OPTIBAR P 1010 C

Technical Datasheet

Pressure transmitter with recessed diaphragm for general applications

- Wide variety thanks to modular design
- Measuring ranges up to 600 bar / 8700 psi
- High overload and temperature stability

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1.1 Universal pressure transmitter for general applications

The **OPTIBAR P 1010 C** pressure transmitter was designed for general applications in the field of industrial measuring technology. Its 1.4435 / AISI 316L diaphragm features good corrosion resistance in many industrial processes.

The modular design of the device allows combining a variety of process connections, pressure ranges and electrical connection variants, covering virtually all industrial application requirements.

① G1/2 EN 837 connection with M12 connector
② ANSI 1/2 NPT connection with cable
③ G1/2 DIN 3852 connection with 10 mm bore and ISO 4400 plug and cable connector

Highlights

- Fully welded pressure measuring cell with 1.4435 / AISI 316L stainless steel diaphragm
- Accuracy, terminal based: ±0.25%
- Outstanding temperature stability at zero point
- Measuring range: 0.1...600 bar / 4...8700 psi
- Modular construction
- Ingress protection up to IP68

Industries

- Plant construction and engineering
- Environmental technology
- Power generation
- Factory automation
- Hydraulic and pneumatic systems
- Pumps and compressors

Applications

- Absolute and gauge pressure measurement in gases and liquids

1.2 Options and variants

M12 connector with ISO 228 G1/2 EN 837 process connection

Cable output with ANSI 1/2 NPT process connection

Valve plug and cable connector acc. to ISO 4400 with ISO 228 G1/2 DIN 3852 process connection and additional 10 mm bore

Field housing with ISO 228 G1/2 DIN 3852 process connection and additional 10 mm bore

2.1 Technical data

- *The following data is provided for general applications. If you require data that is more relevant to your specific application, please contact us or your local sales office.*
- *Additional information (certificates, special tools, software,...) and complete product documentation can be downloaded free of charge from the website (Download Center).*

Measuring system

Measuring principle	Piezoresistive measuring cell up to 40 bar / 580 psi
	Thin-film measuring cell from 60 bar / 870 psi
Application range	Measurement of gauge and absolute pressure in gases and liquids
Measuring range	Fixed 0.1...600 bar / 1.5...8700 psi; refer also to chapter "Measuring ranges"

Measuring accuracy

Reference conditions	Medium: air
	Temperature: ambient temperature
	Ambient pressure: 1013 mbar / 14.7 psi
	Nominal position: vertical, pressure port down
	Power supply: 24 VDC
Pressure type	Gauge pressure / absolute pressure
Measuring accuracy according to IEC 60770 (terminal based) (Hysteresis, non-linearity, non-repeatability)	Nominal pressure (P_N) < 0.4 bar / 5.8 psi: ≤± 0.5% of URL Nominal pressure (P_N) > 0.4 bar / 5.8 psi: ≤± 0.25% of URL (URL = Upper Range Limit)
Ambient temperature effect on zero and span	Nominal pressure (P_N) < 0.4 bar / 5.8 psi: ≤± 1.5% of URL in compensated range of 0...+50°C / +32...+122°F Nominal pressure (P_N) > 0.4 bar / 5.8 psi: ≤± 0.75% of URL in compensated range of -20...+85°C / -4...+185°F Nominal pressure (P_N) = -1...0 bar / -14.5...0 psi: ≤± 0.75% of URL
Long-term stability	≤±0.1% of URL within one year under reference conditions
Step response time	< 10 ms (T90)
Vacuum resistance	$P_N \geq 1$ bar / 14.5 psi: vacuum resistant P_N < 1 bar / 14.5 psi: on request

Operating conditions

Temperature	
Nominal temperature	-20...+80°C / -4...+176°F
Ambient temperature	-40...+85°C / -40...+185°F
	Ex i zone 0: -20...+60°C / -4...+140°F at p_{abs} = 0.8...1.1 bar
	Ex i from zone 1: -20...+70°C / -4...+158°F
Storage temperature	-40...+100°C / -40...+212°F
Medium temperature	$P_N \leq 40$ bar / 580 psi: -40...+125°C / -40...+257°F
	$P_N \geq 60$ bar / 870 psi: -25...+125°C / -13...+257°F
	With cooling fins (optional): $P_N > 0$ barg: -40...+200°C / -40...+392°F; $P_N < 0$ barg: -40...+150°C / -40...+302°F
Other conditions	
Ingress protection acc. to IEC 529 / EN 60529	Connector M16 ISO 4400: IP65
	Connector M12x1, 4-pin: IP67
	Cable PUR: IP67
	Cable PUR with venting: IP68 (1mWS / 24h)
	Thread M12, housing in 1.4404 / AISI 316L: IP67

Installation conditions

Mounting position	Any - factory calibration carried out with pressure port down.
Dimensions	For detailed information refer to chapter "Dimensions and weights".
Weight	Min. 200 g / 0.44 lb (depending on pressure port)

Materials

Housing	Stainless steel 1.4404 / AISI 316L
	Field housing (optional): stainless steel 1.4301 / AISI 304
Cable gland	Nickel-plated brass
Fill fluid	Silicone oil ($P_N \leq 40$ bar / 580 psi)
	Without ($P_N \geq 60$ bar / 870 psi)
Wetted parts	
Pressure port	Stainless steel 1.4404 / AISI 316L
Separating diaphragm	Stainless steel 1.4435 / AISI 316L
Sealing	FKM (medium temperature ≤ +200°C / +392°F); EPDM; NBR

Process connections

Thread	Thread ANSI 1/2 NPT-M; thread ANSI 1/4 NPT-M
	Thread ISO 228 G1/2, EN 837-1; thread ISO 228 G1/2, 10 mm bore, DIN 3852; thread ISO 228 G1/4, EN 837-1; thread ISO 228 G1/4, DIN 3852

Electrical connection

Output signal	4...20 mA current output; 2-wire
Power supply	Standard: U_b = 8...32 VDC
	Ex i: U_b = 10 ... 28 VDC
Safety maximum values (Ex i)	U_i = 28 V, I_i = 93 mA, P_i = 660 mW, $C_i \approx 0$ nF, $L_i \approx 0$ µH; The supply connections have a maximum internal capacity of 27 nF to the housing.
Load	$R_{lmax} \leq (U_b - U_{bmin}) / 0.02$ A [Ohm]
Short circuit protection	Continuously
Reverse polarity protection	In the event of reversed connections there is no damage but also no function.
Ripple	0.05% of URL / 10 V
Electrical connection	Connector M16 ISO 4400
	Connector M12x1, 4-pin
	Cable PUR
	Cable PUR with venting
	Thread M12, housing 316L

Approvals and certificates

CE	The device fulfils the statutory requirements of the EC directives. The manufacturer certifies that these requirements have been met by applying the CE marking.
Electromagnetic compatibility (EMC) acc. to EN 61326	EMC Directive: 2004/108/EC
	For more information consult the relevant declaration of conformity.
Pressure equipment directive	97/23/EC
Ex	
ATEX	II 1G Ex ia IIC T4 or II 1D Ex ia T85°C
IECEx	Ex ia IIC T4 Ga or Ex ia IIIC T85°C Da
Other standards and approvals	
Vibration resistance acc. to EN 60068-2-6	10g RMS (25...2000 Hz)
Shock resistant (impact) according to EN 60068-2-27	500g / 1 ms ($P_N \leq 40$ bar / 580 psi)
	100g / 11 ms ($P_N \geq 60$ bar / 870 psi)

2.2 Dimensions and weights

Connection plug and field housing

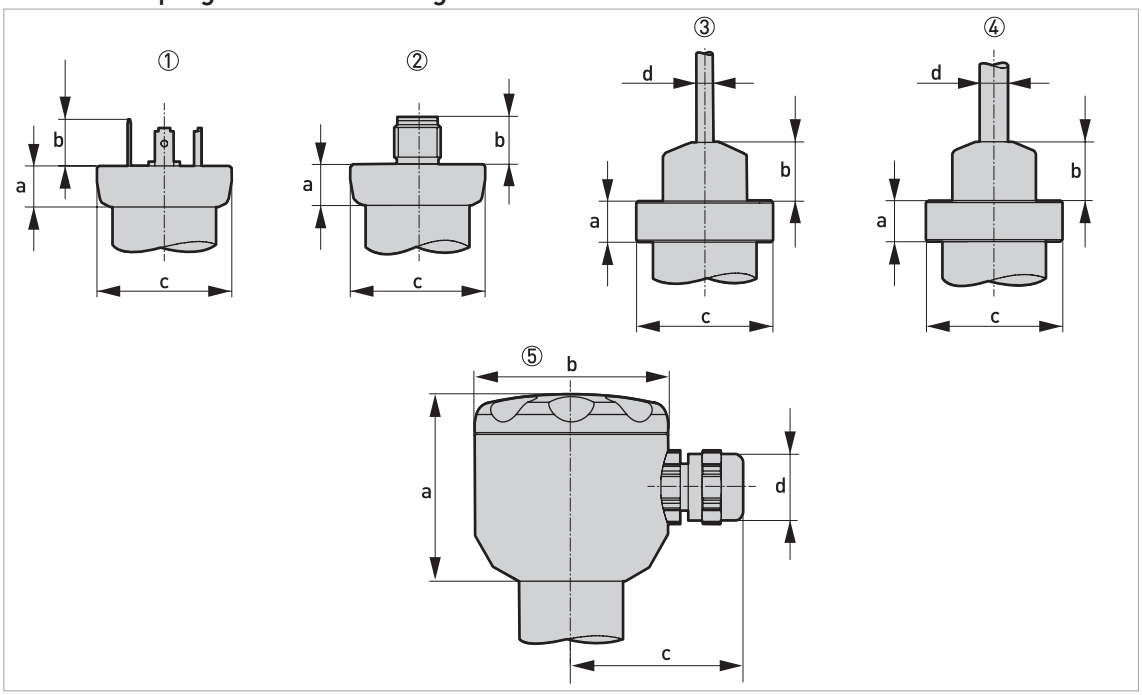


Figure 2-1: Dimensions for connection plug and field housing

① ISO 4400 (cable connector is part of delivery)
② M12x1 (4-pin)
③ Cable output
④ Cable output, cable with venting
⑤ Field housing

	Dimensions									
	①		②		③		④		⑤	
	[mm]	["]	[mm]	["]	[mm]	["]	[mm]	["]	[mm]	["]
a	10.5	0.4	10.5	0.4	10.5	0.4	10.5	0.4	48	1.9
b	12	0.47	10	0.39	Ø4.3	Ø0.17	7.4	0.29	Ø49.5	Ø1.95
c	Ø34.5	Ø1.36	Ø34.5	Ø1.36	Ø35	Ø1.38	Ø35	Ø1.38	44	1.7
d	-	-	-	-	15	0.59	15	0.59	M12x1.5	

Pressure transmitter with threaded connection (ISO 228)

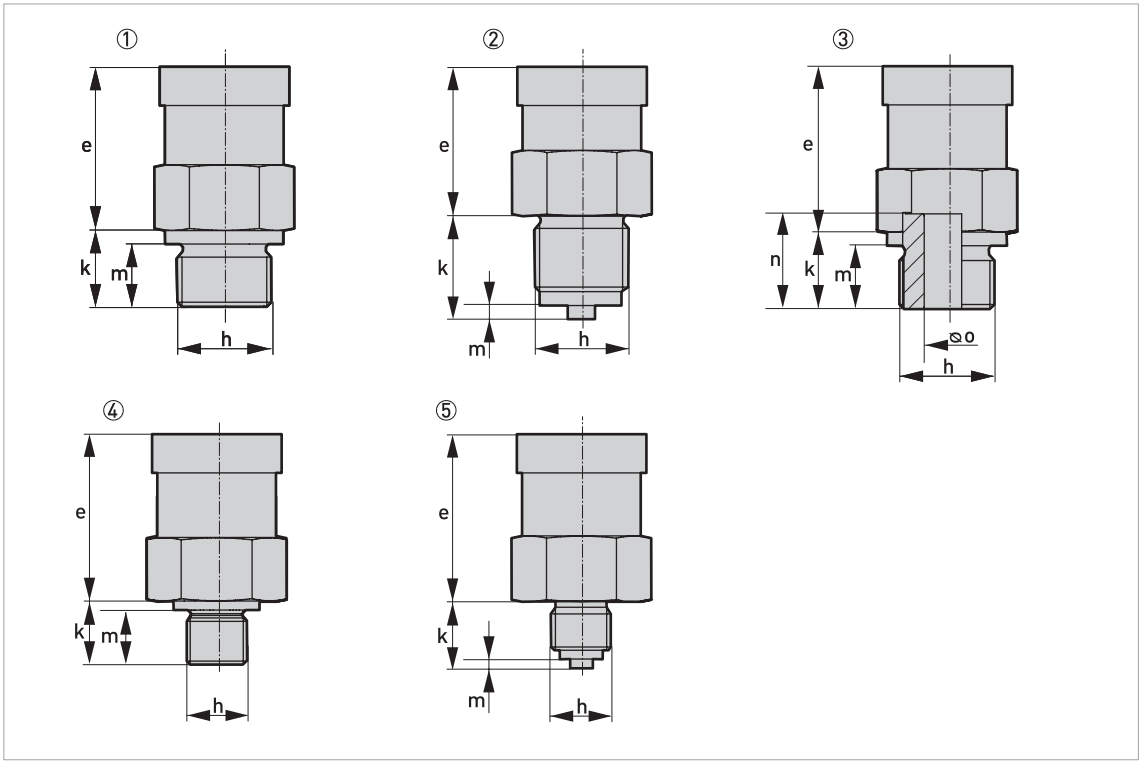


Figure 2-2: Dimensions for pressure transmitter with threaded connection (ISO 228)

① G1/2 DIN 3852
② G1/2 EN 837
③ G1/2 open connection (10 mm / 0.39" bore)
④ G1/4 DIN 3852
⑤ G1/4 EN 837

	Dimensions									
	①		②		③		④		⑤	
	[mm]	["]	[mm]	["]	[mm]	["]	[mm]	["]	[mm]	["]
e	50	2	50	2	50	2	50	2	50	2
h		G1/2		G1/2		G1/2		G1/4		G1/4
k	17	0.67	23	0.9	17	0.67	14	0.55	15	0.59
m	14	0.55	3	0.12	14	0.55	12	0.47	2	0.08
n	-	-	-	-	21	0.83	-	-	-	-
o	-	-	-	-	Ø10	Ø0.39	-	-	-	-
p	-	-	-	-	-	-	-	-	-	-

The entire length of the device is made up of the electrical connection (a), the transmitter housing (e) and the process connection (k).
With cooling fins (optional) additional 32 mm / 1.26".

Pressure transmitter with cooling fins and threaded connection (ANSI)

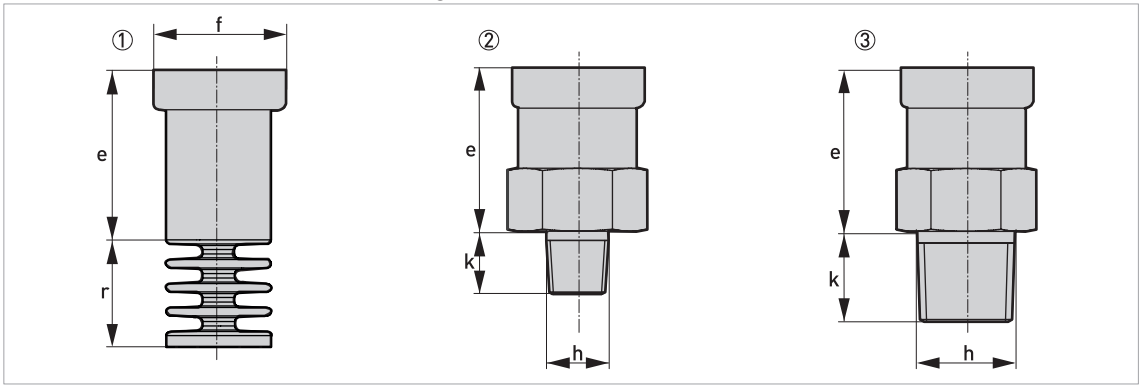


Figure 2-3: Dimensions for pressure transmitter with cooling fins and threaded connection (ANSI)

① Cooling fins (optional)
② Thread ANSI 1/4 NPT-M
③ Thread ANSI 1/2 NPT-M

	Dimensions					
	①		②		③	
	[mm]	["]	[mm]	["]	[mm]	["]
e	50	2	50	2	50	2
h		-		1/4 NPT		1/2 NPT
k	-	-	14	0.55	20	0.79
r	32	1.26	-	-	-	-

The entire length of the device is made up of the electrical connection (a), the transmitter housing (e) and the process connection (k).
With cooling fins (optional) additional 32 mm / 1.26".

2.3 Measuring ranges with piezoresistive measuring cell

Pressure in bar

Nominal pressure (gauge/abs.)	-1...0	0.10	0.16	0.25	0.40	0.60	1	1.6
Max. working pressure (MWP)	5	0.5	1	1	2	5	5	10
Burst pressure (OPL)	7.5	1.5	1.5	1.5	3	7.5	7.5	15

Nominal pressure (gauge/abs.)	2.5	4	6	10	16	25	40
Max. working pressure (MWP)	10	20	40	40	80	80	105
Burst pressure (OPL)	15	25	50	50	120	120	210

Pressure in psi

Nominal pressure (gauge/abs.)	-14.5...0	1.45	2.32	3.63	5.80	8.70	14.5	23.2
Max. working pressure (MWP)	72.5	7.3	14.5	14.5	29	72.5	72.5	145
Burst pressure (OPL)	108.8	21.8	21.8	21.8	43.5	108.8	108.8	217.6

Nominal pressure (gauge/abs.)	36.3	58.0	87.0	145	232.1	362.6	580
Max. working pressure (MWP)	145	290	580	580	1160	1160	1523
Burst pressure (OPL)	217.6	362.6	725	725	1740	1740	3046

2.4 Measuring ranges with thin-film measuring cell

Pressure in bar

Nominal pressure (gauge/abs.)	60	100	160	250	400	600
Max. working pressure (MWP)	210	600	600	1000	1000	1000
Burst pressure (OPL)	420	1000	1000	1250	1250	1250

Pressure in psi

Nominal pressure (gauge/abs.)	870	1450	2321	3626	5800	8700
Max. working pressure (MWP)	3046	8702	8702	14500	14500	14500
Burst pressure (OPL)	6092	14500	14500	18130	18130	18130

3.1 General notes on installation

Inspect the packaging carefully for damages or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.

Do a check of the packing list to make sure that you have all the elements given in the order.

Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

3.2 Intended use

Responsibility for the use of the measuring devices with regard to suitability, intended use and corrosion resistance of the used materials against the measured fluid lies solely with the operator.

The manufacturer is not liable for any damage resulting from improper use or use for other than the intended purpose.

The **OPTIBAR P 1010 C** pressure transmitter is designed to measure the absolute pressure and gauge pressure in gases and liquids.

3.3 Technical limits

The device was constructed solely for use within the technical limits indicated on the nameplate and in the technical data. Applications outside of these limits are not permitted and could lead to significant risk of accident. For this reason, observe the following limits:

- Do not exceed the maximum working pressure (MWP).
- Do not exceed the indicated permissible operating temperature range.
- The permissible ambient temperatures given may not be exceeded or undershot.
- Observe the ingress protection of the housing during use.

3.4 Installation specifications

Install the device only when depressurised and without power!

For installation the respective regulations for explosion protection have to be fulfilled.

For installations outdoor and in damp areas, the following points must be observed:

- *To ensure that no moisture can get into the connector, the device should be connected electrically immediately after installation. Otherwise a moisture admission has to be prevented e.g. by using a suitable protection cap.*
- *Select an installation if possible, where a mounting position allows draining of spray and condensate. Sealing surfaces should not be submerged!*
- *When using devices with cable glands or output, the cable should be looped facing down so that any liquid that collects on the cable can drip off.*
- *Install the device so it is protected from direct sunlight. In the worst case scenario, the permissible operating temperature will be exceeded in the presence of direct sunlight. This can negatively affect or damage the functionality of the device. In addition, it can lead to temporary measuring errors if the internal pressure of the device increases due to the sunlight.*
- *When installing outside where the risk of lightning or overvoltage may exist and damage the device, we recommend installing suitable overvoltage protection between the supply device or control cabinet and the device.*

- *Handle this highly sensitive electronic measuring device with care, both in and out of the packaging!*
- *Only remove the packaging and any protection cap from the device immediately before installing to prevent damage to the diaphrahm! Keep the supplied protection cap! Remove the protection cap slowly and carefully to avoid any negative pressure on the diaphragm.*
- *Handle the unprotected diaphragm with extreme care; it is very easily damaged.*
- *A device with a gauge reference in the housing (small hole next to the electrical connection) must be installed so that the gauge reference necessary for measurement is protected from dirt and moisture. Should the pressure transmitter be exposed to fluid admission, the air pressure compensation is blocked by the gauge reference. Accurate measurement in this state is not possible. It can also result in damage to the pressure transmitter.*
- *Ensure that no mechanical stress is applied to the pressure port during installation as this may result in a shift in the characteristic curve. This applies in particular to very small pressure ranges as well as to devices with plastic pressure ports.*
- *With hydraulic systems, arrange the device so that the pressure port faces up (venting).*
- *Provide cooling fins when using on steam lines.*

3.5 Installation

- *Prior to installing the pressure transmitter, it is essential to verify whether the version of the device on hand completely fulfils the technical and safety requirements of the measuring point. This applies in particular to the measuring range, overpressure resistance, temperature, explosion protection and operating voltage.*
- *Check the materials used for the wetted parts (e.g. gasket, process connection, separating diaphragm etc.) for suitability as regards process compatibility.*

4.1 Safety instructions

All work on the electrical connections may only be carried out with the power disconnected. Take note of the voltage data on the nameplate!

Observe the national regulations for electrical installations!

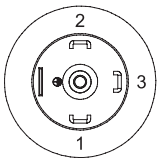
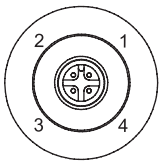
For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.

Observe without fail the local occupational health and safety regulations. Any work done on the electrical components of the measuring device may only be carried out by properly trained specialists.

Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

4.2 Terminal assignment

Install the device only when depressurised and without power!

Electrical connections	ISO 4400	M12x1 (4-pin)	Field housing	Cable colours (DIN 47100)
-			-	-
Supply +	1	1	IN +	wh (white)
Supply -	2	2	IN -	bn (brown)
Shielding	Ground contact	4	-	gn/ye (green/yellow)

4.3 Electrical connection diagram

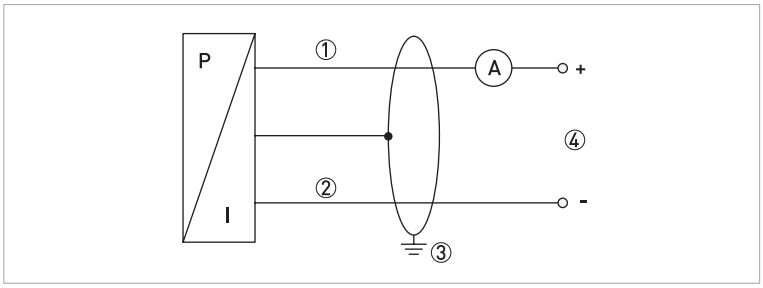


Figure 4-1: Electrical connection diagram

① Supply +
② Supply -
③ Shielding
④ Supply voltage V_S

The characters of the order code highlighted in light grey describe the standard.

Sensor							
VGK1	4	**Version**					
		A	Absolute pressure				
		R	Gauge pressure				
		N	Gauge pressure with negative nominal measuring range (-1...x)				
			Measuring range				
			1	100 mbar / 10 kPa / 1.5 psi (only version N and R)			
			2	160 mbar / 16 kPa / 2.3 psi (only version N and R)			
			4	250 mbar / 25 kPa / 3.6 psi (only version N and R)			
			5	400 mbar / 40 kPa / 6 psi			
			6	500 mbar / 50 kPa / 7.5 psi			
			7	600 mbar / 60 kPa / 8.7 psi			
			A	1.0 bar / 100 kPa / 15 psi			
			B	1.6 bar / 160 kPa / 23 psi			
			C	2.0 bar / 200 kPa / 30 psi			
			D	2.5 bar / 250 kPa / 36 psi			
			E	4.0 bar / 40 kPa / 60 psi			
			F	5.0 bar / 500 kPa / 75 psi			
			G	6.0 bar / 600 kPa / 87 psi			
			H	10 bar / 1 MPa / 150 psi			
			K	16 bar / 1.6 MPa / 232 psi			
			M	25 bar / 2.5 MPa / 375 psi			
			N	40 bar / 4 MPa / 600 psi			
			R	60 bar / 6 MPa / 900 psi (only version A and R)			
			S	100 bar / 10 MPa / 1500 psi (only version A and R)			
			T	160 bar / 16 MPa / 2320 psi (only version A and R)			
			U	250 bar / 25 MPa / 3750 psi (only version A and R)			
			V	400 bar / 40 MPa / 5800 psi (only version A and R)			
			W	600 bar / 60 MPa / 8700 psi (only version A and R)			
			Z	Customer specific measuring range (on request)			
				Process connection			
				0	Thread ANSI 1/2 NPT-M		
				2	Thread ISO 228 G1/2, EN 837-1		
				3	Thread ISO 228 G1/2, 10 mm bore, DIN 3852		
				4	Thread ISO 228 G1/4, EN 837-1		
				5	Thread ISO 228 G1/4, DIN 3852		
				6	Thread ANSI 1/4 NPT-M		
				Z	Customer specific process connection		
					Diaphragm / Fill fluid		
					S	Stainless steel 1.4435 (AISI 316L) / silicone oil	

						Accuracy										
						2	0.25%									
						5	0.5% (P_N < 400 mbar; measuring range code: 0...4)									
							Special versions									
							0	Without								
							C	Cooling fins (up to +200°C / +392°F)								
								Sealing (sensor / process connection)								
								V	FKM ($T_{Process}$ ≤ +200°C / +392°F)							
								E	EPDM ($T_{Process}$ ≤ +125°C / +257°F)							
								N	NBR ($T_{Process}$ ≤ +120°C / +248°F)							
									Approval							
									0	Without						
									1	ATEX: II 1G Ex ia IIC T4 or II 1D Ex ia T85°C; IECEx: Ex ia IIC T4 Ga or Ex ia IIIC T85°C Da						
										SIL						
										0	Without					
										1	SIL 2 (in preparation)					
											Output					
											0	2-wire 4...20 mA				
												Electrical connection				
												M	Connector M12x1, 4-pin; IP67			
												V	Connector ISO 4400, M16; IP65			
												2	Cable 2 m / 6 ft PUR; IP67			
												A	Cable 2 m / 6 ft PUR, vented; IP68			
												F	Field housing, M12x1.5, 1.4301 (AISI 304); IP67			
													Language			
													1	English		
													2	German		
														Services		
														0	Without	
														5	5-point factory calibration certificate	
														D	DAkkS calibration certificate	
														C	Oil and fat-free cleaning	
															Marking	
															0	Without
															T	Tag Plate (30 x 19mm)
																Accessories
																0 Without
VGK1	4										0				0	**Order code**

KROHNE product overview

- Electromagnetic flowmeters
- Variable area flowmeters
- Ultrasonic flowmeters
- Mass flowmeters
- Vortex flowmeters
- Flow controllers
- Level meters
- Temperature assemblies
- Pressure transmitters
- Analysis products
- Products and systems for the oil & gas industry
- Measuring systems for the marine industry

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