Ethernet I/O modules
for the acquisition of displacement transducers

ADDI-DATA®

ARM®9 Technology

MX3701 / MX3700

Acquisition of 16, 8 or 4 inductive displacement transducers

For half-bridge or LVDT transducers

Trigger / Synchro

Degree of protection IP 65 or IP 40

Cascadable

With the intelligent Ethernet I/O modules MX3701 and MX3700, Addi-Data offers a new, decentral platform for the acquisition of displacement transducers, which is based on 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 LVDTs) 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. Thanks to the combination of synchronisation and cascading of the trigger signal, it is possible to acquire data from several modules simultaneously and to trigger the tranducer acquisition with encoders.
The MX3701 and MX3700 are mounted in robust, EMC-protected metal housings, which comply with the degrees of protection IP 65 (with additional protection against waterjet from any direction) or IP 40.

Features

- Connection of all commercially available transducers (half-bridge or LVDT)
- 16, 8, or 4 channels depending on the version, cascadable
- 24-bit resolution
- Fast decentral data acquisition
- Dynamic measurement via 24 V digital trigger input
- Synchronisation of several modules
- Onboard RAM for storing measurement data
- Onboard ARM9 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 IP65 or IP40
- 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"

Connections:

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

Safety features

- Input filter
- 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 (Δ 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 date
- Quality assurance
- Industrial process control
- Automatic parts control
- R&D Instrumentation

Software

Calibration tool SET3701 (supplied with MX370x)

- 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 MX-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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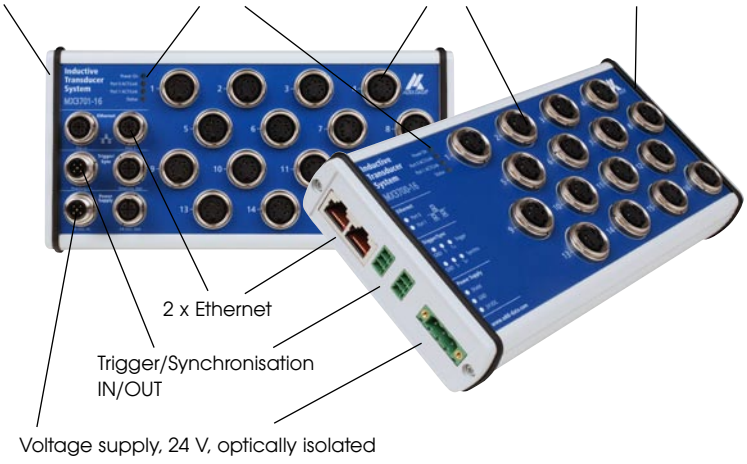
Features

Degree of protection
IP 65: MX3701

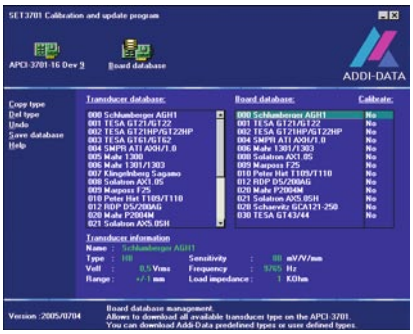
Status LEDs

Connection of up to
16 displacement transducers

Degree of protection
IP 40: MX3700

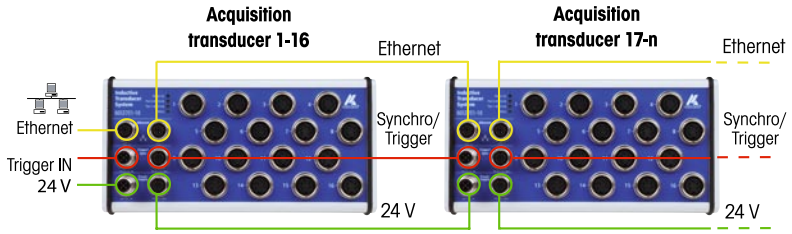


Calibration tool SET3701

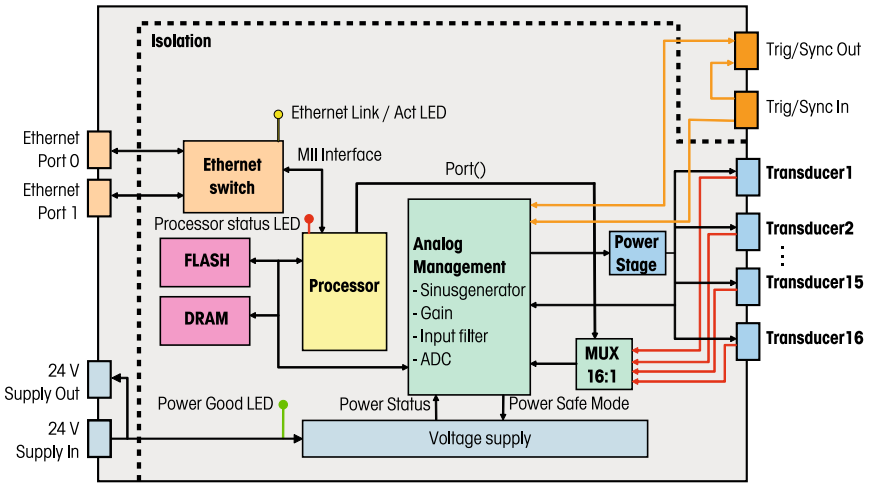


Synchronisation

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 tranducers are synchronised and allow to measure several test pieces simultaneously.
Moreover, cascading the module makes the connection of each module to the PC totally unecessary.



Simplified bloc diagram



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Ethernet I/O modules
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ADDI-DATA®

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 1Vrms poling 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_{A-B}	≤ 1.5 V	Low
	≥ -1.5 V	High
Received level		
(Slave) V_{A-B}	≤ -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 Ω typ.	
	> 30 kΩ typ. in Shutdown Mode	
Short-circuit current	0.7 A typ. at 25°C with thermal protection	
Switching time Buffer Off/On	1 µs 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 ≤ fs ≤ 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 kΩ adjustable through software
	10 kΩ
	100 kΩ
	10 MΩ
Input ranges	± 5 V single ended

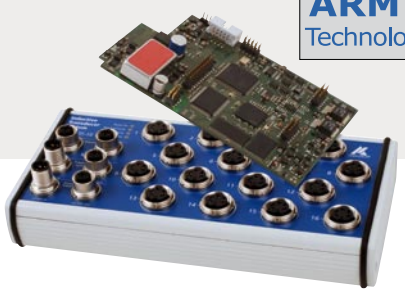
System requirements		
Interface	Ethernet	acc. to specification IEEE802.3
Dimensions	MX370x-16:	200 mm x 106 mm x 32 mm
	MX370x-8/-4:	140 mm x 106 mm x 32 mm
Weight	MX370x-16:	760 g
	MX370x-8:	560 g
	MX370x-4:	530 g
Degree of protection	MX3701-4/-8/-16:	IP 65
	MX3700-4/-8/-16:	IP 40

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

ARM®9 Technology



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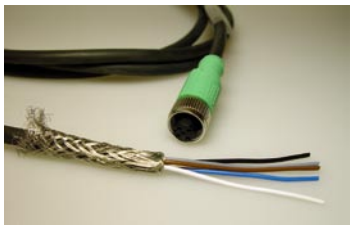
Connection cables and binders

For MX3701

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

Shielded cable,
M12 5-pin cable box/ Connector IP65
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

Shielded cable,
M12 5-pin cable box/ connector, IP65
CMX-58: 0.6 m
CMX-50: 1.5 m
CMX-51: 3 m
CMX-52: 5 m
CMX-59: on request

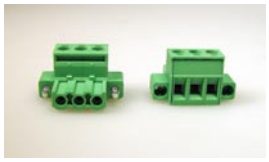
Ethernet

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

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

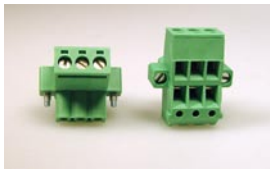
For MX3700

Power Supply / Trigger/Synchro

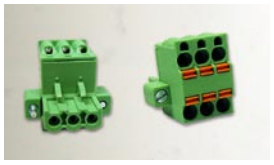


SMX-10:
Standard 3-pin binder
5.08 mm grid,
1-row, screw connector

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

Options for MX3701 and MX3700

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

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Versions and protection classes

Versions	Number of transducers	Type of transducer	Degrees of protection
MX3701-16-HB	16	Half Bridge	**MX3701: Degree of protection IP 65** Protection against a water jet directed at the enclosure from any direction. Protection against the penetration of dust. Total protection against contact (dust-proof). 
MX3701-8-HB	8		
MX3701-4-HB	4		
MX3701-16-LVDT	16	LVDT	
MX3701-8-LVDT	8		
MX3701-4-LVDT	4		
MX3700-16-HB	16	Half Bridge	**MX3700: Degree of protection IP 40** Protection against the penetration of foreign bodies with a diameter more than 1 mm. 
MX3700-8-HB	8		
MX3700-4-HB	4		
MX3700-16-LVDT	16	LVDT	
MX3700-8-LVDT	8		
MX3700-4-LVDT	4		

ORDERING INFORMATION

MX3701 / MX3700

Ethernet I/O modules for the acquisition of up to 16 inductive displacement transducers.
Including standard binder SMX-10 and cable CMX-10, technical description and software drivers.

MX3701 (Degree of protection IP 65)

MX3701-16-HB: for 16 HB displacement transducers
MX3701-16-LVDT: for 16 LVDT displacement transducers
MX3701-8-HB: for 8 HB displacement transducers
MX3701-8-LVDT: for 8 LVDT displacement transducers
MX3701-4- HB: for 4 HB displacement transducers
MX3701-4-LVDT: for 4 LVDT displacement transducers

Connection cable for MX3701

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

Shielded cable, 2 x M12 5-pin cable box, 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, 2 x M12 5-pin cable box, 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

Shielded cable, M12 5-pin cable box/connector IP65
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 cabel, M12 D-coded connector / RJ45 Stecker
CMX-60: 2 m
CMX-61: 5 m
CMX-62: 10 m
CMX-69: Cable length on request

CAT5E cable, 2 x M12 D-coded connectors
CMX-78: 0.6 m
CMX-70: 2 m
CMX-71: 5 m
CMX-72: 10 m
CMX-79: Cable length on request

MX3700 (Degree of protection IP 40)

MX3700-16-HB: for 16 HB displacement transducers
MX3700-16-LVDT: for 16 LVDT displacement transducers
MX3700-8-HB: for 8 HB displacement transducers
MX3700-8-LVDT: for 8 LVDT displacement transducers
MX3700-4- HB: for 4 HB displacement transducers
MX3700-4-LVDT: for 4 LVDT displacement transducers

Binders for MX3700:

Power Supply / Trigger/Synchro

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

Options for MX3701 and MX3700

MX-Rail: Mounting set for DIN-rail mounting
MX-Screw: Mounting set for wall mounting

PCMX-10: protection cap for M12 box (10 caps)
PCMX-11: protection cap for M18 box (10 caps)

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