User manual IML2-2

Multi-function input: direct voltage, direct current, Pt100, Pt1000, thermocouple, pulse signals for frequency and rotational speed measurement or counter

Technical features:

- multi voltage power supply unit of 100-240 VAC/DC or 10-40 VDC/18-30 VAC
- LCD indicator with all graphic features of 128x64 pixel
- measurand indication of -1999…9999 digits
- multicoloured backlight (7 colours available)
- indication of metering point and signal identification
- 3-digit adjustable dimension unit
- adjustment of the metering point, manually via display menu (with help text as ticker) or optionally via interface RS485 with ModBus protocol
- min/max memory, Tara function, 9-points-linearisation
- buzzer alarm for audible signalling with switchable confirmation function
- colour change at threshold value exceedance/undercut
- programming interlock via access code
- pluggable screw terminal
- optional: sensor supply
- optional: digital input for triggering of activities like e.g. TARA
- optional: analog output 0/4-20 mA, 0-10 VDC switchable
- optional: 2 relay outputs
- optional: RS232/RS485 interfaces (ModBus protocol) galvanically isolated
- accessories: PC-based configuration kit PM-TOOL with CD & USB-adapter

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Identification

STANDARD TYPES	ORDER NUMBER
Multifunctional measuring input – multicoloured Housing size: 96x96 mm	**IML2-2UX4C.000X.S70AD** **IML2-2UX4C.000X.W70AD**

Options – order code:

IML	2-	2	U	X	4	C.	0	0	0	X.	S	7	0	A	D

Basic type M-Line LCD

Installation depth
incl. plug-in terminal 82 mm [2]

Housing dimenions
B96xH96xD56 mm [2]

Display type
multifunctional / universal [U]

Display colour
LCD: black [X]
Backlight selectable:
Red, Green, White, Blue, Yellow , Teal, Purple

Number of digits
4-digit [4]

Pixel
128x64 Pixel, [C]
with all graphic features

Digital input
none [0]
Interface RS232 [3]
Interface RS232 [4]
Digital input [I]

Dimension
[D] physical unit (3 digits adjustable)

Version
[A] A

Switching points
[0] no switching points
[2] 2 relay outputs

Protection class
[7] IP65 / plug-in terminal

Power pack
[S] 100-240 VAC, DC ±10%
[W] 10-40 VDC, 18-30 VAC

Measuring input:
[X] Multifunctional: Voltage, current, shunt, frequency, Pt100, Pt1000, Thermocouple

Analog output
[0] none
[X] 1x 0-10 VDC, 0/4-20 mA, 16 Bit
[Z] 1x 0-10 VDC, 0/4-20 mA, 12 Bit

Sensor supply
[0] none
[2] 10 VDC / 50 mA / incl. digital input
[3] 24 VDC / 50 mA / incl. digital input

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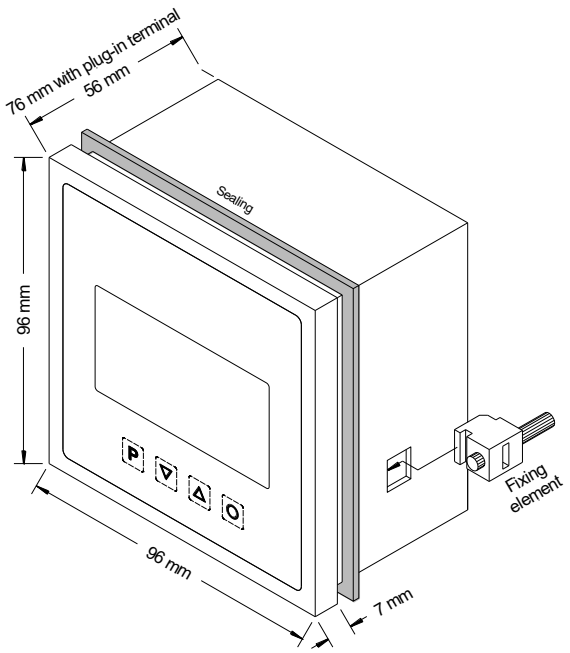
1. Brief description

The panel meter **IML2-2** was designed for measuring of various input signals and their indication on a LCD-display with all graphic features with multicoloured backlight. The configuration happens via 4 front keys or via an optional PC software. The sensor signal can be a signal of 0-10 VDC voltage or 0/4-20 mA current, a resistance thermometer, a thermocouple or a pulse signal. Optionally the conditions of the sensor signal can be evaluated via two changeover contacts, one analog output of 0/4-20 mA, 0-10 VDC or one RS232/RS485 interface. Via a digital input, actions like e.g. TARA can be executed. The **IML2-2** was equipped with a buzzer alarm for the audible signalling of an error status.
The indicator is suitable for voltage supplies of 100-240 VAC/DC or 10-40 VDC/18-30 VAC and available in housing size 96x96mm.

2. Assembly

Read the *Safety advices* on *page 40* before installation and keep this user manual for future reference.



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

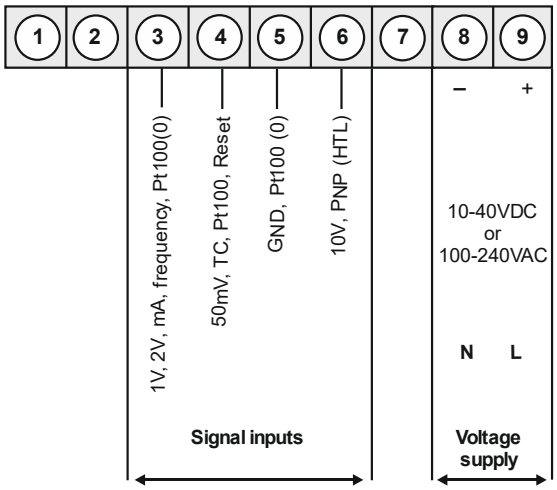
CAUTION! The torque should not exceed 0.1 Nm!

3. Electrical connection

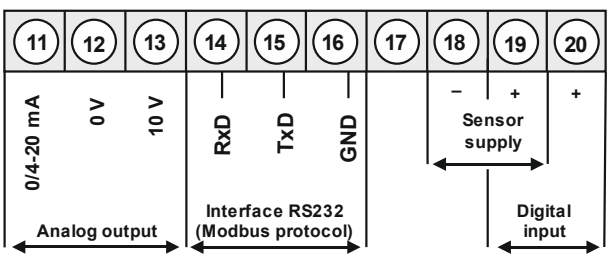
3.1. Terminal pin assignment

Type ML2-2UX.000X.S70AD with a supply of 100-240 VAC, DC ±10%

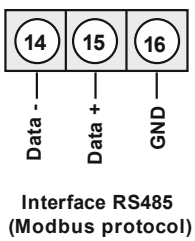
Type ML2-2UX.000X.W70AD with a supply of 10-40 VDC, galv. isolated, 18-30 VAC



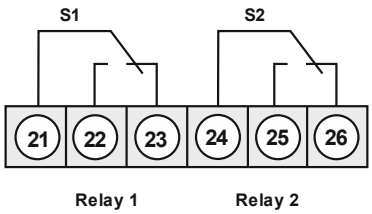
Options:



alternative to RS232



Interface RS485 (Modbus protocol)

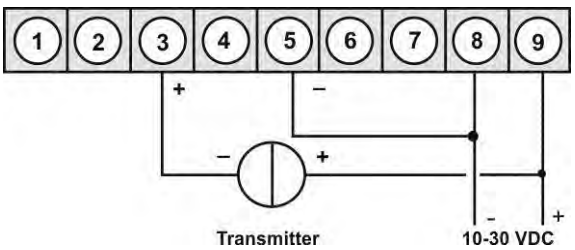


3.2. Connection examples

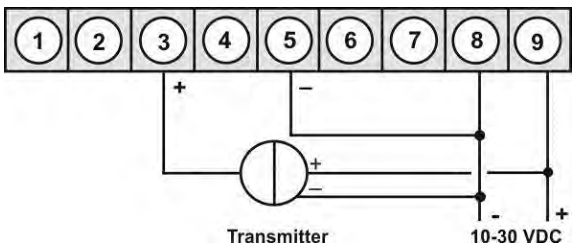
Below please find some connection examples which show practical applications:

3.2.1. Current / Voltage

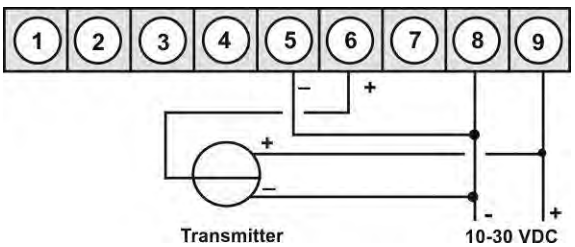
IML2-2 in combination with a 2-wire-sensor 4-20 mA



IML2-2 in combination with a 3-wire-sensor 0/4-20 mA



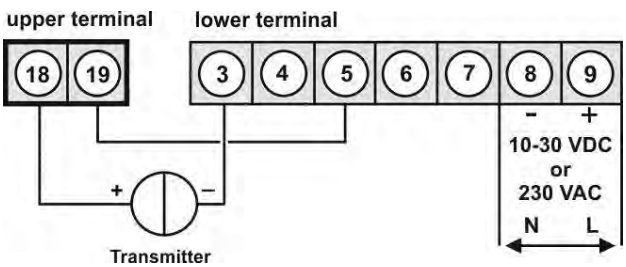
IML2-2 in combination with a 3-wire-sensor 0-10 V



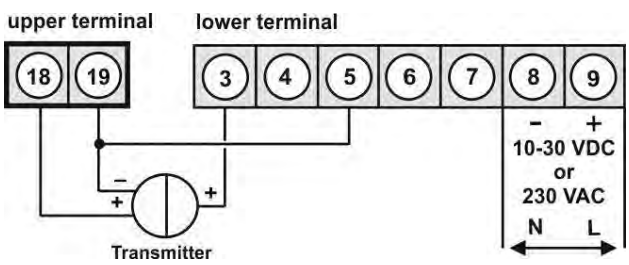
IML2-2 indicators

With current/voltage input in combination with a 24 VDC sensor supply:

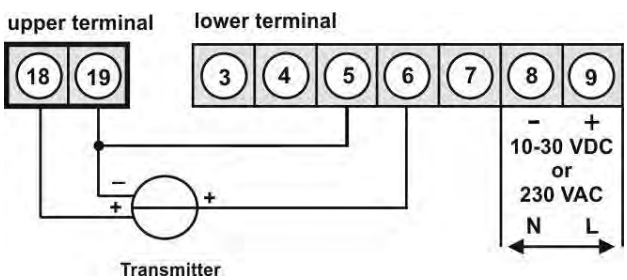
2-wire sensor 4-20 mA



3-wire sensor 0-20 mA

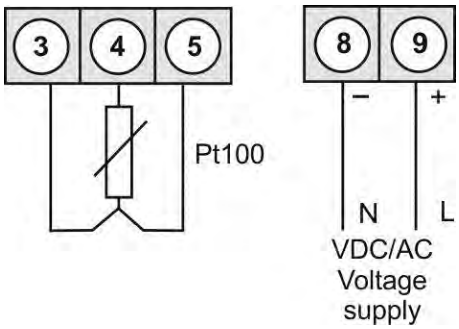


3-wire sensor 0-10 V

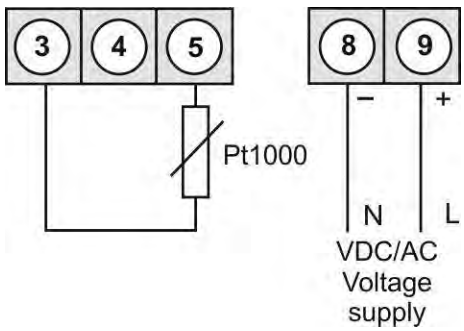


3.2.2. Temperature

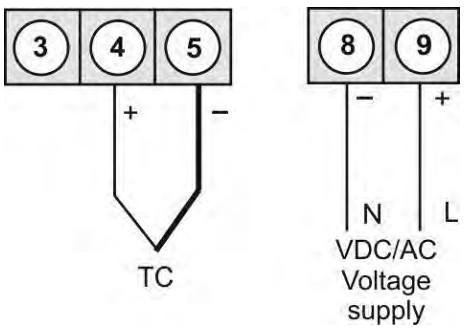
Pt100 3-wire



Pt1000 2-wire

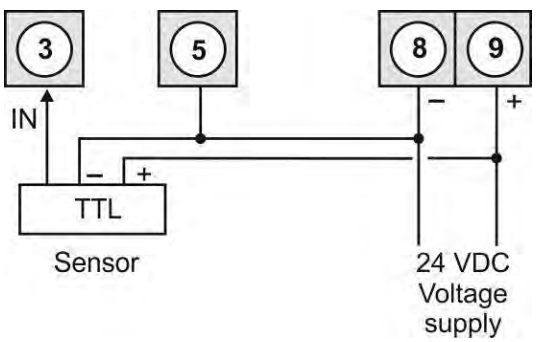


Thermocouple

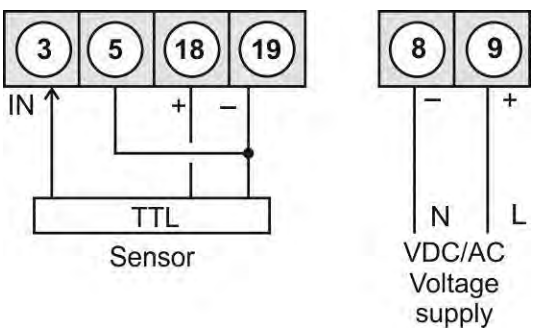


3.2.3. Frequency / Rotational speed

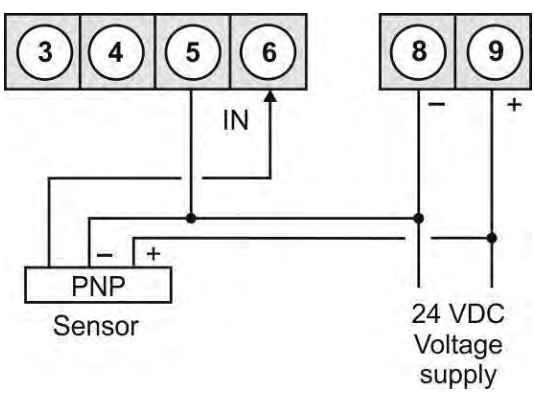
3-wire TTL



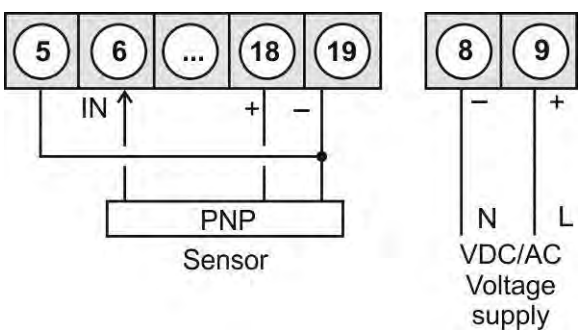
3-wire TTL in combination with a 24 VDC sensor supply



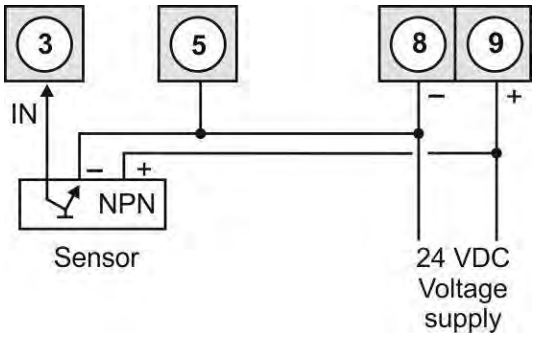
3-wire PNP



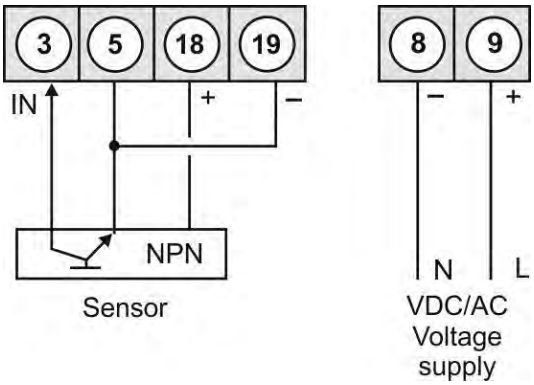
3-wire PNP in combination with a 24 VDC sensor supply



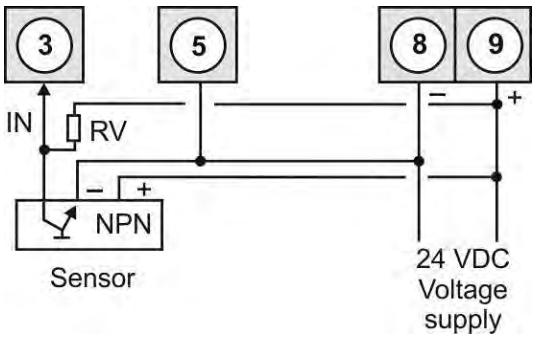
3-wire NPN



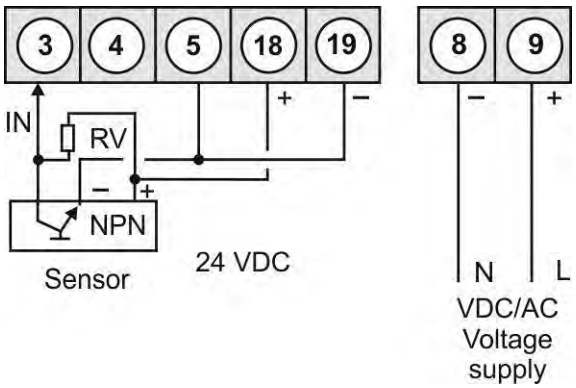
3-wire NPN in combination with a 24 V sensor suppy



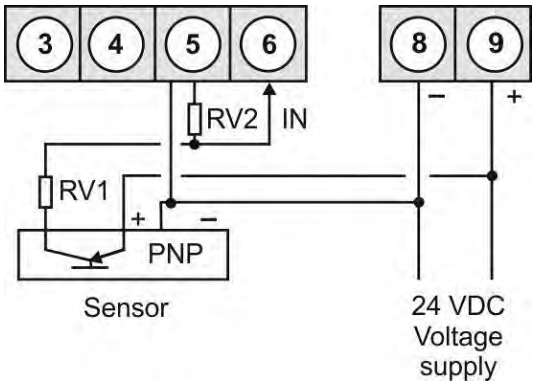
3-wire NPN with required external resistance



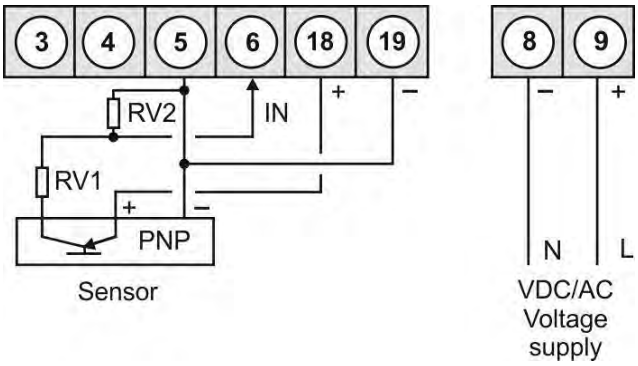
NPN in combination with a 24 V sensor supply and required external resistance



3-Leiter PNP with external resistance circuit



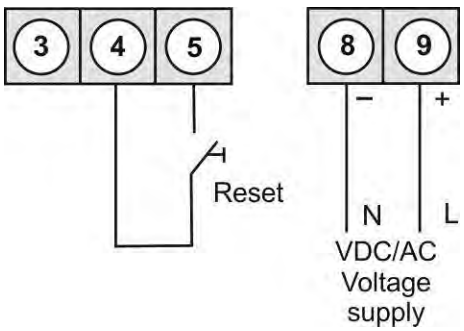
PNP in combination with a 24 V sensor supply and external resistance circuit



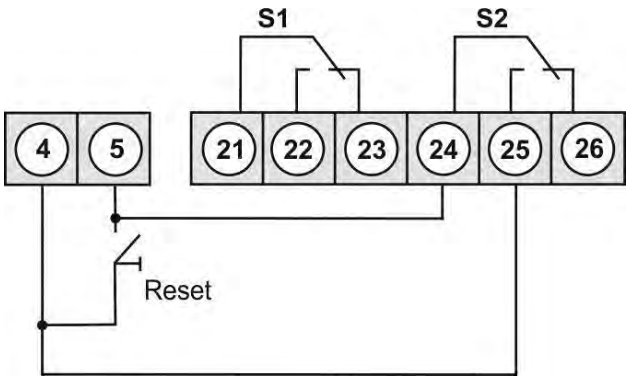
3.2.4. Counter

Use the following connection examples for frequency/rotational speed and reset input, if you use the counter function.

Manual reset with external sensor

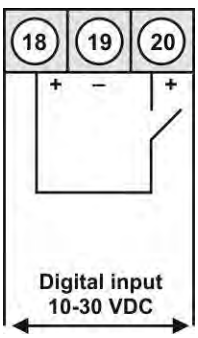


Automatic reset with output 2 and manual reset with external sensor

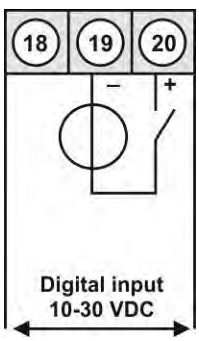


3.2.5. Digital input

IML2-2 with one digital input in combination with a 24 VDC sensor supply

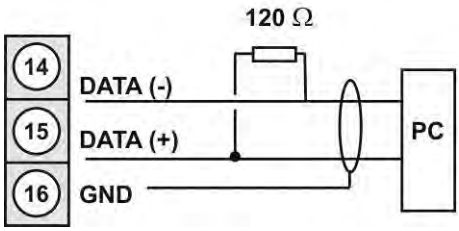


IML2-2 with digital input and external voltage source



3.3. Interface

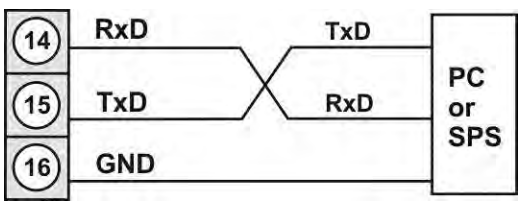
Connection of RS485



The **RS485** interface has to be connected via shielded data line with twistest pair wires. Each end of the bus segment needs to be connected to a termination of the bus wire. It is required to ensure a secure data transfer to the bus. Therefor a resistance (120Ω) must be switched between the lines Data A (-) Terminal 14 and Data (+) Terminal 15.

Connection of RS232

The lines of the **RS232** interface need to be connected 1:1, TxD ton TxD and RxD ton RxD.



4. Description of function and operation

4.1. Operation and display elements

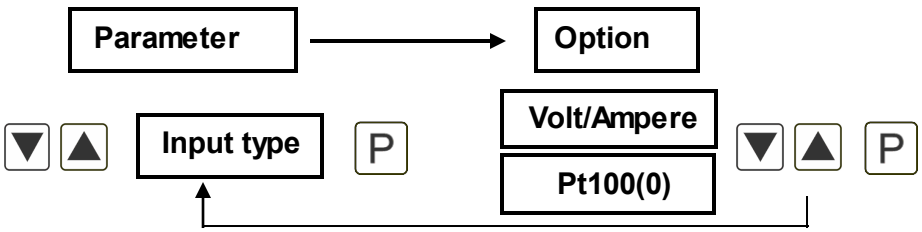
The device comes with four keys, with which the device can be adjusted and deposited functions can be recalled during operation. Adjustable or changeable parameters are always displayed inversed. The selected adjustments in the parameter level need to be confirmed with **[P]** and are thus saved. During configuration mode the parameter name appears in the upper part of the window and in the middle, the current adjustment is shown. Beneath appears a help text in ticker form. Change between the different parameters with the navigation keys **[▼] & [▲]**.

Key symbol	Function during operating mode	Function during parameterisation
Program key [P]	Change into parameterisation with the **[P]-key**.	Change into a lower parameter level or to the deposited value.
Up-key [▲]	Depending on selected key function,the maximum-value can be recalled or a higher threshold can be changed with the **[▲]-key**.	Change between parameters and change of parameters in the value level.
Down-key [▼]	Depending on selected key function, the minimum-value can be recalled or a lower threshold can be changed with the **[▼]-key**.	Change between parameters and change of parameters in the value level.

A switch relay or an activated switching point can be reported visually by a colour change of the background lighting. A display overflow/underflow is displayed with arrows „↑↑↑/↓↓↓„. An activated switching point can be reported by a changeover contact, colour change of the background lighting and a buzzer.

4.2. Parameterisation of device parameter, numerical values and words.

Device parameter, e.g. selection of input signal



Numerical values, e.g. upper range value

Adjust numerical values from the highest to the smallest digit with **[▼] [▲]** and confirm them digit per digit by shortly pressing the **[P]-**key. A minus sign can only be parameterised on the leftmost digit. After the last digit, the input switches again onto the leftmost position. For a take-over keep the **[P]-**key pressed for a longer time. Here, a monitoring of the range and if necessary a correction option take place.

Words, e.g. Area name

A long pushing of the **[P]-**key leads to a take-over of the words. Only the words that are on the left of the current cursor position are taken over. All visible alphabetic or numeric characters that stand after the current cursor position will be deleted. A text length of maximum 15 characters is available. Special characters and small letters can be selected by long pushing of the navigation keys.

5. Switch-on the display

5.1. Switch-on

Once the installation is complete, start the device by applying the voltage supply. Check beforehand once again that all the electrical connections are correct.

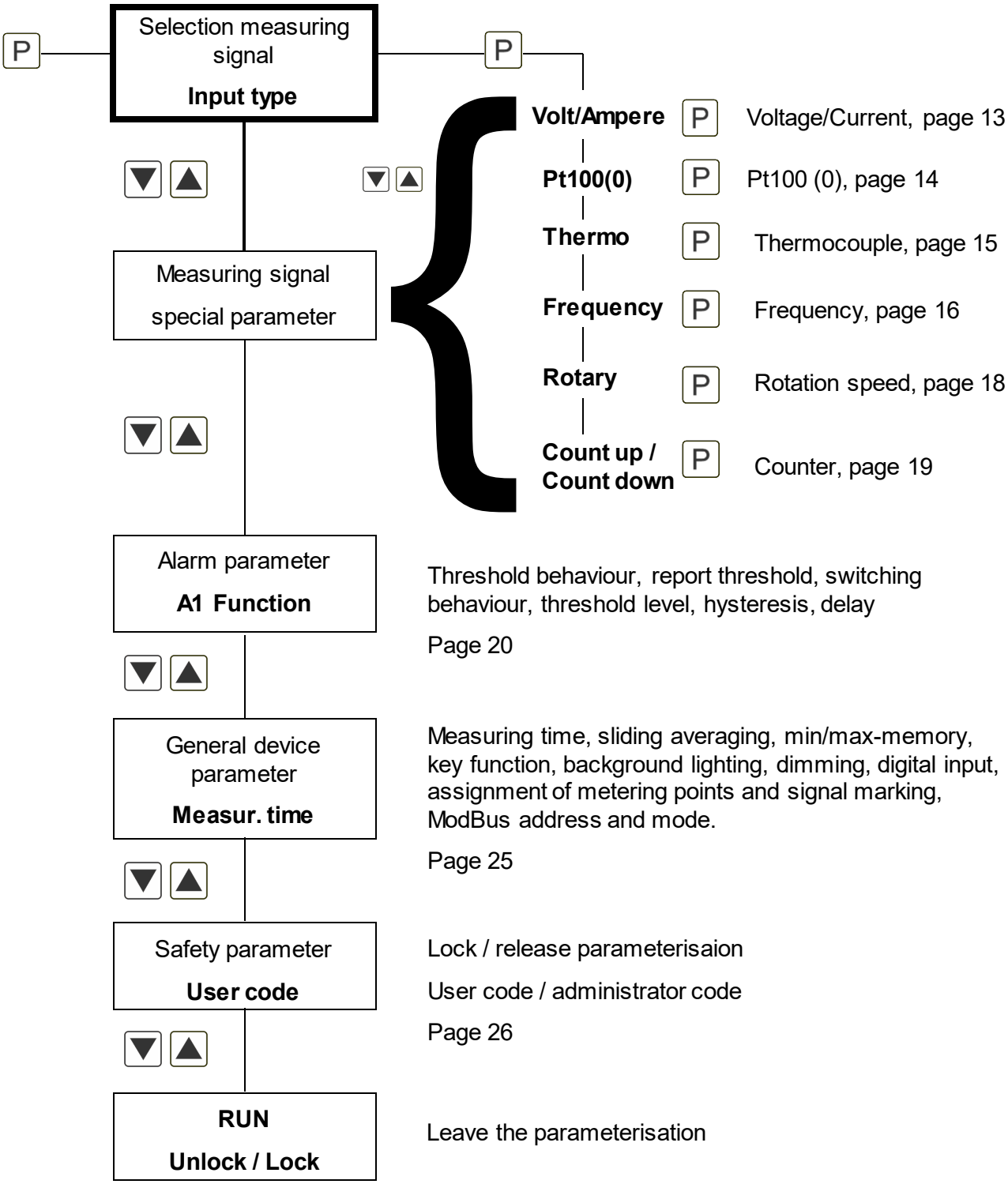
Starting sequence

During the switching-on process, the device type and the software version are shown for 3 seconds. After the start-up sequence, the device switches to operation/display mode.

6. Parameterisation

6.1. Selection of the input signal: Input type

An allocation of the input type takes place during the setting of the type. The following 8 input types are available: Voltage/Current, Pt100(0), Thermocouple, Frequency, Rotational speed, Count up, Count down and Extern.



6.1.1. Device parameter for the allocation of voltage/current signals: VoLT, AMPE

Signal input: 0…10 V, 0…2 V, 0…1 V, 0…50 mV, 0/4…20 mA

Parameter	Option to/or		Default
1234567891234	1234567891234	1234567891234	1234567891234
Input type	Volt/Ampere		
Input range	0-10 V	0-2 V	0-10 V
	0-1 V	0-50 mV	
	0-20 mA	4-20 mA	
End value	-1999	+9999	1000
Start value	-1999	+9999	0
Decimal dot	0	0.000	0
User dim.	AAA	ZZZ	
Analog end	-19.99V	99.99V	10.00V
Analog start	-19.99V	99.99V	0.00V
Value offset	-1999	+9999	0
Overrange	no	ADC	no
	Range	5% range	
	10% range		
Setpoint num.	0	9	0
Display SP#1	-1999	+9999	
Analog SP#1			
…			
Display SP#9	-1999	+9999	
Analog SP#9			

Help text in ticker mode for parameterisation:

Parameter	Option to/or
Input type	Select the measure or sensor type.
Input range	Select the desired measurement range.
End value	Set the value for the chosen analog end.
Start value	Set the value for the chosen analog start.
Decimal dot	Select the position of the shown decimal point in the display.
User dim.	Define the user specified dimension.
Analog end	Define the analog end value of the selected measuring range.
Analog start	Define the analog start value of the selected measuring range.
Value offset	Select the optional offset for the linearization
Overrange	Choose the analog overflow and underflow behaviour of the indicator.
Setpoint num.	Select the number of additional setpoints.
Display SP#x	Set the display value for the following analog signal value.
Analog SP#x	Set the analog signal value for the previous display value.

6.1.2. Device parameter for the allocation of Pt100(0): Pt100

Signal input: resistance-thermometer Pt100(0)

Parameter	Option to/or		Default
1234567891234	1234567891234	1234567891234	1234567891234
Input type	Pt100(0)		
Sensor type	Pt100 (200°C)	Pt100 (850°C)	Pt100 (200°C)
	Pt1000 (850°C)		
Scale unit	°C	°F	°C
Adjustment	-19.9°C	+19.9°C	0.0°C
	-35.9°F	+35.9°F	0.0°F

At the Pt100-3-wire signal recording it differs between Pt100 (200.0°C) for -50…200°C and Pt100 (850°C) with -200…850°C measuring range. In the first case an additional decimal place will be displayed. At the Pt1000-2-wire signal recording, the maximum measuring range of -200…850°C is directly covered by the input and the temperature will be displayed without decimal place.

Help text in ticker mode for parameterisation:

Parameter	Option to/or
Input type	Select the measure or sensor type.
Sensor type	Select the connection type and resolution of the Pt100(0) temperature sensor.
Scale unit	Choose the scale unit for the displayed temperature.
Adjustment	Set the measurement offset in °C/°F.

Device parameter for the allocation of thermocouples: **Thermo**
Signal input thermo couples type: L, J, K, B, S, N, E, T, R

Parameter	Option to/or				Default
1234567891234	1234567891234		1234567891234		1234567891234
Input type	Thermo				
Sensor type	Type K	Type B	Type S	Type N	Type K
	Type E	Type T	Type R	Type L	
	Type J				
Scale unit	°C		°F		°C
Adjustment	-19.9°C		+19.9°C		0.0°C
	-35.9°F		+35.9°F		0.0°F

Help text in ticker mode for parameterisation:

Parameter	Option to/or
Input type	Select the measure or sensor type.
Sensor type	Select the connection type and resolution of the thermocouple temperature sensor.
Scale unit	Choose the scale unit for the displayed temperature.
Adjustment	Set the measurement offset in °C/°F.

6.1.3 Pulse metering

6.1.3.1 Device parameter for the allocation of frequency metering 0-9999 Hz: Frequency

Signal input: TTL, NPN, PNP, Namur

Parameter	Option to/or		Default
1234567891234	1234567891234	1234567891234	1234567891234
Input type	Frequency		
Input signal	TTL	NPN	TTL
	PNP	NAMUR	
Input range	9.999Hz	99.99Hz	9999Hz
	999.9Hz	9999Hz	
Filter	2Hz	5Hz	no
	10Hz	20Hz	
	50Hz	100Hz	
	200Hz	500Hz	
	no		
End value	-1999	+9999	1000
Start value	-1999	+9999	0
Decimal dot	0	0.000	0
User dim.	AAA	ZZZ	
Freq. end	0000Hz	9999Hz	1000Hz
Freq. start	0000Hz	9999Hz	0Hz
Value offset	-1999	+9999	0
Setpoint num.	0	9	0
Display SP#1	-1999	+9999	
Freq. SP#1			
...			
Display SP#9	-1999	+9999	
Freq. SP#9			

Help text in ticker mode for parameterisation:

Parameter	Option to/or
Input type	Select the measure or sensor type.
Input signal	Choose the type of input signal.
Input range	Select the required frequency range.
Filter	Choose an additional frequency filter to reduce the recognition of faulty pulses.
End value	Set the display value for the higher frequency.
Start value	Set the display value for the lower frequency.
Decimal dot	Select the position of the shown decimal point in the display.
User dim.	Define the user specified dimension.
Freq. end	Define the frequency end value for the given display end value.
Freq. start	Define the frequency start value for the given display start value.
Value offset	Set the optional offset of the display value.
Setpoint num.	Select the number of additional setpoints.
Display SP#x	Set the display value for the following frequency value.
Freq. SP#1	Set the frequency signal value for the previous display value.

6.1.3.2 Device parameter for the allocation of rotation speed metering 0-9999 Hz: Rotary

Signal input: TTL, NPN, PNP, NAMUR

Parameter	Option to/or		Default
1234567891234	1234567891234	1234567891234	1234567891234
Input type	Rotary		
Input signal	TTL	NPN	TTL
	PNP	NAMUR	
Filter	2Hz	5Hz	no
	10Hz	20Hz	
	50Hz	100Hz	
	200Hz	500Hz	
	no		
Pulse/turn	0001	9999	1
Time base	Seconds	Minutes	Minutes
	Hour		
Decimal dot	0	0.000	0
User dim.	AAA	ZZZ	

The rotational speed setting stands for a simplified frequency metering, only the essential parameter are shown.

Help text in ticker mode for parameterisation:

Parameter	Option to/or
Input type	Select the measure or sensor type.
Input signal	Choose the type of input signal.
Filter	Choose an additional frequency filter fo reduce the recognition of faulty pulses.
Pulse/turn	Select the resolution/counts of pulses per turn.
Time base	Choose the time base to the shaft speed.
Decimal dot	Select the position of the shown decimal point in the display.
User dim.	Define the user specified dimensions.

6.1.3.3 Device parameter for the allocation of upwards/downwards counter: Count up, Count down

Signal input: TTL, NPN, PNP, NAMUR

Parameter	Option to/or		Default
1234567891234	1234567891234	1234567891234	1234567891234
Input type	Count up	Count down	
Input signal	TTL	NPN	TTL
	PNP	NAMUR	
Count base	Pulses	Seconds	Pulses
	Minutes		
Active edge	Positive	Negative	Positive
Prescaler	0001	9999	1
Filter	2Hz	5Hz	no
	10Hz	20Hz	
	50Hz	100Hz	
	200Hz	500Hz	
	no		
End value	-1999	+9999	1000
End count	0001	9999	1000
Decimal dot	0	0.000	0
User dim.	AAA	ZZZ	

Help text in ticker mode for parameterisation:

Parameter	Option to/or
Input type	Select the measure or sensor type.
Input signal	Choose the type of input signal.
Count base	Choose the source of counting.
Active edge	Select the active edge.
Prescaler	The prescaler is able to be increased to work with higher frequency signals.
Filter	Choose an additional frequency filter to reduce the recognition of faulty pulses.
End value	Define the display value for reaching the end count.
End count	Define the counting value for the end value.
Decimal dot	Select the position of the shown decimal point in the display.
User dim.	Define the user specified dimensions.

6.2. Alarm parameter

Parameter	Option to/or		Default
1234567891234	1234567891234	1234567891234	1234567891234
A1 function	Off	On	Off
	Exceed limit	Undercut limit	
	In the range	Out of range	
	Digital input	MODBUS	
A1 fault	No change	Off	No change
	On		
A1 behaviour	Active High	Active Low	Active High
A1 limit	-1999	+9999	100
A1 hyster.	0000	9999	0
A1 upper lim.	-1999	+9999	200
A1 lower lim.	-1999	+9999	100
A1 off delay	000s	5999s	0 sec
A1 on delay	000s	5999s	0 sec
A1 color	Red	Green	Red
	Blue	White	
	Yellow	Teal	
	Purple	No change	
A1 acknowl.	On	Off	Off
A1 buzzer	On	Off	Off
A1 procval	Local	Remote	Local
A2 function	Off	On	Off
	Exceed limit	Undercut limit	
	In the range	Out of range	
	Digital input	MODBUS	
A2 fault	No change	Off	No change
	On		
A2 behaviour	Active High	Active Low	Active High
A2 limit	-1999	+9999	300
A2 hyster.	0000	9999	0
A2 upper lim.	-1999	+9999	400
A2 lower lim.	-1999	+9999	300
A2 off delay	000s	5999s	0 sec
A2 on delay	000s	5999s	0 sec

Parameter	Option to/or		Default
A2 Color	Red	Green	Red
	Blue	White	
	Yellow	Teal	
	Purple	No change	
A2 acknowl.	On	Off	Off
A2 buzzer	On	Off	Off
A2 procval	Local	Remote	local

Help text in ticker mode for parameterisation:

Parameter	Option to/or
A1 function	Choose the limit behaviour. The other parameter are not displayed by „Off“.
A1 fault	Choose the limit fault behaviour. On an internal error, the alert goes to the selected state.
A1 behaviour	Choose the limit behaviour.
A1 limit	Define the limit value for the choosed function.
A1 hyster.	Define the hysteresis for the limit value.
A1 upper lim.	Define the upper limit for the range control.
A1 lower lim.	Define the lower limit for the range control.
A1 off delay	Define the delay time to off state for the alert.
A1 on delay	Define the delay time to on state for the alert.
A1 color	Choose the background color which will be activated by the alert.
A1 acknowl.	Switch the acknowledgement function of the alert on or off.
A1 buzzer	Switch the buzzer function on or off.
A1 procval	Choose the process value source local or remote.
A2 function	Choose the limit behaviour. The other parameter are not displayed by „Off“.
A2 fault	Choose the limit fault behaviour. On an internal error, the alert goes to the selected state.
A2 behaviour	Choose the limit behaviour.
A2 limit	Define the limit value for the choosed function.
A2 hyster.	Define the hysteresis for the limit value.
A2 upper lim.	Define the upper limit for the range control.
A2 lower lim.	Define the lower limit for the range control.
A2 off delay	Define the delay time to off state for the alert.
A2 on delay	Define the delay time to on state for the alert.

Parameter	Option to/or
A2 color	Choose the background color which will be activated by the alert.
A2 acknowl.	Switch the acknowledgement function of the alert on or off.
A2 buzzer	Switch the buzzer function on or off.
A2 procval	Choose the process value source local or remote.

A1 function: Limit value behaviour
Change between the different working types of switching outputs by using the functional principle.
If **A1 function = Off** was selected, the relevant switching point parameter will not be displayed.

Under menu item „Ax function“ you find the setting „ModBus“. Via this setting it is possible to control the alarm directly via register „Ax active“. It works like a digital input, which is set via the ModBus. The corresponding register can be found in the ModBus protocol.

For the remote control „Remote contr.“ needs to be activated under the menu item of the device.

Off	The switching point is without function and relevant parameter will not be displayed (Default status).
On	The switching point is switched on during measuring operation and corresponding parameter (except **A1 fault** and **A1 behaviour**) will not be displayed.
Exceed limit	Switch at threshold value exceedance.
Undercut limit	Switch at threshold value undercut.
In the range	Switch within the preset range.
Out of range	Switch outside the preset range.
Digital input	Activation via external signal
Modbus	Activation via register „Ax activce“

A1 fault: Report at threshold value errors
If a check sum should not be correct or the range of value is affected, the switching point behaviour can be preset.

On	Selected switching point behaviour is activated.
Off	The switching points behave contrary. The maloperation transcribes the actual threshold function in case of an occured error.
No change	An error has no defined influence.

A1 behaviour: Switching behaviour of the outputs
Depending on connection and operating mode the switching outputs do support and work inverted. This means under alarm condition the switching outputs will be deactivated. Thus the alarm condition remains in case of a device failure.

Active High	The output is switched to HIGH / voltage supply without alarm condition.
Active Low	The output is switched to LOW / GND without alarm condition.

A1 limit: Threshold level
Here the threshold level is defined that activates/deactivates an alarm. This parameter will not be recalled if the window function is used.

A1 hyster.: Hysteresis
The hysteresis defines a difference to the limit value which defines the delay of an alarm. This parameter will not be recalled if the window function is used.

A1 upper lim: Upper limit value
A1 lower lim: Lower limit value
For range functions **A1 function = in the range** or **out of range** this value defines the upper/lower limit of the window function between „-1999…9999“. This parameter will not be displayed with other functional principles. The functional principle can change between switching point 1 and 2.

A1 off delay: Dropout delay
Preset a delayed switching-off of 0-5999 seconds for the limit values. The time value will not be saved permanently and is set back by restart of the device. Furthermore the alarm condition will be detected during restart, without considering the preset delay.

A1 on delay: On-delay
Preset a delayed switching-on of 0-5999 seconds for the limit values. The time value will not be saved permanently and is set back by restart of the device. Furthermore the alarm condition will be detected during restart, without considering the preset delay.

A1 colour: background color

Via „Ax color“ a change of colour can be identified if an alarm occured. If „No change“ was selected, the alarm has no effect on a change of colour in the display. If „A1 color“ and „A2 color“ are occupied with different colours, then „A2 color“ overwrites the selected „A1 color“, if they occur simultaneously.

A1 acknowl.: alarm acknowledgement

The alarm acknowledgement will be adjusted via „Ax acknowledge“ for each alarm. In case of an alarm, reset the alarm indication via the **[O]**-key or optionally via the digital input. Independent from a continuing alarm condition.

Differentiate between 4 alarm conditions:

- switching output to alarm 1 activated / buzzer to alarm 1 activated

- switching output to alarm 2 activated / buzzer to alarm 2 activated

The acoustic signal occurs, if one of the buzzer conditions was activated.

A1 buzzer: Buzzer (acoustic alarm)

A buzzer function can be activated as well as alarm. It can be activated on one or both alarms.

Note: Alarm functions A1 and A2 are equal!

6.2.1 Buzzer function and manual counter reset

Additionally to change of colour and/or switching point process, an acoustic alarm can be generated via the buzzer function (A1 / A2 buzzer). The acknowledgement happens via the **[O]**-key on the front, which needs to be pushed for at least 2 seconds, or via the digital input (Dig input) if it was parameterised on „Accept alert“. With activated counter function „Count down / Count up“, differ between setting back the „BUZZER“ or „COUNTER“. Make a selection with the navigation keys **[▼] [▲]** and confirm via the **[P]**-key. If „COUNTER“ was selected, select under report „Reset counter“ between „Yes“ and „No“. This helps additionally to prevent an accidental setting back.

6.3. Analog output parameter

Parameter	Option to/or				Default
AO Source	Act.value	Min value	Max value		Act. value
AO Range	4-20 mA	0-10 V	0-20 mA		4-20 mA
AO End value	-1999	+9999			1000
AO Start value	-1999	+9999			0
AO Overrange	Edge	to End	to Off	to Min	Edge
	to Max				

Help text in ticker mode for parameterisation:

Parameter	Options
AO Source	Select the input source of analog output.
AO Range	Select the output range.
AO End value	Set the analog output end value.
AO Start value	Set the analog output start value.
AO Overrange	Choose the analog output overflow and underflow behavior.

AO Source – Select reference to analog output

The analog output signal can refer to different functions, in detail these are the current measurand, the minimum value or the maximum value.

AO Range – Select analog output

Available are 3 output signals: 4-20 mA, 0-10 V or 0-20 mA. Select the desired signal with this function.

AO End value – Adjustment of the final value of the analog output up to max. +9999.

AO Start value – Adjustment of the initial value of the analog output up to min. -1999.

AO Overrange – Overflow behaviour

To recognise and evaluate faulty signals, e.g. via a control system, the overflow behaviour of the analog output can be defined. As underflow can be seen either **Edge** (the analog output runs onto the set limits of e.g. 4 and 20 mA), **to.Off** (input value smaller than initial value, analog output switches to e.g. 4 mA) or **to.End** (higher than the final value, analog output switches to e.g. 20 mA).

If **to.Min** or **to.Max** were adjusted, the analog output switches to the smallest or largest possible binary value. This means values of e.g. 0 mA, 0 VDC or values higher than 20 mA or 10 VDC can be reached.

6.4. General device parameter

Parameter	Option to/or		Default
1234567891234	1234567891234	1234567891234	1234567891234
Meas. Time	0.01 sec	2.00 sec	1.00 sec
Moving aver.	1	20	1
Min. value	-1999	+9999	-1999
Max. value	-1999	+9999	9999
Dir. Keys	No function	Min/Max requ.	No function
	Set limits		
Stand. color	Red	Green	Green
	Blue	White	
	Yellow	Teal	
	Purple		
Brightness	1	9	9 (bright)
Dig. Input	No function	Accept alert	No function
	Trigger alert	Tare to zero	
Signal name			
Area name			
MODBUS addr.	1	250	1
MODBUS mode	ASCII	RTU	ASCII
Remote contr.	On	Off	Off

Both menu items „**Meas. time**“ and „**Moving aver.**“ are not visible with input types Pt100, Thermo, Count up/Count down/external, but well-defined.

Pt100/Thermo, Measur. time: 1s, Moving aver.: 10

Count/up/Count up, Measur. Time: 100ms, Moving aver.: 0

By activation of menu item „Remote Cont.“ the device can be set into a control mode. In this mode, only information will be displayed, which have been received by the ModBus master. The previously adjusted input signal will still be collected in the background and can be recalled via the ModBus interface.
Ideally the sensor input should be set on 0-10 V!

Only with activated „Remote Cont.“ a writing access to all register is possible. Apart from that all device internal parameters are active.

In case of a restart all sent ModBus values get lost and have to be sent again, as no permanent storage takes place.

Help text in ticker mode with parameterisation:

Parameter	Option to/or
Measur. Time	Define the measuring time and display time.
Moving aver.	Define the count of measuring values for the moving averaging.
Min. value	Define the lower display limit.
Max. value	Define the higher display limit.
Dir. Keys	Choose the special function of the direction keys.
Stand. colour	Choose the standard background colour.
Brightness	Choose the brightness of the background light.
Dig. input	Choose the function of the digital input.
Signal name	Define the displayed signal name.
Area name	Define the displayed area name.
Modbus addr.	Sets the device address for the communication with a Modbus master.
Modbus mode	Select the Modbus communication mode.
Remote contr.	The enabled remote control will let the Modbus master control the display, alarms and relays.

6.5. Safety parameter for parameterisation locking/release

Parameter	Option to/or		Default
1234567891234	1234567891234	1234567891234	1234567891234
Admin. code	0000	9999	1234
User code	0000	9999	0000
run	Unlocked mode	Locked mode	Unlocked mode

Help text in ticker mode for parameterisation:

Parameter	Option to/or
Admin. code	Select the administration code to unlock the parameter settings.
User code	An user code greater than 0000 disables direct access to the limit parameter.
Run	Choose the unlocking or the locking function and exit the setting mode.

7. RS485 / RS232 – Modbus device interface

Interface parameter - 1 start bit, 8 data bit, 1 stop bit, no parity, **9600** baud

Compatibility – the interface is compatible to ModBus protocol of the company *„Modicon“*. This means that all register have a size of 16 bit. Higher data types can be realised by occupying several register in series. A not-Modicon-compatible-mode is supported, too. In this mode each data type occupies only one register which corresponds to the size of data type (Minimum is always 16 Bit).

(Info: „Modicon“ - company, that produced the first SPS, now „Schneider-Electric“)

Advice: An access to data types that occupy several register, must always be carried out in one write/read access and may not be distributed into several write/read access!

Device address – Use a value between 1 and 247 as device address. On address 0 several devices can be addressed simultaneously (broadcast), if the necessary function is supported (no reception for e.g. reset of the device).

Transmission mode – The devices support the RTU-mode (binary data, default) and the ASCII-mode (alphanumeric characters – hexadecimal). The RTU-mode is faster as less bytes need to be transferred, but more critical in terms of time. The ASCII-mode is suited for the communication with PC-based systems, as they cannot fullfill the time-critical requirements for the RTU-mode.

Advice: The device configuration via the PM-Tool is only possible in ASCII-mode.

Supported data types:

Name	Number range	Memory size	Number of register in modicon-compatible mode	Number of register in not-modicon-compatible mode
INT08	-128…127	2 Byte	1	1
UINT08	0…255	2 Byte	1	1
INT16	-32768…32767	2 Byte	1	1
UINT16	0…65535	2 Byte	1	1
INT32	-2147843648… 2147843647	2 Byte	2	1
UINT32	0…4294967295	4 Byte	2	1
INT64	-9223372036854775808… 9223372036854775807	8 Byte	4	1
FLOAT	± 3.402823466e±38	4 Byte	2	1

Supported function codes:

Code	Function	Note
0x03	READ HOLDING REGISTERS	e.g. readout measuring values and alarm status
0x04	READ INPUT REGISTER	same function as code 0x03
0x08	DIAGNOSTIC	device diagnostic
0x10	WRITE MULTIPLE REGISTERS	e.g. transfer measuring values and alarm status to the device

Register description:

Advice: The display range is limited from -1999 to 9999. A measurand of -2000 or 10000 signalises an underflow or overflow of the measuring range.

Address range 0x4000…0x4FFF – 16 bit register					
Name	**Index (hex/ dec)**	**Access mode**	**min/max-value data type**	**Note**	
Device number	0x4400 /17408	r/w	0…65535 UNIT16	user defined identification	
Digin1	0x4401 /17409	r	0/1 UNIT16	**Bit** 0 1	**Function** Digin 1 low Digin 1 high
Digin2	0x4402 /17410	r	0/1 UNIT16	**Bit** 0 1	**Function** Digin 2 low Digin 2 high
Measured value High-word	0x4501 /17665	r/w	-20000..100000 FLOAT	Current scaled measurand	
Measured value Low-word	0x4502 /17666				
Decimal point	0x4503 /17667	r/w	0…3 UNIT16	**Value** 0 1 2 3	**Display** 0 0,0 0,00 0,000
Signal name (byte 0:1)	0x4608 /17928	r/w	CHAR	Signal name (fill up unimplemented bytes with zeros)	
Signal name (byte 2:3)	0x4609 /17929				
Signal name (byte 4:5)	0x460A /17930				
Signal name (byte 6:7)	0x460B /17931				
Signal name (byte 8:9)	0x460C /17932				
Signal name (byte 10:11)	0x460D /17933				
Signal name (byte 12:13)	0x460E /17934				
Signal name (byte 14:15)	0x460F /17935				

Register description:

Advice: The display range is limited from -1999 to 9999. A measurand of -2000 or 10000 signalises an underflow or overflow of the measuring range.

Address range 0x4000…0x4FFF – 16 bit register				
Name	**Index (hex/ dec)**	**Access mode**	**min/max-value data type**	**Note**
Area name (byte 0:1)	0x4610 /17936	r/w	CHAR	Area name (fill up unimplemented bytes with zeros)
Area name (byte 2:3)	0x4611 /17937			
Area name (byte 4:5)	0x4612 /17938			
Area name (byte 6:7)	0x4613 /17939			
Area name (byte 8:9)	0x4614 /17940			
Area name (byte 10:11)	0x4615 /17941			
Area name (byte 12:13)	0x4616 /17942			
Area name (byte 14:15)	0x4617 /17943			
Dimension (byte 0:1)	0x4618 /17944	r/w	CHAR	Dimension (fill up unimplemented bytes with zeros)
Dimension (byte 2:3)	0x4619 /17945			

Address range 0x4000…0x4FFF – 16 bit register					
Name	**Index (hex/ dec)**	**Access mode**	**Min/Max-value Data type**	**Note**	
Display brightness	0x461A /17946	r/w	0..8 UINT16	**Value** 0 … 8	**Function** Min. brightness Max. brightness
Digital background color	0x461B /17947	r/w	0..6 UNIT16	**Value** 0 1 2 3 4 5 6	**Colour** Red Green Blue White Yellow Violet Teal

Address range 0x4000…0x4FFF – 16 bit register					
Name	**Index (hex/ dec)**	**Access mode**	**min/max-value Data type**	**Note**	
Alarm 1 limit high-word	0x4720 /18208	r/w	-20000..100000 FLOAT	Limit alarm 1	
Alarm 1 limit low-word	0x4721 /18209				
Alarm 1 hysteresis high-word	0x4722 /18210	r/w	-20000..100000 FLOAT	**Hysteresis alarm 1**	
Alarm 1 hysteresis low-word	0x4723 /18211				
Alarm 1 limit max high-word	0x4724 /18212	r/w	-20000..100000 FLOAT	max. alarm 1 (Range)	
Alarm 1 limit max low-word	0x4725 /18213				
Alarm 1 limit min high-word	0x4726 /18214	r/w	-20000..100000 FLOAT	min. alarm 1 (Range)	
Alarm 1 limit min low-word	0x4727 /18215				
Alarm 1 on time	0x4728 /18216	r/w	0..5999 sec UINT	switch-on delay	
Alarm 1 off time	0x4729 /18217	r/w	0..5999 sec UINT	switch-off delay	
Alarm 1 active	0x472A /18218	r/w	0/1	**Value** 0 1	**Function** inactive active
Alarm 2 limit high-word	0x4730 /18224	r/w	-20000..100000 FLOAT	Limit alarm 2	
Alarm 2 limit low-word	0x4731 /18225				
Alarm 2 hysterese high-word	0x4732 /18226	r/w	-20000..100000 FLOAT	Hysteresis alarm 2	
Alarm 2 hysterese low-word	0x4733 /18227				
Alarm 2 limit max high-word	0x4734 /18228	r/w	-20000..100000 FLOAT	max alarm 2 (Range)	
Alarm 2 limit max low-word	0x4735 /18229				
Alarm 2 limit min high-word	0x4736 /18230	r/w	-20000..100000 FLOAT	min alarm 2 (Range)	
Alarm 2 limit min high-word	0x4737 /18231				
Alarm 2 on time	0x4738 /18232	r/w	0..5999 sec UINT	switch-on delay	

Address range 0x4000…0x4FFF – 16 bit register					
Name	**Index (hex/ dec)**	**Access mode**	**min/max-value Data type**	**Note**	
Alarm 2 off time	0x4739 /18233	r/w	0..5999 sec UINT	switch-off delay	
Alarm 2 active	0x473A /18234	r/w	0/1	**Value** 0 1	**Function** inactive active
Relay 1 active	0x4740 /18240	R	0/1 UINT16	**Value** 0 1	**Function** inactive active
Relay 2 active	0x4741 /18241	R	0/1 UINT16	**Value** 0 1	**Function** inactive active
Buzzer active	0x4742 /18242	R	0/1 UINT16	**Value** 0 1	**Function** inactive active

Relay 1, 2 and the buzzer cannot be triggered directly. An activation works only via the corresponding alarm. There are two possibilites of the indirect alarm control, via a change of the limit values or if „Ax function“ is set on „ModBus“ by the register „Alarm x Active“ (in the menu of the device).

Protocol

General form of the telegrams:

ModBus-RTU

Device address	Function	Data	CRC-value
1 Byte	1 Byte	n Bytes	2 signs

ModBus-ASCII

Start	Device address	Function	Data	LRC-value	End
':'	2 signs	2 signs	n x 2 signs	2 signs	‚lrln'

Information: In ASCII-mode a byte with 2 signs in hexadecimal coding ('00…FF') is shown.

Telegram types:

Function 0x03 (read register) - request

Address	Func-tion	Data				Check sum	
		Start address		Number of register			
		High-Byte	Low-Byte	High-Byte	Low-Byte	Low-Byte	High-Byte
0xnn	0x03	0xnn	0xnn	0xnn	0xnn	0xnn	0xnn

Function 0x03 (read register) - answer

Address	Function	Data						Check sum	
		Number of bytes nn = number of register x 2	Register n+0		…	Register n+X			
			High-Byte	Low-Byte	…	High-Byte	Low-Byte	Low-Byte	High-Byte
0xnn	0x03	0xnn	0xnn	0xnn	…	0xnn	0xnn	0xnn	0xnn

Function 0x10 (write register) - request

Addr ess	Func-tion	Data										Check sum	
		Start address		Number of register		Number of bytes = number of register x2	Register n+0		…	Register n+X			
		High Byte	Low Byte	High Byte	Low Byte		High Byte	Low Byte	…	High Byte	Low Byte	Low Byte	High Byte
0xnn	0x10	0xnn	0xnn	0xnn	0xnn	0xnn	0xnn	0xnn	…	0xnn	0xnn	0xnn	0xnn

Function 0x10 (write register) - answer

Address	Func-tion	Data				Check sum	
		Start address		Number of register			
		High-Byte	Low-Byte	High-Byte	Low-Byte	Low-Byte	High-Byte
0xnn	0x10	0xnn	0xnn	0xnn	0xnn	0xnn	0xnn

Example of telegram:

Reading a 32-bit value

ModBus device address 1, register index 0x6000, number of register 2, return value 250000 (0x0003D090)

Protocol: ModBus-RTU

Request

Address	Func-tion	Data				Check sum	
		Start address		Number of register			
		High-Byte	Low-Byte	High-Byte	Low-Byte	Low-Byte	High-Byte
0x01	0x03	0x60	0x00	0x00	0x02	0xnn	0xnn

Response

Addr-ess	Func-tion	Data					Check sum	
		Number of bytes	Low-Word		High-Word			
			High-Byte	Low-Byte	High-Byte	Low-Byte	Low-Byte	High-Byte
0x01	0x03	0x04	0xD0	0x90	0x00	0x03	0xnn	0xnn

Protocol: MODBUS-ASCII

Request

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

Response

Start	Function		Data										Check sum		End	
			Number of bytes		Low-Word				High-Word							
					High-Byte		Low-Byte		High-Byte		Low-Byte					
':'	'0'	'3'	'0'	'4'	'D'	'0'	'9'	'0'	'0'	'0'	'0'	'3'	'n'	'n'	CR	LF
0x3A	0x30	0x33	0x30	0x34	0x44	0x30	0x39	0x30	0x30	0x30	0x30	0x33	0xnn	0xnn	0x0D	0x0A

Write a 32-bit value

ModBus device address 1, register index 0x6002, nunber of register 2, return value 190000 (0x0002E630)

Protocol: ModBus-RTU

Request

Address	Function	Data									Check sum	
		Start address		Number of register		Number of bytes	Low-Word		High-Word			
		High-Byte	Low-Byte	High-Byte	Low-Byte		High-Byte	Low-Byte	High-Byte	Low-Byte	Low-Byte	High-Byte
0x01	0x10	0x60	0x02	0x00	0x02	0x04	0xE6	0x30	0x00	0x02	0xnn	0xnn

Response

Address	Function	Data				Check sum	
		Start address		Number of register			
		High-Byte	Low-Byte	High-Byte	Low-Byte	Low-Byte	High-Byte
0x01	0x10	0x60	0x02	0x00	0x02	0xnn	0xnn

Advice: Please note that in the modicon-compatible mode, the high-byte will always be transferred first for the 16-bit values of the register addresses (index), number of register and register content. In contrast to this the low-byte-values will be transferred first for the 32-bit-values. The same goes for data type FLOAT.

Error codes:

The ModBus-protocol provides a transfer of error codes in certain cases.

Error code	Description
0x01	function code is unsupported
0x02	register address / register index incorrect
0x03	data value incorrect (e.g. number of register or telegram size incorrect)
0x04	general device error (e.g. undercut of minimum/maximum value)

If the check sum is faulty, then the device sends no answer to the request. This behaviour shall create a timeout on the opposite side.

Response – error telegram

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

An error will be signalised in the answer by a set bit 7 in function code.

Device diagnostics

Diagnostic functions

Subfunction	Data	Description
0x0000	0x0000	answers with equal data (echo function – connection test)
0x0001	0x0000	starts device initialization
	0x0001	starts device reset
0x0002	0x0000	calls up the content of the diagnostic register (see below)
0x000A	0x0000	zeroizes all error counters and the diagnostic register
0x000B	0x0000	calls up the counter value for all received requests
0x000C	0x0000	calls up the counter value for all received requests with check sum error
0x000D	0x0000	calls up the counter value for all sent faulty answers
0x000E	0x0000	calls up the counter value for all received requests with concordant device address or device address zero (broadcast)
0x000F	0x0000	calls up the counter value for all received requests device address zero (broadcast)
0x0010	0x0000	equals subfunction 0x000D
0x0012	0x0000	calls up the counter value for occured buffer overflows
0x0014	0x0000	calls up the counter value for occured buffer overflows onto zero

Request / Response – diagnostic function

Address	Func-tion	Data				Check sum	
		Subfunction		Data			
		High-Byte	Low-Byte	High-Byte	Low-Byte	Low-Byte	High-Byte
0x01	0x08	0x00	0x00	0x00	0x00	0xnn	0xnn

Diagnostic register

Bit number	Description
0…15	reserved

Advice: The bits in the diagnostic register remain set as long as they will be reset by sending the sub-function 0x000A.

Char set of characters for signal and area name

Code	...0	...1	...2	...3	...4	...5	...6	...7	...8	...9	...A	...B	...C	...D	...E	...F
0...																
1...																
2...	SP	!	"	#	$	%	&	'	(	)	*	+	,	-	.	/
3...	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
4...	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
5...	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
6...	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
7...	p	q	r	s	t	u	v	w	x	y	z	{	|	}	~	

8. Reset to default values (factory settings)

To put the device into a defined initial state, use the possibility to do a reset to default values. Proceed as follows:

Switch off the voltage supply of the device. Use **[P]**-key and switch on again voltage supply while **[P]-**key is pushed. Push **[P]-key** as long **ML2-2** and the software version appear in the display. The device reports „Reset config“. Two options are available now:

„YES“, default values are loaded and used for further operation. The device was reset to the delivery state.

„No“, error indications, that occured due to a temporary disfunction in the device, can be acknowledged here. The device works with custom-specified data.

ATTENTION! All custom-specific data get lost!

9. Technical data

Housing				
Dimensions	96x96x56 mm (BxHxD), (incl. plug-in terminal: D = 82 mm)			
Panel cut-out	$91.0^{+0.6}$ x $91.0^{+0.6}$ mm			
Fixing	Screw elements for a wall thickness of up to 10 mm			
Housing material	PC Polycarbonate, black			
Sealing material	EPDM, 65 Shore, black			
Protection class	Standard IP65 (front side), IP00 (back side)			
Weight	approx. 330 g			
Connection	Plug-in terminal; wire cross section up to 2.5 mm^2			
Display				
Backlight colour	selectable: red, green, blue, white, yellow, purple, teal			
LCD scripture	black			
Display range	-1999 to 9999, digit height 12 mm			
Switching points	adjustable colour change			
Overflow	arrows ↑↑↑↑			
Underflow	arrows ↓↓↓↓			
Display time	0.1 to 2 seconds			
Signal	**Meas. range**	**Meas. span**	**Resolution**	**Int. resistance**
Voltage	0…10 V	0…12 V	≥ 14 bit	Ri > 100 kΩ
Voltage	0…2 V	0…2,2 V	≥ 14 bit	Ri ≥ 10 kΩ
Voltage	0…1 V	0…1.1 V	≥ 14 bit	Ri ≥ 10 kΩ
Voltage	0…50 mV	0…75 mV		Ri ≥ 10 kΩ
Current	4…20 mA	1…22 mA		Ri = ~125 Ω
Current	0…20 mA	0…22 mA		Ri = ~125 Ω
Pt100-3-wire	-50…200°C	-58…392°F	0.1°C / 0.1°F	
Pt100-3-wire	-200…850°C	-328…1562°F	1°C / 1°F	
Pt1000-2-wire	-200…850°C	-328…1562°F	1°C / 1°F	
Thermo K	-270…1350°C	-454…2462°F	1°C / 1°F	
Thermo S	-50…1750°C	-328…3182°F	1°C / 1°F	
Thermo N	-270…1300°C	-454…2372°F	1°C / 1°F	
Thermo J	-170…950°C	-274…1742°F	1°C / 1°F	
Thermo T	-270…400°C	-454…752°F	1°C / 1°F	
Thermo R	-50…1768°C	-58…3214°F	1°C / 1°F	
Thermo B	80…1820°C	176…3308°F	1°C / 1°F	
Thermo E	-270…1000°C	-454…1832°F	1°C / 1 °F	
Thermo L	-200…900°C	-328…1652°F	1°C / 1 °F	

Signal	**Meas. range**	**Meas.span**	**Resolution**	**Int. Resistance**
Frequency	0…10 kHz	0…10 kHz	0.001 Hz ±1	

Signal	**Measuring range**	**Measuring range**	**Resolution**
NPN	0…3 kHz	0…3 kHz	0.001 Hz ±1
PNP	0…1 kHz	0…1 kHz	0.001 Hz
Rotational speed	0…9999 1/min	0…9999 1/min	0.001 1/min
Counter	0…9999 (prescaler up to1000)		

Pulse input	**TTL**	**HTL/PNP**	**NPN**	**Namur**
	Low <2 V, High >3 V	Low <6 V, High >8 V	Low <0,8 V, High via resistance	Low <1.5 mA, High >2.5 mA

Reset input	aktive <0.8 V
Digital input	< 6 V Low and > 18 V High max. 30 VDC galv. isolated
Measuring error	
Standard	0.2% of measuring range ± 1 Digit
Pt100/Pt1000	0.5% of measuring range ± 1 Digit
Thermocouple	0.3% of measuring range ± 1 Digit
Accuracy	
Reference junction	± 1°C
Temperature drift	100 ppm / K
Measuring time	0.01…2 seconds
Measuring rate	approx. 1/s at thermocouple, approx. 100/s at standard signals
Measuring principle	U/F conversion
Resolution	approx. 14 Bit at 1s measuring time
Output	2 PhotoMos closing contacts, max. 30 VDC / 0.4 A
Buzzer	signal transmitter as alarm indication
Interface	
Protokol Modbus	with ASCII- or RTU-protocol
RS232	9.600 Baud, no parity, 8 Databit, 1 Stopbit, wire length max. 3 m
RS485	9.600 Baud, no parityt, 8 Databit, 1 Stopbit, wire length max. 1000 m
Power pack	100-240 VAC 50/60 Hz, DC ±10% (max. 15 VA) 10-40 VDC, 18-30 VAC 50/60 Hz (max. 15 VA)
Memory	EEPROM
Data life	≥ 100 years at 25°C

Ambient conditions	
Working temperature	0°C…+50°C
Storing temperature	-30°C…+70°C
Weathering resistande	relative humidity 5-90% on years average without dew
Height	up to 2000 m
EMV	EN 61326
CE-identification	Conformity according to directive 2004/108/EG.
Safety standard	According to low voltage directive 2006/95/EG, EN 61010; EN 60664-1.

10. Safety advices

Please read the following safety advices and the assembly in *chapter 2* before installation and keep it for future reference.

Proper use

The **IML2-2** is designed for the evaluation and display of sensor signals.

Danger! Careless use or improper operation can result in personal injury and/or cause 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 **ML2-2** 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 each other 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.
- Galvanically 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.

11. Error elimination

	Error description	Measures
1.	The device shows a permanent overflow. ↑↑↑↑	• The input has a very high measurement, check the measuring circuit. • The measuring range of 9999 respectively the preset measuring range is exceeded; check the supporting points or the selected input type and the signal range. • Not all activated supporting points are parameterised. Check if the relevant parameters are adjusted correctly.
2.	The device shows a permanent underflow. ↓↓↓↓	• The input has a very small measurement, check the measuring circuit. • The measuring range of -1999 respectively the preset measuring range is undercut, check the settings. • Not all activated supporting points are parameterised. Check if the relevant parameters are adjusted correctly.
3.	The display shows „**Lbrk**“.	• Check if the correct input type was selected. Only temperature measurements and 4-20 mA show this kind of error indication. • Check the wiring for contact or correct connection.
4.	The display shows „**HELP**“.	• The device detected an error in the configuration memory, perform a reset to default values and reconfigure the device according to your application.
5.	Parameter for adjustment of the input are not available.	• The programming interlock is activated. • Enter correct code.
6.	Configuration error	• The configuration of the device is secured by the check sum, that is checked during start or return from „Settings“. If an error is detected in the user settings, „**Config error**“ appears in the upper display window and the alarms switch back into their optional safety state. It is still possible to perform a reset to default values in this state. •The input range shows „**Reset settings**“ or „**Restart system**“ as option. At „**Restart system**“ the device tries to perform a restart. In case of „**Reset setting**“ the user settings are set back to the default values. If it is faulty, too, „**Systeme error**“ appears.
7.	The device does not act as expected.	• If you are not sure, if the device has been parameterised before, restore the delivery state as described in *chapter 8*.
8.	There are high constant errors if indication during a thermocouple measurement.	• Remove strong heat/cold sources from the direct vicinity of the device. • Reduce the contact rating of the relay switch points to preferably under 10 mA, as higher switching currents lead to an increased local warming and thus to a bigger error at the reference junction. • If the errors during operation are permanent and constant, correct the reference junction measurement via the offset.

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