

Manual

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## Test thermocouples

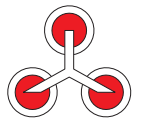


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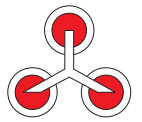
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Test thermocouples



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Test thermocouples

## 1. Allgemeine Hinweise

### 1.1 Incoming goods inspection

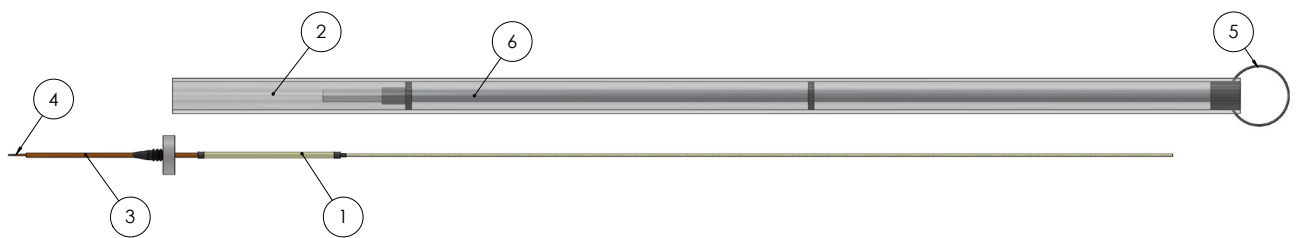
When you receive the goods, you should immediately check them for external damage. Any defects in the packaging should be reported to the carrier immediately and acceptance should be refused.

If the product is damaged after unpacking, this must be reported to thermo-control immediately in writing. The complaint can be accepted no later than 5 days after receipt of the goods..

The delivery documents indicate whether additional transport insurance has been taken out. If this is the case, thermo-control must be informed immediately so that the damage can be claimed from the insurance company.

### 1.2 Content

All thermocouples are delivered with a transport lock. This serves to protect against mechanical stress during transport and storage.



- (1) Test thermocouple
- (2) Plexiglass tube for transport and storage
- (3) Compensation cable
- (4) Assembled end (optional with connector)
- (5) Wire loop
- (6) Ceramic protection tube, cast in aluminum tube

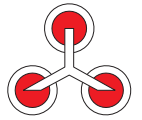
For new parts, a calibration certificate (Certificate of calibration) for the installed thermocouple is included in a DIN A4 envelope attached to the inside of the box with a CERTIFICATE sticker.

### 1.3 Applicable products

The following instructions for use are generally valid for test thermocouples. These include:

- 10-00YYXX-LLLLBL20, 10-01YYXX-LLLLMC

For further variants please refer to the order key.



## 1.4 Transport security

The products are secured for transport using different means. Observance of correct handling ensures the safety of the product.

Essentially, two methods are used:

- Securing with plexiglass tube with filling material
- Securing with stainless steel tube with PVC mesh hose

### 1.4.1 Securing with plexiglass tube with filling material

Thermocouples with small flange or threaded connections are shipped in a 30mm plexiglass tube. In the plexiglass tube, the ceramic tubes of the thermocouple are fixed against movement by a filling material, usually corundum or walnut shell granulate. The open end of the tube is provided with a blue cap.

The thermocouple is removed as follows:

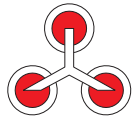
1. Remove the blue cover
2. Completely remove/pour out the filling material from the plexiglass tube
3. Removing the transport tube from the thermocouple

A different order will inevitably lead to breakage of the ceramic tubes, which will void the warranty.

### 1.4.2 Securing with stainless steel tube with PVC mesh hose

This method is used for thermocouples with a holding tube with a metal transport tube. The tube has a diameter of Ø18mm and covers the ceramic protection tubes. The ceramic tubes are covered with a PVC mesh hose to protect them from shocks. The hose can protrude a few centimeters from the transport tube and is usually colored blue.

The transport tube is removed by pulling it out in the direction of the longitudinal axis of the thermocouple. Lateral movements or rotations can cause the ceramic tubes to break and thus void the guarantee.



## 1.5 Certificate of calibration

The certificate is issued according to DIN EN 60584-1 with the correction values for the required temperatures. The correction value at 1000°C is shown as a thermocouple value on the product label.



**thermo-control**  
Körtvélyessy GmbH

### Certificate of Calibration

Form-ID : QMD2009.5.3.2 Rev D

Customer thermo-control Körtvélyessy GmbH Grünspechtweg 19 13469 Berlin Germany	Certificate No.	Date of issue
	1.2023.230637	2023-06-02
	Product Spezifikation 8-050301-0700KF25	Purchase order 24002698
	Thermocouple 2 x S (PtRh(10%) - Pt)	Applied Specification ASTM E230/E230M

It is hereby testified by thermo-control Körtvélyessy GmbH that thermocouple No. **230637**

has been manufactured under highest quality standard using customized high quality thermowires. These wires were taken from a coil which has been calibrated against listed fix points. The patented construction conserves this outstanding high precision for many years and allows its control at any time in the empty protection tube.

#### Production data of thermowire

Wire material	Batch No.	Date of production	Wire diameter
PtRh(10%)	23TAV00375	2023-05-16	0.35
Pt	23TAV00362/S2	2023-05-16	0.50

#### Results of reading at fix point measurements

Fix-Point element	Temperature [°C]	emf [µV]		deviation vs. ITS90	
		specified	reading	µV	°C
Zn ISO	419.53	3446.0	3348.0	1,0	0,1
Al ISO	660.32	5860.0	5862.0	2,0	0,2
Au	1064.18	10334.0	10344.0	10,0	0,9
Pd	1553.50	16223.0	16231.0	8,0	0,7

Based on the given physical fix points following correction can be calculated for the respective temperature points:

Temp. point [°C]	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600
Reading [°C]	400,1	500,2	600,3	700,5	800,6	900,7	1.000,8	1.100,8	1.200,8	1.300,9	1.400,8	1.500,7	1.600,5
Deviation	+0,1	+0,2	+0,3	+0,5	+0,6	+0,7	+0,8	+0,8	+0,8	+0,9	+0,8	+0,7	+0,5
Correction	<b>-0,1</b>	<b>-0,2</b>	<b>-0,3</b>	<b>-0,5</b>	<b>-0,6</b>	<b>-0,7</b>	<b>-0,8</b>	<b>-0,8</b>	<b>-0,8</b>	<b>-0,9</b>	<b>-0,8</b>	<b>-0,7</b>	<b>-0,5</b>
Uncertainty [K]	±1,5	±1,5	±1,5	±1,5	±1,5	±1,5	±1,5	±2,0	±2,0	±2,5	±2,5	±2,5	±3,5

Berlin

2023-06-02

Dipl.-Ing (FH) Daniel Körtvélyessy

Place

Date

Signature of approval

Uncertainty of measurement

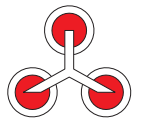
The reported uncertainty of measurement is composed of uncertainty contributions of the calibration method, the standards used and the calibrated object. This uncertainty does not cover a component for the long-term stability of the calibrated object exceeding its warranty period.  
This calibration certificate may only be reproduced in unchanged form.

Grünspechtweg 19 · D - 13469 Berlin  
Tel: +49(0)30 40586 940  
Fax: +49(0)30 40586 941  
E-Mail: info@thermo-control.com

Geschäftsführer: Daniel Körtvélyessy  
VAT: DE 12 00 51 020  
Amtsgericht: Berlin  
HRB 108604 B

Postbank Berlin  
Konto 507 711 102 · BLZ 100 100 10  
IBAN: DE68100100100507711102  
BIC (SWIFT-Code): PBNKDEFF





## 2. Product overview

### 2.1 Order key

As standard, the test thermocouple is supplied with a suitable compensation cable with a length of 2.5 m. The end of the cable is stripped to a length of 20 mm as standard. Other configurations can be implemented on request.

#### Order overview:

10	-	0001ZZ	-	LLLLAA
		00 – Ambient pressure 01 – 1 Thermocouple ZZ – Thermocouple alloy 01 – PtRh10% - Pt (Type S) 02 – PtRh13% - Pt (Type R) 03 – PtRh30% - PtRh16 (Type B) 04 – NiCr – Ni (Type K) 05 – NiCrSi – NiSi (Type N)		LLLL – Nominal length [mm] 0400 – 400 mm to 1600 – 1600 mm In 100 mm steps  AA– Assembly BL20 – 20 mm Stripped blank MC – Thermocouple connector Miniature SC – Thermocouple connector Standard LS – LEMO FFA.2S.301

#### Example: 10-000101-0700SC

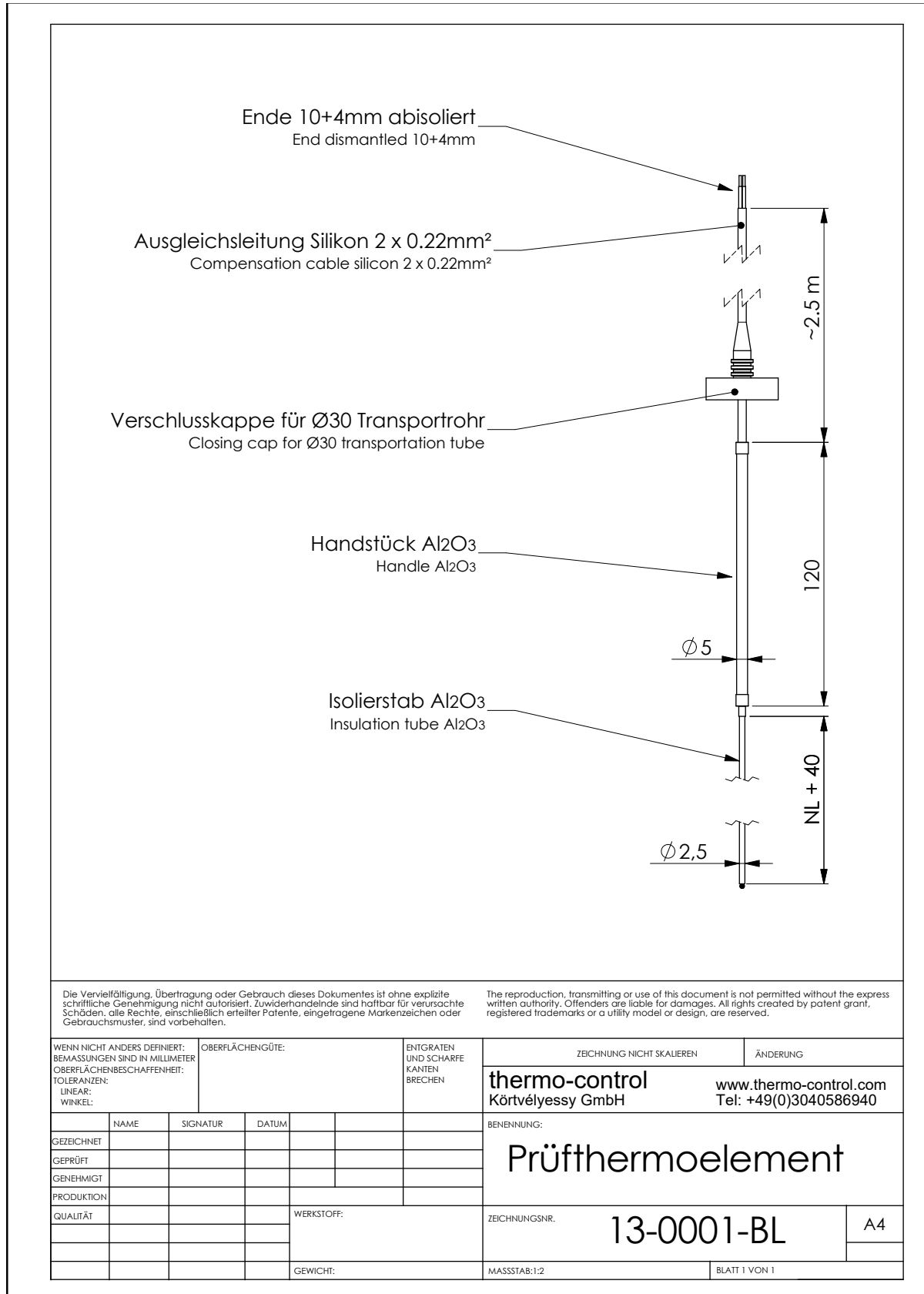
Test thermocouple type S (PtRh10 - Pt), suitable for thermo-control thermocouples with a nominal length of up to 700 mm, assembled with 2.5 m compensation cable type S and a standard thermo plug.

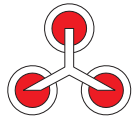


## 2.2 Overview drawing

The current overview drawing has the number 13-0001-BL and is available for download at:

<https://www.thermo-control.com/en/products/thermocouples-test>





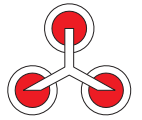
## 2.3 Labelling

Each thermo-control product is given a unique serial number, which consists of the last two digits of the year and month of manufacture and a consecutive number. This serial number is printed on the type plate, which is attached to the compensation line..

The type plate contains all essential features of the product:

- Specification
- Nominal length
- Type and number of built-in thermocouples
- Serial number
- Correction value at 1000°C

Artikel	<b>10-000101-1200BL</b>	Länge	<b>1200</b>
Seriennummer	<b>201212</b>	Typ	<b>1 x S</b>
		Korrektur 1000°C	<b>-0,3K</b>



### 3. Commissioning of the Test Thermocouple

The installation and commissioning of the thermocouple must only be carried out by appropriately trained specialists. Thermo-control accepts no liability for any indirect or direct damage caused by improper installation.

#### 3.1 Removal from the Transport Tube

Carefully pull the cap off the plexiglass tube. There should be enough compensating cable in the tube to prevent the internal test element from moving. Holding the cap, pull the test element out of the ceramic protection tube.

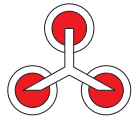
#### ***Important!***

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*Ensure that you do not make any lateral movements when pulling it out. Such movements can cause the insulating rod to break. If this happens, the test thermocouple can continue to be used as long as the thermocouple wires are undamaged.*

#### 3.2 Inspection for Damage

Check if the compensating cable shows any signs of damage. Also, the handle should not be broken. It is important to inspect the ceramic insulating rod for contamination. Specifically, at the end of the rod, where the weld point of the thermocouple is located, there should be no deposits. The weld point itself should have a metallic shine.



## 4. Test measurement

The following steps should be taken to perform a successful test:

The furnace must have reached its typical temperature and already stabilized.

The compensating cables of the test thermocouple should be directly connected to the screw terminals of the reading instrument: red wire to the “+” terminal and white wire to the “-” terminal. Banana plugs or brass clamps should not be used, as these can cause measurement errors in the range of 2-5K.

The reading instrument should be placed on a table or chair along with the test thermocouple. When the ring at the end of the acrylic protection tube rests, it prevents it from rolling.

The head of the thermocouple should be opened by unscrewing the cover. In the case of protective gas thermocouples, the empty test tube is already accessible. For a vacuum thermocouple, the M8 sealing screw must be unscrewed first to access the empty test tube.

The test thermocouple should ideally be pulled out of its ceramic protection tube in the acrylic protection tube in a horizontal position.

The guide tube facilitates insertion into the empty test tube of the thermocouple. Hold the guide tube with one hand directly in front of the opening and slowly and continuously (in about one minute) push the thermocouple to the end of the test tube with the other hand.

The reading of the test thermocouple, along with the simultaneous reading of the furnace controller (e.g., 930°C) and those of other instruments connected to the triple thermocouple, should be noted. For this, the furnace should be in equilibrium (e.g., 932°C).

The true temperature is then calculated using the certificates provided as in the following example:

Measured values

$$T_{\text{Test-Thermocouple}} = 932 \text{ }^{\circ}\text{C}$$

$$T_{\text{Correction-Value (900}^{\circ}\text{C)}} = +0,7\text{K}$$

$$T_{\text{Reading-Thermocouple,1}} = 930 \text{ }^{\circ}\text{C}$$

$$T_{\text{Reading-Thermocouple,2}} = 930 \text{ }^{\circ}\text{C}$$

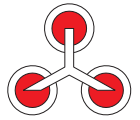
The true furnace temperature is therefore:

$$T_{\text{Furnace, Actual}} = T_{\text{Test-Thermocouple}} - T_{\text{Correction-Value}} = 932^{\circ}\text{C} - (+0,7\text{K}) = 931,3 \text{ }^{\circ}\text{C}$$

*Both thermocouples show ~1K less.*

After the measurement, the test thermocouple should be pulled out of the triple thermocouple together with the guide tube as slowly and continuously as it was pushed in.

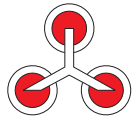
Even if you pull it out slowly, it is still very hot, although you cannot see it. If you notice that the test thermocouple is jammed, then you only have a few millimeters of the ceramic rod left in the thermocouple. The jamming is caused by the axis of the test thermocouple not being coaxial with that of the empty pipe. Find the optimal direction by making small on-off movements and pull the test thermocouple out completely.



## 5. Instructions for use

Please note the following instructions to ensure the full service life of the test thermocouple can be achieved:

- Do not repair the thermocouple yourself. This will immediately void the warranty!
- The faster you insert the test thermocouple, the longer you have to wait for it to stabilize. There is no time to gain by hurrying. If the cold test thermocouple is pushed into the empty pipe too quickly, it can even break.
- When pulling out the Ø 5mm guide tube, do not let it fall into the connection head of the thermocouple. If the triple thermocouple is hanging, it should be held with heat-protective gloves.
- In contrast to conventional thermocouples, this test thermocouple consists of two thermocouple wires of different thicknesses. This means that it has a practically unlimited service life, provided that you do not touch it with oily, dirty hands and also push it into its storage protection tube after each measurement without putting it down. It should not be warmer than 250°C.
- If you want to measure the temperature of liquids, powder baths or exhaust gases, for example, you must order a special protective tube from thermo-control.
- The test thermocouple must not be used to measure the temperature in a metal protection tube! Any other metal contact also leaves a metal trace on the 2.5 mm thin ceramic insulating rod of the test thermocouple. It should therefore never be placed on a metal table, for example, without a protection tube. Later, in the empty protection tube of the thermocouple, these metal traces evaporate and poison the platinum.
- In contrast to many other thermocouples, this test thermocouple remains elastic forever. However, if you bend it more than 20mm at a length of 600mm, it can break. In this case, the thermocouple wires usually remain uncracked, so another test measurement is still possible. However, you should have the broken test thermocouple repaired immediately at thermo-control. If you continue to use it with a broken insulating rod, there is a risk that the thermocouple wires will break. A repair would be expensive compared to the new value.
- Unlike other calibrated thermocouples, this test thermocouple does not have to be sent for calibration every year or even every six months. This calibration would of course not damage the test thermocouple, but its stability (+/-0.1 K annually) is greater than the currently possible reproducibility of a simple calibration when used correctly. Experience has shown that a calibration interval of 10 years is sufficient..



## 6. Troubleshooting

### 6.1 No reading

If the thermocouple does not show a temperature despite correct commissioning, the thermocouples used should be checked for continuity. If this is the case, the rest of the measuring section should be checked for an interruption, for example a broken cable. If it is suspected that the fault lies with the thermocouple, the thermocouple must be sent in for inspection and a precise fault analysis carried out.

### 6.2 The thermocouple always shows only 30°C (±10°C)

There is a short circuit in the thermocouple wires in the connection head and the temperature of the connection head is measured. This extremely rare error can only occur when the thermocouple is first installed. If the suspicion is confirmed during inspection that this short circuit was caused by thermo-control, the repair will of course be processed as a warranty case.

### 6.3 The thermocouple indicates a falling temperature when heated

The reason for this behavior is usually incorrect polarity of the compensating cable with the thermocouple wires. If no change is visible despite the color match (white on white terminal and orange/red on orange terminal), the silicone insulation tubes have been put on incorrectly. This extremely rare, production-related error can be remedied by simply re-wiring the wires. It is recommended to pull the silicone tubes off with your thumbnail and replace them. Another indication is the different thickness of the thermocouple wire, where the thicker is always the negative wire.

### 6.4 The thermocouple drifts

Due to the different thicknesses of the thermo-control thermocouples never drift. However, if drift does occur, it is necessary to check whether there is any external damage, mechanical or chemical. If no external influences are evident, the thermocouple should be sent in.

#### ***Notice***

*PtRh-Pt thermocouples always drift downwards, meaning they show a lower temperature than the actual one. If the new, supposedly drifting, thermocouple shows more than the built-in ones, it is more likely that the built-in thermocouple has a certain drift.*

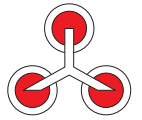
#### ***Tip***

*Order a suitable test thermocouple for the thermocouple. This is made from the same wire batch. Since it is not constantly exposed to the temperature, drift is unlikely.*

## 7. Calibration

Each thermo-control thermocouple has a separate empty protective tube into which a test thermocouple can be inserted. Access to the empty tube is available in the connection head. This design means that the thermocouple does not have to be removed for calibration!

Details on the calibration procedure can be found in the documentation for the test thermocouples or on the website at: <https://www.thermo-control.com/en/products/thermocouples-test>



## 8. Safety Information

### **Do not repair the thermocouple yourself!**

*In this case, the warranty is immediately voided and there is an increased risk of damage to the furnace and the batch. Damaged thermocouples should be sent for inspection, during which the possibility of repair will be investigated.*

### **Protective measures when working during ongoing operations**

*If a thermocouple is replaced during operation, it is essential to wear appropriate protective clothing and equipment, as hot furnace gases can escape and cause injuries.*

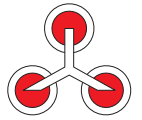
*When removing the thermocouple, you should also be aware that the protective tubes may still be very hot. There is an increased risk of injury! Ideally, the thermocouple should only be disconnected after removal. This way, you can easily see from the temperature display when there is no risk potential.*

### **Installation instructions**

*Please note that the feedthroughs from the furnace to the chamber are coaxial to each other! Due to the thin design of the ceramic protective tubes, they are easily bendable, so that a slight shift in the coaxiality is not noticed at first. However, as soon as the connection is tightened, so-called root fractures can occur.*

### **Note when using in pressure chambers**

*When using thermocouples in pressure atmospheres >1 bar, the fastening via the respective process connection must be additionally secured against loosening, for example by means of a bracket or a chain.*



## 9. Warranty information

All thermocouple protection tubes are tested for gas tightness using a helium leak test before production. The highest level of purity is also ensured during production.

The resulting quality enables a warranty period of 4 years from delivery against drift and thermowire breakage.

The guarantee is void if a ceramic protective tube is mechanically and/or chemically attacked and/or damaged by external influences. It is also void if repairs are carried out by third parties or changes are made to the design if these have not been clarified in writing with thermo-control. thermo-control Körtvélyessy GmbH accepts no liability for any type of damage resulting from improper fastening or use.

## 10. Packaging

If this is your first thermo-control probe, you should keep the box in which the probe was delivered. This ensures that if the probe is returned, it will survive the transport undamaged. If the box is no longer available after many years of use, you should consider the following recommendations for shipping.

### 10.1 Box material

The box should be made of at least 2-ply cardboard 2.3 strength. Wood or stiffened plastic packaging is also suitable.

### 10.2 Filler

thermo-control has been successfully using paper balls (wrapping paper or similar material) for almost 2 decades, whereby the ball should be about the size of a crumpled newspaper page. Styrofoam flakes (or similar material) are not permitted as fillers! Styrofoam is too hard and does not adequately dampen jerky movements, and the small particles do not sufficiently fix the part against slipping. Machine-made paper pads are also suitable, as long as sufficient cushioning can be guaranteed..

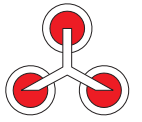
### 10.3 Loading

A maximum of 2 components should be packed in a box. Exceptions are very short probes NL=500mm and smaller, of which 3 - 4 can be packed per box.

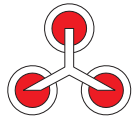
The connection head should be placed in the middle and at least 10cm from the back wall. If there are two parts, the connection heads should be placed opposite each other and care should be taken to ensure that the two parts cannot collide.

You can request a new box of filling material from thermo-control at <https://www.thermo-control.com/en/service/repair/#request-box>.





## 11. Notes



## 12. Imprint

### **Postal:**

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thermo-control Körtvélyessy GmbH  
Grünspechtweg 19  
D – 13469 Berlin  
Deutschland

### **Company:**

---

Managing director : Dipl.-Ing. (FH) Daniel Körtvélyessy  
UStNr-ID : DE120051020  
Register-No : HRB 108604 B  
Registriert in der Handelskammer Berlin HR

### **Contact:**

---

Telefon: : +49 (0)30 40 58 69 40  
Telefax: : +49 (0)30 40 58 69 41  
E-Mail: : info@thermo-control.com

Web: www.thermo-control.com  
Web-Shop: shop.thermo-control.com  
Customer portal: portal.thermo-control.com

### **Zertifizierungen / Sonstiges**

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Quality management : ISO9001-2015  
DUNS-ID. : 36892734  
NATO-Supplier-ID : 837462912

### **Disclaimer**

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