Content

Safety ..................................................................................... 3
Correct usage ....................................................................... 3
Transport and Storage ....................................................... 3
General description ............................................................ 3
Principle of operation and construction ............................... 3
Mounting ............................................................................... 4
General ................................................................. 4
Transmitter .......................................................... 4
Measuring piping .......................................................... 4
Electrical connection .......................................................... 5
Mounting of the socket connector ........................................ 5
Protective conductor / grounding ......................................... 5
Transmitter with integrated Surge Protector ....................... 5
Connecting cable .......................................................... 6
PROFIBUS-PA transmitters .................................................. 6
Explosion protection ............................................................. 6
Commissioning ............................................................... 7
Transmitters with 4...20 mA output signal ............................ 7
Write protection .............................................................. 7
Oblique sensor/ zero correction ........................................... 7
Assembly / disassembly of push button unit ........................ 8
Mount LCD indicator ............................................................ 8
Operation ............................................................................... 8
Operation with "local keys" ................................................... 8
Calibration ............................................................................. 8
Operation with "local keys" with LCD indicator ..................... 9
Measured value display ...................................................... 10
Operation with PC / laptop or handheld terminal ............... 12
Configuration ...................................................................... 12
Operation via graphical user interface (DTM) ..................... 13
Maintenance ....................................................................... 14
Dismantling / fitting the process flanges ............................ 14
Repairs ................................................................................. 14
Technical Data ..................................................................... 15
Operative limits ................................................................. 15
Environmental limits .......................................................... 16
Electrical Characteristics and Options ............................... 16
Performance specifications ................................................ 17
Physical Specification ......................................................... 18
Compliance with pressure device rules (97/23/EC) .2 0
Devices with PS ≥ 200 bar .................................................. 20
Devices with PS < 200 bar .................................................. 20
Dimensional Diagrams ..................................................... 21
Transmitter with barrel-type amplifier housing ................... 21
Transmitter with DIN-type amplifier housing ...................... 22
Mounting Options ............................................................. 23
With bracket for barrel type electronic housing .................... 23
EC Declaration of Conformity ........................................ 24

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 100 bar. The transmitter can be overloaded on one side up to working pressure stages 6 bar (sensor code A), 20 bar, 100 bar.

The transmitter has a modular design and consists of the pressure sensor module, which is only exposed to the pressure at the pressure sensor and a silicon differential pressure sensor. The absolute pressure sensor, 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.

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 hand-held 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.
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.

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 mm².

screw terminals for 0.5 ... 2.5 mm² wires

output signal / power supply

earting potential / equalizing terminal

test sockets for
4 ... 20 mA
(not with fieldbus transmitters)

cable entry (e.g. M20 x 1.5)

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.

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 mm²) 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.
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:

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

where:
- \(L\) = line length in m
- \(R\) = joint resistance [Ohm]
- \(C\) = line capacitance in pF
- \(C_f\) = 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 Certificate 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 intrinsically safe circuit which is connected to the housing for potential compensation.

5.6.2 Transmitters of protection class “Intrinsically safe (EEx i)”

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 \(U_0\), \(I_0\) and \(P_0\) 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

(category 3 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 Ex 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 13.1 and/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 opera-

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 ° / 90 °.

For deactivation the switch has to be pushed down a little and turned counterclockwise by 90 ° / 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 - disassembly / 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

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

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.

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.

<table>
<thead>
<tr>
<th>Display for ...</th>
<th>Character</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transfer function</td>
<td>( L, \sqrt{ } ) or /</td>
<td>Always one of these characters appears.</td>
</tr>
<tr>
<td>Write protection</td>
<td>( \square )</td>
<td>Only if write protection has been set.</td>
</tr>
<tr>
<td>Cyclic communica-</td>
<td>. . . .</td>
<td>Only in case of</td>
</tr>
<tr>
<td>Status available</td>
<td>( \square )</td>
<td>Only if a status is available.</td>
</tr>
<tr>
<td>Code of measured</td>
<td>( 1 \ldots 9 )</td>
<td>see menu Display</td>
</tr>
<tr>
<td>Transmitter is</td>
<td>( \square )</td>
<td>This character overwrites</td>
</tr>
<tr>
<td>busy</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Tab. 1: Legend

7.4.3 Display of the percent value

Fig. 13: Control elements (option)

<table>
<thead>
<tr>
<th>Display on LCD indicator</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1(^{st}) line</td>
<td>Percent value, limits: -25% to 125%, 2 decimal places</td>
</tr>
<tr>
<td>2(^{nd}) line</td>
<td>1(^{st}) position: Transfer function (Table 1)</td>
</tr>
<tr>
<td></td>
<td>2(^{nd}) position: Write protection (Table 1)</td>
</tr>
<tr>
<td></td>
<td>7(^{th}) position: %</td>
</tr>
<tr>
<td>Bar chart</td>
<td>2% steps - from -2% to +100%, no hysteresis</td>
</tr>
</tbody>
</table>

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**

- **Start with „mode key“ (M)**
  - **EXIT**
  - **VIEW** (temporary presentation of display values)
    - Output signal in physical unit (265J: current measured value of the differential pressure or the derived measured value such as flow / level. In each case with user specific unit) corresponds to „OUT“ variable at PROFIBUS-PA.
  - Percent value of the output signal
  - Current (not for fieldbus transmitters)
  - Static pressure
  - Differential pressure
  - Sensor temperature

- **Damping**
  - **ALARM CURRENT** (not for fieldbus transmitters)
    - HIGH ALARM
    - LOW ALARM
    - LAST VALUE

- **DISPLAY**
  - Output signal in physical unit (265J: current measured value of the differential pressure or the derived measured value such as flow / level. In each case with user specific unit) corresponds to „OUT“ variable at PROFIBUS-PA.
  - Percent value of the output signal
  - Current (not for fieldbus transmitters)

- **UNIT**
  - p/dp
    - Pa
    - GPa
    - MPa
    - KPa
    - mPa
    - uPa
    - HPa
    - bar
    - mbar
    - Torr
    - Atm
    - psi
    - g/cm²
    - kg/cm²
    - in H₂O
    - mm H₂O
    - ft H₂O
    - in HG
    - mm HG
  - **OUT**
    - „Selection list“ with units (for the output variable; e. g. kg/h; m)

- **FUNCTION**
  - Linear
  - Square root
  - Custom (activation / deactivation of freely programmable characteristic)

- **ADDRESS** (only for fieldbus transmitters)

---

1 = code of the display value
2nd line left

---
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 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: 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: Lower 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.

7.6.3 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: Lower 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.

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.
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 \( M_F = 10 \text{ Nm} \) (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 \( \alpha = 180^\circ \), 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 \( M_A = 10 \text{ Nm} \) (1.0 kpm).
8. Check for leaks. Apply pressure with max. 1.3 x SWP simultaneously to both sides of the sensor.
9. Check the lower range value and the upper range value in accordance with Section 7 “Operation”.

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

Measuring ranges

<table>
<thead>
<tr>
<th>Sensor Code</th>
<th>Upper Range Limit (URL)</th>
<th>Lower Range Limit (LRL)</th>
<th>Minimum Span</th>
<th>SWP [bar]</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1.0 kPa</td>
<td>0.05 kPa</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>6 kPa</td>
<td>0.2 kPa</td>
<td>160...410</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>40 kPa</td>
<td>0.4 kPa</td>
<td>160...410</td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>250 kPa</td>
<td>2.5 kPa</td>
<td>160...410</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>2000 kPa</td>
<td>20 kPa</td>
<td>160...410</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>10000 kPa</td>
<td>100 kPa</td>
<td>160...410</td>
<td></td>
</tr>
</tbody>
</table>

Absolute pressure sensors

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

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 (-4°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.

Sensor Code providing the turndown value
It is recommended to select the transmitter sensor code providing the turndown value as lowest as possible to optimize performance characteristics.

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 flouride
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 flouride
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
10.3.2 Optional indicators

A minimum of 250 Ohm is required for HART communication.

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

Output interface
PROFIBUS PA communication according to Proibus 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 current or
- output current in mA or
- free process variable
Diagnostic message, alarms, measuring range infringements and changes in the configuration are also displayed.

Transmitter failure mode
Permanent self-diagnostics; 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): 11.7 mA
fault current limiting: 17.3 mA max.

Output signal
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 oustscale 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)

<table>
<thead>
<tr>
<th>Measuring range</th>
<th>Sensor A</th>
<th>Sensor C, F, L, N</th>
<th>Sensor R</th>
</tr>
</thead>
<tbody>
<tr>
<td>on zero</td>
<td>up to 2 bar, 0.05% URL</td>
<td>up to 100 bar, 0.05% URL/100bar</td>
<td>up to 100 bar, 0.1% URL/100bar</td>
</tr>
<tr>
<td>&gt; 2 bar</td>
<td>0.05% URL/bar</td>
<td>&gt; 100 bar, 0.05% URL/100bar</td>
<td>&gt; 100 bar, 0.1% URL/100bar</td>
</tr>
<tr>
<td>on span</td>
<td>up to 2 bar, 0.05% span</td>
<td>up to 100 bar, 0.05% span/100bar</td>
<td>up to 100 bar, 0.1% span/100bar</td>
</tr>
<tr>
<td>&gt; 2 bar</td>
<td>0.05% span/bar</td>
<td>&gt; 100 bar, 0.05% span/100bar</td>
<td>&gt; 100 bar, 0.1% span/100bar</td>
</tr>
</tbody>
</table>

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 negligi-

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 x 0.35kPa (3.5 mbar, 1.4in H2O) 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 to specific model or version 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 (* 1)
AISI 316 L ss ; Hastelloy C276™ ; Monel 400™, Kynar (PVDF)

Sensor fill fluid
Silicone oil; inert fill (Carbon Fluoride).

Mounting bracket
AISI 316 L ss.

Gaskets (* 1)
Viton™ (FPM, green); Perbunan (NBR, black); (EPDM, black); PTFE (white; for sensors C, F, L, N, R) or FEP coated Viton™ (for sensor A) 1)

* wetted 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 2.5mm² (14AWG) and four connection points for test and communication purposes.
Fieldbus versions: two terminals for signal (bus connection) wiring up to 2.5mm² (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 EEEx 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 EEEx ia IIC T6
II 1/2 GD T 95°C EEEx 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 EEEx ib IIB/IIC resp. EEEx ia IIB/IIC for connection to supply units with maximum values:
II 1/2 GD T 50°C EEEx ia resp. ib IIC T6
II 1/2 GD T 95°C EEEx ia resp. ib IIC T4
for Temperature class T4:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>U_i</td>
<td>30 V</td>
</tr>
<tr>
<td>I_i</td>
<td>200 mA</td>
</tr>
<tr>
<td>P_1</td>
<td>0.8 W</td>
</tr>
<tr>
<td>T_1</td>
<td>1.0 W</td>
</tr>
<tr>
<td>P_2</td>
<td>0.7 W</td>
</tr>
</tbody>
</table>

for Temperature class T6:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>U_i</td>
<td>30 V</td>
</tr>
<tr>
<td>I_i</td>
<td>200 mA</td>
</tr>
<tr>
<td>P_1</td>
<td>0.8 W</td>
</tr>
<tr>
<td>T_1</td>
<td>1.0 W</td>
</tr>
<tr>
<td>P_2</td>
<td>0.7 W</td>
</tr>
</tbody>
</table>

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 $U_i = 17.5 \text{ V}$
- II 1/2 GD T 95°C EEx ia resp. ib IIC T4 $I_i = 360 \text{ mA}$ $P_i = 2.52 \text{ W}$
- II 1/2 GD T 50°C EEx ia resp. ib IIB T6 $U_i = 17.5 \text{ V}$
- II 1/2 GD T 95°C EEx ia resp. ib IIB T4 $I_i = 380 \text{ mA}$ $P_i = 5.32 \text{ W}$

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 $U_i = 24 \text{ V}$
- II 1/2 GD T 95°C EEx ia bzw. ib IIC T4 $I_i = 250 \text{ mA}$ $P_i = 1.2 \text{ W}$

effective internal inductance $L_i \leq 10 \mu\text{H}$
effective internal capacitance $C_i \approx 0$

Maximum permissible ambient temperatures depending on the temperature class:
- T4: $-40°C ... +85°C (-40°F ... +185°F) 200 \text{ mA} 0.80 \text{ W}$
- T5, T6: $-40°C ... +40°C (-40°F ... +104°F) 25 \text{ mA} 0.75 \text{ W}$

<table>
<thead>
<tr>
<th>Ambient temperature</th>
<th>Temperature class</th>
<th>$I_{max}$</th>
<th>$P_i$</th>
</tr>
</thead>
<tbody>
<tr>
<td>-40°C ... +85°C (-40°F ... +185°F)</td>
<td>T4</td>
<td>200 mA</td>
<td>0.80 W</td>
</tr>
<tr>
<td>-40°C ... +70°C (-40°F ... +129°F)</td>
<td></td>
<td></td>
<td>1.00 W</td>
</tr>
<tr>
<td>-40°C ... +40°C (-40°F ... +104°F)</td>
<td>T5</td>
<td>25 mA</td>
<td>0.75 W</td>
</tr>
<tr>
<td></td>
<td>T6</td>
<td></td>
<td>0.50 W</td>
</tr>
</tbody>
</table>

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 + /-):
- $U \leq 45 \text{ V}$
- $I \leq 22.5 \text{ mA}$

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 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, 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 contains the following specifications:

```
ABB
D-32425 Minden

PED: 1G

S/N xxxxxxxxxxx
PED: 1G PS: 400 bar
Flange 1.4404 Gasket Buna
Diaph Hast. C Fill Siliconel
LRL -2.5 bar 10.5 ... 30V DC
URL +2.5 bar 4 ... 20 mA
MWP 400 bar
min. Span 0.025 bar
adjusted: +0.00...+0.650 bar
PED: 1G
```

### 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 contains the following specifications:

```
PED: SEP
```

---

*Note: The image contains a table with technical specifications that are not transcribed here.*
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 100 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

13.1 With bracket for barrel type electronic housing.

(option)

Errors and omissions excepted. All dimensions in mm.

Fig. 19:
Vertical pipe mounting  Horizontal pipe mounting  Vertical pipe mounting and transmitter above the mounting bracket  Horizontal pipe mounting and transmitter above the mounting bracket

Fig. 20:
1 U-bolt for pipe mounting.
Pipe: 2" (int. diam.)
Permissible pipe diam. 53...64 mm

Fig. 21:

Fig. 22:

Fig. 23:
14 EC Declaration of Conformity

ABB

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

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)

Druck/Pressure/Pression PS ≤ 200bar: SEP

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 EMV law and the instruments safety law
* y compris les modifiction et la réalisation allemande par la loi concernant 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
Date

Dr. Wolfgang Scholz
Leiter R&D
Head of R&D
Responsible R&D

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Responsible Assurance de la Qualité

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USt-IdNr.: DE 115 300 097

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Joachim Braun
Erik Huggen
Dr. Peter Timmis

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