Pressure Transmitter Standard PT-ST2

Characteristics

Pressure type:	Relative / absolute / vacuum / ±ranges
Ranges:	0...0,4 up to 0...1600 bar / -1...+59 bar
Output:	Current / voltage/ ratiometric
Accuracy:	0,5% of span (Option: 0,25% of span)
Temperature medium:	-30...+100 °C (Option: -40...+125°C)
Material casing:	316Ti
Process connection:	G1/2 / G1/4 / 1/2 NPT / 1/4 NPT
Electr. connection:	see technical data
Protection class:	IP67 (IP65 with valve plug)

Technical Data

Pressure Input

Relative pressure:	0...0,4 up to 0...1600 bar
Absolute pressure:	0...0,4 up to 0...40 bar
Vacuum & ±ranges:	-0,4...0 up to -1...0 bar / -1...+0,6 up to -1...+59 bar
Ranges:	see table page 5
Vacuum resistance:	available

Analog Output

4...20 mA, 20...4 mA:	2-wire	Load:	≤ (U+ - 7,5 V) / 0,023 A ≤ (U+ - 11,5 V) / 0,023 A (with settling time 1 ms)
0...10 V, 10...0 V:	3-wire	Load:	> 10 kΩ
0...5 V, 1...5 V:	3-wire	Load:	>5 kΩ
0,5...4,5 V:	3-wire	Load:	>4,5 kΩ
1...6 V:	3-wire	Load:	>6 kΩ
0,5...4,5 V (ratiometric):	3-wire	Load:	>4,5 kΩ
Option:			
Signal edge:	4...20 mA:	Zero point:	3,6 mA, 3,8 mA, 4 mA (3,6 mA not combined with zero point adjustment)
		Terminal value:	20 mA, 21,5 mA, 23 mA
	0...10 V:	Terminal value:	10 V, 11,5 V

Response Time

Settling time per IEC 62594

Current (2-wire):	3 ms (standard)	Option: 1 ms
Voltage (3-wire):	2 ms (standard)	Option: 1 ms
Ratiometric (3-wire):	2 ms (standard)	Option: 1 ms
Settling time:	3 dB-limit frequency:	Standard: 500 Hz 1 ms: 1000 Hz

Option: Signal damping

With current, voltage and ratiometric:	10 / 50 / 100 / 500 / 1000 / 5000 ms
Activation time:	150 ms
Activation drift:	5 s (60 s with optional zero point adjustment 0,1%)

Applications

The Pressure Transmitter Standard is suitable for all application ranges of industrial pressure measurement technology. (Engineering, hydraulics, pneumatics, general industrial applications.)

Photos: www.pixelio.de

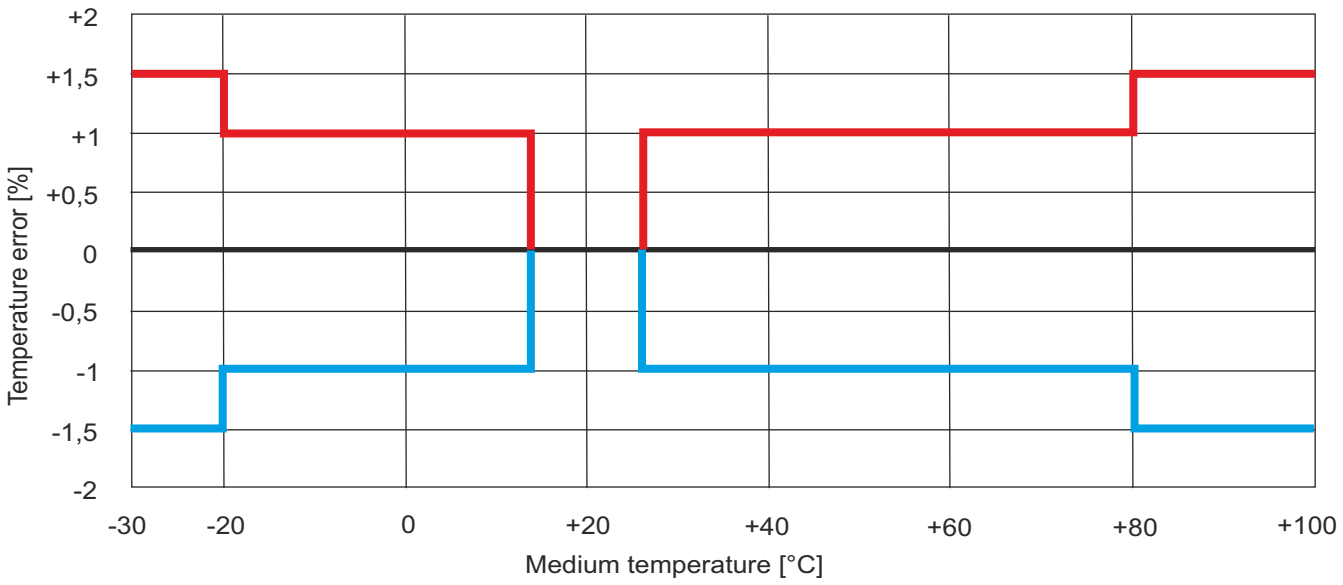
Technical Data (Continued)

Accuracy

	Non-linearity (per IEC 61298-2) (in % of span)		Accuracy at calibration temperature (in % of span)
	BFSL	Zero point adjustment	
Standard:	≤ ±0,25%	≤ ±0,5%	≤ ±0,5%
Option 1:	≤ ±0,5%	≤ ±1%	≤ ±1%
Option 2:	≤ ±0,125%	≤ ±0,25%	≤ ±0,25%
	Option 2 only for output signal 4...20 mA and 0...10 V		

Calibration temperature:	Standard:	15...25 °C
	Optionen:	4 °C ±5 °C / 40 °C ±5 °C / 60 °C ±5 °C / 80 °C ±5 °C
Zero point adjustment:	Standard:	≤ ±0,2% of span (factory setting)
	Option 1:	≤ ±0,1% of span (factory setting) Only with: Relative pressure, 4...20 mA, 0...10 V, Calibration temperature standard
	Option 2:	±10% of span (in steps of 0,05% for customers) Not available for all electric connections.
Dependence fitting position:		For ranges <1 bar there is an additional zero point offset of up to 0,15%
Non-repeatability:		≤ ±0,1% of span
Temperature hysteresis:		0,1 % of span (>80 °C)
Long-term drift:		≤ ±0,1% of span ≤ ±0,2% of span for special measuring ranges and measuring ranges <1 bar

Temperature error (for calibration temperature 15...25 °C):
For measurement ranges <1 bar, special measuring ranges and transmitters with heightened overload limit, the temperature error raises by 0,5% of span.



Supply

On output:	4...20 mA / 20...4 mA / 0...5 V / 1...5 V / 0,5...4,5 V:		8...36 VDC
	4...20 mA with optional settling time 1 ms:		12...36 VDC
	0...10 V / 10...0V:		12...36 VDC
	1...6 V:		9...36 VDC
	0,5...4,5 V ratiometric:		5 VDC ±10%
Power loss:	Current output (2-wire):	828 mW	(22 mW/K Derating of power loss at Environmental temperature ≥ 100 °C)
	Voltage output (3-wire):	432 mW	
Current consumption:	Current output (2-wire):	25 mA maximum	
	Voltage output (3-wire):	12 mA maximum	

Technical Data (Continued)

Environmental Conditions

Temperature ranges:

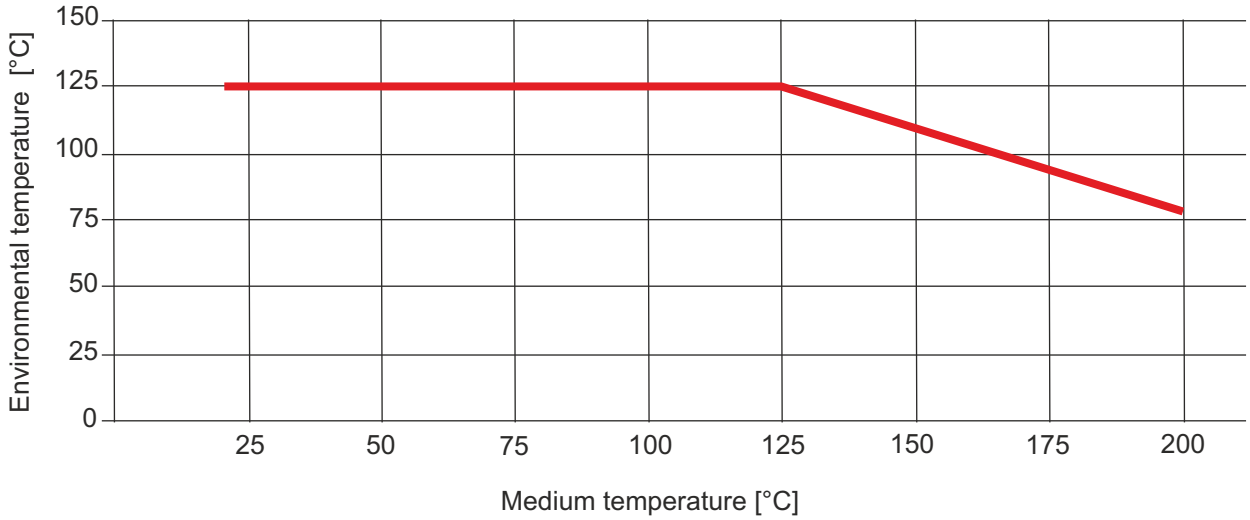
Medium and environmental temperatures can change depending on process connection sealing and electrical connection.

Standard:	Medium: -30...+100 °C	Environment:	-30...+100 °C	
Option:	Medium: -40...+125 °C	Environment:	-40...+125 °C	

Temperature ranges with integrated cooling stretch

Option 1:	Medium: -40...+150 °C	Environment:	-40...+125 °C	Max. pressure: 400 bar
Option 2:	Medium: -40...+200 °C	Environment:	-40...+125 °C	Max. pressure: 400 bar

Derating Curve Cooling Stretch



Maximum safe environmental temperature
Temperature medium <125 °C: 125 °C
Temperature medium ≥125 °C: 202 °C - (0,62*temperature medium [°C])

Maximum safe medium temperature
Temperature environment <80 °C: 200 °C
Temperature environment ≥80 °C: 326 °C - (0,61*temperature environment [°C])

Storage and transport:	Temperature range:	-40...+70 °C
	Humidity:	67% rF at 40 °C (climate class 4K4H per EN 60721-3-4)
Climate class:	Storage:	1K3 (EN 60721-3-1)
	Transport:	2K3 (EN 60721-3-2)
	Operation:	4K4H (EN 60721-3-4, without condensation or icing)
Vibration resistance:	Standard:	20 g, 10...2000 Hz (per IEC 60068-2-6)
	with M12x1 metal:	40 g, 10...2000 Hz (per IEC 60068-2-6)
	with cooling stretch:	10 g, 10...2000 Hz (per IEC 60068-2-6)
Long-term vibration resistance:		
	Standard:	10 g (per IEC 60068-2-6)
Shock resistance:	Standard:	100 g, 6 ms (per IEC 60068-2-27)
	with M12x1 metal:	500 g, 1ms (per IEC 60068-2-27)
EM-field:	30 V/m (80...1000 MHz)	
Service life:	Standard:	100 million load changes
	Ranges >600 bar:	10 million load changes
CE-conformity:	Pressure equipment directive:	2014/68/EU
	EMC directive:	2014/30/EU
		EN 61326: Emission (group 1, class B) and Jamming resistance (industrial sector)
Test report (on request):	Non-linearity 0,5%	
	Non-linearity 0,25%	
	Non-linearity 0,125%	

Technical Data (Continued)

Mechanics

Material:

Casing:	316Ti-steel	
Electrical connections:		
	Round plug M12 x 1 (4-pole):	PBT/PET GF30
	Round plug M12 x 1 (4-pole, metallic) :	316L-steel
	Right angle plug DIN 175301-803 A:	PBT/PET GF30
	Right angle plug DIN 175301-803 C:	PBT/PET GF30
	Heavy-Duty-Connector:	316L-steel
	Bajonett plug (6-pole):	316L+Al-steel
	Field housing:	316L-steel, 316Ti-steel
	Cable outlet:	
	IP 67:	PA66, PBT/PET GF30
	1/2 NPT-Conduit:	316L-steel
	IP 68:	316L-steel
	IP 68, FEP:	316L-steel
	IP 6K9K:	316L-steel
Zero point adjustment ring:	PBT/PET Gf30	
Parts in contact with medium:		
Relative measurement range:	Ranges ≤ 10 bar:	316L-steel
	Ranges > 10 bar:	316L-steel + 13-8 PH
	Ranges > 1000 bar:	ASTM 630 and 13-8 PH
Absolute pressure measurement range:		316L-steel
Sealings:	see sealings, p. 10	
Pressure transmission fluid:	Ranges < 10 bar relative: (and for all absolute)	Synthetic oil

Options for special media:

Option oil and fat free:

Residual hydrocarbon:	< 1000 mg/m²

(with protection cap on process connection)

Option oxygen, oil and fat free:

Residual hydrocarbon:	Messbereich < 30 bar:	< 500 mg/m²
	Messbereich > 30 bar:	< 200 mg/m²

(with protection cap on process connection, device shrink-wrapped in PE-bag)

Max. permissible temperature:	-20...+60 °C
Elastomer seal:	-15...+60 °C

(Only possible with FKM and max. 30 bar measurement range.)

Attention: This option is not possible for process connections with internal threads.

Option hydrogen:	on request
Ranges:	from 25 bar relative
Parts in contact with medium:	316L-steel and Elgiloy® (2.4711)
Max. permissible temperature:	-30...+30 °C

Pressure Ranges

Pressure table relative pressure (in bar)

Measurement range	0...0,4	0...0,6	0...1	0...1,6	0...2,5	0...4	0...6	0...10
Measurement range	0...16	0...25	0...40	0...60	0...100	0...160	0...250	0...400
Measurement range	0...600	0...1000	0...1600					

Pressure table absolute pressure (in bar)

Measurement range	0...0,4	0...0,6	0...1	0...1,6	0...2,5	0...4	0...6	0...10
Measurement range	0...16	0...25	0...40					

Pressure table vacuum and ±ranges (in bar)

Measurement range	-0,4...0	-0,6...0	-1...0	-1...+0,6	-1...+1,5	-1...+3	-1...+5	-1...+9
Measurement range	-1...+15	-1...+24	-1...+39	-1...+59				

Given measurement ranges are also available in psi, kg/cm², kPa and MPa. Special measuring ranges are available on request in ranges between 0…0,4 bar and 0…1600 bar. Special measuring ranges have a reduced long-time stability and increased measurement errors.

Overload limits

Given overload limits are only valid for the sensor element used. The pressure limit can be lower, depending on which process connection and seal is used. A higher overload limit leads to increased measurement errors.

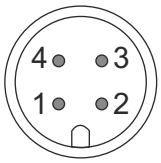
Overload limit:	<10 bar:	3 times
	≥10 bar:	2 times (absolute pressure maximum 60 bar)
Option:	<10 bar:	5 times
	≥10 bar:	3 times (relative pressure up to ≤400 bar, absolute pressure up to <16 bar)

Reference conditions (per IEC 61298-1)

Temperature:	15...25 °C
Air pressure:	860...1060 mbar
Humidity:	45...75% rF
Auxiliary energy:	24 VDC / 5 VDC for ratiometric output
Fitting position:	Calibrated at vertical fitting position (process connection facing down)

Electrical Connection

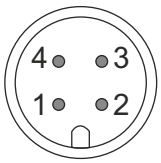
Round plug M12x1. 4-pole



	2-wire	3-wire
U+	1	1
U-	3	3
SIG+		4
Shield	casing	casing

Option:	Zero point adjustment (customized)
Delivery:	without mating plugs
Protection class:	IP67
Temperature:	-30...+100 °C
Shield:	is optional

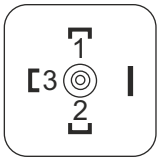
Round plug M12x1. 4-pole metal



	2-wire	3-wire
U+	1	1
U-	3	3
SIG+		4
Shield	casing	casing

Delivery:	without mating plugs
Protection class:	IP67
Temperature:	-40...+125 °C
Shield:	is optional

Right angle plug DIN 175301-803 A (valve plug)



	2-wire	3-wire
U+	1	1
U-	2	2
SIG+		3
Shield	4	4

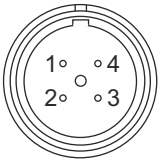
Option:	Zero point adjustment (customized)
Delivery:	without mating plugs
Protection class:	IP65
Temperature:	-30...+100 °C
Shield:	is optional

Right angle plug DIN 175301-803 C (valve plug)

	2-wire	3-wire
U+	1	1
U-	2	2
SIG+		3
Shield	4	4

Option:	Zero point adjustment (customized)
Delivery:	without mating plugs
Protection class:	IP65
Temperature:	-30...+100 °C
Shield:	is optional

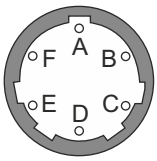
Heavy Duty Connector



	2-wire	3-wire
U+	1	1
U-	2	2
SIG+		3
Shield	casing	casing

Delivery:	without mating plugs
Protection class:	IP68
Temperature:	-40...+125 °C

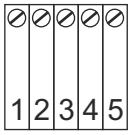
Bajonett plug, 6-pole



	2-wire	3-wire
U+	A	A
U-	B	B
SIG+		C
Shield	casing	casing

Delivery:	without mating plugs
Protection class:	IP67
Temperature:	-40...+125 °C

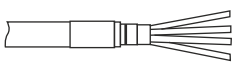
Field housing



	2-wire	3-wire
U+	1	1
U-	2	2
SIG+		3
Shield	5	5

Protection class:	IP6K9K
Temperature:	-25...+100 °C
Cable-Ø:	7...13 mm

Cable outlet connection colors



	2-wire	3-wire
U+	brown	brown
U-	blue	blue
SIG+		black
Shield	gray	gray

Shield:	Option for IP67 Option for 1/2NPT conduit

Electrical Connection (Continued)

Cable outlet variants

Cable outlets	Protection	Wires	Cable-Ø	Material	Temperature	Wire ends[1)]
IP67[2)]	IP67	3x0,34 mm²	5,5 mm	PUR	-30...+100 °C	unfinished
1/2NPT conduit	IP67	6x0,35 mm²	6,1 mm	PUR	-30...+100 °C	end splices
IP68	IP68	6x0,35 mm²	6,1 mm	PUR	-30...+125 °C	end splices
IP68, FEP	IP68	6x0,39 mm²	5,8 mm	FEP	-40...+125 °C	end splices
IP6K9K	IP6K9K	6x0,35 mm²	6,1 mm	PUR	-30...+125 °C	end splices

1) Wire ends: Option for all variants: Tinned wire ends
Option 2 for cable outlet IP67: with wire end splices

2) Option: Customized zero point adjustment

Cable length: 2 m / 5 m / other lengths on request

Further details for electrical connection

Connection designation:	U+:	Positive supply connection
	U-:	Negative supply connection
	SIG+:	Analog output

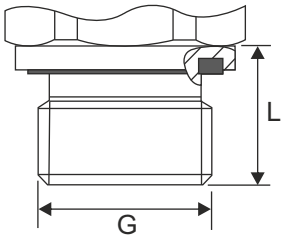
With plug connection: The given protection class is valid only in plugged condition with mating plugs of the corresponding protection class.

Electrical protection measures (not valid for ratiometric output)

Short-circuit resistance:	SIG+ vs. U-
Reverse polarity protection:	U+ vs. U-
Overvoltage resistance:	40 VDC
Insulation voltage:	750 VDC

Process Connection (in mm)

DIN 3852-E

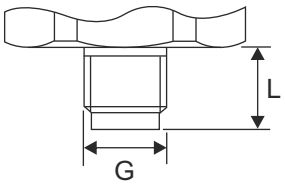


G	L (in mm)	Max. overload-limit	Option pressure channel
G1/4 A[1)]	14	600 bar	0,3 / 0,6 mm
G1/2 A	17	600 bar	0,3 / 0,6 / 12 mm[2)]
M14x1,5	14	600 bar	-

1) Cooling stretch available for medium temperatures up to 150 °C / 200 °C

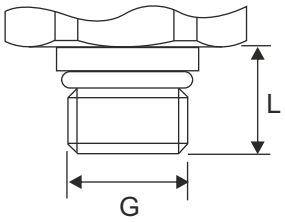
2) Pressure channel 12 mm only feasible for ranges up to and including 40 bar

EN 837



G	L (in mm)	Max. overload-limit	Option pressure channel
G1/8 B	10	800 bar	-

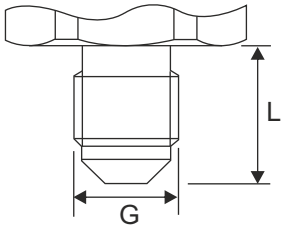
SAE J514 E



G	L (in mm)	Max. overload-limit	Option pressure channel
7/16-20 UNF BOSS	12,06	600 bar	0,3 / 0,6 / 6 mm[3)]
9/16-18 UNF BOSS	12,85	600 bar	-

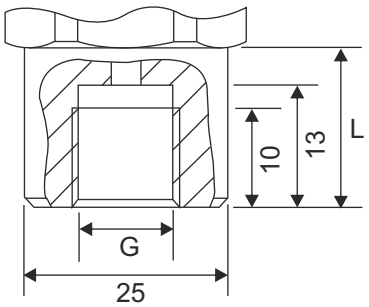
3) Pressure channel 6 mm only feasible for ranges up to and including 40 bar

SAE J514 E



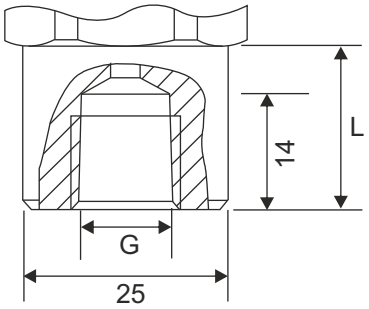
G	L (in mm)	Max. overload-limit	Option pressure channel
7/16-20 UNF J514 (sealing cone 74°)	15	1100 bar	-

G1/4 Innen



G	L (in mm)	Max. overload-limit
G1/4 internal	20	1400 bar

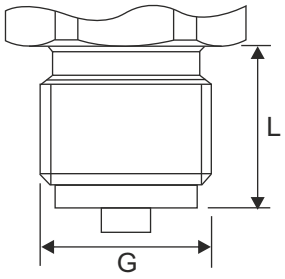
ANSI/ASME B1.20.1



G	L (in mm)	Max. overload-limit
1/4NPT internal	20	1500 bar

Process Connection (in mm) (Continued)

EN 837



G	L (in mm)	Max. overload-limit	Option pressure channel
G1/4 B[1)]	13	1400 bar	0,3 / 0,6 / 6 mm[2)]
G1/2 B[1)] (1.4404)	20	1800 bar	0,3 / 0,6 mm
(1.4542)		3200 bar	0,3 / 0,6 mm
G3/8 B	16	1400 bar	-

1) Cooling stretch available for medium temperatures up to 150 °C / 200 °C
2) Pressure channel 6 mm only feasible for ranges up to and including 40 bar

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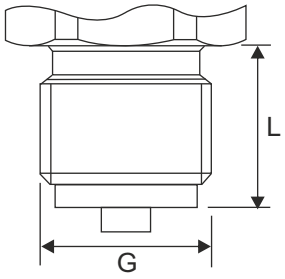
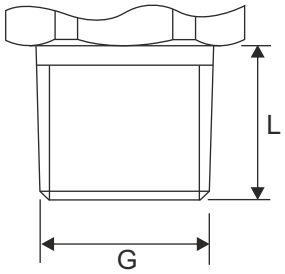


G	L (in mm)	Max. overload-limit	Option pressure channel
M12x1,5	15	1400 bar	-
M20x1,5 (1.4404)	20	1800 bar	-
(1.4542)		3300 bar	-

ANSI/ASME B1.20.1



G	L (in mm)	Max. overload-limit	Option pressure channel
1/8NPT	10	1100 bar	-
1/4NPT	13	1500 bar	0,3 / 0,6 / 6 mm[3)]
1/2NPT[1)] (1.4404)	19	1500 bar	0,3 / 0,6 / 12 mm[3)]
(1.4542)		2800 bar	0,3 / 0,6 / 12 mm[3)]

1) Cooling stretch available for medium temperatures up to 150 °C / 200 °C
2) Pressure channel 6 / 12 mm only feasible for ranges up to and including 40 bar

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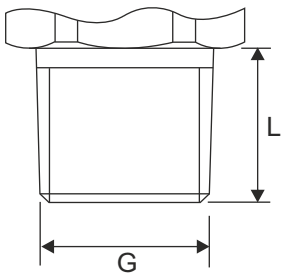
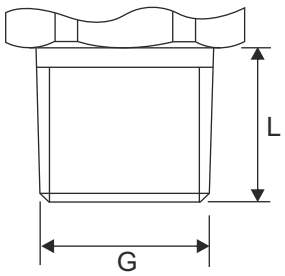


G	L (in mm)	Max. overload-limit	Option pressure channel
PT1/4	13	1600 bar	0,3 / 0,6 / 6 mm[2)]
PT1/2	19	1500 bar	-
PT3/8	15	1400 bar	-

2) Pressure channel 6 mm only feasible for ranges up to and including 40 bar

ISO 7



G	L (in mm)	Max. overload-limit	Option pressure channel
R1/4[1)]	13	1600 bar	0,3 / 0,6 / 6 mm[2)]
R1/2 (1.4404)	19	1400 bar	-
(1.4542)		2840 bar	
R3/8	15	1500 bar	-

1) Cooling stretch available for medium temperatures up to 150 °C / 200 °C
2) Pressure channel 6 mm only feasible for ranges up to and including 40 bar

The pressure channel has a length of 2,5 mm by default.

Please pay attention to the specifications for female threads and welding sockets!

Seals

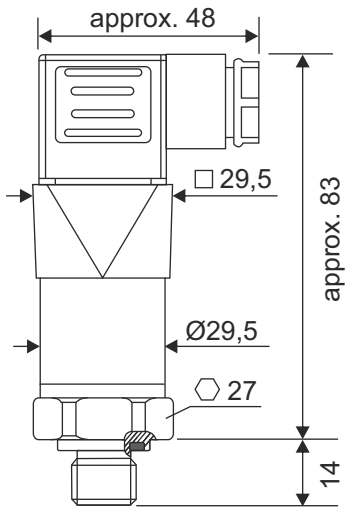
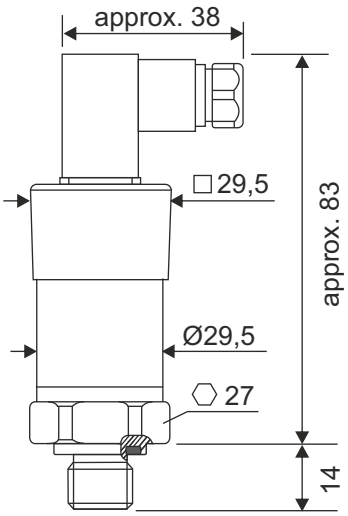
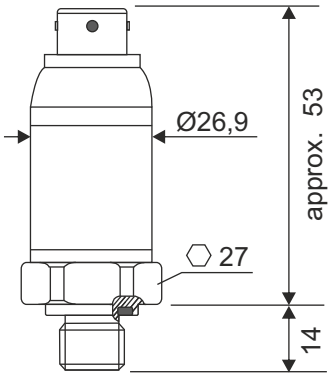
Process connection EN 837:	Standard:	Copper (-40...+125 °C)
	Option:	CrNi-steel (-40...+125 °C)
Process connection DIN 3852-E:	Standard:	NBR (-20...+100 °C)
	Option:	FKM (-15...+125 °C)
	Option:	FPM (-15...200 °C)
Process connection DIN 16288:	Standard:	Copper (-40...+125 °C)
	Option:	CrNi-steel (-40...+125 °C)
Process connection SAE J514 E:	Standard:	NBR (-20...+100 °C)
	Option:	FKM (-15...+125 °C)

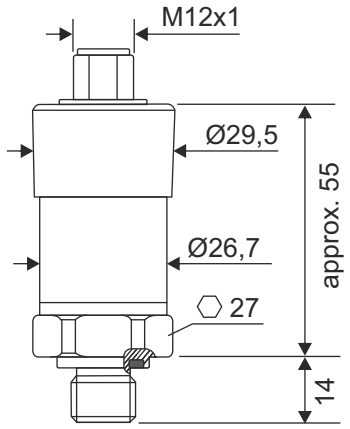
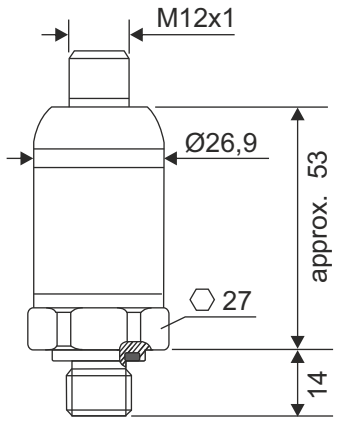
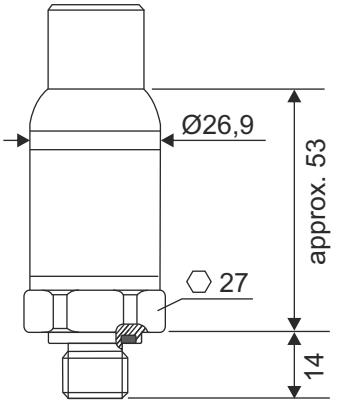
Accessories

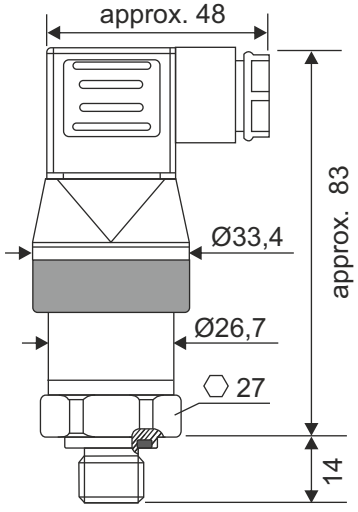
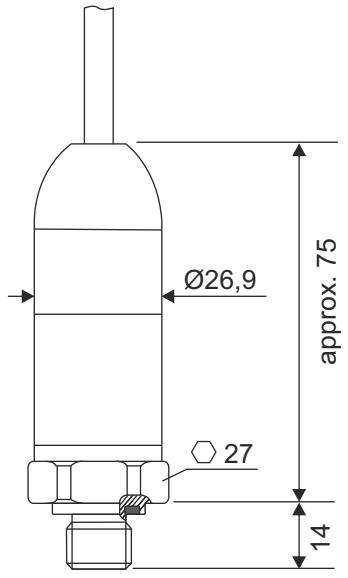
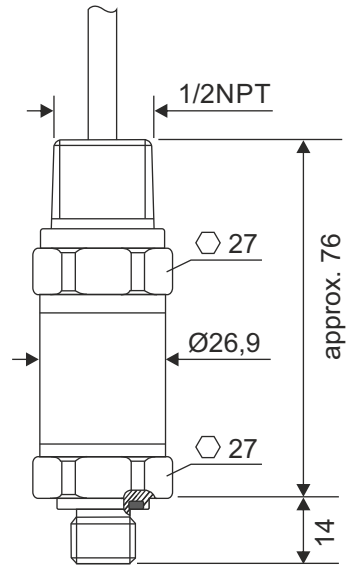
Mating plugs:		
Right angle plug DIN EN 175301-803 A:	with screw connection, metric:	without cable 2 m cable 5 m cable 2 m cable, shielded
	with screw connection, conduit:	without cable
Right angle plug DIN EN 175301-803 C:	without cable 2 m cable 5 m cable	
Round plug M12 x 1 (4-pole):	straight:	2 m cable 5 m cable 2 m cable, shielded
	angled:	2 m cable 5 m cable
Seals for mating plugs:		
Right angle plug DIN EN 175301-803 A:	brown	
Right angle plug DIN 175301-803 C:	brown	

Seals for process connection:			
G 1/8 B	Copper	G 1/4 B	Copper CrNi-steel
G 1/2 B	Copper CrNi-steel	G 3/8 B	Copper
M12 x 1,5	Copper CrNi-steel	M20 x 1,5	Copper CrNi-steel
G 1/4 A	NBR FKM FPM	G 1/2 A	NBR FKM
M14 x 1,5	NBR FKM	7/16-20 UNF BOSS	NBR FKM
9/16-18 UNF BOSS	NBR FKM		

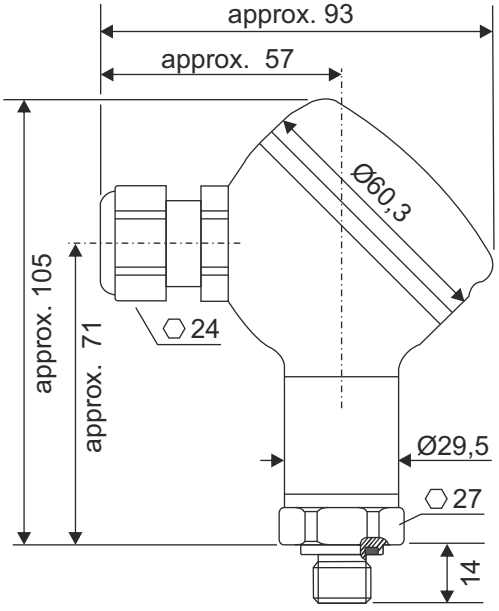
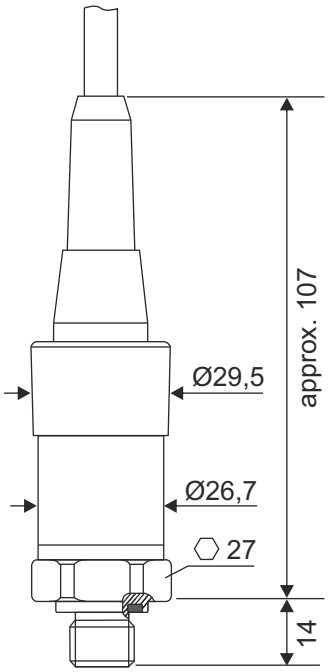
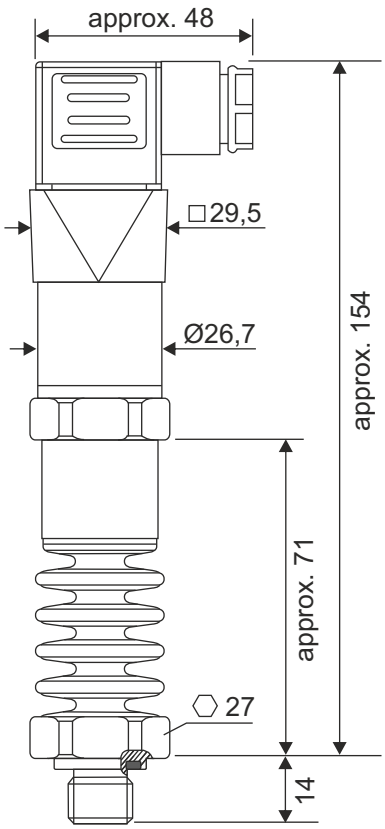
Dimensions (in mm)

Right angle plug (valve plug type A) DIN EN 175301-803A	Right angle plug (valve plug type C) DIN EN 175301-803C	Bajonett plug 6-pole
		
Weight: approx. 150 g	Weight: approx. 150 g	Weight: approx. 150 g

Round plug M12x1 4-pole	Round plug M12x1 (metal) 4-pole	Heavy-Duty-Connector 4-pole
		
Weight: approx. 150 g	Weight: approx. 150 g	Weight: approx. 150 g

Right angle plug (valve plug type A) DIN EN 175301-803A	Cable outlet IP68, FEP, IP6K9K	Cable outlet 1/2NPT conduit
with zero point adjustment 		
Weight: approx. 150 g	Weight: approx. 220 g	Weight: approx. 220 g

Dimensions (in mm) (Continued)

Field housing	Cable outlet IP67	Right angle plug (valve type A) DIN EN 175301-803A
		with cooling stretch 
Weight: approx. 290 g	Weight: approx. 150 g	Weight: approx. 360 g

Ordering Code

(1) **Pressure type:**	Relative pressure	0
	Absolute pressure	1
	Vacuum, ±-ranges	2

(2) **Pressure range:**	0...0,4 bar	= A4	0...0,6 bar	= A5	0...1 bar	= B1
	0...1,6 bar	= B2	0...2,5 bar	= B3	0...4 bar	= B4
	0...6 bar	= B5	0...10 bar	= C1	0...16 bar	= C2
	0...25 bar	= C3	0...40 bar	= C4	0...60 bar	= C5
	0...100 bar	= D1	0...160 bar	= D2	0...250 bar	= D3
	0...400 bar	= D4	0...600 bar	= D5	0...1000 bar	= E1
	0...1600 bar	= E2	-0.4...0 bar	= J4	-0,6...0 bar	= J5
	-1...0 bar	= J1	-1...+0,6 bar	= L2	-1...+1,5 bar	= L3
	-1...+3 bar	= L4	-1...+5 bar	= L5	-1...+9 bar	= L1
	-1...+15 bar	= M2	-1...+24 bar	= M3	-1...+39 bar	= M4
	-1...+59 bar	= M5				

(3) **Accuracy:**	0,25% BFSL (standard)	0
	0,5% BFSL	1
	0,125% BFSL	2

(4) **Output:**	4...20 mA	1
	0...10 V	4
	0...5 V	B
	1...5 V	F
	0,5...4,5 V	G
	1...6 V	D
	0,4...4,5 V ratiometric	H

(5) **Medium Temp.**:	-30...+100 °C (standard)	1
	-40...+125 °C	2
	-40...+150 °C (with cooling stretch)	3
	-40...+200 °C (with cooling stretch)	4

(6) **Process con.:**	G1/8 B (EN837)	= 1	G1/4 B (EN837)	= 2
	G3/8 B (EN837)	= 3	G1/2 B (EN837)	= 4
	M12x1,5 (DIN 16288)	= 5	M20x1,5 (DIN 16288)	= 6
	G1/4 A (DIN 3852-E)	= 7	G1/2 A (DIN 3852-E)	= 8
	M14x1,5 (DIN 3852-E)	= 9	1/8NPT (ANSI/ASME)	= A
	1/4NPT (ANSI/ASME)	= B	1/2NPT (ANSI/ASME)	= C
	7/16-20 UNF BOSS (SAE J514 E)	= M	9/16-18 UNF BOSS (SAE J514 E)	= N
	7/16-20 UNF (SAE J514 E), 74°	= O	G1/4 Innen	= P
	1/4NPT Innen (ANSI/ASME)	= Q	PT1/4 (KS)	= R
	PT1/2 (KS)	= S	PT3/8 (KS)	= T
	R1/4 (ISO 7)	= U	R1/2 (ISO 7)	= V
	R3/8 (ISO 7)	= W		

(7) **Electrical con.:**	M12x1, 4-pole	1
	M12x1, 4-pole, metal	D
	Right angle plug (valve) (DIN 175301-803 A)	8
	Right angle plug (valve) (DIN 175301-803 C)	C
	Cable IP67	E
	Cable 1/2NPT Conduit	F

Ordering Code (Continued)

⑧	**Cable length:**	Without (plug) 2 m	0 1
⑨	**Configuration:**	Factory setting Customized	0 1
⑩	**Other:**	Special model	0
⑪	**Accessories:**	Without For possible selections, see Accessories, page 11	8 9

①	②						③	④	⑤	⑥	⑦		⑧	⑨			⑩		⑪	
U	Z	X	1	-	X	X	-	1	X	X	X	X	X	-	1	X	X	1	1	X	-	X	X