Pharmaceutical
Food & Beverage
Biotechnology
Cosmetics

Pressure and temperature measurement for sanitary applications

WIKA

Part of your business

About us

Alexander Wiegand,
Chairman and CEO WIKA

Over the past 60 years WIKA Alexander Wiegand SE & Co. KG has built a reputation for innovation and quality in the manufacture and service of pressure and temperature measuring instruments. On the basis of steadily growing efficiency, innovative technologies are applied when developing new products and system solutions. The reliability of the products and the readiness to face all challenges of the market have been the key factors for WIKA to achieve a leading position in the global market.

Within the WIKA Group more than 7,000 employees are dedicated to maintaining and improving technology in pressure and temperature measurement. Over 500 experienced employees of the sales department consult the customers and users competently on a partnership basis.

More than 300 engineers and technicians are searching continually on behalf of WIKA to provide innovative product solutions, improved materials and profitable production methods. In close co-operation with renowned universities, institutes and industrial companies, solutions for specific applications are developed and designed, also including a program of pressure and temperature measuring instruments to meet hygienic standards.

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WIKA - your partner for sanitary applications

In the production of foodstuffs and pharmaceuticals, the safety of production and the prevention of any risks to the consumer of the finished product is of the highest priority.

In the chain of all the process components within a plant, measurement technology plays a key role. Measurement technology delivers process-specific information which enables high-quality production. For this, the hygienic requirements in the design of the measuring instruments and the connection of the sensors to the production plant must be fulfilled optimally with respect to ease of cleaning.

This brochure will assist you in selecting hygienic measuring instruments to solve pressure and temperature measurement challenges. In co-operation with you, we will develop tailored solutions geared to the individual requirements of your process.

Hygienic design

In view of the increasing requirements on safety and cleanability in production, the quality requirements for measuring instruments are also increasing. Thus, in choosing the correct measuring instrument, the choice of material and the required surface finish quality is a decisive factor.

Materials

Austenitic stainless steel is used as a standard material for wetted areas. In the food and beverage industry and also in the pharmaceutical industry, 316L grades are preferred.

Stainless steels are inert to the majority of foods and pharmaceuticals and also offer solid corrosion protection against the disinfectant and cleaning media. For specific applications, special alloys are used, such as the fully austenitic stainless steel or Hastelloy C, and also plastic coatings such as PFA (perfluoroalkoxy) or PTFE (poly-tetra-fluoro-ethylene).

As a standard material for all those metallic surfaces that will come into contact with the process medium, we use stainless steel 316L.

Surfaces

An important aspect in the cleaning of a plant using CIP/SIP processes is the quality of the surfaces in contact with the process medium.

To enable the easy cleaning of the measuring instruments, and also to prevent biofilms, the wetted surfaces must be passive and free from microscopic flaws. In addition to the surface topography, the surface roughness is an important criterion for cleanability. In the standards, such as 3-A Standard 74-05 Sanitary Standard for Sensors and Sensor Fittings and Connections, a roughness of Ra 32 µin (0.8 µm) is considered as sufficient for normal cleaning processes.

For sensitive biotechnology processes, surfaces with a lower roughness are needed.

Electropolishing

By using electrolytic polishing, the cleanability of the surfaces can be improved. In this way, essentially, the topographical structure of the surfaces is smoothed and therefore the roughness is decreased. A further advantage is that electropolishing increases the passive layer of stainless steel, and thus the corrosion resistance is improved, especially with reducing media.

Sealing materials

In the selection of suitable sealing material, various process parameters and also the process media are important. Sealing materials must be toxicologically harmless and sufficiently resistant to abrasion, be resistant against aggressive cleaning and disinfecting media, and be stable in superheated steam at high sterilisation temperatures.

Predominantly, special compounds are used for O-rings or form seals, for example fluororubber-based (FKM) such as VITON®, ethylene-propylene-diene material (EPDM) or poly-tetra-fluoro-ethylene (PTFE). The materials used for the sealing elements, and also their manufacturing processes, must conform to the rules of the regulatory authorities and organisations.

Process connections

Process connections which are used in CIP-capable equipment should not constitute any risk in respect to sterility. They are characterised by the following features:

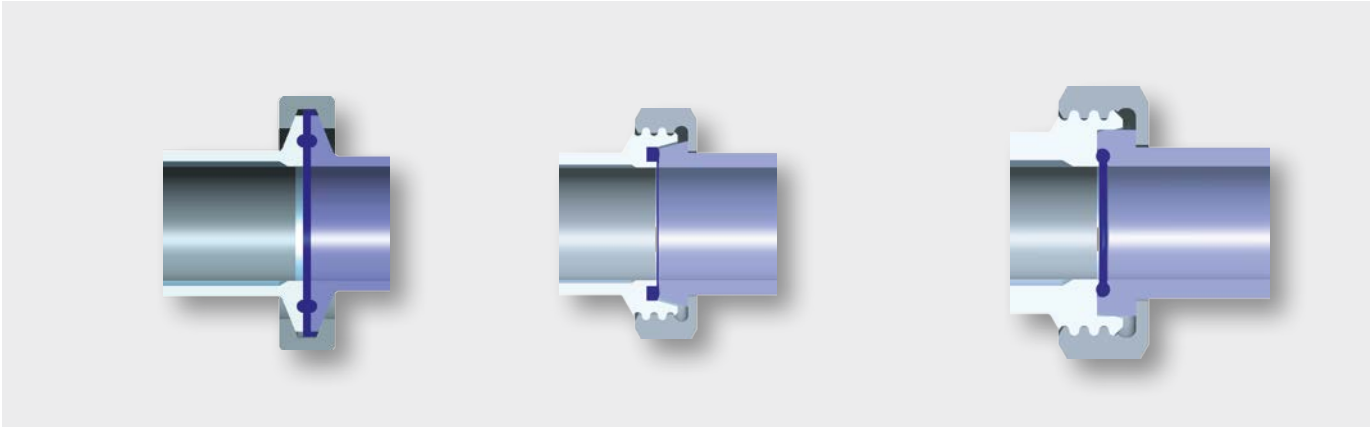
- A defined pre-load of the sealing element through a metallic stop
- Centering via a cylindrical guide
- Crevice-free sealing on the inside of the pipe

For this, there are connections such as those in accordance with DIN 11864, Neumo BioConnect®, BioControl® and Varivent®.

The widely-used clamp connections were originally developed in order that plant components could easily be disassembled.

They are therefore ideally suited to equipment that needs to be removed for cleaning. If measuring instruments with these process connections are operated with CIP cleaning, the appropriate profile sealing has to be used.

Process connections with metallic sealing components (thread with sealing cone) form a gap at the sealing point and are therefore viewed very poorly with respect to cleanability; especially with recurrent sealing and fitting following the calibration of the measuring instruments.



Clamp Connection per ASME BPE

Threaded pipe connection per DIN 11887

Threaded pipe connection per DIN 11864-1, form A

Housing

The design of the non-wetted parts must be made so that the equipment is easy to clean from the outside as well. Particularly with open processes in food production, the machinery and equipment must be cleaned after production. For this, WIKA has developed specific hygienically-designed housings. These are easy to clean from the outside. Without any gaps or corners and with a high IP protection, these are especially suited to the harsh conditions of washdowns.

Directives and standards

Measuring instruments from WIKA are manufactured in line with the cGMP guidelines (current good manufacturing practice) and meet the stringent requirements of the following organizations, among others.

They meet the stringent requirements of, amongst others,

- 3-A Sanitary Standards, Inc.
- FDA (Food and Drug Administration)
- USP (U. S. Pharmacopeia)
- CSA
- EHEDG (European Hygienic Engineering & Design Group)
- ATEX (directive 94/9/EG)
- ASME BPE
- CRN


Certificate of Compliance


CERTIFICATE OF COMPLIANCE

Connection to the process with diaphragm seals

The connection of pressure measuring instruments to the process is ideally performed by means of diaphragm seals with hygienic connections.

Diaphragm seals

Diaphragm seals separate the pressure gauge, pressure transmitter or pressure switch from the measuring medium and ensure a process connection which is either free of dead spaces or where dead spaces are reduced to a minimum. The isolation is achieved by means of a flexible diaphragm. The internal space between the diaphragm and the pressure measuring instrument is completely filled with a system fill fluid. The process pressure is transmitted from the measured medium by the elastic diaphragm into the fluid and from there to the measuring instrument.

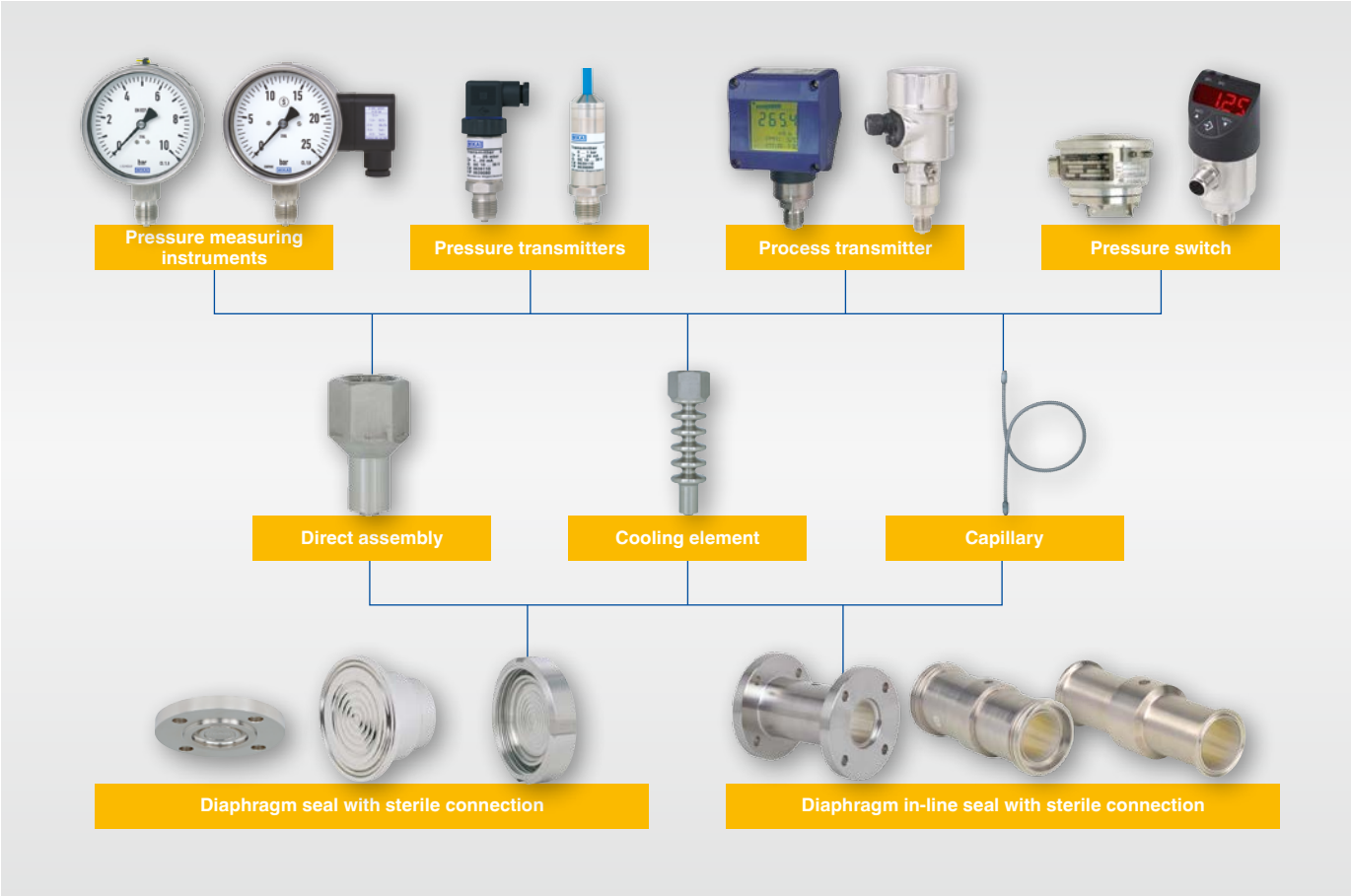
Advantages of diaphragm seals

In contrast to ceramic principles, with diaphragm seals - as a result of the measuring cell's metallic construction - additional sealing elements are eliminated, and so the maintenance burden is significantly reduced. Ceramic measuring cells exhibit a high sensitivity to dynamic loads. With any sudden pressure spikes, the ceramic cell can be destroyed. In these cases, combinations of pressure measuring instruments and diaphragm seals are clearly preferable.

Diaphragm seal with clamp connection

Possibilities for combination and assembly

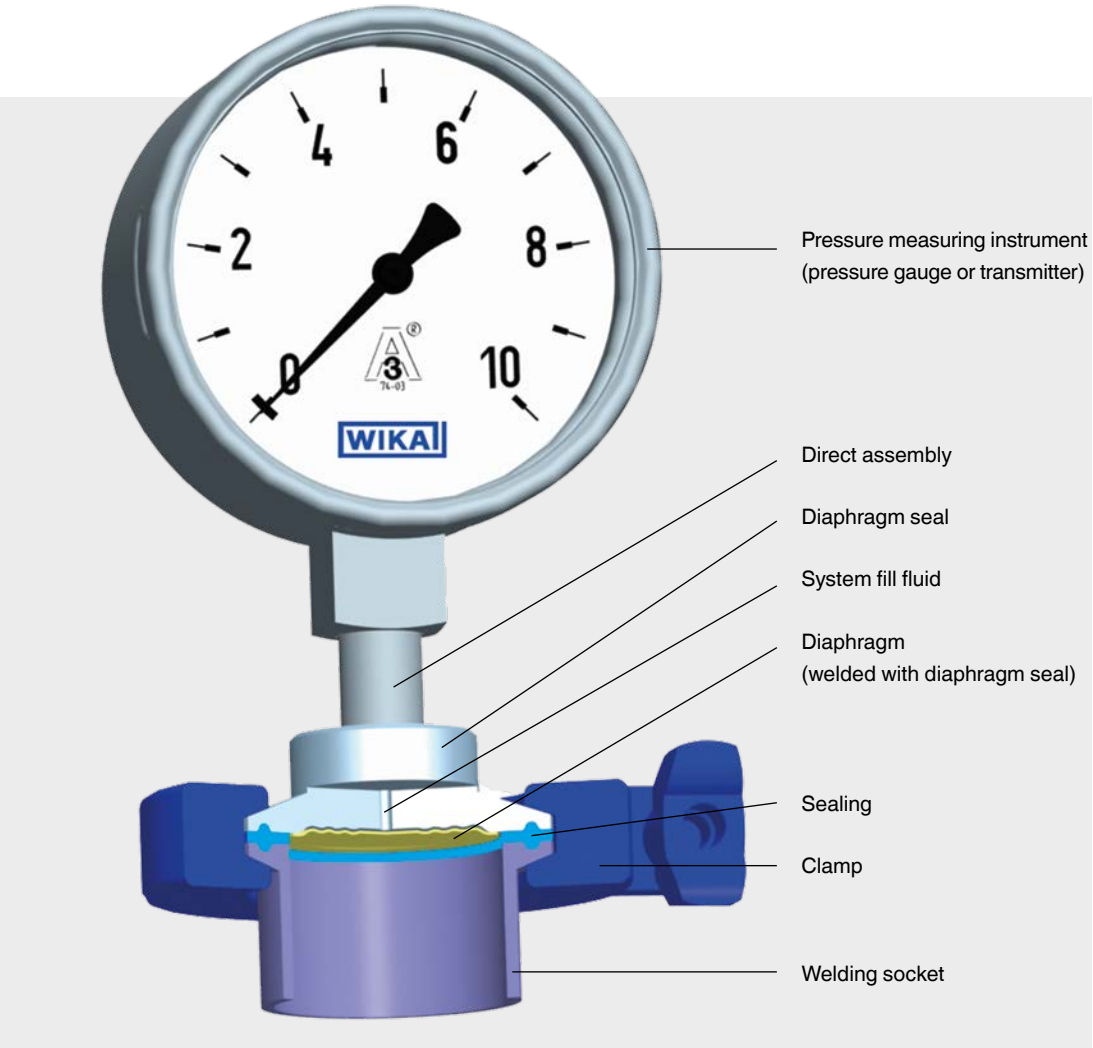
The combination of mechanical or electronic pressure measuring instruments with flush diaphragm seals or diaphragm in-line seals meets the stringent demands made on hygienic instrumentation and is suitable for even the most difficult measuring requirements. Assembly of the diaphragm seal to the measuring instrument may be made via a direct connection, for high temperatures via a cooling element or via a flexible capillary.



Diaphragm seals

Diaphragm seals are mounted to existing fittings. Usually the fittings consist of T-pieces which are integrated into a pipeline, or welding sockets which are welded to a pipeline, the process reactor or a tank.

This diaphragm seal type offers the advantage that the "contact surface" between pressure medium and diaphragm is relatively large, thus ensuring accurate pressure measurement. Furthermore, they can be easily removed for cleaning or calibration.



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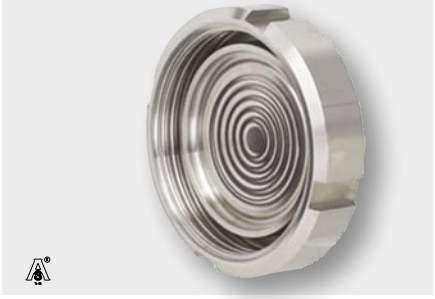
Milk thread fitting per DIN 11851



Process connection:	Thread with grooved union nut
MWP:	600 psi or 360 psi
Data sheet:	DS 99.40

990.22

Tri-clamp

Process connection:	Tri-clamp ASME BPE or BS4825
MWP:	■ 600 psi (1" ... 2½") ■ 360 psi (from 3")
Data sheet:	DS 99.41

990.24

VARIVENT® connection

Process connection:	For installation into the VARINLINE® access unit or connecting flange
MWP:	360 psi
Data sheet:	DS 99.49

990.51

Aseptic connection per DIN 11864

Process connection:	■ DIN 11864-1 threaded connection ■ DIN 11864-2 flange ■ DIN 11864-3 clamp connection
MWP:	360 ... 600 psi depending on the process connection
Data sheet:	DS 99.51

990.57

Cherry Burrell® connection

Process connection:	Cherry Burrell® connection (1½" ... 3")
MWP:	■ 15 ... 500 psi (1.5") ■ 15 ... 450 psi (2") ■ 15 ... 350 psi (3")

990.58

Aseptic process connection

Process connection:	For APC aseptic process connection
MWP:	15 ... 500 psi

990.SD

Clamped tank spud

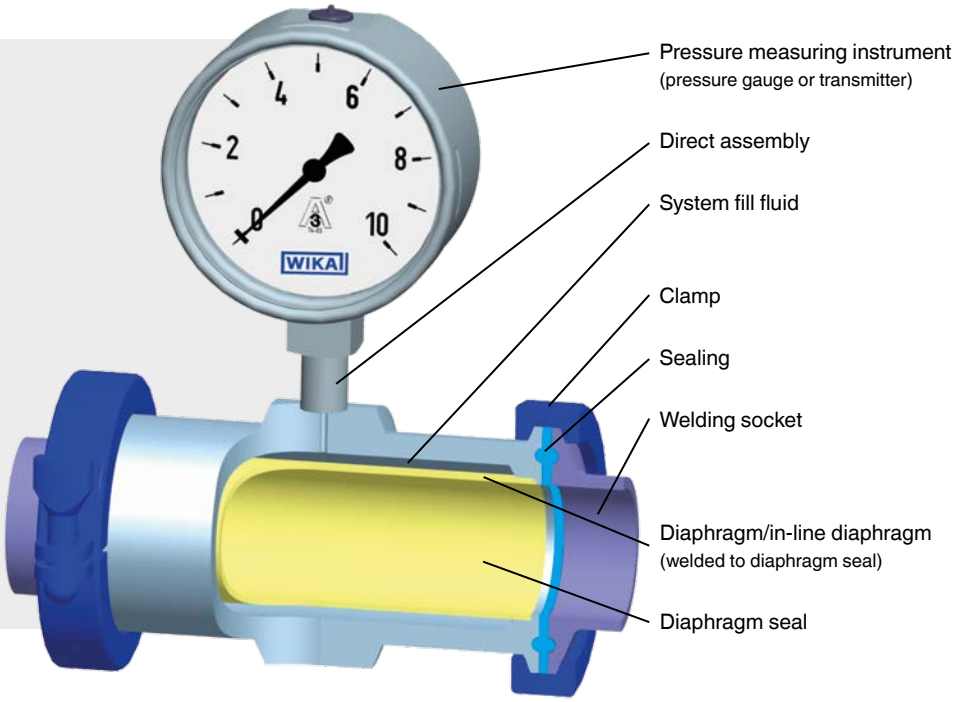
Process connection:	4" tank spud
MWP:	15 ... 600 psi

Diaphragm in-line seal

The diaphragm in-line seal is perfectly suited for use with flowing media. With the seal being completely integrated into the process line, measurements are not affected by any turbulence, corners, dead spaces or other obstructions in the flow direction.

The measured medium flows, without obstruction, through the diaphragm in-line seal. This effects an additional self-cleaning of the measuring chamber.

The diaphragm in-line seal is installed directly into the pipeline.



System fill fluids for diaphragm seal systems

We use FDA-compliant media as system fill fluids between diaphragm seals and measuring instruments:

Name	Code No.	Permissible medium temperature		S.G. at temperature		Viscosity at temperature		Conformities
	KN	P ≥ 14.5 psia	P 14.5 psia	[g/cm3]	[°C]	[$m^2/s \cdot 10^{-6}$]	[°C]	
Glycerine	7	+17** … +230 °C	–	1.26	+20	1110	+20	FDA 21 CFR 182.1320
Neobee® M-20	59	-20 … +200 °C	-20 … +160 °C	0.92	+20	10.1	+25	FDA 21 CFR 172.856, 21 CFR 174.5
Medicinal white mineral oil	92	-10 … +260 °C	-10 … +160 °C	0.85	+20	23	+40	FDA 21 CFR 172.878, 21 CFR 178.3620(a); USP, EP, JP

Neobee® is a registered trademark of the Stepan Company
Further system fill fluids can be used for special applications after technical application support.

981.18

Milk thread fitting DIN 11851

Process connection:	Thread (other connections on request)
MWP:	■ 600 psi (1 ... 2") ■ 360 psi (from 2½")
Data sheet:	DS 98.40

981.22

Tri-clamp ASME BPE

Process connection:	Tri-clamp, ASME BPE, ISO 2852
MWP:	■ 600 psi (1 ... 2") ■ 360 psi (from 2½")
Data sheet:	DS 98.52

981.51

Aseptic connection

Process connection:	■ DIN 11864-1 threaded connection ■ DIN 11864-2 flange ■ DIN 11864-3 clamp connection
MWP:	■ 600 psi (1 ... 1½") ■ 360 psi (from 2 ... 4")
Data sheet:	DS 98.51

981.50

NEUMO BioConnect®

Process connection:	NEUMO BioConnect® thread or flange
MWP:	■ 230 psi (thread) ■ 1000 psi (flange) ■ higher pressure ranges on request
Data sheet:	DS 98.50

Source: Sartorius Stedim Biotech

Electronic pressure measuring instruments

Electronic pressure measurement contributes to the precise and energy-saving control and regulation of processes. Alongside temperature, pressure is the most important and most common technology for monitoring and controlling plants and machinery.

With pressure measuring instruments, alongside the monitoring of process pressure and hydrostatic level measurement, a full range of process steps can be controlled, such as the dosing of inert gas blankets, the monitoring of filters in downstream areas and filling pressures. For the various applications there are a number of pressure transmitters available.

The pressure transmitters shown here are particularly suited for combination with diaphragm seals for hygienic adaption and therefore ensure the ability of the instruments for CIP and SIP processes.

S-10

Pressure transmitter

Non-linearity (± % of span): ≤ 0.2 BFSL

Measuring range:
- 0 … 50 inWC to 0 … 15,000 psi
- 0 … 15 to 0 … 250 psia
- -15 … 0 inHg to -30 inHg ... +300 psi

Special feature:
- Zero point and span adjustable
- Customer-specific options

IS-20-S, IS-20-F

Pressure transmitter, intrinsically safe

Non-linearity (% of span): ≤ 0.2 BFSL

Measuring range:
- 0 … 50 inWC to 0 … 15,000 psi
- 0 … 15 to 0 … 250 psia
- -15 … 0 inHg to -30 inHg ... +300 psi

Special feature:
- Further worldwide Ex approvals
- High-pressure version (optional)
- Suitable for SIL 2 per IEC 61508/ IEC 61511

PSD-30

Electronic pressure switch with display

Accuracy (% of span): ≤ 1

Measuring range:
- 0 … 15 to 0 … 8,000 psi
- 0 … 15 to 0 … 300 psia
- -30 … 0 inHg to -30 inHg ... +300 psi

Special feature:
- Easily-readable, robust display
- Intuitive and fast setup
- Easy and flexible mounting configurations

UT-10, IUT-10

Universal pressure transmitter, standard version or intrinsically safe

Non-linearity (% of span): ≤ 0.1

Measuring range:
- 0 … 0.4 to 0 … 4,000 bar
- -1 … 0 to -1 … +15 bar
- 0 … 0.4 to 0 … 16 bar absolute

Special feature:
- Freely scaleable measuring ranges (turndown to 1 : 20)
- Case from plastic or aluminium

IPT-10

Process pressure transmitter, intrinsically safe or with flame-proof enclosure

Non-linearity (% of span): ≤ 0.075 ... 0.1

Measuring range:
- 0 … 0.1 to 0 … 4,000 bar
- -1 … 0 to -1 … +60 bar
- 0 … 0.1 to 0 … 60 bar absolute

Special feature:
- Freely scaleable measuring ranges (turndown to 1 : 30)
- Case from plastic, aluminium or stainless steel

DPT-10

Differential pressure transmitter, intrinsically safe or with flameproof enclosure

Non-linearity (% of span): ≤ 0.075 … 0.15

Measuring range: 0 … 10 mbar to 0 … 40 bar

Special feature:
- Freely scaleable measuring ranges
- Case from plastic, aluminium or stainless steel
- Optionally with integrated display and mounting bracket for wall/pipe mounting

Pressure transmitter for sanitary applications

SA-11

For hygienic processes

Accuracy (± % of span): ≤ 0.2 BFSL

Measuring range:
- -30 … 0 inHg to -30 … 300 psi
- 0 … 5 to 0 … 300 psi relative
- 0 … 15 to 0 … 250 psi absolute

Special feature:
- Flush diaphragm with a surface roughness of Ra < 0.4 µm
- Fully welded

Suitable for SIP and CIP

For the special conditions of cleaning-in-place (CIP) processes, such as chemical stability with cleaning solutions, as well as high temperatures for subsequent sterilisation in place (SIP), the SA-11 pressure transmitter is ideally suited.

Flush

The flush metallic measuring cell is directly welded to the process connection. This guarantees a crevice-free connection between the process connection and the measuring cell; additional sealings are not required. For dead-space free instrumentation, a number of aseptic process connections (e.g. clamp, threaded, Varivent®, DIN 11864 and DRD) are available. The SA-11 pressure transmitter fulfils, ideally, the stringent demands of sanitary applications. This is verified by a 3-A Sanitary Standards certificate and an EHEDG cleanability test. The fluid used for pressure transmission is FDA approved.

Design

A diaphragm made of 316L stainless steel forms a flush separation of the process medium from the pressure measuring instrument. The process pressure is transmitted hydrostatically from the diaphragm, via an FDA-approved fill-fluid, to a piezo-resistive sensor.

Cable outlet, IP 68

Big DIN connector, 4-pin, EN 175301-803, form A, IP65

Circular connector, 4-pin, with screw-fastening M12 x 1, IP 67

Stainless steel field case, IP 67

Process pressure transmitter

With its 4 ... 20 mA/HART®, PROFIBUS® PA or FOUNDATION Fieldbus™ output signals, combined with either intrinsically safe or flameproof enclosure ignition protection type (in accordance with ATEX or FM), the IPT-1x is ideally suited for use in appropriate plants. The instruments can be used for standard pressure measurement and also for hydrostatic level measurement. The programming of the tank linearisation can be made graphically and very simply with the assistance of the DTM (Device Type Manager).

Easy configuration and operation

The operation and configuration at the instrument can be made, optionally, on a display and operation module via 4 membrane keys. The operation menu has a simple and self-explanatory structure and has 9 selectable languages as standard.

Special features

- High measuring accuracy
- Best long-term stability
- Freely scaleable measuring ranges (turndown to 1 : 30)
- Configuration via DTM (Device Type Manager) in accordance with the FDT (Field Device Tool) concept (e.g. PACTware) and primary standards

IPT-11

Process pressure transmitter in stainless steel case

Accuracy:	0.075 to 0.25 %
Measuring range:	■ 0 … 0.1 to 0 … 600 bar ■ -1 … 0 to -1 … +60 bar ■ 0 … 0.1 to 0 … 60 bar absolute
Output signal:	■ 4 … 20 mA ■ 4 … 20 mA, HART® ■ PROFIBUS® PA ■ FOUNDATION™ Fieldbus

Pressure switch

The PSA-31 electronic pressure switch is recommended, among other things, for applications in filling and packaging machinery for the food and pharmaceutical industries.

The 3-key operation makes simple, intuitive menu navigation possible, with no need for additional assistance, for setting the two switch points.

The instrument is extremely robust and the wetted parts are particularly easy to clean.

With its case that can be turned through 300 degrees, this electronic pressure switch can be easily adjusted to any individual installation situation. The large, angled display, which is also rotatable, is easy to read from any position.

PSA-31

Pressure switch with display

Accuracy:	≤ 1 % of span
Measuring range:	■ 0 ... 15 to 0 ... 300 psi relative ■ 0 ... 15 to 0 ... 300 psi absolute ■ -14.5 ... 0 inHg to -14.5 inHG ... 300 psi vacuum
Switching output:	1 or 2 (PNP or NPN)
Analogue output (optional):	■ 4 … 20 mA ■ DC 0 ... 10 V(optional)

Mechatronic and mechanical pressure measuring instruments

For a reliable on-site display of the working pressure, a wide range of mechanical pressure measuring instruments is available. Our product line ranges from proven Bourdon tube instruments, through diaphragm and capsule gauges to robust pressure gauges in stainless steel for the measurement of gauge, absolute and differential pressure. In conjunction with diaphragm or diaphragm in-line seals, these instruments can be adapted to a wide range of hygienic fittings. The gauges are characterised, in particular, by mechanics made completely from stainless steel.

Mechatronic measuring instruments

At any point where the process pressure has to be indicated locally, and, at the same time, a signal is wanted to be transmitted to a central controller or remote control room, the intelliGAUGE® model PGT23 can be used.

Through the combination of a mechanical measuring system and electronic signal processing, the process pressure can be read securely, even if the power supply is lost.

The intelliGAUGE® model PGT23 fulfils all safety-related requirements of the relevant standards and regulations for the on-site display of the working pressure of pressure vessels. An additional measuring point for mechanical pressure indication can thus be saved.

Our offer is completed by the mechatronic pressure gauges with switch contacts, making it possible to simultaneously monitor the equipment and to switch circuits for the control and regulation of various processes.

The following measuring instruments are particularly recommended for use in sanitary applications and for combination with diaphragm seals for a hygienic adaption to the process and therefore ensure the ability of the instruments for CIP and SIP processes.

Internal workings of a mechanical pressure measuring instrument

131.11

Stainless steel version, standard

Nominal size:	1.5", 2" and 2.5"
Scale range:	0 ... 15 to 0... 10,000 psi 0 ... 1 to 0 ... 1,000 bar
Accuracy class:	2.5 % FS
Ingress protection:	IP 54

232.50, 233.50

Stainless steel version

Nominal size:	2½", 4", 4½" and 6"
Scale range:	0 ... 10 to 0 ... 20,000 psi 0 ... 0.6 to 0 ... 1,600 bar
Accuracy class:	2½" (2½ %) 4", 4½", 6" (1% FS)
Ingress protection:	IP 65

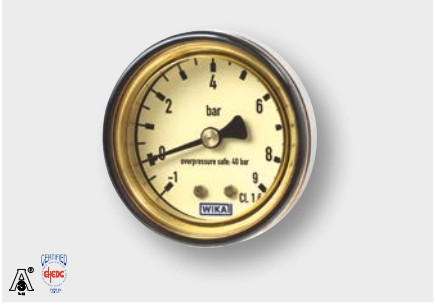
432.55

Stainless steel sanitary gauge, with dry flush diaphragm element

Nominal size:	4" and 6"
Permissible temperatures:	Ambient: -4 ... 140 °F (-20 ... +60 °C) Medium: -4 ... 302 °F (-20 ... +150°C)
Accuracy class:	1.6
Ingress protection:	NEMA 3S, IP54
Special feature:	■ Dry measuring system ■ Without transmission fluid

PG43SA

Stainless steel version, with flush diaphragm element



Nominal size:	1.5" and 2.5"
Scale range:	-30 inHg ... 30 psi to -30 inHg ... 160 psi -1 ... 2 bar to 0 ... 10 bar
Accuracy class:	1.6 or 2.5
Permissible temperatures:	Medium: max. 302 °F (150 °C), auto-claving: 273 °F (134 °C), 20 min.
Special feature:	■ Dry measuring system ■ Without transmission fluid ■ Compact design

M93X.3A

Stainless steel sanitary gauge assembly

Nominal size:	21/2" and 4"
Scale range:	-30inHG ... 0 psi to 0 ... 800 psi
Accuracy class:	2½" (2½ % FS) 4", 4½", 6" (1 % FS)
Permissible temperatures:	Max. 149 °C, autoclavable
Ingress protection:	IP 65
Special features:	■ Zero point adjustment ■ Electropolished housing

PGS23

Pressure gauge with switch contacts

Nominal size:	4" and 6"
Scale range:	0 ... 10 to 0 ... 20,000 psi 0 … 0.6 to 0 … 1,600 bar
Accuracy class:	1.0
Ingress protection:	IP 65

Electrical temperature measurement

Resistance thermometers

Resistance thermometers are particularly suited, as a result of their quality and measuring accuracy, to applications in the food and beverage industry and also the pharmaceutical, biotechnology and cosmetics manufacturing industries.

Resistance thermometers have metallic-conductor based sensor elements which change their electrical resistance as a function of temperature. The connection to the evaluation electronics (transmitter, controller, display, chart recorder, etc.) can be made with a 2, 3 or 4-wire circuit, depending on the application.

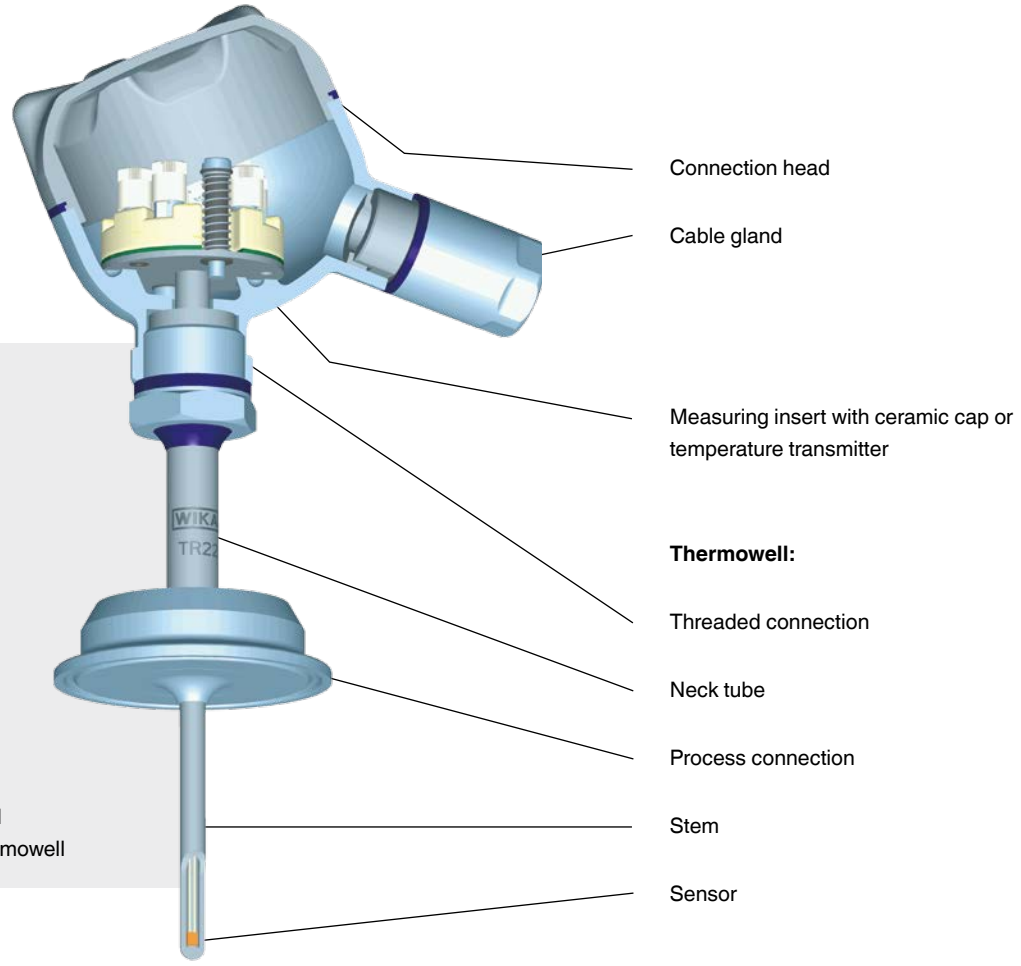
Design of an electrical thermometer

An electrical thermometer, as a rule, is modular in design and consists of **3 main components:** the **thermowell**, the **connection head** and the **measuring insert**.

The thermowell is used for adapting the thermometer to the process and to protect the sensor against the sometimes harsh process conditions.

In the connection head, the electrical connection of the measuring insert is made, which can either be fitted with a ceramic cap or a temperature transmitter.

With a rotatable screw connection between the thermowell and the connection head, this can be rotated in the desired direction, and in addition, if required, the connection head can be removed together with the measuring insert. This allows the thermometer, with the entire measuring chain, to be calibrated directly on site without having to disconnect the electrical connections. This avoids having to open the process, and thus a potential risk of contamination is minimised.



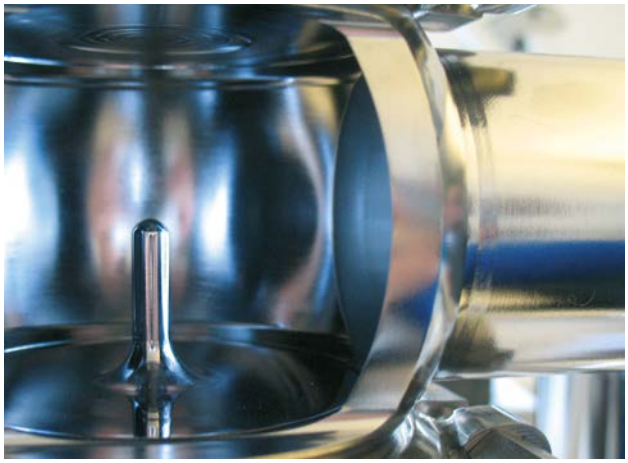
Design of an electrical thermometer with thermowell

Thermowells

For connecting the thermometer to a process line or a vessel, WIKA offers a comprehensive program of thermowells.

Here, the following thermowell groups can be distinguished:

- Thermowells with clamp connections are integrated into the process via an existing connection welded into the pipe or tank. For aseptic processes, it is recommended that the connection is made via Varivent® or Neumo BioControl® flanges.
- For a direct connection of the thermowell into the pipeline, thermowells are available which are fitted via an orbital weld or via an orbital weld according to ASME BPE 2012 Appendix P or via hygienic process connection sandwiched into the pipeline.
- For temperature measurement in tanks and larger vessels, the thermowells can be welded to the tanks with welding balls or welding collars. One should however take care that the inner welding seam is polished and passivated after welding.



Process connection with VARIVENT® connection

Thermowell TW22
with Varivent® flange

Thermowell TW61
for inline measurement

Thermowell TW22
with welding ball

Thermowell TW60
solid machined

Electrical temperature measuring instruments

For temperature measurement in the widest range of applications, WIKA offers a comprehensive product program of electrical thermometers. The TR21 series is characterised by a compact design and quick electrical connection. The TR21 series housings are available with IP 68 and IP 69k protection. In the TR22 series WIKA's proven temperature transmitters are used, with which all standard output signals are available.

Easy calibration or maintenance, without having to open the process, is possible in both series with connection to the process via thermowell. In this way, hygiene risks can be minimised and downtimes can be reduced. Suitability for use in sanitary applications is confirmed by the successful 3-A auditing and EHEDG certification.

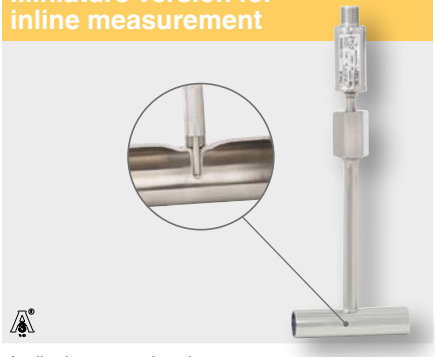
TR21-A

Miniature version with flange connection

Sensor element:	Pt100 DIN
Measuring range:	-50 ... 250 °C (-58 ... 482 °F)
Output:	Pt100, 4 … 20 mA
Connection to thermowell:	Removable G ⅜"

TR21-B

Miniature version for inline measurement



Application:	Invasive temperature measurement in the product stream
Sensor element:	Pt100 DIN
Measuring range:	--50 ... 250 °C (-58 ... 482 °F)
Output:	Pt100, 4 … 20 mA
Connection to thermowell:	Removable G⅜
Connection to pipe:	Orbital welding or clamp connections

TR21-C

Miniature version with welded flange connection

Sensor element:	Pt100 DIN
Measuring range:	-50 … +250 °C (-58 ... 482 °F)
Output:	Pt100, 4 … 20 mA
Connection to thermowell:	Welded

TR22-A

With flange connection

Sensor element:	Pt100 DIN
Measuring range:	-50 … +250 °C (-58 ... 482 °F)
Connection to thermowell:	Removable M24

TR22-B

For for inline measurement

Application:	Invasive temperature measurement in the product stream
Sensor element:	Pt100 DIN
Measuring range:	-50 … +250 °C (-58 ... 482 °F)
Connection to thermowell:	Removable M24
Connection to pipe:	Orbital welding or clamp connections

TR25

In-line resistance thermometer

Application:	For piggable systems
Sensor element:	Pt100 DIN
Measuring range:	-50 … +250 °C (-58 ... 482 °F)
Pin assignment:	3- or 4-wire
Data sheet:	TE 60.25

Model TR51

Pipe surface resistance thermometer

Sensor element:	Pt100
Output:	Pt100, 4 … 20 mA, HART®, FOUNDATION™ Fieldbus, PROFIBUS® PA
Measuring insert:	Exchangeable
Process connection:	For retrofitting into pipelines
Data sheet:	TE 60.51

TR60

Indoor resistance thermometer

Application:	For refrigerators and storage rooms
Sensor element:	Pt100 DIN
Measuring range:	-40 … +80 °C (-40 ... +176 °F)
Pin assignment:	2-, 3- and 4-wire
Data sheet:	TE 60.60

Temperature transmitters

Transmitters convert the temperature-dependent change in resistance of the resistance thermometer or the temperature-dependent voltage change in a thermocouple into a proportional standard signal. The most commonly used standard signal is the analogue 4 ... 20 mA signal, though digital signals (fieldbus) are gaining more and more importance.

By using intelligent circuit concepts with analogue 4 … 20 mA signals, any sensor errors that occur are signalled and simultaneously transmitted with the measured value over a two-wire line (current loop). The conversion and transmission of the standard signals (analogue or digital) is made over long distances and completely fail-safe. A temperature transmitter can either be mounted directly at the measuring point in the connection head or on a DIN rail in a cabinet.

Interoperability: Internal and external tests certify the compatibility of our transmitters with almost all open software and hardware tools.

T19

Analogue transmitter 2-wire, 4 ... 20 mA

Input:	Pt100
Accuracy:	< 0.50 %
Output:	4 … 20 mA
Special feature:	Excellent price/performance ratio
Data sheet:	TE 19.03

T32

HART® transmitter

Input:	Resistance thermometers, thermo-couples, potentiometers
Accuracy:	< 0.12 %
Output:	4 … 20 mA with HART® protocol
Special feature:	PC configurable
Data sheet:	TE 32.04

T24

Programmable analogue transmitter

Input:	Pt100
Accuracy:	< 0.20 %
Output:	4 … 20 mA
Special feature:	PC configurable
Data sheet:	TE 24.01

T53

FOUNDATION™ Fieldbus and PROFIBUS® PA transmitter

Input:	Resistance thermometers, thermocouples
Accuracy:	< 0.10 %
Special feature:	PC configurable
Data sheet:	TE 53.01

T12

Universally programmable digital transmitter

Input:	Resistance thermometers, thermocouples
Accuracy:	< 0.25 %
Output:	4 … 20 mA
Special feature:	PC configurable
Data sheet:	TE 12.03

Digital indicators and temperature controllers

With digital indicators, the measured values from electrical temperature sensors or from pressure and temperature transmitters are shown on a display. Integrated alarm outputs enable, in addition, the control of the measured process values. Even simple two-position control, such as level control, is possible with the switching outputs from the digital indicators.

Temperature controllers are used to control the temperature in production processes or for the temperature regulation of raw materials and finished products in storage and transport vessels. With the help of switchable set points, different set points can be easily selected. Via optional serial interfaces, controllers can be connected to a network and connected to a higher-level control room.

DI15

For panel mounting, 48 x 24 mm

Input:	Multi-function input for resistance thermometers, thermocouples and standard signals
Alarm output:	2 electronic contacts
Power supply:	DC 9 … 28 V
Data sheet:	AC 80.01

DI25

For panel mounting, 96 x 48 mm

Input:	Multi-function input for resistance thermometers, thermocouples and standard signals
Alarm output:	■ 3 relays ■ 2 relays for instruments with integrated transmitter power supply DC 24 V
Power supply:	■ AC 100 … 240 V ■ AC/DC 24 V
Special feature:	Analogue output signal
Data sheet:	AC 80.02

A-AS-1

Attachable indicator with LED and switching outputs

Dimensions:	38 x 29 mm
Input:	■ 4 … 20 mA, 2-wire ■ 0 … 5 V, 3-wire ■ 0 … 10 V, 3-wire
Power supply:	■ DC 16 ... 30 V for 4 ... 20 mA ■ DC 10 ... 30 V for 0 ... 5 V ■ DC 15 ... 30 V for 0 ... 10 V
Data sheet:	AC 80.09

A-AI-1, A-IAI-1

Attachable indicators with LCD for transmitters

Dimensions:	50 x 50 mm (case)
Input:	4 … 20 mA, 2-wire
Power supply:	from the 4 ... 20 mA current loop
Special feature:	Model A-IAI-1 intrinsically safe per ATEX
Data sheet:	AC 80.07

CS4M, CS4H, CS4L and CS4R

For panel mounting, 48 x 24, 48 x 96, 96 x 96 mm, for rail mounting (only CS4R), 22.5 x 75 mm

Input:	Multi-function input for resistance thermometers, thermocouples and standard signals
Control characteristic:	PID, PI, PD, P, ON/OFF (configurable)
Control output:	Relay or logic level DC 0/12 V to control an electronic switch relay (SSR) or analogue current signal 4 … 20 mA
Power supply:	■ AC 100 … 240 V ■ AC/DC 24 V
Data sheet:	AC 85.06, AC 85.03, AC 85.04, AC 85.05

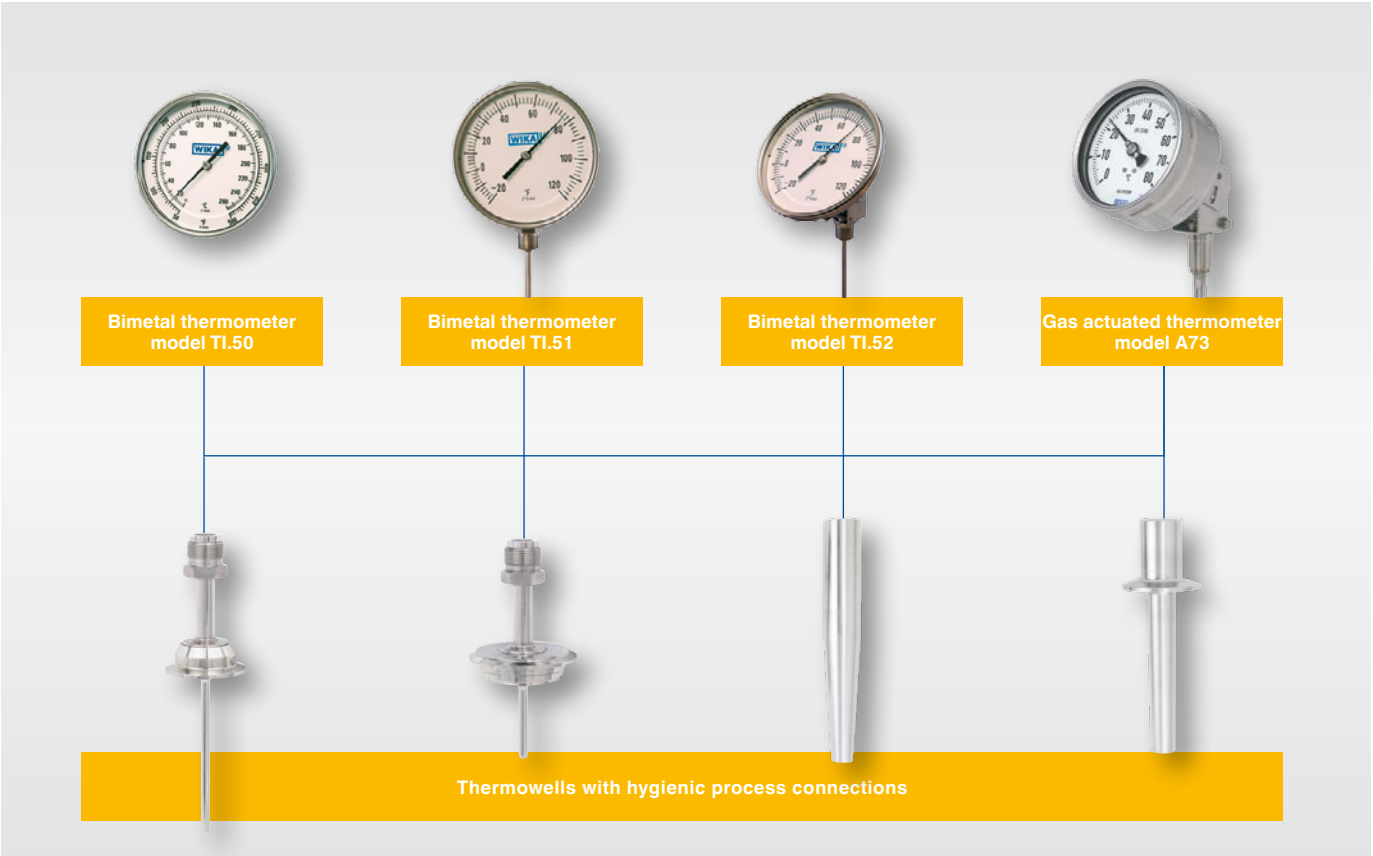
Mechanical temperature measuring instruments

For temperature measurement with mechanical temperature measuring instruments, WIKA manufactures bimetal and gas actuated thermometers.

Based on these measurement methods, there is a comprehensive range of instruments.

For hygienic applications in areas such as the food, beverage, pharmaceutical, cosmetic manufacturing and biotechnology industries, some examples of mechanical temperature measuring instruments with stainless steel housings are listed below.

For all thermometers, WIKA offers a comprehensive range of themowells with hygienic process connections.



TI30, TI.50

Process grade resettable, hermetically sealed, back connected with reset

Nominal size:	3", 5"
Scale range:	-100 ... 1,000 °F
Wetted parts:	Stainless steel
Dampening:	Inert gel
Option:	■ Non-standard stem lengths ■ Min/max pointer

TI.31, TI.51

Process grade resettable, hermetically sealed, bottom connected with reset

Nominal size:	3", 5"
Scale range:	-100 ... 1,000 °F°C
Wetted parts:	Stainless steel
Dampening:	Inert gel
Option:	■ Non-standard stem lengths ■ Sharp top

TI.32, TI.52

Process grade, any angle adjustable dial, stainless steel case & screw

Nominal size:	3", 5"
Scale range:	-100 ... 1,000 °F
Wetted parts:	Stainless steel
Dampening:	Inert gel
All angle case:	Rotation of 360 grad and stem variation of more than 180 grad

R73, S73, A73

Axial and radial, adjustable stem and dial

Nominal size:	4", 6"
Scale range:	-20 … +60 to 0 … +160 °C (-4 ... 140 to 32 ... +320 °F)
Wetted parts:	Stainless steel
Option:	■ Liquid damping (housing) ■ Contact bulb

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For sanitary applications

Nominal size:	4"
Scale range:	0 … 120 or 0 … 160 °C (-4 ... 140 to 32 ... +320 °F)
Wetted parts:	Stainless steel
Option:	■ Liquid damping (housing) ■ Wetted parts with electropolished surface

TT.30, TT.32, TT.50, TT.52 Twin-Temp

Bimetal thermometer with Pt100

Nominal size:	3", 5"
Measuring range:	-40 ... 750 °F
Wetted parts:	Stainless steel
Option:	■ Bimetal and Thermocouple or RTD Thermowells ■ Back connection, bottom connection, any angle adjustable dial

Special applications

Mechanical pressure measuring instrument for homogenisers

The model 990.30 mechanical pressure measuring instrument has been specifically developed for homogenising processes, where there are extremely dynamic pressure loads.

Complex structural features allow static pressures of up to 1,600 bar (23,000 psi), with pressure peaks of up to 2,000 bar (29,000 psi), and ensure a long service life. The model is available as a purely mechanical solution or with a 4 ... 20 mA output signal.

Dry cell mechanical pressure gauges

The sanitary gauges 432.55 and PG43SA have no fluid behind the measuring diaphragm. This innovative measuring technology is being introduced into the sanitary industry for all applications where possible contamination of the process media can be extremely expensive. The greatest advantage is the reduced risk of contamination in the case of an unforeseen break in the measuring diaphragm. This is due to the fact that no system fill fluid is necessary, as this is a dry measuring cell. Furthermore, the diaphragm is thicker than standard diaphragms and is therefore more robust.

Additional advantages: this system offers over-pressure protection up to 5x the full scale (considerably greater than a Bourdon tube measuring system), little to no external temperature influence due to no fill fluid behind the diaphragm and the assembly is designed to comply with CIP, SIP and autoclaving (PG43SA only).

Process adapter system

The WIKA process adapter system has been developed to meet the requirements of the food, beverage and pharmaceutical industries. The adapter system consists of a pressure gauge or transmitter with a built-in process adapter.

The flexible, modular system allows connection to a wide range of aseptic process connections (e.g. clamp, threaded, VARIVENT® or NEUMO®). All parts are made of 316L stainless steel. The O-ring for sealing the process is supplied with a 3.1 material test certificate in accordance with EN 10204. There is a choice of EPDM or FKM and they are approved by FDA, USP Class VI and 3-A 18-03.

The WIKA adapter system meets the high requirements of sterile processes and has been developed in accordance with the 3-A sanitary standards.

Installation examples

Process connection of the BioControl® system

The pharmaceutical BioControl® system is used to connect pressure and temperature measuring instruments to piping systems and vessels. For the different types of problems encountered in sanitary applications, there are various designs of the BioControl® system with component approvals available.

An advantage to the user is that the system is highly flexible. In the design of the plant, it makes no difference whether the port is fitted with a pressure or a temperature measuring instrument. Design errors can be avoided due to the modular system with standardised interfaces. Furthermore, storage costs are reduced to a minimum since only a few components need to be kept in stock.

Process connection of the VARINLINE® system

To connect the pressure and temperature measuring instruments to the aseptic processes, aseptic fittings are required. For this, VARIVENT® connections are available to the process engineer in the production of foodstuffs, which ensure a dead-space free transition from the process line to the measuring instrument. WIKA pressure and temperature measuring instruments with VARIVENT® connections fit smoothly into the VARINLINE® access units.

BioControl® is a registered trademark of Neumo.
VARIVENT® and VARINLINE® are registered trademarks of GEA Tuchenhagen

Clamp model 990.22 with sterile extension

WIKA has developed a diaphragm seal system with a process connection that is specifically suited to pressure measurement in sanitary applications. The EHEDG (European Hygienic Engineering & Design Group) has tested the model 990.22 clamp with sterile extension and has certified it as having exceptional suitability for sanitary applications.

The model 990.22 clamp with sterile extension is easy to handle when installing and removing. With the help of a special welding socket, a flush sealing to vessels and pipelines is ensured. Thus it offers the user an easy-to-clean pressure measuring point, which is suitable for CIP and SIP.

Weld-on adapter for flush pressure transmitters

In open vessels or vented tanks, the operator measures the level hydrostatically with a pressure transmitter. For this, one installs the measuring instrument in the bottom or close to the bottom. This measurement can be used on practically all liquids whose density remains constant. The measurement is not affected by pastes, emulsions or blends of solid ingredients. Also, hydrostatic level measurement is not affected by foaming on the liquid surface.

To mount the measuring instrument, a socket is welded into the vessel wall and the inside smoothed. This enables a flush and easy-to-clean measuring point for pressure measurement in a vessel. The aseptic design is made in accordance with the EHEDG guidelines.

Interior view of vessel

Installation examples for temperature measuring instruments

Thermowell for orbital welding

Flow-through housing

The model TW61 thermowell serves as the process connection for a model TR21-B or TR22-B resistance thermometer. The thermowell is especially suitable for the adaption of temperature measurement into pipelines for sanitary applications and for CIP and SIP processes. The ease of cleaning is ensured through the optimal hygienic design. For fitting into the process, the thermowell is orbitally welded directly into a pipeline. The connection ends are smooth and prepared for orbital welding.

The measuring insert can be withdrawn together with the connection head. This makes it possible to calibrate the thermometer on-site with the entire measuring chain without disconnecting the electrical connections. In addition, this avoids having to open the process, and thus the risk of contamination is minimised.

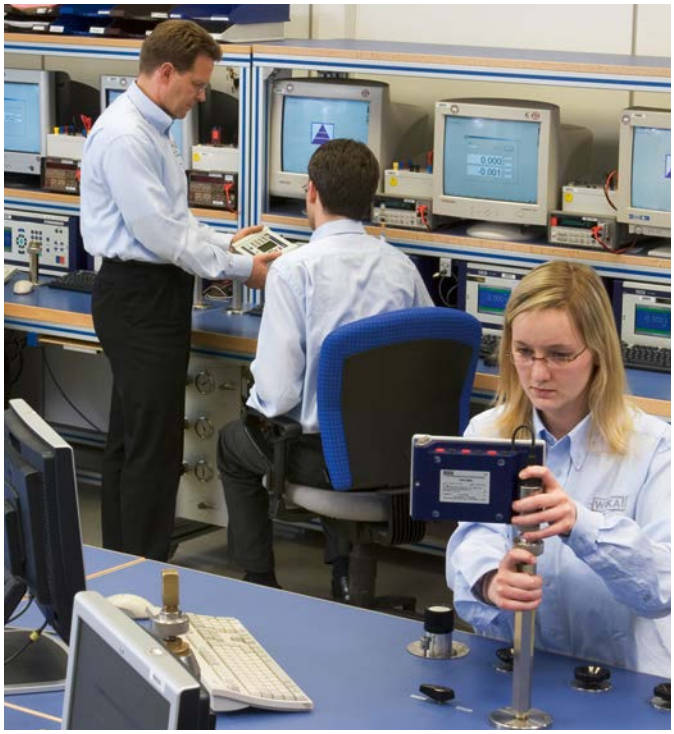
Angular housing

For small nominal pipe sizes and in cramped conditions, angular housing thermowells are available.

The thermowell is dead-space optimised and is welded automatically, thus it is preferable to thermowells with welding balls and hand-welded seams. The measuring instruments should be aligned horizontally in order to avoid air pockets in the cupola.

Calibration services

-30 inHG ... 20,000 psi



IEC 17025

Our calibration laboratory for pressure has been accredited to IEC 17025 since 2010.

We calibrate your pressure measuring instruments quickly and precisely:

- in the range from -30 inHG ... 20,000 psi
- using high-precision reference standards (pressure balances) and working standards (precise electrical pressure measuring instruments)
- with an accuracy from 0.05 ... 0.1 % FS of the measured value of the measured value depending on the pressure range

-35 ... 1,100 °C

IEC 17025

Our calibration laboratory for temperature has been accredited to IEC 17025 since 2010.

We calibrate your temperature measuring instruments quickly and precisely:

- in the range from -35 ... 1,100 °C
- in calibration baths, dry block, tube furnaces or at fixed points using appropriate reference thermometers
- with an accuracy from 0.05 ... 0.92 °C on temperature and the applied procedure

Calibration technology

From individual components ...

WIKA is the ideal partner for solutions in calibration technology, whether only a single service instrument is required quickly on site, or whether a fully automated calibration system needs to be designed for the laboratory or production.

We are able to offer an appropriate solution for each application. In relation to the measuring task and the measurement parameters, the following product matrix will assist you.

Portable pressure generation

Test pumps serve as pressure generators for the testing of mechanical and electronic pressure measuring instruments through comparative measurements.
These pressure tests can be carried out statically in the laboratory or workshop, or on site at the measuring point.

Measuring components

High-precision pressure sensors and very stable standard thermometers are ideal for applications as references in industrial laboratories. Due to their analogue or digital interfaces they can be connected to existing evaluation instruments.

Hand-helds, calibrators

Our hand-held measuring instruments (process tools) offer a simple capability for measurement or simulation of all established measurement parameters on site. They can be operated with a wide variety of pressure sensors or thermometers.

- Pressure
- Temperature
- Current, voltage, resistance

... to a fully automated system

Digital indicating precision measuring instruments

High-accuracy digital precision measuring instruments are ideal for application as reference standards in industrial laboratories, enabling high-accuracy calibration.
They feature exceptionally simple handling and an extensive range of functionality.

Digital precision instruments and controllers

Due to their integrated controller, these instruments offer exceptional convenience. Typically, a fully automated setting of the required value can be set via the interface.

Fully automated calibration systems as integrated solutions

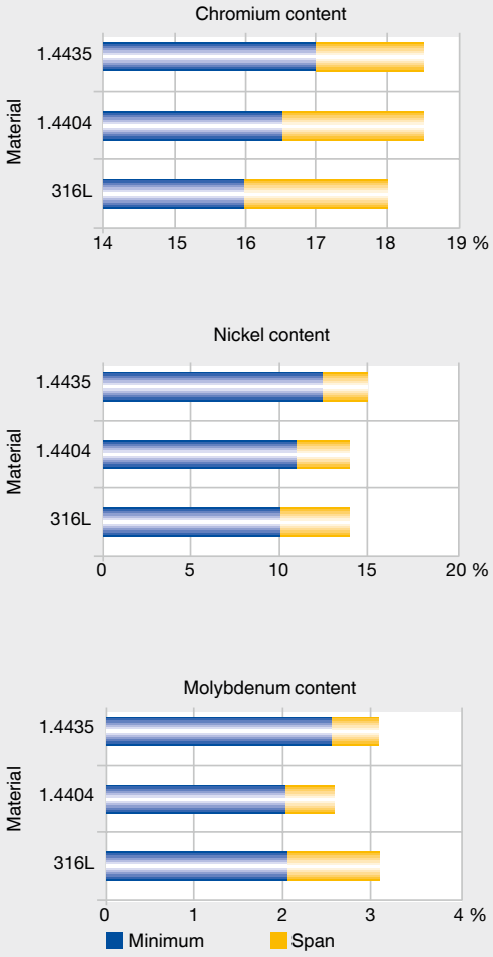
Fully automated calibration systems are customer-specific, turnkey installations which can be fitted in laboratories as well as in the production environment. With integrated reference instruments and calibration software, calibration certificates can be generated and archived in a simple and reproducible way.

Pressure
Temperature
Current, voltage, resistance

Material composition

In sterile engineering, it is preferable to use CrNiMo steels, of quality 1.4404 and 1.4435 or 316L. In regions which refer to American standards 316L is usually specified, while in Europe 1.4404 and 1.4435 are used equally.

These three materials have different required tolerance ranges of the percentages of chromium, nickel and molybdenum in them. The tables shown here illustrate the relationships.



Pipe standards

The following are those process connections most commonly-used today in sanitary applications as well as the dimensions for pipes to ASME BPE, DIN11850, DIN 11866, ISO 2037/BS 4825 part 1, DIN EN ISO 1127 and O.D. tube, displayed in tabular form.

Imperial pipes to ASME-BPE (O.D. tube) and DIN 11866-C

- Tri-clamp
- Aseptic clamp DIN 11864-3

Pipes per DIN 11850 and DIN 11866-A

- Milk thread fitting DIN 11851
- Aseptic threaded connection DIN 11864-1
- Aseptic flange DIN 11864-2
- Aseptic clamp DIN 11864-3
- Clamp connection DIN 32676 clamp
- Neumo BioConnect®
- Neumo BioControl®
- VARINLINE® access unit

Pipes per ISO 2037 (resp. BS 4825 Part 1)

- Aseptic threaded connection DIN 11864-1
- Aseptic flange DIN 11864-2
- Clamp ISO 2852

Pipes per ISO 1127 (resp. DIN 2463) and DIN 11866-B

- Aseptic threaded connection DIN 11864-1
- Aseptic flange DIN 11864-2
- Aseptic clamp DIN 11864-3
- Neumo BioConnect®
- Neumo BioControl®
- VARINLINE® access unit

The specifications of the pipe dimensions, especially the pipe's inner diameter, are needed for the design of in-line instrumentation. This ensures a crevice-free and smooth transition from the process pipe to the measuring instrument.

The most common used pipes in North America are specified to ASME-BPE.

Imperial pipes to ASME-BPE (O.D. tube) and DIN 11866-C

Nominal width DN/OD	Wall thickness s [inch]	Inner Ø d [inch]	Inner Ø d [mm]
½"	0.065	0.37	9.4
¾"	0.065	0.62	15.8
1"	0.065	0.87	22.1
1½"	0.065	1.37	34.8
2"	0.065	1.87	47.5
2½"	0.065	2.37	60.2
3"	0.065	2.87	72.9
4"	0.083	3.83	97.4

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