ABB MEASUREMENT & ANALYTICS | OPERATING INSTRUCTION

# 266 DDS Digital Diaphragm Seal - HART Version

## Pressure transmitters



Engineered solutions for all applications

**Measurement made easy**

266 DDS models

## 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 and liquid level is provided, in the even most difficult and hazardous industrial environments.
Model 266DDS is 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.

# Contents


**1 Safety ..... 4**
General safety information..... 4
Improper use..... 4
Technical limit values ..... 4
Warranty provision ..... 4
Use of instruction ..... 4
Operator liability .....5
Qualified personnel .....5
Returning devices .....5
Disposal .....5
Information on WEEE Directive 2012/19/EU
(Waste Electrical and Electronic Equipment) .....5
Transport and storage.....5
Safety information for electrical installation .....5
Safety information for inspection and maintenance . 6
Cyber security ..... 6
Disclaimer..... 6
Communication protocol specific..... 6

**2 Transmitter overview .....7**
Transmitter components overview .....7
Range and span consideration ..... 8

**3 Opening the box.....9**
Identification plates..... 9
Optional wired-on plate .....11
Handling and storage.....11

**4 Mounting .....12**
General .....12
IP protection and designation.....12
Mounting the transmitter.....12
Transmitter factory configuration
consideration ..... 12
Hazardous area considerations..... 13
Pressure Equipment Directive (PED)
(2014/68/EU) .....13
Devices with PS >200 ..... 13
Devices with PS ≤ 200..... 13
Mounting 266DDS pressure transmitter .....14
Transmitter housing rotation .....16
Integral display rotation .....16
Display removal .....16
Impulse piping connection for standard
instruments.....16

**5 Transmitter wiring.....17**
Cable connection.....17
Analog output (HART) transmitter wiring.....17
Supply requirement .....18
Wiring procedure.....19
Grounding .....19
Surge protector equipped terminal block (optional) .19
Common mode voltages..... 20
Wirings accessories ..... 20

**6 Commissioning.....21**
General remarks.....21
Analog and HART Communication models .....21
Standard setting for normal operation
3.8 mA / 20.5 mA .....21
Standard setting for error detection (alarm)
3.6 mA / 21 mA .....21
Write protection .....21
Correcting the lower range value / zero shift..... 22
Set lower range value..... 22
Correct the zero shift..... 22
Installing/Removing the external push buttons .... 22
Local display ..... 23
Installing/Removing the LCD display ..... 23
Securing the housing cover in flameproof areas.... 23

**7 Operation . . . . . 24**
Local push buttons functionality . . . . . 24
Factory settings. . . . . 24
Configuration types . . . . . 24
Configuring the transmitter without an integral LCD HMI . . . . . 24
LRV and URV configuration (4 to 20 mA ranging) . . . 24
HMI as feedback of the local push button operations. . . . . 25
Correction of zero shift caused by installation with PV Zero Bias / Offset.. . . . . 25
Hardware settings. . . . . 25
Configuration of the pressure transmitter using the optional LCD HMI with keypad (menu-controlled) . . 26
LCD (L1 option) activation considerations. . . . . .27
Activation procedure for LCDs . . . . . .27
HMI menu structure . . . . . .27

**8 Error messages . . . . . 46**
LCD display messages . . . . . 46
Error states and alarms . . . . . 46

**9 Maintenance / Repair . . . . . 50**
Returns and removal. . . . . 50
Pressure transmitter sensor . . . . . 50
Pressure transducer replacement . . . . . .51
Electronic replacement . . . . . .51

**10 Hazardous Area considerations . . . . . 52**
Specific Conditions of Use (X). . . . . 52
Type-examination certificate/Declaration of conformity. . . . . 52
Type of protection “intrinsic safety Ex ia” . . . . . 52
Use in areas with combustible dust. . . . . 52
Use of handheld terminal / PC. . . . . 52
Hazardous atmospheres. . . . . 53
ATEX . . . . . .53
IECEx . . . . . .53
Electrical parameters (entities) . . . . . .58
Ex Safety aspects and IP protection (North America) . . . . . .58

# 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, please refer to chapter 3 “Opening the box”, “Handling and storage” paragraph. 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

**Models covered by this manual**

This manual can be used for all the 266 models with output code D, Digital Diaphragm Seal, 4-20 mA plus HART.

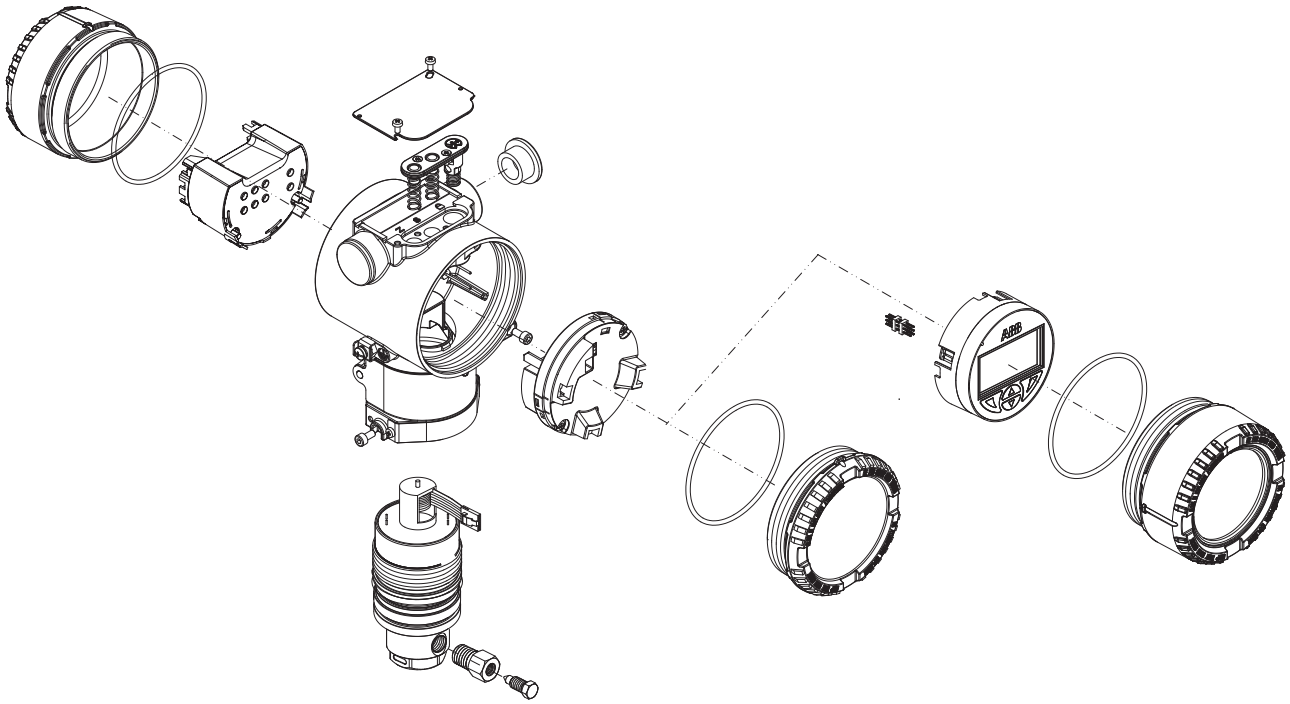


Figure 1a - 266 DDS pressure transmitter components - LCD display with keypad (L1 option) is only available on primary device.



Figure 1b - 266 Digital Diaphragm Seal System

***IMPORTANT***

This picture shows a typical 266DDS system with direct seal process connection and LCD mounted on primary device.

# ...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 ≤ LRV ≤ (URL - CAL SPAN)
- CAL SPAN ≥ MIN SPAN
- URV ≤ 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 (**ref. C**), instead, provides customer tag number and calibrated range.

The DDS plates (**ref. D**) are wired-on AISI 316 ss plates for cross identification of Primary-Secondary on both devices with same DDS identification tag number.

Both certification (**ref. A**) and tag plates (**ref. C**) 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 266xRx models.

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 (**ref. A**) is issued by ABB S.p.A, 22016 Tremezzina, Italy, with the numbers:
- FM09ATEX0024X or IECEx FME 16.0003X or FM22UKEX0087X (Ex ia)
- FM09ATEX0023X or IECEx FME 16.0002X or FM22UKEX0086X (Ex db, Ex tb)
- FM09ATEX0025X or IECEx FME 16.0004X or FM22UKEX0088X (Ex ic, Ex tc)

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.

# 3 Opening the box

## Identification plates

The instrument is identified by the plates shown in Figure 3.

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The Tag plate (**ref. C**), instead, provides customer tag number and calibrated range.

The DDS plates (**ref. D**) are wired-on AISI 316 ss plates for cross identification of Primary-Secondary on both devices with same DDS identification tag number.

Both certification (**ref. A**) and tag plates (**ref. C**) 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.

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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.

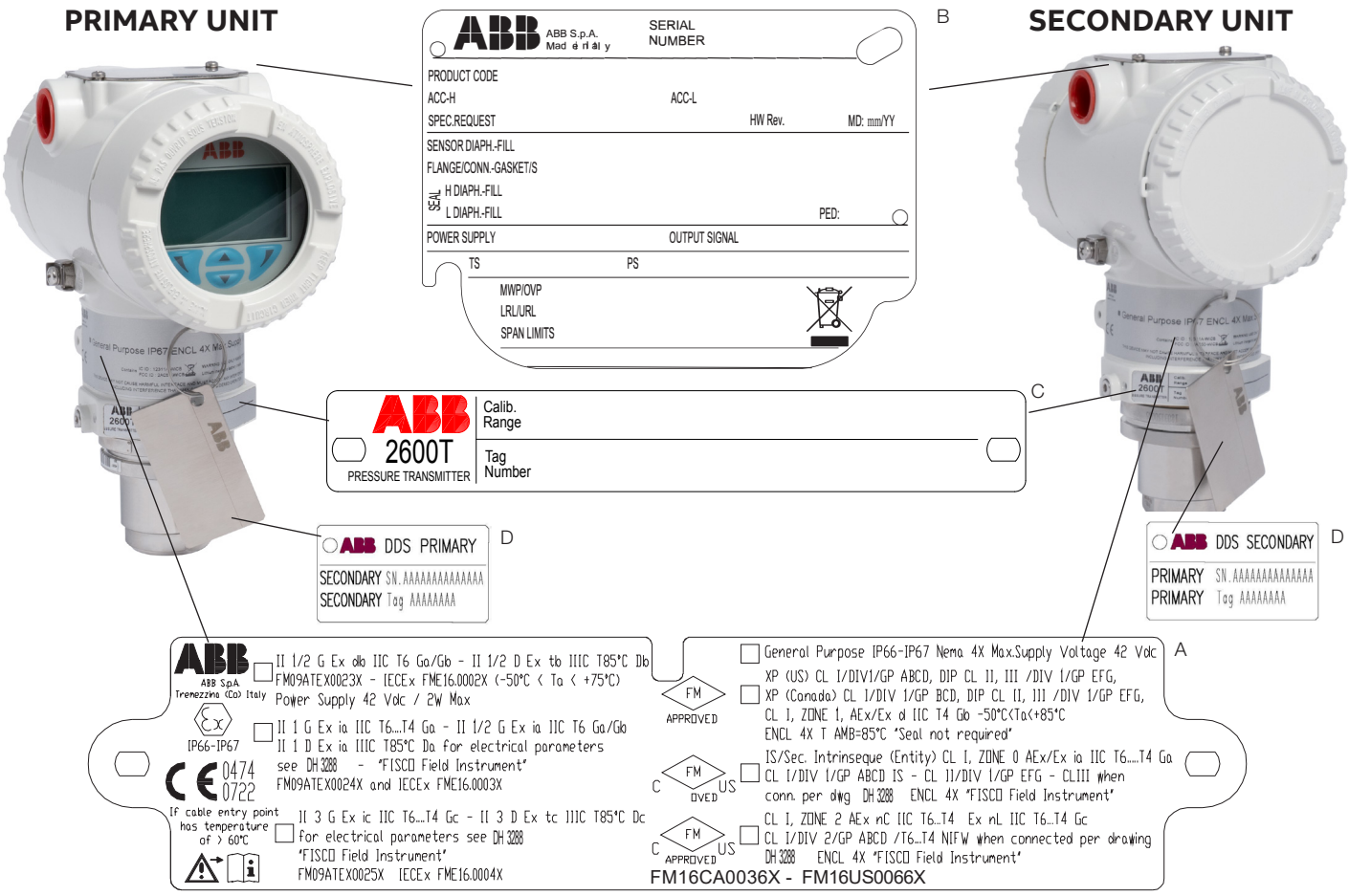
266DDS pressure transmitters comply with directive EMC 2014/30/EU.

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

- FM09ATEX0024X or IECEx FME 16.0003X or FM22UKEX0087X (Ex ia)
- FM09ATEX0023X or IECEx FME 16.0002X or FM22UKEX0086X (Ex db, Ex tb)
- FM09ATEX0025X or IECEx FME 16.0004X or FM22UKEX0088X (Ex ic, Ex tc)

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.



## Optional wired-on SST plate (I1)

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.

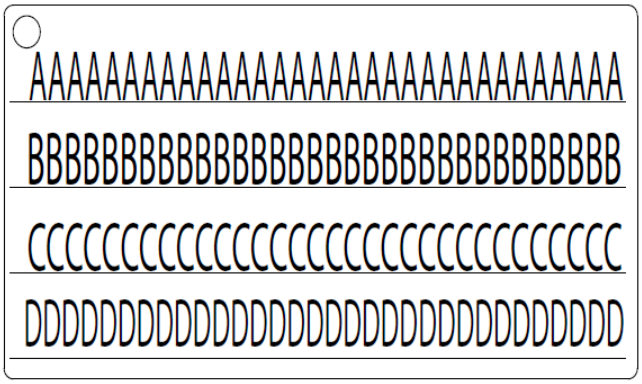



Figure 4 - 4-line layout of the optional wired-on Stainless Steel plate

## 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 end user customer according to this operating instruction.
Please check on DDS plates which is the primary (master) and secondary (slave) device 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

The suitability of the materials must be checked as regards 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.
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.

## 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 (long tag number, interconnects the primary and secondary devices)
- 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 neck of the transmitter top housing. The 266 Pressure Transmitter Line can have the following certifications:

- **ATEX Intrinsic Safety Ex ia (code E1)**
- **ATEX Explosion Proof Ex db_tb (code E2)**
- **ATEX Intrinsic Safety Ex ic_tc (code E3)**
- **Combined ATEX Ex ia, Ex db_tc and Ex ic_tc (code EW)**
- **IECEx Intrinsic Safety Ex ia (code E8)**
- **IECEx Explosion Proof Ex db_tb (code E9)**
- **IECEx Intrinsic Safety Ex ic_tc (code ER)**
- **Combined IEC Approval Ex ia and Ex db_tb (code EH)**
- **Combined IEC Approval Ex ia, Ex db_tb and Ex ic_tc (code EI)**
- **FM Approvals (Canada) approval (XP, DIP, IS, NI) (code E4)**
- **FM Approvals (US) approval (XP, DIP, IS, NI) (code E6)**
- **FM Approvals (US and Canada) Intrinsically safe (code EA)**
- **FM Approvals (USA and Canada) Nonincendive (code EC)**
- **Combined FM (code EB) approvals (US and Canada)**
- **Combined ATEX, IECEx and FM Approvals (US and Canada) (code EN)**

Type 4X, IP66, IP67 for all above markings.

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 specifications relevant to Pressure Equipment Directive (PED) (2014/68/EU).

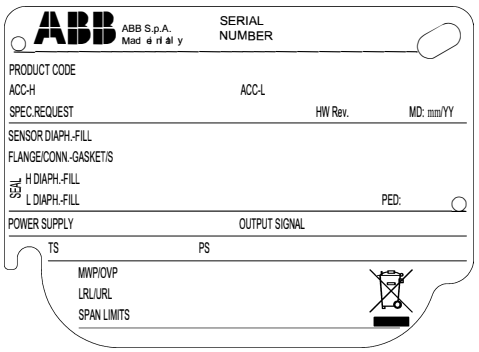



Figure 5: 266DDS nameplate with PED data

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

# ...4 Mounting

## Mounting 266DDS pressure transmitter

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

***IMPORTANT***

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

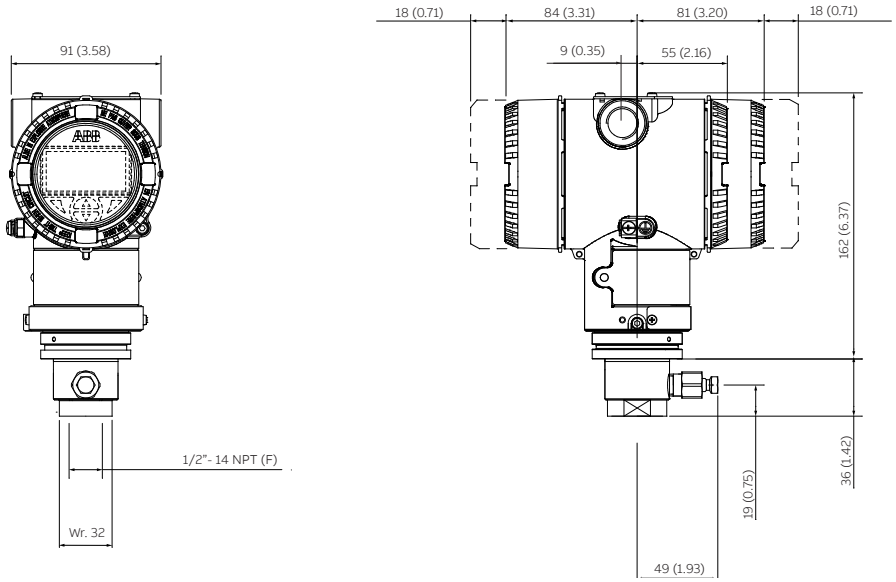



Figure 6: Transmitter with barrel housing with 1/2-14 NPT female process connection

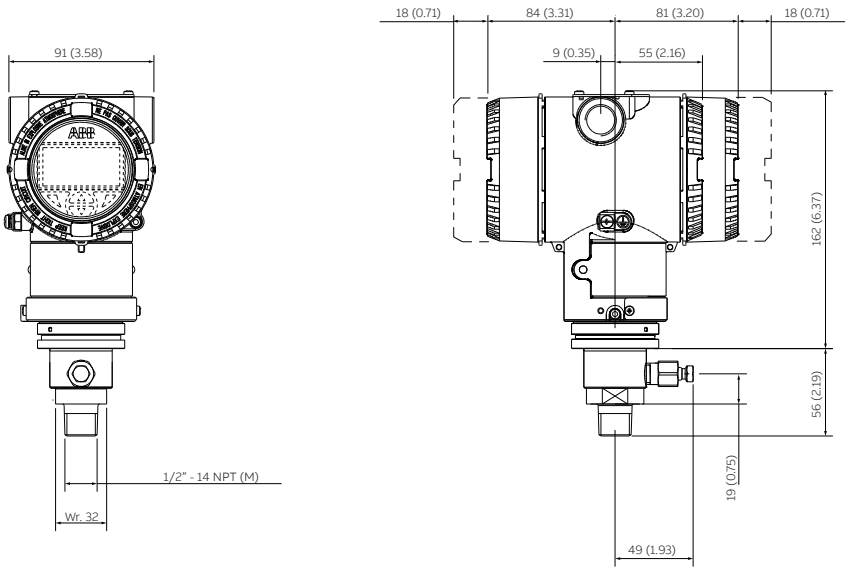



Figure 7: Transmitter with barrel housing with 1/2-14 NPT male process connection

## ⚠ WARNING - POTENTIAL DAMAGE TO TRANSMITTER

In case of an HART gauge pressure transmitter with 1050 bar/15000 psi sensor range and 1/4" 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, DD/FDI or handheld terminals.

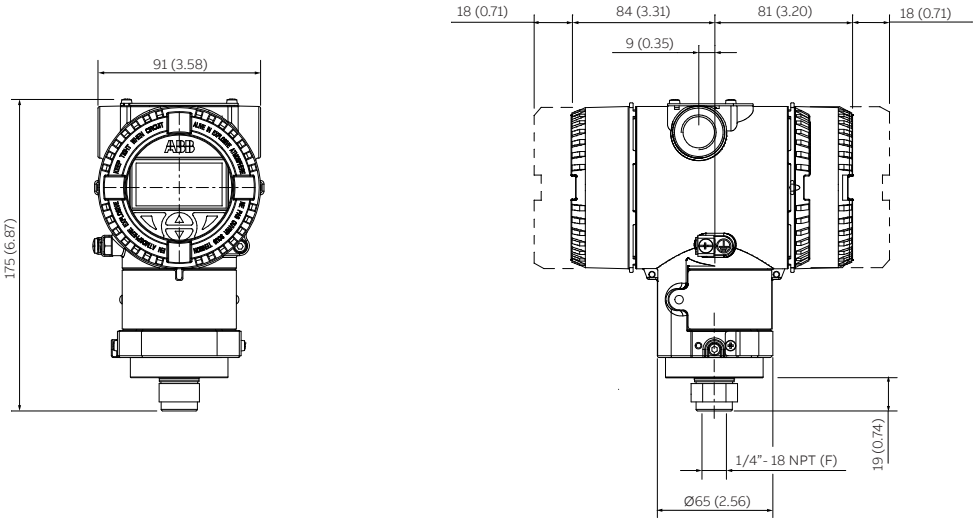
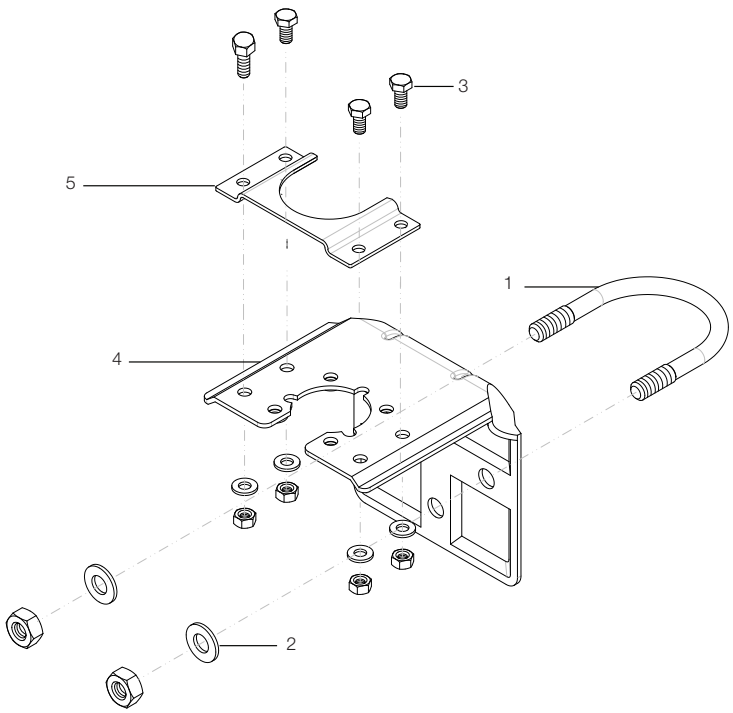



Figure 8: Transmitter with barrel housing with 1/4-18 NPT female process connection

## *IMPORTANT*

For Hazardous Areas installations, at least six (6) threads on the cover must be engaged in order to meet flameproof (explosion-proof) requirements.

**B6 and B7 Barrel housing bracket details**




1 – U-bolt

2 – U-bolt fixing washers and nuts

3 – Transmitter fixing bolts

4 – B6 or B7 bracket

5 – Fitting adapter (supplied with 266HSH)

Figure 7: Pipe and wall mounting bracket kits for P style transmitter with Barrel housing

## 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. In order to proceed with housing rotation, the housing stop tang-screw has to be unscrewed by approximately 1 rotation (do not pull it out) and, once the desired position has been reached, retightened.

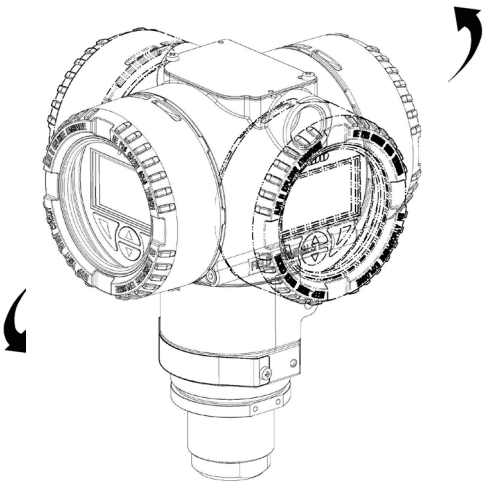


Figure 11: Housing rotation

## 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.

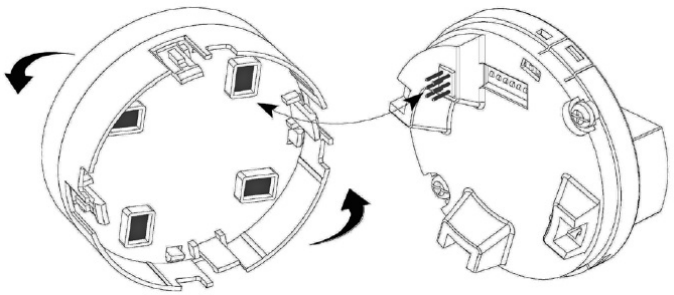


Figure 12: Display rotation

## 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.

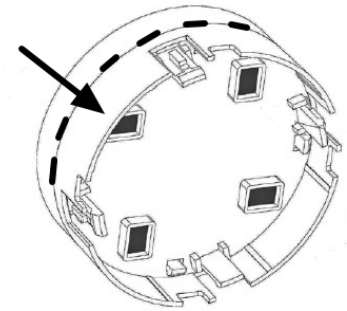


Figure 13: Grabbing area for display removal

## Impulse piping connection for standard instruments

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

- The measuring pipes must be as short as possible and free from sharp bends.
- Lay the impulse piping in such a way that no deposits accumulate in them. Gradients should not be less than approx. 8% (ascending or descending).
- The measuring pipes should be blown through with compressed air or, better yet, flushed through with the measuring medium before connection.
- 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.

**⚠ CAUTION**

Process leaks may cause harm or result in death. Install and tighten process connectors and all accessories (including manifolds) before applying pressure. In case of toxic or otherwise dangerous process fluid, take any precautions as recommended in the relevant Material Safety Data Sheet when draining or venting. Use only a 12 mm (15/32 in) hexagonal spanner to tighten the bracket bolts..

# 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 power supplied from a voltage source isolated from mains (galvanic separation). Furthermore the equipotentiality 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.

### 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.
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 in) off the cable jacket (see figure 14). Use wiring rated 10 °C minimum above ambient temperature).

## *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 section “Hazardous Area Consideration”). A thread is in the electronics housing for this purpose. For ransmitters 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.

### Analog output (HART) transmitter wiring

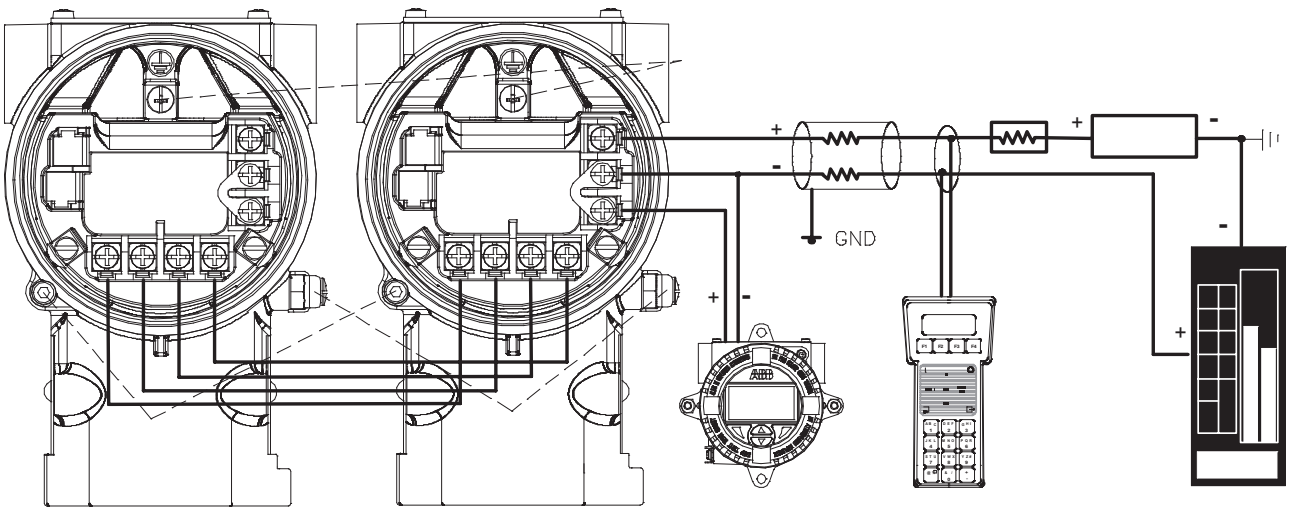



Figure 16 - HART transmitter connection scheme

| Application | Permissible voltage range of power supply |
|---|---|
| | **Standard** |
| Transmitter operated outside the potentially explosive atmosphere | from 12 to 42 V |
| Transmitter operated inside the potentially explosive atmosphere | from 12 to 30 V max (intrinsically safe) |
| Transmitter operated inside the potentially explosive atmosphere | from 12 to 42 V max (explosion proof) |

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.

## Supply requirement

For signal/power connection use twisted, stranded pairs of wiring no 18 to 22 AWG / 0.8 to 0.35mm2 ø 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 12 to 42 V DC with no load and is protected against reverse polarity connection.
For Ex ia and other intrinsically safe approval power supply must not exceed 30 V DC.
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:

$$L = \frac{65x10^6}{RxC} - \frac{C_f + 10000}{C}$$

Where:
L = Line length in meters
R = Total line 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.

## ⚠ WARNING - GENERAL RISKS

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.

# ...5 Transmitter wiring

## 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.
- 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).
- 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.

## 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 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 impedance equal to or less than 5 ohm.

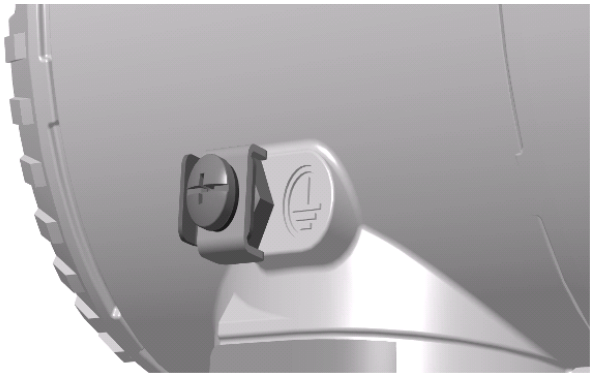


Figure 15 - Ground connection on transmitter housing

## Surge protector equipped terminal block (optional)

The pressure transmitter housing with surge protector (ordering code digit 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 have 4.00mm2 of maximum cross-section.

***IMPORTANT***

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

## Common mode voltages

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

## Wirings accessories

Recommended specifications for wiring accessories to connect primary and secondary device of 266 DDS Digital Diaphragm Seal.

| Part no. | Description | Material | Dimensions | Temperature range | Picture |
|---|---|---|---|---|---|
| 3KXP001186L0100 | Cable gland general purpose 1/2in NPT | Grey PVC<br>Polyamide V0<br>according to UL94 | Thread 1/2 NPT - 13 mm<br><br>Cable diameter 5 - 9 mm | -40 °C to +80 °C |  |
| 9287119-2 | Cable gland general purpose M20x1.5 | Black PVC<br>Polyamide V2<br>according to UL94 | Thread M20x1.5 - 9 mm<br><br>Cable diameter 6 - 12 mm | -40 °C to +100 °C |  |
| 3KXP001186L0200 | Cable gland Ex-i M20x1.5 | Blue PVC<br>Polyamide V0<br>according to UL94 | Thread M20x1.5 - 9 mm<br><br>Cable diameter 5 - 9 mm | -40 °C to +80 °C |  |
| 3KXP001186L0300 | Cable gland Ex-i 1/2in NPT | Blue PVC<br>Polyamide V0<br>according to UL94 | Thread 1/2 NPT - 13 mm<br><br>Cable diameter 5 - 9 mm | -40 °C to +80 °C |  |
| 3KXP001186L0400 | Cable gland Ex-d 1/2in NPT | Nickel-plated brass | Thread 1/2 NPT - 20 mm<br>Cable diameter<br>A1: 12.5 - 20.5 mm<br>A2: 9 - 14 mm | -60 °C to +105 °C |  |
| 3KXP001186L0500 | Cable gland Ex-d M20X1.5 | Nickel-plated brass | Thread M20x1.5 - 16 mm<br>Cable diameter<br>A1: 12.5 - 20.5 mm<br>A2: 9 - 14 mm | -60 °C to +105 °C |  |
| MV3014 | Stainless steel plug Ex-d M20x1.5 | AISI 316 / 316L<br><br>O-ring LSR silicone | M20x1.5<br>Height 19<br>CH24 across corner | -50 °C to +200 °C |  |
| MV3015 | Stainless steel plug Ex-d 1/2in NPT | AISI 316 / 316L | 1/2in NPT | |  |
| 3KXP001185L0100 | Cable for general purpose applications<br>Connection cable between<br>PRIMARY-SECONDARY 266DDS | 7-wire bare copper stranded conductor; Insulation between conductors in polyethene (PE); Twisted pair and shielded cable with copper braiding; Gray PVC outer sheath | Length upon request in multiples of 1 meter | -40 °C to +80 °C |  |
| 3KXP001185L0200 | Cable for intrinsically safe areas<br>Connection cable between<br>PRIMARY-SECONDARY 266DDS | Fine bare copper wires. Conductor insulation in blue PVC | Length upon request in multiples of 1 meter | -40 °C to +80 °C |  |
| 3KXP001185L0300 | Cable for Ex-d applications<br>Connection cable between<br>PRIMARY-SECONDARY 266DDS | XLPE/IS/OS/LSZH/<br>SWA/LSZH | Length upon request in multiples of 1 meter | -40 °C to +80 °C |  |

# 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
- 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 order (in the default setting, all valves are closed):

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

2 Open the positive shut-off valve.

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

**IMPORTANT**

If, when using “intrinsically safe” transmitters, 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 capacitances and inductances of all circuits, including the transmitter (see EC-typeexamination certificate) must be equal to or less than the permissible capacitances and inductances 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.

## Analog 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

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 or via a DD/FDI based configuration tool (FIM).

## Standard setting for error detection (alarm) 3.6 mA / 21 mA

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

**IMPORTANT**

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

**IMPORTANT - ALARM CURRENT**

- Lower limit: 3.6 mA (configurable from 3.6 to 4 mA)
- Upper limit: 21 mA (configurable from 20 to 23 mA
  Factory setting: high alarm current (21.0 mA)

## Write protection

Write protection prevents the configuration data from being overwritten by unauthorized users.
If write protection is enabled, the “Z” and “S” buttons (both internal or external) are disabled. However, it is still possible to read out the configuration data using the graphical user interface (DD/FDI) or another, similar communication tool. The control unit may be leaded if required.

**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 at chapter 3) 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°.

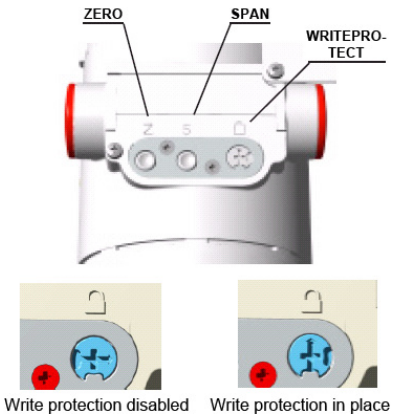



Figure 17 - Write-protection pushbutton

# ...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.

## Correcting the lower range value / zero shift

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

**IMPORTANT**

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

**IMPORTANT**

The button unit must be available for this purpose Operating the buttons using a magnetic screwdriver is not permitted because it may generate some interferences with the magnetic pickup system.

## Set lower range value

- Apply the lower range value pressure (4 mA) from the process or from a pressure generator on 266 DDS system, primary and secondary units. The pressure must be stable and applied with a high level of accuracy << 0.05 % (observing the set damping value).
- Press the "Z" button the primary 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.

## 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 of primary device to the up (1) position and press the zero button. This functionality will align the PV digital value to 0 of 266DDS and if the calibrated span it is zero based, the output will go at 4 mA.
- 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. 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.

## Installing/Removing the external push buttons

- Loosen the screws that fix the nameplate plate 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.

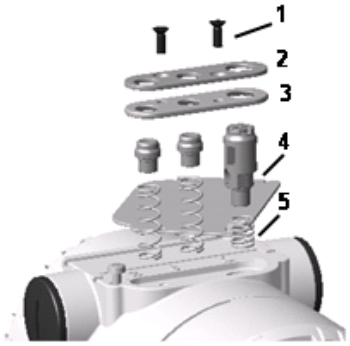
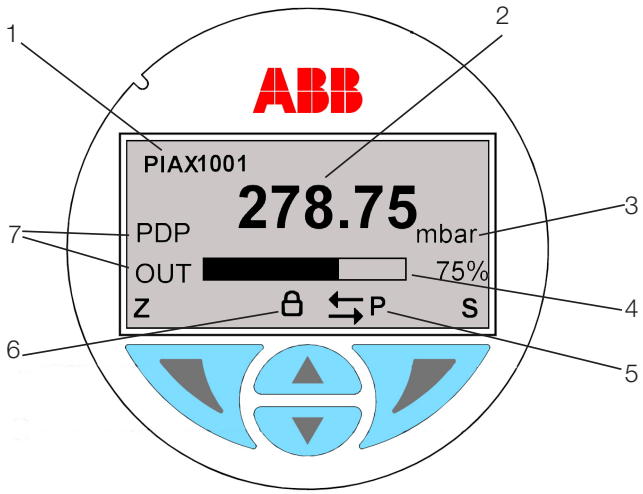



Figure 18 - External pushbutton assembly components

## Local display

The displays feature a LCD dot matrix for clear visualizations. Here after a view with 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.

| 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 teperature |
| SP | Static Pressure |
| HMI | Measured value after dispaly scaling (HMI transfer function and scaling) |

## 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 dedicated paragraph.

***IMPORTANT***

Retighten the housing cover until is hand-tight. If necessary, refer to the section “Securing the housing cover in flameproof areas”.

***IMPORTANT***

Picture shows L1 display version, cover is dimensionally different (short) but features the same threads and requires the same installation practices.

## 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

## Local push buttons functionality

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

**⚠ WARNING**

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

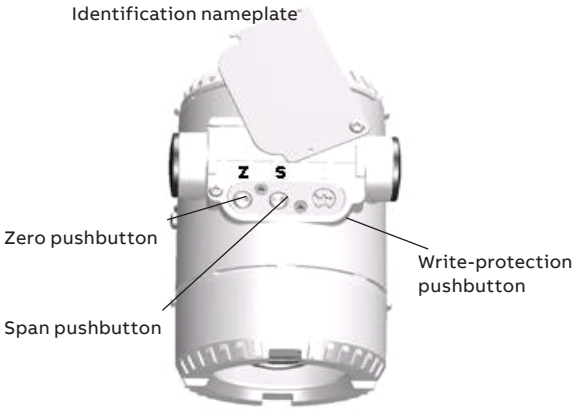



Figure 47: Pushbutton functionalities

## Factory settings

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

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

***IMPORTANT***

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

## Configuration types

Pressure transmitters can be configured as follows:

- Configuration of the parameters for the lower and upper range values (via Zero and Span push buttons), without an integral LCD HMI.
- Configuration of the pressure transmitter using the integral LCD HMI with keypad (menu-controlled).
- Configuration with a handheld terminal.
- Configuration using a PC/laptop via the graphical user interface (DD/FDI).

## Configuring the transmitter without an integral LCD HMI

The "lower range value" and "span" parameters can be set directly on the transmitter using the external push buttons. The transmitter has been calibrated by the manufacturer based on the order information. The tag plate contains information on the "lower range value" and "upper range value" set. In general, the following applies:
The first pressure value (e.g., 0 mbar) is always assigned to the 4 mA signal (or 0%), while the second pressure value (e.g., 400 mbar) is always assigned to the 20 mA 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.

## LRV and URV configuration (4 to 20 mA ranging)

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

***IMPORTANT***

This configuration procedure only changes the 4 to 20 mA current signal; it does not affect the physical process pressure (PV value) also shown on the digital display or user interface. To avoid potential discrepancies, you can follow the procedure below. After performing a correction, you must check the device configuration.

## HMI as feedback of the local push button operations

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

| Message | Description |
|---|---|
| **! Oper Done** | The push button operation has been successfully executed |
| **! Proc Too Low** | The Pressure measured in input is too low and not acceptable for the requested operation |
| **! Proc Too High** | The Pressure measured in input is too high and not acceptable 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 lower than the Minimum Span value |
| **! Oper Disabled** | The push button operation has been refused because the Write Protection is enabled |
| **! LRV Too Low** | New LRV is too low and not acceptable for the requested operation |
| **! LRV Too High** | New LRV is too high low and not acceptable for the requested operation |
| **URV Too Low** | New URV is too low and not acceptable for the requested operation |
| **URV Too High** | New URV is too high and not acceptable for the requested operation |
| **Armed** | Device is armed to accept HART command 73 “Find Device”. This message can be triggered only during the device wakeup operation |

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

- Raise the dip switch 3 in 1 (up) position.
- Press the “Z” button. This sets the output current to 4 mA, 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 rezeroed following the above procedure, a zero bias/offset value is applied and stored in the transmitter memory.

***IMPORTANT***

This action can be performed both by using the external, non-intrusive push buttons and the on-board buttons of the integrated LCD display, which become respectively associated to B and R letters in the lower corners.

***IMPORTANT***

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

## Hardware settings

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

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

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

**Replace mode (switches 1 and 2)**

Usually switches 1 and 2 are down in “0” position. They are moved when a replace operation is required.

Switch 1 up in “1” position is required before power up the transmitter, when user needs to replace the electronics or the sensor.

Switch 2 down in “0” position allows the replace of the secondary electronics. It must be moved in this position before power up the transmitter.

Switch 2 up in “1” position indicates that a new sensor has been installed.

AFTER ANY REPLACE OPERATION MOVE DOWN IN “0” POSITION THE RELEVANT SWITCHES

**Push buttons mode (switch 3)**

Dip switch 3 is set at the factory on “0” position. This means that the external push buttons perform the zero/span adjustments. If the user puts this switch on “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 (switch 4 and 5)**

Should the user modify the factory-defined parameters for the fail safe output condition in case of transmitter failure, it is necessary to enable the modification by putting dip switch 4 on “1” position. Consequently, it is necessary to choose whether the output has to go Upscale or Downscale.

Dip switch 5:

on “0” position the output is driven upscale (High alarm 21mA)

on “1” position the output is driven downscale (Low alarm 3.6 mA)

For exceptions please refer to diagnostics chapter.

## ...Hardware settings

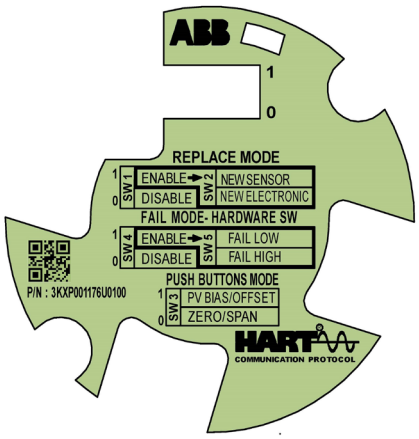



Figure 48a: Dip switches position on HART communication board

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

The integral LCD option (L1 option) is connected on the 266 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 carried out.

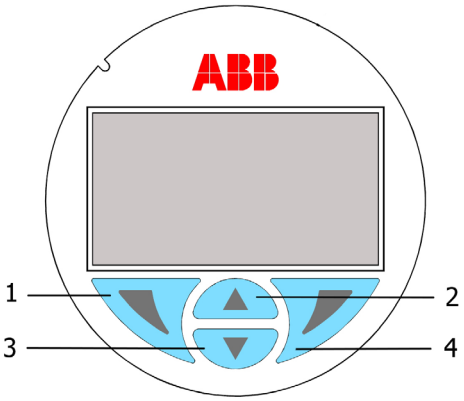



Figure 49: Display keypad of L1 LCD display options

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

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

| Button (1) functionalities | Meaning |
|---|---|
| Exit | Exit menu |
| Back | Back one submenu |
| Cancel | Exit without saving 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 |

## LCD (L1 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.

## Activation procedure for LCDs

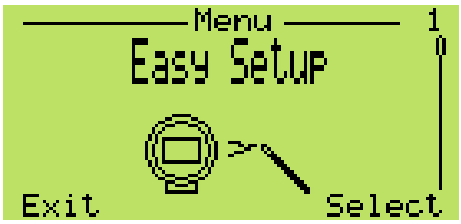
The LCD display features 4 push buttons (see figure 49) that allow the navigation through the various functions.

- Press simultaneously the buttons (2) ▲ and (3) ▼ until two icons will appear at the bottom corners of the display.
- Press the 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.

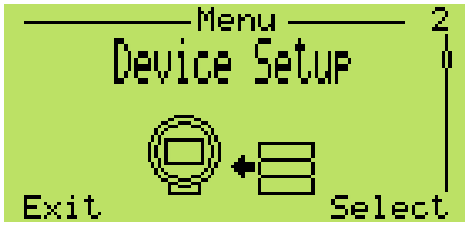
## HMI menu structure

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

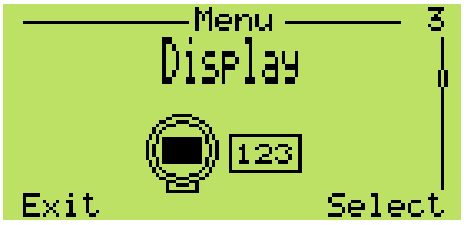
Follow the instruction on the screen to perform the configuration of the different parameters.



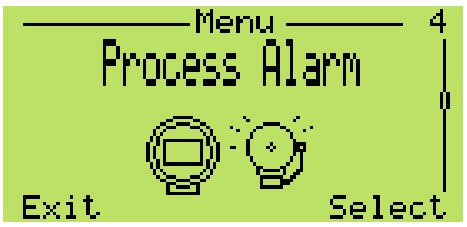

This menu allows the verification and the parameterization of the basic configuration of the 266 DDS pressure transmitter. The menu driven structure will guide you to the choice of the interface language, the tag number configuration, the engineering units, the URV and LRV (Upper range value and lower range value), the transfer function (linear or square root) the damping time, the auto set zero (set the input measured value to 4 mA and the PV value to 0), the display visualization mode (the value that need to be visualized on the LCD).



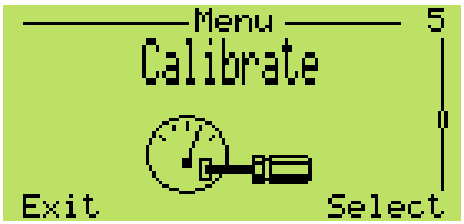

This menu allows the verification and the parameterization of the entire device The menu driven structure includes the write protection enabling, process variable settings (unit, LRV and URV), transfer function selection (linearization type and low flow cut-off) and output scaling (unit according to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



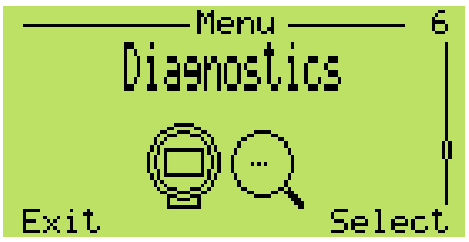

This menu allows the set-up of different functions relevant to the display itself. The menu driven structure will guide you through the choice of some functional aspects as the display language and contrast. Moreover, it is possible to choose in details what you want to see on the display: one or two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



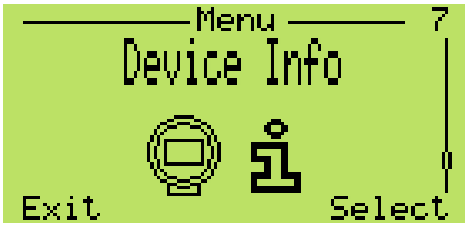

This menu allows the parameterization of the process alarm. The menu driven structure will guide you through the choice of the fail safe functions such as the saturation limits, the fail level (upscale or downscale) and the fails safe type which is set as software at the factory. Software fail safe type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



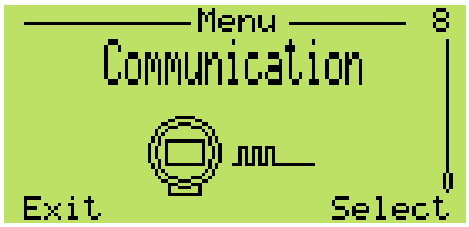

This menu allows the local calibration of the instrument. The menu driven structure will guide you through the choice of pressure sensor trimming (low or high), the output setting (set to 4 or 20 mA) and at the end you can reset these parameters (to factory sensor trimming, to user sensor trimming or to factory output trimming).




This menu allows you to monitor diagnostics messages related to pressure variable, output current, output percentage, scaled output, static and sensor pressure. The menu driven structure will also guide you through the loop test (set 4 and 20 mA and set the output value).

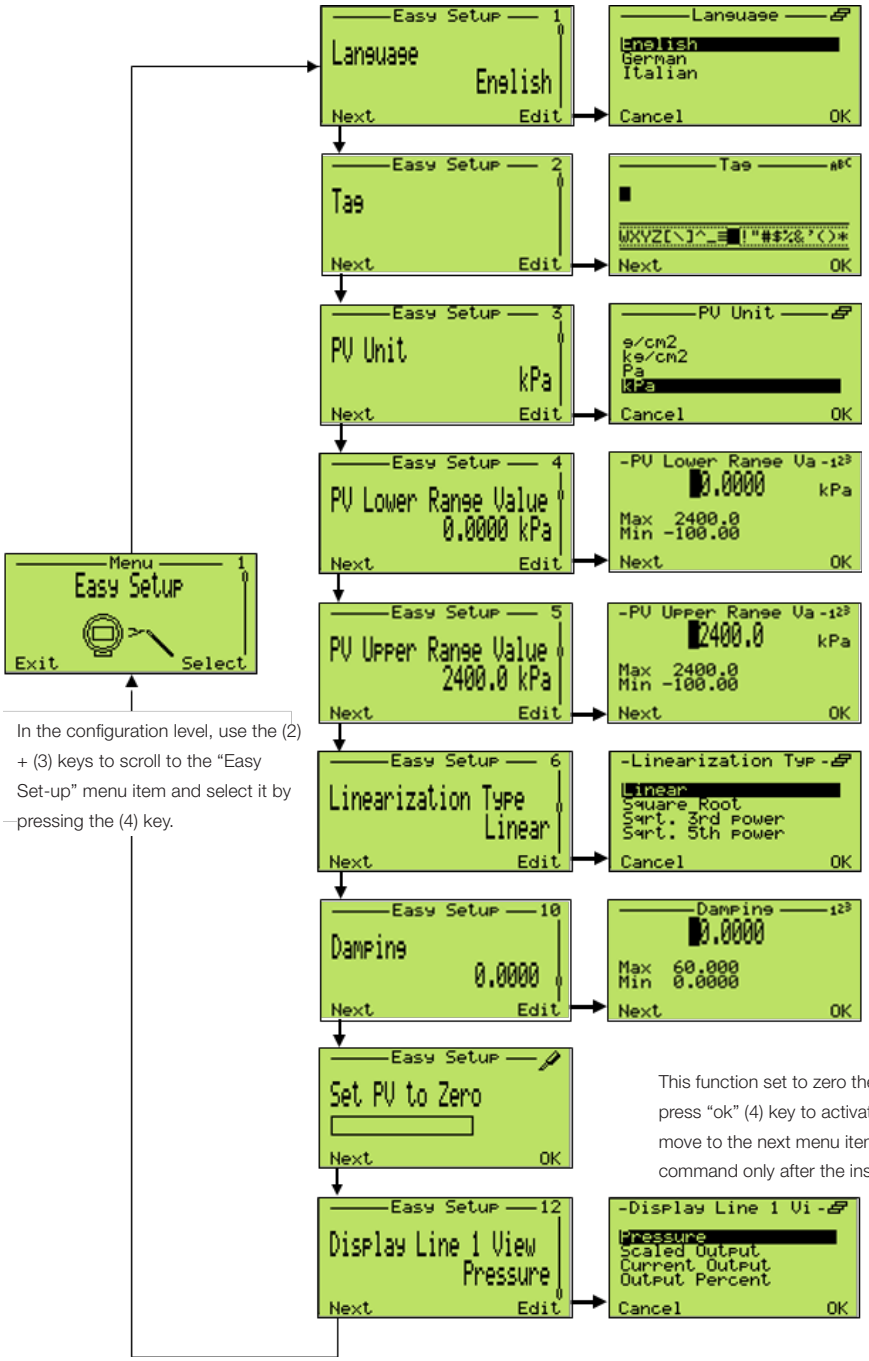



This menu gives you all information about the device. The menu driven structure will show you what is the sensor type, the hardware and software revisions, the high and low sensor limits as well as the minimum applicable span.




The last section of this structured and driven menu gives you the possibility of changing the communication tag and the MULTI-DROP mode with HART address numbers of the device.

## Easy Set-up




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

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

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

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

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

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

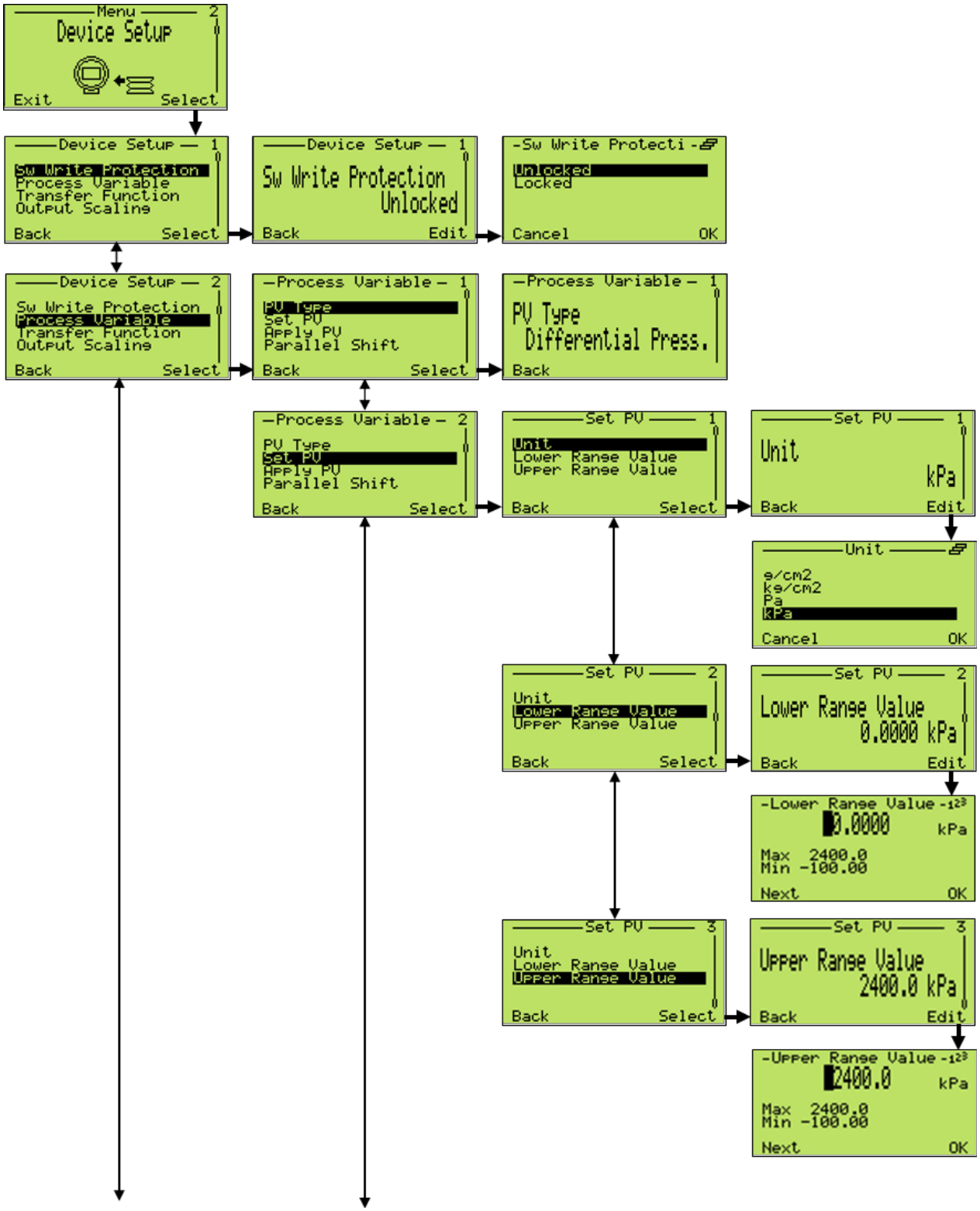
Press the (4) key and select the transfer function from the list with (2) + (3). After entering the settings, press the “ok” (1) key to move to the next menu item.

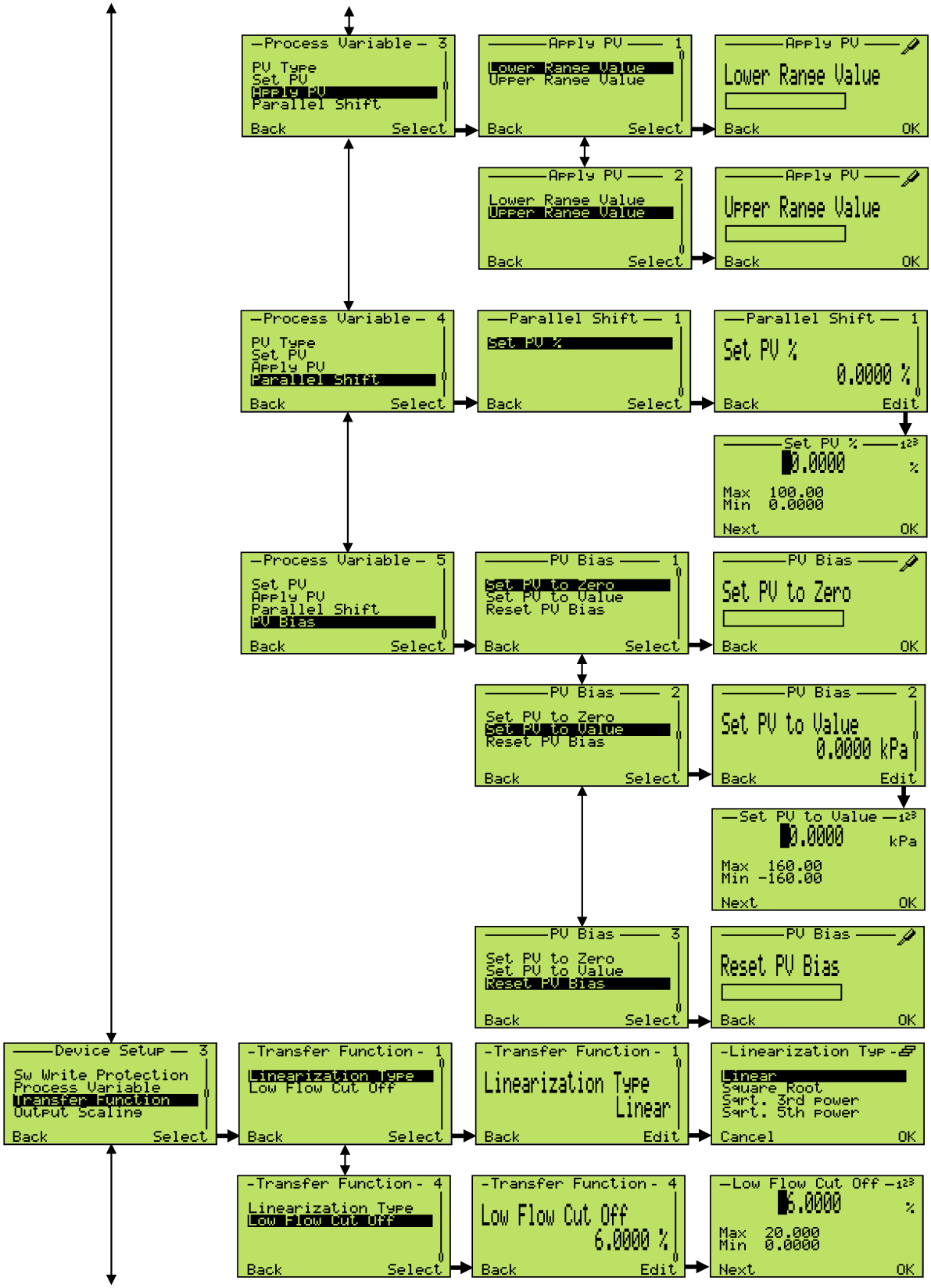
Press the (4) key and set the damping. After entering the settings, press the (1) key to move to the next menu item.

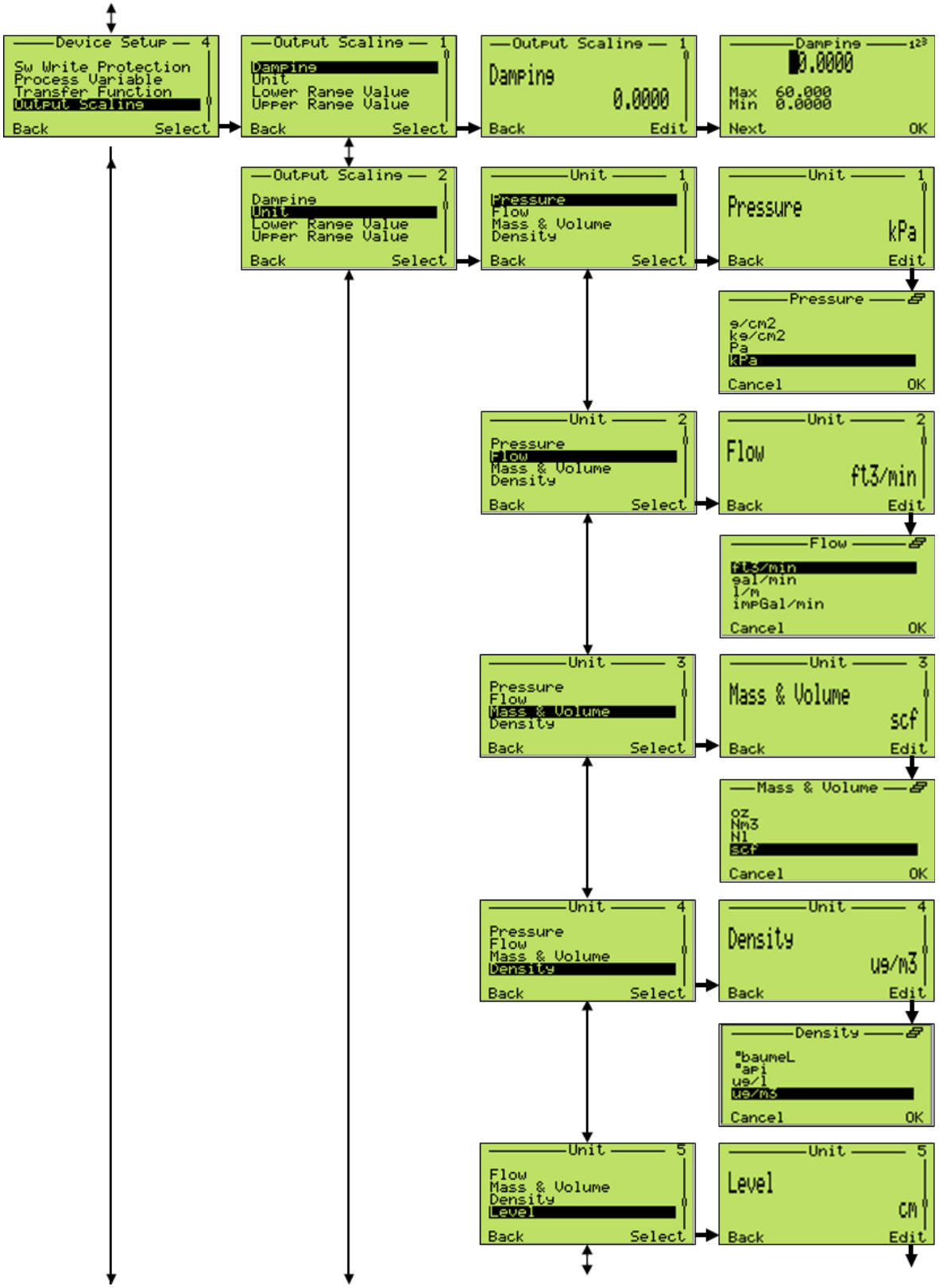
This function set to zero the PV value and to 4 mA the analog output. Simply press “ok” (4) key to activate the PV to zero function. Press Next (1) key to move to the next menu item. ABB suggest user should perform this specific command only after the installation and configuration phases are complete

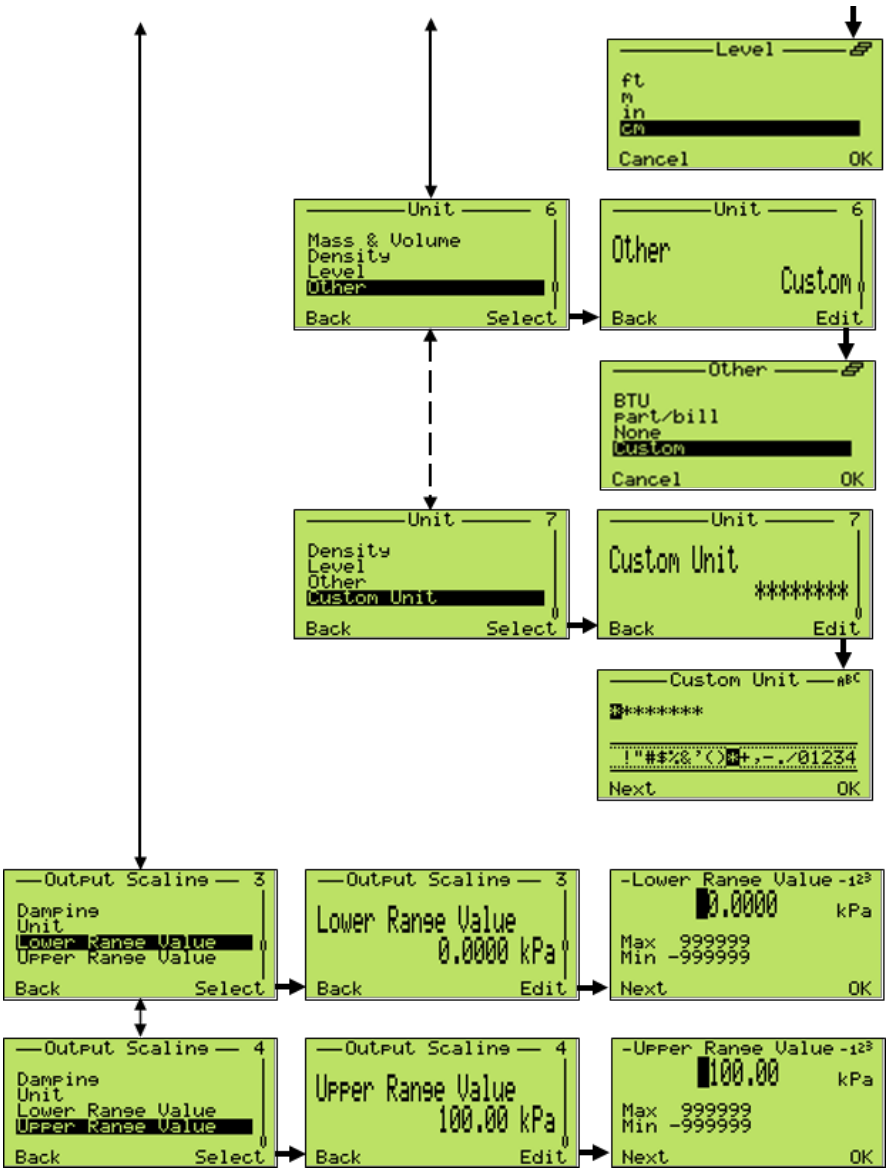
This function allows the selection of the LCD visualization. Select between the list and confirm with “ok” (1) key.

**Device Set-up**

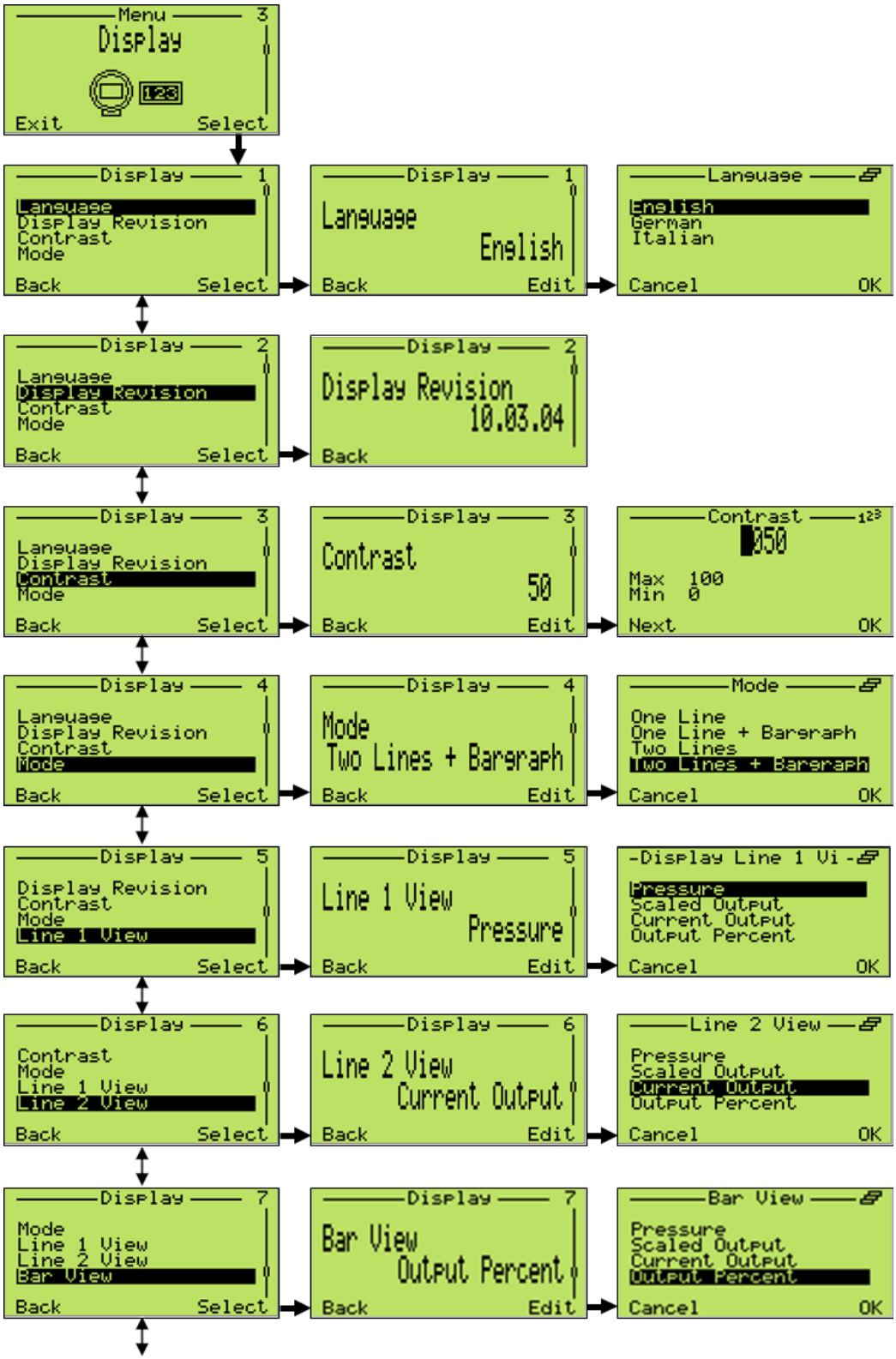


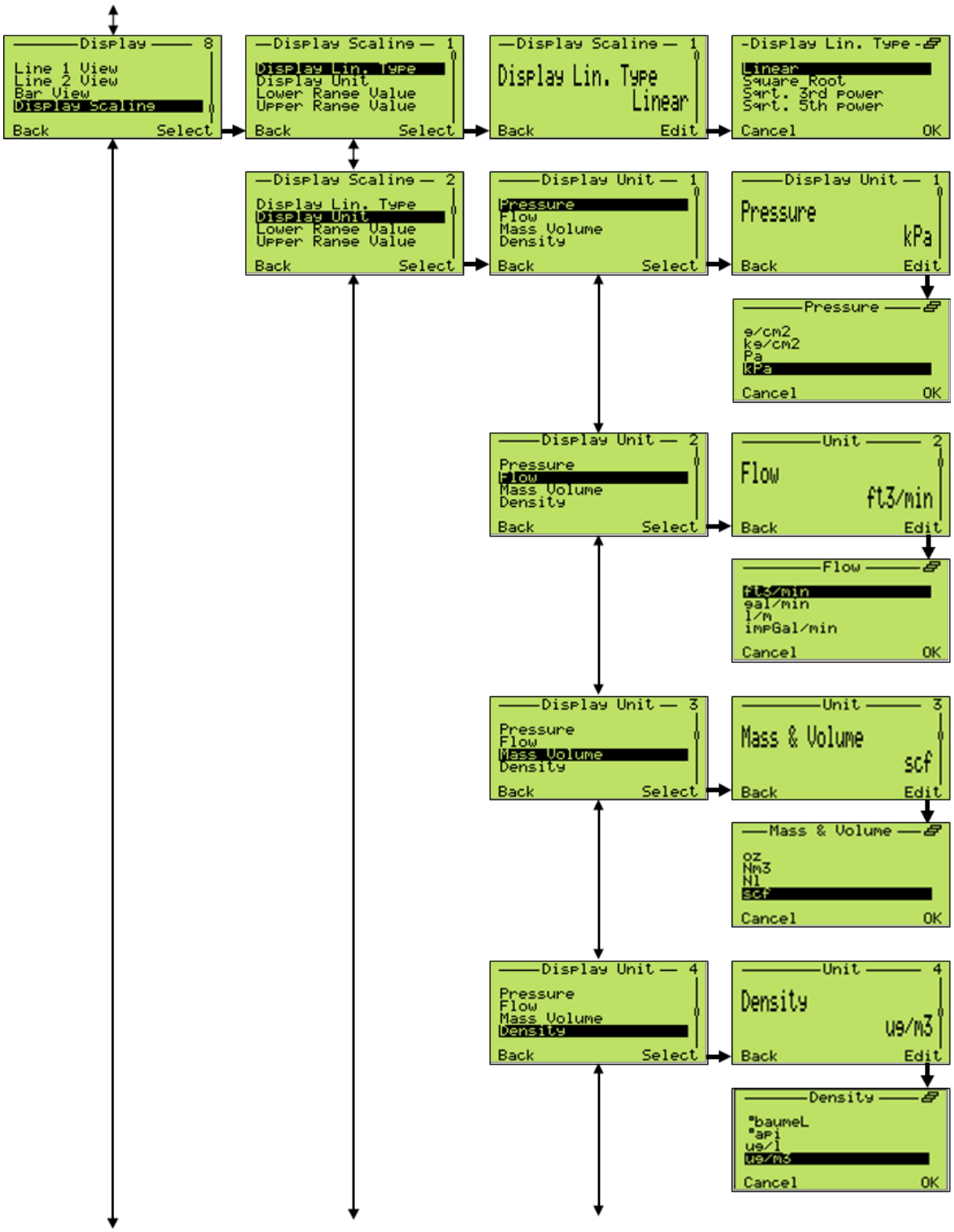

Process Variable 3
PV Type
Set PV
Apply PV
Parallel Shift
Back Select
Apply PV 1
Lower Range Value
Upper Range Value
Back Select
Apply PV
Lower Range Value
Back OK
Apply PV 2
Lower Range Value
Upper Range Value
Back Select
Apply PV
Upper Range Value
Back OK
Process Variable 4
PV Type
Set PV
Apply PV
Parallel Shift
Back Select
Parallel Shift 1
Set PV %
Back Select
Parallel Shift 1
Set PV %
0.0000 %
Back Edit
Set PV %
0.0000 %
Max 100.00
Min 0.0000
Next OK
Process Variable 5
Set PV
Apply PV
Parallel Shift
PV Bias
Back Select
PV Bias 1
Set PV to Zero
Set PV to Value
Reset PV Bias
Back Select
PV Bias
Set PV to Zero
Back OK
PV Bias 2
Set PV to Zero
Set PV to Value
Reset PV Bias
Back Select
PV Bias 2
Set PV to Value
0.0000 kPa
Back Edit
Set PV to Value
0.0000 kPa
Max 160.00
Min -160.00
Next OK
PV Bias 3
Set PV to Zero
Set PV to Value
Reset PV Bias
Back Select
PV Bias
Reset PV Bias
Back OK
Device Setup 3
Sw Write Protection
Process Variable
Transfer Function
Output Scaling
Back Select
Transfer Function 1
Linearization Type
Low Flow Cut Off
Back Select
Transfer Function 1
Linearization Type
Linear
Back Edit
Linearization Type
Linear
Square Root
Sqrt. 3rd power
Sqrt. 5th power
Cancel OK
Transfer Function 4
Linearization Type
Low Flow Cut Off
Back Select
Transfer Function 4
Low Flow Cut Off
6.0000 %
Back Edit
Low Flow Cut Off
6.0000 %
Max 20.000
Min 0.0000
Next OK

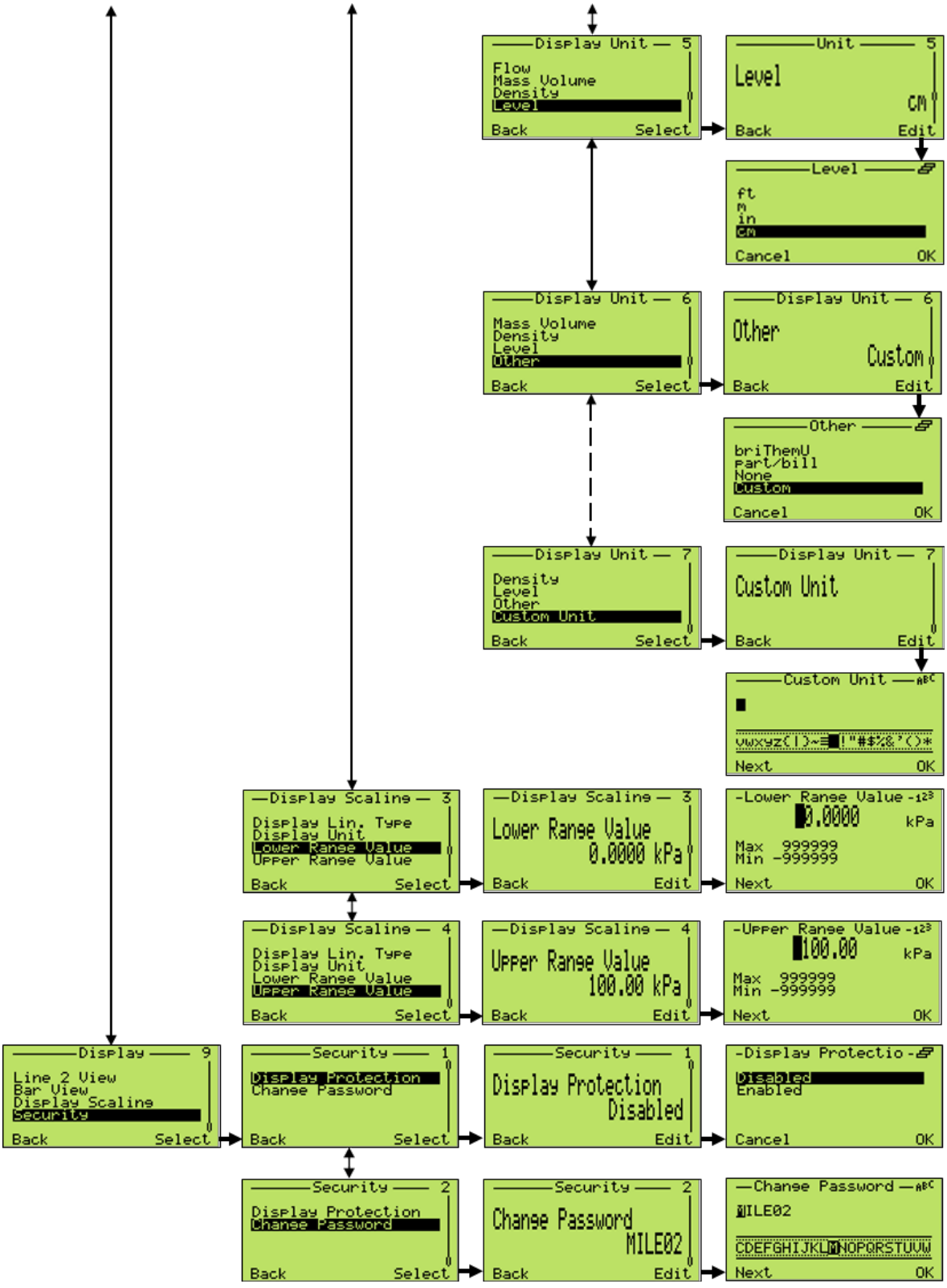

Device Setup — 4
Sw Write Protection
Process Variable
Transfer Function
Output Scaling
Back Select
Output Scaling — 1
Damping
Unit
Lower Range Value
Upper Range Value
Back Select
Output Scaling — 1
Damping
0.0000
Back Edit
Damping 123
0.0000
Max 60.000
Min 0.0000
Next OK
Output Scaling — 2
Damping
Unit
Lower Range Value
Upper Range Value
Back Select
Unit 1
Pressure
Flow
Mass & Volume
Density
Back Select
Unit 1
Pressure
kPa
Back Edit
Pressure
g/cm2
kg/cm2
Pa
kPa
Cancel OK
Unit 2
Pressure
Flow
Mass & Volume
Density
Back Select
Unit 2
Flow
ft3/min
Back Edit
Flow
ft3/min
gal/min
l/m
ImpGal/min
Cancel OK
Unit 3
Pressure
Flow
Mass & Volume
Density
Back Select
Unit 3
Mass & Volume
scf
Back Edit
Mass & Volume
oz
Nm3
Nl
scf
Cancel OK
Unit 4
Pressure
Flow
Mass & Volume
Density
Back Select
Unit 4
Density
ug/m3
Back Edit
Density
°baumeL
°api
ug/l
ug/m3
Cancel OK
Unit 5
Flow
Mass & Volume
Density
Level
Back Select
Unit 5
Level
cm
Back Edit


Level
ft
m
in
cm
Cancel
OK
Unit 6
Mass & Volume
Density
Level
Other
Back
Select
Unit 6
Other
Custom
Back
Edit
Other
BTU
Part/bill
None
Custom
Cancel
OK
Unit 7
Density
Level
Other
Custom Unit
Back
Select
Unit 7
Custom Unit
*******
Back
Edit
Custom Unit
*******
!"#$%&'()*+,-./01234
Next
OK
Output Scaling 3
Damping
Unit
Lower Range Value
Upper Range Value
Back
Select
Output Scaling 3
Lower Range Value
0.0000 kPa
Back
Edit
Lower Range Value
0.0000
kPa
Max 999999
Min -999999
Next
OK
Output Scaling 4
Damping
Unit
Lower Range Value
Upper Range Value
Back
Select
Output Scaling 4
Upper Range Value
100.00 kPa
Back
Edit
Upper Range Value
100.00
kPa
Max 999999
Min -999999
Next
OK

**Display**


Menu 3
Display
Exit Select
Display 1
Language
Display Revision
Contrast
Mode
Back Select
Display 1
Language
English
Back Edit
Language
English
German
Italian
Cancel OK
Display 2
Language
Display Revision
Contrast
Mode
Back Select
Display 2
Display Revision
10.03.04
Back
Display 3
Language
Display Revision
Contrast
Mode
Back Select
Display 3
Contrast
50
Back Edit
Contrast
050
Max 100
Min 0
Next OK
Display 4
Language
Display Revision
Contrast
Mode
Back Select
Display 4
Mode
Two Lines + Bargraph
Back Edit
Mode
One Line
One Line + Bargraph
Two Lines
Two Lines + Bargraph
Cancel OK
Display 5
Display Revision
Contrast
Mode
Line 1 View
Back Select
Display 5
Line 1 View
Pressure
Back Edit
-Display Line 1 Vi-
Pressure
Scaled Output
Current Output
Output Percent
Cancel OK
Display 6
Contrast
Mode
Line 1 View
Line 2 View
Back Select
Display 6
Line 2 View
Current Output
Back Edit
Line 2 View
Pressure
Scaled Output
Current Output
Output Percent
Cancel OK
Display 7
Mode
Line 1 View
Line 2 View
Bar View
Back Select
Display 7
Bar View
Output Percent
Back Edit
Bar View
Pressure
Scaled Output
Current Output
Output Percent
Cancel OK

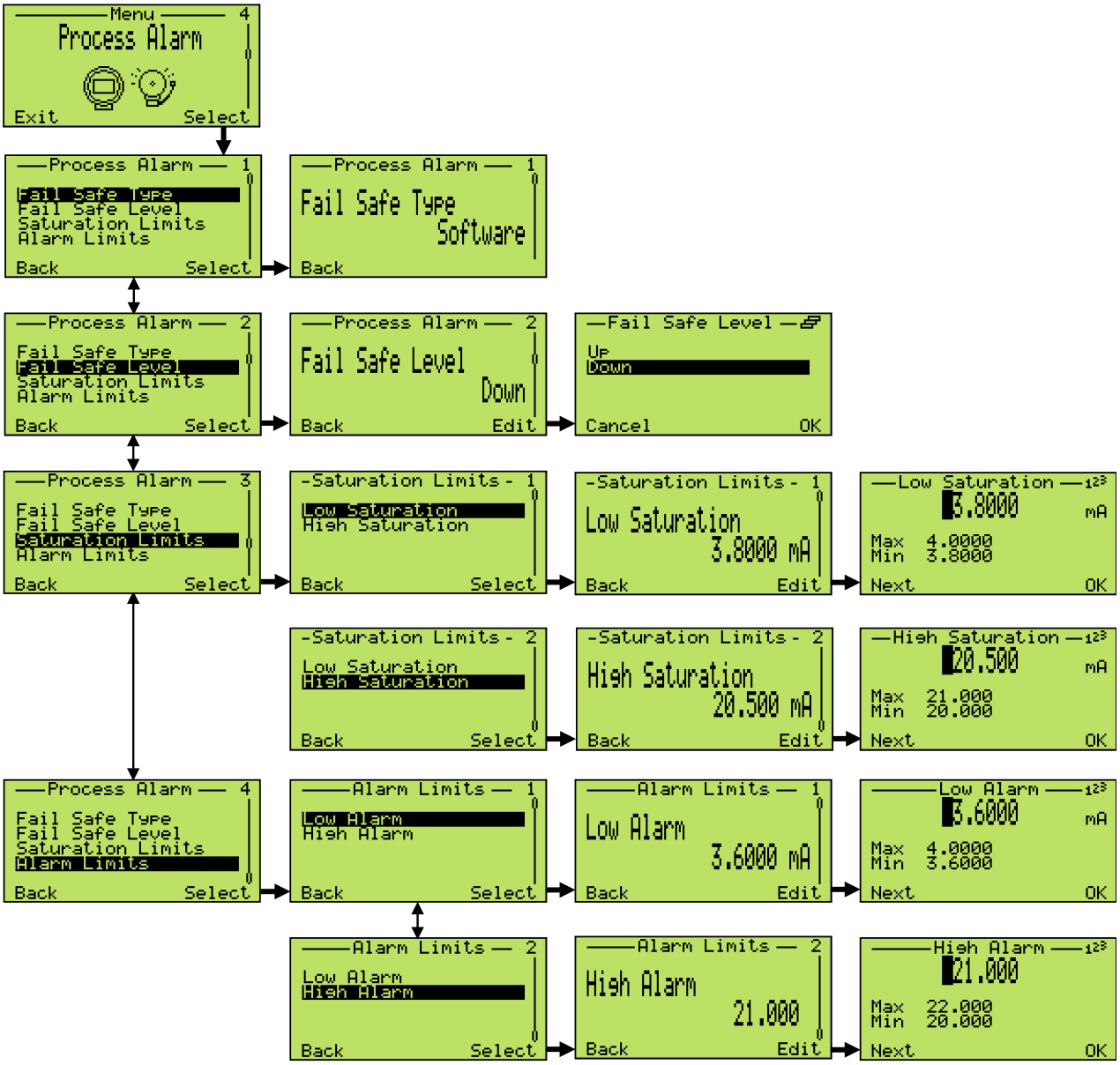

Display 8
Line 1 View
Line 2 View
Bar View
Display Scaling
Back Select
Display Scaling 1
Display Lin. Type
Display Unit
Lower Range Value
Upper Range Value
Back Select
Display Scaling 1
Display Lin. Type
Linear
Back Edit
Display Lin. Type
Linear
Square Root
Sqrt. 3rd power
Sqrt. 5th power
Cancel OK
Display Scaling 2
Display Lin. Type
Display Unit
Lower Range Value
Upper Range Value
Back Select
Display Unit 1
Pressure
Flow
Mass Volume
Density
Back Select
Display Unit 1
Pressure
kPa
Back Edit
Pressure
g/cm2
kg/cm2
Pa
kPa
Cancel OK
Display Unit 2
Pressure
Flow
Mass Volume
Density
Back Select
Unit 2
Flow
ft3/min
Back Edit
Flow
ft3/min
gal/min
l/m
ImpGal/min
Cancel OK
Display Unit 3
Pressure
Flow
Mass Volume
Density
Back Select
Unit 3
Mass & Volume
scf
Back Edit
Mass & Volume
oz
Nm3
Nl
scf
Cancel OK
Display Unit 4
Pressure
Flow
Mass Volume
Density
Back Select
Unit 4
Density
ug/m3
Back Edit
Density
°baumeL
°api
ug/l
ug/m3
Cancel OK


Display Unit 5
Flow
Mass Volume
Density
Level
Back
Select
Unit 5
Level
CM
Back
Edit
Level
ft
M
in
CM
Cancel
OK
Display Unit 6
Mass Volume
Density
Level
Other
Back
Select
Display Unit 6
Other
Custom
Back
Edit
Other
briThemU
Part/bill
None
Custom
Cancel
OK
Display Unit 7
Density
Level
Other
Custom Unit
Back
Select
Display Unit 7
Custom Unit
Back
Edit
Custom Unit
vwxyz{|}~≡ !"#$%&'()*
Next
OK
Display Scaling 3
Display Lin. Type
Display Unit
Lower Range Value
Upper Range Value
Back
Select
Display Scaling 3
Lower Range Value
0.0000 kPa
Back
Edit
Lower Range Value
0.0000
kPa
Max 999999
Min -999999
Next
OK
Display Scaling 4
Display Lin. Type
Display Unit
Lower Range Value
Upper Range Value
Back
Select
Display Scaling 4
Upper Range Value
100.00 kPa
Back
Edit
Upper Range Value
100.00
kPa
Max 999999
Min -999999
Next
OK
Display 9
Line 2 View
Bar View
Display Scaling
Security
Back
Select
Security 1
Display Protection
Change Password
Back
Select
Security 1
Display Protection
Disabled
Back
Edit
Display Protectio
Disabled
Enabled
Cancel
OK
Security 2
Display Protection
Change Password
Back
Select
Security 2
Change Password
MILE02
Back
Edit
Change Password
MILE02
CDEFGHIJKLMNOPQRSTUVW
Next
OK

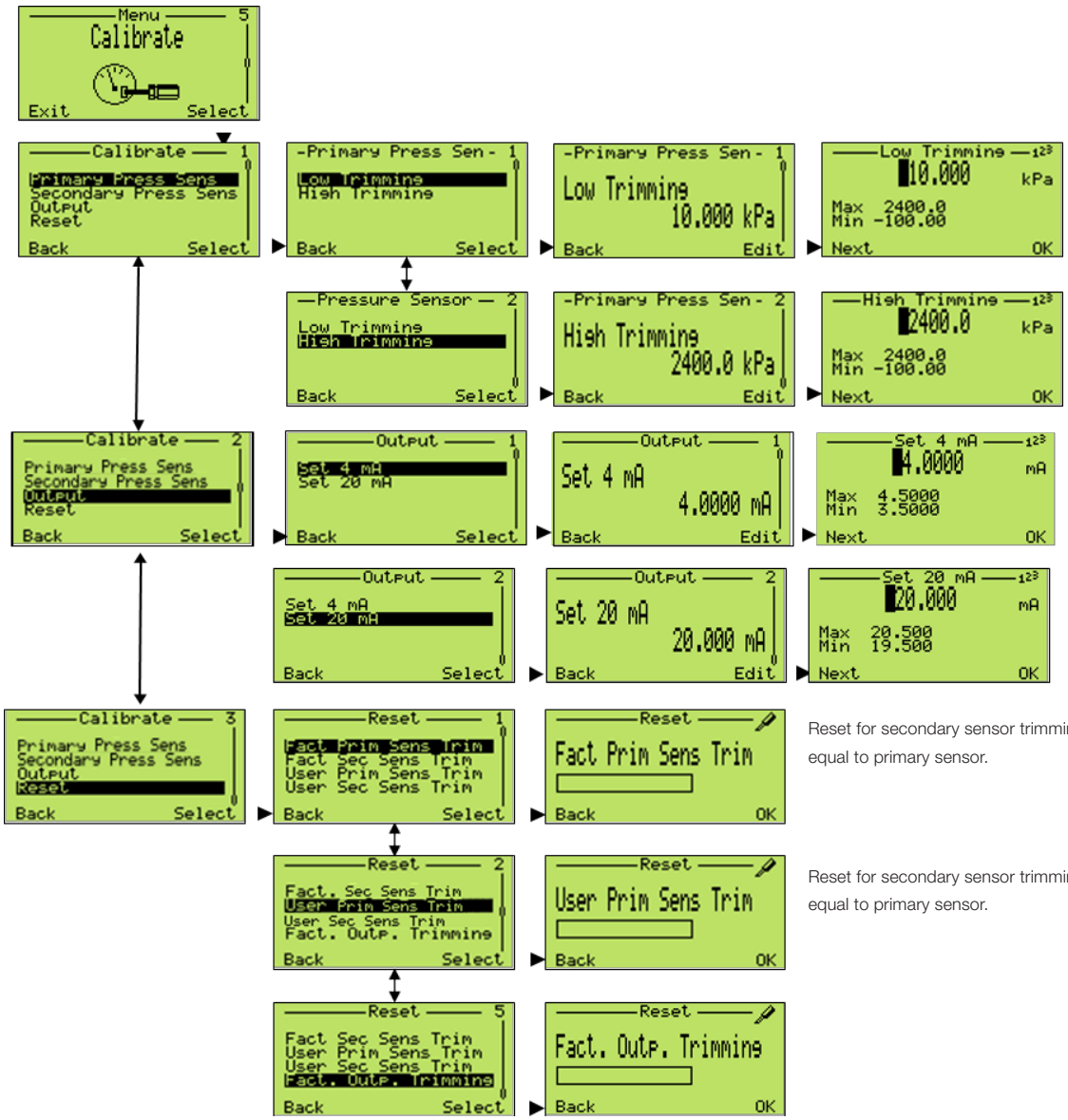
**Process Alarm**

This menu allows the complete configuration of the analog output in case of saturation and alarm. The output signal will range from 4 to 20 mA in case the process variable is within the calibrated span limits. In case the process variable (PV) will be below the LRV (lower range value) the signal will be driven to the “Low Saturation” limit (which is configurable), in case the PV will be above the URV (upper range value) the signal will be driven to the “High Saturation” limit (which is configurable too).

In case the transmitter diagnostic detects a failure the signal will be driven upscale or downscale according to the user preferences (the failure direction is selected via the dip switch 4 and 5 on the communication board). The exact value to which the signal will be driven can be configured via the above menu (Alarm limits). As a convention the Low Alarm limit must be lower than the Low Saturation limit and the High Alarm limit must be higher than the High Saturation limit.



## Calibrate

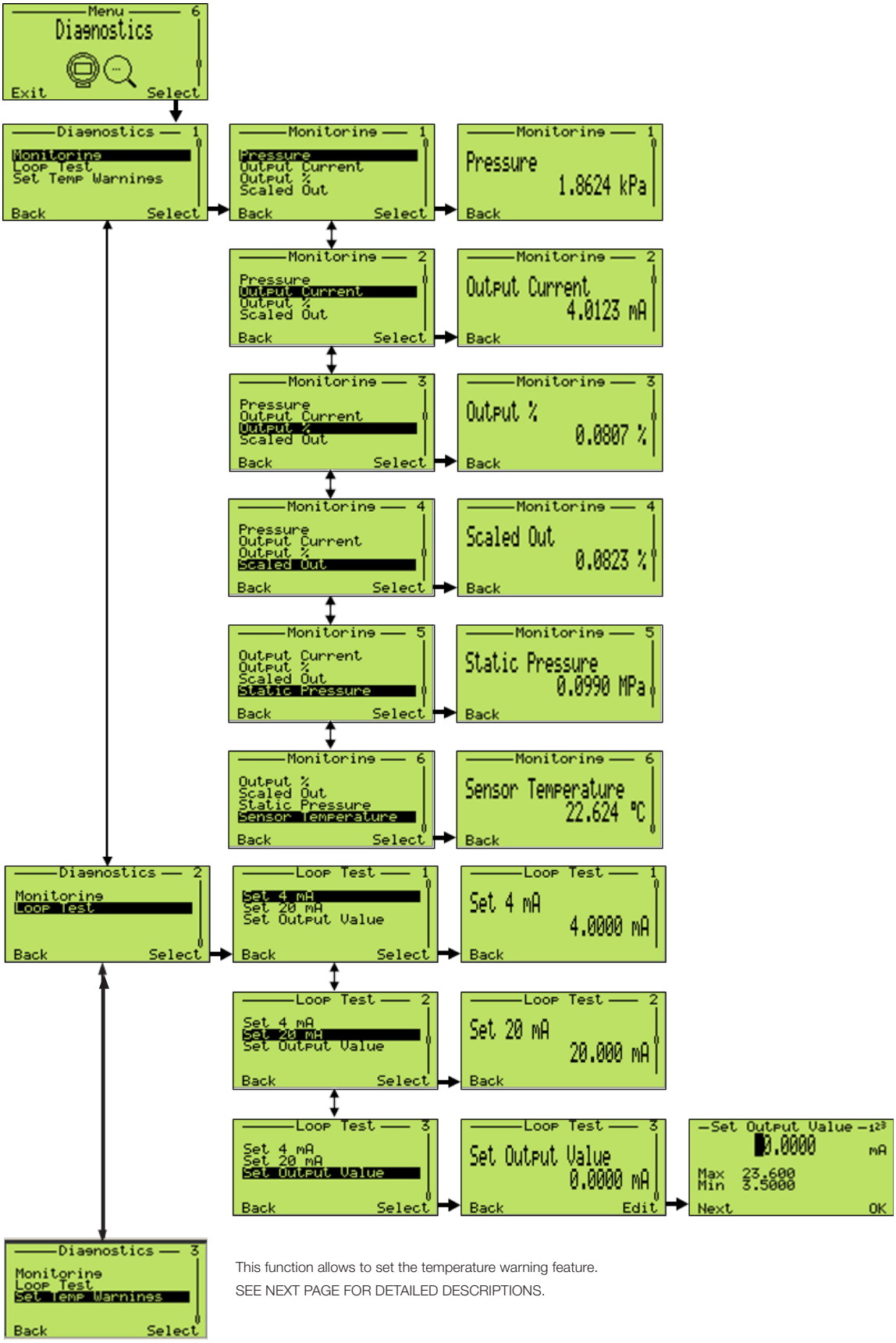



Low/High trimming setting for secondary sensor equal to primary sensor.

Reset for secondary sensor trimming equal to primary sensor.

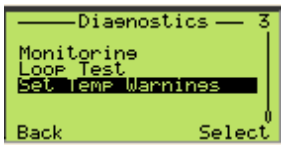
Reset for secondary sensor trimming equal to primary sensor.

## Diagnostics

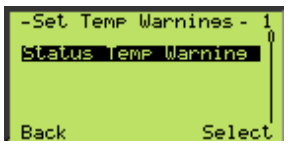



This function allows to set the temperature warning feature.

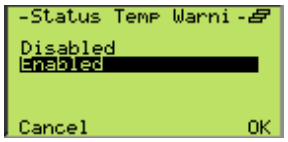
SEE NEXT PAGE FOR DETAILED DESCRIPTIONS.




To activate or deactivate the Temperature Warning feature,
choose “Set Temp Warnings” and then press “Select” to enter setting.

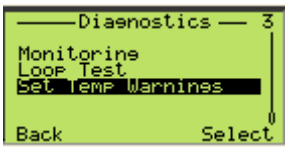


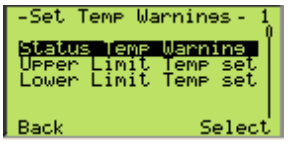

Choose “Status Temp Warning” and then press “Select” to enter setting.

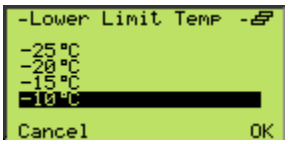


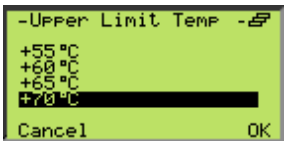

Using the right button “Edit” modify the setting by selecting “Enabled” or
“Disabled” to activate or de-activate.
Confirm selection by pressing right button “Ok”.

Press left button “Back” to go back to previous screen view.




In order to set “H” and “L” limit warning, Status temp warning” needs to be enabled.

Choose “Set temp warning” and then press “Select” to enter setting.

Using keypad select “Upper Limit Temp set” (H) or “Lower Limit Temp set” (L)
and then select the desired warning-related value
in the preset scale (+85°C / -40°C with 5°C intervals).

a. If for the lower limit (L), a value higher than the higher temperature limit (H) value is selected, an error will be displayed and selected value will be rejected (i.e. Setting L = 35°C with H = 25° C ➡ Error).

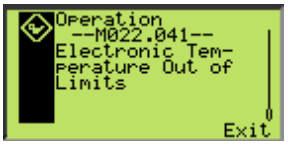
b. If for the higher limit, a value lower than the lower temperature limit value is selected, an error will be displayed and selected value will be rejected (i.e. Setting H = 10°C with L = 35° C ➡ Error).

c. It is possible to set a value for “Upper Limit Temp set” or “Lower Limit Temp set” warnings outside the alarm temperatures (+85°C / -40°C).
This means that no warning limit is selected
(i.e. Setting H = 90°C ➡ No “Upper Limit Temp Set” enabled).

Confirm selection by pressing right button “Ok”.

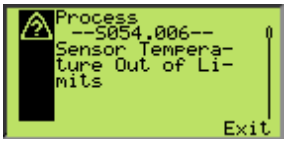
Press left button “Back” to go back to previous screen view.










The display will show the following cases (*):

1. In case of Warning (H or L):

   a. On Operator view, “Operation” white message on black background will appear on screen together with icon. 

   b. On Diagnostic view, following message will be displayed:
   “M022.041- Electronic temperature out of limits” (**).

2. In case of Alarm (HH or LL):

   a. On Operator view, “Process” white message on black background will appear on screen together with 

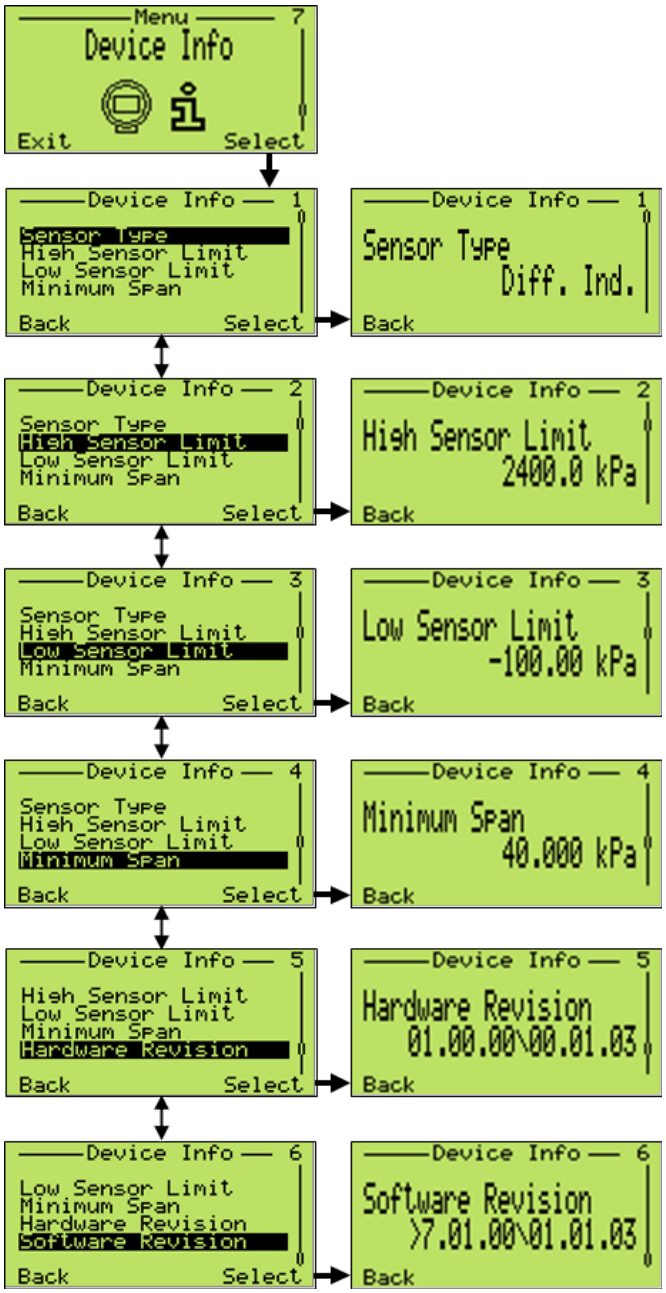
   b. On Diagnostic view, following message will be displayed:
   “S054.006 - Sensor temperature out of limits” (**).

   c. In case Warning limits (H / L) are within Alarm limits (HH / LL), on Operator view message “M022.041 Electronic temperature out of limits” will also be displayed.

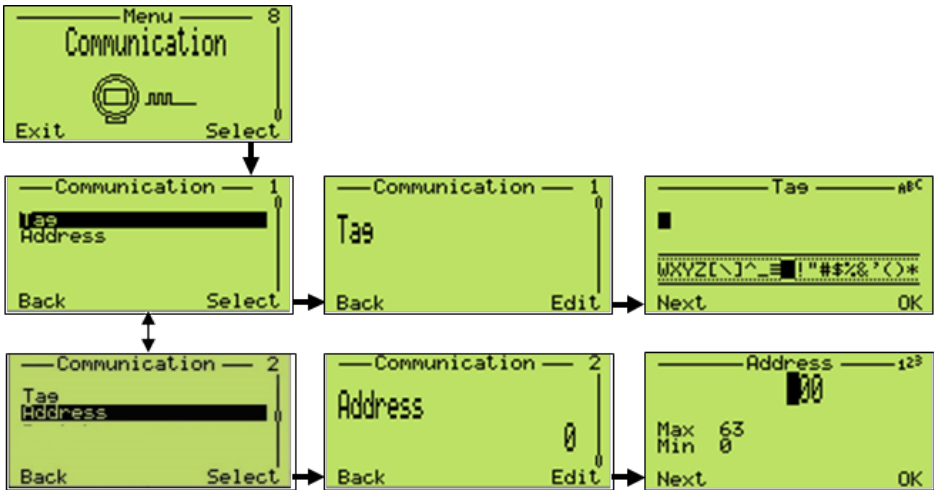
(*) Note: visualization of errors / messages is subject to the diagnostic behavior already present as standard device behavior described in Operating Manual

(**) Note: when either sensor or communication board temperature should exceed the settled temperature limits the above message will be displayed.

**Device Info**


Menu 7
Device Info
Exit
Select
Device Info 1
Sensor Type
High Sensor Limit
Low Sensor Limit
Minimum Span
Back
Select
Device Info 1
Sensor Type
Diff. Ind.
Back
Device Info 2
Sensor Type
High Sensor Limit
Low Sensor Limit
Minimum Span
Back
Select
Device Info 2
High Sensor Limit
2400.0 kPa
Back
Device Info 3
Sensor Type
High Sensor Limit
Low Sensor Limit
Minimum Span
Back
Select
Device Info 3
Low Sensor Limit
-100.00 kPa
Back
Device Info 4
Sensor Type
High Sensor Limit
Low Sensor Limit
Minimum Span
Back
Select
Device Info 4
Minimum Span
40.000 kPa
Back
Device Info 5
High Sensor Limit
Low Sensor Limit
Minimum Span
Hardware Revision
Back
Select
Device Info 5
Hardware Revision
01.00.00\00.01.03
Back
Device Info 6
Low Sensor Limit
Minimum Span
Hardware Revision
Software Revision
Back
Select
Device Info 6
Software Revision
>7.01.00\01.01.03
Back

**Communication**



**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 0 s and 60 s in increments of 0.0001 s. 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 the local HMI:
  Enter the menu: > Device Setup > Output Scaling > Damping.
  Set the damping to the desired value.
- Via the DD/FDI Software:
  See DD/FDI Software Operating Instructions.
- Via the Hand Held Terminal:
  See relevant operating instruction.

**Transfer function**
The 266 Pressure Transmitter provides a selection of output functions, as follows:

- Linear for differential, gauge and absolute pressure or level measurements.
- Sq. Root (x) for flow measurements using restriction type primary element, like orifice plate, integral orifice, Venturi or Dall tube and similar.
- Sq. Root (x3) for open channel flow measurements using rectangular or trapezoidal weir.
- Sq. Root (x5) for open channel flow measurements using V-notch (triangular) weir.
- Bidirectional Flow.
- Custom linearization table.
- Cylindrical lying tank.
- Spherical tank.

These output functions can be activated using a Configuration Tool (Digital LCD Integral Display, Hand Held Communicator or PC based software as **ABB Field Information Manager**). The transfer function can be applied to the analog signal 4 to 20 mA only or also to the indication (in engineering units).vant operating instruction.

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

No further settings are possible here.

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

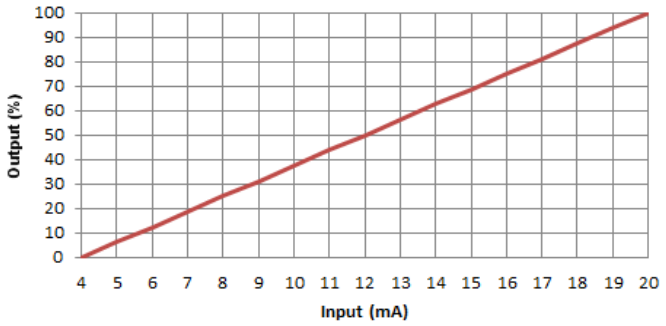



**Figure 50: Linear output**

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

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

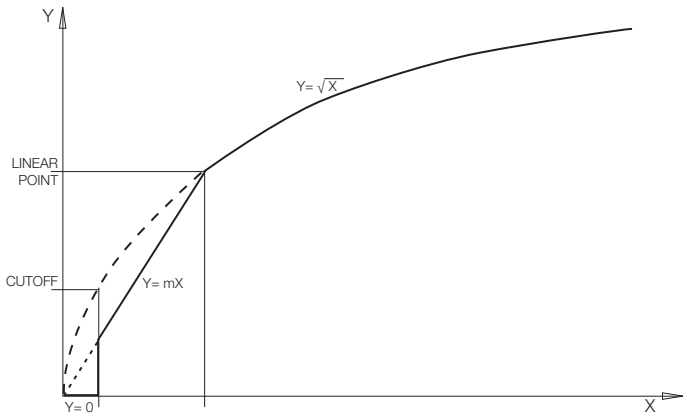



**Figure 51: Square-Root transfer functions**

**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.

**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.

**Custom linearization curve**

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

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

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

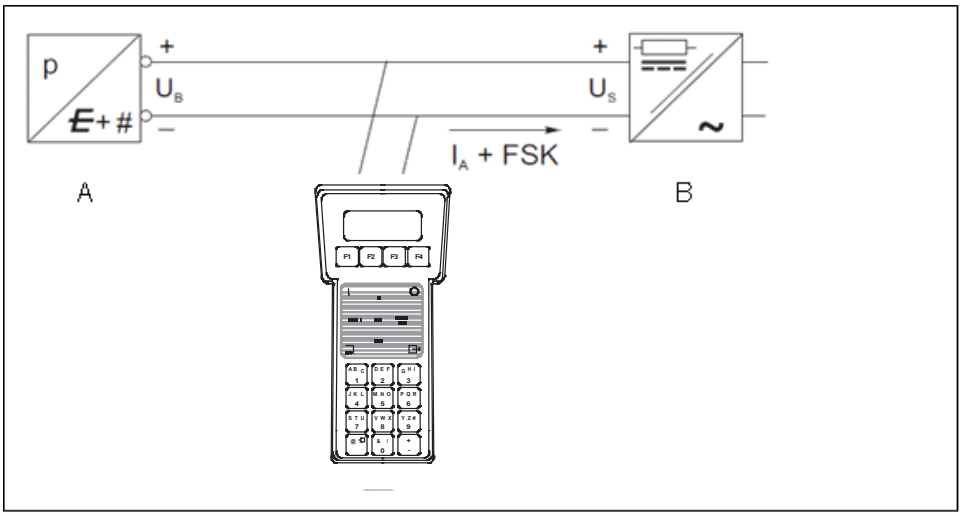
**Configuration with the PC/laptop or handheld terminal**

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

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

- Any Hand Held terminals provided the 266 EDD has been downloaded and enabled in the terminal.
- ABB Field Information Manager, a new free of charge software configurator downloadable at **www.abb.com/ Instrumentation**
- Any FDI/DTM based software for HART instruments configuration provided it is compatible with EDD/DD or FDI/DTM.

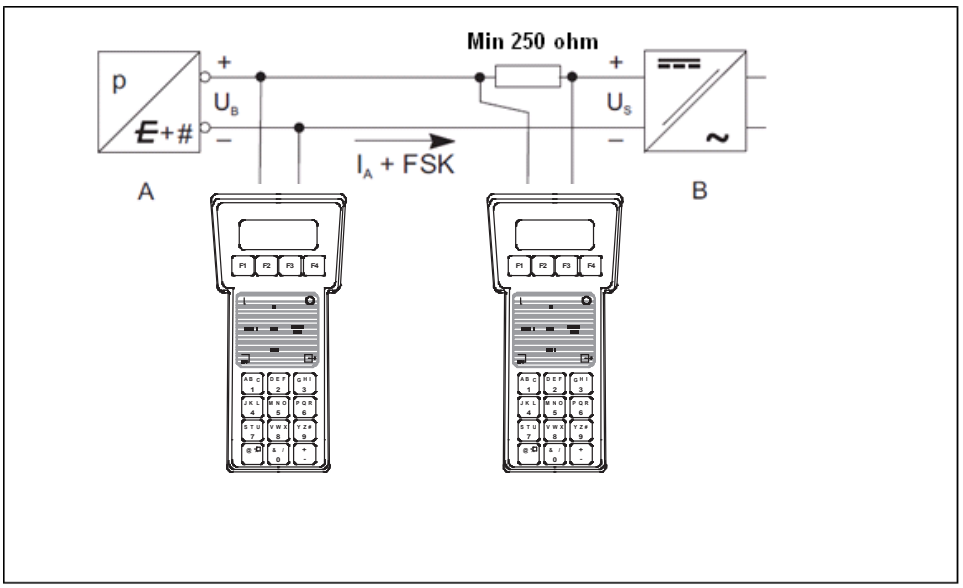
You can use a handheld terminal to read out or configure/ calibrate the transmitter. If a communication resistor is installed in the connected supply unit, you can clamp the handheld terminal directly along the 4 to 20 mA line. If no communication resistor is present (min. 250 Ω), you will need to install one in the line. The handheld 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 handheld 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 or additional information, refer to the operating instructions included with the handheld terminal.
If the transmitter has been configured in the factory according to customer specifications for the measuring point, all you have to do is mount the transmitter as prescribed (to correct potential zero shifts, refer to the section “Correcting the zero shift”), and switch it on. The measuring point will now be ready for use.
If, however, you wish to make changes to the configuration, a handheld terminal or - preferably - a graphical user interface (FDI/DTM) is required. This DTM tool renders the device fully configurable. It supports the HART and can be run on a PC or laptop, or as part of an automation system.
Refer to the installation manual provided with the software for the steps required to install the operating tool. The most important parameters can be set via the path “Parametrize_ Differential Pressure Measurement”.
The program offers the option of configuring, polling, and testing the transmitter.
In addition, offline configuration can be performed by means of an internal database.
Each configuration step is subject to a plausibility check.
You can call up context-sensitive help at any time by pressing the “F1” key. Immediately after you have received the transmitter or before you change the configuration, we recommend that you save the existing configuration data to a separate data storage medium, via the path “File_Save”.

**Configuration with the graphical user interface (DD/FDI) - System requirements**

- Operating control program (e.g., ABB Field Information Manager)
- DD/FDI (Device Type Manager; graphical user interface)
- Operating system (depending on the respective control program)

To operate the ABB Field Information Manager, please refer to the relevant operating instruction.

**Advanced HART software revision history**

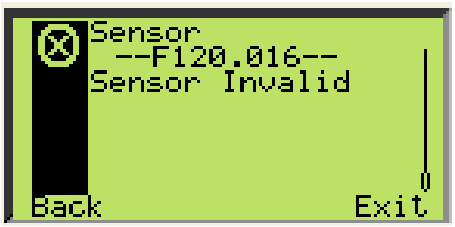
| Revision | | Description | Release date |
|---|---|---|---|
| From | To | | |
| | 147.1.1 | First release | 05/2022 |

# 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, Operanting and Process.

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




## Error states and alarms

| Error code | Description | Possible cause | Suggested /recommended action | Current output |
|---|---|---|---|---|
| F114.000 | The sensor signal value of the Primary unit is incorrect due to a mechanical failure. | Mechanical damage to the sensor. Loss of fill fluid from the cell, ruptured diaphragm, broken sensor, etc | The Primary unit sensor must be replaced. | UP/DW ALARM |
| F110.001 | The measurement accuracy could be decreased more than an acceptable error. | The circuitry for the sampling of the Primary unit temperature has failed. | The Primary unit sensor must be replaced. | UP/DW ALARM |
| F113.002 | The sensor signal value of the Secondary unit is incorrect due to a mechanical failure. | Mechanical damage to the sensor. Loss of fill fluid from the cell, ruptured diaphragm, broken sensor, etc | The Secondary unit sensor must be replaced. | UP/DW ALARM |
| F109.003 | The measurement accuracy could be decreased more than an acceptable error. | The circuitry for the sampling of the Secondary unit temperature has failed. | The Secondary unit sensor must be replaced. | UP/DW ALARM |
| F102.004 | The Process value of the Primary unit is outside the sensor limits and no longer representing the true applied process value. | The measurement range has not been correctly calculated OR an incorrect transducer model has been selected. | The compatibility of pressure transmitter model and process conditions has to be checked. Probably a different transmitter type is required. | no effect |
| S054.005 | The sensor temperature of the Primary unit is outside of its operational limits. | The temperature of the process environment affects the pressure transmitter. Excess temperature can reduce accuracy, degrade device components and may require calibration/replacement. | The compatibility of pressure transmitter model and process conditions has to be checked. A different installation type could be required e.g. use of remote seals. | no effect |
| F101.006 | The Process value of the Secondary unit is outside the sensor limits and no longer representing the true applied process value. | The measurement range has not been correctly calculated OR an incorrect transducer model has been selected. | The compatibility of pressure transmitter model and process conditions has to be checked. Probably a different transmitter type is required. | no effect |
| S053.007 | The sensor temperature of the Secondary unit is outside of its operational limits. | The temperature of the process environment affects the pressure transmitter. Excess temperature can reduce accuracy, degrade device components and may require calibration/replacement. | The compatibility of pressure transmitter model and process conditions has to be checked. A different installation type could be required e.g. use of remote seals. | no effect |

| Error code | Description | Possible cause | Suggested /recommended action | Current output |
|---|---|---|---|---|
| F120.016 | The Basic signal of the Primary unit sensor is no longer available. The transducer is not in a condition to generate a valid signal. | 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. | Check cable connection, check sensor and if problem persists, the Primary unit sensor must be replaced. | UP ALARM |
| | Primary Unit Sensor and/or the connected electronics are incompatible | The Primary unit sensor model/ version is no longer compatible with the connected electronic version | The Primary unit sensor must be replaced | |
| F118.017 | The data in the Primary unit sensor memory are corrupted precluding the correct functionality of the device | Primary unit Sensor memory corrupted | The Primary unit Sensor must be replaced | UP/DW ALARM |
| M028.018 | The device continues to work without problems but any replacement operation relating the Primary unit is compromised because the backuped configuration is not updated | Writings to the Primary unit Sensor non-Volatile Memory was not successful | The Primary unit Sensor should be replaced as soon as possible. | no effect |
| M030.020 | 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 | Exchange of data between the Electronics (Communication Board) and Primary unit Sensor have problems | Power cycle the device and retry the operation, if the error persist the electronics/Comm.Board should be replaced as soon as possible. | no effect |
| F116.023 | The device data loaded at the start up are corrupted precluding the correct functionality of the device | Electronic memory corrupted | The electronics (communication board) must be replaced | UP/DW ALARM |
| M026.024 | The device continues to work without problems but after the next power cycle the new configuration will be lost | Writings to the electronic non-Volatile Memory was not successful | The electronics (communication board) should be replaced as soon as possible. | no effect |
| C088.030 | The Primary unit Process Value is simulated and do not represent the real Process value. | The Pressure Value produced by the Primary unit Sensor is derived by the value simulated in input | Use an HART configurator to place device back into normal operating mode (Remove the input simulation) | no effect |
| | The Secondary unit Process Value is simulated and do not represent the real process value | The Pressure Value produced by the Secondary unit Sensor is derived by the value simulated in input | Use a HART configurator to place device back into normal operating mode (Remove the input simulation) | |
| | The Temperature Value of the Primary unit sensor is simulated and do not represents the real Primary Sensor Temperature | The Sensor Temperature of the Primary unit is derived by the value simulated in input | Use a HART configurator to place device back into normal operating mode (Remove the input simulation) | |
| | The Temperature Value of the Secondary unit sensor is simulated and do not represents the real Secondary unit sensor Temperature | The Sensor Temperature of the Secondary unit is derived by the value simulated in input | Use a HART configurator to place device back into normal operating mode (Remove the input simulation) | |
| S052.031 | The Process Pressure measureed by the Primary sensor is higher than the acceptable mechanical limit of the process connection elements. | 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 | 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. | no effect |
| F104.032 | An overpressure has been detected by the Primary unit sensor | 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. | The compatibility of pressure transmitter model and process conditions has to be checked. A different transmitter type could be required | no effect |
| C090.033 | Analog output current fixed. The primary variable (PV) analog and digital analog outputs will not respond to the applied process. | 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. | Use a HART configurator to place device back into normal operating mode (Remove from Loop Test - Fixed output mode) | no effect |

# ...8 Error messages

## ...Error states and alarms

| Error code | Description | Possible cause | Suggested /recommended action | Current output |
|---|---|---|---|---|
| S098.034 | The result of the selected Calculation type (Primary-Secondary unit or Viceversa) is outside its Low Saturation Limit | 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. | Adjust the Saturation Limit or the working range if possible. | no effect |
| | The result of the selected Calculation type (Primary-Secondary unit or Viceversa) is outside its High Saturation Limit | 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 | Adjust the Saturation Limit or the working range if possible. | |
| F106.035 | The Analog Output Current could deviate from the correct value due to D to A problems | The D to A converter is not properly Calibrated/Trimmed | Perform an Output Trimming and if the error persist the electronics (communication board) must be replaced | UP/DW ALARM |
| | Wrong device configuration could produce a digital value that the D to A converter cannot manage | The device is not properly configured | Check the Device configuration. | |
| M024.036 | The device continues to work without problems but the power supply level is close to a threshold that could preclude the correct functionality | The Device Power Supply is close to the lowest acceptable limit | Check the Voltage at the terminal block and if it is not within the valid range check the external power supply | no effect |
| | The device continues to work without problems but the power supply level is close to a threeshold that could preclude the correct functionality | The Device Power Supply is close to the highest acceptable limit | Check the Voltage at the terminal block and if it is not within the valid range check the external power supply | |
| S051.037 | The Process Pressure measured by the Secondary unit sensor is higher than the acceptable mechanical limit of the process connection elements. | 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 | 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. | no effect |
| F103.038 | An overpressure has been detected by the Secondary unit sensor | 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. | The compatibility of pressure transmitter model and process conditions has to be checked. A different transmitter type could be required | no effect |
| F115.039 | 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 | The Primary and Secondary units have Different Module type or sensor limits (Upper Range Limit) | 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 | UP/DW ALARM |
| F108.040 | The reading of the 4-20mA output signal is too different from what should have been generated | The output circuit could be broken or not correctly calibrated | Perform an Output Trimming and if the error persist the electronics (communication board) must be replaced | UP/DW ALARM |
| S022.041 | The Accuracy of the D/A conversion could be decreased. The Output 4/20 mA signal representing the measure could be not correctly compensated. | The electronics (communication board) temperature is out of its lower acceptable limit. | The electronics (communication board) should be replaced as soon as possible. | no effect |
| M022.041 | The Accuracy of the D/A conversion could be decreased. The Output 4/20 mA signal representing the measure could be not correctly compensated. | The electronics (communication board) temperature is out of its higer acceptable limit. | The electronics (communication board) should be replaced as soon as possible. | no effect |

| Error code | Description | Possible cause | Suggested /recommended action | Current output |
|---|---|---|---|---|
| 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:<br>-Move the SW 1 of the electronics (communication board) in position 1 = Enable replace mode<br>-Select the SW 2 the element that has been changed between new Sensor or new electronics (communication board)<br>-Power Cycle the device<br>-Move the SW 1 of the electronics (communication board) in position 0" | no effect |
| | 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:<br>Only the data of the electronics (communication board) can be copied into the sensor<br>-Move the SW 1 to Enable replace mode (1)<br>-Select with the SW 2 to New Sensor (1)<br>-Power Cycle the device<br>-Move the SW 1 to Disable replace mode (0)<br>" | no effect |
| | 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 replacememt direction (if possible)<br>-The SW 1 is already set to Enable replace mode (1)<br>-Select with the SW 2 to New Sensor (1)<br>-Power Cycle the device<br>-Move the SW 1 to Disable replace mode (0)<br>" | no effect |
| F105.043 | The Accuracy of the D/A conversion could be decreased.<br>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 backuped 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.<br>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 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.

***IMPORTANT***

In case of aggressive environment and any critical condition, ABB recommends to check O-rings periodicalli. In case of damage, user shall replace them with original spare parts.

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.

**⚠ 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 cleaning, inspection, repairs, and replacement of damaged components.

## Returns and removal

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

**⚠ WARNING - GENERAL RISK**

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

## Pressure transmitter sensor

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

- Check the integrity of the pressure boundary (no cracks should be visible on the process connection or on the process flanges.
- Check that there is no leakage from the sensor/flange interface or from the vent/drain valves.

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

***IMPORTANT***

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

In case you want ABB to perform the repair, please send back the transmitter to your local ABB office.

***IMPORTANT***

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

## 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.
During replacement of the pressure transducer, please do not disconnect the primary unit from the secondary one.

## 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.
During replacement of the electronic module, please do not disconnect the primary unit from the secondary one.

# 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 266DDS 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 266DDS 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.

## 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". 266DDS must be connected in an intrinsically safe safety loop with galvanically isolated safety barrier.

## 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 2600T SERIES pressure transmitters 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 1/2 G Ex ia IIC T4/T5/T6 Ga/Gb and II 1/2 D Ex ia IIIC T85°C Da**

FM Approvals Certificate number FM09ATEX0024X (Tremezzina, Warminster, Bangalore Shanghai and Dammam products)

***IMPORTANT***

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

The meaning of ATEX code is as follows:

- II: Group for surface areas (not mines)
- 1/2: Category - It means that only a part of the transmitter complies with category 1 and a second part complies with category 2 (see 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 up to 50 mm depth. T85°C: as before for Dust for a Ta +85°C.

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

IECEx certificate number IECEx FME 16.0003X (Tremezzina, Warminster, Bangalore, Shanghai and Dammam products)

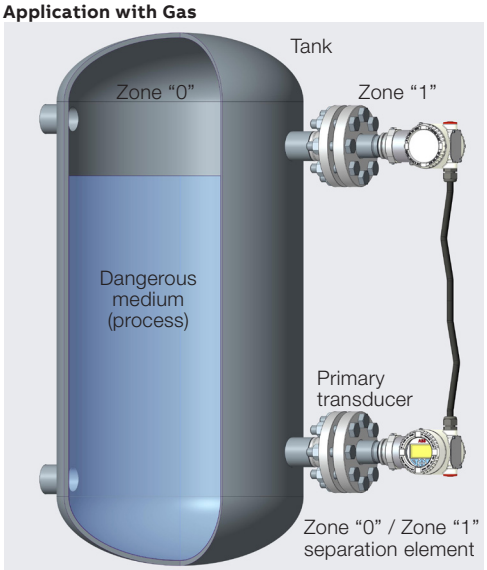
The other marking refers to the protection type used according to relevant EN standards:

- 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

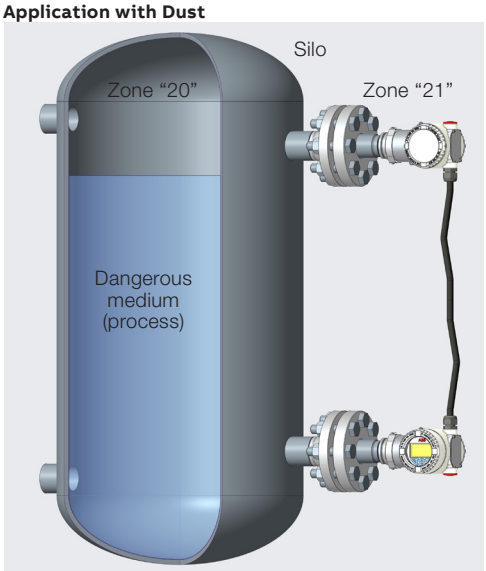
About the applications, this transmitter can be used in Zone “0” (Gas) classified areas (continuous hazard) with its “process part” only, whereas the remaining part of the transmitter, i.e. its enclosure, can be used in Zone 1 (Gas), only (see sketch below). Reason of this is the process part of the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

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

**Application with Gas**




**Application with Dust**



# ...10 Hazardous Area considerations

## ...Hazardous atmospheres

### ATEX transmitter with the following types of protection: "intrinsic safety Ex ia" in accordance with Directive 2014/34/EU

| **Transmitter with 4 to 20 mA output signal and HART communication** | |
|---|---|
| Certificate no. | FM09ATEX0024X |
| Marking | 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 Da, II 1/2 D Ex ia IIIC T85 °C Da; IP66, IP67. |

| **Permissible ambient temperature versus process temperature** | | |
|---|---|---|
| **Type of protection** | **Process temperature** | **Max. ambient temperature** |
| II 1/2 G Ex ia IIC T6...T4 Ga/Gb | ≤ 121° C | 85° C |
| II 1/2 D Ex ia IIIC T85 °C Da | ≤ 121° C | 85° C |

| **Power supply and signal circuit with "intrinsic safety Ex ia" type of protection, with the following maximum values** |
|---|
| U = 30 Vdc |

### IECEx transmitter with the following types of protection: "intrinsic safety Ex ia" in accordance with IEC standards

| **Transmitter with 4 to 20 mA output signal and HART communication** | |
|---|---|
| Certificate no. | IECEx FME 16.0003X |
| Marking | Ex ia IIC T6...T4 Ga/Gb, Ex ia IIIC T85 °C Da; IP66, IP67. |

| **Permissible ambient temperature versus process temperature** | | |
|---|---|---|
| **Type of protection** | **Process temperature** | **Max. ambient temperature** |
| Ex ia IIC T6...T4 Ga/Gb | ≤ 121° C | 85° C |
| Ex ia IIIC T85 °C Db | ≤ 121° C | 85° C |

| **Power supply and signal circuit with "intrinsic safety Ex ia" type of protection, with the following maximum values** |
|---|
| U = 30 Vdc |

**b) Certificate ATEX II 1/2 G Ex db IIC T6 Ga/Gb and II 1/2 D Ex tb IIIC T85°C Db, Ta = -50°C to +75ºC**
FM Approvals Certificate number FM09ATEX0023X (Tremezzina, Warminster, Bangalore, Shanghai and Dammam products)

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

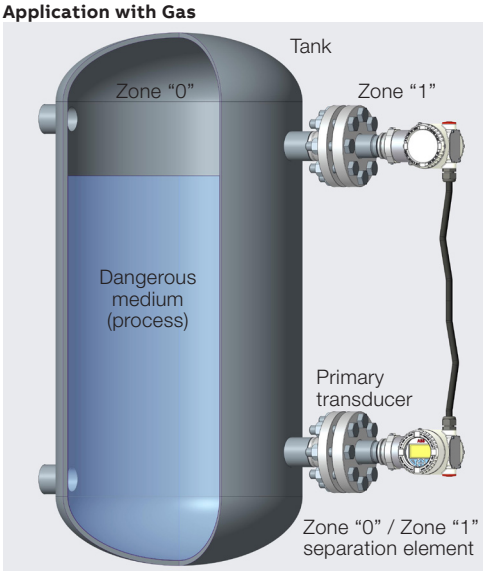
The number close to the CE marking of the transmitter safety label identifies the Notified Body which has responsibility for the surveillance of the production.

Certificate IECEx Ex db IIC T6 Ga/Gb and Ex tb IIIC T85°C Db, Ta= -50°C to +75°C
IECEx certificate number IECEx FME 16.0002X (Tremezzina, Warminster, Bangalore, Shanghai and 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 +40°C

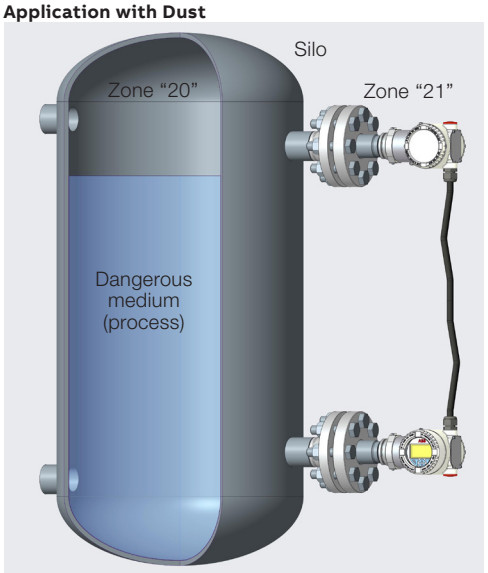
About the applications, this transmitter can be used in Zone “0” (Gas) classified areas (continuous hazard) with its “process part” only, whereas the remaining part of the transmitter, i.e. its enclosure, can be used in Zone 1 (Gas), only (see sketch below). Reason of this is the process part of the transmitter (normally called primary transducer) that provides inside separation elements to seal off the electrical sensor from the continuously hazardous process, according to the EN 60079-1.
.
About Dust application, the transmitter is suitable for “Zone 21” according to the EN 60079-1 as it is shown on 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**



# ...10 Hazardous Area considerations

## ...Hazardous atmospheres

**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,<br>II 1/2 D Ex tb IIIC T85 °C Db Ta = –50 °C to +75 °C;<br>IP66, IP67. |

| **Permissible ambient temperature versus process temperature** | | |
|---|---|---|
| **Type of protection** | **Process temperature** | **Max. ambient temperature** |
| II 1/2 G Ex db IIC T6 Ga/Gb | ≤ 121° C | 75° C |
| II 1/2 D Ex tb IIIC T85 °C Db | ≤ 121° C | 75° C |

| **Power supply and signal circuit with “flameproof enclosure Ex db and Ex tb” type of protection, with the following maximum values** |
|---|
| U = 42 Vdc |
| P = 2 W |

**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**

| **Transmitter with 4 to 20 mA output signal and HART communication** | |
|---|---|
| Certificate no. | IECEx FME 16.0002X |
| Marking | Ex db IIC T6 Ga/Gb Ta=–50 °C to +75 °C,<br>Ex tb IIIC T85 °C Db Ta = –50 °C to +75 °C;<br>IP66, IP67. |

| **Permissible ambient temperature versus process temperature** | | |
|---|---|---|
| **Type of protection** | **Process temperature** | **Max. ambient temperature** |
| Ex db IIC T6 Ga/Gb | ≤ 121° C | 75° C |
| Ex tb IIIC T85 °C Db | ≤ 121° C | 75° C |

| **Power supply and signal circuit with “flameproof enclosure Ex db and Ex tb” type of protection, with the following maximum values** |
|---|
| U = 42 Vdc |
| P = 2 W |

**c) Certificate ATEX II 3 G Ex ic IIC T4/T5/T6 Gc and II 3 D Ex tc IIIC T85°C Dc, Ta = -50°C to +75°C**
FM Approvals Certificate number FM09ATEX0025X (Tremezzina, Warminster, Bangalore, Shanghai and Dammam products)
The meaning of 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).

## *IMPORTANT*

It 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 the rated voltage of 42 V d.c. being exceeded.

Certificate IECEx Ex ic IIC T4/T5/T6 Gc and Ex tc IIIC T85°C Dc, Ta = -50°C to +75°C
IECEx certificate number IECEx FME 16.0004X (Tremezzina, Warminster, Bangalore, Shanghai and Dammam products)
The other marking refers to the protection type used according to 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: type of protection “tc” means protection by enclosure technique

About the applications, this transmitter can be used in Zone 2 (Gas) and in Zone 22 (Dust) (unlikely/infrequent hazard) .

## *IMPORTANT*

**Note for pressure transmitter with combined approval.**
Before installation of the Transmitter, the customer should permanently mark his chosen Protection Concept on the safety label. The transmitter can only be used with according to this Protection Concept for the whole life. If two or more types of protection box (on safety label) are permanent marked, the pressure transmitter must be removed from hazardous classified locations. The selected Type of Protection is allowed to be changed only by manufacturer after a new satisfactory assessment.

**ATEX transmitter with the following types of protection: “intrinsic safety Ex ic” in accordance with Directive 2014/34/EU**

| **Transmitter with 4 to 20 mA output signal and HART communication** | |
|---|---|
| Certificate no. | FM09ATEX0025X |
| Marking | II 3 G Ex ic IIC T6...T4 Gc, II 3 D Ex tc IIIC T85 °C Dc; IP66, IP67. |

| **Permissible ambient temperature versus process temperature** | | |
|---|---|---|
| **Type of protection** | **Process temperature** | **Max. ambient temperature** |
| II 3 G Ex ic IIC T6...T4 Gc | ≤ 121° C | 85° C |
| II 3 D Ex tc IIIC T85 °C Dc | ≤ 121° C | 85° C |

| **Power supply and signal circuit with “intrinsic safety Ex ic” type of protection, with the following maximum values** |
|---|
| U = 42 Vdc |

**IECEx transmitter with the following types of protection: “intrinsic safety Ex ic” in accordance with IEC standards**

| **Transmitter with 4 to 20 mA output signal and HART communication** | |
|---|---|
| Certificate no. | IECEx FME 16.0004X |
| Marking | Ex ic IIC T6...T4 Gc, Ex tc IIIC T85 °C Dc; IP66, IP67. |

| **Permissible ambient temperature versus process temperature** | | |
|---|---|---|
| **Type of protection** | **Process temperature** | **Max. ambient temperature** |
| Ex ic IIC T6...T4 Gc | ≤ 121° C | 85° C |
| Ex ic IIIC T85 °C Db | ≤ 121° C | 85° C |

| **Power supply and signal circuit with “intrinsic safety Ex ic” type of protection, with the following maximum values** |
|---|
| U = 42 Vdc |

# ...10 Hazardous Area considerations

## ...Hazardous atmospheres

## Electrical parameters (entities)

| **Transmitter with or without LCD display** | | | | | |
|---|---|---|---|---|---|
| Ui= 30 Vdc 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 | 1.75 |
| T6 | T85 °C | -50 °C | +44 °C | 50 | 0.4 |

## Ex Safety aspects and IP protection (North America)

**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 | Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III Division 1 and 2 Hazardous (Classified) Locations |
| FM 3615 | Explosionproof Electrical Equipment |
| FM 3810 | Electrical and Electronic Test, Measuring and Process Control Equipment |
| NEMA 250 | Enclosure for Electrical Equipment (1000 Volts Maximum) |

**Classifications**

The 2600T 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.

- Explosionproof (US) for Class I, Division 1, Groups A, B, C and D, hazardous (classified) locations.
- Explosionproof (Canada) for Class I, Division 1, Groups B, C and D; T5, hazardous (classified) locations.
- Flameproof (US): Class I, Zone 1 AEx d IIC T4 Gb, hazardous (classified) locations.
- Flameproof (Canada): Class I, Zone 1 Ex d IIC T4 Gb, hazardous (classified) locations.
- Dust Ignition proof for Class II, Division 1, Groups E, F, G, Class III Division 1; T5, hazardous (classified) locations.
- NonIncendive for Class I, Division 2, Groups A, B, C and D, in accordance with Nonincendive field wiring requirements for hazardous (classified) locations.
- Energy limited (US): Class I, Zone 2 AEx nC IIC T6...T4, in accordance with Nonincendive field wiring requirements for hazardous (classified) locations.
- Energy limited (Canada): Class I, Zone 2 Ex nC IIC T6...T4, in accordance with Nonincendive field wiring requirements for hazardous (classified) locations.
- Intrinsically Safe for use in Class I, II and III, Division 1, Groups A, B, C, D, E, F, and G,
  Class I, Zone 0 AEx ia IIC T6...T4 (US)
  Class I, Zone 0 Ex ia IIC T6...T4 (Canada)
  in accordance with Entity requirements for hazardous (classified) locations.
- Temperature class T4 to T6 (dependent on the maximum input current and the maximum ambient temperature).
- Ambient Temperature range -40°C to +85°C (dependent on the maximum input current and the maximum temperature class).
- Electrical Supply range Minimum 12 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 field of 2600T Series pressure transmitters please see the related control drawing.
Note that the associated apparatus must be FM approved.

# Notes

**ABB Measurement & Analytics**
For your local ABB contact, visit:
**abb.com/contacts**

For more product information, visit:
**abb.com/measurement**

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