



Installation and Operation

Installation systems **for pipes** EKL/EMK

Introduction

This BARTEC instruction manual for installation and operation is intended to give you important information on electric trace heating systems for pipes. Reference is made here only to the use of BARTEC self-limiting parallel circuit tapes. The contents of this manual are intended mainly for persons who are familiar with the plans, installation, operation and maintenance of electric trace heating systems.

Reservation

Technical data are subject to change without notice. Changes, errors and printer's errors do not justify claims for damages. For safety components and systems the relevant standards and regulations are to be observed, as well as the corresponding operating and installation instructions.

Content

1. Introduction	2
2. Installation and Operation	2
3. Selection of the Heating Cable and Configuration	2
4. Storage	3
5. Installation	3 - 8
5.1 Installation preparations	3
5.2 Installation of the heating cable	4 - 6
5.3 Installation of accessories	6
5.4 Acceptance and inspection	7
6. Temperature Control	8
7. Temperature Limiter	9
8. Heat Insulation	10
9. Power Supply and Electrical Protection Devices	11
10. Inspection and Commissioning	12
11. Operation and Maintenance	13 - 14
12. Proceeding in Fault Cases	15 - 16
12.1 Circuit-breaker trips	15
12.2 Residual current operated circuit-breaker (RCCB) trips	15
12.3 No or insufficient heating capacity	16
12.4 Heating capacity seems to be correct, the pipe temperature, however, does not reach the desired temperature	16
13. Acceptance report	17



1. Introduction

The present BARTEC manual for installation + maintenance is to provide you with important information on electrical trace heatings for vessels and surfaces.

It exclusively applies to the use of

- BARTEC-EKL (flexible single-core heating cables) as well as
- BARTEC-EMK (single-core mineral-insulated heating cables).

The content of this manual is particularly directed towards persons who are entrusted with the planning, erection, operation and maintenance of electrical trace heatings.

2. Installation and operation



NOTICE

Under all circumstances the following instructions must be heeded during the mounting and maintenance of BARTEC EKL and EMK heating tapes and their installation systems. Disregarding these instructions can lead to serious danger for personnel and installation equipment.

BARTEC's guarantee will be valid only if all instructions and recommendations in this manual and the installation and mounting instructions enclosed with the product are followed exactly.

The correct installation of BARTEC heating tapes requires the use of BARTEC connections, tape-to-tape joining and remote-end termination sets. These were developed specially for BARTEC heating tapes and tested and approved by various testing institutes.

- An incorrect installation of the trace heating and the adjoining system parts or damage to the heating tape can cause short-circuiting and the risk of fire during operation.
- The relevant currently applicable national regulations and the respective currently applicable safety regulations must be observed during the installation and maintenance of electric heating tapes.
- Always use a temperature monitor as well as a temperature limiter when using an EKL or EMK heating tape in hazardous areas.
- Protect both ends of the single-core heating tape from environmental influences.
- Junctions or contact points on the single-core heating tapes are impermissible because they can cause the heating tape's limit temperature and max. permissible operating temperature to be exceeded.
- Examples of the valid standards and directives which apply to the use of electric trace heating systems in hazardous areas are

IEC or EN 60079-30-1 Explosive Atmospheres - Part 30-1:
Electrical resistance trace heating -
General and testing requirements.

IEC or EN 60079-30-2 Explosive Atmospheres - Part 30-2:
Electrical resistance trace heating - Application guide for design,
installation and maintenance.

IEC or EN 60079-14 Explosive Atmospheres - Part 14:
Electrical installations design, selection and erection

IEC or EN 61241-14 electrical apparatus for use in the presence of
combustible dust - Part 14: Selection and installation.

3. Selection of the heating tape and project engineering

Before installing any electric trace heating, the person installing must check if the trace heating has been designed and planned correctly. It is particularly essential to verify the following points:

- complete project planning documentation, operating instructions and installation instructions.
- correct selection of the heating tape and accessories with respect to:
 - calculation of heat losses
 - max. permissible operating temperature
 - max. permissible ambient temperature
 - temperature class
 - length

4. Storage

Incoming goods

- Compare the delivery note with the supplied goods.
- Examine the supplied heating cables and accessory components for possible transport damage.

Storage

- Store heating cables and connection components at a clean and dry location.
- During storage, particularly contact with chemicals and petrochemical products must be effectively avoided.
- It must be ensured that the heating cables are protected against mechanical damage during storage.
- The storage temperature is specified in the respective data sheets and must be observed.
- Even if heating cables and connection components are only shortly stored in damp rooms or at a construction site, the ends must be effectively protected against humidity (e.g. by installing an end termination).

5. Installation

5.1 Installation preparations

5.1.1 Scheduling

- The installation of the electrical trace heating must be temporally coordinated with other installation works. This particularly refers to works carried out at the vessels and surfaces to be heated, the electrical installation and heat insulation.
- All installation works at the vessels and surfaces must have been completed.
- Pressure tests as well as material tests of the piping system should have been terminated prior to installing the electrical trace heating.



5.1.2 Inspections prior to installation

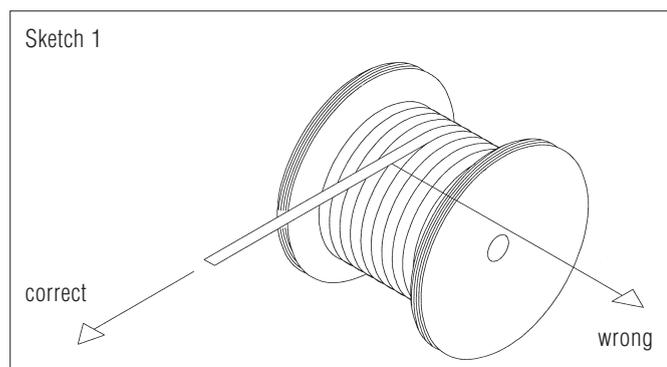
- Measure the installation resistance at the heating cable shortly before starting the installation works.
- Check on the basis of the insulation resistance measuring whether the supplied heating cable length corresponds to the configuration specifications.
- Check whether all material required for the installation of the electrical trace heating is available at the construction site and free of damage.
- Above all, check whether the identification of the heating cable and the components complies with the configuration documents (material list and type examination certificates).
- Check on the basis of the product-accompanying installation instructions whether all required tools are completely available.
- Plan the routing of the heating cable by inspecting the vessel/surface to be heated.
- Within this context, pay attention to sharp edges and uneven surfaces which may damage the heating cable and remove them.
- Lacquered and painted pipes and surfaces must be completely dry before installation is commenced. Complete drying and outgassing takes about 3 weeks.
- Verify whether the actual surface to be heated complies with the calculated surface.
- Prior to routing the heating cable, verify whether the vessel/surface dimensions comply with the dimensions used for design dimensioning. Only cut the heating cable to length after it has been routed and fixed in accordance with the design dimensioning.

5.2 Installation of the heating cable

5.2.1 Handling of the heating cable

To unroll the heating cable, use a stable fixture for the heating cable reel.

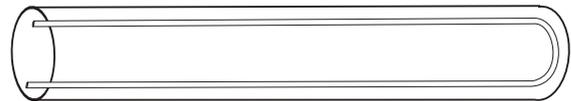
- Evenly wind the heating cable off the reel (sketch 1). Avoid extensive pulling as well as bending and crimping of the heating cable.
- When rolling the heating cable off the reel, observe that the cable does not run over corners or sharp edges.
- Do not step on the heating cable! Do not use the heating conductor as stepping loop! Do not drive over the heating cable with a vehicle and keep other people from driving over the cable.



5.2.2 Routing of the heating cable

- Always route the heating cable in a stretched way along the pipe to reduce expensive installation time, avoid installation faults caused by complicated spiral routing and avert heating cable damage during heat insulation works. In addition to this, the heating cable can be easily localized afterwards if it was stretched for routing.

Sketch 2

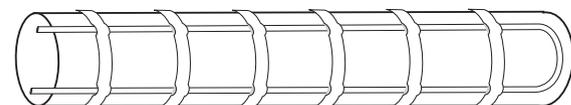


- Only spiral-route the heating cable if this is expressly required by configuration.
- To ensure a sound heat transmission, the heating cable must be fitted planely over its entire length. If required, the spacings between the fitting points must be reduced.
- When routing the heating cable (1st cable), observe that the heating cable can be re-routed at pipe fixtures and other accessories without any junctions.
- Observe bypass and branch lines when routing.
- When installing EMK heating cables, make sure that the connecting sleeves are taken out of the insulation with pipe surface temperatures > 400 °C or maintained temperatures > 200 °C.

5.2.3 Fixation

- Fix the heating cable at least every 200 mm by means of a temperature-resistant self-adhesive tape or plastic cable ties. EMK mineral-insulated heating cables are to be fixed using stainless-steel fixing straps or cable ties (Sketch 3).

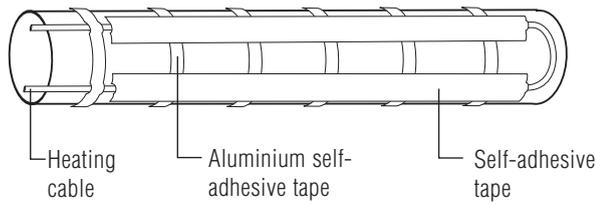
Sketch 3



- When selecting proper fixation means, please observe the following instructions:
 - Preferably fix the heating cable by means of BARTEC self-adhesive tapes/cable ties (refer to the selection chart "Fixing material").
 - When using cable ties, ensure a sufficient temperature resistance and resistance against chemical influences.
 - Do not use any metal fixtures for flexible single-core heating cables.
 - Only use aluminium self-adhesive tape if this is required by the configuration. The use of aluminium self-adhesive tapes improves heat transmission. Such tapes prevent insulation material from intruding between the heating cable and the piping wall.



Sketch 4



- For the heating of plastic pipes, aluminium self-adhesive tape or aluminium foil is to be provided for under or under and over the heating cable for a better heat transmission and distribution.

Routing at controls and instruments, flanges and pumps

- When routing the heating cable, always observe the minimally permissible bending radius! (5 x external diameter for EKL and EMK)

Example tank:

AD heating cable = 3 mm

Bending radius = Factor bending radius x AD heating cable

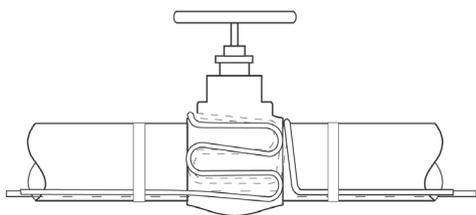
Bending radius = 5 x 3 mm = 15 mm

Cable spacing = Bending radius x 2

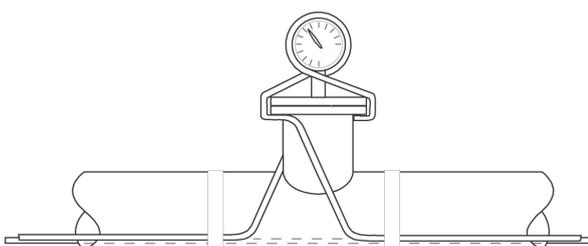
Cable spacing = 15 mm x 2 = 30 mm

- Always route heating cables at controls and instruments, valves, etc. in a way which ensures that they are freely accessible and replaceable in case of maintenance and servicing works and that heating circuits do not need to be cut. The use of a sufficiently large heating cable loop is the easiest way to achieve this.
- As a result of the increased heat losses at controls and instruments, valves, flanges, etc., a longer heating cable is required. These additional requirements are listed in the configuration.
- For typical routing methods, please refer to the following sketches.

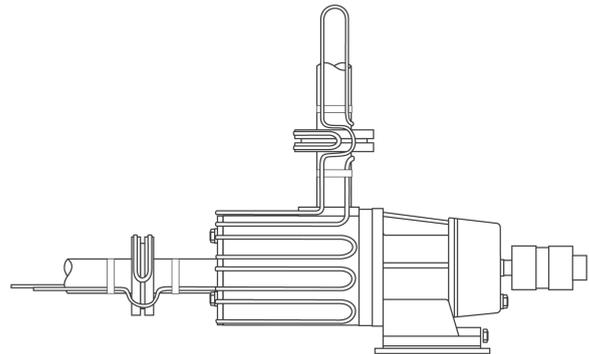
Routing at valves (Sketch 6a)



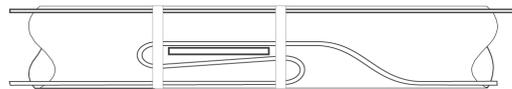
Routing at pumps (Sketch 6b)



Routing at monometers (Sketch 6c)



Routing at supports (Sketch 6d)

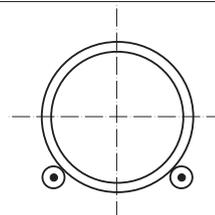


Stretched routing

- With double laying on the pipe, route the heating cable approx. in the "4.30 pm" and "7.30 pm" position.
- With horizontal pipes, do not route the heating cable at the deepest point.
- Do not route the heating cable at horizontal pipes on the upper pipe half unless this is required by the configuration. This protects the heating cable against mechanical damage, e. g. if installation personnel walks on the pipe.

Furthermore, a routing at the upper pipe half is not recommendable for reasons of heat distribution and only reasonable with certain applications.

Sketch 5





5.3 Installation of accessories



NOTICE

To ensure compliance with the existing technical regulations, use only original accessories from BARTEC.

The use of original accessories from BARTEC is a precondition for the consideration of any claims under guarantee.

5.3.1 BARTEC system accessories

Beside the heating cable, the following system accessories are usually required for the complete installation of a heating circuit:

- Heating cable connection system
- Cold leads
- Fixing accessories for the heating cable
- Heat-insulation ducts
- Warning labels "electrically heated"

Further system accessories may additionally be required:

- Heating cable connection
- Terminal box/connection box
- Mounting bracket and mounting plate for terminal or connection box
- BARTEC control units

5.3.2 Further installation instructions

- Prior to installing the power supply lines, install the heating cable connections.
- Install terminal boxes in a freely accessible way.
- When positioning the terminal boxes, make sure that the box entries with cable and heating cable screw connections do not point upwards.
- When installing connections, ensure that existing cable paths can be further used.
- During installation, keep the terminal boxes closed as long as possible to provide protection against dirt and humidity.
- Check for a proper establishment of the termination system and the correct functioning of the heating circuit by measuring the insulation and the loop resistance. (section 10).

After the installation of boxes, check:

- whether suitable and approved screw connections and filler plugs have been used and whether they have been properly installed.
- for a tight fit of screw connections and filler plugs.
- for a tight fit of the box at the mounting bracket.
- Ensure whether the requirements stipulated in the type examination certificates have been met.

5.4 Acceptance and inspection



CAUTION

Prior to fitting the heat insulation, the installed heating circuits must be inspected.

Inspection process

- Make sure that the heating cable has been properly routed. Observe particularly that
 - the heating cable fits tightly with the pipe or the tank
 - the heating cable does not show any contact points or junctions
 - the length of the additional heating cable routed at flanges, valves, pumps, controls and instruments is sufficient
 - the heating cable does not show any damage and has not been routed under pipe clamps.
- Check for a proper installation of terminals, connections and terminal boxes as well as temperature controllers and sensors (visual check).
- Check for a proper installation of the limiter sensor (mandatory for heating circuits in hazardous areas), as well as for the limiter setting.
- Enter the position of the heating cables as well as that of terminals and connections into the piping documentations.
- Measure the insulation resistance in all heating circuits before installing the heat insulations (section 10).
- The correct installation and functioning of the electric trace heating must be confirmed by an acceptance report (section 13).



NOTICE

Claims under warranty will not be considered if the acceptance report is not filled in completely.

6. Temperature Control

Selection of a temperature controller

- For operations with single-core heating cable systems, a temperature controller is always required.
- When selecting a suitable temperature controller, particularly the following technical data must comply with the requirements of the respective application:
 - Operating voltage
 - Rated current
 - Temperature control range
 - Max. permissible temperature/max. perm. sensor temperature
 - IP protection
 - Explosion protection, if required
 - Type examination certificate
- For reasons of an economical power utilization, the use of a controller with surface sensor is in all cases recommendable.
- Prior to installation, verify whether the applied temperature controller complies with the technical requirements and the configuration.



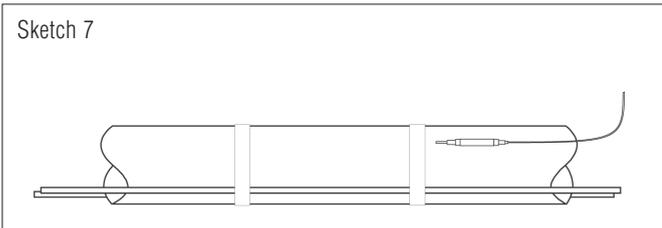
Room temperature controller

- Install a room temperature controller always at the coolest spot of the environment (e. g. north side).
- Observe the installation instructions of the respective room temperature controller.

Temperature controller with sensing line

- With trace heatings for pipes, the temperature sensor should not be positioned directly at the heating cable, but at a safe distance (Sketch 7).
- When fixing the temperature sensor, a sound heat transmission between the sensor and the pipe must be ensured (e.g. by using an aluminium self-adhesive tape or heat transfer compound).
- Usually, the temperature sensor is fixed at a distance of at least 2 m from controls and instruments, flanges, pumps and supports to avoid false measurements.
- Observe the installation instructions of the respective temperature controller.

Sketch 7



Further installation instructions

- During installation, keep the casing of temperature controllers closed as long as possible to prevent dirt and humidity from intruding.
- Ensure for a proper fixing of the casing cover and a close sealing.
- Use suitable screw connections and filler plugs in accordance with the technical requirements and type examination certificates and check for their impermeability.

7. Temperature Limiter

For all single-core heating cable systems (EKL or EMK), a temperature limiter must be used in hazardous areas. A limiter permanently switches off the heating circuit upon exceedance of the limit temperature. The temperature limiter must be installed at the hottest spot.

Maximum surface temperature	Temperature class
450°C	T1
300°C	T2
200°C	T3
135°C	T4
100°C	T5
85°C	T6

The temperature limiter's task is to avoid an exceedance of the limit temperature in the tracer heating system, e.g. in case of controller failures or overvoltage, by switching off the heating. Within this context, the selection and installation of the temperature sensor plays a particularly important role. As regards the measuring accuracy, the selected sensor mass should be as low as possible.

As a matter of fact, the hottest spot in the system is supposedly at the heating cable itself – usually at locations where a sound thermal connection of the heating cable to the surface to be heated is hardly possible, e. g. at valves or flanges.

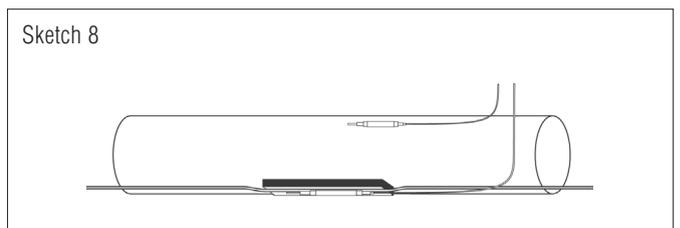
Artificial hot spot

An artificial hot spot is created by fitting a heat insulation between the heating cable and the surface to be heated, at which the sensor for the temperature limiter is installed with direct contact to the heating cable (Sketch 8).

- When installing the temperature limiter, observe that the sensor is positioned at the hottest system spot. Use aluminium to fix the sensor and the heating cable to each other. To ensure that the temperature at the artificial hot spot is definitely higher than the heating cable temperature at spots with minor thermal connection, this hot spot must be dimensioned with approx. double sensor length.
- As a result of the unavoidable heat dissipation of the sensor itself, the deviation from the sensor mass depends on the heating cable mass (proportion of diameters) as well as on the specific heating capacity (W/m) and must be considered when setting the limiter temperature.
- Each EKL/EMK heating circuit in hazardous areas must be equipped with a limiter.
- When using an adjustable temperature limiter, the switch-off point must be set at up to T3 min. 5 K and T2 and T1 min. 10 K under the maximum surface temperature of the temperature class.

Example: For T3, limiter setting 195 °C.

Sketch 8





8. Heat Insulation

NOTICE

Prior to fitting the heat insulation, verify whether an acceptance inspection of the installation has been carried out and documented.

Installation of the heat insulation

The reliable functioning and efficiency of an electrical trace heating essentially depends on a proper and professional heat insulation installation.

The following factors must be particularly observed:

- Check for the compliance of the heat insulation (type, insulation thickness) with the configuration. A heat insulation deviating from the configuration must, in no case, be installed as otherwise a correct functioning of the trace heating can no longer be guaranteed.
- Install the heat insulation immediately after the installation of the trace heating to minimize the risk of heating cable damage.
- Only use dry insulation material. Humidity reduces the efficiency of insulation material and thus impairs the function of the trace heating.
- When installing the heat insulation, always take care not to damage the heating cable.
- Only use BARTEC heat insulation ducts for the ducting of heating and connection cables.
- Seal the heat insulation at all welds of the steel jacket and entries (valve entries, suspenders). The entire insulation must be reliably water-proof.
- After installation of the heat insulation, measure the insulation resistance at all heating circuits once more to ensure that the heating cable has not been damaged during the installation.
- Face caps must generally be provided with a mechanical protection to prevent the heating cable from damage.
- In general, end caps must be provided with mechanical protection to prevent damage to the heating cable.

Marking

- Mark the outer sheath of the heat insulation with “electrically heated” warning labels in clearances of maximally 3 meters in order to draw the attention of maintenance personnel to the electrical trace heating.

9. Power Supply and Electrical Protection Devices

Rated voltage

- BARTEC heating cables are available for various rated voltages. Respective information is available in BARTEC technical literature and from the technical department of BARTEC.
- Operate the respective heating cable only with the rated voltage provided for. The rated voltage is stated on the computer print-out of the heating cable layout.

Overcurrent protection device

- For overcurrent protection, please only use circuit-breakers which comply with the configuration and the technical BARTEC documents. Deviations therefrom may result in false tripping of the circuit-breaker and impairment of the efficiency of the overcurrent protection.
- If other protection units than those specified in the configuration or the technical BARTEC documents are to be used, please contact the technical department of BARTEC.

Residual current operated circuit-breaker

- Principally, the use of a residual current operated circuit-breaker with 30 mA is recommended.
- To ensure for the efficiency of this protection measure, a heating cable with protective braiding is to be used. This protective braiding must be incorporated into the protection measures. This particularly applies to all trace heatings connected to non-conducting pipes (plastic pipes, coated pipes) and surfaces.

CAUTION

When implementing the electrical protection measures, the respectively applicable national technical regulations must be adhered to.



10. Inspection and Commissioning

Inspections

Continuing inspections of the trace heating during installation and operation serve the prevention of additional costs accruing from a belated detection of installation and mounting faults. As the installation costs for the trace heating and the heat insulation exceed the costs for the heating cable by far, the following inspection procedures should be consistently followed.

The insulation resistance is to be measured at the following points of time:

- a) **Pre-inspection**
Shortly before commencing installation of the heating cable at the construction site
- b) **Acceptance inspection**
After the heating circuit has been completely installed or prior to applying the heat insulation
- c) **Final inspection**
Immediately after the works at the heat insulation have been completed
- d) **Commissioning inspection**
Prior to switching on the system

Measuring of the insulation resistance

- This inspection procedure serves the detection of heating cable damage and possible installation faults of terminals and connections.
- Use an insulation tester with a minimum test voltage of DC 500 V and a maximum test voltage of DC 1000 V for EMK mineral-insulated heating tapes and DC 2500 V for EKL plastic-insulated heating tapes (insulation resistance at least 20 MΩ)
- Measuring:
 - The measuring is to be carried out between the heating conductor and the protective braiding.
 - A further measuring is to be carried out between the protective braiding and the earthed piping

Acceptance and documentation

- After completion of the installation work (before fitting the thermal insulation) an acceptance inspection must be performed on each heating circuit, where possible in the customer's presence (see section 13).
- All further inspections must also be documented in the form of an inspection report.
- After the heat insulation has been completely installed, a final inspection of the individual heating circuits is recommendable.
- Usually, such inspection lies in the area of responsibility of the client or the final customer, (= Final inspection).

Commissioning

- Each trace heating may only be commissioned if
 - the acceptance certificates are available for each heating circuit and the fault-free condition of the trace heating has been confirmed.
 - the heat insulation has been completely installed and is in a dry state.
 - it is ensured that the heating circuit is operated in compliance with the data specified by BARTEC.



NOTICE

Additional heating energy which is required for heating empty or already filled pipings has usually not been accounted for by the configuration. With system cold starts, you should therefore grant a sufficient period of time for the piping to achieve the desired temperature.



CAUTION

In hazardous areas only electrical apparatus that has the appropriate test certificate or a certificate from a notified inspection body may be put into operation.



11. Operation and Maintenance

Operation

- During the operation of the electrical trace heating, it must be ensured that all system components are operated in compliance with the operating data specified by BARTEC. This particularly applies to the observance of maximum temperatures. Operation within the range of these operating data forms a condition for possible future warranty claims.

System documentation

- For each system, a complete documentation ranging from configuration, to installation and commissioning to periodical maintenance works of a trace heating, should be kept.
- Such documentation should include:
 - Configuration documents
 - Heat loss calculation
 - Selection of the heating cable
 - Piping plans with heating circuit allocation
 - Circuit diagrams
 - Current piping plans
 - Acceptance reports
 - Reports on servicing works and interventions with the piping system, the trace heater and the heat insulation
 - Inspection reports
 - Operating manual



NOTICE

To allow for the best possible safety and reliability of a trace heating system, BARTEC recommends the implementation of a maintenance program which provides for visual, functional and electrical checks within specified time intervals.

Visual and functional check

- Carefully check the heat insulation for possible damage, lacking sealings, cracks, outer sheath damage, lacking heat insulation ducts for heating cables and other cables, intruded water or chemicals.
If the heat insulation is subject to damage, the heating cable must be checked for possible impairments.
 - Damaged heating cables must be replaced by new ones.
 - Wear parts (e.g. sealings, locking plates, etc.) must be replaced.
- Check the terminal boxes, connection boxes and casings of temperature controllers for corrosion damage and possible mechanical impairments. Make sure that all casing covers are correctly locked.
- Check the temperature controller's connecting cables and capillary tube systems for damage and mechanically protected routing.
- Temperature controllers must be checked for their correct functioning.
- Temperature limiters must also be checked for their correct functioning.

Electrical inspection

- The measuring of the insulation resistance should be considered as an inherent part of the regular maintenance works.

Inspection intervals

- With anti-freeze systems, inspections should be carried out annually before the heating period.
- With systems serving the maintenance of process temperatures, inspections should be carried out in regular intervals, however, at least twice a year.

Personnel training

- The regular maintenance works should be carried out by trained and experienced maintenance personnel.
- You are recommended to support maintenance personnel with the implementation of new developments in the fields of application technology and maintenance by training measures.

BARTEC service

- Apart from establishing complete heating circuits, BARTEC also offers its experienced service personnel for accruing maintenance works.

Servicing works at the heat insulation and pipings

- Observe that the system is to be activated prior to each servicing procedure.
- Ensure not to damage the trace heating system during servicing works at the piping system or the heat insulation.
- Make sure that, upon completion of servicing works, the heating circuits, including heat insulation, are properly and professionally installed in accordance with the configuration.
- Upon completion of servicing works, carry out a visual, functional and electrical check at the trace heating and document such checks.



NOTICE

The persons with responsibility must be able to prove their competence and provide evidence that they have acquired the skills and specialised knowledge relating to the types of protection and/or types of devices concerned. At the very least, they must have

- a general understanding of the relevant electrical engineering
- a practical understanding of the principles and techniques of explosion protection
- a working knowledge and understanding of the relevant standards of explosion protection
- a basic knowledge of quality assurance, including the principles of auditing documentation, traceability of measurements and calibration of measuring instruments.



12. Proceeding in Fault Cases

Damage in the heating circuit

- For servicing the heating circuit, only use original BARTEC components, (e. g. connections, terminals, sealings, etc.)!

Instructions for the rectification of faults

- If faults occur in the trace heating system, we recommend troubleshooting in accordance with the following instructions and, if applicable, rectification of the fault.
- If the rectification measure in accordance with the following instructions is not successful, please immediately contact the technical department of BARTEC.

12.1 Circuit-breaker trips

Possible cause	Measures
1. Underdimensioned circuit-breaker	Check the current load, the overcurrent protection fuse and the max. current carrying capacity of the electrical supply line
2. Faulty RCCB	Replace the RCCB
3. Short-circuit/ground fault at - terminal - connection(s) - connection lines - heating cable due to damage	Localise and repair faulty terminal or connection or localize and replace the faulty heating cable

12.2 Residual current operated circuit-breaker (RCCB) trips

Possible cause	Measures
1. Underdimensioned circuit-breaker 2. Faulty RCCB 3. Short-circuit/ground fault at - terminal - connection(s) - connection lines - heating cable due to damage	Check the current load, the overcurrent protection fuse and the max. current carrying capacity of the electrical supply line
4. Excessive humidity in terminal or connection(s) due to improper and unprofessional installation	Localise damp spot(s), replace the terminal block and dismount affected parts. First, check and repair casings outside and then casings underneath the insulation.
5. Heating cable or connection line damage	Localise the impaired spot and install a new heating cable or connection line



12.3 No or insufficient heating capacity

Possible cause	Measures
1. No or insufficient line voltage	Control the line voltage at the heating circuit infeed and rectify existing faults
2. Heating circuit length is longer than specified in the configuration a) Connections have not been established b) The heating cable has been interrupted	Check heating circuit allocation, routing and length, re-calculate required heating capacity a) Establish connections and re-check the heating capacity b) Localise and remove the interruption, then re-check the heating capacity
3. High transmission resistance due to an improperly installed terminal, connection	Re-install the respective terminal, connection, etc. and ensure for a correct clamping and crimping
4. Temperature controller has been incorrectly connected or set or wrong sensor position	Correct the wiring or position the sensor properly
5. Exceedance of the max. permissible piping temperature	Check the piping temperature
6. Heating cable has been subjected to excessive humidity (e.g. faulty connection or heating cable damage)	Replace faulty parts
7. Heating cable has been subjected to excessive temperature	Replace the heating cable
8. Temperature limiter has tripped	Check and, if required, replace the heating circuit

12.4 Heating capacity seems to be correct, the pipe temperature, however, does not reach the desired temperature

Possible cause	Measures
1. Damp heat insulation	Replace the damp heat insulation by a dry one and ensure for a correct sealing
2. Insufficient fit of the heating cable routing with flanges, valves and controls and instruments	Use an additional heating cable by means of connections while not exceeding the max. permissible heating circuit length
3. Incorrect setting of the temperature controller	Correct the controller setting
4. Insufficient thermal dimensioning	Check the dimensioning in cooperation with the technical department of BARTEC and observe the recommendations of the BARTEC planning department
5. The connection line cross-section underruns the permissible value (excessive voltage drop)	Use a connection line with a permissible cross-section
6. Wrong sensor position	Position the sensor correctly

13. Acceptance report

The supplier can use the acceptance report in the following section as a form to fill in.

- Standard acceptance report - BARTEC

 NOTICE

Claims under warranty will not be considered if the acceptance report is not filled in completely.

Acceptance and test report

Supplier

Electrical pipe trace heating <input type="checkbox"/>	Sheet <input type="checkbox"/>	of <input type="checkbox"/>	Comments/appendix <input type="checkbox"/>
Tank heating <input type="checkbox"/>	Date <input type="text"/>		

Customer	Order no. /Comm. no.
	Project
	Plant
	Order no.

Ex area yes <input type="checkbox"/> no <input type="checkbox"/>	Zone <input type="text"/>	Temperature class <input type="text"/>	Explosions group <input type="text"/>
---	---------------------------	--	---------------------------------------

Examination before first-time operation <input type="checkbox"/>	Examination after change <input type="checkbox"/>	Periodic inspection <input type="checkbox"/>
Visual inspection <input type="checkbox"/>	Re-examination <input type="checkbox"/>	Detailed inspection <input type="checkbox"/>

Heating circuit no.				
Partial heating circuit yes <input type="checkbox"/> no <input type="checkbox"/>				
Pipe/tank or vessel no.				
Building				
Product				
Heating cable/type				
Batch no. heating cable				
Heating cable length		_____ m	_____ m	_____ m
Serial no. Connection				
Serial no. Housing				
Voltage		_____ V	_____ V	_____ V
Current	Inrush	_____ A	_____ A	_____ A
	Operating	_____ A	_____ A	_____ A
Power heating cable		_____ W/m	_____ W/m	_____ W/m
Heating cable resistance	cold	_____ Ω	_____ Ω	_____ Ω
	hot	_____ Ω	_____ Ω	_____ Ω
Insulation resistance at _____ V		> _____ MΩ	> _____ MΩ	> _____ MΩ
Temperature setting		Test for correct functioning	Test for correct functioning	Test for correct functioning
		yes no	yes no	yes no
Regulator		_____ °C <input type="checkbox"/> <input type="checkbox"/>	_____ °C <input type="checkbox"/> <input type="checkbox"/>	_____ °C <input type="checkbox"/> <input type="checkbox"/>
Limiter		_____ °C <input type="checkbox"/> <input type="checkbox"/>	_____ °C <input type="checkbox"/> <input type="checkbox"/>	_____ °C <input type="checkbox"/> <input type="checkbox"/>
Subnormal temperature		_____ °C <input type="checkbox"/> <input type="checkbox"/>	_____ °C <input type="checkbox"/> <input type="checkbox"/>	_____ °C <input type="checkbox"/> <input type="checkbox"/>
Thermal insulation	Inspection before installation <input type="checkbox"/>		Inspection after installation <input type="checkbox"/>	
	Thermal insulation material		Thermal insulation thickness in mm <input type="text"/>	
Switchgear/distribution panels	included in the scope of supply <input type="checkbox"/> <input type="checkbox"/>		Name of the switchgear/distribution panel <input type="text"/>	
	yes no		Acceptance report <input type="checkbox"/>	

Comments:

Place/date	Installer	Customer
------------	-----------	----------

BARTEC protects
people and the
environment
by the safety

of components,
systems
and plants.

