Operating Instructions

2600T Series

Pressure Transmitters
Model 265J

15d_0010x1

Content

Legend

ELECTRICAL WARNING

.An instruction with reference to electrical components or equipment. It draws attention to the risk of injury or death to persons or damage to the product, process or surroundings

WARNIG

General instruction that draws attention to the risk of injury or death to persons or damage to the product, process or surroundings

INFORMATION

Further reference for more detailed information or technical details.

1 Safety

For reasons of clarity, the instructions do not contain all details on all types of product and do therefore not take into account every conceivable case of assembly, operation or maintenance. If you want further information or if special problems arise which are not treated in detail in the instructions, please ask the manufacturer for the necessary information.

Moreover we would like to point out that the content of these instructions is neither part of nor provided for changing a previous or existing agreement, promise or legal relationship.

All obligations of ABB Automation Products GmbH result from the respective sales contract which also comprises the complete and solely valid warranty clauses. Such contractual warranty clauses will neither be limited nor extended by the content of these instructions

Observe warning signs at packaging, etc.!

General safety precautions and health protection. To ensure safe operation of the 265J Transmitter, the following instructions have to be observed

- For assembly, electrical connection, commissioning and maintenance of the transmitter, only qualified and authorized specialists are to be employed.
- Qualified specialists are persons who are experienced in the assembly, electrical connection, commissioning and operation of the transmitter or similar devices holding the necessary qualifications for their job, e.g.:
- Training or instruction and / or authorization to operate and maintain devices / systems according to the safety engineering standard for electric circuits, high pressures and aggressive media.
- Training or instruction according to the safety engineering standard regarding maintenance and use of adequate safety systems.
- For the sake of your own safety, we draw your attention to the fact that for the electrical connection, only sufficiently isolated tools acc. to DIN EN 60 900 may be used.
- Furthermore, the pertinent safety regulations concerning the construction and operation of electrical installations, e.g. the rule regarding technical working material §3 (safety rule for instruments, have to be observed.
- The pertinent standards, e.g. DIN 31 000 / VDE 1000.
- The regulations and recommendations relating to explosion protection if explosion-proof transmitters are to be installed.
- The device can be operated with high pressure and aggressive media.
- Serious injury and / or considerable material damage can therefore be caused when this device is handled incorrectly.
- The regulations, standards, recommendations and rules mentioned in these instructions are valid in Germany. When using the transmitter in other countries, the pertinent national rules have to be observed.

1.1 Correct usage

The 265J transmitters measure accurately the differential pressure, flow rate or level of gases, vapors and liquids. The measuring ranges are graduated from 10 mbar to 100 bar, for the safe working pressure stages 6 bar (sensor code A), 20 bar, 100 bar and 410 bar. The transmitter can be overloaded on one side up to the relevant no-minal pressure.

2 Transport and Storage

After unpacking the transmitter, check the device for transport damage. Check the packing material for accessories. During the intermediate storage / transport, store and transport the transmitter in the original packaging only. See section 10 "Technical Data" for permissible ambient conditions regarding storage and transport. The storage time is indefinite, however, the warranty conditions stipulated in the order confirmation of the supplier are valid.

3 General description

The digital 265J Transmitters are communicating field devices with microprocessor-controlled electronic in multi-sensor technology.

For bi-directional communication, an FSK signal according to the HART, protocol is overlaid to transmitters with 4 ... 20 mA output signal, whereas in case of fully digital transmitters, communication is effected via the fieldbus protocols PROFIBUS-PA or FOUNDATION Fieldbus, depending on the model.

The graphical user interface allows for PC-based configuration, scanning and testing of transmitters according to the respective protocol. Communication is also possible by means of a handheld terminal provided that the transmitters are working according to the HART, protocol.

For ”local” operation, a control unit is optionally available which can also be retrofitted.

The control unit consists of two keys for the adjustment of zero and span and a write protect key. In conjunction with an installed LCD indicator, a complete external configuration and parameter setting of the transmitter is possible via the ”local control unit”, irrespective of the selected communication protocol.

As standard, the amplifier housing has a coat of varnish resistant to aggressive atmosphere; the process connection is made of stainless steel or Hastelloy C. The housing cover and the push button unit can be sealed.

The relevant transmitter data, such as transmitter type, communication, wetted parts material (O-ring, separating diaphragm or measuring diaphragm), measuring range, min. span, operating voltage, output signal, adjusted span and serial number (F.-No.) are to be found on the type plate. In case of inquiries, please always indicate this number which is valid worldwide!

For explosion-proof transmitters, the explosion protection type is described on a separate plate.

Another separate plate in front of the ”local” control unit shows the functions of the three control elements by means of readily comprehensible symbols.

Additionally, a tie-on plate indicating the tag number may be attached (optional).

3.1 Principle of operation and construction

The transmitter has a modular design and consists of the pressure sensor module with an integrated electronic matching unit and an amplifier with control unit.

The completely welded sensor module is a twin-chamber system with an integral overload diaphragm, an internal absolute pressure sensor and a silicon differential pressure sensor. The absolute pressure sensor, which is only exposed to the pressure at the high pressure side (⊕) , acts as a reference value to compensate for the static pressure. The differential pressure sensor is connected via a capillary tube to the negative side of the sensor module. The applied differential pressure (dp) is transferred via the separating diaphragm and the fill fluid to the diaphragms of the silicon differential pressure sensor.

A minimal deflection of the silicon diaphragm changes the output voltage of the pick-up system. This output voltage, proportional to the pressure, is converted by the matching unit and the amplifier into an electrical signal.

Depending on the model, the transmitter is connected to the process by means of oval flanges with fixing threads according to DIN 19213 (M10 / M12) or 7/16 - 20 UNF, 1/4-18 NPT female thread or remote seal.

The transmitter operates with a 2-wire system. The same wires are used for the operating voltage (depending on the transmitter, see section 10 ”Technical Data”) and the output signal (4...20 mA or digital). The electrical connection is made via cable entry or plug.

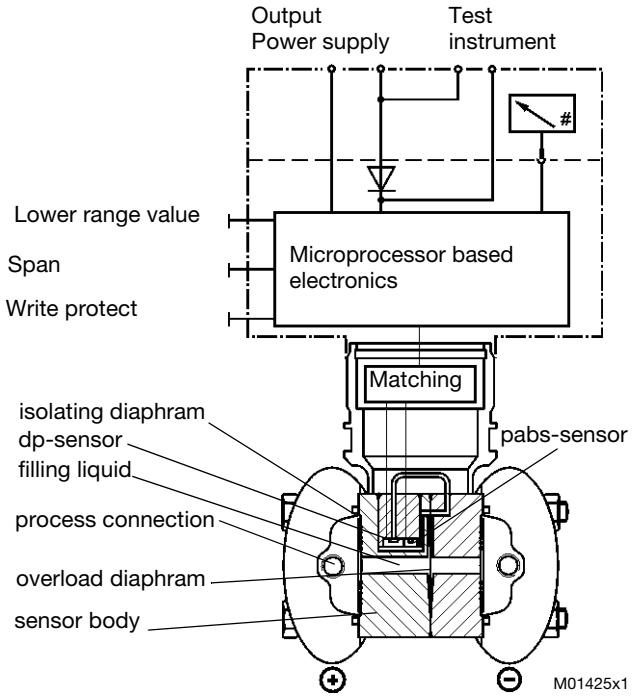


Fig. 1: Transmitter 265J for differential pressure

In case of HART® devices, the output signal 4...20 mA can be measured at the "TEST" sockets without interrupting the signal circuit (not applicable in case of fieldbus devices!).

A fixing possibility is provided for a stainless steel tie-on plate indicating the tag number.

Lower range value and upper range value can be set by means of "local" keys (optional, can be retrofitted) and, if required, the keys can be interlocked with the write protect switch.

The transmitter may be equipped with an LCD indicator which can be read from the front (optional, can be retrofitted).

In conjunction with the LCD indicator, an external parameter setting and configuration of the most important transmitter function / data is possible via the "local" control unit (see section 7 "Operation").

4 Mounting

4.1 General

Before mounting the transmitter, check whether the model meets the measurement and safety requirements of the measuring point, e.g. with regard to materials, pressure rating, temperature, explosion protection and operating voltage. The relevant recommendations, regulations, standards and the rules for prevention of accidents must also be observed! (e.g. VDE / VDI 3512, DIN 19210, VBG, Elex V, etc.)

Measurement accuracy is largely dependent upon correct installation of the transmitter and the related measurement piping(s). The measuring set-up should be screened as much as possible from critical ambient conditions such as major temperature variations, vibration and shock. If unfavorable ambient conditions cannot be avoided owing to reasons related to building structure, measuring requirements or other reasons, this may influence the measurement quality! (see section 10 "Technical Data").

If remote seals with capillary tubes are attached to the transmitter, see also the Instructions 42/15-813 EN.

4.2 Transmitter

The transmitter can be connected directly onto the shut-off valve. There is also a mounting bracket for wall or pipe mounting (2" pipe) available as an accessory.

Preferably in such a position that the process flange axes are vertical (horizontal with barrel-type amplifier housing) so as to avoid zero shifts.

If the transmitter were installed inclined, the hydrostatic pressure of the filling fluid would exert pressure on the sensing diaphragm and thus cause a zero shift! A zero point correction would then be necessary.

Various versions are available for connecting the measuring lines, and these are shown in detail on the dimensional diagram. Unconnected process connections on the measuring mechanism must be sealed with the enclosed blanking plugs (1/4-18 NPT).

For this purpose use your officially approved sealant.

Please refer to section 11 "Dimensional Diagrams" for possible mounting with bracket.

To align the transmitter (torsion by max. 360°) at the measuring-point, the rotatable housing can be loosened at the shaft between sensor and housing:

- Release the attachment screw by max. 1 rotation.
- Align the housing.
- Retighten the attachment screw!

4.3 Measuring piping

The following points must be observed for correct installation:

- Keep the measurement piping as short as possible and avoid sharp bends.
- Lay the measurement pipings so that no deposits can accumulate. Gradients should not be less than 8 %.
- Measurement pipings should be blown through with compressed air or, better still, flushed through with the measuring medium before connecting to the measuring element.
- If the medium is a liquid/vapour the filling liquid must be at the same level in both pipes. If using separating liquids, both pipes must be filled to the same height.
- Keep both pipes at the same temperature whenever possible.
- Completely bleed measuring pipings if the medium is a liquid.
- Lay the process piping so that gas bubbles, when measuring liquids, or condensate when measuring gases, can flow back into the process piping.
- Ensure that the process piping is correctly connected (+ HP and – LP side on measuring mechanism, seals, ...).
- Take care of the tightness of the connection.
- Lay the process piping so that blow-outs do not occur via the transmitter!

5 Electrical connection

The relevant guidelines must be observed during the electrical installation!

Since the transmitter has no switch-off elements, overcurrent protection devices or mains disconnection possibilities must be provided on the system side. (Overvoltage protection at option)

Check that the existing operating voltage corresponds to that indicated on the type plate. For power supply and output signal, the same lines are used. Consult the enclosed connection diagram! Depending on the supplied model, the electrical connection is made via cable entry 1/2-14 NPT or M 20 x 1.5 or via plug Han 8 U. The screw terminals are suitable for wire cross-sections up to 2.5 mm^2.

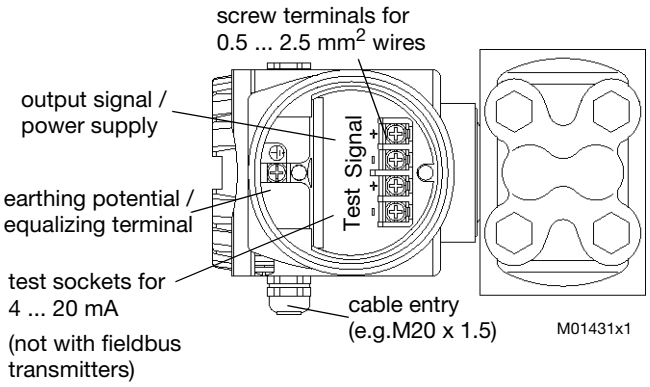


Fig. 2: Cable connection compartment

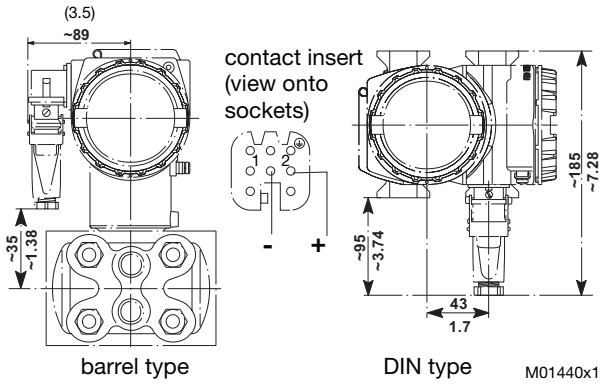


Fig. 3: plug connection

5.1 Mounting of the socket connector

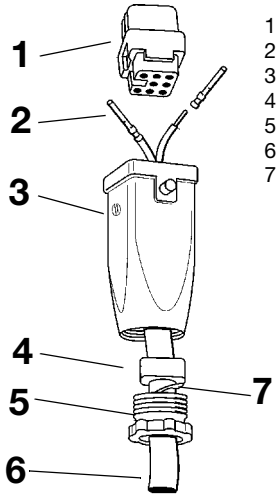
The socket connector for the cable connection is enclosed with the transmitter for the plug version.

Installation (see Fig. 4):

The contact sockets (2) are crimped or soldered onto the cable ends (wire cross-section 0.75...1 mm²) from which 1.5...2 cm of the sheath and about 8 mm of the insulation has been removed and inserted from the rear into the contact insert (1). The screwed gland (5), thrust ring (7), sealing ring (4) and grommet housing (3) must be pushed onto the cable in the specified order prior to installation. (The sealing ring (4) may have to be adapted to the cable diameter first.)

Check the connecting points again before pressing the sockets all the way into the contact insert. Incorrectly installed sockets can only be removed again with a special removal tool (item no.: 0949 813) or with a standard ball pen refill.

A connection terminal is available for grounding (PE) on the transmitter exterior and also in the plug. Both terminals are electrically interconnected.



1 contact insert
2 contact socket
3 grommet housing
4 sealing ring (can be cut out)
5 screwed gland PG 11
6 cable (diam. 5 ... 11 mm)
7 thrust collar

Fig. 4:

5.2 Protective conductor / grounding

The transmitter operates within the specified accuracy with common mode voltages between the signal lines and the housing up to 250 V.

On principle the power supply of the transmitter with an output voltage of max. 60 VDC has to be effected from a voltage source which is safely separated from mains. In order to fulfill the requirements of the low-voltage guidelines and the relevant EN 61010 rules for the installation of electrical components, the housing must be provided with a protective circuit (e.g. grounding, protective conductor) if voltages of >60 VDC could occur.

Grounding terminals (PE) are available on the transmitter exterior and in the plug. Both terminals are connected.

5.3 Transmitter with integrated Surge Protector

Use a short wire to connect the transmitter housing via the earthing connection (PA) to potential equalization. Potential equalization (min. 4 mm^2) is necessary over the entire wiring. The transmitter is no longer test voltage proof.

5.3.1 Set-up of the signal circuit / communication circuit

(for transmitters with 4...20 mA output signal (HART, protocol)

The transmitter can be operated via a modem by means of a PC or laptop. The modem can be connected in parallel to the transmitter at any place in the signal circuit. Communication between transmitter and modem is made via AC signals which are overlaid to the analog 4...20 mA output signal. This modulation is effected without averaging and therefore, it does not influence the measuring signal.

Communication between transmitter and PC or laptop is only possible if the signal circuit is set up as shown in Fig. 5. The resistance between the connecting point of the FSK modem and the power supply must be at least 250 Ohm including the internal resistance of the supply unit. If this value is not reached with the normal installation, an additional resistance must be used.

The additional resistance has already been installed by the manufacturer in the supply units TZN 128 and TZN 129. In the ”FSK bus” mode, the TZN 128 allows to communicate directly via the supply unit.

For power supply, either supply units, batteries or power packs can be used which must be designed to ensure that the operating voltage UB of the transmitter is always between 10.5 and 45 V DC (for LCD indicator 14 ... 45 V DC).

The max. current of 20... 22.5 mA which may occur by overranging according to the respective parameter setting, must be taken into account. The minimum value for US results from this. If further signal receivers (e.g. indicators) are connected into the signal circuit, their resistance must also be taken into account.

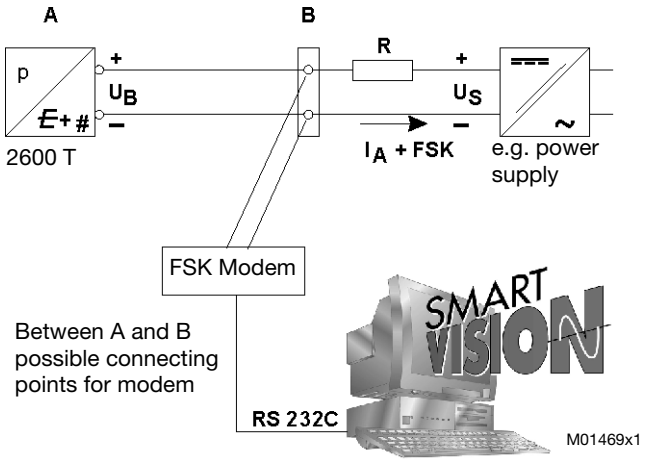


Fig. 5: Communication mode „point to point“

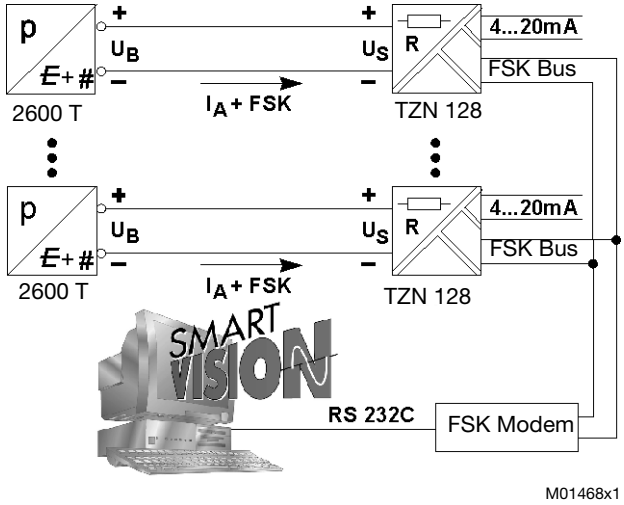


Fig. 6: Communication mode „FSK bus“

5.4 Connecting cable

To allow communication between transmitter and PC/laptop, cabling must meet the following requirements:

It is recommended to use shielded and twisted pair lines.

The minimum wire diameter should be:

- 0.51 mm for lines up to 1500 m
- 0.81 mm for lines longer than 1500 m

The maximum line length is limited to:

- 3000 m for twin-core cable
- 1500 m for multicore cable

The actually possible line length of the electric circuit depends on the total capacitance and joint resistance; it can be estimated according to the following formula:

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

L = line length in m

R = joint resistance [Ohm]

C = line capacitance in pF

Cf = capacitance of the devices existing within the circuit

The shield should be grounded on one side only.

Laying together with other electric circuits (with inductive load, etc.) and the proximity of large electrical installations should be avoided.

5.5 PROFIBUS-PA transmitters

Fieldbus transmitters are provided for the connection to segment couplers DP/PA. The permissible terminal voltage ranges from 10.2... 32 V DC.

A shielded cable is recommended. Contacting of the shield is effected in the metal screwing. The transmitter must be grounded.

The transient behavior corresponds to the draft DIN IEC 65C / 155 / CDV dated June 1996. When operating with an Ex-segment coupler according to DIN EN 61 158-2 October 1994, the max. number of devices may be reduced by a time-dependent current limitation.

During cyclic data traffic, the OUT variable is transmitted. It is composed of the output value and 1 byte status information. The output value is transmitted with 4 bytes as IEEE-754 Floating-Point-Type.

Further notes on PROFIBUS-PA, e.g. with respect to the "Ident Number", are given in the "Additional Instructions 42/15-110", the data sheet "Installation Suggestions 10/63-0.40" as well as under the Internet address http://www.profibus.com.

5.6 Explosion protection

For the installation (electrical connection, grounding / potential equalization, etc) of explosion protected transmitters, observe the national statutory orders, DIN/VDE rules, guidelines for explosion protection and the enclosed EC Type-Examination Cerertificate of the device. The certified explosion proofness of the transmitter is indicated on the type plate.

5.6.1 Transmitter with integrated Surge Protector

Transmitters with integrated surge protection feature an instrinsically safe circuit which is connected to the housing for potential compensation.

5.6.2 Transmitters of protection class ”Intrinsically safe

(EEx i” according to the directions 94 / 9 / EC (ATEX):)

- Install only intrinsically safe devices within the transmitter signal circuit.
- The signal circuit may be interrupted even when the transmitter is in operation (e.g. disconnect and connect signal lines).
- The housing may be opened during operation.
- Transmitters with and without remote seal of the protection type "Intrinsically Safe EEx i" may be installed directly at Zone 0 if the power supply is effected via an intrinsically safe circuit EEx ia or EEx ib.
- Test circuit (terminals "TEST +/-"): in protection type Intrinsically Safe only for connection to passive intrinsically safe circuits. The category, the explosion class as well as the max. values Uo, Io and Po of the intrinsically safe test circuit are determined by the connected intrinsically safe signal circuit. The rules for interconnection have to be observed!

5.6.3 Transmitters of category 3

(for the application in "Zone 2" according to the directions 94 / 9 / EC (ATEX))

- The transmitter has to be connected via a certified screwed cable gland (protection type "Increased Safety EEx e" according to ATEX). It must be provided by the customer. Furthermore, the conditions stated in the type test certificate of the cable gland have to be observed!
- It is not permitted to open the housing during operation (operating voltage switched on)!

5.6.4 Transmitters for use in areas with inflammable dust

- Only use a certified cable gland in acc. with EN 50 014: 1997 (not in scope of supply) for the transmitter connection. The cable gland must also meet the degree of protection IP 67 requirements. Considering the intrinsic heat generation, the smoulder temperature of the dust must be at least 85 deg. K above the ambient temperature.
- Consider the possible danger of an electro-static discharge under consideration of the medium and the transportation speed when using remote seals with an anti-stick coating.

5.6.5 Transmitters of protection class “flameproof enclosure EEx d”

(according to the directions 94 / 9 / EC (ATEX):)

- It is not permitted to open the housing during operation (operating voltage switched on)!
- The following set-up instructions have to be observed:
  - The transmitter has to be connected via suitable cable and line entries or piping systems which meet the requirements according to EN 50 018:1994, Section 13.1and/or 13.2 and for which a separate test certificate is available!
  - Unused openings of the housing have to be closed according to EN 50 018:1994, Section 11.9!
  - Cable and line entries as well as blanking plugs which do not correspond to the points 1. and 2. must not be used!
- Before switching on the operating voltage:
  - Close the housing.
  - Secure enclosure cover by turning the attachment screw (hexagon socket screw) to the left.
  - Protect housing from torsion by turning the attachment screw (stud) to the right.
- Enclosure cover, electronic housing and sensor may only be replaced by approved components!

5.6.6 Transmitters of prot. class „Explosion Proof“ acc. to Canadian Standard (CSA)

Electrical connection with cable conduit -

To ensure the type 4X and IP 67 protection class, use a suitable sealing compound when screwing the conduit into the 1/2“ NPT female. The blanking plug has been sealed with Molykote DX. The use of any other compound is at the owners risk.

5.6.7 Type test certificate / Conformity statement

For transmitters in explosion-proof design the EC type test certificate and/or the conformity statement have to be considered.

6 Commissioning

After installing the transmitter, it is placed into operation by switching on the operating voltage.

- Check the following before switching on the operating voltage:
  - Process connections.
  - Electrical connections.
  - That the measurement piping and measuring chamber of the transmitter are completely filled with the medium.
- Subsequently it is placed into operation.
- The shut-off valves should be operated in the following sequence (basic setting: all valves closed):
  - Open the shut-off valves on the pressure tap connections - if present.
  - Open the pressure equalisation valve of the manifold.
  - Open the positive shut-off valve.
  - Close the pressure equalisation valve.
  - Open the negative shut-off valve.
- Proceed in the reverse order when taking the unit out of operation.

If, in case of transmitters of the type of protection ”Intrinsically safe”, a current meter is connected to the test sockets or a modem is connected in parallel when an explosion hazard is existing, the sums of the capacitance and inductance of all circuits including transmitter (see type plate) must be equal to or smaller than the permissible capacitance and inductance of the intrinsically safe signal circuit (see type plate of the supply unit). Only passive or explosion-proof test devices or indicators may be connected.

If the output signal is slow to stabilize, a high damping time constant has probably been set in the transmitter.

6.1 Transmitters with 4...20 mA output signal

(HART protocol)

If the applied pressure is within the values indicated on the type plate, the output current ranges between 4 and 20 mA. If the applied pressure exceeds the calibrated range, the output current is between 3.5 mA and 4 mA in case of underranging or between 20 mA and 22.5 mA (according to the respective parameter setting) in case of overranging; standard setting: 3.8 mA / 20.5 mA.

In order to prevent errors in the lower flow ranges it is possible, via the graphical user interface (DTM), to adjust the "Zero suppressor" and/or the lin./sq. rt. transition point. Should no values have been given then the factory set values will be: 5% for the lin./sq. rt. transition point and 6% for the "Zero suppressor" of the maximum flow, i.e. the transmitter operates only with the "Zero suppressor".

A current of < 4 mA or > 20 mA may also indicate that the microprocessor has detected an internal error; standard setting: 21 mA. Via the graphical user interface (DTM), an exact diagnosis of the error can be performed. A short-time interruption of power supply results in an initialization of the electronic (restart of the program).

6.2 Write protection

Write protection prevents an illegal overwriting of the configuration data. If write protection is activated, the function of the keys 0 % and 100 % is disabled. However, it is still possible to read out the configuration data by means of the graphical user interface (DTM).

If necessary, the control unit can be leaded.

Write protection is activated as follows (see also symbolism on the plate):

1 First, fully press down the switch with an appropriate screwdriver.

2 Then turn the switch clockwise by 90 °∠.

For deactivation the switch has to be pushed down a little and turned counterclockwise by 90 °∠.

6.3 Oblique sensor/ zero correction

During the installation of the transmitter, zero shifts (e.g. slightly inclined installed position, uneven liquid columns in the differential pressure lines, additional remote seals etc.) caused by mounting may occur which have to be corrected.

The transmitter must have reached its operating temperature (approx. 5 min after switch-on if the transmitter has already assumed ambient temperature) in order to be able to carry out the zero check.

The correction has to be made at dp = 0 / pabs = 0 !

There are two possibilities (point 1A or 1B) to perform the 4...20 mA-output signal correction directly at the transmitter (control unit is available):

1A Apply pressure at lower range value (4 mA) – from the processor from a pressure pick-off. The pressure must be stable and applied with high accuracy << 0.05% (observe adjusted damping. Press the 0 % key at the transmitter – output signal is adjusted to 4 mA. The span remains unchanged. Subsequent to the last actuation of the 0% key, the non-volatile storing of the lower range value adjusted in this way is effected after
< 25s for HART and/or
< 110s for PROFIBUS-PA and/or
< 15s for FOUNDATION Fieldbus

1B In conjunction with an installed LCD indicator, call up the menu item ”SHIFTZERO” via the keys ”M” and ”+”. Corrections are made by pressing the key ”M” (see also section 7 ”Operation”).

2 Subsequently put the transmitter into the operating state.

The above procedure acc. to “1A” has no influence on the display of the physical differential pressure, but instead corrects the analogue output signal. Therefore, a difference may occur between the analogue output signal and the display of the physical differential pressure on the digital display or the graphical user interface (DTM). In order to avoid this difference, the necessary zero-point shift must be carried out using the graphical user interface (DTM) (menu path **Configure_Differential Pressure Measurement_Process Variable** (Oblique Sensor)).

However, then a zero-point shift must not have been carried out with the 0% key beforehand.

6.4 Assembly / disassembly of push button unit

(Figure 7)

- Loosen the screw of the protective cap and turn it aside.
- Push the lock completely out of the push button unit, e.g. by means of a suitable screw driver.
- Remove the uncovered square nut from the push button unit.
- Loosen the fixing screw of the push button unit by a Torx screw driver (size T10) and pull the latter out of the electronic housing.
- If necessary, insert a spacer and tighten it by the attached screw

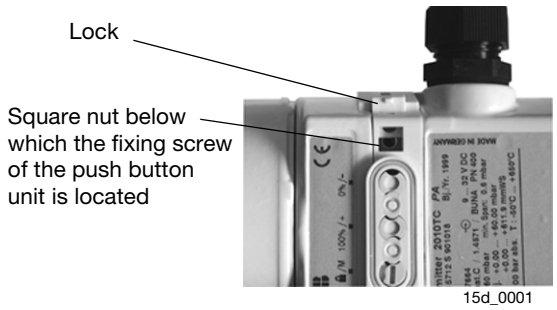


Fig. 7: Push button unit - dissassembly / assembly

6.5 Mount LCD indicator

- Unscrew enclosure cover of the electronic compartment (see figure 8) (if necessary, observe section ”Secure enclosure cover for EEx d”).
- Plug LCD indicator. Depending on the mounting position of the transmitter, the LCD indicator can be slipped on in four different positions; in this way turns by ± 90° or ± 180° are possible.

If the LCD indicator is backlit (option), there is a three core cable with plug on the back of the indicator. Connect this plug with the three-pole plug strip (only with HART transmitters) in the electronic compartment (see Fig. 8) before slipping on the indicator. If there is a jumper on the 3-pole plug strip (only with HART transmitters), it has to be removed and plugged into the “socket for jumper”

- Fasten LCD indicator with both screws.
- Hand-screw the enclosure cover (if necessary, observe section ”Secure enclosure cover for EEx d”).

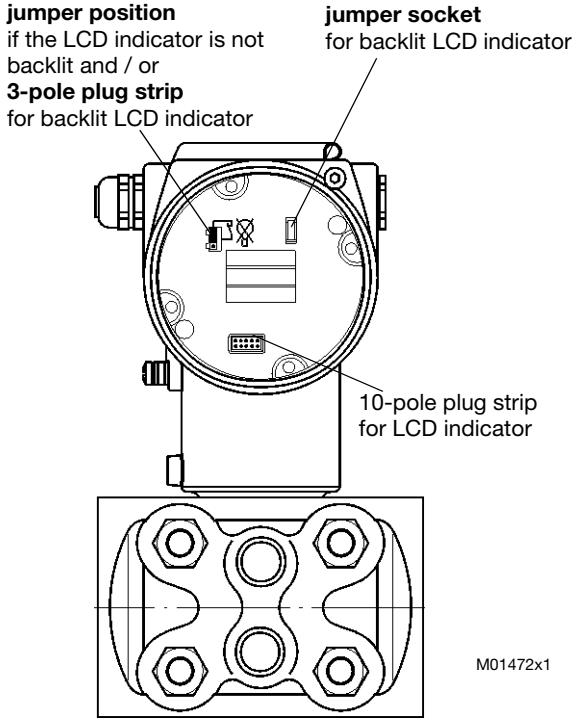


Fig. 8: Electronic compartment - LCD indicator mounting

Secure enclosure cover for EEx d

On the top right of the electronic housing front, there is an attachment screw (hexagon socket screw, SW 3mm).

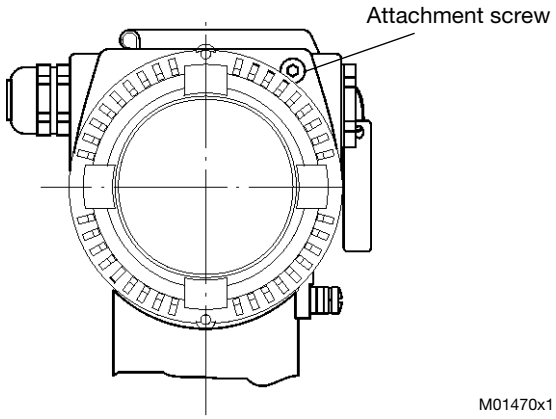


Fig. 9: Secure enclosure cover

- Turn enclosure cover hand-tight into the housing.
- Secure enclosure cover by turning the attachment screw to the left. In doing so the screw must be unscrewed to the stop of the screw head at the housing cover.

7 Operation

There is no protection against electric shock when the housing covers are open. Do not touch live parts.

Fig. 10: Key legend plate

7.1 Operation with”local keys”

(at the device) without LCD indicator

The control unit comprises 2 keys for external adjustment of lower range value (0 %) and upper range value (100 %) and a write protect switch. There are no physical connections through the housing for the keys and the switch.

7.2 Calibration

Lower range value and span may be adjusted directly at the transmitter via keys.

The transmitter has been calibrated by the manufacturer according to the order data. The set values for lower range and upper range are indicated on the type plate.

Generally the following applies:

The 1st pressure value (e.g. 0 mbar) is always assigned to the 4 mA signal and the 2nd pressure value (e.g. 400 mbar) always to the 20 mA signal.

To readjust the transmitter, apply the pressure for the lower and upper range value to the sensor. Make sure that the measuring limits are not exceeded.

Pressure reducing stations with adjustable pressure and comparative displays can be used as sensors. When connecting, take care to avoid residual liquids (with gaseous test media) or air bubbles (with liquid test media) in the piping since they can cause errors.

The pressure reducing station should have an accuracy of at least 3 times better than the transmitter to be tested. It is advisable (adjusted time constant is known!) to set the damping to zero (via key plus LCD indicator or graphical user interface (DTM)).

7.2.1 Sequence of steps:

1. Apply pressure for lower range value and wait approx. 30 s until it has stabilized.
2. Press key 0 % - output current is set to 4 mA.
3. Apply pressure for upper range value and wait approx. 30 s until it has stabilized.
4. Press key 100 % - output current is set to 20 mA.
5. If necessary, reset damping to the initial value.
6. Document new settings.

10 s after the last actuation of the 0 % or 100 % keys, the respective parameter is stored in a failsafe way.

This procedure of adjustment only changes the **4...20 mA** current signal. The representation of the physical process pressure on the digital display or by means of the graphical user interface (DTM), is not changed. To avoid this difference, a correction can be made via the graphical user interface (DTM) and its menu path **<Calibrate_Differential Pressure Measurement_Adjust Input>**.

After such a correction, the calibration of the device must be checked.

7.3 Operation with ”local keys” with LCD indicator

In conjunction with an LCD indicator, the transmitter can be configured with the keys (- / + / M) as follows:

Indications in ( ) designate the menu item, they are shown in the 1st and 2nd line of the indicator.

- (EXIT) Exit the menu
- (VIEW) View selected measured and calculated values
- (GET 0%) Lower range value with applied pressure
- (GET 100%) Upper range value with applied pressure
- (SET 0%) Lower range value without applied pressure
- (SET 100%) Upper range value without applied pressure
- (SHIFTZERO) Correct zero drift (e.g. oblique sensor)
- (OFFSET SHIFT) Parallel shift
- (OUT 0%) Scaling output variable – initial value
- (OUT 100%) Scaling output variable – final value
- (DAMPING) Damping
- (ALARM CURRENT) Output current in case of an error only available for 4...20 mA devices with HART protocol
- (DISPLAY) Displayed value
- (UNIT) Pressure unit
- (UNIT) Temperature unit of internal temperature sensor
- (FUNCTION) Characteristic
- (ADDRESS) Fieldbus address; only available for devices with PROFIBUS-PA or FOUNDATION Fieldbus protocol.

In the following, some of the a.m. menu items are described in detail.

7.3.1 Parallel shift (OFFSET SHIFT)”

This function performs a parallel shift of the characteristic so that it runs through a specified point. Thus, the output signal of several measuring devices which measure the same process variable, can be brought to the same value without carrying out calibration with applied pressure.

On certain conditions, the function may be performed at any point of the characteristic:

- Process variable within the adjusted measuring range
- Transmitter with linear transfer function

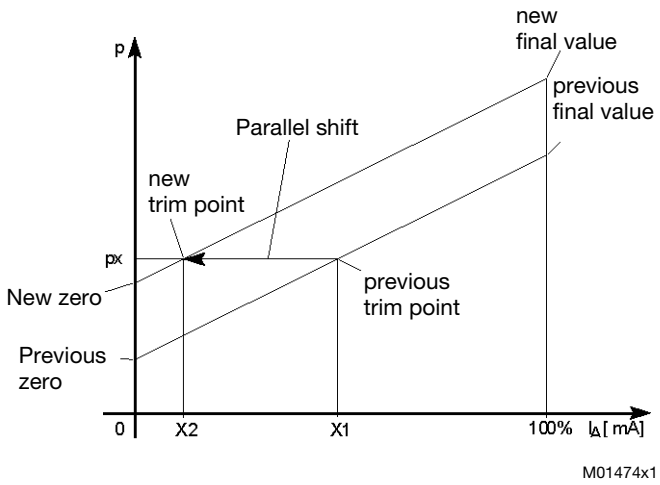


Fig. 11: Parallel shift

By entering a percent value, an offset shift of the measuring range is carried out.

The transmitter displays with applied pressure px the standardized output value x1 in percent. However, for the present application, the value x 2 should be displayed. Now the value x2 is set via local operation. The transmitter calculates the new zero and the new final value and then assumes these new settings.

7.3.2 “Damping (DAMPING)”

A fluctuating output signal of the transmitter, caused by the process, can be electrically smoothed (damped).

The additional time constants is adjustable between 0 sec. and 60 sec. in steps of 0.001s.

The damping set in this way does not affect the digitally indicated value in physical units, only the derivatives such as analogue output current, free process variable, input signal for controller etc.

7.3.3 “Characteristic (FUNCTION)”

In this menu option you can select the functions: linear and freely programmable. The “individuel values of the freely programmable characteristic” cannot be changed here. Use a Hand-Held-Terminal or the graphical user interface (DTM) for changes.

7.3.4 “Fieldbus address (ADDRESS)”

Under this path, the fieldbus-slave-address may be changed. Enter a figure between 0 and 126 for the selected transmitter.

Generally, the manufacturer assigns the address 126 to all new devices! The transmitters should get different addresses in order to allow the addressing of a specific device. If, e.g., the device data are loaded via the graphical user interface (DTM) after the address has been changed, the connection set-up is executed again, and possibly an error message appears. Acknowledge this with ”Repeat”, then the data will be loaded.

7.4 Measured value display

7.4.1 The LCD indicator

2-line, 7-character, 19-segment alphanumeric display with additional bar chart display. Optionally the indicator is available with back illumination.

Characteristics for:
- transfer function; e. g. linear
- mode
- status / code

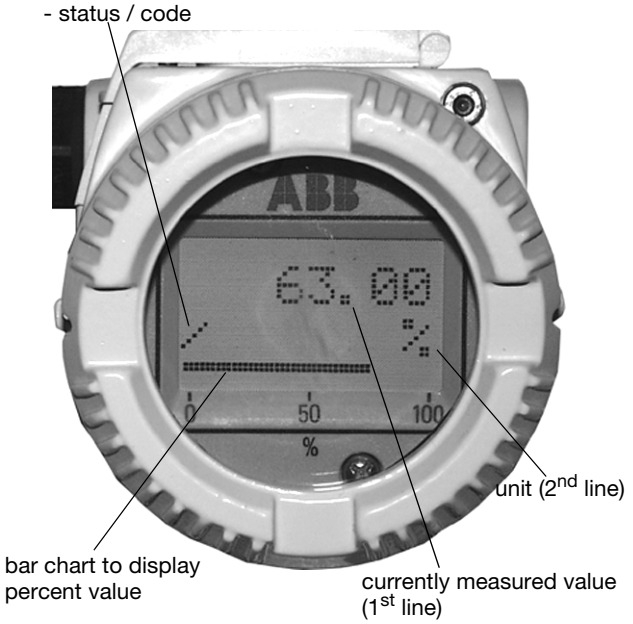


Fig. 12: LCD indicator (option)

7.4.2 Display of the physical value

At the first position of the first line, the sign is displayed. The following six positions show the amount of the measured value. The comma is placed so that the maximum value can be displayed with these six positions. The place of the comma is not changed. A comma at the sixth position is not displayed. Thus it is possible to display max. +/-999999. If this value is exceeded ***Overflow*** is indicated. In the second line, the unit is displayed with the last five positions.

The first position shows the following characters, if necessary, one after the other. Display changes every second.

Display for ...	Character	Comment
Transfer function	L, √ or /	Always one of these characters appears.
Write protection		Only if write protection has been set.
Cyclic communication	. . . .	Only in case of PROFIBUS-PA
Status available (e.g. measuring range infringement or hardware error)		Only if a status is available.
Code of displayed value	1 ... 9	see menu Display (see structure tree)
Transmitter is busy		This character overwrites other characters.

Tab. 1: Legend

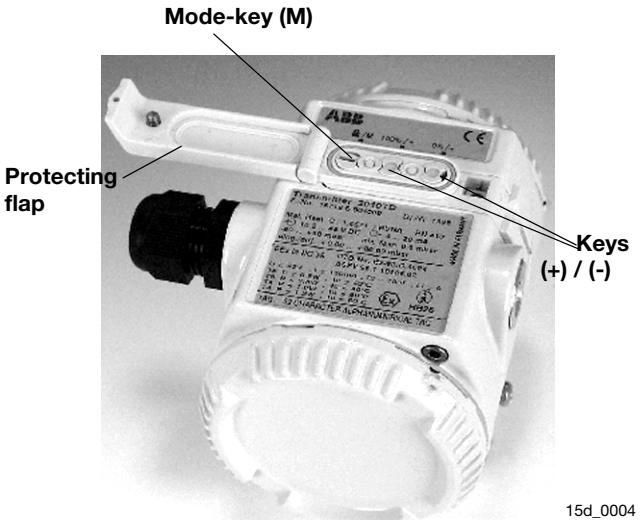


Fig. 13: Control elements (option)

7.4.3 Display of the percent value

	Display on LCD indicator
1st line	Percent value, limits: -25% to 125%, 2 decimal places
2nd line	1st position: Transfer function (Table 1) 2nd position: Write protection (Table 1) 7th position: %
Bar chart	2% steps - from -2% to +100%, no hysteresis

Tab. 2: Percent value display on LC Display

7.4.4 Program control

To make the keys accessible, release the screw and turn the protection flap aside (see Figure 13). With the mode key "M", you can start menu-controlled programming. To call the next menu item, press the key "+". You will return via the key "-". Submenu items / selection lists are activated via the mode key "M". A numerical value can only be changed via the keys "+" and "-". It must be taken into account that the key "+" changes the value (each keystroke increases the value by 1), whereas the position of the value to be changed is reached via the key "-". Acknowledge changes with the mode key "M"; the subsequent OK acknowledgement (via the key "M", "+" or "-") writes the new value into the failsafe storage. An adjusting process can be aborted by pressing simultaneously the keys "+" and "-". From any main menu item, you can return to the menu item "EXIT" by simultaneously pressing the "+" and "-" keys. When the adjustment has been finished, quit the program via the menu item "EXIT".

By means of the following structure tree, you will get an overview of the selection / programming possibilities.

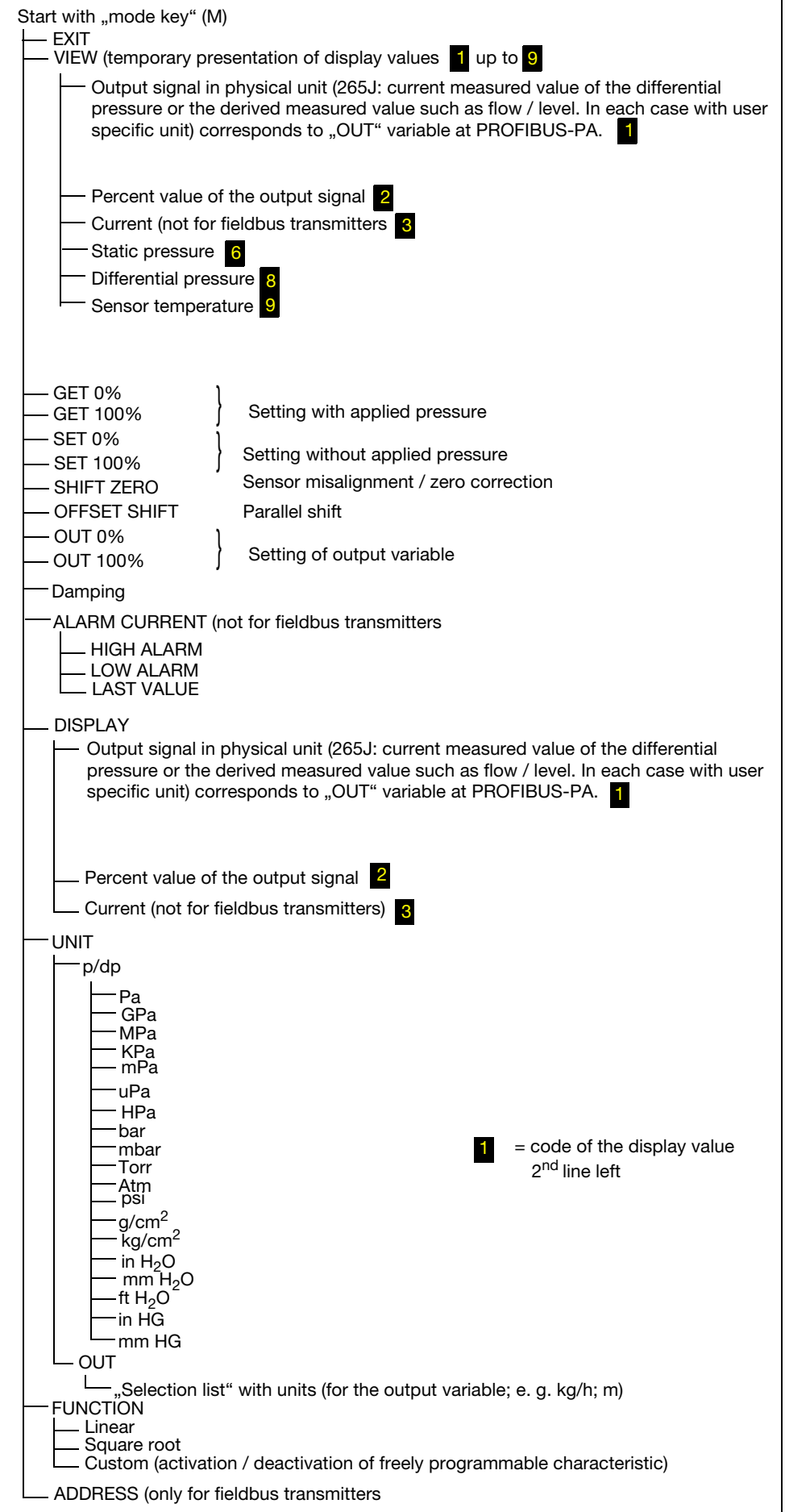


Fig. 14: Structure tree

7.5 Operation with PC / laptop or handheld terminal

To configure the transmitter via PC / notebook the graphical user interface (DTM) is required. Please refer to the software description for operating instructions.

Communication protocol:	PROFIBUS-PA® or FOUNDATION Fieldbus® or HART®
Hardware:	
for HART® :	FSK modem for PC / notebook
Handheld Terminal:	STT 04 or 691 HT or HHT 275

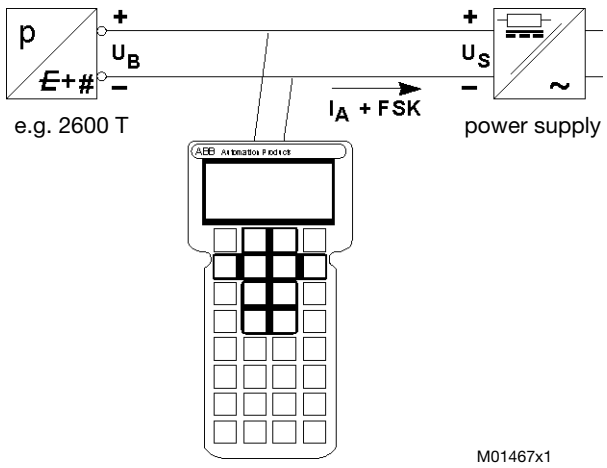


Fig. 15: Communication set-up via STT04

7.6 Configuration

7.6.1 Transmitter with HART communication and 4 to 20 mA

Standard configuration

Transmitters are factory calibrated to customer's specified range. Calibrated range and tag number are stamped on the type plate. If calibration range and tag data are not specified, the transmitter will be supplied configured as follows:

4 mA	Zero
20 mA	Upper Range Limit (URL)
Output	Linear
Damping	0.125s
Transmitter failure mode	21mA

Any or all the above configurable parameters, including lower range value and upper range value can be easily changed using the HART hand–held communicator or the graphical user interface (DTM). The transmitter database is customized with specified flange type and material, O–ring material and filling liquid.

7.6.2 Transmitter with PROFIBUS PA communication

Transmitters are factory calibrated to customer's specified range. Calibrated range and tag number are stamped on the type plate. If calibration range and tag data are not specified, the transmitter will be supplied configured as follows:

Measure Profile	Pressure
Engineering Unit	mbar/bar
Output scale 0%	Lower Range Limit (LRL)
Output scale 100%	Upper Range Limit (URL)
Output	inear
Hi-Hi Limit	Upper Range Limit (URL)
Hi Limit	Upper Range Limit (URL)
Low Limit	Lower Range Limit (LRL)
Low-Low	Limit Lower Range Limit (LRL)
Limits hysteresis	0.5% of output scale
PV filter	0.125s.
Address	126

Any or all the above configurable parameters, including lower range value and upper range value can be easily changed using the HART hand-held communicator or the graphical user interface (DTM). The transmitter database is customized with specified flange type and material, o–ring and filling liquid.

7.6.3 Transmitter with FOUNDATION Fieldbus communication

Transmitters are factory calibrated to customer's specified range. Calibrated range and tag number are stamped on the type plate. If calibration range and tag data are not specified, the transmitter will be supplied configured as follows:

Measure	Profile Pressure
Engineering	Unit mbar/bar
Output scale 0%	Lower Range Limit (LRL)
Output scale 100%	Upper Range Limit (URL)
Output	Linear
Hi-Hi Limit	Upper Range Limit (URL)
Hi Limit	Upper Range Limit (URL)
Low Limit	ower Range Limit (LRL)
Low-Low Limit	Lower Range Limit (LRL)
Limits hysteresis	0.5% of output scale
PV filter	0.125s
Address	Not necessary

Any or all the above configurable parameters, including lower range value and upper range value can be easily changed using the HART hand-held communicator or the graphical user interface (DTM). The transmitter database is customized with specified flange type and material, o–ring and filling liquid.

7.6.4 Configuration of the flow measurement with graphical user interface (DTM)

If the transmitter has been configured at the manufacturer's work for the measuring point according to the specifications given in the questionnaire you do not have to do anything else than to assemble the transmitter as specified (perhaps correct the sensor misalignment - refer to command **Configure_Differential Pressure Measurement_Process Variable** (Oblique Sensor)). After switch on the measuring point is ready for operation. If the transmitter is equipped with an LCD indicator, the current differential pressure (default adjustment) is displayed immediately.

However, it you want to make changes e.g. concerning the configuration of the mass flow measurement, use the appropriate graphical user interface (DTM), which allows for complete configuration. It supports the HART Protocol as well as the fieldbus protocols "PROFIBUS-PA and FOUNDATION Fieldbus" and is operable on a PC / Notebook and/or in an automation system

The required operating steps for the software installation are described in the installation instructions delivered with the software. The parameters can be adjusted via the path <Configure_Differential Pressure Measurement or Configure_Static Pressure Measurement>.

The program offers the possibility to configure, to set parameters, to interrogate and to test the devices. Furthermore an OFF-line configuration can be carried out via an internal data management. Every parameter setting and configuration is subjected to a plausibility check.

The <F1> key provides extensive context-sensitive help at every stage throughout the complete program.

Immediately after the delivery of the transmitters and/ or before changing the configuration we recommend to save the existing configuration data on a data medium using the command **File_Save**.

7.7 Operation via graphical user interface (DTM)

7.7.1 System requirements

- engineering tool SMART VISION as from release 4.01
  - DTM (Device Type Manager)
- Operating systems
  - Windows NT 4.0 (SP 5, 6a) or Windows 2000
  - Internet Explorer as from Version 5.0

The DTM is started by means of the right mouse button or via the menu item "Device" with "Edit". After a "Connection setup", first the data of the 265J should be loaded completely. Changed data are underlined and displayed in blue. These data are transmitted to the device via "Store data in the device".

After the data have been saved in the transmitter, their nonvolatile storage is effected automatically. To do this, power supply to the transmitter must be continued for 2 minutes. If this is not observed, the previous data will become active again during the next operation.

For Profibus devices, the disconnection of "Local operation" only becomes effective in case of cyclic communication. If write protection is set by means of the DTM, the setting of the 265 J can no more changed via the control keys.

For Profibus devices, the slave address must be indicated correctly in the project tree of SMART VISION, Communication name and description are automatically updated when loading the device data.

The most important calibration / parameterization options within the graphical user interface are shortly described in the following. You will find further notes on the menu items in the context-sensitive help. Before carrying out any setting, please ensure that write protection has neither been activated on the transmitter itself (key) or via the graphical user interface (DTM), (menu path **Configuration_Basic Parameters _General _Local Operation**).

7.7.2 Adjust damping

Menu path: <Configuration_Differential Pressure Measurement_Output>. The required value has to be entered in the field "Output parameters" in the line "Damping".

7.7.3 Correct oblique sensor

Menu path: <Configuration_Differential Pressure Measurement_Process Variable>

Actuate the button <Balance> in the field "Oblique sensor". Balancing is immediately effected with nonvolatile storage in the transmitter.

7.7.4 Adjust lower and upper range value

Menu path: <Configuration_Differential Pressure Measurement_Process Variable>

In the field "Scaling", the adjustment is possible in two ways:

- Value input: The required value / values has / have to be entered in the input fields "Lower range value" and / or "Upper range value".

  or

- Process pressure acceptance: For the adjustment, the lower range value and the upper range value are preset as pressure at the sensor. Make sure that the measuring limits are not exceeded. Pressure reducing stations with adjustable pressure and comparative displays can be used as sensors. When connecting, take care to avoid residual liquids (with gaseous test media) or air bubbles (with liquid test media) in the piping since they can cause errors. The pressure reducing station should have an accuracy of at least 3 times better than the transmitter to be tested.

8 Maintenance

The transmitter is maintenance-free. It is sufficient to check the output signal – depending on the operating conditions - at regular intervals according to section 7 ”Operation”.

If deposits in the sensor are to be expected, the sensor should also be cleaned at regular intervals – depending on the operating conditions. Cleaning should preferably be carried out in the workshop.

If remote seals are attached to the sensor, they must not be dismounted!

Replace defective transmitters/units according to the "Spare Parts Data Sheet".

8.1 Dismantling / fitting the process flanges

If remote seals are fitted do not dismantle the flanges!

1. Undo the process flange screws diagonally opposite each other (13 mm Allen key for hexagon screw).
2. Carefully remove the flanges so as not to damage the isolating diaphragms.
3. Using a soft brush and a suitable solvent thoroughly clean the isolating diaphragms and, if necessary, the process flanges. Do not use sharp or pointed tools.
4. Renew the process flange O-rings.
5. Fit the process flanges onto the measuring cell. Take care not to damage the isolating diaphragms. The flange faces of both process flanges must be in one plane and at right angles to the electronic enclosure.
6. Check that the process flange screw thread moves easily. Tighten the nut by hand as far as the screw head. If this is NOT possible, use new screws and nuts.
7. Lubricate the screw threads and contact faces of the screwed joint with, for instance “Anti-Seize AS 040 P” (Supplier: P.W. Weidling & Sohn GmbH & Co.KG, An der Kleimannbrücke 49, D 48157 Münster). With cleanliness stages, the corresponding regulations must be observed, e.g. DIN 25410!

● For 265J with measuring ranges ≥ 60 mbar:

- First tighten the diagonally opposite process flange screws and resp. or nuts with the joining torque M_F = 10 Nm (1.0 kpm) by means of a torque wrench. Then tighten fully by continuing to turn each diagonally opposite screw and / or nut through the tightening angle α_A = 180°, divided into two steps of 90° each.

● For 265J with measuring range 10 mbar:

- Tighten the process flange screws alternately in two steps and diagonally opposite by means of a torque wrench.
- Tightening torque MA = 10 Nm (1.0 kpm).

10. Check for leaks. Apply pressure with max. 1.3 x SWP simultaneously to both sides of the sensor.
11. Check the lower range value and the upper range value in accordance with Section 7 "Operation".

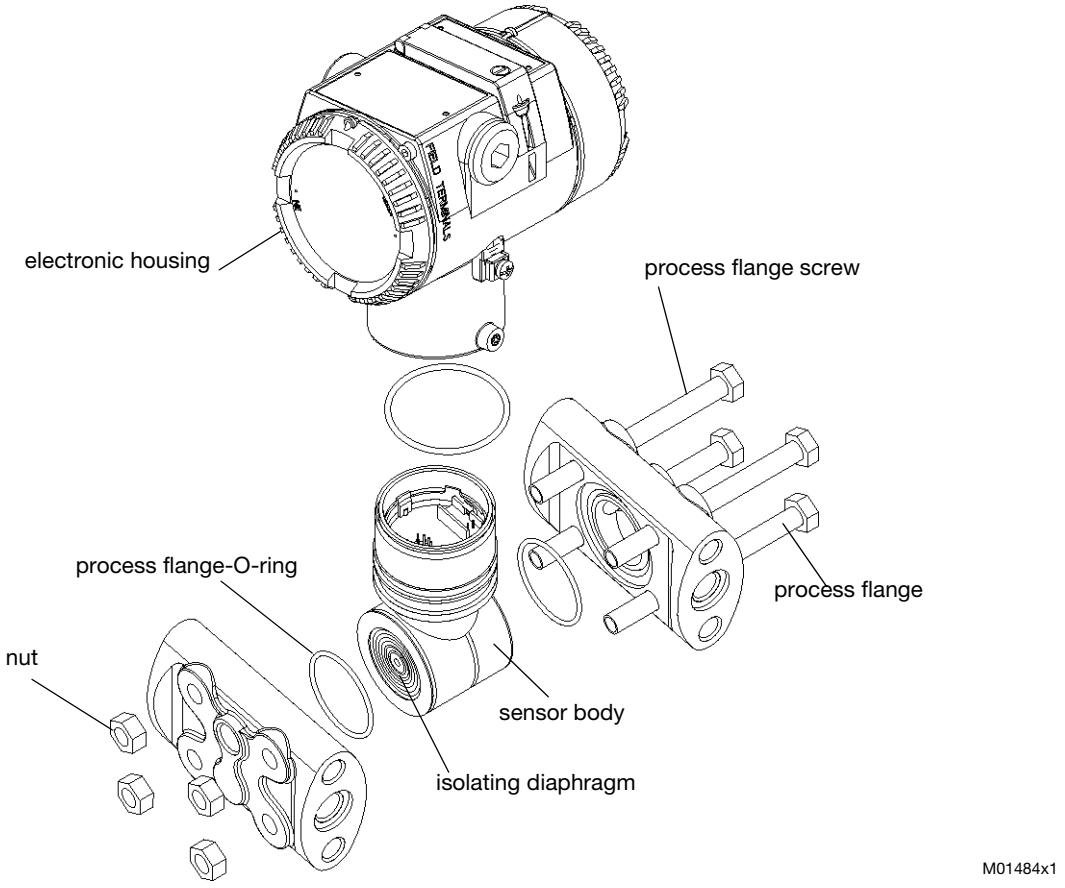


Fig. 16: Exploded view

9 Repairs

Explosion-proof transmitters may only be repaired by the manufacturer, or they must be certified by an acknowledged expert after the repair has been carried out! Observe the pertinent safety regulations before, during and after commissioning.

Disassemble the transmitter only to such extent as necessary for cleaning, checking, repairing and replacing the defective parts.

Observe section 8 "Maintenance"!

Sensor as well as sensor with attached remote seal can only be repaired by the manufacturer.

If the electronic housing has to be detached from the sensor / the measuring cell, the electronic unit must be removed from the electronic housing before in order to prevent a damage to the electronic unit. For this purpose, first of all the housing cover has to be screwed off (attachment screw!, refer to figure 9), then remove a possibly existing LCD indicator from the electronic unit (loosen 2 screws), unscrew the two captive screws of the electronic unit and remove same carefully from the electronic housing. Detach the two plugs from the electronic unit (both plugs have got a mechanical reverse battery protection and the smaller one additionally a mechanical interlock: seize the plug on the front side between thumb and forefinger and press the lock towards the plug, then pull off the plug from the socket). Put the electronic unit on a suitable pad. Unscrew the electronic housing from the sensor / the measuring cell.

Return

Defective transmitters/units are to be sent to the repair department, if possible stating the fault and its cause.

When ordering spare parts or instruments, please quote the serial number (S/N-No. + year) of the original transmitter.

Address:

ABB Process Industries

Department PID / SWM

Schillerstraße 72

32425 Minden

DEUTSCHLAND

10 Technical Data

Measured value

Differential pressure

Characteristic

Linear, square root, freely programmable with 20 reference points, $x^{3/2}$ - and $x^{5/2}$ - output function.

Spans

dp-sensor: The adjusted span must not be lower than the minimum span (recommendation for square root function: at least 10% of the range).

Measuring ranges

Sensor Code	Upper Range Limit (URL)	Lower Range Limit (LRL)	Minmum Span	SWP [bar]
A	1.0 kPa 10.0 mbar 4.0 inH_2O	-1.0 kPa -10.0 mbar -4.0 inH_2O	0.05 kPa 0.5 mbar 0.2 inH_2O	6
C	6 kPa 60 mbar 24 inH_2O	-6 kPa -60 mbar -24 inH_2O	0.2 kPa 2 mbar 0.8 inH_2O	160...410
F	40 kPa 400 mbar 160 inH_2O	-40 kPa -400 mbar -160 inH_2O	0.4 kPa 4 mbar 1.6 inH_2O	160...410
L	250 kPa 2500 mbar 1000 inH_2O	-250 kPa -2500 mbar -1000 inH_2O	2.5 kPa 25 mbar 10 inH_2O	160...410
N	2000 kPa 20 mbar 290 psi	-2000 kPa -20 mbar -290 psi	20 kPa 0.2 bar 2.9 psi	160...410
R	10000 kPa 100 mbar 1450 psi	-10000 kPa -100 mbar -1450 psi	100 kPa 1bar 14.5 psi	160...410

Absolute pressure sensors

Sensor Code	Upper Range Limit (URL)	Lower Range Limit (LRL)	Minimum Span
1	600 kPa 6 bar 87 psi	0 abs	6 kPa 0,06 bar 0,87 psi
2	2000 kPa 20 bar 290 psi	0 abs	20 kPa 0,2 bar 2,9 psi
3	10000 kPa 100 bar 1450 psi	0 abs	100 kPa 1 bar 14,5 psi
4	41000 kPa 410 bar 5945 psi	0 abs	410 kPa 4,1 bar 59,5 psi

Span limits

Maximum span = URL
(can be further adjusted up to ± URL (TD = 0.5) for differential pressure sensors, within the range limits)

IT IS RECOMMENDED TO SELECT THE TRANSMITTER SENSOR CODE PROVIDING THE TURNDOWN VALUE AS LOWEST AS POSSIBLE TO OPTIMIZE PERFORMANCE CHARACTERISTICS.

Zero suppression and elevation

Zero and span can be adjusted to any value within the range limits detailed in the table as long as:

- calibrated span ≥ minimum span

Damping

Adjustable time constant : 0 to 60s.

This is in addition to sensor response time

Turn on time

Operation within specification in less than 2.5s with minimum damping.

Insulation resistance

> 100MW at 1000VDC (terminals to earth)

10.1 Operative limits

10.1.1 Temperature limits °C (°F) :

Ambient (is the operating temperature)

Silicone oil filling: –40°C and +85°C (-40°F and +185°F)

Carbon flouride filling: –20°C and +85°C (-4°F and +185°F)

Lower ambient limit for Viton and PTFE gaskets: –20°C (–4°F)

For Hazardous Atmosphere applications see the temperature range specified on the certificate/approval relevant to the aimed type of protection.

Process

Lower limit

- refer to lower ambient limits

Upper limit

- Silicone oil: 120°C (248°F)
  for working pressure above 10kPa abs, 100mbar abs, 1.45psia(1)
- Carbon flouride: 120°C (248°F) (2)
  for working pressure above atmospheric pressure

(1) 85°C (185°F) for application below 10kPa abs, 100mbar abs, 1.45psia down to 3.5 kPa abs, 35mbar abs, 0.5psia

(2) 85°C (185°F) for application below atmospheric pressure down to 40kPa abs, 400mbar abs, 5.8psia

Storage

Lower limit: –50°C (–58°F); –40°C (–40°F) for LCD indicators

Upper limit: +85°C (+185°F)

10.1.2 Pressure limits

Overpressure limits (without damage to the transmitter)

(also one-sided)

Lower limit

- 0.5kPa abs, 5mbar abs, 0.07psia for silicone oil
- 40kPa abs, 400mbar abs, 5.8psia for carbon fluoride

Upper limit

- 0.6MPa, 6bar, 87psi for differential pressure sensor code A
- 2MPa, 20bar, 290psi or 10MPa, 100bar, 1450psi or 41MPa, 410bar, 5945psi for differential pressure sensor codes C, F, L, N, R according to selected code variant

Static pressure

Transmitters for differential pressure model 265J operates within specifications between the following limits

Lower limit

- 3.5kPa abs, 35mbar abs, 0.5psia for silicone oil
- 40kPa abs, 400mbar abs, 5.8psia for carbon fluoride

Upper limit

- 0.6MPa, 6bar, 87psi for differential pressure sensor code A
- 2MPa, 20bar, 290psi or 10MPa, 100bar, 1450psi or 41MPa, 410bar, 5945psi for differential pressure sensor codes C, F, L, N, R according to selected code variant

Proof pressure

The transmitter can be exposed without leaking to line pressure of up 1.5 times the nominal pressure simultaneously on both sides.

10.2 Environmental limits

Electromagnetic compatibility (EMC)

Definition Class 3

Radio suppression Limit class B (according to EN 550011)

Fulfills NAMUR recommendation

Low voltage directive

Comply with 73/23/EEC

Pressure equipment directive (PED)

Instruments with maximum working pressure 41MPa, 410bar, 5945psi comply with 97/23/EC Category III module H (see as well chpt. 11).

Humidity

Relative humidity: up to 100% annual average

Condensing, icing: admissible

Vibration resistance

Accelerations up to 2 g at frequency up to 1000 Hz (according to IEC 60068–2–26)

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

Acceleration: 50 g

Duration: 11 ms

Wet and dust-laden atmospheres

The transmitter is dust and sand tight and protected against immersion effects as defined by IEC EN60529 (1989) to IP 67 (IP 68 on request) or by NEMA to 4X or by JIS to C0920.

10.3 Electrical Characteristics and Options

10.3.1 HART digital communication and 4 to 20mA output

Power Supply

The transmitter operates from 10.5 to 45 VDC with no load and is protected against reverse polarity connection (additional load allows operations over 45VDC).

Minimum power supply is 14VDC with backlit indicator.

For EEx ia and other intrinsically safe approval power supply must not exceed 30 VDC.

Ripple

Maximum permissible voltage ripple of power supply during the communication:

7Vpp at f = 50 to 100 Hz

1Vpp at f = 100 to 200 Hz

0.2Vpp at f = 200 to 300 Hz

Load limitations

4 to 20mA and HART total loop resistance :

A minimum of 250W is required for HART communication.

$$R[k\Omega] = \frac{\text{Supply voltage - min. operating voltage (VDC)}}{22{,}5}$$

A minimum of 250 Ohm is required for HART communication.

10.3.2 Optional indicators

Integral display

2-line, 6-character 19-segment alphanumeric display with additional bar chart display, optionally with back illumination. User-specific display:

- percentage of the output current or
- output current in mA or
- free process variable

Diagnostic message, alarms, measuring range infringements and changes in the configuration are also displayed.

Optional surge protection

Up to 4kV

- voltage 1.2µs rise time / 50µs delay time to half value
- current 8µs rise time / 20µs delay time to half value

Output signal

Two–wire 4 to 20mA, user-selectable for linear or square root output, power of 3/2 or 5/2, freely programmable with 20 reference points output.

HART® communication provides digital process variable (%, mA or engineering units) superimposed on 4 to 20mA signal, with protocol based on Bell 202 FSK standard.

Output current limits (to NAMUR standard)

Overload condition

- Lower limit: 3.8 mA (configurable down to 3.5 mA)
- Upper limit: 20.5 mA (configurable up to 22.5 mA)

Alarm current

Min. alarm current: configurable from 3.5 mA to 4 mA, standard setting: 3.6 mA

Max. alarm current: configurable from 20mA to 22.5 mA, standard setting: 21 mA

Standard setting: max. alarm current

10.3.3 PROFIBUS PA output

Device type

Pressure transmitters compliant to Profiles 3.0 class A and B Identnumber 04C2 HEX.

Power supply

The transmitter operates from 10.2 to 32 VDC with no polarity.

For EEx ia approval power supply must not exceed 17.5 VDC. Intrinsic safety installation according to FISCO model.

Current consumption

operating (quiescent): 11.7 mA

fault current limiting: 17.3 mA max.

Output signal

Physical layer in compliance to IEC 1158–2/EN 61158–2 with transmission to Manchester II modulation, at 31.25kbit/sec.

Output interface

PROFIBUS PA communication according to Profibus DP50170 Part 2/ DIN 19245 part 1–3.

Output update time

40 ms

Function blocks

2 analog input, 1 transducer, 1 physical

Integral display

2-line, 6-character 19-segment alphanumeric display with additional bar chart display, optionally with back illumination. User-specific display:

percentage of the output or

OUT (analog input function block)

Diagnostic message, alarms, measuring range infringements and changes in the configuration are also displayed.

Transmitter failure mode

Permanent self-diagnostic; possible errors indicated in diagnostic parameters and in the status of process values.

10.3.4 FOUNDATION Fieldbus output

Power supply

The transmitter operates from 10.2 to 32VDC polarity independent.

For EEx ia approval power supply must not exceed 17.5 VDC. Intrinsic safety installation according to FISCO model.

Current consumption

operating (quiescent): 11.7mA

fault current limiting: 17.3mA max.

Output signal

Physical layer in compliance to IEC 1158–2/EN 61158–2 with transmission to Manchester II modulation, at 31.25kbit/sec.

Function blocks/execution period

2 standard Analog Input blocks/25ms max (each)

Additional blocks

1 extended standard pressure transducer block with calibration, 1 standard recource block

Number of link objects

10

Number of VCRs

16

Output interface

FOUNDATION fieldbus digital communication protocol to standard H1, compliant to specification V. 1.5; FF registration in progress.

Integral display

2-line, 6-character 19-segment alphanumeric display with additional bar chart display, optionally with back illumination. User-specific display:

percentage of the output or

OUT (analog input function block)

Diagnostic message, alarms, measuring range infringements and changes in the configuration are also displayed.

Transmitter failure mode

Permanent self-diagnostic; possible errors indicated in diagnostic parameters and in the status of process values.

10.4 Performance specifications

Stated at reference condition to IEC 60770 ambient temperature of 20°C (68°F), relative humidity of 65%, atmospheric pressure of 1013 hPa (1013 mbar), mounting position with vertical diaphragm and zero based range for transmitter with isolating diaphragms in Hastelloy and silicone oil fill and HART digital trim values equal to 4–20mA span end points, in linear mode.

Unless otherwise specified, errors are quoted as % of span.

Some performance data are affected by the actual turndown (TD) as ratio between Upper Range Limit (URL) and calibrated span.

IT IS RECOMMENDED TO SELECT THE TRANSMITTER SENSOR CODE PROVIDING THE TURNDOWN VALUE AS LOWEST AS POSSIBLE TO OPTIMIZE PERFORMANCE CHARACTERISTICS.

Dynamic performance (according to IEC 61298–1 definition)

Standard configuration for instruments with turndown up to 30:1 and linear output characteristics.

Dead time: 30ms

Time constant (63.2% of total step change):

- sensors F to R: 150ms
- sensor C: 400ms
- sensor A: 1000ms

10.4.1 Accuracy rating

% of calibrated span, including combined effects of terminal based linearity, hysteresis and repeatability.

For fieldbus versions SPAN refer to analog input function block outscale range.

For differential pressure sensor

± 0.04% for TD from 1:1 to 10:1

± (0.04 + 0.005 x URL/Span - 0.05) % for TD > 10:1

For absolute pressure sensor

- 0.1% URL of absolute pressure sensor

10.4.2 Operating influences

Ambient temperature (all limits for turn-down ratio up to 15:1)

For differential pressure sensor:

per 20K (36°F) change between the limits of

-20°C to +65°C (–4 to +150°F)

±(0.03% URL + 0.05% span)

For absolute pressure sensor:

per 20K (36°F) change between the limits of –40°C to +80°C (–40°F to +176°F)

- ±(0.08% URL + 0.08% span) limited to ±(0.1% URL + 0.1% span) per the complete temperature range of 120K (216°F)

Static pressure (zero errors can be calibrated out at line pressure)

Measuring range	Sensor A	Sensor C, F, L, N	Sensor R
on zero	up to 2 bar 0.05% URL	up to 100 bar 0.05% URL	up to 100 bar 0.1% URL
	> 2 bar 0.05% URL/bar	> 100 bar 0.05% URL/100bar	> 100 bar 0.1% URL/100bar
on span	up to 2 bar 0.05% span	up to 100 bar 0.05% span	up to 100 bar 0.1% span
	> 2 bar 0.05% span/bar	> 100 bar 0.05% span/100bar	> 100 bar 0.1% span/100bar

Supply voltage

Within voltage/load specified limits the total effect is less than 0.001% of URL per volt.

Load

Within load/voltage specified limits the total effect is negligible.

Radio frequency interference

Total effect : less than 0.05% of span from 20 to 1000MHz and for field strengths up to 10V/m when tested with unshielded conduit, with or without meter.

Common mode interference

No effect from 250 Vrms @ 50 Hz, or 50 VDC

Mounting position

Rotations in plane of diaphragm have negligible effect. A tilt from vertical causes a zero shifts of sin a x 0.35kPa (3.5 mbar, 1.4in H_2O) of URL which can be corrected with the zero adjustment. No span effect.

Stability

±0.10% of URL over a thirty-six-month period

Vibration effect

±0.10% of URL (according to IEC 61298–3)

10.5 Physical Specification

(Refer to ordering information sheets for variant availability related tospecific model or versions code)

10.5.1 Materials

Process isolating diaphragms (*) [1)]

AISI 316 L ss ; Hastelloy C276™ ; Monel 400™; Tantalum.

Process flanges, adapters, plugs and drain/vent valves (*)

AISI 316 L ss [1)]; Hastelloy C276™ [1)]; Monel 400™ [1)], Kynar (PVDF)

Sensor fill fluid

Silicone oil; inert fill (Carbon Fluoride).

Mounting bracket

AISI 316 L ss.

Gaskets (*)

Viton™ (FPM, green)[1)]; Perbunan (NBR, black); (EPDM, black)[1)];

PTFE (white; for sensors C, F, L, N, R) or FEP coated Viton™ (for sensor A)[1)]

---

* wettet parts of the transmitter

[1)] in compliance with NACE MRO175 Class II

Sensor housing

AISI 316 L ss.

Bolts and nuts

Stainless steel bolts and nuts Class A4–70 per ISO 3506, in compliance with NACE MR0175 Class II.

Electronic housing and covers

Barrel version

- Low-copper content aluminium alloy with baked epoxy finish
- AISI 316 L ss.

DIN version

- Low-copper content aluminium alloy with baked epoxy finish.

Covers O-ring

Viton™

Protective Varnish

epoxy resin, grey-white; RAL 9002

Local zero and span adjustments

Glass filled polycarbonate plastic (removable).

Tagging

AISI 316ss or plastic data plate attached to the electronics housing.

10.5.2 Calibration

Standard: at maximum span, zero based range, ambient temperature and pressure;

Optional: at specified range and ambient conditions.

10.5.3 Optional extras

Mounting brackets

For vertical and horizontal 60mm (2in) pipes or wall mounting.

Supplemental customer tag

AISI 316 ss tag fastened to the transmitter with stainless steel wire for customer's tag data up to a maximum of 30 characters and spaces.

Surge protection (not available with PROFIBUS PA and FF output)

Cleaning procedure for oxygen service

Hydrogen preparation

Test Certificates (test, design, calibration, material traceability)

10.5.4 Process connections

on flanges: 1/4in NPT on process axis selectable with 7/16in–20 UNF fixing threads or DIN 19213 connection with M10 fixing threads for working pressure up to 10MPa, 100bar , 1450psi or M12 fixing threads for greater working pressure up to 41MPa, 410bar, 5945psi

on adapters: 1/2in NPT on process axis

centre distance: 54mm (2.13in) on flange; 51,54 or 57mm (2.01, 2.13 or 2.24in) as per adapters fittings.

10.5.5 Electrical connections

Two 1/2 NPT or M20x1.5 threaded conduit entries, direct on housing.

Special communication connector (on request)

- HART : straight or angle Harting HAN connector and one plug.
- FOUNDATION Fieldbus and PROFIBUS PA: M12x1 or 7/8.

Terminal block

HART version: four terminals for signal/external meter wiring up to 2.5mm^2 (14AWG) and four connection points for test and communication purposes.

Fieldbus versions: two terminals for signal (bus connection) wiring up to 2.5mm^2 (14AWG).

Grounding

Internal and external 4mm2 (12AWG) ground termination points are provided.

10.5.6 Mounting position

Transmitter can be mounted in any position. Electronics housing may be rotated to any position. A positive stop prevents over travel.

Mass (without options)

3.5kg approx (8lb); add 1.5kg (3.4lb) for AISI housing.

Add 650g (1.5lb) for packing.

Hazardous atmospheres

Transmitters of the type of protection "Intrinsically safe EEx ia" according to the directions 94 / 9 / EC (ATEX)

Transmitters with 4...20 mA output signal and HART communication

Marking: II 1/2 GD T 50°C EEx ia IIC T6
II 1/2 GD T 95°C EEx ia IIC T4

EC-Type-Examination Certificate no.:
ZELM 01 ATEX 0064
and 1st + 2nd Supplement

Supply and signal circuit type of protection Intrinsic Safety EEx ib IIB/IIC resp. EEx ia IIB/IIC for connection to supply units with maximum values:

II 1/2 GD T 50°C EEx ia resp. ib IIC T6

II 1/2 GD T 95°C EEx ia resp. ib IIC T4

for Temperature class T4:

U_i = 30 V

I_i = 200 mA

P_i = 0.8 W	for T4 with Ta =	(-40...+85)°C / (-40...+185)°F
P_i = 1.0 W for	T4 with Ta =	(-40...+70)°C / (-40...+185)°F

for Temperature class T6:

P_i = 0.7 W for	T6 with Ta =	(-40...+40)°C / (-40...+104)°F
effective internal capacitance		Ci ≤ 10 nF
effective internal inductance		Li ≈ 0

Fieldbus-transmitters

(PROFIBUS PA / FOUNDATION Fieldbus)

Marking: II 1/2 GD T 50°C EEx ia IIC T6
II 1/2 GD T 95°C EEx ia IIC T4

EC-Type-Examination Certificate no.:

ZELM 01 ATEX 0063
and 1. Supplement

Supply and signal circuit type of protection Intrinsic Safety EEx ib IIB/IIC resp. EEx ia IIB/IIC for connection to FISCO supply units with rectangular or trapezoidal characteristics with maximum values:

II 1/2 GD T 50°C EEx ia resp. ib IIC T6 U_i = 17.5 V

II 1/2 GD T 95°C EEx ia resp. ib IIC T4 I_i = 360 mA

P_i = 2.52 W

II 1/2 GD T 50°C EEx ia resp. ib IIB T6 U_i = 17.5 V

II 1/2 GD T 95°C EEx ia resp. ib IIB T4 I_i = 380 mA

Pi = 5.32 W

resp. for connection to supply unit or barrier with linear characteristics with maximum:

II 1/2 GD T 50°C EEx ia bzw. ib IIC T6 U_i = 24 V

II 1/2 GD T 95°C EEx ia bzw. ib IIC T4 I_i = 250 mA

P_i = 1.2 W

effective internal inductance Li ≤ 10 µH,

effective internal capacitance Ci ≈ 0

Maximum permissible ambient temperatures depending on the temperature class:

T4: -40°C ... +85°C (-40°F ... +185°F)

T5, T6: -40°C ... +40°C (-40°F ... +104°F)

Transmitters of category 3 for the application in "Zone 2" according to the directions 94 / 9 / EC (ATEX)

Transmitters with 4...20 mA output signal and HART communication

Marking: II 3 GD T 50°C EEx nL IIC T6
II 3 GD T 95°C EEx nL IIC T4

EC-Type-Examination Certificate no:

ZELM 01 ATEX 3059
and 1. Supplement

Operating conditions:

Supply and signal circuit (terminals signal + /-):

U ≤ 45 V

I ≤ 22.5 mA

Maximum permissible ambient temperatures depending on the temperature class:

T4: Ta = -40°C ... +85°C (-40°F ... +185°F)

T5, T6 Ta = -40°C ... +40°C (-40°F ... +104°F)

Transmitters of the type of protection "flameproof enclosure EEx d" according to the directions 94 / 9 / EC (ATEX)

Transmitters with 4...20 mA output signal and HART communication and Fieldbus-transmitters (PROFIBUS PA / FOUNDATION Fieldbus

Marking: II 1/2 G EEx d IIC T6

EC-Type-Examination Certificate no: PTB 00 ATEX 1018

Ambient temperature range:-40°C ... +75°C (-40°F ... + 167°F)

Factory Mutual (FM)

Transmitters with 4...20 mA output signal and HART communication

Intrinsically Safe:

Class I; Division 1; Groups A, B, C, D;
Class I; Zone 0; Group IIC; AEx ia IIC

Degree of protection:

NEMA Type 4X (indoor or outdoor)

Maximum permissible ambient temperatures depending on the temperature class:

U_{max} = 30 V, C_i = 10.5 nF, L_i = 10 µH			
Ambient temperature	Temperature class	I_{max}	P_i
-40 ... +85°C (-40 … +185°F)	T4	200 mA	0.80 W
-40 ... +70°C (-40 ... +129°F)			1.00 W
-40 ... +40°C (-40 ... +104°F)	T5	25 mA	0.75 W
	T6		0.50 W

Fieldbus-transmitters (PROFIBUS PA / FOUNDATION Fieldbus)

Intrinsically Safe:

Class I, II, and III Division 1,

Groups A, B, C, D, E, F,G;

Class I, Zone 0, AEx ia Group IIC T6; T4

Non- incendive Class I, II, and III, Division 2,

Groups A, B, C, D, F, G

Transmitters with 4...20 mA output signal and HART communication and Fieldbus-transmitters
(PROFIBUS PA / FOUNDATION Fieldbus

Explosion Proof:

Class I, Division 1, Groups A, B, C, D

Class II/III, Division 1, Groups E, F, G

Degree of protection:

NEMA Type 4X (indoor or outdoor)

Canadian Standard (CSA)

Transmitters with 4...20 mA output signal and HART communication and Fieldbus-transmitters (PROFIBUS PA / FOUNDATION Fieldbus)

Explosion Proof:

Class I, Division 1, Groups B, C, D

Class II/III, Division 1, Groups E, F, G

Degree of protection:

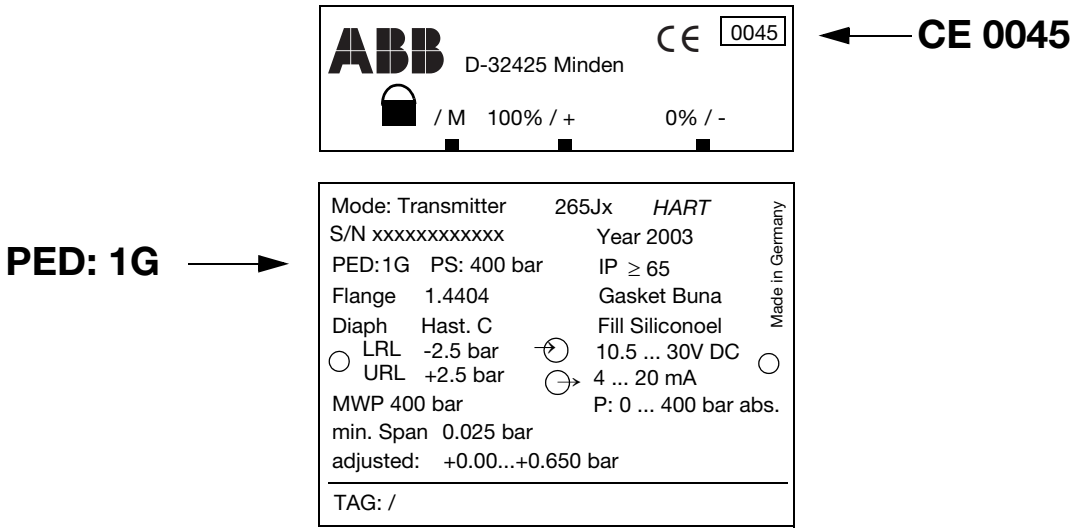
NEMA Type 4X (indoor or outdoor)

11 Compliance with pressure device rules (97/23/EC)

11.1 Devices with PS ≥ 200 bar

Devices with a permissible pressure PS > 200 bar have been subject to a conformity validation by TÜV NORD (0045) acc. to module H. They may be used for liquids of group 1 (PED: 1G).

The data label contents the following specifications:



11.2 Devices with PS < 200 bar

Devices with a permissible pressure PS < 200 bar correspond to article 3 paragraph (3). They have not been subject to a conformity validation. These instruments were designed and manufactured acc. to the proven and practical engineer experiences (SEP).

The CE-label on the data label does not apply for the pressure device rules.

In this case the data label contents the following specifications:
PED: SEP

12 Dimensional Diagrams

12.1 Transmitter with barrel-type amplifier housing

Errors and omissions excepted. All dimensions in inches; (millimeters in brackets).

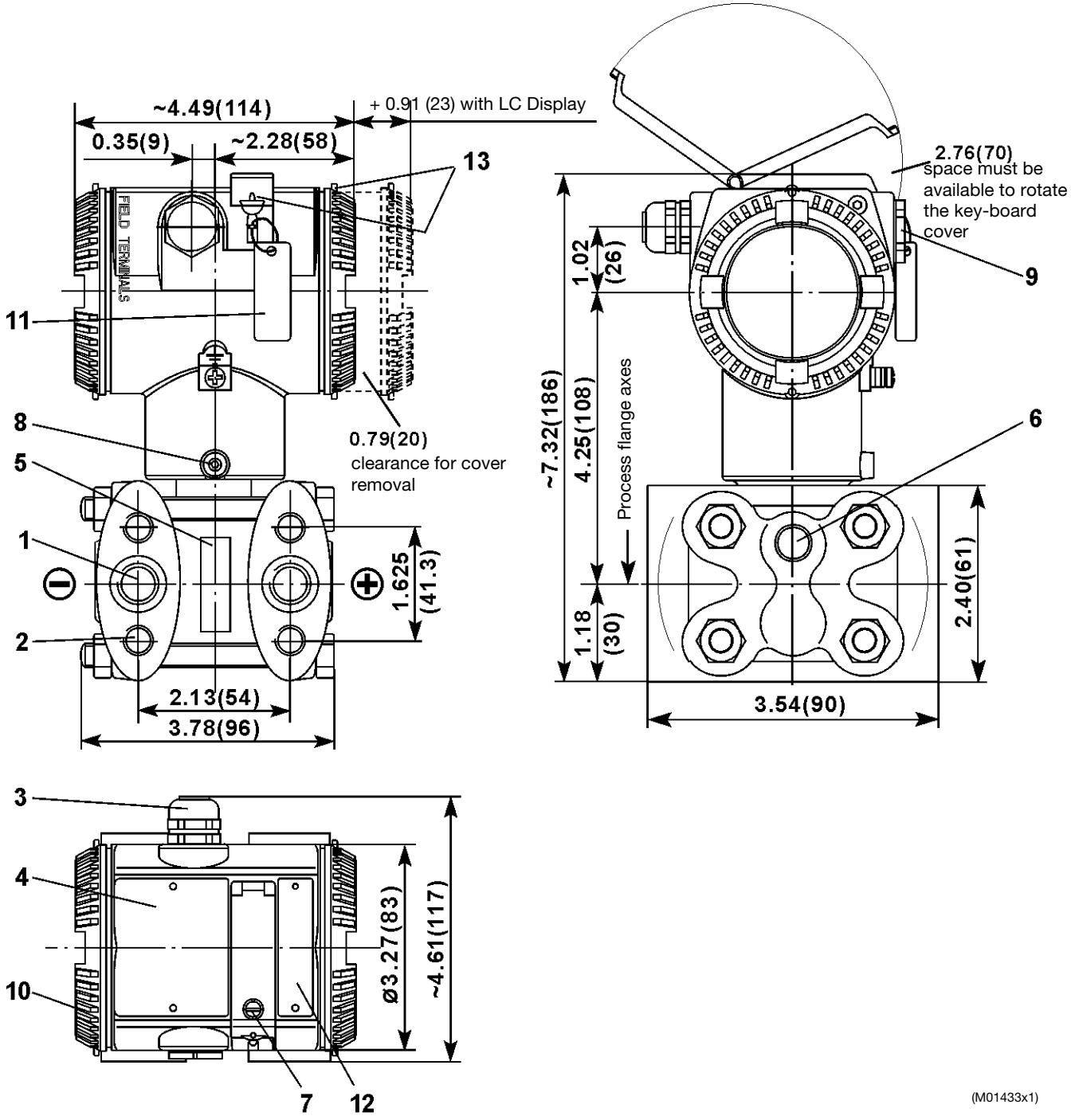


Fig. 17:

1 1/4-18 NPT female thread for process connection or screw plug

2 Thread for fastening screws:
7/16-20 UNF, 16mm deep. Minimum screw-in length: 12mm; however, 15mm for PN 410.
For flange acc. to DIN 19 213:
M10 with SWP 6, 20 and 100 bar
M12 with with SWP 410 bar,
Minimum screw-in length acc. to DIN 19 213.

3 Electrical connection:
M 20x1.5 cable gland or
1/2-14 NPT female threads at both sides or
plug Han 8U (M12x1 with PROFIBUS PA; 7/8“ with FOUNDATION Fieldbus)

4 Type plate

5 Sensor plate

6 Threaded hole 1/4-18 NPT for drain or vent valve

7 Captive screw for key unit protecting flap

8 Housing rotation stop screw

9 Blind plug

10 Enclosure cover

11 Tie-on plate, e.g., for measuring point identification (optional)

12 Plate, also with key legend.

12.2 Transmitter with DIN-type amplifier housing

Errors and omissions excepted. All dimensions in inches; (mm in brackets).

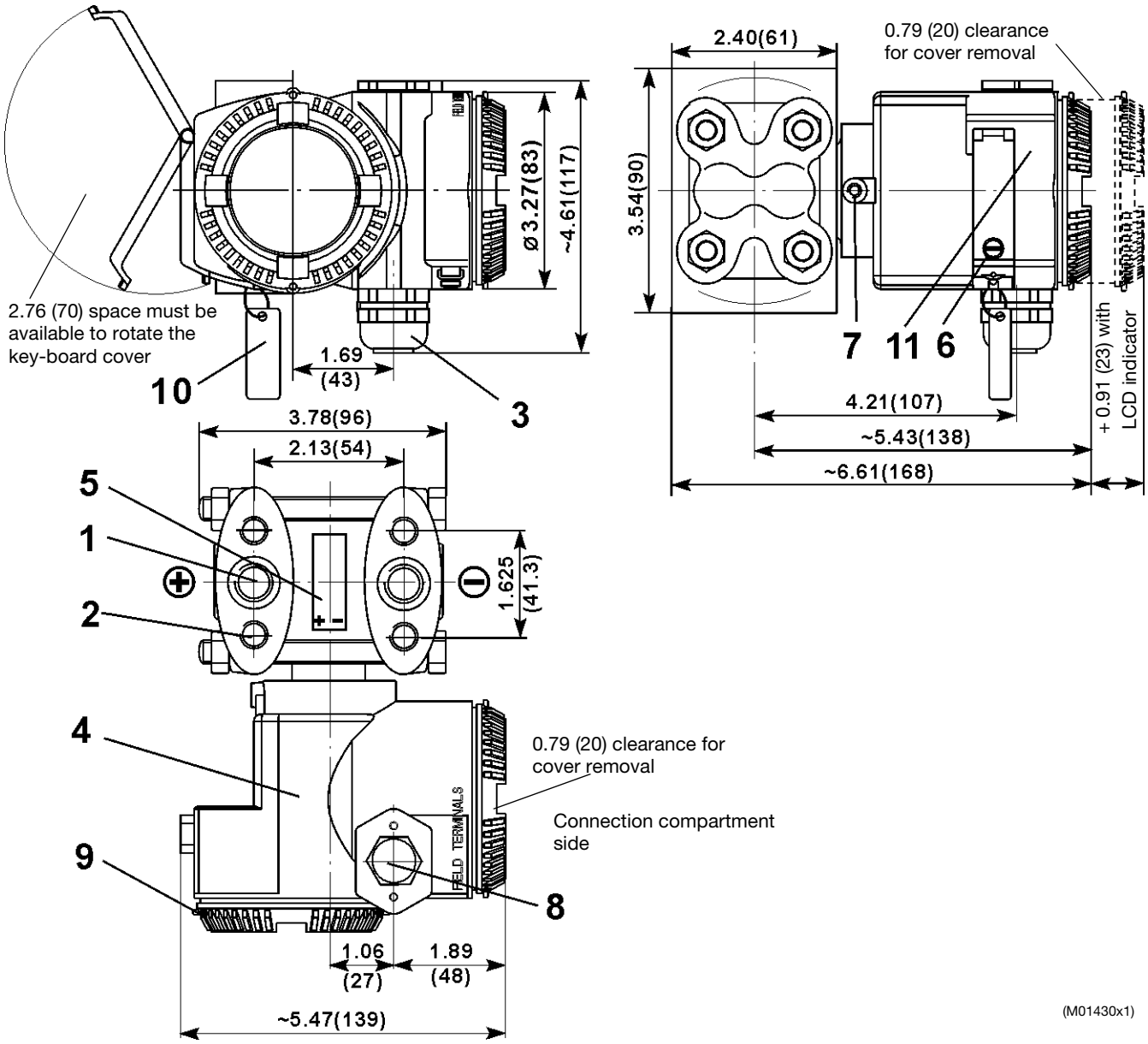


Fig. 18:

1 1/4-18 NPT female thread for process connection or screw plug

2 Thread for fastening screws:
7/16-20 UNF, 16mm deep. Minimum screw-in length:
12mm; however, 15mm for PN 410.
For flange acc. to DIN 19 213:
M10 with with SWP 6, 20 and 100 bar
M12 with SWP 410 bar.
Minimum screw-in length acc. to DIN 19 213.

3 Electrical connection:
M 20x1.5 cable gland or
1/2-14 NPT female threads at both sides or plug Han 8U (M12x1 with PROFIBUS PA; 7/8“ with FOUNDATION Field-bus)

4 Type plate

5 Sensor plate

6 Captive screw for key unit protecting flap

7 Housing rotation stop screw

8 Blind plug

9 Enclosure cover

10 Tie-on plate, e.g. for measuring point identification (optional).

11 Plate, also with key legend

13 Mounting Options

Errors and omissions excepted. All dimensions in mm.

13.1 With bracket for barrel type electronic housing.

(option)

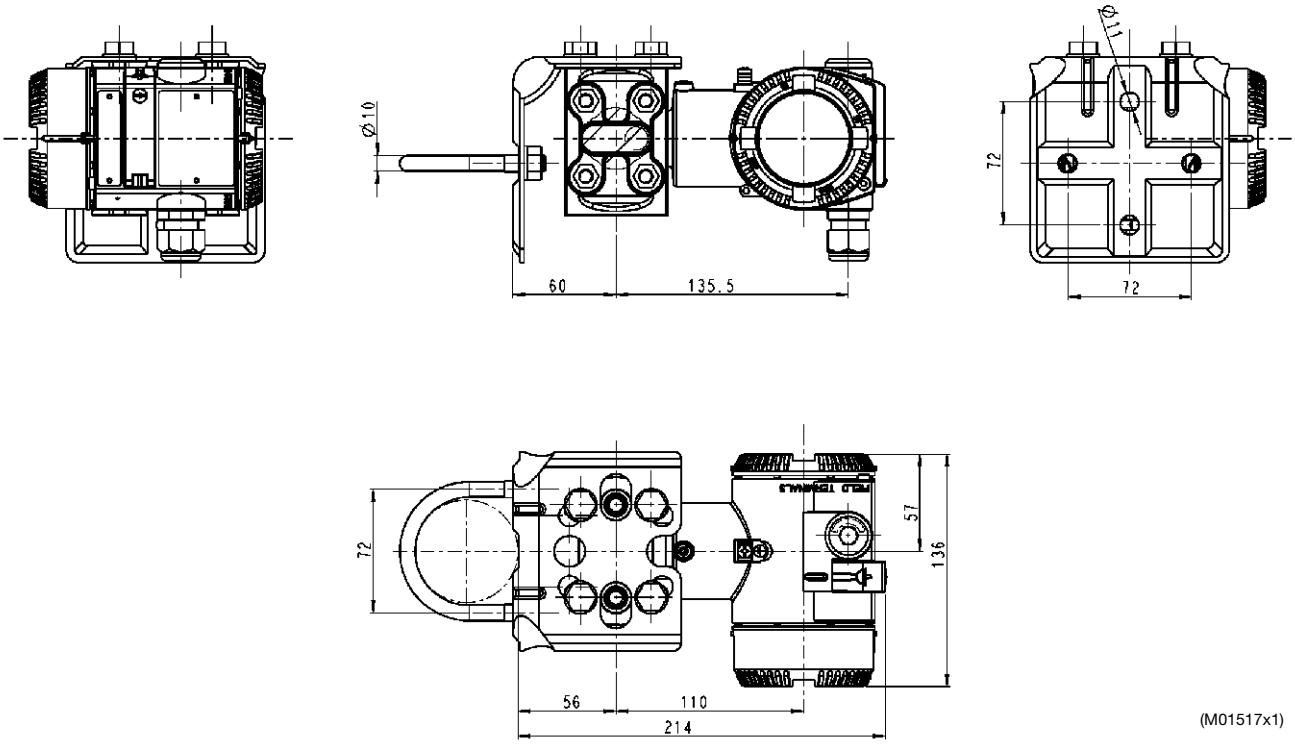


Fig. 19:

Vertical pipe mounting

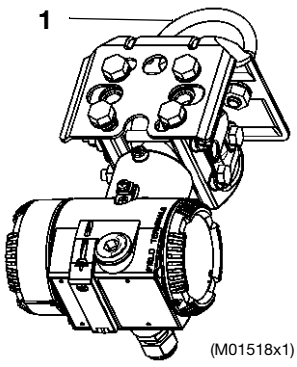


Fig. 20:

1 U-bolt for pipe mounting. Pipe: 2“ (int. diam.) Permissible pipe diam. 53...64 mm

Horizontal pipe mounting

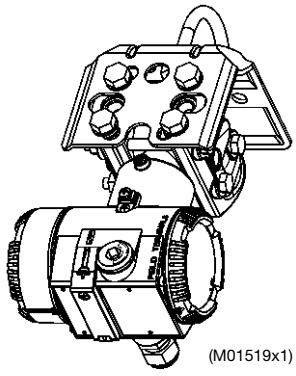


Fig. 21:

Vertical pipe mounting and transmitter above the mounting bracket

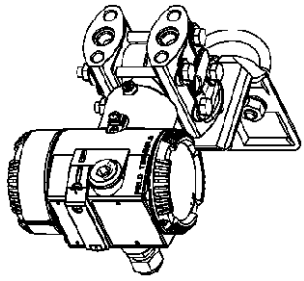


Fig. 22:

Horizontal pipe mounting and transmitter above the mounting bracket

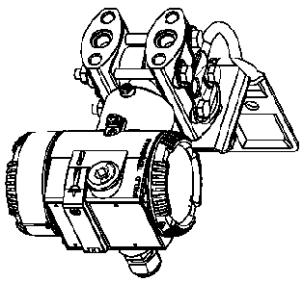


Fig. 23:

14 EC Declaration of Conformity

EG-KONFORMITÄTSERKLÄRUNG

EC DECLARATION OF CONFORMITY
ATTESTATION DE CONFORMITE C.E.

Hersteller:	**ABB Automation Products GmbH**
Manufacturer / Fabricant:	**Minden**
Anschrift:	**Schillerstraße 72**
Address / Adresse:	**D-32425 Minden**
Produktbezeichnung:	**Druck-Messumformer - 263/265A, 263/265D, 263/265G, 263/265J, 267/269C**
Product name:	*Pressure Transmitter – 263/265A, 263/265D, 263/265G, 263/265J, 267/269C*
Désignation du produit:	*Transmetteur de Pression – 263/265A, 263/265D, 263/265G, 263/265J, 267/269C*

Das Produkt stimmt mit den Vorschriften folgender Europäischer Richtlinien überein:
This product meets the requirements of the following European directives:
Les produits répondent aux exigences des Directives C.E. suivantes:

89/336/EWG	**EMV-Richtlinie ***	
89/336/EEC	*Electromagnetic Compatibility Directive **	
89/336/C.E.E.	*Directives concernant la compatibilité électromagnétique **	
73/23/EWG	**Niederspannungsrichtlinie ***	
73/23/EEC	*EC-Low-Voltage Directive **	
73/23/C.E.E.	*Directives concernant la basse tension **	
97/23/EG	**Druckgeräterichtlinie, Kategorie III Modul H**	**(für Druck PS > 200bar)**
97/23/EEC	*Pressure Equipment Directive, Category III Module H*	*(for pressure PS > 200 bar)*
97/23/C.E.E.	*Directive Equipements sous Pression, Catégorie III Module H*	*(pour pression PS > 200 bar)*

Druck/*Pressure/Pression* **PS ≤ 200bar: SEP**

CE 0045

Für Geräte in Ex-Ausführung gemäß Kennzeichnung auf Typschild gilt zusätzlich:
For products in Ex design according to identification on nameplate the following is additionally applicable:
Pour des produits en exécution Ex selon marque sur plaque signalétique le suivant est aussi applicable:

94/9/EG	**ATEX-Richtlinie**
94/9/EEC	*ATEX Directive*
94/9/C.E.E.	*ATEX Directive*

*** einschließlich Änderungen und deutscher Umsetzung durch das EMVG und Gerätesicherheitsgesetz**
* *including alterations and German realization by the EMC law and the instruments safety law*
* *y compris les modifications et la réalisation allemande par la loi cocernant la compatibilité électromagnétique et la sécurité d'appareils*

Die Übereinstimmung mit den Vorschriften dieser Richtlinien wird nachgewiesen durch die vollständige Einhaltung folgender Normen:
Conformity with the requirements of these Directives is proven by complete adherence to the following standards:
La conformité avec les exigences de ces directives est prouvée par l'observation complète des normes suivantes:

EN 50 081-1 / EN 50 082-2 / EN 61 010-1
Ex: EN 50 014 / EN 50 284 / EN 50 018 / EN 50 020

24.06.2003		
Datum	**Dr. Wolfgang Scholz**	**Bernhard Kruse**
Date	**Leiter R&D**	**Leiter Qualitätsmanagement**
Date	Head of R&D	Head of Quality Management
	Responsable R&D	Responsible Assurance de la Qualité

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