Operating instructions

V6

ALMEMO® 1030

Precision temperature measuring instrument for Pt100 sensors

V1.6
04.02.2015

www.ahlborn.com

1. OPERATING CONTROLS

(1) Measuring inputs M0 and M1
M0..M1 Pt100 sensor
M2 Differential

(2) Sleep-LED

(3) Output socket A2
SD memory connector (ZA1904-SD)

(4) Output socket A1
V24 interface (ZA 1909-DK5)
Optic fiber (ZA 1909-DKL)
USB (ZA 19019-DKU)
Ethernet (ZA 1945-DK)

(5) Socket, DC, 12 V
Mains adapter (ZA1312NA10,12V,2A)
Cable, el. isol. (ZA 2690-UK, 10 to 30V)

(6) LCD, graphics display
7 rows for functions
1 row for softkeys F1, ◄, ▲, ►, F2
Shown in brackets: <MEM>, <FCT>

(7) Operating keys

ON	To switch device ON, To switch device OFF: press and hold down
F1, F2	Function keys (softkeys)
▲, ▼ ...	**M:** To select meas. point
▲, ▼, ►	**F:** To select menu
PROG, ▼...	**F:** To select function
◄ ...	return to menu selection
< M▯ >	directly to meas. menu
PROG	To program
▲, ▼, ►...	To enter data

Rear of device:

(8) Battery compartment
3 AA alkaline-manganese batteries

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3. GENERAL

We should like to congratulate you on your purchase of this new and innovative ALMEMO® precision temperature measuring instrument (with 0.001 K resolution).

3.1 Warranty

Each and every device, before leaving our factory, undergoes numerous quality tests. We provide a warranty, lasting two years from delivery date, that your device will function trouble-free. Before returning your device to us, please observe the advisory notes in Chapter 15, ´Trouble shooting´. In the unlikely event that a device does prove defective and you need to return it, please wherever possible use the original packaging materials for dispatch and enclose a clear and informative description of the fault and of the conditions in which it occurs.
This warranty will not apply in the following circumstances:

- Any form of unauthorized tampering or alteration inside the device
- Use of the device in environments or conditions for which it is not suited
- Use of the device with an unsuitable power supply and / or in conjunction with unsuitable peripheral equipment
- Use of the device for any purpose other than that for which it is intended
- Damage caused by electrostatic discharge or lightning
- Failure to properly observe these operating instructionsg

The manufacturer reserves the right to change the product's characteristics in the light of technical progress or to benefit from the introduction of new components.

3.2 Standard delivery

When you unpack the device check carefully for any signs of transport damage and ensure that delivery is complete.

- Measuring instrument ALMEMO® 1030 with 3 AA alkaline batteries
- These operating instructions

In the event of transport damage please retain the packaging material and inform your supplier immediately.

3.3 Handling batteries / rechargeable batteries correctly

When inserting batteries / rechargeable batteries ensure that the polarity is correct.
If the device will probably not be needed for a relatively long period of time or if the batteries are empty, the batteries should be removed; this will prevent battery acid leaking onto the device and damaging it. Rechargeable batteries should be recharged as and when necessary.
You should never attempt to recharge an ordinary (non-rechargeable) battery; it may explode.
Batteries / rechargeable batteries must never be short-circuited

or thrown onto the fire.
Batteries / rechargeable batteries are special waste and must not be discarded as normal domestic waste.

3.4 Special notes on use

- Before using the mains adapter make sure that the mains voltage is suitable.
- Do not run sensor lines in the vicinity of high-voltage power cables.
- Before you touch any sensor lines, ensure that all static electricity has been discharged.

4. INTRODUCTION

Each special ALMEMO® 1030 X6 reference measuring instrument incorporates two electrically isolated high-resolution measuring inputs; these are for Pt100 sensors only. The resolution of measured values obtained is greater than the 16-bit numbers provided by other ALMEMO® devices. This device cannot therefore support the standard functions usually provided (limit values, measured value correction, scaling, or analog output). To facilitate operation the device incorporates an illuminated LCD graphics display and a keypad with softkeys and cursor block. The display can be adapted to any proposed application by means of sensor-specific menus. The device incorporates three output sockets for connecting interface cables, a memory connector, or a mains unit.

4.1 Sensor programming

Measuring ranges
X6 reference measuring instrument ALMEMO® 1030 is designed exclusively for Pt100 temperature sensors; it works to a resolution of 0.001 K across the whole measuring range of -200 to +400 °C. It is thus suitable as reference device for calibration purposes.

Units
The units can be toggled between °C, °F, and K.

Measured value designation
Each sensor is identified by means of a 10-character alphanumeric name. It is entered via the keypad or the interface and appears in the display, in the printout, or on the computer screen.

Correction of measured values
The measured value on each measuring channel can be corrected to zero. The sensors can be adjusted in several aspects; i.e. the applicable error curve is saved in the connector.
All programmed sensor parameters are saved in the connector and are automatically restored as and when a sensor is plugged in.

4.2 Measuring operation

The user can move forwards or backwards from one measuring channel to the next using the keypad. The data is output on the display at a rate of 2.5 measuring operations per second (mops).

Measured value smoothing
For both measuring channels measured values of an unstable, fluctuating nature can be smoothed by taking a sliding average over a number of values programmable from 2 to 99.

Maximum and minimum values
For each measuring operation the maximum value and minimum value are acquired and saved to memory. These values can then be displayed, printed out, or deleted from memory.

Measured value memory
Up to 100 measured values can be saved manually. This data can then be shown on the display or output via the interface.

Operation
All measuring and function values can be displayed in different menus on the dot matrix LCD screen. Seven keys (four of them softkeys) can be used to operate the device. In this way the device and sensors can be programmed.

Output
All data logs, menu functions, saved measured values, and stored program parameters can be output to any peripheral equipment. Using the appropriate interface cables any of interfaces RS232, RS422, USB, or Ethernet can be made available. Measured data can be output in list, column, or table format. Files in table format can be processed directly using any standard spreadsheet software. The print header can be programmed to refer specifically to your company or to your application.

Data logger
The device can, by fitting an external memory connector with a micro-SD memory card, be upgraded to a high-capacity data logger. With an external memory connector (available as an accessory) files can be read out very quickly via any standard card reader. As soon as this is connected two additional menus with all the necessary parameters e.g. date, time-of-day, cycle, start time, end time, memory capacity, file name etc. are made available.

5. PUTTING INTO SERVICE

Sensor connection Connect Pt100 sensor to sockets M0 and M1(1) s.Chap.7

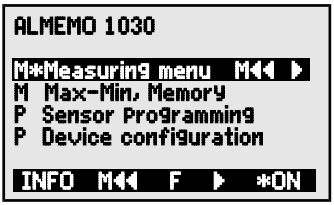
Power supply Via battery or mains adapter connected at socket DC (5) see Sect. 6.1, 6,2

To switch ON Press once and release key **ON / PROG** (7) s. Section 6.4

Automatic display of the measuring menu see Chapter 10.

To call up the menu selection screen press: **<MENU>**

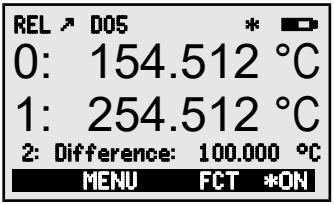
To activate / deactivate display illumination press: **< ON>**



To access the **measuring menu** (see 8.1) press: **<F>**: **▲** / **▼** ...

To call up the menu press: **►** or **PROG**

Measured values are displayed, If there are two channels the difference is also shown.



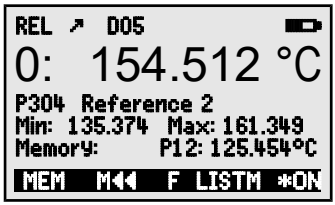
To call up the **functions menu** press: **< FCT >**

or select in the menu selection screen **Maximum / minimum memory** : **▲** / **▼** ... , **►**

To select a meas. point **<M>**: **▲** / **▼** ...

To set a measured value to zero: **PROG**, **<ZERO>**

To save a measured value s. 11.4: **< MEM>**



To display saved values: **< LISTM>**

Memory output via interface to printer or computer:

Connect peripheral equipment via data cable to socket A1 (2) s. 14.4

To output memory s. 11.4 **< PRINT>** or command ´P-04´ from computer

6. POWER SUPPLY

Power can be supplied to the measuring instrument in any of the following ways:

3 AA alkaline batteries (included in delivery)	
Mains adapter, 12 V, 2 A, with ALMEMO® connector	ZA 1312-NA10
Power supply cable, electrically isolated (10 to 30 VDC, 0.25 A)	ZA 2690-UK

Our product spectrum includes all the appropriate accessories.

6.1 Battery operation and supply voltage monitoring

The device is normally powered by 3 AA alkaline batteries. At a current consumption of on average 25 mA, these last for an operating time of approx. 100 hours. If the display illumination is left switched ON, this operating time will be reduced to approx. 50 hours. The operating voltage can be checked in the ´Info´ menu (see Chapter 9); this gives you a basis for estimating the remaining operating time. As soon as the remaining battery capacity drops to approx. 10%, the battery symbol in the status bar of the display will start to flash. If the batteries are completely discharged, the device will switch OFF at approx. 3 V but measured data already acquired will be saved. see Section 6.5
To replace used batteries first unscrew the battery compartment cover (7) on the rear of the device. When inserting batteries ensure that the polarity is correct.

6.2 Mains operation

To power the device from an external source preferably use the mains adapter ZA 1312-NA10 (12 V / 2 A); connect this to the DC socket (3).
Please ensure that the mains voltage is correct.

6.3 External DC voltage supply

The DC socket (3) can also be used to connect another DC voltage, 6 to 13 V (minimum 200 mA). This can be via an ALMEMO® connector (ZA1012-FS).
If, however, the power supply has to be electrically isolated from the transducers or if a larger input voltage range (10 to 30 V) is required, then electrically isolated supply cable ZA 2690-UK must be used.
It will then be possible to use the measuring instrument in a 12-volt or 24-volt on-board supply system.

6.4 Switching ON / OFF, reinitialization

To switch the device ON press **ON PROG** (6) located in the middle of the cursor block. The measuring menu always appears in the display first.
To switch OFF press and hold down the same key(s) **ON PROG**. When the device switches OFF all saved values and settings are retained intact.
see Section 6.5
If interference (e.g. electrostatic) or a malfunction (e.g. battery failure) causes the device to behave abnormally, it can be reinitialized. To activate a reset press and hold down key **F1** when switching on. To completely reinitialize all device programming (including device designation) to the factory defaults press and hold down key **F2** when switching on. In so doing certain parameters will be lost or be returned to their defaults : Language = German, illumination = OFF.

6.5 Data buffering

The sensor's programming is stored in the EEPROM on the sensor connector; the device's calibration values and programmed parameters are stored in the EEPROM on the instrument itself; in the event of failure both will be retained intact. Date and time-of-day settings and the individual values memory on the data logger are retained intact when the device is just switched off but will be lost as and when it is reset or the batteries are replaced.

7. CONNECTING SENSORS / TRANSDUCERS

Only Pt100 sensors with an ALMEMO® plug and range P304 (0.001K) can be connected to the measuring instrument at input sockets M0 and M1 (1). To use any other Pt100 sensor it must be reprogrammed via a terminal (command B00) or via a separate device ALMEMO® 2690 and above.

7.1 Sensors / transducers

All Pt100 sensors with an ALMEMO® connector have their measuring range and units already programmed and can thus be connected to the input sockets without further adjustment. A mechanical coding system ensures that sensors and output modules can only be connected to the correct sockets. All ALMEMO® connectors incorporate two snap-lock levers; these snap into position as soon as the connector is inserted into the socket, thus preventing unintended disconnection if the cable is accidentally pulled. To withdraw the connector both these levers must first be pressed in at the sides.

Splash-proof variants of devices in the ALMEMO® 1030 series are also available as options. For this purpose new sensors are now available with spray-coated ALMEMO® connectors incorporating a double sealing lip specially designed to protect the socket unit against penetration by splashing water. For any unused sockets protective stoppers are available.

7.2 Measuring inputs and additional channels

Each ALMEMO® 1030 measuring instrument incorporates two input sockets (1) to which measuring channels M0 and M1 are assigned..

Device-internal channels:
This device also incorporates additional channel M2, which is programmed as differential channel M1 – M0. However, this will only appear if two sensors are present at measuring points M0 and M1.

7.3 Potential separation

When organizing a properly functioning measuring setup it is very important to ensure that no equalizing current flow between sensors, power supply, and peripherals. All points must therefore lie at the same potential and / or any unequal potentials that do exist must be electrically isolated.

The analog inputs are electrically isolated by means of photovoltaic relays; the maximum potential difference permitted between them is 50 VDC or 60 VAC.

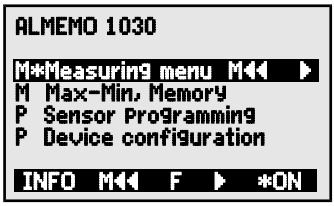
The power supply is isolated by the transformer in the mains adapter or by a DC/DC converter in connecting cable ZA2690-UK.

8. DISPLAY AND KEYPAD

8.1 Display and menu selection

Measuring instrument ALMEMO® 1030 incorporates a display (5) comprising a dot matrix LCD with 128x64 pixels or 8 rows each 8 pixels high.

The menu selection screen offers the following items:



Meas. menu for acquiring meas. values (s. 10),

Memory functions menu see 11 Also accessible from the meas. menu by pressing key < FCT >,

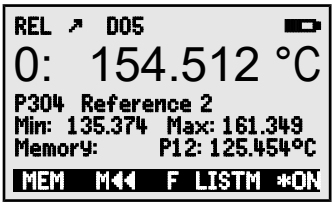
2 programming menus for programming the sensors and the device parameters (s. 13, 14)

Info menu for information regarding the device and the sensors (s. 9)

To call up **menu selection** (depending on the menu) press: ◄ ... or <MENU>
To switch **display lighting ON** (s. 14.3) < ON>
To **switch the device OFF** press and hold down key: ON
To select menus press: ▲ or ▼ ...
To call up the selected menu press: ▶ or PROG
To view the most important device information: < INFO>

8.2 Measured value display and status symbols

The **measuring menu** displays the measured values from the connected sensor or if there are two sensors also the differential. First comes the measuring point, then measured value, then units.



The meas. value is described by a number of status symbols: **Symbol:**

No sensor, measuring point deactivated:	´- - - - -´
Measuring range overshot, Maximum value display	O flashes
Measuring range undershot, Minimum value display	U flashes
Sensor breakage / sensor voltage, ´Lo´ display ´-.-.-´	B flashes / L flashes

In the measuring menus the status bar displays the following states:

Relative measuring with respect to a reference value:	REL
Measured value corrected by multi-point adjustment:	↗
Smoothing set:	D05
Display illumination activated or on pause:	* or *
Battery status full, half full, almost empty:	, ,

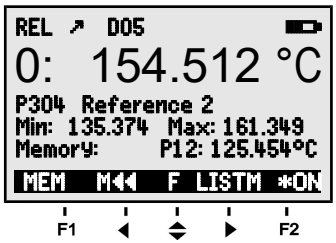
Battery voltage <3.8 V, remaining capacity <10% flashes

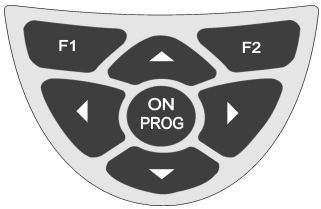
In the first data logger menu the top status bar also displays the following symbols for **checking the measuring sequence**:

Measurement stopped or started: ii or ▶
Measuring point scan started with data saving: REC
Measuring point scan started with data output via interface: COM
Start time or end time of measuring operation programmed: i▶ or ▶i

8.3 Function keys

The way in which the function keys **(6)** F1 , F2 and the cursor keys ◀ , ▶ operate may vary from menu to menu. The function is indicated as an abbreviation in the bottom line of the display (softkeys). In the instructions and documentation these softkey abbreviations are shown in angle brackets. e.g. <MEM>.



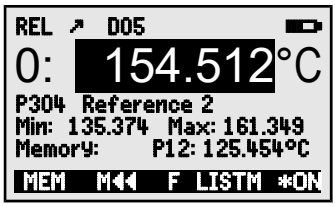


In the measuring menus the following function keys are available:

To **select the measuring point** press cursor keys: ▲ or ▼ ...
Help is provided by the symbol which lights up in the middle: <M>
To **call up** the memory functions menu: < FCT > or F2
To **call up** the data logger menus (with memory connector): < LOG > or F2
To **return** to menu selection: < MENU > or ■
To **return** to the measuring menu: < M◄◄ >

8.4 Selecting a function

Each menu comprises a number of functions; these may have to be activated or programmed during operation.



To select a functions press: PROG

The modifiable parameter is highlighted in inverse font: 154.512
Help is provided by the softkey symbol: <F> for function selection
To jump forward to the next function press: ▲ or ▼ ...

Depending on function
the keys F1 , F2 and ◀ , ▶ are assigned
the desired meaning. e.g.

To set the measured value to zero <ZERO>
To delete the maximum / minimum value <CLR>
To clear the memory <CMEM>
To cancel the function <ESC>

8.5 Entering data

If a programmable parameter is selected (see 8.4) you can clear or reprogram the current value directly.

To **clear the programmed values** press < CLR >
To **program** press PROG
You should now be in **programming mode** <P>
This symbol should appear in the middle of the softkey bar.
The cursor appears below the first input position and flashes. Smoothing 05
To **increment** the selected digit press ▲ ...
To **decrement** the selected digit press ▼ ...
To **change the arithmetic sign** of a numeric value press < +/- >
To **move forward to the next position** press ▶
The cursor now appears below the second position and flashes Smoothing 05
To move back to the previous position press ◀
Each position is programmed like the first. ▲ / ▼..., ▶
To save and **exit** press PROG
To **cancel** without saving press <ESC>
When entering **alphanumeric characters** select the group
Upper-case characters by pressing <ABC>
Lower-case characters by pressing < abc >
Numbers only by pressing < 123 >
Arithmetic signs by pressing < + - >

When entering certain parameters (e.g. units, baud rate, etc.) this procedure can be used to select and program not only characters but whole designations.

9. MENU SELECTION SCREEN

Via the menu selection screen the following menus can be accessed. (see Section 8.1)

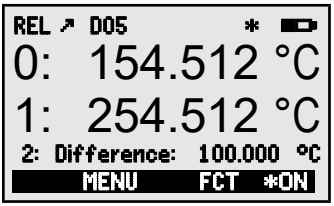
1. **M Measuring menu** see Chapter 10
2. **M Memory functions menu** see Chapter 11
3. **P Sensor Programming** see Chapter 13
4. **P Device configuration** see Chapter 14

To display the most important data regarding the device press: **INFO**

Here, if you have any questions, you can find the exact device type together with its firmware version, options, and serial number. Here, any sensor can be selected by pressing ▲ / ▼ and identified on the basis of its order number (if available). To assess the available power the remaining battery voltage can be displayed. At our WEB address you can obtain any other help you might need.

10. MEASURING MENU

When the device is switched on for the first time it opens with the **measuring menu**.
In the first line a number of status reports appear. (see Section 8.2)
Below this appear the first measuring point, the measured value, and the units - in upper-case format. This is followed if a second sensor is connected, by the second measured value and below this the differential.

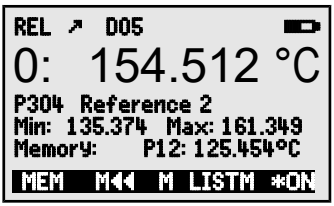


Further measuring functions are provided in the functions menu; these can be accessed by pressing key < FCT >. (see Chapter 11)

10.1 Differential measurement

If two sensors with the same units and same decimal point position are connected at measuring points M0 and M1, the difference appears automatically below device-internal measuring point M2: **M2 = M1 - M0**
(see Section 7.2)

11. FUNCTIONS MENU



It is possible, via the functions menu, to acquire maximum and minimum values over specifiable periods of time or to save measured values at specifiable locations or points in time. Measured values can also be set to zero.

The functions menu can be accessed via the menu selection screen. see Chapter 9.

To access the functions menu press: ▼ and ▶ or PROG

or in the measuring menu press: < FCT >

To return to the measuring menu press: < M >

Symbol <M> in the middle of the softkey bar indicates that the measuring point can be selected by pressing ▲ / ▼.

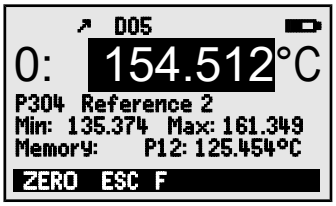
11.1 Selecting a measuring point

To select one after the other all three measuring channels and have the current measured value displayed for each press ▲ To return to the previous channel press ▼

To increment the measuring point press ▲

To decrement the measuring point press ▼

11.2 Setting the measured value to zero



One very useful function is to zero the measured value at certain locations or points in time as a reference value in order then to observe only the subsequent deviations. Having selected the measured value the softkey <ZERO> will appear. Pressing this key sets the displayed measured value to zero.

Select the ´**Measured value**´ function (s. 8.4): 00: 154.512 °C

To zero the measured value press <ZERO>

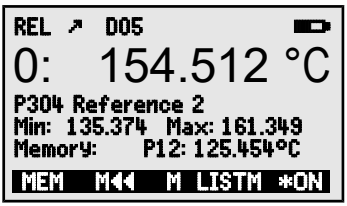
The measured value should then show 00: 0.000 °C with the symbol **REL**

To cancel zero-setting, after selecting this function, <ZERO> press and hold down

The offset is saved **temporarily** in RAM only. After switching OFF the normal measured value is displayed again.

11.3 Maximum / minimum memory

The **functions menu** shows not only the measured value with designation but also the continuously acquired maximum and minimum values for the measuring point selected.



Maximum value, minimum value:
Function **Min** / **Max** :

To clear the memory select the function (s. 8.4):

To delete maximum and minimum values for all channels press: **<CLRA>**

Whenever this memory is cleared, the current measured value will appear (because measuring is continuous). These maximum / minimum values are also cleared automatically whenever the device is switched on or the measured value is set to zero.

11.4 Individual values memory

Each measured value can be saved at the touch of a button. The measured value is displayed together with its units and position number in the memory function. Either just the last value or the whole memory can be cleared. All data thus saved can be shown in the display or output in list form via the interface.

To continuously save the measured value press **<MEM>**

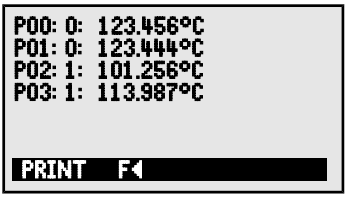
To display a memory position

To clear the last position, after selecting this function, press: **<CLRP>**

To clear all saved values press **<CLRM>**

To display all saved values press **<LISTM>** and **<F >** ...

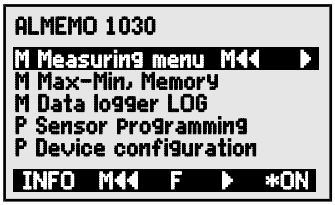
To display memory list



To output all saved values press (s.14.4): **<PRINT>**

To return to the functions menu press: **< F>**

12. DATA LOGGER



Measuring instrument ALMEMO® 1030 can be made into a respectable data logger - by fitting memory connector ZA1904SD with a micro-SD memory card (available as an accessory).
In the main menu an additional menu item **Data logger LOG** should then appear automatically; with this you can call up two further menus offering a comprehensive range of data logger functions. These can be used to acquire measured values either manually at specifiable points in time or cyclically over a specifiable period and record these on the memory card.

12.1 Memory connector with memory card

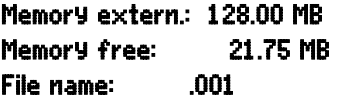
Measured data is written to this memory card via the memory connector to which it is fitted; this data is in table mode and standard FAT16 format. The memory card can be formatted and its contents can be read out or deleted using any standard PC with a standard card reader installed. This measured data can be imported into MS-Excel or into Win-Control.

The memory connector fitted with the memory card can be connected at socket A2; it will be recognized automatically. The first data logger menu should then be accessible - with date, time-of-day, cycle, and file name. It should also be possible to view the memory properties - its total memory capacity, memory still free, and memory time available.

Card memory - total capacity

Card memory - still free

File name (maximum 8 characters)



The device status can be checked by means of the appropriate symbols appearing in the top status bar of the menu. (see Section 8.2)
Before starting any measuring operation you can, in the **File name** function, enter an 8-character file name. In the absence of a user-defined file name, the default `.001` or the name most recently used will be suggested automatically. So long as the connector configuration is not altered, any number of measuring operations can be saved - either manually or cyclically - all in the same file.
If, however, the connector configuration has been changed since the last measuring operation, a new file will be created; and, if no new file name has been programmed, the index in the file name extension will automatically be incremented by 1, e.g. `.002`. Similarly, if the file name now entered already exists, a new file will be created with the same file name prefix but with a new index.

12.2 Date and time-of-day

For logging data recordings a real-time clock with date and time-of-day is provided. This real-time clock is buffered by means of the device battery; in the event of battery replacement date and time-of-day are lost. The first line contains the time-of-day on the left and the date on the right; by selecting this function (see 8.4) these can be programmed in the format indicated. (see 8.5).

Function - Date and time-of-day time of day: 12:34:56 Dat.:01.05.07
Format of time-of-day and date hh:mm:ss tt.mm.jj

12.3 Once-only output / saving of all measuring points

Once-only manual measuring point scans for acquiring the current measured values from all active measuring points can be initiated by pressing <MANU>.

Once-only manual measuring point scan <MANU>
The following symbols are highlighted in the status bar as verification. (see 8.2)
While data is being output via the interface ´COM´
While measured values are being saved ´REC´
Each time the key is pressed again the measured values will be processed in the same way with the associated measuring time.

12.4 Cyclic output / saving of all measuring points

For cyclic recording and output of measured values the cycle must be programmed accordingly. The measuring operation can be started by pressing <START> and stopped by pressing <STOP>. Whenever a measuring operation is started the maximum and minimum values from all measuring points are deleted.
In the course of a measuring operation the external memory must not be unplugged; all temporarily buffered measured values would be lost.
If no measuring operation is running, the **Cycle timer** function displays the cycle currently set. Having selected this function you can specify the cycle directly. (see Section 8.4; 8.5) Once an operation is started the timer can be seen counting down to the next cycle.

Function **Cycle-timer**: Cycle-timer: 00:02:00 S
Cycle (hh:mm:ss), Saving ON

To enable / disable memory activation ´S´ press <M-ON / M-OFF>

To start a cyclic measuring point scan press <START>
The following symbols are highlighted in the status bar as verification:
The START arrow lights up. ´▶´
While data is being output via the interface ´COM´
While measured values are being saved ´REC´

To stop a cyclic measuring point scan press <STOP> ´‖´

12.5 Memory capacity, memory output, clearing the memory

While measured values are being recorded the ´**Memory free**´ function continuously displays the memory capacity still available. Selecting this function enables two softkeys, one for direct memory output and one for memory clearing.

Function - **Memory free** e.g. **Memory free 108.4 MB**

To output memory content via interface (s. 14.4) **<PMEM>**

To clear memory (i.e. reformat the memory card) **<CMEM>**

If a memory card is being used the device itself can only read out in table mode the measured data contained in the file most recently used.

The most sensible approach is to remove the memory card and copy the files via a USB card reader directly onto a PC. These can then be imported either into MS-Excel or into Win-Control.

During memory output the ´**Remaining output**´ function continuously updates and displays the amount still to be output.

Memory output, remaining **Output-remaining 12.5 MB**

12.6 Memory time available

An important parameter for data recording is the memory time available. This depends on the memory still free and the number of active measuring channels.

Memory time available in days (D) and hours (h) **Memory time: 24D 13h**

12.7 Sleep mode

For long-term monitoring involving long measuring cycles the device can also be operated in sleep mode. In energy-saving sleep mode the measuring instrument is completely switched off after each measuring point scan (sensors with their own power supply) and switched on again automatically after the cycle expires ready for the next measuring point scan. In this way with just one set of batteries or one battery recharge up to 15000 measuring point scans can be performed; for a cycle lasting 10 minutes this represents an available measuring duration of over 100 days.

For **data recording** in sleep mode the following parameters must be set:

1. Enter a cycle lasting at least two minutes: **Cycle: 00:05:00**
2. Enable memory activation by pressing **<MON>**: **Cycle: 00:05:00 S**

In the following menu accessible by pressing **< F >**

3. Program sleep mode by pressing **<ON>**: **Sleep mode: ✓**
4. In the measuring menu start measuring operation by pressing **<START>**
   The device should then display, **Sleep On**
   The device then switches off and the only visible activity is the flashing red LED ´SLEEP´ at the top of the display. LED ´SLEEP´ (4) flashes.

5. The device switches on automatically as per the specified cycle, performs one measuring point scan, and then switches off again.
6. To quit sleep mode press: <ON>
7. To terminate the measuring operation press <STOP>

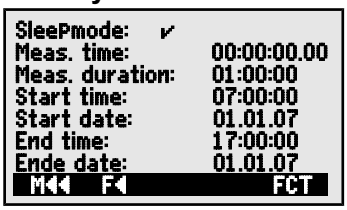
When selecting sleep mode, subject to confirming a check window, all necessary parameters may be configured.

12.8 Starting and stopping measuring operations

A measuring operation can be started / stopped not only by pressing the appropriate keys but also by means of start time / end time or measuring duration.

Start date and time-of-day, end date and time-of-day

A measuring series can be started / stopped automatically at specified times. For this purpose the start date and time-of-day and the end date and time-of-day must be programmed. If no date has been programmed, the measuring operation will be performed every day within the set period. Or, alternatively, instead of specifying the end time the measuring duration itself can be programmed. The total measuring time since starting can be seen in the 'Measuring time' function.



This is assuming of course that the current time-of-day has been programmed. Sleep mode takes no account of end time or measuring duration.

To access the menu press: <►F>

Function - Measuring duration (format hh:mm:ss):	Meas. duration:	00:10:00
Function - Start time-of-day (format hh:mm:ss):	Start time:	07:00:00
Function - End time-of-day (format hh:mm:ss):	End time:	------
Function - Start date (format tt:mm:jj):	Start date:	01.05.07
Function - End date (format tt:mm:jj):	End date:	------
Meas. duration since start (format hh:mm:ss.hh):	Meas. time:	00:01:23.45

To clear these values, after selecting this function, press <OFF>

If the start time-of-day for a measuring operation has been programmed, the following symbol appears in the status bar (s. 8.2): ´▮►´

If the end time-of-day or the measuring duration for a measuring operation has been programmed, the following symbol appears in the status bar: ´►▮´

13. SENSOR PROGRAMMING

Sensors for measuring instrument ALMEMO® 1030 incorporate in the connector a small memory chip ensuring they are automatically recognized when plugged in. It is also possible to program certain parameters (e.g. assigning the sensor a name), to change the units, or, with a view to stabilizing the display, to set a smoothing factor. In the ´**Sensor Programming**´ menu these channel parameters can be entered, viewed, checked, and modified via the keypad - providing the appropriate sensor connector is plugged in. Accessing the ´Sensor programming´ menu (see 9.)

13.1 Measuring point designation

Each measuring point can be assigned a 10-character alphanumerical designation denoting as clearly as possible the type of sensor, measuring location, and / or purpose. This designation is displayed in the functions menu. In outputs via the interface the measuring point designation appears in the program header as ´**Designation**´.

To enter name in ´**Designation**´ function. s. 8.5 **Designation: Reference 2**

13.2 Multi-point calibration

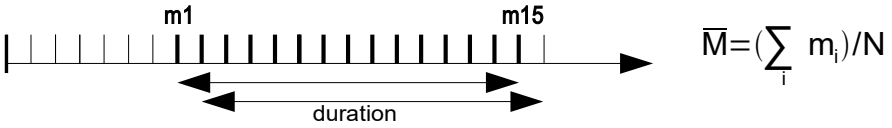
It is possible via the memory chip to store a correction curve in the sensor that will help optimize its measuring accuracy. In a calibration laboratory deviations from the ideal setpoint can be measured at various points; this information can be stored in the sensor and interpolated on a linear basis for subsequent measuring operations.

13.3 Resolution and units

The measuring instrument leaves our factory with default resolution 0.001 K and default units °C. In the ´**Sensor Programming**´ menu you can if so required reduce the resolution to 0.01 K or select other units such as °F or K. (see Section 8.5).

13.4 Smoothing by means of a sliding average

When performing temperature measuring operations at a resolution of 1/1000 °C using sensors in air in particular the measured value display may be unstable. In this case the measured value can be smoothed in the form of a sliding average over a specified time frame. The level of smoothing can be set in the ´**Smoothing**´ function by specifying the number of measured values to be averaged (0 to 99)



Measured value smoothing over e.g. 15 values: **Smoothing: 15**

Time constant (s) = smoothing / 2.5 mops * 2 = 3 seconds

14. DEVICE CONFIGURATION

In the ´**Device configuration**´ menu certain basic settings can be made, e.g. language and illumination. The device designation can be used as print header in log printouts. The baud rate can be adapted for operation with external devices.

14.1 Device designation

In the ´**Device designation**´ function (see Manual 6.2.4) you can enter any text up to maximum 40 characters in length. (see Section 8.5)
This text will then appear in the ´Info´ menu, in the print header for measuring operations, and in device lists (software).

Function **Device designation**: **Device designation Owner**

14.2 Language

The user can choose between German / English / French as the language for function labeling and printouts; (other languages are available on request). The softkeys are international; these cannot be changed:

To select desired language press **<SET>** in the ´**Language**´ function.

14.3 Illumination and contrast

Display illumination can be enabled / disabled in all menus by pressing **<* ON>** or in the function ´Device configuration´ - ´**Illumination**´; (please note that enabling will double current consumption). If illumination is enabled but no mains adapter is connected, it will switch off again automatically as soon as a settable illumination duration expires; this starts with each pause in key operation and restarts as soon as any key is pressed. The contrast of the display can be set in the ´**Contrast**´ function to any one of 10 levels.

To enable illumination press: **<* ON>**

or in the ´**Illumination**´ function: **Illumination: ✓**

To set illumination duration (20 sec. to 10 min.) press **<SET>**: **Duration20 seconds**

If **display illumination** is enabled,
the following symbol appears in the status bar: * Illumination ON
If illumination has temporarily switched off, the following will light up ⁑ Pause
To switch ON again without this function press: ◄
To set the contrast (5 to 100 %) press <-> and <+>: **Contrast: 50%**

14.4 Interface, data cable, baud rate, data format

Via the serial interface you can output measured data online or saved measured values to a printer or computer. For connecting to the various interfaces we have a series of data cables available. The data cables should be plugged in at socket A1 (2); in ´Device configuration´ the programmed baud rate then appears. On leaving our factory the baud rate for all interface modules is programmed to 9600 baud. If this needs to be changed you can, in the ´**Baud rate**´ function, choose from 1200, 2400, 4800, 9600 baud or 57.6, 115.2 kbaud (taking care not to exceed the maximum for the interface module). The baud rate setting is saved to the EEPROM on the interface module and applies when any other device is used.

To set the baud rate (s. 8.5): **Baud rate: 9600 baud**

Data format: Cannot be changed, 8 data bits, 1 stop bit, no parity

15. OPTION FE : FUNCTION EXTENSION

Measuring range ´P314´ (B96) has been extended to:
Measuring range -200.000 to +560.000 °C
Accuracy: ± 0.010 K ± 1 digit (in range -50 to +560°C)

There is also an additional **measuring range ´P214´** (B69).
Measuring range -200.00 to +850.00 °C
Accuracy: ± 0.05 K ± 1 digit (in range -100 to +850°C)

Measured value correction is performed by modifying the coefficientsn of the Pt100 sensors:
When calibrating a Pt100 sensor in a calibration laboratory any deviation detected can be managed by adjusting the sensor on the basis of the four real coefficients in the Van Dusen equation. The easiest way is to use the ALMEMO-Control software package.

This provides the following terminal commands:
The four coefficients of a Pt100 sensor can be identified using command P27:

Select the input channel	E00	
Identify the coefficients	P27	Pt100 COEFFICIENTS: 00: A = 3.90830E-3 00: B = -5.77500E-7 00: C = -4.18300E-12 00: R0 = 100.01234

To enter coefficients A, B, C and resistance R0 (at 0 °C) in the Pt100 formula, first select the input channel and then specify the associated coefficients:

Select the input channel	E00	
		Input range
Enter coefficient A	f1 ax.xxxxx	3.7 ... 4.1
Enter coefficient B	f2 ax.xxxxx	5.6 ... 6.0
Enter coefficient C	f3 ax.xxxxx	4.0 ... 4.4
Enter resistance R0	f2 exxx.xxxxx	95.0 ... 105.0

The input format is one integer digit before the decimal point (three integer digits for R0) and up to five decimal places. If fewer decimal places are entered, the input must be completed by pressing ENTER. There is no need to enter the arithmetic sign or exponent - just the mantissa.
Measured value correction is denoted by '!' at the end of the comments text.
To delete all coefficients use C27; to delete individually enter '0'.

16. TROUBLE-SHOOTING

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

Error: No display, display malfunction, keys do not react.
Remedy: Check the power supply; replace the batteries; switch off and then on again; if necessary re-initialize. (see Section 6.4)

Error: Measured values are incorrect.
Remedy: Check the status of the measuring channel, in particular the offset (REF)

Error: Measured values fluctuate or the system hangs in mid-operation.
Remedy: Check the cabling for any inadmissible electrical connections; unplug all sensors and replace with a hand-held sensor in air or phantoms (for Pt100 sensors, 100 Ω) and test again; then reconnect the sensors one after the other and test again; if the fault occurs again for a connection, check the wiring, insulate the sensor, and eliminate interference by using shielded or twisted wiring.

Error: Data transmission via the interface does not function
Remedy: Check the interface module, connections, and settings. Ensure that both devices are set to the same baud rate and transmission mode. (see Section 14.4) Is the correct COM port on the computer being

addressed ? Test data transmission by means of a terminal. If the computer is in XOFF status. enter <ctrl Q> for XON. Check the programming by means of ´P15´. (see Manual 6.2.3) Test the transmit line by entering a smoothing factor using command ´f1 z10´ and check in ´Sensor programming´. Test the receive line by a memory output in the ´Functions´ menu by pressing <LISTM> and <PRINT> and check the display.

If, after performing the above-listed checks and remedial steps, a device still fails to behave as described in the operating instructions, it must be returned to our factory in Holzkirchen, accompanied by a brief explanatory note, error description, and if available test printouts. With the AMR-Control software you can print out screenshots showing the relevant programming and save and / or print out a comprehensive "Function test" in the device list or terminal mode.

17. DECLARATION OF CONFORMITY

Ahlborn Mess- und Regelungstechnik GmbH declares herewith that the ALMEMO® 1030 device carries the CE label and complies in full with the requirements of EU directives relating to low voltage and to electromagnetic compatibility (EMC) (89/336/EWG).

The device is specially designed for use in the laboratory or in test setups in a controlled electromagnetic environment.

The following standards have been applied in evaluating these products :

Safety / security:	EN 61010-1: 2001
EMC:	EN 61326-1: 2013

CE

If a product is modified in any manner not agreed with us in advance, this declaration becomes void.

18. ANNEX

18.1 Technical data

Measuring inputs	2 ALMEMO® sockets, suitable for ALMEMO® flat connectors
Measuring channels	1 additional channel for differential
Measuring range	From -200 to +400 °C
Resolution	0.001 K / 0.01 K
Linearization accuracy	0.001 K
Measuring current	1 mA
A/D converter	Delta - sigma 24 bit, 2.5 mops, amplification : 5
Accuracy	0.01K ± 1 Digit (at range -50...+400°C)
Nominal conditions:	23°C ± 2°C, 1013mb, Battery without display illumination
Temperature drift:	2 ppm/K
Outputs	1 ALMEMO® socket for data cable
Standard equipment	
Display	Graphics, 128 x 64 pixels, 8 rows of 4 mm
Operation	7 keys (4 softkeys)
Memory	100 measured values in RAM, SD-card memory connector
Date and time-of-day	Real-time clock buffered with device battery
Power supply	External ALMEMO® DC socket, 9 to 13 VDC
Batteries	3 AA alkaline batteries
Mains adapter	ZA 1312-NA10, 100 - 240 VAC to 12 VDC, 2 A
Adapter cable, el. isol.	ZA 2690-UK, 10 - 30 VDC to 12 VDC, 0.25A
Current consumption	without Input and output modules active mode approx. 20 mA (at 4.5 V) With illumination approx. 40 mA (at 4.5 V)
Housing	(LxWxH) 127 x 83 x 42 mm, ABS, Weight approx. 260 g
Suitable conditions	
Operating temperature	-10 to +50 °C, Storage temperature -20 to +60 °C
Ambient atm. humidity	10 to 90 % RH (non-condensing)

18.2 Product overview

High-precision temperature measuring instrument ALMEMO® 1030 plus accessories Evaluation software and Pt100 temperature sensor	**Order no.**
Complete set including DKD calibration certificate	SP10302D
Option FE Function extension Measuring range P314, P214	OA1030FE
Accessories:	
Pt100 temperature sensor	FPA923L0250
Mains adapter with ALMEMO® connector, 12 V, 2 A	ZA1312NA10
DC adapter cable, 10 to 30 VDC, 12 V / 0.25 A, electrically isolated	ZA2690UK
ALMEMO® memory connector with micro-SD	ZA1904SD
Data cable, with USB interface, electr. isol., maximum 115.2 kbaud	ZA1919DKU
Data cable, with V24 interface, electr. isol., maximum 115.2 kbaud	ZA1909DK5
Ethernet data cable	ZA1945DK
Rubberized impact protection, gray	ZB2490GS2
DIN top hat rail mounting	ZB2490H

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18.4 Your contact

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**Even the greatest possible care cannot exclude the possibility of inaccuracies.
We reserve the right to make technical changes without advance notice.**