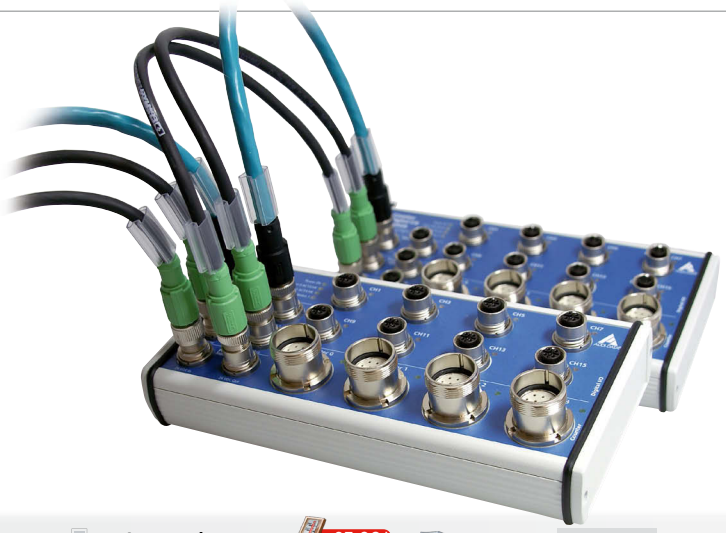
Ethernet multifunction counter system
4 counter inputs (incremental, sin/cos), 16 digital I/O, 24 V



MSX-E1701 / MSX-E1711 / MSX-E1721

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

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

16 digital I/O, 24 V, status LEDs

Configurable inputs and outputs

24 V digital trigger input

M12 and M23 connectors

Integrated Ethernet switch

+ 85 °C* / - 40 °C

IP 65

ARM®9 Technology

Cascadable, can be synchronised in the µs range

Timer function or compare logic for synchro trigger signal

*Operating temperature

RoHS 2011/65/EU

DatabaseConnect
see page 114

More information on www.addi-data.com

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

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

- 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 1V_{pp} (MSX-E1711) or 11 μA_{pp} (MSX-E1721), 250 kHz
- Voltage supply of the sensors through M23 female connector (24 V or 5 V)
- Single, double, quadruple edge analysis (MSX-E1701)
- Compare logic
- Status LEDs for incremental counter inputs

Digital I/O

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

Interfaces

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

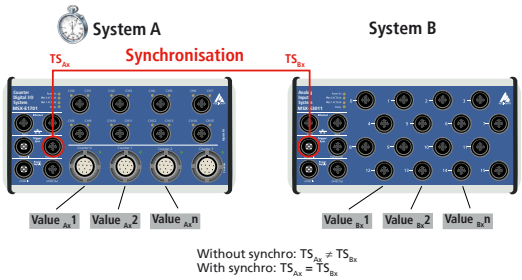
Communication interfaces

- Web server for configuration and monitoring
- SOAP command server for configuration and control
- Data server (TCP/IP or UDP) for high-speed acquisition data
- Event server (TCP/IP) for system events and diagnostics
- Modbus TCP / UDP command server
- **Ready-to-use software clients for Python and .NET (Only for MSX-E1701)**
- Command server Modbus TCP and Modbus (UDP) for sending commands

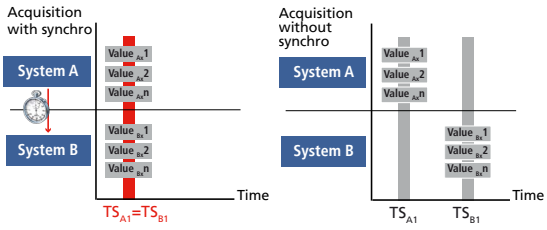
Synchronisation/time stamp

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.



Python – Open-source MSX-E client and ready-to-run examples available on GitHub
.NET – Official MSX-E SOAP client available as a NuGet package

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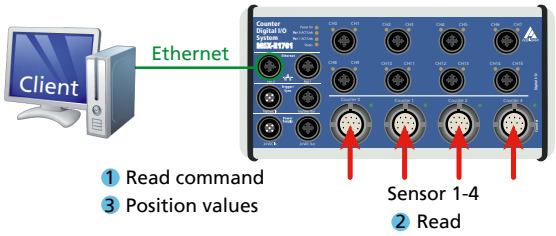
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Acquisition modes

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

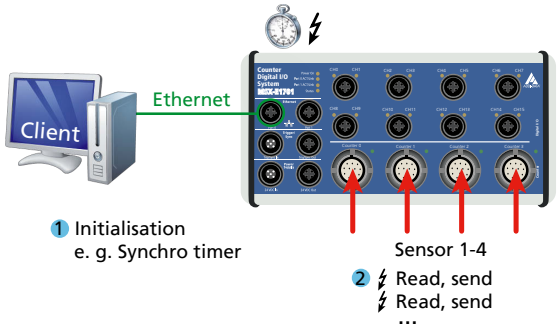
1. Asynchronous acquisition

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

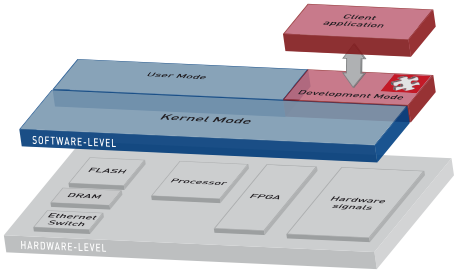
With the compare logic, a synchro-trigger signal can be generated in order to latch the counter value as soon as the counter value is equal to the compare value.
With the additional „Modulo-Mode" (Modulo Compare), a trigger can also be generated at the n value of the compare value.
Thus it is possible, 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

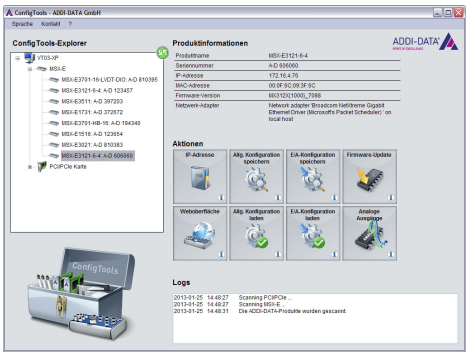
The **ConfigTools** program allows an easy administration of the MSX-E systems. These are automatically detected in the network. **ConfigTools** consists of common and specific functions.
In addition, with **ConfigTools**, the complete configuration of a MSX-E system can be saved and transferred to another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

ConfigTools is included in the delivery.

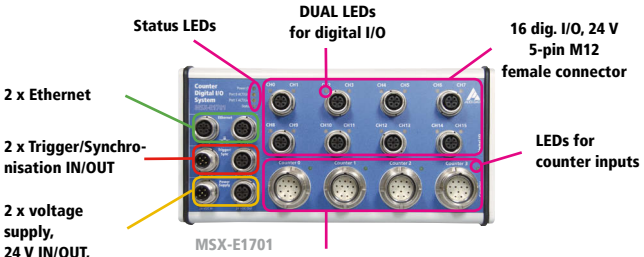
ConfigTools functions for MSX-E1701 / MSX-E1711 / MSX-E1721:

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

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



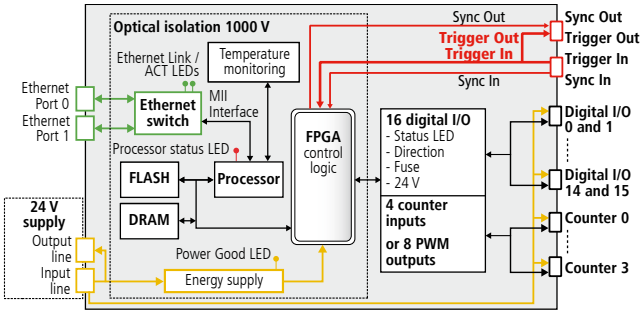
Features



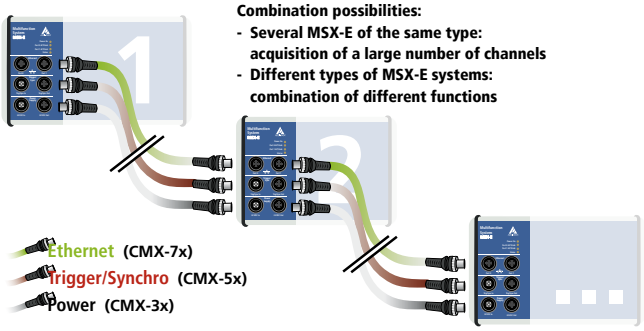
MSX-E1701
4 incremental counter inputs: 12-pin M23 female connector or 4 x 2 PWM outputs

MSX-E1711 / MSX-E1721
4 sin/cos inputs: 1 V_{pp} or 11 μA_{pp}
M23 female connector: 12-pin for MSX-E1711 (1 V_{pp}) or 9-pin for MSX-E1721 (11 μA_{pp})

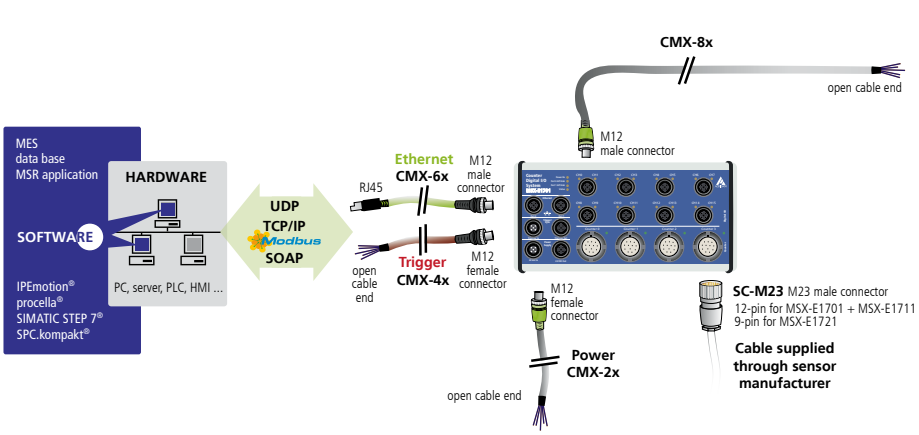
Simplified block diagram

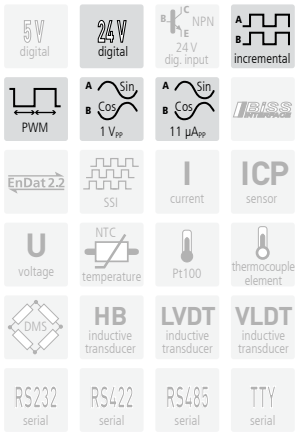


Cascading



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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 hysteresis:	50 mV typ.
Input impedance:	12 kΩ min.
Max. input frequency:	5 MHz
„Open Circuit Fail Safe Receiver Design"	
ESD protection:	Up to ±15 kV
24 V inputs (MSX-E1701-24 version)	
	For 24 V encoders. Only 24 V signals can be connected.
Nominal voltage:	24 VDC
Max. input frequency:	1 MHz at nominal voltage
Input impedance:	> 1 MΩ
Logic input levels:	UH (max): 30 V typ. UH (min): 18 V typ. UL (max): 16 V typ. UL (min): 0 V typ.
Voltage supply:	Incremental encoder selectable, 5 V or 24 V, max. 500 mA

PWM outputs (MSX-E1701)

Number of outputs:	8
Differential I/O:	Complies with the EIA standards RS422A
Output type:	Differential
Common mode range:	+12 / -7 V
Input sensitivity:	± 200 mV
Input hysteresis:	50 mV typ.
Input impedance:	12 kΩ min.
Time base:	250 ns, 1 µs, 1 ms, 1 s
Min. pulse duration:	250 ns
Max. output rate:	n: number of pulses (Duty Cycle), n ≥ 2 $f = \frac{1}{n \cdot \text{time base}}$

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

Duty Cycle 50%
1 high pulse, 1 low pulse, n=2
$f = \frac{1}{2 \cdot 250\ ns} = 2\ MHz$

Duty Cycle 66%
2 high pulses, 1 low pulse, n=3
$f = \frac{1}{3 \cdot 250\ ns} = 1.33\ MHz$

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

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

Number of inputs:	4 x sin/cos counter inputs each with A, B, C and D signals
Resolution:	32-bit
Differential inputs:	- 1 V_{pp} (MSX-E1711) - 11µA_{pp} (MSX-E1721)
Interpolation factor:	Up to 8192
Max. input frequency:	max. 250 kHz (at min. interpolation), on request
ESD protection:	2 kV

Digital inputs

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

Digital outputs

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

Voltage supply, Ethernet, Trigger, Synchro

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

System features

Interface:	Ethernet acc. to specification IEEE802.3
Dimensions (mm):	215 x 110 x 54
Weight:	900 g
Degree of protection:	IP 65
Current consumption at 24 V:	150 mA without load
Operating temperature:	-40 °C to +85 °C
Connectors for sensors	
Digital I/O:	8 x 5-pin M12 female connector
Incremental counter inputs:	4 x 12-pin M23 female connector
Sin/cos counter input 1 V_{ss}:	4 x 12-pin M23 female connector
Sin/cos counter input 11 µA_{ss}:	4 x 9-pin M23 female connector

Ordering information

MSX-E1701 / MSX-E1711 / MSX-E1721

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

Versions

MSX-E1701: 5 V RS422 incremental counter inputs
MSX-E1701-24V: 24 V incremental counter inputs
MSX-E1711: Sin/cos inputs, 1 V_{pp}
MSX-E1721: Sin/cos inputs, 11 µA_{pp}

Connection cables

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

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

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

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

Options

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