Product Review



Diaphragm Seals





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The modern high-bay warehouse ensures efficient logistics



Fully automatic production of standard pressure gauges

Ability to meet any Challenge

Our knowledge for your success

In the course of the last six decades the name WIKA has become a symbol for sophisticated solutions in the field of pressure and temperature measurement.

Our ever increasing ability is the basis for implementation of innovative technologies in the form of reliable products and efficient system solutions.

Our top ranking in the world market today owes itself to the consistent devotion to ensure first class quality backed by 6,000 employees in the WIKA group of companies. Right from the outset more than 500 experienced distribution employees alone ensure that our customers are competently advised and individually serviced throughout the world.

Made by WIKA

The development and high-tech production in our owned modern production facilities (Germany, Brazil, China, India, Canada, Poland, Switzerland, South Africa and U.S.A.) is the best warranty for our flexibility.

Whether SMD automatic insertion machines, CNC automatic machining centres, welding robots, laser welding, sputterers, thermotransfer printing or thin film production - we exploit all possibilities to achieve above-average results.

And the end result: More than 43 million quality products are delivered year in, year out, in more than 100 countries. This means some 350 million WIKA measuring instruments in use all over the globe.

Certified quality

The WIKA quality assurance management system has been certified in accordance with ISO 9001:2001 since 1994. The quality and safety standards of our company meet the standard systems of several countries.



DKD accredited calibration laboratories for pressure, and temperature

WIKA Product lines

The WIKA programme covers the following product lines for various fields of application.

Electronic Pressure Measuring Instruments

WIKA offers a complete range of electronic pressure measuring instruments: pressure sensors, pressure switches and pressure transmitters for the measurement of gauge, absolute and differential pressure. Our pressure measuring instruments are available in the measuring ranges 0...0.6 mbar to 0...15,000 bar. These instruments come supplied with standardised current or voltage output signals (also intrinsically safe or with flameproof enclosure according to ATEX), interfaces and protocols for various Modeles of field buses.

Whether ceramic thick film, metal thin film or piezo-resistive, WIKA is the only manufacturer worldwide that produces the full range of today's leading sensor technologies.

Mechatronic Pressure Measuring Instruments

As a result of the almost unlimited options for different combinations of mechanical and electrical connections, an extraordinary range of instrument variants is possible. For these gauges various digital and analogue output signals are also available.

Within our measuring instruments we use latest sensors, tested in automotive applications millions of times over. They work without any kind of mechanical contact, consequently wear-resistant, and there's absolutely no retroaction to the mechanics.

Mechanical Pressure Measuring Instruments

Indicating instruments for gauge, absolute and differential pressure with bourdon tube, diaphragm or capsule pressure element have been tested millions of times over. These instruments cover pressure ranges from 0...2.5 mbar to 0...7,000 bar and accuracies of up to 0.1 %.

Diaphragm Seals

WIKA diaphragm seals are appreciated and recognised internationally for the adaption of pressure gauges, pressure transducers, pressure transmitters etc., to extremely difficult measuring operations.

Thanks to the diaphragm seals the measuring instruments are suited to extreme temperatures as well as aggressive, corrosive, heterogeneous, abrasive, highly viscous or toxic media.

Electrical Temperature Measuring Instruments

Our range of products includes thermocouples, resistance thermometers (also with local display), temperature switches as well as analogue and digital temperature transmitters for all industrial applications, covering temperature ranges from -200 to +1,800 °C.

Mechatronic Temperature Measuring Instruments

As a result of the integration of switching contacts and output signals into our mechanical temperature measuring instruments, we can offer a wide variety of combined instruments. With switching contacts the pointer position triggers a change-over. Electrical output signals are realised via an additional, independent sensor circuit (resistance thermometer or thermocouple).

Mechanical Temperature Measuring Instruments

Our mechanical temperature measuring instruments work on the bimetal, expansion or gas actuation principle and cover temperature ranges from -200 $^{\circ}$ C to +700 $^{\circ}$ C.

Thermowells

A large variety of thermowells are available for the thermometers, so that they can even be used under extreme process conditions. They can also be ordered in special materials, e.g. Hastelloy or titanium, with tantalum covers or E-CTFE/PFA coatings. As an engineering service we offer thermowell calculations in accordance with ASME PTC 19.3 or Dittrich/Klotter.

Calibration Technology

WIKA offers a wide range of calibration instruments for the measurement parameters pressure and temperature. In addition, as WIKA service, any kind of electronic and mechanical pressure and temperature measuring instruments (even from other manufacturers) are calibrated at our DKD calibration laboratories.

Diaphragm seals with flange connection

For WIKA diaphragm seals with flange connection, the standard diaphragm material is corrosion resistant stainless steel 316L (1.4404/1.4435). Special materials are available on request.

Standards: Options:

Nominal size: DN25 up to DN125 / DN 1" up to DN 5" EN, DIN, ASME (former ANSI) ISO, CSA, JIS, customer-specific versions on request

Diaphragm in-line seals

The diaphragm in-line seal is installed directly in the pipeline between two flanges.

Diaphragm seals

The flange-type diaphragm seal is mounted for pressure measurement in lieu of a blind flange; cell-type diaphragm seals are mounted at the tapping flange using a blind flange. Seals with extended diaphragm are used at thick-walled and/or insulated product lines, tank walls etc.

990.27

Diaphragm seal with flush diaphragm



- Application: Process and petrochemical industries with high measuring requirements Pressure rating max. [bar]: 10 ... 250 (400)
- (Class 150 ... 2500)
- Data sheet: DS 99 27

990.28

Diaphragm seal, cell-type (sandwich)

- Application: Process and petrochemical industries with high measuring requirements Pressure rating max. [bar]: 10 ... 100 (400)
- (Class 150 ... 2500)
- Data sheet: DS 99 28

990.15

990.29

Flange-type seal with extended diaphragm



- Application: Process and petrochemical industries particularly for thick-walled or heavily insulated systems
- Pressure rating max. [bar]: 10 ... 100 (400)
- (Class 150 ... 2500) Data sheet: DS 99 29



- particularly for thick-walled or heavily insulated systems Pressure rating max. [bar]: 10 ... 40 (100)
- (Class 150 ... 600) Data sheet: DS 99.29

Diaphragm seal for block flange or saddle flange



- In connection with block flange or saddle -Application: flange in the chemical engineering and petrochemical industries
- Pressure rating max. [bar]: 100 / 250
- Data sheet: DS 99.35

990.23

Diaphragm seal for pulp and paper industry



- Application: For use in the pulp and paper industry
- Pressure rating max. [bar]: 40 -
- Data sheet: DS 99.34



990.26

Diaphragm seal with internal diaphragm



- Application: Process industry; for small flanged connections (≤ DN 25 / 1")
- Pressure rating max. [bar]: 10 ... 40 (Class 150 ... 300)
 Data sheet: DS 99.26

990.12

Diaphragm seal with internal diaphragm, threaded design



- Application: General applications in the process industry; for small flanged connections (DN 25 / 1") and pressures > 40 bar
- Pressure rating max. [bar]: 10 ... 250 (Class 150 ... 2500)
- Data sheet: DS 99.31

990.41

Diaphragm seal, large volume



- Application: To combine with diaphragm or differential pressure gauges and transmitters, for low pressures
- Pressure rating max. [bar]: 10 ... 40 (Class 150 ... 300)
 Data sheet: DS 98.28

- <section-header><section-header>
- pipelines; for flowing media; measuring point free of dead space
- Pressure rating max. [bar]: 400

Data sheet: DS 98.28

981.27

Diapragm in-line seal, for flange connection



- Application: For direct, permanent installation in pipelines; for flowing media; measuring point free of dead space
- Pressure rating max. [bar]: 16 / 40
- Data sheet: DS 98.27

Diaphragm seals with threaded connection

Diaphragm seals, in their basic design manufactured with female or male thread, can be mounted onto existing fittings without any problem. Usually the fittings consist of T-pieces which are integrated into a pipeline, or of welding sockets which are welded to a pipeline, the process reactor or a tank.

Nominal size: G 1/4 up to G 11/2 / NPT male or female Options: Customer-specific versions on request

990.10



- Application: General applications in the process industry
- Pressure rating max. [bar]: 25, 100, 250
- Data sheet: DS 99.01

990.31

Plastic body, threaded design



- Application: Chemical plant with plastic pipework, electroplating; particularly for farming equipment and waste disposal
- Pressure rating max. [bar]: 10
- Data sheet: DS 99.02

990.36

Small diaphragm seal, with flush diaphragm,



- Application: Particularly for highly viscous and crystallising media -
- Pressure rating max. [bar]: 600
- Data sheet: DS 99.03

990.34

Diaphragm seal, welded design



- Application: Machine-building, plant construction and process industries with high requirements
- Pressure rating max. [bar]: 160, 400, 600 oder 1000
- Data sheet: DS 99.04

990.38





- Application: Standard applications in the process industry; for aggressive, contaminated or heterogeneous media
- Pressure rating max. [bar]: 90
- Data sheet: DS 99.05

990.40

Large volume diaphragm, threaded design



- Application: To combine with diaphragm or differential pressure gauges and transmitters, for low pressures
- Pressure rating max. [bar]: 40
- . Data sheet: DS 98.28

970.10/11/12

Diaphragm probe seals



- Application: Particularly for flowing, heterogeneous media and high pressures from 100 bar
- Pressure rating max. [bar]: 600
- Data sheet: DS 97.01

Diaphragm seals with threaded connection

Diaphragm seals with sterile connection

The combination of 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.

For WIKA diaphragm seals with sterile connection the corrosion resistant stainless steel 316L (1.4404/1.4435) is used as standard diaphragm material. Special materials are available on request. All diaphragm seals listed on pages 7-9 are Sip- and CIP-compatible.





990.20



- Process connection: Male or female hygienic connection
 Pressure rating max. [bar]: 40 or 25
- Data sheet: DS 99.40

990.21



- Process connection: Male or female hygienic connection
 Pressure rating max. [bar]: 40 or 25
- Data sheet: DS 99.40

990.24



- Process connection: For VARINLINE[®] In-line access unit
- Pressure rating max. [bar]: 25
 Data sheet: DS 99.49

Diaphragm seals with sterile connection

990.22



- Process connection: Tri-Clamp
- Pressure rating max. [bar]: 40 (DN 20 ... DN 50) 25 (ab DN 65)
- Data sheet: DS 99.41



- Pressure rating max. [bar]: 40 (DN 20 ... DN 50) 25 (ab DN 65)
- Data sheet: DS 99.41

990.53

Clamp per ISO 2852



- Process connection: Clamp
 Pressure rating max. [bar]: 40 (DN 20 ... DN 50) 25 (ab DN 65)
- Data sheet: DS 99.41

990.50

NEUMO BioConnect®



- Process connection. NEOMO BioConnect threads or flange
 Pressure rating max. [bar]: 16 (threads)
 - 70 (flange) higher pressure ratings on request
- Data sheet: DS 99.49

990.51



- Process connection: Aseptik-threaded pipe connection Aseptik-flanged connection Aseptik-Clamp connection
- Pressure rating max. [bar]: 16 ... 40 depending on the process

Data sheet: DS 99.51

990.60



- Process connection: for installation in NEUMO BioControl®-system
- Pressure rating max. [bar]: 16 (for size 50 ... 80))
 70 (for size 25)
- Data sheet: DS 99.55

990.30



- Application: for homogeniser machines
- Pressure rating max. [bar]: 600 / 1000 / 1600
- Data sheet: DS 99.59

Diaphragm seals with sterile connection



981.18

Diaphragm in-line seals, threaded fittings DIN 11 851



 Process connection: Threads (other connections on request)
 Pressure rating max. [bar]: 40 (DN 20 ... DN 40)

25 (ab DN 50)

Data sheet: DS 98.40

981.22

Diaphragm in-line seals Tri- Clamp

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- Process connection: Tri-Clamp (other connections on request)
 Pressure rating max. [bar]: 40 (DN 20 ... DN 40) 25 (ab DN 50)
- Data sheet: DS 98.52

981.51

3

Diaphragm in-line seals, aseptic connection



- Process connection: DIN 11 864-1 threaded pipe connection
 - DIN 11 864-2 flange
- DIN 11 864-3 Clamp connection Pressure rating max. [bar]: 16 ... 40 depending on the process
 - connection

981.50



- Process connection: NEUMO BioConnect[®] threads or flange
- Pressure rating max. [bar]: 16 (threads) 70 (flange),

Data sheet: DS 98.50

higher pressure ratings on request

983.18 (DIN 11 851)



- Process connection: DIN 11 851 threads
 Pressure rating max. [bar]: 40 (up to DN 50) 25 (to DN 65)
- Data sheet: DS 98.46

983.22

Data sheet: DS 98.51

Diaphragm in-line seals with integrated temperature measurement, Clamp



- Process connection: Tri-Clamp
 Pressure rating max. [barl: 40 (up)
- Pressure rating max. [bar]: 40 (up to DN 50) 25 (to DN 65)
- Data sheet: DS 98.46

HYDRA-Line

Our pressure measuring instruments of the Hydra-Line product family have been developed in co-operation with well-known customers in the semiconductor industry. The complete product concept has been adapted to the special requirements of the process equipment and UHP chemicals distribution system sectors. The patented Hydra double diaphragm system enables a safe and reliable separation of the pressure sensor from the process medium.

Simultaneously diffusing process media such as HF or HCI vapours are given off to the environment to avoid any falsification of the measuring result or the destruction of the sensor element.

All wetted parts are made of PFA or PTFE UHP grade.

HYDRA-GAUGE



- Process connection: 3/8" up to 1 1/4" -flare 1/4" NPT 1/2" NPT
- Scale range [bar]: 0 ... 2.5 up to 0 ... 6
- Data sheet: SP 99.20

HYDRA-sensor



- Process connection: 3/8" up to 1 1/4" -flare 1/4" NPT 1/2" NPT
- Scale range [bar]: 0 ... 2.5 up to 0 ... 6
- Data sheet: SP 99.21

HYDRA-Dry



- Process connection: 3/8" bis 1 1/4" -flare 1/4" NPT 1/2" NPT
- Scale range [bar]: 0 ... 1 up to 0 ... 6
- Data sheet: SP 99.22

Accessories for diaphragm seals

Accessories for diaphragm seals

910.20



- Process connection: For welding onto the product pipeline DN 65 ... DN 150 e. g.
 - DN 65 ... DN 150 e. g. DN 2 ½" ... 6"
- Operating temperature: max. 300 °C
- Data sheet: AC 91.01

910.19



- Process connection: For welding into the product pipeline
 - DN 15 ... DN 150
- Operating temperature: max. 250 °C
 Data sheet: AC 91.01
- Data sheet: AC 91.01

910.23



- Process connection: For welding onto the product pipeline
 DN 15 ... DN 150
- Operating temperature: max. 250 °C
- Data sheet: AC 91.01

910.27



 Process connection: for flange per EN 1092-1 and ASME B 16.5 DN 50, 80, 100, 125 or PN 16 ... 100 Data sheet: AC 91.05

910.60



- Process connection: Neumo BioControl[®]
- Pressure rating max. [bar]: 16
- Data sheet: AC 91.14

Diaphragm seals (also known as chemical seals or remote seals)

By using diaphragm seals, pressure measuring instruments can be adapted to even the harshest of conditions within process industries. A diaphragm made of the appropriate material separates the pressure medium from the pressure instrument, while a suitable liquid (chosen to suit the particular application) transmits the pressure to the instrument's sensing element.

The **operating principle** is shown in the pictures on the right. The process side of the seal is isolated by a flexible diaphragm. The internal space between diaphragm and pressure measuring instrument is completely filled with a system fill fluid. The process pressure is transmitted by the elastic diaphragm into the fluid and from there to the measuring element, i. e. to a pressure gauge or transmitter.

A wide variety of designs and material combinations are possible, enabling pressures from approx. 10 mbar to 1,600 bar to be measured, while dealing with other factors such as extreme temperatures (ranging from -90 °C to +400 °C) and aggressive, corrosive, abrasive, highly viscous, heterogeneous, toxic or aseptic media, thus allowing accurate pressure measurements even under extreme conditions.

WIKA is able to provide diaphragm seals with test certificates and approvals for use in hazardous areas as well as for special sanitary applications, for instance in the food, biotechnology and pharmaceutical industries (e.g. sanitary standards 3A, FDA or EHEDG).

We differentiate between the following standard types of seals:

Process transmitter Model IPT-10 and Diaphragm seal Model 990.27

WIKA

1. Diaphragm seals

Diaphragm seals are mounted to existing fittings. Generally the fittings are T-pieces (which are integrated into a pipeline) or welding sockets (which are then welded onto a pipe, process vessel or 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. The fact that they can be easily dismounted (e.g. for cleaning or calibration purposes) is a further advantage.

2. Diaphram in-line seals

Diaphragm in-line seals are ideal for use with flowing process media. With the seal being completely integrated in the process line, measurements are not affected by any turbulence, corners, dead spaces or other obstructions in the flow direction. In comparison with other designs with grooves or non-circular geometry, diaphragm in-line seals with their perfectly circular cylindrical form are self-cleaning.

The diaphragm in-line seal is installed directly in the pipeline between two flanges. A variety of nominal pipe diameters enables adaptation to the cross-section of the particular pipeline.

Pressure measuring instrument with diaphragm seal



Pressure measuring instrument with in-line diaphragm seal



Pressure measuring instrument

- Pressure gauge
- Pressure transmitter
- Pressure switch

System fill fluid

Capillary/ cooling tower

Diaphragm in-line Body of diaphragm in-line seal

In-line diaphragm

Assembly of the diaphragm seal and measuring instrument may be made via a "rigid" direct connection or via a flexible capillary. The "rigid" assembly is made either by directly screwing or welding the measuring instruments to the diaphragm seal or through a gauge adapter. For high temperatures a cooling tower can be fitted between seal and instrument.



The configuration of the combination of pressure measuring instruments and diaphragm seals depends, among other things, on the application conditions in which the assembly must work. Please do not hesitate to ask your contact at WIKA for advice regarding the selection of suitable diaphragm seals and the best configuration for your specific application.

The standard material for diaphragm seals is stainless steel 316 L. Numerous wetted parts materials are available for nearly all diaphragms.

Table 1: Standard wetted parts materials:

Material	Code designation	Material	Code designation		
Stainless steel	Mat. no's. 316L, 1.4571, 1.4404,	Nickel	Material no. 2.4066 / 2.4068		
	1.4435, 1.4541, 1.4542, 1.4539	Platinum	Pt		
Duplex 2205	Material no. 1.4462	Tantalum	Та		
Hastelloy B2	Material no. 2.4617	Titanium	Material no. 3.7035		
Hastelloy C4	Material no. 2.4610	Zirconium	Zr		
Hastelloy C22	Material no. 2.4602	Ceramic	wikaramic®		
Hastelloy C276	Material no. 2.4819	Polytetrafluorethylene	PTFE		
Incoloy alloy 825	Material no. 2.4858	Perfluoralkoxy	PFA		
Inconel alloy 600	Material no. 2.4816	Copolymer of Ethene and	ECTFE (Halar®)		
Monel alloy 400	Material no. 2.4360	Chlortrifluorethylene			

Tabelle 2: Standard system fill fluids for diaphragm seals (others on request):

Common designation	WIKA code-no. KN	Suitable tempera P ≥ 1000 mbar abs	ature range P < 1000 mbar ¹⁾ abs	S.G. at tempe [g/cm ³]	erature [°C]	Viscosity at temper [m ² /s10 ⁻⁶]	ature [°C]	Notes
Silicone oil	KN 2	-20 +200 °C	-	0.96	+25	50	+25	Standard
Silicone oil	KN 2.2	-40 +300 °C	-40 +150 °C	0.96	+25	55	+20	
Silicone oil	KN 17	-90 +180 °C	-90 +80 °C	0.914	+20	4	+20	
High temperature oil	KN 3.1	-20 ²⁾ +300 °C	-10 +100 °C	1.07	+20	39	+20	
High temperature oil	KN 3.2	-20 ²⁾ +400 °C	-10 +200 °C	1.07	+20	39	+20	
Halocarbon liquid	KN 21	-40 +175 °C (max. 160 bar)	-40 +80 °C	1.968	+20	14	+20	for oxygen and chlorine, BAM ⁴⁾ tested
Glycerine	KN 7	+17 ³⁾ +230 °C	-	1.26	+20	1110	+20	Food and beverage
Neobee [®] M-20	KN 59	-20 +200 °C	-20 +200 °C	0.92	+20	10.1	+25	Food and beverage
Medicinal white mineral oil	KN 92	-10 +260 °C	-10 +160 °C	0.85	+20	23	+40	Food and beverage

1) Vacuum service required

2) From -10 °C with capillary extension

3) From 0 °C with capillary extension

4) Federal Institute for Materials Research and Testing

WIKA worldwide

Europe

Austria

WIKA Messgerätevertrieb Ursula Wiegand GmbH & Co. KG 1230 Vienna Phone: (+43) 1-86 91 631 Fax: (+43) 1-86 91 634 E-mail: info@wika.at www.wika.at

Benelux

WIKA Benelux 6101 WX Echt Phone: (+31) 475-535 500 Fax: (+31) 475-535 446 E-mail: info@wika.nl www.wika.nl

Bulgaria

WIKA Bulgaria EOOD Bul. "Al. Stamboliiski" 205 1309 Sofia Phone: (+359) 2 82138-10 (+359) 2 82138-13 Fax: E-Mail: t.antonov@wika.bg

Croatia

WIKA Croatia d.o.o. Hrastovicka 19 10250 Zagreb-Lucko Phone: (+385) 1 6531034 Fax: (+385) 1 6531357 E-Mail: info@wika.hr

Finland

WIKA Finland Oy 00210 Helsinki Phone: (+358) 9-682 49 20 (+358) 9-682 49 270 Fax: E-mail: info@wika.fi www.wika.fi

France

WIKA Instruments s.a.r.l. 95610 Eragny-sur-Oise Phone: (+33) 1-34 30 84 84 Fax: (+33) 1-34 30 84 94 E-mail: info@wika.fr www.wika.fr

Germany

WIKA Alexander Wiegand GmbH & Co. KG 63911 Klingenberg Phone: (+49) 93 72-13 20 (+49) 93 72-13 24 06 Fax: E-mail: info@wika.de www.wika.de

Italy WIKA Italiana SRL

20020 Arese (Milano) Phone: (+39) 02-93 86 11 (+39) 02-93 86 174 Fax: E-mail: info@wika.it www.wika.it

Poland

WIKA Polska S.A 87-800 Wloclawek Phone: (+48) 542 30 11 00 (+48) 542 30 11 01 E-mail: info@wikapolska.pl www.wikapolska.pl

Romania

WIKA Instruments Romania S.R.L. Bucuresti, Sector 5 Calea Rahovei Nr. 266-268 Corp 61, Etaj 1 Phone: (+40) 21 4048327 (+40) 21 4563137 Fax: E-mail: m.anghel@wika.ro

Russia

ZAO WIKA MERA 127015 Moscow Phone: (+7) 495-648 01 80 Fax: (+7) 495-648 01 81 E-mail: info@wika.ru www.wika.ru

Serbia

WIKA Merna Tehnika d.o.o. Sime Solaje 15 11060 Belgrade Phone: (+381) 11 27 63 722 Fax: (+381) 11 75 36 74 Mail: info@wika.co.yu www.wika.co.yu

Spain

Instrumentos WIKA, S.A. C/Josep Carner, 11-17 08205 Sabadell (Barcelona) Phone: (+34) 902 902 577 Fax: (+34) 933 938 666 E-Mail: info@wika.es www.wika.es

Switzerland

Manometer AG 6285 Hitzkirch Phone: (+41) 41-919 72 72 (+41) 41-919 72 73 Fax: E-mail: info@manometer.ch www.manometer.ch

Turkev

WIKA Instruments Istanbul Basinc ve Sicaklik Ölcme Cihazlari Ith. Ihr. ve Tic. Ltd. Sti. Bayraktar Bulvari No. 21 34775 Yukari Dudullu - Istanbul Phone: (+90) 216/415 90 66 Fax: (+90) 216/415 90 97 E-mail: info@wika.com.tr www.wika.com.tr

Ukraine

WIKA Pribor GmbH 83016 Donetsk Phone: (+38) 062 345 34 16 (+38) 062 345 34 17 Fax: E-mail: info@wika.ua www.wika.ua

United Kingdom

WIKA Instruments Ltd Merstham, Redhill RH13LG Phone: (+44) (0) 1737 644 008 Fax: (+44) (0) 1737 644 403 E-mail: info@wika.co.uk www.wika.co.uk

North America

Canada

WIKA Instruments Ltd. Head Office Edmonton, Alberta, T6N 1C8 Phone: (+1) 780-463 70 35 Fax: (+1) 780-462 00 17 E-mail: info@wika.ca www.wika.ca

Mexico

Instrumentos WIKA Mexico S.A. de C V 01210 Mexico D.F. Phone: (+52) 555 020 53 00 Fax. (+52) 555 020 53 01 E-Mail: ventas@wika.com www.wika.com.mx

USA

WIKA Instrument Corporation Lawrenceville, GA 30043 Phone: (+1) 770-513 82 00 (+1) 770-338 51 18 Fax: E-mail: info@wika.com www.wika.com

South America

Argentina

WIKA Argentina S.A. Buenos Aires Phone: (+54) 11-4730 18 00 (+54) 11-4761 00 50 Fax: E-mail: info@wika.com.ar www.wika.com.ar

Brazil

WIKA do Brasil Ind. e Com. I tda CEP 18560-000 Iperó - SP

Phone: (+55) 15-3459 97 00 Fax: (+55) 15-3266 16 50 E-mail: marketing@wika.com.br www.wika.com.br

Africa / Middle East

Egypt WIKA Near East Ltd. El-Serag City Towers -Tower#2 - Office#67-Nasr City Cairo Phone: (+20) 2 227 33 140 Fax: (+20) 2 227 03 815 Fax: E-mail: wika.repcairo@wika.de www.wika.com.eg

South Africa

WIKA Instruments (Pty.) Ltd. Gardenview, Johannesburg 2047 Phone: (+27) 11-621 00 00 Fax: (+27) 11-621 00 59 E-mail: sales@wika.co.za www.wika.co.za

United Arab Emirates

WIKA Middle East FZE Jebel Ali, Dubai Phone: (+971) 4 - 883 90 90 Fax: (+971) 4 - 883 91 98 E-mail: wikame@emirates.net.ae

Asia

China WIKA International Trading (Shanghai) Co., Ltd. 200001 Shanghai Phone: (+86) 21 - 53 85 25 72 Fax: (+86) 21 - 53 85 25 75 E-mail: info@wika.com.cn

India

WIKA Instruments India Pvt. Ltd. Village Kesnand, Wagholi Pune - 412 207 Phone: (+91) 20 - 66 29 32 00 Fax: (+91) 20 - 66 29 33 25 E-mail: sales@wika.co.in www.wika.co.in

Japan

Firstname, Name

WIKA Japan K K Tokyo 105-0023 Phone: (+81) 3-54 39 66 73 Fax. (+81) 3-54 39 66 74 E-mail: t-shimane@wika.co.jp

Kazakhstan

TOO WIKA Kazakhstan 050050 Almaty Phone: (+7) 32 72 33 08 48 (+7) 32 72 78 99 05 Fax: E-mail: info@wika.kz

Korea

WIKA Korea Ltd. Seoul 153-023 Phone: (+82) 2 - 8 69 05 05 Fax: (+82) 2 - 8 69 05 25 E-mail: info@wika.co.kr

Malaysia

WIKA Instrumentation (M) Sdn. Bhd.

47100 Puchong, Selangor Phone: (+60) 3 80 63 10 80 Fax: (+60) 3 80 63 10 70 E-mail: info@wika.com.my www.wika.com.my

Singapore

WIKA Instrumentation Pte. Ltd. 569625 Singapore Phone: (+65) 68 44 55 06 Fax: (+65) 68 44 55 07 E-mail: info@wika.com.sg www.wika.com.sg

Taiwan

WIKA Instrumentation Taiwan Ltd. Pinjen, Taoyuan

Phone: (+886) 3 420 6052 (+886) 3 490 0080 Fax: E-mail: info@wika.com.tw www.wika.com.tw

Australia

Australia WIKA Australia Pty. Ltd. Rydalmere, NSW 2116 Phone: (+61) 2 - 88 45 52 22 Fax: (+61) 2 - 96 84 47 67

E-mail: sales@wika.com.au www.wika.com.au

New Zealand

Process Instruments Limited Unit 7 / 49 Sainsbury Road St Lukes - Auckland 1025 Phone: (+64) 9 - 847 90 20 Fax: (+64) 9 - 846 59 64 E-mail: info@wika.co.nz www.wika.co.nz

F 2 X (+49) 9372/132-406

Please send me additional information

- **Electronic Pressure** Mechatronic Pressure
- **Mechanical Pressure**
- **Electrical Temperature**
- Mechatronic Temperature
- Mechanical Temperature
- Testing and Calibration

Company Street Postal Code/City Country Phone Fax E-Mail

WIKA Alexander Wiegand GmbH & Co. KG Alexander-Wiegand-Straße 30 • 63911 Klingenberg • Germany Tel. (+49) 9372/132-0 • Fax (+49) 9372/132-406 E-Mail info@wika.de • www.wika.de