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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, kΩ, µS/cm, mS/cm, °C, °F, min^{-1}, rpm, bar, mbar, hPa, mm, cm, m, %, °, l, l/min, m^3, m^3/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 or 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.

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Technical data

Power supply

Supply voltage : 230 V AC ±10 %, 115 V AC ±10 %, or 24 V DC ±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 EN 60664-1:2007
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

EN 60079-0:2006 EN 60079-11:2007
EN 61241-0:2006 EN 61241-11:2006

Standardize EN 61326-1:2013			**Result**
IEC 61000-4-2 (ESD) IEC 61000-4-3 (E-field) IEC 61000-4-8 (Magnetic filed)	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, ±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
CISPR11	Radiated interference		Passed

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 kΩ
(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 t P_0 : 580 mW

Resistance R : 272 Ω

Characteristic curve : trapezoidal

Internal inductivity : 4 µH

Internal inductivity : 1.2 nF

Transmitter supply : approx. 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 µF		0.22 µF	0.76 µF

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

Input	: Resistance 0 ... 20 kΩ (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		
Chraracteristic curve	: trapezoidal		
Internal inductivity	: 4 µH		
Internal inductivity	: 135 nF		
Explosion protection	**Ex**	**ia/IIC**	**ia/IIB**
Maxim. external inductivity	:	100 mH	100 mH
Maxim. external capacity	:	25 µF	120 µF
Input	: Potentiometer 1 ... 100 kΩ (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		
Chraracteristic curve	: trapezoidal		
Internal inductivity	: 4 µH		
Internal inductivity	: negligible		
Explosion protection	**Ex**	**ia/IIC**	**ia/IIB**
Maxim. external inductivity	:	5 mH	20 mH
Maxim. external capacity	:	0.48 µF	2 µF

Model 3

Input	: Pt100 (3-wire) -100.0 ... 600.0 °C / -100 ... 600 °C Pt1000 (3-wire) -100.0 ... 300.0 °C / -100 ... 300°C : Thermocouples (TC) Type J -100.0 ... 800.0 °C / -100 ... 800 °C Type K -150 ... 1200 °C Type N -150 ... 1200 °C Type S -50 ... 1600 °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		
Resitance R	: 5600 Ω		
Characteristic curve	: trapezoidal		
Internal inductivity	: 4 µH		
Internal inductivity	: 135 nF		
Explosion protection	**Ex**	**ia/IIC**	**ia/IIB**
Maxim. external inductivity	:	100 mH	100 mH
Maxim. external capacity	:	25 µF	120 µF

Outputs

Alarm outputs A1, A2	: Relay SPDT < 250 V AC < 250 VA < 2 A cosφ ≥ 0.3, < 300 V DC < 40 W <2 A (Terminals 21, 22, 23; 25, 26, 27)
Analog output	: 0/4 ... 20 mA burden ≤500 Ω; 0/2 ... 10 V burden >500 Ω, galv. isolated, output changes automatically (burden impedance dependent)
Accuracy	: 0.2 %; TK 0.01 %/K

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Technical data

For connection at electrical equipments with supply voltage of max. 230V (Terminals 17 and 18)

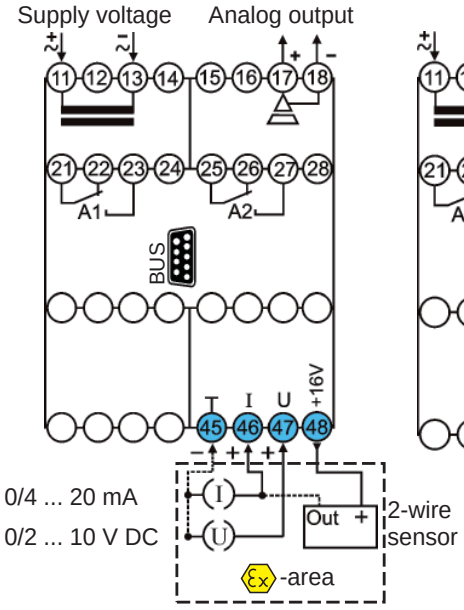
Fault function : For break of wire or short-circuit detection -belongs to the model-
→ Analog output 0 mA, < 3.6 mA or > 21.5 mA programmable
→ Alarm output(s) min. or max. function programmable

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

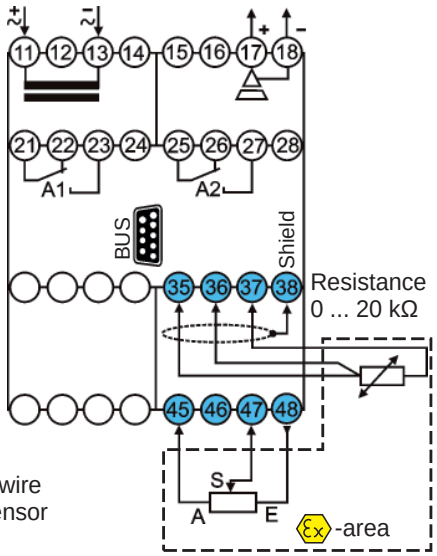
Display : Graphic LCD-Display 128x64 pixels, white background illuminated
Case : Polyamide (PA) 6.6, UL94V-0, DIN rail mounting TS 35
Weight : Approx. 450 g
Connection : Screw terminals 0.14 ... 2.5 mm² (AWG 26 .. 14)
Protection : Case IP30, terminals IP20, German BGV A3

Connection diagram

Model PMT50Ex-1
Standard signals

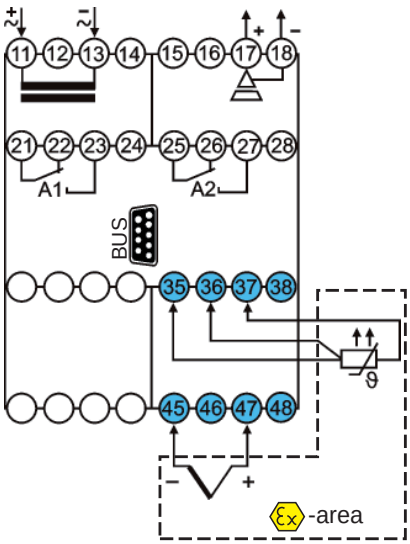


Model PMT50Ex-2
Resistance; potentiometer



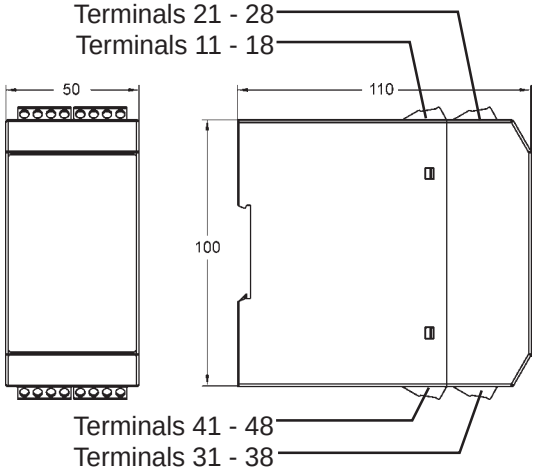
Poti
1 kΩ ... 100 kΩ,
slider current <1 µA

Model PMT50Ex-3
Pt100,Pt1000; thermocouple



Pt100/Pt1000 3-wire,
2-wire (link terminal 35-36),
thermocopules J, K, N, S

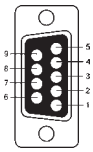
Dimensions



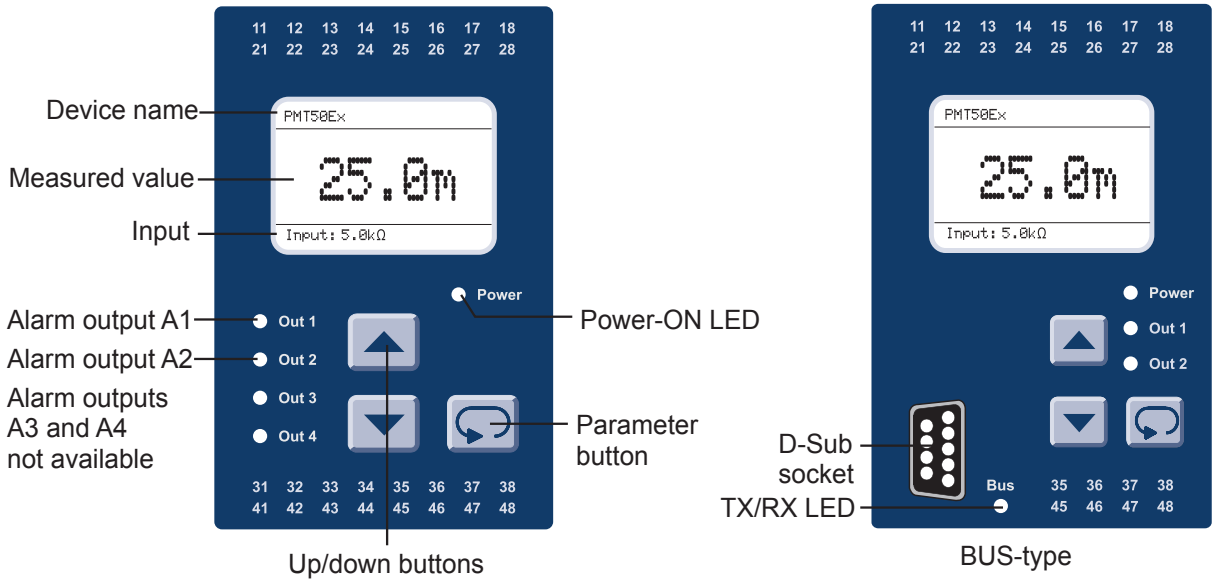
Bus connection (serial interface)

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 and .

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

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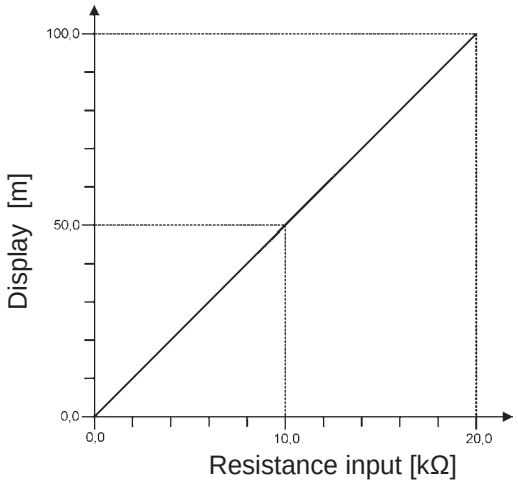
Explanations for characteristic curve programming

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:



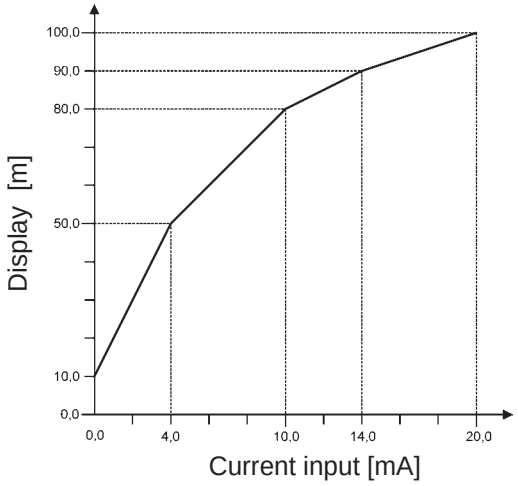
Example:

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

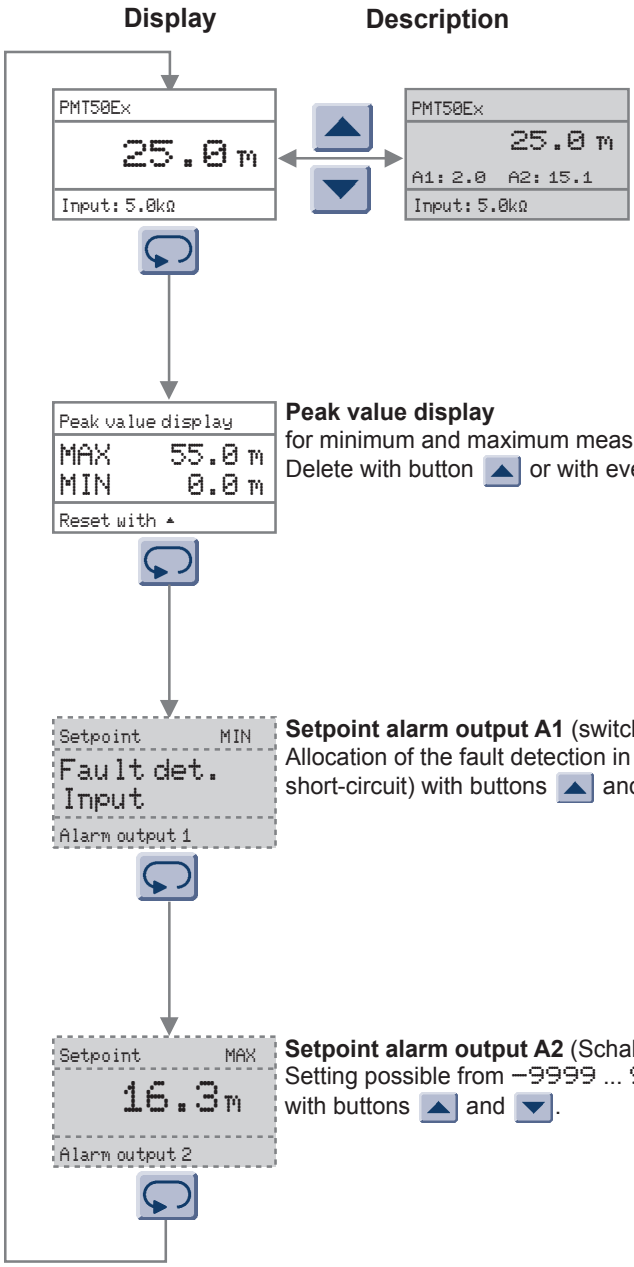
The curve above shows clearly the classification between input signal and display value. This example has 5 value pairs. For every input value the corresponding display value has to be programmed. The procedure is finished, if the button is pressed after the last base-point programming and OFF is selected in the follwing parameter.
At the teach-in programming no manually programming of the input values is necassary. 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



Actual-value displays
Change between the two representations for the actual-value display with the buttons ▲ and ▼.

Only the current value can either be displayed or, in addition, the adjusted values for the switching points of the alarm outputs. This selection is stored and is also retained after a voltage breakdown.

Peak value display
for minimum and maximum measured value.
Delete with button ▲ or with every switch-off of the device.

Setpoint alarm output A1 (switching function MIN or MAX)
Allocation of the fault detection in the measuring circuit (it belongs to the model; break of wire or short-circuit) with buttons ▲ and ▼.

Setpoint alarm output A2 (Schaltfunktion MIN or MAX)
Setting possible from −9999 ... 9999 digits
with buttons ▲ and ▼.

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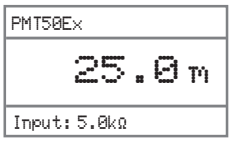
Configuration level

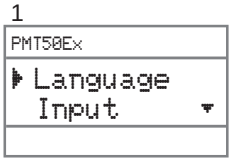
Display

Description (represented values are default settings)

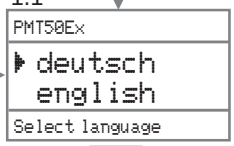


Press 2s

1

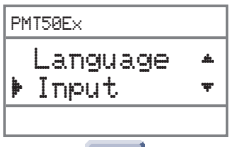


1.1

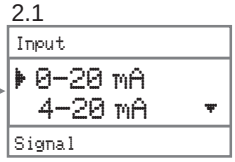


User Language
deutsch
english
Selection with buttons ▲ and ▼.

2



2.1

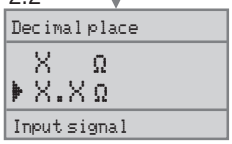


Input signal
For the different devices of the PMT50Ex are following input signals possible:

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

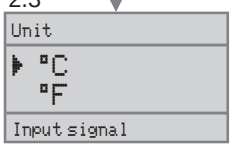
Selection with buttons ▲ and ▼.

2.2



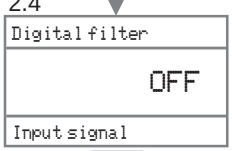
Decimal places resistance input
Parameter 2.2 is only available for model 2, if the input signal resistance is selected.
Selection possible with buttons ▲ and ▼.
The number of the decimal places belongs to the programming of the characteristic curve.

2.3



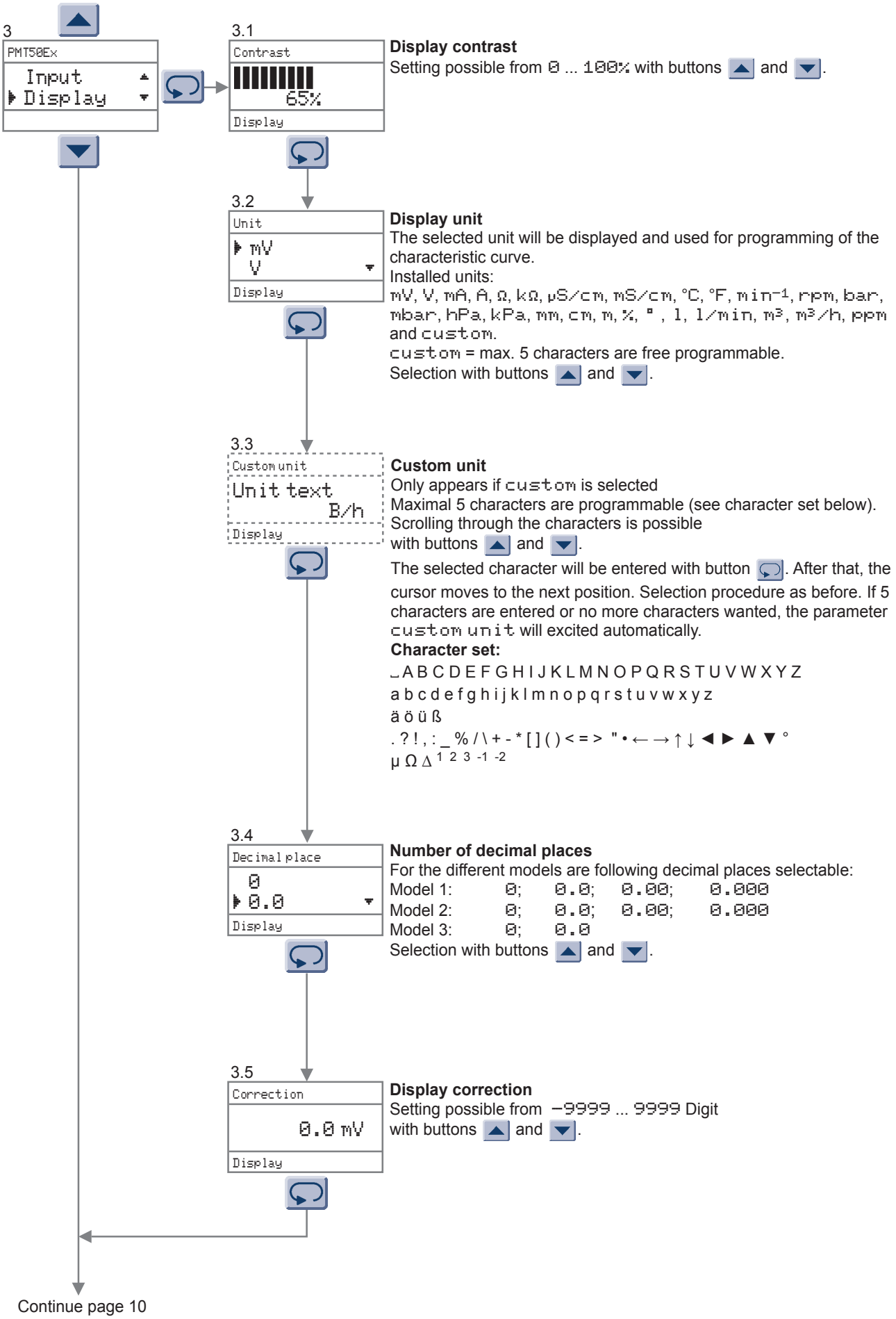
Unit for temperature
Parameter 2.3 is only available for model 3.
Selection possible with buttons ▲ and ▼.

2.4



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 excited 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 ▼.

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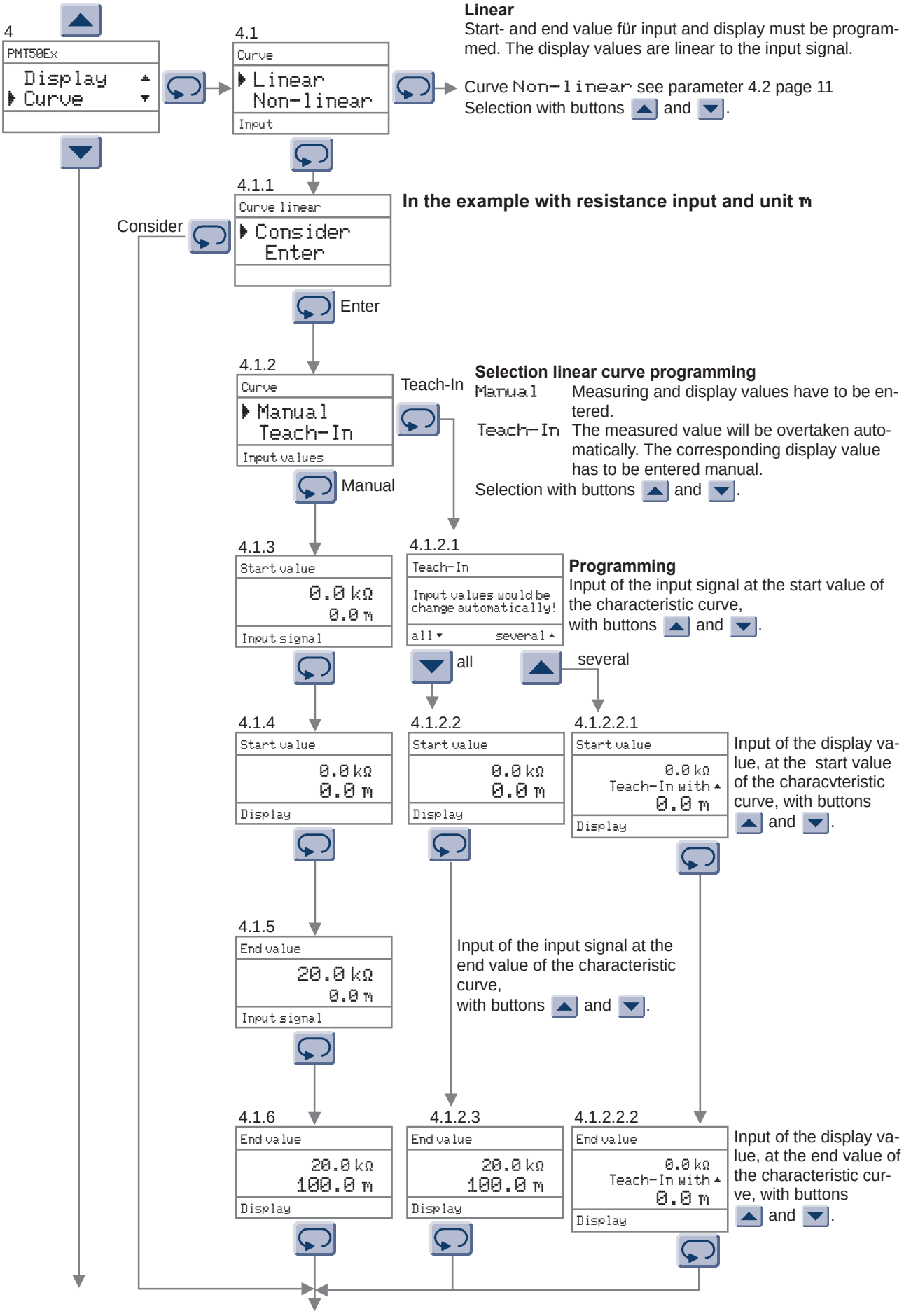
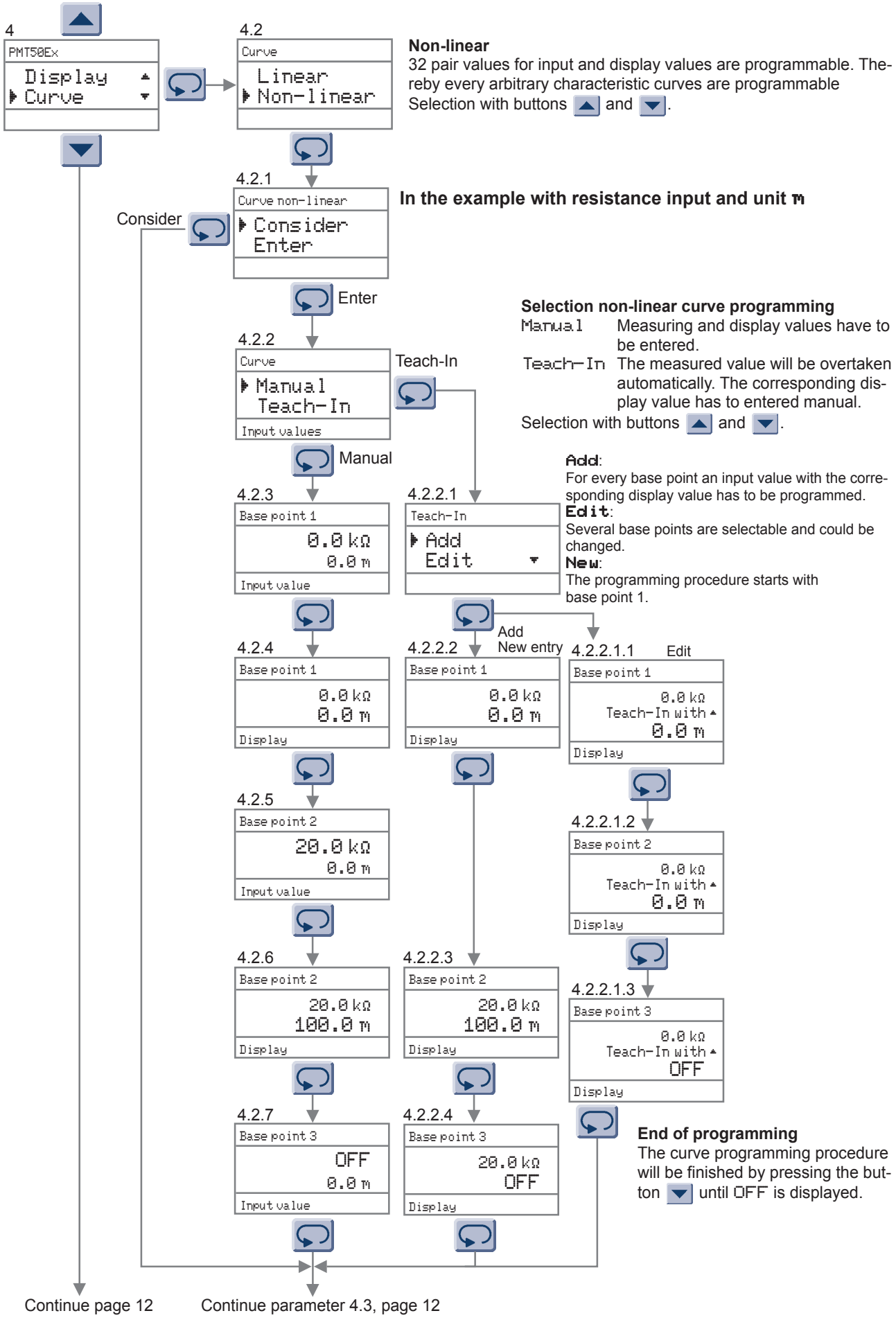


Continue page 12

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 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.

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

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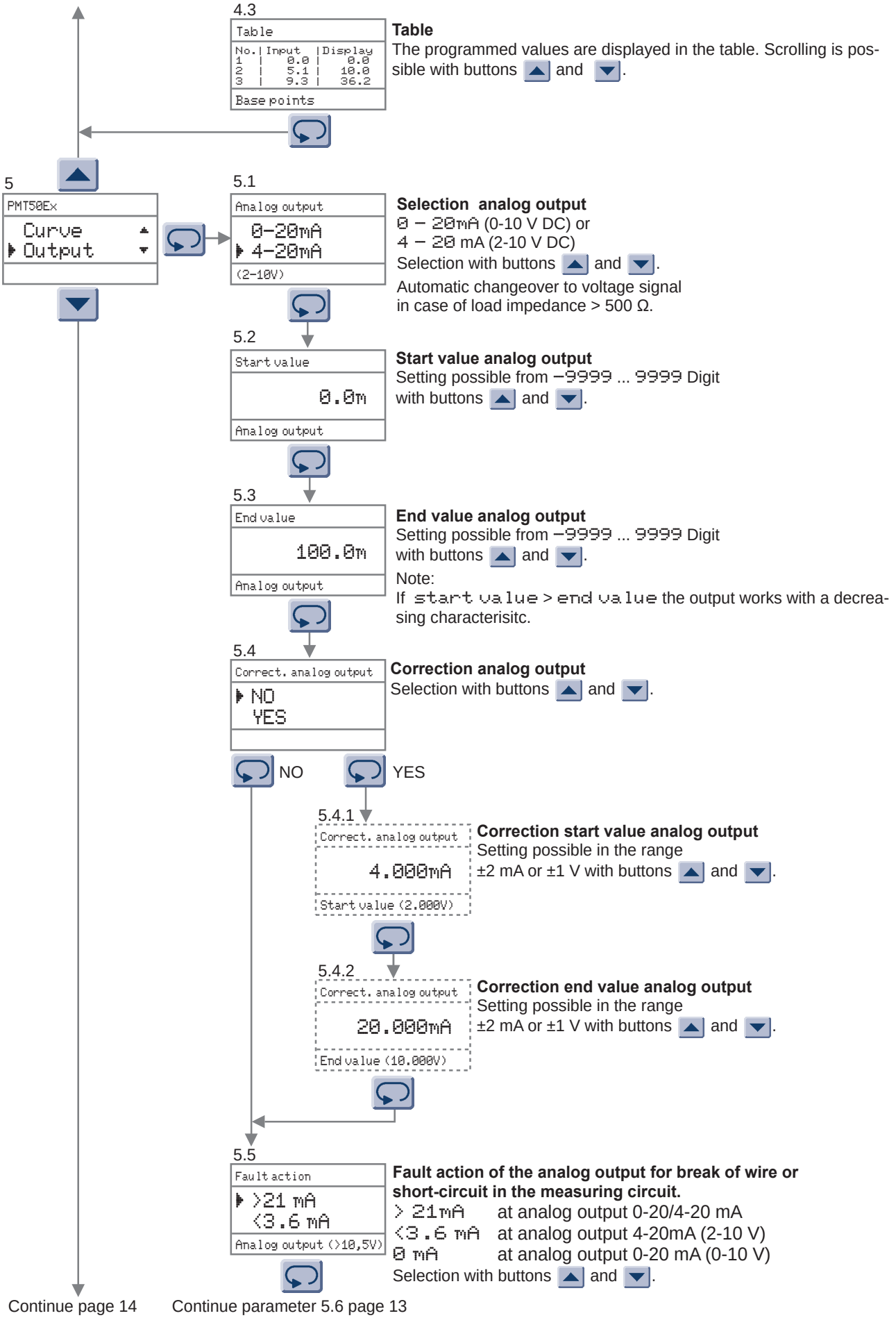


Table
The programmed values are displayed in the table. Scrolling is possible with buttons ▲ and ▼.

Selection analog output
0 – 20mA (0-10 V DC) or
4 – 20 mA (2-10 V DC)
Selection with buttons ▲ and ▼.
Automatic changeover to voltage signal in case of load impedance > 500 Ω.

Start value analog output
Setting possible from –9999 ... 9999 Digit with buttons ▲ and ▼.

End value analog output
Setting possible from –9999 ... 9999 Digit with buttons ▲ and ▼.
Note:
If start value > end value the output works with a decreasing characterisitc.

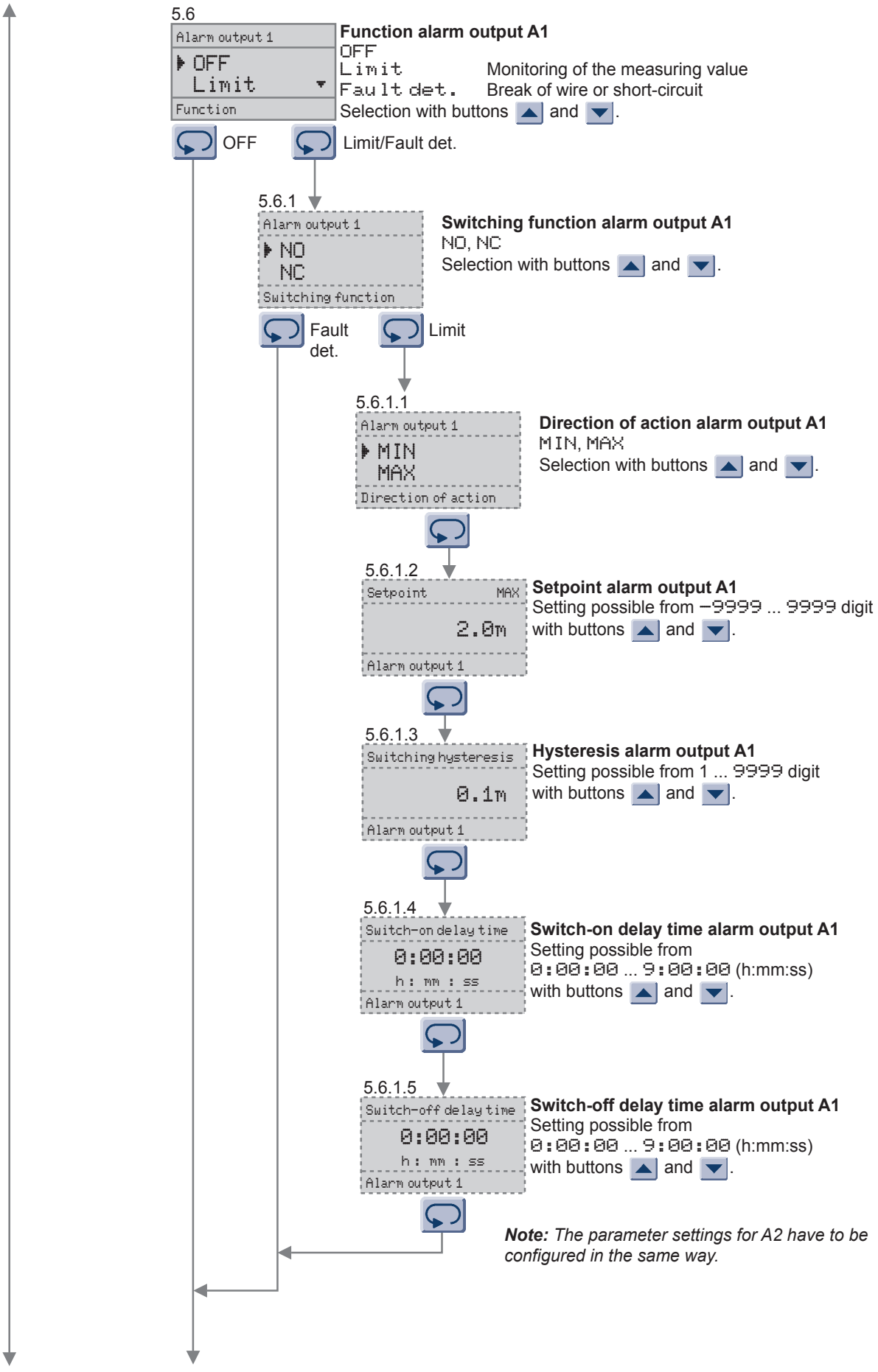
Correction analog output
Selection with buttons ▲ and ▼.

Correction start value analog output
Setting possible in the range ±2 mA or ±1 V with buttons ▲ and ▼.

Correction end value analog output
Setting possible in the range ±2 mA or ±1 V with buttons ▲ and ▼.

Fault action of the analog output for break of wire or short-circuit in the measuring circuit.
> 21mA at analog output 0-20/4-20 mA
<3.6 mA at analog output 4-20mA (2-10 V)
0 mA at analog output 0-20 mA (0-10 V)
Selection with buttons ▲ and ▼.

Continue page 14
Continue parameter 5.6 page 13



Continue page 14

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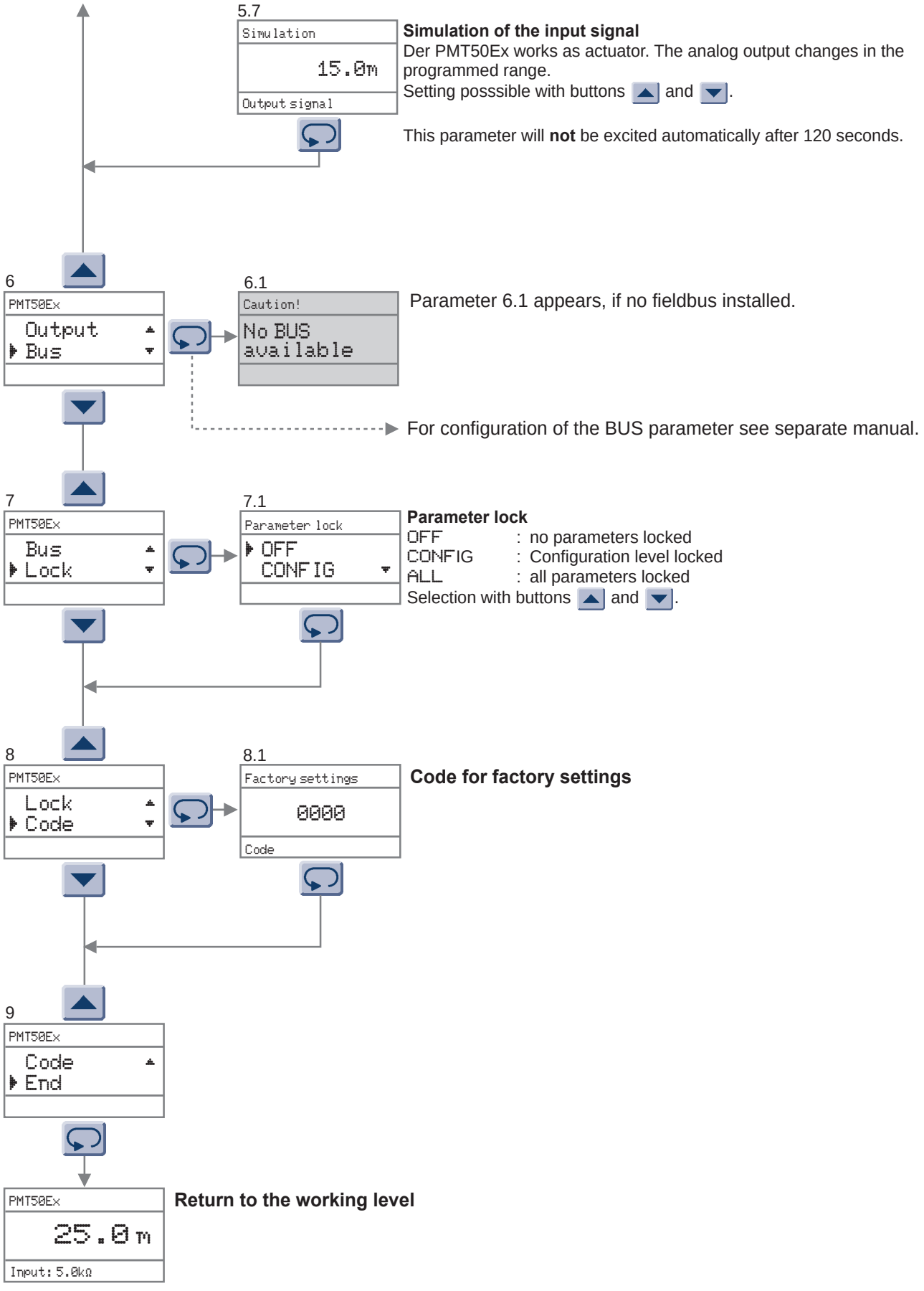


Simulation of the input signal
Der PMT50Ex works as actuator. The analog output changes in the programmed range.
Setting posssible with buttons ▲ and ▼.

This parameter will **not** be excited automatically after 120 seconds.

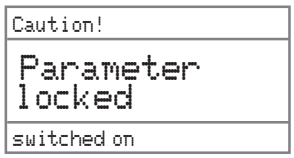
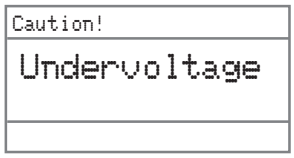
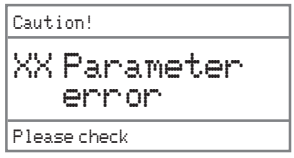
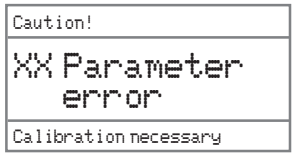
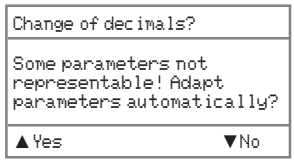
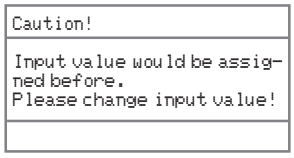
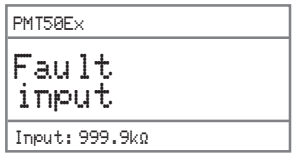
Parameter 6.1 appears, if no fieldbus installed.

For configuration of the BUS parameter see separate manual.

Parameter lock
OFF : no parameters locked
CONFIG : Configuration level locked
ALL : all parameters locked
Selection with buttons ▲ and ▼.

Code for factory settings

Return to the working level

Error reports	Description
	
	Supply voltage to low
	At the check-up of the parameter memory, XX errors are detectet. The incorrect parameter are resetted to the factoty settings. Please check and correct parameters if necessary.
	As before, but the factory settings are incorrect. The device must be checked at works.
	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.
	At the base-point programming the input value is assigned to an display value before.
	Break of wire or short-circuit in the measuring circuit. Text Input: 999.9kΩ is flashing

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Ordering code

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

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 requst!