

Sapphire-design thermocouple

For high-temperature measurements with safety chamber

Model TC84

WIKA data sheet TE 65.84



For further approvals,
see page 4

Applications

- Gasification reactors
- GtL reactors (Gas-to-Liquids)
- Sulphur recovery plants

Special features

- 3 times longer service life in comparison to purely ceramic protection tubes due to the monocrystalline structure of the sapphire sensor protection tube
- High process safety with processes up to 1,700 °C [3,092 °F] and 65 bar [943 psi]
- Reduction of unplanned downtime
- Increased safety against escape of toxic media through double sealing system
- Cost savings through the elimination of a purge system and the reparability of the sensor



**Sapphire sensor with ceramic outer protection tube,
model TC84**

Description

This high-temperature thermocouple with a gas-tight sapphire protection tube has been specifically developed for use in gasification reactors. Through the monocrystalline structure, the sapphire protects the noble metal of the thermocouple from poisonous toxic media in the aggressive atmosphere of the gasification reactor.

This solution has been used successfully in different reactors worldwide since 1997 under the designation model T-FZV. Hermetically sealed, pressure-tight junctions between the sapphire and metal protection tube, and also a multifold sealing system in the connection housing prevents toxic gases from being able to escape the reactor.

The high temperatures and pressures in the gasification processes place very high demands on protection tubes and thermocouples. These process conditions often lead to shutdowns and interruptions in operation. Utilizing the sapphire design can significantly improve life expectancy and reduce downtime.

Specifications

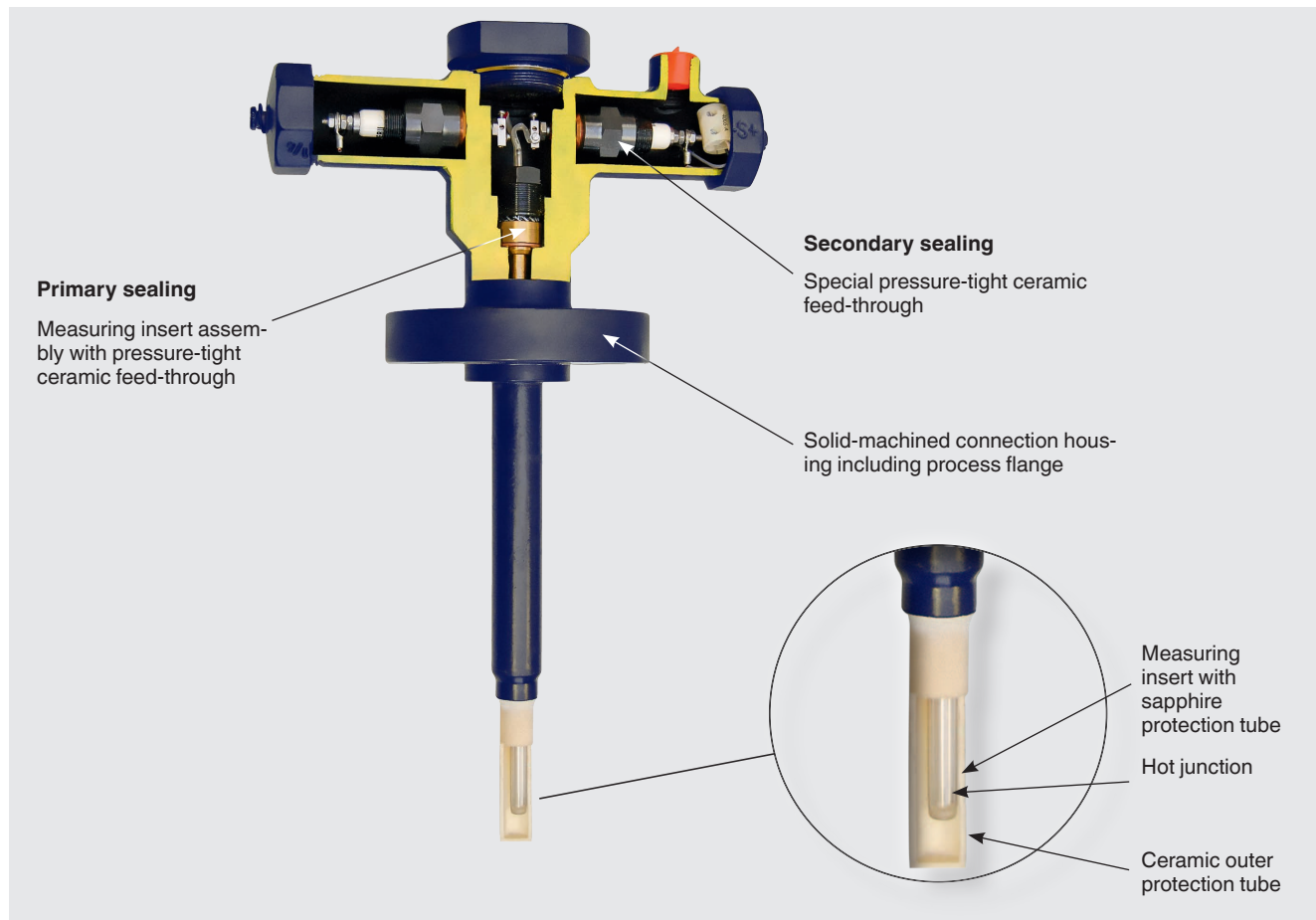
Protection mechanisms

The primary sealing serves as protection against the escape of media from the process at high pressures and temperatures.

The secondary sealing is the safeguard in the event of a malfunction in the primary seal due to any unforeseeable disturbance.

Double-protected sensor tip

- Ceramic outer protection tube for protection against harsh process conditions
- Sapphire measuring insert protection tube for internal protection against contamination of the thermocouples through diffusion



Basic information	
Dimensions	
Metal support tube	Ø 24 mm [0.95 in]
Ceramic protection tube	Ø 15 mm [0.59 in]
Measuring insert with protection tube	Ø 8 mm [0.32 in]
Support tube length SL	Min. 148 mm [5.8 in] Max. 953 mm [37.5 in]
Insertion length U	Min. 395 mm [15.6 in] Max. 1,200 mm [47.2 in]

1) The connection housing and the process flange, including the sealing face, are powder-coated for reasons of corrosion protection for carbon steels.

Measuring element	
Tolerance value	→ See technical information IN 00.23

Accuracy specifications	
Accuracy class per IEC 60584-1:2013	
S	1 and 2
R	1 and 2
B	2

Process connection ¹⁾	
Standard	<ul style="list-style-type: none"> ■ ASME ■ EN 1092-1
Nominal size	
ASME	1.5 ... 4"
EN 1092-1	DN40 ... DN100
Sealing face	
ASME	<ul style="list-style-type: none"> ■ RF ■ RTJ ■ LT ■ ST
EN 1092-1	<ul style="list-style-type: none"> ■ Form B1 ■ Form B2 ■ Form E ■ Form C
Material	<ul style="list-style-type: none"> ■ 1.4541 ■ 1.5415 ■ 1.7335 ■ 1.7380 ■ F11 ■ F22 ■ SS321 <p>→ Other materials on request</p>
Protection tube	
Protection tube diameter	Ø 15 x 2.5 mm [Ø 0.59 x 0.10 in]
	Ø 15 x 2 mm [Ø 0.59 x 0.08 in]
	Ø 8 mm [Ø 0.32 in]
Material (wetted)	Ceramic C799 Tmax = 1600 °C
	Ceramic C610 Tmax = 1,500 °C
	Sapphire T max = 2,500 °C

1) The connection housing is manufactured from forged bar stock. The process connection dimensions, for example, comply with ASME specifications and are compatible with a process flange in accordance with ASME B16.5.





Operating conditions ¹⁾	
Operating temperature	
Type S	Max. 1,600 °C [2,912 °F]
Type R	Max. 1,600 °C [2,912 °F]
Type B	Max. 1,700 °C [3,092 °F]
Ambient temperature range	
T1 ... T6	-40 ... +80 °C [-40 ... +176 °F]
T1 ... T3	-40 ... +195 °C [-40 ... +383 °F]
Storage temperature range	
-40 ... +200 °C [-40 ... +392 °F]	
Pressure limitation	
to 65 bar [943 psi]	

1) Temperature ranges can be limited by protection tube materials.

Approvals

Logo	Description	Region
	EU declaration of conformity	European Union
	EMC directive EN 61326 emission (group 1, class B) and immunity (industrial environments)	
	RoHS directive	

Optional approvals

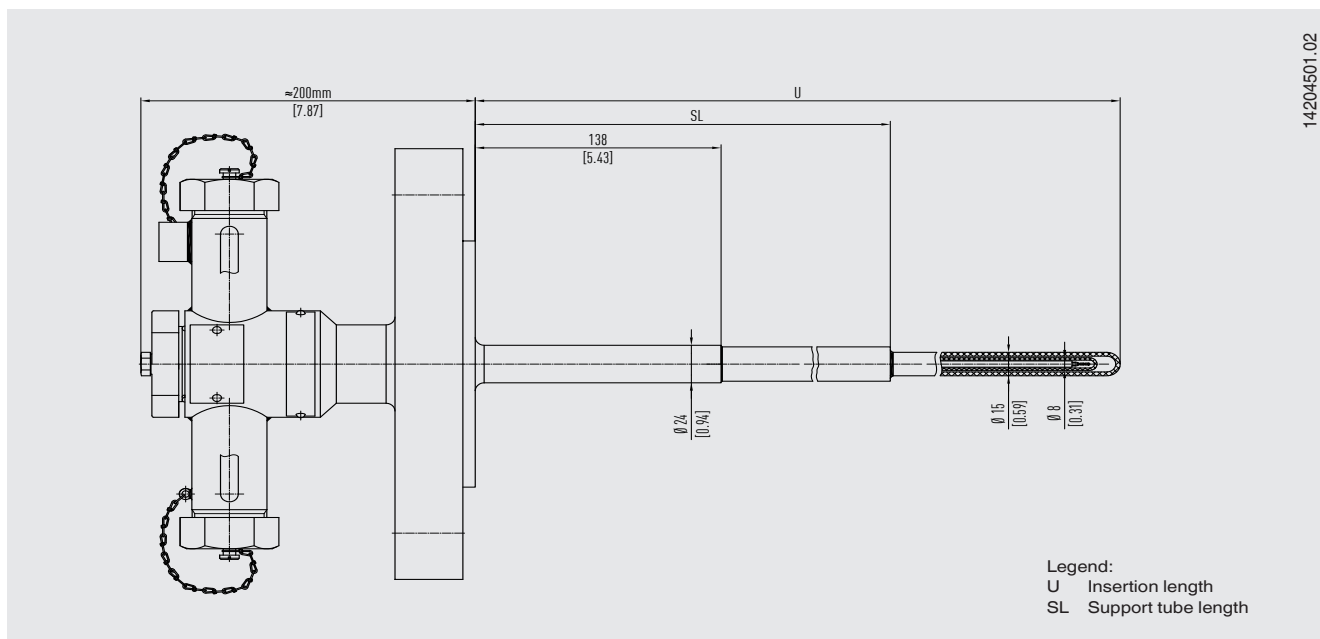
Logo	Description	Region
	EU declaration of conformity	European Union
	ATEX directive Hazardous areas - Ex e Zone 2 gas II 3G Ex ec IIC T1 ... T6 Gc X	
	IECEx (option) Hazardous areas - Ex e Zone 2 gas Ex ec IIC T1 ... T6 Gc	International
-	PAC Ukraine Metrology, measurement technology	Ukraine
	EAC Hazardous areas - Ex e Zone 2 gas Ex ec IIC T1 ... T6 Gc	Eurasian Economic Community
	CCC Hazardous areas - Ex e Zone 2 gas Ex ec IIC T1 ... T6 Gc	China
-	ECAS Hazardous areas - Ex e Zone 2 gas Ex ec IIC T1 ... T6 Gb X	United Arab Emirates

Certificates

Certificates	
Certificates	<ul style="list-style-type: none"> ■ 2.2 test report per EN 10204 (e.g. state-of-the-art manufacturing, material proof, indication accuracy) ■ 3.1 inspection certificate per EN 10204 (e.g. material proof for wetted metal parts, indication accuracy, calibration certificate)
Calibration	<ul style="list-style-type: none"> ■ Factory calibration certificate ■ DAkkS calibration certificate (traceable and accredited in accordance with ISO/IEC 17025)
Recommended calibration interval	1 year (dependent on conditions of use)

→ For approvals and certificates, see website

Dimensions in mm [in]



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Repair

The construction of the thermocouples is designed so that a defective element, following removal from the reactor, can, in most cases and in comparison to the new price of a thermocouple, be quickly and economically repaired and reconditioned. This depends on the type of damage and the number of previous repairs carried out on that particular instrument. For this, the complete defective element must be sent back to the manufacturer. Here, the instrument will be completely dismantled, the metal connection housing with flange will be cleaned, the surface coating renewed and all sealing faces will be smoothed during reassembly. The as-delivered condition of the TC84 will be documented in an incoming goods report. Then, the connection housing will be completed with a new protection tube measuring insert and a combined pressure testing undertaken. Whether a repair can be carried out successfully is only decided during one of these work steps. If the instrument cannot be repaired, the costs already incurred up to €1,000 will be invoiced and a new instrument will be offered. In the event of an order, the processing costs will be reimbursed.

Note:

It is not possible to deliver individual measuring inserts that will be fitted into the element housing at the customer site since the pressure test of the thermometer is a constituent element of the warranty.

Ordering information

Model / Temperature range / Sensor / Measuring point / Connection housing / Thread size cable inlet / Protection tube / Flange nominal size / Pressure rating / Sealing face / Flange, support tube material / Support tube length SL / Insertion length U / Ceramic outer protection tube / Measuring insert / Options

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