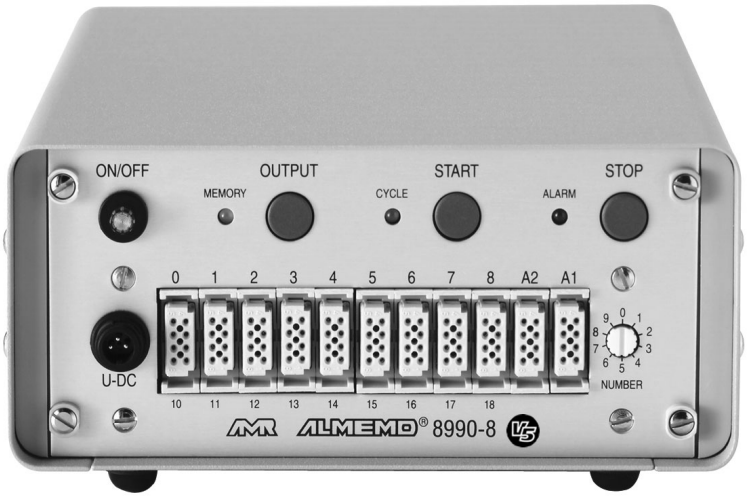
AHLBORN

Operating Instructions



Data Logger

ALMEMO® 8990-8 V5

V1.3
03.02.2004

Operating Instructions

Data Logger

ALMEMO® 8990-8

For reference with the ALMEMO® Manual

Table of Contents

1. INTRODUCTION

The new data logger ALMEMO® 8990-8 *Version 5* is an instrument 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® measuring devices in the same way. The operation and programming is identical with all units. Therefore, all of the 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, therefore, only cover features and controls that are specific for a certain device. As a result, the sections dealing with the system control via keyboard 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 ALMEMO® 8990-8 data logger has nine electrically isolated measuring inputs with up to 36 measuring channels, a real time clock and a 512kB memory for approximately 100,000 measured values. Two output sockets allow for connecting any ALMEMO® output modules, for example, the analogue output, digital interface, trigger input or alarm contacts. Several devices can be networked by a simple connection between the devices. Three keys and the serial interface are used for operating the instrument.

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 interface without affecting the measuring process.

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 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 certain measuring junctions can be programmed as function channels and can be processed and printed like normal measuring junctions. Furthermore, function channels for special measuring tasks are provided to determine temperature coefficient $Q/\Delta t$ and wet bulb globe temperatures.

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).

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 (1 max and 1 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 relay output modules, alarm contacts are provided that can be individually allocated to limit values. As a standard, the hysteresis is set to 10 digits, however, it can also be adjusted. Furthermore, limit value exceeding can also be used to start or stop a measurement.

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 36 measuring channels are available for 9 transducers, i.e. it is also possible to evaluate double sensors, individually scaled sensors, or sensors with function channels. The selected measuring point can be scanned with a conversion rate of 2.5 or 10 measurements/second. The measured value is calculated and provided on the analogue output, if it is available.

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. Sensor breakage recognition, exception: current measurements.

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 (2V, 10V or 20mA).

Measuring Functions
Special measuring functions are required for some sensors in order to achieve an optimal acquisition of measuring data. A cold junction compensation is performed at thermocouples. A temperature compensation is performed at dynamic pressure and pH and conductivity probes and an atmospheric air pressure compensation is performed at humidity sensors and O_2 sensors. With infrared sensors the parameters zero point and slope correction are used for background temperature and emissivity factor.

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

PROCESS FLOW PROGRAMMING

A cyclic measuring point scan with a time-based process flow control is required to register the measuring data of all connected sensors. For this purpose, the real time 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 keyboard, the interface, an external trigger signal, the real time clock or an exceeding of limit values.

Time and Date

The real time clock with date function or the pure measuring time are used for an accurate recording of any measurement. Start and end time/date can be programmed in order to start or stop a measurement.

Print Cycle

The print cycle is programmable between 1s and 59h/59min/59s and provides a cyclic output of measured values to the interfaces or memories and also provides a cyclic averaging.

Print Cycle Factor

If necessary, the print cycle factor allows for limiting the data output of particular channels so that an excessive data flow can be limited, especially during data storage.

Measuring Cycle

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

Average Value

The measured values resulting from scanning the measuring junctions can be averaged as desired either over the total measuring time or over the print cycle time. 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 possible to store all measured values in the memory and/or to perform an output via the interface.

Data Memory

The measured values of any measuring point scans or just the alarm values can be stored in a buffered RAM. The memory capacity is, as standard, 500kB, which allows up to 100,000 measured values. The memory organisation can be configured as linear or ring memory. The output can be optionally performed via interface or the analogue output, if available. With digital outputs it is possible to select a certain time interval, number or alarm value.

Numbering of Measurements
Single scans or entire series of measurements can be identified and selectively read out from the memory.

Control Outputs
The interface allows to individually trigger up to four output relays and one analogue output.

Keyboard Lock
The keyboard operation can be locked with a password.

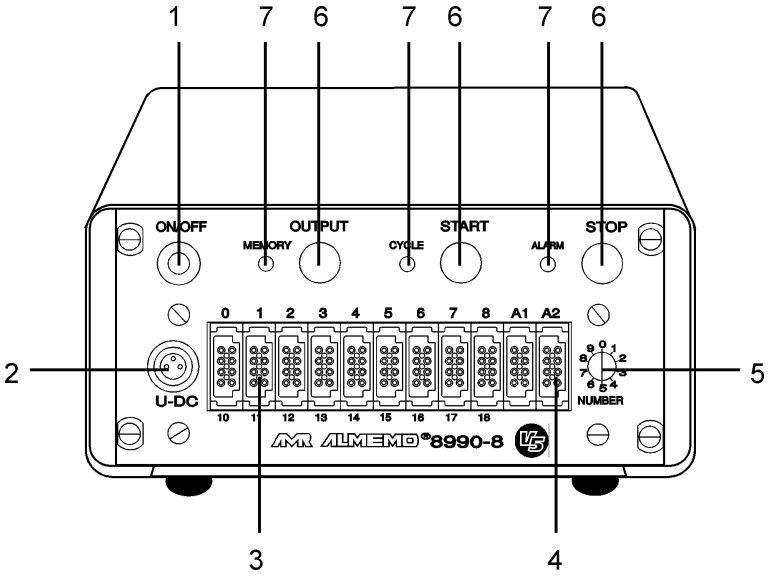
Output
All data logs, measured values and programmed parameters can be provided as output to any peripheral equipment via interface. Interface cables for RS232, RS422, RS485 or Centronics interfaces are available. The output of measuring data can be selected in list format, columns or spreadsheet format. 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, the configuration of the measuring instrument and the read-out of the data memory 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. The software LogCel is provided for an online import of data into MS-Excel®.

OPTION Rechargeable Battery
The data logger becomes completely self-sufficient with the option 'rechargeable battery'. Due to the power saving sleep mode, the measuring instrument can, independent from mains supply, record measuring data for weeks. Afterwards the rechargeable battery can be fully recharged within 2 hours by means of a power supply.

1.2 Operating Controls



(1) **ON/OFF SWITCH**

	Instr.	**Lamp**	
not pressed		OFF	off
pressed	with pow. supp.:	ON	on
Rechargeable battery optional:	with pow. supp.:	ON	on (batt. is recharging)
		ON	flashing (batt. is recharged)
	without pow. supp.:	ON	off (battery operation active)

(2) **CONNECTOR SOCKET**

U-DC	mains adapter ZA 5090-NA2 12V, 800mA connector cable ZB 5090-EK 7-13V DC connector cable ZB 3090-UK 10-30V DC electr. isolated including DC/DC converter

(3) **MEASURING INPUTS**

0 to 8	for all sensors with an ALMEMO® connector
10 to 18 (38)	add. channels for double sensors, funct. chann.

(4) **OUTPUTS**

A1	V24 interface cable (ZA 1909-DK), V24 fiber optic cable (ZA 1909-DKL) RS 422 network branch box (ZA 5099-NVB) RS 485 network branch box (ZA 5085-NV) Centronics interface cable (ZA 1936-DK)
A1 or A2	analogue output with cable (ZA 1601-RK)
A2	networking with network cable (ZA1999-NK) trigger input with cable (ZA 1000-EK/ET), 2 relay outputs with cable (ZA 1000-EGK/EAK)

(5) **CODING SWITCH** setting of the device address
module number 0 to 9, external access
2nd coding switch for decades
internal on the board

(6) **FUNCTION KEYS**

START	start automatic measuring point scan
STOP and START	start automatic meas. point scan in sleep mode
STOP	stop automatic measuring point scan
OUTPUT	memory output to interface
STOP and OUTPUT	clear memory

(7) **CONTROL LAMPS**

CYCLE	start automatic measuring point scan
ALARM	exceeding of limit value or sensor breakage
MEMORY	measuring point scan with storing memory output to interface

2. INITIAL OPERATION

1. Connect **transducers** to the sockets 0 to 8 (3), see 4.
2. **For power supply** connect the mains adapter to socket U-DC (2), see 3.
3. **For switching on** press the ON/OFF push button (1), see 3.5.
4. **Output of measuring data** to printer or 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.
   Enter time and date, as required, see manual 6.2.8.
   Start manual measuring point scan by using the key START, see 5.1.
   Program print cycle, output chann. and output format,
   see man. 6.2.2/6.5.2/6.5.5.
   Start automatic measuring point scan with the key START and stop it with the key STOP, see 5.2.
5. **Storing** of measured values
   Clear memory by using the keys STOP and OUTPUT, see 5.3.
   Activate storing in measuring cycle, see manual 6.5.3.
   Manual storing without cycle by using the key START, see 5.1.
   Enter measuring cycle for cyclic storing, see manual 6.5.3.
   Enter time and date of start and end of measurement, if required,
   see man. 6.6.2.
   Start automatic storing with the key START, see 5.2.
   For long-term recording (cycle > 1min.), start automatic storing in sleep mode by using the keys STOP and START, see 5.4.
   Stop sleep mode by switching the instrument off and on.
   Stop the automatic storing by using the key STOP, see 5.2.
   Output of memory data to printer or computer
   Connect peripheral device via interface cable to socket A1, see manual 5.2.
   Set 9600 bd, 8 data bits, 1 stop bit, no parity at peripheral device.
   Set output format list, column or spreadsheet (table), see man. 6.5.5.
   Perform read-out of memory by using the key OUTPUT, see 5.3.
6. **Monitoring of limit values**
   Enter limit values, see manual 6.3.9.
   Program measuring cycle, see manual 6.5.3.
   Connect alarm device with alarm module to socket A2, see man. 5.1.2/5.1.3.
   Start automatic measuring point scan by using the key START and stop it by using the key STOP, see 5.2.

3. POWER SUPPLY

3.1 Mains Operation

The mains adapter ZB 5090-NA2 (12V DC, 800mA) is used for the power supply to the instrument. It is connected to the socket U-DC (2) and is locked by turning it to the right.

3.2 Operation with Rechargeable Battery (Option A)

With the option A, a NiCd rechargeable battery with 1.5 Ah will be installed, which allows, at a current consumption of approximately 15mA, an uninterrupted operating time of 100 hours at minimum. The operating time will be shorter when sensors are connected that require additional current (e.g. humidity sensors FH A646 2mA or rotating vanes approximately 3mA) or the serial interface (4mA). However, the sleep mode is meant for a long term operation of the data logger. It allows for a measurement of approximately 30000 measuring cycles. An exact determination of the voltage of the rechargeable battery and an estimation of the remaining operating time is available with the measuring channel ´Batt´.

The supplied mains adapter ZB 5090-NA2 allows to recharge a discharged battery within 2 hours. During the recharge process the green lamp of the on/off switch (1) is continuously illuminated. If the green lamp flashes, the battery is completely recharged and the charge circuit is switched to trickle charging. As a result, the power supply can, during buffer operation, remain connected to the measuring instrument.

3.3 External Voltage Supply

It is also possible to connect another DC voltage 7...13V to the socket U-DC (2). The cable ZB 5090-EK, fitted with 2 banana plugs, is available for the connection. However, the electrically isolated supply cable ZA 3090-UK must be used if an electrical isolation between power supply and transducers is required or if a larger input voltage range 10...36V is required. It allows to operate the measuring instrument with 12V or 24V mains supply.

3.4 Battery Buffer

For an uninterrupted power supply of the real time clock and the memory a NiCd rechargeable battery (2.4V) for buffering is installed, which ensures that time and date data and all stored values are maintained for several months if the mains supply is not available or if the rechargeable battery is discharged. However, to prevent the rechargeable battery from completely discharging and to avoid the loss of data, the instrument be operated with mains supply for a few hours should at least once per month.

3.5 Switch On/Off, Reinitialisation

For **switching on** the instrument, the ON/OFF push button (1) must be pressed. If the power supply unit is properly connected the green control lamp in the push button will be illuminated.
The device can be **switched off** by operating the push button once again. The control lamp will no longer be illuminated (not with option A, see 3.2). However, the real time clock continues operating and, due to the buffering rechargeable battery, all stored values remain available (see 3.5).

If the device shows an irregular behaviour due to interference influences (e.g. electrostatic charging or discharged buffering battery) or if incorrect programming must be avoided, the device can be completely reinitialised.
The reset can be achieved if the key STOP is pressed during switch-on. All internal data such as max, min and average values, and the data memory will be cleared. Furthermore, cycles, time, date and device address are set to zero and the conversion rate and atmospheric pressure will be set to their default setting. 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 sockets 0 to 8 of the measuring instrument (3). For connecting existing sensors it is only necessary to connect a corresponding ALMEMO® 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.

The programming of the sensor connectors can, with ALMEMO® 8990-8 data loggers, only be modified by using the serial interface (see manual section 6). This can be carried out by using the PC and the configuration software AMR-Control or any terminal application (e.g. Windows Terminal) and using very easy commands. Due to the data storage within the connector, it is also possible to perform the programming with hand-held instruments of the series

ALMEMO® 2290 via keyboard. The sensor connector must be connected to the selected channel. When programming, it must be considered that factory-programmed parameters 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 manual 6.3.12). The connectors ZA 9000-FS are not locked and are, therefore, most suitable for programming by the user.

4.2 Measuring Inputs and Additional Channels

The data logger ALMEMO® 8990-8 has 9 input sockets that the measuring channels 0 to 8 are initially allocated to. However, ALMEMO® sensors can, if required, provide up to 4 channels so that 36 channels are available with 9 input sockets. The additional channels can be especially used with humidity sensors with 4 measuring variables (temperature/humidity/dew point/mixture ratio) or used for function channels. If required, the sensor can 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. TE/Ntc, mV/V, mA/V etc.). The additional measuring channels of a connector are increased in steps of 10 (e.g. the first sensor has the channels 00, 10, 20, 30, the second sensor has the channels 01, 11, 21, 31 etc.).

	0	1	2	3	4	5	6	7	8	A2	A1
chann. 1	00	01	02	03	04	05	06	07	08		
chann. 2	10	11	12	13	14	15	16	17	18		
chann. 3	20	21	22	23	24	25	26	27	28		
chann. 4	30	31	32	33	34	35	36	37	38		

The 9 analogue inputs are electrically isolated by using photovoltaic relays and a potential difference of 50V DC / 60V AC, 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 ±5V (between B,C,D and A or - respectively).

The cold junction compensation for thermocouple measurement is integrated in socket 3 of the device.

5. DATA ACQUISITION

The instrument ALMEMO® 8990-8 provides the following options for the acquisition of measuring data:

1. Continuous measurement of a selectable measuring point, see manual 6.4
   Possibly, an output of measuring data to an analogue output, see man. 5.1.1
2. Single measuring point scan, see manual 6.5.1.1.
3. Cyclic measuring point scan, see manual 6.5.1.2.
4. Continuous measuring point scan, see manual 6.5.1.3.

Previous measuring data should be cleared before a measurement.

A **total clearing of all measured values**, i.e. the clearing of max, min and average values of all channels, as well as the clearing of the memory is performed by pressing the keys STOP and OUTPUT. For automatic clearing during start, see manual 6.10.13.2.

The programming of the process control is performed via serial interface and by using the configuration software AMR-Control or a terminal (PC) (see manual section 6). If during programming a programming connector (ZA 8990-PS) is connected to the socket A2 all parameters will be transmitted to the connector. If such a connector is also connected to socket A2 during switch-on, the data will be reloaded and the instrument will be programmed correspondingly. By using several connectors the configuration can be easily changed. If a programming via interface is not required the connectors can be ordered factory-programmed to customer specifications.

5.1 Single Measuring Point Scan

If no measuring point scan has been set, only the measured value of the selected measuring point, beginning with measuring point 0, will be continuously acquired with the selected conversion rate (see manual 6.5.4). This is the best possible operating mode for a data logging with analogue output.

Measuring point scans can be used to acquire, indicate and document data from the selected measuring point and also from other measuring points. As long as no print cycle and no measuring cycle are programmed (e.g. after a reinitialisation, see 3.5) only single measuring point scans are triggered by using the key START. The control lamp ´CYCLE´ is only illuminated during the data query and will then turn off. If the time was cleared, it will be restarted, a measuring point scan of all connected active sensors will be performed and the measured values will, for one time, be provided as output to a connected printer. If the memory is activated (see manual 6.5.3) the control lamp ´MEMORY´ will be on during the data query. With each press of the key the measured values are equally processed with the corresponding measuring time. If true time has to be indicated, it must first be set (see manual 6.2.8).

5.2 Cyclic Measuring Point Scan

A cyclic measuring point scan can be started by using the key START if a measuring or print cycle has been programmed. The control lamp ´CYCLE´ will be continuously on afterwards and the measured values will be provided as output to a connected peripheral device. If the memory is active the measured values will also be saved in cycles and, in addition, the control lamp ´MEMORY´ will be on.

The automatic measuring point scan can be stopped by operating the key STOP. The control lamps ´CYCLE´ and ´MEMORY´ will turn off afterwards.

5.3 Data Memory

The setup of the data memory, the data acquisition and data output with the data logger ALMEMO® 8990-8, are described in the manual section 6.9. The easiest way is to program a **measuring cycle including memory activation** and then start the cyclic measuring point scan by using the key START and stop it by using the key STOP.

For an **output of the data memory to the serial interface** the peripheral device must be connected (see manual 5.2), the output channel ´U´ must be set (manual 6.2.2) and an output format, ´List´, ´Column´ or ´Spreadsheet´ must be selected (manual 6.5.5, output logs, see manual 6.6.1).

For **starting the memory output** the key OUTPUT must be operated. During the memory output the control lamp ´MEMORY´ is on. The contents of the memory is provided with the selected output format, if necessary, several times and also in different formats. The output can be interrupted at any time by using the key STOP and afterwards can be continued by using the 3 keys below:

OUTPUT	manual outputs of single measuring point scans
START	automatic output is resumed
STOP	memory output is aborted

Clearing the Data Memory

While pressing and holding the key STOP operate the key OUTPUT.

Further functions of the data recording and output are also described, in detail, in the ALMEMO® manual.

- Starting and stopping the recording with respect to time, exceeding of limit value or external triggering (see manual 6.6)
- Selective data output with respect to time and date, number of the measurement or alarm values only (see manual 6.9)
- Continuous recording of one channel with 10 M/sec. (see manual 6.5.1.3)

5.4 Sleep Mode

For long term monitoring with larger measuring cycles it is possible to operate the instrument in sleep mode by using a rechargeable battery (option A) or an external battery. Within this power saving mode the device will be switched off after each measuring point scan and be automatically switched on for the next scan after the cycle time has expired. This procedure allows, at a fully charged battery to perform approx. 15,000 measuring point scans. At 5 minutes for one cycle this results in a total measuring time of more than 50 days.
The following steps must be performed for an **operation in sleep mode**:

1. Enter a measuring or print cycle of a minimum of 2 minutes.
   If both cycles are programmed the measuring cycle will be ignored.
2. **For starting a measurement in sleep mode**
   the key START must be operated while holding the key STOP pressed.

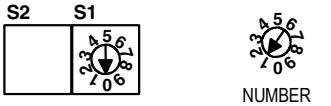
   The starting and stopping by the start and end time,
   and also by the limit values, is generally not possible in sleep mode and must, therefore, be switched off!

   The instrument will be practically switched off after the first scan.
   Within the set cycle the instrument will switch on, perform a measuring point scan, the control lamps CYCLE and MEMORY will be illuminated for a short time and the instrument will then switch off again.
3. **Switch over to active operation:** Switch the device off and on again.
4. Terminate the measurement by pressing the key STOP.

5.5 Device Address and Networking

As with all other ALMEMO® instruments, the data loggers ALMEMO® 8990-8 can also be networked. 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 numbers 0 to 9 can be set using the coding switch (5) on the front panel. If device addresses are required higher than 9, a second coding switch that is mounted internally on the board can be used to set the decimal digit. For setting the address it is necessary to loosen the 4 screws in the upper shell of the housing and remove the shell.

Example: Module Address 01



module address **0** **1**

decimal digit on board inside the instr.

digits on front panel

6. TROUBLESHOOTING

The data logger ALMEMO® 8990-8 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. Therefore, it is possible that, under certain conditions, it does 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: Switch-on indicator is not illuminated or no LEDs are permanently on.
Remedy: Check power supply, recharge battery, switch off and on again, reinitialise (see 3.5)

Error: False measured values.
Remedy: Thoroughly check the programming of the channel (AMR-Control), query the entire programming by means of the command `P15` (see manual 6.2.3) and `f1 P15` (see manual 6.10.1)

Error: Varying meas. values, cyclic measuring point scan blocked.
Remedy: Check cabling for inadmissible electrical connection,
disconnect all suspicious sensors,
hold hand-held sensors in air or connect dummies and check (short circuit AB at thermocouples, 100Ω at Pt100 sensors), then reconnect sensors successively and check. If an error occurs with one sensor, check the wiring, isolate the sensor if necessary, 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 manual 6.10.12)?
Is the correct COM interface addressed at the computer?
Is the output channel set to "U" (see manual 6.2.2)?
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 Gxy (see manual 6.2.1),
internal coding switch must be considered for decimal address digits,
programming must be queried with command P15 (see man. 6.2.3),
sending line must be tested by single measuring point scan with s, if at least one sensor is connected the LED ´CYCLE´ must be on,
receiving line must be tested by a memory output with key OUTPUT

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 Gxy,
addressed device is OK when the feedback is at least y CR LF.
If data transmission is still not possible, disconnect networked devices, check devices separately at data cable of the computer,
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 data logger ALMEMO® 8990-8 meets the electromagnetic compatibility (EMC) safety requirements specified in the relevant CE directive issued by the council for the alignment of legal regulations of the member states (89/336/EWG).

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

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 61000-4-4: 1995+A1:2000 2kV
IEC 61000-4-3: 1995+A1:1998+A2:2000 3V/m

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 (<50µV at 3V/m and 1.5m thermocouple transducers). After the irradiation the device operates again within the specified technical data.

Technical Data (see also Section 2.2 in Manual)

Measuring Inputs:	9 ALMEMO® sockets for ALMEMO® connector
Meas. channels:	9 primary chann. electr. isol., max. 27 addit. chann. for double sensors and function channels
Sensor voltage supply:	mains adapter: approx 12V, max. 100mA rechargeable battery: 7...9V, max. 100mA
Outputs:	2 ALMEMO® sockets for all output modules
Equipment:	
Keyboard:	3 keys
Memory:	500 kB (100000 meas.val.) buff. w. rechar. NiCd batt.
Time and date:	real time clock buff. with rechargeable Lithium battery
Microprocessor:	HD 6303 Y
Voltage Supply:	7 to 13V DC not electrically isolated
Mains adapter:	ZB 5090-NA2 230VAC to 12VDC, 0.8A electr. isol.
Adapter cable electr. isol.:	ZB 3090-UK 9...30V DC to 12V DC, 250mA
Option A:	NiCd recharg. batt. 7.2V, 1.6Ah Time for recharging: ca. 2h, quick and trickle charge
Current consumption without input and output modules:	active mode: approx. 15mA sleep mode: approx. 10µA
Housing:	metal housing H63 x W144 x D219mm (3HU, 6DU)
Operating temperature:	-10 ... +60 °C
Storage temperature:	-30 ... +60 °C
Humidity of ambient air:	10 ... 90% rH non-condensing
Extent of the Delivery:	Measuring Instrument ALMEMO® 8990-8 Mains Adapter ZB 5090-NA2 12V/ 800mA Operating Instructions ALMEMO® 8990-8 ALMEMO® Manual incl. software AMR-Control

Product Overview

	Order No.
Data Logger ALMEMO® 8990-8	
9 inputs, 36 channels at maximum, 500 kB memory, real time clock, 3 keys, RS232 interface that can be cascaded, sleep mode, mains adapter 12V / 0.8A	MA 8990-8
Option A Instr. incl. recharg. batt. 7.2V, 1.6Ah, quick charge within 2h	OA 8990-A
ALMEMO® Programming Connector for process control configuration	ZA 8990-PS
DC Adapter Cable 10 to 30V DC, 12V/250mA electr. isol.	ZB 3090-UK
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-DK
ALMEMO® Data Cable Centronics Interface, electr. isolated	ZA 1936-DK
ALMEMO® Network Cable Current Loop, electr. isolated	ZA 1999-NK
ALMEMO® I/O Cable for Triggering and Limit Value Alarm	ZA 1000-EGK