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certified

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Preliminary version

Technical description

MSX-E3701 and MSX-E3700

Ethernet I/O module for length measurement

Edition: 02.04 – 10/2007

Product information

This manual contains the technical installation and important instructions for correct commissioning and usage, as well as production information according to the current status before printing.
The content of this manual and the technical product data may be changed without prior notice.
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Trademarks

WARNING

The following risks result from improper implementation and from use of the product contrary to the regulations:

- **Personal injury**

- **Damage to the I/0 module, PC and peripherals**

- **Pollution of the environment**

- **Protect yourself, the others and the environment!**

- **Read carefully the safety precautions (yellow leaflet).**

  If this leaflet is not with the documentation, please contact us and ask for it.

- **Observe the instructions of the manual.**

  Make sure that you do not forget or skip any step. We are not liable for damages resulting from a wrong use of the product.

- **Used symbols:**

IMPORTANT!
designates hints and other useful information.

WARNING!
It designates a possibly dangerous situation.
If the instructions are ignored the module, PC and/or peripheral may be destroyed.

Figures

Tables

1 DEFINITION OF APPLICATION

1.1 Intended use

The Ethernet I/O module **MSX-E370x**[(*)] for the acquisition, processing and transmitting of signals of displacement transducers is intended for the connection to a network, which is used as electrical equipment for measurement, control and laboratory pursuant to the norm IEC 61010-1.

1.2 Usage restrictions

The Ethernet I/O module **MSX-E370x** must not to be used as safety related part for securing emergency stop functions.

The Ethernet I/O module **MSX-E370x** must not be used in potentially explosive atmospheres.

1.3 General description of the board

Characteristics

The Ethernet I/O module **MSX-E370x** can be used for length measurements via linear inductive transducers. The electronics is not anymore placed directly in the PC, but in an external box, which is connected to the PC via Ethernet. Because it is placed directly at the transducer (measurement point), the measurements are not influenced negatively by long cables anymore. The length of the connection cable (Ethernet) from the box to the PC can be up to 150 m. The electronics also integrates an Ethernet switch in order to connect several systems easily. The system must be supplied externally (24 V).

The inductive transducer can measure very precisely linear distances. It is a distance / voltage sensor, whose output is relative to the movable core of housing. The magnetic core of housing moves linearly in a transformer that consists of one central primary coil and of two external secondary coils, which wrap each other in a cylindrical form. The primary coil is supplied by an AC-voltage source (typically a few kHz), which introduces a secondary voltage and changes with the position of the magnetic core of housing.

1.4 Safety precautions

1.4.1 Current sources

All connected devices must be supplied from current sources that comply with SELV according to IEC 60950 or EN 60950; or PELV according to IEC 60204-1 or EN 60204-1.

(*) **MSX-E370x** is the common name for **MSX-E3701** and **MSX-E3700**

1.4.2 Degrees of protection

IMPORTANT!
The protection according to the defined degree of protection is only given if the openings are protected with adequate protection caps or connectors.

If you are not sure, please contact us:

Phone: +49 (0)7223/94 93-0
E-mail: info@addi-data.de

1.4.3 Cables

The cables must be installed safely against mechanical load.

1.4.4 Housing

The housing may not be opened. It may be opened only from persons who were authorized by ADDI-DATA.

1.4.5 Connection

Please find information about cables and further accessories in a separate PDF file (see table “Accessories”)

1.4.6 Remarks

The use of the Ethernet I/O module according to its intended purpose includes observing all advices given in this manual and in the safety leaflet.

Uses beyond these specifications are not allowed. The manufacturer is not liable for any damages which would result from the non-observance of this clause.

Make sure that the Ethernet I/O module remains in its protective pack **until it is used**.

Do not remove or alter the identification numbers of the Ethernet I/O module. If you do, the guarantee expires.

2 USER

2.1 Qualification

Only persons trained in electronics are entitled to perform the following works:
- installation
- use
- maintenance

2.2 Personal protection

Consider the country-specific regulations about:
- the prevention of accidents
- electrical and mechanical installations
- radio interference suppression

3 HANDLING OF THE ETHERNET I/O MODULE

Fig. 3-1: Correct handling

- Do not touch the connectors
- Hold the module only at the sides and at the bottom

4 TECHNICAL DATA

4.1 Electromagnetic compatibility (EMC)

The PC is to comply with the norm IEC61326 for measurement, control and laboratory use and with the specifications for EMC protection.

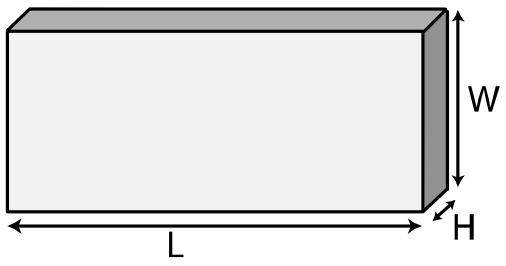
4.2 Physical set-up

Dimensions

Table 4-1: Dimensions

	Length x Width x Height (L x W x H)
MSX-E3700-4	154 mm x 110 mm x 39 mm
MSX-E3701-4	154 mm x 110 mm x 50 mm
MSX-E3700-8	154 mm x 110 mm x 39 mm
MSX-E3701-8	154 mm x 110 mm x 50 mm
MSX-E3700-16	215 mm x 110 mm x 39 mm
MSX-E3701-16	215 mm x 110 mm x 50 mm

Fig. 4-1: Dimensions



Weight

MSX-E3701-4/MSX-E3700-4: ..... 519 g / 474 g
MSX-E3701-8/MSX-E3700-8: ..... 551 g / 513 g
MSX-E3701-16/MSX-E3700-16: ..... 741 g / 707 g

Fig. 4-2: MSX-E3701-4: View from above

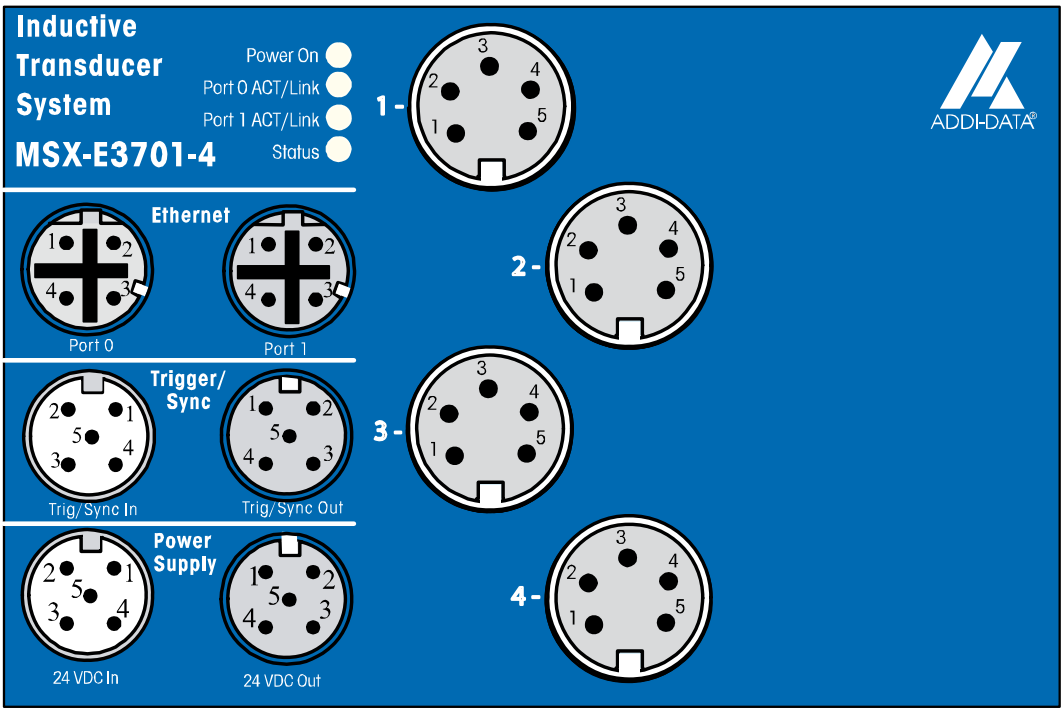


Fig. 4-3: MSX-E3701-8: View from above

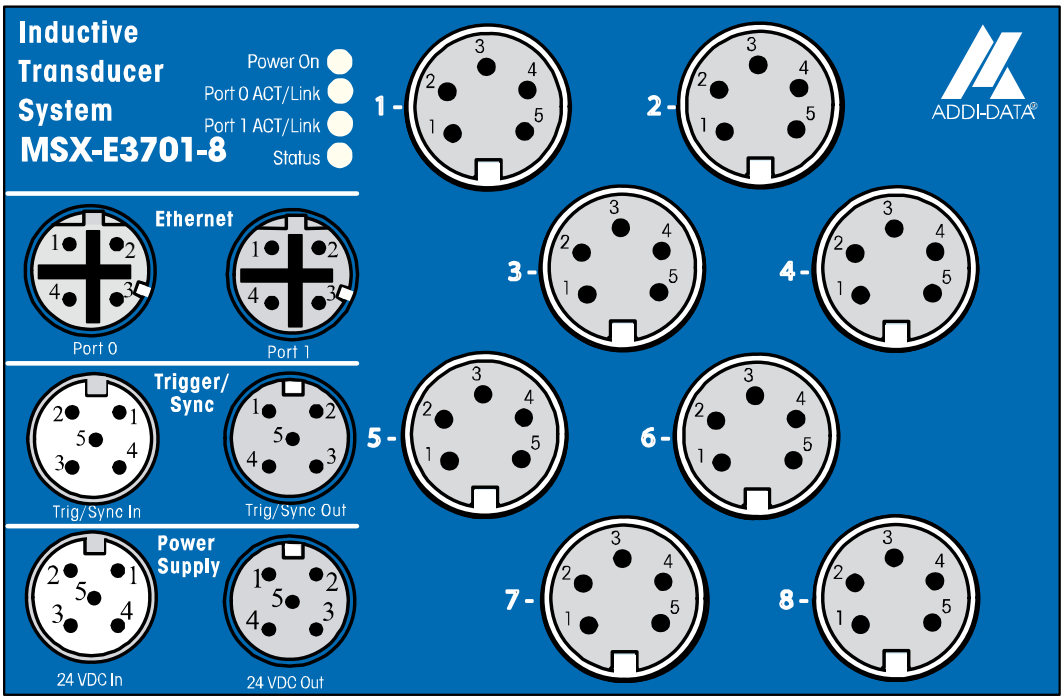


Fig. 4-4: MSX-E3701-16: View from above

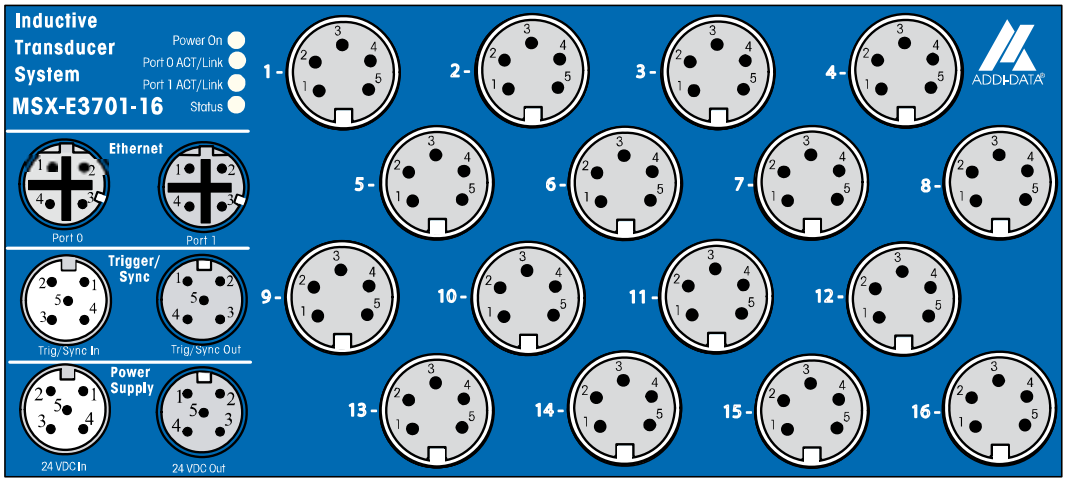


Fig. 4-5: MSX-E3700-4: View from above

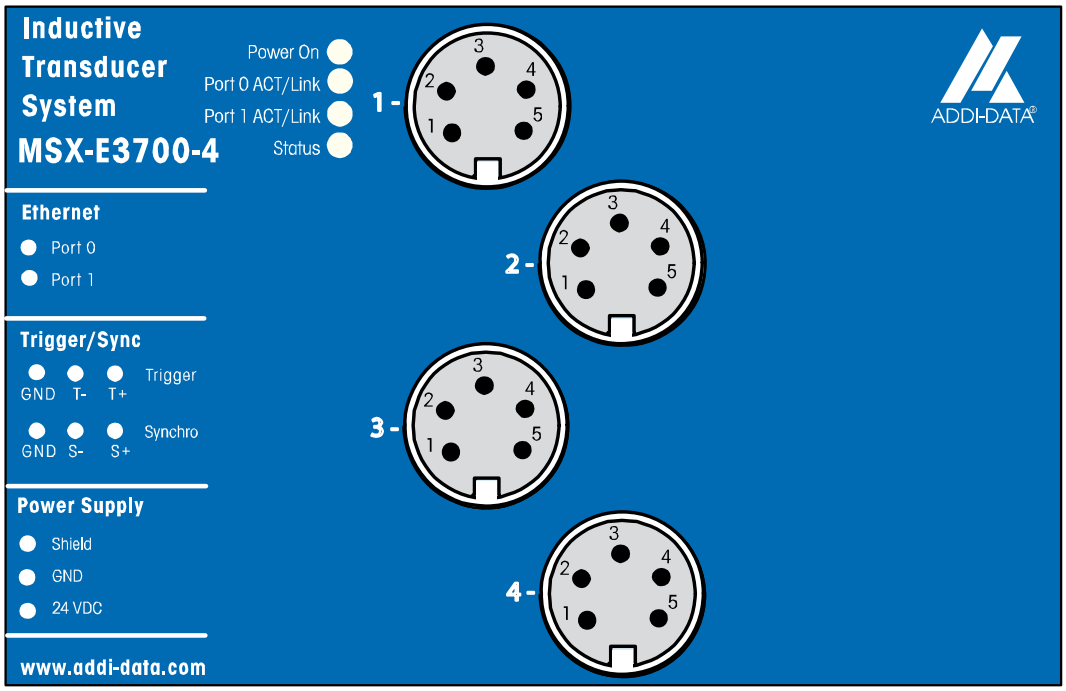


Fig. 4-6: MSX-E3700-8: View from above

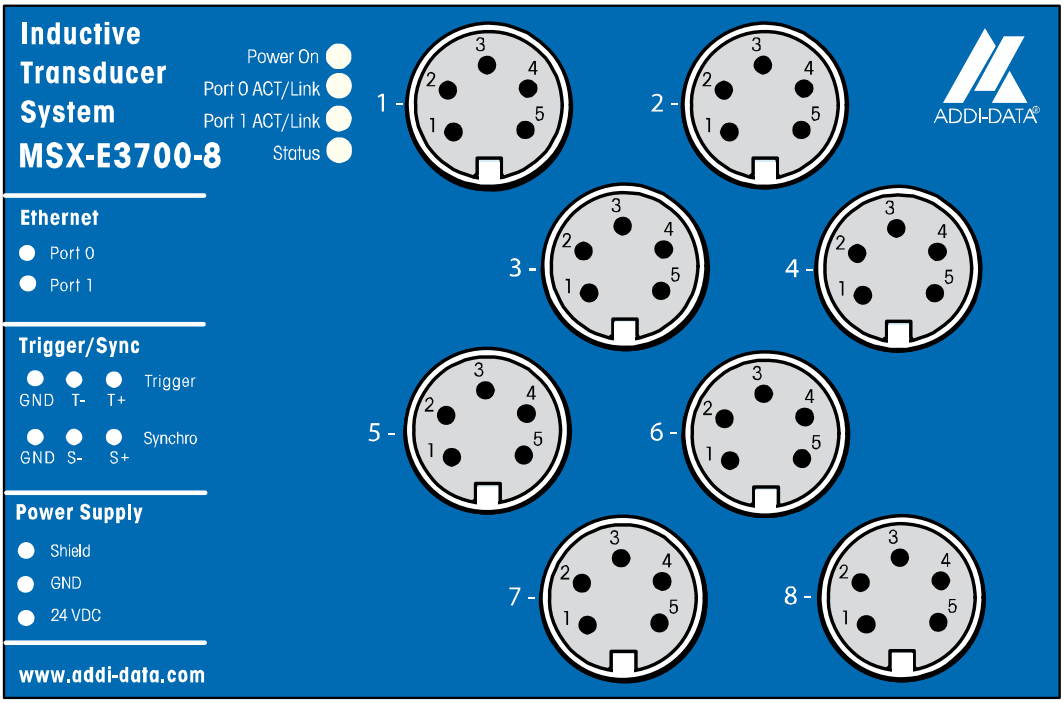
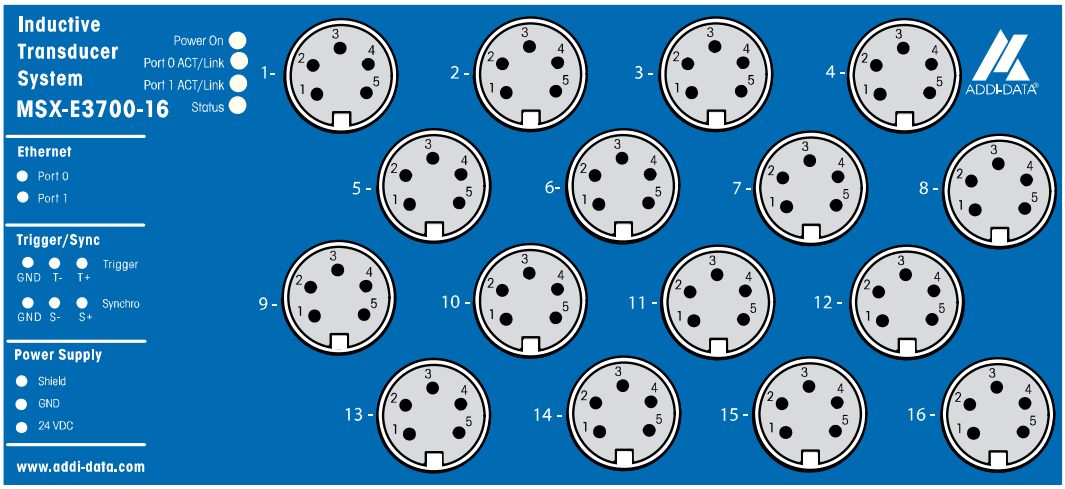


Fig. 4-7: MSX-E3700-16: View from above



Accessories*:
See link in the bookmarks „Table: Accessories“

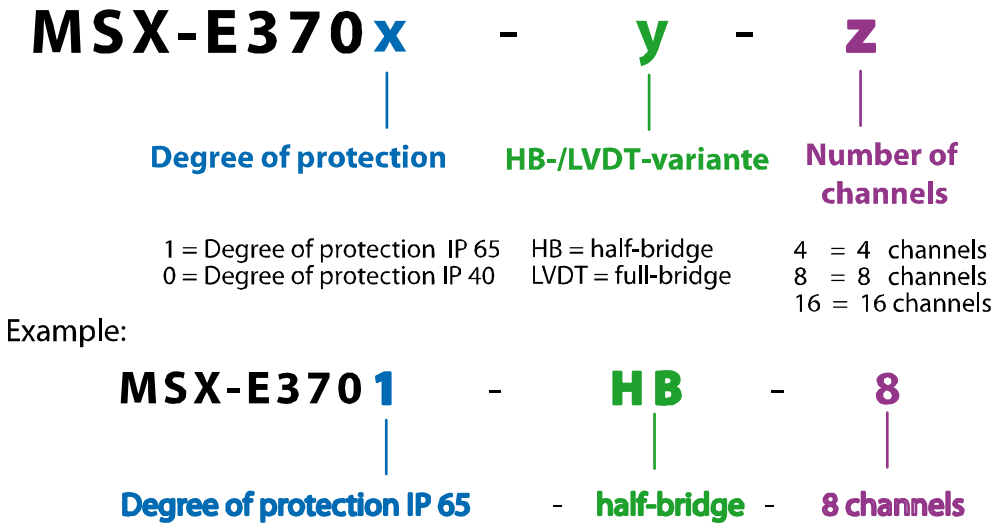
* Not contained in the standard delivery.

4.3 Versions

The Ethernet I/O module **MSX-E370x** is available in the 4-, 8- or 16-channel version. For each version there is a half-bridge (HB) or full-bridge (LVDT) variant.
Furthermore, the Ethernet I/O module is available in two different housing types:

MSX-E3701: Degree of protection IP 65*
MSX-E3700: Degree of protection IP 40*

Fig. 4-8: Versions - Overview



4.4 Limit values

Max altitude: ..... 2000 m
Operating temperature: ..... 0 to 60°C (with forced ventilation)
Relative humidity: ..... 30 to 99% non condensing
Storage temperature: ..... -25 to + 70°C

Safety features:
Optical isolation: ..... 1000 V

Current supply:
Nominal voltage: ..... 24 V direct current ⎓
(symbol acc. to IEC 60417 # 5031)
Supply voltage ..... 18-30 V
Operating voltage: ..... 24 VDC (typ. external from 18 V-30 V)
Current consumption at 24 V: ..... See table (±10 %)

* Please observe that the defined degree of protection is only given if adequate protection caps are used (see also chapter 1.4).

Table 4-2: Current consumption (at 24 V)

	MSX-E370x-4	MSX-E370x-8	MSX-E370x-16
Power Safe Mode / Idle (typ.)	90 mA	90 mA	90 mA
Power On	120 mA	120 mA	120 mA
DAC Init / Sinus On / Buffer Off	150 mA	150 mA	150 mA
Typ. without load (transducer) at ± 9 V power (Buffer On)	200 mA	200 mA	200 mA
Typ. with 16 transducers Solartron AX1S at ± 7 V power, 5 kHz and 3 Vrms	TBD	TBD	320 mA
Typ. with 8 transducers Knäbel IET0200 at ± 5 V power, 50 kHz and 1 Vrms	TBD	330 mA	Not allowed

4.4.1 Ethernet

Number of ports 2
Optical isolation: ..... 1000 V
Cable length: ..... 150 m (max. at CAT5E UTP)
Bandwidth: ..... 10 Mbps (auto-negotiation)
100 Mbps (auto-negotiation)
Protocol: ..... 10 Base-T acc. to IEEE802.3
100 Base-TX acc. to IEEE802.3
MAC address: ..... 00:0F:6C:##:##:## (unique for each device)

4.4.2 Transducer inputs

Number of channels**:** ..... **MSX-E370x-4**: 4 channels (multiplexed)
MSX-E370x-8: 8 channels (multiplexed)
MSX-E370x-16: 16 channels (multiplexed)
Input type: ..... Single-ended
Coupling: ..... DC
Resolution: 24-bit
Input ranges: ..... ± 3.5 V_{max} (programmable)

Sampling frequency f_S:

On one channel:

$F_S = f_P$

If primary frequency f_P is
5 kHz
7.69 kHz
10 kHz
12.5 kHz
20 kHz
50 kHz

From n≥2 channels: $f_S = \frac{f_P}{(SP+1)\times n}$

f_P: primary frequency
SP: settling period 4≤SP≤255
f_S concerns here all n channels

Input level

Input impedance (adjustable through software): 2 kΩ
10 kΩ
100 kΩ
10 MΩ

Input ranges: ..... : ±5 V(Single-Ended)

Precision of the transducer:

See „Transducer list“ (link in the bookmarks)

4.4.3 Trigger inputs

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

4.4.4 Synchro inputs and outputs

Number of inputs: 1
Number of outputs: 1
Optical isolation: ..... 1000 V
Output type: RS485
Output frequency: ..... 800 kHz (typ.)
Driver levels (Master) V_{A-B}: ..... ≤1.5 V (low)
≥ - 1.5 V (high)
Receiver levels (Slave) V_{A-B}: ..... ≤ -200 mV (low)
≥ 200 mV (high)

4.4.5 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 impedance:	<0.1 Ω (typ.) >30 kΩ (typ. in the shutdown mode)
Short circuit current:	0.7 A (typ. at 25 °C with thermal protection)
Switching time Buffer Off/On:	1 µs
-3 dB cutoff frequency:	0.65 Hz high-pass filter 50 kHz low-pass filter (10 Hz to 20 kHz)
Frequency response:	0.7 dB (min.) 0 dB (max.)
Output voltage:	High Z after Power On

4.5 Supported transducers

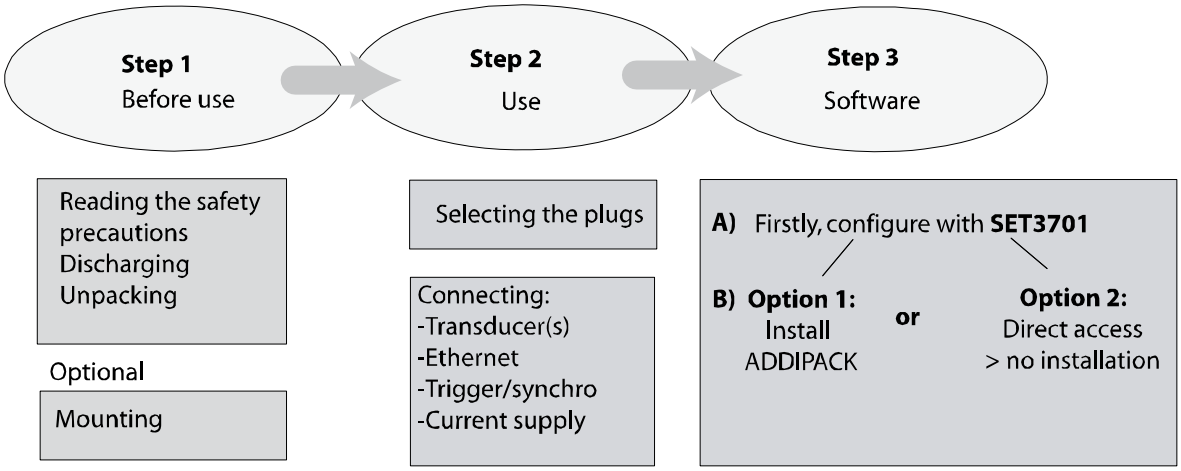
In the transducer list (see separate PDF file as link in the bookmarks) you can find transducer types and manufacturers which are which are parameterised and stored by ADDI-DATA in a function library (**SET3701**).

If you want to install another transducer that is not included in this library, you can integrate your transducer in the “User Transducer database” with help of the update and calibration tool **SET3701** (see chapter 9).

Should you have any further questions, do not hesitate to contact us:
ADDI-DATA: + 49 7223 9493 - 0

5 USE

Fig. 5-1: Use



5.1 Before use

- **Discharge yourself by touching a conducting surface**
- **Remove the Ethernet I/O module from its protective package**

5.1.1 Mounting the Ethernet I/O module: DIN rail

With the mounting set **MX-Rail** (see PDF table „Accessories“) you can attach the Ethernet I/O module to a DIN rail.

WARNING!
Should you have already mounted the **MSX-E370x** and want to transport it in a switch cabinet or in other systems, do ensure that there is sufficient transportation lock. The **MSX-E370x** could fall e.g. from the DIN rail, which could lead to the damage of the **MSX-E370x** and/or other objects/persons.

- **Attach the clamps to the Ethernet I/O module**
- **Fasten the clamps in the holes with the 2 delivered screws**

IMPORTANT!
The spring within the clamps points to the housing ground (see figure below).

Fig. 5-2: Clamps

- **Attach the Ethernet I/O module to the DIN rail by placing the clamp with the springs under the rail**
- **Lift the Ethernet I/O module until the upper part of the clamp locks on the rail**

5.1.2 Mounting the Ethernet I/O module: Angle mounting

With the mounting set **MX-Screw** (see PDF table “Accessories”) you can prepare the Ethernet I/O module for the direct attachment to machines and devices.

According to your requirements you can attach the four angles either pointing inside or outside.

Fig. 5-3: Angles pointing to the outside

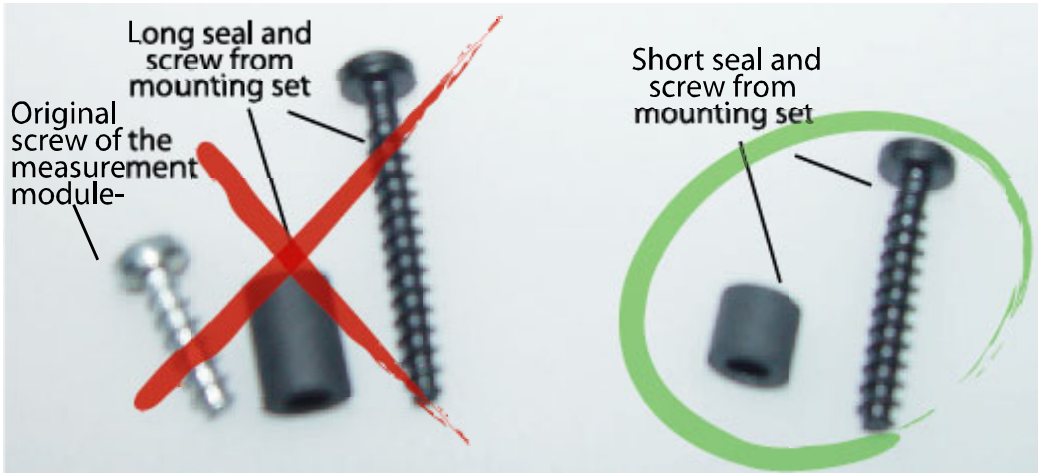
Fig. 5-4: Angles pointing to the inside

For mounting please observe the following steps:

- **Unscrew the screws from the side of the Ethernet I/O module**

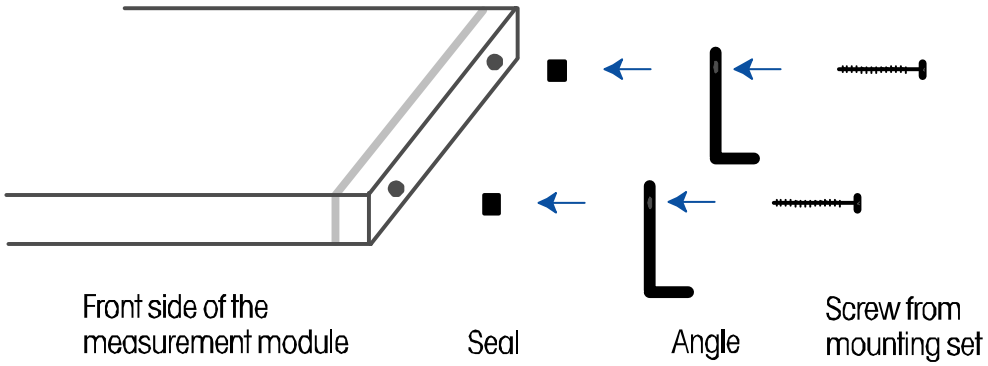
For further mounting please use only the **short** seals and screws from the mounting set.

Fig. 5-5: Screws and seals



- **Put the seal into the opening**
- **Put the angle on the seal**
- **Fasten the angle with a short screw from the mounting set**

Fig. 5-6: Angle mounting



After having attached the angles to the Ethernet I/O module, you can attach the module directly to devices and machines with further screws.

5.2 Connecting the components

♦ **Discharge yourself**

♦ **Take the Ethernet I/O module out of its protective pack**

5.2.1 Connecting the required transducers

♦ **Select one or more transducer plugs** *

Fig. 5-7: Selecting a transducer plug

♦ **Plug the transducer/s into the required plug/s**

* The photos show as example a **MSX-E370x-16** to which max. 16 transducers can be connected. Please observe that max. 8 or 4 transducers can be connected to the **MSX-E370x-8** or **MSX-E370x-4.**

Fig. 5-8: Connecting transducers

5.2.2 Connecting Ethernet ports

You can use a standard Ethernet cable for the **MSX-E370**, whereas you need a special Ethernet cable for the **MSX-E3701** (see PDF-table “Accessories”)

♦ **Plug the Ethernet cable in Ethernet port 0***

Fig. 5-9: Connecting Ethernet ports

* If you want to connect several Ethernet I/O modules, please do observe chapter 5.3.

5.2.3 Connecting trigger and synchro signals

♦ **Plug the cable into the plug Trig/Sync In[1]**

Fig. 5-10: Connecting trigger and synchro signals

5.2.4 Connecting to the current supply

♦ **Plug the cable into the input (24 VDC In)***

Fig. 5-11: Connecting the current supply

* If you want to connect several Ethernet I/O modules please do observe chapter 5.3.

5.3 Connecting several Ethernet I/O modules

You can connect several Ethernet I/O modules. Hereto please observe the following steps:

- **Connect the first Ethernet I/O module as described above**
- **Connect the components as shown in the figure (see next pages)**

Please observe:
You can use only one transducer type per module.

Fig. 5-12: Connecting several Ethernet I/O modules: MSX-E3701

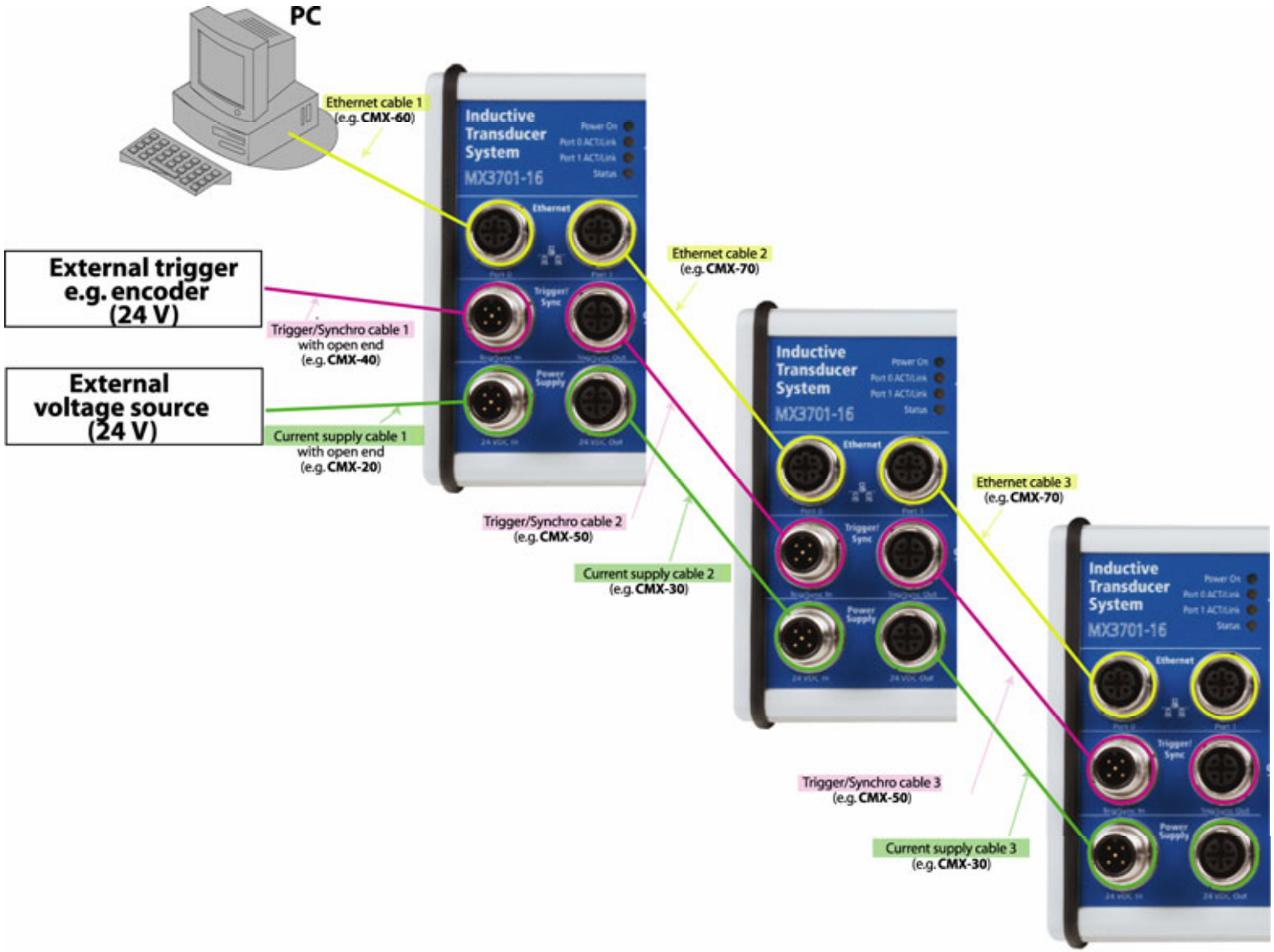
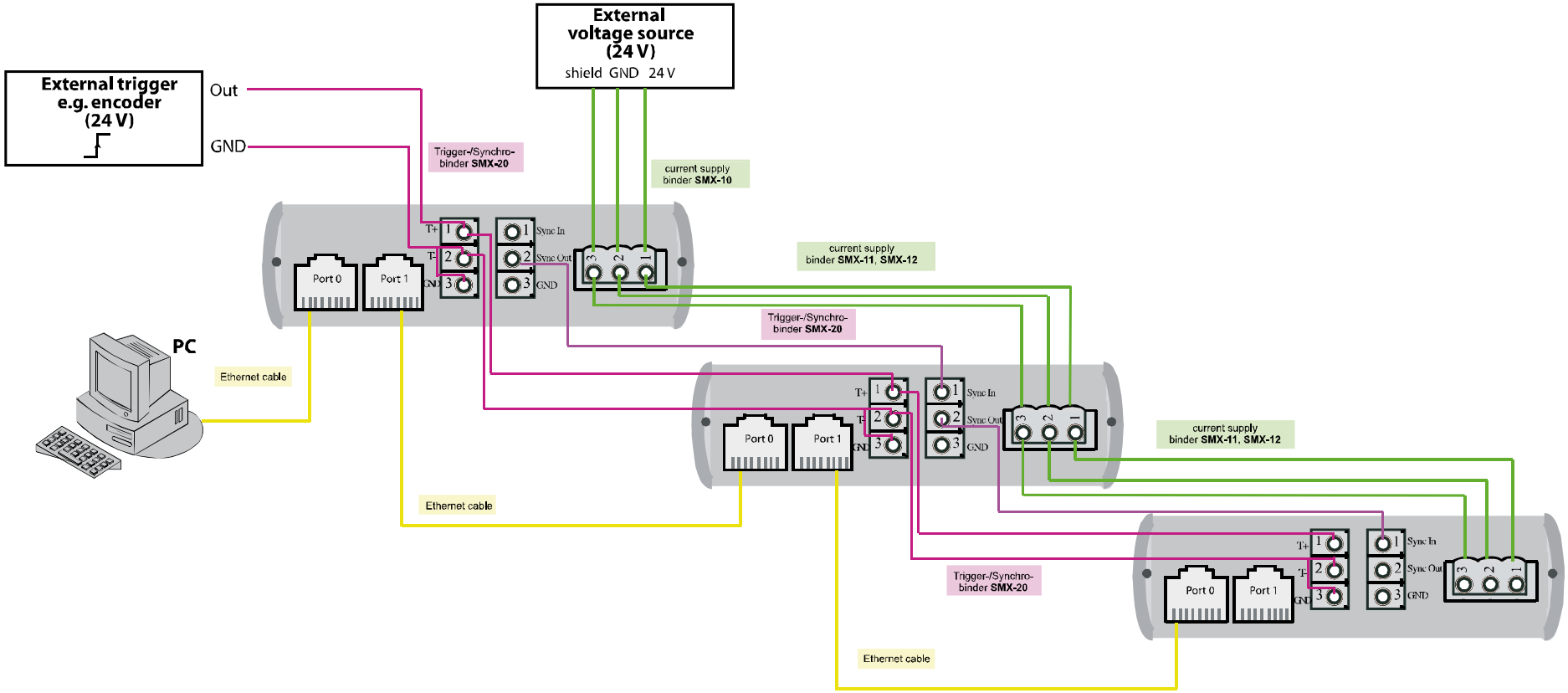


Fig. 5-13: Connecting several I/O modules: MSX-E3700



5.4 LED display

5.4.1 Overview

The LEDs show the following information:

Power On: - lights green = Current supply OK

Port 0 ACT/Link: - blinks yellow = Ethernet cable connected to port 0

Port 1 ACT/Link: - blinks yellow = Ethernet cable connected to port 1

Status: See following table

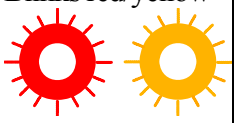
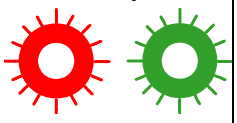
As soon as the Status LED lights green, the module is ready for work

If the Status-LED lights yellow, the network cables are possibly not connected

5.4.2 LED “Status”

The table below contains further information about the LED “Status”.

Table 5-1: LED “Status”

Display	Meaning	Possible cause	Tip
Lights red 	Error during booting	Hardware error (e.g. RAM)	- Contact us for reparation or exchange
Blinks red 	Damaging ambiance conditions	Internal temperature is outside the working range (< 0º or > 70º)	- The module should be handled quickly appropriately - Under such conditions the measurement values are inexact and the whole functions are limited - Such conditions can damage the internal components and thus make the whole system useless
Blinks red/yellow 	The system cannot be accessed via a network connection and encounters conditions considered dangerous.	Internal temperature is low (LOW) or high (HIGH) **and** network cables are not connected.	- The module should be handled appropriately - Check the Ethernetlinks (see LEDs **Port 0 ACT/LINK** and **Port 1 ACT 1/LINK**) - Please observe that in the meantime also further errors can occur that prevent data acquisition (e.g. a short-circuit)
Blinks red/yellow 	System still works and communicates correctly, but encounters conditions considered dangerous	Internal temperature is low (LOW) or high (HIGH)	The module should be handled appropriately
Lights yellow 	System is serviceable, but cannot be accessed via a network connection	- System is booting - Network cables are not connected	- Wait until the system initialization is finished (approx. 40 s) - Check Ethernet connection (see LEDs **Port 0 ACT/Link** or **Port 1 ACT/Link**)

Display	Meaning	Possible cause	Tip
Blinks yellow 	Data acquisition is not possible, but the system can be accessed via a network connection	- After an update with a defect firmware - Essential part works not correctly - Short-circuit at the primary side of one or several sensors - The data acquisition electronic stage stopped after internal temperature exceeded the normal range, but now temperature is normal	- Check the diagnostics on the website of the system - Check the cables and sensors that are connected to the module - Check the temperature and restart the module - Use an updated firmware for your system - Contact us for reparation or exchange
Blinks yellow/green 	Data acquisition is possible but some parts are not working correctly	- The Flash memory is not working correctly - It was tried to configure the module with a wrong IP address	- Check your IP address - Contact us for reparation or exchange
Blinks green 	System is working	- Firmware update - Data acquisition is running	
Lights green 	System is ready for work		

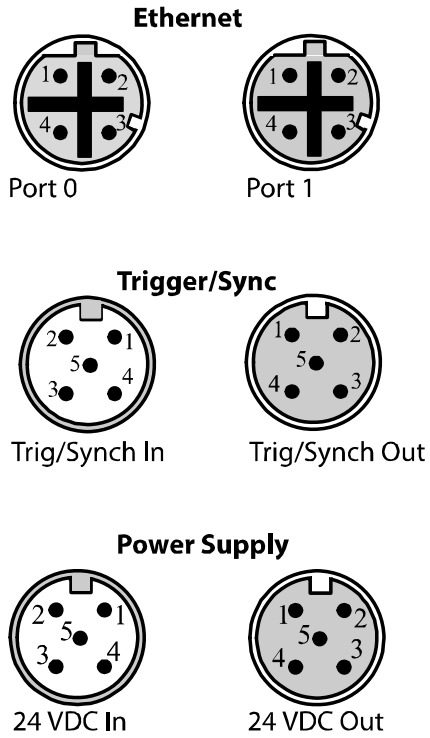
 Note: During booting, the LED “Status” is yellow

6 CONNECTING THE PERIPHERAL

This chapter contains the connector pin assignment of the control signals for the **MSX-E3701** (see chapter 6.1), **MSX-E3700** (see chapter 6.2) and the pin assignment of the transducer signals for the **MSX-E3701** and **MSX-E3700** (see chapter 6.3).

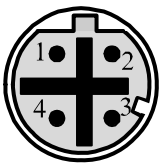
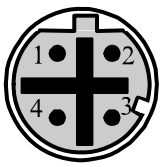
6.1 Pin assignment control signals MSX-E3701

Fig. 6-1: Side view: Control signals MSX-E3701



6.1.1 Ethernet Ports

Table 6-1: Pin assignment MSX-E3701: Ethernet Port 0 and Port 1

	Ethernet port 0	**Ethernet port 1**
Pin No.	Ethernet female connector D-coded, M12	Ethernet female connector D-coded, M12
1	TD0+	TD1+
2	RD0+	RD1+
3	TD0-	TD1-
4	RD0-	RD1-
	Ethernet port 0 	**Ethernet port 1** 

6.1.2 Trigger/synchro

Table 6-2: Pin assignment MSX-E3701: Trigger/Synchro

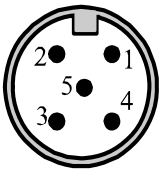
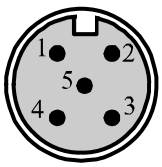
	Trigger/Sync In	Trigger/Sync Out	Cable lead color	
Pin-N0.	Male connector 5-pin, M12	Female connector 5-pin, M12		
1	Dig. trigger input -	Dig. trigger input -	Blue	Pair 1
2	Dig. trigger input +	Dig. trigger input +	White	
3	Synchro trigger input +	Synchro trigger output +	Red	Pair 2
4	Synchro trigger input -	Synchro trigger output -	Blac	
5	Ground	Ground	Open	
	Trigger/Sync In 	**Trigger/Sync Out** 		

Photo: Connecting the trigger/synchro signals (see Fig. 5-10)

6.1.3 Current supply

Table 6-3: MSX-E3701: Current supply

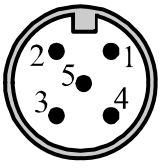
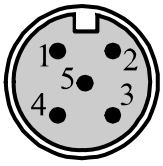
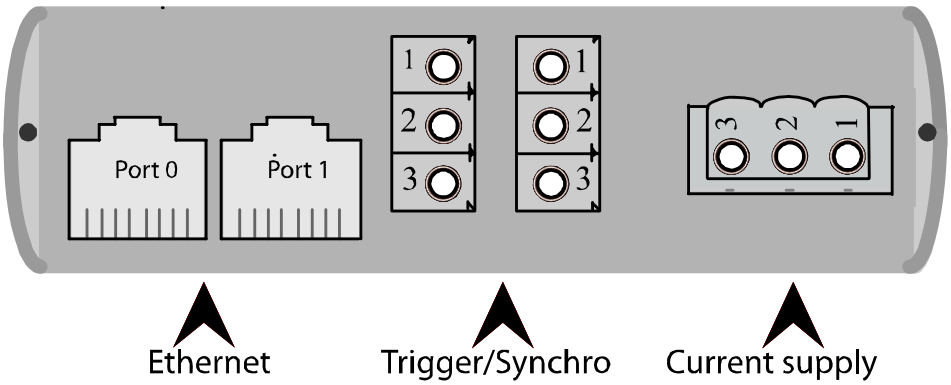
	Power Input	Power Output	Cable lead colour
Pin No.	Connector 5 pin, M12	Female connector 5 pin, M12	
1	24 V	24 V	Brown
2	24 V	24 V	White
3	Ground	Ground	Blue
4	Ground	Ground	Black
5	Shield	Shield	Grey
	Power Input 	**Power Output** 	

Photo: Connecting the current supply (see Fig. 5-11)

6.2 Pin assignment: Control signals MSX-E3700

Fig. 6-2: Control signals MSX-E3700



6.2.1 Ethernet Ports

Table 6-4: Pin assignment MSX-E3700: Ethernet RJ45 (2 Ports)

Ethernet port	Pin No.	Name
Port 0	1	TD0+
	2	TD0-
	3	RD0+
	4	Not connected
	5	Not connected
	6	RD0-
	7	Not connected
	8	Not connected
Port 1	9	TD1+
	10	TD1-
	11	RD1+
	12	Not connected
	13	Not connected
	14	RD1-
	15	Not connected
	16	Not connected

Photo: Connecting the Ethernet Ports (see Fig. 5-9)

6.2.2 Trigger/synchro

Fig. 6-3: Connector assignment MSX-E3700: Trigger/synchro

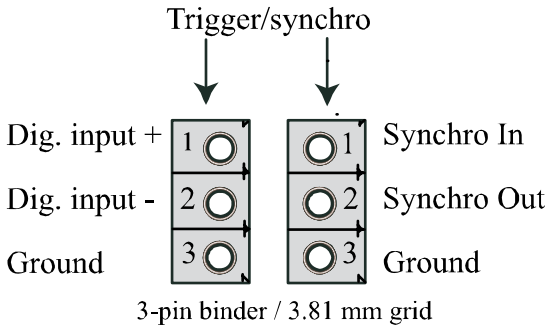


Photo: Connecting the trigger/synchro signals (see Fig. 5-10)

6.2.3 Current supply

Fig. 6-4: MSX-E3700: Current supply

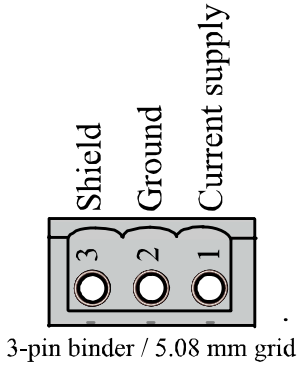
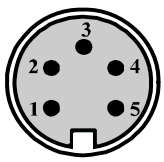


Photo: Connecting the current supply (see Fig. 5-11)

6.3 Transducer signals MSX-E3701 and MSX-E3700

Table 6-5: Pin assignment MSX-E3701 and MSX-E3700

	HB	LVDT
Pin No.	**Connector 5 pin, M18**	**Connector 5 pin, M18**
1	OSC+	OSC+
2	Ground	OSC-
3	Transducer measurement signal	Not connected
4	Not connected	Transducer measurement signal
5	OSC-	Ground
		

7 SOFTWARE: CONFIGURATION-, CALIBRATION- AND UPDATE-TOOL

7.1 Introduction

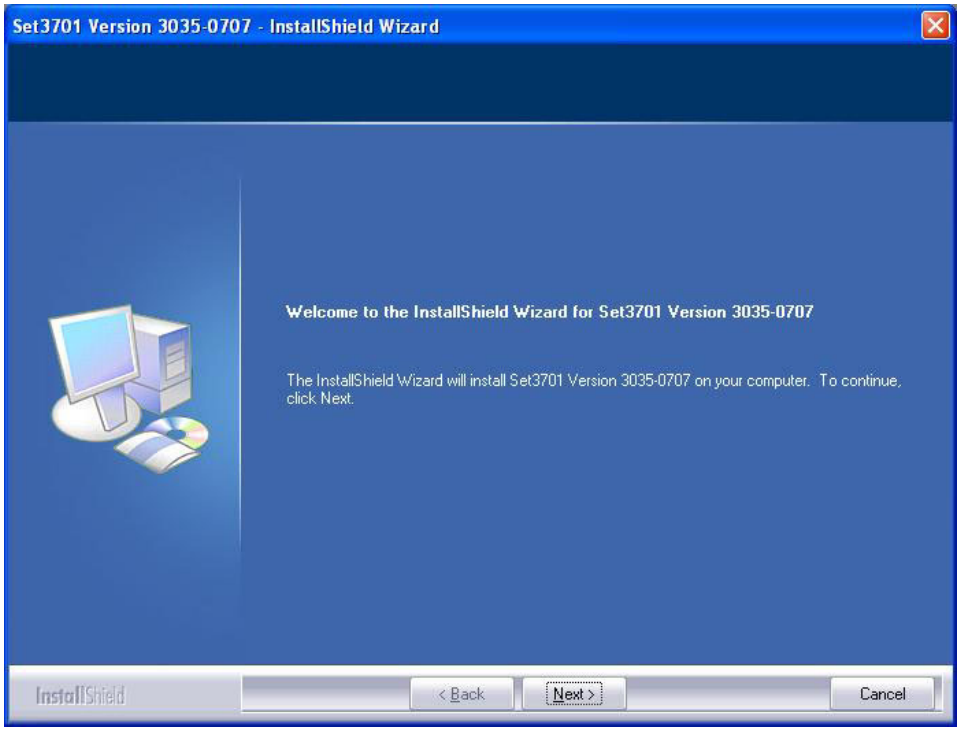
With the program **SET3701** you can:

- identify the characteristics of the module **MSX-E370x**
- configure the module **MSX-E370x** (IP address)
- administrate the transducer database
- calibrate the module **MSX-E370x** for the transducers

7.2 Program start

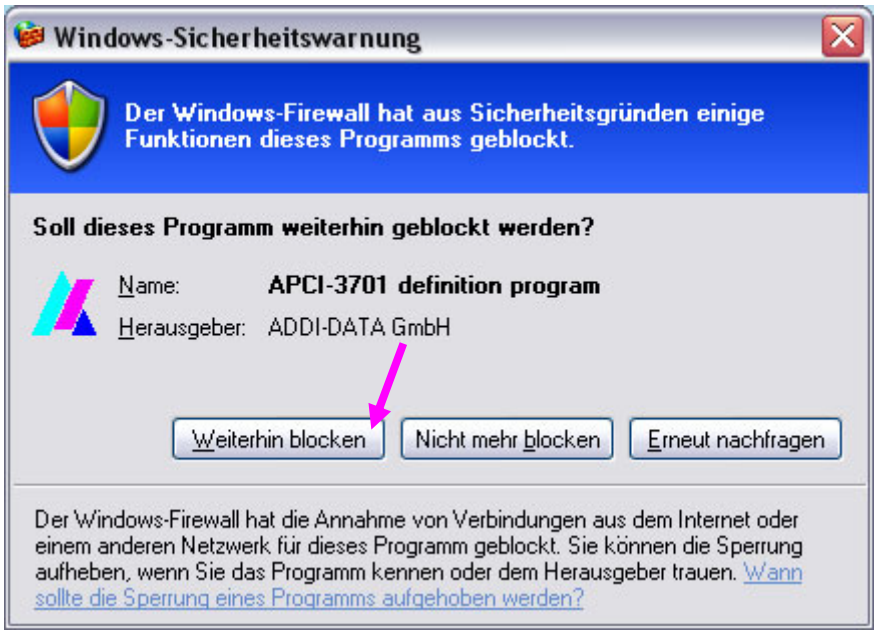
After the installation from CD1 “Standard drivers 1(CD\APCI-3701\SET3701 DISK1)) start **SET3701** through **“Start\Program\ Set3710\Set3701“**.

Fig. 7-1: SET301: InstallShield Wizard



After this it is possible that the following window is displayed:

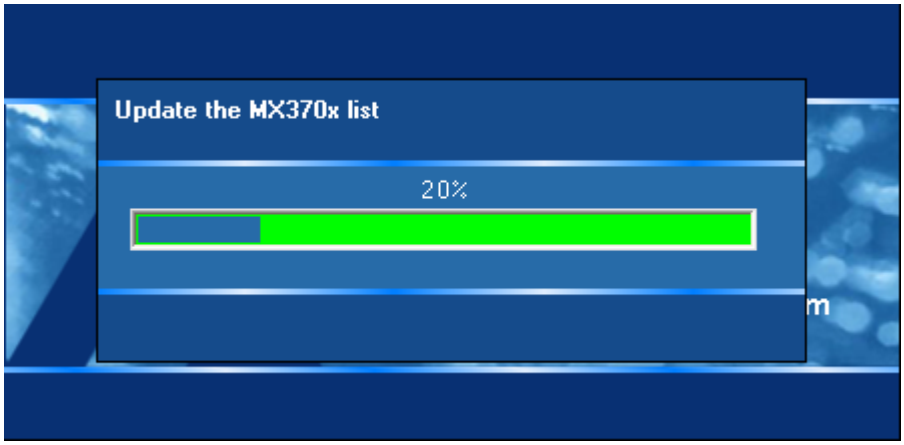
Fig. 7-2: Windows security warning



♦ **Click on „Nicht mehr blocken“ („don’t block“).**

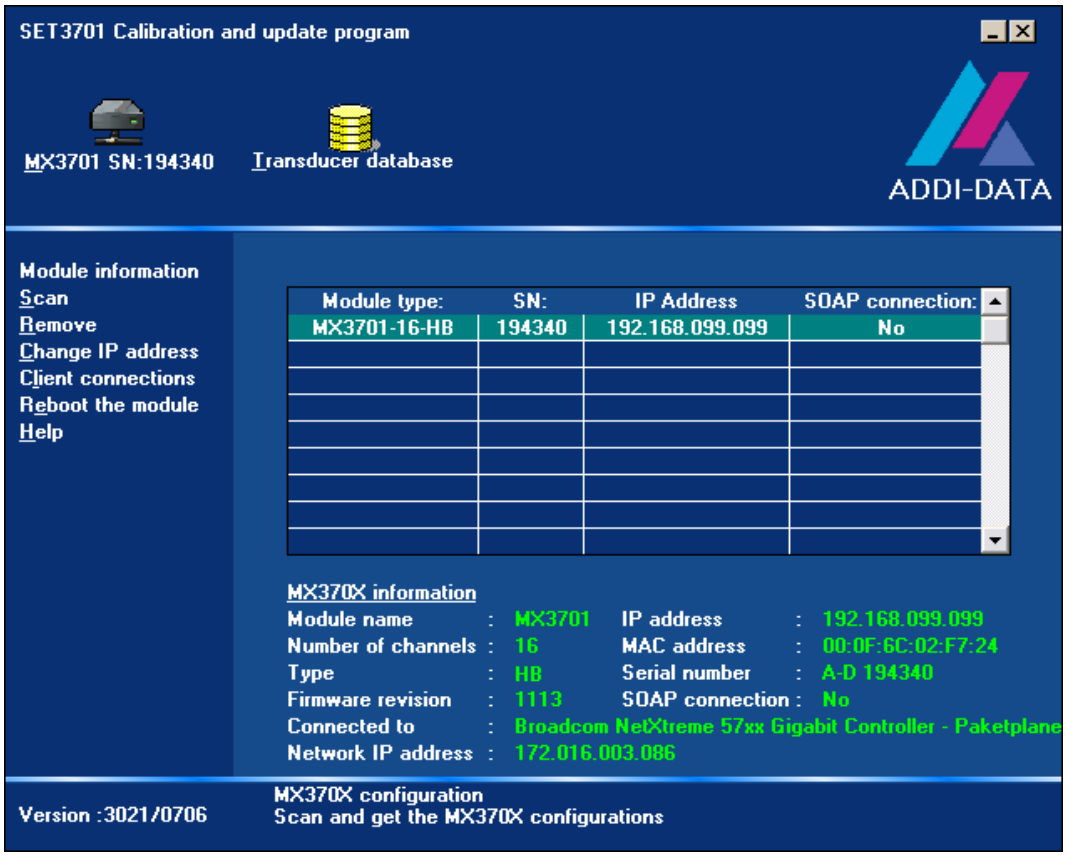
Now the standard IP address of the Ethernet I/O module is scanned automatically (at delivery it is: **192.168.099.099**).

Fig. 7-3: Scanning of the standard IP address



As soon as the module is found, the following window is displayed:

Fig. 7-4: Module found



Should the module not be found, please check the following points:

- Is the module connected correctly to the network?
- Is the module switched on?
- Does the LED „Status“ lights green?
- If the module is searched by an UDP-inquiry (at first configuration): Does a router block this UPD-inquiry?
- If the module is connected directly to the computer: Is you network card connected correctly?

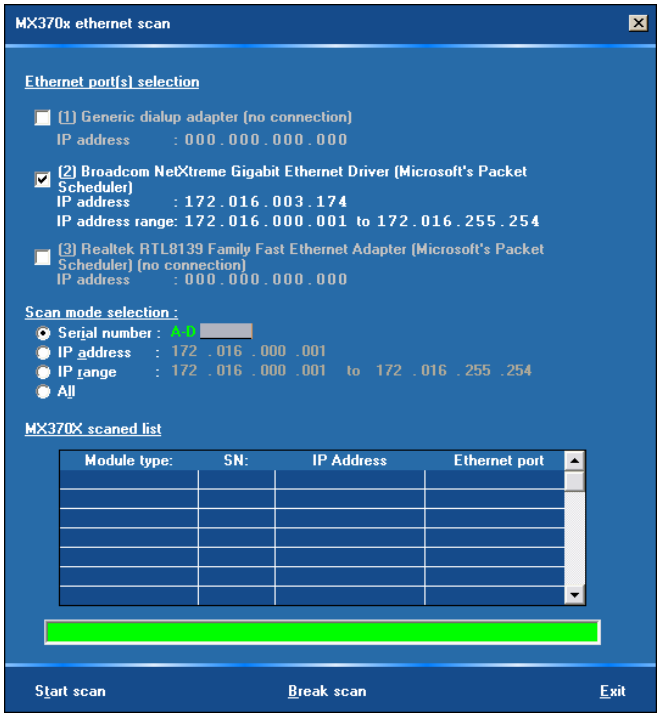
> All points are OK and your module still doesn’t work?

In this case we recommend you rebooting your computer, restarting SET3701 and searching manually.

7.2.1 Searching for a module

If you look for a module, click in the **SET3701** introduction window on „Scan“. The following window will appear:

Fig. 7-5: SET3701: Ethernet scan



With this window you can search in your network for **MSX-E370x** modules. You can select the network cards and the operating modes you want to use for the search. All blanks ("…") must be replaced by "0".
There are four different types of search:

- **Serial number**: Search by the serial number. This can be found on the module (grey-coloured label) and begins with **A-D**.
- **IP address**: Search by an IP address
- **IP range**: Search by an IP address range
- **All**: Searching for all modules.

7.2.2 Changing the IP address

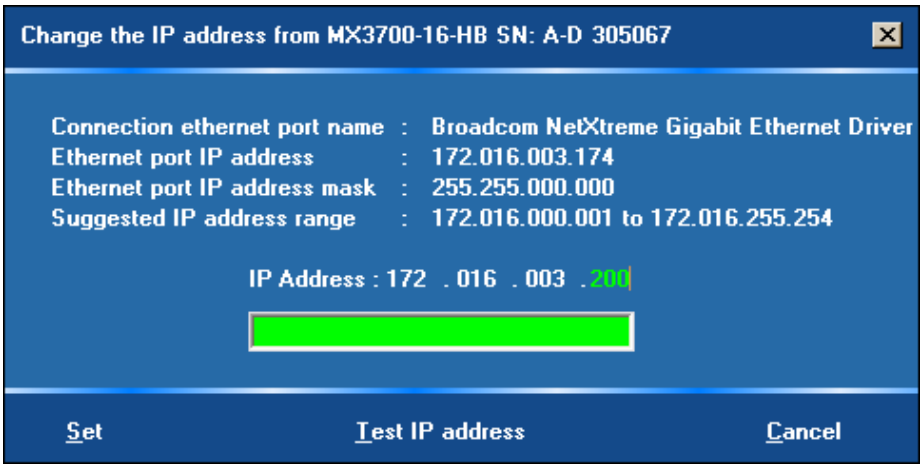
The standard IP address of the Ethernet I/O module is at time of delivery:
192.168.099.099

It is scanned automatically. If you want to change the address later do the following steps:

♦ **Click on "Change IP address"**

The following window will open:

Fig. 7-6: SET3701: IP address



This window displays the information about the network card:
- Name
- IP address of the network card
- IP address mask
- IP address range that can be called by the network card

The Ethernet I/O module can be called later through your PC if the IP address is within the „Suggested IP-address range“. By clicking on “Test IP address” you can check if the selected IP address is free. All blanks (“…”) must be replaced by “0”.

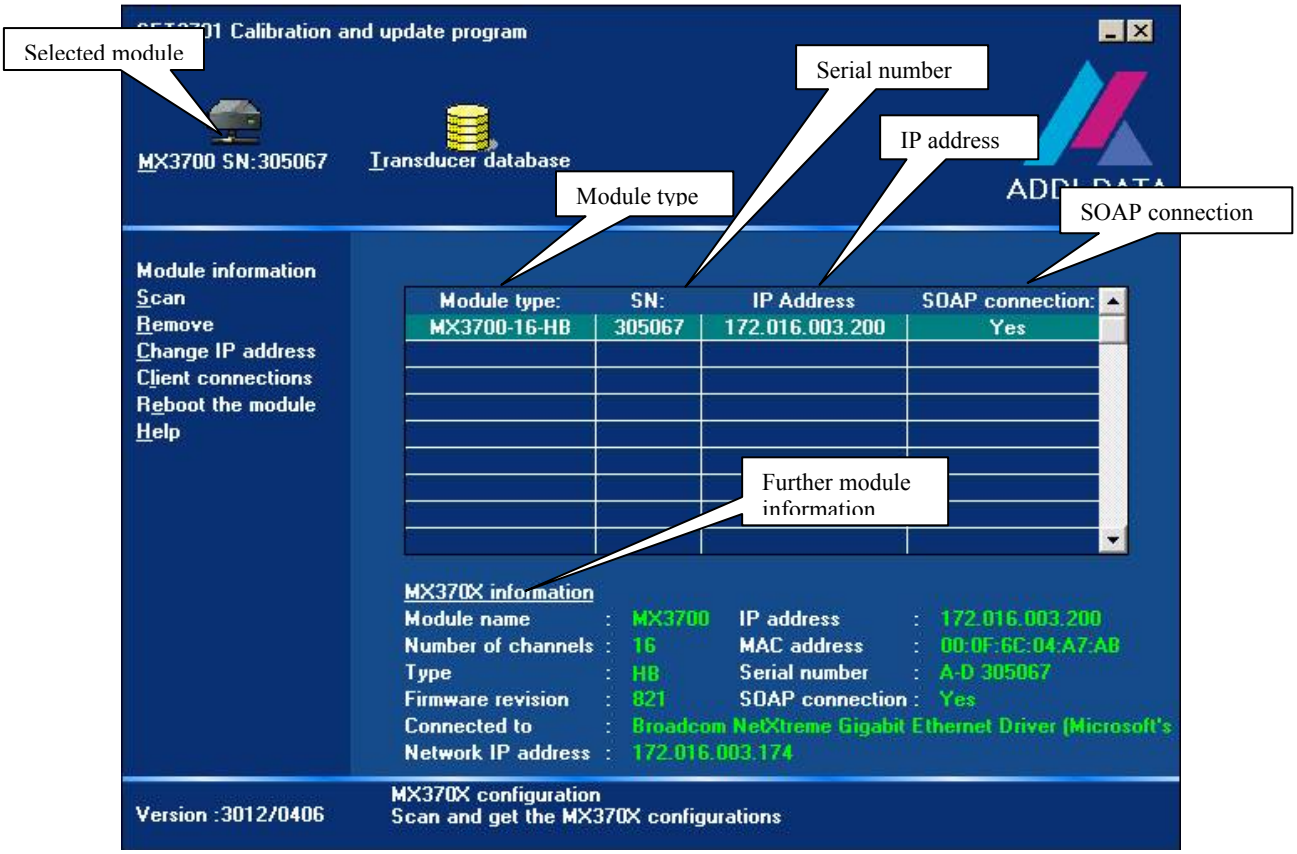
♦ **Select the new IP address and click on “Set“**

7.2.3 Module information

The main window displays the information of all modules.
The „SOAP connection“ **must** be available if you want to use the module with your PC. If the connection should not be available, you have to change the IP address of the module.

Under "SOAP connection" should be displayed "Yes":

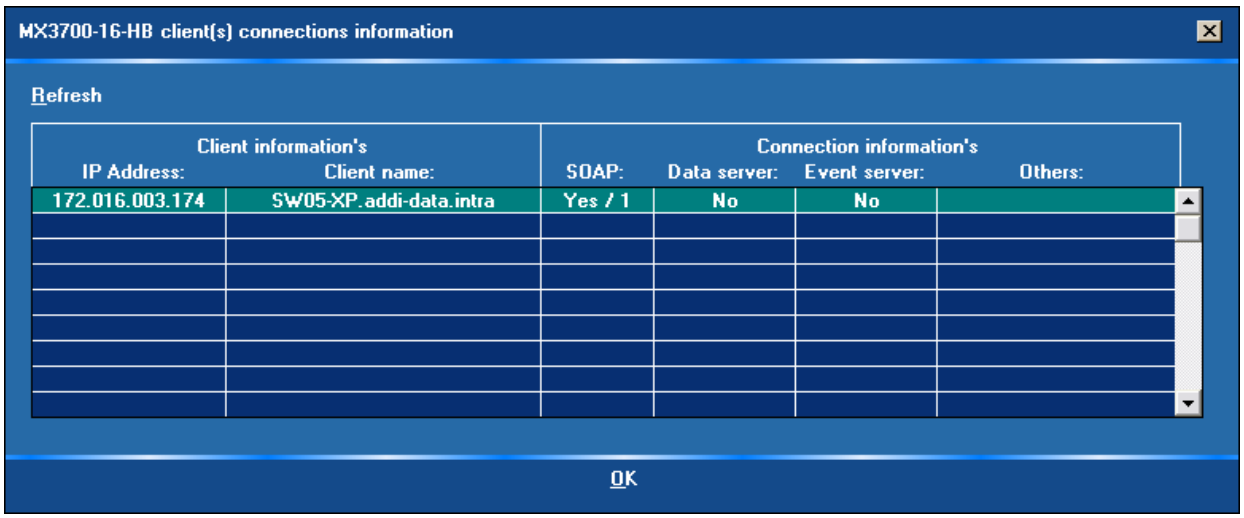
Fig. 7-7: SET3701: Module information



If there are several **Ethernet I/O modules** on your PC, you can get information about the further modules by clicking on the corresponding module.

7.2.4 Client connections

Fig. 7-8: Client connections

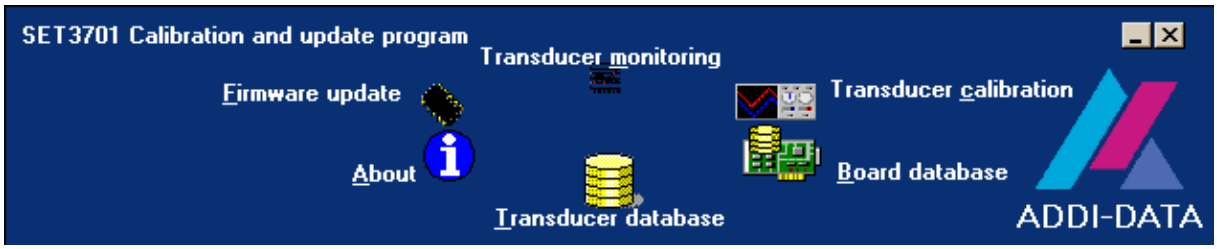


This window shows all client connections of the selected module:
- Client IP address
- Client name (if available)
- Number of SOAP connections
- Number of data server connections
- Number of data event connections
- Further connection information

7.3 Transducer database

♦ **Double-click in the main menu on the icon „Transducer database“.**

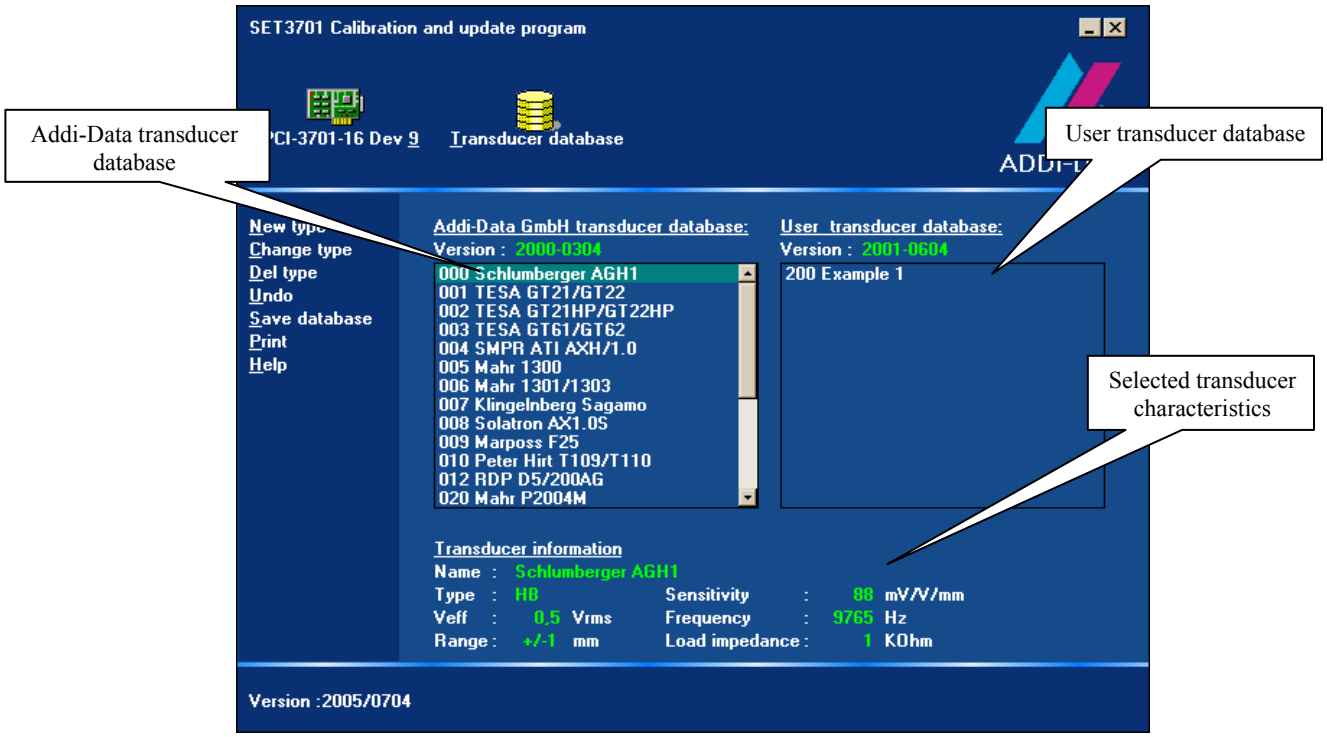
An animated menu opens:



♦ **Double-click on the icon “Transducer database“**

The animated menu disappears and the window „Transducer database” is activated.

Fig. 7-9: Window „Transducer database“



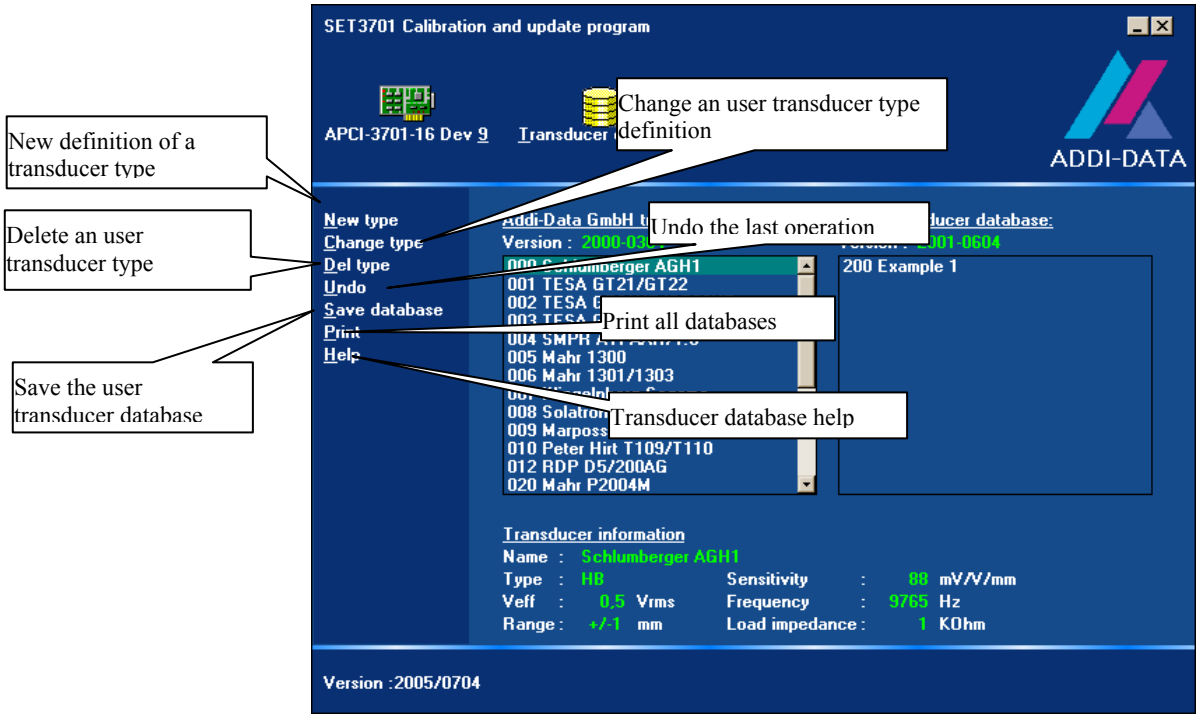
The Ethernet I/O module can be connected to different transducers. All transducer information will be saved in two databases:
- Addi-Data GmbH transducer database
- User transducer database

Each databse contains the following transducer information:
- Transducer name
- Transducer type (LVDT or HB)
- Sensitivity (mV/v/mm)
- Veff (Vrms)
- Frequency (Hz)
- Range (+/- mm)
- Load impedance

Each of these characteristics is given by the transducer manufacturer. Select a transducer and the characteristics will be displayed in the lower field. The databases do not indicate the transducers that are loaded on the module.

7.3.1 Menu transducer database

Fig. 7-10: Menu transducer database



7.3.2 ADDI-DATA transducer database

Addi-Data has already defined several transducers. This transducer list cannot be deleted or modified by the user. The transducers are defined according to the information of the manufacturer. The number before the transducer name is the transducer index number.
The version number above the list “Addi-Data GmbH transducer database” shows the last modification date (the first 4 figures: month and year) and the revision number (last 4 figures).
If you use ADDIPACK:
The index number is the same number which the user must enter in the function „b_ADDIDATA_InitTransducerChannel” of the ADDIPACK driver (sse parameter: w_TransducerIndex).

7.3.3 User transducer database

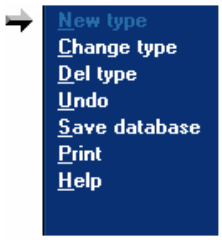
By the first installation the database is empty. If you have not found a compatible transducer in the list “Addi-Data GmbH transducers database”, you shall define a new transducer type. The new types will be saved in database file. The file name for the standard module **MSX-E370x** is „User_SV.DB and for the **MSX-E370x-K**: “User_NKV.DB”.

These files can be found in the **SET3701** installation path "\DataBase". If you delete or reinstall the **SET701** application, these files will not be deleted.

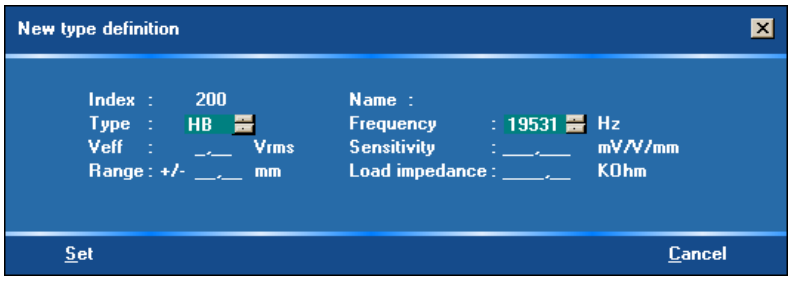
7.3.4 Definition of a new transducer type

The user can create 56 transducer types. For creating a new type observe the following steps:

♦ **Click on "New type" to create a new transducer type**



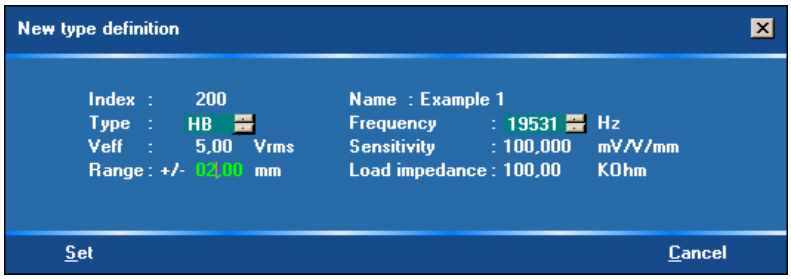
A new window appears:



You must complete the following fields:
- Name
- Type (LVDT or HB)
- Sensitivity (mV/v/mm)
- Veff (Vrms)
- Frequency (Hz)
- Range (mm)
- Load impedance (KOhm)

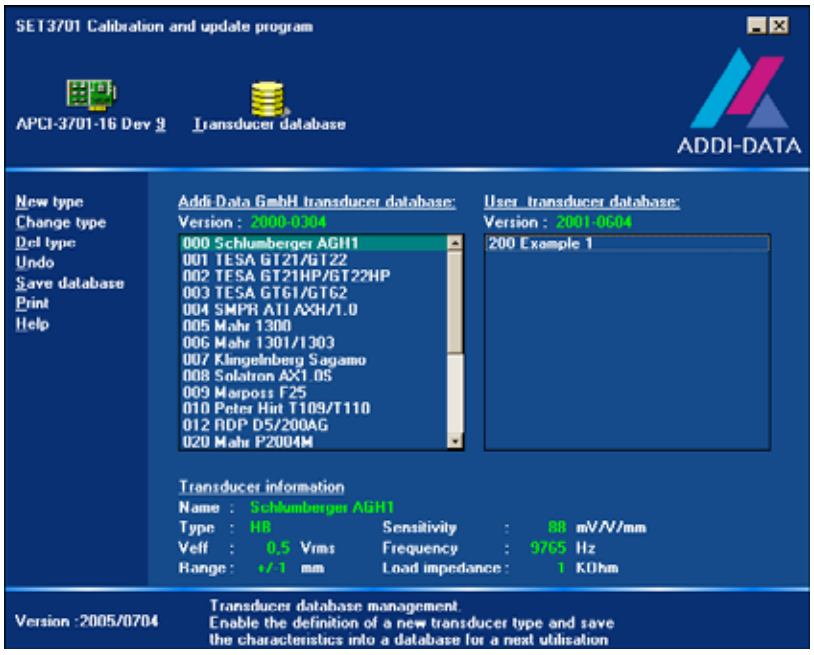
The characteristics of the transducer shall be given by the transducer manufacturer. Except the field „Name", all blanks („ „) must be replaced by „0". „Index" is the index number of the transducer. The value of the "Index" can range between 200 and 255.
If you use ADDIPACK:
The index number is the same number as the one passed in the function „b_ADDIDATA_InitTransducerChannel" of the ADDIPACK driver (see parameter "w_TransducerIndex").

Fig. 7-11: SET 3701: Example: Definition of a new type



After defining the new transducer type it will be displayed in the "User transducer database".

Fig. 7-12: SET 3701: Display: New transducer type

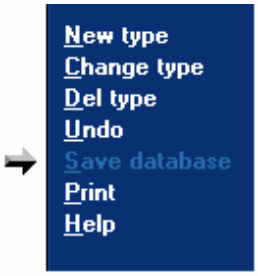


For changing the transducer information do the following steps:

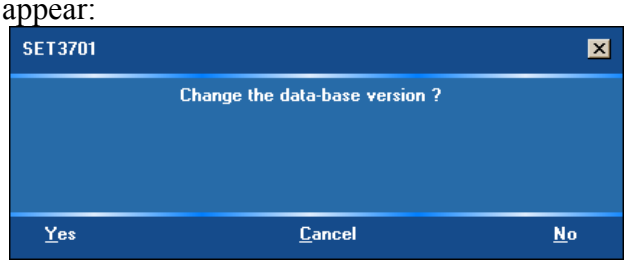
♦ **Double-click on the required type or use the menu "Change type".**

♦ **If all information is correct, click on "Save database" to save the new type.**

Fig. 7-13: SET3701: Save a new type



A new window will appear:



The version above the list “User transducer database” indicates the last modification date (the first 4 numbers: month and year) and the revision number (last 4 numbers).

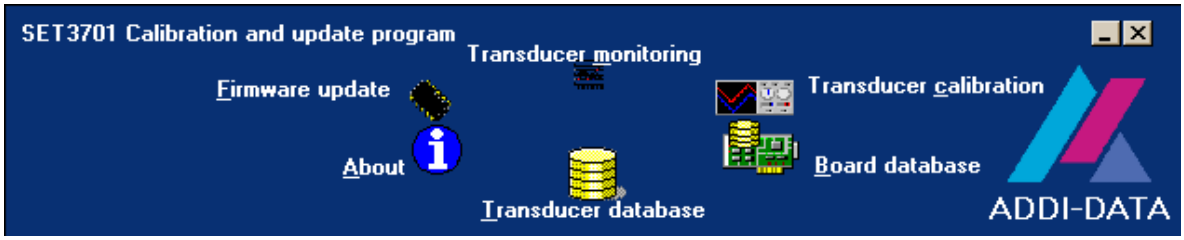
You can change the database’s version. E.g. to compare e.g. this version with the version of your final client. Select “Yes” to change this version.

IMPORTANT!
Please observe that the database firstly is stored only on the computer. The transducer types that you want to use with the module must be loaded on the module with the menu “Board database”.

7.4 Module database

♦ **Double-click on the icon „Transducer database“ in the main menu**

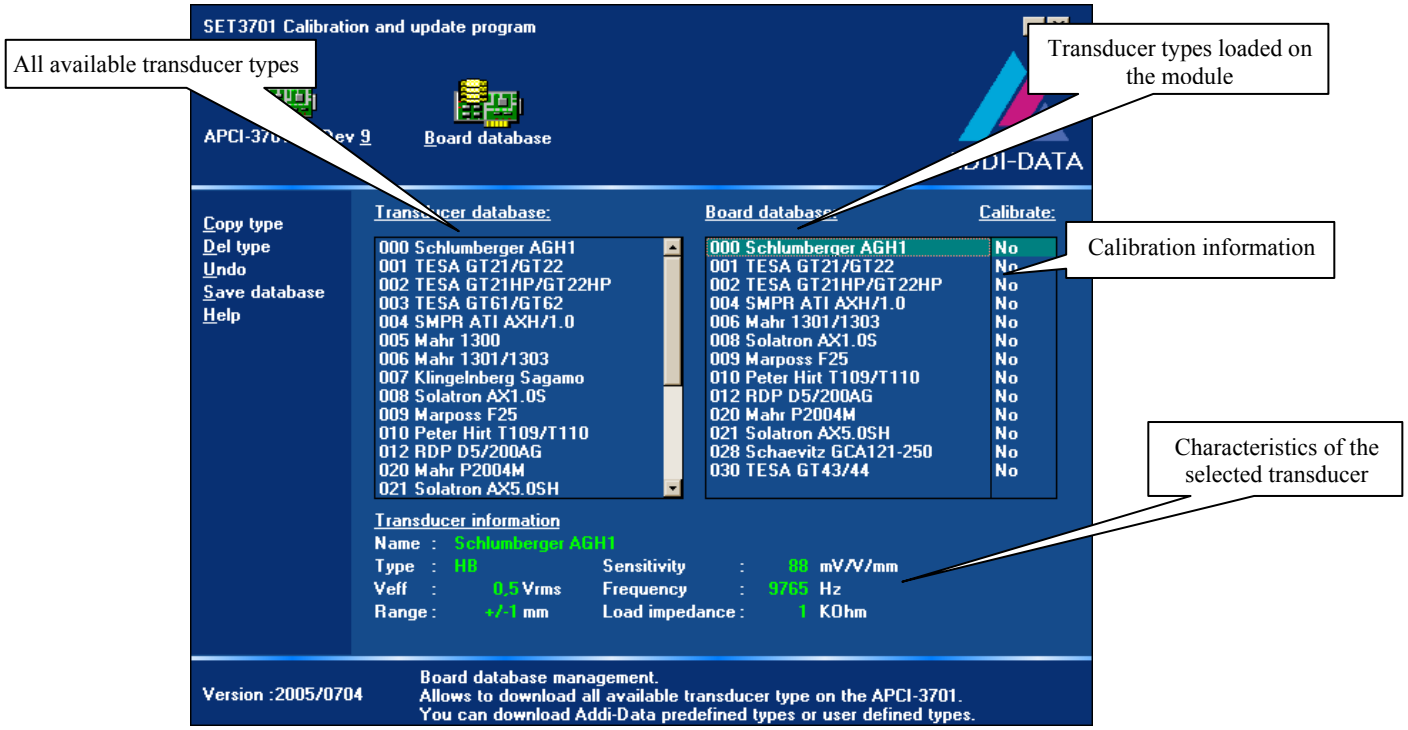
An animated menu appears.



♦ **Double-click on the icon „Board database“.**

The animated menu disappears and the window “Board database” is activated.

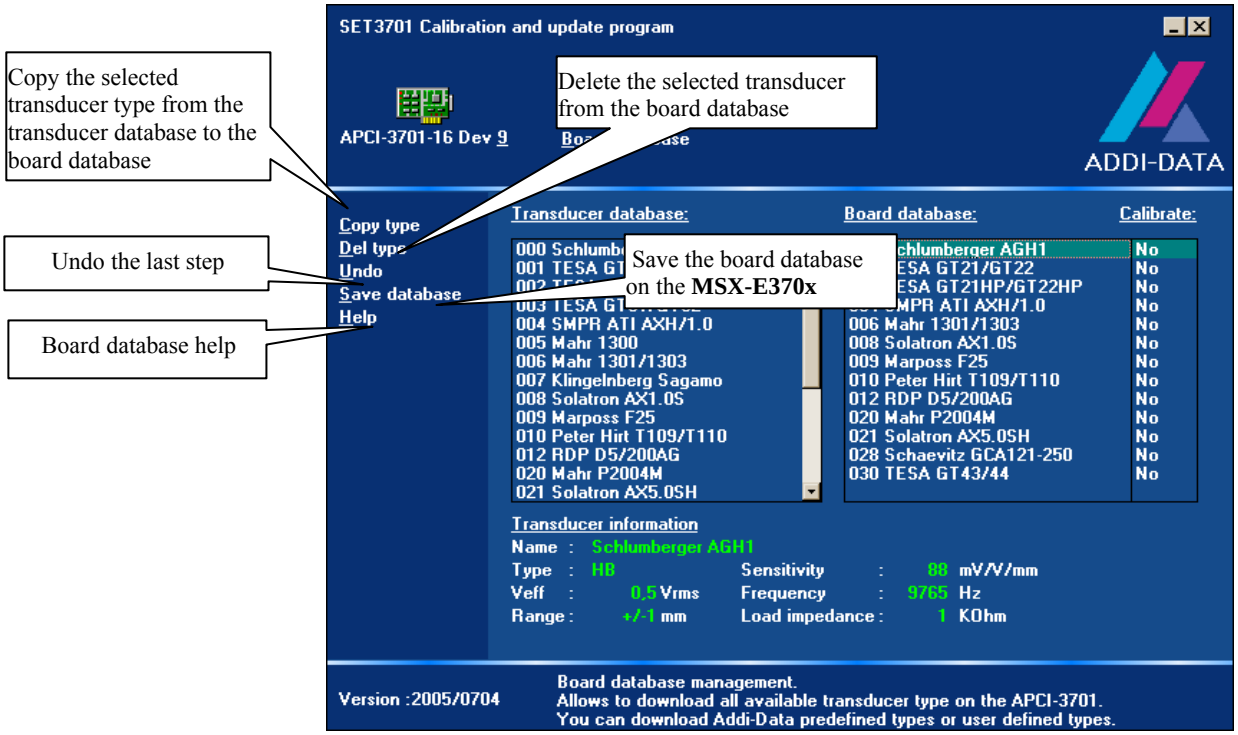
Fig. 7-14: Window„Board database“



You can load up to 14 transducer types on a **MSX-E370x**.
“Transducers database” lists all available transducers. The list contains the “Addi-Data GmbH transducer database” and the “User transducer database”.
“Board database” lists all transducer types that are loaded on the **MSX-E370x**.

7.4.1 "Module database" menu

Fig. 7-15: Menu module database



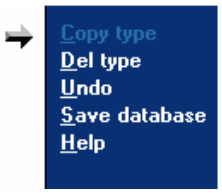
7.4.2 Copy a new transducer type into the board database

You can copy a transducer type to the module either with the command "Copy type" (see below) or with "Drag & Drop" (see below).

7.4.3 Copy through „Copy type"

♦ **Select the transducer type that you want to copy from the "Transducer database" and click on the command "Copy type".**

The selected transducer type was copied into the "Board database".



IMPORTANT!
You can copy only 14 transducer types into the „Board database". You can delete transducer types that are not used with the command „Del type" to leave space for other ones.

7.4.4 Copy through „Drag & Drop“

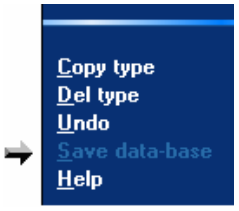
- **Select the transducer type that you want to copy to the “Transducer database”**
- **Press the right mouse key and drop the transducer type to the “Board database”**
- **Release the mouse button**

IMPORTANT!
You can copy max. 14 transducer types into the „Board database“. You can delete transducer types that are not used with the command „Del type“ to leave space for other transducers.

The selection was copied into the „Board database“.

7.4.5 Save the board database

After having loaded all required transducer types, select “Save database” to load this list on the selected Ethernet I/O module **MSX-E370x.**



7.5 Transducer calibration

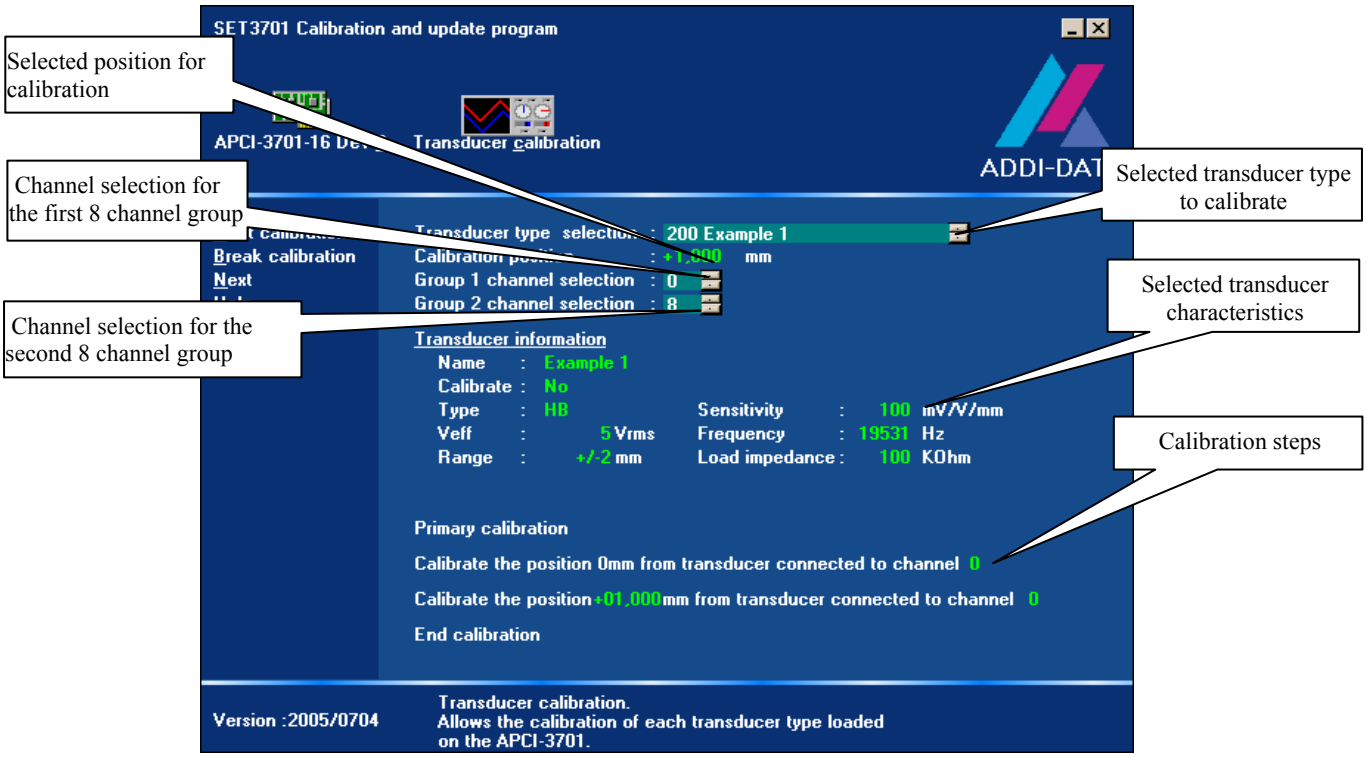
♦ **Double-click on the main menu icon to activate the window "Transducer calibration"**

The animated window appears.

♦ **Double-click on the icon "Transducer calibration".**

Now the window „Transducer calibration" is activated.

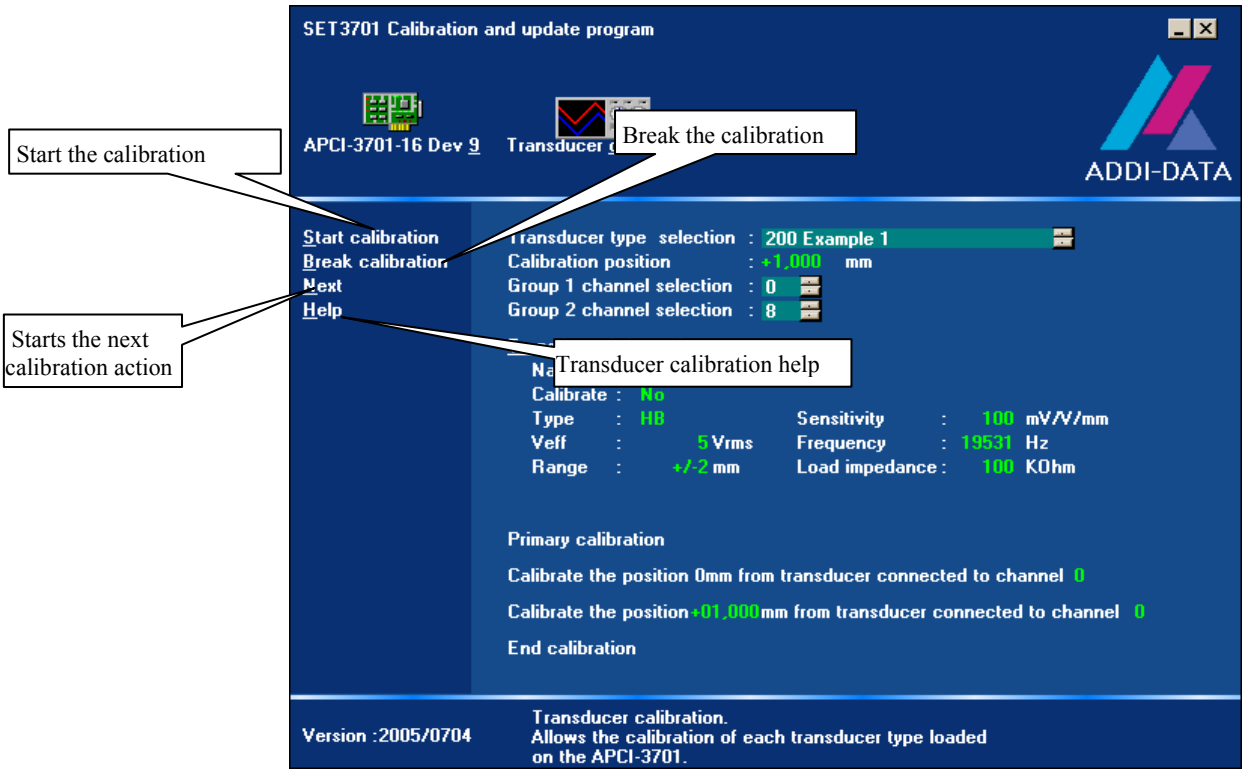
Fig. 7-16: „Transducer calibration" window



For each used transducer type you must calibrate the module. The "Transducer type selection" lists all transducer types that are loaded on the I/O module **MSX-E370x.**
"Calibration position" indicates the position that is used for calibration. This position ranges from 0 to the maximum positive transducer position. Per default the software selects the middle of this range. One channel per module has to be calibrated.

7.5.1 Transducer calibration menu

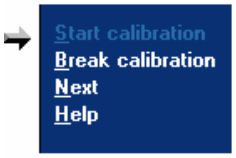
Fig. 7-17: Transducer calibration menu



7.5.2 Calibration

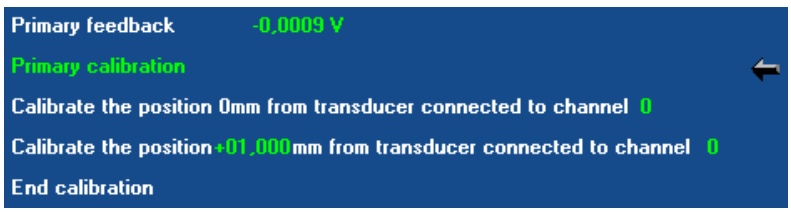
Firstly, do ensure that you have selected the transducer type to be calibrated, the calibration position and the channel to which the transducers are connected.

♦ **Then click on "Start calibration"**

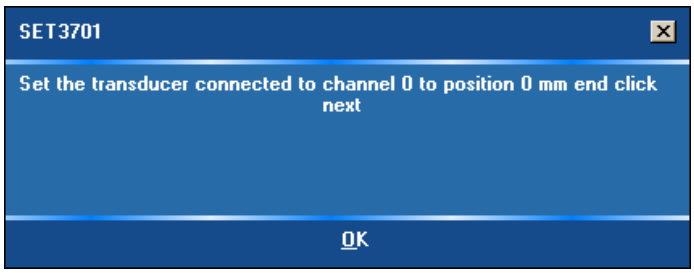


The current step is emphasized with a pointer and green text color. Each step in waiting status is emphasized with a pointer and red-white blinking text color.

The first calibration step is the module calibration. For this step no manipulation of the user is necessary.

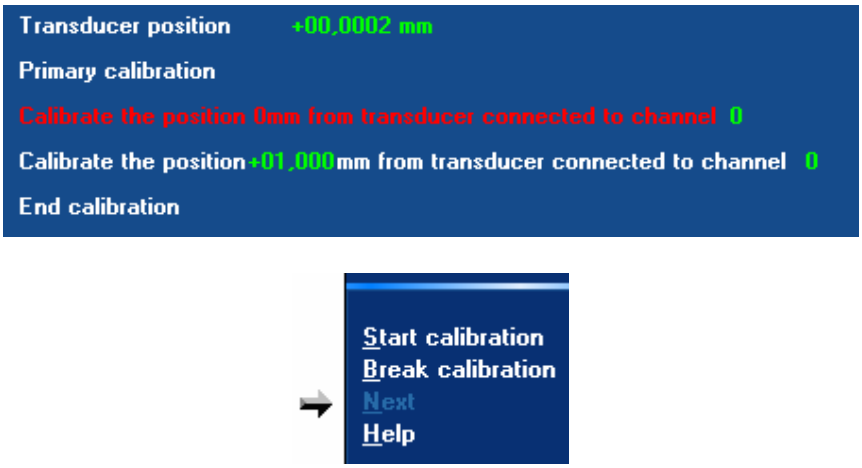


Now the mechanical 0 position is calibrated.

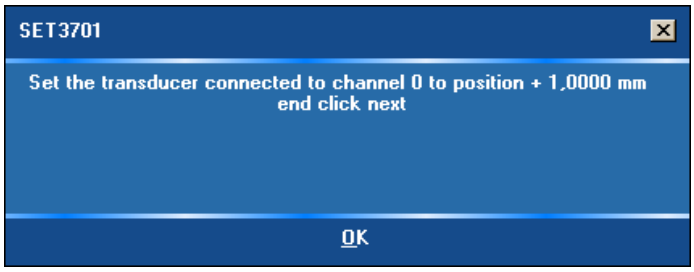


♦ **Click on "OK"**

♦ **Set the transducer to the mechanical position 0 and click on "Next"**

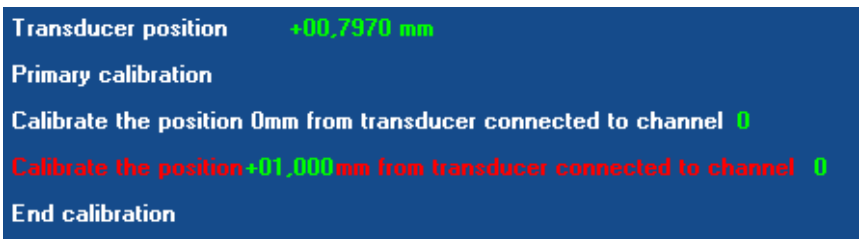


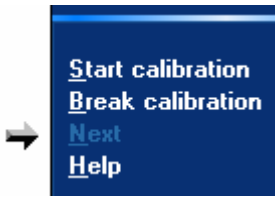
Now the user selected calibration position is calibrated.



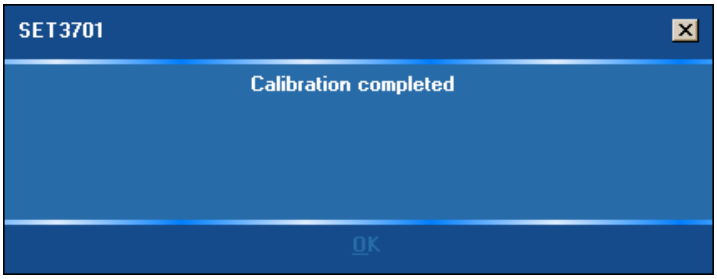
♦ **Click on "OK"**

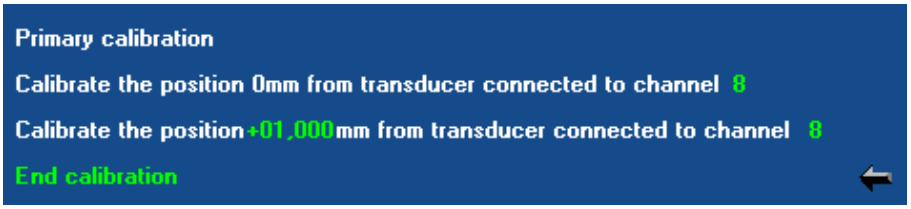
♦ **Set the transducer to the mechanically selected calibration position and click on "Next"**





The calibration is completed.





7.6 Transducer monitoring

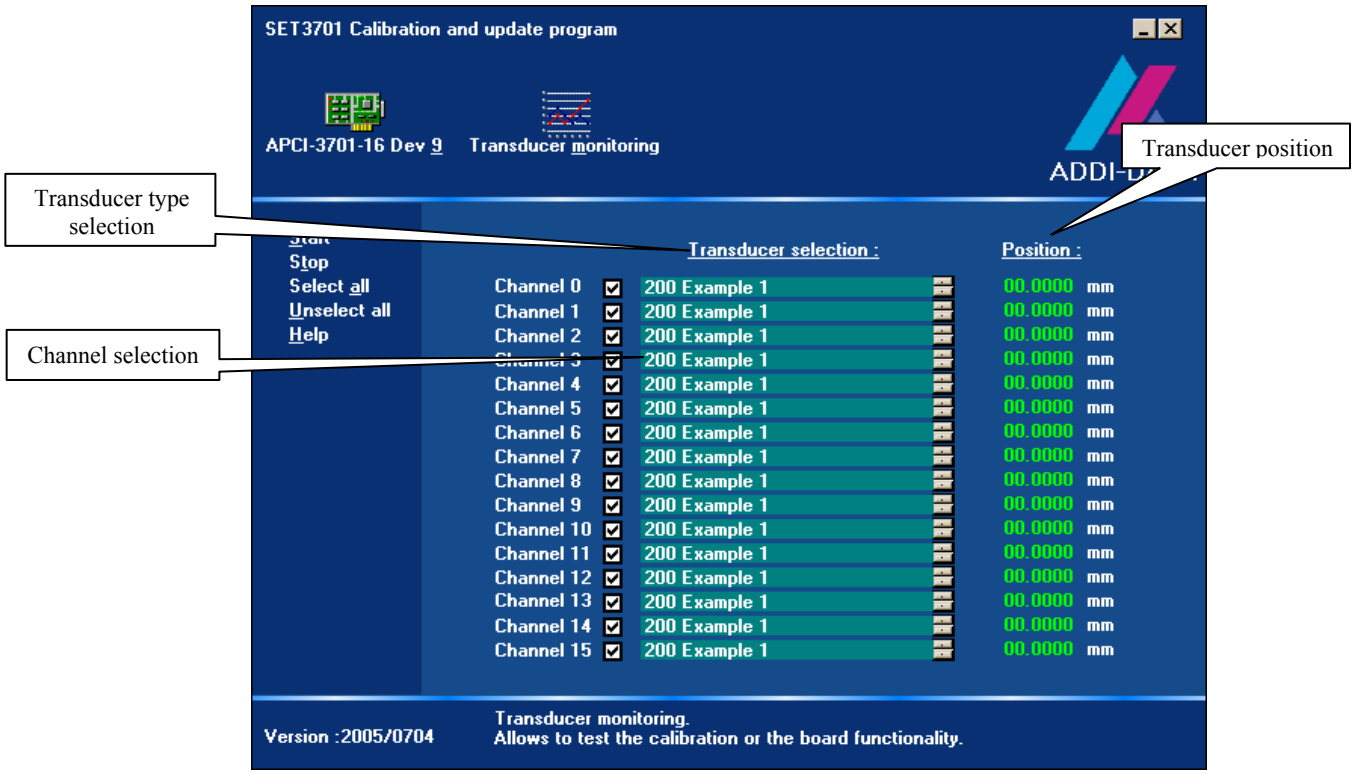
♦ Click in the main menu on the icon „Transducer database“.

An animated menu appears.

♦ Double-click on the icon „Transducer monitoring“

The animated menu disappears and the window “Transducer monitoring” is activated.

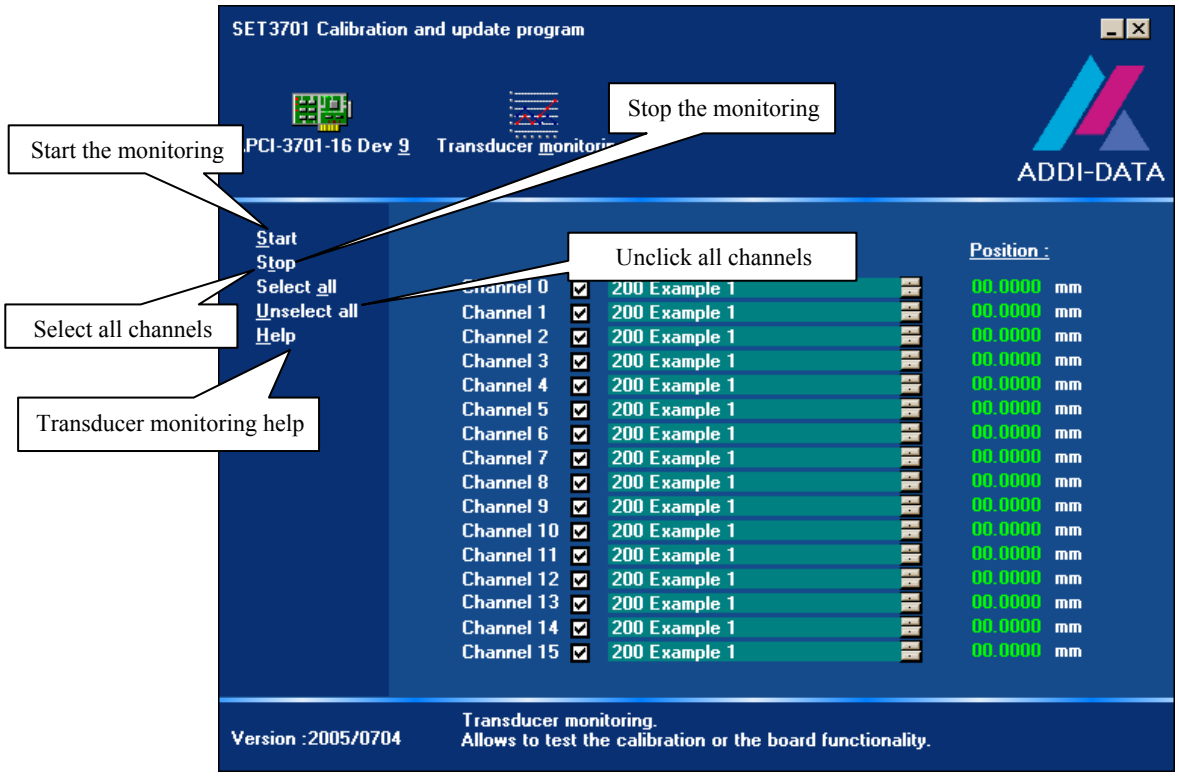
Fig. 7-18: Window „Transducer monitoring“



After having calibrated the Ethernet I/O module, you can use the transducer monitoring for testing the module functions. If the window appears, firstly the last calibrated transducer type is selected automatically as default and all available channels are selected.
You can change the transducer type. All transducer types that are loaded on the Ethernet I/O module can be selected.

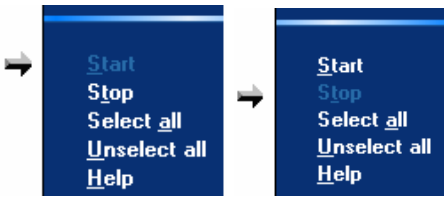
7.6.1 Transducer monitoring menu

Fig. 7-19: Menu transducer monitoring

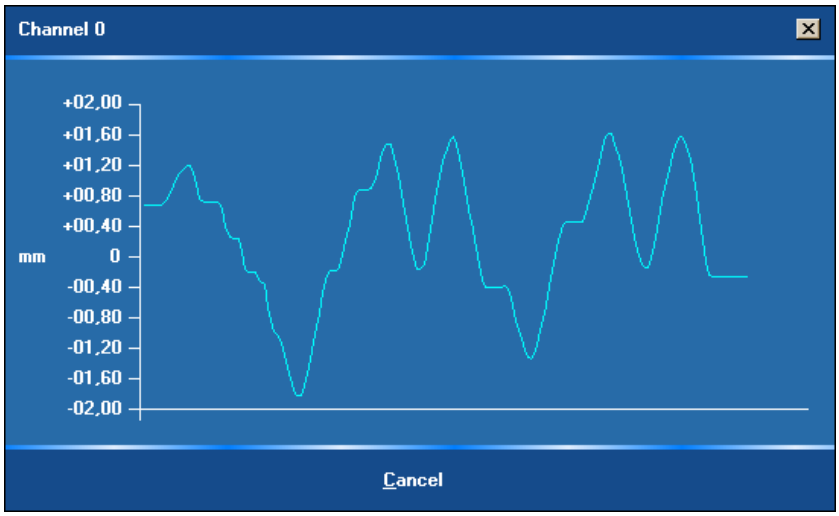


7.6.2 Acquisition

You can select one or more channels for the monitoring (one transducer type for all channels). The commands “Select all” and “Unselect all” allow the selection of all channels by a click. The acquisition rate depends on the number of channels to be acquired. For starting the monitoring click on “Start”. You can stop the monitoring with “Stop” at any time.



After having started the monitoring, you can open a trend graphics window for one channel. To do this, double-click on the selected channel result.

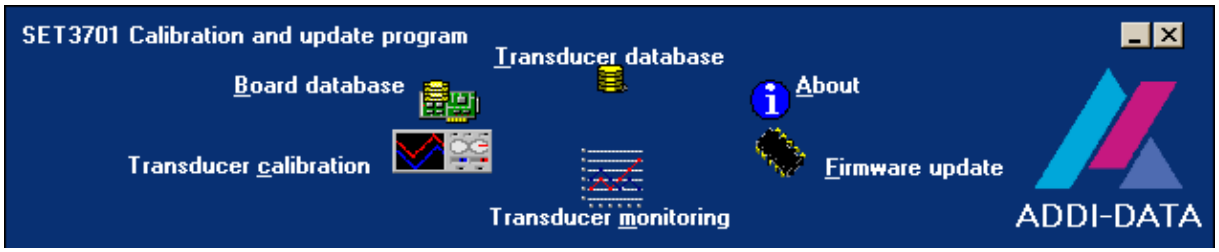


7.7 Firmware-Update

♦ **Double-click in the main menu on the icon „Transducer database" to call the window "Firmware update".**

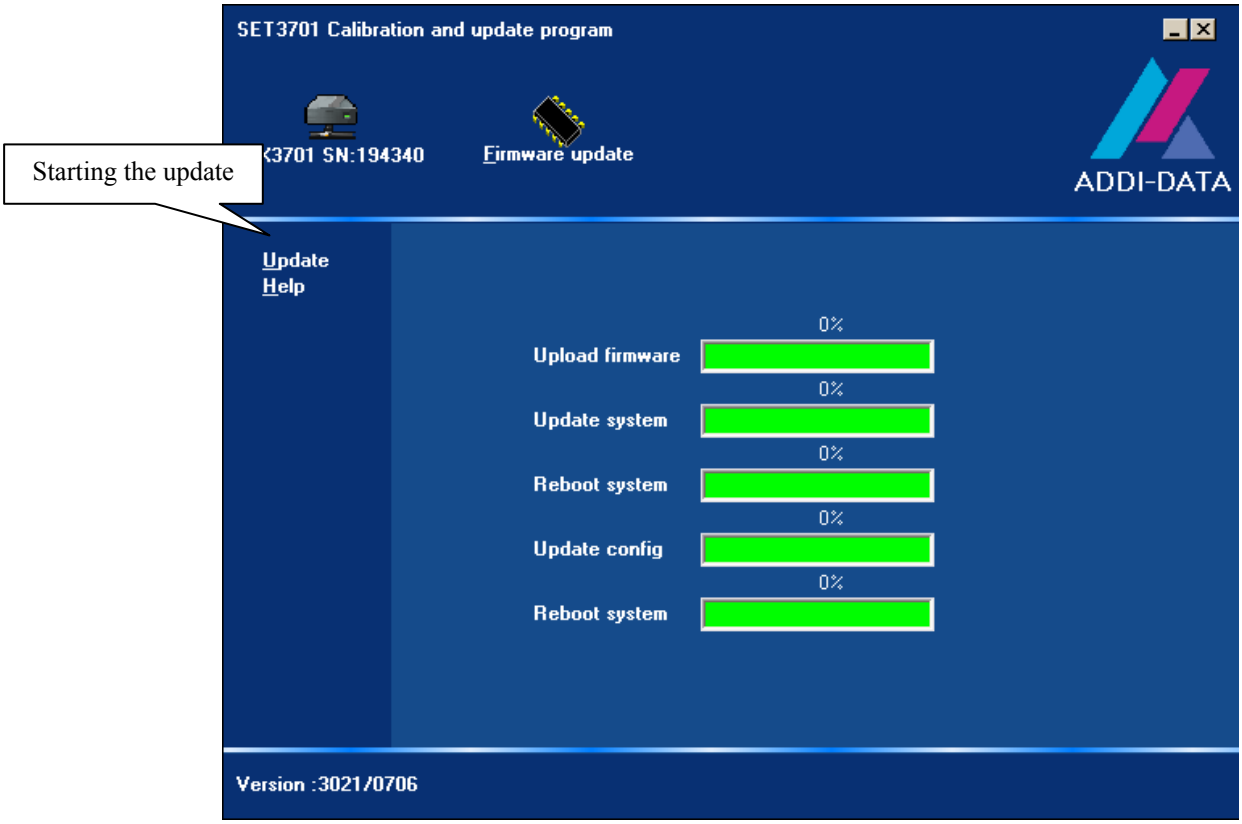
An animated window appears.

♦ **Double-click on "Firmware update".**



The animated menu disappears and the window "Firmware update" is activated.

Fig. 7-20: Window „Firmware update“



♦ **Click on “Update” to start the update automatically.**

8 SOFTWARE – OPTION 1: DIRECT ACCESS

After you have configured your Ethernet I/O module with **SET3701**, you can choose between the following two options for using your module:

Option 1: With direct access (all functionalities of the module can be used)
Option 2: With ADDIPACK (for compatibility with PCI board)

This chapter describes option 1 (direct access).

8.1 Interface to the module

The module is accessed via a TCP/IP socket:

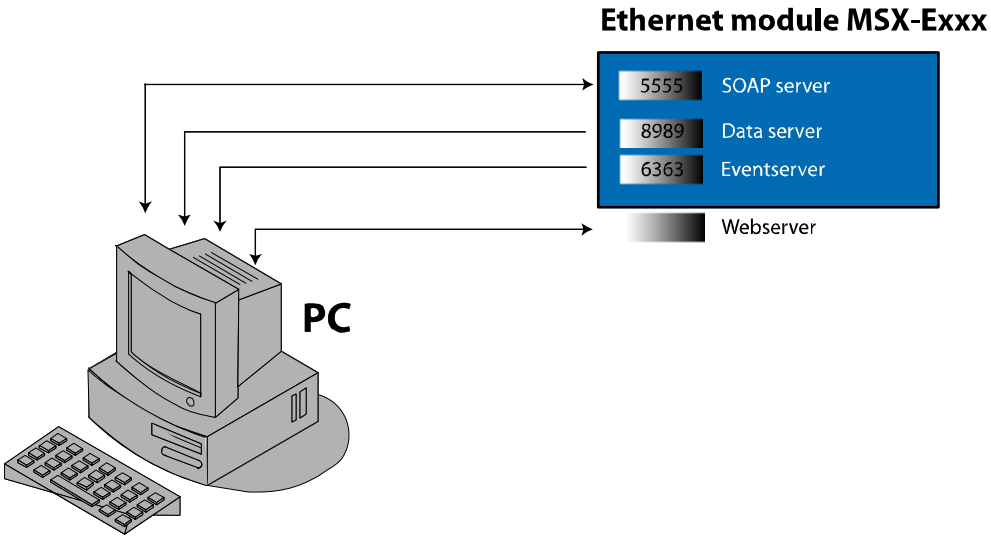
The Ethernet I/O module has the following three servers:

Command server (SOAP)	to send commands (acquisition, initialisation, etc.) > see chapter 8.2/chapter 8.3
Data server (TCP or UDP socket)	to receive the values of the acquisition > see chapter 8.4
Event server (TCP socket)	to receive the events of the module > see chapter 8.6

MSX-E370x server access information:

Server	Port number	Access via webserver
SOAP server	5555	Yes
Data server	8989	Yes
Event server	6363	No

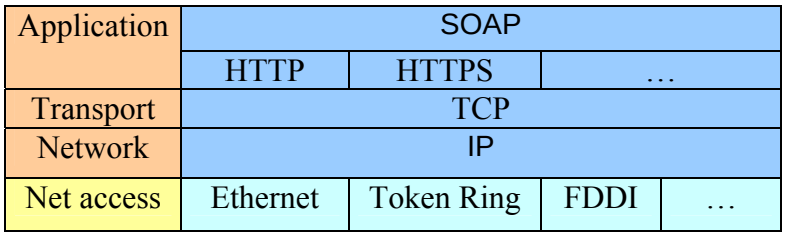
Fig. 8-1: Direct access: Overview



8.2 SOAP: General definition

What is SOAP?
SOAP (originally *Simple Object Access Protocol*) is a protocol with which data can be exchanged between systems, and Remote Procedure Calls can be executed. SOAP is based on services of other standards, XML for representing the data and internet protocols of the transport and user layer (see TCP/IP reference model) for transmitting the messages. The most usual combination is SOAP via HTTP and TCP. The abbreviation SOAP is used not used anymore since version 1.2 because it is (subjective) not „simple“ and it serves not only for accessing to objects (Object Access).

Fig. 8-2: SOAP in the TCP/IP protocol staple



What is a socket?

A **socket** is a bidirectional software interface to interprocess *(IPC)* or network *communication*.

Sockets are a standardized interface (API) between the network-protocol-implementation of the operating system and the actual application software.

8.3 SOAP functions

For further information: See “Public SOAP function description” (see separate PDF file as link in the bookmarks)

8.4 Data server protocol

From version 2.0 the dataserver can be configured to support TCP/IP or UDP/IP.

This page describes the data package format provided by the **MSX-E370x** I/O driver to clients over the network through the dataserver.

A data packet is made of a variable number of fields who depend of the acquisition mode and the parameters specified to the module.

8.5 Description of the data format

Integer format

All Integer characters are Little-Endian.

Conversion in analog values

In the autorefresh and sequence mode it is possible to configure the module for converting digital raw value into analog values (mm units).

Formats: IEEE 754 Intel-compatible 32-bit floating point (unit: mm)

Autorefresh mode

Parameters
Besides the autorefresh counter and data it is possible to request a time stamp to be sent.

Data package format

tv_sec	tv_usec	Autorefresh counter	… (data)
4 bytes	4 bytes	4 bytes	4 bytes
Optional if data format with time stamp	*Optional if data format with time stamp*	always	The number of data depends from the autorefresh mask.

Sequence mode

Parameters

Besides the data it is possible to request a time stamp and a sequence counter.

Data package format

tv_sec	tv_usec	Sequence-counter	…(data)
4 bytes	4 bytes	4 bytes	4 bytes
Optional if data format with time stamp	*Optional if data format with time stamp*	*Optional if data format is with sequence counter*	The number of data depends from the sequence channel list.

MIN/MAX mode

The dataserver does not provide data.

8.6 Eventserver protocol

An **Event** is the change of the status of a subsystem. Read more about subsystems and their states in the documentation „Subsystems and States“ (soon available).

The eventserver is a network service that informs the connected clients about status changes of states in subsystems.

Clients are connected via TCP/IP socket to an eventserver and receive messages about changes in package format.

If a client is connected the first time to an eventserver, it receives a summary about the current state of the module status in form of an event. There is a relation between each newly received package and a change in the subsystem.

8.6.1 Package format version 0

Each package has a time stamp that records when the event was recorded (see chapter **Fehler! Verweisquelle konnte nicht gefunden werden.** “Time stamp format”)

Field	Size (byte)
0 (version of the package format)	1
Number of the following bytes	1
Subsystem ID	1
New status ID (status ID)	1
tv_sec	4
tv_usec	4

8.7 Time stamp format

The time stamp uses the UNIX convention for showing data about the time.

It can be shown in the the C programming language as follows:

```
struct timeval
{
  uint32_t tv_sec;     /* seconds */
  uint32_t tv_usec;    /* microseconds */
};
```

The field **tv_sec** indicates the seconds from the beginning of the UNIX epoch (1st January, 1970)

The field **tv_usec** indicates the remaining microseconds within a second.

9 SOFTWARE - OPTION 2: ACCESS WITH ADDIPACK

After you have configured your Ethernet I/O module with **SET3701**, you can use your module with one of the following options:

Option 1: With direct access (all functionalities of the module can be used)
Option 2: With ADDIPACK (for compatibility with PCI board)

This chapter describes Option 2 (access with ADDIPACK).

9.1 Differences to the board APCI-3701

The Ethernet I/O module **MSX-E370x** can be compared with the board **APCI-3701,** which is already available in our product range.

Table 9-1: Difference between I/O module MSX-E370x and the board APCI-3701

Ethernet I/O module MSX-E370x	PCI board APCI-3701
1 transducer type adjustable per module	1 transducer type adjustable per channel
Additional „Autorefresh Average Mode“ per channel	Only „Autorefresh Average Mode“ per sequence
Programmable filter for the digital input (trigger)	No programmable filter for the digital input (trigger)
Synchronous acquisition between the modules	No synchronous acquisition between the boards
Only 1 A/D converter on the module	2 A/D converters (on APCI-3701-16)
No Timer	Timer
1 digital input	4 digital inputs/outputs
Acquisition modes „Read1“ and „ReadMore“ without IRQ	Acquisition modes „Read1“ and „ReadMore“
ADDIPACK functions that access to the module cannot be called in Ring0.	ADDIPACK functions that access to the module can be called in Ring0.

IMPORTANT!
Install and start firstly SET3701 to configure the module (see chapter 7).

IMPORTANT!
The software functions which support the Ethernet I/O module **MSX-E370x** are listed in the end of this chapter.

The Ethernet I/O module is supplied with a driver-CD-ROM (CD 1) containing the ADDIPACK software package for Windows XP.

ADDIPACK is composed of following programs:
ADDIREG: The ADDIREG registration program is a 32-bit program for Windows XP. The user can register all hardware information necessary to operate the ADDI-DATA Ethernet I/O modules.

ADDIDRIVER contains API functions to operate the ADDI-DATA modules in 32-bit.

ADDevice Manager configures the resources of the ADDI-DATA virtual module (see below).

ADDI-DATA virtual module:
ADDI-DATA software is based on the principle of a **virtual module:** it transposes the different functions (e.g. digital inputs, analog outputs, timer, ...) of all inserted ADDI-DATA modules as the functions of a single (virtual) module. The virtual module features a pool of functions, the functionality of which can be called up without calling a specific module.

ADDEVICE MAPPER was specifically developed for the ADDIPACK module to facilitate the management of the virtual module. With this program you can optimally adapt the virtual module to your application requirements.

IMPORTANT!
For some functions of the **ADDEVICE MAPPER** program the browser Internet Explorer 6 or higher has to be installed on your PC.

9.2 Module registration

a) Assigning the IP address

♦ **Install and start SET3701 (is on CD1 "standard drivers")**

Change the IP address of the Ethernet I/O module (further information: see chapter 7 "SET3701")

b) Module registration

♦ **Install ADDIPACK (is on CD1 "standard drivers")**

After this, continue with the module registration as follows:

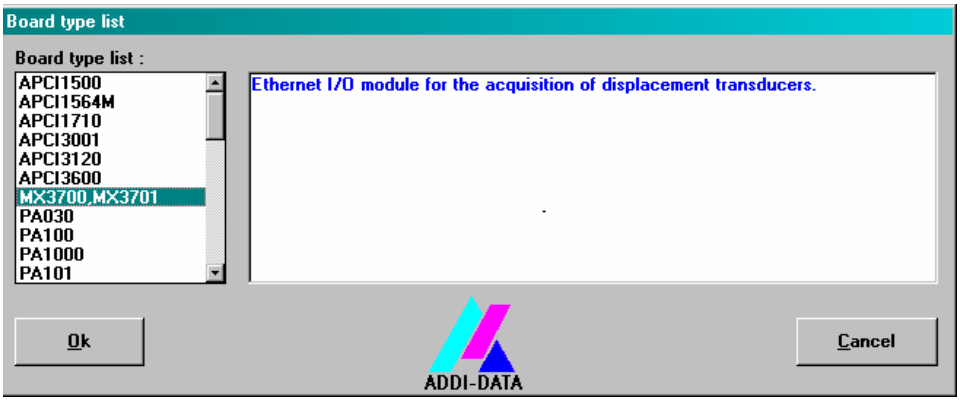
Inserting the module

To use a module you should insert it firstly in ADDIREG.

♦ **Select „MSX-E3700, MSX-E3701“ when clicking on „Insert“ in the ADDIREG-main window (see Fig. 9-5)**

After this the following window will be displayed:

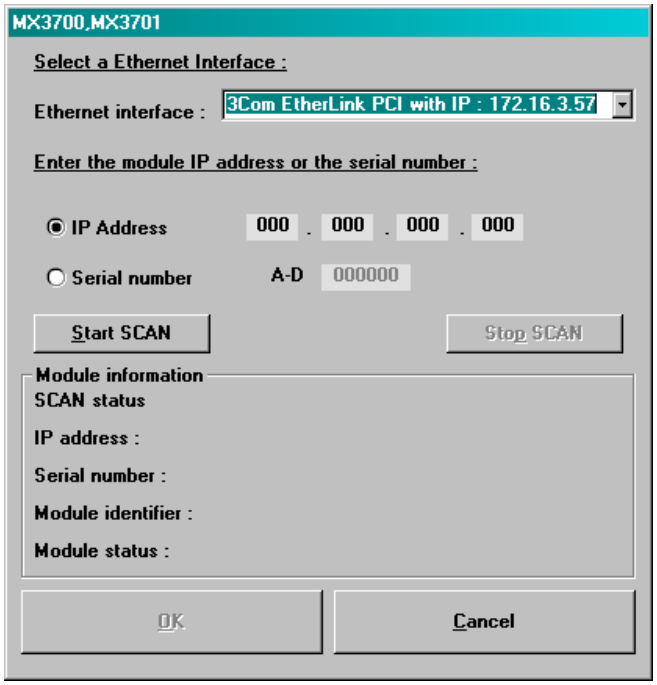
Fig. 9-1: Board type list



♦ **Click on OK.**

After this the following window appears:

Fig. 9-2: Settings



♦ **Select the network card under „Ethernet interface“**

Make sure that you have selected the network card to which the Ethernet I/O module is connected.

♦ **Enter the IP address**

or:

♦ **Enter the serial number of the module**

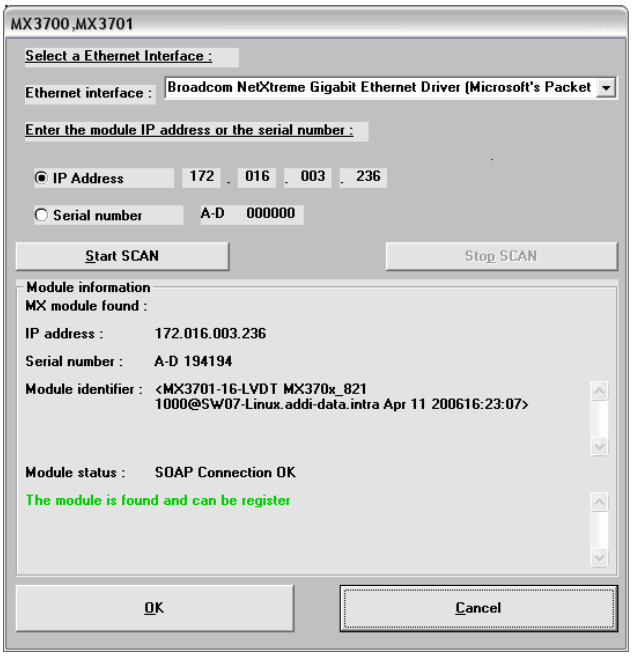
♦ **Click on „Start Scan“**

Depending on the firewall-settings of your PC, it is possible that a Windows-warning will be displayed.

♦ **Click on “Nicht mehr blocken” (don’t block) to start also in this case the scan**

Now the scan will be started. After the module has been recognized, the SOAP connections will be checked.

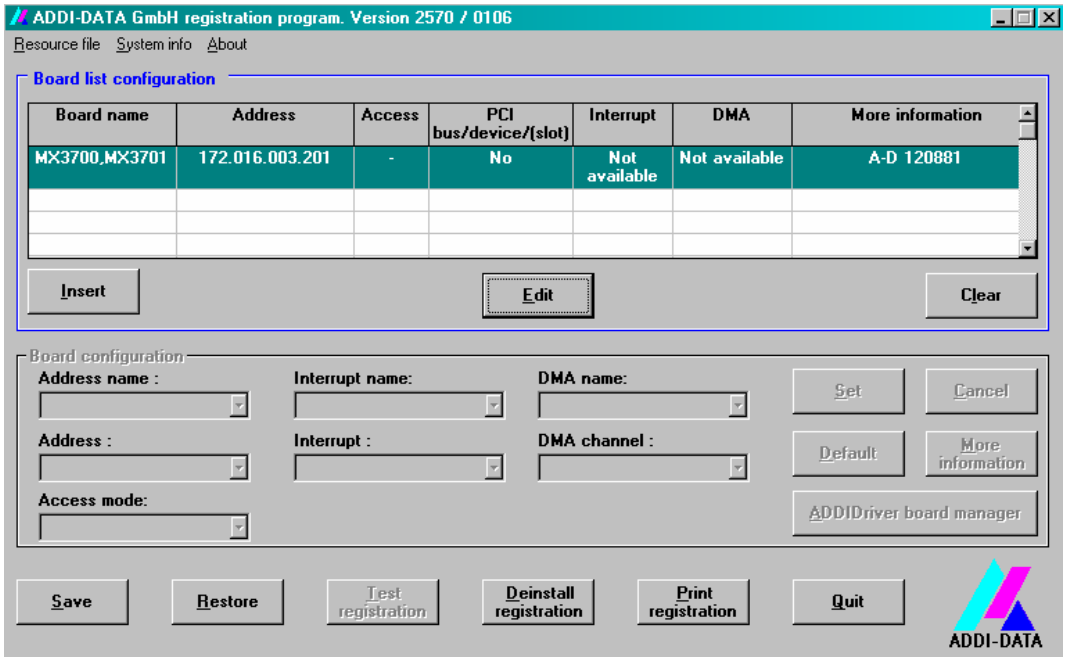
After the scan has been completed successfully and no errors have been detected during the check of the SOAP connections, the **OK** button will be activated and your settings will be listed under “Module information”.

Fig. 9-3: Settings OK	**Fig. 9-4: Settings not OK**
	
This window is displayed if your settings are OK. You can continue as described below.	This window is displayed if your settings are not OK. Follow the advice shown in the window.

♦ **Click on OK**

Now the module is shown in the ADDIREG window:

Fig. 9-5: ADDIREG main window (example)



♦ **Click on „Set“ and then on „Save“**

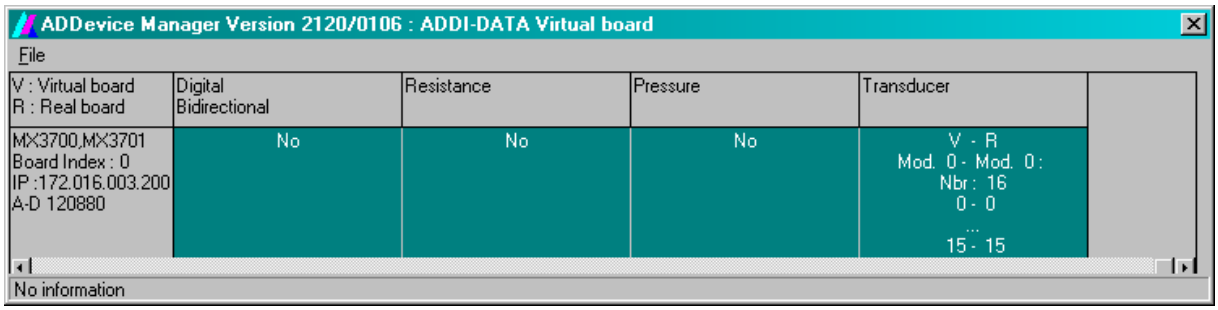
Now the Ethernet I/O module will be integrated in ADDIPACK.

Starting the ADDevice Managers

♦ **Click on „Edit“ and then on „ADDIDriver board manager“**

After this the ADDevice Manager opens:

Fig. 9-6: ADDevice Manager



The ADDevice Manager shows the following information:

First column:
Modul name
Board Index: Number allocated to the Ethernet I/O module when registered in ADDIREG
IP address
Serial number

Further columns:

The program distinguishes between the resources
(Digital/Resistance/Pressure/Transducer, ...) of the virtual module (**V,** software) and the real module (**R,** module).

The following parameters are listed
Module number,
Number of resources
Index: The first index line represents the number of the first resource (left: virtual resource - right: real board) The second index line represents the number of the last resource (left: virtual resource - right: real board).
Type (24 V/5 V, voltage/current, HS/OC - High-Side/Open collector).
IRQ: if the input channels are interruptible, the program displays the number of the first and of the last input channel

By clicking twice within a column, the connection principle and the technical data of the resource are displayed. This function is only possible if a question mark appears with the cursor.

You can export the set configuration as a text file. Click on "file" and save the configuration as a .txt file with "Export information to file...". Then you can print the configuration or use it for other boards.

Once you have controlled the registration, you can quit the window of ADDevice Manager. The module is ready to operate.

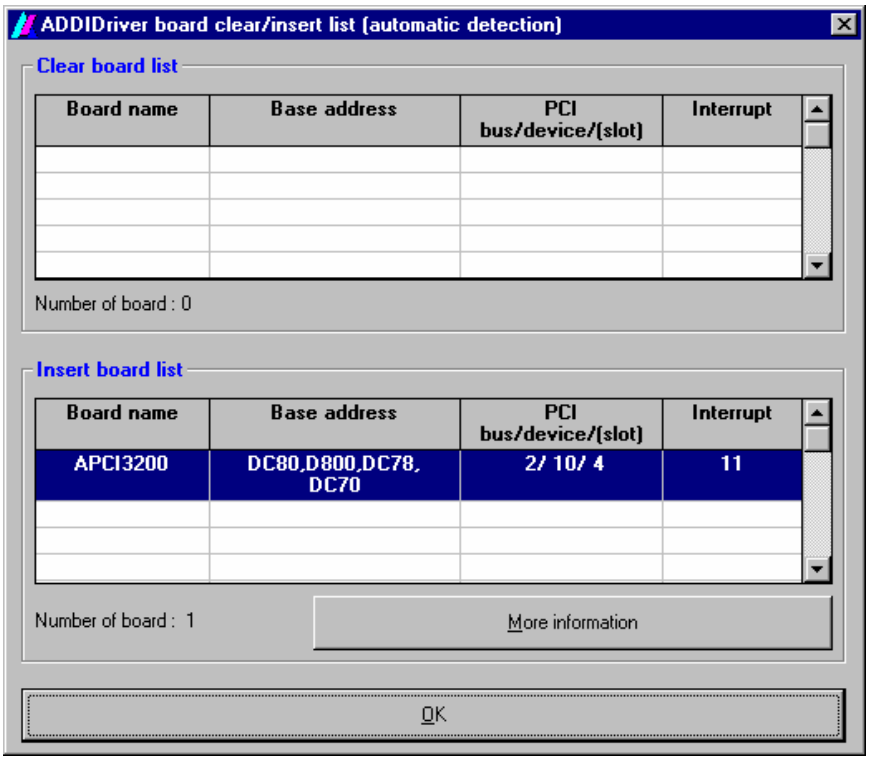
Description of the ADDIREG program

The program is automatically installed with ADDIPACK.
Start ADDIREG under Start/Programme/ADDIPACK/ADDIREG.

IMPORTANT!
First quit all the applications (programs) which use the module before starting the ADDIREG program.

When you start ADDIREG and the Ethernet I/O module is not available anymore you will find it in the “Clear board list”.

Fig. 9-7: Board clear/insert



If you need more information about the operation of the Ethernet I/O module click on “More information”. The ADDevice Manager will be started.

9.3 Questions and software downloads on the web

Do not hesitate to e-mail us your questions.
per e-mail: info@addi-data.de or
hotline@addi-data.de

Free downloads of standard software

You can download the latest version of the software for the Ethernet I/O module **MSX-E370x**:

http://www.addi-data.com

IMPORTANT!
Before using the product or in case of malfunction during operation, check if there is an update of the product (technical description, driver). The current version can be found on the internet or contact us directly.

9.4 Standard software

a) Software functions

ADDIPACK supports the following functions for the **MSX-E370x**.

Table 9-2: Supported software functions

Functionality	Function name
Common functions	i_ADDIDATA_OpenWin32Driver
	i_ADDIDATA_GetCurrentDriverHandle
	i_ADDIDATA_GetDriverVersion
	b_ADDIDATA_CloseWin32Driver
Interrupt	b_ADDIDATA_SetFunctionalityIntRoutineWin32
	b_ADDIDATA_TestInterrupt
	b_ADDIDATA_ResetFunctionalityIntRoutine
Error	i_ADDIDATA_GetLastError
	i_ADDIDATA_GetLastErrorAndSource
	b_ADDIDATA_EnableErrorMessage
	b_ADDIDATA_DisableErrorMessage
	b_ADDIDATA_FormatErrorMessage
Transducer	b_ADDIDATA_GetNumberOfTransducerChannels
	b_ADDIDATA_GetNumberOfTransducerModules
	b_ADDIDATA_GetNumberOfTransducerChannelsForTheModule
	b_ADDIDATA_GetTransducerChannelModuleNumber
	b_ADDIDATA_GetTransducerModuleGeneralInformation
	b_ADDIDATA_GetTransducerModuleAutoRefreshInformation
	b_ADDIDATA_GetTransducerModuleConvertTimeDivisionFactorInformation
	b_ADDIDATA_TestTransducerChannelSecondaryConnection (only for the LVDT version)
	b_ADDIDATA_EnableDisableTransducerModulePrimaryConnectionTest
	b_ADDIDATA_TestTransducerModulePrimaryConnection
	b_ADDIDATA_EnableDisableTransducerModulePrimaryShortCircuitInterrupt
	b_ADDIDATA_RearmTransducerModulePrimaryShortCircuitConnectionTest
	b_ADDIDATA_InitTransducerModuleConvertTimeDivisionFactor
	b_ADDIDATA_ReleaseTransducerModuleConvertTimeDivisionFactor
	b_ADDIDATA_InitTransducerChannel

Functionality	Function name
Transducer	b_ADDIDATA_ReleaseTransducerChannel
	b_ADDIDATA_ConvertDigitalToRealMetricValue
	b_ADDIDATA_ConvertMoreDigitalToRealMetricValues
	b_ADDIDATA_GetTransducerHardwareTriggerInformation
	b_ADDIDATA_GetTransducerHardwareTriggerInformationEx
	b_ADDIDATA_EnableDisableTransducerHardwareTrigger
	b_ADDIDATA_EnableDisableTransducerHardwareTriggerEx
	b_ADDIDATA_GetTransducerHardwareTriggerStatus
	b_ADDIDATA_Read1TransducerChannel (without Interrupt)
	b_ADDIDATA_ReadMoreTransducerChannels (without Interrupt)
	b_ADDIDATA_GetTransducerAutoRefreshChannelPointer
	b_ADDIDATA_GetTransducerAutoRefreshModulePointer
	b_ADDIDATA_GetTransducerAutoRefreshModuleCounterPointer
	b_ADDIDATA_StartTransducerAutoRefresh
	b_ADDIDATA_StopTransducerAutoRefresh
	b_ADDIDATA_SetTransducerAutoRefreshAverageValue
	b_ADDIDATA_SetTransducerAutoRefreshAverageMode
	b_ADDIDATA_Read1TransducerAutoRefreshValue
	b_ADDIDATA_ReadTransducerAutoRefreshCounterValue
	b_ADDIDATA_GetTransducerModuleSequenceInformation
	b_ADDIDATA_InitTransducerSequenceAcquisition
	b_ADDIDATA_StartTransducerSequenceAcquisition
	b_ADDIDATA_StopTransducerSequenceAcquisition
	b_ADDIDATA_ReleaseTransducerSequenceAcquisition
	b_ADDIDATA_ConvertTransducerSequenceDigitalToRealMetricValue
Digital inputs	b_ADDIDATA_GetNumberOfDigitalInputs
	b_ADDIDATA_GetDigitalInputInformation
	b_ADDIDATA_Read1DigitalInput
	b_ADDIDATA_InitDigitalInputModuleFilter (…)
	b_ADDIDATA_EnableDisableDigitalInputModuleFilter (…)

b) Software samples

Table 9-3: Supported software samples for the Ethernet I/O module MSX-E370x

Functionality	Sample number	Description
Transducer	SAMPLE00	Showing the information of a transducer channel
	SAMPLE01	Read 1 transducer channel without interrupt. The user defines the channel he wants to use.
	SAMPLE03	Read more transducer channels without interrupt
	SAMPL05	Testing sequence acquisition with interrupt
	SAMPLE06	Acquisition in the auto refresh mode
Digital inp.	SAMPLE01	Read 1 digital input

9.5 Webserver

9.5.1 Login Webserver

For a more comfortable management we offer you an additional webserver.

You access the webserver as follows:

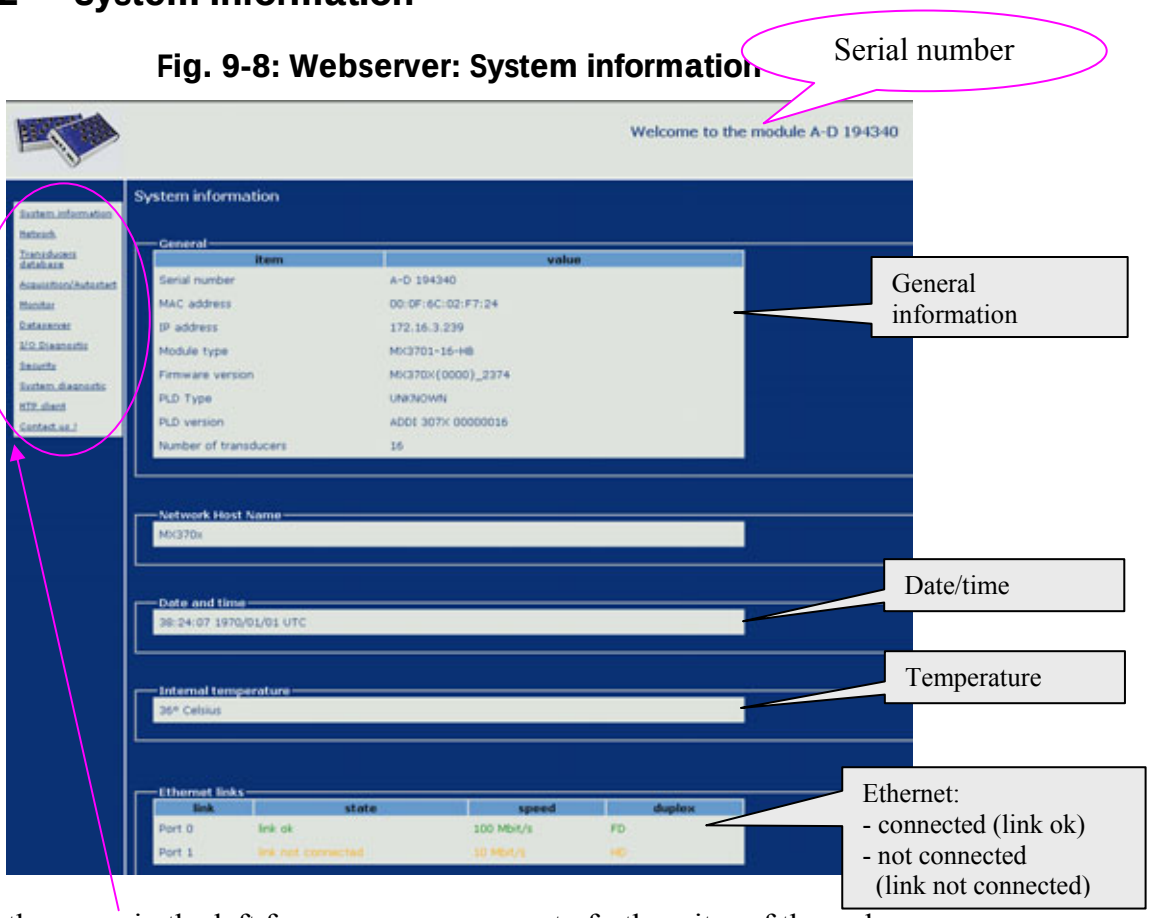
First enter the IP address of the module in a webbrowser (e.g. Internet Explorer or Mozilla Firefox). A login window is displayed.

♦ **Enter „mxadmin“ as username and as password**

After this the window „Sytem information“ is displayed.

9.5.2 System information

Fig. 9-8: Webserver: System information



From the menu in the left frame, you can access to further sites of the webserver. They are described in detail in the following chapters:
- Network
- Transducer database
- Autoconfiguration/Autostart
- Monitor
- Dataserver
- I/O diagnostics
- Security
- System diagnostics

- NTP client
- Contact us

9.5.3 Network

With this website you can change the network configuration of your module.

Network configuration
Eenter in the field “network address of the module” an IP address in the form of 127.0.0.1. The new value will be used after the module reboot.
You can enter max. 64 characters in the field „Network hostname“. This modification is immediately effective.

Syslog (network logging)
The module can send logging information to a system in the network by using the syslog protocol. You must enter the IP address of the system that contains the information in the field „syslog target“.

If the field „syslog target“ is empty, this functionality will be disabled.

The field “**syslog port”** contains the port number (UDP) that should be used (default value is 514). It ranges between 1 and 65535.

The new configuration is effective after restarting the module.

9.5.4 Transducer database

Here the transducers, which are recognised by the system, are listed.

9.5.5 Acquisition/Autostart

Besides the standard configuration (auto refresh, sequence, Min/Max) the webserver offers further options:

Time stamp
You can allocate a time stamp to each measurement value.

Autostart
Please select “**yes”** to start an acquisition with this configuration during the module is booting.

Action on current configuration
Confirm the selected parameters with the button **“Check”.**

Save the currently selected parameters on the module with the button “**Save”**.

Restore the website with the configuration saved on the module with the button **“Reload saved”**.

Restore the website with the currently active configuration on the module with the button "**Display running configuration"**.
This function is available only for the auto refresh and sequence mode, but not for the Min/Max mode.

Note: If you want to watch the measurement values, please change to the menu "Monitor".

9.5.6 Monitor

This website allows you to output the current configuration and fetch data acquired by the module.

To stop the acquisition please change to the menu "Acquisition/Autostart"

Data monitor
After selecting the number of packages (max. 100000) and eventually the output format, please click on the next button to show data from the dataserver.

Configuration details
Here the configuration settings are showed once again.

Data presentation
You can watch the data either directly on the webserver or export them into a CSV-file that you can open with Excel.

9.5.7 Dataserver

The **dataserver** is a network service for providing the acquired data to clients through CP/IP-Sockets. This website allows you to parameterize this service.

Data caching
By default, the values acquired by the module are lost if there is not a least one client connected to read them.

The dataserver can **cache** the data so that there is no loss. If a client connects it receives first the cached data and then the newly acquired one.

There are three parameters that can be independently specified:

- It can work either in **volatile** or **persistent mode**.

  Volatile mode: Data will be cached in a buffer in the RAM. Data is lost when the module is powered off. But the throughput rate is higher.

  Persistent mode: Data is cached internally in a file. When the module restarts, previously acquired data will be available again. Because of the storage method the throughput rate is lower.

- It can **delete** or **keep data, when a client connects.**

Delete mode: The cache is emptied if a client connects to the dataserver to fetch acquired data, and the operation succeeds. New acquired data is not cached but directly sent to the connected clients via the TCP/IP socket.

Keep mode: Data is systematically kept in the cache and is cached.

- It can work in **simple** or **circular mode**.

  These modes define how the dataserver handles cache overflow.

  When working in **simple mode**, and the cache is full, newly acquired values are ignored.

In the **circular mode** newly acquired values are stored from the bottom of the cache when the cache is full. When a client connects, it receives the older data (the one at the top) first. We recommend this mode if a time stamp is delivered with the data.

A further parameter is the **cache size.**
This is the amount of bytes the cache can hold. Its maximum value depends on the amount available on the storage media. To avoid the risk of a system crash, the server will allocate max. **80%** of the available resources.
Please note that in persistent mode, 16 bytes are used to store meta data and therefore must be deduced from cache size to get the actual amount of storage available for data.

Network protocol

The dataserver supports TCP/IP and UDP/IP protocols.

In the **TCP/IP mode**, the programming model is client/server. Clients first must be connected to the server and read incoming data on the socket. This protocol gurantees the delivery of packages (or the connection will fail).

In the **UDP/IP mode**, the programming model is disconnected data streaming.

The dataserver sends the data packages to the specified network client(s). The client must open a socket and read incoming data. The delivery of data packages is not guaranteed, the dataserver has no means to check if the delivery was successful.

Clients must be specified to the dataserver at launch time via the field "**UDP/IP network targets"**. It must be a string of IP address an port number separated by space in the form **IP1:PORT1 IP2:PORT2 ... IPn:PORTn**.
For example "192.168.99.2:8080 192.168.99.3:8888"

Blocking TCP/IP transfer

This controls if the dataserver should send data in synchronous mode through the TCP/IP sockets.

If "**blocking TCP/IP transfer"** is set to **"yes"**, the server waits for each client and each data package to be sent until the transfer is done. While the server is waiting, all newly acquired data are list. This lowers the throughput rate of the dataserver, but is an advantage if the connection with the client blocks. Then this is no error , e.g. debugging a client application.

In this mode you can specify a **TCP/IP timeout** in "seconds,microseconds". For example with the value "1,0" a transfer would timeout one second after it begins.

With the value **0,0** the server would block endlessly.

When "blocking TCP/IP transfer" is set to "**no"**, the actual TCP/IP timeout is the minimum the protocol allows. This mode detects network problems better than the other. Also the throughput rate of the server is increased.

Save and restart (Action)

If you click on "**Save"**, the module saves your new configuration and will use it after each system restart.

If you click on **Reload",** this website is reloaded with the configuration already saved on the module.
Any modification that was not saved, is lost.

If you click on **"Restart",** the dataserver is restarted.
If you want to change the configuration, you must save it firstly (**„save"**).

If you click on "**Restart & reset"**, the datasever is restarted.
If the dataserver was configured in the "**Persistent Mode"** the content of the cache file is emptied.
If you want to change the configuration, you must "**save"** it first.

If you click on „**Restart & delete"** the dataserver is restarted and the data cache file is deleted.
You must do this if you change the size of the cache file.
If you want to change the configuration, you must "**save"** it first.

9.5.8 I/O diagnostics

With the website "I/O diagnostics" you can detect short-circuit and line-break at the transducer signals.

9.5.9 Securtiy

You can configure the security settings under **"security**".

You can use the module immediately, without access security settings.

However, if you want use the security settings, please use the webserver that allows an authentification.

9.5.9.1 Webserver access security

9.5.9.1.1 Webserver access configuration

General information

The default identification/password tokens are mxadmin/mxadmin.

To change your password, please enter you new password under „new password“ and confirm it under „confirm new password“. Then click on the button „Save new authentification.“.

Please observe:

- Changes are immediately effective

- The fields „identification“ and „password“ must be completed.

At first, change the default identification for Name/Password. Select a password that is difficult to decode and keep it in a safe place.

To ensure resistance against errors, the password database is duplicated. If an accident happens while saving this information and the new password is not recognized, please try the old one.

IMPORTANT!
Please observe that this online form is the only possibility to modify remotely the password.

9.5.9.1.2 TLS encryption for the webserver

TLS encryption is not activated

The webserver can use the TLS protocol to encrypt communication with the client. TLS is the successor of the SSL protocol used on Internet for securing communications.

In the other (default) alternative, data transit in clear over the wire, allowing anyone to spy on it. This may allow somebody to catch the identification tokens used to login in the website and control the module.

It is thus advisable to activate the TLS encryption.

Not all web client applications support this protocol, and special configuration steps may be needed to make it work.
Furthermore, not all toolkits for Web service development allow to use an encrypted connexion to download the wsdl file.
This is why it is not activated by default.

It is possible to set the webserver for using the TLS protocol. Then the protocol identification is HTTPS, e.g. https://192.168.99.99. Hereto the TLS protocol must be activated in the client browser. The configuration can be different depending on the browser.

Please note also that when the server uses TLS, the connection must be done to the port https (443) and not http (80).

Click on the button **The webserver should use TLS** below to switch TLS on at next reboot.

9.5.9.2 General system security

The menu system security of the webserver limits or prevents changes in the configuration of module from remote computers.

9.5.9.2.1 Authorisation settings: Remote settime() call

The „SetTime"-SOAP function allows changes in the internal time of the module. This option prevents remote calls of the SetTime, which would lead to error messages.
It is allowed to call the SOAP functions SetAutoConfigurationFile() or StartAutoConfiguration().

Click on the button **Don't authorize remote autoconf/autostart changes** below to change this behaviour.

Changes are immediately effective.

This setting doesn't affect the website.

Tipp:
The time synchronisation can be used by using the NT server and configuring the SNTP client on the module. This option is recommended for production systems.

9.5.9.2.2 Authorisation settings: Remote Autoconf/autostart

It is allowed to call the SOAP functions SetAutoConfigurationFile() or StartAutoConfiguration().

Click on the button **Don't authorize remote autoconf/autostart changes** below to change this behaviour.

Changes are immediately effective.

This setting doesn't affect the website.

Tipp:
This option is recommended for production systems.

9.5.9.2.3 Authorisatiion settings: Remote general system configuration

It is allowed to change remotely some general system configurations. For example:

- Setting a new Customer Key
- Changing the IP address
- Performing installation of a new firmware
- Rebooting the module

Click on the button **Don't authorize remote sysconf changes** below to change this behaviour.

If you do that, tools like Set3701 and SetMSXE cannot work completely.

I/O related SOAP commands stay unaffected by this setting.

Changes are immediately effective.

This setting doesn't affect the websites, data server / event server.

It is not possible anymore to change the IP address from outside the webserver.

Tipp:
This option is recommended for production systems.

9.5.9.2.4 Authorisation settings: Remote commands

Remote SOAP commands are authorized.

Click on the button **Don't authorize remote command** below to change this behaviour. This will forbid all remote commands. It won't be possible to remotely change the IP address. This is the highiest security level possible. Setting changes are possible only through the Web server.

The system **must be restarted** for this setting to take effect.

This setting doesn't affect the website, data server / event server.

Tipp:
This option is recommended for production systems that were configured through autoconf/autostart.

9.5.10 System diagnostics

With the website „System diagnostics“ you get the followin information:
- Subsystem state
- Real time clock
- Resources
- Ethernet statistics
- TCP/IP configuration
- Routing configuration
- Active TCP and UDP connections
- TCP and UDP service
- Inter-module synchronisation

9.5.11 NTP client

The **NTP Client** is a service for synchronising the module with an external network **N**etwork **T**ime **P**rotocol server.

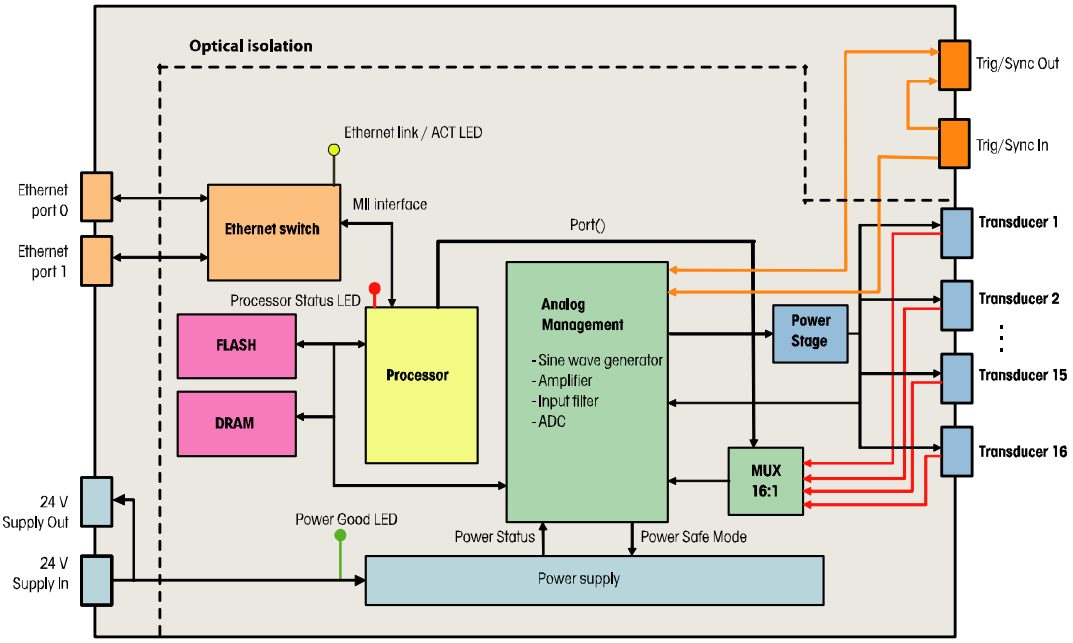
9.5.12 Contact us

This website shows the ADDI-DATA contact data.

10 FUNCTIONS OF THE MODULE

10.1 Block diagram

Fig. 10-1: Block diagram of the MSX-E370x



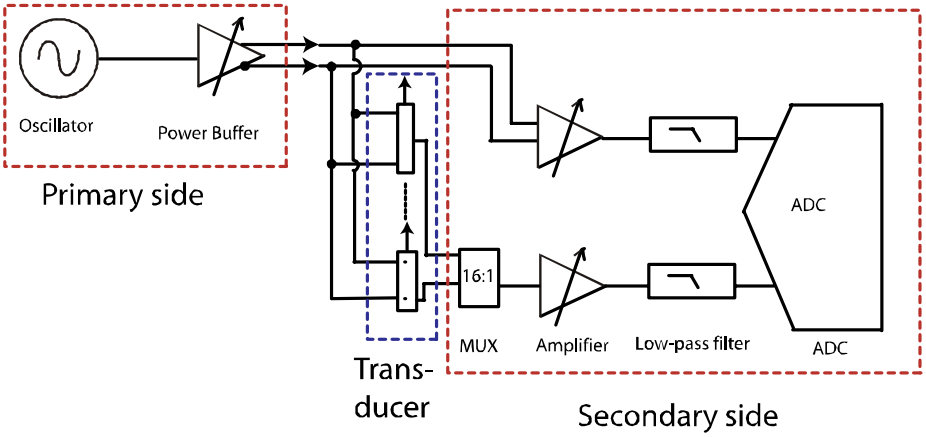
10.2 Measurement principle

The **MSX-E370x** provides all required signals for the supply of the inductive transducers. With the help of a sine wave generator the primary side of the sensor is activated. The output frequency and the amplitude of the sine wave generator can be programmed through the software. The power supply of the transducers is realized by a differential power-buffer.
The incoming measurement signals are led over a multiplexer:

16:1 multiplexer:	**MSX-E370x-16**
8:1 multiplexer:	**MSX-E370x-8**
4:1 multiplexer:	**MSX-E370x-4**

The measurement signal is lead over an amplifier, which can be programmed through software, before the gain- and offset-error of the measurement signal is corrected by a further level. After this the signal is led over an analog low-pass filter and acquired by a 24-bit ADC.
Parallel to the measurement signal, the power signal of the transducer is also measured over a second input at the ADC.

Fig. 10-2: Acquisition principle



10.3 Module calibration

The offset and amplitude error of the **MSX-E370x** is corrected through digital potentiometers. The user can realize this calibration with the help of the program **SET3701** (Set3701.exe). After the calibration has been finished, the values of the digital potentiometer are stored in the Flash. At Power Up the calibration parameters are read from the Flash and are sent to the digital potentiometers.

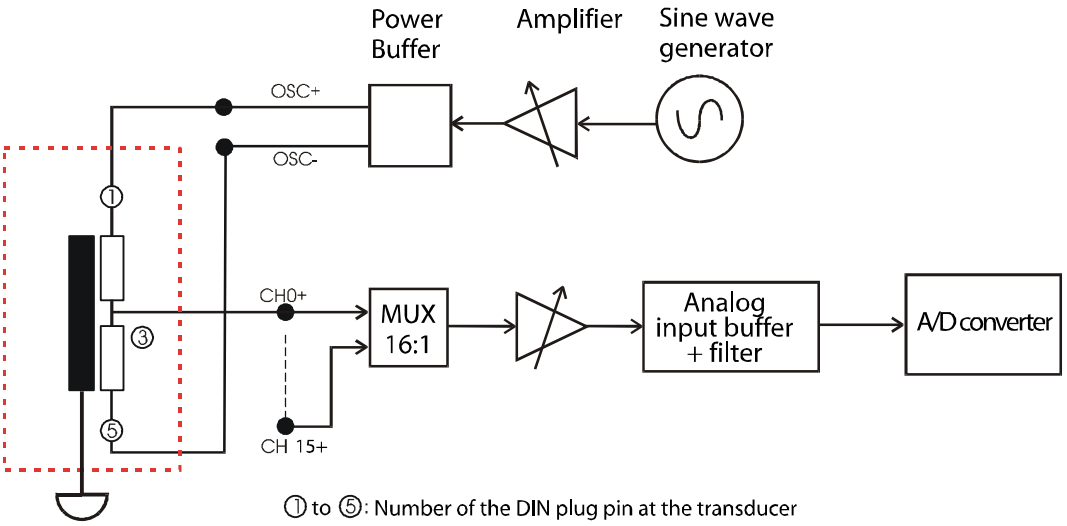
10.4 Transducer principle

The inductive transducer is used basically for precise length measurement. It is a travel/voltage sensor, whose output voltage changes linearly along with the moving magnetic core (ferrite). The magnetic core moves according to a straight line in a transformator, which consists of a central primary coil and two external secondary coils (cylindrical windings). The power buffer provides an AC voltage source to the primary coil. This enables the secondary voltage to be supplied and to change according to the position of the magnetic core.

10.4.1 Half-brigde transducer

The half-bridge transducer features two inductive coils (windings). These are fed directly with two sinusoidal voltage signals (a positive oscillator voltage and a negative oscillator voltage). The measuring bolt moves along the two coils with a ferromagnetic core which changes the voltages in the two coils depending on its position. This measuring bolt functions like a variable voltage distributor and the change in voltage at the coils results in the sinusoidal measuring signal to be evaluated.

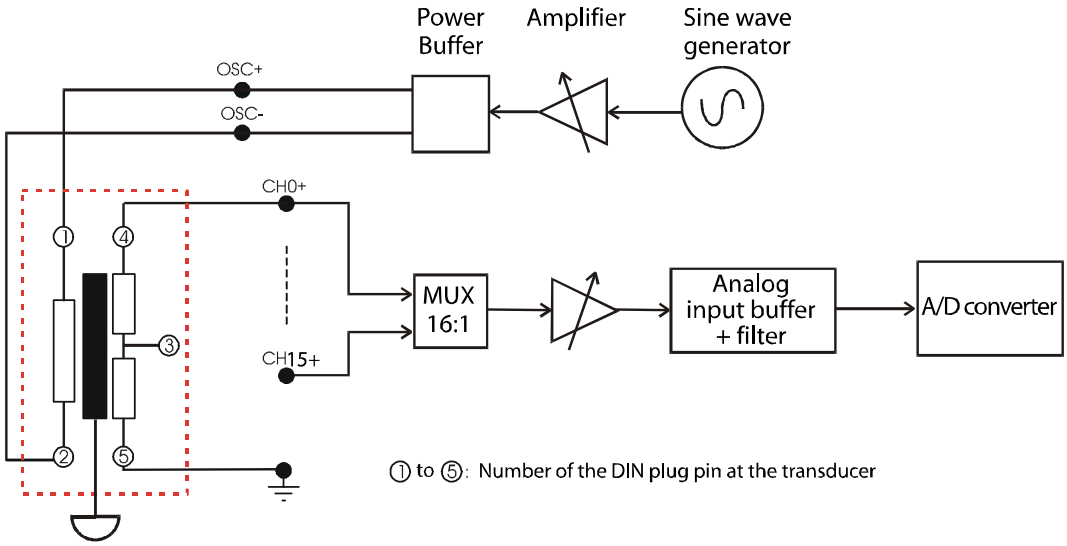
Fig. 10-3: Half-bridge transducer



10.4.2 LVDT transducer (series-opposed)

The series-opposed transducer feature three inductive coils, one primary coil and two secondary coils. These coils are positioned concentrically around the mobile core and form two symmetrical transformers with respect to the electrical zero point of the transducer. The primary coil is fed by two sinusoidal voltage signals (a positive and a negative one) whereas both secondary coils (switched in phase opposition) produce an electrical signal proportional to the measured displacement.

Fig. 10-4: LVDT transducer (series-opposed)



10.4.3 Settings of the transducer

A transducer has different features:
the nominal frequency F in Hz
the nominal voltage V in V_{rms}
the sensitivity S in mV/V/mm
the measuring range d_{max} in mm (+/-d_{max})
the load R_{Load}

According to these values, the setting parameters are programmed for adapting the board to the connected transducer.

10.5 Acquisition modes

There are three acquisition modes on the module:
- Auto refresh mode
- Sequence mode
- Min/Max

10.5.1 Auto refresh mode

In the auto refresh mode the measurement value is updated automatically after each acquisition.

The analog acquisition is initialised and writes the value of the channels into a firm memory space on the Ethernet E/A module **MSX-E370x**. The PC reads the data asynchronously to the acquisition via the data socket or a SOAP function.

When using the module with ADDIPACK, all channels should be initialised and acquired with the auto refresh mode.

When using the module with direct access, you can define a mask of all channels that should be acquired.

In the auto refresh mode you can activate the channel mean value calculation on the module:

Mean value calculation per channel	Each channel is acquired x times to calculate a channel mean value.
Averaging (calculation of the mean value) per sequence	All sequences are acquired x times to calculate a channel mean value.

10.5.2 Sequence mode

A sequence is a list of channels (max. 16) that are acquired.

It can be any order of the channels in this list.

There are different sequence modes:
- Certain number of sequences / continuous
- With/Without delay

a) Certain number of sequences:

After the defined number of sequences is acquired, the acquisition is stopped automatically.

b) Continuous:

The sequences are acquired continuously until a software-stop-command occurs.

c) Without delay:

There is a waiting time between the acquisitions of 2 sequences.

d) With delay:

A delay can be configured between 2 sequences:

For this there are 2 delay types:
> Mode 1: The delay time defines the time between 2 sequence beginnings.

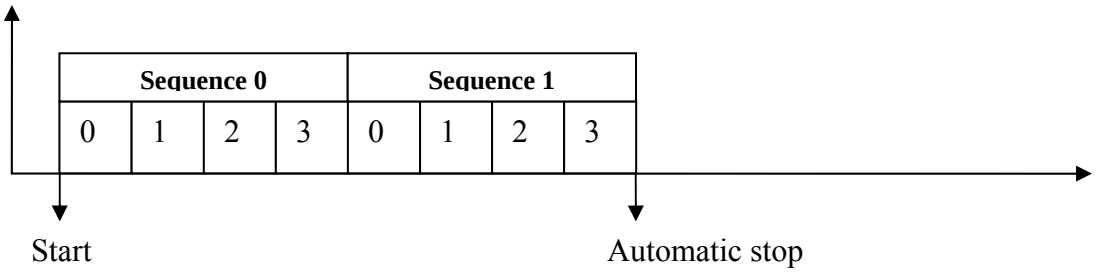
> Mode 2: The delay time defines the time between the end of a sequence until the beginning of the next sequence.

Example 1:

Sequence of the channels: 0,1,2,3

Number of sequences to be acquired: 2

Without delay

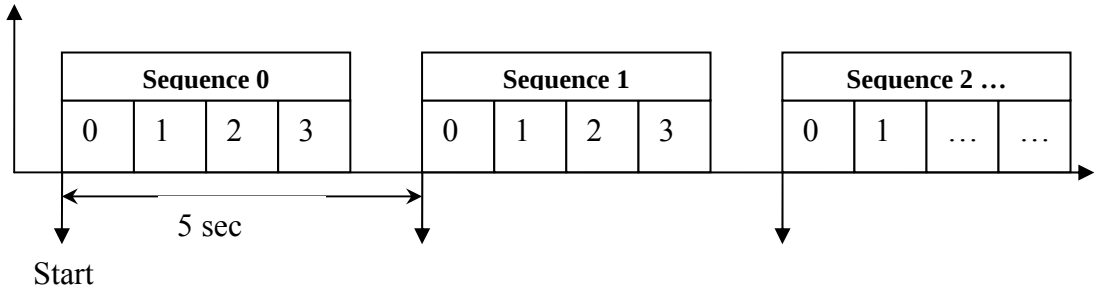


Example 2:

Sequence of the channels: 0,1,2,3

Number of the sequences to be acquired: 0 (means continuous)

With Delay 1 (5 sec)

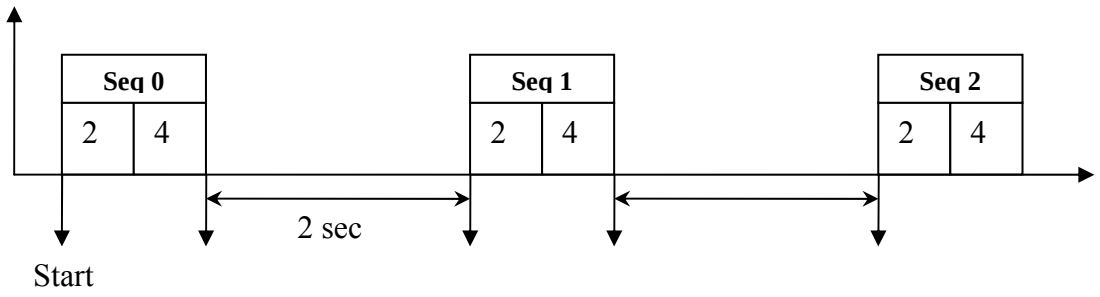


Example 3:

Sequence of the channels: 2, 4

Number of the sequences to be acquired: 0 (means continuous)

With Delay 2 (2 sec)



10.5.3 Min/Max

IMPORTANT!
This mode is **not** available in ADDIPACK.

In the Min/Max-mode an acquisition of certain channels is executed (adjustable by a mask) and the Min-/Max values of each channel are saved.

The acquisition runs until a stop-command (software or hardware: see below) occurs.

In this acquisition mode you have the possibility for a hardware-stop:

A compare-value can be set as well as a condition can be defined for one or more channels.

Example:

If the values of channel 0 are greater than 0 x 1000, the acquisition is stopped.

In this acquisition mode no values are sent to the data server.

To get the Min-/Max values and the acquisition status, the adequate SOAP function must be used (e.g. MX370x__TransducerGetMinMaxStatus)

10.5.4 Hardwaretrigger (for auto refresh and sequence mode)

You can start the acquisition by a hardwaretrigger in the auto refresh and sequence mode.

The hardwaretrigger can react to a rising, falling or both edges.

You have the following possibilities:
- Initialising a filter on the trigger input to avoid errors
- Defining a number of edges before a trigger action is generated

There are two trigger modes:
a) One shot
b) Sequence

a) One shot:
After the software start, the module is waiting for a trigger signal to start the acquisition. After this the trigger signal is ignored.

b) Sequence:
After the software start the module is waiting for the trigger signal and acquires x sequences (also adjustable) and again is waiting.

IMPORTANT!
A trigger edge during an acquisition is ignored.

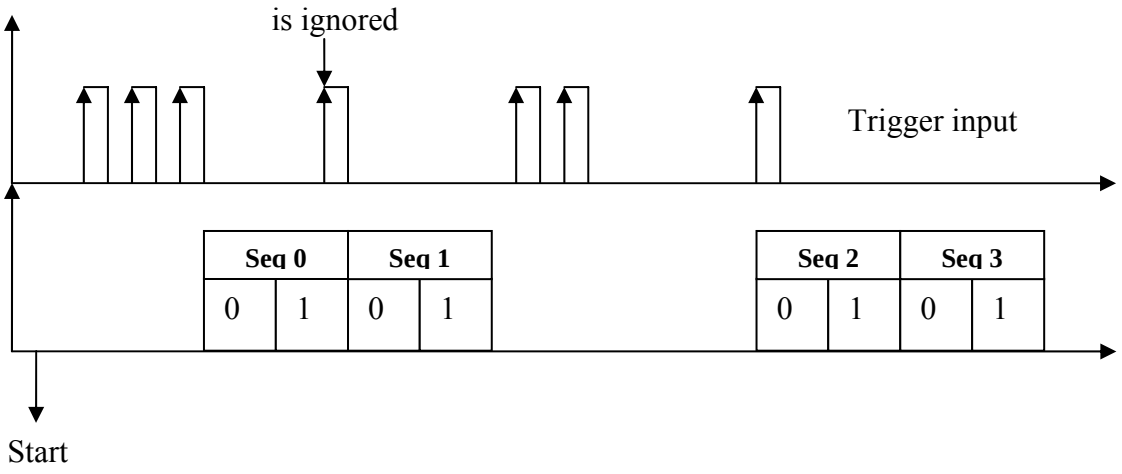
Example 1:

- Continuous sequence mode with channels 0,1 without delay

- Trigger signal reacts on rising edge

- Three rising edges should be available to get a trigger action

- Each trigger action starts the acquisition of 2 sequences



10.6 Synchronisation

The synchronisation's principle is simple: Via the "Synchro" connection, one module generates a synchronisation signal and transfers it to the next module. This transmits the signal to the next module. Herewith one module gives the clock signals for the other modules.
The sinusoidal excitation signals of the transducers are synchronised and allow measuring several test pieces simultaneously. Additionally, because of the cascading of several modules, the connection of all modules to the PC becomes unnecessary.

10.7 Diagnostic

The module **MSX-E370x** disposes of a diagnostic function which, under certain circumstances, can detect a short circuit or line break on the primary circuit as well as on the secondary circuit.

The short-circuit detection on the primary circuit is activated continuously. The other diagnostic functions are activated by software functions.

10.7.1 Short-circuit

On the primary circuit the supply voltage of the power buffer is controlled. If a short circuit occurs (between OSC+ and OSC- or OSC- against mass or OSC+ against mass), a voltage drop is detected. This information is returned by software. (See the software diagnostic function).
In case of short circuit the power buffer disposes of internal fuses which switch the outputs off.

On the secondary circuit the number of the channel which caused a short circuit (between transducer measurement signal against mass) is returned by software.

10.7.2 Line break

In case of a line break (OSC+ or OSC-) on the primary circuit a software function controls if **at least one** of the **n** connected transducers is not correctly connected. The user is to make sure that all transducers are correctly connected.

On the secondary circuit (transducer measurement signal), the number of the channel with a line break is returned by software.

10.8 Time stamp

You can use a time stamp to record the time when the data was processed by the system. Please find more information about the time stamp format in chapter 8.7.

11 APPENDIX

11.1 Glossary

Term	Description
A/D converter	*=ADC* An electronic device that produces a digital output directly proportional to an analog signal output.
Analog	Continuous real time phenomena
Baud rate	Serial communications data transmission rate expressed in bits per second (b/s).
D/A converter	= *DAC* A device that converts digital information into a corresponding analog voltage or current.
Data acquisition	Gathering information from sources such as sensors and transducers in an accurate, timely and organized manner. Modern systems convert this information to digital data which can be stored and processed by a computer.
DC voltage	*= Direct current voltage* DC voltage means that the voltage is constant respecting the time. It will always fluctuate slightly. Especially at switching on and switching off the transition behaviour is of high significance.
Differential input (DIFF)	= DIFF An analog input with two input terminals, neither of which is grounded, whose value is the difference between the two terminals.
Digital signal	A signal which has distinct states. Digital computers process data as binary information having either 1 or 0 states.
Driver	A part of the software that is used to control a specific hardware device such as a data acquisition board or a printer.
Gain	The factor by which an incoming signal is multiplied.
Half Bridge	= *HB* With the core in the central position the two signals VA and VB are equal and half the energising signal VA. As the core is displaced, VA and VB vary in a complimentary fashion. Typically the half-bridge transducer forms half of a Wheatstone Bridge circuit which enables change from null to be readily determined.
Input impedance	The measured resistance and capacitance between the high and low inputs of a circuit.
Input level	The input level is the logarithmic relation of two electric units of the same type (voltage, current or power) at the signal input of any receive device. The receive device is often a logic level that refers to the input of the switch. The input voltage that corresponds with logic “0” is here between 0 and 15 V, and the one that corresponds with logic “1” is between 17 and 30 V.
Limit value	Exceeding the limit values, even for just a short time, can lead to the destruction or to a loss of functionality.
LVDT	*= Linear Variable Differential Transformer* With the core in a central position the coupling from the primary to

	each secondary is equal, so VA = VB and the output V0 = 0. As the core is displaced, VA differs from VB in proportion to the displacement hence V0 changes in magnitude and phase in proportion to movement in either direction from null.
MAC address	*MAC = Media Access Control* Hardware address of network components for precise identification in the network.
Operating voltage	The operating voltage is the voltage that occurs during the continuous operation of the device. It may not exceed the continuous limit voltage. Furthermore, any negative operation situations, such as net overvoltages over one minute at switching on the device must be taken in consideration.
Optical isolation	The technique of using an optoelectric transmitter and receiver to transfer data without electrical continuity, to eliminate high-potential differences and transients.
Output voltage	The nominal voltage output reading when shaft is rotated to full range, expressed in volts DC /Vo DC).
Parameter	The parameters of a control comprise all for the control process required numeric values, e.g. for limit values and technological number.
Reference voltage	Reference voltages are stable voltages that are used as reference unit. From them voltages can be derived that are required for example in current supplies and in other electronic circuitries.
Resolution	The smallest significant number to which a measurement can be determined. For example a converter with 12-bit resolution can resolve 1 part in 4096.
Sensor	A device that responds to physical stimuli (heat, light, sound, pressure, motion, etc.) and produces a corresponding electrical output.
Throughput rate	The maximum repetitive rate at which data conversion system can operate with a specified accuracy. It is determined by summing the various times required for each part of the system and then by taking the inverse of this time.
Trigger	Internal trigger: A software generated event that starts an operation. External trigger: An analog or digital hardware event from an external source that starts an operation. Digital trigger: An event that occurs at a user-selected point on a digital input signal. The polarity and sensitivity of the digital trigger can often be programmed.

11.2 Index

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V

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