

Product Manual Burns T75 (PR 7501)



Field mounted HART temperature transmitter



Burns FORM-161222-G
No. 7501V105-UK
From serial no.: 160801168



Field mounted HART temperature transmitter Burns T75 (PR 7501)

Table of contents

Warning	4
Applications	5
Order	6
Accessories	6
Technical data	6
Block diagram	9
Marking	9
Caution	9
Protection degree	14
Assembly and disassembly	15
Connections	17
Optical buttons	18
Operating the optical buttons	18
Display	18
Device and sensor status indication	21
Display menu	22
Display	25
Tags	25
Calibration	26
Simulation	27
Sensor	28
HART	28
Write-protect	29
Language	29
HART Revision	29
Help text overview	30
Programming	34
Changing the HART protocol version	35
Retrofit	37
Appendix	38
ATEX Installation Drawing	39
IECEx Installation Drawing	45
FM Installation Drawing	51
CSA Installation Drawing	56
Desenho de instalação INMETRO	59
Document history	65

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

Burns T75 (PR 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 definition 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, 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.

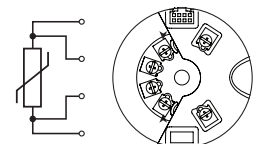
Technical characteristics

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

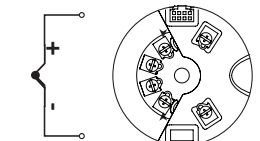
Applications

Input signals:

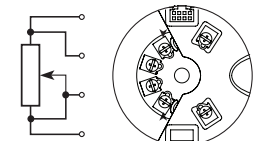
RTD to 4...20 mA



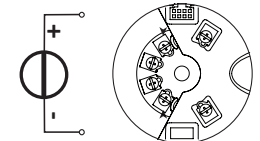
TC to 4...20 mA



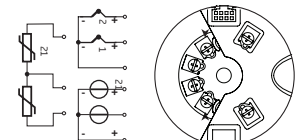
Resistance to 4...20 mA



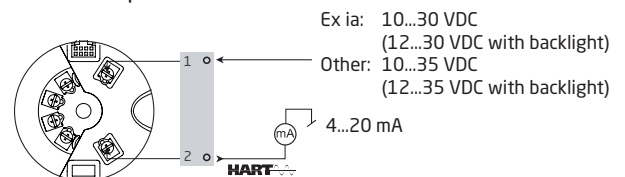
mV to 4...20 mA



Difference or average
RTD, TC or mV



2-wire output and HART:



Model T75:

- Transmitter with Integrated Display
- Aluminum Epoxy Coated Housing
- Local Interface via Optical Buttons
- Silicone O-ring (-40°C to 85°C)
- 1/2" NPT Sensor & Service Ports
- Hazardous Location Approvals:
 - ATEX, IECEx, FM, CSA, INMETRO

Technical data

Environmental conditions:

Operating temperature

with silicone O-ring -40°C to +85°C

with FKM O-ring -20°C to +85°C

Reduced LCD performance below -20°C and above +70°C

Storage temperature -40°C to +85°C

Calibration temperature. 20...28°C

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 mm² / 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	$\leq \pm 0.05\%$ of span	$\leq \pm 0.005\%$ of span / °C

Basic values		
Input type	Basic accuracy	Temperature coefficient
Pt50 - Pt1000	$\leq \pm 0.1^\circ\text{C}$	$\leq \pm 0.005^\circ\text{C}/^\circ\text{C}$
Ni50 - Ni1000	$\leq \pm 0.2^\circ\text{C}$	$\leq \pm 0.005^\circ\text{C}/^\circ\text{C}$
Lin. R	$\leq \pm 0.1 \Omega$	$\leq \pm 5 \text{ m}\Omega / ^\circ\text{C}$
Volt	$\leq \pm 10 \mu\text{V}$	$\leq \pm 0.5 \mu\text{V} / ^\circ\text{C}$
TC type: E, J, K, L, N, T, U	$\leq \pm 0.5^\circ\text{C}$	$\leq \pm 0.025^\circ\text{C} / ^\circ\text{C}$
TC type: B ¹ , Lr, R, S, W3, W5	$\leq \pm 1^\circ\text{C}$	$\leq \pm 0.1^\circ\text{C} / ^\circ\text{C}$
TC type:B ²	$\leq \pm 3^\circ\text{C}$	$\leq \pm 0.3^\circ\text{C} / ^\circ\text{C}$
TC type:B ³	$\leq \pm 8^\circ\text{C}$	$\leq \pm 0.8^\circ\text{C} / ^\circ\text{C}$
TC type:B ⁴	not specified	not specified

TC B¹ accuracy specification range > 400°C
 TC B² accuracy specification range > 160°C < 400°C
 TC B³ accuracy specification range > 85°C < 160°C
 TC B⁴ accuracy specification range < 85°C

TC cold junction compensation. < $\pm 1.0^\circ\text{C}$
 Max. offset on input signal 50% of selec. max. value

EMC - immunity influence.	< $\pm 0.1\%$ of span
Extended EMC immunity:	
NAMUR NE 21, A criterion, burst	< $\pm 1\%$ 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.	$\leq (V_{\text{supply}} - 10) / 0.023 [\Omega]$
with backlight	$\leq (V_{\text{supply}} - 12) / 0.023 [\Omega]$
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

Marine approval:

EU RO Mutual Recognition Type Approval	MRA0000009
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Ex approvals:

ATEX 2014/34/EU.	DEKRA 15 ATEX 0058 X
IECEX.	IECEX DEK 15.0039 X
cFMus	3055380
cCSAus.	70024231
INMETRO	DEKRA 15.0014 X
NEPSI	GYJ15.1336X, GYJ15.1337X and GYJ15.1338X
EAC Ex TR-CU 012/2011	RU C-DK.GB08.V.01316

Observed authority requirements:

EMC.	2014/30/EU
RoHS.	2011/65/EU
EAC.	TR-CU 020/2011

Mechanical specifications

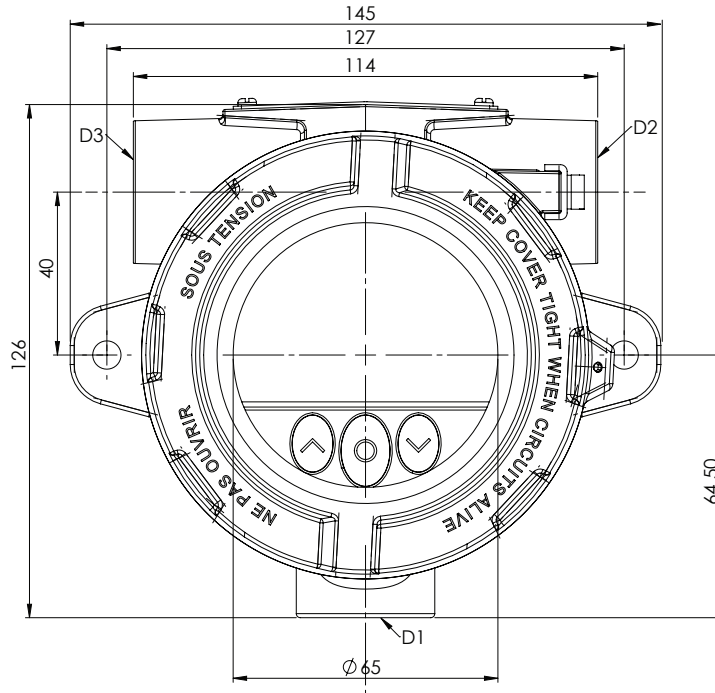


It is important to be careful when screwing the cover on or off. The thread surface must be free of any grains, pellets or other impurities as these can cause the cover to seize or damage the threads.

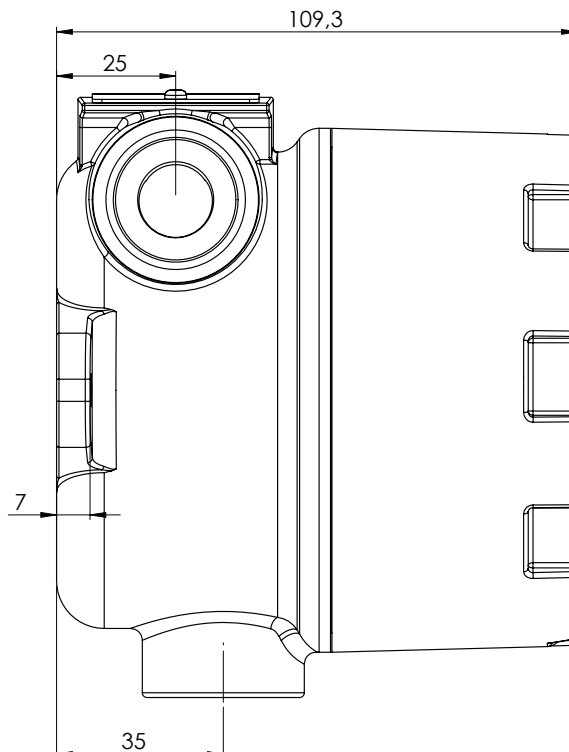
! Never use force to screw on the cover.

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



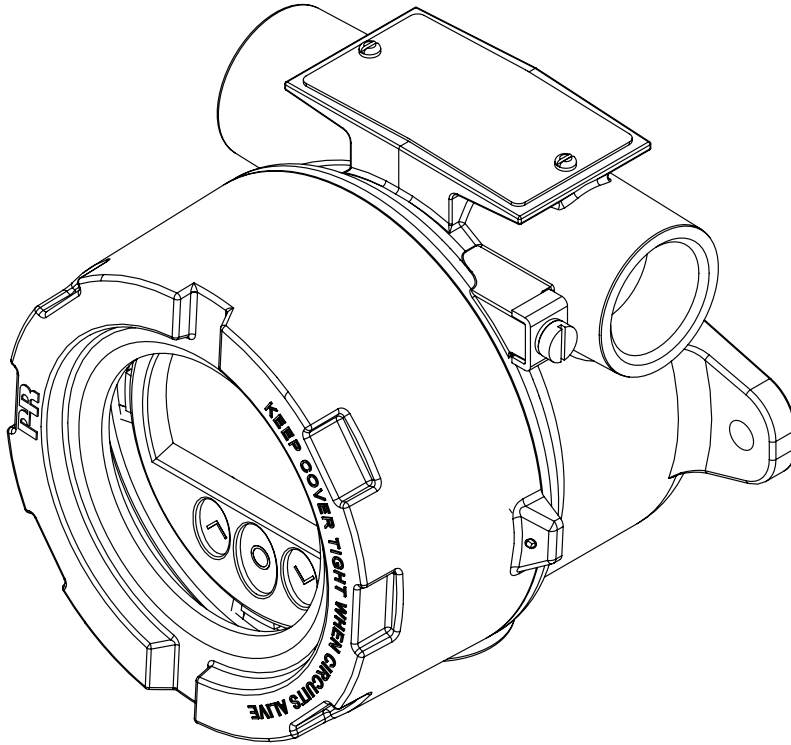
Side view



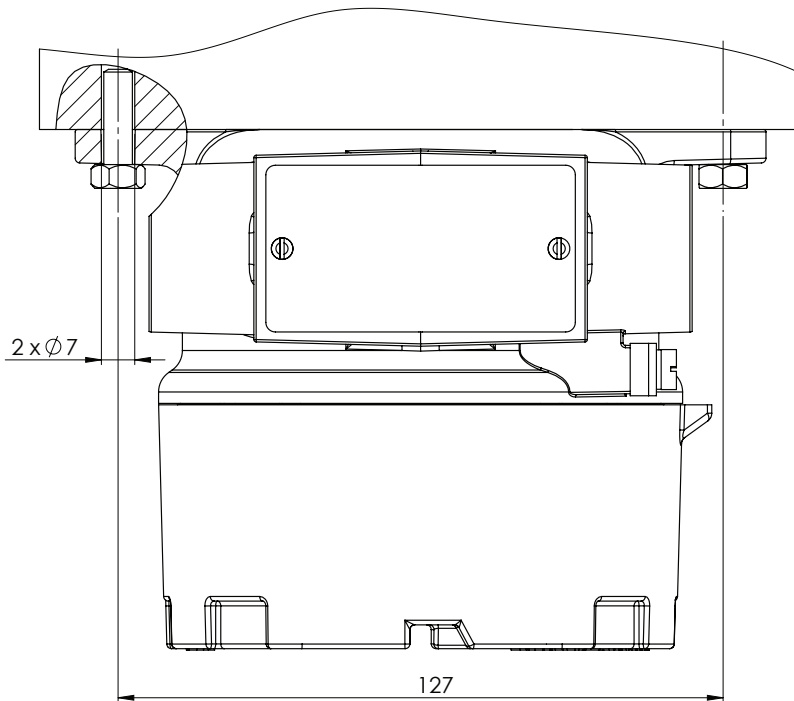


Mounting

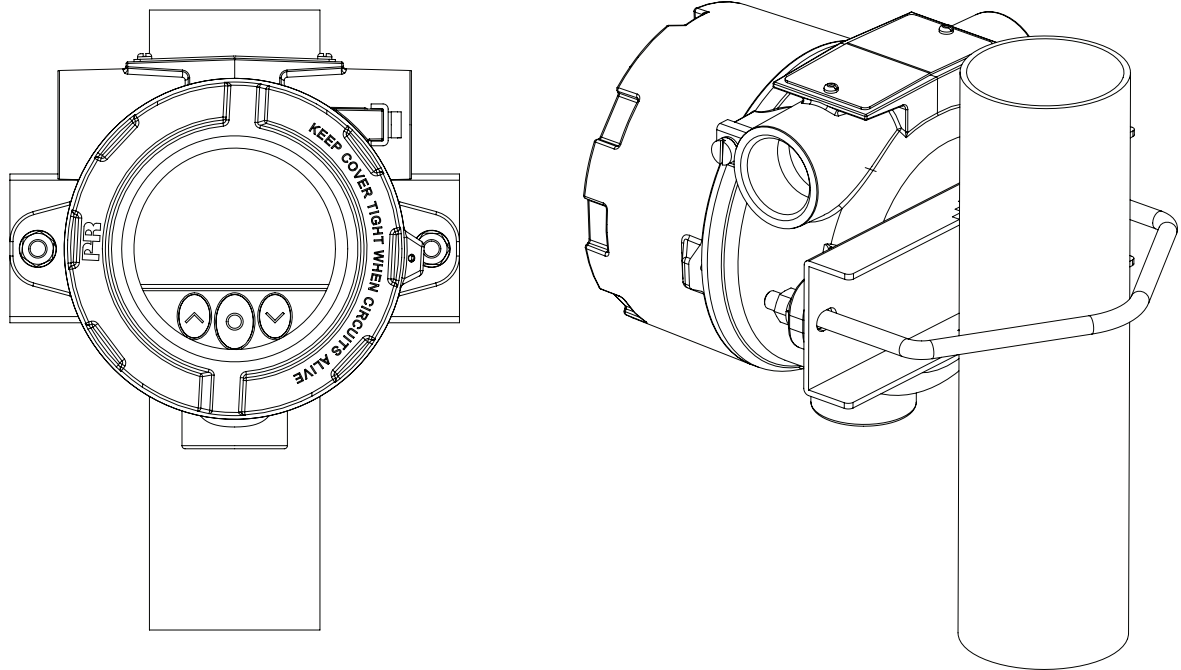
Wall-mounting - side view



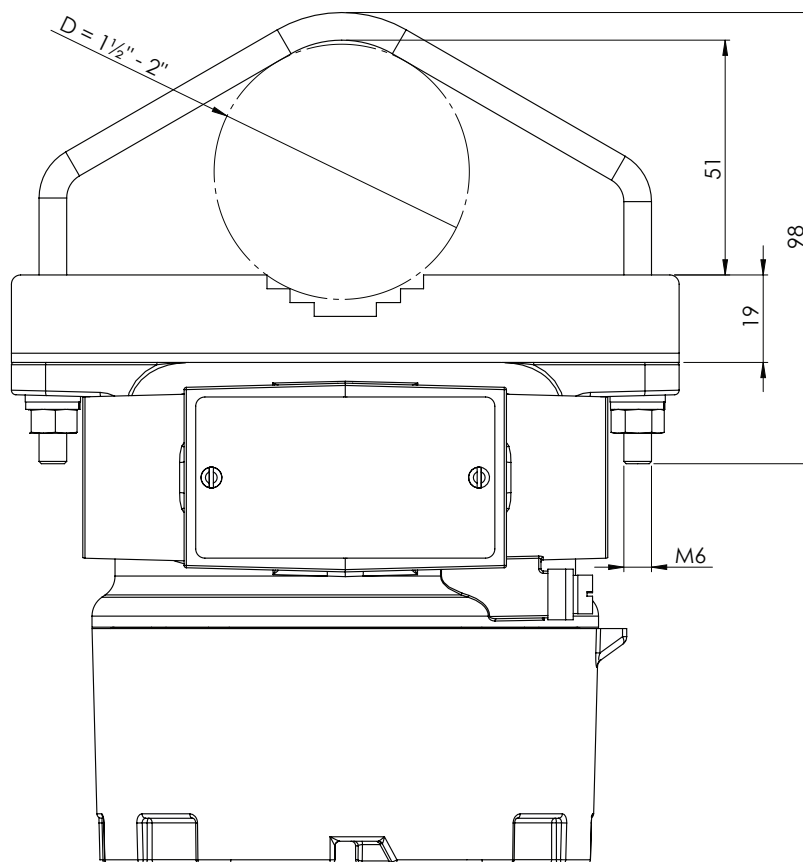
Wall-mounting - top view



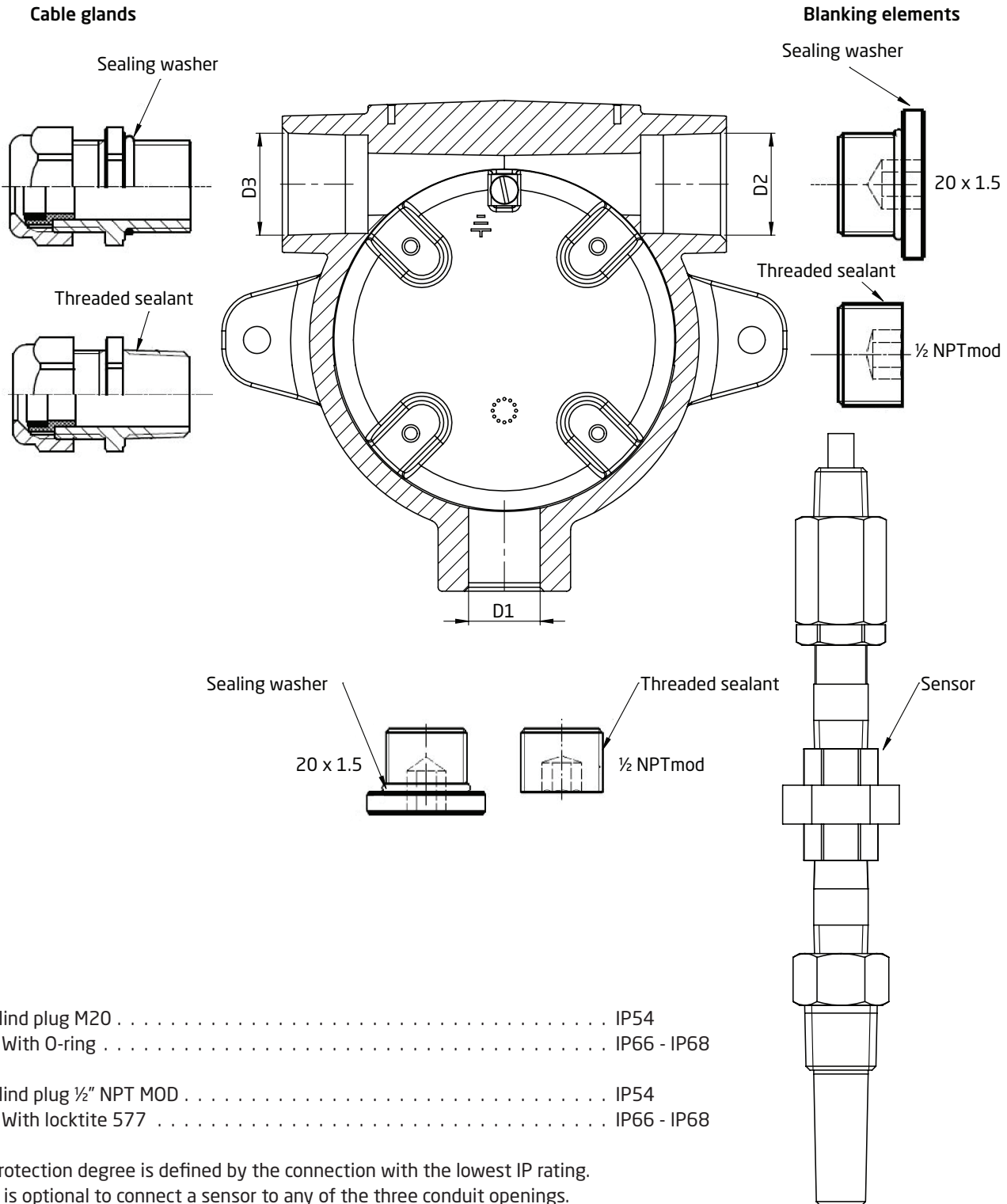
Pipe-mounting - front and back view



Pipe-mounting - top view



Protection degree



Protection degree is defined by the connection with the lowest IP rating.
 It is optional to connect a sensor to any of the three conduit openings.
 Blind plugs are Ex approved only when used together with 7501.

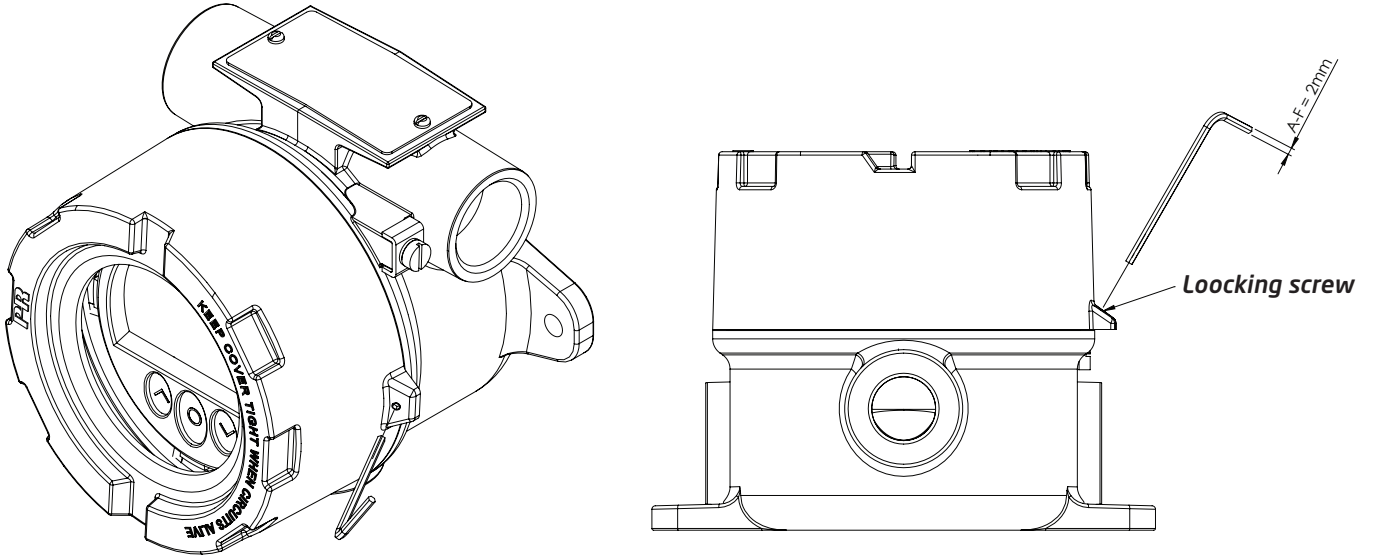
Earth terminal and protection terminal

Placement	Type	Cable cross section [mm ²]	
		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.

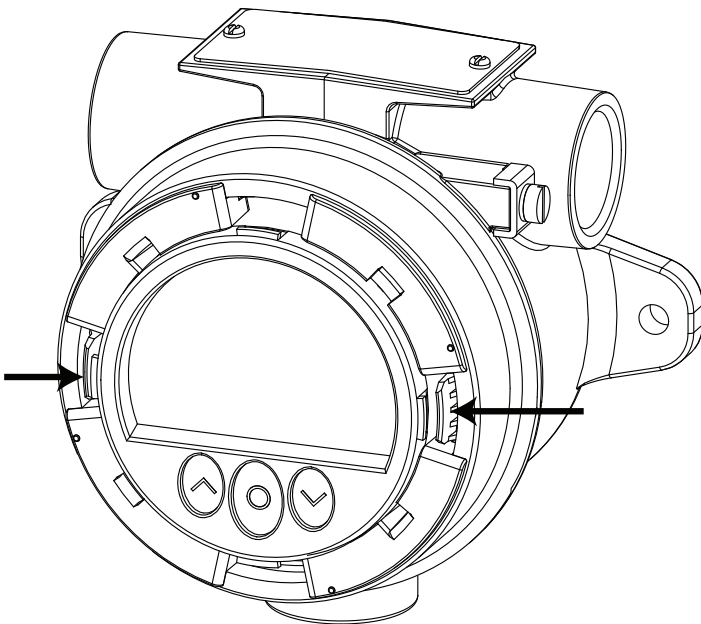
!! Disconnect power to the device before disassembly.

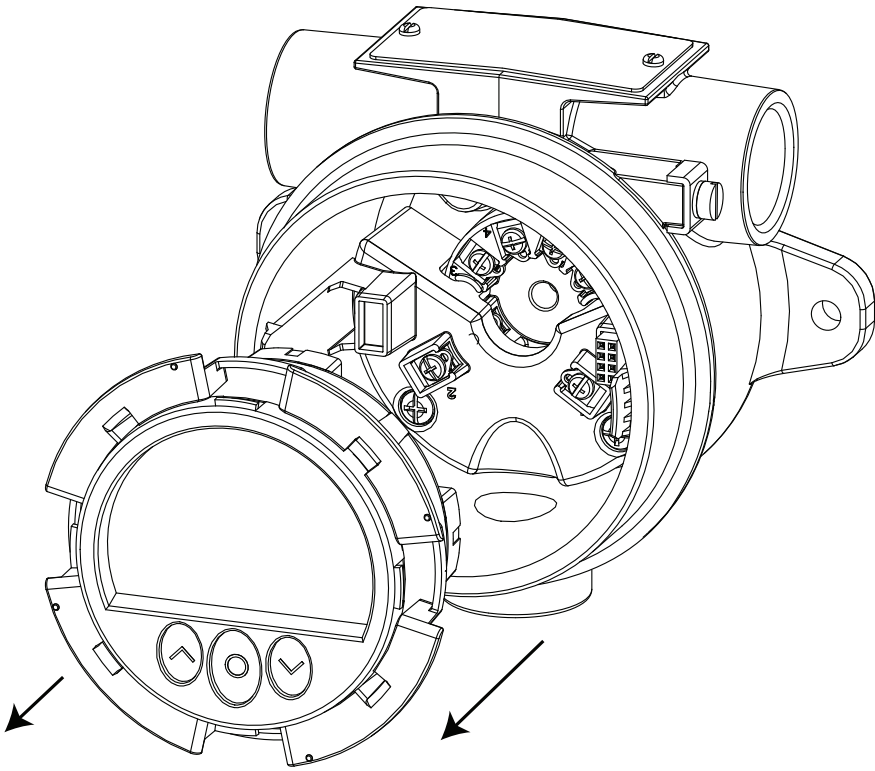


1. Release the **locking screw**, using a hex spanner with a cross-flat of 2 [mm]. This screw is situated on the housing top.
2. Unscrew the **housing lid** by turning it counterclockwise.

Point 3 and 4 only apply to devices with buttons and display.

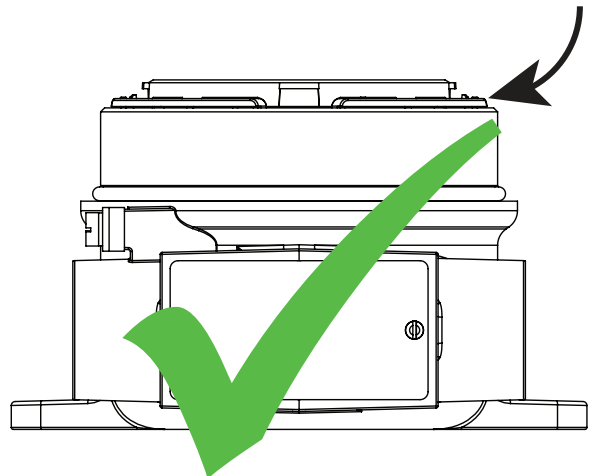
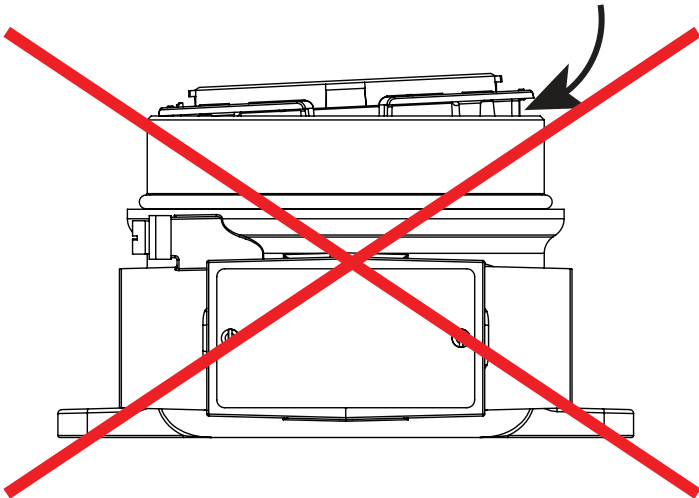
3. Press and hold the two clamps located on the left and right side of the **display unit**.





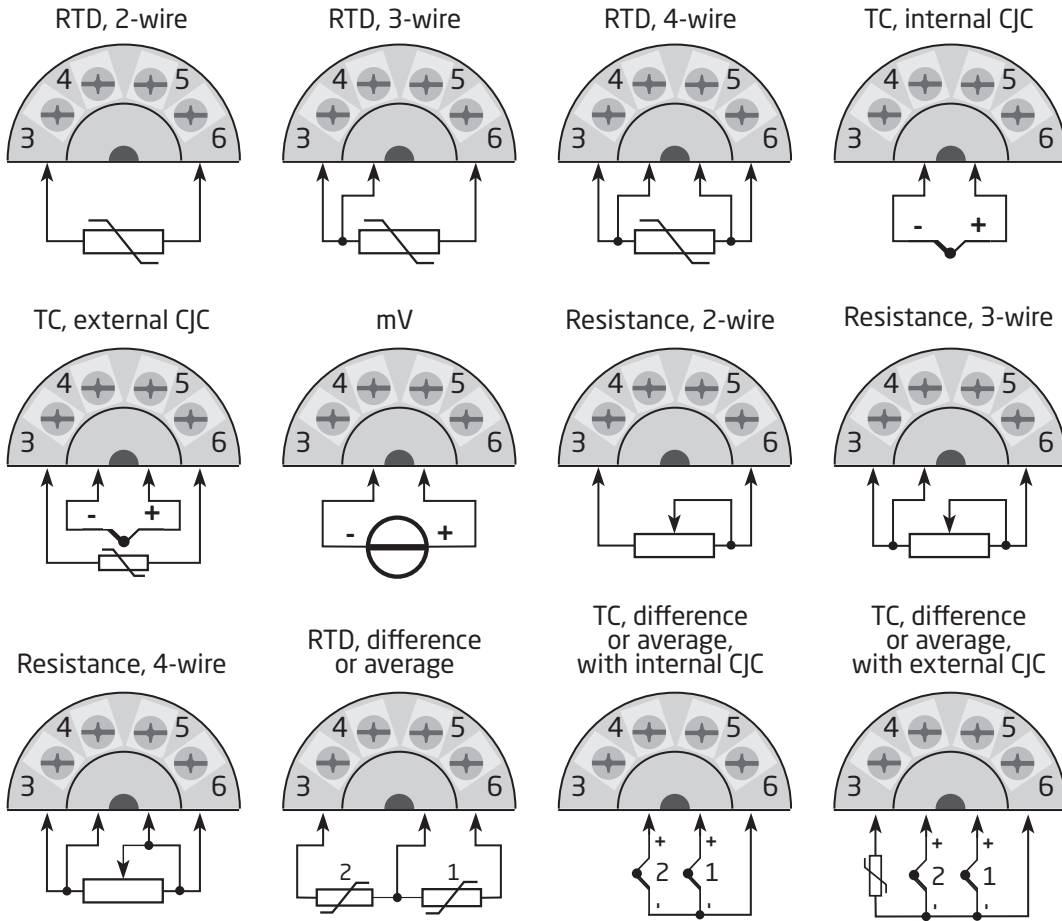
4. While holding the clamps, pull the **display unit** outwards to remove it.
5. The display can now be turned in steps of 90 degrees for best viewing angle.
6. See the section **Connections** for information on connecting sensors to the internal 5337.

Assembly

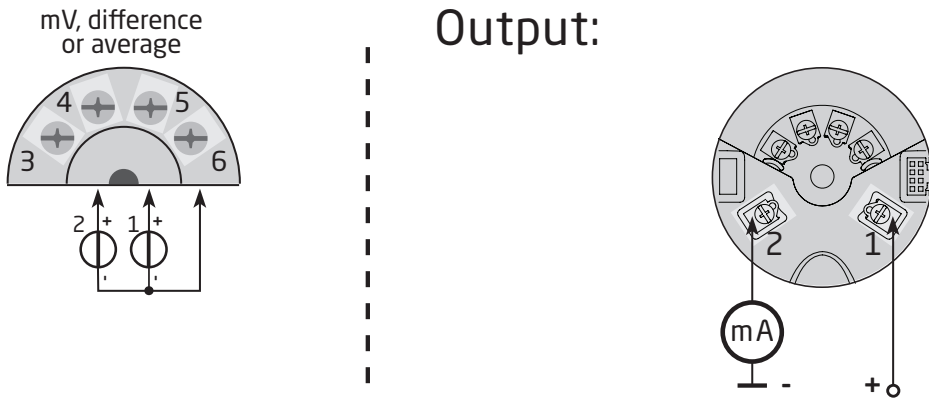


Connections




Input:



Output:



Optical buttons









The user interface features 3 optical buttons: ,  and . The buttons can be operated both with or without gloves¹. 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.




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

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 (except if device is write-protected).
-  In monitor view: switch to previous process variable.
Elsewhere: decrease the value of the selected parameter (except if device is write-protected).
-  Accept chosen value and proceed to next parameter
- Hold  Progressively increase (scroll) the numerical value (except if device is write-protected)
- Hold  Progressively decrease (scroll) the numerical value (except if device is write-protected)
- Hold  Ignore the chosen value and return to previous parameter
- Hold  +  Unlock the monitor view and enter configuration menu²

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.

¹ Dark colored gloves can cause reduced sensitivity.



² 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.

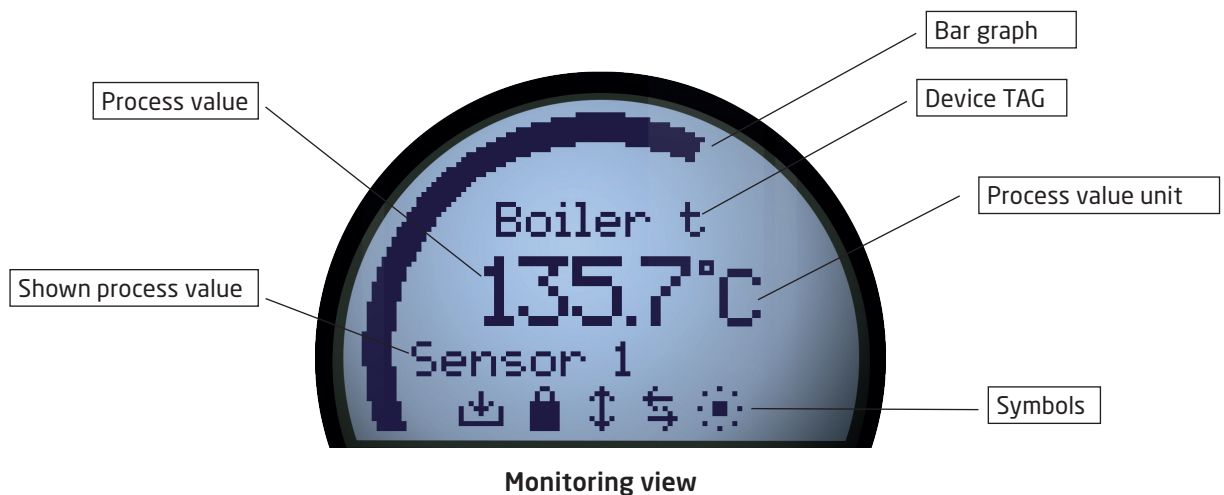
Symbol identification

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

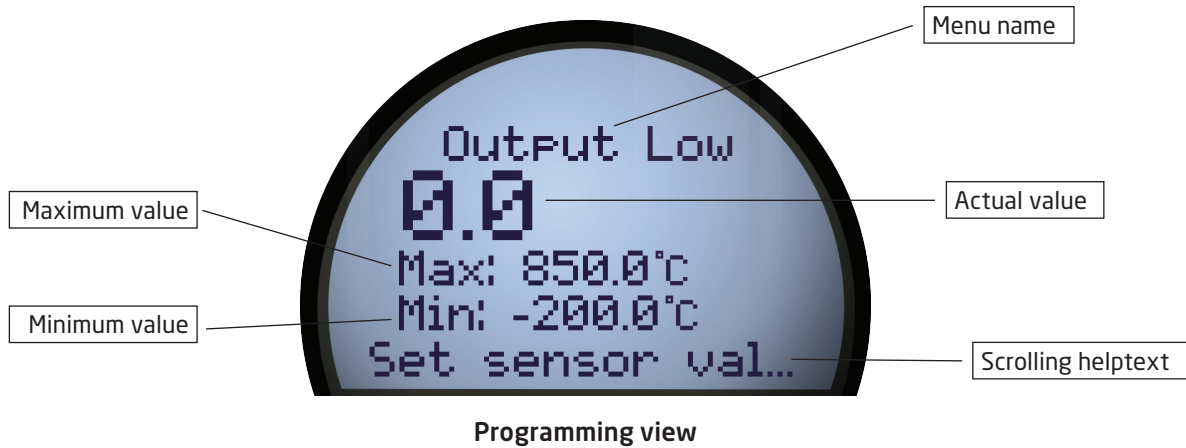
Monitoring view

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.



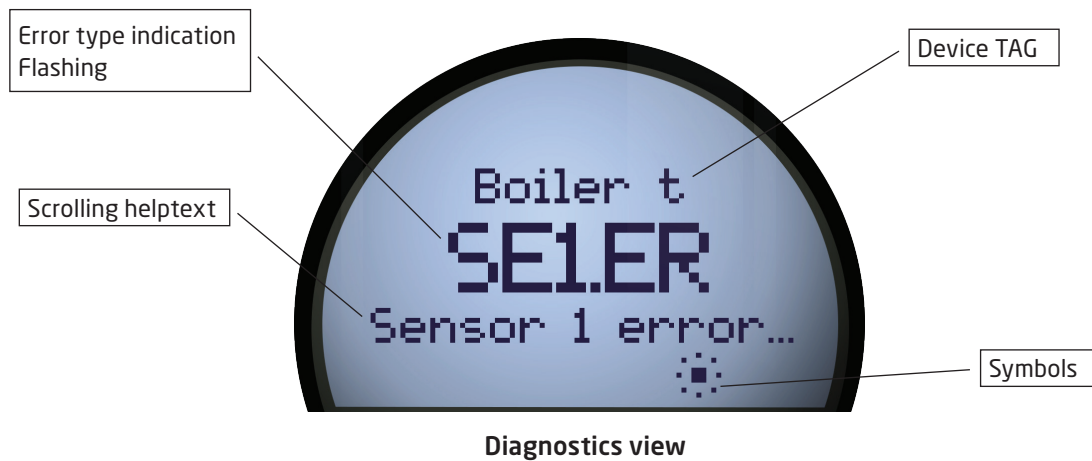
Programming view

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.



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**.



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 ³	
Sensor 1 exceeds upper sensor limit	IN.HI ³
Sensor 1 exceeds lower sensor limit	IN.LO ³
Sensor 2 exceeds upper sensor limit	IN.HI ³
Sensor 2 exceeds lower sensor limit	IN.LO ³
CJC sensor exceeds upper CJC sensor limit	IN.HI ³
CJC sensor exceeds lower CJC sensor limit	IN.LO ³

Sensor errors	
Sensor 1 error	SE1.ER ⁴
Sensor 2 error	SE2.ER ⁴
CJC sensor error	CJC.ER ⁴
Internal temperature sensor error	CJC.ER

Device status	
Configuration is being re-synchronized	SYNC.DEV ⁵
New device attached and configuration is being updated	NEW.DEV ⁵
Last process calibration failed	CA.ER ⁶

Device errors ⁷	
A/D converter error	ADC.ER ⁷
EEPROM memory error	EE.ER ⁷
RAM memory error	RA.ER ⁷
Flash memory error	FL.ER ⁷
Exception error during code execution	SW.ER ⁷
Internal communication error	COM.ER ⁷

³ The scrolling help text will inform you of the affected sensor.

⁴ Check wiring and replace sensor if necessary.

⁵ This message will disappear after a few seconds and the display will enter monitoring view.

⁶ Perform a new process calibration or reset the calibration to cancel this error. See the section **Display**.

⁷ 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

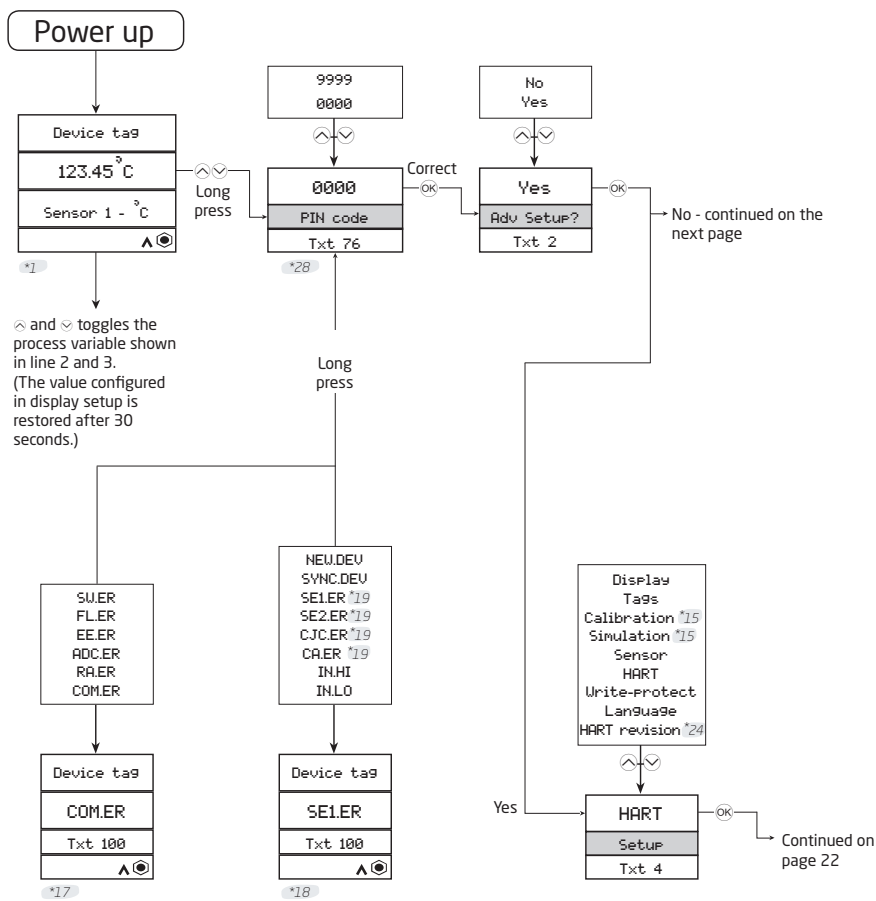
Exiting the monitor view allows you to configure the 7501, using the optical buttons (see the section **Operating the optical buttons**). The display menu is divided into 2 parts: Basic configuration and Advanced configuration. The advanced configuration menu is sub-divided into 9 parts: Display, Tags,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

If the 7501 menu has been PIN code-protected by setting a PIN code different from 0000 in the display menu, the correct PIN code must be entered to proceed to the desired configuration menu. The code 2008 will always give access to the menu.

The menu can be temporarily locked because it is receiving a configuration on the HART interface or because it is synchronizing configuration parameters with the internal device.

If the 7501 has been write-protected it is still possible to proceed to the menu, but no changes can be made, and it is not possible to save the configuration.

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



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

*15 Only shown if Write-protection is disabled.

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

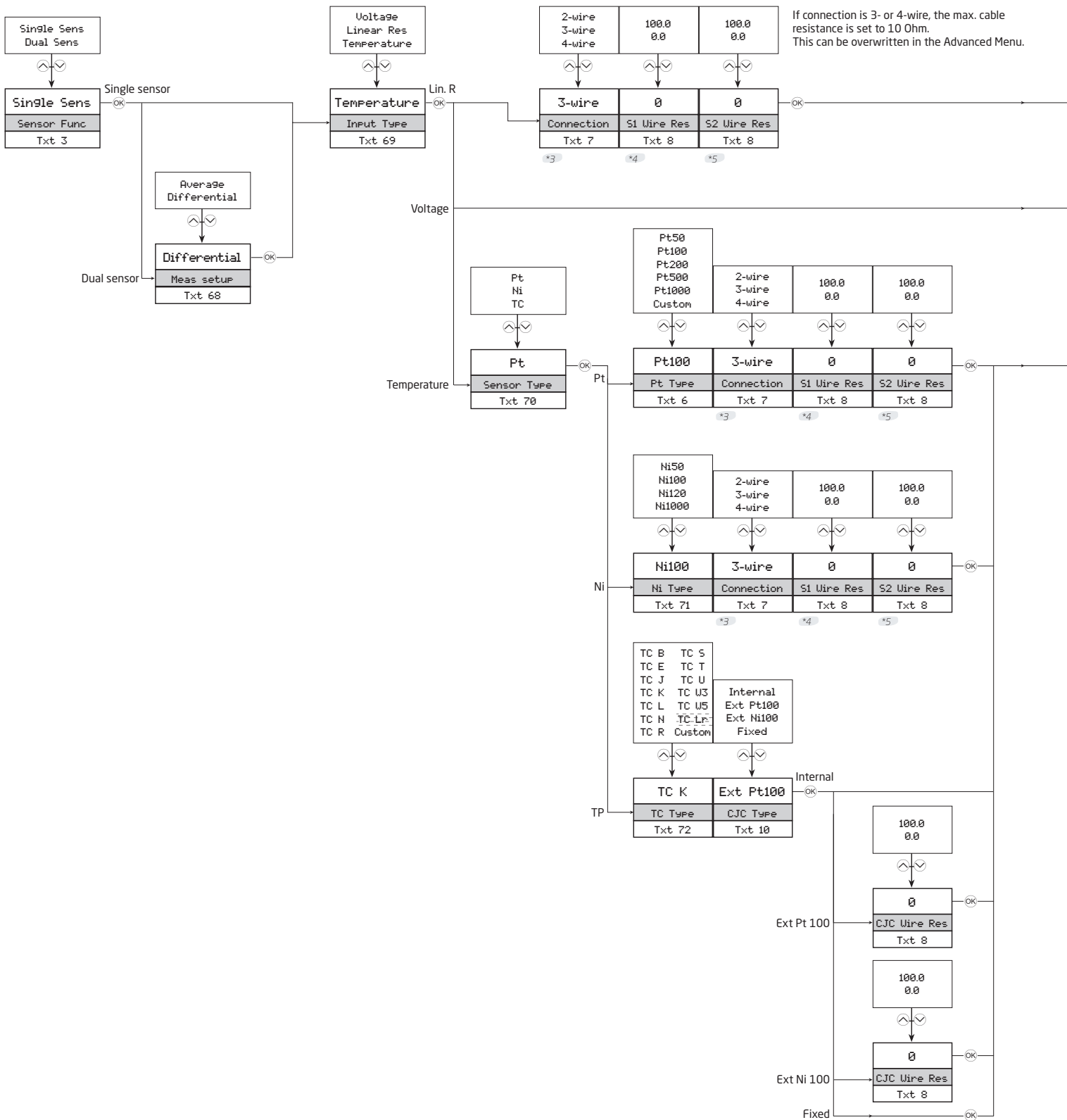
*18 Warning state: will be forced into this state if sensor error or overrange is present. Only from "Monitor" menu.

*19 First long press of \wedge and \vee 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.

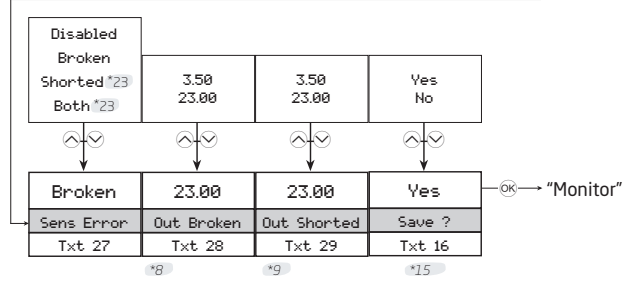
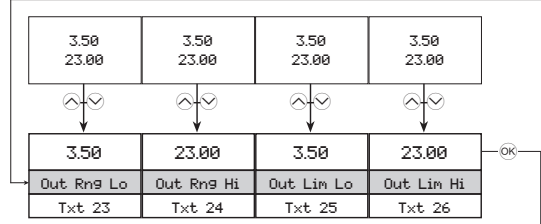
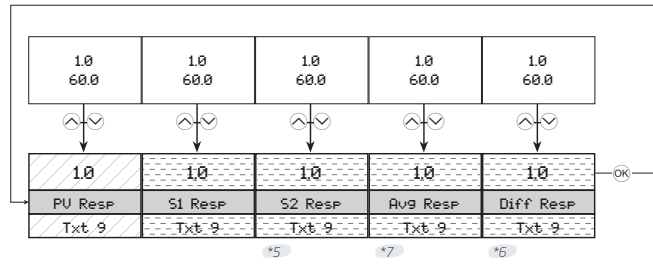
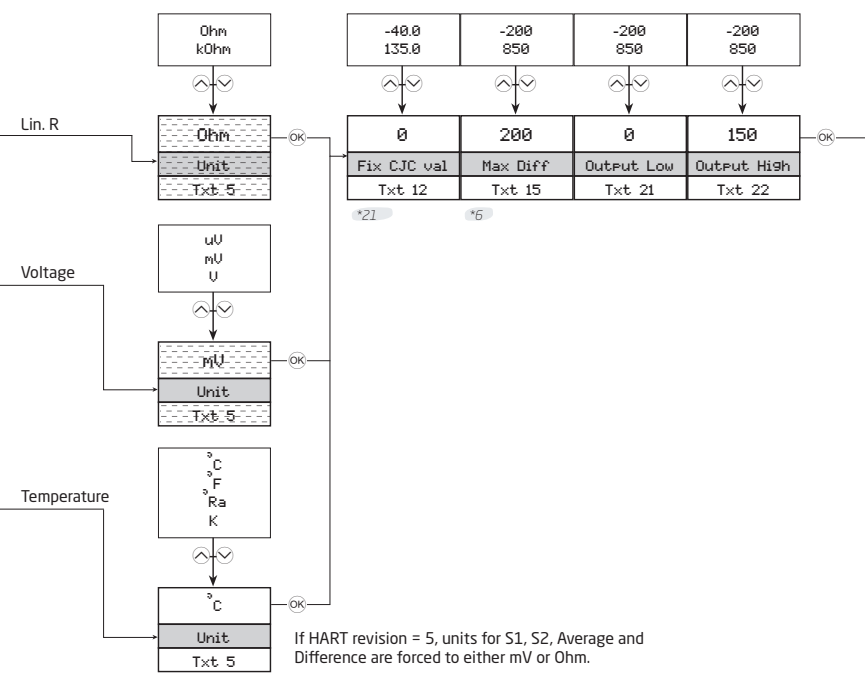
*28 Only shown if pin-code is \neq 0000

Basic configuration



- *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



*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.

*15 Only shown if Write-protection is disabled.

*21 Only shown if TC, fixed CJC is selected.

*23 Selection not available for Voltage Input Type and TC Sensor Type with internal/fixd CJC.

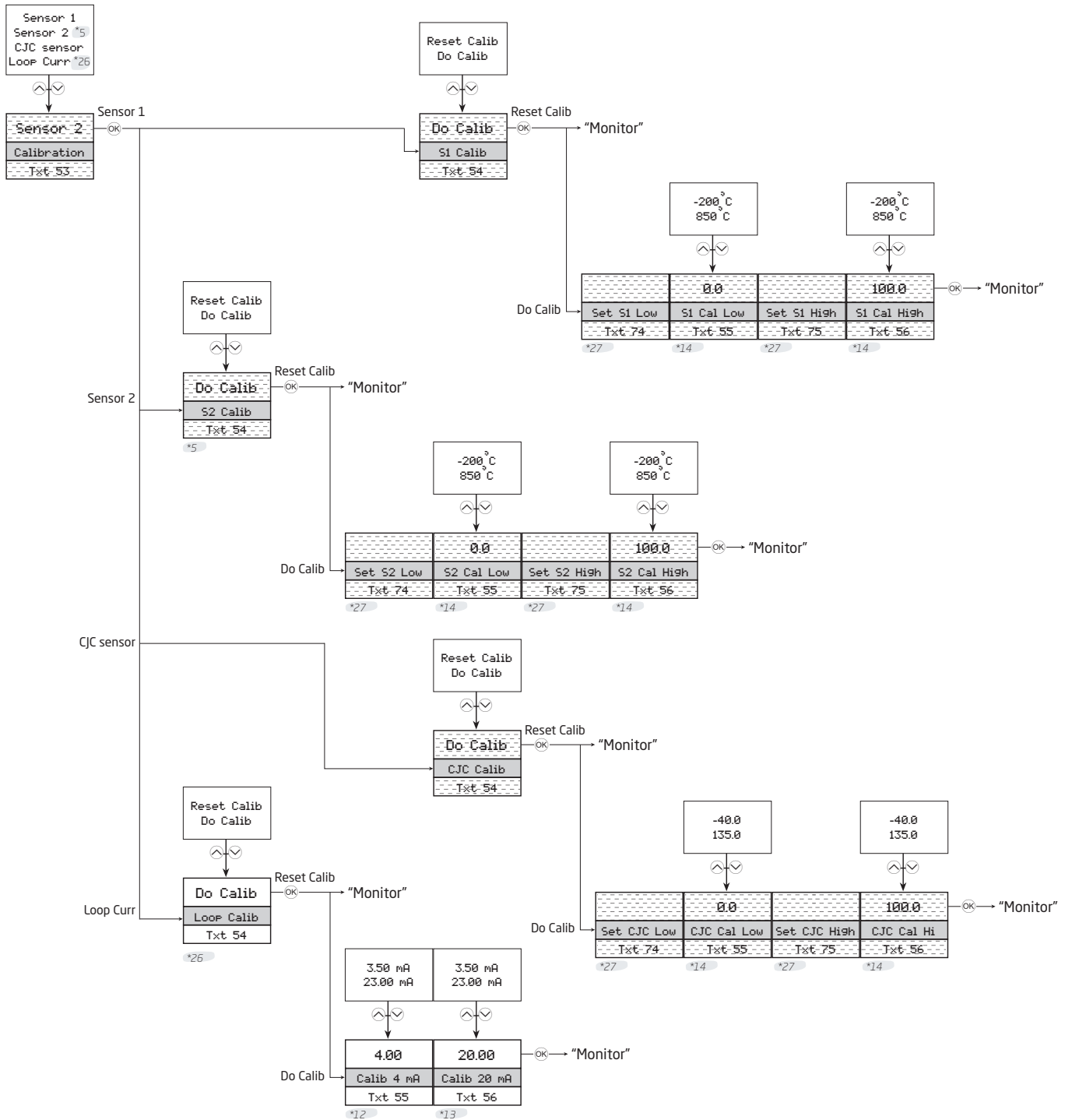
Not available in HART 5 mode

Not available in HART 7 mode

Calibration

(only if Write-protection is disabled)

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.

*14 Default value is current input value. No timeout in this menu.

Not available in HART 5 mode

*12 4 mA fixed output configured internally.

*26 Not possible if Loop Current is not active.

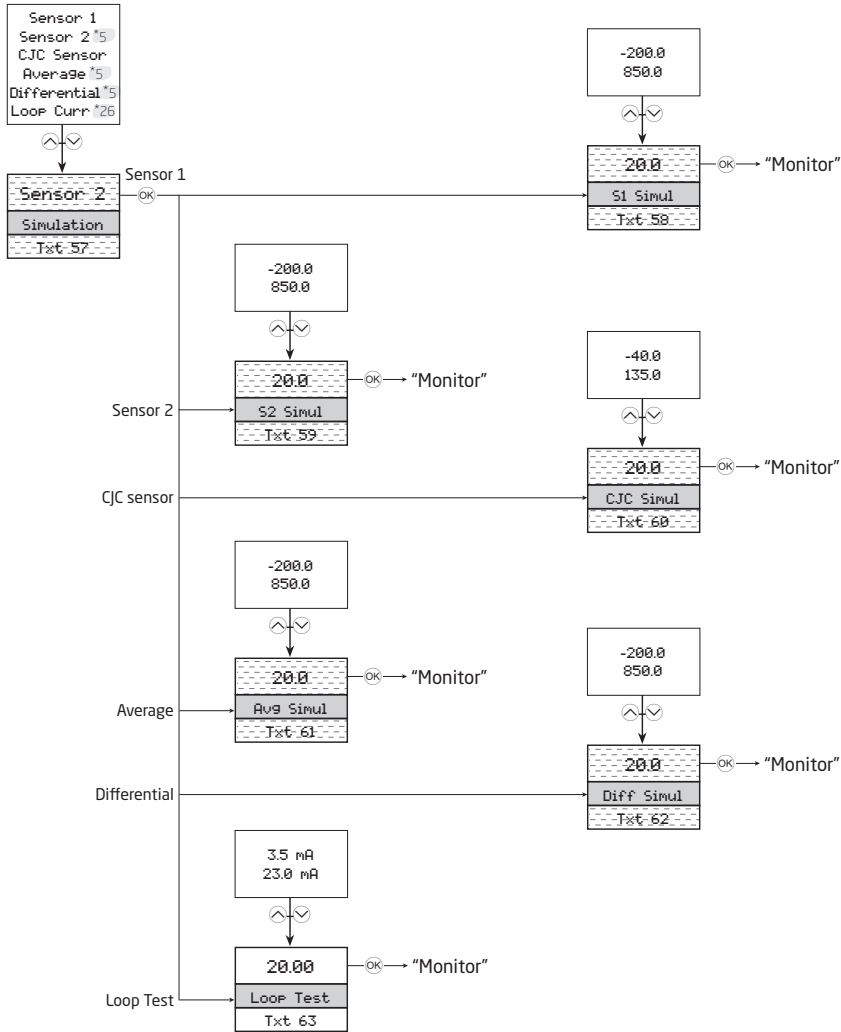
*13 20 mA fixed output configured internally.

*27 No timeout in this menu.

Simulation

(only if Write-protection is disabled)

The 7501 allows you to simulate process values by entering the simulation menu. Using the \uparrow and \downarrow 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.



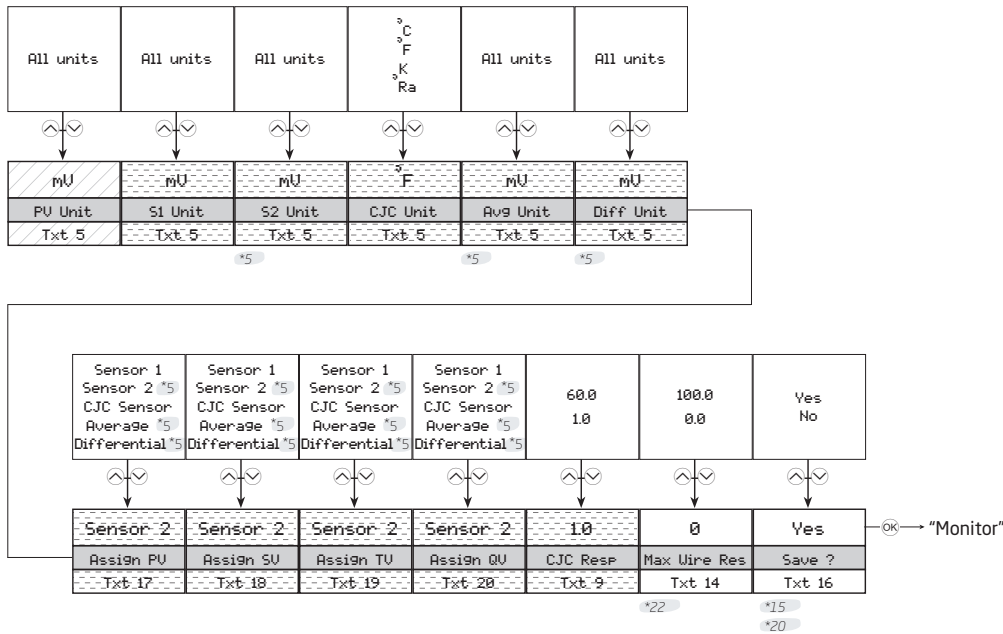
*5 Only shown if dual sensor function is selected.

*26 Not possible if Loop Current is not active.

Not available in HART 5 mode

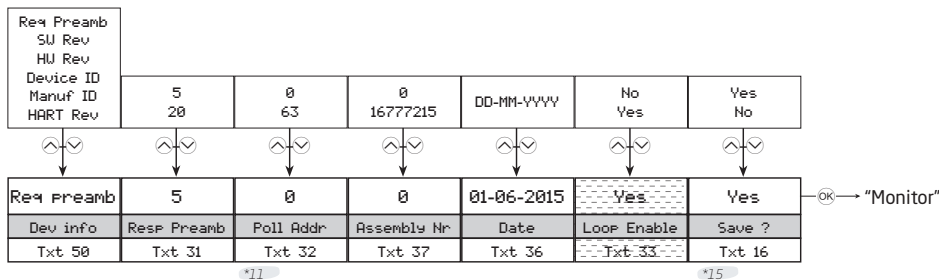
Sensor

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.



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.



*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.

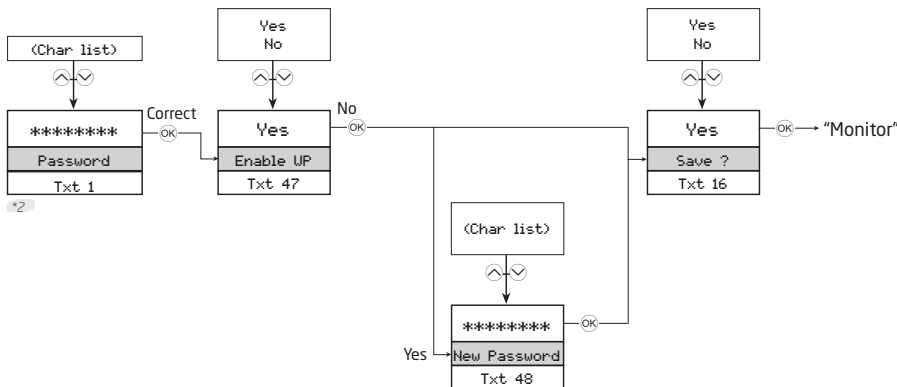
*22 Only shown if 3- or 4-wire connection is selected.

Not available in HART 7 mode

*15 Only shown if Write-protection is disabled.

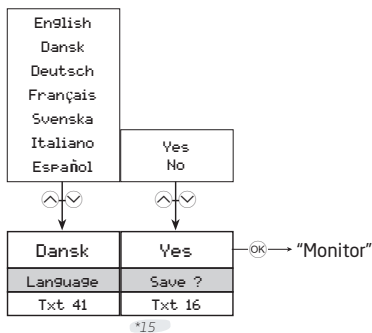
Write-protect

Here you can choose to enable or disable write protection using a password. If write-protection is already enabled, the correct password must be entered to get access. 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 with write-protection disabled. The password 00002008 always allows access to the write-protection menu.



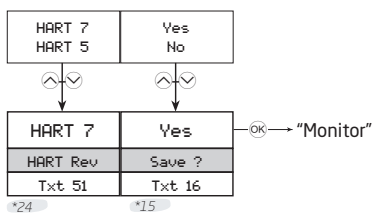
Language

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.



HART Revision

Changing the HART revision is done from this menu. Select the desired HART revision and press the \odot 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.



*2 Only shown if Write-protection is enabled.

*15 Only shown if Write-protection is disabled.

*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 Write-protect 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 measurement 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 measurement 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 measurement 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 measurement 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 write 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	[76] [77]	Set menu access PIN-code Set menu access PIN-code (0000 will disable)
[54]	Reset calibration to factory default Perform process calibration	[100] SW.ER FL.ER EE.ER	Exception error during code execution Flash memory error EEPROM memory error
[55]	Set value for low calibration point	ADC.ER	A/D converter error
[56]	Set value for high calibration point	RA.ER	RAM memory error
[57]	Simulate sensor1 input Simulate sensor2 input Simulate CJC sensor input Simulate average measurement Simulate differential measurement Simulate output loop current	COM.ER NEW.DEV	Internal communication error New device attached - configuration is being updated - please wait
[58]	Set sensor1 simulation value	CONF.ER	Configuration is being re-synchronized - please wait
[59]	Set sensor2 simulation value	SE1.ER	Sensor 1 error, check wiring and replace sensor if necessary
[60]	Set CJC sensor simulation value	SE2.ER	Sensor 2 error, check wiring and replace sensor if necessary
[61]	Set average measurement simulation value	CJC.ER	CJC Sensor error, check wiring and replace sensor if necessary
[62]	Set differential measurement simulation value	CJC.ER	Internal temperature sensor error
[63]	Set output loop current simulation value	CA.ER	Last process calibration failed to succeed - please retry
[64]	Edit the long tag?	IN.HI / IN.LO	Sensor 1 is out of range
[65]	Edit the tag?	IN.HI / IN.LO	Sensor 2 is out of range
[66]	Edit the descriptor?	IN.HI / IN.LO	CJC sensor is out of range
[67]	Edit the message?	IN.HI / IN.LO	Sensor 1 or Sensor 2 measurement is out of range
[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		

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
0	32	°C	<- Sensor specific types
1	33	°F	
2	34	°R	
3	35	K	
4	37	Ohm	
5	163	kOhm	
6	240	µV	
7	36	mV	
8	58	V	
9	39	mA	
10	57	%	
11	1	inH ₂ O	<- Pressure units
12	2	inHg	
13	3	ftH ₂ O	
14	4	mmH ₂ O	
15	5	mmHg	
16	6	psi	
17	7	bar	
18	8	mbar	
19	9	g/cm ²	
20	11	Pa	
21	12	kPa	
22	13	torr	
23	14	atm	
24	237	MPa	
25	17	l/min	<-Volume flow units
26	19	m ³ /h	
27	22	gal/s	
28	24	l/s	
29	25	ml/d	
30	26	ft ³ /s	
31	130	ft ³ /h	
32	27	ft ³ /d	
33	28	m ³ /s	
34	29	m ³ /d	
35	121	m ³ n/h	
36	132	bbl/s	
37	134	bbl/h	
38	135	bbl/d	
39	136	gal/h	
40	138	l/h	
41	235	gal/d	
42	20	ft/s	<-Velocity units
43	21	m/s	
44	114	in/s	
45	120	m/h	

Menu #	HART #	Text	Types
46	40	gal	<- Volume units
47	41	l	
48	43	m ³	
49	46	bbl	
50	110	bush	
51	111	yd ³	
52	112	ft ³	
53	113	in ³	
54	166	m ³ n	
55	167	ln	
56	236	hl	
57	44	ft	<- Length units
58	45	m	
59	47	in	
60	48	cm	
61	49	mm	
62	50	min	<-Time units
63	51	s	
64	52	h	
65	53	d	
66	60	g	<- Mass units
67	61	kg	
68	62	t	
69	63	lb	
70	64	ShTon	
71	65	LTon	
72	125	oz	
73	70	g/s	<- Mass flow units
74	71	g/min	
75	72	g/h	
76	73	kg/s	
77	75	kg/h	
78	76	kg/d	
79	77	t/min	
80	78	t/h	
81	79	t/d	
82	80	lb/s	
83	82	lb/h	
84	83	lb/d	
85	90	SGU	<- Mass per volume units
86	91	g/cm ³	
87	92	kg/m ³	
88	95	g/ml	
89	96	kg/l	
90	97	g/l	
91	146	µg/L	

Menu #	HART #	Text	Types
92	147	µg/m ³	
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			

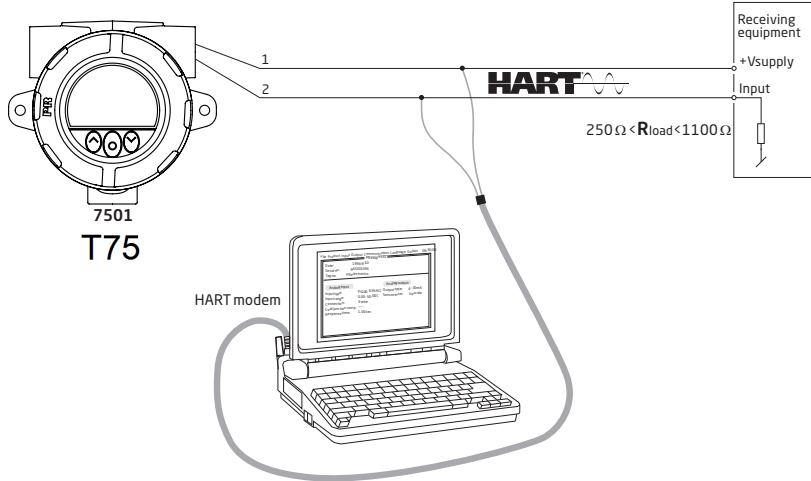
Programming

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.

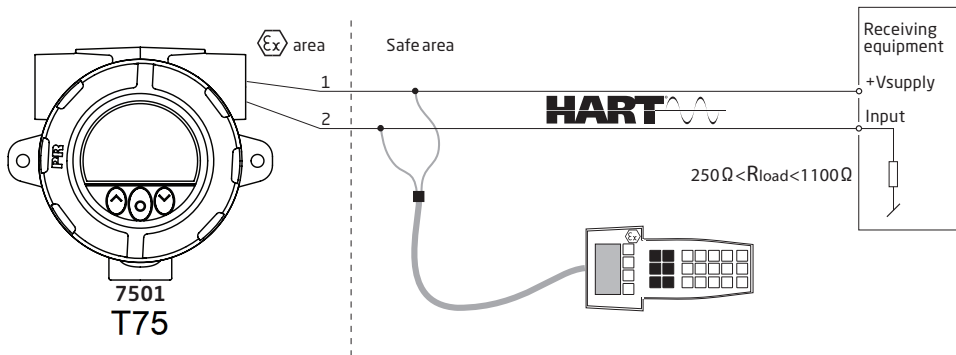
1: HART modem

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

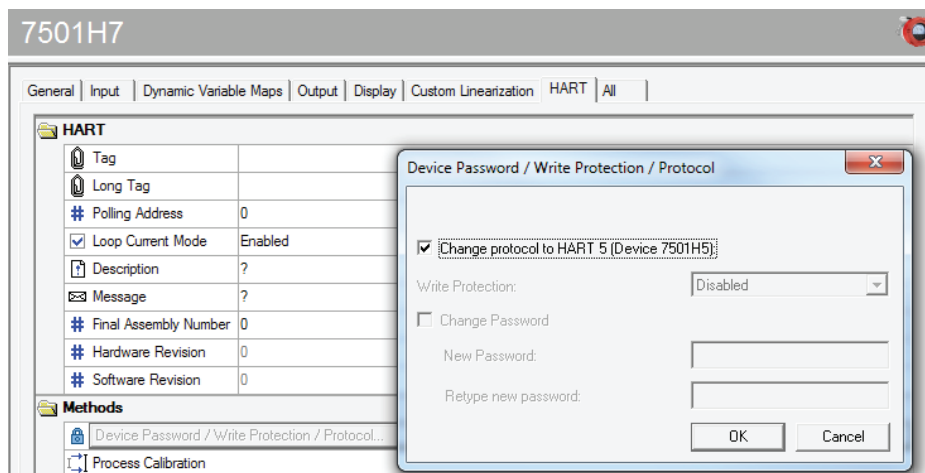
It is possible to change the HART protocol revision of the device by means of the display, utilizing the PReset software and a HART modem or other HART configuration tools such as handheld HART terminals.

Changing the HART revision using the display and the optical buttons

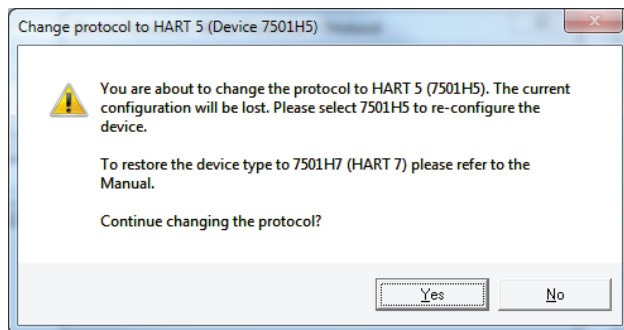
Changing the revision is done from the HART revision view under the Advanced menu. Use the  or  optical buttons to select the desired HART revision. Press the  button to accept the revision and change to the Save view. Select Yes and press  to acknowledge the change or No to cancel.

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-**".

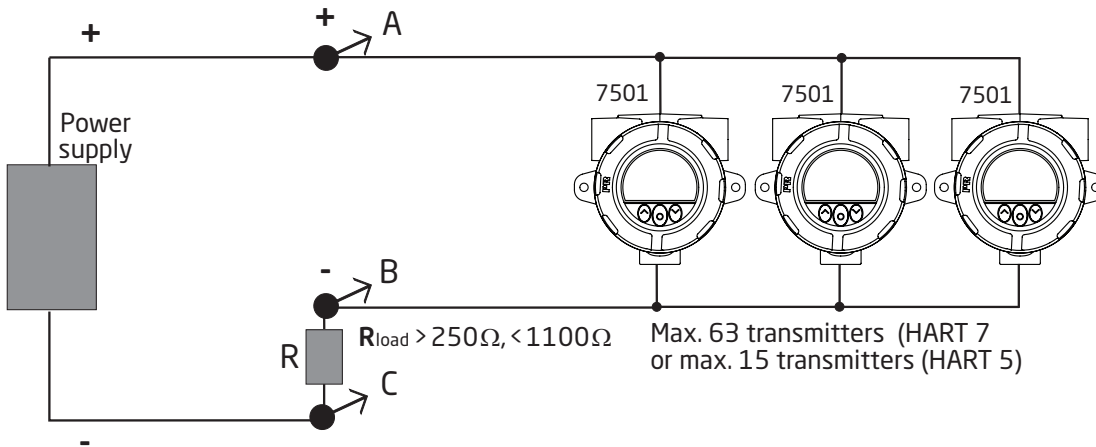
Connection of transmitters in multidrop mode

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.

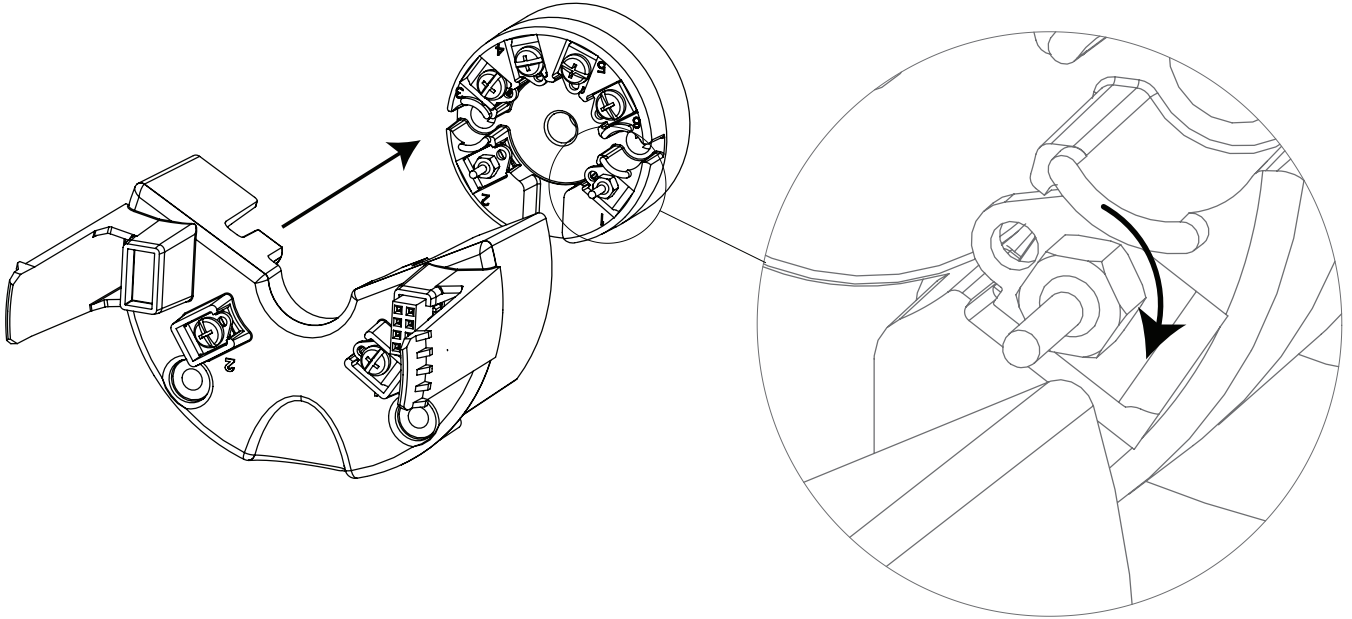


The HART communicator or HART modem can be connected across AB or BC.

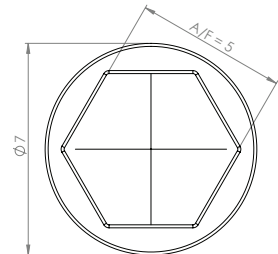
Retrofit

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.
Tighten the screws using a nutdriver or a socket wrench with Across Flats (A/F) of 5 mm and an outer diameter of no more than 7 mm.
Screw torque on connector pins = 0.4 Nm.
3. Mount the device in the main unit, making sure the connectors meet.



Nutdriver / socket wrench head

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 Instalação INMETRO

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



II 1 G Ex ia IIC T6...T4 Ga
II 1 D Ex ia IIIC T100°C Da
I M1 Ex ia I Ma (7501B)

Standards: EN 60079-0: 2012, EN 60079-11: 2012

Hazardous area

Zone 0, 1, 2, 20, 21, 22, (Mines)

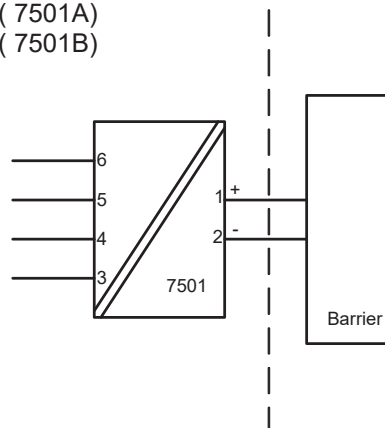
Non Hazardous Area

T4: $-40 \leq T_a \leq 85^\circ\text{C}$ T100 °C (7501A)

T4: $-40 \leq T_a \leq 80^\circ\text{C}$ T100 °C (7501B)

T5: $-40 \leq T_a \leq 60^\circ\text{C}$ T75 °C

T6: $-40 \leq T_a \leq 45^\circ\text{C}$ T60 °C



Sensor

Terminal: 3,4,5,6

Uo: 9.6 VDC

Io: 28 mA

Po: 67 mW

Lo: 35 mH

Co: 3.5 µF

Supply

Terminal: 1,2

Ui: 30 VDC

Ii: 120 mA

Pi: 0.84 W

Li: 0 µH

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 of 7501A 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

Ex nA, ic installation:

Certificate DEKRA 15ATEX0058 X

Marking  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

Type of protection Ex nA

O-ring Sealing : Silicone
T4: $-40 \leq Ta \leq 85^{\circ}\text{C}$ T4 (7501A)
T4: $-40 \leq Ta \leq 80^{\circ}\text{C}$ T4 (7501B)
T6: $-40 \leq Ta \leq 60^{\circ}\text{C}$ T6

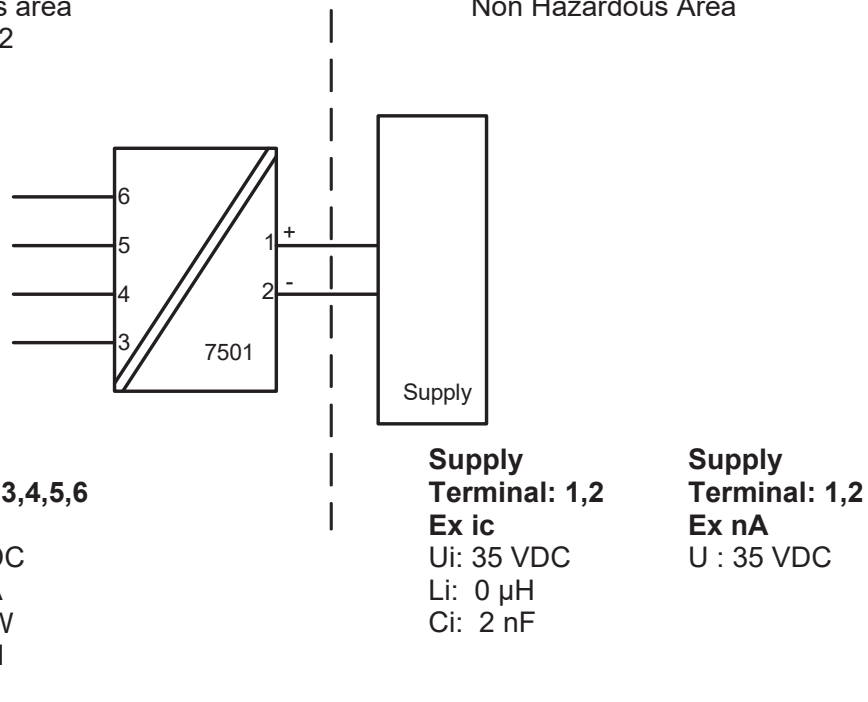
O-ring Sealing : FKM
T4: $-20 \leq Ta \leq 85^{\circ}\text{C}$ (7501A)
T4: $-20 \leq Ta \leq 80^{\circ}\text{C}$ (7501B)
T6: $-20 \leq Ta \leq 60^{\circ}\text{C}$

Type of protection Ex ic

T4: $-40 \leq Ta \leq 85^{\circ}\text{C}$ T100°C (7501A)
T4: $-40 \leq Ta \leq 80^{\circ}\text{C}$ T100°C (7501B)
T6: $-40 \leq Ta \leq 60^{\circ}\text{C}$ T85 °C

Hazardous area
Zone 2, 22

Non Hazardous Area



Ex nA, ic installation:

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

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

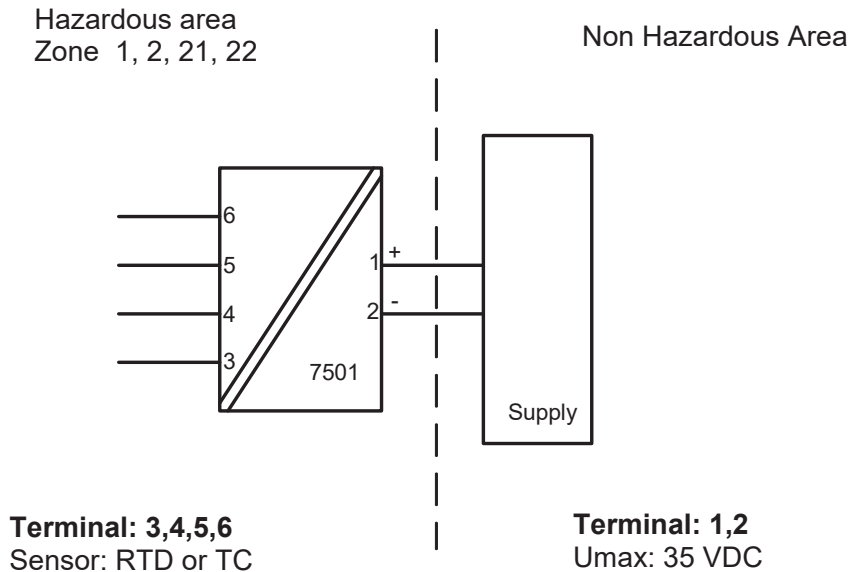
Type of protection Ex d

T4,T5: $-40 \leq Ta \leq 85^{\circ}\text{C}$ (7501A)
T4,T5: $-40 \leq Ta \leq 80^{\circ}\text{C}$ (7501B)
T6: $-40 \leq Ta \leq 70^{\circ}\text{C}$

Type of protection Ex tb

O-ring Sealing : Silicone
 $-40 \leq Ta \leq 85^{\circ}\text{C}$ T100°C (7501A)
 $-40 \leq Ta \leq 80^{\circ}\text{C}$ T100°C (7501B)
 $-40 \leq Ta \leq 70^{\circ}\text{C}$ T85°C

O-ring Sealing : FKM
 $-20 \leq Ta \leq 85^{\circ}\text{C}$ T100°C (7501A)
 $-20 \leq Ta \leq 80^{\circ}\text{C}$ T100°C (7501B)
 $-20 \leq Ta \leq 70^{\circ}\text{C}$ T85°C



Ex d, tb installation:

The transmitter is intended, either to be connected via a cable, or to be mounted directly onto a temperature sensing probe.

Only ATEX/IECEx equipment certified sensors, suitable for the application and correctly installed, may be mounted directly onto the Transmitter without additional certification of the combination.

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.

Unused cable entries must be sealed by the blanking elements 8550-xxx and 8551-xxx 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 90°C shall be used.

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.

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

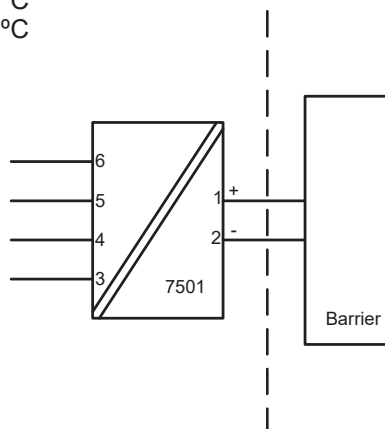
Marking
Ex ia IIC T6...T4 Ga
Ex ia IIIC T100°C Da
Ex ia I Ma (7501B)

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

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

T4: $-40 \leq T_a \leq 85^\circ\text{C}$ T100 °C (7501A)
T4: $-40 \leq T_a \leq 80^\circ\text{C}$ T100 °C (7501B)
T5: $-40 \leq T_a \leq 60^\circ\text{C}$ T75 °C
T6: $-40 \leq T_a \leq 45^\circ\text{C}$ T60 °C

Non Hazardous Area



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

Supply
Terminal: 1,2
Ui: 30 VDC
Ii: 120 mA
Pi: 0.84 W
Li: 0 µH
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 in this manual.

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

For installation of 7501A 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.

Ex nA, ic installation:

Certificate	IECEX DEK 15.0039 X
Marking	Ex nA IIC T6...T4 Gc Ex ic IIC T6...T4 Gc Ex ic IIIC T100°C Dc

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

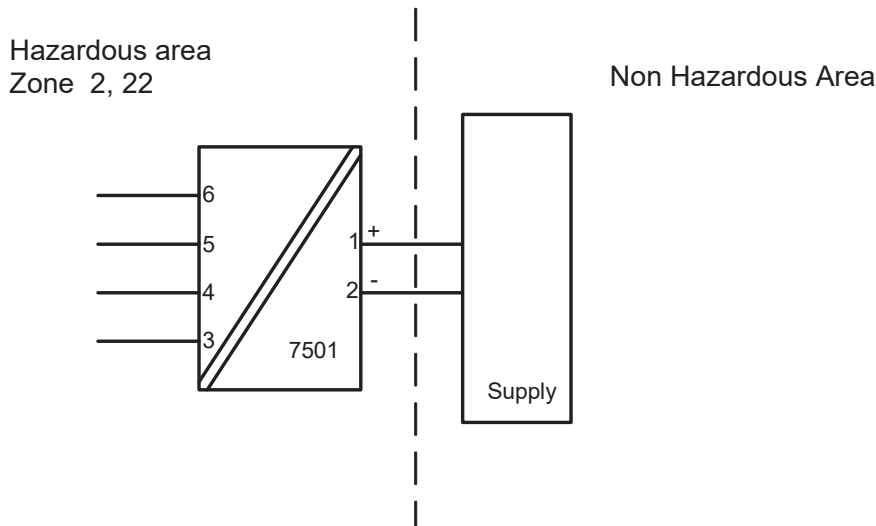
Type of protection Ex nA

O-ring Sealing : Silicone
T4: $-40 \leq Ta \leq 85^{\circ}\text{C}$ T4 (7501A)
T4: $-40 \leq Ta \leq 80^{\circ}\text{C}$ T4 (7501B)
T6: $-40 \leq Ta \leq 60^{\circ}\text{C}$ T6

O-ring Sealing : FKM
T4: $-20 \leq Ta \leq 85^{\circ}\text{C}$ (7501A)
T4: $-20 \leq Ta \leq 80^{\circ}\text{C}$ (7501B)
T6: $-20 \leq Ta \leq 60^{\circ}\text{C}$

Type of protection Ex ic

T4: $-40 \leq Ta \leq 85^{\circ}\text{C}$ T100°C (7501A)
T4; $-40 \leq Ta \leq 80^{\circ}\text{C}$ T100°C (7501B)
T6: $-40 \leq Ta \leq 60^{\circ}\text{C}$ T85 °C



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
Umax : 35 VDC

Ex nA, ic installation:

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

Ex d, tb installation:

Certificate IEC DEK 15.0039 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

Type of protection Ex d

T4,T5: $-40 \leq T_a \leq 85^\circ\text{C}$ (7501A)

T4,T5: $-40 \leq T_a \leq 80^\circ\text{C}$ (7501B)

T6: $-40 \leq T_a \leq 70^\circ\text{C}$

Type of protection Ex tb

O-ring Sealing : Silicone

$-40 \leq T_a \leq 85^\circ\text{C}$ T100°C (7501A)

$-40 \leq T_a \leq 80^\circ\text{C}$ T100°C (7501B)

$-40 \leq T_a \leq 70^\circ\text{C}$ T85°C

O-ring Sealing : FKM

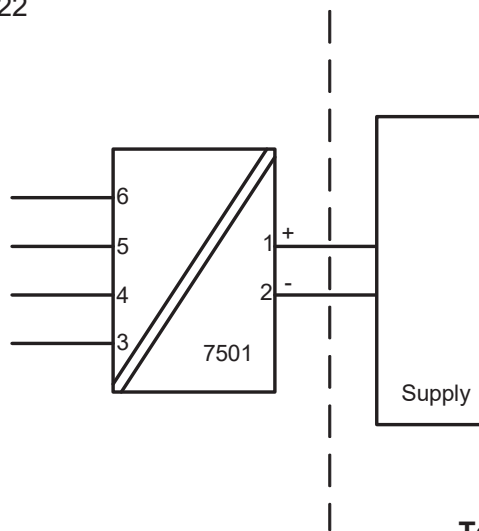
$-20 \leq T_a \leq 85^\circ\text{C}$ T100°C (7501A)

$-20 \leq T_a \leq 80^\circ\text{C}$ T100°C (7501B)

$-20 \leq T_a \leq 70^\circ\text{C}$ T85°C

Hazardous area
Zone 1, 2, 21, 22

Non Hazardous Area



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

Terminal: 1,2
U_{max}: 35 VDC

Ex d, tb installation

The transmitter is intended, either to be connected via a cable, or to be mounted directly onto a temperature sensing probe.

Only IECEx equipment certified sensors, suitable for the application and correctly installed, may be mounted directly onto the Transmitter without additional certification of the combination.

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 IEC60079-1/IEC60079-31

Unused cable entries must be sealed by the blanking elements 8550-xxx and 8551-xxx 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 90°C shall be used.

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.

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:

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

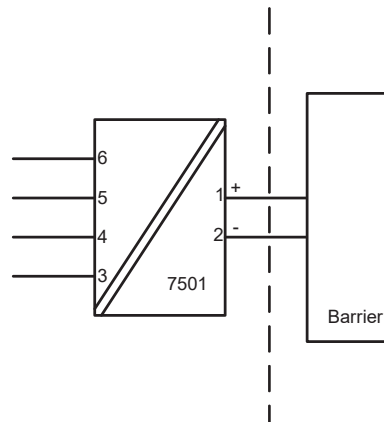
Non classified Location

T4: $-40 \leq T_a \leq 85^\circ\text{C}$ (7501A)
T4: $-40 \leq T_a \leq 80^\circ\text{C}$ (7501B)
T5: $-40 \leq T_a \leq 60^\circ\text{C}$
T6: $-40 \leq T_a \leq 40^\circ\text{C}$

Zone 20 Temperature Class:
 $-40 \leq T_a \leq 85^\circ\text{C}$ T100 °C (7501A)
 $-40 \leq T_a \leq 80^\circ\text{C}$ T100 °C (7501B)
 $-40 \leq T_a \leq 60^\circ\text{C}$ T75 °C
 $-40 \leq T_a \leq 40^\circ\text{C}$ T60 °C

Terminal: 1,2
U_i: 30 VDC
I_i: 120 mA
P_i: 0.84 W
L_i: 0 μH
C_i: 2 nF

Terminal: 3,4,5,6
U_o: 9.6 VDC
I_o: 28 mA
P_o: 67 mW
L_o: 35 mH
C_o: 3.5 μF



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

UM < 250V
V_{oc} or U_o < V_{max} or U_i
I_{sc} or I_o < I_{max} or I_i
P_o < P_i
C_a or C_o > C_i + C_{cabl}
L_a or L_o > L_i + L_{cabl}

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 $U_i(V_{MAX})$ and current $I_i(I_{MAX})$, and maximum power $P_i(P_{max})$, which the device can receive and remain intrinsically safe, must be equal to or greater than the voltage (U_o or V_{OC} or V_t) and current (I_o or I_{SC} or I_t) and the power P_o 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 U_o, V_{OC} or V_t and I_o, 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:

Applicable for (7501A and 7501B)

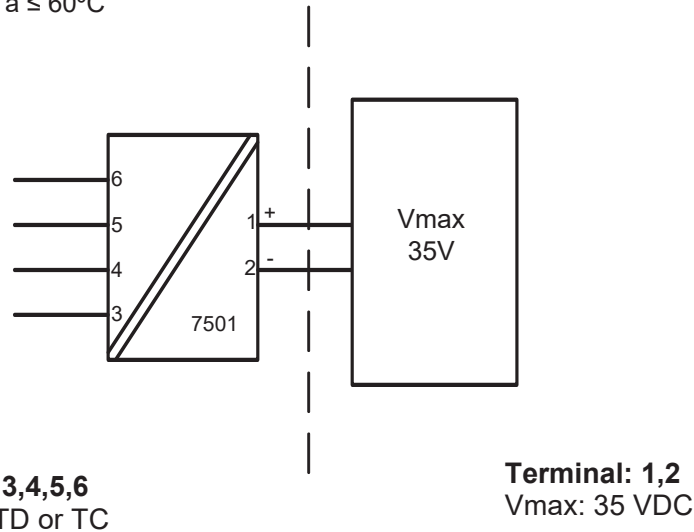
Hazardous classified Location
Class I,II,III ,Division 2, Groups, ABCDFG
Class I, Zone 2, IIC

Non classified Location

T4: $-20/-40 \leq T_a \leq 85^\circ\text{C}$ (7501A)

T4: $-20/-40 \leq T_a \leq 80^\circ\text{C}$ (7501B)

T6: $-20/-40 \leq T_a \leq 60^\circ\text{C}$



O-ring Sealings

Silicone rubber: $-40^\circ\text{C} \leq T_a \leq +85^\circ\text{C}$

FKM rubber: $-20^\circ\text{C} \leq T_a \leq +85^\circ\text{C}$

Protection: Indoor and Outdoor TYPE 4X or IP66

Explosion proof / Dust ignition proof installation

Applicable for (7501A)

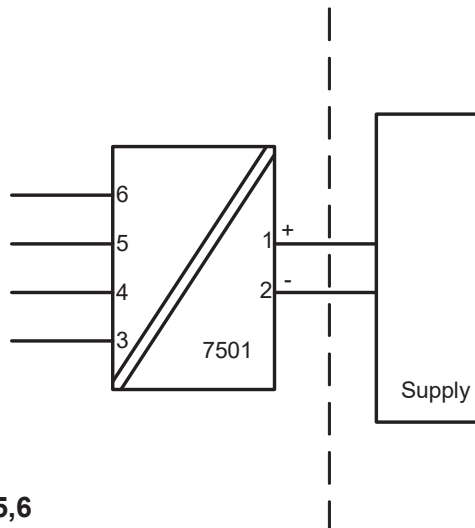
Hazardous area

Class I, II, III Division 1, Groups ABCDEFG

Class I Zone 1, Ex/AEx d IIC T6

Non Hazardous Area

T6: $-20 / -40 \leq T_a \leq 70^\circ\text{C}$
T5, T4: $-20 / -40 \leq T_a \leq 85^\circ\text{C}$



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

Terminal: 1,2
Umax: 35 VDC

O-ring Sealings

Silicone rubber: $-40^\circ\text{C} \leq T_a \leq +85^\circ\text{C}$

FKM rubber: $-20^\circ\text{C} \leq T_a \leq +85^\circ\text{C}$

Protection: Indoor and Outdoor Type 4X or IP66

Explosion proof / Dust ignition proof installation

Applicable for (7501A)

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 Loctite 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 the enclosure.

For Class I Zone I installation, conduit seal is required within 18 inches of the enclosure.

7501 CSA 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 that apply to this area.

Intrinsic Safe Installation / SÉCURITÉ INTRINSÈQUE , Exia

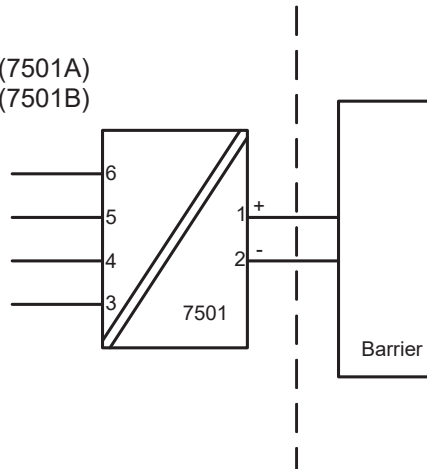
Applicable for (7501A.... and 7501B....).

Hazardous classified Location
Class I, Division 1, Groups, ABCD;
Class II, Group EFG;
Class III, Division 1.
Class I, Zone 0, IIC
Ex/AEx ia IIC Ga

T4: $-40 \leq T_a \leq 85^\circ\text{C}$ T100 °C (7501A)
T4: $-40 \leq T_a \leq 80^\circ\text{C}$ T100 °C (7501B)
T5: $-40 \leq T_a \leq 60^\circ\text{C}$ T75 °C
T6: $-40 \leq T_a \leq 45^\circ\text{C}$ T60 °C

Terminal: 3,4,5,6

Uo: 9.6 VDC
Io: 28 mA
Po: 67 mW
Lo: 35 mH
Co: 3.5 μF



Terminal: 1,2

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

Non classified Location

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

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

Warning

Substitution of components may impair intrinsic safety.

AVERTISSEMENT

LA SUBSTITUTION DE COMPOSANTS PEUT COMPROMETTRE LA SÉCURITÉ INTRINSÈQUE

The module must be installed according to the installation codes stipulated in the Canadian Electrical Code (CEC) or for US the National Electrical Code (NEC).

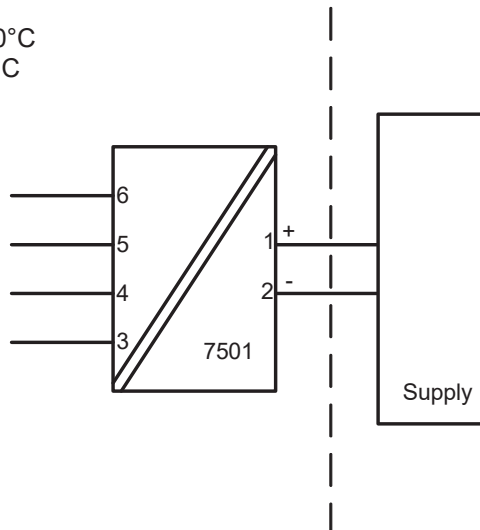
Explosion proof / Dust ignition proof installation:

Applicable for (7501A)

Non Hazardous Area

Explosion proof for Hazardous area
 Class I, Division 1, Groups ABCD;
 Class II, Division 1, Groups EFG;
 Class III
 Ex d IIC, Class I, Zone 1

T4,T5: $-20/-40 \leq Ta \leq 85^{\circ}\text{C}$ T100 $^{\circ}\text{C}$
 T6: $-20/-40 \leq Ta \leq 70^{\circ}\text{C}$ T85 $^{\circ}\text{C}$



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

Terminal: 1,2
 Umax: 35 VDC

O-ring Sealing

Silicone rubber: $-40^{\circ}\text{C} \leq Ta \leq +85^{\circ}\text{C}$
 FKM rubber: $-20^{\circ}\text{C} \leq Ta \leq +85^{\circ}\text{C}$

Explosion proof / Dust ignition proof installation:

Applicable for (7501A)

Conduit and sensor connections must be in NPT modified threads.

Only third party certified sensors suitable for Class I, Division 1, Groups ABCDEFG or Class I ,Zone 1 IIC may be attached to the Temperature Transmitter without additional approval of the combination.

For Class I Group A installation and Class I Zone 1 installation, conduit seal is required within 18 inches of enclosure.

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

The display cover must be screwed all the way in and the safety catch must be fastened before putting the module into service.

Do not open / remove front cover unless area is known to be safe.

The remote temperature sensor must comply with the requirements for installation in hazardous locations "Class I, Division 1 / Zone 1, Groups ABCD / IIC"

The remote temperature sensor must comply with the requirements for Ex d installation

Only certified cable and cable glands shall be used that are suitable for the application and correctly installed.

For protection according to Type 4X / IP66 use Loctite 577 on threads of sensor and cable glands.

The enclosure must be connected to the potential matching line

Unused cable entries must be sealed by the blanking elements supplied with the 7501 or other Ex certified blanking elements.

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.

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 Class II, III, 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.

7501 Desenho de Instalação INMETRO



Para instalação segura do 7501 o seguinte deve ser observado. O módulo deve ser instalado, apenas por pessoas qualificadas as quais estão familiarizadas com as normas nacionais e internacionais, diretrizes e padrões (IEC60079-14) que se aplicam a esta área.

Instalação Segura do Ex ia installation:

Certificado DEKRA 15.0014X

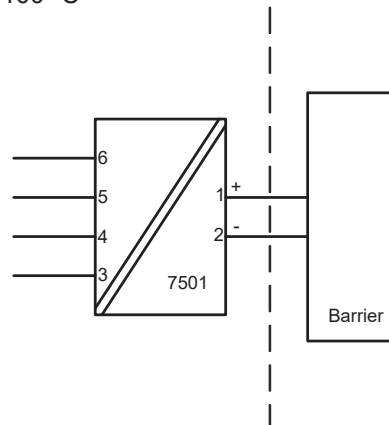
Marca Ex ia IIC T6...T4 Ga
Ex ia IIIC T100°C Da

Normas : ABNT NBR IEC 60079-0: 2013, ABNT NBR IEC 60079-11: 2013

Áreas Perigosas
Zona 0, 1, 2, 20, 21, 22

Áreas não perigosas

T4: $-40 \leq T_a \leq 85^\circ\text{C}$ T100 °C (7501A)
T4: $-40 \leq T_a \leq 80^\circ\text{C}$ T100 °C (7501B)
T5: $-40 \leq T_a \leq 60^\circ\text{C}$ T100 °C
T6: $-40 \leq T_a \leq 45^\circ\text{C}$ T100 °C



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

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

Instalação do Ex ia

Instruções de instalação gerais

O circuito do sensor não é infalivelmente galvânico-isolado do circuito de saída de alimentação. Contudo, a isolação galvânica entre os circuitos é capaz de resistir a teste de tensão de 500Vac durante 1 minuto.

O equipamento deve ser conectado à linha potencial correspondente

Se o transmissor estiver fisicamente conectado a uma possível fonte de calor ou resfriamento, por exemplo, através da montagem de um tubo de processo ou sensor de temperatura, a temperatura no ponto de conexão deve estar entre a faixa de temperatura ambiente determinada no certificado ou neste manual.

As entradas dos cabos e elementos de supressão devem ser usadas adequadamente para aplicação INMETRO, aprovada e instalada corretamente.

Para instalação 7501A em zona 0 / EPL Ga, se aplicam as seguintes instruções:

O transmissor deve ser instalado de modo que, mesmo em um evento raro de incidente, fontes de ignição devido a impactos e fricção, faíscas sejam evitadas.

O grau de proteção do IP 54 de acordo com a IEC 60529 é alcançado se o certificado prensa-cabos ou dispositivos de entrada de conduíte são usados e adequados para a aplicação e instalados corretamente.

O grau de proteção do IP 68 de acordo com a IEC 60529 é apenas alcançado se o certificado prensa-cabos ou dispositivos de entrada de conduíte são usados e adequados para aplicação e instalados corretamente com selos de vedação ou selante Loctite adicionados para as linhas do sensor, elementos de supressão e prensa-cabos.

Cuidado

Cuidados especiais devem ser tomados para evitar o acúmulo de carga eletrostática no equipamento devido ao repetitivo processo de carregamento, por exemplo, fluido de líquidos em alta velocidade, pós ou partículas de plásticos transportados pelo ar e outras cargas eletrostáticas para a superfície.

Instalação ic, Ex nA:

Certificado	DEKRA 15.0014X
Marca	Ex nA IIC T6...T4 Gc Ex ic IIC T6...T4 Gc Ex ic IIIC T100°C Dc

Normas: ABNT NBR IEC 60079-0: 2013, ABNT NBR IEC 60079-15: 2012

Ex nA

Anel de vedação O : Silicone
T4: $-40 \leq Ta \leq 85^{\circ}\text{C}$ T4 (7501A)
T4: $-40 \leq Ta \leq 80^{\circ}\text{C}$ T4 (7501B)
T6: $-40 \leq Ta \leq 60^{\circ}\text{C}$ T6

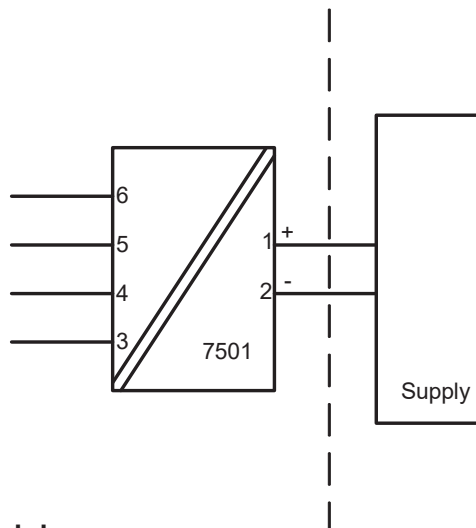
Anel de vedação O : FKM
T4: $-20 \leq Ta \leq 85^{\circ}\text{C}$ (7501A)
T4: $-20 \leq Ta \leq 80^{\circ}\text{C}$ (7501B)
T6: $-20 \leq Ta \leq 60^{\circ}\text{C}$

Áreas perigosas
Zona 2, 22

Ex ic

T4: $-40 \leq Ta \leq 85^{\circ}\text{C}$ T100°C (7501A)
T4: $-40 \leq Ta \leq 80^{\circ}\text{C}$ T100°C (7501B)
T6: $-40 \leq Ta \leq 60^{\circ}\text{C}$ T85 °C

Áreas não perigosas



Terminal do sensor: 3,4,5,6

Ex ic
Uo: 9.6 VDC
Io: 28 mA
Po: 67 mW
Lo: 45 mH
Co: 28 μF

Terminal de alimentação: 1,2

Ex ic
Ui: 35 VDC
Li: 0 μH
Ci: 2 nF

Terminal de alimentação: 1,2

Ex nA
U : 35 VDC

Instalação icx, Ex nA:

Para uma temperatura ambiente excedendo 70 °C, cabos resistentes ao calor e prensa-cabos adequados para pelo menos 90 °C devem ser usados.

Se o transmissor estiver fisicamente conectado a uma possível fonte de calor ou resfriamento, por exemplo, através da montagem de um tubo de processo ou sensor de temperatura, a temperatura no ponto de conexão deve estar entre a faixa de temperatura ambiente determinada no certificado ou neste manual.

As entradas dos cabos e elementos de supressão devem ser usadas adequadamente para a aplicação e instaladas corretamente.

O equipamento deve ser conectado à linha potencial correspondente

O torque aplicado no terminal de parafusos é no máximo 0.4 Nm em todos os terminais.

O grau de proteção do IP 54 de acordo com a IEC 60529 é alcançado se o certificado prensa-cabos ou dispositivos de entrada de conduíte são usados e adequados para a aplicação e instalados corretamente.

O grau de proteção do IP 68 de acordo com a IEC 60529 é apenas alcançado se o certificado prensa-cabos ou dispositivos de entrada de conduíte são usados e adequados para aplicação e instalados corretamente com selos de vedação ou selante Loctite adicionados para as linhas do sensor, elementos de supressão e prensa-cabos.

Cuidado

Cuidados especiais devem ser tomados para evitar o acúmulo de carga eletrostática no equipamento devido ao repetitivo processo de carregamento, por exemplo, fluido de líquidos em alta velocidade, pós ou partículas de plásticos transportados pelo ar e outras cargas eletrostáticas para a superfície

Instalação tb, Ex d:

Certificado DEKRA 15.0014X

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

Normas ABNT NBR IEC 60079-0: 2013, ABNT NBR IEC 60079-1: 2009,
ABNT NBR IEC 60079-31:2014

Ex d

T4,T5: $-40 \leq Ta \leq 85^{\circ}\text{C}$ (7501A)
T4,T5: $-40 \leq Ta \leq 80^{\circ}\text{C}$ (7501B)
T6: $-40 \leq Ta \leq 70^{\circ}\text{C}$

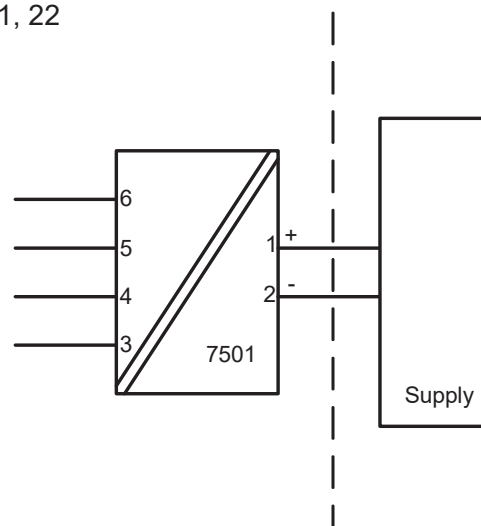
Ex tb

Anel de vedação O: Silicone
 $-40 \leq Ta \leq 85^{\circ}\text{C}$ T100°C (7501A)
 $-40 \leq Ta \leq 80^{\circ}\text{C}$ T100°C (7501B)
 $-40 \leq Ta \leq 70^{\circ}\text{C}$ T85°C

Anel de vedação O: FKM
 $-20 \leq Ta \leq 85^{\circ}\text{C}$ T100°C (7501A)
 $-20 \leq Ta \leq 80^{\circ}\text{C}$ T100°C (7501B)
 $-20 \leq Ta \leq 70^{\circ}\text{C}$ T85°C

Áreas perigosas
Zona 1, 2, 21, 22

Áreas não perigosas



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

Terminal: 1,2
Alimentação: 35 VDC

Instalação tb, Ex d:

O transmissor é destinado, quer para ser ligado através de um cabo, ou pode ser montado directamente sobre uma sonda de detecção de temperatura.

Sensores apenas INMETRO certificadas, apropriadas para a aplicação e instalado corretamente, pode ser montado diretamente sobre o transmissor sem certificação adicional da combinação.

Se o transmissor estiver fisicamente conectado a uma possível fonte de calor ou resfriamento, por exemplo, através da montagem de um tubo de processo ou sensor de temperatura, a temperatura no ponto de conexão deve estar entre a faixa de temperatura ambiente dada no certificado. O sensor deve ser adequado para ser usado como entrada de equipamento no equipamento Ex d e nenhum volume deve ser adicionado no enclosure do 7501.

Entradas de cabos não utilizadas devem ser selados pelas elementos de bloqueio 8550-xxx-xxx e 8551 fornecidos com o 7501 ou seladas pelo INMETRO aprovou elementos adequados para a aplicação.

O Sensor / Sonda aplicado deve ser adequado para a aplicação, instalado corretamente, e deve ser certificado pelo INMETRO.

O grau de proteção do IP 54 de acordo com a IEC 60529 é alcançado se o certificado Ex de prensa-cabos ou dispositivos de entrada de conduíte são usados e adequados para a aplicação e instalados corretamente.

O grau de proteção do IP 68 de acordo com a IEC 60529 é apenas alcançado se o certificado Ex de prensa-cabos ou dispositivos de entrada de conduíte são usados e adequados para aplicação e instalados corretamente com selos de vedação ou selante Loctite adicionados para as linhas do sensor, elementos de supressão e prensa-cabos.

A tampa do display deve ser parafusada em todos os pontos e o fecho de segurança deve ser ajustado antes de colocá-lo em serviço. Não abra a tampa do display até 30 minutos depois de desconectar a alimentação a fim de permitir que os capacitores internos descarreguem, ou não abra a tampa do display a menos que a área seja conhecida como segura.

Para uma temperatura ambiente que excede 70 °C, cabos resistentes a aquecimento e prensa-cabos adequados para pelo menos 90 °C devem ser usados.

O equipamento deve ser conectado em uma linha potencial correspondente.

Quando a faixa de temperatura do processo excede a faixa de temperatura de serviço ela deve ser verificada através de medições de temperatura no local, levando a pior condição em conta, que a temperatura de serviço não exceda a faixa do módulo.

Cuidado

Cuidados especiais devem ser tomados para evitar o acúmulo de carga eletrostática no equipamento devido ao repetitivo processo de carregamento, por exemplo, fluído de líquidos em alta velocidade, pós ou partículas de plásticos transportados pelo ar e outras cargas eletrostáticas para a superfície.

Nenhuma modificação no equipamento pelo cliente é permitida exceto o que é mencionado no manual ou no desenho de instalação.

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
102	1541	CSA, EU-RO marine, InMetro and NEPSI approvals added
103	1543	Assembly drawing added
104	1612	Installations drawings updated 2 items added under accessories
105	1634	New firmware - menu structure updated to enable PIN code access to menus

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