

2600T Pressure Transmitter family

User's Manual

364DS, 364PS, 364DD, 364DR, 364PR Models



Introduction and contacts

This manual is a guide to the operation and maintenance of the 364 Model _____s of the 2600T Series of Differential Pressure Transmitter. It includes information relevant to the initial configuration, calibration and troubleshooting.

With the purpose to support the Users the manual structure has been organized as the instrument lifecycle: opening the box, installation, configuration, operation and maintenance. Furthermore for each setting, the guidance is divided according to the type of tools that are available in order to carry out these activities: the local keys, the Digital LCD Integral Display, the Hand Held terminal and the PC with a suitable software (like Smart Vision).

In case of special applications, not covered by the examples, it is recommended first to get familiar with the functionality of the transmitter, as described in this manual.

In case of calibration or of troubleshooting, go directly to the relevant chapters.

In case of additional information needs please contact ABB at the address of last page of this manual or at the web site: <http://www.abb.com/pressure>.

Safety Notes



Health and Safety

To ensure that our products are safe and without risk to health, the following points must be noted:

1. The relevant sections of these instructions must be read carefully before proceeding.
2. Warning labels on containers and packages must be observed.
3. Installation, operation, maintenance and servicing must only be carried out by suitably trained personnel and in accordance with the information given. Any deviation from these instructions, will transfer the complete liability to the user.
4. Normal safety precautions must be taken to avoid the possibility of an accident occurring when operating in conditions of high pressure and/or temperature.
5. Chemicals must be stored away from heat, protected from temperature extremes and powders kept dry. Normal safe handling procedures must be used.
6. When disposing of chemicals ensure that no two chemicals are mixed.

Safety advice concerning the use of the equipment described in this manual or any relevant hazard data sheets (where applicable) may be obtained from the Company address on the back cover, together with servicing and spares information.



WARNING

Explosions can result in death or serious injury.

- Replace the electrical connection red plastic plugs delivered on the instrument with the appropriated plugs in the unused cable entry
- Do not remove the transmitter cover in potentially explosive atmosphere when the circuit is live.
- Fully engage transmitter cover to meet explosion-proof requirements and the degree of protection
- Before connecting a communicator in a potentially explosive atmosphere, make sure that the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.



WARNING

Electrical shock can result in death or serious injury. Avoid contact with the leads and terminals.



WARNING

Process leaks could result in death or serious injury.

- Be sure that the vents/drain valves are correctly installed and tighten before applying pressure.
- Do not attempt to loosen or remove the vents/drain valves while the transmitter is in service.



WARNING

Replacement equipment or spare parts not approved by ABB for use as spare parts could reduce the pressure retaining capabilities of the transmitter and may render the instrument dangerous. Use only components supplied or sold by ABB as spare parts.

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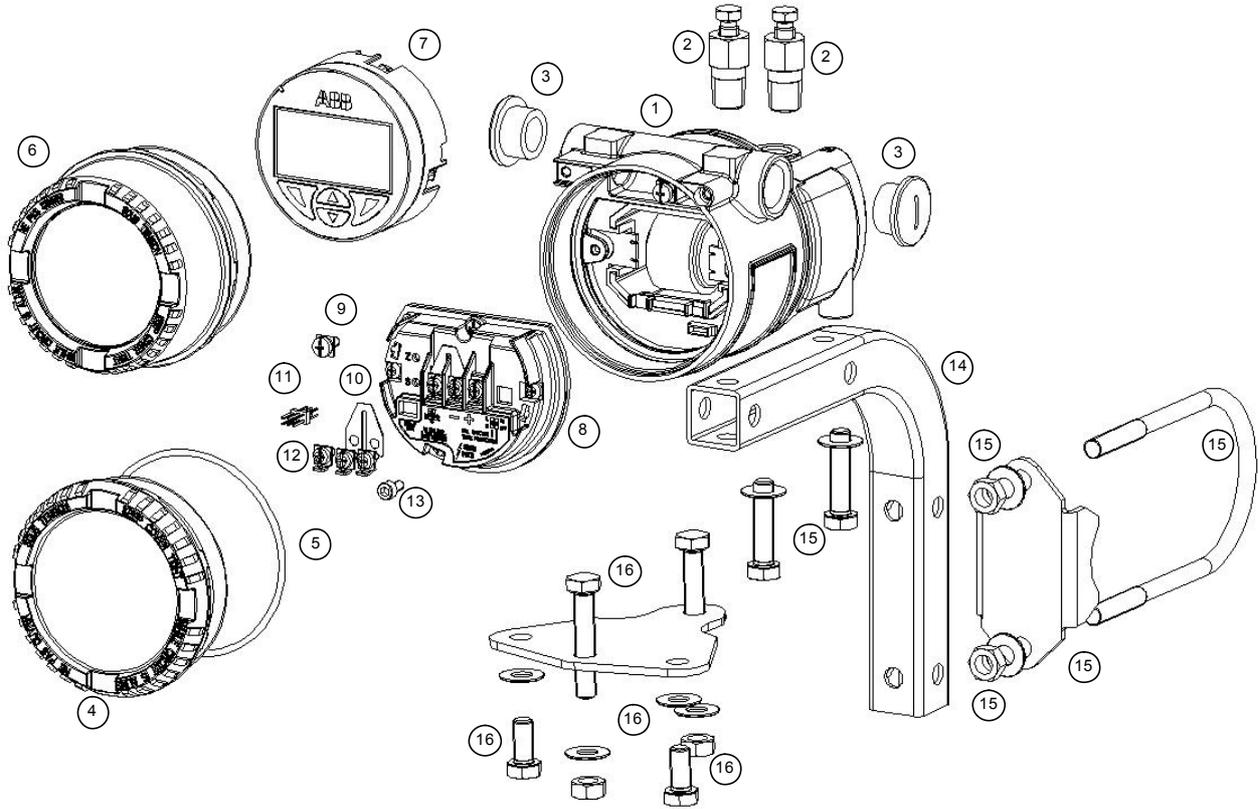
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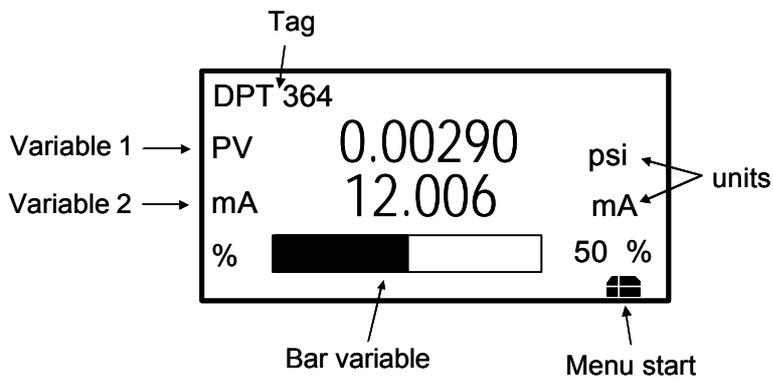
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Transmitter components overview



- | | |
|------------------------------------|-----------------------------------|
| 1. Transmitter | 9. Internal grounding screw |
| 2. Vents/Drain | 10. Terminal block link |
| 3. Plastic plug | 11. Digital LCD Display connector |
| 4. Blind cover | 12. Terminal block screws |
| 5. Cover gasket | 13. Cover locking screw |
| 6. Window cover | 14. Bracket |
| 7. Digital LCD Integral Display | 15. Tool set for pipe mounting |
| 8. Terminal block with electronics | 16. Tool set for wall mounting |



- Digital LCD display view -

Opening the box

Packaging content:

- Standard Transmitters (364DS model or 364PS model)

The transmitter package includes:

- The transmitter
- An envelope including the instruction manual and the calibration report
- Optional content depending on the selected options:
 - Football adapter to 1/2" NPT-f and gaskets
 - Bracket kit
 - Electrical connection blind plug

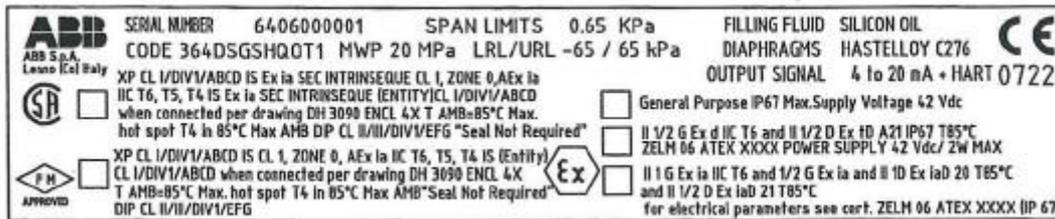
Identification

The instrument is identified by the data plates.

Nameplate

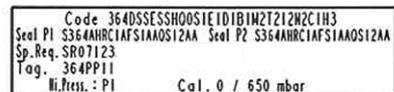
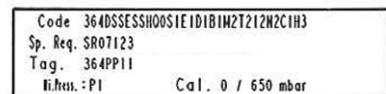
The Nameplate provides information concerning the model code number, maximum working pressure, range and span limits, power supply and output signal. See code/specification sheet for detailed information. This plate also shows:

- the transmitter serial number (please refer to this number in making inquiries)
- the specific details of the transducer (diaphragms material, fill fluid, range limit and identification number)
- the Safety Hazardous Area details (see the specific paragraph in this manual)



Tag plate

An additionally Tag plate, welded to the instrument, provides the customer tag number and the calibrated range. This plate includes also the code (s) of transmitter with relevant options and of seal(s) (if present), the special request code (if any) and the **High Pressure side (P2 as default)**.



Wired on plate (option I2)

Whenever the transmitter has been equipped with the option I2, a wired on SST plate with 4 lines, 32 characters per line will be supplied. The plate will be wired on the instrument with a SST wire.



Handling

The instrument does not require any special precautions during handling although normal good practice should be observed.

Storage

The instrument does not require any special treatment if stored as dispatched and within the specified ambient conditions (Type 2 to ANSI/ASME N45.2.2-1978).

There is no limit to the storage period, although the terms of guarantee remain as agreed with the Company and as given in the order acknowledgement.

Installation

Study these installation instructions carefully before proceeding. Failure to observe the warnings and instructions may cause a malfunction or personal hazard.



WARNING !

Before you begin read "Safety" on page 3.

As already specified in the Safety Notes the installation must only be carried out by suitably trained personnel and in accordance with the information given. Any deviation from these instructions, will transfer the complete liability to the user.

It is not recommended to install the transmitter and leave the cover open or the electrical input without the appropriate plugs. Water penetration can damage the electrical circuit.

Preparing for installation

Before installing the transmitter check its compatibility with the following measurement and safety requirements:

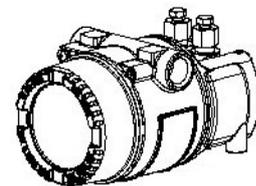
- Explosion protection
- Pressure rating (Maximum Working Pressure and measurement range)
- Operating voltage limits
- Process and ambient Temperature limits
- Environmental limits (EMC, vibration, others)
- Corrosion compatibility of transmitter wetted parts and process media

Mounting the transmitter

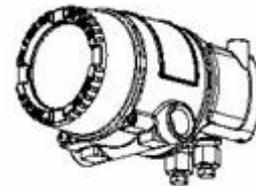
Position the process connection to enable process connections to be made.

It is important to mount the transmitter and to lay the process piping so that gas bubbles, when measuring liquids, or condensate when measuring gases, will flow back to the process and not enter the transmitter measuring chamber.

Vent/drain valves on the transmitter are located on the body. The transmitter and these drain/vent valves have to be located **higher** than the taps on liquid service in order to allow the venting of entrapped gas or **below** the taps on gas service in order to allow the air vent off or condensate to drain off.

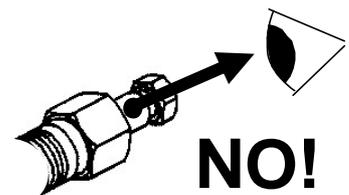


Vent installation



Drain installation

For safety reasons, take care of the drain/vent valves position so that when the process fluid is removed during the drain/vent operation it is directed down and away from technicians. It is recommended to mount the transmitter to prevent this possible source of damage for unskilled operators.



In addition, consider the need for a testing or calibration input, and provide space for the housing cover to be removed for electrical wiring and maintenance.



WARNING !

Process leaks may cause harm or result in death. Install and tighten process connectors and all accessories (including manifolds) before applying pressure.

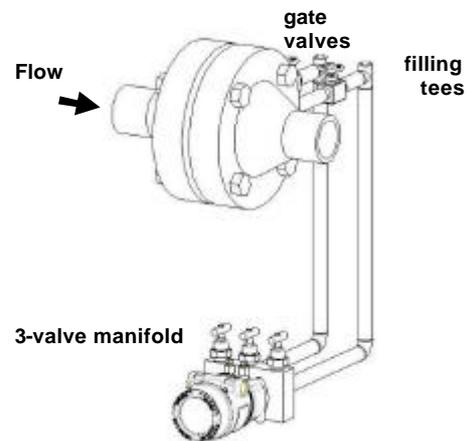
In case of toxic or other dangerous process fluid, take all precautions as recommended in the relevant Material Safety Data Sheet when draining or venting.

Use only a 12 mm (15/32 ") hexagonal spanner to tighten the bracket bolts

Application related recommendation

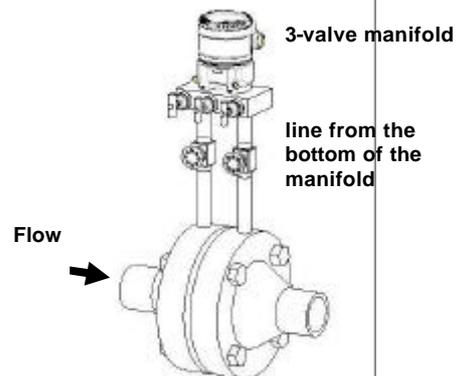
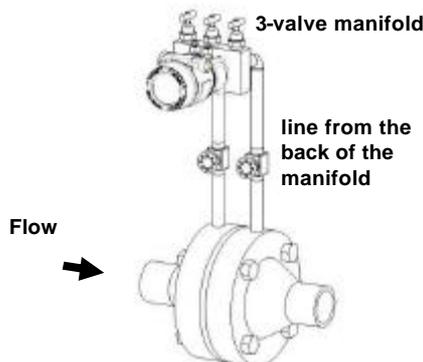
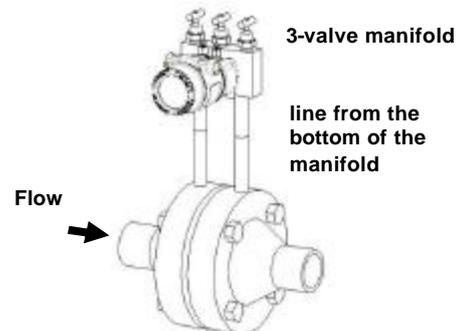
Flow measurement with clean liquids or steam (condensable vapor)

1. Place taps to the side of the line.
2. Mount the drain/vent valve upward.
3. In case of steam application fill the vertical section of the connecting lines with a compatible fluid through the dedicated filling tees.



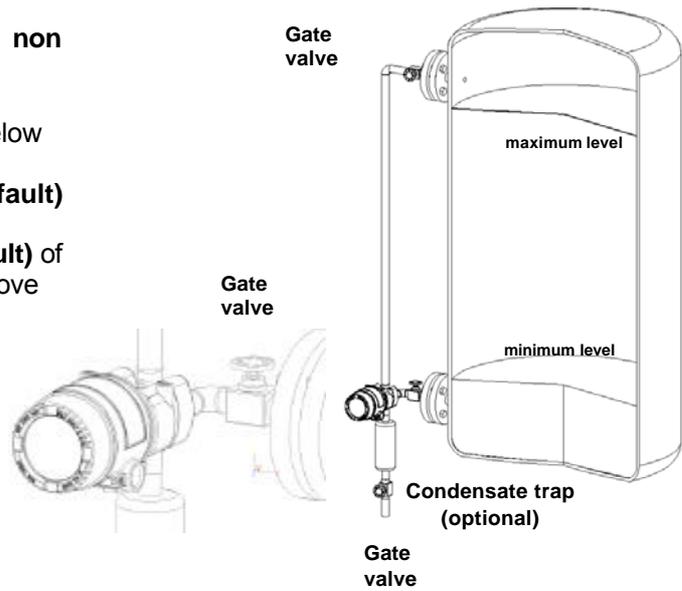
Flow measurement with gas or liquids with solids in suspension

1. Place taps in the top of the line
2. Mount the transmitter above the taps



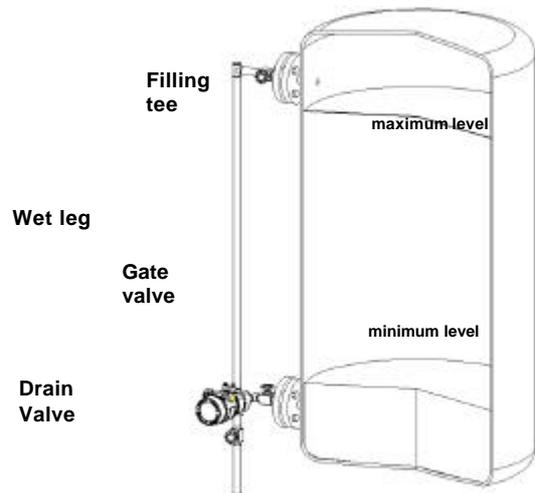
Level measurement with closed tanks and non condensable fluids (dry leg)

1. Mount the transmitter at the same height or below the lowest level to be measured.
2. Connect the **High Pressure Side (P2 as default)** of the transmitter to the bottom of the tank
3. Connect the **Low Pressure Side (P1 as default)** of the transmitter to the upper part of the tank, above the maximum level of the tank.



Level measurement with closed tanks and condensable fluids (wet leg)

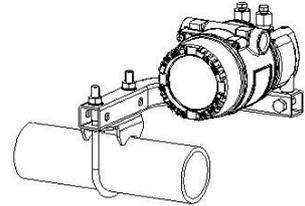
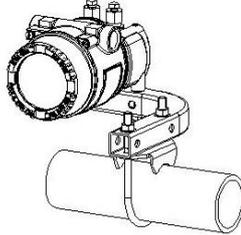
1. Mount the transmitter at the same height or below the lowest level to be measured.
2. Connect the **High Pressure Side (P2 as default)** of the transmitter to the bottom of the tank
3. Connect the **Low Pressure Side (P1 as default)** of the transmitter to the upper part of the tank.
4. Fill the vertical section of the connecting line to the upper part of the tank with a compatible liquid through the dedicated filling tee.



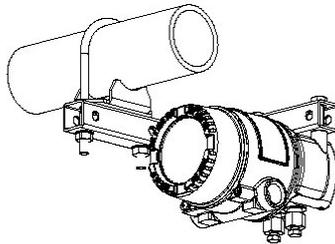
Pipe mounting

In this chapter you can find some suggestions for pipe mounting. These suggestions shall not limit alternative solutions that the end user can define himself.

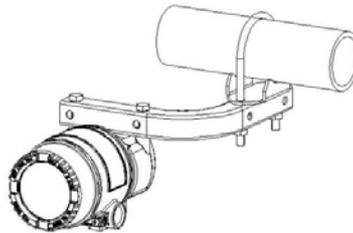
Horizontal pipe
Horizontal bracket
Transmitter on the back
Vent position



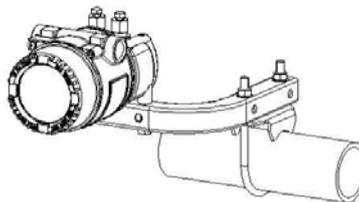
Horizontal pipe
Horizontal bracket
Transmitter on the back
Drain position



Horizontal pipe
Horizontal bracket
Transmitter on the front
Drain position



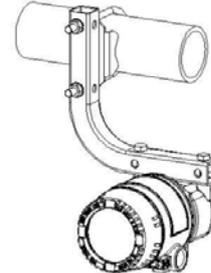
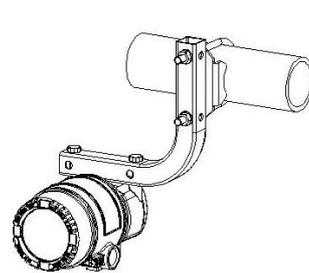
Horizontal pipe
Horizontal bracket
Transmitter on the front
Vent position



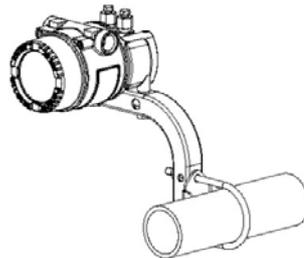
Horizontal pipe
Vertical bracket
Transmitter on the front
Vent position



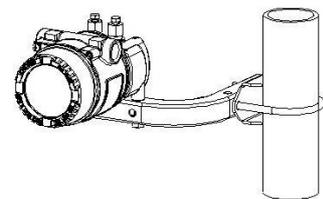
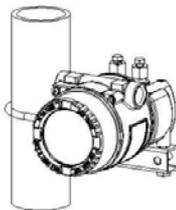
Horizontal pipe
Vertical bracket
Transmitter on the front
Drain position



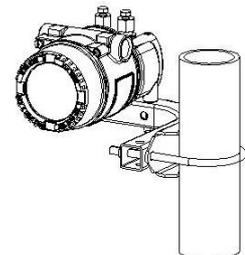
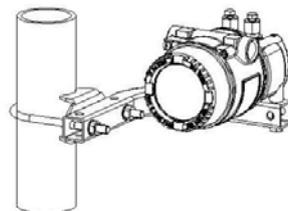
Horizontal pipe
Perpendicular bracket
Vent position



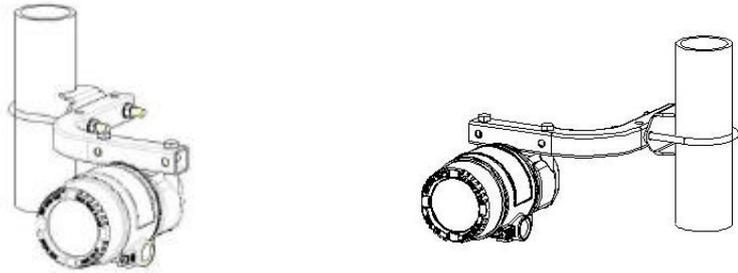
Vertical pipe
Perpendicular bracket
Transmitter on the front
Vent position



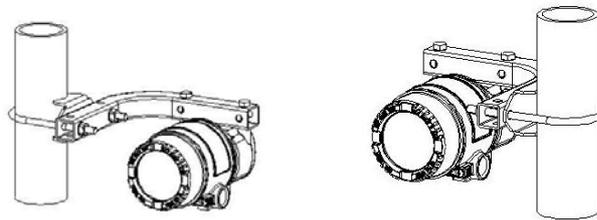
Vertical pipe
Perpendicular bracket
Transmitter on the back
Vent position



Vertical pipe
Perpendicular bracket
Transmitter on the front
Drain position

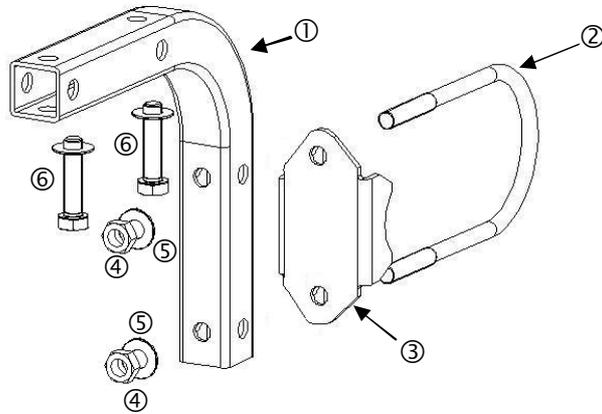


Vertical pipe
Perpendicular bracket
Transmitter on the back
Drain position



Pipe mounting instruction

1. Fix the bracket ① in the defined position on the pipe using the tool ② and the adapter ③ to guarantee the best mechanical performances of the assembly
 2. Tight the nuts ④ with the washers ⑤ below them in order to fix the bracket (the torque value shall be 10 Nm - 12 Nm)
- Fix the Pressure transmitter using the two screws ⑥ in the package; (the torque value shall be 1 Nm ± 0.2 Nm)



Wall mounting

In this chapter you can find suggestions for wall mounting. These suggestions shall not limit alternative solutions that the end user can define himself.

Wall mounting

Vertical bracket

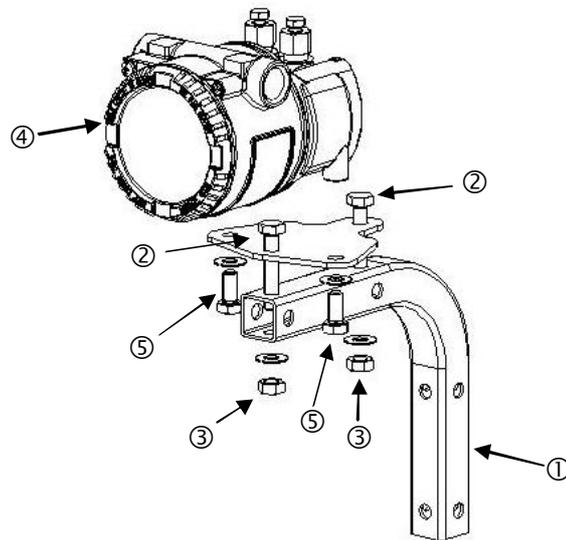
Drain position (left)

Vent position (right)



Wall mounting instruction

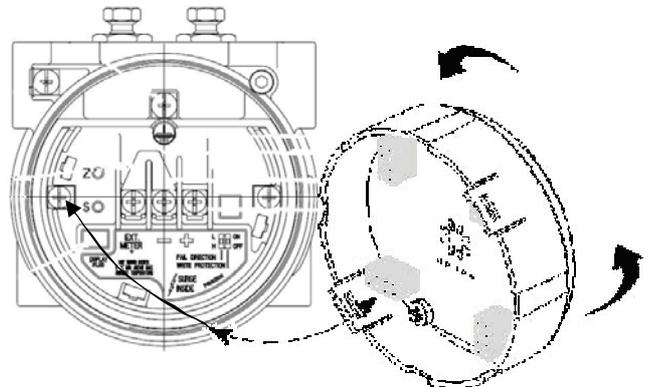
1. Fix the bracket ① at the wall in the final position
2. Connect the instrument interface using the two long screws ② and bolts ③ in the package (the torque value shall be between 10 Nm and 12 Nm)
3. Fix the Pressure transmitter ④ using the two short screws ⑤ in the package (the torque value shall be between 10 Nm and 12 Nm)



The use of the washes as indicated in the picture is strongly recommended

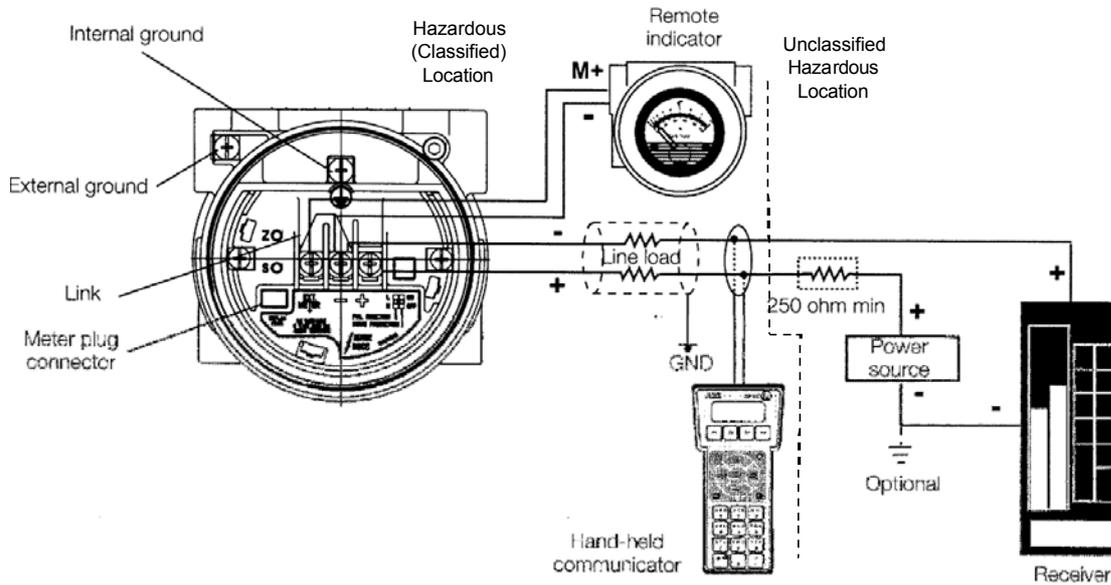
Digital LCD Integral Display positioning

In case the optional integral display meter is installed, it is possible to mount the display in four different positions rotated clockwise or counter clockwise with 90° steps. This is possible by using one of the four connections located on the back of the display at a 90° angle each from the other.



Wiring

HART hand-held communicator may be connected at any wiring termination point in the loop, provided the minimum resistance is 250 ohm. If this is less than 250 ohm, additional resistance should be added to allow communications.



Wiring requirements

For signal / power connection use twisted, stranded pairs of wiring no 18 to 22 AWG / 0.8 to 0.35 mm² Ø up to 5,000 feet (1 500 meters). Longer loops require larger wire.

If a shielded wire is used the shield should be grounded only at one end, not both ends. In case of wiring at transmitter end, use the terminal located inside the housing marked with the symbol: ⊕

Protective Earthing

Wire this ground connection marked with the symbol ⊕ to a suitable earth ground. For a transmitter measuring loop an earth ground should maintain a resistance of 5 ohms or less. Use a heavy conductor, at least 15 AWG / 1,6 mm² Ø



WARNING !

A protective grounding connection is absolutely necessary to insure personnel protection, to protect against surge and to prevent explosions in potentially explosive atmosphere.



WARNING !

The surge protection is always present and if the transmitter is installed in a Hazardous classified location, it must be powered from a voltage source isolated from mains (galvanic separation). Furthermore the potential equalization for the entire powering cable must be guaranteed since the intrinsic safety circuit of the transmitter is grounded.

Electrical connection



WARNING !

Do NOT make electrical connections unless the electrical code designation stamped on the transmitter data plate agrees with the classification of the area in which the transmitter is to be installed. Failure to comply with this warning can result in fire or explosion.

The 4 to 20 mA output signal and the dc power supply to the transmitter are carried from the same pairs of wires. The supply voltage at the transmitter terminals must be between the limits of 10.5 and 42V dc. For intrinsically safe approval EEx ia supply must not exceed 30 Vdc. In some countries the maximum power supply voltage is limited to a lower value.



WARNING !

Electrical shock can result in death or serious injury. Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock.

Follow these steps to wire the transmitter:

1. Remove the red temporary plastic plug from one of the two electrical connection ports located at both sides in the upper part of the transmitter housing
2. These connection ports have a ½ inch internal NPT or CM20 x 1.5 mm threads. Various adaptors and bushings can be fitted to these threads to comply with plant wiring (conduit) standards.
3. Remove the housing cover.



WARNING !

In an Explosion-Proof/Flame-Proof installation, do not remove the transmitter covers when power is applied to the unit. Remove the power supply and continue the operation

4. Run wiring through the open port
5. Connect the positive lead to the + terminal, and the negative lead to the - terminal



WARNING !

Note: Do not connect the power across the test terminals. Power could damage the diode in the test connection.

Plug and seal the electrical ports. Make sure that when the installation has been completed, the electrical ports are properly sealed against entry of water and corrosive vapors and gases.



WARNING !

Cables, cable gland and unused port plug must be in accordance with the intended type of protection (e.g. intrinsically safe, explosion proof, etc.) and degree of protection (e.g. IP6x or NEMA 4x). In particular, for explosion proof installation, plug the unused opening with a plug certified for explosion containment.

6. If applicable, install wiring with a drip loop. Arrange the drip loop so the bottom is lower than the conduit connections and the transmitter housing.
7. Install the housing cover, turn it to seat O-ring into the housing and then continue to hand tighten until the cover contacts the housing metal-to-metal. In EEx d (Explosion Proof) installation, lock the cover rotation by turning the set nut (use the 2 mm Allen key supplied with the instrument).
8. Replace the temporary red plastic plug on the second electrical connection port located in the upper part of the transmitter housing with the appropriate plug depending on the certification requirement or degree of protection (e.g. IP6x or NEMA 4x)

For further information find the relevant instruction manuals www.abb.com or from local ABB representatives.

Remote Meter wiring

Before starting the Remote Meter wiring be sure that the transmitter has been wired according to the previous paragraph instructions.



WARNING !

Electrical shock can result in death or serious injury. Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock.

Follow these steps to wire the Remote Meter:

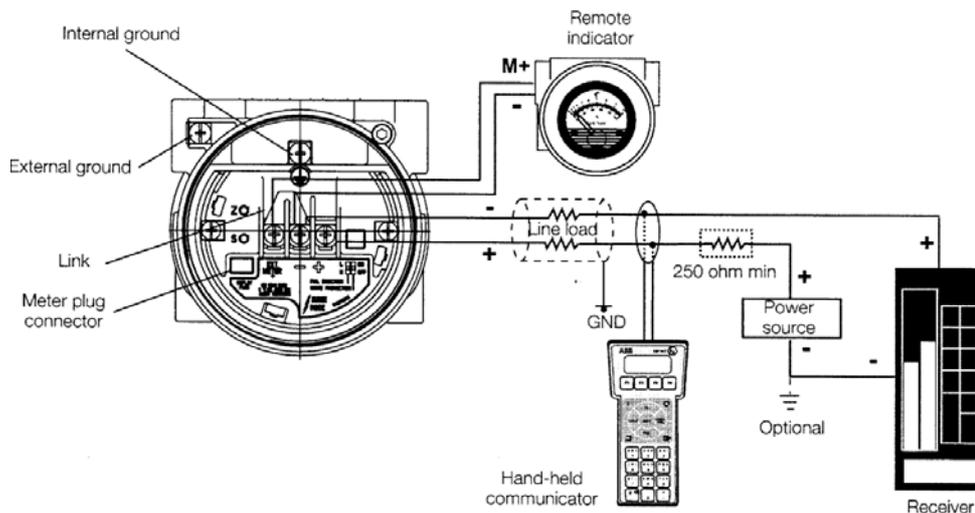
1. Remove the housing cover.



WARNING !

In an Explosion-Proof/Flame-Proof installation, do not remove the transmitter covers when power is applied to the unit. Remove the power supply and continue the operation

2. Run wiring through the same port of the electrical connection or the other port removing the plug.
3. Connect the positive lead of the remote meter to the “EST METER +” terminal, and the negative lead to the “-” terminal.



4. Plug and seal the ports. Make sure that when the installation has been completed, the ports are properly sealed against entry of water and corrosive vapors and gases.



WARNING !

Cables, cable gland and unused port plug must be in accordance with the intended type of protection (e.g. intrinsically safe, explosion proof, etc.) and degree of protection (e.g. IP6x or NEMA 4x). In particular, for explosion proof installation, plug the unused opening with a plug certified for explosion containment.

5. Install the housing cover, turn it to seat O-ring into the housing and then continue to hand tighten until the cover contacts the housing metal-to-metal. In EEx-d (Explosion Proof) installation, lock the cover rotation by turning the set nut (use the 2 mm Allen key supplied with the instrument).

For further information find the relevant instruction manuals searching for the keyword "IM/*36*" on www.abb.com or from local ABB representatives.

Check the installation

Before applying power and pressure, perform the following checks.

Ö	Check
	Installation environment conforms to the transmitter specification for ambient conditions
	The transmitter is mounted securely
	The transmitter is properly grounded
	The input power voltage matches the transmitter nominal input voltage
	The plugs/vents and process connections are tightened as specified
	The proper electrical adapter are installed and are tightened as specified
	The red plug on the electrical input not used is replaced with a proper plug
	The cover is tightened up to metal to metal contact with the housing
	All the requirements are satisfied if the transmitter is working in hazardous area

Apply power

The transmitter will start up automatically at the power up.

Start up

The transmitter has default parameter settings that are sufficient for many situations and start up of the instrument. However, review the configuration chapter for the default parameter settings values and the parameter changes procedures.

Configuration

Default configuration

The data default configuration at the product delivery is the following:

Pressure Polarity:	P2 High pressure
Damping:	1 second
Units:	kPa
LRV:	0 kPa
URV:	equal to URL
Totalizer:	OFF
Transfer function:	linear
Hardware setting:	Write protect mode in OFF, Failsafe direction High
Low saturation current:	3.8 mA
High saturation current:	20.5 mA
Low fail current:	3.7 mA
High fail current:	22 mA

Easy Setup

To facilitate commissioning the 364 Display has the capability to run a sequence of predefined setup steps with the main configuration settings.

When you start the Easy Setup you must continue up to the end to exit.

To start the Easy Setup:

Navigate the Digital LCD Integral Display menu, select **Easy Setup**.

☞ Digital LCD Integral Display Keys sequence to start the Easy Setup: 1

Define the language

If the desired language is different from the indicated language select **Edit** then scroll the desired language (see the following table) with the up and down keys and confirm with **OK**. Select **Next** to continue.

English
German

Spanish
French

Italian

Define the Pressure Polarity

If the desired High Pressure side is different from the indicated select **Edit** then scroll the desired High Pressure side (see the following table) with the up and down keys and confirm with **OK**. Select **Next** to continue.

P2 = High pressure

the high pressure side is the pressure chamber indicated as P2 on the transmitter body. The output pressure will be P2 – P1

P1 = High pressure

the high pressure side is the pressure chamber indicated as P1 on the transmitter body. The output pressure will be P1 – P2

Define the Engineering Unit

If the desired Engineering Unit is different from the indicated, select **Edit** then scroll the desired unit (see the following table) with the up and down keys and confirm with **OK**. Select **Next** to continue.

<i>mbar</i>	millibar	<i>mmH2O°C</i>	millimeter of water at 4 degrees Celsius
<i>g/cm²</i>	grams per square centimeter	<i>inH2O°F</i>	inches of water at 68 degrees Fahrenheit (20°C)
<i>Kg/cm²</i>	kilo grams per square centimeter	<i>inHg°C</i>	inches of mercury at 0 degrees Celsius
<i>Pa</i>	pascal	<i>ftH2O°F</i>	feet of water at 68 degrees Fahrenheit (20°C)
<i>kPa</i>	kilopascal	<i>mmH2O°F</i>	millimeter of water at 68 degrees Fahrenheit (20°C)
<i>torr</i>	torr	<i>mmHg°C</i>	millimeter of mercury at 0 degrees Celsius
<i>atm</i>	atmosphere	<i>psi</i>	pounds per square inch
<i>MPa</i>	Megapascal	<i>bar</i>	bars
<i>inH2O°C</i>	inches of water at 4 degrees Celsius		

Define the Lower Range value (LRV)

If the desired LRV is different from the indicated select *Edit*, scroll the desired value for the digit in reverse color with the up and down keys and confirm with *Next*. Repeat the operation for the seven digits and confirm with *OK*. Select *Next* to continue.

Note: the minimum and the maximum allowed values are indicated on the display .

Define the Upper Range Value (URV)

If the desired URV is different from the indicated select *Edit*, scroll the desired value for the digit in reverse color with the up and down keys and confirm with *Next*. Repeat the operation for the seven digits and confirm with *OK*. Select *Next* to continue.

Note: the minimum and the maximum allowed values are indicated on the display .

Define the Transfer Function Type

If the desired Transfer Function is different from the indicated select *Edit* then scroll the desired Transfer Function (see the following table) with the up and down keys and confirm with *OK*. Select *Next* to continue.

Linear

$$\text{Output} = x$$

Square Root

$$\text{Output} = x^{1/2}$$

3/2

$$\text{Output} = x^{3/2}$$

5/2

$$\text{Output} = x^{5/2}$$

Polynomial

$$\text{Output} = A_0 + A_1 x + A_2 x^2 + A_3 x^3 + A_4 x^4 + A_5 x^5$$

Double Poly

$$\left\{ \begin{array}{ll} \text{Output} = B_0 + B_1 x + B_2 x^2 & \text{if } x \leq k \\ \text{Output} = C_0 + C_1 x + C_2 x^2 & \text{if } x > k \end{array} \right.$$

*Bidirectional Flow**Define the Linearization Point*

If the desired Linearization Point for the Square Root Transfer Function is different from the indicated select *Edit*, scroll the desired value for the digit in reverse colour with the up and down keys and confirm with *Next*. Repeat the operation for the five digits and confirm with *OK*. Select *Next* to continue.

Note: the minimum and the maximum values to introduce is indicated on the display .

Define the Low Flow Cut Off

If the desired Low Flow Cut Off for a Flow Transfer Function is different from the indicated select *Edit*, scroll the desired value for the digit in reverse colour with the up and down keys and confirm with *Next*. Repeat the operation for the five digits and confirm with *OK*. Select *Next* to continue.

Note: the minimum and the maximum values to introduce is indicated on the display .

Run the Zero Scaling

In case a Zero Scaling is required apply the pressure for the Zero and select *OK*. Wait for the auto-set end (the bargraph will indicate the working progress). Select *Next* to continue.

Define the Damping

If the desired Damping is different from the indicated value change it with the up and down keys and confirm with *OK*.

HART Configuration

Basic Configuration Functions

This chapter describes some additional functions provided by the 364xS models which are unique to the 2600T pressure transmitter family.

Set the Pressure Polarity

When a pressure polarity different from default value (P2 – P1) is needed, it is possible to change it following one of the methods described in the next paragraphs.



Caution

In case the Pressure Polarity is changed and the Range Value (LRV or URV) is different from the Range Limit (LRL or URL) it is recommended to trim the 364XS sensor with pressure to obtain the maximum accuracy (see the relevant paragraph in this User's Manual) .

Set the Pressure Polarity by Digital LCD Integral Display

Navigate the Digital LCD Integral Display menu, select **Device Config > Pressure Polarity**, and the used High Pressure side is indicated. To change it select **Edit** then scroll the desired High Pressure side (see the following table) with the up and down keys and confirm with **OK**.

P2 = High pressure

the high pressure side is the pressure chamber indicated as P2 on the transmitter body. The output pressure will be P2 – P1

P1 = High pressure

the high pressure side is the pressure chamber indicated as P1 on the transmitter body. The output pressure will be P1 – P2

☞ Digital LCD Integral Display Keys sequence to set the Pressure Polarity: 2 – 5 – Edit

Set the Pressure Polarity by HHT

Changing the Pressure Polarity by Hand Held Terminal (HHT) is available. Please refer to the device manual for the appropriated operations.

Set the Pressure polarity by PC

Changing the Pressure Polarity by PC is available using dedicated Software . ABB can provide the references and the Software. Please refer to the Software instructions for the appropriate operations.

Set the Damping

When damping different from default value is needed, it is possible to set its value in seconds following one of the methods described in the next paragraphs.

Set the Damping configuration by Digital LCD Integral Display

Navigate the Digital LCD Integral Display menu, select **Device Config > Damping**, set the desired value with the up and down keys and confirm with **OK**.

☞ Digital LCD Integral Display Keys sequence to set the Damping: 2 – 3

Set the Damping configuration by CoMeter

Damping configuration by CoMeter is available with the 695 Field Indicator . Please refer to the device manual for the appropriate operations.

Set the Damping configuration by HHT

Damping configuration by Hand Held Terminal is available . Please refer to the device manual for the appropriate operations.

Set the Damping configuration by PC

Damping configuration by PC is available using dedicated Software. ABB can provide the references and the Software. Please refer to the Software instructions for the appropriate operations.

Set the Units

To monitor the process using the appropriate units follow one of the methods described in the next paragraphs.

Set the Units by Digital LCD Integral Display

To change the unit in the Digital LCD Integral Display

Navigate the Digital LCD Integral Display menu, select **Display** > **Display Settings** > **Display Eng. Unit**, and the possible Engineering variables will be available. To select the type, push **Edit** and scroll with a up and down keys; confirm with **OK**.

Pressure

Temperature

Flow

Mass & Volume

Density

Level

Other

Custom Unit

The in-use unit for the type will be available. To modify select **Edit** then scroll the desired unit (see the following tables) with the up and down keys and confirm with **OK**.

Units for Pressure variable

<i>mbar</i>	millibar	<i>mmH2O°C</i>	millimeter of water at 4 degrees Celsius
<i>g/cm²</i>	grams per square centimeter	<i>inH2O°F</i>	inches of water at 68 degrees Fahrenheit (20°C)
<i>Kg/cm²</i>	kilo grams per square centimeter	<i>inHg°C</i>	inches of mercury at 0 degrees Celsius
<i>Pa</i>	pascal	<i>ftH2O°F</i>	feet of water at 68 degrees Fahrenheit (20°C)
<i>kPa</i>	kilopascal	<i>mmH2O°F</i>	millimeter of water at 68 degrees Fahrenheit (20°C)
<i>torr</i>	torr	<i>mmHg°C</i>	millimeter of mercury at 0 degrees Celsius
<i>atm</i>	atmosphere	<i>psi</i>	pounds per square inch
<i>MPa</i>	Megapascal	<i>bar</i>	bars
<i>inH2O°C</i>	inches of water at 4 degrees Celsius		

Units for Temperature variable

<i>°C</i>	degree Celsius
<i>°F</i>	degree Fahrenheit
<i>°R</i>	degree Rankine
<i>K</i>	Kelvin

Units for Flow variable

<i>m³/h</i>	cubic meter per hour	<i>lb/d</i>	pound per day
<i>gal/s</i>	US gallons per second	<i>STon/min</i>	short ton per minute
<i>Mgal/d</i>	mega US gallons per day	<i>STon/h</i>	short ton per hour
<i>L/s</i>	liter per second	<i>STon/d</i>	short ton per day
<i>ML/d</i>	megaliter per day	<i>LTon/h</i>	long ton per hour
<i>CFS</i>	cubic feet per second	<i>LTon/d</i>	long ton per day
<i>ft³/d</i>	cubic feet per day	<i>Nm³/h</i>	Normal cubic meter per hour
<i>m³/s</i>	cubic meter per second	<i>NL/h</i>	Normal liter per hour
<i>m³/d</i>	cubic meter per day	<i>SCFM</i>	standard cube feet per minute
<i>ImGal/h</i>	Imperial Gallons per hour	<i>CFH</i>	cubic feet per hour
<i>ImGal/d</i>	Imperial Gallons per day	<i>m³/min</i>	cubic meter per minute
<i>g/s</i>	gram per second	<i>bbbl/s</i>	barrel per second
<i>g/min</i>	gram per minute	<i>bbbl/min</i>	barrel per minute
<i>g/h</i>	gram per hour	<i>bbbl/h</i>	barrel per hour
<i>kg/s</i>	kilogram per second	<i>bbbl/d</i>	barrel per day
<i>kg/min</i>	kilogram per minute	<i>gal/h</i>	US gallon per hour
<i>kg/h</i>	kilogram per hour	<i>ImGal/s</i>	Imperial gallon per second
<i>kg/d</i>	kilogram per day	<i>L/h</i>	liter per hour
<i>t/min</i>	ton per minute	<i>gal/d</i>	US gallon per day
<i>t/h</i>	ton per hour	<i>CFM</i>	cubic feet per minute
<i>t/d</i>	ton per day	<i>GPM</i>	US gallon per minute
<i>lb/s</i>	pound per second	<i>L/min</i>	liter per minute
<i>lb/min</i>	pound per minute	<i>ImGal/m</i>	Imperial gallon per minute
<i>lb/h</i>	pound per hour		

Units for Mass and Volume variable

<i>L</i>	liter	<i>Nm³</i>	Normal cubic meter
<i>hl</i>	hectoliter	<i>NL</i>	Normal liter
<i>in³</i>	cubic inch	<i>g</i>	gram
<i>ft³</i>	cubic feet	<i>kg</i>	kilogram
<i>yd³</i>	cubic yard	<i>t</i>	ton
<i>gallon</i>	US gallon	<i>lb</i>	pound
<i>ImpGal</i>	Imperial gallon	<i>STon</i>	short ton
<i>bushel</i>	bushel	<i>LTon</i>	long ton
<i>bbbl</i>	barrel	<i>oz</i>	ounce
<i>bbbl liq</i>	barrel liquid	<i>m³</i>	cubic meter
<i>SCF</i>	standard cubic feet		

Units for Density

<i>degB hv</i>	degrees Baum heavy	<i>lb/ft³</i>	pound per cubic feet
<i>degB lt</i>	degrees Baum light	<i>g/ml</i>	grams per milliliter
<i>degAPI</i>	degrees API	<i>kg/L</i>	kilograms per Liter
<i>SGU</i>	specific gravity units	<i>g/L</i>	grams per Liter
<i>g/cm³</i>	gram per cubic meter	<i>lb/in³</i>	pound per cubic inch
<i>kg/m³</i>	kilogram per cubic meter	<i>STn/yd³</i>	short ton per cubic yard
<i>lb/gal</i>	pound per US gallon	<i>degTwad</i>	degrees Twaddell

Units for Level

<i>m</i>	meter	<i>ft</i>	feet
<i>cm</i>	centimeter	<i>in</i>	inch
<i>mm</i>	millimeter		

Other Units

<i>N</i>	Newton	<i>mV</i>	millivolts
<i>mA</i>	milliamperes	<i>%</i>	percentage
<i>V</i>	volts		

☞ Digital LCD Integral Display Keys sequence to change the unit on the Display : 3 – 7 – 1

To change the PV unit in the transmitter:

Navigate the Digital LCD Integral Display menu, select **Device Config** > *Rerange* > *Rerange no pressure* > *Engineering Unit*, and the used unit will be available. To modify select *Edit* then scroll the desired unit (see the following table) with the up and down keys and confirm with **OK**.

To set the Transmitter LRV with reference pressure:

Set the transmitter applied pressure as for Lower Range value (0%) . Navigate the Digital LCD Integral Display menu, select **Device Config** > **Rerange** > **Rerange with pressure** > **Set LRV (0%)**. Select **OK** to start the autoadjust.

☞ Digital LCD Integral Display Keys sequence to set the LRV with pressure: 2 – 1 – 1 – 1 – OK

Set the LRV by CoMeter

LRV configuration by CoMeter is available with the 695 Field Indicator . Please refer to the device manual for the appropriate operations.

Set the LRV by HHT

LRV configuration by Hand Held Terminal is available . Please refer to the device manual for the appropriate operations.

Set the LRV by PC

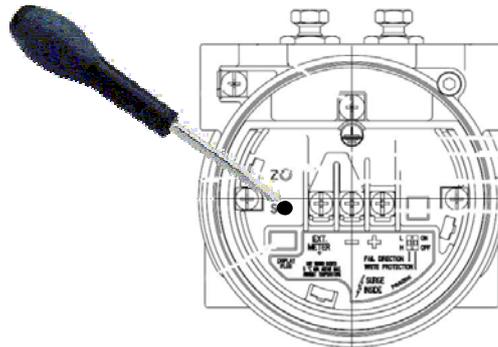
LRV configuration by PC is available using dedicated Software . ABB can provide the references and the Software. Please refer to the Software instructions for the appropriate operations.

Set the URV

When a URV different from the selected is needed it is possible to change it following one of the methods described in the next paragraphs.

Set the URV by Local Keys

Set the transmitter applied pressure as for Upper Range Value. When the applied pressure is stable push the Span local adjustment key (S) located on the terminal block and release. After this operation the reading shall move to 20 mA. If no changes occur repeat the operation.



Set the URV by Digital LCD Integral Display

To set the URV reading of the Digital LCD Integral Display (the engineering units have to be selected):

Navigate the Digital LCD Integral Display menu, select **Display** > **Display settings** > **Display URV (100%)**, and the Span values may be available. Select the desired value and confirm.

☞ Digital LCD Integral Display Keys sequence to set the Display URV : 3 – 7 – 3 - Edit

To set the Transmitter URV without reference pressure:

Navigate the Digital LCD Integral Display menu, select **Device Config** > **Rerange** > **Rerange no pressure** > **Set URV**, and the URV values may be available. Select the desired value and confirm.

☞ Digital LCD Integral Display Keys sequence to set the URV without pressure : 2 – 1 – 2 – 3 – Edit

To set the Transmitter URV with reference pressure:

Set the transmitter applied pressure as for Upper Range value (100%). Navigate the Digital LCD Integral Display menu, select **Device Config** > *Rerange* > *Rerange with pressure* > *Set URV (100%)*. Select **OK** to start the autoadjust.

☞ Digital LCD Integral Display Keys sequence to set the URV with pressure : 2 – 1 – 1 – 2 – OK

Set the URV by CoMeter

URV configuration by CoMeter is available with the 695 Field Indicator . Please refer to the device manual for the appropriate operations.

Set the URV by HHT

URV configuration by Hand Held Terminal is available . Please refer to the device manual for the appropriate operations.

Set the URV by PC

URV configuration by PC is available using dedicated Software . ABB can provide the references and the Software. Please refer to the Software instructions for the appropriated operations.

Set the Totalizer

When a Totalizer setting different from the selected is needed it is possible to change it following one of the methods described in the next paragraphs. In case the Totalizer is used in Bidirectional Flow the Totalizer LRV (0%) and the Totalizer URV (100%) have to be equal in absolute value.

Set the Totalizer by Digital LCD Integral Display

Preliminary operations

To set the Totalizer status:

Navigate the Digital LCD Integral Display menu, select **Totalizer** > *Totalizer status* and the actual status will be available as "on" or "off".

IMPORTANT: Before setting all the different parameters of the totalizer, be sure that it is turned off, in order you can change the totalizer data as required.

After finishing totalizer setting operations, please remember to switch it on. To modify the status select *Edit* and change the status with the up and down keys and confirm with *Next*

☞ Digital LCD Integral Display Keys sequence to set the Totalizer Status: 4 – 1 – 1 - Edit

To set the Totalizer LRV (0%):

Navigate the Digital LCD Integral Display menu, select **Totalizer** > *Totalizer setting* > *Totalizer LRV (0%)*, and the value will be available. To modify select *Edit* then scroll the desired value for the digit in reverse color with the up and down keys and confirm with *Next*. Repeat the operation for the seven digits and confirm with **OK**. Note: the minimum and the maximum values to introduce is indicated on the display .

☞ Digital LCD Integral Display Keys sequence to set the Totalizer LRV : 4 – 3 – 1 – Edit

To set the Totalizer URV (100%):

Navigate the Digital LCD Integral Display menu, select **Totalizer** > *Totalizer setting* > *Totalizer URV (100%)*, and the value will be available. To modify select *Edit* then scroll the desired value for the digit in reverse color with the up and down keys and confirm with *Next*. Repeat the operation for the seven digits and confirm with **OK**. Note: the minimum and the maximum values to introduce are indicated on the display .

☞ Digital LCD Integral Display Keys sequence to set the Totalizer URV : 4 – 3 – 2 – Edit

To set the Input Totalizer Engineering Units:

Navigate the Digital LCD Integral Display menu, select **Totalizer** > *Totalizer setting* > *Input Eng. Units*, and the used Totalizer Engineering Units will be available. To modify select *Edit* then scroll the desired unit (see the following table) with the up and down keys and confirm with **OK**.

☞ Digital LCD Integral Display Keys sequence to set the Totalizer Input Engineering Units : 4 – 3 – 3 – Edit

m^3/h	cubic meter per hour	lb/d	pound per day
gal/s	US gallons per second	$STon/min$	short ton per minute
$Mgal/d$	mega US gallons per day	$STon/h$	short ton per hour
L/s	liter per second	$STon/d$	short ton per day
ML/d	megaliter per day	$LTon/h$	long ton per hour
CFS	cubic feet per second	$LTon/d$	long ton per day
ft^3/d	cubic feet per day	Nm^3/h	Normal cubic meter per hour
m^3/s	cubic meter per second	NL/h	Normal liter per hour
m^3/d	cubic meter per day	$SCFM$	standard cube feet per minute
$ImGal/h$	Imperial Gallons per hour	CFH	cubic feet per hour
$ImGal/d$	Imperial Gallons per day	m^3/min	cubic meter per minute
g/s	gram per second	bbl/s	barrel per second
g/min	gram per minute	bbl/min	barrel per minute
g/h	gram per hour	bbl/h	barrel per hour
kg/s	kilogram per second	bbl/d	barrel per day
kg/min	kilogram per minute	gal/h	US gallon per hour
kg/h	kilogram per hour	$ImGal/s$	Imperial gallon per second
kg/d	kilogram per day	L/h	liter per hour
t/min	ton per minute	gal/d	US gallon per day
t/h	ton per hour	CFM	cubic feet per minute
t/d	ton per day	GPM	US gallon per minute
lb/s	pound per second	L/min	liter per minute
lb/min	pound per minute	$ImGal/m$	Imperial gallon per minute
lb/h	pound per hour		

To set the Permanent Totalizer Engineering units:

Navigate the Digital LCD Integral Display menu, select **Totalizer > Totalizer setting > Permanent Eng. Unit > Engineering Unit**, and the used Permanent Totalizer Engineering Units will be available. To modify select **Edit** then scroll the desired unit (see the following table) with the up and down keys and confirm with **OK**.

L	liter	Nm^3	Normal cubic meter
hl	hectoliter	NL	Normal liter
in^3	cubic inch	g	gram
ft^3	cubic feet	kg	kilogram
yd^3	cubic yard	t	ton
$gallon$	US gallon	lb	pound
$ImpGal$	Imperial gallon	$STon$	short ton
$bushel$	bushel	$LTon$	long ton
bbl	barrel	oz	ounce
$bbl liq$	barrel liquid	m^3	cubic meter
SCF	standard cubic feet		

☞ Digital LCD Integral Display Keys sequence to set the Permanent Totalizer Engineering units: 4 – 3 – 4 – 1 – Edit

To set the Permanent Totalizer Custom unit:

Navigate the Digital LCD Integral Display menu, select **Totalizer > Totalizer setting > Permanent Eng. Unit > Custom Unit**, and the used Permanent Totalizer Custom Units will be available. To modify select **Edit** then scroll the desired alphanumeric symbol with the up and down keys and confirm with **Next**. Repeat the operation for the six digits and confirm with **OK**.

☞ Digital LCD Integral Display Keys sequence to set the Permanent Totalizer Custom units: 4 – 3 – 4 – 2 – Edit

To set the Permanent Totalizer Conversion Factor:

Navigate the Digital LCD Integral Display menu, select **Totalizer > Totalizer setting > Permanent Eng. Unit > Conversion Factor**, and the used Permanent Totalizer Custom Units will be available. To modify select **Edit** then scroll the desired value with the up and down keys and confirm with **Next**. Repeat the operation for the seven digits and confirm with **OK**.

Note: the minimum and the maximum values to introduce are indicated on the display.

☞ Digital LCD Integral Display Keys sequence to set the Permanent Totalizer Conversion Factor: 4 – 3 – 4 – 3 – Edit

To set the Batch Totalizer Engineering units:

Navigate the Digital LCD Integral Display menu, select **Totalizer > Totalizer setting > Batch Eng. Unit > Engineering Unit**, and the used Batch Totalizer Engineering Units will be available. To modify select **Edit** then scroll the desired unit (see the following table) with the up and down keys and confirm with **OK**.

<i>L</i>	liter	<i>Nm³</i>	Normal cubic meter
<i>hl</i>	hectoliter	<i>NL</i>	Normal liter
<i>in³</i>	cubic inch	<i>g</i>	gram
<i>ft³</i>	cubic feet	<i>kg</i>	kilogram
<i>yd³</i>	cubic yard	<i>t</i>	ton
<i>gallon</i>	US gallon	<i>lb</i>	pound
<i>ImpGal</i>	Imperial gallon	<i>STon</i>	short ton
<i>bushel</i>	bushel	<i>LTon</i>	long ton
<i>bbf</i>	barrel	<i>oz</i>	ounce
<i>bbf liq</i>	barrel liquid	<i>m³</i>	cubic meter
<i>SCF</i>	standard cubic feet		

☞ Digital LCD Integral Display Keys sequence to set the Batch Totalizer Engineering units: 4 – 3 – 5 – 1 – Edit

To set the Batch Totalizer Custom unit:

Navigate the Digital LCD Integral Display menu, select **Totalizer > Totalizer setting > Batch Eng. Unit > Custom Unit**, and the used Batch Totalizer Custom Units will be available. To modify select **Edit** then scroll the desired alphanumeric symbol with the up and down keys and confirm with **Next**. Repeat the operation for the six digits and confirm with **OK**.

☞ Digital LCD Integral Display Keys sequence to set the Batch Totalizer Custom units: 4 – 3 – 5 – 2 – Edit

To set the Batch Totalizer Conversion Factor:

Navigate the Digital LCD Integral Display menu, select **Totalizer > Totalizer setting > Batch Eng. Unit > Conversion Factor**, and the used Batch Totalizer Conversion Factor will be available. To modify select **Edit** then scroll the desired value with the up and down keys and confirm with **Next**. Repeat the operation for the seven digits and confirm with **OK**.

Note: the minimum and the maximum values to introduce are indicated on the display.

☞ Digital LCD Integral Display Keys sequence to set the Batch Totalizer Conversion Factor: 4 – 3 – 5 – 3 – Edit

To set the Bidirectional Flow mode:

During this operation the Totalizer status has to be in "Off" mode and the Transmitter Transfer function has to be in Bidirectional Flow (see this manual for the appropriate procedure). Navigate the Digital LCD Integral Display menu, select **Totalizer > Totalizer setting > Bidirectional Flow >**, and the used Totalizer Bidirectional Flow will be available. To modify select **Edit** then scroll the desired value with the up and down keys (see the following table) and confirm with **OK**.

<i>Add</i>	the positive and negative flows are added
<i>Subtract</i>	the total flow is the positive minus the negative

☞ Digital LCD Integral Display Keys sequence to set the Bidirectional Flow mode: 4 – 3 – 6 – Edit

Set the Totalizer by HHT

Totalizer configuration by Hand Held Terminal is available. Please refer to the device manual for the appropriated operations.

Set the Totalizer by PC

Totalizer configuration by PC is available using dedicated Software. ABB can provide the references and the Software. Please refer to the Software instructions for the appropriate operations.

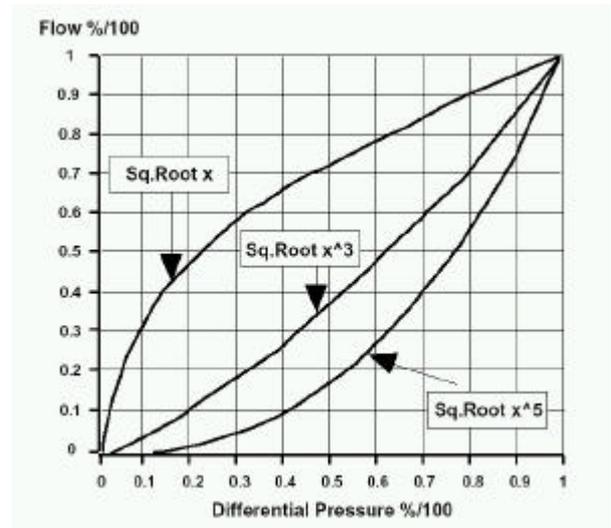
Special functions

The transmitter has some functions to support the user in case of applications that require advance output configuration.

Transfer functions

The 2600T Pressure Transmitter Series provides a selection of output functions, as follows:

Linear	for differential, gauge and absolute pressure or level measurements
Sq. Root (x)	for flow measurements using restriction type primary element, like orifice plate, integral orifice, Venturi or Dall tube and similar.
Sq. Root (x3)	for open channel flow measurements using rectangular or trapezoidal weir
Sq. Root (x5)	for open channel flow measurements using V-notch (triangular) weir.
Polynomial	for input linearization using a 5th-order polynomial function for input linearization using 2 polynomial functions of 2nd order
Costant current	for loop or associated equipment test.



Note: x and output are in the range 0 to 1 (0% to 100%)

These output functions can be activated using a Configuration Tool (CoMeter, Digital LCD Integral Display, Hand Held Communicator and PC).

The transfer function can be applied to the analog signal 4 to 20 mA or to the indication (in engineering units) on the CoMeter with the 695 Field Indicator and/or to the Digital LCD Integral Display.

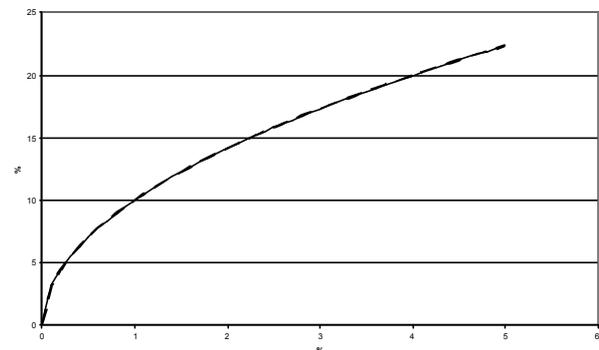
Transfer functions description

Linear

Using this function, the relationship between the input (measured value), expressed in % of the calibrated span and the output is linear (i.e.: at 0% input, corresponds 0% output - 4mA - at 50% input corresponds 50% output - 12mA - and at 100% input corresponds 100% output - 20mA).

Square roots

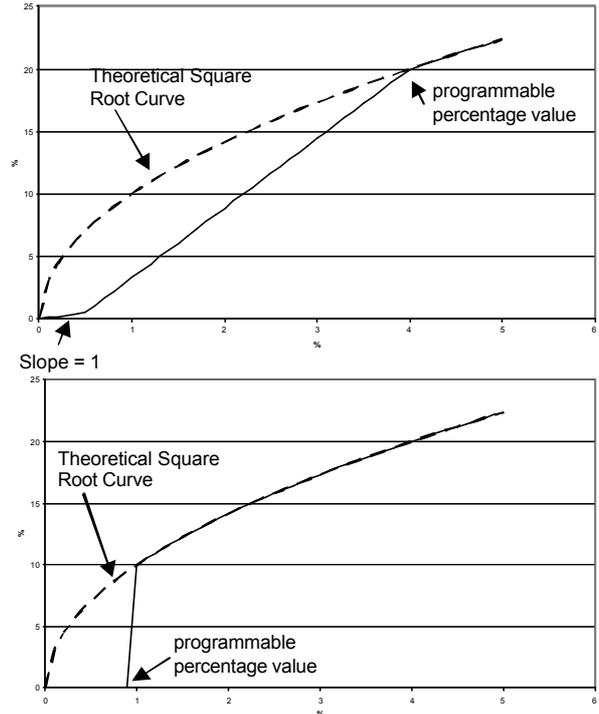
Using the Square Root function, the output (in % of the span) is proportional to the square root of the input signal in percentage of the calibrated span (i.e.: the instrument gives an analog output proportional to the rate of flow). The possibility to have the full Square Root function is given.



To avoid the extremely high gain error with the input approaching zero, the transmitter output is linear with the input up with a slope of 1 up to 0.5% and then still linear with the appropriated slope to a programmable percentage value between 10 % and 20%. This option is offer in order to ensure a more stable output near zero. This also allows an easier zero adjustment and performs a reduced zero error for ambient temperature variations.

To neglect the values with the input approaching zero, the transmitter output is zero with the input up to a programmable percentage value between 0 % and 20%. This option is offer in order to ensure a more stable flow measure.

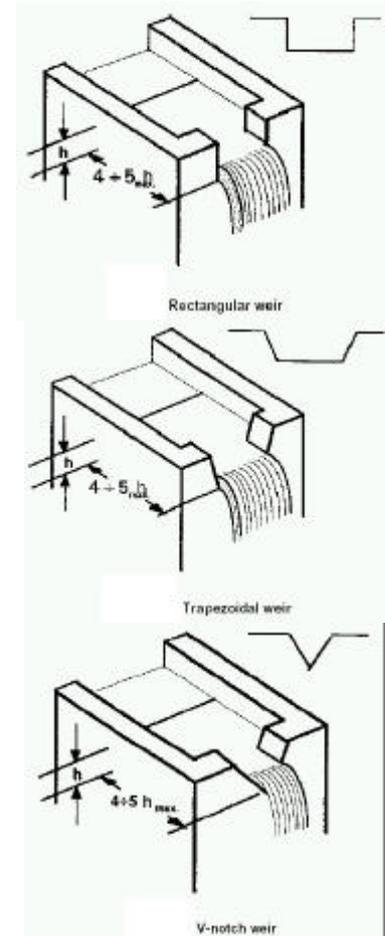
This option is possible for all the listed output functions.



The x^3 Square root Transfer function can be used for open channel (see figures on the right) flow measurement using ISO 1438 rectangular weirs (Hamilton Smith, Kindsvater -Carter, Rehbock formulas) or trapezoidal weirs (Cippoletti formulas) and ISO 1438 Venturi flumes. In these types of devices the relationship between the flow and the developed head h (the differential pressure measured by the transmitter) is proportional to $h^{3/2}$ or square root of h^3 . Other types of Venturi or Parshall flume do not follow this relationship.

Using this function, the output (in % of the span) is proportional to the square root of the third power of the input signal in % of the calibrated span: the instrument gives an output proportional to the rate of flow calculated using the above mentioned formulas.

The x^5 Square root Transfer function can be used for open channel flow measurement using ISO 1438 V-notch (triangular) weirs (see figure on the right) where the relationship between the flow and the developed head h (the differential pressure measured by the transmitter) is proportional to $h^{5/2}$ or square root of h^5 . Using this function, the output (in % of the span) is proportional to the square root of the fifth power of the input signal in % of the calibrated span: the instrument gives an output proportional to the rate of flow calculated using the Kingsvater -Shen formula).



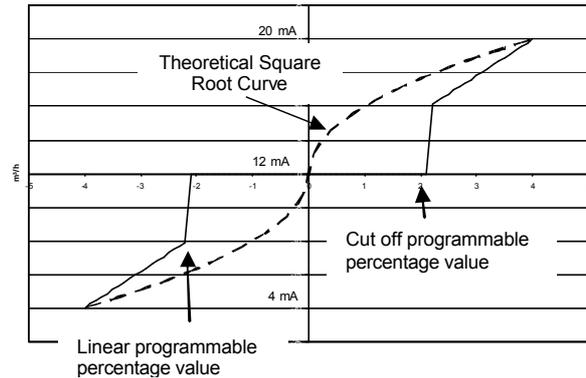
Bidirectional

The bidirectional function, applied to the transmitter input (x) expressed in percentage of the calibrated span, has the following form:

$$\text{Output} = \frac{1}{2} + \frac{1}{2} \text{sign}(x) \cdot |x|^{1/2}$$

where: x and Output should be normalized in the range -1 to 1 for calculation purpose, with following Output meaning: Output = 0 means Analog out 4 mA; Output = 1 means Analog out 20 mA.

This function can be used for flow measurement purpose when the flow is in both the directions and the primary elements are designed to perform this type of measure.



Polynomial

The polynomial function, applied to the transmitter input (x) expressed in percentage of the calibrated span, has the following form:

$$\text{Output} = A_0 + A_1 x + A_2 x^2 + A_3 x^3 + A_4 x^4 + A_5 x^5$$

where: x and Output should be normalized in the range 0 to 1 for calculation purpose, with following Output meaning: Output = 0 means Analog out 4 mA; Output = 1 means Analog out 20 mA

This function can be used for linearization purpose: the user can plot the characteristic curve of the input and find, using a mathematical method, the parameters of the polynomial that better approximate the plotted curve. Check, after the calculation, if the maximum error is compatible with the application.

The following are some application examples.

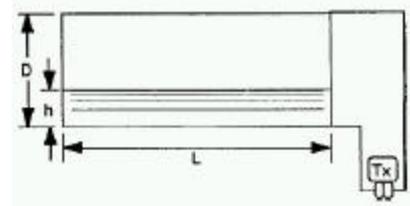
Cylindrical vessel with flat ends

The following polynomial gives the area of the circular section in relation to the height of the liquid in the vessel (h):

$$\text{Output} = -0.02 + 0.297 h + 2.83 h^2 - 4.255 h^3 + 3.5525 h^4 - 1.421 h^5$$

$$\text{Volume} = \text{Output} \cdot (d/1.12838)^2 \cdot L$$

where: d = vessel diameter, L = vessel length.



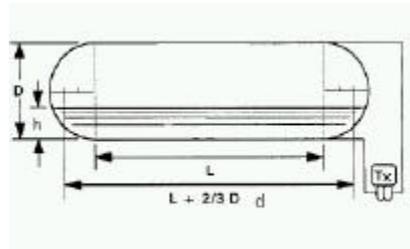
Cylindrical vessel with hemispherical ends

The following polynomial gives the area of the circular section in relation to the height of the liquid in the vessel (h):

$$\text{Output} = -0.02 + 0.297 h + 2.83 h^2 - 4.255 h^3 + 3.5525 h^4 - 1.421 h^5$$

$$\text{Volume} = \text{Output} \cdot (d/1.12838)^2 \cdot (L + 2/3 d)$$

where: d = vessel diameter, L = vessel length.



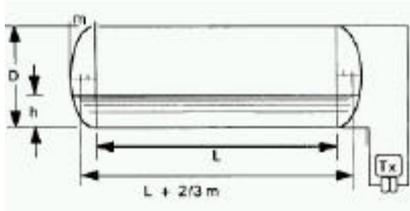
Cylindrical vessel with elliptical or pseudoelliptical ends

The following polynomial gives the area of the circular section in relation to the height of the liquid in the vessel (h):

$$\text{Output} = -0.02 + 0.297 h + 2.83 h^2 - 4.255 h^3 + 3.5525 h^4 - 1.421 h^5$$

$$\text{Volume} = \text{Output} \cdot (d/1.12838)^2 \cdot (L + 2/3 m)$$

where: d = vessel diameter, L = vessel length, m = length of the minor ellipse axis



Spherical tank

The following polynomial gives the area of the circular section in relation to the height of the liquid in the vessel (h):

$$\text{Output} = 3 h^2 - 2h^3$$

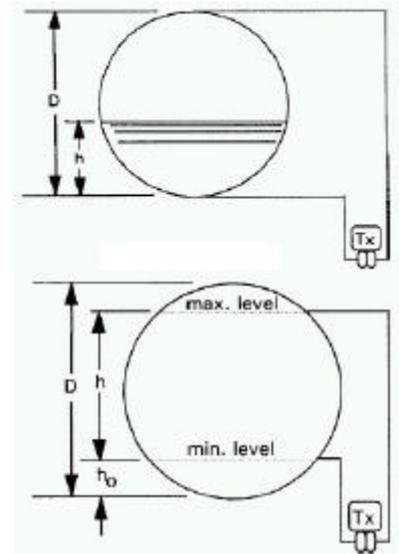
$$\text{Volume} = \text{Output} \cdot (d/1.2407)^3$$

where: d = sphere diameter

Partial level measurement

Two methods can be used:

- 1) Plot the changes in volume in relation to the level changes and using a mathematical method, find the relevant polynomial;
- 2) Use the above polynomial coefficients and calibrate the transmitter range to cover the full diameter of the vessel or tank: the changes in volume for the h changes between h_0 and h_{max} will be correct. Of course the transmitter will transmit, when the level is $\leq h_0$, the volume corresponding to h_0 : the same apply for level $\geq h_{max}$.

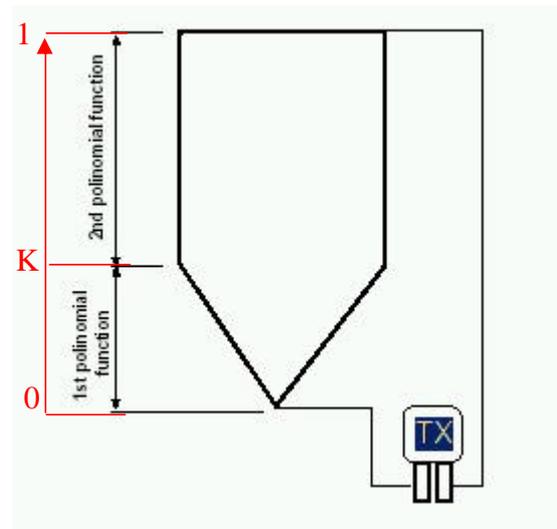


Two Polynomial functions of 2nd order

The Analog Output transfer function can also be defined as a two polynomial function. Both polynomials are of 2nd order. So two different polynomial functions are used:

$$\begin{aligned} \text{Output} &= A_0 + A_1 x + A_2 x^2 && \text{if } x \leq k \\ \text{Output} &= B_0 + B_1 x + B_2 x^2 && \text{if } x > k \end{aligned}$$

Ax and Bx terms of the polynomials have to be calculated according to the shape of the vessel. A PC based software tool is available for polynomial coefficients definition.



Set the Transfer function on the transmitter

Set the Transfer function on the transmitter by Digital LCD Integral Display

Navigate the Digital LCD Integral Display menu, select **Device Config > Transfer Function > Type**, and the Transfer Function in use will be available. To modify select **Edit** then scroll the desired Transfer Function (see the following table) with the up and down keys and confirm with **OK**.

<p><i>Linear</i></p> <p><i>Square Root</i></p> <p><i>3/2</i></p> <p><i>5/2</i></p> <p><i>Polynomial</i></p> <p><i>Double Poly</i></p> <p><i>Bidirectional Flow</i></p>	<p>Output = x</p> <p>Output = x^{1/2}</p> <p>Output = x^{3/2}</p> <p>Output = x^{5/2}</p> <p>Output = A₀ + A₁ x + A₂ x² + A₃ x³ + A₄ x⁴ + A₅ x⁵</p> <p>{ Output = B₀ + B₁ x + B₂ x² if x ≤ k</p> <p> Output = C₀ + C₁ x + C₂ x² if x > k</p> <p>Output = 1/2 + 1/2 sign (x) · x^{1/2}</p>
--	---

☞ Digital LCD Integral Display Keys sequence to set the Transfer Function: 2 – 6 – 1 – Edit

In case the Square root transfer function has been selected

Navigate the Digital LCD Integral Display menu, select **Device Config** > *Transfer Function* > *Linearization Point*, and the percentage input value up to the Transfer function is anyway linear may be available. Select the desired value and confirm.

In case a Flow transfer function has been selected

Navigate the Digital LCD Integral Display menu, select **Device Config** > *Transfer Function* > *Low Flow Cut Off*, and the input value up to the Transfer function is anyway zero may be available. Select the desired value and confirm.

In case one of the polynomial transfer function has been selected

The existing polynomial coefficients in the transmitter will be used. The coefficients can be set or modified only by HHT and PC.

Set the Transfer function on the transmitter by CoMeter

The Transfer function setting by CoMeter is available with the 695 Field Indicator. Please refer to the device manual for the appropriate operations.

Set the Transfer function on the transmitter by HHT

The Transfer function setting by Hand Held Terminal is available. Please refer to the device manual for the appropriate operations.

Set the Transfer function on the transmitter by PC

The Transfer function setting by PC is available using dedicated Software. ABB can provide the references and the Software. Please refer to the Software instructions for the appropriate operations.

Set the Transfer function on the Meters

The Transfer function on the Meters works only on the meters reading and not on the transmitter output.

Set the Transfer function on the Digital LCD Integral Display

On the Digital LCD Integral Display only the transfer function can be selected. The existing Square root parameter or polynomial coefficients in the transmitter will be used. The coefficients can be set or modified only by HHT and PC.

Navigate the Digital LCD Integral Display menu, select **Display** > *Display Settings* > *Display Transfer Function*, and the Transfer functions will be available. Select the desired value and confirm.

☞ Digital LCD Integral Display Keys sequence to set the Transfer Function on the Display : 3 – 7 – 4 – Edit

Set the Transfer function on the Digital LCD Integral Display by HHT

The Digital LCD Integral Display Transfer function setting by Hand Held Terminal is available. Please refer to the device manual for the right operations.

Set the Transfer function on the Digital LCD Integral Display by PC

The Digital LCD Integral Display Transfer function setting by PC is available using dedicated Software. ABB can provide the references and the Software instructions for the right operations.

Signal simulation (fixed output current)

During the start up or for diagnostic purposes, it is useful to have the possibility to generate some reference signal to be sent to the receiver (Controller, DCS, recorder, PLC, etc.). This is possible directly by means of the transmitter, without disconnect its electrical connection and without a 4 – 20 mA generator or a pressure generator.

Fixed output current by Digital LCD Integral Display

To set 4 mA fixed output current

Navigate the Digital LCD Integral Display menu, select **Diagnostics** > *Loop Test* > *Set 4 mA*. Confirm.

☞ Digital LCD Integral Display Keys sequence to set 4 mA fixed output current: 7 – 2 – 1

To set 20 mA fixed output current

Navigate the Digital LCD Integral Display menu, select **Diagnostics** > *Loop Test* > *Set 20 mA* for 20 mA fixed output current. Confirm.

☞ Digital LCD Integral Display Keys sequence to set 20 mA fixed output current: 7 – 2 – 2

To set any fixed output current

Navigate the Digital LCD Integral Display menu, select **Diagnostics** > *Loop Test* > *Set Custom Value* and the fixed output current values will be available. Select the desired value and confirm.

☞ Digital LCD Integral Display Keys sequence to set any fixed output current: 7 – 2 – 3

Fixed output current by CoMeter

Set of the Fixed output current by CoMeter is available with the 695 Field Indicator . Please refer to the device manual for the appropriate operations.

Fixed output current by HHT

Set of the Fixed output current by Hand Held Terminal is available . Please refer to the device manual for the appropriate operations.

Fixed output current by PC

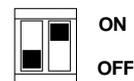
Set of the Fixed output current by PC is available using dedicated Software. ABB can provide the references and the Software. Please refer to the Software instructions for the appropriate operations.

Hardware settings

Write protect mode

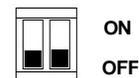
Changes can be prevented to the transmitter configuration data with the write protection electronics dip switch 2. If the transmitter write protection is activated the transmitter will not accept any writes to its memory. Configuration changes, such as trim and reranging cannot take place. In case the Digital LCD Integral Display is installed (no access to switch), the Write protect mode can also be set by HART command using the HHT and the PC. Please refer to the device manual and Software instruction for the right operation.

Position the right dip switch in ON to prevent accidental or deliberate change of configuration data.



ON
OFF

Position the right dip switch in OFF to change the configuration data. If data configuration is not allowed check the Software Write lock using the HHT or PC.



ON
OFF

Change the failsafe direction

The transmitter alarm direction is set by repositioning the electronics dip switch 1. The output value is in accordance with NE43 NAMUR recommendations.

Check the Software failsafe direction is set to Hardware before the operation. Position the left dip switch in L for fail low (i.e. output current: 3.7 mA)



Check the Software failsafe direction is set to Hardware before the operation. Position the left dip switch in H for fail high (i.e. output current: 22 mA)



Software settings

Write protect mode

Changes can be prevented to the transmitter configuration data with the write protection electronics dip switch 1. If the transmitter write protection is activated the transmitter will not accept any writes to its memory. Configuration changes, such as trim and reranging cannot take place. In case the Digital LCD Integral Display is installed the Write protect mode can also be set by HART command using the HHT and the PC. Please refer to the device manual and Software instruction for the right operation.

Change the failsafe direction

The transmitter alarm direction is set selecting the Failure Mode in the transmitter software. The output value is in accordance with NE43 NAMUR recommendations.

Navigate the Digital LCD Integral Display menu, select **Device config** > **Output on alarm** > **Failure Mode** and the Failure Mode in use will be visible. To modify select **Edit** then scroll the desired Failure Mode (see the following table) with the up and down keys and confirm with **OK**.

*As per Dip-Switch
Fail High*

to give the Failure Mode control at the Hardware setting
to set the Failure Mode in high current condition (the value can be set by the user following the appropriate procedure of this manual)

Fail Low

to set the Failure Mode in low current condition (the value can be set by the user following the appropriate procedure of this manual)

☞ Digital LCD Integral Display Keys sequence to change the failsafe direction: 2 – 4 – 1 - Edit

Set the Current Output limits

When the Current Output limits on alarm and saturation different from the selected is needed it is possible to change it following one of the methods described in the next paragraphs.

Set the Current Output limits on the Digital LCD Integral Display

To set High Saturation current

Navigate the Digital LCD Integral Display menu, select **Device config** > **Output on alarm** > **Set Fail Current** > **High Saturation** > **Edit**, and the value change will be possible. Select the desired value and confirm.

☞ Digital LCD Integral Display Keys sequence to set the High saturation current: 2 – 4 – 2 – 1 – Edit

To set Low Saturation current

Navigate the Digital LCD Integral Display menu, select **Device config** > **Output on alarm** > **Set Fail Current** > **Low Saturation** > **Edit**, and the value change will be possible. Select the desired value and confirm.

☞ Digital LCD Integral Display Keys sequence to set the Low saturation current: 2 – 4 – 2 – 2 – Edit

To set Fail High current

Navigate the Digital LCD Integral Display menu, select **Device config** > **Output on alarm** > **Set Fail Current** > **Fail High** > **Edit**, and the value change will be possible. Select the desired value and confirm.

☞ Digital LCD Integral Display Keys sequence to set the Fail High current: 2 – 4 – 2 – 3 - Edit

To set Fail Low current

Navigate the Digital LCD Integral Display menu, select **Device config** > *Output on alarm* > *Set Fail Current* > *Fail Low* > *Edit*, and the value change will be possible. Select the desired value and confirm.

☞ Digital LCD Integral Display Keys sequence to set the Fail Low current: 2 – 4 – 2 – 4 - Edit

Set the Current Output limits by HHT

The setting of the Current Output limits by Hand Held Terminal is available. Please refer to the device manual for the right operations.

Set the Current Output limits by PC

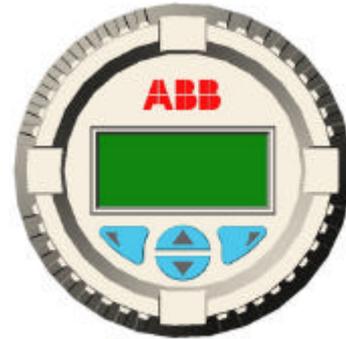
The setting of the Current Output limits by PC is available using dedicated Software. ABB can provide the references and the Software. Please refer to the Software instructions for the right operations.

Operation

Digital LCD Integral Display

The meter, " Digital LCD Integral Display" is connected on the electronics. It is of "digital" type microprocessor driven. It can be used for transmitter configuration, as well as for display various type of information, from Process Variable to output percentage.

In addition, diagnostic information is provided. First, the highest priority message will appear, followed by the next message in order of priority.



Here is a list of self explanatory errors and warning messages:

"Electronic Fail",
 "Sensor Elec. Fail",
 "Sensor Fail",
 "DAC Out of Range",
 "Sensor Invalid",
 "PV out of Limit",
 "Sensor T Out Limit",
 "Static P Out Limit",
 "Electr. T Out Limit",
 "Current Out Satur",
 "Current Out Fixed",
 "Config. Error",
 "Tot. Config Error",
 "Overrange",
 "Consistency Check"

For additional details see the "Transmitter Diagnostics" section of this manual.

Navigate the Digital LCD Integral Display

The Digital LCD Integral Display offers you an extensive range of functions, which are grouped into menus:

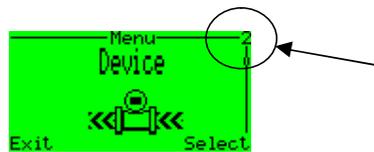
- to **access** the menu, press the key close to the display indication  (the bottom right icons on the Display).
- to **select** the menu or submenus press the key close to the "Select" display indication (bottom right position on the Display)
- to **exit** the menu or submenus press the key close to the "Exit" display indication (bottom left position on the Display)
- to come **back** one step in the menu or submenus press the key close to the " Back" display indication.
- to **scroll** through the menu (up and down in the list on the display) or submenus use two keys in the middle

Digital LCD Integral Display list of menu and submenu functions

The Digital LCD Integral Display menu has been designed to offer self-diagnostics when used by a skilled operator.

Note

The Main Menu, the Sub Menu, the Sub Sub Menu and the Utility view are also indicated on the display with a number. The menu navigation can be described also as a sequence of the corresponding numbers that is called "Digital LCD Integral Display Keys sequence"



In any case the following table better details the available functions. The instructions of this manual further define the Digital LCD Integral Display menu sequence to run an operation.

Display indication	Description	Level	Type
Easy Setup	<i>This function helps the end user to run the instrument basic configuration</i>	Main Menu	
Language	<i>Set the display language</i>	Utility	Enumerated
Pressure Polarity	<i>Set the pressure transmitter High pressure side</i>	Utility	Enumerated
Engineering Unit	<i>Set the Engineering Variable unit</i>	Utility	Enumerated
Set LRV	<i>Set the Lower Range Value</i>	Utility	Numerical
Set URV	<i>Set the Upper Range value</i>	Utility	Numerical
Transfer Function Type	<i>Set the transmitter output transfer function</i>	Utility	Enumerated
Lin Point	<i>Set the point up to the output is linear with input if the Square root is set</i>	Utility	Numerical
Low Flow Cut Off	<i>Set the point up to the output is zero for any input value, when square root is selected</i>	Utility	Numerical
Auto-Set Zero Scaling	<i>Set the Primary Variable at Zero</i>	Utility	Auto Adjust
Damping	<i>Set the damping value</i>	Utility	Manual Adjust
Device Config	<i>This function provides all the settings related to the device configuration</i>	Main Menu	
Rerange	<i>This function provides the transmitter rerange</i>	Sub Menu	
Rerange with pressure	<i>This function provides the transmitter rerange when a pressure source is available</i>	Sub Sub Menu	
Set LRV (0%)	<i>Set the Low Range Value at the applied pressure</i>	Utility	Auto Adjust
Set URV (100%)	<i>Set the Upper Range Value at the applied pressure</i>	Utility	Auto Adjust
Rerange no pressure	<i>This function provides the transmitter rerange when no pressure source is available</i>	Sub Sub Menu	
Engineering Unit	<i>Select the engineering units for the Engineering variable</i>	Utility	Enumerated
Set LRV	<i>Set the Lower Range Value at the defined value</i>	Utility	Numerical
Set URV	<i>Set the Upper Range Value at the defined value</i>	Utility	Numerical
Percentage Rerange	<i>This function provides the transmitter rerange when any pressure source is available related to the percentage value</i>	Sub Sub Menu	
Set LRV (0%)	<i>Set the Lower Range Value at the defined value in percentage</i>	Utility	Numerical
Set URV (100%)	<i>Set the Upper Range Value at the defined value in percentage</i>	Utility	Numerical
PV Scaling	<i>This function provides the Primary Variable Scaling</i>	Sub Menu	
Auto-Set Zero Scaling	<i>Shift the primary variable to zero</i>	Utility	Auto Adjust

Display indication	Description	Level	Type
PV Scaling	Shift the primary variable to the defined pressure value	Utility	Numerical
Reset PV Scaling	Remove the existing Primary Variable Scaling	Utility	Auto Adjust
Damping	Set the damping value	Utility	Manual Adjust
Output on Alarm	This function provides the alarm settings	Sub Menu	
Failure mode	Set the failure mode in down scale or upscale	Utility	Enumerated
Set fail current	This function provides the current values in case of output saturation or transmitter fail	Sub Sub Menu	
High saturation	Set the high saturation current at the desired value	Utility	Numerical
Low saturation	Set the low saturation current at the desired value	Utility	Numerical
Fail high	Set the high fail current at the desired value	Utility	Numerical
Fail low	Set the low fail current at the desired value	Utility	Numerical
Pressure Polarity	Set the pressure transmitter High pressure side	Utility	Enumerated
Transfer Function	This function provides the output transfer function setting	Sub Menu	
Type	Set the transmitter transfer function type	Utility	Enumerated
Linearization Point	Set the value up to the transfer function is linear when the square root is selected	Utility	Numerical
Low Flow Cut Off	Set the value up to the transfer function is zero when the square root is selected	Utility	Numerical
SW Write Protect	Set the write protection of the device	Utility	Enumerated
Display	This function provides all the settings related to the display configuration	Main Menu	
Language	Set the display language	Utility	Enumerated
Operator View	Set the Operator view mode	Utility	Enumerated
Display Variable 1	Set the display first line variable	Utility	Enumerated
Display Variable 2	Set the display second line variable	Utility	Enumerated
Display Bargraph	Set the bargraph variable	Utility	Enumerated
Contrast	Set the display contrast	Utility	Manual Adjust
Display Settings	This function has all the settings related with the variable on the display	Sub Menu	
Display Eng. unit	This function set the display to show the Engineering unit	Sub Sub Menu	
Pressure	Set the display to show the Engineering unit of pressure	Utility	Enumerated
Temperature	Set the display to show the Engineering unit of temperature	Utility	Enumerated
Flow	Set the display to show the Engineering unit of flow	Utility	Enumerated
Mass & Volume	Set the display to show the Engineering unit of mass and volume	Utility	Enumerated
Density	Set the display to show the Engineering unit of density	Utility	Enumerated
Level	Set the display to show the Engineering unit of level	Utility	Enumerated
Other	Set the display to show the Engineering unit not in the main list	Utility	Enumerated
Custom Unit	Set the display to show the customized Engineering unit	Utility	ASCII String

Display indication	Description	Level	Type
Set Display LRV (0%)	Set the display to show 0% at the defined Lower Range Limit	Utility	Numerical
Set Display URV (100%)	Set the display to show 100% at the defined Upper Range Limit	Utility	Numerical
Display Transfer Func	Set the display transfer function (independent from the output transfer function)	Utility	Enumerated
Security	This function set the security features	Sub Sub Menu	
Display Protection	Set the protection or remove the protection	Utility	ASCII String
Change Password	Modify the password	Utility	ASCII String
Totalizer	This function provides all the totalizer settings	Main Menu	
Totalizer status	Set the totalizer status	Utility	Enumerated
Reset	Reset the totalizer value	Sub Menu	
Permanent Totalizer	This function provides the setting of the permanent totalizer	Sub Sub Menu	
Reset	Reset the permanent totalizer	Utility	Auto Adjust
Tot. Protection	Set the permanent totalizer protection	Utility	ASCII String
Change Password	Modify the permanent totalizer password	Utility	ASCII String
Batch Totalizer	Set the batch totalizer parameter	Utility	Auto Adjust
Totalizer Settings	This function provides the totalizer setting	Sub Menu	
Totalizer Status	Set the Totalizer ON/OFF	Utility	Enumerated
Totalizer LRV (0%)	Set the Totalizer Lower Range Value	Utility	Numerical
Totalizer URV (100%)	Set the Totalizer Upper Range Value	Utility	Numerical
Input Eng. Units	Set the Totalizer engineering unit	Utility	Enumerated
Permanent Eng. Unit	This function provides the Permanent Totalizer engineering unit	Sub Sub Menu	
Engineering Unit	Set the Permanent Totalizer engineering unit among a predefined list	Utility	Enumerated
Custom Unit	Set the Permanent Totalizer engineering unit in the custom version	Utility	ASCII String
Conversion Factor	Set the Permanent Totalizer Conversion Factor	Utility	Numerical
Batch Eng. Unit	This function provides the Batch Totalizer engineering unit	Sub Sub Menu	
Engineering Unit	Set the Batch Totalizer engineering unit using a predefined list	Utility	Enumerated
Custom Unit	Set the Batch Totalizer engineering unit in the custom version	Utility	ASCII String
Conversion Factor	Set the Batch Totalizer Conversion Factor	Utility	Numerical
Bidirectional Flow	Defines the sum or the subtraction of the positive and negative flow (the bidirectional transfer function has to be selected)	Utility	Enumerated
Communication	This function provides all the Communication settings	Main Menu	
HART Tag	Set the Tag value in the transmitter database	Utility	ASCII String
Descriptor	Set the Descriptor value in the transmitter database	Utility	ASCII String
Message	Set the Message value in the transmitter database	Utility	ASCII String

Display indication	Description	Level	Type
Polling Address	Set the Polling Address value in the transmitter database	Utility	Enumerated
Calibrate	This function provides all the Calibration settings	Main Menu	
Sensor Trim	This function provides the trimming of the sensor	Sub Menu	
Lower sensor trim	Set the lower Sensor Trim point	Utility	Numerical
Upper sensor trim	Set the upper Sensor Trim point	Utility	Numerical
Output Trim	This function provides all the trimming of the current output	Sub Menu	
Set 4 mA	Trim the output current to 4 mA when the action is performed	Utility	Numerical
Set 20 mA	Trim the output current to 20 mA when the action is performed	Utility	Numerical
Reset to Factory Trim	Set the output current Trim and the Sensor Trim at the Calibration performed in the factory during the transmitter manufacturing	Utility	Enumerated
Diagnostics	This function provides all the Diagnostics information	Main Menu	
Diagnostics	This function provides all the Main Diagnostics information	Sub Menu	
PV	Monitor the PV value	Utility	Numerical
HART Eng. Output	Monitor the HART Engineering Output value	Utility	Numerical
Output current	Monitor the Current Output value	Utility	Numerical
Output %	Monitor the Percentage Output value	Utility	Numerical
Permanent Totalizer	Monitor the Permanent Totalizer value	Utility	Numerical
Batch Totalizer	Monitor the Batch Totalizer value	Utility	Numerical
Static Pressure	Monitor the Static Pressure value	Utility	Numerical
Sensor temperature	Monitor the Sensor temperature value	Utility	Numerical
Loop Test	This function provides to force the output current at a specific value	Sub Menu	
Set 4 mA	Set the output to 4 mA	Utility	Auto Adjust
Set 20 mA	Set the output current to 20 mA	Utility	Auto Adjust
Set custom value	Set the output current to a defined value	Utility	Manual Adjust

Digital LCD Integral Display view setting

To view the menu in a specific language:

Navigate the Digital LCD Integral Display menu, select **Display > Language**, and the used language will be available. To modify select **Edit** then scroll the desired language with the up and down keys and confirm with **OK**.

☞ Digital LCD Integral Display Keys sequence to set the language: 3 – 1 – Edit

To modify the Operator view:

Navigate the Digital LCD Integral Display menu, select **Display > Operator View**, and the used view will be available. To modify select **Edit** then scroll the desired Operator view (see the following table) with the up and down keys and confirm with **OK**.

<i>One Line</i>	to view the Variable 1 as defined in the Display
<i>One Line + Bargraph</i>	to view the Variable 1 as defined in the Display and the Bargraph proportional with the variable full scale
<i>Two Lines</i>	to view the Variable 1 and the Variable 2 as defined in the Display
<i>Two Lines + Bargraph</i>	to view the Variable 1 and the Variable 2 as defined in the Display and the Bargraph proportional with the variable full scale

☞ Digital LCD Integral Display Keys sequence to modify the Operator View: 3 – 2 – Edit

To define the Variable 1 in the Display:

Navigate the Digital LCD Integral Display menu, select **Display > Display Variable 1**, and the used variable will be available. To modify select *Edit* then scroll the desired Variable 1 view (see the following table) with the up and down keys and confirm with *OK*.

<i>Pressure</i>	to view the Primary Variable value
<i>Output %</i>	to view th Primary Variable in percentage
<i>Current Out</i>	to view the current Output value in mA
<i>Engineering Output</i>	to view the Output value in Engineering Units
<i>Static Pressure</i>	to view the Static Pressure value
<i>Sensor Temperature</i>	to view the Sensor Temperature value

☞ Digital LCD Integral Display Keys sequence to modify the define the Variable 1: 3 – 3 – Edit

To define the Variable 2 in the Display:

Navigate the Digital LCD Integral Display menu, select **Display > Display Variable 2**, and the used variable will be available. To modify select *Edit* then scroll the desired Variable 2 view (see the following table) with the up and down keys and confirm with *OK*.

<i>Pressure</i>	to view the Primary Variable value
<i>Output %</i>	to view th Primary Variable in percentage
<i>Current Out</i>	to view the current Output value in mA
<i>Engineering Output</i>	to view the Output value in Engineering Units
<i>Permanent Totalizer</i>	to view the Permanent totalizer value
<i>Batch Totalizer</i>	to view the Batch totalizer value
<i>Static Pressure</i>	to view the Static Pressure value
<i>Sensor Temperature</i>	to view the Sensor Temperature value

☞ Digital LCD Integral Display Keys sequence to modify the define the Variable 2: 3 – 4 – Edit

To define the Bargraph variable in the Display:

Navigate the Digital LCD Integral Display menu, select **Display > Display Bargraph**, and the used variable in the Bargraph will be available. To modify select *Edit* then scroll the desired Variable with the up and down keys for the Bargraph view (see the following table) and confirm with *OK*.

<i>Pressure</i>	to view the Primary Variable value
<i>Output %</i>	to view th Primary Variable in percentage
<i>Current Out</i>	to view the current Output value in mA
<i>Engineering Output</i>	to view the Output value in Engineering Units
<i>Static Pressure</i>	to view the Static Pressure value
<i>Sensor Temperature</i>	to view the Sensor Temperature value

☞ Digital LCD Integral Display Keys sequence to modify the define the Bargraph variable: 3 – 5 – Edit

To regulate the Display Contrast:

Navigate the Digital LCD Integral Display menu, select **Display > Contrast**, and the used contrast will be available. To modify the contrast use the up and down keys and confirm with *OK*.

☞ Digital LCD Integral Display Keys sequence to modify the define the Bargraph variable: 3 – 6

To define the Variable Engineering Units in the display:

Navigate the Digital LCD Integral Display menu, select **Display > Display Settings > Display Eng. Unit**, and the possible engineering variables will be available. To select the type push **Edit** and select with up and down keys; confirm with **OK**.

Pressure
 Temperature
 Flow
 Mass & Volume
 Density
 Level
 Other
 Custom Unit

The in-use unit for the type will be available. To modify select **Edit** then scroll the desired Unit with the up and down keys and confirm with **OK**.

☞ Digital LCD Integral Display Keys sequence to modify the define the Variable Engineering Units in the display: 3 – 7 – 1

To protect the Display from changes:

Navigate the Digital LCD Integral Display menu, select **Display > Security > Display Protection**, and the actual protection will be available (Unlock and Lock). To modify select **Edit** then scroll the desired protection with the up and down keys and confirm with **OK**.

☞ Digital LCD Integral Display Keys sequence to protect the Display: 3 – 8 – 1 – Edit

To change the Display Password:

The Display Password is a five digit string. The default value, at the transmitter delivery is *********. This default password does not give the possibility to lock

Navigate the Digital LCD Integral Display menu, select **Display > Security > Change Password**, and the actual password will be available. To modify select **Edit** then scroll the desired alphanumeric symbol with the up and down keys and confirm with **Next**. Repeat the operation for the five digits and confirm with **OK**.

☞ Digital LCD Integral Display Keys sequence to change the Display password: 3 – 8 – 2 – Edit

HART Transmitter

Accessing Communication data

The Operation data access could be necessary to look or verify the transmitter configuration.

Accessing Communication data by Digital LCD Integral Display

To access the transmitter communication data:

Navigate the Digital LCD Integral Display menu, select **Communication**, scroll the submenu with the up and down keys select one of the following submenu:

Hart Tag	to view e modify the transmitter Tag
Descriptor	to view e modify the transmitter Descriptor
Message	to view e modify the transmitter Message
Polling Address	to view the polling address

To modify select **Edit** then scroll the desired alphanumeric symbol with the up and down keys and confirm with **Next**. Repeat the operation for the necessary digits and confirm with **OK**

☞ Digital LCD Integral Display Keys sequence to access the transmitter communication data: 5

Accessing Communication data by CoMeter

Accessing Communication data by CoMeter is available with the 695 Field Indicator . Please refer to the device manual for the appropriate operations.

Accessing Communication data by HHT

Accessing Communication data by Hand Held Terminal is available . Please refer to the device manual for the appropriate operations.

Accessing Communication data by PC

Accessing Communication data by PC is available using dedicated Software . ABB can provide the references and the Software. Please refer to the Software instructions for the appropriate operations.

Accessing Operation data

The Operation data access could be necessary to look or verify the transmitter configuration.

Accessing Operation data by Digital LCD Integral Display

To access the transmitter measured variables:

Navigate the Digital LCD Integral Display menu, select **Diagnostics > Diagnostics**, scroll the submenu with the up and down keys select one of the following submenu:

<i>PV</i>	to monitor the measured Primary Variable
<i>Hart Eng. Output</i>	to access the Output value in Engineering Units
<i>Output Current</i>	to access the Output value in mA
<i>Output %</i>	to access the Output value in percentage
<i>Premanent Totalizer</i>	to monitor the Permanent Totalizer value
<i>Batch Totalizer</i>	to monitor the Batch Totalizer value
<i>Static Pressur</i>	to access the measured Static Pressure
<i>Sensor Temperature</i>	to access the measured sensor temperature

☞ Digital LCD Integral Display Keys sequence to access the transmitter measured variables : 7 – 1

Accessing Operation data by CoMeter

Accessing Operation data by CoMeter is available with the 695 Field Indicator . Please refer to the device manual for the appropriate operations.

Accessing Operation data by HHT

Accessing Operation data by Hand Held Terminal is available . Please refer to the device manual for the appropriate operations.

Accessing Operation data by PC

Accessing Operation data by PC is available using dedicated Software . ABB can provide the references and the Software. Please refer to the Software instructions for the appropriate operations.

Trimming and Calibration Set Up

The calibration requires a stable Pressure Generator and a Reference Pressure Indicator with the appropriate accuracy (at least 4 times better than the required accuracy of the transmitter/measuring-chain).

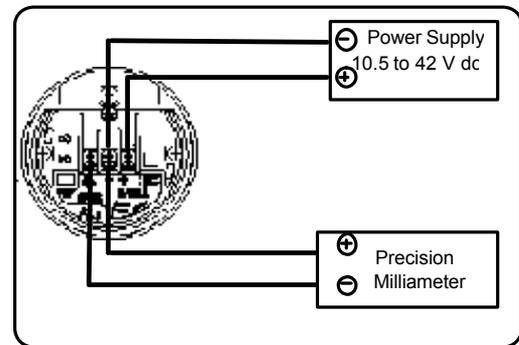
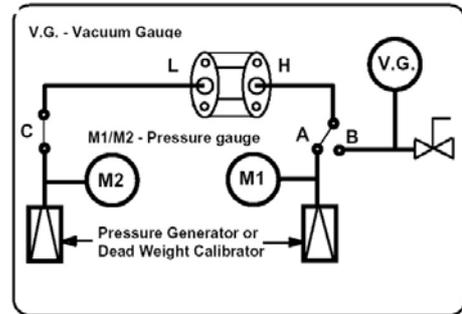
The pneumatic circuit shall be verified to exclude connection leakage problem or plugged lines.

The picture on the right show the complete test rigs that can be selectively used to suit the calibration for the Pressure (gauge) and the Differential transmitters.

Before the calibration ensure that:

- the required span, the upper and lower range value (URV and LRV) are within the span and range limits (URL and LRL) indicated on the nameplate
- the transmitter is properly powered and the electrical connections correctly made.
- the write protect switch, located on the electronics module is in position OFF (write allowed).

Make the electrical connections as indicated in the picture. Connect a precision milliammeter as shown and **remove the short circuit link**.



Sensor trim

The Sensor trim is a "set of operations, which establishes, by reference to standards, the relationship which exists, under specified conditions, between a reference indication and a result of a measurement" (International Vocabulary on Metrology).

In case the detected errors exceed the required accuracy, it is possible to correct the transmitter settings to compensate these errors.

**If the PV scaling has been performed the sensor trim is not available.
Reset the PV scaling before continuing the Sensor trim.**

NOTE: If this cannot be accomplished, the instrument may require a factory calibration or even its substitution.

Sensor Zero Trim

The Sensor Zero trim provide the correct offset of the factory characterization. The transmitter shall be within five percent of the true zero.

**If the PV scaling has been performed the sensor trim is not available.
Reset the PV scaling before continuing the Sensor trim.**

Sensor Zero trim by CoMeter

Sensor Zero trim by CoMeter is available with the 695 Field Indicator . Please refer to the device manual for the appropriated operations.

Sensor Zero trim by HHT

Sensor Zero trim by Hand Held Terminal is available . Please refer to the device manual for the right operations.

Sensor Zero trim by PC

Sensor Zero trim by PC is available using dedicated Software . ABB can provide the references and the Software. Please refer to the Software instructions for the right operations.

Sensor Low Trim

The Sensor Low trim provide the correct offset of the factory characterization. The transmitter shall be within five percent of the true value.

**If the PV scaling has been performed the sensor trim is not available.
Reset the PV scaling before continuing the Sensor trim.**

Sensor Low trim by Digital LCD Integral Display

Set the transmitter applied pressure as for Low trim value and wait for a stable value. Navigate the Digital LCD Integral Display menu, select **Calibrate** > *Sensor Trim* > *Lower Sensor Trim* and the Sensor Low trim values is available. To modify select *Edit* then scroll the desired value with the up and down keys and confirm with *Next*. Repeat the operation for the seven digits and confirm with *OK*. The first digit is the sign (- or space for +) and one digit can be the dot. The Maximum and Minimum values are indicated on the Display as reference.

☞ Digital LCD Integral Display Keys sequence to Low Trim the sensor: 6 – 1 – 1 – Edit

Sensor Low trim by HHT

Sensor Low trim by Hand Held Terminal is available . Please refer to the device manual for the right operations.

Sensor Low trim by PC

Sensor Low trim by PC is available using dedicated Software . ABB can provide the refer ences and the Software. Please refer to the Software instructions for the right operations.

Sensor High trim

Adjustment of the Sensor high trim value provides a slope correction to the characterization curve based on the low trim value.

**If the PV scaling has been performed the sensor trim is not available.
Reset the PV scaling before continue the Sensor trim.**

Sensor High trim by Digital LCD Integral Display

Set the transmitter applied pressure as for High trim value and wait for a stable value. Navigate the Digital LCD Integral Display menu, select **Calibrate** > *Sensor Trim* > *Upper Sensor Trim* and the Sensor High trim values is available. To modify select *Edit* then scroll the desired value with the up a nd down keys and confirm with *Next*. Repeat the operation for the seven digits and confirm with *OK*. The first digit is the sign (- or space for +) and one digit can be the dot. Note: the Maximum and Minimum values are indicated on the Display as reference.

☞ Digital LCD Integral Display Keys sequence to High Trim the sensor: 6 – 1 – 2 – Edit

Sensor High trim by HHT

Sensor High trim by Hand Held Terminal is available . Please refer to the device manual for the right operations.

Sensor High trim by PC

Sensor High trim by PC is available using dedicated Software . ABB can provide the references and the Software.

Sensor Static trim

The purpose of this procedure is to optimize transmitter performance by reducing the effect of static line pressure in these applications. 2600T Pressure transmitter Series does not normally require this procedure because optimization based on factory characterization occurs in the sensor. In any case this trim can be performed if required.

Static trim by HHT

Sensor Static trim by Hand Held Terminal is available . Please refer to the device manual for the right operations.

Static trim by PC

Sensor Static trim by PC is available using dedicated Software . ABB can provide the references and the Software.

Calibration

The Calibration is an operation by which the LRV and URV are adjusted. It sets the 4 and 20 mA points at required pressures.

See Basic Configuration Function, Set the LRV and Set the URV for the procedures.

Output trimming (Digital to Analog trim)

The Analog Output Trim allows the adjustment of the transmitter's current output at the 4 and 20 mA points to match the plant standards. This command adjusts the digital to analog signal conversion.

Output trimming by Digital LCD Integral Display

To set the 4 mA output current

Connect the pressure transmitter as defined in the Trimming and Calibration Set Up. Using a precision milliamperometer read the current output. Navigate the Digital LCD Integral Display menu, select **Calibrate > Output Trim > Set 4 mA** and the value will be available. To modify select **Edit** then scroll the desired value with the up and down keys and confirm with **Next**. Repeat the operation for the seven digits to have the same reading of the milliamperometer and confirm with **OK**.

Note: the Maximum and Minimum values are indicated on the Display as reference.

☞ Digital LCD Integral Display Keys sequence to set the 4 mA output current : 6 – 2 – 1 – Edit

To set the 20 mA output current

Connect the pressure transmitter as defined in the Trimming and Calibration Set Up. Using a precision milliamperometer read the current at the output. Navigate the Digital LCD Integral Display menu, select **Calibrate > Output Trim > Set 20 mA** and the value will be available. To modify select **Edit** then scroll the desired value with the up and down keys and confirm with **Next**. Repeat the operation for the seven digits to have the same reading of the milliamperometer and confirm with **OK**.

Note: the Maximum and Minimum values are indicated on the Display as reference.

☞ Digital LCD Integral Display Keys sequence to set the 20 mA output current : 6 – 2 – 2 – Edit

Output trimming by CoMeter

Output trimming by CoMeter is available with the 695 Field Indicator . Please refer to the device manual for the appropriate operations.

Output trimming by HHT

Output trimming by Hand Held Terminal is available . Please refer to the device manual for the appropriate operations.

Output trimming by PC

Output trimming by PC is available using dedicated Software. ABB can provide the references and the Software. Please refer to the Software instructions for the appropriate operations.

Additional calibration procedures

The 364 pressure transmitter models allow some useful procedures below described.

PV scaling

The PV scaling operation can be used to align the "zero" of the process (e.g. : the minimum tank level) with the "zero" reading of the transmitter. A configuration tool shall be use to perform this operation through digital communication.

After the PV scaling all the Sensor trimming operation are disabled.

There are two different ways to perform a PV scaling:

Method 1: apply to the transmitter a pressure that corresponds to the scaling value (offset) and perform the operation using the configuration tools (Digital LCD Integral Display, Hand Held Terminal and PC).

Method 2 calculate the scaling value (offset) and apply it to the transmitter following the operation available on the configuration tool (Hand Held Terminal and PC). With this method it is possible to perform a scaling operation even for a value different then zero.

PV scaling by Digital LCD Integral Display

As for method 1

Apply to the transmitter a pressure that corresponds to the scaling value, wait for a stable value.

Navigate the Digital LCD Integral Display menu, select **Device Config > PV Scaling > Auto-Set Zero Scaling.**

To accept the operation select **OK** and wait for the end (a bargraph will indicate the working progress).

☞ Digital LCD Integral Display Keys sequence to Auto-Set Zero Scaling: 2 – 2 – 1 – OK

As for method 2

Navigate the Digital LCD Integral Display menu, select **Device Config > PV Scaling > PV Scaling.**

To modify select **Edit** then scroll the desired value with the up and down keys and confirm with **Next**. Repeat the operation for the seven digits and confirm with **OK**.

Note: the Maximum (+ 80% of URL) and Minimum (- 80% of URL) usable values are indicated on the Display as reference.

☞ Digital LCD Integral Display Keys sequence to Set the PV Scaling: 2 – 2 – 2 – Edit

Set PV scaling by HHT

PV scaling by Hand Held Terminal is available . Please refer to the device manual for the appropriate operations.

Set PV scaling by PC

PV scaling by PC is available using dedicated Software . ABB can provide the references and the Software. Please refer to the Software instructions for the appropriate operations.

Removing PV scaling

In case the Sensor trimming operation is necessary the PV scaling (Sensor Offset) has to be removed.

Removing PV scaling by Digital LCD Integral Display

Navigate the Digital LCD Integral Display menu, select **Device Config** > **PV Scaling** > **Reset PV Scaling**. To accept the remove select **OK** and wait for the end (a bargraph will indicate the working progress).

☞ Digital LCD Integral Display Keys sequence to Remove the PV Scaling: 2 – 2 – 3 – OK

Removing PV scaling by HHT

PV scaling removing by Hand Held Terminal is available . Please refer to the device manual for the appropriate operations.

Removing PV scaling by PC

PV scaling removing by PC is available using dedicated Software. ABB can provide the references and the Software. Please refer to the Software instructions for the appropriate operations.

Zero suppression

Two different methods can be used for Zero suppression:

Method 1: after completion of the zero and span trim procedures, apply to the High Side connection (P2 as default) a pressure equal to the pressure to be suppressed. Allow time for pressure stabilization and then press the Zero local adjustment key (Z) located behind the terminal block for at least 2 second and release. After this operation the digital milliammeter reading should be 4mA and the Upper Range Value automatically moved to a value equal to the sum of the pressure to be suppressed and the previous calibrated span.

Method 2: use the zero and span procedure above but apply pressures equal to the Lower Range Value (LRV) and then to Upper Range Value (URV), press for at least 2 second and release, the Zero local adjustment key (Z) and Span local adjustment key (S) respectively.

Zero elevation

Two different methods can be used for Zero elevation:

Method 1: after completion of the zero and span procedure above apply to the Low Side connection (P1 as default) a pressure equal to the pressure to be elevated. Allow time for pressure stabilization and then the Zero local adjustment key (Z) located behind the cover for at least 2 second and release After this operation the digital milliammeter reading should be 4mA and the Upper Range Value (URV) is automatically moved to a value equal to the sum of the pressure to be elevated and the previous calibrated span.

Method 2 use the zero and span procedure above but apply pressures equal to the Lower Range Value (LRV) and then equal to the Upper Range Value (URV) press for at least 2 second and release the Zero local adjustment key (Z) and Span local adjustment key (S) respectively.

The LRV pressure will be applied to the Low Side connection (P1 as default) whereas the URV will be applied to the Low Side (P1 as default) or to the High Side (P2 as default) connection depending upon the whether the range is all negative or crosses zero.

Totalizer

The transmitter provides the possibility of a totalizer function when used for flow measurements. Two Totalizer will be available: Permanent and Batch. The Permanent Totalizer can be protected by a password. The Batch Totalizer is not protected and its reset is always possible.

Totalizer by Digital LCD Integral Display

To operate the Totalizer status

Navigate the Digital LCD Integral Display menu, select **Totalizer** > **Totalizer status**. and the used Totalizer Status will be available. To modify select **Edit** then scroll the desired value with the up and down keys (see the following table) and confirm with **OK**.

On to start the Totalizer
Off to stop the Totalizer

NOTE

In case the Totalizer is used in Bidirectional Flow mode the Totalizer LRV (0%) and the Totalizer URV (100%) have to be equal in absolute value. If different the Totalizer Status remains OFF.
The max integration time selectable is 54 mins.

☞ Digital LCD Integral Display Keys sequence to operate the Totalizer Status: 4 - 1 - Edit

To reset the Permanent Totalizer

Navigate the Digital LCD Integral Display menu, select **Totalizer > Reset > Permanent Totalizer > Reset**. To reset select **OK**.

☞ Digital LCD Integral Display Keys sequence to reset the Permanent Totalizer: 4 - 2 - 1 - OK

To reset the Batch Totalizer

Navigate the Digital LCD Integral Display menu, select **Totalizer > Reset > Batch Totalizer > Reset**. To reset select **OK**.

☞ Digital LCD Integral Display Keys sequence to reset the Batch Totalizer: 4 - 2 - 2 - OK

To protect the Permanent Totalizer

Navigate the Digital LCD Integral Display menu, select **Totalizer > Reset > Permanent Totalizer > Tot. Protection**, and the actual protection will be available (Unlock and Lock). To modify select **Edit** then scroll the desired protection with the up and down keys and confirm with **OK**.

☞ Digital LCD Integral Display Keys sequence to protect the Permanent Totalizer: 4 - 2 - 1 - 2 - Edit

To change the Permanent Totalizer protection Password:

The Permanent Totalizer Password is a five digit string. The default value, at the transmitter delivery is *********. When this default password is set the protection does not work.

Navigate the Digital LCD Integral Display menu, select **Totalizer > Reset > Permanent Totalizer > Change Password**, and the actual password will be available. To modify select **Edit** then scroll the desired alphanumeric symbol with the up and down keys and confirm with **Next**. Repeat the operation for the five digits and confirm with **OK**.

☞ Digital LCD Integral Display Keys sequence to change the Permanent Totalizer Password: 4 - 2 - 1 - 3 - Edit

Totalizer operation by HHT

Totalizer operation by Hand Held Terminal is available. Please refer to the device manual for the appropriated operations.

Totalizer operation by PC

Totalizer operation by PC is available using dedicated Software. ABB can provide the references and the Software. Please refer to the Software instructions for the appropriated operations.

Reset to Factory trim

The transmitter has in the memory the Sensor Low trim, the Sensor High trim and the Output trimming (Digital to analog trim) defined or calculated during the transmitter assembly. These data have been defined as Factory trim.

The Reset to Factory trim allow the restoration of the as-shipped factory settings of the sensor trim and analog output trim.

The Reset to Factory trim is suggested in case wrong trim operations are performed and the transmitter is in an undefined condition (i.e.: inadvertent zero trim of an absolute pressure unit or inaccurate pressure source).

Reset to Factory Trim by Digital LCD Integral Display

Navigate the Digital LCD Integral Display menu, select **Calibrate > Reset to Factory Trim**. To modify select **Edit** then scroll the desired Factory Trim (see the following table) with the up and down keys and confirm with **OK**.

<i>Sensor Trim</i>	Provides the Sensor Low Trim and Sensor High Trim as defined during the factory transmitter assembly
<i>DAC Trim</i>	Provides the Output Current Trimming as during the factory electronics characterization
<i>Full Trim</i>	Provides the Sensor Low Trim and the Sensor High Trim as during the factory transmitter assembly and the Output Current Trimming as during the factory electronics characterization

☞ Digital LCD Integral Display Keys sequence to Reset to Factory Trim: 6 – 3 – Edit

Reset to Factory trim by HHT

Reset to Factory trim (Sensor and Output trim) by Hand Held Terminal is available. Please refer to the device manual for the right operations.

Reset to Factory trimming by PC

Reset to Factory trim (Sensor and Output trim) by PC is available using dedicated Software. ABB can provide the references and the Software. Please refer to the Software instructions for the right operations.

Software Write Protect

Changes can be prevented to the transmitter configuration data with the Software write protection. If the transmitter Software write protection is activated the transmitter will not accept any writes to its memory. Configuration changes, such as trim and reranging cannot take place.

Software Write Protect by Digital LCD Integral Display

Navigate the Digital LCD Integral Display menu, select **Device Config > SW Write Protect**. To change the status of the Software write protection select **Edit** then **Unlock** and **OK** to remove the protection or **Lock** and **OK** to insert the protection.

☞ Digital LCD Integral Display Keys sequence to Software Write Protect: 2 – 7 – Edit

Software Write Protect by HHT

Software write protection by Hand Held Terminal is available. Please refer to the device manual for the appropriate operations.

Software Write Protect by PC

Software write protection by PC is available using dedicated Software. ABB can provide the references and the Software. Please refer to the Software instructions for the appropriate operations.

HART Multidrop mode

The transmitter can work in the HART Multidrop mode with other transmitters on the same line. HHT and PC, using the dedicated Software (ABB can supply the references and the Software), can set this operative mode. Please refer to the device manual and the Software instructions for the right operations.

Maintenance

No specific maintenance actions are required on the 2600T Pressure transmitter Series.

Exterior cleaning

Please note the following points when cleaning the device:

- The cleaning agents used should not attack the surface and the seals (gasket and threads).
- Mechanical damage to the diaphragm (i.e.: due to pointed objects) must be avoided.

Field update

Each transmitter is labeled individually, so it is imperative that the approval codes on each label match exactly during upgrade. The label on the transmitter reflects the replacement model code for reordering an assembled unit with the required communication protocol.

The 2600T Pressure transmitter Series allows for electronics board upgrades. Two provided screws guide and secure the boards into place.

Replacement and Troubleshooting



WARNING !

Before you begin read "Safety" on page 3.

The display, secondary electronic, and transducer assemblies are not user -serviceable; however, they may be replaced. This section describes the dismantle, the replacement and the troubleshooting of these assemblies. Other components are not replaceable except at the factory. As an example the housing covers viewing glass. This because regulations do not permit field replacement of a broken or damaged glass as this would invalidate the enclosure's explosion proof rating. Therefore it is necessary to replace the entire damaged enclosure cap assembly.

Dismantling and reassembly

Dismantling and reassembly should not be carried out on site because of the risk of damage to components and printed circuits as a result of adverse environmental conditions such as humidity, dust, etc. The dismantling and reassembly procedures given below should be carried out in the listed order to avoid instrument damage. See the pictures at the end of the instructions for better understanding.

Operation required tools

- 3 mm Allen key (in the transmitter box)
- Small Phillips screwdriver
- Small flat-bladed screwdriver

Safety information for Dismantling and Reassembly

Read the following Safety information before to start any operation.



WARNING !

Only specialist personnel or ABB may undertake dismantling and reassembly of certified devices.



WARNING !

Process fluids and/or pressure retained in the transmitter primary unit can cause severe injury and death or damage to the equipment. It is the user responsibility to make sure that no pressure is applied before removing the instrument from service or when draining or venting.



WARNING !

For Hazardous classified Location installations, at least seven (7) threads on the cover must be engaged in order to meet the flameproof (explosion-proof) requirements.

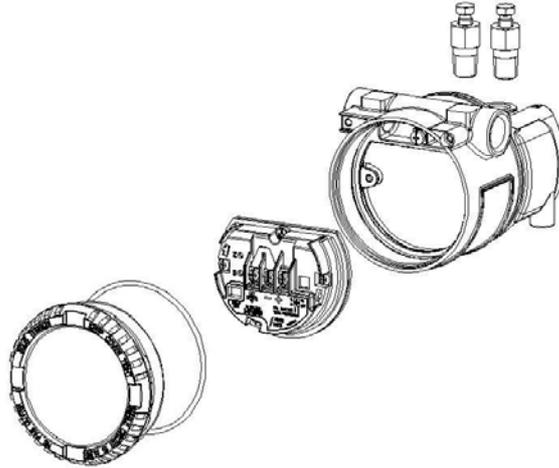


DANGEROUS FLUIDS

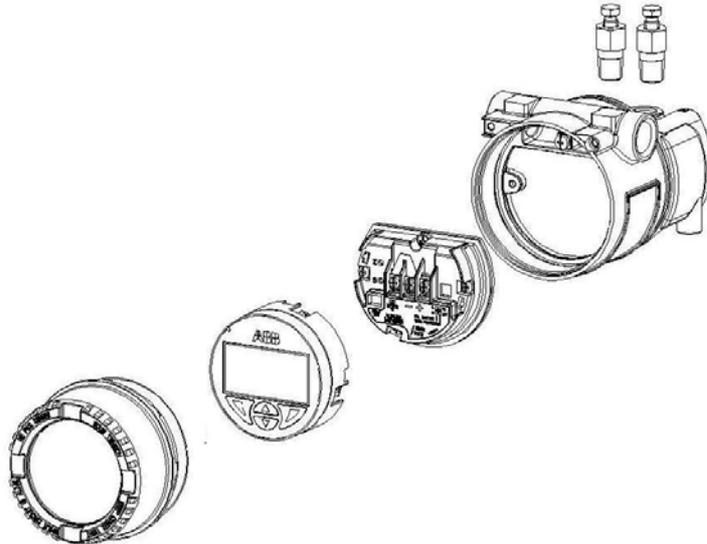
In case of toxic or otherwise dangerous process fluid, take any precautions as recommended in the relevant Material Safety Data Sheet.

Dismantling

The Digital LCD Integral Display and Electronics dismantling are allowed. See the Sectional view as reference.



Transmitter Sectional View for the 364 models without Digital LCD Integral Display



Transmitter Sectional View for the 364 models with Digital LCD Integral Display

Replacement

Electronics replacement

For electronics replacement or update apply the following procedure:

1. Screw down completely the cover locking screw using the 3 mm Allen key
2. Unscrew and remove the cover
3. Unscrew the two fixing screws and remove the secondary electronic assembly
4. Unplug the sensor cable
5. Plug the sensor cable to the new secondary electronics. Fix the electronic circuit by its screws.
6. Refit the covers and tighten securely.
7. Unscrew the cover locking screw to secure the covers. **This is mandatory to meet "Flameproof requirements" for Hazardous Areas installation.**

Data saving in case of replacement

In case it is necessary to replace the secondary electronic (e.g.: fault, HART electronic release update) the configuration of the new electronics is automatically updated, via the primary electronics, when the 364XS is power cycled.

Digital LCD Integral Display installation or replacement

To install the integral display:

1. Look at the indication on the nameplate.



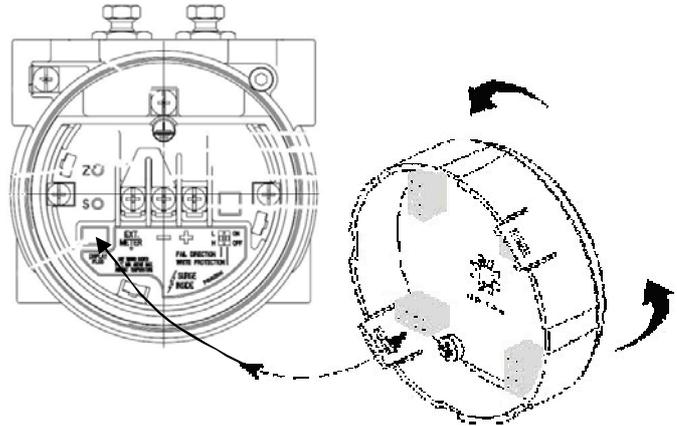
WARNING

In an Explosion-Proof/Flame-Proof installation, do not remove the transmitter covers when power is applied to the unit

2. Remove the housing cover.
3. Fit the Integral display onto the secondary electronic. At this purpose use the 6 pin insert, supplied with the meter, it should be positioned in order to connect the two female connectors with the indicator in the required position

Note that it is possible to select the rotation angle by selecting one of the four different connections rotated clockwise or counterclockwise with 90° steps.

4. Fit the windowed housing cover, turn it to seat the O-ring into the housing and then continue to hand tighten until the cover contacts the housing metal-to-metal



WARNING

In EEx d (Explosion Proof) installation, lock the cover rotation by turning the locking screws (use the 3 mm Allen key supplied with the instrument)

Troubleshooting

Suggestions for the most common operating problems are given in this User's Manual.

If you suspect malfunction despite the absence of any diagnostic messages on the display, follow the procedures described here to verify that transmitter hardware and process connections are in good working order.

Simple fault finding

In case the transmitter is not working properly, carry out the following fault finding checks before contacting your nearest Service Center.



WARNING

If the transmitter is working in a control loop, the loop must be placed under local manual control while the instrument is examined or taken out of service. Take all precautions to avoid damages caused by pressure or dangerous fluids release.

Symptom	Corrective actions
No output current	<ul style="list-style-type: none"> ▪ Check the transmitter power supply ▪ Verify terminal voltage is 10.5 to 42 V dc (or 30Vdc in EE x ia applications) ▪ Check power wires for reversed polarity ▪ Clean the electrical connections ▪ Replace the Electronics module
High, low or irregular output current	<ul style="list-style-type: none"> ▪ Check the transmitter power supply ▪ Verify applied pressure ▪ Verify 4 and 20 mA range points ▪ Verify output is not in alarm condition ▪ Verify if 4 – 20 mA output trim is required ▪ Check for trapped gas in liquid lines and liquid in dry lines ▪ Check for sediment in process flanges ▪ Clear the electronics module connectors contact ▪ Replace the Electronics module
Transmitter Not Communicating with HART Communicator	<ul style="list-style-type: none"> ▪ Verify the output is between 4 and 20 mA or saturation levels ▪ Verify clean DC Power to transmitter (Max AC noise 0.2 volts peak to peak) ▪ Check loop resistance, 250 ohm minimum ▪ Check if unit is addressed properly
Transmitter will not respond to changes in applied pressure	<ul style="list-style-type: none"> ▪ Check the test equipment ▪ Check impulse piping or manifold for blockage ▪ Verify applied pressure is between the Lower Range Limit and the Upper Range Limit ▪ Verify output is not in alarm condition ▪ Verify transmitter is not in Loop Test mode
Digital Pressure Variable reading is erratic	<ul style="list-style-type: none"> ▪ Check application for faulty equipment in pressure line ▪ Verify transmitter is not reacting directly to equipment turning on/off ▪ Verify damping is set properly for application
Milliamp reading is erratic	<ul style="list-style-type: none"> ▪ Verify power source to transmitter has adequate voltage and current ▪ Check for external electrical interference ▪ Verify transmitter is properly grounded ▪ Verify shield for twisted pair is only grounded at one end

Transmitter diagnostics

The transmitter provides some diagnostics messages to the user in case of faults or conditions out of the specification.

Diagnostic messages

Diagnostics messages are provided by Digital LCD Integral Display or by Hart communication using the proper external tools.

Diagnostics on the Digital LCD Integral Display (Hart version)

The diagnostics messages below listed can appear on the Digital LCD Integral Display. The corrective actions are also suggested (see the common corrective actions description at the end of the message list).

Electronic Fail

There are internal inconsistencies in the data base of the HART (secondary) electronic
Corrective actions: 1, 2, 3

Sensor Invalid

There are internal inconsistencies in the data base of the transducer (primary) electronic . This test is performed at the start up.
Corrective actions: 1, 2, 4

Sensor Fail

The reading from the sensor is wrong
Corrective actions: 1, 2, 4

PV out of Limit

The calculated PV is above 110% or below –110% of sensor limit (LRL/URL on the instrument nameplate).
Corrective actions: 5.

Static P Out Lim

The detected static pressure is above the maximum static pressure (MWP on the instrument nameplate).
Corrective actions: 5.

Overrange

The detected pressure is above the maximum static pressure (MWP on the instrument nameplate).
Corrective actions: 5.

Sensor T Out Lim

The sensor temperature is above + 90 °C or below – 50°C.
Corrective actions: 5.

Current Out Satur

The output is limited to the saturation limits, but the measurement is beyond these limits.
 The measured variable could be outside the configured span.
Corrective actions: 5

Current Out Fixed

The output is fixed to a value set by a HART command for simulation purposes
Corrective actions: Use the HART command to exit the simulation mode. If the transmitter is not in simulation mode see 1, 2, 3.

DAC Out of Range

The Digital to Analog Converter (DAC) is out of range
Corrective actions: It is necessary to carry out an Output Trimming operation specified in this manual. If the error persists see 1, 2, 3 or 4.

Electr. T Out Lim

The temperature of the HART electronic is above 90 °C or below –50°C.

Corrective actions: Check the ambient temperature. If it is within the limits see 1, 2, 3.

Consistency Check

The secondary electronic and the primary electronics have not been working together before.

Corrective actions: If this message appears during a replacement, please follow the replacement instruction in the relevant section of this manual. If the error persists see 1, 2, 3 or 4

Config. Error

Bad configuration of range and/or transfer function.

Corrective actions: Please follow the setting configuration instruction in the relevant section of the this manual. If the error persists see 1, 2, 3 or 4

Sensor Elec. Fail

There are internal inconsistencies in the memory of the primary electronic. This test is performed at the start up.

Corrective actions: 1, 2, 4

Tot. Config Error

The configuration of the totalizer is not correct

Corrective actions: Please follow the totalizer instruction in the relevant section of the this manual. If the error persists see 1, 2, 3 or 4

Common corrective actions:

1. Switch the transmitter off and on to verify if the message appears again
2. With the HART command 48 it is possible to obtain additional information on the failed component
3. If the message persists the secondary electronic is suspected to have a failure. If the output is in a failure status (high or low) the fault is severe and it is necessary to substitute the secondary electronic. Otherwise the failure is minor, the signal is still valid but with a lower accuracy. The secondary electronic can be substituted when convenient.
4. If the message persists, the primary electronic could be damaged. If the output is in a failure status (high or low) the fault is severe and it is necessary to substitute the transducer. Otherwise the failure is minor, the signal is still valid but with a lower accuracy. The transducer can be substituted when convenient.
5. Check the process and ambient conditions (e.g.: pressure, process temperature, ambient temperature static pressure, etc.) against the sensor and electronics limits. If the conditions are close or outside the limits, these improper instrument utilization can have seriously compromised the instrument functionality. If the conditions are well inside the limits see the corrective actions of point 4 or 3.

Diagnostics on the CoMeter

The diagnostics messages on the CoMeter and Prometer when installed on the 695 Field Indicator are available. Please refer to the device manual for the right operations.

Hart version diagnostics on the HHT

Hart version diagnostics on the Hand Held Terminal are available. Please refer to the device manual for the right operations.

Hart version diagnostics on thePC

Hart version diagnostics on the PC are available using dedicated Software. ABB can provide the references and the Software. Please refer to the Software instructions for the right operations.

Additional Safety Notes

Hazardous Area

According to ATEX Directive (European Directive 94/9/EC of 23 March 1994) and relative European Standards which can assure compliance with Essential Safety Requirements, i.e., EN 60079-0 (General requirements) EN 60079-1 (Flameproof enclosures "d") EN 50020 (Intrinsic safety "i") EN 50284 (Equipments, group II, category 1G) EN 50281 (Apparatus for use with combustible dusts), EN 60079-15 (Construction test and marking of type of protection "n" electrical apparatus), EN 60079-26 (Construction test and marking of group II zone 0 electrical apparatus).

The 364 pressure transmitter models (2600T series) have been certified for the below indicated groups, categories, media of dangerous atmosphere, temperature classes, types of protection.

Certificate groups

Certificate ATEX II 1G Ex ia IIC T6 and II 1D Ex iaD 20 T85°C

ZELM certificate number ZELM 06 ATEX 0302 X

The meaning of ATEX code is as follows:

- II : Group for surface areas (not mines)
- 1 : Category
- G : Gas (dangerous media)
- D : Dust (dangerous media)
- T85°C: Maximum surface temperature of the transmitter enclosure with Ta (ambient temperature) +75°C for Dust (not Gas) with a dust layer up to 5mm. For application with dust layer between 5 and 50 mm, maximum surface temperature must be considered according to IEC 61241-14 chapter 6.3.3.3.

Note: the number close to the CE marking of the transmitter safety label identifies the Notified Body which has responsibility for the surveillance of the production

The other marking refers to the protection type used according to relevant EN standards:

- Ex ia : Intrinsic safety, protection level "a"
- Ex iaD 20: Construction with inside intrinsic safety electronics suitable for Dust Zone20
- IIC : Gas group
- T6 : Temperature class of the transmitter (which corresponds to 85°C max) with a Ta (ambient temperature) +40°C

About the applications, this transmitter can be used in "Zone 0" (Gas) and "Zone 20" (Dust) classified areas (continuous hazard) as it is shown on the picture on the right.

Certificate ATEX II 1/2G Ex ia IIC T6 and II 1/2D Ex iaD 21 T85°C

ZELM certificate number ZELM 06 ATEX 0302 X

Note: this ATEX Category depends on the application (see below) and also on the intrinsic safety level of the transmitter supply (associated apparatus) which can sometimes suitably be [ib] instead of [ia]. As it is well known, the level of an intrinsic safety system is determined by the lowest level of the various apparatus used, i.e., in the case of [ib] supply, the system takes over this level of protection.

The meaning of ATEX code is as follows:

- II : Group for surface areas (not mines)
- 1/2 : Category - It means that only a part of the transmitter complies with category 1 and a second part complies with category 2 (see picture on the right)
- G : Gas (dangerous media)
- D : Dust (dangerous media)
- T85°C: Maximum surface temperature of the transmitter enclosure with Ta (ambient temperature) +75°C for Dust (not Gas) with a dust layer up to 5mm. For application with dust layer between 5 and 50 mm, maximum surface temperature must be considered according to IEC 61241-14 chapter 6.3.3.3.

Note: the number close to the CE marking of the transmitter safety label identifies the Notified Body which has responsibility for the surveillance of the production

The other marking refers to the protection type used according to relevant EN standards:

- Ex ia : Intrinsic safety, protection level "a"
- Ex iaD 21: Construction with inside intrinsic safety electronics suitable for Dust Zone21
- IIC : Gas group
- T6 : Temperature class of the transmitter (which corresponds to 85°C max) with a Ta (ambient temperature) +40°C

About the applications, this transmitter can be used in Zone "0" (Gas) classified areas (continuous hazard) with its "process part" only, whereas the remaining part of the transmitter, i.e. its enclosure, can be used in Zone 1 (Gas), only (see pictures on the right). Reason of this is the process part of the transmitter (normally called primary transducer) that provides inside separation elements to seal off the electrical sensor from the continuously hazardous process, according to the EN50284 and EN50018. About Dust application, the transmitter is suitable for "Zone 21" according to the EN 50281 as it is shown on the relevant part of the pictures on the right.

Application with Gas



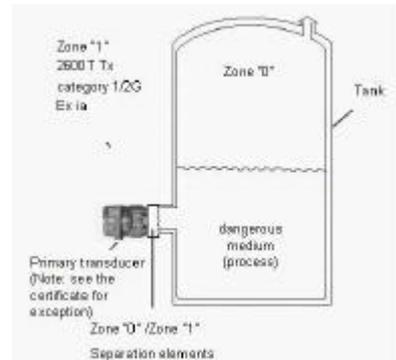
Note: the transmitter must be connected to a supply (associated apparatus) certified [Ex ia]

Application with Dust



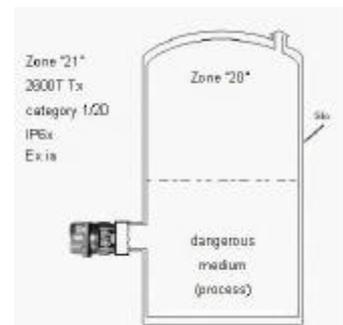
Note: the protection is mainly assured by the "IP degree" associated to the low power from the supply certified [Ex ia]

Application with Gas



Note: the transmitter can be connected to either [ib] or [ia] supply (associated apparatus)

Application with Dust



Note: the protection is mainly assured by the "IP degree" associated to the low power from the supply. This can either be [ib] or [ia]

Certificate ATEX II 1/2G Ex d IIC T6 and II 1/2D Ex tD A21 IP67 T85°C

ZELM certificate number ZELM 06 ATEX 0302 X

The meaning of ATEX code is as follows:

- II : Group for surface areas (not mines)
- 1/2 : Category - It means that only a part of the transmitter complies with category 1 and a second part complies with category 2 (see the picture on the right)
- G : Gas (dangerous media)
- D : Dust (dangerous media)
- T85°C: Maximum surface temperature of the transmitter enclosure with Ta (ambient temperature) +75°C for Dust (not Gas) with a dust layer up to 5mm. For application with dust layer between 5 and 50 mm, maximum surface temperature must be consider according to IEC 61241-14 chapter 6.3.3.3.

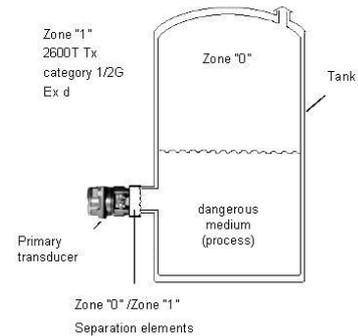
Note: the number close to the CE marking of the transmitter safety label identifies the Notified Body which has responsibility for the Surveillance of the production.

The other marking refers to the protection type used according to relevant EN Standards:

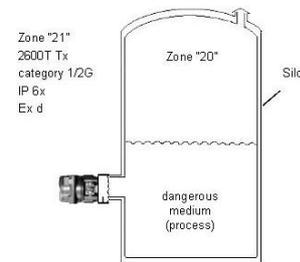
- Ex d: Explosion proof/Flameproof
- Ex tD A21: Construction with flam proof of protection method suitable for Dust - Zone21
- IIC : Gas group
- T6 : Temperature class of the transmitter (which corresponds to 85°C max) with a Ta (ambient temperature) +75°C.

About the applications, this transmitter can be used in Zone "0" (Gas) cla ssified areas (continuous hazard) with its "process part" only, whereas the remaining part of the transmitter, i.e. its enclosure, can be used in Zone 1 (Gas), only (see sketch below). Reason of this is the process part of the transmitter (normally called primary transducer) that provides inside separation elements to seal off the electrical sensor from the continuously hazardous process, according to the EN50284 and EN50018. About Dust application, the transmitter is suitable for "Zone 21" according to the EN 50281 as it is shown on the relevant part of pictures on the right.

Application with Gas



Application with Dust



Note: the protection is mainly assured by the "IP degree" associated to the low power from the supply

Certificate ATEX II 3G Ex nL IIC T6 and II 3D Ex tD A22 IP67 T85°C

ZELM certificate number ZELM 06 ATEX 0302 X

The meaning of ATEX code is as follows:

- II : Group for surface areas (not mines)
- 3 : Category
- G : Gas (dangerous media)
- D : Dust (dangerous media)
- T85°C: Maximum surface tem perature of the transmitter enclosure with Ta (ambient temperature) +75°C for Dust (not Gas) with a dust layer up to 5mm. For application with dust layer between 5 and 50 mm, maximum surface temperature must be consider according to IEC 61241-14 chapter 6.3.3.3.

The other marking refers to the protection type used according to the standards:

- Ex nL : Type of protection "n" with "energy limitation" technique
- Ex tD A22: Construction with flameproof of protection method suitable for Dust - Zone22
- IIC : Gas group
- T6 : Temperature class of the transmitter (which corresponds to 85°C max) with a Ta (ambient temperature) +40°C

Note: when installed this transmitter must be supplied by a voltage limiting device which will prevent the rated voltage of 42 V d.c. being exceeded.

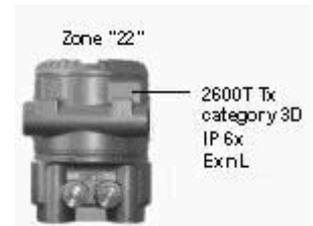
About the applications, this transmitter can be used in "Zone 2" (Gas) and "Zone 22" (Dust) classified areas (unlikely/infrequent hazard) as it is shown on the picture on the right.

Application with Gas



Note: the transmitter must be connected to a supply with 42 V d.c. max output voltage as above indicated. The current of the transmitter is less than 25 mA.

Application with Dust



Note: the protection is mainly assured by the "IP degree" associated to the low power from the supply.

Certificate **ATEX II 1G Ex ia IIC T6 and II 1/2G Ex ia IIC T6 and II 3G Ex nL IIC T6 and
II 1D Ex iaD 20 T85°C and II 1/2D Ex iaD 21 T85°C**

respectively **II 1/2G Ex d IIC T6 and II 1/2D Ex tD A21 IP67 T85°C and
II 3D Ex tD A22 IP67 T85°C**

ZELM certificate number ZELM 06 ATEX 0302 X

For special conditions for safe use see certificate

The meaning of ATEX code is as follows:

II : Group for surface areas (not mines)
1 : Category
1/2 : Category - It means that only a part of the transmitter complies with category 1 and a second part complies with category 2 (see on application sketch)
G : Gas (dangerous media)
D : Dust (dangerous media)
T85°C: Maximum surface temperature of the transmitter enclosure with Ta (ambient temperature) +75°C for Dust (not Gas) with a dust layer up to 5 mm. For application with dust layer between 5 and 50 mm, maximum surface temperature must be considered according to IEC 61241-14 chapter 6.3.3.3.

(Note: the number close to the CE marking of the transmitter safety label identifies the Notified Body which has responsibility for the surveillance of the production)

The other marking refers to the Intrinsic safety protection type used according to relevant EN standards:

Ex ia : Intrinsic safety, protection level "a"
Ex iaD 20 : Construction with inside intrinsic safety electronics suitable for Dust – Zone 20
Ex iaD 21 : Construction with inside intrinsic safety electronics suitable for Dust – Zone 21
IIC : Gas group
T6 : Temperature class of the transmitter (which corresponds to 85°C max) with Ta (ambient temperature) +40°C

The other marking refers to the Flameproof protection type used according to relevant EN standards:

Ex d: Flameproof
Ex tD A21 : Construction with flameproof of protection method suitable for Dust – Zone 21
Ex tD A22 : Construction with flameproof of protection method suitable for Dust – Zone 22
IIC : Gas group
T6 : Temperature class of the transmitter (which corresponds to 85 °C max) with Ta (ambient temperature) +75°C.

About the applications of the transmitter see the relevant sketch.

"Ex Safety" Aspects for North America

According to Factory Mutual Standards which can assure compliance with Essential Safety Requirements

FM 3600 : Electrical Equipment for use in Hazardous (Classified) Locations, General Requirements.

FM 3610 : Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, III, Division 1, and Class I, Zone 0 & 1 Hazardous (Classified) Locations.

FM 3611 : Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III Division 1 and 2 Hazardous (Classified) Locations.

FM 3615 : Explosionproof Electrical Equipment.

FM 3810 : Electrical and Electronic Test, Measuring and Process Control Equipment.

NEMA 250 : Enclosure for Electrical Equipment (1000 Volts Maximum)

The 364 pressure transmitter models have been certified by Factory Mutual for the following Class, Divisions and Gas groups, hazardous classified locations, temperature class and types of protection.

- Explosionproof for Class I, Division 1, Groups A, B, C and D, hazardous (classified) locations.
- Dust Ignition proof for Class II, III Division 1, Groups E, F and G, hazardous (classified) locations.
- Suitable for Class II, III, Division 2, Groups F and G, hazardous (classified) locations.
- NonIncendive for Class I, Division 2, Groups A, B, C and D, in accordance with Nonincendive field wiring requirements for hazardous (classified) locations.
- Intrinsically Safe for use in Class I, II and III, Division 1, Groups A, B, C, D, E, F, and G in accordance with Entity requirements for hazardous (classified) locations.
- Temperature class T4 to T6 (dependent on the maximum input current and the maximum ambient temperature).
- Ambient Temperature range -50°C to +85°C (dependent on the maximum input current and the maximum temperature class).
- Electrical Supply range Minimum 10.5 Volts, Maximum 42 Volts (dependent on the type of protection, maximum ambient
- Temperature, maximum temperature class and communication protocol).
- Type 4X applications Indoors/Outdoors.

NOTE

The 364 pressure transmitter models installed in Explosionproof Class 1 Division 1 Group A, B, C and D hazardous (classified) location does not require conduit sealing as per FM 3615 sect 4.3 / NEC 501.15.

For a correct installation in field of the 364 pressure transmitter models please see the related control drawing.

Note that the associated apparatus must be FM approved.

According to CSA International Standards which can assure compliance with Essential Safety Requirements

C22.2

- 0-M1991** : General Requirements – Canadian Electrical Code Part II.
- 0.4-M1982** : Bounding and Grounding of Electrical Equipment (Protective Grounding)
- 0.5-M1982** : Threaded Conduit Entries
- 25-M1966** : Enclosures for use in Class II Groups E, F and G Hazardous Locations.
- 30-M1986** : Explosion-proof Enclosures for use in Class I Hazardous Locations.
- 94-M1991** : Special Purpose Enclosures.
- 213-M1987** : Non-Incendive Electrical Equipment for use in Class I Division 2 Hazardous Locations.
- 157-M1992** : Intrinsically Safe and Non-Incendive Equipment for use in Hazardous Locations.

CAN/CSA C22.2 No.1010.1-92

Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use, Part 1 : General Requirements (includes Amendment 1)

CAN/CSA C22.2 No.1010.1B-97

Amendment 2 to CAN/CSA C22.2 No 1010.1-92

CAN/CSA E60079-0-00

Electrical apparatus for explosive gas atmosphere. Part 0 : General Requirements.

CAN/CSA E60079-1-01

Electrical apparatus for explosive gas atmosphere. Part 1 : Construction and verification test of flameproof enclosure of electrical apparatus.

CAN/CSA E60079-11-02

Electrical apparatus for explosive gas atmosphere. Part 11 : Intrinsic Safety "i"

The 2600T Series pressure transmitters have been certified by CSA International for the following Class, Divisions and Gas groups, hazardous classified locations, temperature class and types of protection.

- Explosionproof for Class I, Division 1 and 2, Groups A, B, C and D; Class II Groups E, F and G; Class III; Enclosure Type 4X Ex d IIC.
- Non incendive for Class I, Division 2, Groups A, B, C and D; Class II Groups E, F and G; Class III; Enclosure Type 4X Ex nL IIC.
- Intrinsically Safe for Class I, Division 1 and 2, Groups A, B, C and D; Class II Groups E, F and G; Class III; Enclosure Type 4X Ex ia IIC.
- Temperature class T4 to T6 (dependent on the maximum input current and the maximum ambient temperature).
- Ambient Temperature range -50°C to +85°C (dependent on the maximum input current and the maximum temperature class).
- Electrical Supply range Minimum 10.5 Volts, Maximum 42 Volts (dependent on the type of protection, maximum ambient temperature, maximum temperature class and communication protocol).
- Type 4X applications Indoors & Outdoors.
- Pollution Degree I
- Installation Category II
- Altitude 2000 m
- Humidity 0 to 80%

For a correct installation in field of the 364 pressure transmitter models please see the related control drawing.

Note that the associated apparatus must be CSA approved.

Note for pressure transmitter with combined approval



WARNING

Before installing the Transmitter, the end user has to permanent mark on the nameplate his chosen Protection Concept (including general purpose in an unclassified location). The Transmitter can only be used according to this Protection Concept for the life of the product. **If more than one type of protection box (on safety label) are permanent marked, the Pressure Transmitter must be removed from hazardous classified locations.** The selected Type of Protection is allowed to be changed only by manufacture r after a new satisfactory assessment.

ABB ABB S.p.A. Lerino (Co) Italy	SERIAL NUMBER 6406000001	SPAN LIMITS 0.65 KPa	FILLING FLUID SILICON OIL	CE
SA	CODE 364DSGSHQOT1 MWP 20 MPa	LRL/URL -65 / 65 kPa	DIAPHRAGMS HASTELLOY C276	
FH APPROVED	<input type="checkbox"/> XP CL I/DIV1/ABCD IS Ex Ia SEC INTRINSEQUE CL I, ZONE 0, AEx Ia IIC T6, T5, T4 IS Ex Ia SEC INTRINSEQUE (ENTITY)CL I/DIV1/ABCD when connected per drawing DH 3090 ENCL 4X T AMB=85°C Max. hot spot T4 in 85°C Max AMB DIP CL II/III/DIV1/EFG "Seal Not Required"	<input type="checkbox"/> General Purpose IP67 Max. Supply Voltage 42 Vdc	OUTPUT SIGNAL 4 to 20 mA + HART 0722	
	<input type="checkbox"/> XP CL I/DIV1/ABCD IS CL 1, ZONE 0, AEx Ia IIC T6, T5, T4 IS (Entity) CL I/DIV1/ABCD when connected per drawing DH 3090 ENCL 4X T AMB=85°C Max. hot spot T4 in 85°C Max AMB "Seal Not Required" DIP CL II/III/DIV1/EFG	<input type="checkbox"/> II 1/2 G Ex d IIC T6 and II 1/2 D Ex tD A21 IP67 T85°C ZELM 06 ATEX XXXX POWER SUPPLY 42 Vdc/ 2W MAX		
		<input type="checkbox"/> II 1 G Ex ia IIC T6 and 1/2 G Ex ia and II 1D Ex iaD 20 T85°C and II 1/2 D Ex iaD 21 T85°C for electrical parameters see cert. ZELM 06 ATEX XXXX (IP 67)		

Power supply operative limits

The transmitter operates on a minimum voltage of 10.5 Vdc to a maximum of 42 Vdc and is protected against polarity inversion.

Note The transmitter operates from 10.5 to 42 Vdc with no load (additional load allows operation over 42 Vdc). For EEx ia and intrinsically safe (FM, CSA and SAA) approval power supply must not exceed 30 Vdc. In some countries the maximum power supply voltage is limited to a lower value.

Minimum operating voltage is 15.3 Vdc if on terminals for external meter neither link nor remote indicator is present.

The total loop resistance is indicated in the expression below.

$$R \text{ (kohm)} = (\text{Supply voltage} - \text{Minimum operating voltage}) / 22.5$$

The total loop resistance is the sum of the resistance of all elements of the loop, including wiring, conditioning resistor, safety barriers and additional indicators (excluding the equivalent resistance of the transmitter). Where a configuration device (HART), such as the Hand Held Communicator or a Modem is likely to be used, a resistance of 250 ohm minimum should be present between the power supply and the point of insertion of these devices, to allow communication.

Several types of safety barriers, either passive or active, can be satisfactorily used in conjunction with the 364 pressure transmitter models. Nevertheless, in case of use of active barriers, check with the supplier if the model is suitable for use with smart transmitters allowing the connection of the configuration devices in the "safe" or non-hazardous area.

PED information integration

The transmitter may be used in compliance with the Pressure Equipment Directive 97/23/EC in compliance with article 3 comma 3. It is recommended to select the correct fail safe mode for the 4-20 mA signal (as per Namur NE43 recommendation). See also the relevant instructions about the failsafe direction in this manual. For Safety reason the use of the transmitter is limited as following described.

Ambient Temperature limits °C (°F):

Transmitters with Silicone oil filling:	between -40°C and +85°C (between -58°F and +185°F)
Lower ambient limit for LCD indicators:	-20°C (-4°F)
Upper ambient limit for LCD indicators:	+70°C (+158°F)

Process Temperature limits °C (°F):

Transmitters with Silicone oil filling:	between -40°C and +121°C (between -58°F and +250°F)
---	---

Storage Temperature limits °C (°F):

Lower limit	-50°C (-58°F); -40°C (-40°F) for Digital LCD Integral Display
Upper limit	+85°C (+185°F)

Overpressure limits (without damage to the transmitter)

Lower limit	0.067kPa abs, 0.67mbar abs, 0.01psia
Upper limit	16MPa, 160bar, 2320psi for sensor code E 20MPa, 200bar, 3045psi for sensor codes F to S

Static pressure

Lower limit	1.3kPa abs, 13mbar abs, 0.2psia
Upper limit	16MPa, 160bar 2320psi for sensor code E 20MPa, 200bar, 2900psi for sensor code F to S

Proof pressure

The transmitter can be exposed without leaking (meet ANSI/ISA –S 82.03 hydrostatic test requirements and SAMA PMC 27.1) to line pressure of up to 38.5 MPa, 385 bar, 5585 psi.

Electromagnetic compatibility (EMC)

Emission:	Comply with EN 61000-6-3
Immunity:	Comply with EN 61000-6-2
Radiated electromagnetic immunity level:	30V/m (according to IEC 1000–4–3, EN61000–4–3)
Conducted electromagnetic immunity level:	30V (according to IEC 1000–4–6, EN 61000–4–6)
Surge immunity level	4kV (according to IEC 1000-4–5 EN 61000–4–5)
Fast transient (Burst) immunity level:	4kV (according to IEC 1000–4–4 EN 61000–4–4)

Humidity

Relative humidity:	up to 100% annual average
Condensing, icing:	admissible

Vibration resistance (according to IEC 60068–2–6)

Accelerations:	up to 2g at frequency up to 1000Hz
----------------	------------------------------------

Shock resistance (according to IEC 60068–2–27)

Acceleration:	50g
Duration:	11ms

Wet and dust-laden atmospheres

The transmitter is dust and sand tight and protected against immersion effects as defined by IEC 60529 (1989) to IP 67 (IP 68 on request) or by NEMA to 4X.

Fill fluid warning

Be sure that the fill fluid can mix safely with the process fluid in case of rupture of the sensor membrane.

Corrosion

A fluid/material compatibility table is available at www.abb.com searching for "CORROSION.pdf" or from local ABB representatives

Data of the table are based on information from manufacturers.

All data is based on a temperature of 20°C (70°F) unless noted otherwise.

Since corrosion involves many more variables than this table considers, such as trace contaminants, aeration or temperature-concentration profile, stress corrosion cracking and pitting, the table should be used only as a reference in narrowing the choice of materials that merit further investigation. Suitability of a particular material is best determined by field test. For this purpose, please contact the local ABB representatives.

**WARNING !**

For safety purpose the design corrosion allowance of differential pressure instrument flanges is approximately 1.5 mm (0.04 in). Therefore from the safe containment of liquids compatible with a specific material according to the above mentioned table, the expected instrument lifetime is more than 10 years (the previous statement on the corrosion influence variables apply).

IP Protection

The 364 pressure transmitter models have been certified for a degree of protection IP67 according to EN 60529 standard. This protection is provided by the pressure transmitter enclosure.

The first characteristic numeral indicates the protection of the inside electronics against ingress of solid foreign objects including dusts. The assigned "6" means an enclosure dust-tight (no ingress of dust).

The second characteristic numeral indicates the protection of the inside electronics against ingress of water.

The assigned "7" means an enclosure water-protected against a temporary immersion in water under standardized conditions of pressure and time.

Declarations

The 364 pressure transmitter models declarations are attached to this manual



EC DECLARATION OF CONFORMITY

We: ABB S.p.A. – ABB SACE Division
Business Unit Instrumentation
Via Statale, 113
22016 Lenno (Como)
Italy

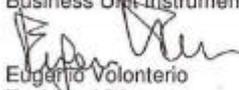
declares under our sole responsibility that the products:
2600T EN Series (Transmitters models 364DS and 364PS)

are in conformity with the following standards:

EN 61000-6-4 (2001) Electromagnetic compatibility (EMC) - Generic standards - Emission standard
for residential, commercial and light-industrial environments
according to: EN55011 (2002)

EN 61000-6-2 (2001) Electromagnetic compatibility (EMC) - Generic standards - Immunity for
industrial environments
according to: EN 61000-4-2 (2001)
EN 61000-4-3 (2002)
EN 61000-4-4 (2004)
EN 61000-4-5 (2001)
EN 61000-4-6 (2001)
EN 61000-4-8 (2001)
EN 61000-4-11 (2004)

following the provisions of the EMC Directives 89/336/EEC and 93/68/EEC.

ABB S.p.A. – ABB SACE Division
Business Unit Instrumentation

Eugenio Volonterio
Technical Director

Lenno, 14th July 2008

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Codice Fiscale e n° di iscrizione del Registro
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Official Company Book: 00736410150
R.E.A. Milano 1513225

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Patrica (FR)
Santa Palomba (Roma)
S. Martino in Strada (LO)
Vittuone (MI)



EC-Declaration of Conformity

We ABB SpA
 BU Instrumentation
 Via Statale 113
 22016 Lenno (Como) Italy

declares under our sole responsibility that the products :

2600T Series Pressure Transmitter : Model 364 DS, 364PS

are in compliance with the requirements of 97/23/CE PED Directive

In accordance with article 3, comma 3, of the Directive itself because designed following the sound engineering practice (SEP)

Lenno 05/05/08

PED Certification Manager
 Business Unit Instrumentation
 Walter Volo

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EC-Declaration of Conformity

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 BU Instrumentation
 Via Statale 113
 22016 Lenno (Como) Italy

Declare that the :

2600T Series Pressure Transmitter, Model 364 Hart (Ex ia+Ex d+Ex nL)

are in conformity with the Council Directive 94/9/EC of 23 March 1994
 and is constructed in accordance with the following standards:

EN 60079-0	(2004)	EN 60079-15	(2005)
EN 50020	(2002)	EN 60079-26	(2004)
EN 60079-1	(2004)	EN 50281-1-1	(1998)

EC- Type Examination Certificate

Certificate Number : **ZELM 06 ATEX 0302 X**
 Certified by : **ZELM**
 Identification number : **0820**
 Address : **Siekgraben 56, D-38124 Braunschweig Germany**

Notified Body entrusted with the surveillance

Name : **CESI**
 Identification number : **0722**
 Address : **Via Rubattino 54, 20134 Milano Italy**

Lenno 05/05/08

Ex Certification Manager
 Business Unit Instrumentation

Walter Volo

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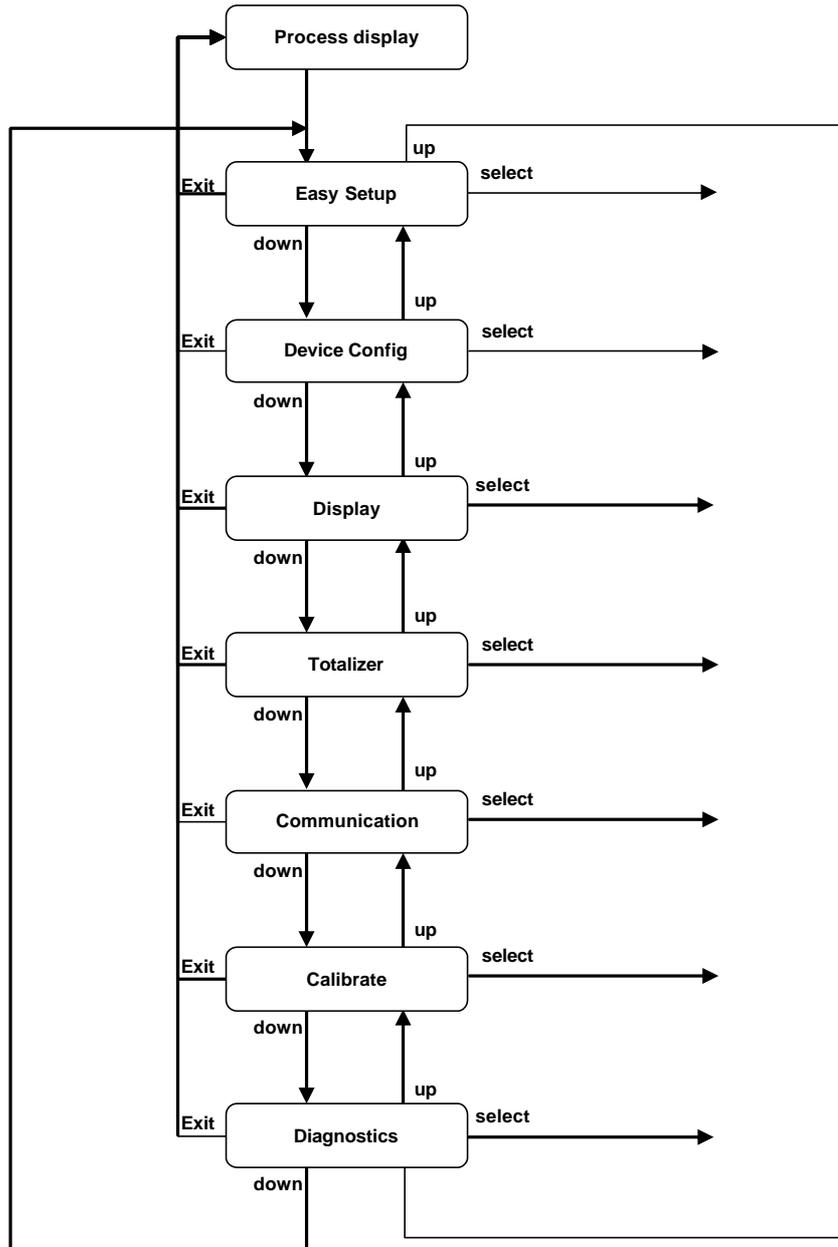
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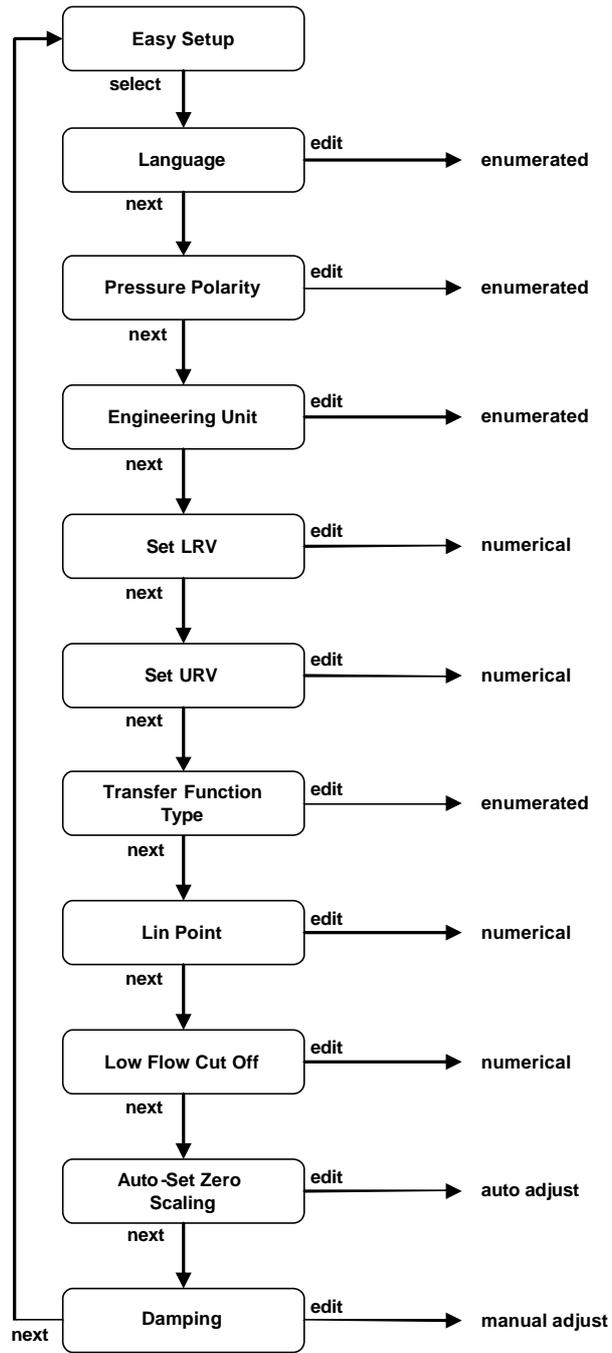
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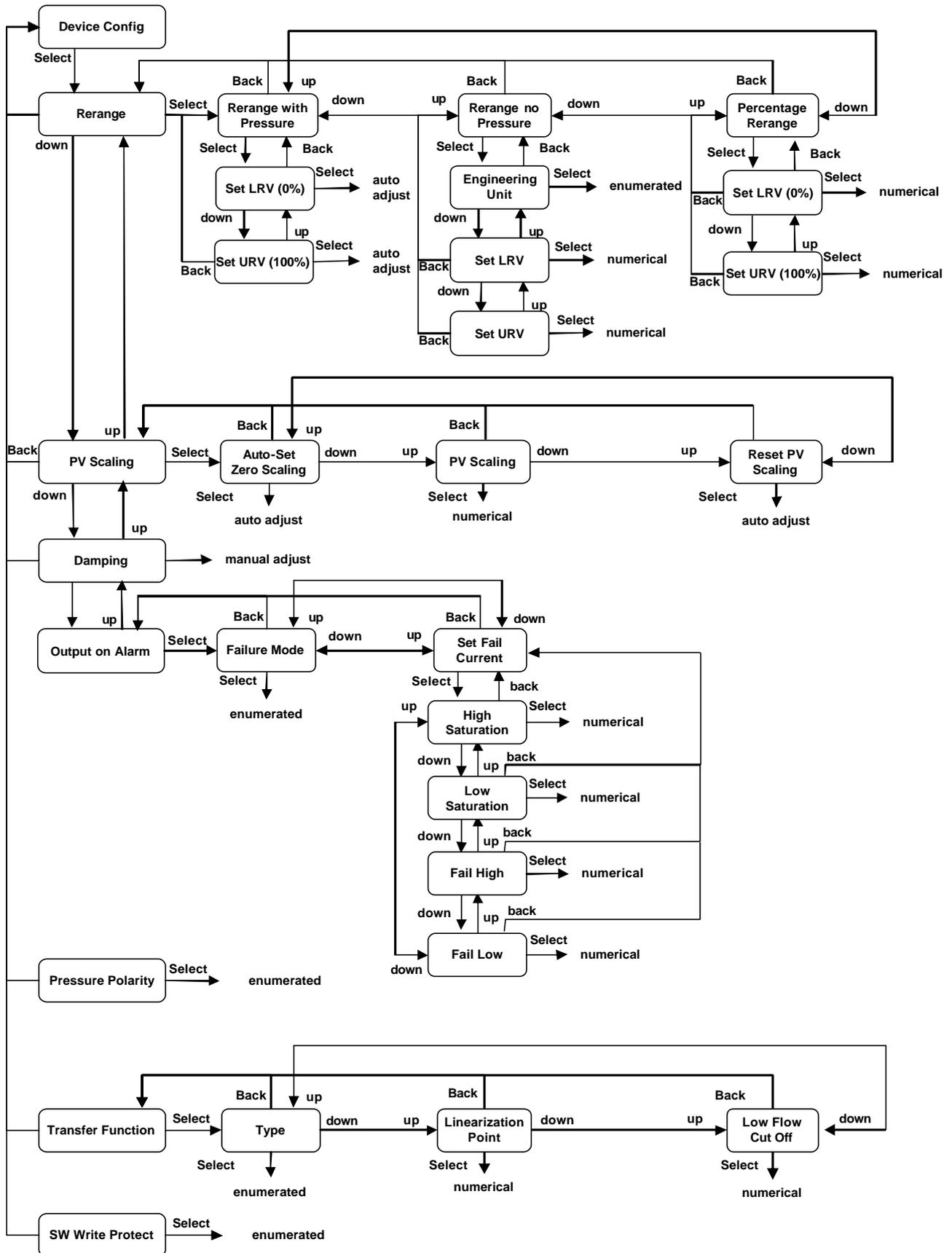
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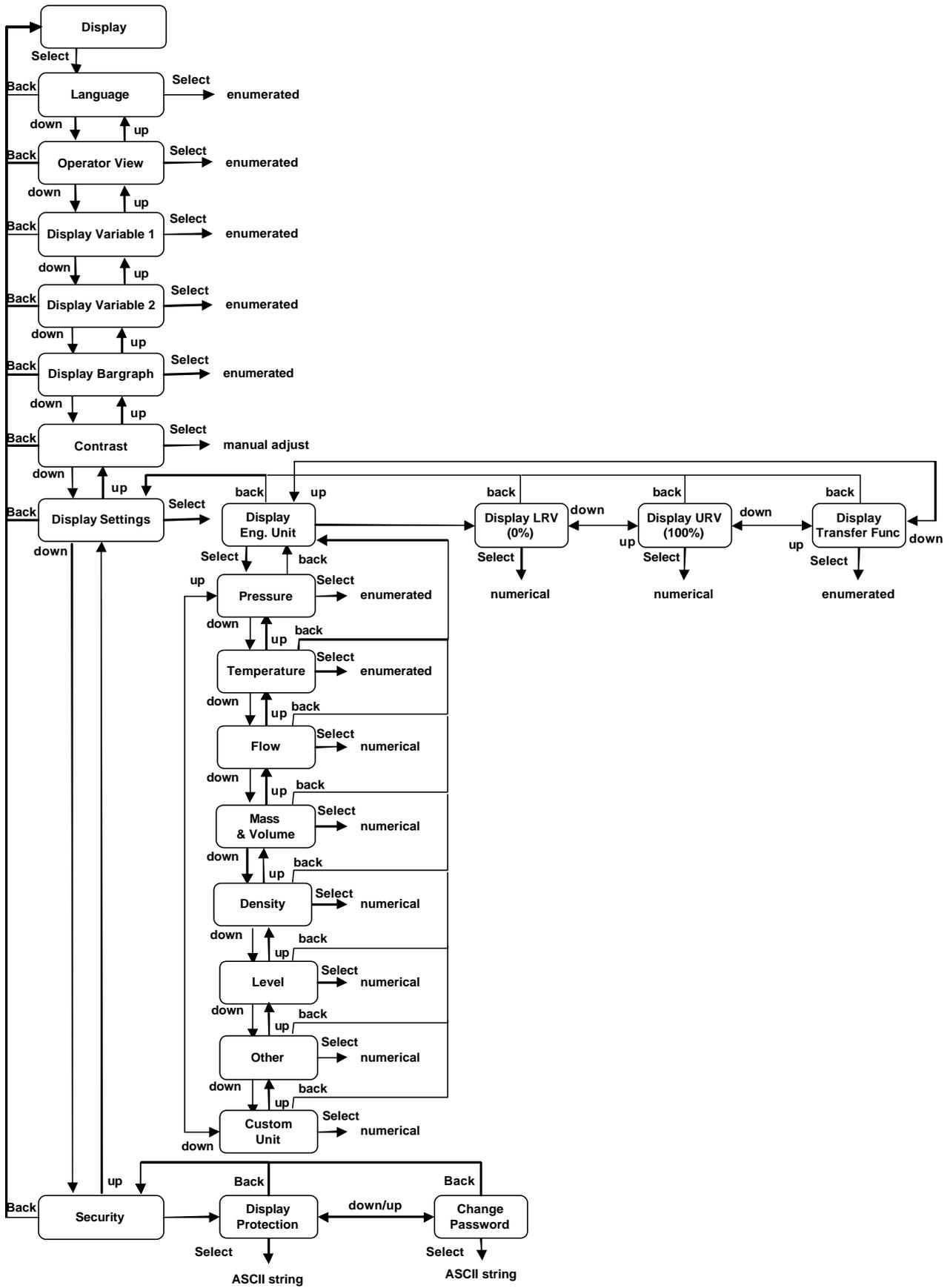
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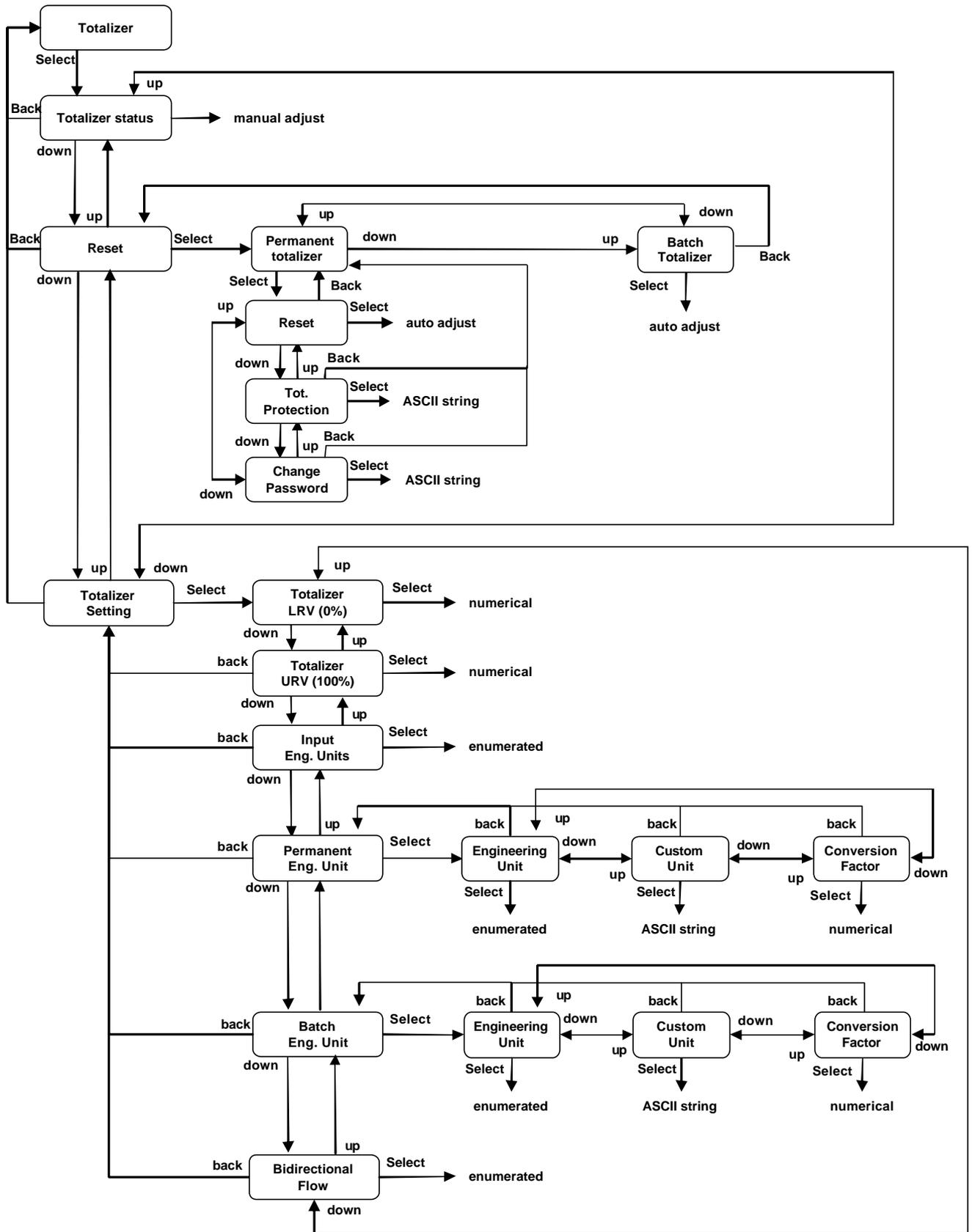
Annex I
Digital LCD Integral Display Menu Flow Chart

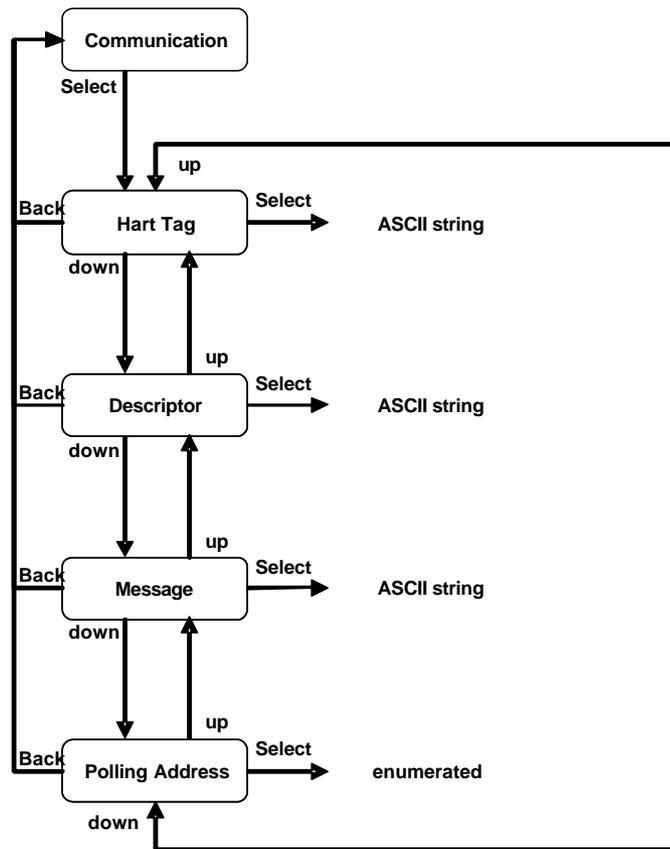


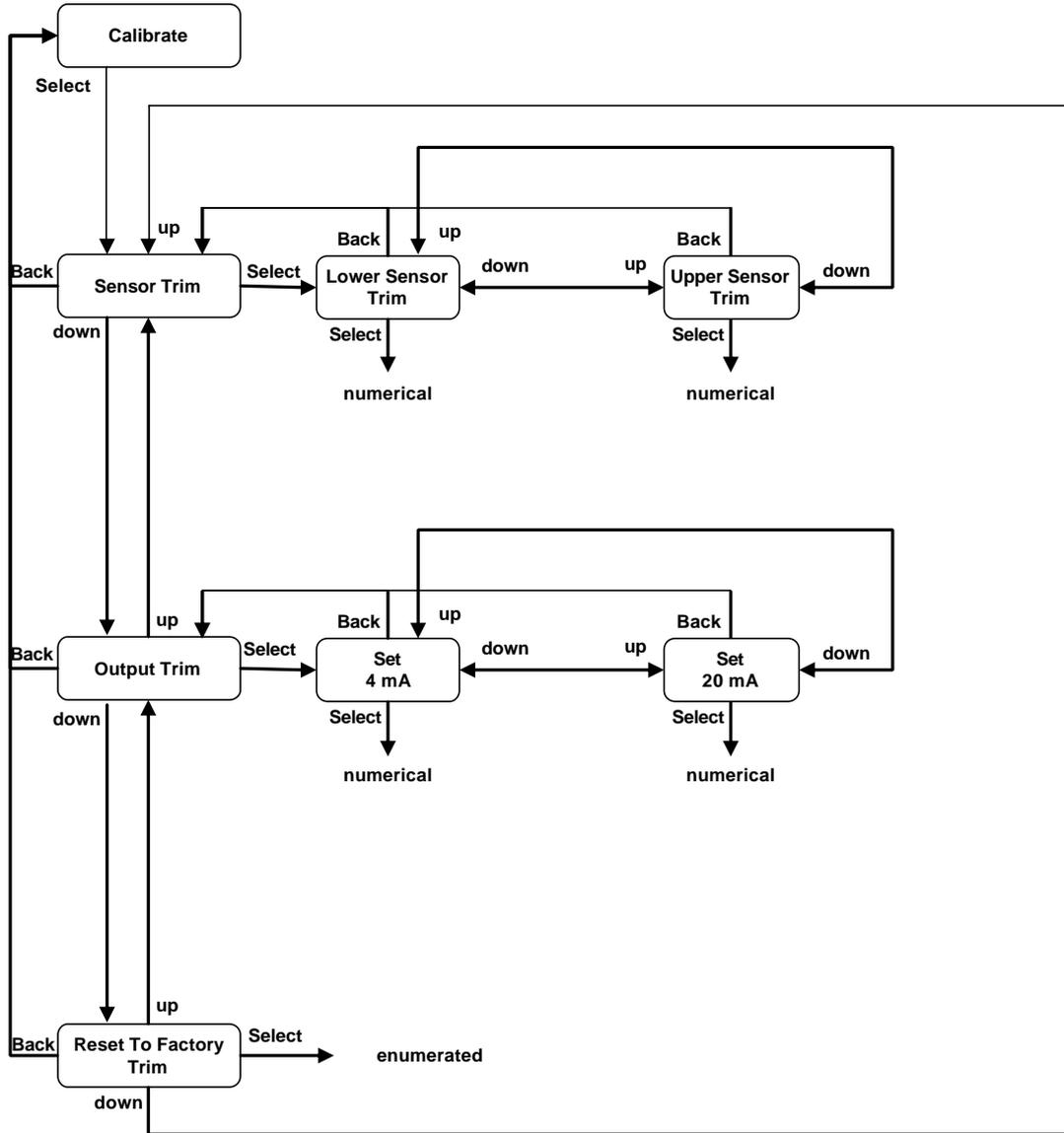


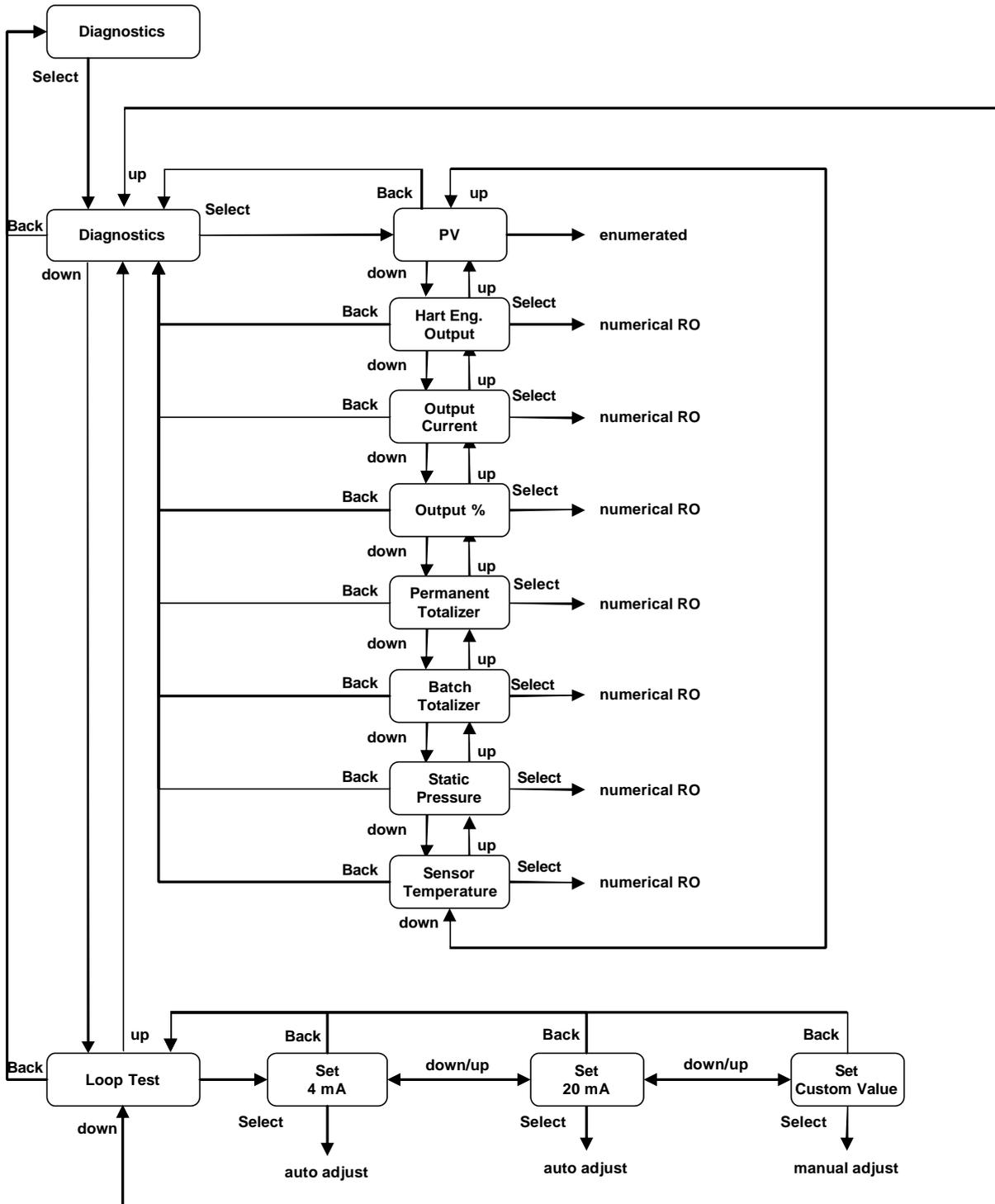












Main Digital LCD Integral Display Keys sequences:

to start the Easy Setup:	1
to set the Pressure Polarity:	2 – 5 – Edit
to set the Damping:	2 – 3
to change the unit on the Display:	3 – 7 – 1
to change the unit in the Transmitter:	2 – 1 – 2 – 1 – Edit
to set the Display LRV :	3 – 7 – 2 - Edit
to set the LRV without pressure:	2 – 1 – 2 – 2 – Edit
to set the LRV without pressure:	2 – 1 – 1 – 1 – OK
to set the Display URV:	3 – 7 – 3 - Edit
to set the URV without pressure:	2 – 1 – 2 – 3 – Edit
to set the URV with pressure:	2 – 1 – 1 – 2 – OK
to set the Totalizer Status:	4 – 1 – 1 – Edit
to set the Totalizer LRV:	4 – 3 – 1 – Edit
to set the Totalizer URV:	4 – 3 – 2 – Edit
to set the Totalizer Input Engineering Units :	4 – 3 – 3 – Edit
to set the Permanent Totalizer Engineering units:	4 – 3 – 4 – 1 – Edit
to set the Permanent Totalizer Custom units:	4 – 3 – 4 – 2 – Edit
to set the Permanent Totalizer Conversion Factor:	4 – 3 – 4 – 3 – Edit
to set the Batch Totalizer Engineering units:	4 – 3 – 5 – 1 – Edit
to set the Batch Totalizer Custom units:	4 – 3 – 5 – 2 – Edit
to set the Batch Totalizer Conversion Factor:	4 – 3 – 5 – 3 – Edit
to set the Bidirectional Flow mode:	4 – 3 – 6 – Edit
to set the Transfer Function:	2 – 6 – 1 – Edit
to set the Transfer Function on the Display:	3 – 7 – 4 – Edit
to set 4 mA fixed output current:	7 – 2 – 1
to set 20 mA fixed output current:	7 – 2 – 2
to set any fixed output current::	7 – 2 – 3
to change the failsafe direction:	2 – 4 – 1 - Edit
to set the High saturation current:	2 – 4 – 2 – 1 – Edit
to set the Low saturation current::	2 – 4 – 2 – 2 – Edit
to set the Fail High current:	2 – 4 – 2 – 3 - Edit
to set the Fail Low current::	2 – 4 – 2 – 4 - Edit
to set the language:	3 – 1 – Edit
to modify the Operator View:	3 – 2 – Edit
to modify the define the Variable 1:	3 – 3 – Edit
to modify the define the Variable 2:	3 – 4 – Edit
to modify the define the Bargraph variable:	3 – 6
to modify the define the Variable Engineering Units in the display:	3 – 7 - 1
to protect the Display:	3 – 8 – 1 – Edit
to change the Display password:	3 – 8 – 2 – Edit
to access the transmitter communication data:	5
to access the transmitter measured variables:	7 – 1
to Low Trim the sensor:	6 – 1 – 1 – Edit
to High Trim the sensor:	6 – 1 – 2 – Edit
to set the 4 mA output current:	6 – 2 – 1 – Edit
to set the 20 mA output current:	6 – 2 – 2 – Edit
to Auto-Set Zero Scaling:	2 – 2 – 1 – OK
to Set the PV Scaling:	2 – 2 – 2 – Edit
to Remove the PV Scaling:	2 – 2 – 3 – OK
to operate the Totalizer Status:	4 - 1 - Edit
to reset the Permanent Totalizer:	4 – 2 – 1 - OK
to reset the Batch Totalizer:	4 – 2 – 2 - OK
to protect the Permanent Totalizer:	4 – 2 – 1 – 2 - Edit
to change the Permanent Totalizer Password:	4 – 2 – 1 – 3 - Edit
to Reset to Factory Trim:	6 – 3 – Edit
to Software Write Protect:	2 – 7 – Edit

Acronyms

The acronyms currently used to define the various parameters are as follows:

- URL** : Upper Range Limit of a specific sensor. The highest value of the measured value that the transmitter can be adjusted to measure.
- LRL** : Lower Range Limit of a specific sensor. The lowest value of the measured value that the transmitter can be adjusted to measure.
- URV** : Upper Range Value. The highest value of the measured value to which the transmitter is calibrated.
- LRV** : Lower Range Value. The lowest value of the measured value to which the transmitter is calibrated.
- SPAN** : The algebraic difference between the Upper and Lower Range Values. The minimum span is the minimum value that can be used without degradation of the specified performance.
- LCD** Liquid Crystal Display
- CPU** Control Process Unit
- DSP** Digital Signal Processing
- DD** Device Description
- IS** Intrinsically Safety

Definitions

The terminology currently used to define the various parameters is as follows:

Totalizer LRV: the totalizer LRV is defined as the value in engineering unit that gives 4 mA at the output

Totalizer URV: the totalizer URV is defined as the value in engineering unit that gives 20 mA at the output

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