

Operating Manual

DE15

**Configurable differential pressure transmitter
for industrial gases**

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1 Safety guidelines

1.1 General points



This operating manual contains instructions fundamental to the installation, operation and maintenance of the instrument 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.

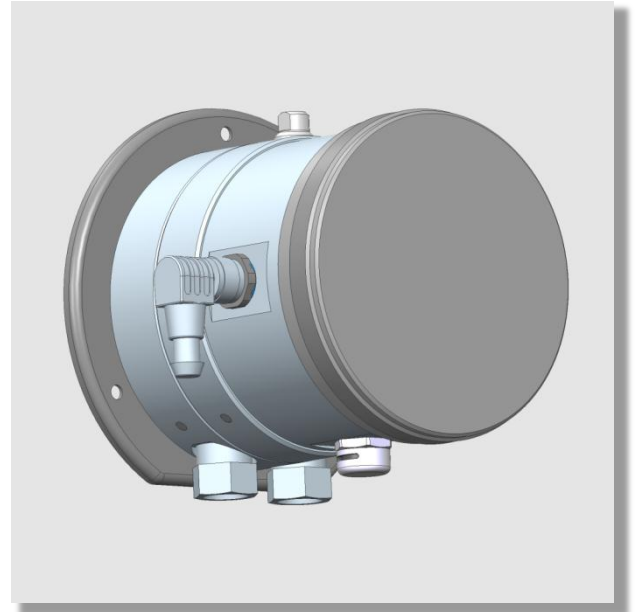
This operating manual is part of the product and must be kept close by where it is easily accessible to the responsible specialized personnel.

The subsequent sections, in particular the instructions on assembly, commissioning and maintenance, contain important safety instructions, non-observance of which can endanger persons, animals, the environment and physical objects.

1.2 Personnel Qualification

The instrument 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 training, 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 instrument or the limit values given in the technical specifications can be hazardous or cause harm to persons, the environment or the system itself.

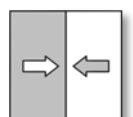
The manufacturer will not be liable for damage claims if this should happen.

1.4 Safety Instructions for the Operating Company and the Operator

The safety instructions on 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. For more information, please see 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 of or other technical alterations to the instrument 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 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.



INFORMATION!

... highlights important information for efficient and smooth operation.



TIP!

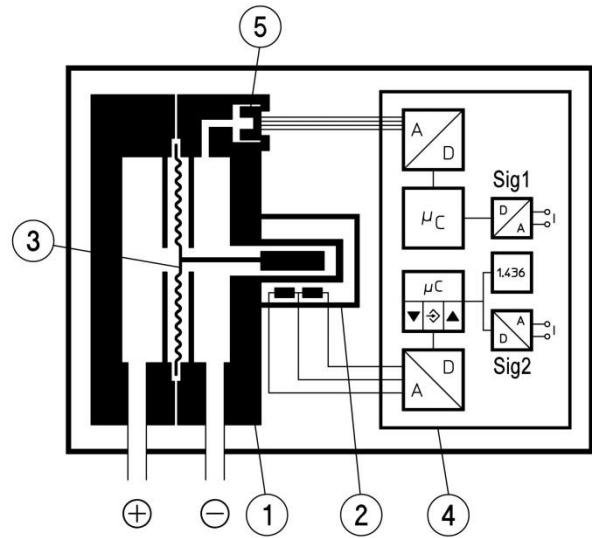
... indicates recommendations that are not specifically necessary in certain situations but which could be useful.

2 Application purpose

The transmitter serves to record the filling level or the content of upright or flat cylindrical tanks for industrial gases. The corresponding differential pressure of the filling level is measured. An additional integrated pressure sensor records the operating pressure of the system independent of this.

3 Description of the product and functional description

3.1 Functional Schematic



- 1 Pressure chamber
- 2 Inductive displacement transducer
- 3 Diaphragm
- 4 Electronics
- 5 Ceramic sensor

3.2 Design and mode of operation

The differential pressure measuring system comprises the pressure chamber, diaphragm, inductive displacement transducer and electronics.

The independent operating pressure system comprises the ceramic sensor and electronics.

3.2.1 Differential pressure measuring system

The measuring system comprises two pressure chambers that are separated by a diaphragm. Differential pressure in one of the chambers leads to a proportional displacement of the diaphragms. This movement is transferred to an inductive displacement transducer and converted into a 4...20 mA output signal by the downstream electronics.

3.2.2 Operating pressure measuring system

There is a ceramic sensor with a DMS bridge installed in the (-) side of the device. The current pressure changes the form of the ceramic membrane and leads to a proportional change of resistance in the DMS bridge. This change of resistance is converted into a 4...20 mA output signal by the downstream electronics.

4 Installation and assembly

The standard DE15 is designed for attachment to devices but can also be supplied with a rear attachment ring (mounting plate).

The instrument is calibrated ex-works for vertical installation, although it can be installed in any position required. If the installation position is not vertical, the zero-point signal can be corrected with the off-set setting (see 5.2.7).

The casing protection type IP65 is only guaranteed if a suitable power supply cable is used (see accessories).

4.1 Process connection

- By authorized and qualified specialized personnel only.
- The pipes need to be depressurized when the instrument is being connected.
- Appropriate steps must be taken to protect the instrument from pressure surges.
- Check the suitability of the instrument for the media that is to be measured.
- Maximum pressures must be observed.
- Before commissioning, check the pressure connections for leaks.

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

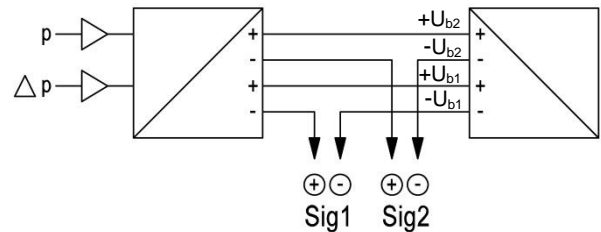
The pressure connections are marked with (+) and (-) symbols on the device. For differential pressure measurements, the higher pressure is connected to the (+) side and the lower pressure to the (-) side of the device.

If the pressure sensing lines are already pressurised at the time of commissioning, zero-point control and adjustment cannot be performed. In such cases, the instrument should be only connected to the mains.

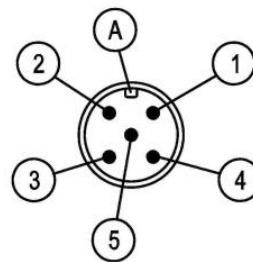
4.2 Electronic connection

- By authorized and qualified specialized personnel only.
- The instrument should be connected to the power supply according to relevant VDE and local electricity board regulations.
- Disconnect the system from the mains before connecting the instrument.
- Add a fuse adapted to the energy requirements.

2-wire connection



Pin assignment



Pin	Signal name		Cable colour
1	Differential pressure	+U _{b1} +Sig1	Brown
2	Differential pressure	- U _{b1} - Sig1	White
3	Operating pressure	+U _{b2} +Sig2	Blue
4	Operating pressure	- U _{b2} - Sig2	Black
5	Functional earth		Green/yellow
A	Coding		

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 instrument.

Before commissioning, check the pressure connections for leaks.

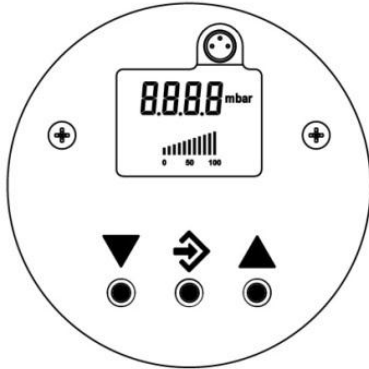
All operating information refers to the differential pressure measuring system. The operating pressure measuring system only provides an analogue signal and cannot be configured or displayed.

There is a large number of setting options for commissioning to allow optimum adaptation of the device to the measuring point and task at hand. These are described step-by-step in the following sections.

5.1 Operation

To reach the operating elements, the lid of the device must be unscrewed in an anti-clockwise direction.

5.1.1 Display



In normal mode, the 4-digit LCD display shows the current measured value numerically and in a bar chart. The unit of the basic measuring range is shown to the right of the numeric measured value.

5.1.2 Operating keys

The operating keys have the following function:

- ▼ Menu downwards, reduce value
- ◆ Enter key
- ▲ Menu upwards, increase value

The user menu is called up by pressing the middle key ◆. The reading now shows the **ESC** parameter.

By pressing the right-hand key ▲ you can page upwards through the menu and select a number of parameters.

By pressing the left-hand key ▼ you can page downwards through the menu until you return to the **ESC** parameter.

Press the middle key ◆ to call up a parameter.

You can set the parameter value using the keys ▼ and ▲

To save a set parameter value, press the key ◆.

If no key is pressed in the user menu for approx. 1 min., the software returns to the normal mode and the readout (**time out**) appears. Any values that have not been saved are lost.

5.2 User menu

<i>Description</i>	<i>Parameter name</i>
ESC	ESC
Password protection	PAS
Damping	dAN
Measuring range start.....	nA
Measuring range end.....	nE

Zero-point stabilisation	nP
Offset.....	OFF
Span correction	SPAN
Function	F
Decimal place-free variable	dPF
Measuring range start-free variable	nAF
Measuring range end-free variable	nEF
Linearity table	L In
Lower current limit	OG1
Maximum output current.....	OG2
Current for error.....	OE_r
Password.....	-P-
Reset.....	rES
ESC.....	ESC

5.2.1 Parameter **ESC**

This parameter stands at the start and end of the list of parameters. The menu is quit via this parameter.

5.2.2 Password protection **PAS**

The password is queried at this point. If the wrong password is entered, the program jumps back directly to the readout. If the password is set to 000, the query is skipped.

5.2.3 Parameter Damping **dAN**

The measuring signal is damped with this parameter.

However, it only acts on the display and output signal but not on the measuring cell itself. This parameter is used to set the response time to pressure jumps. The value range is 0.0 to 100 s.



At maximum damping, it will take more than 2 minutes for the reading to also reach zero after a pressure jump from nominal pressure (100 %) to zero.

5.2.4 Parameter Start of measuring range **nA**

This parameter defines the start of the user measuring range. Any measured value within the basic measuring range can be entered. For this measuring value, 4mA is available at the output.

5.2.5 Parameter End of measuring range **nE**

This parameter defines the end of the user measuring range. Any measured value within the basic measuring range can be entered. For this measuring value, 20mA is available at the output.

If **nA** is smaller than **nE** this is referred to a rising characteristic curve. The output signal grows as the pressure increases.

If NE is smaller than NR , this is a decreasing characteristic curve and the output signal decreases with the falling pressure.

The two parameters NR and NE allow the measuring range to be spread. The maximum spread is 4:1 and can only be carried out within the basic measuring range.

Therefore the following applies for a basic measuring range of 0...400 mbar: $NE - NE \geq 100$ mbar.

When using a value, the device checks whether a permissible spread can be achieved with the settings of the two parameters. If necessary, the error message *Err* and the value is not used.

5.2.6 Parameter Zero-point stabilising nP

The parameter serves to stabilise an unsteady reading in a steady state ($\Delta p = 0$). Its value defines a range around zero within which the measured value is shown as 0.

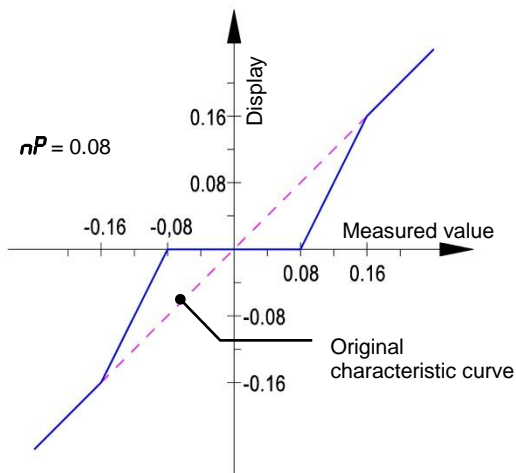


Caution:

The zero-point window is inactive in the parameter change menu.

Example:

A value of 0.08 mbar is entered for nP . In this case all measured values within the range of -0.08 mbar to +0.08 mbar are set to zero.



The reading will only not indicate zero any more if the pressure exceeds this limit of 0.8 mbar; however the measured value and display do not correspond to one hundred percent. The measured value and reading match again when the double value, in this case from 0.16 mbar, is reached again.

5.2.7 Parameter Offset *OFF*

If the device does not display zero in a steady state ($\Delta p = 0$), the measured value can be corrected with this parameter.

If the parameter is called up, the current measured value is shown. The arrow keys can be used to change the value by $\pm \frac{1}{3}$ of the basic measuring range.

The offset setting effects the differential pressure, therefore it is possible that the increment in the content display is $\neq 1$.



Caution:

When using a "free variable" (cf. 5.2.9), the display is limited to the measuring range. Therefore it is possible that the offset adjustment may appear to not react and the offset remains at zero. The offset needs to be corrected carefully.

5.2.8 Parameter Span correction $SPRn$

This parameter corrects the span of the measured signal (measuring range end). The display shows the current measured value that can be changed with the arrow keys by up to $\pm 10\%$ of the basic measuring range.

5.2.9 Parameter Function *F*

This parameter defines the function that is applied to the differential pressure.

- 0 No function
- 2 Content measurement
- 3...30 Table

F = 0 No function

The output is proportional to the differential pressure. The measured value is shown as differential pressure.

F = 2 Content measurement

The content of a flat tank is calculated from the differential pressure. The measured value is shown as a "free variable" without a unit.

The list of parameters is expanded to include the parameters Decimal place-free variable *dPPF*, Measuring range start-free variable *NRf* and Measuring range end-free variable *NEf*.

F = 3...30 Table

The differential pressure functions as an input variable on a linearity table (*L In*). The values in the table are issued as free variables. The parameter value shows the number of support points (value pairs) that are stored in the table.

The list of parameters is expanded to include the parameters Decimal place-free variable *dPPF*, Measuring range start-free variable *NRf* and Measuring

range end-free variable *NEF*. The other added parameter *L In* contains the linearity table.

5.2.9.1 Decimal place-free variable *dPF*

This parameter is used to set the number of decimal places for the free variable. The following display formats are possible:

0 0.1 0.02 0.003

5.2.9.2 Start of measuring range-free variable

NAF

This parameter defines the start of the measuring range-free variable. For this measuring value, 4 mA is available at the output.

The setting range is: -9999 ... +9999

5.2.9.3 End of measuring range free variable

NEF

This parameter defines the end of the measuring range-free variable. For this measuring value, 20mA is available at the output.

The setting range is: -9999 ... +9999

5.2.9.4 Linearity table *L In*

This parameter is used to create the linearity table mentioned under 5.2.9 ¹. The "time out" function (see 5.1.2) is deactivated.

When the parameter *L In* is called up, *End* appears initially on the display. The table is quit via this parameter.

Δp	Filling level
P-01	F-01
P-02	F-02
P-03	F-03
P-30	F-30

P stands for the input variable differential pressure, *F* for the associated filling level value (without a unit). The following number states the number of value pairs.

The number of value pairs is stated by the parameter value *F* and totals at least 3 pairs. The first pair is defined by the parameter value *NAF* and the last pair by the parameter value *NEF*. Within these limits, all value pairs are set so that there is a linear characteristic curve.

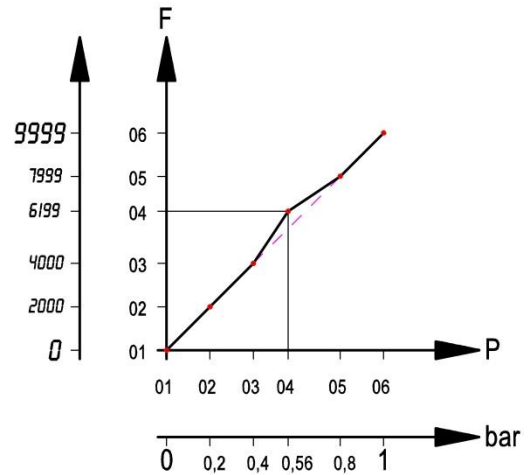
Depending on the characteristic curve direction, table values can be entered either in an increasing or

¹ A table can only be created within the limits of the basic measuring range.

decreasing order. A change of direction within the table is prohibited. It is then not possible to leave the table via *End*.

Example:

Characteristic curve of a table with 6 support points for a basic measuring range 0 ... 1 bar. Support point 4 displaced.



5.2.10 Parameter lower current limit *oG1*

The parameter *oG1* is used to define the lower limit value for the output signal when the measuring range is undercut. An output current of less than 3.5 mA cannot be set.

Values up to 21 mA can be entered, however values above 4 mA do not usually make sense.

5.2.11 Parameter Max. output current *oG2*

The parameter *oG2* is used to define the upper limit value for the output signal when the measuring range is exceeded. An output current of more than 21 mA cannot be set.

Values up to 3.5 mA can be entered, however values below 20 mA do not usually make sense.

5.2.12 Parameter Current for errors *oEr*

The parameter *oEr* is used to set the value for the error signal. The value defined via the *oEr* is issued as an output signal if the device detects an internal error and can no longer work correctly. However, not all potential errors and faults can be detected by the device itself.

The setting range is: 3.5 mA ... 21 mA

5.2.13 Parameter Password *-P-*

The parameter *-P-* serves to enter a password. A value between 001 and 999 can be selected for the password. The value 000 cancels the password function.

If a password is issued, the user menu can only be reached after the correct password has been entered (cf. 5.2.2).

Caution:

The user is not able to unlock a forgotten password!

5.2.14 Parameter Reset rE5

If the parameter is set to 1, all parameters are reset to the delivery status.

Caution:

This step is irrevocable. All user settings are lost.

6 Maintenance

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 must be adapted to the operating and ambient conditions. If various instrument components interact, the operating instructions of all the other instruments also need to be observed.

7 Transport

The instrument must not be exposed to mechanical shocks. It may only be transported in packaging specifically intended for transport.

8 Service

All damaged or faulty instruments must be sent directly to our repair department. Please coordinate all shipments with our sales department.



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

9 Accessories

See order code Section 13.1.

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.



11 Technical Specification

<i>Measuring system:</i>	<i>Differential pressure</i>	<i>Operating pressure</i>
	General points	
Admissible ambient temperature	-20 ... 70 °C	-20 ... 70 °C
Admissible media temperature	-20 ... 70 °C	-20 ... 70 °C
Admissible storage temperature	-30 ... 80 °C	-30 ... 80 °C
Measuring ranges	See order codes	25 bar, 40 bar
Allowed static operating pressure	40 bar	25 bar, 40 bar
Overload capability	One-sided over-pressure-proof up to the rated pressure of the measuring system, resistance to under-pressure on the (+) and (-) side	
Enclosure protection class	IP65 acc. to DIN EN 60529	The ceramic sensor is integrated
Weight	approx. 4.5 kg	
	Electrical data	
Rated voltage	24 VDC	24 VDC
Admissible operating voltage	$U_{b1} = 12 \dots 30$ VDC	$U_{b2} = 12 \dots 30$ VDC
Electrical connection type	2-wire	2-wire
Output signal	Sig1 = 4 ... 20 mA	Sig2 = 4 ... 20 mA
Current limitation	approx. 21 mA	approx. 26 mA
Allowed load at rated voltage	950Ω	900Ω
Allowed load at operating voltage	$R_L \leq (U_{b1} - 5 \text{ V}) / 0.02 \text{ A}$	$R_L \leq (U_{b2} - 6 \text{ V}) / 0.02 \text{ A}$
Characteristic curve	Linear, flat tank, table	Linear
Characteristic curve deviation (1)	< 1 %FS	< 1 %FS
Hysteresis (1)	< 0.5 %FS	< 0.5 %FS
Tk span (2)	< 0.1 %FS/10K	< 0.2 %FS/10K
Tk zero point (2)	< 0.1 %FS/10K	< 0.2 %FS/10K
Power consumption	Approx. 1 W	Approx. 1 W
Display	4-digit LCD	No display
	Connections	
Process connection	Inner thread G $\frac{1}{4}$ cutting ring screw connection for 8 or 10 mm pipe	
Electr. connection	Round plug connector M12 (5-pin male)	
	Materials	
Casing	1.4305	
Media-contacting material	1.4305, NiBe, 1.4404	Al ₂ O ₃
	Assembly	
	Device structure	
	Wall mounting by means of assembly plate	

- (1) : Characteristic curve deviation (non-linearity and hysteresis) at 25°C, basic measuring range (linear characteristic curve, not spread)
 (2) : With reference to the basic measuring range (linear characteristic curve, not spread), compensation range -30..60°C.

11.1 Programming (only differential pressure measuring system)

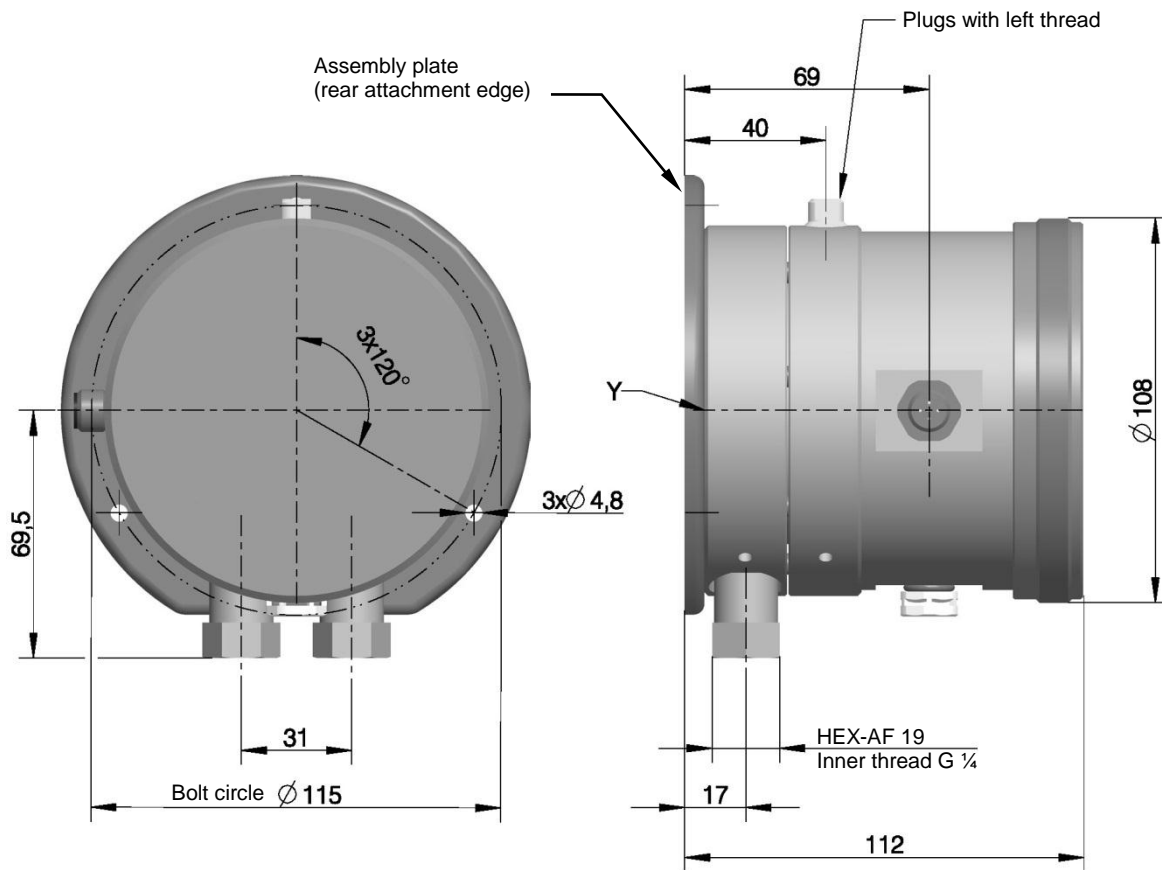
Programming is carried out using the keypad (inside) with a menu navigation system.

	Settings
Attenuation	0.0 ... 100.0 s (jump response 10/90 %) for output and display
Zero-point stabilising	0... $\frac{1}{3}$ of the basic measuring range (3)
Output signal differential pressure	User-definable within the basic measuring range (4)
Offset	$\pm 1/3$ of the basic measuring range
Implementation of characteristic curve	Linear, flat tank, table (3 30 support points)
Password	001 ... 999 (000 = no password protection)

(3) Measuring values (around zero) are set to zero.

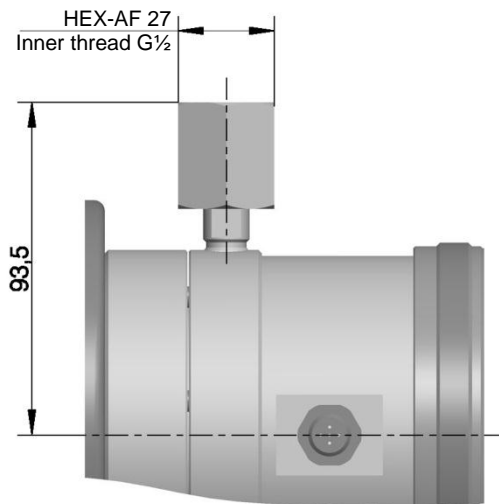
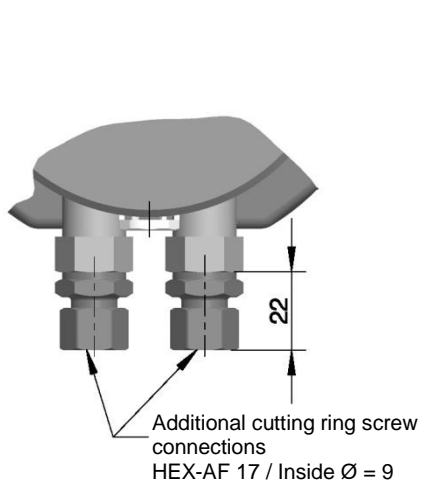
(4) Maximum effective spread 4:1. Only the output signal is influenced. Falling characteristic curve possible.

12 Dimensional drawings (All dimensions in mm unless otherwise specified)

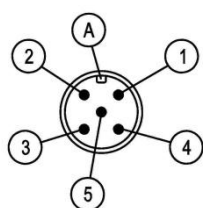


Additional cutting ring screw connections

Additional pressure connection



Electrical closure



Pin	Signal name			Cable colour
1	Differential pressure	+U _{b1}	+Sig1	Brown
2	Differential pressure	- U _{b1}	- Sig1	White
3	Operating pressure	+U _{b2}	+Sig2	Blue
4	Operating pressure	- U _{b2}	- Sig2	Black
5	Functional earth			Green/yellow
A	Coding			

13 Order Codes

Configurable differential pressure transmitter for industrial gases

Oil and grease-free (for O2 measurements)

Type DE15

						B	9	0		0	0
--	--	--	--	--	--	---	---	---	--	---	---

Measuring range allowed stat. operating pressure

0 ... 160 mbar 40 bar.....>	6 0
0 ... 250 mbar 40 bar.....>	8 2
0 ... 400 mbar 40 bar.....>	8 3
0 0.6 bar 40 bar.....>	0 1
0 1 bar 40 bar.....>	0 2
0 1.6 bar 40 bar.....>	0 3
0 2.5 bar 40 bar.....>	0 4

Design

Δp Measuring range, can be configured without operating pressure measurement.....>	D
Δp Measuring range, can be configured with integrated operating pressure measurement 25 bar.....>	E
Δp Measuring range, can be configured with integrated operating pressure measurement 40 bar.....>	F

Pressure connection

Inner thread G 1/4.....>	0 1
Swageloc clamp ring screw connection made of 1.4571 for 8 mm pipe.....>	S 4
Swageloc clamp ring screw connection made of 1.4571 for 10 mm pipe.....>	S 5

Additional pressure connection

not available.....>	0
Union nut G½.....>	1

Electrical output signal

Differential pressure measuring system: 4 - 20 mA 2-wire connection	
Operating pressure measuring system : 4 - 20 mA 2-wire connection.....>	B

Operating voltage

Differential pressure measuring system: 24 VDC	
Operating pressure measuring system : 24 VDC.....>	9

Design

Device structure..... (Standard)	0
Wall mounted (using assembly plate).....	B

13.1 Accessories

Order no.	Designation	Usage
06401822	5-pin x 10 m connection cable with M12-coupling, 90° angled	For supply / signal
06011204	Screw connection G3/8 Media 4 1.4404 bridging length 50 mm	Suitable for attachment to e.g. Samson Media 4, DE15 with pressure connection S5, on device side G3/8 connection thread
06011205	Screw connection G3/8 Media 5 1.4404 bridging length 90 mm	Suitable for attachment to e.g. Samson Media 5, DE15 with pressure connection S5, on device side G3/8 connection thread

14 Manufacturer's Declarations and Certificates

EG-Konformitätserklärung

Für das nachfolgend bezeichnete Erzeugnis

EC Declaration of Conformity

For the product described as follows

**Parametrierbarer Differenzdrucktransmitter für technische Gase
Parameterizeable Differential Pressure Transmitter for industrial gases**

DE15 # # # # # B90 # 00

gemäß gültigem Datenblatt **DB_DE_DE15**
wird hiermit erklärt, dass es den grundlegenden Anforderungen entspricht, die in den nachfolgend bezeichneten Richtlinien festgelegt sind:

in accordance with the valid data sheet **DB_EN_DE15**
it is hereby declared that it corresponds with the basic requirements specified in the following designated directives:

EG Richtlinien		EC Directives		
2004/108/EG	EMV Richtlinie	EMV	EMC Directive	EMC
2001/95/EG	Allgemeine Produktsicherheit	ProdSG	General Product Safety Directive	GPSD

Die Produkte wurden entsprechend der folgenden Normen geprüft:

The products were tested in compliance with the following standards:

EMV (EMC)	
DIN EN 61326-1	2006-10
DIN EN 61326-2-3	2007-05

ProdSG (GPSD)	
DIN EN 61010-1	2011-07

Die Geräte werden gekennzeichnet mit:

The devices bear the following marking:



Die alleinige Verantwortung für die Ausstellung dieser Konformitätserklärung in Bezug auf die Erfüllung der grundlegenden Anforderungen und die Anfertigung der technischen Unterlagen trägt der Hersteller :

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:

Fischer Mess- und Regeltechnik GmbH
Bielefelderstr. 37a
32107 Bad Salzuflen, Germany
Tel. +49 5222 974 0

(rechtsverb. Unterschrift / legally binding signature)

Bad Salzuflen, 25.03.13
(Ort, Datum / Place, date)

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Harmonisierungsrechtsvorschriften, beinhaltet jedoch keine Zusicherung von Eigenschaften.

This declaration certifies compliance with the specified harmonisation law regulations, but does not include assurance of specific properties.

