P-300, P-500

Pressure transmitters



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PDS300/PGS300

Introduction

This manual provides information about installing, operating, and troubleshooting the P-Series pressure transmitter.

Every section of this manual is dedicated to the specific phase of the transmitter, starting from the receipt of the transmitter and its identification, through the installation, to the electrical connections, configuration, and the troubleshooting and maintenance operations.

Additional information

Additional documentation on Pxx300 and Pxx500 (coming soon) is available for free download from our website:

www.abb.com/pressure

or by scanning this code:

The present manual can be used for the following P-Series models:

P-300 Series—All Rounder

- PGS300/PAS300 Gauge/Absolute pressure transmitter with standard process connection
- PGD300/PAD300 Gauge/Absolute pressure transmitter with diaphragm seal
- PDS300 Differential pressure transmitter with standard process connection
- PDD300 Differential pressure transmitter with diaphragm seal(s)

P-500 Series—Top Tier (coming soon)

- PGS500/PAS500 Gauge/Absolute pressure transmitter with standard process connection
- PGD500/PAD500 Gauge/Absolute pressure transmitter with diaphragm seal
- PDS500 Differential pressure transmitter with standard process connection
- PDD500 Differential pressure transmitter with diaphragm seal(s)

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1. Introduction

1.1 Instruction manual structure

This manual provides information about installing, operating, and troubleshooting the P-Series pressure transmitter. Every section of this manual is dedicated to the specific phase of the transmitter life cycle, starting from the receipt of the transmitter and its identification, through the installation, to the electrical connections, the configuration, and the troubleshooting and maintenance operations.

1.2 Models covered by this manual

This manual can be used for all P-300 and P-500 models, except for PMx500 (multi-variable version).

1.3 Product description

The P-Series is a modular range of field-mounted microprocessor based electronic transmitters using multiple sensor technologies. Accurate and reliable measurement of differential pressure, gauge and absolute pressure, flow and liquid level is provided in even the most difficult and hazardous industrial environments. Models Pxx300 and Pxx500 can be configured to provide specific industrial output signals according to 4...20mA with HART digital communication.

2. Safety

2.1 General safety information

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

The device has been constructed in accordance with the state-of-the-art and is operationally safe. It has been tested and left the factory in perfect working condition. The information in the manual, as well as the applicable documentation and certificates, must be observed and followed to maintain this condition throughout the period of operation.

Full compliance with general safety requirements must be observed during the device’s operation. 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 the safety information can you reduce the risk of hazards for personnel and/or the environment to the minimum. These instructions are intended as an overview and do not contain detailed information about all the 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 content of this manual is not part of any prior or existing agreements, commitments, or legal relationships; nor is it intended to amend them.

All ABB’s obligations 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 with experience of the installation, electrical wiring connection, commissioning, and operation of the transmitter or similar devices, and 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 the maintenance and use of adequate safety systems.

To ensure safety, please use only sufficiently insulated tools compliant to EN 60900.

As the transmitter may form part of a safety chain, we recommend replacing the device immediately if any defects are detected. If used in a Hazardous Area, only non-sparking tools 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 for explosion protection.

⚠ WARNING

The device can be operated at high levels of pressure and with aggressive media. Serious injury or significant property damage may therefore 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 nameplate 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 they are described in the manual. Approval from 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 nameplates and within the technical limit values specified on the datasheets.

The following technical limit values must be observed:

— Maximum Working Pressure may not be exceeded.

— Max. ambient operating temperature may not be exceeded

— Max. process temperature may not be exceeded.

— Enclosure method of 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 observe this information will result in death or severe injury.

⚠ WARNING

Bodily injury

This message indicates a potentially dangerous situation. Failure to observe this information will result in death or severe injury.

⚠ CAUTION

Minor or moderate injury

This message indicates a potentially dangerous situation. Failure to observe this information may result in minor or moderate injury. This may also be used as a property damage warning.

NOTICE

Property damage

This message indicates a potentially damaging situation. Failure to avoid this could result in damage to the product or its surrounding area.

IMPORTANT

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

2.6 Operator liability

Prior to using corrosive, abrasive materials for measurement purposes, the operator must check the level of resistance of all parts that will come 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 national regulations regarding the installation, function tests, repairs, and maintenance of electrical devices.

2.7 Qualified personnel

The 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 a 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 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 of 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 ISO 9001:2015, ISO 14001:2015, and OHSAS 18001:2007.

Our products and solutions are intended to have a minimal impact on the environment and persons during manufacturing, storage, transportation, 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/solution is manufactured from materials that can be reused by specialist recycling companies.



2.10 Information about 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 15, 2018, electrical and electronic equipment marked with the crossed-out wheeled bin symbol may not be disposed of as unsorted municipal waste. Waste of electrical and electronic equipment (WEEE) must 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 Transportation and storage

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

For information about permissible ambient conditions for storage and transportation, see section “4.4 Storage” and the product datasheet. Although there is no limit to the duration of storage, the warranty conditions stipulated in the supplier’s order acknowledgment still apply.

2.12 Safety information for electrical installation

Electrical connections may only be established by authorized specialist personnel in accordance with the electrical circuit diagrams. The electrical connection information in the manual must be observed; otherwise, the applicable protection type may be affected. Ground the measurement system according to requirements.

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. The auxiliary power must therefore 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)

Cybersecurity disclaimer

This product is designed to be connected to and communicate information and data via a network interface. It is the operator's sole responsibility to provide and continuously ensure a secure connection between the product and your network or any other network (as the case may be). The operator must establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, the application of authentication measures, the encryption of data, the installation of anti-virus programs, etc.) to protect the product, the network, its system, and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage, and/or theft of data or information.

ABB and its affiliates are not liable for damage and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage, and/or theft of data or information.

Communication protocol-specific

The HART® protocol is an unsecured protocol. As such, the intended application should be assessed to ensure that these protocols are suitable before implementation.

3. Transmitter overview

3.1 Transmitter components overview

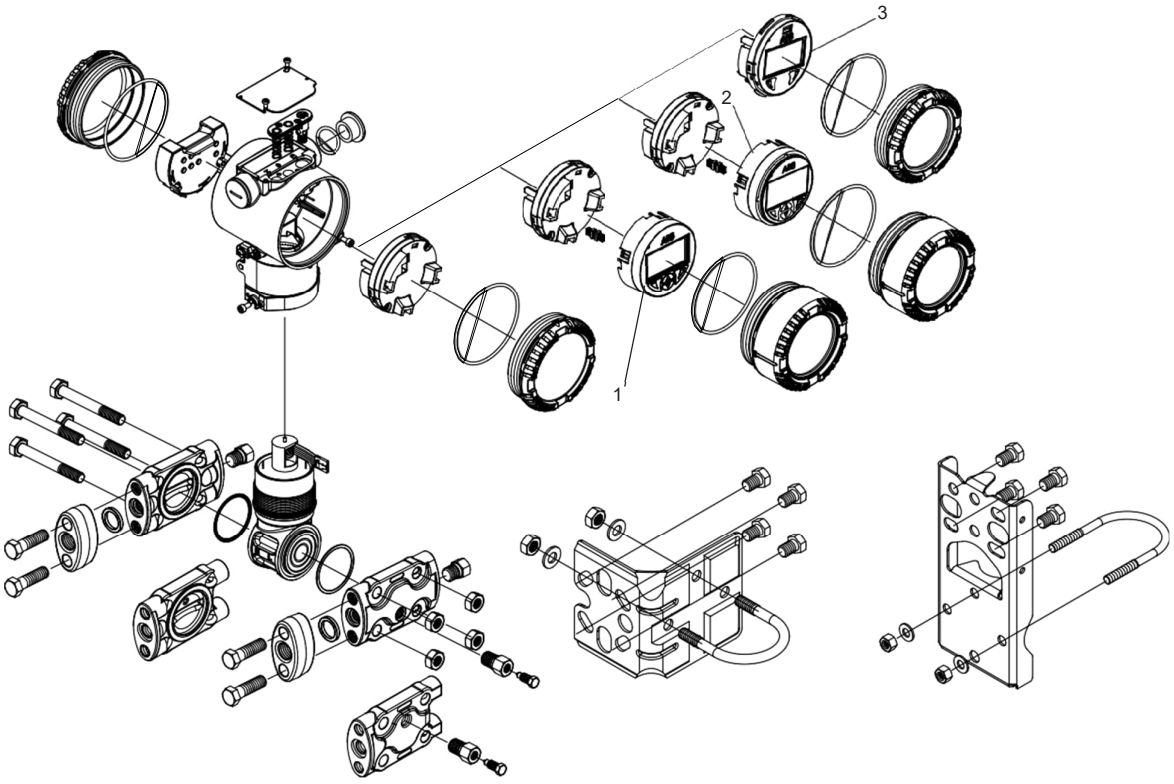
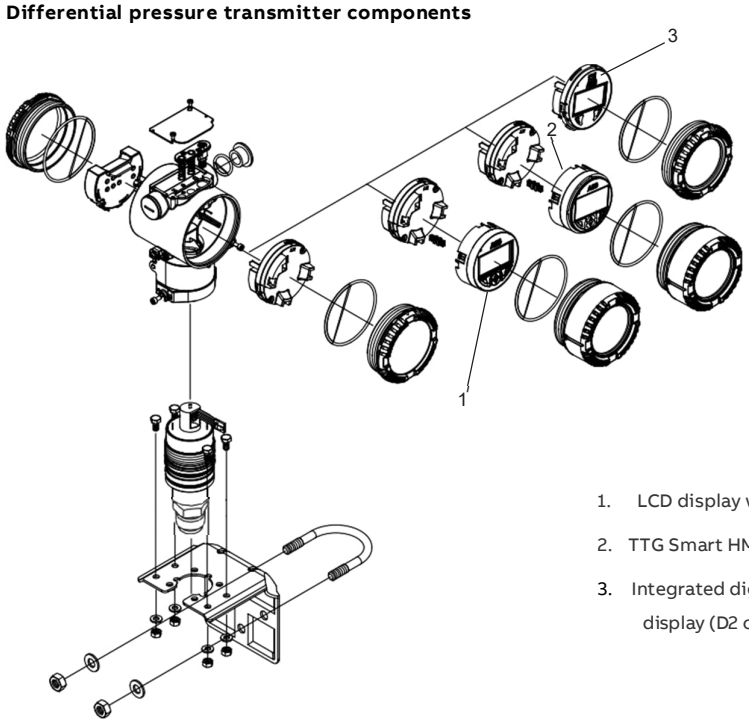


Figure 1: Differential pressure transmitter components



1. LCD display with keypad (D5 option—**PENDING**)
2. TTG Smart HMI with keypad (D6 option—**PENDING**)
3. Integrated digital LCD display (D1 option) and backlight display (D2 option)

Figure 2: Gauge/absolute pressure transmitter components

IMPORTANT

Important. These two pictures show only two different kinds of transmitters equipped with Barrel type housing. Please consider that DIN housings are available only on Pxx500 models only.

3.2 Range & span consideration

The P-Series Transmitter Specification Sheets provide all the 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:

Abbreviation	Description
URL	Measuring Range Upper 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 measured value to which the transmitter is calibrated.
LRV	Lower Range Value. The lowest measured value to which the transmitter is calibrated.
SPAN	The algebraic difference between the Upper and Lower Range Values. The minimum span (MIN SPAN) is the minimum value that can be used without degradation of the specified performance. The calibration span (CAL SPAN) is the difference between Upper Range Value (URV) and Lower Range Value (LRV).
TD	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:

- LRL ≤ LRV ≤ (URL - CAL SPAN)
- CAL SPAN ≥ MIN SPAN
- URV ≤ URL

4.Opening the box

4.1 Identification

The instrument is identified by the data plates shown in Figure 3. The certification plate (ref. B) contains the certification-related parameters for use in a Hazardous Area.

The nameplate (ref. A), always made of AISI 316 ss, provides information concerning the model code, maximum working pressure, range and span limits, power supply, output signal, diaphragm material, fill fluid, range limit, serial number, maximum process working pressure (PS), and temperature (TS).

The tag plate, meanwhile, provides the customer tag number and calibrated range (ref. C).

Both certification and tag plates are supplied self-adhesively attached to the electronics housing as standard. Option LTS allows these plates to be selected as metal AISI 316 ss, fastened to the electronics housing with rivets.

The instrument may be used as a pressure accessory as defined by the Pressure Equipment Directive 2014/68/EU:

- category III module H for PS >20 MPa, 200 bar
- art. 4, par. 3 Sound Engineering Practice (SEP) for PS <20 MPa, 200 bar, and for all PS values of PxxD300, PxD500 models. In this case, near the CE mark, you will find the number of the notified body (0474) that has verified the compliance in accordance with module H.

Pxx300 and Pxx500 pressure transmitters comply with directive EMC 2014/30/EU.

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

- FM24ATEX0035X or IECEx FMG 24.0039X

  Ex ia IIC and Ex ia IIIC
- FM24ATEX0034X or IECEx FMG 24.0038X

  Ex db and Ex tb
- FM24ATEX0036X or IECEx FMG 24.0040X

  Ex ic, Ex nC, Ex tc, Ex ec.

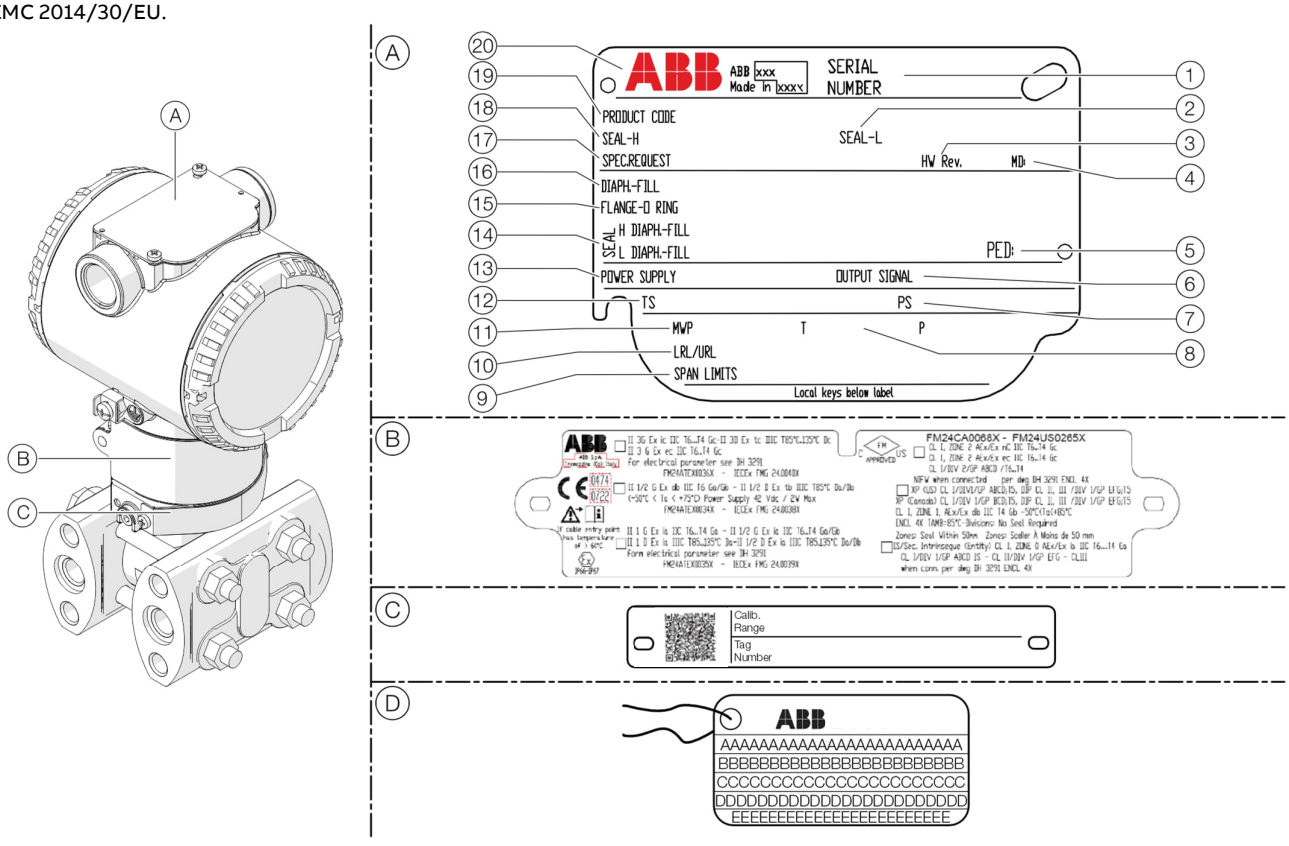
It provides MD, manufacturer date, in the format mm/YY: month of production/year of production.

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

The certification plate may also be issued by

- ABB India Limited, 560058 Bangalore, India
- ABB Inc. Bartlesville OK 74006, USA
- ABB Electrical Industries Co. Ltd. Dammam 31952, Saudi Arabia
- ABB Engineering Limited, Shanghai 201319, P.R. China

with the same certification numbers.



1. Serial number
2. Low side diaphragm seal order code
3. Hardware version
4. Date of manufacture
5. Pressure Equipment Directive (SEP or Fluid group)
6. Output signal
7. Permissible pressure (static)
8. Maximum working temperature
9. Span limits
10. Lower range limit/upper range limit
11. Maximum working pressure
12. Maximum pressure and temperature (PS) and (TS)
13. Power supply
14. Diaphragm seal fill fluid
15. Flange and gasket material
16. Sensor diaphragm material and fill fluid
17. Special code number
18. High side diaphragm seal order code
19. Device type/order code/additional order code
20. Manufacturer logo and address

4.2 Optional wired-on SST plate (LEW)

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

The plate is connected to the transmitter with a stainless steel wire.



Figure 4: 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.

5.Mounting

5.1 General

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

This applies in respect of the explosion protection certification, measuring range, gauge pressure stability, temperature (Ambient and Process), and operating voltage.

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

- gasket, process connection, isolating diaphragm, 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 the correct installation of the pressure transmitter and the associated measuring pipe(s) if applicable. As far as possible, the measuring setup should be free of critical ambient conditions such as large variations in temperature, vibrations, or shocks.

IMPORTANT

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

5.2 IP protection & designation

The P-Series housings for transmitters are certified as conforming to protection type IP66/IP67 (according to IEC 60529) or NEMA 4X (according to NEMA 250).

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 dust ingress).

The second number indicates the type of protection the housing has 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 P-Series pressure transmitter in your hands has been factory calibrated to reflect the published declared performance specification; no further calibration is required in normal conditions. ABB typically configures pressure transmitters in accordance with user requirements. A typical configuration includes:

— TAG number
— Calibrated span
— Output configuration
— LCD display configuration

5.3.2 Hazardous Area considerations

The transmitter must be installed in a Hazardous Area only if it is properly certified. The certification plate is permanently fixed on the neck of the transmitter top housing. The P-Series Pressure Transmitter Line can have the following certifications:

— **INTRINSIC SAFETY Ex ia:**
ATEX Europe (code HAA) approval
II 1 G Ex ia IIC T6...T4 Ga, II 1/2 G Ex ia IIC T6...T4 Ga/Gb,
II 1 D Ex ia IIIC T85 °C..T135 °C Da,
II 1/2 D Ex ia IIIC T85 °C..T135 °C Da/Db; IP66, IP67.

IECEx (code HJA) approval
Ex ia IIC T6…T4 Ga, Ex ia IIC T6…T4 Ga/Gb,
Ex ia IIIC T85 °C...T135 °C Da,
Ex ia IIIC T85 °C...T135 °C Da/Db; IP66, IP67.

NEPSI China (code HNA)
Ex ia IIC T4/T5/T6 Ga, Ex ia IIC T4/T5/T6 Ga/Gb,
Ex iaD 20 T85/T100/T135, Ex iaD 20/21 T85/T100/T135.

INMETRO Brazil (code HBA)
Ex ia IIC T4/T5/T6 Ga, Ex ia IIC T4/T5/T6 Ga/Gb,
Ex ia IIIC T135/T100/T85°C Da,
Ex ia IIIC T135/T100/T85°C Da/Db; IP66W,IP67W

— **EXPLOSION-PROOF:**
ATEX Europe (code HAD) approval
II 1/2 G Ex db IIC T6 Ga/Gb Ta=–50 °C to +75 °C,
II 1/2 D Ex tb IIIC T85 °C Da/Db Ta = –50 °C to +75 °C; IP66, IP67.

IECEx (code HJD) approval
Ex db IIC T6 Ga/Gb Ta=–50 °C to +75 °C,
Ex tb IIIC T85 °C Da/Db Ta = –50 °C to +75 °C; IP66, IP67.

NEPSI China (code HND)
Ex d IIC T6 Gb, Ex tD A21 IP67 T85 °C.

INMETRO Brazil (code HBD)
Ex db IIC T6 Ga/Gb Ta=-50 °C a +75 °C,
Ex tb IIIC T85°C Da/Db Ta = -50 °C a +75 °C; IP66W, IP67W

— **INTRINSIC SAFETY Ex ic:**
ATEX Europe (code HAC) type examination
II 3 G Ex ic IIC T6...T4 Gc, II 3 D Ex tc IIIC T85 °C...T135 °C Dc; IP66, IP67.

INMETRO Brazil (code HBC)
II 3 G Ex ic IIC T6...T4 Gc, II 3 D Ex tc IIIC T85°C...T135° °C Dc; IP66W, IP67W.

— **INCREASED SAFETY Ex ec and methods tc:**
ATEX Europe (code HAC) type examination
II 3 G Ex ec IIC T6... T4 Gc,
II 3 D Ex tc IIIC T85 °C…T135 °C Dc; IP66, IP67.

IECEx (code HJC) type examination
Ex ic IIC T6...T4 Gc, Ex ec IIC T6…T4 Gc,
Ex tc IIIC T85 °C...T135 °C Dc; IP66, IP67.

NEPSI China (code HNC) type examination
Ex ic IIC T4~T6 Gc, Ex tD A22; IP67 T85 °C.

INMETRO Brazil (code HBD)
Ex ec IIC T4/T5/T6 Gc,
Ex tc IIIC T135/T100/T85°CDc; IP66W, IP67W.

— FM Approvals US (code HUD) and Canada (code HCD)
Explosion-proof (US):
Class I, Division 1, Groups A, B, C, D; T5
Explosion-proof (Canada):
Class I, Division 1, Groups B, C, D; T5
Dust-ignition-proof:
Class II, Division 1, Groups E, F, G, Class III, Division 1; T5
Flameproof (US):
Class I, Zone 1 AEx db IIC T4 Gb
Flameproof (Canada):
Class I, Zone 1 Ex db IIC T4 Gb
Nonincendive:
Class I, Division 2, Groups A, B, C, D T6...T4
Energy limited (US):
Class I, Zone 2 AEx nC IIC T6...T4
Energy limited (Canada):
Class I, Zone 2 Ex nC IIC T6...T4
Intrinsically safe:
Class I, II, III, Division 1, Groups A, B, C, D, E, F, G T6...T4
Class I, Zone 0 AEx ia IIC T6...T4 (US)
Class I, Zone 0 Ex ia IIC T6...T4 (Canada)
Increased safety (US):
Class I, Zone 2, AEx ec IIC T6…T4
Increased safety (Canada):
Class I, Zone 2, Ex ec IIC T6…T4 Type

4X, IP66, IP67 for all above markings.

Technical Regulations Customs Union EAC (Kazakhstan), UKCA (United Kingdom), PESO (India), KOSHA (South Korea).

...Mounting

⚠ WARNING

General Risk for model Pxx300, Pxx500 used in zone 0.

The enclosure contains aluminum and is considered to present a potential risk of ignition by impact or friction. Care must be taken during installation and use to prevent impact or friction.

IMPORTANT

Pay attention to explosion-proof ('db'): for Canada Zones installation, a conduit seal is required within 50mm of the enclosures.

Attention pour XP ('db'): pour les installations dans les zones canadiennes, un scellement doit être installé à moins de 50mm du boîtier.

5.4 Pressure Equipment Directive (PED) (2014/68/EU)

5.4.1 Devices with PS >200 bar

Devices with a permissible pressure of PS >200 bar have been subject to a conformity validation. The data label includes the specifications relevant to the Pressure Equipment Directive (PED) (2014/68/EU).

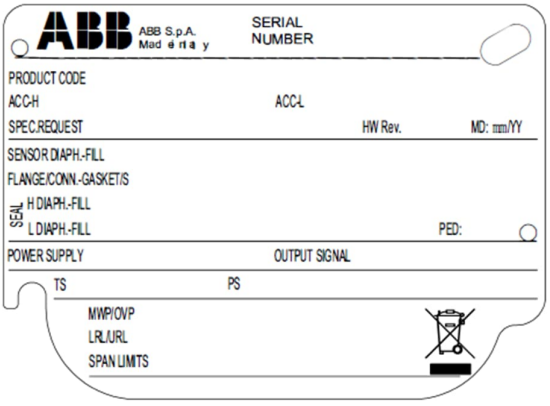


Figure 5: Pxx300, Pxx500 nameplate with PED data

5.4.2 Devices with PS ≤200 bar

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

5.5 Mounting a DP sensor transmitter (PDS300/ PDS500/PDD300/PDD500)

The pressure transmitter models PDS300, PDS500 can be mounted directly on the manifold. A mounting bracket for wall or pipe mounting (2" pipe) is also available as an accessory. For models PDD300, PDD500 with diaphragm seals, mounting brackets should be used (please refer to OI/DS/S26). It is recommended to mount the pressure transmitter 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 valves in the following relevant paragraph.

NOTICE

Potential damage to transmitter. In the case of a high-static differential pressure transmitter (PDS300.x.WR), 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 in 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, flow back to the process and not enter the transmitter measuring chamber.

Optional vent/drain valves (code VA/VT/VB) on the transmitter are located on the sensor flanges. Please refer to Section 5.12 Installation recommendations.

The transmitter must be positioned so that these drain/vent valves are located higher than the taps in liquid service to allow the venting of entrapped gas, or below the taps in gas service to allow the air to vent off, or condensate to drain off. For safety reasons, be alert to the drain/vent valves position so that when the process fluid is removed during the drain/vent operation, it is directed downward and away from technicians. It is recommended to mount the transmitter to prevent this possible source of damage for unskilled operators.



Figure 6: Drain/vent valves configuration (respectively VA/VT/VB)

IMPORTANT

In the case of a high-static differential pressure transmitter, please note that the Vent/Drain valves can be configured only on the process axis (VA).

5.5.1 Bracket mounting (optional)

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

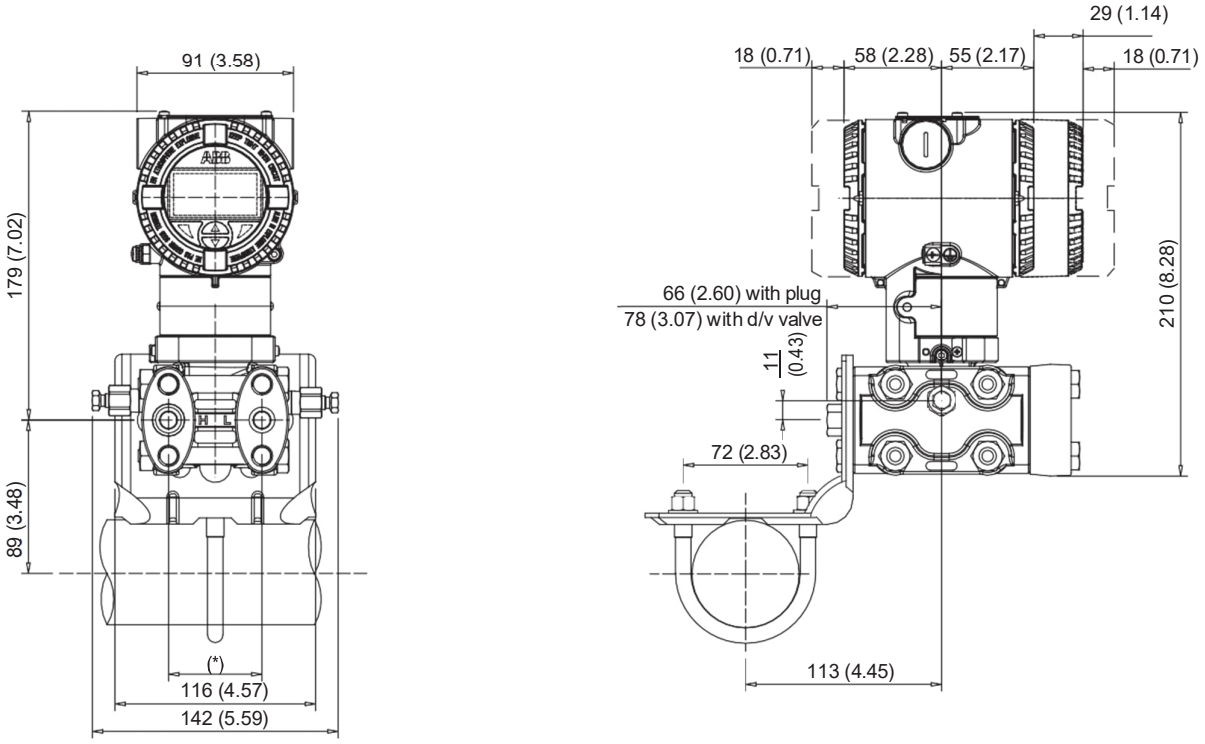


Figure 7: Differential pressure transmitter with barrel housing installed on a horizontal pipe with optional bracket (BC carbon steel or BA stainless steel 316L)—process connection ½ in. NPT through optional flange adapter

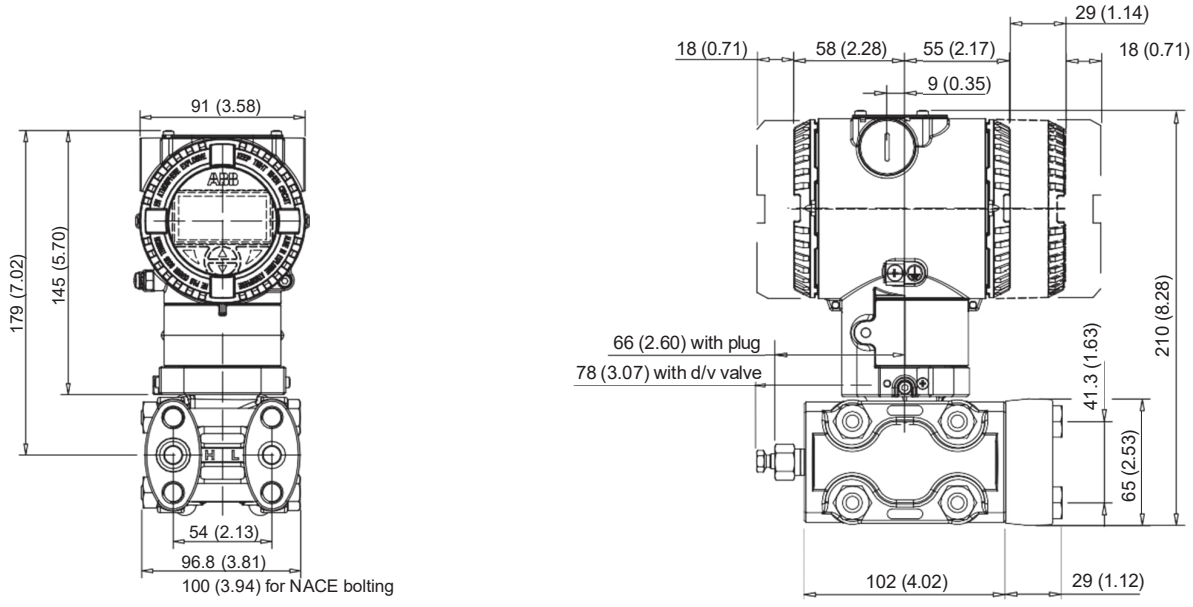


Figure 8: Differential pressure transmitter (high-static option)—process connection ½ in. NPT through optional flange adapter

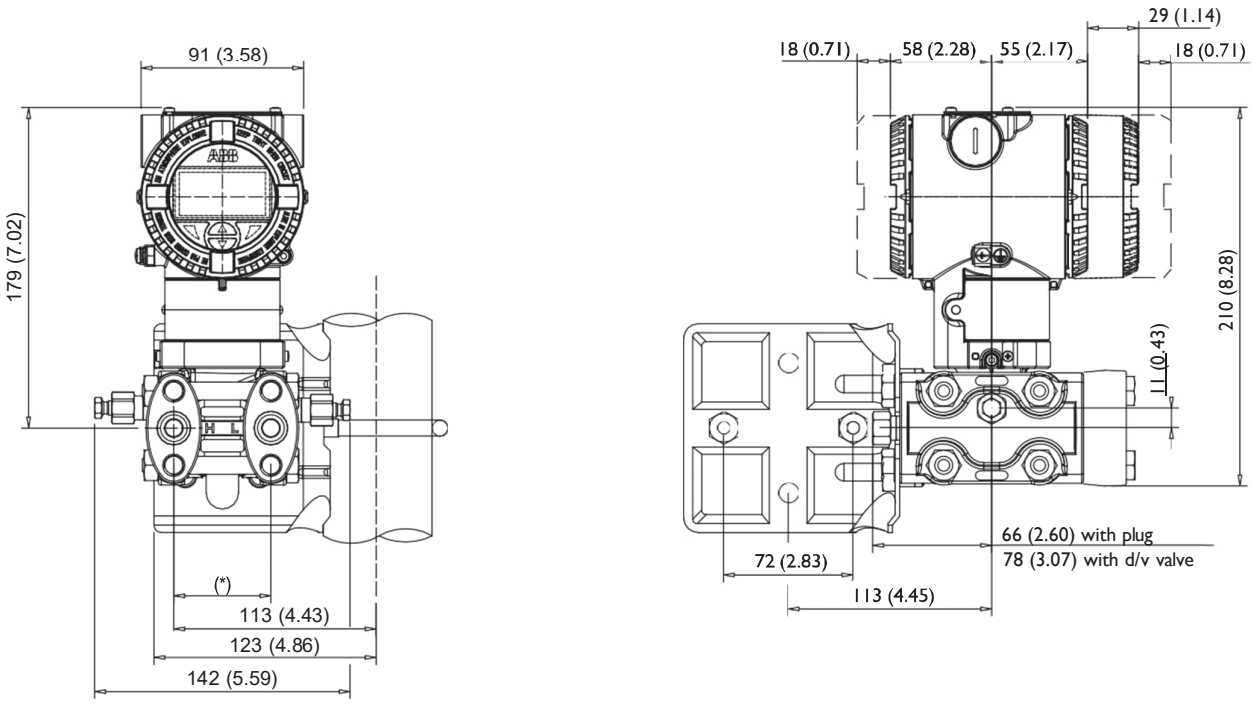


Figure 9: Differential pressure transmitter with barrel housing installed on a vertical pipe with optional bracket (BC carbon steel or BA Stainless Steel 316L)—process connection ½ in. NPT through optional flange adapter

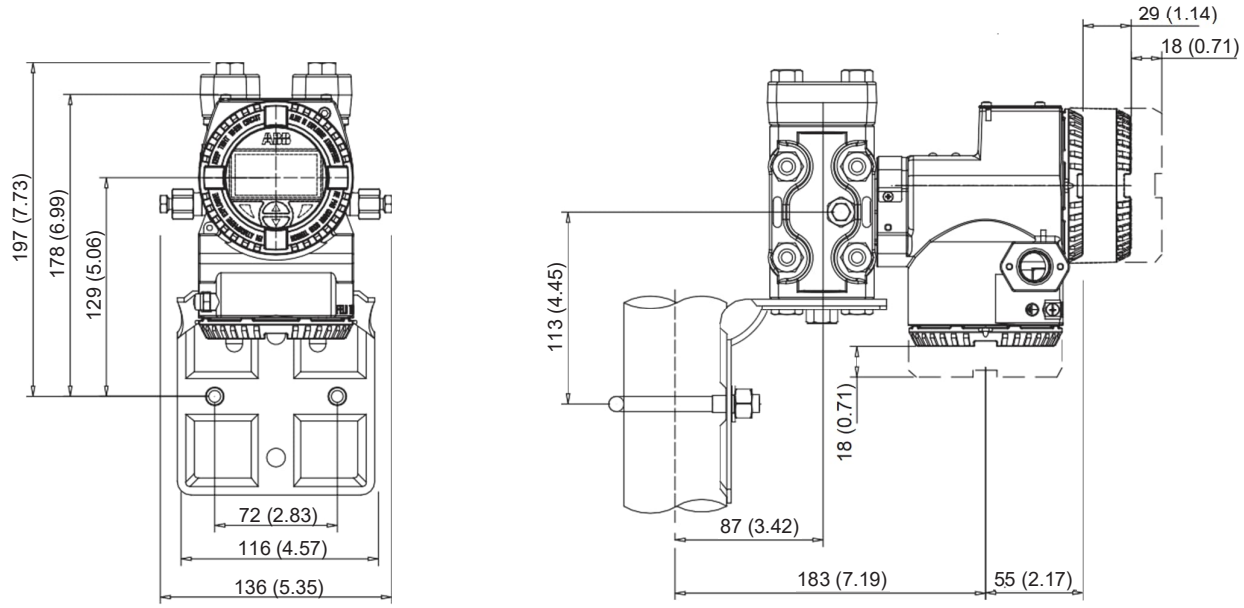


Figure 10: Differential pressure transmitter with DIN housing (PDx500) installed on a vertical pipe with optional bracket (BC carbon steel or BA stainless steel 316L) installation for AIR/GAS measurements—process connection ½ in. NPT through optional flange adapter

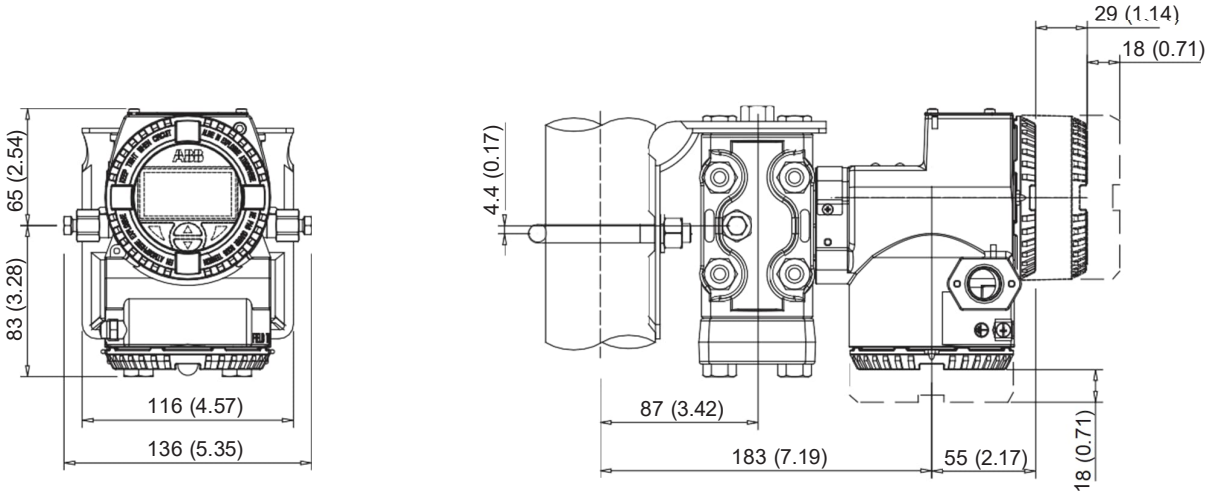
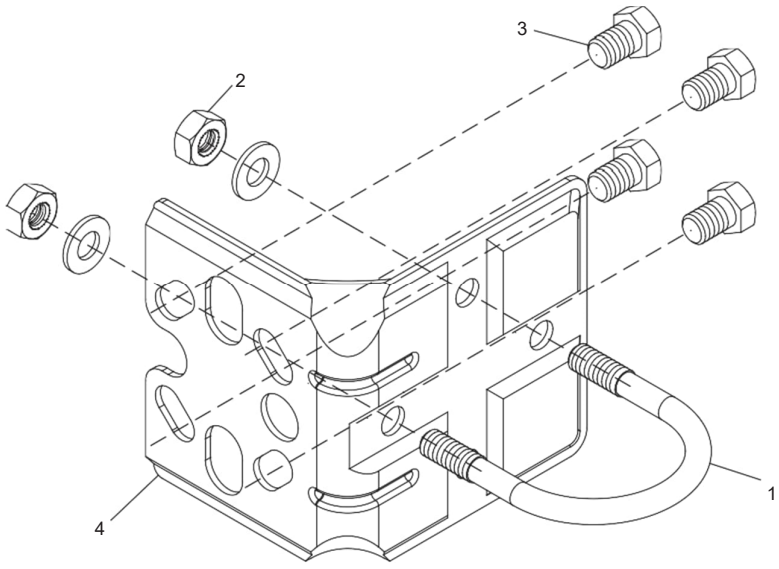


Figure 11: Differential pressure transmitter with barrel housing (PDS500) and Kynar inserts installed on a horizontal pipe with optional bracket (BC carbon steel or BA stainless steel 316L)—process connection ½ in. NPT through optional flange adapter

5.5.2 Pipe and wall-mounting bracket details (code BC, BA)

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

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



1 – U-bolt

2 – U-bolt fixing nuts and washers

3 – Transmitter fixing bolts

4 – BC or BA bracket

Figure 14: Pipe and wall-mounting bracket kit (BC carbon steel or BA stainless steel 316L)

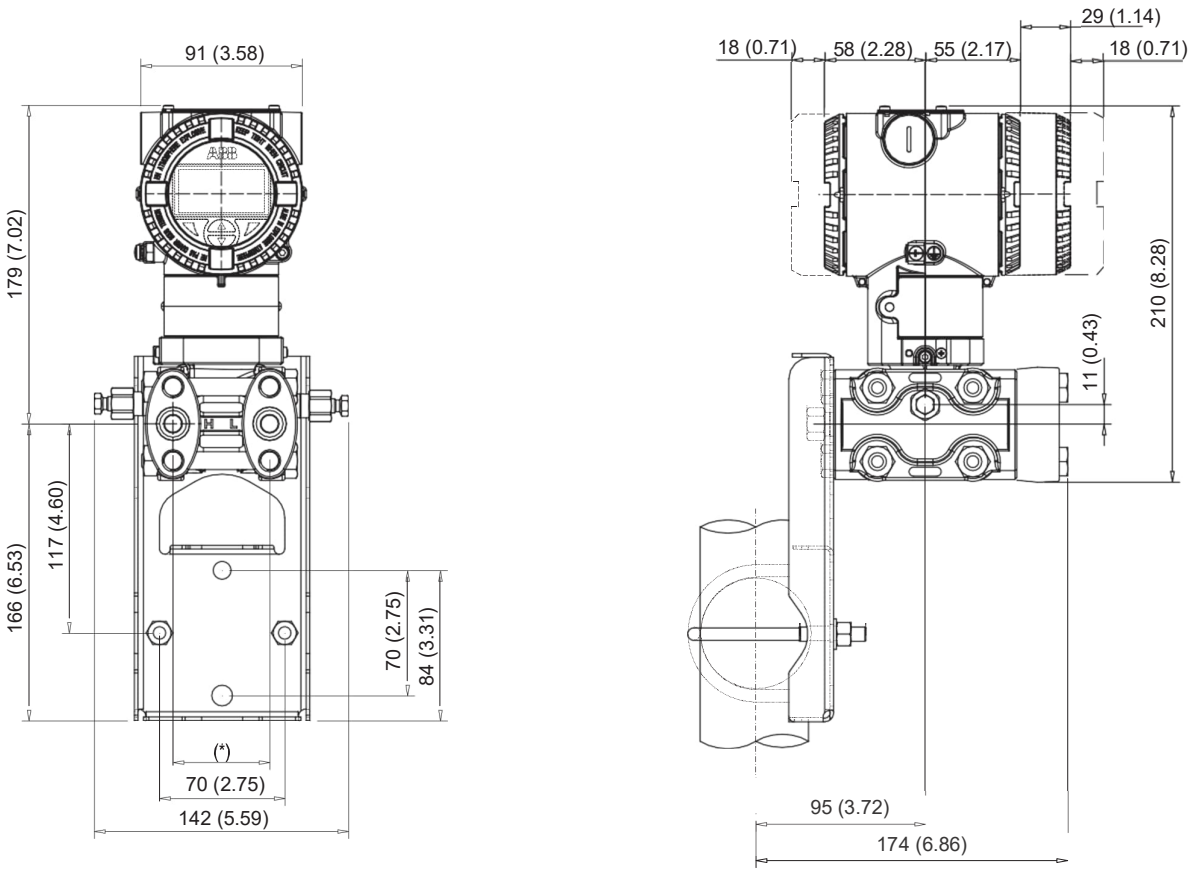
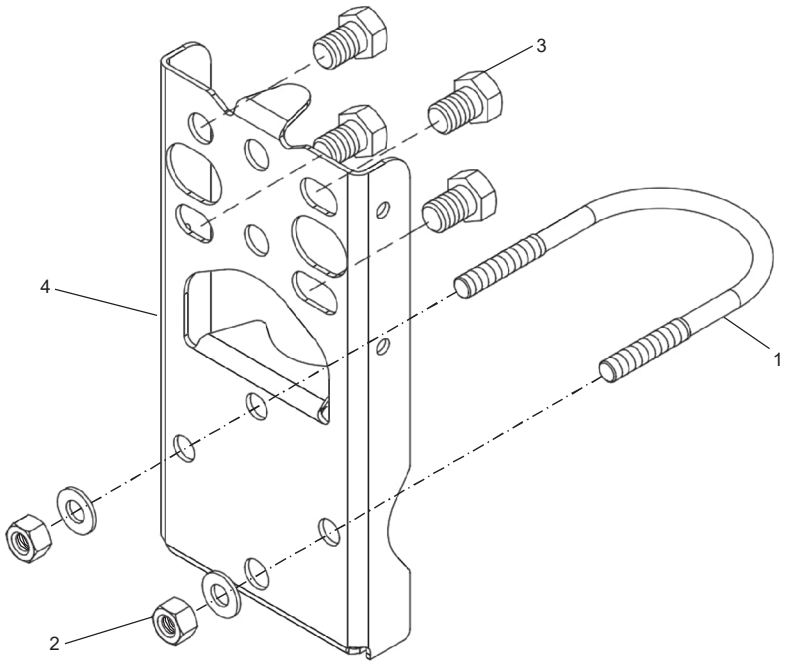


Figure 15: Differential pressure transmitter with barrel housing installed on a box pipe with optional bracket for SST housing (BA stainless steel 316L)

5.5.3 Flat-type bracket details (BF for stainless steel housing)



1 – U-bolt

2 – U-bolt fixing nuts and washers

3 – Transmitter fixing bolts

4 – BF bracket

Figure 16: Flat-type mounting bracket kit

5.6 Mounting a P-style pressure transmitter (PGx300, PAx300, PGx500, PAx500)

The pressure transmitter can be mounted directly onto 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, please read the following considerations on the Vent/Drain valves in the following relevant paragraph.

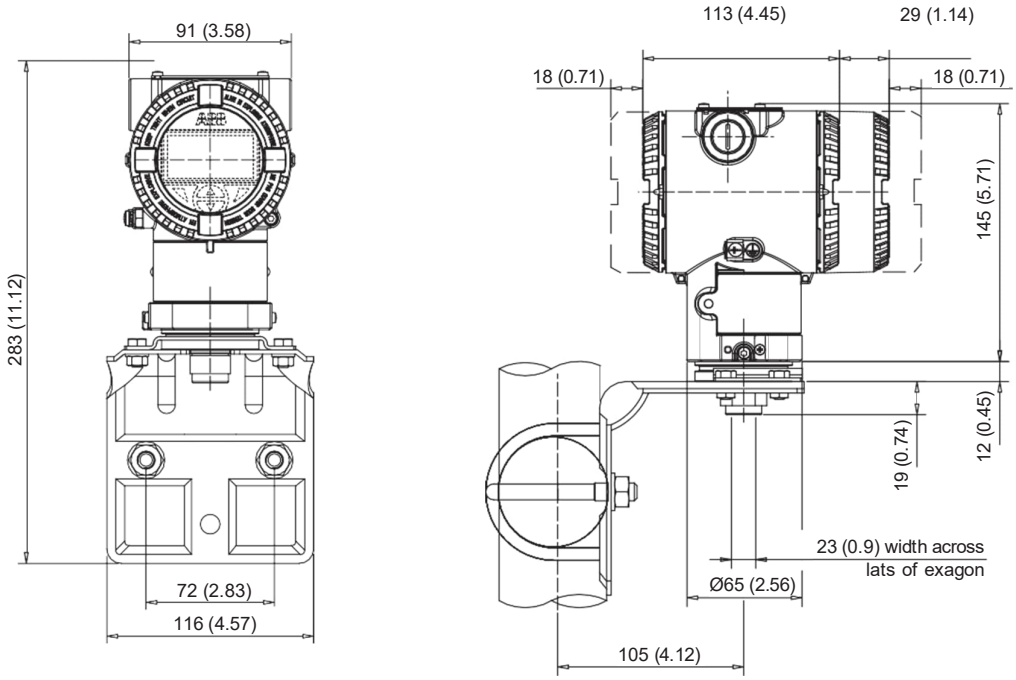


Figure 19: Model PGx or PAx P-style transmitter with sensor Y with barrel housing installed on a 2” pipe with optional bracket (BC carbon steel or BA stainless steel 316L)

NOTICE

Potential damage to transmitter

In the case of a HART gauge/absolute pressure transmitter with a 1050 bar/15000 psi sensor range (PAS300, PGS300, PAS500, PGS500) and 1/4” NPT process connection, please always perform sensor low trimming to remove any zero shift and prevent a serious decrease in total performance in terms of accuracy. Sensor low trim can be performed via LCD, DTM (PENDING), FDI, or hand-held terminals.

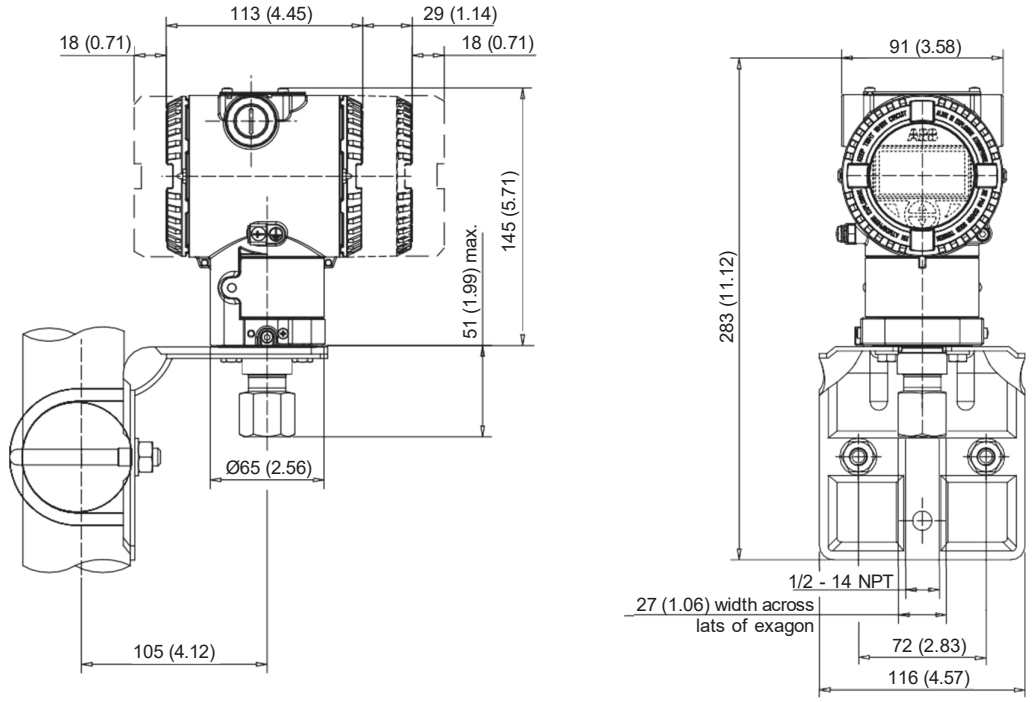
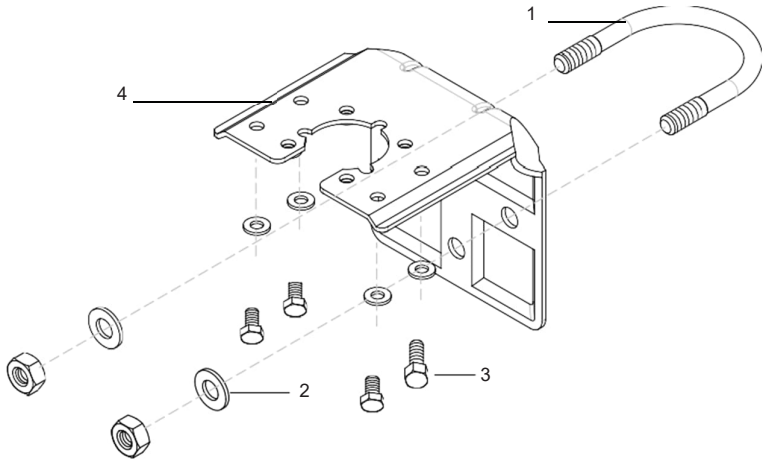


Figure 20: Model PGx300, PAx300, or PGx500, PAx500 P-style transmitter with barrel housing installed on a 2”pipe with optional bracket (BC carbon steel or BA stainless steel 316L)

5.6.1 BC and BA barrel housing bracket details



1 – U-bolt

2 – U-bolt fixing washers and nuts

3 – Transmitter fixing bolts

4 – BC or BA bracket

Figure 21: Pipe and wall-mounting bracket kits for P-style transmitter with barrel housing (BC carbon steel or BA stainless steel 316L)

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. The loosened tang screw acts as a stop to prevent the housing from being turned too far. To proceed with housing rotation, the housing stop tang screw (A) must be unscrewed through approximately 1 rotation (do not pull it out), and, once the desired position (B) has been reached, retightened (C).

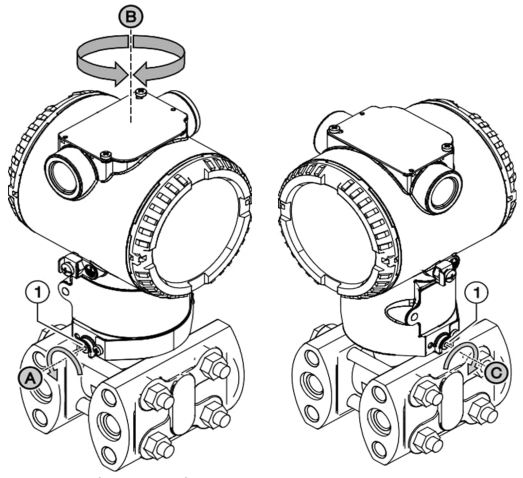


Figure 25: Housing rotation

5.8 Integral display rotation (display code D5, D6)

If 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 desired new position. Push back the LCD module on the communication board. Be sure that the 4 plastic fixing locks are properly in place.

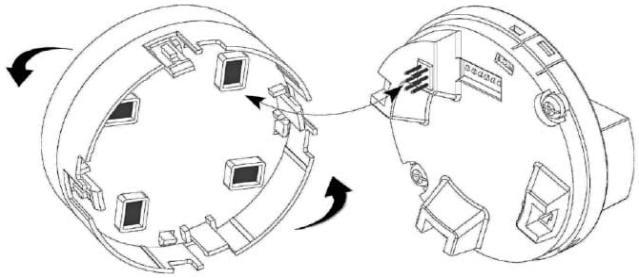


Figure 26: Display rotation

5.9 Display removal

To remove the LCD, it is necessary to gently grab the entire component from the lower plastic, as shown in the picture below.

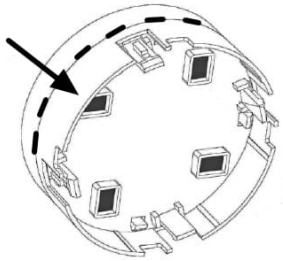


Figure 27: Grabbing area for display removal

In the case of D1, D2 display, the removal procedure requires a specific removing tool, included within spare units, with code 3KXP997000L1300.

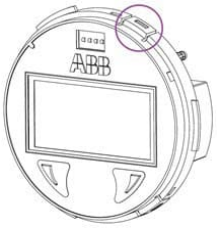


Figure 28: Grabbing area for D1, D2 display removal

5.10 Impulse piping connection for standard instruments

For the pipes to be laid correctly, the following points must be observed:

- The measuring pipes must be as short as possible and free of sharp bends.
- Lay the impulse piping so 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 (PDx300 and PDx500).
- 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 (PDx300 and PDx500).
- It may be necessary to use condensate vessels, etc., with small spans and vaporous measuring media (PDx300 and PDx500).
- If using condensate vessels (steam measurement), you should ensure that the vessels are at the same elevation in the differential pressure piping (PDx300 and PDx500).
- As far as possible, keep both impulse lines at the same temperature (PDx300 and PDx500). Completely depressurize the impulse lines if the medium is a fluid.
- Lay the impulse lines so 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 so that it 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 the case of a toxic or otherwise dangerous process fluid, take any precautions as recommended in the relevant Material Safety Datasheet when draining or venting. Use only a 12mm (15/32“) hexagonal spanner to tighten the bracket bolts.

5.11 Process connections considerations

PDS300, PDS500 differential pressure transmitter process connections on the transmitter flange are 1/4—18 NPT, with a center distance of 54mm (2.13in) between the connections. The process connections on the transmitter flange are on the centers to allow direct mounting to a three-valve or five-valve manifold.

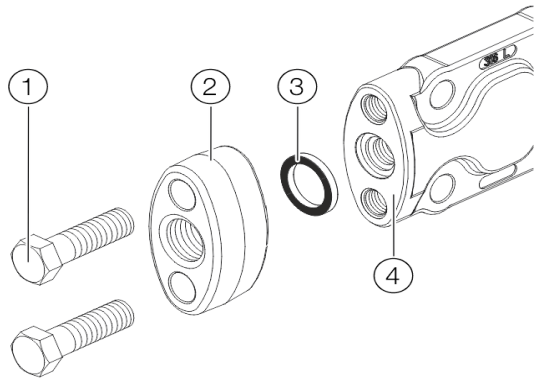
Flange adapter unions with 1/2–14 NPT connections are available as an option and supplied loose. Rotate one or both of the flange adapters to attain connection centers of 51mm (2.01in), 54mm (2.13in), or 57mm (2.24in).

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).

Deviations for models PDx500 and for PTFE O-rings: pre-tightening hand-tight. Pre-tightening to 10Nm. Final tightening to 50Nm.

For high-static model (PDS300.x.WR), tighten the bolts to a torque value of 40Nm (regardless of the material of the bolts used). In the case of PTFE O-rings, pre-tightening to 10Nm and final tightening to 50Nm.



1 Screws
2 Flange adapter
3 O-ring
4 Transmitter connection flange

Figure 29: Adapter

IMPORTANT

For PDS500 with MWP 60MPa/600bar/8,700psi (order code A), the maximum allowable pressure for directly flanged-on shut-off devices (manifolds) and other directly flanged elements is limited to 41.3MPa (413 bar/5,988.5 psi).

5.12 Installation recommendations

Impulse piping configuration depends on the specific measurement application.

5.12.1 Steam (condensable vapor) or clean liquids flow measurement

- Place taps to the side of the line.
- Mount the transmitter beside or below the taps.
- Mount the drain/vent valve upward.
- In the 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 the high-pressure (A) valve to admit process fluid to both sides of the primary.
5 Vent or drain the primary unit and then close the valves.
6 Open the (B) valve and close the equalizing valve.

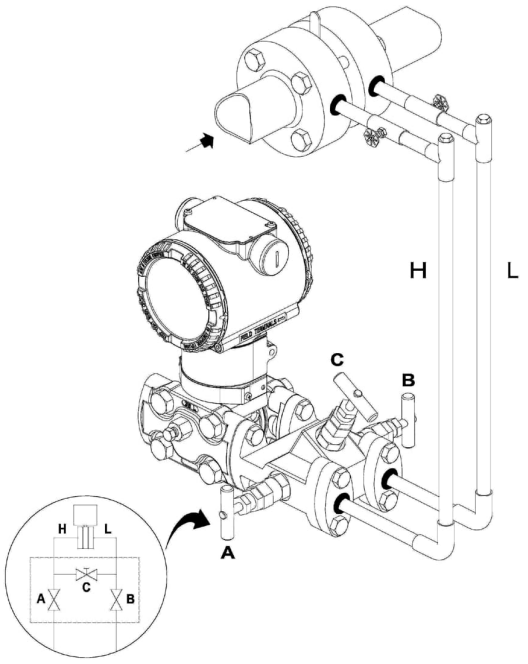


Figure 31: Steam or clean liquid flow measurement (transmitter and manifold)

IMPORTANT

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

When the manifold is assembled to a P-Series 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).

5.12.2 Gas or liquid (with solids in suspension) flow measurement

- Place the taps on the top or to the 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 the high-pressure (A) valve to admit process fluid to both sides of the primary.
5 Vent or drain the primary unit and then close the valves.
6 Open the (B) valve and close the equalizing valve.

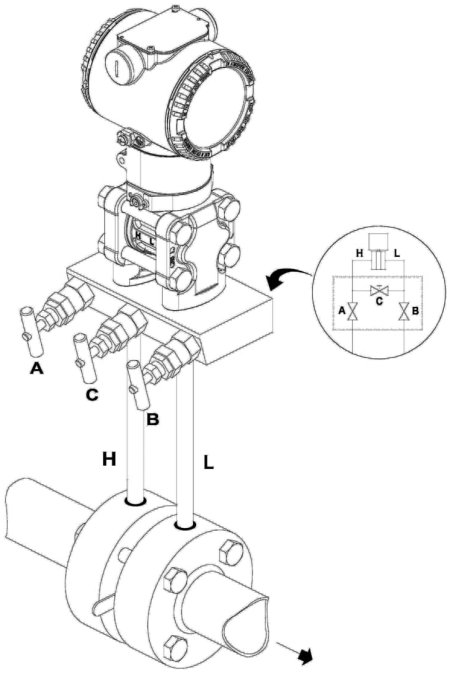


Figure 32: Gas or liquid flow measurement (transmitter and manifold)

⚠ CAUTION

Manifolds can be supplied both mounted on pressure transmitters and loose.

In the case of integral mounting, consider that:

- All adjustments should be conducted 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.

5.12.3 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.

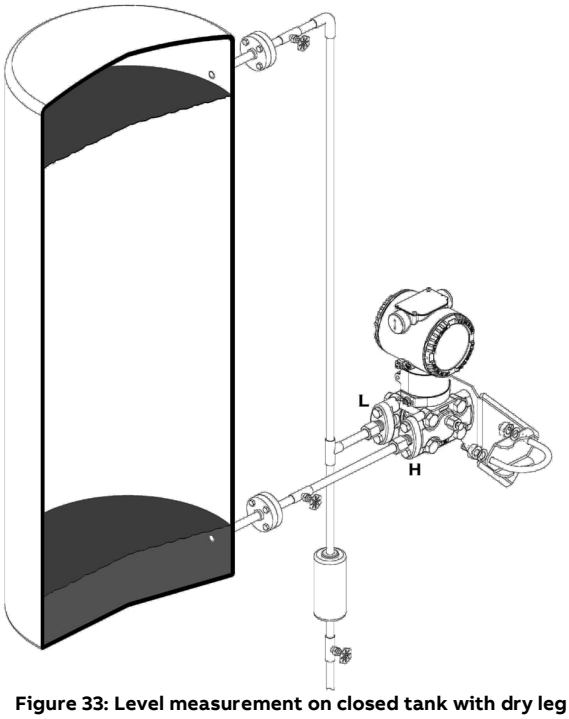


Figure 33: Level measurement on closed tank with dry leg

5.12.4 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.

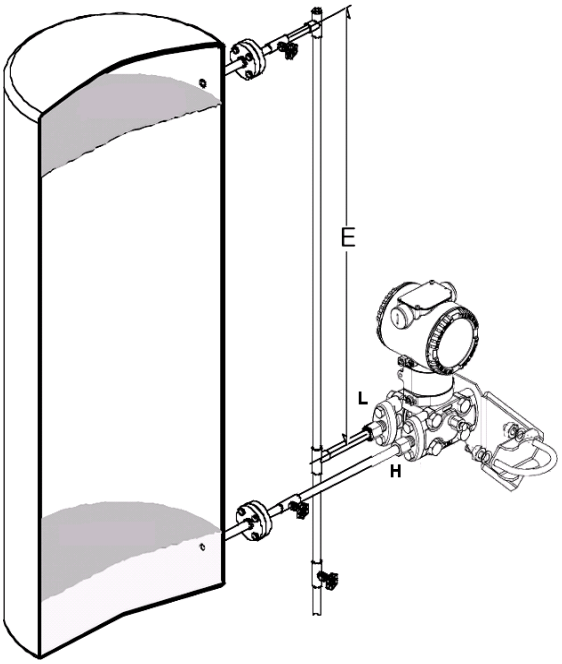


Figure 34: Level measurement on closed tank with wet leg

5.12.5 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).

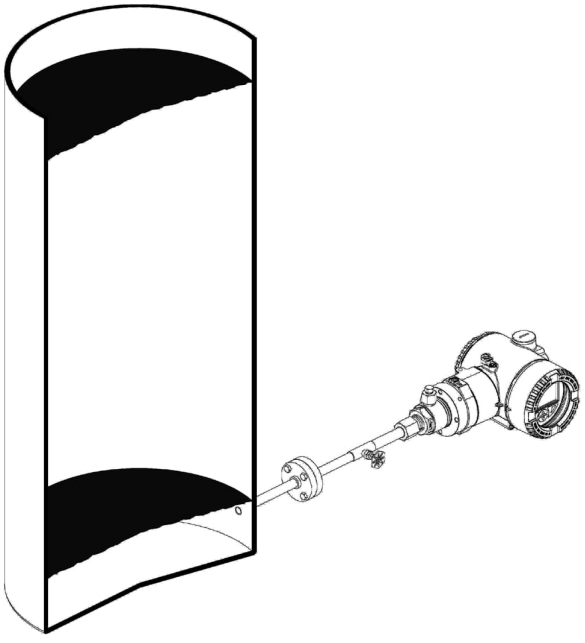


Figure 35: Level measurement on open tank with P-style transmitter

5.12.6 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.

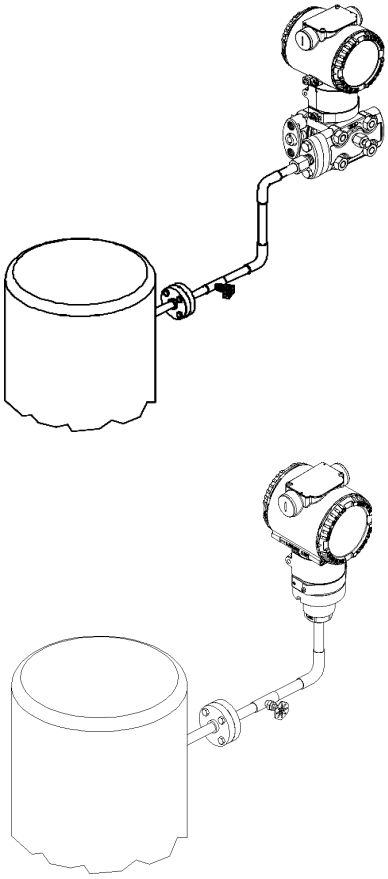


Figure 36: Gauge or absolute pressure measurement on a tank

5.12.7 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.

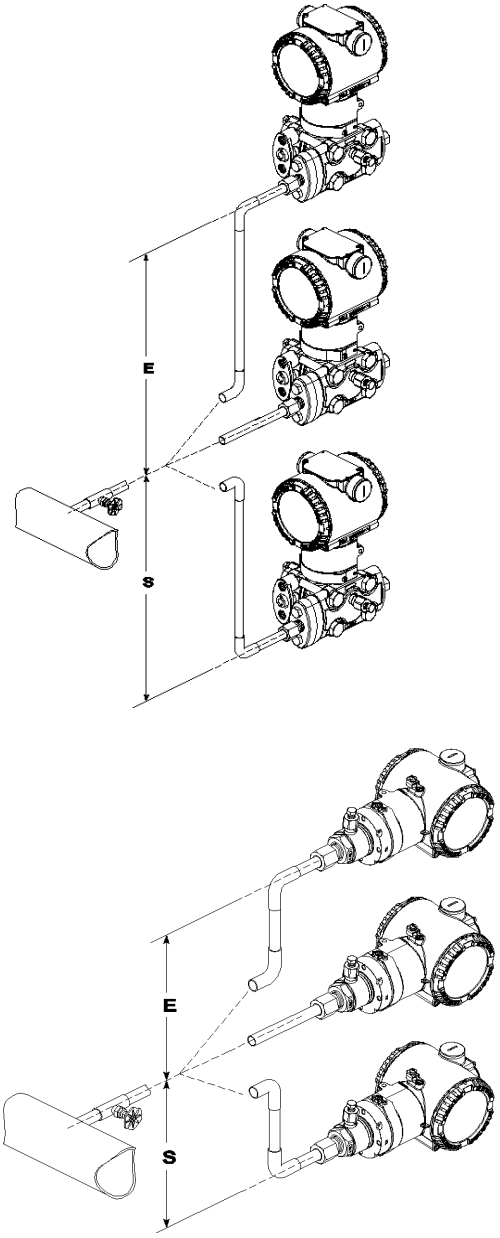


Figure 37: Gauge or absolute pressure measurement of a liquid in a pipe. (E: elevation S: suppression)

5.12.8 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.

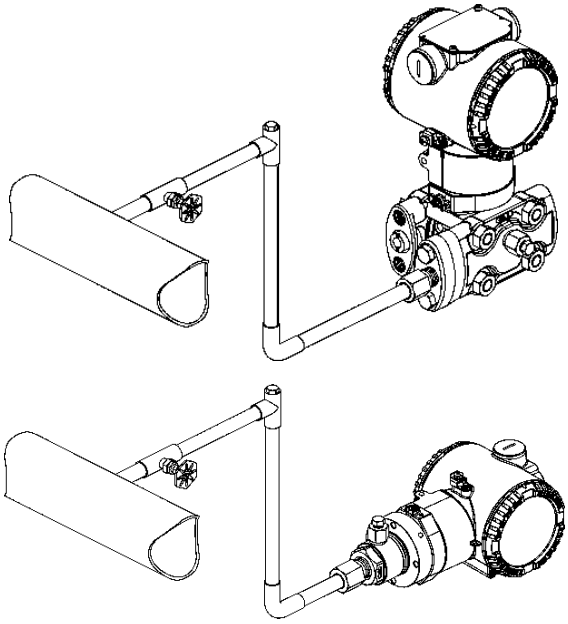


Figure 38: Gauge or absolute pressure measurement of condensable vapor

5.12.9 Pressure or absolute pressure measurement of a gas in a pipe

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

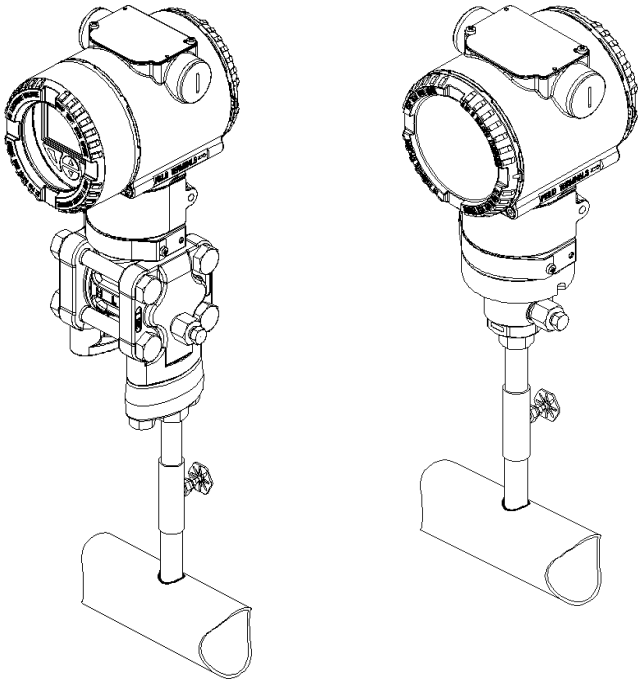


Figure 39: Gauge or absolute pressure measurement of gas in a pipe

6.Transmitter wiring

⚠WARNING

Observe the applicable regulations governing electrical installation. Connections must only be established in a dead-voltage state. As the transmitter has no switch-off elements, overvoltage protection devices, lightning protection, and voltage separation capacity must be provided at the plant (overvoltage/lightning protection is optional). Check that the existing operating voltage corresponds to the voltage indicated on the nameplate. The same lines are used for both the power supply and output signal. If the surge protection option is present, and the transmitter is installed in a Hazardous Area, the transmitter has to be power-supplied from a voltage source isolated from the mains (galvanic separation). Furthermore, the potential equalization for the entire powering cable must be guaranteed because the intrinsic safety circuit of the transmitter is grounded. An electric shock can result in death or serious injury. Avoid contact with the leads and terminals. High voltage, which may be present on leads, can cause an electric shock.

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

6.1 Cable connection

Depending on the design supplied, the electrical connection is established via a cable entry, M20 x 1.5 or 1/2-14 NPT thread. Connectors related to different protocols are available on request. The screw terminals are suitable for wire cross-sections of up to 2.5mm^2 (AWG 14).

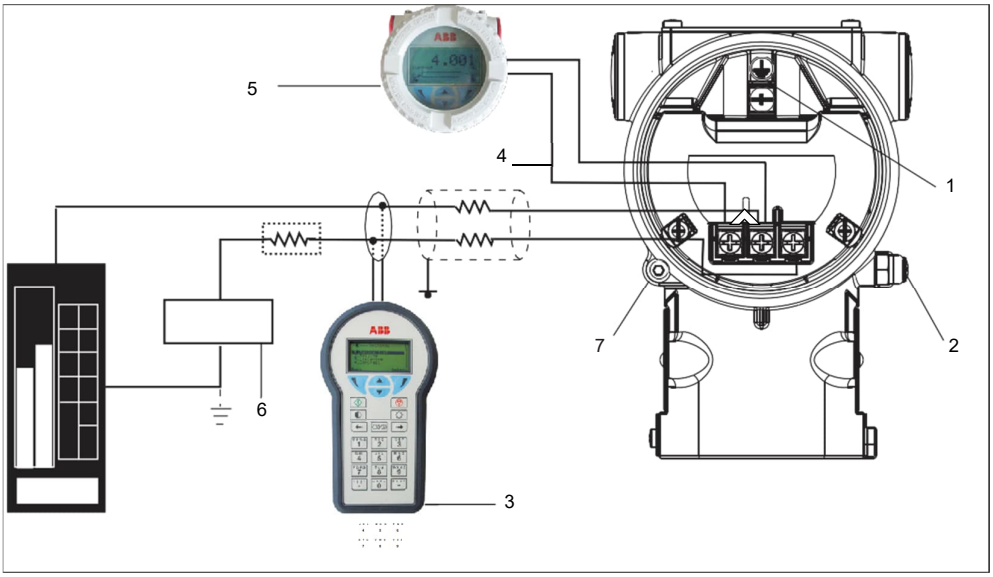
IMPORTANT

With Category 3 transmitters for use in “Zone 2,” a qualified cable gland for this type of protection must be installed by the customer (see the “Hazardous Area consideration” section). A thread is located in the electronics housing for this purpose. For transmitters with a “Flameproof enclosure” (Ex d) type of protection, the housing cover must be secured using the locking screw. The screw plug that may have been supplied with the transmitter must be sealed at the plant using Molykote DX.

The installer bears responsibility for any other type of sealing medium used. At this point, we wish to draw your attention to the fact that increased force will be required to unscrew the housing cover after an interval of several weeks.

This is not caused by the threads but is due solely to the type of gasket.

6.2 Analog output (HART) transmitter wiring



1 - Inner ground termination point

2 - External ground termination point

3 - Hand-held communicator

4 - Line load

5 - Remote indicator*

6 - Power source

7 Locking screw

Figure 40: HART transmitter connection scheme

A HART hand-held communicator may be connected at any wiring termination point in the loop, provided the minimum resistance is 250 ohm. If this is less than 250 ohm, additional resistance should be added to allow communications. The hand-held terminal is connected between the resistor and transmitter, not between the resistor and power source.

*Note: the metal link (⌓) between terminals should be removed only when a remote indicator is connected to Pxx300, Pxx500.

6.3 Supply requirement

For signal/power connection, use twisted, stranded pairs of wiring no. 18 to 22 AWG / 0.8 to 0.35mm^2 ø up to 5000 feet (1500 meters). Longer loops require a longer wire.

If a shielded wire is used, the shield should be grounded only at one end, not both ends. If wiring at the transmitter end, use the terminal located inside the housing marked with the appropriate sign.

The 4 to 20 mA dc output signal and the DC power supply to the transmitter are carried from the same pairs of wires.

The transmitter operates from 10.5 to 42 V DC with no load and is protected against reverse polarity connection.

For Ex ia and other intrinsically safe approval, the power supply must not exceed 30 V DC.

The minimum operating voltage increases to 12.3V DC with an optional surge protector or to 10.8V DC with optional conformity to NAMUR NE 21 (2004).

For the maximum power supply voltage, please refer to the top identification plate of the transmitter.

The actual possible line length of the electrical circuit depends on the total capacitance and resistance, and can be estimated using the following formula:

$$L = \frac{65 \times 10^6}{R \times C} - \frac{C_f + 10000}{C}$$

where:

L = line length in meters

R = total resistance in Ω (ohms) C

= line capacitance in pF/m

Cf = Maximum internal capacitance of the HART field devices located in the circuit, in pF.

Avoid routing cables with other electrical cables (with inductive load, etc.) or near large electrical equipment.

6.4 Wiring procedure

Follow these steps to wire the transmitter:

- 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.
- These connection ports may have a 1/2 inch internal NPT-F or M20 threads. Various adaptors and bushings can be fitted to these threads to comply with plant wiring (conduit) standards.
- Remove the housing cover of the “field terminals” side. See the indication on housing. In an explosion-proof/flame-proof installation, do not remove the transmitter covers when power is applied to the unit.
- Run the cable through the cable gland and the open port.
- Connect the positive lead to the + terminal, and the negative lead to the – terminal.
- Plug and seal the electrical ports. Make sure that when the installation has been completed, the electrical ports are properly sealed against entry of rain and/or corrosive vapors and gases.

⚠ WARNING

A cable, cable gland, and unused port plug must be in accordance with the intended type of protection (e.g., intrinsically safe, explosion-proof, etc.) and degree of protection (e.g., IP6x according to IEC EN 60529 or NEMA 4x). 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.

- If applicable, install wiring with a drip loop. Arrange the drip loop so the bottom is lower than the conduit connections and the transmitter housing.
- Before reassembling covers, the integrity of the cover O-rings must be checked. If damaged, they must be
- replaced with an original spare part. A slight grease layer should be applied for proper lubrication.
- Put back the housing cover, turn it to seat the O-ring into the housing, and then continue to hand-tighten until the cover contacts the housing metal-to-metal. In an Ex-d (explosion-proof) installation, lock the cover rotation by turning the set nut (use the 2mm Allen key supplied with the instrument.

6.5 Electrical connection via connectors

6.5.1 Harting connector (HART output versions)

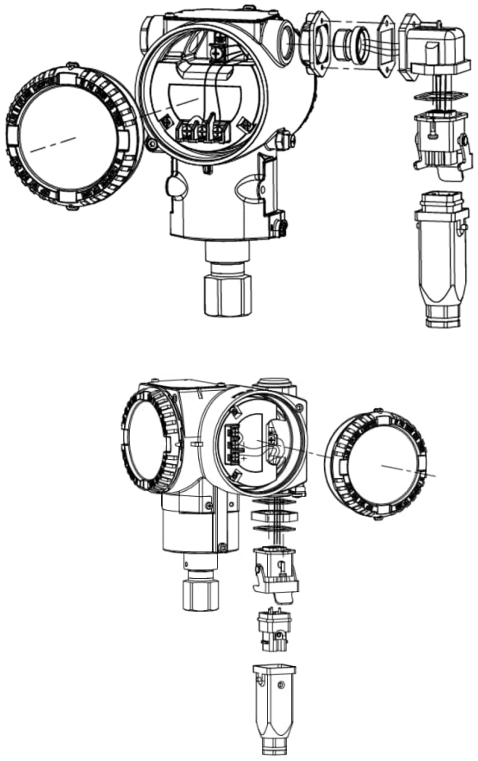


Figure 41: Harting HAN straight and angle connection connectors (supplied loose)

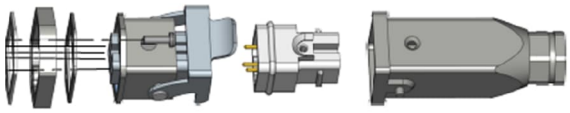
6.5.2 Assembling and connecting the socket connector

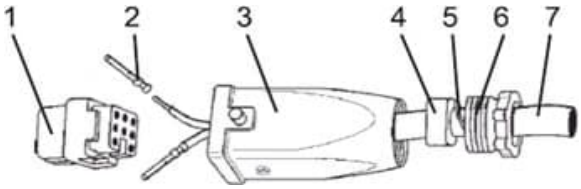
The socket connector for connecting the cable is supplied unassembled as an accessory for the transmitter.

- The contacts (2) are crimped or soldered onto the cable ends (wire cross-section of 0.75 … 1mm² (AWG 18 … AWG 17)), from which approx. 1.5 … 2cm (0.59 … 0.79 inch) of the sleeve and approx. 8mm (0.32 inch) of the insulation have been stripped; they are then inserted into the socket (1) from the rear.
- Slide the set screw (6), clamping ring (5), gasket (4), and housing (3) onto the cable in the order indicated before assembly (you may have to adjust the gasket (4) to fit the cable diameter).

IMPORTANT

Before you press the contacts completely into the socket, check the connection points again. Incorrectly inserted contacts can be removed by using a press-out tool (part no.: 0949 813) or a standard ballpoint pen as a makeshift tool. Please observe the connection diagram included with the plug.





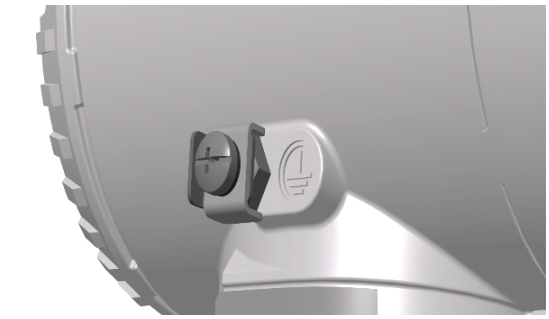
1 – Socket
2 – Contact
3 – Housing
4 – Gasket (can be cut)
5 – Clamping ring
6 – PG 11 set screw
7 – Cable (diam. 5–11mm or 0.2–0.43 inch)

Figure 42: Socket connector components

6.6 Wiring procedure

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 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 is up to the user to decide which one to use. The most effective transmitter case grounding method is direct connection to earth ground, with an impedance equal to or less than 5ohm.



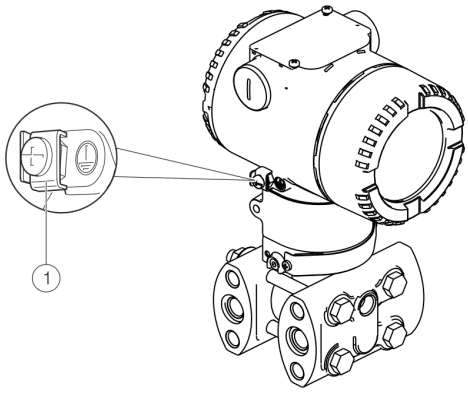


Figure 43: Ground connection on transmitter housing

6.7 Surge-protector-equipped terminal block (optional)

- The pressure transmitter housing with a surge protector (code S2) inside the terminal board must be connected using the grounding terminal (PE) by means of a short connection with the equipotential bonding.
- The equipotential bonding conductor must have a maximum cross-section of 4.00mm².

IMPORTANT

Test voltage withstand capability can no longer be ensured when this protective circuit is used.

6.8 Common mode voltages

The Pxx300, Pxx500 pressure transmitter operates within the specified levels of accuracy for common-mode voltages of up to 250V between lines and housing grounded.

7. Commissioning

Once the transmitter has been installed, it is put into operation by switching on the operating voltage.

Check the following before switching on the operating voltage:

- Process connections.
- Electrical connection.
- 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) PDx300 or PDx500

- 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 decommission the transmitter, conduct the steps in reverse order.

(Gauge & absolute models) PGx300, PGx500, PAx300, PAx500

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

To decommission the transmitter, conduct the steps in reverse order.

IMPORTANT

PAx300, PAx500 with sensor range C, F: Please be aware that the measuring equipment will have been overloaded by the atmospheric pressure due to the long periods of transportation and storage involved.

You will therefore need to allow a starting time of approx. 3 hours for PAx300, PAx500 models after commissioning until the sensor has stabilized to such an extent that they can be maintained.

When using “intrinsically safe” transmitters, if an ammeter is connected to the output circuit, or a modem is connected in parallel while there is a risk of explosion, the sums of the capacitance and inductance of all circuits, including the transmitter (see EC-type-examination certificate) must be equal to or less than the permissible capacitance and inductance of the intrinsically safe signal circuit (see EC-type-examination certificate for the supply unit). Only passive or explosion-proof devices or indicators may be connected. If the output signal stabilizes only slowly, it is likely that a large damping time constant has been set on the transmitter.

7.1 Analog and HART Communication models

If the pressure applied falls within the values indicated on the nameplate, the output current will be between 4mA and 20mA. If the pressure applied falls outside the set range, the output current will be between 3.5mA and 4mA if the range is undershot, or between 20mA and 22.5mA if the range is overshot (depending on the respective configuration).

7.2 Standard setting for normal operation 3.8mA/20.5mA

To prevent errors in flowrate measurements (PDx300 and PDx500) 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 a keypad or via the graphical user interface DTM (PENDING), FDI.

Unless otherwise specified, the “lin./sq. root transition point” is set to 5%, and the “cutoff” to 6%, of the flowrate end value by the manufacturer; a current that is <4mA or >20mA may also indicate that the microprocessor has detected an internal error. In this case, the alarm output can be configured via the local LCD with a keypad, via an external Hart hand-held terminal, or via a FDI, DTM (PENDING) -based configuration tool (FIM).

7.3 Standard setting for error detection (alarm) 3.7mA/21mA

The graphical user interface FDI, DTM (PENDING) or the LCD integral display (if installed) can be used to diagnose the error.

IMPORTANT

A brief interruption in the power supply results in a restart and initialization of the electronics (program restarts).

Alarm current:

- Lower limit: 3.6mA (configurable from 3.6mA to 4mA).
- Upper limit: 21mA (configurable from 20mA to 23mA, limited to 22mA for HART safety; apply for electronics release x.y.zz or later). Factory setting: high alarm current (21.0mA).

7.4 Write protection

Write protection prevents the configuration data being overwritten by unauthorized users.

If write protection is enabled, the “Z” and “S” buttons (both internal and external) are disabled. However, it is still possible to read out the configuration data using the graphical user interface DTM (PENDING), FDI, or another similar communication tool. The control unit may be leaded if required.**7.4.1 Write protection activation via external push button**

When the instrument features the external non-intrusive push buttons, the write protection function can be performed as follows:

- Remove the identification plate (see Figure 3 in Chapter 4) by releasing the holding screw lying on the bottom left corner.
- 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°.

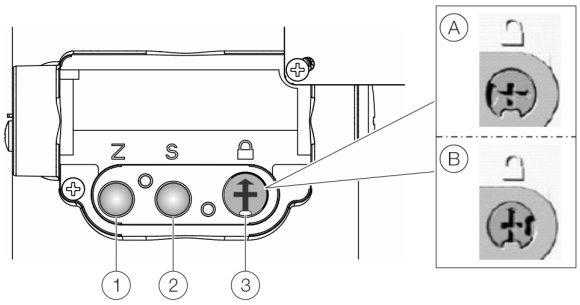


Figure 44: Write protection pushbutton

7.4.2 Write protection activation via dip switch

To activate this function, it is necessary to proceed as detailed below:

- Remove instrument cover and the digital LCD display if installed (on Pxx500).
- On the connection board, place dip switch 4 in the “up” position for Pxx500. On the LCD display (option D1) for Pxx300, place dip switch 4 in the “up” position.

7.5 Correcting the lower range value/zero shift

During the 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) to perform a zero shift correction. The correction must be made at dp (or p) = 0.

IMPORTANT

The button unit must be available for this purpose (option D2, D5, D6). If external push buttons are unavailable, act on the connection board directly by depressing the dedicated internal push buttons with a screwdriver. Operating the buttons using a magnetic screwdriver is not permitted because it may generate some interference with the magnetic pickup system.

7.6 Set lower range value

- Apply the lower range value pressure (4mA) from the process or from a pressure transducer. The pressure must be stable and applied with a high level of accuracy <<0.05% (observing the set damping value).
- Press the “Z” button (external pushbuttons are enabled with display option D2) or the “Zero” command on the connection board of the pressure transmitter for a few seconds. The output signal is set to 4mA. The span remains unchanged.

7.7 Correct the zero shift

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

- Pressing the “Z” button (under the nameplate on the top of the transmitter, enabled with display D2) or the “Zero” internal button (on the connection board) for a few seconds will cause the output to go at 4mA.
- It is also possible to align the digital PV value to zero.

To accomplish this, lift the dip sw. 3 on the communication board to the up (1) position and press the zero button. This functionality will align the PV digital value to 0, and if the calibrated span is zero-based, the output will go at 4mA.

- Using the optional LCD with keypad (“Configuration of the pressure transmitter using the integral LCD HMI” for further information).

IMPORTANT

The procedure described above does not affect the physical pressure shown; it only corrects the analog output signal. The analog output signal may therefore differ from the physical pressure (PV Value) shown on the digital display or the communication tool. To avoid this discrepancy, correct the zero position shift (zero shift) via the PV BIAS/OFF-SET functionality.

7.8 Installing/removing the external push buttons

- Loosen the screws that fix the nameplate and slide the plate to gain access to the local adjustments.
- Loosen the push buttons assembly screws (1), holding down the plastic element which is spring-loaded.
- Remove the gasket (3), which is positioned below the pushbutton plastic cover (2).
- The three push buttons (4) and the relevant springs (5) can now be removed from their seat.

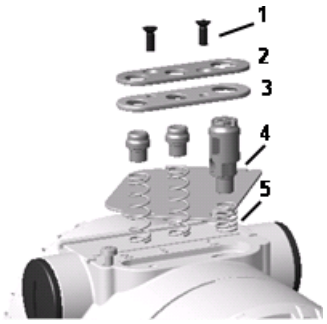


Figure 45: External push button assembly components

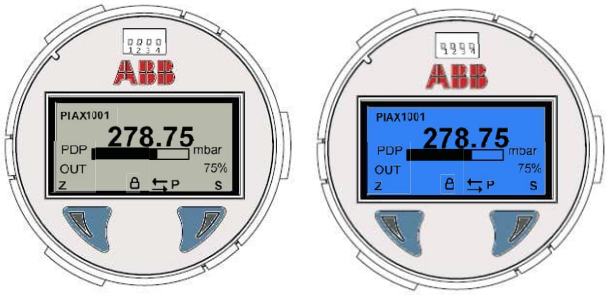
IMPORTANT

Setting the lower range value by using the push buttons is possible if write protection is not enabled.

7.9 Local display

According to the Pxx300 and Pxx500 series and LCD display option, the P-Series pressure transmitter is equipped with different display type. The possible variants follow below.

For Pxx300 with HART protocol (output code H), two different integrated LCD displays are available, as shown in the following figures. On the left is the version without backlight option “D1,” with the on-board Zero and Span buttons feature. On the right is the backlight version, option "D2," with on-board Zero and Span buttons, which also enable the Z and S push buttons located under the nameplate (with the dip switch 3 up, Zero and Span buttons act as set PV Bias & Reset PV Bias respectively, for both versions—with the dip switch 4 down on "D2" optional display, the backlight is disabled).



For Pxx500 transmitters with HART protocol (output code H), the LCD display (code D5) can be with an integrated keypad or with a TTG Smart HMI (code D6) activated keypad, with the same appearance as follows and with buttons used for menu-controlled configuration.

All displays feature an LCD dot matrix for clear visualizations. A possible view according to selected transmitter configuration follows.



The HART short tag (1) is shown in the upper-left corner with a maximum of 8 characters.

Value (2) is displayed with 5 digits, sign, and decimal point for one-line visualization or with 8 digits, sign, and decimal point for two-line visualization.

The engineering unit (3) can be any from the HART list.

A bar graph (4) also provides a different format of indication, with the relevant percentage for a selectable variable.

The polarity symbol (5) is displayed when the high-/low-pressure sides of a differential pressure transmitter are configured to work as “reverse” action, via the HART command. Once the transmitter is connected to the process, it is possible to change the polarity of the process connection via software instead of mechanically reversing the impulse lines.

The lock symbol (6) appears when the write protection is enabled, or either the local operation has been disabled or the device lock has been activated via HART commands.

The ID of variables (7) is a kind of acronym which identifies the variable currently displayed, with the following possibilities.

ID	Description
PDP	Pressure value before transfer function/linearization
ENG	Measured value after transfer function (scaled output)
OUT	Analog current value in mA
PV%	Analog output in percentage of calibrated range
TZ1	Counter of totalizer 1
TZ2	Counter of totalizer 2
BCH	Batch counter
ST	Sensor temperature
SP	Static pressure
HMI	Measured value after display scaling (HMI transfer function and scaling)

7.10 Installing/removing the LCD display

- Unscrew the housing cover of the communication board/ LCD side.
- D5/D6 display versions can be installed in different positions (90° rotations) and must be removed as per the instructions listed in paragraph 5.9

IMPORTANT

With an Ex d/flameproof design, please refer to the “Securing the housing cover in flameproof areas” section.

- D1/D2 display installation must be performed carefully plugging in sensor connections.

IMPORTANT

Retighten the housing cover until it is hand-tight. If necessary, refer to the “Securing the housing cover in flameproof areas” section. The picture shows D5/D6 display versions.

D1/D2 windowed cover is dimensionally different (short) but features the same threads and requires the same installation practices.

7.11 Securing the housing cover in flameproof areas

Each of the front faces of the electronics housing features a locking screw (hex-head socket screw) on the bottom.

- Install the housing cover to the housing by hand-tightening it.
- Turn the locking screw counterclockwise to secure the housing cover. This involves unscrewing the screw until the screw head stops at the housing cover.

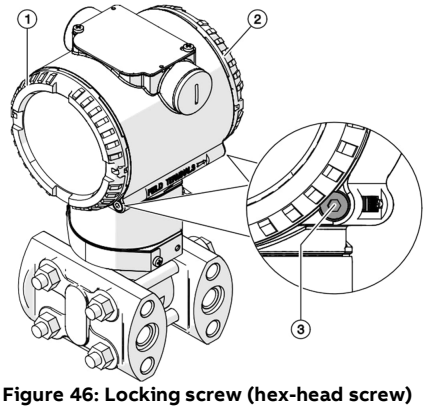


Figure 46: Locking screw (hex-head screw)

8 Operation

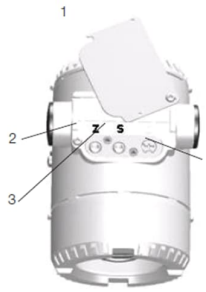
8.1 Local button functionality (display code D2, D5, D6)

Pxx300, Pxx500 allow local adjustments via the on-board non-intrusive push buttons when the D2, D5, D6 display is selected. The push buttons are located under the identification nameplate. To gain access to the local adjustments, release the nameplate's fixing screws and rotate the identification plate clockwise.

⚠ WARNING

Potential damage to parts

Operating the control buttons with magnetic screwdrivers is not permitted



1 - Identification nameplate
2 - Zero pushbutton
3 - Span pushbutton
4 - Write-protection pushbutton

Figure 47: Pushbutton functionalities

8.2 Factory settings

Transmitters are calibrated at the factory to full span (0 to URL) or according to the customer's span if the specified code is SU. The calibrated range and tag number are provided on the tag plate. If this data has not been specified, the transmitter will be delivered with the following configuration:

Lower Range Value (LRV) (4mA)	Zero
Upper Range Value (URV) (20mA)	Upper Range Limit (URL)
Output transfer function	Linear
Damping	1 second
Transmitter failure (alarm)	Upscale (21mA)
Optional LCD HMI scale	1 line PV and output signal bar graph

IMPORTANT

All the configurable parameters here on the left can easily be modified, either via the optional LCD HMI with a HART hand-held terminal or with a compatible software solution. Information regarding flange type and material, O-ring materials, and filling liquid type is stored inside the device's nonvolatile memory.

8.3 Configuration type

Pressure transmitters can be configured as follows:

- Without an LCD display: by external Zero and Span push buttons on Pxx500 or through the internal keypad (communication board) on Pxx300.
- With an LCD display through the easy-set menu: by external Zero and Span push buttons or the internal keypad for Pxx500 through the physical buttons on the integral LCD with display code D1, D2, D5, or external Zero and Span pushbuttons; code D2, D5 for Pxx300.
- With a hand-held terminal
- Using a PC/laptop via the graphical user interface DTM (PENDING), FDI.

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 for Pxx500 and the internal keypad (communication board) on Pxx300.

The transmitter has been calibrated by the manufacturer based on the order information. The tag plate contains information about the "lower range value" and "upper range value" set. In general, the first pressure value (e.g., 0 mbar) is always assigned to the 4mA signal (or 0%), while the second pressure value (e.g., 400mbar) is always assigned to the 20mA signal (or 100%). 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

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, as 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. It is recommended that the damping is set to 1 second (PAS500). With a measuring range less than or equal to 650mbar abs., please be aware that the measuring equipment will have been overloaded by the atmospheric pressure due to the long transportation and storage periods involved. You will therefore need to allow a starting time of approx. 3 hours for PAS300, PAS500 models after commissioning until the sensor has stabilized to the specified extent.

8.5 Configuring the transmitter without an integral LCD HMI

- Apply the pressure for the "lower range value" and wait approx. 30s until it has stabilized.
- Press the "Z" button (internal or external) for at least 5s. This sets the output current to 4mA.
- Apply the pressure for the "upper range value" and wait approx. 30s until it has stabilized.
- Press the "S" button (internal or external) for at least 5s. This sets the output current to 20mA.
- If required, reset the damping to its original value.
- Record the new settings. The respective parameter will be stored in the nonvolatile memory 10s after the "Z" or "S" buttons are last pressed.

IMPORTANT

On Pxx300 without an LCD integral display, the communication board has two LEDs above the physical push buttons. When Zero or Span is pressed, the corresponding LED blinks, indicating if the zero/span operation is:
- "Slow Blink": operation is running
- "Fixed Blink": operation completed successfully
- "Fast Blink": failed operation.

8.6 HMI as feedback of the local push button operations

As a consequence of the operations described in Section 8.5, when the Z or S buttons are released, the feedback of the executed operation is displayed at the bottom of the LCD (same position as per diagnostic messages):

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

8.7 Correction of zero shift caused by installation with PV Zero Bias/Offset

- Raise dip switch 3 to 1 (up) position.
- Press the "Z" button. This sets the output current to 4mA. The digital PV value will be set to 0 (zero).
- To reset the PV zero bias setting, press the "S" button.

IMPORTANT

When the transmitter has been re-zeroed following the above procedure, a zero bias/offset value is applied and stored in the transmitter memory.

This action can be performed both by using the external, non-intrusive push buttons (optional display D2) and the on-board buttons of the integrated LCD (optional display D1/D2, which become respectively associated with the letters B and R in the display's lower corners.

For Pxx300 models, after releasing the Z and S buttons (on LCD or external) during range values configuration or PV to the zero bias/reset PV bias setting, the transmitter displays a message to confirm or abort the operation, showing Yes and No in the display's bottom corners. Proceed accordingly by acting on the corresponding button: Z for NO, S for YES.

8.8 Hardware settings

8.8.1 Pxx500 with HART protocol (code H) (PENDING)

There are 6 dip switches located on this kind of secondary electronics.

Switches 1 and 2 allow the REPLACE MODE for sensor or secondary electronics.

Switch 3 identifies the external push buttons' functionalities: Zero/Span adjustments or PV Bias-Offset/PV Bias Reset.

Switches 4 and 5 are for Fail Low/Fail High selection.
Switch 6: not used.

The electronic label explains how to perform all the possible selections. All operations with the dip switches should be conducted when the transmitter is powered off to upload the new configurations at instrument start-up.

Replace mode (switches 1 and 2)

Switches 1 and 2 are usually down, in the "0" position. They are moved when a replace operation is required.

Switch 1 is required to be up in the "1" position before powering up the transmitter, when the user needs to replace the electronics or the sensor.

Switch 2 down in the "0" position allows the replacement of the secondary electronics. It must be moved to this position before powering up the transmitter.

Switch 2 up in the "1" position indicates that a new sensor has been installed.

AFTER ANY REPLACE OPERATION MOVE THE RELEVANT SWITCHES DOWN TO THE "0" POSITION.

Push buttons mode (switch 3)

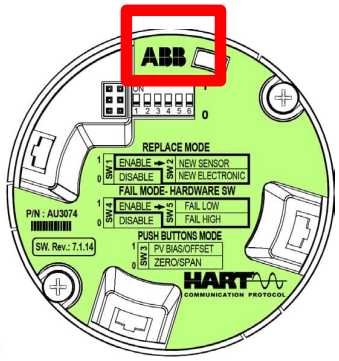
Dip switch 3 is set at the factory in the "0" position. This means the external push buttons perform the zero/span adjustments. If the user puts this switch in the "1" position, the zero push buttons will modify the PV Bias-Offset, and the span push button will reset the PV Bias-Offset value.

Fail mode (switches 4 and 5)

Should the user modify the factory-defined parameters for the fail-safe output condition in the event of transmitter failure, it is necessary to enable the modification by putting dip switch 4 in the "1" position. It is therefore necessary to choose whether the output must go upscale or downscale.

Dip switch 5: in the "0" position, the output is driven upscale (high alarm 21mA). In the"1" position, the output is driven downscale (low alarm 3.6mA)

Figure 48a: Dip switches' position on Pxx500 communication board



8.8.2 Pxx300 with HART protocol (code H)

On PDx300, PGx300, PAs300 the HART version features 4 dip switches on an integrated LCD display.

Switches 1 and 2 are for the Fail Low/Fail High selection.

Switch 3 identifies the external push buttons' functionalities: Zero/Span adjustments or PV Bias-Offset/PV Bias Reset (Z and S letters in the lower corners of display change respectively to B and R).

Switch 4 allows the user to enable the write protection or disable the backlight on the LCD display code D2. The dip switch functions are as follows:

Fail mode (switches 1 and 2)

By moving dip switch 1 to the up position, the operator can enable dip switch 2's hardware failure direction functionality. The hardware failure direction selection cannot be modified through LCD, HART hand-held terminals, or DTM (PENDING), FDI.

If the user wishes to modify the factory-defined parameter for the fail-safe output condition in the event of transmitter failure, it is necessary to put dip switch 2 in the up position. The output will therefore go downscale. See the fail-safe values below:

In the down position, the output is driven upscale (high alarm 21mA).

In the up position, the output is driven downscale (low alarm 3.6mA).

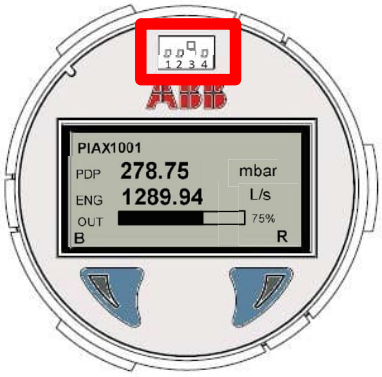
Push buttons mode (switch 3)

Dip switch 3 is set at the factory in the down position. This means that the external push buttons perform the zero/span adjustments. If the user puts this switch in the up position, the zero push buttons will modify the PV Bias-Offset, and the span push button will act on the PV Bias-Offset value.

Write lock (switch 4)

If the user wishes to protect the configuration from unauthorized writing, dip switch 4 must be moved to the up position. Dip switch 4 is used to enable the backlight display when LCD option D2 is selected for the Pxx300HART version, and the write protection is performed by the external button.

Figure 48a: Dip switches on integrated LCD display with on-board buttons and dip switch 3 "up"



IMPORTANT

The integrated LCD display available for the Pxx300 HART version can feature the Zero and Span push buttons. In the LCD display backlight version, the Zero, Span, and Write Protect buttons are installed in the factory below the instrument identification plate, as shown in Figure 45.

8.9 Configuration using the optional LCD HMI with keypad (menu-controlled) (PENDING)

The integral LCD option (D5 or D6 option) is connected on the Pxx500 HART 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 conducted. The keypad activation procedure differs between the TTG Smart HMI (optional display D6) and the conventional LCD display, option D5.

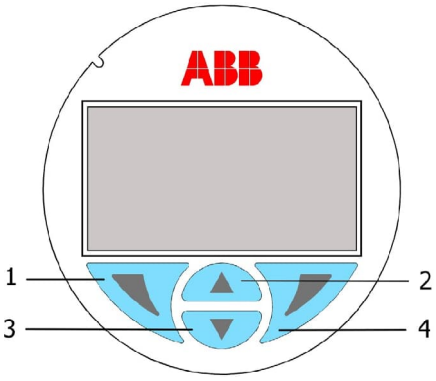


Figure 49: Display keypad of D5 and D6 LCD display options

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

- The menu/submenu name is shown at the top of the LCD display.
- The number/line of the currently selected menu item is displayed on the upper right of the LCD display.
- A scroll bar is located on the right edge of the LCD display, showing the relative position of the currently selected menu item within the menu.
- Both 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 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

The integrated LCD (optional display D1/D2) is located in the housing compartment with the windowed cover of the Pxx300 HART version. It can be used to visualize the process's measured variables and configure the transmitter through the "Easy Setup menu," which is the only menu available for Pxx300 models.

8.10 LCD (D5 and D1, D2 option) activation considerations

Gain access to the display by unscrewing the windowed cover. Please observe the Hazardous Area prescription before proceeding with the cover removal. For activation, see below.

8.11 TTG Smart HMI (D6 option) activation considerations (PENDING)

The TTG technology allows the user to activate the keypad on HMI without needing to open the windowed cover of the transmitter. The capacitive pickups detect the presence of a finger in front of the respective button activating the specific command. At transmitter power-on, the HMI automatically calibrates its sensitivity. It is mandatory for the TTG HMI's proper functioning that the cover is properly tightened at power-on.

If the cover has been removed to access the communication board, it is recommended to power off and power on the transmitter again once the windowed cover has been set in place and properly tightened.

IMPORTANT

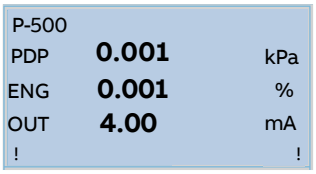
Do not operate the TTG display (D6 option) for 30 seconds after transmitter power-on. During this period, the transmitter is calibrating the capacitive switches.

8.12 Activation procedure for LCDs

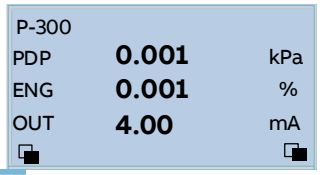
LCD displays D5 and D6 selectable for Pxx500 HART and Safety versions feature 4 push buttons (see Figure 49) that allow the navigation through the various functions.

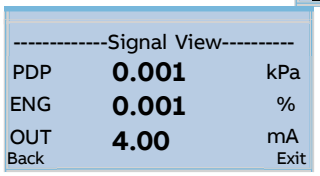
- Press buttons (2) ▲ and (3) ▼ simultaneously until two icons appear at the bottom corners of the display.
- Press button (4) ▶ under the right icon within one second to access the HMI menu or press the left button (1) ◀ to access the instantaneous diagnostic messages.

For TTG display, if the incorrect button is pushed, the following display will appear with "!" marks in the corners.



For the Pxx300 HART version, to access the configuration menu, press the Z and S buttons simultaneously on the D1, D2 display or externally under the nameplate. Two icons will appear at the bottom corners of the display. Then press the right button or external S button for 2s to access the menu or press the left button or external Z button to access signals view or diagnostic messages. If the buttons associated with the bottom icons are not pushed, after a few seconds, the transmitter returns to normal operation, displaying letters in the corners.





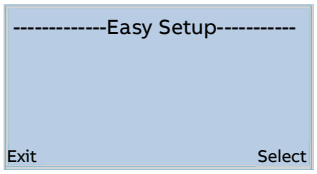
The Pxx300 HART version features only the Easy Setup menu in a dedicated structure. Once accessed, the menu should be completed until the last HART Revision step is reached. Then return to the normal display view. For each step, follow the instructions on the screen, remembering that for alfa/numeric parameters, it is required to move digit by digit until the right bottom corner reads OK. Pressing the right on-board button or the external S button confirms the operation, while pressing the left on-board button or the external Z button changes the display to CANCEL to abort the operation with the associated button (right/S).

IMPORTANT

After 30 seconds without action on on-board buttons or on the external Z/S buttons, the Pxx300 pressure transmitter automatically exits the configuration menu.

For the Pxx500 HART and Safety HART versions, the HMI menu is divided into the following sections, which can be selected by acting on keys (2) ▲ and (3) ▼ once. On the display, the desired sub-menu icon will be visualized. Confirm your selection with [SELECT] key (4) ▶.

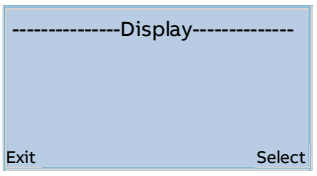
Follow the instruction on the screen to perform the configuration of the different parameters.



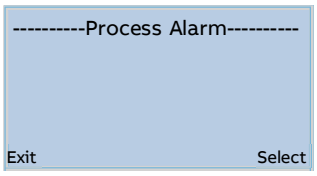
This menu allows the verification and parameterization of the basic configuration of Pxx500 pressure transmitters. The menu-driven structure will guide you in choosing the interface language, the tag number configuration, the engineering units, the URV and LRV (upper range value and lower range value), the transfer function (linear or square root), the damping time, the auto set zero (set the input measured value to 4mA and the PV value to 0), and the display visualization mode (the value that needs to be visualized on the LCD).



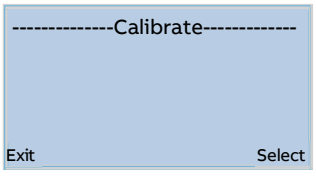
This menu allows the verification and parameterization of the entire device. The menu-driven structure includes the write protection enabling, process variable settings (unit, LRV and URV), transfer function selection (linearization type and low flow cutoff), and output scaling (unit according to the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



This menu allows the setup of different functions relevant to the display itself. The menu-driven structure will guide you through the choice of some functional aspects like the display language and contrast. It is also possible to choose which details you want to see on the display: one or two lines, with or without a bar graph. Inside this menu, it is possible to set a protection password (security) and the display scaling (linearization type, unit, LRV, URV). A display revision number is available.

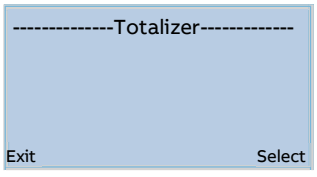


This menu allows the parameterization of the process alarm. The menu-driven structure will guide you through the choice of the fail-safe functions such as the saturation limits, the fail level (upscale or downscale), and the fail-safe type which is set as software at the factory. The software fail-safe type means that the fail direction can be set via EDD, DTM (PENDING), FDI, or display. If hardware is selected, the software settings are disabled, and the user must use the dip switches on the



electronic board.

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), the output setting (set to 4 or 20mA), and at the end, you can reset these parameters (to factory sensor trimming, user sensor trimming, or factory output trimming).

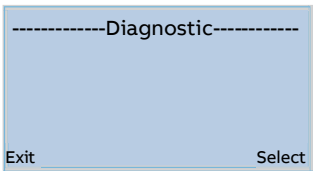


This menu allows the setup of the on-board totalizer. To have the totalizer running, a flow unit must be selected in advance, and it must then be placed in “run” status. Different modes can be selected:

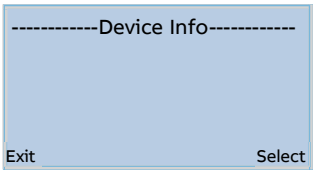
- Normal: standard totalization for the forward flowrate.
- Batch: this kind of setting can be used only on totalizer 1. You need to set a predefined value. When totalization reaches that value, the totalizer will restart from zero, and the batch number increases by one.
- Forward/Reverse: totalizer 1 monitors the forward flow, whereas totalizer 2 monitors the reverse flow.
- Forward – Reverse: the value you will see on the display by applying this mode is the difference between the forward and reverse flowrates.
- Forward + Reverse: the value you will see on the display by applying this mode is the sum of the forward and reverse flowrates.

Another important setting is the conversion factor which is to be used if the totalized unit is not directly related to the scaled one (i.e., m3/h totalized in kg). The conversion factor is basically a multiplier.

The user can add/change/delete the password, as well as reset all totalizers.



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 (set to 4 and 20mA and set the output value).



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



The last section of this structured and driven menu allows you to change the communication tag and the MULTI-DROP mode with the device’s HART address numbers.

8.13 Easy Setup—Pxx300 HART version

Pxx300 models feature the Easy Setup menu in a dedicated structure. Once accessed, the menu should be completed until the last step is reached. Then return to the normal display view.

For each step, follow the instructions on the screen, remembering that for alfa/numeric parameters, it is required to move digit by digit until the right bottom corner displays OK.

When the right on-board button is pressed, the operation is confirmed When the left on-board button is pressed, the display changes to Cancel to abort the operation with the associated button.

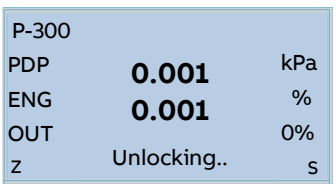
Follow the instruction on the screen to perform the configuration of the different parameters.

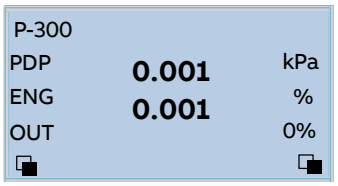
This menu allows the verification and configuration of the basic configuration of the PXS300/PXD300 pressure transmitter.

Note

If the on-board buttons have not been used for 30 seconds, the transmitter automatically exits the configuration menu.

Open the Menu Easy Setup



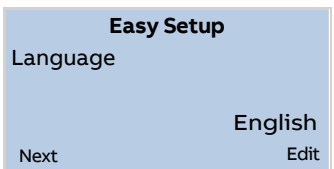


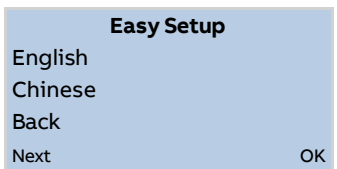
1. To access the configuration menu, press the "Z" and "S" buttons on the on-board LCD display simultaneously for 5 seconds until the unlocking bar is fully loaded. When the display's buttons are released, two icons will appear at the bottom corners of the display.

If the buttons have not been used for 30 seconds, the transmitter returns to normal operation, displaying letters in the corners.

2. Then press the right button for 3 seconds to access the Easy Setup menu or press the left button to access the signals view or diagnostic messages.

Selection of the menu language – 1

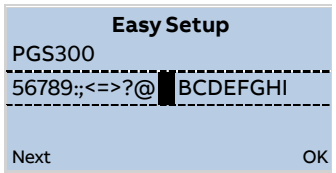




3. Use to call up the edit mode.
4. Use to select the desired language.
5. Confirm the selection with .

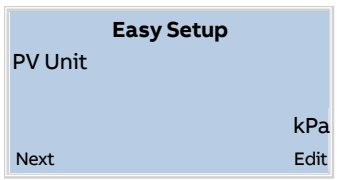
Enter the TAG number (maximum 8 digits) – 2

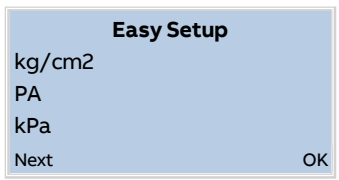




1. Use to call up the edit mode.
2. Use to select the desired character.
3. Confirm the selection with .
4. Select the other characters as described.
5. Confirm the entered TAG with .

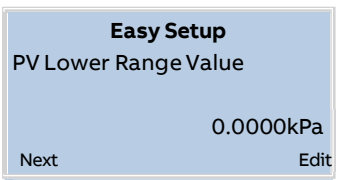
Selection of the PV unit – 3

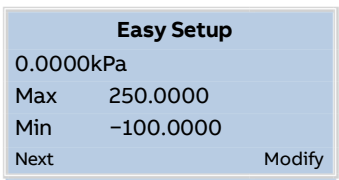


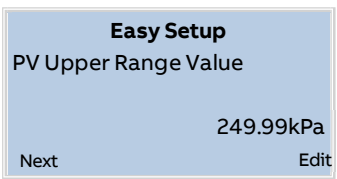


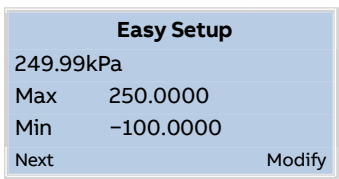
1. Use to call up the edit mode.
2. Use to select the desired unit.
3. Confirm the selection with .

Enter the PV lower and upper range value – 4, 5





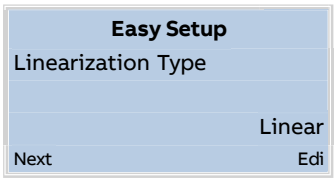


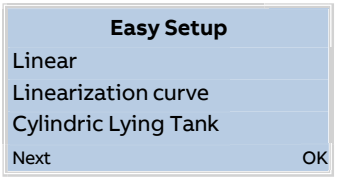


4. Use (Edit) to call up the edit mode.
5. Use (Next) to select the first digit.
6. Use (Modify) to change digit.
7. Repeat previous steps.
8. Confirm the entered value with OK.

...Easy Setup—Pxx300 HART version

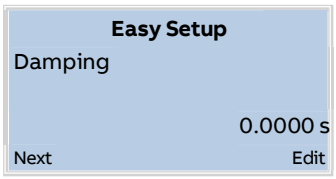
Selection of the linearization type – 6

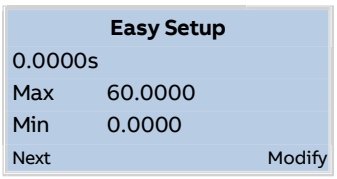




1. Use to call up the edit mode.
2. Use to select the desired linearization type.
3. Confirm the selection with .

Set the damping value – 7

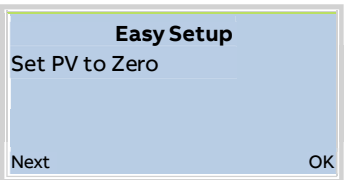




1. Use (Edit) to call up the edit mode.
2. Use (Next) to select the first digit.
3. Use (Modify) to change digit.
4. Repeat the previous steps.
5. Confirm the entered value with OK.

Set PV to Zero – 8

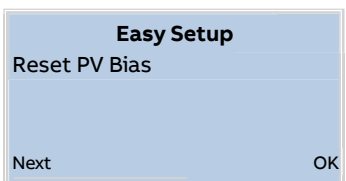
Only if the "Set PV to Zero" action has not yet been set! Refer to **Correcting the lower range value/zero shift** on page 37.



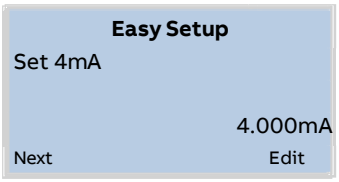
Set the input measured value to 4mA and the PV value to 0

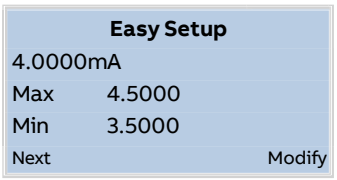
Reset PV Bias – 9

Only if the "Set PV to Zero" action has not yet been set. Refer to **Correcting the lower range value/zero shift** on page 37.



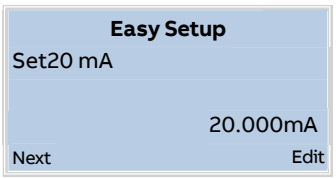
Calibrate 4mA current output value – 10

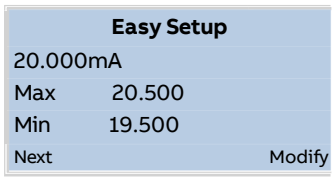




1. Use (Edit) to call up the edit mode.
2. Use (Next) to select the first digit.
3. Use (Modify) to change digit.
4. Repeat the previous steps.
5. Confirm the entered value with OK.

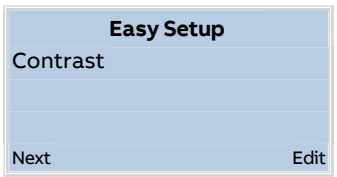
Calibrate 20mA current output value – 11

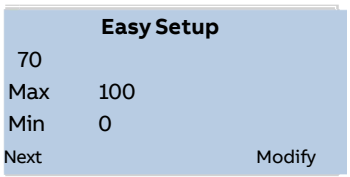




1. Use (Edit) to call up the edit mode.
2. Use (Next) to select the first digit.
3. Use (Modify) to change digit.
4. Repeat the previous steps.
5. Confirm the entered value with OK.

Set the display contrast – 12





1. Use (Edit) to call up the edit mode.
2. Use (Next) to select the first digit.
3. Use (Modify) to change digit.
4. Repeat the previous steps.
5. Confirm the entered value with OK.

Selection of the display mode – 13

Easy Setup	
Display Mode	
Next	Edit

Easy Setup	
1 Line	
1 Line Bar	
1 Line Scroll	
Next	OK

1. Use to call up the edit mode.
2. Use to select the desired display mode view.
3. Confirm the selection with .

Selection of the display Line 1 View – 14

Easy Setup	
Display Line 1 View	
Next	Edit

Easy Setup	
Pressure	
Current Output	
Output Percent	
Next	OK

1. Use to call up the edit mode.
2. Use to select the desired Line 1 View.
3. Confirm the selection with .

Selection of Line 1 Decimals – 15

Easy Setup	
Line 1 Decimals	
3	
Next	Edit

Easy Setup	
0/1/2/3/4/5	
Auto adjust	
Next	OK

1. Use to call up the edit mode.
2. Use to select the desired Line 1 Decimals Point.
3. Confirm the selection with .

*Unless otherwise specified, the standard configuration of the display is "Auto Adjust."

Selection of Polarity Inversion – 16

Easy Setup	
Polarity Inversion	
Next	OK

1. Use to apply polarity inversion.
2. Use to select the next menu.

Selection of Configuration Change Counter – 17

Easy Setup	
Conf. Change count	
Next	OK

Easy Setup	
1	
Next	OK

1. Use to call up and view the configuration change counter.
2. Use to select the next menu

If the setting of the "Display mode" is "2 lines," the position of the "Conf.Change count" menu is displayed at the end of the "Easy Setup" menu.

Selection of the display Line 2 View – 17

Easy Setup	
Display Line 2 View	
Next	Edit

Easy Setup	
Pressure	
Current Output	
Output Percent	
Next	OK

1. Use to call up the edit mode.
2. Use to select the desired Line 2 View.
3. Confirm the selection with .

Selection of Line 2 Decimals – 18

Easy Setup	
Line 2 Decimals	
3	
Next	Edit

Easy Setup	
0/1/2/3/4/5	
Auto adjust	
Next	OK

Use to call up the edit mode.

1. Use to select the desired Line 2 Decimals Point.
2. Confirm the selection with .

*Unless otherwise specified, the standard configuration of the display is "Auto Adjust."

Selection of the display Bar graph View – 19

Easy Setup	
Bar graph View	
Next	Edit

Easy Setup	
Pressure	
Current Output	
Output Percent	
Next	OK

1. Use to call up the edit mode.
2. Use to select the desired Bar graph View.
3. Confirm the selection with .

The LCD indicator now shows the process display. The Easy Setup menu has been completed.

8.14 Damping (DAMPING)

Pressure transmitter output signals that are noisy as a result of the process can be smoothed (damped) electrically.

The additional time constant can be set between 0s and 60s in increments of 0.0001s. Damping does not affect the value shown on the digital display as a physical unit. It only affects the parameters derived from this, such as the analog output current, free process variable, input signal for the controller, and so on.
The damping adjustment can be performed in different ways:

- Via the local HMI:

  Enter the menu: > Device Setup > Output Scaling > Damping.

  Set the damping to the desired value.

- Via the FIM/FDI Package:

  See FIM/FDI Package Operating Instructions.

- Via the Hand-held Terminal:

  See relevant operating instruction.

8.15 Transfer function

The Pxx300, Pxx500 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 an orifice plate, integral orifice, Venturi or Dall tube, and similar.
- Sq. Root (x3) for open channel flow measurements using a 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 an FIM/FDI Package). The transfer function can be applied to analog signal at 4 to 20mA only or also to the indication (in engineering units).

8.15.1 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 to 0% output—4mA, at 100% input, corresponds to 100% output—20mA).

No further settings are possible here.

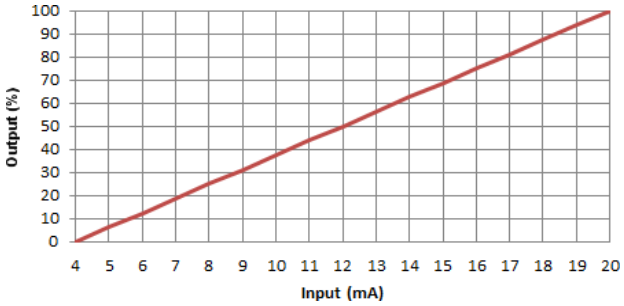


Figure 50: Linear output

8.15.2 Square root

Using this function, the relation between the indicator scale/output value and the input value is the square root.

To avoid extremely high gain errors with an input value approaching 4mA, the indicator scale/output value is equal to Zero Point up to a programmable CUTOFF value. The cutoff value can be customized between 0% and 20%, referred to in the indicator scale/output range; the default value is 6%.

The indicator scale/output value can then be linear with a proper slope and intercept zero up to a programmable LIN POINT value. The linearization point value can either be 0% or between 5% and 20%, referred to in the indicator scale/output range; the default value is 5%. Finally, the square root transfer function is applied.

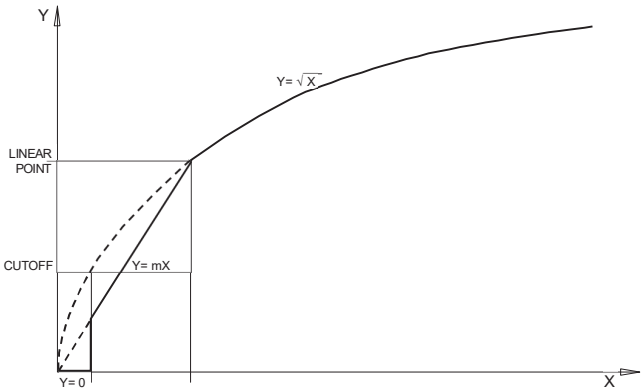


Figure 51: Square-root transfer functions

8.15.3 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 h3/2 or square root of h3.

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 abovementioned formulas.

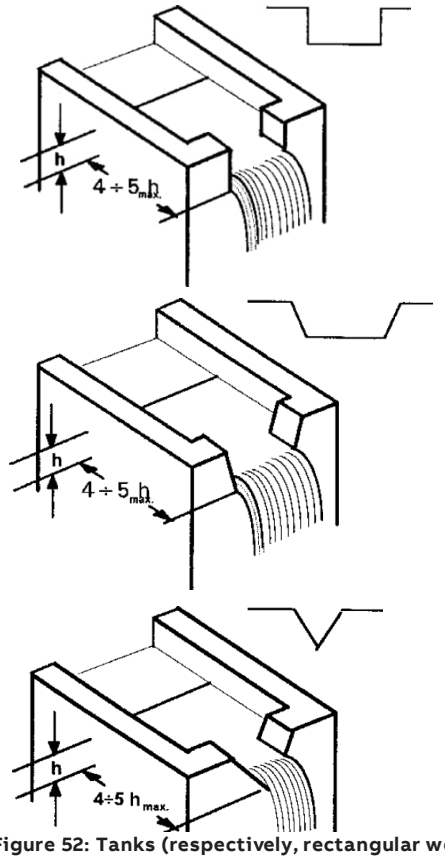


Figure 52: Tanks (respectively, rectangular weir, trapezoidal weir and V-notch weir)

8.15.4 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 h5/2 or the square root of h5.

Using this function, the output (in % of the span) is proportional to the square root of the fifth power of the input signal in % of the calibrated span: The instrument gives an output proportional to the rate of flow calculated using the Kingsvater-Shen formula.

8.15.5 Custom linearization curve

The custom linearization curve transfer function is typically used 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 must be defined by extrapolating the tank filling table data and reducing it to 22 points. Once identified, the 22 points will need to be uploaded onto the device using either an HART hand-held terminal or proper configuration software like the FIM/FDI Package.

8.15.6 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 a percentage of the calibrated span, has the following form:

Output = ½ + ½ sign (x) · x ½,

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

- Output = 0 means Analog out 4mA;
- Output = 1 means Analog out 20mA.

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

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

Max reverse flowrate: -100l/h

Max flowrate: +100l/h

The differential pressure generated by the flow primary is for a maximum flowrate of 2,500mmH2O and a max reverse flowrate of 2,500mmH2O.

The transmitter must be configured as follows:

Calibrated span: 4mA = LRV = -2,500mmH2O

20mA = URV = +2500mmH2O

Transfer function: Bidirectional flow

Once configured as above, the transmitter will deliver:

flowrate 100l/h reverse:	output = 4mA
no flowrate:	output = 12mA
flowrate 100l/h:	output = 20mA

8.15.7 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.

8.15.8 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.

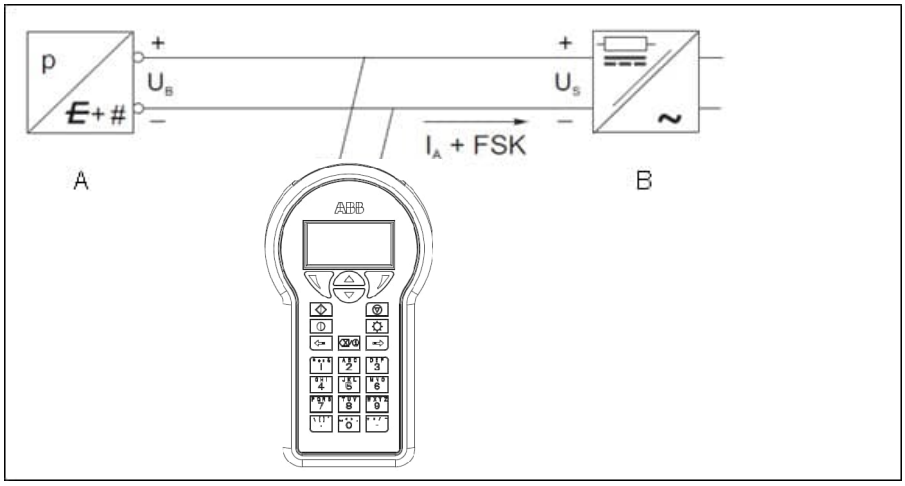
8.16 Configuration with the PC/laptop or hand-held terminal

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

The Pxx300 and Pxx500 can be configured by any of the following devices.

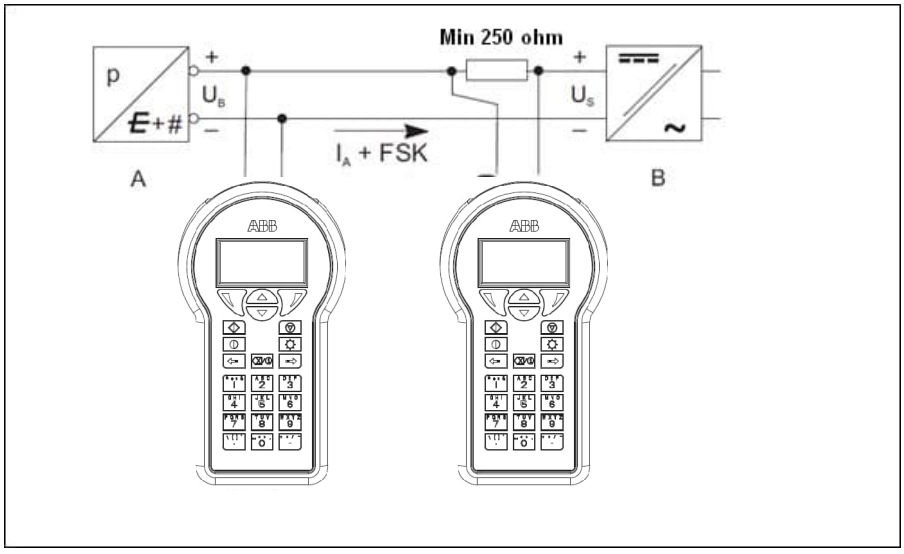
- Hand-held terminals like MFC, Emerson Process 375, and 475, provided the Pxx300, Pxx500 EDD has been downloaded and enabled in the terminal.
- ABB FIM package, a new free-of-charge software configurator downloadable at www.abb.com.
- Any DTM (PENDING) -based software for HART instruments configuration, provided it is compatible with EDD or DTM.

You can use a hand-held terminal to read out or configure/calibrate the transmitter. If a communication resistor is installed in the connected supply unit, you can clamp the hand-held terminal directly along the 4 ... 20mA line. If no communication resistor is present (min. 250 Ω), you will need to install one in the line. The hand-held terminal is connected between the resistor and transmitter, not between the resistor and supply unit.



A – Transmitter
B – Supply unit (communication resistor not provided in supply unit)

Figure 53: Communication setup with hand-held terminal



A – Transmitter
B – Supply unit (communication resistor not provided in supply unit)

Figure 54: Connection examples with communication resistor in the connection line

For additional information, refer to the operating instructions included with the hand-held 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 “Correcting the zero shift”) section and switch it on. The measuring point will now be ready for use.

However, if you wish to make changes to the configuration, a hand-held terminal or—preferably—a graphical user interface is required. This DTM tool (PENDING) renders the device fully configurable. It supports both the HART protocol and PROFIBUS PA fieldbus protocol and can be run on a PC or laptop, or as part of an automation system. Where FOUNDATION Fieldbus is concerned, the device description (DD), which can be loaded onto various configuration tools, is required for configuration purposes.

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 “Parametrize_ Differential Pressure Measurement” path.

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.”

8.17 Configuration with the graphical user interface (DTM)—System requirements

- Operating control program (e.g., ABB FIM/FDI Package)
- DTM Device Type Manager; graphical user interface (PENDING)
- Operating system (depending on the respective control program)

To operate the FIM/FDI Package, please refer to the relevant operating instruction.

8.18 Pxx300 and Pxx500 HART: functionality

P-Series Pressure Transmitters can be codified with:

- Pxx500 HART and 4 to 20mA
- Pxx300 HART and 4 to 20mA

Pxx300 and Pxx500 HART versions feature some differences in terms of functionality.

Functionality	Pxx500 HART	Pxx300 HART
Configuration via HMI	On-board	Only Easy Setup menu
SIL-certified	On-board	Pending
PILD	On-board	On-board
Trend	On-board	Not available
Totalizer	On-board	On-board
Service port	On-board	Not available
LCD replacement	On-board	On-board (no plug & play)

8.19 Pxx500 HART software revision history

Revision		Description	Release date
From	**To**		
		First release	XY/2025

8.20 Pxx300 HART software revision history

Revision		Description	Release date
From	**To**		
	132.1.0 132.1.50	PGx300 Internal release PDx300 Internal release	Not published
	132.1.1 132.1.51	PGx300 First release PDx300 First release	10/2024
	132.1.2 132.1.52	PGx300 Second release PDx300 Second release New Menu and Software Functionalities on HMI: - HMI Activation with Unlocking Bar graph - Measurement Variable Scrolling - Decimal Point Selection - Configuration Change Counter - Polarity Inversion (PDx300) - Contrast Enhancement - Easy Setup menu language in Chinese	04/2025
	132.1.3 132.1.53	PGx300 Third release PDx300 Third release - Fixing: Correction of decimal points visualization on LCD display. - Improvements: Default setting of “Decimal point Line 1” to “Auto adjust.”	06/2025
	132.1.4 132.1.54	PGx300 Fourth release PDx300 Fourth release Fixing: - Hart commands several bugs fixed. - PDS300 diagnostic checks Improvements: - QR-Code visibility on backlight LCD display	**11/2025**

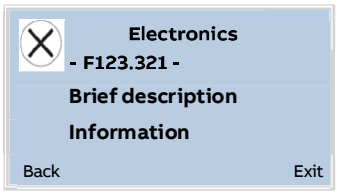
Intermediate releases for internal tests not published

9 Error messages

9.1 LCD Display messages

In the case of transmitter errors or malfunctioning, the LCD HMI is capable of displaying specific error/fault messages to help the user identify the problem and resolve it. In the case of an alarm, a message consisting of an icon and text appears at the bottom of the process display, as shown below. Use the (1) key to call up the information level. Use the “Diagnostics” menu to call up the error description with a help text. In the error description, the error number is displayed in the second line (M028.024). Two further lines are used to describe the error. The device status is divided into four groups. The message text beside this icon in the display provides information about where to look for the error. These are the following areas: Electronic; Sensor; Configuration; Operating; and Process.

Icon	Description
	Error/failure
	Functional check (e.g., during simulation)
	Out of Spec (e.g., operating with empty meter pipe)
	Maintenance required



9.2 Error states and alarms

– Communication board/Electronic-related error messages.

Error message	Tx LCD message	Possible cause	Suggested action	Tx response
F116.023	Electronic Memory Failure	Electronic memory corrupted.	For the P-500, the electronic must be replaced.	Analog Signal to Alarm
F108.040	Output ReadBack Failure	The output circuit could be broken or not correctly calibrated.	For both the P-300 and the P-500, a DAC (digital to output converter) trimming should be performed, and if the error persists, the communication board must be replaced.	Analog Signal to Alarm
M030.020	Electronic Interface Error	Data exchange between the sensor and the electronic memory is incorrect.	For the P-500, turn the power off, and check if the error persists on the transmitter. If yes, replace the communication board as soon as possible.	No effect
M026.024	NV Electronic Memory Burn Error	Writings to the electronic nonvolatile memory has been unsuccessful.	For the P-500, the communication board should be replaced as soon as possible.	No effect
F106.035	Unreliable Output Current	The D to A converter is not properly calibrated/trimmed.	For P-500, perform an Output Trimming, and if the error persists, the communication board must be replaced. For P-300, the device must be replaced (see NOTE below).	Analog Signal to Alarm
C090.033	Analog Output Fixed	The analog output for the Primary Variable is derived by the value simulated in the input.	For both the P-300 and the P-500, use a HART configurator (FIM/FDI Package—hand-held) to return the device to normal operating mode (remove the analog output simulation).	No effect

— Sensor-related error messages

Error message	Tx LCD message	Possible cause	Suggested action	Tx response
F120.016	Sensor Invalid	The sensor signal is not being updated correctly as a result of an electronics failure, sensor error, or a poorly connected sensor cable.	For the P-500, the device must be replaced.	Analog Signal to Alarm
F120.016	Sensor Invalid	The sensor model/version is no longer compatible with the connected electronic version.	For both the P-500 and P-300, the device must be replaced.	Analog Signal to Alarm
F118.017	Sensor Memory Fail	Sensor memory corrupted.	For both the P-500 and P-300, the device must be replaced.	Analog Signal to Alarm
F114.000	P-dP Sensor Fail	Mechanical damage to the sensor. Loss of fill fluid from the cell, ruptured diaphragm, broken sensor.	For both the P-500 and P-300, the device must be replaced.	Analog Signal to Alarm
F112.001	Static Pressure Sensor Fail	The circuitry for the sampling of the static pressure has failed.	For both the P-500 and P-300, the device must be replaced.	Analog Signal to Alarm
F110.002	Sensor Temperature Fail	The circuitry for the sampling of the temperature has failed.	For both the P-500 and P-300, the device must be replaced.	Analog Signal to Alarm
M028.018	NV Sensor Memory Burn Error	Writings to the sensor nonvolatile memory was not successful.	For both the P-500 and P-300, the device must be replaced.	No effect

— Configuration-related error messages.

Error message	Tx LCD message	Possible cause	Suggested action	Tx response
C088.030	Input Simulation Active	The P-dP Value produced in the output is derived by the value simulated in the input.	For both the P-500 and P-300, use a HART configurator (FIM/FDI Package—hand-held) to return the device to normal operating mode (remove the input simulation).	No effect
C088.030	Input Simulation Active	The Static Pressure Value produced in the output is derived by the value simulated in the input.	For both the P-500 and P-300, use a HART configurator (FIM/FDI Package—hand-held) to return the device to normal operating mode (remove the input simulation).	No effect
C088.030	Input Simulation Active	The Sensor Temperature Value produced in the output is derived by the value simulated in the input.	For both the P-500 and P-300, use a HART configurator (FIM/FDI Package—hand-held) to return the device to normal operating mode (remove the input simulation).	No effect
M014.037	Configuration Error	Totalizer not configured correctly.	For both the P-500 and P-300, use a HART configurator (FIM/FDI Package—hand-held) to correct the configuration.	No effect
M020.042	Replace Info	The Electronics or the Sensor have been changed, but the replacement operation has not been executed.	For the P-500, the replacement operation must be executed: Move the SW 1 of the electronics to position 1 = Enable replace mode. -Select the SW 2 element that has been changed between the new Sensor or new electronics. -Power Cycle the device. -Move the SW 1 of the electronics to position 0.	No effect
M020.042	Replace Info	The Electronics or the Sensor have been changed, and a replacement operation for a new sensor must be executed.	For the P-500, the replacement operation must be executed: Only the data of the electronics can be copied into the sensor. -Move the SW 1 to Enable replace mode (1). -Select the device with the SW 2 to New Sensor (1). -Power Cycle. -Move the SW 1 to Disable replace mode (0).	No effect
M020.042	Replace Info	The Electronics or the Sensor have been changed. The replacement has been enabled but in the wrong direction (SW 2 = 0).	For the P-500, change the replacement direction (if possible). -The SW 1 is already set to Enable replace mode (1). -Select the device with the SW 2 to New Sensor (1). -Power Cycle. -Move the SW 1 to Disable replace mode (0).	No effect

— Operation-related error messages

Error message	Tx LCD message	Possible cause	Suggested action	Tx response
M024.036	Power Supply Warning	The Device Power Supply is close to the lowest acceptable limit.	For both the P-300 and the P-500, check the voltage at the terminal block, and if it is not within the valid range, check the external power supply.	No effect
M024.036	Power Supply Warning	The Device Power Supply is close to the highest acceptable limit.	For both the P-300 and the P-500, check the voltage at the terminal block, and if it is not within the valid range, check the external power supply.	No effect
M022.041	Electronic Temperature Out of Limits	The Electronics temperature is out of its lower acceptable limit. The circuitry for the sampling of the Electronics Temperature has failed.	For the P-500, the Electronics should be replaced as soon as possible. For the P-300, the device must be replaced.	No effect
M022.041	Electronic Temperature Out of Limits	The Electronics temperature is out for its Higher acceptable limit. The circuitry for the sampling of the Electronics Temperature has failed.	For the P-500, the Electronics should be replaced as soon as possible. For the P-300, the device must be replaced.	No effect

— Process-related error messages.

Error message	Tx LCD message	Possible cause	Suggested action	Tx response
F104.032	Pressure Overrange	This effect could be produced by other equipment in the process, (valves…..). Exceeding the pressure range can cause reduced accuracy or mechanical damage to the diaphragm material and may require calibration/replacement.	For both the P-300 and the P-500, the compatibility of the pressure transmitter model and process conditions must be checked. A different transmitter type may be required.	No effect
F102.004	P-dP Out Of Limits	The measurement range has not been correctly calculated, OR an incorrect transducer model has been selected.	For both the P-300 and the P-500, the compatibility of the pressure transmitter model and process conditions must be checked. A different transmitter type is probably required.	No effect
F100.005	Static Pressure Out of Limits	The static pressure of the process exceeds the limit of the sensor. Exceeding the Static Pressure can reduce accuracy and mechanically damage the diaphragm, and may require calibration/replacement. An incorrect transducer model may have been selected.	For both the P-300 and the P-500, the compatibility of the pressure transmitter model and process conditions must be checked. A different transmitter type is probably required.	No effect
S054.006	Sensor Temperature Out of Limits	The temperature of the process environment affects the pressure transmitter; an excess temperature can reduce accuracy and degrade device components, and may require calibration/replacement.	For both the P-300 and the P-500, the compatibility of pressure transmitter model and process conditions must be checked. A different installation type may be required, e.g., use of remote seals.	No effect
S052.031	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.	For both the P-300 and the P-500, the compatibility of the pressure transmitter model and process conditions must be checked.	No effect
S098.034	Analog Output Saturated	The analog output for the Primary Variable is beyond its low scaling limit and no longer represents the true applied process. The Analog Output (4–20mA) is saturated to the configured Saturation Limit Low.	Adjust the Saturation Limit or the working range if possible.	No effect
S098.034	Analog Output Saturated	The analog output for the Primary Variable is beyond its high scaling limit and no longer represents the true applied process. The Analog Output (4–20mA) is saturated to the configured Saturation Limit High.	Adjust the Saturation Limit or the working range if possible.	No effect

Error message	Tx LCD message	Possible cause	Suggested action	Tx response
M018.038	PILD Output	One (HIGH or LOW) or both connections between the pressure sensor and the process are blocked either by plugging or closed valves.	For both the P-300 and the P-500, check valves and impulse line. Clean impulse line if necessary and initiate PILD training.	No effect
M016.039	PILD Changed Op. Conditions	Process conditions have changed to an extent that new settings for the PILD algorithm are needed.	For both the P-300 and the P-500, new training is necessary for this new process condition.	No effect

9.3 QR Code Digital Advanced Diagnostic (DAD)

The Digital Advanced Diagnostic (DAD) QR Code is an option (only available with the backlight display), which allows the user to retrieve information about device status directly in the field. With the DAD option activated when a failure/malfunction occurs, the device will show the operator page instead, with the standard diagnostic message and a QR code that the user can scan using any QR code reader.



By scanning the QR code, the user will have access to a specific .pdf format document indicating the suggested action to resolve the failure/malfunction.

Access to the document can happen directly or by clicking on a link, depending on the QR code reader setting, which is independent of ABB devices.

In the same Digital Advanced Diagnostic document, the full list of error codes that can be resolved with the suggested action is also available.

Leveraging the .pdf document with the error list on the device (i.e., mobile or tablet), and by accessing the diagnostic section on the device, the user can exactly retrieve the effective cause of the failure/malfunction and react appropriately.

Digital Advanced Diagnostic is very helpful in the field to have immediate access to information previously unavailable in the field

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 "Operation resp. Configuration of the transmitter" section. If deposits are expected to accumulate, the measuring equipment should be cleaned regularly, in accordance with the operating conditions. Cleaning should ideally be carried out in a workshop.

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

IMPORTANT

In the case of an aggressive environment and any critical condition, ABB recommends checking O-rings periodically. In the event of damage, the user must replace them with original

⚠ CAUTION

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

Explosion-proof transmitters 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 the cleaning, inspection, repairs, and replacement of damaged components.

10.1 Returns and removal

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

⚠ WARNING

Bodily injury

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 "Safety" and "Electrical connection" sections and perform the steps outlined there in reverse order.

10.2 Pressure transmitter sensor

Essentially, maintenance is not required for the transmitter sensor. The following items should be checked periodically in any case:

- 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 PDS300/PDS500 models) should not show excessive rust.

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

The use of non-original spare parts invalidates the warranty. If you want ABB to perform the repair, please return the transmitter to your local ABB office, including the return form that you will find in this manual's appendix with the device.

10.3 Removing/installing the process flanges

1. Slacken the process flange screws by working on each in a crosswise manner SW 13mm (0.51 inch)/SW 17mm (0.67 inch) for PDx300, PDx500).
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).

1. Check that the process flange screw thread can move freely: Manually turn the nut until it reaches the screw head. If this is impossible, use new screws and nuts.
2. Lubricate the screw thread and seats of the screw connection.
3. While performing the preliminary and final tightening of the bolts, please act in a crosswise manner.

⚠ CAUTION

Potential damage to parts

Do not use sharp or pointed tools. Do not damage the isolating diaphragm

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 table indications below when reinstalling the process flanges.

Transmitter model and range			Procedure
PDx300/PDx500 MWP ≤ 41Mpa/410bar/ 5,945psi	All gaskets	All bolting	First, use a torque wrench to tighten the process flange screws/nuts to a joining torque of — MJ = 2Nm (0.2kpm), working in a crosswise manner. — Then tighten them with a torque of MJ = 10Nm (1.0kpm), working in a crosswise manner — Then tighten them fully by turning each nut or screw again (in a crosswise manner) by the tightening angle A = 180°, working in two stages of 90° each. Some transmitter versions use size M10 screws. If these screws are used, the tightening angle is A = 270°, working in three stages of 90° each.
PDx300/PDx500 MWP 60Mpa/600bar/8, 700 psi	Perbunan	All bolting	First, use a torque wrench to tighten the process flange screws/nuts to a joining torque of — MJ = 2Nm (0.2kpm), working in a crosswise manner. — Then tighten them with a torque of MJ = 10Nm (1.0kpm), working in a crosswise manner — Then tighten them fully by turning each nut or screw again (in a crosswise manner) by the tightening angle A = 180°, working in two stages of 90° each.

10.4 Pressure transducer replacement (Pxx500)

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. Disconnect the power supply and disconnect the wiring.
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 and rotate the housing until it is completely removed.
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 Pxx 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 to the up position. Connect the transmitter to the power supply, wait ten seconds and lower dip switches 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 (Pxx500)

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. Disconnect the power supply and disconnect the wiring.
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 the up position.
7. Connect the transmitter to the power supply, wait ten seconds, and lower dip switch 1 to the 0 position. The Pxx500 series can reconfigure itself with the previous configured parameters thanks to the auto-configuration functionality.

11 Hazardous Area considerations

11.1 Specific Conditions of Use (X)

1. When the manufacturer of the equipment has not identified the type of protection on the label, the user should mark the label on installation with the type of protection used. Once the type of protection has been marked, it must not be changed.
2. The material of the partition wall (sensing diaphragm) must not be subject to environmental conditions which might adversely affect it.
3. The Model Pxx300, Pxx500 main electronics enclosure options = A or B contain aluminum and are considered to present a potential risk of ignition by impact or friction. Care must be taken during installation and use to prevent impact or friction.
4. For areas subject to explosive dust atmospheres, the painted surface of the Model Pxx300, Pxx500 may store electrostatic charge and become a source of ignition in applications with a low relative humidity <~30%relative humidity, where the painted surface is relatively free of surface contamination such as dirt, dust, or oil. Guidance on protection against the risk of ignition due to an electrostatic discharge can be found in IEC TS 60079-32-1. The painted surface must only be cleaned in accordance with the manufacturer's instructions.
5. The ABB Instruction Manual for Model Pxx300, Pxx500 Pressure Transmitter details the permitted temperature classification as influenced by the input parameter and ambient temperature.
6. The installation of the transmitter must ensure that in normal operation, there is no release of flammable dust from the containment system to the surrounding atmosphere.
7. The diaphragm of the transmitter can be manufactured from the material in the list below ("List of diaphragm material") and must only be used with flammable dusts that do not alter the characteristics of the diaphragm material.
8. Flameproof joints are not intended to be repaired.

List of diaphragm materials

- Stainless steel AISI 316L or 1.4435 (UNS S31603)
- Hastelloy C-276 (or equiv. UNS N10276)
- Monel 400 (or equiv. UNS N04400)
- Tantalum (equiv. UNS R05200)
- Inconel 718 (or equiv. UNS N07718)
- Hastelloy C-2000 (or equiv. UNS N06200)
- Inconel 625 (equiv. UNS N06625)
- Duplex
- Superduplex ss (equiv. UNS S32750)
- Hastelloy C-276 (or equiv. UNS N10276) gold-plated
- AISI 316 L ss gold-plated
- Monel 400 (or equiv. UNS N04400) gold-plated
- Diaflex anti-abrasion coating on AISI 316 L (coating based on titanium and aluminum nitrides)
- Diaflex anti-abrasion coating on Hastelloy C-276 (or equiv. UNS N10276) (coating based on titanium and aluminum nitrides)
- H-Shield coating on AISI 316 L (titanium nitride based coating)
- AISI 316 L ss with PFA anti-stick coating
- Hastelloy C-276 (or equiv. UNS N10276) with PFA anti-stick coating
- AISI 316 L ss with PFA coating anti-corrosion and anti-stick
- Titanium
- Nickel 301 (duranickel)
- 25-22-2 (this is standard on S26PN separator)
- Alloy 825
- Inconel 600
- AISI 316TI
- AISI 316TI gold-plated
- Hastelloy C22
- Monel 400 with PFA anti-corrosion coating
- HC276 gold + rhodium plated
- Platinum – iridium
- Zirconium
- 25-22-2 gold-plated
- Inconel 625 with Diaflex anti-abrasion coating
- AISI 321
- AISI 317L
- Nickel 301 with PFA anti-corrosion coating
- Nickel 200/201
- AISI 904L
- 25-22-2 with Diaflex anti-abrasion coating

Other material should be used by special request according to the customer.

11.2 Ex Safety aspects and IP Protection (Europe)

According to ATEX Directive (European Directive 2014/34/EU and related European Standards which can assure compliance with Essential Safety Requirements, i.e., EN 60079-0 (General requirements) EN 60079-1 (Flameproof enclosures “d”), EN 60079-11 (Equipment protection by intrinsic safety “i”), EN 60079-7 (Equipment protection by increased safety “e”), EN 60079-31 (Equipment protection by enclosure “t”), the pressure transmitters of the P-Series 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/T5/T6 Ga and II 1 D Ex ia IIIC T85 °C…135 °C Da

FM Approvals certificate number FM24ATEX0035X (Tremezzina, Bangalore, Bartlesville, Shanghai, Dammam products)

The meaning of ATEX code is as follows:

- II: Group for surface areas (not mines)
- 1: Category
- G: Gas (dangerous media)
- D: Dust (dangerous media)
- T85 °C: Maximum surface temperature of the transmitter enclosure with a Ta (ambient temperature) +40 °C for dust (not gas) with a dust layer up to a depth of 50mm.
- T135 °C: As above, but for dust, at 85 °C.
- Ga: Equipment Protection Level for Gas: the level of ignition protection is very high.
- Da: Equipment Protection Level for Dust: the level of ignition protection is very high.

IMPORTANT

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

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

- Ex ia: Intrinsic safety, protection level “a”
- IIC: Gas group
- T4: Temperature class of the transmitter (corresponding to 135 °C max) with a Ta from -50 °C to +85 °C
- T5: Temperature class of the transmitter (corresponding to 100 °C max) with a Ta from -50 °C to +40 °C
- T6: Temperature class of the transmitter (corresponding to 85 °C max) with a Ta from -50 °C to +40 °C
- Ga/Gb: Equipment Protection Level for Gas: Ga the level of ignition protection is very high. Gb the level of ignition protection is high.
- Da/Db: Equipment Protection Level for Dust: Da the level of ignition protection is very high. Db the level of ignition protection is high.

Concerning the applications, this transmitter can be used in “Zone 0” (Gas) and “Zone 20” (Dust) classified areas (continuous hazard) as shown in the following sketches.

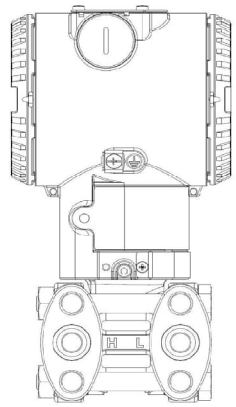
Certificate IECEx Ex ia IIC T4/T5/T6 Ga and Ex ia IIIC T85 °C…T135 °C Da

IECEx certificate number IECEx FMG 24.0039X

(Tremezzina, Bangalore, Bartlesville, Shanghai, Dammam products)

Application for pressure transmitter Ex ia categories 1 Ga and 1 Da

Application with Gas

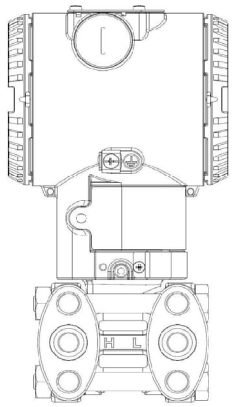


Zone 0

P-Series Tx Category 1 Ga Ex ia

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

Application with Dust



Zone 20

P-Series Tx Category 1 Da IP6x Ex ia

Note: the protection is mainly assured by the “IP” degree associated with the low power from supply. This can either be [ia] or [ib] certified [Ex ia]

b) Certificate ATEX II 1/2 G Ex ia IIC T4/T5/T6 Ga/Gb and II 1/2 D Ex ia IIIC T85 °C…T135 °C Da/Db

FM Approvals certificate number FM24ATEX0035X
(Tremezzina, Bangalore, Bartlesville, Shanghai, Dammam products)

IMPORTANT

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

The meaning of ATEX code is as follows:

- II: Group for surface areas (not mines)
- 1/2: Category—means 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)
- D: Dust (dangerous media)
- T85 °C: Maximum surface temperature of the transmitter enclosure with a Ta from -50 °C to +40 °C for dust (not gas) with a dust layer with a depth of up to 50mm.
- T135 °C: As above, but for dust, at 85 °C.
- Ga/Gb: Equipment Protection Level for Gas: Ga the level of ignition protection is very high. Gb the level of ignition protection is high.
- Da/Db: Equipment Protection Level for Dust: Da the level of ignition protection is very high. Db the level of ignition protection is high.

Certificate IECEx Ex ia IIC T4/T5/T6 Ga/Gb and Ex ia IIIC T85 °C...T135 °C Da/Db

IECEx certificate number IECEx FMG 24.0039X
(Tremezzina, Bangalore, Bartlesville, Shanghai, Dammam products)

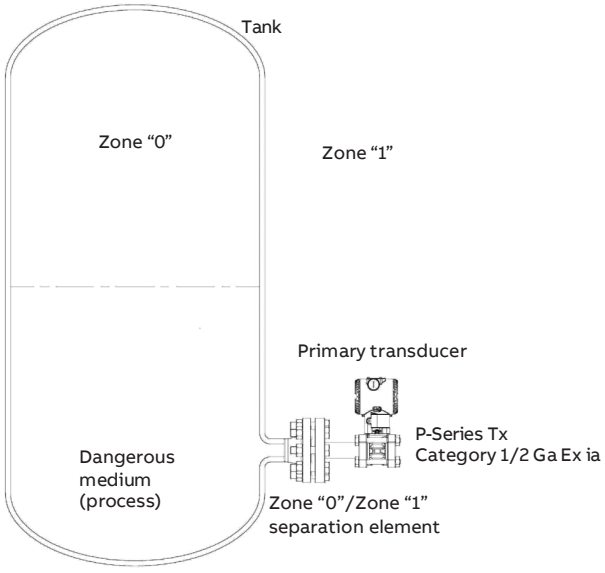
The other marking refers to the protection type used according to relevant EN standards:

- 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 +85 °C
- T5: Temperature class of the transmitter (corresponding to 100 °C max) with a Ta from -50 °C to +40 °C
- T6: Temperature class of the transmitter (corresponding to 85 °C max) with a Ta from -50 °C to +40 °C

Concerning the applications, this transmitter can be used only in Zone “0” (Gas) classified areas (continuous hazard) with its “process part,” whereas the remaining part of the transmitter, i.e., its enclosure, can be used only in Zone 1 (Gas) (see sketch below). The reason for this is the process part of the transmitter (normally called the primary transducer), which provides inside separation elements to seal off the electrical sensor from the continuously hazardous process, in accordance with EN 60079-1. Concerning the dust application, the transmitter is suitable for “Zone 21” in accordance with EN 60079-0 and EN 60079-11, as is shown in the relevant part of the sketches.

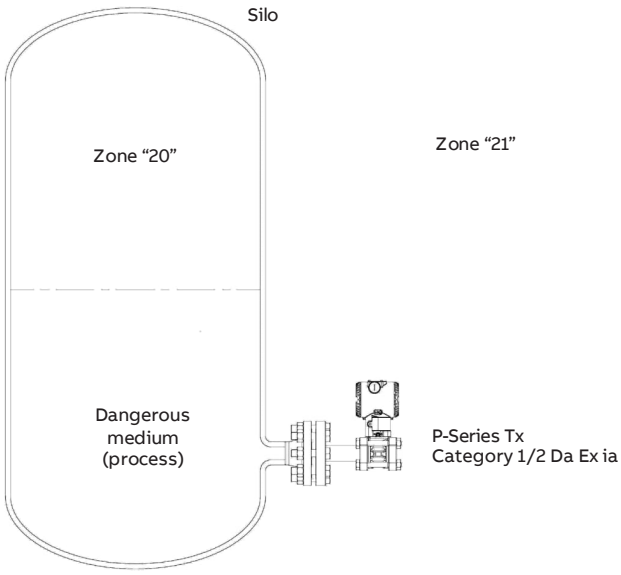
Application for pressure transmitter Ex ia categories 1/2 Ga/Gb and 1/2 Da/Db

Application with Gas



Note: The transmitter can be connected to either [ib] or [ia] supply. (associated apparatus) certified [Ex ia]
Note for “Primary transducer”: See the certification for exceptions

Application with Dust



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

c) Certificate ATEX II 1/2 G Ex db IIC T6 Ga/Gb and II 1/2 D Ex tb IIIC T85 °C Da/Db, Ta = -50 °C to +75 ºC

FM Approvals Certificate number FM24ATEX0034X
(Tremezzina, Bangalore, Bartlesville, Shanghai, Dammam products)

The meaning of the ATEX code is as follows:

- II: Group for surface areas (not mines)
- 1/2: Category—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)
- D: Dust (dangerous media)
- T85 °C: Maximum surface temperature of the transmitter enclosure with a Ta (ambient temperature) +75 °C for dust (not gas) with a dust layer with a depth of up to 50mm.
- Ga/Gb: Equipment Protection Level for Gas: Ga the level of ignition protection is very high. Gb the level of ignition protection is high.
- Da/Db: Equipment Protection Level for Dust: Da the level of ignition protection is very high. Db the level of ignition protection is high.
- Ex tb: Dust-protected flame-proof enclosure
- IIIC: Explosion Group 'dust'
- IIC: Explosion Group 'gas'

IMPORTANT

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

Certificate IECEx Ex db IIC T6 Ga/Gb and Ex tb IIIC T85 °C Da/Db, Ta= -50 °C to +75 °C
IECEx certificate number IECEx FMG 24.0038X
(Tremezzina, Bangalore, Bartlesville, Shanghai, Dammam products)

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

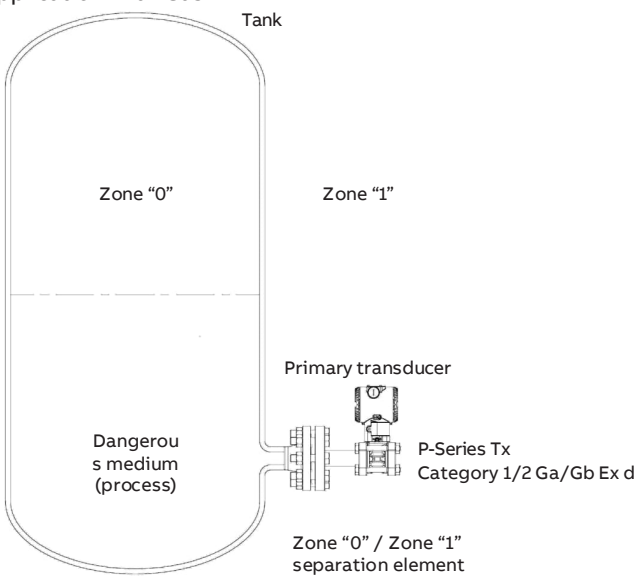
- Ex d: Explosion proof
- IIC: Gas group
- T6: Temperature class of the transmitter (corresponding to 85 °C max) with a Ta from -50 °C to +75 °C

Concerning the applications, this transmitter can be used only in Zone "0" (Gas) classified areas (continuous hazard) with its "process part," whereas the remaining part of the transmitter, i.e., its enclosure, can be used only in Zone 1 (Gas) (see sketch below). The reason for this is the process part of the transmitter (normally called the primary transducer), which provides inside separation elements to seal off the electrical sensor from the continuously hazardous process in accordance with EN 60079-1.

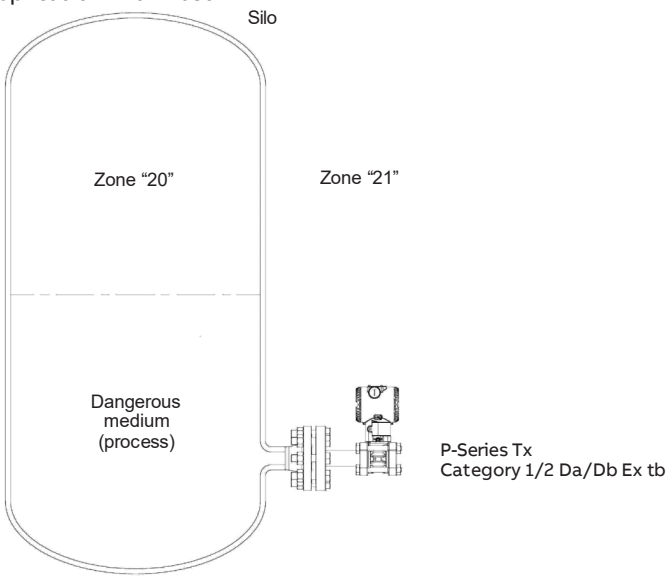
Concerning the dust application, the transmitter is suitable for "Zone 21" in accordance with EN 60079-1 as is shown in the relevant part of the sketches.

Application for pressure transmitter Ex d categories 1/2 G and 1/2 D

Application with Gas



Application with Dust



IP code

Concerning the degree of protection provided by the enclosure of the pressure transmitter, the P-Series has been certified IP66 and IP67 in accordance with the EN 60529 standard. The first characteristic numeral indicates the protection of the inside electronics against the ingress of solid foreign objects, including dust.

The assigned "6" means a dust-tight enclosure (no ingress of dust).

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

The assigned "6" means an enclosure water-protected against powerful jets projected in powerful jets towards the enclosure from any direction.

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

d) Certificate ATEX II 3 G Ex ic IIC T4/T5/T6 Gc and II 3 D Ex tc IIIC T85 °C...T135 °C Dc, Ta = -50 °C to +75 °C

FM Approvals Certificate number FM24ATEX0036X
(Tremezzina, Bangalore, Bartlesville, Shanghai, Dammam products)

The meaning of the ATEX code is as follows:

- II: Group for surface areas (not mines)
- 3: Category of equipment
- G: Gas (dangerous media)
- D: Dust (dangerous media)
- T85 °C: Maximum surface temperature of the transmitter enclosure with a Ta from -50 °C to +40 °C for dust (not gas)
- T135 °C: As above, but for dust, at 85 °C
- Ex tc: Dust-protected flame-proof enclosure
- IIIC: Explosion Group 'dust'
- IIC: Explosion Group 'gas'

IMPORTANT

This is the technical support for the ABB Declaration of Conformity.

IMPORTANT

When installed, this transmitter must be supplied by a voltage limiting device which will prevent a rated voltage of 42V DC being exceeded.

Certificate IECEx Ex ic IIC T4/T5/T6 Gc
and Ex tc IIIC T85 °C...T135 °C Dc, Ta = -50 °C to +75 °C

IECEx certificate number IECEx FMG 24.00040X
(Tremezzina, Bangalore, Bartlesville, Shanghai, Dammam products)

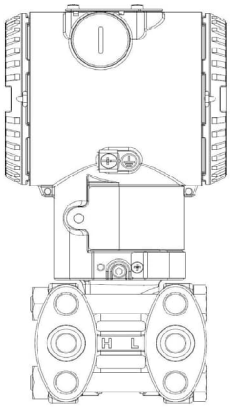
The other marking refers to the protection type used in accordance with relevant EN standards:

- Ex ic: Intrinsic safety, protection level "c"
- IIC: gas group
- T4: Temperature class of the transmitter (which corresponds to 135 °C max) with a Ta from -50 °C to +85 °C
- T5: Temperature class of the transmitter (which corresponds to 100 °C max) with a Ta from -50 °C to +40 °C
- T6: Temperature class of the transmitter (which corresponds to 85 °C max) with a Ta from -50 °C to +40 °C
- Ex tc: the "tc" protection type means protection by enclosure technique

Concerning the applications, this transmitter can be used in Zone 2 (Gas) and in Zone 22 (Dust) (unlikely/infrequent hazard) as is shown in the following sketches.

Application for pressure transmitter Ex ic categories 3 Gc and 3 Dc

Application with Gas

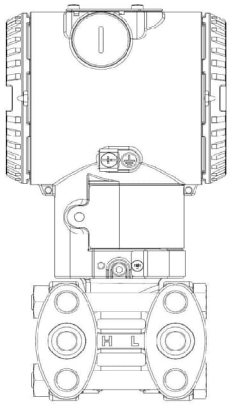


Zone 2

P-Series Tx
Category 3 Gc Ex ic

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

Application with Dust



Zone 22

P-Series Tx
Category 3 Dc IP6x Ex tc

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

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

IMPORTANT

Note for pressure transmitter with combined approval. Before installing the Transmitter, the customer should permanently mark their chosen Protection Concept on the safety label. The transmitter can only be used according to this Protection Concept throughout its life. If two or more types of protection box (on the safety label) are permanently marked, the pressure transmitter must be removed from hazardous classified locations. Only the manufacturer can change the selected Type of Protection after a satisfactory new assessment.

e) Certificate ATEX II 3 G Ex ec IIC T6…T4 Gc

FM Approvals Certificate number FM24ATEX0036X
(Tremezzina, Bangalore, Bartlesville, Shanghai, Dammam products)

The meaning of the ATEX code is as follows:

- II: Group for surface areas (not mines)
- 3: Category of equipment
- G: Gas (dangerous media)
- D: Dust (dangerous media)
- T85 °C: Maximum surface temperature of the transmitter enclosure with a Ta from -50 °C to +40 °C for dust (not gas)
- Gc: Equipment Protection Level for Gas: Gc the level of ignition protection is normal operation
- IIC: Explosion Group “gas”

IMPORTANT

This is the technical support for the ABB Declaration of Conformity.

IMPORTANT

When installed, this transmitter must be supplied by a voltage limiting device which will prevent a rated voltage of 42V DC being exceeded.

Certificate IECEx Ex ec IIC T4/T5/T6 Gc, Ta = -50 °C to +75 °C

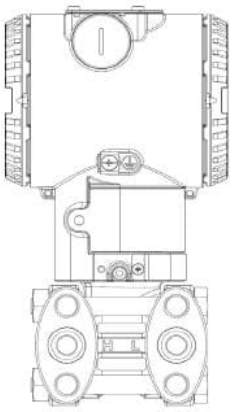
IECEx certificate number IECEx FMG 24.0040X
(Tremezzina, Bangalore, Bartlesville, Shanghai, Dammam products)

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

- Ex ec: Increased safety, protection level “c”
- IIC: Gas group
- T4: Temperature class of the transmitter (which corresponds to 135 °C max) with a Ta from -50 °C to +85 °C
- T5: Temperature class of the transmitter (which corresponds to 100 °C max) with a Ta from -50 °C to +40 °C
- T6: Temperature class of the transmitter (which corresponds to 85 °C max) with a Ta from -50 °C to +40 °C

Concerning the applications, this transmitter can be used in Zone 2 (Gas) and in Zone 22 (Dust) (unlikely/infrequent hazard) as is shown in the following sketches.

Application for pressure transmitter Ex ec categories 3 Gc
Application with Gas



Zone 2

266 Tx Category 3 Gc Ex ec

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

IMPORTANT

Note for pressure transmitter with combined approval. Before installing the Transmitter, the customer should permanently mark their chosen Protection Concept on the safety label. The transmitter can only be used according to this Protection Concept throughout its life. If two or more types of protection box (on the safety label) are permanently marked, the pressure transmitter must be removed from hazardous classified locations. Only the manufacturer can change the selected Type of Protection after a satisfactory new assessment..

11.2.1 Electrical parameters (entities)

According to certificate FM24ATEX0035X (protection method Ex ia):

(PENDING) Pxx500 HART code H without or with LCD display (D5 option)					
Ui = 30V DC Ci = 5 nF Li = 10 µH					
Temperature Class – Gas	**Temperature Class – Dust**	**Minimum amb. °C**	**Maximum amb. °C**	**Imax mA**	**Power W**
T4	T135 °C	-50 °C	+85 °C	100	0.75
T4	T135 °C	-50 °C	+70 °C	160	1
T5	T100 °C	-50 °C	+40 °C	100	1.75
T6	T85 °C	-50 °C	+40 °C	50	0.4

(PENDING) Pxx500 HART code H without or with LCD display (D5 option) with YE option for NAMUR NE 021					
Ui = 30V DC Ci = 17 nF Li = 10 µH					
Temperature Class – Gas	**Temperature Class – Dust**	**Minimum amb. °C**	**Maximum amb. °C**	**Imax mA**	**Power W**
T4	T135 °C	-50 °C	+85 °C	100	0.75
T4	T135 °C	-50 °C	+70 °C	160	1
T5	T100 °C	-50 °C	+40 °C	100	1.75
T6	T85 °C	-50 °C	+40 °C	50	0.4

(PENDING) Pxx500 HART code H without or with LCD display (D6 option)					
Ui = 30V DC Ci = 5 nF Li = 10 µH					
Temperature Class – Gas	**Temperature Class – Dust**	**Minimum amb. °C**	**Maximum amb. °C**	**Imax mA**	**Power W**
T4	T135 °C	-50 °C	+85 °C	100	0.75
T4	T135 °C	-50 °C	+70 °C	160	1
T5	T100 °C	-50 °C	+40 °C	100	1.75
T6	T85 °C	-50 °C	+40 °C	50	0.4

(PENDING) Pxx500 HART code H without or with LCD display (D5 option) with MID option (code YC)					
Ui = 30V DC Ci = 11 nF Li = 64 µH					
Temperature Class – Gas	**Temperature Class – Dust**	**Minimum amb. °C**	**Maximum amb. °C**	**Imax mA**	**Power W**
T4	T135 °C	-50 °C	+85 °C	50	0.75
T4	T135 °C	-50 °C	+70 °C	50	1
T5	T100 °C	-50 °C	+40 °C	50	0.75
T6	T85 °C	-50 °C	+40 °C	50	0.4

(PENDING) Pxx500 HART code H without or with LCD display (D6 option) with YE option to NAMUR NE 021					
Ui = 30V DC Ci = 17 nF Li = 10 µH					
Temperature Class – Gas	**Temperature Class – Dust**	**Minimum amb. °C**	**Maximum amb. °C**	**Imax mA**	**Power W**
T4	T135 °C	-50 °C	+60 °C	100	0.75
T4	T135 °C	-50 °C	+60 °C	160	1
T5	T100 °C	-50 °C	+56 °C	100	1.75
T6	T85 °C	-50 °C	+44 °C	50	0.4

Pxx300 HART code H with HMI without LCD					
Ui = 30V DC C i= 5 nF Li = 10 µH					
Temperature Class – Gas	**Temperature Class – Dust**	**Minimum amb. °C**	**Maximum amb. °C**	**Imax mA**	**Power W**
T4	T135 °C	-50 °C	+60 °C	100	0.75
T4	T135 °C	-50 °C	+60 °C	160	1
T5	T100 °C	-50 °C	+56 °C	100	1.4
T6	T85 °C	-50 °C	+44 °C	50	0.4

Pxx300 HART code H with LCD display (D1,D2 option)					
Ui = 30V DC Ci = 5 nF Li = 10 µH					
Temperature Class – Gas	**Temperature Class – Dust**	**Minimum amb. °C**	**Maximum amb. °C**	**Imax mA**	**Power W**
T4	T135 °C	-50 °C	+60 °C	100	0.75
T4	T135 °C	-50 °C	+60 °C	160	1
T5	T100 °C	-50 °C	+56 °C	100	1.4
T6	T85 °C	-50 °C	+44 °C	50	0.4

According to certificate FM24ATEX0036X (protection method Ex ic):

Pxx300 HART code H with or without LCD display (D1, D2 option)				
Ui = 42V DC Ii = 25mA Ci = 5nF Li = 10uH				
Temperature Class – Gas	**Temperature Class – Dust**	**Minimum amb. °C**	**Maximum amb. °C**	**Power W**
T4	T135 °C	-50 °C	+60 °C	0.75W
T4	T135 °C	-50 °C	+60 °C	1W
T5	T100 °C	-50 °C	+56 °C	1.4W
T6	T85 °C	-50 °C	+44 °C	0.4W

11.3 Ex Safety aspects and IP Protection (North America)

11.3.1 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 3611:	Non-incendive Electrical Equipment for Use in Class I and II, Division 2, and Class III Division 1 and 2 Hazardous (Classified) Locations.
FM 3615:	Explosion-proof Electrical Equipment.
FM 3810:	Electrical and Electronic Test, Measuring and Process Control Equipment.
NEMA 250:	Enclosure for Electrical Equipment (1000 Volts Maximum).
FM3616:	Dust-ignition-proof Electrical Equipment

11.3.2 Classifications

The P-Series 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.

- Explosion-proof (US) for Class I, Division 1, Groups A, B, C, and D, Hazardous (Classified) Locations.
- Explosion-proof (Canada) for Class I, Division 1, Groups B, C- and D; T5, Hazardous (Classified) Locations.
- Flame-proof (US): Class I, Zone 1 AEx db IIC T4 Gb, Hazardous (Classified) Locations.
- Flame-proof (Canada): Class I, Zone 1 Ex db IIC T4 Gb, Hazardous (Classified) Locations.
- Dust-ignition-proof for Class II, Division 1, Groups E, F, G, and Class III Division 1 Groups E, F, G; T5, Hazardous (Classified) Locations.
- Non-incendive for Class I, Division 2, Groups A, B, C, and D, in accordance with non-incendive field wiring requirements for Hazardous (Classified) Locations.
- Energy-limited (US): Class I, Zone 2 AEx nC IIC T6...T4 Gc, in accordance with non-incendive field wiring requirements for Hazardous (Classified) Locations.
- Energy-limited (Canada): Class I, Zone 2 Ex nC IIC T6...T4 Gc, in accordance with non-incendive field wiring requirements for Hazardous (Classified) Locations.
- Intrinsically Safe for use in Class I, II and III, Division 1, Groups A, B, C, D, E, F, and G (A, B, C, D are Class I Division 1, and E, F, G are Class II Division 1), Class I, Zone 0 AEx ia IIC T6...T4 Ga (US) Class I, Zone 0 Ex ia IIC T6...T4 Ga (Canada), in accordance with Entity requirements for Hazardous (Classified) Locations.
- Increased Safe (US): Class I, Zone 2 AEx ec IIC T6...T4 Gc, in accordance with requirements for Hazardous (Classified) Locations.
- Increased Safe (Canada): Class I, Zone 2 Ex ec IIC T6... T4 Gc, in accordance with requirements for Hazardous (Classified) Locations.
- Temperature class T4 to T6 (dependent on the maximum input current and the maximum ambient temperature).
- Ambient Temperature range -40 °C to +8 5 °C (dependent on the maximum input current and the maximum temperature class).
- Electrical Supply range Minimum 10.5 Volts, Maximum 42 Volts (dependent on the type of protection, maximum ambient temperature, maximum temperature class, and communication protocol).
- Type 4X, IP66, IP67 applications Indoors/Outdoors.

For a correct installation in the field of P-Series pressure transmitters, please see the related control drawing.

Note that the associated apparatus must be FM approved.

12 Appendix

Return form

Statement on the contamination of devices and components

Repair and/or maintenance work will only be performed on devices and components if a statement form has been completed and submitted.
Otherwise, the device/component returned may be rejected. This statement form may only be completed and signed by authorized specialist personnel employed by the operator.

Customer details:

Company:	
Address:	
Contact person:	Telephone:
Fax:	Email:

Device details:

Type:	Serial no.:
Reason for the return/description of the defect:	

Was this device used in conjunction with substances which pose a threat or risk to health?

☐ Yes ☐ No

If yes, which type of contamination (please place an X next to the applicable items):

☐ biological	☐ corrosive/irritating	☐ combustible (highly/extremely combustible)
☐ toxic	☐ explosive	☐ other toxic substances
☐ radioactive		

Which substances have come into contact with the device?

1.
2.
3.

We hereby state that the devices/components shipped have been cleaned and are free from any dangerous or poisonous substances.

Town/city, date — Signature and company stamp

Customer support

We provide a comprehensive aftersales service via a Worldwide Service Organization. Contact one of the following offices for details of your nearest Service and Repair Centre.

For details of your nearest Service and Repair Centre, visit:

www.abb.com/contacts

ABB S.p.A.
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ABB Electrical Industries Co. Ltd.
Dammam Industrial City 2, Off Dahran - Jubail highway
31952 Dammam - Saudi Arabia
Tel: +966 13 848 6700

IMPORTANT

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 related to the alleged faulty unit.

Trademarks

Buna-N is a registered trademark of DuPont Dow Elastomers.
Bluetooth is a registered trademarks of Bluetooth Special Interest Group (SIG)

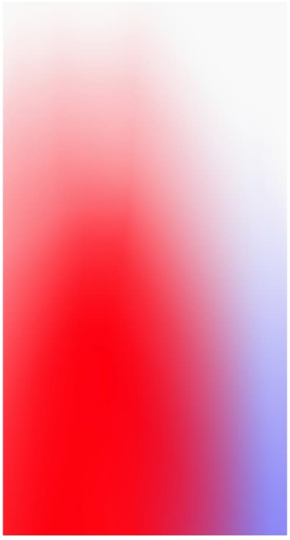
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ABB Measurement & Analytics

For your local ABB contact, visit:
abb.com/contacts

For more product information, visit:
abb.com/pressure



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