

# 266 WirelessHART

## Pressure transmitters



Engineered solutions for all applications

**Measurement made easy**

—

266DSH WirelessHART version

### Introduction

The 2600T family provides comprehensive range of top quality pressure measurement products, specifically designed to meet the widest range of applications ranging from arduous conditions in offshore oil and gas to the laboratory environment of the pharmaceutical industry.

### For more information

Further publications for 2600T series pressure products are available for free download from: [www.abb.com/pressure](http://www.abb.com/pressure)

or by scanning this code:



Download the [Brochure](#) or search for RB/2600T-EN on <https://library.abb.com/en>.

## The Company

We are an established world force in the design and manufacture of measurement products for industrial process control, flow measurement, gas and liquid analysis and environmental applications.

As a part of ABB, a world leader in process automation technology, we offer customers application expertise, service and support worldwide.

We are committed to teamwork, high quality manufacturing, advanced technology and unrivalled service and support.

The quality, accuracy and performance of the Company's products result from over 100 years experience, combined with a continuous program of innovative design and development to incorporate the latest technology.

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# 1. Introduction

## 1.1 Instruction manual structure

The present manual provides information on installing, operating, troubleshooting the 266 pressure transmitter. Every section of the present manual is specifically dedicated to the specific phase of the transmitter lifecycle starting from the receipt of the transmitter and its identification, passing to the installation, to the electrical connections, to the configuration and to the troubleshooting and maintenance operations.

## 1.2 Models covered by this manual

The present manual can be used for all the 266 wireless models (266DxH, 266HxH and 266NxH).

## 1.3 Product description

The pressure transmitters model 266 is a modular range of field mounted, microprocessor based electronic transmitters, multiple sensor technologies. Accurate and reliable measurement of differential pressure, gauge and absolute pressure, flow and liquid level is provided, in the even most difficult and hazardous industrial environments. Model 266 can be configured to provide specific industrial output signals.

## 2 Safety

### 2.1 General safety information

The “Safety” section provides an overview of the safety aspects to be observed for operation of the device.

The device has been designed and manufactured in accordance with the state of the art and is operationally safe. It has been tested and left the factory in perfect working conditions. The information in the manual, as well as the applicable documentation and certificates, must be observed and followed in order to maintain this condition throughout the period of operation. Full compliance with the general safety requirements must be observed during operation of the device. In addition to the general information, the individual sections in the manual contain descriptions of processes or procedural instructions with specific safety information.

Only by observing all of the safety information can you reduce to the minimum the risk of hazards for personnel and/or environment. These instructions are intended as an overview and do not contain detailed information on all available models or every conceivable event that may occur during setup, operation, and maintenance work. For additional information, or in the event of specific problems not covered in detail by these operating instructions, please contact the manufacturer. In addition, ABB declares that the contents of this manual are not part of any prior or existing agreements, commitments, or legal relationships; nor are they intended to amend these. All obligations of ABB arise from the conditions of the relevant sales agreement, which also contains the solely binding warranty regulations in full. These contractual warranty provisions are neither extended nor limited by the information provided in this manual.

**Caution.** Only qualified and authorized specialist personnel should be charged with installation, electrical connection, commissioning, and maintenance of the transmitter. Qualified personnel are persons who have experience in installation, electrical wiring connection, commissioning, and operation of the transmitter or similar devices, and hold the necessary qualifications such as:

- Training or instruction, i.e., authorization to operate and maintain devices or systems according to safety engineering standards for electrical circuits, high pressures, and aggressive media
- Training or instruction in accordance with safety engineering standards regarding maintenance and use of adequate safety systems.

For safety reasons, ABB draws your attention to the fact that only sufficiently insulated tools conforming to IEC 60900 and EN 60900 may be used.

Since the transmitter may form part of a safety chain, we recommend replacing the device immediately if any defects are detected. In case of use in Hazardous Area non sparking tools only must be employed.

In addition, you must observe the relevant safety regulations regarding the installation and operation of electrical systems, and the relevant standards, regulations and guidelines about explosion protection.

**Warning.** The device can be operated at high levels of pressure and with aggressive media. As a result, serious injury or significant property damage may occur if this device is operated incorrectly.

### 2.2 Improper use

It is prohibited to use the device for the following purposes:

- As a climbing aid, e.g., for mounting purposes
- As a support for external loads, e.g., as a support for pipes.
- Adding material, e.g., by painting over the name plate or welding/soldering on parts
- Removing material, e.g., by drilling the housing.

Repairs, alterations, and enhancements, or the installation of replacement parts, are only permissible as far as these are described in the manual. Approval by ABB must be requested for any activities beyond this scope. Repairs performed by ABB-authorized centers are excluded from this.

### 2.3 Technical limit values

The device is designed for use exclusively within the values stated on the name plates and within the technical limit values specified on the data sheets.

The following technical limit values must be observed:

- The Maximum Working Pressure may not be exceeded.
- The Maximum ambient operating temperature may not be exceeded.
- The Maximum process temperature may not be exceeded.
- The housing protection type must be observed.

### 2.4 Warranty provision

Using the device in a manner that does not fall within the scope of its intended use, disregarding this manual, using underqualified personnel, or making unauthorized alterations, releases the manufacturer from any liability for any resulting damage. This makes the manufacturer’s warranty null and void.

### 2.5 Use of instruction

**Danger – <Serious damage to health/risk to life>.** This message indicates that an imminent risk is present. Failure to avoid this will result in death or serious injury.

**Caution – <Minor injuries>.** This message indicates a potentially dangerous situation. Failure to avoid this could result in minor injuries. This may also be used for property damage warnings.

**Important.** This message indicates operator tips or particularly useful information. It does not indicate a dangerous or damaging situation.

**Warning – <Bodily injury>.** This message indicates a potentially dangerous situation. Failure to avoid this could result in death or serious injury

**Attention – <Property damage>.** This message indicates a potentially damaging situation. Failure to avoid this could result in damage to the product or its surrounding area.

## 2.6 Operator liability

Prior to using corrosive and abrasive materials for measurement purposes, the operator must check the level of resistance of all parts coming into contact with the materials to be measured. ABB will gladly support you in selecting the materials, but cannot accept any liability in doing so. The operators must strictly observe the applicable regulations with regard to installation, function tests, repairs, and maintenance of electrical devices.

## 2.7 Qualified personnel

Installation, commissioning, and maintenance of the device may only be performed by trained specialist personnel who have been authorized by the plant operator. The specialist personnel must have read and understood the manual and comply with its instructions.

## 2.8 Returning devices

Use the original packaging or suitably secure shipping package if you need to return the device for repair or recalibration purposes. Fill out the return form (see the end of the document) and include this with the device. According to EC guidelines and other local laws for hazardous materials, the owner of hazardous waste is responsible for its disposal. The owner must observe the proper regulations for shipping purposes. All devices sent back to ABB must be free from any hazardous materials (acids, alkalis, solvents, etc.).

## 2.9 Disposal

ABB actively promotes environmental awareness and has an operational management system that meets the requirements of DIN EN ISO 9001:2008, EN ISO 14001:2004, and OHSAS 18001. Our products and solutions are intended to have minimum impact on the environment and persons during manufacturing, storage, transport, use and disposal. This includes the environmentally friendly use of natural resources. ABB conducts an open dialog with the public through its publications. This product is manufactured from materials that can be reused by specialist recycling companies.

## 2.10 Information on WEEE Directive 2012/19/EU (Waste Electrical and Electronic Equipment)

This product or solution is subject to the WEEE Directive 2012/19/EU or corresponding national laws. Starting from August 15th 2018, electrical and electronic equipment marked with the crossed-out wheeled bin symbol may not be disposed as unsorted municipal waste. Waste of electrical and electronic equipment (WEEE) shall be treated separately using the national collection framework available to customers for the return, recycling and treatment of WEEE.

Proper disposal prevents negative effects on people and the environment, and supports the reuse of valuable raw materials. ABB can accept and dispose of returns for a fee.

## 2.11 Transport and storage

- After unpacking the device, check for transport damage.
- Check the packaging material for accessories.
- During intermediate storage or transport, store the pressure transmitter in the original packaging only.

For information on permissible ambient conditions for storage and transport, see “Technical data”. Although there is no limit on the duration of storage, the warranty conditions stipulated on the order acknowledgment from the supplier still apply.

## 2.11.1 Shipping considerations for wireless products containing Lithium batteries

The device is shipped with a Lithium battery in shape of a D-Cell. The battery is already installed.

Transport of lithium batteries is subject to specific regulations. Regulations are based on the United Nations Model Regulations on the Transport of Dangerous Goods. The most important regulations can be summarized as follows:

C- and D-size cells as well as larger cells and most battery packs have to be transported under dangerous goods regulations.

Lithium batteries below 2 grams lithium content (corresponding approximately to 3 AA cells) are exempted from dangerous goods regulations but each package requires a special label to indicate that it contains lithium batteries and special procedures shall be followed when a package is damaged during transportation.

Transport regulations require that lithium cells and batteries of all kinds, exempted or not, be tested according to the UN test methods.

Packing instructions for air transport of lithium batteries worldwide are revised biennially by the International Civil Aviation Organization (ICAO) and distributed in various languages by the International Air Transport Association (IATA). According to the regulations, Tadiran Lithium Batteries are classified as lithium metal batteries. Different regulations are valid for transport in the USA.

## 2.12 Safety information for battery installation

The battery shall be installed by specialist personnel paying attention to the polarity.

## 2.13 Safety information for inspection and maintenance

**Warning – Risk to persons.** There is no EMC protection or protection against accidental contact when the housing cover is open. There are electric circuits within the housing which are dangerous if touched. Therefore, the auxiliary power must be switched off before opening the housing cover.

**Warning – Risk to persons** The device can be operated at high pressure and with aggressive media. Any process media released may cause severe injuries. Depressurize the pipeline/tank before opening the transmitter connection.

Corrective maintenance work may only be performed by trained personnel.

- Before removing the device, depressurize it and any adjacent lines or containers.
- Check whether hazardous materials have been used as materials to be measured before opening the device. Residual amounts of hazardous substances may still be present in the device and could escape when the device is opened.
- Within the scope of operator responsibility, check the following as part of a regular inspection:

Pressure-bearing walls/lining of the pressure device

Measurement-related function

Leak-tightness

Wear (corrosion)

## 3 Transmitter overview

### 3.1 Transmitter components overview

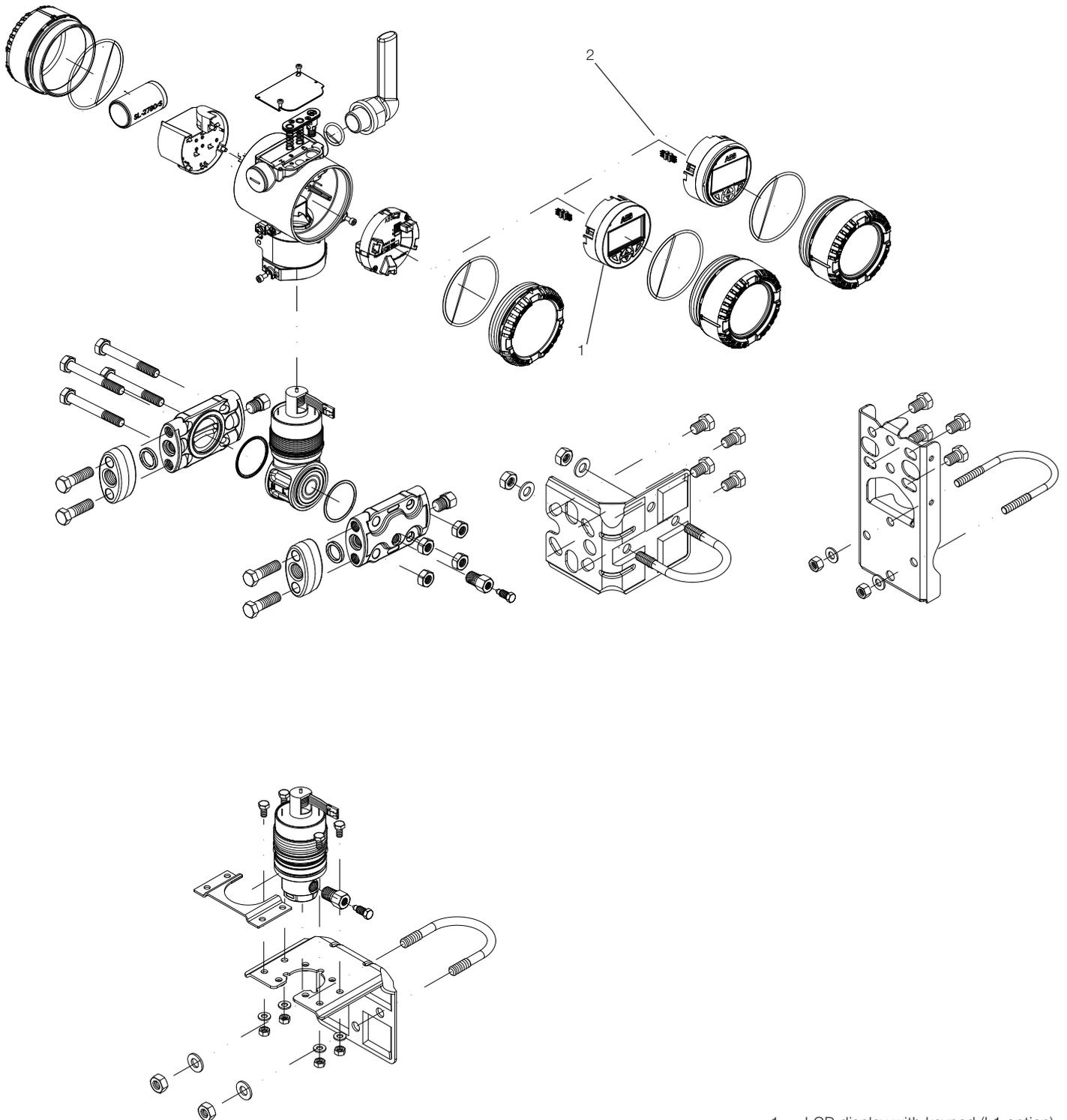


Figure 1: Pressure transmitter components

- 1 - LCD display with keypad (L1 option)
- 2 - TTG display with keypad (L5 option)

### 3.2 Range & Span consideration

The 2600T Transmitter Specification Sheets provide all information concerning the Range and Span limits in relation to the model and the sensor code.

The terminology currently used to define the various parameters is 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.
- TD: (or Turn Down Ratio) is the ratio between the maximum span and the calibrated span.

The transmitter can be calibrated with any range between the LRL and the URL with the following limitations:

$$\text{LRL} \leq \text{LRV} \leq (\text{URL} - \text{CAL SPAN})$$

$$\text{CAL SPAN} \geq \text{MIN SPAN}$$

$$\text{URV} \leq \text{URL}$$

## 4 Opening the box

### 4.1 Identification

The instrument is identified by the data plates shown in Figure 3. The certification plate (ref. A): contains the certification related parameters for use in Hazardous area.

The Nameplate (ref.B) provides information concerning the model code, maximum working pressure, range and span limits, power supply, output signal, diaphragms material, fill fluid, range limit, serial number, maximum process working pressure (PS) and temperature (TS).

**Important.** Please refer to the serial number when making enquiries to ABB Service department.

The Tag plate (ref.C) also provides customer tag number and calibrated range. The instrument may be used as a pressure accessory (category III) as defined by the Pressure Equipment Directive 97/23/EC. In this case, near the CE mark, you will find the number of the notified body (0474) that have verified the compliance. 266 pressure transmitters are in compliance with EMC 2004/108/CE.

The certification plate (ref.A) shown here is issued by ABB S.p.A, 22016 Lenno, Italy, with the numbers:

- FM14ATEX0007 or IECEx FME 14.0002 (Ex ia)
- FM14ATEX0008 or IECEx FME 14.0002 (Ex nA)

CE-Identification number of the notified bodies to Pressure Equipment Directive: 0474, to ATEX certification: 0722, to IECEx certification: IT/CES/QAR07.0001/02.

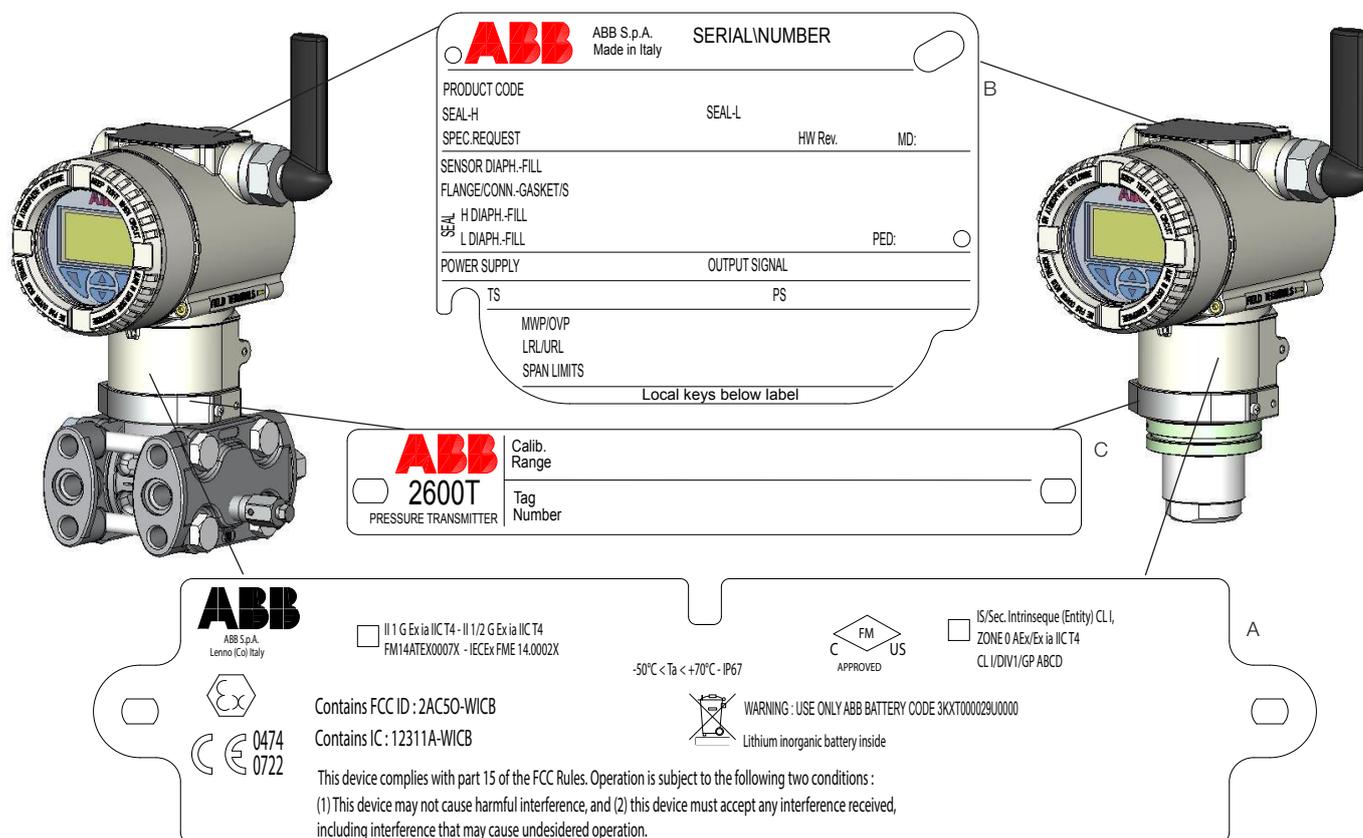


Figure 2: Product identification

## 4.2 Optional wired-on SST plate (I1)

The 266 transmitter can be supplied with the optional “Wired On Stainless Steel plate” (figure 4) which is permanently laser printed with a custom text specified in phase of order. The available space consists in 4 lines with 32 characters per line.

The plate will be connected to the transmitter with a Stainless Steel wire.

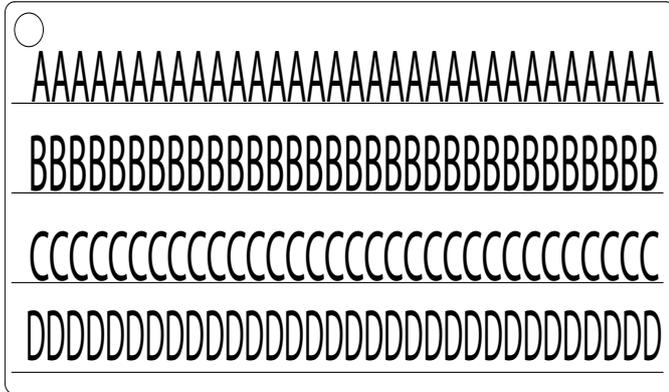


Figure 3: 4-line layout of the optional wired-on Stainless Steel plate

## 4.3 Handling

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

## 4.4 Storage

The instrument does not require any special treatment if stored as dispatched and within the specified ambient conditions.

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.

Lithium batteries installed into the WirelessHART pressure transmitter should be stored in a clean and dry area. For maximum battery life, storage temperature should not exceed 30° C (86 °F).

## 5 Mounting

### 5.1 General

Study these installation instructions carefully before proceeding. Failure to observe the warnings and instructions may cause malfunctionings or personal hazard. Before installing the transmitter, check if the device design meets the requirements of the measuring point from a measurement technology and safety point of view.

This applies in respect of the:

- Explosion protection certification
- Measuring range
- Gauge pressure stability
- Temperature
- Operating voltage

The suitability of the materials must be checked in relation with their resistance to the media. This applies to:

- Gaskets
- Process connections, isolating diaphragms, etc.

In addition, the relevant directives, regulations, standards, and accident prevention regulations must be observed (e.g., VDE/VDI 3512, DIN 19210, VBG, Elex V, etc.). Measurement accuracy is largely dependent on correct installation of the pressure transmitter and, if applicable, the associated measuring pipe(s). As far as possible, the measuring setup should be free from critical ambient conditions such as large variations in temperature, vibrations, or shocks.

**Important.** If unfavorable ambient conditions cannot be avoided for reasons relating to building structure, measurement technology, or other issues, the measurement quality may be affected. If a remote seal with capillary tube is installed on the transmitter, the additional operating instructions for remote seals and the related data sheets must be observed.

### 5.2 IP protection & designation

The housings for 266 transmitters are certified in compliance with protection type IP66 / IP67 (according to IEC 60529).

The first number indicates the type of protection the integrated electronics have against the entry of foreign bodies, including dust.

“6” means that the housing is dust-proof (i.e. no ingress of dust).

The second number indicates the type of protection the housing and the integrated electronics have against the entry of water.

“6” means that the housing is protected against water; specifically, powerful jets of water under standardized conditions.

“7” means that the housing is protected against water; specifically, against the effects of temporary immersion in water under standardized water pressure and temporal conditions.

### 5.3 Mounting the transmitter

#### 5.3.1 Transmitter factory configuration consideration

The 266 pressure transmitter in your hands has been factory calibrated to reflect the published declared performance specification; no further calibration is required in normal condition. ABB typically configures 266 pressure transmitters according to the user requirements. A typical configuration includes:

- TAG number
- Calibrated span
- Scaled output linearization
- LCD display configuration

#### 5.3.2 Hazardous area considerations

The transmitter must be installed in hazardous area only if it is properly certified. The certification plate is permanently fixed on the neck of the transmitter top housing. The 266 Pressure Transmitter Line can have the following certifications:

ATEX INTRINSIC SAFETY

- II 1 G Ex ia IIC T4 and II 1/2 G Ex ia IIC T4

COMBINED ATEX, IECEx and FM Approvals (US and Canada)

- See detailed classifications

FM Approvals US and FM Approvals Canada:

- Intrinsically safe: Class I, Div. 1, Groups A, B, C, D
- Class I, Zone 0, AEx ia IIC T4 (FM US)
- Class I, Zone 0, Ex ia IIC T4 (FM Canada)

IEC (Ex):

- See detailed classifications

**Warning - General risks.** 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 according to IEC EN 60529). See also the addendum for “EX SAFETY” ASPECTS AND “IP” PROTECTION. In particular, for explosion proof installation, remove the red temporary plastic cap and plug the unused opening with a plug certified for explosion containment

**Warning - General risks.** Model 266 enclosure contains aluminum and is considered to present a potential risk of ignition by impact or friction. Care must be taken into account during installation and use to prevent impact or friction.

## 5.4 Pressure Equipment Directive (PED) (97/23/CE)

### 5.4.1 Devices with PS >200

Devices with a permissible pressure PS >200 bar have been subject to a conformity validation. The data label includes the following specifications:

<b>ABB</b> ABB S.p.A. Made in Italy		SERIAL NUMBER	
PRODUCT CODE		SEAL-L	
SEAL-H		HW Rev.	MD:
SPEC.REQUEST			
SENSOR DIAPH.-FILL			
FLANGE/CONN.-GASKET/S			
SEAL	H DIAPH.-FILL	PED: ○	
	L DIAPH.-FILL		
POWER SUPPLY		OUTPUT SIGNAL	
TS		PS	
MWPI/OVP LRL/URL SPAN LIMITS			
Local keys below label			

Figure 4: 266 nameplate with PED data

### 5.4.2 Devices with PS ≤200 bar

Devices with a permissible pressure PS ≤200 bar correspond to article 3 paragraph (3). They have not been subject to a conformity validation. These instruments were designed and manufactured acc. to SEP Sound Engineering Practices.

## 5.5 Mounting a DP sensor transmitter (266DS/266DR)

The pressure transmitter model 266DS can be mounted directly on the manifold. A mounting bracket for wall or pipe mounting (2" pipe) is also available as an accessory. For model 266DR always mounting brackets should be used. Ideally, the pressure transmitter should be mounted in a vertical position to prevent subsequent zero shifts.

**Important.** If the transmitter is installed inclined with respect to the vertical, the filling liquid exerts hydrostatic pressure on the measuring diaphragm, resulting in a zero shift. In such an event, the zero point can be corrected via the zero push-button or via the "set PV to zero" command. Please refer to the [configuration section] for further details. For transmitters without diaphragm seals, please read the following considerations on the Vent/Drain.

**Attention – Potential damage to transmitter.** In case of a High Static differential pressure transmitter (266DSH.x.H) please always open the equalization valve of the manifold (if installed) before applying pressure to the transmitter. High Static pressure can damage the sensor causing a zero shift and a serious decrease of the total performance in terms of accuracy. In this case, please perform a full sensor trim.

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. Optional Vent/drain valves (code V1/V2/V3) on the transmitter are located on the sensor flanges.

The transmitter has to be positioned so that these drain/vent valves will 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 to vent off or condensate to drain off. 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.

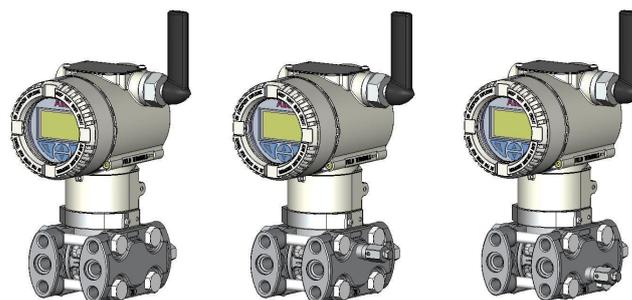


Figure 5: Drain/vent valves configuration (respectively V1, V2, V3)

**Important.** In case of a High Static differential pressure transmitter, please notice that the Vent/Drain valves can be configured only on the process axis (V1).

5.5.1 Bracket mounting (optional)

Different mounting brackets are available please refer to the relevant installation drawing below:

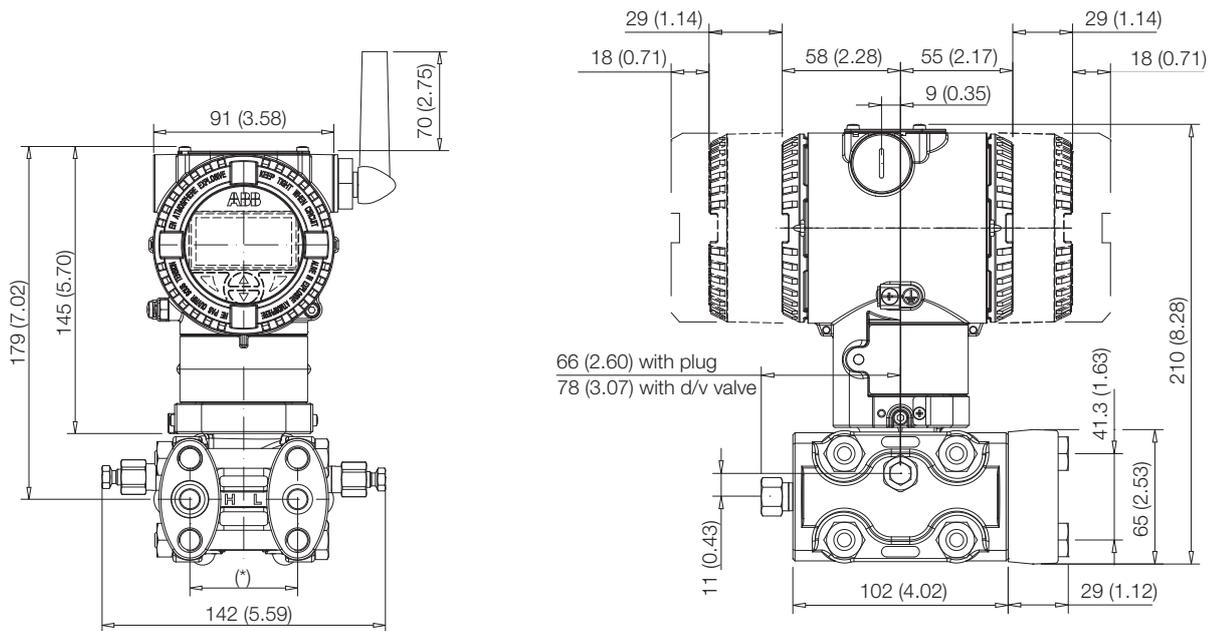


Figure 6: Differential Pressure Style transmitter with barrel housing installed on a horizontal pipe with optional bracket (B2)

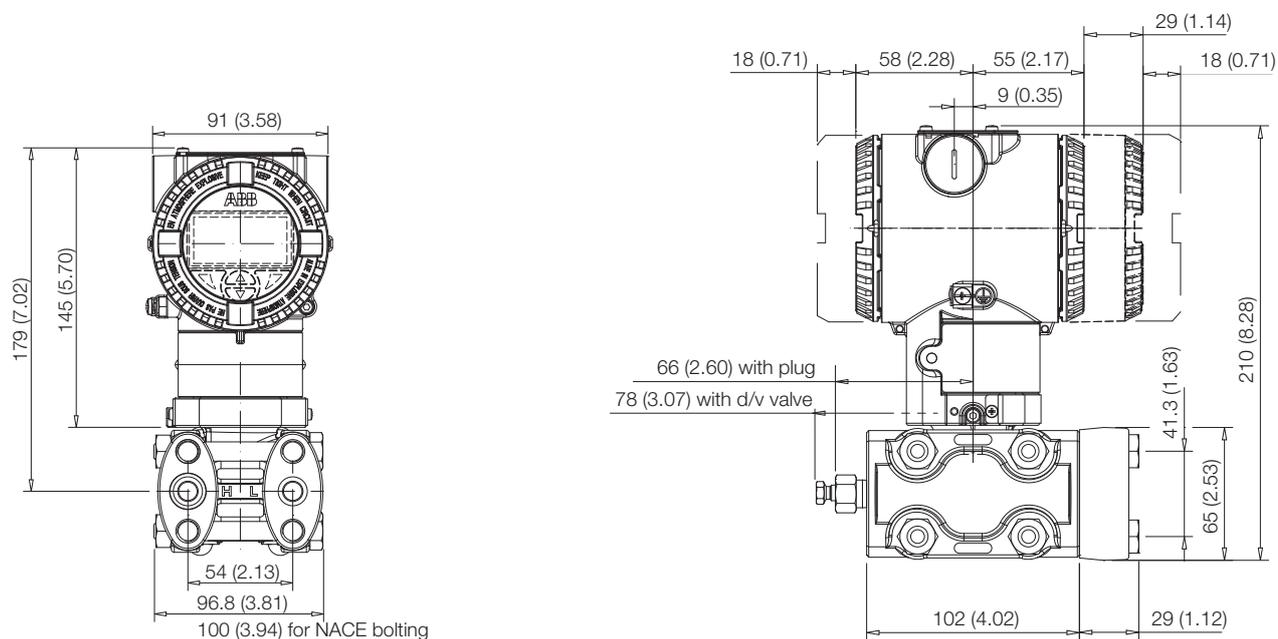


Figure 7: Differential Pressure Style transmitter (High Static option)

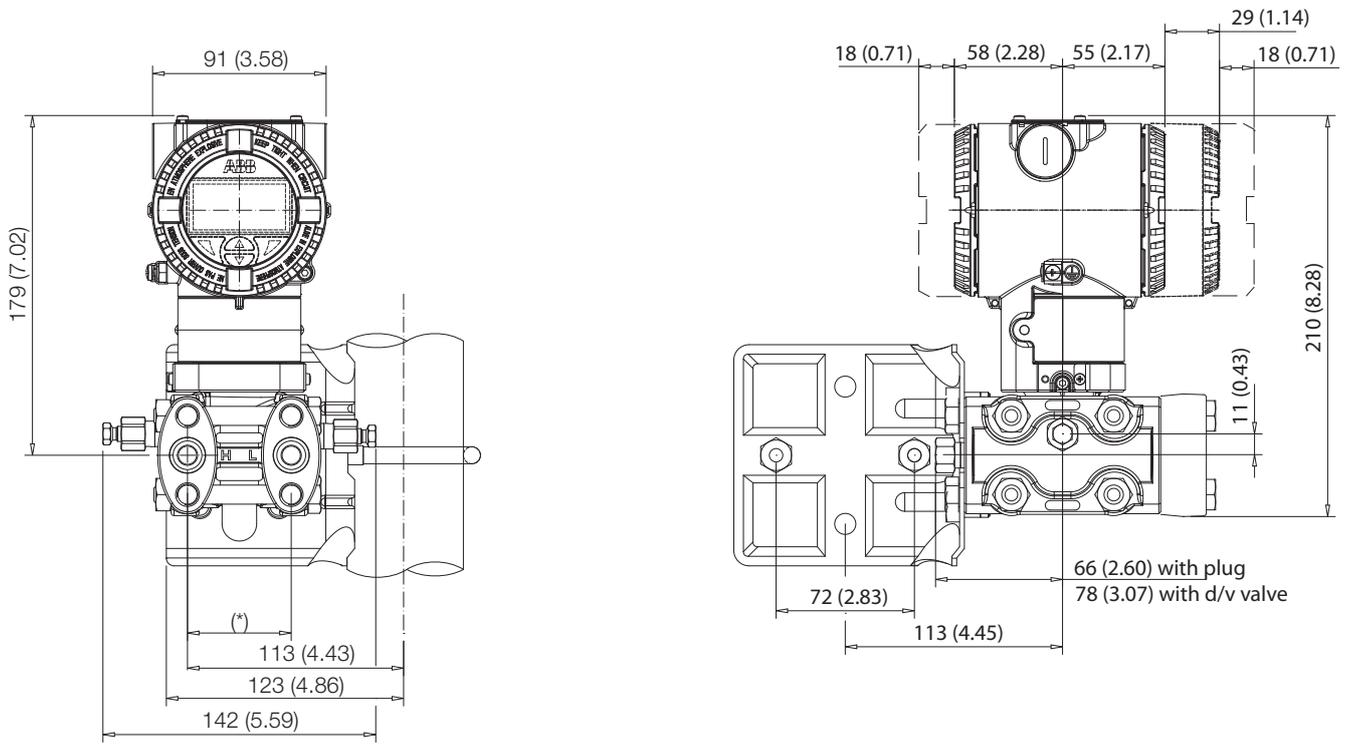


Figure 8: Differential Pressure Style transmitter with barrel housing installed on a vertical pipe with optional bracket (B2)

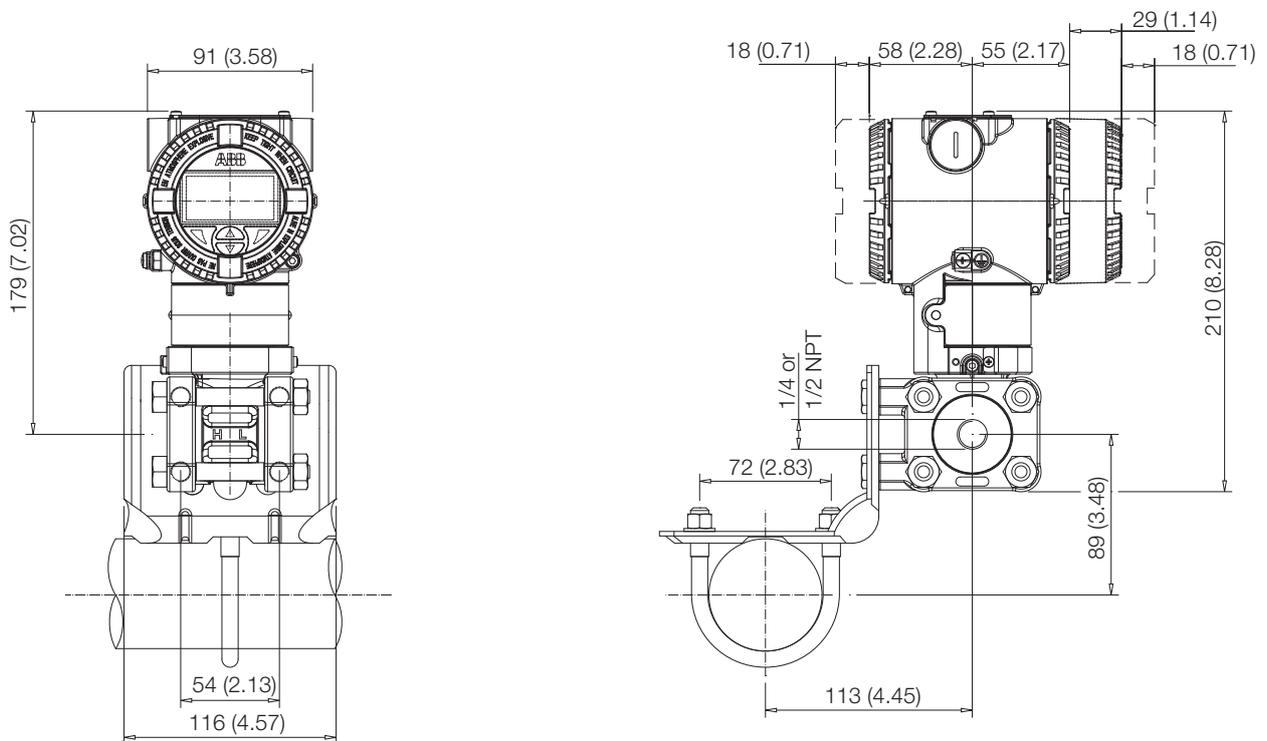


Figure 9: Differential Pressure Style transmitter with barrel housing and Kynar inserts installed on a vertical pipe with optional bracket (B2)

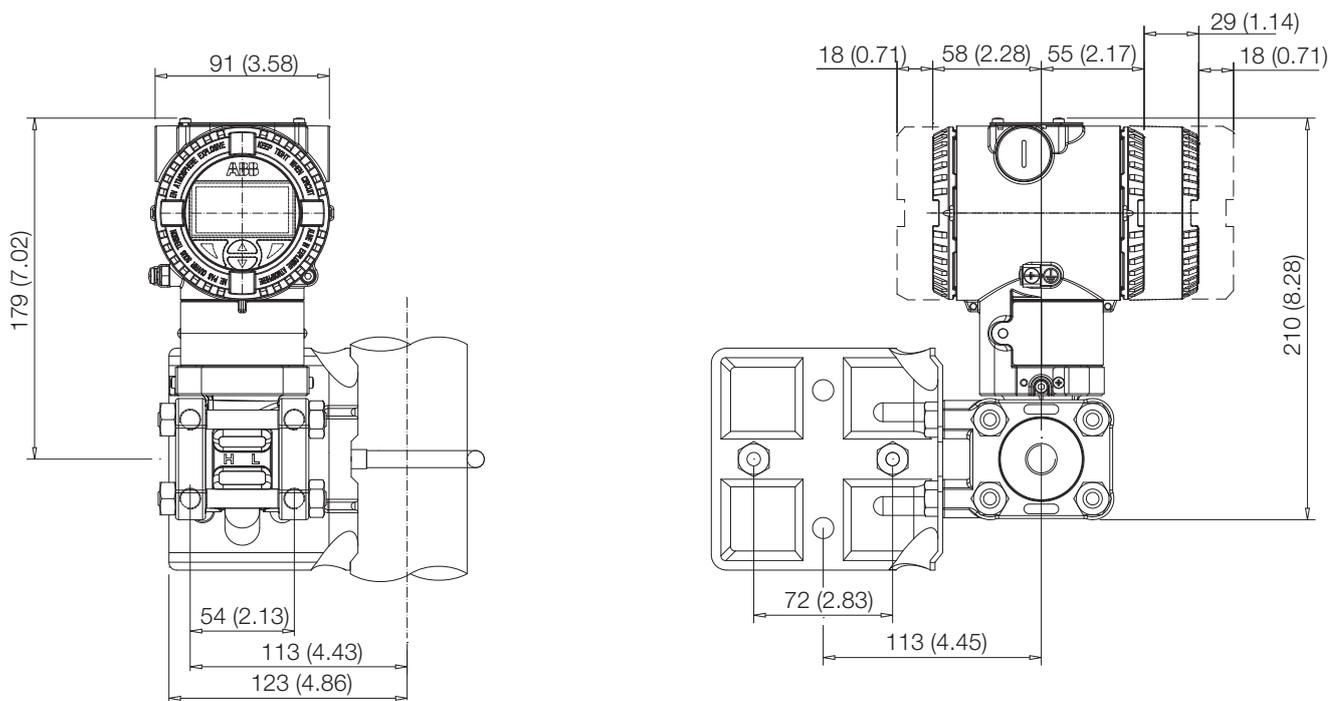
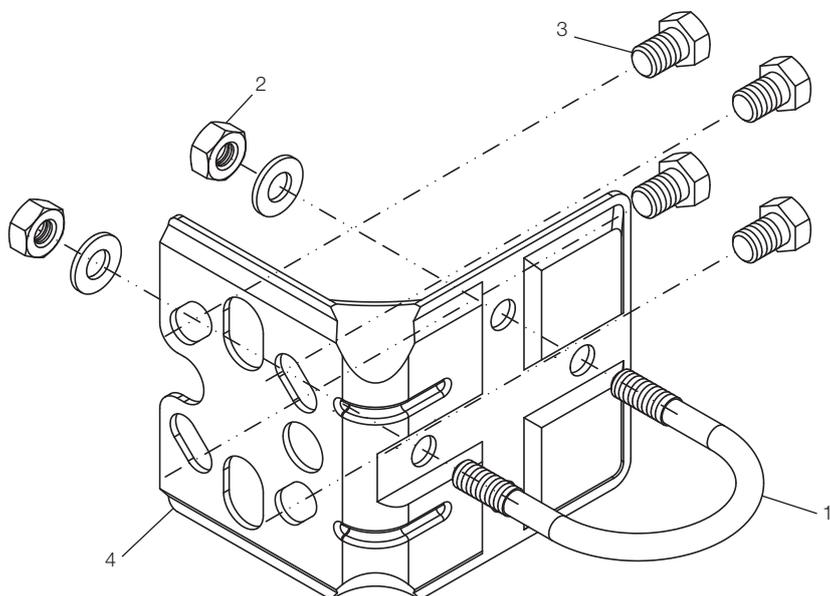


Figure 10: Differential Pressure Style transmitter with barrel housing and Kynar inserts installed on a vertical pipe with optional bracket (B2)

### 5.5.2 B2 Pipe and wall mounting bracket details

All the bolts and nuts supplied are necessary for the installation on pipe. In case of panel or wall installation, the U-bolt and the U-bolt nuts and washers will not have to be used.

The bolts for panel mounting are not within the scope of supply.



- 1 – U-bolt
- 2 – U-bolt fixing bolt and washer
- 3 – Transmitter fixing bolts
- 4 – B2 bracket

Figure 11: Pipe and wall mounting bracket kit (B2)

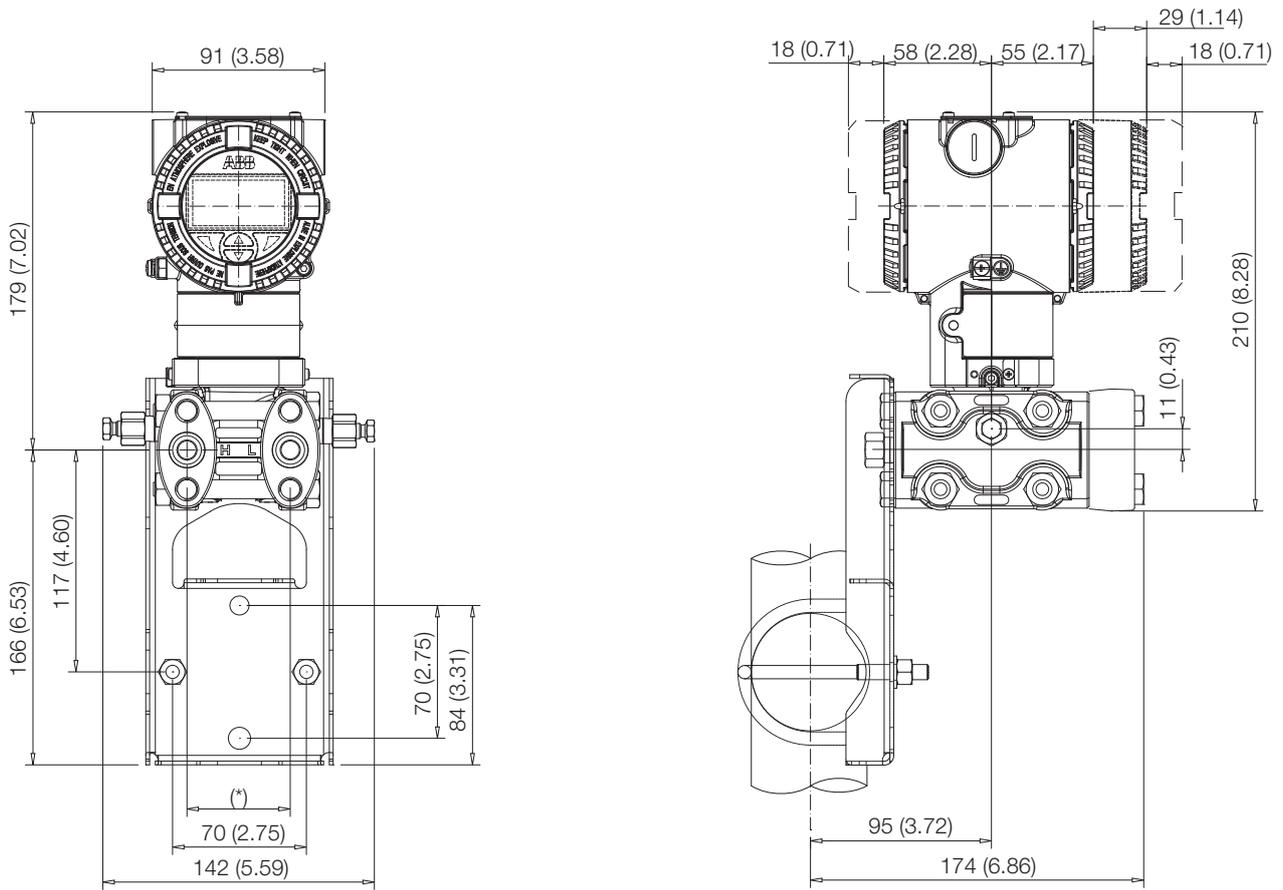
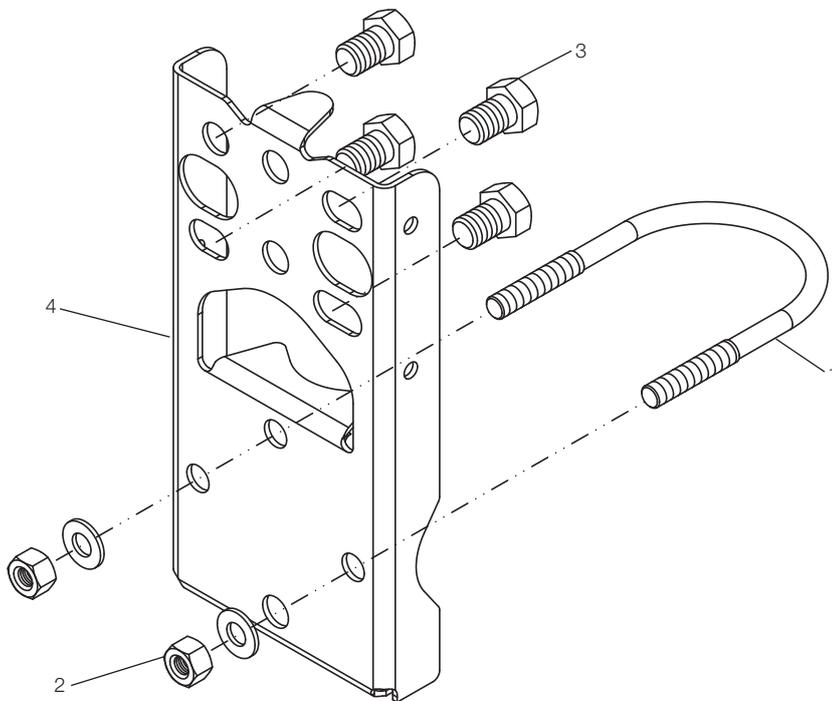


Figure 12: Differential Pressure Style transmitter with barrel housing installed on a box pipe with optional bracket for SST housing (B5)

### 5.5.3 B5 Flat type bracket details



- 1 – U-bolt
- 2 – U-bolt fixing bolt and washer
- 3 – Transmitter fixing bolts
- 4 – B5 bracket

Figure 13: Flat type mounting bracket kit (B5)

### 5.6 Mounting a P style pressure transmitter (266H and 266N)

The pressure transmitter can be mounted directly on the manifold.

A mounting bracket for wall or pipe mounting (2" pipe) is also available as an accessory.

Ideally, the pressure transmitter should be mounted in a vertical position to prevent subsequent zero shifts.

**Important.** If the transmitter is installed inclined with respect to the vertical, the filling liquid exerts hydrostatic pressure on the measuring diaphragm, resulting in a zero shift. In such an event, the zero point can be corrected via the zero push-button or via the "set PV to zero" command. Please refer to the [configuration section] for further details. For transmitters without diaphragm seals the Vent / Drain considerations below should be taken into consideration.

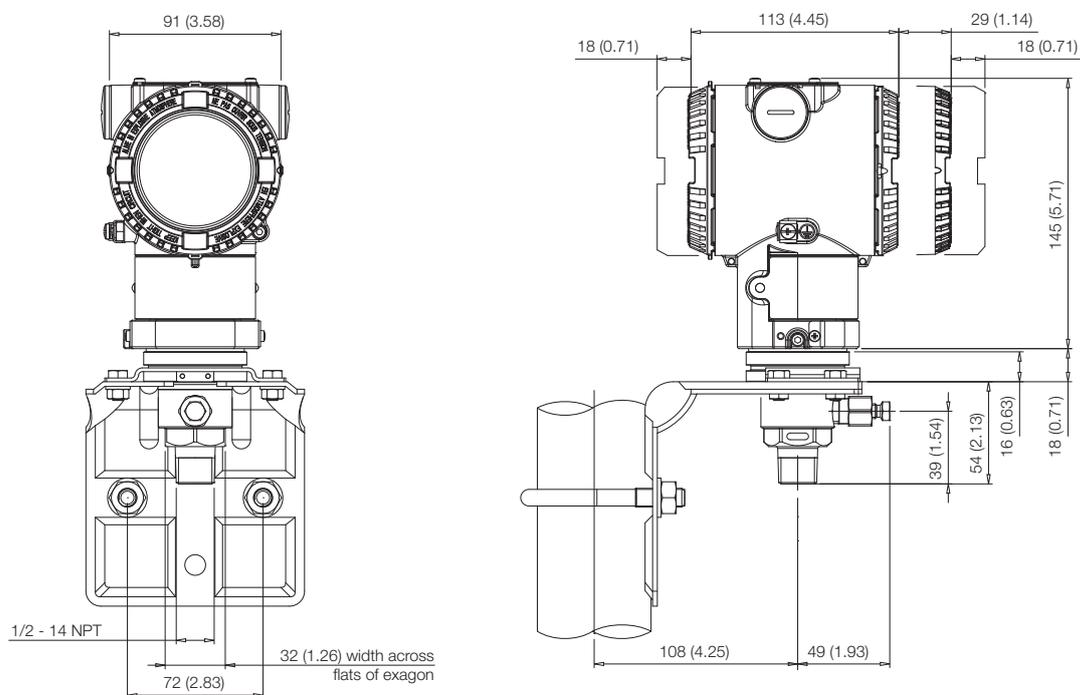


Figure 14: Model 266H or 266N High overload resistant P-Style transmitter with 1/2-14 NPT male process connection and barrel housing installed on a 2"pipe with optional bracket (B6 carbon steel or B7 Stainless Steel 316L)

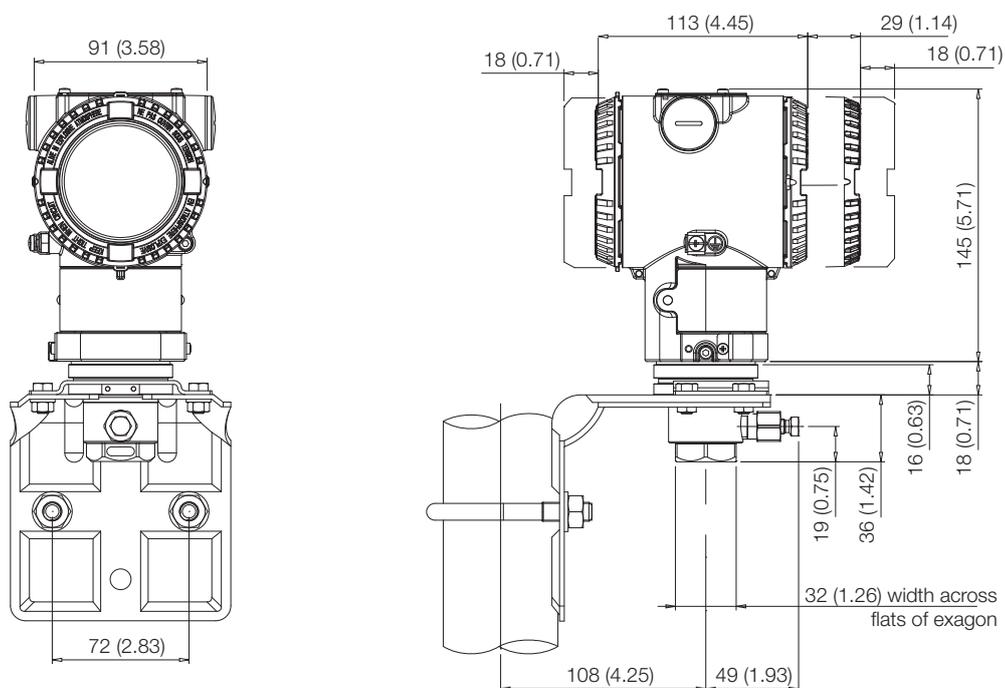


Figure 15: Model 266H or 266N High overload resistant P-Style transmitter with 1/2-14 NPT female process connection and barrel housing installed on a 2"pipe with optional bracket (B6 carbon steel or B7 Stainless Steel 316L)

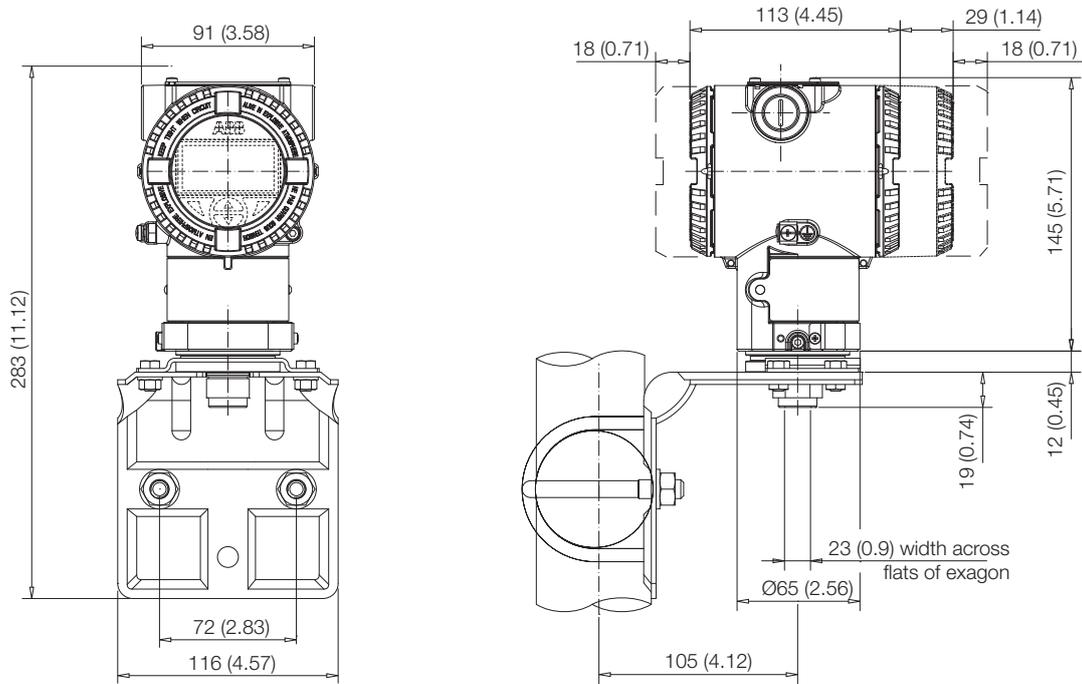


Figure 16: Model 266H or 266N High overload resistant P-Style transmitter with sensor Z with barrel housing installed on a 2" pipe with optional bracket (B6 carbon steel or B7 Stainless Steel 316L)

### 5.6.1 B6 and B7 Barrel housing bracket details

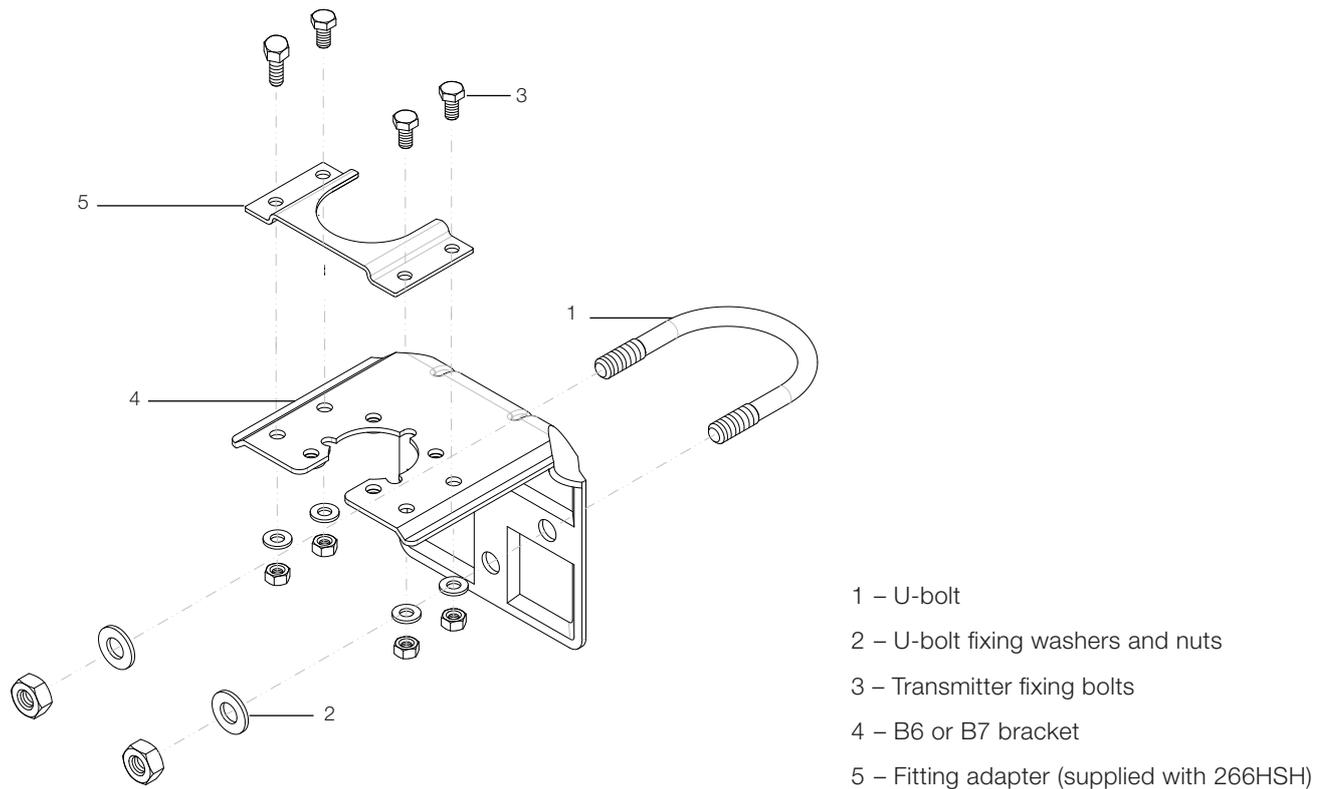


Figure 17: Pipe and wall mounting bracket kits for P style transmitter with Barrel housing

### 5.7 Transmitter housing rotation

To improve field access to the wiring or the visibility of the optional LCD meter, the transmitter housing may be rotated through 360° and fixed in any position. A stop prevents the housing from being turned too far. In order to proceed with housing rotation, the housing stop tang-screw has to be unscrewed by approximately 1 rotation (do not pull it out) and, once the desired position has been reached, retightened.

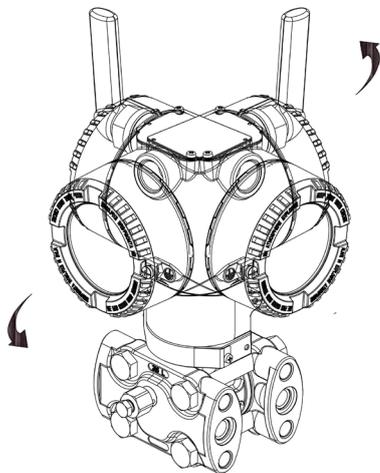


Figure 18: Housing rotation

### 5.8 Integral display rotation

In case an optional integral display meter is installed, it is possible to mount the display in four different positions rotated clockwise or counterclockwise with 90° steps. To rotate the LCD, simply open the windowed cover (Hazardous area prescriptions must be respected), pull-out the display housing from the communication board. Reposition the LCD connector according to the new desired position. Push back the LCD module on the communication board. Be sure that the 4 plastic fixing locks are properly in place.

### 5.9 Antenna rotation

Usually the antenna should be turned into a vertical or horizontal position. Do not turn the antenna more than 360° because HF wires can be seriously damaged compromising radio functionality. Please refer to the pictures below to identify wireless signal coverage areas.

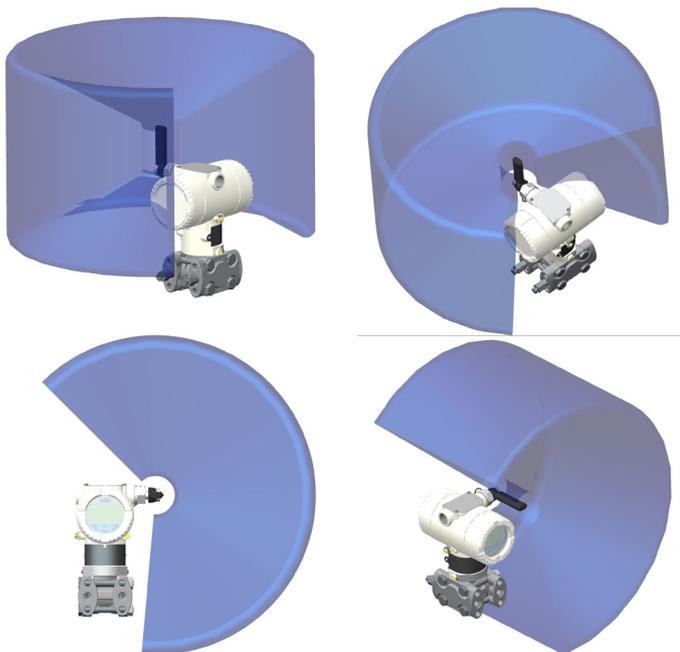


Figure 19: Signal coverage according to antenna rotation

### 5.10 Impulse piping connection for standard instruments

In order for the pipes to be laid correctly, the following points must be observed:

- The measuring pipes must be as short as possible and free from sharp bends.
- Lay the impulse piping in such a way that no deposits accumulate in them. Gradients should not be less than approx. 8% (ascending or descending).
- The measuring pipes should be blown through with compressed air or, better yet, flushed through with the measuring medium before connection.
- Where a fluid/vaporous measuring medium is being used, the liquid in both measuring pipes must be at the same level. If a separating liquid is being used, both measuring pipes must be filled to the same level (266Dx).
- Although it is not absolutely necessary to use balancing vessels with vaporous measuring media, measures must be taken to prevent steam entering the measuring chambers of the measuring equipment (266Dx).
- It may be necessary to use condensate vessels, etc., with small spans and vaporous measuring media (266Dx).
- If using condensate vessels (steam measurement), you should ensure that the vessels are at the same elevation in the differential pressure piping (266Dx).
- As far as possible, keep both impulse lines at the same temperature (266Dx).
- Completely depressurize the impulse lines if the medium is a fluid.
- Lay the impulse lines in such a way that gas bubbles (when measuring fluids) or condensate (when measuring gases) can flow back into the process line.
- Ensure that the impulse lines are connected correctly (High and Low pressure sides connected to measuring equipment, seals...).
- Make sure the connection is tight.
- Lay the impulse line in such a way that prevents the medium from being blown out over the measuring equipment.

**Caution.** 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 otherwise dangerous process fluid, take any 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.

### 5.11 Process connections considerations

266 differential pressure transmitter process connections on the transmitter flange are 1/4 - 18 NPT, with a centers distance of 54mm (2.13in) between the connections. The process connections on the transmitter flange are on centers to allow direct mounting to a three-valve or five-valve manifold.

Flange adapter unions with 1/2 - 14 NPT connections are available as an option. Rotate one or both of the flange adapters to attain connection centers of 51mm (2.01in), 54mm (2.13in) or 57mm (2.24in).

To install adapters, perform the following procedure:

1. Position the adapters with the O-ring in place.
2. Bolt the adapters to the transmitter using the bolts supplied.
3. Tighten the bolts to a torque value of 25Nm (stainless steel bolts) or 15Nm (for Stainless steel NACE bolts).

For high static model (266DSH.x.H) tighten the bolts to a torque value of 40 Nm (regardless of the material of the bolts used). In case of PTFE O-rings, pre-tightening to 10Nm and final tightening to 50 Nm.

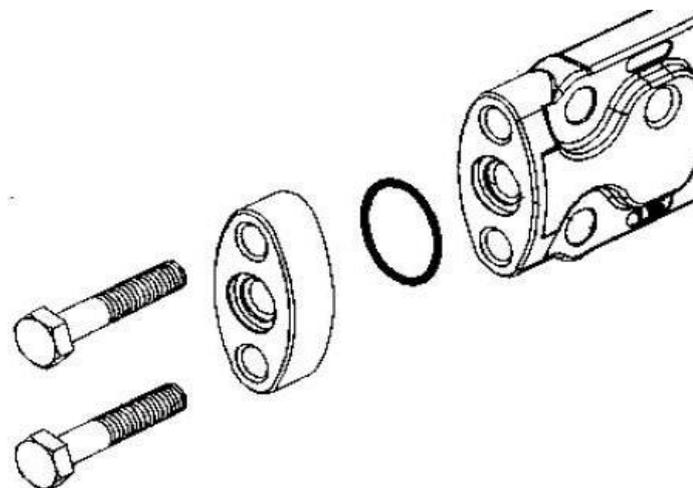


Figure 20: Adapter

### 5.12 Kynar inserts connection

When connecting Pressure transmitters equipped with kynar inserts tighten the bolts to 15 Nm max.



Figure 21: Kynar insert

### 5.13 Installation recommendations

Impulse piping configuration depends on the specific measurement application.

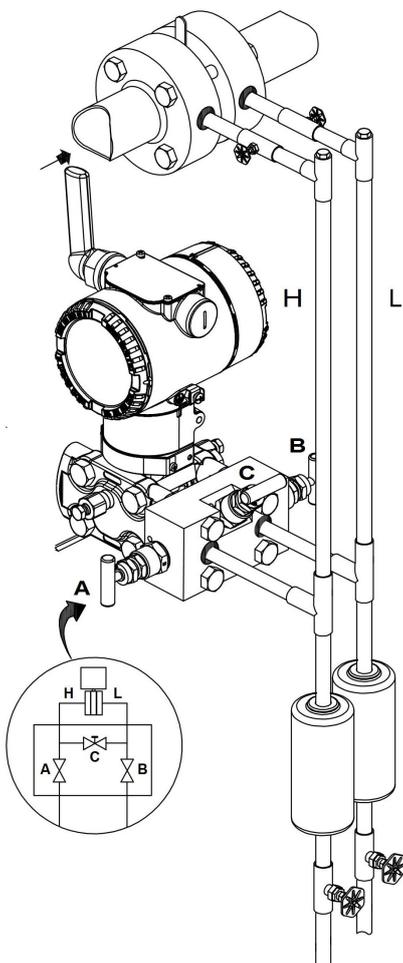
**Important.** Wireless pressure transmitters are equipped with antenna and extended rear cover. The following installation sketches are shown for convenience only. Please consider the antenna and the battery seat while planning installation schemes.

#### 5.13.1 Steam (condensable vapor) or clean liquids flow measurement

- Place taps to the side of the line.
- Mount beside or below the taps.
- Mount the drain/vent valve upward.
- In case of steam application fill the vertical section of the connecting lines with a compatible fluid through the filling tees.

The process fluid must enter the transmitter primary:

1. Open equalizing valve (C)
2. Close low pressure (B) and high pressure (A) valves .
3. Open gate valves
4. Slowly open high pressure (A) valve to admit process fluid to both sides of primary.
5. Vent or drain the primary unit and then close the valves.
6. Open the (B) valve and close the equalizing valve.



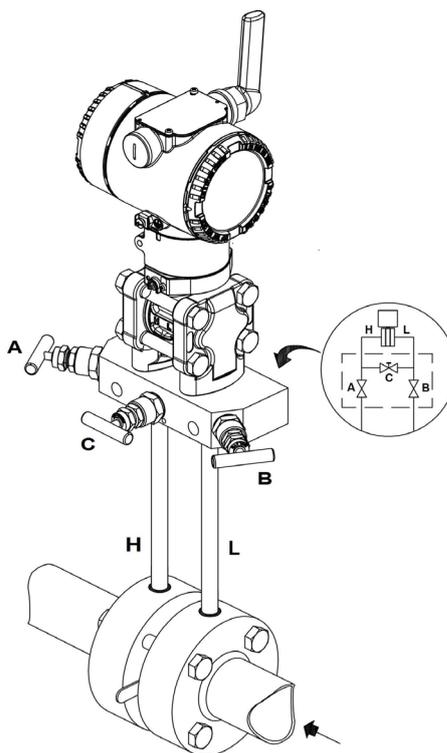
**Figure 22: Steam or clean liquid flow measurement (transmitter and manifold)**

#### 5.13.2 Gas or liquid (with solids in suspension) flow measurement

- Place the taps to the top or side of the line.
- Mount the transmitter above the taps.

The process fluid must enter the transmitter primary:

1. Open equalizing valve (C)
2. Close low pressure (B) and high pressure (A) valves .
3. Open gate valves
4. Slowly open high pressure (A) valve to admit process fluid to both sides of primary.
5. Vent or drain the primary unit and then close the valves.
6. Open the (B) valve and close the equalizing valve.



**Figure 23: Gas or liquid flow measurement (transmitter and manifold)**

**Caution.** Manifolds can be supplied both mounted on pressure transmitters and loose. In case of integral mounting, consider that:

- All adjustments should be carried out by qualified personnel with the valve without pressure.
- End connections must not be removed from the body.
- Do not use handle wrenches or extensions to operate the valves.
- Head units must not be removed once installed.
- Do not cover or remove body marking.

**Important.** The maximum working temperature of the whole assembly (manifold and instrument) corresponds to the temperature limit of the pressure transmitter.

**Important.** When the manifold is assembled to a 2600T pressure transmitter with NACE compliance A4-50 Stainless Steel bolts (available on request), please note that the maximum working pressure is limited to 210 bar (3045 psi).

### 5.13.3 Liquid level measurements on closed tanks and non condensable fluids (dry leg)

- Mount the transmitter at the same height or below the lowest level to be measured.
- Connect the + (H) side of the transmitter to the bottom of the tank.
- Connect the - (L) side of the transmitter to the upper part of the tank, above the maximum level of the tank.

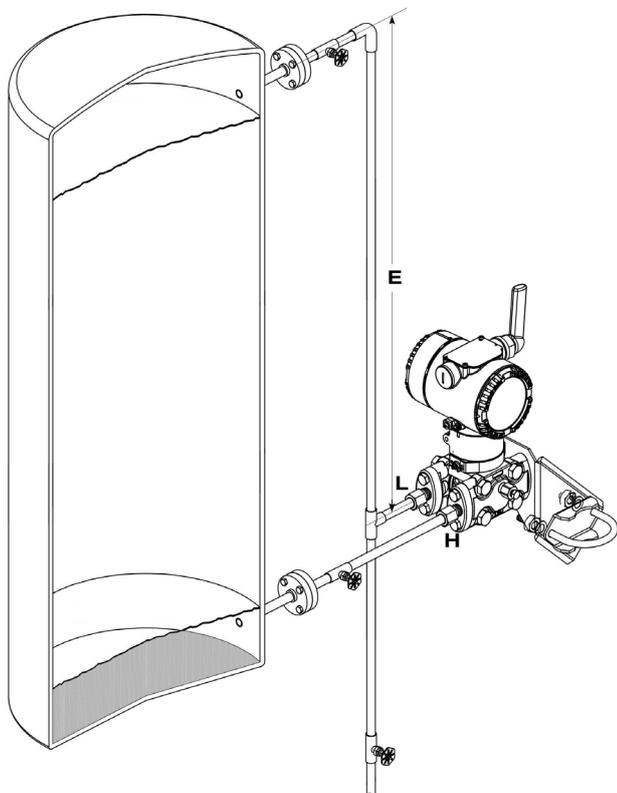


Figure 24: Level measurement on closed tank with dry leg

### 5.13.4 Liquid level measurement with closed tanks and condensable fluids (wet leg)

- Mount the transmitter at the same height or below the lowest level to be measured.
- Connect the + (H) side of the transmitter to the bottom of the tank.
- Connect the - (L) side of the transmitter to the upper part of the tank.
- Fill the vertical section of the connecting line to the upper part of the tank with a compatible liquid through the dedicated filling tee.

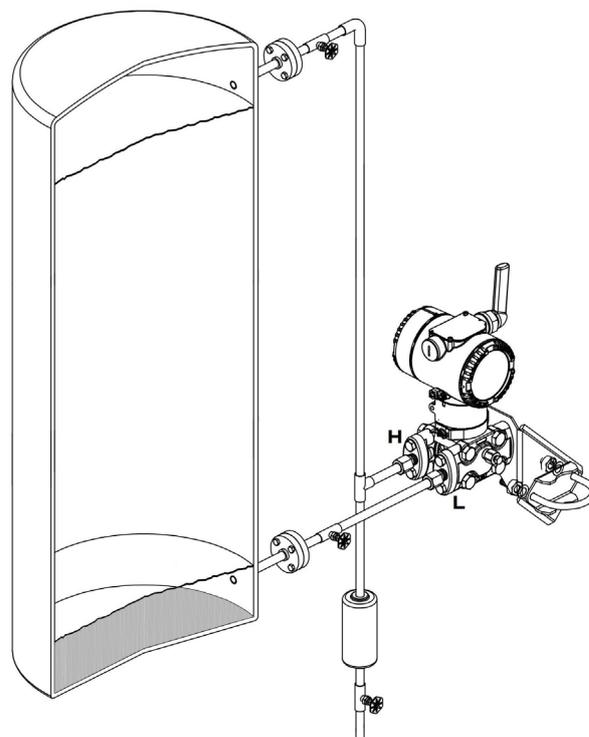


Figure 25: Level measurement on closed tank with wet leg

### 5.13.5 Liquid level measurement with open tanks

- Mount the transmitter at the same height or below the lowest level to be measured.
- Connect the + (H) side to the bottom of the tank.
- Vent the “-” (L) side of the transmitter to the atmosphere (in this case a gauge pressure is shown; the (L) side is already vented to the atmosphere).

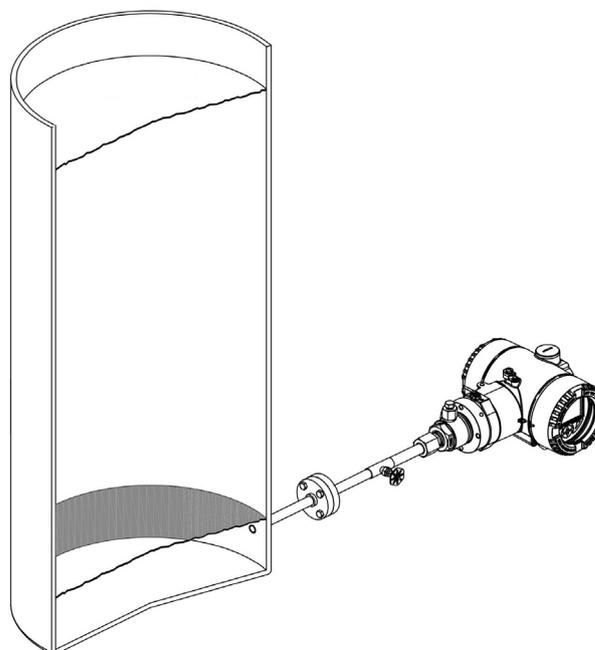


Figure 26: Level measurement on open tank with P style transmitter

### 5.13.6 Pressure or absolute pressure measurement of a tank

- Place the taps in the upper part of the tank.
- Mount the transmitter above the elevation of the process tap (both pressure and differential pressure transmitter can be used).
- Connect the transmitter to the tank.

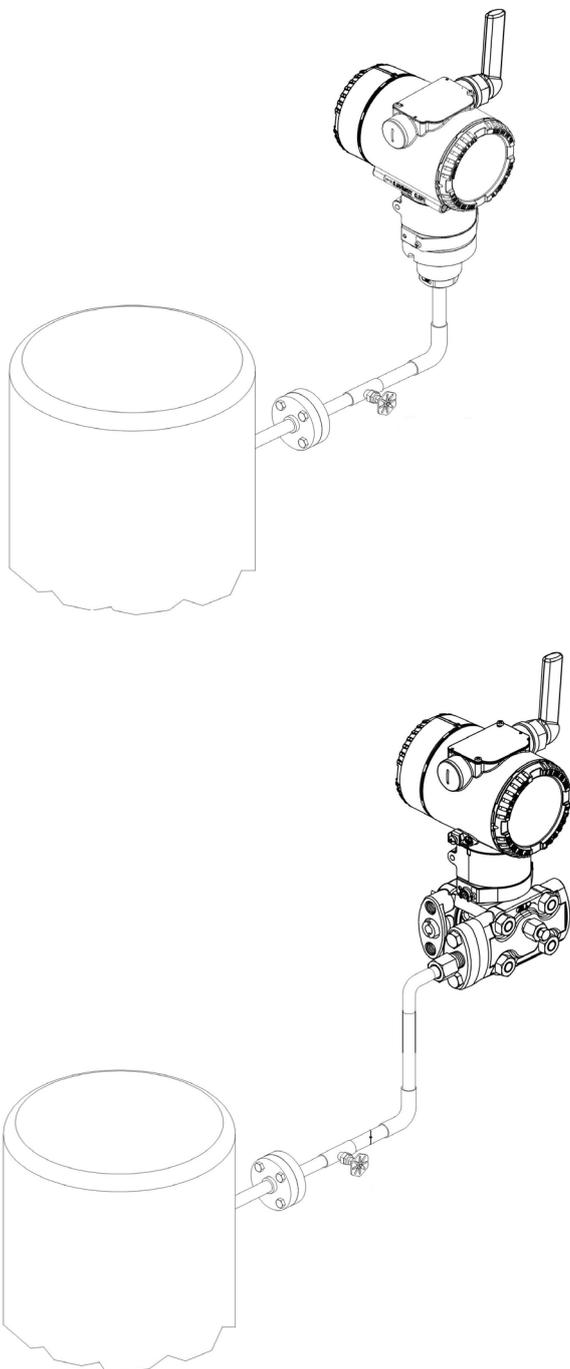


Figure 27: Gauge or absolute pressure measurement on a tank

### 5.13.7 Pressure or absolute pressure measurement of a liquid in a pipe

- Place the tap at the side of the line.
- Mount the transmitter (both pressure and differential pressure transmitters) beside or below the tap for clean fluids, above the tap for dirty fluids.
- Connect the + (H) side of the transmitter to the pipe.

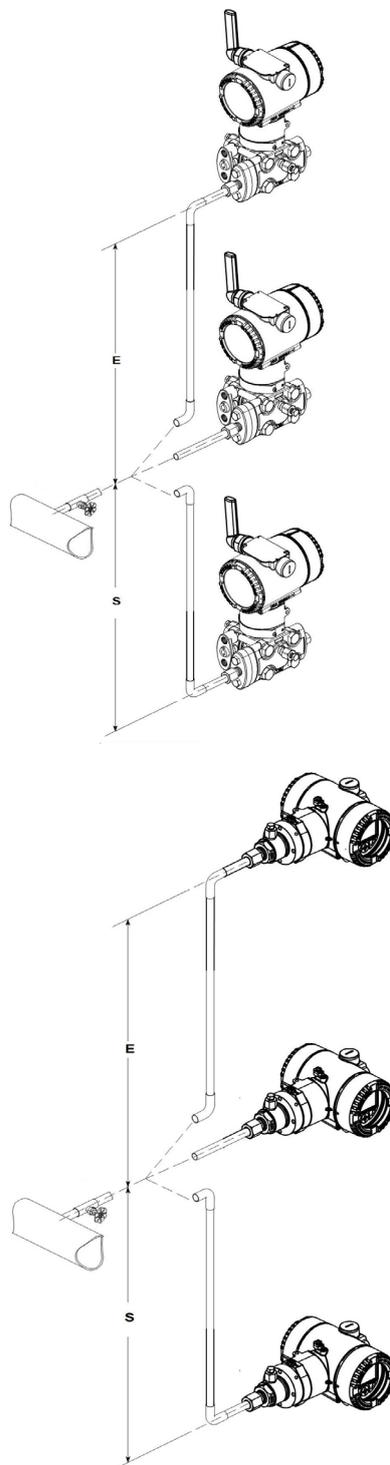


Figure 28: Gauge or absolute pressure measurement of a liquid in a pipe

### 5.13.8 Pressure or absolute pressure measurement of a condensable vapor in a pipe

- Place the tap at the side of the line.
- Mount the transmitter (both pressure and differential pressure transmitter) below the tap.
- Connect the + (H) side of the transmitter to the pipe.
- Fill the vertical section of the connecting line to the tap with a compatible liquid through the dedicated filling tee.

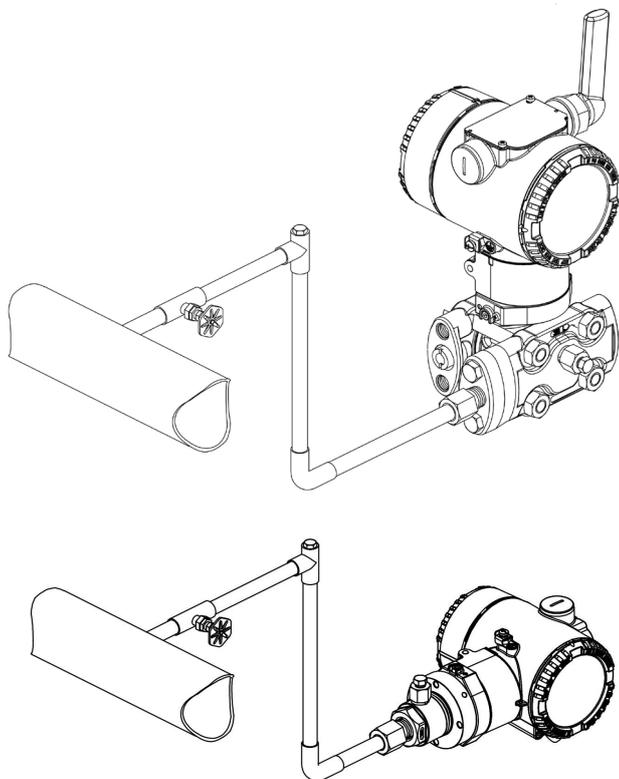


Figure 29: Gauge or absolute pressure measurement of condensable vapor

### 5.13.9 Pressure or absolute pressure measurement of a gas in a pipe

- Place the tap at the top or side of the line.
- Mount the transmitter (both pressure and differential pressure transmitter) beside or above the tap.
- Connect the transmitter to the pipe.

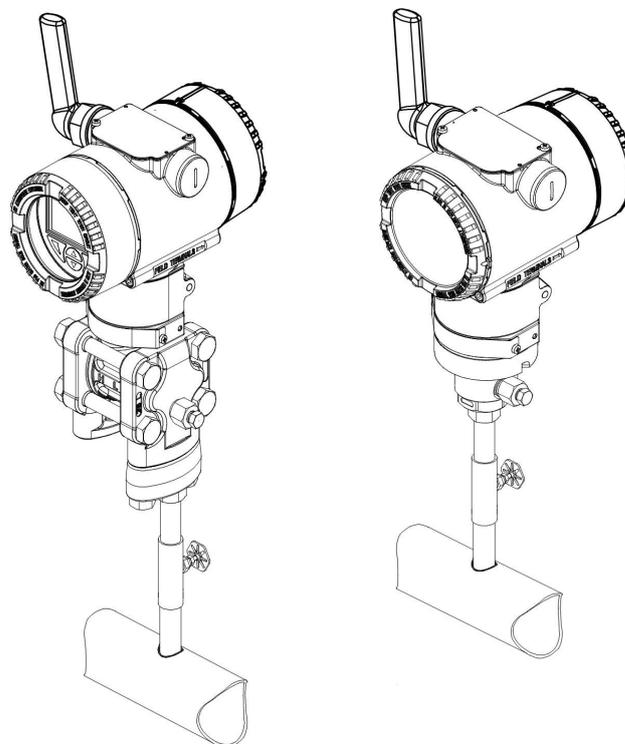
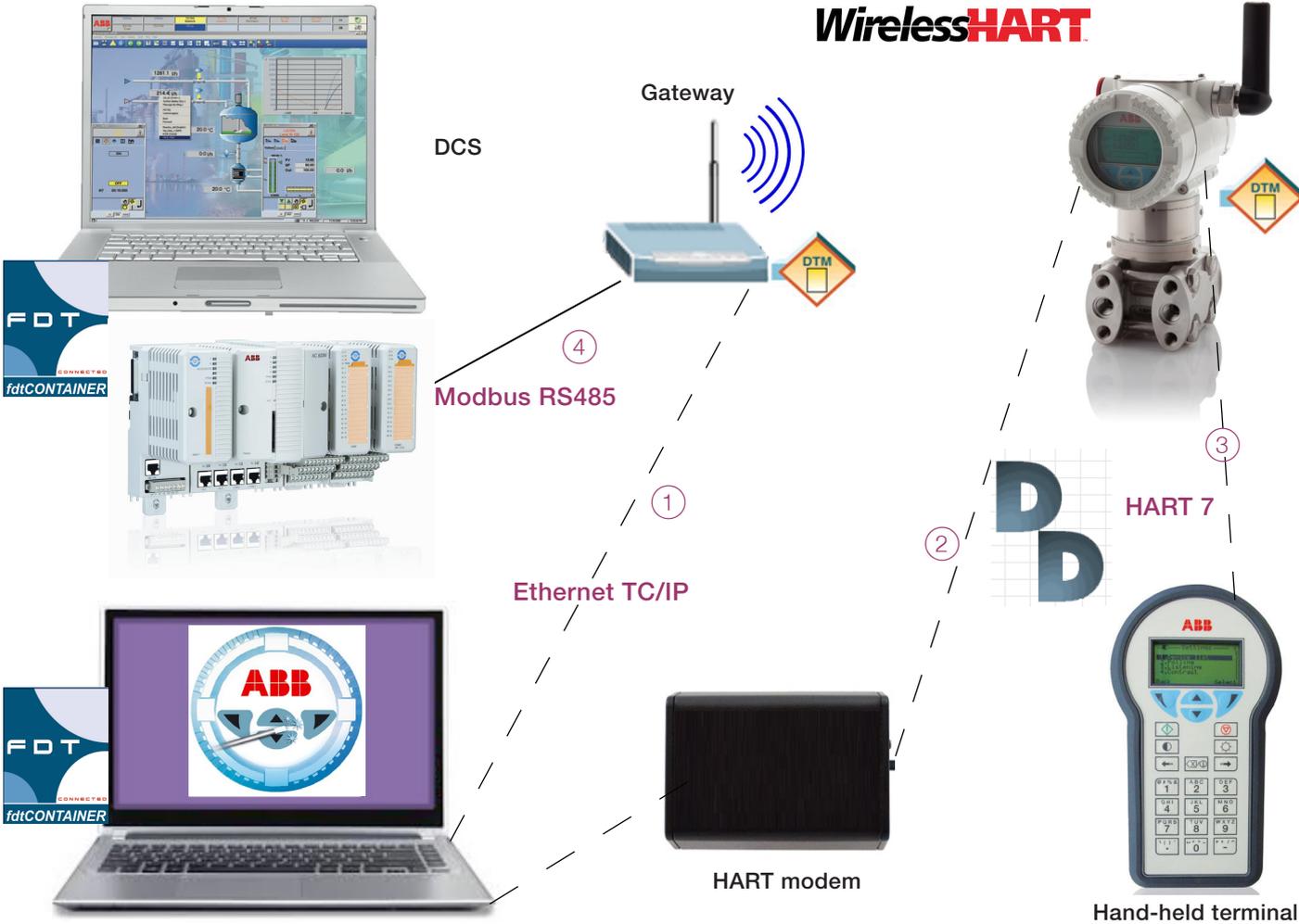


Figure 30: Gauge or absolute pressure measurement of gas in a pipe

# 6 Transmitter connection

## 6.1 Network architecture



### Asset Vision Basic

The picture above represents a generic wireless architecture. Dashed lines are temporarily wired connections.

Wireless devices can communicate both with wired or wireless tools. Wired tools can be: Asset Vision Basic (2) and Hand-held terminal (3) (which has to run HART 7 protocol). Field devices can communicate with Asset Vision Basic wirelessly through the Gateway connected via Ethernet TCP/IP (1). The Gateway communicates to the DCS (Distributed Control System) via Modbus RS485 (4).

## 6.2 Design and function

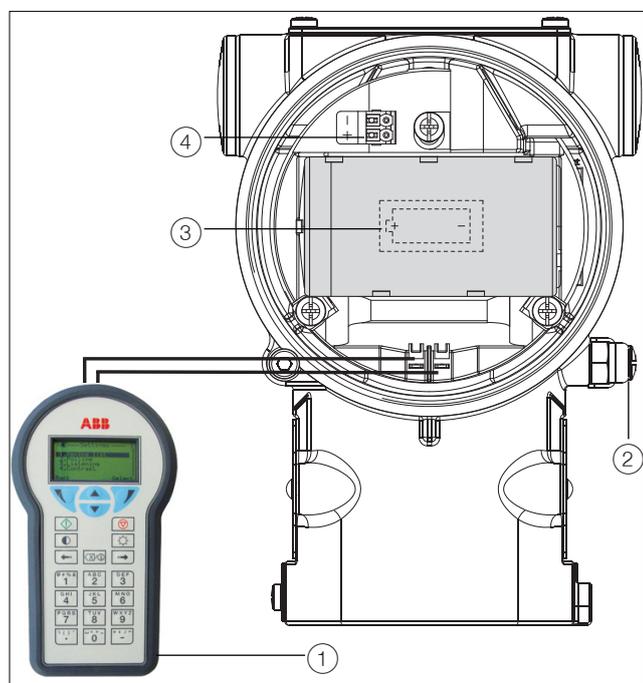
In the network design phase, ABB recommends to follow the steps listed here below:

- Define the Network ID, a common Join Key for all devices and the HART Long Tags (see paragraph “7.6 Joining the network”).
- Use a map of the plant and plan device installation considering that the antenna needs to have a 0.5 meters minimum distance from large obstacles or surfaces. In addition the antennas of gateway and repeaters should be placed 2 meters above possible obstacles in order not to compromise network robustness and communication efficiency.
- Place the gateway in a strategic position in the process unit.
- Plan networks with at least five devices (to create a robust network ensure that each device has three neighbors).
- Install at least five devices within the gateway coverage area.
- Ensure that 25 % of the devices are directly linked to the the gateway and within its coverage area.

Wireless HART transmitters provide an FSK maintenance port too, compatible with existing tools such as modems and handheld terminals with the purpose of configuration and maintenance. Anyway, its main communication interface is wireless. The same protocol is used to communicate with a wireless HART compatible gateway. The gateway provides different kinds of wired interfaces and protocols such as RS-485 or Ethernet.

The transmitters can be configured, polled, and tested using a DTM or an EDD via both, the wired and the wireless interface.

## 6.3 HART



① Handheld communicator | ② External ground termination point | ③ Battery | ④ Fast connection for harvesting unit

Figure 31: HART transmitter connection scheme

**Important.** HART hand-held communicator may be connected at any termination point in the loop. No need of 250 ohms resistance for communication purposes.

## 6.4 Supply requirement

Pressure transmitter power supply is granted by a 3.6V size ‘D’ battery. Standard supplied battery is a Lithium-thionyl chloride cell certified for Hazardous Areas.

## 6.5 Powering the transmitter on

Follow these steps to power the transmitter on:

- Remove the temporary plastic cap from one of the two electrical connection ports located at both sides in the upper part of the transmitter housing.
- This connection port has a M20 threads. Dedicated plug has to be fitted to this port to comply with plant standards.

**Important.** 266 Pressure Transmitter is certified IP67. To maintain the IP67 certification rating, it is necessary to select the dedicated plug.

- Remove the housing cover of the “field terminals” side. See the indication engraved on one side of the housing.
- Remove the battery pull-tab grabbing it firmly and pulling it completely outside from its slot. This will allow the cell to make contact with the electronic module.

**Note.** 266 WiPressure battery is manufactured by TADIRAN Batteries GmbH (manufacturer code SL 2880)

- Before installing the housing cover, check whether the display is working or not. If yes, put back 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.

## 6.6 Protective Grounding

Pressure transmitter housing should be grounded or earthed in accordance with national and local electrical codes. Ground connection is mandatory for surge protector equipped devices in order to ensure proper functioning.

Protective grounding terminals (PE) are available outside and/or inside the housing of the transmitter. Both ground terminals are electrically connected and it up to the user to decide which one to use. The most effective transmitter case grounding method is direct connection to earth ground with impedance equal or less of 5 ohm.

## 7 Commissioning

Once the transmitter has been installed, it is put into operation by enabling the battery. Check the following before switching on the operating voltage:

- Process connections
- The impulse line/s and the measuring chamber of the measuring equipment must be completely filled with the measuring medium.

The transmitter can then be put into operation. To do this, the shut-off valves must be actuated in the following sequence (in the default setting, all valves are closed).

### (Differential models) 266Dx

- Open the shut-off valves on the pressure tap connection
- Open the pressure equalization valve of the manifold.
- Open the positive shut-off valve (on the manifold)
- Open the negative shut-off valve (on the manifold)
- Close the pressure equalization valve.

To put the transmitter out of operation, carry out the steps in reverse order.

### (Gauge & Absolute models) 266Hx, 266Nx

- Open the shut-off valve on the pressure tap connection
- Open the positive shut-off valve.

To put the transmitter out of operation, carry out the steps in reverse order.

**Important.** Please be aware that the measuring equipment will have been overloaded by the atmospheric pressure due to the long periods of transport and storage involved.

For this reason, you will need to allow a starting time of approx. 30 minutes for 266Nx models after commissioning, until the sensor has stabilized to such an extent that the specified accuracy can be maintained.

Only passive devices or indicators may be connected.

### 7.1 Standard setting for normal operation

In order to prevent errors in flow rate measurements (266Dx) in the lower range, it is possible to set a “cut off point” and/or a “lin./sq. root transition point” via the optional LCD integral displays with keypad or via external tools (DD file or DTM). Unless otherwise specified, the “lin./sq. root transition point” is set to 5% and the “cutoff” to 6% of the flow rate end value by the manufacturer.

### 7.2 Standard setting for error detection (alarm)

External tools (DD file on handheld terminal or DTM) or the LCD integral display (if installed) can be used to diagnose the error.

**Important.** A brief interruption in the power supply results in initialization of the electronics (program restarts).

### 7.3 Write Protection

Write protection prevents the configuration data from being overwritten by unauthorized users. If write protection is enabled, the “Z” and “S” buttons are disabled. However, it is still possible to read out the configuration data using communication tools such as DTM or DD file on a handheld terminal.

The write protection function can be performed as follows:

- Remove the ID (see figure 3 at chapter 4) by releasing the holding screw lying on the bottom left corner.
- Turn ON device LCD (if installed) by pressing “Z” button and check if the lock icon  is displayed.
- Use a suitable screwdriver to press the switch down fully.
- Then turn the switch clockwise by 90°.

**Important.** To deactivate the switch, push it down slightly and then turn counterclockwise by 90°.

**Important.** To activate or de-activate the Write Protection function, instrument shall be live. To make instrument go live, press “Z” button for two seconds and wait for the display to turn on.

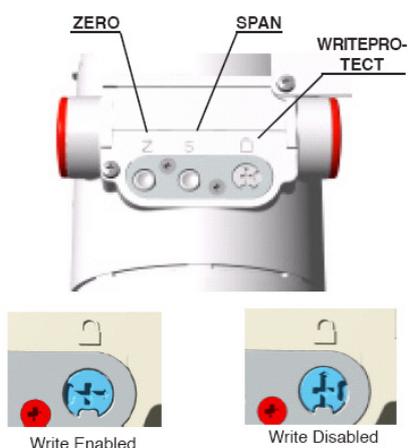


Figure 32: Write-protection pushbutton

### 7.4 Correcting the lower range value / zero shift

During installation of the transmitter, transmitter, zero shifts caused by mounting (e.g., a slightly oblique mounting position due to a remote seal, etc.) may occur; these must be corrected.

**Important.** The transmitter must have reached its operating temperature (approx. 5 min. after startup, if the transmitter has already reached the ambient temperature) in order to perform zero shift correction. The correction must be made at dp (or p) = 0.

### 7.5 Correct the zero shift

The zero shift caused by the installation can be cancelled in different ways:

- By acting on the external push button “Z” with live instrument to align the PV digital output.
- By using the optional LCD with keypad (“Configuration of the pressure transmitter using the integral LCD HMI” for further information).

To correct the zero shift using “Z” push button:

- Wake up the instrument by pressing “Z” push button for at least 2 seconds, then release it
- The HMI should Turn ON (if installed)
- Now press the Z again for at least 2 seconds
- When it is released the PV digital output is zeroed.

## 7.6 Joining the network

In order to allow the wireless communication between transmitter and gateway the transmitter shall join the network configuring the relevant parameters Network ID and Join Key.

This initial basic setting can be done using:

- Asset Vision Basic via HART modem wired connected to the device terminals
- Hand-held terminal wired connected to the device terminals
- The local HMI menu.

Usually 3 parameters should be set always during first commissioning to allow a device to join a network:

- Network-ID. The network-id is the identifier of a network and must be the same for all devices within the same network including the gateway. There might be other networks in parallel but they need to have a different network-id. The network ID is a 16 bit wide number.
- Join-Key. The join key is important to authorize a device joining the network. It serves for network security. The join key can be the same for different networks. The join key is a security relevant information and should be protected as such. In order to grant a higher degree of data security, Wireless HART supports individual join keys; going toward this direction will cause high impacts on maintenance effort. Not all gateways may support individual join keys. The join key is a set of four 32 bit wide numbers (128 bit in total).
- HART Long-TAG: This is human readable identifier of the device in the network and is always used by a gateway to build a device list (“live list”) of the network. The HART Long-TAG shall be unique for every device in the network. Some gateways notify when doubled long TAGs are identified. As the HART Long-TAG is 32 characters long it is suitable to serve as a unique identifier of a single device in a whole plant / installations and not just within the wireless HART network. By default, 266 Pressure Transmitters are delivered with a unique HART Long-TAG containing part of the devices serial number and therefore there is no need to set the HART Long-TAG. HART Long-TAG is necessary for the communication via Ethernet TCP/IP within the Asset Vision Basic projects

In case network ID and join key already match the settings of the gateway e.g. due to prior configuration or default settings are used, there is no need for any further adjustments. 266 WirelessHART will join a reachable network automatically.

**Important.** For security reasons the join key cannot be read back from the local LCD display or handheld terminal.

Check the completion of the joining operation with the pc-tool or looking at the HMI. The operation is completed once the antenna symbol in the right top corner is fixed

**Important.** To switch the HMI press for more than 2 second the “Z” (zero) button. To reach the “Z” button, release the fixing screw of the identification plate on the top of the instrument housing.

## 7.7 Burst

### 7.7.1 Burst configuration

Once the device is in the network the next step is to configure the burst command. Optional burst communication mode allows a single slave pressure transmitter to continuously broadcast a standard HART reply message at a certain, defined, configured interval.

The operation can be done in several ways:

- Wired
- Wireless
- Local display (HMI)

The device can be configured to send up to three burst messages with interval between 2s and 60 minutes.

The configurable message are the following HART commands

HART command	Description
Command #1	Read Primary Variable
Command #2	Read P.V. Current and Percentage of Range
Command #3	Read Dynamic Variables and P.V. Current
Command #9	Read Device Variables with Status
Command #33	Read Device Variables
Command #48	Read Additional Transmitter Status

The burst mode can be set to trigger in different way

- Continuous: the burst message is published continuously at the minimum update period.
- Window: the burst message is triggered when the source value deviates more than the specific trigger value.
- Rising: the burst message is triggered when the source value rises above the specified trigger value.
- Falling: the burst message is triggered when the source value falls below the specified trigger value.

- On-change: the burst message is triggered when any value in the message changes.

The message is normally sent at the configured update period. Once the configured trigger conditions are satisfied, the period is set at the configured maximum update rate.

### 7.7.2 Burst status

The device supports up to three Burst communications. Each burst can be individually configured and enabled (ON) or disabled (OFF). Depending on its configuration, each Burst communication can have different possible Status that could be helpful for detecting and evaluating possible critical or

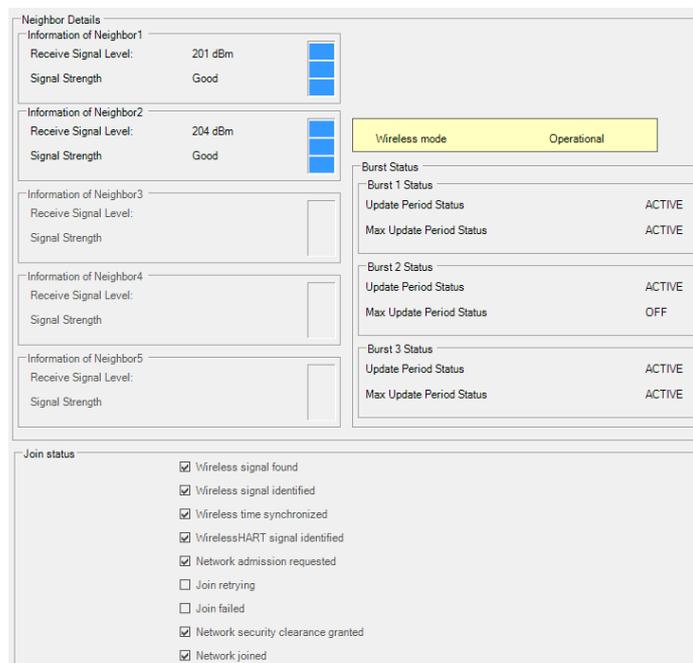


Figure 33: Burst visualization into DTM

anomalous situations between the gateway and the wireless devices. If read from the wireless devices, some Burst Status could give information about the wrong configuration of the gateway and/or the wireless device installed. Burst status is readable via HMI (if installed) or via dedicated section of the DTM (see Commissioning by DTM).

Burst status have the following structure:

“Bn: X-Y” where:

- Bn is the Burst number as B1, B2 or B3
- X-Y represent two possible channels in negotiation with the Network Manager (Gateway) for each Burst. These letters can assume different values:

“O” = OFF

the associated burst has not been enabled. If the device has joined the network bursts can be enabled wirelessly, through wired DTM or using an handheld terminal. In case the device has not yet joined, burst enabling can be done through the wires of the HART protocol or exploiting the DD file (handheld terminal)

“N” = Negotiating phase

the associated burst is in the negotiation phase with network manager (gateway) that is reserving the correct resources bandwidth, timings, etc.

“R” = Reject

the associated burst setting has been refused by the network manager due to some possible conflicts i.e: bandwidth limitation or requested burst update period too short. In case this value appears, review the update period.

“S” = Shutdown

the associated burst is in the shutdown phase. The network manager is deleting all the resources previously reserved at this burst. Until the burst is in this condition, it cannot be reconfigured.

“A” = Active

the associated burst is Active/running. In this condition the associated Burst is transmitting the selected HART command or status to the Gateway according to the update period.

The Bursts will be OK only when X-Y are displayed with “A” - “A” or “A” - “O”.

When the selected “Burst Trigger” is set to “Continuous” there is only one channel to be negotiated with the Network Manager and in this case the second letter is not relevant (value fixed to “O” - OFF). When the selected “Burst Trigger” is set to any



Figure 34: Burst B2 in OFF-OFF status

other event (Window, Rising, Falling or On-change), there are two channels to be negotiated with the Network manager i.e. one for the selected trigger event and the second for the Maximum Update Period in case the trigger event never occurs. In this case the X-Y represents the two channels. The three bursts are displayed cyclically with an interval of 10 seconds.

### 7.7.3 Status byte

The Status byte is the fifth byte of any out value and represents the Quality of the variable. Depending by which of the two selections is active, the list of the possible Status can be the following:

- Classic Status

Binary Code	Decimal Code	Meaning	Possible Cause
0x08	8	More Device Status Available	E.g. failure state. Additional status command shall be sent for more details.
0x40	64	Poor accuracy	E.g. value is beyond rated pressure, temperature outside range. Additional status command shall be sent for more details.
0xB0	176	Manual / Fixed	E.g. simulated value or forced. Additional status command shall be sent for more details.
0xC0	192	Good	Out of Service

## 7.8 Commissioning by EDD-based HART Handheld Terminal

The handheld terminal will allow you to set all the relevant information to let the 266 WiPressure join a WirelessHART network.

- Ensure the EDD has been loaded into the HART handheld terminal.
- Connect the HART handheld configurator to the instrument via the HART maintenance port.
- Set the handheld terminal to polling (Multidrop) mode and scan for devices. The 266 WiPressure has a default polling address 1 (has per HART specification).
- Once connected you can edit the parameters and configuration data.

**Important** An EDD describes structure and type of device parameters but as only a limited influence on how this information is provided to the user. The following is an example of how the EDD could be represented. Even the parameter names may be slightly different as tools typically use vendor specific libraries.

To commission 266 WiPressure using an EDD-based HART handheld terminal, follow the below procedure:

1. Connect the handheld terminal to the 266 WiPressure and select “Communication” and then go “Online”.

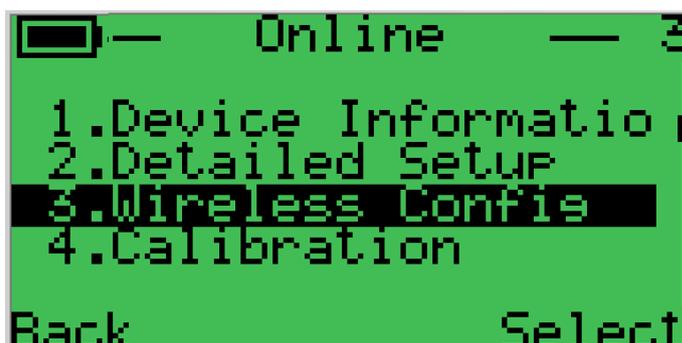


2. After polling, the handheld terminal will show basic device information such as TAG number, Manufacturer ID, Device ID, DD revision and Device revision.

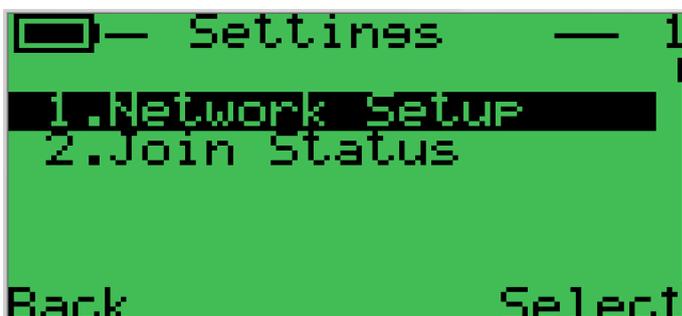
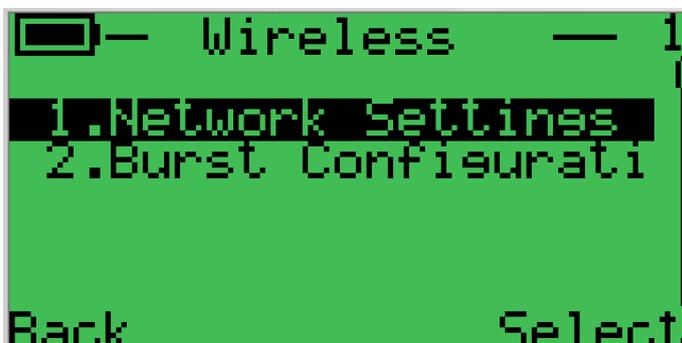
**Important.** Set the handheld terminal to poll in Multidrop or on address 1. 266WiPressure has default address 1 as per WirelessHART specifications.



3. Select “DD navigation” and then “Wireless Config.” to start configuring the instrument to join the network. By using “DD navigation”, it is possible to edit instrument measurement parameters as well as display etc. Please refer to the next sub-chapter for information about 266 WiPressure DD structure.



5. To have 266WiPressure joining the network, there are some parameters to set: Network ID and Join Key. To reach these menus select “Network Settings” and then “Network Setup”.



6. First point is Network ID. This parameter should be written using hexadecimal numbering. After editing the default value (0xABB), depress apply.

**Important.** Network ID can be configured according to customer instructions at the factory.



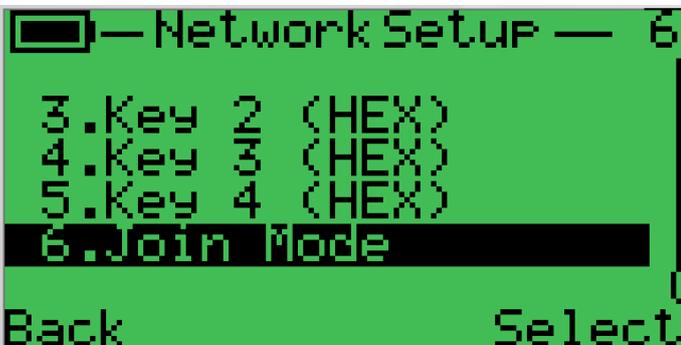
7. Join Key is the second, essential data to insert. Join Key is string of 32 (thirty two) characters divided into 4 (four) groups of 8 (eight) characters each. The four groups are to be written into the 4 different menu entries in hexadecimal notation and allowed characters goes from 0 to 9 and from A to F (capital letters only).

**Note.** Join Key entry is shown just once for convenience. Enter Join Key from Key 1 (HEX) to Key 4 (HEX).

**Important.** For security reasons, Join Key cannot be read back from the handheld terminal.



8. Select "Join Mode" (usually "Join Now") and depress "Apply". With this operation, all network parameters will be sent to 266 WiPressure.



**Note.** Some handhelds or computer based tools require the Join Key to be entered in decimal.

9. By selecting "Join Status" the handheld terminal will show the progress of all actions necessary to have the 266 WiPressure joining the network and communicating with the Network Manager (gateway).



## 7.8.1 EDD structure for 266 WiPressure

**Device information**

- Device
  - Manufacturer
  - Model
  - Device Serial No
  - Device revision
  - HART Revision
  - Device Profile
- Additional Device Revision
  - Hardware Revision
  - Software Revision
- Measurement Point
  - Address
  - Write Protection
  - Communication tag
  - Date
  - Final Assembly Num
  - Descriptor
  - Message
- Additional information
  - Long tag
  - Sensor type
  - Sensor revision
  - Read Sensor SI number

**Detailed Setup**

- General
  - Local Operations
- Sensor Set-up
  - P-dP Sensor
    - Sensor Type
    - Upper Sensor Limit
    - Lower Sensor Limit
    - Minimum span
  - Static Pressure Sensor
    - Upper Sensor Limit
    - Lower Sensor Limit
    - Minimum span
  - Operational limit
    - Max Temperature limit
    - Min Temperature limit
    - Max Working Pressure
- Unit
  - Temperature Unit
  - Static Pressure unit
- Pressure Polarity
  - Pressure input [Direct]
- Sensor materials
  - Basic Sensor materials
    - Diaphragm material
    - Filling Fluid
  - Process Connection High
    - Connection type
    - Flange Material
    - O-Ring Material
    - Blanking Plug
  - Process Connection Low
    - Connection type
    - Flange Material
    - O-Ring Material
    - Blanking Plug

- P-dP
  - Process variable
    - Measured value
      - PdP Value
      - PV % range
  - Scaling
    - Value Input
      - Unit
        - PV LRV
        - PV URV
    - Process Pressure
      - Rerange
  - PV Bias
    - PdP Value
    - Set PV Val
    - Set PV to Zero
    - Bias Value
    - PV Bias Reset
  - Parallel Shift
    - Parallel Shift
  - Transfer Function
    - Transfer Function
    - Square Root Setting
      - Lin.Square root Point [%]
      - Cut Off
- Output
  - Scaling
    - Unit
      - Custom Unit
        - Lower range Value
        - Upper range Value
- Hart Mapping
  - PV is
  - SV is
  - TV is
  - QV is
  - Change SV mapping
  - Change TV mapping
  - Change QV mapping
- Display
  - General
    - Display Revision
    - Contrast
    - Language
  - Display Setting
    - Display Mode
    - Line 1 view
    - Line 2 view
    - Bargraph view

**Wireless Config**

- Network Settings
  - Network setup
    - Network ID (HEX)
    - Key 1 (HEX)
    - Key 2 (HEX)
    - Key 3 (HEX)
    - Key 4 (HEX)
    - Join Mode
  - Join Status
- Burst Configuration
  - Burst Message 1
    - Burst Message 1
      - Burst Mode
      - Burst command
      - Burst Msg Trigger Mode
      - Update period for burst message
    - Change Burst Config
  - Burst Message 2
    - Burst Message 2
      - Burst Mode
      - Burst command
      - Device Variables
      - Burst Msg Trigger Mode
      - Update period for burst message
    - Change Burst Config
  - Burst Message 3
    - Burst Message 3
      - Burst Mode
      - Burst command
      - Device Variables
      - Burst Msg Trigger Mode
      - Update period for burst message
    - Change Burst

**Calibration**

- Pressure Sensor
  - Cal pressure
  - Full trim
  - Zero trim
  - Sensor temperature value
  - Sensor temperature trimming
- Static Pressure
  - StaticPr Value
  - Zero trim
  - Low trim

**Simulation**

- PdP Value
- StaticPr value
- Sensor Temp value
- ScaledOut Value
- Simulation

**Process Variable**

- PdP Value
- PdPstatus
- StaticPr Value
- StaticPr Status
- sensorTemp value
- sensorTemp status
- scaledOut Value
- scaledOut status

**Diagnostics**

- Device Status
- Diagnostics monitoring
  - Diag Simulation enable
- Electronics
  - Sensor/Actuators
  - Installation/Start up
  - Process
  - Operating conditions
  - Wireless
- Simulation
  - Diag Simulation Enable
- Configuration
  - Electronics
  - Operating conditions
  - Sensor/Actuators
  - Process
- Historic Info
  - Device
    - No. Power On
    - Total working time
  - Pressure variable logging
    - Min.Pressure value
    - Max.Pressure value
    - Reset
  - Sensor temperature logging
    - Min. temperature value
    - Max. temperature value
    - Reset
  - Static pressure logging
    - Min.Static Pressure value
    - Max.static Pressure value
    - Reset
- Neighbor details
  - Wireless status
    - Wireless Mode
    - Join Retry timer
    - Join status
  - Neighbor count
- Burst Status
  - Burst 1 status
    - Update rate service
    - Max Update rate service
  - Burst 2 status
    - Update rate service
    - Max Update rate service
  - Burst 3 status
    - Update rate service
    - Max Update rate service

**Extras**

- Resets
- Load Factory Settings
- Lock/Unlock Device
- Start Squawk

**Note.** Some entries may not be available due to instrument configuration (i.e. static pressure entries not implemented for gauge or absolute pressure transmitters).

## 7.9 Commissioning by DTM

The 266WiPressure DTM gives access to all parameters and information relevant to communication and device commissioning. Once the device is taken into the wireless network by the gateway the DTM can be used with the wired but also with the wireless interface, depending of the capabilities of FDT frame application and gateway.

Typically, the connection to the gateway is via Ethernet. This allows a remote access to the wireless HART network and the 266 WiPressure over intranet or Ethernet, depending on the network policies. Components and tools provided or recommended by ABB do not have limitation regarding the communication interface.

Usually the network ID and join key needs to be set to allow a wireless device to enter an existing network. The join key and the network ID are also set in the gateway and must be the same as that entered in the 266 WiPressure.

The following description assumes the device needs a change of network parameters to join a network.

The DTM will have to be connected via a wired interface to the 266 WiPressure. After searching for the device and getting into online mode the dialog Network Settings should be opened:

**Network Settings / Wireless Settings - Online**

**Network Settings**  
All Wireless networks are identified by a Network ID which is set in the Gateway. Please fill in the Network ID of the WirelessHART network you want the device to connect with.

Network ID:

The Join Key is required for the adapter to be allowed to join the desired WirelessHART network. Please fill in the appropriate Join Key (4 sections with 8 HEX numbers each).

Join key (HEX):

**Join Mode**

Attempt to join on powerup or reset  
 Join now  
 Do not Join

[Download JoinMode Only](#)

[Download NetworkId & JoinKey & JoinMode](#)

**Join status**

- Wireless signal found
- Wireless signal identified
- Wireless time synchronized
- WirelessHART signal identified
- Network admission requested
- Join retrying
- Join failed
- Network security clearance granted
- Network joined
- Network bandwidth requested
- Join complete

**Figure 35: Network configuration through DTM**

The sequence of the adjustments is the same as the position of the parameters with the DTM dialog:

1. Network ID to be set in decimal notation within the DTM.
2. Join key to be set in hexadecimal notation
3. Join mode. Usually the option “Join now” is most suitable to let the device enter the (new) network after download all parameters described above.

The data on the bottom of the dialog gives status information about the process of network join. Whenever a wireless HART network is in the range of 266 WiPressure – even it does not match its own network parameters - the “Wireless signal found” flag is set. This is a pre-condition to join a network. The 266 WiPressure now tries to join the network and to establish a connection to the wireless HART gateway.

A successful join phase is indicated by the “Join complete” flag at the end. Depending of the network structure, size and performance of wireless HART gateway and other devices in the network it may take up to 60 minutes.

**Important.** Some gateways need to switch on the “Active Advertising” in order to support devices to join the network.

### 7.9.1 Network Diagnostics by DTM

One of the strengths of wireless HART networks is the capability to automatically build a robust meshed structure. So the wireless devices try to connect to neighbour in order to get multiple paths for any telegram.

Powerful network diagnostics of 266 WiPressure automatically checks the network transmission quality to and from the device itself. DTM gives visibility about signal strength for at maximum five neighbour devices showing their specific link.

Signal strength is returned as a computed value which includes signal level, retries required etc.

**Important.** In a proper and robust network, each wireless device should have at least three neighbour.

## 8 Operation

### 8.1 Local push buttons functionality

266 transmitters allow local adjustments via the on-board non-intrusive push buttons, when selected. The push buttons are located under the identification nameplate. To gain access to the local adjustments release the fixing screws of the nameplate and rotate clockwise the identification plate.

**Warning - Potential damage to parts.** Operating the control buttons with a magnetic screwdriver is not permitted.



Figure 36: Pushbutton functionalities

### 8.2 Factory settings

Transmitters are calibrated at the factory to full span or customer's measuring range, if specified. The calibrated range is provided on the nameplate whereas the tag number on the additional tag plate. The calibrated range and tag number are provided on the name plate. If this data has not been specified, the transmitter will be delivered with the following configuration:

Parameter	Factory setting
Lower Range Value (LRV)	Zero
Upper Range Value (URV)	Upper Range Limit (URL)
Output transfer function	Linear
Optional LCD HMI scale	1 line PV and output signal bargraph
Network ID HEX (DEC)	0XABB (2747)
Join Key HEX	57495245
	4C455353
	4649454C
	444B4559

**Important.** All of the configurable parameters here on the left can easily be modified either via the optional LCD HMI, with a HART handheld terminal or a compatible software solution. Information regarding flange type and material, O-ring materials, and filling liquid type is stored inside the non-volatile memory of the device.

### 8.3 Configuration types

Pressure transmitters can be configured as follows:

- via Zero and Span push buttons (LRV and URV).
- using the integral LCD HMI with keypad (menu-controlled)
- with a HART handheld terminal
- using a PC/laptop via the graphical user interface (DTM)

### 8.4 Configuring the transmitter without an integral LCD HMI

The “lower range value” and “span” parameters can be set directly on the transmitter using the external push buttons.

The transmitter has been calibrated by the manufacturer based on the order information. The tag plate contains information on the “lower range value” and “upper range value” set. In general, the following applies:

To change the transmitter ranging apply the pressure for the “lower range value” and “upper range value” to the measuring equipment. Make sure that the measuring limits are not exceeded.

**Important.** Reducing station with adjustable pressure and reference displays can be used as pressure generators.

When making the connection, please ensure that there are no residual fluids (for gaseous testing materials) or air bubbles (for fluid testing materials) in the impulse lines, since these can lead to errors during inspection. Any potential measuring error for the pressure generator should be at least three times smaller than the desired measuring error for the transmitter.

**Important.** In case of the 266 transmitter for absolute pressure (266Nx) with a measuring range less than or equal 650 mbar abs., please be aware that the measuring equipment will have been overloaded by the atmospheric pressure due to the long periods of transport and storage involved. For this reason, you will need to allow a starting time of approx. 30 minutes for 266Nx model, until the sensor has stabilized to such an extent that the specified accuracy can be maintained.

### 8.5 LRV and URV configuration

- Apply the pressure for the “lower range value” and wait approx. 30 s until it has stabilized.
- Press the “Z” button for 5 seconds to wake the instrument up
- Release the “Z” button and press it again for 10 seconds to assign the LRV applying the minimum pressure.
- Apply the pressure for the “upper range value” and wait approx. 30 s until it has stabilized.
- Press the “S” button for 10 seconds to assign the URV.
- Record the new settings. The respective parameter will be stored in the non-volatile memory 10 seconds after the “Z” or “S” buttons are last pressed.

**Important.** This configuration procedure does not affect the physical process pressure (PV value) also shown on the digital display or user interface. To avoid potential discrepancies, you can use follow the procedure below. After performing a correction, you must check the device configuration.

### 8.6 Configuration of the pressure transmitter using the optional integral LCD HMI with keypad (menu-controlled)

The integral LCD HMI is connected on the 266 communication board. It can be used to visualize the process measured variables as well as to configure the display and the transmitter.

In addition, diagnostic information is provided. To access the functionality of the HMI an activation procedure needs to be carried out. The keypad activation procedure is different between the TTG (Trough The Glass) version and the conventional HMI.

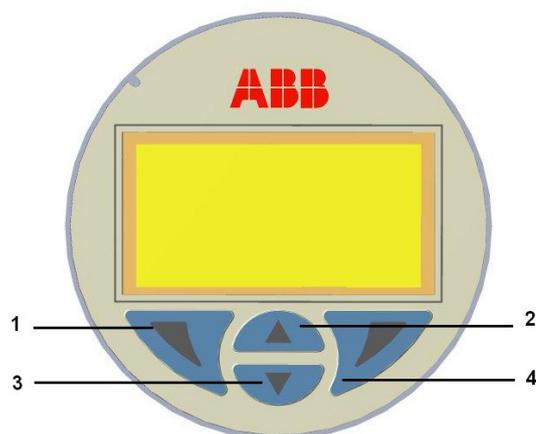


Figure 37: Display keypad

The keys (1) ◀, (4) ▶, (2) ▲ and (3) ▼ are available for the menu-controlled configuration.

- The menu / submenu name is displayed above in the LCD display.
- The number/line of the currently selected menu item is displayed in the upper right of the LCD display.
- A scroll bar is located on the right edge of the LCD display which shows the relative position of the currently selected menu item within the menu.
- Both of the keys (1) ◀ and (4) ▶ can have various functions. The meaning of these buttons is displayed below in the LCD display above the respective button.
- You can browse through the menu or select a number within a parameter value using both keys (2) ▲ and (3) ▼. The button (4) ▶ selects the desired menu item.

Button (1) functionalities	Meaning
Exit	Exit menu
Back	Back one submenu
Cancel	Exit without saving the selected parameter value
Next	Select next position for entering numerical values or letters

Button (4) functionalities	Meaning
Select	Select submenu/parameter
Edit	Edit parameter
Ok	Save selected parameter and display stored parameter value

### 8.7 HMI as feedback of the local push button operations

As consequence of the operations described in the section 8.2, when the Z or S buttons are released, the feedback of the executed operation is displayed in the bottom of the LCD (same position as per diagnostic messages):

Message	Description
<b>! Oper Done</b>	The push button operation has been successfully executed
<b>! Proc Too Low</b>	The Pressure measured in input is too low and not acceptable for the requested operation
<b>! Proc Too High</b>	The Pressure measured in input is too high and not acceptable for the requested operation
<b>! New URV Error</b>	The Zero (Z) operation cannot be accepted because the URV would be shifted outside the Upper Sensor limit
<b>! Span Error</b>	The Span (S) operation cannot be accepted because the new URV would be too close to the LRV and their difference lower than the Minimum Span value
<b>! Oper Disabled</b>	The push button operation has been refused because the Write Protection is enabled.
<b>! LRV Too Low</b>	New LRV is too low and not acceptable for the requested operation
<b>LRV Too High</b>	New LRV is too high low and not acceptable for the requested operation
<b>URV Too Low</b>	New URV is too low and not acceptable for the requested operation
<b>URV Too High</b>	New URV is too high and not acceptable for the requested operation
<b>Armed</b>	Device is armed to accept HART command 73 "Find Device". This message can be triggered only during the device wakeup operation

### 8.8 HMI menu structure

The HMI menu is divided in the following sections which can be selected by acting on the keys (2) ▲ and (3) ▼, once on the display the desired sub-menu icon will be visualized, confirm your selection with the [SELECT] key (4) ▶.

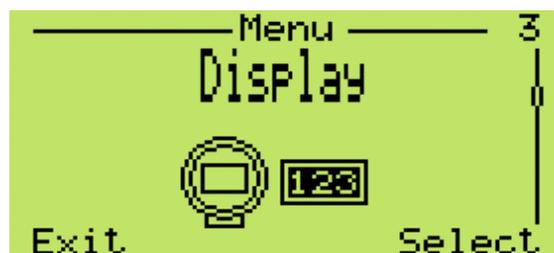
Follow the instruction on the screen to perform the configuration of the different parameters.



This menu allows the verification and the parameterization of the basic configuration of the 266 pressure transmitter. The menu driven structure will guide you to the setting of Join Key, Network ID and tag number. Moreover, display language, engineering units, URV/LRV and transfer function (linear or square root) can be defined inside this menu.



This menu allows the verification and the parameterization of the entire device. The menu driven structure includes the write protection enabling, process variable settings (unit, LRV and URV), transfer function selection (linearization type and low flow cut-off) and output scaling (unit according to the measurement and LRV/URV). The last selectable sub-menu allows user to reset all the parameters to the default configuration.



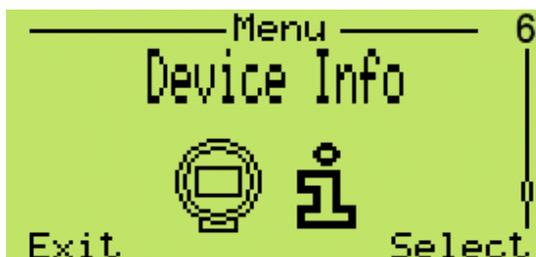
This menu allows the set-up of different functions relevant to the display itself. The menu driven structure will guide you through the choice of some functional aspects as the display language and contrast. Moreover, it is possible to choose in details what you want to see on the display: one or two lines with or without bargraph. Inside this menu there is the possibility of setting a protection password (security) and the display scaling (linearization type, unit, LRV, URV). Display revision number available.



This menu allows the local calibration of the instrument. The menu driven structure will guide you through the choice of pressure sensor trimming (low or high), and at the end you can reset these parameters (to factory sensor trimming, to user sensor trimming).



This menu allows you to monitor diagnostics messages related to pressure variable, output current, output percentage, scaled output, static and sensor pressure. The menu driven structure will also guide you through the loop test.

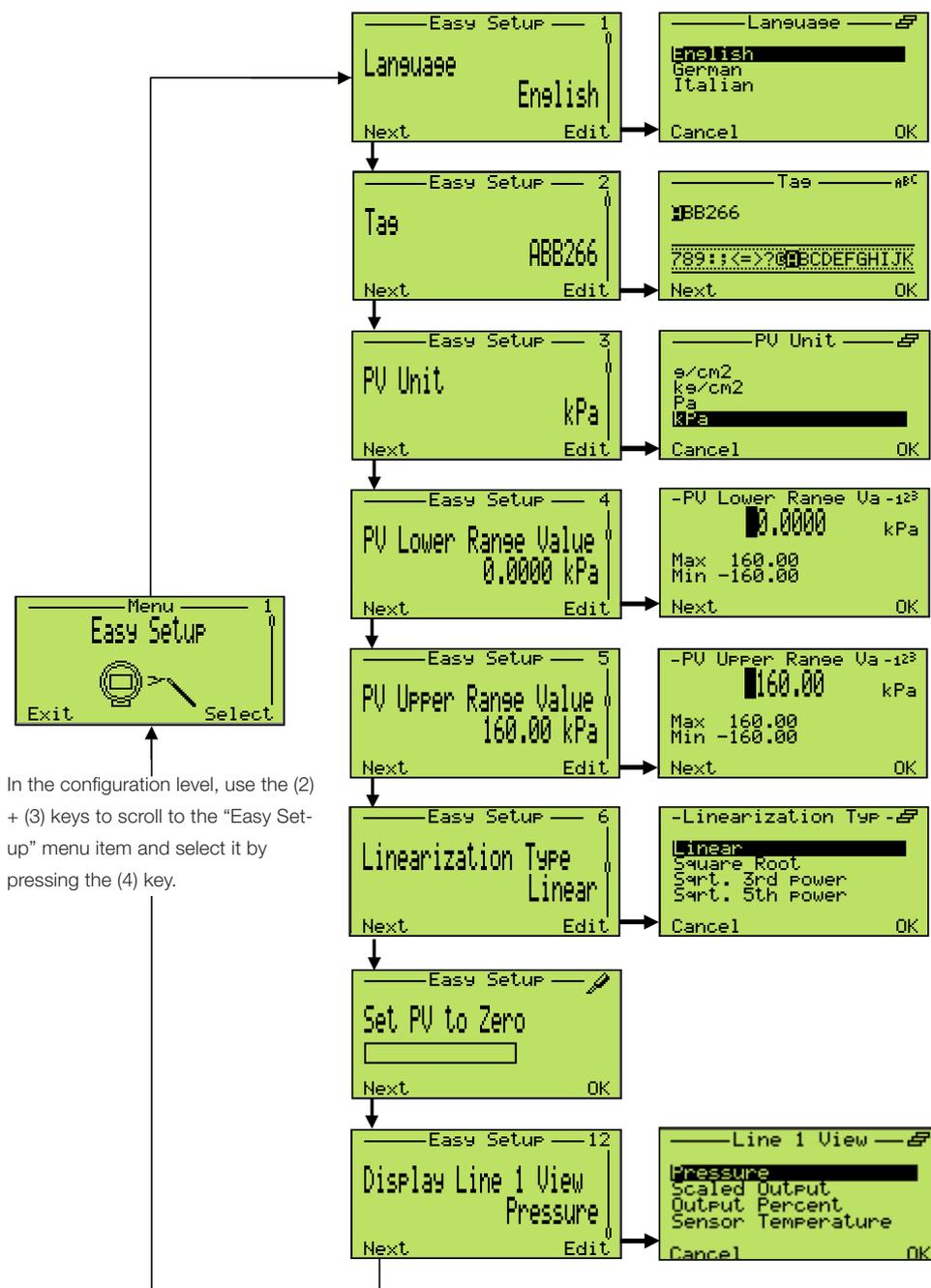


This menu gives you all information about the device. The menu driven structure will show you what is the sensor type, the hardware and software revisions, the high and low sensor limits as well as the minimum applicable span.



The last section of this structured and driven menu gives you the possibility of parameterizing communication-related values such as Tag, HART long Tag, Network ID and Join Key.

8.8.1 Easy Set-up



In the configuration level, use the (2) + (3) keys to scroll to the "Easy Set-up" menu item and select it by pressing the (4) key.

Press key (4) and select the language. After entering the settings, press key (1) to move to the next menu item.

Once in the alphabetic menu use Next (1) key to position the cursor on the character that you want to change. Scroll the character list with (2) + (3), once on the selected one press "next" key (1) once completed press "ok" (4).

Press the (4) key Scroll the eng. units list with (2) + (3) and select with (4) key. Press the (1) key to move to the next menu item.

Press the (4) key and set LRV value. After entering the settings, press the (1) key to move to the next menu item.

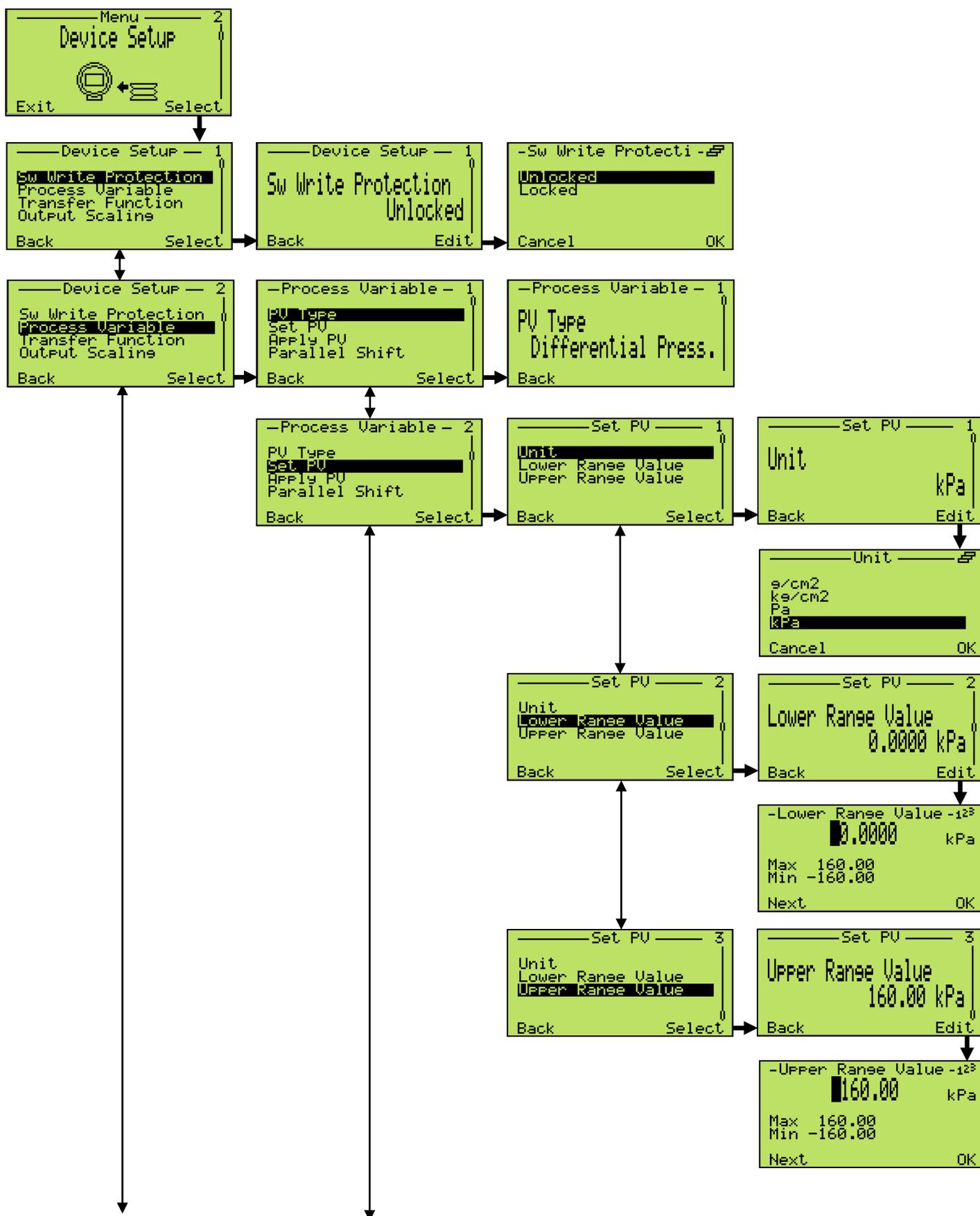
Press the (4) key and set LRV value. After entering the settings, press the (1) key to move to the next menu item.

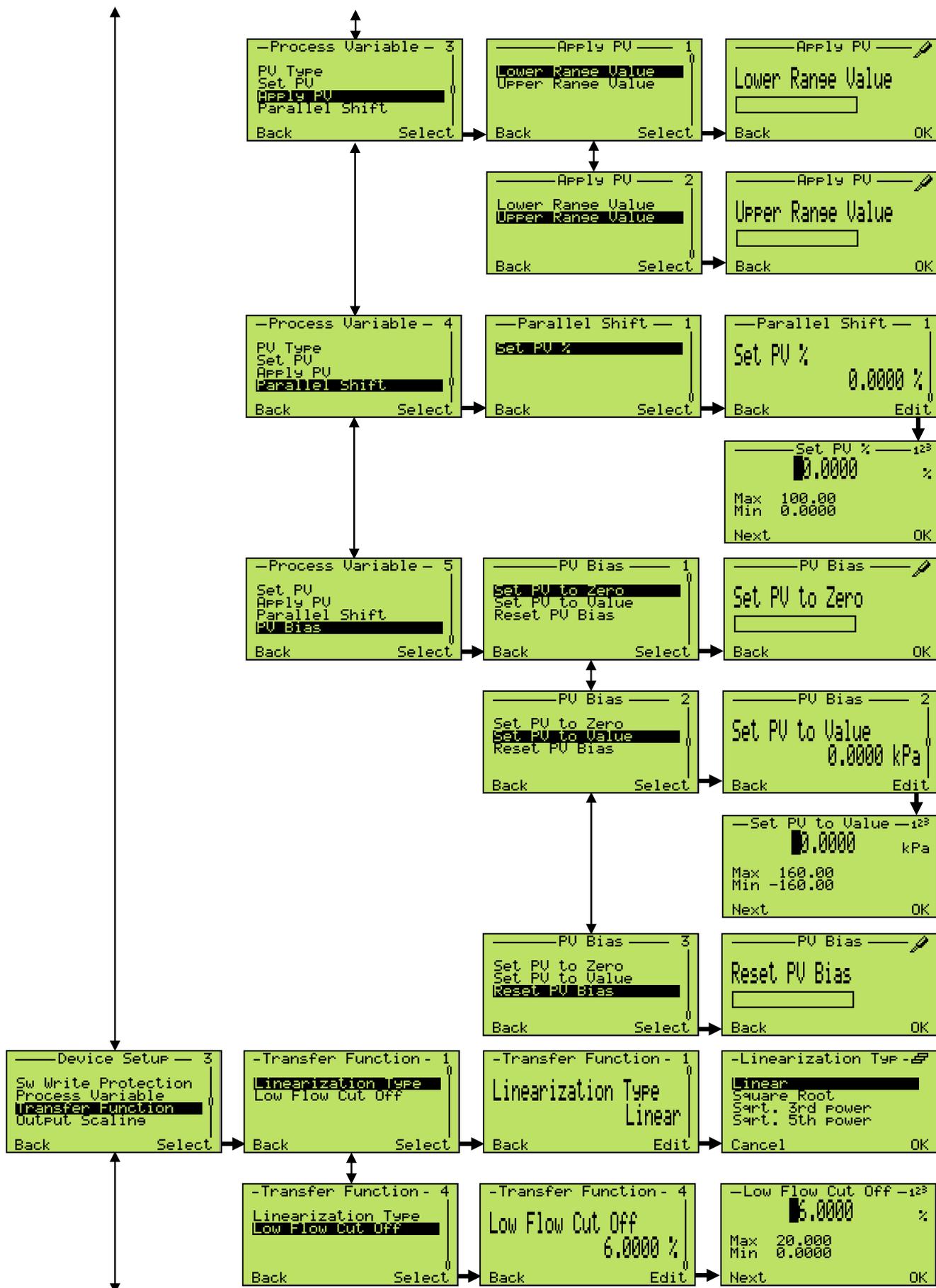
Press the (4) key and select the transfer function from the list with (2) + (3). After entering the settings, press the "ok" (1) key to move to the next menu item.

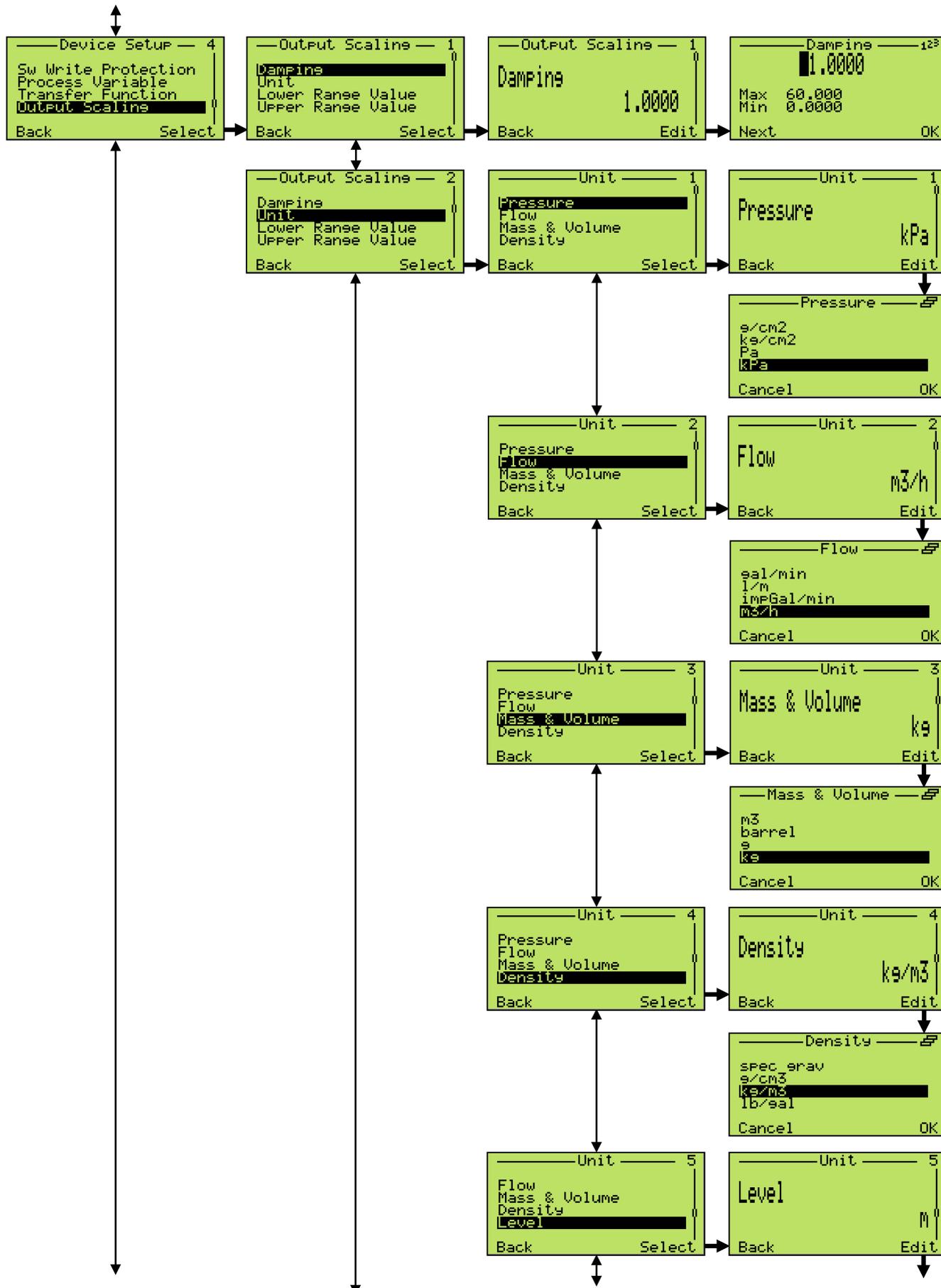
This function set to zero the PV value. Simply press "ok" (4) key to activate the PV to zero function. Press Next (1) key to move to the next menu item.

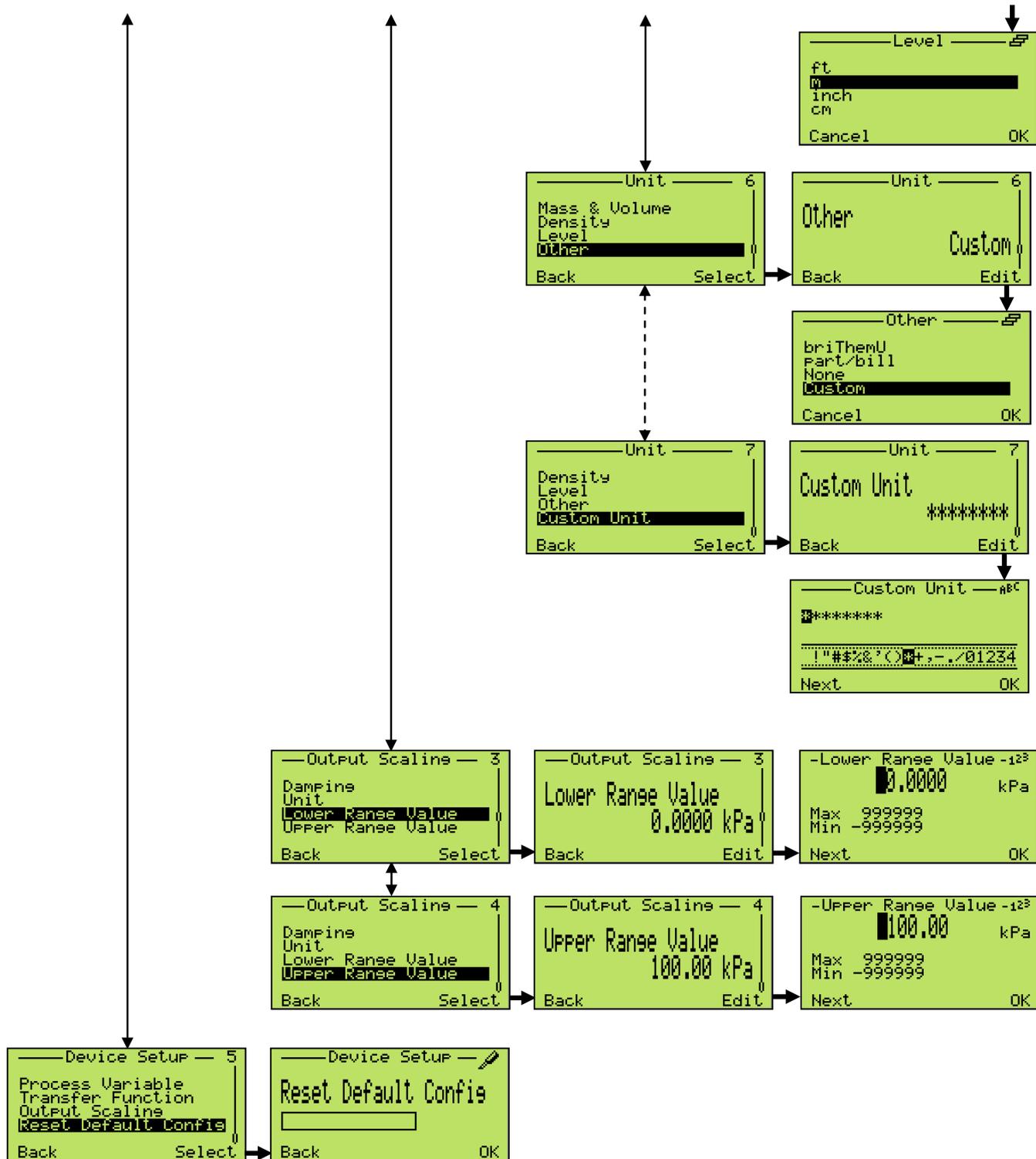
This function allows the selection of the LCD visualization. Select between the list and confirm with "ok" (1) key.

8.8.2 Device Set-up

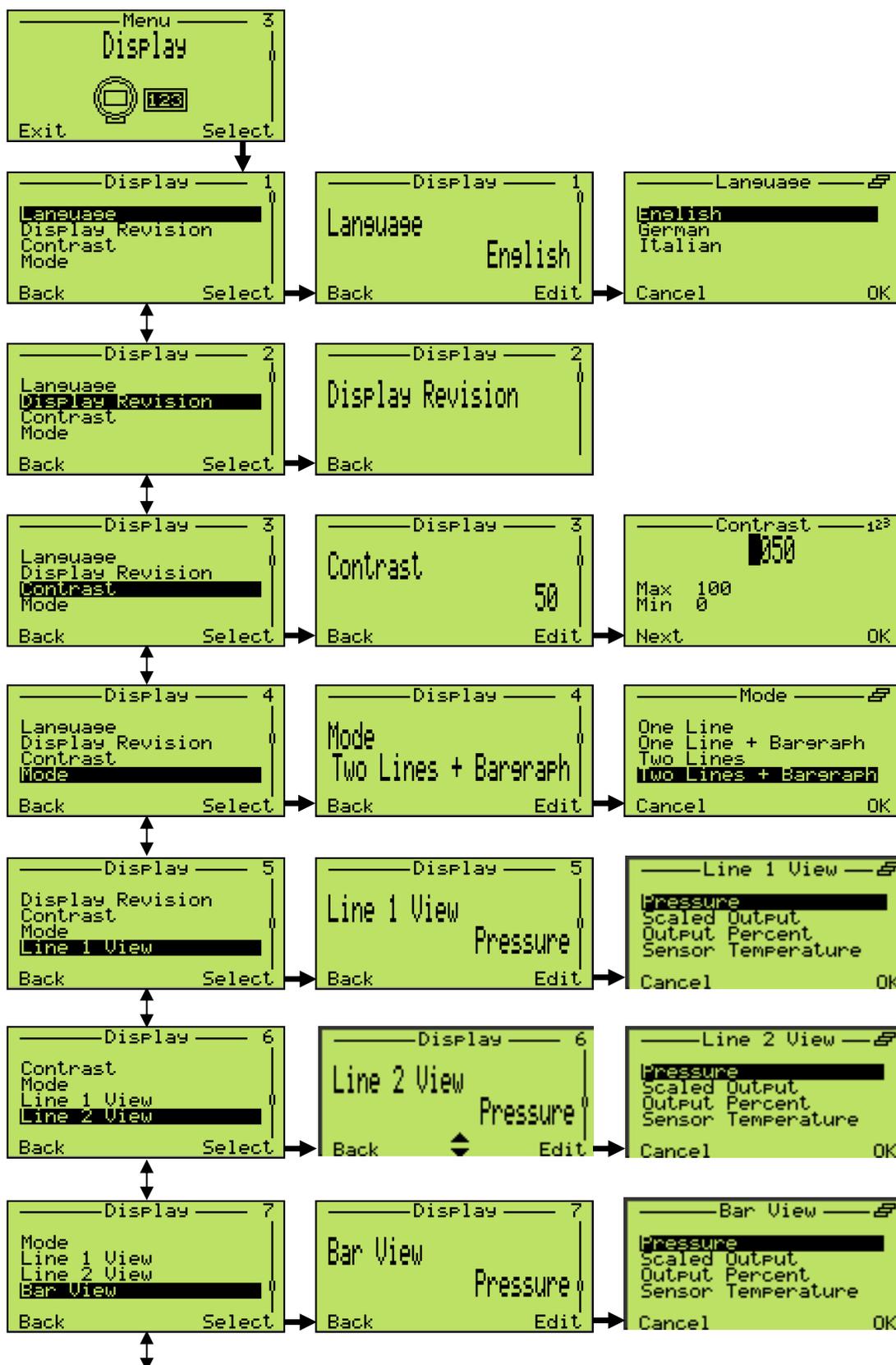


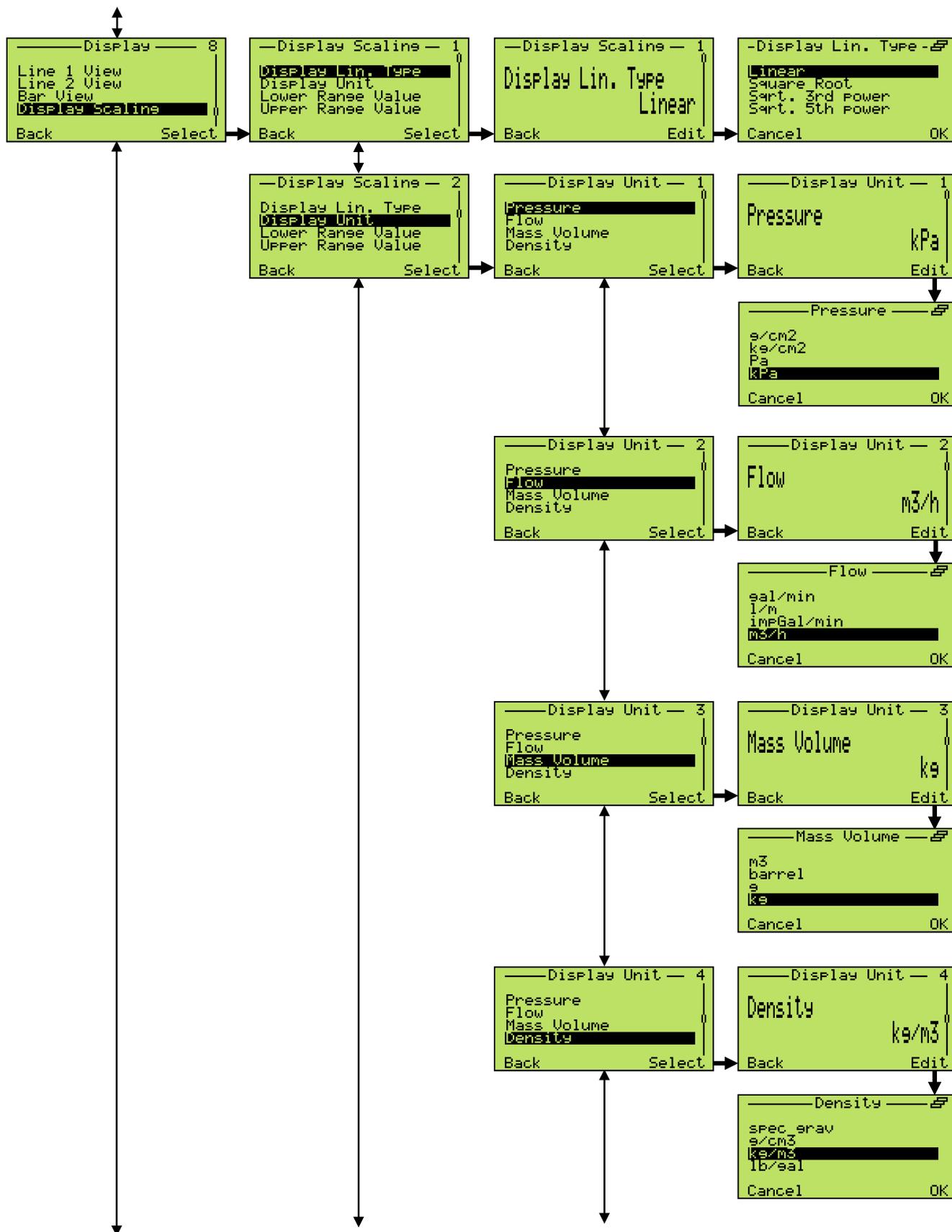


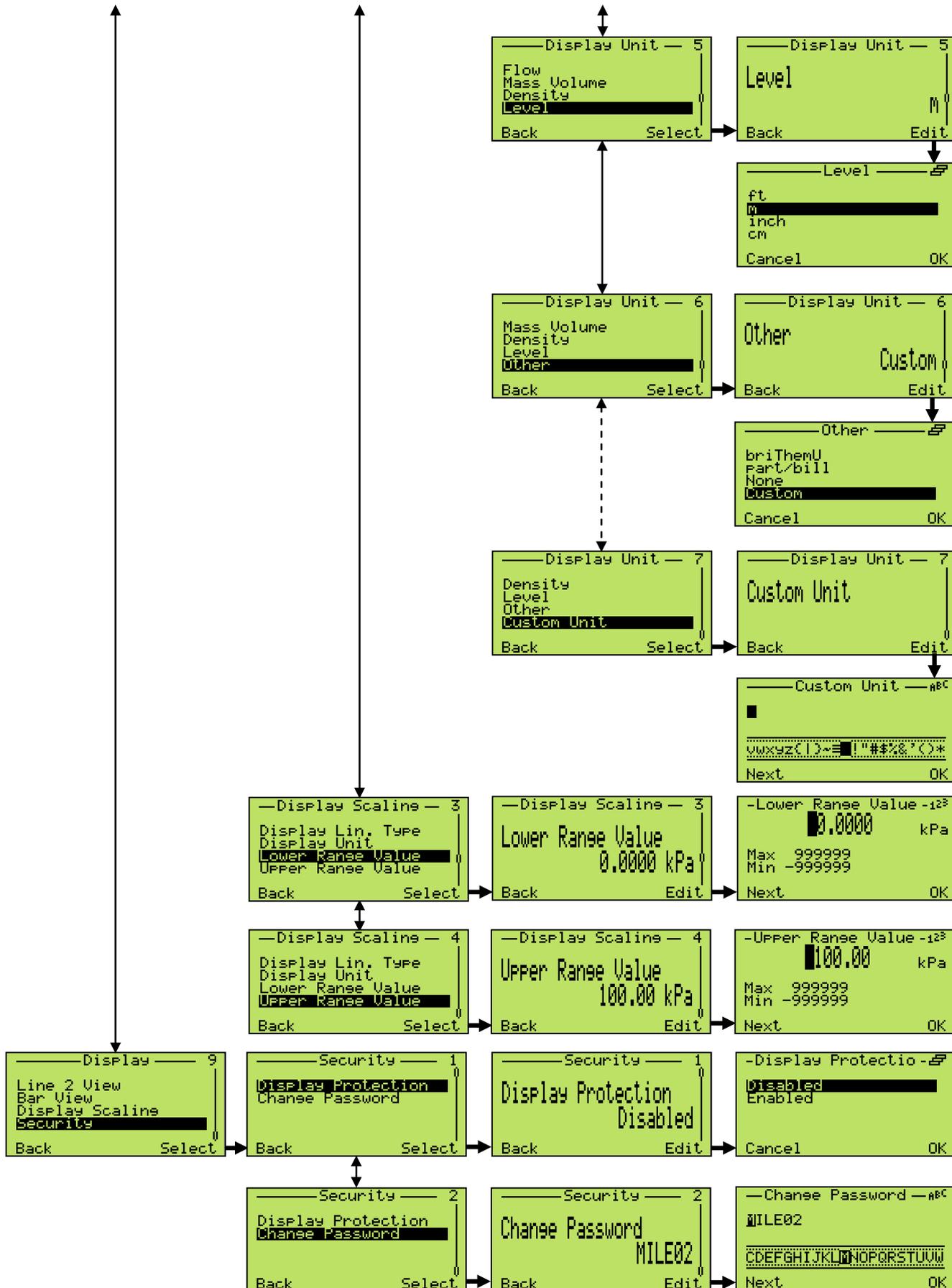




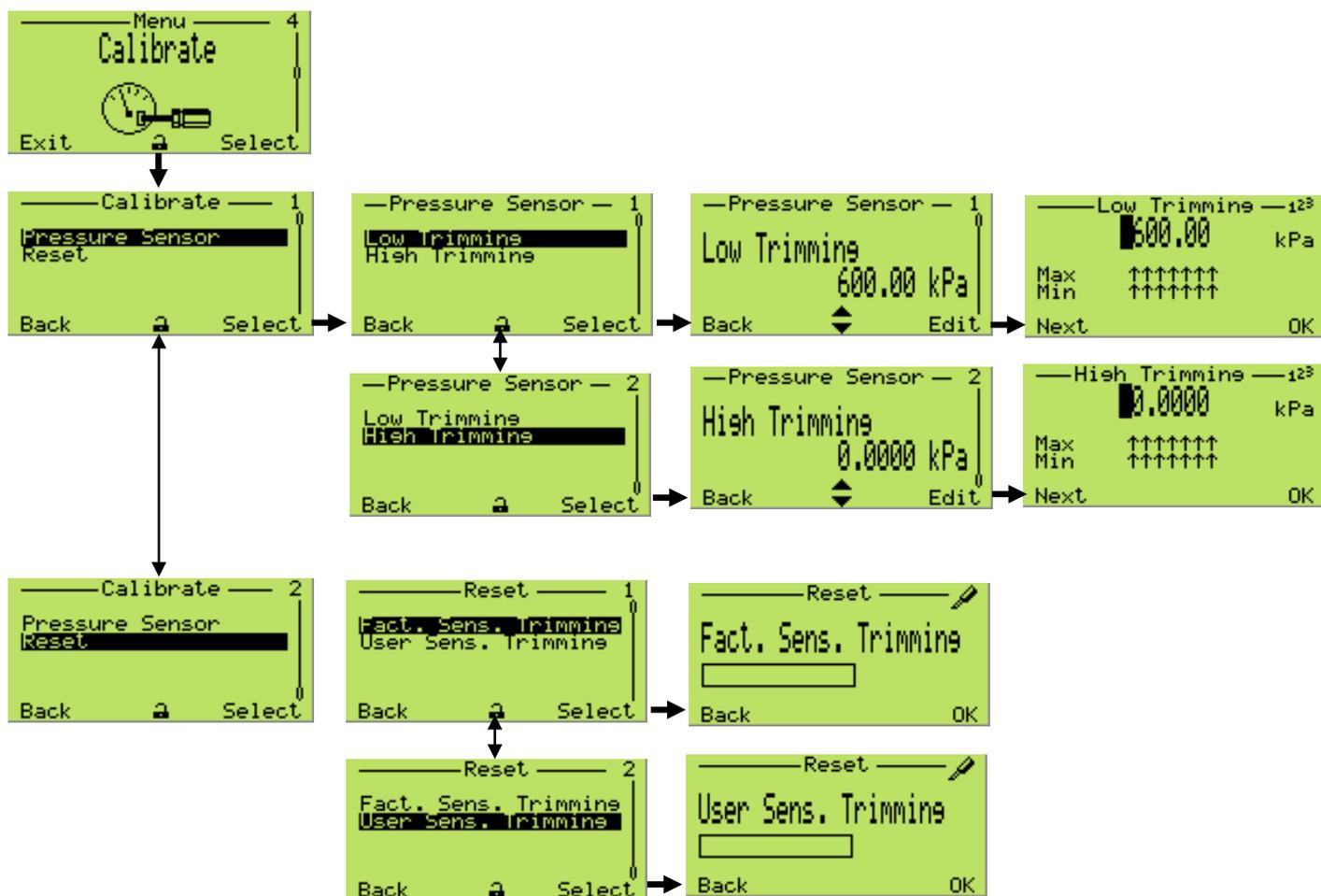
8.8.3 Display



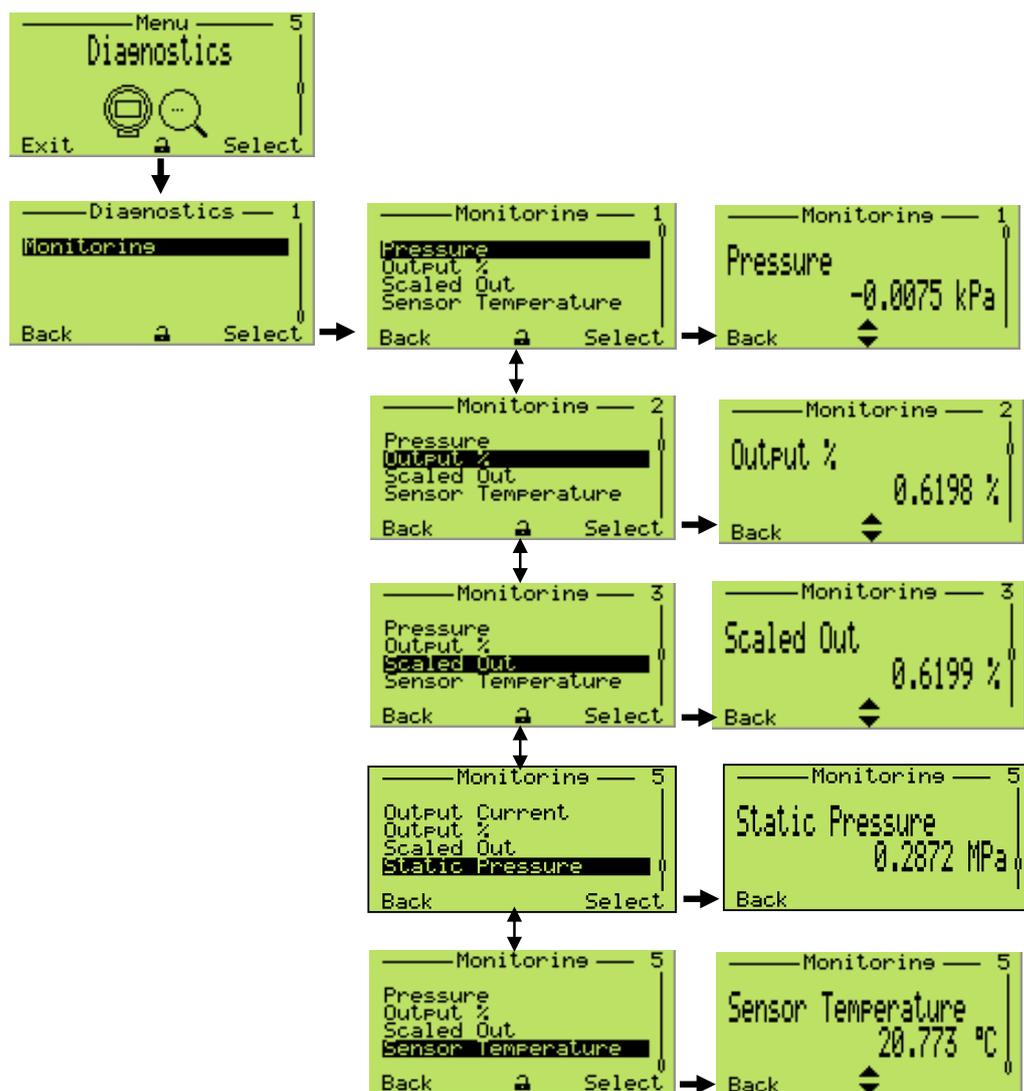




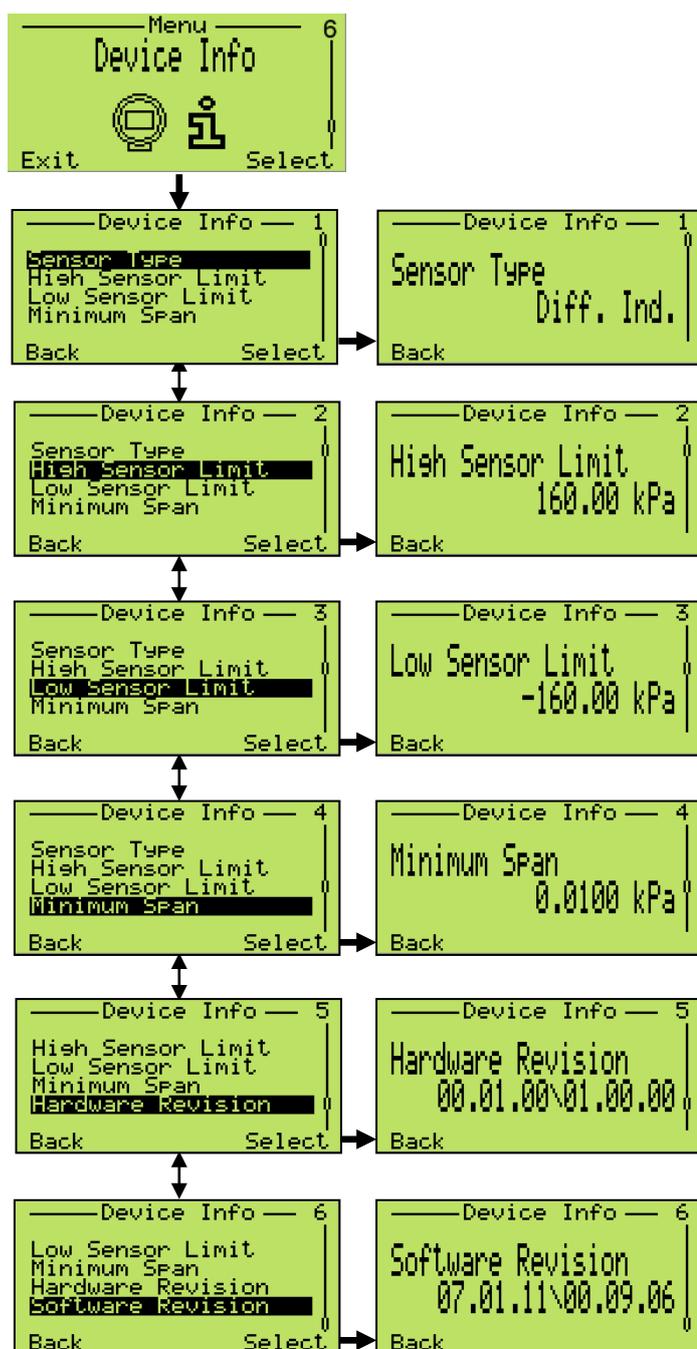
8.8.4 Calibrate



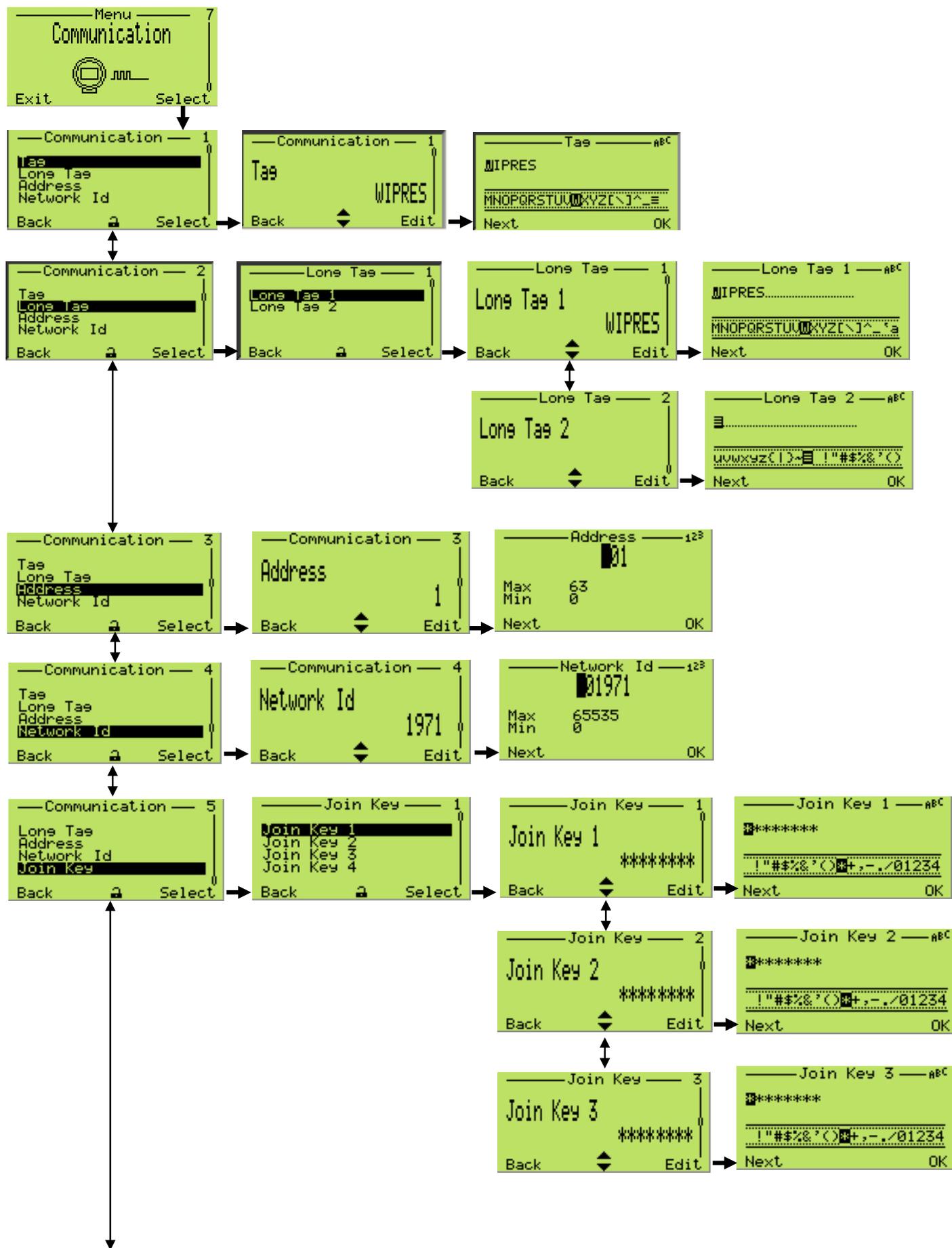
## 8.8.5 Diagnostics

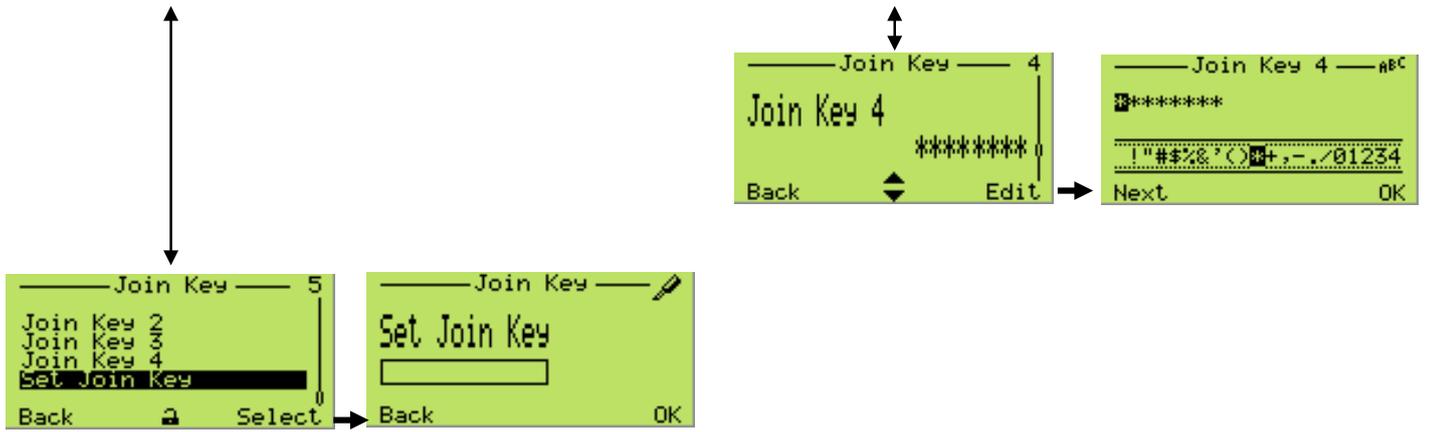


## 8.8.6 Device Info



8.8.7 Communication





## 8.9 Transfer function

The 266 Pressure Transmitter 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.
- Bidirectional Flow
- Custom linearization table
- Cylindrical lying tank
- Spherical tank

These output functions can be activated using a Configuration Tool (Digital LCD Integral Display, Hand Held Communicator or PC based software as Asset Vision Basic).

### 8.12.1 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).

No further settings are possible here.

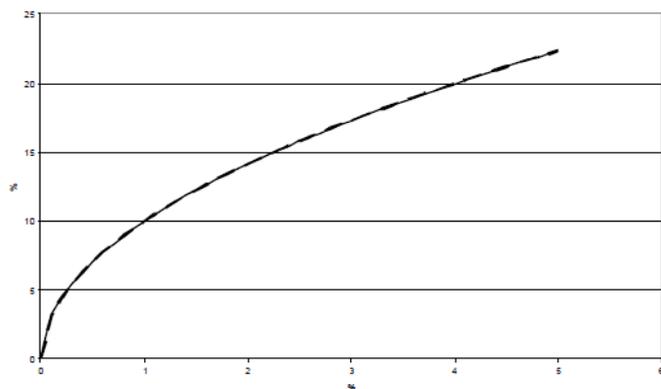


Figure 38: Linear output

### 8.9.2 Square root

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.

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 when the signal is close to zero avoiding errors due to the high gain of the square root.

To negate 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. ).

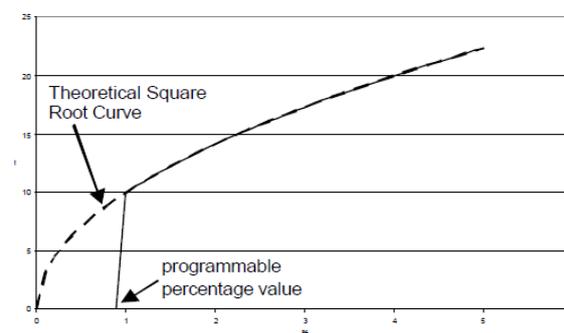
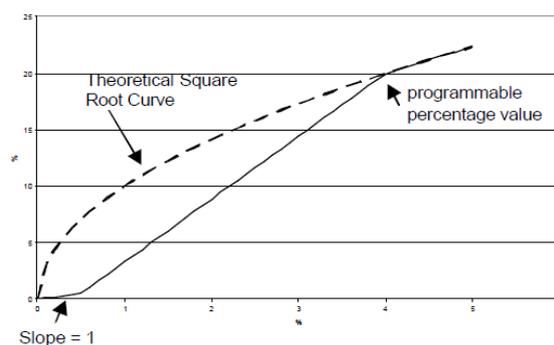


Figure 39: Square-Root transfer functions

### 8.9.3 Square root to the 3rd power

The x3 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 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.

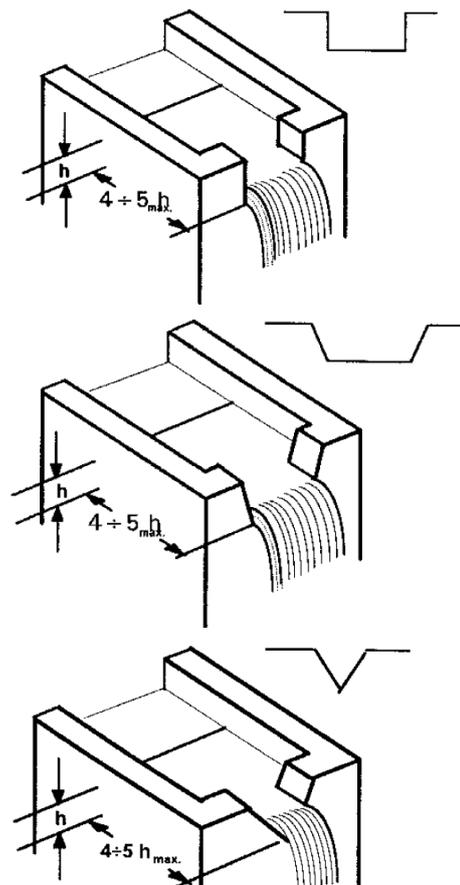


Figure 40: Tanks (respectively rectangular weir, trapezoidal weir and V-notch weir)

### 8.9.4 Square root to the 5th power

The x5 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 (it gives an output proportional to the rate of flow calculated using the Kingsvater-Shen formula).

### 8.9.5 Custom linearization curve

The custom linearization curve transfer function it is used typically for volumetric level measurement in tanks with an irregular shape. It can be registered to a freely identifiable transfer function with a maximum of 22 base points. The first point is always the zero point, the last is always the final value. Neither of these points can be altered.

A maximum of 20 points can be freely entered in between.

These points have to be defined by extrapolating the tank filling table data and reducing them to 22 points. Once identified the 22 points they will need to be uploaded into the device by either using an HART hand held terminal or a proper configuration software like Asset Vision Basic.

### 8.9.6 Bidirectional Flow (to be used when the transmitter is connected to a bidirectional flow element)

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

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

where “ $x$ ” and “Output” should be normalized in the range 0 to 1 for calculation purpose, with the following Output meaning:

- Output = 0
- Output = 1

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.

As an example, if we have a bidirectional flow measurement application with the following data:

Max reverse flow rate: -100 l/h

Max flow rate: +100 l/h

The differential pressure generated by the flow primary is for the maximum flow rate 2500 mmH<sub>2</sub>O, for the max reverse flow rate 2500 mmH<sub>2</sub>O.

The transmitter will have to be configured as follows:

Calibrated span: LRV = -2500mmH<sub>2</sub>O

URV = +2500mmH<sub>2</sub>O

Transfer function: Bidirectional flow

### 8.9.7 Cylindric lying tank

This function is used to measure the volumetric level into a cylindrical horizontal tank with flat ends.

The transmitter calculates the volume from the measured filling level.

### 8.9.8 Spherical Tank

This function is used to measure the volumetric level into a spherical tank.

The transmitter calculates the volume from the measured filling level.

## 8.10 Configuration with the PC/laptop or handheld terminal

A graphical user interface (DTM) is required for configuration of the transmitter via PC or laptop. For operating instructions, please refer to the software description.

The 266 transmitters can be configured by either one of the following device.

- Hand Held terminals like the ABB DHH805, Emerson Process 375 and 475 provided the 266 EDD has been downloaded and enabled in the terminal.
- ABB Asset Vision Basic, a new free of charge software configurator downloadable at [www.abb.com/Instrumentation](http://www.abb.com/Instrumentation)
- Any DTM based software for HART instruments configuration provided it is compatible with EDD or DTM.

You can use a handheld terminal to read out or configure/calibrate the transmitter.

For additional information, refer to the operating instructions included with the handheld terminal.

If the transmitter has been configured in the factory according to customer specifications for the measuring point, all you have to do is mount the transmitter as prescribed (to correct potential zero shifts, refer to the section "Correcting the zero shift"), and switch it on. The measuring point will now be ready for use.

If, however, you wish to make changes to the configuration, a handheld terminal or - preferably - a graphical user interface (DTM) is required. This DTM tool renders the device fully configurable. It supports the HART protocol and can be run on a PC or laptop, or as part of an automation system.

Refer to the installation manual provided with the software for the steps required to install the operating tool. The most important parameters can be set via the path "Parametrize\_Differential Pressure Measurement".

The program offers the option of configuring, polling, and testing the transmitter.

In addition, offline configuration can be performed by means of an internal database.

Each configuration step is subject to a plausibility check. You can call up context-sensitive help at any time by pressing the "F1" key. Immediately after you have received the transmitter or before you change the configuration, we recommend that you save the existing configuration data to a separate data storage medium, via the path "File\_Save".

## 8.11 Configuration with the graphical user interface (DTM) - System requirements

- Operating control program (e.g., ABB Asset Vision Basic version 1.00.17 or higher)
- DTM (Device Type Manager; graphical user interface)
- Operating system (depending on the respective control program)

To operate the Asset Vision Basic please refer to the relevant operating instruction.

## 9 Troubleshooting

### 9.1 Overview

This section provides troubleshooting suggestions for the most common problems occurring in the field.

**Important.** Procedures described in the following paragraphs will help the user to verify that 266 pressure transmitter and wireless communication network are correctly in place.

### 9.2 Device-related issues

#### 9.2.1 Device does not power on

When the user receives a 266 WirelessHART pressure transmitter, the first step to be taken is to power the device on.

After removing the battery pull-tab grabbing it firmly and pulling the cell will give power supply to the electronic module LCD display will go live for 30 seconds and then it will go off.

If this does not happen the possible cause could be:

Possible cause	Solution
Battery discharged	Change the battery (spare part number DR3051)
Display or battery not well connected	Check HMI contacts or invert battery position into the terminal block
Terminal block defect	Check battery and terminal blocks contacts

In case the device is not powering, please check if the battery is still in good conditions and it has not been exposed to high temperatures for long periods. To install a new battery, please follow below instructions

1. Install 266 WirelessHART pressure transmitter properly, according to ABB practices explained in the present document using an approved thread sealant on all connections.
2. Unscrew the battery cover from the wireless device. Battery lays on the opposite side of the display (if installed) as indicated by the writing "Field Terminals" engraved on housing neck.
3. Remove and replace the battery paying attention to the polarity.

**Note.** Wireless devices should be powered up only during the network setup and beginning with the closest device to the Gateway. This will result in a simpler and faster network installation. For further information about the battery, please refer to paragraph 6.6 of this document.

4. Close the housing cover so as to have a metal-to-metal contact but do not over tighten. If the installation of the battery as been properly performed, the LCD display will go live for 30 seconds and then it will go off.

**Important.** Battery part number is DR3051. To get spares batteries, please get in touch with your local ABB service reference. Replacements with non-ABB batteries is forbidden and will lead to certification invalidity.

### 9.3 Network-related issues

#### 9.3.1 General

Network joining could represent a critical point for a wireless transmitter.

Basic preliminary setting for joining consists in writing two parameters both into the device and into the Gateway. These parameters are:

- Network ID
- Join Key

**Important.** Network ID and Join Key are to be always the same both on field instrument and Gateway.

It is also necessary to write the LONG TAG for communication via Ethernet TCP/IP within the Asset Vision Basic projects.

The above-mentioned parameters can be set using:

- Asset Vision Basic wired to device dedicated terminals through a HART modem.
- Hand-held terminal wired to device dedicated terminals
- Local HMI menu

#### 9.3.2 Device does not join the network

After the basic settings have been correctly executed, a typical anomalous situation is that the device does not join to the wireless network.

Network is joined when the radio signal icon  is steady visible on the upper right-hand corner of the HMI (if installed).

Possible cause	Solution
Power supply is missing	Access the "Z" button and depress it for few seconds until the display goes live. If this will not happen, see section 9.2.1

Anyway, device will more likely not join the network due to a radio signal failure. Radio failure can be identified thanks to the above-mentioned icon.

Icon appearance	Cause and suggested actions
Icon is not visible	<p>Serious radio failure</p> <p>Check if there is a Radio Failure diagnostic "ON":</p> <ul style="list-style-type: none"> <li>– using HART wired connection in combination with Asset Vision Basic / DTM</li> <li>– access diagnostics using an Hand-held Terminal</li> <li>– visualize the internal diagnosis menu of HMI by depressing the navigation button on the bottom left-hand corner.</li> </ul>
Icon is blinking	<p>The device is trying to join and/or the joining process is in progress. Normally the joining process takes some time (up to 30 minutes). If the icon keeps on blinking after this period of time, please check if:</p> <ul style="list-style-type: none"> <li>– Network ID and Join Key are properly set.</li> <li>– Long TAG is unique and different from the network one.</li> <li>– Wireless device has previously joined the network with another Long TAG.</li> <li>– Power cycle the pressure transmitter and re-try.</li> <li>– Verify whether the Network Manager is in "advertise" mode</li> </ul>

### 9.3.3 Burst troubleshooting

Burst communication mode allows a single slave pressure transmitter to continuously broadcast a standard HART reply message at a certain, defined, configured interval. Details about all possible with relating descriptions and corrective actions will be reported in the following table.

X	Y	Description
O	O	Both services are OFF
N	O	Triggered service is OFF
A	O	Main service is active. Triggered service is OFF
S	O	Main service is shutting down. Triggered service is OFF
R	O	<p>Main service has been rejected. Triggered service is OFF</p> <p>Possible causes and suggested actions:</p> <ul style="list-style-type: none"> <li>– Timeout. Wait some minutes and retry</li> <li>– Network Manager (gateway) stopped this operation due to a conflict with another operation in progress. Wait some minutes and retry.</li> <li>– Network Manager (gateway) stopped this operation due to unavailable bandwidth. Wait some minutes and retry and/or slow down burst frequency to reduce band allocation.</li> </ul>
O	N	NOT ALLOWED
N	N	Both services under negotiation.
A	N	Main service active. Triggered service under negotiation.
S	N	NOT ALLOWED
R	N	<p>Main service has been rejected. Triggered service is under negotiation. Burst is not active.</p> <p>When the triggered service ends (regardless from the outcome), it is necessary to wait some minutes and re-try. If nothing changes, please slow down the update rate of the rejected service.</p>
O	A	NOT ALLOWED
N	A	NOT ALLOWED

A	A	Both services are active
S	A	NOT ALLOWED
R	A	<p>Main service has been rejected. Triggered service is active. Burst is not active.</p> <p>When the triggered service ends (regardless from the outcome), it is necessary to wait some minutes and re-try. If nothing changes, please slow down the update rate of the rejected service.</p>
O	S	Main service is OFF. Triggered service is shutting down.
N	S	Main service under negotiation. Triggered service is shutting down
A	S	Main service is active. Triggered service is shutting down.
S	S	Both services are shutting down.
R	S	NOT ALLOWED
O	R	NOT ALLOWED
N	R	NOT ALLOWED
A	R	<p>Main service is active. Triggered service rejected. Burst is not active.</p> <p>When the triggered service ends (regardless from the outcome), it is necessary to wait some minutes and re-try. If nothing changes, please slow down the update rate of the rejected service.</p>
S	R	NOT ALLOWED
R	R	<p>Both services have been rejected. Burst is not active.</p> <p>When the triggered service ends (regardless from the outcome), it is necessary to wait some minutes and re-try. If nothing changes, please slow down the update rate of the rejected service.</p>

### 9.4 HMI as diagnostic indicator

While the HMI works as Variable Indicator, also diagnostic strings can be displayed. Whenever a failure or warning condition is detected within the transmitter, a message appears in the low side of the display below the bargraph. The message is formed by the NAMUR NE107 icon and the string of the component where the problem occurred.

NAMUR icons	Description
	Error / Failure
	Functional check (e.g. during simulation )
	Out of Spec (e.g. Sensor temperature outside the specs limits)
	Maintenance required

Possible sources of error are: ELECTRONICS, SENSOR, PROCESS and CONFIGURATION. These sources can show up the above listed icons according to the specific case.

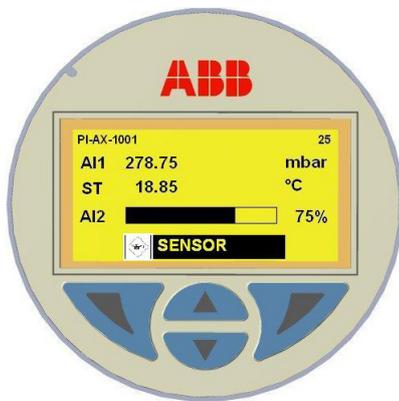


Figure 42: Example of “Maintenance / Sensor” and “Failure / Electronics” diagnostic

#### Detailed diagnostic info from HMI

When the above kind of diagnostic information is displayed, from the HMI it is also possible to see the details.

1. Press the center navigation keys for 4 seconds until two special icons appear on the bottom corners of the display

**Important.** This step is necessary only for the keypad activation of TTG HMI type. For conventional HMI start from step 2.

2. Press the left navigation key
3. The HMI enter in the special menu with three items:
  - Diagnostics
  - Operator View 1
  - Signals View
4. Select “Diagnostics” and the list of all the active error conditions appears with on top the worst condition.

The format of how the detailed diagnostic info are displayed is “XA.BBB” where:

X = NAMUR NE107 Categories	A = Priority. (Higher number = higher priority)	BBB = error code
F = Failure		
M = Maintenance		
O = Out of Specification		
C = Function Check		

## 9.5 Error states and alarms

– Communication Board / Electronic related error messages.

Error message	Tx LCD message	Possible cause	Suggested action
F240.023	Electronic Memory Failure	Electronic memory corrupted	The electronic must be replaced
M140.024	NV Electronic Memory Burn Error	Writings to the electronic non-Volatile Memory has not been successful	The communication board should be replaced as soon as possible
M055.041	Electronic temperature out of limits		

– Sensor related error messages

Error message	Tx LCD message	Possible cause	Suggested action
F250.016	Sensor Invalid	The sensor model/version is no longer compatible with the connected electronic version	The sensor must be replaced
F245.017	Sensor Memory Fail	Sensor memory corrupted	The sensor must be replaced
F225.000	P-dP Sensor Fail	Mechanical damage to the sensor. Loss of fill fluid from the cell, ruptured diaphragm, broken sensor.	The sensor must be replaced
F220.001	Static Pressure Sensor Fail	The circuitry for the sampling of the static pressure has failed.	The sensor must be replaced
F215.002	Sensor Temperature Fail	The circuitry for the sampling of the temperature has failed.	The sensor must be replaced
M145.018	NV Sensor Memory Burn Error	Writings to the sensor non-Volatile Memory was not successful	The sensor should be replaced as soon as possible.

– Installation/Start-up related error messages.

Error message	Tx LCD message	Possible cause	Suggested action
C160.030	Input Simulation Active	The P-dP Value produced in output is derived by the value simulated in input	Use a HART configurator (DTM - Hand held) to place device back in to normal operating mode (Remove the input simulation)
C160.030	Input Simulation Active	The Static Pressure Value produced in output is derived by the value simulated in input	Use a HART configurator (DTM - Hand held) to place device back in to normal operating mode (Remove the input simulation)
C160.030	Input Simulation Active	The Sensor Temperature Value produced in output is derived by the value simulated in input	Use a HART configurator (DTM - Hand held) to place device back in to normal operating mode (Remove the input simulation)
C160.030	Input Simulation Active	The Engineering Output Value is simulated to became the measured Engineering Output value	Use a HART configurator (DTM - Hand held) to place device back in to normal operating mode (Remove the input simulation)
M050.042	Replace Info	The Electronics or the Sensor have been changed but the replacement operation has not been executed	The replacement operation must be executed: Move the SW 1 of the electronics in position 1 = Enable replace mode -Select the SW 2 the element that has been changed between new Sensor or new electronics -Power Cycle the device -Move the SW 1 of the electronics in position 0

– Process related error messages.

Error message	Tx LCD message	Possible cause	Suggested action
F200.004	P-dP Out Of Limits	The measured Process Pressure value is outside the sensor limits and no longer representing the true applied process value.	The compatibility of pressure transmitter model and process conditions has to be checked. Probably a different transmitter type is required.
F195.005	Static Pressure Out of Limits	The static pressure of the process exceeds the limit of the sensor. Exceeding the Static Pressure can reduce accuracy, mechanically damage the diaphragm and may require calibration/replacement. An incorrect transducer model could have been selected.	The compatibility of pressure transmitter model and process conditions has to be checked. Probably a different transmitter type is required.
S190.006	Sensor Temperature Out of Limits	The temperature of the process environment affects the pressure transmitter; Excess temperature can reduce accuracy, degrade device components and may require calibration/replacement.	The compatibility of pressure transmitter model and process conditions has to be checked. A different installation type could be required e.g. use of remote seals.
M155.031	Max Working Pressure Exceeded	The static pressure of the process exceeds the max working Pressure supported by the transmitter. Exceeding the Max Working Pressure can mechanically damage the process connections (flanges, pipes....) and/or be dangerous	The compatibility of pressure transmitter model and process conditions has to be checked.
S150.010	Primary variable out of range	The measured pressure value is beyond its Low or High scaling limits	Adjust the working range if possible.

– Network/Wireless related error messages.

Error message	Tx LCD message	Possible cause	Suggested action
F210.015	Radio Failure	The communication between electronic and wireless chip is not established.	The electronics must be replaced
F205.014	Join Failure	The connection to the wireless network is failed.	Check the Network ID, Join Key and the Long Tag set
M185.011	Battery Warning	Battery Life calculated value is under the specified threshold.	The Battery must be replaced

## 10 Maintenance

If transmitters are used as intended under normal operating conditions, no maintenance is required. It is sufficient to check the output signal at regular intervals (in accordance with the operating conditions), as described in the instructions in the section "Operation resp. Configuration of the transmitter". If deposits are expected to accumulate, the measuring equipment should be cleaned on a regular basis, in accordance with the operating conditions. Cleaning should ideally be carried out in a workshop.

Repair and maintenance activities may only be performed by authorized customer service personnel.

When replacing or repairing individual components, original spare parts must be used.

**Attention – Potential damage to parts.** The electronic components of the printed circuit board can be damaged by static electricity (observe ESD guidelines). Make sure that the static electricity in your body is discharged when touching electronic components. If a remote seal is mounted on the measuring equipment, it must not be removed (please refer to the dedicated document).

**Warning – <Bodily injury>.** Transmitter for hazardous classified location must be either repaired by the manufacturer or approved by a certified expert following repair work. Observe the relevant safety precautions before, during and after repair work. Only disassemble the transmitter to the extent necessary for cleaning, inspection, repairs, and replacement of damaged components.

### 10.1 Returns and removal

Defective transmitters sent to the repairs department must, wherever possible, be accompanied by your own description of the fault and its underlying cause.

**Warning – General risks.** Before removing or disassembling the device, check for hazardous process conditions such as pressure on the device, high temperatures, aggressive or toxic media, and so on. Read the instructions in the sections "Safety" and "Electrical connection", and perform the steps outlined there in reverse order.

### 10.2 Pressure transmitter sensor

Essentially maintenance is not required for the transmitter sensor. Anyway, the following items should be checked periodically:

- Check the integrity of the pressure boundary (no cracks should be visible on the process connection or on the process flanges).
- Check that there is no leakage from the sensor/flange interface or from the vent/drain valves.
- The process flanges bolts (for 266DSH) should not show excessive rust.

In case one of the checkpoints above fails, please replace the damaged part with an original spare part.

Please contact your local ABB office for spare parts support information or refer to the spare part list.

The use of non-original spare parts makes the warranty void. In case you want ABB to perform the repair, please send back the transmitter to your local ABB office complete with the return form that you find in this manual appendix and include it with the device.

### 10.3 Removing/Installing the process flanges

1. Slacken the process flange screws by working on each in a crosswise manner (hexagon head, SW 17 mm (0.67inch) for 266DS).
2. Carefully remove the process flange, making sure that the isolating diaphragms are not damaged in the process.
3. Use a soft brush and a suitable solvent to clean the isolating diaphragms and - if necessary - the process flange.
4. Insert the new process flange O-rings in the process flange.
5. Attach the process flange to the measuring cell.

The surfaces of both process flanges must be at the same level and at a right angle to the electronics housing (with the exception of vertical process flanges).

6. Check that the process flange screw thread can move freely: Manually turn the nut until it reaches the screw head. If this is not possible, use new screws and nuts.
7. Lubricate the screw thread and seats of the screw connection.
8. While performing the preliminary and final tightening of the bolts, please act in a crosswise manner.

**Attention – Potential damage to parts.** Do not use sharp or pointed tools.

Do not damage the insulating diaphragms.

**Important.** In the case of oil and grease-free designs, clean the measuring chambers again if necessary once the process flange has been installed.

– Respect the below table indications for reinstalling the process flanges.

Transmitter model and range			Procedure
266DSH / PSH / VSH	Viton Gaskets	All bolting	Use a torque wrench to tighten the bolts to a torque of 25 Nm.
	PTFE Gaskets	Carbon Steel NACE and Stainless Steel	Use a torque wrench to tighten the process flange nuts to a torque of 40 Nm, let the flange stabilize for an hour, unscrew the nuts and tighten again to 25 Nm.
		Stainless Steel NACE	Use a torque wrench to tighten the process flange nuts to a torque of 25 Nm, let the flange stabilize for an hour and perform the final tightening to 25 Nm.
266DSH.x.H (High static option)	Viton Gaskets	All bolting	Use a torque wrench to tighten the bolts to a torque of 31 Nm.
	PTFE Gaskets	All bolting	Use a torque wrench to tighten the process flange nuts to a torque of 40 Nm, let the flange stabilize for an hour, unscrew the nuts and tighten again to 31 Nm.
266DSH range A (1KPa)	All gaskets	All bolting	Use a torque wrench to tighten the process flange screws/nuts to a torque of 14 Nm. Please be aware that in case of bottom work disassembly and reassembly the original performances can not be guarantee anymore.
266DSH with Kynar inserts	All gaskets	All bolting	Use a torque wrench to tighten the process flange screws/nuts to a torque of 15 Nm

## 10.4 Pressure transducer replacement

If the pressure transducer needs to be replaced proceed as follows:

1. Insulate the transmitter from the process by acting on the manifolds or on the insulation valves.
2. Open the vent valves to allow sensor depressurization.
3. Remove the battery.
4. Disconnect the transmitter from the bracket unscrewing the fixing bolts.
5. Open the communication board compartment cover.
6. The communication board is connected to the sensor via a flat cable and a connector. Remove the communication board and gently disconnect the connector.
7. Release the tang screw until and rotate the housing until its complete removal.
8. Unscrew the fixing bolts from the transducer and remove the process flanges.
9. The O-rings placed between the diaphragm and the flange (Viton or PTFE) must be replaced after every disassembly.
10. Reassemble the flanges following the steps above in reverse order.
11. The 266 can reconfigure itself with the previous configured parameters thanks to the auto-configuration functionality.
12. Before powering on the transmitter raise dip-switches 1 and 2 in up position. Install the battery, wait ten seconds and lower dip-switched 1 and 2 .
13. After installing the transmitter on the bracket and connecting it to the manifold, perform a PV zero bias.

## 10.5 Electronic replacement

If the electronic module needs to be replaced proceed as follows:

1. Insulate the transmitter from the process by acting on the manifolds or on the insulation valves.
2. Open the vent valves to allow sensor depressurization.
3. Remove the battery.
4. Open the communication board compartment cover and remove the LCD display (if installed).
5. Remove the communication board and gently disconnect the connector.
6. Connect the sensor flat cable to the new electronic module with dip switch 1 in up position.
7. Connect the transmitter to power supply, wait ten seconds and lower dip-switch 1 to 0 position. 266 can reconfigure itself with the previous configured parameters thanks to the auto-configuration functionality.

## 10.6 Battery replacement

1. Remove the housing cover of the “field terminals” side. See the indication engraved on one side of the housing.
2. Remove the battery and pulling it completely outside from its slot.
3. Replace the battery paying attention to the polarity and assuring that the cell makes contact with the electronic module.

**Note.** 266 WiPressure battery is manufactured by TADIRAN Batteries GmbH (manufacturer code SL 2880). If you need spare part battery, ABB code is DR3051.

4. To reset the battery lifetime enter the “Service” menu, select “Replace battery mode” and then “OK”.
5. Before installing the housing cover, check whether the display is working or not. If yes, put back 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. If display is not working, please refer to the troubleshooting section.

## 11 Hazardous Area considerations

### 11.1 Ex Safety aspects and IP Protection (Europe)

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 60079-11 (Equipment protection by intrinsic safety “i”) EN 60079-26 (Equipment with equipment protection level -EPL- Ga) the pressure transmitters of the 2600T SERIES wireless have been certified for the following group, categories, media of dangerous atmosphere, temperature classes, types of protection. Examples of application are also shown below by simple sketches.

#### a) Certificate ATEX II 1 G Ex ia IIC T4

FM Approvals certificate number

FM14ATEX0007 (Lenno products)

The meaning of ATEX code is as follows:

- II : Group for surface areas (not mines)
- 1 : Category
- G : Gas (dangerous media)

Certificate IECEx Ex ia IIC T4, IP67

IECEx certificate number

IECEx FME 14.0002 (Lenno products only)

**Important.** The number close to the CE marking of the transmitter safety label identifies the Notified Body that has responsibility for the surveillance of the production.

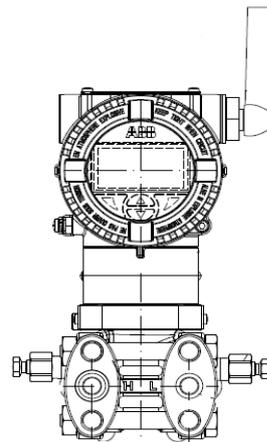
The other marking refers to the protection type used according to relevant EN standards:

- Ex ia: Intrinsic safety, protection level “a”
- IIC: Gas group
- T4: Temperature class of the transmitter  
(corresponding to 135°C max) with a Ta from -50°C to +70°C

About the applications, this transmitter can be used in “Zone 0” (Gas) classified areas (continuous hazard) as it is shown on the following sketch.

### Application for pressure transmitter Ex ia categories 1G

Application with Gas



Zone 0

266 Tx Category 1G Ex ia

**b) Certificate ATEX II 1/2 G Ex ia IIC T4**

FM Approvals certificate number

FM14ATEX0007 (Lenno products)

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 next application sketch).
- G: Gas (dangerous media)

Certificate IECEx Ex ia IIC T4, IP67

IECEx certificate number

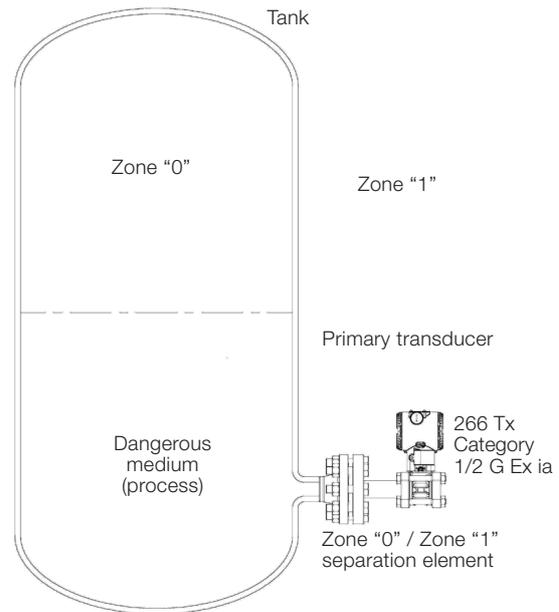
IECEx FME 14.0002 (Lenno products only)

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

- Ex ia: Intrinsic safety, protection level “a”
- IIC: Gas group
- T4: Temperature class of the transmitter (corresponding to 135°C max) with a Ta from -50°C to +70°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 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 EN 60079-26.

### Application for pressure transmitter Ex ia categories 1/2G Application with Gas



#### IP code

About the degree of protection provided by the enclosure of the pressure transmitter, the 2600T SERIES wireless has been certified IP67 according to EN 60529 standard. 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.

According to ATEX Directive (European Directive 94/9/EC of 23 March 1994) and relative Standards which can assure compliance with Essential Safety Requirements, i.e., EN 60079-0 (General requirements) EN 60079-15 (Specification for electrical apparatus with type of protection "n"), the pressure transmitters of the 2600T SERIES wireless have been certified for the following group, categories, media of dangerous atmosphere, temperature classes, types of protection. Examples of application are also shown below by simple sketches.

c) Certificate ATEX II 3 G Ex nA IIC T4  
(for  $T4 = -50^{\circ}\text{C} \leq T_a \leq +70^{\circ}\text{C}$ )

FM Approvals Certificate number

FM14ATEX0008 (Lenno products only)

The meaning of Atex code is as follows :

- II 3G Ex nA IIC T4 (for  $T4 = -50^{\circ}\text{C} < T_a < +70^{\circ}\text{C}$ )
- II: Group for surface areas (not mines)
- 3: Category of equipment
- G: Gas (Dangerous media)
- Ex nA type of protection "n" with "no sparking" technique
- IIC: gas group
- T4: Temperature class of the transmitter (which corresponds to  $135^{\circ}\text{C}$  max) with a  $T_a$  from  $-50^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$

**Important.** It is the technical support for the ABB Declaration of Conformity

About the applications, this transmitter can be used in Zone 2 (Gas) (unlikely/infrequent hazard) as it shown on the following sketch.

Certificate IECEx Ex nA IIC T4

IECEx certificate number

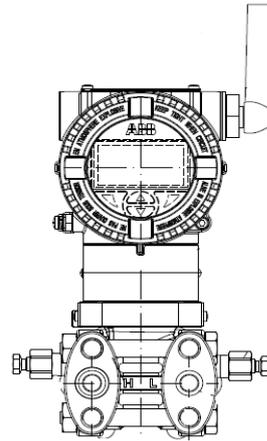
IECEx FME 14.0002 (Lenno products only)

The meaning of IECEx code is as follows :

- Ex nA type of protection "n" with "no sparking" technique
- IIC: gas group
- T4: Temperature class of the transmitter (which corresponds to  $135^{\circ}\text{C}$  max) with a  $T_a$  from  $-50^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$

### Application for pressure transmitter Ex nA categories 3G

Application with Gas



Zone 2

266 Tx Category 3G Ex nA

**Important - Note for pressure transmitter with combined approval.** Before installation of the Transmitter, the customer should permanently mark his chosen Protection Concept on the safety label. The transmitter can only be used with according to this Protection Concept for the whole life. If two or more types 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 manufacturer after a new satisfactory assessment.

## 11.2 Ex Safety aspects and IP Protection (North America)

### 11.2.1 Applicable standards

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

### 11.2.2 Classifications

The 2600T SERIES wireless pressure transmitters have been certified by FM Approvals for the following Class, Divisions and Gas groups, hazardous classified locations, temperature class and types of protection.

- Intrinsically Safe for use in Class I, II and III, Division 1, Groups A, B, C, D.
- Temperature class T4
- Ambient Temperature range -50°C to +70°C (dependent on the maximum input current and the maximum temperature class).
- Electrical Supply 3.6 V by “D” size cell.
- Type 4X applications Indoors/Outdoors.

For a correct installation in field of 2600T SERIES wireless pressure transmitters please see the related control drawing.

## 12 Regulatory Compliance for Radio and Telecommunication

All wireless devices require certification to ensure that they adhere to regulations regarding the use of the RF spectrum. Nearly every country requires this type of product certification. ABB is working with governmental agencies around the world to supply fully compliant products and remove the risk of violating country directives or laws governing wireless device usage.

### 12.1 FCC Compliance

This equipment Contains FCC ID: 2AC5O-WICB.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions: This device may not cause harmful interference and must accept any interference received, including interference that may cause undesired operation.

**Warning.** Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

**Warning.** When using this product, it should be installed and operated with a minimum distance of 20 cm between the radiator and your body. This transmitter must not be collocated or operate in conjunction with any other antenna or transmitter.

### 12.2 IC Compliance

This equipment Contains IC: 12311A-WICB.

This Class A digital apparatus complies with Canadian ICES-003.

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired, operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio RSS-210. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be chosen so that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

### 12.3 R&TTE Compliance 1999/5/EC

266 WirelessHART pressure transmitters are in compliance with Radio and Telecommunications Terminal Equipment Directive (R&TTE)

## 13 Battery Safety Datasheet

### 13.1 Identification

Product Name:	Tadiran High Energy Lithium Battery, or Sonnenschein Lithium Inorganic Lithium Battery SL-2880
Voltage:	3.6 Volts
Chemistry System:	Lithium Thionyl chloride
Anode:	Lithium metal
Cathode:	Liquid, Thionyl chloride
Company:	Tadiran Batteries GmbH
Adress:	Industriestr. 22 63654 BÜDINGEN, Germany
	Tel.: +49(0)6042-954-0
	Fax: +49(0)6042-954-190
	Web: www.tadiranbatteries.de
	Emergency Telephone Number: +49(0)6042/954-599

**Note.** This information sheet refers to cells and batteries assembled

### 13.2 Hazards Identification

**Warning.** Fire, explosion, and severe, burn hazard. Do not recharge, disassemble, heat above 100 °C (series SL-500: 150 °C), incinerate, or expose contents to water.

#### Protection from charging:

Whenever lithium batteries are not the single power source in a circuit the following measures recommended by Underwriters Laboratories are relevant. The cells should not be connected in series with an electrical power source that would increase the forward current through the cells. The circuit for these cells shall include one of the following:

A. Two suitable diodes or the equivalent in series with the cells to prevent any reverse (charging) current. The second diode is used to provide protection in the event that one should fail. Quality control, or equivalent procedures, shall be established by the device manufacturer to ensure the diode polarity is correct for each unit,

or

B. A blocking diode or the equivalent to prevent any reverse (charging) current and a resistor to limit current in case of a diode failure. The resistor should be sized to limit the reverse (charging) current to the maximums given in the data sheets.

### 13.3 Composition/information on ingredients

Substance	CAS No.	Content W/W %	Hazard symbol	R-Phrases	GHS Code	Sianl Word	H-phrases
Lithium Metal	7439-93-2	2 - 6	F, C	14/15, 34	GHS02, GHS05	Danger	260, 314, EUH014
Thionyl Chloride	7719-09-7	18 - 47	C	14, 34, 37	GHS05, GHS06	Danger	302, 331, 314, 335
Aluminium Chloride	7446-70-0	2 - 5	C, Xn	48/20	GHS05, GHS08	Danger	314, 372-373
Lithium Chloride	7447-41-8	1 - 2	Xn	22, 36/38	GHS07	Warning	302, 315, 319
Carbon	7440-44-0	2 - 5	--		--		
Steel, Nickel plated	--	35 - 73	--		--		
Glass	--	0 - 2	--		--		
Organic polymeres	Different	0 - 2	--		--		

Hazard Symbols: C Corrosive  
F Highly flammable  
Xn Harmful

R-Phrases: R 14 Reacts violently with water  
R 14/15 Reacts violently with water liberating extremely flammable gases  
R 22 Harmful if swallowed  
R 34 Causes burns  
R 36/38 Irritating to eyes and skin  
R 37 Irritating to respiratory system  
R 48/20 Danger of serious damage to health by prolonged exposure through inhalation

GHS-Code:	GHS02 Flame
	GHS05 Corrosion
	GHS06 Skull and crossbones
	GHS07 Exclamation mark
	GHS08 Health hazard
H-Phrases:	260 In contact with water releases flammable gases which may ignite spontaneously
	302 Harmful if swallowed
	314 Causes severe skin burns and eye damage
	315 Causes skin irritation
	319 Causes serious eye irritation
	331 Toxic if inhaled
	335 May cause respiratory irritation
	372-373 Causes damage to lung through prolonged or repeated exposure (inhale); may cause damage to central nervous system through prolonged exposure (swallow)
	EUH014 Reacts violently with water

**Important Note.** The material in this section may only represent a hazard if the integrity of the battery is compromised, or if the battery is physically or electrically abused.

### 13.4 First aid measures

#### Electrolyte Contact

- Skin: Immediately flush with plenty of water for at least 15 minutes. If symptoms are present after flushing, get medical attention.
- Eyes: Immediately flush with plenty of water for at least 15 minutes and get medical attention.
- Respiratory system: With large quantities and irritation of the respiratory tract, medical surveillance for 48 hours. Immediately inhale Cortisone Spray, e.g. Pulmicort.

#### Lithium Metal Contact

- Skin: Remove particles of lithium from skin as rapidly as possible. Immediately flush with plenty of water for at least 15 minutes and get medical attention.
- Eyes: Immediately flush with plenty of water for at least 15 minutes and get immediate medical attention.

### 13.5 Fire-Fighting measures

#### Extinguishing media

- During a fire with lithium batteries, copious amounts of cold water is an effective medium to prevent expansion of the fire. Do not use warm water or hot water.
- Lith-X (Class D extinguishing media) is effective on fires involving only a few lithium batteries.
- Do not use CO<sub>2</sub> or Halon type extinguishers.
- Dry chemical type extinguishers have limited extinguishing potential.

#### Fire fighting procedures

- Use a positive pressure self-contained breathing apparatus if batteries are involved in a fire.
- Full protective clothing is necessary.
- During water application, caution is advised as burning pieces of lithium may be ejected from the fire.
- Where the cells or batteries are not at the centre of the fire, copious amounts of water may be supplied to the cells using a diffuser type nozzle so that the cells remain cool during the containment and extinguishing of the fire. A sprinkler system should be sufficient for this purpose, the critical factor being that the lithium cells do not experience temperatures above the melting point of lithium.
- Small amounts of water should never be used such as the volumes contained within portable fire extinguishers. Standard dry powder extinguishers are ineffective. Halon extinguishers must not be used when fighting lithium fires as toxic gases may be generated during fire fighting. It should be noted that a hazard of hydrogen formation exists whenever hot lithium metal comes into contact with water.

### 13.6 Accidental release measures

When the battery housing is damaged, small amounts of electrolyte may leak. Seal battery airtight in a plastic bag, adding some chalk (CaCO<sub>3</sub>) or lime (CaO) powder or Vermiculite. Electrolyte traces may be wiped off dryly using household paper. Rinse with water afterwards.

### 13.7 Handling and storage

- Do not allow terminals to short-circuit.
- Storage preferably in a cool (below 21 °C), dry area that is subject to little temperature change.
- Do not place near heating equipment, nor expose to direct sunlight for long periods. Elevated temperatures can result in reduced battery service life.

### 13.8 Exposure controls / personal protection

Lithium batteries are products, from which no substance is released under normal and reasonably foreseeable conditions of use.

### 13.9 Physical and chemical properties

Refer to information under paragraph 13.3.

### 13.10 Stability and reactivity

May rupture violently when heated above 150 °C or when charged.

### 13.11 Toxicological information

Not applicable. Refer to information under paragraph 13.3.

### 13.12 Ecological information

The batteries do not contain mercury, cadmium or other heavy metals.

### 13.13 Disposal Considerations

- Batteries do not contain hazardous materials according to EC directives 91/157/EEC, 93/86/EEC, and 2011/65/EU (RoHS directive)
- EC battery directive 2006/66/EC has been implemented by most EC member states.
- According to the EU Battery Directive, Batteries are marked with the symbol of the crossed out wheeled bin (see figure). The symbol reminds the end user that batteries are not permitted to be disposed of with household waste, but must be collected separately.
- Waste Batteries must effectively be protected against short circuit during storage and transport.
- A disposal service is offered upon request by Tadiran Batteries.
- For additional information, a Technical Notice is available upon request.

### 13.14 Transport information

Class	9
UN 3090:	LITHIUM METAL BATTERIES
UN 3091:	LITHIUM METAL BATTERIES CONTAINED IN EQUIPMENT, or LITHIUM METAL BATTERIES PACKED WITH EQUIPMENT
Packing group:	II
Special provisions and packing instructions:	ADR, RID: 188, 230, 310, 360, 636, 656, 661, P903, P903a, P903b IATA: A48, A88, A99, A154, A164, A181, A182, A183, P968, P969, P970
IMDG-Code:	188, 230, 310, 957, P903
EmS:	F-A, S-I
Storage and segregation:	Category A

For more information see [www.tadiranbatteries.de](http://www.tadiranbatteries.de) > products > Transport & Information

### 13.15 Regulatory information

Transport Regulations: see in section 13.14

EU Battery Directive: see in section 13.13

### 13.16 Other information

- Tadiran Lithium Batteries are registered by Underwriters Laboratories, Northbrook, U.S.A. under file MH 12827.
- Further information is given in
- Tadiran Lithium Battery Product Data Catalogue
- Tadiran Lithium Battery Technical Brochure.
- For lithium batteries in general, Safety standard IEC 60086-4 applies. It contains detailed recommendations for manufacturers of equipment and users.
- Battery packs

The design and assembly of battery packs require special skills, expertise and experience. Therefore it is not recommended that the end user attempt to self-assemble battery packs. It is preferable that any battery using lithium cells be fabricated by TADIRAN to ensure proper battery design and construction. A full battery assembly service is available from TADIRAN who can be contacted for further information. If for any reason, this is not possible, TADIRAN can review the pack design in confidence to ensure that the design is safe (in assembly and use) and capable of meeting stated performance requirements.

The REACH regulation (1907/2006/EC) has replaced the EU directive for safety data sheets (91/155/EU). Both the now valid REACH regulation and the no longer valid directive require safety data sheets to be created and updated for materials and preparations. For products - including lithium batteries - no EU safety data sheets are required according to European chemicals regulations. The information contained herein is furnished without warranty of any kind. Users should consider these data only as a supplement to other information gathered by them and must make independent determinations of the suitability and completeness of information from all sources to assure proper use and disposal of these materials and the safety and health of employees and customers.





# RETURN REPORT – No.: \_\_\_\_\_

\*) Please always fill in. Otherwise the case will not be handled as return

## CONTROL OF SUBSTANCES HAZARDOUS TO HEALTH (C.O.S.H.H.)

### Decontamination declaration - EQUIPMENT RETURNED FOR REPAIR, CALIBRATION OR CREDIT

From \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Description \_\_\_\_\_

Return authorization no. \_\_\_\_\_

Model number \_\_\_\_\_

Serial number \_\_\_\_\_

- |    |  |
|----|--|
| A) | <i>The above equipment has not been in contact with any material which is hazardous to health.</i>   |
| B) | <i>The above equipment has been in contact with the material(s) noted below but that it has now been completely de-contaminated and is now safe to handle and dismantle without any special precautions.<br/>Material(s) which have been in contact with this equipment:</i> |
| C) | <i>If A) or B) are not applicable full instructions for the safe handling of this equipment <b>for disposal</b> must be supplied.</i>  |

**Please delete A), B) or C) above as applicable, complete the signature section below, then send the completed declaration either with the returned items, or by fax for the attention of the Calibration & Repair Centre..**

**Note – no action to examine or repair equipment will be undertaken until a valid COSHH declaration has been received, completed by an authorized officer of the end user company.**

Signed \_\_\_\_\_

Name \_\_\_\_\_

Position \_\_\_\_\_

Date \_\_\_\_\_

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### **ABB S.p.A**

**Process Automation Division**

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e-mail: [abb.instrumentation@it.abb.com](mailto:abb.instrumentation@it.abb.com)





## Products and customer support

### ABB's portfolio for valve automation:

- Continuous electrical actuators and pneumatic actuators
- Electro-pneumatic, pneumatic, and digital positioners
- I/P signal converters

### ABB's pressure measurement:

- Absolute, gauge and differential pressure transmitters
- IEC 61508 SIL2/3 certified pressure transmitters and switches
- Multivariable transmitters
- Interface level/density transmitters
- Pressure measurement remote seals
- Pressure measurement accessories
- Pneumatic pressure transmitters

### ABB's temperature measurement:

- Universal temperature sensors
- High-temperature sensors
- Temperature sensors for sanitary applications
- Mineral isolated temperature sensors
- Thermowells
- Temperature transmitters
- IEC 61508 SIL2/3 certified temperature sensors and transmitters

### ABB's portfolio of recorders and controllers:

- Process controllers and indicators
- Videographic recorders
- Paper chart recorders
- Field mountable indicators and controllers

### ABB's portfolio of level measurement:

- Magnetic level gauges
- Magnetostrictive and guided wave radar level transmitters
- Laser and scanner level transmitters
- Ultrasonic, capacitance and vibrating fork level transmitters and switches
- Rotating paddle and thermal dispersion level switches
- IEC 61508 SIL2/3 certified level transmitters

### ABB's portfolio of device management:

- Fieldbus and wireless solutions
- Scalable asset & device management
- Asset vision software
- Mobility handhelds

### Customer support

We provide a comprehensive after sales service via a Worldwide Service Organization.

Contact one of the following offices for details on your nearest Service and Repair Centre.

#### ABB S.p.A.

Via Luigi Vaccani 4,  
22016 Tremezzina (Co) – Italien  
Tel: +39 0344 58394

#### ABB Automation Product GmbH

Schillerstraße 72  
D-32425 Minden – Deutschland  
Tel.: +49 571 8300  
Fax: +49 571 8301850

#### ABB Inc.

125 E. County Line Road  
Warminster, PA 18974 – USA  
Tel: +1 215 6746000  
Fax: +1 215 6747183

#### ABB Inc.

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Tel: +1 905 6810565  
Fax: +1 905 6812810

#### ABB India Ltd.

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Bangalore, Karnataka 560058 – India  
Tel: +91 80 4206 9950  
Fax: +91 80 2294 9389

#### ABB Engineering (Shanghai) Ltd.

No. 4528, Kangxin Highway, Pudong New District,  
201319 Shanghai - VR China  
Tel: +86 21 6105 6666  
Fax +86 21 6105 6677

### Client Warranty

Prior to installation, the equipment referred to in this manual must be stored in a clean, dry environment, in accordance with the Company's published specification. Periodic checks must be made on the equipment's condition. In the event of a failure under warranty, the following documentation must be provided as substantiation:

- A listing evidencing process operation and alarm logs at time of failure.
- Copies of all storage, installation, operating and maintenance records relating to the alleged faulty unit.

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**ABB Ltd.****Measurement & Analytics**

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UK

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Fax: +44 (0)1480 213 339

Email: [enquiries.mp.uk@gb.abb.com](mailto:enquiries.mp.uk@gb.abb.com)

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[abb.com/measurement](http://abb.com/measurement)

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