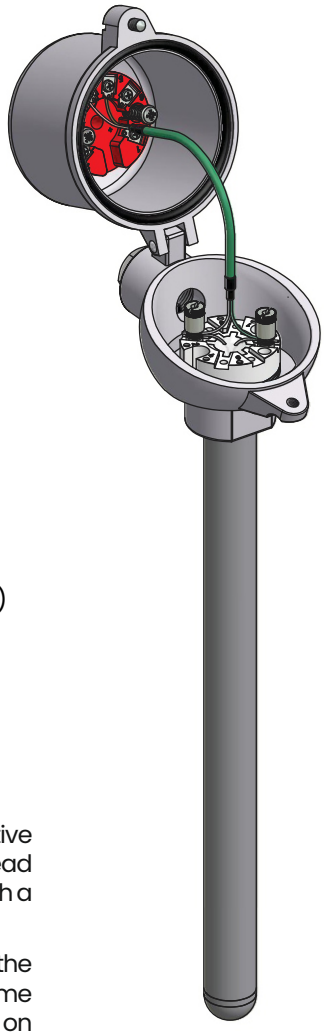
Application

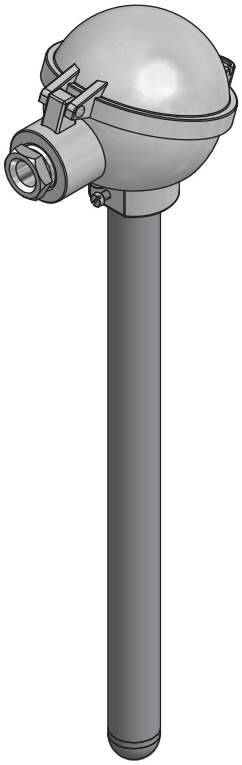
- Measuring range: -40 .. +1200°C
- Industrial furnaces
- Heat treatment processes
- Air ducts and gas ducts
- Bearing alloys in furnace bath

Features

- Standard protection tube material: Stainless Steel 1.4841 (AISI314)*
- Temperature transmitter can be installed in the sensor head
- Gas-tight compression fitting (to 0.1 MPa)
- Optionally the head can be installed with a local temperature display (DANWdie-LED)



Sensor with connection head DANW



Sensor with connection head DAN

The sensor consists of a replaceable insert, a protective tube (thermowell) and an aluminium connection head where a programmable temperature transmitter with a 4-20 mAoutput signal can be installed.

The measuring insert is a replaceable element of the complete sensor, which significantly reduces the time and cost of maintenance of measuring instruments on site.

Immersion length, compression fitting size (optional), material of the protective tube and connection head can be selected depending on the requirements of the application.

Temperature Transmitter (Option)

Measuring transmitter is mounted in the higher cap of the head.

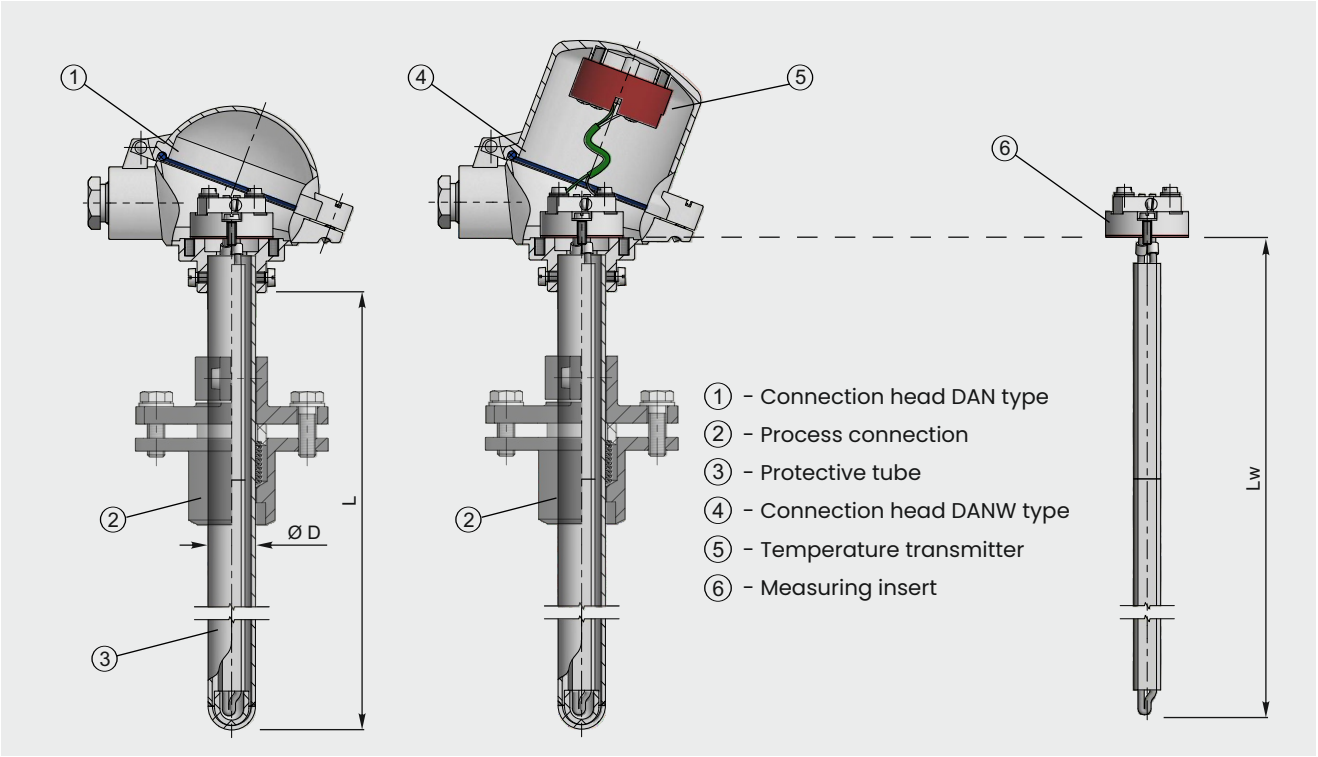
The advantage of this solution is that replacing the standard insert with a terminal block is easy, which significantly shortens the time and lowers the cost of sensor maintenance and protects the connection cables.

Other versions

This data sheet contains only a small portion of our program of supplying thermocouple thermometer with a replaceable measuring insert.

Other versions can be supplied upon customer's request.

Designs



Basic values of thermocouples type J, K, N according to PN-EN 60584 / IEC 584

Temperature		°C	600	700	800	900	1000	1100	1200
Nominal value	Type J	mV	33.10	39.13	-	-	-	-	-
	Type K	mV	24.91	29.13	33.28	37.33	41.28	45.12	48.84
	Type N	mV	20.61	24.53	28.46	32.37	36.26	40.09	43.85
Tolerance	Class 1	°C	±2.4	±2.8	±3.2	±3.6	±4.0	±4.4	±4.8
	Class 2	°C	±4.5	±5.2	±6.0	±6.7	±7.5	±8.2	±9.0

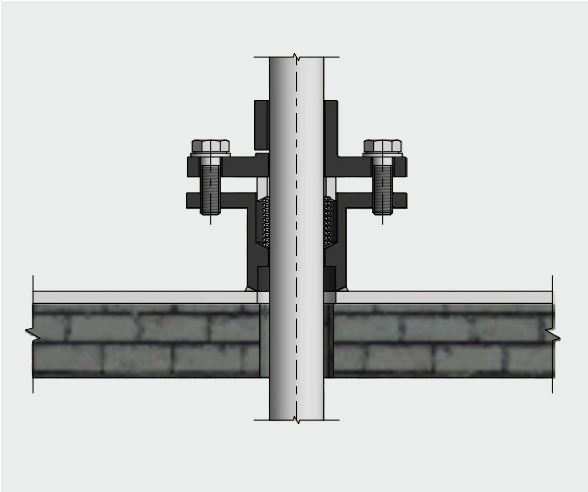
Tolerance

The PN-EN 60584 Standard defines the formulas for calculating acceptable measure tolerance. More information available in the general thermocouple sheet.

Type K (NiCr-Ni), Type N (NiCrSi-NiSi)

Class	Temperature range	Tolerance
1	-40 °C .. +375 °C	± 1.5 °C
	+375 °C .. +1000 °C	± 0.0040 x | t |
2	-40 °C .. +333 °C	± 2.5 °C
	+333 °C .. +1200 °C	± 0.0075 x | t |

Mounting example

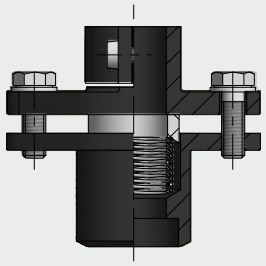


Thermocouple wire diameter

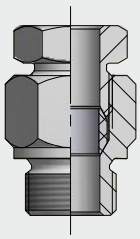
Type	Protection tube dia. D [mm]	Wire dia. d_1 [mm]
J (Fe-CuNi)	Ø15, Ø22	Ø2.0
K (NiCr-Ni)	Ø15 Ø22	Ø2.0 Ø3.0
N (NiCrSi-NiSi)	Ø15 Ø22	Ø2.0 Ø3.0

Mounting bracket / Compression fitting

Typ UZ



Typ UG



More detailed information are available in the „Compression fittings UG" and „Mounting bracket UZ" data sheet.

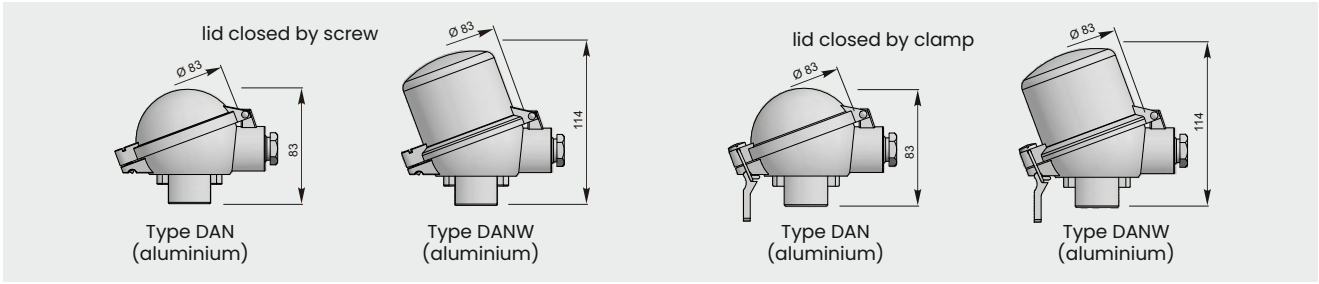
Maximal temperature	Material	Material properties	Applications
800°C	1.4404 **AISI 316 L**	As a result of the addition of molybdenum, this material has higher corrosion resistance in non-oxidizing acids such as ethanolic acid, tartaric acid, phosphoric acid, sulphuric acid and others. Increased pitting resistance.	Sulphite, pulp, textile, dyeing, fatty acid, soap and pharmaceutical industries.
800°C	1.4541 **AISI 321**	Good resistance to intercrystalline corrosion, also after welding. Good resistance to heavy oil products, steam and exhaust gases. Good oxidation resistance. Can be used continuously up to approximately 800 °C.	Nuclear power and reactor construction, chemical apparatus engineering, annealing furnaces, heat exchangers, paper and textile industry, petrochemical and crude oil industry, grease and soap industry, food processing industry.
1150°C	1.4841 **AISI 314**	Excellent resistance to corrosion, also at high temperatures. Also suitable in atmospheres containing carbon and sulphur. Resistant to oxidation in air up to 1000 °C (interrupted service) or 1150 °C (continuous service). Well suited with high thermal cycling. Recommended for long-term continuous use in the temperature range from 425 to 850 °C.	Boilers and blast furnaces, cement and brick kilns, glass production, crude oil and petrochemical industries, furnace construction and power stations.
1200°C	1.4749 1.4762 **AISI 446**	Extremely good resistance to reducing, sulphurous atmospheres. Very good resistance to oxidation and air. Good resistance to corrosion caused by incinerator slag and copper, lead and tin smelts.	Petrochemical industry, metallurgy, power technology, recuperators, heat treatment kilns, vortex firing installations, waste incinerators.
1150°C	2.4816 **Inconel 600™ ***	Good general resistance to corrosion, resistant to tension crack corrosion. Excellent resistance to oxidation. Not recommended with gases containing CO2 and sulphur above 550 °C and sodium above 750 °C. In air, resistant up to 1100 °C.	PWR, nuclear power, furnace construction, plastics industry, heat treatment, paper and food processing industries, boilers, aircraft engines.
1100°C	**Incoloy 800™ ***	Good strength and excellent resistance to oxidation and carburization in high-temperature atmospheres. High corrosion resistance for many aqueous environemnts.	Process pipping, heat exchangers, carburizing equipment, nuclear steam generator tubing
1175°C	2.4851 **Inconel 601™ ***	Similar to Inconel 600, more chromium content provides highest reistance to oxidation, carburization and sulphur atmospheres. Resistant up to 1175°C in air.	Power plants, furnace construction, plastics industry, heat treatment

Maximal temperature	Material	Material properties	Applications
1100°C	**Hastelloy C276 ***	Good corrosion resistance against many chemical environments including iron and copper chloride, contaminated mineral acids, wet chlorine gas. Oxidation resistant up to 990°C.	Heat exchangers, reaction tanks, exaporators, paper and food processing industries, chemical waste recycling system, sulfuric acid reactors, fermentation chambers.
1200°C	**Haynes HR160 ***	Outstanding resistance to various forms of high-temperature corrosion attack. Excellent resistance to sulfidation and chloride attack in both reducing and oxidizing atmospheres.	Refining industry, incinerators, industrial furnaces, heat exchangers
1350°C	**Kanthal® AF ****	Good heat resistance, very good resistance in sulfur contact. Not recommended for work in nitrogen gases. In air resistant up to 1350°C.	Industrial furnaces, metallurgy industry, heat treatment

* Haynes International trade mark
* Sandvik Group trade mark

Connection heads

This sensor can be fitted with one of the following connection heads. For more information about the connection heads see section "Accessories".



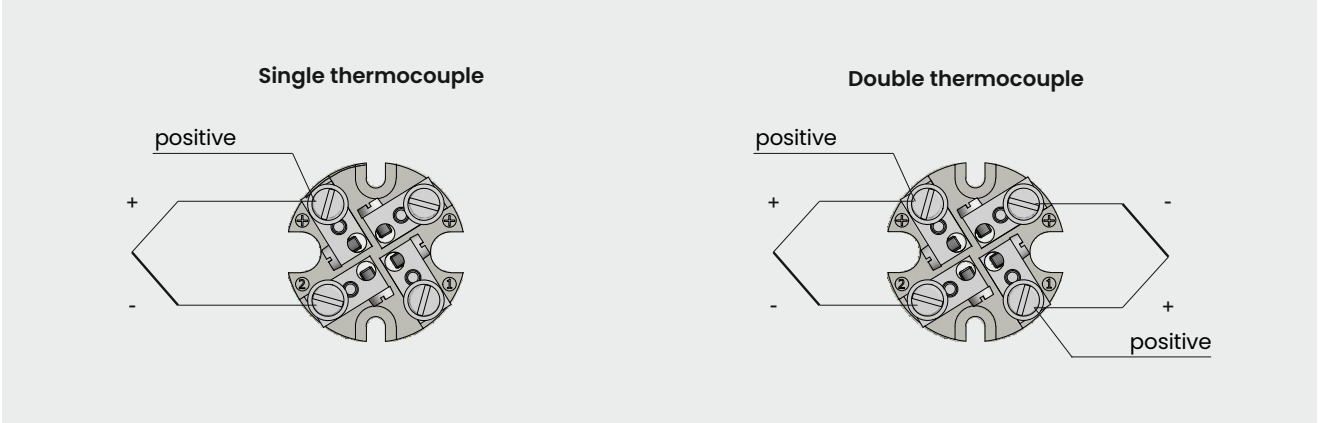
Connection head DANWdie with local LED display

The display is mounted in connection head cover with glass window which allows preview of measuring temperature. 4 digits with a height of 9.5 milimeter ensure clear reading of values.

Programming of measure range can be performed via three buttons placed on the back of display panel.

Mounted temperature transmitter 4..20mA on measuring insert is necessary for proper use. It also works with temperature transmitters with HART® protocol.

Electrical connection on ceramic block



Ordering code

1	2	3	4	5	6	7	8	9	10
	TT		U1		-	-	-	-	-	-	-	-	-

Version

	Single thermocouple
AP	Single thermocouple, with 4..20 mA temperature transmitter
APW	Single thermocouple, with 4..20 mA temperature transmitter and local LED display*
2	Double thermocouple

* only with connection head DANWdie

Thermocouple type

J	Type J (Fe-CuNi)
K	Type K (NiCr-Ni)
xxx	other, please specify

Closing method of connection head

1	Closing by screw
3	Closing by clamp

Connection head

DAN	Type DAN	Aluminium	Cable gland: M20x1.5	IP53
DANW	Type DANW	Aluminium	Cable gland: M20x1.5	IP53
xxx	other, please specify			

Protection tube material

1.4404	Stainless Steel 00H17N14M2 (1.4404, AISI316L)
1.4541	Stainless Steel 1H18N9T (1.4541, AISI321)
1.4841	Heat resistant steel H25N20S2 (1.4841, AISI314)
1.4672	Heat resistant steel H24JS (1.4762, AISI446)
2.4816	Heat resistant alloy INCONEL® 600 (2.4816)
2.4851	Heat resistant alloy INCONEL® 601 (2.4851)
Incoloy800	Heat resistant alloy INCOLOY® 800
C276	Heat resistant alloy Hastelloy C276
HR160	Heat resistant alloy Haynes Hr160
Kanthal AF	Heat resistant alloy Kanthal AF
xxx	other, please specify

Length L [mm]

500	500 mm
710	710 mm
1000	1000 mm
1400	1400 mm
2000	2000 mm
xxx	other, please specify

Protection tube diameter [mm]

15	Ø 15 mm
20	Ø 20 mm
21.3	Ø 21.3 mm
22	Ø 22 mm
26.7	Ø 26.7 mm
xxx	other, please specify

Tolerance

1	Class 1 according to PN-EN 60584-2
2	Class 2 according to PN-EN 60584-2

Measuring range of temperature transmitter

0..100	input signal for 4..20mA: 0..1000°C
xxx	other, please specify

Type of temperature transmitter

PR5334A3B	Output signal 4..20 mA
PR5335A	Output signal 4..20 mA, with HART® protocol
PR5350A	Output signal Profibus® PA / Foundation Fieldbus
xxx	other, please specify

Example

Temperature sensor TTKU11-DAN-1.4841-710-22-1
(sensor 1xK, connection head type DAN closed by screw, length L=710mm, protection tube material 1.4841, diameter Ø22 mm, class 1).