Contents

Information on This Operating Instruction

This manual is not a stand-alone document. It applies only in connection with our operating instruction B08-500 for resistance thermometers and thermocouples as well as operating instruction B08-505 for the operation in explosion-hazardous areas.

This manual contains important information on the safe operation of the device. Before taking the device into operation, this manual has to be read and understood by qualified personnel.

If you have any problems or questions, please contact your supplier or contact us directly at:

ARMANO

1. Optical Buttons

The user interface features 3 optical buttons: ⌃, ⌄ and ○. The buttons can be operated both with and without gloves[1]. The buttons are insensitive to interference from ambient light sources and other measuring instruments (e.g. other PAXd devices mounted in close proximity).

Additionally, the optical buttons are adaptive, meaning that they will adapt to wear and e.g. dirt left on the surface. The buttons work both with and without the front cover mounted.

If a rapid increase in optical reflection occurs, e.g. from mounting the cover or from dust / dirt on the glass, the buttons may be activated. If a keystroke is detected for a period of more than 70 seconds, it is assumed to be an erroneous keystroke and the adaptive function will re-initialize in order to restore the correct keypad functionality. Such re-initialization can also be done by restarting the device.

2. Using the Optical Buttons

The optical buttons are used for operating and programming the PAXd. They offer multi-functionality depending on whether you press them briefly or press and hold them. With the exception of the calibration and simulation menus (⇨ chapter 5 "Display Menu"), the display will return to the monitoring view if no keystroke is registered within one minute.

⌃   in monitoring view: switch to the next process variable
other display view: increase the value of the selected parameter (unless the device is write-protected)

⌄   in monitoring view: switch to the previous process variable
other display view: decrease the value of the selected parameter (unless the device is write-protected)

○   accept the selected value and proceed to the next parameter

Press and hold
⌃   gradually increase (scroll) the numeric value (unless the device is write-protected)

Press and hold
⌄   gradually decrease (scroll) the numeric value (unless the device is write-protected)

Press and hold
○   ignore the selected value and return to the previous parameter

Press and hold
⌃+⌄   unlock the monitoring view and access the configuration menu[2]

The following icons are displayed in the toolbar when a button is pressed:

↑   button Up is pressed

↓   button Down is pressed

(■)   button Enter is pressed

3. Display

The 96 x 64 pixel display can be rotated in 90 degree increments for easy vertical or horizontal viewing. The adjustable backlight allows you to view process values under all lighting conditions without an external light source and can be configured to flash when an error occurs. The optional background lighting and the flashing error backlight can be selected as red or white, or turned off completely.

3.1 Display Views

The appearance of the display changes to indicate the status of the PAXd. This allows for easy and intuitive operation, an ideal status indication and guides you through the configuration of your device.

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[1] Dark gloves can lead to reduced sensitivity.
[2] If the error colour (⇨ chapter 5 "Display Menu") is set to red or white and the background lighting of the display is flashing, the flashing backlight is switched off by the first keystroke.

Meaning of the symbols

The toolbar provides information on the status of the device. Information such as HART communication, write protection and process value tendency are indicated.

⬇️ saving the configuration to internal memory

🔒 device is locked or write-protected

↑↓ current process value tendency indicators

⇄ external HART communication indicator

⬛ internal communication indicator

✕ external HART communication error

Monitoring view

The process value in the configured units can be easily monitored through the glass of the case. A bargraph indicates the process variable at a glance. The device tag is indicated at the top of the display. The device tag allows easy identification of the process value and can be changed by pressing the optical buttons ⌃ or ⌄. At the bottom of the display, the symbols show information on the current status of the device.

monitoring view
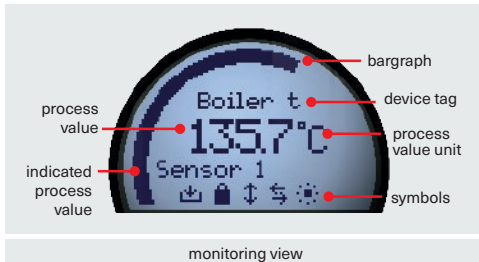
Programming view

Press and hold the optical buttons ⌃ or ⌄ to access the programming view. The programming view guides you quickly and intuitively through the device setup. The name of the selected parameter is indicated at the top of the display, the currently selected value right below. The value can be changed by pressing the optical buttons ⌃ or ⌄. If applicable, information on permissible range and currently configured units are also indicated. At the bottom, a scrolling help text shows information on the parameter you are modifying.

programming view
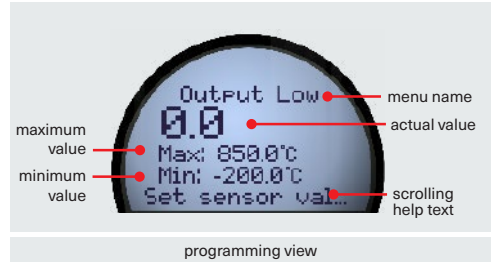
Diagnostics view

The display can be configured to flash with red or white background lighting when a sensor or device error occurs. The display indicates the status / error type in large letters and a scrolling help text with further information appears. The device tag is indicated at the top of the display and the toolbar at the bottom indicates the status of the device. For a detailed description of the different types of displayed diagnostic messages, please refer to chapter 4 "Device and Sensor Status Indication".

diagnostics view

Configuration

During configuration of the PAXd, you are guided through all parameters and can select those settings that are applicable to your application. For each menu, there is a scrolling help text that automatically appears in the display. The configuration is carried out via three optical buttons. When the configuration is complete or the display time has expired, the display returns to the monitoring view.

4. Device and Sensor Status Indication

The PAXd is able to indicate diagnostic information for the sensors and the device. These diagnostics can be divided into 4 categories: sensor status, sensor error, device status and device error.

Sensor status	
sensor 1 exceeds upper sensor limit	IN.HI[1]
sensor 1 exceeds lower sensor limit	IN.LO[1]
sensor 2 exceeds upper sensor limit	IN.HI[1]
sensor 2 exceeds lower sensor limit	IN.LO[1]
CJC sensor exceeds upper CJC sensor limit	IN.HI[1]
CJC sensor exceeds lower CJC sensor limit	IN.LO[1]

Sensor error	
sensor 1 error	SE1.ER[2]
sensor 2 error	SE2.ER[2]
CJC sensor error	CJC.ER[2]
internal temperature sensor error	CJC.ER

Device status	
configuration is resynchronised	SYNC.DEV[3]
new device is connected and configuration is updated	NEW.DEV[3]
last process calibration failed	CA.ER[4]

Device error	
A/D converter error	ADC.ER[5]
EEPROM memory error	EE.ER[5]
RAM error	RA.ER[5]
flash memory error	FL.ER[5]
exception error during code execution	SW.ER[5]
internal communication error	COM.ER[5]

5. Display Menu

Exiting the monitoring view allows you to configure the PAXd with the optical buttons (⇨ chapter 2 "Using the Optical Buttons"). The display menu is divided into two sections: basic configuration and advanced configuration. The advanced configuration is separated into nine sections: display, tags, calibration, simulation, sensor, HART, write protection, language and HART version.

If a write protection PIN other than 0000 was set, the correct PIN code must be entered to proceed to the desired configuration. The PIN code 2008 will always grant access to the menu.

The menu may be temporarily locked when it is receiving a configuration on the HART interface or when it is synchronising configuration parameters with the internal device.

If a PIN code is activated, the menu can be viewed, but configuration changes and saving the configuration is not possible.

It is possible to change the write protection status (enabled / disabled), but the correct write protection password must be entered when prompted.

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[1] The scrolling help text informs you about the affected sensor.
[2] Check the wiring and replace the sensor if necessary.
[3] This message disappears after a few seconds and the display changes to monitoring view.
[4] Perform a new process calibration or reset the calibration to fix the error ⇨ chapter 5.1 "Display".
[5] A device malfunction has occurred. To fix this error, restart the device or reconfigure it via the display.
  If the error still persists, it will reappear and the device may need to be replaced.

Power up

Device tag

123.45 °C

Sensor 1 - °C

❶

△ and ▽ toggles the process variable shown in line 2 and 3. (The value configured in display setup is restored after 30 seconds.)

Long press

9999
0000

0000
PIN code
Txt 76

❼

Correct

Long press

No
Yes

Yes
Adv Setup?
Txt 2

No - continued on the next page

SW.ER
FL.ER
EE.ER
ADC.ER
RA.ER
COM.ER

Device tag

COM.ER

Txt 100

❸

NEW.DEV
SYNC.DEV
SE1.ER ❺
SE2.ER ❺
CJC.ER ❺
CA.ER ❺
IN.HI
IN.LO

Device tag

SE1.ER

Txt 100

❹

Display
Tags
Calibration ❷
Simulation ❷
Sensor
HART
Write-protect
Language
HART revision ❻

Yes

HART
Setup
Txt 4

---

❶ If no keys are pressed for 60 s in any menu (except for Sim and Cal), no parameters are saved and the monitoring menu is shown.
If display scaling is enabled, the display scaling value is indicated, and visible in the monitoring view by default.
❷ Only shown if write protection is disabled.
❸ Will be forced into this state if any device error occurs (from any other menu).
❹ Warning state: will be forced into this state if sensor error or overrange is present. Only from monitoring menu.
❺ First long press of △ and ▽ simultaneously will stop backlight flash but not exit view.
Second long press will enter configuration menu (if allowed).
❻ Only shown if change of protocol is possible.
❼ Only shown if PIN code is > 0000.

Basic configuration

If connection is 3- or 4-wire, the max. cable resistance is set to 10 Ohm.
This can be overwritten in the Advanced Menu.

Single Sens / Dual Sens

```
Single Sens
─────────────
 Sensor Func
    Txt 3
```
Single sensor

```
  Average
 Differential
 ────────────
 Differential
 ────────────
  Meas setup
    Txt 68
```
Dual sensor

```
  Voltage
 Linear Res
 Temperature
 ───────────
 Temperature
 ───────────
  Input Type
    Txt 69
```
Lin. R

```
   Ohm
   kOhm
 ───────────
     Ohm
 ───────────
   Res Type
    Txt 5
```

```
  2-wire
  3-wire
  4-wire
 ───────────
   3-wire
 ───────────
  Connection
    Txt 7
```
❽

```
  100.0
   0.0
 ───────────
     5
 ───────────
 S1 Wire Res
    Txt 8
```
❾

```
  100.0
   0.0
 ───────────
     0
 ───────────
 S2 Wire Res
    Txt 8
```
❿

Temperature

```
   Pt
   Ni
   TC
 ───────────
     Pt
 ───────────
 Sensor Type
    Txt 70
```
Pt

```
  Pt50
  Pt100
  Pt200
  Pt500
  Pt1000
  Custom
 ───────────
   Pt100
 ───────────
   Pt Type
    Txt 6
```

Ni

```
  Ni50
  Ni100
  Ni120
  Ni1000
 ───────────
   Ni100
 ───────────
   Ni Type
    Txt 71
```

TC

```
 TC B   TC S
 TC E   TC T
 TC J   TC U
 TC K   TC U3
 TC L   TC U5
 TC N   TC Ln
 TC R   Custom
 ────────────
     TC K
 ────────────
    TC Type
     Txt 72
```

```
  Internal
  Ext Pt100
  Ext Ni100
  Fixed
 ───────────
  Ext Pt100
 ───────────
   CJC Type
    Txt 10
```
Internal / Fixed

Ext Pt 100 / Ni 100

```
  100.0
   0.0
 ───────────
     0
 ───────────
 CJC Wire Res
    Txt 8
```

Voltage

```
   uV
   mV
   V
 ───────────
     mV
 ───────────
 Voltage Type
    Txt 5
```

❽ Only shown if single sensor function is selected.
❾ Only shown if 2-wire sensor connection is selected.
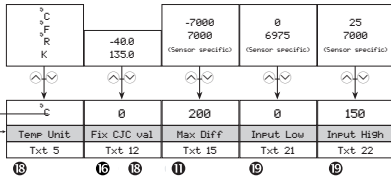❿ Only shown if dual sensor function is selected.

Not available in HART 5 mode

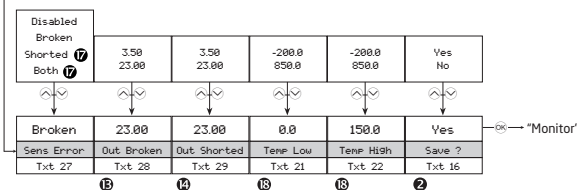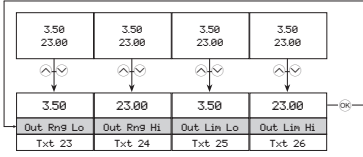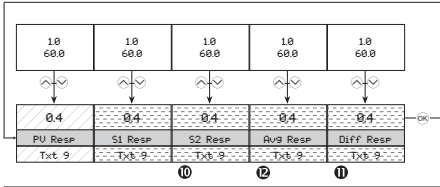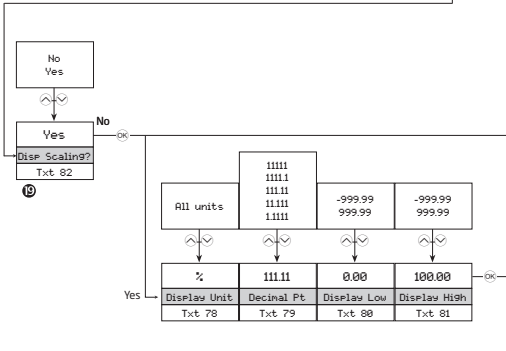If HART revision = 5, units for S1, S2, Average and Difference are forced to either mV or Ohm.

Units for CJC are forced to the same units as S1. If S1 is not = Temperature Type, Unit is set to °C.

All device variable units can be overwritten in the Advanced menu.

°C °F R K	-40.0 135.0	-7000 7000 (Sensor specific)	0 6975 (Sensor specific)	25 7000 (Sensor specific)
°C	0	200	0	150
Temp Unit	Fix CJC val	Max Diff	Input Low	Input High
Txt 5	Txt 12	Txt 15	Txt 21	Txt 22
⓲	⓰ ⓲	⓫	⓳	⓳

No Yes
Yes
Disp Scaling?
Txt 82
⓳

	11111 1111.1 111.11 11.111 1.1111	-999.99 999.99	-999.99 999.99
All units			
%	111.11	0.00	100.00
Display Unit	Decimal Pt	Display Low	Display High
Txt 78	Txt 79	Txt 80	Txt 81

1.0 60.0	1.0 60.0	1.0 60.0	1.0 60.0	1.0 60.0
0.4	0.4	0.4	0.4	0.4
PV Resp	S1 Resp	S2 Resp	Avg Resp	Diff Resp
Txt 9	Txt 9	Txt 9	Txt 9	Txt 9
		⓾	⓬	⓫

3.50 23.00	3.50 23.00	3.50 23.00	3.50 23.00
3.50	23.00	3.50	23.00
Out Rng Lo	Out Rng Hi	Out Lim Lo	Out Lim Hi
Txt 23	Txt 24	Txt 25	Txt 26

Disabled Broken Shorted ⓱ Both ⓱	3.50 23.00	3.50 23.00	-200.0 850.0	-200.0 850.0	Yes No
Broken	23.00	23.00	0.0	150.0	Yes
Sens Error	Out Broken	Out Shorted	Temp Low	Temp High	Save ?
Txt 27	Txt 28	Txt 29	Txt 21	Txt 22	Txt 16
	⓭	⓮	⓲	⓲	❷

"Monitor"

⓾ Only shown if dual sensor function is selected.
⓫ Only shown if differential sensor function is selected.
⓬ Only shown if average sensor function is selected.
⓭ Only shown if sensor breakage detection is activated.
⓮ Only shown if sensor shortage detection is activated.
❷ Only shown if write protection is disabled.
⓰ Only shown if fixed CJC is selected.
⓱ Selection not available for voltage input type and TC sensor type with internal / fixed CJC.
⓲ Only shown if temperature input is selected.
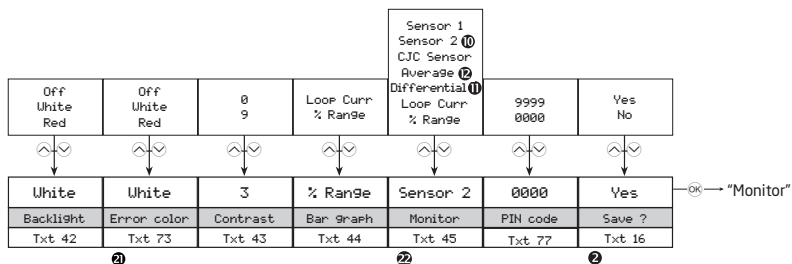⓳ Only shown if temperature input is NOT selected.
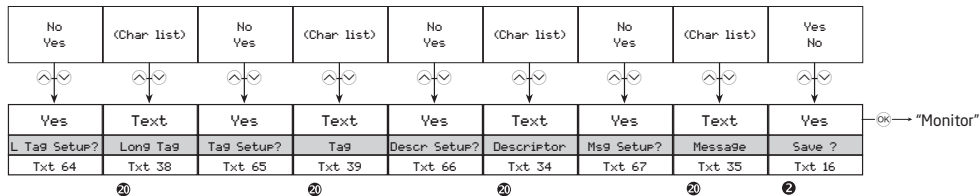
Not available in HART 5 mode

Not available in HART 7 mode

5.1   Display

Off White Red	Off White Red	0 9	Loop Curr % Range	Sensor 1 Sensor 2 ❿ CJC Sensor Average ⓬ Differential ⓫ Loop Curr % Range	9999 0000	Yes No	
⌃⌄	⌃⌄	⌃⌄	⌃⌄	⌃⌄	⌃⌄	⌃⌄	
White	White	3	% Range	Sensor 2	0000	Yes	OK → "Monitor"
Backlight	Error color	Contrast	Bar graph	Monitor	PIN code	Save ?	
Txt 42	Txt 73	Txt 43	Txt 44	Txt 45	Txt 77	Txt 16	
㉑				㉒		❷	

5.2   Tags

| No Yes	(Char list)	No Yes	(Char list)	No Yes	(Char list)	No Yes	(Char list)	Yes No	
⌃⌄	⌃⌄	⌃⌄	⌃⌄	⌃⌄	⌃⌄	⌃⌄	⌃⌄	⌃⌄	
Yes	Text	Yes	Text	Yes	Text	Yes	Text	Yes	OK → "Monitor"
L Tag Setup?	Long Tag	Tag Setup?	Tag	Descr Setup?	Descriptor	Msg Setup?	Message	Save ?	
Txt 64	Txt 38	Txt 65	Txt 39	Txt 66	Txt 34	Txt 67	Txt 35	Txt 16	
	⓴		⓴		⓴		⓴	❷	

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❿ Only shown if dual sensor function is selected.
⓫ Only shown if differential sensor function is selected.
⓬ Only shown if average sensor function is selected.
❷ Only shown if write protection is disabled.
⓴ Only shown if "Yes" was selected in the previous menu.
㉑ NOT shown if backlight is off.
㉒ Only shown if display scaling input is disabled.

5.3 Calibration

(only if write protection is disabled)
The device can be process-calibrated at two points to match a given input signal. A low input signal (not necessarily 0 %) is applied and the actual value is entered. Then a high input signal (not necessarily 100 %) is applied and the actual value is entered. If you accept the calibration (by selecting Yes in the save menu), the device will operate according to the new settings. You can reset the device to factory calibration points by selecting reset calibration in the calibration menu. Please note that the programming mode will not time out while performing a calibration.
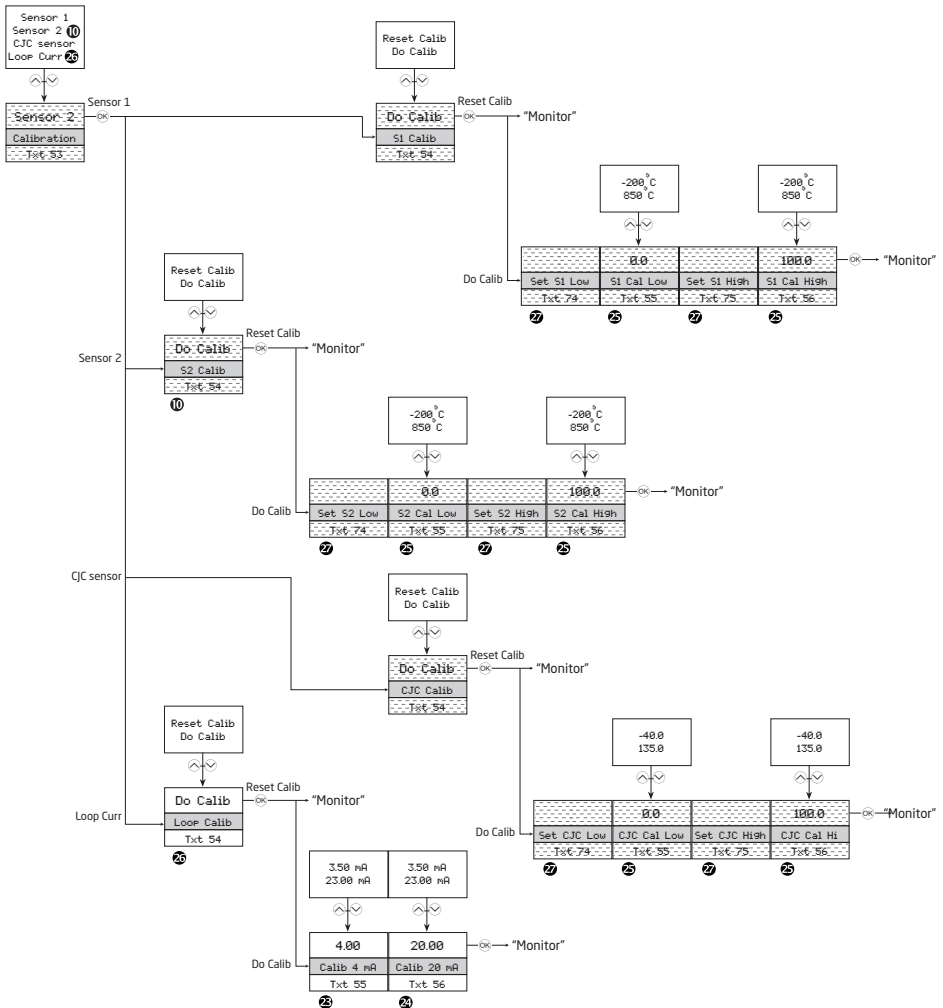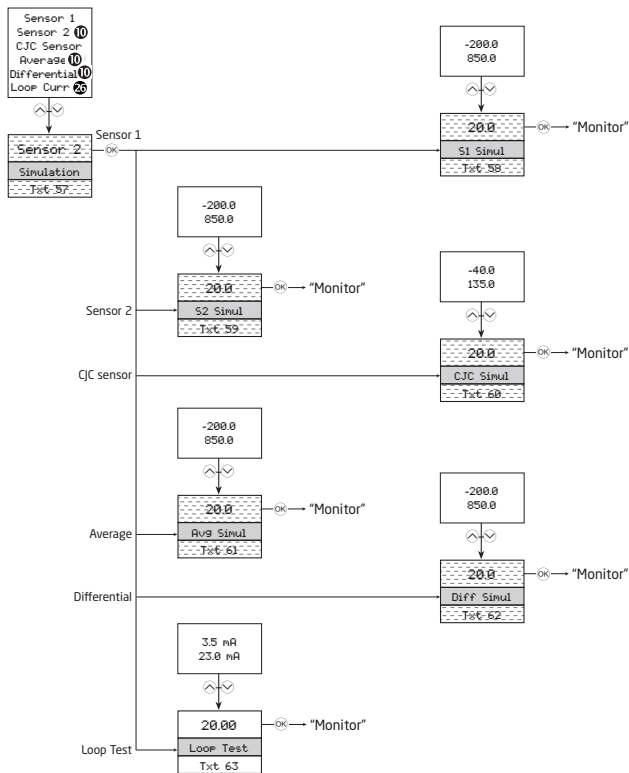

[10] Only shown if dual sensor function is selected.
[23] 4 mA fixed output configured internally.
[24] 20 mA fixed output configured internally.
[25] Default value is current input value. No timeout in this menu.
[26] Not possible if loop current is not active.
[27] No timeout in this menu.

Not available in HART 5 mode

5.4 Simulation

(only if write protection is disabled)
The PAXd allows you to simulate process values in the simulation menu. By using the optical buttons ⌃ and ⌄, the simulated value can be increased or decreased (⇨ chapter 2 "Using the Optical Buttons"). Please note that the display will not time out while performing a calibration.

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❿ Only shown if dual sensor function is selected.
㉖ Not possible if loop current is not active.

Not available in HART 5 mode

5.5 Sensor

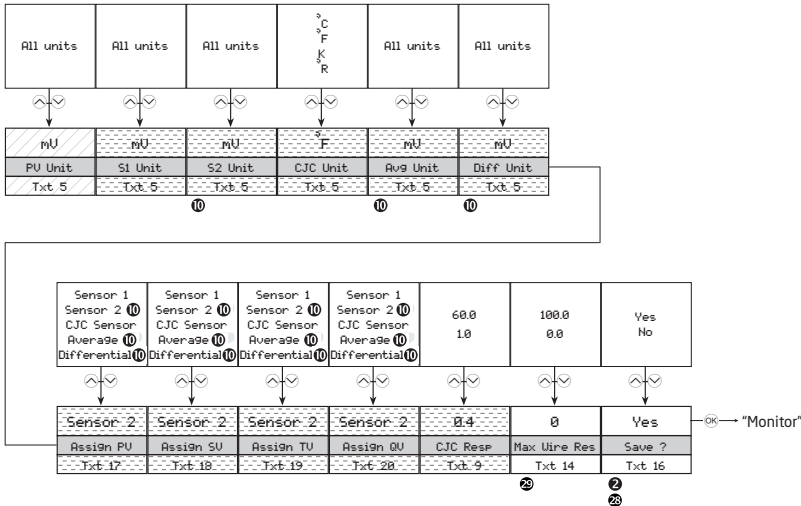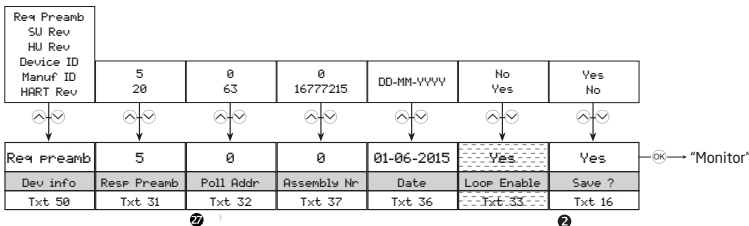The sensor menu allows you to perform a detailed configuration of your sensor values, which are not available in the basic configuration menu. This includes selecting from a large number of process variable units, changing the sensor assignment to PV, SV, TV and QV and specifying the CJC response time. Please note that when performing a basic configuration (⇨ chapter 5 "Display Menu"), these changes will be overwritten.

All units	All units	All units	°C °F K °R	All units	All units
⌃⌄	⌃⌄	⌃⌄	⌃⌄	⌃⌄	⌃⌄
mV	mV	mV	°F	mV	mV
PV Unit	S1 Unit	S2 Unit	CJC Unit	Avg Unit	Diff Unit
Txt 5	Txt 5 ❿	Txt 5 ❿	Txt 5	Txt 5 ❿	Txt 5

Sensor 1 Sensor 2 ❿ CJC Sensor Average ❿ Differential ❿	Sensor 1 Sensor 2 ❿ CJC Sensor Average ❿ Differential ❿	Sensor 1 Sensor 2 ❿ CJC Sensor Average ❿ Differential ❿	Sensor 1 Sensor 2 ❿ CJC Sensor Average ❿ Differential ❿	60.0 1.0	100.0 0.0	Yes No
⌃⌄	⌃⌄	⌃⌄	⌃⌄	⌃⌄	⌃⌄	⌃⌄
Sensor 2	Sensor 2	Sensor 2	Sensor 2	0.4	0	Yes
Assign PV	Assign SV	Assign TV	Assign QV	CJC Resp	Max Wire Res	Save ?
Txt 17	Txt 18	Txt 19	Txt 20	Txt 9 ㉙	Txt 14 ㉘	Txt 16 ❷

→ ⊙ → "Monitor"

5.6 HART

In this menu you will find special parameters for HART. It provides you with general information on a number of request preambles, software and hardware version, device and manufacturer ID and HART version. The menu also allows you to set the number of response preambles, polling address, assembly number and date.

Req Preamb SW Rev HW Rev Device ID Manuf ID HART Rev	5 20	0 63	0 16777215	DD-MM-YYYY	No Yes	Yes No
⌃⌄	⌃⌄	⌃⌄	⌃⌄	⌃⌄	⌃⌄	⌃⌄
Req preamb	5	0	0	01-06-2015	Yes	Yes
Dev info	Resp Preamb	Poll Addr	Assembly Nr	Date	Loop Enable	Save ?
Txt 50	Txt 31	Txt 32 ㉗	Txt 37	Txt 36	Txt 33	Txt 16 ❷

→ ⊙ → "Monitor"

❿ Only shown if dual sensor function is selected.
㉗ Range is 0…15 in HART 5 mode.
❷ Only shown if write protection is disabled.
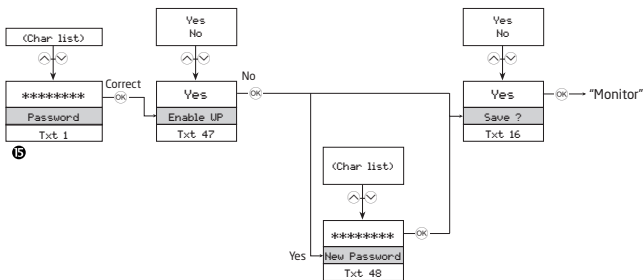㉘ Values may be overwritten when normal menu is saved.
㉙ Only shown if 3- or 4-wire connection is selected.

Not available in HART 5 mode
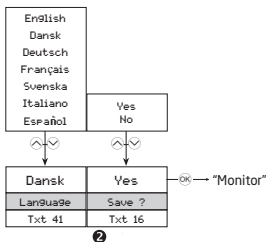
Not available in HART 7 mode

5.7 Write Protection

Here you can select whether to enable or disable write protection using a password. If the write protection is already enabled, the correct password must be entered to gain access. The password must consist of exactly 8 characters, available in the Latin-1 character set. It protects the device against unauthorized configuration modifications. The device is delivered with disabled write protection. The password 00002008 always grants access to the write protection menu.

(Char list)	Yes / No		Yes / No
████████ Password / Txt 1 ❻	Yes / Enable UP / Txt 47		Yes / Save ? / Txt 16 → "Monitor"

(Char list)
████████ / New Password / Txt 48

5.8 Language

In this menu you can choose from seven different language versions for the help text that will appear in the menu (⇨ chapter 5.1 "Display"). The following languages are available: English, Dansk, Deutsch, Français, Svenska, Italiano and Español.

| English / Dansk / Deutsch / Français / Svenska / Italiano / Español	Yes / No
Dansk / Language / Txt 41	Yes / Save ? / Txt 16 → "Monitor" ❷

---

❷ Only shown if write protection is enabled.
❻ Only shown if write protection is disabled.

5.9   HART Version

The HART version is changed via this menu. Select the desired HART version and press the ○ button. Select Yes to confirm the change in the save menu. Please note that the device will restart when changing the HART version. During this time, the display will become blank for a few seconds. If HART 7 is selected, the device will appear as PAXd in the HART interface. If HART 5 is selected, the device will appear as PAXdH5/5335V2 in the HART interface.
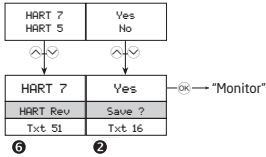
❷ Only shown if write protection is enabled.
❻ Only shown if change of protocol is possible.

6. Scrolling Help Text

[01] set the correct password
[02] enter advanced setup menu ?
[03] select single sensor functionality
select dual sensor functionality
[04] enter display setup
enter tag settings
enter process calibration
enter simulation mode
enter advanced sensor settings
enter HART settings
enter write protection setting
enter setup language
enter HART revision
[05] select measurement unit
[06] select custom RTD as sensor type
select Pt50 as sensor type
select Pt100 as sensor type
select Pt200 as sensor type
select Pt500 as sensor type
select Pt1000 as sensor type
[07] select 2-wire sensor connection
select 3-wire sensor connection
select 4-wire sensor connection
[08] set actual output resistance in 2 wires
[09] set the response time
[10] select internal CJC sensor
select Pt100 as external CJC sensor
select Ni100 as external CJC sensor
select fixed CJC
[12] set fixed CJC value
[13] disable sensor 2
enable sensor 2
[14] set maximum output resistance in 2 wires
[15] set the maximum value for individual sensors in case of differential measurement
[16] save configuration ?
[17] assign sensor 1 to PV and output loop
assign sensor 2 to PV and output loop
assign CJC sensor to PV and output loop
assign internal temperature to PV and output loop
assign average measurement to PV and output loop
assign differential measurement to PV and output loop
[18] assign sensor 1 to SV
assign sensor 2 to SV
assign CJC sensor to SV
assign internal temperature to SV
assign average measurement to SV
assign differential measurement to SV
[19] assign sensor 1 to TV
assign sensor 2 to TV
assign CJC sensor to TV
assign internal temperature to TV
assign average measurement to TV
assign differential measurement to TV

[20] assign sensor 1 to QV
assign sensor 2 to QV
assign CJC sensor to QV
assign internal temperature to QV
assign average measurement to QV
assign differential measurement to QV
[21] set the lower value at the analogue output
[22] set the upper value at the analogue output
[23] set output current to 0 % of measuring range
[24] set output current to 100 % of measuring range
[25] set the lower limit at the current output
[26] set the upper limit at the current output
[27] disable the sensor error detection
enable the cable break detection at the sensor
enable the short circuit detection at the sensor
enable the short circuit and cable break detection at the sensor
[28] set the output current in case of cable breakage
[29] set the output current in case of a short circuit
[31] set the number of preambles in HART messages
[32] set the polling address
[33] disable current loop (no analogue output signal)
enable current loop (analogue output signal)
[34] transfer the description to the device
[35] transfer the message to the device
[36] set the user data on the device
[37] set the final assembly number
[38] transfer long tag number
[39] transfer the tag number
[41] select language
[42] disable the LCD background lighting
select white LCD background lighting
select red LCD background lighting
[43] set LCD contrast
[44] select current loop for bargraph indicator
select % of measuring range for bargraph indicator
[45] select sensor 1 in the process monitoring view
select sensor 2 in the process monitoring view
select CJC sensor in the process monitoring view
select average measurement in the process monitoring view
select differential measurement in the process monitoring view
select current loop in the process monitoring view
select % of measuring range in the process monitoring view
[47] enable the write protection
[48] select a new password
[50] minimum number of preambles in requests
software revision level
hardware revision level
device identification
manufacturer identification
HART protocol revisions level
[51] select HART 7 protocol
select HART 5 protocol

[53] enter sensor 1 configuration menu
enter sensor 2 configuration menu
enter CJC sensor configuration menu
enter output loops configuration menu
[54] restore default settings
perform process calibration
[55] enter the value for the lower calibration point
[56] enter the value for the upper calibration point
[57] simulate sensor 1 input
simulate sensor 2 input
simulate CJC sensor input
simulate average measurement
simulate differential measurement
simulate output current loop
[58] set simulation value sensor 1
[59] set simulation value sensor 2
[60] set simulation value CJC sensor
[61] set simulation value average measurement
[62] set simulation value differential measurement
[63] set simulation value output current loop
[64] edit the long tag number ?
[65] edit the tag number ?
[66] edit the description ?
[67] edit the message ?
[68] select the average value of sensor 1 and sensor 2
select the differential measurement of sensor 1
and sensor 2
[69] select voltage input
select linear resistance input
select temperature input
[70] select Pt sensor type
select Ni sensor type
select TC sensor type
[71] select Ni50 as sensor type
select Ni100 as sensor type
select Ni120 as sensor type
select Ni1000 as sensor type
[72] select custom TC as sensor type
select TC-B as sensor type
select TC-E as sensor type
select TC-J as sensor type
select TC-K as sensor type
select TC-L as sensor type
select TC-N as sensor type
select TC-R as sensor type
select TC-S as sensor type
select TC-T as sensor type
select TC-U as sensor type
select TC-W5 as sensor type
select TC-W3 as sensor type
select TC-Lr as sensor type
[73] disable LCD error backlight
select white LCD error backlight
select red LCD error backlight

[74] apply value for the lower calibration point and
allow it to stabilise
[75] apply value for the upper calibration point and
allow it to stabilise
[76] enter PIN code for menu access
[77] select PIN code for menu access
(0000 disabled)
[78] select display unit
[79] select position of the decimal point
[80] set lower display measurement range
[81] set upper display measurement range
[82] use display scaling (overwrites the configured
monitoring view)

[100]
SW.ER	exception error during code execution
FL.ER	FLASH memory error
EE.ER	EEPROM memory error
ADC.ER	A/D converter error
RA.ER	RAM error
COM.ER	internal communication error
NEW.DEV	new device detected – configuration is being updated – please wait
CONF.ER	configuration is being re-synchronised – please wait
SE1.ER	error sensor 1, check the connection and replace if necessary
SE2.ER	error sensor 2, check the connection and replace if necessary
CJC.ER	error CJC sensor, check the connection and replace if necessary
CJC.ER	error internal temperature sensor
CA.ER	last process calibration not successful – please retry
IN.HI / IN.LO	sensor 1 out of range
IN.HI / IN.LO	sensor 2 out of range
IN.HI / IN.LO	CJC sensor out of range
IN.HI / IN.LO	sensor 1 or sensor 2 measurement out of range

6.1 Available Units

The following table lists the available units. Please note that most units are only available from the sensor menu or from the display scaling menu (⇨ chapter 5 "Display Menu").

Sensor menu #	HART #	Display scaling menu #	Text	Types
0	32	0	°C	temperature units
1	33	1	°F	
2	34	2	°R	
3	35	3	K	
4	37	4	Ohm	resistance units
5	163	5	kOhm	
6	240	6	µV	voltage units
7	36	7	mV	
8	58	8	V	
—	—	9	kV	
—	171	10	µA	current units
9	39	11	mA	
—	172	12	A	
—	—	13	kA	
11	1	15	inH_2O	pressure units
12	2	16	inHg	
13	3	17	ftH_2O	
14	4	18	mmH_2O	
15	5	19	mmHg	
16	6	20	psi	
17	7	21	bar	
18	8	22	mbar	
19	9	23	g/cm^2	
20	11	24	Pa	
—	174	25	hPa	
21	12	26	kPa	
22	13	27	torr	
23	14	28	atm	
24	237	29	MPa	
25	17	32	l/min	volume flow units
—	131	35	m³/min	
26	19	36	m³/h	
27	22	38	gal/s	
—	16	39	gal/min	
28	24	31	l/s	
29	25	30	ml/d	
30	26	42	ft³/s	
31	130	43	ft³/h	
32	27	44	ft³/d	
33	28	34	m³/s	
34	29	37	m³/d	
35	121	45	m³n/h	
36	132	46	bbl/s	
37	134	47	bbl/h	
38	135	48	bbl/d	
39	136	40	gal/h	
40	138	33	l/h	
41	235	41	gal/d	

Sensor menu #	HART #	Display scaling menu #	Text	Types
42	20	57	ft/s	velocity units
—	116	58	ft/min	
—	—	59	ft/h	
—	—	49	mm/s	
43	21	50	m/s	
—	—	51	m/min	
—	—	53	ips	
44	114	54	in/s	
—	115	55	in/min	
—	—	56	in/h	
45	120	52	m/h	
46	40	62	gal	volume units
47	41	60	l	
48	43	61	m³	
49	46	67	bbl	
50	110	68	bush	
51	111	63	yd³	
52	112	64	ft³	
53	113	65	in³	
54	166	66	m³n	
55	167	69	ln	
56	236	70	hl	
57	44	76	ft	length units
58	45	71	m	
59	47	77	in	
60	48	72	cm	
61	49	73	mm	
—	—	74	µm	
—	—	75	yd	
—	—	78	mils	

Sensor menu #	HART #	Display scaling menu #	Text	Types
62	50	80	min	time units
63	51	79	s	
64	52	81	h	
65	53	82	d	
66	60	83	g	mass units
67	61	84	kg	
68	62	85	t	
69	63	87	lb	
70	64	88	ShTon	
71	65	89	LTon	
72	125	87	oz	
—	—	149	mol	
73	70	90	g/s	mass flow units
74	71	91	g/min	
75	72	92	g/h	
76	73	93	kg/s	
77	75	94	kg/h	
78	76	95	kg/d	
79	77	96	t/min	
80	78	97	t/h	
81	79	98	t/d	
82	80	99	lb/s	
83	82	100	lb/h	
84	83	101	lb/d	
85	90	102	SGU	mass per volume units
86	91	103	g/cm^3	
87	92	104	kg/m^3	
88	95	105	g/ml	
89	96	106	kg/l	
90	97	107	g/l	
91	146	108	µg/L	
92	147	109	µg/m^3	
93	54	110	cSt	viscosity units
94	55	111	cP	
95	69	112	N/m	energy (work) units
—	—	113	Wh	
96	128	114	kW/h	
—	—	115	MWh	
97	162	116	Mcal	
—	—	117	kJ	
98	164	118	MJ	
99	165	119	Btu	

| Sensor menu #	HART #	Display scaling menu #	Text	Types
—	175	120	W	power units
100	127	121	kW	
—	170	122	MW	
—	—	123	GW	
101	129	124	hp	
102	141	125	MJ/h	
103	142	126	Btu/h	
104	117	127	deg/s	angular velocity units
105	118	128	rev/s	
106	119	129	rpm	
—	—	133	S	conductivity units
—	—	134	µS	
—	—	137	m/s^2	acceleration unit
10	57	14	%	miscellaneous
107	38	130	Hz	
108	56	131	µMho	
109	59	132	pH	
110	66	135	mS/cm	
111	67	136	µS/cm	
112	68	138	N	
113	139	139	ppm	
114	143	140	deg	
115	144	141	rad	
116	148	142	%Cs	
117	149	143	Vol%	
118	153	144	pF	
119	154	145	ml/l	
120	155	146	µl/l	
121	161	147	%LEL	
122	169	148	ppb	
123	251	150	<blank>*	special units
124	252	151	?	
125	253	152	Spcl	
* no characters displayed				

7.   Programming

The PAXd can be configured in one of the following 3 ways:
• via the optical buttons and the display ($\Rightarrow$ chapter 5 "Display Menu"),
• with a HART modem and the PC software,
• with a HART-compliant, portable communicator with the PAXd H5 or PAXd H7 DD driver installed.
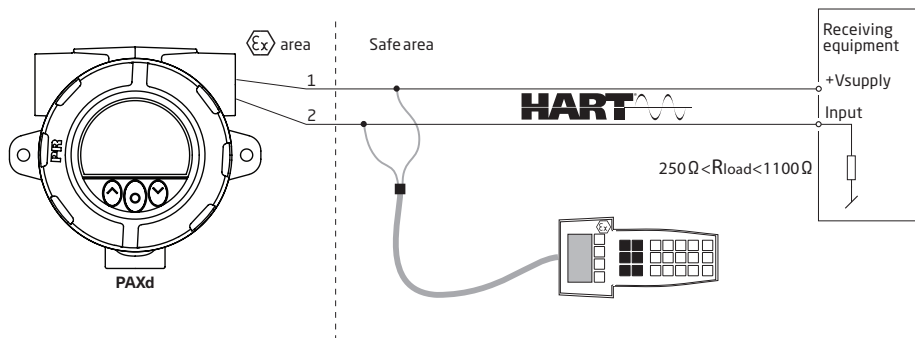
7.1   HART Modem

Please refer to the following drawing for programming.
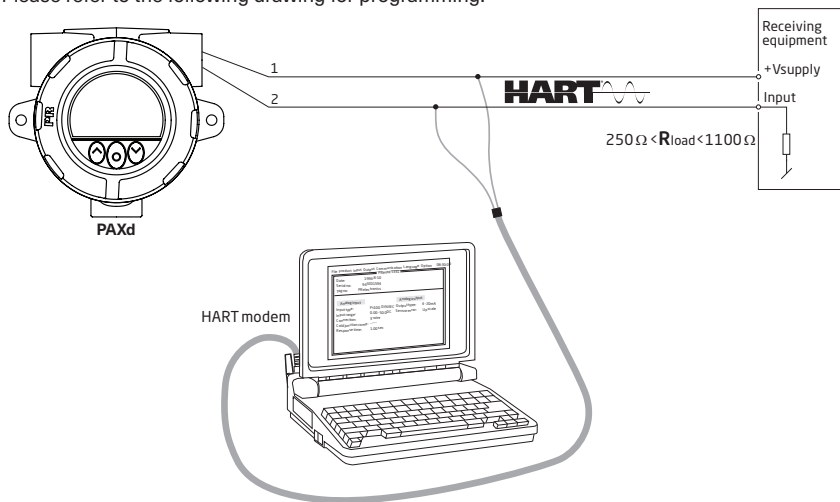

7.2   HART Communicator

Please refer to the following drawing for programming. To gain access to product specific commands, the PAXd H5 / PAXd H7 DD driver must be loaded onto the HART communicator. This can be ordered electronically from the HART Communication Foundation or from ARMANO.

8. Changing the HART Protocol Version

It is possible to change the HART protocol version of the device via the display by using the PC software and a HART modem or other HART configuration tools such as portable HART terminals.

Changing the HART version using the display and the optical buttons
Changing the version is done from the Hart version view in the advanced menu. Use the optical buttons ⊘ or ⊘ to select the desired HART version. Press the ○ button to confirm the version and switch to the save view. Select Yes and press ○ to confirm the change or No to cancel.

Changing the HART version using a portable terminal
- Set the device PAXd online and access Device Setup – Diag / Service.
- Select write protection and set write protection by entering "*********" (eight asterisks).
- Select new password – enter "*********" (eight asterisks) and then "HARTREV5" or "HARTREV7", depending on the desired version.
- Select write enable and enter "-CHANGE-".

### 9. Connection of Transmitters in Multidrop Mode

The outputs of up to 63 devices can be connected in parallel on 2 wires for a digital HART 7 communication. For HART 5, the outputs of up to 15 transmitters can be connected in the same way.

Before being connected, each device must be configured with a unique polling address ranging from one to 63 (HART 7) or 15 (HART 5). If two devices are configured with the same address, both will be excluded. The device must be configured for the multidrop mode (with a fixed output signal of 4 mA). The maximum current in the loop is therefore 252 mA (HART 7) or 60 mA (HART 5).

Communication is done either via a HART communicator or a HART modem.

The PC software can configure the single device for the multidrop mode and provide it with a unique polling address.

The HART communicator or the HART modem can be connected via AB or BC.

$R_{load} > 250\,\Omega, < 1100\,\Omega$

Max. 63 transmitters (HART 7) or max. 15 transmitters (HART 5)
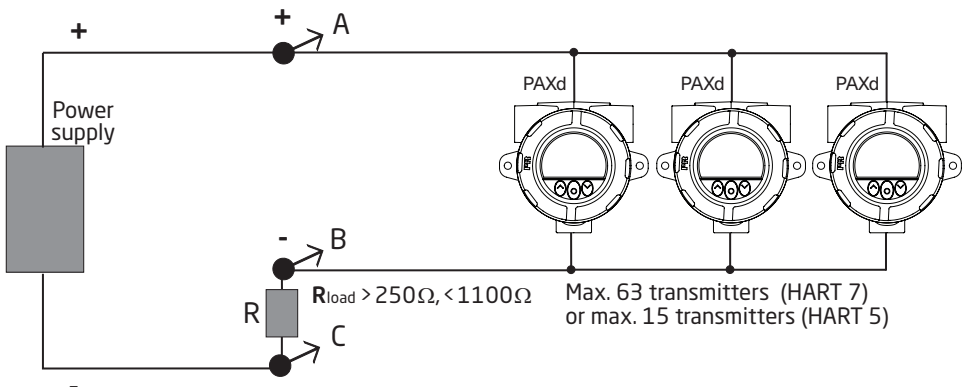
10.   Abbreviations Used

PV, SV, TV, QV:	Variables in the HART protocol
PV:	Primary Value (4...20 mA)
SV:	Secondary Value
TV:	Tertiary Value
QV:	Quaternary Value
CJC:	Cold Junction Compensation
TC:	Thermocouple
WTH:	Resistance Thermometer