Introduction

The present manual provides information on installing, operating, troubleshooting the 266 digital diaphragm seal (DDS) configuration, a solution based on the existing 266 gauge and absolute pressure transmitter models. Every section of the present manual is specifically dedicated to the specific phase of the transmitter lifecycle starting from the receipt of the transmitter and its identification, passing to the installation, to the electrical connections, to the configuration and to the troubleshooting and maintenance operations.

The pressure transmitters model 266DDS is a modular range of field mounted, microprocessor based electronic transmitters, using multiple sensor technologies. Accurate and reliable measurement of gauge for gas ad liquid level is provided, in the even most difficult and hazardous industrial environments.

Model 266 can be configured to provide specific industrial output signals according to 4 to 20mA with HART digital communication.

For more information

Further publications for 2600T series pressure products are available for free download from: www.abb.com/measurement

or by scanning this code:

Download the Brochure or search for RB/2600T-EN on https://library.abb.com/en.
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1 Safety

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

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

Only by observing all of the safety information can you reduce to the minimum the risk of hazards for personnel and/or environment. These instructions are intended as an overview and do not contain detailed information on all available models or every conceivable event that may occur during setup, operation, and maintenance work. For additional information, or in the event of specific problems not covered in detail by these operating instructions, please contact the manufacturer. In addition, ABB declares that the contents of this manual are not part of any prior or existing agreements, commitments, or legal relationships; nor are they intended to amend these.

All obligations of ABB arise from the conditions of the relevant sales agreement, which also contains the solely binding warranty regulations in full. These contractual warranty provisions are neither extended nor limited by the information provided in this manual.

![CAUTION]

Only qualified and authorized specialist personnel should be charged with installation, electrical connection, commissioning, and maintenance of the transmitter. Qualified personnel are persons who have experience in installation, electrical wiring connection, commissioning, and operation of the transmitter or similar devices, and hold the necessary qualifications such as:
- Training or instruction, i.e., authorization to operate and maintain devices or systems according to safety engineering standards for electrical circuits, high pressures, and aggressive media
- Training or instruction in accordance with safety engineering standards regarding maintenance and use of adequate safety systems.

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

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

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

![WARNING]

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

Improper use
It is prohibited to use the device for the following purposes:
- As a climbing aid, e.g., for mounting purposes.
- As a support for external loads, e.g., as a support for pipes.
- Adding material, e.g., by painting over the name plate or welding/soldering on parts.
- Removing material, e.g., by drilling the housing.

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

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

The following technical limit values must be observed:
- The Maximum Working Pressure may not be exceeded.
- The Maximum ambient operating temperature may not be exceeded.
- The Maximum process temperature may not be exceeded.
- The enclosure method of protection type must be observed.

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.

Use of instruction

![DANGER]

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

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

**CAUTION**

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

**IMPORTANT**

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

**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.

---

**Operator liability**

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

**Qualified personnel**

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

**Returning devices**

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

**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 minimum impact on the environment and persons during manufacturing, storage, transport, use and disposal. This includes the environmentally friendly use of natural resources. ABB conducts an open dialog with the public through its publications. This product/solution is manufactured from materials that can be reused by specialist recycling companies.

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

This product or solution is subject to the WEEE Directive 2012/19/EU or corresponding national laws. Starting from August 15th 2018, electrical and electronic equipment marked with the crossed-out wheeled bin symbol may not be disposed as unsorted municipal waste. Waste of electrical and electronic equipment (WEEE) shall be treated separately using the national collection framework available to customers for the return, recycling and treatment of WEEE. Proper disposal prevents negative effects on people and the environment, and supports the reuse of valuable raw materials. ABB can accept and dispose of returns for a fee.

**Transport and storage**

- After unpacking the pressure transmitter, check the device for transport damage.
- Check the packaging material for accessories.
- During intermediate storage or transport, store the pressure transmitter in the original packaging only. For information on permissible ambient conditions for storage and transport, see chapter “4 Handling and storage” and product datasheet. Although there is no limit on the duration of storage, the warranty conditions stipulated on the order acknowledgment from the supplier still apply.

**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.
...1 Safety

Safety information for inspection and maintenance

**WARNING - RISK TO PERSONS**

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

**WARNING - RISK TO PERSONS**

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

Corrective maintenance work may only be performed by trained personnel.
- Before removing the device, depressurize it and any adjacent lines or containers.
- Check whether hazardous materials have been used as materials to be measured before opening the device.
- Residual amounts of hazardous substances may still be present in the device and could escape when the device is opened.

Within the scope of operator responsibility, check the following as part of a regular inspection:
- Pressure-bearing walls/lining of the pressure device
- Measurement-related function
- Leak-tightness
- Wear (corrosion)

Cyber security

Disclaimer

This product is designed to be connected to and to communicate information and data via a network interface. It is 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). Operator shall establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, application of authentication measures, encryption of data, 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 damages 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, such as the intended application should be assessed to ensure that these protocols are suitable before implementation.
2 Transmitter overview

Transmitter components overview

Figure 1 - Pressure transmitter components
...2 Transmitter overview

Range and span consideration

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

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

- **URL**: Upper Range Limit of a specific sensor. The highest value of the measured value that the transmitter can be adjusted to measure.
- **LRL**: Lower Range Limit of a specific sensor. The lowest value of the measured value that the transmitter can be adjusted to measure.
- **URV**: Upper Range Value. The highest value of the measured value to which the transmitter is calibrated.
- **LRV**: Lower Range Value. The lowest value of the measured value to which the transmitter is calibrated.
- **SPAN**: The algebraic difference between the Upper and Lower Range Values. The minimum span (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**: (or Turn Down Ratio) is the ratio between the maximum span and the calibrated span.

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

- \( LRL \leq LRV \leq (URL - CAL \ SPAN) \)
- \( CAL \ SPAN \geq MIN \ SPAN \)
- \( URV \leq URL \)
3 Opening the box

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

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

The Tag plate, instead, provides customer tag number and calibrated range.

Both certification and tag plates are supplied self-adhesive attached to the electronics housing, as standard. Option I2 allows to select these plates 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 266DDS with remote seals.

In this case, near the CE mark, you will find the number of the notified body (0474) that has verified the compliance according to module H.

266DDS pressure transmitters comply with directive EMC 2014/30/EU.

The certification plate is issued by ABB S.p.A, 22016 Tremezzina, Italy, with the numbers:
• FM20ATEX00XXX or IECEx FME 20.000XX (Ex d, Ex tb)

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

Figure 3 - Product identification
Optional wired-on plate
The 266 DDS transmitter can be supplied with the optional “Wired On Stainless Steel plate” (figure 4) which is permanently laser printed with a custom text specified in phase of order. The available space consists in 4 lines with 32 characters per line. The plate will be connected to the transmitter with a Stainless Steel wire.

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

Standard delivery items
Primary and secondary devices are supplied loose, the connection is provided by the customer according to this operating instruction. Please check the right combination by looking on the name plate.

4 Mounting

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 point of view. This applies in respect of the:

- Explosion protection certification
- Measuring range
- Gauge pressure stability
- Temperature (Ambient and Process)
- Operating voltage and current

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

- Process connection, isolating diaphragm, etc.

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

**IMPORTANT**

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

IP protection and designation
The housings for 266DDS 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 ingress of dust).

The second number indicates the type of protection the housing has against the entry of water.
“6” means that housing is protected against water; specifically, powerful jets of water under standardized conditions.
“7” means that the housing is protected against the effects of temporary immersion in water under standardized water pressure and temporal conditions.

The device and its accessories (i.e. cable glands and other electrical connections) must be carefully and duly tightened to meet expected IP protection type.
When using/mounting cable glands, they have to meet expected IP rating.

Mounting the transmitter
Transmitter factory configuration consideration
The 266DDS pressure transmitter in your hands has been factory calibrated to reflect the published declared performance specification; no further calibration is required in normal condition. ABB typically configures 266DDS pressure transmitters according to the user requirements. A typical configuration includes:
- TAG number
- Calibrated span
- Output linearization
- LCD display configuration

Hazardous area considerations
The transmitter must be installed in hazardous area only if it is properly certified. The certification plate is permanently fixed on the housing of the transmitter. Transmitter can have the following certifications:
- ATEX Europe (code E2) approval
- IECEx (code E9) approval
- Combined FM (code EB) approvals (US and Canada)
Type 4X, IP66, IP67 for all above markings.

Technical Regulations Customs Union EAC (Russia, Kazakhstan, Belarus), Inmetro (Brazil), NEPSI (China).

See relevant paragraph for complete markings details.

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

Devices with PS ≤ 200
Devices with a permissible pressure PS ≤200 bar correspond to article 4 paragraph 3. They have not been subject to a conformity validation. These instruments were designed and manufactured according to SEP Sound Engineering Practices.
...4 Mounting

Mounting a P style pressure transmitter

**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.

The pressure transmitter can be mounted directly on the manifold. A mounting bracket for wall or pipe mounting (2” pipe) is also available as an accessory. Ideally, the pressure transmitter should be mounted in a vertical position to prevent subsequent zero shifts.

![Figure 6: Model 266H or 266N High overload resistant P-Style transmitter with 1/2-14 NPT male process connection and barrel housing installed on a 2" pipe with optional bracket (B6 carbon steel or B7 Stainless Steel 316L)](image)

![Figure 7: Model 266H or 266N High overload resistant P-Style transmitter with 1/2-14 NPT female process connection and barrel housing installed on a 2" pipe with optional bracket (B6 carbon steel or B7 Stainless Steel 316L)](image)
In case of an HART gauge pressure transmitter with 1050 bar/15000 psi sensor range and ¼" NPT process connection, please always perform sensor low trimming to remove possible zero shift and prevent a serious decrease of the total performance in terms of accuracy. Sensor low trim can be performed via LCD, DTM or handheld terminals.

**WARNING - POTENTIAL DAMAGE TO TRANSMITTER**

Figure 8: Model 266H or 266N High overload resistant P-Style transmitter with sensor Z with barrel housing installed on a 2” pipe with optional bracket (B6 carbon steel or B7 Stainless Steel 316L)

Figure 9: Model 266G or 266A P-Style transmitter with barrel housing installed on a 2” pipe with optional bracket (B6 carbon steel or B7 Stainless Steel 316L)
...4 Mounting

...Mounting a P style pressure transmitter
B6 and B7 Barrel housing bracket details

![Diagram of mounting components]

Figure 10: Pipe and wall mounting bracket kits for P style transmitter with Barrel housing

Securing the housing cover in flameproof areas
The front face of the field indicator housing features a locking screw (hex-head socket screw) on the top right-end corner.
- Install the cover on 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.

**IMPORTANT**
For Hazardous Areas installations, at least six (6) threads on the cover must be engaged in order to meet flameproof (explosion-proof) requirements.
Transmitter housing rotation
To improve field access to the wiring or the visibility of the optional LCD meter, the transmitter housing may be rotated through 360° and fixed in any position. A stop prevents the housing from being turned too far. In order to proceed with housing rotation, the housing stop tang-screw has to be unscrewed by approximately 1 rotation (do not pull it out) and, once the desired position has been reached, retightened.

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

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.

Impulse piping connection for standard instruments
For proper pipe laying, the following points must be observed:
- The measuring pipes must be as short as possible and free from sharp bends.
- Lay the impulse piping in such a way that no deposits accumulate in them. Gradients should not be less than approx. 8% (ascending or descending).
- The measuring pipes should be blown through with compressed air or, better yet, flushed through with the measuring medium before connection.
- Completely depressurize the impulse lines if the medium is a fluid.
- Lay the impulse lines in such a way that gas bubbles (when measuring fluids) or condensate (when measuring gases) can flow back into the process line.
- Make sure the connection is tight.
- Lay the impulse line in such a way that prevents the medium from being blown out over the measuring equipment.
5 Transmitter wiring

⚠️ WARNING - GENERAL RISKS

Observe the applicable regulations governing electrical installation. Wiring must be executed in absence of power supply. Since 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 name plate. The same lines are used for both the power supply and output signal. In case the surge protection option is present and the transmitter is installed in a Hazardous area, the transmitter has to be powered from a voltage source isolated from mains (galvanic separation). Furthermore the potential equalization for the entire powering cable must be guaranteed since the intrinsic safety circuit of the transmitter is grounded.

Electrical shock can result in death or serious injury. Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock. Do NOT make electrical connections unless the electrical code designation stamped on the transmitter data plate agrees with the classification of the area in which the transmitter is to be installed. Failure to comply with this warning can result in fire or explosion.

Supply requirement

For signal/power connection use twisted, stranded pairs of wiring no 18 to 22 AWG / 0.8 to 0.35mm² up to 5000 feet (1500 meters). Longer loops require larger wire. If a shielded wire is used, the shield should be grounded only at one end, not both ends. In case of wiring at transmitter end, use the terminal located inside the housing marked with the 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 Minimum operating voltage increase to 12.3 V DC with optional surge protector or to 10.8 V DC with optional conformity to NAMUR NE 021 (2004). For 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:

\[ L = \frac{65 \times 10^6}{R \times C} - \frac{C_{f} \times 10^6}{C} \]

Where:
- \( L \) = Line length in m
- \( R \) = Total line resistance in Ω (ohms)
- \( C \) = Line capacitance in pF/m
- \( C_{f} \) = Capacitance of the devices located in the circuit in pF

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

Cable connection

Depending on the design supplied, the electrical connection is established via a cable entry, M20 x 1.5 or ½-14 NPT thread. Connectors related to different protocols are available on request. The screw terminals are suitable for wire cross sections of up to 2.5 mm² (AWG 14). It is recommended that you strip approx. 30 to 35 mm (1.18 to 1.38 inch) off the cable jacket (see figure 14). Use wiring rated 10 °C minimum above ambient temperature.

![Figure 14 - Stripped connecting cable](image)

**IMPORTANT**

For transmitters with “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 assumes 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 instead is due solely to the type of gasket.
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.

Cable and cable gland must be in accordance with the intended type of protection (e.g. intrinsically safe) 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.

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

WARNING - GENERAL RISKS

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

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

Surge protector equipped terminal block (optional)
The pressure transmitter housing with 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. Equipotential bonding conductor must to have 4.00mm2 of maximum cross-section.

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

Analogue output (HART) transmitter wiring

![HART Transmitter connection scheme](image)

Figure 16 - HART Transmitter connection scheme

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

<table>
<thead>
<tr>
<th>Application</th>
<th>Permissible voltage range of power supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmitter operated outside the potentially explosive atmosphere</td>
<td>from 10.5 to 42 V</td>
</tr>
<tr>
<td>Transmitter operated inside the potentially explosive atmosphere</td>
<td>from 10.5 to 30 V max (intrinsically safe)</td>
</tr>
<tr>
<td>Transmitter operated inside the potentially explosive atmosphere</td>
<td>from 10.5 to 42 V max (explosion proof)</td>
</tr>
</tbody>
</table>

**WARNING - RISK OF EXPLOSION**

Communication setup

The transmitter can be operated via a HART modem, using a PC or laptop. The HART modem can be connected to the transmitter in parallel at any point in the signal circuit. Communication between transmitter and modem occurs via FSK signals that are superimposed on the analog 4 to 20 mA output signal. This modulation occurs without averaging, therefore does not affect the measuring signal. Communication between transmitter and PC or laptop is only possible if the signal circuit is set up as shown in the following figure. The resistance between the connecting point for the FSK modem and the power supply must be at least 250 Ω (including internal resistance of the power supply unit). If this value is not achieved within the context of normal installation, an additional resistor must be used.
6 Commissioning

General remarks

Once the pressure 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
- Fill the impulse line and measuring chamber of the measuring cell completely with measuring medium.

The transmitter can then be put into operation.

To do this, the shut-off valves must be actuated in the following order (in the default setting, all valves are closed):

1. Open the discharge shut-off valve, if present.
2. Open the shut-off valve.

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

**NOTICE**

In the case of pressure transmitters for absolute pressure and measuring ranges of $\leq 40$ kPa absolute, please note that the pressure measuring cell has been overloaded over a long period by the atmospheric pressure during transport and storage. For this reason, you will need to allow a starting time of approx. 3 hours after commissioning until the sensor has stabilized to such an extent that the specified accuracy can be maintained.

Only 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.

Analogue and HART Communication models

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

**Standard setting for normal operation**

3.8 mA / 20.5 mA

In order to prevent errors in flow rate measurements (266Dxx and 266Mxx) in the lower range, it is possible to set a “cut off point” and/or a “lin./sq. root transition point” via the optional LCD integral displays with keypad or via the graphical user interface (DTM). Unless otherwise specified, the “lin./sq. root transition point” is set to 5% and the “cutoff” to 6% of the flow rate end value by the manufacturer; A current that is $< 4$ mA or $> 20$ mA may also indicate that the microprocessor has detected an internal error. In this case the alarm output can be configured both via the local LCD with keypad, via an external Hart hand held terminal (ABB DH805) or via a DTM based configuration tool (Asset Vision).

**Standard setting for error detection (alarm)**

3.7 mA / 21 mA

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

**NOTICE**

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

**NOTICE**

- Lower limit: 3.6 mA (configurable from 3.6 to 4 mA)
- Upper limit: 21 mA (configurable from 20 to 23 mA, limited to 22 mA for HART Safety; apply for electronics release 7.1.15 or later)

Factory setting: high alarm current (21.0 mA)

Zero/Span and write protection

There is only one push button behind the display. It changes its function depending on the presence of the display. When the display is installed, it works as hardware write protection switch. When the write protection is disabled, and it is kept pressed for some 1 second, then the write protection becomes enabled. In the opposite logic, when the write protection is enabled, and the button is kept pressed, then the write protection becomes disabled. This enable/disable condition can be observed/confirmed by looking at the lock symbol appearing or disappearing on the top line of the display.

Write protection prevents the configuration/modification of device data from being overwritten by unauthorized users. If write protection is enabled, both local and remote writings are refused. The Z (Zero) and S (Span) button cannot be used to set new range values because their writing is disabled while their use to enter and navigate into the local easy setup menu for the read/review of the device parameter setting is still allowed.

However, when write protect is enabled, it is still possible to read out the configuration data using graphical user interface or communication tools (DD or FDI based).

Transmitter without display requires the communication tool to activate write protection.

**Figure 17 - Write-protection pushbutton**
...6 Commissioning

Write protection activation via dip switch

Standard instruments do not feature the external, non intrusive Zero, Span and Write Protection push buttons. To activate this function it is necessary to proceed as detailed below:

- Remove instrument cover and the integrated digital LCD display (if installed).
- On the connection board, place dip switch 4 in “up” position.

**IMPORTANT**

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

**IMPORTANT**

The button unit must be available for this purpose (option R1). In case external push buttons are not available, act on the connection board directly by depressing with a screwdriver the dedicated internal push buttons. Operating the buttons using a magnetic screwdriver is not permitted because it may generate some interferences with the magnetic pickup system.

Correct the zero shift

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

- Pressing the “Z” button (under the identification plate on the top of the transmitter, if present) or the “Zero” internal button (on the connection board) for few seconds will cause the output to go at 4 mA.
- It is also possible to align the digital PV value to zero. To accomplish it raise 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 it is zero based, the output will go at 4 mA.

**IMPORTANT**

The procedure described above does not affect the physical pressure shown; it only corrects the analog output signal. For this reason, the analog output signal may 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.

Set lower range value

- Apply the lower range value pressure (4 mA) 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 pushbutton - option R1) or the “Zero” command on the connection board of the pressure transmitter for few seconds. The output signal will be is set to 4 mA. The span will remain unchanged.

**IMPORTANT**

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

For HART transmitters with advanced HART functionality or Safety HART certified to IEC 61508 (output code 1 or 8) the LCD can be with integrated keypad having same appearance as follows and with buttons used for menu-controlled configuration.

All displays feature a LCD dot matrix for clear visualizations. Hereafter a possible view according to selected transmitter configuration.

The HART short tag (1) is shown in the upper left corner by maximum 8 characters.
The 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 lines visualization.
The engineering unit (3) can be anyone of HART list.
A bargraph (4) also provide a different format of indication with relevant percentage for a selectable variable.
The polarity symbol (5) is displayed when high/low pressure sides of a differential pressure transmitter are configured to work as “reverse” action, via HART command. Once the transmitter is connected to the process, it is possible to change via software the polarity of the process connection instead than mechanically reverse 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 relevant HART commands.

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

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

Installing/Removing the LCD display

- Unscrew the housing cover of the communication board/LCD side.

**IMPORTANT**

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

- L1/ display versions can be installed in different positions (90° rotations) and shall be removed as per instructions listed at paragraph xxxxx

**IMPORTANT**

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

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 side.

- 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 19 - Windowed front cover and LCD display
7 Operation

Configuration of the pressure transmitter menu-controlled without integrated LCD display

The LCD display is only used for visualization of the measured values and for configuration of the display and of the transmitter. In addition, diagnostics messages are displayed.

Menu navigation

Menu levels

There are two levels under the process display.

<table>
<thead>
<tr>
<th>Process display</th>
<th>Information level</th>
<th>Configuration level</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Diagnostic</td>
<td>- Easy setup</td>
<td>- Device setup</td>
</tr>
<tr>
<td>- Operator page</td>
<td>- Device setup</td>
<td>- Display (???)</td>
</tr>
<tr>
<td>- Signals view</td>
<td>- Process alarm</td>
<td>- Calibrate</td>
</tr>
<tr>
<td></td>
<td>- Diagnostics</td>
<td>- Device info</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Communication</td>
</tr>
</tbody>
</table>

Menu levels

There are two levels under the process display.

<table>
<thead>
<tr>
<th>Process display</th>
<th>Information level</th>
<th>Configuration level</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Diagnostic</td>
<td>- Easy setup</td>
<td>- Device setup</td>
</tr>
<tr>
<td>- Operator page</td>
<td>- Device setup</td>
<td>- Display (???)</td>
</tr>
<tr>
<td>- Signals view</td>
<td>- Process alarm</td>
<td>- Calibrate</td>
</tr>
<tr>
<td></td>
<td>- Diagnostics</td>
<td>- Device info</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Communication</td>
</tr>
</tbody>
</table>

Menu levels

You can use the \( \text{Exit} \) or \( \text{Back} \) operating buttons to browse through the menu or select a number or character within a parameter value. Different functions can be assigned to the \( \text{Exit} \) and \( \text{Back} \) operating buttons. The function that is currently assigned is shown on the LCD display.

Operating button functions

<table>
<thead>
<tr>
<th>Meaning</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exit</td>
<td>Exit menu</td>
</tr>
<tr>
<td>Back</td>
<td>Go back one submenu</td>
</tr>
<tr>
<td>Cancel</td>
<td>Cancel parameter entry</td>
</tr>
<tr>
<td>Next</td>
<td>Select the next position for entering numerical and alphanumeric values</td>
</tr>
<tr>
<td></td>
<td>Select submenu / parameter</td>
</tr>
<tr>
<td></td>
<td>Edit parameter</td>
</tr>
<tr>
<td></td>
<td>Save parameter entered</td>
</tr>
</tbody>
</table>
- TBD - page intentionally blank
8 Error messages

LCD Display messages

The LCD HMI in case of transmitter errors or malfunctioning is capable of displaying specific error/fault messages to help the user in identifying the problem and resolve it. In case of an alarm, a message consisting of an icon and text appears at the bottom of the process display, as shown hereafter. 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 (M028.018). 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. There are the following areas: Electronic, Sensor, Configuration, Operating and Process.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Error / Failure</td>
</tr>
<tr>
<td></td>
<td>Functional check (e.g. during simulation )</td>
</tr>
<tr>
<td></td>
<td>Out of Spec (e.g. operating with empty meter pipe)</td>
</tr>
<tr>
<td></td>
<td>Maintenance required</td>
</tr>
</tbody>
</table>

Error states and alarms

<table>
<thead>
<tr>
<th>Error code</th>
<th>Description</th>
<th>Possible cause</th>
<th>Suggested /recommended action</th>
<th>Current output</th>
</tr>
</thead>
<tbody>
<tr>
<td>F114.000</td>
<td>The sensor signal value of the Primary unit is incorrect due to a mechanical failure.</td>
<td>Mechanical damage to the sensor. Loss of fill fluid from the cell, ruptured diaphragm, broken sensor, etc</td>
<td>The Primary unit sensor must be replaced.</td>
<td>UP/DW ALARM</td>
</tr>
<tr>
<td>F110.001</td>
<td>The measurement accuracy could be decreased more than an acceptable error.</td>
<td>The circuitry for the sampling of the Primary unit temperature has failed.</td>
<td>The Primary unit sensor must be replaced.</td>
<td>UP/DW ALARM</td>
</tr>
<tr>
<td>F113.002</td>
<td>The sensor signal value of the Secondary unit is incorrect due to a mechanical failure.</td>
<td>Mechanical damage to the sensor. Loss of fill fluid from the cell, ruptured diaphragm, broken sensor, etc</td>
<td>The Secondary unit sensor must be replaced.</td>
<td>UP/DW ALARM</td>
</tr>
<tr>
<td>F109.003</td>
<td>The measurement accuracy could be decreased more than an acceptable error.</td>
<td>The circuitry for the sampling of the Secondary unit temperature has failed.</td>
<td>The Secondary unit sensor must be replaced.</td>
<td>UP/DW ALARM</td>
</tr>
<tr>
<td>F102.004</td>
<td>The Process value of the Primary unit is outside the sensor limits and no longer representing the true applied process value.</td>
<td>The measurement range has not been correctly calculated OR an incorrect transducer model has been selected.</td>
<td>The compatibility of pressure transmitter model and process conditions has to be checked. Probably a different transmitter type is required.</td>
<td>no effect</td>
</tr>
<tr>
<td>S054.005</td>
<td>The sensor temperature of the Primary unit is outside of its operational limits.</td>
<td>The temperature of the process environment affects the pressure transmitter. Excess temperature can reduce accuracy, degrade device components and may require calibration/replacement.</td>
<td>The compatibility of pressure transmitter model and process conditions has to be checked. A different installation type could be required e.g. use of remote seals.</td>
<td>no effect</td>
</tr>
<tr>
<td>F101.006</td>
<td>The Process value of the Secondary unit is outside the sensor limits and no longer representing the true applied process value.</td>
<td>The measurement range has not been correctly calculated OR an incorrect transducer model has been selected.</td>
<td>The compatibility of pressure transmitter model and process conditions has to be checked. Probably a different transmitter type is required.</td>
<td>no effect</td>
</tr>
<tr>
<td>S053.007</td>
<td>The sensor temperature of the Secondary unit is outside of its operational limits.</td>
<td>The temperature of the process environment affects the pressure transmitter. Excess temperature can reduce accuracy, degrade device components and may require calibration/replacement.</td>
<td>The compatibility of pressure transmitter model and process conditions has to be checked. A different installation type could be required e.g. use of remote seals.</td>
<td>no effect</td>
</tr>
<tr>
<td>Error code</td>
<td>Description</td>
<td>Possible cause</td>
<td>Suggested /recommended action</td>
<td>Current output</td>
</tr>
<tr>
<td>------------</td>
<td>-------------</td>
<td>---------------</td>
<td>-----------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>F120.016</td>
<td>“The Basic signal of the Primary unit sensor is no longer available. The transducer is not in a condition to generate a valid signal.”</td>
<td>The sensor signal of the Primary unit is not being updated correctly as a result of electronics (communication board) failure, sensor error or a poorly connected sensor cable.</td>
<td>Check cable connection, check sensor and if problem persists, the Primary unit sensor must be replaced.</td>
<td>UP/DW ALARM</td>
</tr>
<tr>
<td></td>
<td>Primary Unit Sensor and/or the connected electronics are incompatible</td>
<td>The Primary unit sensor model/version is no longer compatible with the connected electronic version</td>
<td>The Primary unit sensor must be replaced</td>
<td></td>
</tr>
<tr>
<td>F118.017</td>
<td>The data in the Primary unit sensor memory are corrupted precluding the correct functionality of the device</td>
<td>The data in the Primary unit sensor is corrupted</td>
<td>The Primary unit Sensor must be replaced</td>
<td>UP/DW ALARM</td>
</tr>
<tr>
<td>M028.018</td>
<td>The device continues to work without problems but any replacement operation relating the Primary unit is compromised because the backed up configuration is not updated</td>
<td>Writings to the Primary unit Sensor non-Volatile Memory was not successful</td>
<td>The Primary unit Sensor should be replaced as soon as possible.</td>
<td>no effect</td>
</tr>
<tr>
<td>M030.020</td>
<td>The Primary unit sensor has problem to communicate with the Communication Board due to problem in the transmitter circuit of the electronics or in receiver circuit of the sensor</td>
<td>Exchange of data between the Electronics (Communication Board) and Primary unit Sensor have problems</td>
<td>Power cycle the device and retry the operation, if the error persist the electronics/Comm.Board should be replaced as soon as possible.</td>
<td>no effect</td>
</tr>
<tr>
<td>F116.023</td>
<td>The device data loaded at the start up are corrupted precluding the correct functionality of the device</td>
<td>Electronic memory corrupted</td>
<td>The electronics (communication board) must be replaced</td>
<td>UP/DW ALARM</td>
</tr>
<tr>
<td>M026.024</td>
<td>The device continues to work without problems but after the next power cycle the new configuration will be lost</td>
<td>Writings to the electronic non-Volatile Memory was not successful</td>
<td>The electronics (communication board) should be replaced as soon as possible.</td>
<td>no effect</td>
</tr>
<tr>
<td>C088.030</td>
<td>The Primary unit Process Value is simulated and do not represent the real Process value.</td>
<td>The Pressure Value produced by the Primary unit Sensor is derived by the value simulated in input</td>
<td>Use an HART configurator to place device back into normal operating mode (Remove the input simulation)</td>
<td>no effect</td>
</tr>
<tr>
<td></td>
<td>The Secondary unit Process Value is simulated and do not represent the real process value</td>
<td>The Pressure Value produced by the Secondary unit Sensor is derived by the value simulated in input</td>
<td>Use a HART configurator to place device back into normal operating mode (Remove the input simulation)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The Temperature Value of the Primary unit sensor is simulated and do not represents the real Primary Sensor Temperature</td>
<td>The Sensor Temperature of the Primary unit is derived by the value simulated in input</td>
<td>Use a HART configurator to place device back into normal operating mode (Remove the input simulation)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The Temperature Value of the Secondary unit sensor is simulated and do not represents the real Secondary unit sensor Temperature</td>
<td>The Sensor Temperature of the Secondary unit is derived by the value simulated in input</td>
<td>Use a HART configurator to place device back into normal operating mode (Remove the input simulation)</td>
<td></td>
</tr>
<tr>
<td>S052.031</td>
<td>The Process Pressure measured by the Primary sensor is higher than the acceptable mechanical limit of the process connection elements.</td>
<td>The measured process pressure exceeds the limit of the max working Pressure supported by the primary unit. Exceeding the Max Working Pressure can mechanically damage the process connections (flanges, pipes, etc) and/or be dangerous</td>
<td>The compatibility of the process connection type and material with process conditions has to be checked. A different installation type could be required e.g. use of remote seals.</td>
<td>no effect</td>
</tr>
<tr>
<td>F104.032</td>
<td>An overpressure has been detected by the Primary unit sensor</td>
<td>This effect could be produced by other equipment on the process, (valves, etc). Exceeding the pressure range can cause reduced accuracy or mechanical damage to the diaphragm material and may require calibration/replacement.</td>
<td>The compatibility of pressure transmitter model and process conditions has to be checked. A different transmitter type could be required</td>
<td>no effect</td>
</tr>
<tr>
<td>C090.033</td>
<td>Analog output current fixed. The primary variable (PV) analog and digital analog outputs will not respond to the applied process.</td>
<td>The analog and digital analog outputs for the Primary Variable (PV) are held at the requested value. Device is in fixed current (Loop Test) mode.</td>
<td>Use a HART configurator to place device back into normal operating mode (Remove from Loop Test - Fixed output mode)</td>
<td>no effect</td>
</tr>
</tbody>
</table>
## Error messages

### Error states and alarms

<table>
<thead>
<tr>
<th>Error code</th>
<th>Description</th>
<th>Possible cause</th>
<th>Suggested /recommended action</th>
<th>Current output</th>
</tr>
</thead>
<tbody>
<tr>
<td>S098.034</td>
<td>The result of the selected Calculation type (Primary-Secondary unit or Viceversa) is outside its Low Saturation Limit</td>
<td>The analog output for the Primary Variable (PV) is beyond its Low scaling limit and no longer represents the true applied process. The Analog Output (4-20 mA) is saturated to the configured Saturation Limit Low.</td>
<td>Adjust the Saturation Limit or the working range if possible.</td>
<td>no effect</td>
</tr>
<tr>
<td></td>
<td>The result of the selected Calculation type (Primary-Secondary unit or Viceversa) is outside its High Saturation Limit</td>
<td>The analog output for the Primary Variable (PV) is beyond its High scaling limit and no longer represents the true applied process. The Analog Output (4-20 mA) is saturated to the configured Saturation Limit High</td>
<td>Adjust the Saturation Limit or the working range if possible.</td>
<td></td>
</tr>
<tr>
<td>F106.035</td>
<td>The Analog Output Current could deviate from the correct value due to D to A problems</td>
<td>The D to A converter is not properly Calibrated/Trimmed</td>
<td>Perform an Output Trimming and if the error persist the electronics (communication board) must be replaced</td>
<td>UP/DW ALARM</td>
</tr>
<tr>
<td>M024.036</td>
<td>The device continues to work without problems but the power supply level is close to a threshold that could preclude the correct functionality</td>
<td>The Device Power Supply is close to the lowest acceptable limit</td>
<td>Check the Voltage at the terminal block and if it is not within the valid range check the external power supply</td>
<td>no effect</td>
</tr>
<tr>
<td></td>
<td>The device continues to work without problems but the power supply level is close to a threshold that could preclude the correct functionality</td>
<td>The Device Power Supply is close to the highest acceptable limit</td>
<td>Check the Voltage at the terminal block and if it is not within the valid range check the external power supply</td>
<td></td>
</tr>
<tr>
<td>S051.037</td>
<td>The Process Pressure measured by the Secondary unit sensor is higher than the acceptable mechanical limit of the process connection elements.</td>
<td>The measured process pressure exceeds the limit of the max working Pressure supported by the Secondary unit. Exceeding the Max Working Pressure can mechanically damage the process connections (flanges, pipes, etc) and/or be dangerous</td>
<td>The compatibility of the process connection type and material with process conditions has to be checked. A different installation type could be required e.g. use of remote seals.</td>
<td>no effect</td>
</tr>
<tr>
<td>F103.038</td>
<td>An overpressure has been detected by the Secondary unit sensor</td>
<td>This effect could be produced by other equipment on the process, (valves, etc). Exceeding the pressure range can cause reduced accuracy or mechanical damage to the diaphragm material and may require calibration/replacement.</td>
<td>The compatibility of pressure transmitter model and process conditions has to be checked. A different transmitter type could be required</td>
<td>no effect</td>
</tr>
<tr>
<td>F115.039</td>
<td>The Primary unit at the start up has detected that the connected Secondary unit has characteristics not compatible with it and for this reason the DDS system doesn’t work</td>
<td>The Primary and Secondary units have Different Module type or sensor limits (Upper Range Limit)</td>
<td>Change the Secondary unit with another one having the same sensor type (gauge or Absolute) and with the same sensor limits of the Primary unit</td>
<td>UP/DW ALARM</td>
</tr>
<tr>
<td>F108.040</td>
<td>The reading of the 4-20mA output signal is too different from what should have been generated</td>
<td>The output circuit could be broken or not correctly calibrated</td>
<td>Perform an Output Trimming and if the error persist the electronics (communication board) must be replaced</td>
<td>UP/DW ALARM</td>
</tr>
<tr>
<td>S022.041</td>
<td>The Accuracy of the D/A conversion could be decreased. The Output 4/20 mA signal representing the measure could be not correctly compensated.</td>
<td>The electronics (communication board) temperature is out of its lower acceptable limit.</td>
<td>The electronics (communication board) should be replaced as soon as possible.</td>
<td>no effect</td>
</tr>
<tr>
<td>M022.041</td>
<td>The Accuracy of the D/A conversion could be decreased. The Output 4/20 mA signal representing the measure could be not correctly compensated.</td>
<td>The electronics (communication board) temperature is out of its higher acceptable limit.</td>
<td>The electronics (communication board) should be replaced as soon as possible.</td>
<td>no effect</td>
</tr>
<tr>
<td><strong>Error code</strong></td>
<td><strong>Description</strong></td>
<td><strong>Possible cause</strong></td>
<td><strong>Suggested /recommended action</strong></td>
<td><strong>Current output</strong></td>
</tr>
<tr>
<td>----------------</td>
<td>-----------------</td>
<td>--------------------</td>
<td>-----------------------------------</td>
<td>-----------------</td>
</tr>
</tbody>
</table>
| M020.042       | The Replace operation is required after the changing of the electronics or of the sensor | The electronics (communication board) or the Sensor have been changed but the replacement operation has not been executed | "The replacement operation must be executed:
- Move the SW 1 of the electronics (communication board) in position 1 = Enable replace mode
- Select the SW 2 the element that has been changed between new Sensor or new electronics (communication board)
- Power Cycle the device
- Move the SW 1 of the electronics (communication board) in position 0" | no effect |
| M021.042       | The Replace operation is required after the changing of the electronics or of the sensor | The electronics (communication board) or the Sensor have been changed and a replacement operation for a new sensor has to be executed. | "The replacement operation must be executed:
- Only the data of the electronics (communication board) can be copied into the sensor
- Move the SW 1 to Enable replace mode (1)
- Select with the SW 2 to New Sensor (1)
- Power Cycle the device
- Move the SW 1 to Disable replace mode (0)" | no effect |
| M022.042       | The Replace operation has been attempted but with wrong direction | The electronics (communication board) or the Sensor have been changed, The replacement has been enabled but with a wrong direction (SW 2 = 0) | "Change the replacement direction (if possible)
- The SW 1 is already set to Enable replace mode (1)
- Select with the SW 2 to New Sensor (1)
- Power Cycle the device
- Move the SW 1 to Disable replace mode (0)" | no effect |
| F105.043       | "The Accuracy of the D/A conversion could be decreased. The Output 4/20 mA signal representing the measure is compensated to the last valid temperature" | The circuitry for the sampling of the electronics (communication board) temperature has failed. | The electronics (communication board) should be replaced as soon as possible. | UP/DW ALARM |
| F117.044       | The data in the Secondary unit sensor memory are corrupted precluding the correct functionality of the device | Secondary unit Sensor memory corrupted | The Secondary unit Sensor must be replaced | UP/DW ALARM |
| M027.045       | The device continues to work without problems but the new settings for the Secondary unit sensor can be lost after a power cycle because the backedup configuration is not updated | Writings to the Secondary unit Sensor non-Volatile Memory was not successful | The Secondary unit Sensor should be replaced as soon as possible. | no effect |
| F119.046       | "The Basic signal of the Secondary unit sensor is no longer available. The transducer is not in a condition to generate a valid signal." | The sensor signal of the Secondary unit is not being updated correctly as a result of electronics (communication board) failure, sensor error or a poorly connected sensor cable. | Check cable connection, check sensor and if problem persists, the Secondary unit sensor must be replaced. | UP/DW ALARM |
9 Maintenance / Repair

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). If deposits are expected to accumulate, the equipment should be cleaned on a regular basis, in accordance with the operating conditions.
Cleaning should ideally be carried out in a workshop.
Repair and maintenance activities may only be performed by authorized customer service personnel.
266DDS user repair is not permitted.
When replacing or repairing individual components, original spare parts must be used.

⚠️ WARNING - BODILY INJURY
The device can be operated at high pressure and with aggressive media. Any medium that spurts out can cause severe injuries.
Depressurize the pipeline/tank before opening the transmitter connection.

⚠️ IMPORTANT
Potential damage to device as a result of electrostatic charging!
When the housing is open, EMC protection is impaired and there is no longer any protection against accidental contact.
The electronic components of the printed circuit board can be damaged by static electricity. Do not touch conductive parts of the device or use adequate ESD protections.
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
Transmitters certified for hazardous area must be either repaired by the manufacturer or approved by a certified expert following repair work
Observe the relevant safety precautions before, during and after repair work.
Only disassemble the transmitter to the extent necessary for cleaning, inspection, repairs and replacement of damaged components.

⚠️ IMPORTANT
The use of non original spare parts makes the warranty void.

Check whether hazardous materials have been used as materials to be measured before opening the device. Residual amounts of hazardous material may still be present in the device and could escape when it is opened.
Within the scope of operator responsibility, check the following as part of a regular inspection:
- the pressure-carrying walls / lining of the pressure device
- the measurement-related function
- the leak tightness
- the wear (corrosion)

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

⚠️ WARNING
Potential danger if device is disassembled incorrectly!
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.
Carefully read the instructions in the 'Safety', 'Mounting', and 'Electrical connections' chapters, and perform the specified steps in reverse order.
Pressure transducer replacement

If the pressure transducer needs to be replaced proceed as follows:
1. Insulate the transmitter from the process by acting on the manifolds or on the insulation valves.
2. Open the vent valves to allow sensor depressurization.
3. 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 until and rotate the housing until its complete removal.
8. Unscrew the transducer.
9. Replace the transducer with a new one.
10. The 266 can reconfigure itself with the previous configured parameters thanks to the auto-configuration functionality.
11. Before powering on the transmitter raise dip-switches 1 and 2 in up position. Connect the transmitter to power supply, wait ten seconds and lower dip-switched 1 and 2.
12. After installing the transmitter on the bracket and connecting it to the manifold, perform a PV zero bias.

Electronic replacement

If the electronic module needs to be replaced proceed as follows:
1. Insulate the transmitter from the process by acting on the manifolds or on the insulation valves.
2. Open the vent valves to allow sensor depressurization.
3. 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 up position.
7. Connect the transmitter to power supply, wait ten seconds and lower dip-switch 1 to 0 position. 266 can reconfigure itself with the previous configured parameters thanks to the auto-configuration functionality.
10 Hazardous Area considerations

Specific Conditions of Use (X)

1. When the manufacturer of the equipment has not identified the type of protection on the label, the user shall, on installation, mark the label with the type of protection used. Once the type of protection has been marked it shall not be changed.

2. The material of the partition wall (sensing diaphragm) shall not be subject to environmental conditions which might adversely affect it.

3. The Model 266 main electronics enclosure option s = A or B contains aluminium and is considered to present a potential risk of ignition by impact or friction. Care must be taken into account during installation and use to prevent impact or friction.

4. For areas subject to explosive dust atmospheres the painted surface of the Model 266 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 electrostatic discharge can be found in IEC TS 60079-32-1. Cleaning of the painted surface shall only be done in accordance with the manufacturer’s instructions.

Ex Safety aspects and IP Protection (Europe)

According to ATEX Directive (European Directive 2014/34/EU and relative European Standards which can assure compliance with Essential Safety Requirements, i.e., EN 60079-0 (General requirements) EN 60079-1 (Flameproof enclosures “d”), the pressure transmitters of the 2600T 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.

Type-examination certificate/Declaration of conformity

For transmitters with hazardous location design, the EU declaration of conformity and this operating instruction should be complied with. The EU type examination certificates to be applied are available for download online on the ABB website.

Type of protection “intrinsic safety Ex ia”

Only intrinsically safe devices may be installed in the transmitter signal circuit. The signal circuit can be interrupted while the transmitter is in operation (e.g., clamping/unclamping signal lines). The housing may be opened during operation, in absence of explosive atmosphere. Transmitters with and without remote seals and featuring type of protection “intrinsic safety Ex ia” may be directly integrated into the partition separating application for gas Zone 0 and Zone 1 (sensor diaphragm in Zone 0, transmitter in Zone 1), and application for dust Zone 20 and Zone 21 (sensor diaphragm in Zone 20, transmitter in Zone 21), provided that the power is supplied via an intrinsically safe circuit with type of protection “Ex ia”.

Use in areas with combustible dust

Installation should be performed in accordance with the EN 60079-14 installation regulations. The transmitter should only be connected using cable glands certified in accordance with Directive 2014/34/EU (ATEX). The cable gland must conform to IP rating IP 67. The smoldering temperature of the dust must be at least 75 K above the maximum surface temperature of the transmitter. The maximum surface temperature is 120 °C (248 °F) or T135 °C.

WARNING - RISK OF EXPLOSION

When using remote seals with an anti-stick coating, be aware of the risk of electrostatic discharge (with consideration given to the filling material and transport speed).

WARNING - RISK OF EXPLOSION

Opening the housing during operation (with the supply voltage switched on) is not permitted. Opening the cover presents a risk of spark formation and, therefore, explosion. Only open the housing when the supply voltage is switched off.

Use of handheld terminal / PC

If a handheld terminal or a PC is being used for communication / configuration / parameterization in a potentially explosive atmosphere with type of protection “intrinsic safety”, the devices used must be certified accordingly. This applies even if the device is only connected for a short period of time. This proof of “intrinsic safety” must be supplied in addition to the transmitter.
Hazardous atmospheres

Ex Safety aspects and IP Protection (Europe)

According to ATEX Directive (European Directive 2014/34/EU and relative European Standards which can assure compliance with Essential Safety Requirements, i.e., EN 60079-0 (General requirements) EN 60079-1 (Flameproof enclosures “d”), EN 60079-11 (Equipment protection by intrinsic safety “i”), the pressure transmitters of the 2600T 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.

Certificate ATEX II 1/2 G Ex db IIC T6 Ga/Gb and II ½ D Ex tb IIIC T85°C Db, Ta = -50°C to +75°C

FM Approvals Certificate number FM09ATEX0023X (Tremezzina plant)

The meaning of ATEX code is as follows:
— II: Group for surface areas (not mines)
— 1/2: Category - It means that only a part of the transmitter complies with category 1 and a second part complies with category 2 (see next application sketch).
— G: Gas (dangerous media)
— 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 up to 50 mm depth.

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.

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

Application with Gas

Application with Dust

ATEX transmitter with the following types of protection:
“flameproof enclosure Ex db” and “dust ignition protection by enclosure Ex tb” in accordance with Directive 2014/34/EU

Transmitter with 4 to 20 mA output signal and HART communication

<table>
<thead>
<tr>
<th>Certificate no.</th>
<th>FM09ATEX0023X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marking</td>
<td>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 Db Ta = –50 °C to +75 °C; IP66, IP67.</td>
</tr>
</tbody>
</table>

Permissible ambient temperature versus process temperature

<table>
<thead>
<tr>
<th>Type of protection</th>
<th>Process temperature</th>
<th>Max. ambient temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>II 1/2 G Ex db IIC T6 Ga/Gb</td>
<td>≤ 121°C</td>
<td>75°C</td>
</tr>
<tr>
<td>II 1/2 D Ex tb IIIC T85 °C Db</td>
<td>≤ 121°C</td>
<td>75°C</td>
</tr>
</tbody>
</table>

Power supply and signal circuit with “flameproof enclosure Ex db and Ex tb” type of protection, with the following maximum values

<table>
<thead>
<tr>
<th>U = 42 Vdc</th>
<th>P = 2 W</th>
</tr>
</thead>
</table>
...10  Hazardous Area considerations

Hazardous atmospheres

IECEx transmitter with the following types of protection: “flameproof enclosure Ex db” and “dust ignition protection by enclosure Ex tb” in accordance with IEC standards

<table>
<thead>
<tr>
<th>Transmitter with 4 to 20 mA output signal and HART communication</th>
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<tbody>
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<td>Certificate no.</td>
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<tr>
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</table>

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<th>Permissible ambient temperature versus process temperature</th>
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<tr>
<td>Type of protection</td>
</tr>
<tr>
<td>Ex db IIC T6 Ga/Gb</td>
</tr>
<tr>
<td>Ex tb IIC T85 °C Db</td>
</tr>
</tbody>
</table>

Power supply and signal circuit with “flameproof enclosure Ex db and Ex tb” type of protection, with the following maximum values

\[ U = 42 \text{ Vdc} \]

\[ P = 2 \text{ W} \]
ATEX transmitter with the following types of protection: “flameproof enclosure Ex db” and “dust ignition protection by enclosure Ex tb” in accordance with Directive 2014/34/EU.

Transmitter with 4 to 20 mA output signal and HART communication:
- Certificate no.: FM09ATEX0023X
- Marking: 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 Db Ta = –50 °C to +75 °C; IP66, IP67.

Permissible ambient temperature versus process temperature:

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<th>Type of protection</th>
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<td>II 1/2 D Ex tb IIIC T85 °C Db</td>
<td>≤ 121° C</td>
<td>75° C</td>
</tr>
</tbody>
</table>

Effective internal capacitance: \( C_i = 3.7 \, \text{nF} \)
Effective internal inductance: \( L_i = 0 \, \mu \text{H} \)

Power supply and signal circuit with “flameproof enclosure” type of protection, with the following maximum values:
- \( V_{\text{max}} = 30 \, \text{V} \)
- \( I_{\text{max}} = 100 \, \text{mA} \)
- \( P_{\text{max}} = 1 \, \text{W} \)
- \( C_i = 3.7 \, \text{nF} \)
- \( L_i = 0 \, \mu \text{H} \)

Permissible ambient temperature versus process temperature / class:

<table>
<thead>
<tr>
<th>Type of protection</th>
<th>Process temperature</th>
<th>Max. ambient temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application without HMI</td>
<td>≤ 120° C</td>
<td>85° C</td>
</tr>
<tr>
<td>Ex db xxxxxxxxxx</td>
<td>≤ 85° C</td>
<td>85° C</td>
</tr>
<tr>
<td>Ex db xxxxxxxxxx</td>
<td>&gt; 85° C ≤ 120° C</td>
<td>75° C</td>
</tr>
</tbody>
</table>