# Operating Instructions

# for

# Digital Indicating Unit

### Thermocouple Type K, B, S, N, E, T, R, L, J

## Model: DAG-M4T…, 96 x 48 mm

We don’t accept warranty and liability claims neither upon this publication nor in case of improper treatment of the described products.

The document may contain technical inaccuracies and typographical errors. The content will be revised on a regular basis. These changes will be implemented in later versions. The described products can be improved and changed at any time without prior notice.


# 1. Contents

**Manufactured and sold by:**

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# 2. Note

Please read these operating instructions before unpacking and putting the unit into operation. Follow the instructions precisely as described herein.
The instruction manuals on our website www.kobold.com are always for currently manufactured version of our products. Due to technical changes, the instruction manuals available online may not always correspond to the product version you have purchased. If you need an instruction manual that corresponds to the purchased product version, you can request it from us free of charge by email (info.de@kobold.com) in PDF format, specifying the relevant invoice number and serial number. If you wish, the operating instructions can also be sent to you by post in paper form against an applicable postage fee.

Operating instructions, data sheet, approvals and further information via the QR code on the device or via www.kobold.com

The devices are only to be used, maintained and serviced by persons familiar with these operating instructions and in accordance with local regulations applying to Health & Safety and prevention of accidents.

When used in machines, the measuring unit should be used only when the machines fulfil the EC machinery directive.

# 3. Instrument Inspection

Instruments are inspected before shipping and sent out in perfect condition.
Should damage to a device be visible, we recommend a thorough inspection of the delivery packaging. In case of damage, please inform your parcel service / forwarding agent immediately, since they are responsible for damages during transit.

**Scope of delivery:**
The standard delivery includes:

- Digital Indicating Unit model: “DAG-M4T”

# 4. Regulation Use

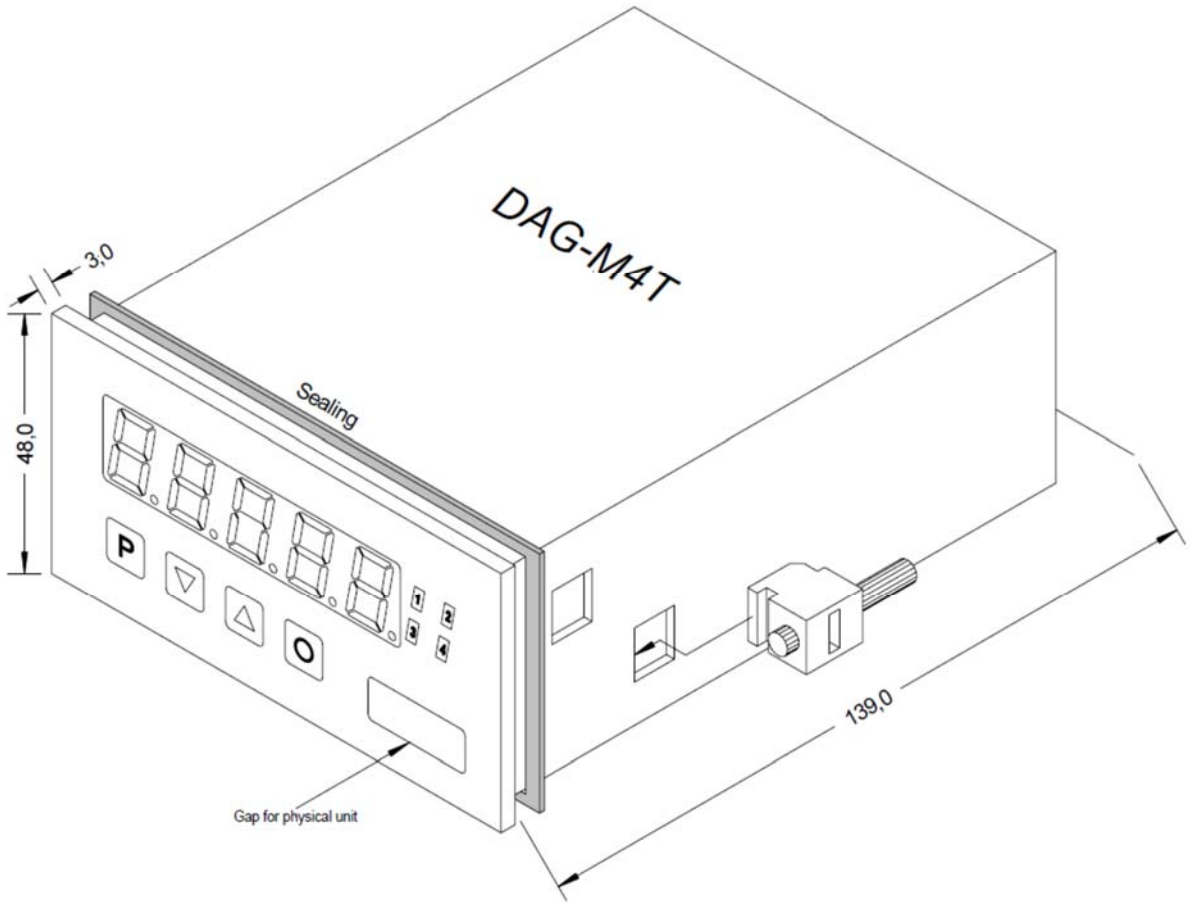
Any use of the device, which exceeds the manufacturer’s specification, may invalidate its warranty. Therefore, any resulting damage is not the responsibility of the manufacturer. The user assumes all risk for such usage.

# 5. Brief description

The panel meter instrument **DAG-M4T** is a 5-digit device for different thermocouples and a visual threshold value monitoring via the display. The configuration happens via four keys at the front. The integrated programming interlock prevents unrequested changes of parameters and can be unlocked again with an individual code. Optional the following functions are available: two analog outputs and interfaces for further evaluating in the unit. With help of the galvanic insulated setpoints (optional), free adjustable limit values can be controlled and reported to a superior master display. The electrical connection is done via plug-in terminals on the back side. Selectable functions like e.g. the recall of the min/max-value, a direct threshold value regulation during operation mode, complete the modern device concept.

# 6. Assembly

Please read the following Safety advices on page 30 before installation and keep this user manual for future reference.



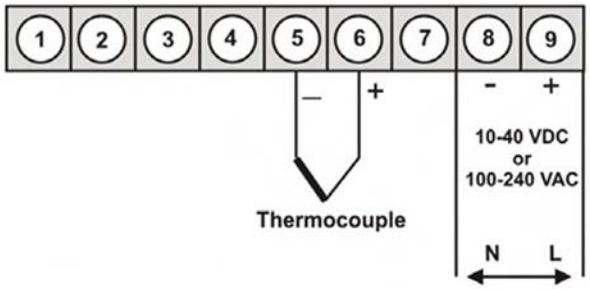

1. After removing the fixing elements, insert the device.
2. Check the seal to make sure it fits securely.
3. Click the fixing elements back into place and tighten the clamping screws by hand. Then use a screwdriver to tighten them another half a turn.

**CAUTION! Tor torque should not exceed 0.1 Nm!**

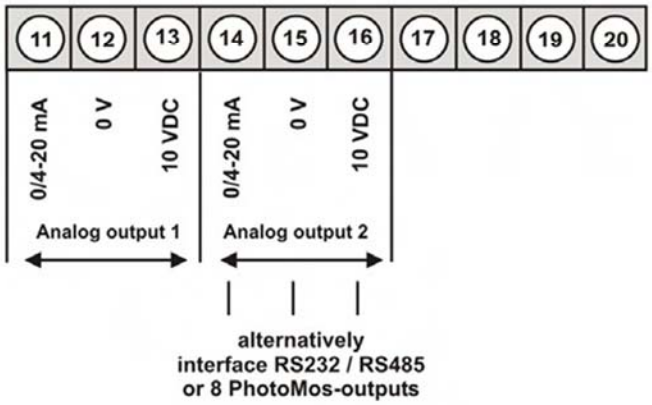
**The dimension symbols can be exchanged before installation via a channel on the side!**

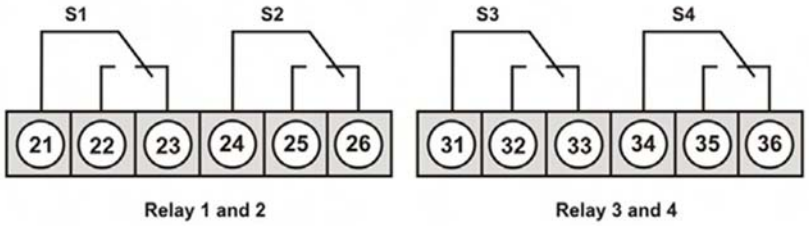
# 7. Electrical Connection

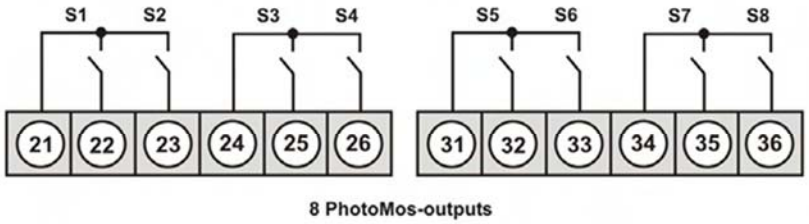
**Type DAG-M4T7** supply 10-40 VDC galv. Isolated, 18-30 VAC
**Type DAG-M4T8** supply 100-240 VAC, DC ±10%



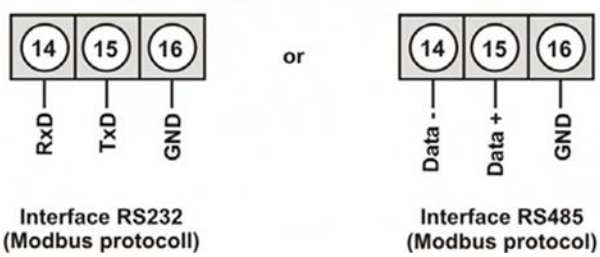

Options:




Alternatively to analog output 2



# 8. Function and operation description

**Operation**
The operation is divided into three different levels.

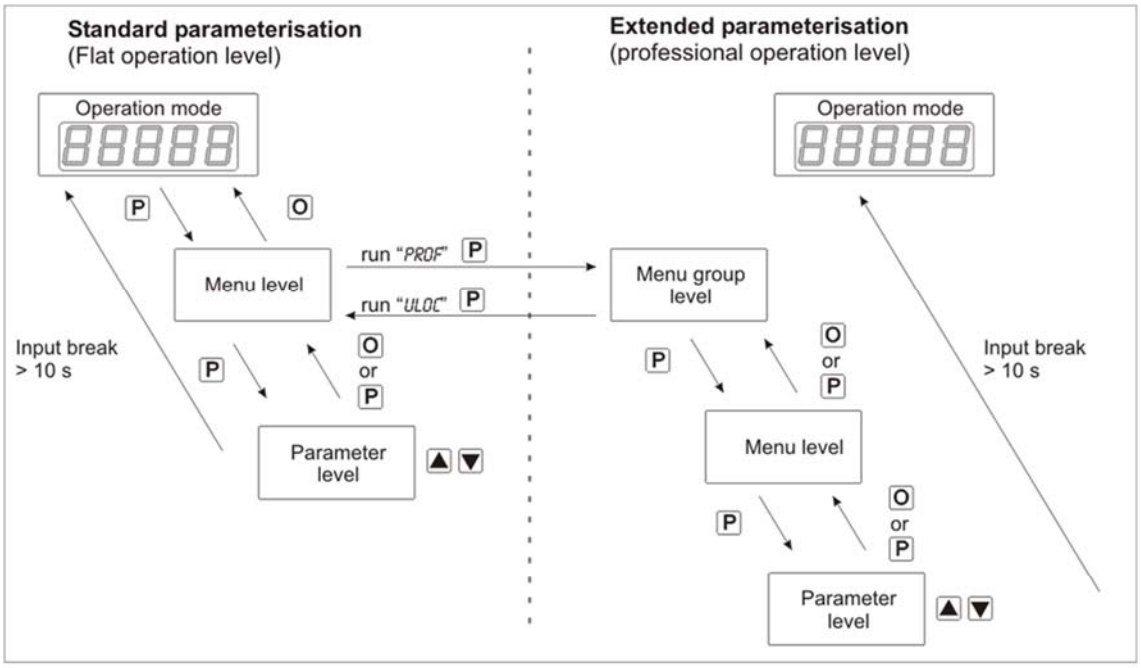
**Menu level** (delivery status)
This level is for the standard settings of the device. Only menu items which are sufficent to set the device into operation are displayed. To get into the professional level, run through the menu level and parameterize **"prof"** under menu item **RUN**.

**Menu group level** (complete function volume)
Suited for complex applications as e.g. linkage of alarms, setpoint treatment, totalizer function etc. In this level function groups which allow an extended parameterization of the standard settings are availabe. To leave the menu group level, run through this level and parameterize „**uloc**„ under menu item **RUN**.

**Parameterization level**
Parameter deposited in the menu item can here be parameterized. Functions, that can be changed or adjusted, are always signalized by a flashing of the display. Settings that are made in the parameterization level are confirmed with **[P]** and thus saved. By pressing the „**[O]-key**" it leads to a break-off of the value input and to a change into the menu level. All adjustments are saved automatically by the device and changes into operating mode, if no further key operation is done within the next 10 seconds.

| Level | Key | Description |
|---|---|---|
| Menu-level | P | Change to parameterisation level and deposited values. |
| | ▲ ▼ | Keys for up and down navigation in the menu level. |
| | O | Change into operation mode. |
| Parameterisation-level | P | To confirm the changes made at the parameterization level. |
| | ▲ ▼ | Adjustment of the value / the setting. |
| | O | Change into menu level or break-off in value input. |
| Menu-group-level | P | Change to menu level. |
| | ▲ ▼ | Keys for up and down navigation in the menu group level. |
| | O | Change into operation mode or back into menu level. |

### Function chart




**Underline:**

- P **Takeover**
- O **Stop**
- ▲ **Value selection (+)**
- ▼ **Value selection (-)**

# 9. Setting up the device

## 9.1 Switching on

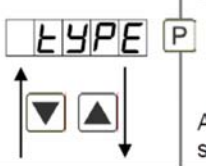
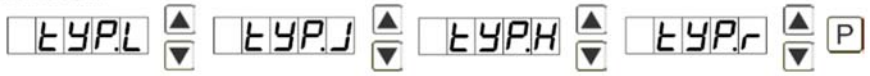
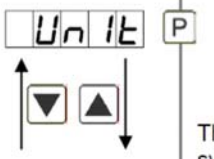
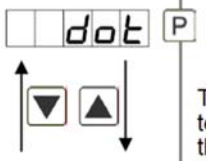
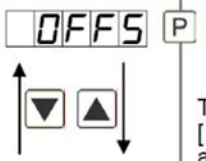
Once the installation is complete, you can start the device by applying the voltage supply. Before, check once again that all electrical connections are correct.

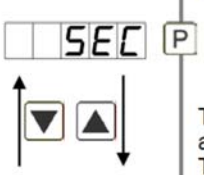
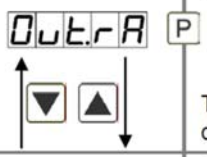
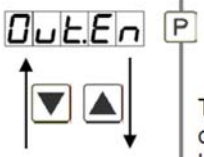
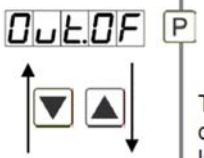
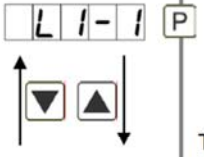
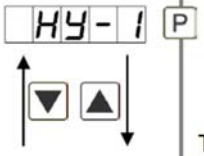
### Starting sequence

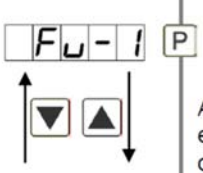
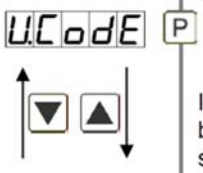
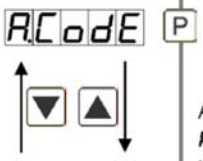
For 1 second during the switching-on process, the segment test (**8 8 8 8 8**) is displayed followed by an indication of the software type and, after that, also for 1 second the software version. After the starting sequence, the device switches to operation/display mode.

### 9.2 **Standard parameterization** (Flat operation level)

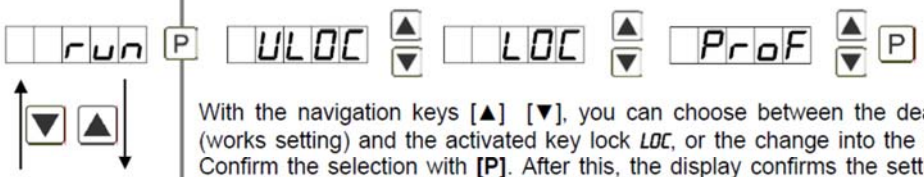
To parameterize the display, press the **[P]** key in operating mode for 1 second. The display then changes to the menu level with the first menu item **TYPE**.

| Menu level | Parameterisation level |
|---|---|
|  | **Selection of the input signal,** *TYPE:*<br>Default: *TYP.L*<br><br>  <br>Available are 9 types of thermocouple as input options (L, J, K, B, S, N, E, T, R). Confirm the selection with **[P]** and the display switches back to menu level. |
|  | **Type of temperature metering** *UNIT:*<br>Default: *°C*<br><br>  <br>The temperature can be displayed in °C or in °F. Confirm the selection with **[P]** and the display switches back to menu level. |
|  | **Setting the decimal point,** *DOT:*<br>Default: *0.0*<br><br>  <br>The decimal point on the display and the physical unit can be changed with [▲] [▼]. If e.g. temperature measurement in °C is selected, then you can choose between 0°C and 0.0°C in the parameterisation level. Confirm with **[P]**, the display then switches back to the menu level again. |
|  | **Impedance matching,** *DOT:*<br>Default: *0.0*<br><br>  <br>The value for the sensor calibration is selectable from the smallest to the highest digit with [▲][▼] and confirmed with **[P]**. After the last digit the display switches back to the menu level again. The value calibration for a temperature measurement in °C can be adjusted between -20.0 and +20.0 and in °F between -36.0 and +36.0. If the type of the measurement is changed later, then the value is rounded. |

| Menu level | Parameterisation level |
|---|---|
|  | **Setting up the display time, SEC:**<br>Default: *1.0*<br>  <br>The display time is set with [▲] [▼]. The display moves up in increments of 0.1 sec up to 1 sec and in increments of 1.0 sec up to 10.0 sec. Confirm the selection by pressing the **[P]** button. The display then switches back to the menu level again. |
|  | **Selection of analog output, OUT.RA:**<br>Default: *4-20*<br>  <br>Three output signals are available: 0-10 VDC, 0-20 mA and 4-20 mA, with this function, the demanded signal is selected. |
|  | **Setting up the final value of the analog output, OUT.EN:**<br>Default: *850.0*<br><br>The final value is adjusted from the smallest digit to the highest digit with **[▲] [▼]** and digit by digit confirmed with **[P]**. A minus sign can only be parameterised on the highest digit. After the last digit, the device changes back into menu level. |
|  | **Setting up the initial value of the analog output, OUT.OF:**<br>Default: *-200.0*<br>  <br>The final value is adjusted from the smallest digit to the highest digit with **[▲] [▼]** and digit by digit confirmed with **[P]**. A minus sign can only be parameterised on the highest digit. After the last digit, the device changes back into menu level. |
|  | **Threshold values / Limits, LI-1:**<br>Default: *200.0*<br>  <br>This value defines the threshold, that activates/deactivates an alarm. |
|  | **Hysteresis for limit values, HY-1:**<br>Default: *0.0*<br>  <br>The delayed reaction of the alarm is the difference to the threshold value, which is defined by the hysteresis. |

| Menu level | Parameterisation level |
|---|---|
|  | **Function for threshold value undercut /exceedance,** *FU-1*:<br>Default: *HIGH*<br>  <br>A limit value undercut is selected with *LOUU* (for LOW = lower limit value), a limit value exceedance with *HIGH* (for HIGH = higher limit value). If e.g. limit value 1 is on a threshold level of 100 and allocated with function *HIGH*, an alarm is activated by reaching of the threshold level. If the threshold value was allocated to *LOW*, an alarm will be activated by undercutting the threshold value, as long as the hysteresis is zero. |
| | **The same applies to** *LI-2* **!** |
|  | **User code (4-digit number-combination, free available),** *U.CODE*:<br>Default: *0000*<br>  <br>If this code was set (>0000), all parameters are locked for the user, if *LOC* has been selected before under menu item *RUN*. By pressing **[P]** for 3 seconds in operation mode, the display shows *CODE*. The *U.CODE* needs to be entered to get to the reduced number of parameter sets. The code has to be entered befor each parametrisation, until the *A.CODE* (Master code) unlocks all parameters again. |
|  | **Master code (4-digit number-combination, free available),** *A.CODE*:<br>Default: *1234*<br>  <br>All parameters can be unlocked with this code, after *LOC* has been activated under menu item *RUN*. By pressing **[P]** for 3 seconds in operation mode, the display shows *CODE* and enables the user to reach all parametes by entering the *A.CODE*. Under *RUN* the parameteisation can be activated permanently by selecting *ULOC* or *PROF*, thus at an anew pushing of **[P]** in operation mode, the code needs not to be entered again. |

## 9.3 Programming interlock RUN

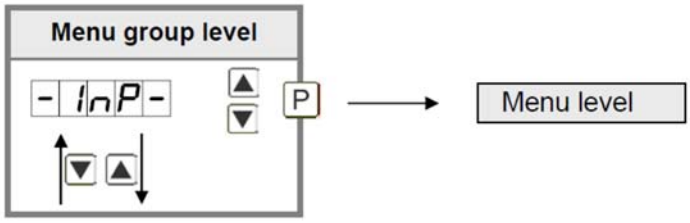



**Activation / deactivation of the programming lock or completion of the standard parameterisation with change into menu group level (complete function range), *RUN*:**
Default: *ULOC*

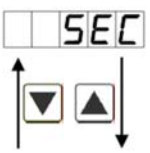
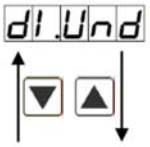
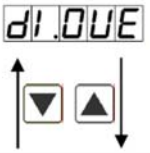
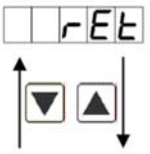
With the navigation keys [▲] [▼], you can choose between the deactivated key lock *ULOC* (works setting) and the activated key lock *LOC*, or the change into the menu group level *PROF*. Confirm the selection with **[P]**. After this, the display confirms the settings with "- - - - -", and automatically switches to operating mode. If *LOC* was selected, the keyboard is locked. To get back into the menu level, press **[P]** for 3 seconds in operating mode. Now enter the *CODE* (works setting *1 2 3 4*) that appears using [▲] [▼] plus **[P]** to unlock the keyboard. *FAIL* appears if the input is wrong. To parameterise further functions *PROF* needs to be set. The device confirms this setting with „- - - - -„ and changes automatically in operation mode. By pressing **[P]** for approx. 3 seconds in operation mode, the first menu group *INP* is shown in the display and thus confirms the change into the extended parameterisation. It stays activated as long as *ULOC* or *LOC* is entered in menu group *RUN*.

## 9.4 **Extended parameterization** (professional operation level)

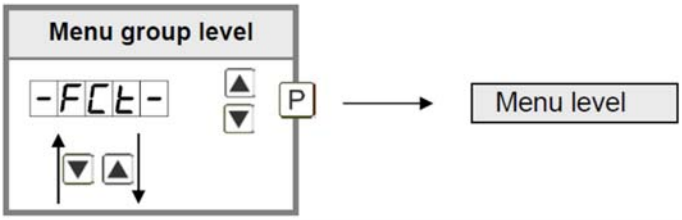
### 9.4.1 Signal input parameters



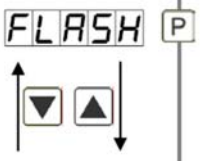
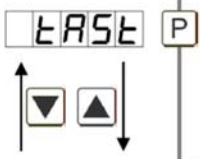
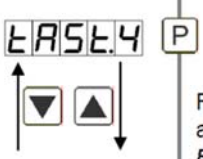
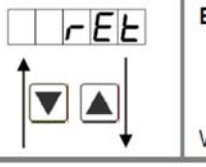

| Menu level | Parameterisation level |
|---|---|
| tYPE P | **Selection of the input signal,** *TYPE:*<br>Default: *TYP.L*<br>tYP.L tYP.J tYP.H tYP.r P<br>Available are 9 types of thermocouple as input options (L, J, K, B, S, N, E, T, R). Confirm the selection with **[P]** and the display switches back to menu level. |
| Unit P | **Type of temperature metering** *UNIT:*<br>Default: *°C*<br>°C °F P<br>The temperature can be displayed in °C or in °F. Confirm the selection with **[P]** and the display switches back to menu level. |
| dot P | **Setting the decimal point,** *DOT:*<br>Default: *0.0*<br>0 0.0 0C 0.0C P<br>The decimal point on the display and the physical unit can be changed with [▲] [▼]. If e.g. temperature measurement in °C is selected, then you can choose between 0°C and 0.0°C in the parameterisation level. Confirm with **[P]**, the display then switches back to the menu level again. |
| OFFS P | **Impedance matching,** *DOT:*<br>Default: *0.0*<br>8 P 8 P 8 P 8 P 8 P<br>The value for the sensor calibration is selectable from the smallest to the highest digit with [▲][▼] and confirmed with **[P]**. After the last digit the display switches back to the menu level again. The value calibration for a temperature measurement in °C can be adjusted between -20.0 and +20.0 and in °F between -36.0 and +36.0. If the type of the measurement is changed later, then the value is rounded. |

| Menu level | Parameterisation level |
|---|---|
|  | **Setting up the display time,** *SEC*:<br>Default: *1.0*<br>  <br>The display time is set with [▲] [▼]. The display moves up in increments of 0.1 sec up to 1 sec and in increments of 1.0 sec up to 10.0 sec. Confirm the selection by pressing the **[P]** button. The display then switches back to the menu level again. |
|  | **Device undercut,** *DI.UND*:<br>Default: *-19999*<br>  <br>With this function the device undercut (_ _ _ _ _) can be defined on a definite value. Exception is input type **4-20 mA**, it already shows undercut at a signal <1 mA, so a sensor failure is marked. |
|  | **Display overflow,** *DI.OUE*:<br>Default: *99999*<br>  <br>With this function the display overflow (-----) can be defined on a definite value. |
|  | Input variable of process value, *SIG.IN*:<br>**Default:** *A.MEAS*<br>  <br>With this parameter, the device can be controlled via the analog input signals *A.MEAS* = 0-20 mA, 4-20 mA or 0-10 VDC or via the digital signals of the interface *M.BUS* = RS232/RS485 (Modbus protocol). With **[P]** the selection is confirmed and the device changes into menu level. |
|  | **Back to menu group level,** *RET*:<br><br>With **[P]** the selection is confirmed and the device changes into menu group level „-*INP*-". |

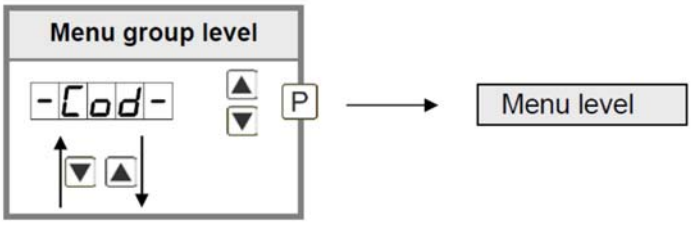
### 9.4.2 General device parameters




| Menu level | Parameterisation level |
|---|---|
| dI.SEC P | **Display time,** *DISEC:*<br>Default: *01.0*<br>001 009 then 01.0 10.0 P<br>The display is set up with [▲] [▼]. Thereby it switches up to 1 second in increments of 0.1 seconds and up to 10.0 seconds in increments of 1.0. With **[P]** the selection is confirmed and the device changes into menu level. |
| round P | **Rounding of display values,** *ROUND:*<br>Default: *00001*<br>00001 00005 00010 00050 P<br>This function is for instable display values, where the display value is changed in increments of 1, 5, 10 or 50. This does not affect the resolution of the optional outputs. With **[P]** the selection is confirmed and the device changes into menu level. |
| dISPL P | **Display,** *DISPL:*<br>Default: *ACTUR*<br>ACtuR MInUR MAXUR P<br>With this function the current measuring value or the min-/max value can be allocated to the display. With **[P]** the selection is confirmed and the device changes into menu level. |
| LIGHt P | **Brightness control,** *LIGHT:*<br>Default: *15*<br>00 15 P<br>The brightness of the display can be adjusted in 16 levels from 00 = very dark to 15 = very bright via this parameter or alternatively via the navigation keys from the outside. During the start of the device the level that is deposited under this parameter will always be used, even though the brightness has been changed via the navigation keys in the meantime. |

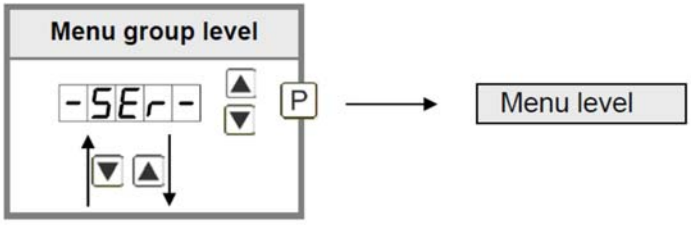
| Menu level | Parameterisation level |
|---|---|
|  | **Display flashing,** *FLASH:*<br>Default: *NO*<br><br>A display flashing can be added as additional alarm function either to single or to a combination of off-limit condition. With *NO*, no flashing is allocated. |
|  | **Assignment (deposit) of key functions,** *TAST:*<br>Default: *NO*<br><br>For the operation mode, special functions can be deposited on the navigation keys [▲] [▼], in particular this function is made for devices in housing size 48x24mm which do not have a 4th key (**[O]** key). If the min-/max-memory is activated with *EHTR*, all measured min/max-values are safed during operation and can be recalled via the navigation keys. The values get lost by re-start of the device. If the threshold value correction *LI.12* or *LI.34* is choosen, the values of the threshold can be changed during operation without disturbing the operating procedure. Under *LIGHT* the brightness can be changed during operation. If *NO* is selected, the navigation keys are without any function in the operation mode. |
|  | **Special function [O]-key,** *TAST.4:*<br>Default: *NO*<br>  <br>For the operation mode, special functions can be deposited on the **[O]**-Taste. This function is activated by pressing the key. *SET.OF* adds a defined value to the currently displayed value. *EHT.RE* deletes the min/max-memory. *ACTUA* shows the measuring value for approx. 7 seconds, after this the device switches back onto the parameterised display value. If *NO* is selected, the **[O]**-key is without any function in the operation mode. |
|  | **Back to menu group level,** *RET:*<br><br>With **[P]** the selection is confirmed and the device changes into menu group level „- *FCT* -". |

### 9.4.3 Safety parameters



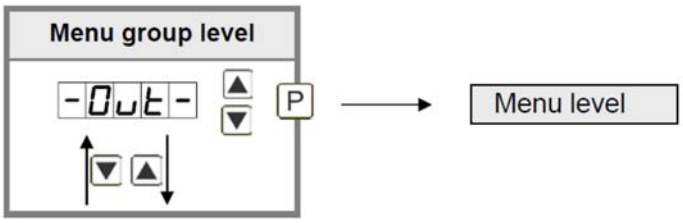

| Menu level | Parameterisation level |
|---|---|
| U.CodE P | **User code** *U.CODE*:<br>Default: *0000*<br>0 P 0 P 0 P 0 ▲▼ P<br>Via this code reduced sets of parameters can be set free. A change of the *U.CODE* can be done via the correct input of the *A.CODE* (master code). |
| A.CodE P | **Master code,** *A.CODE*:<br>Default: *1234*<br>1 P 2 P 3 P 4 ▲▼ P<br>By entering *A.CODE* the device will be unlocked and all parameters are released. |
| OUt.LE P | **Release/lock analog output parameter,** *OUT.LE*:<br>Default: *ALL*<br>no ▲▼ En-OF ▲▼ OUt.EO ▲▼ ALL ▲▼ P<br>Analog output parameter can be locked or released for the user:<br>- At *EN-OF* the initial or final value can be changed in operation mode.<br>- At *OUT.EO* the output signal can be changed from e.g. 0-20 mA to 4-20 mA or 0-10 VDC.<br>- At *ALL* analog output parameters are released.<br>- At *NO* all analog output parameters are locked. |
| AL.LEU P | **Release/lock alarm parameters,** *AL.LEU*:<br>Default: *ALL*<br>no ▲▼ LIMIT ▲▼ ALrM.L ▲▼ ALL ▲▼ P<br>This parameter describes the user relase/user lock of the alarm.<br>- *LIMIT*, here only the range of value of the threshold values 1-4 can be changed.<br>- *ALRM.L*, here the range of value and the alarm trigger can be changed.<br>- *ALL*, all alarm parameters are released.<br>- *NO*, all alarm parameters are locked. |
| rEt | **Back to menu group level,** *RET*:<br>With **[P]** the selection is confirmed and the device changes into menu group level „- *COD* -". |

### 9.4.4 Serial parameters

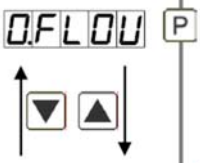
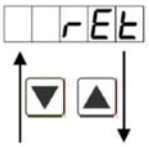



| Menu level | Parameterisation level |
|---|---|
| Addr | **Device address,** *ADDR*:<br>Default: *001*<br>Addr P 001 250 P<br>The device address is adjusted from the smallest to the largest digit with the navigation keys [▲] [▼] and confirmed digit per digit with **[P]**. A device address up to max. 250 is available.<br>Interface data: Baudrate 9600 bit/s, 8 databyte, 1 stopbit, no parity (8n1). |
| b.mode | **ModBus operating modes,** *B.MODE*:<br>Default: *ASCII*<br>b.mode P ASCII rtu P<br>There are two different types of operating modes: *ASCII* and *RTU*. Modbus transfers no binary cycle, but the **ASCII**-Code. Thus it is directly readable, however the data throughput is smaller in comparison to the **RTU**. Modbus **RTU** (**RTU** = **R**emote **T**erminal **U**nit) transfers the data in binary-coded. This leads to a good data troughput, even though the data cannot be evaluated directly, as they first need to be transfered into a readable format. |
| ti.out | **Timeout,** *TIOUT*:<br>Default: *000*<br>ti.out P 000 100 P<br>The monitoring of the data transfer is parameterised in seconds up to max. 100 seconds; there is no monitoring with an input of *000*. The timeout is adjusted from the smallest to the largest digit with the navigation keys [▲] [▼] and confirmed digit per digit with **[P]**. After the last digit the device changes back into menu level. |
| ret | **Back to menu group level,** *RET*:<br>With **[P]** the selection is confirmed and the device changes into menu group level „- *SER* -". |

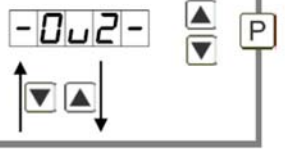
### 9.4.5 Analogue output parameters for analogue output 1



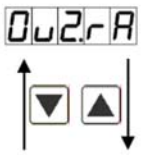
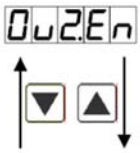
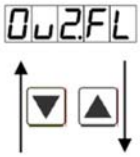
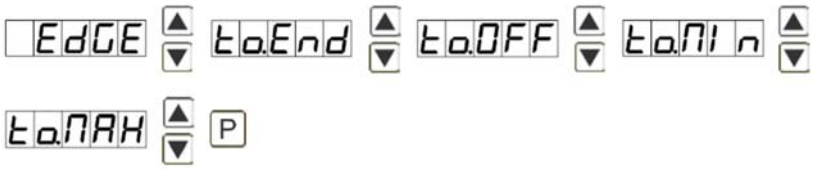
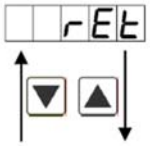

| Menu level | Parameterisation level |
|---|---|
| OUtPt P | **Selection reference of analog output,** *OUTPT:*<br>Default: *ACTUA*<br>ACtuA NI nUA MAXUA P<br>The analog output signal can refer to different functions, in detail these are the current measurand, the min-value or the max-value. With **[P]** the selection is confirmed and the device changes into menu level. |
| Out.rA P | **Selection analog output,** *OUT.RA:*<br>Default: *4-20*<br>0-10 0-20 4-20 P<br>Three output signals are available 0-10 VDC, 0-20 mA and 4-20 mA. Select the desired signal with this function. |
| Out.En P | **Setting the final value of the analog output,** *OUT.EN:*<br>Default: *850.0*<br>8 P 8 P 8 P 8 P 8 P<br>The final value is adjusted from the smallest to the highest digit with [▲] [▼] and confirmed digit per digit with **[P]**. A minus sign can only be parameterised on the highest digit. After the last digit the device changes back into menu level. |
| Out.OF P | **Setting the initial value of the analog output,** *OUT.OF:*<br>Default: *-200.0*<br>8 P 8 P 8 P 8 P 8 P<br>The initial value is adjusted from the smallest to the highest digit with [▲] [▼] and confirmed digit per digit with **[P]**. A minus sign can only be parameterised on the highest digit. After the last digit the device changes back into menu level. |

| Menu level | Parameterisation level |
|---|---|
|  | **Overflow behaviour,** *O.FLOU:*<br>Default: *EDGE*<br><br>To recognise and evaluate faulty signals, e.g. by a controller, the overflow behaviour of the analog output can be defined. As overflow can be seen either *EDGE*, that means the analog output runs on the set limits e.g. 4 and 20 mA, or *TO.OFF* (input value smaller than initial value, analog output switches on e.g. 4 mA), *TO.END* (higher than final value, analog output switches on e.g. 20 mA). If *TO.MIN* or *TO.MAX* is set, the analog output switches on the smallest or highest possible binary value. This means that values of e.g. 0 mA, 0 VDC or values higher than 20 mA or 10 VDC can be reached. With **[P]** the selection is confirmed and the device changes into menu level. |
|  | **Back to menu group level,** *RET*:<br><br>With **[P]** the selection is confirmed and the device changes into menu group level „- *OUT* -". |

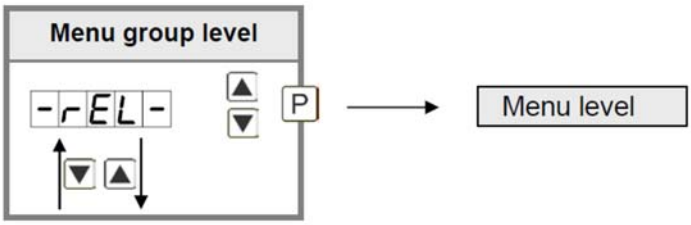
## Analogue output parameters for analogue output 2

| Menu group level |
|---|
|  Menu level |

| Menu level | Parameterisation level |
|---|---|
|  | **Selection reference of analog output,** *OU2PT:*<br>Default: *ACTUR*<br>  <br>The analog output signal can refer to different functions, in detail these are the current measurand, the min-value or the max-value. If *HOLD* is selected, the signal of the analog output will be kept. It can be continued processing after a deactivation of *HOLD*. With **[P]** the selection is confirmed and the device changes into menu level. |

| Menu level | Parameterisation level |
|---|---|
|  | **Selection analog output,** *OU2.RA:*<br>Default: *4-20*<br>  <br>3 output signals are available 0-10 VDC, 0-20 mA and 4-20 mA. Select the desired signal with this function. |
|  | **Setting the final value of the analog output,** *OU2.EN:*<br>Default: *850.0*<br>  <br>The final value is adjusted from the smallest to the highest digit with [▲] [▼] and confirmed digit per digit with **[P]**. A minus sign can only be parameterised on the highest digit. After the last digit the device changes back into menu level. |
|  | **Setting the initial value of the analog output,** *OU2.OF:*<br>Default: *-200.0*<br>  <br>The initial value is adjusted from the smallest to the highest digit with [▲] [▼] and confirmed digit per digit with **[P]**. A minus sign can only be parameterised on the highest digit. After the last digit the device changes back into menu level. |
|  | **Overflow behaviour,** *OU2.FL:*<br>Default: *EDGE*<br>  <br>To recognise and evaluate faulty signals, e.g. by a controller, the overflow behaviour of the analog output can be defined. As overflow can be seen either *EDGE*, that means the analog output runs on the set limits e.g. 4 and 20 mA, or *TO.OFF* (input value smaller than initial value, analog output switches on e.g. 4 mA), *TO.END* (higher than final value, analog output switches on e.g. 20 mA). If *TO.MIN* or *TO.MAX* is set, the analog output switches on the smallest or highest possible binary value. This means that values of e.g. 0 mA, 0 VDC or values higher than 20 mA or 10 VDC can be reached. With **[P]** the selection is confirmed and the device changes into menu level. |
|  | **Back to menu group level,** *RET*:<br>With **[P]** the selection is confirmed and the device changes into menu group level „- *OU2* -". |

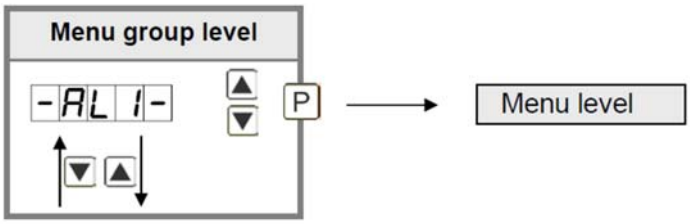
### 9.4.6 Relay functions



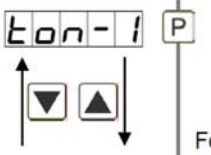
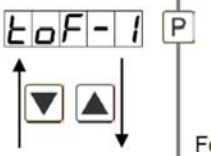
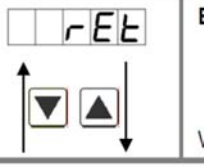

| Menu level | Parameterisation level |
|---|---|
| rEL-1 P | **Alarm relay 1,** *REL-1:* **The same applies for relays 2-4**<br>Default: *AL-1*<br>AL-1 .... AL-4 AL-n1 .... AL-n4<br>LoGIC OFF On P<br>Each setpoint (optional) can be linked up via 4 alarms (by default). This can either be inserted at activated alarms *AL-1/4* or de-activated alarms *ALM1/4*. If *LOGIC* is selected, logical links are available in the menu level *LOG-1* and *COM-1*. One can only get to these two menu levels via *LOGIC*, at all other selected functions, these two parameters are overleaped. Via *ON/OFF* the setpoints can be activated/de-activated, in this case the output and the setpoint display are set/not set on the front of the device. With **[P]** the selection is confirmed and the device changes into menu level. |
| LoG-1 P | **Logic relay 1,** *LOG-1*<br>Default: *OR*<br>or nor And nAnd P<br>Here, the switching behaviour of the relay is defined via a logic link, the following schema describes these functions with inclusion of *AL-1* and *AL-2*. This parameter is only possible if *LOGIC* was selected under *REL-1*. |
| | or — $A1 \vee A2$ — As soon as a selected alarm is activated, the relay operates. Equates to operating current principle. |
| | nor — $\overline{A1 \vee A2} = \overline{A1} \wedge \overline{A2}$ — The relay operates only, if no selected alarm is active. Equates to quiescent current principle. |
| | And — $A1 \wedge a2$ — The relay operates only, if all selected alarms are active. |
| | nAnd — $\overline{A1 \wedge A2} = \overline{A1} \vee \overline{A2}$ — As soon as a selected alarm is not activated, the relay operates. |
| | With **[P]** the selection is confirmed and the device changes into menu level. |
| CoN-1 P | **Alarms for relay 1,** *COM-1:*<br>Default: *A.1*<br>A.1 A.2 .... A.1234 P<br>The allocation of the alarms to relay 1 happens via this parameter, one alarm or a group of alarms can be chosen. With **[P]** the selection is confirmed and the device changes into menu level. |

| Menu level | Parameterisation level |
|---|---|
| rEL-5 P AL-5 .... AL-8 AL-nS .... AL-nB<br>LoGIC OFF On P | **Alarm relay 5,** *REL-5:* **The same applies for relays 6-8**<br>Default: *AL-5*<br>Each setpoint (optional) can be linked up via 4 alarms (by default). This can either be inserted at activated alarms *AL6/8* or de-activated alarms *ALN6/8*. If *LOGIC* is selected, logical links are available in the menu level *LOG-1* and *COM-1*. One can only get to these two menu levels via *LOGIC*, at all other selected functions, these two parameters are overleaped. Via *ON/OFF* the setpoints can be activated/de-activated, in this case the output and the setpoint display are set/not set on the front of the device. With **[P]** the selection is confirmed and the device changes into menu level. |
| LoG-5 P or nor And nAnd P | **Logic relay 5,** *LOG-5:*<br>Default: *OR*<br>Here, the switching behaviour of the relay is defined via a logic link, the following schema describes these functions with inclusion of *AL-1* and *AL-2*: |
| or | $A1 \vee A2$ | As soon as a selected alarm is activated, the relay operates. Equates to operating current principle. |
| nor | $\overline{A1 \vee A2} = \overline{A1} \wedge \overline{A2}$ | The relay operates only, if no selected alarm is active. Equates to quiescent current principle. |
| And | $A1 \wedge a2$ | The relay operates only, if all selected alarms are active. |
| nAnd | $\overline{A1 \wedge A2} = \overline{A1} \vee \overline{A2}$ | As soon as a selected alarm is not activated, the relay operates. |
| | With **[P]** the selection is confirmed and the device changes into menu level. |
| CoN-5 P A.1 A.2 .... A.1234 P | **Alarms for relay 5,** *COM-5:*<br>Default: *A.5*<br>The allocation of the alarms to relay 5 happens via this parameter, one alarm or a group of alarms can be chosen. With **[P]** the selection is confirmed and the device changes into menu level. |
| rEt | **Back to menu group level,** *RET:*<br>With **[P]** the selection is confirmed and the device changes into menu group level „- *REL* -". |

### 9.4.7 Alarm parameters

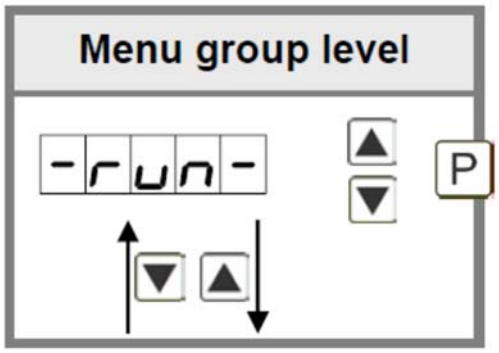



| Menu level | Parameterisation level |
|---|---|
| AL rN.1 P | **Dependency alarm1,** *ALRM.1:*<br>Default: *ACTUA*<br>ACtUA NI nUA MAXUA P<br>The dependency of alarm 1 can be related to special functions, in detail these are the current measuring value, the min-value, the max-value. With **[P]** the selection is confirmed and the device changes into menu level.<br>**Example:**<br>By using the maximum value *ALARM.1 = MAX.VA* in combination with a threshold monitoring *FU-1 = HIGH*, an alarm confirmation can be realised. Use the navigationkeys, the fourth key or the digital input for confirmation. |
| L 1- 1 P | **Threshold values / Limit values,** *LI-1:*<br>Default: *200.0*<br>0 P 0 P 0 P 0 P 0 P<br>The limit value defines the threshold, that activates/deactivates an alarm. |
| HY- 1 P | **Hysteresis for threshold values,** *HY-1:*<br>Default: *0.0*<br>0 P 0 P 0 P 0 P 0 P<br>The delayed reaction of the alarm is the difference to the threshold value, which is defined by the hysteresis. |
| Fu- 1 P | **Function for threshold value undercut /exceedance,** *FU-1:*<br>Default: *HIGH*<br>HIGH LoUU P<br>A limit value undercut is selected with *LOUU* (for LOW = lower limit value), a limit value exceedance with *HIGH* (for HIGH = higher limit value). If e.g. limit value 1 is on a threshold level of 100 and allocated with function *HIGH*, an alarm is activated by reaching of the threshold level. If the threshold value was allocated to *LOW*, an alarm will be activated by undercutting the threshold value, as long as the hysteresis is zero. |

| Menu level | Parameterisation level |
|---|---|
|  | **Switching-on delay,** *TON-1:*<br>Default: *000*<br>  <br>For limit value 1 one can preset a delayed switching-on of 0-100 seconds. |
|  | **Switching-off delay,** *TOF-1:*<br>Default: *000*<br>  <br>For limit value 1 one can preset a delayed switching-off of 0-100 seconds. |
|  | **Back to menu group level,** *RET:*<br>With **[P]** the selection is confirmed and the device changes into menu group level „- *AL1* -". |

**The same applies for *AL2* to *AL8*.**

### Programming interlock RUN




Description see page 13, menu level RUN

# 10. Reset to factory settings

To return the unit to a defined basic state, a reset can be carried out to the default values.
The following procedure should be used:

- Switch off the power supply
- Press button **[P]**
- Switch on voltage supply and press **[P]** button until **"- - - - -"** appears in the display

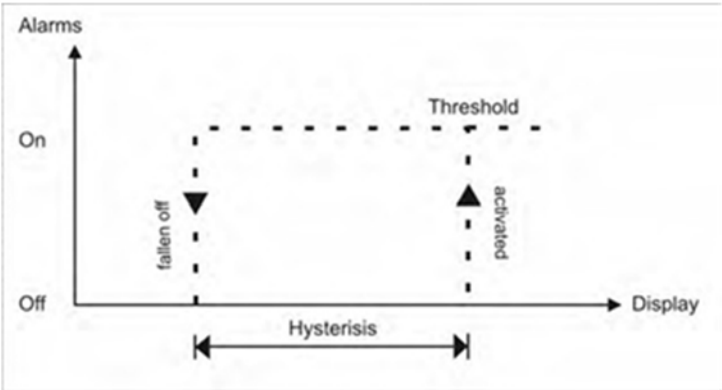
With reset, the default values of the program table are loaded and used for subsequent operation. This puts the device back to the state in which it was supplied.

**Caution!** **All application-related data are lost.**

# 11. Alarms / Relays

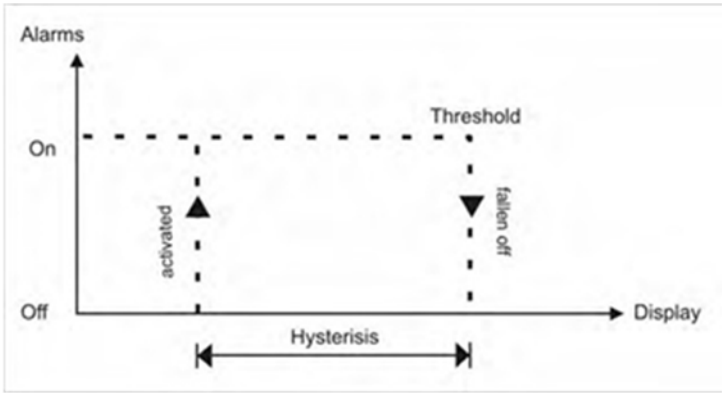
This device has 4 virtual alarms that can monitor one limit value in regard of an undercut or exceedance. Each alarm can be allocated to an optional relay output S1-S4; furthermore alarms can be controlled by events like e.g. min-/max. value.

| **Function principle of alarms / relays** | |
|---|---|
| **Alarm / Relay x** | deactivated, instantaneous value, min-/max-value or an activation via the [O]-key |
| **Switching threshold** | Threshold / limit value of the change-over |
| **Hysteresis** | Broadness of the window between the switching thresholds |
| **Working principle** | Operating current / Quiescent current |



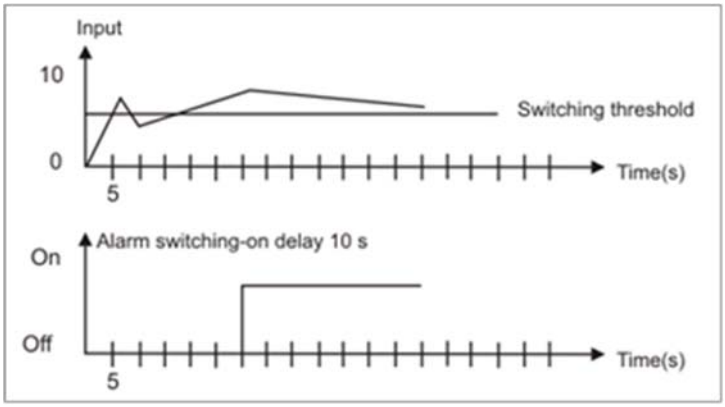

**Operating current**

By operating current the alarm S1-S4 is off below the threshold and on on reaching the threshold.




**Quiescent current**

By quiescent current the alarm S1-S4 is on below the threshold and switched off on reaching the threshold.

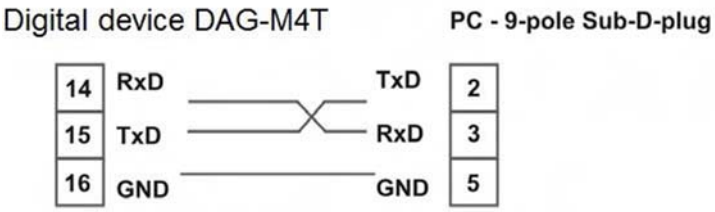



**Switching-on delay**

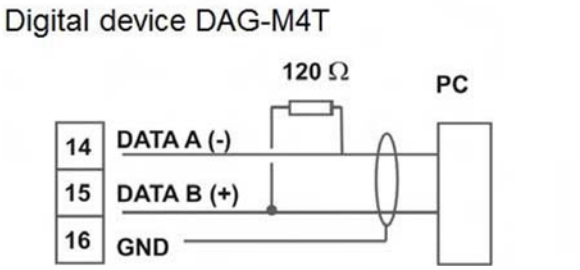
The switching-on delay is activated via an alarm and e.g. switched 10 seconds after reaching the switching threshold, a short- term exceedance of the switching value does not cause an alarm, respectively does not cause a switching operation of the relay. The switching-off delay operates in the same way, keeps the alarm / the relay switched longer for the parameterised time.

# 12. Interfaces RS232 and RS485

### Connection RS232




### Connection RS485




The interface **RS485** is connected via a screened data line with twisted wires (Twisted-Pair). On each end of the bus segment a termination of the bus lines needs to be connected. This is necessary to ensure a secure data transfer to the bus. For this a resistance (120 Ohm) is interposed between the lines Data B (+) and Data A (–).

# 13. Technical Information

Operating instructions, data sheet, approvals and further information via the QR code on the device or via www.kobold.com

# 14. Order Codes

Operating instructions, data sheet, approvals and further information via the QR code on the device or via www.kobold.com

# 15. Dimensions

Operating instructions, data sheet, approvals and further information via the QR code on the device or via www.kobold.com

# 16. Safety advices

Please read the following safety advices and the assembly *chapter 6* before installation and keep it for future reference.

**Proper use**

The **DAG-M4T device** is designed for the evaluation and display of sensor signals.

**DANGER! Careless use or improper operation can result injury personal injury and / or can damage the equipment.**

**Control of the device**

The panel meters are checked before dispatch and sent out in perfect condition. Should there be any visible damage, we recommend close examination of the packaging. Please inform the supplier immediately of any damage.

**Installation**

The **DAG-M4T device** must be installed by a suitably **qualified specialist** (e.g. with a qualification in industrial electronics).

**Notes on installation**

- There must be no magnetic or electric fields in the vicinity of the device, e.g. due to transformers, mobile phones or electrostatic discharge.
- The fuse rating of the voltage supply should not exceed a value of **0.5 A N.B** fuse!
- Do not install **inductive consumers** (relays, solenoid valves etc.) near the device and **suppress** any interference with the aid of RC spark extinguishing combinations or free-wheeling diodes
- Keep input, output and supply lines separate from one another and do not lay them parallel with each other. Position “go” and “return” lines next to one another. Where possible use twisted pair. This way best measuring results can be received.
- Screen off and twist sensor lines. Do not lay current-carrying lines in the vicinity. Connect the **screening on one side** on a suitable potential equalizer (normally signal ground).
- The device is not suitable for installation in areas where there is a risk of explosion.
- Any electrical connection deviating from the connection diagram can endanger human life and / or can destroy the equipment.
- The terminal area of the device is part of the service. Herer electrostatic discharge needs to be avoided. Attention! High voltages can cause dangerous body currents.
- Galvanic isolated potentials within one complex need to be placed on an appropriate point (normally earth or machines ground). So, a lower disturbance sensibility against impacted energy can be reached and dangerous potentials, that can occur on long lines or due faulty wiring, can be avoided.

# 17. Error elimination

| | Error description | Measures |
|---|---|---|
| 1. | The unit permanently indicates overflow.  | • The input has a very high measurement, check the measuring circuit.<br>• The input is open. |
| 2. | The unit permanently shows underflow.  | • The input has a very low measurement, check the measuring circuit .<br>• The input is open. |
| 3. | The word "*HELP*" lights up in the 7-segment display. | • The unit has found an error in the configuration memory. Perform a reset on the default values and re-configure the unit according to your application. |
| 4. | Program numbers for parameterising of the input are not accessible. | • Programming lock is activated<br>• Enter correct code |
| 5. | "*ERRT*" lights up in the 7-segment display | • Please contact the manufacturer if errors of this kind occur. |
| 6. | The device does not react as expected. | • If you are not sure that the device has been parameterised before, then follow the steps as written in *chapter 6* and set it back to its delivery status. |
| 7. | The displayed temperature differs from the reference temperature. | • Check if the right thermocouple type was selected under „*TYPE*“.<br>• Slightly differences can be corrected via the reference junction correction „*OFFS*“. If the parameter that needs to be compensated lies outside of -10…10°C respectively -18…18°F, then you shoud search for a systematic error. If the available adjustment range is not sufficient, a fault in the test setup seems likely. |
| 8. | Clear drift of the displayed temperature over time. | • Avoid airflow, strong heat sources or switched sinks in the direct vicinity of the terminal strip of the device. They lead to measuring errors at the reference junction. Seal off the connection are of the device, if neccessary, with help of iron sheets or an appropriate housing construction. |

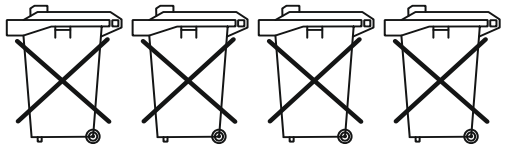
# 18. Disposal

**Note!**

- Avoid environmental damage caused by media-contaminated parts
- Dispose of the device and packaging in an environmentally friendly manner
- Comply with applicable national and international disposal regulations and environmental regulations.

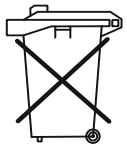
**Batteries**

Batteries containing pollutants are marked with a sign consisting of a crossed-out garbage can and the chemical symbol (Cd, Hg, Li or Pb) of the heavy metal that is decisive for the classification as containing pollutants:




1. „Cd" stands for cadmium
2. „Hg" stands for mercury
3. „Pb" stands for lead
4. „Li" stands for lithium

**Electrical and electronic equipment**



# 19. EU Declaration of Conformance

We, KOBOLD Messring GmbH, Hofheim-Ts, Germany, declare under our sole responsibility that the product:

**Digital Indicating Unit** **model: DAG-M4T**

to which this declaration relates is in conformity with the standards noted below:

**EN 61010-1:2010+A1:2019+A1:2019/AC:2019**
Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements

**EN 61326-1:2013**
Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements

**EN IEC 63000:2018** Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Also, the following EC guidelines are fulfilled:

| | |
|---|---|
| **2014/30/EU** | **EMC Directive** |
| **2014/35/EU** | **Low Voltage Directive** |
| **2011/65/EU** | **RoHS** (category 9) |
| **2015/863/EU** | Delegated Directive (RoHS III) |

Hofheim, 18 April 2023

H. Volz
General Manager

M. Wenzel
Proxy Holder

# 20. UK Declaration of Conformity

We, KOBOLD Messring GmbH, Hofheim-Ts, Germany, declare under our sole responsibility that the product:

**Digital Indicating Unit** **Model: DAG-M4T**

to which this declaration relates is in conformity with the standards noted below:

**BS EN 61010-1:2010+A1:2019**
Safety requirements for electrical equipment for measurement, control, and laboratory use. General requirements

**BS EN 61326-1:2013**
Electrical equipment for measurement, control and laboratory use. EMC requirements. General requirements

**BS EN IEC 63000:2018**
Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances.

Also, the following UK guidelines are fulfilled:

| | |
|---|---|
| **S.I. 2016/1091** | **Electromagnetic Compatibility Regulations 2016** |
| **S.I. 2016/1101** | **Electrical Equipment (Safety) Regulations 2016** |
| **S.I. 2012/3032** | The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 |

Hofheim, 05 June 2023

H. Volz
General Manager

M. Wenzel
Proxy Holder

# 21. Appendix MODBUS Device Interface

## MODBUS Device Interface for M-Line

interface parameters: 1 Start-, 8 Daten-, 1 Stopbit, no parity, 9600 baud

Compatibility – The interface is compatible with the Modicon Modbus protocol. That is, all the registers have a size of 16-bits. Larger data types are then occupied by several registers in a row. It also supports a non-Modicon compatible mode. In this mode, each data type is only one register corresponding to the data type size (minimum is always 16-bits).

*Info:* Modicon - company that has produced the first PLC, now Schneider Electric

*Note:* Access to data types must prove the plurality of registers always be in a read-write and must not be distributed to several write accesses!

Device address: Device address as a value between 1 and 247 can be used. To address 0 multiple devices can simultaneously achieve (broadcast), if the corresponding function is supported (no reception is possible, for example device reset).

*Transfer Mode*: The devices support the RTU mode (binary data, default) and ASCII mode (alphanumeric characters - hexadecimal). The RTU mode is faster because fewer bytes but must be trans-mitted this critical time. The ASCII mode is more suitable for communication with PC based systems, since they often can not meet the time-critical conditions for the RTU mode.

*Note:* The device configuration with the PM tool is possible only in ASCII mode.

### Supported data types

| Name | Number range | Size | Register count Modicon mode | Register count not Modicon mode |
|---|---|---|---|---|
| INT08 | -128..127 | 2 Byte | 1 | 1 |
| UINT08 | 0..255 | 2 Byte | 1 | 1 |
| INT16 | –32768..32767 | 2 Byte | 1 | 1 |
| UINT16 | 0..65535 | 2 Byte | 1 | 1 |
| INT32 | -2147843648.. 2147843647 | 4 Byte | 2 | 1 |
| UIN32 | 0..4294967295 | 4 Byte | 2 | 1 |
| INT64 | -9223372036854775808.. 9223372036854775807 | 8 Byte | 4 | 1 |
| FLOAT | -/+3.402823466e-/+38 | 4 Byte | 2 | 1 |

### Adress range

| Range hex | dec | Comment |
|---|---|---|
| 0x0000 .. 0x3FFF | 0 .. 16383 | Reservated (not Modicon mode) |
| 0x4000 .. 0x4FFF | 16383 .. 20497 | 16-Bit Integer without decimal place |
| 0x5000 .. 0x5FFF | 20480 .. 24575 | Reservated |
| 0x6000 .. 0x6FFF | 24576 .. 28671 | 32-Bit Integer without decimal place |
| 0x7000 .. 0x7FFF | 28672 .. 32767 | 32-Bit Float |
| 0x8000 .. 0xFFFF | 32768 .. 65535 | Reservated |

Supported function codes

| Code (hex) | Function | Comment |
|---|---|---|
| 0x03 | READ HOLDING REGISTERS | For example measuring values or alarms |
| 0x04 | READ INPUT REGISTER | Same function like 0x03 |
| 0x08 | DIAGNOSTIC | Diagnose informations |
| 0x10 | WRITE MULTIPLE REGISTERS | For example measuring values or alarms |

Register description

| Adress range 0x4000 .. 0x4FFF - 16 bit Register | | | | | |
|---|---|---|---|---|---|
| **Name** | **Index** | **Access mode** | **Min/Max- value data type** | **Comment** | |
| Measuring channel | 0x4400 | r/w | 0..65535 UNIT16 | User defined identification | |
| | | | | | |
| Alarm status | 0x4500 | r/w | 0..65535 UNIT16 | **Bit** | **Funktion** |
| | | | | 0 | Alarm 1 active |
| | | | | 1 | Alarm 2 active |
| | | | | 2 | Alarm 3 active |
| | | | | 3 | Alarm 4 active |
| | | | | 4 | Alarm 5active |
| | | | | 5 | Alarm 6 active |
| | | | | 6 | Alarm 7 active |
| | | | | 7 | Alarm 8 active |
| | | | | 8..15 | Reservated |
| | | | | | |
| Relay status | 0x4600 | r/- | 0..65535 UNIT16 | **Bit** | **Funktion** |
| | | | | 0 | Relay 1 active |
| | | | | 1 | Relay 2 active |
| | | | | 2 | Relay 3 active |
| | | | | 3 | Relay 4 active |
| | | | | 4 | Relay 5 active |
| | | | | 5 | Relay 6 active |
| | | | | 6 | Relay 7 active |
| | | | | 7 | Relay 8 active |
| | | | | 8..15 | reserviert |
| | | | | | |
| Display brightness | 0x4700 | r/w | 0..15 | 0 = dark ( lowest level )<br>15 = bright ( highest level ) | |
| | | | | | |

*Note:* 4-digit display is the minimum value and the maximum value -2000 10,000.

The display area is limited to 4-digit displays from -1999 to 9999 and on 5-digit -19999 to 99999. A measured value of -20000 or 100000 (or -2000 to 10000 or 4-digit display) signalisert an underflow or overflow of the measuring range. The same is also valid if on the last digit of the display, a symbol of a unit of measurement is displayed.

| Adress range 0x6000 .. 0x6FFF - 32 bit Register | | | | |
|---|---|---|---|---|
| **Name** | **Index** | **Access mode** | **Min/Max- value data type** | **Comment** |
| Time stamp Low-Word | 0x6000 | r/w | 0..35999 UINT32 | 10ms Stepps. Reset after 1 hour. |
| Time stamp I High-Word | 0x6001 | | | |
| Fieldvalue Low-Word | 0x6002 | r/- | 0..4294967295 UINT32 | Field value of ADC |
| Fieldvalue High-Word | 0x6003 | | | |
| Prozessvalue Low-Word | 0x6004 | r/w | -20000..100000 INT32 | Process value |
| Prozessvalue High-Word | 0x6005 | | | |
| Prozessvalue-Min Low-Word | 0x6006 | r/w | -20000..100000 INT32 | Minimum value |
| Prozessvalue-Min High-Word | 0x6007 | | | |
| Prozessvalue-Max Low-Word | 0x6008 | r/w | -20000..100000 INT32 | Maximum value |
| Prozessvalue-Max High-Word | 0x6009 | | | |
| Prozessvalue-Tot Low-Word | 0x600A | r/w | -20000..100000 INT32 | Totalizer (displayed value) |
| Prozessvalue-Tot High-Word | 0x600B | | | |
| Prozessvalue-Hld Low-Word | 0x600C | r/- | -20000..100000 INT32 | Hold value |
| Prozessvalue-Hld High-Word | 0x600D | | | |
| Prozessvalue-Avg Low-Word | 0x600E | r/- | -20000..100000 INT32 | Average value (averaging function) |
| Prozessvalue-Avg High-Word | 0x600F | | | |
| Prozessvalue-Abs Low-Word | 0x6010 | r/- | -20000..100000 INT32 | Absolute value |
| Prozessvalue-Abs High-Word | 0x6011 | | | |
| Prozessvalue-Nom Low-Word | 0x6012 | r/w | -20000..100000 INT32 | Nominal value, Set value |
| Prozessvalue-Nom High-Word | 0x6013 | | | |
| Prozessvalue-Diff Low-Word | 0x6014 | r/- | -20000..100000 INT32 | Difference value |
| Prozessvalue-Diff High-Word | 0x6015 | | | |
| | | | | |
| | | | | |
| Limit alarm 1 Low-Word | 0x6500 | r/w | -19999..99999 INT32 | |
| Limit alarm 1 High-Word | 0x6501 | | | |
| Limit alarm 2 Low-Word | 0x6502 | r/w | -19999..99999 INT32 | |
| Limit alarm 2 High-Word | 0x6503 | | | |
| Limit alarm 3 Low-Word | 0x6504 | r/w | -19999..99999 INT32 | |
| Limit alarm 3 High-Word | 0x6505 | | | |
| Limit alarm 4 Low-Word | 0x6506 | r/w | -19999..99999 INT32 | |
| Limit alarm 4 High-Word | 0x6507 | | | |
| Limit alarm 5 Low-Word | 0x6508 | r/w | -19999..99999 INT32 | |
| Limit alarm 5 High-Word | 0x6509 | | | |
| Limit alarm 6 Low-Word | 0x650A | r/w | -19999..99999 INT32 | |
| Limit alarm 6 High-Word | 0x650B | | | |
| Limit alarm 7 Low-Word | 0x650C | r/w | -19999..99999 INT32 | |
| Limit alarm 7 High-Word | 0x650D | | | |
| Limit alarm 8 Low-Word | 0x650E | r/w | -19999..99999 | |

| | | | | |
|---|---|---|---|---|
| Grenzwert Alarm 8 High-Word | 0x650F | | INT32 | |
| | | | | |
| | | | | |
| **Adressbereich 0x7000 .. 0x7FFF - 32 bit float Register** | | | | |
| **Name** | **Index** | **Zugriffs-modus** | **Min/Max-Wert Datentyp** | **Bemerkung** |
| Zeitstempel Low-Word | 0x7000 | r/- | 0..35999 FLOAT | 10ms Stepps. Reset after 1 hour. |
| Zeitstempel High-Word | 0x7001 | | | |
| Prozessvalue Low-Word | 0x7004 | r/- | -20000..100000 FLOAT | Field value of ADC |
| Prozessvalue High-Word | 0x7005 | | | |
| Prozessvalue-Min Low-Word | 0x7006 | r/- | -20000..100000 FLOAT | Process value |
| Prozessvalue-Min High-Word | 0x7007 | | | |
| Prozessvalue-Max Low-Word | 0x7008 | r/- | -20000..100000 FLOAT | Minimum value |
| Prozessvalue-Max High-Word | 0x7009 | | | |
| Prozessvalue-Tot Low-Word | 0x700A | r/- | -20000..100000 FLOAT | Maximum value |
| Prozessvalue-Tot High-Word | 0x700B | | | |
| Prozessvalue-Hld Low-Word | 0x700C | r/- | -20000..100000 FLOAT | Totalizer (displayed value) |
| Prozessvalue-Hld High-Word | 0x700D | | | |
| Prozessvalue-Avg Low-Word | 0x700E | r/- | -20000..100000 FLOAT | Hold value |
| Prozessvalue-Avg High-Word | 0x700F | | | |
| Prozessvalue-Abs Low-Word | 0x7010 | r/- | -20000..100000 FLOAT | Average value |
| Prozessvalue-Abs High-Word | 0x7011 | | | |
| Prozessvalue-Nom Low-Word | 0x6012 | r/- | -20000..100000 FLOAT | Absolute value |
| Prozessvalue-Nom High-Word | 0x6013 | | | |
| Prozessvalue-Diff Low-Word | 0x6014 | r/- | -20000..100000 FLOAT | Nominal value, Set value |
| Prozessvalue-Diff High-Word | 0x6015 | | | |
| | | | | |
| | | | | |

## Protocol

Standard form of message:

MODBUS-RTU

| Device address | Function | Data | CRC |
|---|---|---|---|
| 1 Byte | 1Byte | n Bytes | 2 Bytes |

MODBUS-ASCII

| Start | Device address | Function | Data | LRC-Wert | Ende |
|---|---|---|---|---|---|
| ':' | 2 Zeichen | 2 Zeichen | n x 2 Zeichen | 2 Zeichen | '\r\n' |

*Note:* In ASCII mode, we presented one byte with two characters in hexadecimal code ('00 .. FF ').

Massage Format:

Function 0x03 (Register read) - Requirements

| Adresse | Funktion | Daten | | | | Check sum | |
|---|---|---|---|---|---|---|---|
| | | Start address | | Count of registers | | | |
| | | High-Byte | Low-Byte | High-Byte | Low-Byte | Low-Byte | High-Byte |
| 0xnn | 0x03 | 0xnn | 0xnn | 0xnn | 0xnn | 0xnn | 0xnn |

Function 0x03 (Register read) - Reply

| Adresse | Funktion | Daten | | | | | | Check sum | |
|---|---|---|---|---|---|---|---|---|---|
| | | Count of bytes nn = count register x 2 | Register n + 0 | | ... | Register n + X | | | |
| | | | High-Byte | Low-Byte | ... | High-Byte | Low-Byte | Low-Byte | High-Byte |
| 0xnn | 0x03 | 0xnn | 0xnn | 0xnn | ... | 0xnn | 0xnn | 0xnn | 0xnn |

Function 0x10 (Register write) - Requirements

| Adresse | Funk-tion | Data | | | | | | | | | | Check sum | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Start address | | Count of registers | | Anzahl Bytes = Anzahl Register x 2 | Register n + 0 | | ... | Register n + X | | | |
| | | High-Byte | Low-Byte | High-Byte | Low-Byte | | High-Byte | Low-Byte | ... | High-Byte | Low-Byte | Low-Byte | High-Byte |
| 0xnn | 0x10 | 0xnn | 0xnn | 0xnn | 0xnn | 0xnn | 0xnn | 0xnn | ... | 0xnn | 0xnn | 0xnn | 0xnn |

Function 0x10 (Register write) - Reply

| Adresse | Funktion | Data | | | | Check sum | |
|---|---|---|---|---|---|---|---|
| | | Start address | | Count of registers | | | |
| | | High-Byte | Low-Byte | High-Byte | Low-Byte | Low-Byte | High-Byte |
| 0xnn | 0x10 | 0xnn | 0xnn | 0xnn | 0xnn | 0xnn | 0xnn |

## Examples

Read a 32-Bit value

MODBUS Device address 1, Index 0x6004, Register count 2, Reply value 93350 (0x00016CA6)

Telegram: MODBUS-RTU

Anforderung (Request)

| **Adresse** | **Funktion** | **Data** | | | | **Check sum** | |
|---|---|---|---|---|---|---|---|
| | | Start address | | Count of registers | | | |
| | | High-Byte | Low-Byte | High-Byte | Low-Byte | Low-Byte | High-Byte |
| 0x01 | 0x03 | 0x60 | 0x04 | 0x00 | 0x02 | 0xnn | 0xnn |

Antwort (Response)

| **Adresse** | **Function** | **Data** | | | | | **Check sum** | |
|---|---|---|---|---|---|---|---|---|
| | | Count bytes | Low-Word | | High-Word | | | |
| | | | High-Byte | Low-Byte | High-Byte | Low-Byte | Low-Byte | High-Byte |
| 0x01 | 0x03 | 0x04 | 0x6C | 0xA6 | 0x00 | 0x01 | 0xnn | 0xnn |

Telegram: MODBUS-ASCII

Request

| **Start** | **Function** | | **Data** | | | | | | | | **Check sum** | | **End** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Start address | | | | Count of registers | | | | | | | |
| | | | High-Byte | | Low-Byte | | High-Byte | | Low-Byte | | | | | |
| ':' | '0' | '3' | '6' | '0' | '0' | '4' | '0' | '0' | '0' | '2' | 'n' | 'n' | CR | LF |
| 0x3A | 0x30 | 0x33 | 0x36 | 0x30 | 0x30 | 0x30 | 0x30 | 0x30 | 0x30 | 0x32 | 0xnn | 0xnn | 0x0D | 0x0A |

Response

| **Start** | **Function** | | **Data** | | | | | | | | | | **Check sum** | | **End** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Anzahl Bytes | | Low-Word | | | | High-Word | | | | | | | |
| | | | | | High-Byte | | Low-Byte | | High-Byte | | Low-Byte | | | | | |
| ':' | '0' | '3' | '0' | '4' | '6' | 'C' | 'A' | '6' | '0' | '0' | '0' | '1' | 'n' | 'n' | CR | LF |
| 0x3A | 0x30 | 0x33 | 0x30 | 0x34 | 0x36 | 0x43 | 0x41 | 0x36 | 0x30 | 0x30 | 0x30 | 0x31 | 0xnn | 0xnn | 0x0D | 0x0A |

Write a 32-Bit Wertes

MODBUS Device address 1, Register index 0x6004, Count of registers 2, value 91696 (0x00016630)

Protokoll: MODBUS-RTU

Request

| **Address** | **Func-tion** | **Data** | | | | | | | | | **Check sum** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Startadresse | | Anzahl Register | | Count Bytes | Low-Word | | High-Word | | | |
| | | High-Byte | Low-Byte | High-Byte | Low-Byte | | High-Byte | Low-Byte | High-Byte | Low-Byte | Low-Byte | High-Byte |
| 0x01 | 0x10 | 0x60 | 0x04 | 0x00 | 0x02 | 0x04 | 0x66 | 0x30 | 0x00 | 0x01 | 0xnn | 0xnn |

Response

| **Address** | **Func-tion** | **Data** | | | | **Check sum** | |
|---|---|---|---|---|---|---|---|
| | | Start address | | Count of registers | | | |
| | | High-Byte | Low-Byte | High-Byte | Low-Byte | Low-Byte | High-Byte |
| 0x01 | 0x10 | 0x60 | 0x02 | 0x00 | 0x02 | 0xnn | 0xnn |

*Note:* Note that the Modicon compatible mode, with the 16-bit value of the register address (index), number of registers and register contents, always the high byte is first passported. In contrast, the low word is transmitted first with 32-bit values. This is handled for the FLOAT data type as.

## Error codes

Modbus – The Modbus protocol provides for the transmission of error code in some cases.

| Fehlercode | Beschreibung |
|---|---|
| 0x01 | Error code is not supported |
| 0x02 | Register address or index is not supported |
| 0x03 | Data error |
| 0x04 | General device error |

If the checksum is faulty, the device sends no response to the request. This behavior is to generate a timeout on the opposite side.

Response

| Address | Function | Error Number | Check sum | |
|---|---|---|---|---|
| | | | Low-Byte | High-Byte |
| 0x01 | 0x83 | 0x04 | 0xnn | 0xnn |

An error is indicated by a set bit 7 in the function code in the response.

Device diagnostics

Diagnostic functions

| Sub function | Data | Comment |
|---|---|---|
| 0x0000 | 0x0000 | Echo connection test |
| 0x0001 | 0x0000 | Start device initialization |
| | 0x0001 | Reset device |
| 0x0002 | 0x0000 | Request diagnostic register (see below) |
| 0x000A | 0x0000 | Reset all diagnostic registers |
| 0x000B | 0x0000 | Request count of communications |
| 0x000C | 0x0000 | Request count of check sum errors |
| 0x000D | 0x0000 | Request count of request errors |
| 0x000E | 0x0000 | Request the total count of request messages |
| 0x000F | 0x0000 | Request the count of broadcast request messages |
| 0x0010 | 0x0000 | like 0x000D |
| 0x0012 | 0x0000 | Request count of check sum overruns |
| 0x0014 | 0x0000 | Reset count of check sum overruns |

Request / Antwort Response – Diagnostic functions

| Address | Function | Data | | | | Check sum | |
|---|---|---|---|---|---|---|---|
| | | Sub function | | Data | | | |
| | | High-Byte | Low-Byte | High-Byte | Low-Byte | Low-Byte | High-Byte |
| 0x01 | 0x08 | 0x00 | 0x00 | 0x00 | 0x00 | 0xnn | 0xnn |

Diagnostic register

| Bit number | Comment |
|---|---|
| 0 | Time out during data request message |
| 1 | Measure range overrun |
| 2 .. 15 | Reserved |
| | |
| | |
| | |
| | |

*Note:* The bits in the Diagnostic register remain set until they are by sending the subfunction 0x000A reset.