



Ex II 3G Ex nA IIC T4 Gc

Ex II 3D Ex tc IIIB T125°C Dc



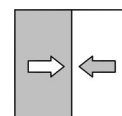
RoHS II
COMPLIANT



Data sheet

DE90

Differential pressure transmitter
PRO-LINE ®



1 Product and functional description

1.1 Performance characteristics

Typical applications

- Space and clean room monitoring
- Supply and exhaust air systems, TNV systems
- Dynamic filter monitoring
- Filter monitoring
- Flow rate measurement
- Surface coating systems
- Process monitoring

Important features

- Robust, resistant to overpressure and maintenance-free
- Simple configuration
- Measuring ranges from
 - 25 Pa to 25 kPa
 - 1 mbar to 250 mbar
- Measuring accuracy up to 0.5%
- Turn Down 4:1
- Optionally one or two-channel mode with
 - Configurable output signal
0/4 ... 20 mA, 0/2 ... 10 V or 1...5V
 - Characteristic curve implementation and adjustment to the process
 - 1 to 4 configurable switching outputs
- Multi-line LC display
 - Full graphic, colour backlighting for visualising the operating states
 - Multilingual plain text menu
- Digital interfaces
 - USB OTG
 - RS485 Modbus RTU

1.2 Intended use

The DE90 is a differential pressure transmitter with additional switch outputs. It is suitable for measuring overpressure, under-pressure and differential pressure in neutral gaseous media.

The device may only be used for the purpose stipulated by the manufacturer. The manufacturer will not be liable for damage arising from incorrect or improper use.

1.2.1 Explosion hazard area classification

1.2.1.1 Gas explosion protection

Devices with the order code **DE90 ## ## ## # 0 # 000 R #####** are suitable as 'Electrical equipment for use in potentially explosive areas', Zone 2 - Gases and vapours.

Designation as per Directive 2014/34/EU:

Ex II 3G Ex nA IIC T4 Gc

1.2.1.2 Dust explosion protection

Devices with the order code **DE90 ## ## ## # 0 # 000 R #####** are suitable as 'Electrical equipment for use in areas with combustible dust', Zone 22 - dry dusts.

Designation as per Directive 2014/34/EU:

Ex II 3D Ex tc IIIB T125°C Dc

$-10^{\circ}\text{C} \leq T_{\text{amb}} \leq 60^{\circ}\text{C}$

1.3 Function diagram

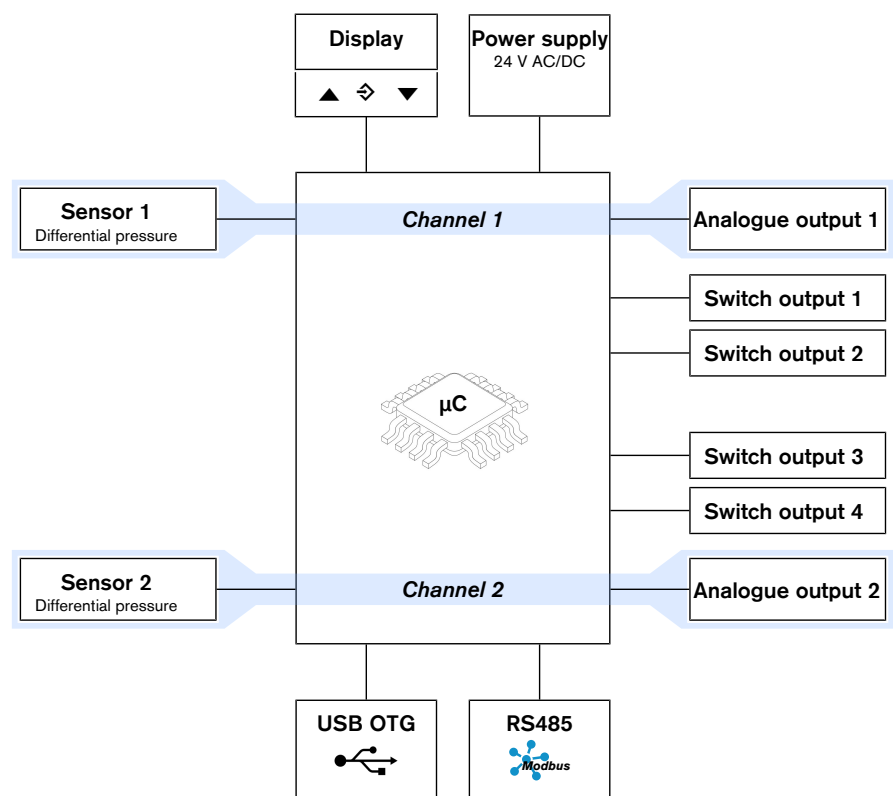


Fig. 1: Function diagram

1.4 Design and mode of operation

The device is based on a piezo-resistive sensor element that is suitable for measuring overpressure, under-pressure and differential pressure. The pressures to be compared directly act on a silicon diaphragm equipped with a measuring bridge.

When the pressure is equal, the measuring diaphragm is in its idle state. If a pressure difference occurs, the diaphragm is deflected, causing a change in resistance of the applied measuring bridge. This change is evaluated by the electronics integrated in the instrument and converted into a display, switching contacts and output signal.

The output signal can be damped, spread, inverted and also non-linearly transformed via a table function.

In the version with only one channel, the device has one analog output and two switching outputs. In the version with two channels, the device has two analog outputs and four switching outputs. Analog and switching outputs can be freely assigned to the measuring channels.

The device can be equipped with two digital interfaces.

1. USB OTG

All devices have a USB interface which can be used for firmware updates as well as for importing and exporting parameters. This can be done with a USB stick or by connecting a computer (e.g. laptop).

2. RS485 Modbus RTU

The device can optionally be equipped with a Modbus interface. In this case, the analog and switching outputs are not available. The measured values can then be interrogated by the master via Modbus.

1.5 Equipment versions

Process connections

The presented connections are used for all models.

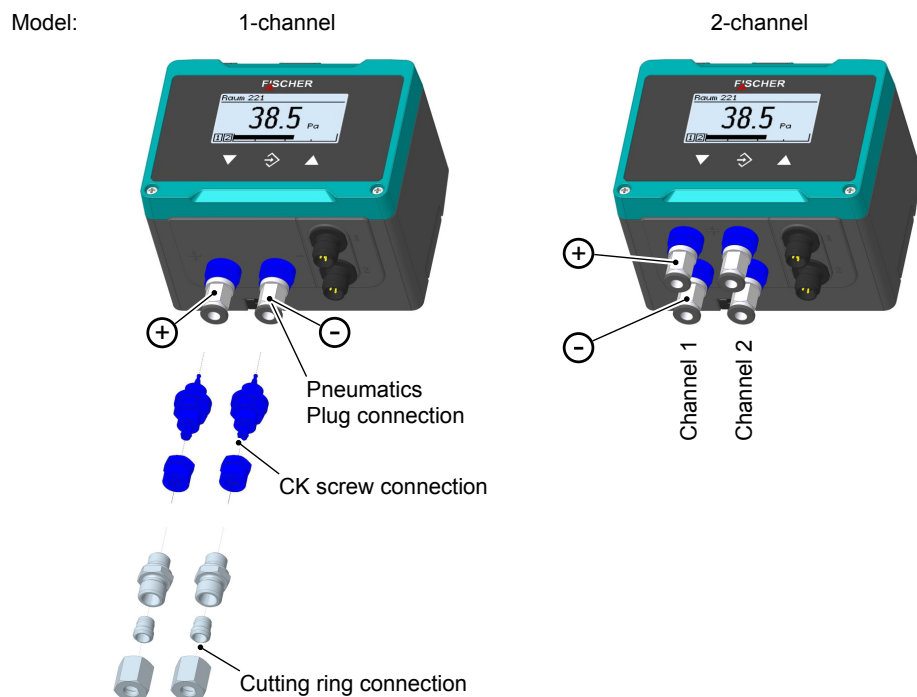


Fig. 2: Process connections

Electrical connections

Two M12 flange connectors are used for the electrical connection.

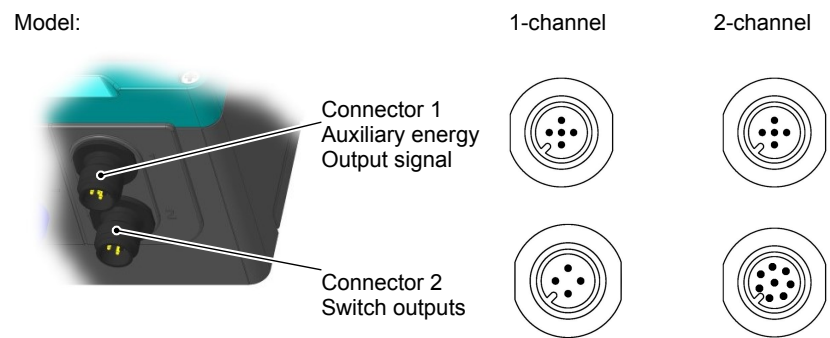


Fig. 3: Electrical connections

ATEX Version



Fig. 4: ATEX Version

2 Technical data

2.1 General

Type designation	DE90
Pressure type	Differential pressure
Measurement principle	Piezo-resistive
Reference conditions (acc. to IEC 61298-1)	
Temperature	+15 ... +25 °C
Relative humidity	45 ... 75 %
Air pressure	86 ... 106 kPa 860 ... 1060 mbar
Installation position	vertical

2.2 Input variables

Asymmetric measuring ranges:

Measuring range (Channel 1 2)		Overload	Bursting pressure	Sensor type
	0 ... 25 Pa	750 mbar	1 bar	A
	0 ... 40 Pa	750 mbar	1 bar	A
	0 ... 60 Pa	750 mbar	1 bar	A
0 ... 1 mbar	0 ... 100 Pa	750 mbar	1 bar	A
0 ... 1.6 mbar	0 ... 160 Pa	750 mbar	1 bar	A
0 ... 2.5 mbar	0 ... 250 Pa	750 mbar	1 bar	A
0 ... 4 mbar	0 ... 400 Pa	100 mbar	200 mbar	B *
0 ... 6 mbar	0 ... 600 Pa	100 mbar	200 mbar	B *
0 ... 10 mbar	0 ... 1 kPa	100 mbar	200 mbar	B *
0 ... 16 mbar	0 ... 1.6 kPa	400 mbar	800 mbar	B
0 ... 25 mbar	0 ... 2.5 kPa	400 mbar	800 mbar	B
0 ... 40 mbar	0 ... 4 kPa	400 mbar	800 mbar	B
0 ... 60 mbar	0 ... 6 kPa	1 bar	2 bar	B
0 ... 100 mbar	0 ... 10 kPa	1 bar	2 bar	B
0 ... 160 mbar	0 ... 16 kPa	2.5 bar	5 bar	B
0 ... 250 mbar	0 ... 25 kPa	2.5 bar	5 bar	B

*) Sensors can be delivered with a higher overload and bursting pressure capability with these measuring ranges (see order code/special aspects).

Symmetric measuring ranges:

Measuring range (Channel 1 2)		Overload	Bursting pressure	Sensor type
	-25 ... +25 Pa	750 mbar	1 bar	A
	-40 ... +40 Pa	750 mbar	1 bar	A
	-60 ... +60 Pa	750 mbar	1 bar	A
-1 ... +1 mbar	-100 ... +100 Pa	750 mbar	1 bar	A
-1.6 ... +1.6 mbar	-160 ... +160 Pa	750 mbar	1 bar	A
-2.5 ... +2.5 mbar	-250 ... +250 Pa	100 mbar	200 mbar	B *
-4 ... +4 mbar	-400 ... +400 Pa	100 mbar	200 mbar	B *
-6 ... +6 mbar	-600 ... +600 Pa	100 mbar	200 mbar	B *
-10 ... +10 mbar	-1 ... +1 kPa	100 mbar	200 mbar	B *

Measuring range (Channel 1 2)		Overload	Bursting pressure	Sensor
-16 ... +16 mbar	-1.6 ... +1.6 kPa	400 mbar	800 mbar	B
-25 ... +25 mbar	-2.5 ... +2.5 kPa	400 mbar	800 mbar	B
-40 ... +40 mbar	-4 ... +4 kPa	400 mbar	800 mbar	B
-60 ... +60 mbar	-6 ... +6 kPa	1 bar	2 bar	B
-100 ... +100 mbar	-10 ... +10 kPa	1 bar	2 bar	B
-160 ... +160 mbar	-16 ... +16 kPa	2.5 bar	5 bar	B
-250 ... +250 mbar	-25 ... +25 kPa	2.5 bar	5 bar	B

^{*)} Sensors can be delivered with a higher overload and bursting pressure capability with these measuring ranges (see order code/special aspects).

2.3 Output sizes

Analog outputs

The number of analog outputs depends on the device version. The output signal can be set by parameterization. On delivery, both analog outputs are set to the same signal (see nameplate).

Device Version	1-channel	2-channel
Number of analog outputs	1	2
Output signal	0 ... 20 mA 4 ... 20 mA	0 ... 10 V 2 ... 10 V 1 ... 5 V
Signal range	0.0 ... 21.5 mA	0.0 ... 10.5 V
Load R_L	$\leq 600 \Omega$	$\geq 2 \text{ k}\Omega$
Turn down	4:1	4:1

Switching outputs

The number of switching outputs depends on the device version. The assignment of the switching outputs to the channels can be freely parameterised.

Device Version	1-channel	2-channel
Number of switching outputs	2	4
Assignment on Delivery	Switch output 1 Switch output 2	Switch output 3 Switch output 4
Type	Potential-free semiconductor switch (MOS-FET)	
Progr. switching function	Single pole make contact (NO) Single pole break contact (NC)	
max. switching voltage	3...32 V AC/DC	
max. switching current	0.25 A	
max. switching capacity	8 W / 8 VA $R_{ON} \leq 4 \Omega$	

2.4 Measuring accuracy

- The data for the measuring deviation are including linearity and hysteresis.
- All data refer to the basic measuring range (see nameplate) and a compensation range of -20 ... +70 °C.

Sensor type A

Measuring range		Measurement error [%]		TC Zero point [%/10K]		TC span [%/10K]	
		Typ.	Max.	Typ.	Max.	Typ.	Max.
	0 ... 25 Pa	1.5	2.5	0.5	1.0	0.3	0.6
	0 ... 40 Pa	1.0	2.0	0.5	1.0	0.2	0.4
	0 ... 60 Pa	0.75	1.5	0.3	0.6	0.2	0.4
0 ... 1 mbar	0 ... 100 Pa	0.5	1.0	0.3	0.6	0.2	0.4
0 ... 1.6 mbar	0 ... 160 Pa	0.5	1.0	0.3	0.6	0.2	0.4
0 ... 2.5 mbar	0 ... 250 Pa	0.5	1.0	0.3	0.6	0.2	0.4
	-25 ... +25 Pa	1.0	2.0	0.4	0.8	0.2	0.4
	-40 ... +40 Pa	0.75	1.5	0.3	0.6	0.2	0.4
	-60 ... +60 Pa	0.5	1.0	0.3	0.6	0.2	0.4
-1 ... +1 mbar	-100 ... +100 Pa	0.5	1.0	0.3	0.6	0.2	0.4
-1.6 ... +1.6 mbar	-160 ... +160 Pa	0.5	1.0	0.3	0.6	0.2	0.4

Sensor type B

Measuring range		Measurement error [%]		TC Zero point [%/10K]		TC span [%/10K]	
		Typ.	Max.	Typ.	Max.	Typ.	Max.
0 ... 4 mbar	0 ... 400 Pa	0.5	1.0	0.15	0.3	0.05	0.1
0 ... 6 mbar	0 ... 600 Pa	0.5	0.75	0.15	0.25	0.05	0.1
0 ... 10 mbar	0 ... 1 kPa	0.25	0.5	0.1	0.2	0.05	0.1
0 ... 16 mbar	0 ... 1.6 kPa	0.25	0.5	0.15	0.3	0.05	0.1
0 ... 25 mbar	0 ... 2.5 kPa	0.25	0.5	0.15	0.25	0.05	0.1
0 ... 40 mbar	0 ... 4 kPa	0.25	0.5	0.1	0.2	0.05	0.1
0 ... 60 mbar	0 ... 6 kPa	0.25	0.5	0.1	0.2	0.05	0.1
0 ... 100 mbar	0 ... 10 kPa	0.25	0.5	0.1	0.15	0.05	0.1
0 ... 160 mbar	0 ... 16 kPa	0.25	0.5	0.05	0.1	0.05	0.1
0 ... 250 mbar	0 ... 25 kPa	0.25	0.5	0.05	0.1	0.05	0.1
-2.5 ... +2.5 mbar	-250 ... +250 Pa	0.5	1.0	0.15	0.3	0.05	0.1
-4 ... +4 mbar	-400 ... +400 Pa	0.5	1.0	0.1	0.2	0.05	0.1
-6 ... +6 mbar	-600 ... +600 Pa	0.5	0.75	0.1	0.15	0.05	0.1
-10 ... +10 mbar	-1 ... +1 kPa	0.25	0.5	0.05	0.1	0.05	0.1
-16 ... +16 mbar	-1.6 ... +1.6 kPa	0.25	0.5	0.1	0.2	0.05	0.1
-25 ... +25 mbar	-2.5 ... +2.5 kPa	0.25	0.5	0.1	0.15	0.05	0.1
-40 ... +40 mbar	-4 ... +4 kPa	0.25	0.5	0.05	0.1	0.05	0.1
-60 ... +60 mbar	-6 ... +6 kPa	0.25	0.5	0.05	0.1	0.05	0.1
-100 ... +100 mbar	-10 ... +10 kPa	0.25	0.5	0.05	0.1	0.05	0.1
-160 ... +160 mbar	-16 ... +16 kPa	0.25	0.5	0.05	0.1	0.05	0.1
-250 ... +250 mbar	-25 ... +25 kPa	0.25	0.5	0.05	0.1	0.05	0.1

2.5 Digital interfaces

USB interface

USB On The Go	2.0
Data rate	12 Mbit/s (Full Speed)
Port	Micro USB type B
Communication	Host/Device mode

Modbus RTU interface

interface	RS 485
Report	Modbus RTU
Modbus specification	Application Protocol Specification V1.1b3 (April 26, 2012)
Address	1 ... 255
Baud rate	2400 ... 115200 Baud
Parity	Even, uneven, parity
Stopbits	1...2

2.6 Auxiliary energy

NOTICE! A CE-conform mains adapter with a slow 200 mA fuse only may be used in the power supply circuit for ATEX devices.

Nominal voltage	24 V AC/DC
Admissible operating voltage U_b	19.2 ... 28.8 V AC/DC
Power consumption	Type 2W (VA) Max. 3W (VA)

2.7 Operating conditions

	Standard	ATEX
Ambient temperature range	-20 ... +70 °C	-20 ... +60 °C
Medium temperature range	-20 ... +70 °C	-20 ... +60 °C
Storage temperature range	-20 ... +70 °C	-20 ... +70 °C
Protection	IP65	IP65
ATEX	EN IEC 60079-0:2018 EN 60079-15:2010 EN 60079-31	
EMC	EN 60730-1:2016 EN 61326-1:2013 EN 61326-2-3:2013	
RoHS	EN IEC 63000:2018	

2.8 Display

Display	Full graphic LC display
Resolution	128 x 64 Pixel
Backlight	RGB
Measured value display	6 digits

2.9 Construction design

Process connection		Ø outside	Ø inside
CK screw connections made of aluminium	Hose	6 mm	4 mm
	Hose	8 mm	6 mm
Pneumatic connector socket in nickel-plated brass	Hose	6 mm	4 mm
	Hose	8 mm	6 mm
Cutting ring connection in stainless steel	Pipe	6 mm	
	Pipe	8 mm	

Electrical connection	1-channel	2-channel
Connector 1 : Auxiliary energy, output	5-pin male	5-pin male
Connector 2 : Switching outputs	4-pin male	8-pin male

Installation position	User-defined
Dimensions (without connections)	120 x 81.5 x 95 mm
Weight	max. 380 g

2.9.1 Materials

Materials of the parts that come into contact with the medium

Silicon, PVC, FKM, aluminium, brass, stainless steel

Materials of the parts that come into contact with the surroundings

Polyester, PET, polyamide 6.6, aluminium, nickel-plated brass, stainless steel

2.9.2 Dimensional drawings

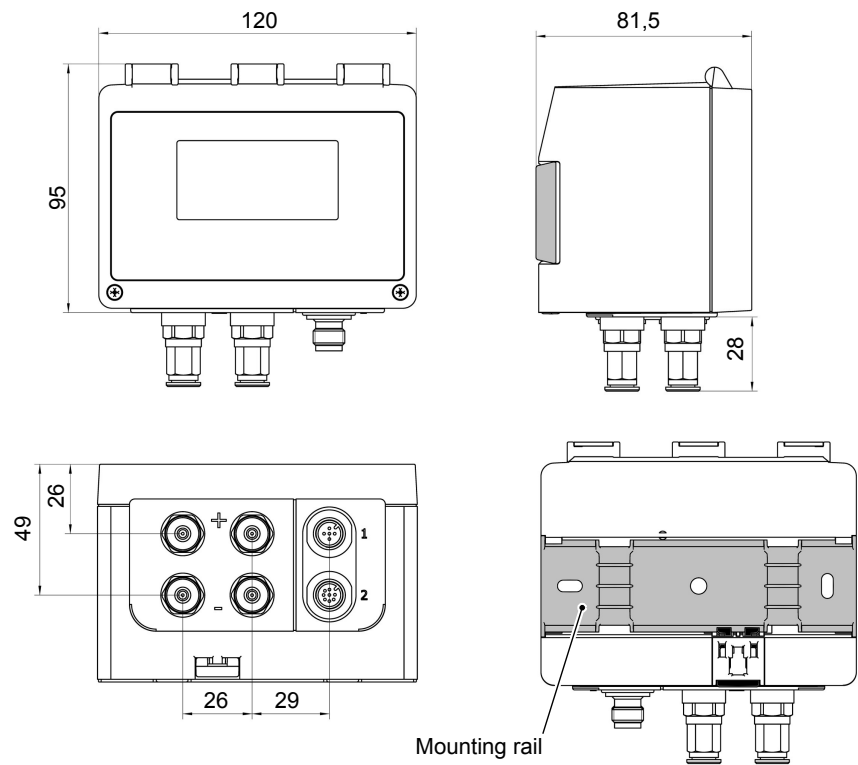


Fig. 5: Dimensional picture

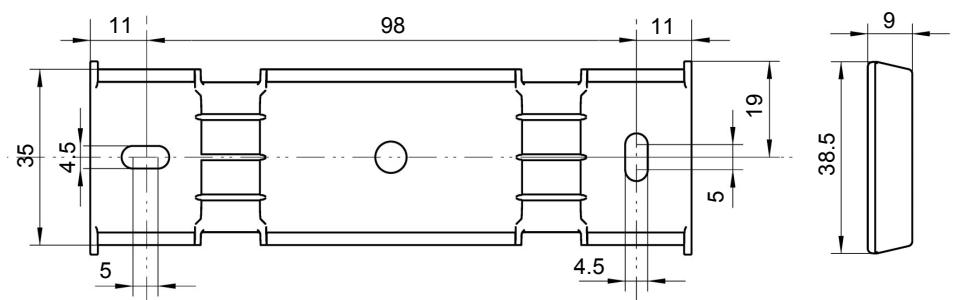
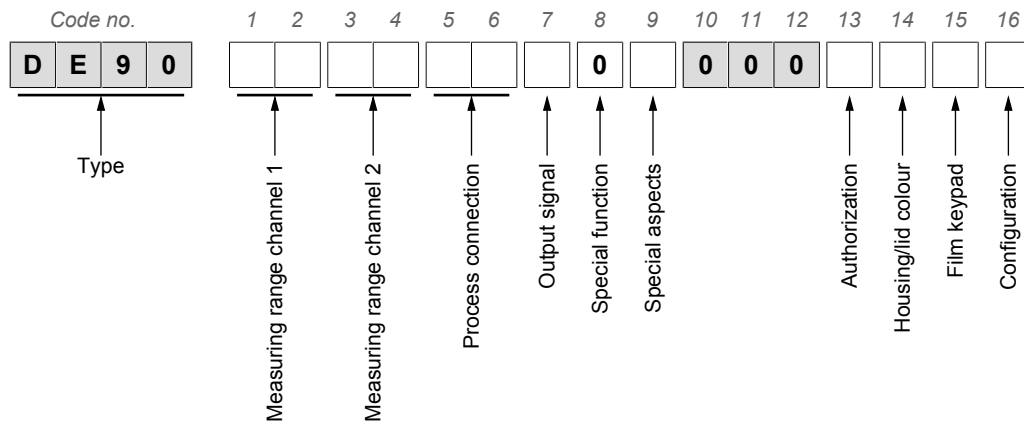


Fig. 6: Mounting rail

3 Order codes



Measuring range channel 1:

[1,2]		[1,2]	
		D1	0 ... 25 Pa
		D2	0 ... 40 Pa
		D3	0 ... 60 Pa
51	0 ... 1 mbar	D4	0 ... 100 Pa
97	0 ... 1.6 mbar	D5	0 ... 160 Pa
98	0 ... 2.5 mbar	D6	0 ... 250 Pa
52	0 ... 4 mbar	D7	0 ... 400 Pa
53	0 ... 6 mbar	D8	0 ... 600 Pa
54	0 ... 10 mbar	N1	0 ... 1 kPa
55	0 ... 16 mbar	N2	0 ... 1.6 kPa
56	0 ... 25 mbar	N3	0 ... 2.5 kPa
57	0 ... 40 mbar	N4	0 ... 4 kPa
58	0 ... 60 mbar	N5	0 ... 6 kPa
59	0 ... 100 mbar	E5	0 ... 10 kPa
60	0 ... 160 mbar	E6	0 ... 16 kPa
82	0 ... 250 mbar	E7	0 ... 25 kPa
		L5	-25 ... +25 Pa
		R6	-40 ... +40 Pa
		2L	-60 ... +60 Pa
A4	-1 ... +1 mbar	L7	-100 ... +100 Pa
A5	-1.6 ... +16 mbar	R7	-160 ... +160 Pa
A6	-2.5 ... +2.5 mbar	L6	-250 ... +250 Pa
A7	-4 ... +4 mbar	R1	-400 ... +400 Pa
A8	-6 ... +6 mbar	R2	-600 ... +600 Pa
A9	-10 ... +10 mbar	L8	-1 ... +1 kPa
B1	-16 ... +16 mbar	L9	-1.6 ... +1.6 kPa
B2	-25 ... +25 mbar	M6	-2.5 ... +2.5 kPa
C5	-40 ... +40 mbar	M7	-4 ... +4 kPa
B3	-60 ... +60 mbar	M8	-6 ... +6 kPa
B4	-100 ... +100 mbar	R8	-10 ... +10 kPa
R5	-160 ... +160 mbar	R9	-16 ... +16 kPa
B6	-250 ... +250 mbar	L5	-25 ... +25 kPa

Measuring range channel 2:

[3,4]		[3,4]	
00	without		
		D1	0 ... 25 Pa
		D2	0 ... 40 Pa
		D3	0 ... 60 Pa
51	0 ... 1 mbar	D4	0 ... 100 Pa
97	0 ... 1.6 mbar	D5	0 ... 160 Pa
98	0 ... 2.5 mbar	D6	0 ... 250 Pa
52	0 ... 4 mbar	D7	0 ... 400 Pa
53	0 ... 6 mbar	D8	0 ... 600 Pa
54	0 ... 10 mbar	N1	0 ... 1 kPa
55	0 ... 16 mbar	N2	0 ... 1.6 kPa
56	0 ... 25 mbar	N3	0 ... 2.5 kPa
57	0 ... 40 mbar	N4	0 ... 4 kPa
58	0 ... 60 mbar	N5	0 ... 6 kPa
59	0 ... 100 mbar	E5	0 ... 10 kPa
60	0 ... 160 mbar	E6	0 ... 16 kPa
82	0 ... 250 mbar	E7	0 ... 25 kPa
		L5	-25 ... +25 Pa
		R6	-40 ... +40 Pa
		2L	-60 ... +60 Pa
A4	-1 ... +1 mbar	L7	-100 ... +100 Pa
A5	-1.6 ... +1.6 mbar	R7	-160 ... +160 Pa
A6	-2.5 ... +2.5 mbar	L6	-250 ... +250 Pa
A7	-4 ... +4 mbar	R1	-400 ... +400 Pa
A8	-6 ... +6 mbar	R2	-600 ... +600 Pa
A9	-10 ... +10 mbar	L8	-1 ... +1 kPa
B1	-16 ... +16 mbar	L9	-1.6 ... +1.6 kPa
B2	-25 ... +25 mbar	M6	-2.5 ... +2.5 kPa
C5	-40 ... +40 mbar	M7	-4 ... +4 kPa
B3	-60 ... +60 mbar	M8	-6 ... +6 kPa
B4	-100 ... +100 mbar	R8	-10 ... +10 kPa
R5	-160 ... +160 mbar	R9	-16 ... +16 kPa
B6	-250 ... +250 mbar	L5	-25 ... +25 kPa

Process connection:

[5,6]	
40	CK aluminum screw connection for 6/4 mm hose
41	CK aluminum screw connection for 8/6 mm hose
P6	Pneumatic plug connector MS nickel-plated for 6/4 mm hose
P8	Pneumatic plug connector MS nickel-plated for 8/6 mm hose
24	Cutting ring connection in stainless steel for 6 mm pipe
25	Cutting ring connection in stainless steel for 8 mm pipe

Output signal:

[7]	Default setting ^{*)}
C	0 ... 10 V
A	0 ... 20 mA
B	4 ... 20 mA
M	RS485 Modbus RTU

Special functions:

[8]
0 None

Special aspects:

[9]
0 None
1 Sensor with increased overload and burst pressure resistance 1 bar only for the pressure ranges:
52 0 ... 4 mbar D7 0 ... 400 Pa
53 0 ... 6 mbar D8 0 ... 600 Pa
54 0 ... 10 mbar N1 0 ... 1 kPa
A6 -2.5 ... +2.5 mbar L6 -250 ... +250 Pa
A7 -4 ... +4 mbar R1 -400 ... +400 Pa
A8 -6 ... +6 mbar R2 -600 ... +600 Pa
A9 -10 ... +10 mbar L8 -1 ... +1 kPa

Approval:

[13]
0 None
R ATEX Zone 2 and 22

Housing/lid color:

[14]
0 Anthracite/Green
1 Black/Black (conductive housing)

For devices in ATEX version, the conductive housing is mandatory.

Foil keypad:

[15]
0 FISCHER
1 Neutral

Parameterization:

[16]	Default setting ^{*)}
0	'Standard' configuration
1	'Linear characteristic curve' configuration
2	'Flow rate' configuration
3	'Table' configuration
4	'Equation' configuration
5	'Dynamic filter monitoring' configuration
6	'Difference' configuration
Z	'Customer-specific' configuration

^{*)} The configuration can be changed on the device at any time. The delivery condition is defined by the order code. For more information about this, please refer to the operating instructions.

3.1 Accessories**Connection cable M12**

Designation	No. of Poles	length	Order no.
PUR connection cable with M12 connector	4-pin	2 m	06401993
		5 m	06401994
		7 m	06401563
		10 m	06401572
	5-pole	2 m	06401995
		5 m	06401996
		7 m	06401564
		10 m	06401573
	8-pole	2 m	09001844
		5 m	09011146
		10 m	09011016

USB interface

Designation		Order no.
Connection cable, USB-A on USB Micro-B connector	2 m	09007340
Stick USB 2.0, USB-A/Micro-B plug	8 GB	09007316

Modbus

Designation		Order no.
Terminating resistor Modbus	120 Ohm bush	04491119
	120 Ohm plug	04491120

Connection set

To connect the differential pressure transmitter to the ventilation channels comprising PVC hose, ABS measuring pipes and attachment screws.

Designation	Hose	length	Order no.
Plastic connection set	2 x 6/4 mm	1 m	04005129
		2.5 m	04005148
		5 m	04005163
		10 m	04005216
	2 x 8/6 mm	1 m	04005217
		5 m	04005218

Comments:

For 2-channel devices, two connection sets may be required in some circumstances.

Software

The configuration software inTouch is available to the fischermesstechnik.de as a download.

3.2 Information about the document

This document contains all technical data about the device. Great care was taken when compiling the texts and illustrations; Nevertheless, errors cannot be ruled out.

Subject to technical amendments.



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