Ethernet system for temperature measurement
16/8/4 channels for thermocouples or RTD, 24-bit
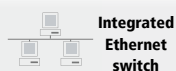
MSX-E3211

16/8/4 differential inputs, 24-bit

For thermocouples or RTD (Pt 100, Pt 1000)

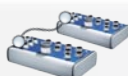**Simultaneous data acquisition up to 8 channels**

24 V digital trigger input

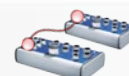|	
Integrated Ethernet switch	+ 85 °C* / - 40 °C
IP 65	ARM®9 Technology
Cascadable, can be synchronised in the µs range	On request: Compare logic for synchro trigger signal

*Operating temperature

RoHS 2002/95/EC

on request

DatabaseConnect
see page 112

More information at
www.addi-data.com

Features

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

Safety features

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

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
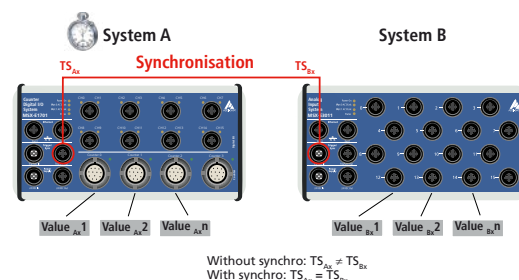- 24 V supply and cascading

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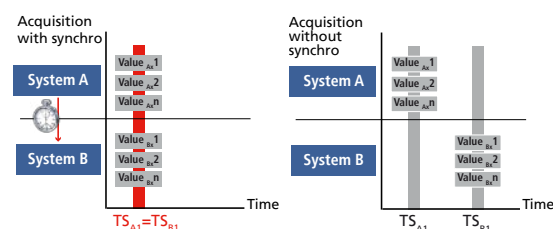- Command server Modbus TCP and Modbus (UDP) for sending commands

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.
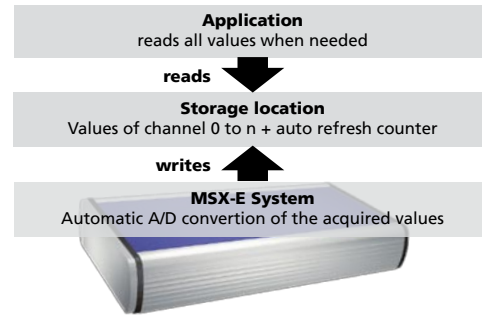

System A   Synchronisation   System B

Value$_{A_x}$1 Value$_{A_x}$2 Value$_{A_x}$n   Value$_{B_x}$1 Value$_{B_x}$2 Value$_{B_x}$n

Without synchro: TS$_{A_x}$ ≠ TS$_{B_x}$
With synchro: TS$_{A_x}$ = TS$_{B_x}$

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

Acquisition with synchro

System A
Value$_{A_x}$1
Value$_{A_x}$2
Value$_{A_x}$n

System B
Value$_{B_x}$1
Value$_{B_x}$2
Value$_{B_x}$n

TS$_{A1}$=TS$_{B1}$ Time

Acquisition without synchro

System A
Value$_{A_x}$1
Value$_{A_x}$2
Value$_{A_x}$n

System B
Value$_{B_x}$1
Value$_{B_x}$2
Value$_{B_x}$n

TS$_{A1}$ TS$_{B1}$ Time

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

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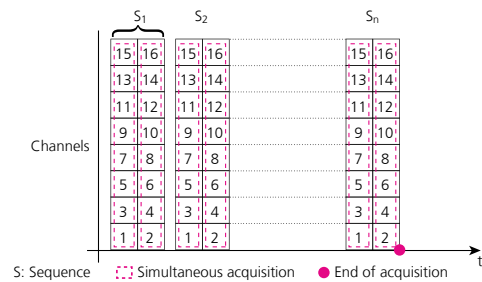
Acquisition modes

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.

Application
reads all values when needed

reads

Storage location
Values of channel 0 to n + auto refresh counter

writes

MSX-E System
Automatic A/D convertion of the acquired 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.

S: Sequence   Simultaneous acquisition   End of acquisition

Acquisition triggered through trigger or synchro input

Example: A measurement process is to be started through an external trigger impulse. For each trigger, 10 sequences are to be acquired. After the acquisition of the 10 sequences they are to be sent to the client.
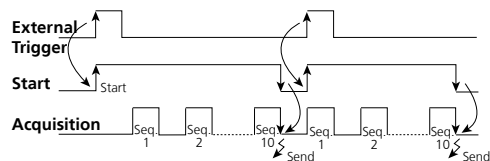
Reading data from a MSX-E system

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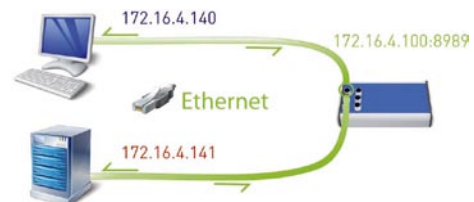
Onboard programming / stand-alone operation

Development mode

With the Development mode of the MSX-E systems you can customise your measurement, control and regulation applications to fit your requirements. The programs run directly on the MSX-E systems, which has two advantages: external PCs are relieved and you can process data freely according to your requirements. This helps you to improve the efficiency of your processes and to secure your investments.
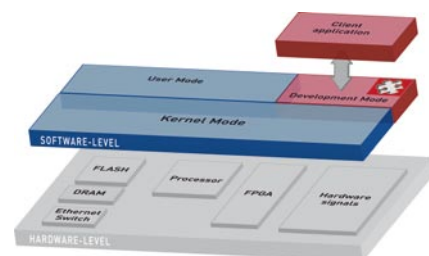
NOTE
With thermocouples, it is only possible to capture the relative temperature between the terminal to which the thermocouple is connected and the welding spot. For this reason, in order to calculate the actual temperature at the measuring point, it is necessary to capture an absolute temperature on a second sensor (PTC) . This is called cold junction compensation (CJC) and is included on the MSX-E3211-TC system.

ConfigTools

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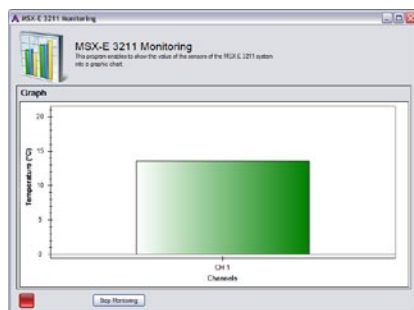
In addition, with **ConfigTools**, the complete configuration of a MSX-E system can be saved and transferred to another system of the same type (clone function).

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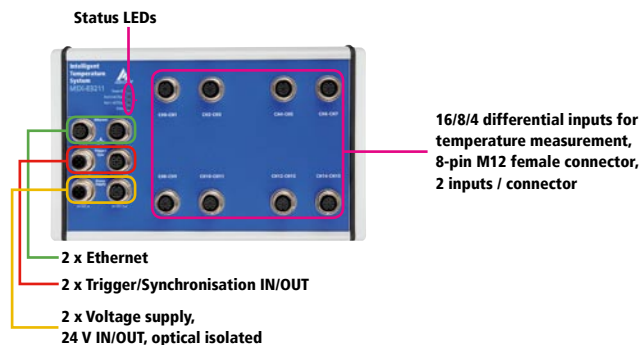
ConfigTools functions for MSX-E3211:
- Change of IP address
- Display of web interface
- Firmware update
- Save/load system configuration
- Save/load channel configuration
- Monitoring the temperature inputs

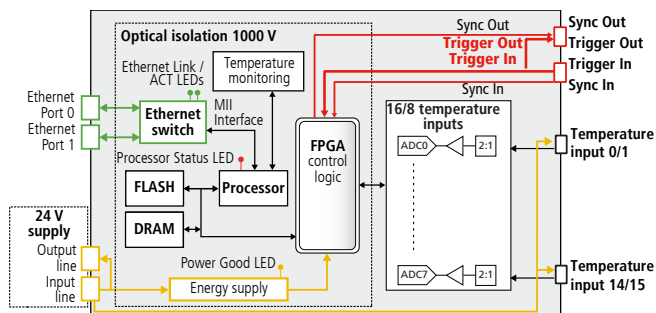**Very easy use through the „ConfigTools" program; The MSX-E system is automatically detected in the network.**

Monitor function example for temperature inputs

Features

Status LEDs

16/8/4 differential inputs for temperature measurement, 8-pin M12 female connector, 2 inputs / connector

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

Ethernet (CMX-7x)
Trigger/Synchro (CMX-5x)
Power (CMX-3x)
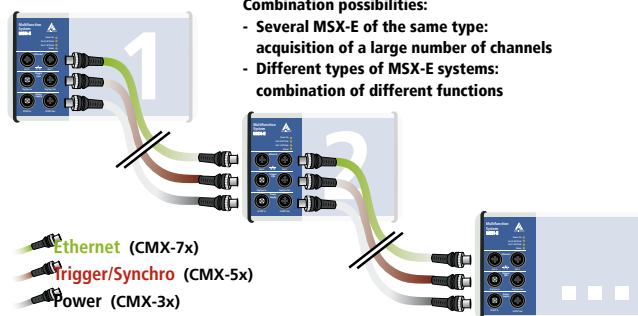
ADDI-DATA connection technology

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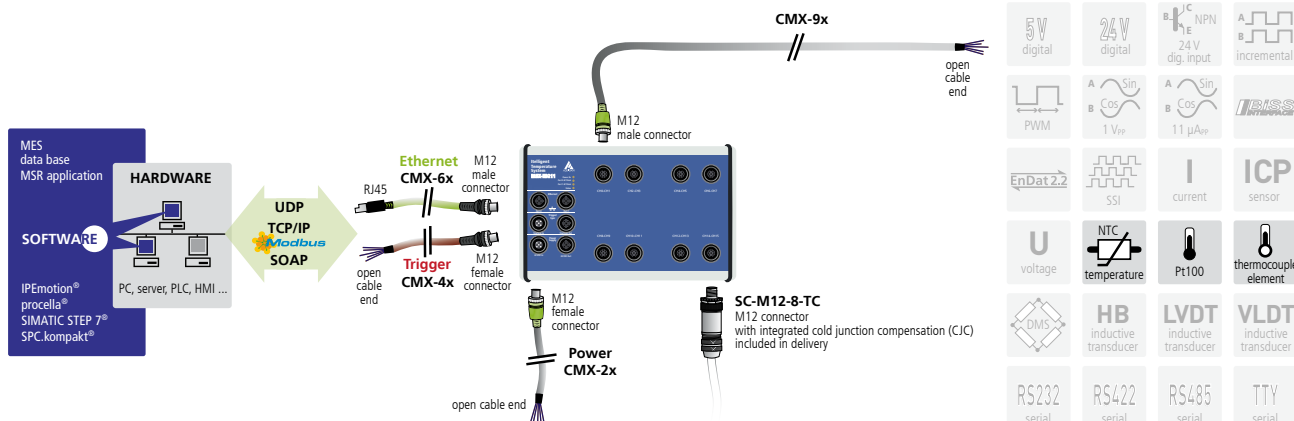
Specifications

Analog inputs

Number of inputs:	16, 8 or 4 differential inputs for thermocouples or RTD 2 outputs for each M12 connector
Resolution:	24-bit
Optical isolation:	1000 V
Throughput:	max. 788 Hz for 1 channel, max. 528 Hz for 2 channels
Current source:	~200 µA (intern kalibriert)

Real acquisition frequency:	at 1 channel	at 2 channels	Sampling frequency (software programmable)
	2.37 Hz	1.585 Hz	5 Hz
	4.73 Hz	3.154 Hz	10 Hz
	9.37 Hz	6.243 Hz	20 Hz
	18.9 Hz	12.6 Hz	40 Hz
	37.35 Hz	24.89 Hz	80 Hz
	73 Hz	48.65 Hz	160 Hz
	145 Hz	96.8 Hz	320 Hz
	276.4 Hz	184.26 Hz	640 Hz
	407.83 Hz	271.96 Hz	1 kHz
	788 Hz	525.48 Hz	2 kHz

Voltage supply, Ethernet, Trigger, Synchro

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

System features

Interface:	Ethernet acc. to specification IEEE802.3
Dimensions (mm):	220 x 140 x 50
Weight:	620 g
Degree of protection:	IP 65
Current consumption:	150 mA ± 10 % typ. in idle/power save
Operating temperature:	-40 °C to +85 °C
Connectors for sensors	
Analog inputs:	8, 4 or 2 x 8-pin M12 female connector

Ordering information

MSX-E3211

Ethernet system for temperature measurement, 16/8/4 channels for thermocouples or RTD, 24-bit. Incl. technical description and software drivers.

Versions

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 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
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

Contents & Services

Distributed Solutions

PC boards

Connection

Appendix