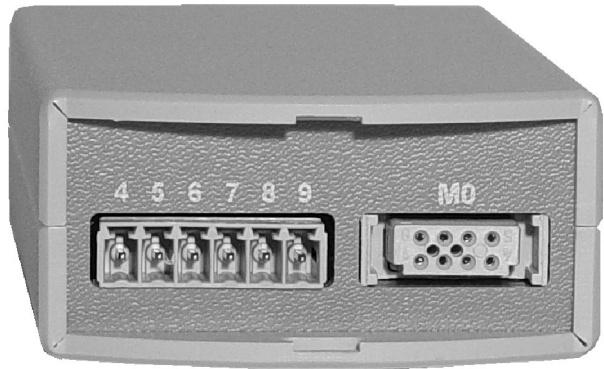


## Operating instruction



### Universal transmitter **ALMEMO® 8390-1**

V1.0  
19.11.2003

## Operating instructions

### Universal transmitter

### ALMEMO® 8390-1

With supplementary reference to the ALMEMO® Manual

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# 1. INTRODUCTION

The universal transmitter ALMEMO® 8390-1 is a new member in our family of unique measuring devices

- all equipped with Ahlborn GmbH's patented ALMEMO® connector system. The intelligent ALMEMO® connector offers decisive advantages when connecting sensors and peripherals because all parameters are stored in an EE-PROM on the connector itself; repeat programming is thus no longer necessary.

All sensors and output modules can be connected to all ALMEMO® measuring instruments - all in the same way. Programming and functioning are largely identical for all units. The following points apply to all devices in the ALMEMO® measuring system and are described in detail in the ALMEMO® Manual supplied with each device.

- Detailed description of the ALMEMO® system (Manual, Chapter 1)
- Overview of the device functions and measuring ranges (Manual, Chapter 2)
- Basic principles, operating instructions, and technical data for all sensors (Manual, Chapter 3)
- Options for connecting your own existing sensors (Manual, Chapter 4)
- All analog and digital output modules (Manual, Section 5.1)
- Interface modules RS-232, optic fiber, Centronics (Manual, Section 5.2)
- The entire ALMEMO® networking system (Manual, Section 5.3)
- All functions and their operation via the interface (Manual, Chapter 6)
- Complete list of interface commands with all the printouts (Manual, Chapter 7)

The operating instructions you are now reading cover only those features and controls that are specific to this device. They often refer to a more detailed explanation in the Manual (Manual, Section x.x.x).

## 1.1 Functions

Universal transmitter ALMEMO® 8390-1 has one measurement input for all ALMEMO® sensors. The measuring possibilities are virtually unlimited; there are 4 channels in the sensor connectors - with over 70 measuring ranges.

ALMEMO® output modules, analog output, or a digital interface can be connected to the output socket. Several devices can be networked via ALMEMO® network distributors. Sensors can be programmed and measuring instruments can be configured for data output as and when necessary via the interface and this is best performed using the accompanying AMR-Control software package. A wall mounting is included in delivery. Available options include one or two integrated analog outputs, an RS-485 interface, or even an Ethernet connector.

## **SENSOR PROGRAMMING**

The measuring channels are automatically and completely programmed by the ALMEMO® sensor connectors. Programming can, however, be modified or supplemented, as and when necessary, via the interface.

### **Measuring ranges**

Appropriate measuring ranges are available for all sensors with a non-linear characteristic, e.g. 10 thermocouple types, Ntc and Pt100 sensors, infrared sensors, and flow sensors (rotating vanes, thermoanemometers, Pitot tubes). For humidity sensors additional function channels are available for calculating humidity variables such as dew point, mixture ratio, vapor pressure, and enthalpy. Even complex chemical sensors are supported. Measured values from other sensors can also be acquired using the voltage, current, and resistance ranges with individual scaling in the connector. Existing sensors can also be used - so long as the appropriate ALMEMO® connector is connected via its screw terminals. For digital input signals and frequencies, adapters are available with an integrated microcontroller. It is thus possible to connect virtually any sensor to any ALMEMO® measuring instrument and to change sensors without the need for any extra settings.

### **Function channels**

Maximum values, minimum values, and differential values at certain measuring points can be programmed as function channels and further processed and printed just like normal measuring points.

### **Units**

The two-character units can be modified per measuring channel; the display thus always indicates the physically correct units. Conversion between °C and °F is performed automatically.

### **Measured value designation**

Each sensor is identified by means of a 10-character alphanumeric name. This name, entered via the interface, will subsequently appear in the printout or, if evaluated by computer, on the screen.

### **Correction of measured values**

The measured value on each measuring channel can be corrected both in terms of zero-point and gain; this means that even sensors usually requiring initial adjustment (expansion, force, pH) can be freely interchanged. Zero-point correction and, partly at least, gain adjustment can be performed at the touch of a button.

### **Scaling**

The corrected measured value on each measuring channel can also be further scaled in terms of zero-point and gain - using the base value and factor. The decimal point position can be set by means of the exponent function.

### **Limit values and alarm**

Per measuring channel two limit values can be set (1 maximum and 1 minimum). In the event of one of these limit values being exceeded, this is indicated in the digital output.

**Sensor locking**

All sensor data stored in the connector EEPROM can be protected by means of a graduated locking function against undesired access.

**MEASUREMENT**

For each transducer up to four measuring channels are available; i.e. it is also possible to evaluate double sensors, individually scaled sensors, and sensors with function channels. All programmed measuring points are scanned continuously at a conversion rate of maximum 10 measuring operations per second; the measured value is calculated, saved, and output, if available, to an analog output.

**Measured value**

The measured value for the selected measuring point is scanned continuously with auto zero and, as and when necessary, with measured value correction. With most sensors, sensor breakage is detected automatically (except for connectors with shunt, dividers, or additional electronics).

**Measuring functions**

With some sensors, in order to achieve optimal measured value acquisition, certain special measuring functions are required. Cold junction compensation is available for thermocouples; temperature compensation is available for dynamic pressure, pH, and conductivity probes. On infrared sensors the parameters for zero-point correction and gain correction are used as the background temperature and the emissivity factor.

**Analog output and scaling**

The displayed measured value can, by means of analog start and analog end, be scaled in such a way that the measuring range thus defined covers the full analog output range (2 V, 10 V, or 20 mA).

**Maximum and minimum values**

For each measuring operation the maximum value and minimum value are acquired and saved to memory. These values can be scanned and, as and when necessary, deleted.

**Differential measurement**

It is possible, by setting the measured value to zero, to perform pseudo differential measurements with respect to a reference value; with two sensors and the same measured variables genuine differential measuring operations can be performed.

**PROCESS FLOW PROGRAMMING**

To digitally record the measured values of all connected sensors a cyclic measuring point scan using data acquisition software or an internal time-based process flow control is required. For this purpose a software clock and the print

cycle are available. The measuring operation can be started and stopped via the interface.

### **Date and time-of-day**

When the measuring instrument is switched on, the date and time-of-day are set to 01.01.00 00:00:00. For the purposes of logging a measuring operation these must be reset each time.

### **Print cycle**

Cyclic output of measured values to the interface can be programmed to anything between 1 second and 24 hours.

### **Print cycle factor**

To avoid excessive data flow the data output of certain channels can, as and when necessary, by means of the print cycle factor, be restricted or altogether disabled. It is also possible to summate pulses over longer cycles.

### **Averaging over measuring point scans**

The measured values obtained by scanning measuring points can be averaged either over a number of measuring points or over one particular measuring point either for the total measuring time or over the print cycle time. Function channels are provided for the cyclic output of such average values.

### **Output**

All measured values and programming values are accessible via various interface cables with RS-232, RS-422, optic fiber, or Ethernet interface. Measured data can be output in list, column, or table format. Files in table format can be processed directly using any standard spreadsheet software. The print header can be programmed specifically to the company or application.

An integrated Ethernet connector is available as an option - for direct incorporation in a PC network.

### **Networking**

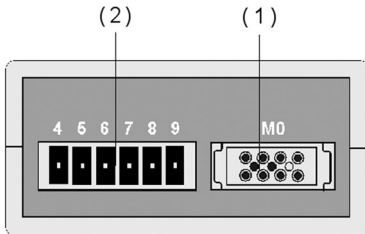
The transmitter is addressable and can be networked - even over long distances - via ALMEMO® network distributors.

### **Software**

Each ALMEMO® Manual is accompanied by the AMR-Control software package, which can be used to configure the measuring instrument and to program the sensors. It is also possible using the integrated terminal to perform measuring operations online and to save the measured values to PC. The WINDOWS® software package, WIN-Control, can be used for data acquisition with graphical presentation and complex data processing.

## 1.2 Operating controls

Front :



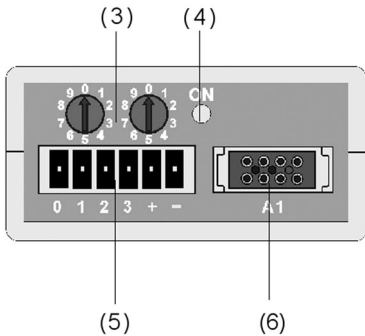
### (1) ALMEMO®-measuring input M0

M0 for all ALMEMO® sensors  
M1 to M3 Additional channels

### (2) Socket for clamp connectors

- 6 7 1. Analog output A-, A+  
0 to 10 V, option R2/R22  
0/4 to 20 mA, option R3/R32
- 4 5 2. Analog output A-, A+  
0 to 10 V, option R22  
0/4 to 20 mA, option R32

Rear



### (3) Address code switch

Device address 00 to 99

### (4) Check lamp

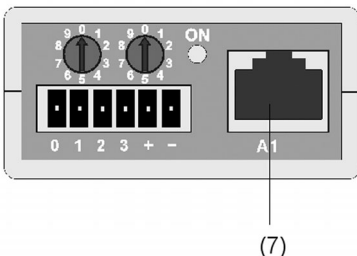
ON Supply, flashes on data transmission

### (5) Socket for clamp connectors

- + - Power supply via mains adapter  
(ZB1012-NA1, 12V / 0.2A)  
RS-485 interface (OA 8390-I)
- 0 1 input RX+, RX-  
2 3 output TX+, TX-

### (6) ALMEMO® output socket A1

Analog output (ZA 1601-RK)  
V24 interface (ZA 1909-DK5/DKL)



### (7) Ethernet option :

Output socket A1  
Ethernet output RJ-45 (OA 8390-E)

## 2. PUTTING INTO SERVICE

1. **Connect transducer** to socket M0 (1); (see Section 4).
2. Ensure the **power supply** is connected via the mains adapter; (see Sections 3.1, 3.2).
3. Connect **analog output** to socket A1 (6) using recording cable ZA 1601-RK. or option R2/3 to socket 2 pins 6 and 7 (see Manual, Section 5.1.1)
4. **Programming or data output** via interface  
Connect computer via interface cable to socket A1 (6) (see Man., Section 5.2).  
Activate supplied software AMR-Control.  
Via 'Setup interface' set the COM port and transmission rate to 9600 bauds.  
Program the sensors via 'Program measuring point list'.  
Measured value display and sensor adjustment via 'Measuring points - Measured values'  
Data logging in the computer :
  - program the print cycle via 'Devices - Programming';
  - open the terminal window via 'File - Terminal';
  - open the file via 'File - Open' and enter file name;
  - start the measuring operation by means of command button 'Start';
  - stop the measuring operation by means of command button 'Stop';
  - close the file via 'File - Close'.



For the available options and the appropriate pin assignment please see the rating plate located on the bottom of the device !



### 3. POWER SUPPLY

As power supply there are the following possibilities :

- mains adapter 12 V / 200 mA ZB 1012-NA1
- DC voltage supply, 7 to 13 V DC
- DC voltage supply, 9 to 30 V DC, electrically isolated OA 8390-U

#### 3.1 Power supply via the mains adapter

On the rear of the device there is the socket (5) for connecting an external power supply. Here by default mains adapter ZB 1012-NA1 (12 V / 200 mA) is connected to the + and - terminals by means of the clamp connector. Or, alternatively, you can use some other DC power source (7 to 13 V).

If, however, the power supply has to be **electrically isolated** from the transducers, then option U is required.

#### 3.2 DC voltage supply (option U)

Option U (OA 8390-U) provides an electrically isolated DC voltage supply with a wide input voltage range, 9 to 30 V. The voltage must also be connected to the clamp / screw terminal of socket (5) on the device using the clamp connector. It will then be possible to use the measuring instrument in a 12-volt or 24-volt on-board supply system.

#### 3.3 Sensor supply

Whatever the power supply, a sensor supply voltage of approx. 12 V DC (maximum 70 mA) is available on the + and - terminals of the ALMEMO® connector. With special connectors, 15 V or 24 V DC or reference voltages of 5 V and 2.5 V are also available.

#### 3.4 Data saving, reinitialization

Sensor programming is saved in the connector itself; calibration and process flow control data is saved in an EEPROM in the device; in the event of an interruption to the power supply this data is retained intact; only the date and time-of-day are lost and as and when power is restored these are reset (to 01.01.00 00:00:00).

If you wish to reset the device parameters to their default values, in particular the baud rate to 9600 bauds, then, when switching on, set the code switches for the address just once to 99. The address must then of course be reset again.

## 4. CONNECTING THE TRANSDUCERS

Virtually any ALMEMO® sensor can be connected to the ALMEMO® input socket M0 (1). To connect your own existing sensors you simply need the appropriate ALMEMO® connector.

### 4.1 Transducers

The ALMEMO® Manual includes detailed descriptions of the comprehensive ALMEMO® sensor range (see Manual, Chapter 3) and of how to connect your own existing sensors to ALMEMO® instruments (see Manual, Chapter 4). All standard sensors with an ALMEMO® connector usually have the measuring range and units already programmed and can thus be connected to any input socket without further adjustment. A mechanical coding system ensures that sensors and output modules can only be connected to the correct sockets. Each ALMEMO® connector also incorporates two snap-lock levers; these snap into position as soon as the connector is inserted into the socket, thus preventing unintended disconnection if the cable is accidentally pulled. To withdraw the connector, both these levers must be pressed in at the sides.

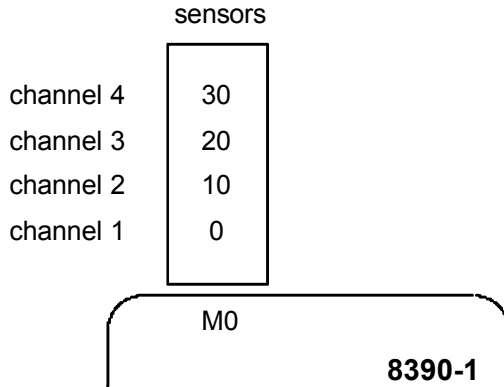
### 4.2 Measuring inputs and additional channels

Measuring instrument ALMEMO® 8390-1 incorporates an input socket M0 (1), to which initially measuring channel M0 is assigned. ALMEMO® sensors can, however, if necessary, provide four channels. Additional channels are available primarily for humidity sensors (temperature / humidity / dew point / mixture ratio) or flow probes and chemical probes incorporating a temperature sensor. A single sensor can be programmed, if necessary, with several ranges or scaling processes; similarly, if pin assignment permits, two sensors can be combined on one connector (e.g. rH / Ntc, mV / V, mA / V, etc.).

#### Measuring point numbering

Each additional measuring channel in a connector lies one level higher. In this new series the levels are now numbered in standard decimal form, i.e. the front digit indicates the level. In this way the measuring point number (and thus also the programmed reference channels) for all devices with 1, 2, 5, or 10 inputs always remains the same. If reference channels are programmed that are not available in the device, the default reference channel (the 1st in the connector) is used.

On the measuring instrument this gives the following channel assignment :



Sensors combined within one connector and sensors with their own power supply are electrically interconnected and must therefore be operated in isolation. The voltage applied to the measuring inputs themselves must not exceed  $\pm 5$  volts (between B, C, D, A and -).

The cold junction compensation for thermocouple measurement is integrated in the device in socket M0.

## 5. SENSOR PROGRAMMING

Since on ALMEMO® devices all sensor programming is stored in the ALMEMO® connector,

you can connect any ALMEMO® sensor without needing to reprogram. To connect certain sensors you can even order ALMEMO® connectors that have already been appropriately programmed. If, however, you wish to create or scale your own sensors or if sensor errors have to be continually corrected, you can do the programming via the serial interface using the AMR-Control software; (see Manual, Section 6.3).

### 5.1 Measuring ranges

In the measuring point programming the measuring ranges are shown by abbreviations as listed in the following table :

Transducer	Sensor/connector	Measuring range	Units	Abbrev.
Pt100-1 (ITS90)	FP Axxx	-200.0...+850.0	°C	P104
Pt100-2 (ITS90)	FP Axxx	-200.00...+300.00	°C	P204
Ni100	ZA 9030-FS3	-60.0...+240.0	°C	N104
NiCr-Ni (K) (ITS90)	FT Axxx	-200.0...+1370.0	°C	NiCr
NiCrSi-NiSi (N) (ITS90)	ZA 9020-FSN	-200.0...+1300.0	°C	NiSi
Fe-CuNi (L)	ZA 9000-FSL	-200.0...+900.0	°C	FeCo
Fe-CuNi (J) (ITS90)	ZA 9000-FSJ	-200.0...+1000.0	°C	IrCo
Cu-CuNi (U)	ZA 9000-FSU	-200.0...+600.0	°C	CuCo
Cu-CuNi (T) (ITS90)	ZA 9000-FST	-200.0...+400.0	°C	CoCo
PtRh10-Pt (S) (ITS90)	FS Axxx	0.0...+1760.0	°C	Pt10
PtRh13-Pt (R) (ITS90)	ZA 9000-FSR	0.0...+1760.0	°C	Pt13
PtRh30-PtRh6 (B) (ITS90)	ZA 9000-FSB	+400.0...+1800.0	°C	EL18
Au-FeCr	ZA 9000-FSA	-270.0...+60.0	°C	AuFe
Ntc type N	FN Axxx	-30.00...+125.00	°C	Ntc
Millivolt	ZA 9000-FS0	-10.000...+55.000	mV	mV
Millivolt 1	ZA 9000-FS1	-26.000...+26.000	mV	mV 1
Millivolt 2	ZA 9000-FS2	-260.0...+260.0	mV	mV 2
Volts	ZA 9000-FS3	-2.0000...+2.6000	V	Vol t
Difference - millivolt	ZA 9050-FS0	-10.000...+55.000	mV	D 55
Difference - millivolt 1	ZA 9050-FS1	-26.000...+26.000	mV	D 26
Difference - millivolt 2	ZA 9050-FS2	-260.0...+260.0	mV	D260
Difference - volt	ZA 9050-FS3	-2.0000...+2.6000	V	D2.6
Sensor voltage	any	0.00...20.00	V	Batt
Milliampere	ZA 9601-FS1	-26.000...+26.000	mA	I032
Percent (4 to 20 mA)	ZA 9601-FS2	0.00... 100.00	%	P420
Ohms	ZA 9003-FS	0.0... 500.0	Ω	Ohm
Frequency	ZA 9909-AK1	0... 32000	Hz	Freq
Pulses	ZA 9909-AK2	0... 65000		Pu l s
Digital input	ZA 9000-EK2	0.0... 100.0	%	Inp

Digital interface	ZA 9919-AKxx	-65000... +65000		DIGI
Infrared 1	FI A628-1/5	0.0... +200.0	°C	Ir 1
Infrared 4	FI A628-4	-30.0... +100.0	°C	Ir 4
Infrared 6	FI A628-6	0.0... +500.0	°C	Ir 6
Snap-on head, normal 20	FV A915-S120	0.30... 20.00	ms	S120
Snap-on head, normal 40	FV A915-S140	0.40... 40.00	ms	S140
Snap-on head, micro 20	FV A915-S220	0.50... 20.00	ms	S220
Snap-on head, micro 40	FV A915-S240	0.60... 40.00	ms	S240
Macro	FV A915-MA1	0.10... 20.00	ms	L420
Water micro	FV A915-WM1	0.00... 5.00	ms	L605
Dynamic pressure, 40 m/s with TC and PC	FD A612-M1	0.50... 40.00	ms	L840
Dynamic pressure, 90 m/s with TC and PC	FD A612-M6	1.00... 90.00	ms	L890
Relative air humidity, capacitive	FH A646	0.0... 100.0	%H	% rH
Relative air humidity, capacitive, with TC	FH A646-R	0.0... 100.0	%H	H rH
Mixture ratio, capacitive, with PC	FH A646	0.0 ... 500.0	gk	H AH
Dew-point temperature, capacitive	FH A646	-25.0... 100.0	°C	H DT
Partial vapor pressure, capacitive	FH A646	0.0 ... 1050.0	mb	H VP
Enthalpy, capacitive	FH A646	0.0 ... 400.0	kJ	H En
Humid temperature	FN A846	-30.00 ... +125.00	°C	P HT
Relative humidity, psychrometric, with PC	FN A846	0.0 ... 100.0	%H	P RH
Mixture ratio, psychrometric, with PC	FN A846	0.0 ... 500.0	gk	P AH
Dew point, psychrometric, with PC	FN A846	-25.0 ... +100.0	°C	P DT
Partial vapor pressure, psychrom., with PC	FN A846	0.0 ... 1050.0	mb	P UP
Enthalpy, psychrometric, with PC	FN A846	0.0 ... 400.0	kJ	P En
Conductivity probe, with TC	FY A641-LF	0.0 ... 20.000	mS	LF
CO <sub>2</sub> sensor	FY A600-CO2	0.0 ... 2.500	%	CO2
O <sub>2</sub> saturation, with TC and PC	FY A640-O2	0 ... 260	%	O2-S
O <sub>2</sub> concentration, with TC	FY A640-O2	0 ... 40.0	mg	O2-C
Function channels				
Differential channels Mb1 - Mb2	any			Diff
Maximum value of channel Mb1	any			Max
Minimum value of channel Mb1	any			Min
Average value M(t) over time of Mb1	any			M(t)
Average value M(n) of Mb2 to Mb1	any			M(n)
Sum S(n) of Mb2 to Mb1	any			S(n)
Total pulses S(t) of Mb1	ZA 9909-AK2	0... 65000		S(t)
Pulses / print cycle of Mb1	ZA 9909-AK2	0... 65000		S(P)
Alarm value of channel Mb1	any			Alrm
Wet bulb globe temperature	ZA 9000-FS		°C	WBGt
Measured value of Mb1	any			Mess
Cold junction temperature	any		°C	CJ
Number of averaged values of Mb1	any			n(t)
Volume flow m <sup>3</sup> /h M(t) (Mb1) *Q	any		mh	Flow

TC = Temperature compensation

PC = Pressure compensation

## 6. MEASURING OPERATIONS

With measuring instrument ALMEMO® 8390-1 up to 4 measuring channels, if these have been programmed, are scanned continuously at a conversion rate of 2.5 or 10 measuring operations per second; this ensures continuous humidity variable calculation or temperature compensation for dynamic pressure probes and chemical probes; (see Manual, Section 6.5.1.3).

Measured values can be output using any of the following methods :

1. Measured value output to an analog output (see Manual, Section 5.1.1)
2. Once-only measured value output via the interface (s. Man., Sec. 6.5.1.1)
3. Cyclic measured value output via the interface (s. Man., Section 6.5.1.2)

### 6.1 Digital interfaces

For communication with the transmitter there is the V24 interface cable ZA 1909-DK5 (available as accessory) (see Manual, Section 5.2.1); this is also available, to cope with environments subject to particularly heavy disturbance, in optic fiber technology (ZA 1909-DKL). This cable is plugged into socket A1 (6). The baud rate is by default 9600 baud; the file format is 8 data bits, 1 stop bit, no parity (settings cannot be changed).

**Sensors can be programmed** and the transmitter can be **completely configured** via the serial interface; this is best performed using the AMR-Control configuration software or a terminal (PC) (see Manual, Chapter 6).

#### RS-485 interface (option I)

Option I provides an integrated RS-485 interface; with this option, in order to connect the first device to a computer, one needs the RS-422 / RS-485 bus driver ZA 5099-AS (see Manual, Section 5.3.3.1) or the RS-422 output of a network distributor. The transmit and receive lines must be crossed once-only. Up to 32 extra devices can then be easily networked using parallel 4-wire cabling - even over long distances (maximum 1 km); (see Manual, Section 5.3.3). Over shorter distances (maximum 100 meters) it is also possible to lead the power supply over the bus using 6-wire cabling. The transmitter is - in each such case - electrically isolated from the bus.

#### Ethernet interface (option E)

With the Ethernet interface it is possible to connect the transmitter to an Ethernet - PC network. It is even possible in this way to link up to the Internet. The device can be connected, via an RJ-45 (10BASE-T) plug connector (7), directly to a PC, switch, or hub. Additional LEDs are provided for the purposes of monitoring the Ethernet connection.

Having an Ethernet transmitter integrated in measured value acquisition is the default setting in the Win-Control WC3 software package; if this is not the case, this can be retrofitted with option WCO6. With additional software AMR2ips SW5500-C22, it is also possible to operate a number of Ethernet transmitters.

## Setting the IP address

The Ethernet transmitter is delivered with the IP address preset by default to 0.0.0.0. With this default address setting it is possible to connect to a DHCP server (dynamic host configuration protocol). The DHCP server provides the Ethernet network distributor with a free IP address, a gateway address, and the subnet mask.

In networks without DHCP server a permanent IP address must be set manually in the Ethernet transmitter. The necessary software XPort-Installer and the instructions for using it are provided on the AMR CD (with effect from version V5.0) in the folder Zubehoer\Ethernet\XPort-Installer (or via the Internet under [www.ahlborn.com](http://www.ahlborn.com)).

### Necessary components :

- PC with operating system WINDOWS 9x / Me / NT 4.0 / 2000 (SP2)
- Microsoft Internet Explorer 5 or higher
- Crosslink cable (for direct connection to PC)

Start the self-extracting installation routine "setup.exe" and follow the instructions on the screen. You can via the menu enter the hardware Ethernet address (see rating plate), the desired IP address, and the subnet mask. You can also, if required, set the baud rate for the transmitter.

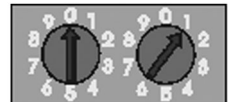
## 6.2 Cyclic output of measured data for a device

If only one transmitter is being used, this can output the measured data via the interface - automatically, independently, with its own time control, by means of the print cycle (see Manual, Section 6.5). You can, using a terminal program on the PC (AMR-Control or WINDOWS Terminal), write the measured values online to a file and then later evaluate this data using a spreadsheet program; (see Manual, Section 6.1).

## 6.3 Networking the devices

ALMEMO® 8390-1 transmitters, like all ALMEMO® devices, can also be networked. Since by default only socket A1 (6) is available, networking is only possible via network distributors (see Manual, Section 5.3.3). If network distributor ZA 5099-NVB is being used, even the power supply can be provided over the network (see Manual, Section 5.3.3.4). To communicate with networked devices it is absolutely indispensable that each device should have its own dedicated address; this is because only one device should respond per command. Before starting network operation therefore ensure that all the measuring instruments involved are assigned different device numbers. On the ALMEMO® 8390-1 two code switches (3) are provided for this purpose on the rear of the device.

*Example : Module address 01*



In network operation consecutive numbers between 01 and 99 should be used; this ensures that device 00 is not addressed unnecessarily in the event of interruption to the power supply. Before each attempt to communicate with a device the desired address must be output (see Manual, Section 6.2.1). The various devices can be addressed manually by a terminal, by a computer, or by AMR measured data acquisition software.

## **6.4 Cyclic output of measured data for networked devices**

To perform measuring point scanning automatically on a number of networked modules you will need some form of measured data acquisition software which will also address the individual modules. This task is usually performed by Win-Control (WINDOWS 3.xx, 95, 98, and NT) available in a range of versions. Win-Control provides an online display of this data as line chart, bar chart, or table and saves it to memory. This data can also be retrieved again offline, evaluated, and printed out.

## **7. ANALOG OUTPUT**

For the analog registration of the selected measuring point you can, to socket A1, connect either an analog output cable ZA 1601-RK (see Manual, Section 5.1.1) without electrical isolation or a relay trigger analog adapter ZA 8000-RTA (see Manual, Section 5.1.3) with electrically isolated analog output. If the device incorporates integrated analog outputs (option Rxx), the analog signals are present at terminals 6, 7 of the socket (4) in the case of a single output - and at terminals 4, 5 and 6, 7 in the case of dual output for double sensors.

It is possible, by means of functions analog output - start and analog output end, to spread any partial measuring range over the standard output signal in the three possible variants 0-2 V, 0-10 V, 0 / 4-20 mA (e.g. 0-20 mA for -10.0 to +50.0 °C); (see Manual, Section 6.10.7).



## 8. TROUBLE-SHOOTING

ALMEMO® 8390-1 transmitter can be configured and programmed in many versatile ways. It is suitable for connecting a wide variety of very different sensors, additional measuring instruments, and peripheral equipment. Given these numerous possibilities the device may in certain circumstances not behave quite as expected. The cause of such unexpected behavior is only very rarely a device defect; more usually it is incorrect operation by the user, an invalid setting, or unsuitable cabling. In such event try to pinpoint and clear the problem with the aid of the following tests :

**Error :** Measured values are incorrect.

**Remedy:** Check the channel's programming (using the AMR-Control software); scan the entire programming using the command P15 (s. Manual, Section 6.2.3) and f1 P15 (s. Manual, Section 6.10.1).

**Error :** Fluctuating measured values, cyclic measuring point scan hangs in mid-operation.

**Remedy:** Check the cabling for any inadmissible electrical connections; unplug any suspicious sensors, replace with hand-held sensors in air or phantoms (for thermocouples short-circuit A-B, for Pt100 sensors use 100-Ω resistor) and check, connect sensors again one at a time and check successively; If a fault persists for any one connection, then check all wiring, if necessary, insulate the sensor, and eliminate interference by using shielded or twisted wiring.

**Error :** Data transmission via the interface does not function.

**Remedy:** Check the power supply, switch off and then on again !  
Check interface module, connections, and settings :

Are both devices set to the same baud rate and transmission mode (see Manual, Section 6.10.12) ?

Is the correct COM interface on the computer being addressed ?

Are the handshake lines DTR and DSR active ?



To check the data flow and the handshake lines a small interface tester with LEDs comes in very handy; (in ready-to-operate status the data lines TXD, RXD carry negative potential of approx. -9V and the LEDs light up green, whereas the handshake lines DSR, DTR, RTS, CTS carry approx. +9V positive voltage and the LEDs light up red. For the duration of data transmission on the data line LEDs must flash red).

Test data transmission by means of a terminal (AMR-Control, WIN-Control, DATA-Control, WINDOWS-Terminal) :

Check the module address and code switch position (see Section 6.3), Address the module using its assigned device number G<sub>xy</sub> (see Manu-

al, Section 6.2.1). Check the programming by means of P15 (see Manual, Section 6.2.3).

**Error :** Data transmission in the network does not function.

**Remedy:** Check to ensure that all modules are set to different addresses.

Address devices individually via terminal and command Gxy.

Addressed device is OK if at least y CR LF is returned as echo.

If transmission is still not possible, unplug external devices and check all devices individually on the data cable to the computer (see above); check the wiring for short-circuit or crossed wires; Are all network distributors supplied with power ? Network the devices again one at a time and check successively (see above).

If, after performing the above-listed checks and remedial steps, the device still fails to behave as described in the operating instructions, it must be returned to our factory in Holzkirchen, accompanied by an explanatory note, error description, and if available test printouts. With the AMR-Control software you can save logs in terminal mode and print these out using the editor.

Service address :

Ahlborn Mess- und Regelungstechnik GmbH

Eichenfeldstr 1-3

D-83607 Holzkirchen, Germany

## 9. ELECTROMAGNETIC COMPATIBILITY

ALMEMO® measuring instrument 8390-1 complies in full with the safety requirements specified in the EU directive on the harmonization of laws in EU member states relating to electromagnetic compatibility (EMC) (89/336/EEC).

The following standards have been applied in evaluating the product :

EN 61326:1997/A1:1998 IEC 61000-3-2:1995,

IEC 61000-4-2:1995, 8 kV

IEC 61000-4-3:1995, 3 V/m: deviation <50 µV

IEC 61000-4-4:1995, 1 kV

The following advisory notes must be observed when operating the device :

1. If the standard sensor is extended (1.5 meters) care must be taken to ensure that the measuring lines are not laid together with high-voltage power cables or that they are properly shielded so as to prevent spurious interference from being induced in the system.
2. Using the device in strong electromagnetic fields may aggravate measuring errors (<50 µV at 3 V/m and 1.5 meters thermocouple sensor). After exposure to such irradiation ceases, the device will again operate within its technical specifications.

## APPENDICES

### Technical data

(see also Manual, Section 2.2)

<b>Measuring inputs :</b>	one ALMEMO® socket for all ALMEMO® sensors
Channels :	4 channels / sensor maximum (measuring and function channels, depending on sensor type)
Sensor power supply :	Mains adapter : approx. 12 V, maximum 70 mA
Measuring rate :	2.5 / 10 measuring operations per second continuous on all channels
System accuracy :	±0.05% of measured value ±2 digits
Temperature drift :	0.01% / K
Cold junction compens.:	± 0.2 K ±0.01 K / °C (-30 to +80 °C)
<b>Outputs :</b>	1 ALMEMO® socket for analog module or interface
Option OA 8390-I	RS-485 interface, electrically isolated, integrated Signals : RX+, RX-, TX+, TX-, line, maximum 1 km
Option OA 8390-E	Ethernet interface, electrically isolated , integrated Socket: RJ-45 10/100 base-T switchover. automatic
Option OA 8390-Rx	Analog output R2 : 0 to 10 V, R3: 0/4 to 20 mA, electrically isolated Accuracy : ±0.1% ± 6 digits, resolution : 15 bits Temperature drift : 1 digit / K
Option OA 8390- Rx2	2 analog outputs R22 : 0 to 10 V, R32: 0/4 to 20 mA, electrically isolated Accuracy : ±0.1% ± 1 digit, resolution : 12 bits Temperature drift : ± 0.005 % / K

### Equipment

A/D converter :	delta-sigma, 16 bit, 2.5 / 10 measuring operations per second
Microprocessor :	NEC 78F0078
<b>Power supply :</b>	7 to 13 V DC, not electrically isolated
Mains adapter :	ZB 1012-NA1 230 V AC to 12 V DC / 200 mA electrically isolated
Current consumption	Without input and output modules : approx. 4.5 mA With Ethernet interface option : approx. 100 mA With analog output option : approx. 50 mA + 2.5 x actually analog current

### Housing

Operating temperature	-10 to +60 °C
Storage temperature	-30 to +60 °C
Ambient relative humidity :	10 to 90 % (non-condensing)
Delivery includes :	Measuring instrument ALMEMO® 8390-1 Operating instructions ALMEMO® 8390-1

ALMEMO® Manual  
AMR-Control software on CD

## Product overview

### Universal transmitter ALMEMO® 8390-1

1 input, 4 channels, 1 ALMEMO® output for analog output  
or interface (network-capable)

### Order no.

MA 8390-1

### Options :

Option U :	DC voltage supply, electrically isolated, 9 to 30 V DC	OA 8390-U
Option I:	RS-485 interface, electr. isolated (including option U)	OA 8390-I
Option E:	Ethernet interface (Option U not possible)	OA 8390-E
Option R2:	Single analog output, 0 to 10 V, 15 bit, electr. isolated	OA 8390-R2
Option R3:	Single analog output, 0/4 to 20 mA, 15 bit, electr. isol.	OA 8390-R3
Option R22:	Double analog output, 0 to 10 V, 12 bit, electr. isol.	OA 8390-R22
Option R32:	Double analog output, 0/4 to 20 mA, 12 bit, electr. isol.	OA 8390-R32
Option HS:	Fixture for top-hat rail mounting	OA 2290-HS

### Accessories

Mounting plate with 2 clips	ZB 8390-H
Mains adapter 12 V / 200 mA	ZB 1012-NA1
ALMEMO® V24 data cable, electrically isolated, 9600 baud (maximum 115.2 kbaud), 1 mA	ZB 1909-DK5
ALMEMO® Analog output cable -1.25 to 2.00 V, 0.1 mV / digit	ZA 1601-RK
Measured value acquisition software WIN-Control	SW 5500-WCx
Software option for connecting an Ethernet transmitter (not WC3)	SW 5500-WC06
Software option AMR2ips for several Ethernet transmitters	SW 5500-C22

## Your contact :