FISCHER MESS- UND REGELTECHNIK

Operating instructions

DE05 | Differential pressure transducer

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1 Safety notes

1.1 General

This operating manual contains instructions fundamental to the installation, operation and maintenance of the device that must be observed unconditionally. It must be read by the assembler, operator and the specialized personnel in charge of the instrument before it is installed and put into operation. This operating manual must always be kept in an easily accessible place at the place of installation.

The subsequent sections on general safety instructions (1.2 - 1.7) as well as the following special instructions in particular about assembly, commissioning and maintenance (2 to 10) contain important safety instructions, the non-observance of which can endanger persons, animals, and physical objects.

1.2 Personnel Qualification

Staff assigned to assembly, operating, maintenance and inspection tasks shall be adequately qualified for this work and must be sufficiently instructed and trained to meet the requirements of assembly, operating, maintenance and inspection work.

1.3 Risks due to Non-Observance of Safety Instructions

Non-observance of these safety instructions, the intended use of the device or the limit values given in the technical specifications can be hazardous or cause harm to persons, the environment or the plant itself. Fischer Mess- und Regeltechnik GmbH will not be liable for damage claims if this should happen.

1.4 Safety Instructions for the Operating Company and the Operator

The safety instructions governing correct operation of the instrument must be observed. The operating company must make them available to the installation, maintenance, inspection and operating personnel. Dangers arising from electrical components, energy discharged by the medium, escaping medium and incorrect installation of the instrument must be eliminated. The particulars can be found in the respective regulations such as DIN EN, explosion hazard, accident prevention regulations and also in the industry guidelines issued by the DVWG, GL, etc. and the VDE as well as the local EVUs.

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1.5 Unauthorised Modification

Modifications of or other technical alterations to the instrument by the customer are not permitted. This also applies to the installation of spare parts that are not explicitly described in the Operating Instructions. Any modifications / alterations required must be carried out by Fischer Mess- und Regeltechnik GmbH only.

1.6 Inadmissible Modes of Operation

The operational safety of this instrument can only be guaranteed if it is used as intended. The instrument model must be suitable for the medium used in the system. The limit values given in the technical data may not be exceeded.

1.7 Safe working practices for maintenance and installation work

The safety instructions given in this operating manual, any nationally applicable regulations on accident prevention and any of the operating company's internal work, operating and safety guidelines must be observed.

The operating company is responsible for ensuring that all required maintenance, inspection and installation work is carried out by qualified specialized personnel.

1.8 Pictogram explanation

WARNING!
… indicates a potentially dangerous situation, non-observance of which could endanger persons, animals, the environment or objects.

2 Application purpose

The differential pressure transducer DE 05 may only be used for the use stated by the manufacturer in the data sheet or the operating manual.

It is designed for measuring the process variables differential pressure, over-pressure and under-pressure. The variant with the root extracted output signal is used for flow rate measurements in line with the differential pressure procedure.

The measuring ranges are scaled from 100 mbar to 10 bar based on DIN EN 837. The rated pressure level PN 250 applies regardless of the measuring range. The design ensures that the overload security is achieved up to the full static rated pressure.

Gases, vapours and fluids can be measured. Parts that come into contact with the measuring media are made of the corrosion-proof chrome-nickel steel 1.4571.

3 Description of the product and functional description

3.1 Assembly

The differential pressure transducer DE05 has a modular design. Together, the measuring cell and pressure caps form the differential pressure measuring mechanism. The electronics comprising the power supply, amplifier and control PCBs are located in a housing with protection class IP65. The differential pressure measuring cell and electronics housing are screwed to each other.

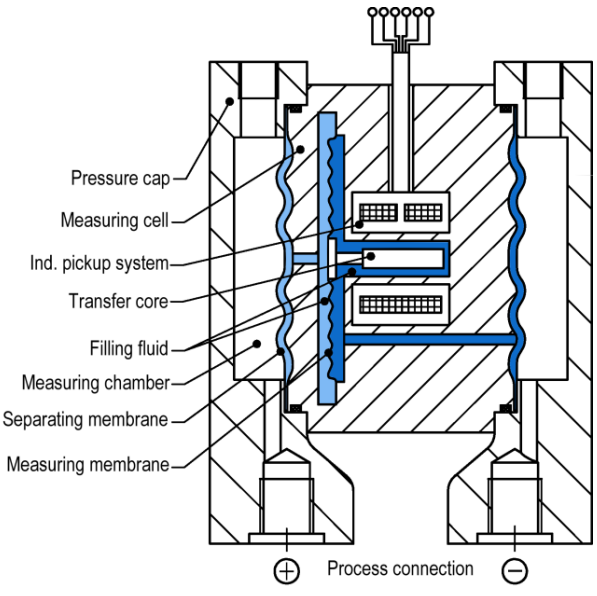
3.2 Measuring cell

The main elements of the measuring cell are the metallic measuring membrane and the inductive pickup system. The transfer core of the inductive pickup system is attached on the centre of the measuring membrane. It is dipped into a pressure-proof sleeve that is welded to the housing of the measuring cell. The coils of the inductive pickup system, which together form the differential transformer, are placed on the outside of the sleeve.

The structure of the measuring cell is the same for all measuring ranges. Depending on the measuring range, the material thicknesses of the measuring membranes vary. The separating membrane closes the measuring cell to the outside and the inside is filled with a filling fluid.

Optimum overload protection is achieved thanks to the fact that the separating membrane and the wall of the measuring cell have the same contours. If the pressure exceeds the respective measuring range, the separating membrane of the overloaded side leans against the wall of the measuring cell to protect itself from damage.

Fig. 1 Differential pressure measuring unit



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3.3 Pressure caps

The pressure caps and the separating membranes form the measuring chambers into which the measuring medium is supplied. They are screwed tightly to the measuring cell with 4 expansion bolts over 2 O-ring seals.

The pressure caps also have standardised flanges for mounting valve blocks and inner threads for the direct connection of process lines.

3.4 Mode of action

If the pressure conditions are the same on both sides of the measuring cell, the separating membranes, measuring membranes and inductive pickup system are in idle. If there is a differential pressure ΔP between the (+) and (-) side, the separating membranes move and the measuring membranes also leave their idle position due to the hydraulic coupling via the filling fluid. The measuring membrane compensates the pressure force.

Due to the changed position of the measuring membrane with the differential transformer core, a differential pressure-proportional voltage change takes place in the inductive pickup system. The downstream electronics convert the voltage change into a direct current signal.

3.5 Power supply board

The power supply board generates the internal voltages required to operate the main board or control board. A switching power supply generates three isolated DC voltages from the supply voltage (approx. +22V, approx. +9.5V and approx. -9.5V). The control electronics stabilise the output voltages and compensate the fluctuations of the incoming voltage.

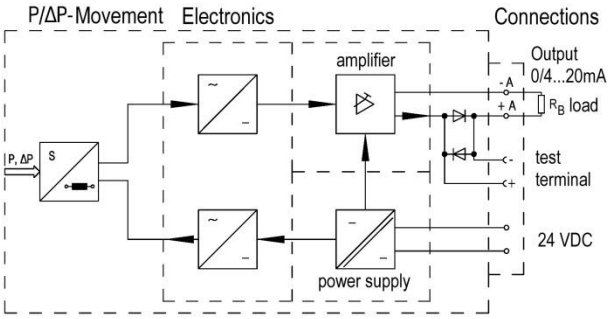
3.6 Main board

The most important components on the main board are the oscillator, rectifier, amplifier and output stage for the 0/4…20mA current output. The oscillator activates the primary coil of the inductive pickup system with a fixed frequency AC current. A voltage that is proportional to the measuring pressure is induced in the secondary side of the displacement transducer. A rectifier converts this AC current into a DC measuring signal that is sent to the characteristic curve correction on the control board. An optional root extraction component influences the characteristic line for flow-rate measurements. An output stage generates a current output signal (0…20mA or 4…20mA, depending on the option).

3.7 Operation board

All setting devices that the user requires to operate the transmitter are located together on the control board. The measuring start (0…100% of the measuring range) and the measuring span (splitting up to 5:1) of the characteristic curve can be influenced via the zero-point and span correction. A switch inverts the signal for a falling characteristic curve. Optionally, an attenuation module can be configured. A test socket allows the signal to be controlled without interrupting the output circuit.

Fig. 2 Block diagram of the electronics



4 Mounting and Installation

4.1 Generalities

Before mounting the differential pressure transducer, check whether the device model satisfies the measuring and safety requirements of the measuring point, e.g. in terms of materials, measuring range, temperature and operating voltage. Also, the relevant guidelines, ordinances, standards and the accident prevention regulations need to be observed!

General information about the correct assembly of differential pressure transducers and measuring lines is provided below. The measuring precision largely depends on the correct installation of the differential pressure transducer and the associated measuring lines. The measuring setup should be protected as far as possible from critical ambient conditions, such as large temperature changes, vibration and shock. If severe ambient conditions cannot be avoided for constructional, measuring-specific or any other reasons, this can affect the measuring quality! (See Chapter 11 "Technical data").

If there are differential pressure sensors with capillary tubes attached to the pressure transducer, the additional operating manual needs to be observed!

4.2 Differential pressure transducer

The differential pressure transducer can be directly flanged to the shutoff fitting. Optionally, there is an attachment bracket for wall and pipe assembly (2" pipe) available as an accessory. The differential pressure transducer must be mounted so that the caps are arranged vertically to avoid displacement of the zero-point. If the differential pressure transducer was installed in a slanted position, the filling fluid and its hydrostatic pressure would press against the measuring membrane thereby displacing the zero-point! This would necessitate a correction of the zero-point.

The inner threads G ¼ in the oval flanges are used for the direct connection of the measuring lines. Suitable pipe screw connections can be screwed into these threaded boreholes. The oval flanges comply with DIN EN 61518

4.3 Measuring lines

The following points should be observed to ensure correct installation:

- Install the measuring lines along the shortest possible path and avoid severe bending.
- Lay the measuring lines so that no deposits can collect inside and so that the gas bubbles/condensate flow back into the process (increase >7.5 %).
- The measuring lines should be blown out or rinsed out with compressed air or even better with the measuring media before they are connected to the measuring unit

  ⚠ Do not blow out via the measuring unit!
- Completely vent the measuring lines with fluid measuring media.
- In the case of fluid/steam-like measuring media, the filling fluid must be at the same level in both measuring lines. If a separating fluid is used, both measuring lines need to be filled to the same level.
- If possible, keep both measuring lines at the same temperature.
- Check that the measuring lines are connected correctly, ((+) and (-) pressure side on the measuring unit, seals, etc.)
- When laying the differential pressure line outdoors, take suitable frost protection measures.

Fig. 3 Mounted directly to the shutoff fittings

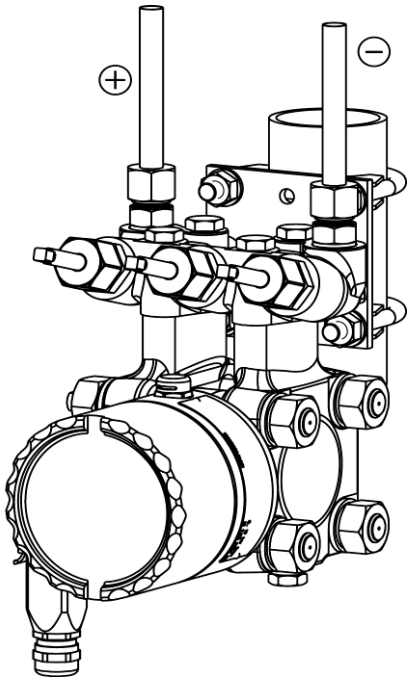
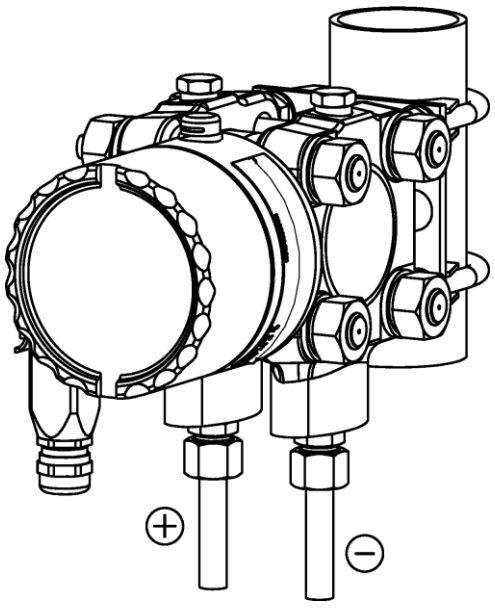


Fig. 4 Mounting the pipe using the attachment bracket



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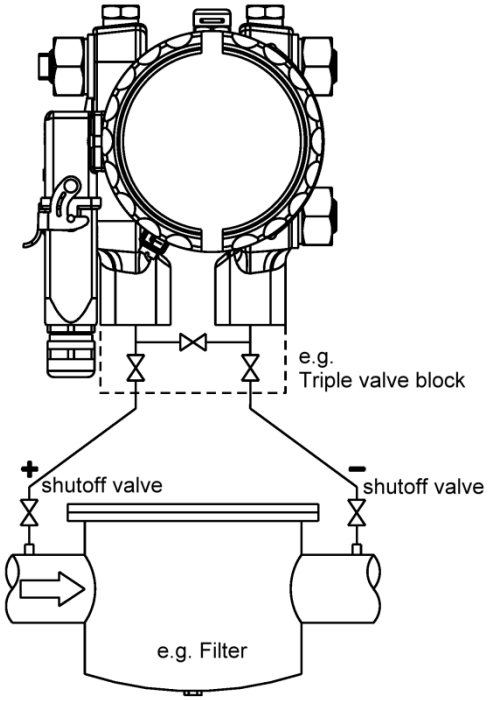
4.4 Differential pressure measurement

4.4.1 Gases and vapours

- The DE05 should be mounted above the measuring point so that the condensation can flow into the process line.
- For simple processing without interrupting the process, use the triple valve block.
- Install the differential pressure lines at an even gradient of at least 7.5 %.

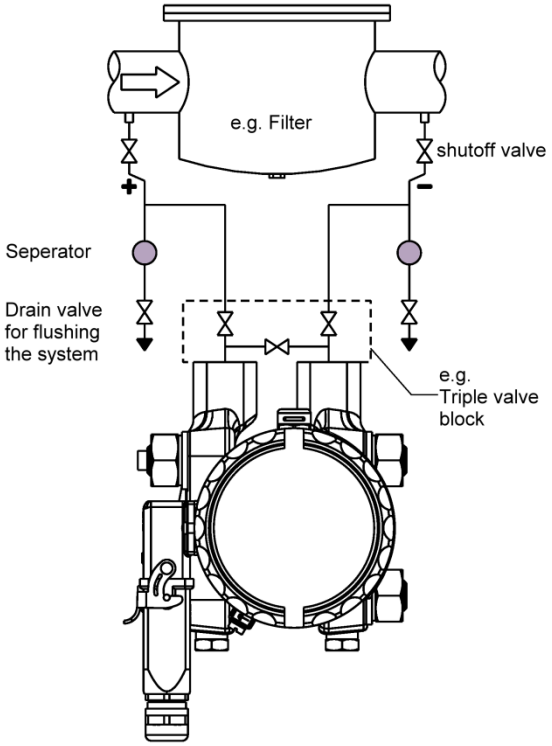
Fig. 5 Differential pressure measurement gas and vapours



4.4.2 Liquids

- Mount the DE05 below the measuring point so that the differential pressure lines are always full of fluid and any gas bubbles can rise up and return to the process line.
- For simple processing without interrupting the process, use the triple valve block.
- If the fluids are dirty, it is recommended using the release valve and filters to collect the deposits.
- Install the differential pressure line at an even gradient of at least 7.5 %.

Fig. 6 Differential pressure measurement fluids



4.5 Flow measurement

4.5.1 Gases

- The DE05 should be mounted above the measuring point so that the condensation can flow into the process line.
- For simple processing without interrupting the process, use the triple valve block.
- Install the differential pressure line at an even gradient of at least 7.5 %.

4.5.2 Vapours

- Mount the DE05 below the measuring point.
- Condensation tank mounted at the same height as the removal pipes.
- Before commissioning, fill the differential pressure lines up to the height of the condensation tanks.
- For simple processing without interrupting the process, use the triple valve block.
- Install the differential pressure line at an even gradient of at least 7.5 %.

Fig. 7 Gas flow rate measurement

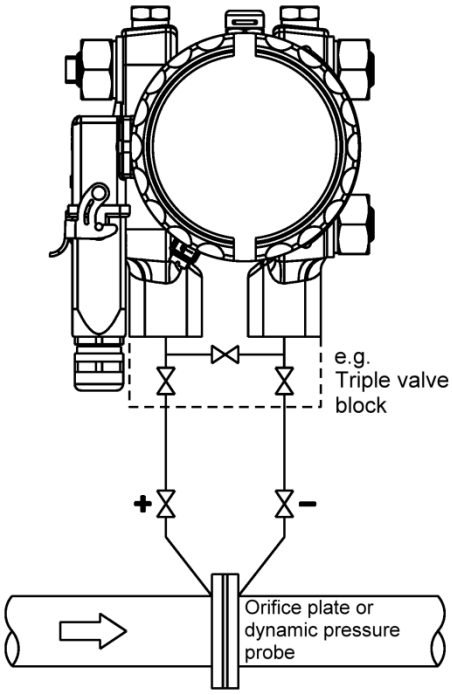
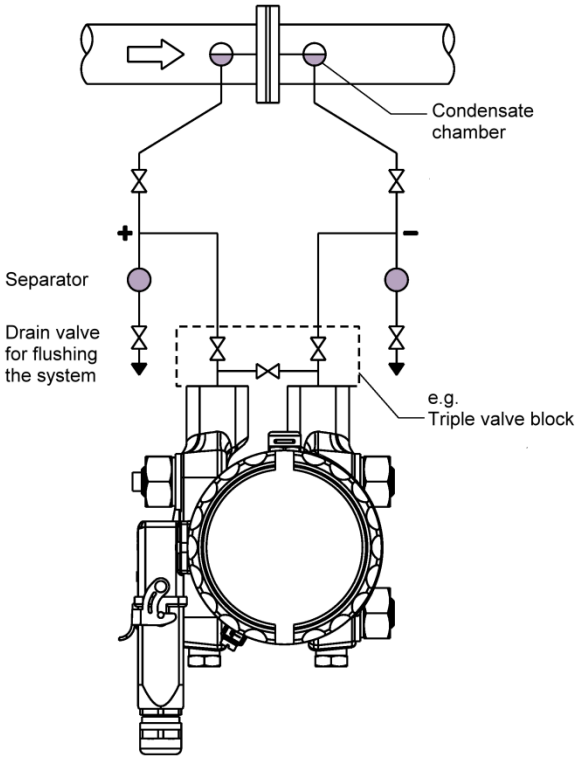


Fig. 8 Vapour flow rate measurement



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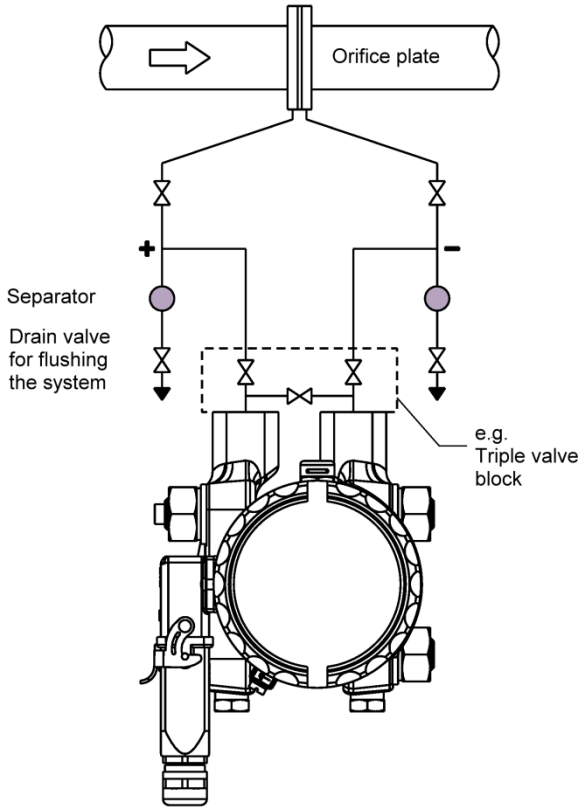
4.5.3 Liquids

- Mount the DE05 below the measuring point so that the differential pressure lines are always full of fluid and any gas bubbles can rise up and return to the process line.
- For simple processing without interrupting the process, use the triple valve block.
- If the fluids are dirty, it is recommended using the release valve and filters to collect the deposits.

Install the differential pressure line at an even gradient of at least 7.5 %.

Fig. 9 Flow rate measurements for fluids



4.6 Filling level measurement

4.6.1 Open tank

- Mount the DE05 below the lower measuring connection so that the differential pressure lines are always full of fluid.
- The minus side is open to the atmospheric pressure.
- The filter prevents the collection of dirt deposits in the differential pressure lines.
- Install the differential pressure line at an even gradient of at least 7.5 %.

4.6.2 Closed tank

- Mount the DE05 below the lower measuring connection so that the differential pressure lines are always full of fluid.
- The minus side needs to be connected above the maximum filling level.
- Filters prevent the collection of dirt deposits in the differential pressure line.
- For simple processing without interrupting the process, use the triple valve block.
- Install the differential pressure line at an even gradient of at least 7.5 %.

Fig. 10 Filling level measurement open tanks

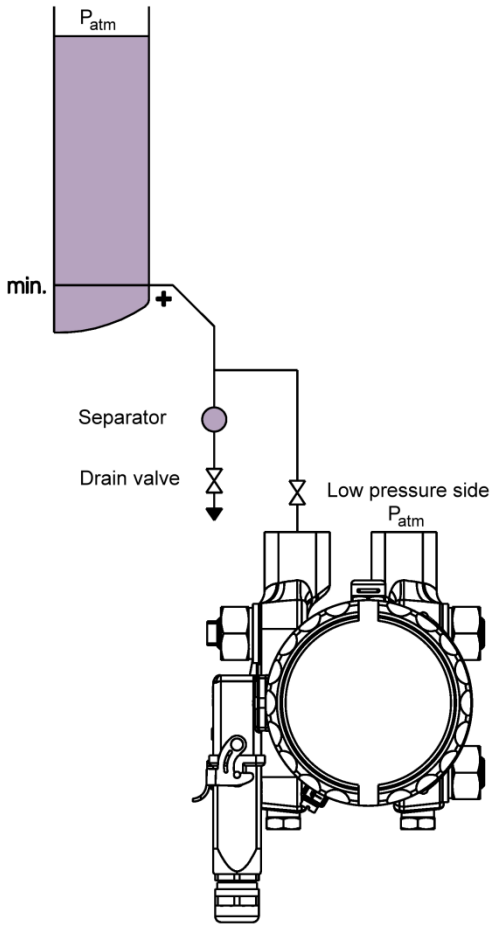
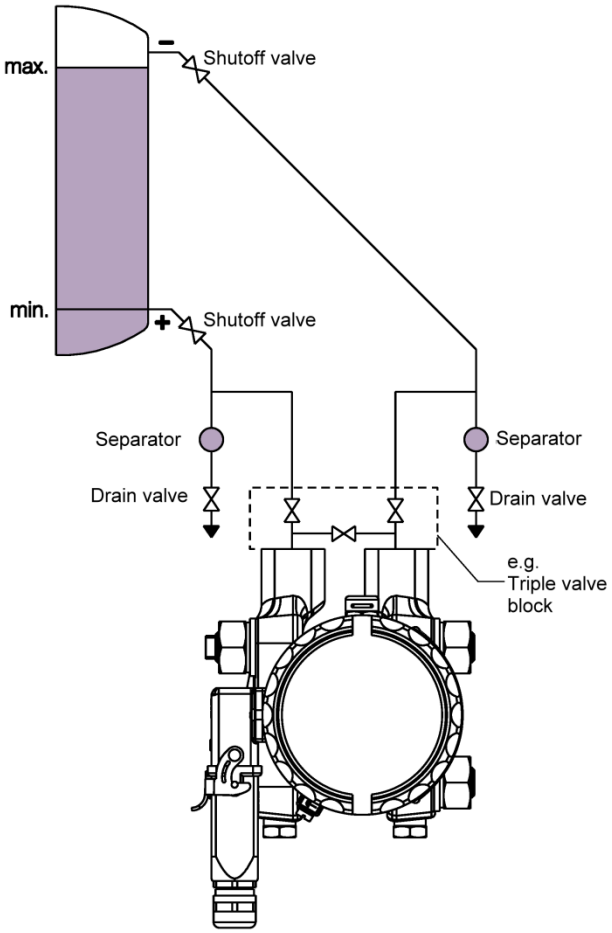


Fig. 11 Filling level measurement closed tanks



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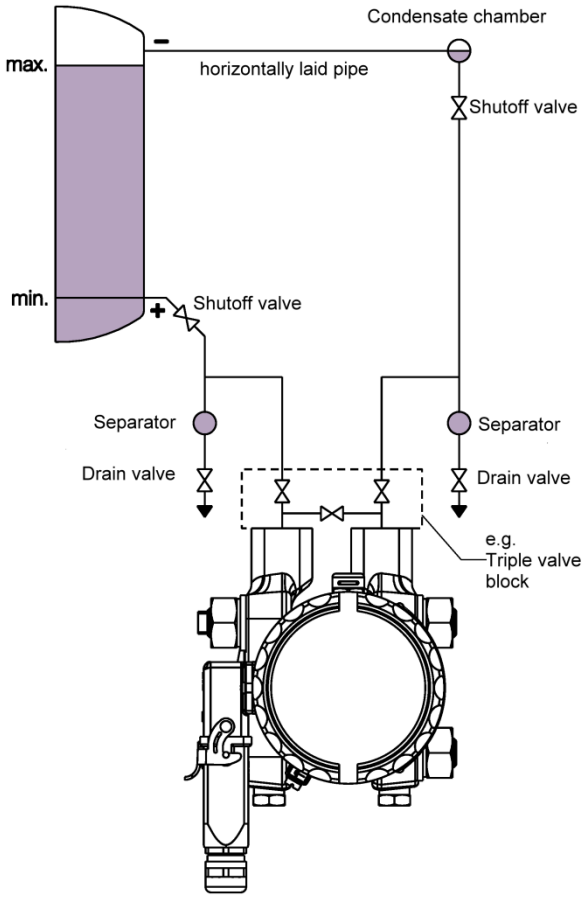
4.6.3 Closed tank with steam overlay

- Mount the DE05 below the lower measuring connection so that the differential pressure lines are always full of fluid.
- The minus side needs to be connected above the maximum filling level. The condensation tank ensures a constant pressure level.
- Filters prevent the collection of dirt deposits in the differential pressure line.
- For simple processing without interrupting the process, use the triple valve block.
- Install the differential pressure line at an even gradient of at least 7.5 %.

Fig. 12 Filling level measurement closed tanks with steam transfer



4.7 Electrical connection

Observe the corresponding regulations during the electrical installation!

Steps need to be taken to check whether the current operating voltage complies with the voltage stated on the type plate.

The energy supply and the output signal are electrically separated. The output signal is short-circuit-proof, no-load-proof and potential-free.

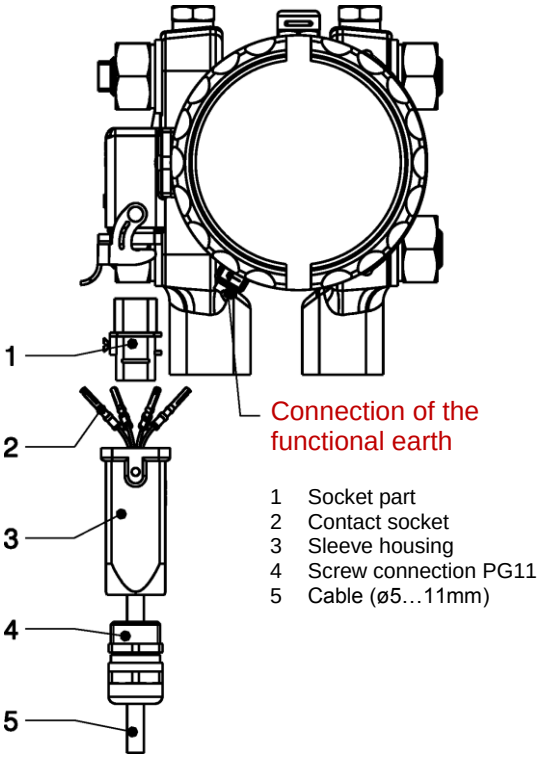
The differential pressure transducer is electrically connected via a plug with a cable gland PG11.

Ensure it is functionally earthed correctly. To this end, the connection on the outside of the housing must be used.

Power supply:
Auxiliary energy U_B 24V DC +50% / - 25%

The plug model (general):
The unit is connected to the power supply on the outside of the housing via the plug. The device socket for the cable connection is enclosed in a dismantled form as an accessory for the differential pressure transducer.

Fig. 13 Assembly of the device socket



Assembly:
The contact sockets (2) are crimped or soldered on the 1.5…2 cm stripped sections or on the approx. 8 mm stripped cable ends and are then fed into the socket part (1) from behind. The sleeve housing (3) and screw connection PG11 (4) need to be pushed onto the cable in the given order before mounting.

Caution:
Before the sockets are completely inserted into the socket part, the connection point must be checked again. Incorrectly inserted sockets can only be removed again using an extraction tool (Harting order no.: 0999 000 0052).

Fig. 14 Socket part (view of the sockets)

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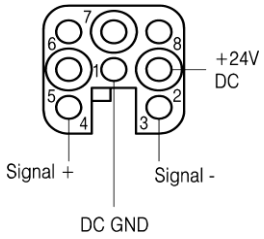


The planned crimp connection for the cable cross-section lies between 0.7mm^2…1.0 mm^2.

5 Commissioning

5.1 Generalities

Once the differential pressure transducer has been installed, it is commissioned by switching on the operating voltage.

- Check the following before switching on the operating voltage:
  - Process connections
  - Electrical connection
  - That the measuring lines and measuring chambers of the differential pressure transducer are completely filled with the measuring media.
- After switching on the operating voltage, carry out a zero-point control ($\Delta p = 0$):
  - Before the zero-point control, the differential pressure transducer must have reached its operating temperature (approx. 5 min. operating duration, if the differential pressure transducer has already adopted the ambient temperature). The effect of the static pressure on the zero-point can be eliminated if the measuring start is readjusted under operating pressure (with the ZERO potentiometer). If the differential pressure transducer is designed for the ± measuring range, the respective current value at Δp = 0 must be calculated.
- This is followed by the commissioning phase. Here, the shut-off valves and fittings should be

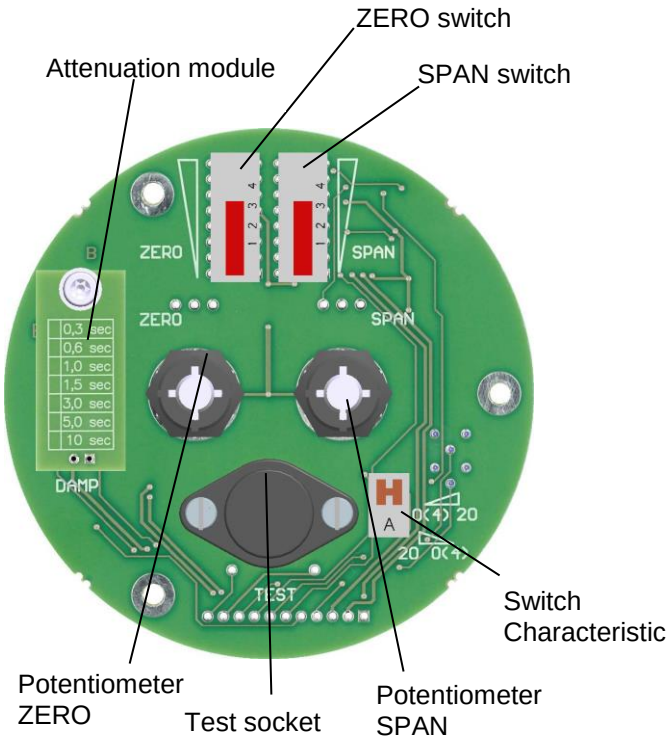
activated in reverse order (basic setting: all valves closed):

- Open the removal shutoff valve at the pressure relief pipes if there are any.
- Open the pressure relief valve of the shutoff fitting.
- Open the plus shutoff valve.
- Close the pressure relief valve.
- Open the minus shutoff valve.

Decommissioning is carried out in reverse order.

5.2 Control Elements

Fig. 15 Operating elements



5.3 Attenuation

An unstable output signal from the differential pressure transducer caused by the process can be electrically smoothed using an attenuation element.

The attenuation elements are available in 7 different time constants: 0.3s; 0.6s; 1.0s; 1.5s; 3.0s; 5.0s; 10.0s

An attenuation element is easy to retrofit. However, it should be noted that if it is installed during operation, the output signal will drop to approx. 0/4mA, after which it will rise again to the measuring value in line with the time constants.

The installation site is easily accessible once the screw-on lid has been removed.

5.4 Checking calibration

The differential pressure transducer must be calibrated by the manufacturer in line with the details on the order. The set values for the measuring start and end are stated on the type plate (see Fig. 16).

Fig. 16 Type plate (example)

The measuring start and measuring end can be calibrated afterwards independently of each other. The measuring range end value is calibrated when the measuring span is configured.

In order to check the differential pressure transducer, the measuring start and end are defined as pressure on the measuring system. If the measuring system is installed to test connections via fittings, these are used for pressurization. If standard shutoff valves, triple combinations etc. are used, the ventilation or drainage valves can serve this purpose. The operating sequence is important:

- Close minus connection valve
- Open the pressure relief valve
- Close the plus relief valve
- Relieve the static pressure on the differential pressure transducer, connect the test sensor
- Close the pressure relief valve
- Checking

Pressure calibrators with configurable pressure and comparison displays can be used as test sensors. When connecting avoid residual fluids (for gaseous test media) or air bubbles (for fluid test media) in the connection lines because this can cause errors in the test.

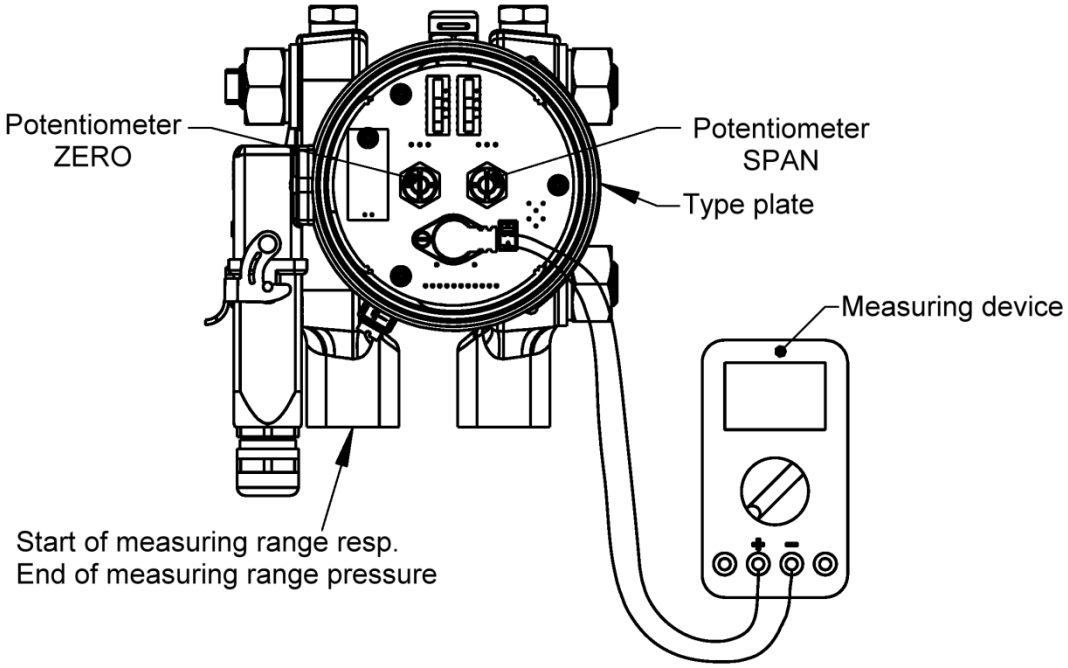
The accuracy of the measuring devices should be much higher than that of the differential pressure transducer.

The time behaviour needs to be taken into account when the attenuation module is installed.

After testing, the differential pressure transducer must be commissioned as described in section 5.1.

The output signal can be measured on the test socket TEST (use the plug defined in DIN 41529). The housing lid needs to be unscrewed. Drop of voltage in the current measuring device < 300mV at 20mA.

Fig. 17 Calibration of the measuring start and end

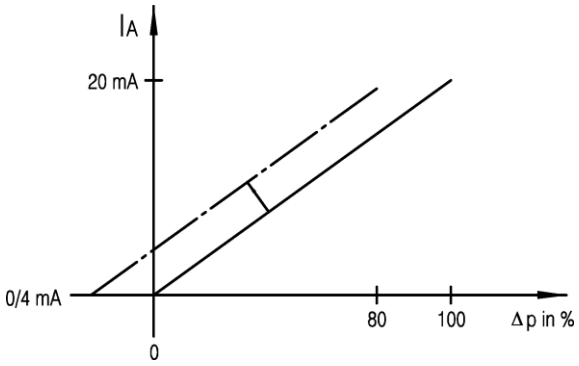


5.4.1 Check measuring start (0 or 4 mA)

At the corresponding pressure level as stated on the type plate, the current measuring unit must show 0 or 4mA on the analogue output or testing socket.

Correct any deviations using the potentiometer ZERO and a screwdriver. The ZERO switch defines the setting range of the potentiometer (see chapter 5.6.1).

Fig. 18 Check measuring start

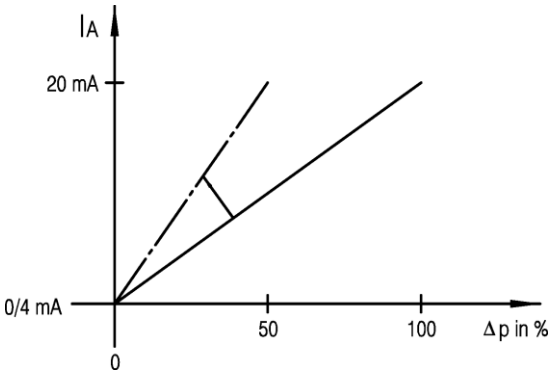


5.4.2 Check measuring end (20mA)

At the corresponding pressure level as stated on the type plate, the current measuring unit must show 20mA on the analogue output or testing socket.

Correct any deviations using the potentiometer SPAN and a screwdriver. The SPAN switch defines the setting range of the potentiometer (see chapter 5.6.2).

Fig. 19 Check measuring end



5.5 Function control and troubleshooting

If the differential pressure transducer does not work properly, check the following:

- does the measuring signal lie within the measuring span
- are all electrical connections connected
- is the required auxiliary energy available
- is the signal circuit closed
- is the resistance within the permissible limit?

5.6 Changes to the device settings

The differential pressure transducer is configured in the factory to the values stated on the type plate. If the differential pressure transducer needs to be set to another measuring span or measuring start, the preliminary or fine adjustment need to be changed for the measuring start and measuring span.

The configured values must be recorded on the type plate!

The measuring span that can be configured depends on the measuring range of the respective measuring system. To this end, the type key on the type plate (see Fig. 16) needs to be compared to the technical data (see chapter 11)

Only measuring spans that lie within the measuring range are permitted.

5.6.1 Measuring start

The ZERO switch and the potentiometer ZERO allow the measuring start to be calibrated to approx. 50% to approx. 100% of the measuring range.

Table 1 Measuring start setting range

ZERO switch	Setting range Potentiometer ZERO
1	approx. -50% … approx. 3.5%
2	approx. -8.5% … approx. 26.5%
3	approx. 15.5% … approx. 74.5%
4	approx. 60.5% … approx. 100%

On delivery, the ZERO switch is in position 2.

The required range must be set initially with the ZERO switch.

Then the potentiometer ZERO is used to set the measuring start precisely. At the corresponding pressure level, the current measuring unit must show 0 or 4mA on the analogue output or testing socket.

5.6.2 Measuring span

The SPAN switch and the potentiometer SPAN allow the measuring span to be calibrated from approx. 20% to approx. 110% of the measuring range.

Table 2 Setting range of measuring span

SPAN switch	Setting range potentiometer SPAN
1	approx. 110% … approx. 83%
2	approx. 100% … approx. 40%
3	approx. 50% … approx. 29%
4	approx. 32% … approx. 17%

On delivery, the SPAN switch is in position 1.

The required range must be set initially with the SPAN switch.

Then the potentiometer SPAN is used to set the measuring end precisely. At the corresponding pressure level, the current measuring unit must show 20mA on the analogue output or testing socket.

Then the measuring start needs to be checked.

5.6.3 Characteristic curve

The characteristic curve switch swaps between the rising and falling characteristic curve.

In the "0 (4) … 20" position, the differential pressure transducer supplies 0 or 4mA at the start of the measuring process and 20mA at the end of the measuring process.

In the "20 … 0 (4)" position, the differential pressure transducer supplies 20mA at the start of the measuring process and 0 or 4mA at the end of the measuring process.

After switching the characteristic curve, the calibration of the measuring start and end must be checked.

When the characteristic curve drops, the analogue output at the start of the measuring process must be calibrated with the potentiometer ZERO to 20mA. At the end of the measuring process, the analogue output must be set to 0 or 4mA with the potentiometer SPAN.

Not all the models of the DE05 series are able to switch the characteristic curve.

6 Maintenance

The instrument is maintenance-free.

It suffices if the output signal is checked at certain intervals – depending on the operating conditions – in accordance with section 5.4 Checking the calibration.

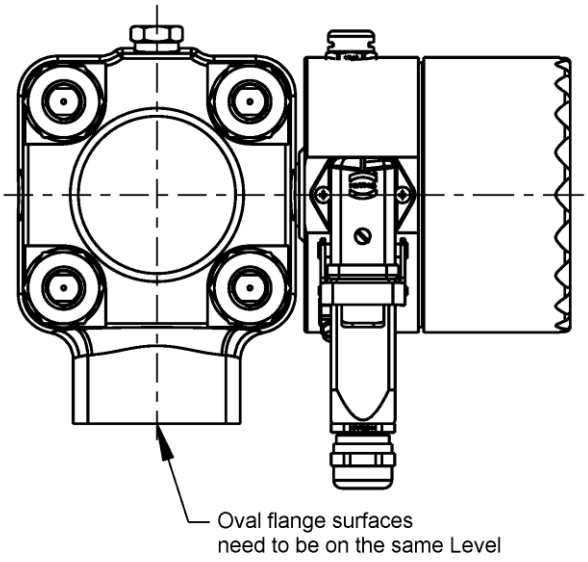
If it is possible for deposits to build up in the measuring unit, the measuring unit also needs to be cleaned at regular intervals depending on the operating conditions. If possible, clean in the workshop.

6.1 Dismantling/assembly of the caps

- Release the expansion screws crosswise (external hex, SW 27 mm)
- Carefully remove the caps so that the separating membranes are not damaged.
- Clean the separating membrane and any caps using a soft brush or a suitable solvent.

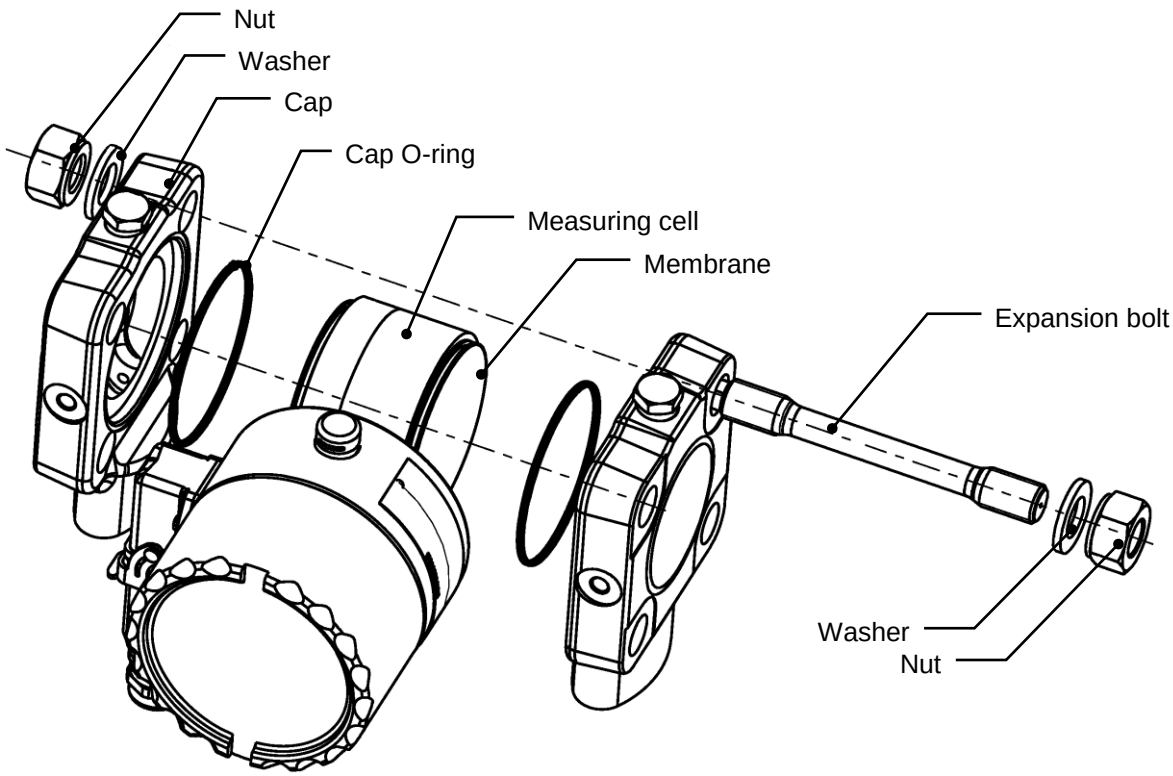
  Do not use any sharp or pointed tools.
- Mount new cap O-rings (see chapter 9 Accessories and spare parts) in the O-ring grooves on the measuring cell.
- Place the caps on the measuring cell. Caution, do not damage the separating membranes.
  Note:
  The flange areas of the two caps need to be on the same level and at right angles to the amplifier housing (Fig.20).

Fig. 20 Information about mounting the caps



- Check that the expansion bolt threads run smoothly: turn the nut manually up to the bolt head. If this is not possible, use new screws (see 9 Accessories and spare parts).
- Lubricate the screw threads and surfaces of the screw connections, e.g. with Optimol paste LN AU 598 (supplier: Optimol Ölwerke GmbH, D – Munich) or Molykote 1000 (supplier: DOW CORNING GmbH, D-Munich).
  If there are any cleanliness specifications, please observe the respective regulations e.g. DIN 25410!
- The work process involving the correct screw attachment of the caps is determined by the cap O-ring material and the expansion screw material.
- The expansion screws or nuts are initially tightened to the specified joining moment of 20 Nm and then further tightened crosswise with a torque wrench.
  The final tightening is then carried out by tightening every screw or nut in 20 Nm steps crosswise until the final torque of 135 Nm is reached.
- Check for leaks. Squeeze with max. 1.3 x PN (bar) ensuring that the pressure is applied on both sides of the measuring unit at the same time.
- Check the measuring start and end according to section 5.4 Checking the calibration.

Fig. 21 Exploded drawing



7 Transport

The measuring device must be protected against impacts. It may only be transported in packaging specifically intended for transport.

8 Service

All defective or faulty devices should be sent directly to our repair department. Please coordinate all shipments with our sales department.

Process media residues in and on dismantled devices can be a hazard to people, animals and the environment. Take adequate preventive measures. If required, the devices must be cleaned thoroughly.

9 Spare parts and accessories

Caps O-rings	Art.-No. 01201556
Nut	Art.-No. 01002156
Washer	Art.-No. 01003229
Expansion screw	Art.-No. 01001664
Attenuation module 0.3s	Art.-No. 04661001
Attenuation module 0.6s	Art.-No. 04661002
Attenuation module 1.0s	Art.-No. 04661003
Attenuation module 1.5s	Art.-No. 04661004
Attenuation module 3s	Art.-No. 04661005
Attenuation module 5s	Art.-No. 04661006
Attenuation module 10s	Art.-No. 04661007
Valve block 3-set	Art.-No. DZ3600SV2700[1]
Valve block 5-set	Art.-No. DZ5600SV2700[1]

10 Disposal

For the sake of the environment ...

Please help to protect our environment and dispose of or recycle used instruments as stipulated by the applicable regulations.

[1] Not type-tested in compliance with KTA 3505

11 Technical data

Measuring ranges	0…100 mbar	0…160 mbar	0…250 mbar	0…400 mbar	-40…+60 mbar	-60…+100 mbar	-100…+150 mbar	-150…+250 mbar	0…0.6 bar	0…1 bar	0…1.6 bar	0…2.5 bar	0…4 bar	0…6 bar	0…10 bar[2]	0…16 bar	0…25 bar
Max. static pressure	250 bar																

General points

Measuring principle	Fluid-filled membrane system with inductive pickup system (see function chart Fig. 1)
Measuring media	Gases, vapours, fluids (that are compatible with EPDM O-rings)
Max. static pressure	PN 250
Measuring ranges	100 mbar … 25 bar (Customer-specific measuring ranges possible)
Measuring span	Can be set steplessly from 20% … 100% of the max. measuring range
Measuring start	Can be set steplessly from 0% to 100% of the measuring range when the characteristic curve falls (switchable) can be set steplessly from 100% to 0% of the measuring range
Overload limit	On each side of the measuring unit 100% PN
Temperature or measuring media	-10 °C … +70 °C

Ambient conditions

Ambient temperature	-10 °C … +70 °C
Storage temperature	-25 °C … +80 °C
Humidity	≤95% annual mean value, moisture condensation permissible
Electromagnetic compatibility	DIN EN 61000-6-2 (interference resistance in the industrial field) DIN EN 61000-6-4 (emitted interference in the industrial field)

Electrical data

Technology	Analogue
Electrical connection type	4-conductor, electrically isolated
Auxiliary energy	24V DC +50 % / -25 % 5 W
Output signal	0/4 … 20 mA
Test socket	Checking the output signal
Admissible resistance	0 … 750 Ohm
Characteristic curve	Linear, rising or falling (switchable)
Square root extraction (optional)	Root-extracted, useful range between 10 % and 100 %
Zero-point suppression	≤ 0.6%
Rising time (damping module)	0.3; 0.6; 1.0; 1.5; 3; 5 and 10s (pluggable)

[2] can be electrically expanded to 11 bar

Technical data (cont'd)

	Measuring chamber
Measuring chamber volume	21 cm³
Displacement volume	2.0 cm³
Fluids	Baysilone oil PD 5
Measuring membranes	Nickel-Beryllium / Duratherm
	Materials that come into contact with the measuring media
Measuring chamber	Chromium nickel steel 1.4571 (AISI 316Ti)
Separating membrane	Chromium nickel steel 1.4571 (AISI 316Ti)
Pressure caps	Chromium nickel steel 1.4571 (AISI 316Ti)
Pressure caps O-rings	EPDM
Process connection	Chromium nickel steel 1.4571 (AISI 316Ti)
Screw plugs	Chromium nickel steel 1.4571 (AISI 316Ti)
	Housing
Device structure	Compact design
Housing (amplifier housing)	Copper-free aluminium (AlMgSiPb)
Protection class as per EN 60 529/IEC 529	IP65
Assembly type	Direct assembly flanged to the fitting Wall and pipe assembly, material 1.4301 (AISIS 304) Deviation from the vertical ±10 °
Nominal position, installation position	Vertical, amplifier in front position
Device blockage (optional)	Device blockage for 3/5-set valve blocks, can be directly flanged acc. to DIN EN 61518, with connection thread 7/16 - 20 UNF
colour	2K-epoxy coloured paint RAL 5021 slik-gloss
	Ports
Device connection	Plug / plug connection Harting HAN 7D
Process connection	Oval flange in compliance with DIN EN 61518, G ¼ inner thread
	Weight
Differential pressure transducer	≤ 8.8 kg
Assembly parts	≤ 0,6 kg (wall mount)

Technical data (cont'd)

Error tolerances according to DIN EN 60770

	Characteristic curve conformity[3]		
	Linear characteristic curve	Rooted characteristic curve for flow rate measurements	
		at Q = 10 … 30%	at Q > 30 … 100%
Measurement deviation (Non-linearity, hysteresis, non-repetitive)	≤ 0.75 %	≤ 2 %	≤ 1 %
Non-linearity/noncompliance	≤ 0.4 %	≤ 0.65 %	≤ 0.65 %
Hysteresis	≤ 0.4 %	≤ 0.4 %	≤ 0.4 %
Non-repetitive	≤ 0.3 %	≤ 0.3 %	≤ 0.3 %
	Temperature influence3		
on the zero-point/useful start	≤ 0.2 % / 10 K	≤ 1 % / 10 K (at Q=10%) [4]	
on the measuring span	≤ 0.2 % / 10 K	≤ 1 % / 10 K	
on the measured value at Q = 20%		≤ 0.5 % / 10 K	
on the measured value at Q = 30%		≤ 0.4 % / 10 K	
on the measured value at Q = 50%		≤ 0.2 % / 10 K	
on the measured value at Q = 100%		≤ 0.2 % / 10 K	
	Static pressure influence3		
on the zero-point/useful start	≤ 0.1 % / 10 bar	≤ 0.5 % /10bar (at Q=10%) 4	
on the measuring span	≤ 0.15 % / 10 bar	≤ 0.75 % /10bar (at Q=10 100%)	
on the measured value at Q = 20%		≤ 0.25 % / 10 bar	
on the measured value at Q = 30%		≤ 0.2 % / 10 bar	
on the measured value at Q = 50%		≤ 0.1 % / 10 bar	
on the measured value at Q = 100%		≤ 0.1 % / 10 bar	
	Impact of range overstepping by 50% of the measuring range in both directions3		
on the zero-point/useful start	≤ 0.2 %	≤ 1 %/25 bar (at Q=10%) 4	
on the measuring span	≤ 0.2 %	≤ 1 %/25 bar (at Q=10…100%)	
	Impact of range overstepping in both directions with PN3		
on the zero-point/useful start	≤ 0.2 % / 25 bar	≤ 1 %/25 bar (at Q=10%) 4	
on the measuring span	≤ 0.2 % / 25 bar	≤ 1 %/25 bar (at Q=10…100%)	
	Electrical influences		
Power supply influence	≤ 0.01% / V		
Output load influence	≤ 0.01 % / 100 Ohm		
Output ripple	≤ 3 %		
Grounding influence	≤ 0.1 %		
Energy input	≤ 5 W		
Insulation resistance	> 1 MΩ		
Withstand voltage	≤ 500 V AC		

[3] All deviations do not refer to the non-spread measuring range. These deviations increase proportionally to the set spread.
[4] 2.5 times the value of the useful start apply for the zero-point (Q=0%) for root-extracted characteristic curves

Technical data (cont'd)

Error tolerances according to DIN EN 60770

Jump response

Measuring range	Linear characteristic curve		Rooted characteristic curve for flow rate measurements	
	≤160 mbar	≥ 250 mbar	≤160 mbar	≥ 250 mbar
Time constants (0…63 %)	< 0.8 s	< 0.4 s	< 0.8 s	< 0.4 s
Rising time (0… 90 %) (without damping module)	< 1.2 s	< 0.8 s	< 1.2 s	< 0.8 s

Other influences[5]

	Linear characteristic curve	Rooted characteristic curve for flow rate measurements
		at Q > 30 … 100%
Long-term stability (long-term drift) / every six months	≤ 0.2 %	≤ 0.2 %
Behaviour in case of system-related pressure oscillations (at a max. amplitude of ±10 % FS and a frequency of 10 … 80 Hz)	The constant component of the output signal is not impacted on impermissibly by the superimposed pressure oscillations.	

Position dependency for ±10 °5

Measuring range	Linear characteristic curve	Rooted characteristic curve for flow rate measurements	
		at Q = 10 … 30%	at Q > 30 … 100%
100 mbar	< 1.2 %		
160 mbar	< 0.8 %		
250 mbar	< 0.6 %	Please note the root extracting function	
400 mbar	< 0.4 %		
> 400 mbar	< 0.3 %		

[5] All deviations do not refer to the non-spread measuring range. These deviations increase proportionally to the set spread.

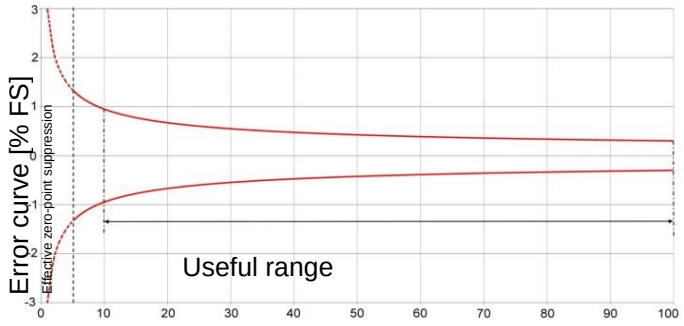
Technical data (cont'd)

for the scope, power station KTA 3505'

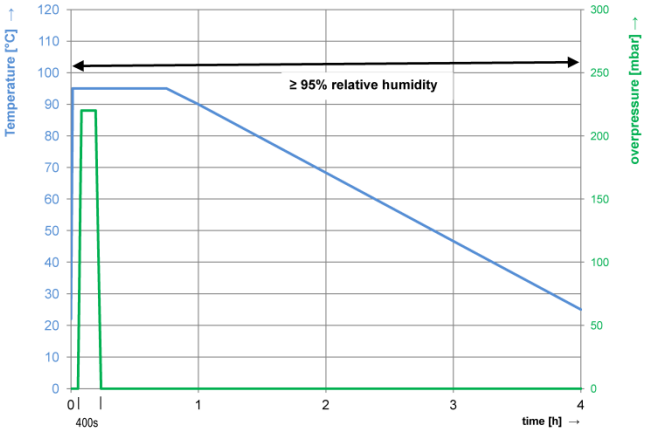
	Design 'K'		
Product qualification	in compliance with KTA 3505		
Area of application	Reactor protection system "KMV incident - ring room leak 1"		
Safety-relevant classification	according to DIN IEC 61226 in category A		
Manufacturer qualification	KTA 1401		
Assembly type	Assembly in compliance with operating equipment installation plan		
allowed deviation during mechanical load in compliance with KTA3505 Sec. 5.8	≤ 3% [6] Test was carried out in compliance with the operating equipment installation plan DE05 (09.005.00.35144.3)		
	Measurement deviation for KMV incident loss of coolant[7]		
	Linear characteristic curve	**Rooted characteristic curve for flow rate measurements**	
		at Q = 10 … 30%	**at Q = 30 … 100%**
Behaviour in case of pressure, temperature and moisture load	≤ 5 %	Please note the root extracting function	
Measuring deviation after pressure, temperature and moisture load	≤ 2 %	Please note the root extracting function	
Behaviour in case of radiation load[8]	≤ 5 %	Please note the root extracting function	

Incorrect information about root-extracted characteristic curve

The relatively large allowed deviations for measuring transducers with root-extracted characteristic curves are based on the curves of the root-extraction function graph. An example curves is shown in the following figure.



Unique allowed incident load

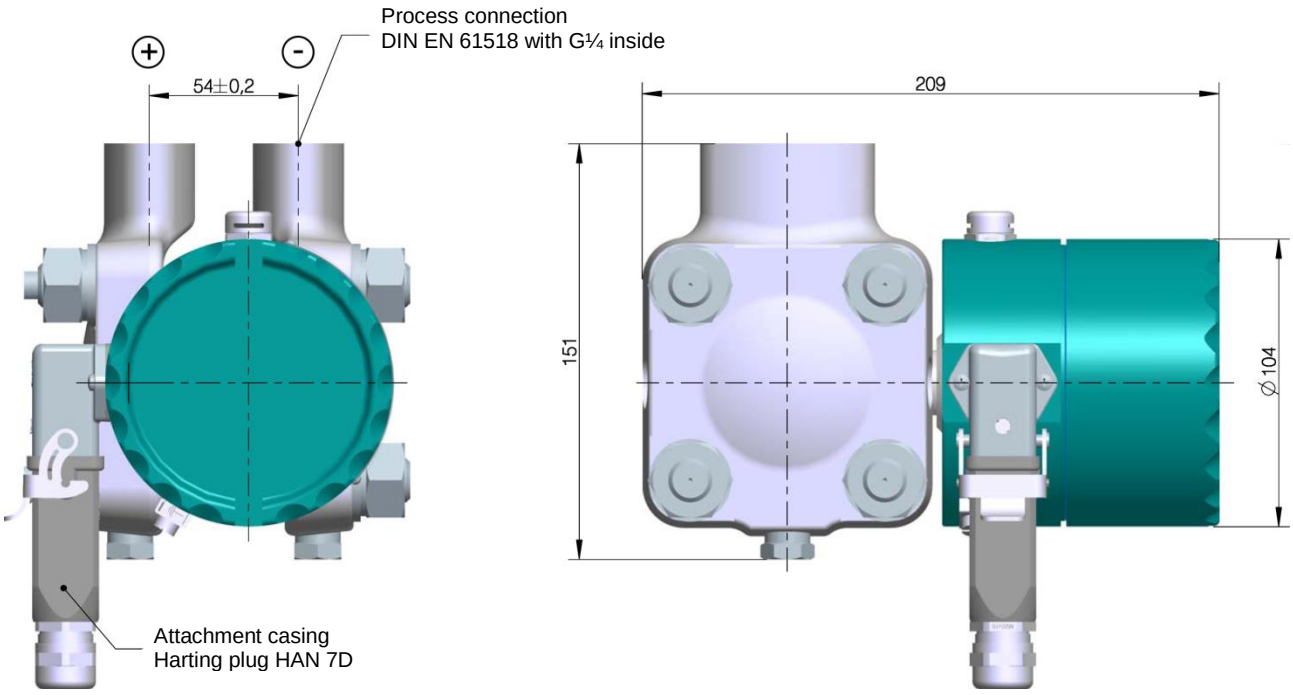


[6] Deviation after the load: see information under measuring deviation page 18
[7] All deviations do not refer to the non-spread measuring range. These deviations increase proportionally to the set spread.
[8] Behaviour in case of a dosing output 5Gy/h < Ḋ ≤ 25 Gy/h up to a total dose of 1000 kGy.

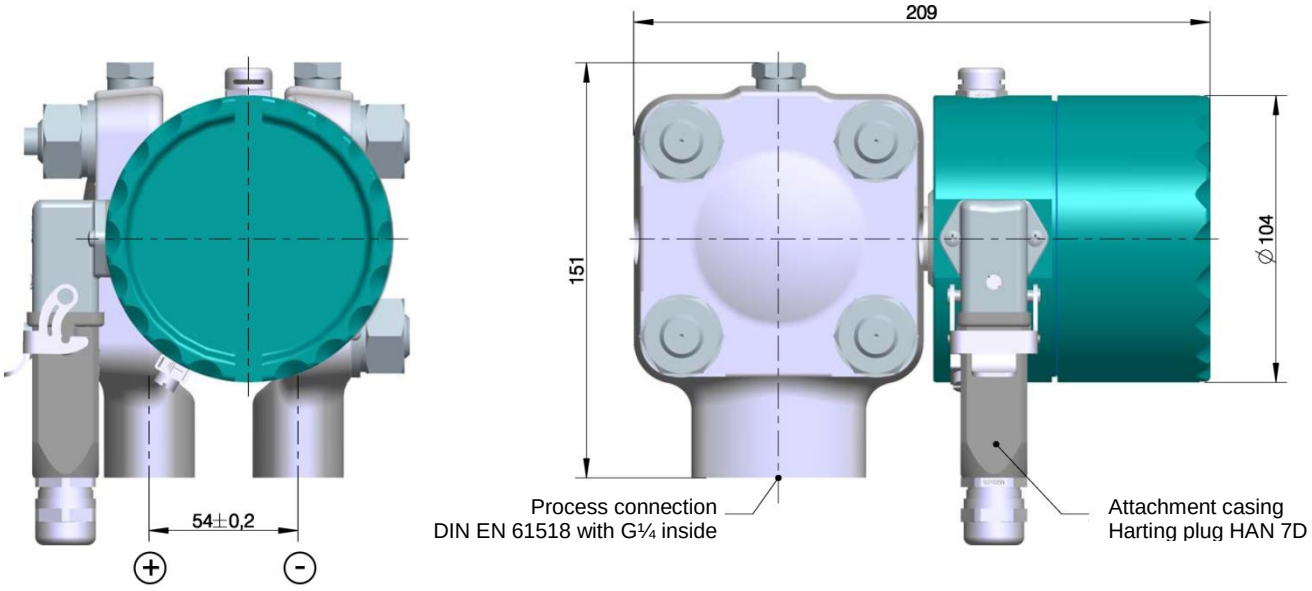
12 Dimensional drawings

(all dimensions in mm unless otherwise specified)

Process connection design above

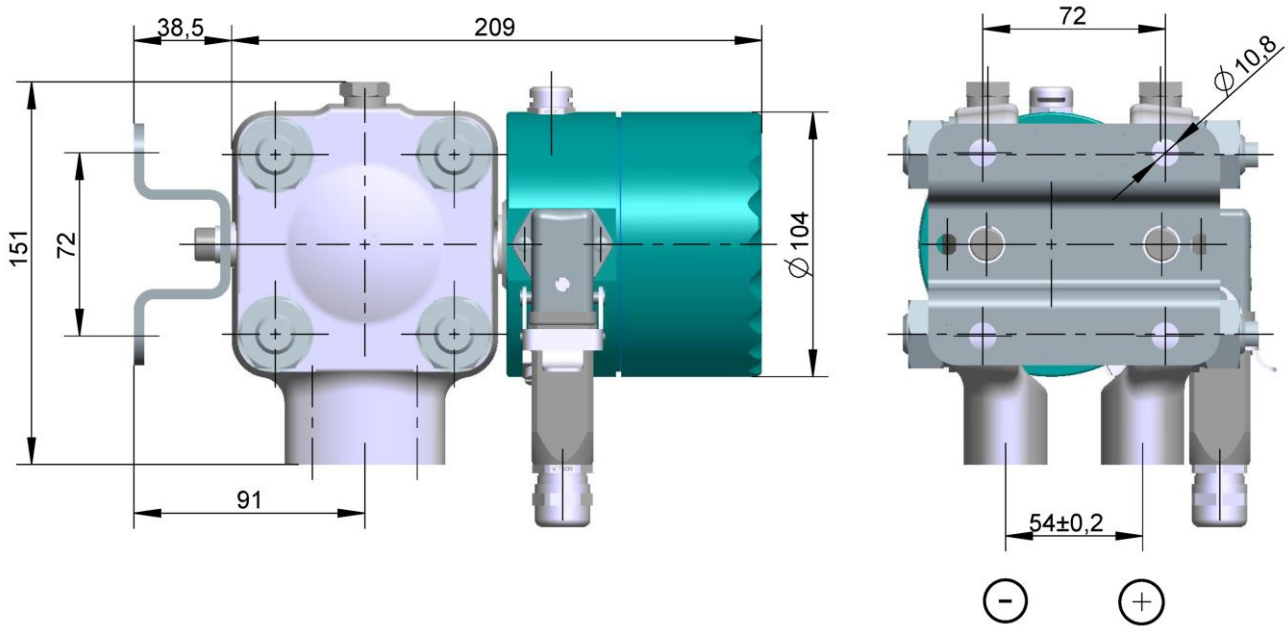


Process connection design below

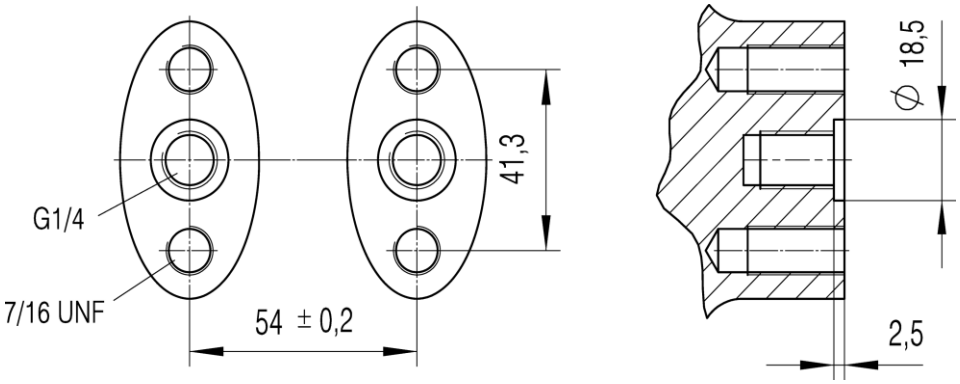


Dimensional drawings (cont'd)

Wall mounting version



Flange connection



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13 Order Codes

Differential pressure transducer

Type DE05				0	0	4		9					U####

Measurement range

0 100	mbar	> 5 9
0 160	mbar	> 6 0
0 250	mbar	> 8 2
0 400	mbar	> 8 3
-40 ..... +60	mbar	> 7 0
-60 ... +100	mbar	> 7 2
-100 . +150	mbar	> 7 4
-150 . +250	mbar	> 7 6
0 0,6	bar	> 0 1
0 1	bar	> 0 2
0 1,6	bar	> 0 3
0 2,5	bar	> 0 4
0 4	bar	> 0 5
0 6	bar	> 0 6
0 10	bar	> 0 7
0 16	bar	> 0 8
0 25	bar	> 0 9

Area of application

Industry	> 0
Power station KTA 3505	> K

Pressure connection

Flange connection according to DIN 61518 with G1/4	0 4

Electrical output signal

0–20 mA linear, 4-conductor	> A
0–20 mA root extracted, 4-conductor	> E
4–20 mA root extracted, 4-conductor	> F
4–20 mA linear, 4-conductor	> P

Operating voltage

24 V DC (18 - 36 V DC)	> 9

Assembly

Direct assembly	> 0
Wall mounting	> W
Pipe mounting	> R

Design

Process connection above	> 0
Process connection below	> U

Electronic attenuation

without	> 0
0.3 s	> 1
0.6 s	> 2
1.0 s	> 3
1.5 s	> 4
3.0 s	> 5
5.0 s	> 6
10.0s	> 7

Order Codes (cont'd)

Differential pressure transducer

Type DE05				0	0	4		9					U####

AKZ (Please clearly state the system code in plain text on the order!)

without system code ..... > **0**
with system code on the type plate ..... > **1**

Customer-specific measuring range:

When a customer-specific measuring range is ordered, the next largest standard measuring range is selected. The customer-specific measuring range must be stated in plain text on the order.
The order code is supplemented with an attached code ex works to securely identify the device.

Example: DE05020004A9W000 **U####**

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