User manual M3

Strain gauge amplifier with a calibration for 350 Ohm – weighing technology

Technical features:

- red display of -19999…99999 digits (optional: green, orange or blue display)
- installation depth: 120 mm without plug-in terminal
- min-/max-memory
- 30 adjustable setpoints
- display flashing at threshold value exceedance/undercut
- zero-key for the triggering of Hold, Tara or sensor calibration
- standard digital input for Hold, Tara or sensor calibration
- sensor calibration with integrated switching output
- permanent min/max-value recording
- arithmetic function
- zero point slowdown
- programming interlock via access code
- protection class IP65 at the front
- pluggable screw clamp
- optional: 1 or 2 analog outputs or 4 relay outputs (Changer)
- optional: 2 or 4 relay outputs (Changer)

Identification

STANDARD TYPES	ORDER NUMBER
Strain gauge amplifier Housing size: 96x48 mm	**M3-1WR5B.020X.470AD** **M3-1WR5B.020X.570AD** **M3-1WR5B.020X.670AD**

Options – break-down product key:

M 3- 1 W R 5 B. 0 2 0 X. 6 7 2 A D

Standard type M line

Installation depth in mm
139 mm, incl. plug-in terminal: 3

Housing size
96x48x120 mm (BxHxD): 1

Display type
Weighing technology: W

Display colour
- Blue: B
- Green: G
- Red: R
- Orange: Y

Number of digits
5-digits: 5

Digit height
14 mm: B

Digital input
- without: 0
- Interface RS232 galv.insulated: 3
- Interface RS485 galv.insulated: 4

Bridge feeding
10 VDC / 20-40 mA incl. digital input: 2

Dimension
- D: physical unit

Version
- A: A

Setpoints
- 0: no setpoints
- 2: 2 relay outputs
- 4: 4 relay outputs
- 8: 8 PhotoMos

Protection class
- 1: without keypad, operation on the back
- 7: IP65 / plug-in terminal

Voltage supply
- 4: 115 VAC
- 5: 230 VAC
- 6: 10-30 VDC galv.insulated

Measuring input
- X: Strain gauge amplifier Weighing techn. 1.1 - 3.3 mV

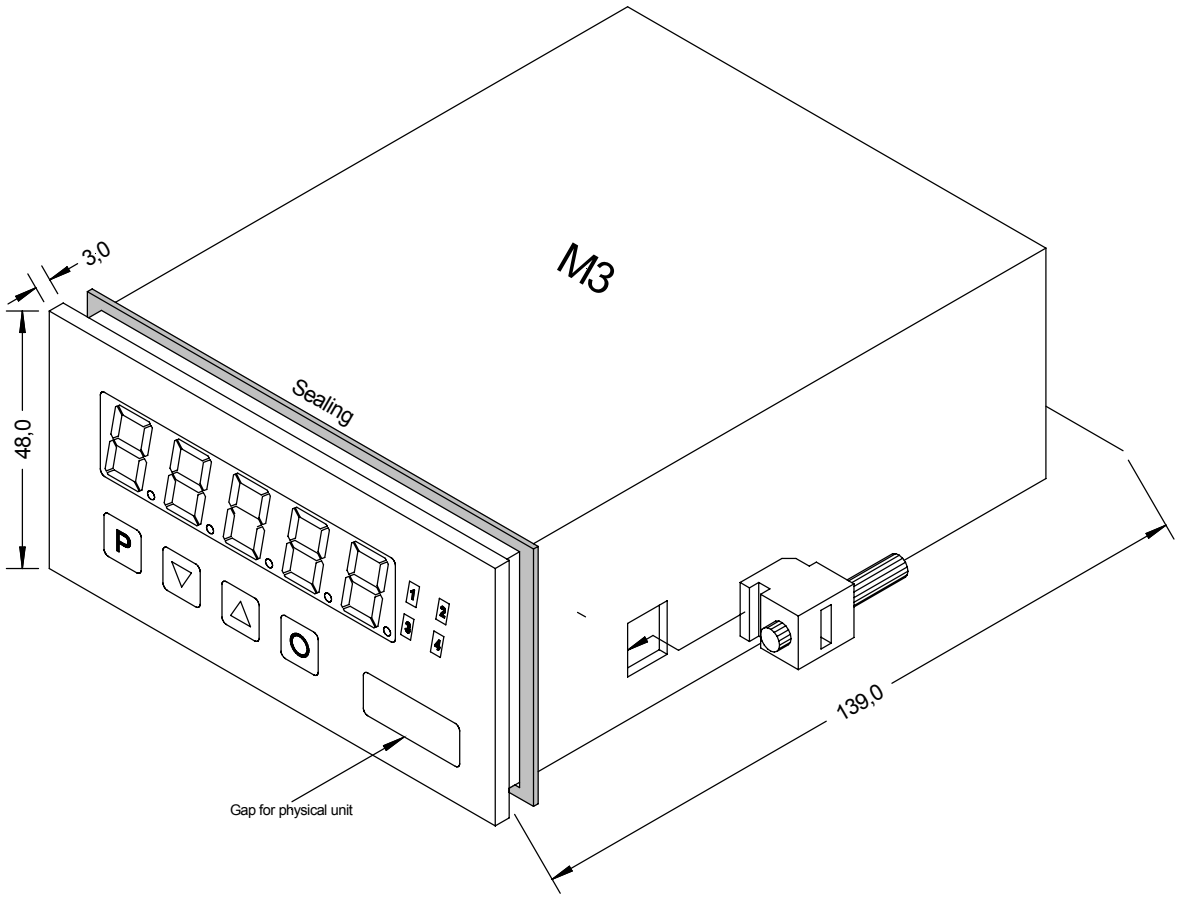
Analog output
- 0: without
- X: 1x 0-10 VDC, 0/4-20 mA
- Y: 2x 0-10 VDC, 0/4-20 mA

Please state physical unit by order, e.g. m/min.

Contents

1. Assembly

Please read the *Safety advice* on *page 33* before installation and keep this user manual for future reference.



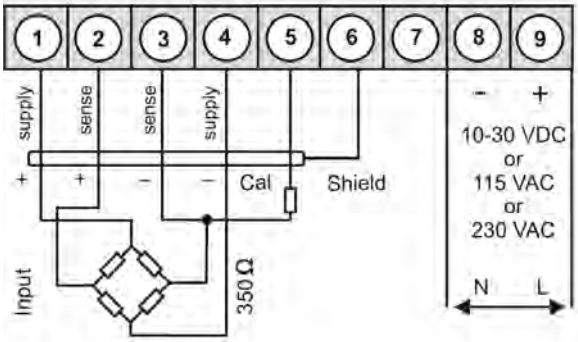
1. After removing the fixing elements, insert the device.
2. Check the seal to make sure it fits securely.
3. Click the fixing elements back into place and tighten the clamping screws by hand. Then use a screwdriver to tighten them another half a turn.

   CAUTION! The torque should not exceed 0.1 Nm!

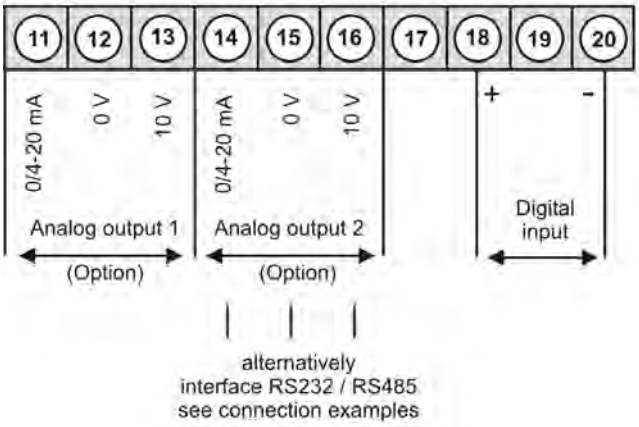
The dimension symbols can be exchanged before installation via a channel on the side!

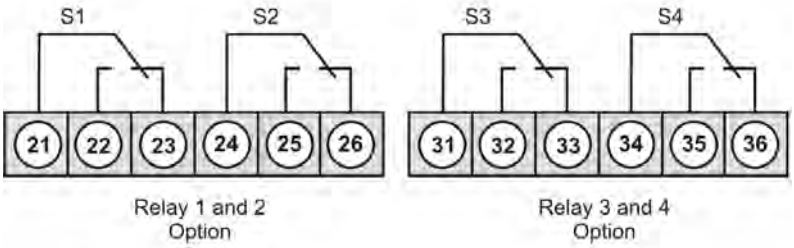
2. Electrical connection

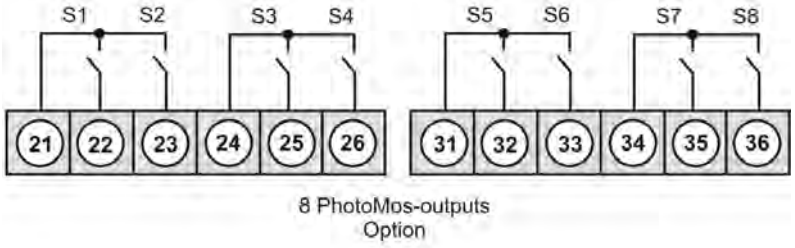
Type M3-1WR5B.020X.470AD with a supply of 115 VAC
Type M3-1WR5B.020X.570AD with a supply of 230 VAC
Type M3-1WR5B.020X.670AD with a supply of 10-30 VDC



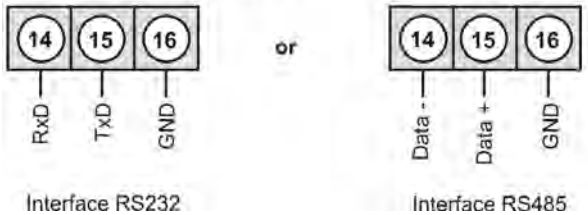
Options:







Alternative for analog output 2



3. Function and operation description

Operation
The operation is divided into three different levels.

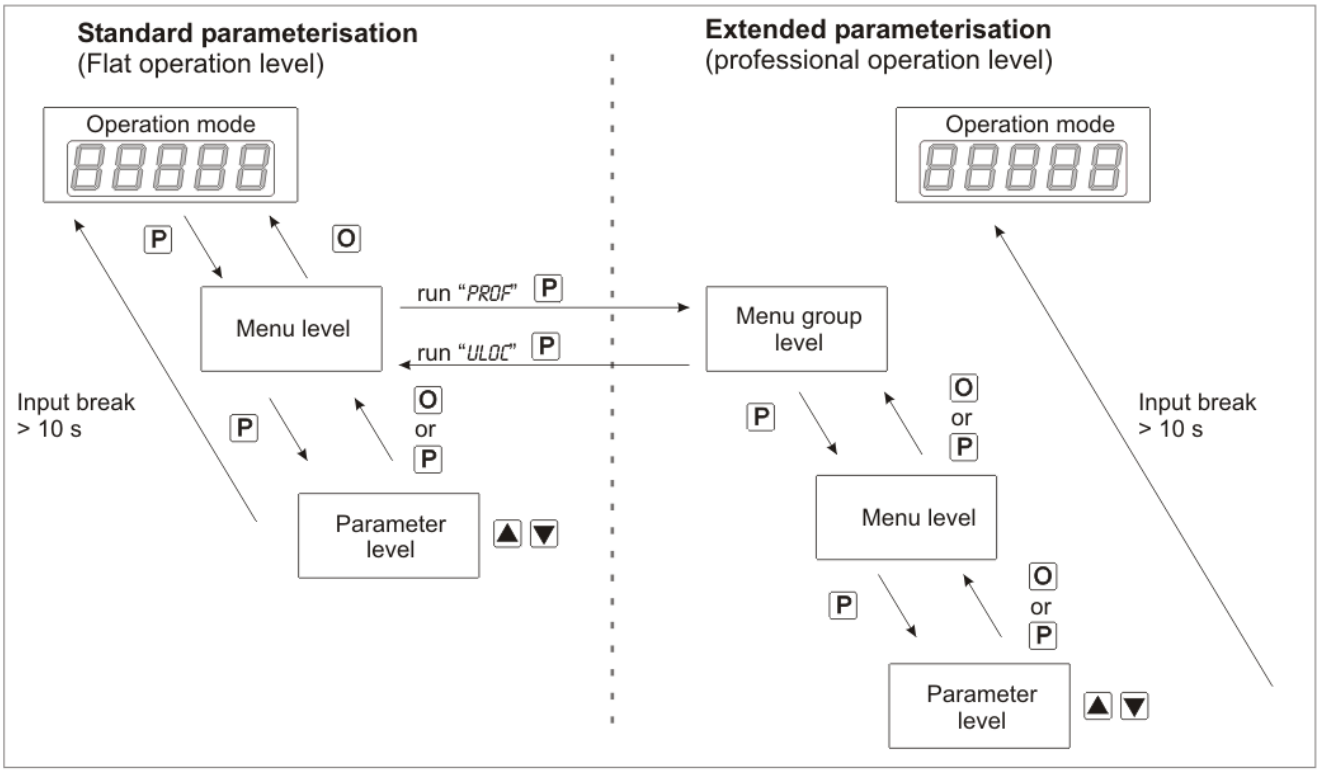
Menu level (delivery status)
This level is for the standard settings of the device. Only menu items which are sufficent to set the device into operation are displayed. To get into the professional level, run through the menu level and parameterise **"***PROF*" under menu item *RUN*.

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

Parameterisation level:
Parameter deposited in the menu item can here be parameterised. Functions, that can be changed or adjusted, are always signalised by a flashing of the display. Settings that are made in the parameterisation level are confirmed with **[P]** and thus safed. By pressing the „zero-key" it leads to a break-off of the value input and to a change into the menu level. All adjustments are safed 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 (-)**

4. Setting up the device

4.1. Switching-on

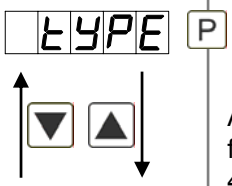
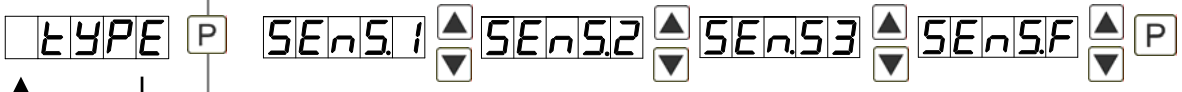
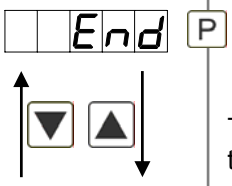
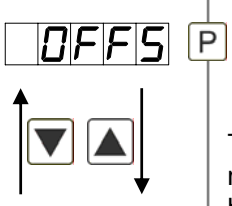
Once the installation is complete, you can start the device by applying the voltage supply. Before, check once again that all electrical connections are correct.

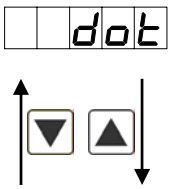
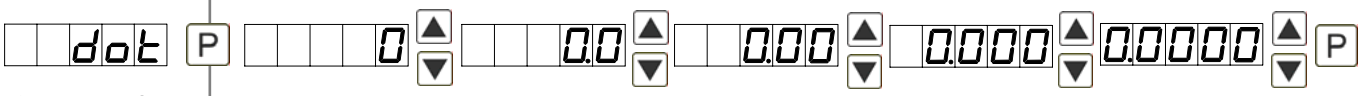
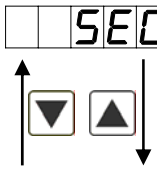
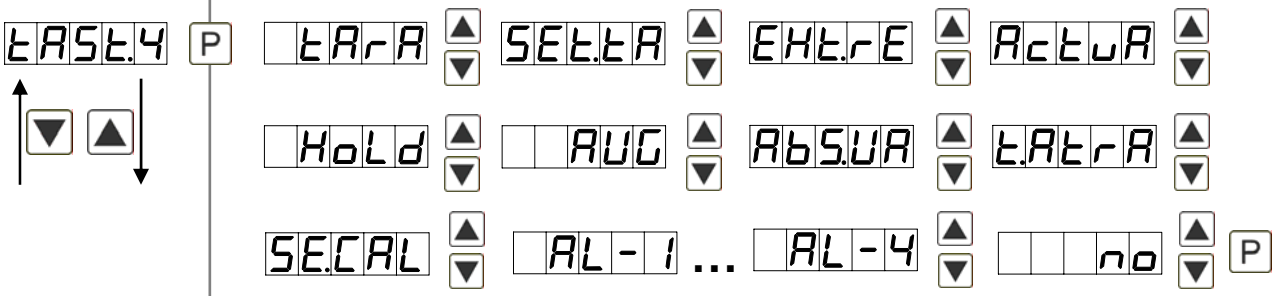
Starting sequence

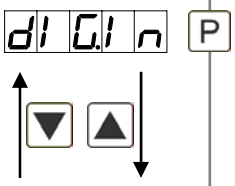
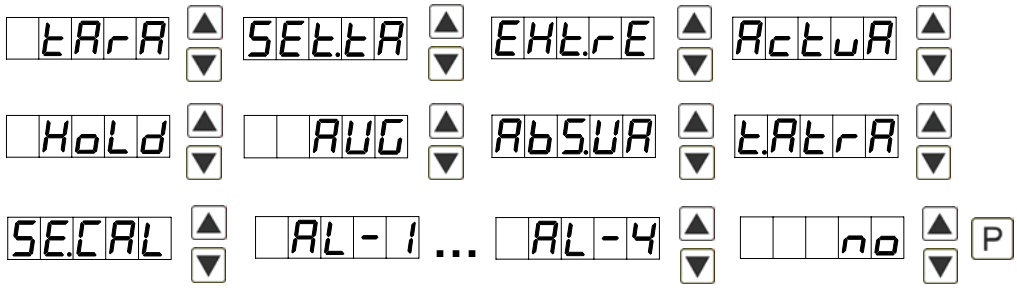
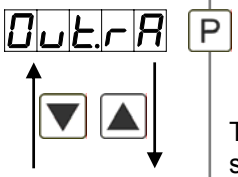
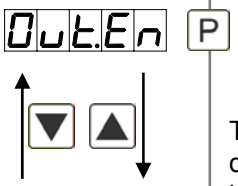
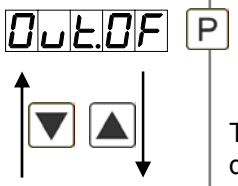
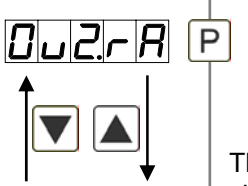
For 1 second during the switching-on process, the segment test (*8 8 8 8 8*) is displayed, followed by an indication of the software type and, after that, also for 1 second, the software version. After the starting sequence, the device switches to operation/display mode.

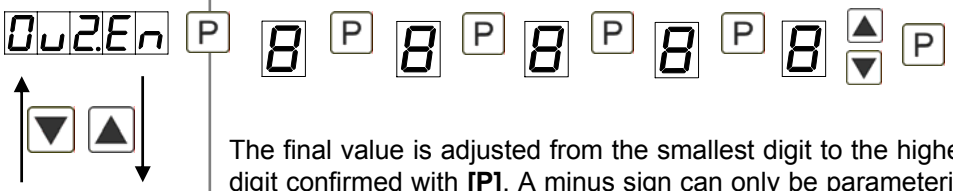
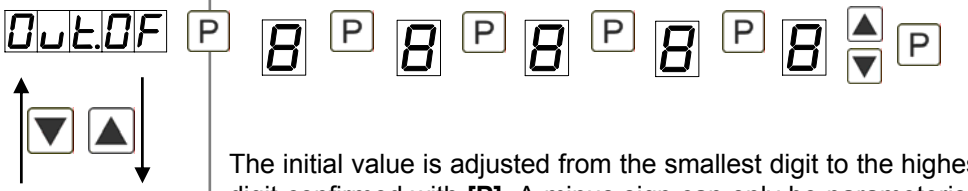
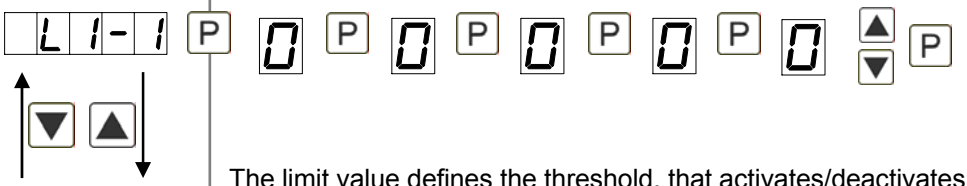
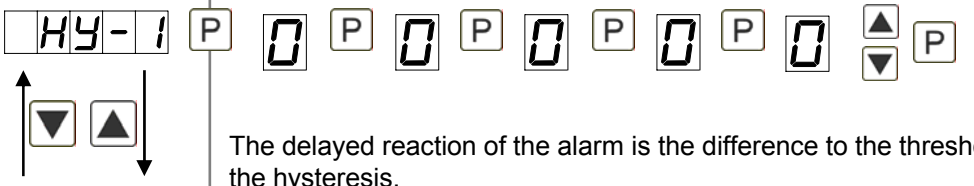
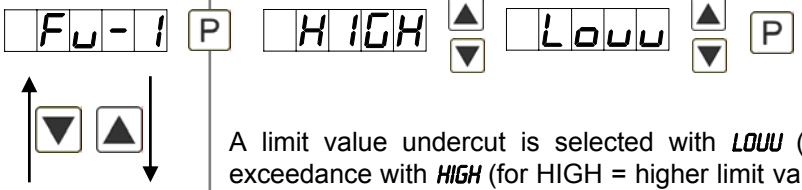
4.2. Standard parameterisation: (flat operation level)

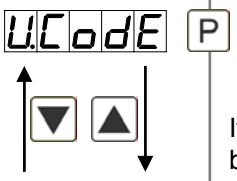
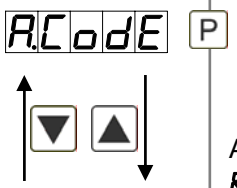
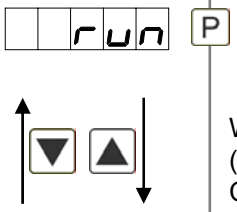
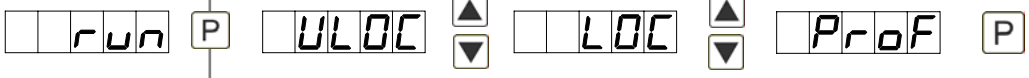
To parameterize the display, press the **[P]** key in operating mode for 1 second. The display then changes to the menu level with the first menu item *TYPE*.

Menu level	Parameterisation level
	**Selection of the input signal, *TYPE*:** Default: *SENS.F*  Available as measuring inputs are *SENS.1* for 1 mV/V, *SENS.2* for 2 mV/V and *SENS.3* for 3.3 mV/V for known sensor sensibilities. Via *SENS.F* each sensor is calibrated and measured up to approx. 4 mV/V. With **[P]** the selection is confirmed and the device changes back into menu level.
	**Setting up the measuring range end value, *END*:** Default: *10000*  The final value has to be adjusted from the smallest to the highest digit with [▲] [▼] and needs to be confirmed digit per digit with **[P]**. A minus sign can only be parameterised on the highest digit. After the last digit, it can then be chosen between *NOCA* and *CAL*. With *NOCA* the display value that has been adjusted bevor can now be taken over, with *CAL* the matching is done via the measuring section and the analog input value is taken over. It is always adopted to 100%. With **[P]** the selection is confirmed and the device changes back into menu level.
	**Setting up the measuring range start/offset value, *OFFS*:** Default: *0*  The initial value has to be adjusted from the smallest to the highest digit with [▲] [▼] and needs to be confirmed digit per digit with **[P]**. A minus sign can only be parameterised on the highest digit. After the last digit, it can then be chosen between *NOCA* and *CAL*. With *NOCA* the display value that has been adjusted bevor can now be taken over, with *CAL* the matching is done via the measuring section and the analog input value is taken over. It is always adopted to 100%. With **[P]** the selection is confirmed and the device changes back into menu level.

Menu level	Parameterisation level
	**Setting of the comma / decimal point, *DOT*:** Default: *0*  The decimal point of the display can be adjusted with **[▲] [▼]**. With **[P]** the selection is confirmed and the device changes back into menu level.
	**Setting of the measuring time, *SEC*:** Default: *1.0*  The measuring time is adjusted with **[▲] [▼]**. The display moves up in increments of 0.1 up to 1 second and in increments of 1.0 up to 10.0 seconds. With **[P]** the selection is confirmed and the device changes back into menu level.
	Special function [O]-key, *TAST.4*: Default: *NO*  For the operation mode, special functions can laid be on the **[O]**-key. This function is triggered by pushing the key. With *TARA* the display is tared to zero and is safed permanently as Offset. The display confirms the correct taring by showing *00000* in the display. *SET.TA* switches into the offset value and can be change via the direction keys **[▲] [▼]**. *EHT.RE* deletes the min/max-memory. *ACTUA* shows the measuring value for approx. 7 seconds. Then the display switches to the parameterised display value. Just as at *AVG*, here the sliding average is displayed. At selected *HOLD* the instant value is held by pushing the **[O]**-key and updated by releasing the key. Advice: *HOLD* can only be activated if *HOLD* was selected under parameter *DISPL*. If *ABS.UA* (Absolute value) was selected, the display shows the values that have been measured since the voltage has been connected, without consideration of a previous taring. With *T.TARA* (temporarily Tara) the Offset is determined by rising shoulder of the digital input and kept only for the period of the signal. Via *SE.CAL* a sensor calibration is done by pushing the zero-key, the flow diagram is shown in *chapter 4.4*. At *AL-1...AL-8* an output can be set and therewith e.g. a switch of the metering point can be done. If *NO* is selected, the **[O]**-key has no function in the operation mode.

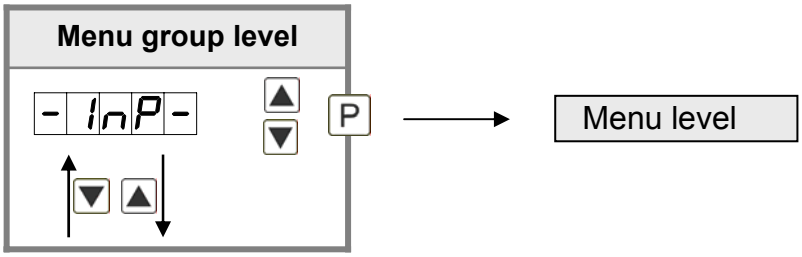
Menu level	Parameterisation level
	**Special function digital input,** *DIG.IN:* Default: *SE.CAL*  The above given parameters can be set for the operation mode onto the optional digital input aswell. See function description *TAST.4*.
	**Selection analog output 1,** *OUT.RA:* Default: *4-20*  Three output signals are available: 0-10 VDC, 0-20 mA and 4-20 mA. With function the desired signal can be selected.
	**Setting the final value of the analog output 1,** *OUT.EN:* Default: *10000*  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 the initial value of the analog output 1,** *OUT.OF:* Default: *00000*  The initial 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.
	**Selection analog output 2,** *OUT.RA:* Default: *4-20*  Three output signals are available: 0-10 VDC, 0-20 mA and 4-20 mA. With function the desired signal can be selected.

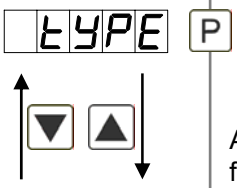
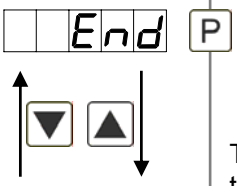
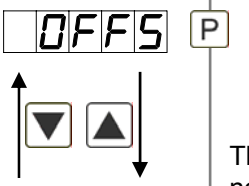
Menu level	Parameterisation level
	**Setting the final value of the analog output 2,** *OUT.EN:* Default: *10000* The final value is adjusted from the smallest digit to the highest digit with **[▲] [▼]** and digit by digit confirmed with **[P]**. A minus sign can only be parameterised on the highest digit. After the last digit, the device changes back into menu level.
	**Setting the initial value of the analog output 2,** *OUT.OF:* Default: *00000* The initial 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 / Limit values,** *LI-1:* Default: *2000* The limit value defines the threshold, that activates/deactivates an alarm.
	**Hysteresis for threshold values,** *HY-1:* Default: *0000* The delayed reaction of the alarm is the difference to the threshold value, which is defined by the hysteresis.
	**Function for threshold value undercut /exceedance,** *FU-1:* Default: *HIGH* 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-1* to *LI-2* !

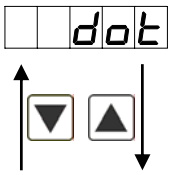
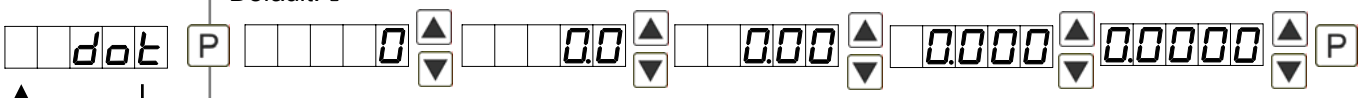
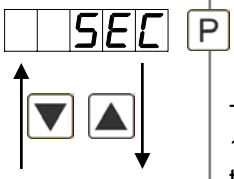
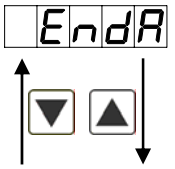
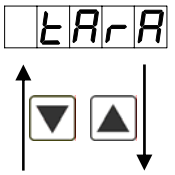
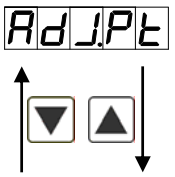
Menu level	Parameterisation level
	**User code (4-digit number-combination, free available), *U.CODE*:** Default: *0000*  If this code was set (>0000), all parameters are locked for the user, if *LOC* has been selected before under menu item *RUN*. By pressing **[P]** for 3 seconds in operation mode, 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*:** Default: *1234*  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 parameterisation 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.
	**Activation / deactivation of the programming lock or completion of the standard parameterization 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 parameterize 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*.

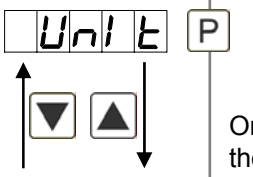
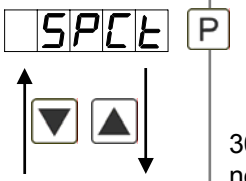
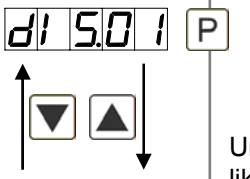
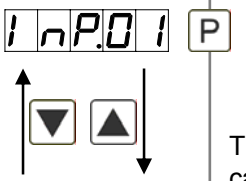
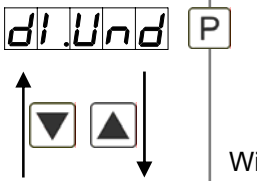
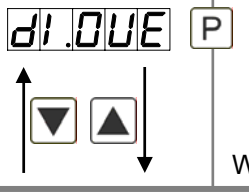
4.3. **Extended parameterisation** (Professional operation level)

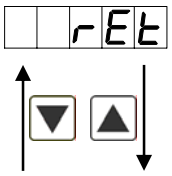
4.3.1. Signal input parameters



Menu level	Parameterisation level
	**Selection of the input signal, *TYPE*:** Default: *SENS.F*  Available as measuring inputs are *SENS.1* for 1 mV/V, *SENS.2* for 2 mV/V and *SENS.3* for 3.3 mV/V for known sensor sensibilities. Via *SENS.F* each sensor is calibrated and measured up to approx. 4 mV/V. With **[P]** the selection is confirmed and the device changes back into menu level.
	**Setting up the end value of the measuring range, *END*:** Default: *10000*  The final value has to be adjusted from the smallest to the highest digit with [▲] [▼] and needs to be confirmed digit per digit with **[P]**. A minus sign can only be parameterised on the highest digit. After the last digit, it can then be chosen between *NOCA* and *CAL*. With *NOCA* the display value that has been adjusted bevor can now be taken over, with *CAL* the matching is done via the measuring section and the analog input value is taken over. It is always adopted to 100%. With **[P]** the selection is confirmed and the device changes back into menu level.
	**Setting up the start/offset value of the measuring range, *OFFS*:** Default: *0*  The initial value has to be adjusted from the smallest to the highest digit with [▲] [▼] and needs to be confirmed digit per digit with **[P]**. A minus sign can only be parameterised on the highest digit. After the last digit, it can then be chosen between *NOCA* and *CAL*. With *NOCA* the display value that has been adjusted bevor can now be taken over, with *CAL* the matching is done via the measuring section and the analog input value is taken over. It is always adopted to 100%. With **[P]** the selection is confirmed and the device changes back into menu level.

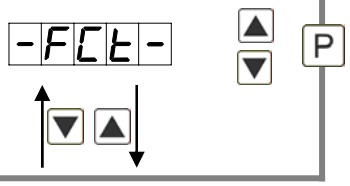
Menu level	Parameterisation level
	**Setting of the comma / decimal point, *DOT*:** Default: *0*  The decimal point of the display can be adjusted with **[▲] [▼]**. With **[P]** the selection is confirmed and the device changes back into menu level.
	**Setting of the measuring time, *SEC*:** Default: *1.0*  The measuring time is adjusted with **[▲] [▼]**. The display moves up in increments of 0.1 up to 1 second and in increments of 1.0 up to 10.0 seconds. With **[P]** the selection is confirmed and the device changes back into menu level.
	**Rescaling the measuring input values, *ENDA*:** Default: *10000*  With this function, you can rescale the final value to **e.g. 0.1 mV** input signal, without applying a measuring signal.
	**Rescaling the measuring input values, *OFFA*:** Default: *0*  With this function, you can rescale the initial value to **e.g. 0.1 mV** input signal, without applying a measuring signal.
	**Setting up the tare/offset value, *TARA*:** Default: *0*  The given value is added to the linerarized value. In this way, the characteristic line can be shifted by the selected amount
	**Setting of the balance point, *ADJ.PT*:** Default: *100.00*  The balance point is preset on 100%. This value can be freely adjusted, aswell.

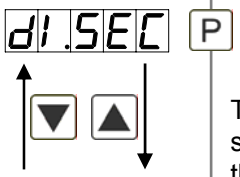
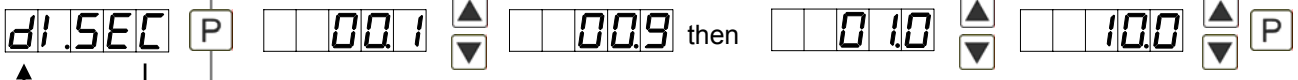
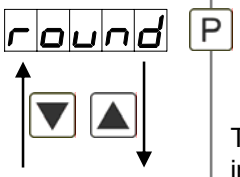
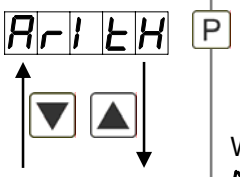
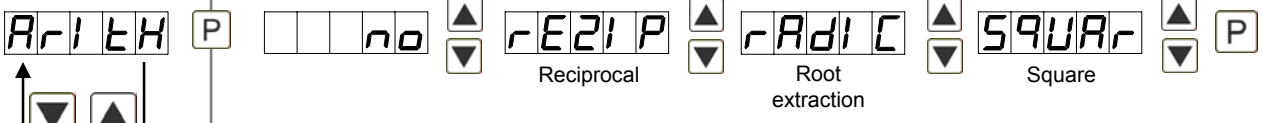
Menu level	Parameterisation level
	**Setting up the physical unit,** *UNIT:* Default: *NO*  One can choose between the above shown physical units. It will be displayed on the 5th digit of the display.
	**Number of additional setpoints,** *SPCT:* Default: *00*  30 additional setpoints can be defined to the initial- and final value, so linear sensor values are not linearised. Only activated setpoint parameters are displayed.
	**Display values for setpoints,** *DIS.01 ... DIS.30:*  Under this parameter setpoints are defined according to their value. At the sensor calibration, like at final value/offset, one is asked at the end if a calibration shall be activated.
	**Analog values for setpoints,** *INP.01 ... INP.30:*  The setpoints are always set according to the selected input signal. The desired analog values can be freely parameterised in ascending order.
	**Display underflow** *DI.UND:* Default: *-19999*  With this function the display underflow (_ _ _ _ _) can be defined to a determinate value.
	**Display overflow,** *DI.OUE:* Default: *99999*  With this function the display overflow (-----) can be defined to a determinate value.

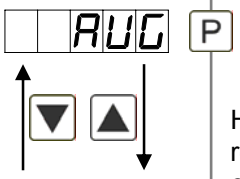
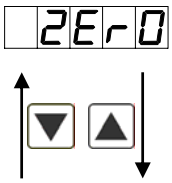
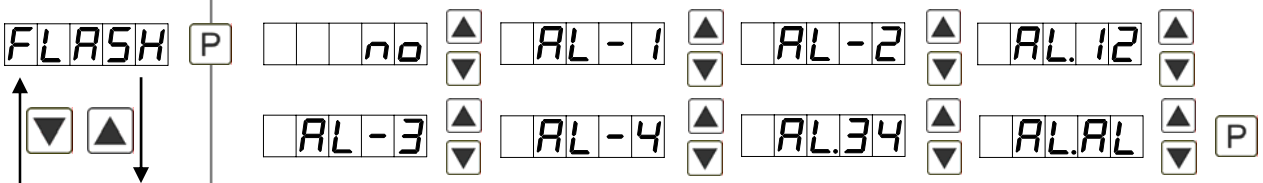
Menu level	Parameterisation level
	**Back to menu group level,** *RET:* With **[P]** the selection is confirmed and the device changes into menu group level *„-INP-"*.

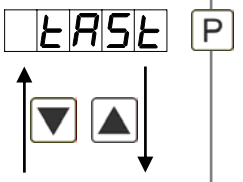
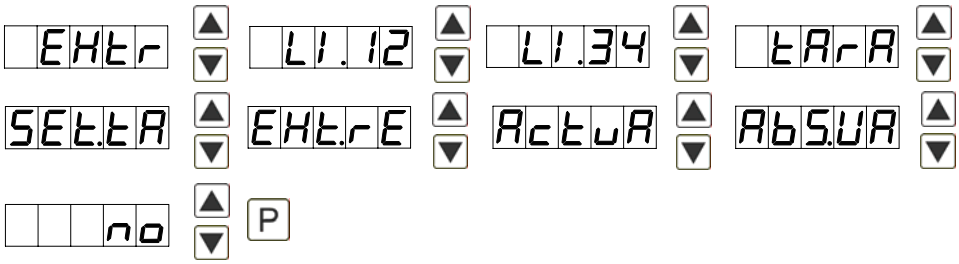
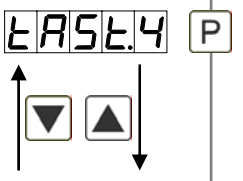
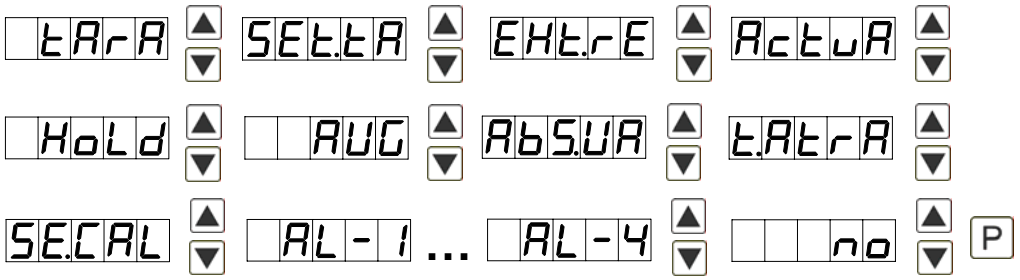
4.3.2. General device parameter

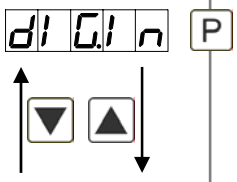
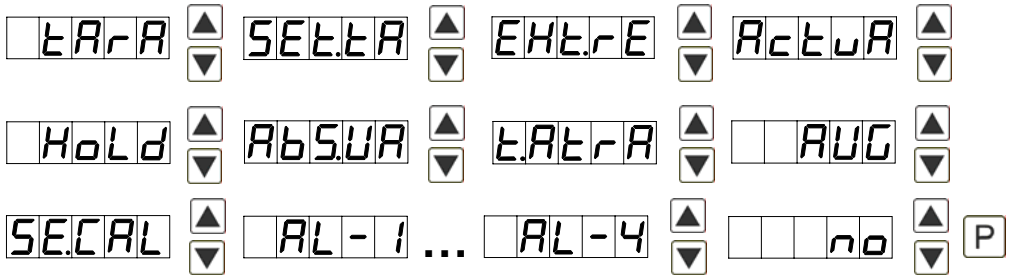
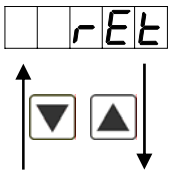
Menu group level



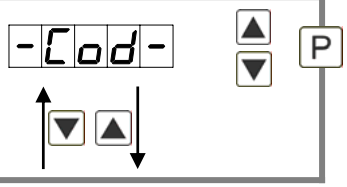
Menu level	Parameterisation level
	**Display time,** *DISEC:* Default: *-01.0*  The display is set up with [▲] [▼]. Thereby it switches until 1 second in increments of 0.1 seconds and until 10.0 seconds in increments of 1.0. With **[P]** the selection is confirmed and the device changes into menu level.
	**Rounding of display values,** *ROUND:* Default: *00001*  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.
	**Arithmetic,** *ARITH:* Default: *NO*  Reciprocal Root extraction Square With this function the calculated value, not the measuring value, is shown in the display. With *NO*, no calulation is deposited. With **[P]** the selection is confirmed and the device changes into menu level.

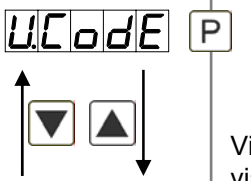
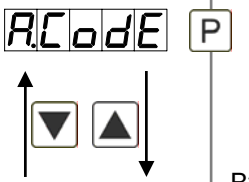
Menu level	Parameterisation level
	**Sliding average determination,** *AVG:* Default: *10*  Here, the number of the meterings that need to be averaged is preset. The time of averaging results of the product of measuring time *SEC* and the averaged metering *AVG*. With the selection of *AVG* in the menu level *DISPL*, the result will be shown in the display and evaluated via the alarms.
	**Zero point slowdown,** *ZERO:* Default: *00*  At the zero point slowdown, a value range around the zero point can be preset, so the display shows a zero. If e.g. a 10 is set, the display would show a zero in the value range from -10 to +10; below continue with -11 and beyond with +11. The maximum adjustable range of value is 99.
	Display, *DISPL:* Default: *ACTUA*  With this function the absolute value, current measuring value, min/max value, the sliding average value or the process-controlled Hold-value can be allocated to the display. With **[P]** the selection is confirmed and the device changes into menu level.
	Display flashing, *FLASH:* Default: *NO*  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.

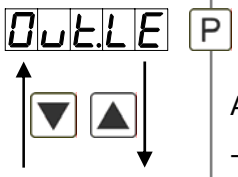
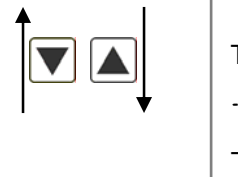
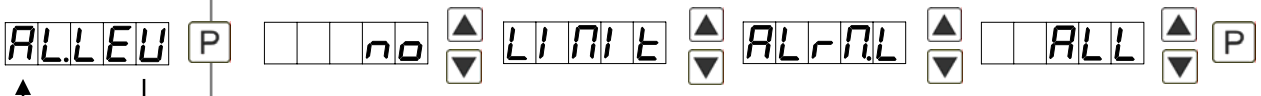
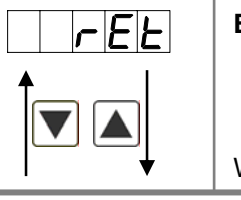
Menu level	Parameterisation level
	**Assignment (deposit) of key functions,** *TAST:* Default: *NO*  For the operation mode, special functions can be deposited on the navigation keys [▲] [▼], in particular this function is made for devices in housing size 48x24mm which do not have a 4th key (**[O]-key**). 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. With *TARA* the device is tared to zero and safed permanently as Offset. The device confirms the correct taring by showing *00000* in the display. *SET.TA* switches into the offset value and can be changed via the navigation keys [▲] [▼]. The configuration of *EHT.RE* deletes the min/max-memory. Under *ACTUA* the measuand is shown for approx. 7s, after this the display returns to the parametrised display value. If *ABS.UA* (absolute value) was selected, the display shows the value that has been measured since voltage connection, without consideration of a previous taring. If *NO* is selected, the navigation keys are without any function in the operation mode.
	**Special function [O]-key,** *TAST.4:* Default: *NO*  For the operation mode, special functions can laid be on the **[O]-**key. This function is triggered by pushing the key. With *TARA* the display is tared to zero and is safed permanently as Offset. The display confirms the correct taring by showing *00000* in the display. *SET.TA* switches into the offset value and can be change via the direction keys **[▲] [▼]**. *EHT.RE* deletes the min/max-memory. *ACTUA* shows the measuring value for approx. 7 seconds. Then the display switches to the parametrised display value. At selected *HOLD* the instant value is held by pushing the **[O]-**key and updated by releasing the key. Advice: *HOLD* can only be activated if *HOLD* was selected under parameter *DISPL*. If *ABS.UA* (absolute value) was selected, the display shows the values that have been measured since the voltage has been connected, without consideration of a previous taring. With *T.TARA* (temporarily Tara) the Offset is determined by rising shoulder of the digital input and kept only for the period of the signal. Via *SE.CAL* a sensor calibration is done by pushing the **[O]-key**, the flow diagram is shown in *chapter 4.4*. At *AL-1...AL-8* an output can be set and therewith e.g. a switch of the metering point can be done. If *NO* is selected, the **[O]-**key has no function in the operation mode.

Menu level	Parameterisation level
	**Special function digital input,** *DIG.IN*: Default: *SE.CAL*  The above given parameters can be set for the operation mode onto the optional digital input aswell. See function description *TAST.4*.
	**Back to menu group level,** *RET*: With **[P]** the selection is confirmed and the device changes into menu group level „- *FCT* -“.

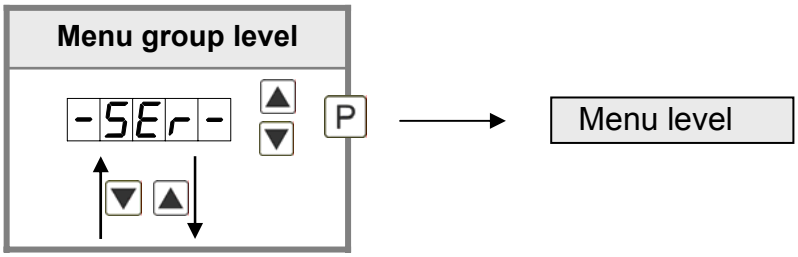
4.3.3. Safety parameter

Menu group level
 Menu level

Menu level	Parameterisation level
	**User code,** *U.CODE*: Default: *0000*  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).
	**Master code,** *A.CODE*: Default: *1234*  By entering *A.CODE* the device will be unlocked and all parameters are released.

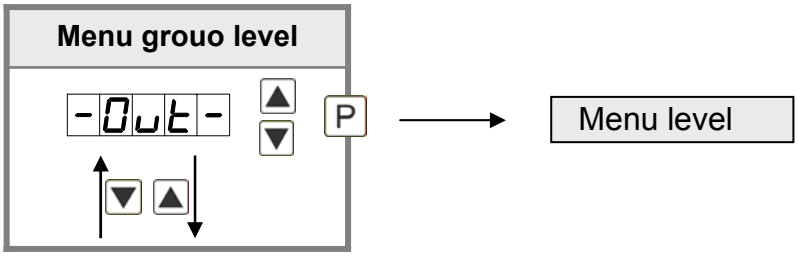
Menu level	Parameterisation level
	**Release/lock analog output parameters,** *OUT.LE:* Default: *ALL*  Analog output parameters can be locked or released for the user: - At *EN-OF* the initial or final value can be changed in operation mode. - At *OUT.EO* the output signal can be changed from e.g. 0-20 mA to 4-20 mA or 0-10 VDC. - At *ALL* analog output parameters are released. - At *NO* all analog outpout parameters are locked.
	**Release/lock alarm parameters,** *AL.LEU:* Default: *ALL*  This parameter describes the user relase/user lock of the alarm. - *LIMIT*, here only the range of value of the threshold values 1-4 can be changed. - *ALRM.L*, here the range of value and the alarm trigger can be changed. - *ALL*, all alarm parameters are released. - *NO*, all alarm parameters are locked.
	**Back to menu group level,** *RET*: With **[P]** the selection is confirmed and the device changes into menu group level „- *COD* -“.

4.3.4. Serial parameter

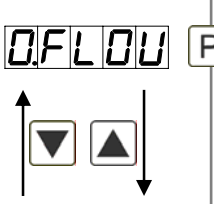
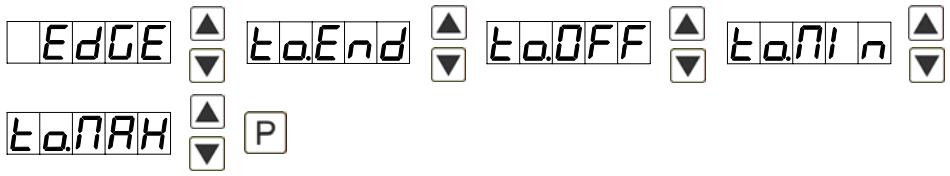
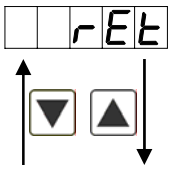


Menu level	Parameterisation level
Addr P 001 250 P	**Device address, *ADDR*:** Default: *001* The device address is adjusted from the smallest to the largest digit with the navigation keys [▲] [▼] and confirmed digit per digit with **[P]**. A device address up to max. 250 is available. Interface data: Baudrate 9600 bit/s, 8 databyte, 1 stopbit, no parity (8n1).
b.mode P ASCII rtu P	**ModBus operating modes, *B.MODE*:** Default: *ASCII* 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 P 000 100 P	**Timeout, *TIOUT*:** Default: *000* The monitoring of the data transfer is parameterized 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*:** With **[P]** the selection is confirmed and the device changes into menu group level „- *SER* -".

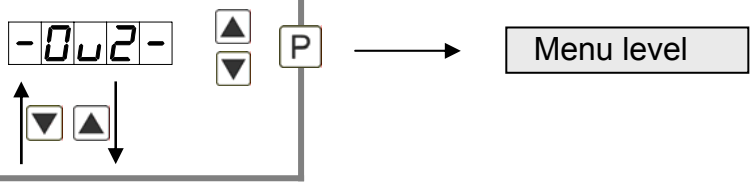
4.3.5. Analog output parameter for analog output 1

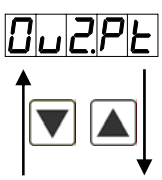


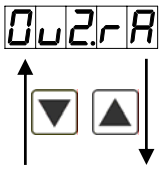
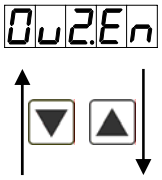
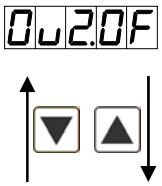
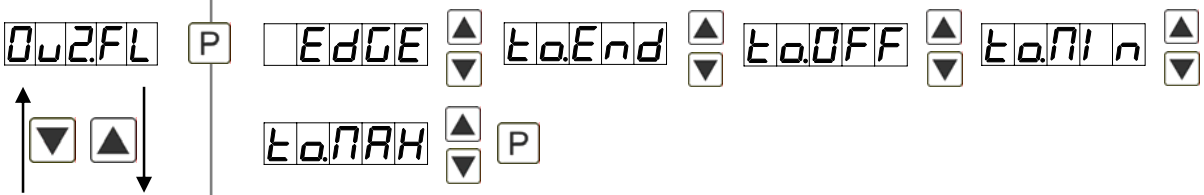
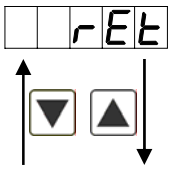
Menu level	Parameterisation level
OUtPt P	**Selection reference of analog output,** *OUTPT:* Default: *ACTUR* ActuA MI nUA MAXUA HoLd AbSUA P The analog output signal can refer to different functions, in detail these are the current measurand, the min-value or the max-value. If *HOLD* is selected, the 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.
Out.rA P	**Selection analog output,** *OUT.RA:* Default: *4-20* 0-10 0-20 4-20 P 3 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:* Default: *10000* 8 P 8 P 8 P 8 P 8 P 8 P 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 parameterized on the highest digit. After the last digit the device changes back into menu level.
Out.0F P	**Setting the initial value of the analog output,** *OUT.0F:* Default: *00000* 8 P 8 P 8 P 8 P 8 P 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 parameterized on the highest digit. After the last digit the device changes back into menu level.

Menu level	Parameterisation level
	**Overflow behaviour,** *O.FLOU:* Default: *EDGE*  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*: With **[P]** the selection is confirmed and the device changes into menu group level *„- OUT -“*.

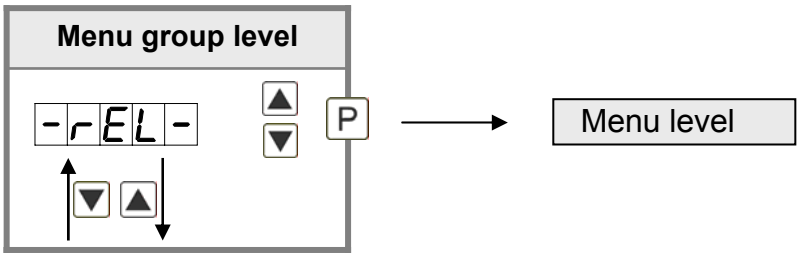
4.3.6. Analog output parameter for analog output 2

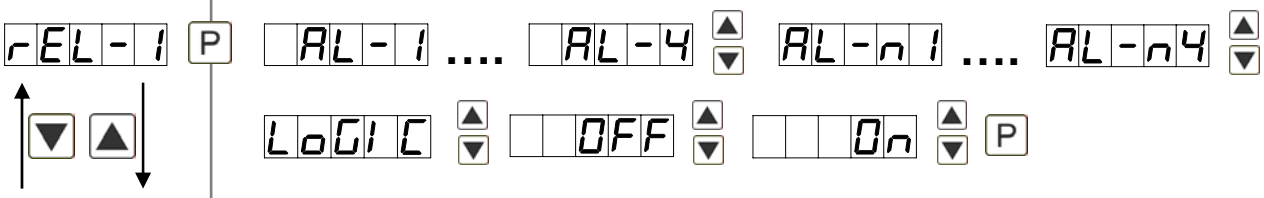
Menu group level


Menu level	Parameterisation level
	**Selection reference of analog output,** *OU2PT:* Default: *ACTUA*  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 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:* Default: *4-20*  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:* Default: *10000*  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 parameterized 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:* Default: *00000*  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 parameterized on the highest digit. After the last digit the device changes back into menu level.
	Overflow behaviour, *OU2.FL:* Default: *EDGE*  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*: With **[P]** the selection is confirmed and the device changes into menu group level *„- OU2 -"*.

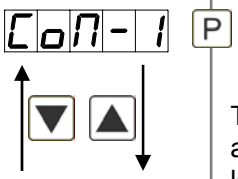
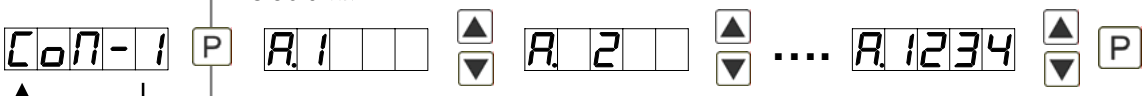
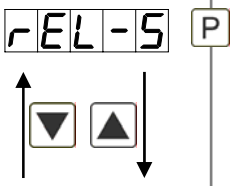
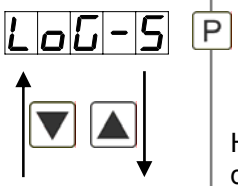
4.3.7. Relay functions



Menu level	Parameterisation level
	Alarm relay 1, *REL-1:* **The same applies for relays 2-4** Default: *AL-1*  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 *ALN1/4*. 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.
	Logic relay 1, *LOG-1* Default: *OR*  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*:

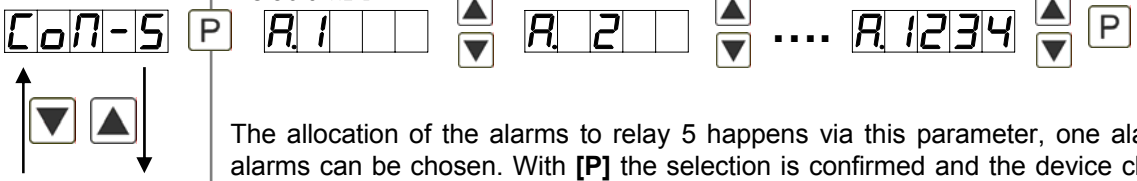
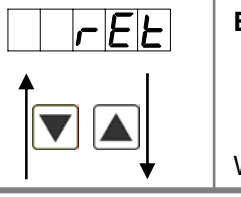
or	$A1 \vee A2$	As soon as a selected alarm is activated, the relay operates. Equates to operating current principle.
nor	$\overline{A1 \vee A2} = \overline{A1} \wedge \overline{A2}$	The relay operates only, if no selected alarm is active. Equates to quiescent current principle.
And	$A1 \wedge a2$	The 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.

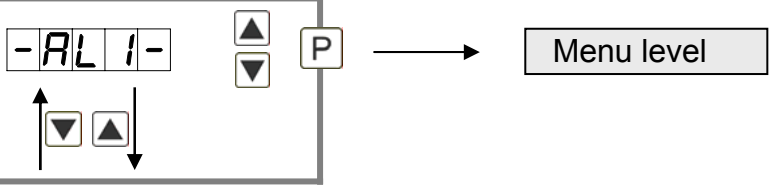
Menu level	Parameterisation level
	**Alarms for relay 1,** *COM-1:* Default: *A.1*  The allocation of the alarms to relay 1 happens via this parameter, one alarm or a group of alarms can be chosen. With **[P]** the selection is confirmed and the device changes into menu level.
	**Alarm relay 5,** *REL-5:* **The same applies for relays 6-8** Default: *AL-5*  Each setpoint (optional) can be linked up via 4 alarms (by default). This can either be inserted at activated alarms *AL1/4* 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.
	**Logic relay 5,** *LOG-5:* Default: *OR*  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*:

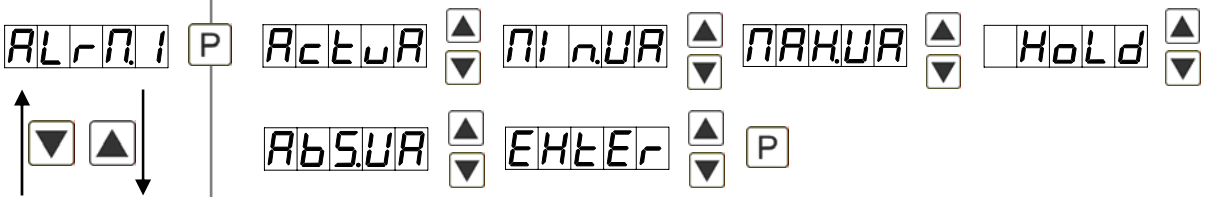
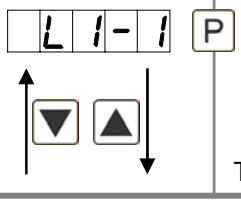
or	*A1* v *A2*	As soon as a selected alarm is activated, the relay operates. Equates to operating current principle.
nor	$\overline{A1 \vee A2} = \overline{A1} \wedge \overline{A2}$	The relay operates only, if no selected alarm is active. Equates to quiescent current principle.
And	A1 ∧ a2	The relay 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.

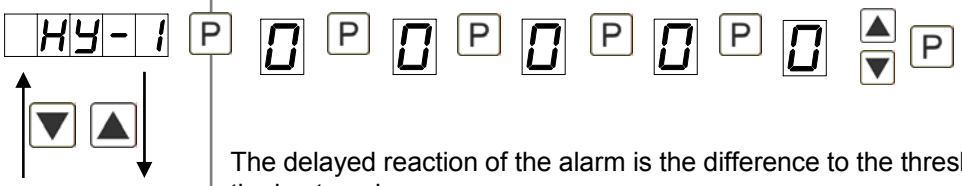
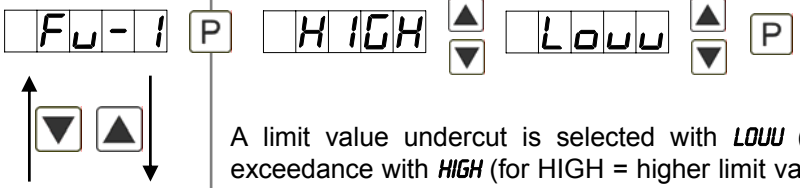
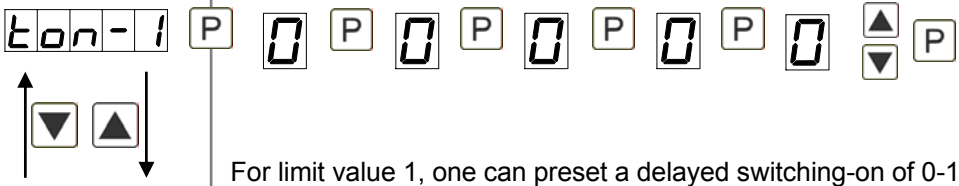
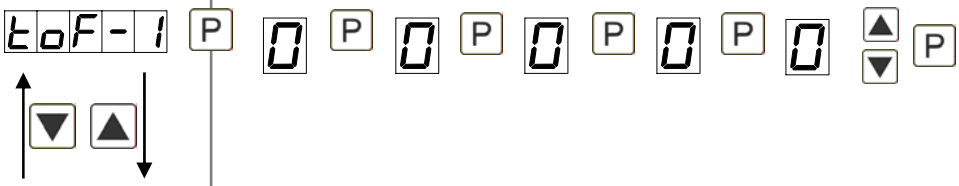
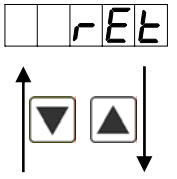
With **[P]** the selection is confirmed and the device changes into menu level.

Menu level	Parameterisation level
	Alarms for relay 5, *COM-5:* Default: *AL-5*  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.
	**Back to menu group level,** *RET*: With **[P]** the selection is confirmed and the device changes into menu group level „– *REL* –".

4.3.8. Alarm parameter

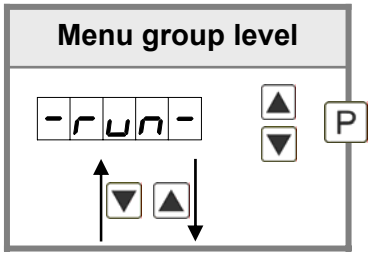
Menu group level


Menu level	Parameterisation level
	Dependency alarm 1, *ALRM.1:* Default: *ACTUA*  The dependency of alarm 1 can be related to special functions, in detail these are the current measuring value, the min-value or the max-value. Is *HOLD* selected, then the alarm is hold and processed just after deactivation of *HOLD*. *ENTER* causes the dependency either by pressing the **[O]**-key on the front of the housing or by an external signal via the digital input. With **[P]** the selection is confirmed and the device changes into menu level.
	**Threshold values / Limit values,** *LI-1:* Default: *2000*  The limit value defines the threshold, that activates/deactivates an alarm.

Menu level	Parameterisation level
	Hysteresis for Threshold values, *HY-1:* Default: *00000*  The delayed reaction of the alarm is the difference to the threshold value, which is defined by the hysteresis.
	Function for threshold value undercut /exceedance, *FU-1:* Default: *HIGH*  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.
	Switching-on delay, *TON-1:* Default: *000*  For limit value 1, one can preset a delayed switching-on of 0-100 seconds.
	Switching-off delay, *TOF-1:* Default: *000*  For limit value 1 one can preset a delayed switching-off of 0-100 seconds.
	**Back to menu group level,** *RET*: With **[P]** the selection is confirmed and the device changes into menu group level „- *AL1* -“.

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

4.3.9. Programming interlock, *RUN*:



Description see page 11, menu level *RUN*

4.4. 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:

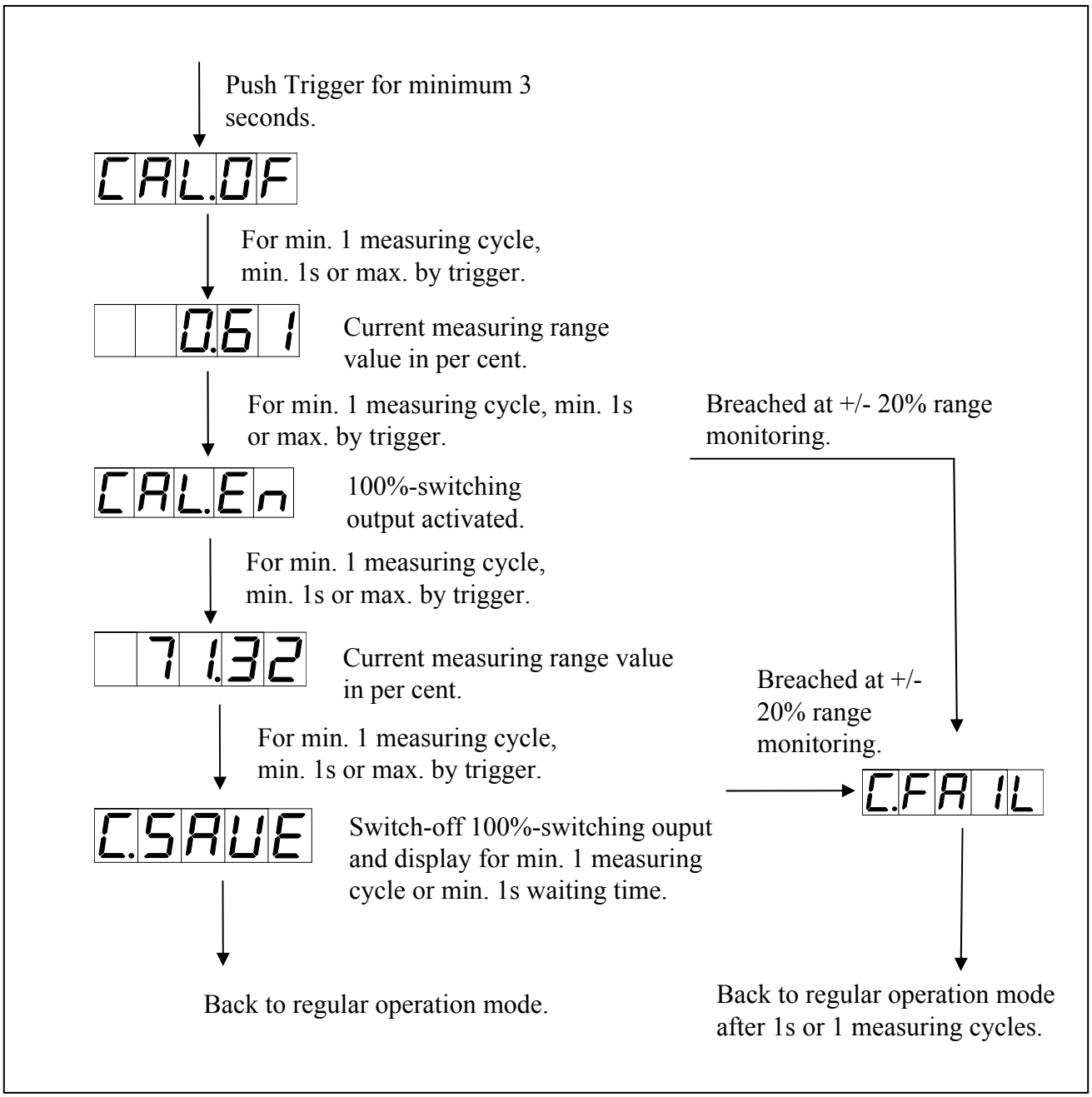
- Switch off the power supply
- Press button [**P**]
- Switch on voltage supply and press **[P]-**button until „- - - - -" is shown in the display.

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

Caution! All application-related data are lost.

4.5. Sensor calibration offset / final value

The device has an automatic calibration at mass pressure sensors, where an integrated switching output operates an often available 100% calibration. Like this offset and final value are adjusted, and the sensor can be applied directly after this. The calibration can be done via the 4th key or the digital input, depending on the parameterisation.

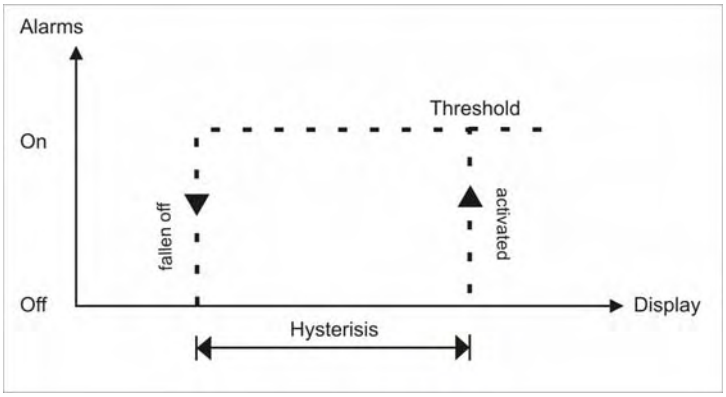


If a special input range *SENS.1*, *SENS.2*, *SENS.3* was selected under *TYPE*, a checking of the range is done for offset and final value. At an undercut/exceedance of +/- 20% of adjustment range, an *C.FAIL* is given out.

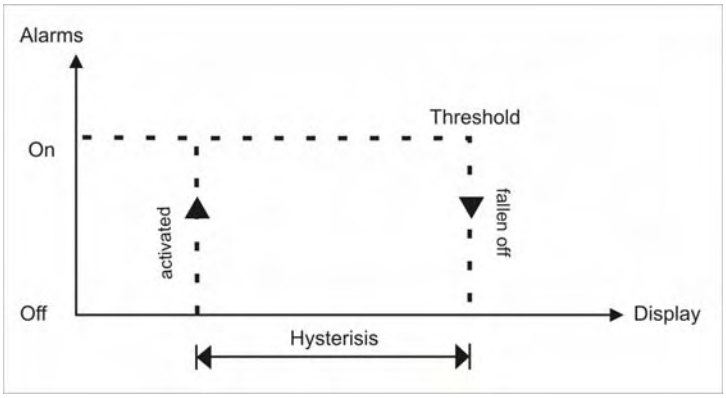
4.6. Alarms / Relays

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-S2; furthermore alarms can be controlled by events like e.g. Hold or min-/max-value.

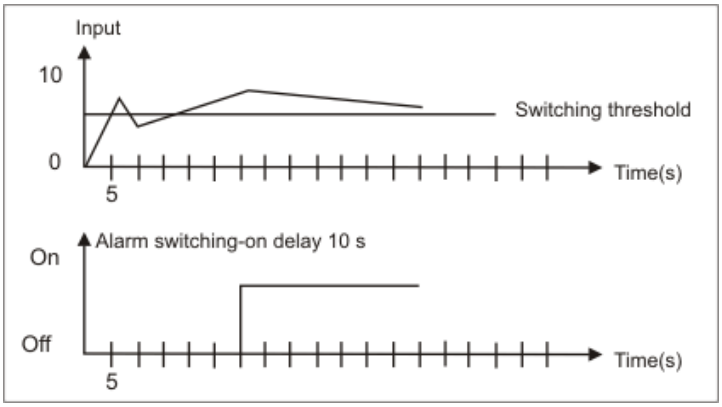
Function principle of alarms / relays	
Alarm / Relay x	De-activated, instantaneous value, min-/max-value, hold-value
Switching threshold	Threshold / limit value of the change-over
Hysteresis	Broadness of the window between the switching thresholds
Working principle	Operating strom / Quiescent current



Operating current
By operating current the alarm S1-S2 is off below the threshold and on on reaching the threshold.



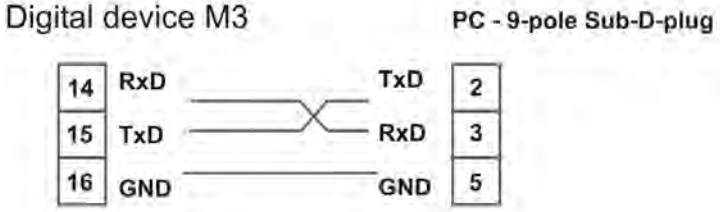
Quiescent current
By quiescent current the alarm S1-S2 is on below the threshold and switched off on reaching the threshold.



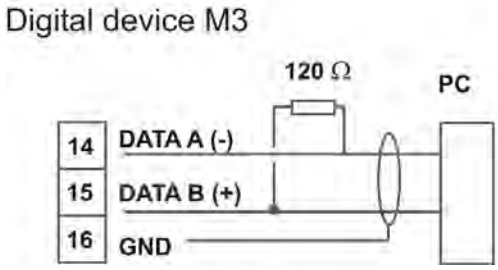
Switching-on delay
The switching-on delay is activated via an alarm and e.g. switched 10 seonds after reaching the switching threshold, a short-term exceedance of the switching value does not cause an alarm, respectively does not cause a switching operation of the relay. The switching-off delay operates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

4.7. 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 neccessary 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 (–).

5. Technical data

Housing	
Dimensions	96x48x120 mm (BxHxD)
	96x48x139 mm (BxHxD) incl. plug-in terminal
Panel cut-out	$92.0^{+0.8}$ x $45.0^{+0.6}$ mm
Wall thickness	up to 15 mm
Fixing	screw elements
Material	PC Polycarbonate, black, UL94V-0
Fixing material	EPDM, 65 Shore, black
Protection class	Standard IP65 (Front), IP00 (Back)
Weight	approx. 300 g
Connection	plug-in terminal; wire cross section up to 2.5 mm^2
Display	
Digit height	14 mm
Segment colour	Red (optional blue/green/orange)
Range of display	-19999 to 99999
Setpoints	one LED per setpoint
Overflow	horizontal bars at the top
Underflow	horizontal bars at the bottom
Display time	0.1 to 10.0 seconds
Input	
Sensor sensitivity	1mV/V, 2mV/V, 3.3mV/V
Measuring bridge	250-500 Ω / 20-40 mA
Measuring error	0.2% of measuring range in electromagnetic dominated environment, 1% of measuring range in industrial invironment with strong disturbing source
Digital input	< 24 V OFF, 10 V ON, max. 30 VDC R_I ~ 5 kΩ
Sensor calibration	always required
Temperature drift	100 ppm / K
Accuracy	
Measuring time	0.1…10.0 seconds
Measuring principle	U/F-conversion
Resolution	approx. 18 Bit at 1s measuring time, 3.3 mV/V measuring range

Output	
Sensor supply	10 VDC / 20-40 mA
Analog output	0/4-20 mA or 0-10 VDC 16 Bit switchable
Switching outputs	
Relay Switching cycles	with change-over contact 250 VAC / 5 AAC; 30 VDC / 5 ADC 30 x 10^3 at 5 AAC, 5 ADC ohm resistive burden 10 x 10^6 mechanically Diversity according to DIN EN50178 / Characteristics according to DIN EN60255
PhotoMos outputs	8 normally open (NO) contacts 30 VDC/AC, 0,4 A
Interface	
Protocol	Modbus with ASCII or RTU-protocol
RS232	9.600 Baud, no parity, 8 databit, 1 stopbit, wire length max. 3 m
RS485	9.600 Baud, no parity, 8 databit, 1 stopbit, wire length max 1000 m
Power pack	230 VAC +/- 10 % max. 10 VA 10-30 VDC galv. insulated, max. 4 VA
Memory	EEPROM
Data life	≥ 100 years
Ambient conditions	
Working temperature	0…50°C
Storing temperature	-20…80°C
Climatic density	relative humidity 0-80% on years average without dew
EMV	EN 61326
CE-sign	Conformity according to directive 2004/108/EG
Safety standard	According to low voltage directive 2006/95/EG EN 61010; EN 60664-1

6. Safety advices

Please read the following safety advice and the assembly *chapter 1* before installation and keep it for future reference.

Proper use

The **M3-1W-device** is designed for the evaluation and display of sensor signals.

Danger! Careless use or improper operation can result in personal injury and/or damage to 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.

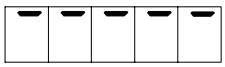
Installation

The **M3-1W-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 supply voltage should not exceed a value of **6A 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. So, you receive best measuring results.
- 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 equaliser (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 devices is part of the service. Here electrostatic discharge needs to be avoided. Attention! High voltages can cause dangerous body currents.
- Galvanic insulated potentials within one complex need to be placed on a 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 to faulty wiring, can be avoided.

7. Error elimination

	Error description	Measures
1.	The unit permanently indicates overflow. 	• The input has a very high measurement, check the measuring circuit. • With a selected input with a low voltage signal, it is only connected on one side or the input is open. • Not all of the activated setpoints are parameterised. Check if the relevant parameters are adjusted correctly.
2.	The unit permanently shows underflow. 	• The input has a very low measurement, check the measuring circuit . • With a selected input with a low voltage signal, it is only connected on one side or the input is open. • Not all of the activated setpoints are parameterised. Check if the relevant parameters are adjusted correctly.
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 • Enter correct code
5.	"*ERR1*" 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 if the device has been parameterised before, then follow the steps as written in *chapter 5.2.* and set it back to its delivery status.