

## Operating Manual

### DA03 | Differential pressure measuring unit Pressure levels PN40/PN100

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## 1 Safety guidelines

### 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 device before it is installed and put into operation.

This operating manual is an integral part of the product and therefore needs to be kept close to the device in a place that is accessible at all times to the responsible personnel.

The following sections, in particular instructions about the assembly, commissioning and maintenance, contain important information, non-observance of which could pose a threat to humans, animals, the environment and property.

### 1.2 Personnel Qualification

The device may only be installed and commissioned by specialized personnel familiar with the installation, commissioning and operation of this product.

Specialized personnel are persons who can assess the work they have been assigned and recognize potential dangers by virtue of their specialized train-

ing, their skills and experience and their knowledge of the pertinent standards.

### 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.

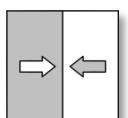
The supplier of the equipment will not be liable for damage claims if this should happen.

### 1.4 Safety Instructions for the Operating Company and the Operator

The safety instructions governing correct operation of the device 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 device must be eliminated. See the information in the applicable national and international regulations.

In Germany these are the DIN EN, UVV regulations, specific industrial guidelines such as DVGW, Ex, GL, etc., the VDE-



regulations and the regulations of the local energy supply companies.

### 1.5 Unauthorised Modification

Modifications or other technical alterations to the device by the customer are not permitted. This also applies to replacement parts. 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 device can only be guaranteed if it is used as intended. The device 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 Explanation of symbol



#### WARNING!

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



#### INFORMATION!

... highlights important information efficient and smooth operation.



#### TIP!

... indicates recommendations that are not specifically necessary in certain situations but which could be useful.

## 2 Application purpose

The units may only be used for the purpose defined by the manufacturer in the data sheet or operating instructions.

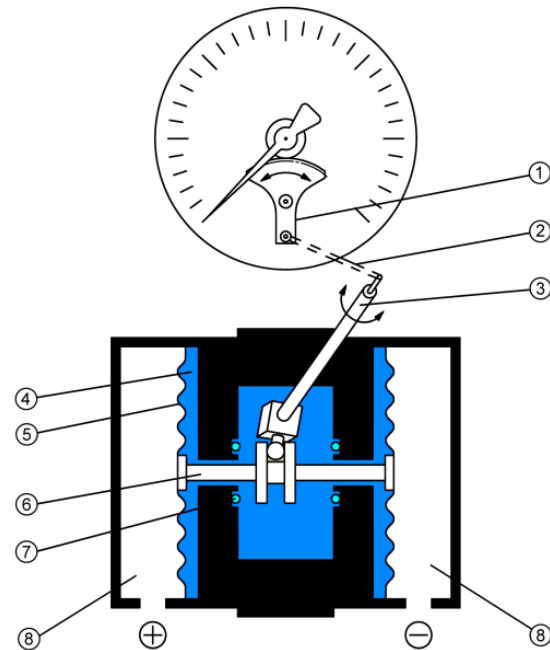
The units are only used to directly display differential pressures.

The installed switch elements are mechanical magnetic spring contacts or inductive proximity switches

in a slotted design that are supplied via isolating amplifiers. If the set limit values are exceeded, the output power circuits are opened or closed.

## 3 Product and functional description

### 3.1 Function diagram



- 1 Motion train
- 2 Transfer lever
- 3 Measuring shaft
- 4 Pressure transfer fluid
- 5 Measuring membranes
- 6 Connecting rod
- 7 O-ring, pressure relief valve
- 8 Pressure chamber

### 3.2 Design and mode of operation

The pressures to be compared each have an effect on a measuring diaphragm. These are connected rigidly to each other with a connecting rod.

To compensate the static pressure, the space between the measuring membranes is filled with a pressure transfer fluid.

During pressure equalisation, the two measuring membranes are in an idle position. In case of pressure difference, the force acting on the measuring membranes causes it to be moved towards the side of the lower pressure.

The connecting rod transfers the deflection of the pressure membranes onto the transfer lever mounted to the measuring shaft.

Proportional to the current differential pressure, the measurement shaft makes a rotational movement that the indicator translates into a rotation angle between 0 and 270°.

In the case of one-sided pressure by the measuring system above and beyond the measuring range, the pressure relief will be activated.

The over-pressure causes the overloaded membrane and its collar to be pressed against the inner O-ring. This creates two separate pressure spaces between the measuring membranes that need to be filled with fluid.

In the pressure space next to the overloaded measuring membrane, a pressure equating to the over-pressure is created so that the measuring membrane is supported by the contained fluid. In this way the measuring membranes compensate the forces acting upon them.

## 4 Installation and assembly

All supply lines are arranged so that there are no mechanical forces acting on the device.

The device is designed for installation onto flat assembly plates. For screw connection to the assembly plate, the device features two M8 assembly bores on its back.

The device is set ex-works for vertical installation, however any installation position is possible. For any installation positions that are not vertical, the zero-point signal needs to be corrected via the installed zero-point adjuster (5.3).

The casing protection class IP65 is only guaranteed if the connection line that matches the cable screw connection is used. Its outer diameter must lie between 7 and 13 mm.

### 4.1 Process connection

- By authorized and qualified specialized personnel only.
- The pipes need to be depressurized when the device is being connected.
- Appropriate steps must be taken to protect the device from pressure surges.
- Check the suitability of the device for the media to be measured.
- Maximum pressures must be observed.
- Check that the pressure connections do not leak before commissioning.

The pressure sensing lines need to be kept as short as possible and installed without sharp bends to avoid interfering delay times.

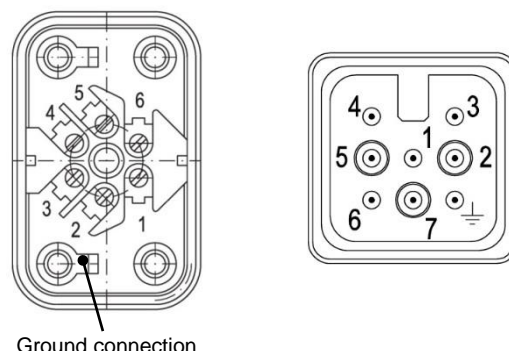
The pressure connections are marked with (+) and (-) symbols on the device. For differential pressure measurements, the higher pressure is connected to the (+) side and the lower pressure to the (-) side of the device.

If during commissioning the pressure measuring lines are already under pressure, the zero-point cannot be checked and no settings can be adjusted. In this case, the device should only be connected electrically first.

## 4.2 Electrical connections

- By authorized and qualified specialized personnel only.
- The electrical connection of the device shall be performed according to relevant VDE and local electricity board regulations.
- Disconnect the system from the mains before connecting the device.
- Add a fuse adapted to the energy requirements.

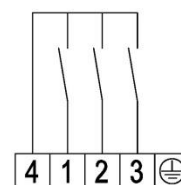
### 4.2.1 Cable socket / HAN7D



### 4.2.2 Switch contacts

Showing all these variants would take up too much space. They are shown in the associated data sheet KE##.

The clamp numbers always correspond to the contact number.



The contacts are assigned to the target value displays from left to right.

For 2 contacts:

Contact 1	left target value display
Contact 2	right target value display

For 3 contacts:

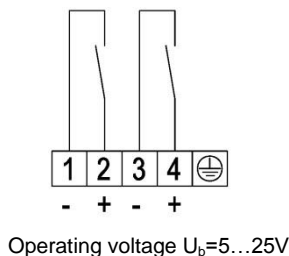
Contact 1	left target value display
Contact 2	middle target value display
Contact 3	right target value display

### 4.2.3 Inductive contacts

Please also note the technical data in the associated data sheet KE##.

Inductive contacts may only be operated in connection with a suitable isolating unit.

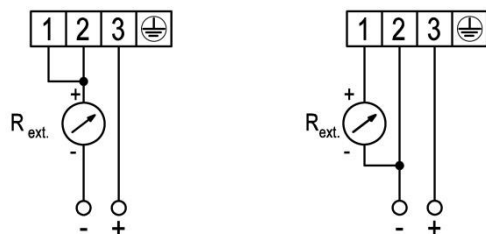
Contact 1 left target value display      Contact 2 right target value display



### 4.2.4 Rotation angle converter KINAX 3W2

2-wire connection

3-wire connection



DC auxiliary energy 12...30V

## 5 Commissioning

All electrical supply, operating and measuring lines, and the pressure connections must have been correctly installed before commissioning. All supply lines are arranged so that there are no mechanical forces acting on the device.

Check that the pressure connections do not leak before commissioning.

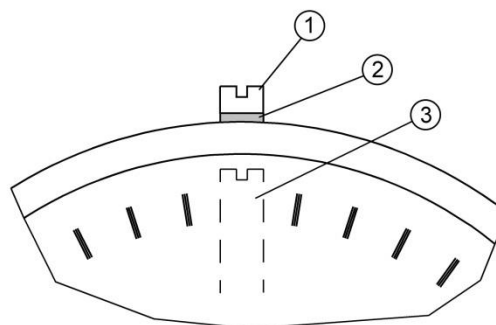
### 5.1 Zero point correction

The differential pressure measuring units are set in the factory before delivery so that they do not usually need to be adjusted at the assembly site.

Depressurise the measuring chamber (+) and (-) side or exert the existing static system pressure.

- Dismantle closing screw
- Set measurement value pointer using zero point correction screw to scale zero point.
- Mount closing screw

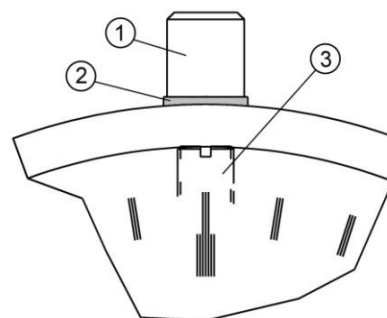
### 5.2 Position of the zero point correction screw



- 1 Closing screw
- 2 Sealing disc
- 3 Zero point correction screw

### 5.3 Position of the zero point correction screw in filled versions

**⚠ In filled models, the venting valve on the upper side of the casing must be opened before commissioning!**

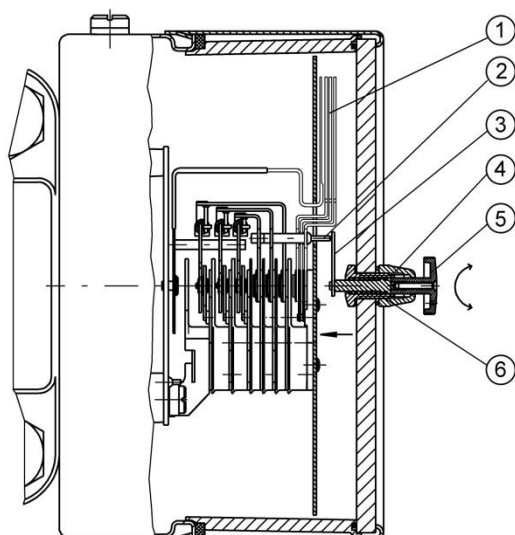


- 1 Closing screw
- 2 Sealing disc
- 3 Zero point correction screw

### 5.4 Switch point setting

There is an adjustment lock attached to the front pane of the measuring unit (see Fig.) Using the detachable adjustment key, the contacts attached to the target indicators can be set to any point along the scale.

To facilitate switching precision and the service life of the mechanical measuring system, the switching points should lie between 10% and 90% of the measuring range.



- 1 Set-point display
- 2 Drive pin
- 3 Drive arm
- 4 Adjusting lock
- 5 Adjustment key
- 6 Axle

#### Adjustment sequence:

- Place the adjustment key on the axle of the adjusting lock
- Press axle inwards until the drive arm reaches behind the setting pin of the target value indicator.
- Set the target value indicator to the required switch point by turning the key.
- Relieve the axle, remove the adjustment key

### 6 Maintenance and Repeat Tests

The instrument is maintenance-free. We recommend the following regular inspection to guarantee reliable operation and a long service life:

- Check the function in combination with downstream components.
- Check the leak-tightness of the pressure connection lines.
- Check the electrical connections.

The exact test cycles need to be adapted to the operating and environmental conditions. In combination with other devices, the operating instructions for the other devices also need to be observed.

### 7 Transport

The measuring device must be protected against impacts. It should be transported in the original packaging or a suitable transport container.

### 8 Service

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

#### Warning



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.

Return the device in the original packaging or a suitable transport container.

### 9 Accessories

Valve block 3-set, wall mounting

### 10 Waste Disposal

Incorrect disposal may pose a risk to the environment.



use them.

Please help to protect the environment by always disposing of the work pieces and packaging materials in compliance with the valid national waste and recycling guidelines or re-use them.



## 11 Technical data

Version	Nominal pressure <sup>1</sup>	Measuring cell	Application information
DA03 G...	PN40	Ø75 (small)	<p>Measuring ranges: 0...0.6 bar to 0...25 bar Allowed ambient temperature -20 °C ... +80 °C</p> <p>Remote seals: It is possible to attach remote seals for measuring ranges <math>\geq 0.6</math> mbar. The remote seals need to be designed for the displacement volume, the length of the cable and the application temperature.</p>
DA03 K...	PN100	Ø75 (small)	<p>Measuring ranges: 0...0.6 bar to 0...25 bar Allowed ambient temperature -20 °C ... +80 °C</p> <p>Remote seals: It is possible to attach remote seals for measuring ranges <math>\geq 0.6</math> mbar. The remote seals need to be designed for the displacement volume, the length of the cable and the application temperature.</p>
DA03 H...	PN40	Ø130 (large)	<p>Measuring ranges: 0...40 mbar to 0...400 mbar Allowed ambient temperature -20 °C ... +80 °C</p> <p>Limitations: Trailing needle measuring ranges <math>\geq 60</math> mbar Contacts / transmitter measuring ranges <math>\geq 100</math> mbar</p> <p>Remote seals: It is possible to attach remote seals for measuring ranges <math>\geq 160</math> mbar. The remote seals need to be designed for the displacement volume, the length of the cable and the application temperature.</p>
DA03 L...	PN100	Ø130 (large)	<p>Measuring ranges: 0...40 mbar to 0...400 mbar Allowed ambient temperature -20 °C ... +80 °C</p> <p>Limitations: Trailing needle measuring ranges <math>\geq 60</math> mbar Contacts / transmitter measuring ranges <math>\geq 100</math> mbar</p> <p>Remote seals: It is possible to attach remote seals for measuring ranges <math>\geq 160</math> mbar. The remote seals need to be designed for the displacement volume, the length of the cable and the application temperature.</p>

	General points
Rated pressure of the measuring system	Max. static operating pressure
Measurement accuracy	$\pm 1.6$ % of the measuring range
Overload capability	on-sided over-pressure-proof up to the rated pressure of the measuring system resistance to under-pressure on the (+) and (-) side
Zero-point adjustment	$\pm 25$ % of the measuring range (can be access through the upper opening in the display housing)
Admissible ambient temperature	-20 °C ... +80 °C
Admissible media temperature	max. 100 °C
Admissible storage temperature	-40 °C ... +80 °C
Temperature sensor	approx. 0.3% / 10 °C
Measured Value Display	Round housing NG100 or NG160
Pressure chambers	smooth walls without undercuts; flat measuring membranes
Enclosure protection class	IP65 as per DIN EN 60529
	<b>Ports</b>
Process connection	Flange connection based on DIN EN 61518 with internal thread G1/2 various connection ports; cutting ring screw connections (see order code)
Purge and venting connection	Inner thread G $\frac{1}{8}$ per pressure cap; closed with a sealing plug

<sup>1</sup> Rated pressure of the measuring system

	<b>Materials</b>
<b>Design of the measuring system</b>	<b>Code R</b>
Pressure caps (contact with the medium)	CrNi-steel 1.4404 (AISI 316L)
Measuring membranes (contact with the medium)	Measuring ranges $\leq 400$ mbar : CrNi-steel 1.4571 (AISI 316Ti) Measuring ranges $\geq 0.6$ bar : NiCrCo alloy. DURATHERM®
<b>Design of the measuring system</b>	<b>Code H</b>
Pressure caps (contact with the medium)	Hastelloy® C276
Measuring membranes (contact with the medium)	Measuring ranges $\leq 2.5$ bar : Hastelloy® C276 Measuring ranges $\geq 4$ bar : Standard membrane with separator film Hastelloy® C276 The model with the separator foil is not suitable for underpressure
<b>Design of the measuring system</b>	<b>Code G</b>
Pressure caps (contact with the medium)	CrNi-steel 1.4404 (AISI 316L)
Measuring membranes (contact with the medium)	Measuring ranges $\leq 2.5$ bar : Hastelloy® C276 Measuring ranges $\geq 4$ bar : Standard membrane with separator film Hastelloy® C276 The model with the separator foil is not suitable for under pressure
Intermediate plate	AlMgSiPb HART-COAT®
Needle mechanism and housing	CrNi-steel 1.4301 (AISI 304)
Inspection disk	Safety laminated glass
Dial face and needle	Aluminum
Sealings and gaskets	Viton® O-rings
	<b>Additional Attachments</b>
Additional electrical attachments	Limit signal transmitters (mechanical sliding, snap action or inductive contacts) and capacitive angular position transducers with output signal can be built into a housing augmented by a corresponding bayonet ring connector. <sup>2</sup> The measuring deviation increases by $\pm 0.5\%$ per contact due to the operation and switching of the contacts.
Fluid charging	If there are built-in contacts with silicone oil, the housing can be filled with glycerine if the meter is to operate under aggravated operating conditions such as vibrations and extreme pressure fluctuations, or in order to avoid condensate formation if used out of doors.
Marker needle	Adjustable needle in the window for noting the limit values
Trailing needle	The trailing needle is 'dragged' with the measured value indicator. As there is no fixed connection between the two needles, one-off maximum values are stored. The trailing needle can be reset using an adjusting dial in the window. Trailing needles cannot be used in conjunction with contacts.
Shut-off fitting	3-spindle valve block made of 1.4571, PN 100, DN 5, can be directly flanged Functions: Shut-off, pressure compensation (Type DZ35)
on request	PTFE-coated seals (medium-compatibility) Special scales; housing made of 1.4571
	<b>Assembly</b>
<b>Wall mounting</b>	<b>Code W</b> by means of a wall assembly plate attached to the reverse
<b>Pipe mounting</b>	<b>Code R</b> by means of a pipe assembly test for attachment to vertical or horizontal 2"-pipes
<b>Direct panel mounting</b>	<b>Code T</b> Owing to the relatively heavy weight, only small measuring cells are suitable for directly mounting to the panel: Measuring ranges $\geq 0.6$ bar, measuring value display NG100 and NG160, without contact or transmitter fittings.
<b>Panel mounting with front ring</b>	<b>Code G</b> All variants can be mounted to the panel using a supporting construction provided by the customer and a front ring set.

<sup>2</sup> See data sheet KE

11.1 Small measuring cell Ø75

Measurement range	Measured value display	Magnetic spring contacts			Inductive contacts		Capacitive angular position transducers	Trailing needle	Marker needle	Remote seal displacement volume 7.5 cm <sup>3</sup> Fischer	Pressure levels
		1	2	3	1	2					
0...40 mbar											
0...60 mbar											
0...100 mbar											
0...160 mbar											
0...250 mbar											
0...400 mbar											
-40...60 mbar											
-60...100 mbar											
-100...250 mbar											
0...0.6 bar	•	•	•	•	•	•	•	•	•	•	PN100 / PN40
0...1,0 bar	•	•	•	•	•	•	•	•	•	•	
0...1.6 bar	•	•	•	•	•	•	•	•	•	•	
0...2.5 bar	•	•	•	•	•	•	•	•	•	•	
0...4.0 bar	•	•	•	•	•	•	•	•	•	•	
0...6.0 bar	•	•	•	•	•	•	•	•	•	•	
0...10 bar	•	•	•	•	•	•	•	•	•	•	
0...16 bar	•	•	•	•	•	•	•	•	•	•	
0...25 bar	•	•	•	•	•	•	•	•	•	•	
-1...0.6 bar	•	•	•	•	•	•	•	•	•	•	
-1...1.5 bar	•	•	•	•	•	•	•	•	•	•	
-1...3 bar	•	•	•	•	•	•	•	•	•	•	
-1...5 bar	•	•	•	•	•	•	•	•	•	•	



## 11.2 Size of the measuring cell Ø130

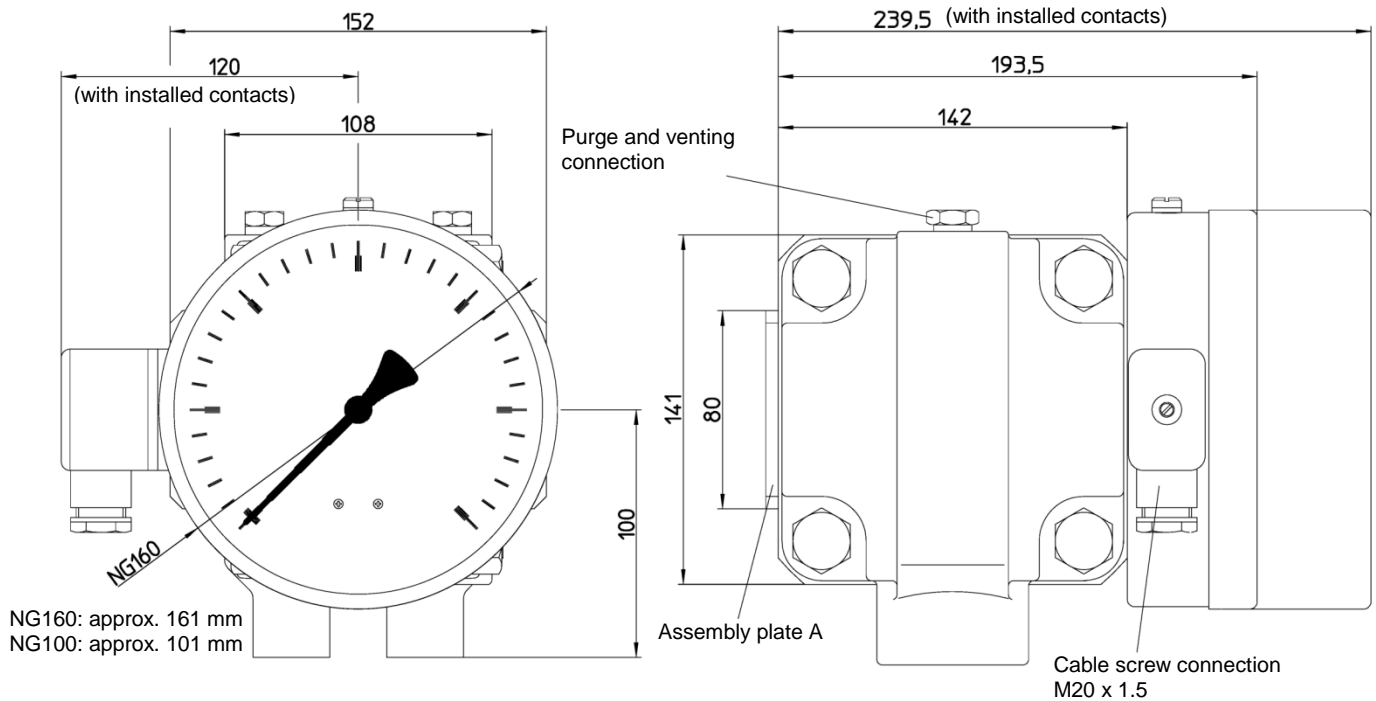
Measurement range	Measured value display	Magnetic spring contacts			Inductive contacts		Capacitive angular position transducers	Trailing needle	Marker needle	Remote seal displacement volume 14 cm <sup>3</sup>	Pressure levels
		1	2	3	1	2					
0...40 mbar	•	□	□		□	□	•		•		PN100 / PN40
0...60 mbar	•	•	•		•	•	•	•	•		
0...100 mbar	•	•	•		•	•	•	•	•	•	
0...160 mbar	•	•	•	•	•	•	•	•	•	•	
0...250 mbar	•	•	•	•	•	•	•	•	•	•	
0...400 mbar	•	•	•	•	•	•	•	•	•	•	
-40...60 mbar	•	•	•	•	•	•	•	•	•	•	
-60...100 mbar	•	•	•	•	•	•	•	•	•	•	
-100...250 mbar	•	•	•	•	•	•	•	•	•	•	
0...0.6 bar											
0...1.0 bar											
0...1.6 bar											
0...2.5 bar											
0...4.0 bar											
0...6.0 bar											
0...10 bar											
0...16 bar											
0...25 bar											
-1...0.6 bar											
-1...1.5 bar											
-1...3 bar											
-1...5 bar											

□ on request

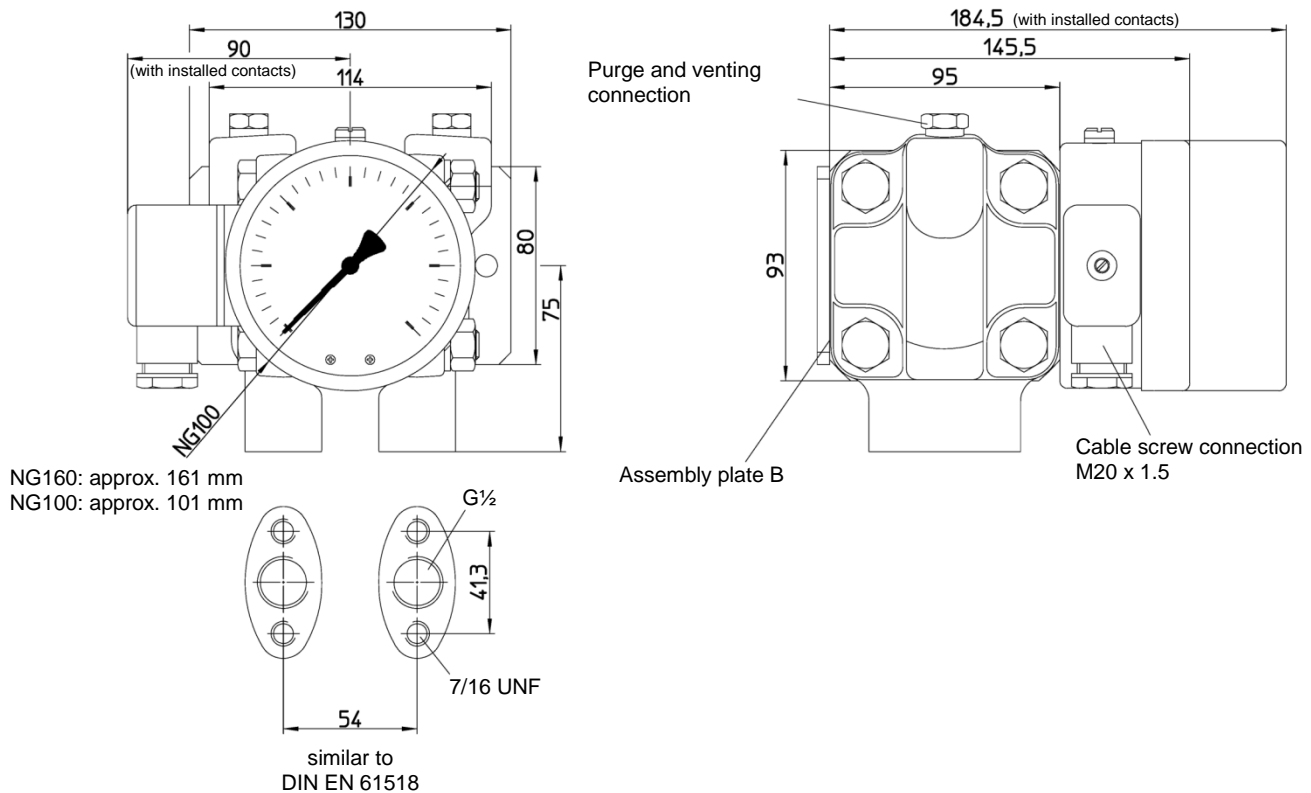
## 12 Dimensional drawings (all dimensions in mm unless otherwise specified)

### 12.1 Models

(A) for measuring ranges 40 ... 400

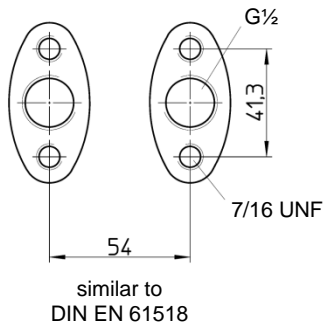


(B) for measuring ranges 0.6 ...

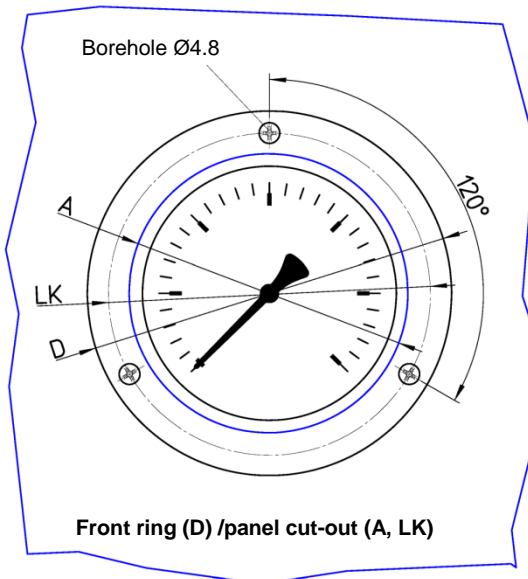
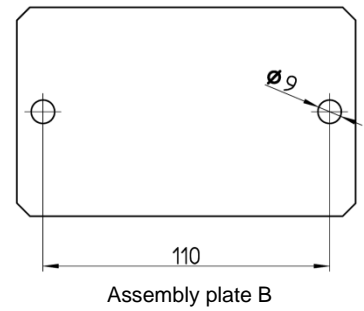
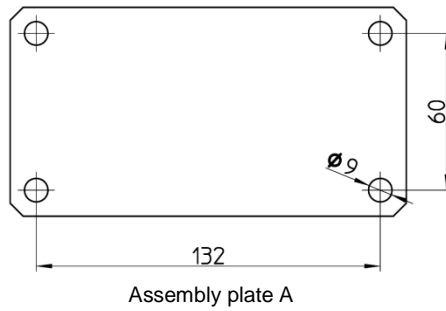


## 12.2 Assembly

### Flange connection

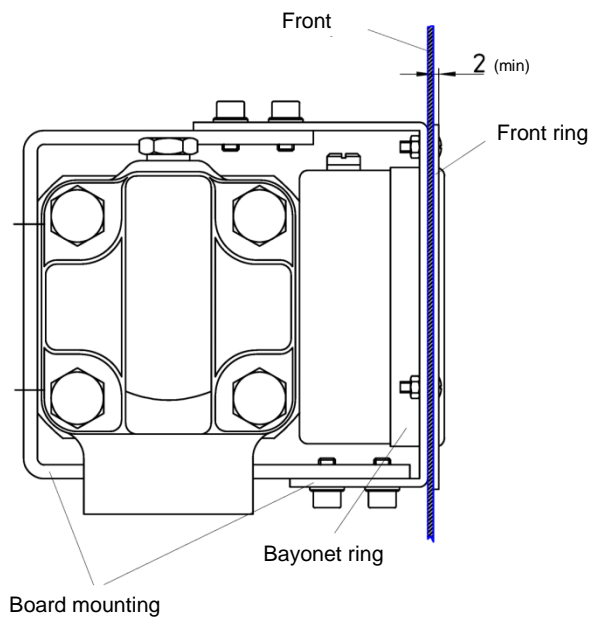
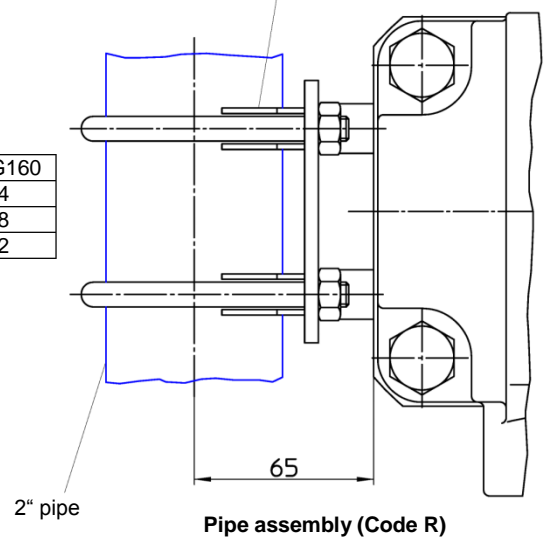


### Wall mounting (Code W)

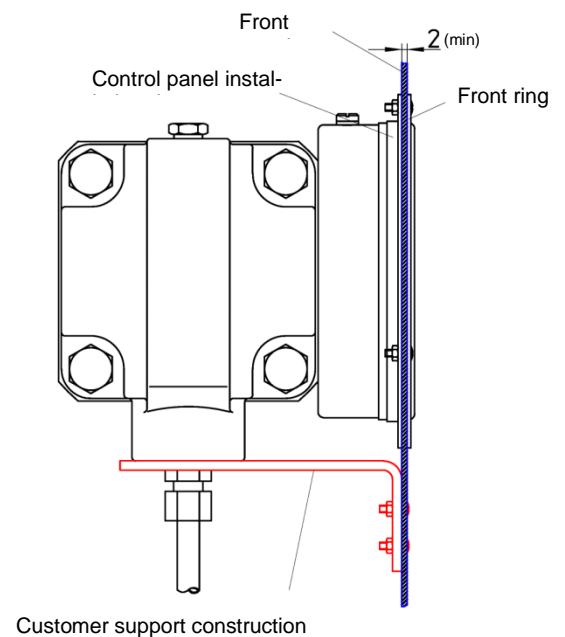


	NG100	NG160
A	104	164
LK	116	178
GB	132	192

### Pipe assembly set

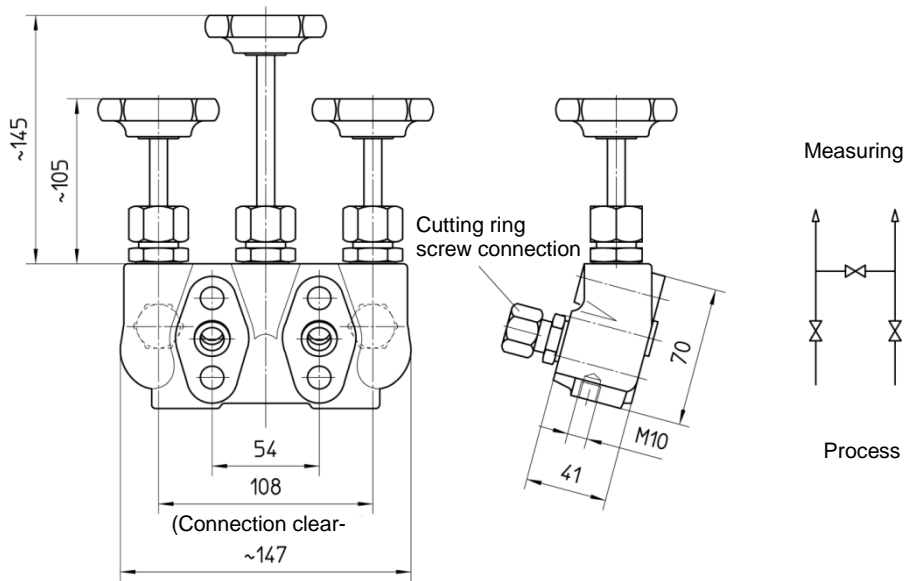


Panel mounting with panel installation fittings  
(Code T)



Direct panel mounting  
(Code G)

### 12.3 Accessories



**Art. No.** DZ3600SV2700  
**Planned measures** Valve block, 3 set, with flange connection DN5-PN420-1.4571 with cutting ring screw connection made of 1.4571 for 12 mm pipe

Plastic hand wheels

### 13 Order Codes

#### Differential pressure measuring unit Small measuring cell Ø75 Type DA03

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#### Device model

- DA03 PN40 measuring system 75 ..... > G  
DA03 PN100 measuring system 75 ..... > K

#### Measuring range

PN100	PN40	7	6
0 ... 0,6 bar	0 ... 0,6 bar	> 0	1
0 ... 1,0 bar	0 ... 1,0 bar	> 0	2
0 ... 1,6 bar	0 ... 1,6 bar	> 0	3
0 ... 2,5 bar	0 ... 2,5 bar	> 0	4
0 ... 4,0 bar	0 ... 4,0 bar	> 0	5
0 ... 6,0 bar	0 ... 6,0 bar	> 0	6
0 ... 10,0 bar	0 ... 10,0 bar	> 0	7
0 ... 16,0 bar	0 ... 16,0 bar	> 0	8
0 ... 25,0 bar	0 ... 25,0 bar	> 0	9
-1 ... 0,6 bar	-1 ... 0,6 bar	> 3	2
-1 ... 1,5 bar	-1 ... 1,5 bar	> 3	3
-1 ... 3,0 bar	-1 ... 3,0 bar	> 3	4
-1 ... 5,0 bar	-1 ... 5,0 bar	> 3	5

#### Design of the measuring system

- Pressure chamber chrome-nickel steel 1.4404 / AISI 316L  
Measuring membrane standard ..... > R  
Pressure chamber Hastelloy C4  
Measuring membrane Hastelloy C276 ..... > H  
Pressure chamber chrome-nickel steel 1.4404 / AISI 316L  
Measuring membrane Hastelloy C276 ..... > G

#### Pressure connection

- Flange connection similar to EN 61518 with internal thread G1/2 ..... > 0 3  
Connecting piece with inside thread 1/4 18 NPT ..... > 0 4  
Connecting piece with inside thread 1/2 14 NPT ..... > 0 5  
Connecting pin with outer thread G1/2 B Niro ..... > 1 3  
Connecting pin with outer thread 1/4-18 NPT EXT Niro ..... > 1 4  
Connecting pin with outer thread 1/2-14 NPT EXT Niro ..... > 1 5  
Cutting ring screw connection made of 1.4571 for 12 mm pipe ..... > 2 7

#### Measured value display

- Bayonet ring connector housing Ø 100mm 1.4301 ..... > L  
Bayonet ring connector housing Ø 160mm 1.4301 ..... > M

#### Assembly option

- Wall mounting ..... > W  
Pipe mounting ..... > R  
Panel mounting set (only for bar ranges / without additional add-ons) ..... > T  
Front ring for panel mounting ..... > G

#### Fluid charging

- No fluid filling ..... > 0  
Measuring value display with damping fluid glycerine (only for devices without contacts) ..... > 1  
Measuring value display with damping fluid paraffin oil (for fitted inductive contacts) ..... > 4  
Measuring value display with damping fluid silicone oil (for devices with and without contacts) ..... > 5

following page









## 14 Manufacturer's Declarations and Certificates

### 14.1 CE Declarations of conformity



#### EU Declaration of Conformity

(Translation)

For the product described as follows

**Product designation**      **Differential Pressure Gauge**

**Type designation**        **DA03**

it is hereby declared that it corresponds with the basic requirements specified in the following designated directives:

2014/35/EU                      *Low Voltage Directive*

2011/65/EU                      *RoHS Directive*

The products were tested in compliance with the following standards.

**Low Voltage Directive**  
EN 61010-1:2010              *Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements*

**RoHS**  
EN 50581:2012                *Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances*

Also they were subjected to the conformity assessment procedure „**Internal production control**".

The object of the declaration described above is in conformity with Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

Sole responsibility for the issue of this declaration of conformity in relation to fulfilment of the fundamental requirements and the production of the technical documents is with the manufacturer.

**Manufacturer**                      **FISCHER Mess- und Regeltechnik GmbH**

Bielefelder Str. 37a  
32107 Bad Salzufen, Germany  
Tel. +49 5222 974 0

**Documentation representative**      Mr. Stefan Richter  
Dipl. Ing.  
General Manager R & D

**The devices bear the following marking:**



Bad Salzufen,  
2016-08-01

S. Richter  
General Manager R & D

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