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



Operating temperature







DatabaseConnect see page 114



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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 ٠
- 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 $\boldsymbol{\mu}\boldsymbol{s}$ range through a synchro connection. This allows to start a synchronous data acquisition, to generate trigger events and to synchronise the time on several MSX-E systems. Furthermore, the systems have a time stamp that logs the point in time at which the data was acquired by the system.



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





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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.



Sn

Pt100

Cn

T8

Τ7

Τ6

T5

Τ4

T3

T2

T1

S: Sequence

Tx: Transducer

couple

Cn: Counter

Pt100: Thermo-

Simultaneous

 acquisition
End of acquisition

Pt100

Cn

T8

T7

T6

T5

T4

T3

T2

Τ1

Channels

Pt100

Cn

Τ8

T7

Τ6

T5

Τ4

T3

T2

T1

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 ٠
- Save/load system configuration •
- Save/load channel configuration ٠
- Calibration of transducers
- Data base of transducers
- Monitoring of transducers
- Diagnostics of transducers

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





Monitor function example: Check of the analog inputs.

Features



Simplified block diagram



Cascading



ADDI-DATA connection technology





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Specifications

Connection of inductive transducers

Inputs for inductive transducers				
Channel features:				
Number:	8 x ADC (not multi	plexed)		
Input type:	Single-ended			
Coupling:	DC			
Resolution:	24-bit			
Sampling rate f_s :	On 8 channels	At primary frequency $f_{\rm P}$ of 5 kHz		
		7.69 kHz		
	$f_{s} = f_{p}$	10 kHz		
		12.5 kHz		
		20 kHz		
		50 kHz		
Example with TESA GT21:	$f_{\rm s} = f_{\rm P} = 12.5 \text{ kHZ}$	on all 8 channels		
Input level				
Input impedance:	2 kΩ	software-programmable		
	10 kΩ			
	100 kΩ			
	10 MΩ			
Transducer accuracy:	± 61 nm (Tesa GT2	1)		
Sensor supply (Sine generat	tor)			
Туре:	Sine differential (180° phase-shift)			
Coupling:	AC			
Programmed signals:				
Output frequency \mathcal{J}_{P}	2-20 kHz depending on the transducer			
(primary frequency)	(50 kHz Knaebel)			
Output impedance:	< 0.1 Ω typ.			
	$>$ 30 k Ω typ. in sh	utdown mode		
Short-circuit current:	0.7 A typ. at 25 °C with thermal protection			

Nominal voltage:	24 V _{pc}	
Max. input frequency:	1 MHz at nominal voltage	
Input impedance:	1 MΩ typ.	
Logic input levels:		
UH (max.)	30 V typ.	
UH (min)	18 V typical (on request)	
UL (max.)	16 V typical (on request)	
UL (min)	0 V typical	
Temperature measurement		
Number of inputs:	1	
Туре:	RTD Pt100 or TC type K (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:	400 mA	
Voltage Supply		
24 VDC IN	1 x 5-pin M12 male connector	
24 VDC OUT	1 x 5-pin M12 female connector	
Connectors for sensors		
For inductive transducers:	8 x 5-pin M18 female connector	
For temperature sensors:	1 x 5-pin M12 female connector	
	1-, 2-, 4-wire Pt100	
For the counter function:	1 x 12-pin M23 female connector	

Counter

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

This version is designed for the connection of 24 V encoders. Only 24 V signals can be connected to the inputs.

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

MSX-E3711-HB:	for 8 HB inductive transducers, 5 V counter input
MSX-E3711-LVDT:	for 8 LVDT inductive transducers, 5 V counter input
MSX-E3711-M:	for 8 Mahr-comp. transducers, 5 V counter input
MSX-E3711-K:	for 8 Knaebel transducers, 5 V counter input
MSX-E3711-HB-24V:	for 8 HB inductive transducers, 24 V counter input
MSX-E3711-LVDT-24V:	for 8 LVDT inductive transducers,
	24 V counter input
MSX-E3711-TC:	Type K thermocouple in place of the Pt100 input,
	other types on request

Connection cables

Voltage supply

CMX-2x: Shielded cable, M12 5-pin female connector/open end, IP 65CMX-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-Clip, MX-Rail (Please specify when ordering!),MX-Screw, PCMX-1x