Product Manual
7501
Field mounted HART temperature transmitter

Boiler t
135.7°c
Sensor 1

ATEX ⟨Ɛx⟩ IECEx FM APPROVED CSA Segurança Desempenho INMETRO DEKRA OCP 0009 Ex NEPSI EAC Ex DNV G L C E

No. 7501V101-UK
From serial no.: 150810001

PR
electronics

6 Product Pillars
to meet your every need

Individually outstanding, unrivalled in combination

With our innovative, patented technologies, we make signal conditioning smarter and simpler. Our portfolio is composed of six product areas, where we offer a wide range of analog and digital devices covering over a thousand applications in industrial and factory automation. All our products comply with or surpass the highest industry standards, ensuring reliability in even the harshest of environments and have a 5-year warranty for greater peace of mind.
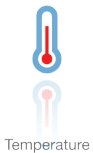
Temperature

Our range of temperature transmitters and sensors provides the highest level of signal integrity from the measurement point to your control system. You can convert industrial process temperature signals to analog, bus or digital communications using a highly reliable point-to-point solution with a fast response time, automatic self-calibration, sensor error detection, low drift, and top EMC performance in any environment.

I.S. Interface

We deliver the safest signals by validating our products against the toughest safety standards. Through our commitment to innovation, we have made pioneering achievements in developing I.S. interfaces with SIL 2 Full Assessment that are both efficient and cost-effective. Our comprehensive range of analog and digital intrinsically safe isolation barriers offers multifunctional inputs and outputs, making PR an easy-to-implement site standard. Our backplanes further simplify large installations and provide seamless integration to standard DCS systems.

Communication

We provide inexpensive, easy-to-use, future-ready communication interfaces that can access your PR installed base of products. The detachable 4501 Local Operator Interface (LOI) allows for local monitoring of process values, device configuration, error detection and signal simulation. The next generation, our 4511 Remote Operator Interface (ROI) does all that and more, adding remote digital communications via Modbus/RTU, while the analog output signals are still available for redundancy.
With the 4511 you can further expand connectivity with a PR gateway, which connects via industrial Ethernet, wirelessly through a Wi-Fi router or directly with the devices using our Portable Plant Supervisor (PPS) application. The PPS app is available for iOS, Android and Windows.

Multifunction

Our unique range of single devices covering multiple applications is easily deployable as your site standard. Having one variant that applies to a broad range of applications can reduce your installation time and training, and greatly simplify spare parts management at your facilities. Our devices are designed for long-term signal accuracy, low power consumption, immunity to electrical noise and simple programming.

Isolation

Our compact, fast, high-quality 6 mm isolators are based on microprocessor technology to provide exceptional performance and EMC-immunity for dedicated applications at a very low total cost of ownership. They can be stacked both vertically and horizontally with no air gap separation between units required.

Display

Our display range is characterized by its flexibility and stability. The devices meet nearly every demand for display readout of process signals, and have universal input and power supply capabilities. They provide a real-time measurement of your process value no matter the industry, and are engineered to provide a user-friendly and reliable relay of information, even in demanding environments.

Field mounted HART temperature transmitter 7501

Table of contents

Warning

Only technicians, who are familiar with the technical terms, warnings, and instructions in the manual and who are able to follow these, should connect the device.

Should there be any doubt as to the correct handling of the device, please contact your local distributor or PR electronics A/S.

Mounting and connection of the device should comply with national legislation for mounting of electric materials.

Repair of the device must be done by PR electronics A/S only.

Do not remove the transmitter cover in explosive atmospheres when the circuit is alive.

The transmitter cover must be fully engaged to meet the explosion proof requirements.

If installed under high-vibration conditions, the transmitter may require supplementary support.

For installation in hazardous area the corresponding installation drawing must be followed in detail.

Take care not to generate mechanical sparking when accessing the instrument and peripheral devices in a hazardous location.

Field mounted HART temperature transmitter
7501

- RTD, TC, Ohm, and bipolar mV input and analog output
- High definition local operator interface (LOI) with 3 optical buttons
- Selectable red or white backlight
- Ex d explosion proof / flame proof
- HART 7 functionality with HART 5 compatibility

High defintion display

- 0, 90, 180, & 270 degree position adjustments.
- Monitoring, programming and diagnostics view.
- Extensive diagnostics with flashing red or white backlight
- Supports 7 languages.

Local operator interface (LOI)

- 3 optical buttons; up, down and enter.
- Dynamically adaptive to wear or accumulation of dirt.
- Immune to interference from ambient light sources.
- Useable with or without gloves.

Configuration

- From the LOI through the PR guided menu.
- PReset and HART modem.
- HHC, DCS or AMS via HART.

Mounting / installation

- For installation in zone 0, 1, 2 and zone 20, 21, 22, in mines M1 and in Class 1, Division 1 and 2 applications.
- Hardware assessed with SFF value of 69%.
- Mounting on 1.5"–2" pipe bracket or on wall / bulkhead.
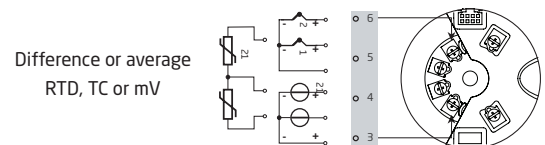
Application

- Linearized temperature measurement with TC and RTD sensors e.g. Pt100 and Ni100.
- HART communication and 4...20 mA analog PV output for individual, difference or average temperature measurement of up to two RTD or TC input sensors.
- Conversion of linear resistance to a standard analog current signal, e.g from valves or Ohmic level sensors.
- Amplification of bipolar mV signals to standard 4...20 mA current signals.
- Up to 63 transmitters (HART 7) can be connected in a multidrop communication setup.

Technical characteristics

- NAMUR NE21, NE43 and NE89.
- HART protocol revision can be changed by user configuration to either HART 5 or HART 7 protocol.

Applications

Input signals:

RTD to 4...20 mA

TC to 4...20 mA

Resistance to 4...20 mA

mV to 4...20 mA

Difference or average RTD, TC or mV

2-wire output and HART:

Ex: 10...30 VDC
(12...30 VDC with backlight)
Other: 10...35 VDC
(12...35 VDC with backlight)

4...20 mA
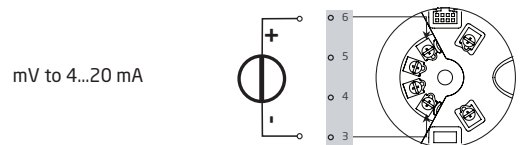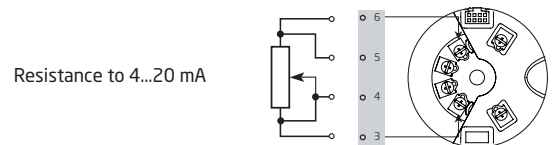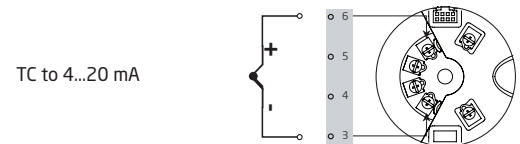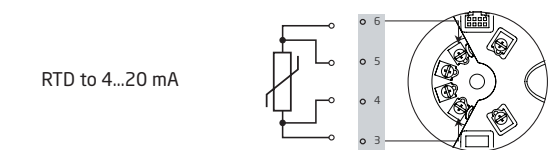
Order

Type	Housing	Local operator interface		O-ring	Conduit thread	Paint type	Transmitter	Approvals
		Optical buttons	Display					
7501	Low copper aluminum : A	No	No : 1	-40 to +85℃ silicone rubber : A	M20x1.5 6H : 1	Epoxy : A	Yes : 1	General purpose : 1
		No	Yes : 2		½ NPT : 2	Epoxy + polyure-thane : B	No (comes with a connection kit) : 2	
		Yes	Yes : 3	-20 to +85℃ FKM rubber : B				Hazardous area : 2

Example : 7501A3B1A12

Accessories
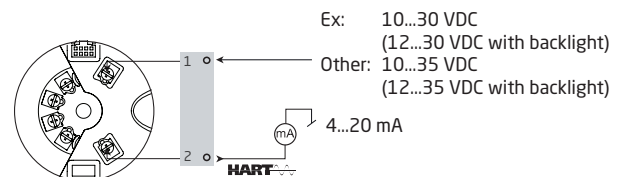
8550 = Blind plug M20 incl. silicone O-ring
8551 = Blind plug ½NPT
8552 = Pipe-mounting bracket P5-B-N (1½"-2")

Technical data

Environmental conditions:
Operating tempeature
  with silicone O-ring . . . . -40℃ to +85℃
  with FKM O-ring . . . . -20℃ to +85℃
  Reduced LCD performance below -20℃ and above +70℃
Storage temperature . . . . -40℃ to +85℃
Calibration temperature. . . . . 20...28℃
Relative humidity . . . . 0...100% RH (condensing)
Protection degree . . . . IP54 / IP66 / IP68 / type 4X

Mechanical specifications:
Dimensions . . . . Ø 110 mm
Dimensions, H x W x D . . . . 109 x 145 x 125.5 mm
Weight approx. . . . . 1.3 kg
Wire size. . . . . 0.13...1.5 mm^2 / AWG 26...16 stranded wire
Screw terminal torque. . . . . 0.4 Nm
Vibration. . . . . IEC 60068-2-6 : 2007
  2...25 Hz. . . . . ±1.6 mm
  25...100 Hz . . . . ±4 g

Display:
Display resolution . . . . 96 x 64 pixels
Number of digits 5
Response time, button to display . . . . < 150 ms
Backlight . . . . Selectable ON / OFF
Backlight color . . . . Selectable white or red
Error indication . . . . Selectable white or red (flashing)

Common electrical specifications:
Supply voltage, DC:
  Ex ia, intrinsically safe . . . . 10...30 VDC
                                             (12...30 VDC with backlight)
  Other. . . . . 10...35 VDC
                                             (12...35 VDC with backlight)
Isolation - test / working . . . . 1.5 kVAC / 50 VAC
Signal / noise ratio. . . . . > 60 dB
Communications interface . . . . HART
Start-up time (transmitter to display). . . . . Max. 5 s
Response time (programmable) . . . . 1...60 s
Long term stability. . . . . 0.1% of span / year

Accuracy, the greater of general and basic values:

General values		
Input type	Absolute accuracy	Temperature coefficient
All	≤ ±0.05% of span	≤ ±0.005% of span / °C

Basic values		
Input type	Basic accuracy	Temperature coefficient
Pt50 - Pt1000	≤ ±0.1°C	≤ ±0.005°C/°C
Ni50 - Ni1000	≤ ±0.2°C	≤ ±0.005°C/°C
Lin. R	≤ ±0.1 Ω	≤ ±5 mΩ / °C
Volt	≤ ±10 µV	≤ ±0.5 µV / °C
TC type: E, J, K, L, N, T, U	≤ ±0.5°C	≤ ±0.025°C / °C
TC type: B[1], Lr, R, S, W3, W5	≤ ±1°C	≤ ±0.1°C / °C
TC type:B[2]	≤ ±3°C	≤ ±0.3°C / °C
TC type:B[3]	≤ ±8°C	≤ ±0.8°C / °C
TC type:B[4]	not specified	not specified

TC B[1] accuracy specification range . . . . > 400°C
TC B[2] accuracy specification range . . . . > 160°C < 400°C
TC B[3] accuracy specification range . . . . > 85°C < 160°C
TC B[4] accuracy specification range . . . . < 85°C

TC cold junction compensation. . . . . < ±1.0°C
Max. offset on input signal . . . . 50% of selec. max. value

EMC - immunity influence. . . . . < ±0.1% of span
Extended EMC immunity:
NAMUR NE 21, A criterion, burst . . . . < ±1% of span

Input specifications:

RTD input types:
Pt50, Pt100, Pt200, Pt500, Pt1000, Ni50, Ni100, Ni120, Ni1000

RTD type	Min. value	Max. value	Min. span	Standard
Pt100	-200°C	+850°C	10°C	IEC 60751
Ni100	-60°C	+250°C	10°C	DIN 43760
Lin. R	0 Ω	7000 Ω	25 Ω	-----

Cable resistance per wire (max.). . . . . 5 Ω
(up to 50 Ω per wire is possible with reduced measurement accuracy)
Sensor current . . . . Nom. 0.2 mA

TC input types:

Type	Min. temperature	Max. temperature	Min. span	Standard
B	0°C	+1820°C	100°C	IEC584
E	-100°C	+1000°C	50°C	IEC584
J	-100°C	+1200°C	50°C	IEC584
K	-180°C	+1372°C	50°C	IEC584
L	-200°C	+900°C	50°C	DIN 43710
Lr	-200°C	+800°C	50°C	GOST 3044-84
N	-180°C	+1300°C	50°C	IEC584
R	-50°C	+1760°C	100°C	IEC584
S	-50°C	+1760°C	100°C	IEC584
T	-200°C	+400°C	50°C	IEC584
U	-200°C	+600°C	50°C	DIN 43710
W3	0°C	+2300°C	100°C	ASTM E988-90
W5	0°C	+2300°C	100°C	ASTM E988-90

Cold junction compensation (CJC):
Constant, internal or external via a Pt100 or Ni100 sensor

mV input:
Voltage input range . . . . -800...+800 mV
Min. span . . . . 2.5 mV
Input resistance . . . . 10 MΩ

Output specifications:
Signal range. . . . . 4...20 mA
Min. signal range . . . . 16 mA
Updating time . . . . 440 ms
Load resistance. . . . . ≤ (Vsupply - 10) / 0.023 [Ω]
  with backlight . . . . ≤ (Vsupply - 12) / 0.023 [Ω]
Sensor error detection, programmable . . . . 3.5...23 mA
  (shorted sensor error detection is ignored at TC and mV input)
NAMUR NE43 Upscale . . . . 23 mA
NAMUR NE43 Downscale. . . . . 3.5 mA
HART protocol revisions. . . . . HART 7 and HART 5

Approvals:
EMC 2004/108/EC. . . . . EN 61326-1
Rohs 2001/695/EU

Marine approval:
Det Norske Veritas, Ships & Offshore. . . . . Standard for Certification No. 2.4 (Pending)
GL. . . . . Pending

Ex / I.S.:
ATEX 94/9/EC . . . . DEKRA 15 ATEX 0058 X
IECEx. . . . . IECEx DEK 15.0039 X
FM 3055380
CSA . . . . Yes
EAC Ex . . . . Yes
INMETRO . . . . Yes
Nepsi. . . . . Yes

Block diagram

7501

Display

UP | DOWN | ENTER

T1

4...20 mA
+ HART

T2

Supply

HART

Application

HART
modem

HART
slave

HART
"master"

HART
modem

HART

Filter

8 V / 4...20 mA

5337
HART
transmitter

T3

T4   Sensor

T5

T6

4...20 mA
+ HART
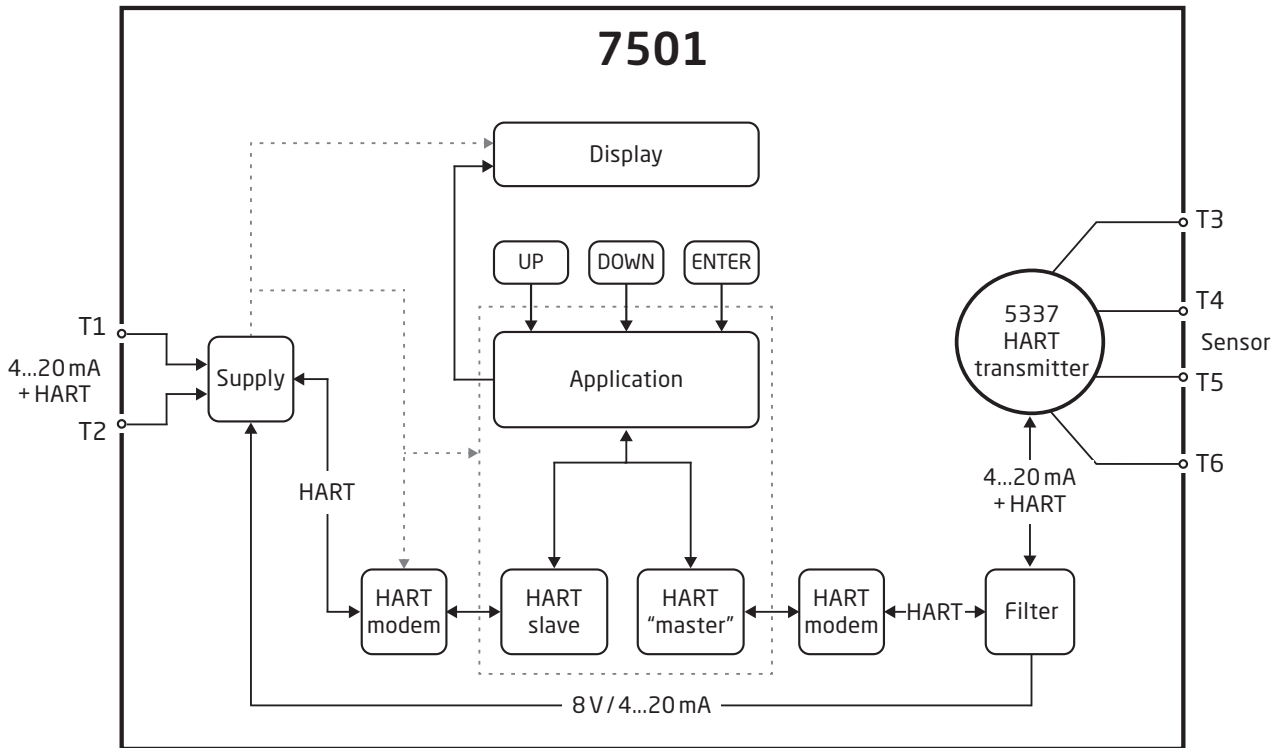
Marking

PR electronics, Lerbakken 10, 8410 Roende, Denmark
pr@prelectronics.com
www.prelectronics.com
Phone +45 8637 2677

MODEL : 151455001
SERIAL :
TAG :

7501-S501

⚠ Read manual / Lisez le manuel -40°C≤Ta≤85°C

II1GEx ia IICT6...T4Ga; II1DEx ia IIICT100°CDa; DEKRA15ATEX00XXX
II2GEx d IICT6...T4 Gb; II 2 D Ex tb IIIC T100°CDb
II3 G Ex nA IIC T6...T4Gc; II3 G Ex ic IIC T6...T4 Gc; IECEx DEK15.00XXX
IS CL I,II,III DIV1, GP ABCDEFG; CLI,II,III DIV 2, GP ABCDFG; CL I, Zn 2, IIC
CL I Zn 0 Ex/AEx ia IIC T6...T4 Ga ;Zn 20 Ex/AEx ia IIIC T60°C...T100°C Da
XP CL I, DIV1, GP ABCD, DIP CL II, DIV1, GP EFG, CL III
CL I, Zn 1, Ex/AEx d IIC T6 Ta=70°C,T4/T5 Ta=85°C Gb

CE
0344   Install Per : 7501QF01   7501QC01   7501QA01   7501QI01   7501QB01

Ex ia ☐
Ex ic ☐

Ex d ☐
Ex nA ☐
Ex tb ☐

Ex EAC   FM APPROVED   SP c us   Ex   IECEx   INMETRO DEKRA OCP 0089   Ex NEPSI GYJ   🗙

For Canada, CL I GP A & CL I Zn 1, seal all conduits within 18"   IP68/IP66   TYPE4X

When this product has been installed as Ex ia, ic, d, nA or tb, use a punch marker in the appropriate box to indicate the type of installation on the top label.

Mechanical specifications

It is important to be careful when screwing the cover on or off. The thread surface must be free of any grains, pellets or other impurities as these can cause the cover to seize or damage the threads.

! Never use force to screw on the cover.

Should it be necessary to open the connection head cover after operation in maximum temperature, please be aware that the cover may be blocked (does not give when attempting to open it by hand). In this case, keep the cover under tension with your hand and hit the cover gently with a rubber hammer.

Front view – with buttons and display
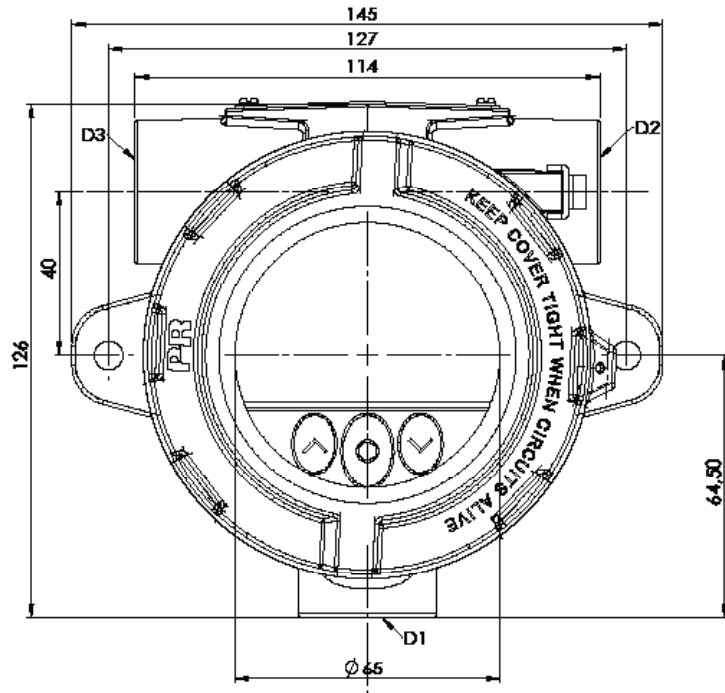
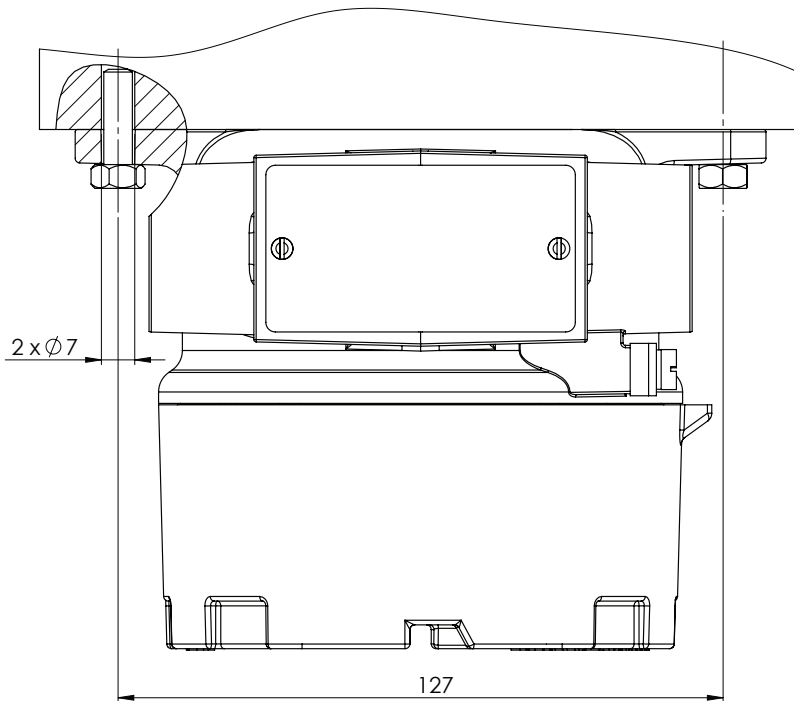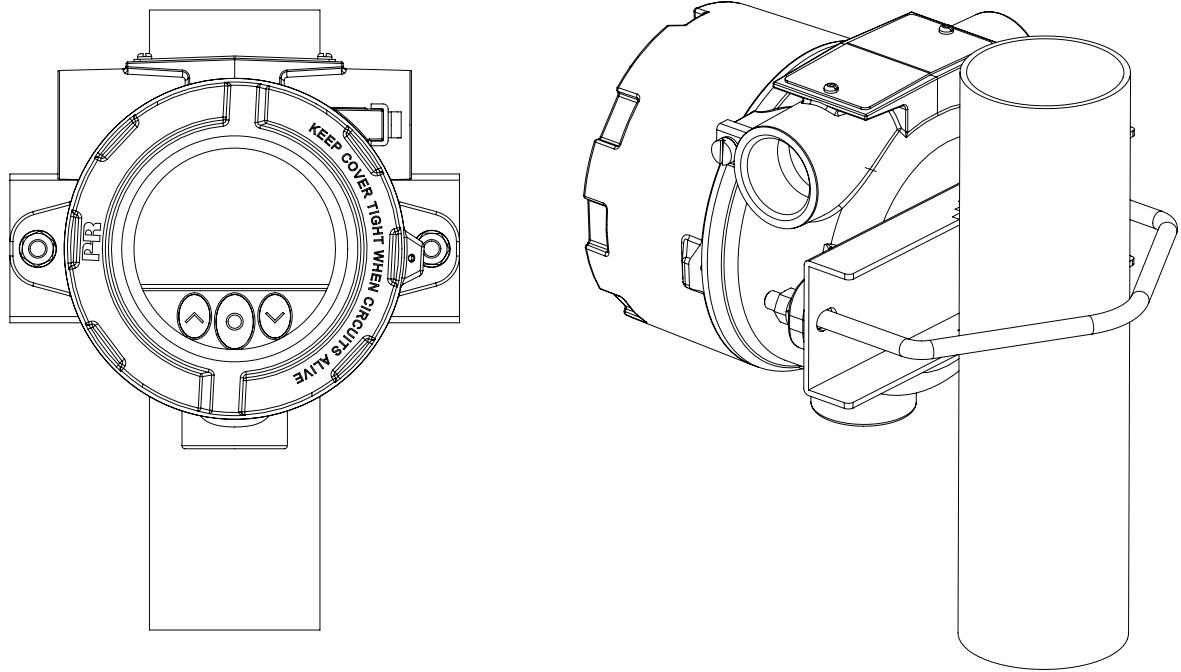Front view – no buttons or display
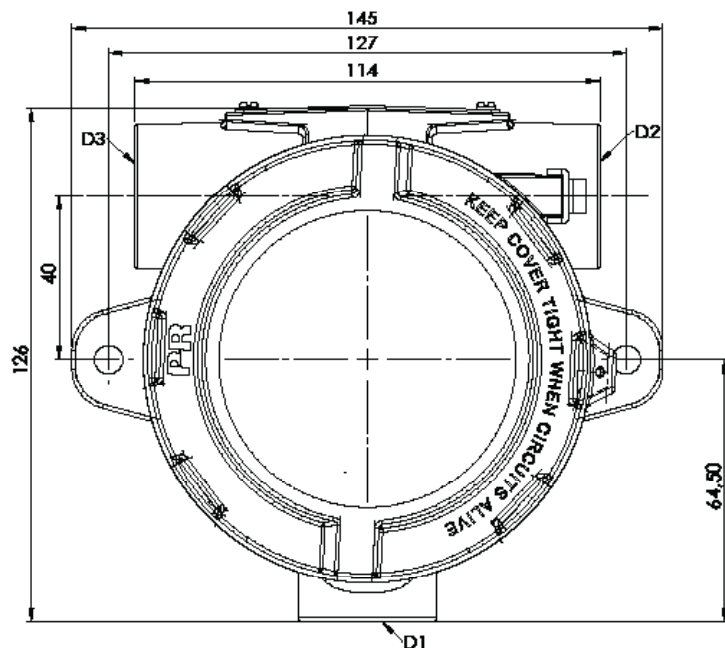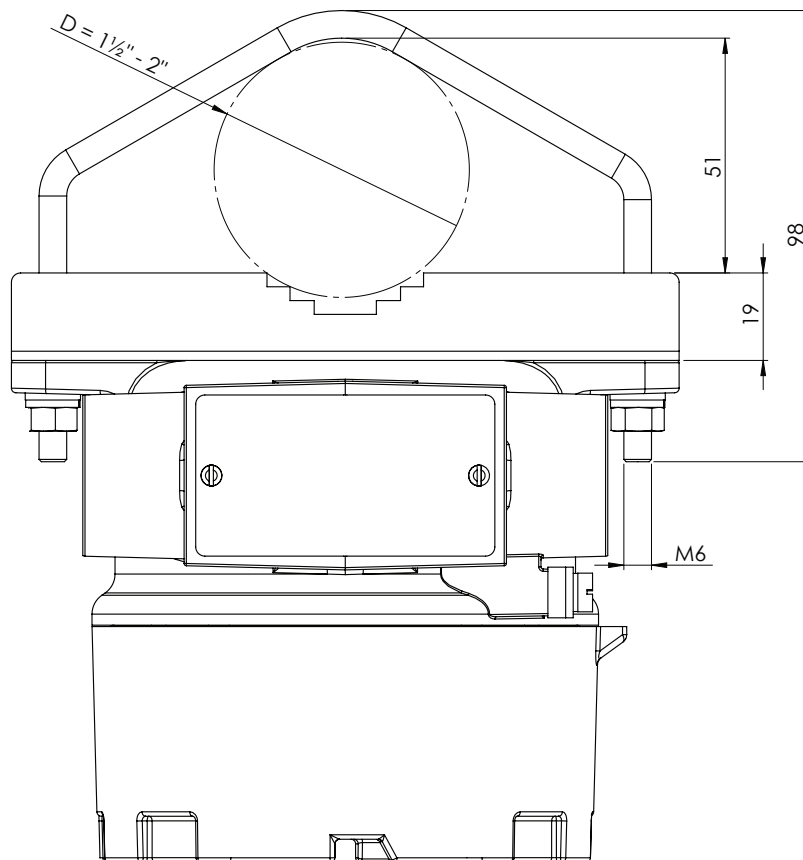
Side view
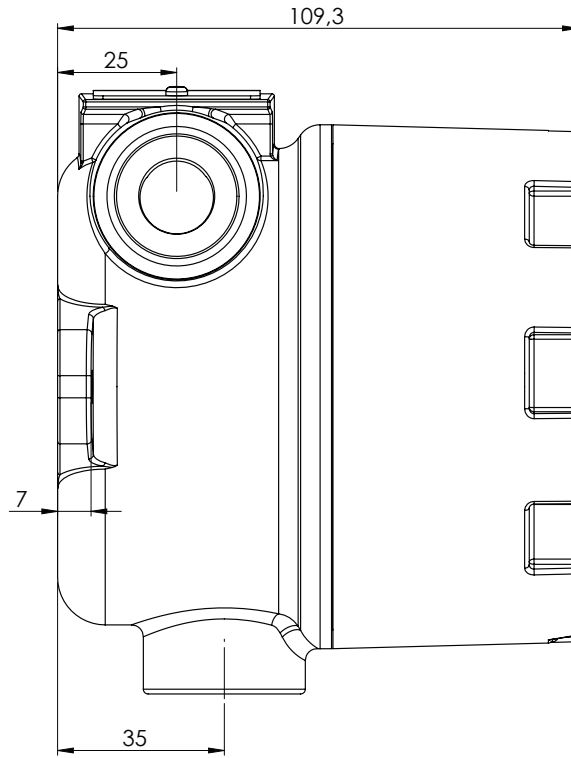
Mounting
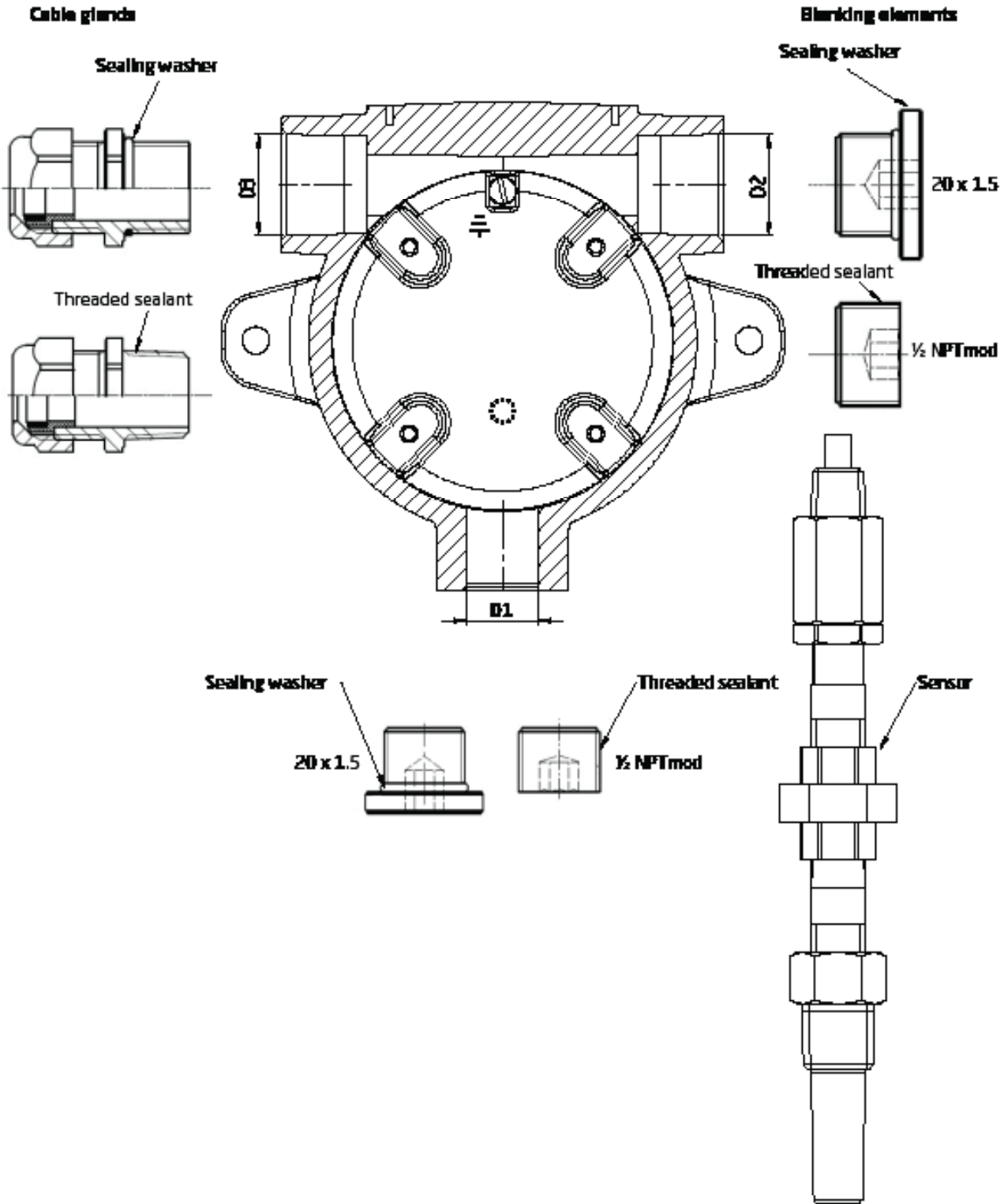
Wall-mounting – side view
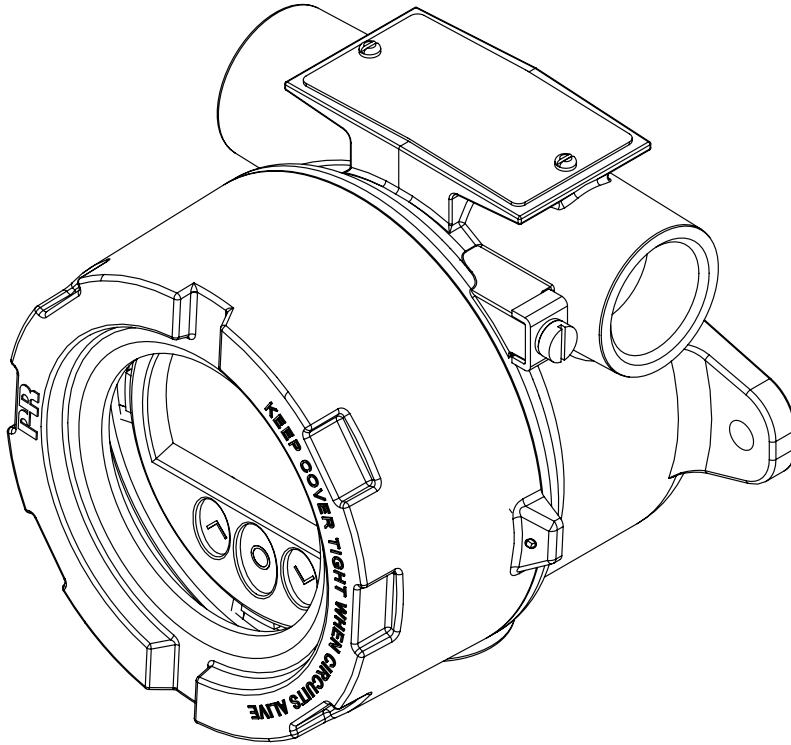
Wall-mounting - top view

2 x ⌀7

127

Pipe-mounting – front and back view

Pipe-mounting – top view

D = 1½" - 2"

51

98

19

M6

Protection degree

Cable glands

Sealing washer

Threaded sealant

Blanking elements

Sealing washer

20 x 1.5

Threaded sealant

½ NPT mod

Sealing washer

20 x 1.5

Threaded sealant

½ NPT mod

Sensor

Earth terminal and protection terminal

Placement	Type	Cable cross section [mm²]	
		Stranded wire	Solid wire
Inside	Protection terminal	1.5	2.5
Outside	Earth terminal	4.0	6.0

Assembly and disassembly

To connect sensor wires to the 7501 or change the orientation of the display, the housing must be disassembled and the internal device must be extracted. This can be done in six easy steps.

!! Disconnect power to the device before disassembly.
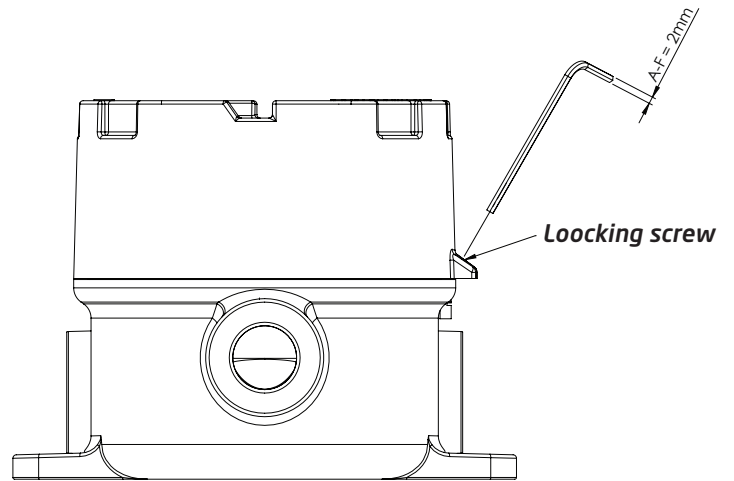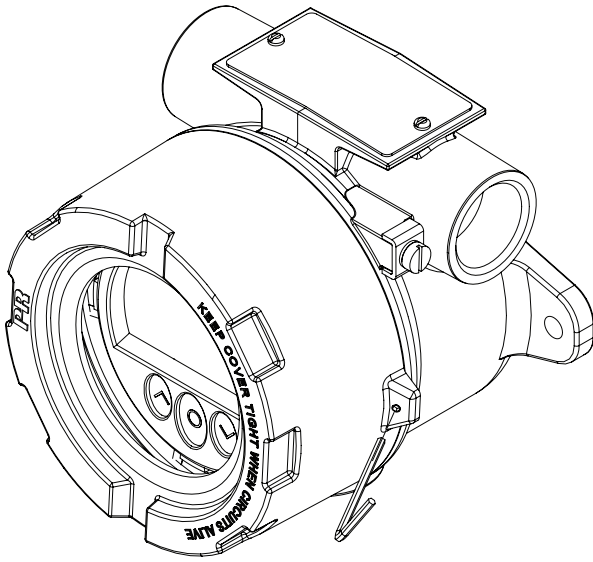
Loocking screw

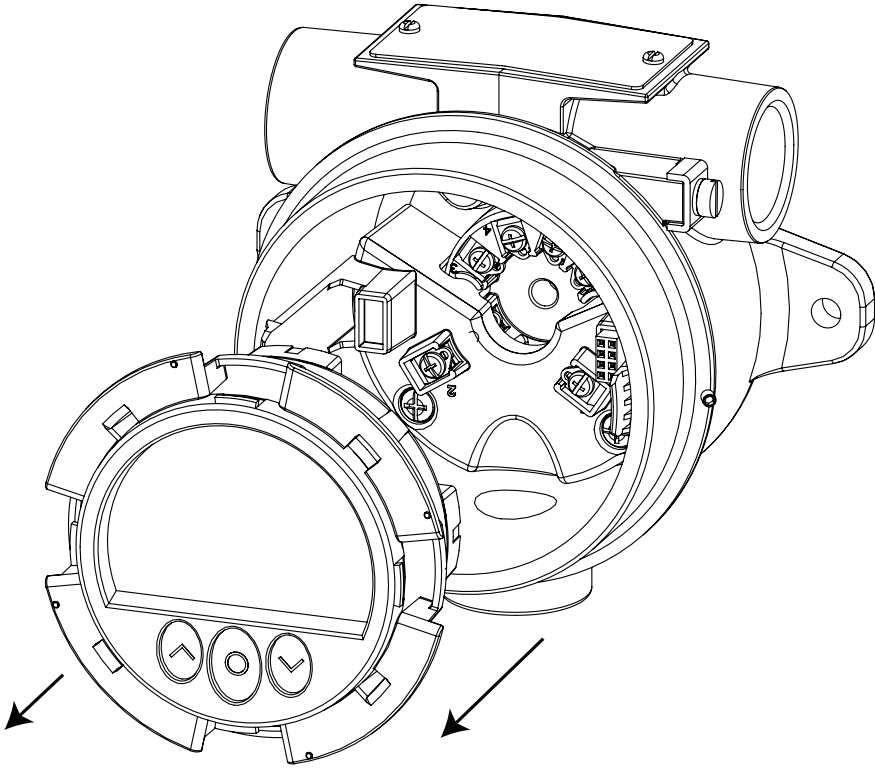1. Release the *locking screw*, using a hex spanner with a cross-flat of 2 [mm]. This screw is situated on the housing top.
2. Unscrew the *housing lid* by turning it counterclockwise.

Point 3 and 4 only apply to devices with buttons and display.
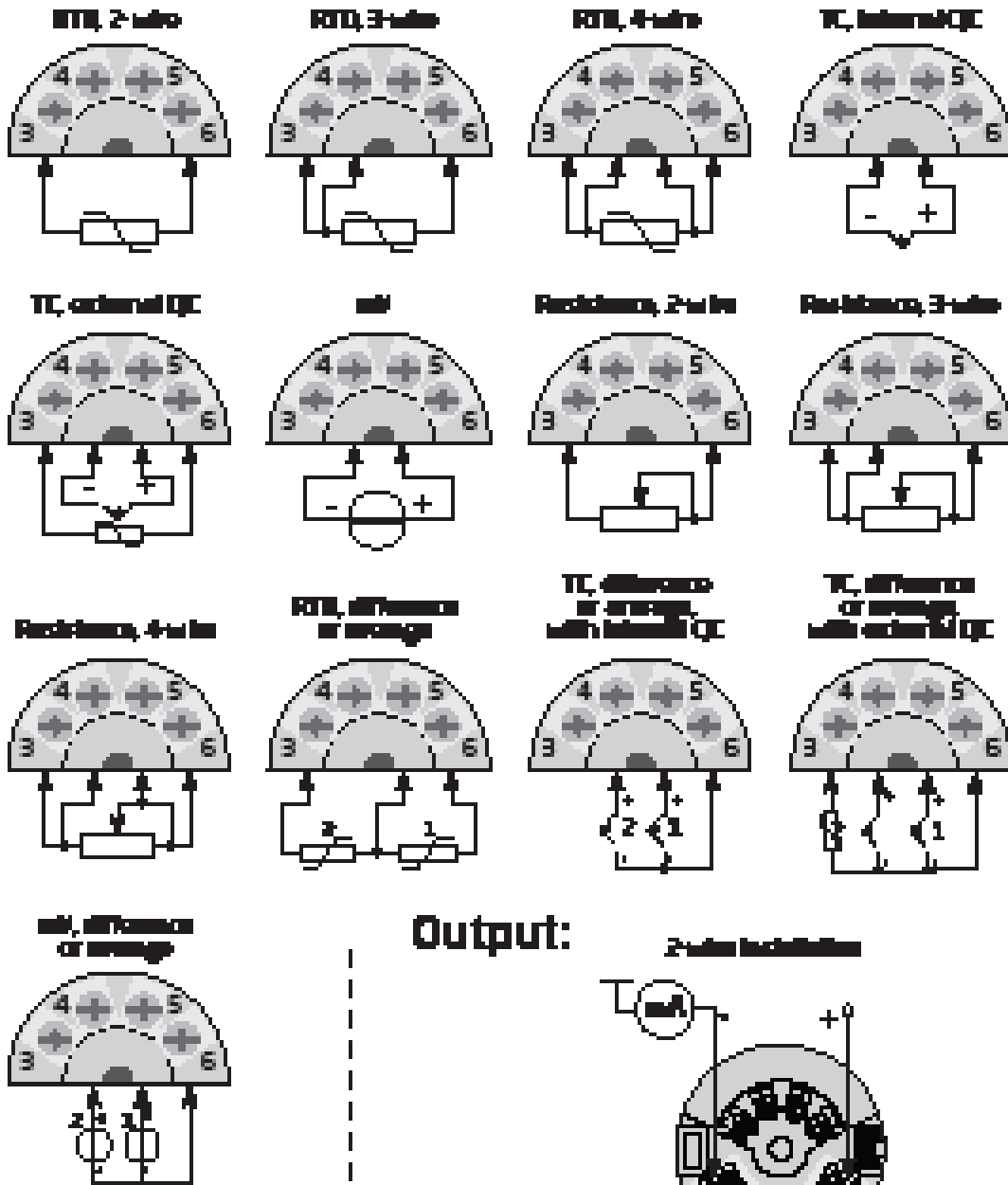3. Press and hold the two clamps located on the left and right side of the *display unit*.
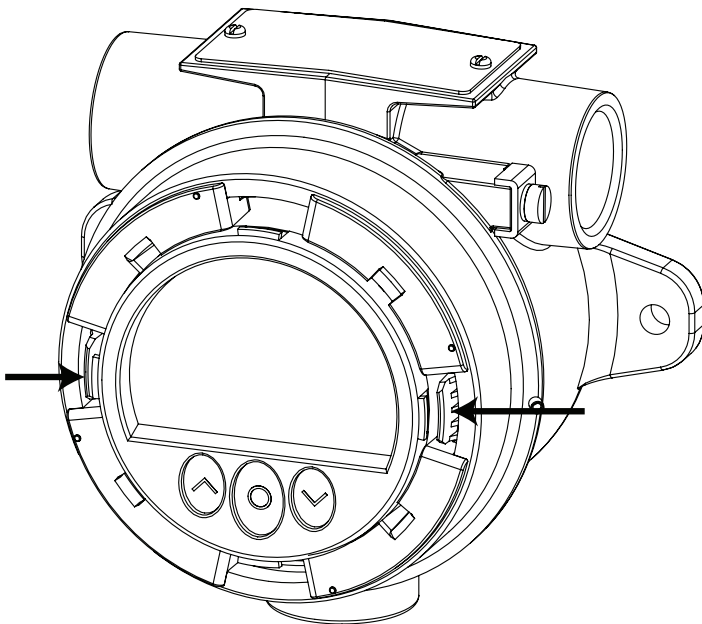
4. While holding the clamps, pull the *display unit* outwards to remove it.

5. The display can now be turned in steps of 90 degrees for best viewing angle.

6. See the section **Connections** for information on connecting sensors to the internal 5337.

Connections

Input:

RTD, 2-wire

RTD, 3-wire

RTD, 4-wire

TC, internal CJC

TC, external CJC

mV

Resistance, 2-wire

Resistance, 3-wire

Resistance, 4-wire

RTD, difference or average

TC, difference or average with internal CJC

TC, difference or average with external CJC

mV, difference or average

Output:

2-wire installation

Optical buttons

The user interface features 3 optical buttons: ⌃, ⌄ and ○. The buttons can be operated both with or without gloves.
The buttons are immune to interference from ambient light sources and other panel meters (e.g. other 7501 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 a front cover mounted.

Operating the optical buttons

The optical buttons are used for operating and programming the 7501. They offer multi-functionality depending on whether you press or long-press them. With the exception of the calibration and simulation menus (see the section **Display menu**), the display will return to the monitor view if no key-press is registered within one minute.

⌃	In monitor view: switch to next process variable. Elsewhere: increase the value of the selected parameter.
⌄	In monitor view: switch to previous process variable. Elsewhere: decrease the value of the selected parameter.
○	Accept chosen value and proceed to next parameter
Hold ⌃	Progressively increase (scroll) the numerical value
Hold ⌄	Progressively decrease (scroll) the numerical value
Hold ○	Ignore the chosen value and return to previous parameter
Hold ⌃ + ⌄	Unlock the monitor view and enter configuration menu[1]

Key presses are reflected in the symbols bar with the following symbols:

↑	Up button is pressed
↓	Down button is pressed
⦿	Enter button is pressed

Display

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

Display views

The appearance of the display will change to reflect the state of the 7501. This allows for easy and intuitive operation, status indication and guides you in configuring the device.

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1   *If error color (see section the **Display menu**) is set to red or white and the display backlight is flashing, the first key press cancels the flashing backlight.*

Symbol identification

The symbols bar provides information on the state of the device. Information such as HART communication, write protection and process value tendency is shown.

⊡ Saving 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

Through the housing glass, you can easily monitor the process value in the configured units. A bar graph indicates the process magnitude at a glance. The device tag is shown at the top of the display. The device tag makes it easy to identify the displayed process value and it can be changed by pressing either the ⊚ or ⊙ optical button. At the bottom of the display, the symbols present information on the current state of the device.

Monitoring view
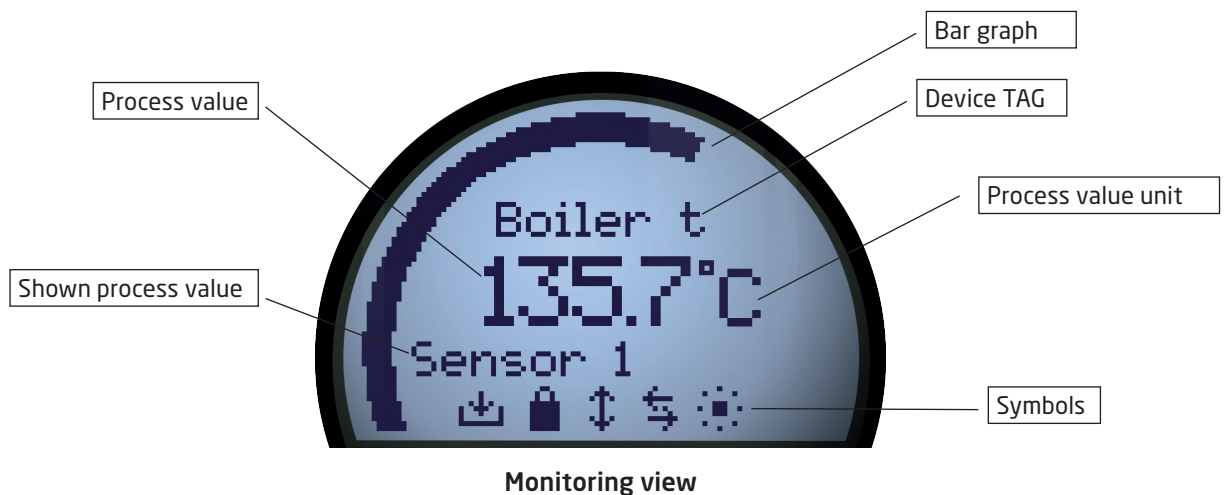
Programming view

To enter the programming view, press and hold the ⌃ and ⌄ optical buttons. The programming views will guide you in a fast and intuitive way when setting up the device. The name of the selected parameter is shown at the top of the display with the currently selected value just below. The value can be changed by pressing the ⌃ or ⌄ optical buttons. Where applicable, information on legal range and currently configured units will also be displayed. At the bottom, a scrolling help text will give you information on the parameter you are modifying.

Menu name

Actual value

Maximum value

Minimum value

Scrolling helptext

Output Low
0.0
Max: 850.0°C
Min: -200.0°C
Set sensor val...

Programming view
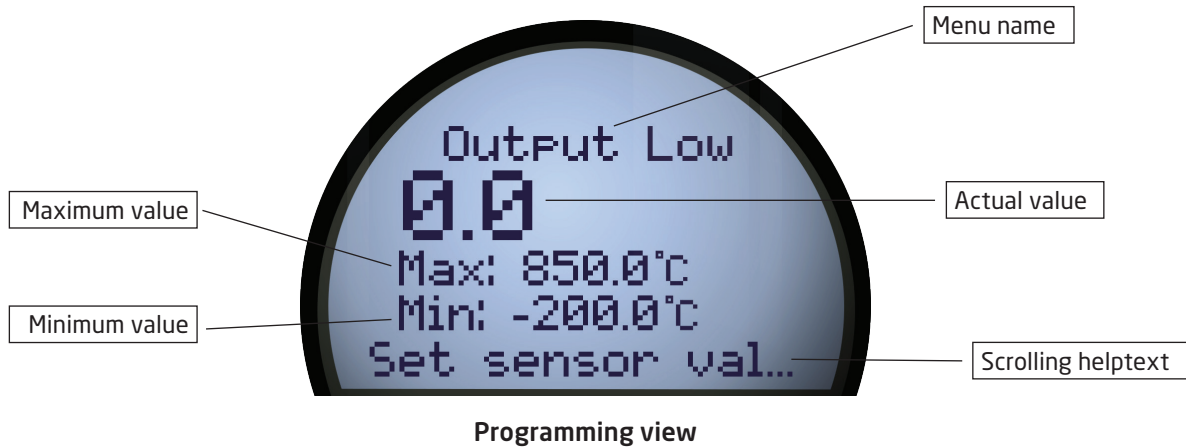
Diagnostics view

If a sensor error or device error occur, the display can be configured to flash in red or white backlight. The display will show the type of status/error in large letters and a scrolling help text will present you with further information. The device tag is shown at the top of the display and at the bottom the symbols bar indicates the state of the device. For a detailed description of the different types of diagnostics messages shown please refer to the section **Device and sensor status indication**.

Error type indication
Flashing

Device TAG

Scrolling helptext

Boiler t
SE1.ER
Sensor 1 error...

Symbols

Diagnostics view
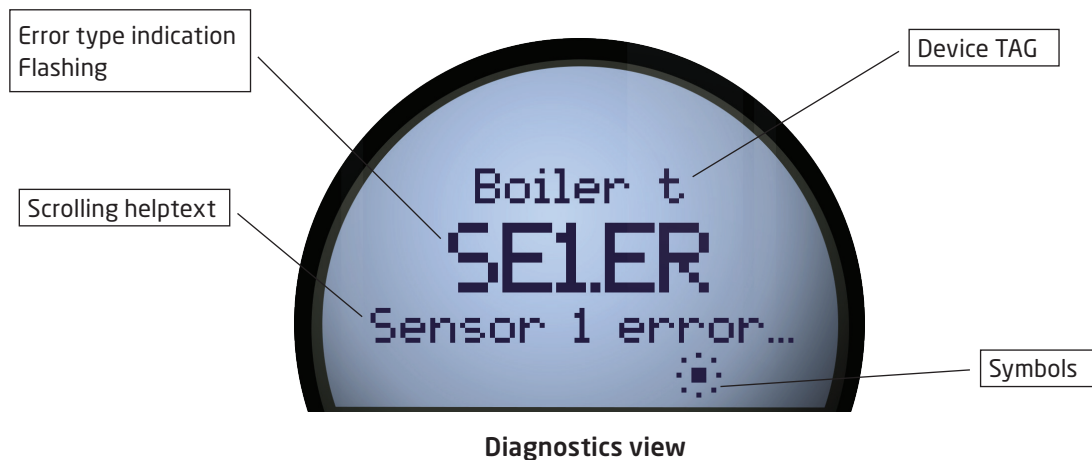
Configuration

When configuring the 7501, you will be guided through all parameters and you can choose the settings which fit the application. For each menu there is a scrolling help text which is automatically shown in the display. Configuration is carried out by use of the three optical buttons. When configuration is completed, or the display times out, the display will return to monitor view.

Device and sensor status indication

The 7501 is capable of displaying diagnostics information for the sensors and the device. These diagnostics can be divided into 4 categories: Sensor status, sensor errors, device status and device errors.

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

Sensor errors	
Sensor 1 error	SE1.ER[3]
Sensor 2 error	SE2.ER[3]
CJC sensor error	CJC.ER[3]
Internal temperature sensor error	CJC.ER

Device status	
Configuration is being re-synchronized	SYNC.DEV[4]
New device attached and configuration is being updated	NEW.DEV[4]
Last process calibration failed	CA.ER[5]

Device errors[6]	
A/D converter error	ADC.ER[6]
EEPROM memory error	EE.ER[6]
RAM memory error	RA.ER[6]
Flash memory error	FL.ER[6]
Exception error during code execution	SW.ER[6]
Internal communication error	COM.ER[6]

---

2   *The scrolling help text will inform you of the affected sensor.*
3   *Check wiring and replace sensor if necessary.*
4   *This message will disappear after a few seconds and the display will enter monitoring view.*
5   *Perform a new process calibration or reset the calibration to cancel this error. See the section **Display**.*
6   *A device malfunction has occurred. To clear this error, repower the device or reconfigure using the display. If the error is persistent, it will reappear and the device may have to be replaced.*

Display menu

Exiting the monitor view allows you to configure the 7501, using the optical buttons (see the section **Operating the optical buttons**). The display menu is divided into 2 parts: Basic configuration and Advanced configuration. The advanced configuration menu is sub-divided into 9 parts: Display, Tags, Calibration, Simulation, Sensor, HART, Password, Language and HART Revision.

If the 7501 has been password-protected, the correct password must be entered to proceed to the desired configuration menu. The menu can be temporaily locked because it is receiving a configuration on the HART interface or because it is synchronising configuration parameters with the internal device.

```
┌──────────────┐
│   Power up   │
└──────────────┘
        │
        ▼
┌──────────────┐                ┌──────────────┐          ┌──────────────┐
│  Device tag  │                │  (Char list) │          │      No      │
│              │                │              │          │      Yes      │
│   123.45 °C  │    ⌃⌄          │     ⌃⌄       │          │     ⌃⌄       │
│              │──────►         │              │          │              │
│ Sensor 1 - °C│  Long    ┌─────┤  ********    │ Correct  │     Yes      │   OK
│              │  press   │     │  Password    │─────OK──►│  Adv Setup?  │─────►
│         ∧◉  │          │     │  Txt 1       │          │  Txt 2       │
└──────────────┘          │     └──────────────┘          └──────────────┘
   *1                     │        *2                                │
```

⌃ and ⌄ toggles the process variable shown in line 2 and 3. (Setting is volatile - use display setup menu to change and store.

No - continued on the next page

Long press

```
┌──────────────┐       ┌──────────────┐          ┌──────────────┐
│   SW.ER      │       │   NEW.DEV    │          │   Display    │
│   FL.ER      │       │   SYNC.DEV   │          │    Tags      │
│   EE.ER      │       │   SE1.ER *19 │          │  Calibration │
│   ADC.ER     │       │   SE2.ER *19 │          │  Simulation  │
│   RA.ER      │       │   CJC.ER *19 │          │   Sensor     │
│   COM.ER     │       │   CA.ER *19  │          │    HART      │
└──────────────┘       │   IN.HI      │          │  Password    │
        │              │   IN.LO      │          │  Language    │
        │              └──────────────┘          │ HART revision *24│
        ▼                      │                  └──────────────┘
┌──────────────┐       ┌──────────────┐                  │⌃⌄
│  Device tag  │       │  Device tag  │          Yes      ▼
│              │       │              │       ┌──────────────┐
│   COM.ER     │       │   SE1.ER     │───────│    HART      │  OK
│              │       │              │       │   Setup      │────►
│   Txt 100    │       │   Txt 100    │       │   Txt 4      │
│         ∧◉  │       │         ∧◉  │       └──────────────┘
└──────────────┘       └──────────────┘             Continued on
   *17                    *18                         page 22
```

*1 If no keys are pressed for 60 s in any menu (10 minutes for Sim and Cal), no parameters are saved and the "Monitor" menu is shown.

*2 Only shown if password is enabled.

*17 Will be forced into this state if any device error occurs (from any other menu).

*18 Warning state: will be forced into this state if sensor error or overrange is present. Only from "Monitor" menu.

*19 First long press of ⌃ and ⌄ simultaneously will stop backlight flash but not exit view. Second long press will enter configuration menu (if allowed).

*24 Not shown if change of protocol is not possible.

Basic configuration

| | | 2-wire / 3-wire / 4-wire | 100.0 / 0.0 | 100.0 / 0.0 |

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

Voltage / Linear Res / Temperature → Temperature | Input Type | Txt 69

2-wire / 3-wire / 4-wire → 3-wire | Connection | Txt 7 *3

100.0 / 0.0 → 0 | S1 Wire Res | Txt 8 *4

100.0 / 0.0 → 0 | S2 Wire Res | Txt 8 *5

Single sensor

Dual sensor → Average / Differential → Differential | Meas setup | Txt 68

Lin. R

Voltage

Pt / Ni / TC → Pt | Sensor Type | Txt 70

Temperture → Pt

Pt50 / Pt100 / Pt200 / Pt500 / Pt1000 / Custom → Pt100 | Pt Type | Txt 6

2-wire / 3-wire / 4-wire → 3-wire | Connection | Txt 7 *3

100.0 / 0.0 → 0 | S1 Wire Res | Txt 8 *4

100.0 / 0.0 → 0 | S2 Wire Res | Txt 8 *5

Ni

Ni50 / Ni100 / Ni120 / Ni1000 → Ni100 | Ni Type | Txt 71

2-wire / 3-wire / 4-wire → 3-wire | Connection | Txt 7 *3

100.0 / 0.0 → 0 | S1 Wire Res | Txt 8 *4

100.0 / 0.0 → 0 | S2 Wire Res | Txt 8 *5

TC

TC B / TC E / TC J / TC K / TC L / TC N / TC R / TC S / TC T / TC U / TC U3 / TC U5 / TC Lr / Custom → TC K | TC Type | Txt 72

Internal / Ext Pt100 / Ext Ni100 / Fixed → Ext Pt100 | CJC Type | Txt 10

Internal

Ext Pt 100

100.0 / 0.0 → 0 | CJC Wire Res | Txt 8

Ext Ni 100

100.0 / 0.0 → 0 | CJC Wire Res | Txt 8

Fixed

---

*3 Only shown if single sensor function is selected.

*4 Only shown if 2-wire sensor connection is selected.

*5 Only shown if dual sensor function is selected.

Not available in HART 5 mode

Lin. R

| Ohm | |
| kOhm | |

↑ ↓

Ohm	OK
Unit	
Txt 5	

Voltage

uV	
mV	
V	

↑ ↓

mV	OK
Unit	
Txt 5	

Temperture

°C	
°F	
Ra	
K	

↑ ↓

°C	OK
Unit	
Txt 5	

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

| -40.0 | -200 | -200 | -200 |
| 135.0 | 850 | 850 | 850 |

↑↓   ↑↓   ↑↓   ↑↓

0	200	0	150	OK
Fix CJC val	Max Diff	Output Low	Output High	
Txt 12	Txt 15	Txt 21	Txt 22	
*21	*6			

| 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| 60.0 | 60.0 | 60.0 | 60.0 | 60.0 |

↑↓   ↑↓   ↑↓   ↑↓   ↑↓

1.0	1.0	1.0	1.0	1.0	OK
PV Resp	S1 Resp	S2 Resp	Avg Resp	Diff Resp	
Txt 9	Txt 9	Txt 9	Txt 9	Txt 9	
	*5	*7	*6		

| 3.50 | 3.50 | 3.50 | 3.50 |
| 23.00 | 23.00 | 23.00 | 23.00 |

↑↓   ↑↓   ↑↓   ↑↓

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

Disabled			
Broken	3.50	3.50	Yes
Shorted *23	23.00	23.00	No
Both *23			

↑↓   ↑↓   ↑↓   ↑↓

Broken	23.00	23.00	Yes	OK → "Monitor"
Sens Error	Out Broken	Out Shorted	Save ?	
Txt 27	Txt 28	Txt 29	Txt 16	
	*8	*9		

*5	Only shown if dual sensor function is selected.
*6	Only shown if differential sensor function is selected.
*7	Only shown if average sensor function is selected.
*8	Only shown if sensor breakage detection is activated.
*9	Only shown if sensor shortage detection is activated.
*21	Only shown if TC, fixed CJC is selected.
*23	Selection not available for Voltage Input Type and TC Sensor Type with internal/fixed CJC.

Not available in HART 5 mode

Not available in HART 7 mode

Display

Off / White / Red	Off / White / Red	0 / 9	Loop Curr / % Range	Sensor 1 / Sensor 2 *5 / CJC Sensor / Average *7 / Differential *6 / Loop Curr / % Range	Yes / No
∧ ∨	∧ ∨	∧ ∨	∧ ∨	∧ ∨	∧ ∨
White	White	3	% Range	Sensor 2	Yes	→ OK → "Monitor"
Backlight	Error color	Contrast	Bar graph	Monitor	Save ?
Txt 42	Txt 73	Txt 43	Txt 44	Txt 45	Txt 16
	*25				

Tags

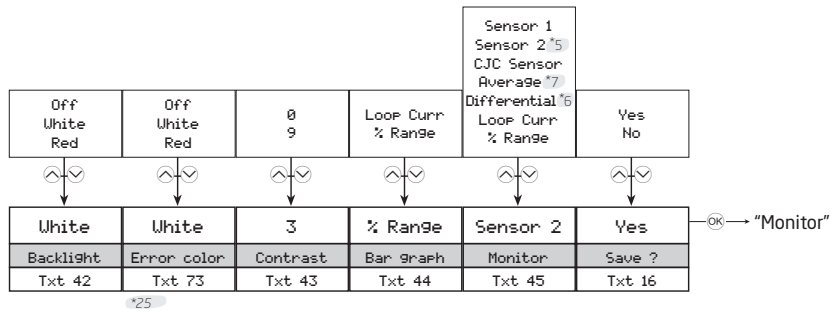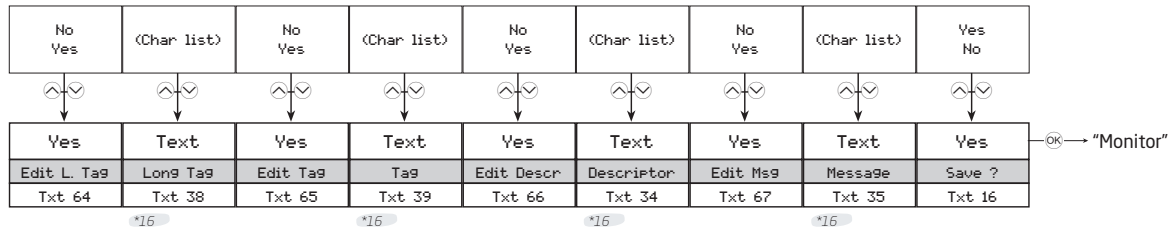| No / Yes	(Char list)	No / Yes	(Char list)	No / Yes	(Char list)	No / Yes	(Char list)	Yes / No
∧ ∨	∧ ∨	∧ ∨	∧ ∨	∧ ∨	∧ ∨	∧ ∨	∧ ∨	∧ ∨
Yes	Text	Yes	Text	Yes	Text	Yes	Text	Yes	→ OK → "Monitor"
Edit L. Tag	Long Tag	Edit Tag	Tag	Edit Descr	Descriptor	Edit Msg	Message	Save ?
Txt 64	Txt 38	Txt 65	Txt 39	Txt 66	Txt 34	Txt 67	Txt 35	Txt 16
	*16		*16		*16		*16	

*5 Only shown if dual sensor function is selected.

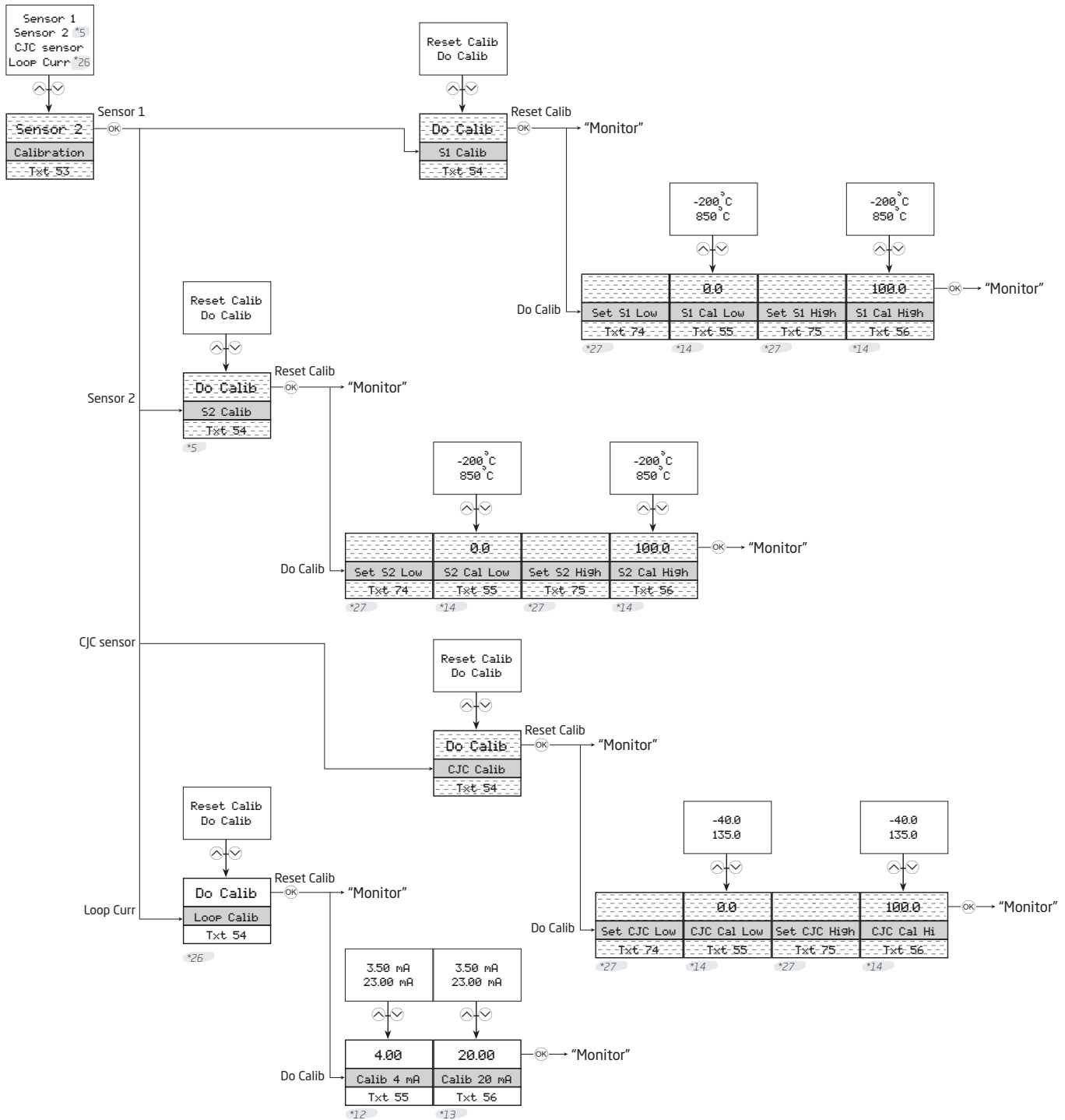*6 Only shown if differential sensor function is selected.

*7 Only shown if average sensor function is selected.

*16 Only shown if "Yes" was selected in the previous menu.

*25 Not shown if backlight is off.

Calibration

The device can be process-calibrated in two points to fit a given input signal. A low input signal (not necessarily 0%) is applied and the actual value is entered. Secondly a high input signal (not necessarily 100%) is applied and the actual value is entered. If you accept to use the calibration (by selecting Yes in the Save menu) the device will work according to the new adjustments. You can return the device to factory calibration points by selecting Reset Calibration from the Calibration menu. Please note that while performing a calibration the programming mode will not time out.

*5	Only shown if dual sensor function is selected.
*12	4 mA fixed output configured internally.
*13	20 mA fixed output configured internally.
*14	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

Simulation

The 7501 allows you to simulate process values by entering the simulation menu. Using the ⌃ and ⌄ optical buttons, the simulated value can be increased and decreased (see the section **Operating the optical buttons**) . Please note that while performing a calibration the display will not time out.
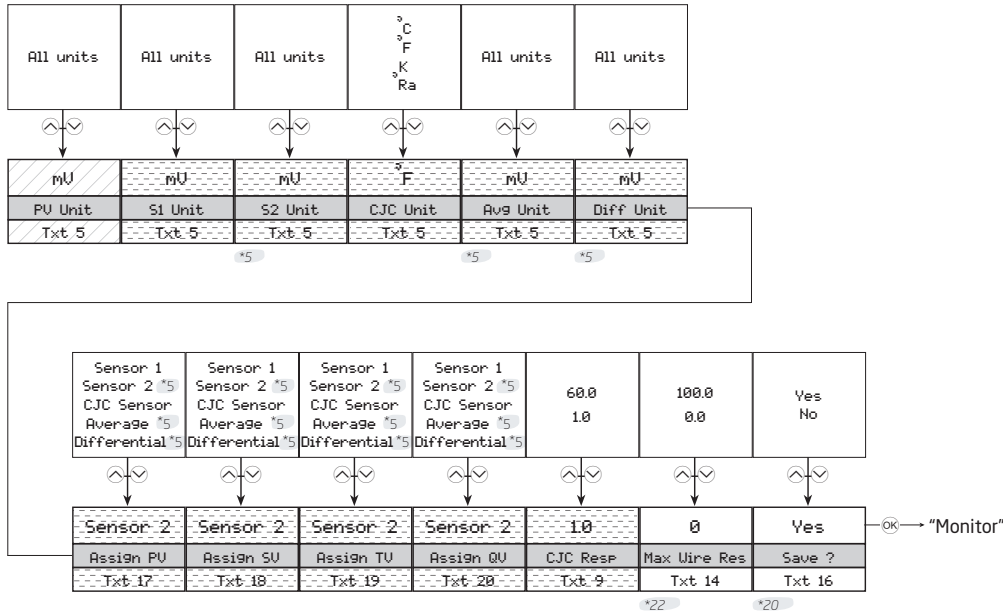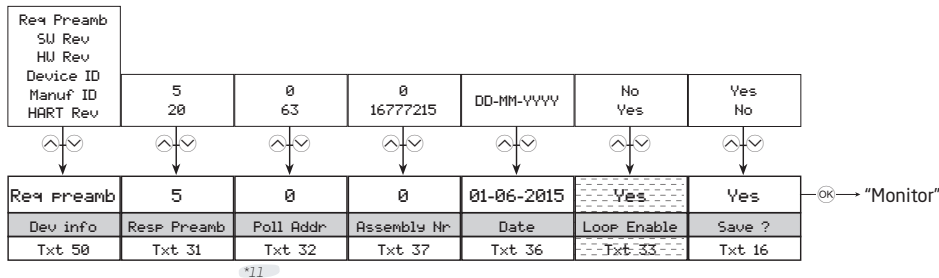
Sensor

The sensor menu allows you to make more detailed configuration of your sensor values, which are not available in the basic configuration menu. These involve selecting from a large amount of process variable units, changing the sensor assignment to PV, SV, TV and QV and specifying the CJC response time. Please note that performing a basic configuration (see the section **Basic configuration**) will overwrite these changes.

All units	All units	All units	°C °F K Ra	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	Txt 5	Txt 5	Txt 5	Txt 5
		*5	*5		*5

Sensor 1 Sensor 2 *5 CJC Sensor Average *5 Differential *5	Sensor 1 Sensor 2 *5 CJC Sensor Average *5 Differential *5	Sensor 1 Sensor 2 *5 CJC Sensor Average *5 Differential *5	Sensor 1 Sensor 2 *5 CJC Sensor Average *5 Differential *5	60.0 1.0	100.0 0.0	Yes No
∧ ∨	∧ ∨	∧ ∨	∧ ∨	∧ ∨	∧ ∨	∧ ∨
Sensor 2	Sensor 2	Sensor 2	Sensor 2	1.0	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	Txt 14	Txt 16
					*22	*20

OK → "Monitor"

HART

Under this menu you will find special parameters pertaining to HART. It will provide you with general information regarding number of request preambles, software and hardware revisions, device and manufacture IDs and HART revision. The menu will also allow you to specify 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	Txt 37	Txt 36	Txt 33	Txt 16
	*11					

OK → "Monitor"

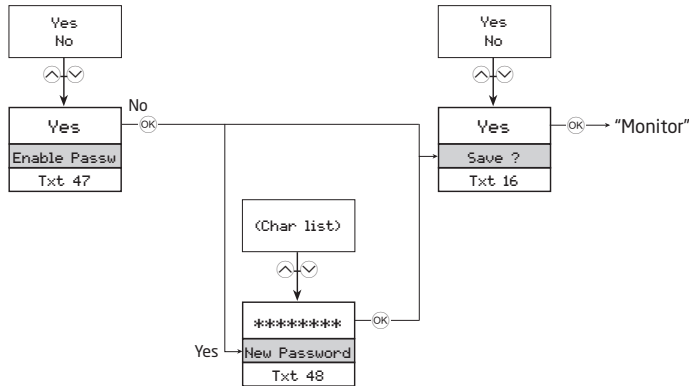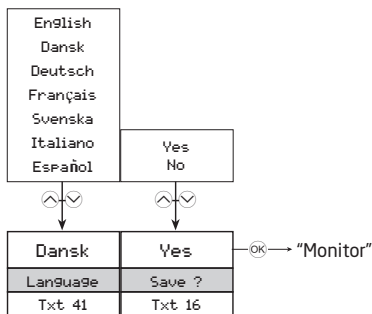| *5	Only shown if dual sensor function is selected.	*20	Values may be overwritten when normal menu is saved.		Not available in HART 5 mode
*11	Range is 0...15 in HART 5 mode.	*22	Only shown if 3- or 4-wire connection is selected.		Not available in HART 7 mode

Password

Here you can choose to enable or disable password protection of the 7501. The password must consist of exactly 8 characters, available in the Latin 1 character set, and will protect the device against unauthorized modifications to the configuration. The device is delivered default without a password.

```
 ┌─────────────┐                          ┌─────────────┐
 │    Yes      │                          │    Yes      │
 │    No       │                          │    No       │
 └─────────────┘                          └─────────────┘
      (∧)(∨)                                   (∧)(∨)
 ┌─────────────┐   No                     ┌─────────────┐
 │    Yes      │──(OK)──────┐             │    Yes      │──(OK)──▶ "Monitor"
 ├─────────────┤            │          ┌─▶├─────────────┤
 │ Enable Passw│            │          │  │   Save ?    │
 ├─────────────┤            │          │  ├─────────────┤
 │   Txt 47    │            │          │  │   Txt 16    │
 └─────────────┘            │          │  └─────────────┘
                            │          │
                 ┌─────────────┐       │
                 │ (Char list) │       │
                 └─────────────┘       │
                      (∧)(∨)           │
                 ┌─────────────┐       │
                 │ ******** │──(OK)────┘
        Yes ────▶├─────────────┤
                 │ New Password│
                 ├─────────────┤
                 │   Txt 48    │
                 └─────────────┘
```
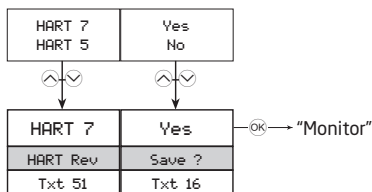
Language

In this menu you can choose between seven different language versions of the help text that will appear in the menu (see the section **Display**). You may choose from the following languages: English, Dansk, Deutsch, Français, Svenska, Italiano and Español.

```
 ┌─────────────┐
 │  English    │
 │  Dansk      │
 │  Deutsch    │
 │  Français   │
 │  Svenska    │  ┌─────────────┐
 │  Italiano   │  │    Yes      │
 │  Español    │  │    No       │
 └─────────────┘  └─────────────┘
      (∧)(∨)           (∧)(∨)
 ┌─────────────┐  ┌─────────────┐
 │   Dansk     │  │    Yes      │──(OK)──▶ "Monitor"
 ├─────────────┤  ├─────────────┤
 │  Language   │  │   Save ?    │
 ├─────────────┤  ├─────────────┤
 │   Txt 41    │  │   Txt 16    │
 └─────────────┘  └─────────────┘
```

HART Revision

Changing the HART revision is done from this menu. Select the desired HART revision and press the ↻ button. Select Yes to effect the change in the Save menu. Please note that changing the HART revision will reboot the device, during which time the display may become blank for a few seconds. If HART 7 is selected the device will appear as 7501 in the HART interface. If HART 5 is selected the device will appear as 7501H5/5335V2 in the HART interface.

```
 ┌─────────────┐  ┌─────────────┐
 │  HART 7     │  │    Yes      │
 │  HART 5     │  │    No       │
 └─────────────┘  └─────────────┘
      (∧)(∨)           (∧)(∨)
 ┌─────────────┐  ┌─────────────┐
 │  HART 7     │  │    Yes      │──(OK)──▶ "Monitor"
 ├─────────────┤  ├─────────────┤
 │  HART Rev   │  │   Save ?    │
 ├─────────────┤  ├─────────────┤
 │   Txt 51    │  │   Txt 16    │
 └─────────────┘  └─────────────┘
  *24
```

*24 Not shown if change of protocol is not
     possible

Help text overview

[01] Set correct password
[02] Enter Advanced setup menu?
[03] Select single sensor functionality
     Select dual sensor functionality
[04] Enter Display setup
     Enter Tags setup
     Enter Process calibration
     Enter Simulation mode
     Enter Advanced sensor setup
     Enter HART setup
     Enter Password setup
     Enter Language setup
     Enter HART Revision setup
[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 cable resistance in 2 wires
[09] Set response time
[10] Select Internal CJC sensor
     Select Pt100 as external CJC sensor type
     Select Ni100 as external CJC sensor type
     Select Fixed CJC
[12] Set fixed CJC value
[13] Disable sensor 2
     Enable sensor 2
[14] Set maximum cable resistance in 2 wires
[15] Set max. value for individual sensors for
     differential measurement
[16] Save configuration?
[17] Map sensor1 to PV and output loop current
     Map sensor2 to PV and output loop current
     Map CJC sensor to PV and output loop current
     Map Internal temperature to PV and output loop
     current
     Map Avg measument to PV and output loop current
     Map differential measurement to PV and output loop
     current
[18] Map sensor1 to SV
     Map sensor2 to SV
     Map CJC sensor to SV
     Map Internal temperature to SV
     Map Avg measument to SV
     Map differential measurement to SV
[19] Map sensor1 to TV
     Map sensor2 to TV
     Map CJC sensor to TV
     Map Internal temperature to TV
     Map Avg measument to TV
     Map differential measurement to TV

[20] Map sensor1 to QV
     Map sensor2 to QV
     Map CJC sensor to QV
     Map Internal temperature to QV
     Map Avg measument to QV
     Map differential measurement to QV
[21] Set sensor value for analog output low
[22] Set sensor value for analog output high
[23] Set output current at 0% input range
[24] Set output current at 100% input range
[25] Set output current lower limit
[26] Set output current upper limit
[27] Disable sensor error detection
     Enable sensor wire breakage detection
     Enable sensor shortage detection
     Enable both sensor wire breakage and sensor
     shortage detection
[28] Set output current in case of sensor wire breakage
[29] Set output current in case of sensor shortage
[31] Set number of preambles in HART response frames
[32] Set polling address
[33] Disable loop current signal (no analog output)
     Enable loop current signal (analog output)
[34] Write description of the device
[35] Write message on the device
[36] Set user date on device
[37] Set the final assembly number
[38] Write long tag
[39] Write tag
[41] Select language
[42] Disable LCD backlight
     Select white LCD backlight
     Select red LCD backlight
[43] Adjust LCD contrast
[44] Select loop current for bar graph indicator
     Select % of range for bar graph indicator
[45] Select Sensor1 for process monitor view
     Select Sensor2 for process monitor view
     Select CJC Sensor for process monitor view
     Select Average measurement for process monitor
     view
     Select differential measurement for process monitor
     view
     Select loop current for process monitor view
     Select % of range for process monitor view
[47] Enable password protection?
[48] Set new password
[50] Minimum number of preambles in requests
     Software revision level
     Hardware revision level
     Device identification
     Manufacturerer identification
     HART protocol revision level
[51] Set HART protocol revision 7
     Set HART protocol revision 5

[53]   Enter sensor1 calibration menu
       Enter sensor2 calibration menu
       Enter CJC sensor calibration menu
       Enter output loop current calibration menu
[54]   Reset calibration to factory default
       Perform process calibration
[55]   Set value for low calibration point
[56]   Set value for high calibration point
[57]   Simulate sensor1 input
       Simulate sensor2 input
       Simulate CJC sensor input
       Simulate average measurement
       Simulate differential measurement
       Simulate output loop current
[58]   Set sensor1 simulation value
[59]   Set sensor2 simulation value
[60]   Set CJC sensor simulation value
[61]   Set average measurement simulation value
[62]   Set differential measurement simulation value
[63]   Set output loop current simulation value
[64]   Edit the long tag?
[65]   Edit the tag?
[66]   Edit the descriptor?
[67]   Edit the message?
[68]   Select averaging of sensor 1 and sensor 2
       Select differential measurement:
       sensor 1 - 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 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-W3 as sensor type
       Select TC-W5 as sensor type
       Select TC-Lr as sensor type
       Select Custom TC as sensor type
[73]   Disable LCD error backlight
       Select white LCD error backlight
       Select red LCD error backlight
[74]   Apply low calibration point value and wait until
       stable
[75]   Apply high calibration point value and wait until
       stable

[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 memory error
COM.ER   Internal communication error
NEW.DEV   New device attached – configuration is being
                 updated – please wait
SYNC.DEV   Configuration is being re-synchronized - please wait
SE1.ER   Sensor 1 error, check wiring and replace sensor if
                 necessary
SE2.ER   Sensor 2 error, check wiring and replace sensor if
                 necessary
CJC.ER   CJC Sensor error, check wiring and replace sensor if
                 necessary
CJC.ER   Internal temperature sensor error
CA.ER   Last process calibration failed to succeed - please
                 retry
IN.HI / IN.LO   Sensor 1 is out of range
IN.HI / IN.LO   Sensor 2 is out of range
IN.HI / IN.LO   CJC sensor is out of range
IN.HI / IN.LO   Sensor 1 or Sensor 2 measurement is out of range

Available units

The following table lists the available units. Please note that most of these are only available from the Sensor menu (see the section **Display menu**).

Menu #	HART #	Text	Types	Menu #	HART #	Text	Types
0	32	°C	<- Sensor specific types	46	40	gal	<- Volume units
1	33	°F		47	41	l	
2	34	°R		48	43	m^3	
3	35	K		49	46	bbl	
4	37	Ohm		50	110	bush	
5	163	kOhm		51	111	yd^3	
6	240	µV		52	112	ft^3	
7	36	mV		53	113	in^3	
8	58	V		54	166	m^3n	
9	39	mA		55	167	ln	
10	57	%		56	236	hl	
11	1	inH_2O	<- Pressure units	57	44	ft	<- Length units
12	2	inHg		58	45	m	
13	3	ftH_2O		59	47	in	
14	4	mmH_2O		60	48	cm	
15	5	mmHg		61	49	mm	
16	6	psi		62	50	min	<-Time units
17	7	bar		63	51	s	
18	8	mbar		64	52	h	
19	9	g/cm^2		65	53	d	
20	11	Pa		66	60	g	<- Mass units
21	12	kPa		67	61	kg	
22	13	torr		68	62	t	
23	14	atm		69	63	lb	
24	237	MPa		70	64	ShTon	
25	17	l/min	<-Volume flow units	71	65	LTon	
26	19	m^3/h		72	125	oz	
27	22	gal/s		73	70	g/s	<- Mass flow units
28	24	l/s		74	71	g/min	
29	25	ml/d		75	72	g/h	
30	26	ft^3/s		76	73	kg/s	
31	130	ft^3/h		77	75	kg/h	
32	27	ft^3/d		78	76	kg/d	
33	28	m^3/s		79	77	t/min	
34	29	m^3/d		80	78	t/h	
35	121	m^3n/h		81	79	t/d	
36	132	bbl/s		82	80	lb/s	
37	134	bbl/h		83	82	lb/h	
38	135	bbl/d		84	83	lb/d	
39	136	gal/h		85	90	SGU	<- Mass per volume units
40	138	l/h		86	91	g/cm^3	
41	235	gal/d		87	92	kg/m^3	
42	20	ft/s	<-Velocity units	88	95	g/ml	
43	21	m/s		89	96	kg/l	
44	114	in/s		90	97	g/l	
45	120	m/h		91	146	µg/L	

Menu #	HART #	Text	Types
92	147	µg/m³	
93	54	cSt	<- Viscosity units
94	55	cP	
95	69	N/m	<- Energy (work) units
96	128	kW/h	
97	162	Mcal	
98	164	MJ	
99	165	Btu	
100	127	kW	<- Power units
101	129	hp	
102	141	MJ/h	
103	142	Btu/h	
104	117	deg/s	<- Angular velocity units
105	118	rev/s	
106	119	rpm	
107	38	Hz	<- Miscellaneous
108	56	µMho	
109	59	pH	
110	66	mS/cm	
111	67	µS/cm	
112	68	N	
113	139	ppm	
114	143	deg	
115	144	rad	
116	148	%Cs	
117	149	Vol%	
118	153	pF	
119	154	ml/l	
120	155	µl/l	
121	161	%LEL	
122	169	ppb	
123	251	<blank>*	<- Special units
124	252	?	
125	253	Spcl	
*No characters shown			

Programming

The 7501 can be configured in one of the following 3 ways:
- Via the optical buttons and the display (see the section **Display menu**).
- With a HART modem and the PReset software.
- With a HART compliant handheld communicator having the 7501H5 or 7501H7 DD driver installed.

1: HART modem

For programming please refer to the drawing below.
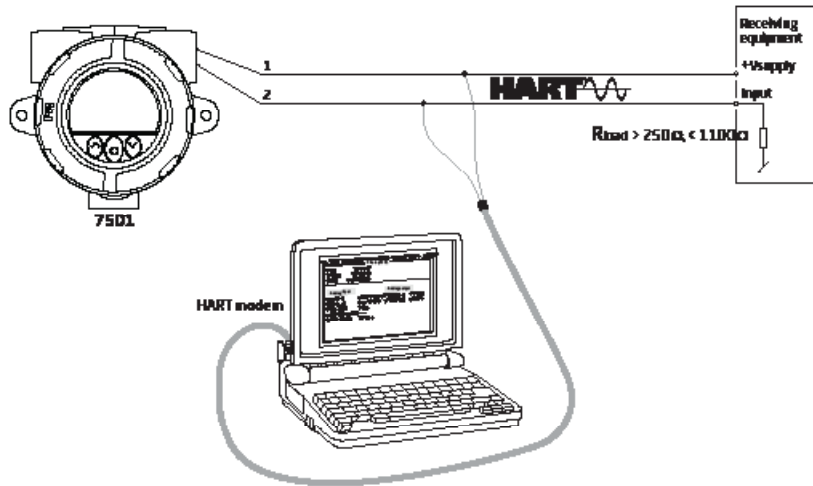
2: HART communicator

For programming please refer to the drawing below. To get access to product-specific commands, the HART communicator must be loaded with the 7501 H5 / 7501 H7 DD driver. This can be ordered either from the HART Communication Foundation or from PR electronics.
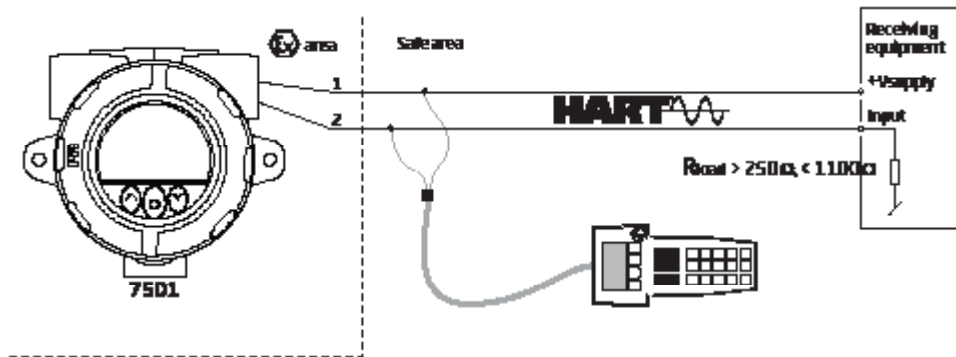
Changing the HART protocol version

It is possible to change the HART protocol revision of the device by means of the display, utilizing the PReset software and a HART modem or other HART configuration tools such as handheld HART terminals.

Changing the HART revision using the display and the optical buttons

Changing the revision is done from the HART revision view under the Advanced menu. Use the ⊙ or ⊙ optical buttons to select the desired HART revision. Press the ○ button to accept the revision and change to the Save view. Select Yes and press ○ to acknowledge the change or **No** to cancel.

Changing the HART revision using the PReset software

Select either 7501H5 or 7501H7 depending on which protocol revision the 7501 is currently running. Click on the HART tab and then on **Device Password / Write Protection / Protocol….** In the newly opened window check the "**Change protocol to HART #**" (# being the desired revision) then acknowledge by pressing the OK button.
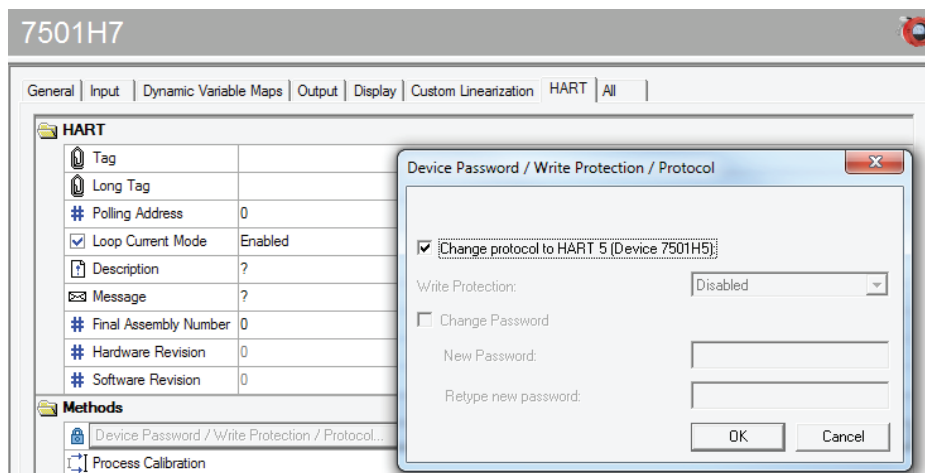
The following warning appears:
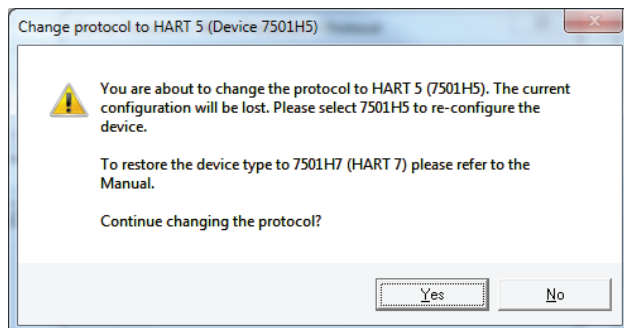
Click **Yes** to accept the changes.

Changing the HART revision using a handheld terminal

- Drive the 7501 device Online and enter **Device setup – Diag/Service.**
- Select **Write protection** and **Write protect** by entering "********" (eight stars).
- Select **New password** - type "********" (eight stars) and then "**HARTREV5**" or "**HARTREV7**" depending on the desired revision
- Select **Write enable** and enter "-**CHANGE**-".

Connection of transmitters in multidrop mode

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

Before they are connected, each transmitter must be configured with a unique polling address ranging from one to 63 (HART 7) or 15 (HART 5). If two transmitters are configured with the same address, both will be excluded. The transmitter must be configured for 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).

The communication is done by means of either a HART communicator or a HART modem.

The PReset configuration software can configure the individual transmitter for multidrop mode and provide it with a unique polling address.
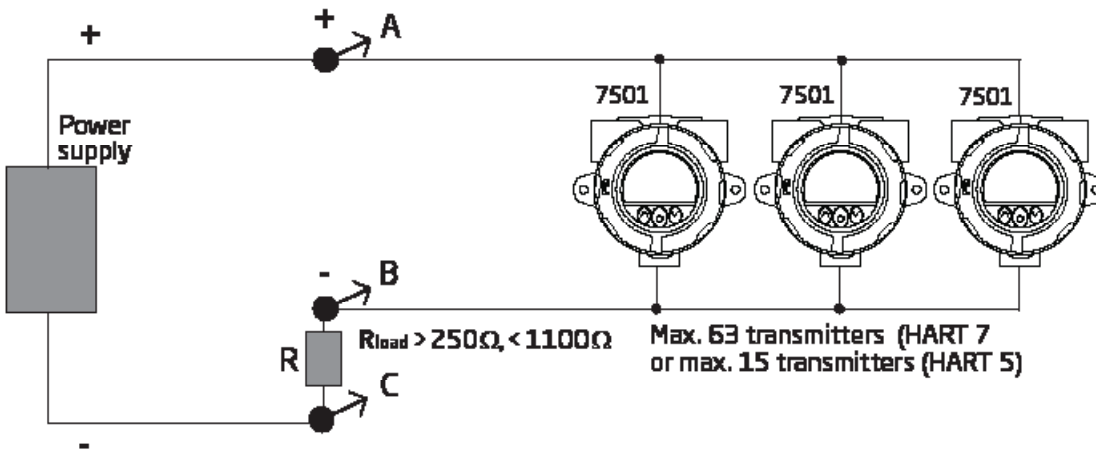
The HART communicator or HART modem can be connected across AB or BC.

Retrofit

The 7501 can be retrofitted with any 5335 or 5337 transmitter. This allows for easy use of existing devices. The following gives you a short guide on how to perform this task.

Before proceeding please refer to the section **Assembly and disassembly** for information on extracting and reassembling the main unit. Then follow the three easy steps below.
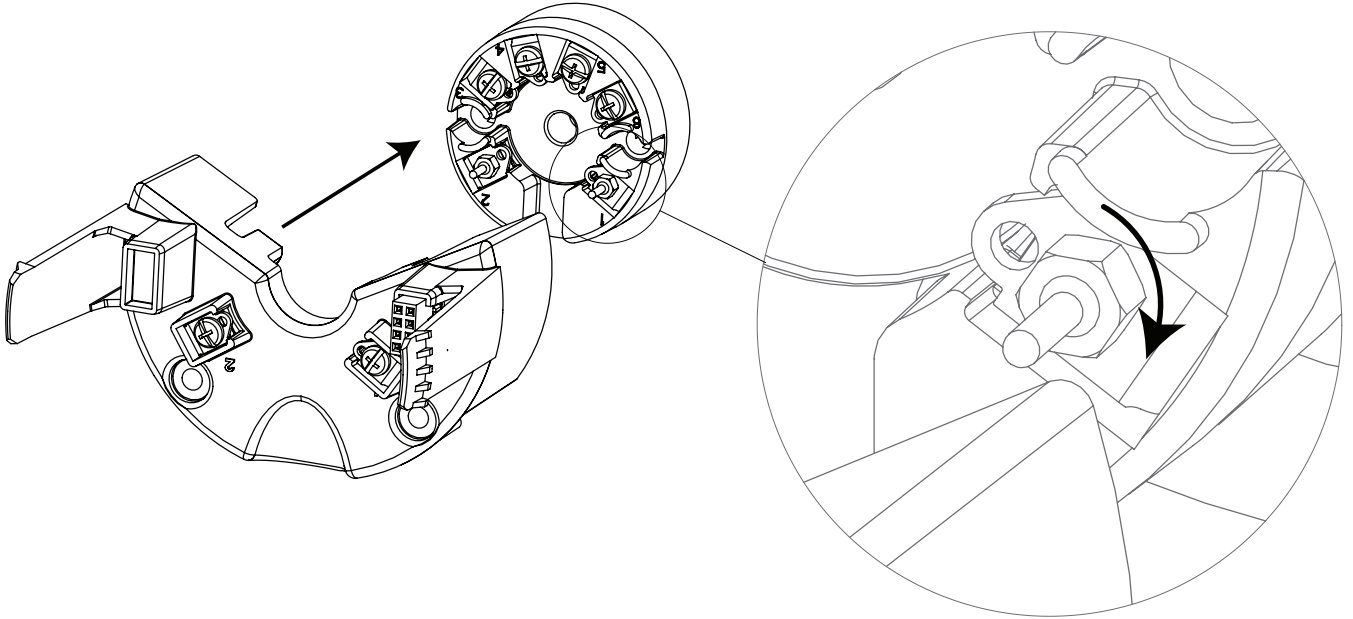
1. On the 5335 / 5337, remove the terminal 1 and 2 screws using a screwdriver.
2. Attach the connector pins to the 5335 / 5337 connector 1 and 2.
   Screw torque on connector pins = 0.4 Nm.
3. Mount the device in the main unit, making sure the connectors meet.

The first time power is applied to the retrofitted 7501, it will synchronize with the configuration parameters from the attached 5335 / 5337. This process will take approximately 30 seconds and during this **NEW.DEV** will appear in the display.

Warning:

For Ex installation the customer must assure that the installed transmitter has all the necessary approvals applicable for the place of installation.
Once a 5335 / 5337 unit which has been fitted into the 7501, it must not be taken out and used in other applications.

Appendix

ATEX Installation Drawing

IECEx installation drawing

FM Installation Drawing

CSA Installation Drawing

Desenho de Instalaçao INMETRO

PR electronics

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7501 ATEX Installation

⚠️ For safe installation of 7501 the following must be observed. The module shall only be installed by qualified personnel who are familiar with the national and international laws, directives and standards (EN60079-14) that apply to this area.

Year of manufacture can be taken from the first two digits in the serial number.

Ex ia installation:

ATEX Certificate   DEKRA 15ATEX0058 X

Marking   ⟨Ex⟩   II 1 G Ex ia IIC T6...T4 Ga
II 1 D Ex ia IIIC T100°C Da

Standards: EN 60079-0: 2012, EN 60079-11: 2012, EN60079-26:2007

Hazardous area
Zone 0, 1, 2, 20, 21, 22

T4: $-40 \leq Ta \leq 85°C$ T100 °C
T5: $-40 \leq Ta \leq 60°C$ T75 °C
T6: $-40 \leq Ta \leq 45°C$ T60 °C

Non Hazardous Area

Sensor	**Supply**
Terminal: 3,4,5,6	Terminal: 1,2
Uo: 9.6 VDC	Ui: 30 VDC
Io: 28 mA	Ii: 120 mA
Po: 67 mW	Pi: 0.84 W
Lo: 35 mH	Li: 0 µH
Co: 3.5 µF	Ci: 2 nF

Ex ia installation

General installation instructions

The sensor circuit is not infallibly galvanic isolated from the supply output circuit. However, the galvanic isolation between the circuits is capable of withstanding a test voltage of 500Vac during 1 minute.

The enclosure must be connected to the potential matching line

-

If the transmitter is physically connected to a possible source of heating or cooling, e.g. by mounting to a process pipe or a temperature sensor, the temperature at the point of connection shall be within the ambient temperature range as given in the certificate or this manual.

Cable entries and blanking elements shall be used that are suitable for the application and correctly installed.

For installation in zone 0 / EPL Ga, the transmitter must be installed such, that even in the event of rare incidents, ignition sources due to impact and friction, sparks are excluded.

Protection degree of IP 54 according to EN 60529 is achieved if certified cable glands or conduit entry devices are used that are suitable for the application and correctly installed.

Protection degree of IP 68 according to EN 60529 is only achieved if certified cable glands or conduit entry devices are used that are suitable for the application and correctly installed with sealing washers or Loctite sealant added to the threads of the sensor, blanking elements and cable glands.

For group III (dust), electrostatic charging of the paint layer shall be avoided

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Ex nA, ic installation:

Certificate	**DEKRA 15ATEX0058 X**
Marking ⟨Ex⟩	**II 3 G Ex nA IIC T6...T4 Gc** **II 3 G Ex ic IIC T6...T4 Gc** **II 3 D Ex ic IIIC T100°C Dc**

Standards: EN 60079-0:2012, EN 60079-11:2012, EN60079-15:2010

T4: $-40 \leq Ta \leq 85°C$ T100
T6: $-40 \leq Ta \leq 60°C$ T85

Hazardous area
Zone 2, 22

Non Hazardous Area

Sensor
Terminal: 3,4,5,6
Ex ic
Uo: 9.6 VDC
Io: 28 mA
Po: 67 mW
Lo: 45 mH
Co: 28 µF

Supply
Terminal: 1,2
Ex ic
Ui: 35 VDC
Li: 0 µH
Ci: 2 nF

Supply
Terminal: 1,2
Ex nA
U : 35 VDC
I : 4-20 mA

Ex nA, ic installation:

For an ambient temperature exceeding 70 °C, heat resistant cables and cable glands suitable for at least 80°C shall be used.

If the transmitter is physically connected to a possible source of heating or cooling, e.g. by mounting to a process pipe or a temperature sensor, the temperature at the point of connection shall be within the ambient temperature range as given in the certificate.

Cable entries and blanking elements shall be used that are suitable for the application and correctly installed.

The enclosure must be connected to the potential matching line

Applied screw terminal torque is max 0.4 Nm on all terminals.

Protection degree of IP 54 according to EN 60529 is achieved if certified cable glands or conduit entry devices are used that are suitable for the application and correctly installed.

Protection degree of IP 68 according to EN 60529 is only achieved if certified cable glands or conduit entry devices are used that are suitable for the application and correctly installed with sealing washers or Loctite sealant added to the threads of the sensor, blanking elements and cable glands.

For group III (dust), electrostatic charging of the paint layer shall be avoided

Revision date:	Version Revision	Page:
2015-07-23	V1R0	4/6

Ex d, tb installation:

ATEX Certificate   DEKRA 15ATEX0058 X

Marking

ⒺⓍ   II 2 G Ex d IIC T6...T4 Gb
II 2 D Ex tb IIIC T100°C Db

Standards: EN 60079-0:2012, EN 60079-1:2007, EN60079-31:2014

T4,T5: -20/-40 ≤ Ta ≤ 85ºC   T100°C
T6:   -20/-40 ≤ Ta ≤ 70ºC   T85°C

Hazardous area
Zone 1, 2, 21, 22

Non Hazardous Area

Terminal: 1,2
Supply: 9.5-35 VDC
Current: 23 mA

Terminal: 3,4,5,6
Sensor: RTD or TC

O-ring Sealing
Silicone rubber:-40°C ≤Ta ≤ +85°C
FKM rubber: -20°C ≤Ta ≤ +85°C

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Ex d, tb installation:

Unused cable entries must be sealed by the blanking elements supplied with the 7501 or other Ex d and/or Ex tb certified blanking elements suitable for the application..

Only Ex d and/or Ex tb certified cable and cable glands shall be used that are suitable for the application and correctly installed.

Protection degree of IP 54 according to EN 60529 is achieved if Ex d certified cable glands or conduit entry devices are used that are suitable for the application and correctly installed.

Protection degree of IP 68 according to EN 60529 is only achieved if Ex d certified cable glands or conduit entry devices are used that are suitable for the application and correctly installed with sealing washers or Loctite sealant added to the threads of the sensor, blanking elements and cable glands.

The display cover must be screwed all the way in and the safety catch must be fastened before putting into service. Do not open display cover until 30 minutes after disconnecting power to the equipment allowing internal capacitors to discharge, or do not open display cover unless area is known to be safe

For an ambient temperature exceeding 70 °C, heat resistant cables and cable glands suitable for at least 80°C shall be used.

If the transmitter is physically connected to a possible source of heating or cooling, e.g. by mounting to a process pipe or a temperature sensor, the temperature at the point of connection shall be within the ambient temperature range as given in the certificate. The sensor shall be suitable for use as entry device on an Ex d enclosure and shall not add volume to the 7501 enclosure. The thread of the sensor must be in compliance with EN60079-1 / EN60079-31.

The enclosure must be connected to the potential matching line.

When the process temperature range exceeds the service temperature range it shall be verified by on-site temperature measurements, taking the worst case conditions into account, that the service temperature does not exceed the range of the module.

For group III (dust), electrostatic charging of the paint layer shall be avoided

No modification to the enclosure is allowed by the customer except as mentioned in the manual or installation drawing.

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7501 IECEx Installation

For safe installation of 7501 the following must be observed. The module shall only be installed by qualified personnel who are familiar with the national and international laws, directives and standards (IEC60079-14) that apply to this area.
Year of manufacture can be taken from the first two digits in the serial number.

Ex ia installation:

Certificate   **IECEx DEK 15.0039 X**

Marking
     Ex ia IIC T6...T4 Ga
     Ex ia IIIC T100°C Da

Standards: IEC 60079-0: 2011, IEC 60079-11: 2011, IEC 60079-26: 2007

Hazardous area
Zone 0, 1, 2, 20, 21, 22   Non Hazardous Area

T4: $-40 \leq T_a \leq 85°C$ T100 °C
T5: $-40 \leq T_a \leq 60°C$ T75 °C
T6: $-40 \leq T_a \leq 45°C$ T60 °C

Sensor	Supply
Terminal: 3,4,5,6	Terminal: 1,2
U_o: 9.6 VDC	U_i: 30 VDC
I_o: 28 mA	I_i: 120 mA
P_o: 67 mW	P_i: 0.84 W
L_o: 35 mH	L_i: 0 µH
C_o: 3.5 µF	C_i: 2 nF

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Ex ia installation

General installation instructions
The sensor circuit is not infallibly galvanic isolated from the supply output circuit. However, the galvanic isolation between the circuits is capable of withstanding a test voltage of 500Vac during 1 minute.

The enclosure must be connected to the potential matching line.

If the transmitter is physically connected to a possible source of heating or cooling, e.g. by mounting to a process pipe or a temperature sensor, the temperature at the point of connection shall be within the ambient temperature range as given in the certificate or in this manual.

Cable entries and blanking elements shall be used that are suitable for the application and correctly installed.

For installation in zone 0 / EPL Ga, the transmitter must be installed such, that even in the event of rare incidents, ignition sources due to impact and friction, sparks are excluded.

Protection degree of IP 54 according to IEC 60529 is achieved if certified cable glands or conduit entry devices are used that are suitable for the application and correctly installed.

Protection degree of IP 68 according to IEC 60529 is only achieved if certified cable glands or conduit entry devices are used that are suitable for the application and correctly installed with sealing washers or Loctite sealant added to the threads of the sensor, blanking elements and cable glands.

For group III (dust), electrostatic charging of the paint layer shall be avoided.

![PR electronics logo]

Ex nA, ic installation:

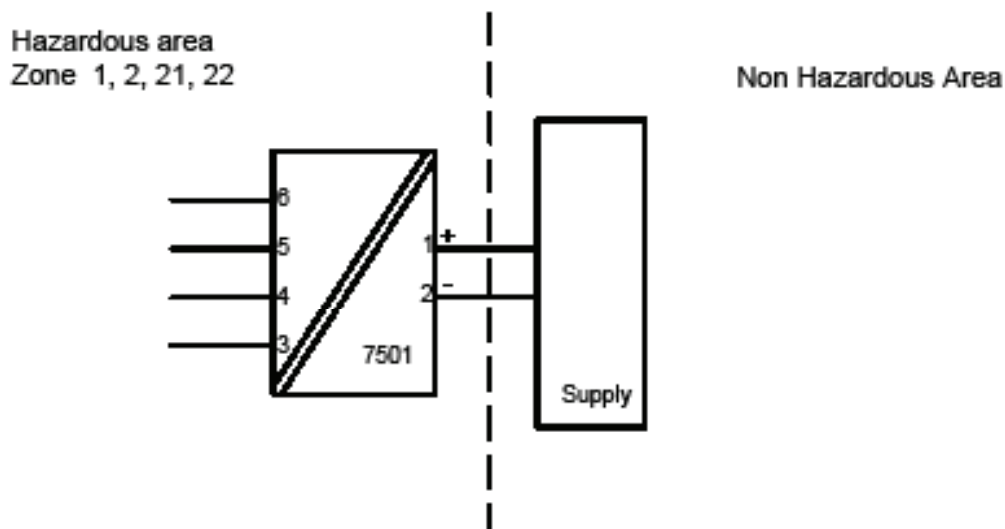|	
Certificate	IECEx DEK 15.0039 X
Marking	Ex nA IIC T8...T4 Gc
	Ex ic IIC T8...T4 Gc
	Ex ic IIIC T100°C Dc

Standards: IEC 60079-0: 2011, IEC 60079-11: 2011, IEC 60079-15: 2010

T4:   −40 ≤ Ta ≤ 85°C T100
T8:   −40 ≤ Ta ≤ 60°C T85

Hazardous area
Zone 2, 22

Non Hazardous Area

Supply

Sensor
Terminal: 3,4,5,6
Ex ic
Uo: 9.6 VDC
Io: 28 mA
Po: 67 mW
Lo: 45 mH
Co: 28 µF

Supply
Terminal: 1,2
Ex ic
Ui: 35 VDC
Li: 0 µH
Ci: 2 nF

Supply
Terminal: 1,2
Ex nA
U : 35 VDC
I : 4-20 mA

Ex nA, ic installation:

For an ambient temperature exceeding 70°C, heat resistant cables and cable glands suitable for at least 80°C shall be used.

If the transmitter is physically connected to a possible source of heating or cooling, e.g. by mounting to a process pipe or a temperature sensor, the temperature at the point of connection shall be within the ambient temperature range as given in the certificate.

Cable entries and blanking elements shall be used that are suitable for the application and correctly installed.

The enclosure must be connected to the potential matching line

Applied screw terminal torque is max 0.4 Nm on all terminals.

Protection degree of IP 54 according to EN 60529 is achieved if certified cable glands or conduit entry devices are used that are suitable for the application and correctly installed.

Protection degree of IP 68 according to EN 60529 is only achieved if certified cable glands or conduit entry devices are used that are suitable for the application and correctly installed with sealing washers or Loctite sealant added to the threads of the sensor, blanking elements and cable glands.

For group III (dust), electrostatic charging of the paint layer shall be avoided

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Ex d, tb installation:

Certificate   IEC DEK 15.0038 X

Marking

Ex d IIC T6...T4 Gb
Ex tb IIIC T100°C Db

Standards: IEC 60079-0: 2011, IEC 60079-1: 2007, IEC 60079-31: 2013

T4,T5: -20/-40 ≤ Ta ≤ 85°C   T100°C
T6:   -20/-40 ≤ Ta ≤ 70°C   T85°C

Hazardous area
Zone 1, 2, 21, 22

Non Hazardous Area

Supply

7501

Terminal: 1,2
Supply: 9.5-35 VDC
Current: 23mA

Terminal: 3,4,5,6
Sensor: RTD or TC

O-ring Sealing
Silicone rubber:-40°C ≤Ta ≤ +85°C
FKM rubber: -20°C ≤Ta ≤ +85°C

Ex d, tb installation

Unused cable entries must be sealed by the blanking elements supplied with the 7501 or other Ex d and/or
Ex tb certified blanking elements suitable for the application.

Only Ex d and/or Ex tb certified cable and cable glands shall be used that are suitable for the application and
correctly installed.

Protection degree of IP 54 according to IEC 60529 is achieved if Ex d certified cable glands or conduit entry
devices are used that are suitable for the application and correctly installed.

Protection degree of IP 68 according to IEC 60529 is only achieved if Ex d certified cable glands or conduit
entry devices are used that are suitable for the application and correctly installed with sealing washers or
Loctite sealant added to the threads of the sensor, blanking elements and cable glands.

The display cover must be screwed all the way in and the safety catch must be fastened before putting into
service. Do not open display cover until 30 minutes after disconnecting power to the equipment allowing
internal capacitors to discharge, or do not open display cover unless area is known to be safe

For an ambient temperature exceeding 70 °C, heat resistant cables and cable glands suitable for at least
80°C shall be used.

If the transmitter is physically connected to a possible source of heating or cooling, e.g. by mounting to a
process pipe or a temperature sensor, the temperature at the point of connection shall be within the ambient
temperature range as given in the certificate. The sensor shall be suitable for use as entry device on an Ex d
enclosure and shall not add volume to the 7501 enclosure. The thread of the sensor must be in compliance
with EN60079-1 / EN60079-31.

The enclosure must be connected to the potential matching line.

When the process temperature range exceeds the service temperature range it shall be verified by on-site
temperature measurements, taking the worst case conditions into account, that the service temperature does
not exceed the range of the module.

For group III (dust), electrostatic charging of the paint layer shall be avoided

No modification to the enclosure is allowed by the customer except as mentioned in the manual or
installation drawing.

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FM Installation drawing 7501

For safe installation of 7501 the following must be observed. The module shall only be installed by qualified personnel who are familiar with the national and international laws, directives and standards that apply to this area.
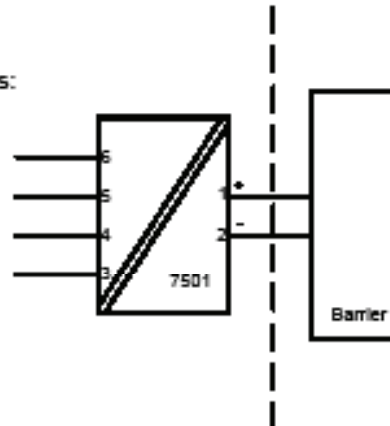
Intrinsic safe installation:

Non classified Location

Hazardous classified Location
Class I,II,II Division1 Groups, ABCDEFG
Class I, Zone 0, IIC, Zone 20

T4: $-40 \leq Ta \leq 85°C$
T5: $-40 \leq Ta \leq 60°C$
T6: $-40 \leq Ta \leq 40°C$

Zone 20 Temperature Class:
$-40 \leq Ta \leq 85°C$ T100 °C
$-40 \leq Ta \leq 60°C$ T75 °C
$-40 \leq Ta \leq 40°C$ T60 °C

The barrier must not be connected to any associated apparatus which uses or generates more than 250 VRMS

Terminal: 1,2
Ui: 30 VDC
Ii: 120 mA
Pi: 0.84 W
Li: 0 µH
Ci: 2 nF

Terminal: 3,4,5,6
Uo: 9.6 VDC
Io: 28 mA
Po: 67 mW
Lo: 35 mH
Co: 3.5 µF

UM < 250V
Voc or Uo < Vmax or Ui
Isc or Io < Imax or Ii
Po < Pi
Ca or Co > Ci + Ccable
La or Lo > Li + Lcable

Revision date:	Version Revision	Page:
2015-07-28	V1R0	1/5

The entity concept

The Transmitter must be installed according to National Electrical Code (ANSI-NFPA 70) and shall be installed with the enclosure, mounting, and spacing segregation requirement of the ultimate application.

Equipment that is FM-approved for intrinsic safety may be connected to barriers based on the ENTITY CONCEPT. This concept permits interconnection of approved transmitters, meters and other devices in combinations which have not been specifically examined by FM, provided that the agency's criteria are met. The combination is then intrinsically safe, if the entity concept is acceptable to the authority having jurisdiction over the installation.

The entity concept criteria are as follows:

The intrinsically safe devices, other than barriers, must not be a source of power.
The maximum voltage $Ui(V_{max})$ and current $Ii(I_{max})$, and maximum power $Pi(Pmax)$, which the device can receive and remain intrinsically safe, must be equal to or greater than the voltage (Uo or V_{OC} or V_t) and current (Io or I_{SC} or I_t) and the power Po which can be delivered by the barrier.

The sum of the maximum unprotected capacitance (C_i) for each intrinsically device and the interconnecting wiring must be less than the capacitance (C_a) which can be safely connected to the barrier.

The sum of the maximum unprotected inductance (L_i) for each intrinsically device and the interconnecting wiring must be less than the inductance (L_a) which can be safely connected to the barrier.

The entity parameters Uo, V_{OC} or V_t and Io, I_{SC} or I_t and C_a and L_a for barriers are provided by the barrier manufacturer.
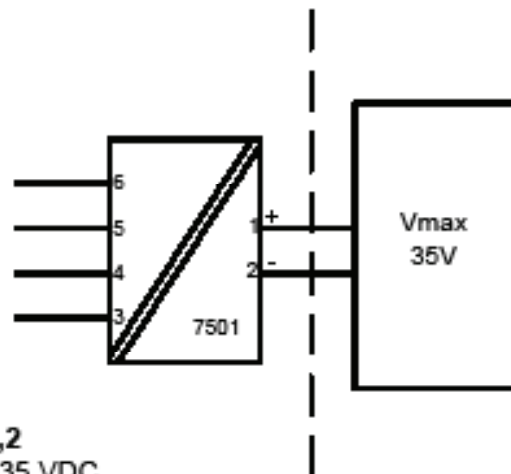
For Class II and Class III installations where rigid conduit is not used, seal cable entries against dust and fibres using a NRTL listed cable gland fitting.

Non incendive installation:

Hazardous classified Location
Class I,II,III ,Division 2, Groups, ABCDFG
Class I, Zone 2, IIC

Non classified Location

T4: −40 ≤ Ta ≤ 85ºC
T6: −40 ≤ Ta ≤ 60ºC

Terminal: 1,2
Vmax: 9.5 - 35 VDC

Terminal: 3,4,5,6
Sensor: RTD or TC

O-ring Sealings
Silicone rubber:-40°C ≤Ta ≤ +85°C
FKM rubber: −20°C ≤Ta ≤ +85°C

Protection: Indoor and Outdoor TYPE 4X or IP66

Explosion proof / Dust ignition proof installation:

Hazardous area
Class I, II, III Division 1, Groups ABCDEFG
Class I Zone 1, Ex/AEx d IIC T6

Non Hazardous Area

T6:	-20/-40 ≤ Ta ≤ 70ºC
T5, T4:	-20/-40 ≤ Ta ≤ 85ºC

Terminal: 1,2
Supply: 9.5-35 VDC
Current: 23 mA
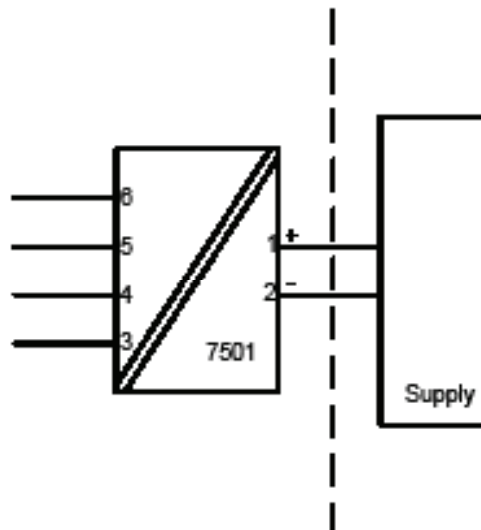
Terminal: 3,4,5,6
Sensor: RTD or TC

O-ring Sealings
Silicone rubber: -40°C ≤ Ta ≤ +85°C
FKM rubber: -20°C ≤ Ta ≤ +85°C

Protection: Indoor and Outdoor Type 4X or IP66

Explosion proof / Dust ignition proof installation.

The enclosure must be installed such, that even in the event of rare incidents, ignition sources due to impact and friction, sparks are excluded.

Unused cable entries must be sealed by approved sealing plugs.

Certified cable and cable glands shall be used that are suitable for the application and correctly installed or the cables must be run in conduit.

For an ambient temperature exceeding 70 °C, heat resistant cables and cable glands suitable for at least 90°C shall be used.

For process temperatures above 85°C or below -20/-40°C installer must verify by measurements that the service temperature of the 7501 module is held within this range taking worst conditions into account.

The display cover must be screwed all the way in and the safety catch must be fastened before operation.

Protection degree of IP 66 or TYPE4X is only achieved if certified cable glands or conduit entry devices are used that are suitable for the application and correctly installed with sealing washers or Loctile sealant is added to the threads of the sensor, blanking elements and cable glands.

The enclosure must be connected to the potential matching line.

Warning.
Do not open display cover unless area is known to be safe.

For installation in Canada the following must be taken into account:

      All openings for conduit and sensor connection must be in NPT threads.
      For Class I Group A installation, conduit seal is required within 18 inches of enclosure.
      For Class I Zone I installation, conduit seal is required within 18 inches of enclosure.

Document history

The following list provides notes concerning revisions of this document.

Rev. ID	Date	Notes
100	1524	initial release of the product
101	1530	FM installation drawing updated
		Application drawing updated

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