

Ethernet I/O modules for length measurement



ARM[®]9
Technology



RoHS
compliant



With the intelligent Ethernet I/O modules MSX-E3701 and MSX-E3700, ADDI-DATA offers a new distributed platform for the acquisition of displacement transducers, based on the ARM[®]9 technology.

The I/O modules are available in 4-, 8- or 16-channel versions and comply with the degrees of protection IP 65 or IP 40.

You can connect up to 16 displacement transducers (half-bridge or LVDT) directly through a 5-pin M18 connector and acquire data on-site in 24-bit resolution. Several modules can be cascaded via a 2-port Ethernet switch: no need to connect each Module to the PC.

The external trigger signal (hardware trigger) can also be cascaded. In addition, the I/O modules can be synchronised and cascading of the trigger signal, it is possible to acquire data from several modules simultaneously and to trigger the transducer acquisition with encoders.

The MSX-E3701 and MSX-E3700 are mounted in robust, EMC-protected metal housings which comply with the degrees of protection IP 65 (with additional protection against waterjets) or IP 40.

Features

- Connection of all commercially available transducers (half-bridge or LVDT)
- 4, 8, or 16 channels depending on the version, cascable
- 24-bit resolution
- Fast distributed data acquisition
- Dynamic measurement via 24 V digital trigger input
- Synchronisation of several modules
- Onboard RAM for storing measurement data
- Onboard ARM[®]9 32-bit processor for data processing
- Integrated Ethernet switch
- The modules can be cascaded
- The 24 V supply can be cascaded
- Possibility of diagnostics at short-circuit or line-break of the transducers
- The modules comply with the degrees of protection IP 65 or IP 40
- Robust, normed metal housing
- Power Save Mode: reduced power consumption when no acquisition runs
- LED status display for fast error diagnostics

Acquisition modes:

- Auto Refresh: Automatic update of the acquired data in the background
- Sequence mode: Data acquisition in „packages“

MSX-E3701 / MSX-E3700

Acquisition of 4, 8 or 16 inductive displacement transducers

For half-bridge or LVDT transducers

Trigger / synchro

Degree of protection IP 65 or IP 40

Cascadable

Connections:

- 2 x Ethernet
- Synchronisation IN / OUT
- 1 x trigger input 24 V
- Voltage supply 24 V

Safety features

- Input filters
- Diagnostic function in case of short-circuit or line-break
- Internal temperature monitoring

Transducer precision

Example for the precision of a measurement with transducer: Type TESA GT21, range ± 2 mm ($\Delta 4$ mm), 16-bit accuracy

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

EMC tested acc. to 89/336/EEC

- IEC 61326: electrical equipment for measurement, control and laboratory use

Applications

- Gear wheel control
- Gauge block
- Acquisition of sensor data
- Quality assurance
- Industrial process control
- Automatic parts control
- R&D Instrumentation

Software

Calibration tool SET3701 (supplied with MSX-E370x)

- Easy transducer calibration
- Step by step from the selection of the transducers up to testing each single channel
- Database with more than 30 predefined transducers
- Update of the MSX-E-370x firmware

Software drivers

for Windows XP/2000.

The Module is delivered with **ADDIPACK** and direct access SOAP, Socket incl. samples (net2003, VC++6.0)

ADDIPACK Samples:

- Microsoft VC++ 5.0 • Borland C++ 5.01 • Visual Basic
- Delphi

Supported ADDIPACK functions:

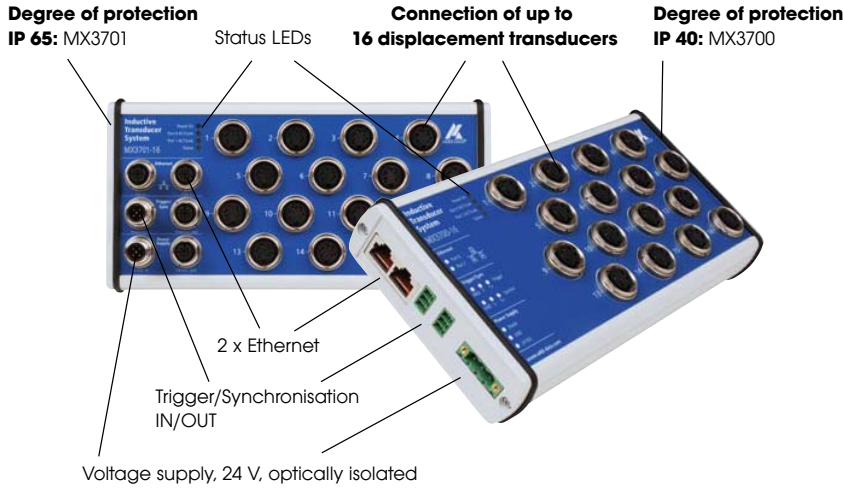
- Transducer • Digital input

Current list on the web: www.addi-data.com

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Features

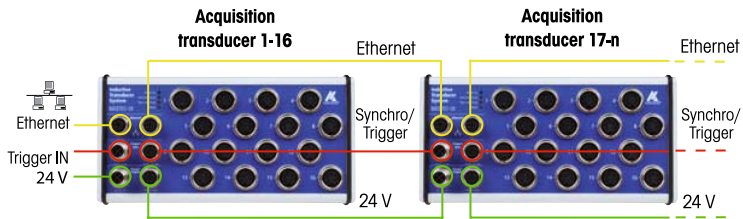


Calibration tool SET3701

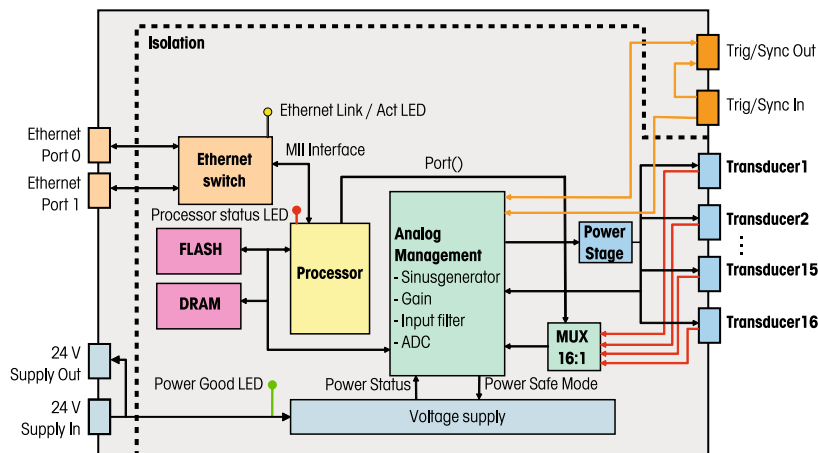


Synchronisation

The synchronisation principle is simple: a module generates a synchronisation signal via the „synchro“ connector and transmits it to the next module, which again transmits it to the next. This is possible because one module gives the others a clock signal. The sinusoidal excitation signals of the transducers are synchronised and allow to measure several test pieces simultaneously. Moreover, cascading the modules makes it unnecessary to connect each module to the PC.



Simplified bloc diagram



Ethernet I/O modules for length measurement



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, Sinus on, Buffer off
	200 mA	typ. without load (transducer) at ± 9 V Power (Buffer on)
	320 mA	typ. with 16 transducers Solartron AX1S at ± 7 V Power, 5 kHz and 3 Vrms
	330 mA	typ. with 8 transducers Knäbel IET0200 at 5 V Power, 50 kHz and 1 Vrms polling protection

Ethernet

Number of ports	2	
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
Optical isolation	1000 V	
MAC address	00:0F:6C:##:##:##	unique for each device

Digital input

Number of inputs	1 trigger input
Filter/protective circuitry	Low-pass/transorb diode
Optical isolation	1000 V
Nominal voltage	24 V external
Input voltage	0 V - 30 V
Input current	11 mA at 24 VDC, typical
Input frequency (max.)	2 MHz at 24 V

Synchro

Number of inputs	1
Number of outputs	1
Max. cable length	20 m
Optical isolation	1000 V
Output type	RS485
Output frequency	800 kHz typ.
Driver level	
(Master) V_{AB}	≤ 1.5 V Low
	≥ -1.5 V High
Received level	
(Slave) V_{AB}	≤ -200 mV Low
	≥ 200 mV High

Sine wave generator

Number	2
Coupling	AC
Pre-programmed signals:	
Type	Sine differential
Output frequency	5 kHz typ.
	7.69 kHz typ.
	10 kHz typ.
	12.5 kHz typ.
	20 kHz typ.
	50 kHz typ.
Output level	
Output range	± 11 V max
Output impedance	$< 0.1 \Omega$ typ.
	> 30 k Ω typ. in Shutdown Mode
Short-circuit current	0.7 A typ. at 25°C with thermal protection
Switching time Buffer Off/On	1 μ s typ.

Analog inputs

Characteristics of the channels	
Number	-4/-8/-16/ multiplexed
Input type	single ended
Coupling	DC
Resolution	24-bit
Sampling frequency	2 kHz \leq fs \leq 200 kHz min to max
At primary frequency	
5 kHz	20 kHz
7.69 kHz	30.769 kHz
10 kHz	40 kHz
12.5 kHz	50 kHz
20 kHz	80 kHz
50 kHz	100 kHz
Frequency precision	± 50 ppm
Input level	
Input impedance	2 k Ω adjustable through software
	10 k Ω
	100 k Ω
	10 M Ω
Input ranges	± 5 V single ended

System requirements

Interface	Ethernet	acc. to specification IEEE802.3
Dimensions	MX370x-16:	200 mm x 106 mm x 32 mm
	MX370x-8/-4:	140 mm x 106 mm x 32 mm
Weight	MX370x-16:	760 g
	MX370x-8:	560 g
	MX370x-4:	530 g
Degree of protection	MX3701-4/-8/-16:	IP 65
	MX3700-4/-8/-16:	IP 40

MX3701 function connectors

Ethernet	2x 4-pin flange type socket, D-coded M12 for Port 0 and 1Port1
Trigger/synchro input	1 x 5-pin flange connector M12
Trigger/synchro output	1 x 5-pin flange type socket M12
24 VDC input	1 x 5-pin flange connector M12
24 VDC output	1 x 5-pin flange type socket M12

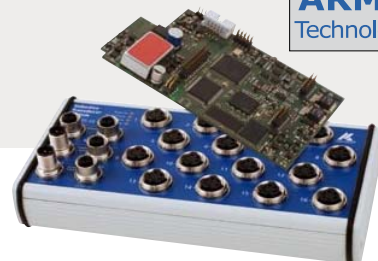
MX3700 function connectors

Ethernet	RJ45 for Port 0 and 1
24 VDC	3-pin binder, 5.08 mm grid
External trigger	1x 3-pin binder, 3.81 mm grid
Synchro signal	1x 3-pin binder, 3.81 mm grid

Connectors for the connection of inductive transducers

MX370x-16	16 x 5-pin flange type socket M18
MX370x-8	8 x 5-pin flange type socket M18
MX370x-4	4 x 5-pin flange type socket M18

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Connection cables and binders

For MSX-E3701

Power Supply



Shielded cable,
M12 5-pin cable box/open
end, IP 65
CMX-20: 1.5 m
CMX-21: 3 m
CMX-22: 5 m
CMX-23: 10 m
CMX-29: on request



For cascading
Shielded cable,
M12 5-pin cable box/
Connector IP 65
CMX-38: 0.6 m
CMX-30: 1.5 m
CMX-31: 3 m
CMX-32: 5 m
CMX-39: on request

Trigger/Synchro



Shielded cable,
M12 5-pin cable box/open
end, IP 65
CMX-40: 1.5 m
CMX-41: 3 m
CMX-42: 5 m
CMX-43: 10 m
CMX-49: on request



For cascading
Shielded cable,
M12 5-pin cable box/
connector, IP 65
CMX-58: 0.6 m
CMX-50: 1.5 m
CMX-51: 3 m
CMX-52: 5 m
CMX-59: on request

Ethernet



CAT5E cable,
M12 D-coded connector/
RJ45 connector
CMX-60: 2 m
CMX-61: 5 m
CMX-62: 10 m
CMX-69: on request



For cascading
CAT5E cable,
2 x M12 D-coded connector
CMX-78: 1 m
CMX-70: 2 m
CMX-71: 5 m
CMX-72: 10 m
CMX-79: on request

For MSX-E3700

Power Supply



SMX-10:
Standard 3-pin binder
5.08 mm grid,
1-row, screw connector

included in the delivery content



SMX-11:
3-pin binder 5.08 mm grid,
2-row, screw connector



SMX-12:
3-pin binder 5.08 mm grid
2-row, spring-cage connector

Trigger / Synchro

SMX-20:
Standard 3-pin binder
5.08 mm grid

included in the delivery content

Options for MSX-E3701 and MSX-E3700

MX-Rail:

for DIN-rail mounting



MX-Screw:

for wall mounting



PCMX-10:

Protection cap for M12 box



PCMX-11:

Protection cap for M18 box



Ethernet I/O modules for length measurement



Versions and protection classes

Versions	Number of transducers	Type of transducer	Schutzklassen
MSX-E3701-HB-16	16	half-bridge	MSX-E3701: Degree of protection IP 65 Protection against a water jet directed at the housing from any direction. Protection against the penetration of dust. Total protection against contact (dust-proof).
MSX-E3701-HB-8	8		
MSX-E3701-HB-4	4		
MSX-E3701-LVDT-16	16	LVDT	
MSX-E3701-LVDT-8	8		
MSX-E3701-LVDT-4	4		
MSX-E3700-HB-16	16	half-bridge	MSX-E3700: Degree of protection IP 40 Protection against the penetration of foreign bodies with a diameter more greater than 1 mm.
MSX-E3700-HB-8	8		
MSX-E3700-HB-4	4		
MSX-E3700-LVDT-16	16	LVDT	
MSX-E3700-LVDT-8	8		
MSX-E3700-LVDT-4	4		

ORDERING INFORMATION

MSX-E3701 / MSX-E3700

Ethernet I/O modules for length measurement. Acquisition of up to 16 inductive displacement transducers.
Incl. technical description and software driver.

MSX-E3701 (Degree of protection IP 65)

MSX-E3701-HB-16: For 16 HB displacement transducers
 MSX-E3701-LVDT-16: For 16 LVDT displacement transducers
 MSX-E3701-HB-8: For 8 HB displacement transducers
 MSX-E3701-LVDT-8: For 8 LVDT displacement transducers
 MSX-E3701-HB-4: For 4 HB displacement transducers
 MSX-E3701-LVDT-4: For 4 LVDT displacement transducers

Connection cables for MSX-E3701

Power Supply

Shielded cable, M12 5-pin cable box/open end, IP 65

CMX-20: 1.5 m
 CMX-21: 3 m
 CMX-22: 5 m
 CMX-23: 10 m
 CMX-29: Cable length on request

For cascading:

Shielded cable, M12 5-pin cable box/cable connector IP 65

CMX-38: 0.6 m
 CMX-30: 1.5 m
 CMX-31: 3 m
 CMX-32: 5 m
 CMX-39: Cable length on request

Trigger/Synchro

Shielded cable, M12 5-pin cable box/open end, IP 65

CMX-40: 1.5 m
 CMX-41: 3 m
 CMX-42: 5 m
 CMX-43: 10 m
 CMX-49: Cable length on request

For cascading:

Shielded cable, M12 5-pin cable box/cable connector IP 65

CMX-58: 0.6 m
 CMX-50: 1.5 m
 CMX-51: 3 m
 CMX-52: 5 m
 CMX-59: Cable length on request

Ethernet

CAT5E cable, M12 D-coded connector/RJ45 connector

CMX-60: 2 m
 CMX-61: 5 m
 CMX-62: 10 m
 CMX-69: Cable length on request

For cascading: CAT5E Kabel, 2 x M12 D-coded connector

CMX-78: 0.6 m
 CMX-70: 2 m
 CMX-71: 5 m
 CMX-72: 10 m
 CMX-79: Cable length on request

MSX-E3700 (Degree of protection IP 40)

Incl. standard binders SMX-10 und SMX-20

MSX-E3700-HB-16: For 16 HB displacement transducers
 MSX-E3700-LVDT-16: For 16 LVDT displacement transducers
 MSX-E3700-HB-8: For 8 HB displacement transducers
 MSX-E3700-LVDT-8: For 8 LVDT displacement transducers
 MSX-E3700-HB-4: For 4 HB displacement transducers
 MSX-E3700-LVDT-4: For 4 LVDT displacement transducers

Binders for MSX-E3700:

Power Supply

SMX-10: Standard 3-pin binder 5.08 mm grid, screw connector (included in the delivery content)
 SMX-11: 3-pin binder 5.08 mm grid, 2-row screw connector
 SMX-12: 3-pin binder 5.08 mm grid, 2-row spring-cage connector

Trigger: SMX-20: Standard 3-pin binder 5.08 mm grid

Options for MSX-E3701 and MSX-E3700

MX-Rail: Mounting set for MSX-E3701 and MSX-E3700 for DIN-rail mounting
 MX-Screw: Mounting set for MSX-E3701 and MSX-E3700 for direct mounting on wall or machines

PCMX-10: Protection cap for MSX-E3701 (10 caps for M12 box)
 PCMX-11: Protection cap for MSX-E3701 and MSX-E3700 (10 caps for M18 box)