Transmitter P 40 / P 41

Measuring ranges from 0...0,25 bar up to 0...400 bar, absolute and gauge pressure

Linearity error 0,3% (typical value, terminal-based)

Output signal 4...20 mA (two-wire) or 0...10 V, 0...5 V, 1...6 V (three-wire)

All parts wetted by process are of stainless steel

Flush-fitting and manometer connections

High overload limit

Special measuring ranges on request

Stainless steel housing

Intrinsically safe versions EEx ib IIC T6

Application

Transmitters of the P4X series are intended for general applications in the area of industrial pressure measurement. The lowest measuring range for the P40 is 0...0,25 bar, whilst for the P41 it is 0...1 bar, due to the flush-fitting separating diaphragm. The highest measuring range for both versions is 0...400 bar, whereby the intermediate ranges are graduated according to DIN. Permissible overload is four times span (max. 600 bar).

P4X transmitters have a silicon pressure sensor with an isolated thin-film strain gauge of polysilicon. This measuring principle features a wide temperature range, low thermal effects and good long-term stability. Furthermore, the sensor's low mass and small dimensions ensure good response to pulsating pressure media and vibrations.

The excellent properties of silicon sensors result in good reproducibility, minimal hysteresis, as well as a high overload limit of up to four times nominal pressure (max. 600 bar). Due to the low mass of the silicon sensor, fast pressure changes can also be detected.

The P40 transmitter has a process connection with an internal stainless steel separating diaphragm. The P41 has a flush-fitting external separating diaphragm, also of stainless steel, thus allowing its installation with practically no clearance volume.
The sensing element is mounted behind the separating diaphragm, and silicone oil is used as pressure transmission fluid. Each sensor is fitted with a temperature-compensating circuit which reduces the effects of environmental temperature changes.

For applications with high pressure peaks, there is a version with built-in mechanical damping. In addition, the P41 with mechanical damping has a protective baffle plate fitted to all ranges ≧ 40 bar. Pressure peaks can be caused for instance by pumps, fast shut-off valves, solenoid valves, hydraulic actuators etc., especially with incompressible pressure media.

If required, the P4X transmitters can be supplied with an intrinsically safe version EEx IIC T6. Together with an intrinsically safe DC power supply, these versions can be used in Zone 1 hazardous areas. The P41 is also available to mount the coupling on Zone 0.

All transmitters have high immunity to interference, as documented by the CE marking.

Function

The pressure applied to the silicon sensor acts on the strain gauge bridge. The resistance change of the bridge results in a pressure-proportional output signal from the bridge. Temperature effects on span and zero are reduced to a minimum by a temperature-compensating circuit.

The amplifier electronics are available in two versions: two-wire technique with 4...20 mA output, and three-wire technique with 0...10, V 0...5 V or 1...6 V output. The nominal pressure range is matched to the corresponding output signal at the factory.

The transmitters are energized with a suitable DC voltage.

TECHNICAL DATA

INPUT

Measuring ranges
Gauge pressure
P40: 0...0,25 bar up to 0...400 bar
P41: 0...1 bar up to 0...400 bar
Absolute pressure
P40: 0... 0,25 bar up to 0...400 bar
P41: 0...1 bar up to 0...400 bar
See „Ordering data"

Span start adjustment
Only on versions with cylindrical connector or DIN 43 650/A connector.
Adjustment range: ± 5% of span

Span adjustment
Only on versions with cylindrical connector or DIN 43 650/A connector.
Adjustment range: ± 5% of span

Overload limit
4 x span, max. 600 bar, (static overload)

Overload effect: ≦ 0,1% of span

Process media: Gases and liquids

Process connection
P40: G ½ A; M 20 x 1,5; G ¼ A according to DIN 16 288, Form B;
Sealing washer: type B to DIN 16 258 (not supplied)
P41: G ½ A, flush-fitting
M 20 x 1,5, flush-fitting
For metal sealing to DIN 3852, Form B, a sealing ring A21 x 26 mm ∅ to DIN 7603 must be used (not supplied).
For elastomer sealing to DIN 3852, Page 2, an FPM (Viton) sealing ring must be used (included in delivery).

Materials wetted by process
Diaphragm: 1.4435 (X2 CrNiMo 1810)
Coupling: 1.4301 (X5 CrNi 189)

Filling medium: silicone oil

OUTPUT

Output signal

4...20 mA,	two-wire
0...10 V,	three-wire
0...5 V,	three-wire
1...6 V,	three-wire

Characteristic: linear

Conformity (terminal-based)
Typically 0,3% of span
(max. 0,5% of span)

Load (4...20 mA)
$R_L = (U_S - 12\,V) / 0{,}02\,A$
(where U_S = supply voltage)

Load (0...10 V): $R_L \geqq 5\,k\Omega$

Load (0...5 V and 1...6 V): $R_L \geqq 2\,k\Omega$

Hysteresis: ≦ 0,1% of span

Settling time
approx. 300 ms (current output)
approx. 12 ms (voltage output)

Other values on request.
Minimum values:
approx. 1,5 ms without mech. damping;
approx. 5 ms with mechanical damping

POWER SUPPLY

Two-wire version 4...20 mA
Supply voltage U_S: 12...30 VDC
Supply voltage U_s: 12...26 VDC for intrinsic safty
Power supply effect:: ≦ 0,1%

Three-wire version 0...10 V
Supply voltage U_S: 15...30 VDC
Power supply effect: ≦ 0,1%

Three-wire version 0...5 V, 1...6 V
Supply voltage U_S: 12...30 VDC
Power supply effect:: (0,1%

Power consumption
≦ 6 mA (three wire)

EXPLOSION PROTECTION

Protection type
Intrinsic safety EEx ib IIC T6 according to European Standards EN 50 014 and EN 50 020

Certificate of conformity
P40: PTB-No. Ex-97.D.2044
P41: PTB-No. Ex-97.D.2045

Maximum values for circuit
voltage: = 26 V
current: = 100 mA
Power consumption: = 0,8 W

Installation
Intrinsically safe versions may be mounted inside Zone 1 areas.
P41: optional mounting the coupling on Zone 0.

ENVIRONMENTAL CONDITIONS

Permitted ambient temperature
–25...+70 °C
–25...+65 °C (intr. safe version)

Permitted process temperature
–25...+70 °C

Temperature effect on span start
Typically 0,2%/10 K (max. 0,4%/10 K)
With measuring ranges ≦ 0,6 bar, the values are 0,1% / 10 K higher.

Temperature effect on span
Typically 0,2%/10 K (max. 0,4%/10 K)
With measuring ranges ≦ 0,6 bar, the values are 0,1% / 10 K higher.

Storage temperature: –40...+85 °C

Climatic influence
Climatic category: 4 Z (with Z = 70 °C) according to VDI/VDE 3540 (corresponds to HSC according to DIN 40 040)

Shock and vibration
Shock test Eb: to DIN IEC 68-2-29
Vibration test Fc: to DIN IEC 68-2-6

ELECTROMAGNETIC COMPATIBILITY

according to EN 50 082-2 with CE marking

High-frequency interference
Amplitude modulated
(80% AM, 1 kHz)
Test to IEC 801-3, Level 3
25...1000 MHz, 10 V/m
Pulse modulated
(50% duty cycle, 200 Hz)
900 MHz, 10 V/m
Effect: ≦ 5%

Low-frequency magnetic field
50 Hz and 30 A/m

Static discharge
4 kV with contact discharge
8 kV with air gap to grounded housing
Test to IEC 801-2, Level 3

High frequency, asymmetric
Amplitude modulated
10V, 80% AM, 1 kHz, 0,15...80 MHz,
Test to IEC 801-4, Level 3

Transients, asymmetric
Test to IEC 801-4, Level 3
2 kV, 5/50 ms, 5 kHz

Low frequency, asymmetric: 20 V, 50 Hz

Transients, asymmetric and symmetric
Test to IEC 801-5, Level 3
Common mode: 2 kV
Direct mode: 1 kV

All measurements with shielded cable.

GENERAL

Materials
Housing: 1.4301 stainless steel
Connector: polyamide

Protection type
Versions with connector
IP 65 to IEC 529, EN 60 529
Versions with fixed cable
IP 68 (1 m) to IEC 529, EN 60 529

Electrical connections
Angled connector to DIN 43 650/A
Angled connector to DIN 43 650/C
Cylindrical connector
Fixed cable, length 1,5 m, 4 x 0,22 mm², screened, with venting tube

Mounting position
Not critical (if mounted 90° from the vertical, the effect is ≦ 0,3% with the 0,25 bar version)

Mounting method
Via process coupling; thread type depends on version

Mounting torque error: ≦ 0,2 %

Weight: approx. 250 g

Operating instructions
P40: 9499 040 50001
P41: 9499 040 50101

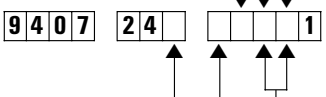
Ordering data

	Ranges	Gauge pressure	Absolute pressure
Coupling without mechanical damping	0...0,25 bar	**02**	**27**
	0...0,4 bar	**03**	**28**
	0...0,6 bar	**04**	**29**
	0...1,0 bar	**05**	**30**
	0...1,6 bar	**06**	**31**
	0...2,5 bar	**07**	**32**
	0...4 bar	**08**	**33**
	0...6 bar	**09**	**34**
	0...10 bar	**10**	**35**
	0...16 bar	**11**	**36**
	0...25 bar	**12**	**37**
	0...40 bar	**13**	**38**
	0...60 bar	**14**	**39**
	0...100 bar	**15**	**40**
	0...160 bar	**16**	**41**
	0...250 bar	**17**	**42**
	0...320 bar	**18**	**43**
	0...400 bar	**19**	**44**
	Special ranges [1]	**23**	**48**

Output signal

4...20 mA, two-wire	**0**
4...20 mA, two-wire, intrinsic safety EEx ib IIC T6	**1**
1...6 V, three-wire	**2**
0...10 V, three-wire	**3**
0...5 V, three-wire	**4**

Transmitter P 40



Process Coupling

G½A	DIN 16288, Form B	**0**
M20 x 1,5	DIN 16288, Form B	**1**
G¼A	DIN 16288, Form B	**2**

Electrical connections

Angled connector to DIN 43650/A	**0**
Angled connector to DIN 43650/C [2]	**4**
Cylindrical connector (Binder, see Accessories)	**2**
Fixed cable, length 1,5 m [2]	**5**
Fixed cable, length to specification [2] [5]	**9**

	Ranges	Gauge pressure	Absolute pressure
Coupling with built-in mechanical damping (process side)	0...6 bar	**59**	**84**
	0...10 bar	**60**	**85**
	0...16 bar	**61**	**86**
	0...25 bar	**62**	**87**
	0...40 bar	**63**	**88**
	0...60 bar	**64**	**89**
	0...100 bar	**65**	**90**
	0...160 bar	**66**	**91**
	0...250 bar	**67**	**92**
	0...320 bar	**68**	**93**
	0...400 bar	**69**	**94**
	Special ranges [1]	**73**	**98**

ACCESSORIES FOR CYLINDRICAL CONNECTORS

Description	Order Nr.
Connector socket, IP 40 with screened cable, length 1,5 m, 4 x 0,14 mm²	**4012 151 62841**
Connector socket, IP 65 with screened cable, length 1,5 m, 4 x 0,14 mm²	**4012 151 62851**

[1] Other values for span and span start on request, valid for nominal span ≧ 0,4 bar:
Span start: −100% ... +50% of respec. nominal span.
Span: 50% ...150% of respective nominal span.
Measuring limit with vacuum: 10 mbar absolute

[2] No access to potentiometers for span and span start

[5] Max. length 15 m

Ordering data

	Ranges	Gauge pressure	Absolute pressure
	0... 1,0 bar	**05**	**30**
	0... 1,6 bar	**06**	**31**
	0... 2,5 bar	**07**	**32**
	0... 4 bar	**08**	**33**
	0... 6 bar	**09**	**34**
Coupling without mechanical damping	0... 10 bar	**10**	**35**
	0... 16 bar	**11**	**36**
	0... 25 bar	**12**	**37**
	0... 40 bar	**13**	**38**
	0... 60 bar	**14**	**39**
	0...100 bar	**15**	**40**
	0...160 bar	**16**	**41**
	0...250 bar	**17**	**42**
	0...320 bar	**18**	**43**
	0...400 bar	**19**	**44**
	Special ranges [1]	**23**	**48**

Output signal

4...20 mA, two-wire	**0**
4...20 mA, two-wire, intrinsic safety EEx ib IIC T6	**1**
1...6 V, three-wire	**2**
0...10 V, three-wire	**3**
0...5 V, three-wire	**4**
4...20 mA, two-wire, intrinsic safety EEx ib IIC T6, Zone 0, mechanical damping and frame trap [3]	**9**

Transmitter P41

9407 24 1

Process connection (flush-fitting diaphragm)

G½A	metal sealing	**5**
M20 x 1,5	metal sealing	**6**
G½A	FPM sealing	**7**
M20 x 1,5	FPM sealing	**8**

Electrical connection

Angled connector to DIN 43650/A	**0**
Angled connector to DIN 43650/C [2]	**4**
Cylindrical connector (Binder, see Accessories)	**2**
Fixed cable, length 1,5 m [2]	**5**
Fixed cable, length to specification [2] [5]	**9**

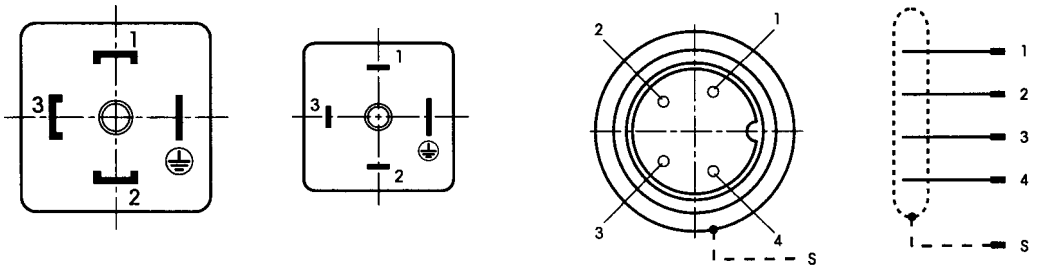
	Ranges	Gauge pressure	Absolute pressure
	0... 1,0 bar [4]	**55**	**80**
	0... 1,6 bar [4]	**56**	**81**
	0... 2,5 bar [4]	**57**	**82**
	0... 4 bar [4]	**58**	**83**
	0... 6 bar	**59**	**84**
Coupling with built-in mechanical damping (process side)	0... 10 bar	**60**	**85**
	0... 16 bar	**61**	**86**
	0... 25 bar	**62**	**87**
	0... 40 bar	**63**	**88**
	0... 60 bar	**64**	**89**
	0...100 bar	**65**	**90**
	0...160 bar	**66**	**91**
	0...250 bar	**67**	**92**
	0...320 bar	**68**	**93**
	0...400 bar	**69**	**94**
	Special ranges [1]	**73**	**98**

ACCESSORIES FOR CYLINDRICAL CONNECTORS

Description	Order Nr.
Connector socket, IP 40 with screened cable, length 1,5 m, 4 x 0,14 mm²	**4012 151 62841**
Connector socket, IP 65 with screened cable, length 1,5 m, 4 x 0,14 mm²	**4012 151 62851**

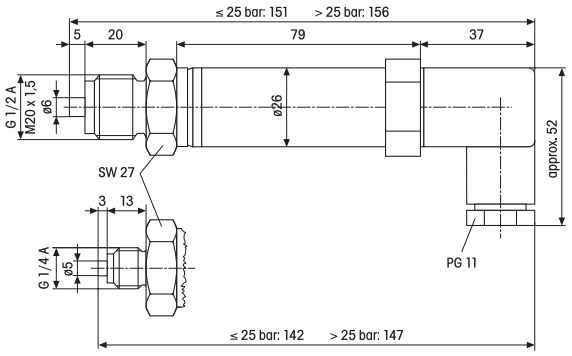
1) Other values for span and span start on request:
Span start: –100% ... +50% of respec. nominal span.
Span: 50% ... 150% of respective nominal span.
Measuring limit with vacuum: 10 mbar absolute.
2) No access to potentiometers for span and span start.
3) Intrinsically safe version for Zone 0 only possible with Range Codes 55 to 98
(mechanical damping / flame trap).
4) Mechanical damping not effective below 6 bar.
5) Max. length 15 m.

Fig. 1 Electrical connection

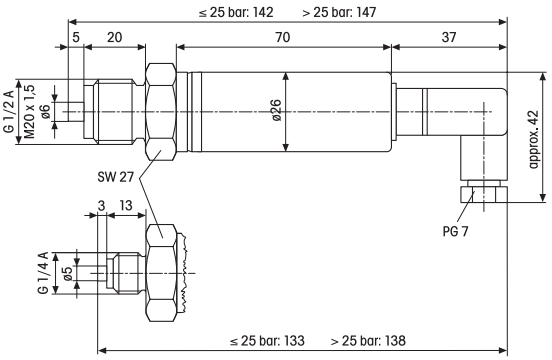


		DIN 43 650/A connector	DIN 43 650/C connector	Cylindrical connector	Fixed cable
Two-wire	**1**	**Output (+)**	**Output (+)**	**(red) output (+)**	**(red) output (+)**
	2	**Output (-)**	**Output (-)**	**(black) not connected**	**(black) not connected**
	3	**Not connected**	**Not connected**	**(white) output (-)**	**(white) output (-)**
	4	**–**	**–**	**(blue) not connected**	**(blue) not connected**
	(⏚)	**Measurement earth**	**Measurement earth**	**(green) Measurement earth**	**(green) Measurement earth**
Three-wire	**1**	**Output (+)**	**Output (+)**	**(red) output (+)**	**(red) output (+)**
	2	**Supply output (-)**	**Supply output (-)**	**(black) supply (+)**	**(black) supply (+)**
	3	**Supply (+)**	**Supply (+)**	**(white) supply output (-)**	**(white) supply output (-)**
	4	**–**	**–**	**(blue) not connected**	**(blue) not connected**
	(⏚)	**Measurement earth**	**Measurement earth**	**(green) Measurement earth**	**(green) Measurement earth**

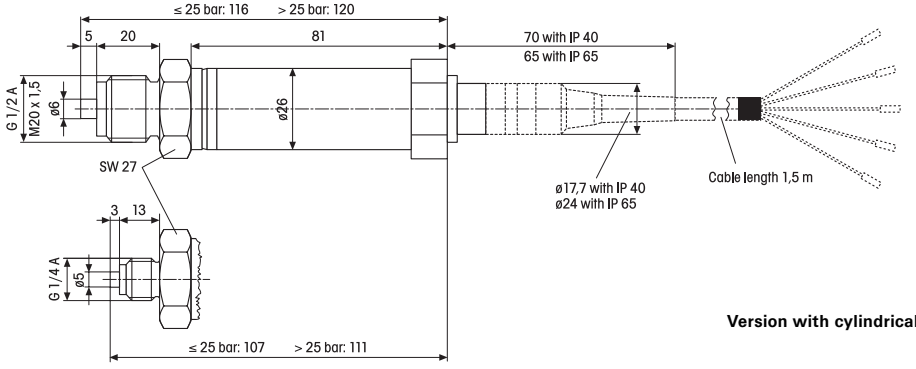
Fig. 2 Overall dimensions P40 (mm)



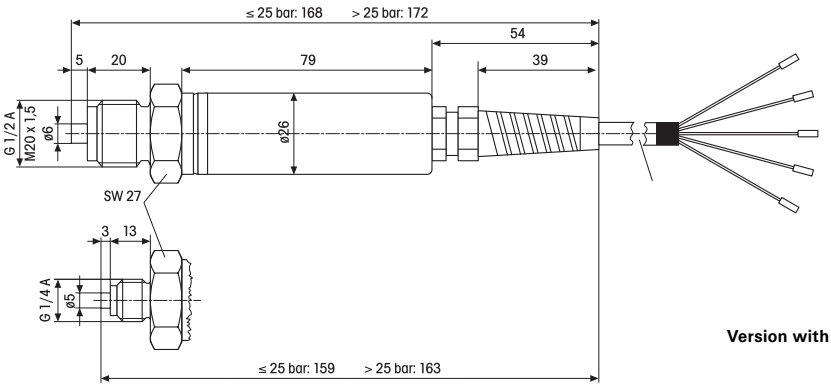
Version with DIN 43 650/A connector



Version with DIN 43 650/C connector

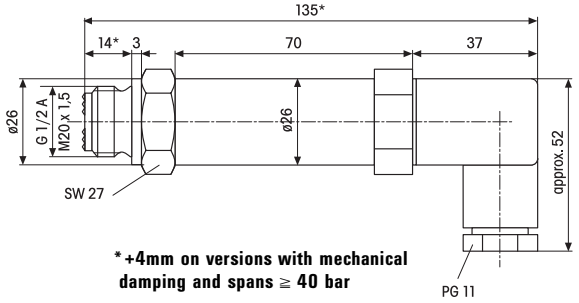


Version with cylindrical connector



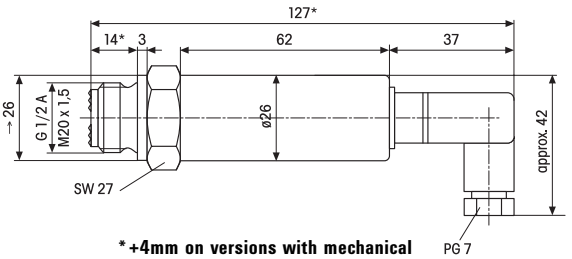
Version with fixed cable

Fig. 3 Overall dimensions P41 (mm)



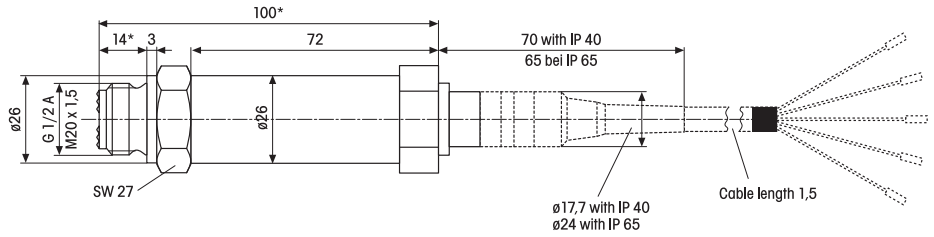
*** +4mm on versions with mechanical damping and spans ≧ 40 bar**

Version with DIN 43 650/A connector



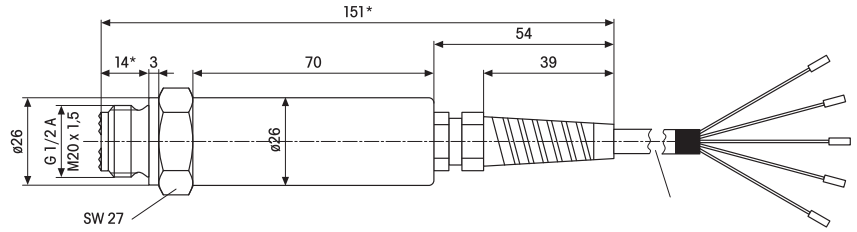
*** +4mm on versions with mechanical damping and spans ≧ 40 bar**

Version with DIN 43 650/C connector



*** +4mm on versions with mechanical damping and spans ≧ 40 bar**

Version with cylindrical connector



*** +4mm on versions with mechanical damping and spans ≧ 40 bar**

Version with fixed cable

PMA
Prozeß- und Maschinen-
Automation GmbH
P.O. Box 31 02 29
D-34058 Kassel
Tel.: +49 - 561 - 505 13 07
Fax: +49 - 561 - 505 16 61
e-mail: mailbox@pma-online.de
Internet: http://www.pma-online.de

Your local representative:

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