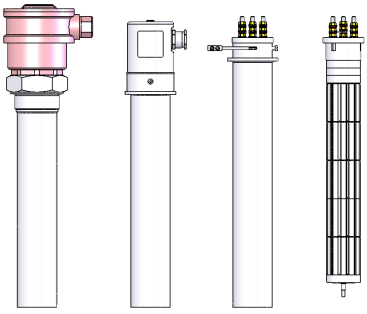
CALOR Cartridge Heaters

Installation instructions

E-MA 22/23 06.07/1



Please copy the following information from the model plate

PHK ▯▯ - ▯▯▯▯ / ▯▯▯ - ▯▯▯ / ▯▯▯ ▯▯ - ▯▯ - ▯▯ / ▯

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1. General information

These installation instructions form an integral part of the device and must be kept available throughout the service life of the device.

Supporting documents

Document	Content
Catalogue 1.3 CALOR Cartridge Heaters	Product description and technical data
Resistance list 0.2 (http://www.rotkappe.de or inquire to the manufacturer)	Recommended uses for materials in process media

1.1 Warnings

Warnings in this document are marked as follows:

 **DANGER**	Warning of immediate danger. Death, serious injury or serious damage will be the result of a failure to observe these warnings.
 **WARNING**	Warning of possible danger. Death, serious injury or serious damage is possible.
 **CAUTION**	Warning of possible dangerous situations. Minor injury or damage is possible.

1.2 Symbols in the instructions

✓ Requirements that must be satisfied.

⇨ Work to be carried out (one step).

1. The first step in work to be carried out.
   Consecutive steps are numbered in ascending order.

1.3 Warranty and repairs

If you wish to make a claim under the warranty or require repairs, return the cleaned and neutralised CALOR Cartridge Heater to the manufacturer postage paid with details of the defect.

2. General safety instructions

2.1 Proper usage

⚠ **DANGER**	**Danger of explosion and fire.** **Do not use the CALOR Cartridge Heater in inflammable or explosive media.** ⇨ If necessary, ask the manufacturer of the process medium for its specification.

CALOR Cartridge Heaters are designed for heating liquid and gas media directly.
They are only designed for commercial and industrial use.
Do not use them in inflammable or explosive media or in environments in which there is a risk of explosion.

Please note that the statements about installation and application in these installation instructions are not applicable if the scope of delivery does not include the immersion tube or terminal cover.
Please contact us for further information about special installation cases.

2.2 Safety instructions for the commissioning

- ⇨ Read the installation instructions carefully before the commissioning and follow the instructions contained therein.
- ⇨ Comply with the safety regulations for handling hazardous substances when dealing with such substances (hot, toxic or harmful).
- ⇨ You must comply with the accident prevention regulations, safety and operating regulations.
- ⇨ Comply with the relevant standards and directives.
- ⇨ Comply with the EMC directive for the entire system.
- ⇨ Comply with the limit values for the proper usage of the CALOR Cartridge Heater (see also 3.3).
- ⇨ Ensure that the operating personnel, surrounding area and process medium are safe at all times.

- ⇨ Ensure that the immersion tube material and process medium are tailored to each other.
- ⇨ Have the CALOR Cartridge Heater connected by a qualified electrician only.
- ⇨ Protect the CALOR Cartridge Heater with an overtemperature guard and for heating liquids, a run-dry protection.
- ⇨ Ensure that the operating personnel receive training and instruction in using the CALOR Cartridge Heater.
- ⇨ Document any changes and additions in this manual.
- ⇨ Keep this manual at the place of use of the CALOR Cartridge Heater.

2.3 Standards and directives

CE

The CALOR Cartridge Heater is an installation device with immersion tube and terminal casing comply with the following requirements:

- Low Voltage Directive 2014/35/EU
- EMC Directive 2014/30/EU
- Thermal safety class 1 with the additional installation of safety equipment (for example temperature limiter, temperature guard) in the tank
- DIN EN 50581 (RoHS)

Complementary safety instructions see page 45

3. Product description

3.1 Construction

The CALOR Cartridge Heater consists of the following:

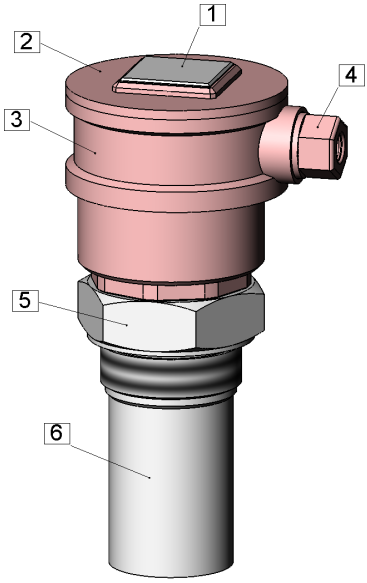
- Immersion tube (metallic)
- PHK heating element (ceramic)
- Terminal casing, without terminal housing necessary (see 3.1.2)

The terminal casing BK is made of polypropylene PP (red) or polyvinylidenefluoride PVDF (white).
Terminal casing B is made of galvanised steel.

The model part numbers and technical data will differ depending on the version (with or without installation device).

There are four different versions listed under the points 3.1.1 to 3.1.3.

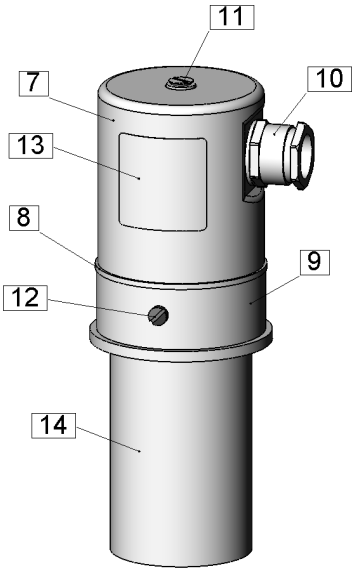
3.1.1 CALOR Cartridge Heater with immersion tube and terminal casing WG 22



B-0101 MA

1 Model plate with wrench area for universal wrench US
2 Terminal casing BK cover
3 Terminal casing BK
4 Compression nut for cable seal
5 Version-dependent installation device*
6 Immersion tube

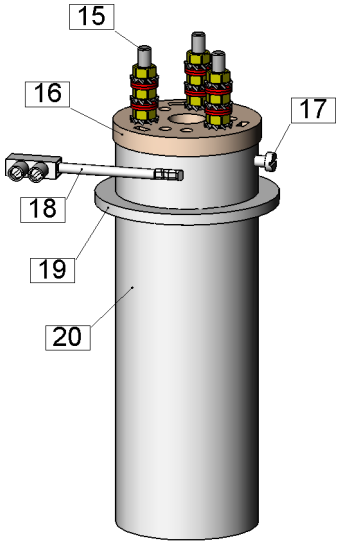
*Depending on version with threaded nipple, screw or weld flange or without installation devices.



B-0102 MA

7 Terminal casing B
8 Sealing ring
9 PHK immersion tube flange
10 Cable gland
11 Fixing screw for terminal casing B
12 Locking screw for PHK heating element
13 Model plate
14 Immersion tube

3.1.2 CALOR Cartridge Heater with immersion tube without terminal casing WG 22

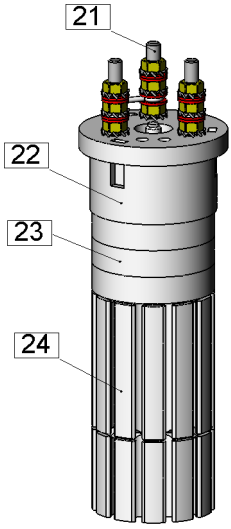


B-0103 MA

15 Connection bolts (with nuts, washers and fan washers)
16 Connection head PHK heating element
17 Locking screw for PHK heating element
18 Earthing wire with Euro terminal
19 Version-dependent installation device*
20 Immersion tube

*Depending on version with threaded nipple, screw or weld flange or without installation devices.

3.1.3 CALOR Cartridge heating element WG 23



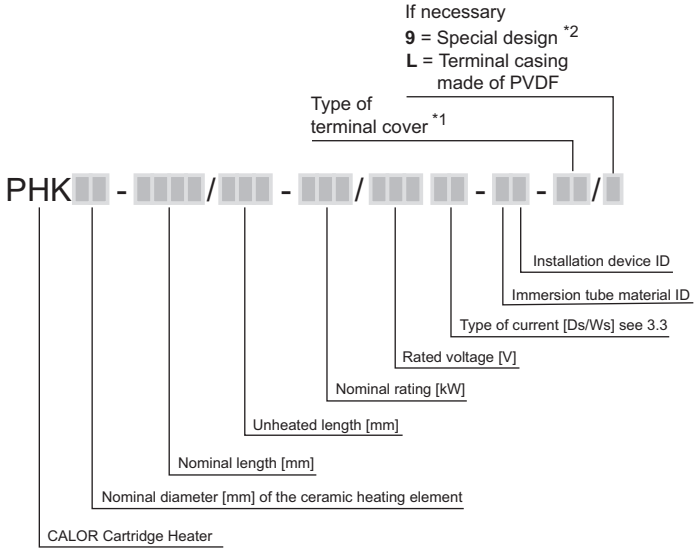
B-0104 MA

21 Connection bolts (with nuts, washers and fan washers)
22 Connection head PHK heating element
23 Locking plate (unheated)
24 Heater

3.2 Model plate

The model plate contains all the main data relating to the CALOR Cartridge Heater. The model part number provides information on the specification.

CALOR Cartridge Heaters



*1 Terminal casing BK, B or without terminal cover OA

*2 Acc. drawing specifications

Other information on the model plate:

Nominal rating **P=**	[W]
Rated voltage **U=**	[V]
Part number	10-figure
Device number	6-figure
Protection	Symbol

3.2.1 Specification of the immersion tube materials

Code letter	Metallic material	Nominal length [mm]	Tube diameter [mm]
S	Steel St 34-2 (material no. 1.0037)	200 - 6000	45/48,3/52
K	Stainless steel (material no. ASTM 316Ti)		45/52
KS	Corrosion-resistant special alloy		45
T	Titanium (material no. ASTM Grade 2)		45

3.3 Technical data

• **Terminal casing BK**	Material: PVDF (white), PP (red) Protection: splash-proof IP64 (EN60528)
• **Terminal casing B**	Material: Galvanised steel Protection: splash-proof IP64 (EN60528)
• **Without terminal casing OA**	no protection class
• **Earth protection**	
all metallic immersion tubes	Protective earth terminal
• **Nominal immersion tube length**	200 - 6000 mm
• **Max. thermal load, immersion tube**	Variable, depending on heated length, rating, immersion tube diameter and immersion tube material (see catalogue 1.3) Max. 4.5 W/cm^2
• **Ambient temperature**	
Terminal casing BK	-20 ... 80 °C
Terminal casing B	-20 ... 100 °C
• **Nominal rating** See model plate figure	P = ... [kW]
• **Rated voltage** See model plate figure	U = ... [V] max. 600 V
• **Type of current** See model plate figure	Ws = 1~/2~ Ds = 3~

4. Installation

- ✓ Immersion tube material is chemically, mechanically and thermally resistant to the fluid to be heated.
- ✓ Visual inspection of the immersion tube shows no signs of damage.

The CALOR Cartridge Heater can be installed with supports or with weld flange, screw flange or threaded nipple installation devices.
The preferred installation position is horizontal.

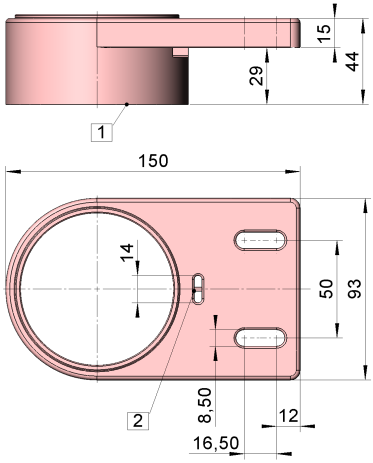
4.1 Installation devices

HB and SHB/HM supports are available ensuring safe and secure fixing with the immersion tube and terminal casing BK in vertical position.

See relevant drawings for fixing dimensions (see 4.1.1 and 4.1.2).

Use the universal wrench US, which is available as an accessory, to secure the terminal casing cover BK and the compression nut for the cable seal.

4.1.1 Support HB

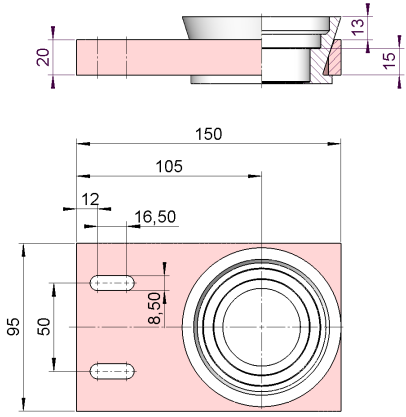


1 Bottom edge of terminal casing BK

2 Opening for cable tie to secure the terminal casing BK

Support HB for CALOR Cartridge Heater with a nominal immersion tube length up to 800 mm and terminal casing BK.

4.1.2 Support SHB/HM



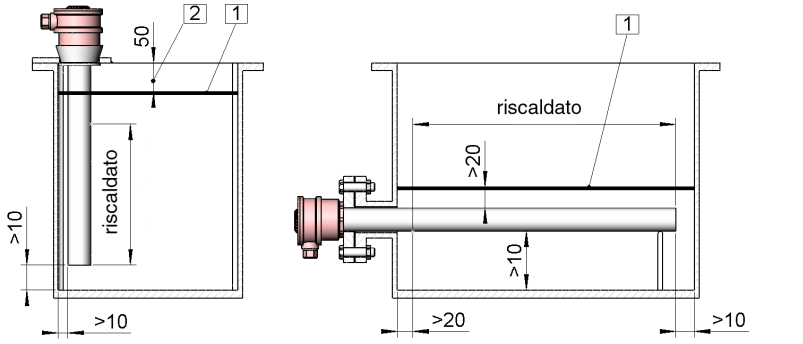
B-0106 MA

Support SHB/HM for CALOR Cartridge Heater with a nominal immersion tube length between 800 mm to max. 2500 mm and terminal casing BK.

4.2 To install the CALOR Cartridge Heater

 **DANGER**	**Danger of burns!** **Hot tank parts, the heated immersion tube or escaping process medium may cause serious burns.** ⇨ Install the CALOR Cartridge Heater in such a way that the immersion tube is a minimum of 10 mm away from heat-sensitive material and surfaces. **Danger of short circuit!** **Overheating or moisture in the terminal casing may cause a short circuit!** ⇨ When vertically installing the CALOR Cartridge Heater, ensure that the minimum heated length of the fluid level is maintained. ⇨ When horizontally installing the CALOR Cartridge Heater, ensure that the surface of the immersion tube is covered by min. 20 mm of fluid. ⇨ Install the CALOR Cartridge Heater in such a way that the maximum immersion depth of the immersion tube is not exceeded. The maximum immersion depth is 50 mm between the bottom of the terminal casing and the level of the fluid.

The CALOR Cartridge Heater can be installed vertically or horizontally. When installed vertically, the terminal casing must be at the top and the unheated length (see model plate) must be greater than the distance between the terminal casing and minimum fill level.



1 Fluid level.

2 Max. immersion depth = 50 mm below the terminal casing.

4.3 Mounting methods on the edge of the tank

✓ Version with immersion tube and terminal casing BK pre-installed.

4.3.1 To install CALOR Cartridge Heater with support HB or SHB/HM

1. Drill the holes for securing it to the edge of the tank as shown in the drawing (see point 4.1.1, 4.1.2).
2. Secure the support to the edge of the tank.
3. Insert the CALOR Cartridge Heater into the support.
4. Secure the terminal casing to the support HB using a cable tie if necessary.

4.4 Mounting method through tank wall

✓ Version with immersion tube and installation device pre-installed.

✓ Horizontal installation position below the minimum fill level.

4.4.1 To install CALOR Cartridge Heater with installation devices

Installation devices such as flanges or threaded nipples can be supplied to suit the needs of specific customers. The following installation devices are available:

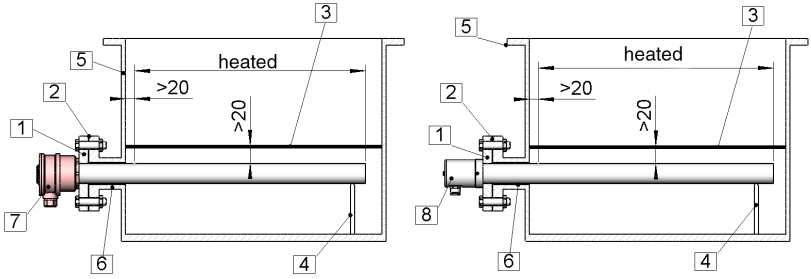
- Weld flange
- Screw flange
- Threaded nipple

The installation device is welded to the immersion tube and available in the following immersion tube materials:

- Steel S
- Stainless steel K
- Corrosion-resistant special alloy KS
- Titanium T

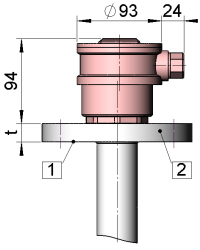
DANGER	**Danger of leakage!** **Incorrect installation or incorrect design may result in the process medium leaking.** ⇨ Have the installation work carried out by a qualified professional. ⇨ Ensure that an operating pressure of > 0.5 bar is not permitted to act on the devices, installation devices or seals. ⇨ Ensure that all the materials that come into contact with the process medium are chemically and thermally resistant to it. ⇨ Install the CALOR Cartridge Heaters in such a way that the heated immersion tube is always fully immersed in the process fluid. ⇨ Ensure that no process fluid is present or can escape during the installation work.

4.4.1.1 To install CALOR Cartridge Heater with screw flange and terminal casing



B-0108 MA

1 Screw flange
2 Flat seal
3 Min. fluid level
4 Support for immersion tube
5 Tank wall
6 Port with counter flange
7 Terminal casing BK
8 Terminal casing B



B-0109 MA

1 Sealing surface
2 Screw flange

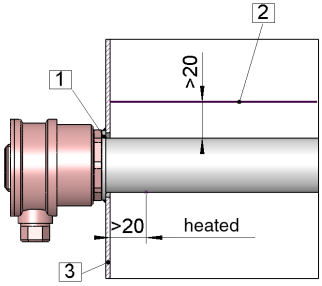
✓ Counter flange suitable for the installation with port on the tank.
✓ Heated length of the immersion tube must be outside the flange tube and be well irrigate by fluid.
✓ Thermally and chemically resistant flat seal available to seal the flange.

Installation

✓ CALOR Cartridge Heater is off circuit.

1. Fit the flat seal to the immersion tube.
2. Slide the CALOR Cartridge Heater into the tank up to the counter flange and position the flat seal.
3. Align the immersion tube you wish to secure and ensure that the screw flange and flat seal are precisely positioned.
4. Provide a support point at the end of the immersion tube if the nominal immersion tube length is sufficiently large relative to the tank wall thickness and tank static details (see Fig. B-0108 MA). Support the immersion tube if it is expected to sag. Use only materials of the same type. Ensure that the immersion tube can move freely as it expands in the heat and prevent any hindrance to the heat dissipation from the immersion tube casing surface into the fluid.
5. Place the securing screws through the holes in the screw flange and tighten the lock nuts crossways after fitting the washers.
6. Check that the tube is secure and conduct a seal test.
7. Install the connection cable (see point 5.1.1, 5.1.2).

4.4.1.2 To install CALOR Cartridge Heater with weld flange and terminal casing BK



B-0110 MA

1 Weld flange

2 Min. fluid level

3 Tank wall

✓ A hole with a diameter of 55-60 mm must be drilled in the metallic tank wall for horizontal installation.

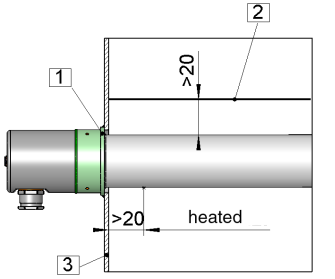
✓ Immersion tube and tank wall material are identical.

✓ CALOR Cartridge Heater is off circuit.

1. Open the terminal casing by turning the terminal casing cover anti-clockwise using the universal wrench US.
2. Open the threaded ring using universal wrench US.
3. Remove the pressure ring.
4. Use a ring wrench SW8 to loosen the earthing wire on the connection bolt.
5. Pull the PHK heating element out of the terminal casing and the immersion tube.
6. Use a screwdriver to remove the three slot screws in the flange.
7. Remove the terminal casing with flange and the O-ring beneath.
8. Push the immersion tube through the tank wall up to the end of the weld flange.

9. Align the immersion tube you wish to weld and ensure that the weld flange is in the centre.
10. Provide a support point at the end of the immersion tube if the nominal immersion tube length is sufficiently large relative to the tank wall thickness and tank static details (see Fig. B-0108 MA). Support the immersion tube if it is expected to sag. Use only materials of the same type. Ensure that the immersion tube can move freely as it expands in the heat and prevent any hindrance to the heat dissipation from the immersion tube casing surface into the fluid.
11. Attach welding tacks to secure the weld flange.
12. Make the weld over the entire circumference between the exterior wall of the tank and the weld flange using a suitable welding method as shown in Fig. B-0110 MA.
13. Conduct a seal test after the weld has cooled.
14. Assemble the CALOR Cartridge Heater following the above disassembly instructions in reverse (7 to 1).
15. Install the connection cable (see point 5.1.1).

4.4.1.3 To install CALOR Cartridge Heater with weld flange and terminal casing B



B-0111 MA

1 Weld flange

2 Min. fluid level

3 Tank wall

✓ A hole with a diameter of 55-60 mm must be drilled in the metallic tank wall for horizontal installation.

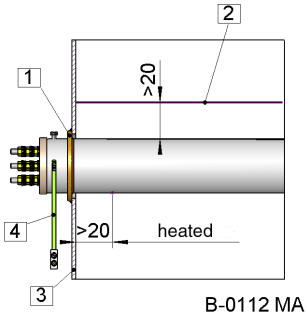
✓ CALOR Cartridge Heater is off circuit.

1. Use a screwdriver to remove the fixing screw incl. the seal on the top of the terminal casing B (see Fig. B-0102 MA).
2. Remove the terminal casing B. The electrical connection between earthing and terminal casing B remains intact.
3. Use a screwdriver to remove the locking screws.
4. Pull the PHK heating element out of the immersion tube.
5. Push the immersion tube through the tank wall up to the end of the weld flange.
6. Align the immersion tube you wish to weld and ensure that the weld flange is in the centre.
7. Provide a support point at the end of the immersion tube if the nominal immersion tube length is sufficiently large relative to the tank wall thickness and tank static details (see Fig. B-0108 MA). Support the immersion tube if it is expected to sag. Use only

materials of the same type. Ensure that the immersion tube can move freely as it expands in the heat and prevent any hindrance to the heat dissipation from the immersion tube casing surface into the fluid.

8. Protect the terminal casing B against thermal damage.
9. Attach welding tacks to secure the weld flange.
10. Make the weld over the entire circumference between the exterior wall of the tank and the weld flange using a suitable welding method as shown in Fig. B-0110 MA.
11. Conduct a seal test after the weld has cooled.
12. Assemble the CALOR Cartridge Heater following the above disassembly instructions in reverse (4 to 1).
13. Install the connection cable (see point 5.1.2).

4.4.1.4 To install CALOR Cartridge Heater with weld flange and without terminal casing B



1 Weld flange

2 Min. fluid level

3 Tank wall

4 Earthing wire

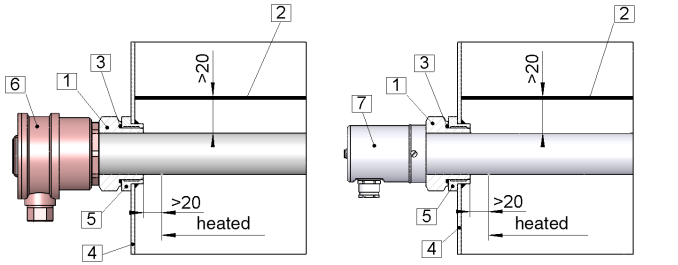
✓ A hole with a diameter of 55-60 mm must be drilled in the metallic tank wall for horizontal installation.

✓ CALOR Cartridge Heater is off circuit.

1. Use a screwdriver to remove the locking screws (see Fig. B-0103 MA).
2. Pull the PHK insert out of the immersion tube.
3. Push the immersion tube through the tank wall up to the end of the weld flange.
4. Align the immersion tube you wish to weld and ensure that the weld flange is in the centre.
5. Provide a support point at the end of the immersion tube if the nominal immersion tube length is sufficiently large relative to the tank wall thickness and tank static details (see Fig. B-0108 MA). Support the immersion tube if it is expected to sag. Use only materials of the same type. Ensure that the immersion tube can move freely as it expands in the heat and prevent any hindrance to the heat dissipation from the immersion tube casing surface into the fluid.

6. Attach welding tacks to secure the weld flange.
7. Make the weld over the entire circumference between the exterior wall of the tank and the weld flange using a suitable welding method as shown in Fig. B-0110 MA.
8. Conduct a seal test after the weld has cooled.
9. Assemble the CALOR Cartridge Heater following the above disassembly instructions in reverse (2 to 1).
10. Install the connection cable (see point 5.1.3).
11. Provide a permanent connection to the earthing connection with the immersion tube/earthing wire.
12. Provide a suitable terminal cover to protect against contact and if necessary, dust and moisture.

4.4.1.5 To install CALOR Cartridge Heater with threaded nipple and terminal casing



B-0113 MA

1 Threaded nipple
2 Min. fluid level
3 FPM seal
4 Tank wall
5 Threaded port
6 Terminal casing BK
7 Terminal casing B

- ✓ Threaded port with sealing surface in the tank suitable for horizontal installation.
- ✓ Heated length of the immersion tube must be outside the threaded port and be well irrigated by fluid.
- ✓ Immersion tube material and material for the threaded port identical.
- ✓ CALOR Cartridge Heater is off circuit.

1. Slide the immersion tube through the threaded port into the tank and screw the threaded nipple into the port.
2. Check that the FPM U-shaped ring is positioned precisely between the chamber, threaded nipple and sealing surface on the front of the threaded port.
3. Tighten the threaded nipple using a 70 mm ring wrench.

4. Provide a support point at the end of the immersion tube if the nominal immersion tube length is sufficiently large relative to the tank wall thickness and tank static details (see Fig. B-0108 MA). Support the immersion tube if it is expected to sag. Use only materials of the same type. Ensure that the immersion tube can move freely as it expands in the heat and prevent any hindrance to the heat dissipation from the immersion tube casing surface into the fluid.
5. Conduct a seal test.
6. Install the connection cable (see point 5.1.1 and 5.1.2).

4.5 To install the CALOR Cartridge Heater heating element

- ✓ The heating element is suitable for horizontal installation.
- ✓ Use a heating element specially designed for vertical installation.
- ✓ Earthing on metallic immersion tube available.
- ✓ Protection against contact with live parts (connection method, heating coil) and if necessary, dust and moisture is available.
- ✓ A precision fitting holder for the heating element is available for installing a suitable immersion tube.
- ✓ Immersion tube is residue-free (oil, swarf or other contamination).
- ✓ Inside diameter of the thermally resistant immersion tube is at least the nominal diameter of the PHK heating element or maximum 3 mm larger.
- ✓ Length of the immersion tube is greater than the nominal length of the heating element plus necessary space for thermal expansion.
- ✓ Heating element is off circuit.

1. Slide the heating element into the metallic immersion tube completely.
2. Using a suitable locking mechanism, secure the heating element to cutouts on the connection head.
3. Install the connection cable (see point 5.1.3).
4. Provide a permanent connection to the earthing connection with the immersion tube.
5. Provide a suitable terminal cover to protect against contact and if necessary, dust and moisture.

Note:
Please note that the statements about installation and application in these installation instructions are not applicable if the scope of delivery does not include the immersion tube or terminal cover.

5. Electrical connection

Type of current	Number of phases	Connection diagram	Cable colours Connection cable (DIN VDE 0293-308)
Alternating current (AC)	Single-phase	L1 | N | PE	brown | blue | green/yellow
	Two-phase	L1 | L2 | PE	brown | blue | green/yellow
Three-phase current	Three-phase	L1 | L2 | L3 | PE	brown | grey | black | green/yellow

The following connection methods are possible:

- CALOR Cartridge Heater without cable for connecting to flexible cable with cable lugs.

Colour code for sealing insert	Designed for cable diameter [mm]
black	6,5 - 9,5
green	7,0 - 10,5
red	9,0 - 13,0

5.1 To connect the device

Check the following points before you start:

- ✓ The rated voltage of the CALOR Cartridge Heater is the same as the mains voltage.
- ✓ Immersion tube material is chemically, mechanically and thermally resistant to the fluid to be heated.
- ✓ Visual inspection of the immersion tube shows no signs of cracking or damage.
- ✓ Connection cable thermally, chemically and mechanically resistant to environmental influences.

DANGER	**Danger of electric shock!** **Damaged cables or incorrect connection may result in high voltage in the process medium.** ⇨ Install the CALOR Cartridge Heater in such a way that the immer-sion tube is a minimum of 10 mm away from heat-sensitive material and surfaces. ⇨ Ensure that the connection cable is not stressed (see also DIN EN 50110-2). ⇨ As protection, use a RCCB with a trip current of 30 mA, EN 61008-1/2-1. ⇨ Protect a maximum of 12 devices or max. 40 kW with a single RCCB. **The ingress of moisture into the terminal casing BK or B may make the terminal casing or cables live.** ⇨ Protect a terminal casing BK made of PP (red) from strongly oxidising fluids (for example chromic acid, HNO_3, H_2O_2) or use CALOR Cartridge Heaters with terminal casings made of PFDF (white).

CAUTION	**Danger of overheating!** **Inadequate heat dissipation or reduced immersion depth of the immersion tube may result in the CALOR Cartridge Heater or heat-sensitive tank parts, etc. being damaged.** ⇨ Comply with the minimum and maximum immersion depths of the immersion tube. ⇨ Clean deposits off the immersion tube at regular intervals. ⇨ Install protection devices in process media that tend to form sludge (for example a conductor plate). ⇨ Avoid conditions of use which negatively affect the heat dissipation of the immersion tube.

5.1.1 To connect connection cable on CALOR Cartridge Heater with terminal casing BK

1. Open the cover on the terminal casing by turning the terminal casing cover anti-clockwise using the universal wrench US.
2. Insert the cable through the compression nut and seal.
3. Connect the various wires in the cable separately with cable lugs to the connection bolts. Pay attention to thermal stability. Provide an all-pole disconnect with an insulating distance of at least 3 mm.
4. The connection bolts identified by the earthing symbol or the green/yellow wire must be used to connect the earthing connection.
5. Secure the cable with a strain-relief clamp inside the terminal casing.
6. Tighten the compression nut for the cable seal securely using universal wrench US. Ensure that the sealing insert is tight and that there are no gaps around the connection cable.
7. Tighten the cover on the terminal casing using universal wrench US until the triangular marks on the cover and on the cable guide line up.
   The terminal casing is splash-proof, IP 64, EN 60529.

5.1.2 To connect connection cable on CALOR Cartridge Heater with terminal casing B

1. Use a screwdriver to remove the fixing screw incl. the seal on the top of the terminal casing B.
2. Remove the terminal casing B. The electrical connection between earthing and terminal casing B remains intact.
3. Use a ring wrench SW20 to open the cable gland and remove the sealing insert.
4. Insert the cable through the pressure screw and sealing insert.
5. Connect the various wires in the cable separately with cable lugs to the connection bolts. Pay attention to thermal stability. Provide an all-pole disconnect with an insulating distance of at least 3 mm.
6. The connection bolts identified by the earthing symbol or the green/yellow wire must be used to connect the earthing connection.

7. Place the sealing ring on the PHK immersion tube flange (see Fig. B-0102 MA).
8. Put the terminal casing B on the PHK central pole. Ensure that the sealing ring is properly positioned between the PHK immersion tube flange and terminal casing B. Align the cable entry.
9. Use a screwdriver to tighten the fixing screw including the seal.
10. Use a ring wrench SW20 to tighten the cable gland. Ensure that the seal is tight and that there are no gaps around the connection cable.

5.1.3 To connect connection cable on CALOR Cartridge Heater without terminal casing

1. Connect the various wires in the cable separately with cable lugs to the connection bolts. Pay attention to thermal stability. Provide an all-pole disconnect with an insulating distance of at least 3 mm.
2. The connection bolts identified by the earthing symbol or the green/yellow wire must be used to connect the earthing connection.
3. Install a suitable terminal cover and check for tightness.

5.2 To test the device

✓ Minimum and maximum immersion depth of the immersion tube satisfied.

✓ Nobody is in contact with the process medium.

1. Activate and switch on voltage.
2. Check the heat generation using a thermometer or check the temperature change in the process medium by some other suitable method.

The CALOR Cartridge Heater is working correctly if the process medium starts to warm up.

5.3 Removal

 **DANGER**	**Caution risk of burns!** **Touching the heated parts of the device may cause burns.** ⇨ It is essential that you wait approx. 15 minutes to allow the heater to cool. ⇨ Ensure that the parts that you wish to remove from the process fluid are cool.

1. Ensure that the CALOR Cartridge Heater is off circuit.
2. Wait for approx. 15 minutes until the stored heat has been dissipated from the immersion tube, heating element and hot tank parts.
3. Disassemble the device or open the terminal casing to remove the heating element (see point 4.3 to 5).

6. Servicing and maintenance

Any deposits must be cleaned off the immersion tube at regular intervals. As a result of the wide variety of process media and ambient conditions at customers' sites, it is not possible to provide a general statement about cleaning methods and servicing cycles.

⇨ If you are in any doubt, ask the manufacturer of the process medium.

6.1 To clean the device

✓ The CALOR Cartridge Heater is off circuit.

✓ The device is disassembled or the immersion tube is accessible.

⇨ Ask the manufacturer about suitable cleaning methods if there are deposits on the immersion tube.

6.2 To replace the seals or PHK heating element

DANGER	**Danger of short circuit!** **The ingress of moisture into the terminal casing BK or B may cause a short circuit.** ⇨ Always replace the complete set of seals.

6.2.1 CALOR Cartridge Heater with terminal casing BK

✓ The CALOR Cartridge Heater is off circuit.

1. Open the cover on the terminal casing BK by turning the terminal casing cover anti-clockwise using the universal wrench US.
2. Disconnect the connection and release the strain-relief clamp.
3. Undo the compression nut and pull out the cable.
4. Remove the sealing insert from the compression nut and insert a new one.
5. Open the threaded ring using universal wrench US.
6. Remove the slotted pressure ring beneath.
7. Disconnect the earthing wire from the connection bolts or earthing terminal.

8. Pull the PHK heating element out of the terminal casing and the immersion tube.
9. Use a screwdriver to remove the three slot screws in the mounting flange.
10. Remove the terminal casing and flange and the O-ring beneath.
11. Check the inside of the CALOR Cartridge Heater for the ingress of moisture. Take the device out of service if you find any moisture inside the CALOR Cartridge Heater.
12. Replace the flange gasket (O-ring).
13. Put the terminal casing BK with O-ring over the immersion tube flange.
14. Install the mounting flange with the three slot screws.
15. Fit the new PHK heating element (with the same technical data) into the immersion tube and connect it to the earth wire using the connection bolts identified by the earthing symbol.
16. Put the slotted pressure ring over the PHK connection head.
17. Use the universal wrench US to tighten the threaded ring.
18. Insert the cable through the compression nut and seal.
19. Connect the various wires in the cable separately with cable lugs to the connection bolts.
20. The connection bolts identified by the earthing symbol or the green/yellow wire must be used to connect the earthing connection.
21. Secure the cable with a strain-relief clamp inside the terminal casing BK.
22. Tighten the compression nut for the cable seal securely using universal wrench US. Ensure that the sealing insert is tight and that there are no gaps around the connection cable.
23. Have the CALOR Cartridge Heater examined by an electrician to ensure that it complies with VDE regulations.
24. Replace the cover seal (O-ring) in the terminal casing BK.
25. Tighten the cover on the terminal casing BK using universal wrench US until the triangular marks on the cover and on the cable guide line up.

6.2.2 CALOR Cartridge Heater with terminal casing B

✓ The CALOR Cartridge Heater is off circuit.

1. Use a screwdriver to remove the fixing screw incl. the seal on the top of the terminal casing B.
2. Remove the terminal casing B.
3. Remove the connection.
4. Remove the electrical connection between earthing and terminal casing B.
5. Use a ring wrench SW20 to open the cable gland and pull out the cable.
6. Remove the sealing insert and insert a new one.
7. If you also wish to replace the PHK heating element, take the PHK heating element out of the immersion tube. Disconnect the earthing wire from the connection bolts or earthing terminal.
8. Use a screwdriver to remove the locking screws.
9. Check the inside of the CALOR Cartridge Heater for the ingress of moisture. Take the device out of service if you find any moisture inside the CALOR Cartridge Heater.
10. Fit the new PHK heating element (with the same technical data) into the immersion tube.
11. Use a screwdriver to tighten the locking screws on the PHK immersion tube flange.
12. Insert the cable through the pressure screw and sealing insert.
13. Connect the various wires in the cable separately with cable lugs to the connection bolts.
14. The connection bolts identified by the earthing symbol or the earthing terminal must be used to connect the earthing connection.
15. Place the new sealing ring on the PHK immersion tube flange.
16. Put the terminal casing B on the PHK central pole. Ensure that the sealing ring is properly positioned between the PHK immersion tube flange and terminal casing B. Align the cable entry.

17. Use a screwdriver to tighten the fixing screw with O-ring and washer.
18. Use a ring wrench SW20 to tighten the cable gland. Ensure that the seal is tight and that there are no gaps around the connection cable.
19. Have the CALOR Cartridge Heater examined by an electrician to ensure that it complies with VDE regulations.

7. To transport/store the device

WARNING	**Danger of injury!** **Contact with residue from hazardous substances may cause injury.** ⇨ Neutralise and clean the contaminated CALOR Cartridge Heater before transport and storage. Refer to the safety directives for handling hazardous substances. ⇨ Comply with local waste disposal regulations.

1. Clean any dirt or process medium residue off the CALOR Cartridge Heater using a suitable method.
2. Neutralise the residue from any hazardous substances.
3. Pack the device carefully to protect it from damage and return the device to the manufacturer, giving details of the defects.

7.1 To dispose of the device

WARNING	**Danger of injury!** **Contact with residue from hazardous substances may cause injury.** ⇨ Neutralise the immersion tube. Refer to the safety directives for handling hazardous substances. ⇨ Clean any dirt or process medium residue off the CALOR Cartridge Heater using a suitable method. ⇨ Comply with local waste disposal regulations.

1. Neutralise and remove any parts of the device that contain residue of hazardous substances.
2. Dispose of the device and residue so that they do not harm the environment and in compliance with local regulations.

Complementary safety instructions

	**Danger of electric shock!** **When operating the CALOR Cartridge Heater with the terminal casing open (version with BC and B terminal casing), there is no contact protection against live parts.** ⇨ Close the terminal casing before commissioning.

	**Danger of fire and electric shock!** **Improper installation can cause the CALOR Cartridge Heater to come loose, in which case the minimum distances will no longer be maintained.** ⇨ The CALOR Cartridge Heater must be permanently installed in the tank, taking into account the prescribed installation instructions.

Modifications and/or conversions to the devices are not permitted.

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Subject to change!

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