
UM 3021

Digital Panel Meter

for Analogaog Input Signal

Instruction Manual



ERMA

Electronic GmbH

Warranty

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All our products are warranted against defective material and workmanship for a period of two (2) years from date of delivery. If it is necessary to return the product, the sender is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit. The warranty does not apply to defects resulting from action of the buyer, such as mishandling, improper interfacing, operation outside of de-

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CONTENTS

1. Description	5
2. Safety instructions	6
2.1. Explanation of symbols	6
3. Mounting	7
3.1. Place of operation	7
3.2. Panel mounting	7
3.2.1. Panel for switch board	7
3.2.2. Panel for mosaic raster	8
4. Electrical connections	9
4.1. General instructions	9
4.2. Hints against noisy environment	9
4.3. Connection and pin assignment	10
4.4. Connection of input signals	11
4.4.1. Input voltage 0 - 10 V/ Analog Output	11
4.4.2. Input current 0/4 - 20 mA/Analog Output	11
4.5. Digital inputs	11
4.6. Connection of the optocoupler	12
4.6.1. Connection to a RS 232 - Interface	12
4.6.2. Connection as alarm output	12
4.6.3. Connection of power and sensor supply voltage	

5. Start-Up	13
6. Service Instruction	13
7. Procedure of programming	14
7.1. Summary of the programming level	16
7.2. Programming level for configuration P-00	17
7.2.1. Scaling the display range	18
7.3. Programming level for linearization P-01	19
7.4. Programming level for further functions P-02	21
7.5. Displaying Maximum Value	21
7.6. Scaling of Analog Output	22
7.7. Programming level of alarm P-03	22
7.7.1. Alarm high setpoint	23
7.7.2. Alarm low setpoint	23
7.8. Programming quick reference	24
8. Software functions	26
8.1. Filtering	26
8.2. Peak memory	26
8.3. Taring	26
8.4. Display of alarm value	27
8.5. Display test	27
8.6. Serial output	27
9. Technical Specifications	29

10. Ordering Information	31
11. Notices	32

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Subjects to technical modifications

1. *Description*

The digital panel meter model **UM 3021** is an universal instrument for measuring analog input signals listed below:

- Voltage 0 - 10 V
- Current 0 - 20 mA / 4 - 20 mA

Standard hardware

- Three digital inputs
- Analog Output 0/4...20 mA
- Sensor supply 24V DC / 100mA
- Four push buttons at the front
- Optocoupler, programmable as:
 - alarm contact
 - serial output

Standard software

- Scaling
- 9-Point-Linearization
- Filtering
- Peak Memory
- Taring
- Free setting of decimal point
- Rounding last digit with 1,2,5 or 10 digit steps
- Display test

2. Safety instructions

This instrument is produced in accordance with Class II of IEC 348 and VDE 0411. When delivered the instrument has been tested to meet all functions described. Before installing the instrument please read the mounting and servicing instructions.

We have no liability or responsibility to customer or any other person or entity with respect to any liability, loss or damage caused or alleged to be caused directly or indirectly by equipment or software sold or furnished by us. Read the installation instruction carefully. No liability will be assumed for any damage caused by improper installation.

Inspect the instrument module carton for obvious damage. Be shure there are no shipping and handing damages on the module before processing. Do not apply power to the instrument if it has been damaged.

ERMA's warranty does not apply to defects resulting from action of the buyer, such as mishandling, improper interfacing, operation outside of design limits, improper repair or unauthorized modifications.



2.1. Explanation of symbols

Caution

Attention

Instruction

Hint

Caution: **Dangerous!**

Attention: Will cause **damage**

Instruction: If not noticed, **trouble** may occur

Tip: Useful hints for **better operation**

3. Mounting

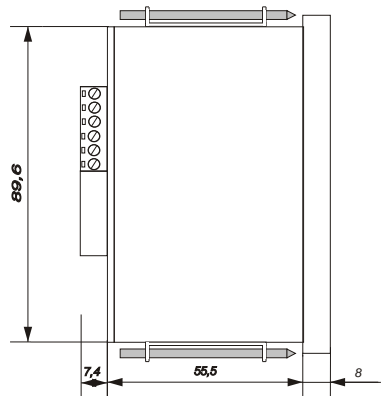
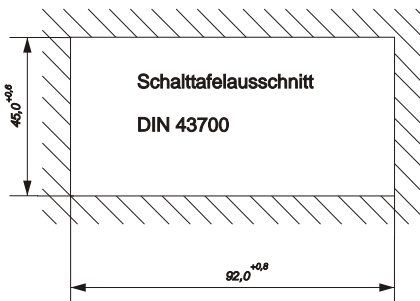
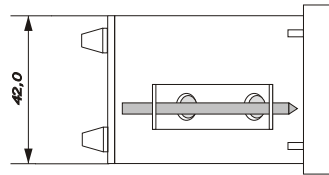
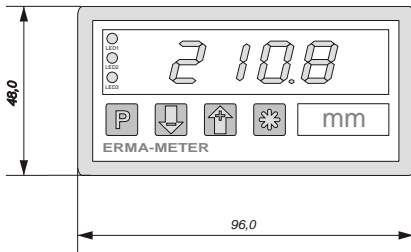
3.1. Place of operation

Attention must be paid to the protection against humidity, dust, high temperatures at the place of operation.

3.2. Panel mounting

3.2.1. Panel for switch board

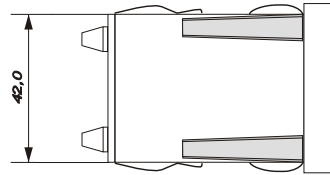
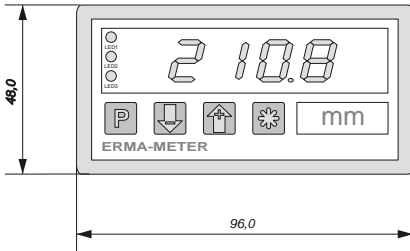
- For mounting in switch boards, insert the case into the panel cutout (according to DIN 43700: $92,0^{+0,8} \times 45,0^{+0,6}$ mm) from the front, using a fresh gasket for sealing as required. Click into and place at each side the two fastening clips (M2,5 x 50 mm).
- Tighten the screws alternately, using enough pressure to get good retention



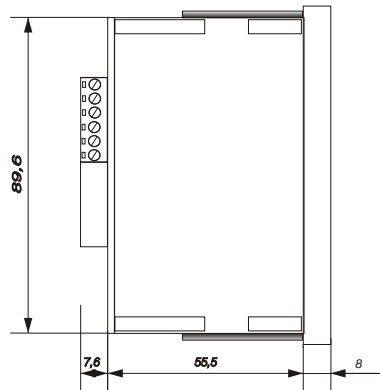
and sealing at the panel.

3.2.2. Panel for mosaic raster

- Insert the case into one of the following mosaic-systems:
 - a) Mosaic-system 8RU (M50x25) from Siemens
 - b) Mosaic-system from Subklev



Mosaiksystem:
Siemens 8RU (M50x25)
Subklev



4. *Electrical connections*

4.1. *General instructions*



- Attach input and output wires to the connectors only without voltages applied
- Cords must be provided with sleeves
- Attention must be paid that the power supply voltage applied will agree with voltage noticed at the name plate.
- The instrument has no power-on switch, so it will be in operation as soon as the power is connected.

4.2. *Hints against noisy environment*

All inputs and outputs are protected against noisy environment and high voltage spikes. Nevertheless the location should be selected to ensure that no capacitive or inductive interference can have an effect on the instrument or the connection lines.

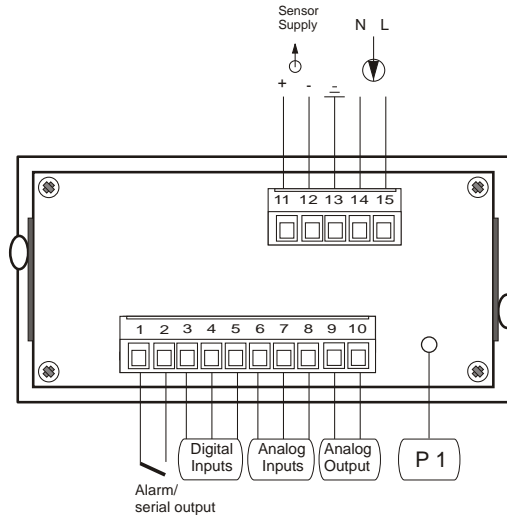
It is advisable:



- To use shielded cables.
- The wiring of shields and ground (0V) should be star-shaped.
- The distance to interference sources should be as long as possible. If necessary, protective screen or metal enclosures must be provided.
- Coils of relays must be supplied with filters.
- Parallel wiring of input signals and AC power lines should be avoided.

4.3. Connection and pin assignment

All inputs and outputs are connectors designed as screw terminals.

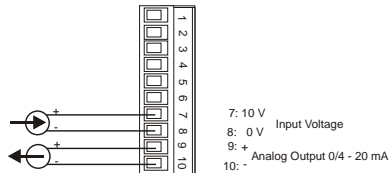


Pin assignment:

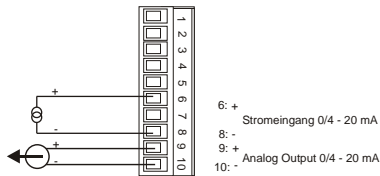
01	optocoupler output (emitter)	09	Analog Output (+)
02	optocoupler output (collector)	10	Analog Output (-)
03	digital input 1 / display test	11	Sensor Supply Voltage (+)
04	digital input 2 / display the alarm value	12	Sensor Supply Voltage (-)
05	digital input 3 / reset the peak value memory	13	Ground PE
06	signal input current	14	Power Supply N
07	signal input voltage	15	Power Supply L
08	signal ground	(P1)	recalibrate the final value of the Analog Output

4.4. Connection of input signals

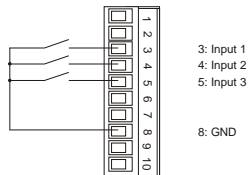
4.4.1. Input voltage 0 - 10 V/ Analog Output



4.4.2. Input current 0/4 - 20 mA/Analog Output



4.5. Digital inputs



Digital input 1

- active => connecting screw terminal 3 to 8
- connecting to ground, low active

Digital input 2

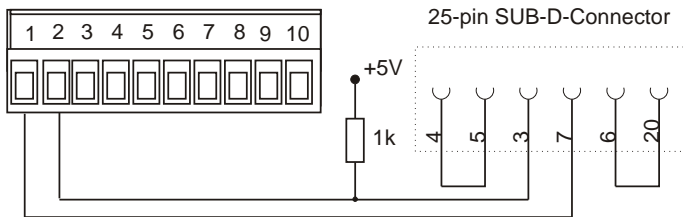
- active => connecting screw terminal 4 to 8
- connecting to ground, low active

Digital input 3

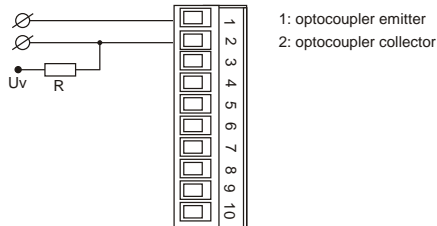
- active => connecting screw terminal 5 to 8
- connecting to ground, low active

4.6. Connection of the optocoupler

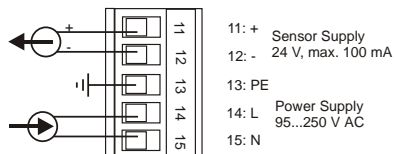
4.6.1. Connection to a RS 232 - Interface



4.6.2. Connection as alarm output



4.6.3. Connection of power and sensor supply voltage



5. Start-Up



Attention must be paid that the power supply voltage applied will agree with the voltage noticed at the name plate.

Switch the power supply on (supply voltage applied to 14 (N) and 15 (L)).

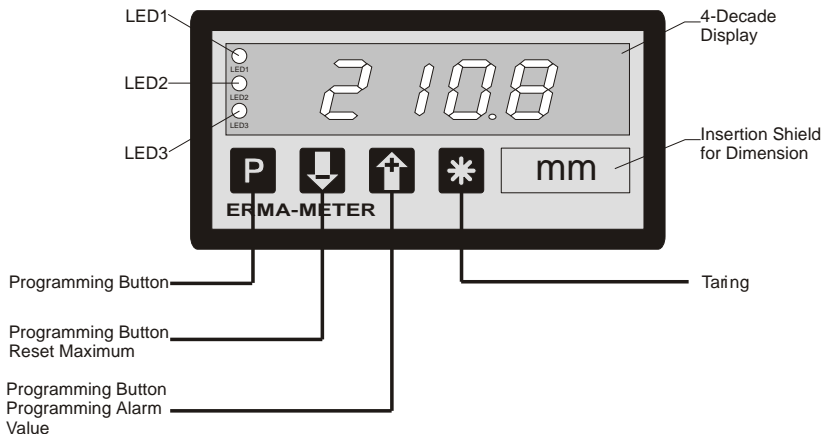
When delivered, the instrument is programmed with a standard configuration (default configuration). According to his measuring task, the customer can change the standard configuration by programming.



Attention: When the instrument is built-in a machine and the customer wants to change the configuration, attention must be paid, that no damage will occur to the machine!

6. Service Instruction

There are four buttons in the front. These push buttons can be used for programming of the panel meter. Besides this push Button “-” can be used for resetting the max. value when using measuring mode “Maximum”. Push button “+” can be used for fast setting of the alarm value.



Function of LEDs

LED 1	LED 2	LED 3	Description
dark			Alarm is not active
lighting			Alarm is active
		dark	Measuring Mode
		green	Max Value is displayed
		green/blinks	Programming Mode is active
lighting		green/blinks	Editing of Alarm Value

7. Procedure of programming

The procedure of programming is organized in different steps and can be carried out via the screw terminals 3, 4 and 5 at the rear of the instrument. It is advisable to connect a push button to the screw terminals 3 - 5.

Push Button	Pressing
screw terminal 3 "P"-button	selection of - programming level - parameter
screw terminal 4 "+"-button	increase of - programming level - number of parameter - parameter
screw terminal 5 "-"-button	decrease of - programming level - number of parameter - parameter

Activating the programming routine

- Press “P” -button together with “+” -button
- The display shows “P-00”

Leaving the programming routine

- Press “+” -button or “-” -button until the display shows “PEnd”
- Confirm the display “PEnd” by pressing “P” -button
- Return to normal measuring

Selection of a programming level

- Selecting a programming level by pressing the “+” -button or “-” -button
- Confirm the selected programming level by pressing the “P” -button
- The display shows the parameter number of the selected programming level
e.g.: “0-00” => Parameter 0 of programming level 0
e.g.: “1-00” => Parameter 0 of programming level 1

Leaving a programming level

- Press “+” -button or “-” -button until the display shows “xEnd”
e.g.: “0End” =>leaving programming level 0
e.g.: “1End” =>leaving programming level 1
- Confirm the display “xEnd” by pressing “P” -button
- The display shows the programming level
e.g. “P-00” => programming level 0
e.g. “P-01” => programming level 1

Selection of a parameter

- Selection the parameter by pressing “+” -button or “-” -button
- Confirm the parameter by pressing “P” -button
- The display shows the last programmed value of the selected parameter

Change and confirm a selected parameter

- Change the parameter by pressing the “+” -button or “-” -button
- Confirm the parameter by pressing “P” -button
- The display shows the programming level and the number of the parameter
e.g.: “0-05” => Parameter 5 of programming level 0
e.g.: ”1-08” => Parameter 8 of programming level 1

7.1. Summary of the programming level

The parameters of the panel meter are organized in different programming levels.

P-00: Programming level for general configuration of the panel meter

The function of the panel meter configuration is used to adapt the sensor and the panel meter.

P-01: Programming level for 9 point linearization

It is possible to carry out a linearization with maximum 9 points.

P-02: Programming level for further functions

The maximum value detection and the tara function can be activated in this programming level. In addition parameters of analog output can be set.

P-03: Programming level for the alarm configuration

All settings for the alarm can be changed in this programming level.

Fast Editing of Alarm Output

If the alarm output is enabled (parameter 0-08 = 2), the alarm value can be displayed and/or also edited during normal measuring mode. Pressing the push button “+” shorter than 3 seconds, the alarm value is only displayed. The edition will start, when the push button “+” is pressed longer then 3 seconds. In this case the alarm value can be changed by the aid of the push buttons “+” and “-”. The edition can be ended, by pressing the push button “*”.

7.2. Programming level for configuration P-00

Param.	Description	Range	Default Value
0-00	Input range 0 -> Voltage 0 to 10 V 1 -> Current 0 to 20 mA 2 -> Current 4 to 20 mA	0 .. 2	0
0-01	Display value of min. input signal	-999 .. +9999	0
0-02	Display value of max. input signal	-999 .. +9999	+2000
0-03	Decimal point 0 -> XXXX 1 -> XXX.X 2 -> XX.XX 3 -> X.XXX	0 .. 3	0
0-04	Configuration of digit 1 0 -> Display in steps of 1 1 -> Display in steps of 2 2 -> Display in steps of 5 3 -> Display in steps of 10	0 .. 3	0
0-05	Filtering 0 -> No filtering X -> Number of filtering cycles	0 .. 99	0
0-06	Brightness of the display 0 -> Brightness 50 % 1 -> Brightness 100 %	0 .. 1	1
0-07	Number of linearization points	0 .. 9	0
0-08	Configuration of the optocoupler 0 -> optocoupler deactivated 1 -> optocoupler as serial output 2 -> optocoupler as alarm	0 .. 2	0
0-09	Reserve: no function	-	-
0End	Leaving programming level P-00		

7.2.1. Scaling the display range

The overflow or underflow becomes active if the displayed value is greater or smaller than more as 5-10 % of the programmed display range (parameter 0-01 and 0-02).

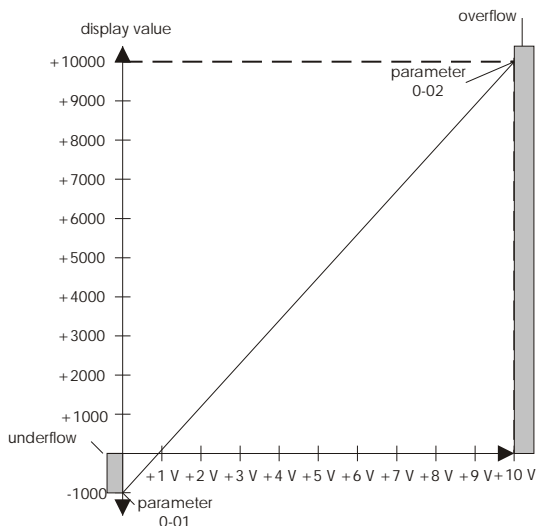
- When **overflow** is active the display shows “nnnn”
- When **underflow** is active the display shows “uuuu”

The assignment of the display range to the minimal and maximal input signal is done by programming the parameter 0-01 and 0-02.

Example:

Input range: 0 to +10 V, Display range : -999 bis +9999

Step	Param.	Range
1.	0-01	-999
2.	0-02	+9999
3.	0End	End



7.3. Programming level for linearization P-01

Param.	Description	Range	Default Value
1-00	Linearization point 1 Input value	-999 .. +9999	
1-01	Linearization point 1 Output value	-999 .. +9999	
1-02	Linearization point 2 Input value	-999 .. +9999	
1-03	Linearization point 2 Output value	-999 .. +9999	
1-04	Linearization point 3 Input value	-999 .. +9999	
1-05	Linearization point 3 Output value	-999 .. +9999	
1-06	Linearization point 4 Input value	-999 .. +9999	
1-07	Linearization point 4 Output value	-999 .. +9999	
1-08	Linearization point 5 Input value	-999 .. +9999	
1-09	Linearization point 5 Output value	-999 .. +9999	
1-10	Linearization point 6 Input value	-999 .. +9999	
1-11	Linearization point 6 Output value	-999 .. +9999	
1-12	Linearization point 7 Input value	-999 .. +9999	
1-13	Linearization point 7 Output value	-999 .. +9999	

Param.	Description	Range	Default Value
1-14	Linearization point 8 Input value	-999 .. +9999	
1-15	Linearization point 8 Output value	-999 .. +9999	
1-16	Linearization point 9 Input value	-999 .. +9999	
1-17	Linearization point 9 Output value	-999 .. +9999	
1End	Leave programming level P-01		

Performing a linearization

- Insert the number of linearization points (Parameter 0-07)
- Two values must be programmed for each point, the input value and the corresponding output value



The insert of the linearization point **must be done** in increasing sequence. That means **the lowest input value must be programmed in parameter 1-00**.



The editing of the output values **is allowed only** in the programmed display range (parameter 0-01 and 0-02).

7.4. Programming level for further functions P-02

Param.	Description	Range	Default Value
2-00	Data source of display 0 -> Direct input value 1 -> Maximum value	0 .. 1	0
2-01	Display Value for Minimal Analog Output Signal	0...9999	0
2-02	Display Value for Maximal Analog Output Signal	0...9999	2000
2-03	Analog Output 0 -> 0 ... 20 mA 1 -> 4 ... 20 mA	0 .. 1	0
2-04	Set taring function on "*" -button 0 -> no taring 1 -> taring activ	0 .. 1	0
2-05	Reserve: no function		
2-06	Reserve: no function		
2-07	Reserve: no function		
2-08	Reserve: no function		
2-09	Reserve: no function		
2End	Leave programming level P-02		

7.5. Displaying Maximum Value

If the function maximum Value is enabled (parameter 2-00 = 1), Led 3 is lighting green. Reset of the maximum value is performed by pressing push button "-" or by activate digital input 3.

7.6. *Scaling of Analog Output*

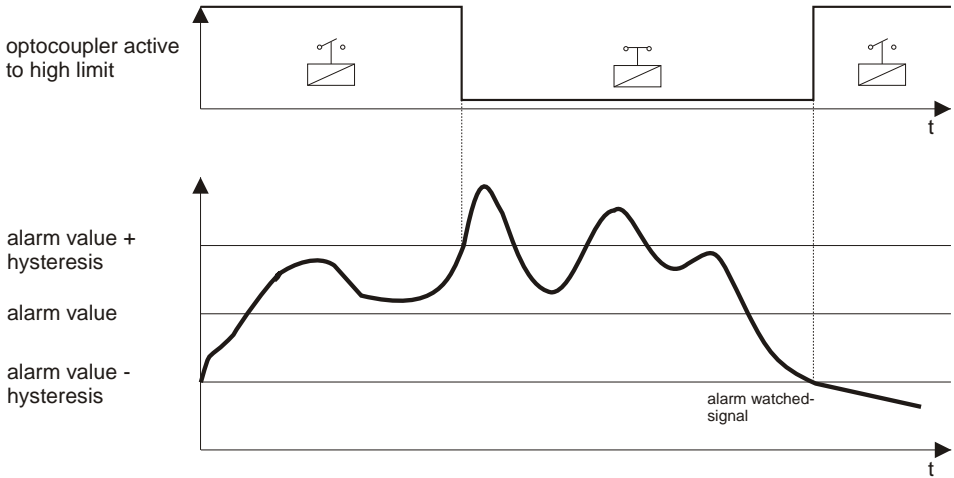
The scaling of the analog output range can be programmed with parameter 2-01, 2-02, and 2-03. Any value in the configured scale (parameter 0-01 and 0-02) can be set to minimal and maximal analog output signal. Attention! Parameter 2-01 must be lower than parameter 2-02.

With the potentiometer "P1" at the rear of the panel meter the final value can be re-calibrated.

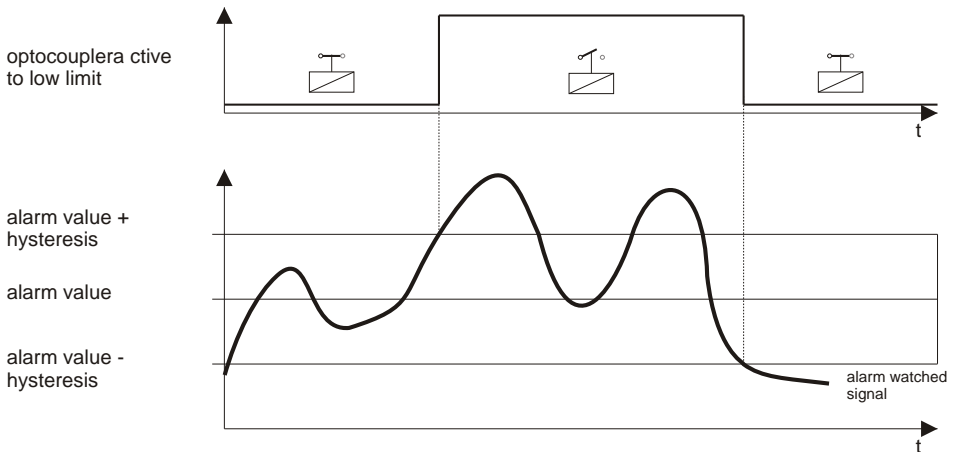
7.7. *Programming level of alarm P-03*

Param.	Description	Range	Default Value
3-00	Configuration of alarm 0 -> optocoupler as alarm off 1 -> optocoupler active by high limit 2 -> optocoupler active by low limit	0 .. 2	0
3-01	Alarm value	-999 .. 9999	0
3-02	Alarm hysteresis	0 .. 99	0
3-03	Reserve: no function		
3-04	Reserve: no function		
3-05	Reserve: no function		
3-06	Reserve: no function		
3-07	Reserve: no function		
3-08	Reserve: no function		
3-09	Reserve: no function		
3End	Leaving programming level P-03		

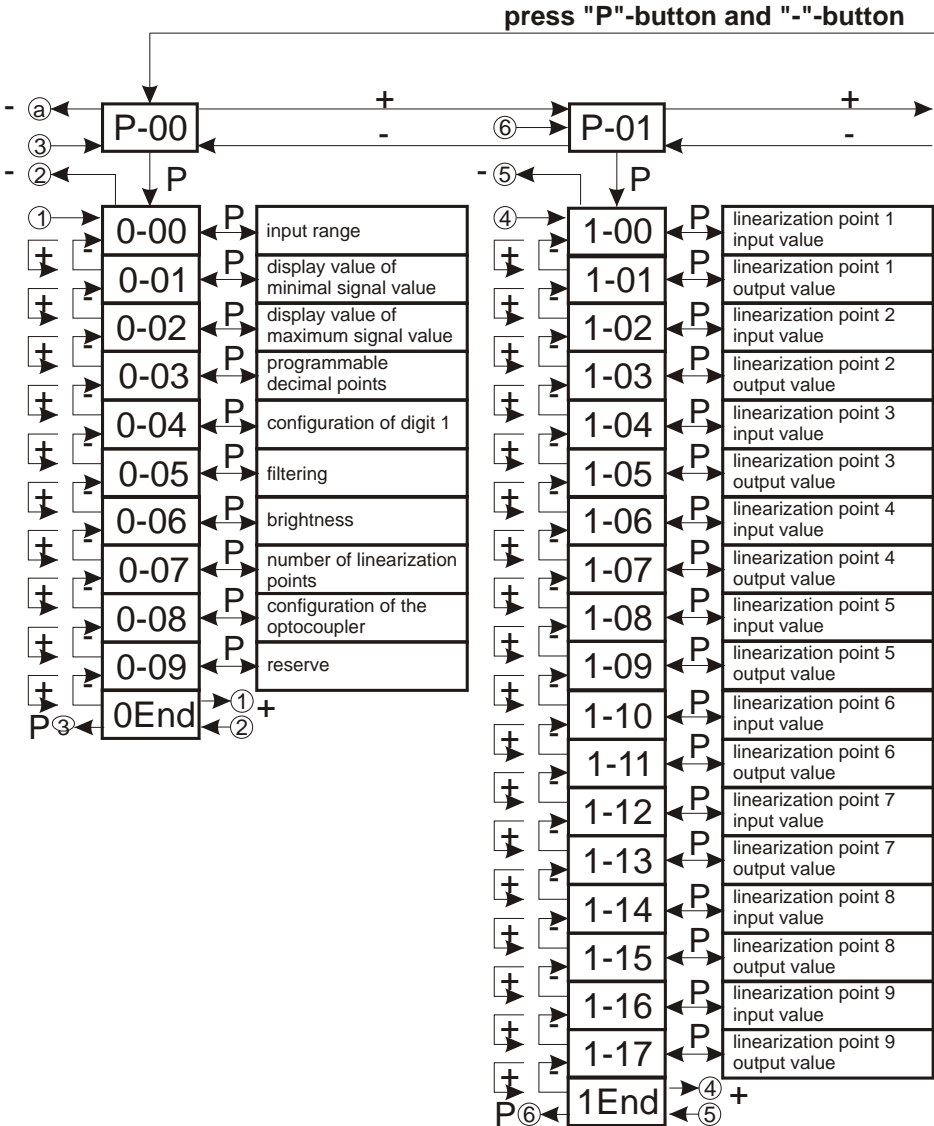
7.7.1. Alarm high setpoint



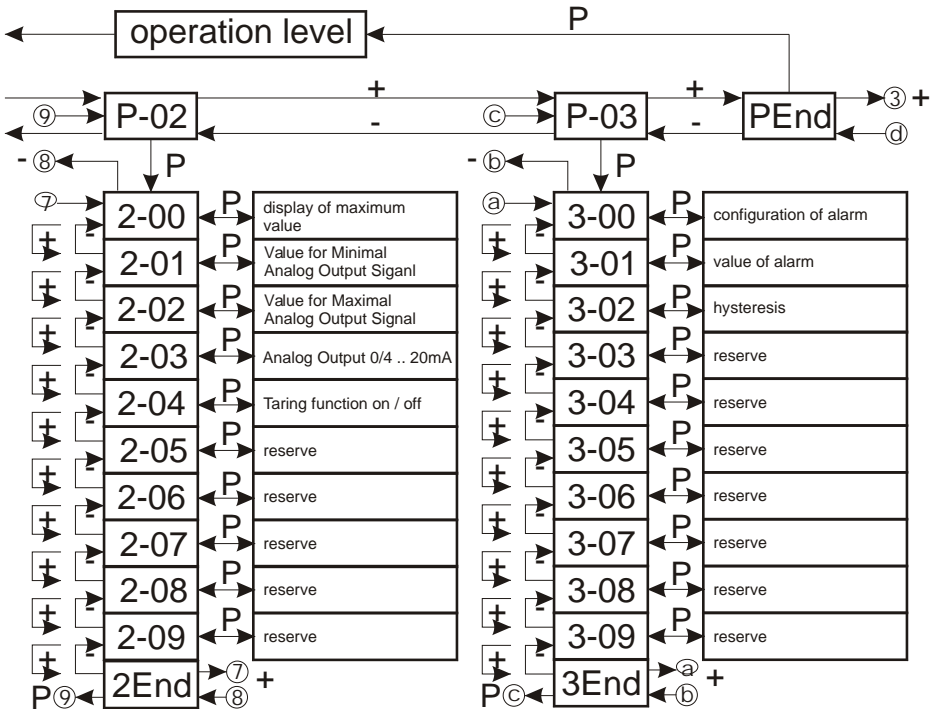
7.7.2. Alarm low setpoint



7.8. Programming quick reference



7. Procedure of programming



description	
P	≡ pressing "P"-button (screw terminal 3)
+	≡ pressing "+"-button (screw terminal 4)
-	≡ pressing "-"-button (screw terminal 5)

8. Software functions

8.1. Filtering

The panel meter include a programmable single pole digital filter. The filter is used to smooth analog input data in noisy environments.

Digital filtering is performed by forming the average of input signals. By a special algorithm it is provided that a smooth filtering will be achieved.

time constant = $\frac{\text{number of measurements}}{\text{conversions rate}}$

If the input signal is a step function, 99,3 % of the final measurement value will be reached within 5 time constants.

8.2. Peak memory

The panel meter include a maximum memory.

Show maximum value:

- Programming parameter 2-00 on 1

Resetting the maximum value:

- By activating the digital input 3, connecting screw terminal 5 and 8
- By pressing push button “-”
- By leaving the programming mode

8.3. Taring

By activating the tara function, the input value will be taken over into the tara memory. The tara value is being subtracted from the input value.

The tara value will be saved into an EEPROM and is still available after power-off.

Activating the tara function

Pressing the functional pushbutton “*” (parameter 2-01 = 1)

Clear the tara value:

Pressing the functional pushbutton “*” for approx. 3 sec.

8.4. Display of alarm value

If the optocoupler is configured as alarm contact (Parameter 0-08 on 2), the alarm value can be displayed.

Display the alarm value:

- By activating the digital input 2, connecting screw terminal 4 and 8
- By pressing push button “+”

8.5. Display test

When activating the display test all segments of the display are light on. The display shows “**8.8.8.8.**”

Activating the display test:

- By activating the digital input 1, connecting screw terminal 3 and 8
- By pressing push button “P”

8.6. Serial output

The optocoupler output of the panel meter can be configured as serial output (Parameter 0-08 on 1). This output can be used for transmitting a measuring value to a peripheral unit. A cyclic transmission is done by each measurement.

Activating the serial output:

- Programming Parameter 0-08 on 1

Telegram

S or X, X, X, (DP), X, 0DH, 0AH

S = sign of the measured value (-)

X = measured value (numeral)

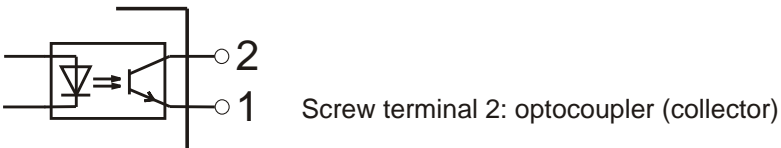
DP = decimal point (dependent on programming)

Tip: positive values will be transmitted with 4 numerals, negative values will be transmitted with 3 numerals and “-” sign.

Transfer Characteristic:

- 9600 baud
- 1 start bit
- 8 data bits
- 1 stop bit
- no parity
- 0DH, 0AH => CR, LF for end of data transfer

Serial Optocoupled Output



Screw terminal 1: optocoupler (emitter)

9. Technical Specifications

Analog input	
Resolution	: 10 Bit
Input ranges	
voltage	: 0 to 10 V, $\pm 0,1\%$, ± 1 digit
impedance	: 1 M
current	: 0/4 to 20 mA, $\pm 0,1\%$, ± 1
digit	
impedance	:
10	
Conversion rate	: 5 measurements/s
Digital inputs	: 10 k pull-up +5 V
Low-level	: < 0,4 V
High-level	: > 3,5 V, max. 30 V
Display	: 4 decades, 14 mm, red
	: decimal point programmable
	: preliminary zero suppression
	: - sign at negative value
Operation, keyboard design	: front membrane with push
buttons	
Power Supply	: 95...250 V AC
power consumption	: approx. 2.5 VA
Sensor Supply	
Voltage	: 24 V DC, $\pm 5\%$ (isolated)
Max. Current	: 100 mA
Analog Output	: 0/4...20 mA
Resolution	: 12 Bit
Accuracy	: 0.1%
max load resistance	: 500
Serial output	: optocoupler output
	9600 baud, 8, N,1
Alarm Contact	: optocoupler
Collector-Emitter-range	: max. 10 mA, 70 V, max. 150
mW	
Case	: 96 x 48 x 60 mm, DIN 43700
depth	: <63 mm (incl. screw
terminal)	
protection case, at the front	: IP 54
protection case, connection	: IP 20

EMV	: in conform with 89/336/EWG
Operating temperature	: 0 to 50 °C
Storage temperature	: - 20 to 70 °C
Humidity	: < 80 %, not-condensing
Field of application	: class 2
	: overvoltage protection II
Weight	: approx. 200 g

10. Ordering Information

UM 3021 -					
Case					
0 Panel mounting					
1 Panel-clip					
Front becel color					
0 Black					
Front design					
0 Reserve					
1 Front foil ERMA-METER					
2 Front foil NEUTRAL					
Display color					
0 Red					
Power supply					
0 95...240 V AC					

11. Notices

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