

Operating Instructions



Switchboard Instrument **ALMEMO® 4490-2 V5**

V1.2
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Operating Instructions

Switchboard Instrument

ALMEMO[®] 4490-2

For Reference with the ALMEMO[®] Manual

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1. INTRODUCTION

The switchboard instruments ALMEMO® 4490-2 *Version 5* are instruments from the unique product range of measuring devices that are all equipped with the ALMEMO® connector system, which has been patented by Ahlborn GmbH. The intelligent ALMEMO® connector provides important advantages with regard to the connection of sensors and peripherals as all parameters are stored in an EEPROM within the connector. As a result, the programming that usually has to be performed for the connection is not required.

All sensors and output modules can be connected to all ALMEMO® instruments in the same way. The operation and programming is identical with all units. Therefore, all ALMEMO® measuring system items listed below are described, in detail, in a separate ALMEMO® manual that is supplied with every device:

- Detailed description of the ALMEMO® system (manual section 1)
- Overview of the device functions and measuring ranges (manual section 2)
- All sensors with basic principles, operation, technical data (man. section 3)
- The options for connecting existing sensors (manual section 4)
- All analogue and digital output modules (manual section 5.1)
- The interface module RS232, fiber optics, Centronics (manual section 5.2)
- The entire ALMEMO® networking system (manual section 5.3)
- All functions and their control via the interface (manual section 6)
- A complete interface command list with all print outputs (manual section 7)

These operating instructions only cover features and controls that are specific for a certain device. As a result, the sections dealing with the system control via keypad will only often provide a note referring to a more detailed description within the manual (manual section x.x.x).

1.1 Function Range

The switchboard instrument ALMEMO® 4490-2 has an ALMEMO® measuring input with 4 channels or a measuring channel for a direct connection of sensors. Two output sockets allow for connecting any ALMEMO® output modules, for example, the analogue output, digital interface, trigger input or alarm contacts. As an option, an electrically isolated analogue output and relays can also be integrated into the instrument. Several devices can be networked by simply connecting them with network cables.

For an easy operation a keypad and a 6-digit LED display are integrated. The instruments have many functions for an optimal evaluation of all sensors. To avoid a difficult operation resulting from functions that are not required, the functions can be activated and deactivated automatically or by selecting the display mode or individually via the interface. A range of special functions can only be accessed via the interface.

SENSOR PROGRAMMING

The measuring channels are automatically programmed by the ALMEMO® connectors of the sensors. However, the user can easily complete or modify the programming via keypad or interface.

Measuring Ranges

There are corresponding measuring ranges for sensors with a non-linear characteristic such as 10 thermocouple types, Ntc and Pt100 sensors, infrared sensors, and flow sensors (rotating vanes, thermoanemometers, pitot tubes). Humidity sensors are available with additional function channels that also calculate humidity data such as dew point, mixture ratio, vapour pressure and enthalpy. Even complex chemical sensors can be used. The acquisition of measured data from other sensors is easily possible by using voltage, current and resistance ranges with individual scaling in the connector. Existing sensors can be used without problems. Only the corresponding ALMEMO® connector has to be connected using its terminals. Furthermore, there are adapter connectors with an own microcontroller for digital signals and for measuring frequencies and pulses. This way, nearly all sensors can be connected to any ALMEMO® measuring instrument and are interchangeable without requiring any settings.

Function Channels

Maximum, minimum, average values and differences of two measuring channels can be programmed as function channels and can be processed and printed like normal measuring points.

Dimension

The 2-digit dimension can be altered for each measuring channel so that the display and the printout will always indicate the correct dimension, for example when a transmitter is connected. The conversion from °C to °F is automatically performed according to the dimension.

Name of Measured Values

Sensors can be identified by a 10-digit alphanumeric designation. It is entered via the interface and appears on the printout or display if the evaluation is done via PC.

Correction of Measured Values

For correcting measured values a zero point and slope (gain) correction can be applied to the measured value of each measuring channel. This also allows for sensors to be interchanged that usually, at first, require an adjustment (expansion, force, pH). The zero point and the slope (gain) correction can be performed by the push of a button.

Scaling

The base value and the factor allow for a further scaling of the corrected measured value of each measuring channel for zero point and slope (gain). The decimal point position can be set by the exponent.

Limit Values and Alarm

Two limit values (optionally Max and/or Min) can be set for each measuring channel. An alarm value printout can be performed if a limit value is exceeded and, by means of the limit value relay option, alarm contacts are available that can be individually allocated to limit values. As a standard, the hysteresis is set to 10 digits, however, it can also be set between 0 and 99 digits. Furthermore, limit value exceeding can also be used to start or stop a measuring point scan.

Sensor Locking

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

MEASUREMENT

A total of up to 4 measuring channels are available for each transducer, i.e. it is also possible to evaluate double sensors, individually scaled sensors, or sensors with function channels. The measuring channels can be successively selected forwards or backwards via keypad. The selected measuring point can be scanned with a conversion rate of 2.5 or 10 measurements/second. The measured value is calculated and indicated on the display or, if available, provided on the analogue output. Standard sensors without an ALMEMO® connector can be directly connected by means of a special multipoint connector. The programming of the corresponding channel must be performed each time the sensor is changed.

Measured Value

A continuous presentation of measuring data from the selected measuring point is provided and also includes automatic zero point correction and optional correction of the measured value or new scaling.

A sensor breakage condition is, with most sensors, automatically detected (exception: connectors with shunts, dividers or additional electronics).

Measuring Functions

Special measuring functions are required for some sensors in order to achieve an optimal acquisition of measuring data. The cold junction compensation is available for thermocouples, a temperature compensation for dynamic pressure and pH and conductivity probes, and an atmospheric air pressure compensation for humidity sensors, dynamic pressure sensors and O₂ sensors. With infrared sensors the parameters zero point and slope correction are used for background temperature and emissivity factor.

Analogue Output and Scaling

By means of analogue start and analogue end the indicated measured value can be scaled so that the resulting measuring range covers the full analogue output range (0-2V, 0-10V or 0/4-20mA).

Max and Min Value

Each measurement involves an acquisition and storing of the maximum and minimum value. These values can be displayed, printed and cleared.

PROCESS FLOW PROGRAMMING

A cyclic measuring point scan with a time-based process flow control is required to register measuring data of all measuring channels via the interface. For this purpose, a clock, the print cycle and the measuring cycle are available and, if fast processing is required, the conversion rate is available. The measurement can be started and stopped by using the interface, an external trigger signal or an exceeding of limit values.

Time and Date

Time and date or the pure measuring time is used for the recording of any measurement.

Print Cycle

The print cycle is programmable between 1s and 59h/59min/59s. It allows a cyclic output of measured values to the interfaces as well as a cyclic averaging.

Measuring Cycle

The measuring cycle, also programmable between 1s and 59h/59min/59s, is for a cyclic scanning with limit value monitoring, alarm message and output of alarm values and averaging.

Average Value over Measuring Point Scans

The measured values that result from measuring point scans can be averaged as desired either over the total measuring time or over the print cycle. Function channels are provided for a cyclic output of average values.

Conversion Rate

With ALMEMO® V5 devices, all measuring points can be continuously scanned with the conversion rate (2.5 or 10 meas./s). It is also possible to provide all measured values as an output via the interface.

Control Outputs

The interface allows to individually trigger the 2 internal or up to 4 external output relays and one analogue output.

Output

All measuring and programming data is, firstly, accessible via keypad and LED display. RS232, RS422 and a Centronics interface are available by using different interface cables. All data logs, stored measured values and programmed parameters can be provided as output to any peripheral equipment. The output of measuring data can be selected in list format, columns or spreadsheet format. Files in spreadsheet format can be processed by each spreadsheet software. The print header can be programmed specifically to the company or application.

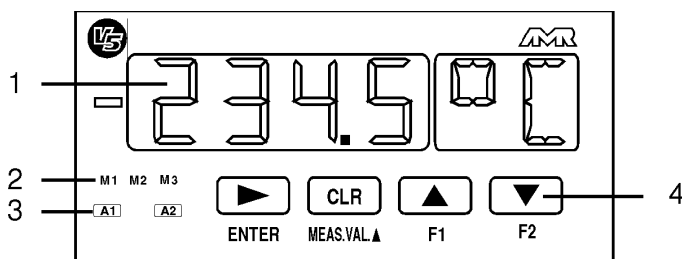
Networking

All ALMEMO® devices can be addressed and can be easily networked by a simple connection with network cables or network junctions for longer distances.

Software

The AMR-Control software, which allows for the entire programming of the sensors and the configuration of the measuring instrument, is supplied with each ALMEMO® manual. The integrated terminal also allows for online measurements. The WINDOWS® software packages, Win-Control and DATA-Control, are available for data acquisition of networked devices, graphical presentation and complex data processing.

1.2 Front Operating Controls



(1) **LED DISPLAY** 4-digit 7-segment and minus f. meas. and progr. values
2-digit 14-segment for dimension or function

(2) **MEAS. CHAN.** M1, M2, M3 (M0 clamp. conn. or ALMEMO® without display)

(3) **ALARM LAMPS** A1 and A2 for limit value 1 and limit value 2

(4) **FUNCTION KEYS**

ENTER, ▲▼, ►

ENTER, CLR

MEAS.VAL. ▲

F1

entering programming values
clear data, set measured value to zero
selection of meas. value and meas. point
selection of measuring functions

max value (Hi) MH

min value (Lo) ML

conversion rate CR

atmospheric pressure mb ~

temperature compensation TC "

~ for humidity, dyn. press. a. O₂ sensors

" for pH and dyn. pressure probes

F2

selection of programming functions

range R

limit value 1 max/min (Hi/Lo) H1 / L1

limit value 2 min/max (Lo/Hi) L2 / H2

hysteresis HY

base value BA

factor FA

exponent EX

zero point correction ZC

slope (gain) correction SC

ambient temperature AT ^

emissivity factor EF ^

locking mode LM

baud rate BR *

device address A *

analogue output - start AS

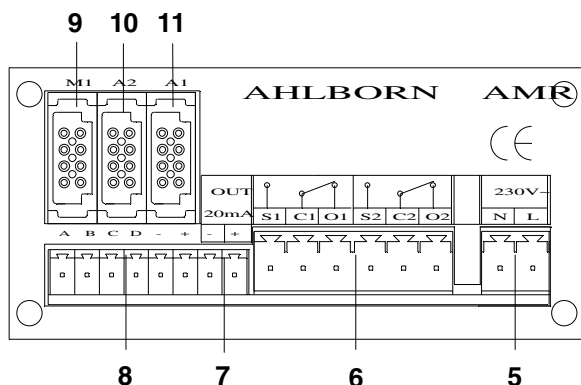
analogue output - end AE

analogue output type 0/4-20 mA

^ for IR sensors

* with interface module

1.4 Rear Operating Controls



(5) **Power Supply** N-L 230 V AC, 50/60 Hz
Option U - + 10..36 V DC

(6) **Relay Contacts** S1-C1-Ö1 lim. value 1 (make and break)
S2-C2-Ö2 lim. value 2 (make and break)

(7) **Analogue Output** Out - + electrically isolated
Option R1 -1.25 V to 2 V (0.1mV/digit)
Option R2 -6.00 V to 10 V (0.5mV/digit)
Option R3 0/4 mA to 20mA (1µA/digit)

Meas. Inputs

(8) **Clamp. Connector** A-B-C-D meas. chan. M0, internal for exist. sensors
Sensor Volt. Supply - + ca. 7V DC, 50 mA not electrically isolated
Option V1 12V DC, 30 mA electrically isolated
Option V2 12V AC, 50 mA electrically isolated
(9) **ALMEMO® socket** M meas. chan. M0 to M3 for all ALMEMO® sensors

Output Sockets

(10) **ALMEMO® socket** A2 network cable ZA1999-NK5
trigger input with cable ZA 1000-ET
relay outputs ZA 1000-EGK
analogue output 2 ZA 1601-RK
(11) **ALMEMO® socket** A1 V24 interface with cable ZA 1909-DK5
V24 interface with fiber optics ZA1909-DKL
RS 422 (ZA 5099-NVB / L)
analogue output 1 with cable ZA 1601-RK

2. INITIAL OPERATION

1. **For power supply**, depending on the version (see type plate), connect mains supply 230 V AC or 10-36 V DC to terminals (5), see 3.1 and 3.2.
2. Connect **transducer with ALMEMO® connector** to socket M1 or connect a **sensor with bare ends** to the clamping connector (8), see 4.2. Program the measuring range in function 'R' (F2), see 6.2.
3. **Displaying the measured values**
Select function MEAS. VALUE and meas. channel with key MEAS.VAL.▲ (4), read measured value, see 7.1.
4. **Limit value monitoring**
Enter limit values using key F2 in function 'H1' or 'L2', see 6.4.
Connect alarm device to clamping connector (6).
5. **Display max and min values** using key F1 in function 'MH' or 'ML', s. 7.1.3.
6. **Data transfer** to a computer
Connect peripheral device via interface cable to socket A1, see man. 5.2.
Set 9600 bd, 8 data bits, 1 stop bit, no parity, at peripheral device, see 9.1.
Enter commands by using the terminal of AMR-Control, see man. 6.

3. POWER SUPPLY



Before connecting any supply voltage refer to the type plate to ensure the correct type of power supply!

3.1 Mains Operation

For mains operation the power supply 230V +-10% / 50-60Hz must be established via the terminal screw connector at socket (5) on the rear side of the unit.



Please note that connection to the 230V mains supply network must only be performed by a qualified electrician.

3.2 DC Voltage Supply

The option U is required for a 10...36 V DC voltage supply with an electrical isolation. The voltage must be connected via a terminal screw connector to socket (5) on the rear side of the unit.

3.3 Data Storage, Reinitialisation

The measured data, time and date will be lost when the device is switched off. However, all programmed values and the calibration in the EEPROMs will be maintained.

If the device is not functioning properly due to disturbances (e.g. electrostatic charging) or if incorrect programming must be avoided, the instrument can be reinitialised.

The **reset** can be achieved if the key **CLR** is pressed during switch-on. During this process the measuring data, time and date, as well as all internal data such as cycles, conversion rate, atmospheric pressure and function key assignment, will be cleared or set to their default values. However, the device configuration and the sensor programming within the ALMEMO® connectors will not be affected by the reset.

4. CONNECTION OF THE TRANSDUCERS

Any ALMEMO® sensors can be connected to the ALMEMO® input socket M (9). Existing sensors with bare ends can be connected directly to the terminal block (8) or to a corresponding ALMEMO® connector.

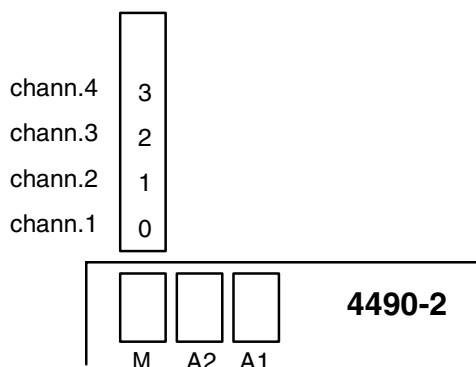
The connection of the sensors should be performed very thoroughly as it can have large effects on the electromagnetic compatibility. Although the measuring input is electrically isolated from the outputs, it is advisable to isolate the transducer when installing because the protective earth connection and the housing can often provide high voltage transients in industrial environments. When performing the cabling it must be considered that the leads are not wired near magnetic valves, contactors and motors and that they are not guided together with leads for such devices. The leads should be as short as possible and should have a cross section of 0.5 mm² at minimum (1.0 mm² at max.). Furthermore, electromagnetic influences can be reduced by twisting the lines or by guiding cables in steel tubes. Electrostatic disturbances can be avoided by using shielded cables. The metal braid shield is then connected to the '—' terminal of the connector.

4.1 Transducers

A detailed description of the comprehensive ALMEMO® sensor range (see manual section 3) and the connection of existing sensors (see manual section 4) to the ALMEMO® instruments are provided in the ALMEMO® manual. All standard sensors with ALMEMO® connector usually have the measuring range and dimension already programmed and can be immediately connected to any input socket. A mechanical coding ensures that sensor and output modules can only be connected to the correct sockets. Furthermore, each ALMEMO® connector has two locking levers that snap in when the insertion into the socket is established and that prevent a disconnection caused by pulling the cable. Both levers must be pressed on the sides for disconnecting the connector.

4.2 Measuring Inputs and Additional Channels

Either the ALMEMO® socket M (9) or the clamping connector (8) can be used as measuring input for the ALMEMO® 4490-2. When using the clamping connector only one measuring channel is available and must be programmed via the instrument. When an ALMEMO® sensor is connected to socket M the programming can cover up to four measuring channels (M0 to M3) and will be automatically loaded from the connector. The additional channels can be especially used for humidity sensors with 4 measuring variables (temperature/humidity/dew point/mixture ratio) or for function channels. A sensor can, if required, also be programmed with several ranges or scalings or, depending on the pin assignment, 2 or 3 sensors can be combined in one connector (e.g. rH/Ntc, mV/V, mA/V etc.).



The measuring input, outputs and power supply are electrically isolated from each other and a potential difference of 50V at maximum is permissible between them. However, sensors combined within one connector and sensors with an own power supply are electrically connected to each other and must, therefore, be operated in isolation. The voltage applied to the measuring inputs must not exceed $\pm 5V$ (between B,C,D and A or - respectively).

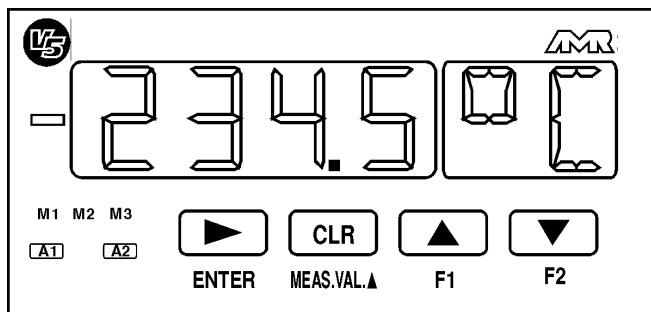
As only **one** input but **two** options for a connection are available, an ALMEMO® connector and a sensor with a clamping connector must not be plugged in at the same time!

The cold junction compensation for thermocouple measurement is integrated in socket M of the device. Therefore, thermocouples should always be connected with an ALMEMO® connector.

5. DISPLAY AND KEYPAD

5.1 Display

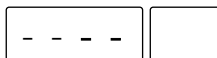
The display (1) of the instrument ALMEMO® 4490-2 consists of a 6-digit LED display plus a minus sign. The first four digits indicate the measuring or programming value including the sign. The following two alphanumeric digits indicate the dimension in case of a measured value, or the selected function (see 6.1). In case of values exceeding 9999 an automatic decimal point switch is performed, so the last digit will disappear.



Special Operating Conditions

Segment test of the display
Sensors that are not connected,
de-activated measuring points,
cleared programming values.

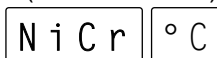
automatically after switching on.



Alarm Conditions

are displayed as follows and cause an alarm (see man. 6.3.9):

Sensor breakage:



abbrev. flashes

Exceeding of limit value:

A1 or **A2** is illuminated

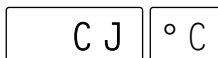
Overshooting of measuring range:

A1 illuminated, max value flashes

Undershooting of measuring range:

A2 illuminated, min value flashes

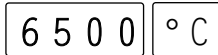
Undershoot. of meas. range CJ compens.



Meas. without ext. CJC or CJC breakage:

(cold junction) flashes

Exceeding of range of values (>65000):



flashes

5.2 Selection and Activation of Functions

The keys **MEAS.VAL.▲**, **F1** and **F2** can be used to successively select the measured values of all channels as well as the following measuring and programming functions. For switching back to the previous channel or function the key must be pressed and held (approx. 1s). The measured value will be automatically indicated again when the keypad has not been used for approx. 1 minute. The functions can be identified by a 2-digit abbreviation, which is displayed instead of the dimension. Some functions will only be activated when they are required by **ALMEMO®** sensors or modules.

MEAS.V.▲	F1			F2		
Meas.Val, Dim	Meas. Functions	Ab	DM	Programming Values	Abbr.	DM
Meas. Ch. M0	Max Value (Hi)	MH	0	Display Mode	DM	0
Meas. Ch. M1	Min Value (Lo)	ML	0	Range	R	0
Meas. Ch. M2	Conversion Rate	CR	7	Limit Value 1 Max/Min	H1/L1	1
Meas. Ch. M3	ˆ Atmosph. Pressure	mb	0	Limit Value 2 Min/Max	L2/H2	1
	° Temp. Compens.	TC	0	Hysteresis	HY	2
				Base Value	BA	3
				Factor	FA	3
				Exponent	EX	3
				Zero Point Correction	ZC	4
				Slope (Gain) Correction	SC	4
				ˆ Ambient Temperature	AT	4
				ˆ Emissivity Factor	EF	4
				Locking Mode	LM	5
				* Baud Rate	BR	6
				* Device Address	A	6
				Analogue Output Start	AS	8
				Analogue Output End	AE	8
				0-20/4-20	mA	9

Automatic activation of the functions by:

- * interface modules
- ˆ infrared sensors
- ° dyn. pressure and pH probes
- ˆ humidity, dyn. press and O₂ sensors

Limitation of Function Range in Display Mode

The last digit in the display mode allows to limit the number of selectable functions, up to a certain level. The disabled functions can then not be selected any more and, therefore, are protected against accidental changes. The display mode 'DM' can be accessed by selecting the function 'R' and by pressing and holding the key **F2** once. Entering the digit 1 (see 5.4) limits the functions to range, lim.val.1 and lim.val.2. The locking mode 'LM' (see 6.7) can be used to lock the sensor parameters.

By setting up the key functions via interface (AMR-Control) the devices can be individually configured for any application (man. 6.10.13.3). The original setting can always be re-established by pressing the key **CLR** during switching on.

5.3 Keypad

The keypad (4) has the following functions that are displayed below the keys:

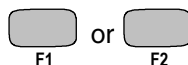
Function	Normal	Input
Data Entry	ENTER	►
Selection Meas. Value, Measuring Point	MEAS.VAL.▲	CLR
Selection of Measuring Functions	F1	▲
Selection of Programming Functions	F2	▼

The key **ENTER** is used for **programming the parameters**. After operating this key a digit or an abbreviation will flash in the display, i.e. the instrument is in edit mode and the red designations on the keys are valid (s. 5.4). Then, the keys ▲, ▼ are available for changing the input digit, the key ► operates as cursor key and **CLR** is available for clearing the parameters. The data input is finished when the last digit has been confirmed by operating the key ►.

5.4 Data Input

The programming of numeric parameters is performed as follows:

Selection of the function by using the keys F1 or F2...



The programming is started by pressing the key **ENTER**.

The first programmable digit flashes and can be altered.

If 5-digit values are entered the upper 4 digits will be indicated at first and then, after switching, the lower 4 digits.



The digit can be **increased** using the key ▲.

After exceeding the maximum value the cycle restarts from zero.



The digit can be **decreased** using the key ▼.

At the 1st digit, negative values follow after falling below zero.



A **switch** to the next digit is performed using the key ►.



Switch back to previous digit by pressing and holding the key ►.



The programming process is complete

after setting the last digit and again operating the key ►.



Programming and meas. values can be cleared by using



6. SENSOR PROGRAMMING


As all ALMEMO® instruments contain the whole sensor programming stored in the ALMEMO® connector plug, the user does not usually need to perform any programming. Only if, for example, sensor errors must be corrected or existing sensors must be scaled or limit values need to be specified, the comprehensive programming options have to be used. It must be considered that standard sensors are, by a locking mode, protected against unintentional modification and that the locking level must first be reduced before desired changes can be performed (see 6.7). All parameters can easily be entered or changed via keypad if the corresponding sensor connector is connected.

6.1 Selecting the Measuring Channel

If no ALMEMO® connector has been connected, measuring channel M0 will only be available. When an ALMEMO® connector is used the function MEAS.VAL. allows, depending on the programming, to select up to four channels by using the key **MEAS.VAL.▲**. For switching back to the previous channel the key must be pressed and held for approx. 1 sec. If the channels are locked, only the activated channels will be considered. Therefore, the selection of a, so far, not programmed channel is only possible if the locking of the 1st channel is cleared.

The channel number will be indicated by illuminated symbols M1, M2 and M3 (2). There is no symbol for the 1st channel.

Increase measuring channel by using:  (programmed chann. only)

Decrease measuring channel with key:  1s → press and hold (ca. 1s)

6.2 Selecting the Measuring Range

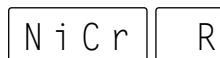
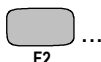
If sensors are connected using the terminal block or if the user wants to program the ALMEMO® connectors on his own, it must be considered that the locking of the connectors is cleared (see 6.7) and that a special connector is required for some transducers (e.g. thermo, shunt, divider etc., see table).

After selecting the corresponding channel (see 6.1), the function RANGE ´ R´ must be selected by using the key F2. For activating a channel that has not yet been programmed the locking of the first channel of the corresponding connector must be cleared. After operating the key ENTER the abbreviation of the measuring range will flash in the display:

The keys ▲ and ▼ can be used to select all possible ranges in the sequence given below. When the desired range is indicated in the display it can, by pressing the key ► again, be transferred including the correct dimension to the connector and the programming can be finished. All other programming values of the channel will be cleared by this.

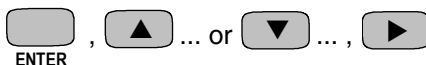
Function RANGE 'R'

Selection with key F2...



Example : range NiCr-Ni

Change meas. range:



Transducer	Conn. / Cable / Sensor	Meas. Range	Dim	Display
Pt100-1	ZA 9000-FS	-200.0...+850.0	°C	P104
Pt100-2	ZA 9000-FS	-200.00...+200.00	°C	P204
Ni100	ZA 9000-FS	-60.0...+240.0	°C	N104
NiCr-Ni (K)	ZA 9020-FS	-200.0...+1370.0	°C	NiCr
NiCroSil-NiSil (N)	ZA 9020-FS	-200.0...+1300.0	°C	NiSi
Fe-CuNi (L)	ZA 9000-FS	-200.0...+900.0	°C	FECO
Fe-CuNi (J)	ZA 9000-FS	-200.0...+1000.0	°C	IrCo
Cu-CuNi (U)	ZA 9000-FS	-200.0...+600.0	°C	CUCO
Cu-CuNi (T)	ZA 9000-FS	-200.0...+400.0	°C	CoCo
PtRh10-Pt (S)	ZA 9000-FS	0.0...+1760.0	°C	Pt10
PtRh13-Pt (R)	ZA 9000-FS	0.0...+1760.0	°C	Pt13
PtRh30-PtRh6 (B)	ZA 9000-FS	+400.0...+1800.0	°C	EL18
Au-FeCr	ZA 9000-FS	-270.0...+60.0	°C	AUFE
Ntc type N	ZA 9000-FS	-30.00...+125.00	°C	Ntc
Millivolt 1	ZA 9000-FS	-26.000...+26.000	mV	U 26
Millivolt	ZA 9000-FS	-10.000...+55.000	mV	U 55
Millivolt 2	ZA 9000-FS	-260.00...+260.00	mV	U260
Volt	ZA 9000-FS	-2.6000...+2.6000	V	U2.60
Differential Millivolt 1	ZA 9050-FS	-26.000...+26.000	mV	d 26
Differential Millivolt	ZA 9050-FS	-10.000...+55.000	mV	d 55
Differential Millivolt 2	ZA 9050-FS	-260.00...+260.00	mV	d260
Differential Volt	ZA 9050-FS	-2.6000...+2.6000	V	d2.60
Sensor voltage	ZA 9000-FS	0.00...20.00	V	UbAt
Milliampere	ZA 9601-FS	-32.000...+32.000	mA	I032
Percent (4-20mA)	ZA 9000-FS	0.00... 100.00	%	P420
Ohm	ZA 9000-FS	0.00... 400.00	Ω	Ohn
Frequency	ZA 9909-AK	0... 25000	Hz	FrEq
Pulses	ZA 9909-AK	0... 65000		PULS

Transducer	Conn. / Cable	Meas. Range	Dim	Display
Digital input	ZA 9000-EK2	0.0... 100.0	%	Inp
Digital interface	ZA 9919-AKxx	-65000... +65000		diGi
Infrared 1	ZA 9000-FS	0.0... +200.0	°C	Ir 1
Infrared 2	ZA 9000-FS	0.0... +800.0	°C	Ir 2
Infrared 3	ZA 9000-FS	-30.0... +70.0	°C	Ir 3
Infrared 4	ZA 9000-FS	-30.0... +100.0	°C	Ir 4
Infrared 6	ZA 9000-FS	0.0... +500.0	°C	Ir 6
Snap-on head Normal 20	FV A915-S120	0.30... 20.00	m/s	S120
Snap-on head Normal 40	FV A915-S140	0.40... 40.00	m/s	S140
Snap-on head Micro 20	FV A915-S220	0.50... 20.00	m/s	S220
Snap-on head Micro 40	FV A915-S240	0.60... 40.00	m/s	S240
Macro	FV A915-MA1	0.10... 20.00	m/s	L420
Water-Micro	FV A915-WM1	0.00... 5.00	m/s	L605
Dyn.press. 40m/s w. TC a. PC	FD A612-M1	0.50... 40.00	m/s	L840
Dyn.press. 90m/s w. TC a. PC	FD A612-M6	1.00... 90.00	m/s	L890
Rel. humidity cap.	FH A646	0.0... 100.0	%H	°orH
Rel. humidity cap. w. TC	FH A646-R	0.0... 100.0	%H	H rH
Mixture ratio w. PC	FH A646	0.0 ... 500.0	g/kg	H AH
Dew point temperature	FH A646	-25.0... 100.0	°C	H dt
Partial vapour pressure	FH A646	0.0 ... 1050.0	mbar	H UP
Enthalpy w. PC	FH A646	0.0 ... 400.0	kJ/kg	H En
Humid temperature	ZA 9000-FS	-30.00 ... +125.00	°C	P Ht
Rel. humidity psychr. w. PC	ZA 9000-FS	0.0 ... 100.0	%H	P RH
Mixture ratio w. PC	ZA 9000-FS	0.0 ... 500.0	g/kg	P AH
Dew point temperature w. PC	ZA 9000-FS	-25.0 ... +100.0	°C	P dt
Partial vapour pressure w. PC	ZA 9000-FS	0.0 ... 1050.0	mbar	P UP
Enthalpy w. PC	ZA 9000-FS	0.0 ... 400.0	kJ/kg	P En
Conductivity probe w. TC	FY A641-LF	0.0 ... 20.000	mS	LF
CO ₂ sensor	FY A600-CO2	0.0 ... 2.500	%	CO2
O ₂ saturation w. TC and PC	FY A640-O2	0 ... 260	%	O2-S
O ₂ concentration with TC	FY A640-O2	0 ... 40.0	mg/l	O2-C

Function Channels:

Difference	any		diFF
Maximum value	any		Hi
Minimum value	any		Lo
Average value over time	any		A[t]
Average value over junctions	any		A[n]
Sum over junctions	any		S[n]
Total number of pulses	ZA 9909-AK2	0... 65000	S[t]
Pulses/print cycle	ZA 9909-AK2	0... 65000	S[P]
Alarm value	any		Alrm

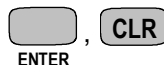
TC=Temperature Compensation, PC=Atmospheric Pressure Compensation

The **use of the function channels** for the output of measuring and calculated variables with the corresponding reference channels is described in the manual section 6.3.4.

Switch-off, i.e. deactivation of a programmed measuring channel

Function: RANGE 'R'

Keys:



After switch-off the measured value is no longer indicated, queried or provided as output. However, the programming is still maintained.

Re-activation of the measuring channel:

Function: RANGE 'R'

Keys:



If the channel was previously deactivated, it will be re-activated with all programmed values. However, if the channel is already active then all programming values will be cleared by operating the above key combination (corresponds to selecting a measuring range).

6.3 Changing the Dimension

Each measuring channel allows replacing the standard dimension of the measuring range by any other dimension that has two digits (see manual 6.3.5). In addition to all capital and normal letters, the characters □, □, Ω, %, [,], *, -, =, ~ and spaces () are available. The dimension is indicated by two 14-segment characters that are indicated following the measuring and programming values.

The **change of the dimension** can be performed within the function MEAS.VALUE by pressing the key **ENTER**. The first character of the dimension will flash in the display. It can then be changed by using the keys ▲ and ▼. When the first character is set the key ► can be operated again and the same procedure can be performed for the second character. When the desired dimension has been set the programming can be completed using the key ►.

Function: MEAS.VAL.



1st dim change 2nd dim change end



When the dimension °F is entered a temperature value in degrees Celsius will be converted into degrees Fahrenheit.

The cold junction compensation can be switched off by using the characters □C or □F.

6.4 Limit Values

For monitoring the measured values each measuring channel allows for programming 2 limit values; generally, a maximum and a minimum value. When limit values are exceeded the corresponding control lamp (3) will be on. If the optionally available limit value relays (option G1 or G2) have been integrated, the related contacts (6), which can be used for activating an alarm circuitry, will also respond. The alarm condition will be maintained until all measured values have dropped below the limit values by as much as the hysteresis. If an alarm cable is not connected, the function of the internal relays can be configured as with the output modules (see man. 6.10.9). The relay condition will, then, also appear in the device programming (man. 6.2.5).

The **hysteresis** (usually 10 digits) can be set in function 'HY' within a range from 00 to 99 digits.

As a standard, limit value 1 is programmed as max value (function 'H1') and limit value 2 as min value (function 'L2'). The switch function can be changed if 2 max values or 2 min values are required.

Reprogramming of the Limit Value Function

Select limit value 1 or 2 by using key F2 and press key ENTER so the first digit flashes. Then, press and hold the key ENTER. The function 'L1'(Lo) will be displayed instead of 'H1'(Hi) and 'H2'(Hi) will be displayed instead of 'L2'(Lo).

Function LIMIT VALUE 1 MAX 'H1' and LIMIT VALUE 2 MIN 'L2'

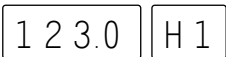
Selection with key F2...  ... 



Programming: Input according to 5.4

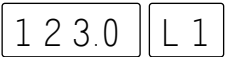
Switching off:  ,  

Switching on again:  ,  ,  ,  ,  , 

Press the key ENTER six times. The display will return to the previously programmed value.



Change the function:  ,  ^{1s} →



Function HYSTERESIS 'HY'

Selection with the F2...  ... 

Programming: Input according to 5.4

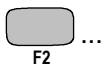
6.5 Correction Values

The correction values ZERO POINT and SLOPE allow for correcting sensors with regard to zero point and slope (gain) (see manual 6.3.10).

Corrected Meas. Value = (Meas. Value - ZERO POINT) x SLOPE

Function ZERO POINT CORRECTION 'ZC'

Selection with key F2...



0 0 3.2

ZC

Programming:

Input according to 5.4

Clearing with keys:



- - - -

ZC

Function SLOPE CORRECTION: 'SC'

Selection with key F2...

Input according to 5.4

1.5 0 0

SC

Sensor Adjustment

To simplify the correction of sensors for the zero point and, possibly, also the slope (gain), a key combination for an automatic adjustment is available in the function **MEAS.VAL.** (see 7.1.4). The corrected measured value will be stored as zero point correction and, as a result, be set to zero. However, the base value will be maintained.

Select function MEAS.VAL. with key:



Adjustment with the keys:



6.6 Scaling, Decimal Point Setting


For indicating the electrical signal of a sensor as a measured value of a physical variable it is, in most cases, necessary to set a zero point shift and to perform a multiplication with a factor. The functions EXPONENT, BASE and FACTOR are available for this. A detailed description of the scaling, including an example, can be found in the manual section 6.3.11.

Indicated value = (corrected meas. value - BASE) x FACTOR.

Decimal Point Setting

The FACTOR can be programmed in the range from -2.0000 to +2.0000. For factors higher than 2.0 or lower than 0.2 a corresponding decimal point setting must be considered by entering the EXPONENT. The function EXPONENT 'EX' allows for shifting the decimal point as far to the left (-) or right (+) as it can be indicated on the display. An exponential presentation of the measured values is not possible.

Function BASE VALUE 'BA'

Selection with key F2...  ... Input see 5.4

0 7 . 0 0 B A

Function FACTOR 'FA'

Selection with key F2...  ... Input see 5.4

- 0 . 1 6 3 F A

Function EXPONENT 'EX'

Selection with key F2...  ... Input see 5.4


- 2 E X

6.7 Locking of the Sensor Programming (s. man. 6.3.12)

The function parameters of each measuring point are protected by the locking mode up to an adjustable locking level. Before any programming is performed the locking mode must be correspondingly lowered. If a dot following the locking mode is indicated on the display then a modification is not possible.

Locking Level	Locked Functions
0	none
1	measuring range + element flags
2	measuring range + zero point and slope correction
3	measuring range + dimension
4	+ zero point and slope correction
5	+ base value, factor, exponent
6	+ analogue output, start and end
7	+ limit values, max and min

Function LOCKING MODE 'LM'

Selection with key F2...  ... Input see 5.4

0 0 0 5 LM

If programmed, the output function, element flags and multiplexer setting will be indicated next to the locking mode (see man. 6.10.2/3).

7. MEASUREMENT

The switchboard instrument ALMEMO® 4490-2 provides the following options for the acquisition of measuring data:

1. Continuous measurement of a selectable meas. point, see man. 6.4.
Output of measuring data to the analogue output, see man. 5.1.1.
2. Continuous measuring point scan, see manual 6.5.1.3.

Via serial interface only:

3. Single measuring point scan, see man. 6.5.1.1.
4. Cyclic measuring point scan, see man. 6.5.1.2.


7.1 Continuous Measurement of a Measuring Point


In the basic setting (e.g. after a reinitialisation, see 3.3) only the measured value of a selected measuring point, which is at first M0, is continuously acquired with the specified conversion rate (see man. 6.5.4). This is the optimal operating mode for data recording with analogue output.


7.1.1 Selecting the Measured Value and Measuring Point

After switch-on the function **MEAS.VAL.** is automatically set and the measured value of the previously selected measuring point will be displayed. After a reset (see 3.3) this will be channel M0. After selecting other functions using the keys **F1** and **F2** it is possible to return to the display of the measured value by using the key **MEAS.VAL. ▲**.

For ALMEMO® sensors with several channels, it is possible in function **MEAS.VALUE** and by using the key **MEAS.VAL.▲** to successively select all other active measuring points and to indicate the actual measured value. If the key **M▲** is pressed and held (approx. 1s) the previous channel is indicated again. The measuring point can be identified by the illuminated symbols M1, M2 or M3; no symbol for M0. If the measuring range changes when switching over, the abbreviation of the meas. range is indicated first. The selected meas. point will be stored in the EEPROM and will be set again after a power failure.

Selecting the measured value:  23.4 °C

Increase meas. channel with key:  51.8 %H M1

Decrease meas. channel with key:  1s → press and hold (approx. 1s)


In case of a sensor breakage the abbreviation of the meas. range will flash instead of the meas. value (s. 6.2). NiCr °C

7.1.2 Conversion Rate, Continuous Measuring Point Scan

The conversion rate can, if necessary, be increased from 2.5 (3) to 10 M/s (s. man. 6.5, 6.5.4). For this purpose, the function CONVERSION RATE 'CR' must be selected using key F1 and set by using the keys ENTER, ▲ ▼, ENTER.

At the same time, it is possible to set the **continuous measuring point scan** with the identification code 'C', i.e. not only the selected measuring point will be acquired but all active measuring channels will be continuously and successively acquired (s. 7.2 and man. 6.5.1.3). This operating mode is, for example, very useful for monitoring the limit values of several channels, for temperature compensation or for controlling two analogue outputs.

Function CONVERSION RATE 'CR'

Selection with key F1...  ...  

Example: 2.5 M/s, one meas. point only

Change with keys:  ,  ... ,    



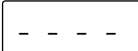

Example: 10 M/s, continuous scanning

7.1.3 Memory for Peak Values

From the acquired measured values of each measuring point the highest and lowest value is each time determined and stored. For indicating the peak values the required channel must be selected and the function MAX VAL 'MH' or MIN VAL 'ML' must be selected with key F1.

Function MAX VALUE 'MH' and MIN VALUE 'ML'

Selection with key F1...  ...  

Clearing the max, min value:  ,   

If the cleared channel is the selected measuring channel, the measured value will be indicated immediately after the clearing.

The peak values are cleared in case of a switch off or if a change of the measuring range (see 6.2) is carried out.

7.1.4 Setting Meas. Values to Zero, Zero Point Correction

Setting the Measured Value to Zero

The user can zero the measured value at certain locations or at certain times in order to check the deviation from this reference value. The indicated measured value is, by the following key combination, stored as base value and, as a result, set to zero.

Function **MEAS.VAL.:**



4 5.6 °C

Zero setting with keys:



0.0 °C



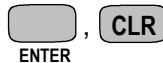
Please note that this function is only available if the locking code is set below 5 (see 6.7).

To return to the original value again, the base value must be cleared.

Selection of function **BASE VALUE** 'BA' using key **F2**...:

4 5.6 B A

Clear base value:



- - - B A

Zero Point Correction

Many sensors must be adjusted at least once or at regular intervals to compensate for instabilities. For this purpose and in addition to the 'Set Measured Value to Zero' mentioned above, a specific **zero point adjustment** is available as some sensors require an additional scaling (e.g. pH probes). In this function the zero point error is not stored as base value but as zero point correction (special cases and slope correction, see 6.5). In this case, the locking mode must be set to less than 4 (see 6.7). The zero point correction is performed with the following keys:

Function **MEAS.VALUE:**



Zero point adjustment (pH):



7.0 0 pH



If a base value is programmed (e.g. -7.00pH) the measured value is not indicated as zero but as the negative base value after the adjustment.

For some sensors **special functions** are available in this context:

1. With pH probes, if the two keys **ENTER** and **F** are pressed during switch-on, the locking is only temporary, i.e. until the device is switched off and set to 3. An undesired adjustment can then be avoided.
2. **Dynamic pressure probes** are very delicate and should be adjusted in an unpressurized state before each use (i.e. disconnected hoses or Pitot tube out of flow). The correction value must be entered before the conversion 'pressure-to-velocity' is performed. For the ranges L840 and L890 an adjustment is possible even if the channel is locked.

The zero point error is temporarily being written into the calibration offset until the switch-off is performed.

3. With the following sensors, a **slope adjustment** is performed in the same way for the corresponding calibration value:

pH-probe:	ZA 9610-AKY:	pH4 or pH10
Conductivity:	FY A641-LF:	2.77 mS/cm,
	FY A641-LF2:	147 uS/cm
	FY A641-LF3:	111.8 mS/cm
O ₂ saturation:	FY A640-O2:	101 %

7.1.5 Atmospheric Pressure Compensation

Some measuring variables depend on the environmental atmospheric pressure (see 6.2 measuring range list 'w. PC'). As a result, higher deviations from the normal pressure of 1013mbar can cause corresponding measuring errors,

e.g. error per 100 mbar:	Rel. humidity psychrometer	approx. 2%
	Dynamic pressure	approx. 5%
	O ₂ saturation	approx. 10%

Therefore, the atmospheric pressure should be considered (approx. -11mb/100m over mean sea level, MSL) especially during use in a corresponding height above sea level. It can either be programmed or measured with a sensor (s. man. 6.7.2).

Function ATM. PRESSURE 'mb'

Selection with key  ... Input in mbar, see 5.4

1 0 1 3 m b

With each reset the atmospheric pressure is set to 1013mb. It can be set to the actual value by the usual data entry (see 5.4).

7.1.6 Temperature Compensation

Sensors with measured values that are strongly depending on the temperature of the measuring medium are, in most cases, equipped with a specific temperature sensor and the instrument will automatically perform a temperature compensation (see measuring range list 6.2 'w. TC'). However, dynamic pressure probes and pH probes are also available without a temperature sensor. If the temperature of the medium deviates from 25°C, the following measuring errors will occur:

e.g. error per 10 °C:	Dynamic pressure	approx. 1.6%
	pH probe	approx. 3.3%

The temperature compensation can also be performed with external temperature sensors by using the reference channel, or within the function 'TC' by entering the temperature manually:

Function TEMPERATURE COMPENSATION 'TC'

Selection with key  ... Input in °C, see 5.4

1 8 0 . 0 T C

7.2 Measuring Point Scans (see also manual 6.5.)

Meas. point scans can be used to acquire, indicate and, in most cases, to document data from the selected meas. point and also from (up to 4) other channels.

When a meas. point scan is performed the meas.inputs of the active meas. points will, at the conversion rate, be switched to the measuring circuit, the measured values will be acquired and provided as output to the connected peripheral device (s. 8.). Max and min values will be updated, exceeding of limit values will be monitored and average values will, possibly, be calculated.

With the switchboard instrument ALMEMO® 4490-2 the programming and triggering of measuring point scans is, generally, only performed via the interface (s. man. 6.6.1). Only **continuous measuring point scans** without an output can be set via the function conversion rate 'CR' (see 7.1.2).

However, if the corresponding programming is available, the measuring point scans can also be started and stopped via exceeding of limit values (s. man. 6.6.3) or via trigger cable (s. man. 6.6.4). As long as no cycle has been programmed **single measuring point scans** will be performed. For **cyclic measuring point scans** the print cycle or measuring cycle (s. man. 6.5.2/3) must be programmed. Depending on the application the output format can be selected as list format, column format or spreadsheet (table) format (s. man. 6.5.5). All parameters will also be maintained after a switch off.

8. ANALOGUE OUTPUT

The following three options are available for an analogue registration of the selected measuring point:

1. Connection of an analogue output cable ZA 1601-RK (-1.25V to 2.0V) without electrical isolation (s. man. 5.1.1).
2. Connection of a relay trigger analogue adapter ZA 8000-RTA with electrically isolated analogue output to the sockets A1 or A2 (s. man. 5.1.3).
3. Use of an integrated, electrically isolated analogue output, which is available as option Rx.

Option	Output Signal	Slope (Gain)
OA 4490-R1	-1.2500 V ... +2.0000 V	0.1 mV/digit
OA 4490-R2	-6.0000 V ... +10.0000 V	0.5 mV/digit
OA 4490-R3	0.000 mA ... +20.000 mA	1 µA/digit

The connection of a recording device can be performed via a terminal screw connector and the terminals Out + and - (7).

The analogue output value corresponds to the linearized measured value. For the measuring range 55 mV the specified slope (gain) refers to 2 digits. In case of a sensor breakage the output voltage will turn to zero.

8.1 Scaling

For each analogue output it is possible to spread any partial range to the standard output signal of the three available options 0-2V, 0-10V, 0/4-20mA if the partial range covers at least 100 digits (e.g. 0-20mA for -10.0 to +50.0°C). To achieve this, the **analogue output-start** and the **analogue output-end** of the desired measuring range must be entered within the functions 'AS' and 'AE' (see man. 6.10.7). If the initial value is zero it will remain cleared.

The **analogue output type** 0-20mA or 4-20mA can be set in function 'mA' with the keys ENTER, ▲ or ▼, ENTER.

Analogue output start:	Selection with key F2...	=	<input type="text" value="10.0"/>	<input type="text" value="AS"/>
Analogue output end:	Selection with key F2...		<input type="text" value="50.0"/>	<input type="text" value="AE"/>
Programming:	Input, see 5.4			
Analogue output type:	Selection with key F2...			
Setting with keys:	<input type="button" value="ENTER"/> , <input type="button" value="▲"/> , <input type="button" value="▶"/>		<input type="text" value="4 - 20"/>	<input type="text" value="mA"/>

Examples: Meas. range -10.0 to 50.0 °C, 4-20 mA

The scaling values will also be stored in the EEPROM of the sensor and are, therefore, individually programmable for each channel, i.e. when manually switching through the channels it is possible to set an own scaling for each measuring variable.

9. DIGITAL DATA OUTPUT

The serial interface can be used to completely program the instrument and sensors or to query the programming (see man. 6.) or to provide outputs of manual and cyclic measurements to a printer or computer. The various interface modules can be connected to socket A1 (11). The connection to the devices is described in the manual section 5.2. Modules for networking the devices follow in section 5.3.

A manual output of all measured values and of the sensor programming and the instrument can only be performed using an additional trigger cable (s. 9.3).

9.1 Baud Rate, Data Format, Output Format

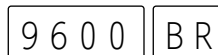
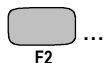
All interface modules are factory-set and programmed to 9600 baud. To avoid unnecessary problems when networking several devices the baud rate should not be modified but the computer or printer should be set up accordingly. If this is not possible the values 150, 300, 600, 1200, 2400, 4800, 9600 bd or 57600 bd can be entered.

The baud rate setting is only possible when the interface module is connected as the baud rate will be stored in the EEPROM of the module. As a result, it will also be applicable when using other ALMEMO® devices.

The input can be started by a press of the key **ENTER**. The display will start to flash and can be modified by using the keys **▲** and **▼**. When the desired transmission rate has been selected the programming can be finished by operating the key **ENTER**.

Function **BAUD RATE** 'BR'

Selection with key **F2**...



Example:

Baud rate 9600 bd

Change with keys:



Data format: Unchangeable 8 data bits, no parity, 1 stop bit

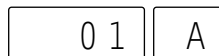
9.2 Device Address and Networking

All ALMEMO® instruments can be very easily networked to centrally acquire the measured values of several instruments that are located at different places (s. man. 5.3). For communicating with networked devices it is mandatory that each device has its own address as only one device is allowed to respond to each command. Therefore, before any network operation it is necessary that all connected devices are set to different device numbers. The function **DEVICE ADDRESS** 'A' is used for this purpose. It can be selected with the key **F2** and, at first, the currently set device number is displayed, which is usually factory-set to 00. It can then be modified by normal data entry (s. 5.4).

Function **DEVICE ADDRESS** 'A'

Selection with key **F2**...

Input, see 5.4



Example: Address 01

Only successive numbers between 01 and 99 should be entered for network operation so that the device 00 cannot be falsely addressed in case of a power supply failure.

9.3 Manual Data Output

All function values that have been selected using the keys **MEAS.VAL.▲**, **F1** or **F2** can be printed out either by using interface commands, or via an additional trigger cable (accessory ZA 1000-ET, variant 3, see man. 6.10.9). This trigger cable is plugged into socket A2 and the outputs with the following printouts are triggered using the external key:

Function	Ab	Ke	Printout
MEAS. VALUE	Dim	MV	12:34:00 00: +0023.5 °C
MAX / MIN VALUE (all meas. values)	MH ML	F1	MS MEASVAL MAXVAL MINVAL AVG COUNT 00:+0023.0 +0025.0 +0019.0 +0022.0 99999 s. man. 6.4.4
RANGE	R	F2	00:NiCr +0123.4 -0012.0 +0000.0 °C 1.0000 E+0 ---
LIMIT VAL MAX	LH	F2	LIM.VAL. MAX: 01: -0100.0 °C
LIMIT VAL MIN	LL	F2	LIM.VAL. MIN: 01: +0020.0 °C
BASE	BA	F2	BASE VAL.: 01: -0273.0 °C
FACTOR	FA	F2	FACTOR: 01: +1.0350E-1
EXPONENT	EX	F2	FACTOR: 01: +1.0350E-1
ZEROPOINT	ZC	F2	ZERO CORR: 01: -0000.7 °C
SLOPE (GAIN)	SC	F2	SLOPE CORR: 01: +1.0013
ANALOG START	AS	F2	ANALOG START:01: +0000.0 °C
ANALOG END	AE	F2	ANALOG END: 01: +0100.0 °C
ATM. PRESSURE DEVICE ADDR. (Device Programming)	mb A	F2	DEVICE: G00 M04 A01 P01/04/00 A.PRESSURE.: +01013. mb CJ-TEMP: +0023.5 °C U-SENSOR: ! 12.5 V HYSTERESIS: 10 CONFIG: FC-DA--- -L-- B-1 a+12345 ALARM: -1-3 A1: DK0 Un A2: AK1 s. man. 6.2.5
BAUD RATE (Sensor Programming)	BR	F2	AMR ALMEMO 4490-2 CH RANGE LV-MAX LV-MIN BASE VAL D FACTOR EXP AVG COMMENT 00:Ntc +040.00 - - - - °C 1.0123 E+0 - - - Temperature 01:°o H +0060.0 +0020.0 - - - %H - - - E+0 - - - Humidity MEAS.CYCLE: 00:00:30 W010 C--U- PRINT CYCLE: 00:10:00 Un 9600 bd s. man. 6.2.3
LOCKING	LM	F2	MS ZERO SLOPE LM P FUNC CALOFS CALFA A-START A-END B1 MX EF AH AL CF UMIN 01:+0000.0 +1.0000 5. 1 MESS +00000 32000 +0000.0 +1000.0-01 M1 -- S- E2 05 12.0 s. man. 6.10.1

10. TROUBLESHOOTING

The switchboard instrument ALMEMO® 4490-2 can be configured and programmed in many different ways. It allows for a connection of many different sensors, additional measuring instruments, alarm signalisers and peripheral devices. Due to the large variety of options it is possible that, under certain conditions, they do not perform as the user would expect. In most cases this will not be related to a defective device but to operating errors such as wrong settings or an inadmissible wiring. The following tests should be performed to correct or to correctly identify the error.

Error: No display data or all display segments are permanently illuminated.

Remedy: Check power supply, switch off and on again, reinitialise (see 3.3).

Error: False measured values.

Remedy: Thoroughly check the programming of the channel (especially base and zero point), query the entire programming by means of the software AMR-Control or the terminal and command P15 (see manual 6.2.3) and f1 P15 (see manual 6.10.1).

Error: Varying meas. values, segment test or blockage during operation.

Remedy: Check cabling for inadmissible electrical connection, Disconnect external power supply and output modules, disconnect suspicious sensors and replace them by hand-held sensors in air or connect dummies and check (short circuit AB at thermocouples, 100Ω at Pt100 sensors). If the error is corrected by this, check the wiring, isolate the sensor if necessary, use electrically isolated power supply, prevent influences from disturbances by shielding or twisting.

Error: Data transmission via interface does not function.

Remedy: Check interface module, connections and settings:

Are both devices set to the same baud rate and transmission mode (see 9.1)?

Is the correct COM interface addressed at the computer?

Is the printer set to ONLINE mode?

Are the handshake lines DTR and DSR active?



A small interface tester with LEDs is very useful for checking the data flow and the handshake lines (during standby mode the data lines TXD and RXD are on a negative potential of approximately -9V and the diodes are illuminated green. The handshake lines DSR, DTR, RTS and CTS have a positive voltage of approximately +9V and the LEDs are illuminated red. During the data transmission the data lines must flash red).

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

Address the device with its device number G_{xy} (see manual 6.2.1), query the programming by P15 (see manual 6.2.3), only check the sending line by cycle input via command G12345 and control in the display.

Error: Data transmission within network does not function.

Remedy: Check that all devices are set to different addresses, address devices individually via terminal and command G_{xy} , addressed device is OK when the feedback is at least $y \text{ CR LF}$. If data transmission is still not possible, disconnect networked devices, check devices separately at data cable of the computer (see above), check the wiring regarding short circuit or twisting. Are all network distributors supplied with power? Network and check the devices successively again (see above).

If the device is, after the above inspections, still not performing as specified in the operating instructions, it must be sent to the factory in Holzkirchen, Germany, including a short report and, possibly, control printouts. The software AMR-Control allows to print the monitor pages including the programming and also to save the terminal operation and to print it out.

11. ELECTROMAGNETIC COMPATIBILITY

The measuring instrument ALMEMO® 4490-2 bears the CE character, since the determinations of the guideline 73/23/EEC and the guideline 89/336/EEC about the electric magnetic compatibility it correspond.

The following standards have been applied for the evaluation of the product:

IEC 61010-1:2001	
IEC 61326:1997+A1:1998+A2:2000	
IEC 61000-6-1:1997	IEC 61000-6-3:1996
IEC 61000-4-2: 1995+A1:1998+A2:2000 8kV	IEC 61000-4-5: 1995+A1:2000
IEC 61000-4-3: 1995+A1:1998+A2:2000 3V/m	IEC 61000-4-6: 1996+A1:2000
IEC 61000-4-4: 1995+A1:2000 2kV	IEC 61000-4-11:1994+A1:2000

The following notes must be observed when operating the instrument:

1. If the standard sensor cables (1.5m) are extended it must be considered that the measuring lines are not guided together with power mains and that they are appropriately shielded to protect against any coupling of disturbance signals.
2. If the instrument is operated within strong electromagnetic fields an additional measuring error must be expected ($<50\mu\text{V}$ at 3V/m and 1.5m thermocouple transducers). After the irradiation the device operates again within the specified technical data.

Technical Data (see also manual 2.2)

Measuring Inputs:	clamping connector for sensors with bare ends or 1 ALMEMO® socket for ALMEMO® flat connectors 1 primary chann., 3 add. channels f. double sensors and function channels
Sensor Voltage Supply:	7...9V, max. 80mA Option V1: 12V, max. 80mA
Outputs:	2 ALMEMO® sockets for all output modules
Equipment:	
Display:	4-digit 7-segment + sign, 2-digit 14-segment, 15mm
Keypad:	4 membrane keys
Time and Date:	not buffered
Microprocessor:	HD 6303 Y
Voltage Supply:	
Mains Operation:	230V AC 50/60 Hz
DC Voltage (Option U):	10...36V DC, 250mA
Housing:	std. plastic housing 96x48mm, mount. depth 152mm
Switchboard Spacing:	90 x 42.5 mm
Environmental Conditions:	
Operating Temperature:	-10 ... +60 °C
Storage Temperature:	-30 ... +60 °C
Humidity of Ambient Air:	10 ... 90 % rH (non-condensing)
Extent of the Delivery:	Switchboard Instrument ALMEMO® 4490-2 Operating Instructions ALMEMO® 4490-2 ALMEMO® Manual with Software AMR-Control

Product Overview

Switchboard Instrument ALMEMO® 4490-2

1 tip jack and 1 ALMEMO® socket (4 meas. channels at max.), 4 keys, interface that can be cascaded, power supply unit 230V AC	MA 4490-2
Option U Voltage Supply, 10-36V DC, electr. isolated	OA 4490-U
Option V1 Sensor Voltage Supply, 12V DC, electr. isolated	OA 4490-V1
Option G1 1 Limit Value Relay with make and break contact	OA 4490-G1
Option G2 2 Limit Value Relays with make and break contact	OA 4490-G2
Option R1 Scalable Analogue Output, 0-2V, electr. isolated	OA 4490-R1
Option R2 Scalable Analogue Output, 0-10V, electr. isolated	OA 4490-R2
Option R3 Scalable Analogue Output, 0/4-20mA, electr. isolated	OA 4490-R3
ALMEMO® Recording Cable -1.25 to 2.00 V, 0.1 mV/digit	ZA 1601-RK
ALMEMO® Data Cable V24 Interface, electr. isolated	ZA 1909-DK5
ALMEMO® Network Cable Current Loop, electr. isolated	ZA 1999-NK5
ALMEMO® Input Cable with Keying for External Triggering	ZA 1000-ET