Industrial Measurement and Automation

Distributed systems

Interference free PC boards

www.addi-data.com
30 years ADDI-DATA – a brief review

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

Richard von Weizsäcker is elected President of the federal Republic of Germany, and Ronald Reagan is re-elected in the USA. Apple revolutionizes the young IT sector with the first Macintosh. It is also the beginnings of ADDI-DATA. The company develops ISA boards, which are then the industrial standard. Intelligent industrial networks are still a long way off.

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

We have taken these changes into account with our “Spirit of Excellence” mindset and our values: Since 1984 we have been developing highly precise, reliable solutions especially for the harsh industrial environment. While doing so, we have kept a focus on industrial developments and constantly adapted our product range. It all began with ISA PC boards, but over time we have been adding many board types and distributed solutions.

And the changes go on: we are eagerly looking forward to the next challenges such as Industry 4.0, which we will follow and master with our Mechatrology* concept. We look forward to mastering these challenges with you and to supporting you with your future projects.

Your

René Ohlmann
Managing Director, ADDI-DATA GmbH

Our values

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

* Mechatrology® www.addi-data.com/mechatrology/
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With ADDI-DATA measurement boards, you can precisely acquire numerous types of signals and sensor and thus control processes reliably. The extremely interference-resistant measurement boards are especially designed for the harsh industrial environment.

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

Temperature regulation for wafer production

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

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

See also data sheet APCI-3120, page 192

Time-critical applications

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

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

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

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

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

See also data sheet PAC system MSX-Box, page 22
Measurement and control with EtherCAT and PROFINET

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

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

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

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

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

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

Precise and error-free diameter detection of gear wheels

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

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

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

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

See also data sheet MSX-E3121, page 72

Measurement and control in the field

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

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

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

See also data sheet MSX-E3701-4, page 19

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

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

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

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

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

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

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

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

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

New CompactPCI serial boards

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

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

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

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

64-bit RTX drivers and ADDIPACK 64-bit version

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

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

Resolver/Digital converter MSX-RDC-17

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

MSX-RDC-17 see page 264

ADDIPACK concept – see page 117
DISTRIBUTED SYSTEMS

Product overview

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

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

1. Industrial data loggers

MSX-ilog

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

2. Intelligent Ethernet systems

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

3. Real-time open source PAC systems

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

4. Real-time Ethernet systems

ADDI-DATA offers I/O slave systems for EtherCAT and PROFINET. They feature highly-precise inputs. The systems can measure faster than the bus cycle and buffer the acquired data. Moreover, the measurement can be started independently from the bus, since by using the 24 V trigger input, the x-ARTS can be combined with hardware that is not connected to the bus.
MSX-ilog data loggers from ADDI-DATA are used for continual data acquisition and storage over long periods of time. Diverse physical measurements can be acquired and shown in different display modes. Data storage and visualisation take place parallel to one another.

Different hardware versions

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

Application areas

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

BENEFITS

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

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

Configuration

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

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

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

Alarms
- Channel selection • Bottom value • Top value

Saving modes
- View only • Save all the time • Trigger mode

Live view
- XY view • Digital view

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

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

Bespoke solutions

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

Advice needed?
Then just call us at +49 7229 1847-0 or send an e-mail to: info@addi-data.com
The intelligent Ethernet data logger MSX-ilog-Al-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.

### Features
- Onboard ARM® 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
- Optical isolation
- 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

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

---

*Preliminary product information*
Specifications

**Analog inputs**

- **Number/type:** 16 differential inputs
- **Architecture:** 4 groups with 4 channels each, 4-port simultaneous converter with one 4-channel multiplexer per converter
- **Resolution:** 16-bit, SAR ADC
- **Accuracy:** ±1.221 mV typ. (±4 LSB)
- **Relative precision (NPL):** ±3.5 LSB max. (ADC)
- **Optical isolation:** 1000 V
- **Input ranges:** ±5 V, ±10 V software-programmable
- **Input frequency:** 1 kHz per channel
- **Gain:** x1, x2, software-programmable
- **Common mode rejection:** 80 dB min. DC up to 60 Hz (diff. amplifier)
- **Input impedance (PGA):** 10^9 Ω // 10 nF against GND
- **Bandwidth (-3 dB):** 160 kHz limited through TP filters
- **Gain error:** ±2.5 LSB
- **Offset error:** ±1 LSB (±305 µV)
- **Temperature drift:** 2.3 x V_in + 22.5 (µV / °C) typ.

**Data storage**

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

**Voltage supply**

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

**Connectors**

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

**Ethernet**

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

**Trigger**

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

**Connectors**

- **Trigger input:** 1 x 5-pin flange connecter M12
- **Trigger output:** 1 x 5-pin flange-type socket M12

**EMC – Electromagnetic compatibility**

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

**System features**

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

**System requirements**

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

---

**Features**

- 16 analog inputs, differential, 16-bit
- 2 x Ethernet
- 2 x Trigger IN/OUT
- 2 x trigger
- 24 V IN/OUT, optically isolated

**Ordering information**

**MSX-ilog-AI-16**

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

**Connection cables**

**Voltage supply**

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

**Trigger**

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

**Ethernet**

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

**Connection to peripherals**

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

**Options**

- **PC-Diff:** Current input 0(4)-20 mA for 1 input, diff. (please indicate the number of channels)
- **MSX-E 5V-Trigger:** Level change of the trigger inputs and outputs to 5 V
- **MX-Clip, MX-Rail** (Please specify when ordering!), **MX-Screw, PCMX-1x**

* Preliminary product information
The intelligent Ethernet data logger MSX-i log-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)

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

More information at www.addi-data.com

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

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

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

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

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

**Ethernet**
- **Interface:** Ethernet acc. to specification IEEE802.3
- **Number of ports:** 2
- **Bandwidth:** 10 Mbps auto-negotiation
- **Protocol:** 10Base-T IEEE802.3 compliant
- **Optical isolation:** 1000 V
- **MAC address:** 00:0F:6C:##:##:##, unique for each device

**Trigger**
- **Number of inputs:** 1 trigger input
- **Number of outputs:** 1 trigger output
- **Optical isolation:** 1000 V
- **Nominal voltage:** 24 V external
- **Input voltage:** 0 to 30 V
- **Input current:** 11 mA at 24 VDC, typical
- **Input frequency (max.):** 2 MHz at 24 V

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

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

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

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

**System requirements**
- **Standard browser (Internet Explorer, Firefox) with Java from version 1.6.x**

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

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

**Ordering information**
- **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

**Cold junction compensation**
**SC-M12-8-TC:** M12 8-pin connector for connecting thermocouples with integrated CJC. (Included in delivery!)

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

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

**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

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

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

### Digital outputs
- **Number:** 4
- **Output type:** Open collector
- **Optical isolation:** Over opto-couplers, 1000 V
- **Max. switching current:** 50 mA typ.
- **Nominal voltage:** 24 V
- **Connectors:** 1 x 37-pin D-Sub connector (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

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

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

### System features
- **Housing:** Chromated aluminium, colour RAL 5010, "Enzianblau"
- **Heat dissipation:** Through programmable fan
- **Housing dimensions:** 278 x 170 x 165 mm
- **Temperature range:** 0 – 50 °C

### System requirements
- **Standard browser (Internet Explorer, Firefox) with Java from version 1.6.x**

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**Ordering information**

**MSX-log-A16-DI040**
Ethernet data logger, 16 analog inputs, 16-bit, diff., 40 dig. I/O. Incl. technical description.

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

**Options**
- **Option PC-Diff:** Current input for 1 diff. channel 0(4)-20 mA
- **Option DF:** Precision filter for 1 channel
- **MSX-SCREW:** Assembly equipment for direct mounting on machines
- **MSX-RAILDIN:** Assembly equipment for DIN-rail mounting
- **Additional analog inputs:** on request
- **Additional digital I/O:** on request
- **SSD hard disk with more storage space:** on request

* Preliminary product information
x-ARTS: ADDI-DATA Realtime Slave System

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

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

High level of protection

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

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

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

The optimal solution

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

In addition, several systems or signals can be synchronised with one another using the synchro line, all in a period of less than 1 µs.

The x-ARTS can also tie together signals from various external devices, such as encoders and analog inputs, and in this way acquire values faster than the bus cycle. This increases the efficiency of your application. Various diagnosis possibilities, retrievable via Ethernet, can be set to work in the real-time Ethernet systems from ADDI-DATA.

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

* Preliminary product information

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

Voltage supply

Control part

Optical isolation 1000 V
Ethernet Link / ACT LEDs
µC
Status LED
Temperature monitoring

FPGA control logic

Trigger In
Trigger Out
Trigger In
Trigger Out

Sync In
Sync Out
Sync Out
Sync In

Output line
Power Good LED
Input line

24 V supply

Signal part

- Counter
- Analog I/O
- Digital I/O
- Length measurement
- Simultaneous length measurement
- Temperature measurement
- Pressure measurement
- Measurement of dynamic signals

The x-ARTS consist of a signal part and a control part with optical isolation.

The real-time connection can be accomplished through EtherCAT and PROFINET. Real-time Ethernet can be used looped-through or as a point-to-point connection.
**ETHERCAT**

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

**EC-ARTS-Systeme**

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

**Available functions**

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

**Examples of EC-ARTS applications**

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

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

---

**PROFINET**

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

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

**PN-ARTS systems**

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

**Available functions**

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

**Examples of PN-ARTS applications**

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

---

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

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

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

**Challenge**

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

**Solution**

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

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![PROFINET](image1.jpg)

![EtherCAT](image2.jpg)
**EtherCAT analog input system**

16 analog inputs, diff., 16-bit

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

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

**Current inputs optional**

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

### Specifications

**Analog inputs**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number/input type</td>
<td>16 differential inputs</td>
</tr>
<tr>
<td>Architecture</td>
<td>4 groups with 4 channels each</td>
</tr>
<tr>
<td>Resolution</td>
<td>4-port simultaneous converter with one 4-channel multiplexer per converter</td>
</tr>
<tr>
<td>Accuracy (Vpp)</td>
<td>± 1.221 mV typ. (± 4 LSB)</td>
</tr>
<tr>
<td>Accuracy (Vpp) max</td>
<td>± 2.442 mV max.</td>
</tr>
<tr>
<td>Relative precision (LINE)</td>
<td>± 3 LSB max (ADC)</td>
</tr>
<tr>
<td>Input ranges</td>
<td>± 5 V, ± 10 V (16-bit), 0-5 V, 0-10 V (15-bit) software-programmable, current inputs optional</td>
</tr>
<tr>
<td>Input frequency</td>
<td>25 kHz per channel / 100 kHz max.</td>
</tr>
<tr>
<td>Gain</td>
<td>x1, x2, software-programmable</td>
</tr>
<tr>
<td>Common mode rejection</td>
<td>80 dB ref min. 10 µV to 50 Hz (diff. amplifier)</td>
</tr>
<tr>
<td>Input impedance (PGA)</td>
<td>100 dB ref. 1000 mΩ against GND</td>
</tr>
<tr>
<td>Bandwidth (-3dB)</td>
<td>160 kHz limited through TP filters</td>
</tr>
<tr>
<td>Input impedance (PGA)</td>
<td>100 kΩ (min.)</td>
</tr>
<tr>
<td>Trigger</td>
<td>digital input, synchro, software-programmable</td>
</tr>
<tr>
<td>Offset error</td>
<td>± 0.2 LSB</td>
</tr>
<tr>
<td>Gain error</td>
<td>± 2,5 LSB</td>
</tr>
<tr>
<td>Temperature drift</td>
<td>2.3 x Vpp + 22.5 µV °C typ.</td>
</tr>
<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>
</tbody>
</table>

**Trigger**

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

**EMC - Electromagnetic compatibility**

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

**System features**

- Interface: EtherCAT
- Dimensions (mm): 215 x 110 x 50
- Weight: 850 g
- Degree of protection: IP 65
- Operating temperature: 40 °C to +85 °C

**EC-ARTS-3011 interface connectors**

- EtherCAT: 2 x 4-pin M12 female connector, D-coded for port 0 and port 1
- RS422 interface: 1 x 5-pin M12 male connector
- Voltage supply: 24 VDC input: 1 x 5-pin M12 female connector
- Voltage supply: 24 VDC output: 1 x 5-pin M12 female connector

**Sensor connectors for analog inputs**

- 16 x 5-pin M12 female connector

### Ordering information

**EC-ARTS-3011**

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

*Preliminary product information*
EtherCAT system for length measurement, 24-bit
4 inductive transducers, LVDT, Half-Bridge, Mahr

EC-ARTS-3701-4
Simultaneous acquisition of up to 4 inductive transducers
For Half-Bridge, LVDT or Mahr transducers
24 V and RS422 trigger interface

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

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

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

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

Specifications
Inputs for inductive transducers
Channel features
- Number: 4 simultaneous
- Input type: single ended
- Coupling: DC
- Resolution: 24-bit
- Sampling frequency $f_s$: At primary frequency $f_P$ of 5 kHz
  - $f_s = f_P$ = 7.69 kHz
  - $f_s = f_P$ = 10 kHz
  - $f_s = f_P$ = 12.5 kHz
  - $f_s = f_P$ = 20 kHz

Example with TESA GT21:
- $f_s = f_P$ = 12.5 kHz

Input level
- Input impedance: 2 kΩ for HB
  - 10 kΩ for LVDT
  - 100 kΩ on request, 10 MΩ on request

Sensor supply (sine generator)
- Type: Sine differential (180° phase-shift)
- Coupling: AC
- Programmated signals:
  - Output frequency $f_P$: 2-20 kHz depending on the transducer
  - Output impedance: < 0.1 Ω typ., > 30 kΩ typ. at shutdown mode
  - Short-circuit current: 0.7 A typ. at 25 °C with thermal protection

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

Transducer precision: Measurement example
Type TESA GT21, range ± 2 mm (≤ 4 mm),
16-bit precision
4 mm
\[ \Delta 61 \text{ nm} = 0.061 \mu \text{m} \]

Current consumption at 24 V: 0.25 A
Reverse voltage protection:

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

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

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

EC-ARTS-3701-4 interface connectors
- EtherCAT: 2 x 4-pin M12 female connector, D-coded for port 0 and port 1
- Trigger interfaces:
  - 1 x 5-pin M12 male connector
  - 1 x 5-pin M12 female connector
- Voltage supply
  - 24 VDC input: 1 x 5-pin M12 male connector
  - 24 VDC output: 1 x 5-pin M12 female connector

Connectors for connecting inductive transducers
4 x 5-pin M18 female connectors

Ordering information
EC-ARTS-3701-4
EtherCAT system for length measurement, 24-bit, 4 inductive transducers, LVDT, Half-Bridge, Mahr-compatible. Incl. technical description and software drivers

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

*Preliminary product information
PAC SYSTEMS MSX-BOX

Distributed data acquisition and control in real time

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

The concept

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

PAC systems

Programmable Automation Controller

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

They execute several tasks simultaneously and in a deterministic way.

Core features of a PAC system:
- Compact and robust design
- Programmable
- Standard Ethernet (TCP/IP)
- CPU board as system controller
- Different I/O modules

Between the production and IT level

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

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

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

Field buses and signals

With the MSX-Box, you can acquire signals from different field buses: CAN, Profinet, 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 Profinet 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.

ADDI-DATA
PAC-System

Signals
- Digital I/O
- Analog I/O
- Serial interfaces
- Counter
- Motion Control
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
MSX-Box-500

PCI controller board
- RISC processor: 64-bit MIPS, no fan
- Clock: 333 MHz
- Memory: 16 MB flash, 128 MB SDRAM, Option up to 256 MB
- Installed OS: Embedded RTAI Linux
- Standard interfaces: D-sub 9-pin:
  - 1 x RS232/RS485, isolated
  - 1 x Profibus/Slave, isolated
  - 2 x Interbus/Master, isolated
  - 4 x dig. input, 24 V/10 mA, isolated
  - 3 x dig. output, 24 V/200 mA, isolated
- Optional: D-sub 25-pin:
  - 8 CAN, Masterslave, isolated
  - 1 x RS232/RS485, isolated
- Additional bracket
- Connection: 2 m power cable
- 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, 30 W (max. 6 A) (other voltage on request)
- Protection against: Short circuit, overload, overvoltage
- Connection: 2 m power cable

ATX backplane with 5 PCI slots
- PCI slots: Total amount: 5
  - 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. 6A)
- Protection against: Short circuit, overload, overvoltage
- Connection: 2 m power cable

ATX backplane with 8 PCI slots
- PCI slots: Total amount: 8
  - 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 Mbit/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:
  - MSX-Box-500: 278 x 170 x 165 mm
  - MSX-Box-800: 292 x 170 x 292 mm
- Weight:
  - MSX-Box-500: approx. 2 kg (standard MSX-Box system)
  - MSX-Box-800: approx. 3 kg (standard MSX-Box system)
- Status display: 5 LEDs, incl. 2 freely programmable

Optional accessories
- Board fixation: Board holder-strap
- Mounting possibilities:
  - DIN rail
  - Removable mounting bracket
  - Carrying handle
- Cable:
  - 2 m Ethernet patch cable, shielded, RJ45 connector (PC ↔ MSX-Box)
- Network card:
  - MSX-ComboCard
  - with additional functions:
  - 2 x PCI Firewire IEEE 1394, 1 x internal, 1 x external connection, data transfer rate up to 400 Mbps
  - 2 x PCI USB 2.0, 2, external, 1 x internal connection, 1 x RS-45 LAN, 10/100 Mbps connection
  - 1 x 5-pin female connector, 12 V
  - Network card PCI 10/100 Mbps, 10Base-T, 10Base-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

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

Versions
- MSX-Box 500: 5 PCI slots (incl. 2 slots reserved for controller and Ethernet board; 3 free PCI slots for half-size boards)
- MSX-Box 800: 8 PCI slots (incl. 2 slots reserved for controller and Ethernet board; 6 free PCI slots for half-size boards)

Options
- MSX-256MB: Memory extension up to 256 MB
- MSX-48/ MSX-232: 1-port serial interface, RS485 or RS232, optically isolated
- MSX-Base: Basic equipment for options MSX-CAN, MSX-Profibus, MSX-IBS and MSX-DIO-IO
- MSX-CAN-x: 1/2/4/8 x CAN bus, master/slave, optically isolated
- MSX-Profibus-x: 1 Profibus, slave
- MSX-DIO-IO: 9-pin D-SUB female connector for the option MSX-Box Profibus (please order separately)
- MSX-IBS-x: 1/2/4 Interbus-S, master
- MSX-DIG-IO: 4 digital inputs and 3 digital outputs, 24 V.
  - All extensions are isolated and include a ribbon cable with a 9-pin D-SUB male connector with bracket
- MSX-RTSYNC: for the synchronisation of several MSX-boxes (with time stamp)

Accessories
- MSX-CLAMP-500/800: Board holding-down clamp for board fixation
- MSX-SCREW: Wall mounting for MSX-Box-500
- MSX-SCREW-800: Wall mounting for MSX-Box-800
- MSX-RAILDIN: DIN rail mounting
- MSX-GRIP: Carrying handle
- MSX-COMBOCARD: Network card LAN / USB / Firewire connection
- MSX-COMBOGIGA: Network card Giga LAN / USB / Firewire connection
- MSX-500-PS-12V/-24V: Mains power supply unit, 12 V DC or 24 V DC
- MSX-ETH-2: Ethernet patch cable 2 m, shielded, RJ45, between PC and MSX-Box
- MSX-CBLR5232: RS232 cable, 1.5 m – 9-pin.
  - On request: Other housing colour or inscriptions on the front side

Phone: +49 7229 1847-0 info@addi-data.com
Fax: +49 7229 1847-222 www.addi-data.com
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
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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
Compact system (B x H x W) 170 x 134 x 240 mm

Industry-suitable power supply (100 – 240 V AC, 47 – 63 Hz)

Controller board 333 MHz with fan-free RISC processor

Status LEDs
9-pin D-Sub: RS232

Optional: 1 – 8 CAN, Profibus, all signals isolated (separate front panel)

Ethernet (RJ45), 10/100 MBits fast communication, network connection

3 or x free CompactPCI slots
### MSX-Box-CPCI-400

**CompactPCI controller board**

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

**Mains supply unit**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input voltage</td>
<td>100 V – 240 V, AC, 47 – 63 Hz (other voltage on request)</td>
</tr>
<tr>
<td>Output voltage</td>
<td>5 V (depending on the system)</td>
</tr>
<tr>
<td>Noise immunity</td>
<td>Short circuit, overload, overvoltage</td>
</tr>
<tr>
<td>Connection</td>
<td>Power cable, 2 m</td>
</tr>
</tbody>
</table>

**CompactPCI backplane with 4 CompactPCI slots**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>CompactPCI slots</td>
<td>Total amount: 4</td>
</tr>
<tr>
<td></td>
<td>Reserved: 1 x CompactPCI controller board</td>
</tr>
<tr>
<td></td>
<td>Free: for 3 additional CompactPCI boards</td>
</tr>
<tr>
<td>Specification</td>
<td>PCI specification PICMG rev. 2.1</td>
</tr>
<tr>
<td></td>
<td>PICMG2.0 R3.0 CPCI Core Specification</td>
</tr>
<tr>
<td></td>
<td>V I/O +5V</td>
</tr>
</tbody>
</table>

### 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**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input voltage</td>
<td>100 V – 240 V, AC, 47 – 63 Hz (other voltage on request)</td>
</tr>
<tr>
<td>Output voltage</td>
<td>5 V, 3.3 V, ±12 V (depending on the system)</td>
</tr>
<tr>
<td>Noise immunity</td>
<td>Short circuit, overload, overvoltage</td>
</tr>
<tr>
<td>Connection</td>
<td>Power cable, 2 m</td>
</tr>
</tbody>
</table>

**CompactPCI backplane with x CompactPCI slots**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of CompactPCI slots</td>
<td>According to requirements</td>
</tr>
<tr>
<td></td>
<td>Reserved: 1 x CompactPCI controller board, further slots free for CompactPCI boards</td>
</tr>
<tr>
<td>Specification</td>
<td>PCI specification PICMG rev. 2.1</td>
</tr>
<tr>
<td></td>
<td>PICMG2.0 R3.0 CPCI Core Specification</td>
</tr>
<tr>
<td></td>
<td>PICMG 2.6 Bridging Specification (according to requirements)</td>
</tr>
<tr>
<td></td>
<td>V I/O +5V</td>
</tr>
</tbody>
</table>

### For MSX-Box-CPCI-400 and -xxxx

**Extensive software support**

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

**Housing**

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

**Optional accessories**

- **Cable:** Ethernet patch cable 2 m, shielded, RJ45 connector (PC ↔ MSX-Box-CPCI)

### Ordering information

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

**Versions**

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

**Options**

- **MSX-256MB:** Memory extension up to 256 MB
- **MSX-Basis:** Basic equipment for the options MSX-CAN, MSX-Profibus, MSX RTSync
  - **MSX-CAN-x:** 1/2/4/8 x CAN bus, master/slave, optically isolated, incl. FB-CPCI-CAN
  - **MSX-Profibus:** 1 x Profibus, slave
  - **FB-Profibus:** FB-CPCI-Profi (please order separately)
  - **MSX-RTSYNC:** for the synchronisation of several MSX-Boxes (with time stamp), incl. FB-CPCI-RTSync
- **On request:** further housing dimensions
The intelligent Ethernet systems of the MSX-E series are especially suited for industrial measurement, control and regulation tasks directly at the measuring point. They are mounted in robust metal housings and comply with the degrees of protection IP67/IP 65/IP 40. Furthermore, they can be used in a temperature range from –40 °C to +85 °C as they are equipped with many protective circuits. The Ethernet systems can be freely cascaded and synchronised in the µs range. Sensors can be connected directly to the measurement systems through screw connectors.

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

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

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

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

The MSX-E systems are organised in two parts:

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

### Time stamp

Several MSX-E systems can be synchronised with one another through a synchronisation 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

<table>
<thead>
<tr>
<th>Digital I/O, 24 V</th>
<th>Multifunction counter</th>
<th>Analog I/O</th>
<th>Analog input</th>
<th>Analog output</th>
<th>Temperature measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSX-E1516</td>
<td>MSX-E1516-nPn</td>
<td>MSX-E1701</td>
<td>MSX-E1711</td>
<td>MSX-E1711</td>
<td>MSX-E1711-VPP</td>
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<td>MSX-E1721</td>
<td>MSX-E1731</td>
<td>MSX-E1741-1VPP</td>
<td>MSX-E1751</td>
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</tbody>
</table>

- **Intelligent through ARM®9 technology**: ✔
- **Ethernet**: ✔
- **Optical isolation 1000 V**: ✔
- **1 x trigger input / 1 x synchro input / time synchronisation**: ✔
- **Compare logic generates synchro trigger signal**: ✔
- **Timer function generates synchro trigger signal**: ✔
- **Cascading**: ✔
- **Degree of protection**: IP 65
- **Temperature range**: from –40 °C to +85 °C (Internal temperature of the system)
- **Dimensions (mm)**: 215 x 110 x 50
- **Digital I/O, 24 V / 5 V, status LEDs**: 16 / 5
- **Event logic**: ✔
- **Input filter configuration through software**: ✔
- **M12 female connector, 5-pin (for 2 inputs or outputs)**: 8
- **Multifunction counter**: ✔
- **Incremental counter inputs (A, B, C, D Signals), M23 female connector**: 4 x 12-pin
- **Sin/Cos counter inputs (A, B, C signals), M23 female connector**: 4 x 12-pin
- **M23 female connector, 9-pin, 11 µA**: 4 x 8-pin
- **Max. input frequency**: 5 MHz
- **Analog input (channels)**: 3 diff.
- **Resolution**: 24-bit
- **Type**: V / A
- **Connector**: 63 x M12 female 5-pin
- **Simultaneous acquisition**: up to 4 channels
- **Throughput**: up to 100 kHz
- **Input ranges**: ± 10 V, ± 1 V, ± 100 mV, ± 10 mV, ± 0 V, ± 100 mV, ± 10 mV
- **Current inputs (PC-Diff option): 0(4)-20 mA**: ✔
- **Analog output, 16-Bit**: 4
- **M12 female connector**: 2 x 4-pin
- **Output voltage**: 0-10 V, ± 10 V
- **Current outputs**: 0-20 mA
- **Length measurement**: ✔
- **Number of transducers (Half-Bridge, LVDT, Mahr)**: 8
- **5-pin M12 female connector**: ✔
- **Simultaneous acquisition**: ✔
- **Temperature input for Pt100**: ✔

---

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

- **Time Synchronization**:
  - 3333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333333
  - 1 x trigger input, 1 x synchro input

### Multifunction Counter

- **Degree of Protection**: IP 65
- **Length Measurement**:
  - 24-bit
- **Dimensions (mm)**: 215 x 110 x 50, 215 x 110 x 54, 215 x 110 x 50
- **Optical Isolation**: 1000 V

### Current Outputs:

- **Current Outputs**: 0-20 mA
- **Software**: Current driver list on the web

### Ethernet

- **Ethernet**: 2 x 4-pin female connector, D-coded M12

### Temperature Input

- **Temperature Input**: for Pt100

### Common Specifications for all MSX-E Systems

#### Voltage Supply

- **Nominal Voltage**: 24 V
- **Supply Voltage**: 18-30 V
- **Optical Isolation**: 1000 V
- **Reverse Voltage Protection**: 1 A (max., except MSX-E3711)

#### Connectors

- **24 V DC Input**: 1 x 5-pin M12 male connector (except MSX-E3700)
- **24 V DC Output**: 1 x 5-pin M12 female connector (except MSX-E3700)

#### Ethernet

- **Interface**: Ethernet acc. to IEEE802.3 specification
- **Number of Ports**: 2
- **Cable Lengths**: 100 m (max. at CAT5e UTP)
- **Bandwidth**: 10 Mbps
- **Auto-Negotiation**: 100 Mbps
- **Protocol**: 10Base-T, IEEE802.3 compliant
- **Optical Isolation**: 1000 V
- **MAC Address**: Unique for each device

#### Temperature Input

- **Temperature Input**: 0 to 30 V
- **Input Current**: 11 mA at 24 VDC, typical
- **Input Frequency**: 2 MHz

#### Connectors, Common with Syncro

- **Trigger Input**: 1 x 5-pin M12 male connector (except MSX-E3700)
- **Trigger Output**: 1 x 5-pin M12 female connector (except MSX-E3700)

#### Synchro

- **Number of Inputs**: 1
- **Max. Cable Length**: 20 m
- **Optical Isolation**: 1000 V
- **Signal Type**: RS422

#### EMC – Electromagnetic Compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm of 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 114.

---

**Common Specifications for all MSX-E Systems**

<table>
<thead>
<tr>
<th>Pressure Measurement</th>
<th>Force Distance Measurement</th>
<th>Acquisition of Dynamic Signals</th>
<th>Length Measurement</th>
<th>Protocol Interpreter</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSX-E3511</td>
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<td>MSX-E3517</td>
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<td>MSX-E3701</td>
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<td>MSX-E3700-DO</td>
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<tr>
<td>MSX-E3511</td>
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</tr>
</tbody>
</table>

**Voltage Supply**

- **Nominal Voltage**: 24 V
- **Supply Voltage**: 18-30 V
- **Optical Isolation**: 1000 V

**Connectors**

- **24 VDC Input**: 1 x 5-pin M12 male connector (except MSX-E3700)
- **24 VDC Output**: 1 x 5-pin M12 female connector (except MSX-E3700)

**Ethernet**

- **Interface**: Ethernet acc. to IEEE802.3 specification
- **Number of Ports**: 2
- **Cable Lengths**: 100 m (max. at CAT5e UTP)
- **Bandwidth**: 10 Mbps
- **Auto-Negotiation**: 100 Mbps
- **Protocol**: 10Base-T, IEEE802.3 compliant
- **Optical Isolation**: 1000 V
- **MAC Address**: Unique for each device

**Temperature Input**

- **Temperature Input**: 0 to 30 V
- **Input Current**: 11 mA at 24 VDC, typical
- **Input Frequency**: 2 MHz

**Connectors, Common with Syncro**

- **Trigger Input**: 1 x 5-pin M12 male connector (except MSX-E3700)
- **Trigger Output**: 1 x 5-pin M12 female connector (except MSX-E3700)

**Synchro**

- **Number of Inputs**: 1
- **Max. Cable Length**: 20 m
- **Optical Isolation**: 1000 V
- **Signal Type**: RS422

**EMC – Electromagnetic Compatibility**

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm of 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 114.
### Accessories for the Ethernet systems

#### Cables and connectors

<table>
<thead>
<tr>
<th>Cables: Temperature range from −25 °C to +80 °C, bent cables and special length on request</th>
</tr>
</thead>
</table>
| **Voltage supply**: Shielded cable, M12 5-pin female connector/open end, IP 65  
CMX-20 (1.5 m), CMX-21 (3 m), CMX-22 (5 m), CMX-23 (10 m), CMX-29 (length on request) |
| ✓ | ✓ | ✓ | ✓ | ✓ |
| **Voltage supply – Cascading**: Shielded cable, M12 5-pin female connector/male connector, IP 65  
CMX-39 (0.6 m), CMX-39 (1 m), CMX-39 (3 m), CMX-39 (5 m), CMX-39 (0.3 m), CMX-39 (10 m), CMX-39 (length on request) |
| ✓ | ✓ | ✓ | ✓ | ✓ |
| **Trigger/Synchro**: Shielded cable, M12 5-pin female connector/open end, IP 65  
CMX-49 (1.5 m), CMX-48 (3 m), CMX-49 (10 m), CMX-49 (length on request) |
| ✓ | ✓ | ✓ | ✓ | ✓ |
| **Trigger/Synchro – Cascading**: Shielded cable, M12 5-pin female connector/male connector, IP 65  
CMX-49 (0.6 m), CMX-49 (1 m), CMX-49 (3 m), CMX-49 (5 m), CMX-49 (10 m), CMX-49 (length on request) |
| ✓ | ✓ | ✓ | ✓ | ✓ |
| **Ethernet**: CAT5E cable, M12 D-coded male connector/RJ45 connector  
CMX-60 (2 m), CMX-61 (5 m), CMX-62 (10 m), CMX-69 (length on request) |
| ✓ | ✓ | ✓ | ✓ | ✓ |
| **Ethernet – Cascading**: CAT5E cable, 2 x M12 D-coded male connector  
CMX-79 (1 m), CMX-75 (2 m), CMX-75 (5 m), CMX-75 (10 m), CMX-75 (3 m), CMX-75 (0.3 m), CMX-75 (length on request) |
| ✓ | ✓ | ✓ | ✓ | ✓ |
| **Connecting peripheral equipment**: Shielded cable, M12 5-pin male connector/open end, IP 65  
CMX-80 (1.5 m), CMX-81 (3 m), CMX-83 (10 m), CMX-89 (length on request) |
| ✓ | ✓ | ✓ | ✓ | ✓ |
| **Connecting peripheral equipment**: Shielded cable, M12 8-pin male connector/open end, IP 65  
CMX-9x (length on request) |
| ✓ | ✓ | ✓ | ✓ | ✓ |

**Connectors**

- **SC-M12**: M12 5-pin connector for connecting open end cables  
✓ | ✓ | ✓ | ✓ | ✓ |
- **SC-M12-8**: M12 8-pin connector for connecting open end cables  
 | ✓ | ✓ | ✓ | ✓ |
- **SC-M12-8-TC**: M12 8-pin connector for connecting thermocouples with integrated cold junction compensation (CJC)  
 | ✓ | ✓ | ✓ | ✓ |
- **SC-M12-ABGW**: M12 5-pin 90° bent connector for connecting open end cables  
✓ | ✓ | ✓ | ✓ | ✓ |
- **SC-M12-BU-ABGW**: M12 5-pin 90° bent female connector for connecting open end cables  
 | ✓ | ✓ | ✓ | ✓ |
- **SC-M12-ABGW**: M12 8-pin 90° bent connector for connecting open end cables  
 | ✓ | ✓ | ✓ | ✓ |
- **SC-M12-ABGW**: M12 5-pin Y-splitter cable with M12 connector to 2 x M12 female connectors  
✓ | ✓ | ✓ | ✓ | ✓ |
- **SC-M23**: M23 12-pin connector for the direct connection of shaft encoders, gauges, and digital transducers  
 | ✓ | ✓ | ✓ | ✓ | ✓ |
### Digital I/O, 24 V

*Analog I/O*

<table>
<thead>
<tr>
<th>Analog I/O</th>
<th>Analog input</th>
<th>Analog output</th>
<th>Force distance measurement</th>
<th>Temperature measurement</th>
<th>Pressure measurement</th>
<th>Acquisition of dynamic signals</th>
<th>Length measurement</th>
<th>Protocol interpreter</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSX-E3211</td>
<td>MSX-E3211</td>
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<td>MSX-E3711</td>
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</table>

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### Analog I/O

- Analog input
- Analog output
- Force distance measurement
- Temperature measurement
- Pressure measurement
- Acquisition of dynamic signals
- Length measurement
- Protocol interpreter

---

### Digital I/O

- Protocol interpreter

---

### 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, IP 65

---

### Ethernet

- CAT5E cable, m12 D-coded male connector/rJ45 connector

---

### Ethernet – Cascading

- Shielded cable, m12 D-coded male connector, IP 65

---

### Connecting peripheral equipment

- Shielded cable, m12 5-pin male connector/open end, IP 65

---

### Connector SC-M12

- m12 5-pin connector for connecting open end cables

---

### Connector SC-M12-8

- m12 8-pin connector for connecting open end cables

---

### Connector SC-M12-8-TC

- M12 8-pin connector for connecting thermocouples with integrated cold junction compensation (CJC)

---

### Connector SC-M23

- m23 12-pin connector for the direct connection of shaft encoders, gauges, and digital transducers

---

### Not suitable for TC

- not suitable for TC

---

### Intelligent Ethernet systems
## Accessories for the Ethernet systems

### Clips and mounting components

<table>
<thead>
<tr>
<th>Accessories</th>
<th>Digital I/O, 24 V</th>
<th>Multifunction counter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screw connector binders for voltage supply: 3-pin binder, 5.08 mm grid</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>SMX-10</strong></td>
<td></td>
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<tr>
<td>1-row screw connector, included in the delivery content</td>
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<tr>
<td><strong>SMX-11</strong></td>
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<tr>
<td>2-row screw connector</td>
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<tr>
<td><strong>SMX-12</strong></td>
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<tr>
<td>2-row spring-cage connector with double link</td>
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<tr>
<td>Screw connector binders for trigger/synchro</td>
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<tr>
<td><strong>SMX-20</strong></td>
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<tr>
<td>3-pin binders, 5.08 mm grid, included in the delivery content</td>
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<tr>
<td>Options / Mounting</td>
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</tr>
<tr>
<td><strong>MX-Clip</strong></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>2 clips for DIN-rail mounting or for direct mounting on units</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td><strong>MX-Rail</strong></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Assembly equipment for DIN-rail mounting. Please specify when ordering!</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td><strong>MX-Screw</strong></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Assembly equipment for direct mounting on machines</td>
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<td>✓</td>
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<tr>
<td>Options / Protection caps</td>
<td></td>
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<tr>
<td><strong>PCMX-10</strong>: 5 x protection caps for M12 connector (4 x female, 1 x male)</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td><strong>PCMX-11</strong>: 10 x protection caps for M18 connector</td>
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<tr>
<td><strong>PCMX-12</strong>: 1 protection cap for M23 connector</td>
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<td>✓</td>
</tr>
<tr>
<td><strong>PCMX-13</strong>: 10 x protection caps for M12 connector</td>
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<td>✓</td>
</tr>
</tbody>
</table>

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

ADDI-DATA
SPIRIT OF EXCELLENCE
<table>
<thead>
<tr>
<th>Analog I/O</th>
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<td>SYX-E3911</td>
<td></td>
<td></td>
<td>SYX-E3911</td>
</tr>
</tbody>
</table>

- **Intelligent Ethernet systems**

- **New!** indicates new products.

- **SMX-10** 1-row screw connector, included in the delivery content
- **SMX-11** 2-row screw connector
- **SMX-12** 2-row spring-cage connector with double link

- **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

Phone: +49 7229 1847-0 info@addi-data.com
Fax: +49 7229 1847-222 www.addi-data.com
Ethernet digital I/O system
16 digital I/O, 24 V, with event logic

MSX-E1516 / MSX-E1516-NPN
16 digital I/O, 24 V, status LEDs
Configurable inputs and outputs
Event logic for the inputs and outputs
24 V digital trigger input
M12 connectors

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
- Overtemperature and reverse voltage protection
- Internal temperature monitoring
- Filters on all inputs (software-programmable)
- Short-circuit protection
- Overvoltage protection 30 V
- Electronic fuse

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

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

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

Synchronisation/time stamp

Time stamp
Several MSX-E systems can be synchronised with one another in the µs range through a syncro 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 (T5) allows the clear allocation of signals that were captured by several systems.

NOTE
NPN
While most sensors when activated will output a 24V signal (PNP sensors), a NPN sensor when activated switches to ground.
The switching to ground of NPN sensors can be read by the MSX-E1516-NPN system.
Acquisition modes

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

1. Asynchronous acquisition

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

2. Synchronous acquisition

With the synchronous acquisition, the inputs are first initialised and then the acquisition is parameterised. The acquisition runs automatically depending from a trigger source. Either the 24V trigger input or a synchro trigger can be used as trigger source.

Synchro latch

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

Event logic

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

This information (time stamp + event mask) is stored on the data server of the MSX-E1516 and can be read through a socket connection. The information can be read either through an application written for this purpose or by using the DatabaseConnect software. DatabaseConnect writes the information in a database and can then evaluate it.

Onboard programming / stand-alone operation

Development mode

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

Safety

Watchdog

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

* Preliminary product information
**ConfigTools**

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

**ConfigTools** is included in the delivery.

**ConfigTools functions for MSX-E1516 / MSX-E1516-NPN:**
- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration
- Save/load channel configuration

---

**Features**

- **Status LEDs**
- **DUAL LEDs for digital I/O**
- **16 digital I/O, 24 V**
- **5-pin M12 female connector**
- **MII Interface**
- **Ethernet switch**
- **Processor status LED**
- **Trigger In**
- **Trigger Out**
- **Sync In**
- **Sync Out**
- **Power Good LED**
- **Trigger Out**
- **Sync In**
- **24 V IN/OUT, optically isolated**

---

**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**

**ADDI-DATA**

**Configuration**

**ADDI-DATA**

**Hardware**

**Software**

**IPEmotion®**

**procella®**

**SIMATIC STEP 7®**

**MSR application**

**IPEmotion® 3.0 addi-data**

**SOAP**

**UDP**

**TCP/IP**

**M2**

**M12**

**PC, server, PLC, HMI...**

---

*Preliminary product information*
**Ordering information**

**MSX-E1516 / MSX-E1516-NPN**

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

**Versions**

- **MSX-E1516:** 16 digital I/O, 24 V
- **MSX-E1516-NPN:** 16 digital inputs, 24 V (NPN)

**Connection cables**

**Voltage supply**

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

**Trigger/Synchro**

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

**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**

**Specifications**

<table>
<thead>
<tr>
<th>Digital inputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of inputs: 16, 2 per M12 female connector</td>
</tr>
<tr>
<td>Overvoltage protection: 30 V</td>
</tr>
<tr>
<td>Optical isolation: 1000 V through opto-couplers</td>
</tr>
<tr>
<td>Nominal voltage: 24 VDC</td>
</tr>
<tr>
<td>Input voltage: 0 to 30 V</td>
</tr>
<tr>
<td>Input impedance: &gt; 1 MΩ</td>
</tr>
<tr>
<td>Logic input levels:</td>
</tr>
<tr>
<td>UH (max) 30 V typ.</td>
</tr>
<tr>
<td>UH (min) 18 V typ.</td>
</tr>
<tr>
<td>UL (max) 15 V typ.</td>
</tr>
<tr>
<td>UL (min) 0 V typ.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Digital outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of outputs: 16, 2 per M12 female connector</td>
</tr>
<tr>
<td>Optical isolation: 1000 V through opto-couplers</td>
</tr>
<tr>
<td>Nominal voltage: 24 V</td>
</tr>
<tr>
<td>Voltage supply: 18 V-30 V</td>
</tr>
<tr>
<td>Current (max): 1.85 A typ. for 8 channels through PTC at 20°C</td>
</tr>
<tr>
<td>Output current per channel: 50 mA max.</td>
</tr>
<tr>
<td>RDS(ON) Resistance: 280 mΩ max.</td>
</tr>
<tr>
<td>Switch-on time: 150 µs max.</td>
</tr>
<tr>
<td>Switch-off time: 150 µs max.</td>
</tr>
<tr>
<td>Temperature (shutdown): 135 °C max. (output driver)</td>
</tr>
<tr>
<td>Diagnostics: Common diagnostic bit for all 16 channels at overtemperature of one channel</td>
</tr>
</tbody>
</table>

**Voltage supply, Ethernet, Trigger, Synchro**

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

**System features**

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

*Preliminary product information*
**Ethernet multifunction counter system**

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

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

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

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

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

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

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

**Syncronisierbar**

**Temperaturbereich**

-40 °C bis 85 °C

**Schutzart IP 65**

**Cascadable, can be synchronised in the µs range**

**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.

**Drivers and samples**

Find software for the MSX-E systems at: www.addi-data.com/downloads

**System A**

**System B**

**Acquisition with synchro**

**Acquisition without synchro**

**Power Save Mode**
Reduced power consumption when no acquisition runs.
Acquisition modes

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

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

2. Synchronous acquisition
With the synchronous acquisition, the inputs are first initialised and then the acquisition is parameterised. The acquisition runs automatically depending from a trigger source. Either the 24V trigger input or a synchro trigger can be used as trigger source.

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

Compare logic
With the compare logic, a synchro-trigger signal can be generated in order to latch the counter value as soon as the counter value is equal to the compare value. With the additional „Modulo-Mode“ (Modulo Compare), a trigger can also be generated at the n value of the compare value. Thus it is possible, e.g. when using an encoder with 3,600 steps / revolution to obtain each degree of a measurement value (Modulo Compare = 10). The thus generated synchro-trigger can also be used for data acquisition on further MSX-E systems.

Onboard programming / stand-alone operation

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

Safety

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

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

**ConfigTools** is included in the delivery.

**ConfigTools functions for MSX-E1701 / MSX-E1711 / MSX-E1721:**
- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration
- Save/load channel configuration

**Features**

- **Status LEDs** for digital I/O
- **16 dig. I/O. 24 V**
- 5-pin M12 female connector
- **LEDs for counter inputs**
- **2 x Ethernet**
- **2 x Trigger/Synchro-nisation IN/OUT**
- **2 x voltage supply. 24 V IN/OUT, optically isolated**
- **4 incremental counter inputs: 12-pin M23 female connector or 4 x 2 PWM outputs**

**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**

**MSX data base**
**MSX application**
**SOFTWARE**
**UDP**
**TCP/IP**
**WebSight**
**EDP**
**scanner**
**Ethernet**
**Trigger**
**CMX-4x**
**Power**
**CMX-2x**
**CMX-8x**
**M12 male connector**
**M12 female connector**
**open cable end**
**SC-M23**
**M23 male connector**
**M23 female connector**
**open cable end**

**Contact**
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Fax: +49 7229 1847-222  www.addi-data.com
Specifications

**Incremental counter inputs (MSX-E1701)**

- **Number of inputs:** 4 x incremental counters each with A, B, C and D signals
- **5 V inputs (MSX-E1701 version)**
  - **Differential inputs:** Complies with the EIA standards RS422A
  - **Input type:** Differential or TTL (with reference voltage)
  - **Common mode range:** ±12 / ±7 V
  - **Input sensitivity:** ±200 mV
  - **Input impedance:** 10 kΩ
  - **Max. input frequency:** 5 MHz

**PWM outputs (MSX-E1701)**

- **Number of outputs:** 8
- **Differential I/O:** Complies with the EIA standards RS422A
- **Output type:** Differential
- **Common mode range:** ±12 / ±7 V
- **Input sensitivity:** ±50 mV
- **Input impedance:** 12 kΩ
- **Time base:** 250 ns, 1 µs, 1 ms, 1 s
- **Min. pulse duration:** 250 ns
- **Max. output rate:** \( n \cdot \text{time base} \)

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

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

**Digital inputs**

- **Number of inputs:** max. 16, 2 per M12 female connector, common ground
  - **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.
    - UL (max): 18 V typ.
    - UL (min): 16 V typ.
    - UL (min): 0 V typ.

**Digital outputs**

- **Number of outputs:** max. 16, 2 per M12 female connector
- **Optical isolation:** 1000 V through opto-couplers
- **Output type:** High-side, load to ground acc. to IEC 1131-2
- **Nominal voltage:** 24 V
- **Voltage supply:**
  - UL (min): 8.5 V typ.
  - UL (max): 16 V typ.
  - UL (min): 0 V typ.

**Voltage supply, Ethernet, Trigger, Synchrony**

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

**System features**

- **Interface:** Ethernet acc. to specification IEEE802.3
- **Dimensions (mm):** 215 x 110 x 54
- **Weight:** 900 g
- **Degree of protection:** IP 65
- **Current consumption:** 150 mA without load
- **Operating temperature:** 40 °C to +85 °C
- **Connectors for sensors**
  - **Digital I/O:** 8 x 5-pin M12 female connector
  - **Incremental counter inputs:** 4 x 12-pin M23 female connector
  - **Sin/cos counter input 1:** 4 x 12-pin M23 female connector
  - **Sin/cos counter input 11:** 4 x 9-pin M23 female connector

**Ordering information**

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

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

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

**Sensor inputs**
- 8-pin M12 female connectors
- 4 x EnDat counter inputs for the acquisition of EnDat encoders
- Max. clock frequency 4.5 MHz
- Voltage supply of the EnDat encoders via M12 female connectors: 5 V ±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 (T5) allows the clear allocation of signals that were captured by several systems.
EnDat

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

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

Acquisition modes

There are two different acquisition modes for EnDat sensors:

Asynchronous acquisition

With the asynchronous acquisition, the EnDat sensors can be read out after initialisation via SOAP or Modbus function. For each function call, one position value is transmitted. EnDat 2.2 also allows to read out additional sensor-specific values (e.g. temperature, ...)

Synchronous acquisition

With the synchronous acquisition, at first the sensors are initialised and then the acquisition is parameterised. The acquisition runs automatically in relation to a trigger source. Either the 24 V trigger input or a Synchro timer can be used as a trigger source.

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

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

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

Onboard programming / stand-alone operation

Development mode

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

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

ConfigTools is included in the delivery.

ConfigTools functions for MSX-E1731:
- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration
- Save/load channel configuration

Features

- 2 x Ethernet
- 2 x Trigger/Synchronization IN/OUT
- 2 x voltage supply, 24 V IN/OUT, optically isolated
- 4 EnDat 2.2 inputs: 8-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

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

**Counter inputs**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input type</td>
<td>EnDat 2.2</td>
</tr>
<tr>
<td>Differential inputs</td>
<td>Complies with the ENA standards RS422A</td>
</tr>
<tr>
<td>Input type</td>
<td>Differential</td>
</tr>
<tr>
<td>Common mode range</td>
<td>± 12 V (V)</td>
</tr>
<tr>
<td>Input sensitivity</td>
<td>± 20 mV RMV</td>
</tr>
<tr>
<td>Input hysteresis</td>
<td>± 50 mV typ.</td>
</tr>
<tr>
<td>Input impedance</td>
<td>72 kΩ typ.</td>
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<tr>
<td>Max. input frequency</td>
<td>3 MHz</td>
</tr>
<tr>
<td>ESD protection</td>
<td>Up to ±15 kV</td>
</tr>
<tr>
<td>Clock frequencies</td>
<td>4500 kHz</td>
</tr>
<tr>
<td></td>
<td>2500 kHz</td>
</tr>
<tr>
<td></td>
<td>1500 kHz</td>
</tr>
<tr>
<td></td>
<td>900 kHz</td>
</tr>
<tr>
<td></td>
<td>500 kHz</td>
</tr>
</tbody>
</table>

**Digital inputs**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of inputs</td>
<td>max. 16, 2 per M12 female connector</td>
</tr>
<tr>
<td>Overvoltage protection</td>
<td>30 V</td>
</tr>
<tr>
<td>Optical isolation</td>
<td>1000 V through opto-couplers</td>
</tr>
<tr>
<td>Nominal voltage</td>
<td>24 VDC</td>
</tr>
<tr>
<td>Input voltage</td>
<td>from 0 to 30 V</td>
</tr>
<tr>
<td>Input impedance</td>
<td>&gt; 1 MΩ</td>
</tr>
<tr>
<td>Logic input levels</td>
<td>UH (max): 20 V typ.</td>
</tr>
<tr>
<td></td>
<td>UH (min): 18 V typ.</td>
</tr>
<tr>
<td></td>
<td>UL (max): 16 V typ.</td>
</tr>
<tr>
<td></td>
<td>UL (min): 0 V typ.</td>
</tr>
</tbody>
</table>

**Digital outputs**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of outputs</td>
<td>max. 16, 2 per M12 female connector</td>
</tr>
<tr>
<td>Optical isolation</td>
<td>1000 V through opto-couplers</td>
</tr>
<tr>
<td>Nominal voltage</td>
<td>24 V</td>
</tr>
<tr>
<td>Voltage supply</td>
<td>18 V-30 V</td>
</tr>
<tr>
<td>Current max</td>
<td>1.25 A typical for 1 channel through PTC</td>
</tr>
<tr>
<td>Output current per output</td>
<td>500 mA max.</td>
</tr>
<tr>
<td>RDS ON resistance</td>
<td>280 mΩ max.</td>
</tr>
<tr>
<td>Switch-on time</td>
<td>100 μs</td>
</tr>
<tr>
<td>max RL=48 Ω from 80 % Vout</td>
<td></td>
</tr>
<tr>
<td>Switch-off time</td>
<td>150 μs</td>
</tr>
<tr>
<td>max RL=48 Ω from 10 % Vout</td>
<td></td>
</tr>
<tr>
<td>Overtemperature (shutdown)</td>
<td>135°C max. (output driven)</td>
</tr>
<tr>
<td>Temperature hysteresis</td>
<td>15°C typ. (output driven)</td>
</tr>
<tr>
<td>Diagnostics</td>
<td>Common diagnostics bits for all 16 channels at overtemperature</td>
</tr>
</tbody>
</table>

**Watchdog**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
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<tbody>
<tr>
<td>Number</td>
<td>1</td>
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<tr>
<td>Resolution</td>
<td>16-bit</td>
</tr>
<tr>
<td>Time base</td>
<td>µs, ms, s (programmable)</td>
</tr>
<tr>
<td>Time value range</td>
<td>1 to 65,535</td>
</tr>
</tbody>
</table>

**Voltage supply, Ethernet, Trigger, Synchronisation**

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

**System features**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface</td>
<td>Ethernet acc. to specification IEEE802.3</td>
</tr>
<tr>
<td>Dimensions (mm)</td>
<td>215 x 110 x 54 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>approx. 900 g</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP 65</td>
</tr>
<tr>
<td>Current consumption at 24 V</td>
<td>150 mA without load</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-40 °C to +85 °C</td>
</tr>
</tbody>
</table>

**Connectors for sensors**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital inputs</td>
<td>8 x 5-pin M12 female connector</td>
</tr>
<tr>
<td>Counter inputs</td>
<td>4 x 6-pin M12 female connector</td>
</tr>
</tbody>
</table>

**Ordering information**

**MSX-E1731**

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

**Connection cables**

**Voltage supply**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</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 IP 65</td>
</tr>
</tbody>
</table>

**Trigger/Synchronisation**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</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 IP 65</td>
</tr>
</tbody>
</table>

**Ethernet**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</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>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMX-8x</td>
<td>For the digital I/O, shielded cable, M12 5-pin male connector/open end, IP 65</td>
</tr>
</tbody>
</table>

**Options**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>S7 Modbus TCP Client Library for S7</td>
<td>Easy use of the Ethernet systems MSX-E with PLCs</td>
</tr>
<tr>
<td>MSX-E 5V-Trigger</td>
<td>Level change of the trigger inputs and outputs to 5 V MX-Clip, MX-Rail (Please specify when ordering!), MX-Screw, PCMX-1x</td>
</tr>
</tbody>
</table>
Ethernet counter system
3 sin/cos counter inputs 1 V<sub>pp</sub>, 1 analog input, 24-bit

MSX-E1741-1VPP
3 sin/cos counter inputs 1 V<sub>pp</sub>
1 analog input
24 V digital trigger input
M12 and M23 connectors

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

Safety features
- Status LEDs for fast error diagnostics
- Optical isolation 1000 V
- Input filters
- Status LED for counter inputs

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

Analog input
- 1 differential, 24-bit, 4-pin M12 female connector
- Sampling frequency 100 kHz/channel max.

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

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

Synchronisation/time stamp

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

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

Drivers and samples
Find software for the MSX-E systems at:
www.addi-data.com/downloads

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

* Preliminary product information
Acquisition modes

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

2. Synchronous acquisition
With the synchronous acquisition, the inputs are first initialised and then the acquisition is parameterised. The acquisition runs automatically depending from a trigger source. Either the 24V trigger input or a synchro trigger can be used as trigger source.

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

Compare logic
With the compare logic, a synchro-trigger signal can be generated in order to latch the counter value as soon as the counter value is equal to the compare value. With the additional „Modulo-Mode“ (Modulo Compare), a trigger can also be generated at the n value of the compare value. Thus it is possible, e. g. when using an encoder with 3,600 steps / revolution to obtain each degree of a measurement value (Modulo Compare = 10).

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

Onboard programming / stand-alone operation

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

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

**ConfigTools** is included in the delivery.

**ConfigTools functions for MSX-E1741-1VPP:**
- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration

**Features**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status LEDs</td>
<td>1 analog input, differential, 24-bit</td>
</tr>
<tr>
<td></td>
<td>4-pin M12 female connector</td>
</tr>
<tr>
<td>2 x Trigger/Synchronisation IN/OUT</td>
<td>3 sin/cos inputs: 1 Vpp</td>
</tr>
<tr>
<td></td>
<td>12-pin M23 female connector, with LEDs</td>
</tr>
<tr>
<td>2 x voltage supply, 24 V IN/OUT, optically isolated</td>
<td></td>
</tr>
</tbody>
</table>

**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
**Ordering information**

**MSX-E1741-1VPP**

Ethernet counter system, 3 sin/cos counter inputs 1 Vpp, 1 analog input, 24-bit. Incl. technical description, software drivers and ConfigTools.

### Connection cables

**Voltage supply**
- CMX-2x: Shielded cable, M12 5-pin female connector/open end, IP 65
- CMX-3x: For cascading, shielded cable, M12 5-pin female connector/male connector IP 65

**Trigger/Synchro**
- CMX-4x: Shielded cable, M12 5-pin female connector/open end, IP 65
- CMX-5x: For cascading, shielded cable, M12 5-pin female connector/male connector IP 65

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

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

**Options**
- **S7 Modbus TCP Client Library for S7:** Easy use of the Ethernet systems MSX-E with PLCs
- **MSX-E 5V-Trigger:** Level change of the trigger inputs and outputs to 5 V

---

**Specifications**

### Sin/cos counter inputs

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of inputs:</td>
<td>3 x sin/cos counter inputs, each with A, B, C signals</td>
</tr>
<tr>
<td>Resolution:</td>
<td>32-bit</td>
</tr>
<tr>
<td>Differential inputs:</td>
<td>1 Vpp</td>
</tr>
<tr>
<td>Interpolation factor:</td>
<td>up to 8192</td>
</tr>
<tr>
<td>Max. input frequency:</td>
<td>max. 250 kHz (at min. interpolation)</td>
</tr>
<tr>
<td>ESD protection:</td>
<td>2 kV</td>
</tr>
</tbody>
</table>

### Analog input

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

**Voltage supply, Ethernet, Trigger, Synchro**

The specifications for the voltage supply, Ethernet, Trigger, Synchronisation and Electromagnetic Compatibility apply to all MSX-E systems. See page 31.
Ethernet analog input system
16 analog inputs, diff., 16-bit

MSX-E3011
16 analog inputs, differential, 16-bit
Voltage or current inputs
Simultaneous acquisition of 4 channels with 100 kHz each
M12 connector
24 V trigger input

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

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

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

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

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

Synchronisation/time stamp

Time stamp
Several MSX-E systems can be synchronised with one another in the 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.

Drivers and samples
Find software for the MSX-E systems at: www.addi-data.com/downloads

More information on www.addi-data.com

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

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

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

Acquisition speed

Different wiring
for 25 kHz/channel and 100 kHz/groups

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

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

Onboard programming / stand-alone operation

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

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

ConfigTools is included in the delivery.

ConfigTools functions for MSX-E3011:
- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration
- Save/load channel configuration
- Monitor for analog inputs

Example of monitor function: Testing the analog inputs.

Features

- Status LEDs
- 16 analog inputs, differential, 16-bit
- 5-pin M12 female connector
- 2 x Ethernet
- 2 x Trigger/Synchronization IN/OUT
- 2 x voltage supply, 24 V IN/OUT, optically isolated

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
Specifications

### Analog inputs

| Number/type: | 16 differential inputs |
| Architecture: | 4 groups of 4 channels each 4-port simultaneous converter with one 4-channel multiplexer per converter |
| Resolution: | 16-bit, SAR ADC |
| Accuracy: | ± 1.221 mV typ. (± 4 LSB) ± 2.442 mV max |
| Relative Accuracy (INL): | ± 3 LSB max (ADC) |
| Optical isolation: | 1000 V |
| Input ranges: | ± 5 V, ± 10 V (16-bit), 0-5 V, 0-10 V (15-bit) software-programmable, current inputs optional |
| Sampling frequency: | ≥ 5 kHz per channel / 10 kHz max |
| Gain: | x1, x2, software-programmable |
| Common mode rejection: | 80 dB min. DC up to 60 Hz (diff. amplifier) |
| Input impedance (PGA): | 10\(^9\) Ω // 10nF against GND |
| Bandwidth (-3dB): | 160 kHz limited through LP filters 16 Hz version with differential filter |
| Offset error: | ± 1.5 LSB (± 305 µV) |
| Offset error: | ± 2.5 LSB |
| Temperature drift: | 2.3 x V\(_{IN}\) + 22.5 (µ V/°C) typ. |
| In the temperature range: | from -40°C to +85°C 4.5 ppm/°C FSR |

### Voltage supply, Ethernet, Trigger, Synchro

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

### System features

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

### Connectors for sensors

| For analog inputs | 16 x 5-pin M12 female connector |

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**MSX-E3011**

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

### Connection cables

**Voltage supply**

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

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

**Trigger/Synchro**

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

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

**Ethernet**

**CMX-6x:** CAT5E cable, M12 D-coded male connector/RI45 connector

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

### Connection to peripherals

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

**Options**

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

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

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

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

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Phone: +49 7229 1847-0
Fax: +49 7229 1847-222
info@addi-data.com
www.addi-data.com
Ethernet force-distance measurement system, 1 counter input, 4 analog inputs, 24-bit, 2 dig. I/O, 24 V

MSX-E3017
1 counter input
4 analog inputs, diff, 24-bit
2 digital I/O, 24 V
Easy configuration: Easy mode

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

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

Counter input
- 1 incremental counter input, 32-bit, (on request: Sin/Cos 1 Vpp or Sin/Cos 11 µApp)
- 12-pin M23 female connector
- Max. input frequency 5 MHz

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

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

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

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

Synchronisation/time stamp

Time stamp
Several MSX-E systems can be synchronised with one another in the 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.

Drivers and samples
Find software for the MSX-E systems at:
www.addi-data.com/downloads

* Operating temperature

New!
Acquisition modes

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

**Auto-refresh mode**

In auto-refresh mode, the measurement values are updated automatically after each acquisition. The acquisition is initialised once and the values of the channels are stored in the memory of the MSX-E Ethernet system. The client (e.g. PC, server, PLC, ...) reads the acquired values asynchronously to the acquisition through socket connection, SOAP or Modbus function. Thereby, the new value is read and the old values are overwritten.

In addition to the measurement values, the auto-refresh counter can also be read, which allows to sort the measurement values chronologically. The auto-refresh mode can be combined with a hardware or a synchro trigger and also allows the automatic averaging of values.

**Sequence mode**

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

**Acquisition triggered through trigger or synchro input**

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

**Reading data from a MSX-E system**

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

**Onboard programming**

**Development mode**

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

*Preliminary product information*
ConfigTools

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

ConfigTools is included in the delivery.

ConfigTools functions for MSX-E3017:
• Change of IP address
• Firmware update
• Save/load system configuration
• Save/load channel configuration
• Monitor for analog inputs
• Visualisation of the force-distance measurement (Easy mode)

Features

4 analog inputs, 2 x M12 Female connector, 8-pol.
1 x inkremental Counter input 12-pin M23 female connector
2 digitale Ein- and outputs, 24 V 5-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
Specifications

Incremental counter
Number of counter inputs: 1
Input type: Differential or TTL inputs
Differential inputs: Complies with the EIA standards RS422A
Common mode range: \(+12 \text{V} - 7 \text{V}\)
Input sensitivity: \(\pm 300 \text{mV}\)
Input hysteresis: \(50 \text{mV typ.}\)
Input impedance: \(12 \text{k} \Omega \text{ min.}\)
Max. input frequency: 5 MHz at nominal voltage
"Open Circuit Fail Safe Receiver Design" *1* = inputs open
ESD protection: Up to \(\pm 15 \text{kV}\)
Voltage supply
Incremental encoder: 5 V or 24 V, max. 500 mA

Analog inputs
Number/type: 4 differential inputs, 1 A/D converter per channel
Resolution: 24-bit, SAR ADC
Optical isolation: 1000 V
Input ranges: \(\pm 10 \text{V} < 3 \text{V (24-bit)}, 0 \text{V} < 5 \text{V (25-bit)}\), software-programmable, current inputs optional
Sampling frequency: 1 MHz per channel
Gain: \(+1 \times, +10 \times, +100 \times, +1000 \times\), software-programmable
Trigger: digital input, synchro, software-programmable

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

Digital outputs
Number of outputs: 2, on 1 M12 female connector
Optical isolation: 1000 V through opto-couplers
Output type: High-side, load to ground acc. to IEC 1131-2
Nominal voltage: 24 V
Voltage supply: 18 V to 30 V
Current (max.): 1.8 A typical for 2 channels through PTC
Output current / output: 500 mA max.
Short-circuit current / output: 1.7 A max.
RDS ON Resistance: 280 m\(\Omega\) max.
Switch-off time: 100 \(\mu\text{s}\)
max. R\text{Li}=48 \(\Omega\) at 80 % V\text{T}
Switch-off time: 150 \(\mu\text{s}\)
max. R\text{Li}=48 \(\Omega\) at 10 % V\text{T}
Overtemperature (shutdown): 135 °C, max. (output driver)
Temperature hysteresis: 15 °C typ. (output driver)
Diagnostics: Common diagnostic bit at overtemperature

Watchdog
Number: 1
Resolution: 16-bit
Time base: \(\mu\text{s}, \text{ms}, \text{s}\) (programmable)
Time value range: 1 to 65535

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

System features
Interface: Ethernet acc. to specification IEEE802.3
Dimensions: 220 x 140 x 50 mm
Weight: ca. 900 g
Degree of protection: IP 65
Current consumption: 150 mA without load
Operating temperature: \(-40 ^\circ \text{C} \text{ to } +85 ^\circ \text{C}\)

Connectors for sensors
For analog inputs: 4 x 4-pin M12 female connector
For digital I/O: 1 x 5-pin M12 female connector
For the counter input: 1 x 12-pin M23 female connector

Specifications*
* Preliminary product information

Ordering information

MSX-E3017
Ethernet force-distance measurement system, 1 counter input, 4 analog inputs, 2 digital I/O, 24 V.
Incl. technical description, software drivers and ConfigTools.

Connection cables
Voltage supply
CMX-2x: Shielded cable, M12 5-pin female connector/open end, IP 65
CMX-3x: For cascadng, 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 cascadng, shielded cable, M12 5-pin female connector/male connector IP 65
Ethernet
CMX-6x: CATSE cable, M12 D-coded male connector/RJ45S connector
CMX-7x: For cascadng, CATSE cable, 2 x M12 D-coded male connector

Digital 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
MX-Trigger: Level change of the trigger inputs and outputs to 5 V
MX-Clip, MX-Rail (please specify when ordering!), MX-Screw, PCMX-1x
Ethernet force-distance measurement system, 1 counter input, 4 inputs for strain gauges, 24-bit, 2 digital I/O, 24 V

New!*

MSX-E3317

1 counter input
4 inputs for strain gauges, diff, 24-bit
2 digital I/O, 24 V
Easy configuration: Easy mode

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 • Input filters

Counter input

- 1 incremental counter input, 32-bit,
  (on request: Sin/Cos 1 Vpp or Sin/Cos 11 µApp)
- 12-pin M23 female connector
- Max. input frequency 5 MHz

Inputs for strain gauges

- 4 inputs for strain gauges, 24-bit,
  M12 female connector, 8-pin
- Sampling frequency max. 798 Hz/channel
  (max. 2 channels simultaneously)

Digital I/O

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

Interfaces

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

Communication interfaces

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

Synchronisation/time stamp

Time stamp

Several MSX-E systems can be synchronised with one another in the 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.

Drivers and samples

Find software for the MSX-E systems at:
www.addi-data.com/downloads

*Preliminary

Product information

More information on www.addi-data.com

DatabaseConnect
on request, see page 114

Integrated Ethernet switch

New!

*Operating temperature

-40 °C bis 85 °C

Schutzart IP 65

on request

Edelstahl

Kaskadierbar

in µs-Bereich

in µs-Bereich

Cascadable,

can be synchronised

in the µs range

On request:

Compare logic for synchro trigger signal

# 32-bit processor

®9

on request

-40 °C

+85 °C

Operating temperature

on request

Ethernet

switch

System A

Without synchro: TSA1 = TSB1

With synchro: TSA1 = TSB1

System B

Acquisition with synch

System A

Acquisition without synch

TS1

TS2

Time

TS1

TS2

Time

TS1

TS2

Time

TS1

TS2

Time
Acquisition modes

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

Auto-refresh mode

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

Sequence mode

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

Acquisition triggered through trigger or synchro input

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

Reading data from a MSX-E system

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

Onboard programming

Development mode

With the Development mode of the MSX-E systems you can customise your measurement, control and regulation applications to fit your requirements. The programs run directly on the MSX-E systems, which has two advantages: external PCs are relieved and you can process data freely according to your requirements. This helps you to improve the efficiency of your processes and to secure your investments.
Intelligent Ethernet systems, analog – MSX-E3317

ConfigTools

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

ConfigTools is included in the delivery.

ConfigTools functions for MSX-E3317:
- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration
- Save/load channel configuration
- Monitor for inputs for strain gauges
- Visualisation of the force-distance measurement (Easy mode)

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

Features

- 4 inputs for strain gauges, 8-pin M12 female connector
- 2 inputs / connector
- 1 x incremental counter input
- 12-pin M23 female connector
- 2 digital inputs and outputs, 24 V
- 5-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
Specifications

Incremental counter

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

Inputs for strain gauges

Number of inputs: 4 differential inputs for strain gauges
Connection: 2 inputs per M12 connector
Optical isolation: 1000 V
Throughput per M12 connector: max. 788 Hz for 1 channel, max. 528 Hz for 2 channels
Voltage supply: 10 V, 50 mA
Trigger: Digital input, synchro, software-programmable

Digital inputs

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

Digital outputs

Number of outputs: 2, on 1 M12 female connector
Optical isolation: 1000 V through opto-couplers
Output type: High-side, load to ground acc. to IEC 1131-2
Nominal voltage: 24 V
Voltage supply: 18 V - 30 V
Current (max): 1.8 A typical for 2 channels through PTC
Output current / output: 500 mA max.
Short-circuit current / output: 1.7 A max.
RDS ON Resistance: 280 mΩ max.
Switch-on time: 100 µs
Switch-off time: 150 µs
Max. RLI=48 Ω at 80 % V
Overtemperature (shutdown): 135 °C max. (output driver)
Temperature hysteresis: 15 °C typ. (output driver)
Diagnostics: Common diagnostic bit at overtemperature

Voltage supply, Ethernet, Trigger, Synchro

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

System features

Interface: Ethernet acc. to specification IEEE802.3
 Dimensions: 220 x 140 x 50 mm
Weight: ca. 900 g
Degree of protection: IP 65
Degree of protection:
Operating Temperature:
Connectors for sensors:
For digital inputs: 1 x 5-pin M12 female connector
For the counter input: 1 x 12-pin M23 female connector

MSX-E3317

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

Connection cables

Voltage supply
CMX-2x: Shielded cable, M12 5-pin female connector/open end, IP 65
CMX-3x: For cascadings, 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 cascadings, 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 cascadings, CAT5E cable, 2 x M12 D-coded male connector

Connection to peripherals
CMX-8x: Shielded cable, M12 5-pin male connector/open end, IP 65
CMX-9x: Shielded cable, M12 8-pin male connector/open end, IP 65

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

Ordering information

* Preliminary product information
**Ethernet analog input system**  
**16 analog inputs, diff., 16-bit**

**MSX-E3021**  
16 analog inputs, differential, 16-bit  
Voltage or current inputs  
Simultaneous acquisition of 4 channels with 100 kHz per channel  
4 GB extended memory  
Buffered real-time clock  
24 V digital trigger input

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

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

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

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

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

### Synchronisation/time stamp

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

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

---

*Preliminary  
Product information*
Acquisition modes

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

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

Acquisition speed
Different wiring for 25 kHz/channel and 100 kHz/groups

<table>
<thead>
<tr>
<th></th>
<th>Group I</th>
<th>Group II</th>
<th>Group III</th>
<th>Group IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>25 kths</td>
<td>25 kths</td>
<td>25 kths</td>
<td>25 kths</td>
</tr>
<tr>
<td>Vertical</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

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

Onboard programming / stand-alone operation

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

* Preliminary product information
### ConfigTools

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

**ConfigTools** is included in the delivery.

**ConfigTools functions for MSX-E3021:**

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

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

### Features

- **Status LEDs**
- 16 analog inputs, differential, 16-bit
- 5-pin M12 female connector
- 2 x Ethernet
- 2 x Trigger/Synchronisation IN/OUT
- 2 x voltage supply, 24 V IN/OUT, optically isolated

### 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*
### 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/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: 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**

---

#### Specifications

**Analog inputs**

<table>
<thead>
<tr>
<th>Number/Type</th>
<th>16 differential inputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architecture</td>
<td>4 groups of 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 Accuracy (INL)</td>
<td>± 3 LSB max (ADC)</td>
</tr>
<tr>
<td>Optical isolation</td>
<td>1000 V</td>
</tr>
<tr>
<td>Input ranges</td>
<td>± 5 V, ± 10 V (16-bit), 0-5 V, 0-10 V (15-bit) current inputs optional</td>
</tr>
<tr>
<td>Sampling frequency</td>
<td>25 kHz per channel / 100 kHz max.</td>
</tr>
<tr>
<td>Gain</td>
<td>x1, x2, x10, x20, x100, x200, x1000, x2000 software-programmable</td>
</tr>
<tr>
<td>Common mode rejection</td>
<td>80 dB min. DC up to 60 Hz (diff. amplifier)</td>
</tr>
<tr>
<td>Input impedance (PGA)</td>
<td>10^12 Ω against GND</td>
</tr>
<tr>
<td>Bandwidth (-3dB):</td>
<td>160 kHz limited through 1P filters 16 Hz version with differential filter</td>
</tr>
<tr>
<td>Trigger</td>
<td>digital input, synchro, software-programmable</td>
</tr>
<tr>
<td>Offset error</td>
<td>± 1 LSB (± 305 µV)</td>
</tr>
<tr>
<td>Gain error</td>
<td>± 5 LSB</td>
</tr>
<tr>
<td>Temperature drift:</td>
<td>2.5 V/V°C ± 1.5 V/V°C typ.</td>
</tr>
</tbody>
</table>

\[ V_{OC} \text{ input voltage in Volts (} -10 \text{ V} \leq V_{OC} \leq +10 \text{ V) in the temperature range from -40°C to +85°C: } 4.5 \text{ ppm/°C FSR} \]

**Data storage**

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

**Voltage supply, Ethernet, Trigger, Syncro**

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

**System features**

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

**Connectors for sensors**

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

---

* Preliminary product information

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

MSX-E3027
16 analog inputs, differential, 16-bit
Voltage or current inputs
4 GB extended memory
Buffered real-time clock
Stainless steel housing – IP 67
Fast distributed data acquisition

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

Analog inputs
- 16 diff. inputs, 16-bit, 5-pin M12 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)
- Gain PGA x1, x2, x10, x20, x100, x200, x1000, x2000 software-programmable, signals up to +/-5mV (16-bit) are possible
- Current inputs 0(4) to 20 mA optional

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

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

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

Synchronisation/time stamp

Time stamp
Several MSX-E systems can be synchronised with one another in the 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.
Acquisition modes

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

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

**Application**
reads all values when needed

**Storage location**
Values of channel 0 to n = auto refresh counter

**MSX-E System**
Automatic A/D conversion of the acquired values

**Example:** 8 channels, each with 10 µs

<table>
<thead>
<tr>
<th>Group IV</th>
<th>Group III</th>
<th>Group II</th>
<th>Group I</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Acquisition speed

**Different wiring**
for 25 kHz/channel and 100 kHz/groups

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

<table>
<thead>
<tr>
<th>Group I</th>
<th>Group II</th>
<th>Group III</th>
<th>Group IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
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<td>2</td>
<td>3</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Group I</th>
<th>Group II</th>
<th>Group III</th>
<th>Group IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

**Onboard programming / stand-alone operation**

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

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

* Preliminary product information
ConfigTools

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

ConfigTools is included in the delivery.

ConfigTools functions for MSX-E3027:
- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration
- Save/load channel configuration
- Monitor for analog inputs

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

Example of monitor function: Testing the analog inputs.

Features

16 analog inputs, differential, 16-bit
2 x Ethernet
2 x Trigger/Synchronization IN/OUT
2 x voltage supply, 24 V IN/OUT, optically isolated

Simplified block diagram

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

ADDI-DATA connection technology

* Preliminary product information
Specifications

### Analog inputs

<table>
<thead>
<tr>
<th>Number/type</th>
<th>16 differential inputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architecture</td>
<td>4 groups of 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>± 2.442 mV max</td>
<td></td>
</tr>
<tr>
<td>Relative Accuracy (INL)</td>
<td>± 3 LSB max (ADC)</td>
</tr>
<tr>
<td>Optical isolation</td>
<td>1000 V</td>
</tr>
<tr>
<td>Input ranges</td>
<td>± 5 V, ± 10 V (16-bit), 0-5 V, 0-10 V (15-bit)</td>
</tr>
<tr>
<td>Current inputs optional</td>
<td></td>
</tr>
<tr>
<td>Sampling frequency</td>
<td>25 kHz per channel / 100 kHz max</td>
</tr>
<tr>
<td>Gain</td>
<td>x1, x2, x10, x20, x100, x200, x1000, x2000</td>
</tr>
<tr>
<td>Software-programmable</td>
<td></td>
</tr>
<tr>
<td>Common mode rejection</td>
<td>80 dB min, 60 dB up to 60 Hz (diff. amplifier)</td>
</tr>
<tr>
<td>Common mode rejection (CMR)</td>
<td>100 kΩ ± 1% against GND</td>
</tr>
<tr>
<td>Bandwidth (3dB)</td>
<td>160 kHz limited through 16 filters with differential filter</td>
</tr>
<tr>
<td>Trigger</td>
<td>digital input, trigger, 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>2.5 x Vref + 22.5 (pW/°C typ)</td>
</tr>
<tr>
<td>In the temperature range from -40°C to +85°C:</td>
<td>4.5 ppm/°C FSR</td>
</tr>
</tbody>
</table>

### Data storage

| RAM | 64 MB |
| FLASh | 4 MB for system data |
| Extended Flash memory | 4 GB (3.7 GB for measured data) |
| Buffered Real-Time Clock | approx. 4 weeks at 20°C |

### Voltage supply, Ethernet, Trigger, Synchro

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

### System features

| Interface | Ethernet acc. to specification IEEE802.3 |
| Degree of protection | IP 67 |
| Current consumption at 24 V | 160 mA |
| Operating temperature | -25 °C to +85 °C |
| -40 °C to +85 °C on request |

### Connectors for sensors

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

### Ordering information

MSX-E3027

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

#### Connection cables

**Voltage supply**
- CMX-2x: Shielded cable, M12 5-pin female connector/open end, IP 67
- CMX-3x: For cascading, shielded cable, M12 5-pin female connector/male connector IP 67

**Trigger/Synchro**
- CMX-4x: Shielded cable, M12 5-pin female connector/open end, IP 67
- CMX-5x: For cascading, shielded cable, M12 5-pin female connector/male connector IP 67

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

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

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* Preliminary product information
Ethernet multifunction system
6 diff./SE inputs, 4 analog outputs, 32 digital I/O

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

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

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 (T3) allows the clear allocation of signals that were captured by several systems.
## Acquisition modes

### Auto-refresh mode

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

### Sequence mode

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

**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.

### 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.
**ConfigTools**

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

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

**ConfigTools** is included in the delivery.

**ConfigTools functions for MSX-E3121:**
- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration
- Save/load channel configuration
- Monitoring the analog inputs/outputs

**Very easy use through the „ConfigTools“ program;**

The MSX-E system is automatically detected in the network.

![ConfigTools screenshot](image)

**Features**

- **Status LEDs**
- 2 x Ethernet
- 2 x Trigger/Synchronisation IN/OUT
- 2 x Voltage supply
- 24 V IN/OUT, optical isolated

**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

Phone: +49 7229 1847-0  info@addi-data.com
Fax: +49 7229 1847-222  www.addi-data.com
### 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, 0-1 V, 0-100 mV, 0-10 mV (23-bit), software-programmable, current input optional |
| Input frequency | 100 kHz per channel |
| Gain | 1 x, 10 x, 100 x, software-programmable |
| Trigger | digital input, synchro, software-programmable |

#### Analog outputs

| Number of outputs | 4 |
| Resolution | 16-bit (differential) / 15-bit (unipolar) |
| Optical isolation | 1000 V |
| Output range | Voltage output: 0-10 V (±10 V) |
| 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 |
| Logic input levels | UH (max) 30 V typ. |
| Logic input levels | UL (max) 14 V typ. |

#### Digital outputs

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

### 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-E3121-6-4x | 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
- **Triggers/Synchro**: CMX-4x: Shielded cable, M12 5-pin female connector/open end, IP 65
- **Ethernet**: CMX-5x: For cascading, shielded cable, M12 5-pin female connector/male connector IP 65
- **Trigger/Synchro**: CMX-6x: CATSE cable, M12 D-coded male connector/RJ45 connector
- **Ethernet**: CMX-7x: CATSE cable, 2 x M12 D-coded male connector

### Ordering information

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
- **MSX-E 5V-Trigger**: Level change of the trigger inputs and outputs to 5 V
- **MX-Clip, MX-Rail, MX-Screw, PCMX-1x**: (Please specify when ordering!)
**Ethernet multifunction system**
6 diff./SE inputs, 4 analog outputs, 64 dig. I/O

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

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

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

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

**Digital I/O**
- 32 optically isolated digital inputs, 24 V
- 32 optically isolated digital outputs, 24 V

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

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

**Synchronisation/time stamp**
**Time stamp**
Several MSX-E systems can be synchronised with one another in the 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.

---

**MSX-E3122**
6 analog inputs, differential/Single-Ended, 24-bit

**Voltage or current inputs**
4 analog outputs, 16-bit, voltage outputs, current outputs

64 digital I/O, 24 V

24 V digital trigger input
Acquisition modes

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

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

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

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

**Onboard programming / stand-alone operation**

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

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

*Preliminary product information*
ConfigTools

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

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

ConfigTools is included in the delivery.

ConfigTools functions for MSX-E3122:

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

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

Example of monitor function: Testing the analog outputs — Value output without programming.

Features

- Status LEDs
- 2 x Ethernet
- 2 x Trigger/Synchronisation IN/OUT
- 2 x voltage supply, 24 V IN/OUT, optically isolated
- 32 digital inputs and 32 digital outputs, 24 V, 37-pin D-Sub male connector
- 4 analog outputs, 16-bit
- 5-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

Intelligent Ethernet systems, analog – MSX-E3122
### Specifications

#### Analog inputs
- Number/type: 6 differential/Single-Ended inputs (software-configurable), 1 A/D converter per channel
- Resolution: 24-bit
- Optical isolation: 1000 V
- Input ranges: ±10 V, ±1 V, ±100 mV, ±10 mV (24-bit), ±5 V, ±100 mV, ±10 mV (23-bit), software-programmable.
- Current inputs (0-4) – 20 mA optional
- Sampling Frequency: 100 kHz per channel
- Gain: x1, x10, x100, software-programmable

#### 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)
- Output value after reset: 0 V voltage output, not calibrated

#### Digital inputs
- Number of inputs: 32, common ground acc. to IEC 1131-2
- Optical isolation: 1000 V through opto-couplers
- Nominal voltage: ±24 V
- Input voltage: 0 – 30 V
- Logic input levels: UH (max) 30 V t yp, UH (min) 19 V t yp, UL (max) 14 V t yp, UL (min) 0 V t yp.

#### Digital outputs
- Number of outputs: 32
- Optical isolation: 1000 V through opto-couplers
- Output type: High-side, load to ground acc. to IEC 1131-2
- Nominal voltage: ±24 V
- Voltage supply: 11 – 30 V
- Output current per channel: 500 mA max.
- Max. total current of 16 outputs: 2 A
- Diagnostics: Common diagnostics bit for all 16 channels at Overtemperature of one channel

### Ordering information

**MSX-E3122**

Ethernet multifunction system, 6 diff./SE inputs, 4 analog outputs, 64 digital I/O. Incl. technical description, software drivers and ConfigTools.

#### Versions
- **MSX-E3122:** 4 voltage outputs
- **MSX-E3122-C:** 2 voltage outputs, 2 current outputs

#### Connection cables
- **Voltage supply:** CMX-2x: Shielded cable, M12 5-pin female connector/open end, IP 65
- **CMX-3x:** For cascading, shielded cable, M12 5-pin female connector/male connector IP 65
- **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
- **Trigger/Synchro**
- **CMX-6x:** CAT5E cable, M12 D-coded male connector/RJ45 connector
- **CMX-7x:** For cascading, CAT5E cable, 2 x M12 D-coded male connector

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

#### System features
- **Interface:** Ethernet acc. to specification IEEE802.3
- **Dimensions:** 380 x 130 x 50 mm
- **Weight:** in preparation
- **Degree of protection:** IP 65
- **Current consumption at 24 V:** 350 mA typ., ± 10 %
- **Operating temperature:** -40 °C to +85 °C

#### Connectors for sensors
- For analog inputs: 6 x 4-pin M12 female connector
- For analog outputs: 2 x 5-pin M12 female connector
- For digital I/O: 2 x 9-pin D-Sub male connector

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

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* Preliminary product information

Phone: +49 7229 1847-0  info@addi-data.com
Fax: +49 7229 1847-222  www.addi-data.com
Ethernet analog output system
8 analog outputs (voltage and/or current), 16-bit

MSX-E3511 / MSX-E3511-C
8 analog outputs, 16-bit
Function generator for the output of any signal type, e.g. sine curves, sawtooth curves etc. – can be configured separately for each channel
M12 connector
24 V trigger input

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
- Diagnostics in case of short-circuits (voltage mode) or line break (current mode)
- Internal temperature monitoring

Analog outputs
- 8 analog outputs, 16-bit: MSX-E3511: voltage outputs 0-10 V, ± 10 V
  MSX-E3511-C: each output can be configured as voltage or current output 0-20 mA
- Output voltage after reset: 0 V
- 5-pin M12 female connector
- Output mode/operation mode: Data output per software function, trigger input or synchro output

Function generator
- Output of any signal type, e.g. sine curves, sawtooth curves etc.
- Maximal 8 channels (each channel independently)
- Can be used without programming skills, e.g. via .csv-file or mathematic functions such as \( f(x) = \sin(x) \)

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

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

Synchronisation/time stamp

Time stamp
Several MSX-E systems can be synchronised with one another in the 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.
Output modes

Output modes – Analog output values can be generated either via direct access or through function generator:

1. Direct access
In direct access, the values of the outputs are transmitted via SOAP or Modbus function.
For each function call, 1 value (for one or several outputs) is sent.
The value output is triggered per software, 24V hardware or synchro trigger.

2. Function generator
The MSX-E3511 system features a function generator for each analog output. The values are sent either automatically at a defined rate or using a trigger. The 24V trigger input or the synchro trigger can be used, included those issued by another MSX-E system.

Generator with CSV File
The value are transmitted to the function generator via a CSV file which contains both the values and the number of cycles for each value.

Generator with mathematical formula
The values are generated through a formula, e.g. \( f(x) = \sin(x) \).

„Single Mode“ Generator
In „Single Mode“, an array with values is sent to the respective generator via SOAP function. After all values have been transmitted, the generator stops automatically (outputs = 0V).

„Continuous Mode“ Generator
In „Continuous Mode“, an array with values is sent to the respective generator via SOAP function. After all values have been transmitted, the generator automatically starts again at the first value.

Onboard programming / stand-alone operation

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

Safety

Watchdog
The MSX-E3511 Ethernet system has a 16-bit watchdog which can be programmed in 3 time units (µs, ms, s). The watchdog is used for automatically resetting the digital outputs to 0 V after a defined time in order e. g. to switch off actuators if an error has occurred.

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

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

**ConfigTools** is included in the delivery.

**ConfigTools functions for MSX-E3511 / MSX-E3511-C:**
- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration

---

**Features**

- **Status LEDs**
- 8 analog outputs, 16-bit

**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

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**Simplified block diagram**

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**Cascading**

---

**ADDI-DATA connection technology**
**Ordering information**

**MSX-E3511 / MSX-E3511-C**

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

**Versions**

- **MSX-E3511-C**: Ethernet analog output system, 8 analog outputs (voltage and/or current), 16-bit.
- **MSX-E3511**: Ethernet analog output system, 8 analog outputs, only voltage for fast signal output, 16-bit

**Connection cables**

- **Voltage supply**
  - CMX-2x: Shielded cable, M12 5-pin female connector/open end, IP 65
  - CMX-3x: For cascading, shielded cable, M12 5-pin female connector/male connector IP 65
- **Trigger/Synchro**
  - CMX-4x: Shielded cable, M12 5-pin female connector/open end, IP 65
  - CMX-5x: For cascading, shielded cable, M12 5-pin female connector/male connector IP 65

**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

**Specifications**

### Analog outputs

<table>
<thead>
<tr>
<th>Number of outputs:</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution:</td>
<td>16-bit (bipolar)</td>
</tr>
<tr>
<td></td>
<td>15-bit (unipolar)</td>
</tr>
<tr>
<td>Optical isolation</td>
<td>1000 V</td>
</tr>
<tr>
<td>Output range:</td>
<td>Voltage output: 0-10 V (±10 V)</td>
</tr>
<tr>
<td></td>
<td>Current output: 0-20 mA</td>
</tr>
<tr>
<td>Output velocity:</td>
<td>Voltage version: max. 40 kHz</td>
</tr>
<tr>
<td></td>
<td>Current version: depending on load</td>
</tr>
<tr>
<td>Overvoltage protection:</td>
<td>±14 V</td>
</tr>
<tr>
<td>Output current/last:</td>
<td>Voltage output: 15 mA, min. 480 Ω</td>
</tr>
<tr>
<td></td>
<td>Current output: 20 mA, max. 550 Ω</td>
</tr>
<tr>
<td>Short-circuit current:</td>
<td>Voltage output: ± 20 mA</td>
</tr>
<tr>
<td></td>
<td>Current output: ± 32 mA</td>
</tr>
<tr>
<td>Output value after reset:</td>
<td>0 V voltage output, not calibrated</td>
</tr>
<tr>
<td>I Watchdog (programmable):</td>
<td>16-bit, 1 μs to 65535 s</td>
</tr>
</tbody>
</table>

**Voltage supply, Ethernet, Trigger, Synchro**

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

**System features**

<table>
<thead>
<tr>
<th>Interface:</th>
<th>Ethernet acc. to specification IEEE802.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions:</td>
<td>154 mm x 110 mm x 50 mm</td>
</tr>
<tr>
<td>Weight:</td>
<td>620 g</td>
</tr>
<tr>
<td>Degree of protection:</td>
<td>IP 65</td>
</tr>
<tr>
<td>Current consumption at 24 V:</td>
<td>750 mA without load</td>
</tr>
<tr>
<td></td>
<td>310 mA current outputs switched on</td>
</tr>
<tr>
<td></td>
<td>410 mA voltage outputs switched on</td>
</tr>
<tr>
<td>Operating temperature:</td>
<td>-40°C to + 85°C</td>
</tr>
</tbody>
</table>

**Connectors for sensors**

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

---

Phone: +49 7229 1847-0
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info@addi-data.com
www.addi-data.com
MSX-E3211
16/8/4 differential inputs, 24-bit
For thermocouples or RTD (Pt100, Pt1000)
Simultaneous data acquisition up to 8 channels
24 V digital trigger input

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

Safety features
- Status LEDs for fast error diagnostics
- Optical isolation
- Input filters

Temperature inputs
- 16/8/4 differential inputs for thermocouples or RTD, 24-bit
- Sampling frequency max. 788 Hz/channel (max. 8/4/2 channels simultaneously)
- Auto gain: Optimal adjustment of the gain to the measuring range
- Integrated cold junction compensation (CJC) for thermocouples
- NTC sensors optional

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

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

Synchronisation/time stamp
Time stamp
Several MSX-E systems can be synchronised with one another in the 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.
Acquisition modes

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

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

Acquisition triggered through trigger or synchro input

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

Reading data from a MSX-E system
MSX-E systems are multi-client capable, this means several clients (e.g. PC, server, PLC, …) can read the measurement values of one MSX-E system at the same time. For this, each client establishes a socket connection to the data server of the MSX-E system (port 8889). As soon as the measurement values are available on the data server, the MSX-E system transfers them to the clients.

Onboard programming / stand-alone operation

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

NOTE
With thermocouples, it is only possible to capture the relative temperature between the terminal to which the thermocouple is connected and the welding spot. For this reason, in order to calculate the actual temperature at the measuring point, it is necessary to capture an absolute temperature on a second sensor (PTC). This is called cold junction compensation (CJC) and is included on the MSX-E3211-TC system.
**ConfigTools**

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

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

**ConfigTools** is included in the delivery.

**ConfigTools functions for MSX-E3211:**
- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration
- Save/load channel configuration
- Monitoring the temperature inputs

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

**Features**

- 16/8/4 differential inputs for temperature measurement, 8-pin M12 female connector, 2 inputs / connector
- 2 x Voltage supply, 24 V IN/OUT, optical isolated
- 2 x Trigger/Synchronisation IN/OUT
- 2 x Ethernet
- 2 x Voltage supply, 24 V IN/OUT, optical isolated

**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**

- Ethernet (CMX-7x)
- Trigger/Synchro (CMX-5x)
- Power (CMX-3x)
## Specifications

### Analog inputs

<table>
<thead>
<tr>
<th>Number of inputs</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>16, 8 or 4 differential inputs</td>
<td>for thermocouples or RTD</td>
</tr>
<tr>
<td>2 outputs for each M12 connector</td>
<td></td>
</tr>
</tbody>
</table>

| Resolution | 24 bit |
| Optical isolation | 1000 V |
| Throughput | max. 788 Hz for 1 channel, max. 528 Hz for 2 channels |

### Voltage supply, Ethernet, Trigger, Synchronisation

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

### System features

| Interface | Ethernet acc. to specification IEEE802.3 |
| Dimensions (mm) | 220 x 140 x 50 |
| Weight | 620 g |
| Degree of protection | IP 65 |
| Current consumption | 150 mA ± 10 % typ. in idle/power save |
| Operating temperature | -40 °C to +85 °C |

### Connectors for sensors

| Analog inputs | 8, 4 or 2 x 8-pin M12 female connector |

---

### MSX-E3211

Ethernet system for temperature measurement, 16/8/4 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-TC-16 | for 4 thermocouples |
| MSX-E3211-RTD-16 | for 16 RTD |
| MSX-E3211-RTD-8 | for 8 RTD |
| MSX-E3211-RTD-4 | for 4 RTD |

#### Connection cables

| Voltage supply | CMX-2x: Shielded cable, M12 S-pin female connector/open end, IP 65 |
| CMX-3x: For cascading, shielded cable, M12 S-pin female connector/male connector IP 65 |
| Trigger/Synchronisation | CMX-4x: Shielded cable, M12 S-pin female connector/open end, IP 65 |
| CMX-5x: For cascading, shielded cable, M12 S-pin female connector/male connector IP 65 |

#### Ethernet

| 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 |

#### Cold junction compensation

| Cold junction compensation | SC-M12-B-TC: M12 B-pin connector for connecting thermocouples with integrated CJC. (Included in delivery!) |

#### Options

| 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 |
| MSX-E-Filter-20Hz: 20 Hz input filter |
| MSX-E-NTC-100µA: for NTC sensors with 0-20 kΩ |
| MSX-E-NTC-50µA: for NTC sensors with 0-40 kΩ |
| MX-Rail (Please specify when ordering!), MX-Screw, PCMX-1x |

---

### Ordering information

**Phone:** +49 7229 1847-0  
**Fax:** +49 7229 1847-222  
**info@addi-data.com**  
**www.addi-data.com**
Ethernet system for pressure/force measurement
16/8 channels for strain gauges, 24-bit

MSX-E3311
16/8 differential inputs, 24-bit
For strain gauges
Simultaneous acquisition of up to 8 channels
24 V digital trigger input

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
- Input filters

Inputs for strain gauges
- 16/8 differential inputs for strain gauges, 24-bit
- Sampling frequency max. 788 Hz/channel (max. 8/4 channels simultaneously)
- Autogain: Optimal adjustment of the gain to the measuring range
- Integrated sensor supply: 10 V, 50 mA (5 V optional)

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

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

Synchronisation/time stamp

Time stamp
Several MSX-E systems can be synchronised with one another in the 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 (T5) allows the clear allocation of signals that were captured by several systems.
**Acquisition modes**

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

<table>
<thead>
<tr>
<th>Application</th>
<th>reads all values when needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage location</td>
<td>Values of channel 0 to n + auto refresh counter</td>
</tr>
<tr>
<td>MSX-E System</td>
<td>Automatic A/D conversion of the acquired values</td>
</tr>
</tbody>
</table>

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

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

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

**Onboard programming / stand-alone operation**

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

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

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

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

**ConfigTools** is included in the delivery.

**ConfigTools functions for MSX-E3311:**

- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration
- Save/load channel configuration
- Monitor for Inputs for strain gauges

### Features

- **Status LEDs**
  - 16/8 differential inputs for pressure/force measurement,
  - 8-pin M12 female connector, 2 inputs / connector
  - 2 x Trigger/Synchronization IN/OUT
  - 2 x voltage supply, 24 V IN/OUT, optically isolated

### Simplified block diagram

**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

**ADDI-DATA** connection technology

---

Phone: +49 7229 1847-0  
Fax: +49 7229 1847-222  
info@addi-data.com  
www.addi-data.com
Intelligent Ethernet systems, analog – MSX-E3311

Ordering information

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

Versions
- MSX-E3311-16: for 16 strain gauges
- MSX-E3311-8: for 8 strain gauges
- Opt.MSX-E-5Vss: Bridge supply voltage adjustment to 5 V (optional)

Connection cables
- Voltage supply
  - CMX-2x: Shielded cable, M12 5-pin female connector/open end, IP 65
  - CMX-3x: For cascading, shielded cable, M12 5-pin female connector/ male connector IP 65

- Trigger/Synchro
  - CMX-4x: Shielded cable, M12 5-pin female connector/open end, IP 65
  - CMX-5x: For cascading, shielded cable, M12 5-pin female connector/male connector IP 65

- Ethernet
  - CMX-6x: CATSE cable, M12 D-coded male connector/RJ45 connector
  - CMX-7x: For cascading, CATSE 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-Trig: Level change of the trigger inputs and outputs to 5 V
  - MX-Rail (please specify when ordering!), MX-Screw, PCMX-1x

Specifications

<table>
<thead>
<tr>
<th>Inputs for strain gauges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of inputs:</td>
</tr>
<tr>
<td>16 or 8 differential inputs for strain gauges</td>
</tr>
<tr>
<td>2 inputs per M12 connector</td>
</tr>
<tr>
<td>Resolution:</td>
</tr>
<tr>
<td>24 bit</td>
</tr>
<tr>
<td>Optical isolation:</td>
</tr>
<tr>
<td>1000 V</td>
</tr>
<tr>
<td>Throughput per M12 connector: max. 788 Hz for 1 channel, max. 528 Hz for 2 channels</td>
</tr>
<tr>
<td>Voltage supply for the sensors:</td>
</tr>
<tr>
<td>10 V, 50 mA</td>
</tr>
<tr>
<td>Voltage supply:</td>
</tr>
<tr>
<td>–10 V / optional 5 V (onboard calibration) 100 mA max.</td>
</tr>
<tr>
<td>Real Sampling frequency:</td>
</tr>
<tr>
<td>on 1 channel          on 2 channels (software-configurable)</td>
</tr>
<tr>
<td>2.37 Hz                1.585 Hz                  5 Hz</td>
</tr>
<tr>
<td>4.73 Hz                3.154 Hz                  10 Hz</td>
</tr>
<tr>
<td>9.37 Hz                6.243 Hz                  20 Hz</td>
</tr>
<tr>
<td>18.9 Hz                12.6 Hz                   40 Hz</td>
</tr>
<tr>
<td>37.35 Hz               24.89 Hz                  80 Hz</td>
</tr>
<tr>
<td>73 Hz                  48.65 Hz                  160 Hz</td>
</tr>
<tr>
<td>145 Hz                 96.8 Hz                   320 Hz</td>
</tr>
<tr>
<td>276.4 Hz               184.26 Hz                 640 Hz</td>
</tr>
<tr>
<td>407.83 Hz              271.96 Hz                 1 kHz</td>
</tr>
<tr>
<td>788 Hz                 525.48 Hz                 2 kHz</td>
</tr>
</tbody>
</table>

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

System features

- Interface: Ethernet acc. to specification IEEE802.3
- Dimensions: 220 mm x 140 mm x 50 mm
- Weight: 620 g
- Degree of protection: IP 65
- Current consumption: 150 mA ± 10 % typ. in idle/powerv save mode
- Operating temperature: -40 °C to +70 °C

Connectors for sensors
- Analog inputs: 8 or 4 x 8-pin female connector, M12

Phone: +49 7229 1847-0  info@addi-data.com
Fax: +49 7229 1847-222  www.addi-data.com
Ethernet system for the acquisition of dynamic signals
8 or 2 SE/diff. inputs, 24-bit, simultaneous acquisition

MSX-E3601 / MSX-E3601-2
8 or 2 SE/diff. inputs, 24-bit
Simultaneous acquisition
8 or 2 current sources for ICP® or IEPE sensors
Onboard calibration
24 V digital trigger input

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

Analog inputs
- 8 or 2 SE or diff. inputs, 24-bit, AC/DC coupling
- One A/D converter per channel: simultaneous acquisition on all analog inputs
- Sampling rate up to 128 kHz
- Anti-aliasing filter
- BNC female connector:
  - inner conductor for positive input
  - outer conductor for negative input (diff) or GND (SE)
- Gain x1, x10, x100

Current sources
- 8 or 2 current sources for the direct connection of ICP® sensors (integrated circuit piezoelectric) or IEPE sensors (integrated electronics piezoelectric)
- 4 mA typ., 24 V max.

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

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

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

Synchronisation/time stamp
Time stamp
Several MSX-E systems can be synchronised with one another in the 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.
Acquisition modes

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

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

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

Onboard programming / stand-alone operation

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

Anti-aliasing filter
Low-pass filters are used before or during digitising in order to remove all frequency components which are higher than the Nyquist frequency. This is to make sure that the digitised value or result does not contain any unwanted frequencies (aliasing frequencies). According to the Nyquist criterion, in order to obtain the full signal information, the sampling rate must be at least 2 x the signal band width.

Firmware and software adaptation
Because MSX-E systems are very flexible, the MSX-E3601 firmware can be easily extended. Thus, calculations such as RMS or limit values etc. can be integrated. Using the Development Mode, it is possible to create self-sufficient intelligent nodes.

Onboard programming / stand-alone operation

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

Anti-aliasing filter
Low-pass filters are used before or during digitising in order to remove all frequency components which are higher than the Nyquist frequency. This is to make sure that the digitised value or result does not contain any unwanted frequencies (aliasing frequencies). According to the Nyquist criterion, in order to obtain the full signal information, the sampling rate must be at least 2 x the signal band width.

Firmware and software adaptation
Because MSX-E systems are very flexible, the MSX-E3601 firmware can be easily extended. Thus, calculations such as RMS or limit values etc. can be integrated. Using the Development Mode, it is possible to create self-sufficient intelligent nodes.
Intelligent Ethernet systems – MSX-E3601 / MSX-E3601-2

ConfigTools

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

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

ConfigTools is included in the delivery.

ConfigTools functions for MSX-E3601 / MSX-E3601-2:

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

Features

8 analog inputs, BNC female connector:
- inner conductor for pos. input
- outer conductor for neg. input (diff) or GND (SE)

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

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

**Analog inputs**

<table>
<thead>
<tr>
<th>Number of inputs:</th>
<th>MSX-E3601: 8, 1 AD converter per channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coupling:</td>
<td>DC, AC (software-configurable)</td>
</tr>
<tr>
<td>Input type:</td>
<td>single-ended or differential (software-configurable)</td>
</tr>
</tbody>
</table>

**Input ranges**

- **Gain x10:**
  - ± 10 V single-ended
  - ± 0.1 V single-ended
- **Gain x100:**
  - ± 100 V single-ended
  - ± 0.1 V single-ended

**ADC-Typ:**
- Overampled SAR with linear phase FIR anti-aliasing digital filter

**Resolution:**
- 24-bit

**Sampling rate:**
- up to 128 kHz

**Detectable frequencies f<sub>in</sub>:**
- DC to 10 kHz

**Input stage characteristics**
- Input impedance: 1 MΩ

**AC coupling frequency (f<sub>ac</sub>):**
- 48 Hz typ.

**Overvoltage protection:**
- Positive input: +27 V
- Negative input: ± 14 V

**Filter response:**
- PLL bandwidth: DC to 0.547 x f<sub>in</sub>
- Stop band: 0.547 x f<sub>in</sub>

**Dynamic characteristics**

<table>
<thead>
<tr>
<th>Signal-to-noise ratio (SNR)</th>
<th>f&lt;sub&gt;in&lt;/sub&gt; = 1 kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>-95 dB</td>
<td>Gain x1</td>
</tr>
<tr>
<td>-94 dB</td>
<td>Gain x10</td>
</tr>
<tr>
<td>-75 dB</td>
<td>Gain x100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Harmonic Distortion (THD)</th>
<th>f&lt;sub&gt;in&lt;/sub&gt; = 1 kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>-95 dB</td>
<td>Gain x1</td>
</tr>
<tr>
<td>-90 dB</td>
<td>Gain x10</td>
</tr>
</tbody>
</table>

**Dynamic range:**
- Shorted inputs:
  - ± 105 dB
  - ± 100 dB
  - ± 85 dB

**Crosstalk:**
- Between channels 1-2, 3-4, 5-6, 7-8, with gain x1
  - ≥ 104 dB
  - ≥ 100 dB
  - ≥ 100 dB

**Phase mismatch:**
- Between channels 1-2, 3-4, 5-6, 7-8, with gain x1
  - ≥ 0.001°
  - ≥ 0.01°

**Amplitude accuracy:**
- ± 0.009 dB max. at f<sub>in</sub> = 1 kHz sine signal, Gain x1, x10, x100

**CMRR:**
- > 110 dB typ. at DC
- > 90 dB typ. at f<sub>in</sub> < 1000 Hz

**Offset error:**
- ≤ 90 µV after calibration at 25 °C

**Unibond DC calibration:**
- software-configurable

**Calibration voltage:**
- 9 V typ. gain x1
- 90 mV typ. Gain x10
- 900 mV typ. Gain x100

**Temperature drift:**
- ≤ ± 5 ppm/C typ.

**Sensor supply voltage**

| Number of channels: | 8 (MSX-E3601) or 2 (MSX-E3601-2) |

**Current source:**
- ≤ 4 mA typ. to 24 V max.

**Chopping:**
- AC (positive input)
- DC

**Recording duration:**
- TBD max. at 128 kHz sampling rate on 8 channels

**Current sources**

| Number: | 8 or 2 constant current sources for the supply of the ICP or IEPE sensors, 4 mA typ., 24 V max.

**Voltage supply, Ethernet, Trigger, Synchronisation**

**EMC – Electromagnetic compatibility**

**System features**

<table>
<thead>
<tr>
<th>Interface:</th>
<th>Ethernet acc. to specification IEC60802.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight:</td>
<td>860 g</td>
</tr>
<tr>
<td>Dimensions:</td>
<td>215 x 110 x 52 mm</td>
</tr>
</tbody>
</table>

**Connectors for sensors**

<table>
<thead>
<tr>
<th>for analog inputs:</th>
<th>8 x BNC female connector (MSX-E3601)</th>
</tr>
</thead>
</table>

**Ordering information**

**MSX-E3601 / MSX-E3601-2**

*Ethernet system for the acquisition of dynamic signals, 8 or 2 SE/diff. inputs, 24-bit, simultaneous acquisition. Incl. technical description, software drivers and ConfigTools.*

**Versions**

<table>
<thead>
<tr>
<th>MSX-E3601:</th>
<th>8 SE/diff. inputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSX-E3601-2:</td>
<td>2 SE/diff. inputs</td>
</tr>
</tbody>
</table>

**Connection cables**

<table>
<thead>
<tr>
<th>Voltage supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMX-2x: Shielded cable, M12 5-pin female connector/open end, IP 65</td>
</tr>
<tr>
<td>CMX-3x: For cascading, shielded cable, M12 5-pin female connector/male connector IP 65</td>
</tr>
<tr>
<td>Trigger/Synchronisation</td>
</tr>
<tr>
<td>CMX-4x: Shielded cable, M12 5-pin female connector/open end, IP 65</td>
</tr>
<tr>
<td>CMX-5x: For cascading, shielded cable, M12 5-pin female connector/male connector IP 65</td>
</tr>
<tr>
<td>Ethernet</td>
</tr>
<tr>
<td>CMX-6x: CAT5E cable, M12 D-coded male connector/ RJ45 connector</td>
</tr>
<tr>
<td>CMX-7x: For cascading, CAT5E cable, 2 x M12 D-coded male connector</td>
</tr>
</tbody>
</table>

**Options**

<table>
<thead>
<tr>
<th>S7 Modbus TCP Client Library for S7:</th>
<th>Easy use of the Ethernet systems MSX-E with PLCs</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSX-E 5V-Trigger:</td>
<td>Level change of the trigger inputs and outputs to 5 V</td>
</tr>
<tr>
<td>MX-Screw, PCMX-1x</td>
<td></td>
</tr>
</tbody>
</table>

**Fax:** +49 7229 1847-222

**Phone:** +49 7229 1847-0

**www.addi-data.com**
Ethernet system for length measurement, 24-bit, simultaneous, 8 transducers, counter and temperature inputs

MSX-E3711
- Simultaneous acquisition of up to 8 inductive displacement transducers
- For half-bridge, LVDT, Mahr or Knaebel transducers
- 1 incremental counter input (32-bit)
- 1 input for temperature measurement (Pt100) or for thermocouples (TC)
- 24 V digital trigger input

Features
- ARM®9 32-bit processor
- Robust standardized metal housing
- Power Save Mode: Reduced power consumption when no acquisition runs

Transducer inputs
- 8 transducer inputs, 24-bit, 5-pin M18 female connector
- Half-bridge (HB), LVDT, Mahr-compatible, Knaebel
- Simultaneous acquisition
- Diagnostic option (short-circuit, line break)

Counter input
- 1 x 32-bit incremental counter input, max. 5 MHz
- Voltage supply of sensors with M23 female connector (24 V or 5 V)
- Single, double, quadruple edge analysis
- Compare logic

Temperature input
- 1 x RTD input, 16-bit, 5-pin M12 female connector
- +/-0.01 °C resolution
- Thermocouple input, optional (MSX-E3711-TC)

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

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

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

Synchronisation/time stamp

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

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

Compare logic
With the compare logic of the incremental counter, a synchro-trigger signal can be generated in order to latch the counter value, the transducers and the temperature input as soon as the counter value is equal to the compare value. Thus all the inputs of the MSX-E3711 system can be acquired simultaneously.
With the additional „Modulo-Mode“ (Modulo Compare), a trigger can also be generated at the n value of the compare value. Thus it is possible, e.g. when using an encoder with 3,600 steps / revolution to obtain each degree of a measurement value (Modulo Compare = 10). The thus generated synchro-trigger can also be used for data acquisition on further MSX-E systems.

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

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

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

ConfigTools is included in the delivery.

ConfigTools functions for MSX-E3711:
- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration
- Save/load channel configuration
- Calibration of transducers
- Data base of transducers
- Monitoring of transducers
- Diagnostics of transducers

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

Features

- Status LEDs
- 8 x inductive transducers, half-bridge, LVDT, Mahr-compatible or Knaebel, M18 female connector, 5-pin
- 1 x temperature input for Pt100 for temperature measurement
- M12 female connector, 5-pin, or thermocouples type K (TC)
- 1 x incremental counter input M22 female connector, 12-pin
- 2 x Trigger/Synchronization IN/OUT
- 2 x Ethernet
- 2 x voltage supply, 24 V IN/OUT, optical isolated

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

Phone: +49 7229 1847-0
Fax: +49 7229 1847-222
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www.addi-data.com
Ordering information

MSX-E3711
Ethernet system for length measurement, 24-bit, simultaneous, 8 transducers, counter and temperature input.
Incl. technical description, software drivers and ConfigTools.

Versions

<table>
<thead>
<tr>
<th>Version</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSX-E3711-HB</td>
<td>for 8 HB inductive transducers, 5 V counter input</td>
</tr>
<tr>
<td>MSX-E3711-LVDT</td>
<td>for 8 LVDT inductive transducers, 5 V counter input</td>
</tr>
<tr>
<td>MSX-E3711-M</td>
<td>for 8 Mahr-comp. transducers, 5 V counter input</td>
</tr>
<tr>
<td>MSX-E3711-K</td>
<td>for 8 Knaebel transducers, 5 V counter input</td>
</tr>
<tr>
<td>MSX-E3711-HB-24V</td>
<td>for 8 HB inductive transducers, 24 V counter input</td>
</tr>
<tr>
<td>MSX-E3711-LVDT-24V</td>
<td>for 8 LVDT inductive transducers, 24 V counter input</td>
</tr>
<tr>
<td>MSX-E3711-TC</td>
<td>Type K thermocouple in place of the Pt100 input</td>
</tr>
</tbody>
</table>

Connection cables

<table>
<thead>
<tr>
<th>Voltage supply</th>
<th>Description</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/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

Options

S7 Modbus TCP Client Library for S7: Easy use of the Ethernet systems MSX-E with PLCs
MSX-E 3V-Trigger: Level change of the trigger inputs and outputs to 5 V
MX-Clip, MX-Rail (Please specify when ordering!) MX-Screw, PCMX-1x

Specifications

Connection of inductive transducers

Inputs for inductive transducers

Channel features:
- Number: 8 x ADC (not multiplexed)
- Input type: Single-ended
- Coupling: DC
- Resolution: 24-bit

Sampling rate \( f_s \):
- On 8 channels
- At primary frequency \( f_p \) of 5 kHz: 7.69 kHz
- 10 kHz
- 12.5 kHz
- 20 kHz
- 50 kHz

Example with TESA GT21: \( f_s = f_p = 12.5 \text{kHz} \) on all 8 channels

Input level

- Input impedance: 2 kΩ software-programmable
  - 10 kΩ
  - 100 kΩ
  - 1 MΩ
- Transducer accuracy: ± 61 nm (Tesa GT21)
- Sensor supply (Sine generator)
  - Type: Sine differential (180° phase-shift)
  - Coupling: AC
  - Programmed signals:
    - Output frequency / (primary frequency)
      - 2-20 kHz depending on the transducer (50 kHz Knabeil)
    - 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

Counter

- Number of counter inputs: 1
- Input type: Differential inputs or TTL
- 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 V
Max. input frequency: 1 MHz at nominal voltage
Input impedance: 1 MΩ typ.
Logic input levels:
- UH (min): 30 V typ.
- UH (max): 18 V typ.
- UL (min): 16 V typ.
- UL (max): 0 V typ.

Temperature measurement

- Number of inputs: 1
- Type: K type Pt100 or J type (optional)
- 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: 40 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

Phone: +49 7229 1847-0 info@addi-data.com
Fax: +49 7229 1847-222 www.addi-data.com
Features
- ARM® 32-bit processor
- Robust standardized metal housing
- Power Save Mode: Reduced power consumption when no acquisition runs

Inputs for transducers
- 4, 8 or 16 inputs for transducers, 24-bit, 5-pin M18 female connector
- Half-bridge (HB), LVDT, Mahr compatible, Knaebel
- Diagnostics (short-circuits, line break)
- 16-bit accuracy, example of a measurement:
  Typ TESA GT21, range ± 2 mm (Δ 4 mm),
  \[ \frac{4\, \text{mm}}{2^{16}} \approx 61\, \text{nm} = 0.061\, \mu\text{m} \]

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

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

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

Synchronisation/time stamp

Time stamp
Several MSX-E systems can be synchronised with one another in the 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.
**Acquisition modes**

**Auto-refresh mode**

In the auto-refresh mode, the measurement values are updated automatically after each acquisition. The acquisition is initialized 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.

**Digital output with Compare logic**

The MSX-3701-x-4 system can optionally be equipped with a digital 24 V output with Compare logic (OPT. MSX-E Dig. Out). This output can be set either manually or through a transducer. This allows easy threshold value monitoring, e.g. probing a workpiece and then automatically sending an message to a PLC.

**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.

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* Preliminary product information
ConfigTools

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

ConfigTools is included in the delivery.

ConfigTools functions for MSX-E3701 / MSX-E3701-x / MSX-E3700:
- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration
- Save/load channel configuration
- Transducer calibration
- Transducer database
- Transducer monitoring
- Transducer diagnostics

Simplified block diagram

Features

MSX-E3701
Degree of protection IP 65

MSX-E3700
Degree of protection IP 40

Connection of up to 16 transducers, Half-Bridge, LVDT or Mahr compatible, 5-pin M18 female connector

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

M18 cable and sensor supplied through the sensor manufacturer
## Inputs for inductive transducers

### Channel features
- **Number:** -4/-8/-16 multiplexed
- **Input type:** single-ended
- **Coupling:** DC
- **Opto-isolation:** 2000 V

### Sampling frequency, \( f_s \):
- **On 1 channel:** 
  - At primary frequency, \( f_p \), of 5 kHz: 7.69 kHz
  - At 10 kHz: 12.5 kHz
  - At 20 kHz: 25 kHz
  - At 50 kHz: 125 kHz

### Example with TESA GT21:
- **On 1 channel:** 
  - \( f_s = f_p \) of 12.5 kHz

### Input level
- **Input impedance:** 2 kΩ software-programmable
- **Input current:** 11 mA at 24 VDC, typical

### Sensor supply (sine generator)
- **Type:** sine differential (180° phase-shift)
- **Coupling:** AC
- **Programmed signals:**
  - Output frequency, \( f_o \), of 2-20 kHz depending on the transducer (50 kHz Knaebel)
  - Output frequency, \( f_o \), of 2-20 kHz depending on the transducer (50 kHz Knaebel)

### Short-circuit current, \( I_{sc} \):
- **Maximum:** 0.8 A max. at 25 °C with thermal protection

### Optical isolation:
- **1000 V** through opto-couplers

### Number of outputs:
- **1 trigger input**
- **1 trigger output**

### System features
- **Interface:** Ethernet acc. to specification IEEE802.3
- **Dimensions:**
  - MSX-E3700-16: 215 x 110 x 50 mm
  - MSX-E3700-8: 215 x 110 x 50 mm
  - MSX-E3700-4: 215 x 110 x 50 mm
- **Weight:**
  - MSX-E3700-16: 760 g
  - MSX-E3700-8: 560 g
  - MSX-E3700-4: 320 g
- **Degree of protection:**
  - MSX-E3701-4/-8/-16: IP 65
  - MSX-E3700-4/-8/-16: IP 65

## Ethernet

### Number of ports:
- **2**

### Cable length:
- **150 m** max. at CAT 5e UTP

### Bandwidth:
- **10 Mbps** auto-negotiation
- **100 Mbps** auto-negotiation

### Protocol:
- **10Base-T** IEEE802.3 compliant
- **100Base-TX** IEEE802.3 compliant

### Optical isolation:
- **1000 V**

### MAC address:
- **00:0F:6C:##:##:##**, unique for each device

## Trigger

### Number of inputs:
- **1 trigger input**

### Number of outputs:
- **1 trigger output**

## Synchro

### Number of inputs:
- **1**

### Number of outputs:
- **1**

### Input current:
- **11 mA at 24 VDC, typical**

### Input frequency (max.):
- **2 MHz at 24 V**

### Connector, common with Synchro

### Trigger input:
- **1 x 5-pin male connector M12**

### Trigger output:
- **1 x 5-pin female connector M12**

## 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
  - 10Base-T IEEE802.3 compliant

### Number of ports:
- **2**

### Number of inputs:
- **1**

### Number of outputs:
- **1**

### Weight:
- **760 g**

### Degree of protection:
- **IP 65**

### Operating temperature:
- **-40 °C to + 85 °C**

### MSX-E3701 interface connectors

- **Ethernet:**
  - 2 x 4-pin M12 female connector, D-coded for port 0 and port 1

### MSX-E3700 interface connectors

- **Ethernet:**
  - RJ45 for Port 0 and 1
  - 1 x 5-pin male connector M12

- **Trigger/Synchro IN:**
  - 1 x 5-pin female 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

### MSX-E3700 interface connectors

- **Ethernet:**
  - RJ45 for Port 0 and 1

- **External trigger:**
  - 1 x 3-pin binder, 3.81 mm grid

- **Synchro signal:**
  - 1 x 3-pin binder, 3.81 mm grid

- **Voltage supply:**
  - 24 V DC IN:
    - 1 x 3-pin female connector, 5.08 mm grid

### Connectors for connecting inductive transducers

- **MSX-E370x-4:**
  - 4 x 5-pin M18 female connector

- **MSX-E370x-8:**
  - 8 x 5-pin M18 female connector

- **MSX-E370x-16:**
  - 16 x 5-pin M18 female connector
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<td></td>
<td>MSX-E3700: Degree of protection IP 40</td>
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<tr>
<td>MSX-E3701-M-4</td>
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<td></td>
<td>Protection against the penetration of foreign bodies with a diameter greater than 1 mm.</td>
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<tr>
<td>MSX-E3701-HB-16</td>
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<tr>
<td>MSX-E3701-LVDT-4</td>
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</tbody>
</table>

### Ordering information

**MSX-E3701 / MSX-E3701-x / MSX-E3700**

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

**MSX-E3701: IP 65, standard system**

| MSX-E3701-HB-16:          | For 16 HB inductive displacement transducers |
| MSX-E3701-LVDT-16:        | For 16 LVDT inductive displacement transducers |
| MSX-E3701-HB-8:           | For 8 HB inductive displacement transducers |
| MSX-E3701-K-8:            | For 8 Knaebel induct. displacement transducers |
| MSX-E3701-LVDT-8:         | For 8 LVDT inductive displacement transducers |
| MSX-E3701-HB-4:           | For 4 HB inductive displacement transducers |
| MSX-E3701-LVDT-4:         | For 4 LVDT inductive displacement transducers |
| MSX-E3701-M-8:            | For 8 Mahr-compatible displacement transducers |
| MSX-E3701-M-4:            | For 4 Mahr-compatible displacement transducers |

**Options**

- **MSX-E 5V-Trigger:** Level change of the trigger inputs and outputs to 5 V
- **Opt. MSX-E Dig. Out:** additional dig. outpuit with compare logic for transducer 0 (only available for MSX-E3701-x-4)

**MSX-E3700 (degree of protection IP 40)**

Incl. standard binders SMX-10 and SMX-20

| MSX-E3700-HB-16:          | For 16 HB inductive displacement transducers |
| MSX-E3700-LVDT-16:        | For 16 LVDT inductive displacement transducers |
| MSX-E3700-HB-8:           | For 8 HB inductive displacement transducers |
| MSX-E3700-LVDT-8:         | For 8 LVDT inductive transducers |
| MSX-E3700-HB-4:           | For 4 HB inductive displacement transducers |
| MSX-E3700-LVDT-4:         | For 4 LVDT inductive displacement transducers |

**Binders for MSX-E3700:**

- **Power Supply**
  - SMX-10: Standard 3-pin binder, 5.08 mm grid, screw connector (included in delivery)
  - SMX-11: 3-pin binder, 5.08 mm grid, 2-row screw connector
  - SMX-12: 3-pin binder, 5.08 mm grid, 2-row spring-cage connector
  - SMX-20: Standard 3-pin binder, 5.08 mm grid

**Options for MSX-E3701 and MSX-E3700**

- **S7 Modbus TCP Client Library for S7:** Easy use of the Ethernet systems MSX-E with PLC
- **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
  - **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
    - 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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Phone: +49 7229 1847-0  info@addi-data.com  Fax: +49 7229 1847-222  www.addi-data.com
Precise and error-free diameter detection of gear wheels

**Challenge**
A manual test station shall be replaced by a modern and easy-to-use measuring system. The goal is to improve the accuracy of the measurement and to avoid errors which occur when measurement values are entered manually.

**Solution**
The diameter between the gear teeth shall be measured. Therefore the gear wheel is put on a measurement table with a ball for stopping. On the opposite side, a spring-loaded ball and an inductive measurement sensor are installed. The diameter between the fixed ball and the sensor is detected by the Ethernet length measurement system MSX-E3701. Then the measured values are calculated through an integrated logic and classified in 4 predefined categories (tolerance range). The measurement result is displayed with an LED on the digital Ethernet system MSX-E1516.

Consistent data for parameter corrections and precise rework of brake discs

**Challenge**
A manufacturer of car parts wants to test the surface of his produced brake discs as exactly as possible for roundness, radius and surface quality. In order to allow precise rework and corrections of the process parameters, the measurement device must be able to transfer a consistent data set of the position value and the measured value to the control unit.

**Solution**
For this application, two intelligent Ethernet systems are used: The MSX-E1701 counter system for the position acquisition and the MSX-E3701 length measurement system for the detection of the measurement values through the connected displacement transducers. For each measurement point, the MSX-E1701 system triggers the MSX-E3701 system angle-dependently. For a precise matching of position and measurement values at each measurement point, both systems are synchronised and have a time stamp. The acquired data is then transferred through Ethernet to a PC or a PLC for evaluation and regulation purposes. Exceeded tolerance values are forwarded to the super-ordinate machine in order to adjust process parameters or to effect corrections on the measured brake disc.
Ethernet system for length measurement, 24-bit 16 inductive transducers, LVDT, half-bridge

### Features
- ARM®9 32-bit processor
- Robust standardized metal housing
- Power Save Mode: Reduced power consumption when no acquisition runs

### Inputs for transducers
- 16 inputs for transducers, 24-bit, 5-pin M18 female connector
- Half-bridge (HB), LVDT
- Diagnostics at short-circuits or line break
- 16-bit accuracy

### Transducer precision: example of a measurement
Typ TESA GT21, range ± 2 mm (± 4 mm), 16-bit accuracy

$$\Delta = 61 \, \text{nm} = 0.061 \, \text{µm}$$

### Digital I/O
- 16 inputs for transducers, 24-bit, 5-pin M18 female connector
- 32 digital I/O, 24 V:
  - 16 opt. isolated inputs, 24 V, optional filter
  - 16 opt. isolated outputs, 11 V to 36 V, output current per channel 150 mA

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

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

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

### Synchronisation/time stamp

#### Time stamp
Several MSX-E systems can be synchronised with one another in the 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.

### MSX-E3701-DIO
**Acquisition of 16 inductive transducers**
For half-bridge and LVDT transducers
- 24 V digital trigger input
- 32 digital I/O, 24 V
Acquisition modes

Auto-refresh mode
In the auto-refresh mode, the measurement values are updated automatically after each acquisition. The acquisition is initialised once and the values of the channels are stored in the memory of the MSX-E Ethernet system. The client (e.g. PC, server, PLC, …) reads the acquired values asynchronously to the acquisition through socket connection, SOAP or Modbus function.

Thereby, the new value is read and the old values are overwritten.

In addition to the measurement values, the auto-refresh counter can also be read, which allows to sort the measurement values chronologically. The auto-refresh mode can be combined with a hardware or a synchro trigger and also allows the automatic averaging of values.

Sequence Mode
In the sequence mode, a list of channels is acquired. Thereby, the single measurement rows are stored one after another. The client receives the acquired values asynchronously to the acquisition through a socket connection. In the sequence mode, the measurement values are read in chronological order, this means the oldest values are read first.

The acquisition can be effected continuously, with or without delay or in combination with a hardware or synchro trigger.

Example: Sequence acquisition of 6 channels, 1 trigger per sequence
Send data after 2 sequences − 1000 sequences in total

Digital I/O
In addition to the transducer channels, the MSX-3701-DIO system has 32 digital 24 V I/O channels (16 inputs, 16 outputs). The system is therefore very flexible and can manage complete measurement and test applications. Example: Test bench for cylindrical parts, probing the workpieces, automatic regulation of the transducers and visualisation of the results via LED traffic light. The measurement data is at the same time stored in a database.

Onboard programming / stand-alone operation

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

* Preliminary product information
ConfigTools

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

ConfigTools is included in the delivery.

ConfigTools functions for MSX-E3701-DIO:
- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration
- Transducer calibration
- Transducer database
- Transducer monitoring
- Transducer diagnostics

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

Features

Connection of up to 16 transducers, half-bridge, LVDT, 5-pin M18 female connector

Simplified block diagram

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*

Inputs for inductive transducers

Channel features

- Number: 16 multiplexed
- Input type: Single-Ended
- Coupling: DC
- Resolution: 24 bit
- Sampling frequency $f_s$: on 1 channel at primary frequency $f_p$ of
  - 5 kHz
  - 7.69 kHz
  - 10 kHz
  - 12.5 kHz
  - 20 kHz
  - 50 kHz
- $f_p = f_s$, $f_p$ = primary frequency
- SP = settling period (5 ≤ SP ≤ 255)
- $f_i$ concerns here all n channels

Example with TESA GT21:
- On one channel $f_i = f_p = 12.5$ kHz
- From n ≥ 2 channels $f_i = \frac{12.5 \text{kHz}}{n}$ for 4 channels
- $f_i = \frac{31.25 \text{kHz}}{n}$ for 8 channels
- $f_i = \frac{156.25 \text{kHz}}{n}$ for 16 channels

Input level
- Input impedance: 2 kΩ software-configurable
- Nominal voltage: 24 V
- Optical isolation: 1000 V through opto-couplers
- Number of inputs: 16, common ground acc. to IEC 1131-2

Power Supply
- Nominal voltage: 24 V
- Voltage supply: 18-30 V
- Optical isolation: 1000 V
- Current consumption at 24 V:
  - 90 mA typ. in power safe mode / idle
  - 120 mA Power on
  - 150 mA DAC init, signal on, buffer off
  - 200 mA typ. without load (transducer) at 9 V power (buffer on)
  - 320 mA typ. with 16 Solatron AX15 transducers at ± 7 V power, 5 kHz and 3 V power (buffer on)

Reverse voltage protection
- Max. voltage: 11 V, 36 V
- Output current per channel: 150 mA max.

Diagnostics
- Common diagnostics bit for all 16 channels at overtemperature of one channel

Ethernet

- Number of ports: 2
- Cable length: 150 m max. at CAT5E UTP
- Bandwidth: 10 Mbps auto-negotiation
- Protocol: 10Base-T IEEE802.3 compliant
- 100Base-TX IEEE802.3 compliant
- Optical isolation: 1000 V
- MAC address: 00:0F:5C:8R:WW:PP, unique for each device

Trigger

- Number of inputs: 1 trigger input
- Number of outputs: 1 trigger output
- Filters/protective circuit: Low-pass/transorb diode
- Optical isolation: 1000 V
- Nominal voltage: 24 V external
- Number of outputs: 1
- Max. cable length: 20 m
- Number of inputs: 1
- Input current: 11 mA at 24 VDC, typical

Connector, common with Synchro

- Trigger input: 1 x 5-pin male connector M12
- Trigger output: 1 x 5-pin female connector M12

Synchro

- Number of inputs: 1
- Number of outputs: 1
- Max. cable length: 20 m
- Optical isolation: 1000 V
- Signal type: RS485
- Connector, common with Trigger
  - Trigger input: 1 x 5-pin male connector M12
  - Trigger output: 1 x 5-pin female connector M12

EMC – Electromagnetic compatibility

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

System features

- Interface: Ethernet acc. to specification IEEE802.3
- Dimensions: 260 x 110 x 50 mm
- Weight: 905 g
- Degree of protection: IP 65
- Operating temperature: -40 °C to + 85°C

Interface connectors

- Ethernet: 2 x 4-pin female connectors, D-coded M12 for port 0 and port 1
- Trigger/Synchro input: 1 x 5-pin M12 male connector
- Trigger/Synchro output: 1 x 5-pin M12 female connector
- Voltage supply:
  - 24 VDC input: 1 x 5-pin M12 male connector
  - 24 VDC output: 1 x 5-pin M12 female connector

Ordering information

MSX-E3701-DIO

 Ethernet system for length measurement, 24-bit, 16 inductive transducers, LVDT, half-bridge. Incl. technical description, software drivers and ConfigTools.

Versions

- MSX-E3701-DIO-HB-16: for 16 HB inductive transducers
- MSX-E3701-DIO-LVDT-16: for 16 LVDT inductive transducers

Connection cables for 32 dig. I/O, 24 V auf 37-pol. D-Sub-Connector

ST010: Standard round cable, shielded twisted pairs, 2m
PNK01-DG: Screw terminal board with Schraubklemmen, LED Status display, for DIN rail

Voltage supply

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

* Preliminary product information

Phone: +49 7229 1847-0 info@addi-data.com
Fax: +49 7229 1847-222 www.addi-data.com
Ethernet system for serial interfaces
4 ports for RS232, RS422, RS485 or 20 mA CL

MSX-E7511
4 serial interfaces
RS232, RS422, RS485, 20 mA Current Loop
128-byte FIFO buffer for each port
16C950 compatible UART
Optical isolation
Onboard evaluation of user data

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

Safety features
- Status LEDs for fast error diagnostics
- Optical isolation + Input filters

Serial interfaces
- 4 serial interfaces
- RS232, RS422, RS485 and TTY (20 mA Current Loop)
- The port modes can be mixed
- The channels are optically isolated from each other

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

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

Synchronisation/time stamp
Time stamp
Several MSX-E systems can be synchronised with one another in the 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.

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

Flexibility through firmware and software adaptation
Thanks to the flexibility of the MSX-E product range, the MSX-E7511 system can be easily extended via firmware, e. g. to install additional protocols on the serial interfaces.

Fields of application
The MSX-E7511 Ethernet system features 4 serial interfaces. Depending on the version, the interface standards are RS232, RS422, RS485 and TTY (20 mA Current Loop). Any application can be programmed either through a firmware adaptation or using the Development mode.

Data collector
Via the RS485 interface, the Modbus RTU protocol can be used. For example, temperature sensors featuring an integrated Modbus RTU interface can be read and the complete protocol interpretation can be made on the MSX-E7511 system. It is thus possible to filter the actual user data - in this case temperature data - and to transmit only this data or to store it in a database.

Onboard calculation
As the system can be programmed, it is possible to effect calculations with the different ports.

**Example:**
Using a radar sensor, the position of an object is to be displayed. The sensors indicate the distance via RS422. Three sensors are used:
- Sensor 1 as a reference to control whether there is an object or not.
- Sensor 2 and 3 for establishing the position of the object.

On the MSX-E7511 system, the interface data is read and interpreted. The position of the object is obtained through calculation of the values of sensor 2 and 3 (e.g. as x/y value). Sensor 1 is used to validate the result. The MSX-E7511 system transmits then only the position data to the Client.

Self-sufficient unit
Using further systems from the MSX-E product range, the MSX-E7511 system can also be used as a self-sufficient unit.

**Example:**
Components are acquired via a scanner (RS232). The MSX-E7511 system reads the barcode and sends the corresponding commands for the processing of the components to a MSX-E1516 Ethernet digital I/O system (handling) and a printer (marking). There is thus no need for an additional PLC or PC.
**ConfigTools**

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

ConfigTools is included in the delivery.

**ConfigTools functions for MSX-E7511:**
- Change of IP address
- Firmware update
- Save/load system configuration

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

---

**Features**

- **Status LEDs**
  - 4 serial interfaces, RS232, RS422, RS485, 20 mA CL
  - 9-pin D-Sub male connector
  - 2 x Ethernet
  - 2 x Trigger/Synchronization IN/OUT
  - 2 x voltage supply, 24 V IN/OUT, optically isolated

**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**

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

MSX-E7511
Ethernet system for serial interfaces, 4 ports for RS232, RS422, RS485 or 20 mA CL. Incl. technical description, software drivers and ConfigTools.

**Versions**

- **MSX-E7511-XXXX**
  - A: RS232, optically isolated
  - B: RS422, optically isolated
  - C: RS485, optically isolated
  - D: 20mA CL

**Example:**
- MSX-E7511-AACC
  - Port 1 = RS232, Port 2 = RS232, Port 3 = RS485, Port 4 = RS485

**Connection cables**

- For serial interfaces
  - Open cable end, 9-pin D-Sub female connector
  - ST073-RS232 (A): RS232 cable
  - ST073-RS422 (B): RS422 cable
  - ST073-RS485 (C): RS485 cable
  - ST073-CL (D): 20mA CL cable

**Voltage supply**

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

**Trigger/Synchro**

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

**Ethernet**

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

**Options**

- S7 Modbus TCP Client Library for S7: Easy use of the Ethernet systems MSX-E with PLCs
- MSX-E 5V-Trigger: Level change of the trigger inputs and outputs to 5 V
- MX-Rail (please specify when ordering!)
- MX-Screw

**Specifications**

**Serial interfaces**

- Number of ports: 4
- Mode: RS232, RS422, RS485, 20 mA CURRENT LOOP (active, passive) with optical isolation
- Configuration: at ordering
- Optical isolation: 1000 V
- Transmission mode: Asynchronous, full or half duplex
- Addressing: Automatic
- Memory: 128-byte FIFO memory for sender and receiver
- Transfer rate: Programmable up to 115.2 kbit/s
- Protocol: 5-, 6-, 7- or 8-bit character 1, 1½ or 2 stop bits
- Parity: Even, odd, none, mark, space
- Connectors: 4 x 9-pin D-Sub male connector

**Voltage supply, Ethernet, Trigger, Synchro**

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

**System features**

- Interface: Ethernet acc. to specification IEEE802.3
- Dimensions: 220 mm x 140 mm x 50 mm
- Weight: 620 g
- Degree of protection: IP 65
- Current consumption: 150 mA ± 10 % typ. in idle/power save
- Operating temperature: -40 °C to +85 °C

Phone: +49 7229 1847-0 info@addi-data.com
Fax: +49 7229 1847-222 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
- Easy to use
- Based on the latest technology (XML, SOAP, etc.)
- Ideal addition to the MSX-E systems as interface between field and IT levels
- Data transfer via standard Ethernet
- No programming needed
- Raw data is converted into real values
- Optional filtering of values

Functions
- **First Steps**
  DatabaseConnect First Steps are easy-to-follow instructions for creating a project
- **Storage function**
  for storing DatabaseConnect projects
- **Parameterisation function**
  Measurement parameterisation and system configuration via the website of the MSX-E systems
- **Calculation function**
  Measurement data is converted into "real values," e.g. a 0..10 V standardised signal into fill level [%], pressure [bar], etc.
- **Scan function**
  Easy detection and selection of MSX-E systems present in the network
- **Database function**
  for creating and configuring databases
- **Data monitoring** (Live values)
- **Error analysis** (Log files)
- **Export** as .txt, .csv or .xml files
- **Direct connection of databases:**
  MS SQL Server®, MySQL, MS Access®

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

Extras
- Language versions on request
- Multi-user/server licence on request

Examples of use
- Acquisition of machine data, e.g. number of produced pieces, downtime, etc.
- Temperature data logger, e.g. in server rooms
- Documentation of production data and quality parameters in databases
- Company-wide availability of measurement data

Scope of delivery
The program is supplied on a CD-ROM including a quick installation manual and an online tutorial.

First Aid Functions
Online help, tutorial, First Steps

Read further information about the current software version on the internet at www.addi-data.com

on request
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

<table>
<thead>
<tr>
<th>Ethernet systems</th>
<th>DatabaseConnect compatible</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSX-E1516:</td>
<td>Digital I/O system, 16 digital I/O</td>
</tr>
<tr>
<td>MSX-E1516-NPN:</td>
<td>Digital I/O system, 16 digital I/O</td>
</tr>
<tr>
<td>MSX-E1701:</td>
<td>Multifunction counter system, digital I/O</td>
</tr>
<tr>
<td>MSX-E1711:</td>
<td>Multifunction counter system, sin/cos, digital I/O</td>
</tr>
<tr>
<td>MSX-E1721:</td>
<td>Multifunction counter system, sin/cos, digital I/O</td>
</tr>
<tr>
<td>MSX-E1731:</td>
<td>Multifunction counter system, digital</td>
</tr>
<tr>
<td>MSX-E1741-1VPP:</td>
<td>Multifunction counter system, digital</td>
</tr>
<tr>
<td>MSX-E3121:</td>
<td>Analog input system</td>
</tr>
<tr>
<td>MSX-E3122:</td>
<td>Analog input system, analog I/O</td>
</tr>
<tr>
<td>MSX-E3011:</td>
<td>Analog input system</td>
</tr>
<tr>
<td>MSX-E3021:</td>
<td>Analog input system</td>
</tr>
<tr>
<td>MSX-E3027:</td>
<td>Analog input system</td>
</tr>
<tr>
<td>MSX-E3017:</td>
<td>Force distance measurement system</td>
</tr>
<tr>
<td>MSX-E3317:</td>
<td>Force distance measurement system</td>
</tr>
<tr>
<td>MSX-E3211:</td>
<td>System for temperature acquisition</td>
</tr>
<tr>
<td>MSX-E3311:</td>
<td>System for pressure acquisition</td>
</tr>
<tr>
<td>MSX-E3601:</td>
<td>System for the acquisition of dynamic signals</td>
</tr>
<tr>
<td>MSX-E3601-2:</td>
<td>System for the acquisition of dynamic signals</td>
</tr>
<tr>
<td>MSX-E3711:</td>
<td>System for length measurement, 24-bit, simultaneous</td>
</tr>
<tr>
<td>MSX-E3701-x:</td>
<td>System for length measurement</td>
</tr>
<tr>
<td>MSX-E3700:</td>
<td>System for length measurement</td>
</tr>
<tr>
<td>MSX-E7511:</td>
<td>System for length measurement</td>
</tr>
</tbody>
</table>

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

DatabaseConnect
- Parameterisation of the acquisition
- Monitoring
- 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

Database Connect
Database interface software, Ethernet-based, no programming needed

Versions
DatabaseConnect
Version 1.1: CD-ROM incl. Quick Installation and online manual
INTERFERENCE FREE PC BOARDS

Performance and reliability in the industrial environment

With the sophisticated and reliable ADDI-DATA PC boards, your measurement and automation tasks will be a success! High quality products, well thought-out design concepts and robust constitution guarantee a reliable function of ADDI-DATA PC boards in a harsh industrial environment.

For more than 25 years ADDI-DATA has been developing interference-free PC boards for industrial measurement and automation and offers a wide range of solutions for PCI-Express, PCI, CompactPCI Serial and CompactPCI-bus:
- Digital I/O
- Analog I/O or multifunction boards
- Serial interfaces
- Multifunction counter boards
- Motion control boards

For a safe and reliable use in your application, ADDI-DATA PC boards are protected by numerous protective circuits like optical isolation, filters, protection against short-circuits etc.

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
Fast and easy application design

ADDI-DATA PC boards are supplied with an extensive software package for a fast and convenient integration into your application: the clever driver concept ADDIPACK, a wide range of drivers and samples and a configuration tool assist you from the beginning.

ADDIPACK: Easy board handling - now available as 64-bit version!
For an easy administration of the boards installed in the PC ADDI-DATA has developed a convenient driver system that lists the functionalities of all boards inside your PC on a virtual board. This means that you do not administer 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.

Numerous drivers and samples
ADDI-DATA offers 64-bit drivers for Windows 8/7 and XP for numerous PCI-Express, PCI, CompactPCI-Serial and CompactPCI boards. 64-bit .NET assemblies (for C#.Net and VB.Net) are also available. The 64-bit drivers can be used either in 64-bit or in 32-bit systems. Drivers for older operating systems are of course also available. Contact us: Phone: +49 7229 1847-0.

Drivers for real-time applications
For time-critical tasks, ADDI-DATA offers real-time drivers for Linux (RTAI extension) and for Windows 32-/64-bit (RTX, VWorks). With these drivers, the boards can be easily integrated in real-time systems.

Linux drivers
In the of automation sector, Linux allows an easy and cost-effective realisation of highly efficient systems. Depending on the board type, our Linux drivers are available for Kernel 2.4, 2.6 or 3.0.

Practical simulation
In order to simplify the initiation of our boards the drivers come with numerous programming examples. They allow you to parameterise the inputs and outputs of your process and to simulate it practically. Complete measurement, control and regulation processes can be developed fast and easily.

Fast integration in LabVIEW
LabVIEW drivers are available for numerous ADDI-DATA PC boards. They enable a fast and convenient parameterisation of your measurement boards with LabVIEW.

Individual driver adaptations
You cannot find the drivers you need on our website? You need a driver adaptation for your application? Our experts will be glad to advise you. Contact us: Phone: +49 7229 1847-0.
### PCI EXPRESS BOARDS

**Digital**

<table>
<thead>
<tr>
<th>Model</th>
<th>New PCI-exPress boards</th>
<th>Digital</th>
<th>Watchdog</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCI Express bus</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>FPGA</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Filter and protective circuits</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Optical isolation</td>
<td>1000 V</td>
<td>1000 V</td>
<td>1000 V</td>
</tr>
</tbody>
</table>

**Input channels**

<table>
<thead>
<tr>
<th>Model</th>
<th>New PCI-exPress boards</th>
<th>Digital</th>
<th>Watchdog</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 V / 12 V / 5 V</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Output channels**

<table>
<thead>
<tr>
<th>Model</th>
<th>New PCI-exPress boards</th>
<th>Digital</th>
<th>Watchdog</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 V / 12 V / 5 V</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Watchdog / Timer**

<table>
<thead>
<tr>
<th>Model</th>
<th>New PCI-exPress boards</th>
<th>Digital</th>
<th>Watchdog</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 watchdog / timer + 1 timer (12-bit)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>1 watchdog / timer + 1 timer (12-bit)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>1 watchdog / timer + 1 timer (12-bit)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Counter**

<table>
<thead>
<tr>
<th>Model</th>
<th>New PCI-exPress boards</th>
<th>Digital</th>
<th>Watchdog</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 x 16-bit</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>1 x 16-bit</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Reprogrammable function modules**

- Incremental counter
- SSI synchronous serial interface,
- Counter/timer
- Pulse acquisition
- Frequency, pulse width, period duration measurement, PWM
- Diff. in- and outputs
- BiSS-B, BiSS-C
- Parallel interface
- New: EnDat 2.2
- New: Sin/Cos ...

**Analog**

**Signals**

**Operating mode configuration through SI modules**

**Software**

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

**Page**

120 | 122 | 124 | 126 | 128 | 130 | 132 | 134 | 136 | 138
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 ensure a reliable and smooth operation, particularly in case of dangerous interferences like voltage peaks or high currents. With the ADDI-DATA PCI Express boards, you secure your investments in the long term.

**Simplified application design**
ADDI-DATA PCI Express boards come with useful software tools for a fast and convenient integration into your application: The ingenious driver concept ADDIPACK (see page 117), a wide range of drivers and samples and a configuration tool assist you from the beginning.

**Shorter cycle times through FPGA technology**
PCI Express boards with FPGA components reduce the cycle time of signal acquisition and regulation tasks. Use the full hardware and software capacity of your board and accelerate your processes. In the product overview, PCI Express boards with FPGA component are indicated.

**Upgrade from PCI to PCI Express**
Your application is running with ADDI-DATA PCI boards and you would like to upgrade to PCI Express boards? Our PCI Express follow-up models are functionally compatible with our PCI boards. Benefit from the new technologies and the new efficient FPGA components that we have added to our PCI Express boards.

Any questions on compatibility? Contact us! +49 7229 1847-0 or per e-mail at info@addi-data.com.
Digital I/O board, optically isolated, 32 digital inputs and outputs, 24 V / 12 V, for PCI Express

APCIe-1500 / APCIe-1500-12V
16 digital inputs, 24 V or 12 V, including 14 interruptible inputs
16 digital outputs, 11-36 V, 500 mA/channel
Optical isolation 1000 V
Input and output filters
1 watchdog, 3 timers/counters
At Power-On, the outputs are reset to "0"

Features
- 3 programmable timers/counters
- Connector and software compatible to the digital I/O board APCI-1500 for the PCI bus.
- Monitoring program for testing and setting the board functions

Inputs
- 16 optically isolated digital inputs, 24 V or 12 V (APCIe-1500-12V), including 14 interruptible inputs
- Reverse voltage protection
- All inputs are filtered

Outputs
- 16 optically isolated digital outputs, 11 V to 36 V
- Output current per channel 500 mA
- Timer programmable as a watchdog for resetting the outputs to "0"
- Diagnostic report through status register at short-circuits, overtemperature, voltage drop or watchdog
- Interrupt triggered through watchdog, timer, error
- At Power-On, reset of the outputs to "0"
- Current limit for 16 outputs ~ 3 A typ.
- Short-circuit current per output ~ 1.5 A typ.
- Self-resetting fuse (electronic fuse)
- Overtemperature and overvoltage protection
- 24 V power outputs with protective diodes and filters
- Output capacitors against electromagnetic emissions
- External 24 V voltage supply screened and filtered
- Shutdown logic, when the external supply voltage drops below 7 V

Timer / Watchdog / Counter
- 3 timers respectively counters (16-bit resolution)
- 1 timer can be used as a watchdog

Safety features
- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Protection against fast transients (burst), overvoltage, electrostatic discharge and high-frequency EMI
- Separate ground lines for inputs and outputs

Applications
- Industrial I/O control
- PLC coupling
- Reading of encoder values for process control
- Signal switching
- Interface to electromechanical relays
- ON/OFF monitoring of motors, lights...
- Watchdog/timer • Interface to machines...

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

Standard drivers for:
- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

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

On request:
Further operating systems, compilers and samples.

Driver download: www.addi-data.com/downloads

*Preliminary product information

Also for PCI
See APCI-1500, page 158

Also for PC104-PLUS
see PC104-PLUS1500, page 226

*New!*

Fax: +49 7229 1847-222 www.addi-data.com
Specifications

Digital inputs

<table>
<thead>
<tr>
<th>Number of inputs:</th>
<th>16 (common ground acc. to IEC 1131-2)</th>
</tr>
</thead>
<tbody>
<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 (APCle-1500) / 12 V (APCle-1500-12V)</td>
</tr>
<tr>
<td>Input current at 24 V:</td>
<td>2 mA typ. at 12 V</td>
</tr>
<tr>
<td>Logic input levels:</td>
<td>at 24 V</td>
</tr>
<tr>
<td>UH max.:</td>
<td>30 V</td>
</tr>
<tr>
<td>UL max.:</td>
<td>14 V</td>
</tr>
<tr>
<td>Maximum input frequency:</td>
<td>5 kHz (at 24 V version and 12 V version)</td>
</tr>
</tbody>
</table>

Digital outputs

| Number of outputs: | 16, optically isolated up to 1000 V through opto-couplers |
| Output type:       | High-side (load to ground) acc. to IEC 1131-2 |
| Nominal voltage:   | 24 V (APCle-1500) / 12 V (APCle-1500-12V) |
| Supply voltage:    | 11 V to 36 V, min. 7 V (via front connection) |
| Max. current for 16 outputs: | 3 A typ. |
| Output current/output: | 500 mA typ. |
| Shortcircuit current/output: | 1.5 A typ. (pulse current) |
| RDS ON resistance:  | 0.2 Ω max. |
| Switch-off time:    | 1μs |
| Switch-off time:    | 15 μs |
| Overtemperature:    | 135 °C (output driver) |
| Temperature hysteresis: | 15 °C (output driver) |

Timer/watchdog

| Timer: | 3 x 16-bit timer, 1 timer can be used as a watchdog |
| Watchdog: | For resetting the outputs to 0 |

Safety

| Shutdown logic: | When the ext. 24 V voltage drops below 7 V: The outputs are switched off. |
| Diagnostics:    | Status bit sent to the PC |

EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available upon 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 x 11.4 x 11.4 PCI Express slot |
| Operating voltage: | ± 3.3 V from PC |
| Current consumption: | Inputs and outputs inactive: 420 mA ± 10 %, typical |
|                      | 16 inputs/outputs active: 470 mA ± 10 %, typical |
| Front connector:    | 37-pin D-Sub male connector |
| Temperature range:  | 0 to 60 °C (with forced cooling) |

APCle-1500 / APCle-1500-12V

Digital I/O board, optically isolated, 32 digital inputs and outputs, 24 V / 12 V, for PCI Express. Includes technical description and software drivers.

Versions

<table>
<thead>
<tr>
<th>APCle-1500:</th>
<th>Digital I/O board, opt. isolated, 32 dig. I/O, 24 V inputs, outputs 11–36 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>APCle-1500-12V:</td>
<td>Digital I/O board, opt. isolated, 32 dig. I/O, 12 V inputs, outputs 11–36 V</td>
</tr>
</tbody>
</table>

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-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 APCle-1500 and PX85000-G, shielded, twisted pairs, 2 m |
| ST022: | Cable between PX85000-G and PX901-DG or PX9000, shielded, 2 m |
| ST8500: | Ribbon cable for cascading two PX8500 |

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

**APCle-1532 / APCle-1532-12V**

**PCI Express interface**
- 16 digital inputs, 24 V / 12 V, including 15 interruptible inputs
- 16 digital outputs, 24 V, 500 mA/channel

**Optical isolation 1000 V**

**Input and output filters**
- Connection through industry-standard D-Sub connector

**Features**

**Inputs**
- 16 optically isolated inputs, 24 V (APCle-1532) or 12 V (APCle-1532-12V) incl. 15 interruptible inputs
- Channel 0 can be used as a 16-bit counter input (up to 100 kHz)
- Reverse voltage protection
- All inputs are filtered

**Outputs**
- 16 optically isolated outputs, 11 to 36 V
- Output current per channel 500 mA
- Total current: 3 A typ. (fused through PTC resistor)
- Watchdog for resetting the outputs to "0"
- At Power-On, reset of the outputs to "0"
- Current limit: ~1.5 A per 8 channels (through PTC)
- Short-circuit current per output ~1.5 A typ.
- Self-resetting fuse (electronic fuse)
- Overvoltage, overvoltage protection
- 24 V power outputs with protection diodes and filters
- Ext. 24 V voltage supply screened and filtered
- Shutdown logic, when the external supply voltage drops below 7 V

**Timer / Counter**
- 2 timers (12-bit resolution)
- 1 timer can be used as watchdog
- 1 counter

**Safety features**
- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Protection against fast transients (burst), overvoltage, electrostatic discharge and high-frequency EMI
- Separate ground line for inputs and outputs

**Applications**
- Industrial I/O control
- PLC coupling
- Reading of encoder values for process control
- Signal switching
- Interface to electromechanical relays
- ON/OFF monitoring of motors, lights...
- Watchdog timer
- Interface to machines

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

**Standard drivers for:**
- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

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

**ADDIPACK functions:**
- Digital input • Digital output • Watchdog
- Timer • Counter

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

Driver download: www.addi-data.com/downloads

**Protective circuit for the input channels**

**Protective circuit for the output channels**
**Specifications**

### Digital inputs

<table>
<thead>
<tr>
<th>Number of inputs:</th>
<th>16 digital inputs, (common ground channel 0 can be used as a 16-bit counter input acc. to IEC 1131-2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interrupted inputs:</td>
<td>15 channels (channel 1 to 15)</td>
</tr>
<tr>
<td>Optical isolation:</td>
<td>1000 V through opto-couplers, from PC to peripheral</td>
</tr>
<tr>
<td>Nominal voltage:</td>
<td>+24 V (APCIe-1532) -12 V (APCIe-1532-12V)</td>
</tr>
<tr>
<td>Input current:</td>
<td>Channel 0 or 0-1: 6.6 mA typ. 3.2 mA typ.</td>
</tr>
<tr>
<td>Input frequency (max.):</td>
<td>at 24 V at 12 V (APCIe-1532-12V)</td>
</tr>
<tr>
<td>Logic input levels:</td>
<td>at 24 V at 12 V (APCIe-1532-12V)</td>
</tr>
<tr>
<td>UH (max.):</td>
<td>30 V 16 V</td>
</tr>
<tr>
<td>UM (min.):</td>
<td>19 V 9 V</td>
</tr>
<tr>
<td>UL (max.):</td>
<td>14 V 6 V</td>
</tr>
<tr>
<td>UL (min.):</td>
<td>0 V 0 V</td>
</tr>
</tbody>
</table>

**Digital outputs**

<table>
<thead>
<tr>
<th>Number of outputs:</th>
<th>16 digital outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output type:</td>
<td>High-side (load to ground) acc. to IEC 1131-2</td>
</tr>
<tr>
<td>Optical isolation:</td>
<td>1000 V through opto-couplers, from PC to peripheral</td>
</tr>
<tr>
<td>Nominal voltage:</td>
<td>+24 V</td>
</tr>
<tr>
<td>Supply voltage range:</td>
<td>11 to 36 V</td>
</tr>
<tr>
<td>Current limit:</td>
<td>1.5 A per 8 channels (through PFC)</td>
</tr>
<tr>
<td>Output current per output:</td>
<td>500 mA (typical)</td>
</tr>
<tr>
<td>Short-circuit current per output:</td>
<td>1.5 A (typ) pulse current</td>
</tr>
<tr>
<td>Shutdown at 24 V:</td>
<td>470 mA ± 10 %, typical</td>
</tr>
<tr>
<td>RDS ON resistance:</td>
<td>max. 0.2 Ω</td>
</tr>
<tr>
<td>Switch-off time:</td>
<td>out=0.5 A, load = resistance: 75 µs</td>
</tr>
<tr>
<td>Overtemperature (shutdown):</td>
<td>135 °C (output driver)</td>
</tr>
<tr>
<td>Temperature hysteresis:</td>
<td>15 °C (output driver)</td>
</tr>
</tbody>
</table>

**Timer/watchdog**

- Timer: 2 x 12-bit timers, 1 up to 4095 µs, ms, s
- 1 timer can be used as watchdog.

**Safety**

- Shutdown logic (VCC > 24 V at 12 V (APCIe-1532-12V) at 24 V at 12 V (APCIe-1532-12V)
- Overvoltage (shutdown): 135 °C (output driver)
- Switch-on time: 50 µs
- Switch-off time: 75 µs
- Input current: 2 mA typ. 1.5 mA typ. at 24 V at 12 V (APCIe-1532-12V)
- Input frequency (max.): 20 kHz
- Input voltage (min.): 19 V
- Input voltage (max.): 36 V
- Input current: 100 mA at 24 V
- Input current: 6.6 mA at 24 V
- Input current: 1.5 mA at 24 V

**EMC – Electromagnetic compatibility**

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory according to 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)
- Operating voltage: +3.3 V and +5 V
- Current consumption: 320 mA ± 10 %, typical
- Front connector: 37-pin D-Sub male connector
- Temperature range: -20 to +55 °C (passive forced cooling)
- Temperature hysteresis: 15 °C (output driver)

**Ordering information**

- **APCIe-1532 / APCIe-1532-12V**
  - Digital I/O board, optically isolated, 32 digital inputs and outputs, 24 V / 12 V, for PCI Express. Incl. technical description and software drivers.
  - **APCIe-1532**: 16 inputs, 24 V, 16 outputs, 11-36 V, 1 counter
  - **APCIe-1532-12V**: 16 inputs, 12 V, 16 outputs, 11-36 V, 1 counter

- **Accessories**
  - **PX901-D**: Screw terminal panel, LED status display
  - **PX901-DG**: Screw terminal panel, LED status display, for DIN rail
  - **PX9000**: 3-way screw terminal panel for DIN rail with LED status display
  - **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
- **ST021**: Round cable between APCIe-1532 and PX8500-G, shielded, twisted pairs, 2 m
- **ST022**: Round cable between PX8500-G and PX901 or PX9000, shielded, 2 m
- **ST8500**: Ribbon cable for cascading two PX8500-G

*Preliminary product information*
Digital I/O board, optically isolated, 16 digital inputs and outputs, 24 V, for PCI Express

APCIe-1516
PCI Express interface
8 digital inputs, 24 V
8 digital outputs, 24 V, 500 mA/channel
Optical isolation 1000 V
Input and output filters
Connection through industry standard
D-Sub connector

Features
Inputs
• 8 optically isolated inputs, 24 V
• Reverse voltage protection
• All inputs are filtered

Outputs
• 8 optically isolated outputs, 11 to 36 V
• Output current per channel 500 mA
• Total current: 1.5 A typ. (fused through PTC resistor)
• Watchdog for resetting the outputs to “0”
• At Power-On, reset of the outputs to “0”
• Current limit: ~ 1.5 A per 8 channels (through PTC)
• Short-circuit current per output: ~ 1.5 A typ.
• Self-resetting fuse (electronic fuse)
• Overtemperature and overvoltage protection
• 24 V power outputs with protection diodes and filters
• External 24 V voltage supply screened and filtered
• Shutdown logic, when the external supply voltage drops below 7 V

Safety features
• Optical isolation 1000 V
• Creeping distance IEC 61010-1
• Separate ground line for inputs and outputs
• Protection against fast transients (burst), overvoltage, electrostatic discharge and high-frequency EMI
• Watchdog for the outputs

Applications
• Industrial I/O control
• PLC coupling
• Signal switching
• Interface to electromechanical relays

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

Standard drivers for:
• Linux
• 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
• Signed 64-bit drivers for Windows 8 / 7 / XP
• Real-time use with Linux and Windows on request

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

ADDIPACK functions:
• Digital input • Digital output • Watchdog

On request:
Further operating systems, compilers and samples.

Driver download: www.addi-data.com/downloads

Also for PCI
See APCI-1516, page 160

Windows
64/32-bit drivers

AddiPACK functions:
Digital input • Digital output • Watchdog

On request:
Further operating systems, compilers and samples.

Driver download: www.addi-data.com/downloads

LabVIEW™
LabWindows/CVI™

Protective circuit for the input channels

Protective circuit for the output channels
Specifications

### Digital inputs

<table>
<thead>
<tr>
<th>Specifications</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of inputs:</td>
<td>8 digital</td>
</tr>
<tr>
<td>(common ground acc. to IEC 1131-2)</td>
<td></td>
</tr>
<tr>
<td>Optical isolation:</td>
<td>1000 V through opto-couplers, from PC to peripheral</td>
</tr>
<tr>
<td>Nominal voltage:</td>
<td>24 V</td>
</tr>
<tr>
<td>Input current:</td>
<td>Channel 0-7: 2 mA at 24 V, typical</td>
</tr>
<tr>
<td>Input frequency (max.):</td>
<td>Channel 0-7: 5 kHz at 24 V</td>
</tr>
<tr>
<td>Logic input levels:</td>
<td></td>
</tr>
<tr>
<td>UN (max.):</td>
<td>30 V</td>
</tr>
<tr>
<td>UN (min.):</td>
<td>19 V</td>
</tr>
<tr>
<td>UL (max.):</td>
<td>14 V</td>
</tr>
<tr>
<td>UL (min.):</td>
<td>0 V</td>
</tr>
<tr>
<td>Filters/protective circuit:</td>
<td></td>
</tr>
<tr>
<td>Input filters, transistors, RC filters, RC, Diodo, opto-couplers</td>
<td></td>
</tr>
</tbody>
</table>

### Digital outputs

<table>
<thead>
<tr>
<th>Specifications</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of outputs:</td>
<td>8 digital</td>
</tr>
<tr>
<td>Output type:</td>
<td></td>
</tr>
<tr>
<td>High-side (load to ground) acc. to IEC 1131-2</td>
<td></td>
</tr>
<tr>
<td>Optical isolation:</td>
<td>1000 V (through opto-couplers), from PC to peripheral</td>
</tr>
<tr>
<td>Nominal voltage:</td>
<td>24 V</td>
</tr>
<tr>
<td>Supply voltage range:</td>
<td>11 to 36 V</td>
</tr>
<tr>
<td>Current limit:</td>
<td>1.5 A for all channels (through PTC)</td>
</tr>
<tr>
<td>Output current per output:</td>
<td>500 mA (typical)</td>
</tr>
<tr>
<td>Short-circuit current per output:</td>
<td>1.5 A (typ.) pulse current</td>
</tr>
<tr>
<td>RDS ON resistance:</td>
<td>max. 0.2 Ω at 25 °C</td>
</tr>
<tr>
<td>Switch-on time:</td>
<td>tON=0.5 A, load = resistance: 50 µs</td>
</tr>
<tr>
<td>Switch-off time:</td>
<td>tOFF=0.5 A, load = resistance: 75 µs</td>
</tr>
<tr>
<td>Overtemperature (shutdown):</td>
<td>135 °C (output driver)</td>
</tr>
<tr>
<td>Temperature hysteresis:</td>
<td>15 °C (output driver)</td>
</tr>
</tbody>
</table>

### Safety

**Shutdown logic (Vcc diagnostic):** When the ext. 24 V voltage drops below 7 V: The outputs are switched off.

**Watchdog:**
- For reserving the outputs to “0”
- Time units: 1 up to 4095 µs, ms, s

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

### EMC – Electromagnetic compatibility

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

### Physical and environmental conditions

**Dimensions:**
- 149 x 99 mm

**System bus:**
- Acc. to PCI Express base specification, Revision 1.0a (PCI Express 1.0a)

**Space required:**
- 1-14 lanes – 16-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)

---

### Ordering information

**APCle-1516**
Digital I/O board, optically isolated, 16 digital inputs and outputs, 24 V, for PCI Express. Incl. technical description and software drivers.

**Accessories**

- **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
**ST010-5:** 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

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 channel ~1.5 A typ.
- Self-resetting fuse (electronic fuse)
- Overvoltage protection
- High-frequency EMI
- Separate ground line for inputs and outputs

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
- Creepage distance IEC 61010-1
- Separate ground line for inputs and outputs

Applications

- Industrial I/O control
- PLC coupling
- Signal switching
- Interface to electromechanical relays
- Automatic test equipment
- ON/OFF monitoring of motors, lights...
- Watchdog timer
- ...

Software drivers

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

Standard drivers for:
- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

Drivers and samples for the following compilers and software packages:
- C#, .NET, C

On request:
Further operating systems, compilers and samples.

Driver download: www.addi-data.com/downloads

Preliminary product information

Also for
See APCI-1564, page 162
Digital inputs

Number of inputs: 32 digital inputs, (common ground channel 0-2 can be used as 32-bit counter inputs acc. to IEC 1131-2) (up to 500 kHz)
Interconnectable inputs: 16 channels (channel 4 to 19)
Optical isolation: 1000 V through opto-couplers, from PC to peripheral
Nominal voltage: 24 V
Input current: Channel 0-2: 6 mA at 24 V, typical
Input frequency (max.): Channel 0-2: 500 kHz at 24 V
Input voltage (max.): 30 V at 24 V
Logic input levels: UH (max.): 19 V / 1 mA, typical (channel 4-31)
UL (max.): 14 V / 0.1 mA, typical
UL (min.): 0 V / 0 mA, typical
Filters/protective circuit: input filters, transistor, RC filters, Z diode, opto-couplers

Digital outputs

Number of outputs: 32 digital outputs
Output type: High-side (load to ground) acc. to IEC 1131-2
Optical isolation: 1000 V (through opto-couplers), from PC to peripheral
Nominal voltage: 24 V
Supply voltage range: 11 to 36 V
Current limit: 1.5 A per 8 channels (through PTC)
Output current per output: 500 mA (typical)
Short-circuit current per output: 1.5 A (typ.) pulse current
Switch-on time: t_on = 0.5 µs, load = resistance: 50 µs
Switch-off time: t_off = 0.5 µs, load = resistance: 75 µs
Overtemperature (shutdown): 135 °C (output driver)
Temperature hysteresis: 15 °C (output driver)
Timer/watchdog

Time: 2 x 12-bit, 1 x programmable as watchdog from 1 µs to 4095 s

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: 168 x 99 mm
System bus: Acc. to PCI Express base specification, Revision 1.0a (PCI Express 1.0a)
Space required: 1 x 37-pin D-Sub male connector
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: 24-pin male connector
Temperature range: 0 to 60 °C (with forced cooling)

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

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
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, 64 digital inputs and outputs, 5 V, for PCI Express

**APCIe-1564-5V / APCIe-1564-5V-HS**

**PCI Express interface**
- 32 digital inputs, 5 V, including 16 interruptible inputs
- 32 digital outputs, 5 V, 50 mA/channel, Open Collector (5V) or High-Side (5V-HS)
- Optical isolation 1000 V

**Input and output filters**
- Connection through industry-standard D-Sub connector

**Features**

**Inputs**
- 32 optically isolated inputs, 5 V, incl. 16 interruptible inputs
- Channels 0–2 can be used as 32-bit counter inputs (up to 500 kHz)
- Reverse voltage protection
- All inputs are filtered

**Outputs**
- 32 optically isolated outputs, 5 V
  - APCIe-1564-5V: Open Collector outputs
  - APCIe-1564-5V-HS: High-Side outputs
- Output current per channel 50 mA
- Watchdog for resetting the outputs to "0"
- At Power-On, reset of the outputs to "0"
- Current limit: ~0.5 A per 8 channels (through PTC)
- Short-circuit current per output ~0.5 A typ.
- Self-resetting fuse (electronic fuse)
- Overtemperature and overvoltage protection
- External voltage supply screened and filtered

**Timer / Watchdog / Counter**
- 2 timers (12-bit), of which one can be used as a watchdog
- 3 counter (32-bit)

**Safety features**
- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Protection against fast transients (burst), overvoltage, electrostatic discharge and high-frequency EMI
- Separate ground line for inputs and outputs

**Applications**

- Industrial I/O control
- PLC coupling
- Signal switching
- Interface to electromechanical relays
- Automatic test equipment
- ON/OFF monitoring of motors, lights...
- Watchdog timer
- ...

**Software drivers**

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

**Standard drivers for:**
- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

**Drivers and samples for the following compilers and software packages:**
- C# .NET, C

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

Driver download: www.addi-data.com/downloads

---

**Protective circuit for the input channels**

- EMI filters and overvoltage protection
- Signal conditioning
- Optical isolation

---

**Protective circuit for the output channels**

- Filters and overvoltage protection
- Optical isolation
PCI Express boards, digital – PClE-1564-5V / PClE-1564-5V-HS

**Specifications**

**Digital inputs**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of inputs</td>
<td>32 digital inputs, (common ground) 16 channels (channel 4 to 19)</td>
</tr>
<tr>
<td>Acc. to IEC 1131-2</td>
<td>(up to 500 kHz)</td>
</tr>
<tr>
<td>Optical isolation</td>
<td>1000 V through opto-couplers, from PC to peripheral</td>
</tr>
<tr>
<td>Nominal voltage</td>
<td>5 V</td>
</tr>
<tr>
<td>Input current: Channel 0-2</td>
<td>8.5 mA at 5 V, typ.</td>
</tr>
<tr>
<td>Channel 4-31</td>
<td>5.9 mA at 5 V, typ.</td>
</tr>
<tr>
<td>Input frequency (max.): Channel 0-3</td>
<td>500 kHz at 5 V</td>
</tr>
<tr>
<td>Channel 4-31</td>
<td>5 kHz at 5 V</td>
</tr>
<tr>
<td>Logic input levels: UM (max.)</td>
<td>6 V / 7.8 mA typ. (channel 4-31)</td>
</tr>
<tr>
<td>UM (min.):</td>
<td>4 V / 4.1 mA typ. (channel 4-31)</td>
</tr>
<tr>
<td>UM (max.):</td>
<td>6 V / 11.3 mA typ. (channel 0-3)</td>
</tr>
<tr>
<td>UM (min.):</td>
<td>4 V / 5.6 mA typ. (channel 0-3)</td>
</tr>
<tr>
<td>UL (max.):</td>
<td>2 V / 0.8 mA typ. (channel 4-31)</td>
</tr>
<tr>
<td>UL (min.):</td>
<td>2 V / 1.1 mA typ. (channel 0-3)</td>
</tr>
<tr>
<td>UL (min.):</td>
<td>0 V / 0 mA typ.</td>
</tr>
<tr>
<td>Protective circuit</td>
<td>Input filters, transil diode, RC filters, Z diode, opto-couplers</td>
</tr>
</tbody>
</table>

**Digital outputs**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of outputs</td>
<td>32 digital outputs</td>
</tr>
<tr>
<td>Output type:</td>
<td>PClE-1564-5V: Open Collector PClE-1564-5V-HS: High-Side (load to ground)</td>
</tr>
<tr>
<td>Acc. to IEC 1131-2</td>
<td></td>
</tr>
<tr>
<td>Optical isolation</td>
<td>1000 V through opto-couplers, from PL to peripheral</td>
</tr>
<tr>
<td>Nominal voltage</td>
<td>5 V</td>
</tr>
<tr>
<td>Supply voltage range:</td>
<td>2.5 to 12 V (5V-Version) 5 to 35 V (5V-HS-Version)</td>
</tr>
<tr>
<td>Current limit:</td>
<td>0.5 A (typ) per 8 channels (through PTC)</td>
</tr>
<tr>
<td>Output current per output:</td>
<td>50 mA (typical)</td>
</tr>
<tr>
<td>Short-circuit current per output:</td>
<td>0.5 A (typ)</td>
</tr>
<tr>
<td>Timer/watchdog</td>
<td>Timer: 2 x 12-bit, 1 x programmable as watchdog from 1 µs to 4095 s</td>
</tr>
</tbody>
</table>

**Safety**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Watchdog:</td>
<td>For resetting the outputs to “0”</td>
</tr>
<tr>
<td>Common diagnostics:</td>
<td>For all 16 channels at overtemperature of one channel</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>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions:</td>
<td>168 x 99 mm</td>
</tr>
<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+8/16/16-lane PCI Express slot</td>
</tr>
<tr>
<td>Operating voltage:</td>
<td>+3.3 V from PCI</td>
</tr>
<tr>
<td>Current consumption:</td>
<td>inputs and outputs inactive 240 mA ± 10 %, typical inputs and outputs active 590 mA ± 10 %, typical</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>

**Preliminary product information**

**APClE-1564-5V / APCIe-1564-5V-HS**

Digital I/O board, optically isolated, 64 digital inputs and outputs, 5 V, for PCI Express. Incl. ribbon cable, technical description and software drivers.

**Versions**

- **APCIe-1564-5V:** 64 digital I/O, 5 V, Open Collector outputs
- **APCIe-1564-5V-HS:** 64 digital I/O, 5 V, High-Side outputs

**Accessories**

- **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

**Ordering information**

Phone: +49 7229 1847-0  info@addi-data.com
Fax: +49 7229 1847-222  www.addi-data.com
Digital I/O board, optically isolated, 16 digital inputs, 24 V, for PCI Express

Features
- Connector and software compatible to the digital I/O board APCIe-1016 for the PCI bus.

Inputs
- 16 optically isolated digital inputs, 24 V
- Reverse voltage protection
- All inputs are filtered

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

Applications
- Industrial I/O control
- PLC coupling
- Signal switching
- Interface to electromechanical relays
- ON/OFF monitoring of motors, lights...
- Interface to machines

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

Standard drivers for:
- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

On request:
Further operating systems, compilers and samples.

Driver download: www.addi-data.com/downloads

Protective circuit for the input channels

APCIe-1016
PCI-Express interface
16 digital inputs, 24 V
Optical isolation 1000 V
Input filters
Reverse voltage protection
Connection through industry-standard
D-Sub connector

* Preliminary product information
Digital I/O board, optically isolated, 16 digital inputs, 24 V, for PCI Express.

**Digital inputs**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of inputs:</td>
<td>16</td>
</tr>
<tr>
<td>(common ground acc. to IEC 1131-2)</td>
<td></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</td>
</tr>
<tr>
<td>Input current at 24 V:</td>
<td>2 mA typ.</td>
</tr>
<tr>
<td>Maximal input frequency:</td>
<td>5 kHz at 24 V</td>
</tr>
<tr>
<td>Logic input levels:</td>
<td>U nominal: 24 V</td>
</tr>
<tr>
<td>UH max.:</td>
<td>30 V/Current 9 mA typ.</td>
</tr>
<tr>
<td>UL max.:</td>
<td>19 V/Current 2 mA typ.</td>
</tr>
<tr>
<td>UL min.:</td>
<td>0 V/Current 0 mA typ.</td>
</tr>
<tr>
<td>Filters/protective circuits</td>
<td>Input filters, transit diodes, RC filters, Z diodes, opto-couplers</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>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions:</td>
<td>149 x 99 mm</td>
</tr>
<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- to 8-lane PCI Express slot</td>
</tr>
<tr>
<td>Operating voltage:</td>
<td>+3.3 V from PC</td>
</tr>
<tr>
<td>Current consumption:</td>
<td>Inactive inputs: 320 mA ± 10 %, typical</td>
</tr>
<tr>
<td></td>
<td>8 active inputs: 400 mA ± 10 %, typical</td>
</tr>
<tr>
<td>Port 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**

**APCIe-1016**

Digital input board, optically isolated, 16 digital inputs, 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, LED status display
- **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)
Digital input board, optically isolated, 32 digital inputs, 24 V, for PCI Express

APCIe-1032
PCI Express interface
32 digital inputs, 24 V, including 16 interruptible inputs
Optical isolation 1000 V
Input filters
Reverse voltage protection
Connection through industry-standard D-Sub connector

Features
- Connector and software compatible to the digital input board APCI-1032 for the PCI bus
- Monitoring program for testing and setting the board functions

Inputs
- 32 optically isolated digital inputs, 24 V, including 16 interruptible inputs
- Reverse voltage protection
- All inputs are filtered

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

Applications
- Industrial I/O control
- Signal switching
- Interface to electromechanical relays
- Automatic test equipment
- ON/OFF monitoring of motors, lights...
- Machine interfacing
- ...

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

Standard drivers for:
- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

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

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

Protective circuit for the input channels

*Preliminary product information
Digital inputs

Number of inputs: 32 (common ground acc. to IEC 1131-2)
Including interruptible inputs: 16 (input 0 to 15)
Optical isolation: Through opto-couplers, 1000 V from PC to peripheral

Comparator logic: ABS and UV mode
Nominal voltage: 24 V
Input current at 24 V: 6 mA typical
Maximum input frequency: 5 kHz (at nominal voltage)
Signal delay: 70 µs (at nominal voltage)

Logic input levels:
- U nominal: 24 V
- UH (max.): 30 V
- UL (min.): 14 V
Opto-couplers

Filters / protective circuits:
- Input filters, transil diodes, RC filters, Z diodes, opto-couplers

EMC – Electromagnetic compatibility

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

Physical and environmental conditions

Dimensions: 149 x 99 mm
System bus: Acc. to PCI Express base specification, Revision 1.0a (PCI Express 1.0a)
Space required: 1 slot or 1 lane PCI Express slot
Operating voltage: +3.3 V from PC
Current consumption: Inactive inputs 320 mA ± 10 %, typical
Active inputs 400 mA ± 10 %, typical
Front connector: 37-pin D-Sub male connector
Temperature range: 0 to 60 °C (with forced cooling)

Simplified block diagram

Pin assignment – 37-pin D-Sub male connector

ADC-1032
Digital Input board, optically isolated, 32 digital inputs, 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
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

Ordering information

APCIe-1032
Digital Input board, optically isolated, 32 digital inputs, 24 V, for PCI Express. Incl. technical description and software drivers.

* Preliminary product information
Digital output board, optically isolated, 32 digital outputs, 24 V / 5 V, for PCI Express

APCIe-2032 / APCIe-2032-5
PCI Express interface
32 digital outputs, 24 V or 5 V, 500 mA/channel
Optical isolation 1000 V
Output filters, short-circuit protection
Watchdog
The outputs are reset to “0” at Power-On

Features
- Connector and software compatible to the digital output board APCI-2023 for the PCI bus.
- 32 digital outputs, 24 V (APCIe-2032) or as 5 V version (APCIe-2032-5), optically isolated.
- Output current per channel: 500 mA
- Voltage range: 10 V to 36 V
- Diagnostic report, through status register at short-circuits, overtemperature, voltage drop or watchdog
- Programmable watchdog for resetting the outputs to “0”, function release through software
- Interrupt triggered through error
- At Power-On the outputs are reset to “0”

Safety features
- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Protection against fast transients (burst), overvoltage, electrostatic discharge and high-frequency EMI
- Maximum output current for 32 outputs 6 A typ.
  (2 x 3 A)
- 24 V power outputs with protection diodes and filters
- Self-resetting fuse (electronic fuse)
- Short-circuit current per output 1.5 A typ.
- Output capacitors against electromagnetic emissions
- Fast demagnetisation in case of inductive loads
- External 24 V voltage supply screened and filtered
- Shutdown logic: If the external 24 V voltage drops below 5 V, then the outputs are switched off.

Applications
- Signal switching
- Interface to electromechanical relays
- Automatic test equipment
- ON/OFF monitoring of motors, lights...
- Watchdog timer • Machine interfacing

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

Standard drivers for:
- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

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

ADDIPACK functions:
Digital output • Watchdog

On request:
Further operating systems, compilers and samples.

Driver download: www.addi-data.com/downloads

New!

* Preliminary product information
**Digital outputs**

Outsuts: 32  
Output type: High-side (load to ground) acc. to IEC 1131-2  
Optical isolation: through opto-couplers, 1000 V from PC to peripheral  
Nominal voltage: 24 V (APCIe-2032); at 5 V (APCIe-2032-5)  
Supply voltage: for 24 V version: 10 V to 36 V  
for 5 V version: 5 V to 12 V via front connector  
Max. current for 32 outputs: 6 A typ. (25 A)  
Output current: 500 mA max./channel  
Short-circuit current/output shutdown at 24 V, R_{in} < 0.1 Ω: 1.5 A  
RDS-ON resistance: 0.85 Ω max.  
Switch-on time:  
1. out=0,5 A, load = resistance: 94 µs typ. (APCIe-2032)  
2. out=50 mA, load = resistance: 250 µs typ. (APCIe-2032-5V)  
Switch-off time:  
1. out=0,5 A, load = resistance: 8 µs typ. (APCIe-2032)  
2. out=50 mA, load = resistance: 3 µs typ. (APCIe-2032-5V)  
Overtemperature (shutdown): 170 °C (output driver)  
Temperature hysteresis: 20 °C (output driver)

**Safetly**

Shutdown logic (Vcc diagnostic):  
If the ext. 24 V voltage drops below 5 V, then the outputs are switched off.  
CC-Diagnostics (short circuit): Pin 19: status bit or interrupt to the PC  
Watchdog: 8-bit, programmable, 20 ms to 5 s in steps of 20 ms

**EMC – Electromagnetic compatibility**

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

**Physical and environmental conditions**

Dimensions: 168 x 99 mm  
System bus: Acc. to PCI Express base specification, Revision 1.0a (PCI Express 1.0a)  
Space required: 1/4/8/16-lane PCI Express slot  
Operating voltage: +3.3 V from PC  
Current consumption: 350 mA ± 10 % typ.  
Front connector: 37-pin D-Sub male connector  
Temperature range: 0 to 60 °C (with forced cooling)

Screw terminal panel PX901-DG with cable ST010

Relay output board PX8500-G

**Accessories**

APCIe-2032:  
Digital output board, optically isolated, 32 digital outputs, 24 V. Incl. technical description and software drivers  
APCIe-2032-5:  
Digital output board, optically isolated, 32 digital outputs, 5 V. Incl. technical description and software drivers

**Ordering information**

**Simplified block diagram**

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

**ADDI-DATA connection**

Example 1  
Connection of the outputs through screw terminal panels

Example 2  
Connection of the outputs through PX8500-G relay output boards cascaded in 32 relays

**APCIe-2032 / APCIe-2032-5**

- APCIe-2032: Digital output board, optically isolated, 32 digital outputs, 24 V. Incl. technical description and software drivers  
- APCIe-2032-5: Digital output board, optically isolated, 32 digital outputs, 5 V. 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 (24 V supply separate)**  
**ST022: Round cable between two PX8500-G, shielded, 2 m**  
**ST8500: Ribbon cable for cascading two PX8500-G**

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

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
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

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

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

On request:
Further operating systems, compilers and samples.

Driver download: www.addi-data.com/downloads

Function principle of the relays

APCIe-2200

8 or 16 relay output channels
Max. switching voltage 200 VDC, 200 VAC
max. switching current 2 A

8/16 digital inputs 24 V,
incl. 7/15 interruptible inputs

Optical isolation 1000 V

Also for PCI
see APCIe-2200, page 174
Specifications

Relays
Type of contacts: 8/16 change-over
Max. switching voltage: 200 VDC, 200 VAC
Max. switching current: 2 A
Max. switching capacity: 60 W
Contact resistance: < 100 mΩ
Contact material: Ag and Au plated
Response time: Max. 4 ms, typ. 2.5 ms
Release time: Max. 4 ms, typ. 0.9 ms
Mechanical life: 10^8 operations
Electrical life: 10^5 operations at rated load

Digital inputs
Number of inputs: 8/16 incl. 7/15 interruptible inputs
Optical isolation: Through opto-couplers, 1000 V
Nominal voltage: 24 V
Input current: 5 – 8 mA
Signal delay: 70 µs (at 24 V)
Maximal input frequency: 10 kHz (at 24 V)

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

Simplified block diagram

APCIe-2200-16-8/APCIIe-2200-16-16

Pin assignment – 50-pin D-Sub connector

Example 1: APCIe-2200-16/8/APCIe-2200-16-16
- Connection of the relay outputs through screw terminal panel PX8001
- Connection of the digital inputs through ribbon cable to the screw terminal panel PX901-ZG

Example 2: APCIe-2200-8/8/APCIe-2200-8-8/ APCIe-2200-16
Connection of the relay outputs and the digital inputs through front connector to the screw terminal panel PX8001

ADDI-DATA connection

APCIe-2200
Relay board, optically isolated, 8/16 relays, 8/16 digital inputs, 24 V. Incl. technical description and software drivers.

APCIe-2200-16-16: 16 relays, 16 dig. inputs, with ribbon cable for the connection of the digital inputs
APCIe-2200-16-8: 16 relays, 8 dig. inputs, with ribbon cable for the connection of the digital inputs
APCIe-2200-8-8: 8 relays, 8 digital inputs, 24 V
APCIe-2200-8: 16 relays
APCIe-2200-8: 8 relays

Ordering information

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

Physical and environmental conditions
Dimensions: 149 x 99 mm
System bus: ACC. to PCI Express base specification, Revision 1.0a (PCI Express 1.0a)
Space required: 1-/4-/8-/16-lane PCI Express slot
Operating voltage: +3.3 V from the PC
Max. current consumption: 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)

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.
Watchdog board, optically isolated, 7 watchdogs/timer

APCIe-040
7 watchdogs/timers
8 electromechanical relays
with change-over contacts
7 digital inputs 24 V
2 alarm levels
Temperature monitoring from -35 °C to + 85 °C
Optical isolation 1000 V

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 software and hardware monitoring. External devices can thus be monitored (e.g. alarm systems, PLCs) and controlled (e.g. modems, dialing devices).

In addition, the PCI Express watchdog board 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 / Timer
- 7 watchdogs/timers
- 7 trigger channels/Gate inputs (24 V)
- Activation through software
- Configuration through software, readable
- Can be triggered through software or digital input
- Time base for the watchdog/timer: 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:
- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

Drivers and samples for the following compilers and software packages:
- C#, .NET, C

On request:
Further operating systems, compilers and samples.

Driver download: www.addi-data.com/downloads

*Preliminary product information
Specifications

Relays
Type of contacts: 8 change-over
Max. switching voltage: 200 V DC, 200 V AC
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: 1-4-8-16-lane PCI Express slot
Operating voltage: +3.3 V from the PC
Max. current consumption: 0.67 A ±10 %
Front connector: 50-pin D-Sub male connector
Temperature range: 0 to 60 °C (with forced cooling)

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

Ordering information
* Preliminary product information
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!

Features

- 32-bit data access
- RS422 driver with 5 MHz max.
  (10 MHz for the APCie-1711-10MHz – without ESD protection)
- With RS422/TTL input/output signals (APCie-1711) or 24 V input signals (APCie-1711-24V)
- Four onboard programmable function modules

Functions

- Incremental counter for the acquisition of incremental encoders (90° phase-shifted signals)
- BiSS-Master (B and C mode)
- SSI Synchronous Serial Interface. The SSI function is an interface for systems which allow an absolute position information via serial data transfer.
- Counter/timer (82C54)
- Pulse acquisition
- Frequency measurement
- Pulse width modulation (PWM)
- Period duration measurement
- Velocity measurement
- Digital inputs and outputs
- Edge time measurement (ETM)
- Parallel interface
- Sin/Cos (1 Vpp, 11 µApp)
- EnDat 2.2
- Customised functions

Available channels on one function module

- 4 channels, programmable either as digital inputs or outputs, optically isolated, RS422
- 3 channels, digital inputs, optically isolated, 24 V
- 1 digital power output, optically isolated, 24 V

Available functions:

- Incremental counter, SSI Synchronous Serial Interface, counter/timer, pulse acquisition, frequency, pulse width, period duration, velocity measurement, PWM, BiSS-Master, digital inputs and outputs, Sin/Cos, EnDat 2.2 ...

Function selection through software

Optical isolation

Inputs and outputs: RS422, TTL, 24 V

Customised functions

APCie-1711

Available functions:

- Incremental counter, SSI Synchronous Serial Interface, counter/timer, pulse acquisition, frequency, pulse width, period duration, velocity measurement, PWM, BiSS-Master, digital inputs and outputs, Sin/Cos, EnDat 2.2 ...

Function selection through software

Optical isolation

Inputs and outputs: RS422, TTL, 24 V

Customised functions

Additional channels

- 28 TTL I/O, without optical isolation

Versions

<table>
<thead>
<tr>
<th></th>
<th>RS422/ TTL- I/O</th>
<th>24 V inputs</th>
<th>5 V inputs</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>-</td>
<td>12</td>
<td>4</td>
<td>28</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:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

Drivers and samples for the following compilers and software packages:

- Microsoft VC++ • Borland C++ 5.01

On request:

Further operating systems, compilers and samples.

Driver download: www.addi-data.com/downloads
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>
<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>Incremental counter</td>
<td>Incremental counter</td>
<td>Pulse acquisition</td>
<td>Counter/Timer</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Configuration example 2</th>
<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>SSI</td>
<td>SSI</td>
<td>Incremental counter</td>
<td>digital I/O</td>
<td></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 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 APCie-1711</th>
<th>Max. number of signal generators or functions for 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>180</td>
</tr>
<tr>
<td>SSI</td>
<td>3</td>
<td>4</td>
<td>12</td>
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</tr>
<tr>
<td>Chronos</td>
<td>1</td>
<td>4</td>
<td>4</td>
<td>181</td>
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<td>BISS-Master</td>
<td>6</td>
<td>4</td>
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<td>Counter/Timer</td>
<td>3</td>
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<tr>
<td>TOR</td>
<td>2</td>
<td>4</td>
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<td>Pulse acquisition</td>
<td>4</td>
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<td>PWM</td>
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<td>ETM</td>
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<td>Digital I/O</td>
<td>8</td>
<td>4</td>
<td>32</td>
<td>185</td>
</tr>
<tr>
<td>TTL</td>
<td>24</td>
<td>1</td>
<td>24</td>
<td>–</td>
</tr>
<tr>
<td>Parallel Interface</td>
<td>1</td>
<td>4</td>
<td>1</td>
<td>142</td>
</tr>
<tr>
<td>Sin/Cos*</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>144</td>
</tr>
<tr>
<td>EnDat 2.2</td>
<td>2</td>
<td>4</td>
<td>8</td>
<td>143</td>
</tr>
</tbody>
</table>

*Extension module (EM) is required

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 in parallel. Up to 28 digital inputs, 24 V, can be acquired with the APCIe-1711-24 V. Up to 16 RS422 and 12 digital 24 V 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) in parallel. If an external trigger signal is used (maskable, rising or falling edge), there is no need to use one of the inputs for triggering.

The data is transferred directly via DMA into the RAM of the PC. If the Parallel Interface function is loaded on all function modules up to 28 digital inputs (RS422 / 24 V) are available.

### Used signals

<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 to 1 V

### Block diagram Parallel Interface

**Function BiSS-Master**

The **BiSS-Master** function is a bidirectional sensor interface for the communication with up to 6 sensors. BiSS B and C are supported.

### Features of the BiSS-Master function:
- 1 function module with a maximum amount of 6 sensors (3 per channel) for cascading the sensors it is necessary that each sensor has a data input and data output
- Read sensor data
- Read/Write register data

Get more information about the function range of the BiSS interface at [www.biss-interface.com](http://www.biss-interface.com).

### Used signals

<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) MA0</td>
</tr>
<tr>
<td>Input_Ch0_x</td>
<td>Bx +/-</td>
<td>RS422</td>
<td>Dig. input 0 (data line from slave to master) SL0</td>
</tr>
<tr>
<td>Output_Ch1_x</td>
<td>Cx +/-</td>
<td>RS422</td>
<td>Dig. output 1 (clock line from master to slave) MA1</td>
</tr>
<tr>
<td>Input_Ch1_x</td>
<td>Dx +/-</td>
<td>RS422</td>
<td>Dig. input 1 (data line from slave to master) SL1</td>
</tr>
</tbody>
</table>

x: Number of the function module (See pin assignment page 141)

* 24 V for the APCIe-1711-24 V

### Block diagram BiSS-Master
Function EnDat 2.2

EnDat 2.2 is a bidirectional synchronous-serial interface for position measurement devices. This interface allows the reading out of absolute position values and parameters, the writing of status and initialisation registers and the transfer of additional information about the position value. Furthermore, the EnDat 2.2 function modules support the analysis of diagnostic values and access to the OEM memory. Data transfer is effected serially.

On one board you can use up to 8 EnDat 2.2 sensors (2 sensors per function module). Each function module has its own clock pulse line (B or D) and data line (A or C).

The function EnDat 2.2 is only available for the 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>O</td>
<td>Bx +</td>
<td>Clock pulse line</td>
</tr>
<tr>
<td>0</td>
<td>CLK_0-</td>
<td>O</td>
<td>Bx -</td>
<td>Clock pulse line</td>
</tr>
<tr>
<td>0</td>
<td>DATA_0+</td>
<td>I/O</td>
<td>Ax +</td>
<td>Data line</td>
</tr>
<tr>
<td>0</td>
<td>DATA_0-</td>
<td>O</td>
<td>Ax -</td>
<td>Data line</td>
</tr>
<tr>
<td>1</td>
<td>CLK_1+</td>
<td>O</td>
<td>Dx +</td>
<td>Clock pulse line</td>
</tr>
<tr>
<td>1</td>
<td>CLK_1-</td>
<td>O</td>
<td>Dx -</td>
<td>Clock pulse line</td>
</tr>
<tr>
<td>1</td>
<td>DATA_1+</td>
<td>I/O</td>
<td>Cx +</td>
<td>Data line</td>
</tr>
<tr>
<td>1</td>
<td>DATA_1-</td>
<td>O</td>
<td>Cx -</td>
<td>Data line</td>
</tr>
<tr>
<td>Dig. I/O</td>
<td>DigIn0_x</td>
<td>1 (24 V)</td>
<td>Ex</td>
<td>Digital channel for unrestricted use</td>
</tr>
<tr>
<td>Dig. I/O</td>
<td>DigIn1_x</td>
<td>1 (24 V)</td>
<td>Fx</td>
<td>Digital channel for unrestricted use</td>
</tr>
<tr>
<td>Dig. I/O</td>
<td>DigIn2_x</td>
<td>1 (24 V)</td>
<td>Gx</td>
<td>Digital channel for unrestricted use</td>
</tr>
<tr>
<td>Dig. I/O</td>
<td>DigOut_x</td>
<td>0 (24 V)</td>
<td>Hx</td>
<td>Digital channel for unrestricted use</td>
</tr>
</tbody>
</table>

x: Number of the module (See pin assignment page 141)

Application example

Exact positioning of axes for the regulation of surface measurement devices for rotationally symmetric parts (e.g. gear wheels)

Challenge
For the measurement of the surfaces of rotationally symmetric parts numerous axes must be positioned. Furthermore the signals must be fastly transferred in order to detect the position as exactly as possible. To safe 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 (optional APCIe-1711-10MHZ version) and its resistance to interferences, the board is able to move the axes precisely even at high speed.
Function Sin/Cos

With the function Sin/Cos, up to 4 Sin/Cos sensors can be used on one board (function module 0 or 1 as well as 2 or 3). The extension module EM-SINCOS is meant for the connection of signals with 1 Vpp, the EM-SINCOS-11µApp is able to acquire 11 µApp signals. A signal period of the Sin/Cos signal is divided in a predefined number of steps, depending on the chosen resolution. The maximum input frequency of the counter input also depends on the chosen resolution.

Please note: The function Sin/Cos can only be used with the extension module EM-SINCOS.

### Used signals

<table>
<thead>
<tr>
<th>Signal name</th>
<th>Signal type</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMx_Sin+</td>
<td>1 Vp/11 µA diff.</td>
<td>Trace A (Sinus) of Sin/Cos sensor 0</td>
</tr>
<tr>
<td>EMx_Sin0</td>
<td>1 Vp/11 µA diff.</td>
<td>Trace A (Sinus) of Sin/Cos sensor 0</td>
</tr>
<tr>
<td>EMx_Cos+</td>
<td>1 Vp/11 µA diff.</td>
<td>Trace B (Cosinus) of Sin/Cos sensor 0</td>
</tr>
<tr>
<td>EMx_Cos0</td>
<td>1 Vp/11 µA diff.</td>
<td>Trace B (Cosinus) of Sin/Cos sensor 0</td>
</tr>
<tr>
<td>EMx_Index0+</td>
<td>differential</td>
<td>Trace C+ (Index) of Sin/Cos sensor 0</td>
</tr>
<tr>
<td>EMx_Index0-</td>
<td>differential</td>
<td>Trace C- (Index) of Sin/Cos sensor 0</td>
</tr>
<tr>
<td>EMx_Sin1+</td>
<td>1 Vp/11 µA diff.</td>
<td>Trace A (Sinus) of Sin/Cos sensor 1</td>
</tr>
<tr>
<td>EMx_Sin1-</td>
<td>1 Vp/11 µA diff.</td>
<td>Trace A (Sinus) of Sin/Cos sensor 1</td>
</tr>
<tr>
<td>EMx_Cos1+</td>
<td>1 Vp/11 µA diff.</td>
<td>Trace B (Cosinus) of Sin/Cos sensor 1</td>
</tr>
<tr>
<td>EMx_Cos1-</td>
<td>1 Vp/11 µA diff.</td>
<td>Trace B (Cosinus) of Sin/Cos sensor 1</td>
</tr>
<tr>
<td>EMx_Index1+</td>
<td>differential</td>
<td>Trace C+ (Index) of Sin/Cos sensor 1</td>
</tr>
<tr>
<td>EMx_Index1-</td>
<td>differential</td>
<td>Trace C- (Index) of Sin/Cos sensor 1</td>
</tr>
<tr>
<td>EMx_DIG_IN</td>
<td>24 V / optional 5 V</td>
<td>Digital trigger input (can be used for latch resp. interrupt logic)</td>
</tr>
<tr>
<td>DigIn0, y</td>
<td>24 V / optional 5 V</td>
<td>Digital input for unrestricted use</td>
</tr>
<tr>
<td>DigIn1, y</td>
<td>24 V / optional 5 V</td>
<td>Digital input for unrestricted use</td>
</tr>
<tr>
<td>DigOut, y</td>
<td>24 V</td>
<td>Digital output for unrestricted use</td>
</tr>
</tbody>
</table>

x: Number of the extension module (0 resp. 1); y: Number of the function module (0 to 3)

### Pin assignment – 50-pin D-Sub male connector

### Pin assignment – 78-pin D-Sub female connector

**FM** = Function module

**EM** = Extension Module

---

**ADDI-DATA**

SPIRIT OF EXCELLENCE

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

**Free programming of the functions**
- Acquisition of incremental encoders (1 x 32-bit or 2 x 16-bit)
-SSI (max. 3 encoders per module)
- Counter/Timer (3 counters similar to 82C54)
- Pulse counter (4 x 32-bit counters per module)
- Chronos (chronometer)
-TOR (pulse counter with time slices, ...)
-Digital I/O (4 x 24 V, 4 x TTI, RS422)
-PWM (pulse width modulation, 2 x per module)
-BIOS-Master (B and C mode)
-ETM (Timer interface for period duration measurement, edge time, ...)
-TTI (TTI I/O without isolation)
-Parallel Interface
-EnDat 2.2
-Sin/Cos
-Customised functions

### Signals

Digital I/O signals, TTL or RS422, 24 V

### Inputs

**Digital inputs or outputs (A, B, C, D)**

- **APCIe-1711**: Isolated counter board with programmable functionality
- **APCIe-1711-24V**: 24 V inputs instead of RS422 (A, B, C, D)
- **APCIe-1711-5V-I**: 5 V inputs instead of 24 V (E, F, G)
- **APCIe-1711-10MHz**: Input frequency 10 MHz, Inputs (A, B, C, D)
- **APCIe-1711-10MHz**: Input frequency 10 MHz (at nominal voltage)

#### Mass-related inputs, 24 V (E, F, G):

- **Number of inputs**: 12
- **Nominal voltage**: 24 VDC
- **Logic input levels**: Unnominal: 24 V
- **UH max.**: 30 V
- **UH min.**: 19 V
- **UL max.**: 14 V
- **UL min.**: 0 V

#### Outputs:

- **Nominal output frequency**: 5 MHz (at nominal voltage)
- **Max. number of outputs**: 16
- **Digital outputs, 24 V (H)**
  - **Output type**: High-side (load to ground)
  - **Nominal voltage**: 24 VDC
  - **Supply voltage range**: 4.75 V to 25 VDC, 24 V ext. pin
  - **Maximum current**: 50 mA per output / 270 mA for all outputs (PCL)
  - **Overtemperature**: 165 °C (all outputs switch off)

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

- **24 V inputs (channels A to G)**
- **Nominal voltage**: 24 VDC
- **Max. input frequency**: 1 MHz (at nominal voltage) depending on the function
- **Logic input levels**: Unnominal: 24 V
  - **UH max.**: 30 V
  - **UH min.**: 18 V
  - **UL max.**: 16 V
  - **UL min.**: 0 V

#### Functions

- **On the board APCIe-1711-24V A0, Bx, Lx and Dx are only available as 24 V inputs and not as outputs. Therefore not any function can be used on any version of the board.**
- **Available functions**: - Incremental counter
  - Sin/Cos
- **Partially available**: - PWM

Please find more detailed information in the respective function manual.

### Safety

- **Optical isolation**: 1000 V

### EMC – Electromagnetic compatibility

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

### PC system requirements and environmental conditions

- **Dimensions**: 168 x 98 mm
- **System bus**: Acc. to PCI Express base specification, Revision 1.0a (PCI Express 1.0a)
- **Space required**: 1-/4-/8-/16-lane PCI Express slot
- **Operating voltage**: + 3.3 V / + 12 V from the PC +24 V ext.
- **Current consumption APCIe-1711**: 3.3 V / 30 mA
  - 12 V / 76 mA typ.
- **Power connector**: 7-pin D-Sub female connector
- **Pinout connector**: 34-pin D-Sub male connector
- **Temperature range**: 0 to 60 °C (with forced cooling)
- **Temperature range**: 0 to 60 °C (with forced cooling)

### Option

- **Opt. 5V**: 3.3 V outputs instead of 24 V (H0, H1, H2, H3)

### Accessories

- **PX8001**: 3-row screw terminal panel with housing for DIN rail
- **ST1771-50**: Standard round cable, shielded, twisted pairs, 2 m, 78-pin male connector to 50-pin male connector
- **ST370-16**: Standard round cable, shielded, twisted pairs, 2 m, 78-pin male connector to 50-pin male connector
- **FB8001**: Ribbon cable

* Preliminary product information
Multifunction board, optically isolated, 16 SE / 8 differential inputs, 4/8 analog outputs, 16-bit

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, 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 Express DMA for analog data acquisition
- Overvoltage protection
- Input filters: 159 kHz

**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

**Analog outputs**
- 8 or 4 analog outputs, optically isolated 500 V
- Voltage or current outputs
- 16-bit resolution (15-bit for 0-10 V)
- Output voltage: ± 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 / Watchdog**
- 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:
- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

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

ADDPACK functions
- Analog input • Analog output • Digital input
- Digital output • Watchdog • Timer

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

Driver download: www.addi-data.com/downloads

Also for PCI
see LPC-3120, page 192
Also for CompactPCI™
see CPC-3120, page 250
Also for CompactPCI™ Serial
see CPCs-3121, page 236
Specifications

### Analog inputs

- **Number of inputs:** 16 single-ended / 8 differential inputs or 8 single-ended / 4 differential inputs
- **Resolution:** 16-bit
- **Optical isolation:** ±10 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)
- **Throughput:** 100 kHz
- **Gain:** Software programmable (x1, x2, x5, x10)
- **Resolution (± LSB):** ± 1 LSB max. (A/D converter)
- **Data transfer:** Through software, timer, external event (24 V input)
- **Trigger:** Endpoint, conversion, EOC (End Of Conversion), EOS (End Of Scan), DMA transfer at EOC
- **Interrupts:** End of conversion, at timer overrun, line of scan

### Analog outputs

- **Number of outputs:** 8 or 4
- **Resolution:** 16-bit
- **Optical isolation:** ±10 V through opto-couplers
- **Output range:** ±10 V ±10 V switchable through software (0-20 mA optional)
- **Overvoltage protection:** ± 15 V
- **Max. output current per load:** ± 5 mA, ± 25 mA (short time)
- **Output voltage after reset:** 0 V
- **Current outputs**
  - **Resolution:** 15-bit
  - **Output range:** 0-20 mA
  - **Max. output current:** 0-20 mA
  - **Output voltage after reset:** 0 V

### Digital I/O

- **Number of I/O channels:** 4 digital inputs, 4 digital high-side outputs, 24 V
- **Optical isolation:** 1000 V through opto-couplers
- **Input current at 24 V:** 0 mA typ.
- **Input range:** 0-24 V
- **Supply voltage:** 8-32 V
- **Max. switching current:** 50 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:** Addi to PCI Express base specification, Revision 1.0a (PCI Express 1.0a)
- **Space required:** 16 Mbps;
- **Operating voltage:** ±5 V, ±12 V from PC
- **Front connector:** 37-pin D-Sub female connector
- **Temperature range:** -20 to +55 °C (min. forced cooling)

### Ordering information

- **APCle-3121 / APCle-3123**
  - Multifunction board, optically isolated, 16 SE/B differential inputs, 4/8 analog outputs, 16-bit, for PCI Express. Incl. techn. description and software drivers.

### Versions

- **Voltage**
  - **APCle-312x-16-8**
    - Version with 16 SE / 8 diff. inputs, 8 analog outputs
  - **APCle-312x-16-4**
    - Version with 16 SE / 8 diff. inputs, 4 analog outputs
  - **APCle-312x-8-8**
    - Version with 8 SE / 4 diff. inputs, 8 analog outputs
  - **APCle-312x-8-4**
    - Version with 8 SE / 4 diff. inputs, 4 analog outputs

### Current

- **APCle-3121-16-8C**
  - Version with 16 SE / 8 diff. inputs, 8 analog outputs
- **APCle-3121-16-4C**
  - Version with 16 SE / 8 diff. inputs, 4 analog outputs
- **APCle-3121-8-8C**
  - Version with 8 SE / 4 diff. inputs, 8 analog outputs
- **APCle-3121-8-4C**
  - Version with 8 SE / 4 diff. inputs, 4 analog outputs

### Options

- **Please indicate the number of channels**
  - **Option SF:** Precision filter for 1 single-ended channel
  - **Option DF:** Precision filter for 1 diff. channel
  - **Option PC:** Current input (0)-(4)-20 mA for 1 channel
  - **PC-SE:** for single-ended PC-Diff; for differential

### Accessories

- **PX901-A:** Screw terminal panel for connecting the analog I/O
- **PX901-A:** Same as PX901-A with housing for DIN rail
- **PX_BNC:** BNC connection box for connecting the analog I/O
- **PX901-ZG:** Standard round cable, shielded, twisted pairs, 2 m
- **ST010:** Standard round cable, shielded, twisted pairs, 5 m
- **FB3000:** Ribbon cable for digital I/O

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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
- 16-bit resolution
- Optical isolation 500 V
- Throughput: 100 kHz
- 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 (option) freely programmable through software for each channel
- Gain PGA x1, x2, x5, x10 freely programmable through software for each channel
- PCI Express DMA for analog data acquisition
- Overvoltage protection
- Input filters: 159 kHz

Analog acquisition
- One single channel, several channels, several channels through scan list
- Automatic analog acquisition through cyclic timer control
- Acquisition through scan list: up to 16 entries with gain, channel, unipolar/bipolar
- Acquisition triggered through software, timer, external event
- Trigger functions: Software trigger or external trigger: the analog acquisition (single or sequence) is started through signal switching from 0 V to 24 V at the digital input 0.
- Interrupt: end of single channel, end of multichannel, end of scan list

Digital
- 4 dig. inputs including 1 interruptible input
- 4 dig. outputs, 24 V, optically isolated

Timer
- 1 timer

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:
- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

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

ADDIPACK functions
- Analog input • Digital input
- Digital output • Watchdog • Timer

On request:
Further operating systems, compilers and samples.

Driver download: www.addi-data.com/downloads
Specifications

Analog inputs

- Number of inputs: 16 single-ended / 8 differential inputs or 8 single-ended / 4 differential inputs
- Resolution: 16-bit
- Optical isolation: 500 V through opto-couplers from PC to peripheral
- Input ranges: 0-10 V, ± 10 V, ± 5 V, ± 0.5 V ranges
- Throughput: 100 kHz
- Scan: Software programmable (x1, x2, x5, x10)
- Relative precision (INL): ± 2 LSB max. (ADC converter)
- Diff. non-linearity (DNL): ± 1 LSB max. (ADC converter)
- Bandwidth (–3 dB): Limited to 139 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

- Number of I/O channels: 4 digital inputs, 4 digital high-side outputs, 24 V
- Input current at 24 V: 10 mA typ.
- Input range: 0-30 V
- Supply voltage: 8-32 V
- Max. switching current: 65 mA typ.

EMC – Electromagnetic compatibility

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

Physical and environmental conditions

- Dimensions: 168 x 99 mm
- System bus: Acc. to PCI Express base specification, Revision 1.0a (PCI Express 1.0a)
- Space required: 1-/4-/8-/16-lane PCI Express slot
- Operating voltage: + 3.3 V, +12 V from PC
- Front connector: 37-pin D-Sub male connector
- Temperature range: 0 to 60 °C (with forced cooling)

ADC

- Analog I/O conversion: 16-bit
- Resolution: 16-bit
- Input ranges: 0-10 V, ± 10 V, ± 5 V, ± 0.5 V
- Bandwidth (–3 dB): Limited to 139 kHz
- Trigger: Through software, timer, external event
- Data transfer: Data to the PC through FIFO memory, I/O commands, interrupt at EOC, DMA transfer at EOC
- Interupts: End of conversion, at timer overrun, End of scan

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- Front connector: 37-pin D-Sub male connector
- Temperature range: 0 to 60 °C (with forced cooling)

PCI Express boards, analog – APCIe-3021

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

**Versions**

- APCIe-3021-16: Version with 16 SE/8 diff. inputs
- APCIe-3021-8: Version with 8 SE/4 diff. inputs
- APCIe-3021-4: Version with 4 SE/2 diff. inputs

**Options**

- 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 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

Phone: +49 7229 1847-0  
Fax: +49 7229 1847-222  
info@addi-data.com  
www.addi-data.com
**Analog output board, optically isolated, 8/4 analog outputs, 16-bit**

### Features

**Analog outputs**
- 8 or 4 analog outputs, optically isolated 500 V
- Voltage or current outputs
- 16-bit resolution (15-bit for 0-10 V)
- Output ranges: ±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 / Watchdog**
- 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:**
- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

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

**ADDIPACK functions**
- Analog input • Analog output • Digital input
- Digital output • Watchdog • Timer

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

Driver download: www.addi-data.com/downloads

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### PCIe-3521

**PCI Express interface**

- 8/4 analog outputs, 16-bit
- Optical isolation 500 V
- 8 digital I/O, 24 V, optically isolated, timer, watchdog
Specifications

Analog outputs

<table>
<thead>
<tr>
<th>Number of outputs:</th>
<th>8 or 4</th>
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<tbody>
<tr>
<td>Resolution:</td>
<td>16-bit</td>
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<tr>
<td>Optical isolation:</td>
<td>500 V through opto-couplers</td>
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<tr>
<td>Output range:</td>
<td>±10 V, ±20 V switchable through software</td>
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<tr>
<td>Overvoltage protection:</td>
<td>±15 V</td>
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<tr>
<td>Max. output current</td>
<td>±5 mA, 2 mA</td>
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<tr>
<td>Short-circuit current:</td>
<td>±25 mA (short time)</td>
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<tr>
<td>Output voltage after reset:</td>
<td>0 V</td>
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</tbody>
</table>

Current outputs

| Resolution: | 15-bit |
| Output range: | 0-20 mA |
| Load (at 20 mA): | 10.11 mm, 560.12 mm |
| Output current after reset: | 0 mA |

Digital I/O

| Number of I/O channels: | 4 dig. inputs, 4 dig. high-side outputs, 24 V |
| Optical isolation:      | 1000 V through opto-couplers |
| Input current at 24 V:  | 10 mA typ. |
| 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: | 1/4-1/8-1/16-lane PCI Express slot |
| Operating voltage: | +3.3 V, +12 V from PC |
| Front connector: | 37-pin D-Sub male connector |
| Temperature range: | 0 to 60 °C (with forced cooling) |

PIN diagram – 37-pin D-Sub male connector

PIN diagram – 16-pin male connector

ADDI-DATA connection

Ordering information

APCle-3521
Analog output board, optically isolated, 8/4 analog outputs, 16-bit, for PCI Express.
Incl. technical description and software drivers.

Versions

<table>
<thead>
<tr>
<th>Voltage</th>
<th>APCle-3521-8</th>
<th>Version with 8 analog voltage outputs</th>
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<tr>
<td>Current</td>
<td>APCle-3521-4</td>
<td>Version with 4 analog voltage outputs</td>
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</table>

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<th>Voltage</th>
<th>APCle-3521-8C</th>
<th>Version with 8 analog current outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td>APCle-3521-4C</td>
<td>Version with 4 analog current outputs</td>
</tr>
</tbody>
</table>

Accessories

PX901-A: Screw terminal panel for connecting the analog I/O
PX901-A: 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 dig. I/O
ST001: Standard round cable, shielded, twisted pairs, 2 m
ST011: Standard round cable, shielded, twisted pairs, 5 m
FB3000: Ribbon cable for digital I/O

Phone: +49 7229 1847-0 info@addi-data.com
Fax: +49 7229 1847-222 www.addi-data.com
Noise and vibration measurement board, optically isolated, 4 analog inputs, 24-bit, for PCI-Express

**APCle-3660-4**

4 SE/diff. {+-} inputs, simultaneous sampling

- Sampling frequency up to 4 MHz
- Connection through BNC connectors
- Onboard power supply for ICP™ sensors
- 4 digital inputs, 4 digital outputs, 24 V
- Optical isolation between the channels
- Onboard SDRAM module (option)

**Features**

- 4-lane PCI-Express board

**Analog inputs**

- 4 SE or diff. {+-} inputs
- One A/D converter per channel: simultaneous acquisition on all analog channels
- Sampling frequency between 125 kHz and 4 MHz
- 24-bit resolution
- Input range ±10 V
- Gain 1 to 10, software-programmable
- Input coupling AC, DC, GND, software-programmable for each channel
- Anti-aliasing filter
- 1000 V optical isolation between the channels
- Overvoltage protection

**Current sources**

- 4 current sources for the direct connection of ICP™ sensors (integrated circuit piezoelectric)
- 4 mA typ., 24 V max.

**Counter inputs (option)**

- 4 counter inputs, RS422

**Digital**

- 4 digital inputs, 24 V, optoisolated
- 4 digital outputs, 24 V, optoisolated

**Onboard SDRAM module (option)**

- 1 GByte

**Software**

- Standard drivers for:
  - Linux
  - 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
  - Signed 64-bit drivers for Windows 8 / 7 / XP
  - Real-time use with Linux and Windows on request

- Samples for the following compilers:
  - Visual C++
  - Borland C

Driver download: www.addi-data.com/downloads

**Ordering information**

**APCle-3660-4**

Noise and vibration measurement board, optically isolated, 4 analog inputs, 24-bit, 4 current sources, anti aliasing filter, for PCI-Express.

Incl. technical description and software drivers.

**Versions**

- APCle-3660-4: 4 analog inputs, 4 current sources for connecting ICP™ sensors, 4 digital inputs, 4 digital outputs

**Options**

- 4 counter inputs
- 1 GByte SDRAM

**Accessories**

- FB3660-D: Ribbon cable for connecting the digital I/O on separate bracket, 30 cm

* Preliminary product information
Noise and vibration measurement board, optically isolated, 4 analog inputs, 24-bit, for PCI-Express.

**Features**
- 4-lane PCI-Express board
- Analog inputs
  - 4 SE or diff. (+/-) inputs
  - One A/D converter per channel: simultaneous acquisition on all analog channels
  - Sampling frequency between 125 kHz and 4 MHz
  - 24-bit resolution
  - Input range ±10 V
  - Gain 1 to 10, software-programmable
  - Input coupling AC, DC, GND, software-programmable for each channel
  - Anti-aliasing filter
  - 1000 V optical isolation between the channels
  - Overvoltage protection
- Current sources
  - 4 current sources for the direct connection of ICP™ sensors (integrated circuit piezoelectric)
  - 4 mA typ., 24 V max.
- Counter inputs (option)
  - 4 counter inputs, RS422 digital
- Digital inputs, 4 digital outputs, 24 V, optoisolated
- Onboard sdRAM module (option)
  - 1 GB

**Software**
- Standard drivers for:
  - Linux
  - 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
  - Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request
- Samples for the following compilers:
  - Visual C++
  - Borland C

**Driver download**: www.addi-data.com/download

**Versions**
- **aPCIe-3660-4**: 4 analog inputs, 4 current sources for connecting ICP™ sensors, 4 digital inputs, 4 digital outputs

**Options**
- 4 counter inputs
- 1 GByte SDRAM

**Accessories**
- FB3660-D: Ribbon cable for connecting the digital I/O on separate bracket, 30 cm
1 to 8-port serial interface, RS232, RS422, RS485, 20 mA CL, modular mounting through modules

The APCE-7xxx communication boards are configured by inserting SI modules which the board identifies automatically. The serial interfaces can be configured through modules in the following modes: RS232, RS422, RS485 (with or without optical isolation) and current loop (with optical isolation). The SI modules with optical isolation allow a protection of up to 1000 V for the use in noisy environments where earth loops can occur. The I/O lines are protected against short-circuits, fast transients, electrostatic discharge and high-frequency EMI. The interface is supported through a 128-byte FIFO buffer for sending and receiving data and guarantees reliable operation at high transfer rates.

Features

- Asynchronous communication adapter
- Modular mounting through SI modules
- 1 socket for 1-port serial interface (APCE-7300)
- 2 sockets for 2-port serial interface (APCE-7420)
- 4 sockets for 4-port serial interface (APCE-7500, APCE-7500/4C)
- 8 sockets for 8-port serial interface (APCE-7800)
- Can be configured as RS232, RS422, RS485 with/without optical isolation, 20 mA Current Loop (active, passive), with optical isolation through separate SI modules
- Automatic addressing through BIOS
- Automatic module identification
- UART 16C950, downwards compatible until 16C450
- 128-byte FIFO buffer for sending and receiving data
- Programmable transfer rate
- 5, 6, 7 or 8-bit character
- 1, 1½ or 2 stop bits
- Parity: even, odd or none
- Automatic transmitter control for RS485 and transmitter control through FIFO level
- Common interrupt

Safety features

- SI modules available with optical isolation 1000 V
- Creeping distance IEC 61010-1 (VDE411-1)
- Protection against fast transients (Burst)
- Short-circuit protection for RS422 and RS485
- Internal diagnostic possibility, break, parity, overrun and framing error

Applications

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

Software drivers

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

Standard drivers for:
- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

Drivers and samples for the following compilers and software packages:
- Microsoft VC++
- Visual Basic
- Delphi

On request:
Further operating systems, compilers and samples.

Driver download: www.addi-data.com/downloads
### Specifications

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

- **Mode:** RS232, RS422, RS485, 20 mA Current Loop (active, passive) with or without optical isolation through separate SI modules
- **Transmission mode:** Asynchronous, full or half duplex (SI modules)
- **Addressing:** Automatic through BIOS
- **Memory:** 128-byte FIFO buffer for transmitter and receiver
- **Protocol:** 5-, 6-, 7- or 8-bit character 1, 1½ or 2 stop bits
- **Parity:** Even, odd, none, mark, space
- **Interupt lines:** Automatic configuration through BIOS

**EMC – Electromagnetic compatibility**

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

### Safety features

- **Optical isolation:** 1000 V (SI modules)

### Physical and environmental conditions

- **Dimensions:** 168 x 99 mm
- **System bus:** ACC. to PCI Express base specification, Revision 1.0a (PCI Express 1.0a)
- **Space required:** 1-/4-/8-/16-lane PCI Express slot
- **Operating voltage:** +3.3 V from the PC
- **Front connector:** 9-pin D-Sub male connector (APCIe-7300), 2 x 9-pin D-Sub male connector (APCIe-7420), 37-pin D-Sub male connector (APCIe-7500), 78-pin D-Sub female connector (APCIe-7800)
- **Temperature range:** 0 to 60 °C (with forced cooling)

### Ordering information

**SI modules:** Please order the modules separately!

- **SI232-G:** RS232 mode, isolated
- **SI232:** RS232 mode
- **SI422-G:** RS422 mode, isolated
- **SI422:** RS422 mode, isolated with RTS/CTS
- **SI422-PEP:** RS422 mode
- **SI485-G:** RS485 mode, isolated
- **SI485:** RS485 mode
- **SITTY:** 20 mA Current Loop mode (active, passive), isolated

**Accessories**

- **ST075:** Shielded round cable, 37 to 4 x 9-pin (for 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)
Digital boards are used for industrial I/O regulation, signal switching, as interface to automatic test devices, for the on/off monitoring of electrical consumers or as interfaces to machines. They can activate e.g. ventilation, valves, pumps and electromechanical relays.

**A large product range**
Our product range of digital input and output boards for the PCI bus is as varied as their possibilities of use. In our product range you will find:
- Digital input boards, 5 V, 24 V
- Digital I/O boards, 5 V, 12 V, 24 V, TTL
- Digital output boards, 24 V
- Relay boards, 8 to 16 relays
All PCI boards can be used in 5 V systems.
Some of the boards have been developed for use in 5 V systems as well as in 3.3 V systems.

**More performance through CPU relief**
The interruptible inputs of the digital I/O boards make continuous cyclic scan processes (polling) for routine monitoring and analysis tasks unnecessary, which relieves the processor and the software. At a status change of the digital inputs, a corresponding interrupt is generated, enabling the system to react to the event through the interrupt routine and thus meet the defined real-time criteria.

**Safe machine start**
Until the current supply provides its nominal voltage in the initialisation phase, the logic components on electronic devices run through different undefined intermediate states.
Without special measures the state of the digital outputs cannot be ascertained. Thus the I/O and output boards reset all outputs to “0” at power-on or reset. This allows straight solutions for machine starts or the start of measurement processes.

**Correct state identification**
With the digital boards by ADDI-DATA, you can reliably find out the state (0 or 1) of the connected devices or sensors. There is thus no undefined range that could lead to switching errors.

**Real-time complete system MSX-Box**
Combination of the MSX-Box PAC system and PCI boards
- Compact and flexible
- Stand-alone system (own CPU)
- Long-term availability
MSX-Box product information see page 20

**High degree of protection**
- Optical isolation from 500 V to 1000 V
- Protection against short-circuits, overtemperature, overvoltage
- Filters for the inputs and outputs
- Industry-standard D-Sub connectors
### Product overview

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<td>PCI boards, digital I/O</td>
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</table>

| 32-bit PCI bus          | PCI 5 V          | 5 V                  | 5 V                  | 3.3 V       | 5 V              | 3.3 V / 5 V     | 3.3 V / 5 V     |
|-------------------------|------------------|----------------------|----------------------|-------------|------------------|------------------|
| FPGA                    |                   |                      |                      |             |                  |                  |
| Filters and protective  | ✓                 | ✓                   | ✓                   | ✓           | ✓                | ✓                |                  |
| circuits                |                   |                      |                      |             |                  |                  |
| Input channels          | 16                | 8                   | 32                  | 32          | 32               | 16               | 48 TTL (APCI-1648) 96 TTL (APCI-1696) |
| Optical isolation 1000 V|                   |                      |                      |             |                  |                  |
| Interruptible           |                   |                      |                      |             |                  |                  |
| input channels          | 14                |                    |                      |             |                  |                  |
| Nominal voltage (V)     | 24 V (19-30)      |                     |                     |             | 24 V (19-30)    |                     |                      |
| DC (V)                  | 12 V (APCI-1500-12V) |                   |                      |             | 5 V              |                     |                      |
| Input current at 24 VDC | 6 mA              | 6 mA                | 5 mA                | 5 mA        | 6 mA             |                   |
| Output channels         |                   |                      |                      |             |                  |                  |
| (24 V high-side drivers)| 16                | 8                   | 32                  | 32          | 16               | 48 TTL (APCI-1648) 96 TTL (APCI-1696) |
| Optical isolation 1000 V|                   |                      |                      |             |                  |                  |
| Output channels (5 V   |                   |                      |                      |             |                  |                  |
| high-side drivers)      |                   |                      |                      |             |                  |                  |
| Open Collector          |                   |                      |                      |             |                  |                  |
| Relays                  |                   |                      |                      |             | 8/16 relays      |                  |
| Optical isolation 1000 V|                   |                      |                      |             |                  |                  |
| Nominal voltage (V)     | 24 V DC (10-36)   | 24 V DC (10-36)     | 24 V DC (10-36)     | 5 V         | 24 V DC (10-36)  | 24 V DC (10-36)  | 60 V DC          |
| DC (V)                  |                   |                     |                     |             | 5 V (APCI-1502-5) | 24 V DC (10-36)  | 48 V AC          |
| Output current (A)      | 0.5(1)            | 0.5(1)              | 0.5(1)              | 50 mA       | 0.5(1)           | 0.5(1)           | 1                |
| for one channel         |                   |                      |                      |             |                  |                  | 12 LS TTL Loads  |
| Watchdog (depth)        | ✓ (16-bit)        | ✓ (8-bit)           | ✓ (8-bit)           | ✓ (8-bit)   | ✓ (8-bit)        | ✓ (8-bit)        |                  |
| Timer / Counter (depth) | ✓ (2-bit)         | 1/3 (32-bit)        | 1/3 (32-bit)        |             |                  |                  |                  |
| Page                    | 158               | 160                 | 162                 | 164         | 166              | 168              | 170              |
| Software                |                   |                     |                      |             |                  |                  |

(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 APCI-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 electromechanical relays
- ON/OFF monitoring of motors, lights...
- Watchdog / Timer
- Machine interfacing, ...

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

Standard drivers for:
- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

Drivers and samples for the following compilers and software packages:
- Microsoft VC++
- Microsoft C
- Borland C++
- Borland C
- Visual Basic
- Delphi
- .NET on request
- LabVIEW
- LabWindows/CVI
- DASYLab
- DiAdem
- On request:
  Further operating systems, compilers and samples.

Driver download: www.addi-data.com/downloads
**Specifications**

**Digital Inputs**
- Number of inputs: 16 (common ground acc. to IEC 1131-2)
- Including interruptible inputs: 14, IRQ line selected through BIOS
- Optical isolation: Through opto-couplers, 1000 V from PC to peripheral
- Compare logic: AND and OR mode; UH priority

**24 V version (APCI-1500)**
- Nominal voltage: 24 V
- Input current at 24 V: 6 mA typ.
- Logic input levels:
  - U nominal: 12 V
  - UH max.: 16 V
  - UH min.: 6 V
  - UL max.: 12 V
  - UL min.: 0 V
- Signal delay: 70 µs (at nominal voltage)
- Maximum input frequency: 5 kHz (at nominal voltage)

**12 V version (APCI-1500-12V)**
- Nominal voltage: 12 V
- Input current at 12 V: 4.2 mA typ.
- Logic input levels:
  - U nominal: 12 V
  - UH max.: 16 V
  - UH min.: 6 V
  - UL max.: 12 V
  - UL min.: 0 V
- Signal delay: 70 µs (at nominal voltage)
- Maximum input frequency: 5 kHz (at nominal voltage)

**Digital Outputs**
- Number of outputs: 16, optically isolated up to 1000 V through opto-couplers
- Output type: High-side (load to ground) acc. to IEC 1131-2
- Nominal voltage: 24 V / 12 V (APCI-1500-12V)
- Supply voltage: 10 V to 36 V; min. 5 V (via front connector)
- Output current per output: 500 mA max.
- Short-circuit current/output shutdown at 24 V, $R_{OC} < 0.1\,\Omega$: 1.5 A
- RDS ON resistance: 0.4 mΩ max.
- Switch-on time: 1 ms (at 0.5 A load)
- Switch-off time: 60 µs (at 0.5 A load)
- Overtemperature (shutdown): 170 °C (output driver)
- Switch-off time: 60 µs (at 0.5 A load)
- 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: Status bit or interrupt to the PC
- Timer: 3
- Watchdog: timer-programmable, 10 µs to 37 s

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

**Physical and environmental conditions**
- Dimensions: 131 x 99 mm
- System bus: PCI 32-bit 3.3/5 V acc. to specification 2.1 (PCISIG)
- Operating voltage: +5 V, ± 5 % from the PC
- 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**

**APCI-1500 / APCI-1500-12V**
- Digital I/O board, optically isolated, 32 digital inputs and outputs, 24 V / 12 V. Incl. technical description, software drivers and monitoring program.

**Versions**
- **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
- PX901-DG: Screw terminal panel, LED status display
- PX8500: 3-row screw terminal panel for DIN rail, LED status display
- PX8500-G: Relay output board for DIN rail, cascadable
- PX901-DG: Screw terminal panel, LED status display

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

**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
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

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

**ADDIPACK functions:**
- Digital input • Digital output • Watchdog

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

**Driver download:** [www.addi-data.com/downloads](http://www.addi-data.com/downloads)
Specifications

Digital inputs

- Number of inputs: 8 (common ground acc. to IEC 1131-2)
- Nominal voltage: 24 V
  - Input current at 24 V: 6 mA typ.
- Logic input levels:
  - U nominal: 24 V
  - UH max.: 30 V, current 9 mA typ.
  - UH min.: 19 V, current 2 mA typ.
  - UL max.: 14 V, current 0.6 mA typ.
  - UL min.: 0 V, current 0 mA typ.
- Optical isolation: Through opto-couplers, 1000 V from PC to peripheral
- Signal delay: 70 µs (at 24 V)
- Maximal input frequency: 5 kHz (at 24 V)

Digital outputs

- Number of outputs: 8, optically isolated up to 1000 V through opto-couplers
- Output type: High side (load to ground) acc. to IEC 1131-2
- Nominal voltage: 24 V
  - Supply voltage: 10 V to 36 V, min. 5 V (via front connector)
- Max. current for 8 outputs: 3 A typ.
- Output current/output: 500 mA max.
  - Short-circuit current/output: 1.5 A
  - RDS ON resistance: 0.4 Ω max.
- Switch-on time: 1 ms, load = resistance: 100 µs
- Switch-off time: 1 ms, 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.
- 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 3.3/5 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

Example 1
Connection of the inputs and outputs through screw terminal panels

Example 2
- Connection of the inputs through screw terminal panel PX901-DG
- Connection of the outputs through relay output board PX8500-G

Ordering information

APCI-1516
Digital IO board, optically isolated, 16 digital inputs and outputs, 24 V. Incl. 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
- 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
Digital I/O board, optically isolated, 64 digital inputs and outputs, 24 V

APCI-1564 / APCI-1564_3,3V
PCI 5 V (APCI-1564)
PCI 3.3 V (APCI-1564_3,3V)
32 digital inputs, 24 V,
including 16 interruptible, filtered
32 digital outputs, 24 V, 500 mA/channel, filtered
Optical isolation 1000 V
Watchdog, timer,
3 x 32-bit counters up to 500 kHz
The outputs are reset to "0" at Power-On

Features
- 32-bit, 33 MHz, PCI interface
- PCI 5 V (APCI-1564)
- PCI 3.3 V (APCI-1564_3,3V)
Inputs
- 32 optically isolated digital inputs, 24 V,
  including 16 interruptible and 3 counter inputs
- Inputs organised in 4 groups of 8 channels,
  each group has its own ground line
- Reverse voltage protection
- All inputs are filtered
Outputs
- 32 optically isolated digital outputs, 10 V to 36 V
- Output current per channel 500 mA
- Watchdog for resetting the outputs to "0"
- At Power-On, the outputs are reset to "0"
- Total current for 16 outputs ~ 3 A
- Total current for 32 outputs ~ 6 A
- Electronic fuse
- Short-circuit current per output ~1.5 A
- Overtemperature and overvoltage protection
- 24 V power outputs with protection diodes and filters
- Output capacitors against electromagnetic emissions
- Ext. 24 V voltage supply screened and filtered
- Shutdown logic, when the external supply voltage drops below 5 V
Safety features
- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Protection against fast transients (burst), overvoltage,
electrostatic discharge and high-frequency EMI

Applications
- Interrupt started through counter, timer
- Separate ground lines for inputs and outputs

Software drivers
A CD-ROM with the following software and programming samples is supplied with the board.
Standard drivers for:
- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

Drivers and samples for the following compilers and software packages:
- .NET
- Microsoft VC++ • Borland C++
- Visual Basic • Delphi
- LabVIEW • LabWindows/CVI
ADDPACK functions:
Digital input • Digital output
Watchdog • Timer • Counter
On request:
Further operating systems, compilers and samples.

Driver download: www.addi-data.com/downloads
### Specifications

#### Digital inputs

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

- Optical isolation: Through opto-couplers, 1000 V

- Input current at 24 V:
  - Channel 0-3: 10.5 mA typ., 5 mA typ.
  - Channel 4-31: 15 mA typ., 7.5 mA typ.

- Logic input levels:
  - U nominal: 24 V
  - UH max.: 26 V / 12.3 mA typ., 26 V / 5 mA typ.
  - UH min.: 19 V / 5.5 mA typ., 19 V / 3.2 mA typ.
  - UL max.: 14 V / 0.7 mA typ., 14 V / 1.3 mA typ.
  - UL min.: 0 V / 0 mA typ., 0 V / 0 mA typ.

- Signal delay: 1 µs

- Maximum input frequency: 500 kHz

#### Digital outputs

- Number of outputs: 32, optically isolated up to 1000 V

- Output type: High side (load to ground) acc. to IEC 1131-2

- Nominal voltage: 24 V

- Supply voltage: 10 V to 36 V

- Max. current for 16 / 32 outputs: 3 A typ./6 A typ.

- Short-circuit current/output shutdown at 24 V, Rload < 0.1 Ω

- RDS ON resistance: 0.4 Ω

- Switch-on time: Iout=0.5 A, load = resistance: 94 µs typ.

- Overtemperature (shutdown): 170 °C (output driver)

- Switch-off time: Iout=0.5 A, load = resistance: 8 µs typ.

- Temperature hysteresis: 20 °C (output driver)

- Safety

  - Shutdown logic: When the ext. 24 V voltage drops below 5 V:
    - The outputs are switched off
    - Pin 19: status bit or interrupt to the PC

  - Timer: 12-bit

  - Watchdog: 8-bit, timer-programmable from 20 ms to 5 s in steps of 20 ms

- EMC – Electromagnetic compatibility

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

#### Physical and environmental conditions

- Dimensions: 171 x 99 mm

- System bus: PCI 32-bit 5 V acc. to specification 2.1 (PCISIG) or 3.3 V

- Space required: 1 PCI slot + 1 additional slot opening

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

- Current consumption: 410 mA ± 10 % typ.

- Front connector: 37-pin D-Sub male connector for 32 digital outputs

- Additional connector: 37-pin D-Sub male connector on separate bracket for 32 digital inputs

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

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### Ordering Information

**APCI-1564 / APCI-1564_3,3V**

**APCI-1564**: Digital I/O board, optically isolated, 64 digital inputs and outputs, 24 V. Incl. ribbon cable, technical description, software drivers

**APCI-1564_3,3V**: Same as APCI-1564, for PCI 3.3 V

#### Accessories

- **PX901-D**: Screw terminal panel
- **PX901-DG**: Screw terminal panel for DIN rail
- **PX9000**: 3-row screw terminal panel
- **PX85000-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**: Between 2 relay output boards PX85000-G
- **ST85000-G**: Ribbon cable for cascading two PX85000-G

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**ST011**: Standard round cable, shielded, twisted pairs, 5 m
**ST010-S**: Same as ST010, for high currents (24 V supply separate)
**ST022**: Between 2 relay output boards PX85000-G
**ST85000-G**: Ribbon cable for cascading two PX85000-G
Digital I/O board, optically isolated, 64 digital inputs and outputs, 5 V

APCI-1564-5V / APCI-1564-5V-HS
32 digital inputs, 5 V, including 16 interruptible, filtered
32 digital outputs, 5 V, 500 mA/channel, filtered open collector (5V) or high side (5V-Hs)
Optical isolation 1000 V
Watchdog, timer, 3 x 32-bit counters up to 500 kHz
The outputs are reset to "0" at Power-On

Features

- 32-bit, 33 MHz, PCI interface
- PCI 5 V
- Inputs
  - 32 optically isolated digital inputs, 5 V, including 16 interruptible and 3 counter inputs
  - Inputs organised in 4 groups of 8 channels, each group has its own ground line
  - Reverse voltage protection
  - All inputs are filtered
- Outputs
  - 32 optically isolated digital outputs, 5 V
    - APCI-1564-5V: Open Collector outputs
    - APCI-1564-5V-HS: High-side outputs
  - Output current per channel 50 mA
  - Watchdog for resetting the outputs to "0"
  - At Power-On, the outputs are reset to "0"
  - Total current for 8 outputs ~ 0.5 A (via PTC)
  - Electronic fuse
  - Short-circuit current per output ~1.5 A
  - Overtemperature and overvoltage protection
  - Output capacitors against electromechanical emissions
  - Ext. 24 V voltage supply screened and filtered
  - Shutdown logic, when the external supply voltage drops below 5 V

Safety features

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

Connection principle of the 5 V outputs

Applications

- Interrupt started through counter, timer
- Separate ground lines for inputs and outputs

Software drivers

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

Standard drivers for:
- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

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

ADDPACK functions:
Digital input • Digital output
Watchdog • Timer • Counter
On request:
Further operating systems, compilers and samples.

Driver download: www.addi-data.com/downloads
Permissions and limits:

- **Temperature range**: 0 to 60 °C (with forced cooling)
- **Current consumption**: 410 mA ± 10 % typ.
- **Operating voltage**: +5 V, ± 5 % from the PC
- **Space required**: 1 PCI slot + 1 additional slot opening
- **Dimensions**: 171 x 99 mm

**Physical and environmental conditions**

- **Dimensions**: 171 x 99 mm
- **System bus**: PCI 32-bit 5 V acc. to specification 2.1 (PCISIG) or 3.3 V
- **Space required**: 1 PCI slot + 1 additional slot opening
- **Operating voltage**: +5 V ± 5 % from the PC
- **Current consumption**: 410 mA ± 10 % typ.
- **Front connector**: 37-pin D-Sub male connector for 32 digital outputs
- **Additional connector**: 37-pin D-Sub male connector on separate bracket for 32 digital inputs
- **Temperature range**: 0 to 60 °C (with forced cooling)

**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.

**Digital inputs**

- **Number of inputs**: 32; 4 groups of channels with common ground:
  - Input: 0-7, 8-15, 16-23, 24-31
  - -0-2: fast counter inputs, 500 kHz
  - -4-19: interruptible inputs
- **Optical isolation**: Through opto-couplers, 1000 V
- **Input current at 5 V**: 8.5 mA typ., 6 mA typ.
- **Logic input levels**: V nominal = 5 V
- **UH max.**: 6 V / 11.3 mA typ., 5 V / 8.4 mA typ.
- **UL max.**: 3 V / 1 mA typ., 2 V / 0.8 mA typ.
- **UH typ.**: 2.5 V / 2 mA typ., 2 V / 1 mA typ.
- **UL typ.**: 1.4 V / 1 mA typ., 1 V / 500 μA typ.
- **Signal delay**: 1 μs
- **Maximal input frequency**: 500 kHz

**Digital outputs**

- **Number of outputs**: 32, optically isolated up to 1000 V
- **Output type**: High side (load to ground) acc. to IEC 1131-2
- **Open collector (only APCI-1564-5V)**
- **Output type**: High side (load to ground) acc. to IEC 1131-2
- **Number of outputs**: 32, optically isolated up to 1000 V
- **Digital input assignments**:
  - Channel 0-3
  - Channel 4-31
- **Counter input 0**
- **Counter input 1**
- **Counter input 2**
- **Counter input 3**
- **Counter input 4**
- **Counter input 5**
- **Counter input 6**
- **Counter input 7**
- **Counter input 8**
- **Counter input 9**
- **Counter input 10**
- **Counter input 11**
- **Counter input 12**
- **Counter input 13**
- **Counter input 14**
- **Counter input 15**
- **Ext. voltage**
- **GND 0**
- **GND 1**
- **GND 2**
- **GND 3**
- **GND 4**
- **GND 5**
- **GND 6**
- **GND 7**
- **GND 8**
- **GND 9**
- **GND 10**
- **GND 11**
- **GND 12**
- **GND 13**
- **GND 14**
- **GND 15**
- **GND 16**
- **GND 17**
- **GND 18**
- **GND 19**
- **GND 20**
- **GND 21**
- **GND 22**
- **GND 23**
- **GND 24**
- **GND 25**
- **GND 26**
- **GND 27**
- **GND 28**
- **GND 29**
- **GND 30**
- **GND 31**
- **GND 32**
- **GND 33**
- **GND 34**
- **GND 35**
- **GND 36**
- **GND 37**

**Safety**

- **Diagnotics**: 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

**Simplified block diagram**

**ADDI-DATA connection**

**Ordering information**

**APCI-1564-5V / APCI-1564-5V-HS**

Digital I/O board, optically isolated, 64 digital inputs and outputs, 5 V. Incl. ribbon cable, technical description, software drivers

- **APCI-1564-5V**: open collector outputs
- **APCI-1564-5V-HS**: high-side outputs

**Accessories**

- **PX 901-ZG**: Screw terminal panel (only for APCI-1564-5V)
- **ST010**: Standard round cable, shielded, twisted pairs, 2 m
- **ST011**: Standard round cable, shielded, twisted pairs, 5 m
Digital input board, optically isolated, 32 digital inputs, 24 V / 5 V

**APCI-1032 / APCI-1032-5**
32 digital inputs, 24 V or 5 V, including 16 interruptible inputs

**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
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

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

**ADDIPACK functions:**
Digital input

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

Driver download: www.addi-data.com/downloads

---

**Protective circuit for the input channels**

![Protective Circuit Diagram](Image)
**Specifications**

<table>
<thead>
<tr>
<th>Digital inputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of inputs: 32</td>
</tr>
<tr>
<td>Optical isolation: through opto-couplers, 1000 V from PC to peripherals</td>
</tr>
<tr>
<td>Interruptible inputs: 16 (input 0 to 15)</td>
</tr>
<tr>
<td>Interrupt compare logic: AND and OR mode</td>
</tr>
<tr>
<td>Nominal voltage: 24 V (APCI-1032); 5 V (APCI-1032-5)</td>
</tr>
<tr>
<td>Input current at U nominal: 5 mA (24 V), 6 mA typ. (5 V)</td>
</tr>
<tr>
<td>Logic input levels: U nominal: 24 V, U nominal: 5 V</td>
</tr>
<tr>
<td>UH max.: 30 V/Current 7.3 mA typ. 6 V/8.4 mA typ.</td>
</tr>
<tr>
<td>UH min.: 19 V/Current 3.2 mA typ. 4 V/4 mA typ.</td>
</tr>
<tr>
<td>UL max.: 14 V/Current 1.3 mA typ. 2 V/0.7 mA typ.</td>
</tr>
<tr>
<td>UL min. at nominal voltage: 0 V/Current 0 mA typ.</td>
</tr>
<tr>
<td>Signal delay: 70 µs</td>
</tr>
<tr>
<td>Maximal input frequency: 5 kHz at nominal voltage</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**

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
Max. current consumption: +5 V from the PCI 140 mA ± 10 %
Front connector: 37-pin D-Sub male connector
Temperature range: 0 to 60 °C (with forced cooling)

**APCI-1032 / APCI-1032-5**

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

**Accessories for the APCI-1032**

- PX901-D: Screw terminal panel, LED status display
- PX901-DG: Screw terminal panel, LED status display, for DIN rail
- PX9000: 3-row screw terminal panel for DIN rail, LED status display
- ST010: Standard round cable, shielded, twisted pairs, 2 m
- ST011: Standard round cable, shielded, twisted pairs, 5 m

**Accessories for the APCI-1032-5**

- PX91-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

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

(without illustration: The APCI-1032-5 can only be connected to the PX901-ZG)
Digital input board, optically isolated, 16 digital inputs, 24 V

APCI-1016

16 digital inputs, 24 V
Optical isolation 1000 V
Input filters
Reverse voltage protection

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
• 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
• Signed 64-bit drivers for Windows 8 / 7 / XP
• Real-time use with Linux and Windows on request

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

ADDIPACK functions:
Digital input

On request:
Further operating systems, compilers and samples.

Driver download: www.addi-data.com/downloads

Protective circuit for the input channels

Peripherals | Board
---|---
24 V input | 24 V input
[Image of protective circuit diagram]
### Specifications

<table>
<thead>
<tr>
<th>Digital inputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of inputs:</td>
</tr>
<tr>
<td>Optical isolation:</td>
</tr>
<tr>
<td>Nominal voltage:</td>
</tr>
<tr>
<td>Input current at U nominal:</td>
</tr>
<tr>
<td>Logic input levels:</td>
</tr>
<tr>
<td>UH max.:</td>
</tr>
<tr>
<td>UH min.:</td>
</tr>
<tr>
<td>UL max.:</td>
</tr>
<tr>
<td>UL min. at nominal voltage:</td>
</tr>
<tr>
<td>Signal delay:</td>
</tr>
<tr>
<td>Maximal input frequency:</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

| Dimensions: | 131 x 99 mm (PCI short) |
| System bus: | PCI 32-bit 3.3/5 V acc. to specification 2.1 (PCISIG) |
| Space required: | 1 PCI slot |
| Operating voltage: | +5 V ± 5 % from the PC |
| Max. current consumption: | +5 V from the PCI 180 mA ± 10 mA typ. |
| Front connector: | 37-pin D-Sub male connector |
| Temperature range: | 0 to 60 °C (with forced cooling) |

### Ordering information

**APCI-1016**
Digital input board, optically isolated, 16 digital inputs, 24 V. Incl. technical description and software drivers

**Accessories**

- **PX900-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**

**APCI-2032 / APCI-2032-5**

- 32 digital outputs, 24 V or 5 V, 500 mA/channel
- Optical isolation 1000 V
- Output filters, short-circuit protection
- Watchdog

The outputs are reset to “0” at Power-On

**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
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

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

**ADDIPACK functions:**
- Digital output • Watchdog

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

Driver download: www.addi-data.com/downloads

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

Digital outputs

| Outputs: 32 |
| Output type: High-side (load to ground) acc. to IEC 1131-2 |
| Optical isolation: through opto-couplers, 1000 V from PC to peripheral |
| Nominal voltage: 24 V (APCI-2032), or 5 V (APCI-2032-5) |
| Supply voltage: |
| for 24 V version: 10 V to 36 V |
| for 5 V version: 5 V to 12 V via front connector |
| Max. current for 32 outputs: 6 A typ. (2x3 A) |
| Output current: 500 mA max./channel |
| Short-circuit current/output shutdown at 24 V, R<sub>load</sub> < 0.1 Ω: 1.5 A |
| RDS ON resistance: 0.41 Ω max. |
| Switch-on time: |
| I output=0.5 A, load = resistance: 94 μs typ. (APCI-2032) |
| I output=50 mA, load = resistance: 250 μs typ. (APCI-2032-5V) |
| Switch-off time: |
| I output=0.5 A, load = resistance: 8 μs typ. (APCI-2032) |
| I output=50 mA, load = resistance: 3 μs typ. (APCI-2032-5V) |
| Overtemperature (shutdown): 170 °C (output driver) |
| Temperature hysteresis: 20 °C (output driver) |

Safety

- Shut-down logic (V<sub>CC</sub> 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) |

Screw terminal panel PX901-DG with cable ST010

Relay output board PX8500-G

APCI-2032 / APCI-2032-5

APCI-2032: Digital output board, optically isolated, 32 digital outputs, 24 V. Incl. technical description and software drivers

APCI-2032-5: Digital output board, optically isolated, 32 digital outputs, 5 V. Incl. technical description and software drivers

Accessories

| PX901-D: Screw terminal panel, LED status display |
| PX901-DG: Same as PX901-D, for DIN rail |
| PX 901-2G: 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, twisted pairs, 2 m |
| ST011: Standard round cable, 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 |
| STB500: Ribbon cable for cascading two PX8500-G |

ADDI-DATA connection

Example 1
Connection of the outputs through screw terminal panels

Example 2
Connection of the outputs through relay output board PX8500-G cascaded in 32 relays

Ordering information

Phone: +49 7229 1847-0 info@addi-data.com
Fax: +49 7229 1847-222 www.addi-data.com
Digital output board, optically isolated, 16 digital outputs, 24 V

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

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
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

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

ADDIPACK functions:
Digital output • Watchdog

On request:
Further operating systems, compilers and samples.

Driver download: www.addi-data.com/downloads

Protective circuit for the output channels

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

ADDI-DATA™
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, R<sub>load</sub> < 0.1 Ω: 1.5 A
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 3.3/5 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)

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
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, 2 m
ST8500: Ribbon cable for cascading two PX8500-G

Phone: +49 7229 1847-0 info@addi-data.com
Fax: +49 7229 1847-222 www.addi-data.com
Relay board, optically isolated, 8/16 relays, 8 digital inputs, 24 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
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

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

ADDIpack functions:
- Digital output • Watchdog

On request:
Further operating systems, compilers and samples.

Driver download: www.addi-data.com/downloads

Function principle of the relays
Specifications

Relays
Type of contacts: 8/16 change-over
Max. switching voltage: 60 VDC, 48 VAC
Max. switching current: 1 A
Max. switching capacity: 30 W
Contact resistance: < 100 mΩ
Contact material: Ag and Au plated
Response time: Max. 5 ms, typ. 2.5 ms
Release time: Max. 5 ms, typ. 0.9 ms
Mechanical life: 5 x 10^6 operations
Electrical life: 10^5 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: < 10 µs
Maximal input frequency: 5 kHz (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 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 5 V acc. to specification 2.1 (PCISIG) or 3.3 V
Space required: 1 PCI slot
Current consumption: 550 mA ± 10 % typ. (APCI-2200-16-8)
Operating voltage: +5 V, ± 5 % from the PC
Front connector: 50-pin D-Sub male connector
Additional connector: 16-pin D-Sub male connector
Additional connector: 16-pin D-Sub male connector.
Temperature range: 0 up to 60 °C (with forced cooling)

Ordering information
APCI-2200 /APCI-2200-8-8_3,3V
Relay board, optically isolated, 8/16 relays output channels, 8 digital inputs, 24 V. Incl. technical description and software drivers.

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 digital inputs, 24 V, PCI 5 V
APCI-2200-8-8_3,3V: 8 relays, 8 digital inputs, 24 V, PCI 3.3 V
APCI-2200-16: 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

Simplified block diagram

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

ADDI-DATA connection

Example 1: APCI-2200-16-8
- Connection of the relay outputs through screw terminal panel PX8001
- Connection of the digital inputs through ribbon cable to the screw terminal panel PX901-ZG

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

Phone: +49 7229 1847-0 info@addi-data.com
Fax: +49 7229 1847-222 www.addi-data.com
TTL I/O board, 
48 or 96 digital TTL inputs and outputs

Features

- PCI 3.3 V or 5 V
- 48 digital TTL inputs/outputs (APCI-1648)
- 96 digital TTL inputs/outputs (APCI-1696)
- Each group of 8 lines (1 port) can be configured as input or output.
- All I/Os are driven through pull-up resistors to 5 V
- Easy programming through I/O read/write commands

Connection

- APCI-1648: 50-pin D-Sub male connector
- APCI-1696: 50-pin D-Sub male connector and I/O 49 - 96 to 50-pin male connector

Software drivers

Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

Drivers and samples for the following compilers and software packages:

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

ADDPACK functions:

- Digital input • Digital output

On request:

Further operating systems, compilers and samples.

Driver download: www.addi-data.com/downloads

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

Specifications

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

<table>
<thead>
<tr>
<th>Inputs and outputs:</th>
<th>48 digital TTL I/O (APCI-1648)</th>
<th>96 digital TTL I/O (APCI-1696)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/O address range:</td>
<td>128 byte</td>
<td></td>
</tr>
<tr>
<td>Programming:</td>
<td>Through write/read commands</td>
<td></td>
</tr>
<tr>
<td>Driver type:</td>
<td>74 HC 574</td>
<td></td>
</tr>
<tr>
<td>Max. input and output voltage:</td>
<td>TTL Level</td>
<td></td>
</tr>
<tr>
<td>Output current:</td>
<td>DC ± 35 mA</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

- 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
- 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
Multifunction counter board, optically isolated, encoder, incremental counter, timer/counter, SSI, PWM, ...

The board APCI-1710 is a fast multifunction and multi-channel counter board for the PCI bus. The strengths of this board are its wide range of applications and high precision and reliability for rough industrial applications. With this board you can realise many different applications on the same hardware base. The board is supplied with a pool of functions which provides the user with maximum efficiency yet minimum space and parts requirement. The functions are individually configured for each channel through the supplied software. The flexible programming facilities on this board allow many different user applications to be quickly and easily developed and reconfigured as further requirements arise. Thanks to the FPGA board structure, further counting applications can be realised through software adaptation. Contact us!

**Features**
- 32-bit data access
- Up to 5 MHz input frequency
- Signals in TTL or RS422 mode (APCI-1710), 24 V signals (APCI-1710-24V)
- Four onboard function modules
- Reprogrammable functions

**Functions**
- Incremental counter for the acquisition of incremental encoders (90° phase-shifted signals)
- SSI synchronous serial interface. The SSI function is an interface for systems which allow an absolute position information via serial data transfer.
- Counter/timer (82C54)
- Pulse acquisition
- Frequency measurement
- Pulse width modulation (PWM)
- Period duration measurement
- Velocity measurement
- Digital inputs and outputs
- Edge time measurement (ETM)
- Customised functions

**Available channels for all four function modules**
- 20 channels for digital inputs, optically isolated
- 8 channels, programmable either as digital inputs or outputs, optically isolated
- 4 digital power outputs, optically isolated

**Available lines for each function module**
- 8 lines are available for each function module

**Versions**

<table>
<thead>
<tr>
<th></th>
<th>RS422/ TTL I/O</th>
<th>24 V inputs</th>
<th>5 V inputs</th>
<th>24 V outputs</th>
<th>5 V outputs</th>
<th>TTL I/O</th>
</tr>
</thead>
<tbody>
<tr>
<td>APCI-1710</td>
<td>16</td>
<td>12</td>
<td>–</td>
<td>4</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>APCI-1710-24V</td>
<td>–</td>
<td>28</td>
<td>–</td>
<td>4</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>APCI-1710-5V-I</td>
<td>16</td>
<td>12</td>
<td>4</td>
<td>28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>APCI-1710-5V-I-O</td>
<td>16</td>
<td>12</td>
<td>4</td>
<td>4</td>
<td>28</td>
<td></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:**
- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

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

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

Driver download: www.addi-data.com/downloads 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>180</td>
</tr>
<tr>
<td>SSI[1]</td>
<td>3</td>
<td>4</td>
<td>12</td>
<td>180</td>
</tr>
<tr>
<td>Chronos</td>
<td>1</td>
<td>4</td>
<td>4</td>
<td>181</td>
</tr>
<tr>
<td>Counter/Timer[2]</td>
<td>3</td>
<td>4</td>
<td>12</td>
<td>182</td>
</tr>
<tr>
<td>TOR</td>
<td>2</td>
<td>4</td>
<td>8</td>
<td>183</td>
</tr>
<tr>
<td>Pulse acquisition</td>
<td>4</td>
<td>4</td>
<td>16</td>
<td>184</td>
</tr>
<tr>
<td>PWM[3]</td>
<td>2</td>
<td>4</td>
<td>8</td>
<td>184</td>
</tr>
<tr>
<td>ETM</td>
<td>2</td>
<td>4</td>
<td>8</td>
<td>185</td>
</tr>
<tr>
<td>Digital I/O</td>
<td>8</td>
<td>4</td>
<td>32</td>
<td>185</td>
</tr>
<tr>
<td>TTL</td>
<td>24</td>
<td>1</td>
<td>24</td>
<td>–</td>
</tr>
</tbody>
</table>

[2] Can be used only to a limited extent for the APCI-1710-24V

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

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

- 90° phase-shifted input signals (displacement measurement systems)
- Motion control
- Pulse width and frequency measurement
- Incremental encoder acquisition
- Tolerance measurement
- Velocity measurement
- Rotation measurement
- Electronic “mouse”

Function range of the counter component

- Simple, double, quadruple analysis of 2 phase-shifted clock signals (A, B)
- Direction detection for upwards or downwards counting
- Hysteresis circuit for the suppression of the first pulse after a change in rotation; can be switched off
- 2 x 32-bit data latches, individually programmable for internal / external strobe, latch strobe synchronised with internal clock
- Operating mode is defined by an internal mode register, loadable and readable through the data bus
- Strobe inputs which can be triggered either through 2 external pins (24 V input) or by writing in a register
- Interrupt indication triggered through the external strobe inputs
- Compare logic, interrupt logic and reference point logic

Function Synchronous serial interface [SSI]

The function module is programmed as a synchronous serial interface. The SSI function is an interface for systems which an absolute position output through serial data transfer.

Typical application examples:
- Acquisition of displacement measurement systems
- Axis control (X, Y and Z)
- Tolerance measurement...

Block diagram SSI

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./TI/24 V*</td>
<td>Trace A of the incremental encoder (32-bit) or Trace A of the incremental encoder 0 (16-bit)</td>
</tr>
<tr>
<td>B_x</td>
<td>Bx +/-</td>
<td>Diff./TI/24 V*</td>
<td>Trace B of the incremental encoder (32-bit) or Trace B of the incremental encoder 0 (16-bit)</td>
</tr>
<tr>
<td>INDEX_x</td>
<td>Cx +/-</td>
<td>Diff./TI/24 V*</td>
<td>Index trace of the incremental encoder (32-bit)</td>
</tr>
<tr>
<td>C_x</td>
<td>Cx +/-</td>
<td>Diff./TI/24 V*</td>
<td>Trace A of the incremental encoder 1 (2x16-bit)</td>
</tr>
<tr>
<td>UAS_x</td>
<td>Dx +/-</td>
<td>Diff./TI/24 V*</td>
<td>Error signal input (32-bit)</td>
</tr>
<tr>
<td>D_x</td>
<td>Dx +/-</td>
<td>Diff./TI/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 / optional 5 V</td>
<td>Digital input (can also control the reference point logic)</td>
</tr>
<tr>
<td>ExtStrb_a_x</td>
<td>Fx</td>
<td>24 V / optional 5 V</td>
<td>Digital input (can be used for the latch logic or interrupt logic)</td>
</tr>
<tr>
<td>ExtStrb_b_x</td>
<td>Gx</td>
<td>24 V / optional 5 V</td>
<td>Digital input (can be used for latch logic or interrupt logic)</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 179)
* 24 V for the APCI-1710-24V

Properties

- 4 function modules for each board, up to 3 SSI sensors per function module
- Optical isolation of the inputs and outputs through opto-couplers to prevent ground loops
- Serial data transfer
- Common clock for all 3 sensor interfaces of one function module
- Clock frequency and number of data bits are software suitable
- GRAY to BINARY conversion possible
- For each function module, there are 3 digital inputs and 1 digital output for an additional function (no effect on SSI function)

The interface includes:

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

Used signals

<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 for the SSI sensors</td>
</tr>
<tr>
<td>DATA1_x</td>
<td>Bx +/-</td>
<td>RS422/TL</td>
<td>Data input of SSI sensor 0</td>
</tr>
<tr>
<td>DATA2_x</td>
<td>Cx +/-</td>
<td>RS422/TL</td>
<td>Data input of SSI sensor 1</td>
</tr>
<tr>
<td>DATA3_x</td>
<td>Dx +/-</td>
<td>RS422/TL</td>
<td>Data input of SSI sensor 2</td>
</tr>
<tr>
<td>Input1_x</td>
<td>Ex</td>
<td>24 V / 5 V optional</td>
<td>Digital input 0</td>
</tr>
<tr>
<td>Input2_x</td>
<td>Fx</td>
<td>24 V / 5 V optional</td>
<td>Digital input 1</td>
</tr>
<tr>
<td>Input3_x</td>
<td>Gx</td>
<td>24 V / 5 V optional</td>
<td>Digital input 2</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 179)
The SSI function cannot be programmed on the APCI-1710-24V.
Function Chronos

The function Chronos is a timer interface which allows to measure the time between two “events” like a chronometer.

3 functions are available:
- a 32-bit timer to create a time reference,
- a 32-bit measuring timer to determinate and measure the time between start and stop pulse.
- 3 digital inputs and 3 digital outputs

Properties
- Optical isolation of the inputs and outputs through opto-couplers to prevent ground loops
- Interrupt status at the end of the measuring time
- Timer readable
- Input and output channels can be inverted through software, Software GATE possible

Function description
The pulse signals from Timer 0 are counted between the start pulse signal and the stop pulse signal. The number of pulses is then stored in the measuring timer and can be read through I/O read commands. The timer 0 is used as a time reference generator. The divider factor is written in timer 0 and determines the output frequency.

The input frequency is set according to the PCI clock pulse or to the 10 MHz onboard clock generator. Timer 0 is synchronised with the start event or with the 40 MHz quartz of the board. Timer 0 can be read at any time. The Chronos function can be used in 8 different modes.

Used signals

<table>
<thead>
<tr>
<th>Pin name</th>
<th>Signal type</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ax +/-</td>
<td>DIF/UTL, 24 V*</td>
<td>Digital output 1; set to &quot;0&quot; after reset</td>
</tr>
<tr>
<td>Bx +/-</td>
<td>DIF/UTL, 24 V*</td>
<td>Digital output 2; set to &quot;0&quot; after reset</td>
</tr>
<tr>
<td>Cx +/-</td>
<td>DIF/UTL/24 V*</td>
<td>Start pulse for measuring</td>
</tr>
<tr>
<td>Dx +/-</td>
<td>DIF/UTL/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>

x: Number of the function module (See pin assignment page 179)

*24 V for the APCI-1710-24V

Block diagram Chronos

PCI clock (30 MHz or 33 MHz) / 4 or internal reference of the board (10 MHz)

Divider factor

Start

Inc Cx

Cx

Stop

Inc Dx

Dx

Timer 0

32-bit reload register

32-bit counter

Clock 0

OUT 0

Clock 1

Stop

Latch register

Start

Gate 1

32-bit clear counter

Time base

Time measurement

Divide factor

Modes

Start

Clock 1

Time measurement

SC

Clock

-1
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 mode will interrupt the PC.

- Optical isolation of the inputs and outputs through opto-couplers to prevent ground loops
- 3 x 32-bit counters/timers, binary counting only
- 6 programmable modes
- Status readback and latch command
- Inputs and outputs can be inverted through software
- Hardware and software gate possible, readable
- Simple interface: no multiple assignment of the addresses
- Interrupt enabled with an individual release bit per counter/timer and interrupt status register
- Available clock: PCI clock divided by four (APCI-1710 only) or 10 MHz of the onboard quartz oscillator, selectable through software

Typical applications:
- Event counter
- Programmable rate generator
- Binary rate multiplier
- Square-wave generator
- Complex motor controller / signal generator

Programmable modes

For each counter/timer (3 x 32-bit) there are 6 modes available: mode 0 to mode 5, which can be programmed independently.

**Mode 0: Interrupt on terminal count**

Mode 0 is particularly suitable for event counting. The output is initially set to “Low” and remains “Low” until the counter reaches 0. The output then goes “High” and holds this state until a new count or a new counter value is written into the counter.

**Mode 1: Hardware retriggerable one-shot**

This mode is identical to mode 0 except for the GATE input. The GATE input is not used to activate or deactivate the timer, but to trigger it.

**Mode 2: Pulse generator**

In this mode the counter is dividing the choosen 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 to “Low” and remains “Low” until the counter reaches 0. 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/UTL</td>
<td>Output of counter/timer 0</td>
</tr>
<tr>
<td>OUT2_x</td>
<td>Bx +/-</td>
<td>DIF/UTL</td>
<td>Output of counter/timer 1</td>
</tr>
<tr>
<td>OUT3_x</td>
<td>Hx</td>
<td>24V / 5V opt.</td>
<td>Output of counter/timer 2</td>
</tr>
<tr>
<td>GATE1_x</td>
<td>Ex</td>
<td>24V / 5V opt.</td>
<td>GATE Input of counter/timer 0</td>
</tr>
<tr>
<td>GATE2_x</td>
<td>Fx</td>
<td>24V / 5V opt.</td>
<td>GATE Input of counter/timer 1</td>
</tr>
<tr>
<td>GATE3_x</td>
<td>Gx</td>
<td>24V / 5V 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/UTL/24V opt.</td>
<td>Clock counter input of counter/timer 1</td>
</tr>
<tr>
<td>CLK3_x</td>
<td>Dx +/-</td>
<td>DIF/UTL/24V opt.</td>
<td>Clock counter input of counter/timer 2</td>
</tr>
</tbody>
</table>

x: Number of the function module (See pin assignment page 179)

The Counter/Timer function is suited only to a limited extent for the APCI-1710-24V.

### Block diagram Counter/Timer

[Diagram of Counter/Timer showing the components and connections]
**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 AxBx. During the process the status bit “Counter in Progress” is set. As soon as a stop signal occurs from Timer 1, the Timer 0 is stopped and the status bit “Counter in Progress” is reset.

An interrupt can also be generated. The value can then be read. The latest measured value is read in the counter measurement register.

### Properties

- Optical isolation of the inputs and outputs through opto-couplers to prevent ground loops
- Interrupt status at the end of the measuring period
- Inputs and output can be inverted through software
- Software GATE

The function **TOR** occupies 4 inputs (A to D) of the corresponding function module of the APCI-1710 or CPCI-1710.

### Used signals

<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>Digital input 1 (TOR1)</td>
</tr>
<tr>
<td>Bx +/-</td>
<td>Diff./TTL/24 V*</td>
<td>Digital input 2 (TOR2)</td>
</tr>
<tr>
<td>Cx +/-</td>
<td>Diff./TTL/24 V*</td>
<td>External Gate (TOR1)</td>
</tr>
<tr>
<td>Dx +/-</td>
<td>Diff./TTL/24 V*</td>
<td>External Gate (TOR2)</td>
</tr>
</tbody>
</table>

x: Number of the function module (see pin assignment page 179)

*24 V for the APCI-1710-24V

**Block diagram TOR**

![Block diagram TOR](image-url)
Function Pulse counter

The Pulse counter is an interface for the acquisition of external digital pulses. Each rising or falling edge on the counter input starts decrementing from the initially set counter value. An interrupt is generated at logical “0”, i.e. the digital output is set or reset.

• 4 x 32-bit downward counters
• Optical isolation of the inputs and outputs through opto-couplers to prevent ground loops
• Each counter can be loaded with a predefined counter value
• Interrupt at overflow
• Output can be set or reset at overflow
• Polarity of the inputs selectable through software

The interface includes:
• 4 x 32-bit counters
• 4 independent 32-bit registers, readable through the data bus
• a function and control logic.

Used signals

<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 179)
* 24 V for the APCI-1710-24V

Function PWM (Pulse width modulation)

The function PWM is an interface for pulse width modulation. It generates a frequency and defines the time duration (pulse width) of the “Low” and “High” level. The function generates rectangle signals. The output pulses from the timer generate the pulse width modulation.

PWM generator

The “Low/High” time-divider factor is written in the timer and determines the output frequency. The input frequency is set according to the PCI clock or the 40 MHz quartz of the board.

The function includes:
• a 32-bit frequency generator for setting the “Low” and “High” levels
• 2 digital inputs as start or stop trigger
• 2 digital frequency outputs

Properties

• Optical isolation of the inputs and outputs through opto-couplers to prevent ground loops
• Interrupt status at the end of a period
• Selection of the start level
• Selection of the stop level
• Hardware gate
• Software gate

Typical applications

• Frequency generation
• Pulse width modulation
• Drive technology

Used signals

<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 input</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_OUT_H_x</td>
<td>Hx</td>
<td>24 V output</td>
<td>digital output PWM 0</td>
</tr>
</tbody>
</table>

x: Number of the function module (See pin assignment page 179)
The PWM function only can be used restricted to the 24 V version. Only PWM0 is available for the DIG_OUT_H_x 24 V output.

Block diagram PWM
Function 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 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/24V*</td>
<td>Dig. input and output (with 24 V* only input)</td>
</tr>
<tr>
<td>Bx +/-</td>
<td>Diff/TTL/24V*</td>
<td>Dig. input and output (with 24 V* only input)</td>
</tr>
<tr>
<td>Cx +/-</td>
<td>Diff/TTL/24V</td>
<td>Digital input</td>
</tr>
<tr>
<td>Dx +/-</td>
<td>Diff/TTL/24V</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 179)

*24 V for the APCI-1710-24V

---

**Function ETM (Edge Time Measurement)**

The **ETM** function is a timer interface which allows measuring the duration of a period, and simultaneously, the “High” or “Low” level time of this period. A function module with the ETM function has
- 1 timer to create a time base
- 2 counters to measure the period duration
- 2 counters to measure the “High” or “Low” level time
- 2 gate inputs

The ETM function uses 4 inputs (A to D) with each function module of the APCI-1710 or CPCI-1710. Up to 8 ETM (2 per module) can be operated on one board.

**Properties**
- Optical isolation of the inputs and outputs through opto-couplers to prevent ground loops
- Interrupt status at the end of a period
- Timer can be read back
- Inputs and outputs can be inverted through software
- Software gate

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

**Used signals**

<table>
<thead>
<tr>
<th>Signal name</th>
<th>Pin name</th>
<th>Signal type</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gate0_x</td>
<td>Ax +/-</td>
<td>Diff/TTL/24V*</td>
<td>Gate input of ETM counter 0</td>
</tr>
<tr>
<td>Input0_x</td>
<td>Bx +/-</td>
<td>Diff/TTL/24V*</td>
<td>Input of ETM counter 0</td>
</tr>
<tr>
<td>Gate1_x</td>
<td>Cx +/-</td>
<td>Diff/TTL/24V*</td>
<td>Gate input of ETM counter 1</td>
</tr>
<tr>
<td>Input1_x</td>
<td>Dx +/-</td>
<td>Diff/TTL/24V*</td>
<td>Input of ETM counter 1</td>
</tr>
</tbody>
</table>

x: Number of the function module (see pin assignment page 179)

PCI, counter – APCI-1710

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

Counter components
- Counting depth: 32-bit, Counting frequency: up to 5 MHz

Free programming of the functions
- 32-bit or 16-bit acquisition of incremental encoders
- Acquisition of absolute encoders
- Counter/timer
- Chronos for frequency measurement
- Chronos for period duration measurement
- Chronos for pulse width modulation
- Chronos for velocity measurement
- Digital IO, 24 V, TTL, RS422
- PWM
- ETM
- PWK
- Customised functions

Signals
- Digital I/O signals, TTL or RS422

Inputs
- Number of inputs: 20
- 5 V inputs: 8/16 (8 can be used as inputs or outputs)
- Nominal voltage: 5 VDC
- Common mode range: ±12 V
- Max. differential voltage: ±2 V
- Input sensitivity: 200 mV
- Input resistance: 1 MΩ
- Input impedence: 12 kΩ
- Terminal resistor: 150 Ω (serial with 10 nF (typ.))
- Signal delay: 120 ns (at nominal voltage)
- Mass-related inputs, 24 V (channels E, F, G):
  - Number of inputs: 12
  - Nominal voltage: 24 VDC
  - Input current: 11 mA (typical) at nominal voltage
- Logic input levels:
  - U nominal: 24 V
  - UH max.: 30 V
  - UH min.: 19 V
  - UL max.: 15 V
  - UL min.: 0 V
- Signal delay: 120 ns (at nominal voltage)
- Maximal input frequency: 1 MHz

Outputs
- Nominal voltage: 5 VDC
- Maximum output frequency: 2.5 MHz (shift. outputs)
- Max. number of outputs: 8 (if they are not used as diff. inputs)
- Digital outputs, 24 V:
  - Output type: High-side (load to ground)
  - Number of outputs: 4
  - Nominal voltage: 24 VDC
  - Range of the supply voltage: 10 V to 36 VDC (via 24 V ext. pin)
  - Maximum current for 4 outputs: 2 A typ. (limited to the voltage supply)
  - Maximum output current:
    - max. output current at 24 V, R<sub>ON</sub> < 0.1 Ω: 1.5 A max. (output switches on)
  - Power consumption of the output:
    - 0.1 A max. (output switches on)

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

APCI-1710:
- Multifunction counter board, optically isolated
- APCI-1710-24V:
  - 24 V for differential input signals (A and B for counter, I (Index) and UAS (error) signals)
- APCI-1710-5V-I:
  - 5 V inputs instead of 24 V (E, F, G)
- APCI-1710-5V-O:
  - 5 V outputs instead of 24 V (H0, H1, H2, H3)

Option
- Opt. 5V: 5 V outputs instead of 24 V (H0, H1, H2, H3)

Accessories
- ST370-16: Shielded round cable, 2 m
- PX8001: 3-row terminal panel for DIN rail
- FBB001: Ribbon cable for connecting the TTL I/O function

Ordering information
- APCI-1710:
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- Opt. 5V: 5 V outputs instead of 24 V (H0, H1, H2, H3)

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  - 5 V outputs instead of 24 V (H0, H1, H2, H3)

Option
- Opt. 5V: 5 V outputs instead of 24 V (H0, H1, H2, H3)
High-precision measurement in the field

There are numerous measurement systems that provide precise data under laboratory conditions. This is different in the production or in outdoor areas, where the conditions are considerably more demanding. There the measurement results play a central role. Rework and defective goods can only be effectively reduced if the tolerance testing during the production process is precise enough to sort products reliably as being within or without the tolerance range. The importance of accuracy appears even clearer in cases where the measurement is used for regulation.

Precise even in case of temperature drift

Temperature drift can be caused by the surrounding temperature as well as by the board itself. To ensure the accuracy of the measurement, on the one hand we are careful to use only high-quality components with little drift. On the other hand we pay a lot of attention to the board layout. For example, components that generate heat are placed where they will not heat up the other components unnecessarily.

Precision through interference resistance

Not only the quality of the A/D converter is important but the interference resistance of the whole chain of acquisition has to be analysed, from the sensors to the acquisition board. Therefore in addition to our PC boards we offer robust cables and screw terminal panels that are intended for the use in a harsh industrial environment.

High-precision measurement

Measurement technology is the basis of every automation process. Therefore the accuracy of the sensor acquisition is highly important. The environment of a production line with a lot of interference requires peak performance from the measurement technology. For more than 25 years, ADDI-DATA has been developing analog boards for data acquisition intended for an industrial environment: they are robust, precise and fast.

Single-ended or differential inputs

When measuring input voltage you can choose between 2 modes with important differences:

Single-ended mode – One-wire inputs connected to the system ground.

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 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)
### 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-3501</td>
</tr>
<tr>
<td>3.3/5 V</td>
<td>3.3/5 V</td>
<td>3.3/5 V</td>
</tr>
<tr>
<td>APCI-3116</td>
<td>APCI-3109</td>
<td>APCI-3003</td>
</tr>
<tr>
<td>3.3/5 V</td>
<td>3.3/5 V</td>
<td>3.3/5 V</td>
</tr>
<tr>
<td>APCI-3106</td>
<td>APCI-3016</td>
<td>APCI-3001</td>
</tr>
<tr>
<td>3.3/5 V</td>
<td>3.3/5 V</td>
<td>3.3/5 V</td>
</tr>
<tr>
<td>APCI-3010</td>
<td>APCI-3002</td>
<td></td>
</tr>
<tr>
<td>3.3/5 V</td>
<td>3.3/5 V</td>
<td></td>
</tr>
<tr>
<td>APCI-3003</td>
<td>APCI-3001</td>
<td></td>
</tr>
<tr>
<td>3.3/5 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32-bit PCI bus</td>
<td>3.3/5 V</td>
<td>3.3/5 V</td>
</tr>
<tr>
<td>FPGA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
<td></td>
</tr>
<tr>
<td>Simultaneous acquisition</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

### Analog inputs

<table>
<thead>
<tr>
<th>Single Ended</th>
<th>16/8</th>
<th>16/8</th>
<th>16/8</th>
<th>16/8/4</th>
<th>16/8/4</th>
<th>16/8/4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Differential</td>
<td>8/4</td>
<td>8/4</td>
<td>8/4</td>
<td>8/4/2</td>
<td>16</td>
<td>8/4</td>
</tr>
<tr>
<td>Diff. separated from each other</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resolution (bit)</td>
<td>16</td>
<td>12</td>
<td>16</td>
<td>12</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Resolution (bit)</td>
<td>16</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optical isolation</td>
<td>500 V</td>
<td>✓</td>
<td>✓</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Throughput (kHz)</td>
<td>100</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>400/ channel 100</td>
</tr>
<tr>
<td>Voltage range</td>
<td>0-10 V, ± 10 V / 0-5 V, ± 5 V</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voltage range</td>
<td>0-2 V, ± 2 V / 0-1 V, ± 1 V</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other ranges (optional)</td>
<td>0-20 mA</td>
<td>0-20 mA</td>
<td>0-20 mA</td>
<td>0-20 mA</td>
<td>0-20 mA</td>
<td>0-20 mA</td>
</tr>
<tr>
<td>Gain 1, 2, 5, 10</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIFO (value)</td>
<td>256</td>
<td>512</td>
<td>512</td>
<td>512</td>
<td>512</td>
<td>512</td>
</tr>
</tbody>
</table>

### Functions of the analog inputs

| DMA (scatter gather, single, continuous, Sequence) | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ |
| DMA (single, continuous, Sequence) | ✓ |
| Auto Refresh | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ |
| Interrupt | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ |
| Programmed I/O | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ |
| Trigger: Software | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ |
| TLI input 24 V input | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ |
| Sequence RAM | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ |
| Analog outputs | 4 or 8 | 4 | 4 | 4 or 8 |
| Resolution (bit) | 14 | 12 | 12 | 14 |
| Optical isolation | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ |
| 0-10 V ± 10 V | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ |
| Current outputs | ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ |
| Setup time | 30 µs | 15 µs | 15 µs | 30 µs |
| Digital I/O 24 V inputs, optically isolated 24 V outputs, optically isolated | 4 4 (OpenC) | 4 4 (50mA) | 4 4 (50mA) | 4 4 (50mA) | 4 4 (50mA) | 4 4 (50mA) | 4 4 (OpenC) |
| TLI I/O | 24 | 24 | 24 | 4 |
| Timer/Counter/Watchdog (depth) and/or | 1 /– / – 12-bit |
| Page | 192  |
| Software | Current driver list on the web: www.addi-data.com |
Temperature, pressure, noise, vibration and length measurement

<table>
<thead>
<tr>
<th>Temperature measurement</th>
<th>Pressure measurement</th>
<th>Noise and vibration measurement</th>
<th>Length measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>APCI-3200</td>
<td>APCI-3300</td>
<td>APCI-3600</td>
<td>APCI-3700</td>
</tr>
</tbody>
</table>

- **64-bit or 32-bit PCI-Bus:**
  - 3.3 V / 5 V

- **FPGA:** ✔
- **Noise and vibration:** ✔
- **Thermocouples:** J, K, E, R, S, B, N, Pt100, Pt1000
- **Strain gauges:** ✔
- **Inductive transducers:** Half Bridge, LVDT
- **Signal conditioning:** 8 current sources for connecting ICP™ sensors
- **Analog inputs:**
  - 4 groups
  - 4 channels
  - 4 groups
- **Single Ended (SE)/differential (diff.)**
  - 16 thermo/8 RTDs
  - 8 thermo/4 RTDs
  - 4 thermo/2 RTDs
- **Resolution (-bit):**
  - 18
  - 18
  - 24
  - 16
  - 16
- **Optical isolation:** ✔
- **Throughput:**
  - 20-160 Hz
  - 20-160 Hz
  - 2-200 kHz (through software)
  - depends on transducer type
- **Voltage ranges:**
  - ± 1.25 V
  - ± 1.25 V
  - ± 10 V
- **Gain:**
  - 1, 2, 4, 8, 16, 32, 64, 128
  - 1, 2, 4, 8, 16, 32, 64, 128
- **FIFO (Values):** 128 DWORD

**Functions of the analog inputs**

- **DMA (scatter gather; single; continuous; Sequence):**
- **Auto Refresh:** ✔
- **Interrupt:** ✔
- **Programmed I/O:** ✔
- **Trigger:**
  - Software 24 V Input
  - ✔
- **Sequence RAM:**
- **Analog outputs:**
  - 2
  - **Resolution (-bit):**
  - 16
- **Optical isolation:**
  - 0-10 V ± 10 V
  - ± 10 V
- **Chronometer inputs**
  - Gate inputs
  - 4
  - 2
- **Timer/Watchdog** (depth)
  - in combination, and/or
  - – / –
  - – / –
  - – / –
  - 1 / –
  - 16-bit
  - 1 / –
  - 16-bit

**Digital I/O**

- **Inputs 24 V, optically isolated:**
  - 4
  - 3 (Open Collector)
- **Outputs 24 V, optically isolated:**
  - 4
  - 3 (Open Collector)
  - 8
  - 8 (50 mA)
  - 8
  - 8 (125 mA)
- **Page:**
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**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**

**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) freely programmable through software for each channel
- Gain PGA x1, x2, x5, x10 freely programmable through software for each channel
- PCI DMA for analog data acquisition
- Overvoltage protection
- Input filters: 159 kHz

**Analog acquisition**
- One single channel, several channels, several channels through scan list
- Automatic analog acquisition through cyclic timer control
- Acquisition through scan list: up to 16 entries with gain, channel, unipolar/bipolar
- Acquisition triggered through software, timer, external event
- Trigger functions:
  - Software trigger or external trigger: the analog acquisition (single or sequence) is started through signal switching from 0 V to 24 V at the digital input 0.
  - Interrupt: end of single channel, end of multichannel, end of scan list

**Analog outputs**
- 4 or 8 analog outputs, optically isolated 500 V
- Setup time 10 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
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

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

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

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

Analog inputs
Number of inputs: 16 single-ended/differential inputs or 8 single-ended/differential inputs
Resolution: 16-bit resolution
Optical isolation: 500 V through opto-couplers from PC to peripheral
Input ranges: software-programmable for each channel
Resolution: ± 1 LSB (ADC)
Input impedance (PGA): ± 10 kΩ
Common mode rejection: DC at 10 Hz, ± 10 kΩ differential against GND
Banding (-3 dB): Limited to 159 kHz with low-pass filter
Trigger: Through software, timer, external event (± 24 V input)
Data transfer: DMA transfer if ED, direct access to 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
Setup time at ± 10 V: 10 µs
Overvoltage protection: ± 90 V
Max. output current / load: ± 5 mA / 500 pF, 2 kΩ
Overvoltage protection: ± 12 V

Digital I/O
Number of I/O channels: 4 dig. inputs, 4 dig. outputs, 24 V
Optical isolation: 1000 V through opto-couplers
Input current at 24 V: 3 mA typ.
Input range: 0-20 mA optional

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: 169 x 99 mm
System bus: PCI, 32-bit, 3.3 V acc. to specification 2.1 (PCISIG)
Space required: 1 PCI slot for analog I/O
Operating voltage: ± 5 V, ± 5 V from the PC
Operating temperature: 0 to 60 °C (with forced cooling)
Relative precision (INL): ± 1 LSB (ADC)
Common mode rejection: DC at 10 Hz, 90 dB minimum
Gain: Software programmable (1, 2, 5, 10)
Throughput: 100 kHz

Ordering information
APCI-3120
Multifunction board, optically isolated, 16 SE/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/diff. inputs, 8 analog outputs
APCI-3120-16-16: Version with 16 SE/diff. inputs, 4 analog outputs
APCI-3120-8-8: Version with 8 SE/diff. inputs, 8 analog outputs
APCI-3120-8-4: Version with 8 SE/diff. inputs, 4 analog outputs

Options
Please indicate the number of channels
Option SF: Precision filter for 1 single-ended channel
Option DF: Precision filter for 1 differential channel
Option PC: Current input 0/-20 mA for 1 channel
PC-SE: for single-ended PC-DIFF: for differential

Pin assignment – 37-pin D-Sub male connector

Pin assignment – 16-pin male connector

ADDI-DATA connection

Phone: +49 7229 1847-0
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www.addi-data.com
193
Multifunction board, optically isolated, 16/8 SE or 8/4 diff. inputs, 4 analog outputs, 12-/16-bit

APCI-3110 / APCI-3116
PCI 3.3 V or 5 V
Optical isolation 1000 V
16/8 SE or 8/4 diff. inputs
12-bit or 16-bit resolution, 200 kHz
PCI DMA, programmable gain
4 analog outputs, 12-bit
Timer/counter/watchdog
8 optically isolated dig. I/O, 24 V, 24 TTL I/O

Features
- PCI 3.3 V or 5 V

Analog inputs
- 16/8 SE or 8/4 diff. inputs, optically isolated
- Resolution: 12-bit (APCI-3110) or 16-bit (APCI-3116)
- Throughput: 200 kHz
- Input voltage: 0-10 V, ±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)
  can be combined freely with voltage inputs
- Gain PGA x1, x2, x5, x10 freely programmable through software for each channel

Analog acquisition
- Different input modes:
  1) Simple mode
  2) Scan modes
  3) Sequence modes
  4) Auto Refresh mode
- Onboard FIFO (for 512 analog values)
- PCI-DMA for analog data acquisition

Analog outputs
- 4 analog outputs, optically isolated
- 12-bit resolution
- Setup time 15 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: outputs / Port1: inputs / Port2: I/O
- All I/O are at 5 V through pull-up resistors
- Easy programming through I/O read and write commands

Timer/counter
- 3 / 3, 16-bit
  Watchdog
- 2, 16-bit

Safety features
- Optical isolation 1000 V min.
- Creeping distance IEC 61010-1
- Circuit part of the analog acquisition is separated from the circuit part of the digital function
- Overvoltage protection ±40 V
- Protection against high-frequency EMI
- Input filters
- Noise neutralisation of the PC supply
- Connection of the I/O signals through robust industry-standard D-Sub connector

Applications
- Industrial process control
- Industrial measurement and monitoring
- Multichannel data acquisition
- Control of chemical processes
- Factory automation
- Acquisition of sensor data
- Laboratory equipment
- Current measurement
- Instrumentation

Software
Standard drivers for:
- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

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

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: -10 V to +10 V (± 1 LSB)
- Gain: Software programmable (1, 2, 5, 10)
- Trigger: Through software, timer, external event (± 20 mA)
- Data transfer: Data to the PC through FIFO memory, DMA transfer at EOC
- Intermittent: End of conversion, at timer overrun, End of scan

Analog outputs
- Number of outputs: 4
- Optical isolation: 1000 V through opto-couplers
- Resolution: 12-bit
- Voltage range:
  - Output range: -10 V to +10 V (± 1 LSB)
  - Logic level
    - "1": ± 30 V
    - "0": ± 15 V (± 10 V step)
  - Maximum output current: ± 5 mA
  - Short-circuit current: ± 20 mA
  - Output voltage after reset: 0 V
  - Short-circuit current: ± 20 mA

Digital I/O
- Number of I/O channels: 4 digital inputs, 24 V
- Logical "0" level: -5 V, ± 5 % from the PC
- Logical "1" level: 19-30 V
- Interrupts: End of conversion, at timer overrun, End of scan

Physical and environmental conditions
- Dimensions: 175 x 99 mm
- System bus: PCI, 32-bit, 3.3V acc. to spec C.2.2 (PCI/PC)
- Space required: 1 Pci slot for analog I/O
- 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)

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
- Multifunction board, optically isolated, 16/8 SE or 8/4 diff. inputs, 4 analog outputs, 12-/16-bit.
- Incl. technical description and software drivers.

Accessories
- PX901-A: Screw terminal panel with transorb diodes
- PX901-AG: Same as PX901-A with housing for DIN rail
- PX_BNC: BNC connection box for connecting the analog I/O
- ST010: Standard round cable, shielded, twisted pairs, 2 m
- ST011: Standard round cable, shielded, twisted pairs, 5 m
- PX8001: 3-row screw terminal panel, 50-pin, for DIN-rail mounting
- FB8001: Ribbon cable for digital I/O
- ST370-16: Standard round cable, shielded, twisted pairs, 2 m

Phone: +49 7229 1847-0 info@addi-data.com
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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 SE8 diff. inputs, 4 analog outputs, 12-bit
- APCI-3110-8: 8 SE4 diff. inputs, 4 analog outputs, 12-bit
- APCI-3116-16: 16 SE8 diff. inputs, 4 analog outputs, 16-bit
- APCI-3116-8: 8 SE4 diff. inputs, 4 analog outputs, 16-bit

Options
- Please indicate the number of channels
- Option SF: Precision filter for 1 single-ended channel
- Option DP: Precision filter for 1 diff. channel
- Option PC: Current input 0-20 mA for 1 channel

Pin assignment – 37-pin D-Sub male connector
- Channel 1-8: Channel 1-8
- Channel 9-16: Channel 9-16
- Channel 17-24: Channel 17-24

Pin assignment – 50-pin male connector
- Channel 1-8: Channel 1-8
- Channel 9-16: Channel 9-16
- Channel 17-24: Channel 17-24
- Channel 25-32: Channel 25-32

ADDI-DATA connection
Analog input board, optically isolated, 16/8/4 SE or 8/4/2 diff. inputs, 12-/16-bit

### 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) can be combined freely with voltage inputs
  - Gain PGA x1, x2, x5, x10 freely programmable through software for each channel
- Analog acquisition
  - Different input modes:
    1) Simple mode
    2) Scan modes
    3) Sequence modes
    4) Auto Refresh mode
  - Trigger functions:
    - Software trigger or
    - External trigger: the analog acquisition (single or sequence) is started through the signal on digital input 0 from 0 V to 24 V
  - Onboard FIFO (for 512 Analog values)
  - PCI-DMA for analog data acquisition
- 24 V digital I/O
  - 24 V digital I/O enable a high interference distance and a long distance between signal transmitter and data acquisition
  - 4 digital inputs, 24 V, optically isolated
  - 4 digital outputs, 24 V, optically isolated
- TTL I/O
  - 24 digital TTL inputs/outputs
  - Port1: inputs / Port2: outputs / Port3: I/O
  - All I/O are at 5 V through pull-up resistors
  - Easy programming through I/O read and write commands
- Customer-tailored modifications
designed to suit your needs.
Hardware and software, firmware, PLDs, ...
Contact us!

### 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
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

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

ADDIPACK functions:
- Analog input • Digital input • Digital output
- Watchdog • Timer • Counter

On request:
Further operating systems, compilers and samples.

Driver download: www.addi-data.com, 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
- 0-1 V ± 0.5 V, 5 V, 2 V, 0 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
Logical “0” Level: 0-14 V
Logical “1” Level: 19-30 V
Output ranges: High Side, 50 mA

TTL I/O
Number of TTL I/O channels: 24
Programming: Through write/read commands

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

Physical and environmental conditions
Dimensions: 175 x 99 mm
System bus: PCI 32-bit 3.3V/5V, acc. to spec. 2.2 (PCISiG)
Operating voltage: +5 V, ±5 % from the PC
Additional connector: 50-pin male connector for connecting the digital I/O
Temperature range: 0 to 60 °C (with forced cooling)

Screw terminal panel PX901-AG with cable ST010
Connection box PX-BNC with cable ST010

ADDI-DATA connection

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

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, 5 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
Analog input board, optically isolated, 16 differential inputs, 16-bit

APCI-3002
PCI 3.3 V or 5 V
Optical isolation 1000 V
16 differential inputs, 200 kHz throughput
16-bit resolution
PCI DMA, programmable gain
Trigger functions, timer
8 optically isolated digital I/O, 24 V

Features
- PCI 3.3 V or 5 V
- Analog inputs
  - 16 differential inputs
  - 16-bit resolution
  - Throughput: 200 kHz
  - Voltage inputs: 0-10 V, ±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
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

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

ADDIPACK functions:
Analog input • Digital input • Digital output • Timer

On request:
Further operating systems, compilers and samples.

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

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

Analog inputs
Number of inputs: 16 differential inputs
Resolution: 16-bit
Optical isolation: 1000 V through opto-couplers from PC to peripheral
Input ranges: 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 (24 V input)
Data transfer: Data to the PC through FIFO memory, Interrupt at EOC (End Of Conversion), DMA transfer at EOC
Interrupts: End of conversion, at timer overrun, End of scan

Digital I/O
Number of I/O channels: 4 digital inputs, 24 V, 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)
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: 814 mA ±10 mA
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)

Accessories
PX901-AG: Screw terminal panel with transorb diodes, with housing for DIN rail for connecting the analog inputs
PX901-ZG: Screw terminal panel for connecting the digital I/O, for DIN rail
ST010: Standard round cable, shielded, twisted pairs, 2 m
ST011: Standard round cable, shielded, twisted pairs, 5 m
FB3000: Ribbon cable for digital I/O

Simplified block diagram

Pin assignment – 37-pin D-Sub male connector

Pin assignment – 16-pin male connector

ADDI-DATA connection

APCI-3002
Analog input board, optically isolated, 16 analog 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

Ordering information

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

**Timer**
- 1, 12-bit
- Timer as cyclic time counter

**Safety features**
- For more protection in noisy industrial environment
- Optical isolation 1000 V min.
- Creeping distance IEC 61010-1
- Overvoltage protection ± 40 V
- Protection against high-frequency EMI
- Input filters
- Noise neutralisation of the PC supply

**Applications**
- Industrial process control
- Industrial Measurement and monitoring
- Multichannel data acquisition
- Control of chemical processes
- Factory automation
- Acquisition of sensors
- Laboratory equipment
- Current measurement
- Instrumentation

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

**Standard drivers for:**
- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

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

**ADDIPACK functions:**
- Analog input • Digital input • Digital output • Timer

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

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

Analog inputs

- Number of inputs: 4 differential inputs
- Resolution: 16-bit
- Optical isolation: 1000 V through opto-couplers from PC to peripheral
- Input ranges: Software-programmable for each channel
  - 0-10 V, ±10 V, ± 5 V, ± 2 V, ± 1 V
  - 0-20 mA optional
- 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, Interrupt at EOC (End Of Conversion), DMA transfer at EOC
- Interrupts: End of conversion, at timer overrun, End of scan

Digital I/O

- Number of I/O channels: 4 digital inputs, 24 V, 4 digital outputs, 24 V, 50 mA typ., Open Collector
- Logical "0" level: 0-13 V
- Logical "1" level: 16-30 V
- Optical isolation: 1000 V through opto-couplers from PC to peripheral

EMC – Electromagnetic compatibility

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

Physical and environmental conditions

- Dimensions: 175 x 99 mm
- System bus: PCI 32-bit 3.3/5V acc. to specification 2.2 (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)

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(A)-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, ±1 V, 0-20 mA (option), freely programmable through software for each channel
  • Gain PGA x1, x2, x5, x10 freely programmable through software for each channel
- PCI-DMA for analog data acquisition

Analog acquisition
- Single channel, several channels, several channels through scan list
- Automatic analog acquisition through cyclic timer control
- Acquisition through scan list: up to 16 entries with gain, channel, unipolar/bipolar
- Acquisition triggered through software, timer, external event
- Trigger functions:
  - Software trigger or
  - External trigger: the analog acquisition (single or scan) is started through signal switching from 0 V to 24 V at the digital input 0.
  - Interrupt: End of single channel, end of multichannel, end of scan list

Digital
- 4 digital inputs, 24 V, optically isolated
- 4 digital outputs, 24 V, optically isolated

Timer
- 24-bit, can be used as cyclic time counter

Safety features
- Optical isolation 500 V min.
- Creeping distance IEC 61010-1
- Overvoltage protection ± 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
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

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

On request:
Further operating systems, compilers and samples.

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

Analog inputs

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of inputs:</td>
<td>16 single-ended/8 differential inputs, 8 single-ended/4 differential inputs or 4 single-ended inputs</td>
</tr>
<tr>
<td>Resolution:</td>
<td>12 bit</td>
</tr>
<tr>
<td>Optical isolation:</td>
<td>500 V through opto-couplers from PC to peripheral</td>
</tr>
<tr>
<td>Input ranges:</td>
<td>Software-programmable for each channel</td>
</tr>
<tr>
<td></td>
<td>0-10 V, ±10 V, 0-5 V, ±5 V, 0-2 V, ±2 V, 0-1 V, ±1 V, 0-20 mA optional</td>
</tr>
<tr>
<td>Throughput:</td>
<td>100 kHz</td>
</tr>
<tr>
<td>Gain:</td>
<td>Software programmable (x1, x2, x5, x10)</td>
</tr>
<tr>
<td>Relative precision (VNL):</td>
<td>± 1 LSB (ADL)</td>
</tr>
<tr>
<td>Differential non-linearity (VNL):</td>
<td>± 0.5 LSB (ADIC)</td>
</tr>
<tr>
<td>Input impedance (PGA):</td>
<td>10/12/10 nF single-ended, 10/12/20 nF differential against GND</td>
</tr>
<tr>
<td>Bandwidth (± 3 dB):</td>
<td>Limited to 159 kHz with low-pass filter</td>
</tr>
<tr>
<td>Trigger:</td>
<td>Through software, timer, external event (24 V input)</td>
</tr>
<tr>
<td>Data transfer:</td>
<td>Data to the PC through FIFO memory, I/O commands, interrupt at EDC (End Of Conversion) and EOS (End of Scan), DMA transfer at EOC</td>
</tr>
<tr>
<td>Interrupts:</td>
<td>End of conversion, at timer overrun, End of scan</td>
</tr>
<tr>
<td>Time base timer 2:</td>
<td>50 µs; smallest programmable value: 100 µs</td>
</tr>
</tbody>
</table>

Digital I/O

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of I/O channels:</td>
<td>4 digital inputs, 4 digital outputs, 24 V</td>
</tr>
<tr>
<td>Optical isolation:</td>
<td>500 V through opto-couplers from PC to peripheral</td>
</tr>
<tr>
<td>Input range:</td>
<td>0-30 V - Logical &quot;0&quot;, 0-5 V - Logical &quot;1&quot;: 10-30 V</td>
</tr>
<tr>
<td>Input current at 24 V:</td>
<td>3 mA typ.</td>
</tr>
<tr>
<td>Output range:</td>
<td>5-30 V</td>
</tr>
<tr>
<td>Max. switching current:</td>
<td>10 mA typ.</td>
</tr>
<tr>
<td>Output type:</td>
<td>Open Collector</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>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions:</td>
<td>169 x 99 mm</td>
</tr>
<tr>
<td>System bus:</td>
<td>PCI 32-bit 3.3 / 5 V acc. to specification 2.1 (PCI SIG)</td>
</tr>
<tr>
<td>Space required:</td>
<td>1 PCI slot for analog input, 1 slot opening for digital I/O</td>
</tr>
<tr>
<td>Operating voltage:</td>
<td>+5 V ± 5 % from the PC</td>
</tr>
<tr>
<td>Current consumption:</td>
<td>500 mA typ., ± 10 %</td>
</tr>
<tr>
<td>Front connector:</td>
<td>37-pin D-Sub male connector</td>
</tr>
<tr>
<td>Additional connector:</td>
<td>16-pin male connector for ribbon cable for connecting the digital inputs and outputs</td>
</tr>
<tr>
<td>Temperature range:</td>
<td>0 to 60 °C (with forced cooling)</td>
</tr>
</tbody>
</table>

APCI-3001

Analog input board, optically isolated, 16/8/4 SE or 8/4/4 diff. inputs, 12-bit. Inc. technical description and software drivers.

Versions

<table>
<thead>
<tr>
<th>Version</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>APCI-3001-16</td>
<td>16 SE/8 diff. inputs, 8 dig. I/O</td>
</tr>
<tr>
<td>APCI-3001-8</td>
<td>8 SE/4 diff. inputs, 8 dig. I/O</td>
</tr>
<tr>
<td>APCI-3001-4</td>
<td>4 SE inputs, 8 dig. I/O</td>
</tr>
</tbody>
</table>

Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option SF</td>
<td>Please indicate the number of channels</td>
</tr>
<tr>
<td>Option DF</td>
<td>Precision filter for 1-single channel</td>
</tr>
<tr>
<td>Option SC</td>
<td>Precision filter for 1 differential channel</td>
</tr>
<tr>
<td>Option DC</td>
<td>Current input for 1-single channel (0/4)-20 mA</td>
</tr>
<tr>
<td></td>
<td>Current input for 1 diff. channel, (0/4)-20 mA</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 inputs</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>
<tr>
<td>PX901-2G</td>
<td>Screw terminal panel for connecting the digital I/O, for DIN rail</td>
</tr>
<tr>
<td>ST010</td>
<td>Standard round cable, shielded, twisted pairs, 2 m</td>
</tr>
<tr>
<td>ST011</td>
<td>Standard round cable, shielded, twisted pairs, 5 m</td>
</tr>
<tr>
<td>FB3000</td>
<td>Ribbon cable for digital I/O</td>
</tr>
</tbody>
</table>

Phone: +49 7229 1847-0 info@addi-data.com
Fax: +49 7229 1847-222 www.addi-data.com
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/200 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
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

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

ADDIPACK functions
- Analog output • Digital input • Digital output • Timer
- Watchdog

On request:
Further operating systems, compilers and samples.

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

<table>
<thead>
<tr>
<th>Analog outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of outputs:</td>
</tr>
<tr>
<td>Resolution:</td>
</tr>
<tr>
<td>Monobrane:</td>
</tr>
<tr>
<td>Optical isolation:</td>
</tr>
<tr>
<td>Output range:</td>
</tr>
<tr>
<td>Setup time at 2 kΩ, 1000 pF:</td>
</tr>
<tr>
<td>Overvoltage protection:</td>
</tr>
<tr>
<td>Max. output current:</td>
</tr>
<tr>
<td>Short-circuit current:</td>
</tr>
<tr>
<td>Output voltage after reset:</td>
</tr>
<tr>
<td>Watchdog:</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Digital I/O</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of I/O channels:</td>
</tr>
<tr>
<td>Optical isolation:</td>
</tr>
<tr>
<td>Input current at 24 V:</td>
</tr>
<tr>
<td>Input range:</td>
</tr>
<tr>
<td>Max. switching current:</td>
</tr>
<tr>
<td>Output range:</td>
</tr>
<tr>
<td>Output type:</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**

- **Dimensions:** 175 x 99 mm
- **System bus:** PCI 32-bit 3.3/5 V acc. to specification 2.1 (PCISIG)
- **Space required:** 1 PCI slot for analog outputs, 1 slot opening for digital I/O with FB3000
- **Operating voltage:** ±5 V, ±5 % from the PC
- **Current consumption:** 440 mA ± 10 % 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)

**APCI-3501**

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

**Versions**

- **APCI-3501-8**: Version with 8 analog voltage outputs
- **APCI-3501-4**: Version with 4 analog voltage outputs

**Accessories**

- **PX901-A**: Screw terminal panel with transorb diodes, for connecting the analog outputs
- **PX901-AG**: Same as PX901-A with housing for DIN rail
- **PX_BNC**: BNC connection box for connecting the analog I/O

**Ordering information**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST010</td>
<td>Standard round cable, shielded, twisted pairs, 2 m</td>
</tr>
<tr>
<td>ST011</td>
<td>Standard round cable, shielded, twisted pairs, 5 m</td>
</tr>
<tr>
<td>PX901-ZG</td>
<td>Screw terminal panel for connecting the digital I/O, for DIN rail</td>
</tr>
<tr>
<td>FB3000</td>
<td>Ribbon cable for digital I/O</td>
</tr>
</tbody>
</table>

Phone: +49 7229 1847-0  info@addi-data.com
Fax: +49 7229 1847-222  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 screw terminal panel PX3200

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 SE/B 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 panel)
- Gain and offset calibration
- Linearisation through table and calculation for thermocouple types J, K, T, E, R, S, B, N and RTDs
- Programmable gain
- 16-bit accuracy with converter sample rate of 20, 40, 80 or 160 Hz (higher sample rate on request)
- 4 digital inputs, 24 V and 3 digital outputs, open collector, optically isolated
- Base address and IRQ channels set through BIOS

Software drivers

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

Standard drivers for:
- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

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

ADDIPACK functions
- Analog input
- Temperature
- Resistance
- Digital input
- Digital output

On request:
Further operating systems, compilers and samples.

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

Safety features

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

Pin assignment – 50-pin D-Sub male connector

ADDI-DATA connection

Pin assignment – 16-pin male connector

Accessories:
- screw terminal panel PX3200-G with cold junction compensation, ST3200 cable, see page 209.
### Specifications

#### Analog inputs
- **16 x thermocouples**
- **8 x RTD with 2 or 4 wire connection**
- **4 x RTD with 3 wire connection**
- **16 SE/8 diff. inputs, ± 2.5 V**

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

#### Sample frequencies

<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></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Thermocouples accuracy

<table>
<thead>
<tr>
<th>Type</th>
<th>Range</th>
<th>Accuracy (+/-)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type J</td>
<td>-200.0 °C</td>
<td>±0.5 °C</td>
</tr>
<tr>
<td></td>
<td>+600.0 °C</td>
<td>±0.6 °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° C to +60° C</td>
<td>±(0.30 °C + 0.0050 x</td>
</tr>
</tbody>
</table>

#### Physical and environmental conditions

**Dimensions:**
- 131 x 99 mm
**System bus:**
- PCI 32-bit 2.2 (PCISiG)
**Space required:**
- 1 slot opening for the digital I/O
**Operating voltage:**
- 220 V ± 5% from the PC
**Current consumption:**
- 550 to 660 mA
**Operating temperature:**
- 0 to 60 °C (with forced cooling)

### 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 for inspection.

**Operating environment:**
- 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).

**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>1</td>
<td>±0.40 °C</td>
</tr>
<tr>
<td>2</td>
<td>±0.20 °C</td>
</tr>
<tr>
<td>4</td>
<td>±0.15 °C</td>
</tr>
<tr>
<td>8</td>
<td>±0.10 °C</td>
</tr>
<tr>
<td>16</td>
<td>±0.08 °C</td>
</tr>
<tr>
<td>32</td>
<td>±0.08 °C</td>
</tr>
<tr>
<td>64</td>
<td>±0.08 °C</td>
</tr>
</tbody>
</table>

**Sensor short-circuit / line break detection**

<table>
<thead>
<tr>
<th>Type</th>
<th>Short-circuit</th>
<th>Line break</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermocouple (ok)</td>
<td>no detection</td>
<td>no detection</td>
</tr>
<tr>
<td>Resistance (diff.)</td>
<td>detection</td>
<td>detection</td>
</tr>
<tr>
<td>Potentiometer (diff.)</td>
<td>detection</td>
<td>detection</td>
</tr>
</tbody>
</table>
The PX3200-G screw terminal panel is used for connecting thermocouples/RTDs. It is connected to the APCI-3200 through the ST3200 cable. The housing of the female connector is connected to two ground terminals so that the board is additionally earthed for more security. All components of the board are enclosed in an earthing strip also connected to the ground terminals. Each terminal is directly connected to one pin of the 50-pin D-Sub female connector. The designations on the terminals indicate the respective connections for the 50-pin D-Sub female connector. The PX3200-G features an integrated CJC\(^{[1]}\). 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
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

Software

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

-** Standard drivers for:**
  - Linux
  - 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
  - Signed 64-bit drivers for Windows 8 / 7 / XP
  - Real-time use with Linux and Windows on request

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

-** ADDIPACK functions**
  - Pressure • Digital input • Digital output

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

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

Safety features

- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Protection against overvoltage (±30 V) and high-frequency EMI

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
Input voltage range: 0 to 1.25 V
Input 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

Simplified block diagram

Pin assignment – 50-pin D-Sub male connector

Pin assignment – 16-pin male connector

ADDI-DATA connection

Ordering information

APCI-3300

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

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
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-3400)**
- 8 digital inputs, 24 V, optically isolated
- 8 digital outputs, 24 V, optically isolated

**Onboard SDRAM module**
- 128 MB (256 MB or 512 MB on request)

**Applications**

The following applications can be realised with the APCI-3600:
- Noise measurement with fault diagnosis on gear and drive over FFT. Encoders are connected to the chronometer inputs and microphones are connected to the analog inputs. Encoders measure the position of the drive and the analog inputs measure the noise of the system at a specific position. For this purpose the analog inputs and the chronometer inputs are controlled synchronously. To each analog sample belongs a position of the chronometer. The synchronisation results from a FFT.
- Measurement of the transfer function of a DUT (“Device Under Test”).
- Noise analysis: Evaluation of a washing machine, measurements in the automotive field, etc.

**Software**

Standard drivers for:
- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

**Samples for the following compilers:**
Visual C++ • Borland C

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

*Preliminary product information*
### Specifications

#### Analog inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>8</td>
</tr>
<tr>
<td>Input type</td>
<td>Single-ended or differential through software</td>
</tr>
<tr>
<td>Resolution</td>
<td>24-bit</td>
</tr>
<tr>
<td>A/D Converter</td>
<td>Delta-Sigma, 5th order, multibit</td>
</tr>
<tr>
<td>Gain</td>
<td>x1, x10 software programmable</td>
</tr>
<tr>
<td>Input ranges</td>
<td>Gain x1: ± 10 V single-ended, Gain x10: ± 1 V single-ended</td>
</tr>
<tr>
<td>Sampling rate</td>
<td>2 kHz to 200 kHz selectable through software</td>
</tr>
<tr>
<td>Selectable frequencies:</td>
<td></td>
</tr>
</tbody>
</table>

#### Versions

<table>
<thead>
<tr>
<th>Version</th>
<th>8 analog inputs</th>
<th>8 ICP power supply (current sources)</th>
<th>4 chronometer inputs</th>
<th>2 analog outputs</th>
<th>8 digital inputs, 24 V, optically isolated</th>
<th>8 digital outputs, 24 V, optically isolated</th>
<th>Onboard SD RAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>APCI-3600</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>APCI-3600-L</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

#### Analog inputs

- **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 x10: ± 1 V single-ended
- **Sampling Rate:** 2 kHz to 200 kHz selectable through software
- **Selectable Frequencies:**
  - 2 kHz ≤ f ≤ 1 kHz
  - 1 kHz ≤ f ≤ 5 kHz
  - 5 kHz ≤ f ≤ 10 kHz
  - 10 kHz ≤ f ≤ 100 kHz
  - 100 kHz ≤ f ≤ 200 kHz
  - 200 kHz ≤ f ≤ 1 MHz
  - 500 kHz ≤ f ≤ 666.67 kHz
  - 1 MHz ≤ f ≤ 2 MHz
  - 2 MHz ≤ f ≤ 3 MHz
  - 3 MHz ≤ f ≤ 4 MHz
  - 4 MHz ≤ f ≤ 5 MHz
  - 5 MHz ≤ f ≤ 10 MHz
  - 10 MHz ≤ f ≤ 20 MHz
  - 20 MHz ≤ f ≤ 50 MHz
  - 50 MHz ≤ f ≤ 100 MHz
  - 100 MHz ≤ f ≤ 200 MHz
  - 200 MHz ≤ f ≤ 500 MHz
  - 500 MHz ≤ f ≤ 1 GHz
  - 1 GHz ≤ f ≤ 2 GHz
  - 2 GHz ≤ f ≤ 5 GHz
  - 5 GHz ≤ f ≤ 10 GHz
  - 10 GHz ≤ f ≤ 20 GHz
  - 20 GHz ≤ f ≤ 50 GHz
  - 50 GHz ≤ f ≤ 100 GHz
  - 100 GHz ≤ f ≤ 200 GHz
  - 200 GHz ≤ f ≤ 500 GHz
  - 500 GHz ≤ f ≤ 1 THz
  - 1 THz ≤ f ≤ 2 THz
  - 2 THz ≤ f ≤ 5 THz
  - 5 THz ≤ f ≤ 10 THz
  - 10 THz ≤ f ≤ 20 THz
  - 20 THz ≤ f ≤ 50 THz
  - 50 THz ≤ f ≤ 100 THz
  - 100 THz ≤ f ≤ 200 THz
  - 200 THz ≤ f ≤ 500 THz
  - 500 THz ≤ f ≤ 1 MHz

#### Oversampling

- **64 x 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 0.45 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 0.45 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-3dB Limit Frequency:** 1.6 Hz
- **Overvoltage Protection:**
  - R1+, L1+, R2+, L2+: ± 36 V, ± 70 mA
  - R1-, L1-, R2-, L2-: ± 12 V, ± 300 mA
  - L/R3+, L/R4+: ± 12 V, ± 300 mA

---

*Preliminary product information*
Specifications

**Analog inputs (continued)**

**Dynamic properties**

- **2 kHz ≤ fIN ≤ 50 kHz:**
  - Passband: DC (Ω) up to 0.47 x fIN min. to max.
  - Stopband: 0.58 x fIN min.
  - Stopband attenuation: -95 dB min.
  - Total group delay: 12fIN s typical
- **50 kHz ≤ fIN ≤ 100 kHz:**
  - Passband: DC (Ω) up to 0.45 x fIN min. to max.
  - Stopband: 0.68 x fIN min.
  - Stopband attenuation: -92 dB min.
  - Total group delay: 9fIN s typical
- **100 kHz ≤ fIN ≤ 200 kHz:**
  - Passband: DC (Ω) up to 0.24 x fIN min. to max.
  - Stopband: 0.78 x fIN min.
  - Stopband attenuation: -97 dB min.
  - Total group delay: 5fIN s typical

**Dynamic range SNR**

- 2 kHz ≤ fIN ≤ 50 kHz:
  - < -105 dB (short input gain x1)
  - < -100 dB (open input gain x10)
- 50 kHz ≤ fIN ≤ 100 kHz:
  - < -105 dB (short input gain x1)
  - < -100 dB (open input gain x10)
- 100 kHz ≤ fIN ≤ 200 kHz:
  - < -75 dB (short input gain x1)
  - < -75 dB (open input gain x10)

**Crosstalk**

Between channel R0 and L0, R1 and L1, R2 and L2, R3 and L3.
- **Short input at fIN = 100 kHz:**
  - 2 kHz ≤ fIN ≤ 50 kHz:
    - < -95 dB
  - 50 kHz ≤ fIN ≤ 100 kHz:
    - < -95 dB
  - 100 kHz ≤ fIN ≤ 200 kHz:
    - < -70 dB
- **Short input at fIN = 1 kHz:**
  - 2 kHz ≤ fIN ≤ 50 kHz:
    - < -95 dB
  - 50 kHz ≤ fIN ≤ 100 kHz:
    - < -95 dB
  - 100 kHz ≤ fIN ≤ 200 kHz:
    - < -70 dB
- **1 kΩ load at fIN = 100 kHz:**
  - 2 kHz ≤ fIN ≤ 50 kHz:
    - < -95 dB
  - 50 kHz ≤ fIN ≤ 100 kHz:
    - < -95 dB
  - 100 kHz ≤ fIN ≤ 200 kHz:
    - < -70 dB

**Phase error**

Between channel R0 and L0, R1 and L1, R2 and L2, R3 and L3.
- **fIN = 200 kHz:**
  - 0.3° max.
  - 0.2° at fIN = 10 kHz sinus signal
  - 0.02° at fIN = 1 kHz sinus signal

**Amplitude error**

± 0.02 dB max. at fIN = 1 kHz sinus signal

**Offset error**

± 200 µV max. at fIN = 2 kHz

**Digital inputs**

- **Number of inputs:** 8
- **Filter/protective circuit:** Low-pass/transorb diode
- **Optical isolation:** 1000 V
- **Nominal voltage:** 24 V external
- **Input voltage:** ± 30 V
- **Input current:** 7 mA at 24 VDC, typical
- **Logic input levels:**
  - NM (max.): 19 V
  - UL (max.): 14 V
  - UL (min.): 0 V
- **Input frequency (max.):** 4 kHz at 24 V
- **Trigger input:** Digital input 0

**Digital outputs**

- **Number of outputs:** 8, open collector
- **Optical isolation:** 1000 V
- **Nominal voltage:** 24 V
- **Supply voltage:** 5-30 V
- **Output current per output:** 50 mA max.
- **Total current:** 200 mA limited through PFI
- **Switch-on time:** 0.25 µs typical
- **Switch-off time:** 0.25 µs typical

**Current sources**

- **Number:** 8 constant current sources for the power supply of the ICP™ sensors, 4 mA typical, 24 V max.

**Chronometer**

- **Number:** 4 x chronometer, 2 x gate on chronos 1+2
- **Input type:** RS485
- **Max. speed:** 1 MHz max.
- **Counting depth:** 32-bit
- **Divider:** From 2 to 2^13 per chronometer
- **FIFO depth:** 256 DWORD
- **Data transfer:** DMA, ILDA, IRDA
- **Differential threshold voltage:** -200 mV to +50 mV
- **Input resistance:** 12Ω differential
- **ESD protection:** ±15 kV Human Body Model

**EMC – Electromagnetic compatibility**

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

**Physical and environmental conditions**

- **Dimensions:** 175 x 99 mm
- **System bus:** PCI 32-bit 3.3 V acc. to spec. 2.2 (PCISiG)
- **Space required:** 1 PCI slot for the analog inputs
- **Front connector:** 8 SMB coaxial connector on bracket
- **Additional connector:**
  - 37-pin D-Sub connector for digital I/O
  - 15-pin D-Sub connector for chronometer inputs
  - 15-pin D-Sub connector for analog outputs
- **Operating voltage:** ±5 V, ±5 % from the PC
- **Optical isolation:** 1000 V
- **Temperature range:** 0 to 60 °C (with forced cooling)

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*Preliminary product information*
PCI, analog – APCI-3600, APCI-3600-L

Noise and vibration measurement board, optically isolated, 24-bit, multifunction board, 8 analog inputs, 8 current sources, antialiasing filter.

**Versions**

- **APCI-3600:**
  - 8 analog inputs,
  - 8 current sources for connecting ICP™ sensors,
  - 8 digital inputs, 8 digital outputs,
  - 128 MBytes SDRAM

- **APCI-3600-L:**
  - 8 analog inputs,
  - 8 current sources for connecting ICP™ sensors,
  - 128 MBytes SDRAM

**Accessories**

- **ST3601:** Connection cable, 2 m
  - SMB co-axial female connector on BNC male connector

- **ST3600:** Connection cable, 2 m (ST3600 = 8 x ST3601)

- **FB3600-D:** Ribbon cable for connecting the digital I/O on separate bracket, 30 cm

- **FB3600-AC:** Ribbon cable for connecting the chronometer and analog outputs on separate bracket, 30 cm

**Pin assignment of the chronometer and analog outputs [ribbon cable FB3600-AC]**

**Connection of 8 analog inputs on front connector**

**Pin assignment of the digital inputs and outputs**

26-pin male connector on separate 37-pin D-Sub-male connector (ribbon cable FB3600-D)

**Ordering information**

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

### 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

### Applications
- Gear wheel control
- Gauge block
- Acquisition of sensor data
- Quality control
- Industrial process control
- Automatic parts control
- R&D instrumentation

### Safety features
- Input filters
- Diagnostic function in case of short-circuits or line break

### Connection box for transducers
Specifications

Connection of inductive transducers

<table>
<thead>
<tr>
<th>Number</th>
<th>5 (simultaneous)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input type</td>
<td>Single ended</td>
</tr>
<tr>
<td>Coupling</td>
<td>AC</td>
</tr>
<tr>
<td>Resolution / Accuracy</td>
<td>10-bit / 13-bit</td>
</tr>
<tr>
<td>Sampling rate / 5 channels</td>
<td>Depending on the transducer</td>
</tr>
<tr>
<td>selectable per software</td>
<td>4.883 kHz (typ.)</td>
</tr>
<tr>
<td></td>
<td>6.975 kHz (typ.)</td>
</tr>
<tr>
<td></td>
<td>9.768 kHz (typ.)</td>
</tr>
<tr>
<td></td>
<td>13.951 kHz (typ.)</td>
</tr>
<tr>
<td></td>
<td>19.531 kHz (typ.)</td>
</tr>
<tr>
<td>Example with TeSA G121</td>
<td>13.951 kHz (on 5 channels)</td>
</tr>
</tbody>
</table>

Input level

<table>
<thead>
<tr>
<th>Input impedance</th>
<th>2 kΩ</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 kΩ</td>
<td></td>
</tr>
<tr>
<td>100 kΩ</td>
<td></td>
</tr>
<tr>
<td>1 MΩ</td>
<td></td>
</tr>
</tbody>
</table>

Sensor supply (sinus generator)

<table>
<thead>
<tr>
<th>Type</th>
<th>Sinus differential (180° phase-shift)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of outputs</td>
<td>2</td>
</tr>
<tr>
<td>Coupling</td>
<td>AC</td>
</tr>
<tr>
<td>Programmed signals:</td>
<td>output frequency / (primary frequency)</td>
</tr>
<tr>
<td></td>
<td>2-20 kHz depending on the transducer / (50 kHz Knabé)</td>
</tr>
</tbody>
</table>

Output level

<table>
<thead>
<tr>
<th>Output impedance</th>
<th>&lt; 0.1 kΩ</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 30 kΩ typ. in shutdown mode</td>
<td></td>
</tr>
</tbody>
</table>

Digital I/O

<table>
<thead>
<tr>
<th>Number of I/O channels</th>
<th>8 dig. inputs, 8 dig. outputs, 24 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optical isolation:</td>
<td>1000 V through opto-couplers</td>
</tr>
<tr>
<td>Input current at 24 V</td>
<td>11 mA typ.</td>
</tr>
<tr>
<td>Max. input frequency</td>
<td>5 kHz (inputs 1 to 7)</td>
</tr>
<tr>
<td>Max. switching current at 24 V</td>
<td>50 mA typ.</td>
</tr>
<tr>
<td>Input voltage</td>
<td>0-30 V</td>
</tr>
<tr>
<td>Output voltage</td>
<td>&gt; 30 V</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

| Dimensions | 109 x 138 mm |
| System bus | PCI 32-bit 3.3 V acc. to spec. 2.2 (PCISig) |
| Space required | 1 PCI slot for analog inputs, 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) |

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
- ST3701-8-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

Ordering information

Phone: +49 7229 1847-0
Fax: +49 7229 1847-222
info@addi-data.com
www.addi-data.com
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):
  - Solarton • Tesa • Marposs • Schlumberger
  - Peter & Hirt • Mahr • RDP • Schaevitz
  - SMPR Controle • Knäbel

Safety features

- Input filters
- Diagnostic function in case of short-circuits or line break

Applications

- Gear wheel control
- Gauge block
- Acquisition of sensor data
- Quality control
- Industrial process control
- Automatic parts control
- R&D Instrumentation

Software

ConfigTools (supplied with the board)

- Easy transducer calibration
- Step by step from the transducer selection up to testing each single channel.
- Database with more than 50 pre-calibrated transducers
- Update of the APCI-3701 firmware

Standard drivers for:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

Drivers for the following compilers and software packages:

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

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

Inputs for inductive transducers

Channel features

<table>
<thead>
<tr>
<th>Number</th>
<th>Multiplexed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input type</td>
<td>Single ended</td>
</tr>
<tr>
<td>Cables</td>
<td>AC</td>
</tr>
<tr>
<td>Resolution</td>
<td>24-bit</td>
</tr>
<tr>
<td>Sampling rate</td>
<td>f_s = 6 kHz</td>
</tr>
<tr>
<td>At primary frequency</td>
<td>f_s = 13.95 kHz</td>
</tr>
<tr>
<td>f_s = 13.95 kHz</td>
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</tr>
<tr>
<td>f_s = 19.53 kHz</td>
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<tr>
<td>f_s = 31.9 kHz</td>
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<tr>
<td>f_s = 42.4 kHz</td>
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<tr>
<td>f_s = 51.8 kHz</td>
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<tr>
<td>f_s = 59.1 kHz</td>
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<tr>
<td>f_s = 66.6 kHz</td>
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<tr>
<td>f_s = 73.5 kHz</td>
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<tr>
<td>f_s = 80.4 kHz</td>
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<td>f_s = 86.6 kHz</td>
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<tr>
<td>f_s = 92.7 kHz</td>
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<td>f_s = 98.3 kHz</td>
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<tr>
<td>f_s = 104 kHz</td>
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<tr>
<td>f_s = 109.2 kHz</td>
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<td>f_s = 114.3 kHz</td>
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<tr>
<td>f_s = 118.8 kHz</td>
<td></td>
</tr>
<tr>
<td>f_s = 122.7 kHz</td>
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</tr>
<tr>
<td>f_s = 126.5 kHz</td>
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</tr>
<tr>
<td>f_s = 130.2 kHz</td>
<td></td>
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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 (PCI SIG) |
| Space required | 1 PCI slot for analog input, 1 slot opening for digital I/O with FB3701 |
| Operating voltage | ±5 V, ±5 % from the PC, 24 V external |
| Current consumption | ±5 V from the PCI: 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) |

Ordering information

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
PX901-1: 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 APCI-3701

Simplified block diagram

Pin assignment
50-pin D-Sub male connector (APCI-3701-16)

ADDI-DATA connection

Fax: +49 7229 1847-222
Phone: +49 7229 1847-0 info@addy-data.com
www.addi-data.com
Large field of application
Serial products are still very popular and thus widespread in measurement technology. They are mainly used for the parameterising of machines or for data acquisition of measurement instruments or sensors. Examples are barcode scanners, magnetic card readers, various types of sensors, counter modules, speedometer modules, weighting devices, displays, CNC machines, robots, PLC systems etc.

Flexible mode configuration
ADDI-DATA serial interfaces are based on a concept of a basic circuit board and modules. For the 1-port, 2-port, 4-port or 8-port interfaces, the following modules are available in standard or 20 mA current loop (TTY) version: RS323, RS422 and RS485. The modules can be freely combined. Due to the modular structure, each interface can be configured as required. Thus the hardware can be adapted optimally to your requirements.

No data loss
To guarantee a reliable data transfer, the baud rate (max. 1 MBaud) can be adapted to the required frequency and, for higher transfer rates, a 128-byte FIFO buffer is available.

Robust for a safe data transfer
In the industrial environment, potential differences can occur. Therefore, each port of the ADDI-DATA serial interfaces is optically isolated from the other ports. There is also an optical isolation on the PC side. For a reliable data transfer, further protective measures have been implemented: EMC protection such as ESD, burst and short-circuit protection.

Saving money with serial interfaces through retrofit
The serial interfaces of the APCI-7xxx-3 series are available over years in order to secure your investment. They are suitable for retrofit projects with sensors or devices with serial interfaces. You can thus keep on using your sensors for a long time which means huge cost savings.

Module serial interfaces

Application example for a 4-port serial interface (APCI-7500-3)

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>Boards</th>
<th>1-port</th>
<th>2-port</th>
<th>4-port</th>
<th>8-port</th>
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<tr>
<td>APCI-7300-3</td>
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<td>APCI-7420-3</td>
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<td>APCI-7500-3, APCI-7500-3/4C</td>
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<td>APCI-7800-3</td>
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<td>PCI 5V / 3.3V</td>
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<tr>
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<td>1000 V , optional</td>
<td>1000 V , optional</td>
<td>1000 V , optional</td>
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<td>222</td>
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</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>
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<td>MX422-G</td>
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<td>Short-circuit protection</td>
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<td>✓</td>
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<td>✓</td>
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<td>Duplex</td>
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<td>Full</td>
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<td>Full</td>
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<td>Max. Baud rate*</td>
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<td>✓</td>
<td>Optional RTS/CTS (MX-422-PEP)</td>
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<td>Current consumption</td>
<td>16 mA</td>
<td>1 mA</td>
<td>15 mA</td>
<td>5 mA</td>
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</table>

* max 115.2 kBaud, optional up to 1 MBaud with crystal quartz adjustment (Quarz option)
1 to 8-port serial interface, RS232, RS422, RS485, 20 mA CL, modular mounting through modules

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
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

**Drivers and samples for the following compilers and software packages:**

- Microsoft VC++
- Visual Basic • Delphi
- On request: Further operating systems, compilers and samples.

Driver download: www.addi-data.com, 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
PCI, serial – APCI-7xxx

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>MX232-G</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>MX232</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>MX422-G</td>
<td>✔</td>
<td></td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>MX422</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>MX485-G</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>MX485</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>MXTTY</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
Burnt protection
Duplex
Max. Baud rate
Modem control signals
Automatic transmitter control
Current consumption

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/5 V acc. to spec. 2.2 (PCISIG)
Space required: 1 PCI slot
Operating voltage: +5 V, ± 5 % from the PC
Current consumption (without modules): 160 mA typ. / APCI-7800: 220 mA
Front connector:

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.

Optical isolation: 1000 V
Creeping distance: 3.2 mm
Short-circuit protection
ESD protection
Burnt protection: Full
Max. Baud rate: 1MBaud
Modem control signals: Automatic through MBUS

MX modules

| MX232-G | MX232 | MX422-G | MX422 | MX485-G | MX485 | MXTTY
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>RS232</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>RS422</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>RS485</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

Ordering information

MX modules: Please order the modules separately!
MX232-G: RS232 mode, optically isolated
MX232: RS232 mode
MX422-G: RS422 mode, optically isolated
MX422: RS422 mode
MX485-G: RS485 mode, optically isolated
MX485: RS485 mode
MXTTY: 20 mA Current Loop mode (active, passive), optically isolated
Option: Quartz: <1 MBaud transfer rate for RS232, RS422, RS485, TTY

Accessories
ST075: Shielded round cable, 37 to 4 x 9-pin (for APCI-7500-3)
ST074: Shielded round cable, 37 to 4 x 25-pin (for APCI-7500-3)
ST7809: Shielded round cable, 78 to 8 x 9-pin (for APCI-7800-3)
ST7825: Shielded round cable, 78 to 8 x 25-pin (for APCI-7800-3)
The board APCI-8008 for the PCI bus is used for the control of up to 8 servo or stepper motor axes through a PC. With this intelligent and flexible board, many control tasks from simple to complicated can be realised. The board has three stepping/direction output channels (D/A channels, 16-bit). They are optically isolated from the digital current supply and are used for the control of commercially available power amplifiers connected as speed controlling devices or current regulators. Incremental encoders, SSI encoders and EnDat encoders as well as end and reference switches can be connected to each axis channel. Digital PID filters with forward compensation and optional Notch filters are also involved in the axis control. The "open" controlling concept of the APCI-8008 is intended in the first place for manufacturers of special-purpose machines and users who need a flexible integration as well as a CNC solution.

Features

Hardware/properties
- Intelligent board based on a 64-bit RISC processor
- Positioning of up to 3 axes either with servo or stepper motors. Mixed operating of servo and stepper motors possible. Up to 8 axes with slave board
- Interface for commercially available power amplifiers
- All input and output channels are optically isolated
- A multiple-axis system can be realised by inserting several APCI-8008 in the same PC.
- 2 Ethernet interfaces incl. one which can be used as an EtherCAT interface.

Software
- Linear, circular, helical, spline and CAD interpolation
- Point-to-point movement with independent control of each axis
- Function library for .NET, Pascal, C-Basic, Borland Delphi, Borland C++, Visual Basic, Visual C++, LabVIEW
- Programming through a PC application software or stand-alone (a compiler similar to pascal is supplied with the board)
- The operating program can be easily adapted to specific requirements using program modules supplied with the board (e.g. GEAR, SCANNER, ELCAM)
- User programs created with the compiler can be processed automatically
- Multitasking: the board can simultaneously process up to 4 user programs.

Applications
- Motion control and position measurement (e.g. optical component measurement)
- Laser processing machines
- Bonding robots
- Water-jet cutting machines
- Tube bending machines
- Tube welding machines
- Component mounting machines (SMD)
- Fibreglass wrapping devices
- Handling systems for analysis technology
- Machines for contact lens production
- Stud welding machines
- Machines for processing dental prostheses
- Production quality control
- Cutting-to-length devices with flying saw

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

On request:
Other operating systems, compilers and samples

Driver download: www.addi-data.com/downloads

* Preliminary product information
Specifications

**APCI-8008**

CPU system: 64-bit RISC processor 333 MHz

RAM: 64 MB / Flash 32 MB (1 GB optional)

Data exchange with the PC: Through PCI bus

Controller software: PID (PID filters with forward compensation)

Interpolation: 2D – 30 lines, 20 circular, 3D, text, spline, asynchronous and synchronous interpolation with secondary axes.

With OPMF-8008 all interpolations 2D..8D depending on the number of axes

Inputs for incremental encoders: DII or 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 EnDat: 16 inputs, 4V as, reference switch or freely programmable

Isoalted digital inputs: 8 channels, 24 V 500 mA, for releasing the power amplifiers or freely programmable

Bresolution: 12 bits, 2 kHz to 2 MHz

DMA: through PCI BIOS

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 3.3V acc. to spec. 2.2 (PCISiG)

Space required: Board APCI-8008: 1 PCI slot

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: 1 slot opening

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

**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-SP-** same as APCI-8008, only for stepper motors

**Options:** All options begin with OPMF-8008. Please complete with the following option name:

- **-Basis:** Mezzanine board for the extension with
  - -AI16-4, -AO and -DIO (only up to 3 axes)
  - -4A-SRV/-4A-STP: 4th axis – 8 inputs and 4 dig. outputs in addition
  - -5A-SRV/-5A-STP: 5th axis – 16 inputs and 8 dig. outputs in addition
  - -6A-SRV/-6A-STP: 6th axis – 16 inputs and 8 dig. outputs in addition
  - For the option -7A and more the FB8008 cable is required
  - -7A-SRV/-7A-STP: 7th axis – 24 inputs and 12 dig. outputs in addition
  - -8A-SRV/-8A-STP: 8th axis – 24 inputs and 12 dig. outputs in addition
  - -AI16-4: 4 analog inputs (option available in single or double, max. 8 analog inputs), 16-bit resolution.
  - -ETH: Mezzanine board for the connection of 2 Ethernet interfaces (Standard Ethernet / EtherCAT)
  - -DIO: 8 digital inputs and 4 dig. outputs, opt. isolated (option available up to 3 times, max. 24 inputs and 12 outputs)
  - -AO: 1 analog output, option available up to 5 times (max. 8 analog outputs)
  - (output is only free when the axis is not used)

**OPT.CAN-8008:** CAN bus connection of the APCI-8008 (not CAN Open).

**Accessories:**

- **FB-CAN:** Ribbon cable between OPMF and 9-pin D-Sub male connector for connecting the CAN bus
- **FB-INTERBUS:** Ribbon cable between OPMF and 9-pin D-Sub male connector for connecting the INTERBUS
- **FB8008:** From the 1st axis on for connecting the analog inputs (option OPMF-8008-AI-16-4). Ribbon cable between OPMF and a 50-pin D-Sub male connector with bracket.
- **FB8008_50_25:** From the 4th axis on for connecting the analog inputs (OPMF-8008-AI-16-4) or from the 7th axis on (OPMF/7; OPMF/6) for connecting additional axes. Ribbon cable between OPMF and D-Sub male connector on bracket and the 25-pin D-Sub for the connecting the relays.
- **FBSRELAY:** For releasing the relays
  - **FBSRELAY 9:** Standard, 9-pin cable with bracket
  - **FBSRELAY 25:** more than 3 axes: 25-pin cable
  - **PX8001:** 3-row terminal panel for DIN rail
  - **ST8001:** Cable for connecting APCI-8008 and OPMF, 50-pin.

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

**Fax:** +49 7229 1847-222 www.addi-data.com

225
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
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

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

ADDPACK functions
- Digital input • Digital output
- Watchdog • Timer • Counter

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

Protective circuit for the input channels

Protective circuit for the output channels

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

Digital inputs

<table>
<thead>
<tr>
<th>Number of inputs:</th>
<th>16 (common ground acc. to IEC 1131-2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>including one input used as a counter input (channel 0)</td>
</tr>
<tr>
<td>Interrupt inputs:</td>
<td>2 (channel 2 and 3)</td>
</tr>
<tr>
<td>Optical isolation:</td>
<td>through opto-couplers, 1000 V, from PC to peripheral</td>
</tr>
<tr>
<td>Interrupt compare logic:</td>
<td>Off mode (with fixed filter times)</td>
</tr>
<tr>
<td>Filters for interruptible inputs:</td>
<td>40 µs</td>
</tr>
<tr>
<td>Nominal voltage:</td>
<td>24 V</td>
</tr>
<tr>
<td>Input current at 24 V:</td>
<td>Channel u: 6 mA typ.</td>
</tr>
<tr>
<td></td>
<td>Channel 1-15: 3.9 mA typ.</td>
</tr>
<tr>
<td>Logic input levels:</td>
<td>U nominal: 24 V</td>
</tr>
<tr>
<td>UH max.:</td>
<td>30 V (current 6 mA typ.)</td>
</tr>
<tr>
<td>UH min.:</td>
<td>19 V (current 2 mA typ.)</td>
</tr>
<tr>
<td>UL max.:</td>
<td>14 V (current 0.7 mA typ.)</td>
</tr>
<tr>
<td>UL min.:</td>
<td>0 V (current 0 mA typ.)</td>
</tr>
<tr>
<td>Maximal input frequency:</td>
<td>Channel u: 100 kHz (at 24 V)</td>
</tr>
<tr>
<td></td>
<td>Channel 1-15: 5 kHz (at 24 V)</td>
</tr>
</tbody>
</table>

Digital outputs

<table>
<thead>
<tr>
<th>Number of outputs:</th>
<th>16, optically isolated up to 1000 V through opto-couplers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output type:</td>
<td>High-side (load to ground) acc. to IEC 1131-2</td>
</tr>
<tr>
<td>Nominal voltage:</td>
<td>24 V</td>
</tr>
<tr>
<td>Supply voltage:</td>
<td>11 V up to 36 V</td>
</tr>
<tr>
<td>Current limit:</td>
<td>1.5 A typ. per 8 channels</td>
</tr>
<tr>
<td>Output current/output:</td>
<td>100 mA typ.</td>
</tr>
<tr>
<td>Short-circuit current/output shutdown at 24 V:</td>
<td>R load &lt; 0.1 Ω</td>
</tr>
<tr>
<td>Switch-on time (typ.):</td>
<td>50 µs</td>
</tr>
<tr>
<td>Switch-off time (typ.):</td>
<td>75 µs</td>
</tr>
<tr>
<td>Overtemperature (shutdown):</td>
<td>135 °C (output driver)</td>
</tr>
<tr>
<td>Temperature hysteresis:</td>
<td>10 °C (output driver)</td>
</tr>
</tbody>
</table>
| Safety

| Shutdown logic: | When the ext. 24 V voltage drops below 7 V: The outputs are switched off |
| Diagnostics: | Status bit or interrupt to the PC |
| TimeWatchdog: | 1, 12-bit, timer base ps, ms, s |
| Counter: | 1, 16-bit, signal channel u, 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 |
| IO-connector: | 40-pin male connector (2-row, 2.54 mm grid) |
| Temperature range: | 0 to 60 °C (with forced cooling) to +85 °C (with forced cooling), PC104-PLUS1500-EXT |

Ordering information

PC104-PLUS1500

PC104-PLUS1500: Digital I/O board, digitally isolated, 32 digital inputs and outputs, 24 V. Incl. technical description and software drivers.

Accessories

| FB104-1500: | Ribbon cable, 40-pin to 37-pin D-Sub male connector, 25 cm |
| PX901-D: | Screw terminal panel, LED status display |
| PX901-DG: | Screw terminal panel, LED status display for DIN rail |
| PX9000: | 3-row screw terminal panel, for DIN rail, LED status display |
| PX8500-G: | Relay output board for DIN rail, 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 (24 V supply separate)
ST021: Round cable between FB104-1500 and PX 8500-G, shielded, twisted pairs, 2 m
ST022: Round cable between PX 8500-G and PX 901-DG, shielded, 2m
ST8500: Ribbon cable for cascading two PX 8500-G
More data – simply faster!

With its new serial data transfer, the new CompactPCI Serial bus is especially interesting for developing new high-performance systems in industrial environment. It also opens up new fields of application.

ADDI-DATA now offers digital, analog and counter boards for the new CompactPCI Serial bus technology, in the tried-and-tested quality we always deliver.

Multiple data transfer options
What was not possible with the CompactPCI bus is now possible: the extension boards can now be accessed via Ethernet, PCI Express, SATA or USB. All protocols are available on the connector with equal priority.

High immunity to interferences
The well-though concept of design and protective circuitry is the key for the high immunity to interferences featured by the CompactPCI Serial boards by ADDI-DATA. These boards are thus especially suited for use in extreme industrial environment. They are resistant to vibration, acceleration and dirt while supplying reliable data.

Faster through FPGA
A FPGA component has a programmable logic on which you can save your own algorithms in order to adapt the functionality of the PC board to your requirements. This adaptation makes your PC board unique and improves the performance of your applications. The onboard algorithms reduce the cycle time of signal acquisition and regulation tasks.

Most ADDI-DATA CompactPCI Serial boards are equipped with a FPGA component. Use the full potential of your PC board hardware and software resources and thus accelerate your processes.

YOUR BENEFITS
- Fast data transmission rate: up to 12 GB/s
- Star topology
- Standardized 19” technology (IEEE 1101)
- All protocols available on the connector
- Hybrid systems

Hybrid systems
Some housing manufacturers offer hybrid systems in which existing applications can run with CompactPCI while new functions can be added using CompactPCI serial. This saves time and money and allows for a smooth transition between these two technologies.
## CompactPCI Serial boards

<table>
<thead>
<tr>
<th></th>
<th>Digital</th>
<th>Counter</th>
<th>Analog</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>New! CPCIs-1532</td>
<td>New! CPCIs-1564</td>
<td>New! CPCIs-1711</td>
</tr>
</tbody>
</table>

### CompactPCI Serial bus
- ✓
- ✓
- ✓
- ✓
- ✓

### FPGA
- ✓
- ✓
- ✓
- ✓
- ✓

### Filter and protective circuits
- ✓
- ✓
- ✓
- ✓
- ✓

### Optical isolation
- 1000 V
- 1000 V
- 1000 V
- 500 V
- 1000 V

### Digital, 24 V

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Input channels, 24 V</td>
<td>16</td>
<td>32</td>
<td>12 (dependent on function)</td>
<td>4</td>
</tr>
<tr>
<td>Output channels, 24 V</td>
<td>16</td>
<td>32</td>
<td>4</td>
<td>4</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>4</td>
</tr>
</tbody>
</table>

### Timer / Counter / Watchdog

<table>
<thead>
<tr>
<th></th>
<th>2 x 12 bit timer, 1 can be used as a watchdog.</th>
<th>2 x 12 bit timer, 1 can be used as a watchdog.</th>
<th>3 x 32 bit counter</th>
</tr>
</thead>
</table>

### Counter

<table>
<thead>
<tr>
<th></th>
<th>4</th>
</tr>
</thead>
</table>

### Function modules

<table>
<thead>
<tr>
<th></th>
<th>Incremental counter, SSI synchronous serial interface, Counter/timer, Pulse acquisition, Frequency, Pulse width, Period duration measurement, velocity measurement, PWM, BiSS-Master, digital inputs and outputs, ...</th>
</tr>
</thead>
</table>

### Functions

<table>
<thead>
<tr>
<th></th>
<th>Reprogrammable</th>
</tr>
</thead>
</table>

### Input frequency
- up to 5 MHz

### Signals
- TTL, RS422, 24 V

### Analog

<table>
<thead>
<tr>
<th></th>
<th>16 SE or 8 diff.</th>
<th>8 SE or 8 diff.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Throughput [kHz]</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Voltage range</td>
<td>0-10 V ± 10 V</td>
<td>0-10 V ± 10 V</td>
</tr>
<tr>
<td>Gain PGA</td>
<td>x1, x2, x5, x10</td>
<td>x1, x10, x100, x1000</td>
</tr>
<tr>
<td>Trigger (software or 24 V)</td>
<td>✓ ✓ ✓ ✓</td>
<td>✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>Sequence RAM</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Analog outputs</td>
<td>8 or 4, 16 bit</td>
<td>4, 16 bit</td>
</tr>
<tr>
<td>0-10 V ± 10 V</td>
<td>✓</td>
<td>✓</td>
</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, for CompactPCI Serial

Features

Inputs
- 16 optically isolated inputs, 24 V incl. 15 interruptible inputs
- Channel 0 can be used as a 16-bit counter input (up to 100 kHz)
- Reverse voltage protection
- All inputs are filtered

Outputs
- 16 optically isolated outputs, 11 to 36 V
- Output current per channel 500 mA
- Total current: 3 A typ. (fused through PTC resistor)
- Watchdog for resetting the outputs to “0”
- At Power-On, reset of the outputs to “0”
- Current limit: ~1.5 A per 8 channels (through PTC)
- Short-circuit current per output ~1.5 A typ.
- Self-resetting fuse (electronic fuse)
- Overtemperature and overvoltage protection
- 24 V power outputs with protection diodes and filters
- Ext. 24 V voltage supply screened and filtered
- Shutdown logic, when the external supply voltage drops below 7 V

Timer / Counter
- 2 timers (12-bit resolution)
- 1 timer can be used as watchdog

Safety features
- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Protection against fast transients (burst), overvoltage, electrostatic discharge and high-frequency EMI
- Separate ground line for inputs and outputs

Applications

- Industrial I/O control
- PLC coupling
- Reading of encoder values for process control
- Signal switching
- Interface to electromechanical relays
- ON/OFF monitoring of motors, lights...
- Watchdog / timer
- Interface to machines

Software drivers

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

Standard drivers for:
- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

Drivers and samples for the following compilers and software packages:
- MC .NET, C

On request:
Further operating systems, compilers and samples.

Driver download: www.addi-data.com/downloads

Also for
See APCI-1532, page 118
See PCI-1500, page 146
See CPCI-1500, page 230
See PC/104-PLUS1500 page 214

* Preliminary product information

CPCIs-1532
CompactPCI Serial interface
16 digital inputs, 24 V, including 15 interruptible inputs
16 digital outputs, 24 V, 500 mA/channel
Optical isolation 1000 V
Input and output filters
Connection through industry-standard D-Sub connector
Extended temperature range –40 °C to +85 °C

Also for
See PCI EXPRESS

NEW*
Specifications*

### Digital inputs

**Number of inputs:** 16 digital inputs, 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 (CPCIs-1532), 12 V (CPCIs-1532-12V)

**Input current:**
- at 24 V: at 2 V (CPCIs-1532)
- at 12 V (CPCIs-1532-12V)

**Channel 0 or 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 (CPCIs-1532)

**Channel 0 or 1:**
- 100 kHz
- 100 kHz

**Channel 1-15 or 2-16:**
- 5 kHz
- 5 kHz

**Logic input levels:**
- at 24 V: at 12 V (CPCIs-1532)

**UL (min.):**
- 30 V
- 16 V

**UL (max.):**
- 19 V
- 9 V

**UL (min.):**
- 0 V
- 0 V

**UL (max):**
- 14 V
- 6 V

**UL (min.):**
- 0 V
- 0 V

Filters/protective circuit:
- Input filters, transil diode, RC filters, Z diode, opto-couplers

### Digital outputs

**Number of outputs:** 16 digital outputs

**Output type:** High side (load to ground), acc. to IEC 1131-2

**Optical isolation:** 1000 V (through opto-couplers), from PC to peripheral

**Nominal voltage:** 24 V

**Supply voltage range:** 11 to 36 V

**Current limit:**
- 1.5 A per 8 channels (through PTC)

**Input current:**
- at 24 V: at 12 V (CPCIs-1532)

**Output current per output:**
- Inputs/outputs inactive: 320 mA ± 10 %, typ.

**Operating voltage:** +3.3 V from PC

**Space required:** 1 x CompactPCI Serial slot

**System bus:** PCI Express according to CompactPCI Serial specification PICMG CPCi-5.0 R1.0

**Dimensions:** 149 x 99 mm

**System bus:** PCI Express according to CompactPCI Serial specification PICMG CPCi-5.0 R1.0

**Operating voltage:** +3.3 V from PC

**Current consumption:**
- Inputs/outputs inactive: 320 mA ± 10 %, typ.
- Inputs/outputs active: 400 mA ± 10 %, typ.
- 16 inputs/outputs active: 470 mA ± 10 %, typ.

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

**Temperature range:**
- from –40°C to +85 °C

**Physical and environmental conditions**

**Dimensions:** 149 x 99 mm

**System bus:** PCI Express according to CompactPCI Serial specification PICMG CPCi-5.0 R1.0

**Space required:** 1 x CompactPCI Serial slot

**Operating voltage:** +3.3 V from PC

**Current consumption:**
- Inputs/outputs inactive: 320 mA ± 10 %, typ.
- Inputs/outputs active: 400 mA ± 10 %, typ.
- 16 inputs/outputs active: 470 mA ± 10 %, typ.

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

**Temperature range:**
- from –40°C to +85 °C

---

### ADDI-DATA connection

**Example 1**
Connection of the inputs and outputs through screw terminal panel

**Example 2**
Connection of the inputs through screw terminal panel PX901-DG

Connection of the outputs through relay output board PX8500-G

---

### Ordering information

**CPCIs-1532**
Digital I/O board, optically isolated, 32 digital inputs and outputs, 24 V, for CompactPCI Serial. Incl. technical description and software drivers.

**CPCIs-1532:**
16 inputs, 24 V, 16 outputs, 11-36 V, 1 counter

**Accessories**

**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

**ST010-5:** Same as ST010, for high currents

**ST021:** Round cable between APCLe-15x2 and PX8500-G, shielded, twisted pairs, 2 m or PX9000, shielded, 2 m

**ST8500:** Ribbon cable for cascading two PX8500-G

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*Preliminary product information*
Digital I/O board, optically isolated, 64 digital inputs and outputs, 24 V, for CompactPCI Serial

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 channel ~1.5 A typ.
- 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 channel ~1.5 A typ.
- Self-resetting fuse (electronic fuse)
- Overtemperature and overvoltage protection
- 24 V power outputs with protection diodes and filters
- Ext. 24 V voltage supply screened and filtered
- Shutdown logic, when the external supply voltage drops below 7 V

**Timer / Watchdog / Counter**
- 2 timers (12-bit), of which one can be used as a watchdog
- 3 counter (32-bit)

**Safety features**
- Optical isolation 1000 V
- Creeping distance IEC 61010-1
- Protection against fast transients (burst), overvoltage, electrostatic discharge and high-frequency EMI
- Separate ground line for inputs and outputs

Applications

- Industrial I/O control
- PLC coupling
- Signal switching
- Interface to electromechanical relays
- Automatic test equipment
- ON/OFF monitoring of motors, lights...
- Watchdog/timer
- ...

Software drivers

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

**Standard drivers for:**
- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

**Drivers and samples for the following compilers and software packages:**
- C#.NET, C

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

Driver download: www.addi-data.com/downloads

Protection circuit for the input channels

![Protection circuit for the input channels](image1)

Protection circuit for the output channels

![Protection circuit for the output channels](image2)

*Preliminary product information*
**Digital inputs**

- Number of inputs: 32 digital inputs, (common ground acc. to IEC 1131-2)
- (channel 0-2 can be used as 32-bit counter inputs)
- Interruptible inputs: 15 channels (channel 4 to 19)
- Optical isolation: 1000 V through opto-couplers, from PC to peripheral
- Nominal voltage: 24 V
- Input current:
  - Channel 0-2: 6.6 mA at 24 V, typical
  - Channel 4-31: 2 mA at 24 V, typical
- Input frequency (max.):
  - Channel 0-2: 500 kHz at 24 V
  - Channel 3-31: 5 kHz at 24 V
- Logic input levels:
  - UH (max.): 20 V / 1 mA, typical (channel 0-3)
  - UH (min.): 19 V / 0.1 mA, typical
  - UL (max.): 14 V / 0.1 mA, typical
  - UL (min.): 0 V / 0 mA, typical
- Filters/protective circuit: Input filters, transistors, RC filters, Z diode, opto-couplers

**Digital outputs**

- Number of outputs: 32 digital outputs
- Output type: High-side (load to ground) acc. to IEC 1131-2
- Optical isolation: 1000 V through opto-couplers, from PC to peripheral
- Nominal voltage: 24 V
- Supply voltage range: 11 to 36 V
- Current limit:
  - 1.5 A per 8 channels (through PFC)
- Output current per output:
  - 500 mA (typical)
- Short-circuit current per output:
  - 1.5 A (typ.) pulse current
  - shutdown at 24 V & RLR < 0.1 Ω
- RDS ON resistance: 0.2 Ω at 25 °C
- Switch-on time:
  - USW = 0.5 A, load = resistance: 50 µs
- Switch-off time:
  - UOFF = 0.5 A, load = resistance: 75 µs
- Overtemperature (shutdown): 135 °C (output driver)
- Temperature hysteresis: 15 °C (output driver)

**Timer/watchdog**

- Timer: 2 x 12-bit, 1 x programmable as watchdog from 1 µs to 4095 s

**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: 160 x 100 mm
- System bus: CompactPCI Serial specification PICMG CPCI-S.0 R1.0
- Space required:
  - 1 x CompactPCI Serial slot
- Operating voltage: +12 V ± 5 %
- Current consumption:
  - in preparation
- Front connector: 37-pin D-Sub male connector
- Temperature range:
  - from -40 °C to +85 °C
- MTBF:
  - in preparation

**CPCIs-1564**

Digital I/O board, optically isolated, 64 digital inputs and outputs, 24 V, for CompactPCI Serial. Incl. technical description and software drivers.

**Accessories**

- 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

**Specifications**

**Simplified block diagram**

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

**ADDI-DATA connection**

**Example 1:**
- Connection of the inputs (ribbon cable)
- Connection of the outputs through screw terminal panel PX901-DG or PX8000

**Example 2:**
- Connection of the outputs with relay output board PX8500-G cascaded in 32 relays

**Ordering information**

Phone: +49 7229 1847-0  info@addi-data.com
Fax: +49 7229 1847-222  www.addi-data.com
Multifunction counter board, optically isolated, fast counter inputs – programmable functions, for CompactPCI Serial

CPCIs-1711

Available functions: incremental counter, SSI Synchronous Serial Interface, counter/timer, pulse acquisition, frequency, pulse width, period duration, velocity measurement, PWM, BISS-Master, digital I/O, Sin/Cos, EnDat 2.2 ...

Function selection through software

Optical isolation

Inputs and outputs: RS422, TTL, 24 V

Customised functions

Extended temperature range -40 °C to +85 °C

The board CPCIs-1711 is a fast multifunction and multi-channel counter board for CompactPCI Serial. The strengths of this board are its wide range of applications and high precision and reliability in harsh industrial environment.

With this board you can realise many different applications on the same hardware base. The board is supplied with a pool of functions which provides the user with maximum efficiency yet minimum space and parts requirement. The functions are individually configured for each channel through the supplied software. The flexible programming facilities on this board allow many different user applications to be quickly and easily developed and reconfigured as further requirements arise. Thanks to the FPGA board structure, further counting applications can be realised through software adaptation. Contact us!

Features

- 32-bit data access
- RS422 driver 5 MHz (up to 20 MHz on request)
- With RS422/TTL input/output signals (CPCIs-1711) or 24 V input signals (CPCIs-1711-24V)
- Four onboard function modules

Functions

- Incremental counter for the acquisition of incremental encoders (90° phase-shifted signals)
- BISS-Master (B and C mode)
- SSI Synchronous Serial Interface. The SSI function is an interface for systems which allow an absolute position information via serial data transfer.
- Counter/timer (82C54)
- Pulse acquisition
- Frequency measurement
- Pulse width modulation (PWM)
- Period duration measurement
- Velocity measurement
- Digital inputs and outputs
- Edge time measurement (ETM)
- Parallel interface
- Sin/Cos (1 Vss, 11 µA ss)
- EnDat 2.2
- Customised functions

Available channels on one function module

- 4 channels, programmable either as digital inputs or outputs, optically isolated, RS422
- 3 channels, digital inputs, optically isolated, 24 V
- 1 digital power outputs, optically isolated, 24 V

Additional channels

- 28 TTL I/O, without optical isolation

Versions

<table>
<thead>
<tr>
<th></th>
<th>RS422/</th>
<th>24 V</th>
<th>5 V</th>
<th>24 V</th>
<th>TTL</th>
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<td>CPCIs-1711</td>
<td>16</td>
<td>12</td>
<td>–</td>
<td>4</td>
<td>28</td>
</tr>
<tr>
<td>CPCIs-1711-24V</td>
<td>–</td>
<td>28</td>
<td>–</td>
<td>4</td>
<td>28</td>
</tr>
<tr>
<td>CPCIs-1711-5V-I</td>
<td>16</td>
<td>12</td>
<td>4</td>
<td>28</td>
<td></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:

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

Drivers and samples for the following compilers and software packages:

- Microsoft VC++
- Borland C++ 5.01

On request:

Further operating systems, compilers and samples.

Driver download: www.addi-data.com/downloads

*Preliminary product information
Specifications

Free programming of the functions
- Acquisition of incremental encoders (1 x 32-bit or 2 x 16-bit)
- SSI (max. 3 encoders per module)
- Counter/Timer (3 counters similar to 82C54)
- Pulse counter (4 x 32-bit counters per module)
- Chronos (chronometer)
- TOR (pulse counter with time slices, ...)
- Digital I/O (B I/O, 24 V, T/L, R5422)
- PWM (pulse width modulation, 2 x per module)
- BiOS-Master (B and C mode)
- ETM (Timer interface for period duration measurement, edge time, ...)
- TTI (TTL I/O without isolation)
- Parallel Interface
- EdDat 2.2
- SinCos
- Customised functions

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

Inputs
- Differential inputs or outputs (A, B, C, D)
  - Differential inputs, RS422: 16 (can be used as inputs or outputs)
  - Nominal voltage: 2.5 VDC
  - Common mode range: ±15 V
  - Input sensitivity: 200 mV
  - Input hysteresis: 50 mV
  - Input impedance: 12 kΩ
  - Terminal resistor: 120 Ω (not supplied)
- Max. input frequency: CPCIs-1711: 5 MHz (at nominal voltage) up to 20 MHz on request!

Mass-related inputs, 24 V (E, F, G):
- Number of inputs: 12
- Nominal voltage: 24 VDC
- Logic input levels:
  - Unominal: 24 V
  - UH max.: 30 V
  - UH min.: 19 V
  - UL max.: 14 V
  - UL min.: 0 V
- Maximal input frequency: 1 MHz (at nominal voltage) depending on the function

Outputs
- Nominal voltage: 3.3 VDC
- Maximum output frequency: 5 MHz (diff. outputs)
- Max. number of outputs: 16 (if they are not used as diff. inputs)
- Digital outputs, 24 V (H)
  - Output type: High-side (load to ground)
  - Number of outputs: 4
  - Nominal voltage: 24 VDC
  - Supply voltage range: 4.75 V to 36 VDC (via 24 V ext. pin)
  - Maximum current: 5 mA per output
  - 270 mA total current limit (PTC)
  - Overtemperature: 165 °C (all outputs switch off)

Technical data CPCIs-1711-24 V version
- 24 V inputs (channels A to G).
- This board version is intended for the connection of 24 V encoders.
- Only 24 V signals can be connected to the inputs.

- Nominal voltage: 24 VDC
- Max. input frequency: 1 MHz (at nominal voltage) depending on the function
- Logic input levels:
  - Unominal: 24 V
  - UH max.: 30 V
  - UH min.: 18 V
  - UL max.: 16 V
  - UL min.: 0 V
- All functions using channels A, B, C, D as outputs cannot be used.
- See the manuals of the functions!

Safety
- Optical isolation: 1000 V

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

PC system requirements and environmental conditions
- Dimensions: 160 x 100 mm
- System bus: PCI Express according to CompactPCI Serial specification PICMG CPCI-S.0 R1.0
- Space required: 1 x CompactPCI slot for digital I/O
  - 1 x slot opening for TTL I/O with FB1711
- Operating voltage: +12 V, ± 5 %
- Current consumption: 230 mA, ± 10 %
- Front connector: 78-pin D-Sub female connector
- Additional connector: 50-pin D-Sub male connector
- Temperature range: from –40 °C to +85 °C
- MTBF: in preparation

Ordering information
CPCIs-1711
- Multifunction counter board, optically isolated, fast counter inputs – programmable functionality, for CompactPCI Serial.
- Incl. technical description and software drivers.

CPCIs-1711:
- Multifunction counter board, optical isolated

CPCIs-1711-24V:
- 24 V instead of RS422 / TTL I/O (A, B, C, D)

CPCIs-1711-5V:
- 5 V inputs instead of 24 V (E, F, G)

Option
- Opt. 5V:
  - Outputs 3.3 V instead of 24 V (H0, H1, H2, H3)

Accessories
- 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

For the TTL I/O function
- ST370-16:
  - Standard round cable, shielded, twisted pairs, 2 m

FB1711:
- Ribbon cable (included in delivery)

For the SinCos function
- EM-SINCOS-11µAPP:
  - Extension module, 2 x 11 µApp inputs, 1 digit. output, 24 V

- EM-SINCOS-1VPP:
  - Extension module, 2 x 1 Vpp inputs, 1 digit. output, 24 V

ST1711-50-37:
- Y-cable, round, shielded, twisted pairs, 78-pin D-Sub male connector to 50-pin D-Sub male connector and 37-pin D-Sub male connector

PX901-ZG:
- Screw terminal panel for DIN rail

* Preliminary product information
Multifunction board, optically isolated, 16 SE / 8 differential inputs, 4/8 analog outputs, 16-bit

CPCIs-3121
CompactPCI Serial interface
16 single-ended / 8 differential inputs, 16-bit
8/4 analog outputs, 16-bit
Optical isolation of inputs and outputs, 500 V
PCI-Express DMA, programmable gain
Trigger functions
8 digital I/O, 24 V, isolated, timer, watchdog
Extended temperature range –40°C to +85°C

Features

Analog inputs
- 16 single-ended / 8 differential inputs
- 16-bit resolution
- Optical isolation 500 V
- Throughput: 100 kHz
- Input ranges: 0-10 V, ±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
- 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, at 20 mA
- EMI filters

Digital
- 4 digital inputs including 1 interruptible input
- 4 digital outputs, 24 V, optically isolated

Timer
- 2 timers, incl. 1 which can be used as a watchdog

Safety features
- Optical isolation 500 V min.
- Creeping distance IEC 61010-1
- Overvoltage protection ± 40 V, analog inputs
- Protection against high-frequency EMI
- Input filters: 159 kHz
- Noise neutralisation of the PC supply

Applications
- Industrial process control
- Industrial measurement and monitoring
- Multichannel data acquisition
- Control of chemical processes
- Factory automation
- Acquisition of sensor data, current measurement
- Laboratory equipment, instrumentation

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

Standard drivers for:
- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

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

ADDIPACK functions
- Analog input • Analog output • Digital input
- Digital output • Watchdog • Timer

Drivers download: www.addi-data.com/downloads

Also for see APCI-3121, page 134
Also for CompactPCI™ see CPCI-3120, page 238
Also for CompactPCI™ see APCI-3120, page 180
CompactPCI Serial boards, analog – CPCIs-3121

Specifications*

Analog inputs
Number of inputs: 16 single-ended / 8 differential inputs or 8 single-ended / 4 differential inputs

Input ranges:
- 0-10 V, ± 10 V (D-sub connector, ± 5 V
- 0-2 V, ± 2 V, ± 1 V (D-sub connector, ± 5 V

Throughput: 1 MHz

Gain: Software programmable (x1, x2, x4, x10)

Relative precision (INL): ± 2 LSB max. (A/D converter)

Settling time (3σ): ± 2 LSB max. (A/D converter)

Bandwidth (–3 dB): Limited to 159 kHz with low-pass filter

Trigger: Through software, timer, external event (24 V input)

Data transfer: Data to the PC through FIFO memory, I/O commands, interrupt at EOC (End Of Conversion) and EOS (End Of Sequence), DMA transfer at EOC

Interrupts: End of conversion, all timer over-run, end of sequence

Analog outputs
Number of outputs: 8 or 4

Isolation: 16 kV

Output range: 0-10 V, ± 10 V switchable through software (± 20 mA optional)

Overvoltage protection: ± 15 V

Max. output current / load: ± 20 mA (short time)

Output voltage after reset: 0 V

Digital I/O
Number of I/O channels: 4 digital inputs, 4 digital high-side outputs, 24 V

Input isolation: 1000 V through opto-couplers

Input current at 24 V: 10 mA typ.

Input range: ± 30 V

Supply voltage: ± 32 V

Max. switching current: 85 mA typ.

EMC – Electromagnetic compatibility

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

Physical and environmental conditions

Dimensions: 160 x 100 mm

System bus: PICMG CPCP-9.01-2

Space required: 1 x CompactPCI slot for analog I/O

1 x slot opening for digital I/O with FB3001

Operating voltage: +12 V, ± 5 %

Current consumption:
- 201 mA, ± 10 %

Front connector: 37-pin D-Sub male connector

Temperature range: –40 °C to +85 °C

MTBF: in preparation

Pin assignment – 37-pin D-Sub male connector

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-8</td>
<td>GND</td>
</tr>
<tr>
<td>9-16</td>
<td>Vpp</td>
</tr>
<tr>
<td>17-24</td>
<td>Vio</td>
</tr>
<tr>
<td>25-32</td>
<td>Vio</td>
</tr>
</tbody>
</table>

Pin assignment – 16-pin male connector

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-4</td>
<td>GND</td>
</tr>
<tr>
<td>5-8</td>
<td>Vpp</td>
</tr>
<tr>
<td>9-12</td>
<td>Vio</td>
</tr>
<tr>
<td>13-16</td>
<td>Vio</td>
</tr>
</tbody>
</table>

ADDI-DATA connection

Ordering information

CPCIs-3121
Multifunction board, opt. isolated, 16 SE / 8 diff. inputs, 4/8 analog outputs, 16-bit, for CompactPCI Serial. Incl. techn. description and software drivers.

Versions
CPCIs-3121-16-8: Version with 16 SE / 8 diff. inputs, 8 analog outputs
CPCIs-3121-16-4: Version with 16 SE / 4 diff. inputs, 8 analog outputs
CPCIs-3121-8-8: Version with 8 SE / 4 diff. inputs, 8 analog outputs
CPCIs-3121-8-4: Version with 8 SE / 4 diff. inputs, 4 analog outputs

Options
Option SF: Precision filter for single-ended channel
Option DF: Precision filter for single diff. channel
Option PC: Current input 0(4)-20 mA for 1 channel
PC-SE: for single-ended PC-Diff: for differential

Accessories
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
FB3001: Ribbon cable for digital I/O with 3U bracket

* Preliminary product information
Multifunction board, optically isolated, 8 SE or 8 diff. inputs, 4 analog outputs, 24-bit

The CompactPCI Serial board CPCi-3131 is a fast and highly-precise multifunction board. Each of the 8 inputs has an own A/D converter, the resolution is 24-bit. On the CPCi-3131, not only the analog and digital part are optically isolated but also all analog channels are separated from each other. Further protective circuits complete the interference resistance of the board and offer an excellent protection for your application in the harsh industrial environment. Please contact us for further information!

Features

- CompactPCI Serial (PICMG CPCI-S.0 R1.0)
- Analog inputs
  - 8 SE/diff. inputs, optically isolated 1000 V
  - Optical isolation between channels 500 V
  - 24-bit resolution
  - Throughput: max. 100 kHz, programmable for each channel
- Input voltage:
  - PGA unipolar bipolar
  - 1 0-10 V ±10 V
  - 10 0-1 V ±1 V
  - 100 0-0.1 V ±0.1 V
  - 1000 0-0.01 V ±0.01 V
- Current inputs: 0-20 mA, software-programmable for each channel
- Gain PGA x1, x10, x100, x1000 software-programmable for each channel
- Analog acquisition
  - Different acquisition modes are available:
    1) Simple Mode
    2) Scan Mode
    3) Sequence Mode
    4) Auto Refresh Mode
  - Onboard FIFO
  - PCI-Express DMA for analog data acquisition
  - MSI interrupt
- Analog outputs
  - Simultaneous output through DMA
  - 4 analog outputs, optically isolated
  - 16-bit resolution, setup time 18 µs max. (voltage in 10 V steps)
  - Output voltage after reset: 0 V
  - Each output has its own ground line (without optical isolation)

CPCi-3131-8-4

CompactPCI Serial interface
- 8 SE or 8 differential inputs
- 24-bit resolution, 250 kHz
- 4 analog outputs, 16-bit
- 8 digital I/O, optically isolated, 24 V

Extended temperature range

- Output voltage range:
  - 0-10 V, ± 10 V
  - 0-5 V, ± 5 V
  - 0-20 mA, 4-20 mA, 0-24 mA
- Output current: ± 20 mA
- Short-circuit current: in preparation
- 24 V digital I/O
  - 4 digital inputs, 24 V, optically isolated
  - 4 digital outputs, 24 V, optically isolated

Timer / Counter / Watchdog
- 3 / 3 / 2, 16-bit

Safety features

- Optical isolation 1000 V min.
- Optical isolation between analog inputs: 500 V
- Creeping distance IEC 61010-1
- Circuit part of the analog acquisition is separated from the circuit part of the digital function
- Overvoltage protection
- Protection against high-frequency EMI
- Input filters
- Noise neutralisation of the PC supply
- Connection of the I/O signals via robust industry-standard D-Sub connector

Software

Standard drivers for:
- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

On request:
Further operating systems, compilers and samples

Driver download: www.addi-data.com/downloads

* Preliminary product information
**Specifications**

### Analog inputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of inputs</td>
<td>8 differential inputs</td>
</tr>
<tr>
<td>Resolution</td>
<td>24-bit</td>
</tr>
<tr>
<td>Optical isolation</td>
<td>1000 V through opto-couplers</td>
</tr>
<tr>
<td>Voltage inputs</td>
<td>Each channel is freely</td>
</tr>
<tr>
<td></td>
<td>programmable through software</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PGA</td>
</tr>
<tr>
<td></td>
<td>bipolar</td>
</tr>
<tr>
<td>1000</td>
<td>0-10 V</td>
</tr>
<tr>
<td>100</td>
<td>0-0.1 V</td>
</tr>
<tr>
<td>1000</td>
<td>0-0.01 V</td>
</tr>
<tr>
<td>Current inputs</td>
<td>0-20 mA (option)</td>
</tr>
<tr>
<td>Throughput</td>
<td>max. 250 kHz, software-programmable</td>
</tr>
<tr>
<td>Trigger</td>
<td>through software, timer, ext. event (24 V input)</td>
</tr>
<tr>
<td>Data transfer</td>
<td>Data to the PC through FIFO memory, Interrupt at EOC (End Of Conversion) DMA transfer at EOC</td>
</tr>
<tr>
<td>Interrupts</td>
<td>End of conversion, end of timer, end of sequence</td>
</tr>
</tbody>
</table>

### Analog outputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of outputs</td>
<td>4</td>
</tr>
<tr>
<td>Resolution</td>
<td>16-bit</td>
</tr>
<tr>
<td>Optical isolation</td>
<td>1000 V through opto-couplers</td>
</tr>
<tr>
<td>Output range</td>
<td>Option: 0-20 mA, 4-20 mA, 0-24 mA</td>
</tr>
<tr>
<td>LSB:</td>
<td>in preparation</td>
</tr>
<tr>
<td>Accuracy</td>
<td>13.5-bit for voltage outputs</td>
</tr>
<tr>
<td></td>
<td>14-bit for current outputs</td>
</tr>
<tr>
<td>Read time</td>
<td>in preparation</td>
</tr>
<tr>
<td>Setup time</td>
<td>Output voltage, max. 18 µs (in 10 V steps) Output current, typ. 15 µs (0 mA - 24 mA)</td>
</tr>
<tr>
<td>Max. output current</td>
<td>in preparation</td>
</tr>
<tr>
<td>Short-circuit current</td>
<td>in preparation</td>
</tr>
<tr>
<td>Output-voltage after reset</td>
<td>0 V</td>
</tr>
</tbody>
</table>

### Digital I/O

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of inputs</td>
<td>4 digital inputs, 24 V</td>
</tr>
<tr>
<td></td>
<td>1 input is programmable as counter input</td>
</tr>
<tr>
<td>Number of outputs</td>
<td>4 digital outputs (50 mA, 24 V)</td>
</tr>
<tr>
<td>Input range</td>
<td>0-30 V – logic „0“: 0-14 V, logic „1“: 19-30 V</td>
</tr>
<tr>
<td>Optical isolation</td>
<td>1000 V through opto-couplers</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 compiled with. The respective EMC test report is available on request.

### Physical and environmental conditions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>3U/4TE</td>
</tr>
<tr>
<td>System bus</td>
<td>PCI Express nach CompactPCI Serial Specification PCI-MCG CPC 5.0 R1.0</td>
</tr>
<tr>
<td>Space required</td>
<td>1 CompactPCI Serial slot for analog inputs, 1 slot opening for digital I/O with FB300x</td>
</tr>
<tr>
<td>Operating voltage</td>
<td>±12 V, ± 5 %</td>
</tr>
<tr>
<td>Current consumption</td>
<td>in preparation</td>
</tr>
<tr>
<td>Front connector</td>
<td>25-pin D-Sub male connector (analog input) 9-pin D-Sub male connector (analog output)</td>
</tr>
<tr>
<td>Additional connector</td>
<td>50-pin D-Sub male connector for 8 digital I/O through ribbon cable FB300x</td>
</tr>
<tr>
<td>Temperature range</td>
<td>from -40 °C to +85 °C</td>
</tr>
</tbody>
</table>

### Ordering information

**CPCIs-3131-8-4**

Multifunction board, optically isolated, 8 SE or 8 diff. inputs, 4 analog outputs, 24-bit. Technical description, software drivers and monitoring program included.

**Accessories**

FB300x: Ribbon cable for digital I/O

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* Preliminary product 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.

Faster through FPGA
A FPGA component has a programmable logic on which you can save your own algorithms in order to adapt the functionality of the PC board to your requirements. This adaptation makes your PC board unique and improves the performance of your applications. The on-board algorithms reduce the cycle time of signal acquisition and regulation tasks. Most ADDI-DATA CompactPCI boards are equipped with a FPGA component. Use the full potential of your PC board hardware and software resources and thus accelerate your processes.

Complete real-time system
- Combination of the PAC-system MSX-Box-CPCI and CompactPCI boards
- Compact and flexible
- Stand-alone system (own CPU)
- Long-term availability
Information about the MSX-Box-CPCI on page 20

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
<table>
<thead>
<tr>
<th></th>
<th>Digital</th>
<th>Counter</th>
<th>Analog</th>
<th>Serial interfaces (base board)</th>
<th>Motion control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CPU-1500</td>
<td>CPU-1564</td>
<td>CPU-1710</td>
<td>CPU-3009</td>
<td>CPU-3120</td>
</tr>
<tr>
<td></td>
<td>CPU-3001</td>
<td>CPU-3901</td>
<td>CPU-7500</td>
<td>CPU-3001-30V</td>
<td>CPU-8094</td>
</tr>
<tr>
<td>32-bit CompactPCI bus</td>
<td>5 V</td>
<td>3.3 V / 5 V</td>
<td>5 V</td>
<td>3.3 V / 5 V</td>
<td>3.3 V / 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>Optical isolation 1000 V</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Digital, 24 V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input channels, 24 V</td>
<td>16</td>
<td>32</td>
<td>12 (depending on function)</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Output channels, 24 V</td>
<td>16</td>
<td>32</td>
<td>4</td>
<td>4</td>
<td>4</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>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>
</tr>
<tr>
<td>Watchdog / Timer / Counter</td>
<td>2 x 12-bit timer 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>
</tr>
<tr>
<td>Counter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Function modules</td>
<td>4</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Functions</td>
<td>Incremental counter, SSI synchronous serial interface, counter/timer, pulse acquisition, frequency, pulse width, Period duration, velocity measurement, PWM, BISS master, digital inputs and outputs, ...</td>
<td>reprogrammable</td>
<td>reprogrammable</td>
<td>4 incremental counters or SSI</td>
<td></td>
</tr>
<tr>
<td>Input frequency</td>
<td>up to 5 MHz</td>
<td>up to 5 MHz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Signals</td>
<td>TTL, RS422, 24 V</td>
<td>TTL, RS422, 24 V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analog</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analog inputs, 16-bit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Throughput (kHz)</td>
<td>100</td>
<td>100</td>
<td>100</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>
</tr>
<tr>
<td>Gain 1, 2, 5, 10</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIFO (value)</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>
</tr>
<tr>
<td>Sequence RAM</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>
</tr>
<tr>
<td>0-10 V ± 10 V</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Settling time</td>
<td>15 µs</td>
<td>30 µs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serial interfaces (base board)</td>
<td></td>
<td></td>
<td></td>
<td>4-port</td>
<td></td>
</tr>
<tr>
<td>Configuration of the operation mode through MX modules</td>
<td></td>
<td>RS232, RS422, RS485, RS485, 20 mA CL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motion Control</td>
<td></td>
<td></td>
<td></td>
<td>1 to 4 servo or stepper motors</td>
<td></td>
</tr>
<tr>
<td>Software</td>
<td></td>
<td></td>
<td></td>
<td><a href="http://www.addi-data.com">www.addi-data.com</a></td>
<td></td>
</tr>
<tr>
<td>Page</td>
<td>242</td>
<td>244</td>
<td>246</td>
<td>248</td>
<td>250</td>
</tr>
</tbody>
</table>
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
- 16 optically isolated digital inputs, 24 V, including 14 interruptible inputs
- Reverse voltage protection
- All inputs are filtered
- 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

Applications
- Industrial I/O control
- PLC coupling
- Acquisition of encoder data for process control
- Signal switching
- Interface to electromechanical relays
- ON/OFF monitoring of motors, lights...
- Watchdog / timer
- Machine interfacing
- ...

Software drivers
A CD-ROM with the following software and programming samples is supplied with the board.
Standard drivers for:
- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request
Drivers and samples for the following compilers and software packages:
- Microsoft VC++ • Microsoft C
- Borland C++ • Borland C
- Visual Basic • Delphi
- LabVIEW • LabWindows/CVI • DASYLab • DiAdem
On request:
Further operating systems, compilers and samples.
Driver download: www.addi-data.com/downloads

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
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, Rload <0.1 Ω: 1.5 A
- RDS ON resistance: 0.4 mΩ max.
- Switch-on time: tout = 0.5 A, load = resistance: 120 μs
- Switch-off time: tin = 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: CompactPCI 32-bit (5 V signal voltage)
- Space required: 1 CompactPCI 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

- 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
- PX900: 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)
- ST021: Round cable between CPCI-1500 and PX8500, shielded, twisted pairs, 2 m
- ST022: Round cable between PX8500 and PX901, shielded, 2 m
- ST8500: Ribbon cable for cascading two PX8500

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 PX9000-G

Connection of the outputs through relay output board PX8500-G cascaded in 16 relays.

Ordering information

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

- **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
  - 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
  - Signed 64-bit drivers for Windows 8 / 7 / XP
  - Real-time use with Linux and Windows on request

- **Drivers and samples for the following compilers and software packages:**
  - C#, .NET, C

**On request:**

Further operating systems, compilers and samples.

Driver download: www.addi-data.com/downloads
Digital I/O board, 64 digital I/O, optically isolated, 24 V. Incl. technical description, software drivers

CPCI-1564

Digital I/O board, 64 digital I/O, optically isolated, 24 V. Incl. technical description, software drivers

**Specifications**

**Digital inputs**
- Number of inputs: 32; 4 groups of channels with common ground:
  - Input: 0-7, 8-15, 16-23, 24-31
  - Output: 0-3; fast counter input, 500 kHz
  - -4-19: interruptible inputs
- Optical isolation: Through opto-couplers, 1000 V
- Nominal voltage 24 V (CPCI-1564): Digital inputs
  - Counter inputs
- Input current at 24 V: 4 mA typ., 10,5 mA typ.
- Logic input levels:
  - UL max.: 30 V
  - UL min.: 19 V
  - UIH max.: 14 V
  - UIH min.: 0 V

**Digital outputs**
- Number of outputs: 32, optically isolated up to 1000 V
- Output type: High side (load to ground) acc. to IEC 1131-2
- Supply voltage: 11 V to 36 V, min. 5 V (via front connector)
- Nominal voltage: 24 V (CPCI-1564); or 5 V (CPCI-1564-5V)
- Output type: High side (load to ground) acc. to IEC 1131-2
- Number of outputs: 32, optically isolated up to 1000 V
- Maximum current for 8 outputs: 1.85 A typ.
- Current consumption: 395 mA ± 15 mA typ.
- Space required: 1 CompactPCI slot 3U (only at 3HE)

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

**Physical and environmental conditions**
- Dimensions: 160 x 100 mm
- System bus: CompactPCI 32-bit
- Space required: 1 CompactPCI slot 3U (only at 3HE)
- Operating voltage: ±5 V, ±3 V, ±1.5 V from CompactPCI system
- Current consumption: 395 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 3HE)
- 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)

**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
- ST85000: Ribbon cable for cascading two PX8500

**ADDI-DATA connection**

**Example 1:**
- Connection of the inputs (ribbon cable)
- Connection of the outputs through screw terminal panel PX901-DG or PX9000

**Example 2:**
- Connection of the outputs through relay output board PX8500-G cascaded in 32 relays

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

**Simplified block diagram**

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**Phone:** +49 7229 1847-0
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**www.addi-data.com**
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 though industrial applications. With this board you can realise many different applications on the same hardware base. The board is supplied with a pool of functions which are individually configured for each channel through the supplied software. The flexible programming facilities on this board allow many different user applications to be quickly and easily developed or reconfigured as further requirements arise. Thanks to the FPGA board structure, further counting applications can be realised through software adaptation. Contact us!

**Features**

- Can be inserted in PXI systems, with restricted functionality
- 32-bit data access
- Counter component with 32-bit counting depth and 5 MHz counting frequency
- Signals in TTL or RS422 mode, 24 V signals optional
- Four onboard function modules
- Reprogrammable functions

**Functions (detailed description see APCI-1710)**

- Acquisition of incremental encoders (90° phase-shifted signals)
- Synchronous serial interface for systems allowing an absolute position information through serial data transfer
- Counter/timer (82C54)
- Pulse acquisition
- Frequency measurement
- Pulse width modulation / PWM
- Period duration measurement
- Velocity measurement
- Digital inputs and outputs
- Customised functions

**Available channels for all four function modules**

- 20 channels for digital inputs, optically isolated
- 8 channels, programmable either as digital inputs or outputs, optically isolated
- 4 digital power outputs, optically isolated

**Applications**

- Event counting
- Position acquisition
- Motion control
- Batch counting

**Software**

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

**Standard drivers for:**

- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

**Drivers and samples for the following compilers and software packages:**

- .NET
- Microsoft VC++
- Microsoft C
- Borland C++
- Borland C
- Visual Basic
- Delphi
- LabVIEW
- DIAdem

**On request:**

Further operating systems, compilers and samples.

Driver download: www.addi-data.com/downloads
### Specifications

**Free programming of the functions**
- 32-bit or 16-bit acquisition of incremental encoders
- Acquisition of absolute encoders/SSI
- Counter/timer
- Chronos/TOR for frequency measurement
- Pulse acquisition
- Chronos for pulse width modulation
- Chronos for period duration measurement
- TOR for velocity measurement
- Digital I/O, 24 V, TTL, RS422
- PWM
- Customised functions

**Signals**
- Digital I/O signals, TTL or RS422

**Inputs**
- Number of inputs: 20
- Differential Inputs or outputs
  - Differential inputs, 5 V: 8/16 (8 can be used as inputs or outputs)
  - Nominal voltage: 5 VDC
  - Common mode range: +12 / -12 V
  - Max. differential voltage: ±12 V
  - Input sensitivity: 200 mV
  - Input hysteresis: ±50 mV
  - Input impedance: 12 kΩ
  - Terminal resistor: 150 Ω serial with 10 nF (typ.)
  - Signal delay: 120 ns (at nominal voltage)
  - Max. input frequency: 2.5 MHz
- 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
  - UH min.: 19 V
  - UL max.: 15 V
  - UL min.: 0 V
  - Signal delay: 120 ns (at nominal voltage)
- Maximal input frequency: 1 MHz

**Outputs**
- Nominal voltage: 5 VDC
- Maximum output frequency: 2.5 MHz (diff. outputs)
- Max. number of outputs: 8 (if they are not used as diff. inputs)
- Differential 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, Rload < 0.1 Ω:
  - 1.5 A max. (output switches off)
- ON-resistance of the output:
  - 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. 125-150 °C (chip temperature)
- Outputs (at overtemperature): Outputs switch off

**Protection against undervoltage**
- Effective at V ext. < 5 V
- Outputs (at undervoltage): All outputs switch off

**Switching characteristics of the outputs**
- (V ext. = 24 V, T = 25 °C, ohmic load: 500 mA)
  - Switch ON time: 200 µs
  - Switch OFF time: 15 µs

**Digital outputs, 5 V (option)**
- Output type: TTL
- Number of outputs: 4
- Nominal voltage: 5 VDC

**Switching characteristics of the outputs**
- (T = 25 °C, TTL load):
  - Switch ON time: 0.06 µs
  - Switch OFF time: 0.02 µs

**Technical data for the option 24 V**
- 24 V inputs (channels A up to G):
  - This board version is intended for the connection of 24 V encoders. Only 24 V signals can be connected to the input channels.
- Nominal voltage: 24 VDC / 10 mA
- Max. input frequency: 10 kHz
- Logic input levels (Standard):
  - Unominal: 24 V
  - UH max.: 25 V
  - UH min.: 19 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 signal voltage)
- Space required: 1 slot
- Operating voltage: ±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: 54287 hours at 45 °C

### Ordering information

**CPCI-1710:** Multifunction counter board, optically isolated, encoder, incremental counter, timer/counter, SSI, PWM.

**MX1710:** Peripheral module for the board CPCI-1710. 2 modules are necessary for each CPCI-1710 board. **Please order with the board!**

**Options**
- **URS-1710-6U:** 6U bracket for mounting in 6U housing
- **Option 24V:** 24 V for differential inputs (channels A up to G, A and B for counter, I (index) and UAS (error) signals)
- **Option 5V:** 5 V outputs instead of 24 V (E, F, G)

**Accessories**
- **ST370-16:** Shielded round cable, 2 m
- **PX8001:** 3-row screw terminal panel, 50-pin, for DIN-rail mounting

**Contact Information**
- Phone: +49 7229 1847-0
- Fax: +49 7229 1847-222
- www.addi-data.com
- info@addi-data.com
Multifunction board, optically isolated, 16 SE or 8 diff. inputs, 4 analog outputs, 16-bit

The board CPCI-3009 is a fast multifunction and counter board for the CompactPCI bus. It is characterised by flexible applications, high accuracy, speed and reliability in severe industrial environments.

With this board you can put into practice a large range of applications on the same hardware basis thanks to FPGA technology. The board is supplied with a pool of functions allowing a high efficiency on just one board. The functions are programmed using the supplied software. You can adapt the functions of the board to the requirements of your application and change them as required. On request, further counter applications can be adapted per software thanks to the the FPGA. Contact us!

**Features**

- CompactPCI 3.3 V or 5 V
- Can be inserted in PXI systems, with restricted functionalities

**Analog inputs**
- 16 SE or 8 diff. inputs, optically isolated 1000 V
- Resolution: 16-bit
- Throughput: 100 kHz
- Voltage inputs: 0-10 V, ±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
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

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

Driver download: www.addi-data.com/downloads
**Specifications**

### Analog Inputs
- **Number of inputs:** 16 SE or 8 differential inputs, 16-bit resolution
- **Optical isolation:** up to opto-couplers from PC to peripheral
- **Voltage inputs:** software-programmable for each channel
  - CPCI-3009: 0-10 V, ± 0.5 V, ± 0.25 V, ± 0.1 V
  - CPCI-3009-30V: 0-30 V
- **Gain:** Software programmable
- **Throughput:** up to 100 kHz
- **Trigger:** through software, timer, external event (24 V input)
- **Data transfer:** through interrupt EOC (End Of Conversion), DMA transfer at EOC
- **Interrupts:** end of conversion, end of timer, end of scan

### Analog Outputs
- **Number of outputs:** 4, 12-bit resolution
- **Optical isolation:** up to opto-couplers
- **Voltage outputs:**
  - Output range: –10 V to 10 V
  - Accuracy: ± 0.0025 V
  - Time to read: typ. 5 µs
  - Setup time: typ. 15 µs (at 10 V step)
  - Max. output current: ± 5 mA (each output)
  - Short-circuit current: max. ± 100 mA (temporary)
  - Output voltage after reset: 0 V

### Counter Components
- **Counting depth:** 32-bit, counting frequency up to 5 MHz
- **Optical isolation:** up to 1000 V
- **Free programming of the functions:** select one from the list on the right.
- **Signals:**
  - Digital I/O, 24 V signals, TTL or RS422

### Digital I/O
- **Number of I/O channels:** 4 digital inputs, 4 digital outputs (50 mA), 24 V
- **Logical “0” level:** 0-4 V
- **Logical “1” level:** 5-10 V
- **Optical isolation:** up to 1000 V through opto-couplers from PC to peripheral

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

### Physical and environmental conditions
- **Dimensions:** 3U/4TE
- **System bus:** CompactPCI 32-bit
- **Space required:** 1 x CompactPCI slot for analog I/O, counter
- **Operating voltage:** ± 5 V ± 10 %
- **Current consumption:** 790 mA ± 10 %
- **Front connector:** 26-pin D-Sub female connector (analog I/O)
- **Temperature range:** 0 to 60 °C (with forced cooling)

**CPCI-3009**
- Multifunction board, optically isolated, 16 SE or 8 diff. inputs, 4 analog outputs, 16-bit. Incl. technical description and software drivers.

### Versions
- **CPCI-3009_30V:** Same as CPCI-3009, only SE inputs, unipolar, 0-30 V input range

### Options
**Please specify the number of channels when ordering**
- **URS-3009-6U:** 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 PC:** Current output 0/4-20 mA for 1 channel
- **PC-SE:** For 1 single-ended channel
- **PC-Diff:** For 1 diff. channel (30 Hz)
- **Option CAL3009:** Only for 32-bit operation system. On-site calibration of the CPCI-3009. Do the fine adjustment fast and reliably and then save the calibration report file.

### Ordering information
**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

**Further functions on request:**
- 3 x acquisition of absolute encoders/SSI
- 3 x counter/timer
- 4 x pulse acquisition
- 2 x PWM
- 2 x ETM
- 1 x SSI monitor

For a detailed description of the functions, please see the data sheet of the board APCI-1710 on page 166.
Multifunction board, optically isolated, 16 SE or 8 diff. inputs, 8 analog outputs, 16-bit

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

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)
  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
- Input filters: 159 kHz

Analog acquisition
- Single channel, several channels, several channels through scan list
- Autom. analog acquisition through cyclic timer control
- Acquisition through scan list: up to 16 entries with gain, channel, unipolar/bipolar
- Acquisition triggered through software, timer, external event
- Trigger functions:
  - Software trigger or
  - external trigger: the analog acquisition (single or sequence) is started through signal switching from 0 V to 24 V at the digital input 0.
  - Interrupt: End of single, End of multichannel, End of scan list

Analog outputs
- 4 or 8 analog outputs, optically isolated 500 V
- Setup time 30 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

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
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

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

On request:
Further operating systems, compilers and samples.

Driver download: www.addi-data.com/downloads
Specifications

Analog inputs
Number of inputs: 16 single-ended / 8 differential inputs or 8 single-ended / 4 differential inputs
Resolution: 16-bit
Optical isolation: 200 V through opto-couplers from PL 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, ±0.02 mA
Common mode rejection: 90 dB, 1 kHz
Relative precision (max.): ±1.3 dB, ±0.3 %
DIFF Non-linearity (DNL): ±0.3 LSB
Input impedance: 10 kΩ, 10 kΩ minimum, 10 kΩ ±25 %
Bandwidth (min.:): Limited to 135 MHz with low-pass filter
Trigger: Through software, timer, event, input 24 V input
Data transfer: Data to the PLC through FIFO memory, data transfer at the beginning of the conversion.
Interrupts: End of conversion, end of timer, scan

Analog outputs
Number of outputs: 4 or 8
Resolution: 16-bit
Optical isolation: 200 V through opto-couplers
Output range: 0-10 V, ±10 V switchable through software
Setup time at ±10 V, 10 µs
Overvoltage protection: ±12 V
Max. output current / load: ±5 mA, 500 pF, 2 kΩ
Output range: 0-10 V, ±10 V, ±5 V, ±2 V, ±1 V
Optical isolation: 1000 V through opto-couplers
Resolution: 16-bit resolution
Number of output channels: 4 or 8
Input current at 24 V: 3 mA typ.
Optical isolation: 500 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 of the EN 61326 series (IEC 61326). The limits as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

Physical and environmental conditions
Dimensions: 160 x 100 mm
System bus: CompactPCI 32-bit (5 V signal voltage)
Space required: 1 PCI slot for analog I/O, 1 slot opening for digital I/O with FB3001
Operating voltage: +5 V, ±5 %, ±2 V from CompactPCI system
Current consumption: 900 mA
Temperature range: 0 to 60 °C, 20 °C ±10 °C
MTBF: 73887 hours at 40 °C

Ordering information

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.

Version
CPCI-3120-16A: 16 SE / 8 diff. inputs, 4 analog outputs
CPCI-3120-16B: 16 SE / 8 diff. inputs, 8 analog outputs

Options: Please specify the number of channels when ordering

Option SF: Precision filter for 1 single-ended channel
Option OF: Precision filter for 1 diff. channel (30 Hz)
Current input 0(0)-20 mA for 1 channel
PC-SE: For 1 single-ended channel
PC-Diff: For 1 diff. channel (30 Hz)
Option CAL3120: Only for 32-bit operation system. On-site calibration of the CPCI-3120. Do the fine adjustment fast and reliably then save the calibration report file.

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
PX_BNC: BNC connection box for connecting the analog I/O
ST010: Standard round cable, shielded, twisted pairs, 2 m
ST011: Standard round cable, shielded, twisted pairs, 5 m
FB3001: Ribbon cable for digital I/O, with 37-pin D-Sub male connector on 3U bracket

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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

Analog acquisition
- Single channel, several channels, several channels through scan list
- Autom. analog acquisition through cyclic timer control
- Acquisition through scan list: up to 16 entries with gain, channel, unipolar/bipolar
- Acquisition triggered through software, timer, external event
- Trigger functions:
  - Software trigger or
  - external trigger: the analog acquisition (single or sequence) is started through signal switching from 0 V to 24 V at the digital input 0.
- Interrupt: end of single channel, end of multichannel, end of scan list

Digital
- 4 digital inputs, 24 V, optically isolated
- 4 digital outputs, 24 V, optically isolated

Timer
- 24-bit
- Timer 2 as cyclic time counter

Safety features
- Optical isolation 500 V min.
- Creeping distance IEC 61010-1
- Overvoltage protection ± 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
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

Drivers and samples for the following compilers and software packages:
- Microsoft VC++ • Microsoft C
- Borland C++ • Borland C
- Visual Basic • Delphi • Turbo Pascal
- LabVIEW • DASYLab • DiAdem

On request:
Further operating systems, compilers and samples.

Driver download: www.addi-data.com/downloads

Also for PCI-Express
See APcIe-3021, page 134

Also for PCI
See APcI-3001, page 190

CompactPCI™ 32-bit

Also for PCI-Express
See APCIe-3021, page 134

Also for PCI
See APCI-3001, page 190

Windows
64/32-bit drivers

LabVIEW™

LabWindows/CVI™

DASYLab10

CompactPCI, analog – CPCI-3001

Specifications

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, ±1 V, ±1 V
- 0-20 mA optional

Threshold: 100 kHz

Gain: Software programmable (x1, x2, x5, x10)

Common mode rejection: DC at 10 Hz, 90 dB minimum

Relative precision (PNL): ±1 LSB (ADC)

Diff. Non-linearity (DNL): ±0.5 LSB (ADC)

Input impedance (PGA):
- Single-ended: 10^12 Ω (–20 nF)
- Differential: 10^12 Ω (20 nF against GND)

Bandwidth (–3 dB): Limited to 159 kHz with low-pass filter

Triggers: 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)
- EOS (End of Scan), DMA transfer at EOC

Interrupts:
- End of conversion, End of timer, End of scan

Timer

Time base Timer 2: 24-bit, 50 µs; smallest programmable value: 100 µs

Digital I/O

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

Optical isolation: 500 V through opto-couplers from PC to peripheral

Input range: 0-30 V

Output range: 0-30 V

Max. switching current: 3 mA typ.

Output type: Open collector

EMC – Electromagnetic compatibility

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

Physical and environmental conditions

Dimensions: 160 x 100 mm

System bus: CompactPCI 32-bit

Space required: 1 PCI slot for analog inputs, 1 slot opening for digital I/O

Operating voltage: ±5 V ± 5 %, 3.3 V from CompactPCI system

Current consumption: 550 mA typ.

Front connector: 37-pin D-Sub male connector

Additional connector: 16-pin male connector for ribbon cable for connecting the digital inputs and outputs

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

MTBF: 75867 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, 8 digital I/O

CPCI-3001-8
- 8 SE / 4 diff. inputs, 8 digital I/O

CPCI-3001-4
- 4 SE inputs, 8 digital I/O

Options:

Please specify the number of channels when ordering

URS-3001-6U:
- 6U bracket for mounting in 6U housing

Option SD:
- Precision filter for 1 single-ended channel

Option DF:
- Precision filter for 1 diff. channel (30Hz)

Option SC:
- Current input 0(4)-20 mA for 1 single-ended channel

Option DC:
- Current input 0(4)-20 mA for 1 diff. channel

Accessories

PX901-A: Screw terminal panel with transorb diodes for connecting the analog inputs

PX901-AG: Same as PX901-A with housing for DIN rail

PX901-ZG: Screw terminal panel for connecting the dig. I/O, for DIN rail

PX_BNC: BNC connector box for connecting the analog I/O

ST010: Standard round cable, shielded, twisted pairs, 2 m

ST011: Standard round cable, shielded, twisted pairs, 5 m

FB3001: Ribbon cable with 37-pin D-Sub male connector on 3U bracket for the digital I/O

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4-port serial interface, RS232, RS422, RS485, 20 mA CL

CPCI-7500
4-port, RS232, RS422, RS485, 20 mA Current Loop
Mode selection through MX modules
With/without optical isolation
Free mode configuration for each port
128-byte FIFO buffer per port
MTBF: 98 551 hours at 45 °C

The board CPCI-7500 is a 4-port serial interface for industrial applications. It is configured by inserting MX modules which the board identifies automatically. Each serial port can be configured individually through modules in the following modes: RS232, RS422, RS485 (with or without optical isolation) and Current Loop (optically isolated). The optically isolated modules allow a protection up to 1000 V for the use in noisy environments where earth loops can occur. Interrupts, addressing and transfer rate are controlled through the BIOS. The I/O lines are protected against short-circuits, fast transients, electrostatic discharge and high-frequency EMI. Each port is supported through a 128-byte FIFO buffer for sending and receiving data which guarantees reliable operation with high data volumes.

Features
- Asynchronous 4-port serial interface
- 4 socket for MX modules
- Modular mounting through MX modules
- Can be configured as RS232, RS422, RS485 with or without optical isolation, 20 mA Current Loop (active, passive), with optical isolation
- Addressing through software
- No jumpers: software configuration
- Automatic module recognition
- 128-byte FIFO memory for each interface
- Common interrupts
- Programmable transfer rate
- 5-, 6- or 8-bit character
- 1, 1½ or 2 stop bits
- Parity: even, odd or none
- Automatic transmitter control for RS485

Safety features
- MX modules with optical isolation available
- Protection against fast transients (burst)
- Short-circuits protection for RS422 and RS485
- Internal diagnostic, break, parity, overrun and framing error
- Creeping distance IEC 61010-1 (MX modules)

Applications
- Data acquisition
- Industrial process control
- Industrial communication
- Multi-user systems
- Modem and printer monitoring
- Multidrop applications

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

Standard drivers for:
- Linux
- 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
- Signed 64-bit drivers for Windows 8 / 7 / XP
- Real-time use with Linux and Windows on request

Drivers and samples for the following compilers and software packages:
- Microsoft VC++
- Visual Basic  Delphi

On request:
Further operating systems, compilers and samples.

Driver download: www.addi-data.com/downloads

URS-7500-6U
6U bracket

Also for PCI-Express
See APCh-7xxx, page 142

Also for CompactPCI
See APCh-7500, page 210

CompactPCI™ 32-bit

Also for PCI-Express
See APCh-7xxx, page 142

Also for CompactPCI
See APCh-7500, page 210

CompactPCI™ 32-bit

Also for PCI-Express
See APCh-7xxx, page 142

Also for CompactPCI
See APCh-7500, page 210

CompactPCI™ 32-bit

Also for PCI-Express
See APCh-7xxx, page 142

Also for CompactPCI
See APCh-7500, page 210

CompactPCI™ 32-bit

Also for PCI-Express
See APCh-7xxx, page 142

Also for CompactPCI
See APCh-7500, page 210

CompactPCI™ 32-bit

Also for PCI-Express
See APCh-7xxx, page 142

Also for CompactPCI
See APCh-7500, page 210

CompactPCI™ 32-bit
4-port serial interface

Modes:
- RS232, RS422, RS485, 20 mA Current Loop
- (active, passive) with or without optically isolated via separate MX modules

Transmission mode: Asynchronous, full/half duplex (MX modules)

Addressing: Automatic through BIOS

Memory: 128-byte FIFO buffer for each interface

Transfer rate: Programmable up to 1 MBaud (optional)

Protocol:
- 5-, 6-, or 8-bit Character
- 1, 1½ or 2 Stop bits
- Even, odd, none, mark, space
- Interrupt: Interrupt configuration through BIOS

Safety

Optical isolation: 1000 V (MX modules)

EMC – Electromagnetic compatibility

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

Physical and environmental conditions

Dimensions: 3U/4TE

System bus: CompactPCI 32-bit (5 V signal voltage)

Space required: CompactPCI-slot, 3U

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

Current consumption: 192 mA typ.

Front connector: 37-pin D-Sub male connector

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

MTBF: 98 551 Hours at 45 °C

CompactPCI, serial – CPCI-7500

Application example

Connection cables

- 37-pin D-Sub female connector
- 4 x 9-pin D-Sub male connector (ST075)
- or
- 4 x 25-pin D-Sub male connector (ST074)

CPCI-7500

4-port serial interface, RS232, RS422, RS485, 20 mA CL. Incl. technical description and software drivers.

MX modules: Please order separately!

- MX232-G: RS232 mode optically isolated
- MX232: RS232 mode
- MX422-G: RS422 mode optically isolated
- MX422-PEP: RS422 mode optically isolated, with RTS/CTS
- MX485-G: RS485 mode optically isolated
- MX485: RS485 mode
- MX485-G: RS485 mode optically isolated
- MX485: RS485 mode
- MX232: RS232 mode
- MX422: RS422 mode
- MX422-PEP: RS422 mode optically isolated, with RTS/CTS
- MX485-G: RS485 mode optically isolated

MX485: 20 mA Current Loop (active, passive), optically isolated

Option:
- URS-7500-6U: 6U bracket for mounting in 6U housing

Ordering information

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The board CPCI-8004 for the CompactPCI bus is used for the control of up to four servo or stepper motor axes through a PC. With this intelligent and flexible board, many control tasks from simple to complicated can be realised.

The board has four stepping/direction output channels (D/A channels, 16-bit). They are isolated from the digital current supply and are used for the control of commercially available power amplifiers connected as speed controlling devices or current regulators. Incremental encoders, SSI encoders and EnDat encoders as well as end and reference switches can be connected to each axis channel.

Digital PID filters with forward compensation and optional Notch filters are also involved in the axis control. The "open" controlling concept of the CPCI-8004 is intended in the first place for manufacturers of special-purpose machines and users which need a flexible integration as well as a CNC solution.

Applications
- Precision positioning
- CNC control
- Semi-conductor manufacturing
- Event counting
- Motion control
- Robots
- X-Y-Z position control
- Stepper motor control
- Machine monitoring
- Research and development

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

- Standard drivers for:
  - Linux
  - 32-bit drivers for Windows 8 / 7 / Vista / XP / 2000
  - Signed 64-bit drivers for Windows 8 / 7 / XP
  - Real-time use with Linux and Windows on request

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

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

Driver download: www.addi-data.com/downloads
### Specifications

#### CPCI-8004

- **CPU system:** 64-bit RISC processor 150 MHz
- **RAM:** 16 MB
- **Data exchange with the PC:** Through CompactPCI bus
- **Controller software:** PIFD (PID filters with forward compensation)
- **Interpolation:** 2D, 4D linear, 2D circular, 3D circular, 4D helix, interpolation with secondary axes.
- **Inputs for incremental encoders:** Diff. or TTL max. 2 MHz, word length: 32-bit with sign
- **Inputs for SSI encoders:** Up to 32-bit, gray / binary code, variable frequency 30 kHz to 1.5 MHz
- **Setpoint value outputs (servo):** 1 per channel, D/A converter, 16-bit resolution, ± 10 V
- **Pulse outputs:** 1 stepper signal (RS422) and 1 directional signal (RS422) for each channel, pulse frequency up to 2 MHz
- **Isolated digital inputs:** 24 inputs, 24 V, as end or reference switch or freely programmable
- **Isolated digital outputs:** 12 channels, 24 V / 500 mA, for releasing the power amplifiers or freely programmable
- **Interrupts:** Through PCI BIOS
- **DMA:** Bus master
- **Auxiliary voltage:** 24 V external for digital I/O
- **Options:** Interbus or CAN-Bus

#### Safety

- **Optical isolation:** 1000 V

#### EMC – Electromagnetic compatibility

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

#### Physical and environmental conditions

- **Dimensions:** 160 x 100 mm
- **System bus:** CompactPCI 32-bit
- **Space required:** 1 CompactPCI slot
- **Operating voltage:** +5 V and 3.3 V, ± 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

**CPCI-8004**

Motion control board for 4 servo or stepper motors. Incl. technical description and software drivers.

**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

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Screw terminal panels, Relay output boards, connection cables

How important are cables and terminal panels?
When the PC runs important controlling and regulating tasks in a processing system, then data transfer must be reliable in order to ensure the reliability of the whole system. This is why ADDI-DATA cables and terminal panels have the same high safety and EMC standards as the PC boards and MSX-E systems.

What makes the difference between cables?
The connection cable as a mechanical device is not submitted to the EMC specifications, though it can affect the emission immunity of the devices to which it is connected.
The use of cables with industry-standard D-Sub connectors has many advantages:
• Robustness
• Protection against EM fields
• Earthing on both connector ends
• High noise immunity

Application
Suitable for use as control or signal cables in noisy environment, for indoor or outdoor applications. The tight braid reduces the emissions.
The copper braid is used as “ground”. Twisted pairs provide protection against crosstalk and external interference. The cables are suited for dry or damp environments.

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.

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>Description</th>
<th>PX901</th>
<th>PX9000</th>
<th>PX8001</th>
<th>PX8500</th>
<th>PX_BNC</th>
</tr>
</thead>
<tbody>
<tr>
<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>Relay output board with 8 relays, cascadable in 16, 24 and 32 relays</td>
<td>BNC connection box for connecting up to 8 diff. or 16 SE inputs and 8 outputs</td>
<td></td>
</tr>
<tr>
<td>Function indication with LEDs</td>
<td>PX901-D: yes</td>
<td>For 24 V and sensor supply</td>
<td></td>
<td>For relay and sensor supply</td>
<td></td>
</tr>
<tr>
<td>Overvoltage protection of the 24 V supply voltage</td>
<td>Through varistors and transit diodes</td>
<td>Through varistors and transit diodes</td>
<td>Through varistors and transit diodes</td>
<td></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.</td>
<td></td>
<td>PX8500-G: With housing for DIN rail</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PX901-DG: Same as PX901-D with housing</td>
<td>PX8500-Vt+G: With varistors and housing for DIN rail</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PX901-A: For analog boards with transit diodes for the overvoltage protection of the analog I/O</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PX901-AG: Same as PX901-A with housing for DIN rail</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PX901-ZG: For digital I/O boards, analog boards APCi-1710, APCi-1711, APCi-1711, APCi-800B, APCi-8004, APCi-2200, APCi-2200, APCi-311x/301x, APCi-040, APCi-1696/1648</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>APCi-1710, APCi-1711, APCi-1711, APCi-800B, APCi-8004, APCi-2200, APCi-2200, APCi-311x/301x, APCi-040, APCi-1696/1648</td>
<td>ADDI-DATA digital boards with digital outputs</td>
<td>ADDI-DATA analog boards</td>
</tr>
<tr>
<td>Page</td>
<td>259</td>
<td>262</td>
<td>262</td>
<td>260</td>
<td>263</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 STxxx series. The housing of the female connector is connected with two ground terminals so that the board is additionally earthed for more security. All components of the board are enclosed in an earthing strip also connected to the ground terminals. Each terminal is directly connected to one pin of the 37-pin D-Sub female connector. Designations on terminals indicate respective connections for the 37-pin D-Sub female connector.

The PX901-D version is equipped with LEDs which are ideal for status display when working with ADDI-DATA digital 24 V I/O boards. The PX901-A version is fitted with transil diodes for analog signals, but without LEDs. An additional 4-pin terminal is available in order to be able to connect more than one 24 V operating voltage and ground line. The 24 V or the ground terminal can be connected very easily through wire wrap to the 4-pin terminal. The 24 V operating voltage lines are additionally protected against 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

**Safety features**
- Overvoltage protection of the 24 V supply terminals through varistors and transil diodes

**Applications**
- Process control
- Industrial measuring
- Acquisition of sensor data
- Signal analysis

**Specifications**

<table>
<thead>
<tr>
<th>Signal line terminals:</th>
<th>32 for the connection of peripherals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additional terminals:</td>
<td>– 4 for feeding the external operating voltage (digital I/O)</td>
</tr>
<tr>
<td></td>
<td>– 2 for the connection of ground lines</td>
</tr>
<tr>
<td>Status indication:</td>
<td>32 LEDs for status indication, 1 LED for status display of the operating voltage (PX901-D)</td>
</tr>
<tr>
<td>Safety features:</td>
<td>Varistors and transil diodes</td>
</tr>
<tr>
<td>Connector:</td>
<td>37-pin D-Sub female connector</td>
</tr>
<tr>
<td>Dimensions of the board:</td>
<td>130 x 70 x 35 mm (L x W x H)</td>
</tr>
<tr>
<td>Dimensions with housing:</td>
<td>132 x 87 x 70 mm (L x W x H)</td>
</tr>
<tr>
<td>Temperature range:</td>
<td>0-60 °C</td>
</tr>
</tbody>
</table>

**Example:**
Connection of a digital input board to the screw terminal panel PX901-DG

**Ordering information**

**Versions**

- **PX901-D:** For digital boards, with status indication through LEDs and the Ethernet systems MSX-E312x and MSX-E3701-DIO
- **PX901-DG:** Same as PX901-D, with housing for mounting on DIN rail
- **PX901-A:** For analog boards, with transil diodes
- **PX901-AG:** Same as PX901-A, with housing for mounting on DIN rail

**PX901-ZG:**
- For the counter boards PCIe-1711 and CPCIs-1711 (function Sin/Cos)
- For connecting digital I/O to analog PC boards
- For the relay boards (digital inputs) PCIe-2200 and APCi-2200
- With housing for DIN-rail mounting

**Accessories please order separately!**

- **ST010:** Standard round cable, shielded, twisted pairs, 2 m
- **ST011:** Standard round cable, shielded, twisted pairs, 5 m
The PX8500 is an external 8-port relay board for the connection to digital output boards. It can be cascaded in 16, 24 and 32 relays and is intended for mounting on DIN rails. The board is an interface between the PC and industrial process equipment.
The change-over contacts of the relay are controlled through 24 V signals. The 24 V voltage supply is protected through varistors and transil diodes.
The board is intended for use with 220 V supply. The creeping distances (acc. to DIN VDE0110) and the conductor cross sections allow operations with high switching capacity (up to 2,500 VA). The board has a female D-Sub connector for connecting an ADDI-DATA digital 24 V output board through a standard I/O cable ST010. The red LEDs display the state of the relays (open/closed). A green LED displays the ON/OFF of the operating voltage.
The 37-pin cable shield can be grounded on both sides for the protection against high-frequency EMI.

Features
- Relay output board with 8 relays, 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 transil diodes
- Contact protection of the relays through varistors (PX8500-VIG)
- 4 mm creeping distance between change-over, closing and opening contact
- 6 mm creeping distance between change-over and closing contact of adjoining relays
- Free-wheeling diode in the coil circuit
- With housing for mounting on a standard DIN rail
- Operating safety tested according to the low-voltage directive: 73/23/EEC

Applications
- Industrial digital I/O control
- Automatic test equipment
- External high power relay control
- Alarm monitoring
- Test automation
- Alarm monitoring
- Digital monitoring
- ON/OFF monitoring of motors, lights ...
- ...

Function principle of the relays

<table>
<thead>
<tr>
<th>CO: Change-over contact</th>
<th>CC: Closing contact</th>
<th>OC: Opening contact</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Rest state (open)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO</td>
</tr>
<tr>
<td>CC</td>
</tr>
<tr>
<td>OC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Work state (closed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO</td>
</tr>
<tr>
<td>CC</td>
</tr>
<tr>
<td>OC</td>
</tr>
</tbody>
</table>
Specifications

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

Contact side
Type of contacts: 8 change-over
Max. switching voltage: 30 VDC / 277 VAC
Max. switching capacity: 300 W / 2500 VA
Max. switching current: 10 A
Contact resistance: < 100 mΩ
Response time: 15 ms
Release time: 5 ms
Mechanical life: 5 x 10^6 operations
Life at max. switching capacity: 10^5 operations

Control side
Switching behaviour: Monostable
Operating voltage: 24 VAC
Operating capacity: 533 mW
Switch. frequency at max. load: 20 switchings/minute
Response voltage at +20 °C: 16.8 V
Release voltage at +20 °C: 2.4 V

Physical and environmental conditions
Operating voltage: +24 V
Current consumption: 210 mA typ.
Dimensions: 212 x 87 x 72 mm (L x W x H)
Connector: 2 x 37-pin D-Sub female connector
X1: For the connection to the PC board
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 relay 1, output 2 to relay 2, etc.
Temperature range: 0-60 °C
Humidity: 50 % at +40 °C
80 % at +31 °C

Ordering information

PX8500 cascaded in 32 relays
Relay output board PX8500-G cascaded in 32 Relais.
For the boards:
- APCIe-1564
- APCI-1564
- APCI-2032
- CPCi-1564
- CPCi-1564

PX8500 cascaded in 16 relays
- Connection of the outputs with relay output board PX8500-G cascaded in 16 relays.
- Connection of the inputs with screw terminal panel
For the boards:
- APCIe-1532
- APCIe-1502
- APCI-1500
- APCI-2016
- CPCi-1500
- CPCi-1530
- PC104PLUS1500

Connection example – digital I/O board in 8 relays
- Connection of the outputs with relay output board PX8500-G
- Connection of the inputs with screw terminal panel PX901-DG
For the boards:
- APCIe-1516
- APCI-1516

PX8500
8-port relay output board. Incl. technical description.
PX8500-G: With housing for mounting on DIN rail (IP 20)
PX8500-VtG: PX8500 with varistors and housing for mounting on DIN rail (IP 20)

Accessories
ST8500: Ribbon cable for cascading the board in 16, 24 or 32 relays. (Info: For 24 or 32 relays the cable ST022 is also required.)
ST021: Standard round cable, shielded, twisted pairs, 2 m. For connecting 37-pin digital I/O boards and MSX-E systems.
ST022: Standard round cable, shielded, twisted pairs, 2 m. For connecting the 37-pin screw terminal panel and for cascading.
ST010: Standard round cable, shielded, twisted pairs, 2 m. For connecting 37 pin digital I/O boards to relay output boards up to 32 relays.
ST011: Same as ST010, 5 m.
Specifications

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 24 V 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>Cross conductor section up to</th>
<th>4 mm²</th>
<th>0.2 – 2.5 mm² (flexible)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input/output test voltage</td>
<td>2.5 kV, 50 Hz, 60 s</td>
<td></td>
</tr>
<tr>
<td>Operating temperature</td>
<td>–20 °C to +50 °C</td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
<td>69 x 98 x 62 mm (L x W x H)</td>
<td></td>
</tr>
<tr>
<td>Current/Voltage</td>
<td>2 A / 125 V</td>
<td></td>
</tr>
</tbody>
</table>

**PX9000**

3-row screw terminal panel, 37-pin, with housing for DIN-rail mounting. Incl. technical description.

**PX8001**

3-row screw terminal panel, 50-pin, with housing for DIN-rail mounting. Incl. technical description.

**Accessories**

Please order separately!

ST010: Standard round cable 37-pin, shielded, twisted pairs, 2 m
ST011: Standard round cable 37-pin, shielded, twisted pairs, 5 m
ST370-16: Standard round cable 50-pin, shielded, twisted pairs, 2 m
ST8001: Round cable 50-pin, shielded, twisted pairs, 2 m.
For connecting the APCI-8008 (motion control) to the screw terminal panel PX8001
ST8004: Round cable 78-pin female connector to 2 x 50-pin male connector, shielded, twisted pairs, 2 m.
For connecting the CPCI-8004 (motion control) to the screw terminal panel PX8001.
Features

The connection box PX_BNC serves for the connection of analog voltage and current signals through BNC female connectors. Up to 8 differential or 16 single-ended analog inputs as well as 8 analog outputs of an ADDI-DATA analog board can be connected to the PX_BNC (see table on the right).

Housing

The compact housing consists of black painted impact-resistant aluminium.

Accessories

The standard delivery contains 2 clamps for DIN rail mounting.

Connection to the board

The PX_BNC is connected to the board through the 37-pin D-Sub female connector. The pin assignment is adjusted to the board. The connection between the PX_BNC and the ADDI-DATA analog board is established through the standard round cable ST010 or ST011. Please order the cable separately.

16 BNC female connectors for analog inputs

The connection box has 16 BNC female connectors In 0 to In 15 for further connection of the analog input channels (channels 0-15) of many ADDI-DATA input and multifunction boards (see table on the right). The BNC shield is connected to the analog signal ground of the respective analog inputs. The connection of the differential channels (DIFF) is only possible through a special BNC cable.

8 BNC female connectors for analog outputs

The connection box has 8 BNC female connectors Out 0 to Out 7 for further connection of the analog output channels (channels 0-7) of many ADDI-DATA multifunction and output boards (see table on the right). The BNC shield is connected to the analog signal ground of the respective analog outputs.

The PX_BNC can be connected to the following ADDI-DATA analog boards:

<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-3521</td>
</tr>
<tr>
<td>APCIe-3021</td>
<td>CPC-3009</td>
<td></td>
</tr>
<tr>
<td>APCI-3110 / APCIe-3116</td>
<td>APCIe-3121 / APCIe-3123</td>
<td></td>
</tr>
<tr>
<td>APCIe-3120 / CPCI-3120</td>
<td>CPCls-3121</td>
<td></td>
</tr>
<tr>
<td>CPC-3009</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPCls-3121</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Specifications

- BNC connector: For the connection of peripherals
  - In 0-15 for analog inputs
  - Out 0-7 for analog outputs
- D-Sub connector: 37-pin D-Sub female connector
- Dimensions: 210 x 105 x 50 mm (L x W x H)
- Weight: 727 g
- Temperature range: 0-60 °C
- Housing: black painted aluminium, impact-resistant
- DIN-rail mounting: Fixing with 2 clamps (included in delivery)

Ordering information

PX_BNC

BNC connection box for DIN rail. Incl. 2 clamps for DIN-rail mounting and technical description.

Accessories

Please order separately!

• ST010: Standard round cable, shielded, twisted pairs, 2 m
• ST011: Same as ST010, 5 m

ST3009-A: 26-pin HD D-Sub female to 37-pin D-Sub male connector (for CPCI-3009)

ST3009-DZ: 15-pin HD D-Sub female to 37-pin D-Sub male connector (for CPCI-3009)

Other cable versions on request
Resolver-to-digital converter

The MSX-RDC-17 is a device for supplying and acquiring a resolver. It converts the position value given by the resolver into a digital incremental output signal. The resolution of the incremental encoder output can be defined using the switch on the front side of the MSX-RDC-17.

**Features**

**Power supply**
- Nominal voltage: 5 V

**Resolver output/input**
- Frequency: 10 kHz

**Incremental encoder output**
- Output signals: incremental A+, A-, B+, B-, Index+, Index-
- Output type: differential, RS485
- Resolution: 1024, 2048, 4096, 8152

**Switch**
On the front side of the MSX-RDC-17, a switch panel with three switches is installed. Switches 1 and 2 are used for setting the resolution of the incremental encoder output. Switch 3 allows you to reset the MSX-RDC-17. To do a reset, you have to switch on switch 3 for a short time and then switch it off again. Please do not leave switch 3 switched on permanently, because the MSX-RDC-17 is not functional with this switch position!

### Pin No. 1 2 3
OFF OFF OFF 16-bit resolution
OFF ON OFF 14-bit resolution
ON OFF OFF 12-bit resolution
ON ON OFF 10-bit resolution
X X ON Whole device in reset state

**Incremental encoder output**
The incremental encoder signals are available at the 9-pin D-Sub male connector of the MSX-RDC-17.

### Pin No. 1 2 3 4 5 6 7 8 9
1 Ground
2 Index-
3 Index+
4 A-
5 A+
6 Not connected
7 +Vs
8 B-
9 B+
Shield PE

---

**Power supply connector**
For the power supply of the MSX-RDC-17, a 4-pin screw terminal is fixed on the bottom side of the housing.

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+Vs (5 V)</td>
</tr>
<tr>
<td>2</td>
<td>Ground</td>
</tr>
<tr>
<td>3</td>
<td>Ground</td>
</tr>
<tr>
<td>4</td>
<td>+Vs (5 V)</td>
</tr>
</tbody>
</table>

The Ground and the supply pins are connected internally with each other. For less current flow over the terminals, please connect all four pins externally with each other!

**Resolver connector**
The resolver has to be connected to the 9-pin D-Sub female connector on the front side of the MSX-RDC-17.

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ref-</td>
</tr>
<tr>
<td>2</td>
<td>Not connected</td>
</tr>
<tr>
<td>3</td>
<td>Not connected</td>
</tr>
<tr>
<td>4</td>
<td>Not connected</td>
</tr>
<tr>
<td>5</td>
<td>SIN+</td>
</tr>
<tr>
<td>6</td>
<td>SIN-</td>
</tr>
<tr>
<td>7</td>
<td>Ref+</td>
</tr>
<tr>
<td>8</td>
<td>COS+</td>
</tr>
<tr>
<td>9</td>
<td>COS-</td>
</tr>
<tr>
<td>Shield</td>
<td>PE</td>
</tr>
</tbody>
</table>

---

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

`MSX-RDC-17`

Resolver-to-digital converter, conversion into digital signals, 4 different resolution settings.

---

**Specifications**

### Power supply

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal voltage</td>
<td>+5 V</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>+4.9 V to +5.25 V</td>
</tr>
<tr>
<td>Current consumption at 5 V</td>
<td>140 mA (at 100 rps / 16-bit resolution)</td>
</tr>
<tr>
<td>Reverse voltage protection</td>
<td>-6 V</td>
</tr>
</tbody>
</table>

### Resolver output/input

#### Output reference signal

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amplitude</td>
<td>7 V vr (differential)</td>
</tr>
<tr>
<td>Frequency</td>
<td>10 kHz</td>
</tr>
<tr>
<td>Max. output current</td>
<td>100 mA</td>
</tr>
</tbody>
</table>

#### Input signals

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. amplitude</td>
<td>4 V vr</td>
</tr>
</tbody>
</table>

### Incremental encoder output

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output signals</td>
<td>A+, A-, B+, B- Index+, Index-</td>
</tr>
<tr>
<td>Output type</td>
<td>differential, RS485</td>
</tr>
<tr>
<td>Nominal voltage</td>
<td>+5 V</td>
</tr>
<tr>
<td>Max. output current</td>
<td>100 mA</td>
</tr>
<tr>
<td>Resolution</td>
<td>10-12-14- or 16-bit (selectable via switch)</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±5 arcmin</td>
</tr>
<tr>
<td>Max. speed</td>
<td>depends on the selected resolution</td>
</tr>
<tr>
<td></td>
<td>10-bit: 2500 rps</td>
</tr>
<tr>
<td></td>
<td>12-bit: 1000 rps</td>
</tr>
<tr>
<td></td>
<td>14-bit: 500 rps</td>
</tr>
<tr>
<td></td>
<td>16-bit: 125 rps</td>
</tr>
</tbody>
</table>

---

**Intended Use**

The resolver-to-digital converter MSX-RDC-17 has to be used as electrical equipment for measurement, control and laboratory pursuant to the norm EN 61010-1 (IEC 61010-1).

The power supply for the resolver-to-digital converter MSX-RDC-17 must fulfill the requirements of IEC 60950-1 (SELV) or EN 60950-1 (SELV) and EN 55022 or IEC/CISPR 22 and EN 55024 or IEC/CISPR 24.

**Usage restrictions**

The resolver-to-digital converter MSX-RDC-17 must not be used as safety related part (SRP).

The resolver-to-digital converter MSX-RDC-17 must not be used for safety related functions, for example for emergency stop functions.

The resolver-to-digital converter MSX-RDC-17 must not be used in potentially explosive atmospheres.

The resolver-to-digital converter MSX-RDC-17 must not be used as electrical equipment according to the Low Voltage Directive 2006/95/EC.

**Limits of use**

All safety information and the instructions on this data sheet must be followed to ensure proper intended use.

Uses of the resolver-to-digital converter beyond these specifications are considered as improper use. The manufacturer is not liable for damages resulting from improper use.

The resolver-to-digital converter must remain in its anti-static packaging until it is installed.

Please do not delete the identification numbers of the resolver-to-digital converter or the warranty claim will be invalid.

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**Ordering information**

`MSX-RDC-17`

Resolver-to-digital converter, conversion into digital signals, 4 different resolution settings.

---

* Preliminary product information
Shielded cables for industrial applications

What makes the difference between cables?

The connection cable as a mechanical device is not submitted to the EMC specifications, though it can affect the emission immunity of the devices to which it is connected. The use of cables with industrial standards has many advantages:

- Protection against EM fields: The shield of the cable is connected to the metallised hood of the D-sub connector. The connection between housing and shield creates an earthing on both sides.
- High noise immunity: More protection through adapted pin assignment of the cables. The way the cable leads are twisted in pairs corresponds to the pin assignment of the boards.

Industry-standard D-sub connectors versus SCSI-connector

D-sub connectors fit the high requirements of industrial measurement and control. They are robust and have a high noise immunity. This is why we equip all our boards with D-sub connectors.

Application

Suitable for use as control or signal cables in noisy environment, for indoor or outdoor applications. The tight braid reduces the emissions. The copper braid is used as “ground”. Twisted pairs provide protection against crosstalk and external interference. The cables are suited for dry or damp environments.

Design of the cables

- Plain copper conductor, fine-strand according to IEC 60228
- Special PVC conductor insulation
- Twisted-pair conductors
- Core identification according to DIN 47100
- Conductors laid up in layers
- Aluminium foil
- Tinned copper braid shielding
- Covering grade approx. 85%
- Special outer sheath, grey PVC
- Oil and petrol resistant according to VDE 0250 and 04772
- Self-extinguishing (SE) and flame-retardant, according to IEC 60332-1

Special versions on request

- Other lengths
- Open cable end, on one or on both ends
- Bent connectors on one or on both ends

Specifications of the cables (STxxxx type)

<table>
<thead>
<tr>
<th>Twisted pairs</th>
<th>Aluminium foil</th>
<th>Copper braid shielding</th>
<th>PVC outer sheath</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specifications:</td>
<td>Special PVC data line for electronic control tasks according to VDE 0812 and 0814.</td>
<td>Temperature range: -30 °C to +80 °C laid permanently.</td>
<td>Minimum bending radius: Laid permanently 15 x cable diameter</td>
</tr>
<tr>
<td>Operating voltage:</td>
<td>Max. 350 V</td>
<td>Test voltage: 1200 V (0.14 mm²)</td>
<td>Construction: The cable screen is screwed with low impedance over the strain relief on both sides of the housing hood with locking screws, the connections are crimped.</td>
</tr>
<tr>
<td>Insulation resistance:</td>
<td>± 20 MΩ/ km</td>
<td>Inductance: Approx. 0.65 mH / km</td>
<td>Impedance: Approx. 78 Ω</td>
</tr>
<tr>
<td>Capacitive coupling:</td>
<td>Approx. 300 pF/100m</td>
<td>Attenuation factor: &gt; 40 dB between 300 and 900 MHz</td>
<td></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>
<td>Construction:</td>
<td></td>
</tr>
</tbody>
</table>

Specifications of the cables (STxxxx type)

<table>
<thead>
<tr>
<th>Cable designation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FB MSX-DIG-10</td>
<td>For the MSX-Box option MSX-DIG-IO, 9-pin ribbon cable with D-Sub male connector.</td>
</tr>
<tr>
<td>FB-INTERBUS</td>
<td>For the APCI-8008, 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 PC104-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 3U 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>
</tr>
<tr>
<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>
</tr>
<tr>
<td>FB3600-D</td>
<td>For the digital I/O port of the APCI-3600. Ribbon cable, 37-pin D-Sub male connector with bracket.</td>
</tr>
<tr>
<td>FB3702</td>
<td>For the digital I/O port of the APCI-3701 and APCI-3702. Ribbon cable, 37-pin D-Sub male connector with bracket.</td>
</tr>
<tr>
<td>FB8001/88008</td>
<td>For APCI-800x, APCI-30xx and APCI-31xx. Ribbon cable, 50-pin D-Sub male connector with bracket for external CAN connections.</td>
</tr>
<tr>
<td>FB-CAN</td>
<td>For APCI-800x, between OPMF and 9-pin D-Sub male connector with bracket for external CAN connections.</td>
</tr>
</tbody>
</table>
### Shielded standard cables with metallised hoods

<table>
<thead>
<tr>
<th>Cable designation</th>
<th>Description</th>
<th>Twisted pairs</th>
<th>Shielded round cable</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Round cable, 1 to 20 m, 2 x 37-pin D-Sub connector</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ST010_1</td>
<td>Female connector / male connector</td>
<td>✓</td>
<td>✓</td>
<td>1 m</td>
</tr>
<tr>
<td>ST010</td>
<td>Female connector / male connector</td>
<td>✓</td>
<td>✓</td>
<td>2 m</td>
</tr>
<tr>
<td>ST010_3</td>
<td>Female connector / male connector</td>
<td>✓</td>
<td>✓</td>
<td>3 m</td>
</tr>
<tr>
<td>ST011</td>
<td>Female connector / male connector</td>
<td>✓</td>
<td>✓</td>
<td>5 m</td>
</tr>
<tr>
<td>ST011_10</td>
<td>Female connector / male connector</td>
<td>✓</td>
<td>✓</td>
<td>10 m</td>
</tr>
<tr>
<td>ST011_15</td>
<td>Female connector / male connector</td>
<td>✓</td>
<td>✓</td>
<td>15 m</td>
</tr>
<tr>
<td>ST011_20</td>
<td>Female connector / male connector</td>
<td>✓</td>
<td>✓</td>
<td>20 m</td>
</tr>
</tbody>
</table>

**Round cable with one 90° bent female connector, 2 x 37-pin D-Sub connector**

<table>
<thead>
<tr>
<th>Cable designation</th>
<th>Description</th>
<th>Twisted pairs</th>
<th>Shielded round cable</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST010_1_ABGW</td>
<td>90° bent female connector / male connector</td>
<td>✓</td>
<td>✓</td>
<td>1 m</td>
</tr>
<tr>
<td>ST010_ABGW</td>
<td>90° bent female connector / male connector</td>
<td>✓</td>
<td>✓</td>
<td>2 m</td>
</tr>
<tr>
<td>ST010_3_ABGW</td>
<td>90° bent female connector / male connector</td>
<td>✓</td>
<td>✓</td>
<td>3 m</td>
</tr>
<tr>
<td>ST011_ABGW</td>
<td>90° bent female connector / male connector</td>
<td>✓</td>
<td>✓</td>
<td>5 m</td>
</tr>
</tbody>
</table>

**Round cable with two 90° bent connectors, 2 x 37-pin D-Sub connectors**

<table>
<thead>
<tr>
<th>Cable designation</th>
<th>Description</th>
<th>Twisted pairs</th>
<th>Shielded round cable</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST010_1_2XABGW</td>
<td>Female connector / male connector</td>
<td>✓</td>
<td>✓</td>
<td>1 m</td>
</tr>
<tr>
<td>ST010_2XABGW</td>
<td>Female connector / male connector</td>
<td>✓</td>
<td>✓</td>
<td>2 m</td>
</tr>
</tbody>
</table>

**Round cable, 2 m and 5 m, or high currents (for 24 V digital outputs), 2 x 37-pin D-Sub connector**

<table>
<thead>
<tr>
<th>Cable designation</th>
<th>Description</th>
<th>Twisted pairs</th>
<th>Shielded round cable</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST010_5</td>
<td>Female connector / male connector, with separate connection for 24 V voltage supply</td>
<td>✓</td>
<td>✓</td>
<td>2 m</td>
</tr>
<tr>
<td>ST011_5</td>
<td>Female connector / male connector, with separate connection for 24 V voltage supply</td>
<td>✓</td>
<td>✓</td>
<td>5 m</td>
</tr>
</tbody>
</table>

**Round cable with one open end, 1 x 37-pin D-Sub connector**

<table>
<thead>
<tr>
<th>Cable designation</th>
<th>Description</th>
<th>Twisted pairs</th>
<th>Shielded round cable</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST010_1_O</td>
<td>Female connector / other side open and bared, incl. colour table according to DIN 47100</td>
<td>✓</td>
<td>✓</td>
<td>1 m</td>
</tr>
<tr>
<td>ST010_0</td>
<td>Female connector / other side open and bared, incl. colour table according to DIN 47100</td>
<td>✓</td>
<td>✓</td>
<td>2 m</td>
</tr>
<tr>
<td>ST010_3_O</td>
<td>Female connector / other side open and bared, incl. colour table according to DIN 47100</td>
<td>✓</td>
<td>✓</td>
<td>3 m</td>
</tr>
<tr>
<td>ST011_0</td>
<td>Female connector / other side open and bared, incl. colour table according to DIN 47100</td>
<td>✓</td>
<td>✓</td>
<td>5 m</td>
</tr>
</tbody>
</table>

**Round cable between digital I/O boards and relay output board PX8500, 2 x 37-pin D-Sub connectors**

<table>
<thead>
<tr>
<th>Cable designation</th>
<th>Description</th>
<th>Twisted pairs</th>
<th>Shielded round cable</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST021</td>
<td>Between digital I/O boards (APCI-1500-1516/-2016, CPCI-1500) and PX8500 female connector / male connector</td>
<td>✓</td>
<td>✓</td>
<td>2 m</td>
</tr>
<tr>
<td>ST022</td>
<td>Between two PX8500 or PX90x male connector / male connector</td>
<td>✓</td>
<td>✓</td>
<td>2 m</td>
</tr>
<tr>
<td>ST8500</td>
<td>Ribbon cable between two PX8500-x</td>
<td>✓</td>
<td>✓</td>
<td>5 cm</td>
</tr>
</tbody>
</table>

**Miscellaneous cables**

<table>
<thead>
<tr>
<th>Cable designation</th>
<th>Description</th>
<th>Twisted pairs</th>
<th>Shielded round cable</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST1711-50</td>
<td>Connection cable for the APCI-1711, for connecting the PX8001, 78-pin D-Sub male connector / 50-pin D-Sub male connector Enables the compatibility with the APCI-1710</td>
<td>✓</td>
<td>✓</td>
<td>2 m</td>
</tr>
<tr>
<td>ST3003-A</td>
<td>Connection cable for the APCI-3003, for the analog input signals, 15-pin male connector / 37-pin male connector</td>
<td>✓</td>
<td>✓</td>
<td>2 m</td>
</tr>
<tr>
<td>ST3003-D</td>
<td>Cable for the APCI-3003, for the digital signals,15-pin male connector / 37-pin male connector</td>
<td>✓</td>
<td>✓</td>
<td>2 m</td>
</tr>
<tr>
<td>ST3200</td>
<td>50-pin female connector / 50-pin male connector</td>
<td>✓</td>
<td>✓</td>
<td>2 m</td>
</tr>
<tr>
<td>ST3601</td>
<td>Coaxial cable for the APCI-3600</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>Cable designation</th>
<th>Description</th>
<th>Twisted pairs</th>
<th>Shielded round cable</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST370-16_1</td>
<td>Female connector / male connector</td>
<td>✓</td>
<td>✓</td>
<td>1 m</td>
</tr>
<tr>
<td>ST370-16</td>
<td>Female connector / male connector</td>
<td>✓</td>
<td>✓</td>
<td>2 m</td>
</tr>
<tr>
<td>ST370-16_5</td>
<td>Female connector / male connector</td>
<td>✓</td>
<td>✓</td>
<td>5 m</td>
</tr>
<tr>
<td>ST370-16_1_ABGW</td>
<td>90° bent female connector / male connector</td>
<td>✓</td>
<td>✓</td>
<td>1 m</td>
</tr>
<tr>
<td>ST370-16_ABGW</td>
<td>Female connector / 90° bent male connector</td>
<td>✓</td>
<td>✓</td>
<td>2 m</td>
</tr>
<tr>
<td>ST370-16_5_ABGW</td>
<td>90° bent female connector / male connector</td>
<td>✓</td>
<td>✓</td>
<td>5 m</td>
</tr>
<tr>
<td>ST3701</td>
<td>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 motion control**

<table>
<thead>
<tr>
<th>Cable designation</th>
<th>Description</th>
<th>Twisted pairs</th>
<th>Shielded round cable</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST8001</td>
<td>50-pin D-Sub female connector / 50-pin D-Sub male connector; APCI-8008</td>
<td>✓</td>
<td>✓</td>
<td>2 m</td>
</tr>
<tr>
<td>ST8001_5</td>
<td>50-pin D-Sub Female connector / 50-pin D-Sub male connector; APCI-8008</td>
<td>✓</td>
<td>✓</td>
<td>5 m</td>
</tr>
<tr>
<td>ST8004</td>
<td>78-pin female connector / 2 x 50-pin male connector; CPCI-8004</td>
<td>✓</td>
<td>✓</td>
<td>2 m</td>
</tr>
</tbody>
</table>

**Round cables for the connection of serial interfaces**

<table>
<thead>
<tr>
<th>Cable designation</th>
<th>Description</th>
<th>Twisted pairs</th>
<th>Shielded round cable</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST074</td>
<td>4-port serial interfaces, 37-pin D-Sub female connector / 4 x 25-pin D-Sub male connector</td>
<td>✓</td>
<td></td>
<td>35 cm</td>
</tr>
<tr>
<td>ST075</td>
<td>4-port serial interfaces, 37-pin D-Sub female connector / 4 x 25-pin D-Sub male connector</td>
<td>✓</td>
<td></td>
<td>35 cm</td>
</tr>
<tr>
<td>ST075_ABGW</td>
<td>4-port serial interfaces, 37-pin D-Sub female connector / 4 x 9-pin D-Sub male connector</td>
<td>✓</td>
<td></td>
<td>35 cm</td>
</tr>
<tr>
<td>ST7809</td>
<td>8-port serial interfaces, 78-pin male connector / 8 x 9-pin D-Sub male connector</td>
<td>✓</td>
<td></td>
<td>35 cm</td>
</tr>
<tr>
<td>ST7825</td>
<td>8-port serial interfaces, 78-pin D-Sub male connector / 8 x 25-pin D-Sub male connector</td>
<td>✓</td>
<td></td>
<td>35 cm</td>
</tr>
</tbody>
</table>
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