

Progr. Universal-Transmitter PMT 50Ex

Signal conditioning - linearization - output characteristic transformation

Features

- Input intrinsically safe ATEX II (1) G [Ex ia] IIC/IIB
ATEX II (1) D [Ex iaD]
for standard signals, resistance/poti or Pt100/Pt1000 and thermocouples J, K, N, S
- Measuring range programmable
- Installed units:
mV, V, mA, A, Ω , k Ω , μ S/cm, mS/cm, °C, °F, min⁻¹, rpm, bar, mbar, hPa, mm, cm, m, %, °, l, l/min, m³, m³/h, ppm and custom units programmable
- Transmitter supply 16 V DC, max. 20 mA
- Linearization or transformation of output characteristic via 32 base-points programmable
- Basic accuracy <0.2 %
- Teach-In and simulator function
- Fault monitoring for break of wire and short-circuit in the measuring circuit
- Programmable fault function:
Analog output min. or max. overflow
Alarm outputs min. or max. function
- Analog output 0/4 ... 20 mA; 0/2 ... 10 V DC
- 2 alarm outputs (relay SPDT)
- Fieldbus connection MODBUS RTU/ASCII RS485/Profibus DP
- Full 3-port isolation



General

The programmable measurement transmitter PMT50Ex operates with analog input signals direct out of the endangered area. The device convert input signals to analog output 0/4 ... 20 mA; 0/2 ... 10 V DC. Optional a serial interface is available. According to the model version, temperature probes and potis situated in the explosive area are connected to the device direct or an intrinsic safe transmitter supply allows feeding of 2-wire transmitters. The device offers a linearization function for any sensor curves and a simulator function. 2 alarm outputs for monitoring are available.

Short information

Programming	The device is programmed by frontal buttons, in connection with the LCD display.
Alarm outputs	The alarm outputs can be programmed as max. or min. function. Switch-on delay and switch-off delay time is programmable from 1 s up to 9 h. The switching status is displayed through LED's.
Teach-In function	The input signals for start- and end value or the values of the characteristic curve will be stored automatically. Only the corresponding display values have to be entered manually.
Fault function	A fault in the measuring circuit could be monitored (break of wire/short-circuit). The switching function of the analog and alarm output(s) is programmable in case of an fault.

Technical data

Power supply

Supply voltage : 230 V AC $\pm 10\%$, 115 V AC $\pm 10\%$, or 24 V DC $\pm 15\%$
 U_m 253 V AC or 125 V DC
 (Terminals 11 and 13)

Power consumption : < 5 VA

Operating temperature : -10 ... 55 °C (14 ... 131 °F)

Rated voltage : 250 VAC acc. to DIN EN 60664-1
 between input/relay output/analog output/supply voltage
 degree of pollution 2, overvoltage category III

Test voltage : 4 kV DC between input/relayoutput/analog output/supply voltage

CE-conformity : ATEX-directive 94/9/EG

(Certificate PMT50ATEX.001) EN 60079-0:2006 EN 60079-11:2007

EN 61241-0:2006 EN 61241-11:2006

Standardize IEC61326 05/2004			Result
IEC 61000-4-2 (ESD) IEC 61000-4-3 (E-field) IEC 61000-4-8 (Magnetic field)	Case	4 kV/8 kV contact/air 10 V/m 30 A/m	B A dispensed with
IEC 61000-4-11 (Voltage dip) IEC 61000-4-4 (Burst) IEC 61000-4-5 (Surge) IEC 61000-4-6 (HF- current feed)	AC power supply connection	0.5 period, $\pm 100\%$ 2 kV 1 kV L/N, 2 kV L,N/PE 3 V	A A A A
IEC 61000-4-4 (Burst) IEC 61000-4-5 (Surge) IEC 61000-4-6 (HF- current feed)	DC power supply connection	2 kV 1 kV L/N, 2 kV L,N/PE 3 V	A A A
IEC 61000-4-4 (Burst) IEC 61000-4-5 (Surge) IEC 61000-4-6 (HF- current feed)	Input/output, signal/control	1 kV 1 kV L/N/PE 3 V	A B A
CISPR16-1/16-2	Radiated interference		Passed

The EC-Type Examination Certificate is posted @ internet: www.martens-elektronik.de

Explosion protection

Certification :  II (1) G [Ex ia] IIC/IIB or II (1) D [Ex iaD]

Approval : TÜV 08 ATEX 554329

Inputs

Model 1

Input : 0/2 ... 10 V DC, 0/4 ... 20 mA

Fault detection : Break of wire

Input resistance : Current input 10 Ω , voltage input 10 k Ω
 (Terminals 45, 46, 47)

Basic accuracy : <0.1 %, ± 1 Digit

Temperature coefficient : 0.01 %/K

Max. voltage (no load) U_0 : 18.9 V

Max. short circuit current I_0 : 92.5 mA

Max. power consumption P_0 : 580 mW

Resistance R : 272 Ω

Characteristic curve : trapezoidal

Internal inductivity : 4 μ H

Internal inductivity : 1.2 nF

Transmitter supply : 16 V DC, max. 20 mA
 (Terminal 48)

Explosion protection	Ex	ia/IIC	or	ia/IIC	ia/IIB
Maxim. external inductivity	:	2.3 mH		0.1 mH	5 mH
Maxim. external capacity	:	0.12 μ F		0.22 μ F	0.76 μ F

At connection of externally supplied active and intrinsically safe circuits the rules for the interconnection to intrinsically safe circuits have to be observed.

Max. values U_i : 30 V
 I_i : 52 mA
 P_i : 980 mW

Continue page 3

Technical data

Model 2

<i>Input</i>	: Resistance 0 ... 20 k Ω (Terminals 35, 36, 37, 38;)
Fault detection	: Break of wire
Basic accuracy	: <0.2 %, ± 1 Digit
Temperature coefficient	: 0.01 %/K
Max. voltage (no load) U_0	: 1.4 V
Max. short circuit current I_0	: 2.5 mA
Max. power consumption P_0	: 3 mW
Resistance R	: 5600 Ω
Chrcharacteristic curve	: trapezoidal
Internal inductivity	: 4 μ H
Internal inductivity	: 135 nF

Explosion protection

	Ex	ia/IIC	ia/IIB
Maxim. external inductivity	:	100 mH	100 mH
Maxim. external capacity	:	25 μ F	120 μ F

Input : Potentiometer 1 ... 100 k Ω
(Terminals 45, 47, 48)

Basic accuracy	: <0.2 %, ± 1 Digit
Temperature coefficient	: 0.01 %/K
Max. voltage (no load) U_0	: 9.6 V
Max. short circuit current I_0	: 56 mA
Max. power consumption P_0	: 200 mW
Resistance R	: 259 Ω
Chrcharacteristic curve	: trapezoidal
Internal inductivity	: 4 μ H
Internal inductivity	: negligible

Explosion protection

	Ex	ia/IIC	ia/IIB
Maxim. external inductivity	:	5 mH	20 mH
Maxim. external capacity	:	0.48 μ F	2 μ F

Model 3

Input : Pt100 (3-wire) -100.0 ... 600.0 $^{\circ}$ C / -100 ... 600 $^{\circ}$ C
Pt1000 (3-wire) -100.0 ... 300.0 $^{\circ}$ C / -100 ... 300 $^{\circ}$ C
: Thermocouples (TC)
Type J -100.0 ... 800.0 $^{\circ}$ C / -100 ... 800 $^{\circ}$ C
Type K -150 ... 1200 $^{\circ}$ C
Type N -150 ... 1200 $^{\circ}$ C
Type S -50 ... 1600 $^{\circ}$ C
(Terminals 35, 36, 37; 45, 47)

Fault detection	: Break of wire (Pt100/1000,TC) or short-circuit (only Pt100/1000)
Basic accuracy	: <0.1 %, ± 1 Digit
Temperature coefficient	: 0.01 %/K
Max. voltage (no load) U_0	: 1.4 V
Max. short circuit current I_0	: 2.5 mA
Max. power consumption P_0	: 3 mW
Resistance R	: 5600 Ω
Characteristic curve	: trapezoidal
Internal inductivity	: 4 μ H
Internal inductivity	: 135 nF

Explosion protection

	Ex	ia/IIC	ia/IIB
Maxim. external inductivity	:	100 mH	100 mH
Maxim. external capacity	:	25 μ F	120 μ F

Outputs

Alarm outputs A1, A2 : Relay SPDT < 250 V AC < 250 VA < 2 A $\cos\phi \geq 0.3$,
< 300 V DC < 40 W < 2 A
(Terminals 21, 22, 23; 25, 26, 27)

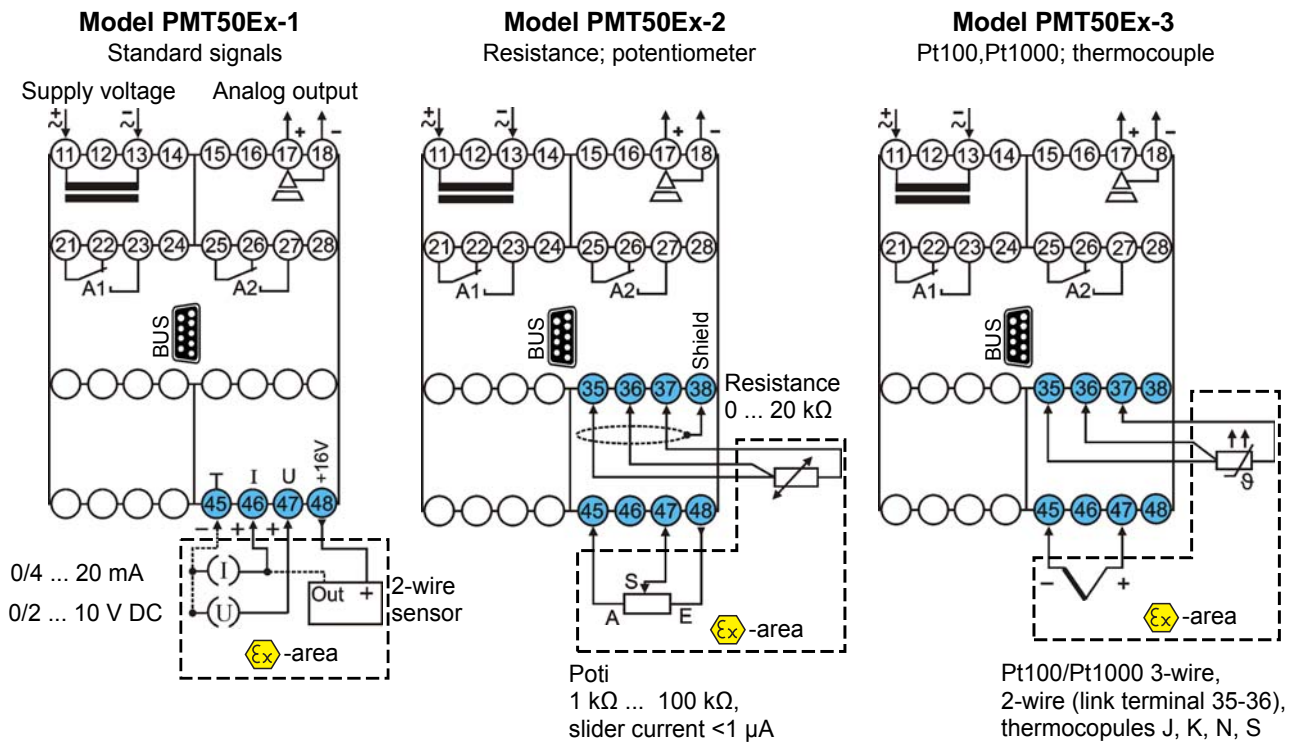
Analog output : 0/4 ... 20 mA burden $\leq 500 \Omega$; 0/2 ... 10 V burden $> 500 \Omega$, galv. isolated,
output changes automatically (burden impedance dependent)
For connection at electrical equipments with supply voltage of max. 230V
(Terminals 17 and 18)

Continue page 4

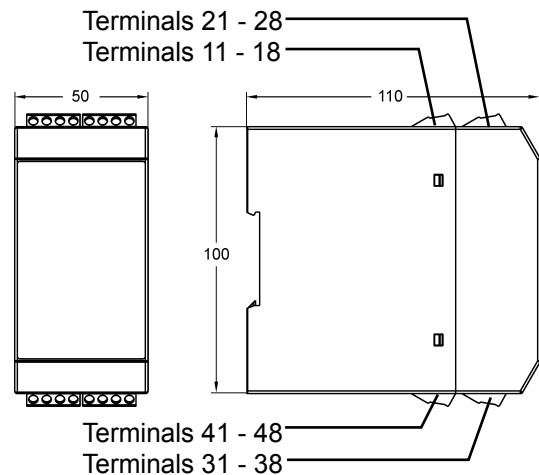
Technical data

Fault function	: For break of wire or short-circuit detection -belongs to the model- → Analog output 0 mA, < 3.6 mA or > 21.5 mA programmable → Alarm output(s) min. or max. function programmable
Fieldbus	
Modbus	: RS485, RTU or ASCII max. 38400 Baud
Profibus	: Profibus DP
Connection	: 9pol. D-SUB connector socket in the front For connection at electrical equipments with supply voltage of max. 230V
Display	: Graphic LCD-Display 128x64 pixels, white background illuminated
Case	: Polyamide (PA) 6.6, UL94V-0, DIN rail mounting TS 35
Weight	: Approx. 450 g
Connection	: Screw terminals 0.14 ... 2.5 mm ² (AWG 26 .. 14)
Protection	: Case IP30, terminals IP20, German BGV A3

Connection diagram



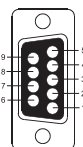
Dimensions



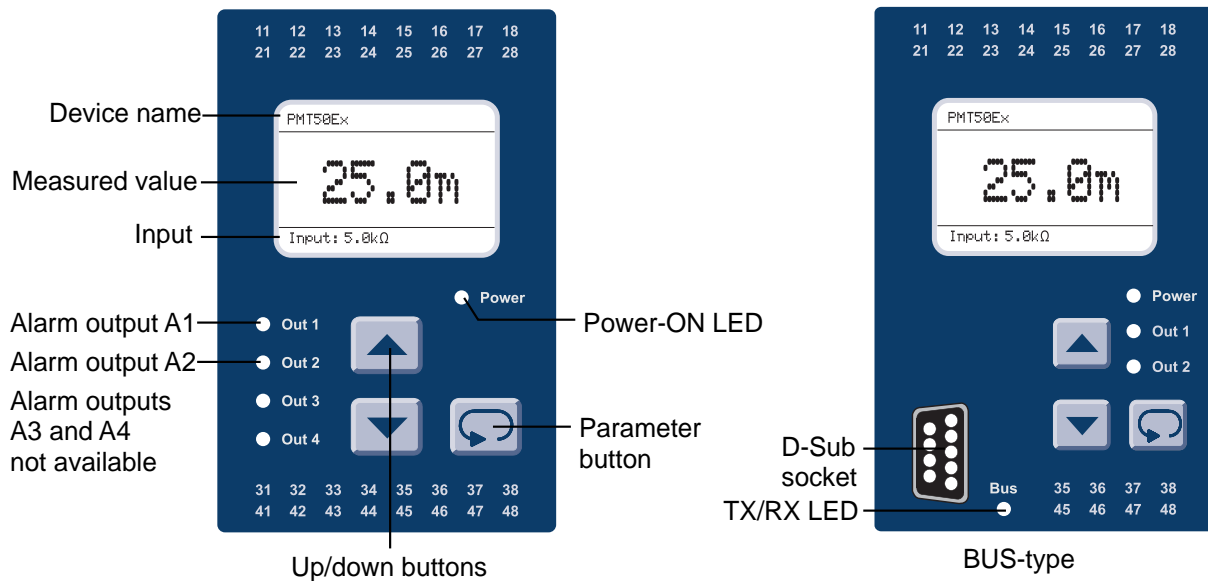
Bus connection (serial interface)

Modbus		
PIN	Signal	EIA/TIA-485 Name
5	TXD1	B
9	TXD0	A
1	Common	C/C'
Profibus		
3	RxD/TxD-P	
5	DGND	
6	VP/+5V max 10 mA	
8	RxD/TxD-N	


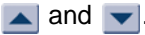
9pol. D-Sub connector
in the front







Control and indicators





Description

The operation of the device is implemented in 2 levels. The required parameter is called up with the button . The selection within a parameter and the setting-adjustment of a value is implemented with the buttons .

Button combinations (press buttons simultaneously):

-  +  1 Parameter back
-  +  Parameter is set to "0" or minimum value.

After the switching on the supply voltage, the device initializes itself. In the display the message indicating device type and software version is shown. After the initialization, the device is running in the working level. The peak value storage is called up and the setpoints of the alarm outputs can be programmed.

The configuration level is called up by activation of the button  for 2 seconds. In this case, all parameters which determine the properties of the device are programmed. After the last menu item, or if no button is pressed for longer than 2 minutes, a skip-back into the working level is implemented automatically and the current measured value is indicated in the display. The configuration level can be exited at any time by holding down button  for 2 seconds.

Error reports

In case of occurring faults, the messages are shown on the display in plain text. This simplifies the location of the error. See explanation page 15.

Operational startup reference!

The device is preset with an ex-works default setting. Therefore it must be adapted to each special application. See Page 8.

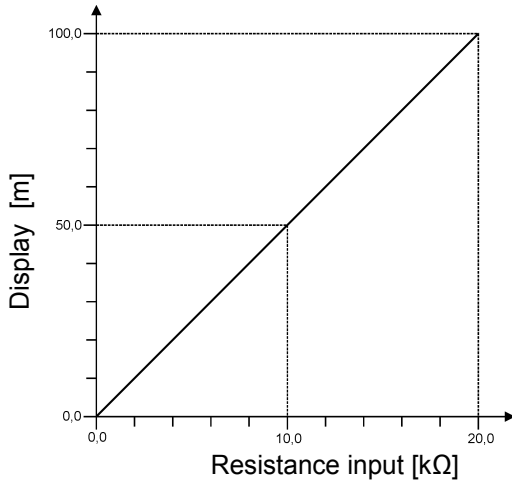
Requirements

- It is necessary to keep the conditions of the ATEX EC-Type Examination Certificate.
- The device must be installed in dry and good monitored rooms.
- If the intrinsic safety input is connected to the dust and dangerous area of zone 20 or 21, it has to be ensured that the corresponding devices in this circuit have the requirements of category 1D or 2D.
- Repairing and design modifications are only allowed at works.

Explanations for characteristic curve programming

Linear curve (see page 10)

The linear curve needs only one value pair for start- and end value. At this every input value, the corresponding display value has to be assigned. See example:



Example:

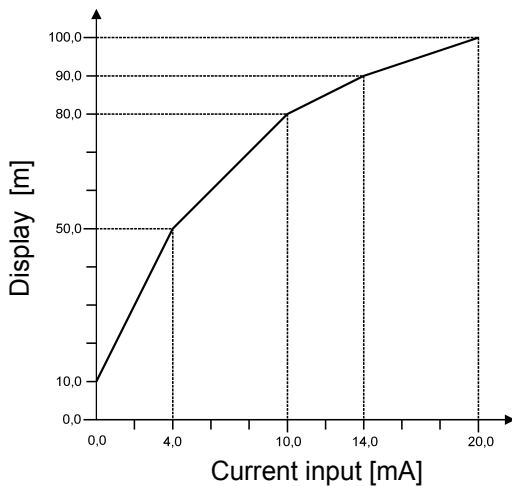
Input : Resistance
 Start value : 0.0 kΩ
 End value : 20.0 kΩ

Display : Height [m]
 Start value : 0.0 m
 End value : 100.0 m

In this example, 4 values for input and display range are needed. Every interem value belongs to the curve. Example: an input value of 10.0 kΩ is leading to the display value of 50.0 m.

Nonlinear curve (see page 11)


The nonlinear curve can have max. 32 value pairs for input and output to emulate the curve. At this, for every input value a display value can be programmed. Every interem value belongs to the curve.



Example: curve with 5 base-points

Input : 0 ... 20 mA
 Display : 0.0 ... 100.0 m

Base-point	Input value	Display value
1	0.0 mA	10.0 m
2	4.0 mA	50.0 m
3	10.0 mA	80.0 m
4	14.0 mA	90.0 m
5	20.0 mA	100.0 m

The curve above shows clearly the classification between input signal and display value. This example has 5 value pairs. For every input value the corresponding display value has to be programmed. The procedure is finished, if the button  is pressed after the last base-point programming and OFF is selected in the following parameter.

At the teach-in programming no manually programming of the input values is necessary. At this, for the measured input values the actual values will be taken over. This method is ideal if the input signal is unknown but the corresponding display value is known (capacity gauging of tanks).

Note on the representation

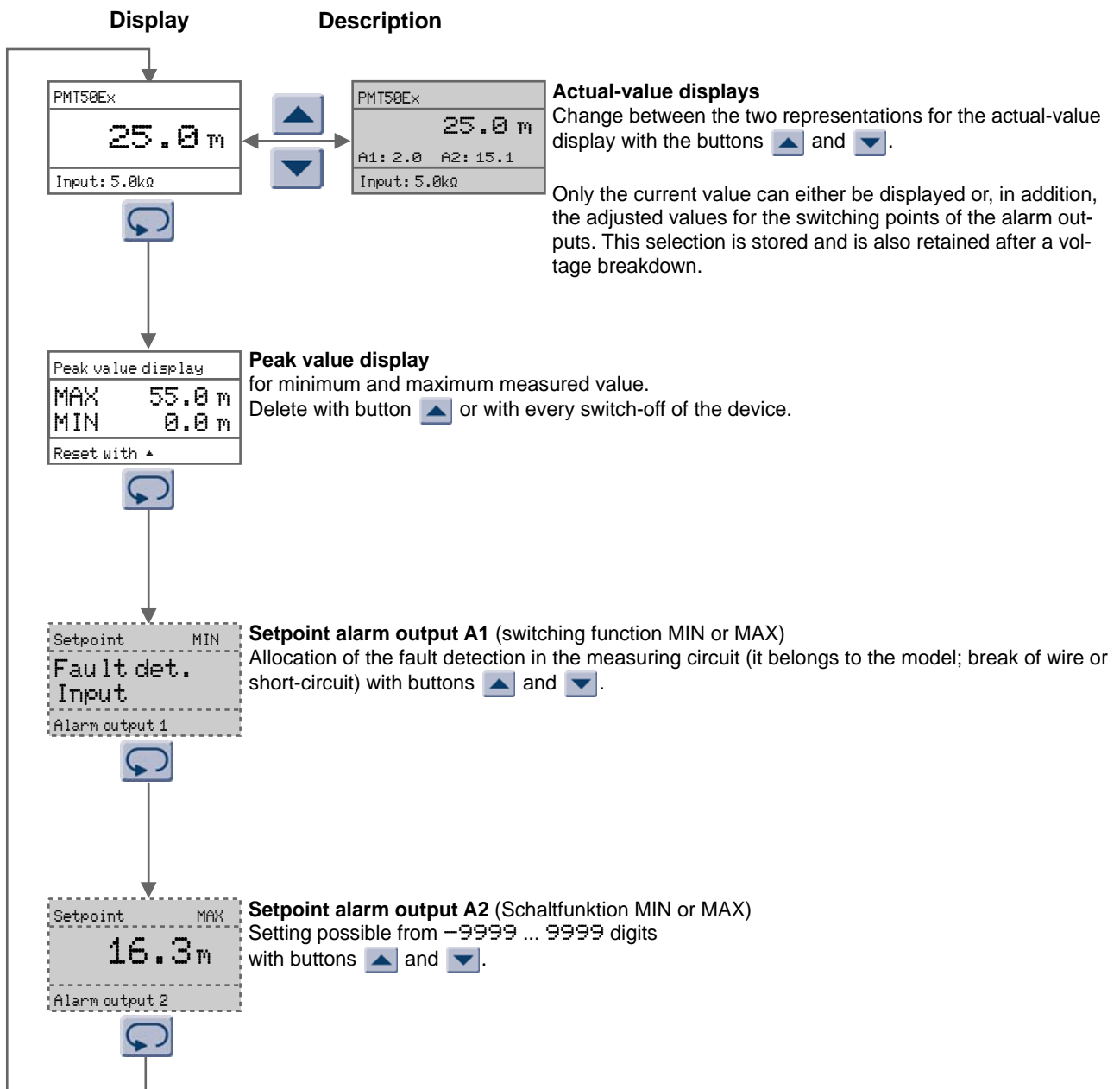


Parameter appears only with corresponding configuration



Parameter appears only with corresponding equipment version

Working level



Configuration level

Display

Description (represented values are default settings)

PMT50Ex

25.0 m

Input: 5.0k Ω



Press 2s

1

PMT50Ex

▶ Language

Input



1.1

PMT50Ex

▶ deutsch

english

Select language



User Language

deutsch
english
Selection with buttons and .

2

PMT50Ex

▶ Language

▶ Input



2.1

Input

▶ 0-20 mA

4-20 mA

Signal



Input signal

For the different devices of the PMT50Ex are following input signals possible:

Model 1	Model 2	Model 3
0 - 20 mA	Resistance	Pt100
4 - 20 mA	Poti	Pt1000
0 - 10 V DC		Thermo J
2 - 10 V DC		Thermo K
		Thermo N
		Thermo S

Selection with buttons and .

2.2

Decimal place

X Ω

▶ X.X Ω

Input signal



Decimal places resistance input

Parameter 2.2 is only available for model 2, if the input signal resistance is selected.

Selection possible with buttons and .

The number of the decimal places belongs to the programming of the characteristic curve.

2.3

Unit

▶ $^{\circ}\text{C}$

$^{\circ}\text{F}$

Input signal



Unit for temperature

Parameter 2.3 is only available for model 3.

Selection possible with buttons and .

2.4

Digital filter

OFF

Input signal

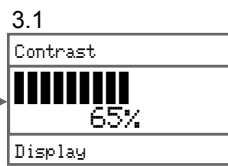
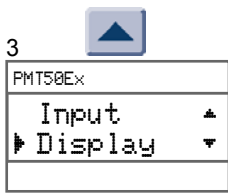


Digital filter

OFF or in steps of 0.5 s in the range from 0.5 ... 40s

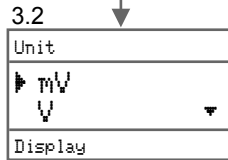
Selection with buttons and .

Continue page 9



Display contrast

Setting possible from 0 ... 100% with buttons ▲ and ▼.



Display unit

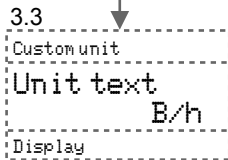
The selected unit will be displayed and used for programming of the characteristic curve.

Installed units:

mV, V, mA, A, Ω, kΩ, μS/cm, mS/cm, °C, °F, min⁻¹, rpm, bar, mbar, hPa, kPa, mm, cm, m, %, °, l, l/min, m³, m³/h, ppm and custom.

custom = max. 5 characters are free programmable.

Selection with buttons ▲ and ▼.



Custom unit

Only appears if custom is selected

Maximal 5 characters are programmable (see character set below).

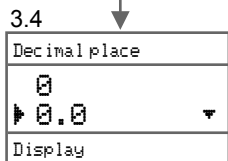
Scrolling through the characters is possible

with buttons ▲ and ▼.

The selected character will be entered with button ↻. After that, the cursor moves to the next position. Selection procedure as before. If 5 characters are entered or no more characters wanted, the parameter custom unit will be exited automatically.

Character set:

_ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
 a b c d e f g h i j k l m n o p q r s t u v w x y z
 ä ö ü ß
 . ? ! , : _ % / \ + - * [] () < = > " • ← → ↑ ↓ ◀ ▶ ▲ ▼ °
 μ Ω Δ ^{1 2 3} -^{1 -2}



Number of decimal places

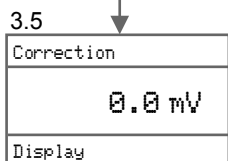
For the different models are following decimal places selectable:

Model 1: 0; 0.0; 0.00; 0.000

Model 2: 0; 0.0; 0.00; 0.000

Model 3: 0; 0.0

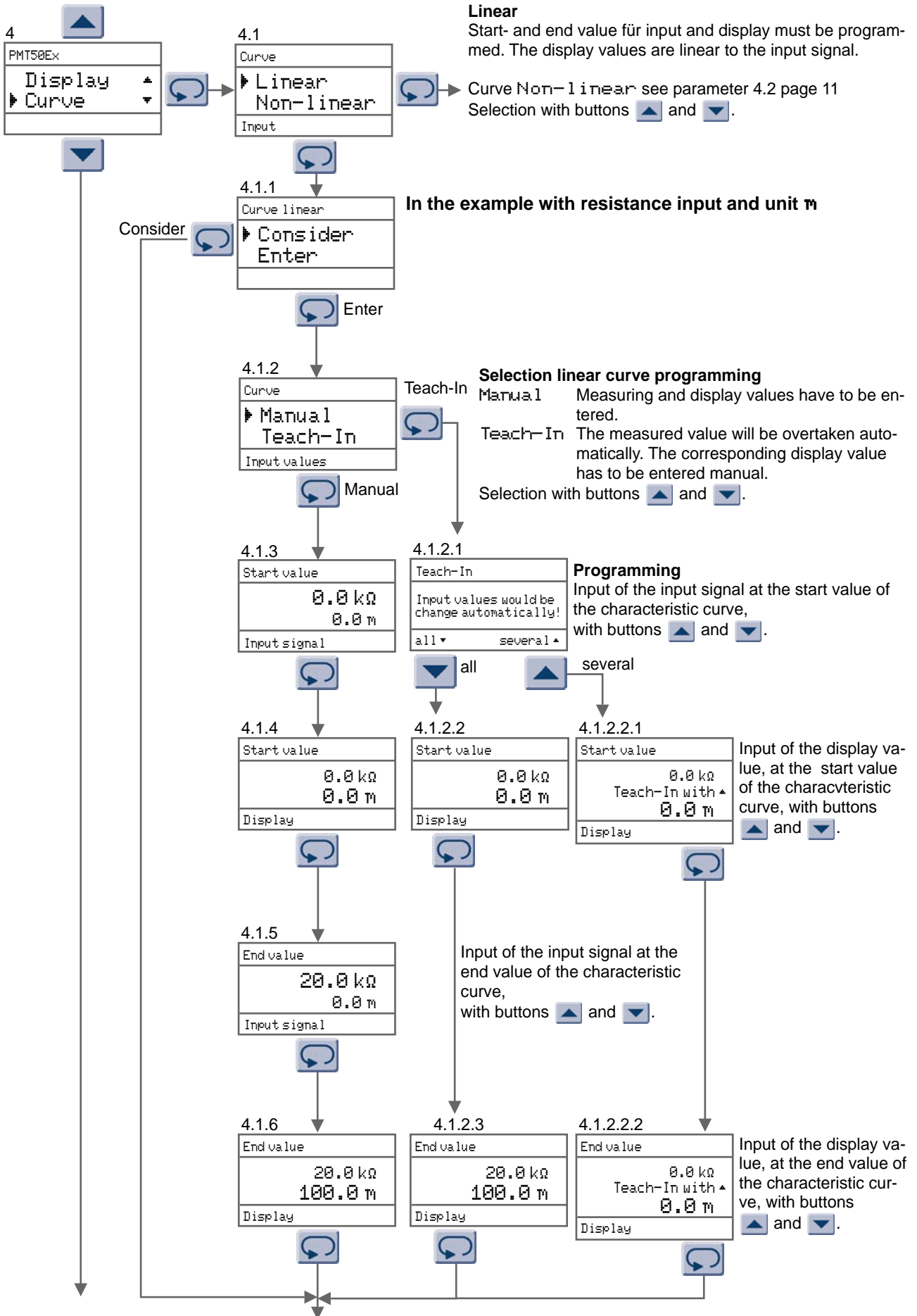
Selection with buttons ▲ and ▼.



Display correction

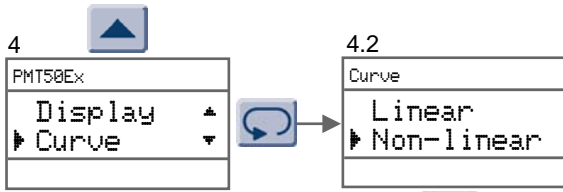
Setting possible from -9999 ... 9999 Digit with buttons ▲ and ▼.

Continue page 10



Continue page 12

Continue parameter 4.3, page 12



Non-linear

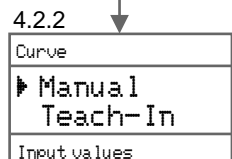
32 pair values for input and display values are programmable. Thereby every arbitrary characteristic curves are programmable. Selection with buttons ▲ and ▼.

In the example with resistance input and unit m



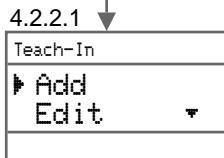
Selection non-linear curve programming

Manual Measuring and display values have to be entered.
Teach-In The measured value will be overtaken automatically. The corresponding display value has to be entered manual.
 Selection with buttons ▲ and ▼.

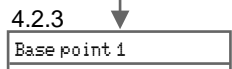
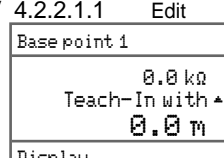
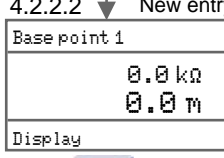


Add:

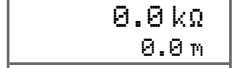
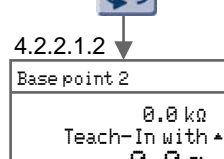
For every base point an input value with the corresponding display value has to be programmed.
Edit: Several base points are selectable and could be changed.
New: The programming procedure starts with base point 1.



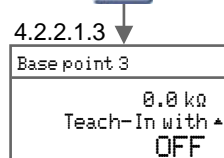
Add New entry



Edit



Add



Add

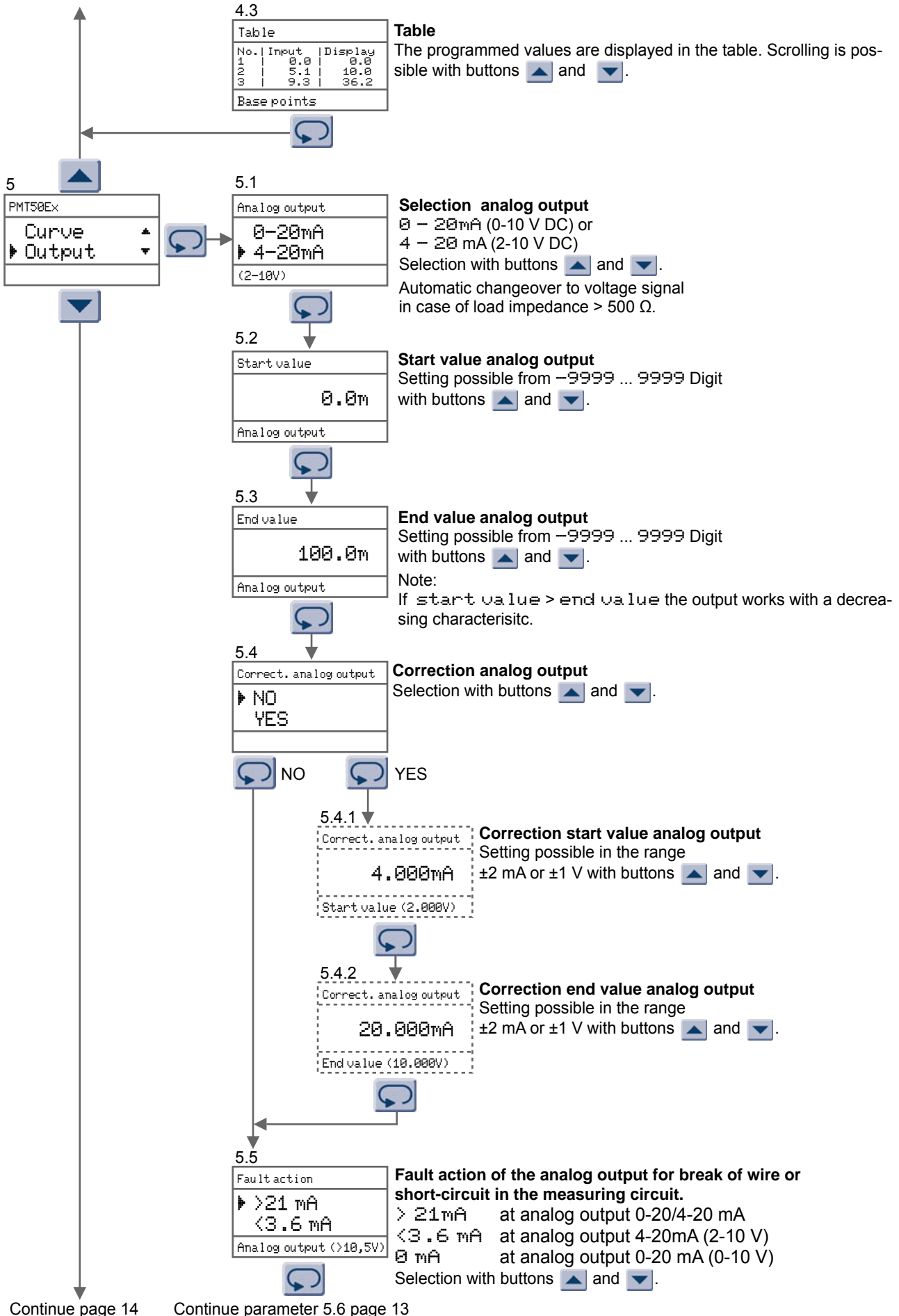


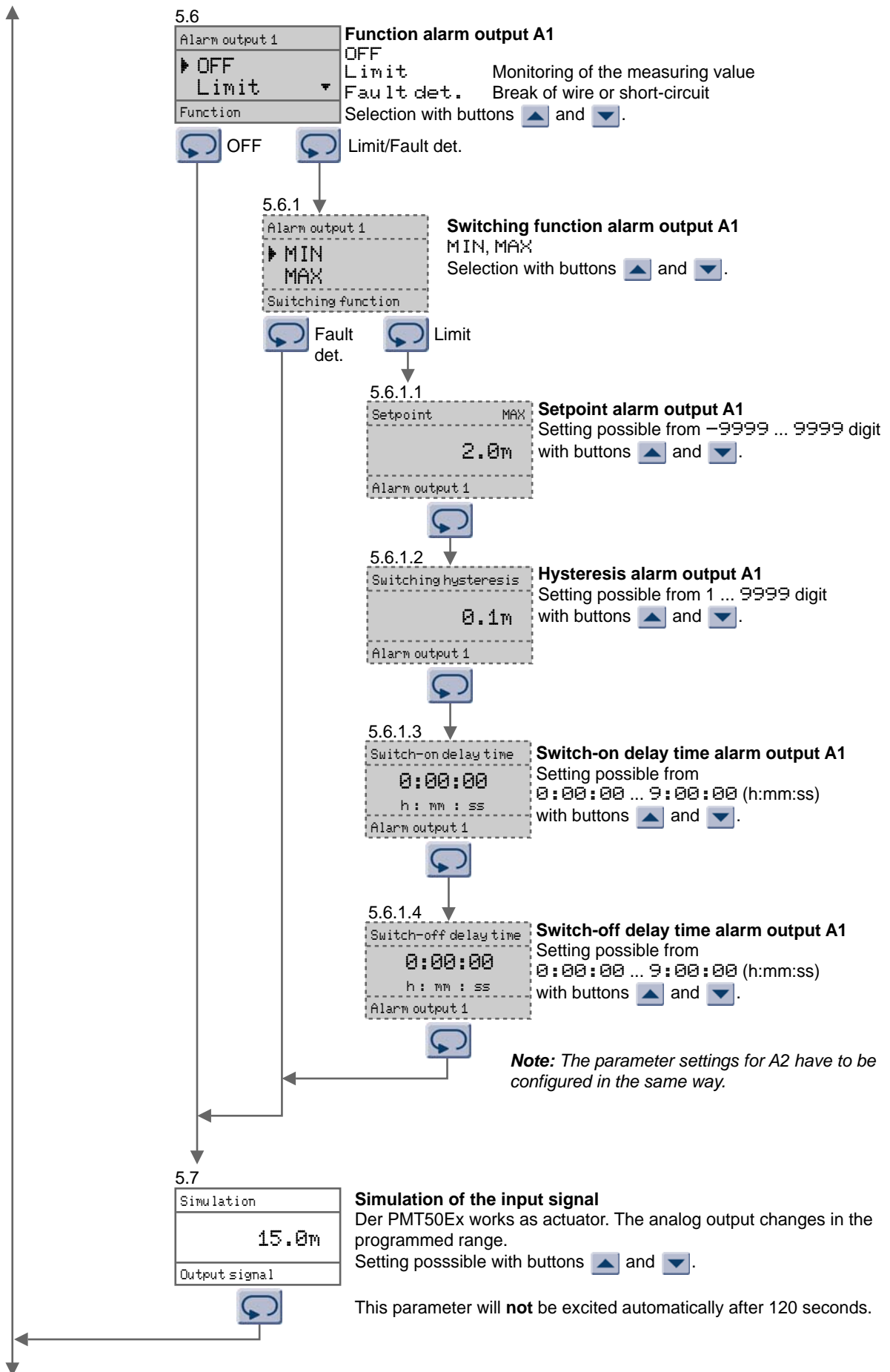
End of programming

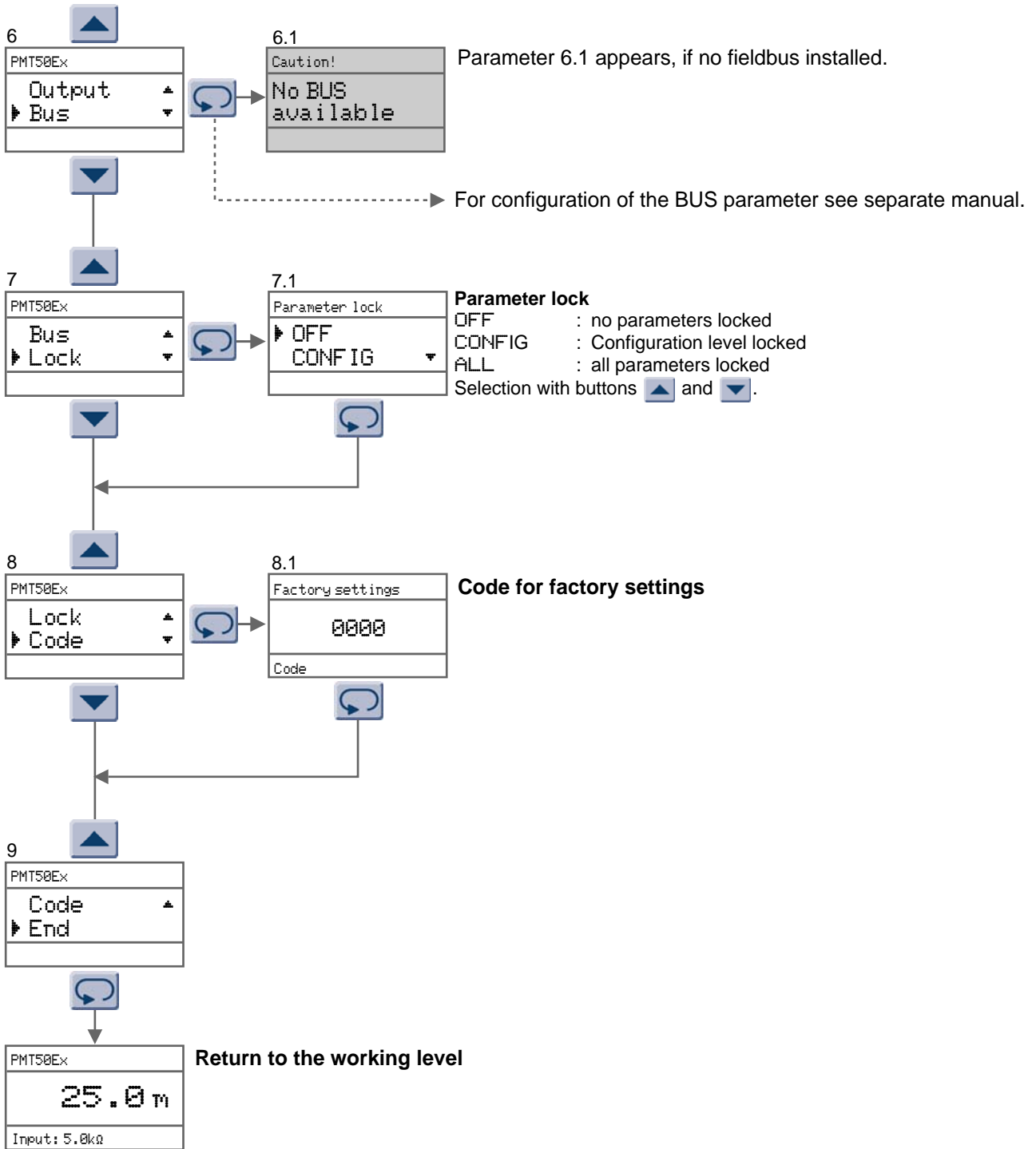
The curve programming procedure will be finished by pressing the button ▼ until OFF is displayed.

Continue page 12

Continue parameter 4.3, page 12









Error reports

Description

Caution!
Parameter locked
switched on

Caution!
Undervoltage

Supply voltage to low

Caution!
XX Parameter error
Please check

At the check-up of the parameter memory, XX errors are detected. The incorrect parameters are reset to the factory settings. Please check and correct parameters if necessary.

Caution!
XX Parameter error
Calibration necessary

As before, but the factory settings are incorrect. The device must be checked at work.

Change of decimals?
Some parameters not representable! Adapt parameters automatically?
▲ Yes ▼ No

Change of decimal places

While changing number of decimal places, some parameters can be converted, but however, not represented!

Selection "No" : Change of the decimal places is not carried out.

Selection "Yes" : Decimal places are changed automatically, where the affected parameters are set to the maximum possible value. A subsequent verification of the accepted parameters is absolutely necessary.

Caution!
Input value would be assigned before. Please change input value!

At the base-point programming the input value is assigned to a display value before.

PMT50Ex
Fault input
Input: 999.9kΩ

Break of wire or short-circuit in the measuring circuit.

Text Input: 999.9kΩ is flashing

Ordering code

PMT50Ex - 1. - 2. - 3. - 4. - 5. - 6.

1. Model/Input

1	Standard signals 0/4 ... 20 mA; 0/2 ... 10 V DC		
2	Resistance from 0 ... 20 kΩ, Poti 1 kΩ ... 100 kΩ		
3	Pt100	3-wire	-100.0 ... 600.0 °C/-100 ... 600 °C
	Pt1000	3-wire	-100.0 ... 300.0 °C/-100 ... 300 °C
	Thermocouple	J (Fe-CuNi)	-100.0 ... 800.0 °C/-100 ... 800 °C
		K (NiCr-Ni)	-150 ... 1200 °C
		N (NiCrSi-NiSi)	-150 ... 1200 °C
		S (Pt10Rh-Pt)	-50 ... 1600 °C
Inputs intrinsically safe	ATEX II (1) G [Ex ia] IIC/IIB ATEX II (1) D [Ex iaD]		

2. Analog output

AO 0/4 ... 20 mA/0/2 ... 10 V DC, isolated

3. Alarm outputs

00 not installed
 2R 2 relay outputs A1, A2 SPDT

4. BUS configuration

00 not installed
 MB Modbus RTU/ASCII RS485
 PB Profibus DP

5. Supply voltage

0 230 V AC ± 10 % 50-60 Hz
 1 115 V AC ± 10 % 50-60 Hz
 5 24 V DC ± 15 %

6. Options

00 without option

Custom configuration on request!