File formats for customer logos on dials

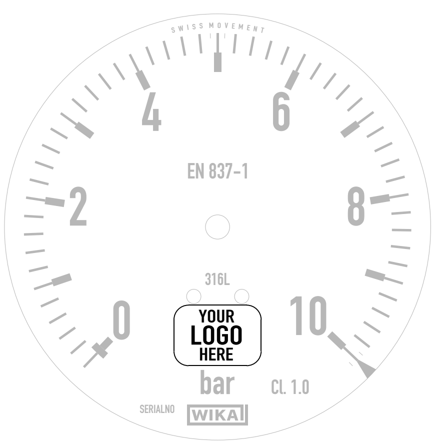
Technology

WIKA uses the latest technologies to custom print pressure gauge and thermometer dials. The high-quality printing features excellent UV resistance for long-lasting optimal readability of the measuring instruments.

The scale is defined using a specifically developed software tool and then drawn automatically using CAD software.

Trademark with customer logo

In pointer gauges, the dial is the component that permits the greatest variance for individual customer specifications. Since the dial is the focus of any measurement, WIKA is happy to fulfil the wish of many customers to have their own brand logo printed onto it.



Example of dial with customer logo

Requirements for the logo file

File format
For optimal representation of logos, they should be supplied in a vector format, as this allows scaling without losses.

Vector formats (preferred)	
File type	**Description**
EPS / PS	Encapsulated Postscript / Postscript
AI	Adobe Illustrator
CDR	Corel Draw
DWG	Autodesk AutoCAD
DXF	Drawing Interchange File Format

Bitmap formats (if vector format not available)	
File type	**Description**
TIFF / TIF	Tagged Image File Format
PNG	Portable Network Graphics
JPG / JPEG	Joint Photographic Experts Group

Size for bitmap formats
At least 1,200 pixels, width or height

Colour specifications
- Full-tone colours (RAL or Pantone)
- Colour space (CMYK or sRGB)

In the event that there is no colour specification, the correctness of custom colours cannot be guaranteed. Files in bitmap format are vectorised for further processing.

Data administration
For the correct processing of the logo file, it must be stated whether it replaces an existing logo. Ideally, the customer logo should be transmitted to the sales team contact via the **questionnaire** in the download area of the WIKA website.

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Elastic element pressure gauges

WIKA data sheet IN 00.01

Description

Indicating pressure gauges with elastic measuring elements are used extensively to measure pressure in technical applications due to their robustness and ease-of-use. They incorporate measuring elements which deform elastically under the influence of pressure. Mechanical pressure gauges are produced with bourdon tube, diaphragm, capsule and spring elements and are differentiated as a result of these.
The measuring elements are made of copper alloys, alloyed steels or, for specific measuring applications, produced in special materials. Pressures are only measurable in combination with a reference pressure. Atmospheric pressure usually serves as the reference pressure, and the pressure gauge therefore shows how much the measured pressure is higher or lower in relation to the given atmospheric pressure (i.e. an overpressure measuring instrument).
The pressure is indicated in standard measuring ranges over a 270 degree sweep on the dial. Liquid-filled pressure gauges, due to their damping effect, offer optimal protection against damage from high dynamic pressure loads or vibrations. By combination with limit signal indicators, switching can be carried out, while in combination with transmitters, electrical output signals (e.g. 4 ... 20 mA) can be used for industrial process automation.

Pressure gauges with bourdon tube

Bourdon tubes are circular-shaped tubes with an oval cross-section. The pressure of the media acts on the inside of this tube which results in the oval cross section becoming almost circular. Through the curvature of the tube, hoop stresses occur which bend the bourdon tube. The end of the tube, which is not fixed, moves, and this indicates the measurement for the pressure.

Through the pointer movement this motion is indicated on the display. The circular-shaped tubes, formed through an angle of approx. 250°, are used for pressures up to about 60 bar.

For higher pressures, bourdon tubes are used with either a number of superimposed coils of the same diameter (i.e. helical coils), or a spiral-shaped coil (i.e. spiral springs) in a single plane.

Bourdon tubes can only be protected against overload to a limited extent. In order to fulfil particularly harsh measuring tasks, the pressure gauge can be fitted with a chemical seal upstream as a separation or protection system.

The pressure ranges can be between 0 ... 0.6 and 0 ... 7000 bar with a reading accuracy (or class) from 0.1 to 4.0 %.

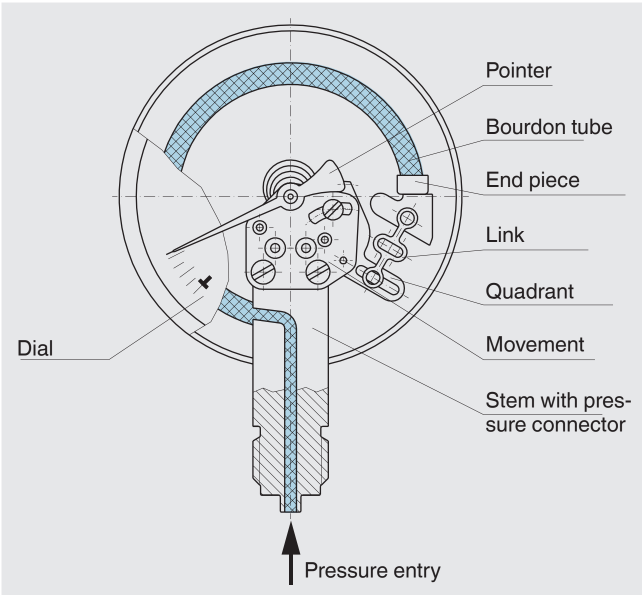

Fig. Pressure gauges with bourdon tube

Pressure gauges with diaphragm elements

Diaphragm elements are circular-shaped, corrugated membranes. They are either clamped around their rim between two flanges or welded and are subjected to the pressure of the media acting on one side. The deflection caused by this is used as a measurement for the pressure and is indicated by a pointer.

In comparison with bourdon tubes, these diaphragm elements have a relatively high actuating force and, as a result of the annular clamping of the element, they are insensitive to vibration.

The diaphragm element can be subject to higher overload through the load take-up (diaphragm element resting against the upper flange), and by coating it with special material or covering it with foil, the gauge can be protected against extremely corrosive media.

For measurements with highly viscous, impure or crystallizing media, wide connection ports, open connection flanges and purging capabilities can be integrated.

Pressure ranges can be between 0 ... 16 mbar and 0 ... 40 bar with accuracy classes from 0.6 to 2.5.

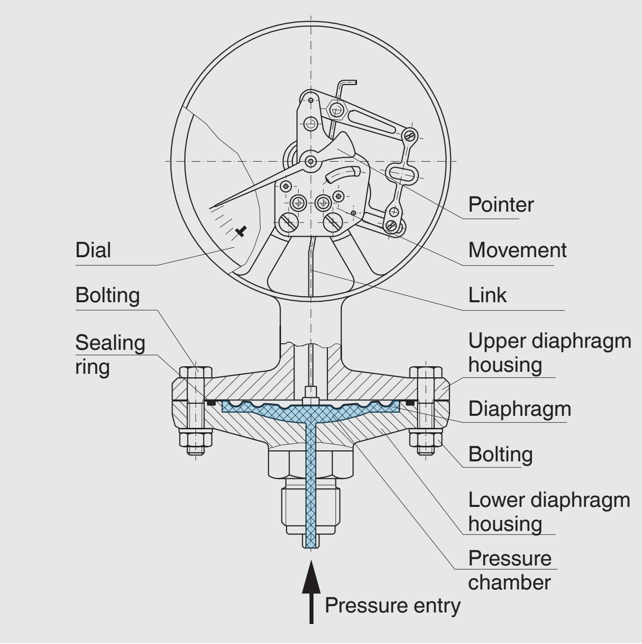

Fig. Pressure gauges with diaphragm elements

Pressure gauges with capsule elements

The capsule element comprises two circular-shaped, corrugated membranes fully-sealed around their circumference. The pressure acts on the inside of this capsule and the stroke movement generated is indicated by a pointer as the measurement of pressure.

Pressure gauges with capsule elements are particularly suited to gaseous media and relatively low pressures. Overload protection is possible within certain limits. The actuating force is increased if a number of capsule elements are connected mechanically in series (a capsule element "package").

Pressure ranges can be between 0 ... 2.5 mbar and 0 ... 0.6 bar with accuracy classes of 0.1 to 2.5.

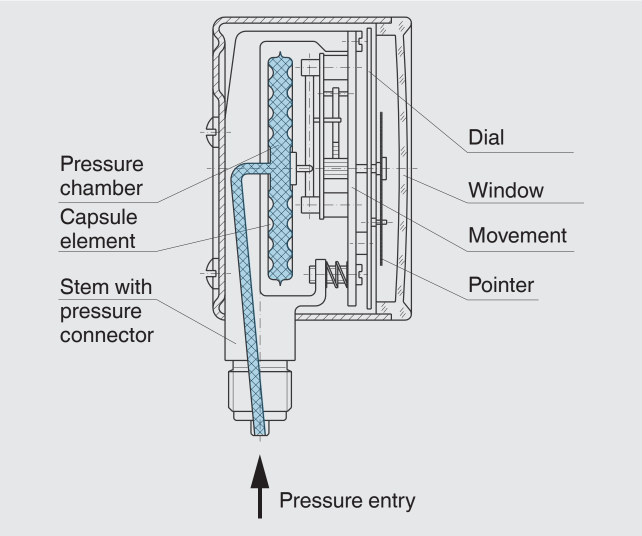

Fig. Pressure gauges with capsule elements

Absolute pressure gauges

These instruments are used where pressures are to be measured independently of the natural fluctuations in atmospheric pressure. As a general rule, all the previously shown overpressure gauge elements and measuring principles can be applied.

The pressure of the media to be measured is compared against a reference pressure which is equal to absolute zero. On the side of the measuring element that is not subjected to the pressure media, an absolute vacuum exists as the reference pressure. This function is achieved by sealing off the appropriate measuring chamber or surrounding housing.

Measuring element movement transmission and pressure indication are achieved in the same way as with the previously described overpressure gauges.

Pressure ranges can be between 0 ... 25 mbar and 0 ... 25 bar with accuracy classes of 0.6 to 2.5.

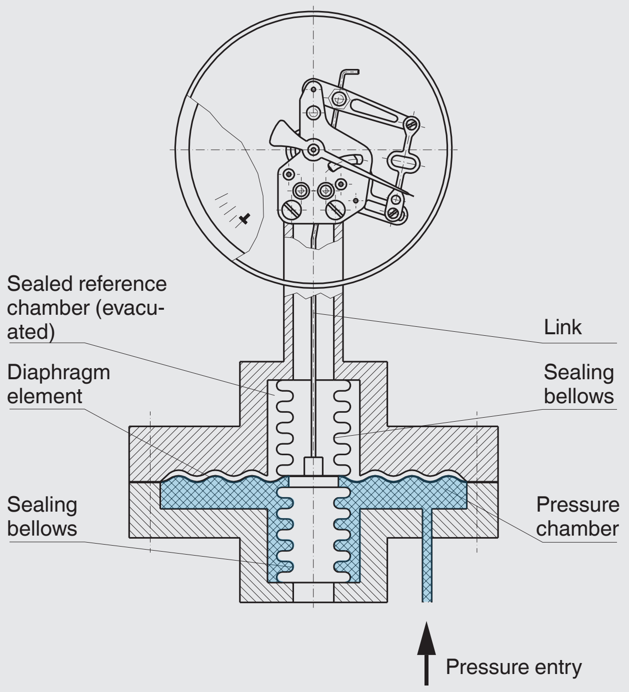

Fig. Absolute pressure gauges

Differential pressure gauges

With differential pressure gauges, the difference between two pressures is determined directly and shown on the display. Here again, all the previously shown overpressure gauge measuring elements and measuring principles can be applied.

Two sealed pressure media chambers are separated by the measuring element/s. If both operating pressures are the same, no movement of the measuring element occurs and no pressure will be indicated. A differential pressure reading is only given when one of the pressures is either higher or lower than the other.

Even with high static pressures, low differential pressures can be measured directly. With diaphragm elements, a very high overload capability is achieved.

The permissible static pressure and the overload capability on the ⊕ and ⊖ side must be observed.

In the majority of cases, measuring element movement transmission and pressure indication are achieved in the same way as with the previously described overpressure gauges.

Pressure ranges can be between 0 ... 16 mbar and 0 ... 40 bar with accuracy classes of 0.6 to 2.5.

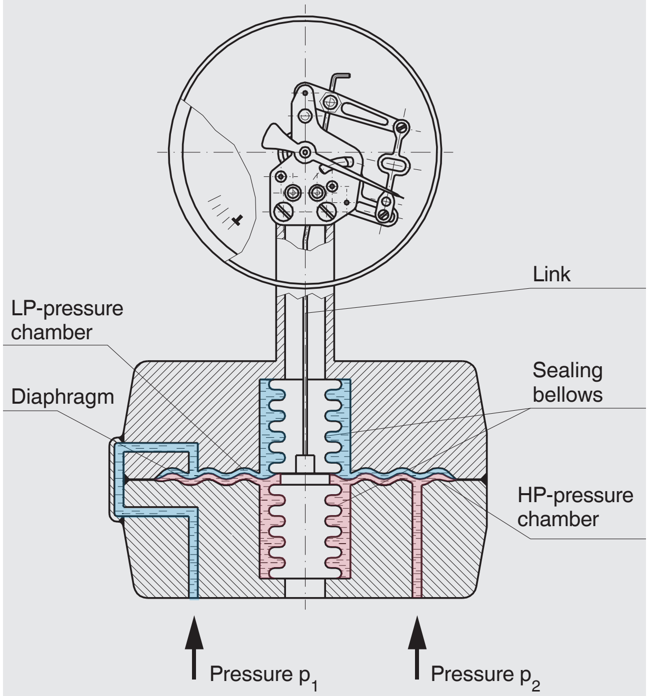

Fig. Differential pressure gauges

Applications

- Filter technology (monitoring filter state)
- Level measurement (in closed vessels)
- Flow measurement (pressure drop)

The specifications given in this document represent the state of engineering at the time of publishing.
We reserve the right to make modifications to the specifications and materials.

09/2010 GB

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Scale ranges of pressure gauges
Scale mark spacing and numbering of the scale per EN 837

WIKA data sheet IN 00.02

General information

Scale range, nominal size (NS, case diameter) and accuracy class of a pressure gauge determine the design of the scale. In the European EN 837-1 and EN 837-3 standards, the specifications about the layout of dials with concentric scales are contained.
In addition to the scales in accordance with EN 837, all internationally common scale ranges, double and multiple scales, coloured scales etc. are, of course, also available.

Scale ranges of EN 837

The preferred pressure unit is the bar.

Scale ranges for pressure in bar				
0 ... 0.6	0 ... 1	0 ... 1.6	0 ... 2.5	0 ... 4
0 ... 6	0 ... 10	0 ... 16	0 ... 25	0 ... 40
0 ... 60	0 ... 100	0 ... 160	0 ... 250	0 ... 400
0 ... 600	0 ... 1,000	0 ... 1,600		

Scale ranges for pressure in mbar			
0 ... 1	0 ... 6	0 ... 40	0 ... 250
0 ... 1.6	0 ... 10	0 ... 60	0 ... 400
0 ... 2.5	0 ... 16	0 ... 100	0 ... 600
0 ... 4	0 ... 25	0 ... 160	

For pressure gauges, the pointer turns anticlockwise with increasing vacuum.

Scale ranges for vacuum in bar			
-0.6 ... 0	-1 ... 0		

Scale ranges for vacuum in mbar			
-1 ... 0	-6 ... 0	-40 ... 0	-100 ... 0
-1.6 ... 0	-10 ... 0	-60 ... 0	-160 ... 0
-2.5 ... 0	-16 ... 0	-100 ... 0	-600 ... 0
-4 ... 0	-25 ... 0	-160 ... 0	

Scale ranges for pressure and vacuum in bar				
-1 ... +0.6	-1 ... +1.5	-1 ... +3	-1 ... +5	-1 ... +9
-1 ... +15	-1 ... +24			

Nominal sizes

For pressure measuring instruments, the following nominal sizes (NS) are defined:
NS 40, 50, 63, 80, 100, 160 and 250

Accuracy classes

The following table specifies the error limits at the reference temperature of 20° C.

Accuracy class	Error limits (percent of scale range)
0.1	± 0.1 %
0.25	± 0.25 %
0.6	± 0.6 %
1	± 1 %
1.6	± 1.6 %
2.5	± 2.5 %
4	± 4 %

For pressure gauges with a pointer stop, the accuracy class applies from 10 to 100 % of the scale range. For pressure gauges with a free zero point, the accuracy class applies from 0 to 100 % of the scale range.

Assignment of nominal size and accuracy class

NS	Accuracy class						
	0.1	0.25	0.6	1.0	1.6	2.5	4
40, 50					x	x	x
63				x	x	x	x
80				x	x	x	x
100				x	x	x	
160		x	x	x	x		
250	x	x	x	x	x		

Scale interval

The minimum number of scale divisions for each accuracy class and nominal size is given in the following table.

Scale (scale range)	Nominal size (NS)	Minimum number of scale divisions						
		Accuracy class						
		0.1	0.25	0.6	1	1.6	2.5	4
0 to 100	40					20	20	20
	50					20	20	20
	63				20	20	20	20
	80				50	50	50	50
	100			100	50	50		
	160		200	100 1)	50	50		
	250	500	200	100 1)	50	50		
0 to 160	40					32	32	32
	50					32	32	32
	63				32	32	32	32
	80				32	32	32	32
	100			80	32	32		
	160		160	80 2)	32	32		
	250	320	320	80 2)	32	32		
0 to 250	40					25	25	25
	50					25	25	25
	63				25	25	25	25
	80				50	50	50	50
	100			125	50	50		
	160		125	125	50	50		
	250	500	250	125	50	50		
0 to 400	40					20	20	20
	50					20	20	20
	63				20	20	20	20
	80				40	40	40	40
	100			80	40	40		
	160		200	200	40	40		
	250	400	200	200	40	40		
0 to 600	40					30	30	30
	50					30	30	30
	63				30	30	30	30
	80				60	60	60	60
	100			120	60	60		
	160		120	120	60	60		
	250	300	300	120	60	60		

1) Unless there is additional ordering information, WIKA manufactures these scales with 200 scale divisions
2) Unless there is additional ordering information, WIKA manufactures these scales with 160 scale divisions

The scale mark spacing is ≥ 1 mm.
The width of the scale marks is ≤ 1/5 of the scale mark spacing.

See page 3 for pictorial examples of scale interval, various designs of the scale marks and the numbering of the scales at WIKA.

Additional information on this topic is given in the EN 837-1 and EN 837-3 standards.

Examples for scale mark spacing and numbering of scales

Examples for accuracy class 1 to 4

Nominal size (NS)	Scale (scale range)	Scale mark spacing and numbering of the scale	Scale interval	Number of scale divisions
40 50 63	0 ... 1	0 0.2 0.4 0.6 0.8 1	0.05	20
	0 ... 10	0 2 4 6 8 10	0.5	
	0 ... 100	0 20 40 60 80 100	5	
	0 ... 1000	0 200 400 600 800 1000	50	
	-1 ... 0	-1 - 0.8 -0.6 -0.4 -0.2 0	0.05	
	-1 ... 0 ... +9	-1 0 1 2 3 4 5 6 7 8 9	0.5	
80 100 160 250	0 ... 2.5	0 0.5 1 1.5 2 2.5	0.05	50
	0 ... 25	0 5 10 15 20 25	0.5	
	0 ... 250	0 50 100 150 200 250	5	
	0 ... 2500	0 500 1000 1500 2000 2500	50	
	-1 ... 0 ... +1.5	-1 -0.5 0 0.5 1 1.5	0.05	
	-1 ... 0 ... +24	-1 0 5 10 15 20 24	0.5	
80 100 160 250	0 ... 0.6	0 0.1 0.2 0.3 0.4 0.5 0.6	0.01	60
	0 ... 6	0 1 2 3 4 5 6	0.1	
	0 ... 60	0 10 20 30 40 50 60	1	
	0 ... 600	0 100 200 300 400 500 600	10	
	-0.6 ... 0	-0.6 -0.5 -0.4 -0.3 -0.2 -0.1 0	0.01	
	-1 ... 0 ... +5	-1 0 1 2 3 4 5	0.1	

Examples for accuracy class 0.6

160 250	0 ... 4	0 0.5 1 3 3.5 4	0.02	200
	0 ... 40	0 5 10 30 35 40	0.2	
	0 ... 400	0 50 100 300 350 400	2	
	0 ... 4000	0 500 1000 3000 3500 4000	20	
	-1 ... 0 ... +3	-1 -0.5 0 2 2.5 3	0.02	

Examples for accuracy class 0.25

250	0 ... 1.6	0 0.1 0.2 1.3 1.4 1.5 1.6	0.005	320
	0 ... 16	0 1 2 13 14 15 16	0.05	
	0 ...160	0 10 20 130 140 150 160	0.5	
	0 ... 1600	0 100 200 1300 1400 1500 1600	5	
	-1 ... 0 ... +0.6	-1 -0.9 -0.8 0.3 0.4 0.5 0.6	0.005	
	-1 ... 0 ... +15	-1 0 1 12 13 14 15	0.05	

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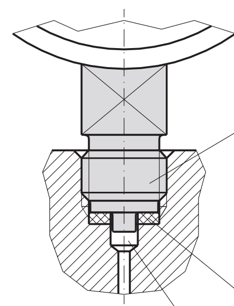
Process connection per EN 837

Applications

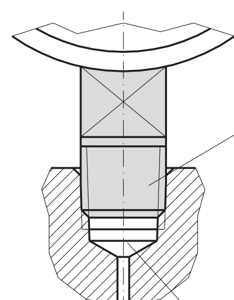
- For the definition of the process connections for WIKA pressure measuring instruments

Variants

- Process connections with parallel thread
- Process connections with tapered thread
- Industry-specific special connections



Installation example with parallel thread



Installation example with tapered thread

Description

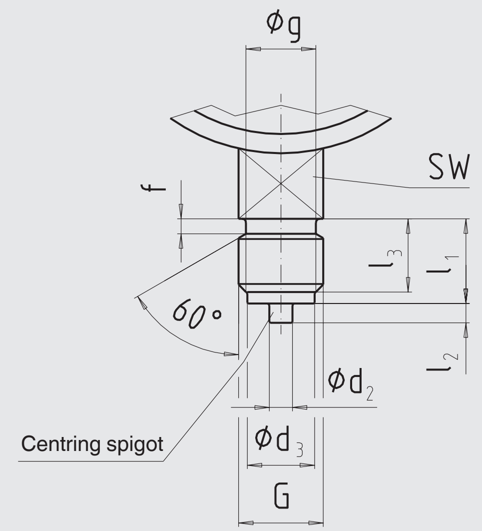
WIKA offers pressure measuring instruments with a variety of process connections in order to meet diverse customer-specific application requirements.

For pressure measuring instruments with parallel or tapered thread, process connections with a range of dimensions are specified.

The permissible maximum pressure of a process connection is a result of the combination of thread size and material. The correlation is illustrated for a selection of representative process connections in a table on page 3.

Smart in sensing

Connection shank with parallel male thread

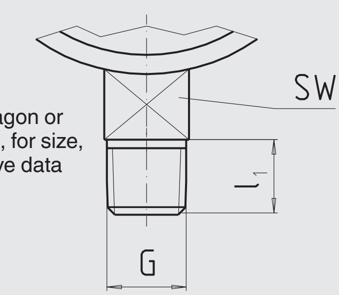


Parallel thread G	Dimensions in mm							
	d2	d3	f with Brass	Stain-less steel	g -0.2	l_1 +0.3	l_2 ±0.1	l_3 +0.3
G ⅛ 1)	2)	8	2)	2)	2)	10	2)	8
M10 x 1	2)	8	2)	2)	2)	10	2)	8
G ¼ 1)	5	9.5	2	3	11	13	2	11
M12 x 1.5	5	9.5	2	3	9.7	13	2	11
G ⅜	5.5	13	2	3	14.5	16	3	13
G ½ 1)	6	17.5	3	4	18	20	3	17
M20 x 1.5	6	17.5	3	4	17.7	20	3	17

1) Preferably with WIKA standard versions
2) With WIKA, without centring spigot; thread run-out instead of thread undercut

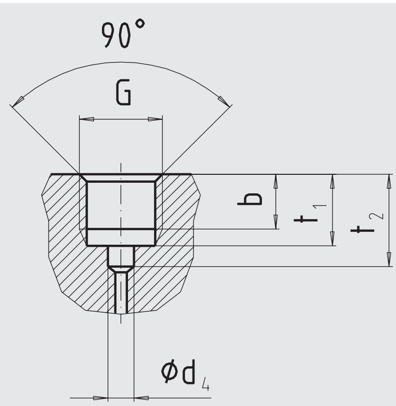
Connection shank with tapered thread

SW:
Square, hexagon or spanner flats, for size, see respective data sheet



Tapered thread G	Dimensions in mm l_1 min.
⅛ NPT, R ⅛	10
¼ NPT, R ¼	13
⅜ NPT, R ⅜	15
½ NPT, R ½	19

Tapped hole with parallel female thread



Parallel female thread G	Dimensions in mm			
	b min.	d_4	t_1 -0.5	t_2 min.
G ⅛ 1)	7.5	4.4 3)	10	13
M10 x 1	7.5	4.5 3)	10	13
G ¼ 1)	10	5.5	13	16.5
M12 x 1.5	9.5	5.5	13	16.5
G ⅜	12	6.5	16	19.5
G ½ 1)	15	7	19	24.5
M20 x 1.5	15.5	7	19	24.5

1) Preferably with WIKA standard versions
3) Can be omitted with WIKA instruments since without centring spigot

Standards for threads

Parallel threads: Pipe threads, code G, per ISO 228-1
Metric ISO threads, code M, per DIN 13

Tapered threads: Pipe threads, code NPT, per ANSI / ASME B1.20.1
Pipe threads, code R, per ISO 7

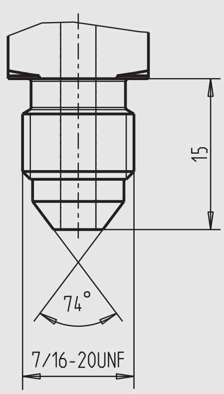
Maximum allowable pressure

Thread 1)	Maximum allowable pressure 2)					
	Cu alloy		Stainless steel		Monel®	
	bar	psi	bar	psi	bar	psi
G ⅛	400	6,000	400	6,000	400	6,000
G ¼	600	8,600	1,000	15,000	1,000	15,000
G ⅜	600	8,600	1,000	15,000	1,000	15,000
G ½	1,000	15,000	2,500	36,000	2,500	36,000
M10 x 1	400	6,000	400	6,000	400	6,000
M12 x 1.5	400	6,000	400	6,000	400	6,000
M20 x 1.5	1,000	15,000	2,500	36,000	2,500	36,000
⅛ NPT, R ⅛	400	6,000	400	6,000	400	6,000
¼ NPT, R ¼	600	8,600	1,000	15,000	1,000	15,000
⅜ NPT, R ⅜	600	8,600	1,000	15,000	1,000	15,000
½ NPT, R ½	1,000	15,000	1,600	23,000	1,600	23,000
7/16-20 UNF	400	6,000	800	12,000	800	12,000

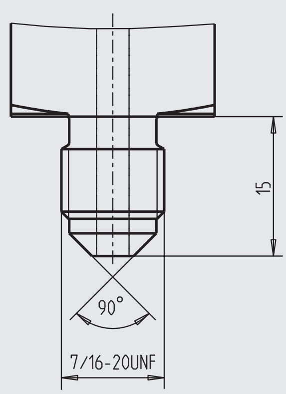
1) Valid for the thread standards for connection shanks and female threads mentioned on page 2.
2) The specified values for the maximum pressure are rounded values and are assigned to the nearest standard scale range.

Examples of industry-specific process connections

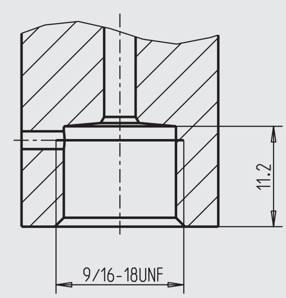
Hydraulic connection with 74° sealing cone SAE J 514



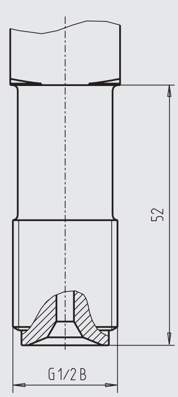
Refrigeration connection with 90° sealing cone SAE J 513



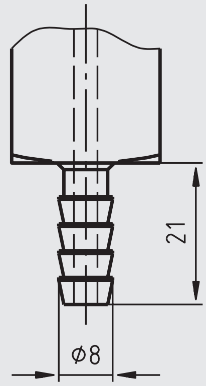
High-pressure process connection per Autoclave Engineering or Nova Swiss M16 x 1.5 female



High-pressure process connection (HP) for connection with lens-type sealing ring, per EN 837



Hose connection

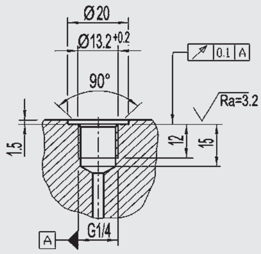


Other process connections on request

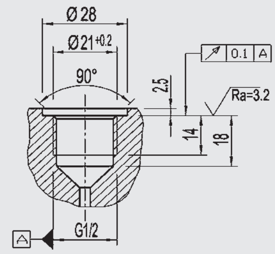
Examples of other tapped holes

Version per DIN EN ISO 1179-2 (sealing with profile sealing)

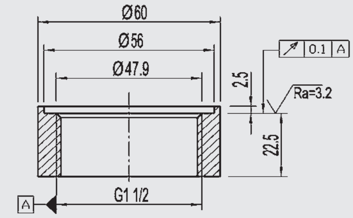
G ¼



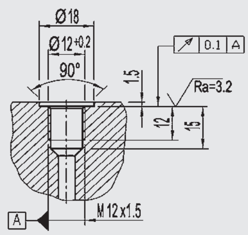
G ½



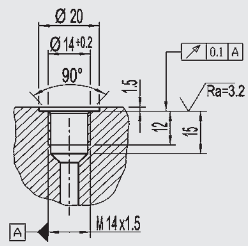
G 1 ½ 1)
Order number: 2158982



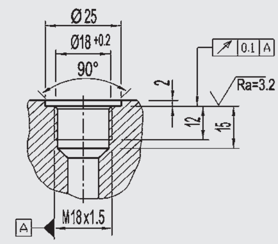
M12 x 1.5



M14 x 1.5

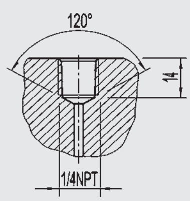


M18 x 1.5

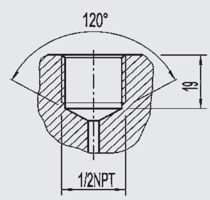


Version per ANSI / ASME B1.20.1

¼ NPT

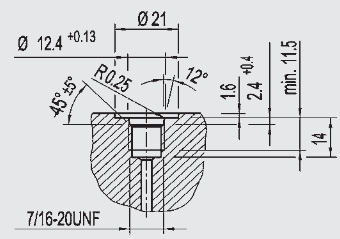


½ NPT



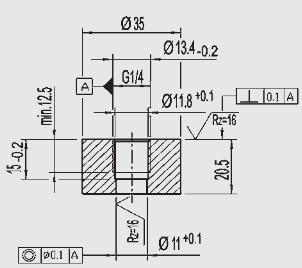
Version per SAE J 514

7/16-20 UNF

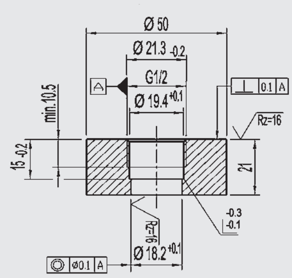


Flush WIKA version

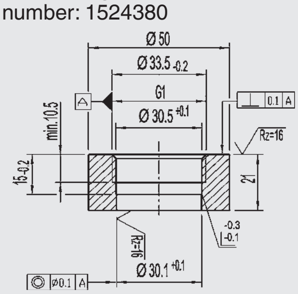
G ¼, with O-ring 2)



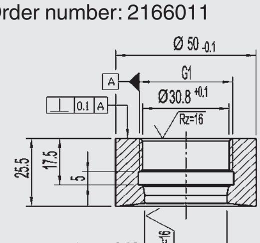
G ½, with O-ring 1) 2)



G 1, with O-ring 1) 2)
Order number: 1192264
G 1, with sealing cone
Order number: 1524380



G 1, EHEDG 1) 2) 3)
Order number: 2166011



1) Also available as welding socket from WIKA.
2) The screw-in holes made by the customer must be drilled out after thread cutting.
3) European Hygienic Engineering & Design Group

WIKA makes every effort to ensure that the screw-in holes shown are kept up-to-date. The corresponding current regulations are applicable for the production of the screw-in hole.
We reserve the right to make technical changes to the WIKA versions for screw-in holes and welding sockets.

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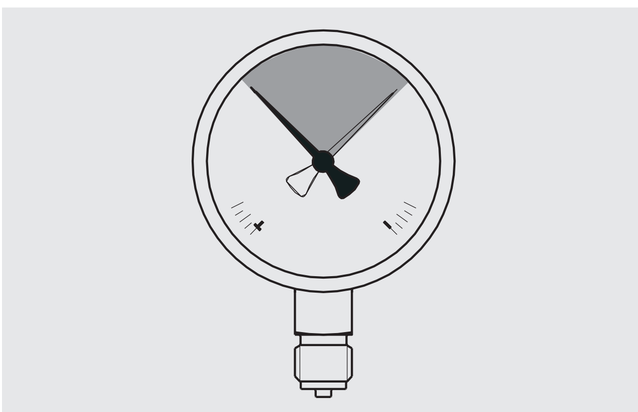
Selection, installation, handling and operation of pressure gauges

General information

The user must ensure that the appropriate pressure gauge has been selected in terms of scale range and design.
The scale range is optimally selected when the operating pressure lies in the middle third of the scale range.



The pressure gauge must be mounted free from vibration and should be aligned so that it is easy to read.

The process connection must be sealed properly.

For zero point checking or the exchange of the instrument during operation, the installation of a shut-off device between pressure tapping and pressure gauge is recommended.

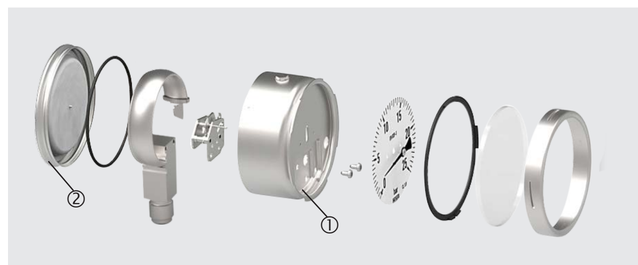
Case designs

For operational safety and the protection of personnel who find themselves in the vicinity of the measuring location, the EN 837-2 user standard requires different safety levels for cases.

Safety levels for cases per EN 837

- “S1” with blow-out device in case back
- “S2” for NS 40 ... NS 80 with blow-out device in case back or blow-out back
- “S3” for NS 40 ... NS 250 with solid baffle wall ① (Solidfront) and blow-out back ②

Exploded diagram of safety level “S3”



For non-hazardous, liquid media < 25 bar without case filling, no safety level is required. For gaseous or vaporous media from an operating pressure of 25 bar, in accordance with EN 837-2, a pressure gauge with safety level “S3” is recommended. Furthermore, in accordance with EN 837-2, further criteria are specified for the selection of the appropriate safety level for specific fields of application and instrument versions.

Instrument fixing

If the line to the instrument is not rigid enough for a vibration-free installation, the gauge should be mounted by means of appropriate fastening elements for wall or pipe mounting - if necessary, through the insertion of a capillary.

Measuring system dampening

If vibrations cannot be avoided by means of suitable installation, instruments with a liquid case filling should be used.

Shut-off devices

Depending on the intended use, stopcocks or shut-off valves are fitted upstream of the pressure gauge.

Stopcock and shut-off valve
Stopcocks have up to 4 functions:

- **Vent** The supply line is shut and the pressure element is connected to the atmosphere. The zero point can be checked.
- **Operation** The supply line is open, the pressure element is pressurised.
- **Blow out** The supply line is open, the medium escapes into the atmosphere.
- **Testing** The supply line is open and, in addition to the working pressure gauge, a test pressure gauge can be installed if a test connection is available.

Shut-off valves with or without test connection in accordance with DIN 16270 or DIN 16271 have a vent screw between the valve seat and instrument connection. If the vent screw is loosened, the venting can be controlled through the thread.

In specific applications (e.g. steam boilers) the shut-off devices must have a test connection, so that the pressure gauge can be tested without being dismounted. With shut-off valves in accordance with DIN 16272, the test connection can be isolated separately. In the process industry, the block-and-bleed valve is used for this functionality.

Due to their one-piece design, monoflanges can withstand high overpressures. Through this, the robust and compact mounting of the measuring instrument directly to the process flange is possible.

Temperature load

When mounting the pressure gauge it must be ensured that, taking into consideration the influence of convection and heat radiation, no deviation above or below the permissible ambient and media temperatures can occur. Thus the instrument and the shut-off device must be protected by sufficiently long measuring lines or syphons. The influence of temperature on the indication accuracy must be observed.

Diaphragm seals/Separators

In the case of aggressive, hot, highly viscous, contaminated or crystallising media, which must not penetrate into the pressure element, diaphragm seals must be provided as separators.

To transmit the pressure to the pressure element, a neutral system fill fluid is used, which must be selected to correspond to the measuring range, temperature and compatibility with the medium. The connection between instrument and diaphragm seal must not be disconnected under any circumstances.

Protection of the pressure elements from overpressure

If the medium is subject to rapid changes in pressure, or pressure surges are expected, then these must not act directly on the pressure element. The action of the pressure surges must be dampened, for example with the fitting of a throttle section (reduction in cross-section in the pressure port) or through the addition of an adjustable snubber.
If, to favour a higher display resolution, the measuring range selected is smaller than the maximum pressures that occur for short times, the pressure element must be protected against damage. For this purpose, an overpressure protector must be connected upstream (external protection); this closes immediately in the event of a pressure surge, and only gradually if the pressure rises slowly. The closing pressure to be set thus depends on the pressure profile over time. A further possibility is the use of a pressure gauge with high overload safety (internal protection).

Pressure tapping

The pressure tapping should be arranged with as large a bore as possible (≥ 6 mm) via a shut-off device, so that the pressure tap is not distorted by any flow in the medium.
The measuring line between the pressure tapping and the pressure gauge should have a large enough inner diameter and no sharp bends to prevent blockage and lag in the pressure transmission. Its installation with a steady slope of approx. 1:15 is recommended.

Measuring line

The measuring line should be designed and installed so that the loads occurring due to expansion, vibration and thermal effects can be absorbed.
With gaseous media, a drain should be provided at the lowest point; with liquid media, a vent should be provided at the highest point.

For particle-laden gases or liquids, separators must be provided which can be isolated from the plant during operation, using shut-off devices, and emptied. If the instrument needs to be mounted either higher or lower than the pressure tapping, the measuring range shifts if the medium in the measuring line does not have the same density as the ambient air.

The shift, Δp, is derived from the density difference (ρM - ρL) and the height difference, Δh, in accordance with the formula:

$\Delta p = (\rho_M - \rho_L) \bullet g \bullet \Delta h \bullet 10^{-5}$ (bar)
Shift in the measuring range

ρ_M = Density of the medium (kg/m³)

ρ_L = Density of the ambient air (kg/m³)
(1.205 kg/m³ at 20 °C)

Δh = Height difference (m)

g = Gravitational acceleration (m/s²)
(average gravitational acceleration = 9.81 m/s²)

The display decreases by Δp, if the pressure gauge is higher; it increases by Δp, if the pressure measuring instrument is lower than the pressure tapping.
Usually, a pressure gauge is mounted with its dial vertical. With any deviation, the position indicator on the dial must be observed.

Mounting and commissioning

For process connections with parallel threads, use flat gaskets, lens-type sealing rings or WIKA profile sealings at the sealing face ①. The tightening torque is dependent upon the process connection, the material and the sealing. With tapered threads (e.g. NPT threads), sealing is made in the threads, ② using a suitable sealing material (EN 837-2).

Parallel and tapered thread connection

In order to orientate the instrument so that it can be read as well as possible, a connection with LH-RH union or union nut should be used.
When screwing the instruments in, the force required for sealing must not be applied through the case, but only through the spanner flats provided for this purpose, and using a suitable tool.

If the instrument is located below the pressure tapping, the measuring line must be flushed thoroughly before installation to remove any foreign bodies.

Some instrument models have a vent valve with the inscription CLOSE and OPEN for internal pressure compensation. In the condition at time of supply, this vent valve is closed (lever to setting CLOSE). Before checking and/or after installation and before commissioning, these instruments must be vented, i.e. the lever set to OPEN.

When pressure testing or blowing through pipes or vessels, the pressure gauge must not be subjected to a higher load than indicated by the identifying mark ▼ on the dial (EN 837-1 and EN 837-3). Otherwise the pressure gauge must either be protected by a shut-off device or dismounted.

Before the dismounting of a pressure gauge, it must be ensured that it is no longer pressurised. If necessary, the measuring line must have strain relief.
For diaphragm pressure gauges, the clamping bolts of the upper and lower flange must not be loosened.
Liquid media with the property of changing the volume during solidification can damage the measuring system (e.g. water if it falls below the freezing point).
Residual media in dismounted pressure gauges can result in a risk to persons, the environment and equipment. Sufficient precautionary measures must be taken.

Operation

In order to prevent any pressure surges, shut-off devices must only be opened slowly.

The maximum pressure for static load is indicated by the identifying mark ▼ on the dial (EN 837-1 and EN 837-3). Lower values apply for alternating loads.

For a zero point check during operation, the shut-off device must be closed and the pressure element vented. The pointer must then be within the range marked h at the zero point.

If the pointer is outside the transverse bar, it can generally be assumed that the pressure element is permanently deformed, which would have to be subjected to closer inspection in order to avoid measuring errors or accidents.

To check the display during operation, the pressure gauge must be separated from the process, via the shut-off device with test connection, and loaded with a test pressure. For instruments in accordance with EN 837-1 and EN 837-3, the permissible error limits are defined.

Improper handling with hazardous media, such as, for example, oxygen, acetylene, flammable or toxic substances, as well as in refrigeration systems, compressors etc., can cause dangerous or harmful media to escape into the environment, which can lead to damage or injury. For these media, in addition to all standard regulations, the appropriate existing codes or regulations must also be followed.

Storage

To avoid damage, the following points must be observed when storing the pressure gauges until installation:

- Leave the instruments in their original packaging and store them protected from damage by external influences.
- Following any possible removal of the instruments, e.g. for testing, the instrument should again be stored in its original packaging.
- Storage temperature range: -40 ... +70 °C
  Deviating storage temperatures are possible. The permissible temperature range can be taken from the respective data sheet.
- Protect the instruments from moisture and dust.

Reference documents

Quoted standards

EN 837-1
Bourdon tube pressure gauges - part 1:
Dimensions, metrology, requirements and testing

EN 837-2
Pressure gauges - part 2:
Selection and installation recommendations for pressure gauges

EN 837-3
Diaphragm and capsule pressure gauges - part 3:
Dimensions, metrology, requirements and testing

DIN 16270
PN 250 and PN 400 valves without test connection for pressure gauges

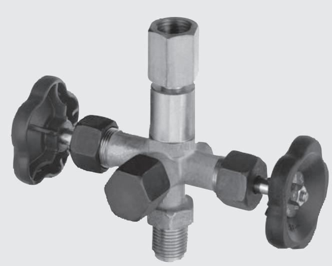
DIN 16271
PN 250 and PN 400 valves with test connection for pressure gauges

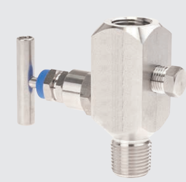
DIN 16272
PN 250 and PN 400 valves with blocking test connection for pressure gauges

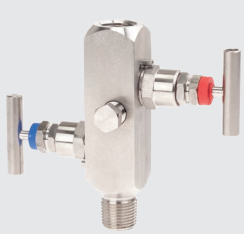
Shut-off devices


Stopcock

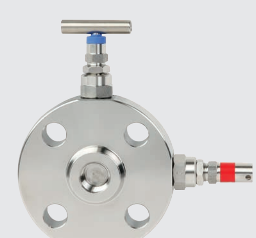

Shut-off valve


Shut-off valve with separately isolatable test connection


Needle valve with vent connection


Block-and-bleed valve

Double-block-and-bleed valve manifold


Monoflange

Mounting accessories

LH-RH union

Adjustable snubber

Adapter piece for instrument mounting bracket

Instrument mounting bracket

Syphon, compact form

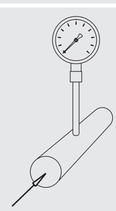
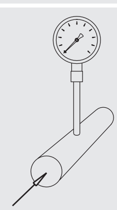
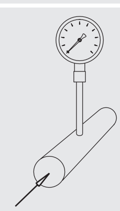
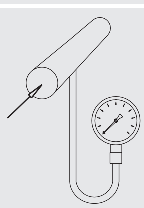
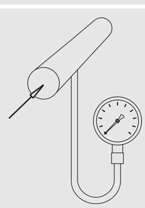
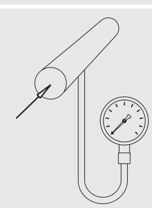
Syphon, trumpet form

Syphon, U-form

Overpressure protector

Measuring arrangement

Proven measuring assemblies for various types of media.

	Liquid media			Gaseous media		
Filling of the measuring line	**Liquid**	**Liquid with vapour**	**Completely vapourised**	**Gaseous**	**Partially con-densed (damp)**	**Completely condensed**
Examples	Condensate	Boiling liquids	“Liquid gases”	Dry air	Moist air Flue gases	Steam
Pressure gauge above the pressure tapping						
Pressure gauge below the pressure tapping						

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