Solutions for industrial Measurement and Automation
We know it from our private life: through social media networks and the cross-reference of information we are shown contents which match our interests.

As soon as we indicate new interests, the advertisements are adapted.

It is similar in industry: the “4th Industrial Revolution” has been officially proclaimed. This means that future automation and production systems will be part of an interacting network and will have a high power of learning and adaptation. In short: intelligent adaptive systems with fast reaction times, on which algorithms can be stored.

Long before Industry 4.0 resounded throughout the land, ADDI-DATA GmbH already had intelligent systems in its portfolio and was ready for the future. Last year we actually gave our long-standing project a name: Mechatrology.

These future-oriented solutions for the industry are our contribution to the “high-tech strategy” of the German Federal Government.

René Ohlmann
Managing Director, ADDI-DATA GmbH
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Fax: +49 7229 1847-222 www.addi-data.com
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New analog multifunction board for PCI-Express: APCIe-3123

The analog PCI-Express multifunction board APCIe-3123 is the successor product of the PCI board APCI-3120. It is interesting for users that use the PCI version via direct access or via the driver of the APCI-3120. At the moment, the APCIe-3123 is available without DMA.

See APCIe-3123 page 92

Digital I/O board PCI-Express with two counters: APCIe-1502

The APCIe-1502 has 32 digital inputs and outputs including two fast counter inputs (100 kHz). They work independently from each other and can be used for pulse counting or velocity measurement. 15 inputs are interruptible. The board is optically isolated up to 1000 V and offers various protective circuits for use in harsh environments. The field of application of the digital inputs lies in sectors where 12 V and 24 V levels are used, e.g. the IT sector, for security and alarm technologies, in the car electronics or in the mining sector.

See APCIe-1502 page 78

64 digital I/O board, 24 V, PCI-Express

16 of the 32 digital inputs of the digital I/O board APCIe-1564 are interruptible. The channels 0-2 can be used as 32-bit counter inputs. The 32 digital inputs have an output current of 500 mA per channel. With the watchdog function the outputs can be reset to “0”.

See APCIe-1564 page 62

Digital I/O board, CompactPCI bus

The CompactPCI board CPCI-1564 has 64 digital inputs and outputs, 24 V. 16 of the 32 inputs are interruptible. The inputs are organised in 4 groups of 8 channels, each with a separated ground line. The 32 outputs have a current output of 500 mA per channel. With the watchdog function the outputs can be reset to “0”. A timer and 3 32-bit counters up to 500 kHz are available. The CPCI-1564 is protected against burst, overvoltage, ESD and high-frequency interferences. The board can be used in an extended temperature range from -40 to +85 °C.

See CPCI-1564 page 178

Intelligent motion control board

The intelligent PCI board APCI-8008 is used for the control and regulation of axes of up to eight servo motors or stepper motors. The advantage of this board is the highly efficient combination of hardware and software. The APCI-8008 features a PCI bus master which enables a direct access to PC boards without using the CPU of the PC. It has amongst others a stand-alone motion control application with a compiler for programming. Using this, the user can adjust the speed and flexibility of the axes to his requirements. The APCI-8008 can process incremental encoders, SSI encoders and EnDat 2.2 encoders. The signal output can be effected either through the analog interfaces (+/-10V) or through EtherCAT. The control can be accessed to via PC (PCI bus) or Ethernet.

See APCI-8008 page 170

Length measurement, IP 65 – MSX-E3701 with 24 V digital I/O

The range of intelligent Ethernet length measurement systems MSX-E37xx has been extended with digital I/O. In addition to the inputs for inductive transducers (HB/LVDT/Mahr/Knaebel), the MSX-E3701-DIO system now features an additional 16 digital inputs and outputs, for example for status reports or for connecting to a PLC. The digital I/O are available for all versions of the MSX-E3701 system: Half-Bridge, LVDT, Knaebel and Mahr.

See MSX-E3701 and MSX-E3701-DIO from page 62

Fast distributed signal acquisition and signal output, IP 65

The intelligent Ethernet system MSX-E3121 combines analog and digital I/O: 6 differential analog inputs (16 bit, 100kHz/channel) and 4 analog outputs (16-bit) as well as 16 digital inputs and 16 digital outputs, 24 V (for example for status reports or connection to a PLC).

See MSX-E3121 page 38

Ethernet counter system for EnDat 2.2 sensors: MSX-E1731

The intelligent Ethernet counter system MSX-E1731 acquires the position values of 4 EnDat 2.2 sensors. With the ARM® processor, the system can effect calculations that can be used as a basis for readjustments or regulation tasks. The EnDat 2.2 sensors are connected directly through the 8-pin M12 connectors. LEDs show the state of the counter inputs. Furthermore, the MSX-E1731 system is equipped with 16 digital lines that can be parameterized as inputs or outputs.

See MSX-E1731 page 34
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 proven network buses Ethernet, EtherCAT, ProfinET and VARAN – also in real-time versions.

The market offers varied distributed solutions. 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 spare 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 spares 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 spare licence costs.

4. Real-time Ethernet systems

ADDI-DATA offers I/O slave systems for EtherCAT, ProfinET and VARAN. They are characterised by highly precise inputs. While the bus is clocking time, they are able to measure more quickly and to buffer these values. 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**

*industrial + internet technology + intelligent + intuitive + integrated =  innovative data loggers from ADDI-DATA*

Data recording and visualisation made easy

MSX-i-log 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-i-log data loggers can be supplied by ADDI-DATA over many years.

**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
- Rapid acquisition

**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 Channel Configuration
- Activate channel • Colour • Name • Unit • Frequency • Offset • Multiplication factor
- Polarity • Gain

Virtual Channel Configuration
- Activate virtual channel • Colour • Name • Unit • Operation • Frequency

Alarm
- Channel • Type • Value

Recording
- Start/Stop recording • View only • Record all the time • Trigger mode

Real-time view
- XY view • Digital view • Meter view

Trigger
- Activate trigger • Pre-trigger number • Pre-trigger channels
- Start/Stop type (software, digital, analog, manual, stop time)
- Action (execute script, start acquisition) • Unit • Operation • Frequency

Exporting
- CSV • XML • View as chart • View/load acquisition configuration • Delete acquisition file
- Delete all selected files

Administration
- User administration • Acquisition parameters • System configuration / information • Logs

Ethernet data loggers

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
Tel.: +49 7229 1847-0 or send an e-mail to: info@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 ARM®9 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: ±5 V, ±10 V (16-bit)
- 0-5 V, 0-10 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)

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

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

**Safety features**
- LED status display for fast error diagnostics
- Overvoltage protection ±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

**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.

*Operating temperature*

<table>
<thead>
<tr>
<th>Operating temperature</th>
<th>°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>25°C</td>
<td></td>
</tr>
<tr>
<td>40°C</td>
<td></td>
</tr>
<tr>
<td>85°C</td>
<td></td>
</tr>
</tbody>
</table>

*More information at www.addi-data.com*
### Specifications*

#### Analog inputs

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number/type</td>
<td>16 differential inputs</td>
</tr>
<tr>
<td>Architecture</td>
<td>4 groups with 4 channels each, 4-port simultaneous converter with one 4-channel multiplexer per converter</td>
</tr>
<tr>
<td>Resolution</td>
<td>16-bit, SAR ADC</td>
</tr>
<tr>
<td>Accuracy</td>
<td>± 1.221 mV typ. (± 4 LSB)</td>
</tr>
<tr>
<td>Relative precision (max.)</td>
<td>± 2.442 mV max.</td>
</tr>
<tr>
<td>Optical isolation</td>
<td>1000 V</td>
</tr>
<tr>
<td>Input ranges</td>
<td>± 5 V ± 10 V software-programmable</td>
</tr>
<tr>
<td>Input frequency</td>
<td>1 kHz per channel</td>
</tr>
<tr>
<td>Gain</td>
<td>x1, x2, software-programmable</td>
</tr>
<tr>
<td>Common mode rejection</td>
<td>80 dB min., 60 dB up to 60 Hz (Bessel filter)</td>
</tr>
<tr>
<td>Input impedance (PGA)</td>
<td>10¹¹/17/10³F against GND</td>
</tr>
<tr>
<td>Bandwidth (-3 dB)</td>
<td>160 kHz limited through TP filters</td>
</tr>
<tr>
<td>Bandwidth (-3 dB)</td>
<td>16 Hz version with differential filter</td>
</tr>
<tr>
<td>Trigger</td>
<td>Digital input, software-programmable</td>
</tr>
<tr>
<td>Offset error</td>
<td>± 1 LSB (± 305 µV)</td>
</tr>
<tr>
<td>Gain error</td>
<td>± 2.5 LSB</td>
</tr>
<tr>
<td>Temperature drift</td>
<td>2.3 x V_H + 22.5 µV (°C) typ.</td>
</tr>
<tr>
<td>In the temperature range:</td>
<td>from -40 °C to +85 °C</td>
</tr>
<tr>
<td>Connectors for sensors</td>
<td>8 x 5-pin female M12 connector</td>
</tr>
</tbody>
</table>

#### Data storage

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAM</td>
<td>64 MB</td>
</tr>
<tr>
<td>FLASH memory</td>
<td>4 MB for system data</td>
</tr>
<tr>
<td>Extended FLASH memory</td>
<td>4 GB (1.7 GB for measured data)</td>
</tr>
<tr>
<td>Buffered real-time clock</td>
<td>approx. 4 weeks at 20 °C</td>
</tr>
</tbody>
</table>

#### Voltage supply

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal voltage</td>
<td>24 V</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>18-30 V</td>
</tr>
<tr>
<td>Optical isolation</td>
<td>1000 V</td>
</tr>
<tr>
<td>Reverse voltage protection</td>
<td>1 A max.</td>
</tr>
<tr>
<td>Connectors (24 VDC input)</td>
<td>1 x 5-pin male M12 connector</td>
</tr>
<tr>
<td>24 VDC output</td>
<td>1 x 5-pin female M12 connector</td>
</tr>
</tbody>
</table>

#### Ethernet

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface</td>
<td>Ethernet acc. to specification IEEE802.3</td>
</tr>
<tr>
<td>Number of ports</td>
<td>2</td>
</tr>
<tr>
<td>Cable length</td>
<td>150 m max. at CAT5e UTP</td>
</tr>
<tr>
<td>Bandwidth</td>
<td>10 Mbps</td>
</tr>
<tr>
<td>Protocol</td>
<td>100 Mbps (auto-negotiation)</td>
</tr>
<tr>
<td>MAC address</td>
<td>00:0F:6C:##:##:##, unique for each device</td>
</tr>
<tr>
<td>Connectors (2 x Ethernet)</td>
<td>2 x 4-pin flange-type socket, D-coded M12 for Port 0 and Port 1</td>
</tr>
</tbody>
</table>

#### 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 EN 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

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface</td>
<td>Ethernet acc. to specification IEEE802.3</td>
</tr>
<tr>
<td>Dimensions</td>
<td>215 x 110 mm x 50 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>850 g</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP 65</td>
</tr>
<tr>
<td>Current consumption at 24 V</td>
<td>160 mA</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-25 °C to +85 °C (-40 °C to +85 °C on request)</td>
</tr>
</tbody>
</table>

#### System requirements

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

#### Ordering information

**MSX-ilog-AI-16**

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

**Connection cables**

**Voltage supply**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMX-2x</td>
<td>Shielded cable, M12 5-pin female connector/open end, IP 65</td>
</tr>
<tr>
<td>CMX-3x</td>
<td>For cascading, shielded cable, M12 5-pin female connector/male connector IP 65</td>
</tr>
</tbody>
</table>

**Trigger**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMX-4x</td>
<td>Shielded cable, M12 5-pin female connector/open end, IP 65</td>
</tr>
<tr>
<td>CMX-5x</td>
<td>For cascading, shielded cable, M12 5-pin female connector/male connector IP 65</td>
</tr>
</tbody>
</table>

**Ethernet**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMX-6x</td>
<td>CAT5e cable, M12 D-coded male connector/RJ45 connector</td>
</tr>
<tr>
<td>CMX-7x</td>
<td>For cascading: CAT5e cable, 2 x M12 D-coded male connector</td>
</tr>
</tbody>
</table>

**Connection to peripherals**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMX-8x</td>
<td>Shielded cable, M12 5-pin male connector/open end, IP 65</td>
</tr>
</tbody>
</table>

**Options**

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

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

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

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*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)

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®9 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 ± 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.
**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.

### 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
- **Protocol:** 10Base-T IEEE802.3 compliant
- **100 Mbps auto-negotiation**
- **Optical isolation:** 1000 V
- **MAC address:** 00:0F:6C:##:##:##, unique for each device

### Sensor connectors
- **Analog inputs:** 8 x 8-pin female connectors, M12

**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 °C 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**

- 2 x Ethernet
- 16/8 differential inputs for temperature acquisition, 8-pin M12 female connectors
- 2 x voltage supply, 24 V IN/OUT, optically isolated

**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.

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**Ordering information**

**Ethernet data loggers** – 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**
- MSX-ilog-RTD-16: for 16 RTD
- MSX-ilog-RTD-8: for 8 RTD
- MSX-ilog-TC-16: for 16 thermocouples
- MSX-ilog-TC-8: for 8 thermocouples

**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

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**Options**

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

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*Preliminary product information*
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, ±10 V, 0-5 V, ±5 V, 0-2 V, ±2 V, 0-1 V, ±1 V
- Current inputs: 0-20 mA (option) can be combined freely with voltage inputs

**Digital inputs and outputs**

- 36 optoisolated digital inputs, 24 V
- 4 optoisolated 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

**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 ± 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

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*Preliminary product information*
### Specifications

#### Analog inputs
- **Number/type:** 16 differential inputs
- **Resolution:** 16 bit
- **Input ranges:**
  - 0-10 V, ±10 V, 0-5 V, ±5 V, 0-2 V, ±2 V, 0-1 V, ±1 V
  - 0-20 mA optional
- **Input frequency:** 200 kHz
- **Connector for sensors:** 37-pin D-Sub connector

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

#### Digital outputs
- **Number:** 4
- **Output type:** Open collector
- **Optical isolation:** Over optocoupler, 1000 V
- **Max. switching current:** 50 mA typ.
- **Nominal voltage:** 24 V
- **Connectors:** 1 x 37-pin D-Sub connector (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
  - 100 Mbps auto-negotiation
- **Protocol:**
  - 10Base-T IEEE802.3 compliant
  - 100Base-TX IEEE802.3 compliant
- **MAC address:** unique for each device
- **Connector:** RJ45

### 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**

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

**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

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*Preliminary product information*
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), ProfiNet (PN-ARTS) and VARAN (V-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. While the bus is clocking time, they are able to measure more quickly and to buffer these values. Moreover, the measurement can be started independent of the bus, since by the use of 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.

*Preliminary product information*
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 has still 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-Al-16: Analog inputs (16-bit),
Further systems in preparation: Temperature (RTD/TC, 24-bit), pressure (24-bit)

Examples of EC-ARTS applications

Various signals are acquired or set 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-Al-16: Analog inputs (16-bit),
Further systems in preparation: Temperature (RTD/TC, 24-bit), pressure (24-bit)

Examples of PN-ARTS applications

PROFINET 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.

VARAN

VARAN – Versatile Automation Random Access Network

The VARAN bus was completed as a hardware solution and developed for hard real-time requirements. It is characterised by high speed, short cycle times and minimal synchronicity jitters.

The possibility of asynchronous access is unique. The information exchange consists of simple memory write/read commands. The bus manager coordinates the entire data traffic in order to avoid collisions. Data packets can be repeated within a cycle up until receipt of a valid back confirmation.

The VARAN bus can also transport standard Ethernet frames.

V-ARTS systems

The V-ARTS are slave systems that are completely compatible with VARAN. They are connected with the master by a point-to-point connection and can send 10 data packets per analog input.

Available functions

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

Examples of V-ARTS applications

V-ARTS are, for example, perfectly suited for hydraulic testing in the aviation sector. They assure that all measured values (100 kHz) are acquired and the data is safely transferred while the interplay with the control runs without interruption.
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.

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 (±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 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

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

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
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
D-Sub 25-pin: 1 x RS232/RS485, isolated
Optional: D-Sub 25-pin: 1 x CAN, Master/Slave, isolated
1 x Profibus/Slave, isolated
2 x Interbus/Master, isolated
4 x dig. input, 24 V/I0 mA, isolated
3 x dig. output, 24 V/I200 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. 15 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
Reserved: 1 x PCI controller board
1 x PCI Ethernet board
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. 30 A) (other voltage on request)
Protection against: Short circuit, overload, overvoltage
Connection: 2 m power cable

ATX backplane with 8 PCI slots

PCI slots: Total amount: 8
Reserved: 1 x PCI controller board
1 x PCI Ethernet board
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 Mb/s

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)
For 8 PCI boards and 3 brackets (MSX-Box-800)
Housing dimensions (L x W x H): 292 x 170 x 282 mm (MSX-Box-800)
Weight: approx. 2 kg (standard MSX-Box system) MSX-Box-500 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:
• DIN rail
• Removable mounting bracket
• Carrying handle
Cable:
• 2 m Ethernet patch cable, shielded, RJ45 connector (PC ↔ MSX-Box)
Network card:
• 2 x PCI FireWire IEEE 1394, 1 x internal, 1 x ext.
• 2 x PCI USB 2.0, 2 external, 1 x internal connection,
• 1 x RJ-45 LAN, 10/100 Mbps connection
• 1 x 5-pin female connector, 12 V
• 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,
• 32-bit PCI system
• 5 V voltage

Colours:
• Other housing colours (according to RAL scale) and inscriptions (on request)

Ordering information

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-Profilbus, MSX-IBS and MSX-DIO-IO
MSX-CAN-x: 1/2/4/8 x CAN bus, master/slave, optically isolated
MSX-Profilbus: 1 x Profibus, slave
MSX-IBS-x: 1 x Interbus-S, master
MSX-DIG-I0: 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-Z: 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

Robust chromated aluminium housing
Controller board 333 MHz with fan-free RISC processor
Status LEDs

Compact system
(B x H x W) 170 x 134 x 240 mm
Industry-suitable power supply
(100 – 240 V AC, 47 – 63 Hz)
9-pin D-Sub: RS232
Optional: 1 – 8 CAN, Profibus, all signals isolated (separate front panel)
Ethernet (RJ45), 10/100 MBit/s fast communication, network connection
3 or x free CompactPCI slots
## 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; relay output, freely programmable, closing contact
- **Optional**: Additional front panel: D-Sub 25-pin: 1 – 8 CAN, Master/Slave, isolated
  - 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, 3.3 V, ±12 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
  - Reserved: 1 x CompactPCI controller board
  - Free: for 3 additional CompactPCI boards
- **Specification**: PCI specification PCI2.1, PICMG2.0 R3.0 CPCI Core Specification
  - 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, further slots free for CompactPCI boards
- **Specification**: PCI specification PCI2.1, PICMG2.0 R3.0 CPCI Core Specification
  - PICMG 2.6 Bridging Specification (according to requirements)
  - V I/O +5V

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

### On request:
- further housing dimensions

---

**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
- **Rear 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)
  - for x CompactPCI boards and 1 bracket (MSX-Box-CPCI-xxxx)
- **Housing dimensions**: 170 x 134 x 240 mm (without fan) (MSX-Box-CPCI-400)
  - 190 x 134 x 240 mm (without fan) (MSX-Box-CPCI-xxxx)
- **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, RJ45 connector (PC ↔ MSX-Box-CPCI)

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You will find a large range of adapted CompactPCI boards on page 174
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/IP65/IP40. 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.

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 and French.

Characteristics
- 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 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.
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

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.

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

### Digital I/O, 24 V

<table>
<thead>
<tr>
<th>Device</th>
<th>MSK-E1516</th>
<th>MSK-E701</th>
<th>MSK-E1711</th>
<th>MSK-E1721</th>
<th>MSK-E3121</th>
<th>MSK-E3011</th>
<th>MSK-E3021</th>
<th>MSK-E3027</th>
<th>MSK-E3511</th>
<th>MSK-E3211</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intelligent through Arm/9 technology</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Ethernet</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Optical isolation 1000 V</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>1 x trigger input / 1 x syncro input / time synchronisation</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Compare logic generates synchro trigger signal</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Timer function generates synchro trigger signal</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Cascading</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP 65</td>
<td>IP 65</td>
<td>IP 65</td>
<td>IP 65</td>
<td>IP 65</td>
<td>IP 65</td>
<td>IP 65</td>
<td>IP 65</td>
<td>IP 65</td>
<td>IP 65</td>
</tr>
<tr>
<td>Temperature range from –40°C to + 85°C</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Dimensions (mm)</td>
<td>215 x 110 x 50</td>
<td>215 x 110 x 54</td>
<td>215 x 110 x 54</td>
<td>215 x 110 x 50</td>
<td>260 x 140 x 50</td>
<td>215 x 110 x 50</td>
<td>154 x 110 x 54</td>
<td>215 x 138 x 50</td>
<td>215 x 110 x 50</td>
<td>215 x 110 x 50</td>
</tr>
</tbody>
</table>

### Digital I/O, 24 V, status LEDs

- 16
- 16
- 16
- 16
- 8
- 8
- 8
- 8
- ✓

### Multifunction counter

- Incremental counter inputs (A, B, C, D signals) | 4
- Sin/Cos counter inputs (A, B, C signals) | 4
- M23 female connector, 12-pin for incremental counter and Sin/Cos counter 1 V, (MSX-E1721) | 4

### Event logic

- ✓

### M12 female connector, 5-pin (for 2 inputs or outputs)

- 8
- 8
- 8
- 8
- ✓

### Analog input

- Max. input frequency | 5 MHz
- Throughput | 250 kHz
- Input ranges | 1.5 V, ± 10 V, ± 100 mV
- Current inputs (PC-DIFF option) | 0(0)-20 mA
- Analog input, 16-bit | 4
- M12 female connector, 5-pin | 2
- Output ranges | 0-10 V, ± 10 V, 0-100 mV
- Current outputs | 0-20 mA

### Temperatures measurement

- Number of transducers (half-bridge, LVDT, Mahr) | 4
- Simultaneous acquisition | ✓
- Temperature input for Pt100 | ✓

### Dimensions (mm)

- 215 x 110 x 50

### Current driver list on the web: [www.addi-data.com](http://www.addi-data.com)
### Common specifications for all MSX-E systems

**Pressure measurement**

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Acquisition of dynamic signals</th>
<th>Length measurement</th>
<th>Serial interfaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSX-E3311</td>
<td>MSX-E3401</td>
<td>MSX-E3711</td>
<td>MSX-E3701</td>
</tr>
<tr>
<td>MSX-E3711</td>
<td>MSX-E3700</td>
<td>MSX-E3701</td>
<td>MSX-E3700</td>
</tr>
<tr>
<td>MSX-E5718-24-bit</td>
<td>MSX-E7511</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- ✓: Available
- ✓ on request
- Φ: Not available

**Length measurement**

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Acquisition of dynamic signals</th>
<th>Length measurement</th>
<th>Serial interfaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>215 x 138</td>
<td>215 x 138</td>
<td>215 x 138</td>
<td>215 x 138</td>
</tr>
<tr>
<td>x 50</td>
<td>x 50</td>
<td>x 50</td>
<td>x 50</td>
</tr>
</tbody>
</table>

**Serial interfaces**

- 1 x trigger input / 1 x synchro input / time synchronisation
- Optical isolation: 1000 V
- Ethernet: 10Base-Tx, 100Base-Tx, 1000Base-Tx
- MAC address: 00:0F:6C:##:##:##, unique for each device
- Ethernet: 10Base-Tx, 100Base-Tx, 1000Base-Tx

**Trigger**

- Number of inputs: 1
- Number of outputs: 1
- Serial interfaces: RS232, RS422, RS485, 20mA CL

**Synchro**

- Number of inputs: 1
- Number of outputs: 1
- Signal type: RS422
- Connectors, common with synchro

**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.

**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 72.
**Intelligent Ethernet systems**

## Accessories for the Ethernet systems

<table>
<thead>
<tr>
<th>Digital I/O, 24 V</th>
<th>Multifunction counter</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSX-E1516</td>
<td>MSX-E1711</td>
</tr>
<tr>
<td>MSX-E1721</td>
<td>MSX-E1731</td>
</tr>
<tr>
<td>New! MSX-E1731</td>
<td></td>
</tr>
</tbody>
</table>

### Cables: Temperature range from -25 °C to +80 °C
- Bent cables and special length on request

#### Voltage supply
- Shielded cable, M12 5-pin female connector/open end, IP65
  - CMX-20 (1.5 m), CMX-21 (3 m), CMX-22 (5 m), CMX-23 (10 m), CMX-29 (length on request)
- Shielded cable, M12 5-pin connector/male connector, IP65
  - CMX-38 (0.6 m), CMX-39 (1 m), CMX-31 (3 m), CMX-32 (5 m), CMX-39_0.3 (0.3 m), CMX-39 (length on request)
- Shielded cable, M12 5-pin female connector/male connector, IP65
  - CMX-40 (1.5 m), CMX-41 (3 m), CMX-42 (5 m), CMX-43 (10 m), CMX-49 (length on request)

#### Trigger/Synchro
- Shielded cable, M12 5-pin female connector/open end, IP65
  - CMX-40 (1.5 m), CMX-41 (3 m), CMX-42 (5 m), CMX-43 (10 m), CMX-49 (length on request)

#### Ethernet
- CAT5E-Kabel, M12 D-coded male connector/RJ45 connector
  - CMX-50 (2 m), CMX-61 (5 m), CMX-62 (10 m), CMX-69 (length on request)
- CAT5E-Kabel, M12 8-pin male connector/open end, IP65
  - CMX-69 (5 m), CMX-70 (3 m), CMX-71 (1 m), CMX-72 (10 m), CMX-79_0.3 (0.3 m), CMX-79 (length on request)
- Shielded cable, M12 5-pin male connector/open end, IP65
  - CMX-81 (3 m), CMX-89 (length on request)

### Connector
- M12 5-pin connector for connecting open end cables
- M12 8-pin connector for connecting open end cables
- M12 5-pin connector for connecting open end cables
- M12 8-pin connector for connecting open end cables
- 5-pin Y-splitter cable with M12 connector to 2 x M12 female connectors
- 5 x protection caps for M12 connector (4 x female, 1 x male)

### Screw connector binders for voltage supply: 3-pin binder, 5.08 mm grid
- SMX-10: 1-row screw connector, included in the delivery content
- SMX-11: 2-row screw connector
- SMX-12: 2-row spring-cage connector

### Screw connector binders for trigger/synchro
- SMX-20: 3-pin binders, 5.08 mm grid, included in the delivery content

### Options / Mounting
- MX-Clip: 2 clips for DIN-rail mounting or for direct mounting on units.
- MX-Rail: Assembly equipment for DIN-rail mounting. Please specify when ordering.
- MX-Screw: Assembly equipment for direct mounting on machines

### Options / Protection caps
- PCMX-10: 5 x protection caps for M12 connector (4 x female, 1 x male)
- PCMX-11: 10 x protection caps for M18 connector
- PCMX-12: 1 protection cap for M23 connector
- PCMX-13: 10 x protection caps for M12 connector
<table>
<thead>
<tr>
<th>Analog I/O</th>
<th>Analog input</th>
<th>Analog output</th>
<th>Temp. measurem.</th>
<th>Pressure measurem.</th>
<th>Acquisition of dynamic signals</th>
<th>Length measurement</th>
<th>Serial interfaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSX-E312</td>
<td>MSX-E3011</td>
<td>MSX-E3027</td>
<td>MSX-E3511</td>
<td>MSX-E3211</td>
<td>MSX-E3311</td>
<td>MSX-E3601</td>
<td>MSX-E7511</td>
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<td>✓</td>
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Intelligent Ethernet systems
The intelligent Ethernet digital I/O system MSX-E1516 has 8 x 2 digital lines, 24 V, which can be parameterised as pairs of inputs or outputs. The function is displayed through DUAL LEDs. The system has an event logic for the inputs and the output: a datagram can be generated at status change. The systems can be freely cascaded and synchronised in the µs range. You can thus acquire data from several systems at the same time. The ARM®9 processor allows the system to perform calculations. The timer function can generate a synchro trigger signal in order to start the acquisition, e.g. of analog measurement values on another system.

**Features**
- Watchdog for resetting the outputs to "0"
- At Power-On the outputs are set to "0"
- 64 MB onboard SDRAM for storing data
- Robust normed 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
- All inputs are filtered (software configuration)
- Short-circuit protection
- Overvoltage protection 30 V
- Electronic fuse

**Applications**
- PLC coupling
- Signal switching
- Acquisition and monitoring of machine operating time

**Interfaces**
- Fast 24 V trigger input
- Ethernet switch with 2 ports
- Synchronisation/Trigger In/Out
- 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

**Software**
- Direct access via SOAP (TCP/IP), WSDL files
- Direct access via Modbus TCP and Modbus (UDP)
- Programming examples .net2005, VC++ 6.0
- On request: LabVIEW from 8.5, Linux
- Instruction manual for connecting a PLC (SIMATIC® S7®)
- Driver download: www.addi-data.com, download menu

**Synchronisation**

Ethernet, synchronisation and supply signals can be looped from one system to the next. In this way, you can acquire and process distributed I/O signals directly at production machines. The timer function can generate a synchro trigger signal in order to start the acquisition, e.g. of analog measurement values on another MSX-E system.
Specifications

Digital inputs
Number of inputs: 16, 2 per 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 MΩ
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: 16, 2 per 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
Supply voltage: 18-30 V
Current (max.): 1.85 A typical for 8 channels through PTC at 20 °C
Output current per output: 500 mA max.
Short-circuit current per output: 1.7 A max.
  Shut-down logic at 24 V, R_{load} = 10 mΩ
RDS ON resistance: 280 mΩ max.
Switch-on time: 100 µs max.
  PTC at 20 °C, RL = 48 Ω
Switch-off time: 150 µs max.
  PTC at 20 °C, RL = 48 Ω
Overtemperature (shutdown): 135 °C max. (output driver)
Temperature hysteresis: 15 °C typ. (output driver)
Diagnostics: Common diagnostic bit for all 16 channels at overtemperature of one channel

Supply voltage, Ethernet, Trigger, Synchro

The specifications for the voltage supply, Ethernet, Trigger, Synchronisation and Electromagnetic Compatibility apply to all MSX-E systems. See page 22.

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

Ordering information
MSX-E1516, MSX-E1516-NPN, MSX-E1516-5V-Input
Ethernet digital I/O system, 16 digital inputs/outputs, 24 V, with event logic. Incl. technical description and software drivers.

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

Features
Status LEDs
DUAL LEDs for digital I/O
2 x Ethernet
16 digital I/O, 24 V
M12 female connector, 5-pin
2 x Trigger/Synchronisation IN/OUT
2 x voltage supply, 24 V IN/OUT optically isolated

Simplified block diagram

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
The intelligent Ethernet multifunction counter systems MSX-E1701, MSX-E1711 and MSX-E1721 have 4 counter inputs for incremental or sin/cos encoders (1 V_pp or 11 µA_ips) as well as 16 digital inputs and outputs, 24 V.

The systems can be freely cascaded and synchronised in the µs range. You can thus acquire data from several systems at the same time. The ARM®9 processor allows the system to perform calculations. The compare logic of the counter or the timer function can generate a synchro trigger signal in order to start the acquisition, e.g. of analog measurement values on another system.

Applications
- Event counting
- Position acquisition
- Signal switching
- PLC coupling
- Output of PWM signals
- Process monitoring
- Position-related acquisition of sensors signals

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

Counter
- M23 female connector, 12-pin (incremental, sin/cos 1 V_pp) or 9-pin (sin/cos 11 µA_ips)
- Optical isolation 1000 V
- 4 x 32-bit incremental counter inputs for the acquisition of incremental encoders (MSX-E1701), inputs in RS422 or 24 V available
- 4 x 32-bit sin/cos counter inputs for the acquisition of encoders with 1 V_pp (MSX-E1711) or 11 µA_ips (MSX-E1721) signals
- Counting frequency 5 MHz (MSX-E1701), 250 kHz (MSX-E1711 and MSX-E1721)
- Supply voltage of the incremental encoders through the M23 connector: 24 V or 5 V, protective filters
- Single, double, quadruple edge analysis, direct mode up/down counter
- A, B (incremental signal inputs), C (index signal input) and D (ref.) signals
- Compare logic
- Status LEDs for incremental counter input A/B

Digital
- 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"

Safety features
- Status LEDs for fast error diagnostics
- Optical isolation 1000 V
- Overtemperature and reverse voltage protection
- Internal temperature monitoring
- Input filter • Short-circuit protection
- Overvoltage protection 30 V

Interfaces
- Fast 24 V trigger input
- Ethernet switch with 2 ports
- Synchronisation/Trigger In/Out
- 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

Software
- Software drivers for Windows 7 (32-bit)/Vista™ (32-bit)/XP2000. On request: Windows 7 (64-bit), Linux
- Direct access via SOAP (TCP/IP), WSDL files
- Direct access via Modbus TCP and Modbus (UDP)
- Programming examples.net2005, VC++ 6.0 on request: LabVIEW from 8.5, Linux
- Instruction manual for connecting a PLC (SIMATIC® S7*)

Driver download: www.addi-data.com, download menu
Specifications

Incremental counter inputs (MSX-E1701)

- Number of inputs: 4 incremental counter inputs each with A, B, C and D signals
- 5V inputs (Version MSX-E1701)
  - Differential inputs: Complies with the EIA standards, RS422A
  - Input type: Differential inputs or TTL
  - Common mode range: +12.7 to -7 V
  - Input sensitivity: ± 200 mV
  - Input hysteresis: 50 mV typ.
  - Input impedance: 12 kΩ min.
  - Max. input frequency: 5 MHz
  - Open circuit fail safe receiver design
  - Max. input frequency: 5 MHz

- 24 V inputs (Version MSX-E1701-24)
  - 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 MΩ
  - Logic input levels: UH (max.) = 30 V typ.
  - Input voltage: 0 to 30 V
  - Input impedance: > 1 MΩ

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

Features

- 2 x Ethernet
- 2 x Trigger/Synchronisation IN/OUT
- 2 x voltage supply, 24 V IN/OUT optically isolated
- Status LEDs
- DUAL LEDs for digital I/O
- 16 digital I/O, 4 V
- M12 5-pin female connector
- MSX-E1701, 4 incremental counter inputs:
  - M23 12-pin female connector
  - MSX-E1711 / MSX-E1721
  - 4 sin/cos inputs: 1 Vpp or 11 µAtyp ; M23 female connector, 12-pin (1 Vpp) or 9-pin (11 µA)

Simplified block diagram

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 and software drivers.

Versions

- MSX-E1701:
  - 5 V RS422 incremental counter inputs
- MSX-E1701-24V:
  - 24 V incremental counter inputs
- MSX-E1711:
  - Sin/cos inputs, 1 Vpp
- MSX-E1721:
  - Sin/cos inputs, 11 µA

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/open end 65

- Trigger/Synchr
  - 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

Options

- S7 Modbus TCP Client Library for 57: Easy use of the Ethernet systems MSX-E with PLCs
- MSX-E E-SV-Trigger: Level change of the trigger inputs and outputs to 5 V
- MSX-Clip, MX-Rail (Please specify when ordering)
- MSX-Screw, PCMX-1x

Phone: +49 7229 1847-0 Fax: +49 7229 1847-222 info@addi-data.com www.addi-data.com
**Features**

- 24 V digital trigger input
- ARM® 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 connector
- 4 x EnDat counter inputs for the acquisition of EnDat encoders
- Max. clock frequency 4.5 MHz
- Supply voltage of the EnDat encoders via M12 female connector: 5 V ±10%
- Output of the values as raw value or position value (mm or °)
- 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 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.
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, frequency depends on the subsequent electronics
- 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
- 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, 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.

*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-E1731:**
- Change of IP address
- View 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

- **2 x Ethernet**
- **2 x Trigger/Synchronisation IN/OUT**
- **2 x voltage supply, 24 V IN/OUT, optically isolated**
- **4 EnDat 2.2 inputs: B pin M12 female connector**

### Simplified block diagram

#### Cascading

Combination possibilities:
- Several MSX-E of the same type: acquisition of a large number of channels
- Different types of MSX-E systems: combination of different functions

### ADDI-DATA connection technology

*Preliminary product information*
**Counter inputs**

| Input type | EnDat 2.2 |
| Differential inputs: | Complies with the EIA standards RS422A |
| Common mode range: | ±12 ± 7 V |
| Input sensitivity: | ± 200 mV |
| Input impedance: | 12 kHz min. |
| Max. input frequency: | ± MHz |
| ESD protection: | Up to ±15 kV |

| Clock frequencies: | 4500 kHz |
| | 2500 kHz |
| | 1500 kHz |
| | 900 kHz |
| | 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 solution: | 1000 V through opto-couplers |
| Nominal voltage: | 24 VDC |
| Input voltage: | from 0 to 30 V |
| Input impedance: | > 1 MΩ min. |

**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 |
| Overvoltage protection: | 30 V |
| Optical solution: | 1000 V through opto-couplers |
| Nominal voltage: | 24 V |
| Supply voltage: | 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.
- Shut-down logic at 24 V, Rload=10mΩ

**RDS ON resistance:**

- 280 mΩ max.

**Switch on time:**

- 110 μs
- max. RL=48 Ω from 80 % Vout

**Switch off time:**

- 150 μs
- 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 bis 65535

**Supply voltage, Ethernet, Trigger, Synchro**

The specifications for the voltage supply, Ethernet, Trigger, Synchronisation and Electromagnetic Compatibility apply to all MSX-E systems. See page 27.

**System features**

- Interface: Ethernet acc. to specification IEEE802.3
- Dimensions (mm): 215 x 110 x 54
- 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 female connector M12
- Counter inputs: 4 x 8-pin female connector M12

**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: CATSE cable, M12 D-coded male connector/RJ45 connector
- CMX-7x: For cascading: CATSE 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

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*Preliminary product information*
**Features**

- 24 V digital trigger input
- ARM® 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

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**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.

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**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
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.

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.

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
- View of web interface
- Firmware update
- Save/load system configuration
- Save/load channel configuration
- Monitoring the analog inputs/outputs

**Features**

- **Status LEDs**
- **2 x Ethernet**
- **2 x Trigger/Synchronisation IN/OUT**
- **2 x Voltage supply 24 V IN/OUT, optical isolated**
- **6 analog inputs, differential, 24-bit, M12 female connector, 4-pin.**
- **16 digital inputs and 16 digital outputs, 24 V, 37-pin D-Sub male connector**
- **4 analog outputs, 16-bit, M12 female connector, 5-pin**

**Simplified block diagram**

**Cascading**

Combination possibilities:
- Several MSX-E of the same type: acquisition of a large number of channels
- Different types of MSX-E systems: combination of different functions

**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:** ± 10 V, ± 1 V, ± 100 mV, ± 10 mV (24-bit), 0-10 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, sync, 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 (±10 V), 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:** OFF (max) 30 V typ., OFF (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. IEC 1131-2
- **Nominal voltage:** 24 V
- **Supply voltage:** 11 – 36 V
- **Output current per output:** 150 mA max.
- **Diagnostics:** Common diagnostic bit for 16 channels at overtemperature of one channel

### 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**
- **MSX-E3121-6-4:** 4 voltage outputs
- **MSX-E3121-6-4C:** 2 voltage outputs, 2 current outputs

**Connection Cables**
- **Voltage supply:** CMX-2x: Shielded cable, M12 5-pin female connector/open end, IP 65
- **Trigger/Synchro:** CMX-4x: Shielded cable, M12 5-pin female connector/open end, IP 65
- **Ethernet:** CMX-6x: CAT5E cable, M12 D-coded male connector/RJ45 connector

**Connection to Peripherals**
- **CMX-8x:** Shielded cable, M12 5-pin male connector/open end, IP 65
- **ST010:** Standard round cable, shielded, twisted pairs, 2m
- **PX901-DG:** Screw terminal panel 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
- **MX-Clip, MX-Rail, MX-Screw, PCMX-1x:** (Please specify when ordering)

---

**Supply Voltage, Ethernet, Trigger, Synchro**
The specifications for the voltage supply, Ethernet, Trigger, Synchronisation and Electromagnetic Compatibility apply to all MSX-E systems. See page 27.

**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. ± 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

---

**Analog Inputs**
- Number of inputs: 6, A/D converter per channel
- Resolution: 24-bit
- Optical isolation: 1000 V
- Input ranges: ± 10 V, ± 1 V, ± 100 mV, ± 10 mV (24-bit), 0-10 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, sync, 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 (±10 V), 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: OFF (max) 30 V typ., OFF (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. IEC 1131-2
- Nominal voltage: 24 V
- Supply voltage: 11 – 36 V
- Output current per output: 150 mA max.
- Diagnostics: Common diagnostic bit for 16 channels at overtemperature of one channel
The intelligent Ethernet analog input system MSX-E3011 has 16 differential analog inputs, 16-bit, with a sampling frequency of 25 kHz/channel. The systems can be freely cascaded and synchronised in the µs range. You can thus acquire data from several systems at the same time. The ARM® processor allows the system to perform calculations.

**Features**

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

**Analog inputs**

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

**Acquisition modes:**

- Auto-refresh mode: Automatic update of the acquired data in the background
- Sequence mode: Data acquisition in “packages”
- Acquisition triggered through trigger or synchro input

**Safety features**

- Status LEDs for fast error diagnostics
- Optical isolation 1000 V • Input filters
- Overvoltage protection ± 40 V
- Internal temperature monitoring

**Applications**

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

**Interfaces**

- Fast 24 V trigger input
- Ethernet switch with 2 ports
- Synchronisation/trigger In/Out
- 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

**Software**

- Direct access via SOAP (TCP/IP), WSDL files
- Direct access via Modbus TCP and Modbus (UDP)
- Programming examples .net2005, VC++ 6.0
- On request: LabVIEW from 8.5, Linux
- Instruction manual for connecting a PLC (SIMATIC® S7®)

Driver download: www.addi-data.com, download menu

**Synchronisation**

Ethernet, synchronisation and supply signals can be looped from one system to the next. In this way, you can acquire and process distributed I/O signals directly at production machines.
Specifications

**Analog inputs**
- Number/type: 16 differential inputs
- Architecture: 4 groups with 4 channels each
- Resolution: ±1.221 mV typ. (±4 LSB)
- Accuracy: ±2.442 mV max.
- Relative precision (NLX): ±0.3 LSB max. (NLX)
- Optical isolation: 1000 V
- Input ranges: ±5 V, ±10 V software-programmable, current input optional
- Input frequency: 25 kHz per channel / 100 kHz max.
- Gain: ±1, ±2, software-programmable
- Common mode rejection: 80 dB min. Dc, up to 60 Hz (diff. amplifier)
- Input impedance (PGA): 10\(^9\) Ω / 10 nF against GND
- Bandwidth (-3 dB): 160 kHz limited through 16 DAC filters
- Trigger: Digital input, synchro, software-programmable
- Offset error: ±1.221 mV typ. (±305 µV)
- Gain error: ±2.5 LSB
- Temperature drift: ±2.3 x V\(_{\text{in}}\) + 22.5 (µV / °C) typ.
- In the temperature range: from -40 °C to +85 °C 4.5 ppm/°C FSR

**Supply voltage, Ethernet, Trigger, Syncro**
- The specifications for the voltage supply, Ethernet, Trigger, Synchronisation and Electromagnetic Compatibility apply to all MSX-E systems. See page 22.

**System features**
- Interface: Ethernet acc. to specification IEEE802.3
- Dimensions (mm): 215 x 110 x 51
- Weight: 850 g
- Degree of protection: IP 65
- Current consumption at 24 V: 180 mA
- Operating temperature: -40 °C to +85 °C
- Connectors for sensors:
  - For analog inputs: 16 x 5-pin M12 female connector

**MSX-E3011**
- Ethernet analog input system, 16 analog inputs, diff., 16-bit. Incl. technical description and software drivers.

**Features**
- Status LEDs
- 2 x Ethernet
- 2 x Trigger/Synchronisation
- IN/OUT
- 2 x voltage supply, 24 V, IN/OUT, optically isolated

**Simplified block diagram**

**Ordering information**

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

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Phone: +49 7229 1847-0   Fax: +49 7229 1847-222   info@addi-data.com
## 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 each 100 kHz
- 4 GB extended memory
- Buffered real-time clock
- 24 V digital trigger input

### Features
- Onboard ARM®9 32-bit processor
- 4 GB memory, data remains stored at power loss
- Buffered real-time clock, keeps the system time even without supply voltage
- Robust normed metal housing
- Power Save Mode: Reduced power consumption when no acquisition runs

#### Analog inputs
- 16 differential inputs, 16-bit, 5-pin M12 female connectors
- Sampling frequency max. 100 kHz, up to 4 simultaneous channels
- Input ranges: ±5 V, ±10 V (16-bit), 0-5 V, 0-10 V (15-bit)
- Current inputs optional

#### Acquisition modes:
- Auto-refresh mode: Automatic update of the acquired data in the background
- Sequence mode: Data acquisition in “packages”
- Acquisition triggered through trigger or synchro input

### Safety features
- LED status display for fast error diagnostics
- Optical isolation • Input filters
- Overvoltage protection ± 40 V
- Internal temperature monitoring

### Applications
- Industrial process control and measurement
- Multichannel data acquisition • Factory automation
- Long-term measurement • Remote diagnosis

### Interfaces
- Fast 24 V trigger input
- Ethernet switch with 2 ports
- Synchronisation/trigger In/Out
- 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

### Software:
- On request: Windows 7 (64-bit), Linux
- Direct access via SOAP (TCP/IP), WSDL files
- Direct access via Modbus TCP and Modbus (UDP)
- Programming examples .net2005, VC++ 6.0
- On request: LabVIEW from 8.5, Linux
- Instruction manual for connecting a PLC (SIMATIC® S7®)

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### Synchronisation
Ethernet, synchronisation and supply signals can be looped from one system to the next. In this way, you can acquire and process distributed I/O signals directly at production machines.
## Specifications

### Analog inputs
- **Number/type:** 16 differential inputs
- **Architecture:** 4 groups with 4 channels each
- **Resolution:** 16-bit, SAR ADC
- **Accuracy:** ± 1.221 mV typ. (± 4 LSB)
- **Common mode rejection:** 80 dB min., DC up to 60 Hz (diff. amplifier)
- **Gain:** x1, x2, x10, x20, x100, x200, x1000, x2000, software-programmable
- **Bandwidth (-3 dB):** 160 kHz limited through IF filters
- **Trigger:** Digital input, synchro, software-programmable
- **Offset error:** ± 1.221 mV typ.
- **Temperature drift:** ± 2.3° C per °C (± 305 µV)
- **Gain error:** ± 2.3° C per °C
- **Relative precision (INL):** ± 3 LSB max. (ADC)
- **Optical isolation:** 1000 V

### Data storage
- **RAM:** 64 MB
- **FLASH:** 4 MB for system data
- **Extended FLASH memory:** 4 GB
- **Buffered real-time clock:** approx. 4 weeks at 20 °C

### Energy supply
- **Voltage supply:** 24 V IN/OUT, optically isolated
- **Input ranges:** ± 5 V, ± 10 V
- **Common mode rejection:** 80 dB min., DC up to 60 Hz (diff. amplifier)
- **Input impedance (PGA):** 10^9 Ω / 10 nF against GND
- **Bandwidth (-3 dB):** 160 kHz limited through IF filters

### System features
- **Interface:** Ethernet acc. to specification IEEE802.3
- **Dimensions (mm):** 215 x 110 x 50
- **Weight:** 850 g
- **Degree of protection:** IP 65
- **Current consumption at 24 V:** 180 mA
- **Operating temperature:** -25 °C to +85 °C (-40 °C to +85 °C on request)
- **Connectors for sensors:** B x 5-pin M12 female connector

### Ordering information

**MSX-E3021**
- Ethernet analog input system, 16 analog inputs, diff., 16-bit, incl. technical description and software drivers.

#### 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/Synchronisation**
  - **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 with one 4-channel multiplexer per converter

- **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

---

*Preliminary product information*
The intelligent Ethernet analog input system MSX-E3027 has 16 differential analog inputs, 16-bit, with a sampling frequency of 25 kHz/channel.

In addition to a buffered real-time clock which keeps the system time even at power loss, the MSX-E3027 has an extended 4 GB memory for storing the measured values. It is therefore ideal for long-term measurement. The systems can be freely cascaded and synchronised in the µs range. You can thus acquire data from several systems at the same time. The ARM®9 processor allows the system to perform calculations. The high degree of protection (IP 67) combined with the extended operating temperature and the stainless steel housing allow to use this system in very harsh conditions.

Features
- Onboard ARM®9 32-bit processor
- 4 GB memory, data remains stored at power loss
- Buffered real-time clock, keeps the system time even without supply voltage
- Robust normed metal housing
- Power Save Mode: Reduced power consumption when no acquisition runs

Analog inputs
- 16 diff. inputs, 16-bit, 5-pin M12 female connectors
- Sampling frequency max. 100 kHz, up to 4 simultaneous channels
- Input voltage: ±5 V, ±10 V (16-bit), 0-5 V, 0-10 V (15-bit)
- Gain PGA x1, x2, x10, x20, x100, x200, x1000, x2000 programmable with software
- Signals up to +/-5mV (16-bit) possible
- Current inputs optional

Acquisition modes:
- Auto-refresh mode: Automatic update of the acquired data in the background
- Sequence mode: Data acquisition in "packages"
- Acquisition triggered through trigger or synchro input

Safety features
- LED status display for fast error diagnostics
- Optical isolation + Input filters
- Overvoltage protection ± 40 V
- Internal temperature monitoring

Applications
- Industrial process control and measurement
- Factory automation
- Long-term measurement • Remote diagnosis

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

Synchronisation
Ethernet, synchronisation and supply signals can be looped from one system to the next. In this way, you can acquire and process distributed I/O signals directly at production machines.
**Intelligent Ethernet systems, analog – MSX-E3027**

### Specifications

**Analog inputs**

- **Number/type**: 16 differential inputs
- **Architecture**: 4 groups with 4 channels each
- **Resolution**: 16-bit, SAR ADC
- **Accuracy**: ± 1.221 mV typ. (± 4 LSB)
- **Relative precision (max.)**: ± 3 LSB max. (DNL)
- **Optical isolation**: 1000 V
- **Input ranges**: ± 5 V, ± 10 V (16-bit), ± 5 V to 10 V (15-bit)
- **Input frequency**: 25 kHz per channel, 100 kHz max
- **Gain**: x1, x2, x10, x20, x100, x200, x1000, x2000
- **Common mode rejection**: 80 dB min. DC up to 60 Hz (diff. amplifier)
- **Input impedance (PGA)**: 10\(^9\) Ω // 10 nF against GND
- **Bandwidth (-3 dB)**: 160 kHz limited through TP filters
- **Gain error**: ± 2.5 LSB
- **Temperature drift**: ± 2.3 x V\(_{in}\) + 22.5 (µV / °C) typ.
- **Input ranges**: ± 5 V, ± 10 V, ± 15 V (15-bit)

### Data storage

- **RAM**: 64 MB
- **FLASH**: 4 MB for system data
- **Extended FLASH memory**: 4 Gb (1.7 Gb for measured data)
- **Buffered real-time clock**: approx. 4 weeks at 20 °C

### Supply voltage, Ethernet, Trigger, Synchronisation

The specifications for the voltage supply, Ethernet, Trigger, Synchronisation and Electromagnetic Compatibility apply to all MSX-E systems. See page 22.

### 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
- **Connectors for sensors**

| Analog inputs | 8 x 5-pin M12 female connector |

### Ordering information

**MSX-E3027**

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

**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/Synchronisation**: CMX-4x: Shielded cable, M12 5-pin female connector/male connector, 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**

*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 display of various signal curves such as sine curves, sawtooth curves, etc - selectable for each channel

24 V trigger input

---

The intelligent Ethernet analog output system MSX-E3511 has 8 analog outputs with a 16-bit resolution. The systems can be freely cascaded and synchronised in the µs range. You can thus acquire data from several systems at the same time. The ARM®9 processor allows the system to perform calculations.

**Features**

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

**Analog outputs**

- 8 analog outputs, 16-bit, each configurable as voltage or current output
- Output voltage 0-10 V, ± 10 V
- Current outputs 0-20 mA
- Output voltage after reset 0 V
- M12 female connector, 5-pin
- Output mode/operation mode: Data output per software function, trigger input or synchro output

**Function generator**

- Display of various signal curves such as sine curves, sawtooth curves, ...
- Maximum of 8 channels (independent of one another)
- Applicable without programming knowledge, e.g. via CSV files or mathematical functions such as f(x) = sin(x)

**Safety features**

- LED status display for fast error diagnostics
- Optical isolation
- Diagnostic possible at short-circuits (voltage mode)

---

**Synchronisation**

Ethernet, synchronisation and supply signals can be looped from one system to the next. In this way, you can acquire and process distributed I/O signals directly at production machines.

---

**Applications**

- Industrial process control and regulation
- Output of different geometrical signals

**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

**Software**

  On request: Windows 7 (64-bit), Linux
- Direct access via SOAP (TCP/IP), WSDL files
- Direct access via Modbus TCP and Modbus (UDP)
- Programming examples .net2005, VC++ 6.0
  on request: LabVIEW from 8.5, Linux
- Instruction manual for connecting a PLC (SIMATIC® S7®)

Driver download: www.addi-data.com, download menu

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**More information at**

www.addi-data.com
**Specifications**

<table>
<thead>
<tr>
<th>Analog outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of outputs: 8</td>
</tr>
<tr>
<td>Resolution: 16-bit (bipolar)</td>
</tr>
<tr>
<td>Optical isolation: 1000 V</td>
</tr>
<tr>
<td>Output range: Voltage output: 0-10 V (±10 V)</td>
</tr>
<tr>
<td>Output velocity: Voltage version: max. 40 kHz</td>
</tr>
<tr>
<td>Overvoltage protection: ±14 V</td>
</tr>
<tr>
<td>Output current/load: Voltage output: 0 mA, min. 880 Ω</td>
</tr>
<tr>
<td>Short-circuit current: Voltage output: ±20 mA</td>
</tr>
<tr>
<td>Output value after reset: 0 V, voltage output, without calibration</td>
</tr>
<tr>
<td>1 watchdog (programmable): 16-bit, 1 µs up to 65535 µs</td>
</tr>
</tbody>
</table>

**Supply voltage, Ethernet, Trigger, Synchronro**

The specifications for the voltage supply, Ethernet, Trigger, Synchronisation and Electromagnetic Compatibility apply to all MSX-E systems. See page 22.

**System features**

| Interface: Ethernet acc. to specification IEEE802.3 |
| Dimensions (mm): 154 x 110 x 50 |
| Weight: 420 g |
| Degree of protection: IP 65 |
| Current consumption: 150 mA ± 10 % typical in idle / power save |
| Operating temperature: -40 °C to +85 °C |

**Connectors for sensors**

| Analog outputs: 8 x 5-pin M12 female connector |

**Features**

- 8 analog outputs, 16-bit, M12 female connector, 5-pin
- 2 x voltage supply, 24 V, IN/OUT, optically isolated
- 2 x Trigger/Synchronisation IN/OUT
- 2 x Ethernet

**Ordering information**

MSX-E3511 / MSX-E3511-C

Ethernet analog output system (voltage and/or current), 8 analog outputs, 16-bit. Incl. technical description and software drivers.

**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/Synchronro**

- 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 SV-Trigger: Level change of the trigger inputs and outputs to 5 V
- MX-Clip, MX-Rail (Please specify when ordering!), MX-Screw, PCMX-1x
The intelligent Ethernet system MSX-E3211 has 8 or 16 differential inputs for thermocouples or resistance temperature detectors (RTD, Pt100/Pt1000). The systems can be freely cascaded and synchronised in the μs range. You can thus acquire data from several systems at the same time. The ARM®9 processor allows the system to perform calculations.

**Features**
- 64 MB onboard SDRAM for storing data
- Onboard ARM®9 32-bit processor
- Robust normed metal housing
- Power Save Mode: Reduced power consumption when no acquisition runs

**Analog inputs**
- M12 8-pin female connector
- 16/8 differential inputs for thermocouples or RTD, 24-bit
- Sampling frequency max. 788 Hz/Kanal (max. 8/4 channels simultaneously)
- Auto gain: Optimal adjustment of the gain to the measuring range

**Acquisition modes:**
- Auto-refresh mode: Automatic update of the acquired data in the background
- Sequence mode: Data acquisition in “packages”
- Acquisition triggered through trigger or synchro input

**Safety features**
- LED status display for fast error diagnostics
- Optical isolation 1000 V
- Internal temperature monitoring

**Norms**
- Vibrations (sinusoidal): IEC 60068-2-6
- Shock: IEC 60068-2-27

**Applications**
- Industrial temperature monitoring in the steel industry
- Remote diagnosis

**Interfaces**
- Fast 24 V trigger input
- Ethernet switch with 2 ports
- Synchronisation/trigger In
- 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

**Software**
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- Instruction manual for connecting a PLC (SIMATIC® S7®)

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**Ethernet, synchronisation and supply signals can be looped from one system to the next. This way, you can acquire and process distributed I/O signals directly at production machines.**

**System 1**
- e.g. temperature acquisition

**System 2**
- e.g. digital I/O
Specifications

Analog inputs
- Number of inputs: 16 or 8 differential inputs for thermocouples or RTD
- 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

Supply voltage, Ethernet, Trigger, Synchro
- The specifications for the voltage supply, Ethernet, Trigger, Synchronisation and Electromagnetic Compatibility apply to all MSX-E systems. See page 22.

System features
- Interface: Ethernet acc. to specification IEEE802.3
- Dimensions (mm): 220 x 140 x 50
- Weight: 920 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 or 4 x 8-pin M12 female connector

Analog inputs
- Number of inputs: 16 or 8 differential inputs for thermocouples or RTD
- 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

Ethernet system for temperature measurement, 16/8 channels for thermocouples or RTD, 24-bit. Incl. technical description and software drivers.

Versions
- MSX-E3211-TC-16: for 16 thermocouples
- MSX-E3211-TC-8: for 8 thermocouples
- MSX-E3211-RTD-16: for 16 RTD
- MSX-E3211-RTD-8: for 8 RTD

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

Features

Simplified block diagram

Ordering information

MSX-E3211
Ethernet system for temperature measurement, 16/8 channels for thermocouples or RTD, 24-bit. Incl. technical description and software drivers.

Versions
- MSX-E3211-TC-16: for 16 thermocouples
- MSX-E3211-TC-8: for 8 thermocouples
- MSX-E3211-RTD-16: for 16 RTD
- MSX-E3211-RTD-8: for 8 RTD

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/Synchronisation
- IN/OUT
- Sync In
- Sync Out
- Trigger Out

Temperature input 0/1
- Temperature input 14/15

Processor
- FPGA
- Processor Status LED

Ethernet
- Port 0
- Port 1
- Ethernet Link / ACT LEDs
- Ethernet switch

Power Good LED
- Energy supply

Status LEDs
- 2 x Ethernet
- 16/8 differential inputs for temperature measurement, 8-pin M12 female connector
- 2 inputs / connector
- 1 x voltage supply, 1 x voltage for cascading

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

Phone: +49 7229 1847-0 info@addi-data.com
Fax: +49 7229 1847-222 www.addi-data.com

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Ethernet system for pressure measurement
16/8 channels for strain gauges, 24-bit

The intelligent Ethernet system MSX-E3311 has 8 or 16 differential inputs for strain gauges.
The systems can be freely cascaded and synchronised in the µs range. You can thus acquire data from several
systems at the same time.
The ARM®9 processor allows the system to perform calculations.

Features
- 64 MB onboard SDRAM for storing data
- Onboard ARM®9 32-bit processor
- Robust normed metal housing
- Power Save Mode: Reduced power consumption when no acquisition runs

Strain gauges inputs
- M12 8-pin female connector
- 16/8 differential inputs, 24-bit
- Sampling frequency max. 788 Hz/Kanal (max. 8/4 channels simultaneously)
- Auto gain: Optimal adjustment of the gain to the measuring range
- Voltage supply for the sensors 10 V, 50 mA

Acquisition modes:
- Auto-refresh mode: Automatic update of the acquired data in the background
- Sequence mode: Data acquisition in „packages“
- Acquisition triggered through trigger or synchro input

Safety features
- LED status display for fast error diagnostics
- Optical isolation 1000 V
- Internal temperature monitoring

Applications
- Industrial pressure and lengths measurement
- Weighing cells evaluation
- Industrial process control
- Industrial measurement and monitoring
- Remote diagnosis

Interfaces
- Fast 24 V trigger input
- Ethernet switch with 2 ports
- Synchronisation/trigger In
- 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

Software:
- Direct access via SOAP (TCP/IP), WSDL files
- Direct access via Modbus TCP and Modbus (UDP)
- Programming examples .net2005, VC++ 6.0, on request: LabVIEW from 8.5, Linux
- Instruction manual for connecting a PLC (SIMATIC® S7®)

Driver download: www.addi-data.com, download menu

Synchronisation
Ethernet, synchronisation and supply signals can be looped from one system to the next. In this way, you can acquire and process distributed I/O signals directly at production machines.
### Intelligent Ethernet systems, analog – MSX-E3311

**Inputs for strain gauges**
- Number of inputs: 16 or 8 differential inputs for strain gauges
- 2 inputs for each M12 connector

**Optical isolation:** 1000 V

**Throughput:**
- max. 788 Hz for 1 channel,
- max. 528 Hz for 2 channels

**Voltage supply for the sensors:** 10 V, 50 mA

### 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 x 8-pin M12 female connectors

### Specifications

- **Inputs for strain gauges**
  - Number of inputs: 16 or 8 differential inputs for strain gauges
  - 2 inputs for each M12 connector
- **Optical isolation:** 1000 V
- **Throughput:**
  - max. 788 Hz for 1 channel,
  - max. 528 Hz for 2 channels
- **Voltage supply for the sensors:** 10 V, 50 mA

### Features

#### Status LEDs
- 2 x Ethernet
- Trigger/Synchronisation IN/OUT
- 1 x voltage supply
- 1 x voltage supply for cascading

#### 16/8 differential inputs for strain gauges,
- 8-pin M12 female connectors
- 2 inputs / connector

### Simplified block diagram

- **Optical isolation 1000 V**
- **Temperature monitoring**
- **Processor Status LED**
- **FPGA control logic**
- **Processor**
- **FLASH**
- **DRAM**
- **Power Good LED**
- **Energy supply**
- **24 V supply**
- **Output line**
- **Input line**

#### Ethernet switch
- **Ethernet Port 0**
- **Ethernet Port 1**
- **Ethernet Link / ACT LEDs**
- **MI Interface**

#### Options

- **Trigger/Synchronro**
  - 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

#### Ordering information

**MSX-E3311**
- Ethernet system for pressure measurement, 16/8 channels for strain gauges, 24-bit. Incl. technical description and software drivers.

**Versions**
- MSX-E3311-16: for 16 strain gauges
- MSX-E3311-8: for 8 strain gauges

**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

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*Preliminary product information*
Ethernet system for the acquisition of dynamic signals
8 SE/diff. inputs, 24-bit, simultaneous acquisition

MSX-E3601
8 SE/diff. inputs, simultaneous acquisition
8 current sources for ICP sensors
Fast distributed data acquisition
24 V digital trigger input
Onboard calibration

The intelligent Ethernet system MSX-E3601 for the acquisition of dynamic signals has 8 SE/diff. 24-bit analog inputs, and 8 integrated current sources for ICP sensors. The systems can be freely cascaded and synchronised in the µs range. You can thus acquire data from several systems at the same time.

The ARM®9 processor allows the system to perform calculations. The system is used in noise and vibration measurement applications.

**Features**
- Synchronisation of several systems
- 64 MB onboard SDRAM for storing data
- Onboard ARM®9 32-bit processor
- Robust normed metal housing

**Analog inputs**
- BNC connectors
  - Inner conductor for positive input
  - Outer conductor for negative input (diff.) or GND (SE)
- 8 SE or diff. Inputs
- AC/DC coupling
- Sampling frequency up to 128 kHz
- Gain x1, x10, x100
- Anti-aliasing filter
- One A/D converter per channel: simultaneous sampling on all analog inputs
- 24-bit resolution
- DC and AC specification
- Input ranges:
  - SE
    - ± 10 V
  - Diff.
    - ± 5 V
  - Gain
    - x1
    - ± 1 V
    - ± 0.5 V
    - ± 0.1 V
    - x10
    - ± 0.05 V
    - x100

**Current sources**
- 8 current sources for the direct connection of ICP™ sensors (Integrated Circuit Piezoelectric)
- 4 mA typ., 24 V max.

**Acquisition modes**
- Auto-refresh mode: Automatic update of the acquired data in the background
- Sequence mode: Data acquisition in „packages”
- Acquisition triggered through trigger or synchro input

**Safety features**
- LED status display for fast error diagnostics
- Optical isolation
- Input filters
- Overvoltage protection
- Internal temperature monitoring

**Interfaces**
- Fast 24 V trigger input
- Ethernet switch with 2 ports
- Synchronisation/trigger In/Out
- 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

**Software**
- Direct access via SOAP (TCP/IP), WSDL files
- Direct access via Modbus TCP and Modbus (UDP)
- Programming examples .net2005, VC++ 6.0
- Programming examples LabVIEW from 8.5 and for Linux on request
- Instruction manual for connecting a PLC (SIMATIC® S7™)

Driver download: www.addi-data.com, download menu
Ethernet, synchronisation and supply signals can be looped from one system to the next. In this way, you can acquire and process distributed I/O signals directly at production machines. With these features, the MSX-E systems are suited both for simple distributed applications and for complex applications, in which multiple devices with physically widely separated signals have to operate together.

### Simplified block diagram

- **Optical isolation 1000 V**
- **Ethernet Link / ACT LEDs**
- **Temperature monitoring**
- **MII Interface**
- **Ethernet switch**
- **Processor Status LED**
- **FPGA control logic**
- **ADC 0**
- **ADC 7**
- **Power Good LED**
- **Energy supply**
- **Trigger In**
- **Trigger Out**
- **Sync In**
- **Sync Out**
- **24 V supply**
- **Output line**
- **Input line**
- **Ethernet Port 0**
- **Ethernet Port 1**

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**Features**

- Status LEDs
- 2 x Ethernet
- 2 x Trigger/Synchronisation IN/OUT
- 2 x voltage supply, 24 V IN/OUT optically isolated
- 8 analog inputs, BNC connectors:
  - Inner conductor for pos. input
  - Outer conductor for neg. input (diff.) or GND (SE)
**Specifications**

**Analog inputs**

- **Number of inputs:** 8, simultaneous acquisition
- **Coupling:** DC, AC (software-programmable)
- **Input type:** Single-ended or differential (software-programmable)
- **Input voltage range:**
  - Gain x1: ± 10 V single-ended
  - Gain x10: ± 1 V single-ended
  - Gain x100: ± 0.1 V single-ended

**Resolution:**

- Selectable frequencies: 1 MHz / 300 pf typ., DC coupled
- **Sampling frequency f_s:**
  - 24 kHz
- **Selecturable frequencies:**
  - up to 128 kHz:
    - 128000.00
    - 100000.00
    - 80000.00
    - 66666.67
  - 32000.00
  - 25000.00
  - 20000.00
  - 16666.67
  - 10000.00
  - 8000.00
  - 6666.67
  - 6000.00
  - 5000.00
  - 4000.00
  - 3333.33
  - 3000.00
  - 2500.00
  - 2000.00
  - 1250.00
  - 1200.00
  - 1000.00
  - 600.00
  - 500.00
  - 400.00
  - 300.00
  - 200.00
  - 100.00
  - 50.00
  - 40.00
  - 30.00
  - 20.00
  - 10.00
  - 5.00
  - 4.00
  - 3.00
  - 2.00
  - 1.00
  - 0.10
  - 0.01
  - 0.001

- **Oversampling:**
  - 8 x f_s

**Dynamic range:**

- Shorted inputs
- **Total Harmonic Distortion (THD):**
  - FSR, f < 1 kHz
  - FSR, f > 1 kHz
- **Signal-to-Noise Ratio (SNR):**
  - FSR, f < 1 kHz
  - FSR, f > 1 kHz

**Temperature drift:**

- ± 50 ppm

**Stop band attenuation:**

- 100 dB

**Stop band:**

- 0.547 x f

**-3 dB bandwidth:**

- 0.49 x f

**Pass band ripple:**

- ± 0.1 dB max.

**Filter response**

- **Gain x1:**
  - ± 1 mV typ., 24 V max.
- **Gain x10:**
  - ± 10 mV typ., 24 V max.
- **Gain x100:**
  - ± 100 mV typ., 24 V max.

**Crosstalk:**

- Between channels 0-1, 2-3, 4-5, 6-7, with gain x1
  - ≥ 100 dB

**Phase mismatch:**

- between channels 1-2, 3-4, 7-8, with gain x1
  - ≤ 10°
  - ≤ 0.01°

**Amplitude accuracy:**

- ± 0.005% of full scale

**Uniboard DC calibration**

- ± 0.005 V

**Current consumption at 24 V:**

- 350 mA

**Degree of protection:**

- IP 65

**Weight:**

- 850 g

**Dimensions (mm):**

- 215 x 110 x 50

**Interface:**

- Ethernet acc. to specification IEEE802.3

**Connectors for sensors**

- For analog inputs: 8 x BNC connectors

**Cables**

- CAT5E cable, M12 D-coded male connector/RJ45 connector

**Ordering information**

**MSX-E3601**

Ethernet system for the acquisition of dynamic signals, 8 SE/diff. inputs, 24-bit, simultaneous acquisition. Incl. technical description and software drivers.

**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/Synchrone**
  - 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-Switch:** Level change of the trigger inputs and outputs to 5 V
Applications
Practical Examples

Energy

Monitoring of wind power plants

Challenge:
A manufacturer of wind power plants is looking for the reason of repeated breakdowns of wind turbines. He assumes that the reason is an overheating of the PCs in the switch cabinet located inside the tower. One possible reason could be that the ventilation system is not activated at the right time. A data logger has to make a long-term measurement of the temperature and record when the ventilation system is switched on and off. The measurement system has to be portable because the long-term measurement is to be made in all towers of the plant. Furthermore, it must be resistant against harsh environment and interferences. To simplify data evaluation, the acquired data is to be imported from the system directly into Excel.

Solution:
With three cascadable intelligent MSX-E systems a measurement over weeks can be realised and logged. Therefore, two MSX-E3211 are used for capturing the temperature and one MSX-E1516 for registering the switching on and off of the ventilation. For this application, the MSX-E systems are the ideal solution as they are compact and portable systems which can work in stand-alone mode and be easily transported from one tower to the next. The cascadable systems can be synchronised in the µs range and thus provide highly-precise measured values. To resist strains such as current peaks, vibrations, dirt or extreme temperatures from -40°C to +85°C the MSX-E systems are built in robust IP65-compliant metal housings. The software DatabaseConnect which is used with the application allows to import data directly into Excel without programming.
With the intelligent Ethernet system MSX-E3711 you can acquire up to 8 half-bridge, LVDT, Mahr or Knäbel displacement transducers simultaneously with 24-bit resolution. An incremental counter input and an input for temperature measurement (Pt100) supplement the measurement data with temperature and position references. The transducers can be connected directly through the 5-pin M18 connectors. The systems can be freely cascaded and synchronised in the µs range. You can thus acquire data from several systems at the same time.

The ARM®9 processor allows the system to perform calculations. The compare logic of the counter or the timer function can generate a synchro trigger signal in order to start acquisitions. The system can trigger its own inputs as well as inputs on another MSX-E system.

**Features**

- Connection of all commercially available transducers (half-bridge, LVDT, Mahr or Knäbel)
- 8 channels for length measurement, cascadable
- 24-bit resolution
- 1 incremental counter input
- 1 input for Pt100 for temperature measurement
- Fast distributed data acquisition
- Example for TESA transducers GT21:
  - Sampling frequency: 12.5 kHz per channel,
  - sampling period for one sequence,
  - of 1 to 8 channels: 0.080 ms
- Synchronisation of several systems
- 64 MB onboard SDRAM for storing data
- ARM®9 32-bit processor for data processing
- Diagnostics possibility at short-circuits or line break of the transducers
- Robust metal housing, degree of protection IP 65
- Power Save Mode: reduction of the power consumption when no acquisition runs

**Acquisition modes:**

- Auto-refresh mode: Automatic update of the acquired data in the background
- Sequence mode: Data acquisition in “packages”
- With trigger or synchro input

**Safety features**

- LED status display for fast error diagnostics
- Optical isolation 1000 V for inductive transducers, counter and temperature measurement
- Input filters
- Diagnostics at short-circuits or line break of the inductive transducers
- Internal temperature monitoring

**Interfaces**

- Fast 24 V trigger input
- Ethernet switch with 2 ports
- Synchronisation/trigger In/Out
- 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

**Software**

- Software drivers for Windows 7 (32-bit)/Vista™ (32-bit)/XP2000. On request: Windows 7 (64-bit) and Linux
- Direct access via SOAP (TCP/IP), WSDL files
- Direct access via Modbus TCP and Modbus (UDP)
- Programming examples .net2005, VC++ 6.0
- Programming examples LabVIEW from 8.5 and for Linux on request
- Instruction manual for connecting a PLC (SIMATIC® S7+)

Driver download: www.addi-data.com, download menu
Synchronisation

Ethernet, synchronisation and supply signals can be looped from one system to the next. In this way, you can acquire and process distributed I/O signals directly at production machines. With these features, the MSX-E systems are suited both for simple distributed applications and for complex applications, in which multiple devices with physically widely separated signals have to operate together.

Simplified block diagram
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 $f_s$: UH 8 channels At primary frequency $f_P$ of
5 kHz
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 kΩ software-programmable
10 kΩ
100 kΩ
10 MΩ

Transducer accuracy: ± 61 nm (Tesa GT21)

Sensor supply (Sine generator)

Type: Sine differential (180° phase-shift)

Programmed signals:
Output frequency $f_s$: 2-20 kHz depending on the transducer
(50 kHz Knäbel)
Output impedance: < 0.1 Ω typ.
Output impedance in shutdown mode: > 30 kΩ typ.

Short-circuit current: ± 5 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: ± 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 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 Vc
Max. input frequency: 1 MHz at nominal voltage
Input impedance: 1 MΩ typ.
Logic input levels:
UH (max.): 30 V typ.
UL (min): 18 V typical (on request)
UL (min): 0 V typical

Temperature measurement

Number of inputs: 1
Type: RTD Pt100
Connection: 4-wire
Temperature range: -200 to 850 °C
Resolution: ± 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
For the counter function: 1 x 12-pin M23 female connector

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 of the encoder: 5 or 24 V/500 mA max.

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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
For the counter function: 1 x 12-pin M23 female connector
Applications

Practical Examples

Transportation

Measurement of railway tracks

**Challenge:**
A railway company wants a system for the measurement of railway tracks (elevations, depressions etc.) and for the contact or the force between pantograph and overhead traction line in order to reduce the wear and to optimise the travelling speed. The system is to be used in test trains as well as in standard trains and is to be installed inside the power car or in wagons. Railway standards [compatibility in order to avoid disturbing existing frequency uses] and EN50155 norm are to be complied with. Furthermore an extended temperature range is required (from -15°C to +70°C). The system should be a complete solution from one source.

**Solution:**
For this application a PC with Windows is used with a CPCI-1710 and a CPCI-3120 board. The CPCI-1710 is connected to rotary encoders, which acquire data and trigger the acquisition of the analog board through a hardware signal. The analog values are acquired simultaneously to the counter values.

Defense

Muzzle velocity measurement of machine guns

**Challenge:**
A weapon manufacturer wants to modernise a shooting tunnel in order to measure the muzzle velocity of machine guns. During the test single shots and salvoes are fired off. The bullets pass two light barriers which measure their velocity. The time the bullet needs between the two light barriers is counted and the speed is calculated. The system has to be precise enough to be able to measure times from 500 µs to 10 ms.

**Solution:**
In order to measure the time that one bullet needs to get from the first light barrier to the second one, the intelligent multifunction counter system MSX-E1710 is used. Two counter inputs are used for the light barriers. The time is calculated using the difference between the time stamps of the two inputs. As the system is IP65 compliant, it is resistant to gun powder dust that arises in the shooting tunnel. A PC is not necessary because the system calculates and evaluates the acquired values in stand-alone mode. The Ethernet connection allows the data transfer to a display screen in another room.
## MSX-E3701 / MSX-E3701-x / MSX-E3700

**Acquisition of 4, 8 or 16 inductive displacement transducers**

For half-bridge, LVDT, Mahr or Knäbel transducers

- 24 V digital output with compare logic
- 24 V digital trigger input

---

### Features

- Connection of all commercially available transducers (half-bridge, LVDT, Mahr-compatible or Knäbel)
- 4, 8 or 16 channels depending on the version, cascadable
- 24-bit resolution
- Fast distributed data acquisition
- 16 MB onboard SDRAM for storing data
- ARM®9 32-bit processor for data processing
- Diagnostics possibility at short-circuits or line break of the transducers
- Robust normed metal housing
- Power Save Mode: reduction of the power consumption when no acquisition runs
- 1 digital output, 24 V with compare logic for input 0 (optional, only available for MSX-E3701-x-4)
- Extended temperature range -40 °C to +85 °C (optional, only available for MSX-E3701-x-4)

### Transducer precision: Example of a measurement

Type TESA GT21, range ± 2 mm (± 4 mm), 16-bit accuracy

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

### Applications

- Gear wheel control • Gauge block control
- Acquisition of sensor data
- Quality assurance, automatic parts control
- Industrial process control
- Profile and surface measurement

### Interfaces

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

### Communication interfaces

- Web server (configuration and monitoring)
- Command server SOAP for transferring commands
- Data server (TCP/IP 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

### Software

- Software drivers for Windows 7 (32-bit)/Vista™ (32-bit)/XP/2000. On request: Windows 7 (64-Bit), Linux
- Direct access via SOAP (TCP/IP), WSDL files
- Direct access via Modbus TCP and Modbus (UDP)
- Programming examples .net2005, VC++ 6.0
- Programming examples LabVIEW from 8.5 on request
- Programming examples for Linux on request
- Instruction manual for connecting a PLC (SIMATIC® 57ª)

Driver download: www.addi-data.com, download menu
Features

Ethernet, synchronisation and supply signals can be looped from one system to the next. In this way, you can acquire and process distributed I/O signals directly at production machines. With these features, the MSX-E systems are suited both for simple distributed applications and for complex applications, in which multiple devices with physically widely separated signals have to operate together.

New!* Calibration tool

Synchronisation

Simplified block diagram

* Preliminary product information
Intelligent Ethernet systems, analog – MSX-E3701 / MSX-E3701-x / MSX-E3700

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 \( f_s \), 5 kHz
- From n ≥ 2 channels: \( f_s \) = primary frequency

RMS SP x n

\( f_s \) concerns here all n channels

Example with TESA GT21:
- On 1 channel: \( f_s \) = 12.5 kHz
- From n ≥ 2 channels: \( f_s \) = 625 Hz for 4 channels

Sensor supply (sine generator)

Type: Sine differential (180° phase-shift)
Coupling: AC
Programmed signals:
- Output frequency \( f_s \)
- (primary frequency)
- Output impedance:
- < 0.127 typ.
- > 30 kΩ typ. in shutdown mode
Short-circuit current:
- 0.7 A typ. at 25 °C with thermal protection

Voltage supply

Nominal voltage: 24 V
Optical isolation: 1000 V
Current consumption at 24 V:
- 0.6 A
- 0.8 A max.
RMS UN resistance:
- 1 MΩ max.
Switch-on time:
- 2 ms typ.
- RL = 270 Ω
Switch-off time:
- 11 μs typ.
- RL = 270 Ω
Overtemperature (shutdown): 150°C max. (output driver)
Temperature hysteresis:
- 10°C typ. (output driver)

Outputs for inductive transducers

Number of outputs: 1, M12 female connector
Optical isolation: 1000 V
Number of ports: 2
Cable length: 150 m max. at CAT5E UTP
Bandwidth: 10 Mbps auto-negotiation
100 Mbps auto-negotiation
Protocol: IEEE802.3 compliant
Protocol: 10Base-T IEEE802.3 compliant
Optical isolation: 1000 V
MAC address: 00:0F:6C:##:##:##, unique for each device

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-E3701-16: 215 x 110 x 39 mm
- MSX-E3700-4/-8/-16: 154 x 110 x 39 mm
- MSX-E3701-4/-8/-16: 154 x 110 x 50 mm
Weight:
- MSX-E3701-4/-8/-16: 760 g
- MSX-E3700-4/-8/-16: 660 g
Degree of protection:
- MSX-E3701-4/-8/-16: IP 65
- MSX-E3700-4/-8/-16: IP 65
Operating temperature:
- MSX-E3701: 0 to + 60 °C
- MSX-E3700: -40 °C to + 85 °C
- MSX-E3701 interface connectors:
  - Ethernet: 2 x 4-pin M12 female connector; D-coded for Port 0 and 1Port1
  - Trigger/Synchro: 1 x 5-pin male connector M12
  - Trigger/Synchro: 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
Synchronous signal: 1 x 3-pin binder, 3.81 mm grid
Voltage supply:
- 24 VDC: 3-pin binder, 5.08 mm grid

Connectors for connecting inductive transducers

MSX-E3704-4: 4 x 5-pin M12 female connector
MSX-E3705-8: 8 x 5-pin M12 female connector
MSX-E3706-16: 16 x 5-pin M12 female connector

Temperature hysteresis:
- 10°C typ. (output driver)
- 10°C typ. (output driver)
## Versions

<table>
<thead>
<tr>
<th></th>
<th>Temperature range</th>
<th>Number of transducers</th>
<th>Type of transducer</th>
<th>Digital output 24 V (option)</th>
<th>Degrees of protection</th>
</tr>
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<tbody>
<tr>
<td>MSX-E3701-HB-16</td>
<td>0 to 60 °C</td>
<td>16</td>
<td>Half-Bridge</td>
<td></td>
<td>MSX-E3701: Degree of protection IP 65</td>
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<td>MSX-E3701-HB-16-EXT</td>
<td>-40 °C to 85 °C</td>
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<td>MSX-E3701-HB-8-EXT</td>
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<td>MSX-E3701-HB-4</td>
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<tr>
<td>MSX-E3701-LVDT-16</td>
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<td>16</td>
<td>LVDT</td>
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<td>Mahr-compatible</td>
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<td>MSX-E3700-HB-16</td>
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<td>Half-Bridge</td>
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<td>MSX-E3700-HB-8</td>
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<td>MSX-E3700-HB-4</td>
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<td>MSX-E3700-LVDT-4-EXT</td>
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</tbody>
</table>

### Ordering information

**MSX-E3701 / MSX-E3701-EXT / MSX-E3700**

Ethernet system for length measurement, 24-bit, 16/8/4 inductive displacement transducers, LVDT, half-bridge, Mahr-compatible, Knäbel. Incl. technical description and software drivers

**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 Knäbel 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-EXT: IP 65, with extended temperature range**

Available versions like MSX-E3701. When ordering, please add -EXT to the product version. Example: MSX-E3701-LVDT-16-EXT: For 16 LVDT inductive 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. ouptut 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

**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**

- **57 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

**MSX-Clip, MX-Rail** (Please specify when ordering!), **MX-Screw, PCMX-1x**
With the intelligent Ethernet system MSX-E3701-DIO you can acquire 16 half-bridge or LVDT displacement transducers with 24-bit resolution. The 32 digital I/O allow, amongst others, the connection to a PLC, the display of status reports or the control of actuators. The system can be freely cascaded and synchronized in µs range. Thus data can be simultaneously acquired from several systems. For example you can make status exports or you add a PLC. The ARM®9 processor allows the system to perform calculations. The timer function can generate a synchro trigger signal in order to start acquisitions.

**Features**
- 32 digital inputs/outputs, 24 V
- 16 optically isolated inputs, 24 V, filters optional
- 16 optically isolated outputs, 11 V to 36 V, output current per channel 150 mA
- Connection of all commercially available transducers (half-bridge, LVDT)
- 16 channels, cascadable
- 24-bit resolution
- Fast distributed data acquisition
- 16 MB onboard SDRAM for storing data
- ARM®9 32-bit processor for data processing
- Diagnostics 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
- Extended temperature range -40 °C to +85 °C

**Acquisition modes:**
- Auto-refresh mode: Automatic update of the acquired data in the background
- Sequence mode: Data acquisition in “packages”
- With trigger or synchro input

**Safety features**
- LED status display for fast error diagnostics
- Input filters
- Diagnostic possible at short-circuits or line break
- Internal temperature monitoring

**Transducer precision:** Example of a measurement
Type TESA GT21, range ± 2 mm (± 4 mm), 16-bit accuracy

\[ \frac{4 \text{ mm}}{2} = 2 \text{ mm} = 0.061 \mu \text{m} \]

**Applications**
- Gear wheel control
- Gauge block control
- Acquisition of sensor data
- Quality assurance, automatic parts control
- Industrial process control
- Profile and surface measurement

**Interfaces**
- Fast 24 V trigger input
- Ethernet switch with 2 ports
- Synchronisation/trigger In/Out
- 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

**Software:**
- Software drivers for Windows 7 (32-bit)/Vista (32-bit)/XP/2000. On request: Windows 7 (64-Bit), Linux
- Direct access via SOAP (TCP/IP), WSDL files
- Direct access via Modbus TCP and Modbus (UDP)
- Programming examples .net2005, VC++ 6.0
- On request: LabVIEW from 8.5, Linux
- Instruction manual for connecting a PLC (SIMATIC® S7®)

Driver download: www.addi-data.com, download menu
Simplified block diagram

Synchronisation

Features

New!

* Preliminary product information
Intelligent Ethernet systems, analog – MSX-E3701-DIO

**Specifications**

**Inputs for inductive transducers**

<table>
<thead>
<tr>
<th>Channel features</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number:</td>
<td>16 multiplexed</td>
</tr>
<tr>
<td>Input type:</td>
<td>single-ended</td>
</tr>
<tr>
<td>Coupling:</td>
<td>DC</td>
</tr>
<tr>
<td>Resolution:</td>
<td>24-bit</td>
</tr>
<tr>
<td>Sampling frequency $f_s$:</td>
<td>20 kHz</td>
</tr>
<tr>
<td>$f_s = f_p$:</td>
<td>12.5 kHz</td>
</tr>
<tr>
<td>$f_s = 2f_p$:</td>
<td>25 kHz</td>
</tr>
<tr>
<td>$f_s = 5f_p$:</td>
<td>62.5 kHz</td>
</tr>
</tbody>
</table>

**Power supply**

<table>
<thead>
<tr>
<th>Channel features</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal voltage:</td>
<td>24 V</td>
</tr>
<tr>
<td>Output voltage:</td>
<td>18 V-30 V</td>
</tr>
<tr>
<td>Input voltage:</td>
<td>18 V-30 V</td>
</tr>
<tr>
<td>Input impedance:</td>
<td>&gt; 30 kΩ</td>
</tr>
</tbody>
</table>

**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 |
| Activation voltage: | 24 V |
| Supply voltage: | 18-30 V |
| Output current per channel: | 150 mA max. |

**Ethernet**

| Number of ports: | 2 |
| Cabinet length: | 150 m max. at CAT5e UTP |
| Bandwidth: | 10 Mbps auto-negotiation |
| Protocol: | 10Base-T IEEE802.3 compliant |
| Optical isolation: | 1000 V |

**Trigger**

| Number of inputs: | 1 trigger input |
| Number of outputs: | 1 trigger output |
| Filters/protective circuit: | Low-pass/Transorb diode |

**Synchro**

| Number of inputs: | 1 |
| Number of outputs: | 1 |
| Max. cable length: | 20 m |
| Optimal 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: | Ethernet acc. to specification IEEE802.3 |
| Dimensions: | 200 x 110 x 50 mm |
| Weight: | 780 g |
| Degree of protection: | IP 65 |
| Operating temperature: | -40 °C to + 85°C |

**Interface connectors**

| Ethernet: | 2 x 4-pin M12 female connector D-coded M12 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 V DC IN | 1 x 5-pin male connector M12 |
| 24 V DC OUT | 1 x 5-pin female connector M12 |

**Ordering information**

| MSX-E3701-DIO | Ethernet system for length measurement, 24-bit, 16 inductive displacement transducers, LDVT, half-bride, Incl. technical description and software drivers |

**Versions**

| MSX-E3701-DIO-HB-16 | for 16 HB displacement transducers |
| MSX-E3701-DIO-LDVT-16 | for 16 LDVT displacement transducers |

**Connection cables**

| with 32 dig. E/A, 24 V on 37-pin D-Sub connector |
| Standard round cable, shielded, twisted pairs, 2 m |
| Screw terminal panel, LED status display, for DIN rail |

**Voltage supply**

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

**New!**

*Preliminary product information*
Measurement of the emission values, boost pressure and temperature for engine test benches

Challenge:
An automotive manufacturer wants to build test benches for engines to measure, among other data, the temperature inside the engines, the emission values and the boost pressure. The data is to be acquired simultaneously and the measured raw values to be calculated and stored in a self-consistent data set. The data is stored on a centralised server and the visualisation is effected via a central control station.

Solution:
For this task the MSX-Box, our real-time stand-alone system, was chosen as the engine test benches are located at different places of the factory and a high amount of raw data is gathered. At each test bench there are 4 MSX boxes with analog and digital inputs, connected to each other as well as to the main server through Ethernet.

The calculation is done onboard in order to discharge the central server and to take full advantage of the MSX-Box capacity. The CAN messages and the data from the serial interfaces are combined with the other measurement values (temperature, boost pressure, etc.) using an interrupt routine and provided with a time stamp. On the centralised server, all the measurement data is collected. The data is visualised on a netbook. Meanwhile, this manufacturer has built many of these test benches.

Automatic measurement device for the functional reliability tests of pull-back springs on clutch discs

Challenge:
The functional reliability of the pull-back springs on clutch discs shall be tested. Thereby the force in relation to the distance shall be measured. How can the relation force / distance be exactly established?

Solution:
For establishing correctly the relation force / distance, position acquisition plays an important role. A clutch disc is positioned and locked in place on a conveyor belt. A plunger gets down until it reaches the clutch disc. The plunger is turned and thereby force and distance are measured. In order to find the absolute positions as fast and as accurately as possible, EnDat 2.2 encoders are used for the positioning of the axes. An APCI-8008 board acquires data from the EnDat 2.2 encoders and the position values are included in the regulating process. To get the force values, the APCI-8008 reads the measured values of the PCI pressure measurement board APCI-3300 directly via bus master access.
**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
Onboard evaluation of user data
128-byte FIFO buffer for each port
16C950 compatible UART
Optical isolation

---

The intelligent Ethernet system MSX-E7511 has 4 configurable serial ports. The ARM®9 processor allows to process the user data from each port directly on the system. Thus it is possible e.g. to filter data or to calculate it and to export only the values needed. The system is therefore ideal for the direct processing of serial protocols on site. The systems can be freely cascaded and synchronised in the µs range. You can thus acquire data from several systems at the same time.

**Features**
- 64 MB onboard SDRAM for storing data
- Onboard ARM®9 32-bit processor
- Robust normed metal housing

**Serial interfaces**
- 9-pin D-Sub male connectors
- 4 serial ports
- RS232, RS422, RS485, 20 mA Current Loop (configurable when ordering)
- 128-byte FIFO buffer for each port
- 16C950 compatible UART
- Max. baud rate 1MBaud
- Modem control signals (RTS/CTS) for RS232 (RS422 on request)

**Data processing**
- Acquisition of raw data
- The evaluation of raw data is programmable in the development mode
- Optional: firmware adaptation for direct calculation

**Safety**
- LED status display for fast error diagnostics
- Optical isolation
- Internal temperature monitoring

**Applications**
- Translation of serial protocols
- Free programming of serial protocols
- Direct signal processing on site
- Conversion of user data

**Interfaces**
- Fast 24 V trigger input
- Ethernet switch with 2 ports
- Synchronisation/trigger In
- 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

**Software**
- Software drivers for Windows 7 (32-bit)/Vista™ (32-bit)/XP/2000. On request: Windows 7 (64-bit), Linux Direct access via SOAP (TCP/IP), WSDL files
- Direct access via Modbus TCP and Modbus (UDP)
- Programming examples .net2005, VC++ 6.0 on request: LabVIEW from 8.5, Linux
- Instruction manual for connecting a PLC (SIMATIC® S7®)

**Synchronisation**
Ethernet, synchronisation and supply signals can be looped from one system to the next. In this way, you can acquire and process distributed I/O signals directly at production machines.

---

**Operating temperature**
- -40 °C bis 85 °C

**Schutzart**
- IP 65

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ADDI-DATA®
SPIRIT OF EXCELLENCE
Specifications

Serial interfaces

| Number of ports: | 4 |
| Mode: | Mode: RS232, RS422, RS485, 20 mA Current Loop |
| Configuration: | at ordering |
| Optical isolation: | 1000 V |
| Transmission mode: | Asynchronous, full or half duplex |
| Addressing: | Automatically |
| Transfer rate: | Programmable up to 115.2 kbaud |
| Baud rate: | Up to 1 MBaud on request |
| Parity: | Even, odd, none, mark, space |
| Connectors: | 4 x 9-pin D-Sub male connectors |

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 22.

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 |

Simplified block diagram

Features

- Status LEDs
- 2 x Ethernet
- 4 serial ports
- RS232, RS422, RS485, 20 mA CL
- 9-pin D-Sub male connectors
- 24 V supply
- Processor
- Flash
- DRAM
- Ethernet switch
- Processor status LED
- Ethernet Link / ACT LEDs
- Temperature monitoring
- MII Interface
- Ethernet
- Port 0
- Port 1
- Power Good LED
- Energy supply
- Sync Out
- Trigger Out
- Sync In
- Serial port 1
- Serial port 2
- Serial port 3
- Serial port 4
- Options

Ordering information

MSX-E7511

Ethernet system for serial interfaces, 4 ports for RS232, RS422, RS485 or 20 mA CL. Incl. technical description and software drivers

Versions

<table>
<thead>
<tr>
<th>MSX-E7511-XXXX</th>
</tr>
</thead>
<tbody>
<tr>
<td>A: RS232, optically isolated</td>
</tr>
<tr>
<td>B: RS422, optically isolated</td>
</tr>
<tr>
<td>C: RS485, optically isolated</td>
</tr>
<tr>
<td>D: 20mA CL</td>
</tr>
</tbody>
</table>

Example: MSX-E7511-AACC

Connection cables

For serial interfaces

| ST073-RS232 (A): | RS232 cable, open end, 9-pin D-Sub fem. connector |
| ST073-RS422 (B): | RS422 cable, open end, 9-pin D-Sub fem. connector |
| ST073-RS485 (C): | RS485 cable, open end, 9-pin D-Sub fem. connector |
| ST073-CL (D): | 20mA CL cable, open end, 9-pin D-Sub fem. connector |

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

Ethernet

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

MX-Rail (Please specify when ordering!), MX-Screw

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

Phone: +49 7229 1847-0
Fax: +49 7229 1847-222
info@addi-data.com
www.addi-data.com
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

### Features

**Description**
- Program for storing measurement data in databases
- Ease of 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®

### 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

### Licence conditions

- 1 PC
- a maximum of 20 MSX-E systems

### Extras

- Language versions on request
- Multi-user/server licence on request
DatabaseConnect
Database interface software, Ethernet-based, no programming needed

Versions
DatabaseConnect
Version 1.1: CD-ROM incl. Quick Installation and online manual

Specifications

Program features

| DatabaseConnect | Single-user licence |
| Data processing | Measurement data is read, converted, calculated and stored |
| Language | English |
| Other languages on request |

Database connection

| File format | .txt, .csv, .xml |
| Databases | Microsoft SQL-Server, mySQL. MS Access® |
| 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 |
| (300 MB for .Net and 50 MB for DatabaseConnect) |
| Operating system | Microsoft Windows 2000 |
| Microsoft Windows XP (32-bit) |
| Microsoft Vista (32-bit) |
| Microsoft Windows 7 (32-bit) |
| Linux on request |
| Monitor screen resolution | min. 1024 x 768 pixels |

MSX-E system compatibility

| MSX-E systems | DatabaseConnect compatible |
| MSX-E1516: Ethernet digital I/O system, 16 digital I/O | yes |
| MSX-E1701: Ethernet multifunction counter system, digital I/O | on request |
| MSX-E1711: Ethernet multifunction counter system, sin/cos, digital I/O | on request |
| MSX-E1721: Ethernet multifunction counter system, sin/cos, digital I/O | on request |
| MSX-E3121: Ethernet analog input system | yes, max. 1 kHz/channel |
| MSX-E3011: Ethernet analog input system | yes, max. 1 kHz/channel |
| MSX-E3021: Ethernet analog input system | yes, max. 1 kHz/channel |
| MSX-E3027: Ethernet analog input system | yes, max. 1 kHz/channel |
| MSX-E3211: Ethernet system for temperature acquisition | on request |
| MSX-E3311: Ethernet system for pressure acquisition | on request |
| MSX-E3601: Ethernet system for the acquisition of dynamic signals | on request |
| MSX-E3711: Ethernet system for length measurement, 24-bit, simultaneous | on request |
| MSX-E3701: Ethernet system for length measurement | on request |
| MSX-E3700: Ethernet system for length measurement | on request |

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

**MSX-E systems**

- Raw data (on data server)
- for example
- Channel 1: 0...10 V
- Channel 2: ± 10 V
- ...
- Channel 20: off
- Channel 21: on
- ...
- Channel n: 4...20 mA

**Parameterisation of the acquisition**

- Monitoring
- Database management
- Processing the measurement data
- Storing the configuration (backup)

IT level

**Time stamp**

- Channel 1: Fill level in %
- Channel 2: Pressure in bar
- ...
- Channel 20: Fan 1 off
- Channel 21: Door A open
- ...
- Channel n: humidity in %

Ordering information

Phone: +49 7229 1847-0
Fax: +49 7229 1847-222
info@addi-data.com
www.addi-data.com
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 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.

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

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.

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
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: welcome to the virtual world**

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.

**ADDEVICE MAPPER and ADDEVICE MANAGER:** With these programs, you can administrate the functionalities of the virtual board. The programs help you by showing a clear visualisation of the virtual board.

These two principles are the interface between ADDI-DATA boards and your application.

---

Numerous drivers and samples

ADDI-DATA boards come with drivers and samples, software packages and compilers for the most common operating systems like Linux, Windows 7/ Vista/XP/2000, LabVIEW, etc.

For time-critical tasks ADDI-DATA offers real-time drivers for Linux and Windows (RTX, VxWorks). They allow an easy integration of our boards into real-time systems.

**Linux drivers**

In the sector of automation, 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.

The driver model is based on 2 levels: the user level and the Kernel level. The source code of all drivers is included, allowing you to adapt the drivers to your personal requirements.

---

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. Just call us!
Prepared for the future

Realise your future PC-based applications with efficient and robust PCI Express boards by ADDI-DATA.

The boards of the APcIe-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 assure 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 75), 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 capacity of your board’s hardware and software resources 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.

More information about compatibility can be found in the download section on our website www.addi-data.com.

YOUR BENEFITS
- Higher data transmission rate
- Shorter cycle times through FPGA technology
- Simplified application design
- Safe operation in an industrial environment
- Long term availability
- Fast upgrade from PCI to PCI Express
- Free loan period.

HIGH LEVEL OF 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

READY FOR HARSH INDUSTRIAL ENVIRONMENT
## Contents & Services

### Distributed Solutions

- **PC boards**
- **Connection**
- **Appendix**

### Digital, 24 V

<table>
<thead>
<tr>
<th></th>
<th>16</th>
<th>16</th>
<th>8</th>
<th>32</th>
<th>16</th>
<th>16</th>
<th>4</th>
<th>4</th>
<th>4</th>
<th>1</th>
<th>1</th>
<th>1</th>
<th>1</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input channels, incl. interruptible</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output current per channel</td>
<td>500 mA (typ.)</td>
<td>500 mA (typ.)</td>
<td>500 mA (typ.)</td>
<td>Relays 2A</td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relays</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Watchdog / Timer / Counter</td>
<td>1 x watchdog/timer, 1 x 12-bit timer, 2 x 16-bit counters</td>
<td>1 x watchdog/timer, 1 x 12-bit timer, 1 x 16-bit counters</td>
<td>watchdog</td>
<td>1 x watchdog/timer, 1 x 12-bit timer, 3 x 16-bit counters</td>
<td>watchdog timer</td>
<td>2x16-bit timers, incl. 1 which can be used as watchdog</td>
<td>1 x 16-bit timer</td>
<td>2x16-bit timers, incl. 1 which can be used as watchdog</td>
<td>7 watchdogs/timers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

### Optical isolation

<table>
<thead>
<tr>
<th>Voltage</th>
<th>1000 V</th>
<th>1000 V</th>
<th>1000 V</th>
<th>1000 V</th>
<th>1000 V</th>
<th>500 V</th>
<th>500 V</th>
<th>500 V</th>
<th>1000 V</th>
<th>optional</th>
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</thead>
</table>

### Analog

<table>
<thead>
<tr>
<th>Gain</th>
<th>1, 2, 5, 10</th>
<th>1, 2, 5, 10</th>
<th>1, 2, 5, 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trigger (software or 24 V)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Analog outputs, 16-bit</td>
<td>8 or 4</td>
<td>8 or 4</td>
<td></td>
</tr>
<tr>
<td>0-10 V / ± 10 V</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

### Software

- Current driver list on the web: [www.addi-data.com](http://www.addi-data.com)

---

* *Base Boards*
Digital I/O board, optically isolated, 32 digital inputs and outputs, 24 V / 12 V, for PCI Express

**New!**

12 V version

**APCIe-1532 / APCIe-1532-12V / APCIe-1502**

**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

**Features**

### Inputs

- 16 optically isolated inputs, 24 V (APCIe-1532 / APCIe-1502) or 12 V (APCIe-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 (APCIe-1502: 2 counters)

### Safety features

- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Protection against fast transients (burst), overvoltage, electrostatic discharge and high-frequency EMI

### Protective circuit for the input channels

- Separate ground line 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 (real-time)
- 32-bit drivers for Windows 7/Vista/XP/2000 (real-time)
- Signed 64-bit drivers for Windows 7/XP

**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, download menu

**Protective circuit for the output channels**

---

*Preliminary product information*
Specifications

**Digital inputs**

- Number of inputs: 16 digital inputs, (common ground: channel 0 can be used as a 16-bit counter input acc. to IEC 1131-2)
- Interruptible inputs: 15 channels (channel 1 to 15)
- Optical isolation: 1000 V through opto-couplers, from PC to peripheral
- Nominal voltage: 24 V at 12 V (APCIe-1532-12V)
- Input current: at 24 V at 12 V (APCIe-1532-12V)
  - 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.): at 24 V at 12 V (APCIe-1532-12V)
  - Channel 0 or 0-1: 100 kHz
  - Channel 1-15 or 2-16: 5 kHz
- Logic input levels: at 24 V at 12 V (APCIe-1532-12V)
  - UH (max.): 30 V
  - UH (min.): 19 V
  - UL (max.): 14 V
  - UL (min.): 0 V

**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 consumption: Inputs and outputs inactive 320 mA ± 10 %, typical
- Operating voltage: + 3.3 V from PC
- Temperature range: 0 to 60 °C (with forced cooling)
- Front connector: 37-pin D-Sub male connector
- 16 inputs, 24 V, 16 outputs, 11-36 V, 1 counter

**Ordering information**

- APCIe-1532 / APCIe-1532-12V
  - 16 inputs, 24 V, 16 outputs, 11-36 V, 1 counter
- APCIe-1502
  - 16 inputs, 24 V, 16 outputs, 11-36 V, 2 counters

**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, cascadable

**Safety**

- Shutdown logic (VCC 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-lane PCI Express slot
- Upgrading voltage: + 3.3 V from PC
- Current consumption: Inputs and outputs inactive 320 mA ± 10 %, typical
- 16 inputs and outputs active 470 mA ± 10 %, typical
- Switch-off time: l
- Switch-on time: l
- RDS ON resistance: max. 0.2 Ω, load = resistance: 75 µs
- Short-circuit current per output: 1.5 A (typ.) pulse current
- Supply voltage range: 11 to 36 V
- Standard round cable, shielded, twisted pairs, 2 m
- Standard round cable, shielded, twisted pairs, 5 m
- Round cable between PX8500 and PX9000, shielded, twisted pairs, 2 m
- Ribon cable for cascading two PX8500-G

**Ordering information**

- 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 APCIe-15x2 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

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 (real-time)
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- Signed 64-bit drivers for Windows 7/XP

Drivers and samples for the following compilers and software packages:
- .NET
- Microsoft VC++ • Borland C++
- Visual Basic • Delphi
- LabVIEW • LabWindows/CVI

ADDITION functions:
- Digital input • Digital output • Watchdog

On request:
Further operating systems, compilers and samples.

Driver download: www.addi-data.com, download menu

Protective circuit for the input channels

Protective circuit for the output channels
**Specifications**

### Digital inputs

- **Number of inputs:** 8 digital inputs
- **Common ground acc. to IEC 1131-2**
- **Optical isolation:** 1000 V through opto-couplers, from PC to peripheral
- **Nominal voltage:** 24 V
- **Input current (max.):** Channel 0-7: 2 mA at 24 V
- **Logic input levels:**
  - UH (max.): 30 V
  - UH (min.): 19 V
  - UL (min.): 14 V
  - UL (max.): 0 V
- **Input 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
- **Overtemperature (shutdown):** 135 °C (output driver)
- **Temperature hysteresis:** 15 °C (output driver)
- **Shutdown logic (Vcc diagnostic):**
  - When the ext. 24 V voltage drops below 7 V:
    - The outputs are switched off.
- **Watchdog:**
  - For resetting the outputs to “0”
  - Time units: 1 up to 4095 µs, ms, s

### Safety

- **Common Diagnostics for all 8 channels at overtemperature of one channel**

### 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 1/4-lane PCI Express slot
- **Operating voltage:** +3.3 V from PC
- **Current consumption:**
  - Inputs and outputs inactive: 320 mA ± 10 %, typical
  - 8 inputs and outputs active: 400 mA ± 10 %, typical
- **Front connector:** 37-pin D-Sub male connector
- **Temperature range:** 0 to 60 °C (with forced cooling)

### Accessories

- **PKX901-D:** Screw terminal panel, LED status display
- **PKX901-DG:** Screw terminal panel, LED status display, for DIN rail
- **PKX9000:** 3-row screw terminal panel for DIN rail, with LED status display
- **PX8500-G:** Relay output board for DIN rail, cascadable

### 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.

**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
**ST021:** Round cable between APcLe-1516 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
Digital I/O board, optically isolated, 64 digital inputs and outputs, 24 V, for PCI Express

**APCIe-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

**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

**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 (real-time)
- Signed 64-bit drivers for Windows 7/XP

**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, download menu

**Protective circuit for the input channels**

**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 acc. to IEC 1131-2.
- **Interuptible inputs:** 16 channels (channel 4 to 19).
- **Optical isolation:** 1000 V through opto-couplers, from PC to peripherals.
- **Input current:**
  - Channel 0-3: 6.6 mA at 24 V, typical
  - Channel 4-31: 2 mA at 24 V, typical
- **Input frequency (max.):** Channel 0-3: 300 kHz at 24 V, typical
- **Logic input levels:**
  - UH (max.): 30 V / 1.1 mA, typical (channel 4-31)
  - UH (min.): 19 V / 1 mA, typical (channel 4-31)
  - UH (max.): 30 V / 11 mA, typical (channel 0-3)
  - UH (min.): 19 V / 3.4 mA, typical (channel 0-3)
- **UL (max.):** 14 V / 0.1 mA, typical
- **UL (min.):** 0 V / 0 mA, typical
- **Current consumption:**
  - Inputs and outputs inactive: 340 mA ± 10 %, typical
  - Inputs and outputs active: 590 mA ± 10 %, typical
- **Operating voltage:** +3.3 V from PC
- **Revision:** 1.0a (PCI Express 1.0a)
- **System bus:** Acc. to PCI Express base specification
- **Dimensions:** 168 x 99 mm
- **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:** 1.44 mm PCI Express slot
  - **Operating voltage:** ± 3.3 V from PC
  - **Current consumption:**
    - Inputs and outputs inactive: 340 mA ± 10 %, typical
    - 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)

### Digital outputs
- **Number of outputs:** 32 digital outputs
- **Output type:** High-side (load to ground) acc. to IEC 1131-2
- **Optical isolation:** Through Opto-couplers
- **Current limit:** 1.5 A per 8 channels (through PTC)
- **Output current per output:** 500 mA (typical)
- **RDS ON resistance:** 0.2 Ω at 25 °C
- **Switch-on time:** 0.5 A, load = resistance: 50 µs
- **Switch-off time:** 0.5 A, load = resistance: 75 µs
- **Overtemperature (shutdown):** 135 °C (output driver)
- **Temperature hysteresis:** 15 °C (output driver)

### Timer/watchdog
- **Watchdog:** 12-bit, programmable as timer from 1µs to 4095 s

### Safety
- **Shutdown logic (Vcc diagnostic):** When the ext. 24 V voltage drops below 7 V, the outputs are switched off.
- **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 are fulfilled. The respective EMC 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:** 1.44 mm PCI Express slot
- **Operating voltage:** ± 3.3 V from PC
- **Current consumption:**
  - Inputs and outputs inactive: 340 mA ± 10 %, typical
  - 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)

### Ordering information
- **APCIe-1564**
  - Digital I/O board, optically isolated, 64 digital inputs and outputs, 24 V, for PCI Express.
  - Incl. technical description and software drivers.

### 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, cascadable

---

*Preliminary product information*
Relay board, optically isolated, 8/16 relays, 8/16 digital inputs, 24 V

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
- ...

Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

Standard drivers for:
- Linux (real-time)
- 32-bit drivers for Windows 7/Vista/XP/2000/ (real-time)
- Signed 64-bit drivers for Windows 7/XP

Drivers and samples for the following compilers and software packages:
- .NET
- Microsoft VC++ • Borland C++
- Visual Basic • Delphi
- LabVIEW • LabWindows/CVI

ADDITION functions:
- Digital input • Digital output
- Watchdog • Timer

On request:
Further operating systems, compilers and samples.
Driver download: www.addi-data.com, download menu

Function principle of the relays

Rest state (open)
- $I_{OC} \approx 0 mA$
- $CO$
- $CC$
- $OC$

Work state (closed)
- $I_{IOM}=1 \text{ A}$
- $CO$
- $CC$
- $OC$

CO: Change-over contact
CC: Closing contact
OC: Opening contact
### Specifications

#### Relays

<table>
<thead>
<tr>
<th>Type of contacts:</th>
<th>8/16 change-over</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. switching voltage:</td>
<td>200 VDC, 200 VAC</td>
</tr>
<tr>
<td>Max. switching current:</td>
<td>2 A</td>
</tr>
<tr>
<td>Max. switching capacity:</td>
<td>60 W</td>
</tr>
<tr>
<td>Contact resistance:</td>
<td>&lt; 100 mΩ</td>
</tr>
<tr>
<td>Response time:</td>
<td>Max. 4 ms, typ. 2.5 ms</td>
</tr>
<tr>
<td>Release time:</td>
<td>Max. 4 ms, typ. 0.9 ms</td>
</tr>
<tr>
<td>Mechanical life:</td>
<td>10⁸ operations</td>
</tr>
<tr>
<td>Electrical life:</td>
<td>10⁵ operations at rated load</td>
</tr>
</tbody>
</table>

#### Digital inputs

<table>
<thead>
<tr>
<th>Number of inputs:</th>
<th>8/16</th>
</tr>
</thead>
<tbody>
<tr>
<td>incl. 7/15 interruptible inputs</td>
<td></td>
</tr>
<tr>
<td>Optical isolation:</td>
<td>Through opto-couplers, 1000 V</td>
</tr>
<tr>
<td>Nominal voltage:</td>
<td>24 V</td>
</tr>
<tr>
<td>Signal delay:</td>
<td>76 µs (at 24 V)</td>
</tr>
<tr>
<td>Maximal input frequency:</td>
<td>10 kHz (at 24 V)</td>
</tr>
</tbody>
</table>

#### Timer

| Time settings: | 16-bit, programmable, 1 µs to 65535 s |

#### Safety

| Test voltage: | 1000 V |
| Watchdog: | For resetting the outputs to “0”: |
| Time: | 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, Revision 1.0a (PCI Express 1.0a) |
| Space required: | 1-14 lane, 1 PCI Express slot |
| Operating voltage: | ±3.3 V from the PC |
| Max. current consumption: | 1 A ±10% (typ. APCIE-2200-16-16) |
| Front connector: | 50-pin D-Sub male connector |
| Additional connector: | 32-pin male connector |
| Temperature range: | 0 up to 60 °C (with forced cooling) |

---

### Ordering information

**APCIe-2200**

Relay board, optically isolated, 8/16 relays, 8/16 digital inputs, 24 V. Incl. technical description and software drivers.

**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
Multifunction counter board, optically isolated, fast counter inputs - programmable functions, for PCI Express

The board APCie-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!

Additional channels
* 28 TTL I/O, without optical isolation

Versions

<table>
<thead>
<tr>
<th>APCie-1711</th>
<th>RS422/TTL I/O</th>
<th>24 V inputs</th>
<th>5 V outputs</th>
<th>24 V outputs</th>
<th>TTL I/O</th>
</tr>
</thead>
<tbody>
<tr>
<td>APCie-1711</td>
<td>16</td>
<td>12</td>
<td>–</td>
<td>4</td>
<td>28</td>
</tr>
<tr>
<td>APCie-1711-24V</td>
<td>–</td>
<td>28</td>
<td>–</td>
<td>4</td>
<td>28</td>
</tr>
<tr>
<td>APCie-1711-5V-I</td>
<td>16</td>
<td>12</td>
<td>4</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>APCie-1711-10MHz</td>
<td>16</td>
<td>12</td>
<td>–</td>
<td>4</td>
<td>28</td>
</tr>
</tbody>
</table>

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:
* 32-bit drivers for Windows 7/Vista/XP/2000/ (real-time)
* Signed 64-bit drivers for Windows 7/Vista/XP

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, download menu
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.

<table>
<thead>
<tr>
<th>Configuration example 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Function module 0</td>
</tr>
<tr>
<td>Incremental counter</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Konfigurationsbeispiel 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Function module 0</td>
</tr>
<tr>
<td>SSI</td>
</tr>
</tbody>
</table>

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 respectively functions

<table>
<thead>
<tr>
<th>Application</th>
<th>Max. number of signal generators or functions for each function module</th>
<th>Max. number of function modules for each APCIe-1711</th>
<th>Max. number of signal generators or functions of each APCIe-1711</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incremental counter</td>
<td>1 (32-bit) or 2 (16-bit)</td>
<td>4</td>
<td>4 or 8</td>
<td>124</td>
</tr>
<tr>
<td>SSI</td>
<td>3</td>
<td>4</td>
<td>12</td>
<td>124</td>
</tr>
<tr>
<td>Chronos</td>
<td>1</td>
<td>4</td>
<td>4</td>
<td>125</td>
</tr>
<tr>
<td>BISS-Master</td>
<td>6</td>
<td>4</td>
<td>24</td>
<td>88</td>
</tr>
<tr>
<td>Counter/Timer</td>
<td>3</td>
<td>4</td>
<td>12</td>
<td>126</td>
</tr>
<tr>
<td>TOR</td>
<td>2</td>
<td>4</td>
<td>8</td>
<td>127</td>
</tr>
<tr>
<td>Pulse acquisition</td>
<td>4</td>
<td>4</td>
<td>16</td>
<td>128</td>
</tr>
<tr>
<td>PWM</td>
<td>2</td>
<td>4</td>
<td>8</td>
<td>128</td>
</tr>
<tr>
<td>ETM</td>
<td>2</td>
<td>4</td>
<td>8</td>
<td>129</td>
</tr>
<tr>
<td>Digital I/O</td>
<td>8</td>
<td>4</td>
<td>32</td>
<td>129</td>
</tr>
<tr>
<td>TTL</td>
<td>24</td>
<td>1</td>
<td>24</td>
<td>129</td>
</tr>
<tr>
<td>Parallel Interface</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>88</td>
</tr>
<tr>
<td>Sinus/Cosinus</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>89</td>
</tr>
<tr>
<td>EnDat 2.2</td>
<td>2</td>
<td>4</td>
<td>8</td>
<td>89</td>
</tr>
</tbody>
</table>

Customer-tailored modifications, designed to suit your needs.
Hardware and software, firmware, PLDs, ...
Contact us!
Function Parallel Interface

With the **Parallel Interface** function, the digital inputs of the APCIe-1711 are acquired parallelly. Up to 28 digital inputs, 24 V, can be acquired with the APCIe-1711-24 V. Up to 16 RS422 and 12 24 V digital inputs can be acquired with the APCIe-1711.

There are different methods for the acquisition of the inputs:
- Timer controlled (max. resolution 1 µs = 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 APCIe-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) parallelly. If an external trigger signal is used (maskable, rising or falling edge) then there is no need to use one of the inputs for triggering.

The data is transferred directly via DMA in the RAM of the PC.

If the **Parallel Interface** function is loaded on all function modules, then up to 28 digital inputs (RS422 / 24 V) are available.

Used signals

<table>
<thead>
<tr>
<th>Pin name</th>
<th>Signal type</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ax +/-</td>
<td>24 V*/RS422</td>
<td>Digital input</td>
</tr>
<tr>
<td>Bx +/-</td>
<td>24 V*/RS422</td>
<td>Digital input</td>
</tr>
<tr>
<td>Cx +/-</td>
<td>24 V*/RS422</td>
<td>Digital input</td>
</tr>
<tr>
<td>Dx +/-</td>
<td>24 V*/RS422</td>
<td>Digital input</td>
</tr>
<tr>
<td>Ex</td>
<td>24 V</td>
<td>Digital input</td>
</tr>
<tr>
<td>Fx</td>
<td>24 V</td>
<td>Digital input</td>
</tr>
<tr>
<td>Gx</td>
<td>24 V</td>
<td>Digital input</td>
</tr>
</tbody>
</table>

The 24 V switching level can be adjusted optionally down 1 V

x: Number of the module (See pin assignment page 93)

* 24 V for the APCIe-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 which can be assigned freely to 1 or 2 channels.
- Sensor data transmission
- Register data transmission


Used signals

<table>
<thead>
<tr>
<th>Signal name</th>
<th>Pin name</th>
<th>Signal type</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output_Ch0_x</td>
<td>Ax +/-</td>
<td>RS422</td>
<td>Dig. output 0 (clock line from master to slave) MA 0</td>
</tr>
<tr>
<td>Input_Ch0_x</td>
<td>Bx +/-</td>
<td>RS422</td>
<td>Dig. input 0 (data line from slave to master) SL 0</td>
</tr>
<tr>
<td>Output_Ch1_x</td>
<td>Cx +/-</td>
<td>RS422</td>
<td>Dig. output 1 (clock line from master to slave) MA 1</td>
</tr>
<tr>
<td>Input_Ch1_x</td>
<td>Dx +/-</td>
<td>RS422</td>
<td>Dig. input 1 (data line from slave to master) SL 1</td>
</tr>
</tbody>
</table>

x: Number of the module (See pin assignment page 93)
Function EnDat 2.2

EnDat 2.2 is a bidirectional synchronous-serial interface for position measurement devices. This interface allows the read-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 respectively D) and data line (A respectively C).

The function EnDat 2.2 is only available for the APCIe-1711! (not for the APCIe-1711-24V and APCIe-1711-5V-I)

Used signals

<table>
<thead>
<tr>
<th>Channel</th>
<th>Signal name</th>
<th>I/O</th>
<th>Pin name</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>CLK_0+</td>
<td>0</td>
<td>Ax +</td>
<td>Clock pulse line</td>
</tr>
<tr>
<td>0</td>
<td>CLK_0-</td>
<td>0</td>
<td>Ax -</td>
<td>Clock pulse line</td>
</tr>
<tr>
<td>0</td>
<td>DATA_0+</td>
<td>0</td>
<td>Bx +</td>
<td>Data line</td>
</tr>
<tr>
<td>0</td>
<td>DATA_0-</td>
<td>0</td>
<td>Bx -</td>
<td>Data line</td>
</tr>
<tr>
<td>1</td>
<td>CLK_1+</td>
<td>0</td>
<td>Cx +</td>
<td>Clock pulse line</td>
</tr>
<tr>
<td>1</td>
<td>CLK_1-</td>
<td>0</td>
<td>Cx -</td>
<td>Clock pulse line</td>
</tr>
<tr>
<td>1</td>
<td>DATA_1+</td>
<td>1</td>
<td>Dx +</td>
<td>Data line</td>
</tr>
<tr>
<td>1</td>
<td>DATA_1-</td>
<td>0</td>
<td>Dx -</td>
<td>Data line</td>
</tr>
</tbody>
</table>

x: Number of the module (See pin assignment page 93)

Function Sinus/Cosinus

With the function Sinus/Cosinus 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-1Vpp is meant for the connection of signals with 1 Vpp, the EM-SINCOS-11µA is able to acquire 11 µA 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.

Used signals

<table>
<thead>
<tr>
<th>Extension module 0</th>
<th>Sensor 1</th>
<th>Sensor 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal</td>
<td>Pin name</td>
<td>Pin no.*</td>
</tr>
<tr>
<td>Sin+</td>
<td>EM0[0]</td>
<td>18</td>
</tr>
<tr>
<td>Cos+</td>
<td>EM0[1]</td>
<td>19</td>
</tr>
</tbody>
</table>

Extension module 1

<table>
<thead>
<tr>
<th>Extension module 1</th>
<th>Sensor 1</th>
<th>Sensor 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal</td>
<td>Pin name</td>
<td>Pin no.*</td>
</tr>
</tbody>
</table>

* 78-pin D-Sub female connector

Please note: The function Sinus/Cosinus can only be used with the extension module EM-SINCOS and it is only available for the pins EM0(0) to EM0(12) or EM1(0) to EM1(12).
### 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 8254)
- Pulse counter (4 x 32-bit counters per module)
- Chronos (chronometer)
- TGR (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 (8 and 3 mode)
- EMT (Timer interface for period duration measurement, edge time, ...)
- TTL (TTL I/O without isolation)
- Parallel interface
- EnDat 2.2
- Signal control
- Customised functions

#### Signals
- Digital I/O signals, TTL or RS422, 24 V

### Technical data APCIe-1711-24 V version

#### Technical data
- **APCIe-1711**
  - 24 V inputs (Channels A, B, C, D).
  - 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

#### Logic input levels:
- (Standard)
  - UH max.: 30 V
  - UL min.: 18 V
  - UL max.: 16 V
  - UL min.: 0 V

- All functions using port 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:
- 168 x 98 mm

#### System bus:
- ACC: 10 PCI Express base specification, Revision 1.0a (PCI Express 1.0a)

#### Space required:
- 1/4-lane PCI Express slot

#### Operating voltage:
- +3.3 V / +12 V from the PC
- +24 V ext.

#### Current consumption:
- APCIe-1711: 3.3 V / 341 mA
- 12 V / 76 mA typ.

#### Temperature range:
- 0 to 60 °C (with forced cooling)

### Ordering information

#### APCIe-1711
- Multifunction counter board, optically isolated, fast counter inputs – programmable functionality, for PCI Express.
- Incl. technical description and software drivers.
- **APCIe-1711:** Isolated counter board with programmable functionality
- **APCIe-1711-24 V:** 24 V instead of RS422 (A, B, C, D).
- **APCIe-1711-5V:** 5 V inputs (E, F, G) instead of 24 V
- **APCIe-1711-10MHz:** Input frequency 10 MHz
  - Inputs (A, B, C, D)

#### Option
- **Opt. 5V:** 5 V outputs (H1, H2, H3, H4) instead of 24 V

#### Accessories
- **PX8001:** 3-row screw terminal panel with housing for DIN rail
- **ST1711-50:** Standard round cable, shielded, twisted pairs, 2 m, 78-pin male connector to 50-pin male connector

*Preliminary product information*
Exact axis positioning 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 APCIe-1711: Thanks to its high input speed of 10 MHz and its robustness, the board is able to move the axes precisely even at high speed.
Multifunction board, optically isolated, 16 SE/8 differential inputs, 4/8 analog outputs, 16-bit

**APCIe-3121 / APCIe-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

**Features**

**Analog inputs**
- 16 single-ended/8 differential inputs
- 16-bit resolution
- Optical isolation 500 V
- Throughput: 100 kHz
- Input ranges: 0-10 V, ±10 V, 0-5 V, ±5 V, ±2 V, ±1 V, ±0.2 V, ±0.1 V, ±0.2 mA (option) freely programmable through software for each channel
- Gain PGA x1, x2, ±x3, 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**
- 4 or 8 analog outputs, optically isolated 500 V
- Voltage or current outputs
- 16-bit resolution (15-bit for 0-10 V)
- Output voltage: ±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 ±5 mA max. for voltage outputs
- Current outputs: 0-20 mA, min. load 10 Ω, max. load 560 Ω, ±20 mA
- EMI filters

**Digital**
- 4 dig. inputs including 1 interruptible input
- 4 dig. 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 ± 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:**
- 32-bit drivers for Windows 7/Vista/XP/2000 (real-time)
- Signed 64-bit drivers for Windows 7/XP

**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, download menu

**Also for**
see APCIe-3120, page 136
Also for CompactPCI™
see CPCI-3120, page 184

Signed 64-bit drivers for Windows 7/XP

on request

LabVIEW™

LabWindows/CVI™
## Analog inputs

| Number of inputs: | 16 single-ended/8 differential inputs or 8 single-ended/4 differential inputs |
| Resolution:       | 16-bit |
| Optical isolation:| ± 3.0 V through opto-couplers |
| Input range:      | 0-10 V, ±10 V switchable through software (0-20 mA optional) |
| Throughput:       | 100 kHz |

## Analog outputs

| Number of outputs: | 8 or 4 |
| Resolution:        | 15-bit |
| Output range:      | ±50 mA, ±50 mA |
| Load (at 20 mA):   | 60 ohm 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 |
| Input current at 24 V:  | 10 mA typ. |
| Input range:            | 0-30 V |
| Supply voltage:         | 5V-30V |
| Max. switching current: | 650 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 3.0a (PCI Express 3.0a) |
| Space required:      | 144 mm 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) |

## Specifications

### Analog inputs
- Number of inputs: 16 single-ended/8 differential inputs or 8 single-ended/4 differential inputs
- Resolution: 16-bit
- Optical isolation: ± 3.0 V through opto-couplers
- Input range: 0-10 V ±10 V switchable through software (0-20 mA optional)
- Throughput: 100 kHz
- Gain: Software programmable (1, 2, 5, 10)
- Diff. non-linearity (UNL): ± 1 LSB max. (AD converter)
- Bandwidth (-3 dB): Limited to 130 kHz with low-pass filter
- Trigger: Through software, timer, external event (24 V input)
- Voltages: Data to the PC, through TLP 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: 15-bit
- Output range: ±50 mA, ±50 mA
- Load (at 20 mA): 60 ohm 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
- Input current at 24 V: 10 mA typ.
- Input range: 0-30 V
- Supply voltage: 5V-30V
- Max. switching current: 650 mA typ.

### Physical and environmental conditions
- Dimensions: 168 x 99 mm
- System bus: Acc. to PCI Express base specification, Revision 3.0a (PCI Express 3.0a)
- Space required: 144 mm 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)

## Ordering information

### Versions
- **APCle-312x-16-8** Version with 16 SE/8 diff. inputs, 8 analog outputs, 8 dig. I/O
- **APCle-312x-16-4** Version with 16 SE/8 diff. inputs, 4 analog outputs, 16 SE/4 diff. inputs, 4 analog outputs, 8 dig. I/O
- **APCle-312x-8-8** Version with 8 SE/4 diff. inputs, 8 analog outputs, 8 dig. I/O
- **APCle-312x-8-4** Version with 8 SE/4 diff. inputs, 4 analog outputs, 8 dig. I/O
- **Current versions**
  - APCle-3121-16-8C Version with 16 SE/8 diff. inputs, 8 analog outputs, 16 SE/8 diff. inputs, 8 analog outputs
  - APCle-3121-8-8C Version with 8 SE/4 diff. inputs, 8 analog outputs, 8 dig. I/O
  - APCle-3121-8-4C Version with 8 SE/4 diff. inputs, 4 analog outputs, 8 dig. I/O

### Accessories
- **PX901-A**: Screw terminal panel 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
- **FB3000**: Ribbon cable for digital I/O

### 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

### Addi-data connection

### PIN assignment – 37-pin D-Sub male connector

### Pin assignment – 16-pin male connector

## Simplified block diagram

## Appendix

### Connection diagram

### Contents & Services

### Distributed Solutions

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**Phone:** +49 7229 1847-0  
**Fax:** +49 7229 1847-222  
**info@addi-data.com**  
**www.addi-data.com**
Analog input board, optically isolated, 16 SE/8 differential inputs, 16-bit

**APCI-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

---

### Features

**Analog inputs**

- 16 single-ended/8 differential inputs
- Optical isolation 500 V
- Input ranges: 0-10 V, ±10 V, 0-5 V, ±5 V, 0-2 V, ±2 V, 0-1 V, ±1 V, 0-20 mA
- Gain PGA x1, x2, x5, x10
- PCI Express DMA

**Analogue 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

---

### Safety features

- Optical isolation 500 V min.
- Creeping distance IEC 61010-1
- Overvoltage protection ± 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:**

- Signed 64-bit drivers for Windows 7/XP

**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, download menu

---

Also for

see APCI-3001, page 146
and APCI-3010 / APCI-3016, page 140
Also for

see CPCI-3001, page 186

Signed 64-bit drivers for Windows 7/XP

LabVIEW™

LabWindows/CVI™
**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 (0-10 V, ±10 V, 0-5 V, ±5 V, 0-2 V, ±2 V, 0-1 V, ±1 V, 0-20 mA)
- Throughput: 100 kHz
- Gain: Software programmable (1, 2, 5, 10)
- Relative precision (INL): ±2 LSB max. (A/D converter)
- Differential non-linearity (DNL): ±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

### 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-lane PCI Express slot
- Operating voltage: +3.3 V, +12 V from PC
- Temperature range: 0 to 60 °C (with forced cooling)

### Ordering information

**APCle-3021**

Analog input board, optically isolated, 16 SE/8 differential inputs, 16-bit. Incl. technical description and software drivers.

**Versions**

- APCle-3021-16: Version with 16 SE/8 differ. inputs
- APCle-3021-8: Version with 8 SE/4 differ. inputs
- APCle-3021-4: Version with 4 SE/2 differ. inputs

**Options**

- Please indicate the number of channels if necessary.
- 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 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
- PX901-ZG: Screw terminal panel for connecting the digital I/O
- 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

**ADDI-DATA connection**

[Diagram showing connection details]

**Simplified block diagram**

[Diagram showing block diagrams]

**Pin assignment – 37-pin D-Sub male connector**

[Diagram showing pin assignments]

**Pin assignment – 16-pin male connector**

[Diagram showing pin assignments]

**ADDI-DATA connection**

[Diagram showing connection details]
Analog output board, optically isolated, 8/4 differential outputs, 16-bit

**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

---

### Features

**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 ranges: ±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 ±5 mA max. for voltage outputs
- Current outputs: 0-20 mA, min. load 10 Ω, max. load 560 Ω, at 20 mA
- EMI filters

**Digital**
- 4 dig. inputs including 1 interruptible input
- 4 dig. 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
- 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:**
- 32-bit drivers for Windows 7/Vista/XP/2000/ (real-time)
- Signed 64-bit drivers for Windows 7/XP

**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, download menu
## Specifications

### Analog outputs

<table>
<thead>
<tr>
<th>Number of outputs:</th>
<th>8 or 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution:</td>
<td>16-bit</td>
</tr>
<tr>
<td>Optical isolation:</td>
<td>500 V through opto-couplers</td>
</tr>
<tr>
<td>Output range:</td>
<td>0-20 mA switchable through software (0-20 mA optional)</td>
</tr>
<tr>
<td>Overvoltage protection:</td>
<td>±15 V</td>
</tr>
<tr>
<td>Max. output current</td>
<td>±5 mA, 2 kΩ</td>
</tr>
<tr>
<td>Short-circuit current:</td>
<td>±35 mA (short time)</td>
</tr>
<tr>
<td>Output voltage after reset:</td>
<td>0 V</td>
</tr>
</tbody>
</table>

### Digital I/O

<table>
<thead>
<tr>
<th>Number of I/O channels:</th>
<th>4 dig. inputs, 4 dig. high-side outputs, 24 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>optical isolation:</td>
<td>500 V through opto-couplers</td>
</tr>
<tr>
<td>Input current at 24 V:</td>
<td>±10 mA typ.</td>
</tr>
<tr>
<td>Input range:</td>
<td>0-30 V</td>
</tr>
<tr>
<td>Supply voltage:</td>
<td>8-32 V</td>
</tr>
<tr>
<td>Max. switching current:</td>
<td>±5 mA typ.</td>
</tr>
</tbody>
</table>

### 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

<table>
<thead>
<tr>
<th>Dimensions:</th>
<th>168 x 99 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>System bus:</td>
<td>Acc. to PCI Express base specification, Revision 1.0a (PCI Express 1.0a)</td>
</tr>
<tr>
<td>Space required:</td>
<td>1/4-lane PCI Express slot</td>
</tr>
<tr>
<td>Operating voltage:</td>
<td>+3.3 V, -12 V from PC</td>
</tr>
<tr>
<td>Front connector:</td>
<td>37-pin D-Sub male connector</td>
</tr>
<tr>
<td>Temperature range:</td>
<td>0 to 60 °C (with forced cooling)</td>
</tr>
</tbody>
</table>

### Ordering information

**APCle-3521**

Analog output board, optically isolated, 8/4 differential outputs, 16-bit. Incl. technical description and software drivers.

#### Versions

**Voltage**

- APCle-3521-S: Version with 8 analog voltage outputs
- APCle-3521-4: Version with 4 analog voltage outputs

**Current**

- APCle-3521-SC: Version with 8 analog current outputs
- APCle-3521-4C: Version with 4 analog current outputs

### Accessories

**PX901-A:** Screw terminal panel 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

**PX901-ZG:** Screw terminal panel for connecting the digital I/O

**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
Features

Maximise the reliability of your telecom, ISP, Voice Mail, File Server or industrial systems under Windows operating systems with the APCIe-040 PCI Express watchdog board. The board is equipped with 7 watchdogs for simultaneous soft- and hardware monitoring. In this way, external devices can be monitored (e.g. alarm systems, PLCs) and controlled (e.g. modems, dialing devices).

In addition, the PCI Express watchdog board APCIe-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
- 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: µs, 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

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:
- 32-bit drivers for Windows 7/Vista/XP
- Signed 64-bit drivers for Windows 7/XP

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, download menu

In preparation
The software Watch & Act® monitors the software and hardware levels of the PC or server on which it is installed. System services can be stopped or restarted as needed. Combined with the watchdog board APCIe-040, it is possible to monitor the complete system, i.e. in case of error the PC or server can be rebooted. It is also possible to watch external devices such as diagnostic or monitoring systems and to control modems or other dialing devices.
**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 10^8 operations

**Electrical life:** 10^5 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 (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-lane, 1 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)

---

**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
1 to 8-port serial interface, RS232, RS422, RS485, 20 mA CL, modular mounting through modules

The APCIe-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.

**Applications**

- Industrial serial communication
- Data acquisition
- Industrial process control
- Multi-user systems
- PLC interface
- Modem and printer control
- Multidrop applications
- etc.

**Software drivers**

A CD-ROM with the following software and programming samples is supplied with the board.

- Signed 64-bit drivers for Windows 7/Vista/XP

Drivers and samples for the following compilers and software packages:

- .NET
- Microsoft VC++
- Borland C++
- Visual Basic
- Delphi
- LabVIEW
- LabWindows/CVI
- ADDIPACK functions
  - Watchdog
  - Timer
  - Temperature

On request:

Further operating systems, compilers and samples.

Driver download: www.addi-data.com, download menu

---

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

---

**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 or 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
- Detection of false start bits
- Internal diagnostic possibility, break, parity, overrun and framing error
### Specifications

#### Serial interface – 1-port, 2-port, 4-port, 8-port

<table>
<thead>
<tr>
<th>Operating mode</th>
<th>RS232</th>
<th>RS422</th>
<th>RS485</th>
<th>20 mA CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1232-G</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>S1232</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>S1422-G</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>S1422</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>S1485-G</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>S1485</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>SITTY</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

| Optical isolation 1000 V | ✔ | ✔ | ✔ | ✔ |
| Creeping distance 3.2 mm | ✔ | ✔ | ✔ | ✔ |
| Short-circuit protection | ✔ | ✔ | ✔ | ✔ |
| ESD protection | ✔ | ✔ | ✔ | ✔ |
| Burst protection | ✔ | ✔ | ✔ | ✔ |
| Duplex | ✔ | ✔ | ✔ | ✔ |
| Max. Baud rate | 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 |

### Safety features

- Optical isolation: 1000 V (SI modules)

### Physical and environmental conditions

- Dimensions: 168 x 99 mm
- System bus: PCIe.x PCI Express base specification, Revision 1.0a (PCI Express 1.0a)
- Space required: 1 PCIe Express slot
- Operating voltage: + 3.3 V from the PC
- Front connector: 9-pin D-Sub male connector (APCIe-7300)
- 2x9-pin D-Sub male connector (APCIe-7420)
- 37-pin D-Sub male connector (APCIe-7500)
- 78-pin D-Sub female connector (APCIe-7800)

### 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.

### Ordering information

#### SI modules

Please order the modules separately!

<table>
<thead>
<tr>
<th>Module</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1232-G</td>
<td>RS232 mode, isolated</td>
</tr>
<tr>
<td>S1232</td>
<td>RS232 mode</td>
</tr>
<tr>
<td>S1422-G</td>
<td>RS422 mode, isolated</td>
</tr>
<tr>
<td>S1422</td>
<td>RS422 mode</td>
</tr>
<tr>
<td>S1485-G</td>
<td>RS485 mode, isolated</td>
</tr>
<tr>
<td>S1485</td>
<td>RS485 mode</td>
</tr>
<tr>
<td>SITTY</td>
<td>20 mA Current Loop mode (active, passive), isolated</td>
</tr>
</tbody>
</table>

#### Accessories

**APCIe-7500/4C:** 4-port serial interface (4 x 9-pin D-Sub)

**APCIe-7300 / APCIe-7420 / APCIe-7500 / APCIe-7800**

- APCIe-7300: 1-port serial interface (1 x 9-pin D-Sub)
- APCIe-7420: 2-port serial interface (2 x 9-pin D-Sub)
- APCIe-7500: 4-port serial interface (1 x 37-pin D-Sub)
- APCIe-7800: 8-port serial interface (1 x 78-pin D-Sub)

Each incl. technical description and software drivers.

**ST075:** Shielded round cable, 37 to 4 x 9-pin (for APCIe-7500)

**ST074:** Shielded round cable, 37 to 4 x 25-pin (for APCIe-7500)

**ST7809:** Shielded round cable, 78 to 8 x 9-pin (for APCIe-7800)

**ST7825:** Shielded round cable, 78 to 8 x 25-pin (for APCIe-7800)
The digital boards are used in the industrial I/O regulation, in signal switching, as interface to automatic test devices, for the on/off monitoring of electrical consumers or as an interface to machines. In this way, for example, ventilation, valves, pumps and electromechanical relays can be activated.

**A wide 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. Thus there is no undefined range that could result in 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
Informations see page 16

**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

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PCI 5 V</td>
<td>5 V</td>
<td>5 V</td>
<td>3.3 V</td>
<td>5 V</td>
<td>5 V</td>
</tr>
<tr>
<td>FPGA</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Filters and protective circuits</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Input channels</td>
<td>16</td>
<td>8</td>
<td>32</td>
<td>32</td>
<td>16</td>
</tr>
<tr>
<td>Optical isolation 1000 V</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Interruptible input channels</td>
<td>14</td>
<td>16</td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nominal voltage (V) DC (V)</td>
<td>24 V (19-30) 12 V (APCI-1500-12V)</td>
<td>24 V (19-30)</td>
<td>24 V (19-26) 5 V (APCI-1564-5V)</td>
<td>24 V (19-30) 5 V (APCI-1032-5)</td>
<td>24 V (19-30)</td>
</tr>
<tr>
<td>Input current at 24 VDC</td>
<td>6 mA</td>
<td>6 mA</td>
<td>5 mA</td>
<td>5 mA</td>
<td>6 mA</td>
</tr>
<tr>
<td>Output channels (24 V high-side drivers)</td>
<td>16</td>
<td>8</td>
<td>32</td>
<td>32</td>
<td>16</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Relays</th>
<th>8/16 relays</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optical isolation 1000 V</td>
<td>✓</td>
</tr>
<tr>
<td>Nominal voltage (V) DC (V)</td>
<td>24 V DC (10-36)</td>
</tr>
<tr>
<td>Output current (A) for one channel</td>
<td>0.5(2)</td>
</tr>
<tr>
<td>Watchdog (depth)</td>
<td>✓ (16-bit)</td>
</tr>
<tr>
<td>Timer / Counter (depth)</td>
<td>32-bit (16-bit)</td>
</tr>
<tr>
<td>Page</td>
<td>104</td>
</tr>
</tbody>
</table>

Software: Driver download: [www.addi-data.com](http://www.addi-data.com), download menu

(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

**Features**

- 3 programmable timers
- Connector compatible to the ISA board PA 1500. Connector and software compatible to the digital I/O boards APCIe-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

**Applications**

- Industrial I/O control
- PLC coupling
- Reading of encoder values for process control
- Signal switching
- Interface to encoder values for process control
- 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 (real-time)
- RTX drivers (real-time)

**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, download menu

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**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”
### Specifications

<table>
<thead>
<tr>
<th>Digital inputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of inputs: 16 (common ground acc. to IEC 1131-2)</td>
</tr>
<tr>
<td>Including interruptable inputs: 14, IRQ line selected through BIOS</td>
</tr>
<tr>
<td>Optical isolation: Through opto-couplers, 1000 V from PC to peripheral</td>
</tr>
<tr>
<td>Compare logic: AND and OR mode; OR priority</td>
</tr>
</tbody>
</table>

#### 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 Vcurrent 9 mA typ.
- **UL min.**: 19 Vcurrent 2 mA typ.
- **UL max.**: 14 Vcurrent 0.7 mA typ.
- **UL min.**: 0 Vcurrent 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 Vcurrent 6.3 mA typ.
- **UL min.**: 9 Vcurrent 2.7 mA typ.
- **UL max.**: 6 Vcurrent 1.2 mA typ.
- **UL min.**: 0 Vcurrent 0 mA typ.
- **Signal delay**: 70 µs (at nominal voltage)
- **Maximum input frequency**: 5 kHz (at nominal voltage)

<table>
<thead>
<tr>
<th>Digital outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of outputs: 16, optically isolated up to 1000 V through opto-couplers</td>
</tr>
<tr>
<td>Output type: High-side (load to ground) acc. to IEC 1131-2</td>
</tr>
<tr>
<td><strong>Nominal voltage</strong>: +5 V, ± 5 % from the PC</td>
</tr>
<tr>
<td><strong>Supply voltage</strong>: 10 V to 36 V, min. 5 V (via front connector)</td>
</tr>
<tr>
<td><strong>Max. current for 16 outputs</strong>: 3 A typ.</td>
</tr>
<tr>
<td><strong>Output current/output shutdown at 24 V, R load &lt; 0.1 Ω</strong>: 1.5 A</td>
</tr>
<tr>
<td><strong>RDS ON resistance</strong>: 0.4 Ω max.</td>
</tr>
<tr>
<td><strong>Switch-on time</strong>: I out=0.5 A, load = resistance: 100 µs</td>
</tr>
<tr>
<td><strong>Switch-off time</strong>: I out=0.5 A, load = resistance: 60 µs</td>
</tr>
<tr>
<td><strong>Overtemperature (shutdown)</strong>: 170 °C (output driver)</td>
</tr>
<tr>
<td><strong>Temperature hysteresis</strong>: 20 °C, (output driver)</td>
</tr>
</tbody>
</table>

#### Safety
- **Shutdown logic**: When the ext. 24 V voltage drops below 5 V:
  - The outputs are switched off.
- **Diagnoses**: status bit or interrupt to the PC.
- **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 5 V acc. to specification 2.1 (PCISIG)
- **Space required**: 1 PCI slot
- **Operating voltage**: 400 mA typ. ± 10 %
- **Current consumption**: 400 mA typ. ± 10 %
- **Front connector**: 37-pin D-Sub male connector
- **Temperature range**: 0 to 60 °C (with forced cooling)

### Ordering information

#### Versions
- **APCI-1500**: Digital I/O board, opt. isolated, 32 dig. I/O, 24 V inputs, outputs 10 to 36 V
- **APCI-1500-12V**: Digital I/O board, opt. isolated, 32 dig. I/O, 12 V inputs, outputs 10 to 36 V

#### 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, cascadable
- **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 (separate 24 V supply)
- **ST021**: Round cable between APCI-1500 and PX8500-G, shielded, twisted pairs, 2 m
- **ST022**: Cable between PX8500-G and PX01-DG, shielded, 2 m
- **ST8500**: Ribbon cable for cascading two PX 8500
Digital I/O board, optically isolated, 16 digital inputs and outputs, 24 V

APCI-1516

8 digital inputs, 24 V
8 digital outputs, 24 V, 500 mA/channel
Optical isolation 1000 V
Input and output filters
Watchdog

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

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 (real-time)
- 32-bit drivers for Windows 7/Vista/XP/2000 (real-time)
- Signed 64-bit drivers f. Windows 7/Vista/XP

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, download menu

106 | Phone: +49 7229 1847-0 info@addi-data.com Fax: +49 7229 1847-222 www.addi-data.com
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.: 14 V (current 0.6 mA typ.)
  - UH min.: 19 V (current 2 mA typ.)
  - UL max.: 14 V (current 9 mA typ.)
  - UL min.: 24 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.
- Overtemperature (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): Diagnostics at output overload and overtemperature
- Watchdog: Timer-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: 131x 99 mm
- System bus: PCI 32-bit 5 V acc. to specification 2.1 (PCISIG)
- Space required: 1 PCI slot
- Operating voltage: 5 V ± 5 % from the PC
- Current consumption: 210 mA ±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

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**Ordering information**

**APCI-1516**

Digital I/O board, optically isolated, 16 digital inputs and outputs, 24 V. Included: technical description, software drivers

**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, cascadable

**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 APCI-1516 and PX8500-G, shielded, twisted pairs, 2 m
**ST022**: Round cable between PX8500-G and PX 901 or PX9000, shielded, 2 m
**ST8500**: Ribbon cable for cascading two PX 8500

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Digital I/O board, optically isolated, 64 digital inputs and outputs, 24 V

**Features**
- 32-bit, 33 MHz, PCI interface
- PCI 5 V (APCI-1564, APCI-1564-5V, APCI-1564-5V-HS)
- PCI 3.3 V (APCI-1564_3,3V)

**Inputs**
- 32 optically isolated digital inputs, 24 V or 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, 10 V to 36 V or 5 V (APCI-1564-5V)
- 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
- 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 (real-time)
- 32-bit drivers for Windows 7/Vista/XP (real-time)
- Signed 64-bit drivers for Windows 7/Vista/XP
- RTX drivers (real-time)

**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, download menu

Connection principle of the 24 V outputs (APCI-1564, APCI-1564_3,3V) and 5 V outputs (APCI-1564-5V)
Specifications

Digital inputs

- Number of inputs: 32, 4 groups of channels with common ground:
  - Input: 9-7, 8-15, 16-23, 24-31
  - 0-2: fast counter inputs, 500 kHz
  - 4-19: interruptible inputs

Optical isolation: Through opto-couplers, 1000 V

Nominal voltage 24 V (APCI-1564 and APCI-1564_3,3V): Channel 0-3 Channel 4-31
- Input current at 24 V: 0.5 mA typ. 5 mA max.
- Logic input levels: U nominal = 24 V
  - UH max.: 26 V / 13.2 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.

Nominal voltage 5 V (APCI-1564-5V): Channel U-3 Channel 4-31
- Input current at 5 V: 0.5 mA typ. 5 mA max.
- Logic input levels: U nominal = 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.

Safety

- Overtemperature (shutdown): 170 °C (output driver)
- Pathfinder: 10 s
- 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 (PCI SIG) or 3.3 V
- Space required: 1 PCI slot + 1 additional slot opening
- Operating voltage: 170 °C (input driver)
- Current consumption: 410 mA x 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)

APCI-1564 / APCI-1564_3,3V / APCI-1564-5V / APCI-1564-5V-HS

- 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
- APCI-1564-5V: Same as APCI-1564, for 5 V inputs and outputs (open collector)
- APCI-1564-5V-HS: Same as APCI-1564, for 5 V inputs and outputs (high side)

Accessories

- PX901-D: Screw terminal panel
- PX901-DG: Screw terminal panel for DIN rail
- PX 901-ZG: Screw terminal panel (only for APCI-1564-5V)
- PX85000: 3-row screw terminal panel
- PX8500-G: Relay output board for DIN rail, cascadable

APCI-1564 / APCI-1564_3,3V / APCI-1564-5V / APCI-1564-5V-HS

- ST010: Standard round cable, shielded, twisted pairs, 2 m
- ST011: Same as ST010, for high currents (24 V supply separate)
- 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 input board, optically isolated, 32 digital inputs, 24 V / 5 V

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

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
- ...

Software drivers
A CD-ROM with the following software and programming samples is supplied with the board.

Standard drivers for:
- Linux (real-time)
- Signed 64-bit drivers f. Windows 7/Vista/XP
- RTX drivers (real-time)

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, download menu
**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/0.4 mA typ.
- UL max.: 14 V/current 1.3 mA typ., 2 V/0.7 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
- Max. current consumption: +5 V ± 5 % from the PC
- Front connector: 37-pin D-Sub male connector
- Temperature range: 0 to 60 °C (with forced cooling)

---

**Pin assignment – 37-pin D-Sub male connector**

---

**ADDI-DATA connection for the APCI-1032**

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**Ordering information**

**APCI-1032**
- Screw terminal panels PX9000 and PX901-DG with cable ST010

**APCI-1032-5**
- Digital input board, optically isolated, 32 digital inputs, 24 V. Incl. technical description and software drivers
- 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
- PX90000: 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**
- PX901-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

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
- ...

Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.

Standard drivers for:

- Linux (real-time)
- 32-bit drivers for Windows 7/Vista/XP/2000 (real-time)
- Signed 64-bit drivers for Windows 7/XP

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, download menu

APCI-1016

16 digital inputs, 24 V

Optical isolation 1000 V

Input filters

Reverse voltage protection

Protective circuit for the input channels

Peripherals | Board
---|---
24 V input | EMI filters and overvoltage protection
0 V | Signal conditioning

Resolution: 1024x768
### 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 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)

**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**

- **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
Digital output board, optically isolated, 32 digital outputs, 24 V / 5 V

**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

**Software drivers**
A CD-ROM with the following software and programming samples is supplied with the board.

**Standard drivers for:**
- Linux (real-time)
- 32-bit drivers for Windows 7/Vista/XP/2000 (real-time)
- Signed 64-bit drivers for Windows 7/Vista/XP

**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, download menu

**Connection principle of the outputs at 24 V (APCI-2032) and 5 V (APCI-2032-5)**
**Contents & Services**

**Distributed Solutions**

**PC boards**

**Connection**

**Appendix**

**ordering information**

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### Specifications

#### Digital outputs

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<th>Outputs</th>
<th>32</th>
</tr>
</thead>
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<tr>
<td>Output type</td>
<td>High-side (load to ground) acc. to IEC 1131-2</td>
</tr>
<tr>
<td>Optical isolation</td>
<td>Through opto-couplers, 1000 V from PC to peripheral</td>
</tr>
<tr>
<td>Nominal voltage</td>
<td>24 V (APCI-2032); or 5 V (APCI-2032-5)</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>for 24 V version: 10 V to 36 V for 5 V version: 5 V to 12 V via front connector</td>
</tr>
<tr>
<td>Max. current for 32 outputs</td>
<td>6 A typ. (2x3 A)</td>
</tr>
<tr>
<td>Output current</td>
<td>500 mA max./channel</td>
</tr>
<tr>
<td>Short-circuit current/output shutdown at 24 V</td>
<td>1.5 A</td>
</tr>
<tr>
<td>RDS ON resistance</td>
<td>0.4 Ω max.</td>
</tr>
<tr>
<td>Switch-on time</td>
<td>I out=0.5 A, load = resistance: 94 µs typ. (APCI-2032)</td>
</tr>
<tr>
<td>Switch-off time</td>
<td>I out=0.5 A, load = resistance: 8 µs typ. (APCI-2032)</td>
</tr>
<tr>
<td>Overtemperature (shutdown)</td>
<td>170 °C (output driver)</td>
</tr>
</tbody>
</table>

#### Safety

**Shut-down logic (VCC 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, ± 5 % from the PC

**Current consumption:** 230 mA ± 10 % typ.

**Front connector:** 37-pin D-Sub male connector

**Temperature range:** 0 to 60 °C (with forced cooling)

---

### 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-S:** 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, cascadable

**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

---

### Pin assignment – 37-pin D-Sub male connector

**Example 1**

Connection of the outputs through screw terminal panels

**Simplified block diagram**

**Example 2**

Connection of the outputs through relay output board PX8500-G cascaded in 32 relays

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### Screw terminal panel PX901-DG

with cable ST010

- Relay output board PX8500-G

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 PCI, digital – APCI-2032 / APCI-2032-5
Digital output board, optically isolated, 16 digital outputs, 24 V

**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

**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 (real-time)
- 32-bit drivers for Windows 7/Vista/XP/2000 (real-time)
- Signed 64-bit drivers for Windows 7/XP

**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, download menu

**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

**Protective circuit for the output channels**

<table>
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<tr>
<th>Peripherals</th>
<th>Board</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 V Output</td>
<td>Filters and overvoltage protection</td>
</tr>
<tr>
<td>0 V</td>
<td>optical isolation</td>
</tr>
</tbody>
</table>

Phone: +49 7229 1847-0  info@addi-data.com
Fax: +49 7229 1847-222  www.addi-data.com
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: < 0.1 Ω
- RDS ON resistance: 0.4 Ω max.
- Switch-on time: 1 out=0.5 A, load = resistance: 100 µs
- Switch-off time: 1 out=0.5 A, load = resistance: 60 µs
- Overtemperature (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.
- 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 ± 5 % from the PC
- Current consumption: 233 mA ± 10 % typ.
- Front connector: 37-pin D-Sub male connector
- Temperature range: 0 to 60 °C (with forced cooling)

Audio-Video connection
Screw terminal panel PX901-DG with cable ST010
Relay output board PX8500-G

APCI-2016
Digital output board, optically isolated, 16 digital outputs, 24 V. Incl. technical description and software drivers

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, cascadable

Ordering information

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 APCI-2016 and PX8500-G, shielded, twisted pairs
ST8500: Ribbon cable for cascading two PX8500-G
Relay board, optically isolated, 8/16 relays, 8 digital inputs, 24 V

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

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
• ...

Software drivers
A CD-ROM with the following software and programming samples is supplied with the board.

Standard drivers for:
• Linux (real-time)
• 32-bit drivers for Windows 7/Vista/XP/2000 (real-time)
• Signed 64-bit drivers for Windows 7/XP

Drivers and samples for the following compilers and software packages:
• .NET
• Microsoft VC++ • Borland C++
• Visual Basic • Delphi
• LabVIEW • LabWindows/CVI • DiAdem

ADDPACK functions:
Digital output • Watchdog

On request:
Further operating systems, compilers and samples.

Driver download: www.addi-data.com, download menu

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: 60 VDC, 48 VAC
Max. switching current: 1 A
Max. switching capacity: 30 W
Contact resistance: < 100 mΩ
Response time: Max. 5 ms, typ. 2.5 ms
Release time: Max. 5 ms, typ. 0.9 ms
Mechanical life: 5 x 10^6 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. APCI-2200-16-8: Connection with delivered ribbon cable FB2200-3. Connects the board to a bracket with a 37-pin D-Sub male connector. For connecting the PX 901-ZG.
Temperature range: 0 up to 60 °C (with forced cooling)

Screw terminal panel PX8001
with cable ST370-16

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.

APCI-2200-16-8: 16 relays, 8 dig. inputs, with ribbon cable for the connection of the dig. inputs, PCI 5 V
APCI-2200-8-8: 8 relays, 8 dig. inputs, 24 V, PCI 5 V
APCI-2200-8-8_3,3V: 8 relays, 8 dig. inputs, 24 V, PCI 3.3 V
APCI-2200-2200: 16 relays, PCI 5 V
APCI-2200-8: 8 relays, PCI 5 V

Accessories

PX8001: 3-row screw terminal panel, 50-pin, for DIN-rail mounting
ST370-16: Shielded round cable, 2 m
PX 901-ZG: Screw terminal panel for DIN rail

Ordering information

Pin assignment – 50-pin D-Sub connector APCI-2200-16-8

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

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
TTL I/O board, 48 or 96 digital TTL inputs and outputs

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

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 (real-time)  
• 32-bit drivers for Windows 7/Vista/XP/2000 (real-time)  
• Signed 64-bit drivers f. Windows 7/XP

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, download menu

Specifications

48 TTL I/O channels - 96 TTL I/O channels

Inputs and outputs:  
48 digital TTL I/O (APCI-1648)  
96 digital TTL I/O (APCI-1696)

I/O address range:  
128 byte

Programming:  
Through write/read commands

Driver type:  
74 HC 574

Max. input and output voltage:  
TTL Level

Output current:  
DC ± 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
acc. to spec. 2.2 (PCISIG)

Space required:  
1 PCI slot  
+ 1 slot opening for bracket (APCI-1696)

Operating voltage:  
+5 V ± 5 % from the PC

Current consumption:  
124 mA ± 10 %  
(APCI-1696, all channels as output without load)

Connectors:  
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

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

Phone: +49 7229 1847-0  Fax: +49 7229 1847-222
info@addi-data.com  www.addi-data.com

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

**Challenge:**
To execute measurement, calibration and analysis tasks as precisely and error-free as possible, it is important to monitor the temperature and air humidity of clean rooms, laboratories and calibration rooms in real time. Constant values are needed as even in case of a minimal variation high-precise tasks cannot be guaranteed any more.

**Solution:**
First of all the reference values for temperature, air humidity and quality of the ambient air are defined. The temperature and the air humidity are measured through sensors. As soon as there is a change in the room conditions and the tolerance values are exceeded, the ventilation is activated to restore the reference values. For the acquisition of the sensor values the real-time measurement and control system MSX-Box is equipped with the temperature measurement board APCI-3200 and the analog input board APCI-3001. The digital output board APCI-2032 is used for the control of the ventilation.
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
- BiSS-Master
- Digital inputs and outputs
- Edge time measurement (ETM)
- Customised functions

### Available lines for each function module
- 8 lines are available for each function module
  - Input lines: 2 x TTL and RS422 (APCI-1710) or 2 x 24 V (APCI-1710-24V)
  - 3 x 24 V, optional 5 V for channels E, F, G
  - Output lines: 1 x 24 V, optional 5 V (power output)
  - 2 channels, programmable either as digital inputs or outputs, optically isolated: 2 x TTL, 4 x 24 V

### 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 (real-time)
- 32-bit drivers for Windows 7/Vista/XP (real-time)
- Signed 64-bit drivers for Windows 7/Vista/XP
- RTX drivers (real-time)

### Drivers and samples for the following compilers and software packages:
- .NET
- Microsoft Visual C++ • Microsoft C
- Borland C++ • Borland C
- Visual Basic • Delphi
- LabVIEW

### On request:
Further operating systems, compilers and samples.

Driver download: www.addi-data.com, download menu

The software functions can be adapted to your applications on request. The board can also be implemented for other software applications.
Wide range of applications through free combination of function modules

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

<table>
<thead>
<tr>
<th>Function module 0</th>
<th>Function module 1</th>
<th>Function module 2</th>
<th>Function module 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 x 32-bit Incremental counter</td>
<td>1 x 32-bit Incremental counter</td>
<td>4 x Pulse counter</td>
<td>3 x Counter/Timer</td>
</tr>
</tbody>
</table>

Configuration example 2

<table>
<thead>
<tr>
<th>Function module 0</th>
<th>Function module 1</th>
<th>Function module 2</th>
<th>Function module 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 x SSI</td>
<td>3 x SSI</td>
<td>1 x 32-bit Incremental counter</td>
<td>8 x Digital I/O, 24 V</td>
</tr>
</tbody>
</table>

Programmable onboard modules

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.

Overview of signal generators resp. functions

<table>
<thead>
<tr>
<th>Application</th>
<th>Max. number of signal generators or functions for each function module</th>
<th>Max. number of function modules for each APCI-1710</th>
<th>Max. number of signal generators or functions of each APCI-1710</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incremental counter</td>
<td>1 (32-bit) or 2 (16-bit)</td>
<td>4</td>
<td>4 or 8</td>
<td>128</td>
</tr>
<tr>
<td>SSI*</td>
<td>3</td>
<td></td>
<td>12</td>
<td>128</td>
</tr>
<tr>
<td>Chronos</td>
<td>1</td>
<td>4</td>
<td>4</td>
<td>129</td>
</tr>
<tr>
<td>BISS-Master</td>
<td>1</td>
<td>4</td>
<td>4</td>
<td>129</td>
</tr>
<tr>
<td>Counter/Timer*</td>
<td>3</td>
<td>4</td>
<td>12</td>
<td>130</td>
</tr>
<tr>
<td>TOB</td>
<td>2</td>
<td>4</td>
<td>8</td>
<td>131</td>
</tr>
<tr>
<td>Pulse acquisition</td>
<td>4</td>
<td>4</td>
<td>16</td>
<td>132</td>
</tr>
<tr>
<td>PWM*</td>
<td>2</td>
<td>4</td>
<td>8</td>
<td>132</td>
</tr>
<tr>
<td>ETM</td>
<td>2</td>
<td>4</td>
<td>8</td>
<td>133</td>
</tr>
<tr>
<td>Digital I/O</td>
<td>8</td>
<td>4</td>
<td>32</td>
<td>133</td>
</tr>
<tr>
<td>TTL</td>
<td>24</td>
<td>1</td>
<td>24</td>
<td>133</td>
</tr>
</tbody>
</table>

* Funktion not for APCI-1710-24V

Customer-tailored modifications, designed to suit your needs.

Hardware and software, firmware, PLDs, ...

Contact us!

Customer-tailored modifications, designed to suit your needs.

Hardware and software, firmware, PLDs, ...

Contact us!
Function Incremental encoder

Up to 2 incremental encoders can be connected to a module programmed with the function incremental encoder.

- 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 pulses (A, B)
- Direction recognition for upwards or downwards counting
- Hysteresis circuit for the absorption of the first pulse after a change in rotation; switchable
- 2 x 32-bit data latches, indiv. programmable for internal / external strobe, latch strobe synchronised with an internal clock pulse
- 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 and reference point logic

Function Synchronous serial interface (SSI)

The function module is programmed as a synchronous serial interface. The SSI function is an interface for systems which allow an absolute position information 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 encoders per function module (depends on encoder)
- Complete isolation through opto-couplers for the input and output channels for avoiding earth circuits
- Serial data transfer
- Common clock pulse for the 3 interfaces per function module
- Clock frequency and number of data bits are software-programmable
- 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**

<table>
<thead>
<tr>
<th>Signal name</th>
<th>Pin name</th>
<th>Signal type</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>A_x</td>
<td>Ax +/-</td>
<td>Diff./TTL/24 V*</td>
<td>A signal of the incremental encoder (32-bit) resp. A signal of the incremental encoder 0 (16-bit)</td>
</tr>
<tr>
<td>B_x</td>
<td>Bx +/-</td>
<td>Diff./TTL/24 V*</td>
<td>B signal of the incremental encoder (32-bit) resp. B signal of the incremental encoder 0 (16-bit)</td>
</tr>
<tr>
<td>INDEX_x</td>
<td>Cx +/-</td>
<td>Diff./TTL/24 V*</td>
<td>Index signal of the incremental encoder (32-bit)</td>
</tr>
<tr>
<td>C_x</td>
<td>Cx +/-</td>
<td>Diff./TTL/24 V*</td>
<td>A signal of the incremental encoder 1 (2x16-bit)</td>
</tr>
<tr>
<td>UAS_x</td>
<td>Dx +/-</td>
<td>Diff./TTL/24 V*</td>
<td>Error signal input (32-bit)</td>
</tr>
<tr>
<td>D_x</td>
<td>Dx +/-</td>
<td>Diff./TTL/24 V*</td>
<td>B signal of the incremental encoder 1 (2x16-bit)</td>
</tr>
<tr>
<td>REF_x</td>
<td>Ex</td>
<td>24 V / 5 V optional</td>
<td>Digital input (can also control the reference point logic)</td>
</tr>
<tr>
<td>ExtStb_a_x</td>
<td>Fx</td>
<td>24 V / 5 V optional</td>
<td>Digital input (can be used for latch logic, respectively generate an interrupt)</td>
</tr>
<tr>
<td>ExtStb_b_x</td>
<td>Gx</td>
<td>24 V / 5 V optional</td>
<td>Digital input (can be used for latch logic, respectively generate an interrupt)</td>
</tr>
<tr>
<td>DIG_OUT_x</td>
<td>Hx</td>
<td>24 V / optional 5 V</td>
<td>Digital output</td>
</tr>
</tbody>
</table>

x: Number of the function module (See pin assignment page 123)

* 24 V for the APCI-1710-24 V

**Block diagram SSI**

- Three independent 32-bit SHIFT registers, which can be read through the data bus
- Clock and pulse generator
- Function and control logic

**Used signals**

<table>
<thead>
<tr>
<th>Signal name</th>
<th>Pin name</th>
<th>Signal type</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clock_x</td>
<td>Ax +/-</td>
<td>RS422</td>
<td>Clock output signal for the SSI encoders</td>
</tr>
<tr>
<td>DATA1_x</td>
<td>Bx +/-</td>
<td>RS422/TTL</td>
<td>Data input 1 for the first encoder</td>
</tr>
<tr>
<td>DATA2_x</td>
<td>Cx +/-</td>
<td>RS422/TTL</td>
<td>Data input 2 for the second encoder</td>
</tr>
<tr>
<td>DATA3_x</td>
<td>Dx +/-</td>
<td>RS422/TTL</td>
<td>Data input 3 for the third encoder</td>
</tr>
<tr>
<td>Input1_x</td>
<td>Ex</td>
<td>24 V / 5 V optional</td>
<td>Digital input 1</td>
</tr>
<tr>
<td>Input2_x</td>
<td>Fx</td>
<td>24 V / 5 V optional</td>
<td>Digital input 2</td>
</tr>
<tr>
<td>Input3_x</td>
<td>Gx</td>
<td>24 V / 5 V optional</td>
<td>Digital input 3</td>
</tr>
<tr>
<td>Output_x</td>
<td>Hx</td>
<td>24 V / 5 V optional</td>
<td>Digital output</td>
</tr>
</tbody>
</table>

x: Number of the function module (See pin assignment page 123)

The SSI function cannot be programmed on the APCI-1710-24 V.
**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**
- Complete isolation through opto-couplers for the input and output channels for avoiding earth circuits
- 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**

<table>
<thead>
<tr>
<th>Pin name</th>
<th>Signal type</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ax +/-</td>
<td>DIF/TTL, 24 V*</td>
<td>Digital output 1; set to &quot;0&quot; after reset</td>
</tr>
<tr>
<td>Bx +/-</td>
<td>DIF/TTL, 24 V*</td>
<td>Digital output 2; set to &quot;0&quot; after reset</td>
</tr>
<tr>
<td>Cx +/-</td>
<td>DIF/TTL/24 V*</td>
<td>Start pulse for measuring</td>
</tr>
<tr>
<td>Dx +/-</td>
<td>DIF/TTL/24 V*</td>
<td>Stop pulse for measuring</td>
</tr>
<tr>
<td>Ex</td>
<td>24 V / 5 V optional</td>
<td>Digital input 0, inverting</td>
</tr>
<tr>
<td>Fx</td>
<td>24 V / 5 V optional</td>
<td>Digital input 1, inverting</td>
</tr>
<tr>
<td>Gx</td>
<td>24 V / 5 V optional</td>
<td>Digital input 2, inverting</td>
</tr>
<tr>
<td>Hx</td>
<td>24 V / 5 V optional</td>
<td>Digital output 0; set to &quot;0&quot; after reset</td>
</tr>
</tbody>
</table>

*Number of the function module (See pin assignment page 123)

**Block diagram Chronos**

![](image1)

**Function BiSS-Master**

The function **BiSS-Master** is a bidirectional sensor interface for the communication with positioning encoders. The following types of communications are supported:

- **Functions of the BiSS-Master:**
  - Sensor data transmission
  - Register data transmission
  - Multicycle data transmission


**Limits and differences with respect to the BiSS specification:**
- One channel available, to which a BiSS slave can be connected
- The functionality “automatic sensor data request” is not available
- Data buffer for two sensor registers available
- The board APCI-1710-10K20 is required

**Used signals**

<table>
<thead>
<tr>
<th>Signal name</th>
<th>Pin name</th>
<th>Signal type</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Ch1_x</td>
<td>Cx +/-</td>
<td>Diff.</td>
<td>Digital input 1 (data line from slave to master)</td>
</tr>
<tr>
<td>Output Ch1_x</td>
<td>Ax +/-</td>
<td>Diff.</td>
<td>Digital output 1 (clock line from master to slave)</td>
</tr>
</tbody>
</table>

*Number of the function module (See pin assignment page 123)

**Block diagram BiSS-Master**

![](image2)
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 through opto-couplers for the input and output channels for avoiding earth circuits
- 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) x 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) x 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**

<table>
<thead>
<tr>
<th>Signal name</th>
<th>Pin name</th>
<th>Signal type</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUT1_x</td>
<td>Ax +/-</td>
<td>DIF./TTL</td>
<td>Output of counter/timer 0</td>
</tr>
<tr>
<td>OUT2_x</td>
<td>Bx +/-</td>
<td>DIF./TTL</td>
<td>Output of counter/timer 1</td>
</tr>
<tr>
<td>OUT3_x</td>
<td>Hx</td>
<td>24 V / 5 V opt.</td>
<td>Output of counter/timer 2</td>
</tr>
<tr>
<td>GATE1_x</td>
<td>Ex</td>
<td>24 V / 5 V opt.</td>
<td>GATE Input of counter/timer 0</td>
</tr>
<tr>
<td>GATE2_x</td>
<td>Fx</td>
<td>24 V / 5 V opt.</td>
<td>GATE Input of counter/timer 1</td>
</tr>
<tr>
<td>GATE3_x</td>
<td>Gx</td>
<td>24 V / 5 V opt.</td>
<td>GATE Input of counter/timer 2</td>
</tr>
<tr>
<td>CLK1_x</td>
<td>-</td>
<td>-</td>
<td>Internal clock</td>
</tr>
<tr>
<td>CLK2_x</td>
<td>Cx +/-</td>
<td>DIF./TTL 24 V opt.</td>
<td>Clock counter input of counter/timer 1</td>
</tr>
<tr>
<td>CLK3_x</td>
<td>Dx +/-</td>
<td>DIF./TTL 24 V opt.</td>
<td>Clock counter input of counter/timer 2</td>
</tr>
</tbody>
</table>

x: Number of the function module (See pin assignment page 123)

The Counter/Timer function cannot be programmed on the APCI-1710-24 V.

**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 Ax(Bx).

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:
- Complete isolation through opto-couplers for the input and output channels to avoid earth circuit
- 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

<table>
<thead>
<tr>
<th>Pin name</th>
<th>Signal type</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ax +/-</td>
<td>DIF/TTL24 V*</td>
<td>Digital input 1 (TOR1)</td>
</tr>
<tr>
<td>Bx +/-</td>
<td>DIF/TTL24 V*</td>
<td>Digital input 2 (TOR2)</td>
</tr>
<tr>
<td>Cx +/-</td>
<td>DIF/TTL24 V*</td>
<td>External Gate (TOR1)</td>
</tr>
<tr>
<td>Dx +/-</td>
<td>DIF/TTL24 V*</td>
<td>External Gate (TOR2)</td>
</tr>
</tbody>
</table>

x: Number of the function module (see pin assignment page 123)
*24 V for the APCI-1710-24 V

Block diagram TOR

```
GATE (C,D)
PCI clock/4

Gate
Clock
32-bit Timer 1

Time reference
(Timer1)

Clear
Gate
Latch
Clock
32-bit Timer 0

Ax6x

DQ0...31 Pulse number
```
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 down counters
- Optical isolation through opto-couplers for the input and output channels for avoiding earth circuits
- 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

<table>
<thead>
<tr>
<th>Pin name</th>
<th>Signal type</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ax +/-</td>
<td>Diff/TTL/24 V*</td>
<td>Input of the 1st counter</td>
</tr>
<tr>
<td>Bx +/-</td>
<td>Diff/TTL/24 V*</td>
<td>Input of the 2nd counter</td>
</tr>
<tr>
<td>Cx +/-</td>
<td>Diff/TTL/24 V*</td>
<td>Input of the 3rd counter</td>
</tr>
<tr>
<td>Dx +/-</td>
<td>Diff/TTL/24 V*</td>
<td>Input of the 4th counter</td>
</tr>
<tr>
<td>H</td>
<td>24 V/5 V optional</td>
<td>Common digital output of the counter</td>
</tr>
</tbody>
</table>

x: Number of the function module (see pin assignment page 123)
* 24 V for the APCI-1710-24 V

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 through opto-couplers for the input and output channels for avoiding earth circuits.
- Interrupt status after end of 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

<table>
<thead>
<tr>
<th>Signal name</th>
<th>Pin name</th>
<th>Signal type</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>PWM_OUT_CH0_x</td>
<td>Ax +/-</td>
<td>Diff/TTL output</td>
<td>digital output PWM 0</td>
</tr>
<tr>
<td>PWM_OUT_CH1_x</td>
<td>Bx +/-</td>
<td>Diff/TTL output</td>
<td>digital output PWM 1</td>
</tr>
<tr>
<td>GATE_CH0_x</td>
<td>Cx +/-</td>
<td>Diff/TTL input</td>
<td>Gate input PWM 0</td>
</tr>
<tr>
<td>GATE_CH1_x</td>
<td>Dx +/-</td>
<td>Diff/TTL input</td>
<td>Gate input PWM 1</td>
</tr>
<tr>
<td>DIG_IN_E_x</td>
<td>Ex</td>
<td>24 V output</td>
<td>digital input</td>
</tr>
<tr>
<td>DIG_IN_F_x</td>
<td>Fx</td>
<td>24 V input</td>
<td>digital input</td>
</tr>
<tr>
<td>DIG_IN_G_x</td>
<td>Gx</td>
<td>24 V input</td>
<td>digital input</td>
</tr>
<tr>
<td>DIG_IN_E_x</td>
<td>Ex</td>
<td>24 V input</td>
<td>digital input or freely controllable</td>
</tr>
</tbody>
</table>

x: Number of the function module (See pin assignment page 123)
The PWM function cannot be programmed on the APCI-1710-24 V.
**Function ETM (Edge Time Measurement)**

The ETM function is a timer interface, which allows to measure simultaneously the time of a period and the time of the “High” or “Low” levels of this period. 2 functions are implemented:
- 1 x 32-bit timer which is set as the reference time
- 2 x 32-bit measuring timers which measure the time of the period and of the “High” or “Low” levels

**Properties:**
- Optical isolation through opto-couplers for the input and output channels for avoiding earth circuits
- Interrupt can be generated at the end of the measurement
- Timer can be read back
- Inputs and outputs can be inverted through software
- Software gate

The interface includes:
- 1 gate input
- 2 independent 32-bit timers which can be written or read back through the data bus.

**Typical applications:**
- Period duration measurement
- Level duration measurement

**Used signals**
The ETM function requires 4 inputs (A to D) on each function module of the APCI-1710 or CPCI-1710 (see page 130).

Up to 8 ETM (2 per module) can be used on one board.

**Used signals**

<table>
<thead>
<tr>
<th>Pin name</th>
<th>Signal type</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ax +/-</td>
<td>Diff./TTL/24 V*</td>
<td>Gate input of the ETM counter 0</td>
</tr>
<tr>
<td>Bx +/-</td>
<td>Diff./TTL/24 V*</td>
<td>Input of the ETM counter 0</td>
</tr>
<tr>
<td>Cx +/-</td>
<td>Diff./TTL/24 V*</td>
<td>Gate of the ETM counter 1</td>
</tr>
<tr>
<td>Dx +/-</td>
<td>Diff./TTL/24 V*</td>
<td>Input of the ETM counter 1</td>
</tr>
</tbody>
</table>

x: Number of the function module (see pin assignment page 123)

*24 V for the APCI-1710-24V

**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**

<table>
<thead>
<tr>
<th>Pin name</th>
<th>Signal type</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ax +/-</td>
<td>Diff./TTL/24 V*</td>
<td>Dig. input and output (with 24 V* only input)</td>
</tr>
<tr>
<td>Bx +/-</td>
<td>Diff./TTL/24 V*</td>
<td>Dig. input and output (with 24 V* only input)</td>
</tr>
<tr>
<td>Cx +/-</td>
<td>Diff./TTL/24 V*</td>
<td>Digital input</td>
</tr>
<tr>
<td>Dx +/-</td>
<td>Diff./TTL/24 V*</td>
<td>Digital input</td>
</tr>
<tr>
<td>Ex</td>
<td>24 V / 5 V optional</td>
<td>Digital input</td>
</tr>
<tr>
<td>Fx</td>
<td>24 V / 5 V optional</td>
<td>Digital input</td>
</tr>
<tr>
<td>Gx</td>
<td>24 V / 5 V optional</td>
<td>Digital input</td>
</tr>
<tr>
<td>Hx</td>
<td>24 V / 500 mA (10..36 V)</td>
<td>Digital output</td>
</tr>
</tbody>
</table>

x: Number of the function module (see pin assignment page 123)

*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 encoder/SSI
- Counter/timer
- Chronos/TO for frequency measurement
- Pulse acquisition
- Chronos for pulse width modulation
- Chronos for period measurement
- UI for velocity measurement
- BiSS-Master
- Digital outputs, 24 V, TTL, RS422
- PWM

Signals
- 5 V inputs (E, F, G) instead of 24 V
- 24 V for differential input signals (A and B for counter, I (Index) and UAS (error) signals)

Inputs
- Number of inputs: 12
- Nominal voltage: 24 VDC
- Input current: 11 mA (typical) at nominal voltage
- Logic input levels: Unominal: 24 V
- Switch ON time: 15 µs
- Switch OFF time: 200 µs

Outputs
- Nominal voltage: 5 VDC
- Maximum output current: 500 mA (per output)
- Switching characteristics of the 5 V outputs
  - Switch OFF time: 0.02 µs
  - Switch ON time: 0.06 µs
- Protection against undervoltage: effective at V ext.<5 V

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)

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
- Temperature range: 0 to 60 °C (with forced cooling)

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).

Ordering information

APCI-1710
- Multifunction counter board, optically isolated, encoder, incremental counter, timer/counter, SSI, PWM,...
- Incl. technical description and software drivers.

APCI-1710-24V
- 24 V for differential input signals (A and B for counter, I (Index) and UAS (error) signals)

APCI-1710-24V
- 5 V inputs (E, F, G) instead of 24 V

APCI-1710-5V-I
- 5 V inputs (E, F, G) instead of 24 V, outputs (H1, H2, H3, H4) S 5 V instead of 24 V

APCI-1710-10K20
- Same as APCI-1710, with additional function for connecting a BiSS interface

Option
- Opt. 5 V: 5 V outputs (H1, H2, H3, H4) instead of 24 V

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
**Applications**

**Practical Examples**

**Machinery**

### Inline quality control of balls for ball-bearings

**Challenge:**
On a grinding machine balls for ball-bearings are ground. After the grinding process the balls are to be measured directly on site and evaluated. Possible correction values for the production process are to be transferred directly to the PLC which controls the grinding machine. For this purpose a very robust measurement technology is required as the measurement is effected on the production site. The application controls whether the dimensions of the balls lie within predefined parameters or not. If not, the PLC is to initiate the necessary corrections.

**Solution:**
For this task the robust MSX-E3701 system is used with a development mode application, in which two sensors acquire and measure the balls. The measured values are calculated and compared to the predefined parameters of the PLC. With this predefined values it is possible to check if the balls have the correct size or if it is necessary to regrind them. The result of the calculation and the measured values are transferred to the PLC which controls the grinding machine. The PLC can then readjust the grinding process. The capacity to calculate values onboard relieves the PLC, accelerates production cycles and achieves significant improvements in quality.

### Temperature regulation for the production of wafers

**Challenge:**
During the production process, a wafer has to go through several temperature stages, which must be regulated in order to avoid wasting the expensive material. This involves much data and complex calculations, and therefore a PC-based solution is chosen. With an analog PC board the values of 32 pyrometers (0 to 10 V) are to be acquired with an acquisition cycle of 1 ms. For regulating the heating lamps, an algorithm is executed on the FPGA of the PC board. Analog and digital outputs are used for controlling and regulating the heating lamps.

**Solution:**
For the measurement and regulation of the temperature the analog I/O board APCI-3120 for the PCI-bus was chosen. It satisfies all requirements: speed, precision, FPGA technology and long-term availability. Due to its various protective circuits it is suitable for the use in an environment with interferences.
High-precision measurement

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.

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

<table>
<thead>
<tr>
<th>Multifunction boards</th>
<th>Analog input boards</th>
<th>Analog output boards</th>
</tr>
</thead>
<tbody>
<tr>
<td>APCI-3120</td>
<td>APCI-3110</td>
<td>APCI-3116</td>
</tr>
<tr>
<td>APCI-3010</td>
<td>APCI-3016</td>
<td>APCI-3002</td>
</tr>
<tr>
<td>APCI-3003</td>
<td>APCI-3001</td>
<td>APCI-3501</td>
</tr>
</tbody>
</table>

### 32-bit PCI bus

<table>
<thead>
<tr>
<th>Bus Type</th>
<th>3.3 V</th>
<th>3.3 V</th>
<th>3.3 V</th>
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</tr>
</thead>
<tbody>
<tr>
<td>APCI-3120</td>
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<td>✔</td>
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<td>✔</td>
</tr>
</tbody>
</table>

### FPGA

- ✔
- ✔
- ✔
- ✔
- ✔
- ✔
- ✔
- ✔
- ✔

### Simultaneous acquisition

- ✔

### Analog inputs

**Single Ended**
- 16/8
- 16/8
- 16/8
- 16/8
- 16/8
- 16/8
- 16/8
- 16/8

**Differential**
- 8/4
- 8/4
- 8/4
- 8/4
- 8/4
- 8/4
- 8/4
- 8/4

**Resolution (bit)**
- 16
- 12
- 16
- 12
- 16
- 16
- 12
- 16

**Optical isolation**
- 500 V
- ✔
- ✔
- ✔
- ✔
- ✔
- ✔
- ✔
- ✔

**Throughput (kHz)**
- 100
- 200
- 200
- 200
- 200
- 200
- 200
- 400

**Voltage range**
- 0-10 V ± 10 V
- 5 V ± 5 V
- 2 V ± 2 V
- 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
- 1, 2, 5, 10
- 1, 2, 5, 10
- 1, 2, 5, 10
- 1, 2, 5, 10
- 1, 2, 5, 10
- 1, 2, 5, 10
- 1, 2, 5, 10

**FIFO (value)**
- 256
- 512
- 512
- 512
- 512
- 512
- 256

### Functions of the analog inputs

**DMA**
- (scatter gather, single, continuous, Sequence)
- ✔
- ✔
- ✔
- ✔
- ✔
- ✔
- ✔
- ✔

**DMA (single, continuous, Sequence)**
- ✔

**Auto Refresh**
- ✔
- ✔
- ✔
- ✔
- ✔
- ✔
- ✔
- ✔

**Interrupt**
- ✔
- ✔
- ✔
- ✔
- ✔
- ✔
- ✔
- ✔

**Programmed I/O**
- ✔
- ✔
- ✔
- ✔
- ✔
- ✔
- ✔
- ✔

**Trigger**

<table>
<thead>
<tr>
<th>Software</th>
<th>✔</th>
<th>✔</th>
<th>✔</th>
<th>✔</th>
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<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>24 V input</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Sequence RAM</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
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</table>

### Analog outputs

**4 or 8**
- 4
- 4
- 4

**Resolution (bit)**
- 14
- 12
- 12

**Optical isolation**
- ✔
- ✔
- ✔

**0-10 V ± 10 V**
- ✔
- ✔
- ✔

**Current outputs**

**Setup time**
- 30 µs
- 15 µs
- 15 µs
- 30 µs

### Digital I/O

**24 V inputs, optically isolated**
- 4
- 4
- 4

**24 V outputs, optically isolated**
- 4
- 4
- 4

**TTL I/O**
- 24
- 24
- 24
- 24

**Timer/Counter/Watchdog**
- (depth) and/or
- 1/1
- 1/1
- 1/1
- 1/1

**Page**
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- 138

**Software**
- Current driver list on the web: [www.addi-data.com](http://www.addi-data.com)
### Temperature, pressure, noise, vibration and length measurement

<table>
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<tr>
<th></th>
<th>Temperature measurement</th>
<th>Pressure measurement</th>
<th>Noise and vibration measurement</th>
<th>Length measurement</th>
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<tr>
<td></td>
<td>APCI-3200</td>
<td>APCI-3300</td>
<td>APCI-3600</td>
<td>APCI-3702</td>
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<td></td>
<td>3.3 V / 5 V</td>
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<td><strong>64-bit or 32-bit PCI-Bus</strong></td>
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<td>FPGA</td>
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<td>Noise and vibration</td>
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<td>Thermocouples LK,TE,R,S,B,N Pt100, Pt1000</td>
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<td>Strain gauges</td>
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<td>Inductive transducers</td>
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<td></td>
<td>Half Bridge, LVDT</td>
<td>Half Bridge, LVDT</td>
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<td>Signal conditioning</td>
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<td>8 current sources for connecting ICP™ sensors</td>
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<td><strong>Analog inputs</strong></td>
<td>4 groups 4 channels</td>
<td>4 groups 4 channels</td>
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<td>Single Ended (SE)/ differential (diff.)</td>
<td>16 thermo8 RTDs 8 thermo4 RTDs 4 thermo2 RTDs</td>
<td>8/4 inputs for strain gauges</td>
<td>8/4 simultaneous acquisition for induct. displacement transducers</td>
<td>16/8/1 channels for inductive displacement transducers</td>
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<tr>
<td>Resolution (bit)</td>
<td>18</td>
<td>18</td>
<td>24</td>
<td>16</td>
</tr>
<tr>
<td>Optical isolation</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Throughput</td>
<td>20-160 Hz</td>
<td>20-160 Hz</td>
<td>2-200 kHz (through software)</td>
<td>depends on transducer type</td>
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<tr>
<td>Voltage ranges</td>
<td>+ 1.25 V</td>
<td>+ 1.25 V</td>
<td>± 10 V</td>
<td>depends on transducer type</td>
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<tr>
<td>Gain</td>
<td>1, 2, 4, 8, 16, 32, 64, 128</td>
<td>1, 2, 4, 8, 16, 32, 64, 128</td>
<td>16/8/1 channels for inductive displacement transducers</td>
<td>depends on transducer type</td>
</tr>
<tr>
<td>FIFO (Values)</td>
<td>128 DWORD</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Functions of the analog inputs

- **DMA (scatter gather; single; continuous; Sequence)**: scatter gather free run, ring buffer
- **Auto Refresh**: ✓ ✓ ✓ ✓
- **Interrupt**: ✓ ✓ ✓ ✓ ✓ ✓ ✓
- **Programmed I/O**: ✓ ✓ ✓ ✓ ✓
- **Trigger**:
  - Software: ✓ ✓ ✓ ✓ ✓ ✓
  - 24 V input: ✓ ✓ ✓ ✓ ✓ ✓ ✓
- **Sequence RAM**: ✓ ✓

### Analog outputs

- **Analog outputs**: 2
- **Resolution (bit)**: 16
- **Optical isolation**: 0-10 V ± 10 V
- **Chronometer inputs**: 4
- **Gate inputs**: 2
- **Timer/Watchdog (depth)** in combination, and/or: 1-16-bit, 16-bit
- **Digital I/O**
  - Inputs 24 V, optically isolated: 4, 8 (50 mA)
  - Outputs 24 V, optically isolated: 3 (Open Collector), 8 (125 mA)
- **Page**: 150, 154, 156, 160, 162

Software: Current driver list on the web: [www.addi-data.com](http://www.addi-data.com)
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

**Analogue 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, ±10 V, 0-5 V, ±5 V, 0-2 V, ±2 V, 0-1 V, ±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

**Analogue acquisition**

- One single channel, several channels, several channels through scan list
- Automatic analogue 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

**Analogue outputs**

- 4 or 8 analog outputs, optically isolated 500 V
- Setup time 10 μs typ.
- 14-bit resolution (13-bit for 0-10 V)
- Output voltage: ±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 ± 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 (real-time)
- 32-bit drivers for Windows 7/Vista/XP (real-time)
- Signed 64-bit drivers for Windows 7/XP
- RTX drivers (real-time)

**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, download menu
### 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 0-10 V, 10 V, 0.5 V, 5 V, 0.2 V, ± 2 V, ± 1 V, ± 0.2 mA
- **Throughput:** 100 kHz
- **Common mode rejection:** ± 1138 (ADC)
- **Relative precision (NL):** ± 0.5 LSB (ADC)
- **Input impedance (PGA):** 10^4 / 10^5 of single-ended, 10^4 / 10^20 of differential against GND
- **Data transfer:** Data to the PC through FIFO memory
- **Trigger:** through software, timer, external event (24 V input)
- **Data interrupt:** End of conversion, at timer overrun, End of Scan, DMA transfer at EOC
- **Data transfer:** Data to the PC through FIFO memory

### Analog Outputs

- **Number of outputs:** 4 or 8
- **Resolution:** 16-bit resolution
- **Optical isolation:** 500 V through opto-couplers
- **Output range:** 0-10 V, ± 10 V, switchable through software
- **Overvoltage protection:** ± 12 V
- **Max. output current / load:** ± 5 mA / 500 pF, 2 kΩ
- **Overvoltage protection:** ± 12 V
- **Max. output current / load:** ± 5 mA / 500 pF, 2 kΩ
- **Output voltage after reset:** 0 V

### Digital I/O

- **Number of I/O channels:** 4 digital, 4 digital, 4 digital, 24 V
- **Optical isolation:** 500 V through opto-couplers
- **Input current at 24 V:** 3 mA typ.
- **Input range:** 0-30 V
- **Output range:** 0-30 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.

### PC System Requirements and Environmental Conditions

- **Dimensions:** 175 x 99 mm
- **Option box:** PCL-SE, PCL-D, PCL-V, acc. to specification 2.1 (PCL-MU)
- **Space required:** 1 slot opening for digital I/O with FB3000
- **Operating voltage:** ± 5 % from the PC
- **Current consumption:** From 710 to 790 mA typ. depending on the board version
- **Temperature range:** 0 to 60 °C (with forced cooling)

### Ordering Information

**APCI-3120**

Multifunction board, optically isolated, 16 SE/B diff. inputs, 4/8 analog outputs, 16-bit. Incl. technical description, monitoring program and software drivers.

**Versions**

- APCI-3120-16-8 Version with 16 SE/B diff. inputs, 8 analog outputs
- APCI-3120-16-4 Version with 16 SE/B diff. inputs, 4 analog outputs
- APCI-3120-8-8 Version with 8 SE/B diff. inputs, 8 analog outputs
- APCI-3120-8-4 Version with 8 SE/B diff. inputs, 4 analog outputs

**Options**

- **Option SF:** Precision filter for 1 single-ended channel
- **Option DF:** Precision filter for 1 differential channel
- **Option PC:** Current input 0(4)-20 mA for 1 channel

---

**APCI-3120**

Multifunction board, optically isolated, 16 SE/B diff. inputs, 4/8 analog outputs, 16-bit. Incl. technical description, monitoring program and software drivers.

**Versions**

- APCI-3120-16-8 Version with 16 SE/B diff. inputs, 8 analog outputs
- APCI-3120-16-4 Version with 16 SE/B diff. inputs, 4 analog outputs
- APCI-3120-8-8 Version with 8 SE/B diff. inputs, 8 analog outputs
- APCI-3120-8-4 Version with 8 SE/B diff. inputs, 4 analog outputs

**Options**

- **Option SF:** Precision filter for 1 single-ended channel
- **Option DF:** Precision filter for 1 differential channel
- **Option PC:** Current input 0(4)-20 mA for 1 channel

**PC-SE:** For single-ended PC-Diff: for differential

### Pin Assignment – 37-pin D-Sub Male Connector

**Digital I/O**

- **Dig. input 0:** 1
- **Dig. output 0:** 1
- **Dig. input 1:** 2
- **Dig. output 1:** 2
- **Dig. input 2:** 5
- **Dig. output 2:** 5
- **Dig. input 3:** 7
- **Dig. output 3:** 7

**Analog Input**

- **Analog input 0:** 1
- **Analog input 1:** 2
- **Analog input 2:** 3
- **Analog input 3:** 4

**Analog Output**

- **Analog output 0:** 10
- **Analog output 1:** 11
- **Analog output 2:** 12
- **Analog output 3:** 13

**Trigger**

- **Trigger/dig. input 0:** 10
- **Trigger/dig. input 1:** 11
- **Trigger/dig. input 2:** 12
- **Trigger/dig. input 3:** 13

**Options**

- **Option CAL3120:** On-site calibration of the APCI-3120. Do the fine adjustment fast and reliably and then save the calibration report file.

### Accessories

- **PX901-A:** Screw terminal panel for connecting the analog I/O
- **PX901-AG:** Screw terminal panel for connecting the dig. I/O
- **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

---

**Fax:** +49 7229 1847-222  
**Phone:** +49 7229 1847-0  
**info@addi-data.com**  
**www.addi-data.com**
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

- **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, ±10 V, 0-5 V, ±5 V, 0-2 V, ±2 V, 0-1 V, ±1 V, 0-20 mA (option), freely programmable through software for each channel
  - Current inputs: 0-20 mA (Option)

- **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 µs 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: ± 5 mA
  - Short-circuit current: ± 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: inputs / Port1: outputs
  - 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 ± 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 (real-time)
  - 32-bit drivers for Windows 7/Vista/XP/2000 (real-time)
  - Signed 64-bit drivers for Windows 7/XP

### 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 • Counter

### On request:

Further operating systems, compilers and samples.

Driver download: www.addi-data.com, download menu
**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
  - 0-10 V, ±10 V, 0-5 V, ±5 V, 0-2 V, ±2 V, 0-1 V, ±1 V
- Gain: 0-20 mA optional
- 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
- Interupts: End of conversion, at timer overrun, end of scan

**Analog outputs**
- Number of outputs: 4
- Resolution: 12-bit (APCI-3110) or 16-bit (APCI-3116)
- Voltage outputs
  - Output range: -10 V to +10 V (1 LSB)
  - LSI: 4.8828 BV
  - Accuracy: 1% DB
  - Time to ready: 10s, 15 μs (at 10 V step)
  - Max. output current: ± 5 mA
  - Short-circuit current: ± 20 mA
- Output voltage after reset: 0 V

**Digital I/O**
- Number of I/O channels: 4 digital inputs, 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
- Voltage level: 0 V
- 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 requirement: 1 slot opening for digital I/O with FB8001
- Operating voltage: ±5 V ±5 % from the PC
- Additional connector: 3-pin D-sub male connector for connecting the dig. I/O
- Temperature range: 0 to 60 °C (with forced cooling)

**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**
- APCI-3110-16: 16 SE/8 diff. inputs, 4 analog outputs, 12-bit
- APCI-3110-B: 8 SE/4 diff. inputs, 4 analog outputs, 12-bit
- APCI-3116-16: 16 SE/8 diff. inputs, 4 analog outputs, 16-bit
- APCI-3116-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

**Accessories**
- PX901-A: Screw terminal panel with transorb diodes for connecting the analog I/O
- PX901-B: 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
- FBB001: Ribbon cable for digital I/O
- ST370-16: Standard round cable, shielded, twisted pairs, 2 m

**Ordering information**

**ADDI-DATA connection**

**Simplified block diagram**

**Pin assignment – 37-pin D-Sub male connector**

**Pin assignment – 50-pin male connector**

**APPENDIX**

*Phon: +49 7229 1847-0 info@addi-data.com*
Analog input board, optically isolated, 16/8/4 SE or 8/4/2 diff. inputs, 12-/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

**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, ±10 V, 0-5 V, ±5 V, 0-2 V, ±2 V, 0-1 V, ±1 V, freely programmable through software for each channel
  - Current inputs: 0-20 mA (option)
  - 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

**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 ± 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 (real-time)
- 32-bit drivers for Windows 7/Vista/XP/2000 (real-time)
- Signed 64-bit drivers for Windows 7/XP
- 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 • Digital input • Digital output
- Watchdog • Timer • Counter
- On request: further operating systems, compilers and samples.

Driver download: 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
- 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
- Intermittents: End of conversion, at timer overrun, End of scan

Digital I/O
- Number of I/O channels: 4 digital inputs, 24 V
- 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 (PC/Ind)
- Space required: 1 PCI slot for analog inputs, 1 slot opening for digital I/O with FB8001
- Operating voltage: +5 V ±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
Connection box PX_BNC with cable ST010

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
- APCI-3010-16: 16 SE/8 diff. inputs, 12-bit
- APCI-3010-8: 8 SE/4 diff. inputs, 12-bit
- APCI-3010-4: 4 SE/2 diff. inputs, 12-bit
- APCI-3016-16: 16 SE/8 diff. inputs, 16-bit
- APCI-3016-8: 8 SE/4 diff. inputs, 16-bit
- APCI-3016-4: 4 SE/2 diff. inputs, 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

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
- PX_BNC: BNC connection box for connecting the analog inputs
- ST010: Standard round cable, shielded, twisted pairs, 2 m
- ST011: Standard round cable, shielded, twisted pairs, 2 m
- PX8001: Screw terminal panel for connecting the digital I/O, for DIN rail
- FB8001: Ribbon cable for digital I/O
- ST370-16: Standard round cable, shielded, twisted pairs, 2 m
Features

- PCI 3.3 V or 5 V
- Analog inputs
  - 16 differential inputs
  - 16-bit resolution
  - Throughput: 200 kHz
  - Voltage inputs: 0-10 V, ±10 V, 0-5 V, ±5 V, 0-2 V, ±2 V, 0-1 V, ±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 ±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 (real-time)
- 32-bit drivers for Windows 7/Vista/XP/2000 (real-time)
- Signed 64-bit drivers for Windows 7/XP

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, download menu
## 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:**
  - 0-10 V, ±10 V, 0-5 V, ±5 V, 0-2 V, ±2 V, 0-1 V, ±1 V
  - 0-20 mA optional
- **Gain:** Software programmable (x1, x2, x5, x10)
- **Throughput:** 200 kHz
- **Trigger:** Through software, timer, external event
- **Data transfer:** Data to the PC through FIFO memory, 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, 4 digital outputs, 24 V, 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 (PCISiG)
- **Operating voltage:** +5 V ± 5 % from the PC
- **Current consumption:** 814 mA ± 10 mA
- **Front connector:** 37-pin D-Sub male connector
- **Additional connector:** 16-pin male connector for ribbon cable
- **Temperature range:** 0 to 60 °C (with forced cooling)

### 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
- **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

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### Simplified Block Diagram

- **APCI-3002**
- **PX901-ZG**
- **PX901-AG**
- **ST010/ST011**
- **FB3000**
- **Digital I/O**
- **D-Sub female connector**
- **D-Sub male connector**
- **37-pin SUB-D connector**
- **Optical isolation**
- **Low-pass filters**
- **MUX**
- **Gain**
- **A/D converter**
- **DC/DC converter**
- **Dig. I/O**
- **16 diff. inputs**
- **4 dig. inputs**
- **4 dig. outputs**
- **and ext. trigger input**
- **PCI bus**
- **FPGA control logic**
- **Timer**
- **Sequ. RAM**
- **FIFO**
- **Failure modes**
- **PC board**
- **Appendix**
- **Contents & Services**
- **Distributed Solutions**
- **PC boards**
- **Connection**

---

**Screw terminal panel PX901-AG with cable ST010**
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, ± 10 V, 0-5 V, ± 5 V, 0-2 V, ± 2 V, 0-1 V, ± 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
  - 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
- 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 ± 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 (real-time)
- 32-bit drivers for Windows 7/Vista/XP/2000 (real-time)
- Signed 64-bit drivers for Windows 7/XP

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 • Digital input • Digital output • Timer

On request:

Further operating systems, compilers and samples.

Driver download: www.addi-data.com, download menu
### 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, 0-10 V, ±10 V, 0.5 V, ±5 V, 0.2 V, ±2 V, 0.1 V, ±1 V
- **Gain:** Software programmable (x1, x2, x5, x10)
- **Throughput:** 400 kHz per input
- **Trigger:** Through software, timer, external event (24 V input)
- **Data transfer:** Data to the PC through FIFO memory, 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 differential inputs, 24 V, 4 digital outputs, 24 V
- **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: PC 3.3/5V acc. to specification 2.2 (PCISIG)
- **Space required:** 1 PCI slot for analog inputs, 1 slot opening for digital I/O
- **Operating voltage:** ±5 V, ±5 % from the PC
- **Current consumption:** 1.55 A typ.
- **Front connector:** 15-pin D-Sub male connector for analog inputs, 15-pin female connector for digital I/O
- **Temperature range:** 0 to 60 °C (with forced cooling)

### 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, 0-10 V, ±10 V, 0.5 V, ±5 V, 0.2 V, ±2 V, 0.1 V, ±1 V
- **Gain:** Software programmable (x1, x2, x5, x10)
- **Throughput:** 400 kHz per input
- **Trigger:** Through software, timer, external event (24 V input)
- **Data transfer:** Data to the PC through FIFO memory, 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, 4 digital outputs, 24 V
- **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:** PC 3.3/5V acc. to specification 2.2 (PCISIG)
- **Space required:** 1 PCI slot for analog inputs, 1 slot opening for digital I/O
- **Operating voltage:** ±5 V, ±5 % from the PC
- **Current consumption:** 1.55 A typ.
- **Front connector:** 15-pin D-Sub male connector for analog inputs, 15-pin female connector for digital I/O
- **Temperature range:** 0 to 60 °C (with forced cooling)

### 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

**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, ±10 V, 0-5 V, ±5 V, 0-2 V, ±2 V, 0-1 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

**Analogue 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 ± 40 V
- 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 drivers**

A CD-ROM with the following software and programming examples is supplied with the board.

**Standard drivers for:**

- Linux (real-time)
- 32-bit drivers for Windows 7/Vista/XP/2000 (real-time)
- Signed 64-bit drivers for Windows 7/Vista/XP

**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, download menu
### Analog Specifications

**Number of inputs:**
- 16 single-ended/8 differential inputs
- 8 single-ended/4 differential inputs
- 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, 0-5 V, ± 5 V, 0-2 V, ± 2 V, ± 1 V
- 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 (DNL):** ± 1 LSB (ADC)

**Input impedance (PGA):**
- 10\(^{12}\) Ω // 10 nF single-ended,
- 10\(^{12}\) Ω // 20 nF differential against GND

**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

**Interupts:**
- End of conversion, at timer overrun, End of scan

### Digital I/O Specifications

**Number of I/O channels:**
- 4 digital inputs, 4 digital outputs, 24 V

**Input range:** 0-30 V
- 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:** 175 x 99 mm

**System bus:** PCI 32-bit 3.3 / 5 V acc. to specification 2.1 (PCISiG)

**Temperature range:** 0 to 60 °C (with forced cooling)

### 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**
- APCI-3001-16: 16 SE/8 diff. inputs, 8 dig. I/O
- APCI-3001-8: 8 SE/4 diff. inputs, 8 dig. I/O
- APCI-3001-4: 4 SE inputs, 8 dig. I/O

**Options**
- Please indicate the number of channels

**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
- PX_BNC: BNC connection box for connecting the analog I/O
- PX901-ZG: Screw terminal panel for connecting the digital I/O, for DIN rail
- PX_BNC: BNC connection box for connecting the digital I/O

**Distributed Solutions**
- APCI boards
- Bus boards
- Bus cards
- Accessories
- Complete systems

**Contents & Services**
- Distributed Solutions
- PC boards
- References
- Schematics
- Appendix
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

**Features**

- 8 or 4 analog outputs
- Optical isolation 500 V
- Setup time 30 µs typ.
- 14-bit resolution (13-bit for 0-10 V)
- Output voltage: ±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: µs, 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 (real-time)
- 32-bit drivers for Windows 7/Vista/XP/2000 (real-time)
- Signed 64-bit drivers for Windows 7/XP
- RTX drivers (real-time)

**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, download menu.
**Specifications**

### Analog outputs

<table>
<thead>
<tr>
<th>Specification</th>
<th>APCI-3501-8</th>
<th>APCI-3501-4</th>
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<tbody>
<tr>
<td>Number of outputs</td>
<td>8 or 4</td>
<td></td>
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<tr>
<td>Resolution</td>
<td>14-bit</td>
<td>12-bit</td>
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<tr>
<td>Monotony</td>
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<td></td>
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<tr>
<td>Optical isolation</td>
<td>500 V</td>
<td></td>
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<tr>
<td>Output range</td>
<td>0-10 V, ±10 V</td>
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<td>Setup time at 2 kHz, 1000 pF</td>
<td>30 µs</td>
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<tr>
<td>Output voltage after reset</td>
<td>0 V</td>
<td></td>
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<tr>
<td>Watchdog</td>
<td>software-programmable</td>
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<tr>
<td>Number of inputs</td>
<td>2 digital inputs</td>
<td>2 digital outputs</td>
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<tr>
<td>Resolution</td>
<td>14-bit</td>
<td></td>
</tr>
<tr>
<td>Overvoltage protection</td>
<td>±12 V</td>
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</tr>
<tr>
<td>Max. output current</td>
<td>±5 mA / 500 pF, 2 kHz</td>
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</tr>
<tr>
<td>Short-circuit current</td>
<td>±25 mA</td>
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### Digital I/O

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<th>APCI-3501-4</th>
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<tr>
<td>Optical isolation</td>
<td>500 V</td>
<td></td>
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<tr>
<td>Input range</td>
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<tr>
<td>Input current</td>
<td>3 mA typ.</td>
<td></td>
</tr>
<tr>
<td>Output range</td>
<td>5-30 V</td>
<td></td>
</tr>
<tr>
<td>Output type</td>
<td>Open Collector</td>
<td></td>
</tr>
</tbody>
</table>

### 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

<table>
<thead>
<tr>
<th>Specification</th>
<th>APCI-3501-8</th>
<th>APCI-3501-4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>175 x 99 mm</td>
<td></td>
</tr>
<tr>
<td>System bus</td>
<td>PCI 32-bit 3.3/5 V acc. to specification 2.1 (PCISIG)</td>
<td></td>
</tr>
<tr>
<td>Space required</td>
<td>1 PCI slot for analog outputs, 1 slot opening for digital I/O with FB3000</td>
<td></td>
</tr>
<tr>
<td>Operating voltage</td>
<td>±5 V, ±5 % from the PC</td>
<td></td>
</tr>
<tr>
<td>Current consumption</td>
<td>440 mA ± 10 % typ.</td>
<td></td>
</tr>
<tr>
<td>Additional connector</td>
<td>16-pin male connector for connecting the digital inputs and outputs</td>
<td></td>
</tr>
<tr>
<td>Temperature range</td>
<td>0 to 60 °C (with forced cooling)</td>
<td></td>
</tr>
</tbody>
</table>

**APCI-3501**

Analog output board, optically isolated, 8/4 analog outputs, 14-bit. Incl. technical description and software drivers.

### Versions

<table>
<thead>
<tr>
<th>Version</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>APCI-3501-8</td>
<td>Version with 8 analog voltage outputs</td>
</tr>
<tr>
<td>APCI-3501-4</td>
<td>Version with 4 analog voltage outputs</td>
</tr>
</tbody>
</table>

### Accessories

<table>
<thead>
<tr>
<th>Accessory</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PX901-A</td>
<td>Screw terminal panel with transorb diodes, for connecting the analog outputs</td>
</tr>
<tr>
<td>PX901-AG</td>
<td>Same as PX901-A with housing for DIN rail</td>
</tr>
<tr>
<td>PX_BNC</td>
<td>BNC connection box for connecting the analog I/O</td>
</tr>
</tbody>
</table>

**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

---

**Ordering information**

**Simplified block diagram**

**Pin assignment – 37-pin D-Sub male connector**

**ADDI-DATA connection**

**Ordering information**

**PCI, analog – APCI-3501**

**Phone:** +49 7229 1847-0  
**Fax:** +49 7229 1847-222  
**info@addi-data.com**  
**www.addi-data.com**
Temperature measurement board, optically isolated, 16/8/4 channels for thermocouples, Pt100, RTD, 18-bit

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 PX3200-G

Software linearisation

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 SE8 differential analog voltage inputs, ±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 board PX3200-G)
- 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
- The board is supplied with a monitoring program for testing and setting the board functions

Safety features

- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Diagnostic functions: Short-circuits- and line break detection, depending on the type of sensor used
- Protection against overvoltage (±30 V) and high-frequency EMI

Software drivers

A CD-ROM with the following software and programming examples is supplied with the board.

Standard drivers for:

- Linux (real-time)
- 32-bit drivers for Windows 7/Vista/XP (real-time)
- Signed 64-bit drivers for Windows 7/XP

Drivers and samples for the following compilers and software packages:

- .NET
- Microsoft VC++ • Borland C++
- Visual Basic • Delphi
- LabVIEW • LabWindows/CVI • DIAdem

ADIPACK functions

- Analog input • Temperature • Resistance • Digital input • Digital output

On request:
Further operating systems, compilers and samples.

Driver download: www.addi-data.com, download menu
Simplified block diagram

- PCI bus
- 16-pin male connector
- 4 dig. inputs
- 3 dig. outputs
- Opto-couplers
- FPGA
  - Control logic
  - Sequence
  - Timer
- A/D converters
- Low-pass filters
- Protective circuit and filters
- DC/DC converter
- Current source
- 4 dig. inputs
- 3 dig. outputs
- Opto-couplers
- PCI controller

Connectors:
- 50-pin D-Sub connector
- 16 SE/8 diff. or 8 SE/4 diff. or 4 SE/2 diff.
**Analog inputs**

Analog inputs:
- 16 x thermocouples or
- 8 x RTD with 2 or 4 wire connection or
- 4 x RTD with 3 wire connection

**Resolution:** 16-bit

**Input amplifier:** 125 mA typ., open collector

**Conversion start:** through software or external trigger

**Number of I/O channels:**
- 4 digital inputs, 24 V,
- 3 digital outputs, 24 V

**Logical “0” level:** 0-5 V

**Logical “1” level:** 12-30 V

**Optical isolation:** 1000 V through opto-couplers for analog

**Conversion start:** through software or external trigger

**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

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Selectable sampling frequencies</th>
<th>Sampling frequencies in „Read 1“ Mode</th>
<th>Sampling frequencies in „Scan“ Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTD (Pt100….)</td>
<td>160 Hz</td>
<td>53 Hz / channel</td>
<td>32 Hz</td>
</tr>
<tr>
<td></td>
<td>80 Hz</td>
<td>26 Hz / channel</td>
<td>16 Hz</td>
</tr>
<tr>
<td></td>
<td>40 Hz</td>
<td>13 Hz / channel</td>
<td>8 Hz</td>
</tr>
<tr>
<td></td>
<td>20 Hz</td>
<td>6 Hz / channel</td>
<td>4 Hz</td>
</tr>
<tr>
<td>Thermo-couples</td>
<td>160 Hz</td>
<td>26 Hz / channel</td>
<td>23 Hz</td>
</tr>
<tr>
<td></td>
<td>80 Hz</td>
<td>16 Hz / channel</td>
<td>11 Hz</td>
</tr>
<tr>
<td></td>
<td>40 Hz</td>
<td>6 Hz / channel</td>
<td>6 Hz</td>
</tr>
<tr>
<td></td>
<td>20 Hz</td>
<td>3 Hz / channel</td>
<td>3 Hz</td>
</tr>
</tbody>
</table>

**Four cases are possible:**

1. „Read 1“ mode with RTD

\[ F_1 = \frac{f_{sec}}{3} \]

With RTD (Pt100….) 3 values are acquired at each measurement:
- the measured value,
- the offset,
- the reference voltage.

\[ F_1 = \frac{53 \text{ Hz}}{2}, \quad \frac{26 \text{ Hz}}{2}, \quad \frac{13 \text{ Hz}}{2} \]

2. „Read 1“ mode with thermocouples (TC)

\[ F_1 = \frac{f_{sec}}{6} \]

With TC 2 x 3 values are acquired at each measurement:
- the measured value,
- the offset,
- the reference value.

\[ F_1 = \frac{53 \text{ Hz}}{2}, \quad \frac{26 \text{ Hz}}{2}, \quad \frac{13 \text{ Hz}}{2} \]

3. „Scan“ mode with RTD

\[ F_1 = \frac{f_{sec}}{5} \]

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

\[ F_1 = \frac{32 \text{ Hz}}{2}, \quad \frac{16 \text{ Hz}}{2}, \quad \frac{8 \text{ Hz}}{1}, \quad \frac{4 \text{ Hz}}{1} \]

4. „Scan“ mode with thermocouples (TC)

\[ F_1 = \frac{f_{sec}}{7} \]

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

\[ F_1 = \frac{23 \text{ Hz}}{1}, \quad \frac{11 \text{ Hz}}{1}, \quad \frac{6 \text{ Hz}}{1}, \quad \frac{3 \text{ Hz}}{1} \]

**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 limits 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, 3.375 V acc. to spec. 2.2 (PCI-SIG)

**Space required:** 1 PCI slot and 1 slot opening for the digital I/O

**Operating voltage:** +5 V, ±5 % from the PC

**Current consumption (typ.):** 500 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**

<table>
<thead>
<tr>
<th>Type</th>
<th>Range</th>
<th>Accuracy (+/-)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIN EN 60584</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type T</td>
<td>-200.0 °C</td>
<td>±0.1 °C</td>
</tr>
<tr>
<td></td>
<td>0.0 °C</td>
<td>±0.2 °C</td>
</tr>
<tr>
<td></td>
<td>+600.0 °C</td>
<td>±1.0 °C</td>
</tr>
<tr>
<td>Type T</td>
<td>-200.0 °C</td>
<td>±0.3 °C</td>
</tr>
<tr>
<td></td>
<td>0.0 °C</td>
<td>±0.4 °C</td>
</tr>
<tr>
<td></td>
<td>+1000.0 °C</td>
<td>±1.6 °C</td>
</tr>
<tr>
<td>Type E</td>
<td>-200.0 °C</td>
<td>±0.5 °C</td>
</tr>
<tr>
<td></td>
<td>0.0 °C</td>
<td>±0.7 °C</td>
</tr>
<tr>
<td></td>
<td>+1000.0 °C</td>
<td>±1.4 °C</td>
</tr>
</tbody>
</table>

**Accuracy of the reference cold junction temperature**

<table>
<thead>
<tr>
<th>Type</th>
<th>Range</th>
<th>Accuracy (+/-)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PT100</td>
<td>0.0 °C</td>
<td>±0.2 °C</td>
</tr>
</tbody>
</table>

**Accuracy of the resistance thermometer (RTD)**

<table>
<thead>
<tr>
<th>Type</th>
<th>Range</th>
<th>Accuracy (+/-)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIN EN 60751</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PT100</td>
<td>-200.0 °C</td>
<td>±0.3 °C</td>
</tr>
<tr>
<td></td>
<td>+850.0 °C</td>
<td>±1.0 °C</td>
</tr>
<tr>
<td>PT200</td>
<td>-200.0 °C</td>
<td>±0.4 °C</td>
</tr>
<tr>
<td></td>
<td>+850.0 °C</td>
<td>±1.0 °C</td>
</tr>
<tr>
<td>PT500</td>
<td>-200.0 °C</td>
<td>±0.6 °C</td>
</tr>
<tr>
<td></td>
<td>+850.0 °C</td>
<td>±1.0 °C</td>
</tr>
<tr>
<td>PT1000</td>
<td>-200.0 °C</td>
<td>±0.8 °C</td>
</tr>
<tr>
<td></td>
<td>+850.0 °C</td>
<td>±1.0 °C</td>
</tr>
</tbody>
</table>

**Accuracy in the temperature range of -20 °C to +40 °C with Pt100**

<table>
<thead>
<tr>
<th>Gain</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>±0.4 °C</td>
</tr>
<tr>
<td>1</td>
<td>±0.2 °C</td>
</tr>
<tr>
<td>10</td>
<td>±0.1 °C</td>
</tr>
<tr>
<td>100</td>
<td>±0.08 °C</td>
</tr>
<tr>
<td>1000</td>
<td>±0.08 °C</td>
</tr>
</tbody>
</table>

**Sensor short-circuit / line break detection**

<table>
<thead>
<tr>
<th>Type</th>
<th>Detection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermocouple (SE)</td>
<td>no detection</td>
</tr>
<tr>
<td>Resistance thermometer (diff.)</td>
<td>detection</td>
</tr>
<tr>
<td>Potentiometer (diff.)</td>
<td>detection</td>
</tr>
</tbody>
</table>
Screw terminal panel with cold junction compensation PX3200-G

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 cold junction compensation. The voltage ($V_{\text{CJC}}$) 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.

1 CJC: Cold Junction Compensation

### Specifications

<table>
<thead>
<tr>
<th>Versions</th>
<th>Number of thermocouples (SE inputs)</th>
<th>Number of RTDs (diff. inputs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2-wire connection</td>
<td>3-wire connection</td>
</tr>
<tr>
<td>APCI-3200-4</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>APCI-3200-8</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>APCI-3200-16</td>
<td>16</td>
<td>8</td>
</tr>
</tbody>
</table>

Safety features: Ground terminals

Connector: 50-pin D-Sub female connector

Dimensions of the board: L x W x H: 110 x 70 x 45 mm

Dimensions with housing: L x W x H: 113 x 87 x 80 mm

Temperature range: 0-70 °C

### Pin assignment – 50-pin D-Sub male connector

<table>
<thead>
<tr>
<th>Pin</th>
<th>CJC</th>
<th>Pin</th>
<th>Pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>34</td>
<td></td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td></td>
<td>36</td>
<td></td>
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<tr>
<td>36</td>
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<td>37</td>
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<td>37</td>
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<td>47</td>
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<td></td>
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<td>48</td>
<td></td>
<td>49</td>
<td></td>
</tr>
<tr>
<td>49</td>
<td></td>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>

### Pin assignment – 16-pin male connector

<table>
<thead>
<tr>
<th>Pin</th>
<th>Pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>GND</td>
</tr>
</tbody>
</table>

### ADDI-DATA connection

- **FB3000**: Ribbon cable for digital I/O on separate bracket
- **ST010**: Screw terminal panel for connecting the digital I/O, for DIN rail
- **ST011**: Standard round cable, shielded, twisted pairs, 5 m

### Ordering information

**APCI-3200**
Temperature measurement board, optically isolated, 16/8/4 channels for thermocouples, Pt100, RTD, 18-bit. Incl. technical description, software drivers and monitoring program.

#### 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

- **APCI-3200-G**: Screw terminal panel with cold junction compensation and housing for DIN rail
- **APCI-3200**: 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

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 (±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:
  - 32-bit drivers for Windows 7/Vista/XP/2000 (real-time)
- 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, download menu

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
Specifications

**Analog inputs**
- Resolution: 18-bit, unipolar
- Number of inputs: 8 or 4 analog inputs for strain gauges, 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 external trigger, with or without timer
- Voltage sources: 4 or 8
- Output voltage for the voltage sources: 5 V, 30 mA (other values on request)

**Digital I/O**
- Number of I/O channels: 4 digital inputs, 24 V;
3 digital outputs, 24 V;
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 of the outputs: 125 mA
- Optical isolation: 1000 V through opto-couplers 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 1 slot opening for 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 (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)

**APCI-3300**
Pressure measurement board, optically isolated, up to 8 channels for strain gauges, 18-bit. Incl. technical description and software drivers.

**Versions**
- APCI-3300-4: 4 analog inputs for pressure signals
- APCI-3300-8: 8 analog inputs for pressure signals

**Accessories**
- PX3200-G: Screw terminal panel with housing for DIN rail
- PX3200: Screw terminal panel with 4 mounting holes

**Pin assignment – 50-pin D-Sub male connector**

**Pin assignment – 16-pin male connector**

**ADDI-DATA connection**

**Ordering information**

**ST3200**: Standard round cable, shielded, twisted pairs, 2 m
**FB3000**: Ribbon cable for dig. I/O on separate bracket
**PX901-ZG**: Screw terminal panel for digital I/O for DIN rail
**ST010**: Standard round cable, shielded, twisted pairs, 2 m
**ST011**: Standard round cable, shielded, twisted pairs, 5 m
Noise and vibration measurement board, optically isolated, multifunction board, 8 analog inputs, 24-bit

**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

**Features**

**Analog inputs (for all versions)**

- 8 SE or diff. (+/-) inputs
- Sampling rate can be set between 2 and 200 kHz
- SNR (signal/noise ratio) > 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
- Anti-aliasing 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

**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 µs
- 16-bit resolution
- Simultaneous sampling on both channels
- 13-bit accuracy
- DAC type: R-2R
- Output range: ± 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**

Software drivers for:

- Linux (real-time), 32-bit drivers for Windows 7/Vista/XP/2000 (real-time) and signed 64-bit drivers for Windows 7/XP

**Samples for the following compilers:**

Visual C++ • Borland C

Driver download: www.addi-data.com, download menu

---

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 ratio) > 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
- Anti-aliasing 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

**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 µs
- 16-bit resolution
- Simultaneous sampling on both channels
- 13-bit accuracy
- DAC type: R-2R
- Output range: ± 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.
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- Noise analysis: Evaluation of a washing machine, measurements in the automotive field, etc.

**Software**

Software drivers for:

- Linux (real-time), 32-bit drivers for Windows 7/Vista/XP/2000 (real-time) and signed 64-bit drivers for Windows 7/XP

**Samples for the following compilers:**

Visual C++ • Borland C

Driver download: www.addi-data.com, download menu
### Analog Inputs

#### Specifications

**Number:** 8

- Input type: Single-ended or differential through software
- Resolution: 24-bit
- A/D Converter: Delta-Sigma, 5th order, multibit
- 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
  - 200 kHz ≤ $f_s$ ≤ 500 kHz
  - 500 kHz ≤ $f_s$ ≤ 2 MHz
- Oversampling: $64 \times f_s$ (for sampling rate $f_s$)
- Frequency precision: ± 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 kHz ≤ $f_s$ ≤ 50 kHz: -0.1 dB, DC to 0.47 x $f_s$
  - 50 kHz ≤ $f_s$ ≤ 100 kHz: -0.1 dB, DC to 0.45 x $f_s$
  - 100 kHz ≤ $f_s$ ≤ 200 kHz: -0.1 dB, DC to 0.24 x $f_s$
- -3 dB bandwidth:
  - 2 kHz ≤ $f_s$ ≤ 50 kHz: 0.5 x $f_s$
  - 50 kHz ≤ $f_s$ ≤ 100 kHz: 0.5 x $f_s$
  - 100 kHz ≤ $f_s$ ≤ 200 kHz: 0.358 x $f_s$
- Input coupling: AC, DC, GND, selectable through software
- AC-3 dB limit frequency: 1.6 Hz
- Overvoltage protection:
  - $R_1$, $L_1$, $R_2$, $L_2$: ± 12 V, ± 200 mA
  - $R_1$, $R_2$, $L_2$, L/R3, L/R4: ± 12 V, ± 300 mA
  - $R_1$, $L_1$, $R_2$, $L_2$: ± 36 V, ± 30 mA
  - $R_1$, $L_1$, $R_2$, $L_2$: ± 36 V, ± 70 mA
  - ESD protection: > 2 kV, ESD protection through method 3015.17

* Preliminary product information
### Specifications

#### Analog inputs (continued)

**Dynamic properties**

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Frequency</th>
<th>SNR (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 kHz ≤ f ≤ 50 kHz</td>
<td>50 kHz</td>
<td>&lt; -105 dB (short input gain x1)</td>
</tr>
<tr>
<td>50 kHz ≤ f ≤ 100 kHz</td>
<td>100 kHz</td>
<td>&lt; -100 dB (short input gain x10)</td>
</tr>
<tr>
<td>100 kHz ≤ f ≤ 200 kHz</td>
<td>200 kHz</td>
<td>&lt; -95 dB</td>
</tr>
</tbody>
</table>

**Crosstalk**

Between channel R0 and L0, R1 and L1, R2 and L2, R3 and L3, Gain x1:

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Frequency</th>
<th>Crosstalk (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 kHz ≤ f ≤ 50 kHz</td>
<td>50 kHz</td>
<td>&lt; -95 dB</td>
</tr>
<tr>
<td>50 kHz ≤ f ≤ 100 kHz</td>
<td>100 kHz</td>
<td>&lt; -95 dB</td>
</tr>
<tr>
<td>100 kHz ≤ f ≤ 200 kHz</td>
<td>200 kHz</td>
<td>&lt; -70 dB</td>
</tr>
</tbody>
</table>

**Phase error**

between channel R0 and L0, R1 and L1, R2 and L2, R3 and L3

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Frequency</th>
<th>Phase Error (°)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 kHz ≤ f ≤ 200 kHz</td>
<td>200 kHz</td>
<td>0.3° max.</td>
</tr>
<tr>
<td>50 kHz ≤ f ≤ 100 kHz</td>
<td>100 kHz</td>
<td>0.2° at f = 1 kHz sinus signal</td>
</tr>
<tr>
<td>1 kHz load at f₁ = 100 Hz</td>
<td>1 kHz</td>
<td>0.02° at f = 1 kHz sinus signal</td>
</tr>
</tbody>
</table>

**Amplitude error**

± 0.02 dB, max. at f₁ = 1 kHz sinus signal (Gain x1 and x10)

**Offset error**

± 200 µV, max. at f₁ = 2 kHz

#### Digital inputs

<table>
<thead>
<tr>
<th>Number of inputs</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input type</td>
<td>RS-485</td>
</tr>
<tr>
<td>Max. speed</td>
<td>1 MHz max.</td>
</tr>
<tr>
<td>Input frequency (max.)</td>
<td>5 kHz at 24 V</td>
</tr>
</tbody>
</table>

#### Digital outputs

<table>
<thead>
<tr>
<th>Number of inputs</th>
<th>8, open collector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal voltage</td>
<td>24 V</td>
</tr>
<tr>
<td>Input resistance</td>
<td>120 differential</td>
</tr>
</tbody>
</table>

#### Chronometer

<table>
<thead>
<tr>
<th>Number</th>
<th>4 x chronometer, 2 x gate on chronos 1+2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input type</td>
<td>RS-485</td>
</tr>
<tr>
<td>Max. speed</td>
<td>1 MHz max.</td>
</tr>
<tr>
<td>Counting depth</td>
<td>32-bit</td>
</tr>
<tr>
<td>Divisor</td>
<td>From 2^7 to 2^27 per chronometer</td>
</tr>
<tr>
<td>Final output</td>
<td>0 V</td>
</tr>
<tr>
<td>Data transfer</td>
<td>DMA, 70 MHz</td>
</tr>
<tr>
<td>Differential threshold voltage</td>
<td>-200 mV min -50 mV max.</td>
</tr>
<tr>
<td>Input resistance</td>
<td>120 Differential</td>
</tr>
<tr>
<td>ESD protection</td>
<td>±15 kV Human Body Model</td>
</tr>
</tbody>
</table>

#### 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).

#### Physical and environmental conditions

- **Dimensions**: 175 x 99 mm
- **System bus**: PCI 32 bit, 3.3 V acc. to spec. 2.2 (PCISIG)
- **Space required**: 1 PCI slot for the analog inputs and outputs
- **Temperature range**: 0 to 60 °C (with forced cooling)
- **Optical isolation**: 1000 V
- **Input voltage**: 0 up to 30 V
- **Input type**: RS-485
- **Logic input levels**: UH (max.): 70 V, UL (max.): 14 V, UH (min.): 19 V, UL (min.): 0 V
- **Trigger input**: Digital input
- **Input range**: 0 V
- **Trigger out**: 0 V

*Preliminary product information*
Connection of 8 analog inputs on front connector

Pin assignment of the chronometer and analog outputs (ribbon cable FB3600-AC)

26-pin male connector on separate 37-pin D-Sub-male connector (ribbon cable FB3600-D)

APCI-3600
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 IO on separate bracket, 30 cm
FB3600-AC: Ribbon cable for connecting the chronometer and analog outputs on separate bracket, 30 cm

Ordering information
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.

### 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 (real-time)
- 32-bit drivers for Windows 7/Vista/XP/2000 (real-time)

**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, 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:** Depending on the transducer
  - 4.883 kHz (typ.)
  - 6.976 kHz (typ.)
  - 9.768 kHz (typ.)
  - 13.951 kHz (typ.)
  - 19.531 kHz (typ.)

**Example with TESA GT21**
13.95 kHz (on 5 channels)

**Input Impedance**
- 2 kΩ software-programmable
- 10 kΩ
- 100 kΩ
- 1 MΩ

**Sensor supply (simus generator)**
- **Type:** Sinus differential (180° phase-shift)
- **Number of outputs:** 2
- **Coupling:** AC

**Programmed signals:**
- **Output frequency:** 2-20 kHz depending on the transducer
  - (primary frequency) 50 kHz (Knäbel)
- **Output level**
  - Output impedance < 0.1 kΩ typ.
  - > 30 kΩ 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 (PCI-SIG)
- **Space required:** 1 slot opening for digital I/O with FB3702
- **Operating voltage:** ± 5 V ± 5 % from the PC, 24 V external
- **Current consumption:** 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)

### 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:**
- PX3701HB-B: Connection box of the APCI-3702
- PX3701LVDT-B: Connection box of the APCI-3702
- ST3701-B-KS: Shielded coaxial cable between APCI-3702 and connection box PX3701-B

**Accessories:**
- FB3702: Ribbon cable for digital I/O
- PX901-ZG: Screw terminal panel for digital I/O, for DIN rail
- ST010: Standard round cable, shielded, twisted pairs, 2 m
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

### 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 (real-time)
- 32-bit drivers for Windows 7/Vista/XP/2000 (real-time)
- Signed 64-bit drivers for Windows 7 and XP

**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, download menu
Specifications

Inputs for inductive transducers

<table>
<thead>
<tr>
<th>Channel features</th>
<th>Numbered</th>
<th>-ac- or hz</th>
<th>mixed</th>
<th>Input type</th>
<th>Single ended</th>
<th>Coupling</th>
<th>DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution</td>
<td>24-bit</td>
<td></td>
<td></td>
<td>Sampling rate</td>
<td>4.883 kHz, 6.975 kHz, 9.768 kHz, 13.951 kHz, 19.531 kHz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f_p</td>
<td>On 1 channel</td>
<td>At primary frequency</td>
<td>f_p = f_p (primary frequency)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f_p</td>
<td>4.883 kHz, 6.975 kHz, 9.768 kHz, 13.951 kHz, 19.531 kHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f_p</td>
<td>Ab n ≥ 2 channels</td>
<td>f_p = primary frequency</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f_p</td>
<td>4.883 kHz, 6.975 kHz, 9.768 kHz, 13.951 kHz, 19.531 kHz</td>
<td></td>
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<td>Ab n ≥ 2 channels</td>
<td>f_p = primary frequency</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Example with TESA GT21

<table>
<thead>
<tr>
<th>Input level</th>
<th>2 kHz, software-programmable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input impedance</td>
<td>10 kHz, 100 kHz, 10 MΩ</td>
</tr>
<tr>
<td>Input ranges</td>
<td>± 3 V single ended</td>
</tr>
</tbody>
</table>

Sensor supply (sinus generator)

| Type | sinus differential [180° phase-shift] |
| Coupling | DC |
| Programmed signals | 2-20 kHz depending on the transducer (50 kHz Knäbel) |
| Output frequency | 2-20 kHz depending on the transducer (50 kHz Knäbel) |
| Output impedance | < 0.1 Ω typ., > 30 kΩ 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 | 1200 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 | 0-30 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 (PCCISG) |
| Space required | 1 PCI slot for analog inputs, 1 slot opening for digital I/O with FB3701 |
| Operating voltage | ± 5 V from the PC, ± 5 % from the PC; 24 V external |
| Current consumption | APCI-3701-8: typ. 630 mA, 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.

APCI-3701-8:
For 8 inductive transducers

APCI-3701-16:
For 16 inductive transducers

APCI-3701-8-K:
For 8 Knäbel inductive transducers

APCI-3701-16-K:
For 16 Knäbel inductive transducers

Accessories:

| FB3702 | Ribbon cable for digital I/O |
| PX901-2G | Screw terminal panel for digital I/O, for DIN rail |
| ST010 | Standard round cable, shielded, twisted pairs, 2 m |

Accessories for half-bridge and LVDT transducer:

PX3701HB-8:
Connection box of the APCI-3701-8, 8 x half-bridge

PX3701HB-16:
Connection box of the APCI-3701-16, 16 x half-bridge

PX3701LVDT-8:
Connection box of the APCI-3701-8, 8 x LVDT

PX3701LVDT-16:
Connection box of the APCI-3701-16, 16 x LVDT

ST3701:
Connection cable between APCI-3701 and connection box PX3701

System bus: PCI 32-bit 3.3/5 V acc. to spec. 2.2 (PCCISG)
Watchdog board, optically isolated, 4 watchdogs/timers

Maximise the reliability of your telecom, ISP, Voice Mail, File Server or industrial systems under Windows operating systems with the APCI-035 PCI watchdog board. The board is equipped with 4 watchdogs for simultaneous soft- and hardware monitoring. In this way, external devices can be monitored (e.g. alarm systems, PLCs) and controlled (e.g. modems, dialing devices).

In addition, the PCI watchdog board APCI-035 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.

**Features**

- **PCI 3.3 V or 5 V**
- **Watchdog**
  - 4 watchdogs/timers
  - 1 trigger channel/gate input (24 V)
  - Activation through software
  - Configuration through software, readable
  - Can be triggered through software or digital input
  - Time base for the watchdog/timer: µs, ms, s, min
  - Two completely separated programmable alarm levels:
    - Level 1 generates an interrupt or switches the warning relay, level 2 switches the reset relay.
  - 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.
  - 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

**Diagnostic**

- The status of the 4 watchdogs is readable
- 1 digital input (watchdog trigger or timer gate)
- Watchdog 1 can switch 2 software-controlled relays

**APCI-035**

- **4 watchdogs/timers**
- **2 relays with change-over contacts**
- **1 digital input, 24 V**
- **2 alarm levels**
- **Temperature monitoring from -45 °C to +135 °C**

**Safety**

- Optical isolation 500 V

**Temperature measurement**

- 1 temperature onboard sensor
- Alarm function when a programmable limit value is exceeded

**Applications**

- Control of industrial PC-based process
- Time measurement • Temperature monitoring
- Timer-driven software applications

**Software**

A CD-ROM with the following software and programming examples is supplied with the board.

**Standard drivers for:**

- 32-bit drivers for Windows 7/Vista/XP/2000 (real-time)
- Signed 64-bit drivers for Windows 7/Vista/XP

**Drivers and samples for the following compilers and software packages:**

- .NET
- Microsoft VC++ • Borland C++
- Visual Basic • Delphi
- LabVIEW • LabWindows/CVI

**ADDIPACK functions**

Watchdog • Timer • Temperature

**On request:**

Further operating systems, compilers and samples.

Driver download: www.addi-data.com, download menu

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**Discontinued**

Phone: +49 7229 1847-0  info@addi-data.com
Fax: +49 7229 1847-222  www.addi-data.com
### Specifications

#### APCI-035

- **Addressing**: 32-bit
- **Addressing range**: 256 byte
- **Interrupt**: Through BIOS
- **Optical isolation**: 500 V (from the PC to the peripheral)

#### Watchdog/timer

- **Depth**: 8-bit
- **Switching time of the reset relays**: 2 s
- **4 x programmable watchdogs/timers**: Time selectable from 2 µs to 255 min
- **Time units**: µs, ms, s, min

#### Temperature monitoring

- **Accuracy**: ± 2 °C
- **Measurement range**: -45 °C to 175 °C
  (real range of application 0-60 °C)
- **Resolution**: 8-bit

#### Relay data

- **Type of contacts**: 2 change-over contacts
- **Max. switching voltage**: 60 VDC, 48 VAC
- **Max. switching current**: 1 A
- **Max. switching capacity**: 50 W
- **Min. permissible load**: 1 mA
- **Nominal load**: 4.24 VDC
- **Contact resistance**: < 100 mΩ
- **Contact material**: Ag + Au-plated
- **Response time**: max. 5 ms, typ. 2.5 ms
- **Release time**: max. 5 ms, typ. 0.5 ms
- **Mechanical life**: 5 x 10^6 operations
- **Electrical life at 24 V**: 10^5 operations

#### Digital input

- **Nominal input current at 24 V**: 6 mA
- **Switching threshold**: >16 V for logical “1”.

#### 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**: 120 x 85 mm
- **System bus**: PCI 32-bit 3.3/5 V acc. to spec. 2.2 (PCISig)
- **Space required**: 1 PCI slot
- **Operating voltage**: ±5 V ± 5 % from the PC
- **Current consumption**: 240 mA ± 10 % typ.
- **Front connector**: 9-pin D-Sub male connector
- **Temperature range**: -10 to 60 °C (with forced cooling)

### Ordering information

- **APCI-035**
  - Watchdog board, optically isolated, 4 watchdogs/timers. Incl. technical description and software drivers.

### Pin assignment – 9-pin D-Sub male connector

- **GND trigger input**
- **SK – Reset relay 1**
- **24V Gate/Trigger input**
- **OC – Reset relay 1**
- **CO – Reset relay 1**
- **CC – Warning relay 0**
- **OC – Warning relay 0**
- **CO – Warning relay 0**

  
  CO: Change-over contact
  CC: Closer contact
  OC: Opening contact

### Possible alarm system settings

**Function settings through software**

- **24 V trigger/gate input**
- **Time units**: µs, ms, s, min
- **Level 1**: Interrupt / warning relay
- **Level 2**: Reset relay / reset generated through reset switch of the PC system

### Simplified block diagram

- **FPGA**
- **4 x Timer/Watchdog**
- **Temperature monitoring**
- **Optical isolation**

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Phone: +49 7229 1847-0 info@addi-data.com
Fax: +49 7229 1847-222 www.addi-data.com 165
**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. In addition, for higher transfer rates, a 128-byte FIFO buffer is built in.

**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.

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**Application example for a 4-port serial interface (APCI-7500-3)**

- **Port 1**: RS485
- **Port 2**: TTY 20 mA Current Loop
- **Port 3**: TTY 20 mA Current Loop isolated
- **Port 4**: RS232

---

**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)

<table>
<thead>
<tr>
<th>Serial interfaces</th>
<th>1-port</th>
<th>2-port</th>
<th>4-port</th>
<th>8-port</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boards</td>
<td>APCI-7300-3</td>
<td>APCI-7420-3</td>
<td>APCI-7500-3, APCI-7500-3/4C</td>
<td>APCI-7800-3</td>
</tr>
<tr>
<td>32-bit data bus</td>
<td>PCI 5 V / 3.3 V</td>
<td>PCI 5 V / 3.3 V</td>
<td>PCI 5 V / 3.3 V</td>
<td>PCI 5 V / 3.3 V</td>
</tr>
<tr>
<td>Optical isolation</td>
<td>1000 V , optional</td>
<td>1000 V , optional</td>
<td>1000 V , optional</td>
<td>1000 V , optional</td>
</tr>
<tr>
<td>Can be configured as standard interface</td>
<td>✅</td>
<td>✅</td>
<td>✅</td>
<td>✅</td>
</tr>
<tr>
<td>Interrupts</td>
<td>BIOS</td>
<td>BIOS</td>
<td>BIOS</td>
<td>BIOS</td>
</tr>
<tr>
<td>FIFO memory</td>
<td>128-byte</td>
<td>128-byte</td>
<td>128-byte</td>
<td>128-byte</td>
</tr>
<tr>
<td>Remarks</td>
<td>Common interrupt</td>
<td>Common interrupt</td>
<td>Common interrupt</td>
<td>Common interrupt</td>
</tr>
<tr>
<td>Addressing</td>
<td>Through software</td>
<td>BIOS</td>
<td>BIOS</td>
<td>BIOS</td>
</tr>
<tr>
<td></td>
<td>COM</td>
<td>Free configuration</td>
<td>Free configuration</td>
<td>Free configuration</td>
</tr>
<tr>
<td>Connection cable</td>
<td>For APCI-7500-3</td>
<td>ST0709: 8 x 9 pin</td>
<td>ST0709: 4 x 9 pin</td>
<td>ST074: 4 x 25 pin</td>
</tr>
<tr>
<td>Page</td>
<td>168</td>
<td>168</td>
<td>168</td>
<td>168</td>
</tr>
</tbody>
</table>

### 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

<table>
<thead>
<tr>
<th>Operating mode</th>
<th>RS232</th>
<th>RS422</th>
<th>RS485</th>
<th>20 mA CL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MX232-G</td>
<td>MX232</td>
<td>MX422-G</td>
<td>MX422</td>
</tr>
<tr>
<td>Optical isolation 1000 V</td>
<td>✅</td>
<td>✅</td>
<td>✅</td>
<td>✅</td>
</tr>
<tr>
<td>Creeping distance 3.2 mm</td>
<td>✅</td>
<td>✅</td>
<td>✅</td>
<td>✅</td>
</tr>
<tr>
<td>Short-circuit protection</td>
<td>✅</td>
<td>✅</td>
<td>✅</td>
<td>✅</td>
</tr>
<tr>
<td>ESD protection</td>
<td>✅</td>
<td>✅</td>
<td>✅</td>
<td>✅</td>
</tr>
<tr>
<td>Burst protection</td>
<td>✅</td>
<td>✅</td>
<td>✅</td>
<td>✅</td>
</tr>
<tr>
<td>Duplex</td>
<td>Full</td>
<td>Full</td>
<td>Full</td>
<td>Full</td>
</tr>
<tr>
<td>Max. Baud rate*</td>
<td>1 MBaud</td>
<td>1 MBaud</td>
<td>1 MBaud</td>
<td>1 MBaud</td>
</tr>
<tr>
<td>Modem control signals</td>
<td>✅</td>
<td>✅</td>
<td>Optional RTS/CTS (MX-422-PEP)</td>
<td>✅</td>
</tr>
<tr>
<td>Autom. transmitter control</td>
<td>✅</td>
<td>✅</td>
<td>✅</td>
<td>✅</td>
</tr>
<tr>
<td>Current consumption</td>
<td>16 mA</td>
<td>1 mA</td>
<td>15 mA</td>
<td>5 mA</td>
</tr>
</tbody>
</table>

* max 115.2 kBaud, optional up to 1 MBaud with adaption of quartz crystal (Option Quarz)
1 to 8-port serial interface, RS232, RS422, RS485, 20 mA CL, modular mounting through modules

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

**Applications**

- Data acquisition • Industrial process control
- Direct connection to sensors
- Multi-user systems
- PLC interface
- Multidrop applications
- Weighting 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 (real-time)
- 32-bit drivers for Windows 7/Vista/XP/2000 (real-time)
- Signed 64-bit drivers for Windows 7/Vista/XP

**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, download menu

**Application example for APCI-7500-3**

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

168
### Specifications


<table>
<thead>
<tr>
<th>Operating mode</th>
<th>RS232</th>
<th>RS422</th>
<th>RS485</th>
<th>20 mA CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>APCI-7300</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>APCI-7420</td>
<td></td>
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<td></td>
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<tr>
<td>APCI-7500</td>
<td></td>
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<tr>
<td>APCI-7500-3/C</td>
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<tr>
<td>APCI-7800</td>
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</tr>
</tbody>
</table>

**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:** 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
- **Protocol:** RS232, RS422, RS485, 20 mA Current Loop
- **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.

### Operating Information

**MX modules**

- **Option**
  - **Quarz:** 1 Mbaud transfer rate for RS232, RS422, RS485, TTY

**MX modules:** Please order the modules separately!

- **MX232-G:** RS232 mode, optically isolated
- **MX232:** RS232 mode
- **MX422-G:** RS422 mode, optically isolated
- **MX422-P:** 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

### 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, 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:** 160 mA typ. / APCI-7800: 220 mA
- **Front connector:** 9-pin D-Sub male connector (APCI-7300-3)
  - 2x9-pin D-Sub male connector (APCI-7420-3)
  - 4 x 9-pin D-Sub male connector on separate bracket (APCI-7500-3/4C)
  - 37-pin D-Sub male connector (APCI-7500-3)
  - 78-pin D-Sub female connector (APCI-7800-3)
- **Temperature range:** 0 to 60 °C (with forced cooling)

### 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

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 or Langham controllers 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)

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)
- Production quality control
- Cutting-to-length devices with flying saw

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.

* Preliminary product information

Signed 64-bit drivers for Windows 7/XP

User programs created with the compiler can be processed automatically
Multitasking: the board can simultaneously process up to 4 user programs.
### 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.
- **With OPMF-8008 all interpolations** 2D .. 3D depending on the number of axes
- **Inputs for incremental encoders:** Shift on TTL max. 16 MHz
  - Word length: 32-bit with sign
  - Short-circuit and line break protection
- **Inputs forSSI encoders:** Up to 32-bit, Gray / binary code, variable frequency 30 kHz to 2 MHz
- **Inputs for Ethernet:** Ethernet 2.2 up to 4 MHz
- **Setpoint value outputs (servo):** 4 D/A converters, 16-bit resolution, ± 10 V
- **Pulse outputs (stepper motors):** 1 stepper signal (HS422) and 1 directional signal (RS422) for each channel, pulse frequency up to 2 MHz
- **Isolated digital inputs:** 16 inputs, 24 V, in 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 V acc. to spec. 2.2 (PCI32)
- **Space required:** Slave board OPMF: 1 PCI slot
  - Cable FB8008: 1 slot opening
- **Operating voltage:** ± 5 V ± 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)

### 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:

- **-BA:** 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
- **-A16-4:** 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, optically isolated (option available up to 3 times, max. 24 dig. inputs and 12 outputs)
- **-AO:** 1 analog output, option available up to 5 times

**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 5-pin D-Sub male connector with bracket for connecting the INTERBUS.
- **FB8008:** From the 7th axis on (OPMF/7, OPMF/8) or with option OPMF-8008-AI-16-4, Ribbon cable between OPMF and 5-pin D-Sub male connector with bracket. On request with female connector.
- **FBRELAY:** For releasing the relays
  - **FBRELAY 9:** Standard, 9-pin cable with bracket
  - **FBRELAY 25:** more than 3 axes: 25-pin cable.

**FB8008-50,25:** Combination of FB8008 and FBRELAY 25

**PX8001:** 3-row terminal panel for DIN rail

**ST8001:** Cable for connecting APCI-8008 and OPMF, 50-pin.

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*Preliminary product information*
Digital I/O board, optically isolated, 32 digital inputs and outputs, 24 V, for PC/104-Plus

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 (real-time)
- 32-bit drivers for Windows XP Embedded/2000 Embedded

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, download menu

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: OFF 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.
- 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)
- 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 per 8 channels: 1.5 A typ.

Output current per output:
- 150 mA typ.
- Short-circuit current: 7.5 A (typ.)

Overtemperature (shutdown): 135 °C (output driver)

Temperature hysteresis: 10 °C (output driver)

Safety

Shutdown logic: When the ext. 24 V voltage drops below 7 V:
- The outputs are switched off

Diagnose:
- Status bit or interrupt to the PC

Timer1/Timedlog:
- 1, 16-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: PC/104-Plus system

Operating voltage: +5 V or +3.3 V, ± 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)

Operating temperature range: -40 to +85 °C (with forced cooling), PC104-PLUS1500-EXT

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 SUB-D 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, LED status display, for DIN rail

PX8500-G: Relay output board for DIN rail, cascadeable

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, 2 m

STBE00: Ribbon cable for cascading two PX 8500-G

Simplified block diagram

Pin assignment – 40-pin to 37-pin male connector

ADDI-DATA connection

Ordering information
**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.

**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

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**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 boards are equipped with a FPGA component. Use the full potential of your PC board hardware and software resources and thus accelerate your processes.

---

**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

---

**READY FOR HARSH INDUSTRIAL ENVIRONMENT**

Phone: +49 7229 1847-0
Fax: +49 7229 1847-222
### Digital

<table>
<thead>
<tr>
<th>Feature</th>
<th>CPCi-1500</th>
<th>CPCi-1564</th>
<th>CPCi-1710</th>
<th>CPCi-3009</th>
<th>CPCi-3120</th>
<th>CPCi-3001</th>
<th>CPCi-7500</th>
<th>CPCi-8004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital, 24 V</td>
<td>32-bit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Input channels, 24 V</td>
<td>16</td>
<td>16</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output channels, 24 V</td>
<td>16</td>
<td>16</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output current per output</td>
<td>500 mA (typ.)</td>
<td>500 mA (typ.)</td>
<td>500 mA (typ.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</table>

### Counter

<table>
<thead>
<tr>
<th>Feature</th>
<th>CPCi-1500</th>
<th>CPCi-1564</th>
<th>CPCi-1710</th>
<th>CPCi-3009</th>
<th>CPCi-3120</th>
<th>CPCi-3001</th>
<th>CPCi-7500</th>
<th>CPCi-8004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Watchdog / Timer / Counter</td>
<td>2 x 12-bit timers, incl. 1 which can be used as a watchdog</td>
<td>Timer (12-Bit)/Watchdog (8-Bit)</td>
<td>16-bit 3/3/2</td>
<td>1 x 24-bit timer which can be used as a watchdog</td>
<td>1 x 24-bit timer which can be used as a watchdog</td>
<td>4 incremental counters or SSI</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Analog

<table>
<thead>
<tr>
<th>Feature</th>
<th>CPCi-1500</th>
<th>CPCi-1564</th>
<th>CPCi-1710</th>
<th>CPCi-3009</th>
<th>CPCi-3120</th>
<th>CPCi-3001</th>
<th>CPCi-7500</th>
<th>CPCi-8004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog inputs, 16-bit</td>
<td>16 SE / 8 diff.</td>
<td>16 SE or 8/4 diff.</td>
<td>16 SE or 8/4 diff.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Throughput (kHz)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voltage range</td>
<td>0-10 V ± 10 V</td>
<td>0-10 V ± 10 V</td>
<td>0-10 V ± 10 V</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Gain 1, 2, 5, 10</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>FIFO (value)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trigger (software or 24 V)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sequence RAM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analog outputs</td>
<td>4, 12-bit</td>
<td>8 or 4, 14-bit</td>
<td>4, 16-bit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>0-10 V ± 10 V</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Setting time</td>
<td>15 µs</td>
<td>30 µs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Serial interfaces (base board)

<table>
<thead>
<tr>
<th>Feature</th>
<th>CPCi-1500</th>
<th>CPCi-1564</th>
<th>CPCi-1710</th>
<th>CPCi-3009</th>
<th>CPCi-3120</th>
<th>CPCi-3001</th>
<th>CPCi-7500</th>
<th>CPCi-8004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration of the operation mode through MX modules</td>
<td>RS232, RS422, RS485, 20 mA CL</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

### Software

Current driver list on the web: [www.addi-data.com](http://www.addi-data.com)
Digital I/O board, optically isolated, 32 digital inputs and outputs, 24 V

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

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

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 (real-time)
- Signed 64-bit drivers for Windows 7/Vista/XP
- RTX drivers (real-time)

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, download menu
Specifications

Digital inputs

- Number of inputs: 16 (common ground acc. to IEC 1131-2)
- Interruptible inputs: 14 out of 16 digital inputs
- Optical isolation: Through opto-couplers, 1000 V 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,<0.1 Ω: 1.5 A
- RDS ON resistance: 0.4 Ω max.
- Switch-on time: 1 out=0.5 A, load = resistance: 120 µs
- Switch-off time: 1 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: The outputs are switched off.
- Diagnostics: Short-circuits, overtemperature, status bit or interrupt to the PC.
- Timer: 3 (max. 10 kHz, 24 V)
- Watchdog: Timer programmable, 17 µs up to 36 s 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: CPCI 32-bit acc. to specification CompactPCI 2.1
- Space required: 1 CPCI slot 3U
- Operating voltage: +5 V ± 5 %, from the PC
- Current consumption: 220 mA typ. ± 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

CPCI-1500

Digital I/O board, 32 digital inputs and outputs, optically isolated, 24 V. Incl. technical description, software drivers and monitoring program.

Option

- 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
- PX85000: Relay output board for DIN rail, cascadable
- 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 PX85000, shielded, twisted pairs, 2 m
- ST022: Round cable between PX8500 and PX901, shielded, 2 m

Ordering information

Phone: +49 7229 1847-0 info@addi-data.com
Fax: +49 7229 1847-222 www.addi-data.com

Contents & Services

Distributed Solutions

PC boards

Appendix

CompactPCI, digital – CPCI-1500
Digital I/O board, optically isolated, 64 digital inputs and outputs, 24 V

**Features**

- CompactPCI 3.3 V or 5 V

**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

**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 (real-time)
- Signed 64-bit drivers for Windows 7/Vista/XP

**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, download menu

---

* Preliminary product information

Phone: +49 7229 1847-0  info@addi-data.com
Fax: +49 7229 1847-222  www.addi-data.com
**Specifications**

**Digital inputs**
- Number of inputs: 32; 4 groups of channels with common ground:
  - Input: 9-7, 8-5, 16-23, 24-31
  - -0-3: fast counter input, 500 kHz
  - - 4-15: interruptible inputs
- Optical isolation: through opto-couplers, 1000 V
- Nominal voltage 24 V (CPCI-1564): Digital inputs
  - Input current at 24 V: 4 mA typ., 10.5 mA typ.
  - Logic input levels:
    - UL max.: 30 V
    - UL min.: 19 V
    - UL min.: 14 V
    - UL min.: 0 V
- Nominal voltage 24 V (CPCI-1564): Counter inputs
  - Output voltage: +5 V, ± 5 % from CPCI system
- Space required: 1 CPCI slot 3U (only at 3HE)
- System bus: CPCI 32-bit 5 V acc. to specification CompactPCI 2.1

**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); 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:
  - max. 1.7 A
- Output shutdown at 24 V:
  - max. 10 mA
- Output resistances:
  - 150 mΩ typ.
- Switch-on time:
  - 40 μs typ.
- Switch-off time:
  - 470 μs typ.
- Overtemperature (shutdown): 130 °C (output driver)
- Overtemperature (output driver): 15 °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: 160 x 100 mm
- System bus: CPCI 32-bit 5 V acc. to specification CompactPCI 2.1
- Space required: 1 CompactPCI slot 3U (only at 3HE)
- Operating voltage: ± 5 V, ± 5 % from CPCI system
- Current consumption:
  - 350 mA ± 15 mA typ.
- Front connector:
  - 37-pin D-Sub male connector for 32 dig. outputs
  - 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)
  - 15 °C (output driver)

**Ordering information**
- **CPCI-1564**
  - Digital I/O board, 64 digital I/O, optically isolated, 24 V. Incl. technical description, software drivers

**Accessories**
- **URS-1564-6U:** 6U bracket for mounting in 6U housing
- **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, cascadable
- **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:** Standard round cable between PX8500 and PX901, shielded, 2 m
- **ST8500:** Ribbon cable for cascading two PX8500

*Preliminary product information*
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
- BiSS-Master
- Digital inputs and outputs
- Customised functions

Available lines for each function module
8 lines are available for each function module
- Input lines:
  - 2 x TTL and RS422 (CPCI-1710) or 2 x 24 V (option)
  - 3 x 24 V, optional 5 V for channels E, F, G
- Output lines:
  - 1 x 24 V, optional 5 V (power output)
  - 2 channels, programmable either as digital inputs or outputs, optically isolated: 2 x TTL, RS422

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 (real-time)
- 32-bit drivers for Windows 7/Vista/XP/2000 (real-time)
- Signed 64-bit drivers for Windows 7/Vista/XP
- RTX drivers (real-time)

Drivers and samples for the following compilers and software packages:
- .NET
- Microsoft VC++ • Microsoft C
- Borland C++ • Borland C
- Visual Basic • Delphi
- LabVIEW • DIAadem

On request:
Further operating systems, compilers and samples.

Driver download: www.addi-data.com, download menu
Free programming of the functions
- 32-bit or 16-bit acquisition of incremental encoders
- Acquisition of absolute encoders SSI
- Counter/timer
- Chronos/TOF for frequency measurement
- Pulse acquisition
- Chronos for pulse width modulation
- Chronos for period duration measurement
- TOF for velocity measurement
- BISS-Master
- Digital I/O, 24 V, TTL, RS422
- PWM
- Customised functions

Signals
- Digital I/O signals, TTL or RS422

Inputs
- Number of inputs: 20
- Differential inputs or outputs
  - Differential inputs, 5 V: B16 (8 can be used as inputs or outputs)
  - Nominal voltage: 5 VDC
  - Common mode range: +12 V ± 7 V
  - Max. differential voltage: ±12 V
  - Input sensibility: 200 mV
  - Input hysteresis: 50 mV
  - Input impedance: 10 kΩ
  - Terminal resistor: 150 kΩ serial with 10 nF (typ.)
  - Signal delay: 120 ns (at nominal voltage)
  - Max. input frequency: 5 MHz (at nominal voltage)

- Mass-related inputs, 24 V (channels E, F, G):
  - Number of inputs: 12
  - Nominal voltage: 24 VDC
  - Input current at nominal voltage: 11 mA
  - Logic input levels:
    - Unominal: 24 V
    - UH max.: 30 V
    - UL max.: 15 V
    - UL min.: 0 V

- Signal delay:
  - 120 ns (at nominal voltage)

- Maximal input frequency:
  - 2.5 MHz (at nominal voltage)

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
  - Output range:
    - 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<sub>Load</sub> ≤ 0.1 Ω: 1.5 A max. (output switched 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 (switch temperature): Outputs switch off
- Protection against undervoltage: Effective at Vext < 3 V
- Outputs (at undervoltage): All outputs switch off

Switching characteristics of the outputs
- (Vext = 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: 0.04 µs

Technical data for the option 24 V
- 24 V inputs (channels A up to D),
- 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: 1 MHz (at nominal voltage)
- Logic input levels:
  - Unominal: 24 V
  - UH max.: 25 V
  - UH min.: 15 V
  - UL max.: 11 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: 3U/4TE
- System bus: CompactPCI 32-bit 5 V acc. to spec. 2.1 (PCISIG)
- Space required: 1 slot
- Operating voltage:
  - +5 V, ± 5 % from the PC
  - +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: 54 287 hours at 45 °C

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.

Specifications
- 32-bit or 16-bit acquisition of incremental encoders
- Acquisition of absolute encoders SSI
- Counter/timer
- Chronos/TOF for frequency measurement
- Pulse acquisition
- Chronos for pulse width modulation
- Chronos for period duration measurement
- TOF for velocity measurement
- BISS-Master
- Digital I/O, 24 V, TTL, RS422
- P WM
- Customised functions

Signals
- Digital I/O signals, TTL or RS422

Inputs
- Number of inputs: 20
- Differential inputs or outputs
  - Differential inputs, 5 V: B16 (8 can be used as inputs or outputs)
  - Nominal voltage: 5 VDC
  - Common mode range: +12 V ± 7 V
  - Max. differential voltage: ±12 V
  - Input sensibility: 200 mV
  - Input hysteresis: 50 mV
  - Input impedance: 10 kΩ
  - Terminal resistor: 150 kΩ serial with 10 nF (typ.)
  - Signal delay: 120 ns (at nominal voltage)
  - Max. input frequency: 5 MHz (at nominal voltage)

- Mass-related inputs, 24 V (channels E, F, G):
  - Number of inputs: 12
  - Nominal voltage: 24 VDC
  - Input current at nominal voltage: 11 mA
  - Logic input levels:
    - Unominal: 24 V
    - UH max.: 30 V
    - UL max.: 15 V
  - UL min.: 0 V

- Signal delay:
  - 120 ns (at nominal voltage)

- Maximal input frequency:
  - 2.5 MHz (at nominal voltage)

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:
    - 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<sub>Load</sub> ≤ 0.1 Ω: 1.5 A max. (output switched off)
  - ON-resistance of the output (RDS ON-resistance): 0.4 Ω max.

- Overtemperature: 170 °C (all outputs switch off)

Ordering information
- CPCI-1710: Multifunction counter board, optically isolated, encoder, incremental counter, timer/counter, SSI, PWM.
  - Incl. technical description and software drivers.
- CPCI-1710-10K2: Same as CPCI-1710, with additional function for connecting a BISS interface.
- MX1710: Peripheral module for the board CPCI-1710. 2 modules are necessary for each CPCI-1710 board. Please order with the board!
- CPCI-1711: Multifunction counter board, optically isolated, with 2 function modules. Incl. technical description and software drivers.

Options
- URS-1710-6U: 6U bracket for mounting in 6U housing
- Option 24 V: 24 V for differential inputs
  - (channels A up to G, A and B for Counter), I (Index) and UAS (error) signals

Accessories
- ST370-16: Shielded round cable, 2 m
- PX8001: 3-row screw terminal panel, 50-pin, for DIN-rail mounting
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 FPGA. Contact us!

**Features**

- CompactPCI 3.3 V or 5 V
- Can be inserted in PXI systems, with restricted functionalities

**Analog inputs**

- 16 diff. inputs, optically isolated 1000 V
- Resolution: 16-bit
- Throughput: 100 kHz
- Voltage inputs: 0-10 V, ±10 V, 0-5 V, ±5 V, 0-2 V, ±2 V, 0-1 V, ±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 µs 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: ±5 mA
- Short-circuit current: ±20 mA

**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 ±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 (real-time)
- 32-bit drivers for Windows XP (real-time)
- On request:
  - Further operating systems, compilers and samples.

Driver download: www.addi-data.com, download menu
Specifications

**Analog inputs**
- Number of inputs: 16 differential inputs, 16-bit resolution
- Optical isolation: 1000 V through opto-couplers from PC to peripheral
- Voltage inputs: software programmable for each channel
  - CPCI-3009: 0-10 V, ±10 V, 0-2 V, ±2 V, 0-1 V, ±0.2 mA optional
  - CPCI-3009 30V, 0-30V
- Gain: software programmable (x1, x2, x5, x10)
- Throughput: 100 kHz
- Trigger: through software, timer, external (24 V input)
- Data transfer: data to PC, through FIFO memory, Interrupt at EOC (End Of Conversion), DMA transfer at EOC
- Intermits: 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
  - Output range: -10 V to +10 V (± 1 LSB)
  - Accuracy: ±0.028 %
  - Time to ready: 10 µs ±5 %
  - Setup time: 10 µs ±5 % (at 10 V step)
  - Max. output current: ±5 mA
  - Short-circuit current: ±20 mA
  - Output voltage after reset: ±5 V

**Counter components**
- Counting depth: 32-bit, counting frequency: up to 5 MHz
- Time resolution: 10 V

**Digital I/O**
- Number of I/O channels: 4 dig. inputs, 4 dig. outputs (50 mA), 24 V
- Logical "0" level: 0 V
- Logical "1" level: 24 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/4E
- Option box: PXC 32-bit PC, to CompactPCI specification 2.1
- Space required: 1 x CompactPCI slot for analog I/O, counter
- Operating voltage: ±14 V
- Current consumption: 790 mA, ±10 %
- Front connector: 15-pin D-sub female connector (analog I/O)
- 15-pin D-sub female connector (counter module)
- Separ. 37-pin D-sub connector for 8 dig. I/O via FB3001
- Temperature range: 0 to 60 °C (with forced cooling)
  - -30° up to +70° 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, 0-30V input range

**Options**
- Please specify the number of channels when ordering
- URS-3009-6U: D/3U-shelf for mounting in 3U housing
- Option SF: Precision filter for 1 single-ended channel
- Option DF: Precision filter for 1 diff. channel (300 Hz)
- Option PC: Current input (0) 20 mA for 1 channel
  - PC-SE: For single-ended channel
  - PC-Diff: For 1 diff. channel (30 Hz)

**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
- PX901-ZG: Screw terminal panel for connecting the digital I/O, for DIN rail
- ST3009-DZ: 15-pin HD D-sub female to 37-pin D-sub male connector
- ST3009-A: 26-pin HD D-sub female to 37-pin D-sub male connector
- FB3001: Ribbon cable for dig. I/O, with 37-pin D-sub male connector on 3U bracket
- ST010: Standard round cable, shielded, twisted pairs, 2 m

**Ordering information**
- Fax: +49 7229 1847-222
- Phone: +49 7229 1847-0
- www.addi-data.com
- info@addi-data.com

*Preliminary product information*
Multifunction board, optically isolated, 16 SE or 8 diff. inputs, 8 analog outputs, 16-bit

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, ±10 V, 0-5 V, ±5 V, 0-2 V, ±2 V, 0-1 V, ±1 V, 0-20 mA (option)
  - Gain PGA x1, x2, x5, x10
  - 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
  - Automated 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 μs
  - 14-bit resolution (13-bit for 0-10 V)
  - Output voltage: ±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 ± 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 (real-time)
- 32-bit drivers for Windows 7/Vista/XP/2000 (real-time)

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, download menu
### 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: 0-10 V, ±10 V, ±5 V, ±2 V, 0-1 V, ±1 V, 0-20 mA optional
- Throughput: 100 kHz
- Gain: Software programmable (1, 2, 5, 10)
- Common mode rejection: 5 V, ±10 V, ±20 V (20 ω differential against GND)
- RSD (± 3 V): ± 1 LSB (ADU)
- DT Non-linearity (DNL): ± 0.5 LSB (ADC)
- Input impedance (PDA): 100 kΩ through low-pass filter
- Trigger: through software, timer, ext. event (24 V inputs)
- 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
- Intermittents: End of conversion, End of timer, End of scan

**Time**
- Time base of timer 2: 24-bit; 50 μs

**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.
- 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: 3U/4TE
- System bus: PCI 32-bit acc. to CompactPCI specification 2.1
- Space required: 1 PCI slot for analog I/O, 1 slot opening for digital I/O with FB3001
- Operating voltage: ± 5 V ± 5 %, 3.3 V vom CPCI-System
- Front connector: 16-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
- Temperature range: 0 to 60 °C (with forced cooling)
- Current consumption: 800 mA
- Operating voltage: +5 V, ±5 %, 3.3 V vom CPCI-System
- Front connector: 16-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)

**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**
- CPCI-3120-16-4: 16 SE/4 diff. inputs, 4 analog outputs
- CPCI-3120-16-8: 16 SE/8 diff. inputs, 8 analog outputs
- CPCI-3120-8-4: 8 SE/4 diff. inputs, 4 analog outputs
- CPCI-3120-8-8: 8 SE/8 diff. inputs, 8 analog outputs

**Options:** Please specify the number of channels when ordering
- URS-3120-6U: 6U bracket for mounting in 6U housing

#### Option SF:
- Precision filter for 1 single-ended channel

#### Option DF:
- Precision filter for 1 diff. channel (30 Hz)

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**Simplified block diagram**

**Pin assignment – 37-pin D-Sub male connector**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>1+</td>
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<tr>
<td>A2</td>
<td>2+</td>
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<tr>
<td>A3</td>
<td>3+</td>
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<tr>
<td>A4</td>
<td>4+</td>
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<td>A5</td>
<td>5+</td>
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<tr>
<td>A18</td>
<td>18+</td>
</tr>
<tr>
<td>A19</td>
<td>19+</td>
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</tbody>
</table>

**Pin assignment – 16-pin connector**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FB3001</td>
<td>FB3001</td>
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<tr>
<td>ST010/ST011</td>
<td>ST010/ST011</td>
</tr>
<tr>
<td>PX901-ZG</td>
<td>PX901-ZG</td>
</tr>
<tr>
<td>PX901-A</td>
<td>PX901-A</td>
</tr>
<tr>
<td>PX_BNC</td>
<td>PX_BNC</td>
</tr>
</tbody>
</table>

**Ordering information**

**Option PC:** Current input 0(4)-20 mA for 1 channel
**PC-SE:** For 1 single-ended channel
**PC-Diff:** For 1 diff. channel (30 Hz)

**Accessories**
- PX901-A: Screw terminal panel with transponder, 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
- 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
- FB3001: 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

**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

**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, ±10 V, 0-5 V, ±5 V, 0-2 V, ±2 V, 0-1 V, ±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

**Analogue 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 ± 40 V (analog inputs)

**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 (real-time)
- 32-bit drivers for Windows 7/Vista/XP/2000 (real-time)
- Signed 64-bit drivers for Windows 7/XP

**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, download menu
CPCI-3001 - Analog Input Board

### Analog Inputs

**Number of Inputs:**
- 16 single-ended/8 differential inputs
- 8 single-ended/4 differential inputs or 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, ±10 V, 0-5 V, ± 5 V, 0-2 V, ± 2 V, 0-1 V, ± 1 V, 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):**
- ± 1 LSB (ADC)

**Differential Non-linearity (DNL):**
- ± 0.5 LSB (ADC)

**Input Impedance (PGA):**
- 10^12 Ω // 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

### 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 Voltage:**
- 0-30 V

**Input Current at 24 V:**
- 3 mA typ.

**Output Voltage:**
- 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:**
- 3U/4TE

**System Bus:**
- PCI 32-bit acc. to CompactPCI specification 2.1

**Space Required:**
- 1 PCI slot for analog inputs,
- 1 slot opening for digital I/O

**Operating Voltage:**
- + 5 V ± 5 %, 3.3 V from CPCI system

**Current Consumption:**
- 550 mA typ.

**Front Connector:**
- 37-pin D-Sub male connector

**Additional Connector:**
- 16-pin male connector for Ribbon cable for connecting the digital inputs and outputs

**Temperature Range:**
- 0 to 60 °C (with forced cooling)

**MTBF:**
- 75887 hours at 45 °C

### Ordering Information

**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

**CPCI-3001-8**
- 8 SE/4 diff. inputs

**CPCI-3001-4**
- 4 SE inputs

**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 (30 Hz)

**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

### 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
- **PX BNC:** BNC connection box for connecting the analog I/O
- **PX901-ZG:** Screw terminal panel with 37-pin D-Sub male connector on 3U bracket for the digital I/O

**Phone:** +49 7229 1847-0  
**Fax:** +49 7229 1847-222  
**info@addi-data.com**  
www.addi-data.com
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, ½ 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)

**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 (real-time)
- Signed 64-bit drivers for Windows 7/Vista/XP

**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, download menu
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!

<table>
<thead>
<tr>
<th>Operating mode</th>
<th>RS232</th>
<th>RS422</th>
<th>RS485</th>
<th>20 mA CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Port 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Port 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Port 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Optical isolation 1000 V
Creeping distance 3.2 mm
Short-circuit protection
ESD protection
Burst-protection
Duplex
Max. Baud rate
Modem control signals
Autom. transmitter control
Current consumption

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)

Memory: 128-byte FIFO buffer for each interface

Protocol: 5-, 6-, or 8-bit Character 1, 1½ or 2 Stop bits

Safety

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: CPCI 32-bit acc. to specification CompactPCI 2.2
Space required: CPCI-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

CompartmentPCI

Embedded system

PLC

Modem

Port 1
RS485

Port 2
TTY
20 mA Current Loop

Port 3
TTY
20 mA Current Loop

Port 4
RS232 optically isolated

Connection cables

4 x 9-pin D-Sub male connector (ST075)
or
4 x 25-pin D-Sub male connector (ST074)

37-pin D-Sub female connector

CPCI-7500

4-port serial interface, RS232, RS422, RS485, 20 mA CL. Incl. technical description and software drivers.

MX modules: Please order separately!

<table>
<thead>
<tr>
<th>MX232-G</th>
<th>MX232</th>
<th>MX422-G</th>
<th>MX422</th>
<th>MX485-G</th>
<th>MX485</th>
<th>MXTTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS232 mode optically isolated</td>
<td>RS232 mode</td>
<td>RS422 mode optically isolated</td>
<td>RS422 mode optically isolated, with RTS/CTS</td>
<td>RS485 mode</td>
<td>RS485 mode</td>
<td>RS485 mode</td>
</tr>
</tbody>
</table>

Option:

URS-7500-6U: 6U bracket for mounting in 6U housing

Quarz: Up to 1 Mbaud transfer rate

Connection cables:

ST075: Shielded round cable, 37-pin to 4 x 9-pin
ST074: Shielded round cable, 37-pin to 4 x 25-pin.

Phone: +49 7229 1847-0  info@addi-data.com
Fax: +49 7229 1847-222  www.addi-data.com
Motion control for 4 servo or stepper motors

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 or Langham controllers 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.

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.

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 dig. inputs and 12 dig. outputs, optically isolated

Phone: +49 7229 1847-0 info@addi-data.com
Fax: +49 7229 1847-222 www.addi-data.com
## Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CPCI-8004</strong></td>
<td></td>
</tr>
<tr>
<td>CPU system:</td>
<td>64-bit RISC processor 150 MHz</td>
</tr>
<tr>
<td>RAM:</td>
<td>16 MB</td>
</tr>
<tr>
<td>Data exchange with the PC:</td>
<td>Through CompactPCI bus</td>
</tr>
<tr>
<td>Controller software:</td>
<td>PDF (PID filters with forward compensation)</td>
</tr>
<tr>
<td>Interpolation:</td>
<td>2D, 3D linear, 2D circular, 3D circular, 4D helix, interpolation with secondary axes</td>
</tr>
<tr>
<td>Inputs for incremental encoders:</td>
<td>Diff. or TTL max. 2 MHz, Word length: 32-bit with sign</td>
</tr>
<tr>
<td>Inputs for SSI encoders:</td>
<td>Up to 32-bit, gray / binary code variable frequency 30 kHz to 1.5 MHz</td>
</tr>
<tr>
<td>Setpoint value outputs (servo):</td>
<td>1 per channel, D/A converter, 16-bit resolution, ± 10 V</td>
</tr>
<tr>
<td>Pulse outputs: (stepper motors)</td>
<td>1 stepper signal (RS422) and 1 directional signal (RS422) for each channel, pulse frequency up to 2 MHz</td>
</tr>
<tr>
<td>Isolated digital inputs:</td>
<td>24 inputs, 24 V, as end or reference switch or freely programmable</td>
</tr>
<tr>
<td>Isolated digital outputs:</td>
<td>12 channels, 24 V / 500 mA, for releasing the power amplifiers or freely programmable</td>
</tr>
<tr>
<td>Interrupts:</td>
<td>Through PCI BIOS</td>
</tr>
<tr>
<td>DMA:</td>
<td>Bus master</td>
</tr>
<tr>
<td>Auxiliary voltage:</td>
<td>24 V external for dig. I/O</td>
</tr>
<tr>
<td>Options:</td>
<td>Interbus or CAN-Bus</td>
</tr>
</tbody>
</table>

### 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 – universal
- **Space required:** 1 CompactPCI slot
- **Operating voltage:** ± 5 V and 3.3 V, ± 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)

---

## Ordering information

### Accessories

- **PX8001:** 3-row screw terminal panel, 50-pin, for DIN-rail mounting
- **ST8004:** Shielded round cable, 2 m, 78-pin female connector to 2 x 50-pin male connector
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 copperbraid is used as „ground“. Twisted pairs provide protection against crosstalk and external interference. The cables are suited for dry or damp environments.

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

<table>
<thead>
<tr>
<th>PX901</th>
<th>PX9000</th>
<th>PX8001</th>
<th>PX9200</th>
<th>PX8500</th>
<th>PX_BNC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Panel for connecting up to 32 signal lines</td>
<td>Panel for connecting up to 32 signal lines</td>
<td>Panel for connecting 50 signal lines</td>
<td>Panel for connecting 22 signal lines and 4 analog channels</td>
<td>Relay output board with 8 relays, cascadable in 16, 24 and 32 relays</td>
</tr>
<tr>
<td>Function indication with LEDs</td>
<td>PX901-D: yes for 24 V and sensor supply</td>
<td>For 24 V and sensor supply</td>
<td>Through varistors and diode</td>
<td>For 24 V and sensor supply</td>
<td>Through varistors and diode</td>
</tr>
<tr>
<td>Overvoltage protection of the 24 V supply voltage</td>
<td>Through varistors and diode</td>
<td>Through varistors and diode</td>
<td>Through varistors and diode</td>
<td>Through varistors and diode</td>
<td></td>
</tr>
<tr>
<td>Available versions</td>
<td>PX901-D: For digital boards, with 32 LEDs for status indication of the data lines. PX901-DG: Same as PX901-D with housing PX901-A: For analog boards with varistors and diodes for the overvoltage protection of the analog I/O PX901-AG: Same as PX901-A with housing for DIN rail PX901-ZG: For digital I/O boards, analog boards PCIe-3121, PCIe-3121/3021/3521 and counter boards PA1700-2, with housing for DIN rail PX8500-G: With housing for DIN rail PX8500-Vt+G: With varistors and housing for DIN rail</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection to</td>
<td>ADDI-DATA digital, analog or counter boards</td>
<td>All ADDI-DATA digital boards</td>
<td>APCL-1710, APCC-1710, APCL-8001, APCC-1711, APCL-2200, APCC-2200, APCL-311x/301x, APCC-3004</td>
<td>Multifunction board APCL-3122 and analog board APCL-3504</td>
<td>ADDI-DATA digital boards with digital outputs</td>
</tr>
<tr>
<td>Page</td>
<td>193</td>
<td>194</td>
<td>194</td>
<td>195</td>
<td>196</td>
</tr>
</tbody>
</table>
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 the 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. The designations on the terminals indicate the 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 overvoltage 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 mm²

Specifications

| Signal line terminals: | 32 for the connection of peripherals |
| Additional terminals: | - 4 for feeding the external operating voltage (digital I/O) |
| status indication: | 32 LEDs for status indication, 1 LED for status display of the operating voltage (version D) |
| Safety features: | Varistors and transil diodes |
| Dimensions of the board: | (L x W x H) 130 x 70 x 35 mm |
| Dimensions with housing: | (L x W x H) 132 x 87 x 70 mm |
| Temperature range: | 0-60 °C |

Ordering information

PX901-ZG: For analog output boards with current outputs and for connecting the digital I/O on some ADDI-DATA boards. With housing for DIN-rail mounting

Accessories (see page 200/201)

Please order separately!

ST010: Standard round cable, shielded, twisted pairs, 2 m
ST011: Standard round cable, shielded, twisted pairs, 5 m
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 mm²
- 2 x 39 screw terminals to the distribution of the voltage supply e.g. on sensors and for cascading several PX9000

**Specifications**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal line terminals</td>
<td>32 for the connection of peripherals</td>
</tr>
<tr>
<td>Supply voltage terminals</td>
<td>2 rows of 39 terminals</td>
</tr>
<tr>
<td>Additional terminals</td>
<td>4 terminals for the external voltage power supply (digital I/O)</td>
</tr>
<tr>
<td></td>
<td>2 for connecting the ground lines</td>
</tr>
<tr>
<td>Status indication</td>
<td>37 LEDs for status indication, LEDs for operating and supply voltage</td>
</tr>
<tr>
<td>Safety features</td>
<td>Varistors and transorb diodes, ground lines</td>
</tr>
<tr>
<td>Connector</td>
<td>37-pin D-Sub female connector</td>
</tr>
<tr>
<td>Dimensions of the board</td>
<td>(L x W x H) 244 x 68 x 35 mm</td>
</tr>
<tr>
<td>Dimensions with housing</td>
<td>(L x W x H) 248 x 87 x 78 mm</td>
</tr>
<tr>
<td>Temperature range</td>
<td>0-60 °C</td>
</tr>
</tbody>
</table>

**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.

**Accessory**

Please order separately!

**ST010:** Shielded round cable, twisted pairs, 2 m, 37-pin

**ST011:** Shielded round cable, twisted pairs, 5 m, 37-pin

**ST370-16:** Shielded round cable, twisted pairs, 2 m, 50-pin

**ST8001:** Cable for connecting the APCI-8001 and APCI-8008 to the screw terminal panel PX8001
The terminal panel PX9200 combines the connection of analog and digital channels. It features 2 separate male connectors between the digital and the analog signals. Both signal types are driven through one own layer board and are protected from each other.

The two terminals blocks for the digital signals allow to connect 22 lines distributed as follows: 12 lines for digital output signals and 10 lines for digital input signals. The cable ST3122-D is used for digital data transfer to the ADDI-DATA boards and is equipped with a 26-pin D-Sub high-density female connector.

The terminal block for the analog signals allow to connect 4 analog channels with a separated ground line. The cable ST3122-A is used for analog data transfer to the ADDI-DATA boards and is equipped with a 15-pin D-Sub high-density female connector.

All components of the layer board are included in an earthing strip which is itself connected to the earthing terminal. The screw terminals are labelled to differentiate the different signals (analog/digital).

The PX9200 is supplied with LEDs for status display of the digital signals. The analog signals are protected against fast transients and the mechanical layout allows the separation from the digital signals. The voltage supply for the analog or digital functions are driven separately.

### Features
- Max. connection of 22 digital signal lines and 4 analog channels with separated ground line
- Separate ground connection
- Connection through screw terminals
- Separated connection blocks for analog and digital channels
- Terminals can be labelled
- With housing for DIN rail mounting
- All terminals for screw terminals for large conductor cross sections: up to 2.5 mm²

### Safety features
- Transil diodes on the analog channels
- Separate lines for analog and digital channels

### PX9200
Screw terminal panel. Incl. technical description.

**PX9200:** for multifunction board APCI-3122 and analog output board APCI-3504 with status indication through LEDs

### Applications
- Process control
- Industrial measurement
- Acquisition of sensor data
- Signal analysis

### Specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal line terminals</td>
<td>for the connection of peripherals</td>
</tr>
<tr>
<td>Status indication</td>
<td>22 LEDs for digital status indication, including:</td>
</tr>
<tr>
<td></td>
<td>– 12 yellow LEDs for digital outputs</td>
</tr>
<tr>
<td></td>
<td>– 10 orange LEDs for digital inputs</td>
</tr>
<tr>
<td></td>
<td>One additional LED (green) for the voltage supply of the analog and digital channels</td>
</tr>
<tr>
<td>Safety features</td>
<td>Varistors and transil diodes</td>
</tr>
<tr>
<td>Connector</td>
<td>26-pin high-density D-Sub female connector (digital)</td>
</tr>
<tr>
<td></td>
<td>15-pin high-density D-Sub female connector (analog)</td>
</tr>
<tr>
<td>Dimensions</td>
<td>L x W x H 132 x 87 x 65 mm</td>
</tr>
<tr>
<td>Temperature range</td>
<td>0-60 °C</td>
</tr>
</tbody>
</table>

### Ordering information

**Accessories**

**ST3122-D:** High-density round cable, 2 m, shielded, twisted pairs, for digital inputs and outputs

**ST3122-A:** High-density round cable, 2 m, shielded, twisted pairs, for analog outputs
The PX8500 is an external 8-channel relay board for the connection of digital output boards. It can be cascaded in 16, 24 and 32 relays and is intended for mounting on DIN supporting rails. The board provides a convenient interface between an industrial process and the D-Sub connectors on ADDI-DATA boards. 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 the use with 220 V supply. The creeping distance (acc. to DIN VDE0110) and the connector cross sections allows high-power switching (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 shielded can be grounded on both sides for the protection against high-frequency EMI.

**Features**

- Relay output board with 8 relays, cascadable 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 mm²
- Operating voltage display through green LED
- Relay state display through red LED
- Relays mounted on sockets
- High switching capacity
- Long-lasting life

**Safety features**

- Overvoltage protection of the 24 V supply voltage through varistors and tranil diodes
- Contact protection of the relays through varistors (option Vt)
- 4 mm creeping distance between change-over, closer and opening contact
- 6 mm creeping distance between change-over contact and closer of adjoining relay
- Free-wheeling diode in the coil circuit
- With housing for mounting on a standard DIN rail, (option G)
- 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 ...
- ...

**Function principle of the relays**

![Diagram of relay connections](image)

- **CO**: Change-over contact
- **CC**: Closing contact
- **OC**: Opening contact

**PX8500**

For the connection of digital output boards

- Cascadable in 16/24/32 relays
- 8 relays on socket
- DIN-rail mounting
- 30 VDC - 277 VAC
- 300 W - 2500 VA
- 10 A
### 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:** 5,000,000 operations
- **Life at max. switching capacity:** 100,000 operations

**Control side**

- **Switching behaviour:** Monostable
- **Operating voltage:** 24 VAC
- **Operating efficiency:** 533 mW
- **Switching frequency at max. load:** 20 switchings/minute
- **Threshold 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 (L x W x H):** with housing 212 x 87 x 72 mm
- **Connector:** 2 x 37-pin D-Sub female connector
- **X1:** For the connection to the PC
- **X2:** 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 relays 1, output 2 to relays 2, etc.
- **Temperature range:** 0-60 °C
- **Humidity:** 30-95 %

**Accessories**

- **ST8500:** Ribbon cable for cascading the board in 16, 24 or 32 relays
- **ST021:** Standard round cable, shielded, for connecting to APCI-1500 or APCI-1516
- **ST022:** Standard round cable, shielded, for cascading two PX8500
- **ST010:** Standard round cable, shielded, twisted pairs, 2 m, for connecting to APCI-2032, APCI-1564
- **ST011:** Same as ST010, 5 m

**Ordering information**

**PX8500**

8-port relay output board. Incl. technical description.

**PX8500-G:** With housing for mounting on DIN rail
**PX8500-VTG:** PX8500 with varistors and housing for mounting on DIN rail

**Connection example for the digital I/O board APCI-1516**

- **Connection of the outputs through relay output board PX8500-G cascaded in 32 relays**
- **Connection of the inputs through screw terminal board PX901-DG**

**Connection – PX8500**

**PX8500 cascaded in 32 relays**

Relay output board PX8500-G cascaded in 32 relays.

For the boards
- APCI-1564
- APCI-1564
- APCI-2032

**PX8500 cascaded in 16 relays**

Relay output board PX8500-G cascaded in 16 relays.

For the boards
- APCIe-1532
- APCI-1502
- APCI-1500
- APCI-2016
- CPCI-1500

**Connection example for the digital I/O board APCI-1516**

- **Connection of the outputs through relay output board PX8500-G**
- **Connection of the inputs through screw terminal board PX901-DG**
**Features**

The connection box PX_BNC allows the direct connection of analog voltage and current signals through BNC connectors. Many ADDI-DATA analog boards can be connected (see table on the right). With the PX-BNC, you can connect up to 8 differential or 16 single-ended analog inputs as well as 8 analog output channels through BNC connectors.

**Housing**

The compact housing consists of black painted aluminium, profile IP65 with good impact resistance.

**Accessories**

The standard delivery contains 2 clamps for DIN rail mounting.

**Connection to the board**

The connection to the board is made through the 37-pin D-Sub female connector, the pin assignment depends on the type of board connected.

The connection between PX_BNC and the ADDI-DATA analog board is made through the standard round cable ST010 (shielded cable, 2 m).

Please order the cable separately.

**16 BNC connectors for analog inputs**

The connection box has 16 BNC connectors In 0 to In 15 for the connection of the analog input channels (Channel 0-15) of many ADDI-DATA input and multifunction boards (see table on the right).

The BNC ground is connected to the ground of the analog signals.

The connection of the differential channels (DIFF) is only possible through a special BNC cable.

**8 BNC connectors for analog outputs**

The connection box has 8 BNC connectors Out 0 to Out 7 for the connection of the analog output channels (channel 0-7) of many ADDI-DATA multifunction and output boards (see table on the right).

The BNC ground is connected to the ground of the respective analog output channel.

---

**The PX-BNC can be connected to the following ADDI-DATA analog boards:**

<table>
<thead>
<tr>
<th>Analog input boards</th>
<th>Multifunction boards</th>
<th>Analog output board</th>
</tr>
</thead>
<tbody>
<tr>
<td>APCI-3001 / CPCI-3001</td>
<td>APCI-3110 / APCI-3116</td>
<td>APCI-3501</td>
</tr>
<tr>
<td>APCI-3010 / APCI-3016</td>
<td>APCI-3120 / CPCI-3120</td>
<td>APCIe-3121 / APCIe-3123</td>
</tr>
<tr>
<td>APCIe-3021</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Specifications**

<table>
<thead>
<tr>
<th>BNC connector:</th>
<th>For the connection of peripherals</th>
</tr>
</thead>
<tbody>
<tr>
<td>BNC connector:</td>
<td>In 0-15 for analog inputs</td>
</tr>
<tr>
<td></td>
<td>Out 0-7 for analog outputs</td>
</tr>
</tbody>
</table>

| D-Sub connector: | 37-pin D-Sub female connector |
| Dimensions: | (L x W x H) 210 x 105 x 50 mm |
| Weight: | 727 g |
| Temperature range: | 0-60 °C |

---

**Ordering information**

<table>
<thead>
<tr>
<th>PX_BNC</th>
<th>BNC connection box for DIN rail. Incl. technical description.</th>
</tr>
</thead>
</table>

**Accessories**

Please order separately!

- **ST010:** Standard round cable, shielded, twisted pairs, 2 m
- **ST011:** Same as ST010, 5 m
- Other cable version on request
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 metallized 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.

**CABLES**

**Dedicated cables**

Special versions on request

**Standard cables for industrial applications**

More safety for your application

**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 connector on one or on both ends
- ...

**Twisted pairs**

Twisted pairs ensure electrical isolation and protect the signal against interference.

**Aluminium foil**

Aluminium foil is used to shield the cable from external interference and to reduce the emissions.

**Copper braid shielding**

Copper braid provides additional protection against crosstalk and external interference.

**PVC outer sheath**

PVC outer sheath ensures durability and protection against mechanical damage.

**Specifications of the cables (STxxxx type)**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specifications</td>
<td>Special PVC data line for electronic control tasks according to VDE 0812 and 0814</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-30 °C to +80 °C laid permanently</td>
</tr>
<tr>
<td>Operating voltage</td>
<td>Max. 350 V</td>
</tr>
<tr>
<td>Test voltage</td>
<td>1200 V (0.14 mm²)</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>± 20 MΩ/km</td>
</tr>
<tr>
<td>Inductance</td>
<td>Approx. 0.65 mH/km</td>
</tr>
<tr>
<td>Impedance</td>
<td>Approx. 78 Ω</td>
</tr>
<tr>
<td>Capacitive coupling</td>
<td>Approx. 300 pF/100m</td>
</tr>
<tr>
<td>Connector cross section</td>
<td>0.14 mm² (ST010-S and ST011-S with a connector cross section of 0.25 mm²)</td>
</tr>
<tr>
<td>Attenuation factor</td>
<td>&gt; 40 dB between 300 and 900 MHz</td>
</tr>
<tr>
<td>Construction</td>
<td>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.</td>
</tr>
<tr>
<td>Minimum bending radius</td>
<td>Laid flexibly 15 x cable diameter</td>
</tr>
<tr>
<td></td>
<td>Laid permanently 6 x cable diameter</td>
</tr>
<tr>
<td>Cable designation</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Round cable, 1 to 20 m, 2 x 37-pin D-Sub connector</td>
<td></td>
</tr>
<tr>
<td>ST010_1</td>
<td>Female connector / male connector</td>
</tr>
<tr>
<td>ST010</td>
<td>Female connector / male connector</td>
</tr>
<tr>
<td>ST01_3</td>
<td>Female connector / male connector</td>
</tr>
<tr>
<td>ST011</td>
<td>Female connector / male connector</td>
</tr>
<tr>
<td>ST011_10</td>
<td>Female connector / male connector</td>
</tr>
<tr>
<td>ST011_15</td>
<td>Female connector / male connector</td>
</tr>
<tr>
<td>ST011_20</td>
<td>Female connector / male connector</td>
</tr>
<tr>
<td>Round cable with one 90° bent female connector, 2 x 37-pin D-Sub connector</td>
<td></td>
</tr>
<tr>
<td>ST010_1_ABGW</td>
<td>90° bent female connector / male connector</td>
</tr>
<tr>
<td>ST010_ABGW</td>
<td>90° bent female connector / male connector</td>
</tr>
<tr>
<td>ST010_3_ABGW</td>
<td>90° bent female connector / male connector</td>
</tr>
<tr>
<td>ST011_ABGW</td>
<td>90° bent female connector / male connector</td>
</tr>
<tr>
<td>Round cable with two 90° bent connectors, 2 x 37-pin D-Sub connectors</td>
<td></td>
</tr>
<tr>
<td>ST010_1_2XABGW</td>
<td>Female connector / male connector</td>
</tr>
<tr>
<td>ST010_2XABGW</td>
<td>Female connector / male connector</td>
</tr>
<tr>
<td>Round cable, 2 m and 5 m, or high currents (for 24 V digital outputs), 2 x 37-pin D-Sub connector</td>
<td></td>
</tr>
<tr>
<td>ST010_5</td>
<td>Female connector / male connector, with separate connection for 24 V voltage supply</td>
</tr>
<tr>
<td>ST011_5</td>
<td>Female connector / male connector, with separate connection for 24 V voltage supply</td>
</tr>
<tr>
<td>Round cable with one open end, 1 x 37-pin D-Sub connector</td>
<td></td>
</tr>
<tr>
<td>ST010_1_O</td>
<td>Female connector / other side open and bared, incl. colour table according to DIN 47100</td>
</tr>
<tr>
<td>ST010_0</td>
<td>Female connector / other side open and bared, incl. colour table according to DIN 47100</td>
</tr>
<tr>
<td>ST010_3_O</td>
<td>Female connector / other side open and bared, incl. colour table according to DIN 47100</td>
</tr>
<tr>
<td>ST011_0</td>
<td>Female connector / other side open and bared, incl. colour table according to DIN 47100</td>
</tr>
<tr>
<td>Round cable between digital I/O boards and relay output board PX8500, 2 x 37-pin D-Sub connectors</td>
<td></td>
</tr>
<tr>
<td>ST021</td>
<td>Between digital I/O boards (1500) and PX8500 female connector / male connector</td>
</tr>
<tr>
<td>ST022</td>
<td>Between two PX8500 or PX90x male connector / male connector</td>
</tr>
<tr>
<td>ST8500</td>
<td>Ribbon cable between two PX8500-x</td>
</tr>
<tr>
<td>Miscellaneous cables</td>
<td></td>
</tr>
<tr>
<td>ST1711-50</td>
<td>Connection cable for the PCIe-1711, for connecting the PX8001, 78-pin D-Sub male connector / 50-pin D-Sub male connector</td>
</tr>
<tr>
<td>ST3003-A</td>
<td>Connection cable for the PCI-3003, for the analog input signals, 15-pin male connector / 37-pin male connector</td>
</tr>
<tr>
<td>ST3003-D</td>
<td>Cable for the PCI-3003, for the digital signals, 15-pin male connector / 37-pin male connector</td>
</tr>
<tr>
<td>ST3122-A</td>
<td>Cable for the PCI-3122 and PCI-3504, for the analog outputs 15-pin male connector / 15-pin male connector</td>
</tr>
<tr>
<td>ST3122-A_5</td>
<td>Cable for the PCI-3122 and PCI-3504, for the analog outputs 15-pin male connector / 15-pin male connector</td>
</tr>
<tr>
<td>ST3122-D</td>
<td>Cable for the PCI-3122 and PCI-3504, for the digital I/O 26-pin male connector / 26-pin male connector</td>
</tr>
</tbody>
</table>
### Cable designation

<table>
<thead>
<tr>
<th>Description</th>
<th>Twisted pairs</th>
<th>Shielded round cable</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST3122-D_5</td>
<td>✓</td>
<td>✓</td>
<td>5 m</td>
</tr>
<tr>
<td>ST3200</td>
<td>✓</td>
<td>✓</td>
<td>2 m</td>
</tr>
<tr>
<td>ST3601</td>
<td></td>
<td></td>
<td>2 m</td>
</tr>
</tbody>
</table>

**Round cables, 2 x 50-pin D-Sub connector**

<table>
<thead>
<tr>
<th>Description</th>
<th>Twisted pairs</th>
<th>Shielded round cable</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST370-16_1 Female connector / male connector</td>
<td></td>
<td></td>
<td>1 m</td>
</tr>
<tr>
<td>ST370-16 Female connector / male connector</td>
<td>✓</td>
<td>✓</td>
<td>2 m</td>
</tr>
<tr>
<td>ST3701 Cable for the APCI-3701, female connector / male connector</td>
<td>✓</td>
<td>✓</td>
<td>2 m</td>
</tr>
<tr>
<td>ST370-16_5 Female connector / male connector</td>
<td></td>
<td></td>
<td>5 m</td>
</tr>
<tr>
<td>ST370-16_1_ABGW 90° bent female connector / male connector</td>
<td>✓</td>
<td>✓</td>
<td>1 m</td>
</tr>
<tr>
<td>ST370-16_ABGW Female connector / 90° bent male connector</td>
<td>✓</td>
<td>✓</td>
<td>2 m</td>
</tr>
<tr>
<td>ST370-16_5_ABGW 90° bent female connector / male connector</td>
<td>✓</td>
<td>✓</td>
<td>5 m</td>
</tr>
<tr>
<td>ST3701 Round cable for the APCI-3701 female connector / male connector</td>
<td>✓</td>
<td>✓</td>
<td>2 m</td>
</tr>
</tbody>
</table>

**Round cables for the APCI-8001, 2 x 50-pin D-Sub connector**

<table>
<thead>
<tr>
<th>Description</th>
<th>Twisted pairs</th>
<th>Shielded round cable</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST8001 Female connector / male connector</td>
<td></td>
<td></td>
<td>2 m</td>
</tr>
<tr>
<td>ST8001_5 Female connector / male connector</td>
<td>✓</td>
<td>✓</td>
<td>5 m</td>
</tr>
</tbody>
</table>

**Round cables for serial interfaces**

<table>
<thead>
<tr>
<th>Description</th>
<th>Twisted pairs</th>
<th>Shielded round cable</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST074 Connection cables for 4-port serial interfaces 37-pin female connector / 4 x 25-pin D-Sub male connector</td>
<td></td>
<td></td>
<td>35 cm</td>
</tr>
<tr>
<td>ST075 Connection cables for 4-port serial interfaces 37-pin female connector / 4 x 9-pin D-Sub male connector</td>
<td>✓</td>
<td>✓</td>
<td>35 cm</td>
</tr>
<tr>
<td>ST075_ABGW Connection cables for 4-port serial interfaces, 37-pin D-Sub female connector / 4 x 9-pin D-Sub male connector 90° bent female connector</td>
<td>✓</td>
<td>✓</td>
<td>35 cm</td>
</tr>
<tr>
<td>ST7809 Connection cables for 8-port serial interfaces 78-pin male connector / 8 x 9-pin female connector</td>
<td></td>
<td></td>
<td>35 cm</td>
</tr>
<tr>
<td>ST7825 Connection cables for 8-port serial interfaces 78-pin male connector / 8 x 25-pin male connector</td>
<td>✓</td>
<td>✓</td>
<td>35 cm</td>
</tr>
</tbody>
</table>

### Ribbon cables

<table>
<thead>
<tr>
<th>Cable designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FB MSX-DIG-I0</td>
<td>For the MSX-Box option MSX-DIG-I0, 9-pin ribbon cable with D-Sub connector with bracket.</td>
</tr>
<tr>
<td>FB-INTERBUS</td>
<td>For the APCI-8001, for connecting the Interbus. Ribbon cable, 9-pin D-Sub female connector with bracket.</td>
</tr>
<tr>
<td>FB-PROFIBUS</td>
<td>For the MSX Box, for connecting the Profibus. Ribbon cable, 9-pin D-Sub female connector with bracket.</td>
</tr>
<tr>
<td>FB104-1500</td>
<td>For the digital I/O port of the PCI104-PLUS1500. Ribbon cable, 37-pin D-Sub male connector</td>
</tr>
<tr>
<td>FB3000</td>
<td>Ribbon cable for the digital I/O port, 37-pin D-Sub male connector with bracket.</td>
</tr>
<tr>
<td>FB3001</td>
<td>Ribbon cable for the digital I/O port of the CompactPCI boards, 37-pin D-Sub male connector with 3U bracket.</td>
</tr>
<tr>
<td>FB3003</td>
<td>Ribbon cable for the digital I/O port, 37-pin D-Sub male connector with bracket.</td>
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<td>FB3600-AC</td>
<td>For the analog and counter functions of the APCI-3600. Ribbon cable, 2x15-pin D-Sub male connector with bracket.</td>
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<td>FB3600-D</td>
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<td>FB3702</td>
<td>For APCI-800x, APCI-30xx and APCI-31xx. Ribbon cable, 50-pin D-Sub male connector with bracket.</td>
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<tr>
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  - Digital I/O
  - Relay

- COUNTER

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  - Analog input
  - Analog output
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  - Pressure measurement
  - Length measurement (transducers)
  - Noise and vibration measurement

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