ETH messtechnik

User manual

ValueView D-01

Supply and display device with display for torque, speed and pulse stretching

D-01: two devices=Standard	• for positve and negatve peak value measurement or • Tracking and peak value measurement
D-02: standard + variant	Torque and speed measurement
D-03: standard + variant	Eight potental-free changeover contacts limit value outputs, four for torque and four for speed
D-XX: standard + variant	Descripton of the desired functons

This operator manual is not a quality agreement or durability guarantee as set out in Section 443 of the German Civil Sode.

Specification changes, typing and printing errors reserved.

Content

1. USER MANUAL TORQUE DISPLAY

Digital panel meter with universal measuring input:

Standard Features:

- **5-digit red display (-9999…99999 digits)**
- **min/max value survey**
- **30 point linearization**
- **permanent wire breakage monitoring**
- **optical setpoint indication**
- **Hold-/Tara function via keypad or digital input**
- **totaliser function (summation function)**

1.1 Technical data torque display

Display	
Digit height	14 mm
Segment Color	Red
Display range	-9999 to 99999
Switching points:	1 LED per switching point
Overflow	horizontal bar above
Underflow	horizontal bar above
Display time	0,1 to 10 seconds

Entrance Voltage / current	**Measurement-range**	**R_1**	**measurement error Tu=20..40°C (%)MB**	**Digit**
	±10 V	10 M	0,02	± 1
	± 5 V	10 M	0,04	± 1
Measuring time at peak value measurement Rise time 0 - 100 1 ms = 98%				

temperature drift at TU < 20°C bzw. > 40°C	**all measuring inputs**	**50 ppm / K**
Measuring time	voltage	0,02 ... 10,00 seconds
Principle of measurement	Sigma / Delta	
resolution	24 Bit	
Totalizer time error	max. 0.1% of the totalizer value at integration times> 1 min	
Digital input	< 2,4 V OFF, > 10 V ON, max. 30 VDc, Ri ~ 2 kΩ	

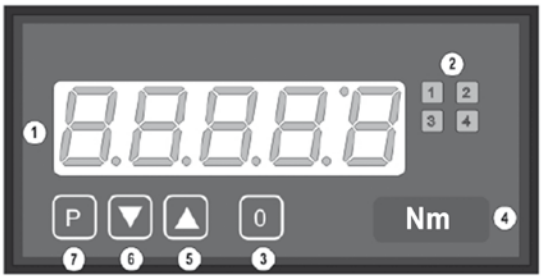
Output (Option)	
Relais	-Umschaltkontakt 250VAC / 5A; 30VDC / 5A with resistive load
switching	0,5 * 105 at max. contact rating 5 * 106 mechanical Separation according to DIN EN 50178 / Characteristics according to gemäß DIN EN 60255
Interface (option)	
Protocol	manufacturer specific ASCII
RS232 (optionally galvanically isolated)	9600 Baud, no Parität, 8 Datenbit, 1 Stopbit
cable length	max. 3m
RS485	9600 Baud, no Parität, 8 Datenbit, 1 Stopbit
Cable length	max. 1000 m
Power supply	
Supply voltage	230 VAC / 50/60 Hz, ± 10 % (max. 35 VA) other supply voltage on request
Memory	parameter memory EEPROM
Data retention	≥ 100 years at 25 °C
Ambient conditions	
Working temperature	0 … 50°C
Storage temperature	-20 … 80°C
Climatic conditions	relative humidity ≤ 75% annual mean without condensation
Internal protection	IP30
EMV	DIN 61326
CE-sign	Conformity according to Directive 2004/108 / EC
Safety standard	in accordance with the Low Voltage Directive 2006/95 / EC; EN61010; EN60664-1
Power supply	12 V max 1 A

Security alert
Please read the following safety precautions before installation and keep this manual for future reference.

2. OPERATION AND FUNCTIONAL CHARACTERISTICS

2.1 Operation

Attention: The following programming manual describes some functions that are not possible in the ValueView. The indicator is intended for torque indication.
Not possible are e.g. Position detection, temperature, resistance, current, etc.
As an option, relay outputs, analogue output, RS232 are available.



1. 7-Segment display
2. Switching point display 1-4
3. Zero key
4. Gap for physical unit
5. Plus-key
6. Minus-key
7. Programm-key

Display (1)	
7 segment display	5-digit, red
Digit height	14 mm
Display range	-9999…99999
Decimal points	none, 1, 2, 3, 4 (adjustable)
Physical unit	°C, °F, Pt100 / Thermocouple
Setpoint displays (2)	
Optical threshold message	4 LED, red
Keys (5), (6), (7), and (3)	
P	Programming mode
▲	Increase of value range
▼	Decrease of value range
P + ▼	Address Next lower program number
P + ▲	Address Next higher program number
0	Activation of TARA or HOLD, Reset for MIN/MAX permanent
Dimension gap (4) for physical unit	
Variable dimension strip	Dimension on demand e.g. kg, m³…

Switching on

Before switching on, check all the electrical connections to make sure they are correct. On completion of the installation, the device can be switched on by applying the supply voltage.

Starting sequence

During the switching-on process, a segment test is performed for approx. 1 second, whereby all LED on the front (including setpoint LED) are triggered. After this, the type of software is indicated for approx. 1 second and then, also for 1 second, the software version. After the starting procedure, the unit changes to operation/display mode.

MIN/MAX memory

The measured minimum and maximum values are saved in a volatile memory in the unit and get lost when the unit is switched off.
You can call up the contents of the memory by pushing (less than 1 second) the **[▲]** or **[▼]** key. The relevant value is indicated for approx. 7 seconds. By briefly pressing the same key again, you will return immediately to the display mode .

[▲] ⇒ Display of MAX value
[▼] ⇒ Display MIN value

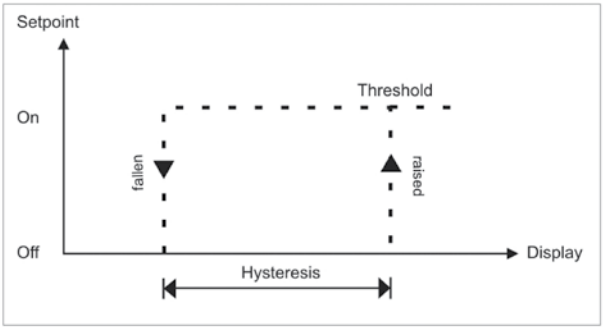
Erase the value shown in the display by simultaneously operating the **[▲]** and **[▼]** keys. The erasure is acknowledged by horizontal bars. The content of the memory will be lost with switching-off of the device.

Overflow / Underflow	
Overflow	An **overflow** of the display is indicated by horizontal bars at the top of the 7-segment display.
Underflow	An **underflow** of the display is indicated by horizontal bars at the bottom of the 7-segment display.

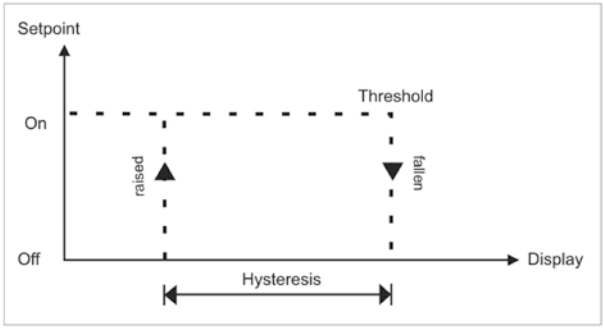
2.2 Alarms / Relays

With the aid of the LED next to the 7-segment display, you can view the switching state of the relays. An active relay is indicated by the relevant LED lighting up.

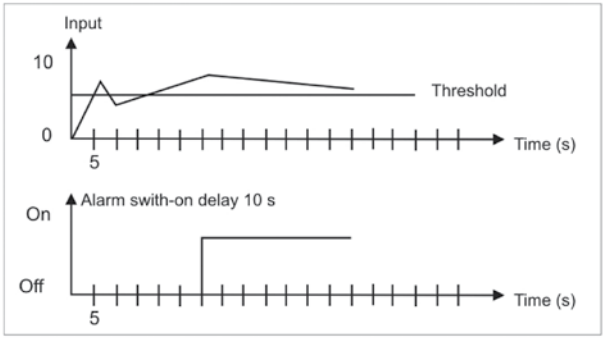
Functional principle of alarms / relays	
Alarm / Relay x	Deactiviated, instananeaous value, MIN value, MAX value, Hold value, sliding average value, totalizator value
Threshold	Threshold / Switch-over threshold
Hysteresis	Width of window between switching threshold
Working principle	Operating current / quiescent current
Switch-on delay	Time between reaching the threshold and the resultant switching on of the relay.
Swith-off delay	Time between reaching the threshold and the resultant switching off of the relay.
Alarm confirmation	Switch-on or switch-off interlock and rejection at activated digital input or zero key



Operating current
The setpoint is **off** below the threshold and **on** on reaching the threshold.



Quiescent current
The setpoint is **on** below the threshold and switched **off** on reaching the threshold.



Switching-on delay
The relays S1-S4 are on 10 seconds after reaching the threshold; briefly exceeding the threshold does not lead to the relay being switched on. The switch-off delay functions in a similar manner, in other words it keeps the set point switched on until the parameterised time has elapsed.

Allocation of the alarms to a certain actuate value
As it is not always desired that alarms follow the operating mode, the outputs can be assigned to the minimum/maximum value or any other value. Therefor the adjustable value range is assigned to the according program number (PN60, PN70, PN80 and PN90).

Alarms 1-4	
Mode	Actuate value
0	Keine
1	Instananeaous value
2	Minimal value
3	Maximal value
4	HOLD-value
5	Sliding average value
6	Totaliser value

Alarm confirmation
If one wants to display interim occured alarms, the self-acting switching-on or switching-off can be blocked. Therefor the confirmation of the according setpoints 1-4 must be assigned to the digital input or the zero key under program numbers 67, 77, 87 and 97.
Caution!!! Alarm status will get lost by voltage drop!

Optical response, flashing display
If one or some thresholds are broken, the flashing of the alarm LED can amplify the optical response by assignment of the threshold PN59 to the 7 segment display.

Example:
The threshold for flashing of the display is set at setpoint 2.
If setpoint 1 is exceeded and set point 2 is not, the set point LED 1 lights up permanently.
If setpoint 2 exceeds the threshold, the 7-segment display will start to flash, setpoint 1 will light up permanently and set point LED 2 will flash.
The flashing enhances the optical response and the operator sees immediately that an important threshold has been exceeded with this unit.

2.3 Analog out
The optional analog output is used for the transduction of a measuring value, supported by a standard signal of 0…10V or 0/4…20mA. The signal selection happens under program number 23. So, PN23=0 equates to the 0-10 V signal, PN23= 1 equates to the 0-20 mA signal and PN23=2 equates to the 4-20 mA signal. The analog output is parameterised via the two program numbers PN20 final value (fullscale) and PN21 initial value (Offset). At the initial value, the value is set where the analog output transmits the minimal value (0V or 0/4mA), and with „Full scale“, the value at which the output transmits its maximum (10V or 20mA).
By this means it is possible to rescale the input signal of a transducer or even to convert it into another standard signal. The analog output can be deactivated via the actuate value PN22, as well as set on the active measuring value, MIN value, MAX value, HOLD value, sliding average value or totaliser value. The analog output is updated within the cycle of the measuring time. At a high measuring rate, smaller cycle fluctuations of some milli-seconds are possible.

2.4. Digital input / Zero key

In combination with the digital input (via terminal) and/or the zero key at the front, functions like e.g. HOLD, TARA, MIN/MAX permanent or the totaliser function, can be actuated or set back. The digital input is available in combination with the option sensor supply or via an external 24 VDC signal. The zero key at the front of the device can be activated by keypress.

2.4.1 HOLD function

The HOLD function is a static signal and will be activated via the digital input or the zero key (see page 26, PN15=4). With activated HOLD the lastly given measuring value remains and is by deactivation permanently overwritten by the measuring value recording. With this function a teststate can be recorded beyond a specific period, so that this device can be used for control in run production, too.
Advice: HOLD value gets lost with re-start!

2.4.2 TARA function

The TARA function can be activated by zero key, digital input or with boot-up, the display value is then on the tare value.
This function is only done once, after actuation of the desired trigger and has to be taken back bevor anew alignment.

2.4.3 MIN/MAX permanent

To measure a MIN/MAX value the display can be set back by the display mode (PN15) in a way, that it only shows the minimum or maximum measured value. The value can be reset by the zero key and/or the digital input.
Advice: MIN/MAX value get lost with restart!

2.4.4 Totaliser functions

With the totaliser, the measured display value can be integrated or accumulated over a time. The accumulated time-frame depends on the preset measuring time (PN14). With this function e.g. a volume over the current discharge can be recorded. So this function is qualified for the dose of fillup quantities in conjunction with relays. The mileage section can be detected by the measured speed.

The cumulative value:

- can be parameterised on different time bases and dimensions (e.g. for volume, liter, m^3, km^3, …).
- can be directed to the display and outputs as a default display value.
- can be reset by a parameterised signal as counter reset (PN185) or by the counter value (PN184).
- is saved in the device even beyond a voltage drop by long-lasting memory. A data loss of max. 30 minutes can occur in case of a voltage drop.

2.5. Serial interface RS232 / RS485

All PU5-devices can optionally be programmed or configurated via an interface. Devices of the basic type do not have an interface.

Operating mode

The interface can be operated in various modes that can be parameterised via the PN34.

PN34=0

Standard mode in which the unit only replies if called on to do so. This mode is used only for configuration. Furthermore the current measuring value can be recalled via commando " A ↵"

PN34=1

Transmission mode in which the measurements are transmitted via the serial interface cyclically with the set measuring time.
The transmission mode is interrupted on receipt of " **>** ↵" and the unit changes to standard mode. To change back to transmission mode, the display must be restarted, either by entering the command "S ↵" or by switching the device off and on.

With the transmission mode, the display value is transmitted via the interface in ASCII format. Minus signs and decimal points are also transmitted so that the output can be displayed directly on a terminal or processed by a SPS. Zeros at the front are suppressed during transmission. With an over or underflow, the display transmits horizontal bars (hyphens) „- - - - - ↵". Examples: „0.00 ↵" ; „-9.99 ↵" ; „999.99 ↵" ; „-123.45" ; „- - - - - ↵"

With the aid of this simple protocol structure, the display data can be transferred very easily to a PC etc. and further processed there. In the simplest case, a terminal program from the operating system is sufficient to store the received data in a file.

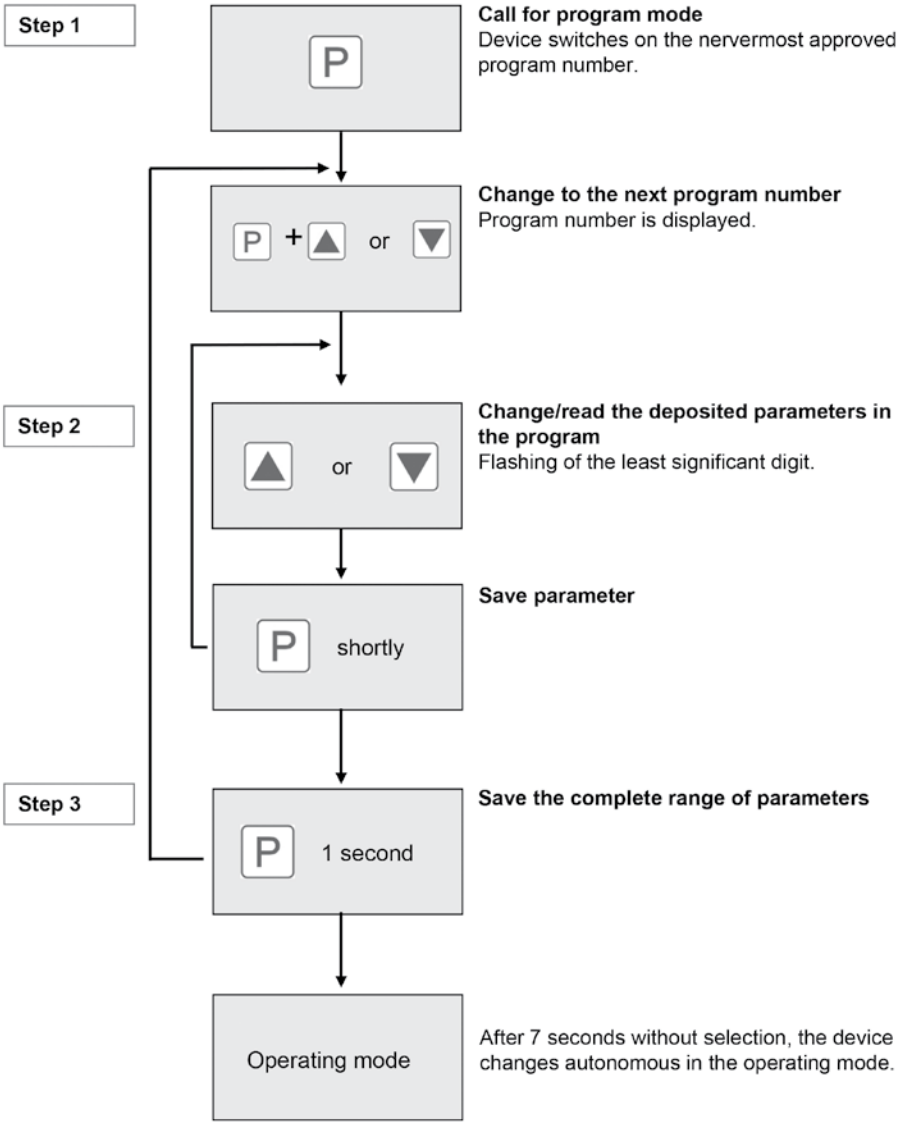
Configuration of the device via interface

For configuration the set-up tool PM-Tool can be used. As the communication is a straight point-topoint connection.

The baud rate is set to 9600 baud, with 8 databits, without parity and one stopbit .
Configuration is performed by transmitting ASCII symbols.

3. PROGRAMMING

Functional diagram of programming via key pad



Description of the program numbers

The program numbers (PN) are shown in the display, right-justified, as a 3-digit number with a P in front of them:

Display of e.g. program number 0

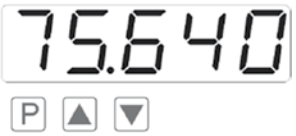
Programming procedure
The entire programming of the PU5 is done by the steps described below.

Change to programming mode
Push the [P] key to change into programming mode. The unit goes to the lowest available programnumber. If the programming lock is activated, the key must be pushed for at least 1 second.

Change between program numbers
To change between individual program numbers, hold the [**P**] key down and push the [▲] key for changing to a higher program number or the [▼] key for changing to a lower number. By keeping the keys pushed, e.g. [**P**] + [▲], the display will begin, after approx. 1 second, to automatically run through the program numbers.

Change to the parameter
Once the program number appears in the display, you can push the [▼] or [▲] key to get to the parameters set for this program number. The currently stored parameters are displayed

In this case, it is 75,640



Changing a parameter

After changing to the parameter, the lowest digit of the respective parameter flashes on the display. The value can be changed with the [▲] or [▼] key. To move to the next digit, the [**P**] key must bebriefly pushed. Once the highest digit has been set and confirmed with [**P**], the lowest digit will begin to flash again.

Example:
The 0 is flashing this is the lowest digit and asks if you want to change it. Let us assume the figure is to be changed from 75,640 to 75,000.
Briefly push the [P] key to move to the next digit. The 4 begins to flash. Change the figure by pushing [**P**] or [▲] to change the digit from 4 to 0. Briefly push the [**P**] key to move on to the next digit. The 6 begins to flash. Change the digit by pushing [▲] or [▼] to move the 6 to a 0. Briefly push the [**P**] key to move to the next digit. The 5 and 7 do not need to be changed.

Saving of parameters

All parameters must be acknowledged by the user by pushing the [**P**] key for one second. The changed parameters are then taken over as the current operating parameters and saved in the EEPROM.
This is confirmed by horizontal bars lighting up in the display. All the newly entered data are confirmed by the unit. If no confirmation is received, the relevant parameters have not been saved, e.g. confirmation of parameters:

Changing from programming to operating mode

If no key is pushed in the programming mode for about 7 seconds, the unit will return automatically to operating mode. Before SAVE will be displayed untill the next measuring value is displayed.

Universal measuring input

The PU5 is equipped with a universal measuring input that enables the signals from all kinds of different sensors to be measured direct. So that the unit can work according to the signal generated by the sensor, the input must be configured. The basic parameter is always set under PN0

Attention!
For the unit to function correctly, it is absolutely essential that the right sensor is parameterised under **program number 0**. If a wrong sensor is parameterised there, the operating behaviour may be impaired.

Setting / Calibration of the measuring input
All the units are calibrated in the factory, whereby offset and full scale have been saved for the various measuring ranges. Via terminal connections and the choice of the measuring input under PN0, different types of input signals can be worked up.

Factory calibration current / voltage under PN0 = 1…12
For these parameters, new scaled display values can be allocated which are used for scaling the measurement on the display. For the offset, an input signal of 0 is assumed and for full scale, the specific full scale of the parameterised measuring range.
For parameterisation, no sensor signal has to be applied because stored values are used. Because of the differing input signals, the corresponding input configuration must be parameterised via PN0. For the sensor signal with 4...20 mA, for example, PN0=2 has to be parameterised.

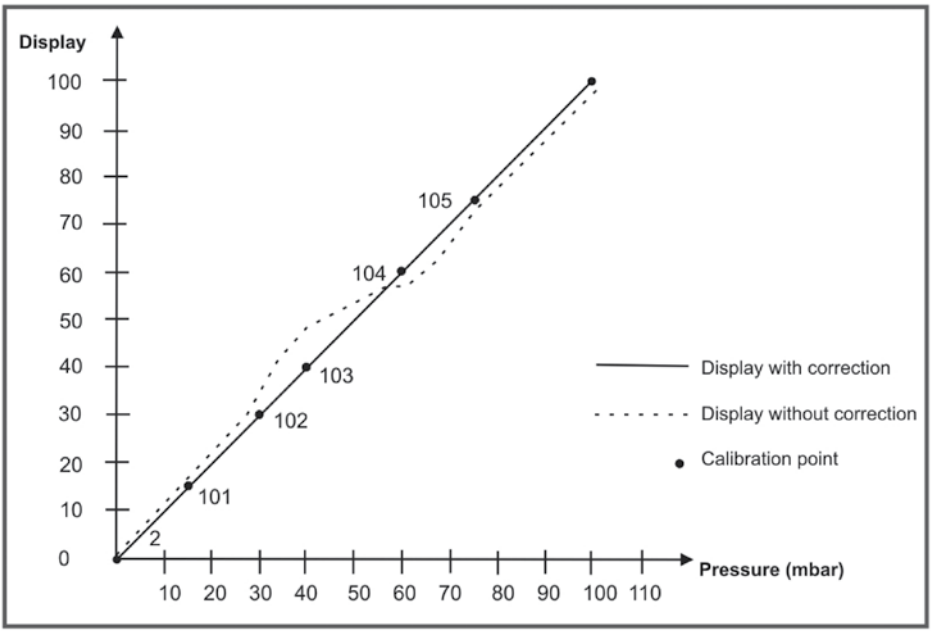
Temperature measurement PN0 = 13…29
For the temperature measurement, the scaling cannot be changed by the user and is only determined from the standardized sensor range. Sensor-caused variations can be balanced by offset shift (PN5) on the characteristic line.

Sensor calibration for resistance / current / voltage PN0 ≥ 3
With the sensor calibration, the unit can be calibrated or set up directly via the sensor signal or via a calibrator. For this, the measuring signal must be connected to the input of the unit. The respective display value (SCALE) must then be saved under the program number PN1 (full scale) and PN2 (offset). The sensor signal is measured via the factory parameter and displayed as current or voltage. A measurement must be started by shortly pushing the [P] key. Through this process with two calibration points, the unit is matched up with the measuring section. For more far-reaching adjustments to the characteristic line of the sensor, a linearization can be activated.
At the resistance measurement, only the display value (SCALE) is parameterised. The adjoining sensor signal (INPUT) will not be displayed, but directly absorbed unit-intern. For linearization of the parameter at least PN1 (final value) or PN2 (zero point) must be preset.

Linearization PN100
The PU5 offers the possibility to linearize, with up to 30 additional setpoints, non-linear sensors for the display of the measuring values and their subsequent processing (analog output). The number of the desired setpoints is determined under PN100. Be aware of chosing the one that makes the most sense, as it can lead to a malfunction of the device in case of no adjustment.

Approach to sensor calibration PN0 => 33
To program e.g. 5 additional calibration points, 5 must be entered under PN100. Subsequently, for each of the calibration points, the voltage/current must be applied to the unit and the respective display value programmed under the following program numbers PN101 – PN105.
The sensor signal must be consistently parameterised. A gap of at least +1 digit to the previous display value must be adhered to, otherwise the input will be refused and no confirmation of the saving will be given.
Linearization of a pressure transducer for 0...100 mbar with an output of 0...20 mA. The display value before correction can be either calculated from the known characteristic line of the transducer or be determined empirically.
The non-linear range between 0...75 mbar. For calibration point 101, this means: A pressure of 15 mbar, the transducer delivers 3.3 mbar instead of the optimum value of 3.0 mbar. As 20 mA in the display corresponds to 100.0 mbar, 3.3 mA in the display corresponds to 16.5 mA before the correction.

Calibration point (PN)	Pressure (mbar)	Output Transducer (mA)	Display before correction (IN)	Desired display (OUT)
2	0	0,5	2,5	0,0
101	15	3,3	16,5	15,0
102	30	6,2	31,0	30,0
103	40	9,2	46,0	40,0
104	60	11,4	57,0	60,0
105	75	14,7	73,5	75,0
1	100	20,0	100,0	100,0



Proceeding with factory calibration PN0 ≤12

With adjusted factory calibration a linearisation without connection of the sensor signal can be presetted. Therefore the number of the desired setpoints needs to be filled in under PN100, to subsequently relate the display values to a certain measuring signal.

Starting on setpoint (PN101) the display value (SCALE) and subsequently the according measuring signal (INPUT) need to be programmed. Both inputs are saved by pushing the [**P**]-key (for approx. 1 sec).

4. PROGRAM NUMBER DESCRIPTION

The PU5 device has a default configuration ex factory, where a 0…10 V input signal is changed into a display value of 0…10000. For devices, where the preconfiguration is unknown, a reset on the default parameter should be done (see chapter 9). Otherwise unwanted reactions of the device can occur due to foreign settings.
The devices do have a digital input, with which some functions like e.g. HOLD, TARA, or MIN/MAX can be actuated.

Measuring input PN0
For the basic configuration of the unit, you must parameterise the right measuring input for your application under PN0. There is a choice of various inputs in the program number table (chapter 8.1).

Scaling PN1 and PN2
The two program numbers 1 and 2 serve to scale the display; with these two parameters, the offset and full scale are parameterised. For each setpoint there is a SCALE–value and a InPUt–value. The SCALE–value indicates the desired display value. The according measuring signal is detemined by the InPUt–value. In case of factory calibration the desired current or voltage value is preset. If a sensor calibration is demanded, a measurement can be actuated by a short pushing of the [P]-key.
Before the saved current value/voltage value is visible. All inputs need to be confirmed by pushing the [P]-key for approx. 1 second; the device confirms the correct take-over with 5 vertically bars in the display.

Decimal point PN3
By changing this parameter, the position of the decimal point in the display is changed. With temperature measurements, the physical unit °C or °F can also be added.

Offset shift / Zero point shift PN5
With this parameter it is possible to carry out a parallel shift of the parameterised characteristic line. This may be necessary if, for example, a pressure sensor ages over the course of time and a shift in the zero point occurs. With the parallel shift, the sensor can be adjusted back to the zero point. Another application would be to parameterise a certain tank level to zero and have any deviation from this level displayed.
With the offset it does not matter whether the original characteristic line has been program-med by the user with PN1, PN2 or PN101...130 or whether it is the characteristic line of a temperature sensor. The value parameterised under PN5 is added to the original display value. If, for example, a temperature sensor shows approx. 3 °C instead of 0 °C, you can compensate for this deviation by changing the value under PN 5 from 0 to -3.
If the comparison metering point is turned off for the thermocouple, the comparison metering temperature can be preset manually. This parameter can be changed directly by taring, if it has been actuated by a configurated incident (see PN8).

Thermocouple reference junction PN6
The thermocouple reference junction is only available for thermocouples and can be activated or deactivated under PN6. Deactivation may be useful where the interchange point is kept at a very constant level or the temperature constitutes the direct relationship to the process. In this case the wiring to the measuring device can be conducted in simple wiring copper.

Setpoint value for taring PN7
By actuation of the taring, the display value is set on the taring value. This means the offset / zero point is shifted in a way that the display value is equivalent to the taring value.

Actuation for taring PN8
During taring, the instantaneaus value is set on a demanded setpoint value, which is configurated under PN7. The difference between setpoint value and actual value is saved as offset PN5 in the device. Following operational modes are known for taring, they are adjustable under PN8:

PN8 =	Actuation for taring
0	none
1	Digital input active, longer than 3 seconds
2	Zero key actuated for longer than 3 seconds
3	Digital input or zero key active for longer than 3 seconds
4	Taring at boot-up
5	Taring at boot-up and with digital input
6	Taring at boot-up and with zero key
7	Taring at boot-up, digital input and zero key
8	Taring with activated digital input for activation period
9	Fast taring on digital input
10	Fast taring on zero key
11	Fast taring on digital input or zery key

The taring can be called off by programming of the PN5 offset shift on the value zero.
A special form is taring PN8 = 8: the taring is not saved in PN5 offset shift, but charged temporarily for the duration of the activated digital input. The old tara value gets lost by a boot-up. The display shows 00000 for approx. 1 second to confirm the taring. Taring is done only one time after actuation of the desired activator. For a anew calibration the signal for the activation of the taring musst be cancelled.
If the MIN/MAX value reset is programmed on the same activator as the taring, then after taring a MIN/MAX value reset takes place, too. Furthermore the taring can be watched very well as the instantaneous value is shown directly before and after taring.

Sliding average value PN12
The complete average time is a result of the product or a multiplication of time and recorded average value PN14 x PN12. If one wants to see this result in the display, the display mode PN15 needs to be programmed parallel on this result. This must be pointed out with an optional analog output or with the relays, too

Display time PN13
The display time is the interval at which the display is updated. The longer the time between two display cycles, the calmer the display. The eye perceives a display time of 1 second as very pleasant.

Measuring time PN14
The PU5 performs an averaging process by calculating an average from several measure-ments taken during the measuring time (1/measuring time = Samples/s). For most applications, a measuring time of 0.20 to 1.00 seconds is suitable.

Caution: The update of other functional components (analog output and relay) is carried out cyclically with the set measuring time. If the measuring time is set very short, it is possible that there will be jumps in the analog output in case of a noisy signal or a brief switching of the relay. When selecting the measuring time, it should be borne in mind that the MIN/MAX memory receives its values on the basis of the set measuring time. Should the peaks of a turbulent signal be recorded, it may certainly be worthwhile to choose a very short measuring time.

Display mode PN15
The device supports several operational modes, which are seletcable under PN15.

Instantaneous value (PN15 = 1)
Operational mode „instantaneous value“ is equal to the standard display, where the last measured value is displayed.

Minimal value display (PN15 = 2)
In this operational mode, the smallest occured display value, since the last minimal value reset, is displayed. The minimal value reset is actuated by boot-up (switching-on) or by the digital input/zero key.

Maximal value display (PN15 = 3)
In this operational mode, the largest occured display value, since the last maximal value reset, is displayed. The maximal value reset is actuated by boot-up (switching-on) or by the digital input/zero key.

HOLD function (PN15 = 4)
If duty type HOLD was selected, the zero key and the digital input may not be occupied with other functions lige e.g. trigger for taring (PN8) or MIN/MAX value reset (PN16), trigger for counter reset (PN185) or display change onto totaliser value (PN186). With setpoint confirmation (PN67, 77, 87, 97) both functions will be carried out parallely

Sliding average value (PN15 = 5)
The complete average time is a result of the product or a multiplication of time and recorded average value PN14 x PN12. If one wants to see this result in the display, the display mode PN15 needs to be programmed parallel on this result. This must be pointed out with an optional analog output or with the relays, too

Totaliser value (PN15 = 6)
In operation mode „Totaliser value“, the totaliser/sum value is displayed. With this value by means of an active flow rate, a volume about the time can be collected. As this time can be very long (approx. 1 year), the value needs to be displayed in a individual adjustable dimension.

Absolute value (PN15 = 7)
In operation mode „absolute value“ the display shows the value that has been measured since voltage connection, without consideration of a previous taring.

Trigger mode (PN15 = 8)
In operation mode „trigger mode“ the instantaneous value is only transmitted on the display by a increasing shoulder via the digital input or by activating of the zero key.

Activator for MIN/MAX value reset PN16
After boot-up the MIN/MAX values are automatically set back on the instantaneous value. To set back minimum/maximum values even during operation, 3 additional escapements are available.

PN16 =	Activator for MIN/MAX value reset
0	None
1	Digital input active, for longer than 50 ms
2	Zero key pressed for longer than 50 ms
3	Digital input or zero key active, for longer than 50 ms
4	Taring function

The value reset is only shown shortly after actuation of the digital input or zero key by 5 horizontal bars (“ - - - - - “) for 0.5 seconds. After that the instantaneous value is shown as long in operating mode MIN/MAX value display, as the activator is taken back. This way the instantaneous value can be watched for a longer time.
If the value reset ought to be done during taring, then there is no report in the display. During value reset only the MIN/MAX value that presently shown in the display is set back!

Zero point suppression PN18
The zero point suppression offers the possibility of masking an area around zero for displaying a value of zero. In the program number the amount is parameterised which is then effective in both the positive and the negative directions. This may be necessary if, for example, a number of revolutions is being measured by an analog sensor and has a drift around zero. If the signal changes slightly when the motor comes to a standstill, a speed of zero is still indicated. In addition, slightly negative rpms are suppressed.

Analog output PN20 and PN21, PN22 and PN23
The parameters of the analogue output refer to the scaling of the display and are cyclically updated with the measuring time. With PN22 = 0 the analog output can be deactivated, whereas it remains on its inital value after a restart of the device.
The analog output can be related to all possible values that are recorded in the device. For further information please see chapter 6.3 or program number table chapter 8.1.
The inital and final value is always displayed without comma. The demonstration of the measuring value in the display is taken as base, so with a demonstration of e.g. 6.400 the final value can be parameterised by 6400 on this display value.
PN23 determines the output signal either 0-20 mA, 4-20 mA or 0-10 VDC..

Interface behaviour PN34

The current display value can be sent by the optional interface. In standard mode PN34 = 0 the display remains passive and expects data from the bus. This operation is used for the configuration of the display. For slower actions the instantaneous measuring value can be actively asked for by command. In sending mode PN34 = 1 the displays sends actively in cycle of the measuring time the current measuring value. For further information please see chapter 7 „Operation mode“.

Security setting, user level PN50 to PN52

With the parameters in the security settings, access to the program numbers is regulated through the setting of various user levels. The user levels divide the access into various levels. The user is only given access to the settings authorised by the system operator, such as the setting of thresholds. The lower the figure for the user level given under PN52, the lower the level of security of the unit parameters against user intervention .

Userlevel PN52=		0	1	2	3	4	5	6	7	8
Access to:	PN	X	X	X	X	X	X	X	X	X
Display brightness	19	X	X	X	X	X	X	X	X	X
Programming lock	50	X	X	X	X	X	X	X	X	X
Serial number	200	X	X	X	X	X	X	X	X	
Setpoint threshold values	61, 71, 81, 91	X	X	X	X	X	X			
Setpoint parameters	59…95	X	X	X	X	X	X	X		
Interface parameters (option)	32…34	X	X	X	X	X				
Analog output parameter (option)	20…22	X	X	X	X	X				
Measuring input parameters	0…18	X	X	X						
Linearization parameters for measuring input	100…130	X	X	X						
Authorization code	51	X								
Userlevel	52									

User levels 1, 3, 5 and 7 are reserved user levels for which the authorization is in each case the same as the next lower level.

The parameterised user level PN52 is active as long as the authorisation code PN51 and programming lock PN50 are different. On delivery both parameters are set to 0000, so that the programming lock is deactivated.

To activate the set user level, enter a 4-digit number under PN51 as a „locking code“ and confirm it by pressing the [P]-key for approx. 1 second.

On changing to programming mode, the unit switches to the first authorised program number. If user level PN52 = 3, then, for example, the parameters of the set points can be changed, but changing the parameter of the measuring input (PN0) is not possible at this user level.

In order to obtain access to all program numbers later (equivalent to user level 0), you have to enter under PN50 the same code you used before under PN51. You must then acknowledge this by pressing the [P] key for approx. 1 second. After this you have access to all program numbers.

Attention! If the authorisation code becomes lost, the unit can be set to the default value 0000 at the manufacturer's without any data loss.

Servicing level PN53
Via this program numbers, a change between different user levels can be done. This function shall simplify the programming process, if there are no special requirements.

Simple servicing level (PN53=1, limited programming)**:**
Designed for the standard adjustments of the device. Only program numbers which are needed toset a device into operation are displayed.

Professional servicing level (PN53=2, all PN (program numbers) are released):
This level is preset in the delivery state and contains the complete functional range of the device. The functions that are available in this level are designed for a further parameterisation in the standard settings. The programming level is needed for complexe applications, like e.g. the linkage of alarms, supporting point treatment, totaliser functions, etc..

Which program numbers are available in the simple servicing level and which are available in the professional servicing level is shown in chapter 4 „Program number table", in column „Servicing level".

Attention should be paid to the follwing aspect:
For some program numbers, only the mostly used options are available in the simple servicing level (e.g. PN0 Input signal).

Setpoints / Relays PN59 to PN97
You can influence the behaviour of the setpoints with various program numbers. The figures refer to the scaled measurement and are updated with the set measuring time. A description of the various parameters is given in chapter 6.2.Setpoints / Relays.

Linearization PN100 to PN130
Through the linearization, the user has the possibility to linearize a non-linear sensor signal. A detailed description can be found in chapter 8 on linearization PN100 ≥ 0.

Totaliser / summation function PN180
For the add of measuring values, 3 operation types are available:

PN180=0 Without summation function, the sum value is preallocated with „0“ and does not change any more
PN180=1 Without permanent storage e.g. for dose procedures < 30 min the sum value is not stored in the devices memory, it could be damaged by being set back too often. In case of power failure all data get lost.
PN180=2 Permanent storage e.g. for the survey of quantities or distances or for longer spaces of time > 1h. Here a data loss in case of a power failure is avoided.

Totaliser calculation PN181, PN182 and PN183
To calculate a totaliser/sum value the time base and the unit are very important. The discharge isstated in amount per time and the speed in distance per time.

By parameterisation of the time base PN181 to s, min or h the device adds up the die totalisor value.If e.g. a sensors collects 1.200l/h, you only have to add up the 3.600th part of the total amountof liter at a measuring time of 1 second; in this case it would be 0.333 liter per measuring cycle. Despite of this small value, the totaliser value can add up itself to a quite high value during a period of one year. In this example it would be approx. 10,512,000 liter in a year. Here, a declaration incubic metres would be reasonable. For the realization of this, you have to preset a factor, in thisexample PN182=3 (10 3), so the value can be divided and liters become cubic metres.

If you want to integrate the amount for only one month, the demonstration in cubic metres can beprovided with a decimal place under PN183.

If you paramerterise now factor PN182=2 and the decimal place PN183=1, it would lead to ademonstration of 864.0 cubic metres at the end of the month.

Totaliser reset PN184, PN185
According to the demanded application the totaliser/sum value needs to be set back to a special point of time. This can be done directly by a parameterisation of the inital value PN184 on zero or by the under PN185 parameterised actuators (see program number table chapter 8.1). The most reasonable way is by the digital input, as it is not easy accessible for the operating personal.

Recall of the totaliser values PN186
The totaliser/sum value can be permanently or displayed by an actuator (zero key / digital input). Often the sum value has not the first priority, so its demonstration occurs as a coproduct.

Serial number PN200
Under PN200 you can call up the 5-digit serial number that allows allocation to the production process and the manufacturing procedure.

4.1 Program table

The program table lists all the program numbers (PN) with their function, range of values, default values, user level and servicing level.

PN	Function	Range of values	Default	User level	Servicing level
Channel 1					
0	Measuring input Parameters 1 to 29 make use of the **factory calibration**. At PN0 = 1-12 set points can be changed in the measuring range. **ATTENTION!** **Only 03 = ± 10 V** **or 04 = ± 5 V** **for use!** The parameters ≥ 30 need **sensor calibration.**	**Current, voltage** 01 = 0…20 mA 02 = 4…20 mA 03 = 0…10 V 04 = 0…5 V 05 = 0…2500 mV 06 = 0…1250 mV 07 = 0…600 mV 08 = 0…300 mV 09 = 0…150 mV 10 = 0…75 mV 11 = 0…35 mV 12 = 0…18 mV **Temperature measurement** 13 = Pt100 (4/2 wire) 14 = Pt100 (3 wire) 15 = Pt200 (4/2 wire) 16 = Pt200 (3 wire) 17 = Pt500 (4/2 wire) 18 = Pt500 (3 wire) 19 = Pt1000 (4/2 wire) 20 = Pt1000 (3 wire) 21 = L 22 = J 23 = K 24 = B 25 = S 26 = N 27 = E 28 = T 29 = R **Resistance / Potentiometer** 30 = ≤ 100 Ω (4/2 wire) 31 = ≤ 1 kΩ (4/2 wire) 32 = ≤ 10 kΩ (4/2 wire) 33 = 0/4…20 mA 34 = -1…10 V 35 = -1…5 V 36 = -500…2500 mV 37 = -500…1250 mV 38 = -500…600 mV 39 = ± 300 mV 40 = ± 150 mV	3	2	1 (01..04, 13, 14, 19, 20, 22, 23) 2 (rest)

PN	Function	Range of values	De-fault	User level	Servicing level
0	Measuring input (continued)	**Sensor calibration** 40 = ± 150 mV 41 = ± 75 mV 42 = ± 35 mV 43 = ± 18 mV 44 = 0…5 mA 45 = 0…2 mA			
1	Final value / Fullscale PN20 ≤ 12 or PN0 ≥ 30	-9999…99999	10000	2	1
2	Zero point / Offset PN0 ≤ 12 and PN0 ≥ 30	-9999…99999	0	2	1
3	Decimal point **Voltage, current** With PN0 ≤ 12 and PN0 ≥ 30 **Ptxxx resistance thermometer** Physical unit and number after the decimal point; with PN0 = 13 to 20 0 or 1: the physical unit is not shown in the display 2 to 5: the unit is shown after the figure **Thermocouple** Physical unit and number after the decimal point; PN0 = 21 to 29 0 or 1: the physical unit is not shown in the display	00000…0.0000 0 = *8888.8* [°C] 1 = *8888.8* [°F] 2 = *8888°C* [°C] 3 = *8888°F* [°F] 4 = *888.8°C* [°C] (-99.9…999.9) 5 = *888.8°F* [°F] (-99.9…999.9) 0 = *8888.8* [°C] 1 = *8888.8* [°F] 2 = *8888°C* [°C] 3 = *8888°F* [°F]	none 2	2 2	1 2
5	Offset shift At analogue or resistance measurements and sensor calibration PN0 = 1 to 12 or 30 to 45, with temperature sensors, PN0 = 13 to 29	-9999…99999 Measuring range	0 0 / 0.0	2 2	2 2
6	With PN0 = 21 to 29 thermocouple reference junction (can only be parameterised with thermocouples)	0 = inactive 1 = active	1	2	2
7	Setpoints for taring	-9999…99999	0	2	2

PN	Function	Range of values	De-fault	User level	Servicing level
8	Activator for taring	0 = none 1 = digital input 2 = zero key 3 = digital input without key 4 = boot-up 5 = combination 1 with 4 6 = combination 2 with 4 7 = combination 3 with 4 8 = temporarily taring via digital input 9 = fast taring on digital input 10 = fast taring on zero key 11 = fast taring on digital input or zero key		**2**	**2**
General settings					
12	Sliding average value	0 = off 1…100 measuring values	0	2	2
13	Display time	0.1…10.0	1.0	2	2
14	Measuring time Voltage, current PN0 = 1…12; 33…45 Ptxxxx 2/4 wire Ptxxxx 3 wire Temperature measurement thermocouple Resistance 2/4 wire Resistance 3 wire	**always set to 0.02** 0.02…10.00 0.04…10.00 0.06…10.00 0.04…10.00 0.04…10.00 0.06…10.00	 1.0 1.0 1.0 1.0 1.00 1.00	 2 2 2 2 2 2	2
15	Display mode	1 = instantaneous value 2 = MIN value 3 = MAX value 4 = HOLD value 5 = sliding average value 6 = totaliser value 7 = absolute value 8 = trigger mode	1	2	2
16	Activator for MIN/MAX value reset	0 = no reset activator 1 = digital input 2 = zero key 3 = digital input or zero key 4 = with taring function	2	2	2
18	Zero point suppression	0…99999	0	4	2
19	Display brightness	0…9 (0 = bright / 9 = dark)	3	8	2

PN	Function	Range of values	De-fault	User level	Servicing level
Analogue output (Option)					
20	Final value / Fullscale	-9999….99999	10000	4	2
21	Inital value / Offset	-9999…99999	0	4	2
22	Analog output	0 = deactivated 1 = instantaneous value 2 = MIN value 3 = MAX value 4 = HOLD value 5 = sliding average value 6 = totaliser value 7 = absolute value	1	4	2
23	Signal selection	0 = 0-10 V 1 = 0-20 mA 2 = 4-20 mA	2	4	1
Interface					
34	Interface behaviour	0 = standard operation 1 = transmission operation	0	4	2
Security settings					
50	Programming lock	0000…9999	0000	8	2
51	Authorization code	0000…9999	0000	0	2
52	User level	0…8	8	0	1
Servicing level					
53	Simple servicing level Professional servicing level	1 = limited programming 2 = all PN (program numbers) are released	2	2	2
Flashing of the LED display					
59	Display flashing (approx. 0.5 seconds) No flashing Flashing at set point 1 Flashing at set point 2 Flashing at set point 3 Flashing at set point 4 Flashing at set point 1 and 2 Flashing at set point 3 and 4 Flashing at set point 1, 2, 3 and 4	0 = no flashing 1 = flashes at 1 2 = flashes at 2 3 = flashes at 3 4 = flashes at 4 5 = flashes at 1 and 2 6 = flashes at 3 and 4 7 = flashes at 1, 2, 3 & 4	0	6	2

PN	Function	Range of values	De-fault	User level	Servicing level
Setpoint 1					
60	Setpoint 1 (Source / Trigger value)	0 = not activated 1 = instantaneous value 2 = MIN value 3 = MAX value 4 = HOLD value 5 = sliding average value 6 = totaliser value 7 = absolute value	1	6	1
61	Threshold	-9999…99999	1000	6	1
62	Hysteresis	1…99999	1	6	1
63	Active above / below SP value	0 = active below SP 1 = active above SP	1	6	1
64	Switch delay	0.0…10.0 seconds	0.0	6	1
65	Delay type	0 = none 1 = switch-on delay 2 = switch-off delay 3 = switch-on/-off delay 4 = suppression with activated digital input	1	6	1
67	Setpoint confirmation	0 = no locking 1 = switch-off locking by zero key 2 = switch-off locking by external input 3 = switch-off locking by both 4 = no locking 5 = switch-on locking by zero key 6 = switch-on locking by digital input 7 = switch-on locking by both	0	6	2

PN	Function	Range of values	De-fault	User level	Servicing level
Setpoint 2					
70	Setpoint 2 (Source / Trigger value)	0 = not activated 1 = instantaneous value 2 = MIN value 3 = MAX value 4 = HOLD value 5 = sliding average value 6 = totaliser value 7 = absolute value	1	6	1
71	Threshold	-9999…99999	1000	6	1
72	Hysteresis	1…99999	1	6	1
73	Active above / below SP value	0 = active below SP 1 = active above SP	1	6	1
74	Switch delay	0.0…10.0 seconds	0.0	6	1
75	Delay type	0 = none 1 = switch-on delay 2 = switch-off delay 3 = switch-on / -off delay 4 = suppression with activated digital input	1	6	1
77	Setpoint confirmation	0 = no locking 1 = switch-off locking by zero key 2 = switch-off locking by external input 3 = switch-off locking by both 4 = no locking 5 = switch-on locking by zero key 6 = switch-on locking by digital input 7 = switch-on locking by both	0	6	2

PN	Function	Range of values	De-fault	User level	Servicing level
Setpoint 3					
80	Setpoint 3 (Source / Trigger value)	0 = not activated 1 = instantaneous value 2 = MIN value 3 = MAX value 4 = HOLD value 5 = sliding average value 6 = totaliser value 7 = absolute value	1	6	1
81	Threshold	-9999…99999	1000	6	1
82	Hysteresis	1…99999	1	6	1
83	Active above / below SP value	0 = active below SP 1 = active above SP	1	6	1
84	Switch delay	0.0…10.0 seconds	0,0	6	1
85	Delay type	0 = none 1 = switch-on delay 2 = switch-off delay 3 = switch-on /-off delay 4 = suppression with activated digital input	1	6	1
87	Setpoint confirmation	0 = no locking 1 = switch-off locking by zero key 2 = switch-off locking by external input 3 = switch-off locking by both 4 = no locking 5 = switch-on locking by zero key 6 = switch-on locking by digital input 7 = switch-on locking by both	0	6	2

PN	Function	Range of values	De-fault	User level	Servicing level
Setpoint 4					
90	Setpoint 4 (Source / Trigger value)	0 = not activated 1 = instantaneous value 2 = MIN value 3 = MAX value 4 = HOLD value 5 = sliding average value 6 = totaliser value 7 = absolute value	1	6	1
91	Threshold	-9999…99999	1000	6	1
92	Hysteresis	1…99999	1	6	1
93	Active above / below SP value	0 = active below SP 1 = active above SP	1	6	1
94	Switch delay	0.0…10.0 seconds	0,0	6	1
95	Delay type	0 = none 1 = switch-on delay 2 = switch-off delay 3 = switch-on / -off delay 4 = suppression with activated digital input	1	6	1
97	Setpoint confirmation	0 = no locking 1 = switch-off locking by zero key 2 = switch-off locking by external input 3 = switch-off locking by both 4 = no locking 5 = switch-on locking by zero key 6 = switch-on locking by digital input 7 = switch-on locking by both	0	6	2

PN	Function	Range of values	De-fault	User level	Servicing level
Linearization					
100	Number of additional setpoints	0…30	0	2	2
101 … 130	Setpoints 1…30	-9999…99999		2	2
180	Totaliser function	0 = off 1 = totaliser without permanent saving (Reset by boot-up) 2 = totaliser with permant saving	0	3	2
181	Time base of display value for totalizator function	0 = second 1 = minute 2 = hour	0	3	2
182	Factor for totalizer value in powers of 10	0 = 1…6 = 1.000.000	0	3	2
183	Decimal point for totaliser value	00000…0,0000	0	3	2
184	Counter value in digit (for Reset through 0, too), inital value aswell	0…99999	0	3	2
185	Activator for counter reset on 0 (Zero key or digital input: push for at least 50 ms)	0 = no reset source 1 = by zero key 2 = by external input 3 = by zero key and digital input 4 = UP and DOWN while showing totaliser value	0	3	2
186	Change display on totaliser value	0 = no change 1 = by zero key 2 = by digital input	0	3	2
Information					
200	Serial number	0…99999	0	8	2

5. ERROR ELIMINATION

The following list gives the recommended procedure for dealing with faults and locating their possible cause.

	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 parameter PN1, PN2, PN100…PN130 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 parameter PN1, PN2, PN100…PN130 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 reconfigure the unit according to your application.
4.	Program numbers for parameterising of the input are not accessible.	• The programming lock is set at a user level that does not allow access. • Under PN1, a different sensor type was parameterised so that the desired program number cannot be parameterised.
5.	*ERR1* lights up in the 7-segment display.	• Please contact the manufacturer if errors of this kind occur.
6.	The addressed digital input does not react.	• Measure the current of the digital input with a multimeter. It should be between 1 mA and 3 mA.
7.	Program numbers for the analog output PN20…PN23 are not accessible.	• The analog output is an option of this device type. If it is not assembled, then the program numbers are not shown.
8.	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 the next chapter and set it back to its delivery status.

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 the power supply and press **[P]** for approx. further 2 seconds.

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!

•This is only possible when the programming lock PN50 allows access to all PNs or *HELP* is shown in the display.
•All application-related data are lost.

6. USER MANUAL SPEED DISPLAY

Frequency input: 0,01 Hz bis 999,99 kHz / 0,01 Hz bis 9,9999 kHz / 0-2,5000 kHz

Standard Features:

- red display from -19999 ... 99999 digits (optional: green, orange, blue)
- Indicator flashes when limit value exceeded / limit value undershooting
- simplified parameterization rpm with only 3 parameters
- Schmitt trigger input
- Zero key to trigger HOLD, TARA, etc.
- digital frequency filter for debouncing and filtering
- Frequency filter with different duty cycle
- moving averaging with optional dynamic display filter
- Brightness control
- Programming lock via code entry
- optional: relay output

7. FUNCTION AND OPERATION DESCRIPTION

Operation
The operation is divided into three different levels.

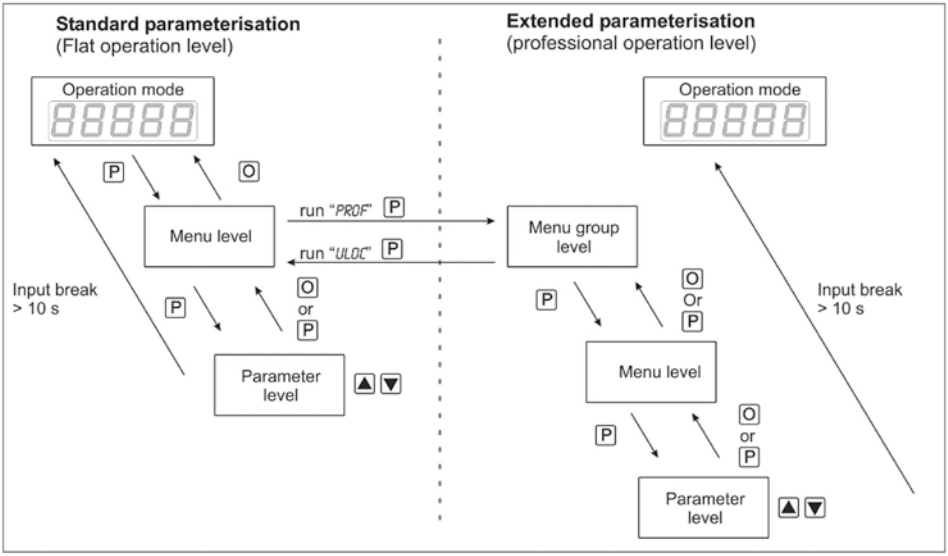
Menu level (delivery status)
This level is for the standard settings of the device. Only menu items which are sufficent to set the device into operation are displayed. To get into the professional level, run through the menu level and parameterise "PROF" under menu item RUN.

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 be parameterised here. 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.



Underline:

P **Takeover** ▲ **Value selection (+)**

O **Stop** ▼ **Value selection (-)**

ATTENTION!
The following programming manual describes some functions that are not possible in the ValueView. The display unit is intended for the speed display.
Not possible is e.g. Position detection, angle measurement and analog output.
Relay outputs are available as an option.

8. SETTING UP THE DEVICE

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

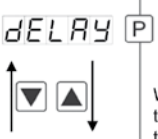
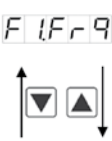
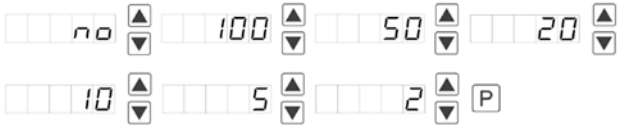
Start sequence
For 1 second during the switching-on process, the segment test (8 8 8 8 8) is displayed, followed by an indication of the software type and, after that, also for 1 second, the software version. After the starting sequence, the device switches to operation/display mode..

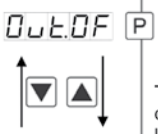
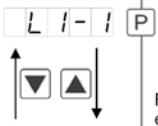
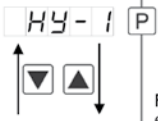
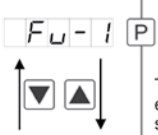
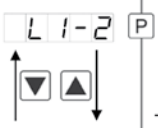
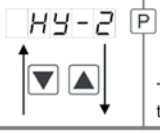
8.1 Standard parameterisation: (flat operation level)

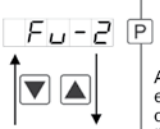
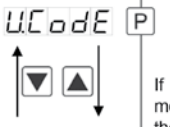
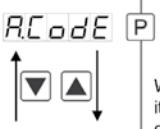
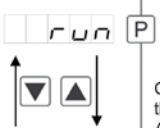
To parameterize the display, press the **[P]** key in operating mode for 1 second. The display then changes tothe menu level with the first menu item TYPE.

Menu level	Parameterisation level
	**Selection of the input signal,** *TYPE*: Default: *FREQU* If the scaling of the device is done via *SENS.F* (Sensor calibration), the frequency range needs to be preset under *RANGE* and is adjusted by application of the final value / initial value. If *FREQU* (Factory calibration) is preferred, the final value needs to be entered under *END* and the final frequency needs to be entered under *ENDA*. Under *OFFS* the initial value needs to be entered and under *OFFSA* the initial frequency. There is no application of the measuring signal. *ROTAR* is the rotation in r.p.m. up to 10 kHz input frequency. *POSIT* is the position recognition per incremental encoder. Confirm the selection with **[P]** and the display switches back to menu level.
	**Adjustment of pulses per rotation,** *PPR*: Default: *1* This parameter is only important if *TYPE=ROTAR* or =*POSIT* have been selected. Generally it shows the number of pulses per rotation.
	**Setting end value of the measuring range,** *END*: Default: *10.0E3* 9.9999 Hz / 99.999 Hz / 999.99 Hz / 9.9999 kHz / 99.999 kHz / 999.99 kHz Choose between six different frequency ranges. Confirm the selection with **[P]** and the display switches back to menu level.

Menu level	Parameterisation level
End	**Setting the final value of the measuring range, *END*:** Default: *10000*  Set the final value from the smallest to the highest digit with **[▲] [▼]** and confirm each digit with **[P]**. A minus sign can only be parameterized on the highest value digit. After the last digit, the display switches back to the menu level. If *SENS* was selected as input option, you can only select between *NOCA* and *CAL*. With *NOCA*, only the previously set display value is taken over, and with *CAL*, the device takes over both the display value and the analogue input value.
OFFS	**Setting the start/offset value of the measuring range, *OFFS*:** Default: *0*  Enter the start/offset value from the smallest to the highest digit **[▲] [▼]** and confirm each digit with **[P]**. After the last digit the display switches back to the menu level. If *SENS.F* was selected as the input option, you can only select between *NOCA* and *CAL*. With *NOCA*, only the previously set display value is taken over, and with *CAL*, the device takes over both the display value and the analogue input value.
dot	**Setting the decimal point, *DOT*:** Default: *0*  The decimal point on the display can be moved with **[▲] [▼]** and confirmed with **[P]**. The display then switches back to the menu level again.
SEC	**Setting up the display time, *SEC*:** Default: *1.0*  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.
EndA	**Rescaling the measuring input values, *ENDA*:** Default: *10000*  With this function, you can rescale the input value of **e.g. 8.000 Hz** (works setting) without applying a measuring signal. If sensor calibration has been selected, these parameters are not available.

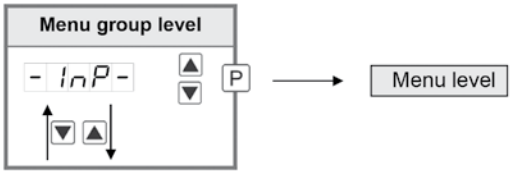
Menu level	Parameterisation level
	**Rescaling the measuring input values,** *OFFR*: Default: *0*  With this function, you can rescale the input value of **e.g. 100 Hz** (works setting) without applying a measuring signal. If sensor calibration has been selected, these parameters are not available.
	**Setting of the pulse delay,** *DELAY*: Default: *0*  With the pulse delay of 0–250 s (max), frequencies can be collected, which are even smaller than by the predetermined measuring time of the device. If e.g. a delay of 250 seconds is set, this means that the device waits up to 250 seconds for an edge, before it assumes a 0 Hz frequency. Thus frequencies up to 0.004 Hz can be collected.
	**Adjustment of the optimum digital frequency filter,** *FI.FRQ*: Default: *NO*  If the optional filter is not activated by the adjustment „*NO*", frequencies are ignored by the adjusted frequency filter. Act on the assumption that the pulse-duty factor is 1:1. Accordingly the minimal pulse duration is derived from the half of the time of oscillation. Use a filter of 10 Hz or 20 Hz for contact bounce suppression.
	**Selection of analog output,** *OUT.RA*: Default: *4-20*  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*: 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.

Menu level	Parameterisation level
	**Setting up the initial value of the analog output,** *OUT.OF*: Default: *00000* 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 / limit values,** *LI-1*: Default: *2000* For both limit values, two different values can be parameterized. With this, the parameters for each limit value are called up one after another.
	**Hysteresis for limit values,** *HY-1*: Default: *00000* For all limit values exists a hysteresis function, that reacts according to the settings (threshold exceedance / threshold undercut).
	**Function if display falls below / exceeds limit value,** *FU-1*: Default: *HIGH* The limit value undercut can be selected with *LOUU* (LOW = lower limit value) and limit value exceedance can be selected with *HIGH* (HIGH = upper limit value). If e.g. limit value 1 is on a switching threshold of 100 and occupied with function „*HIGH*", the alarm will be activated by reaching the threshold. If the limit value is allocated to „*LOW*", an alarm will be activated by undercut of the threshold. See page 29.
	**Threshold values / limits,** *LI-2*: Default: *3000* This value defines the threshold, that activates/deactivates an alarm.
	**Hysteresis for limit values,** *HY-2*: Default: *00000* The delayed reaction of the alarm is the difference to the threshold value, which is defined by the hysteresis.

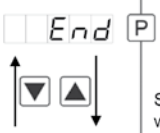
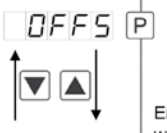
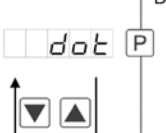
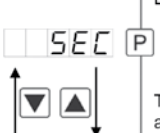
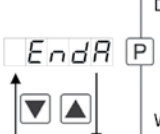
Menu level	Parameterisation level
	**Function for threshold value undercut / exceedance,** *FU-2*: Default: *HIGH* A limit value undercut is selected with *LOUU* (for LOW = lower limit value), a limit value exceedance with *HIGH* (for HIGH = higher limit value). If e.g. limit value 1 is on a threshold level of 100 and allocated with function *HIGH*, an alarm is activated by reaching 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.
	**User code (4-digit number-combination, free available),** *U.CODE*: Default: *0000* If this code is set (>0000), all parameters are locked, if *LOC* has been selected before under menu item *RUN*. By pushing **[P]** during operation mode for approx. 3 seconds, *CODE* appears in the display. To get access to the unlocked reduced parameter, the user needs to enter the preset *U.CODE*. This code has to be entered before each parameterisation, until the *A.CODE* (Master code) unlocks all parameters again.
	**Master code (4-digit number-combination free available),** *A.CODE*: Default: *1234* With this code, all parameters can be unlocked, if *LOC* has been activated before under menu item *RUN*. By pushing **[P]** during operation mode for approx. 3 seconds, *CODE* appears in the display. The user can now reach all parameters by entering *A.CODE*. Leaving the parameterisation, under menu item *RUN*, the user can unlock them permanently by choosing *ULOC* or *PROF*. So, there is no need for anew code entering, even by pushing **[P]** during operation mode again.
8.2 Programming interlock „RUN“	
	**Activation / deactivation of the programming lock or completion of the standard parameterization with change into menu group level (complete function range),** *RUN*: Default: *ULOC* Choose between the deactivated key lock *ULOC* (works setting) and the activated key lock *LOC*, or the menu group level *PROF*, with the navigation keys **[▲] [▼]**. 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 was wrong. To parameterise further functions *PROF* needs to be set. The device confirms this setting with „- - - - -„ and changes automatically into 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* is entered in menu group *RUN*, thus the display is set back in standard parameterisation again.

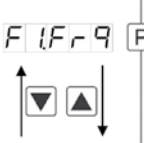
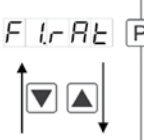
8.3. Extended parameterisation (Professional operation level)

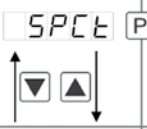
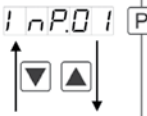
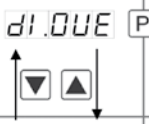
8.3.1 Signal input parameters



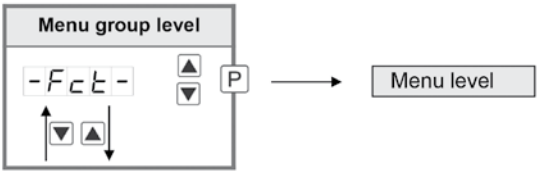
Menu level	Parameterisation level
tYPE P	**Selection of the input signal,** *TYPE*: Default: *FREQU* SEnS.F FrEqU rotAr PoS It P If the scaling of the device is done via *SENS.F* (Sensor calibration), the frequency range needs to be preset under *RANGE* and is adjusted by application of the final value / initial value. If *FREQU* (Factory calibration) is preferred, the final value needs to be entered under *END* and the final frequency needs to be entered under *ENDA*. Under *OFFS* the initial value needs to be entered and under *OFFSA* the initial frequency. There is no application of the measuring signal. *ROTAR* is the rotation in r.p.m. up to 10 kHz input frequency. *POSIT* is the position recognition per incremental encoder. Confirm the selection with **[P]** and the display switches back to menu level.
PPr P	**Adjustment of pulses per rotation,** *PPR*: Default: *1* 8 P 8 P 8 P 8 P 8 P This parameter ist only important if *TYPE* = *ROTAR* or = *POSIT* have been selected. Generally it shows the number of pulses per rotation.
rAnGE P	**Setting the end value of the measuring range,** *END*: Default: *100E3* 1E0 (9.9999 Hz) 10E0 (99.999 Hz) 100E0 (999.99 Hz) 1E3 (9.9999 kHz) 10E3 (99.999 kHz) 100E3 (999.99 kHz) P Choose between six different frequency ranges. Confirm the selection with **[P]** and the display switches back to menu level.

Menu level	Parameterisation level
	**Setting the final value of the measuring range,** *END*: Default: *10000* Set the final value from the smallest to the highest digit with **[▲] [▼]** and confirm each digit with **[P]**. A minus sign can only be parameterized on the leftmost digit. After the last digit, the display switches back to the menu level. If *SENS* was selected as input option, one can only select between *NOCA* and *CAL*. With *NOCA*, only the previously set display value is taken over, and with *CAL*, the device takes over both the display value and the analogue input value.
	**Setting the start/offset value of the measuring range,** *OFFS*: Default: *0* Enter the start/offset value from the smallest to the highest digit **[▲] [▼]** and confirm each digit with **[P]**. After the last digit the display switches back to the menu level. If *SENS.F* was selected as the input option, you can only select between *NOCA* and *CAL*. With *NOCA*, only the previously set display value is taken over, and with *CAL*, the device takes over both the display value and the analogue input value.
	**Setting the decimal point,** *DOT*: Default: *0* The decimal point on the display can be moved with **[▲] [▼]** and confirmed with **[P]**. The display then switches back to the menu level again.
	**Setting up the display time,** *SEC*: Default: *1.0* 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.
	**Rescaling the measuring input values,** *ENDA*: Default: *10000* With this function, you can rescale the input value of **e.g. 8.000 Hz** (works setting) without applying a measuring signal. If sensor calibration has been selected, these parameters are not available.

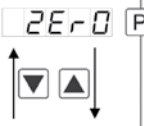
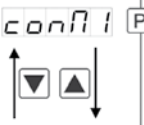
Menu level	Parameterisation level
	**Rescaling the measuring input values,** *OFFR:* Default: *0* With this function, one can rescale the input value of **e.g. 100 Hz** (works setting) without applying a measuring signal. If sensor calibration has been selected, these parameters are not available.
	**Setting up the pulse delay,** *DELAY:* Default: *0*  With the pulse delay of 0–250 seconds (maximum), frequencies that are even smaller than by the predetermined measuring time of the device, can be collected. If e.g. a delay of 250 seconds is set, it means that the device waits up to 250 seconds for an edge, before it assumes a 0 Hz frequency. Thus frequencies up to 0.004 Hz can be collected.
	**Adjustment of the optimum digital frequency filter,** *FI.FRQ:* Default: *NO* If the optional filter is not activated by the adjustment „*NO*", frequences are ignored by the adjusted frequency filter. Act on the assumption that the pulse-duty factor is 1:1. Accordingly the minimal pulse duration is derived from the half of the time of oscillation. Use a filter of 10 Hz or 20 Hz for contact bounce suppression.
	**Adjustment of the pulse-duty factor at activated digital filter,** *FI.RAT:* Default: *1-1*  Adjustment of the desired pulse-duty factor for pulse duration and pulse interruption. Like this, a special pulse behaviour can be adjusted.
	**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.

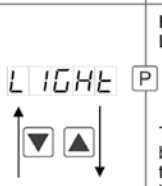
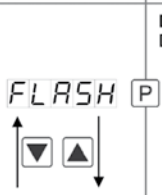
Menu level	Parameterisation level
	**Number of additional setpoints,** *SPCT:* Default: *00* 30 additional setpoints can be defined to the initial value and final value, so linear sensor values are not linearised. Only activated setpoint parameters are displayed.
	**Display values for setpoints,** *DIS.01 ... 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:* These setpoints are displayed at works setting (4-20 mA) only. Here, demanded analog values can be choosen freely. The input of steadily rising analog values needs to be done self-contained.
	**Display underflow,** *DI.UND:* Default: *-19999* With this function the device undercut (_ _ _ _ _) can be defined on a definite value.
	**Display overflow,** *DI.OUE:* Default: *99999* With this function the display overflow (¯ ¯ ¯ ¯ ¯) can be defined on a definite value.
	Input variable of process value, *SIG.IN:* **Default:** *A.MEAS* This parameter controls the device via the analog input signals *A.MEAS* = *SENS.F* repectively *FREQU* or via the digital signals of the interface *M.BUS* = RS232/RS485 (Modbus protocol). Confirm the selction with **[P]** and the device changes back into menu level.
	**Back to menu group level,** *RET:* With **[P]** the selection is confirmed and the device changes into menu group level „*-INP-*".

8.3.2 General device parameters



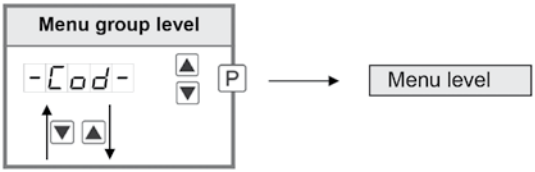
Menu level	Parameterisation level
dI.SEC P	**Display time,** *DISEC:* Default: *01.0* 0.01 ▲▼ 00.9 then 01.0 ▲▼ 10.0 ▲▼ P The display is set up with **[▲] [▼]**. Thereby on switches until 1 second in 0.1 steps and until 10.0 seconds in 1.0-steps. With **[P]** the selection is confirmed and the device changes into menu level.
round P	**Rounding of display values,** *ROUND:* Default: *00001* 00001 ▲▼ 00005 ▲▼ 00010 ▲▼ 00050 ▲▼ P 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.
ArItH P	**Arithmetic,** *ARITH:* Default: *no* no ▲▼ rEZIP (Reciprocal) ▲▼ rAdIC (Root extraction) ▲▼ SqUAr (Square) ▲▼ P With this function the calculated value, not the measuring value, is shown in the display. Calculation types rEZIP = (Final value*Final value)/Display value rAdiC = Root(Display value*Final value) SqUAr = (Display value)²/Final value **Advice:** The denominator of fractions should not be 0 because a division by 0 is not possible. It creates an undefined state and the display goes into the overflow. With *no*, no calulation is deposited. With **[P]** the selection is confirmed and the device changes into menu level.
AVG P	**Sliding average determination,** *AVG:* Default: *10* 001 ▲▼ 100 ▲▼ P 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.

Menu level	Parameterisation level
	**Dynamic for the sliding average determination,** *STEP*: Default: *no*  With *STEP* the sliding average determination can be adjusted dynamically. If 6pro or 12pro is selected, a frequency value with a variance of 6% or 12% of the current display value is taken over directly for the sliding averaging. The display appears to be more dynamic at a fast frequency change, without appearing disturbed by a slightly unsteady frequency.
	**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.
	**Definite contstant value,** *CONST*: Default: *0* The constant value can be evaluated via the alarms or via the analog output, like the current measurand. The decimal place cannot be changed for this value and is taken over by the current measurand. Like this a setpoint generator can be realised via the analog output by this value. Furthermore it can be used for calculating the difference. At this the constant value is substracted from the current measurand and the difference is evaluated in the alerting or by the analog output. Thus regulations can be displayed quite easily.
	**Minimum constant value,** *CON.MI*: Default: *-19999* The minimum constant value is adjusted from the smallest to the highest digit with the navigation keys **[▲] [▼]** and confirmed digit per digit with **[P]**. A minus sign can only be adjusted on the leftmost digit. After the last digit the display changes back into menu level.
	**Maximum constant value,** *CON.MA*: Default: *99999* The maximum constant value is adjusted from the smallest to the highest digit with the navigation keys **[▲] [▼]** and confirmed digit per digit with **[P]**. A minus sign can only be adjusted on the leftmost digit. After the last digit the display changes back into menu level.

Menu level	Parameterisation level
	**Display,** *DISPL:* Default: *ACTUR* With this function the current measurand, min/max-value, totaliser value, the process-controlled Hold-value, the sliding average value, the constant value or the difference between constant value and current value can be allocated to the display. With **[P]** the selection is confirmed and the device changes into menu level.
	**Brightness control,** *LIGHT:* Default: *15* 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. 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.
	**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.
	**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 restart 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 **[▲] [▼]**.

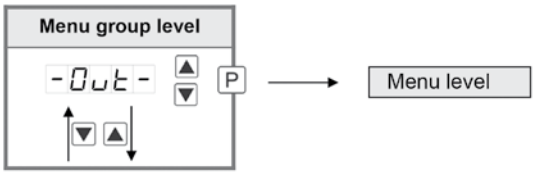
Menu level	Parameterisation level
Continuation	Via *TOTAL* the current value of the totaliser can be displayed for approx. 7 seconds, after this the device changes back onto the parameterised display value. If *TOT.RE* is deposited, the totaliser can be set back by pressing the navigation keys **[▲] [▼]**, the device acknowledges this with showing *00000* in the display. The configuration of *EHT.RE* deletes the min/max-memory. Under *ACTUR* the measurand is shown for approx. 7 seconds, after this the display returns to the parameterised display value. The brightness can be adjusted with *LIGHT*. This adjustment is not safed and lost at a restart of the device. 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 be deposited on the **[O]**-Taste. This function is activated by pressing the key. With *TARA* the device is set temporarily on a parameterised value. The device acknowledges the correct taring with *00000* in the display. *SET.TA* adds a defined value on to the currently displayed value. Via *TOTAL* the current value of the totaliser can be displayed for approx. 7 seconds, after this the device switches back on the parameterised display value. If *TOT.RE* is deposited, the totaliser can be set back by pressing of the navigation keys **[▲] [▼]**, the device acknowledges this with *00000* in the display. *EHT.RE* deletes the min/max-memory. If *HOLD* has been selected, the moment can be hold constant by pressing the **[O]**-key, and is updated by releasing the key. **Advice:** *HOLD* is activated only, if *HOLD* is selected under parameter *DISPL. ACTUR* shows the measuring value for approx. 7 seconds, after this the device switches back on the parameterised display value. The same goes for *AVG*, here the sliding average values will be displayed. The constant value *CONST* can be recalled via the digital input, or changed digit per digit. At *AL-1...AL-4* an output can be set and therewith e.g. a setpoint adjustment can be done. If *NO* is selected, the **[O]**-key is without any function in the operation mode.
	**Special function digital input,** *DIG.IN*: Default: *NO*  In operation mode, the above shown parameter can be laid on the optional digital input, too. Function description see *TAST.4*.
	**Back to menu group level,** *RET*: With **[P]** the selection is confirmed and the device changes into menu group level „*-FCT-*".

8.3.3 Safety parameters



Menu level	Parameterisation level
U.CodE P	**User code,** *U.CODE*: Default: *0000* 0 P 0 P 0 P 0 P 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*: Default: *1234* 1 P 2 P 3 P 4 P By entering *A.CODE* the device will be unlocked and all parameters are released.
Out.LE P	**Release/lock analog output parameters,** *OUT.LE*: Default: *ALL* no En-OF OutEO ALL P Analog output parameter 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 output parameters are locked.
ALLEU P	**Release/lock alarm parameters,** *AL.LEU*: Default: *ALL* no LIMIt ALrM.L ALL P This parameter describes the user release/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.
rEt	**Back to menu group level,** *RET*: With **[P]** the selection is confirmed and the device changes into menu group level „- *COD* -".

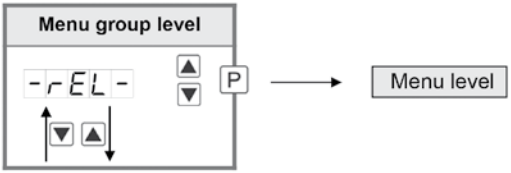
8.3.4 Analog output parameters



Menu level	Parameterisation level
OutPt P	**Selection reference of analog output,** *OUTPT:* Default: *ACTUA* ActuA MI nUA MAXUA totAL HoLd AUG conSt diFF P The analog output signal can refer to different functions, in detail these are the current measurand, the min-value, the max-value, the totaliser function / sum function, the constant value or the difference between current measurand and constant 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.
Out.rA P	**Selection analog output,** *OUT.RA:* Default: *4-20* 0-10 0-20 4-20 P 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:* Default: *10000* 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 parameterised on the leftmost 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:* 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 parameterised on the leftmost 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 onto 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-*“ .

8.3.5 Relay functions

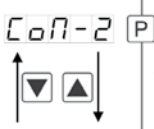
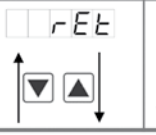


Menu level	Parameterisation level		
rEL-1 P	**Alarm relay 1,** *REL-1*: Default: *AL-1* AL-1 .... AL-4 AL-n1 .... AL-n4 LoGIC OFF On P Each setpoint (optional) can be linked up via 4 alarms (by default). This can either be inserted at activated alarms *AL1/4* or deactivated alarms *ALN1/4*. If *LOGIC* is selected, logical links are available in the menu level *LOG-1* and *COM-1*. Access to these two menu levels is via *LOGIC*, at all other selected functions, these two parameters are overleaped. Via *ON/OFF* the setpoints can be activated/deactivated, 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*: Default: *OR* or nor And nAnd P 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.		

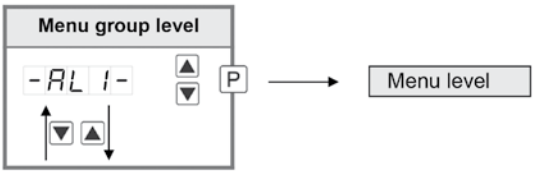
Menu level	Parameterisation level
	**Alarms for relay 1,** *COM-1:* Default: *A.1*  The allocation of the alarms to relay 1 happens via this parameter, one alarm or a group of alarms can be chosen. With **[P]** the selection is confirmed and the device changes into menu level.
	**Alarm relay 2,** *REL-2:* Default: *AL-2* Each setpoint (optional) can be linked up via 4 alarms (by default). This can either be inserted at activated alarms *AL1/4* or deactivated alarms *ALN1/4*. If *LOGIC* is selected, logical links are available in the menu level *LOG-2* and *COM-2*. Access to these two menu levels is via *LOGIC*, at all other selected functions, these two parameters are overleaped. Via *ON/OFF* the setpoints can be activated/deactivated, 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.

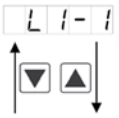
With **[P]** the selection is confirmed and the device changes into menu level.

Menu level	Parameterisation level
	**Alarms for relay 2,** *COM-2:* Default: *A. 2* The allocation of the alarms for relay 2 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-*".

8.3.6 Alarm parameters

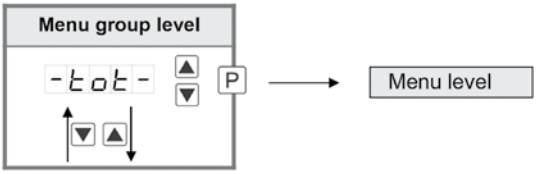


Menu level	Parameterisation level
	**Dependency alarm 1,** *ALRM.1:* Default: *ACTUA* The dependency of alarm 1 can be related to special functions, in detail these are the current measurand, the min-value, the max-value, the totaliser value / sum-value, the constant value or the difference between the current measurand and the constant value. Is *HOLD* selected, then the alarm is hold and processed just after deactivation of *HOLD*. *EHTER* 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. **Example:** 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 navigation keys, the 4th key or the digital input for confirmation.

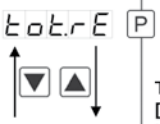
Menu level	Parameterisation level
	**Threshold values / limit values,** *LI-1:* Default: *2000*  For both limit values, two different values can be parameterized. With this, the parameters for each limit value are called up one after another.
	**Hysteresis for limit values,** *HY-1:* Default: *00000*  For all limit values exists a hysteresis function, that reacts according to the settings (threshold exceedance / threshold undercut).
	**Function if display falls below / exceeds limit value,** *FU-1:* Default: *HIGH*  The limit value undercut can be selected with *LOUU* (LOW = lower limit value) and limit value exceedance can be selected with *HIGH* (HIGH = upper limit value). If e.g. limit value 1 is on a switching threshold of 100 and occupied with function „*HIGH*“, the alarm will be activated by reaching the threshold. If the limit value is allocated to „*LOW*“, an alarm will be activated by undercut of the threshold.
	**Switching-on delay,** *TON-1:* Default: *000*  For limit value 1 a delayed switching-on of 0-100 seconds can be preset.
	**Switching-off delay,** *TOF-1:* Default: *000*  For limit value 1 a delayed switching-off of 0-100 seconds can be preset.
	**Back to menu group level,** *RET:* With **[P]** the selection is confirmed and the device changes into menu group level „*-AL1-*“.

The same applies to *-AL2-* to *-AL4-*.

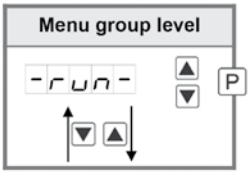
8.3.7 Totaliser (Volume measurement)



Menu level	Parameterisation level
totAL P	**Totaliser state,** *TOTAL:* Default: *OFF* OFF ▲▼ StEAd ▲▼ tEMP ▲▼ P The totaliser makes measurements on a time base of e.g. l/h possible, at this the scaled input signal is integrated by a time and steadily (select *STEAD*) or temporarily (select *TEMP*) safed. If *OFF* is selected, the function is deactivated. With **[P]** the selection is confirmed and the device changes into menu level.
t.bASE P	**Time base,** *T.BASE:* Default: *SEC* SEC ▲▼ MIn ▲▼ hour ▲▼ P Under this parameter the time base of the measurement can be preset in seconds, minutes or hours.
FActo P	**Totaliser factor,** *FACTO:* Default: 10^0 10^0 ▲▼ ... 10^6 ▲▼ P At this the factor (10^0…10^6) respectively the divisor for the internal calculation of the measuring value is assigned.
tot.dt P	**Setting up the decimal point for the totaliser,** *TOT.DT:* Default: *0* 0 ▲▼ 0.0 ▲▼ 0.00 ▲▼ 0.000 ▲▼ 0.0000 ▲▼ P The decimal point of the device can be adjusted with the navigation keys **[▲] [▼]**. With **[P]** the selection is confirmed and the device changes into menu level.

Menu level	Parameterisation level
	**Totaliser reset,** *TOT.RE:* Default: *00000*  The reset value is adjusted from the smallest to the highest digit with the navigation keys **[▲] [▼]** and digit per digit confirmed with **[P]**. After the last digit, the display switches back to the menu level. The activator for the reset is parameter driven via the 4th key or via the optional digital input.
	**Back to menu group level,** *RET*: With **[P]** the selection is confirmed and the device changes into menu group level „*-TOT-*“.

Programming lock, *RUN*:



Description see page 11, menu level *RUN*

9. 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:

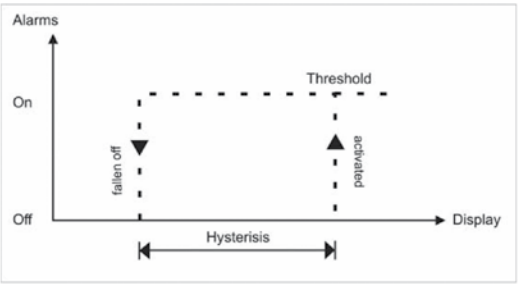
- Switch off the power supply
- Press button [P]
- Switch on voltage supply and press [P]-button until „- - - - -“ is shown in the display.

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.

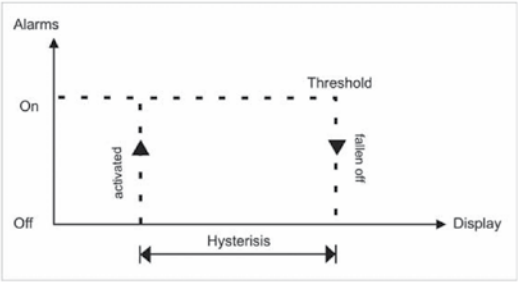
10. Alarms / Relays

This device has 4 virtual alarms that can monitor a 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.

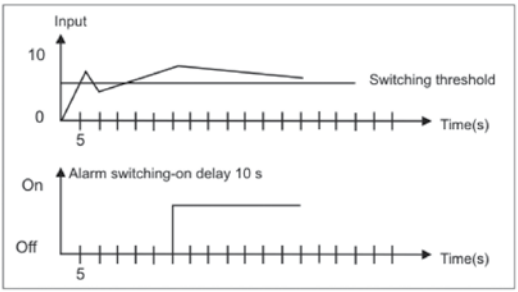
Function principle of alarms / relays	
Alarm / Relay x	Deactivated, instantaneous value, min/max-value, hold-value, totaliser value, sliding average value, constant value, difference between instantaneous value and constant value or an activation via the digital input or via the **[O]**-key.
Switching 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-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 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.

11. PROGRAMMER EXAMPLES

Example for the rotation speed adjustment:

In this application the rotation speed of an axis shall be collected via a toothed wheel with 30 sprockets, per Namur sensor. It is then displayed with one position after decimal point and the dimension rpm.

Parameter	Settings	Description
tYPE	rotAr	Rotation – rotation speed measurment up to 10 kHz
PPr	30	Number of sprockets
dot	0.0	1 position after decimal point

Advice: The input frequency may be maximum 9.999 kHz in this operating module. So, a rotation speed parameterisation via the frequency adjustment is rarely necessary.

Example for the position coverage:

A measuring system for length works via a incremental encoder with two dephased output signals (typically A and B) and 100 pulse/rotation. The axis perimeter was calculated in a way that the measuring section can be extracted by a rotation of 6 cm = 60 mm. The display shall show the relative position in millimeter. There is a zero joint position with a limit switch that can zero the display if required.

Parameter	Settings	Description
tYPE	PoSIt	Positioning – rotary encoder
PPr	100	Pulse number per rotation
End	60	Change of length per rotation
dIG.In	tArA	Display zero

Advice: The display starts always on position zero. The parameter *DIG.IN* can be found under parameter group *-FCT-* in the extended parameterisation *PROF*.

Example for angle coverage:

On a manually operated bender for sheet metal the bending angle shall be displayed in degree. The device is in zero state (0°) during switching on of the display. An incremental encoder with 360 pulses/rotation is used.

Parameter	Settings	Description
tYPE	PoSIt	Positioning – rotary encoder
PPr	360	Pulse number per rotation
End	360	Angle sum per rotation

Examples: Adjustment according to number of sprockets at unknown rotation speed.

- nearly 100% of the rotation speeds are in the range of 0 to 30.000 r.p.m.
- the number of sprockets varies (without gearing) between 1 and 100
- in automation, the frequency supply never exceeds 10 kHz (rather 3 kHz)

Assume a rotation speed of 60 r.p.m. at 1 Hz, whereat the real frequency value will not be considered.

Our example complies with a number of sprockets of 64.

Setting up the advice

Based on the default settings of the display, the following parameters need to be changed:

Parameter	Settings	Description
tYPE	FrEqU	Applying of the measuring signal is not applicable.
rAnGE	1E3	Complies with 9.9999 Hz.
End	6	Assumed final value.
EndA	0.0064	Complies with 64 sprockets.

If the frequency needs to be displayed with a position after decimal point, then a 60 has to be selected as final value for this adjustment.

Parameter	Settings	Description
tYPE	FrEqU	Applying of the measuring signal is not applicable.
rAnGE	1E3	Complies with 9.9999 Hz
End	60	Assumed final value
dot	0.0	1 position after decimal point
EndA	0.0064	Complies with 64 sprockets

Example: Rotation speed of a machine shaft

There are 4 sprockets on one machine shaft. Applied in an angle of 90° to each other and to the rotation speed measurement. The sprockets are collected via a proximity switch and evaluated by the frequency device, which shall display the rotation speed in U/min. 0…3600 U/min is preset as rotation speed range of the machine.

Calculation of the input frequency

Number of sprockets = 4
Rotation speed = 3600 U/min

$$\text{Final frequency [Hz]} = \frac{\text{Final rotation speed } [\frac{U}{\text{min}}]}{60\ [\frac{s}{\text{min}}] \times 1U} \times \text{Number of sprockets}$$

$$\text{Final frequency [Hz]} = \frac{3600\ \frac{U}{\text{min}}}{60\ \frac{s}{\text{min}} \times 1U} \times 4 = 240\ Hz$$

Setting up the device

Based on the default settings of the device, following parameters need to be changed:

Parameter	Settings	Description
tYPE	FrEqU	As the input frequency is known, the device does not need to be applied to the measuring section.
rAnGE	100E0	The final frequency is in the range of 100.00 to 999.99 Hz.
End	3600	A rotation speed of 3600 shall be displayed as final value.
EndA	240.00	The final frequency for display value 3600 is 24.00 Hz.

12. TECHNICAL DATA

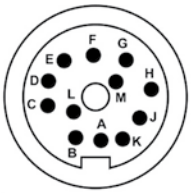
Housing	
Dimensions	96x48x70 mm (WxHxD)
	96x48x89 mm (WxHxD) incl. plug-in terminal
Panel cut-out	$92.0^{+0.8}$ x $45.0^{+0.6}$ mm
Wall thickness	up to 15 mm
Fixing	screw elements
Material	PC Polycarbonate, black, UL94V-0
Sealing material	EPDM, 65 Shore, black
Protection class	Standard IP65 (Front), IP00 (back side)
Weight	approx. 200 g
Connection	plug-in terminal; wire cross section up to 2.5 mm^2
Display	
Digit height	14 mm
Segment colour	red (optional green, yellow or blue)
Range of display	-19999 to 99999
Switching points	one LED per switching point
Overflow	horizontal bars at the top
Underflow	horizontal bars at the bottom
Display time	0.1 to 10.0 seconds
Input	
Sensing device	Namur, 3-wire initiator, pulse input, TTL
High/Low level TTL level	> 15 V / < 4 V – U_{in} max. 30 V > 4.6 V / < 1.9 V
Input frequency	0.01 Hz – 999.99 kHz 0.01 Hz – 9.9999 kHz at rotation speed *ROTAR* 0 – 2.5000 kHz at position coverage *POSIT*
Input resistance	R_i at 24 V / 4 kΩ / R_i at Namur 1.8 kΩ
Frequency filter	none, 100 Hz, 50 Hz, 20 Hz, 10 Hz, 5 Hz, 2 Hz
Digital input	<24 V OFF, >10 V ON, max. 30 VDC R_i ~ 5 kΩ
Accuracy	
Temperature drift	50 ppm / K
Measuring time	0.1…10.0 seconds, respectively optional pulse delay 250 seconds
Measuring principle	Frequency measuring / pulse width modulation
Measuring error	0.05% of measuring range; ± 1 digit
Resolution	approx. 19 bit per measuring range

Output	
Sensor supply	24 VDC / 50 mA
Pulse output	max. 19 kHz
Analog output	0/4-20 mA / burden ≤500 Ω or 0-10 VDC / ≥10 kΩ, 16 bit
Switching outputs	
Relay Switching cycles	with change-over contacts 250 VAC / 5 AAC; 30 VDC / 5 ADC 30 x 10^3 at 5 AAC, 5 ADC ohm resistive load 10 x 10^6 mechanically Diversity according to DIN EN50178 / Characteristics according to DIN EN60255
Power supply	230 VAC ±10 % max. 10 VA 10-30 VDC galv. isolated, max. 4 VA
Memory	EEPROM
Data life	≥ 100 years at 25°C
Ambient conditions	
Working temperature	0…50°C
Storing temperature	-20…80°C
Climatic density	relative humidity 0-80% on years average without dew
Height	up to 200m above sea level
EMV	EN 61326
CE-sign	Conformity to directive 2014/30/EU
Safety standard	According to low voltage directive 2014/35/EU EN 61010; EN 60664-1

13. CONNECTION ASSIGNMENT

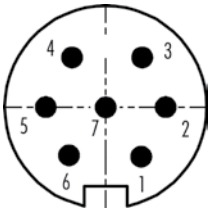
(Seen on the solder connections of the mating connector)

12-pin round socket

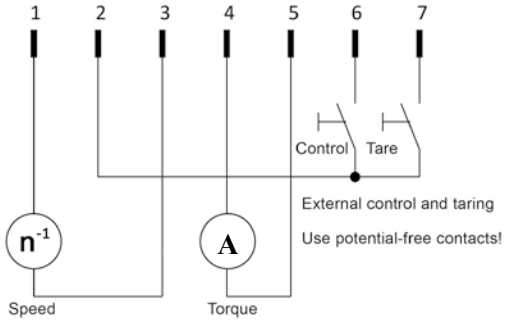


Pin	Connection
A	NC (reserved)
B	Angle track B
C	Voltage
D	Output ground
E	Power supply & Angle ground/rotation speed
F	Power supply +12 V
G	Angle track A/rotation speed
H	NC (reserved)
J	NC (reserved)
K	Control input
L	NC (reserved)
M	NC (reserved)

7-pin round socket



Pin	Color of the cable with free cable end	Signal
1	pink	Speed output (looped)
2	brown	+ 12 V
3	green	mass speed
4	yellow	voltage output
5	white	output ground
6	grey	control
7	grey/pink	taring



ca. 17,5 V
0 V
only high impedance > 100 kΩ
connect external display/evaluation devices

14. SAFETY ADVICES

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

Proper use

The **M2-1F-device** is designed for the evaluation and display of sensor signals.

Attention! Careless use or improper operation can result in personal injury and/or 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 **M2-1F-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 0.5A 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, the 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 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 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 to faulty wiring, can be avoided.

15. ERROR ELIMINATION

	Error description	Measures
1.	The device shows a permanent overflow 	• The input frequency is too high for the selected frequency range. Correct „*RANGE*“ according to this. • Disturbing pulses lead to an increased input frequency, activate „*FI.FRQ*“ at smaller frequencies or shield the senor line. • A mechanic switching contact chatters. Activate the frequency filter „*FI.FRQ*“ with 10 or 20 kHz. • The display was taught faulty under „*TYPE*“ = „*SENS.F*“. Error elimination see below.
2.	The device shows a permanent underflow. 	• An offset frequency „*OFFSA*“ bigger than 0 Hz respectively a „Living Zero“ was selected, in which no frequency is aligned. Check the sensor lines or set the „*OFFSA*“ onto 0 Hz. • The display underflow *DL.UND* was selected too high. The according parameter needs to be adapted. • The device was taught faulty under „*TYPE*“ = „*SENS.F*“. Error elimination see below.
3.	The displayed values switches sporadical.	• Disturbances lead to short-term display switches. For smaller frequences use the frequency filter „*FI.FRQ*“, select a higher measuring time or use the sliding averaging. • The sprockets that needs to be collected, are not evenly spread on a shaft or are not measured accurately. Use the sliding averaging „*AVG*“ if necessary with the dynamic function „*STEP*“. The displayed value „*DISPL*“ needs to be set on „*AVG*“.
4.	The display remains on zero.	• The sensor was not connected properly. Check the connection lines and if necessary the sensor supply. Best directly on the screw terminals of the device! • A PNP- respectively NPN-output does not reach the required threshold. Check the voltage between terminal 2 and 3 with a Multimeter. Depending on signal form it generally shoud be between 4 V and 15 V. The thresholds can be checked more safely with an oscilloscope. If necessary include an external pull-up or pull-down. • A Namur-sensor does not react. Check the distance between the sensor and the sprocket / survey mark and if necessary measure the voltage between 1 and 3. In open condition the input voltage needs to be smaller than 2.2 V and in active condition bigger than 4.6 V. • The selected range of the input frequency is too high. Reduce the frequency range „*RANGE*“ to a smaller value. • The activated frequency filter „*FI.FRQ*“ suppresses the relevant pulses. Increase the filter frequency „*FI.FRQ*“ or use the adaption of the key proportion „*FI.RAT*“. If this should not work, temporarily deactivate the frequency filter with „*FI.FRQ*“ = „*NO*“. • The device was taught faulty under „*TYPE*“ = „*SENS.F*“. Change into „*TYPE*“ „*FREQU*“ and preset the assumed frequency range „*RANGE*“ and the according initial and final values „*END*“, „*OFFS*“, „*ENDA*“, and „*OFFSA*“. So you can check if a frequency signal was connected to the input.
5.	The device shows „*HELP*“ in the 7-segment display	• The device located an error in the configuration memory, excecute a reset to the default values and set up the device according to your application.
6.	Program numbers for the parameterisation of the input are not available	• The programming interlock is activated. • Enter correct code.
7.	The device shows „*ERRT*“ in the 7-segment display	• Contact the manufacturer if errors of this kind occur.
8.	The device does not react as expected.	• If you are not sure, that the device has been parameterised before, restore the state of delivery as described in *chapter 6*.

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