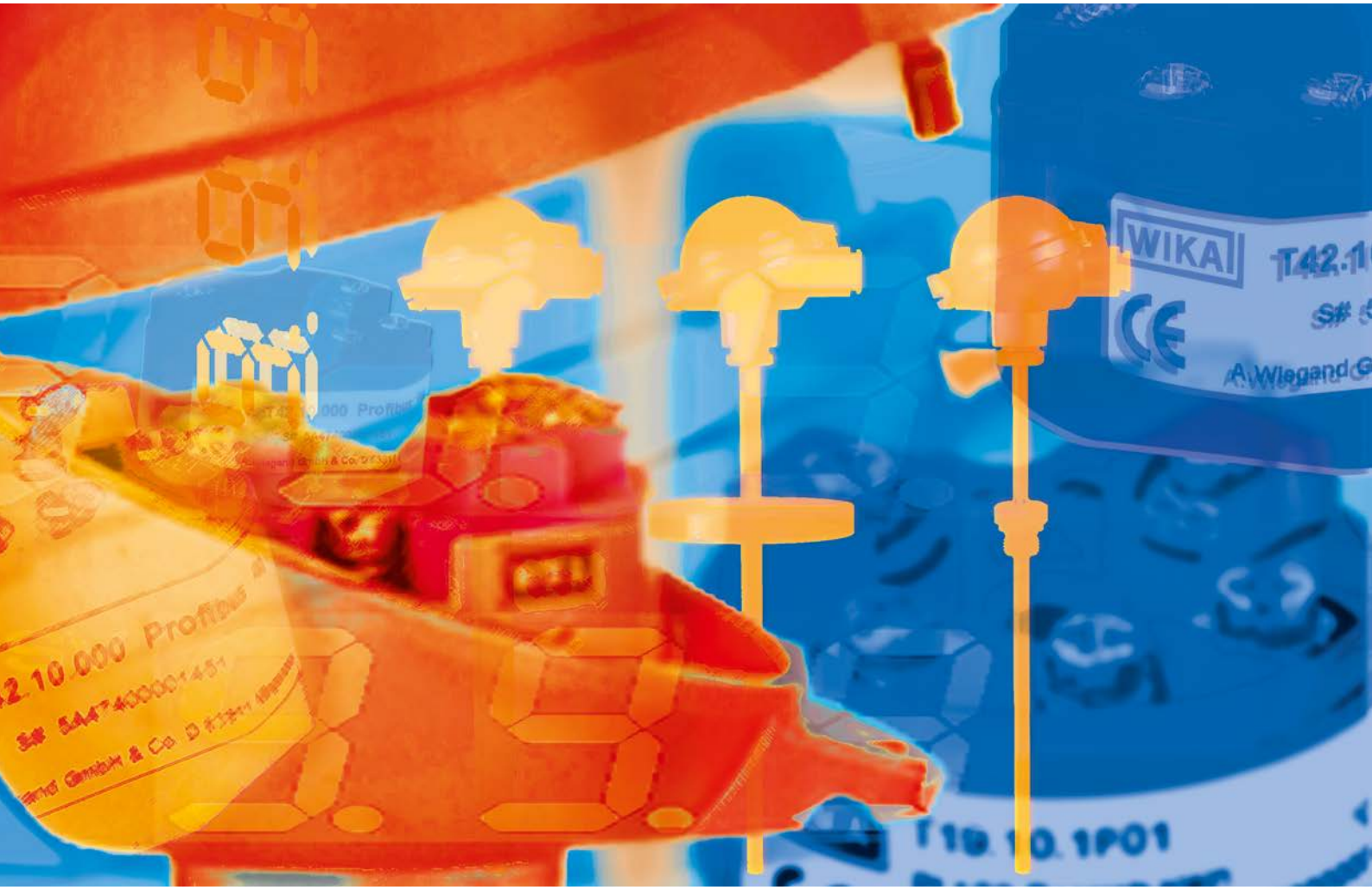
Product review

Electrical temperature measuring instruments



WIKA

Part of your business

Contents

Fully automatic production of measuring instruments

The modern high-bay warehouse ensures efficient logistics

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.

We owe our leading position in the world market to the consistent dedication towards premium quality, to which, today, 7,900 employees of the WIKA group of companies are committed. More than 500 experienced sales representatives provide competent and individual advice and support for our customers from the beginning.
Everywhere and anytime.

Certified quality

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

Made by WIKA

The development and high-tech production in our owned modern production facilities (Germany, Brazil, Canada, China, India, Italy, Poland, South Africa, Switzerland and USA) 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 50 million quality products are delivered year in, year out, in more than 100 countries. Worldwide, approximately 600 million WIKA measuring instruments are in use.

DKD/DAkkS 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 measurement

WIKA offers a complete range of electronic pressure measuring instruments: pressure sensors, pressure switches, pressure transmitters and process 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 per ATEX or with flameproof enclosure), interfaces and protocols for various field buses. Whether ceramic thick film, metal thin film or piezo-resistive, WIKA is the leading manufacturer worldwide that develops and produces the full range of today's leading sensor technologies.

Mechatronic pressure measurement

As a result of the almost unlimited options for different combinations of mechanical and electrical connections, an extraordinary range of instrument variants is possible. Various digital and analogue output signals are also available for these measuring instruments.
For our measuring instruments we use latest sensors, tested in automotive applications millions of times over. They work without any kind of mechanical contact, consequently they are wear-resistant, and there's absolutely no influence on the mechanics.

Mechanical pressure measurement

Indicating pressure gauges for gauge, absolute and differential pressure with Bourdon tube, diaphragm or capsule pressure elements have been tested millions of times over. These instruments cover scale ranges from 0 … 0.5 mbar to 0 … 7,000 bar and indication accuracies of up to 0.1 %.

Diaphragm seals

WIKA diaphragm seals, mounted with pressure gauges, pressure transducers, pressure transmitters etc., are recognised and valued internationally for the most difficult of measuring tasks. The measuring instruments can therefore be used at extreme temperatures (-130 ... +400 °C), and with aggressive, corrosive, heterogeneous, abrasive, highly viscous or toxic media. The optimal diaphragm seal designs, materials and filling media are available for each application.

Electrical temperature measurement

Our range of products includes thermocouples, resistance thermometers (also with on-site display), temperature switches as well as analogue and digital temperature transmitters for all industrial applications. Measuring ranges from -200 to +1,600 °C are covered.

Mechatronic temperature measurement

As a result of the integration of switch contacts and output signals into our mechanical temperature measuring instruments, we can offer a wide variety of combined instruments. With switch 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 measurement

The mechanical temperature measuring instruments work on the bimetal, expansion or gas actuation principle and cover scale ranges from -200 ... +700 °C. All thermometers are suited for operation in a thermowell if necessary.

Level measurement

WIKA has a comprehensive range of level measuring instruments available for temperatures up to 450 °C, specific gravity from 400 kg/m^3 and pressure ranges up to 420 bar. This includes standard instruments and customised products.

Calibration technology

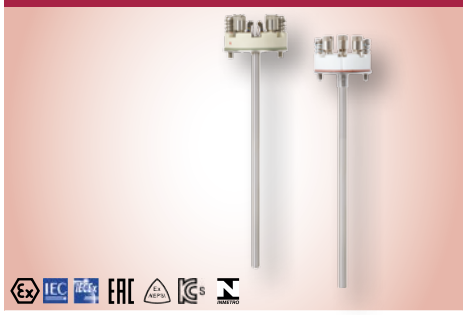
WIKA offers a broad product range of calibration instruments for the physical units of measurement for pressure and temperature, and for electrical measurands. Numerous patents ensure unmatched performance from many of our calibration instruments. The range of services covers the calibration of pressure and temperature measuring instruments in our accredited DKD/DAkkS calibration laboratories and a mobile service to calibrate your instruments on site.

For all product lines product reviews are available.

Resistance thermometers

TR10-A

Measuring insert



Sensor element:	1 x Pt100, 2 x Pt100
Measuring range:	-200 … +600 °C
Connection method:	2-, 3- and 4-wire
Data sheet:	TE 60.01

TR10-B

For additional thermowell

Sensor element:	1 x Pt100, 2 x Pt100
Measuring range:	-200 … +600 °C
Connection method:	2-, 3- and 4-wire
Data sheet:	TE 60.02

TR10-C

Threaded, with fabricated thermowell

Sensor element:	1 x Pt100, 2 x Pt100
Measuring range:	-200 … +600 °C
Connection method:	2-, 3- and 4-wire
Process connection:	Mounting thread
Data sheet:	TE 60.03

TR10-D

Threaded, miniature design

Sensor element:	1 x Pt100, 2 x Pt100
Measuring range:	-200 … +500 °C
Connection method:	2-, 3- and 4-wire
Process connection:	Mounting thread
Data sheet:	TE 60.04

TR10-F

Flanged resistance thermometer, with fabricated thermowell

Sensor element:	1 x Pt100, 2 x Pt100
Measuring range:	-200 … +600 °C
Connection method:	2-, 3- and 4-wire
Process connection:	Flange
Data sheet:	TE 60.06

TR10-H

Without thermowell

Sensor element:	1 x Pt100, 2 x Pt100
Measuring range:	-200 … +600 °C
Connection method:	2-, 3- and 4-wire
Process connection:	Mounting thread
Data sheet:	TE 60.08

TR10-J

Threaded, with perforated thermowell

Sensor element:	1 x Pt100, 2 x Pt100
Measuring range:	-200 … +600 °C
Connection method:	2-, 3- and 4-wire
Process connection:	Mounting thread
Data sheet:	TE 60.10

TR10-K

Measuring insert, for installation in TR10-L

Sensor element:	1 x Pt100, 2 x Pt100
Measuring range:	-200 … +600 °C
Connection method:	2-, 3- and 4-wire
Data sheet:	TE 60.11

TR10-L

Flameproof enclosure, for additional thermowell

Sensor element:	1 x Pt100, 2 x Pt100
Measuring range:	-200 … +600 °C
Connection method:	2-, 3- and 4-wire
Data sheet:	TE 60.12

TR12-B

Process resistance thermometer, for additional thermowell

Sensor element:	1 x Pt100, 2 x Pt100
Measuring range:	-200 … +600 °C
Connection method:	2-, 3- and 4-wire
Option:	Ex i, Ex d
Data sheet:	TE 60.17

TR12-M

Process resistance thermometer, basic module

Sensor element:	1 x Pt100, 2 x Pt100
Measuring range:	-200 … +600 °C
Connection method:	2-, 3- and 4-wire
Option:	Ex i, Ex d
Data sheet:	TE 60.17

TR30

Compact version

Sensor element:	1 x Pt100
Measuring range:	-50 ... +250 °C
Output:	Pt100, 4 ... 20 mA, 0 ... 10 V
Data sheet:	TE 60.30

Further information at www.wika.com

Resistance thermometers

TR31

Miniature design

Sensor element:	1 x Pt100
Measuring range:	-50 ... +250 °C
Output:	Pt100, 4 ... 20 mA
Data sheet:	TE 60.31

TR40

Cable resistance thermometer

Sensor element:	1 x Pt100, 2 x Pt100
Measuring range:	-200 … +600 °C
Connection method:	2-, 3- and 4-wire
Cable:	PVC, silicone, PTFE
Data sheet:	TE 60.40

TR50

Surface resistance thermometer

Sensor element:	1 x Pt100, 2 x Pt100
Measuring range:	-50 ... +250 °C
Connection method:	2-, 3- and 4-wire
Process connection:	Surface mounting
Data sheet:	TE 60.50

TR53

Bayonet resistance thermometer

Sensor element:	1 x Pt100, 2 x Pt100
Measuring range:	-50 ... +400 °C
Connection method:	2-, 3- and 4-wire
Process connection:	Bayonet
Data sheet:	TE 60.53

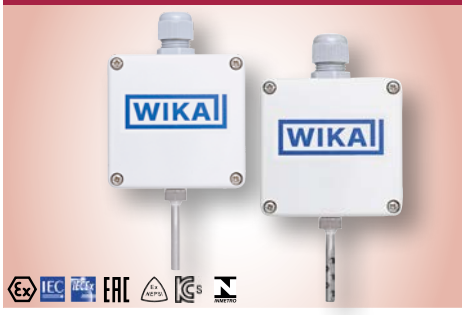
TR55

With spring-loaded tip

Sensor element:	1 x Pt100, 2 x Pt100
Measuring range:	-50 ... +450 °C
Connection method:	2-, 3- and 4-wire
Process connection:	Compression fitting
Data sheet:	TE 60.55

TR60

Indoor and outdoor resistance thermometer



Sensor element:	1 x Pt100, 2 x Pt100
Measuring range:	-40 ... +80 °C
Connection method:	2-, 3- and 4-wire
Process connection:	Wall mounting
Data sheet:	TE 60.60

Resistance thermometers, temperature switches

TSD-30

Electronic temperature switch

Sensor element:	Pt1000
Measuring range:	-20 ... +80 °C
Switching output:	1 or 2 (PNP or NPN), analogue output (optional)
Data sheet:	TE 67.03

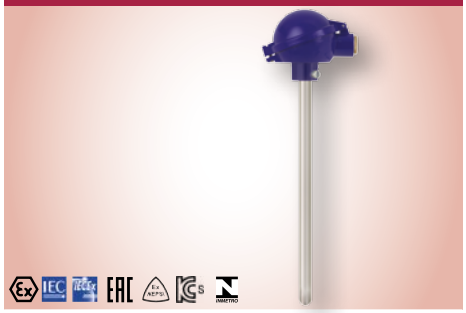
TR75

DiwiTherm® with digital indicator

Measuring range:	■ -50 ... +450 °C ■ -50 ... +199.9 °C
Power supply:	Battery operation
Data sheet:	TE 60.75

TR81

For flue gas temperature measurements



Sensor element:	1 x Pt100, 2 x Pt100
Measuring range:	-200 ... +600 °C
Connection method:	2-, 3- and 4-wire
Thermowell:	Metal
Data sheet:	TE 60.81

TF-LCD

Longlife digital thermometer

Measuring range:	-40 ... +120 °C
Special feature:	■ Resistant to steam diffusion ■ Battery or solar powered ■ Extremely long service life
Data sheet:	TE 85.01

TF35

OEM screw-in thermometer, with plug connection

Measuring range:	-50 ... +300 °C
Measuring element:	Pt100, Pt1000, NTC, KTY, Ni1000
Special feature:	■ Compact design ■ High vibration resistance ■ Plug connector for electrical connection
Data sheet:	TE 67.10

TF44

Strap-on temperature sensor with connecting cable

Measuring range:	-50 ... +200 °C
Measuring element:	Pt100, Pt1000, NTC
Special feature:	■ Connecting lead from PVC, silicone ■ Thermowell from aluminium ■ Mounting on pipe surfaces
Data sheet:	TE 67.14

TF45

OEM insertion thermometer with connecting cable

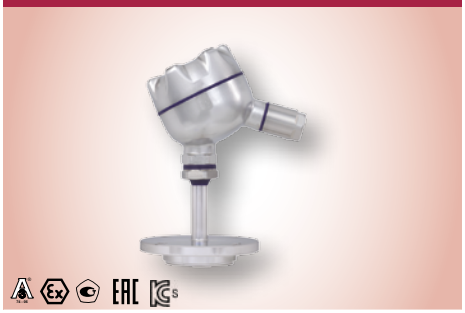
Measuring range:	-50 ... +260 °C
Measuring element:	Pt100, Pt1000, NTC, KTY, Ni1000
Special feature:	■ Connecting lead from PVC, silicone, PTFE ■ With single or dual measuring element ■ Thermowells from stainless steel
Data sheet:	TE 67.15

Further information at www.wika.com

Resistance thermometers for sanitary applications

TR20

Flush



Sensor element:	Pt100
Measuring range:	-50 ... +250 °C
Connection method:	2-, 3- and 4-wire
Data sheet:	TE 60.20

TR21-A

Miniature design with flange connection

Sensor element:	Pt100
Measuring range:	-50 ... +250 °C
Output:	Pt100, 4 ... 20 mA
Connection to thermowell:	Removable G ⅜"
Data sheet:	TE 60.26

TR21-B

Miniature design for orbital welding

Sensor element:	Pt100
Measuring range:	-50 ... +250 °C
Output:	Pt100, 4 ... 20 mA
Connection to thermowell:	Removable G ⅜"
Data sheet:	TE 60.27

TR21-C

Miniature design with welded flange connection

Sensor element:	Pt100
Measuring range:	-50 ... +250 °C
Output:	Pt100, 4 ... 20 mA
Connection to thermowell:	Welded
Data sheet:	TE 60.28

TR22-A

With flange connection

Sensor element:	Pt100
Measuring range:	-50 ... +250 °C
Connection to thermowell:	Removable M24
Data sheet:	TE 60.22

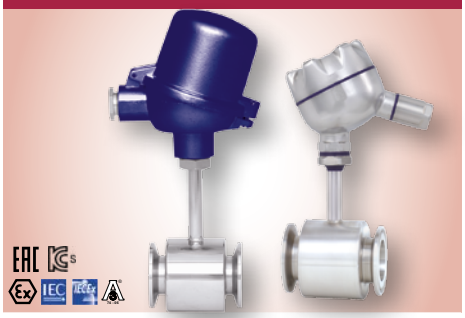
TR22-B

For orbital welding

Sensor element:	Pt100
Measuring range:	-50 ... +250 °C
Connection to thermowell:	Removable M24
Data sheet:	TE 60.23

TR25

In-line resistance thermometer



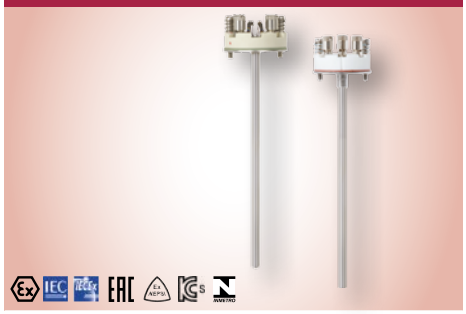
Sensor element:	Pt100
Measuring range:	-50 ... +250 °C
Connection method:	3- or 4-wire
Data sheet:	TE 60.25

Further information at www.wika.com

Thermocouples

TC10-A

Measuring insert



Sensor element:	Type K, J, E, N or T
Measuring range:	-200 … +1,200 °C
Measuring point:	Ungrounded or grounded
Data sheet:	TE 65.01

TC10-B

For additional thermowell

Sensor element:	Type K, J, E, N or T
Measuring range:	-200 … +1,200 °C
Measuring point:	Ungrounded or grounded
Data sheet:	TE 65.02

TC10-C

Threaded, with fabricated thermowell

Sensor element:	Type K, J, E, N or T
Measuring range:	-200 … +600 °C
Measuring point:	Ungrounded or grounded
Process connection:	Mounting thread
Data sheet:	TE 65.03

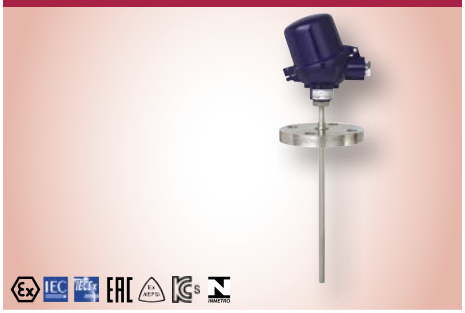
TC10-D

Threaded, miniature design

Sensor element:	Type K, J, E, N or T
Measuring range:	-200 … +600 °C
Measuring point:	Ungrounded or grounded
Process connection:	Mounting thread
Data sheet:	TE 65.04

TC10-F

Flanged thermocouple, with fabricated thermowell



Sensor element:	Type K, J, E, N or T
Measuring range:	-200 … +600 °C
Measuring point:	Ungrounded or grounded
Process connection:	Flange
Data sheet:	TE 65.06

TC10-H

Without thermowell

Sensor element:	Type K, J, E, N or T
Measuring range:	-200 … +1,200 °C
Measuring point:	Ungrounded or grounded
Process connection:	Mounting thread
Data sheet:	TE 65.08

TC10-K

Measuring insert, for installation in TC10-L

Sensor element:	Type K, J, E, N or T
Measuring range:	-200 … +1,200 °C
Measuring point:	Ungrounded or grounded
Data sheet:	TE 65.11

TC10-L

Flameproof enclosure, for additional thermowell

Sensor element:	Type K, J, E, N or T
Measuring range:	-200 … +1,200 °C
Measuring point:	Ungrounded or grounded
Data sheet:	TE 65.12

TC12-B

Process thermocouple, for additional thermowell

Sensor element:	Type K, J, E, N or T
Measuring range:	-200 … +1,200 °C
Measuring point:	Ungrounded or grounded
Option:	Ex i, Ex d
Data sheet:	TE 65.17

TC12-M

Process thermocouple, basic module

Sensor element:	Type K, J, E, N or T
Measuring range:	-200 … +1,200 °C
Measuring point:	Ungrounded or grounded
Option:	Ex i, Ex d
Data sheet:	TE 65.17

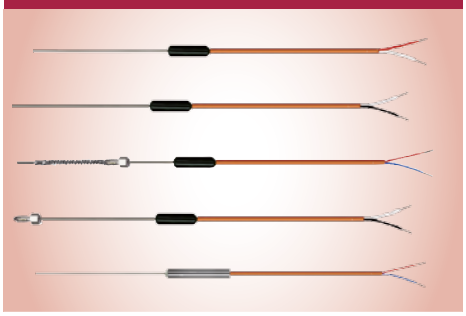
TC40

Cable thermocouple

Sensor element:	Type K, J, E, N or T
Measuring range:	-200 ... +1,260 °C
Measuring point:	Ungrounded or grounded
Cable:	PVC, silicone, PTFE, glass fibre
Data sheet:	TE 65.40

TC46

Hot runner thermocouple



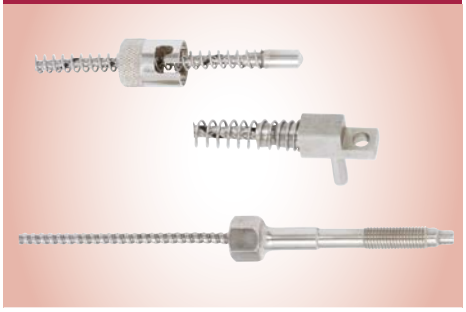
Sensor element:	Type J or K
Measuring range:	-25 … +400 °C
Measuring point:	Ungrounded or grounded
Special feature:	■ Sensor diameter 0.5 ... 3.0 mm ■ Plastic-moulded transition
Data sheet:	TE 65.46

Further information at www.wika.com

Thermocouples

TC47

Plastics machinery thermocouple



Sensor element:	Type J, or K
Measuring range:	-25 … +400 °C
Measuring point:	Ungrounded or grounded
Special feature:	■ Various process connections ■ Connection cable glass fibre, Kapton
Data sheet:	TE 67.20

TC50

Surface thermocouple

Sensor element:	Type K, J, E, N or T
Measuring range:	-200 ... +400 °C
Measuring point:	Ungrounded or grounded
Process connection:	Surface mounting
Data sheet:	TE 65.50

TC53

Bayonet thermocouple

Sensor element:	Type J, K, N or T
Measuring range:	-200 ... +1,200 °C
Measuring point:	Ungrounded or grounded
Special feature:	■ Single and dual thermocouples ■ Explosion-protected version Ex i (optional)

TC59-V

V-PAD pipe surface thermocouple for fuelling plants

Sensor element:	Type K or N
Measuring range:	0 ... +1,200 °C
Measuring point:	Grounded
Process connection:	V-PAD for welding
Data sheet:	TE 65.59

TC80

Straight version per EN 50446

Sensor element:	Type S, R, B, K, N or J
Measuring range:	-200 ... +1,600 °C
Measuring point:	Ungrounded
Process connection:	Stop flange, threaded bushing
Data sheet:	TE 65.80

TC81

For flue gas temperature measurements

Sensor element:	Type K, N or J
Measuring range:	-200 ... +1,200 °C
Measuring point:	Ungrounded or grounded
Process connection:	Stop flange, threaded bushing
Data sheet:	TE 65.81

Temperature transmitters

T32

HART® transmitter

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

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

T24

Programmable analogue transmitter

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

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

T53

FOUNDATION™ Fieldbus and PROFIBUS® PA transmitter

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

T91

Analogue transmitter 3-wire, 0 ... 10 V

Input:	Resistance thermometers, thermocouples
Accuracy:	< 0.5 or < 1 %
Output:	0 … 10 V, 0 … 5 V
Special feature:	Fixed measuring range
Data sheet:	TE 91.01, TE 91.02

TIF50, TIF52

HART® field temperature transmitter

Input:	Resistance thermometers, thermocouples, potentiometers
Accuracy:	< 0.12 %
Output:	4 … 20 mA, HART® protocol
Special feature:	PC configurable
Data sheet:	TE 62.01

Further information at www.wika.com

Digital indicators

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 08.02

DI35

For panel mounting, 96 x 48 mm

Input:	■ Multi-function input for resistance thermometers, thermocouples and standard signals ■ Alternatively double input for standard signals with calculation function (+ - x /) for two transmitters
Alarm output (optional):	■ 2 relays ■ 4 relays
Power supply:	■ AC 230 V ■ AC 115 V or DC 24 V
Data sheet:	AC 80.03

DIH10

Connection head with digital indicator

Input:	4 ... 20 mA
Power supply:	From the 4 ... 20 mA current loop
Data sheet:	AC 80.11

DIH50

For current loops with HART® communication

Dimensions:	150 x 127 x 127 mm
Case:	Aluminium, stainless steel
Special feature:	■ Adjustment of indication range and unit via HART® communication ■ Additionally, model DIH52-F is suitable for multidrop operation and with local master function
Approval:	■ Intrinsically safe per ATEX ■ Flameproof enclosure
Data sheet:	AC 80.10

Temperature controllers

CS4M, CS4S

For panel mounting, 48 x 24 mm, 48 x 48 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 for 3-point control 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 85.02

CS4H, CS4L

For panel mounting, 48 x 96 mm, 96 x 96 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 for 3-point control 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 85.03, AC 85.04

SC58

For panel mounting, 62 x 28 mm

Input:	Pt100 or PTC
Control characteristic:	Simple 2-point controller
Control output:	Relay switching output 12 A, 250 V
Power supply:	■ AC 230 V ■ AC 12 ... 24 V or DC 16 ... 32 V
Data sheet:	AC 85.24

SC64

For panel mounting, 64 mm, round

Input:	Pt100 or PTC
Control characteristic:	Simple 2-point controller
Control output:	Relay switching output 16 A, 250 V
Power supply:	■ AC 230 V ■ AC 12 ... 24 V or DC 16 ... 32 V
Data sheet:	AC 85.25

CS4R

For rail mounting, 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 85.05

Further information at www.wika.com

Thermowells

TW10

Flanged (solid machined)

Thermowell form:	Tapered, straight or stepped
Nominal width:	ASME 1 to 4 inch DIN/EN DN 25 to DN 100
Pressure rating:	ASME to 2,500 psig (DIN/EN to PN 100)
Data sheet:	TW 95.10, TW 95.11, TW 95.12

TW15

Threaded (solid machined)

Thermowell form:	Tapered, straight or stepped
Head version:	Hexagon, round with hexagon, or round with spanner flats
Process connection:	½, ¾ or 1 NPT
Data sheet:	TW 95.15

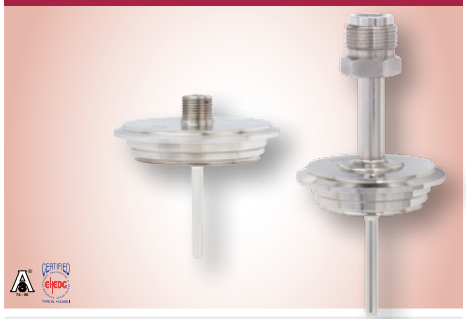
TW20

Socket weld (solid-machined)

Thermowell form:	Tapered, straight or stepped
Welding diameter:	1.050, 1.315 or 1.900 inch (26.7, 33.4 or 48.3 mm)
Pressure rating:	3,000 or 6,000 psig
Data sheet:	TW 95.20

TW22

Fabricated with flange connection for sanitary applications



Aseptic connection:	■ DIN 11851 ■ DIN 32676 ■ Tri-clamp ■ VARIVENT® ■ BioControl®
Thermowell material:	Stainless steel 1.4435
Data sheet:	TW 95.22

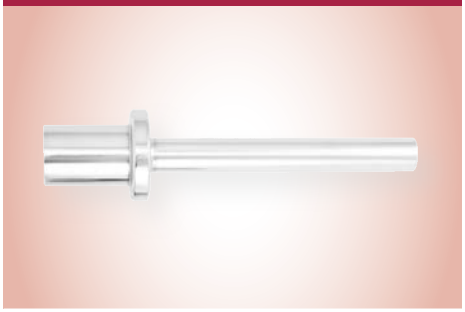
TW25

Weld–in (solid-machined)

Thermowell form:	Tapered, straight or stepped
Head diameter:	Up to 2 inch (50.8 mm)
Data sheet:	TW 95.25

TW30

Vanstone (solid-machined) for lapped flanges

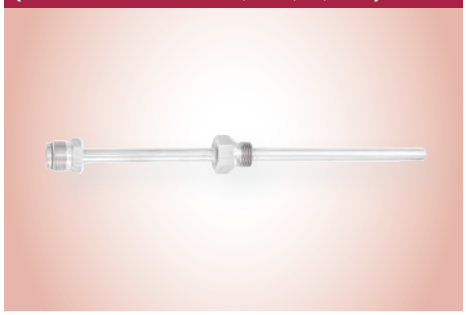


Thermowell form:	Tapered, straight or stepped
Nominal width:	ASME 1, 1½ or 2 inch
Pressure rating:	ASME up to 2,500 psig
Data sheet:	TW 95.30

VARIVENT® is a registered trademark of the company GEA Tuchenhagen
BioControl® is a registered trademark of the company NEUMO

TW35

Threaded (fabricated) (DIN 43772 form 2, 2G, 3, 3G)



Thermowell form:	Form 2, 2G, 3 or 3G
Material:	Stainless steel
Instrument connection:	M24 x 1.5 rotatable
Data sheet:	TW 95.35

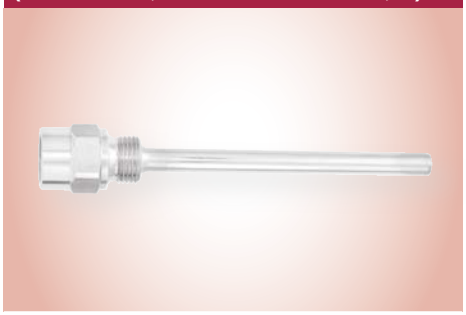
TW40

Flanged (fabricated) (DIN 43772 form 2F, 3F)

Thermowell form:	Form 2F or 3F
Nominal width:	DIN/EN DN 25 to DN 50 ASME 1 to 2 inch
Pressure rating:	DIN/EN up to PN 100 (ASME up to 1,500 psig)
Data sheet:	TW 95.40

TW45

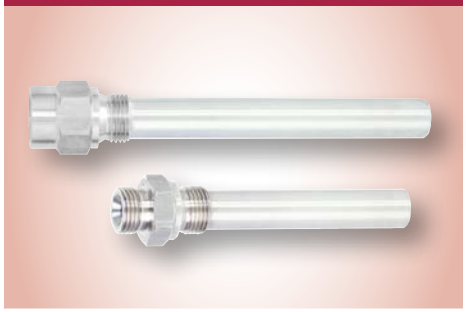
Threaded (fabricated, DIN 43772 form 5, 8)



Thermowell form:	Form 5 or 8
Material:	Stainless steel or copper alloy
Data sheet:	TW 95.45

TW50

Threaded (solid-machined, DIN 43772 form 6, 7, 9)



Thermowell form:	Form 6, 7 or 9
Data sheet:	TW 95.50

TW55

Solid-machined for weld-in or with flange (DIN 43772 form 4, 4F)

Thermowell form:	Form 4 or 4F
Nominal width:	DIN/EN DN 25 to DN 50 ASME 1 to 2 inch
Pressure rating:	DIN/EN up to PN 100 (ASME up to 2,500 psig)
Data sheet:	TW 95.55

TW61

For orbital welding for sanitary applications

Tube standard:	DIN 11866 series A, B, C
Material:	Stainless steel 1.4435
Data sheet:	TW 95.61

Further information at www.wika.com

Special instrument designs

For your individual applications, WIKA can offer specific temperature measuring instruments.

Resistance thermometers

- Resistance thermometers with multipoint sensors, for applications requiring high precision for monitoring vessels and for level control.
- Resistance thermometers with non-standard or country-specific temperature coefficients.

Thermocouples

- Free-hanging and spring-loaded multipoint thermocouples and multipoint thermocouples with fabricated thermowell for use in catalytic reactors, reformers and heat exchangers.
- High-pressure thermocouples for use with highest process pressures (4,500 bar).
- Thermocouples for gas turbines, to measure input and combustion chamber temperatures.
- Hot-runner and nozzle thermocouples and melt-bolt type thermocouples for the plastics and rubber industries.
- Borehole thermocouples for temperature monitoring in various zones in oil and gas wells.
  These mineral-insulated, metal-sheathed thermocouples can exceed 3,000 metres (10,000 ft) in length.

Multipoint thermocouple designs

High-pressure thermocouple TC90

Multipoint thermometer Tx95

Thermowells

- **Thermowells with metal or polymer coating:** Special metallic plating or polymer coatings can be applied to the surface of a thermowell so it can be used in a process where there is a high risk of abrasion, due to a high flow of suspended solids, or where high concentrations of acids may cause corrosion.

- **Thermowells with anchor support:** On customer request, the thermowell can be manufactured with a support collar in order to offer additional support in the flange nozzle for applications with high flow rates.

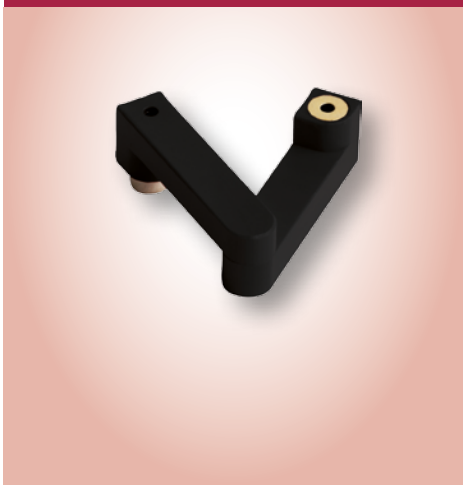
- **Thermowells for medium sampling:** These thermowells are delivered with an open tip, to enable process sampling and for injection of chemicals into a piping system or vessel.

Accessories

Temperature calibrators

Hand-held measuring instruments

magWIK magnetic quick connector



Coupler connector

Fittings

Wires & cables

Further information at www.wika.com

Technical information

Measuring resistors

- Industrial resistance thermometers are equipped with platinum temperature sensors which change their electrical resistance as a function of temperature.

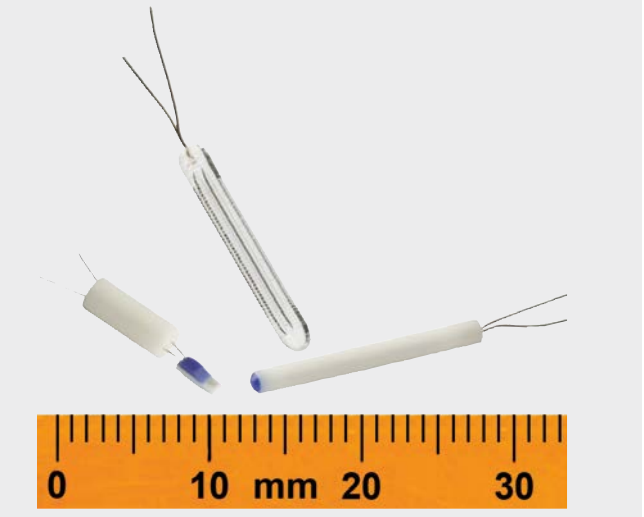


Fig. left: Thin-film resistor
Fig. centre: Glass resistor
Fig. right: Ceramic resistor

- In accordance with DIN EN 60751 (IEC 60751), resistance thermometers and measuring resistors are divided into accuracy classes. For wire-wound resistors and film resistors, these accuracy classes are assigned to the corresponding temperature ranges.

Class		Temperature range Wire-wound (W)	Thin-film (F)	Tolerance value
B	°C	-196 … +600	-50 … +500	±(0.30 + 0.0050 I t I) [1]
A	°C	-100 … +450	-30 … +300	±(0.15 + 0.0020 I t I) [1]
AA	°C	-50 … +250	0 … 150	±(0.10 + 0.0017 I t I) [1]

1) I t I is the value of the temperature in °C without consideration of the sign.

- The electrical resistance of a resistance thermometer's sensor changes with the temperature.
  As the resistance increases when temperature is raised, we refer to it as PTC (Positive Temperature Coefficient).

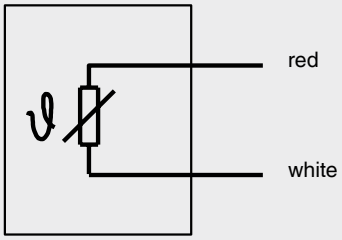
Resistance values and tolerance values with selected temperatures (Pt100)

Temperature in °C (ITS 90)	Resistance value in Ω Tolerance class B	Tolerance class A	Tolerance class AA
-196	19.69 ... 20.80	-	-
-100	59.93 ... 60.58	60.11 ... 60.40	-
-50	80.09 ... 80.52	80.21 ... 80.41	80.23 ... 80.38
-30	88.04 ... 88.40	88.14 ... 88.30	88.16 ... 88.28
0	99.88 ... 100.12	99.94 ... 100.06	99.96 ... 100.04
20	107.64 ... 107.95	107.72 ... 107.87	107.74 ... 107.85
100	138.20 ... 138.81	138.37 ... 138.64	138.40 ... 138.61
150	156.93 ... 157.72	157.16 ... 157.49	157.91 ... 157.64
250	193.54 ... 194.66	193.86 ... 194.33	193.91 ... 194.29
300	211.41 ... 212.69	211.78 ... 212.32	-
450	263.31 ... 265.04	263.82 ... 264.53	-
500	280.04 ... 281.91	-	-
600	312.65 ... 314.77	-	-

Sensor connection methods

2-wire connection

The lead resistance to the sensor is recorded as an error in the measurement. For this reason, this connection type is not allowed when using Pt100 measuring resistors for accuracy classes A and AA, since the electrical resistance of the connection lines and their own temperature dependence are fully included in the measurement result and thus falsify it.

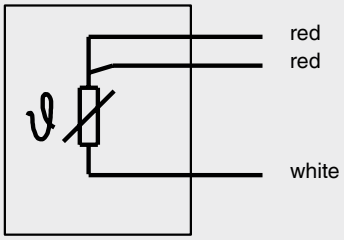


Applications

- Connecting cables up to 250 mm
- Standard when using Pt1000 measuring resistors

3-wire connection (standard version)

The influence of the lead resistance is compensated as far as possible. The maximum length of the connecting cable depends on the conductor cross-section and the compensation options of the electronic evaluation system (transmitter, display, controller or process control system).

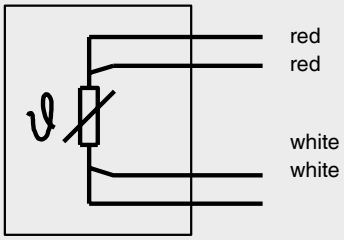


Applications

- Connecting cables up to approx. 30 m

4-wire connection

The influence of the connecting cable on the result of measurement is completely eliminated since any possible asymmetries in the connecting cable's lead resistance are also compensated. The maximum length of the connecting cable depends on the conductor cross-section and the compensation options of the electronic evaluation system (transmitter, display, controller or process control system). A 4-wire connection can also be used as a 2-wire or 3-wire connection by disconnecting the unnecessary conductors.



Applications

- Laboratory technology
- Calibration technology
- Tolerance class A or AA
- Connecting cables up to 1,000 m

Dual sensors

In the standard version a single sensor is fitted.
The combination of black and yellow is reserved for an optional second measuring resistor. For certain combinations (e.g. small diameter) dual sensors are not possible for technical reasons.

Thermocouples

- Thermocouples generate a voltage directly dependent on temperature. Suited to the corresponding measurement temperature, you can choose from a variety of thermocouple models.

- Thermocouples are particularly suited for high temperatures (up to 1,600 °C). Instrument designs from mineral-insulated sheathed cable are very resistant against extremely high vibration loads (depending on instrument model, sensor element and wetted materials).

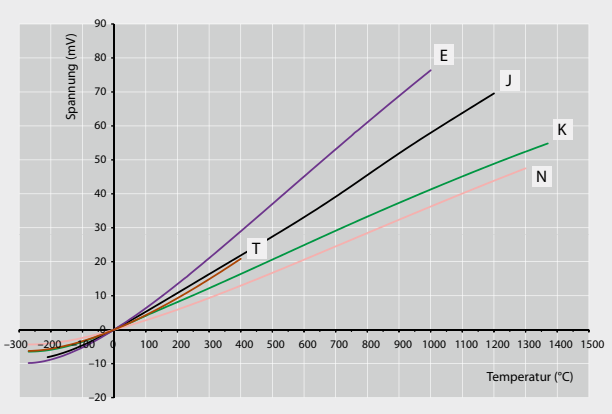
Information on the application of thermocouples

- **Type K**
  NiCr-Ni thermocouples are suitable for continuous use in oxidising or inert gas atmospheres up to 1,200 °C with the largest wire thickness. They must be protected from sulphurous atmospheres. Since they are less susceptible to oxidation than thermocouples made of other materials, they are mostly used for applications at temperatures above 550 °C up to the maximum working pressure of the thermocouple.
- **Type N**
  NiCrSi-NiSi thermocouples are suitable for use in oxidising atmospheres, in inert gas atmospheres or dry reduction atmospheres up to 1,200 °C. They must be protected from sulphurous atmospheres. They are very accurate at high temperatures. The source voltage (EMF) and the range are almost the same as with type K. They are used in applications where a longer service life and greater stability are required.
- **Type J**
  Fe-CuNi thermocouples are suitable for use in vacuum, in oxidising and reducing atmospheres or inert gas atmospheres. They are used for temperature measurements up to 760 °C with the largest wire size.
- **Type E**
  NiCr-CuNi thermocouples are suitable for use in oxidising or inert gas atmospheres up to 900 °C with the largest wire thickness. Type E thermocouples, of all the generally used thermocouples, develop the highest source voltage (EMF) per degree.
- **Type T**
  Cu-CuNi thermocouples are suitable for temperatures below zero with an upper temperature limit of 350 °C and can be used in oxidising, reducing and inert gas atmospheres. They do not corrode in moist atmospheres.
- **Type R**
  Pt-10%Rh/Pt thermocouples are suitable for continuous use in oxidising or inert gas atmospheres for temperatures up to 1,600 °C.
- **Type R**
  Pt-13%Rh/Pt thermocouples are suitable for continuous use in oxidising or inert gas atmospheres for temperatures up to 1,600 °C.
- **Type B**
  Pt-30%Rh/Pt-6%Rh thermocouples are suitable for continuous use in oxidising or inert gas atmospheres and for short-term use in vacuum environments (applications) for temperatures up to 1,700 °C.

Type S, R or B thermocouples can be inserted into metallic thermowells only if a very clean sleeve, with sealed ceramic ends, is used. Care must be taken over embrittlement through contamination. Higher stability at high temperatures than types N or K.

For thermocouples, the accuracy classes and tolerance values per DIN EN 60584 or ISA (ANSI) MC96.1 apply.

Thermocouple characteristics for thermocouples from base metal per DIN EN 60584 (IEC 60584)

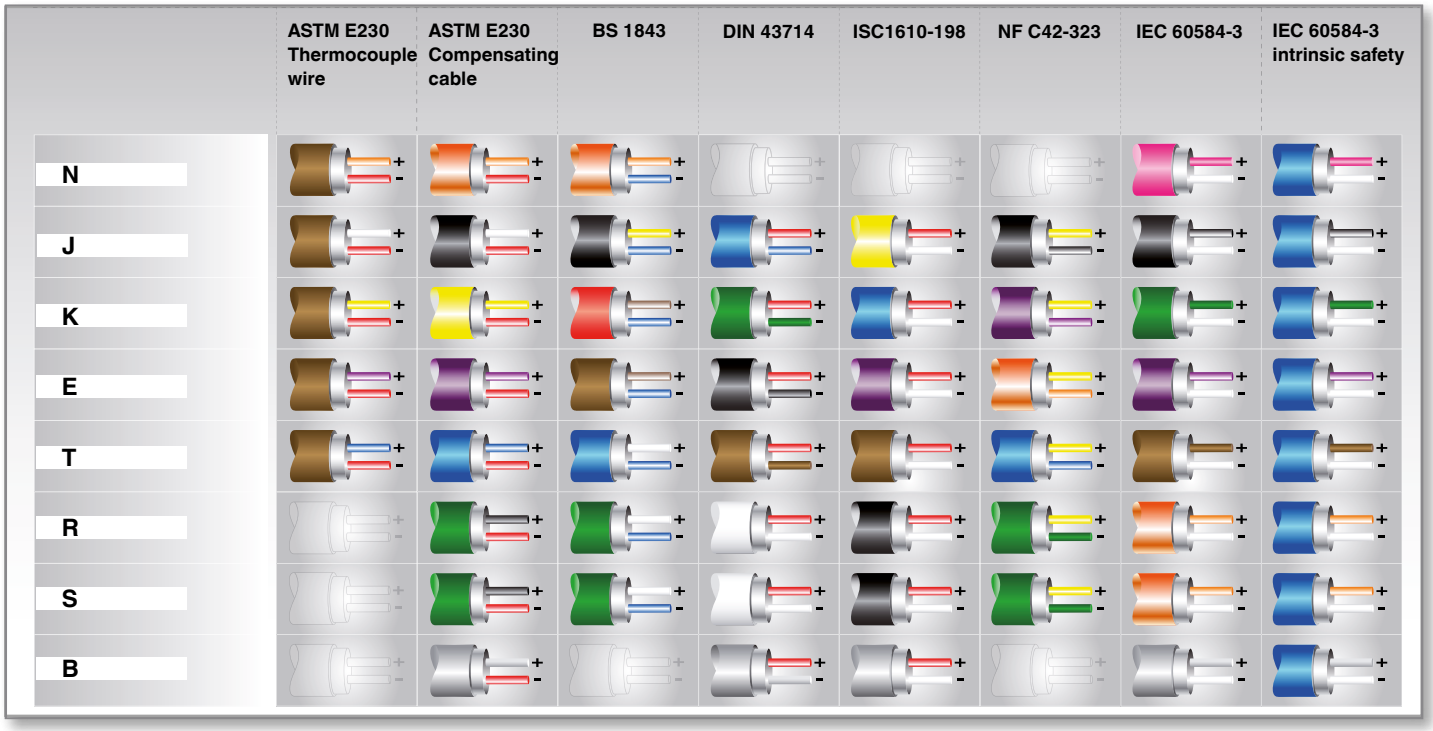


Tolerance value classes for thermocouples (cold junction temperature 0 °C)

Tolerance value classes (DIN EN 60584-2 / IEC 60584-2)				
Type		**Class 1**	**Class 2**	**Class 3**
K, N	Temperature range	-40 ... +375 °C	+40 ... +333 °C	-167 ... +40 °C
	Tolerance value	±1.5 °C	±2.5 °C	±2.5 °C
	Temperature range	+375 ... +1,000 °C	+333 ... +1,200 °C	-200 ... -167 °C
	Tolerance value	±0.004 |t|	±0.0075 |t|	±0.015 |t|
J	Temperature range	-40 ... 375 °C	-40 ... +333 °C	-
	Tolerance value	±1.5 °C	±2.5 °C	-
	Temperature range	+375 ... +750 °C	+333 ... +750 °C	-
	Tolerance value	±0.004 |t|	±0.0075 |t|	-
E	Temperature range	-40 ... +375 °C	-40 ... +333 °C	-167 ... +40 °C
	Tolerance value	±1.5 °C	±2.5 °C	±2.5 °C
	Temperature range	+375 ... +800 °C	+333 ... +900 °C	-200 ... -167 °C
	Tolerance value	±0.004 |t|	±0.0075 |t|	±0.015 |t|
T	Temperature range	-40 ... +125 °C	-40 ... +133 °C	-67 ... +40 °C
	Tolerance value	±0.5 °C	±1.0 °C	±1.0 °C
	Temperature range	+125 ... +350 °C	+133 ... +350 °C	-200 ... -67 °C
	Tolerance value	±0.004 |t|	±0.0075 |t|	±0.015 |t|
R, S	Temperature range	0 ... +1,100 °C	0 ... +600 °C	-
	Tolerance value	±1.0 °C	±1.5 °C	-
	Temperature range	+1,100 ... +1,600 °C	+600 ... +1,600 °C	-
	Tolerance value	±[1 + 0.003 (t-1,100)]	±0.0025 |t|	-
B	Temperature range	-	-	+600 ... +800 °C
	Tolerance value	-	-	+4.0 °C
	Temperature range	-	+600 ... +1,700 °C	+800 ... +1,700 °C
	Tolerance value	-	±0.0025 |t|	+0.005 |t|

ASTM tolerance values (ASTM E230)					
Type		**Standard** (whichever value is greater)		**Special** (whichever value is greater)	
K	Temperature range	0 ... +1,260 °C	+32 ... +2,300 °F	0 ... +1,260 °C	+32 ... +2,300 °F
	Tolerance value	±2.2 °C or ±0.75 %	±4.0 °F or ±0.75 %	±1.1 °C or ±0.4 %	±2.0 °F or ±0.4 %
	Temperature range	-200 ... 0 °C	-328 ... 32 °F	-	-
	Tolerance value	±2.2 °C or ±2.0 %	±4.0 °F or ±2.0 %	-	-
N	Temperature range	0 ... +1,260 °C	+32 ... +2,300 °F	0 ... +1,260 °C	+32 ... +2,300 °F
	Tolerance value	±2.2 °C or ±0.75 %	±4.0 °F or ±0.75 %	±1.1 °C or ±0.4 %	±2.0 °F or ±0.4 %
J	Temperature range	0 ... +760 °C	+32 ... +1,400 °F	0 ... +760 °C	+32 ... +1,400 °F
	Tolerance value	±2.2 °C or ±0.75 %	±4.0 °F or ±0.75 %	±1.1 °C or 0.4 %	±2.0 °F or 0.4 %
E	Temperature range	0 ... +870 °C	+32 ... +1,600 °F	0 ... +870 °C	+32 ... +1,600 °F
	Tolerance value	±1.7 °C or ±0.5 %	±3.1 °F or ±0.5 %	±1.0 °C or ±0.4 %	±1.8 °F or ±0.4 %
	Temperature range	-200 ... 0 °C	-328 ... 32 °F	-	-
	Tolerance value	±1.7 °C or ±1.0 %	±3.1 °F or ±1.0 %	-	-
T	Temperature range	0 ... +370 °C	+32 ... +700 °F	0 ... +370 °C	+32 ... +700 °F
	Tolerance value	±1 °C or ±0.75 %	±1.8 °F or ±0.75 %	±0.5 °C or 0.4 %	±0.9 or 0.4 %
	Temperature range	-200 ... 0 °C	-328 ... 32 °F	-	-
	Tolerance value	±1.0 °C or ±1.5 %	±1.8 °F or ±1.5 %	-	-
R, S	Temperature range	0 ... +1,480 °C	+32 ... +2,700 °F	0 ... +1,480 °C	+32 ... +2,700 °F
	Tolerance value	±1.5 °C or ±0.25 %	±2.7 °F or ±0.25 %	±0.6 °C or ±0.1 %	±1.1 °F or ±0.1 %
B	Temperature range	+870 ... 1,700 °C	+1,600 ... +3,100 °F	+870 ... 1,700 °C	+1,600 ... +3,100 °F
	Tolerance value	±0.5 %	±0.5 %	±0.25 %	±0.25 %

Thermocouple and extension wire colour codes



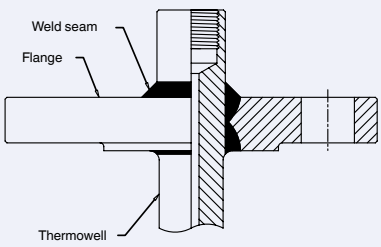
Thermowells

WIKA thermowells are available both in solid-machined and fabricated designs. The variants offered include designs with flanges, with threads and for welding. Furthermore, thermowells are available in Vanstone design and with connections for sanitary applications for fixing by means of a lapped clamping flange. The choice of material and manufacturing to customer requirements ensures optimal protection of the sensor and precise measurements. Thermowells with flanges can be manufactured with double fillet weld, penetration weld or in threaded weld designs.

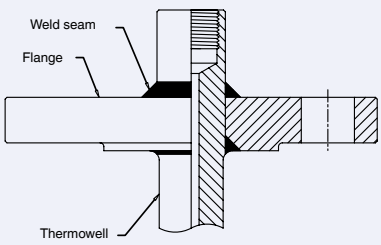
A full-penetration weld seam guarantees a complete joining of the flange and the thermowell, and thus the strongest welded joint. The double fillet weld offers a good alternative with its excellent stability.

Thermowells in thread-welded design consist of a thermowell with a 1-NPT thread, which is screwed into a threaded flange. In addition, the thermowell is secured on one or both sides by a weld seam.

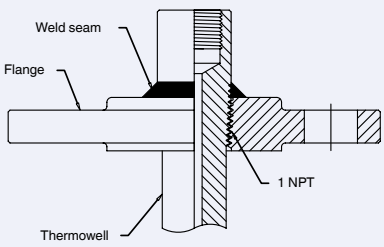
Welding options



Full penetration weld design



Fillet weld, double-sided

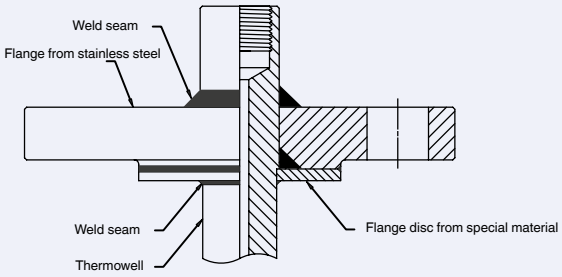


Screwed and welded design

Flange disc option for special materials

The design with a flange disc is available for solid-machined or fabricated flanged thermowells. In this design, the flange disc material is matched to the material of the thermowell shaft; the non-wetted flange is manufactured from stainless steel. The flange disc is welded to the thermowell and the stainless steel flange, so that all the parts form a single unit. After welding, the sealing face of the flange disc is turned to the required surface roughness.

The flange disc design is used when chemically aggressive process media require the use of special materials, while the flange, for cost considerations, can be manufactured from stainless steel.
Normally 316/316L stainless steel is used as flange material. The weld seam used is a double fillet weld between all components.



Note: The main advantage of this design is the cost saving over a complete construction from special materials. However, due to the design, an air gap exists between the stainless steel flange and the flange disc, which could be detrimental in critical processes.

Flange sealing faces on thermowells

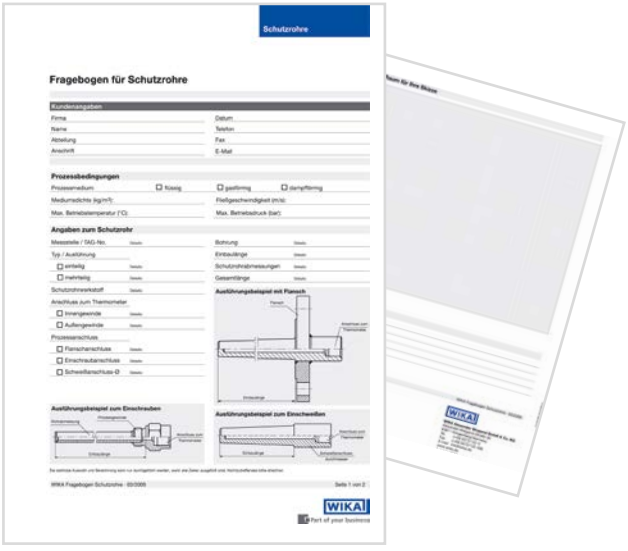
For flanges in accordance with the standards ASME B16.5, EN 1092-1 and DIN 2527 there are different sealing face forms and surface finishes in use. The most commonly-used sealing face of all the standards is the version with offset raised face with spiral phonographic grooves in the sealing face. The form and depth of the grooves is defined in the corresponding flange standards.

Less common in thermowells are flanges with smooth sealing faces without detectable grooves or designs with concentric, continuous grooves.

Flange form		
Standard flange sealing faces to ASME B16.5		
	AARH (µinch)	Ra (µm)
Stock finish	125 ... 250	3.2 ... 6.3
Smooth finish	< 125	< 3.2
RTJ (Ring joint groove)	< 63	< 1.6
Tongue/groove	< 125	< 3.2
Standard flange sealing faces to DIN 2527		
	Ra (µm)	Rz (µm)
Form C	-	40 ... 160
Form E	-	< 16
Standard flange sealing faces to EN 1092-1		
	Ra (µm)	Rz (µm)
Form B1	3.2 ... 12.5	12.5 ... 50
Form B2	0.8 ... 3.2	3.2 ... 12.5

Calculation of the thermowell strength to ASME PTC 19.3 TW-2010

To assist in the design of the thermowell, a separate spreadsheet is provided. This enables the dimensions to be determined for tapered, straight and stepped thermowells on which the process medium flow in the pipeline causes vibration or stress. Invalid value inputs or results that are outside the permissible limits can thus be identified. The calculation includes a wide range of standard and special materials.



Non-destructive test/evaluation

NDE or NDT

NDE/NDT are abbreviations for “Non-Destructive Examination”/“Non-Destructive Testing”.
The abbreviations NDE or NDT stand for “Non-Destructive Examination” or “Non-Destructive Testing”, respectively. This is used to refer to non-destructive inspections or tests of components, in general.

Liquid penetrant inspection

With the penetrant test in accordance with DIN EN 571-1, fine surface cracks and porosities in weld seams can be made visible. After cleaning the surface to be inspected, a contrast agent (red or fluorescent) is sprayed on. Through the capillary effect, this agent penetrates any surface defects there might be. After re-cleaning the surface, a developer (white) is then sprayed on, which extracts the contrast agent (from any hairline cracks, etc.) and through colour contrast, enables an easy evaluation of the defects. After passing a liquid penetration test, the thermowell is marked with “PT”.

X-ray testing

Through an X-ray test to EN 1435 or ASME Section V, Article 2, Edition 2004, for example, full penetration welds on thermowells can be investigated with respect to irregularities (cracks, voids, insufficient bonding). Here, depending on the dimensions of the thermowell, up to five X-ray images may be necessary to determine irregularities with sizes < 0.5 mm in the full-penetration weld. An X-ray examination can also be used to record the bore centrality in solid body material thermowells. For this purpose, two images of the thermowell tip at 90° to each other are required.

Pressure and stability tests

The hydrostatic pressure test is a pressure and stability test of the components of a thermowell following AD 2000 code of practice HP30. For the test, the thermowell is clamped into a testing device and subjected to a defined test pressure at room temperature for a certain period of time (e.g. three minutes). In general, a distinction is made between the outside and inside pressure test. A typical pressure is 1.5 times the nominal pressure of the flange as outside pressure or 500 bar as inside pressure. After passing a hydrostatic pressure test, the thermowell is marked with “P”.

Helium leak test

For leak testing in accordance with DIN EN 1779 (1999)/ EN 13185, helium 4.6 is used as a test gas. The test is able to detect minimal leakage rates and is considered the most sensitive test method for leak testing. In general, one should distinguish between an integral and local test method. In the integral test, leak rates (e.g. 1x10-7 mbar * l / s) can be determined, while the local testing enables the location of the leak to be determined using a spray probe. After passing a helium leak test, the thermowell is marked with a corresponding sticker.

Ultrasonic test

Through an ultrasonic test in accordance with DIN EN ISO 17640, for example, full penetration weld seams on thermowells can be investigated with respect to irregularities (cracks, voids, insufficient bonding). For this, the reflections of a radiated ultrasound signal are measured at the interfaces of irregularities. To determine the position of the irregularities, the ultrasonic device is adjusted beforehand by means of a reference body. The ultrasonic test can also be used to measure the wall thicknesses of a thermowell from solid body material to determine the bore centrality.

Positive material identification test (PMI)

The PMI (positive material identification) test proves which alloy constituents exist in the material. There are various common test procedures. With optical emission spectroscopy (OES) in accordance with DIN 51008-1 and -2, an arc is generated between the thermowell surface and the test equipment, and the spectrum of this arc enables the alloy’s elements to be identified – both qualitatively and quantitatively. This process does leave a characteristic burn mark on the workpiece. A test procedure which doesn’t damage the surface is the X-ray analysis in accordance with DIN 51001; during the X-ray the atoms of the thermowell material are energised until they radiate themselves. The wavelength and intensity of the emitted radiation is again a measure of the alloy’s constituent elements and their concentrations. After passing a positive material identification test (PMI), the thermowell is marked with “PMI”.

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