

# TESH/TES

## INSTALLATION INSTRUCTIONS

### SERIES HEATING CABLES WITH BRAIDING AND OVERJACKET



**ISO 9001**  
REGISTERED

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# Introduction

## The Netherlands

These installation instructions have been made in such a way as to comply with the applicable Dutch norms for installation of heating cables.

The installation must be in conformity with the installation regulations NEN-1010, the requirements as per the guidelines of 1985 of the "Direktoraat Generaal van de Arbeid" for hazardous areas and the regulations as per the norm EN-NEN 50.014 - 50.020 for hazardous areas (where applicable).

Applying these installation instructions will ensure compliance with the requirements of the "Arbeidsinspectie" and the general guidelines as made out by the local electricity board.

### Note:

- In all cases heat tracing systems must be protected by means of earth fault protection of 30 or 300 mA.
- In all cases the braid of the heat tracing cable must be connected to a suitable earthing system.
- Materials with **IND** in the product reference are for use in non-hazardous areas only.
- Materials with **Ex** in the product reference are for use in hazardous areas.

## Belgium

These installation instructions have been made to ensure compliance with the applicable Belgian norms for installation of heating cables.

The installation must be in conformity with the installation regulations AREI / RGIE and the regulations as per the norm NBN C-23-001, C-23-101 thru 106 for hazardous areas (where applicable).

Applying these installation instructions will ensure compliance with the requirements of the "Arbeidsinspectie" and the general guidelines as made out by the local electricity board.



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# Upon receipt of Thermon heat tracing materials

Check the supplied materials and quantities against the packing lists. In case of deviations please contact Thermon within 3 days.

## A) Inspection of the TESH/TES heating cable

1. Check the printing on the heating cable to make sure that the correct type and resistance have been received. (see page 6 and 8)
2. Check the printing on the cold lead cable to make sure that the cable with the correct conductor size has been received (see page 7 and 9 for cold lead data).
3. Inspect visually for any damage incurred during shipment.
4. Store in a dry place.

### **Caution:**

Do not connect power to the heating cable while it is on the reel or in the shipping carton.

## B) Inspection of accessories for heat tracing cable (if applicable)

### **Cable accessories**

- Insulation Entry Kits (IEK-TES)
- Power and End Termination Kits (PETK....-TES-OJ-...)
- cable glands (M20-PT100/TES-EXE...)
- pipe support/cable entry device XP Plus for junction boxes/thermostats/limiters (mention cable type when ordering)  
XP Plus grommet:  
GR-3E for all TESH and TES
- heat shrink sets for TESH CL- 2.5 mm<sup>2</sup> cold lead cable CETI 1525 (IND)
- connector sets for all TESH CL-... cold lead cables TESHFIT-EX (Ex)

### **General accessories**

- circuit switches
- thermostats (TED-.../T-.../TC-...)
- junction boxes (JB-K-CW-...)
- pipe support (XP-1...) for junction boxes/thermostats/limiters
- RTV silicon sealant
- Fixing Tape (FT-1L/FT-1M/FT-1H)
- aluminium tape (AL-20P/AL-30P)
- SS clamps (ABA)/B-type banding (B-4/B-10/B-21)
- punch strip
- Caution Labels (CL . . )



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INSTALLATION INSTRUCTIONS TESH/TES

PAGE 3

# Installation sequence of heat tracing system

1. Ensure that all piping and equipment to be traced is completely installed, tested and released.
2. Equipment surface should be reasonably clean. Any loose scale, oil or rust should be removed. Sharp edges should be avoided to prevent the cable from being damaged during installation.
3. Coating on pipes must be dry before the heating cable is installed.
4. Install the correct heating cable lengths indicated in the design. **Any deviation from these lengths will result in a change in output!**
5. Determine which heating circuits can be made from which reel.
6. Start, if possible, to install the long heating circuits first.
7. Take the correct reel for the line to be traced.
8. If the required length of heating cable has been determined, the connection between the cold lead cable to the heating cable can already be made in the workshop.
9. In order to connect the TESH/TES cable, two options are available for each area of application (Ex or IND):

## In Explosion Proof Area (Ex)

- a) Direct connection of max. 3 times 175 mm TESH/ TES heating cable in Thermon JB-K/XP Plus... or JB-K-0... junction boxes. Either via a gland (page 23) or an expediter XP Plus (page 20). For termination of the cable see page 19.

Following criteria are applicable to this practice:

T-Class	Maintenance temperature	Max. allowed heating cable output
T5	up to +100°C	up to 8 W/m
T4	up to +100°C	up to 11 W/m
	+101°C up to 125°C	up to 10 W/m
	+126°C up to 135°C	up to 8 W/m
T3	up to +75°C	up to 16 W/m
	+76°C up to 100°C	up to 12 W/m
	+101°C up to 125°C	up to 10 W/m
	+126°C up to 150°C	up to 8 W/m
	+151°C up to 200°C	up to 5 W/m

b) With higher cable outputs than mentioned under point a) direct connection of TESH/TES heating cable in junction box is not allowed. A TESH CL-... cold lead cable utilising the TESHFIT-EX EEx e certified connector shall be applied to the heating cable. The cold lead cable can be connected in the junction box. For installation of the connector see page 15.

## Non Explosion Proof Area (IND)

a) Direct connection of max. 3 times 175 mm TESH/ TES heating cable in Thermon JB-K/XP Plus... or JB-K-0... junction boxes. Either via a gland (page 23) or an expediter XP Plus (page 20). For termination of the cable see page 19.

Following criteria are applicable to this practice:

Maintenance temperature	Max. allowed heating cable output
up to +75°C	up to 16 W/m
+76°C up to 100°C	up to 12 W/m
+101°C up to 125°C *	up to 10 W/m
+126°C up to 150°C *	up to 8 W/m
+151°C up to 200°C *	up to 5 W/m

\* for XP Plus-IND max. pipe temperature 120°C

b) With higher cable outputs than mentioned under point a) direct connection of TESH/ TES heating cable in junction box is not allowed.

Either a TESH CL-2.5 cold lead cable utilising the CETI 1525 or any TESH CL-... cold lead cable utilising the TESHFIT-EX connector shall be applied to the heating cable. The cold lead cable can be connected in the junction box. For installation of the CETI 1525 see page 11, For installation of the TESHFIT-EX see page 15.

10. The junction box with non-metallic expediter XP Plus can be mounted to the heating cable in the workshop (see power termination page 19), with or without non-metallic expediter XP Plus, page 20 - 22). See table 5.1 for further information.

Colour XP Plus	Application	
	Max. pipe temperature	Area
Brown/black	200°C	Hazardous
Grey	120°C	Non-hazardous

Table 5.1 application area XP Plus

11. In case a thermostat/limiter EEx d must be mounted to the pipe, this must be done first (see page 25 - 32). Mark by means of for example a permanent marker the controller knob with C and the limiter knob with L, for EEx ed or IND thermostat with XP Plus see page 25 - 29. For horizontal pipes it is recommended to mount the thermostat in an up right position.

In case a thermostat with XP Plus is mounted at the bottom section of a pipe, moisture can accumulate on the grommet inside the XP Plus. To prevent this, one of the knock-out holes must be opened, for draining purposes. Ensure that the thermostat is not mounted too close to an instrument or flange, since the thickness of the thermal insulation at those locations can be such that the thermostat is partly or totally covered by the insulation.



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# Installation sequence of heat tracing system

12. Determine the position of the junction box and from that point lay out the cable over the pipe. Mount the junction box on the pipe (See page 20 - 23). For horizontal pipes it is recommended to mount the junction box in an upright position. If a junction box with an expediter XP Plus is mounted at the bottom section of a pipe, moisture can accumulate on the grommet inside the XP Plus. To prevent this, one of the knock out holes must be opened, for draining purposes. Ensure that the junction box is not mounted too close to an instrument or flange, since the thickness of the thermal insulation at those locations can be such that the junction box is partly or totally covered by the insulation.

With a "single phase + neutral" or a "two phase" system, the cable will start from , and end at one point. With a "three phase" system three cables should be laid out over the pipe and at the end be connected in star into a termination box.

Mount the heating cable to the pipe by means of fixing tape (FT-1L/FT-1M/FT-1H).

**Caution:**

FT-1L tape for pipe temp. up to 85°C

FT-1M tape for pipe temp. up to 200°C

FT-1H tape for pipe temp. up to 260°C

Ensure that the heating cable is mounted on the pipe at the right location (see page 36). The heating cable is to be fixed to the pipe every 30 cm by means of fixing tape. If required, the heating cable, after having been fixed to the pipe, must be covered with aluminium tape. In case of plastic pipes with a low temperature resistance, the pipe must be wrapped with aluminium foil before the heating cable is mounted.

13. Ensure the correct amount of cable is allowed for locations where additional heat losses can be expected (such as pipe supports, flanges, valves, instruments etc., see page 37 and further). **The heating cables may never touch or cross one another.**
14. In case the heating cable cannot be terminated in the junction box at once, the cable ends must be sealed off temporarily with some RTV-2 silicon sealant.
15. If applicable, connect a cold lead cable to each end of the heating cable.
16. Protect the cable against damage at those locations where damage could typically occur (at insulation endplates at valves, pumps etc.)
17. Checking of the heat tracing circuit.

Installed heat tracing systems will only perform as expected if installed according to the design documents. In order to ensure this a suggested heat tracing checklist is shown on page 46 of this manual. The suggested heat tracing system checklist is divided into 4 parts.

Part 1. General project and circuit information for references: Thermon suggests to use this part as a guide in order to have your heat tracing circuit references available.

Part 2. Checks to be done after installation (before thermal insulation is installed)

Thermon suggests this part as a guide to make sure installation is checked prior to insulation. This avoids unnecessary costs for removing insulation in case something went wrong during installation.

Meggering prior to thermal insulation and installation of cladding:

- to ensure electrical insulation integrity
- test voltage 1000 Vdc
- test result 20 MOhms
- results need to be recorded in checklist

Part 3. Checks to be done after thermal insulation and cladding

Thermon suggests this part as a guide to make sure that:

- the right insulation has been installed (as specified in the heat tracing design) and cladding entries of heat tracing system are weatherproof
  - the heating tracing system has not been damaged while installing the thermal insulation and its cladding, which can have sharp edges
  - temperature controller setting
- These checks ensure that the heat tracing system will perform as expected.

Meggering after thermal insulation and installation of cladding:

- to ensure electrical insulation integrity, and heating cables are not damaged in by thermal insulation covered areas
- test voltage 1000 Vdc
- test result 10 MOhms
- results need to be recorded in checklist

Part 4. Final test

Thermon suggests this part as a guide to check whether the heat tracing system installation complies with the heat tracing system design.

**Caution:**

Information marked with \*\* is important in case stabilised design has been applied for the particular heat tracing circuit and must be recorded. All those parameters need to be thoroughly checked with design documents to ensure safety and functionality of stabilised design.

Design documents:

- Heat tracing isometrics
- Heat tracing circuit lists, bill of materials

In case of stabilised design (Thermon advises to apply the below in any case):

- design documents to be issued by Thermon Engineering or Thermon CompuTrace software
- the end user must record the system parameters with the \*\*-mark and the applicable T-class on the checklist
- the end user needs to keep a record of the applicable design documents and checklists

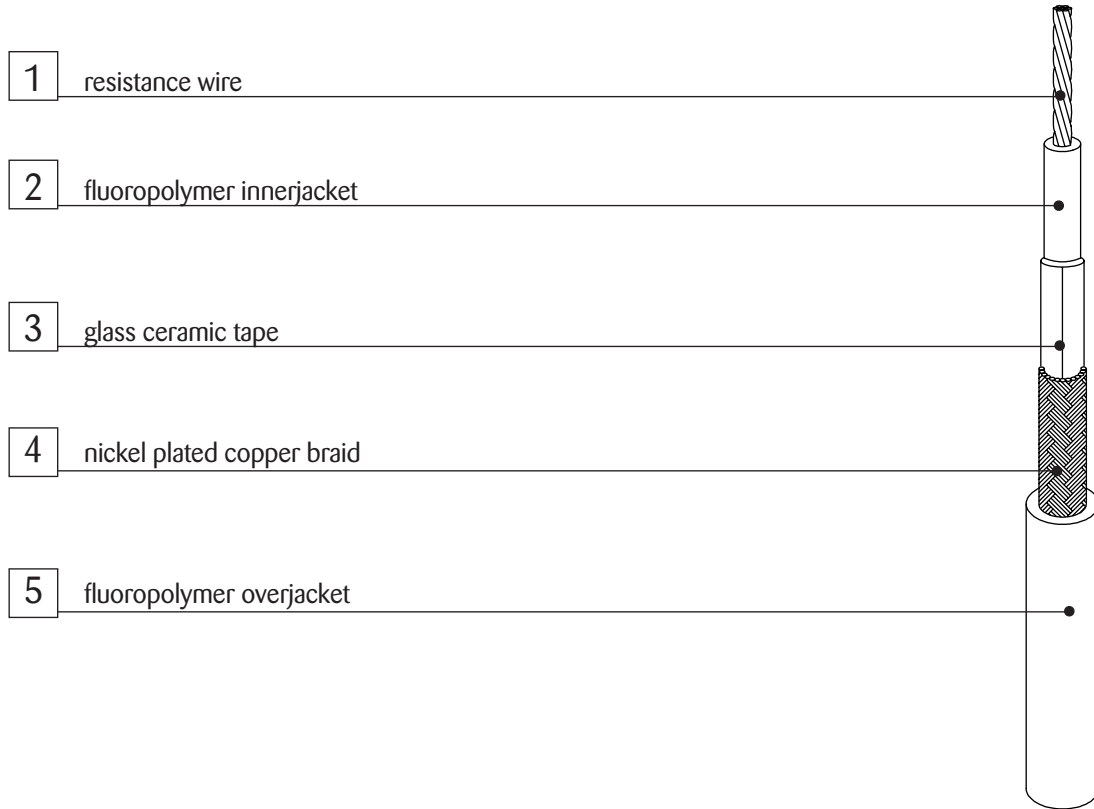
18. Make sure caution labels (see page 35) are installed visible on the insulation cladding every 3m.



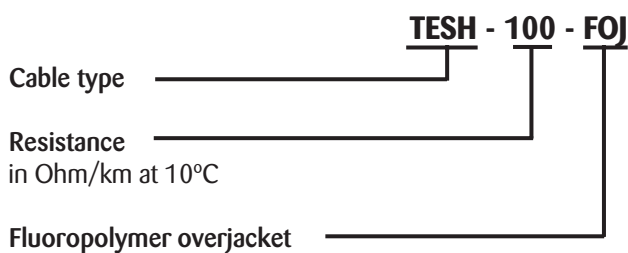
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# Construction and selection of TESH series heating cable

## Construction TESH cable



## Type description TESH cable



### Recommended outputs

Up to 25 W/m. consult Thermon heat tracing design software CompuTrace

Construction meets:

7 Joule impact resistant per EN50019

Max. exposure temp (power off)

260°C

Min. installation temperature

-55°C

Supply voltage

up to 750 V

Minimum bending radius

5 x cable diameter (see product data)

### ATEX marking

CE 0539 II 2 G & D EEx edm IIC T2 TO T6 LCIE 00ATEX6014X



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# Construction and selection of TESH series heating cable

## PRODUCT DATA

Product reference	Resistance Ohm/m at 20°C	Conductor size (mm <sup>2</sup> )	Conductor diameter (mm)	$\alpha$ coeff. · 10 <sup>-3</sup> (1 /°C)	Max. cable length* (m) with 30 mA earth leakage protection	Cable diameter (mm)
TESH 2.9-FOJ	0.0029	6.00	3.50	3.90	1435	7.0
TESH 4.4-FOJ	0.0044	4.00	2.80	3.90	1525	6.3
TESH 7-FOJ	0.0072	2.50	1.94	3.90	1855	5.5
TESH 10-FOJ	0.010	1.79	1.75	3.90	1775	5.1
TESH 11.7-FOJ	0.0117	1.50	1.57	3.90	2025	4.9
TESH 15-FOJ	0.015	1.20	1.42	3.90	2090	4.7
TESH 17.8-FOJ	0.0178	1.00	1.30	3.90	2275	4.6
TESH 25-FOJ	0.025	1.11	1.27	3.00	2525	4.6
TESH 31.5-FOJ	0.0315	1.60	1.62	1.30	2400	4.9
TESH 50-FOJ	0.050	1.02	1.35	1.30	2335	4.7
TESH 65-FOJ	0.065	0.75	1.11	1.30	1890	4.4
TESH 80-FOJ	0.080	1.21	1.02	1.30	2190	4.3
TESH 100-FOJ	0.100	1.50	1.56	0.40	2025	4.9
TESH 150-FOJ	0.150	1.02	1.27	0.40	2335	4.6
TESH 200-FOJ	0.200	0.75	1.10	0.40	2605	4.4
TESH 320-FOJ	0.320	0.92	1.23	0.25	2420	4.5
TESH 380-FOJ	0.380	0.79	1.13	0.25	2555	4.4
TESH 480-FOJ	0.480	0.64	1.00	0.25	2765	4.3
TESH 600-FOJ	0.600	0.49	0.93	0.25	3010	4.2
TESH 700-FOJ	0.700	0.43	0.84	0.25	3155	4.1
TESH 810-FOJ	0.810	0.62	0.99	0.04	2780	4.3
TESH 1000-FOJ	1.000	0.49	0.90	0.04	3010	4.2
TESH 1440-FOJ	1.440	0.34	0.75	0.04	3395	4.1
TESH 1750-FOJ	1.750	0.29	0.75	0.04	3615	4.1
TESH 2000-FOJ	2.000	0.55	0.93	0.37	2900	4.2
TESH 3000-FOJ	3.000	0.34	0.75	0.37	3395	4.1
TESH 8000-FOJ	8.000	0.14	0.48	0.05	4455	3.8

\* Cable lengths are also limited by other design parameters, such as circuit breaker size, circuit length and more. Contact Thermon for design assistance.

## COLD LEAD CABLE DATA

Product reference	Conductor size (mm <sup>2</sup> )	Cable diameter (mm)	Maximum load (A)	Type EEx connector shrink connection	Type IND connector or
TESH CL-2.5	2.5	5.9	32	TESFIT-EX	CETI 1525
TESH CL-4	4.0	6.6	40	TESFIT-EX	TESFIT-EX
TESH CL-6	6.0	7.6	50	TESFIT-EX	TESFIT-EX

The maximum exposure temperature of the TESFIT-EX connection is 260°C

The maximum exposure temperature of the CETI shrink connection is 200°C

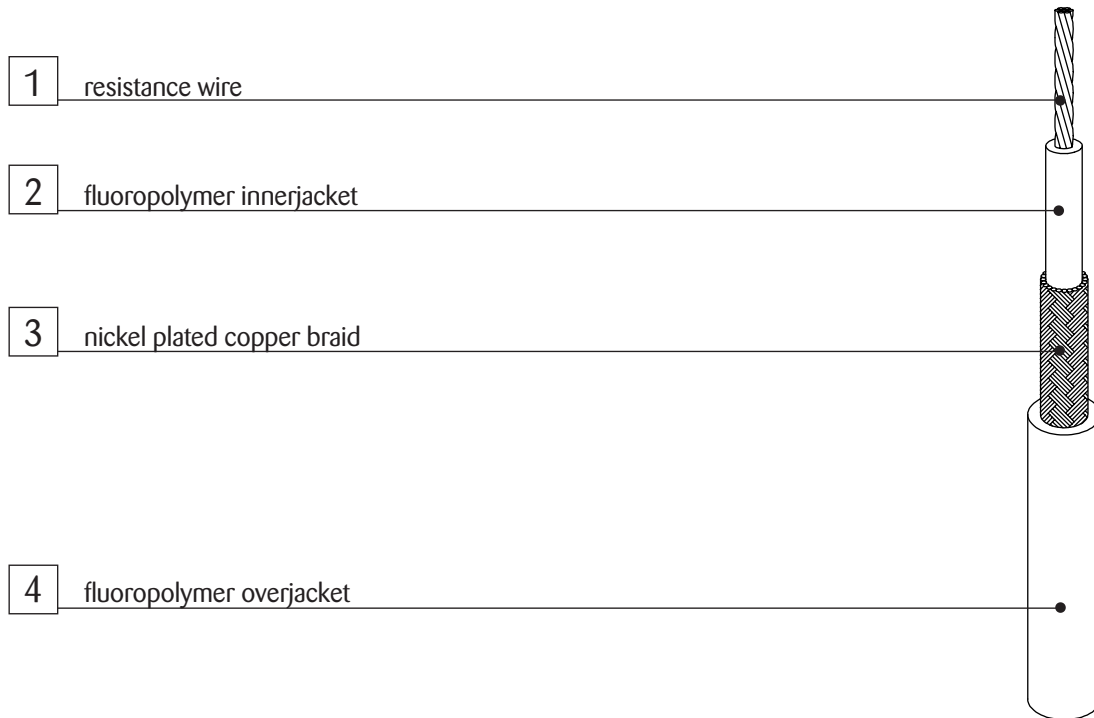


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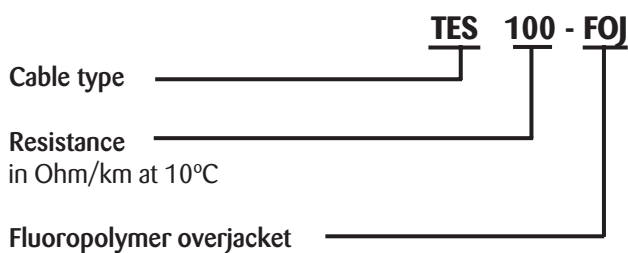
INSTALLATION INSTRUCTIONS TESH/TES

# Construction and selection of TES series heating cable

## Construction TES cable



## Type description TES cable



## Recommended outputs

	up to +10°C	- 25 W/m
+11°C	up to +30°C	- 20 W/m
+31°C	up to +50°C	- 18 W/m
+51°C	up to +75°C	- 16 W/m
+76°C	up to +100°C	- 12 W/m
+101°C	up to +125°C	- 10 W/m
+126°C	up to +150°C	- 8 W/m
+151°C	up to +200°C	- 5 W/m

## ATEX marking

CE 0539 II 2 G & D EEx edm IIC T2 TO T6 LCIE 00ATEX6014X

Contact Thermon for design assistance.

Max. exposure temp (power off)	260°C
Min. installation temperature	-55°C
Supply voltage	up to 750 V
Minimal bending radius	5 x cable diameter (see product data)



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# Construction and selection of TES series heating cable

## PRODUCT DATA

Product reference	Resistance Ohm/m at 20°C	Conductor size (mm <sup>2</sup> )	Conductor diameter (mm)	$\alpha$ coeff. · 10 <sup>-3</sup> (1 /°C)	Max. cable length* (m) with 30 mA earth leakage protection	Cable diameter (mm)
Consult Thermon for lower resistances						
TES 10-FOJ	0.010	1.79	1.71	3.90	1775	4.90
TES 11.7-FOJ	0.0117	1.50	1.56	3.90	2025	4.60
TES 15-FOJ	0.015	1.20	1.41	3.90	2090	4.54
TES 17.8-FOJ	0.0178	1.00	1.29	3.90	2275	4.35
TES 25-FOJ	0.025	1.11	1.35	3.00	2525	4.20
TES 31.5-FOJ	0.0315	1.60	1.62	1.30	2400	4.80
TES 50-FOJ	0.050	1.02	1.29	1.30	2335	4.33
TES 65-FOJ	0.065	0.75	1.11	1.30	1890	4.15
TES 80-FOJ	0.080	1.21	1.41	1.30	2190	4.45
TES 100-FOJ	0.100	1.50	1.56	0.40	2025	4.60
TES 150-FOJ	0.150	1.02	1.29	0.40	2335	4.33
TES 200-FOJ	0.200	0.75	1.11	0.40	2605	4.15
TES 320-FOJ	0.320	0.92	1.23	0.25	2420	4.27
TES 380-FOJ	0.380	0.79	1.14	0.25	2555	4.18
TES 480-FOJ	0.480	0.64	1.02	0.25	2765	4.06
TES 600-FOJ	0.600	0.49	0.90	0.25	3010	3.94
TES 700-FOJ	0.700	0.43	0.84	0.25	3155	3.88
TES 810-FOJ	0.810	0.62	1.01	0.04	2780	4.05
TES 1000-FOJ	1.000	0.49	0.90	0.04	3010	3.94
TES 1440-FOJ	1.440	0.34	0.75	0.04	3395	3.79
TES 1750-FOJ	1.750	0.29	0.68	0.04	3615	3.72
Consult Thermon for higher resistances						

\* Cable lengths are also limited by other design parameters, such as circuit breaker size, circuit length and more. Contact Thermon for design assistance.

## COLD LEAD CABLE DATA

Product reference	Conductor size (mm <sup>2</sup> )	Cable diameter (mm)	Maximum load (A)	Type EEx connector shrink connection	Type IND connector or
TESH CL-2.5	2.5	5.9	32	TESFIT-EX	CETI 1525
TESH CL-4	4.0	6.6	40	TESFIT-EX	TESFIT-EX
TESH CL-6	6.0	7.6	50	TESFIT-EX	TESFIT-EX

The maximum exposure temperature of the TESFIT-EX connection is 260°C

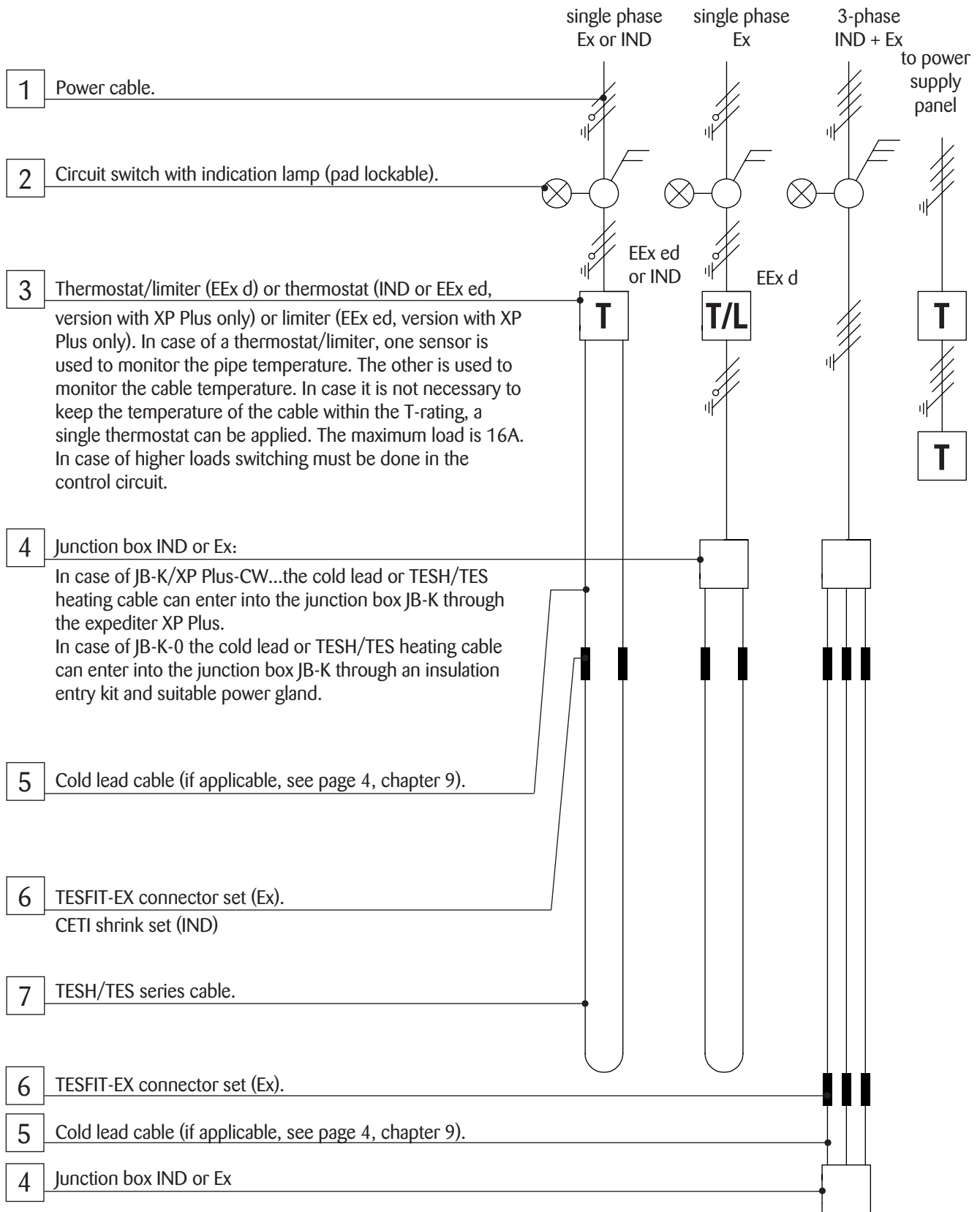
The maximum exposure temperature of the CETI shrink connection is 200°C



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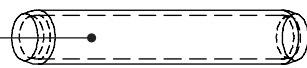
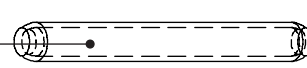
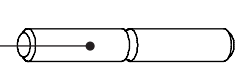
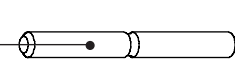
# Typical heat tracing system



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# Heat shrink connection CETI (IND) for installation of cold lead cable 2.5 mm<sup>2</sup>

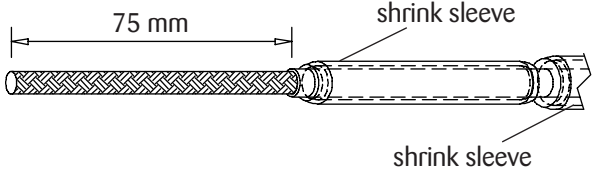
## Heat shrink set CETI 1525 for 2 connections

a	2 pcs PTFE shrinksleeves SM-TES-9 (L=170mm)	
b	4 pcs PTFE shrinksleeves SM-TES-4 (L=40mm)	
c	2 pcs PTFE shrinksleeves SM-TES-1.5 (L=40mm)	
d	2 pcs crimp connectors 2.5 mm <sup>2</sup>	
e	2 pcs crimp connectors 1.5 mm <sup>2</sup>	
<p>Special tools to be provided by installation contractor:</p> <ul style="list-style-type: none"> <li>- hot air gun of approx. 1400 W</li> <li>- ratched controlled crimping plier for uninsulated crimp connectors.</li> </ul> <p>For connection of two TES cables see step 5 (page 12)</p>		

## Procedure

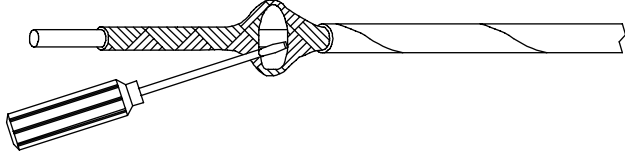
**1 Termination of the TESH CL-2.5 cold lead cable**

Slip shrink sleeve SM-TES-9 over the TESH CL- 2.5 mm<sup>2</sup> cold lead cable first, and then the shrink sleeve SM-TES-4. Remove the overjacket over 75 mm.



**2** Push back the braid so that the openings in the braid get wider.

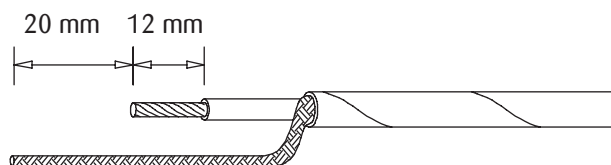
Pull the insulated conductor and glassceramic tape through the braid near the overjacket. Cut and remove the glassceramic tape at the overjacket. Twist the braid.




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# Heat shrink connection CETI (IND) for installation of cold lead cable 2.5 mm<sup>2</sup>

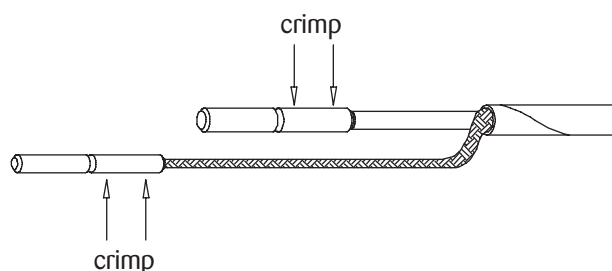
- 3** Cut back the conductor by 20 mm.  
Remove the innerjacket over 12 mm.



- 4** Slip the crimp connector of 2.5 mm<sup>2</sup> over the conductor and the crimp connector of 1.5 mm<sup>2</sup> over the twisted braid.  
Crimp both crimp connectors twice.

**Caution:**

Use a ratched controlled crimping plier for uninsulated crimp connectors of 1.5 mm<sup>2</sup> and 2.5 mm<sup>2</sup>.

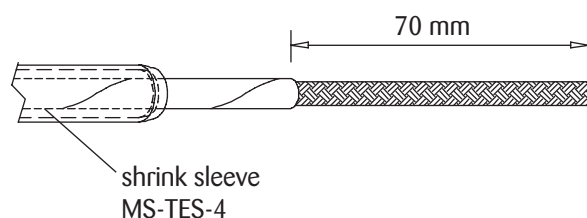


- 5** Termination of TESH/TES heating cable

**Note:**

For connecting two TESH/TES cables this procedure must be done for each cable end.

Remove the overjacket over 70 mm.  
Slip the shrink sleeve SM-TES-4 over the heating cable.



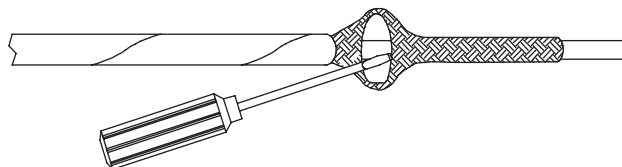
- 6** Push back the braid so that the openings in the braid get wider.

**For TESH:**

Pull the insulated conductor and glassceramic tape through the braid near the overjacket. Cut and remove the glassceramic tape at the overjacket.  
Twist the braid.

**For TES:**

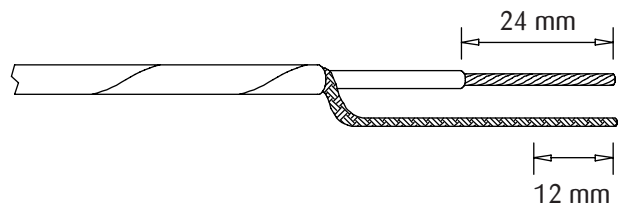
Pull the insulated conductor through the braid near the overjacket. Twist the braid.



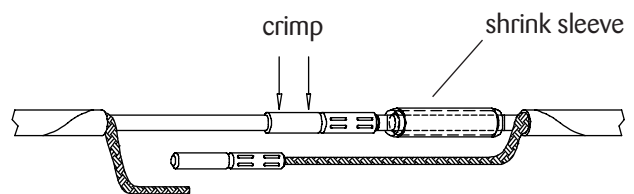
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# Heat shrink connection CETI (IND) for installation of cold lead cable 2.5 mm<sup>2</sup>

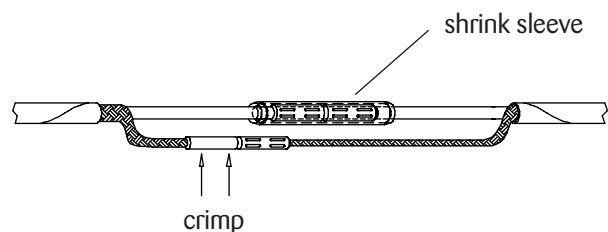
- 7 Remove the innerjacket over 24 mm.  
Cut back the conductor and the twisted braid by 12 mm. Keep the pieces of conductor and braid for later use.



- 8 First slip the shrink sleeve SM-TES-1.5 over the crimp connector that has been mounted to the cold lead cable, as shown.  
Put the conductor of the heating cable into the 2.5 mm<sup>2</sup> crimp connector, together with the little piece of **braid** (see step 7), to fill up the connector sufficiently.  
The little piece of **conductor** is only used to fill up the crimp connector in case TESH/TES-11.7, 15, 31.5, 80 and 100 cable is connected. The TESH/TES-10 cable can be mounted directly into the 2.5 mm<sup>2</sup> crimp connector.  
Crimp the crimp connector twice.  
Cut back the twisted braid in such a way that the crimp connectors are staggered (as shown).



- 9 Slip the shrink sleeve SM-TES-1.5 over the crimp connector as shown.  
Put the twisted braid into the butt connector. See to it that no loose braiding wires stick out near the overjacket and from under the crimp connector.  
Crimp the crimp connector twice.



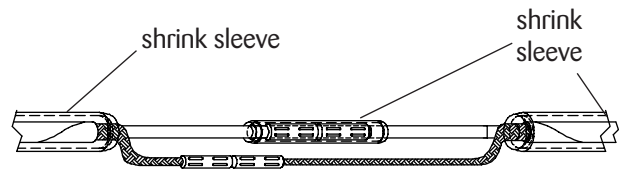
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INSTALLATION INSTRUCTIONS TESH/TES

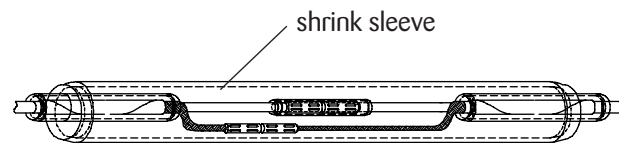
PAGE 13

# Heat shrink connection CETI (IND) for installation of cold lead cable 2.5 mm<sup>2</sup>

- 10** Position both shrink sleeves SM-TES-4 as shown. Heat shrink the sleeves by means of a hot air gun (or gas torch).



- 11** Slip back the previously positioned shrink sleeve SM-TES-9 (see step 1) over the connection and heat shrink the sleeve.  
In order to connect the other end of the heating cable with the cold lead cable, the same procedure must be followed, starting with step 1 at page 11.



Thermon provides complete Power and End Termination Kits for the overjacketed TESH/TES heating cable. If these kits are used all needed materials are included in the kit.

There are kits available to be used in combination with XP Plus (PETK/XP Plus-...-TES-OJ-...) and kits to be used as side entry into the thermon junction box JB-K-0 M20/M25...(PETK-...-TES-OJ-...).

See type description PETK sets.

Description:	Art. no.:
<b>Power and End Termination Kits</b>	
PETK-CL-TES-OJ-IND	422.303.610
PETK/XP Plus-CL-TES-OJ-IND	422.303.611
<b>Connector set</b>	
CETI 1515 shrink connection*	421.417.110

\* If separate parts are ordered yellow/green sleeve and wire pins for connection to junction box terminals are to be supplied by electrical contractor.

## Type description PETK-kits

	PETK/XP Plus	CL	TES	OJ	Ex
<b>Application type</b>	_____	_____	_____	_____	_____
XP Plus	:with XP Plus				
No indication	:side entry junction box				
<b>Cold Lead</b>	_____	_____	_____	_____	_____
CL :	with cold lead cable and connector				
No indication:	without cold lead cable and connector				
<b>Cable Type</b>	_____	_____	_____	_____	_____
TES	:for TESH/TES				
<b>Cable options</b>	_____	_____	_____	_____	_____
No indication	:braided cable (BC/BN)				
OJ	:overjacket cable (OJ/FOJ)				
<b>Area options</b>	_____	_____	_____	_____	_____
Ex	:hazardous and non-hazardous area				
IND	:non-hazardous area				

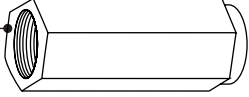
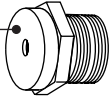
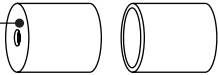


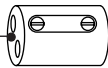
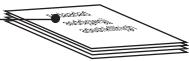


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# Installation of EEx e cold lead connectors TESHFIT-EX

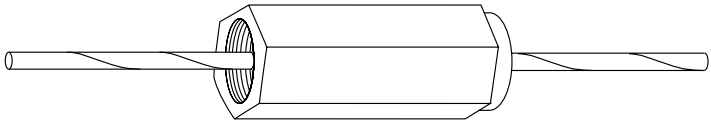
The Ex connectors between the TESH/TES heating cable and the TESH CL-... cold lead cable or between two TESH/TES cables can be installed without using a heat source.

## TESFIT-EX for two connections:

<b>a</b>	1 pc stainless steel enclosure	
<b>b</b>	1 pc stainless steel cap	
<b>c</b>	2 pcs insulating shells	
<b>d</b>	6 pcs fluoropolymer conical sealing discs	
<b>e</b>	2 pcs stainless steel washers	
<b>f</b>	1 pc fluoropolymer terminal block	
<b>g</b>	termination instructions	

Tools to be provided by installation contractor:  
- Wrench no. 27 (mm)

## Procedure

<b>1</b>	Push the stainless steel enclosure (a) over the TESH CL-... cold lead or TESH/TES heating cable with the threaded side towards the end of the cable.	
----------	--	--



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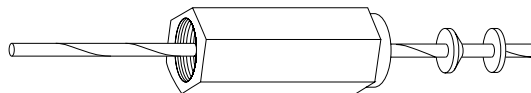
INSTALLATION INSTRUCTIONS TESH/TES

# Installation of EEx e cold lead connectors TESFIT-EX

**2** Push the fluoropolymer conical sealing disk (d) and if necessary the metallic washer (e) over the cable.

**Caution:**

TESH CL-... cod lead cables and TESH/TES heating cables have a variety of cable diameters.



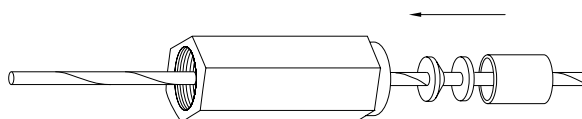
Consult the table to the right to select the applicable concentric sealing disc for cable to be terminated.

Use the metallic washer only in combination with the conical sealing disc white

Product reference	Conical sealing disc color	Product reference	Conical sealing disc color
TESH 2.9-FOJ	black 7.5 mm (hole)	TES 10-FOJ	white 5.0 mm (hole)
TESH 4.4-FOJ	black 7.5 mm (hole)	TES 11.7-FOJ	white 5.0 mm (hole)
TESH 7-FOJ	grey 6.0 mm (hole)	TES 15-FOJ	white 5.0 mm (hole)
TESH 10-FOJ	grey 6.0 mm (hole)	TES 17.8-FOJ	white 5.0 mm (hole)
TESH 11.7-FOJ	grey 6.0 mm (hole)	TES 25-FOJ	white 5.0 mm (hole)
TESH 15-FOJ	white 5.0 mm (hole)	TES 31.5-FOJ	white 5.0 mm (hole)
TESH 17.8-FOJ	white 5.0 mm (hole)	TES 50-FOJ	white 5.0 mm (hole)
TESH 25-FOJ	white 5.0 mm (hole)	TES 65-FOJ	white 5.0 mm (hole)
TESH 31.5-FOJ	grey 6.0 mm (hole)	TES 80-FOJ	white 5.0 mm (hole)
TESH 50-FOJ	white 5.0 mm (hole)	TES 100-FOJ	white 5.0 mm (hole)
TESH 65-FOJ	white 5.0 mm (hole)	TES 150-FOJ	white 5.0 mm (hole)
TESH 80-FOJ	white 5.0 mm (hole)	TES 200-FOJ	white 5.0 mm (hole)
TESH 100-FOJ	grey 6.0 mm (hole)	TES 320-FOJ	white 5.0 mm (hole)
TESH 150-FOJ	white 5.0 mm (hole)	TES 380-FOJ	white 5.0 mm (hole)
TESH 200-FOJ	white 5.0 mm (hole)	TES 480-FOJ	white 5.0 mm (hole)
TESH 320-FOJ	white 5.0 mm (hole)	TES 600-FOJ	white 5.0 mm (hole)
TESH 380-FOJ	white 5.0 mm (hole)	TES 700-FOJ	white 5.0 mm (hole)
TESH 480-FOJ	white 5.0 mm (hole)	TES 810-FOJ	white 5.0 mm (hole)
TESH 600-FOJ	white 5.0 mm (hole)	TES 1000-FOJ	white 5.0 mm (hole)
TESH 700-FOJ	white 5.0 mm (hole)	TES 1440-FOJ	white 5.0 mm (hole)
TESH 810-FOJ	white 5.0 mm (hole)	TES 1750-FOJ	white 5.0 mm (hole)
TESH 1000-FOJ	white 5.0 mm (hole)		
TESH 1440-FOJ	white 5.0 mm (hole)		
TESH 1750-FOJ	white 5.0 mm (hole)		
TESH 2000-FOJ	white 5.0 mm (hole)	TESH CL-2.5	grey 6.0 mm (hole)
TESH 3000-FOJ	white 5.0 mm (hole)	TESH CL-4	black 7.5 mm (hole)
TESH 8000-FOJ	white 5.0 mm (hole)	TESH CL-6	black 7.5 mm (hole)

**3** Push the fluoropolymer shell (c) over the cable, with the open side towards the end of the cable.

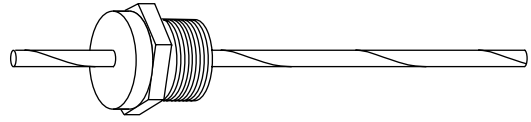
Push the conical sealing disc and the fluoropolymer terminal shell in the stainless steel enclosure.



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# Installation of EEx e cold lead connectors TESFIT-EX

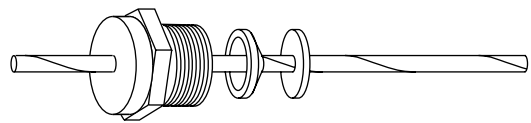
- 4 Push the stainless steel cap (b) over the TESH CL-... cold lead or TESH/TES heating cable with the threaded side towards the end of the cable.



- 5 Push the fluoropolymer conical sealing disc (d) and if necessary the metallic washer (e) over the cable.

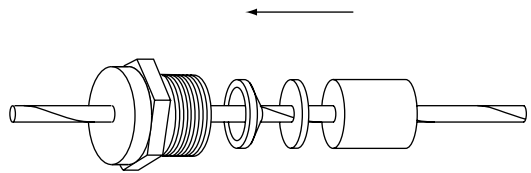
**Caution:**  
TESH CL-... cold lead cables and TESH/TES heating cables have a variety of cable diameters.

Consult the table of step 2 to select the applicable conical sealing disc for cable to be terminated.



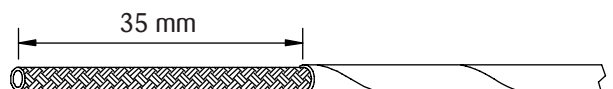
- 6 Push the fluoropolymer insulating shell (c) over the cable, with the open side towards the end of the cable.

Push the conical sealing disc and the fluoropolymer terminal shell in the short body stainless steel enclosure.



- 7 **Termination of TESH CL-... cold lead or TESH/TES heating cable**

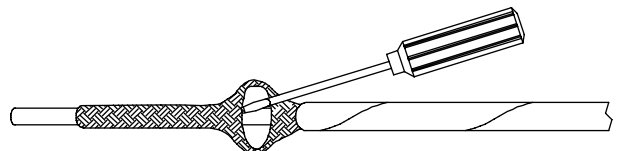
Remove overjacket over 35 mm.



- 8 Push back the braid so that the openings in the braid get wider. Twist the braid.

**For TESH:**  
Pull the insulated conductor and glassceramic tape through the braid near the overjacket. Cut and remove the glassceramic tape at the overjacket. Twist the braid.

**For TES:**  
Pull the insulated conductor through the braid near



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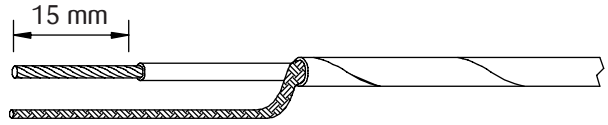
INSTALLATION INSTRUCTIONS TESH/TES

# Installation of EEx e cold lead connectors TESFIT-EX

9 Remove innerjacket over 15 mm.

**Caution:**

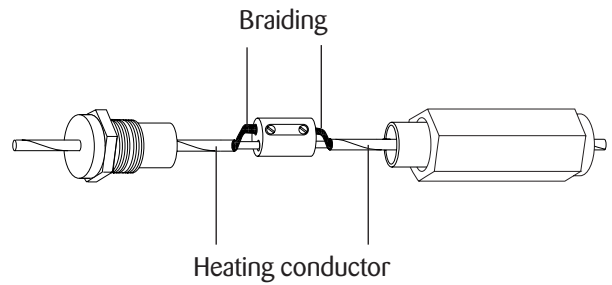
Do not cut strands of the heating conductor.  
For terminating the second TESH CL-... cold lead or TESH/TES heating cable repeat steps 7 through 9.



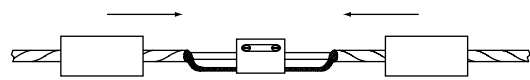
10 Install the two heating conductors in the same terminal of the fluoropolymer terminal block, the conductors need to overlap each other totally. Tighten the two screws of the applicable terminal. Guide the two ends of twisted braid into the remaining pair of holes of the fluoropolymer terminal block. Tighten the two screws of the applicable terminal.

**Caution:**

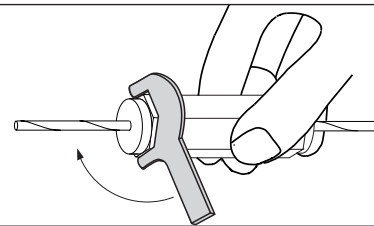
Don't overlap the braiding and check that no small pieces of braid are stick out.



11 Guide stainless steel enclosures including the fluoropolymer terminal shells over the fluoropolymer terminal block.



12 Screw the stainless steel cap into the stainless steel enclosure till the hexagonals are tight together. Use a wrench no. 27 (mm). In order to connect the other end of heating cable with the cold lead cable, the same procedure must be followed, starting with step 1 at page 15.



Thermon provides complete Power and End Termination Kits for the overjacketed TESH/TES heating cable. If these kits are used all needed materials are included in the kit.

There are kits available to be used in combination with XP Plus (PETK/XP Plus-...-TES-OJ-...) and kits to be used as side entry into the thermon junction box JB-K-0 M20/M25...(PETK-...-TES-OJ-...).

See type description PETK sets.

Description:	Art. no.:
<b>Power and End Termination Kits</b>	
PETK-CL-TES-OJ-EX	422.301.610
PETK/XP Plus-CL-TES-OJ-EX	422.301.611
PETK-TES-OJ-EX	422.301.620
PETK/XP Plus-TES-OJ-EX	422.301.621
<b>Connector set</b>	
TESFIT-EX connector*	422.407.350

\* If separate parts are ordered yellow/green sleeve and wire pins for connection to junction box terminals are to be supplied by electrical contractor.

## Type description PETK-kits

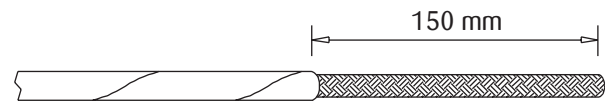
	PETK/XP Plus - CL - TES -OJ - Ex
<b>Application type</b>	
XP Plus	:with XP Plus
No indication	:side entry junction box
<b>Cold Lead</b>	
CL :	with cold lead cable and connector
No indication:	without cold lead cable and connector
<b>Cable Type</b>	
TES-OJ	:for TESH/TES
<b>Cable options</b>	
No indication	:braided cable (BC/BN)
OJ	:overjacket cable (OJ/FOJ)
<b>Area options</b>	
Ex	:hazardous and non-hazardous area
IND	:non-hazardous area



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# Termination of TESH CL-... cold lead cable and TESH/TES heating cable

- 1 Remove the overjacket over 150 mm.



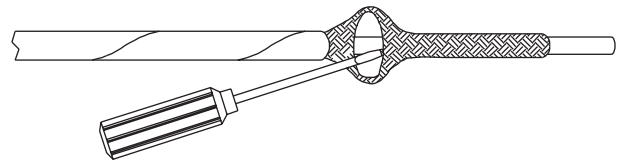
- 2 Push back the braid so that the openings in the braid get wider.

**For TESH CL-... and TESH:**

Pull the insulated conductor and glass ceramic tape through the braid near the overjacket. Cut and remove the glass ceramic tape at the overjacket. Twist the braid.

**For TES:**

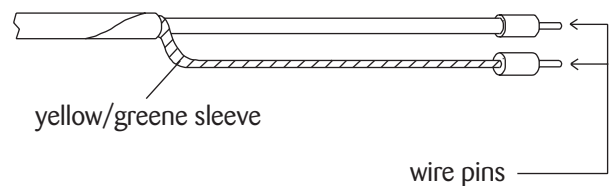
Pull the insulated conductor through the braid near the overjacket. Twist the braid.



- 3 Remove the innerjacket over 10 mm.



- 4 Slip a piece of yellow/green sleeve over the twisted braid and mount correct wire pins.



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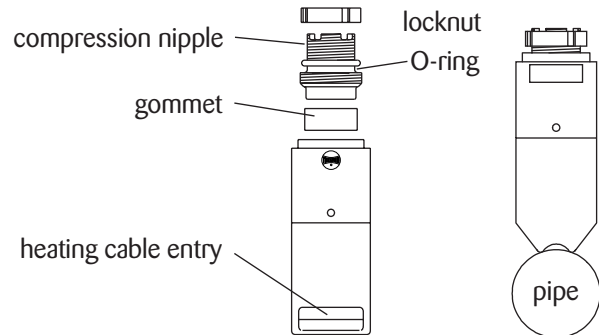
INSTALLATION INSTRUCTIONS TESH/TES

# Installation of junction box JB-K with expediter XP Plus

## 1 Construction XP Plus.

### Caution:

- Black/brown XP Plus is for application in hazardous areas (EEx e) and for max. pipe temp. up to 200°C
- Grey XP Plus is for application in Non-hazardous (IND) area and for max. pipe temp. up to 120°C.

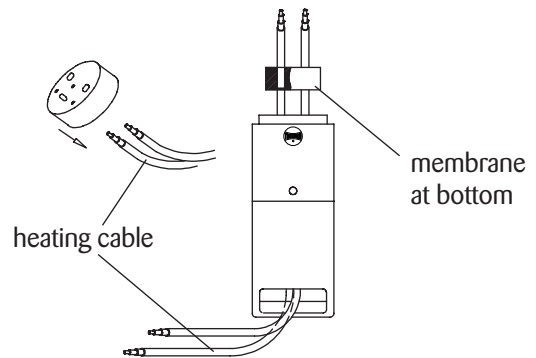


- ## 2
- Verify if the right grommet is selected (see below). Put each heating cable through one of the slots in the XP Plus. Cut in the membrane in the grommet for each heating cable. Use the small holes for cables up to 6 mm and the large holes for cable diameters of 7-10 mm. Slide the grommet over the heating cable down to the collar at the inside of the XP Plus as shown.

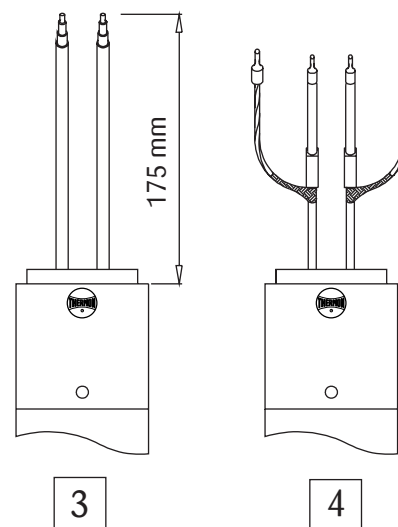
### Caution:

XP Plus grommet to be checked:

- grommet GR-3E for TESH/TES
- grommet GR-3G for HPT (see HPT installation instruction)



- ## 3
- Caution:**  
The heating cable must protrude 175 mm above the XP Plus!!!



- ## 4
- For termination of the heating/cold lead cable see page 19.



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# Installation of junction box JB-K with expediter XP Plus

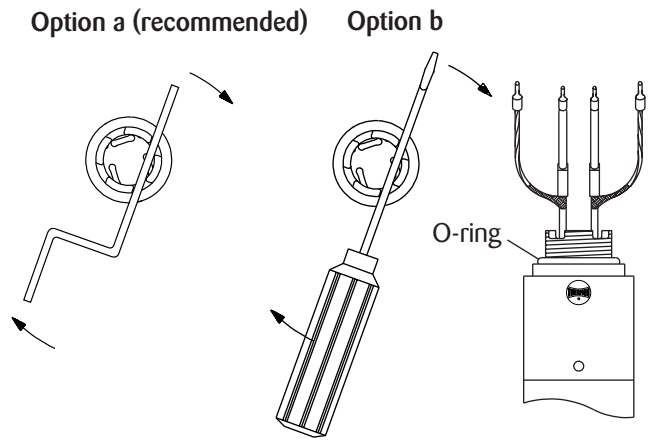
**5** Remove the locknut from the compression nipple. Slide the nipple over the cable and screw it manually into the XP Plus housing.

**Option a (recommended):**

Put the XP Plus-LN-Tool (to be ordered separately) on its side into the slots as shown alongside, and screw the nipple carefully down to the grommet.

**Option b:**

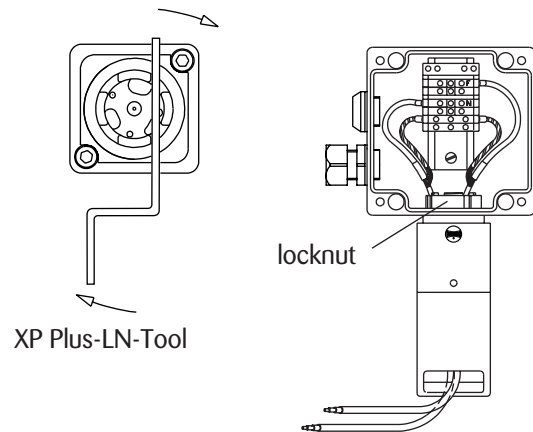
Put a screwdriver into the slots as shown alongside, and screw the nipple carefully down to the grommet.



**6** Place the junction box on the XP Plus. Tighten the locknut with the XP Plus-LN-Tool (to be ordered separately). Connect the heating cable to the terminals. Mount the cover on the junction box

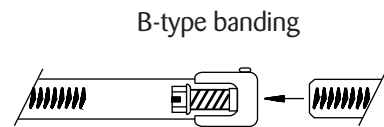
**Caution:**

Tighten screws cross wise.  
Close entries with blindplug and/or gland.  
Mount the junction box with XP Plus on the pipe.



**7** The XP Plus is mounted to the pipe with the following mounting materials:

- ABA 25 Clamp: 1/2" diam. pipe
- ABA 40 Clamp: 3/4" diam. pipe
- B-4 banding: > 1" ≤ 4" diam. pipe
- B-10 banding: > 4" ≤ 10" diam. pipe
- B-21 banding: > 10" ≤ 21" diam. pipe



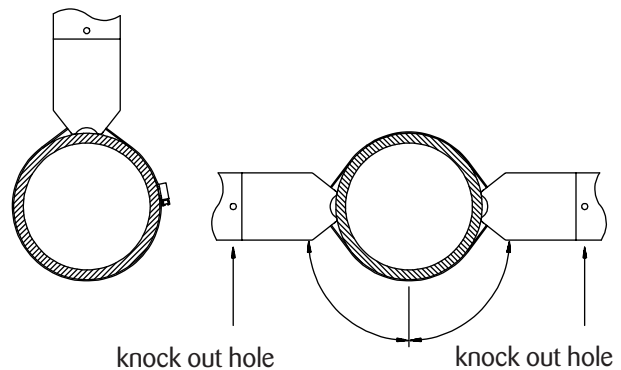
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# Installation of junction box JB-K with expediter XP Plus

- 8 Place the non-metallic expediter XP Plus on the pipe and insert the ABA clamp or B-type banding (B-4...B-21) through the slots of the XP Plus. Tighten the ABA clamp or B-type banding with a screwdriver.

**Caution:**

In case the XP Plus is mounted at the bottom section of a horizontal pipe, the knock-out hole at the lowest position must be opened. See also sketch along side.



9 **Description** **Art. no.:**

**Junction box with expediter and grommets**

JB-K/XP Plus-CW-120-IND 431.331.353

JB-K/XP Plus-CW-200-Ex 431.131.355

Grommet 3E\* 459.000.320

\* Grommet included with JB-K/XP Plus-CW...

**Power and End Termination Kits**

PETK/XP Plus-CL-TES-OJ-EX 422.301.611

PETK/XP Plus-TES-OJ-EX 422.301.621

PETK/XP Plus-CL-TES-OJ-IND 422.303.611

**Mounting material**

ABA 25 clamp 479.000.032

ABA 40 clamp 479.000.033

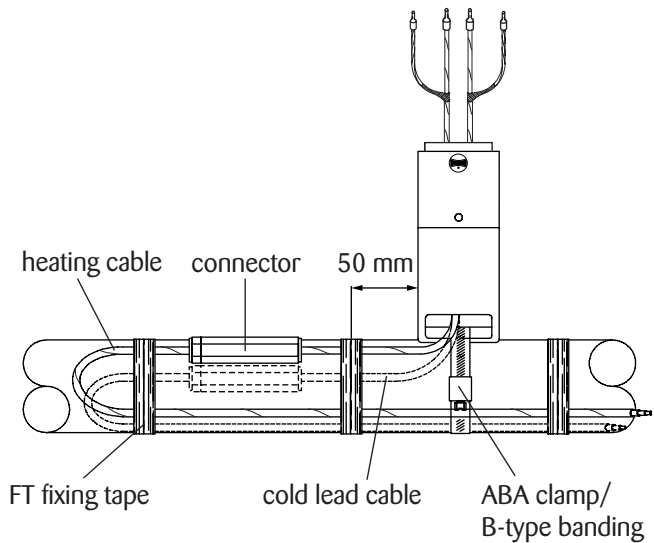
B-4 banding 479.011.060

B-10 banding 479.011.061

B-21 banding 479.011.062

**Tool**

XP Plus-LN-Tool 455.150.002



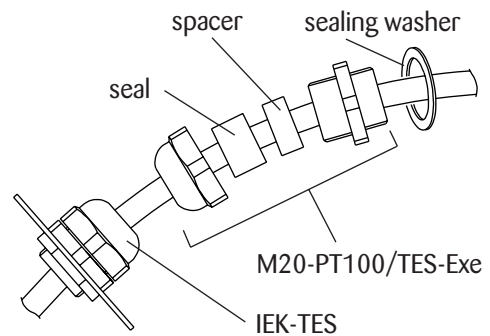
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# Installation of junction box JB-K-0 with mounting bracket XP-1

- 1 Cable gland type M20-PT100/TES-Exe is to be slid over the cable as shown.

**Caution:**

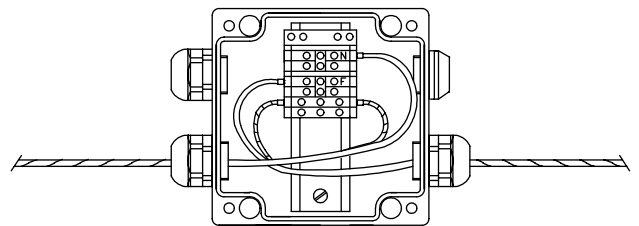
In case an insulation entry kit type IEK-TES is used, this must be put over the heating cable prior to the cable gland.  
For termination of the heating cable see page 23.



- 2 Put the heating cable into the junction box and install the gland. Position the heating cable and tighten the cap of the cable gland. Connect the cable to the terminals. Mount the junction box to the mounting bracket with SS bolts, nuts and rings. (to be supplied by electrical contractor). Mount the cover on the junction box.

**Caution:**

Tighten the screws cross wise.  
Close the entries with blindplug and/or gland. After this the combination JB-K/XP-1 can be mounted onto the pipe.



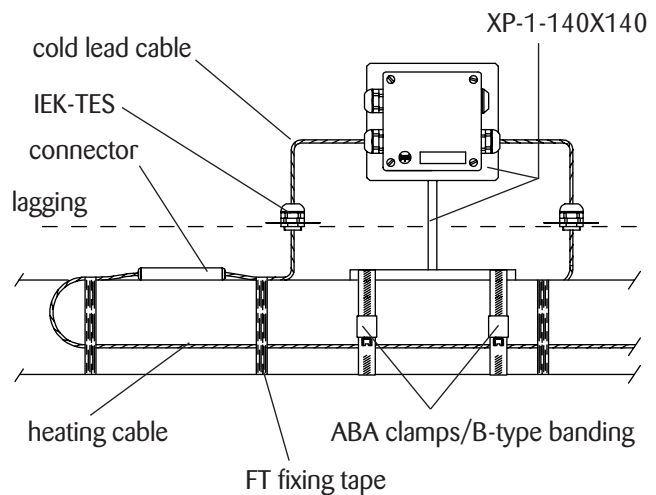
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# Installation of junction box JB-K-0 with mounting bracket XP-1

3	Description:	Art. no.:
	<b>Hazardous area junction box</b>	
	JB-K-0-M20/M25-EX	
	4x6 mm <sup>2</sup> terminals	433.148.220
	<b>Hazardous area glands and blindplugs</b>	
	M25-HPT/PWR-Exe (8-17 mm)**	453.105.410
	M25-PWRL-Exe (16-20.5 mm)*	453.028.600
	M25-B-Exe blindplug**	454.105.010
	M20-B-Exe blindplug**	454.104.010
	M20-PT100/TES-Exe tracer gland*	453.028.280
	<b>Hazardous area Power and End Termination Kits</b>	
	PETK-CL-TES-OJ-EX	422.301.610
	PETK-TES-OJ-EX	422.301.620
	<b>Non hazardous area junction box</b>	
	JB-K-0-M20/M25-IND	
	4x6 mm <sup>2</sup> terminals	433.348.220
	<b>Non hazardous area glands and blindplugs</b>	
	M25-PWR-IND (11-18 mm)**	453.305.410
	M25-B-IND blindplug*	454.305.010
	M20-B-IND blindplug*	454.304.010
	M20-TES/PWR-IND tracer gland*	453.304.410
	<b>Non hazardous area Power and End Termination Kits</b>	
	PETK-CL-TES-OJ-IND	422.303.610
	PETK/XP Plus-CL-TES-OJ-IND	422.303.611
	<b>Sealing washers</b>	
	SW-20 sealing washer	459.000.097
	SW-25 sealing washer	459.000.098
	<b>Insulation Entry Kit</b>	
	IEK-TES insulation entry kit	471.000.008
	<b>Mounting material</b>	
	XP-1-140X140 mounting bracket	479.000.022
	ABA 25 clamp	479.000.032
	ABA 40 clamp	479.000.033
	B-4 banding	479.011.060
	B-10 banding	479.011.061
	B-21 banding	479.011.062

\* Sealing washer included

\*\* No sealing washer required



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# Installation of thermostat TED (EEx ed) and TC (IND) with expediter XP Plus

**1** Construction XP Plus

locknut  
O-ring  
compression nipple  
grommet  
heating cable entry  
Capillary plug  
pipe

**2** Put the heating cable through one of the slots in the XP Plus. Cut in the membrane of the grommet.

- the small holes are for the TESH/TES cable
- the central hole is for the capillary

Slide the grommet approximately 250 mm over the heating cable as shown

TESH/TES  
heating cable  
membrane at bottom

**3** **Caution:**  
The heating cable must protude 180 mm above the XP Plus!!!

180 mm

**3** **4**

**4** For termination of the heating cable see page 19 and further.

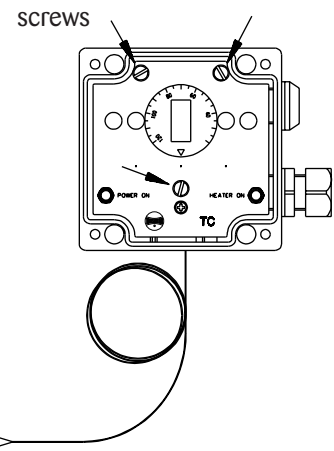


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# Installation of thermostat TED (EEx ed) and TC (IND) with expediter XP Plus

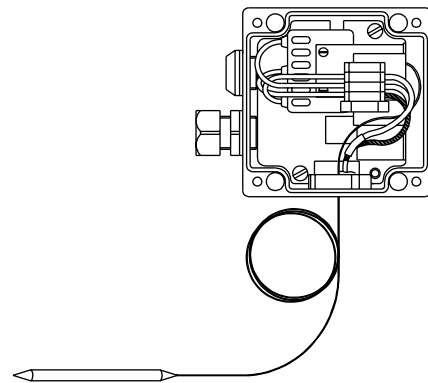
- 5** For type TC (IND):  
Remove the transparent cover. Remove the three indicated screws and take out the cover plate, so the internals become accessible.

IND

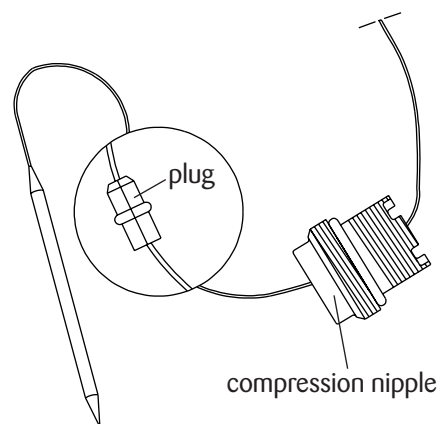


- For type TED (EEx ed):  
Remove the cover so that the internals become accessible.

EEx ed



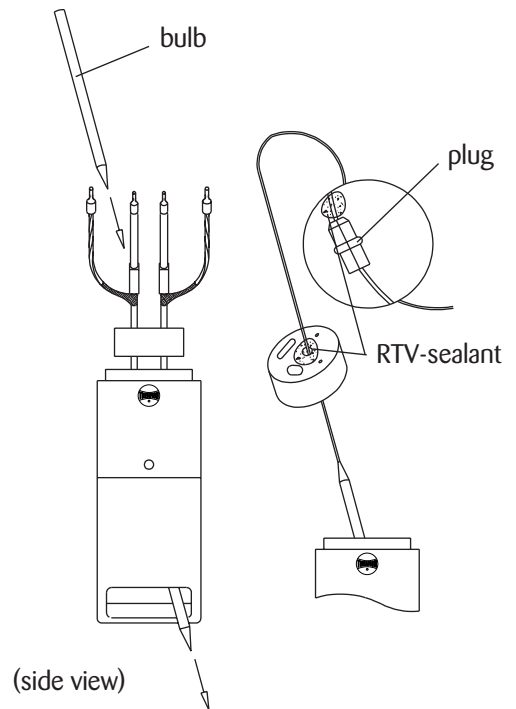
- 6** Roll off the capillary. Slide the compression nipple over the capillary. Install the plug over the capillary as shown, conical side downwards.



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# Installation of thermostat TED (EEx ed) and TC (IND) with expediter XP Plus

- 7 Put the bulb through the central hole of the grommet. Pull the capillary as far as possible through the unused slot in the base of the XP Plus. Put some RTV silicon sealant in the central hole of the grommet and on the capillary in front of the plug. Then slide the plug over the capillary into the hole. Put the grommet including plug into the XP Plus housing.



- 8 Remove the locknut from the compression nipple. Slide the nipple over the cable and screw it manually into the XP Plus housing.

**Option a (recommended):**

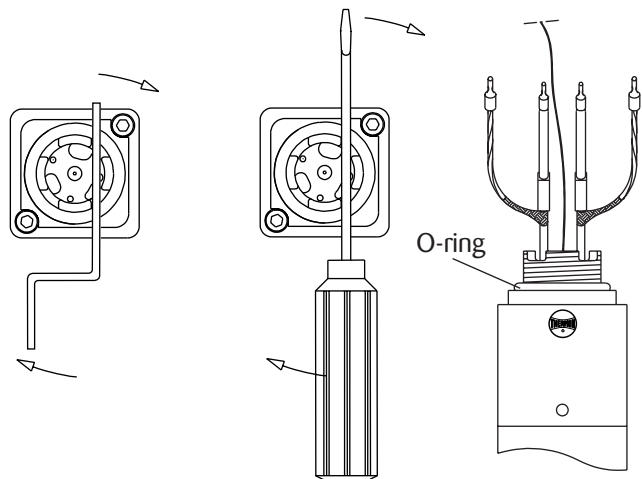
Put the XP Plus-LN-Tool (to be ordered separately) on its side into the slots as shown alongside, and screw the nipple carefully down to the grommet.

**Option b:**

Put a screwdriver into the slots as shown alongside, and screw the nipple carefully down to the grommet.

**Option a (recommended)**

**Option b**



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INSTALLATION INSTRUCTIONS TESH/TES

PAGE 27

# Installation of thermostats TED (EEx ed) and TC (IND) with expediter XP Plus

9 Place the thermostat on the XP Plus and tighten the locknut with the XP Plus-LN-Tool. Connect the heating cable to the terminals of the TC thermostat, the coverplate must be installed again. Mount the thermostat with XP Plus on the pipe.

- ABA 25 Clamp 1/2" diameter pipe
- ABA 40 Clamp 3/4" diameter pipe
- B-4 banding: > 1" ≤ 4" diam. pipe
- B-10 banding: > 4" ≤ 10" diam. pipe
- B-21 banding: > 10" ≤ 21" diam. pipe

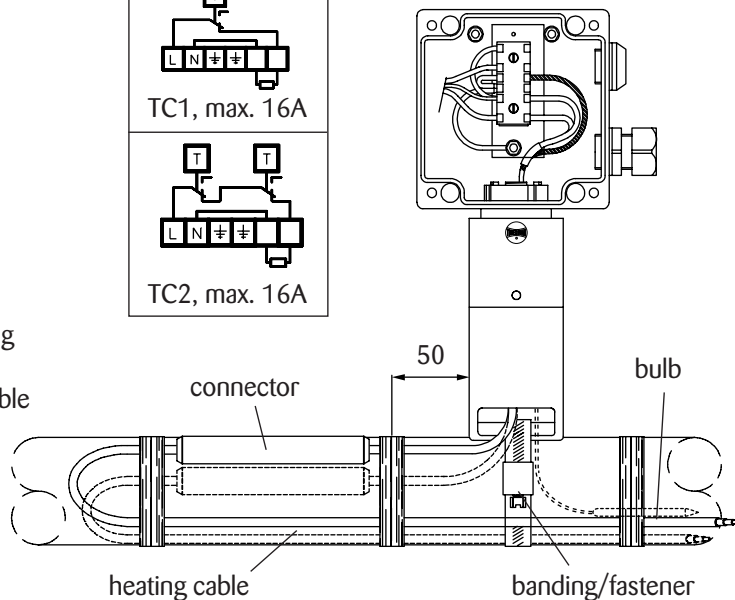
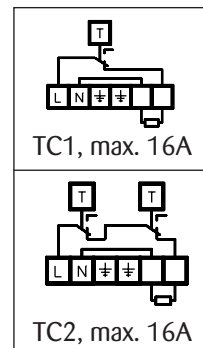
**Remark:**

- a. The bulb must be fixed to the pipe with fixing tape as shown.
- b. To each thermostat maximal one heating cable and one power cable can be connected.

**Caution:**

Tighten the screws of the cover crosswise.

**IND**



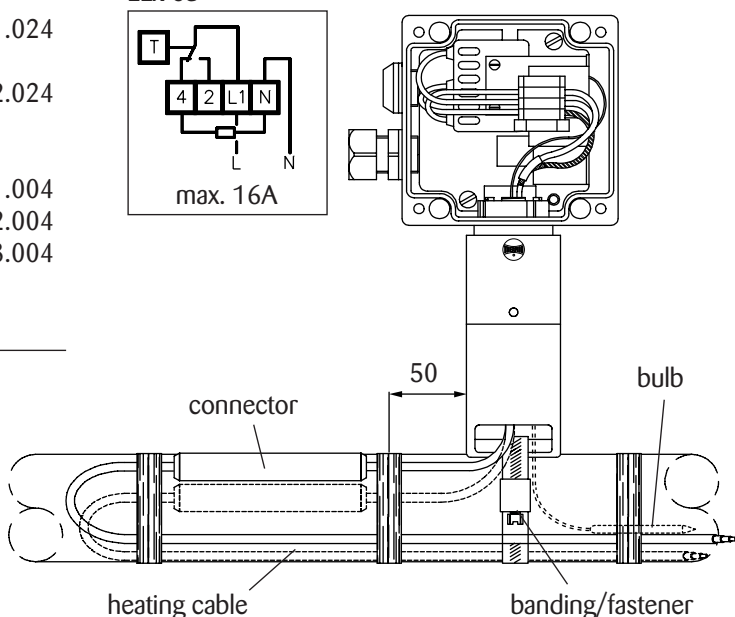
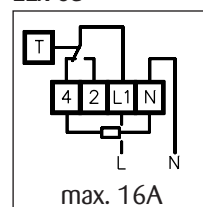
**Thermostatranges Art. no.:**

IND	Single	Art. no.:
0-60°C	TC1-1-40/XP Plus	441.501.004
20-120°C	TC1-1-120/XP Plus	441.502.004

IND	Double	Art. no.:
0-60/20-120°C	TC2-1-40/120/XP Plus	441.501.024
20-120/20-120°C	TC2-1-120/120/XP Plus	441.502.024

EEx ed	Single	Art. no.:
-20-50°C	TED1-1-50/XP Plus	440.301.004
0-100°C	TED1-1-100/XP Plus	440.302.004
0-200°C	TED1-1-200/XP Plus	440.303.004

**EEx ed**



**Accessories**

see page 24 for:

- Hazardous area glands and blindplugs
- Hazardous area connector sets
- Non hazardous area glands and blindplugs
- Non hazardous area connector set
- Sealing washers
- Insulation Entry Kit
- Mounting material



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# Installation of thermostats TED (EEx ed) and TC (IND) with mounting bracket XP-1

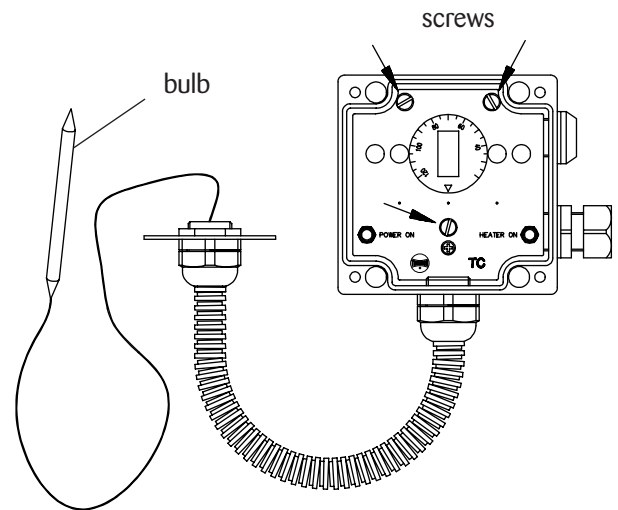
- 1 Using the TED (EEx ed) or TC (IND) thermostats with mounting bracket XP-1, the TESH/TES heating cable has to be terminated in a separate Junction Box JB-K with XP Plus or JB-K-0 with mounting bracket XP-1.

For termination of the TESH CL-... cold lead cable and TESH/TES heating cable see page 19.

For installation of junction box page 20 - 24.

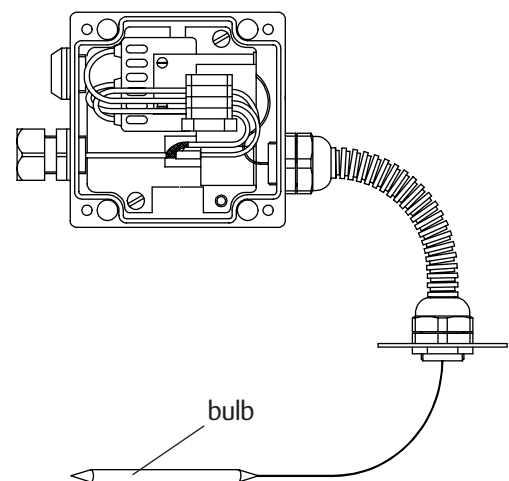
- 2 For type TC (IND): remove the transparent cover. Remove the three screws as indicated and take out the cover plate, so that the internals become accessible.

## TC (IND)



For type TED1 (EEx ed): remove the cover, so that the internals become accessible.

## TED1 (EEx ed)



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# Installation of thermostat TED (EEx ed) and TC (IND) with mounting bracket XP-1

- 3 Put the power cable into the thermostat and install the gland. Position the power cable and tighten the cap of the the cable gland. Connect the cable into the terminals. Mount the junction box of thermostat to the XP-1-140x140 mounting bracket with SS bolts, nuts and rings (to be supplied by the electrical contractor) in such way that no glands or plugs are at the top side of the box. Mount the cover on the junction box.

**Caution:**

Tighten the screws crosswise.  
Close entries with blindplug and/or gland. After this the thermostat can be mounted to the pipe.

**Thermostat ranges** **Art. no.:**

IND	Single	
0 - 60°C	TC1-1-40	441.811.104
20-120°C	TC1-1-120	441.814.104
20-300°C	TC1-1-300	441.816.104

IND	Double	
0-60°C /20-120°C	TC2-1-40/120	441.601.024
20-120°C /20-300°C	TC1-1-120/300	441.802.034

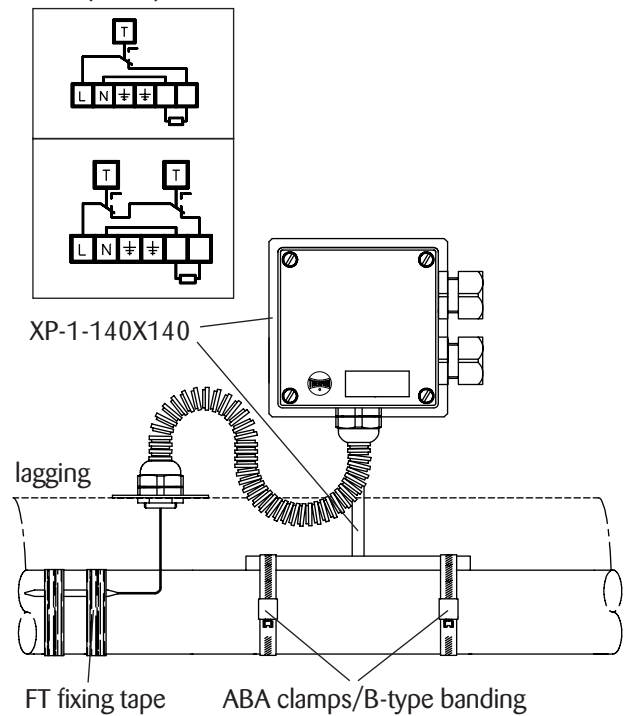
EEx ed	Single	
-20-50°C	TED1-1-50	440.020.104
0 -100°C	TED1-1-100	440.020.204
0 -200°C	TED1-1-200	440.020.304
50-300°C	TED1-1-300	440.020.404
20-300°C	TED1-1-R-300	400.200.045

**Accessories**

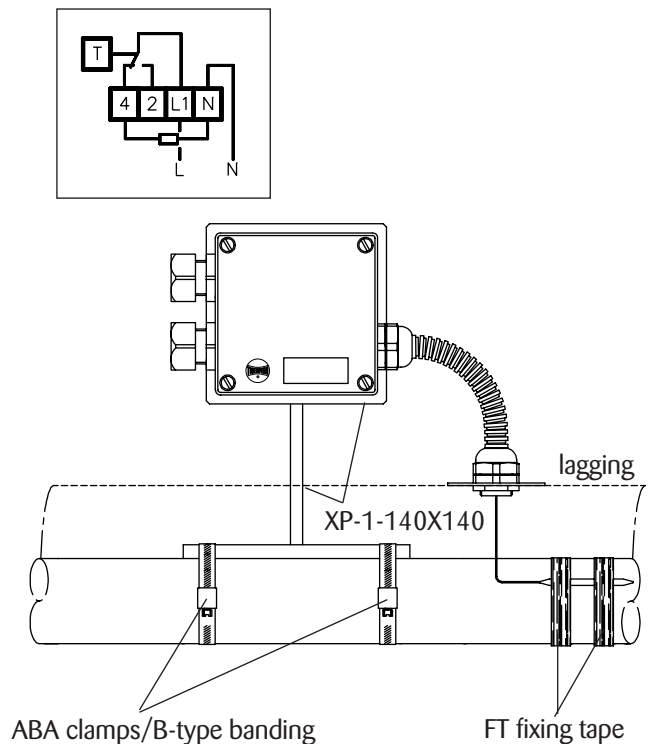
see page 22 and 24 for:

- Hazardous area junction box (with expediter and grommet)
- Hazardous area glands and blindplugs
- Hazardous area connector sets
- Non hazardous area junction box (with expediter and grommet)
- Non hazardous area glands and blindplugs
- Non hazardous area connector set
- Sealing washers
- Insulation Entry Kit
- Mounting material

**TC (IND)**



**TED1 (EEx ed)**



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# Installation of EEx d thermostats with mounting Bracket XP-1

**Thermostat**  
T1- ... - (R) - ...

**Controller range:**  
40 = 0 - 60°C  
120 = 20 - 120°C  
200 = 0 - 200°C  
300 = 50 - 300°C

**R = reset (optional, limiter)**  
(only 50 - 300°C)

**Switch contacts:**  
1 = 1-pole  
2 = 2-poles  
(only 0 - 200°C)

**1 = Controller**

**Thermostat T1**

max. load 16A

XP-1-...

lagging

ABA clamps/B-type banding

**Thermostat/limiter**  
T2 - ... - (R) - ... / ...

**Limiter range:**  
120 = 20 - 120°C  
300 = 50 - 300°C

**Controller range:**  
40 = 0 - 60°C  
120 = 20 - 120°C  
300 = 50 - 300°C

**R = reset (optional)**

**Switch contacts:**  
1 = 1-pole  
2 = Controller/limiter

**Thermostat T2**

max. load 16A

XP-1-185X230

lagging

ABA clamps/B-type banding

Selection mounting bracket	Art. no.:
Thermostat type T1-1	
XP-1 165x165 mm (no reset)	479.000.024
XP-1 185x230 mm (reset)	479.000.028
Thermostat type T1-2	
XP-1 155x220 mm	479.000.026
Thermostat type T2-1	
XP-1 185x230 mm	479.000.028

\* Reset optional.  
\*\* The bulb of the thermostat must be mounted to the pipe with FT fixing tape.  
\*\*\* The bulb of the limiter must be mounted on the heating cable.



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# Dimensions T1 and T2 (EEx d) thermostats

**1** Dimensions ambient and T1-1 thermostat.  
The thermostat is provided with 2 gland entries  
M20 x 1.5.

**T1-1**

<b>Accessories</b>	<b>Art. no.:</b>
<b>Flameproof glands and blindplugs for hazardous area</b>	
M20-PWR-Exd cable gland*	
Outer diameter (O.D.) 9.5-15.9 mm	453.204.001
M20-B-Exd blindplug*	454.204.001
Sealing washer SW-20	459.000.097

**2** Dimensions T1-2 thermostat.  
The thermostat is provided with 2 gland entries  
M20 x 1.5.

**T1-2**

<b>Accessories</b>	<b>Art. no.:</b>
<b>Flameproof glands and blindplugs for hazardous area</b>	
M20-PWR-Exd cable gland*	
Outer diameter (O.D.) 9.5-15.9 mm	453.204.001
M20-B-Exd blindplug*	454.204.001
Sealing washer SW-20	459.000.097

**3** Dimensions T2-1, T2-1-R and T2-2 thermostat.  
The thermostat is provided with 2 gland entries  
M20 x 1.5.

**T2-1/T2-1-R/T2-2**

<b>Accessories</b>	<b>Art. no.:</b>
<b>Flameproof glands and blindplugs for hazardous area</b>	
M20-PWR-Exd cable gland*	
Outer diameter (O.D.) 9.5-15.9 mm	453.204.001
M20-B-Exd blindplug*	454.204.001
Sealing washer SW-20	459.000.097

\* Before the glands or blindplugs are installed, the threads need to be greased (for example acid free vaseline or PCB grease). Moreover a sealing washer must be installed.



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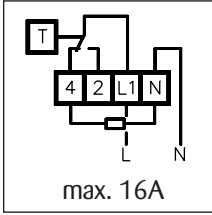
# Ambient thermostats (EEx ed/EEx d/IND)

The TED Ambient (EEx ed) thermostat must be installed at the coldest location (in the shadow).

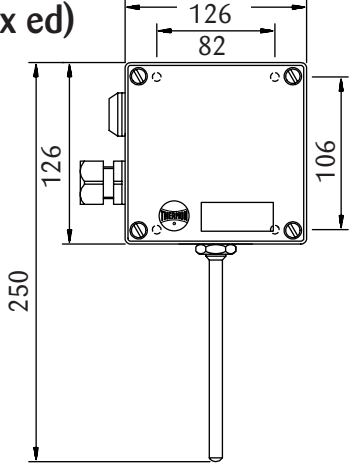
The thermostat is provided with two M25 entries including 1 blindplug and 1 cable gland.

Description	Art. no.:
EEx ed TED-1-ambient (-20/+50°C)	440.101.004

Accessories	Art. no.:
<b>Power cable glands for hazardous area</b>	
M25-HPT/PWR-Exe (8-17 mm)**	453.105.410
M25-PWRL-Exe (16-20,5 mm)*	453.028.600
* Sealing washer included	
** No sealing washer required	



max. 16A

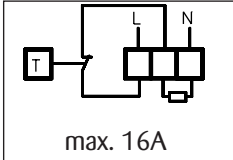


The T-Ambient (EEx d) thermostat must be installed at the coldest location (in the shadow). The thermostat is provided with two M25 entries excluding glands.

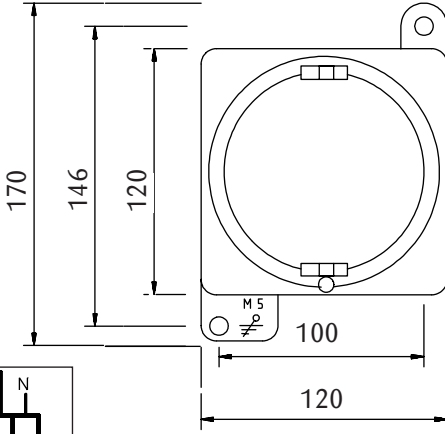
Description	Art. no.:
T-Ambient EEx d version (0/+40°C)	441.111.001

Accessories	Art. no.:
<b>Flameproof glands and blindplugs for hazardous area</b>	
M20-PWR-Exd cable gland*	
Outer diameter (O.D.) 9.5-15.9 mm	453.204.001
M20-B-Exd blindplug*	454.204.001
Sealing washer SW-20	459.000.097

\* Before the glands or blindplugs are installed, the threads need to be greased (for example acid free vaseline or PCB grease). Moreover a sealing washer must be installed.



max. 16A

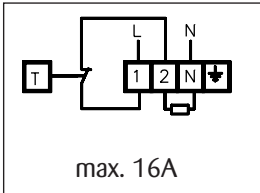


The IND ambient thermostat type TC must be installed at the coldest location (in the shadow).

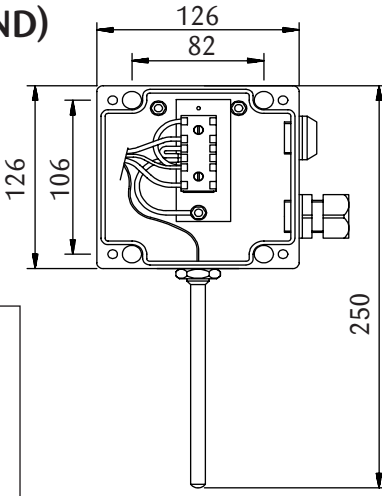
The thermostat is provided with with a M25-PWR-IND powergland and a M25-B-IND blindplug also 2 sealing washers are included.

Description	Art. no.:
TC-Ambient IND version (0/+40°C)	441.711.001

Accessories	Art. no.:
<b>Power cable glands for hazardous area</b>	
M25-PWR-IND (11-18 mm)*	453.105.410
* No sealing washer required	



max. 16A





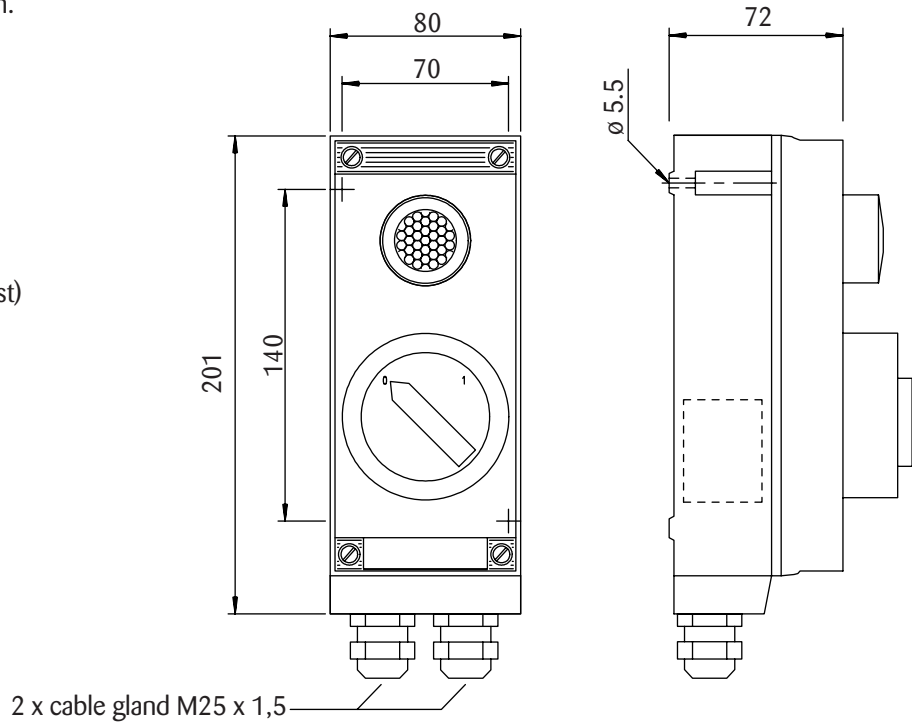
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# Circuit switches (EEx ed)

Max. cable size per terminal 4 mm<sup>2</sup>.  
 Switch padlockable in 0-position.  
 Lens colour red.  
 2-pole 230 Vac  
 Max. load 16 A

EEx edm Ilc T6  
 PTB no. Ex-93.C.1036  
**Art. no.:** 438.223.002

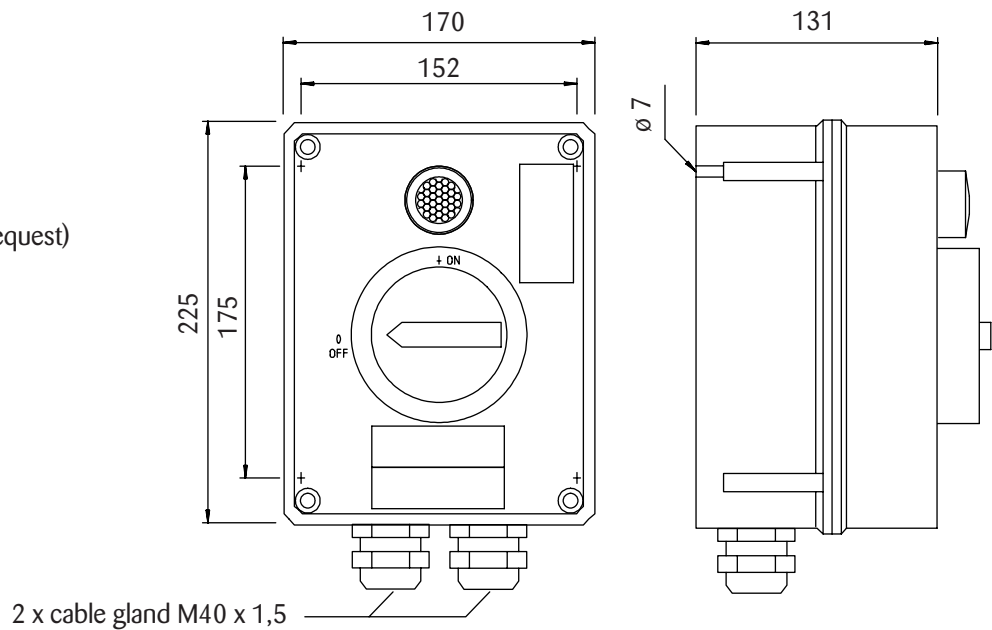
(Other types available on request)



Max. cable size per terminal 10 mm<sup>2</sup>.  
 Switch padlockable in 0-position.  
 Lens colour red.  
 2-pole 380 Vac  
 Max. load 16 A

EEx ed Ilc T6  
 PTB no. Ex-84/1019  
**Art. no.:** 438.223.004

(Other types available on request)



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Art. no.: 461.000.032  
(other types and languages available on request)



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INSTALLATION INSTRUCTIONS TESH/TES

# Installation on pipe work

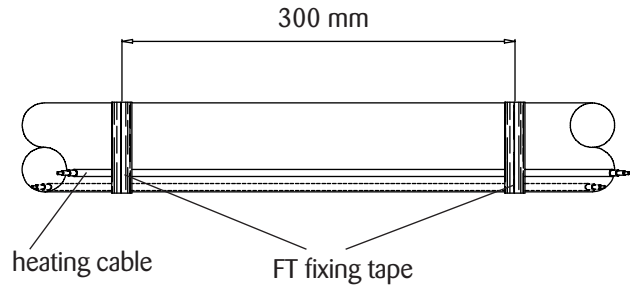
In principle the heating cable is mounted parallel to the pipe and fixed by means of fixing tape as shown on the sketch alongside. Only if prescribed in the design, the cable must be covered with aluminium tape.

**Description:**

FT-1L tape for max. 85°C  
 FT-1M tape for max. 200°C  
 FT-1H tape for max. 260°C

**Art. no.:**

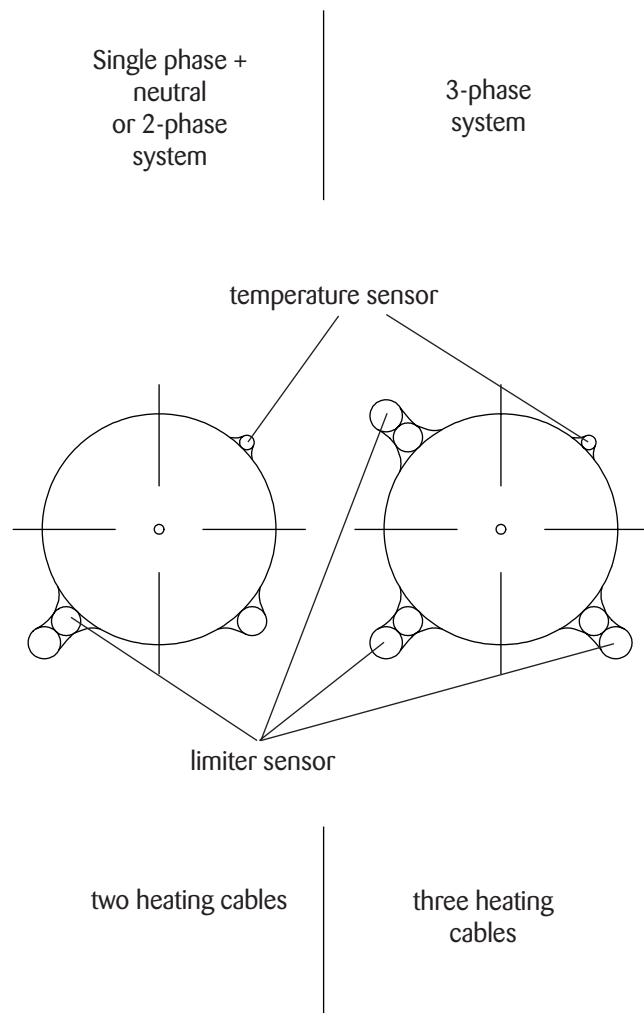
460.550.817  
 460.551.920  
 460.552.660



For applications with multiple passes of heating cables, we refer to the sketch alongside.

**Note:**

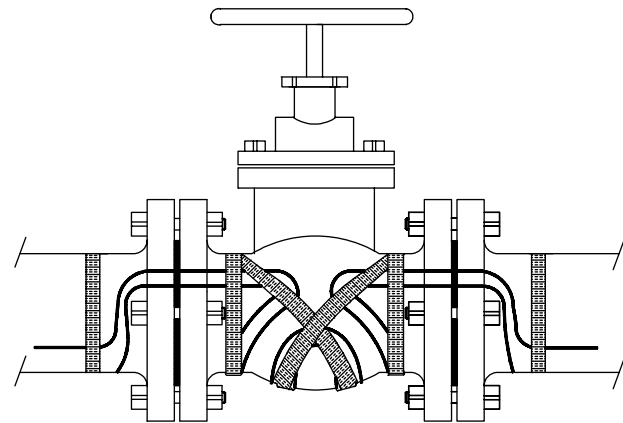
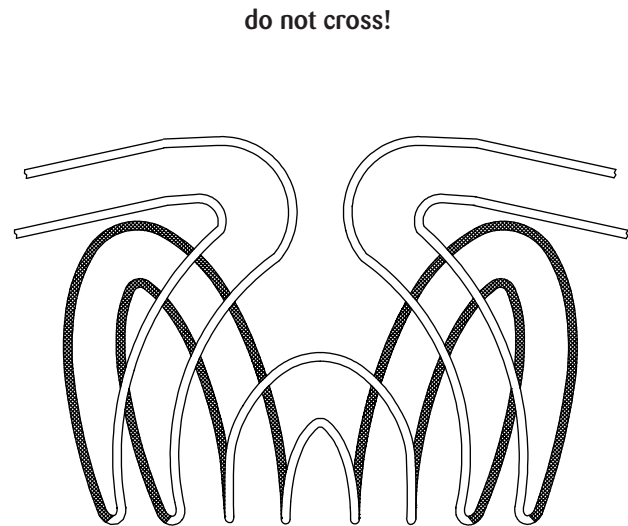
One limiter per heating cable connection in Ex area.  
 With a three phase system each heating cable must be supplied with a limiter, or in Ex area, with a combination of one limiter and a three phase current protection relay.



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# Installation on valves

TYPICAL CABLE ALLOWANCES PER VALVE * (single pass) in mm					
N O M I N A L	P I P E S I Z E	D N	S C R E W E D	F L A N G E D	B U T T E R F L Y
NPS					
	1/2"	12	150	300	--
	3/4"	20	220	450	--
	1"	25	300	600	300
	1 1/2"	40	450	600	450
	2"	50	600	750	600
	2 1/2"	65		900	750
	3"	80		1050	750
	4"	100		1500	900
	6"	150		2400	1050
	8"	200		3300	1200
	10"	250		4200	1350
	12"	300		5000	1500
	14"	350		5900	1650
	16"	400		6900	1800
	18"	450		8100	1950
	20"	500		9000	2100



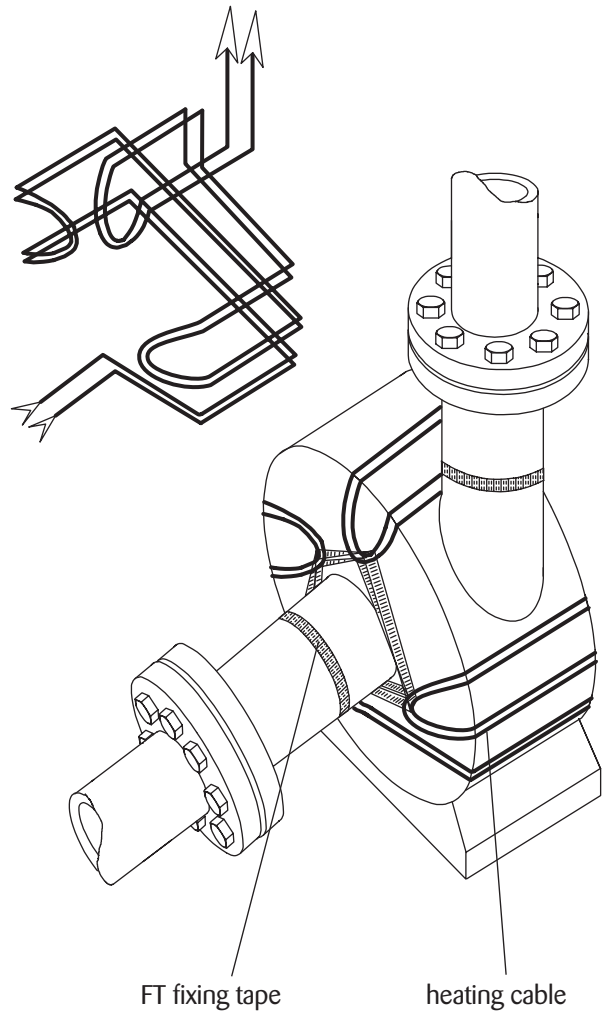
The heating cables should not touch or cross one another. When prescribed in design apply aluminium tape over the heating cable.  
Min. bending radius of the heating cable is 5 x cable diameter.



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# Installation on pumps

TYPICAL CABLE ALLOWANCES PER PUMP (per pass) in mm		
N O M I N A L	P I P E S I Z E	P U M P
NPS	DN	
1/2"	12	600
3/4"	20	900
1"	25	1200
1 1/2"	40	1200
2"	50	1500
2 1/2"	65	1800
3"	80	2100
4"	100	3000
6"	150	4800
8"	200	6600
10"	250	8400
12"	300	10000
14"	350	11800
16"	400	13800
18"	450	16200
20"	500	18000



The heating cables should not touch or cross one another. When prescribed in design apply aluminium tape over the heating cable.

Min. bending radius of the heating cable is 5 x cable diameter.

**Note:**

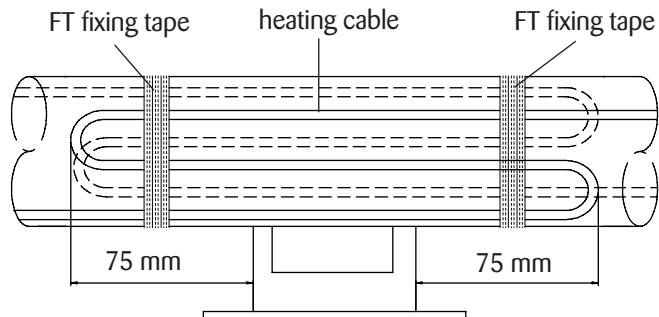
Apply additional tiewire/mounting tape in such way that heating cable makes close contact with the pump housing.



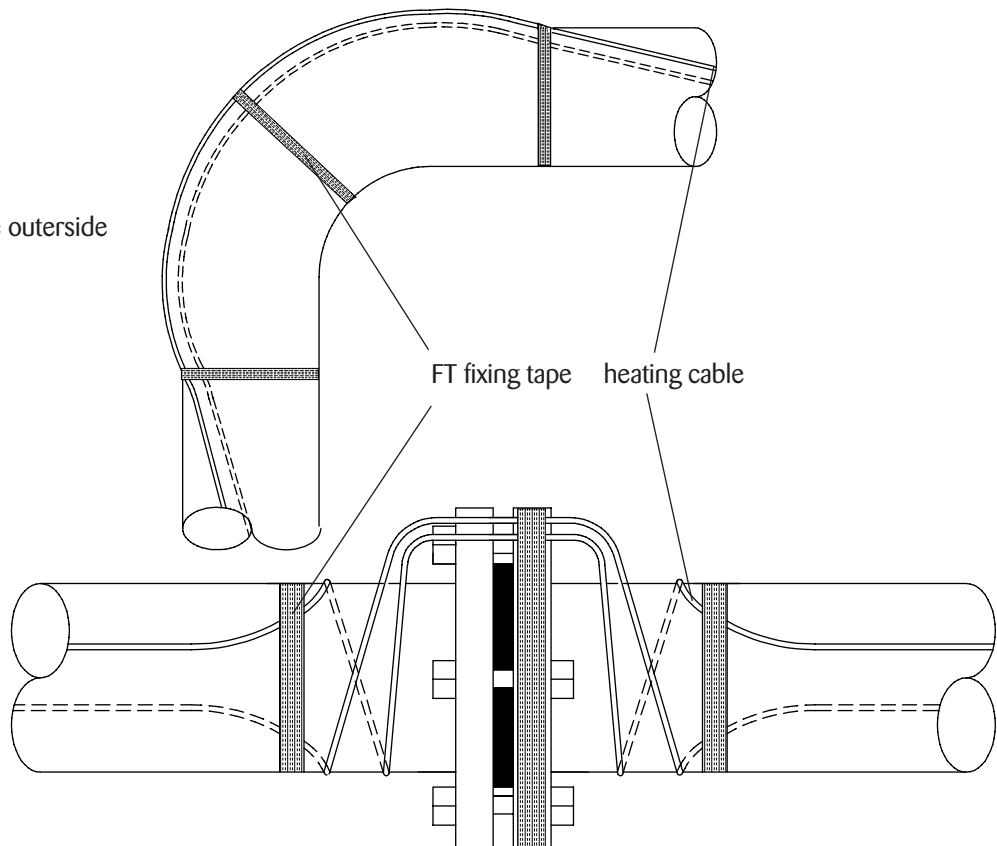
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# Installation on pipe supports (shoes) bends and flanges

For 2" lines and bigger



**Note:**  
Install the cables on the outside of the bend as shown.



The heating cables should not touch or cross one another.  
When prescribed in design apply aluminium tape over the heating cable.  
Min. bending radius of the heating cable is 5 x cable diameter.

**Note:**  
In each heating cable a loop must be made on the flange if the pipe diameter allows for this.

**Note:**

- In process temperature maintenance systems the pipe supports must be isolated from the pipes.
- In winterizing systems Therman highly recommends to isolate the pipe supports from the pipes



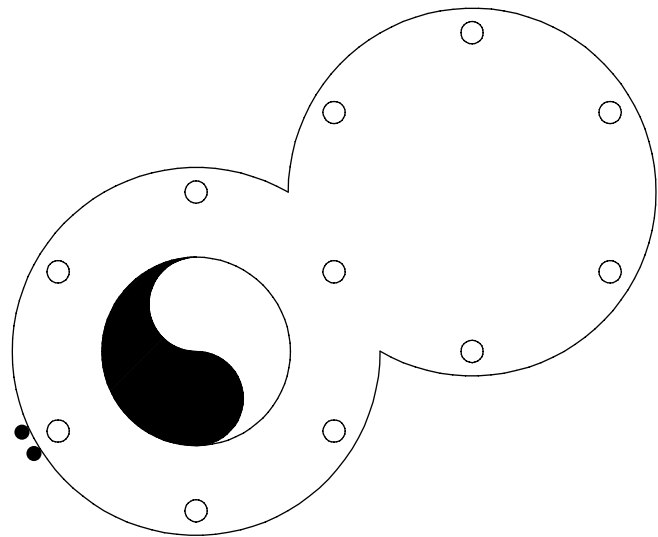
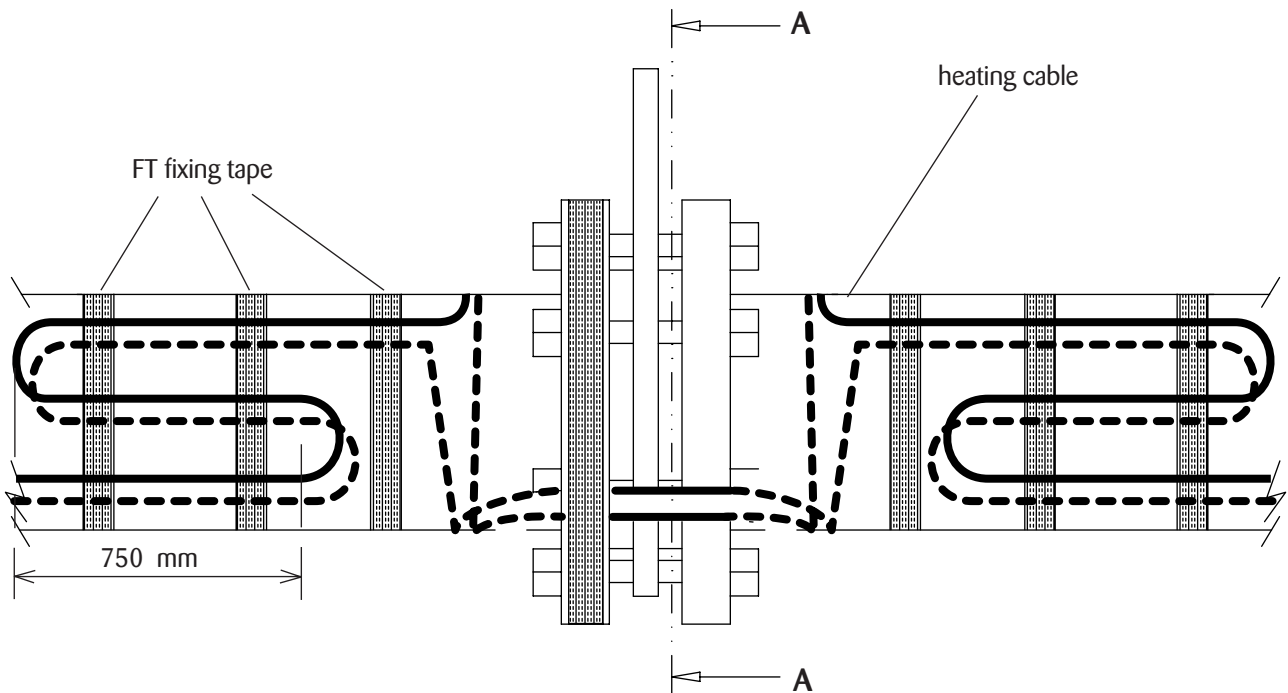
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INSTALLATION INSTRUCTIONS TESH/TES

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# Installation on spectacle blinds

For uninsulated spectacle blinds and lines bigger than 2"



Section A-A

The heating cables should not touch or cross one another.  
Apply aluminium tape over the heating cable (if applicable)  
Min. bending radius of the heating cable is 5 x cable diameter.

**Note:**

In each heating cable a loop must be made on the flange and, if the pipe diameter allows for this, also extra loops before and after the flange.

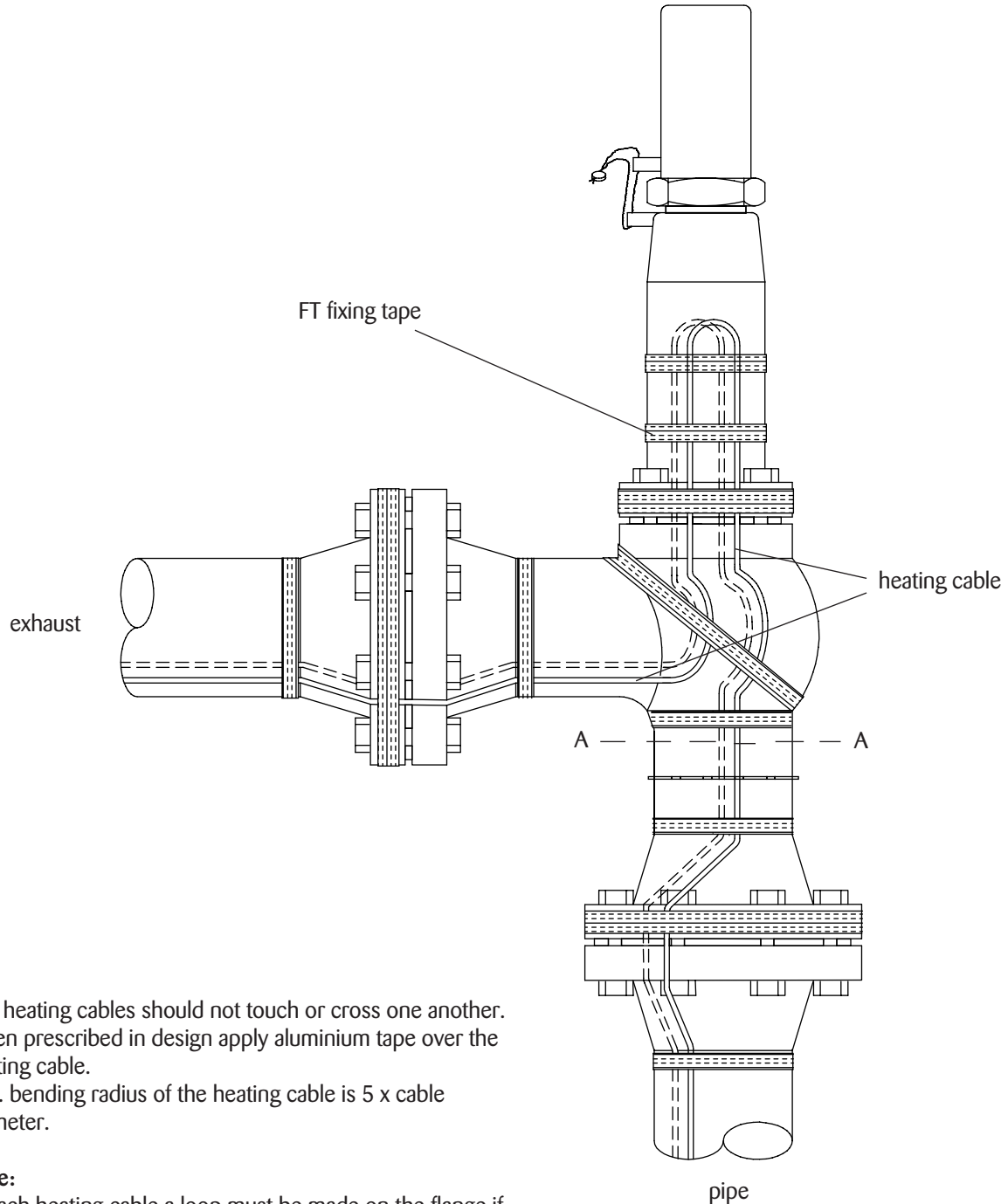


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# Installation on safety valves

## For lines bigger than 6"

(for cable length see valve allowances on page 37)



The heating cables should not touch or cross one another.  
When prescribed in design apply aluminium tape over the heating cable.  
Min. bending radius of the heating cable is 5 x cable diameter.

**Note:**

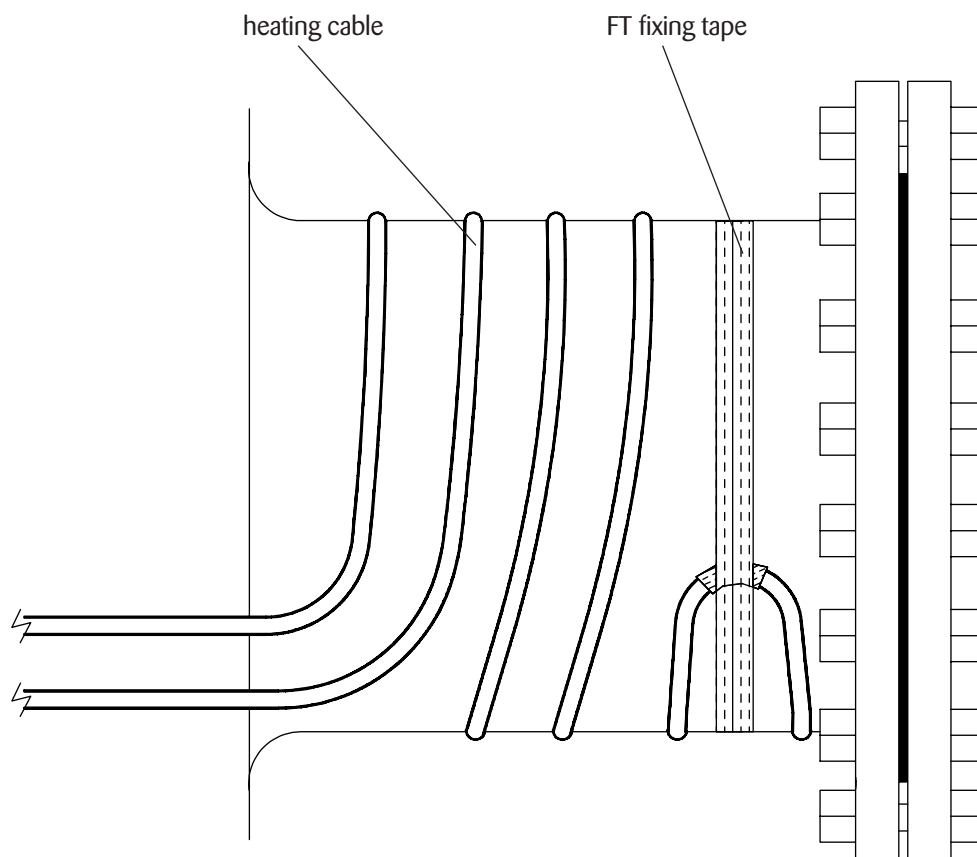
In each heating cable a loop must be made on the flange if the pipe diameter allows for this.  
In case of process heating, the valve and the piping upto section A - A to be traced as an individual circuit.



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INSTALLATION INSTRUCTIONS TESH/TES

# Installation on manholes



The heating cables should not touch or cross one another.  
When prescribed in design apply aluminium tape over the heating cable.  
Min. bending radius of the heating cable is 5 x cable diameter.

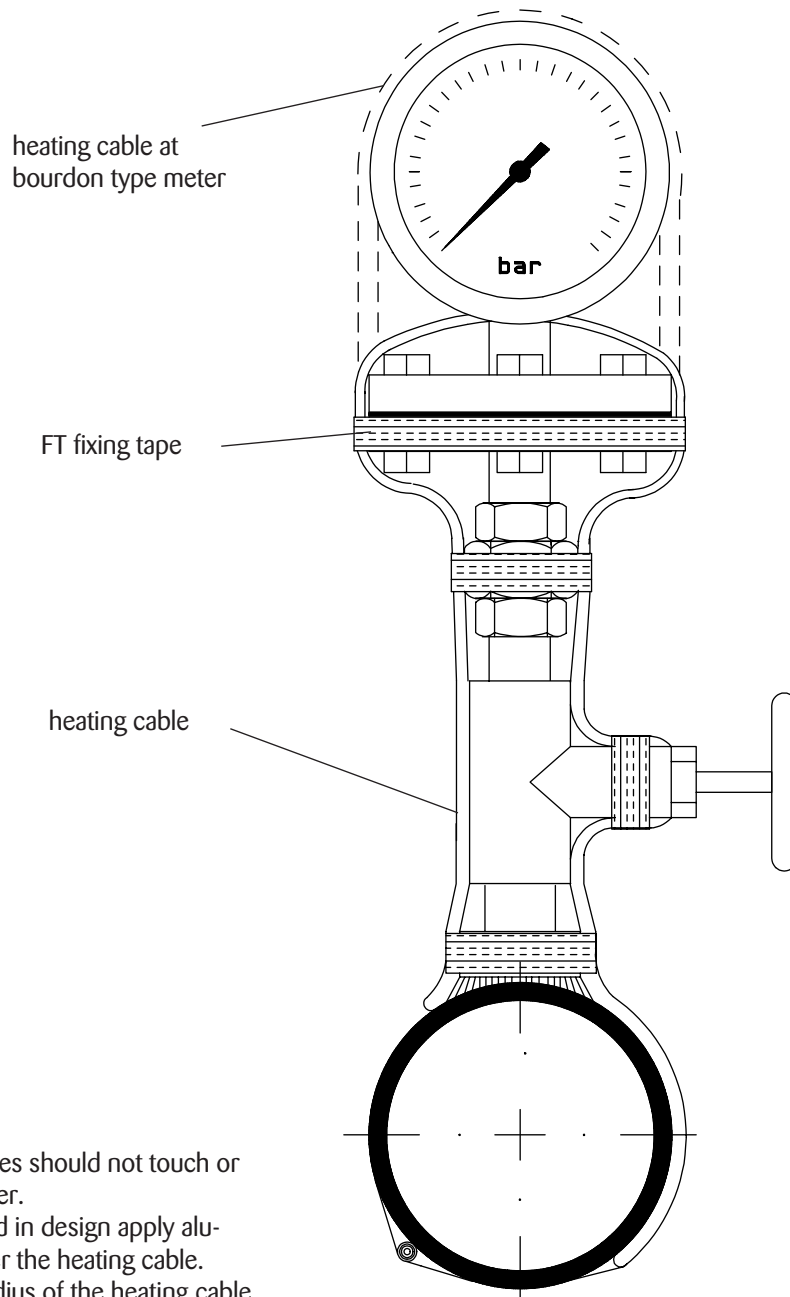
**Note:**

First mount the loop in the heating cable by means of tiewire/mounting tape as shown.  
No heating cable to be installed on the manhole cover.



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# Installation on pressure gauges (sealed type)



The heating cables should not touch or cross one another.  
When prescribed in design apply aluminium tape over the heating cable.  
Min. bending radius of the heating cable is 5 x cable diameter.

**Note:**

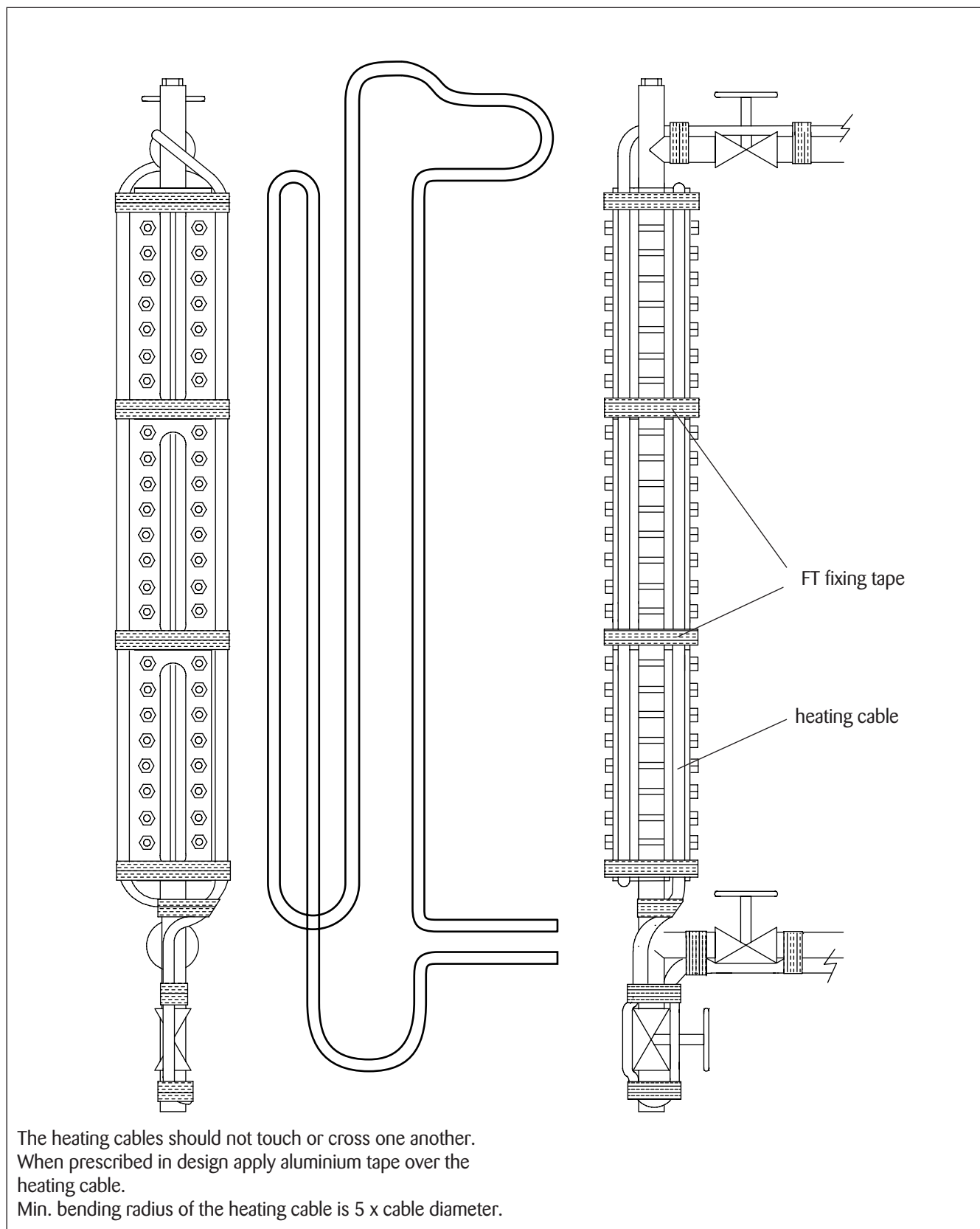
One heating cable is installed over the gauge, the other heating cable(s) continue(s) straight on.



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INSTALLATION INSTRUCTIONS TESH/TES

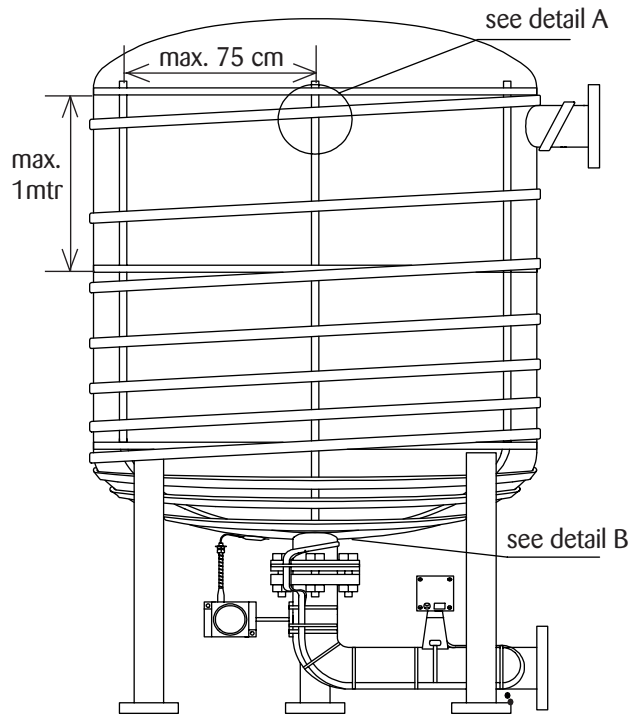
# Installation on level gauges



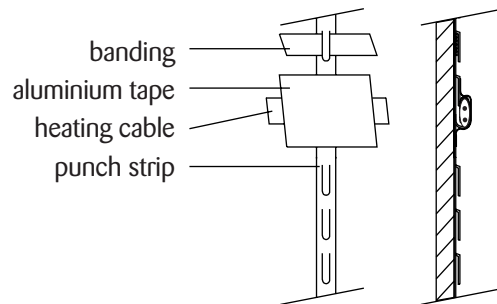
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# Installation on vessels or tanks

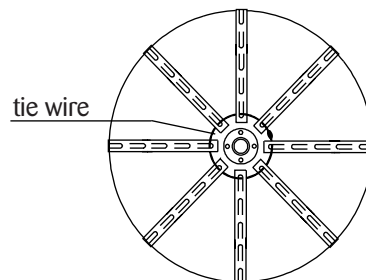
1. Mount banding (not too tight) at the upper side of the vessel or tank.
2. Push the required number of punch strips of sufficient length between the banding and the tank vessel wall. Hang up the punch strips to the banding. The open side of the lips in the punch strip must point downwards (see detail A). Space the punch strips equally over the circumference of the tank with a maximum spacing of 75 cm).
3. Tighten the upper banding.
4. Bend the punch strips to the middle of the tank bottom. Put a tie wire through the last slot of the punch strips. Twist the ends of the tie wire until the punch strips are tight against the wall and bottom (see detail B).
5. First mount a banding at the lower side of the tank and other bandings at a distance from each other of max. 1 meter.
6. Bend the lips of the punch strips upwards where heating cable will be installed.
7. Place the heating cable in the upwards bended lips (the lips are a support only and should not be tightened over the heating cable!!!).
8. Connect the heating/cold lead cables into the power supply box.
9. With a single phase + neutral or a two phase system, the heating cable must be laid out along the tank wall as a loop (so two heating cables parallel to each other).
10. With a three phase system, the end of the three cables must be connected to the endbox, where a star connection can be made.
11. The heating cable must be covered with aluminium tape.



Detail A



Detail B (without heating cable)



**Description:**

**Art. no.:**

SS punch strip	479.000.044
Aluminium tape	460.251.533
Banding	479.000.035
Banding seal	479.000.036

Tie wire is to be supplied by the electrical contractor.



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# Checklist page 1 of 4

<b>Part 1. Project information</b>						
Project name:						
Thermon Project no.:						
Customer:						
Customer reference no.:						
Electrical contractor:						
Contractor reference no.:						
Plant:				Unit:		
<b>Circuit information</b>						
Circuit no.:						
Tracing ISO no.:						
Line or equipment no.:						
In case of hazardous area:				Applicable T-class on site **: T-		
Stabilised design applied **: Y / N						
Line diameter **: NPS:				DN: mm		
Pipe/equipment material: Metallic / Coated / Non metallic						
<b>Part 2. After installation</b>						
<b>General checks:</b>						
Design documents are marked and approved for "as built" **: Y / N						
Tracing fully installed in accordance with design documents and free of damage, for incompliance and damage please note in "Remarks" on next page **: Y / N						
Tracing material installed in accordance with Thermon TESH/TES installation manual **: Y / N						
Location of junction boxes and thermostats in accordance with design documents **: Y / N						
Marking and tagging of heat tracing material complete **: Y / N						
<b>General checks, enclosures, terminations and junction boxes:</b>						
Circuit switch no. (if applicable):						
Junction box no(s).:		Main feeder 1.				
		2.				
		3.				
		4.				
Cable entries are either equipped with cable glands or blind plugs providing the appropriate degree of hazardous area or IP protection and have been tightened sufficiently:					Y / N	
Metallic glands connected to earth:						
All:			Circuit switch		Y / N	
- power connections fully terminated and connected to junction box terminals including earth connection(s):			Junction box(es)		1.	Y / N
					2.	Y / N
					3.	Y / N
					4.	Y / N
For 3 phase whye star connection box:			Temperature controller(s)			
- Terminals where 3 phase conductors are terminated are interconnected by jumper					1.	Y / N
					2.	Y / N
					3.	Y / N
- jumper tightened			Temperature limiter(s)		1.	Y / N
					2.	Y / N
					3.	Y / N
All components free of moisture and kept closed when not accessed:					Y / N	
<b>Heating cable:</b>						
	Type of tracing cable **: :	Total cable length **: :	Amount of cable passes **: :	Installation method **: :		
				With aluminium tape	Without aluminium tape	
1.		m				
2.		m				
3.		m				
Tracing cables provided mechanical protection for insulation cladding entry:					XP Plus / IEK-TES	
Tracing cable is fully terminated and connected to junction box terminals including braid connection(s):					Y / N	

\*\* All parameters need to be thoroughly checked with engineering design documents to ensure safety and functionality of stabilised design



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# Checklist page 2 of 4

<b>Temperature control (if applicable):</b>			
Type of temperature control:		TC 365c / FP16 / T1 / T2 / TED1 / TS-01 / TC1 / TC2	
For T1/T2/TED1/TS-01/TC1/TC2 temperature controllers only:		Range:	°C
Quantity:		1 / 2 / 3	
Temperature –sensor or –controller no(s):		1.	
		2.	
		3.	
Temperature controller sensor mounted on pipe			Y / N
Temperature controllers set at:		1.	°C
		2.	°C
		3.	°C
For T2, TC2 only: Temperature controller knob marked with "C"			Y / N
<b>Cable sheath temperature limitation control (if applicable):</b>			
For hazardous area applications where stabilised design (design without limiters) has <b>not</b> been applied, or systems where customer has explicitly asked for temperature limiters:			
Type of temperature limiter:		TC 365c / FP16 / T1 / T2 / TED1 / TS-01 / TC1 / TC2	
For T1/T2/TED1/TS-01/TC1/TC2 temperature limiters only:		Range:	°C
Quantity:		1 / 2 / 3	
Temperature limiter –sensor or –controller no(s):		1.	
		2.	
		3.	
Temperature limiter sensor(s) mounted on tracing cable			Y / N
Temperature limiters set at:		1.	°C
		2.	°C
		3.	°C
<b>Electrical tests (on main feeder junction box 1.):</b>			
Megger test with 1000 Vdc, result > 20 MΩ		Resistance test **	
Outgoing tracing cable	Reading	Outgoing tracing cable	
L1 or N to earth:	MΩ	L1 to N (or L2 *):	Ω
L2 to earth *:	MΩ	L2 to L3 *:	Ω
L3 to earth *:	MΩ	L3 to L1 *:	Ω
In case TS-01 or TC1/2 thermostats are used in the system disconnect them prior to meggering the heat tracing system. * in case of 3 phase whye circuit configuration			
<b>Remarks:</b>			
<b>Approval:</b>			
Checklist sequence number:			
Copies to:			
<b>Installer:</b>		<b>Installation Supervisor: APPROVED FOR INSULATION</b>	
Name:		Name:	
Company:		Company:	
Date:		Date:	
Signature:		Signature:	
		<b>CC field inspector:</b>	
Name:		Name:	
Company:		Company:	
Date:		Date:	
Signature:		Signature:	

\*\* All parameters need to be thoroughly checked with engineering design documents to ensure safety and functionality of stabilised design



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# Checklist page 3 of 4

Part 3. After thermal insulation and installation of cladding:			
<b>General checks:</b>			
Tracing circuit fully installed in accordance with design documents **:			Y / N
Tracing material installed in accordance with Thermon TESH/TES installation manual **:			Y / N
Mechanical cable protection for tracing cables insulation entry installed and mounted watertight to insulation cladding:			Y / N
Junction box and/or temperature controller/sensor insulation entries sealed off to the insulation cladding:			Y / N
Tracing caution labels mounted visible on insulation cladding:			Y / N
<b>Insulation data:</b>			
Insulation type **: _____			
Insulation thickness **: _____ mm		Insulation size (inner diameter) **: _____ mm	
<b>Check settings of temperature controllers / limiters (if applicable):</b>			
Temperature controllers set at:	1.	°C	Y / N
	2.	°C	Y / N
	3.	°C	Y / N
Temperature limiters set at:	1.	°C	Y / N
	2.	°C	Y / N
	3.	°C	Y / N
<b>Electrical tests (on main feeder junction box 1.):</b>			
Megger test with 1000 Vdc, result > 10 MΩ		Resistance test **	
Outgoing tracing cable	Reading	Outgoing tracing cable	
L1 or N to earth:	MΩ	L1 to N (or L2 *):	Ω
L2 to earth *:	MΩ	L2 to L3 *:	Ω
L3 to earth *:	MΩ	L3 to L1 *:	Ω
In case TS-01 or TC1/2 thermostats are used in the system disconnect them prior to meggering the heat tracing system. * in case of 3 phase whye circuit configuration			
<b>Remarks:</b>			
<b>Approval:</b>			
Checklist sequence number: _____			
Copies to:			
<b>Installer:</b>		<b>Installation Supervisor: APPROVED FOR INSULATION</b>	
Name: _____		Name: _____	
Company: _____		Company: _____	
Date: _____		Date: _____	
Signature: _____		Signature: _____	
		<b>CC field inspector:</b>	
		Name: _____	
		Company: _____	
		Date: _____	
		Signature: _____	

\*\* All parameters need to be thoroughly checked with engineering design documents to ensure safety and functionality of stabilised design



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# Checklist page 4 of 4

<b>Part 4. Final test:</b>			
<b>Electrical tests (on main feeder junction box 1.):</b>			
Megger test with 1000 Vdc, result > 10 MΩ		Resistance test **	
Outgoing tracing cable	Reading	Outgoing tracing cable	
L1 or N to earth:	MΩ	L1 to N (or L2 *):	Ω
L2 to earth *:	MΩ	L2 to L3 *:	Ω
L3 to earth *:	MΩ	L3 to L1 *:	Ω
* in case of 3 phase whye circuit configuration			
<b>Performance tests:</b>			
Prior to energising the circuit all above mentioned checks and the checks after installation and insulation are done:			Y / N
Power supply panel has been commissioned:			Y / N
All lids of junction boxes and temperature controller/sensor enclosures are closed:			Y / N
Ambient temperature (when measuring voltage and load/current):			°C
Line/equipment temperature (if plant is in operation):			°C
Voltage on main feeder junction box 1. **:		Outgoing tracing cable	Reading
		L1 to N (or L2 *):	V
		L2 to L3 *:	V
		L3 to L1 *:	V
Load measurement on main feeder junction box 1.:		Outgoing tracing cable	Reading
		No. 1:	A
		No. 2 *:	A
		No. 3 *:	A
* in case of 3 phase whye circuit configuration			
<b>Remarks:</b>			
<b>Approval:</b>			
Checklist sequence number:			
Copies to:			
<b>Installer:</b>		<b>Installation Supervisor: APPROVED FOR INSULATION</b>	
Name:		Name:	
Company:		Company:	
Date:		Date:	
Signature:		Signature:	
		<b>CC field inspector:</b>	
Name:		Name:	
Company:		Company:	
Date:		Date:	
Signature:		Signature:	

\*\* All parameters need to be thoroughly checked with engineering design documents to ensure safety and functionality of stabilised design



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