VDC   |
| Common mode range:                                   | +12 / -7 V  |
| Max. differential voltage                            | ± 12 V  |
| Input sensitivity:                                   | 200 mV  |
| Input hysteresis:                                    | 50 mV   |
| Input impedance:                                     | 12 kΩ   |
| Terminal resistor:                                   | 150 Ω serial with 10 nF (typ.)  |
| Signal delay:  | 120 nS (at nominal voltage)   |
| Max. input frequency:                                | 2.5 MHz   |
| <b>Mass-related inputs, 24 V (channels E, F, G):</b> |   |
| Number of inputs:                                    | 12  |
| Nominal voltage:                                     | 24 VDC  |
| Input current  |   |
| at nominal voltage:                                  | 11 mA   |
| Logic input levels:                                  | Unominal: 24 V<br>UH max.: 30 V<br>UH min.: 19 V<br>UL max.: 15 V<br>UL min.: 0 V |
| Signal delay:  | 120 ns (at nominal voltage)   |
| Maximal input frequency:                             | 1 MHz   |

### Outputs

|   |  |
|---|--|
| Nominal voltage:  | 5 VDC                                    |
| Maximum output frequency:                                       | 2.5 MHz (diff. outputs)                  |
| Max. number of outputs:   | 8 (if they are not used as diff. inputs) |
| <b>Digital outputs, 24 V:</b>                                   |  |
| Output type:  | High-side (load to ground)               |
| Number of outputs:  | 4  |
| Nominal voltage:  | 24 VDC                                   |
| Range of the supply voltage:                                    | 10 V up to 36 VDC (via 24 V ext. pin)    |
| Maximum current for 4 outputs:                                  | 2 A typ. (limited to the voltage supply) |
| Maximum output current:   | 500 mA                                   |
| Short-circuit current/output at 24 V, $R_{last} < 0.1 \Omega$ : | 1.5 A max. (output switches off)         |
| ON-resistance of the output (RDS ON-resistance):                | 0.4 Ω max.                               |
| Overtemperature:  | 170 °C (all outputs switch off)          |

### Overtemperature protection (24 V outputs)

|                               |  |
|-------------------------------|--|
| Activated:                    | From approx. 150-170 °C (chip temperature) |
| Deactivated (automatically):  | From approx. 125-140 °C (chip temperature) |
| Outputs (at overtemperature): | Outputs switch off                         |

|                                 |                              |
|---------------------------------|------------------------------|
| Protection against undervoltage | (effective at V ext. < 5 V): |
| Outputs (at undervoltage):      | All outputs switch off       |

### Switching characteristics of the outputs

|   |        |
|---|--------|
| (V ext. = 24 V, T = 25 °C, ohmic load: 500 mA): |        |
| Switch ON time:                                 | 200 µs |
| Switch OFF time:                                | 15 µs  |

### Digital outputs, 5 V (option)

|                    |       |
|--------------------|-------|
| Output type:       | TTL   |
| Number of outputs: | 4     |
| Nominal voltage:   | 5 VDC |

### Switching characteristics of the outputs

|                        |         |
|------------------------|---------|
| (T = 25 °C, TTL load): |         |
| Switch ON time:        | 0.06 µs |
| Switch OFF time:       | 0.02 µs |

### Technical data for the option 24 V

|  |   |
|--|---|
| 24 V inputs (channels A up to G).<br>This board version is intended for the connection of 24 V encoders. Only 24 V signals can be connected to the input channels. |   |
| Nominal voltage:   | 24 VDC / 10 mA  |
| Max. input frequency:  | 10 kHz  |
| Logic input levels :<br>(Standard)   | Unominal: 24 V<br>UH max.: 25 V<br>UH min.: 15 V<br>UL max.: 11 V<br>UL min.: 0 V |

### Safety

|                    |        |
|--------------------|--------|
| Optical isolation: | 1000 V |
|--------------------|--------|

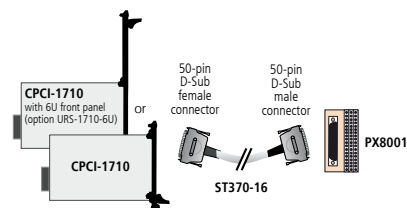
### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### Physical and environmental conditions

|                      |   |
|----------------------|---|
| Dimensions:          | 3U/4TE  |
| System bus:          | CompactPCI 32-bit (5 V signal voltage)        |
| Space required:      | 1 slot  |
| Operating voltage:   | +5 V, ± 5 % from the PC<br>+24 V ext. / 10 mA |
| Current consumption: | CPCI-1710: 877 mA typ. ± 10 %                 |
| Front connector:     | 50-pin D-Sub male connector                   |
| Temperature range:   | 0 to 60 °C (with forced cooling)              |
| MTBF:                | 54287 hours at 45 °C                          |

### ADDI-DATA connection



## Ordering information

|                   |  |
|-------------------|--|
| <b>CPCI-1710:</b> | Multifunction counter board, optically isolated, encoder, incremental counter, timer/counter, SSI, PWM.<br>Incl. technical description and software drivers. |
| <b>MX1710:</b>    | Peripheral module for the board CPCI-1710. 2 modules are necessary for each CPCI-1710 board. <b>Please order with the board!</b>                             |

### Options

|                     |   |
|---------------------|---|
| <b>URS-1710-6U:</b> | 6U bracket for mounting in 6U housing   |
| <b>Option 24V:</b>  | 24 V for differential inputs<br>(channels A up to G, A and B for counter, I (index) and<br>UAS (error) signals) |
| <b>Option 5V:</b>   | 5 V outputs instead of 24 V (E, F, G)   |

### Accessories

|                  |   |
|------------------|---|
| <b>ST370-16:</b> | Shielded round cable, 2 m                                 |
| <b>PX8001:</b>   | 3-row screw terminal panel, 50-pin, for DIN-rail mounting |

# Multifunction board, optically isolated, 16 SE or 8 diff. inputs, 4 analog outputs, 16-bit



CompactPCI™ 32-bit



The board CPCI-3009 is a fast multifunction and counter board for the CompactPCI bus. It is characterised by flexible applications, high accuracy, speed and reliability in severe industrial environments.

With this board you can put into practice a large range of applications on the same hardware basis thanks to FPGA technology. The board is supplied with a pool of functions allowing a high efficiency on just one board. The functions are programmed using the supplied software. You can adapt the functions of the board to the requirements of your application and change them as required. On request, further counter applications can be adapted per software thanks to the the FPGA. Contact us!

## Features

- CompactPCI 3.3 V or 5 V
- Can be inserted in PXI systems, with restricted functionalities

### Analog inputs

- 16 SE or 8 diff. inputs, optically isolated 1000 V
- Resolution: 16-bit
- Throughput: 100 kHz
- Voltage inputs: 0-10 V,  $\pm 10$  V, 0-5 V,  $\pm 5$  V, 0-2 V,  $\pm 2$  V, 0-1 V,  $\pm 1$  V, 0-20 mA (option) freely programmable through software for each channel
- Gain PGA x1, x2, x5, x10 freely programmable through software for each channel
- Version with input range 0-30 V (only SE inputs)

### Analog acquisition

- Different input modes for the analog acquisition:
  - 1) Simple mode
  - 2) Scan modes
  - 3) Sequence modes
  - 4) Auto Refresh mode
- Onboard FIFO
- PCI-DMA for analog data acquisition

### Analog outputs

- 4 analog outputs, optically isolated
- 12-bit resolution, setup time 15  $\mu$ s typ
- Output voltage after reset: 0 V
- Each output has its own ground line (without optical isolation)
- Output voltage range: - 10 V to + 10 V
- Output current:  $\pm 5$  mA
- Short-circuit current:  $\pm 20$  mA

## CPCI-3009

16 SE or 8 diff. inputs

16-bit resolution, 100 kHz

Voltage and current inputs (optional)

4 analog outputs, 12-bit

Reprogrammable counter function module

8 optically isolated digital I/O, 24 V

### 24 V digital I/O

- 4 digital inputs, 24 V, optically isolated
- 4 digital outputs, 24 V, optically isolated

### Reprogrammable counter function module

- 32-bit data access
- Counter component with 32-bit width and 5 MHz counting frequency, signals in RS422 mode

#### Functions:

- Incremental counter for the acquisition of incremental encoders (90° phase-shifted signals)
- Chronos for frequency, pulse width and period duration measurement
- Digital inputs and outputs, 24 V, TTL, RS422

#### Further functions on request:

- SSI synchronous serial interfaces. The SSI function is an interface for systems which allow an absolute position information via serial data transfer.
- Counter/timer (82C54)
- Pulse acquisition
- Velocity measurement
- PWM (Pulse Width Modulation)
- Customised functions

### Timer/Counter/Watchdog

- 3 / 3 / 2, 16-bit

### Safety features

- Optical isolation 1000 V min.
- Creeping distance IEC 61010-1
- Circuit part of the analog acquisition is separated from the circuit part of the digital function
- Overvoltage protection  $\pm 40$  V
- Protection against high-frequency EMI
- Input filters
- Noise neutralisation of the PC supply
- Connection of the I/O-signals via robust industry-standard D-Sub connector

## Software

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### On request:

Further operating systems, compilers and samples.  
Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)

\* Preliminary  
product information

## Specifications

### Analog inputs

|                    |   |
|--------------------|---|
| Number of inputs:  | 16 SE or 8 differential inputs, 16-bit resolution   |
| Optical isolation: | 1000 V through opto-couplers from PC to peripheral  |
| Voltage inputs:    | software-programmable for each channel<br>CPCI-3009: 0-10 V, $\pm 10$ V, 0-5 V, $\pm 5$ V, 0-2 V, $\pm 2$ V, 0-1 V, $\pm 1$ V, 0-20 mA optional<br>CPCI-3009_30V: 0-30V |
| Gain:              | Software programmable (x1, x2, x5, x10)   |
| Throughput:        | 100 kHz   |
| Trigger:           | Through software, timer, ext. event (24 V input)  |
| Data transfer:     | Data to the PC through FIFO memory, Interrupt at EOC (End Of Conversion), DMA transfer at EOC   |
| Interrupts:        | End of conversion, End of timer, End of scan  |

### Analog outputs

|                             |                                |
|-----------------------------|--------------------------------|
| Number of outputs:          | 4, 12-bit resolution           |
| Optical isolation:          | 1000 V through opto-couplers   |
| <b>Voltage outputs</b>      |                                |
| Output range:               | -10 V to +10 V (-1 LSB)        |
| LSB:                        | 4.8828 mV                      |
| Accuracy:                   | 11-bit                         |
| Time to read:               | typ. 5 $\mu$ s                 |
| Setup time:                 | typ. 15 $\mu$ s (at 10 V step) |
| Max. output current:        | $\pm 5$ mA (each output)       |
| Short-circuit current:      | max. $\pm 20$ mA (temporary)   |
| Output voltage after reset: | 0 V                            |

### Counter components

|  |  |
|--|--|
| Counting depth:                          | 32-bit, counting frequency up to 5 MHz   |
| Optical isolation:                       | 1000 V   |
| <b>Free programming of the functions</b> |  |
|  | For programming your function module select one function from the list on the right. |
| Signals                                  | Digital I/O, 24 V signals, TTL or RS422  |

### Digital I/O

|                         |  |
|-------------------------|--|
| Number of I/O channels: | 4 digital inputs, 4 digital outputs (50 mA), 24 V  |
| Logical "0" level:      | 0-14 V   |
| Logical "1" level:      | 19-30 V  |
| Optical isolation:      | 1000 V through opto-couplers from PC to peripheral |

### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### Physical and environmental conditions

|                      |   |
|----------------------|---|
| Dimensions:          | 3U/4TE  |
| System bus:          | CompactPCI 32-bit   |
| Space required:      | 1 x CompactPCI slot for analog I/O, counter<br>1 x slot opening for digital I/O with FB3001   |
| Operating voltage:   | +5 V, $\pm 5$ %, 3.3 V from CompactPCI system   |
| Current consumption: | 790 mA, $\pm 10$ %  |
| Front connector:     | 26-pin D-Sub female connector (analog I/O)<br>15-pin D-Sub female connector (counter module)<br>Separ. 37-pin D-Sub connector for 8 dig. I/O via FB3001 |
| Temperature range:   | 0 to 60 °C (with forced cooling)<br>-30 °C up to +70 °C in preparation  |

### CPCI-3009

Multifunction board, optically isolated, 16 SE or 8 diff. inputs, 4 analog outputs, 16-bit. Incl. technical description and software drivers.

### Versions

**CPCI-3009\_30V:** Same as CPCI-3009, only SE inputs, unipolar, 0-30 V input range

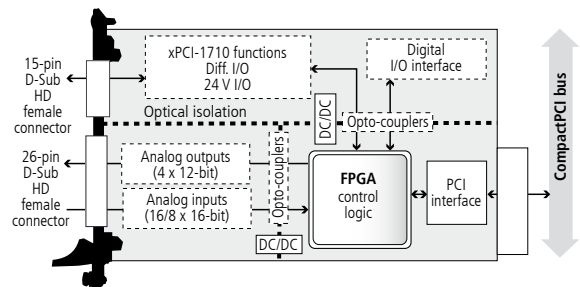
### Options

**Please specify the number of channels when ordering**

|                     |   |
|---------------------|---|
| <b>URS-3009-6U:</b> | 6U bracket for mounting in 6U housing   |
| <b>Option SF:</b>   | Precision filter for 1 single-ended channel   |
| <b>Option DF:</b>   | Precision filter for 1 diff. channel (30Hz)   |
| <b>Option PC:</b>   | Current input 0(4)-20 mA for 1 channel<br>PC-SE: For 1 single-ended channel<br>PC-Diff: For 1 diff. channel (30 Hz) |

**Option CAL3009:** Only for 32-bit operation system. On-site calibration of the CPCI-3009. Do the fine adjustment fast and reliably and then save the calibration report file.

### Simplified block diagram



### Reprogrammable function module allows many different applications

The function module has numerous functions which can be programmed quickly and easily. For the programming of your function module, choose one of the following functions. If your application changes, just reprogram the function module and use another function from the list below.

#### Select one of the following functions:

- 1 x 32-bit acquisition of incremental encoders
- 2 x 16-bit acquisition of incremental encoders
- 1 x Chronos/TOR for frequency measurement
- 1 x Chronos for pulse width modulation
- 1 x Chronos for period duration measurement
- 8 digital I/O, 24 V, TTL, RS422

#### Further functions on request:

- 3 x acquisition of absolute encoders/SSI
- 3 x counter/timer
- 4 x pulse acquisition
- 2 x TOR for velocity measurement
- 2 x PWM
- 2 x ETM
- 1 x SSI monitor

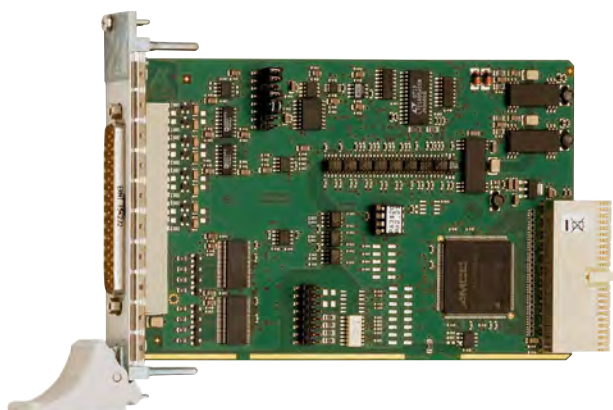
**For a detailed description of the functions, please see the data sheet of the board APCI-1710 on page 166**

## Ordering information

### Accessories

|                   |   |
|-------------------|---|
| <b>PX901-A:</b>   | Screw terminal panel with transorb diodes for connecting the analog I/O   |
| <b>PX901-AG:</b>  | Same as PX901-A with housing for DIN rail                                 |
| <b>PX901-ZG:</b>  | Screw terminal panel for connecting the digital I/O, for DIN rail         |
| <b>PX_BNC:</b>    | BNC connection box for connecting the analog I/O                          |
| <b>ST3009-DZ:</b> | 15-pin HD D-Sub female to 37-pin D-Sub male connector                     |
| <b>ST3009-A:</b>  | 26-pin HD D-Sub female to 37-pin D-Sub male connector                     |
| <b>FB3001:</b>    | Ribbon cable for dig. I/O, with 37-pin D-Sub male connector on 3U bracket |
| <b>ST010:</b>     | Standard round cable, shielded, twisted pairs, 2 m                        |

# Multifunction board, optically isolated, 16 SE or 8 diff. inputs, 8 analog outputs, 16-bit



CompactPCI™ 32-bit

## Also for PCI-Express

See APCle-3121, page 134

## Also for **PCI**

See APCI-3120, page 180



**URS-3120-6U**  
6U bracket  
with FB3001



LabVIEW™



LabWindows/CVI™

**DASYLab10**  
Data Acquisition System Laboratory



## Features

- Can be inserted in PXI systems, with restricted functionality

### Analog inputs

- 16 single-ended/8 differential inputs or 8 single-ended/4 differential inputs
- 16-bit resolution
- Optical isolation 500 V
- Throughput: 100 kHz
- Input voltage: 0-10 V,  $\pm 10$  V, 0-5 V,  $\pm 5$  V, 0-2 V,  $\pm 2$  V, 0-1 V,  $\pm 1$  V, 0-20 mA (option) freely programmable through software for each channel
- Gain PGA x1, x2, x5, x10 freely programmable through software for each channel
- PCI DMA for analog data acquisition
- Overvoltage protection
- Input filters: 159 kHz

### Analog acquisition

- Single channel, several channels, several channels through scan list
- Autom. analog acquisition through cyclic timer control
- Acquisition through scan list: up to 16 entries with gain, channel, unipolar/bipolar
- Acquisition triggered through software, timer, external event
- Trigger functions:
  - Software trigger or
  - external trigger: the analog acquisition (single or sequence) is started through signal switching from 0 V to 24 V at the digital input 0.
- Interrupt: End of single, End of multichannel, End of scan list

### Analog outputs

- 4 or 8 analog outputs, optically isolated 500 V
- Setup time 30  $\mu$ s
- 14-bit resolution (13-bit for 0-10 V)
- Output voltage:  $\pm 10$  V, 0-10 V (through software)
- Output voltage after reset: 0 V
- Each output has its own ground line (without optical isolation)
- Driver capacity: 5 mA/500 pF
- Short-circuit protection, EMI filters

### Digital

- 4 dig. inputs, 4 dig. outputs, 24 V, optically isolated

### Timer

- 24-bit; as cyclic time counter or watchdog

## CPCI-3120

16/8 single-ended or

8/4 differential inputs, 16-bit

8/4 analog outputs, 14-bit

Optical isolation of the inputs and outputs, 500 V

Automatic analog acquisition

Output voltage after reset 0 V

MTBF: 75 867 hours at 45 °C

Timer, watchdog

## Safety features

- Optical isolation 500 V min.
- Creeping distance IEC 61010-1
- Overvoltage protection  $\pm 40$  V (analog inputs)
- Protection against high-frequency EMI
- Input filters: 159 kHz
- Noise neutralisation of the PC supply

## Applications

- Industrial process control
- Industrial measurement and monitoring
- Multichannel data acquisition
- Control of chemical processes
- Factory automation
- Acquisition of sensor data, current measurement, pressure data
- Laboratory equipment, instrumentation

## Software

Calibration tool (**Option CAL3120**): Do the fine adjustment fast and reliably and save the generated calibration report file. All you need is a highly precise calibration source and a precise digital multimeter (not included in the delivery content).

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- Microsoft VC++ • Microsoft C
- Borland C++ • Borland C
- Visual Basic • Delphi
- LabVIEW • LabWindows/CVI • DASYLab • DIAdem

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)

## Specifications

### Analog inputs

|                            |  |
|----------------------------|--|
| Number of inputs:          | 16 single-ended / 8 differential inputs or 8 single-ended / 4 differential inputs  |
| Resolution:                | 16-bit resolution  |
| Optical isolation:         | 500 V through opto-couplers from PC to peripheral  |
| Input ranges:              | Software-programmable for each channel<br>0-10 V, $\pm 10$ V, 0-5 V, $\pm 5$ V, 0-2 V, $\pm 2$ V, 0-1 V, $\pm 1$ V, 0-20 mA optional |
| Throughput:                | 100 kHz  |
| Gain:                      | Software programmable (1, 2, 5, 10)  |
| Common mode rejection:     | DC at 10 Hz, 90 dB minimum   |
| Relative precision (INL):  | $\pm 1$ LSB (ADC)  |
| Diff. Non-linearity (DNL): | $\pm 0.5$ LSB (ADC)  |
| Input impedance (PDA):     | $10^{12} \Omega / 10$ nF single-ended,<br>$10^{12} \Omega / 20$ nF differential against GND  |
| Bandwidth (-3 dB):         | Limited to 159 kHz with low-pass filter  |
| Trigger:                   | Through software, timer, ext. event (24 V input)   |
| Data transfer:             | Data to the PC through FIFO memory, I/O commands, Interrupt at EOC (End Of Conversion) and EOS (End of Scan), DMA transfer at EOC    |
| Interrupts:                | End of conversion, End of timer, End of scan   |

### Timer

|                       |                    |
|-----------------------|--------------------|
| Time base of timer 2: | 24-bit; 50 $\mu$ s |
|-----------------------|--------------------|

### Analog outputs

|                                      |  |
|--------------------------------------|--|
| Number of outputs:                   | 4 or 8   |
| Resolution:                          | 14-bit resolution                              |
| Optical isolation:                   | 500 V through opto-couplers                    |
| Output range:                        | 0-10 V, $\pm 10$ V switchable through software |
| Setup time at 2 k $\Omega$ , 1000pF: | 10 $\mu$ s (10 V step)                         |
| Overvoltage protection:              | $\pm 12$ V                                     |
| Max. output current / load:          | $\pm 5$ mA / 500 pF, 2 k $\Omega$              |
| Short-circuit current:               | $\pm 25$ mA                                    |
| Output voltage after reset:          | 0 V  |

### Digital I/O

|                         |                                     |
|-------------------------|-------------------------------------|
| Number of I/O channels: | 4 dig. inputs, 4 dig. outputs, 24 V |
| Optical isolation:      | 1000 V through opto-couplers        |
| Input current at 24 V:  | 3 mA typ.                           |
| Input range:            | 0-30 V                              |
| Output range:           | 5-30 V                              |
| Max. switching current: | 10 mA typ.                          |

### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### Physical and environmental conditions

|                       |  |
|-----------------------|--|
| Dimensions:           | 160 x 100 mm   |
| System bus:           | CompactPCI 32-bit (5 V signal voltage)                                   |
| Space required:       | 1 PCI slot for analog I/O,<br>1 slot opening for digital I/O with FB3001 |
| Operating voltage:    | +5 V, $\pm 5\%$ , 3.3 V from CompactPCI system                           |
| Current consumption:  | 800 mA   |
| Front connector:      | 37-pin D-Sub male connector  |
| Additional connector: | 16-pin male connector for connecting the dig. I/O                        |
| Temperature range:    | 0 to 60 °C (with forced cooling)   |
| MTBF:                 | 75867 hours at 45 °C   |

### CPCI-3120

Multifunction board, optically isolated, 16 SE or 8 diff. inputs, 8 analog outputs, 16-bit. Incl. technical description, monitoring program and software drivers.

#### Versions

|                       |  |
|-----------------------|--|
| <b>CPCI-3120-16-4</b> | 16 SE / 8 diff. inputs, 4 analog outputs |
| <b>CPCI-3120-16-8</b> | 16 SE / 8 diff. inputs, 8 analog outputs |

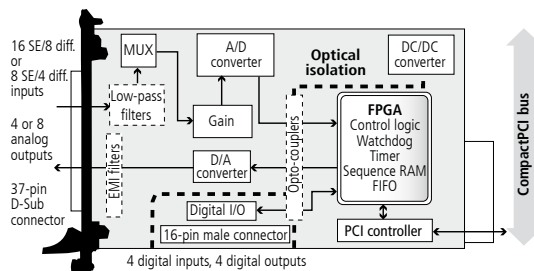
#### Options: Please specify the number of channels when ordering

|                     |  |
|---------------------|--|
| <b>URS-3120-6U:</b> | 6U bracket for mounting in 6U housing        |
| <b>Option SF:</b>   | Precision filter for 1 single-ended channel  |
| <b>Option DF:</b>   | Precision filter for 1 diff. channel (30 Hz) |
| <b>Option PC:</b>   | Current input 0(4)-20 mA for 1 channel       |

**PC-SE:** For 1 single-ended channel  
**PC-Diff:** For 1 diff. channel (30 Hz)

**Option CAL3120:** Only for 32-bit operation system. On-site calibration of the CPCI-3120. Do the fine adjustment fast and reliably and then save the calibration report file.

### Simplified block diagram



### Pin assignment – 37-pin D-Sub male connector

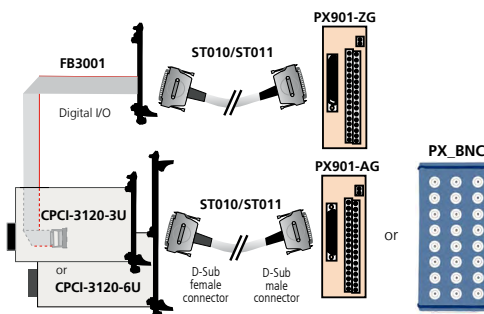
| DIFF                 | SE              |    | SE               | DIFF            |
|----------------------|-----------------|----|------------------|-----------------|
| (+) An. input 0      | (+) An. input 0 | 20 | (+) An. input 8  | (+) An. input 4 |
| (+) An. input 1      | (+) An. input 1 | 21 | (+) An. input 9  | (+) An. input 5 |
| (+) An. input 2      | (+) An. input 2 | 22 | (+) An. input 10 | (+) An. input 6 |
| (+) An. input 3      | (+) An. input 3 | 23 | (+) An. input 11 | (+) An. input 7 |
| (-) An. input 3      | (+) An. input 7 | 24 | (+) An. input 15 | (-) An. input 7 |
| (-) An. input 2      | (+) An. input 6 | 25 | (+) An. input 14 | (-) An. input 6 |
| (-) An. input 1      | (+) An. input 5 | 26 | (+) An. input 13 | (-) An. input 5 |
| (-) An. input 0      | (+) An. input 4 | 27 | (+) An. input 12 | (-) An. input 4 |
| 1 { Analog input GND |                 | 28 | Analog input GND |                 |
| Analog input GND     |                 | 29 | Analog input GND |                 |
| An. output 0 GND     |                 | 30 | Analog input GND |                 |
| An. output 1 GND     |                 | 31 | An. output 0     |                 |
| An. output 2 GND     |                 | 32 | An. output 1     |                 |
| An. output 3 GND     |                 | 33 | An. output 2     |                 |
| An. output 4 GND     |                 | 34 | An. output 3     |                 |
| An. output 5 GND     |                 | 35 | An. output 4     |                 |
| An. output 6 GND     |                 | 36 | An. output 5     |                 |
| An. output 7 GND     |                 | 37 | An. output 6     |                 |
|                      |                 |    | An. output 7     |                 |

1: The analog inputs have a common ground line  
2: Each analog output has its own ground line

### Pin assignment – 16-pin connector

|                          |    |                          |    |
|--------------------------|----|--------------------------|----|
| Dig. output 0 (+)        | 1  | Dig. output 0 (-)        | 1  |
| Dig. output 1 (+)        | 3  | Dig. output 1 (-)        | 3  |
| Dig. output 2 (+)        | 5  | Dig. output 2 (-)        | 5  |
| Dig. output 3 (+)        | 7  | Dig. output 3 (-)        | 7  |
| Trigger/dig. input 0 (+) | 9  | Trigger/dig. input 0 (-) | 9  |
| Dig. input 1 (+)         | 11 | Dig. input 1 (-)         | 11 |
| Dig. input 2 (+)         | 13 | Dig. input 2 (-)         | 13 |
| Dig. input 3 (+)         | 15 | Dig. input 3 (-)         | 15 |

### ADDI-DATA connection



### Ordering information

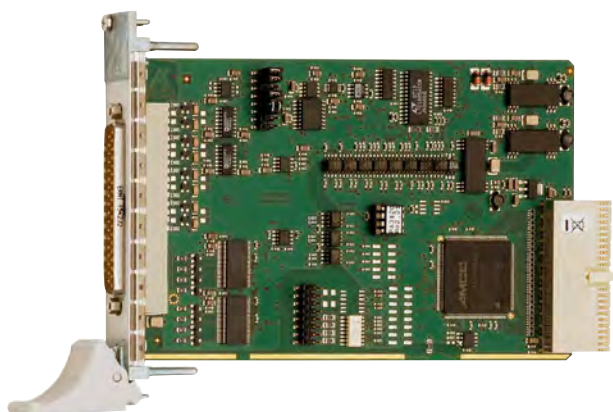
|                      |   |
|----------------------|---|
| <b>CPCI-3120-8-4</b> | 8 SE / 4 diff. inputs, 4 analog outputs |
| <b>CPCI-3120-8-8</b> | 8 SE / 4 diff. inputs, 8 analog outputs |

#### Accessories

|                  |  |
|------------------|--|
| <b>PX901-A:</b>  | Screw terminal panel with transorb diodes, for connecting the analog I/O     |
| <b>PX901-AG:</b> | Same as PX901-A with housing for DIN rail                                    |
| <b>PX901-ZG:</b> | Screw terminal panel for connecting the digital I/O, for DIN rail            |
| <b>PX_BNC:</b>   | BNC connection box for connecting the analog I/O                             |
| <b>ST010:</b>    | Standard round cable, shielded, twisted pairs, 2 m                           |
| <b>ST011:</b>    | Standard round cable, shielded, twisted pairs, 5 m                           |
| <b>FB3001:</b>   | Ribbon cable for digital I/O, with 37-pin D-Sub male connector on 3U bracket |



# Analog input board, optically isolated, 16 SE or 8 diff. inputs, 12-bit



CompactPCI™ 32-bit

## Also for PCI-Express

See APCle-3021, page 134

## Also for **PCI**

See APCI-3001, page 190



Windows  
64/32-bit drivers



LabVIEW™



LabWindows/CVI™



DASYLab 10  
Data Acquisition System Laboratory

## Features

- Can be inserted in PXI systems, with restricted functionality
- Monitoring program for testing and setting the board functions

## Analog inputs

- 16 single-ended/8 differential inputs or 8 single-ended/4 differential inputs or 4 single-ended inputs
- 12-bit resolution
- Throughput: 100 kHz
- Input voltage: 0-10 V,  $\pm 10$  V, 0-5 V,  $\pm 5$  V, 0-2 V,  $\pm 2$  V, 0-1 V,  $\pm 1$  V, 0-20 mA (option) freely programmable through software for each channel
- Gain PGA x1, x2, x5, x10 freely programmable through software for each channel
- PCI DMA for analog data acquisition

## Analog acquisition

- Single channel, several channels, several channels through scan list
- Autom. analog acquisition through cyclic timer control
- Acquisition through scan list: up to 16 entries with gain, channel, unipolar/bipolar
- Acquisition triggered through software, timer, external event
- Trigger functions:
  - Software trigger or
  - external trigger: the analog acquisition (single or sequence) is started through signal switching from 0 V to 24 V at the digital input 0.
- Interrupt: end of single channel, end of multichannel, end of scan list

## Digital

- 4 digital inputs, 24 V, optically isolated
- 4 digital outputs, 24 V, optically isolated

## Timer

- 24-bit
- Timer 2 as cyclic time counter

## Safety features

- Optical isolation 500 V min.
- Creeping distance IEC 61010-1
- Overvoltage protection  $\pm 40$  V (analog inputs)

## CPCI-3001

16/8/4 single-ended or 8/4 differential inputs

12-bit resolution

Optical isolation 500 V

100 kHz throughput

Automatic analog acquisition

Trigger functions

MTBF: 75867 hours at 45 °C

Graphical display of the measured data

- Protection against high-frequency EMI
- Input filters: 159 kHz
- Noise neutralisation of the PC supply

## Applications

- Industrial process control
- Industrial Measurement and monitoring
- Multichannel data acquisition
- Control of chemical processes
- Factory automation
- Acquisition of sensors
- Laboratory equipment
- Current measurement
- Instrumentation

## Software

A CD-ROM with the following software and programming samples is supplied with the board.

## Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

## Drivers and samples for the following compilers and software packages:

- Microsoft VC++ • Microsoft C
- Borland C++ • Borland C
- Visual Basic • Delphi • Turbo Pascal
- LabVIEW • DASYLab • DIAdem

## On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)

## Specifications

### Analog inputs

|                            |  |
|----------------------------|--|
| Number of inputs:          | 16 single-ended/8 differential inputs<br>8 single-ended/4 differential inputs or<br>4 single-ended inputs                                |
| Resolution:                | 12-bit   |
| Optical isolation:         | 500 V through opto-couplers from PC to peripheral  |
| Input ranges:              | Software-programmable for each channel, 0-10 V, $\pm 10$ V,<br>0-5 V, $\pm 5$ V, 0-2 V, $\pm 2$ V, 0-1 V, $\pm 1$ V,<br>0-20 mA optional |
| Throughput:                | 100 kHz  |
| Gain:                      | Software programmable (x1, x2, x5, x10)  |
| Common mode rejection:     | DC at 10 Hz, 90 dB minimum   |
| Relative precision (INL):  | $\pm 1$ LSB (ADC)  |
| Diff. Non-linearity (DNL): | $\pm 0.5$ LSB (ADC)  |
| Input impedance (PGA):     | $10^{12} \Omega/10$ nF Single-ended,<br>$10^{12} \Omega/20$ nF Differential against GND  |
| Bandwidth (-3 dB):         | Limited to 159 kHz with low-pass filter  |
| Trigger:                   | Through software, timer, ext. event (24 V input)   |
| Data transfer:             | Data to the PC through FIFO memory,<br>I/O commands, Interrupt at EOC (End Of Conversion)<br>and EOS (End of Scan), DMA transfer at EOC  |
| Interrupts:                | End of conversion, End of timer, End of scan   |

### Timer

|                    |  |
|--------------------|--|
| Time base Timer 2: | 24-bit; 50 $\mu$ s; smallest programmable value: 100 $\mu$ s |
|--------------------|--|

### Digital I/O

|                         |   |
|-------------------------|---|
| Number of I/O channels: | 4 digital inputs, 4 digital outputs, 24 V             |
| Optical isolation:      | 500 V through opto-couplers from PC to peripheral     |
| Input range:            | 0-30 V<br>- Logical "0": 0-5 V - Logical "1": 10-30 V |
| Input current at 24 V:  | 3 mA typ.   |
| Output range:           | 5-30 V  |
| Max. switching current: | 10 mA typ.  |
| Output type:            | Open collector  |

### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### Physical and environmental conditions

|                       |   |
|-----------------------|---|
| Dimensions:           | 160 x 100 mm  |
| System bus:           | CompactPCI 32-bit   |
| Space required:       | 1 PCI slot for analog inputs,<br>1 slot opening for digital I/O                         |
| Operating voltage:    | +5 V, $\pm 5\%$ , 3.3 V from CompactPCI system  |
| Current consumption:  | 550 mA typ.   |
| Front connector:      | 37-pin D-Sub male connector   |
| Additional connector: | 16-pin male connector for ribbon cable<br>for connecting the digital inputs and outputs |
| Temperature range:    | 0 to 60 °C (with forced cooling)  |
| MTBF:                 | 75867 Hours at 45 °C  |

### CPCI-3001

Analog input board, optically isolated, 16 SE or 8 diff. inputs, 12-bit. Incl. technical description, software drivers and monitoring program.

**CPCI-3001-16** 16 SE / 8 diff. inputs, 8 digital I/O

**CPCI-3001-8** 8 SE / 4 diff. inputs, 8 digital I/O

**CPCI-3001-4** 4 SE inputs, 8 digital I/O

**Options:** Please specify the number of channels when ordering

**URS-3001-6U:** 6U bracket for mounting in 6U housing

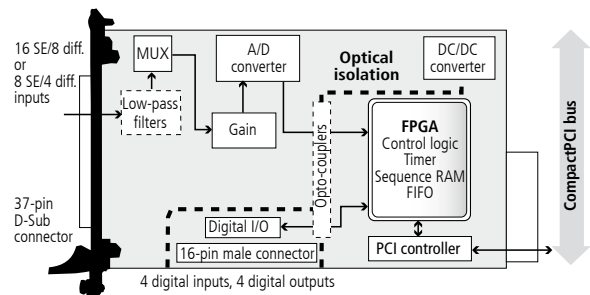
**Option SF:** Precision filter for 1 single-ended channel

**Option DF:** Precision filter for 1 diff. channel (30Hz)

**Option SC:** Current input 0(4)-20 mA for 1 single-ended channel

**Option DC:** Current input 0(4)-20 mA for 1 diff. channel

### Simplified block diagram



### Pin assignment – 37-pin D-Sub male connector

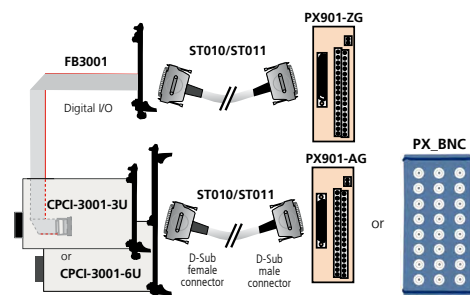
| DIFF               | SE              |    | SE                 | DIFF            |
|--------------------|-----------------|----|--------------------|-----------------|
| (+) An. input 0    | (+) An. input 0 | 20 | (+) An. input 8    | (+) An. input 4 |
| (+) An. input 1    | (+) An. input 1 | 21 | (+) An. input 9    | (+) An. input 5 |
| (+) An. input 2    | (+) An. input 2 | 22 | (+) An. input 10   | (+) An. input 6 |
| (+) An. input 3    | (+) An. input 3 | 23 | (+) An. input 11   | (+) An. input 7 |
| (-) An. input 3    | (+) An. input 7 | 24 | (+) An. input 15   | (-) An. input 7 |
| (-) An. input 2    | (+) An. input 6 | 25 | (+) An. input 14   | (-) An. input 6 |
| (-) An. input 1    | (+) An. input 5 | 26 | (+) An. input 13   | (-) An. input 5 |
| (-) An. input 0    | (+) An. input 4 | 27 | (+) An. input 12   | (-) An. input 4 |
| { Analog input GND |                 | 28 | { Analog input GND |                 |
| { Analog input GND |                 | 29 | { Analog input GND |                 |
| { Analog input GND |                 | 30 | { Analog input GND |                 |
| { Analog input GND |                 | 31 | { Analog input GND |                 |
| { Analog input GND |                 | 32 | { Analog input GND |                 |
| { Analog input GND |                 | 33 | { Analog input GND |                 |
| { Analog input GND |                 | 34 | { Analog input GND |                 |
| { Analog input GND |                 | 35 | { Analog input GND |                 |
| { Analog input GND |                 | 36 | { Analog input GND |                 |
| { Analog input GND |                 | 37 | { Analog input GND |                 |

1: The analog inputs have a common ground line

### 16-pin male connector

|                          |   |                          |
|--------------------------|---|--------------------------|
| Dig. output 0 (+)        | 1 | Dig. output 0 (-)        |
| Dig. output 1 (+)        | 2 | Dig. output 1 (-)        |
| Dig. output 2 (+)        | 3 | Dig. output 2 (-)        |
| Dig. output 3 (+)        | 4 | Dig. output 3 (-)        |
| Trigger/dig. input 0 (+) | 5 | Trigger/dig. input 0 (-) |
| Dig. input 1 (+)         | 6 | Dig. input 1 (-)         |
| Dig. input 2 (+)         | 7 | Dig. input 2 (-)         |
| Dig. input 3 (+)         | 8 | Dig. input 3 (-)         |

### ADDI-DATA connection



### Ordering information

#### Accessories

**PX901-A:** Screw terminal panel with transorb diodes for connecting the analog inputs

**PX901-AG:** Same as PX901-A with housing for DIN rail

**PX901-ZG:** Screw terminal panel for connecting the dig. I/O, for DIN rail

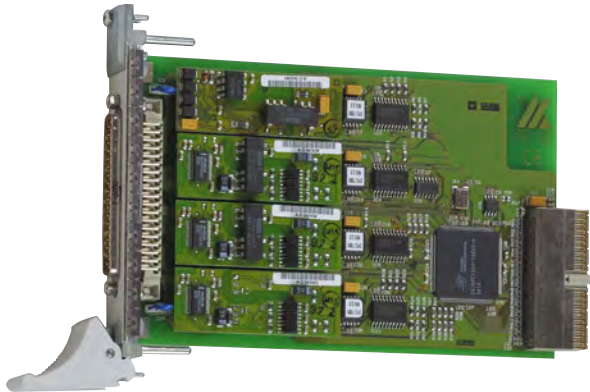
**PX\_BNC:** BNC connection box for connecting the analog I/O

**ST010:** Standard round cable, shielded, twisted pairs, 2 m

**ST011:** Standard round cable, shielded, twisted pairs, 5 m

**FB3001:** Ribbon cable with 37-pin D-Sub male connector on 3U bracket for the digital I/O

# 4-port serial interface, RS232, RS422, RS485, 20 mA CL



CompactPCI™ 32-bit

**Also for PCI-Express**  
See APCLe-7xxx, page 142

**Also for *PCI***  
See APCI-7500, page 210



**URS-7500-6U**  
6U bracket



The board CPCI-7500 is a 4-port serial interface for industrial applications. It is configured by inserting MX modules which the board identifies automatically. Each serial port can be configured individually through modules in the following modes: RS232, RS422, RS485 (with or without optical isolation) and Current Loop (optically isolated). The optically isolated modules allow a protection up to 1000 V for the use in noisy environments where earth loops can occur. Interrupts, addressing and transfer rate are controlled through the BIOS.

The I/O lines are protected against short-circuits, fast transients, electrostatic discharge and high-frequency EMI. Each port is supported through a 128-byte FIFO buffer for sending and receiving data which guarantees reliable operation with high data volumes.

## Features

- Asynchronous 4-port serial interface
- 4 socket for MX modules
- Modular mounting through MX modules
- Can be configured as RS232, RS422, RS485 with or without optical isolation, 20 mA Current Loop (active, passive), with optical isolation
- Addressing through software
- No jumpers: software configuration
- Automatic module recognition
- 128-byte FIFO memory for each interface
- Common interrupts
- Programmable transfer rate
- 5-, 6- or 8-bit character
- 1, 1½ or 2 stop bits
- Parity: even, odd or none
- Automatic transmitter control for RS485

## Safety features

- MX modules with optical isolation available
- Protection against fast transients (burst)
- Short-circuits protection for RS422 and RS485
- Internal diagnostic, break, parity, overrun and framing error
- Creeping distance IEC 61010-1 (MX modules)

## CPCI-7500

4-port, RS232, RS422, RS485,  
20 mA Current Loop

Mode selection through MX modules

With/without optical isolation

Free mode configuration for each port

128-byte FIFO buffer per port

MTBF: 98 551 hours at 45 °C

## Applications

- Data acquisition
- Industrial process control
- Industrial communication
- Multi-user systems
- Modem and printer monitoring
- Multidrop applications

## Software

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:








- Microsoft VC++
- Visual Basic • Delphi

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)

## MX modules

| Operating mode             | RS232   |   | RS422   |   | RS485   |   | 20 mA CL  |
|----------------------------|---|---|---|---|---|---|---|
|                            |  |  |  |  |  |  |  |
|                            | MX232-G   | MX232   | MX422-G   | MX422   | MX485-G   | MX485   | MXTTY   |
| Optical isolation 1000 V   | ✓   |   | ✓   |   | ✓   |   | ✓   |
| creeping distance 3.2 mm   | ✓   |   | ✓   |   | ✓   |   | ✓   |
| short-circuit protection   |   |   | ✓   | ✓   | ✓   | ✓   |   |
| ESD protection             | ✓   | ✓   | ✓   |   | ✓   |   |   |
| Burst-protection           | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   | ✓   |
| Duplex                     | Full  | Full  | Full  | Full  | Half  | Half  | Full  |
| Max. Baud rate             | 1 MBaud   | 1 MBaud   | 1 MBaud   | 1 MBaud   | 1 MBaud   | 1 MBaud   | 19,2 kBaud  |
| Modem control signals      | ✓   | ✓   | Optional RTS/CTS (MX-422-PEP)   |   |   |   |   |
| Autom. transmitter control |   |   |   |   | ✓   | ✓   |   |
| Current consumption        | 16 mA   | 1 mA  | 15 mA   | 5 mA  | 15 mA   | 5 mA  | 82 mA   |

## 4-port serial interface

|                    |  |
|--------------------|--|
| Modes:             | RS232, RS422, RS485, 20 mA Current Loop (active, passive) with or without optically isolated via separate MX modules |
| Transmission mode: | Asynchronous, full /half duplex (MX modules)   |
| Addressing:        | Automatic through BIOS   |
| Memory:            | 128-byte FIFO buffer for each interface  |
| Transfer rate:     | Programmable up to 1 MBaud (optional)  |
| Protocol:          | 5-, 6-, or 8-bit Character 1, 1½ or 2 Stop bits  |
| Parity:            | Even, odd, none, mark, space   |
| Interrupt:         | Interrupt configuration through BIOS   |

## Safety

|                    |                     |
|--------------------|---------------------|
| Optical isolation: | 1000 V (MX modules) |
|--------------------|---------------------|

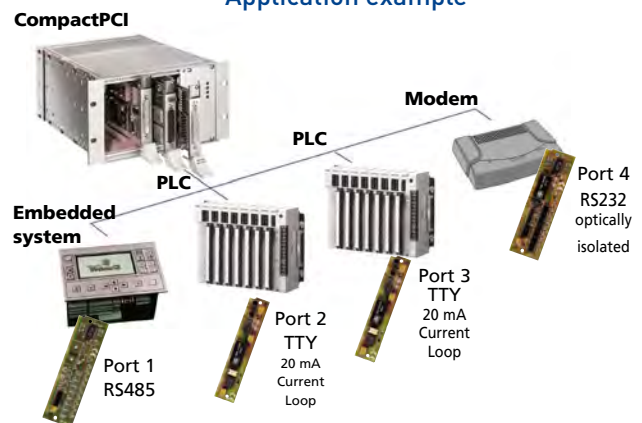
## EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

## Physical and environmental conditions

|                      |  |
|----------------------|--|
| Dimensions:          | 3U/4TE                                 |
| System bus:          | CompactPCI 32-bit (5 V signal voltage) |
| Space required:      | CompactPCI-slot, 3U                    |
| Operating voltage:   | +5 V, ± 5 % from the PC                |
| Current consumption: | 192 mA typ.                            |
| Front connector:     | 37-pin D-Sub male connector            |
| Temperature range:   | 0 to 60 °C (with forced cooling)       |
| MTBF:                | 98 551 Hours at 45 °C                  |

## Application example



## Connection cables



## Ordering information

## CPCI-7500

4-port serial interface, RS232, RS422, RS485, 20 mA CL. Incl. technical description and software drivers.

## MX modules: Please order separately!

|                   |   |
|-------------------|---|
| <b>MX232-G:</b>   | RS232 mode optically isolated               |
| <b>MX232:</b>     | RS232 mode                                  |
| <b>MX422-G:</b>   | RS422 mode optically isolated               |
| <b>MX422-PEP:</b> | RS422 mode optically isolated, with RTS/CTS |
| <b>MX422:</b>     | RS422 mode                                  |
| <b>MX485-G:</b>   | RS485 mode optically isolated               |

|                           |  |
|---------------------------|--|
| <b>MX485:</b>             | RS485 mode   |
| <b>MXTTY:</b>             | 20 mA Current Loop (active, passive), optically isolated |
| <b>Option:</b>            |  |
| <b>URS-7500-6U:</b>       | 6U bracket for mounting in 6U housing                    |
| <b>Quarz:</b>             | Up to 1 MBaud transfer rate                              |
| <b>Connection cables:</b> |  |
| <b>ST075:</b>             | Shielded round cable, 37-pin to 4 x 9-pin                |
| <b>ST074:</b>             | Shielded round cable, 37-pin to 4 x 25-pin               |



# Motion control for 4 servo or stepper motors



CompactPCI™ 32-bit



Also for **PCI**  
See page 212



The board CPCI-8004 for the CompactPCI bus is used for the control of up to four servo or stepper motor axes through a PC. With this intelligent and flexible board, many control tasks from simple to complicated can be realised.

The board has four stepping/direction output channels (D/A channels, 16-bit). They are isolated from the digital current supply and are used for the control of commercially available power amplifiers connected as speed controlling devices or current regulators. Incremental encoders, SSI encoders and EnDat encoders as well as end and reference switches can be connected to each axis channel.

Digital PID filters with forward compensation and optional Notch filters are also involved in the axis control.

The "open" controlling concept of the CPCI-8004 is intended in the first place for manufacturers of special-purpose machines and users which need a flexible integration as well as a CNC solution.

## Features

### Hardware/Properties

- Intelligent board based on a 64-bit RISC processor
- Positioning of up to 4 axes either with servo or stepper motors. Mixed operating of servo and stepper motors possible.
- Interface for all commercially available power amplifiers
- All input and output channels are optically isolated
- A multiple-axis system can be realised by inserting several CPCI-8004 in the same PC.

### Software

- Linear, circular, helical, spline and CAD interpolation
- Point-to-point movement with independent control of each axis
- Function library for Pascal, C-Basic, Borland Delphi, Borland C++, Visual Basic, Visual C++
- Programming through a PC application software or stand-alone
- The operating program can be easily adapted to specific requirements using program modules supplied with the board
- User programs created with the compiler can be processed automatically
- Multitasking: the board can simultaneously process up to 4 user programs.

## CPCI-8004

For 1 to 4 servo or stepper motors

Onboard 64-bit RISC processor

Optical isolation

16-bit analog output channels

24 digital inputs and 12 digital outputs,  
optically isolated

## Applications

- Precision positioning
- CNC control
- Semi-conductor manufacturing
- Event counting
- Motion control
- Robots
- X-Y-Z position control
- Stepper motor control
- Machine monitoring
- Research and development

## Software

A CD-ROM with the following software and programming samples is supplied with the board.

### Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

### Drivers and samples for the following compilers and software packages:

- Visual C++ • Microsoft C Lib. • Borland C Lib.
- Visual Basic • Delphi

### On request:

Further operating systems, compilers and samples.

Driver download: [www.addi-data.com/downloads](http://www.addi-data.com/downloads)



## Specifications

### CPCI-8004

|                                  |   |
|----------------------------------|---|
| CPU system:                      | 64-bit RISC processor 150 MHz   |
| RAM:                             | 16 MB   |
| Data exchange with the PC:       | Through CompactPCI bus  |
| Controller software:             | PIDF (PID filters with forward compensation)  |
| Interpolation:                   | 2D .. 4D linear, 2D circular, 3D circular, 4D helix, Interpolation with secondary axes.                 |
| Inputs for incremental encoders: | Diff. or TTL max. 2 MHz.<br>Word length: 32-bit with sign   |
| Inputs for SSI encoders:         | Up to 32-bit, gray / binary code<br>variable frequency 30 kHz to 1.5 MHz                                |
| Setpoint value outputs (servo):  | 1 per channel, D/A converter,<br>16-bit resolution, $\pm 10$ V  |
| Pulse outputs:                   | 1 stepper signal (RS422) and 1 directional signal (RS422) for each channel, pulse frequency up to 2 MHz |
| Isolated digital inputs:         | 24 inputs, 24 V, as end or reference switch or freely programmable                                      |
| Isolated digital outputs:        | 12 channels, 24 V / 500 mA, for releasing the power amplifiers or freely programmable                   |
| Interrupts:                      | Through PCI BIOS  |
| DMA:                             | Bus master  |
| Auxiliary voltage:               | 24 V external for digital I/O   |
| Options:                         | Interbus or CAN-Bus   |

### Safety

|                    |        |
|--------------------|--------|
| Optical isolation: | 1000 V |
|--------------------|--------|

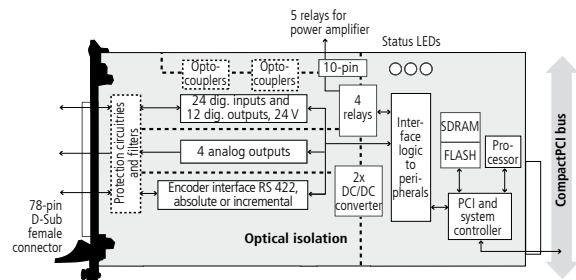
### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

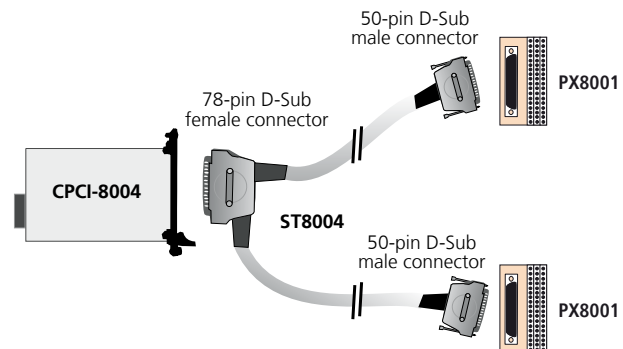
### Physical and environmental conditions

|                                |  |
|--------------------------------|--|
| Dimensions:                    | 160 x 100 mm                                   |
| System bus:                    | CompactPCI 32-bit                              |
| Space required:                | 1 CompactPCI slot                              |
| Operating voltage:             | +5 V and 3.3 V, $\pm 5$ % from the PC          |
| Front connector for CPCI-8004: | Axis 1, 2, 3, 4: 78-pin D-Sub female connector |
| Temperature range:             | 0 to 60 °C (with forced cooling)               |

### Simplified block diagram



### ADDI-DATA connection



## Ordering information

### CPCI-8004

Motion control board for 4 servo or stepper motors. Incl. technical description and software drivers.

### Accessories

|                |  |
|----------------|--|
| <b>PX8001:</b> | 3-row screw terminal panel, 50-pin, for DIN-rail mounting                          |
| <b>ST8004:</b> | Shielded round cable, 2 m,<br>78-pin female connector to 2 x 50-pin male connector |

# Screw terminal panels, Relay output boards, connection cables

## How important are cables and terminal panels?

When the PC runs important controlling and regulating tasks in a processing system, then data transfer must be reliable in order to ensure the reliability of the whole system. This is why ADDI-DATA cables and terminal panels have the same high safety and EMC standards as the PC boards and MSX-E systems.

## What makes the difference between cables?

The connection cable as a mechanical device is not submitted to the EMC specifications, though it can affect the emission immunity of the devices to which it is connected.

The use of cables with industry-standard D-Sub connectors has many advantages:

- Robustness
- Protection against EM fields
- Earthing on both connector ends
- High noise immunity

## Application

Suitable for use as control or signal cables in noisy environment, for indoor or outdoor applications. The tight braid reduces the emissions.

The copper braid is used as "ground". Twisted pairs provide protection against crosstalk and external interference. The cables are suited for dry or damp environments.

## Robust industry-standard D-Sub connector

## Protection against electromagnetic fields

## High noise immunity

## Indispensable terminal panels

Terminal panels are essential in most industrial applications. They dispatch to the sensors, tracers or control modules the numerous signals which are to be processed.

## Prevent connection errors

- The terminal panels are pin-compatible with the PC boards
- The terminal panels lead the control signals in increasing order from the PC to the screw terminal which also corresponds to the bit set in the board

## Helpful LEDs

- Indicate the status of each digital signal

## Integrated 24 V supply

- Separate 24 V supply terminal for the easy connection of digital 24 V PC boards
- Varistors and diodes for overvoltage protection are connected to the screw terminals to prevent emissions from the external supply voltage.

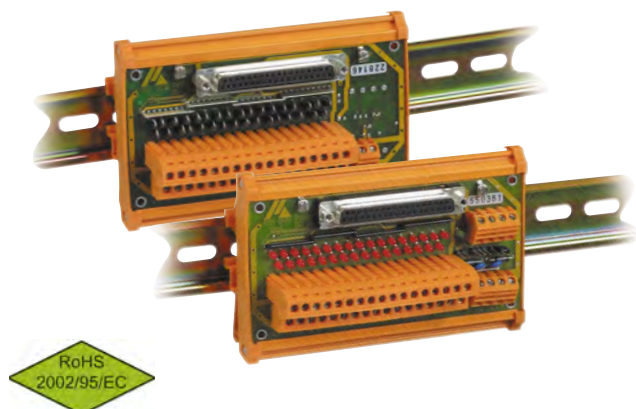
## High noise immunity

- The connection between housing and shield through the ground connection terminal creates an earthing on both sides



|  | PX901  | PX9000                                     | PX8001   | PX8500  | PX_BNC   |
|--|--|--|--|---|--|
| <b>Description</b>                                       | Panel for connecting up to 32 signal lines   | Panel for connecting up to 32 signal lines | Panel for connecting 50 signal lines   | Relay output board with 8 relays, cascable in 16, 24 and 32 relays  | BNC connection box; for connecting up to 8 diff. or 16 SE inputs and 8 outputs |
| <b>Function indication with LEDs</b>                     | <b>PX901-D:</b> yes  | For 24 V and sensor supply                 |  | For relay and sensor supply   |  |
| <b>Overvoltage protection of the 24 V supply voltage</b> | Through varistors and transil diodes   | Through varistors and transil diodes       |  | Through varistors and transil diodes  |  |
| <b>Available versions</b>                                | <b>PX901-D:</b><br>For digital boards, with 32 LEDs for status indication of the data lines .<br><br><b>PX901-DG:</b><br>Same as PX901-D with housing<br><br><b>PX901-A:</b><br>For analog boards with transil diodes for the overvoltage protection of the analog I/O<br><br><b>PX901-AG:</b><br>Same as PX901-A with housing for DIN rail<br><br><b>PX901-ZG:</b> For digital I/O boards, analog boards APCle-3120/-3001, and APCle-3121/-3021/-3521, and also for the SIN/COS function of counter boards APCle-1711 and CPCIs-1711; with housing for DIN rail |  |  | <b>PX8500-G:</b> With housing for DIN rail<br><br><b>PX8500-Vt+G:</b> With varistors and housing for DIN rail |  |
| <b>Connection to</b>                                     | ADDI-DATA digital, analog or counter boards  | All ADDI-DATA digital boards               | APCI-1710, CPCI-1710, APCle-1711, CPCIs-1711, APCI-8008, CPCI-8004, APCI-2200, APCle-2200, APCI-311x/301x, APCle-040, APCI-1696/1648 | ADDI-DATA digital boards with digital outputs   | ADDI-DATA analog boards  |
| <b>Page</b>  | 259  | 262  | 262  | 260   | 263  |

# Screw terminal panel for DIN rail



The screw terminal panel PX901-xx is used for the connection of maximum 32 signal or signal-reference lines.

ADDI-DATA boards can be connected through 37-pin D-Sub female connector with our standard cables of STxxx series.

The housing of the female connector is connected with two ground terminals so that the board is additionally earthed for more security. All components of the board are enclosed in an earthing strip also connected to the ground terminals.

Each terminal is directly connected to one pin of the 37-pin D-Sub female connector. Designations on terminals indicate respective connections for the 37-pin D-Sub female connector.

The PX901-D version is equipped with LEDs which are ideal for status display when working with ADDI-DATA digital 24 V I/O boards.

The PX901-A version is fitted with transil diodes for analog signals, but without LEDs.

An additional 4-pin terminal is available in order to be able to connect more than one 24 V operating voltage and ground line.

The 24 V or the ground terminal can be connected very easily through wire wrap to the 4-pin terminal.

The 24 V operating voltage lines are additionally protected against over-voltage through varistors and transil diodes.

## Features

- Connection of up to 32 signal lines
- Separate ground connections
- Connection through screw terminals
- 2 rows of terminals
- Terminals can be labelled
- Additional 4-pin terminal for connecting the ground or the supply voltage
- With housing for mounting on a standard DIN rail
- All terminals intended for large conductor cross sections: up to 2.5 mm<sup>2</sup>

## PX901

32 terminals for signal lines

LED status indication for digital signals

Transil diodes for analog signals

DIN-rail mounting

Direct connection to ADDI-DATA boards

## Safety features

- Overvoltage protection of the 24 V supply terminals through varistors and transil diodes

## Applications

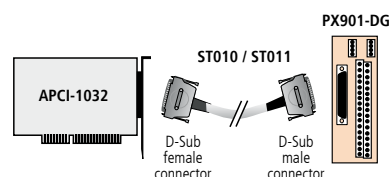
- Process control
- Industrial measuring
- Acquisition of sensor data
- Signal analysis

## Specifications

|                          |  |
|--------------------------|--|
| Signal line terminals:   | 32 for the connection of peripherals   |
| Additional terminals:    | – 4 for feeding the external operating voltage (digital I/O)<br>– 2 for the connection of ground lines |
| status indication:       | 32 LEDs for status indication, 1 LED for status display of the operating voltage (PX901-D)             |
| Safety features:         | Varistors and transil diodes   |
| Connector:               | 37-pin D-Sub female connector  |
| Dimensions of the board: | 130 x 70 x 35 mm (L x W x H)   |
| Dimensions with housing: | 132 x 87 x 70 mm (L x W x H)   |
| Temperature range:       | 0-60 °C  |

### Example:

Connection of a digital input board to the screw terminal panel PX901-DG



## Ordering information

### PX901

Screw terminal panel. Incl. technical description.

### Versions

- PX901-D:** For digital boards, with status indication through LEDs and the Ethernet systems MSX-E312x and MSX-E3701-DIO
- PX901-DG:** Same as PX901-D, with housing for mounting on DIN rail
- PX901-A:** For analog boards, with transil diodes
- PX901-AG:** Same as PX901-A, with housing for mounting on DIN rail

- PX901-ZG:** – For the counter boards APCle-1711 and CPCIs-1711 (function Sin/Cos)  
– for connecting digital I/O to analog PC boards  
– for the relay boards (digital inputs) APCle-2200 and APCI-2200

With housing for DIN-rail mounting

### Accessories please order separately!

- ST010:** Standard round cable, shielded, twisted pairs, 2 m
- ST011:** Standard round cable, shielded, twisted pairs, 5 m

# 8-port relay output board



The PX8500 is an external 8-port relay board for the connection to digital output boards. It can be cascaded in 16, 24 and 32 relays and is intended for mounting on DIN rails. The board is an interface between the PC and industrial process equipment.

The change-over contacts of the relay are controlled through 24 V signals. The 24 V voltage supply is protected through varistors and transil diodes.

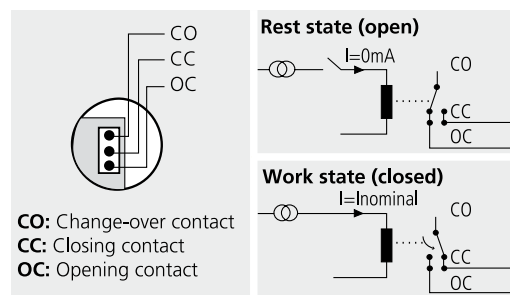
The board is intended for use with 220 V supply. The creeping distances (acc. to DIN VDE0110) and the conductor cross sections allow operations with high switching capacity (up to 2,500 VA). The board has a female D-Sub connector for connecting an ADDI-DATA digital 24 V output board through a standard I/O cable ST010. The red LEDs display the state of the relays (open/closed). A green LED displays the ON/OFF of the operating voltage.

The 37-pin cable shield can be grounded on both sides for the protection against high-frequency EMI.

## Features

- Relay output board with 8 relays, cascable in 16, 24 and 32 relays
- Max. switching voltage: 30 VDC / 277 VAC
- Max. switching current: 10 A
- All terminals intended for large conductor cross sections up to 2.5 mm<sup>2</sup>
- Operating voltage display through green LED
- Relay state display through red LED
- Relays mounted on sockets
- High switching capacity
- Long-lasting life

## Function principle of the relays



## PX8500

For the connection to digital output boards

Cascable in 16/24/32 relays

8 relays on socket

DIN-rail mounting

30 VDC / 277 VAC

300 W / 2500 VA

10 A

## Safety features

- Overvoltage protection of the 24 V supply voltage through varistors and transil diodes
- Contact protection of the relays through varistors (PX8500-VtG)
- 4 mm creeping distance between change-over, closing and opening contact
- 6 mm creeping distance between change-over and closing contact of adjoining relays
- Free-wheeling diode in the coil circuit
- With housing for mounting on a standard DIN rail
- Operating safety tested according to the low-voltage directive: 73/23/EEC

## Applications

- Industrial digital I/O control
- Automatic test equipment
- External high power relay control
- Alarm monitoring
- Test automation
- Alarm monitoring
- Digital monitoring
- ON/OFF monitoring of motors, lights ...
- ...

## Specifications

### EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

### Contact side

|                                  |                                |
|----------------------------------|--------------------------------|
| Type of contacts:                | 8 change-over                  |
| Max. switching voltage:          | 30 VDC / 277 VAC               |
| Max. switching capacity:         | 300 W / 2500 VA                |
| Max. switching current:          | 10 A                           |
| Contact resistance:              | < 100 mΩ                       |
| Response time:                   | 15 ms                          |
| Release time:                    | 5 ms                           |
| Mechanical life:                 | 5 x 10 <sup>6</sup> operations |
| Life at max. switching capacity: | 10 <sup>5</sup> operations     |

### Control side

|                                 |                      |
|---------------------------------|----------------------|
| Switching behaviour:            | Monostable           |
| Operating voltage:              | 24 VAC               |
| Operating capacity:             | 533 mW               |
| Switch. frequency at max. load: | 20 switchings/minute |
| Response voltage at +20 °C:     | 16.8 V               |
| Release voltage at +20 °C:      | 2.4 V                |

### Physical and environmental conditions

|                      |   |
|----------------------|---|
| Operating voltage:   | +24 V   |
| Current consumption: | 210 mA typ.   |
| Dimensions:          | 212 x 87 x 72 mm (L x W x H)  |
| Connector:           | 2 x 37-pin D-Sub female connector   |
| <b>X1:</b>           | For the connection to the PC board  |
| <b>X2:</b>           | For cascading the PX8500 in max. 32 relays, for example the digital output board APCI-2032. In this case the digital output signal 1 corresponds to the 24 V control signal of the relay 1, output 2 to relay 2, etc. |
| Temperature range:   | 0-60 °C   |
| Humidity:            | 50 % at +40 °C<br>80 % at +31 °C  |



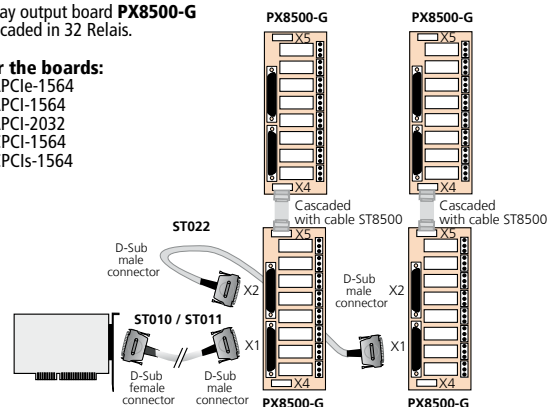
Standard round cable **ST010**

### PX8500 cascaded in 32 relays

Relay output board **PX8500-G** cascaded in 32 Relais.

**For the boards:**

- APCle-1564
- APCI-1564
- APCI-2032
- CPCl-1564
- CPCIs-1564

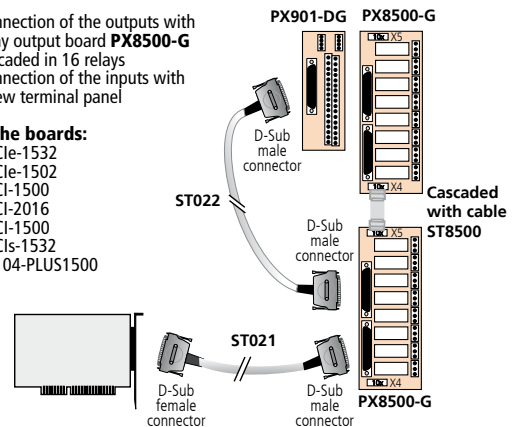


### PX8500 cascaded in 16 relays

- Connection of the outputs with relay output board **PX8500-G** cascaded in 16 relays
- Connection of the inputs with screw terminal panel

**For the boards:**

- APCle-1532
- APCle-1502
- APCI-1500
- APCI-2016
- CPCl-1500
- CPCIs-1532
- PC104-PLUS1500

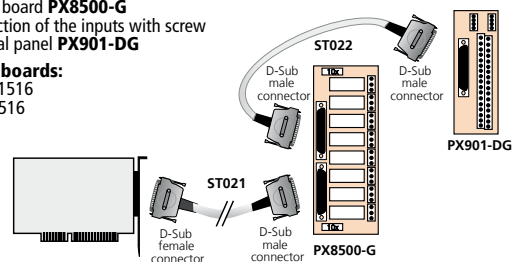


### Connection example – digital I/O board in 8 relays

- Connection of the outputs with relay output board **PX8500-G**
- Connection of the inputs with screw terminal panel **PX901-DG**

**For the boards:**

- APCle-1516
- APCI-1516



## Ordering information

### PX8500

8-port relay output board. Incl. technical description.

**PX8500-G:** With housing for mounting on DIN rail (IP 20)

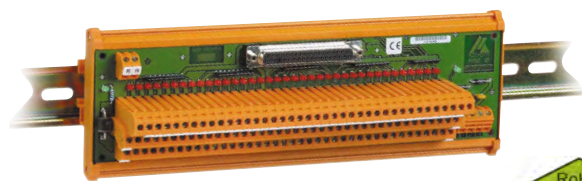
**PX8500-VtG:** PX8500 with varistors and housing for mounting on DIN rail (IP 20)

### Accessories

- ST8500:** Ribbon cable for cascading the board in 16, 24 or 32 relays. (Info: For 24 or 32 relays the cable ST022 is also required.)
- ST021:** Standard round cable, shielded, twisted pairs, 2 m. For connecting 37-pin digital I/O boards and MSX-E systems.
- ST022:** Standard round cable, shielded, twisted pairs, 2 m. For connecting the 37-pin screw terminal panel and for cascading.
- ST010:** Standard round cable, shielded, twisted pairs, 2 m. For connecting 37 pin digital I/O boards to relay output boards up to 32 relays.
- ST011:** Same as ST010, 5 m.



# Screw terminal panels for DIN rail



## PX9000

3-row screw terminal panel

LED status indication

DIN rail mounting

For digital or analog boards

The screw terminal panel PX9000 is intended for the connection of maximum 32 signal lines and the voltage supply for the external sensors/actuators. All components of the board are enclosed in an earthing strip which is also connected to the ground terminals.

On the 3x39-pin terminal block, all 37 contacts of the 37-pin female connector are assigned a contact on a row of terminals. Each signal line (terminal 1-32) is assigned a status LED.

Both other rows of terminals are intended for connecting the voltage supply for the sensors/actuators. These rows are protected against unintentional voltage reversal through a diode. A LED indicates when a voltage is applied.

These rows of terminals are equipped with 2 additional terminals, one on the right and one on the left side, for the easy connection of the voltage supply to a further terminal panel.

4 further screw terminals are at disposal for the supply voltage of ADDI-DATA digital I/O boards: two for the connection of the 24 V operating voltage and two for the operating ground.

Both terminals for the operating voltage 24V are in addition protected against overvoltages through varistors and transorb diodes.

### Features

- 3 rows of terminals, terminals can be labelled
- LED indicator status
- Additional 4-pin terminal for the direct connection of the ground and the 24 V supply voltage to ADDI-DATA boards
- With housing for DIN-rail mounting
- All terminals intended for large conductor cross sections: up to 2.5 mm<sup>2</sup>
- 2 x 39 screw terminals to the distribution of the voltage supply e.g. on sensors and for cascading several PX9000

### Specifications

|                           |  |
|---------------------------|--|
| Signal line terminals:    | 32 for the connection of peripherals   |
| Supply voltage terminals: | 2 rows of 39 terminals   |
| Additional terminals:     | – 4 terminals for the external voltage power supply (digital I/O)<br>– 2 for connecting the ground lines |
| Status indication:        | 37 LEDs for status indication, LEDs for operating and supply voltage                                     |
| Safety features:          | Varistors and transil diodes, ground lines   |
| Connector:                | 37-pin D-Sub female connector  |
| Dimensions of the board:  | 244 x 68 x 35 mm (L x W x H)   |
| Dimensions with housing:  | 248 x 87 x 78 mm (L x W x H)   |
| Temperature range:        | 0-60 °C  |



## PX8001

3-row screw terminal panel, 50-pin, for DIN rail

Connection of 50 signal lines

With numbered screw terminals)

### Features

- Screw terminal panel for 50 signal line terminals
- Ground connection of the connector is lead directly to the connecting terminal
- With 50-pin female connector
- For free mounting

### Specifications

|                                |                             |                                      |
|--------------------------------|-----------------------------|--------------------------------------|
| Cross conductor section up to: | 4 mm <sup>2</sup>           | 0.2 – 2.5 mm <sup>2</sup> (flexible) |
| Input/output test voltage:     | 2.5 kV, 50 Hz, 60 s         |                                      |
| Operating temperature:         | –20 °C to +50 °C            |                                      |
| Dimensions:                    | 69 x 98 x 62 mm (L x W x H) |                                      |
| Current/Voltage:               | 2 A / 125 V                 |                                      |

### Ordering information

#### PX9000

3-row screw terminal panel, 37-pin, with housing for DIN-rail mounting. Incl. technical description.

#### PX8001

3-row screw terminal panel, 50-pin, with housing for DIN-rail mounting. Incl. technical description.

### Accessories

#### Please order separately!

- ST010:** Standard round cable 37-pin, shielded, twisted pairs, 2 m
- ST011:** Standard round cable 37-pin, shielded, twisted pairs, 5 m
- ST370-16:** Standard round cable 50-pin, shielded, twisted pairs, 2 m
- ST8001:** Round cable 50-pin, shielded, twisted pairs, 2 m.  
For connecting the APCI-8008 (motion control) to the screw terminal panel PX8001
- ST8004:** Round cable 78-pin female connector to 2 x 50-pin male connector, shielded, twisted pairs, 2 m.  
For connecting the CPCI-8004 (motion control) to the screw terminal panel PX8001.

# BNC connection box for DIN rail



## PX\_BNC

BNC connection box

For analog I/O boards

DIN-rail mounting

### Features

The connection box PX\_BNC serves for the connection of analog voltage and current signals through BNC female connectors. Up to 8 differential or 16 single-ended analog inputs as well as 8 analog outputs of an ADDI-DATA analog board can be connected to the PX\_BNC (see table on the right).

### Housing

The compact housing consists of black painted impact-resistant aluminium.

### Accessories

The standard delivery contains 2 clamps for DIN rail mounting.

### Connection to the board

The PX\_BNC is connected to the board through the 37-pin D-Sub female connector. The pin assignment is adjusted to the board.  
The connection between the PX\_BNC and the ADDI-DATA analog board is established through the standard round cable ST010 or ST011.  
Please order the cable separately.

### 16 BNC female connectors for analog inputs

The connection box has 16 BNC female connectors In 0 to In 15 for further connection of the analog input channels (channels 0-15) of many ADDI-DATA input and multifunction boards (see table on the right).  
The BNC shield is connected to the analog signal ground of the respective analog inputs.  
The connection of the differential channels (DIFF) is only possible through a special BNC cable.

### 8 BNC female connectors for analog outputs

The connection box has 8 BNC female connectors Out 0 to Out 7 for further connection of the analog output channels (channels 0-7) of many ADDI-DATA multifunction and output boards (see table on the right).  
The BNC shield is connected to the analog signal ground of the respective analog outputs.

The PX-BNC can be connected to the following ADDI-DATA analog boards:

| Analog input boards  | Multifunction boards   | Analog output board     |
|--|--|-------------------------|
| APCI-3001 / CPCI-3001<br>APCI-3010 / APCI-3016<br>APCLe-3021 | APCI-3110 / APCI-3116<br>APCI-3120 / CPCI-3120<br>CPCI-3009<br>APCLe-3121 / APCLe-3123<br>CPCIs-3121 | APCI-3501<br>APCLe-3521 |



### Specifications

|                    |  |
|--------------------|--|
| BNC connector:     | For the connection of peripherals<br>In 0-15 for analog inputs<br>Out 0-7 for analog outputs |
| D-Sub connector:   | 37-pin D-Sub female connector  |
| Dimensions:        | 210 x 105 x 50 mm (L x W x H)  |
| Weight:            | 727 g  |
| Temperature range: | 0-60 °C  |
| Housing:           | black painted aluminium, impact-resistant  |
| DIN-rail mounting: | Fixing with 2 clamps (included in delivery)  |

### Ordering information

#### PX\_BNC

BNC connection box for DIN rail. Incl. 2 clamps for DIN-rail mounting and technical description.

#### Accessories

Please order separately!

- ST010:** Standard round cable, shielded, twisted pairs, 2 m  
**ST011:** Same as ST010, 5 m

- ST3009-A:** 26-pin HD D-Sub female to 37-pin D-Sub male connector (for CPCI-3009)  
**ST3009-DZ:** 15-pin HD D-Sub female to 37-pin D-Sub male connector (for CPCI-3009)

Other cable versions on request

# Resolver-to-digital converter



The MSX-RDC-17 is a device for supplying and acquiring a resolver. It converts the position value given by the resolver into a digital incremental output signal. The resolution of the incremental encoder output can be defined using the switch on the front side of the MSX-RDC-17.

## MSX-RDC-17

### Resolver-to-digital converter

Conversion of resolver signals into digital signals

4 different resolution settings

### Features

#### Power supply

Nominal voltage: 5 V

#### Resolver output/input

- Frequency: 10 kHz

#### Incremental encoder output

- Output signals: incremental A+, A-, B+, B-, Index+, Index-
- Output type: differential, RS485
- Resolution: 1024, 2048, 4096, 8152

### Power supply connector

For the power supply of the MSX-RDC-17, a 4-pin screw terminal is fixed on the bottom side of the housing.

| Pin No. | Signal                |
|---------|-----------------------|
| 1       | +V <sub>s</sub> (5 V) |
| 2       | Ground                |
| 3       | Ground                |
| 4       | +V <sub>s</sub> (5 V) |

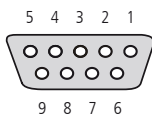


The Ground and the supply pins are connected internally with each other. For less current flow over the terminals, please connect all four pins externally with each other!

### Resolver connector

The resolver has to be connected to the 9-pin D-Sub female connector on the front side of the MSX-RDC-17.

| Pin No. | Signal        |
|---------|---------------|
| 1       | Ref-          |
| 2       | Not connected |
| 3       | Not connected |
| 4       | Not connected |
| 5       | SIN+          |
| 6       | SIN-          |
| 7       | Ref+          |
| 8       | COS+          |
| 9       | COS-          |
| Shield  | PE            |



### Switch

On the front side of the MSX-RDC-17, a switch panel with three switches is installed. Switches 1 and 2 are used for setting the resolution of the incremental encoder output. Switch 3 allows you to reset the MSX-RDC-17. To do a reset, you have to switch on switch 3 for a short time and then switch it off again. Please do not leave switch 3 switched on permanently, because the MSX-RDC-17 is not functional with this switch position!

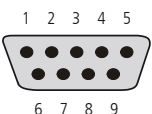
| 1   | 2   | 3   |                             |
|-----|-----|-----|-----------------------------|
| OFF | OFF | OFF | 16-bit resolution           |
| OFF | ON  | OFF | 14-bit resolution           |
| ON  | OFF | OFF | 12-bit resolution           |
| ON  | ON  | OFF | 10-bit resolution           |
| X   | X   | ON  | Whole device in reset state |



### Incremental encoder output

The incremental encoder signals are available at the 9-pin D-Sub male connector of the MSX-RDC-17.

| Pin No. | Signal          |
|---------|-----------------|
| 1       | Ground          |
| 2       | Index-          |
| 3       | Index+          |
| 4       | A-              |
| 5       | A+              |
| 6       | Not connected   |
| 7       | +V <sub>s</sub> |
| 8       | B-              |
| 9       | B+              |
| Shield  | PE              |



Specifications\*

Power supply

|                             |   |
|-----------------------------|---|
| Nominal voltage:            | +5 V                                    |
| Supply voltage:             | +4.9 V to +5.25 V                       |
| Current consumption at 5 V: | 140 mA (at 100 rps / 16-bit resolution) |
| Reverse voltage protection: | -6 V                                    |

Resolver output/input

Output reference signal

|                      |                                  |
|----------------------|----------------------------------|
| Amplitude:           | 7 V <sub>pp</sub> (differential) |
| Frequency:           | 10 kHz                           |
| Max. output current: | 100 mA                           |

Input signals

|                 |                   |
|-----------------|-------------------|
| Max. amplitude: | 4 V <sub>pp</sub> |
|-----------------|-------------------|

Incremental encoder output

|                      |   |
|----------------------|---|
| Output signals:      | A+, A-, B+, B-, Index+, Index-                |
| Output type:         | differential, RS485                           |
| Nominal voltage:     | +5 V  |
| Max. output current: | 100 mA  |
| Resolution:          | 10-/12-/14- or 16-bit (selectable via switch) |
| Accuracy:            | ±5 arcmin                                     |
| Max. speed:          | depends on the selected resolution            |
|                      | 10-bit: 2500 rps                              |
|                      | 12-bit: 1000 rps                              |
|                      | 14-bit: 500 rps                               |
|                      | 16-bit: 125 rps                               |

Intended Use

The resolver-to-digital converter MSX-RDC-17 has to be used as electrical equipment for measurement, control and laboratory pursuant to the norm EN 61010-1 (IEC 61010-1).  
The power supply for the resolver-to-digital converter MSX-RDC-17 must fulfil the requirements of IEC 60950-1 (SELV) or EN 60950-1 (SELV) and EN 55022 or IEC/CISPR 22 and EN 55024 or IEC/CISPR 24.

Usage restrictions

The resolver-to-digital converter MSX-RDC-17 must not be used as safety related part (SRP).  
The resolver-to-digital converter MSX-RDC-17 must not be used for safety related functions, for example for emergency stop functions.  
The resolver-to-digital converter MSX-RDC-17 must not be used in potentially explosive atmospheres.  
The resolver-to-digital converter MSX-RDC-17 must not be used as electrical equipment according to the Low Voltage Directive 2006/95/EC.

Limits of use

All safety information and the instructions on this data sheet must be followed to ensure proper intended use.  
Uses of the resolver-to-digital converter beyond these specifications are considered as improper use. The manufacturer is not liable for damages resulting from improper use.  
The resolver-to-digital converter must remain in its anti-static packaging until it is installed.  
Please do not delete the identification numbers of the resolver-to-digital converter or the warranty claim will be invalid.

Ordering information

MSX-RDC-17

Resolver-to-digital converter, conversion into digital signals, 4 different resolution settings.

\* Preliminary product information

# Shielded cables for industrial applications



## CABLES

Dedicated cables

Special versions on request

Standard cables for industrial applications

More safety for your application



## What makes the difference between cables?

The connection cable as a mechanical device is not submitted to the EMC specifications, though it can affect the emission immunity of the devices to which it is connected.

The use of cables with industrial standards has many advantages:

- Protection against EM fields: The shield of the cable is connected to the metallised hood of the D-sub connector. The connection between housing and shield creates an earthing on both sides.
- High noise immunity: More protection through adapted pin assignment of the cables. The way the cable leads are twisted in pairs corresponds to the pin assignment of the boards.

## Industry-standard D-sub connectors versus SCSI-connector

D-sub connectors fit the high requirements of industrial measurement and control. They are robust and have a high noise immunity.

This is why we equip all our boards with D-sub connectors.

## Application

Suitable for use as control or signal cables in noisy environment, for indoor or outdoor applications. The tight braid reduces the emissions. The copper braid is used as "ground". Twisted pairs provide protection against crosstalk and external interference. The cables are suited for dry or damp environments.

## Design of the cables

- Plain copper conductor, fine-strand according to IEC 60228
- Special PVC conductor insulation
- Twisted-pair conductors
- Core identification according to DIN 47100
- Conductors laid up in layers
- Aluminium foil
- Tinned copper braid shielding
- Covering grade approx. 85%
- Special outer sheath, grey PVC
- Oil and petrol resistant according to VDE 0250 and 04772
- Self-extinguishing (SE) and flame-retardant, according to IEC 60332-1



## Special versions on request

- Other lengths
- Open cable end, on one or on both ends
- Bent connectors on one or on both ends

## Specifications of the cables (STxxxx type)

|  |                          |   |
|--|--------------------------|---|
| <p>Twisted pairs</p> <p>Aluminium foil</p> <p>Copper braid shielding</p> <p>PVC outer sheath</p> | Specifications:          | Special PVC data line for electronic control tasks according to VDE 0812 and 0814   |
|  | Temperature range:       | -30 °C to +80 °C laid permanently   |
|  | Operating voltage:       | Max. 350 V  |
|  | Test voltage:            | 1200 V (0.14 mm <sup>2</sup> )  |
|  | Insulation resistance:   | ± 20 MΩ / km  |
|  | Inductance:              | Approx. 0.65 mH / km  |
|  | Impedance:               | Approx. 78 Ω  |
|  | Capacitive coupling:     | Approx. 300 pF/100m   |
|  | Connector cross section: | 0.14 mm <sup>2</sup> (ST010-S and ST011-S with a connector cross section of 0.25 mm <sup>2</sup> )  |
|  | Attenuation factor:      | > 40 dB between 300 and 900 MHz   |
|  | Construction:            | The cable screen is screwed with low impedance over the strain relief on both sides of the housing hood with locking screws, the connections are crimped. |
|  | Minimum bending radius:  | Laid flexibly 15 x cable diameter   |
|  |                          | Laid permanently 6 x cable diameter   |

## Ribbon cables

| Cable designation | Description  |
|-------------------|--|
| FB MSX-DIG-IO     | For the MSX-Box option MSX-DIG-IO, 9-pin ribbon cable with D-Sub male connector.                                 |
| FB-INTERBUS       | For the APCI-8008, for connecting the Interbus. Ribbon cable, 9-pin D-Sub female connector with bracket.         |
| FB-PROFIBUS       | For the MSX Box, for connecting the Profibus. Ribbon cable, 9-pin D-Sub female connector with bracket.           |
| FB104-1500        | For the digital I/O port of the PC104-PLUS1500. Ribbon cable, 37-pin D-Sub male connector.                       |
| FB3000            | Ribbon cable for the digital I/O port, 37-pin D-Sub male connector with bracket.                                 |
| FB3001            | Ribbon cable for the digital I/O port of the CompactPCI boards. 37-pin D-Sub male connector with 3U bracket.     |
| FB3003            | Ribbon cable for the digital I/O port, 37-pin D-Sub male connector with bracket.                                 |
| FB3600-AC         | For the analog and counter functions of the APCI-3600. Ribbon cable, 2x15-pin D-Sub male connector with bracket. |
| FB3600-D          | For the digital I/O port of the APCI-3600. Ribbon cable, 37-pin D-Sub male connector with bracket.               |
| FB3702            | For the digital I/O port of the APCI-3701 and APCI-3702. Ribbon cable, 37-pin D-Sub male connector with bracket  |
| FB8001/FB8008     | For APCI-800x, APCI-30xx and APCI-31xx. Ribbon cable, 50-pin D-Sub male connector with bracket.                  |
| FB-CAN            | For APCI-800x, between OPMF and 9-pin D-Sub male connector with bracket for external CAN connection.             |



## Shielded standard cables with metallised hoods



| Cable designation  | Description  | Twisted pairs | Shielded round cable | Length |
|--|--|---------------|----------------------|--------|
| <b>Round cable, 1 to 20 m, 2 x 37-pin D-Sub connector</b>  |  |               |                      |        |
| ST010_1  | Female connector / male connector  | ✓             | ✓                    | 1 m    |
| ST010  | Female connector / male connector  | ✓             | ✓                    | 2 m    |
| ST010_3  | Female connector / male connector  | ✓             | ✓                    | 3 m    |
| ST011  | Female connector / male connector  | ✓             | ✓                    | 5 m    |
| ST011_10   | Female connector / male connector  | ✓             | ✓                    | 10 m   |
| ST011_15   | Female connector / male connector  | ✓             | ✓                    | 15 m   |
| ST011_20   | Female connector / male connector  | ✓             | ✓                    | 20 m   |
| <b>Round cable with one 90° bent female connector, 2 x 37-pin D-Sub connector</b>                        |  |               |                      |        |
| ST010_1_ABGW   | 90° bent female connector / male connector   | ✓             | ✓                    | 1 m    |
| ST010_ABGW   | 90° bent female connector / male connector   | ✓             | ✓                    | 2 m    |
| ST010_3_ABGW   | 90° bent female connector / male connector   | ✓             | ✓                    | 3 m    |
| ST011_ABGW   | 90° bent female connector / male connector   | ✓             | ✓                    | 5 m    |
| <b>Round cable with two 90° bent connectors, 2 x 37-pin D-Sub connectors</b>                             |  |               |                      |        |
| ST010_1_2XABGW   | Female connector / male connector  | ✓             | ✓                    | 1 m    |
| ST010_2XABGW   | Female connector / male connector  | ✓             | ✓                    | 2 m    |
| <b>Round cable, 2 m and 5 m, or high currents (for 24 V digital outputs), 2 x 37-pin D-Sub connector</b> |  |               |                      |        |
| ST010_S  | Female connector / male connector, with separate connection for 24 V voltage supply  | ✓             | ✓                    | 2 m    |
| ST011_S  | Female connector / male connector, with separate connection for 24 V voltage supply  | ✓             | ✓                    | 5 m    |
| <b>Round cable with one open end, 1 x 37-pin D-Sub connector</b>   |  |               |                      |        |
| ST010_1_0  | Female connector / other side open and bared, incl. colour table according to DIN 47100  | ✓             | ✓                    | 1 m    |
| ST010_0  | Female connector / other side open and bared, incl. colour table according to DIN 47100  | ✓             | ✓                    | 2 m    |
| ST010_3_0  | Female connector / other side open and bared, incl. colour table according to DIN 47100  | ✓             | ✓                    | 3 m    |
| ST011_0  | Female connector / other side open and bared, incl. colour table according to DIN 47100  | ✓             | ✓                    | 5 m    |
| <b>Round cable between digital I/O boards and relay output board PX8500, 2 x 37-pin D-Sub connectors</b> |  |               |                      |        |
| ST021  | Between digital I/O boards (APCI-1500/-1516/-2016, CPCI-1500) and PX8500 female connector / male connector   | ✓             | ✓                    | 2 m    |
| ST022  | Between two PX8500 or PX90x male connector / male connector  | ✓             | ✓                    | 2 m    |
| ST8500   | Ribbon cable between two PX8500-x  |               |                      | 5 cm   |
| <b>Miscellaneous cables</b>  |  |               |                      |        |
| ST1711-50  | Connection cable for the APCI-1711, for connecting the PX8001, 78-pin D-Sub male connector / 50-pin D-Sub male connector<br>Enables the compatibility with the APCI-1710 | ✓             | ✓                    | 2 m    |
| ST3003-A   | Connection cable for the APCI-3003, for the analog input signals, 15-pin male connector / 37-pin male connector  | ✓             | ✓                    | 2 m    |
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| ST3200   | 50-pin female connector / 50-pin male connector  | ✓             | ✓                    | 2 m    |
| ST3601   | Coaxial cable for the APCI-3600  |               |                      | 2 m    |
| <b>Round cables, 2 x 50-pin D-Sub connector</b>  |  |               |                      |        |
| ST370-16_1   | Female connector / male connector  | ✓             | ✓                    | 1 m    |
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| ST370-16_1_ABGW  | 90° bent female connector / male connector   | ✓             | ✓                    | 1 m    |
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| ST3701   | Round cable for the APCI-3701 female connector / male connector  | ✓             | ✓                    | 2 m    |
| <b>Round cables for motion control</b>   |  |               |                      |        |
| ST8001   | 50-pin D-Sub female connector / 50-pin D-Sub male connector; APCI-8008   | ✓             | ✓                    | 2 m    |
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| ST8004   | 78-pin female connector / 2 x 50-pin male connector; CPCI-8004   | ✓             | ✓                    | 2 m    |
| <b>Round cables for the connection of serial interfaces</b>  |  |               |                      |        |
| ST074  | 4-port serial interfaces, 37-pin D-Sub female connector / 4 x 25-pin D-Sub male connector  |               | ✓                    | 35 cm  |
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Bent connector

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for high currentsOpen  
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| APCLe-3660-4     | 152 |
| APCLe-7xxx       | 154 |

**PN-ARTS see Real-time Ethernet systems****Positioning**

|           |     |
|-----------|-----|
| APCI-8008 | 224 |
| CPCI-8004 | 256 |

**Pressure measurement**

|           |     |
|-----------|-----|
| APCI-3300 | 210 |
| MSX-E3311 | 88  |
| MSX-E3317 | 60  |

**PROFINET see Real-time Ethernet systems****Pt100**

|             |     |
|-------------|-----|
| APCI-3200   | 206 |
| MSX-E3211   | 84  |
| MSX-E3711   | 96  |
| MSX-ilog-TC | 12  |

**Pt1000**

|             |     |
|-------------|-----|
| APCI-3200   | 206 |
| MSX-E3211   | 84  |
| MSX-ilog-TC | 12  |

**Pulse acquisition**

|            |     |
|------------|-----|
| APCI-1710  | 178 |
| APCLe-1711 | 140 |
| CPCI-1710  | 246 |
| CPCI-3009  | 248 |
| CPCIs-1711 | 234 |

**Pulse counter**

|            |     |
|------------|-----|
| APCI-1710  | 178 |
| APCLe-1711 | 140 |
| CPCI-1710  | 246 |
| CPCI-3009  | 248 |
| CPCIs-1711 | 234 |
| MSX-E1711  | 40  |
| MSX-E1721  | 40  |

**Pulse width measurement**

|            |     |
|------------|-----|
| APCI-1710  | 178 |
| APCLe-1711 | 140 |
| CPCI-1710  | 246 |
| CPCI-3009  | 248 |
| CPCIs-1711 | 234 |

**Pulse width modulation**

|            |     |
|------------|-----|
| APCI-1710  | 178 |
| APCLe-1711 | 140 |
| CPCI-1710  | 246 |
| CPCI-3009  | 248 |
| CPCIs-1711 | 234 |

**PWM see Pulse width modulation****R****Real-time Ethernet systems**

|                   |    |
|-------------------|----|
| EC-ARTS           | 17 |
| EC-ARTS-3011      | 18 |
| EC-ARTS-3701-4    | 19 |
| MSX-Box-500       | 23 |
| MSX-Box-800       | 23 |
| MSX-Box-CPCI-400  | 24 |
| MSX-Box-CPCI-xxxx | 24 |
| PN-ARTS           | 17 |

**Relay output boards**

|            |     |
|------------|-----|
| APCI-2200  | 174 |
| APCLe-2200 | 136 |
| PX8500     | 260 |

**Resolver-to-digital converter**

|            |     |
|------------|-----|
| MSX-RDC-17 | 264 |
|------------|-----|

**RS232**

|             |     |
|-------------|-----|
| APCI-7xxx-3 | 222 |
| APCLe-7xxx  | 154 |
| CPCI-7500   | 254 |
| MSX-E7511   | 110 |

**RS422**

|             |     |
|-------------|-----|
| APCI-7xxx-3 | 222 |
| APCI-1710   | 178 |
| APCLe-7xxx  | 154 |
| APCLe-1711  | 140 |
| CPCI-3009   | 248 |
| CPCI-7500   | 254 |
| CPCIs-1711  | 234 |
| MSX-E7511   | 110 |

**RS485**

|             |     |
|-------------|-----|
| APCI-7xxx-3 | 222 |
| APCLe-7xxx  | 154 |
| CPCI-7500   | 254 |
| MSX-E7511   | 110 |

**RTD acquisition**

|              |     |
|--------------|-----|
| APCI-3200    | 206 |
| MSX-E3211    | 84  |
| MSX-ilog-RTD | 12  |

**S****Screw terminal panels**

|        |     |
|--------|-----|
| PX901  | 259 |
| PX8001 | 262 |
| PX9000 | 262 |

**Serial interfaces**

|             |     |
|-------------|-----|
| APCI-7xxx-3 | 222 |
| APCLe-7xxx  | 154 |
| CPCI-7500   | 254 |
| MSX-E7511   | 110 |

**Servo motor**

|           |     |
|-----------|-----|
| APCI-8008 | 224 |
| CPCI-8004 | 256 |

**Simultaneous acquisition**

|                |     |
|----------------|-----|
| APCI-3003      | 200 |
| APCI-3600      | 212 |
| APCI-3702      | 216 |
| EC-ARTS-3011   | 18  |
| EC-ARTS-3701-4 | 19  |
| MSX-E3011      | 52  |
| MSX-E3017      | 56  |
| MSX-E3021      | 64  |
| MSX-E3027      | 68  |
| MSX-E3121      | 72  |
| MSX-E3122      | 76  |
| MSX-E3211      | 84  |
| MSX-E3311      | 88  |
| MSX-E3317      | 60  |
| MSX-E3601      | 92  |
| MSX-E3711      | 96  |
| MSX-ilog-AI-16 | 10  |
| MSX-ilog-RTD   | 12  |
| MSX-ilog-TC    | 12  |

**Sin/Cos counter**

|                |     |
|----------------|-----|
| APCLe-1711     | 140 |
| CPCIs-1711     | 234 |
| MSX-E1711      | 40  |
| MSX-E1721      | 40  |
| MSX-E1741-1VPP | 48  |

**SSI**

|            |     |
|------------|-----|
| APCI-1710  | 178 |
| APCI-8008  | 224 |
| APCLe-1711 | 140 |
| CPCI-3009  | 248 |
| CPCI-8004  | 256 |
| CPCIs-1711 | 234 |
| MSX-E1701  | 40  |

**Stepper motor**

|           |     |
|-----------|-----|
| APCI-8008 | 224 |
| CPCI-8004 | 256 |

**Strain gauge acquisition**

|           |     |
|-----------|-----|
| APCI-3300 | 210 |
| MSX-E3311 | 88  |
| MSX-E3317 | 60  |

**Synchronous serial interface see SSI****T****Temperature measurement**

|              |     |
|--------------|-----|
| APCI-3200    | 206 |
| MSX-E3211    | 84  |
| MSX-E3711    | 96  |
| MSX-ilog-RTD | 12  |
| MSX-ilog-TC  | 12  |

**Temperature monitoring**

|          |     |
|----------|-----|
| APCI-040 | 138 |
|----------|-----|

**Thermocouple acquisition**

|             |     |
|-------------|-----|
| APCI-3200   | 206 |
| MSX-E3211   | 84  |
| MSX-ilog-TC | 12  |

**TOR counter function**

|            |     |
|------------|-----|
| APCI-1710  | 178 |
| APCLe-1711 | 140 |
| CPCI-1710  | 246 |
| CPCI-3009  | 248 |
| CPCIs-1711 | 234 |

**Transducer**

|                |     |
|----------------|-----|
| APCI-3701      | 218 |
| APCI-3702      | 216 |
| EC-ARTS-3701-4 | 19  |
| MSX-E3700      | 100 |
| MSX-E3701      | 100 |
| MSX-E3701-DIO  | 106 |
| MSX-E3701-x    | 100 |
| MSX-E3711      | 96  |

**TTL**

|            |     |
|------------|-----|
| APCI-1648  | 176 |
| APCI-1696  | 176 |
| APCI-1710  | 178 |
| APCI-3010  | 196 |
| APCI-3016  | 196 |
| APCI-3110  | 194 |
| APCI-3116  | 194 |
| APCLe-1711 | 140 |
| CPCI-1710  | 246 |
| CPCI-3009  | 248 |
| CPCIs-1711 | 234 |

**TWINCAT**

|                |    |
|----------------|----|
| EC-ARTS-3011   | 18 |
| EC-ARTS-3701-4 | 19 |

**V****Vibration measurement**

|              |     |
|--------------|-----|
| APCI-3600    | 212 |
| APCLe-3660-4 | 152 |
| MSX-E3601    | 92  |

**W****Watchdog**

|          |     |
|----------|-----|
| APCI-040 | 138 |
|----------|-----|

**X****X-ARTS see Real-time Ethernet systems**



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