Operating instruction

English

Simulator

ALMEMO® KA 7531

V6

03.12.2012

www.ahlborn.com
1. OPERATING CONTROLS

(1) Signal sockets P0 to P4
   for ALMEMO® clamp connectors
   P0 Pt100
   P1 10V, 60mV, thermocouples
   P2 20mA
   P3 Digital signals
   P4 Continuity check

(2) Output socket A1
   A1 V24 Interface (ZA 1909-DK5)
   USB (ZA 1919-DKU)
   LWL (ZA 1909-DKL)
   Ethernet (ZA 1945-DK)

(3) DC socket
   DC Mains adapter (ZA 1312NA1, 12V)
   12V and RS422 (ZA 5099-FSV)
   9V and USB (ZA 1919-DKUV)

(4) LCD, graphics display
   7 rows for functions
   1 row for softkeys F1, ▼, ▲, ►, F2
   Shown in brackets: <SET>

(5) Operating keys
   <CONFIG> Device configuration
   <MENU> Main menu, simulator
   <☼ ON> Display illumination ON
   PROG Programming
   ▲ ▼ ▶ F: Function selection
   <SET> To change the function
   ▲ ▼ S: To set the steps
   PROG Programming
   ▲ ▼ ▶ P: Data entry
   <ESC> To cancel the function

Accessories
(7) Pt100 test connector
(8) ALMEMO® test cable
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3. GENERAL

Congratulations on your purchase of this new and innovative ALMEMO® simulator. It will allow you to perform a wide range of simulation runs on sensors and transmitters and put data acquisition and automation systems into service quickly and easily. It also accepts signals from Pt100 and thermocouple sensors, e.g. 0-10 V, 0-20 mA, and pulses and frequencies, 0-100 kHz. With its range of softkeys and its clear and readily understandable graphics display the device is easy and convenient to operate. You are nonetheless advised to properly familiarize yourself with the way the device functions and with its numerous possibilities and to carefully read these operating instructions and the basic information on sensors in the ALMEMO® Manual. This is the best way to avoid operating errors and prevent damage to the device. To help you find answers to your questions as quickly and easily as possible an index is provided at the end of these instructions and at the end of the Manual.

3.1 Warranty

Each and every device, before leaving our factory, undergoes numerous quality tests. We provide a guarantee, lasting two years from delivery date, that your device will function trouble-free. In the unlikely event that the device proves defective and you need to return it please wherever possible use the original packaging material for dispatch and enclose a clear and informative description of the fault and of the conditions in which it occurs.

This guarantee will not apply in the following circumstances:
- The user attempts any form of unauthorized tampering and alteration inside the device.
- The device is used in environments or conditions for which it is not suited.
- The device is used with an unsuitable power supply and / or in conjunction with unsuitable peripheral equipment.
- The device is used for any purpose other than that for which it is intended.
- The device is damaged by electrostatic discharge or lightning.
- The user fails to observe these operating instructions

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:

Simulator ALMEMO® KA 7531, ALMEMO® clamp connector, test cable with test probes, These operating instructions, ALMEMO® Manual, CD with AMR-Control software and various useful accessories

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

This symbol means that the product is subject to European Union regulations on segregated waste disposal. This applies both to the product itself and to any accessories marked with the same symbol. Disposal of any such item as unsorted domestic waste is strictly forbidden. Batteries and rechargeable battery packs are special waste and must not be discarded as normal domestic waste. Please dispose of packaging materials, plastics, and electronic components separately and in the proper manner.

4. SAFETY INSTRUCTIONS

CAUTION! This sign is intended to warn the user of a situation that risks damaging the device. The user should carefully read the operating instructions in order to avoid possible errors, damage to equipment, and even the risk of personal injury. The device may only be opened by duly authorized and qualified service technicians.

WARNING! This sign is intended to warn the user of a possibly life-threatening situation with risk of fatal injury through high voltage. Before connecting any equipment to the power supply always ensure that the operating voltage is correct. Please note that the device may be susceptible to damage by electrostatic discharge or lightning. Do not run wires in the vicinity of high-voltage power cables!

4.1 Special notes on use

If the device is brought into the work-room from a cold environment there is a risk that condensation might form on the electronics. You are advised therefore to wait until the device has adjusted to the ambient temperature before starting to use it.

4.2 Handling batteries / rechargeable batteries correctly

When inserting batteries / rechargeable batteries ensure that these are correctly polarized. If the device will probably not be needed for a relatively long period of time or if the batteries are empty remove the batteries; 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 on the fire.
5. THE SIMULATOR FUNCTIONS
Simulator ALMEMO® KA7531 is a universal generator of sensor and transmitter variables. For Pt100 sensors it incorporates 5 precision resistors in 4-conductor circuitry. Voltage signals from 7 different thermocouple types with settable cold junction temperature are calculated and output via a 16-bit D/A converter. Transmitter signals 0-10 V and 0-20 mA are generated in exactly the same way. Pt100, voltage, and current signals are electrically isolated from one another. The output values can be specified digit-by-digit or set manually in selectable steps or automatically. It even provides continuous ramp generation with settable limit values. Digital signals of 0.01 Hz to 500 kHz can be used as frequency with selectable pulse width or pulse / pause duration. A continuity check is also provided; this measures the voltage drop and, in the event of the result exceeding a settable threshold, issues an acoustic signal. The simulator can also, via the interface, be controlled from a PC or operated in an ALMEMO® network.

6. CONNECTING THE SIMULATOR
To supply simulator variables to the appropriate devices the simulator incorporates 5 ALMEMO® sockets P0 to P4 (1). The accessories include one ALMEMO® test connector (7) with 6 terminals for connecting the Pt100 resistors in 4-conductor circuitry. For all other signals there is the connector with two-pole cable and banana plugs. For the continuity check test probes are also provided.

Connection of Pt100 simulator with ALMEMO® test connector ZA 100-TS in 4-conductor circuitry (terminals A, B, C, D):

Connection of voltage signals, current signals, digital signals, and continuity check via 2-contact ALMEMO® test cable ZA 1000-TK fitted with banana plugs, (terminals A = +, B = -):
7. POWER SUPPLY

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

- 3 AA alkaline batteries, in the device
- Mains adapter 12 V, 0.2 A, with ALMEMO® connector ZA1312NA1
- External DC voltage, 10 to 30 V via ALMEMO® connector ZA1000FSV
- Supply and RS422 network connection via ALMEMO® connector ZA5099FSV
- Supply and USB connection via ALMEMO® data cable ZA1919DKUV

7.1 Battery operation and supply voltage monitoring

The measuring instrument is powered by 3 AA alkaline batteries. Basic current consumption is approx. 30 mA; this will give an operating time of approx. 70 hours. If the display illumination is left switched on, this operating time will be reduced to approx. 30 hours. If the current output is often used the batteries may last as little as 15 hours. The available operating voltage is displayed in the device configuration (see 9.4), thus allowing you to assess the remaining operating time. As soon as the remaining battery capacity drops to approx. 10%, the battery symbol in the softkey bar of the displays will start to flash and display illumination is switched off. If the batteries are completely discharged the device itself will switch off. To replace old batteries unscrew the battery compartment cover (6) on the rear of the device.

To save on battery use when in battery mode the electrically isolated current / voltage signals P1 and P2, so long as they are not selected, are switched off.

7.2 External power supply

Via the simulator it is also possible to draw power from an external source - preferably using mains adapter ZA1312NA1 (12 V / 0.2 A) connected via the DC socket (3). Please ensure that the mains voltage is correct. At this socket it is also possible, via an ALMEMO® connector (ZA1000FSV) to connect a DC voltage from 9 to 12 V (minimum 0.2 A). Another interesting possibility is the combined connection of power supply and interface to the ALMEMO® network via ALMEMO® connector ZA5099FSV or to a USB interface via ALMEMO® cable ZA 1919-DKUV.

With an external supply all outputs can be used simultaneously.

7.3 Switching ON / OFF, reinitialization

To switch the device ON briefly press and release the key ON (5) in the middle of the keypad; to switch the device OFF press the key ON and hold down. If interference (e.g. electrostatic) or a malfunction (e.g. battery failure) causes the device to behave abnormally, it can be reinitialized; to do so press key F2 when switching on. This will restore all settings to the factory default status.
8. DISPLAY AND OPERATING CONTROLS

The simulator incorporates a keypad (4) and a graphic display (5) for the purposes of configuring the device and operating all signals. The main menu shows the associated ports P0 to P4 and the variables set.

8.1 Function keys

The way in which the function keys \( \text{F1}, \text{F2} \) (5) and the cursor keys \( \ll, \gg, \up, \dn \) 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.

- To select device configuration
  
- To return to main menu
  
- To switch display illumination ON / OFF

To switch device OFF press and hold down

To select a function press any of keys

Symbol lights up in the middle indicating function selection.

The function is highlighted in inverse font.

To access the next submenu press

Depending on the function the keys are assigned an abbreviation.

To set a parameter directly

To cancel the function

8.2 Data entry

If a programmable function is selected you can clear or reprogram the current value directly.

To program press

Symbol lights up in the middle indicating programming mode.

The cursor blinks below the first input position.

To clear the programmed values

To increment the selected digit

To decrement the selected digit
To change the arithmetic sign
To select the next position
The cursor blinks below the second digit.
To move back to the previous digit
Each position is programmed like the first.
To complete data input
To cancel programming

If a data cable or interface connector is plugged in at socket A1 or DC, key operation on the simulator is - for safety reasons - automatically blocked.

The following should appear in the softkey bar:
Remote Control! *ON

9. MENUS
The simulator is operated via the main menu and a series of associated submenus in which its operating parameters can be individually set.

9.1 Main menu
In the main menu all parameters for output ports P0 to P3 can be selected and set directly by means of keys PROG, ▲ / ▼. see 8.2.
The threshold for the continuity check can be programmed via port P4. The ports can be configured in detail via the appropriate submenus.
The 5 Pt100 values can also be selected by means of.

9.2 Submenus
Passing via the main menu to the submenus all ports P0 to P4 can be configured in detail and simulation functions can be activated.
To call up these submenus press
To return to the main menu press

9.2.1 Pt100 output
At socket P0 there are 5 resistors in 4-conductor circuitry for simulating Pt100 sensors. (see 6.)
In submenu P0 Pt100 you can by means of keys ▲ / ▼ (abbreviation S for steps) scroll up and down between the 5 temperature values 0, 50, 100, 200, and 300 °C.
9.2.2 Voltage output, thermocouples
The voltage output is present at socket P1. In associated submenu P1 the following voltage ranges can be selected:
-3 to 10V,
-10 to 60mV
plus 7 thermocouple ranges:
TC NiCr type K 0.1°C
TC Nisil type N 0.1°C
TC FeCo type J 0.1°C
TC CoCo type T 0.1°C
TC Pt10 type S 1 °C
TC Pt13 type R 1 °C
TC El18 type B 1 °C
To select function ‘P1: Output’ press (see 9.3):
To choose the output range
press:
To choose simulator functions
press:
Display of temperature value in mV
To simulate real temperatures the cold junction temperature (socket temperature of test item) must either be disabled in the test item or imaged in the simulator.
To select the cold junction temperature press
To enable / disable the cold junction temperature
Display of temperature value in mV
To return to simulator’s main menu

9.2.3 Current output
The current output is present at socket P2. In submenu P2 the current range is fixed permanently at 0 to 20 mA.
To choose simulator functions (see 9.3)
To return to simulator’s main menu
9.2.4 Digital signal output

Frequencies
For frequencies and pulses socket P3 is provided. In submenu P3 the following can be selected:

- 4 frequency ranges:
  - 1 to 4000 Hz,
  - 1 to 10.00 kHz
  - 1 to 40.0 kHz
  - 1 to 100 kHz

Within these ranges the pulse width and the pulse / pause ratio can be set in %.

Pulses
There are also two pulse ranges for which the period duration is specified:
- 2 µs to 99.999 ms
- 2 ms to 99.999 s

The pulse duration can also be set here.

Pulse variables, an overview
For a clear and easy-to-understand overview of these variables (frequency, pulse width, pulse duration, pause duration) there is a further submenu; this can be accessed by pressing the ►F key again.

To return to the 1st submenu press:

9.2.5 Continuity check
The test cable connected at socket P4 provides a continuity check. The threshold above which continuity is reported (by visual and acoustic signals) can be set between 1 and 1000 mV. The displayed measured value indicates the voltage drop, e.g. the voltage flowing through a diode.
9. Menus

9.3 Simulator functions
To run a quick and easy check on a control process or a control element various values can be systematically specified either in steps or automatically in ramp form. To do this select the ‘Function’ line (see 8.1).

Program one of the available functions or by means of key (see 8.2)

9.3.1 Steps, manual
In this function the output value can be selected and modified manually digit-by-digit; to terminate press <PROG>. (see 8.2)
To specify a step percentage select the function ‘Steps’ (see 8.1) and enter the desired value.
To change the control variable step-by-step press ▲ or ▼ (softkey abbreviation S)

9.3.2 Steps, automatic
In this function ‘Steps automatically’ modification of the control variable can be automated. In the function ‘Time’ the waiting period per step can be entered.
To start step-by-step output press: <START>
To stop step-by-step output press: <STOP>

9.3.3 Ramp, automatic
In this function the control variable is simulated automatically and continuously from a start value up to a stop value or for a certain period of time. One can enter a start value; one can also enter a stop value in the ‘Stop’ function and the period of time from start to stop in the ‘Time’ function.
To start continuous output press: <START>
To start continuous output press: <STOP>
9.4 Device configuration

In the menu „DEVICE CONFIGURATION“ certain basic settings for the adapter can be made, namely the operating parameters „Device address“ and „Baud rate“ for the serial interface, the menu language, and the display illumination mode.

To select „Device configuration“ in the main menu <CONFIG>
To return to the main menu: <MENU>

9.4.1 Language

As menu language the user can choose between „Deutsch“ / „English“ / „Français“; (other languages are available on request). The softkeys are international; these cannot be changed.

To select the „Language“ function: Language:
To change the language <SET>

9.4.2 Illumination and contrast

The display can be illuminated but this consumes more power. In battery mode therefore backlighting switches off automatically on expiry of a settable period of time during which no key is touched.

To switch display illumination ON <* ON>
To switch display illumination OFF <* OFF>
To enter a duration for display illumination ON
To switch illumination ON permanently ON or <
To switch back ON again without this function
Set the contrast (5 to 100 %) in the function

9.4.3 Battery voltage

View current operating voltage
As soon as battery voltage drops below 3.5 V display illumination is switched OFF automatically.
As soon as battery voltage drops below 3.0 V the device itself is switched OFF automatically.

UBat: 4.5 V

9.4.4 Baud rate, data format

On leaving the factory the baud rate for all interface modules is programmed to 9600 baud. In order to avoid unnecessary problems when networking several devices together the baud rate should not be altered; instead, the computer should be set to match. If for some reason this proves impossible you can, in the „Baud rate“ function, choose a value from 1200 / 2400 / 4800 / 9600 baud or 57.6 / 115.2 kilobaud. Set the baud rate in the function (s. 8.2): Baud rate: 9600 bd

Data format 8 data bits, 1 stop bit, no parity (cannot be changed)
9. Menus

9.4.5 Device address
To communicate with networked devices it is absolutely essential that all the devices concerned should have the same baud rate setting but that each should have its own dedicated address; this is because only one device should respond per command. Before starting network operation ensure therefore that all the measuring instruments and modules involved are assigned different device addresses. On leaving the factory address 00 is normally set.

Set the device address in the function (see 8.2): **Device address: 00**

10. SERIAL INTERFACE
All ports can be controlled not only by pressing the appropriate keys but also, with option I, via the serial interface; (see Manual, Chapter 6). For connecting to socket A1 (2) various data cables are available; (see Manual 5.2). The best way of connecting to a network distributor is on a 6-wire basis via connector ZA 5099-FSV in the DC socket leading to a free RS422 output; (see Manual 5.3). This combines power supply and data transmission.

![Diagram of ZA 5099-FSV and ZA 5099-NVx connectors]

The same combined connection is also implemented with the new USB data supply cable ZA 1919-DKUV.

If a data cable or interface connector is plugged in at socket A1 or DC, key operation on the simulator is - for safety reasons - automatically blocked.

The following should appear in the softkey bar:

Remote Control ! *ON

The **Device address** can be modified as and when necessary in the menu **DEVICE Configuration**. (see 9.4.5)
### 10.1 Programming via the interface

#### To program a function

| Command | Port 01 range V | Port 01 range mV | Port 01 range TC type K | Port 01 range TC type N | Port 01 range TC type J | Port 01 range TC type T | Port 01 range TC type S | Port 01 range TC type R | Port 01 range TC type B | Port 03 range 4000Hz | Port 03 range 10kHz | Port 03 range 40kHz | Port 03 range 100kHz | Port 03 range 99ms | Port 03 range 99s |
|---------|----------------|-----------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|--------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| i01 B11 | i01 B10        | i01 B04         | i01 B34                | i01 B35                | i01 B36                | i01 B07                | i01 B37                | i01 B08                | i03 B29                | i03 f1 B29        | i03 f2 B29        | i03 f3 B29        | i03 f1 B54        | i03 f2 B54        | i03 f3 B54        |

#### Cold junction temperature in digits (e.g. 23.4°C)

<table>
<thead>
<tr>
<th>Port 03 range 4000Hz</th>
<th>Port 03 range 10kHz</th>
<th>Port 03 range 40kHz</th>
<th>Port 03 range 100kHz</th>
<th>Port 03 range 99ms</th>
<th>Port 03 range 99s</th>
</tr>
</thead>
<tbody>
<tr>
<td>i03 f1 g00234</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Value of simulator port pp to 5 digits

<table>
<thead>
<tr>
<th>Command</th>
<th>Port 03 range 4000Hz</th>
<th>Port 03 range 10kHz</th>
<th>Port 03 range 40kHz</th>
<th>Port 03 range 100kHz</th>
<th>Port 03 range 99ms</th>
<th>Port 03 range 99s</th>
</tr>
</thead>
<tbody>
<tr>
<td>ipp f9 ayyyyy Aufl. s.u.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Output programming and status

<table>
<thead>
<tr>
<th>Px</th>
<th>Interface element</th>
<th>Variant</th>
<th>Response</th>
<th>Simulator</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>Pt100 output</td>
<td>Controlled</td>
<td>00:T00 COM +0300.0°C</td>
<td></td>
</tr>
<tr>
<td>01</td>
<td>Analog output, 10 V</td>
<td>Controlled</td>
<td>01:DA1 COM +10.000 V</td>
<td></td>
</tr>
<tr>
<td>01</td>
<td>Analog output, 60 mV</td>
<td>Controlled</td>
<td>01:DA7 COM +60.000mV</td>
<td></td>
</tr>
<tr>
<td>01</td>
<td>Analog output, TC type K</td>
<td>Controlled</td>
<td>01:TC0 COM +1370.0°C VK:+025.1°C</td>
<td></td>
</tr>
<tr>
<td>01</td>
<td>Analog output, TC type N</td>
<td>Controlled</td>
<td>01:TC1 COM +1300.0°C VK: - - -°C</td>
<td></td>
</tr>
<tr>
<td>01</td>
<td>Analog output, TC type J</td>
<td>Controlled</td>
<td>01:TC2 COM +1000.0°C VK: - - -°C</td>
<td></td>
</tr>
<tr>
<td>01</td>
<td>Analog output, TC type T</td>
<td>Controlled</td>
<td>01:TC3 COM +0400.0°C VK: - - -°C</td>
<td></td>
</tr>
<tr>
<td>01</td>
<td>Analog output, TC type S</td>
<td>Controlled</td>
<td>01:TC4 COM +01760.0°C VK:+0025.0°C</td>
<td></td>
</tr>
<tr>
<td>01</td>
<td>Analog output, TC type R</td>
<td>Controlled</td>
<td>01:TC5 COM +01760.0°C VK: - - -°C</td>
<td></td>
</tr>
<tr>
<td>01</td>
<td>Analog output, TC type B</td>
<td>Controlled</td>
<td>01:TC6 COM +01800.0°C VK: - - -°C</td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>Analog output, 20 mA</td>
<td>Controlled</td>
<td>02:DA2 COM +20.000mA</td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>Frequency output, 0.4 kHz</td>
<td>Controlled</td>
<td>03:F00 COM +04000.Hz</td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>Frequency output, 10 kHz</td>
<td>Controlled</td>
<td>03:F01 COM +010.00kH</td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>Frequency output, 40 kHz</td>
<td>Controlled</td>
<td>03:F02 COM +0040.0kH</td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>Frequency output, 100 kHz</td>
<td>Controlled</td>
<td>03:F02 COM +00100.kH</td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>Pulse output, 99 ms</td>
<td>Controlled</td>
<td>03:P00 COM +99.999ms</td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>Pulse output, 99 s</td>
<td>Controlled</td>
<td>03:P01 COM +99.999 s</td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>Continuity voltage</td>
<td>Controlled</td>
<td>04:IN0 +01000.mV DS:+0500.mV</td>
<td></td>
</tr>
</tbody>
</table>

**ALMEMO® KA7531**
11. ELECTROMAGNETIC COMPATIBILITY

Ahlborn Mess- und Regelungstechnik GmbH declares herewith that measuring instrument ALMEMO® KA 7531 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 following standards have been applied in evaluating the product.

<table>
<thead>
<tr>
<th>Safety / security:</th>
<th>EN 61010-1:2001</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMC:</td>
<td>EN 61326-1: 2013</td>
</tr>
</tbody>
</table>

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

12.1 Technical data

**Pt100**
- 5 resistors in 4-conductor circuitry, electr. isolated
- **Temperature values**: 0, 50, 100, 200, 300 °C
- **Accuracy**: ±0.1 °C
- **Temperature drift**: 0.01 °C/K

**Analog outputs**
- Electr. isolated
- **Resolution**: 15 bits
- **Load**:
  - -4.0 to +10.000 V: >100 kΩ
  - -10.0 to +60 000 mV: >1 MΩ
  - 0.0 to +20 000 mA: <500 Ω
- **Accuracy**:
  - ±0.05% of final value
  - Temp. drift: 20 ppm / K
- **Time constant**: 100 µs

**Thermocouple ranges**
- Types K, N, T, J (ITS90)
  - **Resolution**: 0.1 K
- Types S, R, B (ITS90)
  - **Resolution**: 1 K
- **Accuracy**:
  - ±0.05% of final value
- **Temp. range for cold junction compensation**: -30 to +100 °C

**Frequency ranges**
- 1 to 4000 Hz; 0.01 to 10.00 kHz; 0.1 to 40.0 kHz; 1 to 100 kHz
- **Accuracy**:
  - as per resolution

**Pulse ranges**
- **Period duration**: 2 µs to 99.999 ms
- **Pulse duration**: 1 µs to 99.998 ms
- **2 ms to 99.999 s**: 1 ms to 99.998 s
- **Accuracy**: 0.01%

**Continuity check**
- Current appr. 1 mA
- Threshold 0 to 1000 mV

**Power supply**
- 10 to 12 VDC
- **Current consumption**:
  - Standard: approx. 30 mA
  - From battery 4.5 V: With voltage / current output approx. 80mA + 4x $I_{OUT}$
  - Illumination approx. 40 mA extra

**Standard equipment**
- Graphics display 126 x 64 (55x30 mm) 7 silicone keys
- **Housing**:
  - (LxWxH) 127x83x42mm, ABS
  - Weight approx. 260g

**Suitable conditions**
- **Operating temperature**: -10 to +50 °C
- **Storage temperature**: -20 to +60 °C
- **Ambient relative humidity**: 10 to 90 % RH (non-condensing)

12.2 Product overview

**ALMEMO®-Simulator**
- Pt100, 7 thermocouples
- -10 to +60 mV, -3 to +10 V, 0 to 20 mA, 0 to 500 kHz
- Continuity check, graphics display, keypad, ALMEMO® clamp connector,
- ALMEMO® test cable, test probes
- Option I Interface for control via PC
- **Order No.**
  - KA 7531
  - OA 7531-I

**Accessories**
- ALMEMO® test cable with test probes
- Mains adapter with ALMEMO® connector, 12 V, 0.2 A
- ALMEMO® supply connector
- ALMEMO® data cable, V24 interface, el. isol., max. 115.2 kilobaud
- ALMEMO® data cable, USB interface, 9 V, 200 mA
- ALMEMO® data supply cable with RS422 interface
- **Order No.**
  - ZA 1000-TK
  - ZA 1312-NA1
  - ZA 1000-FSV
  - ZA 1909-DK5
  - ZA 1919-DKU
  - ZA 5099-FSV
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