Boehme + Ewert
EXPERT TEMPERATURE SOLUTIONS

Product group electrical thermometers (TE)

Metal sheathed thermometers, series: TES

Areas of application

- Tank and pipeline construction
- General process engineering
- Laboratories
- Environmental technology
- Mechanical and plant engineering
- Research and development

Features

- flexible
- short response times
- universally applicable
- robust

Approvals

– ATEX
– optional IECEx

Metal sheathed thermometers, series: TES

Contents:

Metal sheathed thermometers, series: TES

Type series: TES21; TES22; TES23; TES24

1. General information

Sheath thermometers are divided into sheath thermocouples and sheath resistance thermometers.
Depending on the sensor used, the type designations are given the index T or W.
In addition to the thermometers defined in this data sheet, they also form the basic design for measuring inserts (catalog data sheet ....), surface thermometers (catalog data sheet .....), bearing thermometers (catalog data sheet ....) and multilevel thermometers (catalog data sheet ....).
This basic design can be found in the B+E components catalog .....

Structure:

Sheathed thermometers consist of the name-giving sheathed cable with a prefabricated sensor (or sensors) at the "hot end" and an electrical connection at the other end. With sheathed thermocouples, one or more thermocouples are formed by welding the thermocouple wires together. In sheathed resistance thermometers, a measuring resistor is connected to the neutral inner conductors (copper or nickel) and then encapsulated.
The design of the electrical connection determines the type of this series.

The thermocouple sheathed cables' thermocouple wires comply with the international standards DIN EN, IEC, ASTM, BS, JIS. The neutral inner conductors for resistance thermometer sheathed cablesare most frequently made of copper. Nickel, nickel-copper or nickel-chromium alloys are also used. Magnesium oxide or aluminum oxide is mainly used as a ceramic insulator. Geometries and other properties of sheathed cables are defined in DIN EN IEC 61515. They are manufactured by drawing processes in several stages. The insulation ceramic is highly compacted and sheathed cables have good ductility. The bending radius is min. 5x outer diameter. The non-bendable areas of the sensor sides must be taken into account. A large number of combinations can be produced on this basis. The possible combinations are limited by the maximum temperature load and the necessary heat treatment during the drawing process. Sheathed cables are available in outer diameters between 0.25 and 12.7 mm. For special requirements, sheathed cables can also be manufactured with a double wall thickness.
This can be specified as a requirement in the inquiry or order.

Insulation resistance R_{iso}:

The insulation resistance, measured between the outer sheath and inner conductors, is at least 1000 Mohm at ambient temperatures up to 40 °C.
This is higher than required by the DIN EN IEC 60584 and 60751 standards.

Operating temperatures:

The operating temperature range is determined by the combination of sensor (thermocouple, measuring resistor) and sheath material.
In the low-temperature range, sheath materials with good cold toughness such as 1.4541 and 1.4571 are used.
Tolerance class 3 is available for some thermocouples in accordance with DIN EN IEC 60584;
for ANSI - ASTM, the operating range must be specified separately and the material must be selected accordingly.
The resistance thermometer standard DIN EN IEC 60751 covers the range down to -200 °C.
In the high temperature range, the maximum operating temperature is generally determined by the corrosion behavior of the sheath material under the given operating conditions. The maximum continuous operating temperature of the sensor used also determines the upper limit.

The following overview of sheath materials and their properties provides a guide. For special requirements, coatings with ECTFE or PFA or stellite coatings in particularly corrosive areas can also be realized.
Böhme + Ewert GmbH's application technology department will be happy to provide you with further advice.

2. Sheath materials

Sheath materials can be divided into the following groups according to their alloy components:

1) Stainless steels (austenites)
2) Iron-chromium alloys (ferrites)
3) Nickel-based alloys
4) Platinum alloys

2.1 Stainless steels (austenitic steels)

1.4404 (A616L)
Good corrosion resistance, less suitable in reducing atmospheres
Maximum operating temperature in air at approx. 800 °C
Not resistant to seawater

1.4541 (A321)
Stabilized against intergranular corrosion by titanium additions,
Good corrosion and oxidation resistance, good formability and good cold toughness
Maximum service temperature in air at approx. 800 °C

1.4571 (A316Ti)
A chromium-nickel-molybdenum steel stabilized with titanium.
Good corrosion resistance in most natural waters with low to medium concentrations of chlorides, salt and hydrochloric acid. Good corrosion resistance in most organic acids.
Characterized by good formability and cold toughness.
Maximum service temperature in air at approx. 900 °C

1.4841 (A314)
Excellent corrosion resistance, even at high temperatures. Also suitable in atmospheres containing carbon and sulphur.
Scale-resistant in air up to 1150°C, application range 900°C - 1120°C

1.4845 (A310)I
ts high chromium and nickel content offers good corrosion resistance and better resistance to oxidation and sulphidization against oxidation and sulphidization.
This material has good heat resistance.Maximum application temperature 1150°C

1.4876 (Alloy 800)
High temperature nickel-iron-chromium solid solution alloy with controlled carbon content, aluminum, titanium, silicon and manganese as well as a controlled sum content (Al + Ti).
Good resistance in oxidizing, reducing and nitrogenizing atmospheres as well as in alternating oxidizing and carburizing conditions.

2.2 Iron-chromium alloys (ferrites)

1.4749 (A446)
Extremely good resistance to reducing sulphurous atmospheres.
Very good resistance to oxidation and air due to approx. 1.7% aluminum content.
Good resistance to corrosion from combustion ash, copper, lead and tin melts.

2.3 Nickel-based alloys

2.4816 (Alloy 600)
Nickel-chromium-iron alloy with generally good corrosion resistance, resistant to stress corrosion cracking, carburization and nitriding. Excellent oxidation resistance.
Good resistance to dry chlorine and hydrogen chloride up to 550 °C, resistant to high-purity water, caustic soda and organic acids. Can be used in the cryogenic range up to 1100 °C

2.4665 (Hastelloy X)
Nickel-chromium-iron-molybdenum alloy
Excellent oxidation resistance up to 1,200 °C, can be used in both neutral and reducing atmospheres, resistant in carburizing and nitriding atmospheres
Exceptionally resistant to stress corrosion and cracking in petrochemical applications Applications.
High heat resistance

2.4880 (Alloy HR-160)
Solid solution hardening nickel-cobalt-chromium-silicon alloy; high resistance to sulphurization, carburization, metal dusting, nitriding, hot gas corrosion, oxidation up to 1205 °C, high creep strength

Pryrosil (Alloy TD)
Ni-22% Cr alloy with the addition of 1.4% Si, 3.0% Mo and rare earth metals excellent oxidation and nitriding corrosion resistance, less susceptible to degradation in carbonaceous atmospheres excellent static and cyclic oxidation resistance at temperatures up to 1250°C
The composition is similar to thermocouple wires, which reduces the potential for diffusion of alloying constituents between the thermocouple wires and sheath (for type N)

2.4 Platinum alloys

PT10%RH

Resistant to high temperatures up to 1300 °C under oxidizing conditions in the absence of oxygen, sulphur or silicon. Proven in air up to 1200 °C, in molten glass

3. Resistance thermometer

The selection of a suitable measuring resistor essentially depends on the operating temperature and the required mechanical properties. Sheet measuring resistors and measuring resistors with a platinum wire helix and ceramic body are used. Plating resistors are less expensive and allow shorter temperature-sensitive lengths. PT1000 measuring resistors are almost exclusively designed as film measuring resistors. Wire-ceramic measuring resistors enable extended temperature measuring ranges and are mechanically more robust and also have increased long-term stability.
An overview of designs and recommended measuring ranges is given in the table on the following page.

The measuring resistors comply with the IEC-based standard DIN EN 60751. On request, resistance thermometers can also be supplied in accordance with other international standards such as JIS C1604 or ASTM E1137 can also be supplied on request.
All variants of the sheathed elements used in the TES series meet the minimum vibration resistance requirement of 3 g in accordance with DIN EN 60751 achieves values of at least 20 g.

Design	Temperature range	PT10	PT100	PT1000
Sheet resistance	-50 ... 400 °C (standard)		●	●
	-50 ... 600 °C (extended)		●	●
	-200 ... +150 °C (kryo)		●	
Wire ceramics	-200 ... 600 °C (standard)	●	●	
	-200 ... 800 °C (high temperature)	●	●	

Tolerance classes according to DIN EN 60751 and specific to Böhme + Ewert GmbH:
(apply within a sub-range of the temperature range, the validity range)

Class	Scope of validity (°C)		Limit deviation (K) *1)	DIN EN	B+E - specific
	Sheet resistance	Wire-ceramic measuring resistor			
AA	0 ... 150	-50 ... 250	±(0,1 + 0,0017|t|)	●	
A	-30 ... 300	-100 ... 450	±(0,15 + 0,002|t|)	●	
B	-50 ... 500	-196 ... 600	±(0,3 + 0,005|t|)	●	
C	-50 ... 600	-196 ... 600	±(0,6 + 0,005|t|)	●	
AC	-	-196 ... 200	±(0,15 + 0,002|t|)		●
BH	-	0 ... 800	±(0,3 + 0,005|t|)		●

Possible combinations of the number of measuring circuits and circuits depend on the diameter of the measuring insert. With single measuring circuits, all circuit types are possible for all diameters.
It should be noted that only tolerance classes B and C are recommended for two-wire circuits.
The following dependency exists for multiple measuring circuits:

Diameter (mm)	2 measuring circuits			3 measuring circuits	
	2 - Head	3 - Head	4 - Head	2 - Head	3 - Head
1.5 - 2	●				
3 - 4,5	●	●			
6 - 6,4	●	●	●	●	●
8	●	●	●	●	●

Response times according to IEC EN DIN 60751

Ø Temperature sensor	Water 0.4 m/s		Air 3 m/s	
	$t_{0.5}$	$t_{0.9}$	$t_{0.5}$	$t_{0.9}$
Resistance thermometer				
3,0 mm	1,5	5,5	20,0	78,0
4,5 mm	2,4	6,5	26	77
6,0 mm	4,0	10	46	108

Depending on the configuration, sheath resistance thermometers have different temperature-sensitive lengths and non-flexible ranges depending on the configuration.
The following table shows the dependencies:

temperature-sensitive length		**non-flexible area**	
standard	short	standard	short
20 mm	10 mm	50 mm	40 mm

4. Thermocouples

In addition to normative specifications, such as factory standards, the operating temperature essentially determines the choice of thermocouple. Type K is widely used as a "universal thermocouple", increasingly also type N. At high temperatures, precious metal pairings of types R, S or B are the better choice. At lower operating temperatures up to approx. 300 °C, the thermocouples E, J and T offer a better signal-to-noise ratio.
To improve the response time, sheathed thermocouples can also be supplied with a tapered tip.
Our application technology department will be happy to advise you.

Depending on the diameter, the following measuring circuit variants are possible:

Diameter (mm)	1 - measuring circuit	2 - measuring circuit	3 - measuring circuit
1.5	●		
2	●	●	
3	●	●	●
4.5	●	●	●
6	●	●	●
8	●	●	●

The following tables provide an overview of temperature ranges, limit deviations and response times of sheath thermocouples.

Limit deviations of the thermoelectric voltages according to IEC 60584-1

CLASS 1

Typ Type	Name Name	Temperaturbereich Temperature Range	Grenzabweichungen Tolerance values
E	NiCr-CuNi	-40 bis / to 375 °C 375 bis / to 800 °C	±1,5 °C ±0,004 (t)
T	Cu-CuNi	-40 bis / to 125 °C 125 bis / to 350 °C	±0,5 °C ±0,004 (t)
J	Fe-CuNi	-40 bis / to 375 °C 375 bis / to 750 °C	±1,5 °C ±0,004 (t)
K/N	NiCr-Ni / NiCrSi-NiSi	-40 bis / to 375 °C 375 bis / to 1000 °C	±1,5 °C ±0,004 (t)
R/S	Pt 13 Rh-Pt / Pt 10 Rh-Pt	0 bis / to 1100 °C 1100 bis / to 1600 °C	±1,0 °C ±[1+0,003(t-1100)

CLASS 2

Typ Type	Name Name	Temperaturbereich Temperature Range	Grenzabweichungen Tolerance values
E	NiCr-CuNi	-40 bis / to 375 °C 375 bis / to 800 °C	±2,5 °C ±0,0075 (t)
T	Cu-CuNi	-40 bis / to 125 °C 125 bis / to 350 °C	±1 °C ±0,0075 (t)
J	Fe-CuNi	-40 bis / to 375 °C 375 bis / to 750 °C	±2,5 °C ±0,0075 (t)
K/N	NiCr-Ni/ NiCrSi-NiSi	-40 bis / to 375 °C 375 bis / to 1000 °C	±2,5 °C ±0,0075 (t)
R/S	Pt 13 Rh-Pt / Pt 10 Rh-Pt	0 bis / to 1100 °C 1100 bis / to 1600 °C	±1,5 °C ±[1+0,003(t-1100)
B	Pt 30 Rh-Pt 6 Rh	600 bis / to 1700 °C	±0,0025(t)

CLASS 3

Typ Type	Name Name	Temperaturbereich Temperature Range	Grenzabweichungen Tolerance values
E	NiCr-CuNi	-167 bis / to 40 °C -200 bis / to -167 °C	±2,5 °C ±0,015 (t)
T	Cu-CuNi	-67 bis / to 40 °C -200 bis / to -67 °C	±1 °C ±0,015 (t)
K/N	NiCr-Ni / NiCrSi-NiSi	-167 bis / to 40 °C -200 bis / to -167 °C	±2,5 °C ±0,015 (t)
B	Pt 30 Rh-Pt 6 Rh	600 bis / to 800 °C 800 bis / to 1700 °C	±4 ±0,005(t)

Tolerance values according to ANSI MC96.1-1982 and ASTM E230

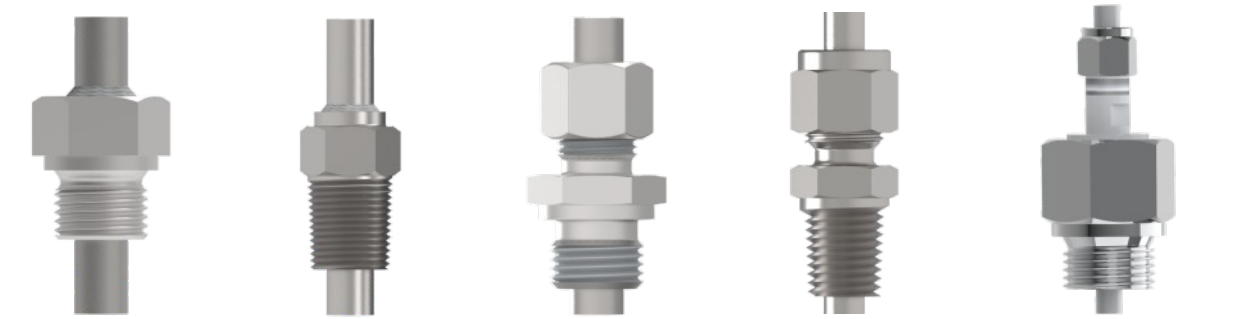
Reference temperature 0º C (32º F)

Typ Type	Temperaturbereich Temperature Range		Standard Toleranz Standard Tolerance		Spezielle Toleranz Special Tolerance	
Standard	ºC	º F	ºC (der großere Wert gilt) ºC (whichever is greater)	ºF (der großere Wert gilt) ºF (whichever is greater)	ºC (der großere Wert gilt) ºC (whichever is greater)	ºF (der großere Wert gilt) ºF (whichever is greater)
J	0 bis / to 760	32 bis / to 1400	±2.2ºC oder / or ±0.75%	±4.0ºF oder / or ±0.75%	±1.1ºC oder / or ±0.4%	±2.0ºF oder / or ±0.4%
K und/ and N	-200 bis / to 0	-328 bis / to 32	±2.2ºC oder / or ±2.0%	±4.0ºF oder / or ±2.0%		
	0 bis / to 1260	32 bis / to 2300	±2.2ºC oder / or ±0.75%	±4.0ºF oder / or ±0.75%	±1.1ºC oder / or ±0.4%	±2.0ºF oder / or ±0.4%
E	-200 bis / to 0	-328 bis / to 32	±1.7ºC oder / or ±1.0%	±3.0ºF oder / or ±1.0%	±1.0ºC oder / or ±0.5%	±1.8ºF oder / or ±0.5%
	0 bis / to 870	32 bis / to 1600	±1.7ºC oder / or ±0.5%	±3.0ºF oder / or ±0.5%	±1.0ºC oder / or ±0.4%	±1.8ºF oder / or ±0.4%
T	-200 bis / to 0	-328 bis / to 32	±1.0ºC oder / or ±1.5%	±1.8ºF oder / or ±1.5%	±0.5ºC oder / or ±0.8%	±0.9ºF oder / or ±0.8%
	0 bis / to 370	32 bis / to 700	±1.0ºC oder / or ±0.75%	±1.8ºF oder / or ±0.75%	±0.5ºC oder / or ±0.4%	±0.9ºF oder / or ±0.4%
R und/ and S	0 bis / to 1400	32 bis / to 2700	±1.5ºC oder / or ±0.25%	±2.7ºF oder / or ±0.25%	±0.6ºC oder / or ±0.1%	±1.1ºF oder / or ±0.1%
B	870 bis / to 1700	1600 bis / to 3100	±0.5%	0.5%	±0.25%	0.25%

Response times according to IEC EN DIN 60584

Ø Temperature sensor	Water 0.4 m/s		Air 3 m/s	
	$t_{0.5}$	$t_{0.9}$	$t_{0.5}$	$t_{0.9}$
Thermocouples				
1,5 mm		4,5	15,0	50,0
3,0 mm	1,5	4,5	15,0	50,0
4,5 mm	2,5	6,3	24,7	75,5
6,0 mm	4,0	9,7	43,5	105,0

5. Process connections



For sheathed cable	Connection thread	fixed	movable	resilient VS
1,0 - 3,0 mm	M8 x 1	●	●	
3,0 - 6,0 mm	G 1/4	●	●	
	1/4" NPT	●	●	
4,5 - 8,0 mm	G 3/8	●	●	●
	1/2" NPT	●	●	●
	G 1/2	●	●	●
	M 18 x 1,5	●	●	●
	M 20 x 1,5	●	●	●

Other threads on request.

The movable process connections are compression fittings.

The standard material for the fitting bodies is 1.4401 or 1.4571.
Clamping rings can be made of 1.4401/1.4571 or PTFE for pressures up to 10 bar and temperatures up to 150 °C.

Optional materials for highly corrosive applications:
- Hastelloy C276 (2.4819)
- Monel400 (2.4360)
- Inconel600 (2.4816)
- Titanium size 4 (3.7065)

Optional accessories:
- Sealing rings
- Flange adapters
- Element guides

Other process connections such as vacuum flanges can also be supplied on request.

6. Type series: type overview

6.1 Type TES21 with connection head form F, aluminum, skirt type IP 65

6.2 Type TES22 with cable

6.3 Type TES 23 with plug connector

6.3.1 Thermo plug

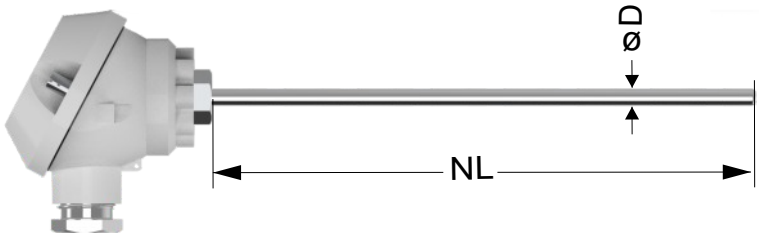
6.3.2 Lemo plug/coupling

Other connectors on request

6.4 Type TES24 with insulated connecting wires

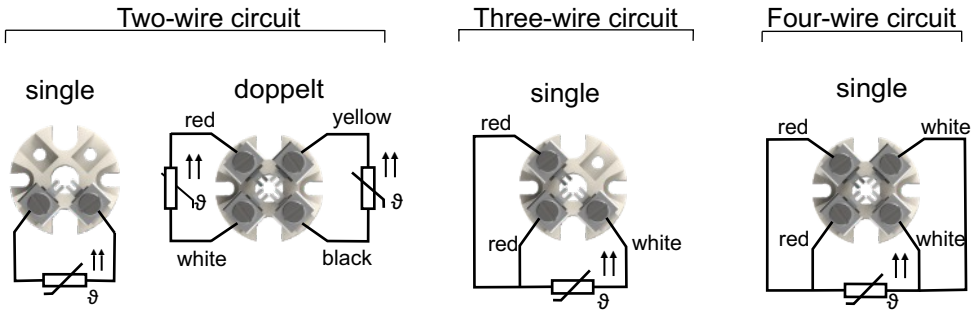
7. Types

7.1 TES21 with connection head form F, aluminum, skirt type IP 65

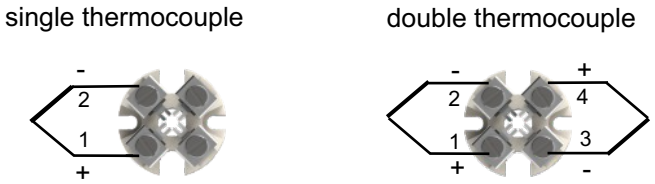


Cable entry M16x1.5 as standard; pressure screw version, nickel-plated brass Variants:
- Cable gland in plastic, nickel-plated brass or stainless steel
- Sensor plug / sensor coupling

7.1.1 Connection diagrams for resistance thermometers according to IEC DIN EN 60751

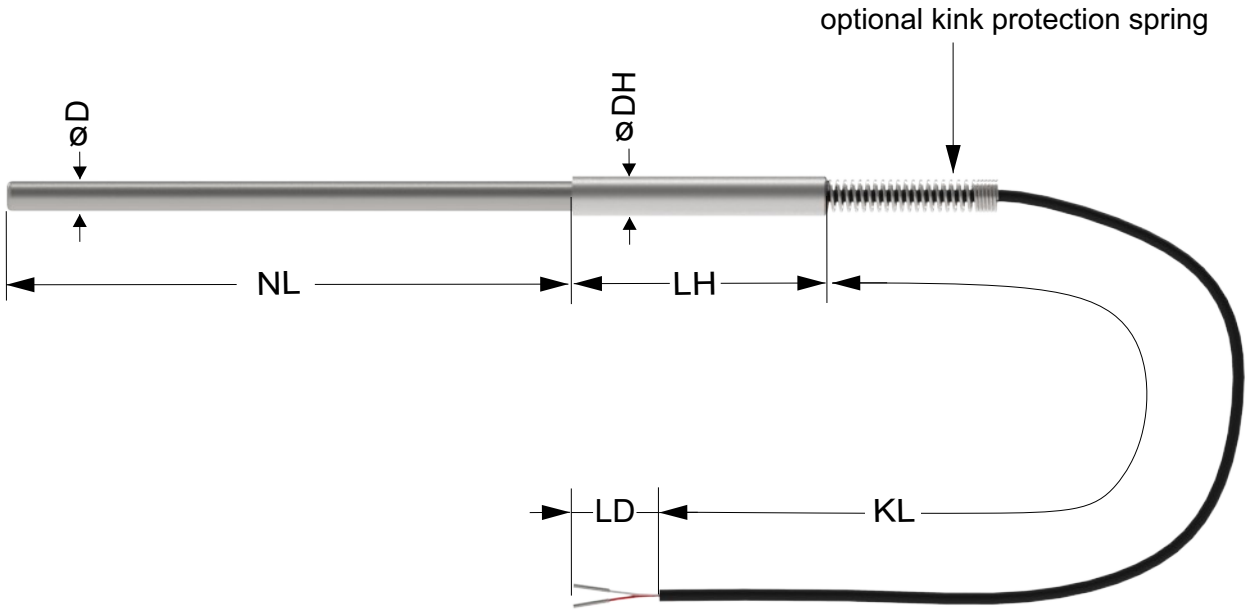


Connection diagrams for thermocouples according to IEC DIN EN 60584



Marking of the positive pole by color dot.

7.2 TES22 Sheath thermometer with cable



General notes:

The diameter and length of the transition sleeve is determined by the diameter and structure of the supply cable used. The following minimum diameters apply:
- up to sheathed cable diameter 4.8 mm - DH >= 6 mm
- sheathed cable diameter > 4.8 mm to 6.4 mm - DH >= 8 mm
- sheathed cable diameter > 6.4 mm to 8 mm - DH >= 10 mm

Max. ambient temperature at the transition sleeve 150 °C (except for PVC cables)

Option for transition sleeve:
- welded to sheathed cable
- max. ambient temperature 300 °C (depending on the cable used)

Kink protection spring:
Bend protection is recommended both for frequent relative movements between the sheathed thermocouple and the cable as well as in the case of pronounced vibration stress at the installation point, e.g. reciprocating compressors.

Materials for adapter sleeve and anti-kink spring: Stainless steel

Design options for the cable ends:

- free wires with ferrules (standard)
- free wires bare
- free wires tinned
- thermocouple plug or coupling
- Lemo plug or coupling - sensor plug

Standard length (DL) = 50 mm

The cable ends of shielded cables are fitted with a bare earthing wire.

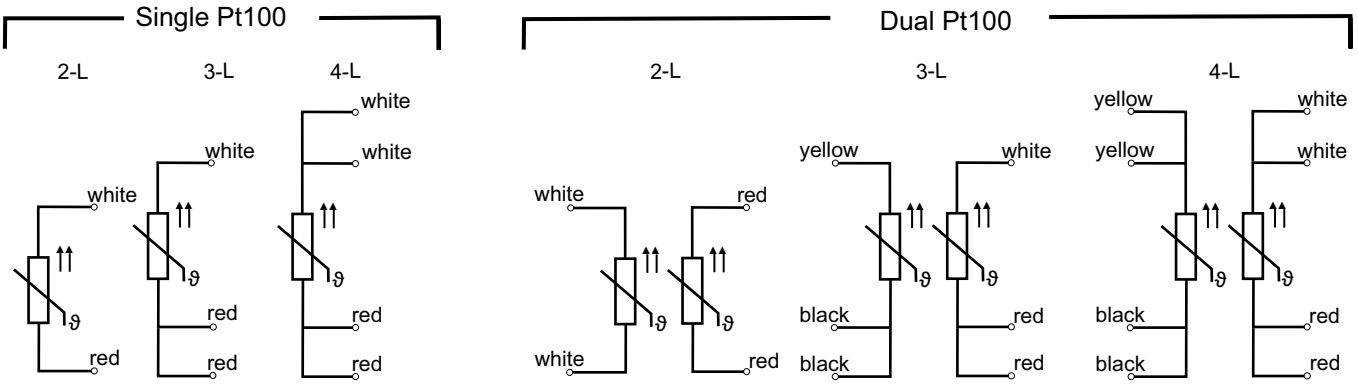
Connecting cables - insulation and structure					
Abbreviation	**Core insulation**	**Core protection**	**Shielding**	**Outer sheath**	**Cable protection**
JJ	PVC	-	-	PVC	-
JFJ	PVC	-	Kupfergeflecht	PVC	-
SLSL	Silicone	-	-	Silicone	-
SLSLP	Silicone	-	-	Silicone	Steel wire mesh, galvanized
SLSLV	Silicone	-	-	Silicone	Stainless steel wire mesh
GLGLV	Glass silk	-	-	Glasfaser	Stainless steel wire mesh
TSFS	FEP	Silicone	Kupfergeflecht	Silicone	-
TSL	FEP	-	-	Silicone	-
TT	FEP	-	-	FEP	-
PP	PFA	-	-	PFA	-
PFP	PFA	-	Kupfergeflecht	PFA	-
TAT	FEP	-	Aluminiumfolie	FEP	-
PGLV	PFA	Silicone			Stainless steel wire mesh

other cable types on request, e.g. with armouring to ANSI standard

General information:
- Core cross-sections from 0.22 - 1.5 qmm
- Silicone vapor and notch resistant

Connection diagrams for resistance thermometers

The cores of the connection cables are color-coded in accordance with IEC EN DIN 60751:



Connection diagrams for thermocouples

The others of the connection cables have a color coding according to the applied standard (IEC EN DIN 60584, ASTM E-230).
No distinction is made between single and multiple elements.

7.3 TES23 with plug connector

Plug variants:

- Thermocouple plug / coupling for sheathed thermocouples
- Lemo plug / coupling for sheathed thermocouples and sheathed resistance thermometers
- Lemo plug connection standard series "S" and "E" (watertight)

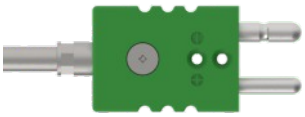
Other connectors on request

7.3.1 Thermo plug

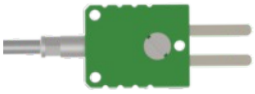
Thermo plugs/couplings are available in "Standard" and "Mini" sizes

Housing variants:

Standard plug connector*



Mini plug connector*



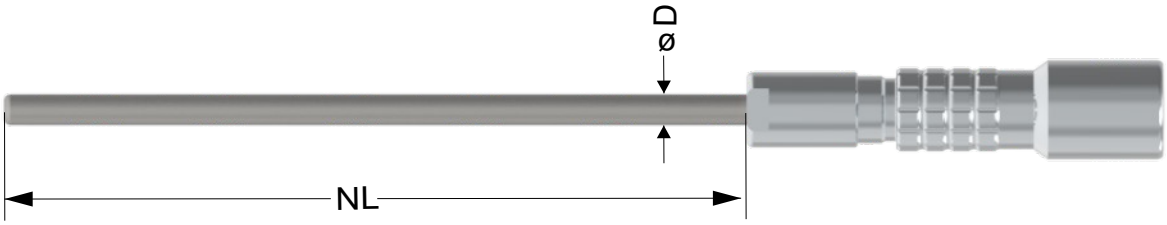
* Color coding according to DIN IEC 584/DIN 43710. The example shows plug pin type K.

General notes on connectors for thermocouple and resistance thermometer measuring circuits:

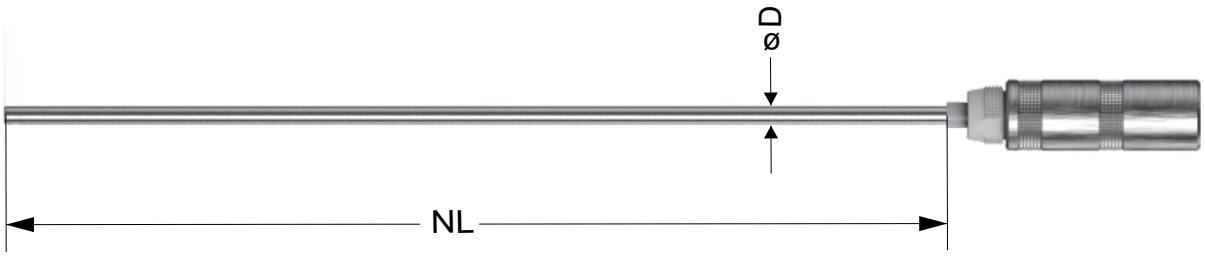
- for diameters 1.6 and 2 mm, note internal cable resistance
- coupling/plug maximum temperature load 220°C, housing made of fiberglass-filled plastic.

7.3.2 Lemo plug/coupling
Other connectors on request

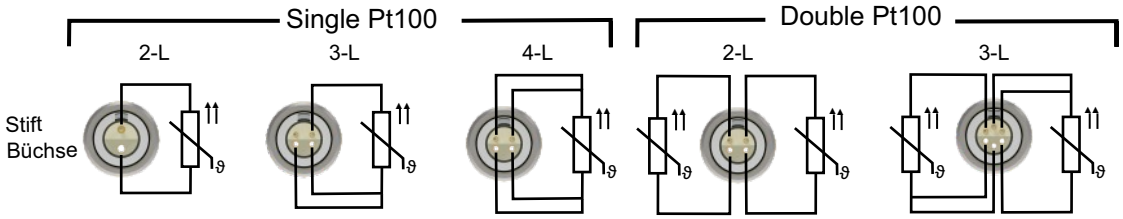
Plug series E - watertight



Plug series S -Standard

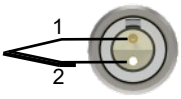


7.3.2.1 Connection diagrams for resistance thermometers

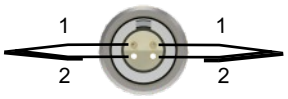


Connection diagrams for thermocouples

Single thermocouple

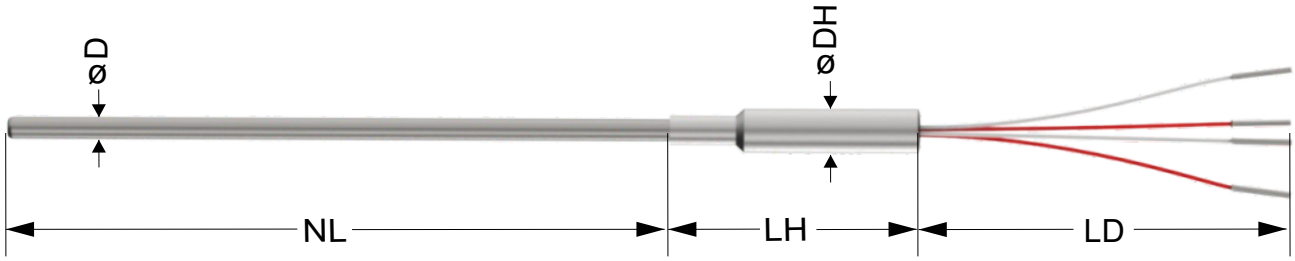


Double thermocouple



Available accessories: Sensor cable with connectors

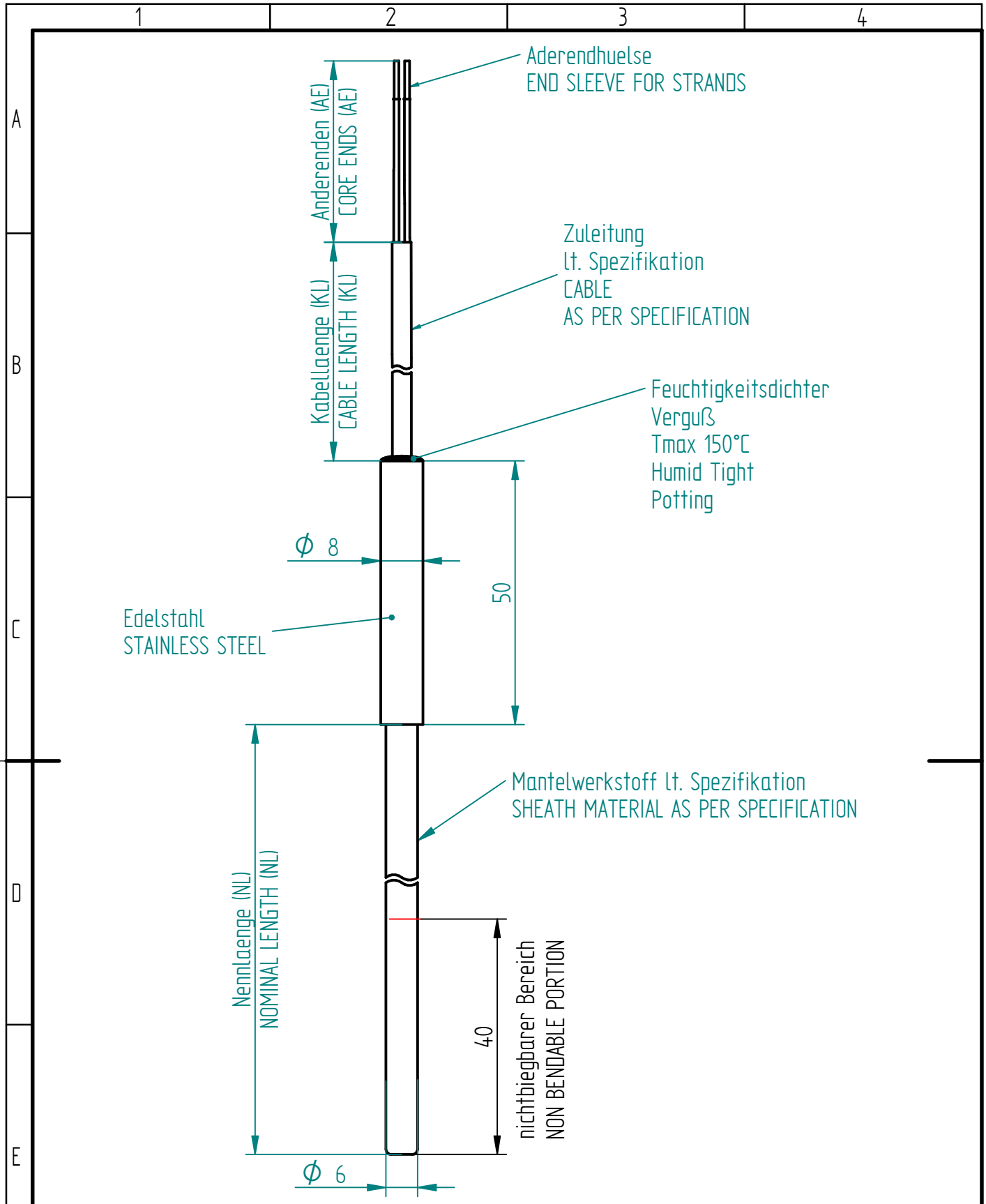
7.4 Type TES24 with insulated connecting wires



Adapter sleeve:
- standard material stainless steel
- optional brass or nickel-based alloys
- standard length (LH) = 40 mm, lengths adapted to the installation situation possible
- from ØD=4 mm ØD = ØDH is possible
- ambient temperature Tmax. 150 °C, optionally 300 °C

Connection wires:
- Stranded wires, 0.22 mm^2 cross-section, insulation PTFE or PFA
- Standard length (LD) = 200 mm
- Wire end design:
  - wire end ferrules (standard)
  - tinned
  - bare
  - flat plug
  - round plug (pin)

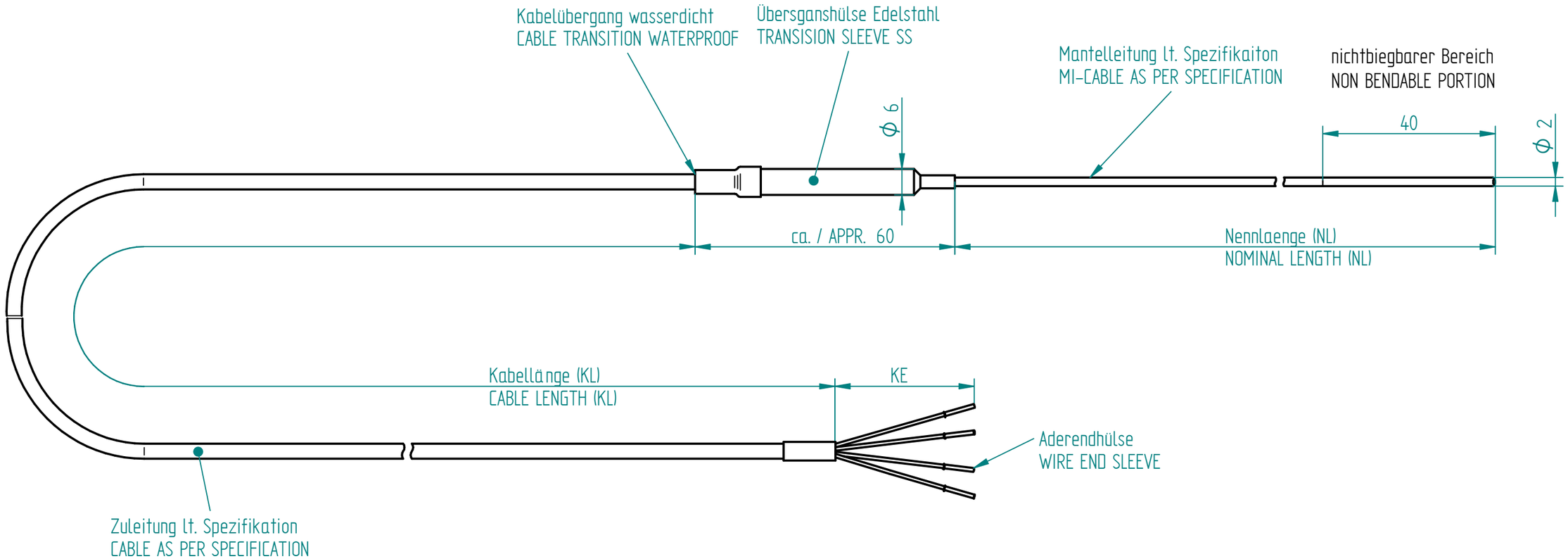
Böhme + Ewert GmbH
Am Spielacker 4
63571 Gelnhausen
Federal Republic of Germany
Tel.: +49 (0)6051 916656 0
Fax: +49 (0)6051 916656 9
E-Mail: sales@be-temp.de
www.be-temp.com



Aend. / REVISIONS			
R	Aend. / CHANGE	Dat. / DATE	Name/NAME

Sensor und Schaltung lt. Spezifikation
SENSOR AND WIRING AS PER SPECIFICATION

Schutzvermerk nach DIN ISO 16016 @ Böhme + Ewert REFER TO PROTECTION NOTICE ISO 16016 @ Boehme + Ewert	ISO 128	Maßstab 1:1	Werkstoff	Allgemeintoleranz / GENERAL TOLERANCE DIN ISO 2768-m
Boehme + Ewert		Erstellt durch SergejEwert	Genehmigt von Michael Boehme	Dokumentart
		Titel, Zusätzlicher Titel Mantel-WTH, Typ TES22 METAL SHEATED RTD-ELEMENT TYPE TES22	Sachnummer 111222-0001	
			Änd. Spr. 01.10.2021 Blatt 1	



Aend. / REVISIONS			
R	Aend. / CHANGE	Dat. / DATE	Name/NAME

Typ / TYPE TES22-W

Schutzvermerk nach DIN ISO 16016 @ Böhme + Ewert
REFER TO PROTECTION NOTICE ISO 16016 @ Boehme + Ewert

Maßstab: 1:1

Werkstoff:

Allgemeintoleranz / GENERAL TOLERANCE: DIN ISO 2768-m

Boehme + Ewert

Erstellt durch: Michael Boehme

Genehmigt von: MichaelBoehme

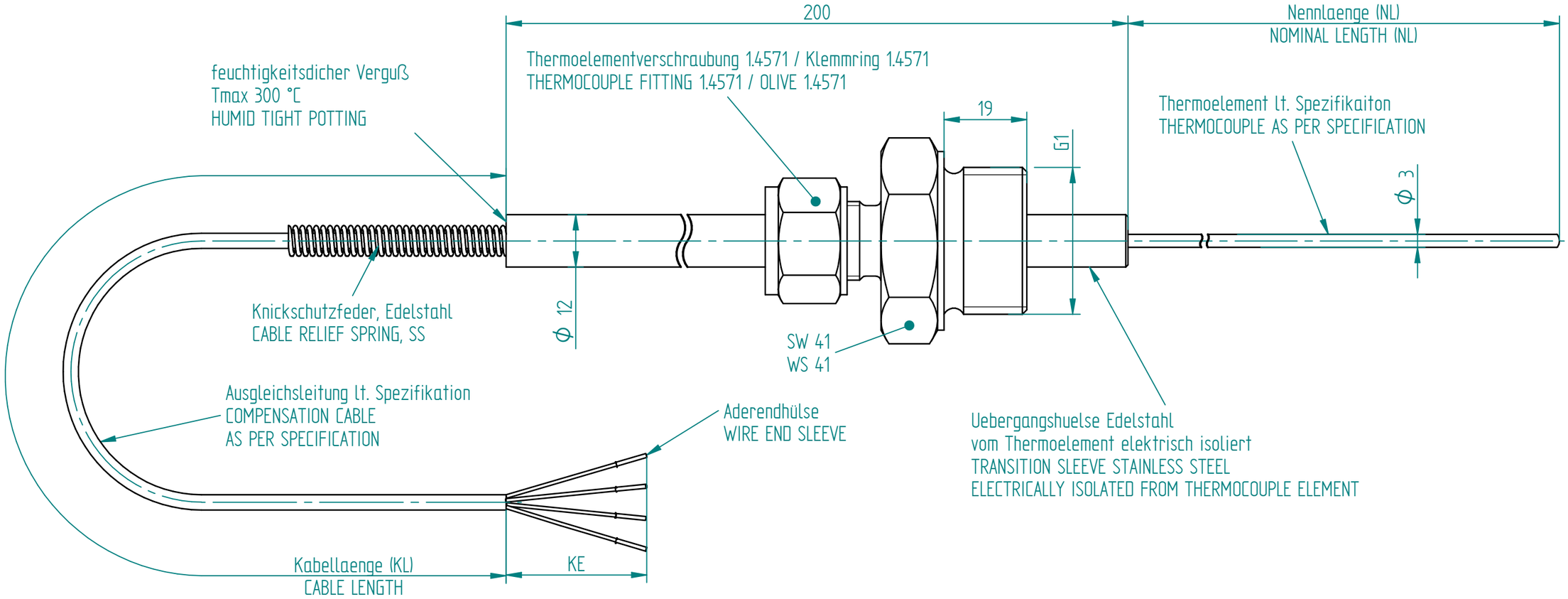
Dokumentenart:

Titel, Zusätzlicher Titel: Mantelwiderstandsthermometer METAL SHEATHED RTD

Sachnummer: 111222-0005

Änd.	Ausgabedatum	Spr.	Blatt
0	05.07.2022		1/1

A3



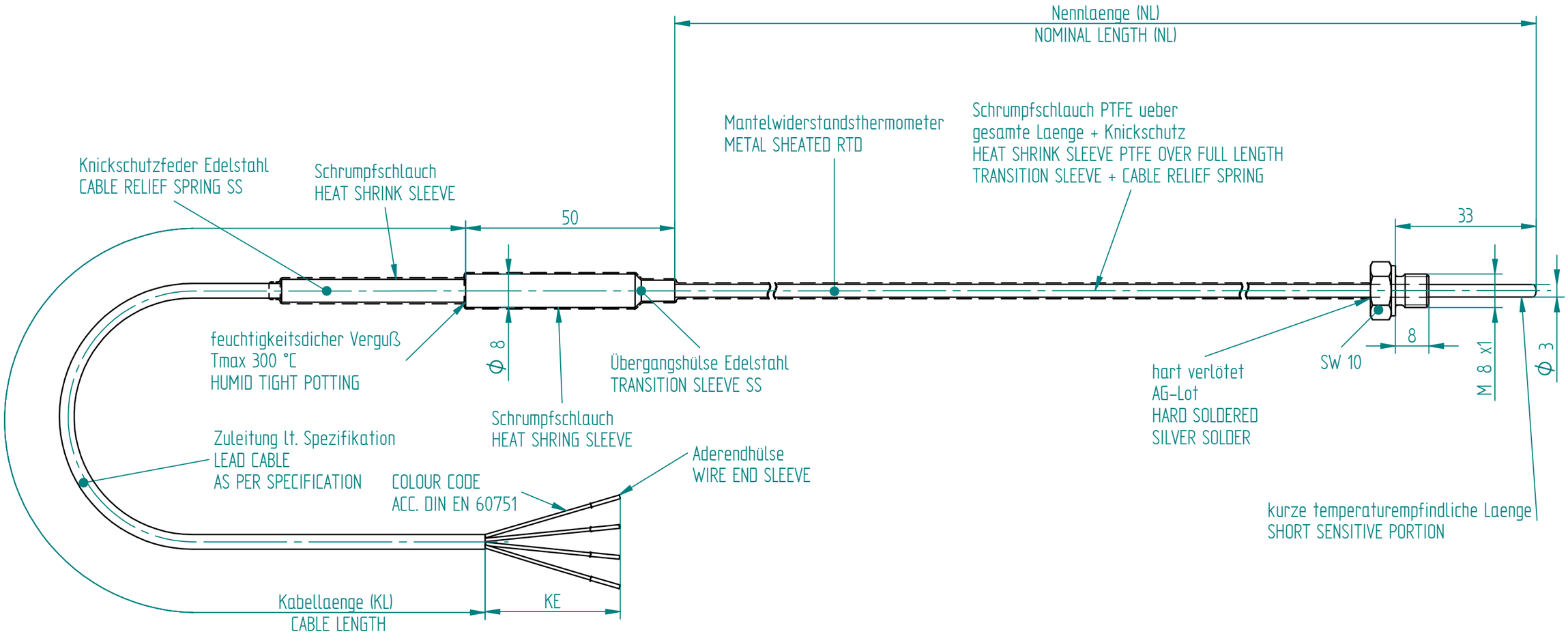
Aend. / REVISIONS			
R	Aend. / CHANGE	Dat. / DATE	Name/NAME

Schutzvermerk nach DIN ISO 16016 @ Böhme + Ewert
REFER TO PROTECTION NOTICE ISO 16016 @ Boehme + Ewert

Boehme + Ewert

Maßstab: 1:1	Werkstoff:		Allgemeintoleranz / GENERAL TOLERANCE: DIN ISO 2768-m
Erstellt durch: SergejEwert	Genehmigt von: Michael Böhme		Dokumentenart:
Titel, Zusatzlicher Titel: Mantelthermoelement TYP TES22T METAL SHEATED TC-ELEMENT TYPE TES22T		Sachnummer: 111222-0010	
		Änd.: 0 / Ausgabedatum: 29.09.2022 / Spr.: / Blatt: 1/1	

A3



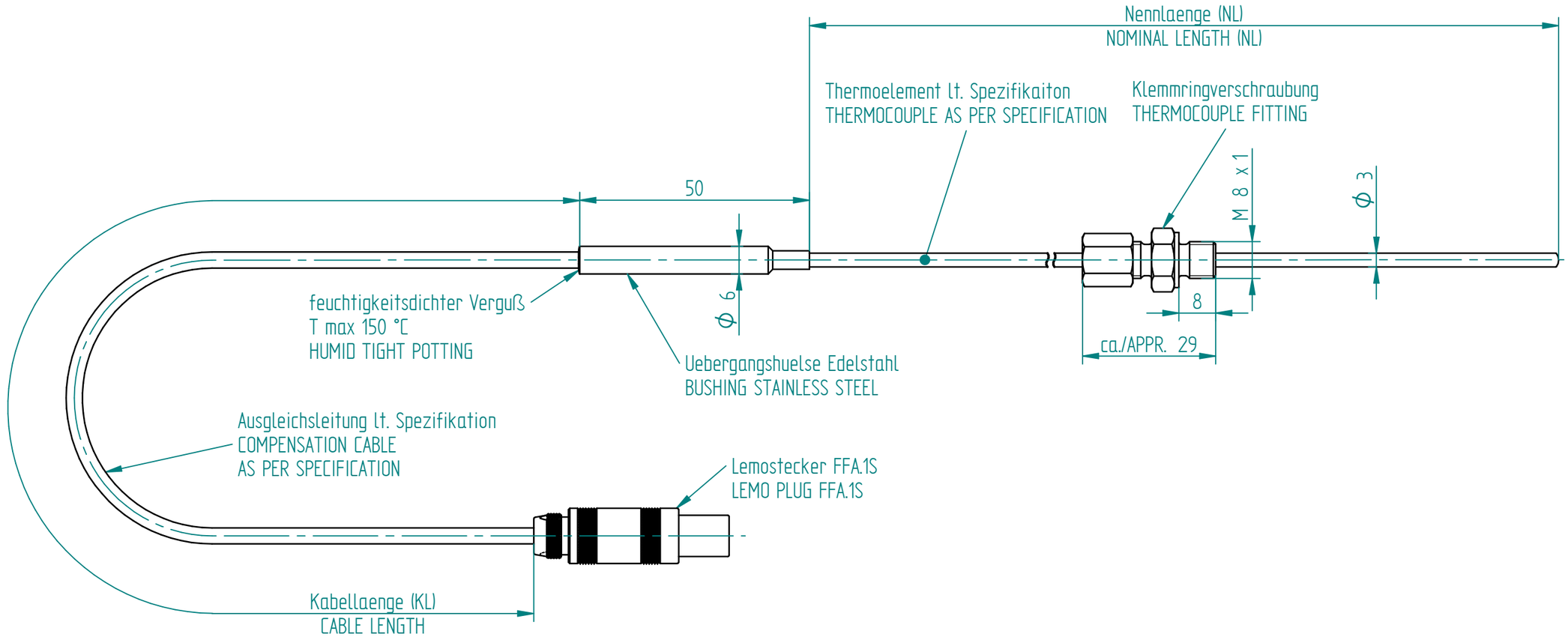
Aend. / REVISIONS			
R	Aend. / CHANGE	Dat. / DATE	Name/NAME

Schutzvermerk nach DIN ISO 16016 @ Böhme + Ewert
REFER TO PROTECTION NOTICE ISO 16016 @ Boehme + Ewert

Boehme + Ewert

Maßstab: 1:1	Werkstoff:		Allgemeintoleranz / GENERAL TOLERANCE: DIN ISO 2768-m
Erstellt durch: SergejEwert	Genehmigt von: Michael Böhme		Dokumentenart:
Titel, Zusätzlicher Titel: Widerstandsthermometer TYP TES22-W RTD TYPE TES22-W			Sachnummer: 111222-0011
		And.: 0 / Ausgabedatum: 30.09.2022 / Spr.: / Blatt: 1/1	

A3



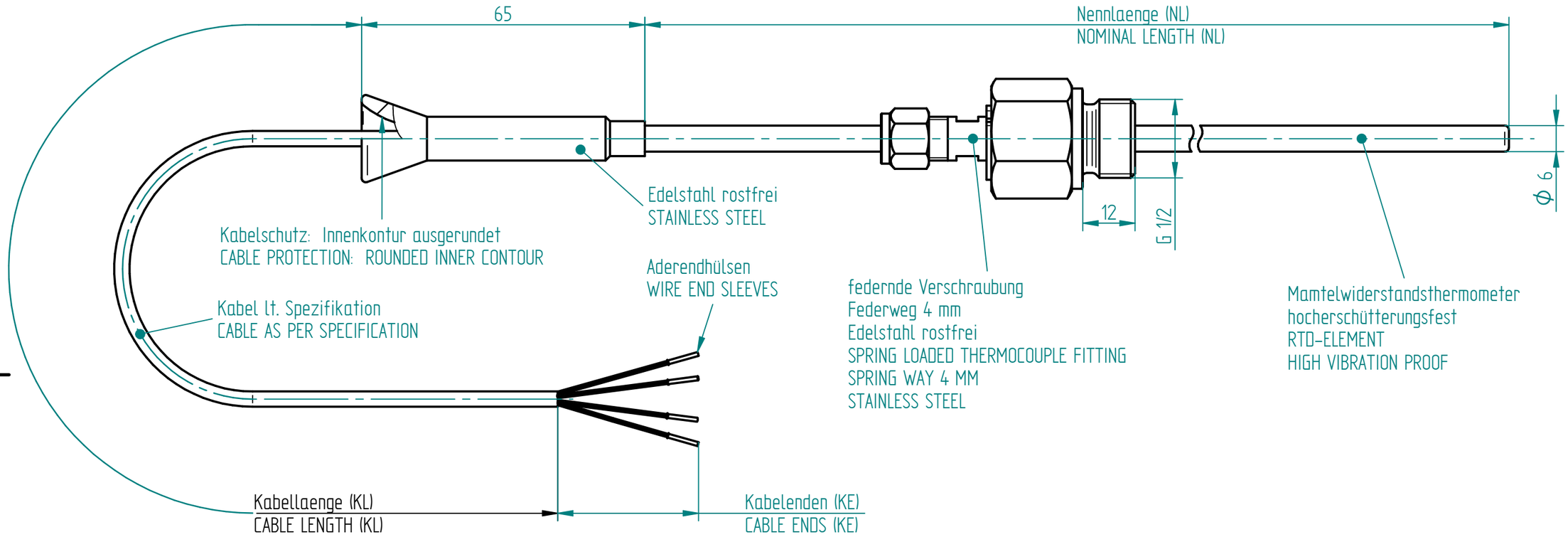
Aend. / REVISIONS			
R	Aend. / CHANGE	Dat. / DATE	Name/NAME

Schutzvermerk nach DIN ISO 16016 @ Böhme + Ewert
REFER TO PROTECTION NOTICE ISO 16016 @ Boehme + Ewert

Boehme + Ewert

Maßstab: 1:1	Werkstoff:		Allgemeintoleranz / GENERAL TOLERANCE: DIN ISO 2768-m
Erstellt durch: SergejEwert	Genehmigt von: Michael Böhme		Dokumentenart:
Titel, Zusätzlicher Titel: Mantelthermoelement TYP TES22-T METAL SHEATED TC-ELEMENT TYPE TES22-T			Sachnummer: 111222-0016
Änd.: 00	Ausgabedatum: 16.12.2022	Spr.:	Blatt: 1/1

A3



Aend. / REVISIONS			
R	Aend. / CHANGE	Dat. / DATE	Name/NAME

Schutzvermerk nach DIN ISO 16016 @ Böhme + Ewert
REFER TO PROTECTION NOTICE ISO 16016 @ Boehme + Ewert

Maßstab: 1:1

Werkstoff:

Allgemeintoleranz / GENERAL TOLERANCE: DIN ISO 2768-m

Boehme + Ewert

Erstellt durch: Michael Boehme

Genehmigt von: MichaelBoehme

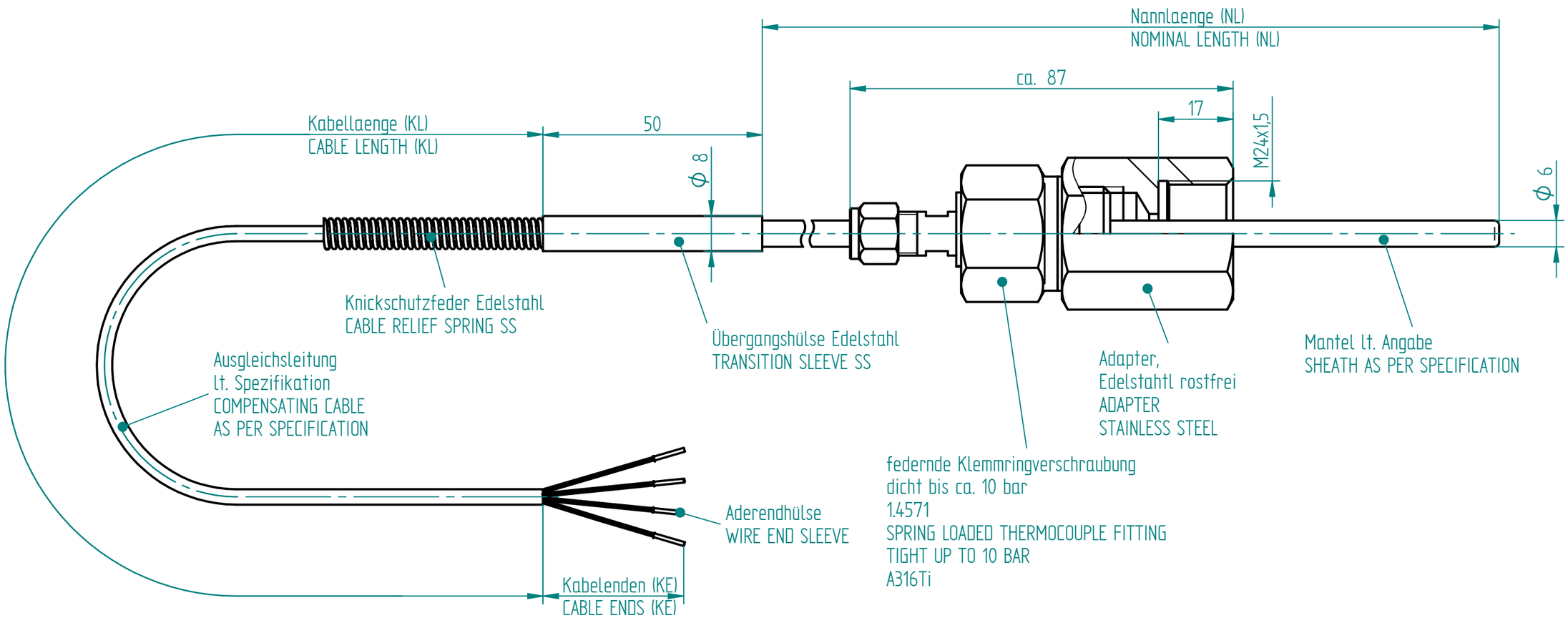
Dokumentenart:

Titel, Zusatzlicher Titel:
Mantel-WTH, Typ TES22-W
METAL SHEATH RTD, TYPE TES22

Sachnummer: 111222-0021

Änd.	Ausgabedatum	Spr.	Blatt
0	16.02.2023		1/1

A3



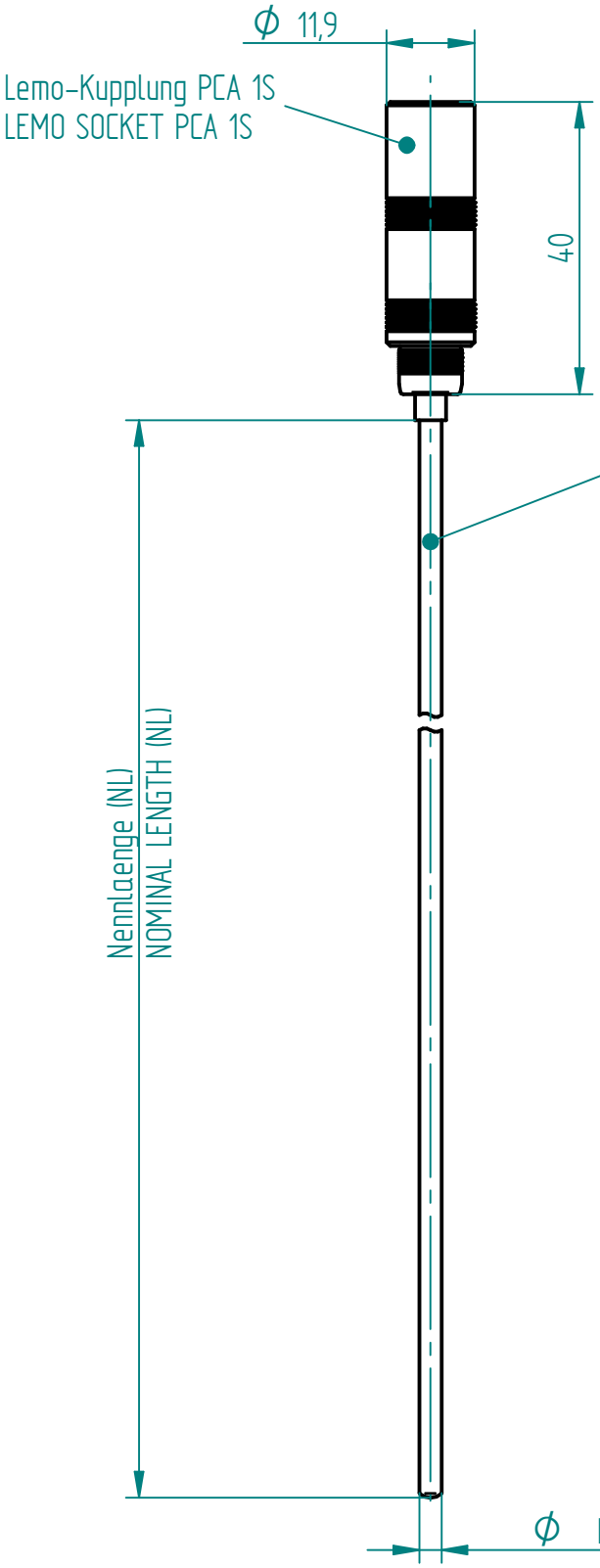
Aend. / REVISIONS			
R	Aend. / CHANGE	Dat. / DATE	Name/NAME

Schutzvermerk nach DIN ISO 16016 @ Böhme + Ewert
REFER TO PROTECTION NOTICE ISO 16016 @ Boehme + Ewert

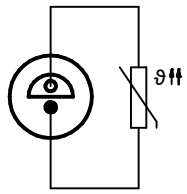
Boehme + Ewert

Maßstab: 1:1	Werkstoff:		Allgemeintoleranz / GENERAL TOLERANCE: DIN ISO 2768-m
Erstellt durch: Michael Boehme	Genehmigt von: MichaelBoehme		Dokumentenart:
Titel, Zusatzlicher Titel: Mantelthermoelement, Typ TES22T METAL SHEATHED TC-ELEMENT, TYPE TES22T			Sachnummer: 111222-0032
And.: 0	Ausgabedatum: 04.03.2024	Spr.:	Blatt: 1/1

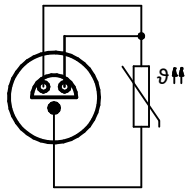
A3



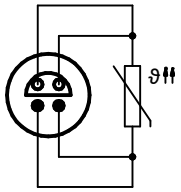
2-Leiteranschluss
2-WIRE-CONNECTION:



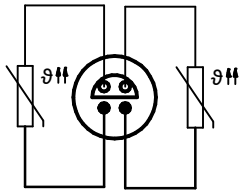
3-Leiteranschluss
3-WIRE-CONNECTION:



4-Leiteranschluss
4-WIRE-CONNECTION:



2x PT100
2-Leiteranschluss:
2-WIRE-CONNECTION:



Aend. / REVISIONS			
R	Aend. / CHANGE	Dat. / DATE	Name/NAME

Schutzvermerk nach DIN ISO 16016 @ Böhme + Ewert
REFER TO PROTECTION NOTICE ISO 16016 @ Boehme + Ewert

ISO 128

Maßstab: 1:1

Werkstoff:

Allgemeintoleranz / GENERAL TOLERANCE: DIN ISO 2768-m

Boehme + Ewert

Erstellt durch: Michael Boehme

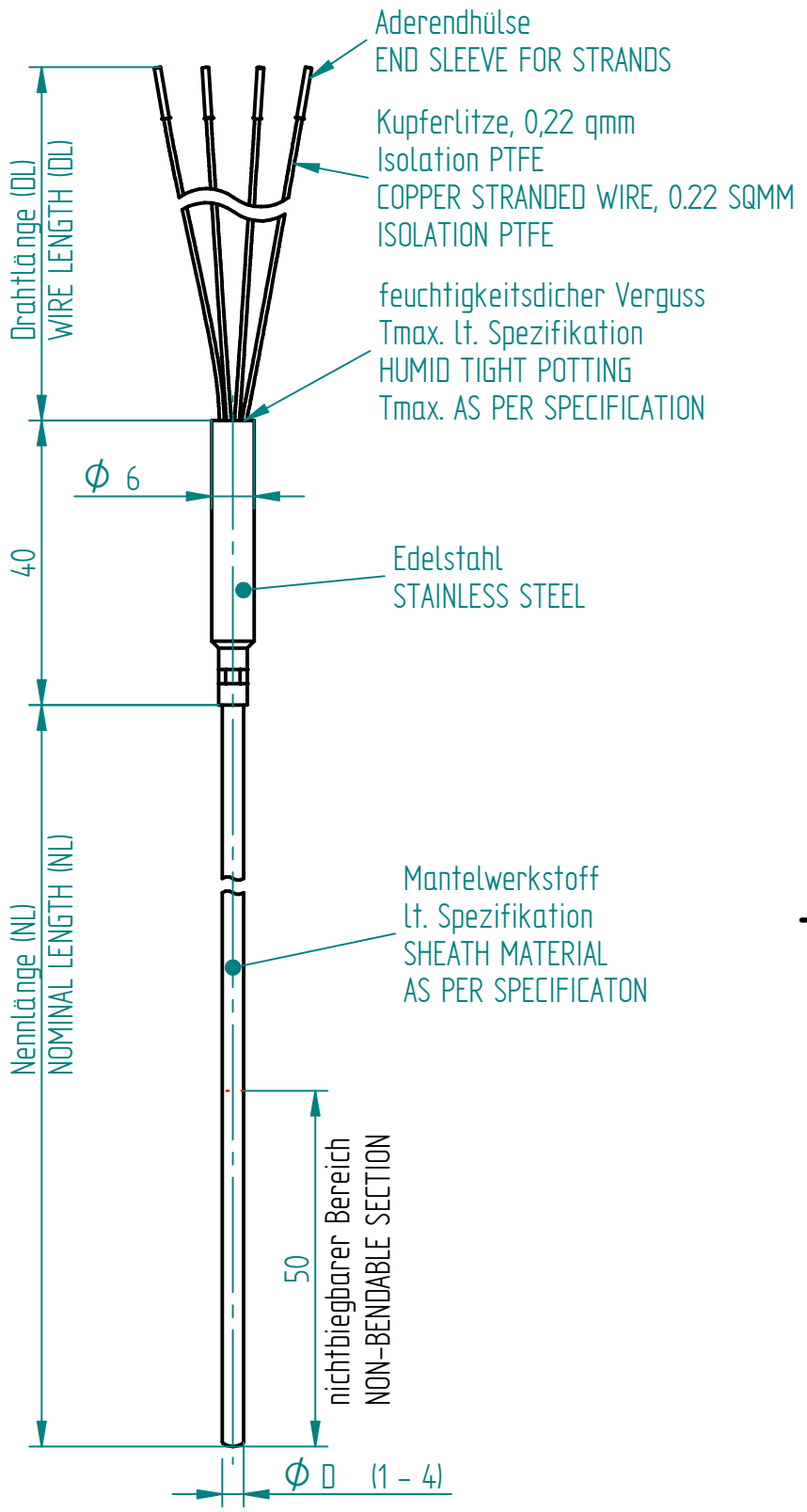
Genehmigt von: Michael Boehme

Dokumentart:

Titel, Zusätzlicher Titel:
Mantel-WTH, Typ TES23W
METAL SHEATHED RTD-ELEMENT,
TYPE TES23W

Sachnummer: 111223-0004

And.		Spr.	Blatt
0	12.06.2023		1



Typ / TYP'E TES24W

Aend. / REVISIONS			
R	Aend. / CHANGE	Dat. / DATE	Name/NAME

Messwiderstand und Schlaltung lt. Spezifikation
SENSOR ELEMENT AND WIRING AS PER SPECIFICATION

Schutzvermerk nach DIN ISO 16016 @ Böhme + Ewert REFER TO PROTECTION NOTICE ISO 16016 @ Boehme + Ewert	ISO 128	Maßstab 1:1	Werkstoff	Allgemeintoleranz / GENERAL TOLERANCE DIN ISO 2768-m
Boehme + Ewert		Erstellt durch Michael Boehme	Genehmigt von Michael Boehme	Dokumentart
		Titel, Zusätzlicher Titel Mantelwiderstandsthermometer METAL SHEATHED RTD-ELEMENT		Sachnummer 111224-0005
			Änd. 0	16.12.2023	Spr.	Blatt 1