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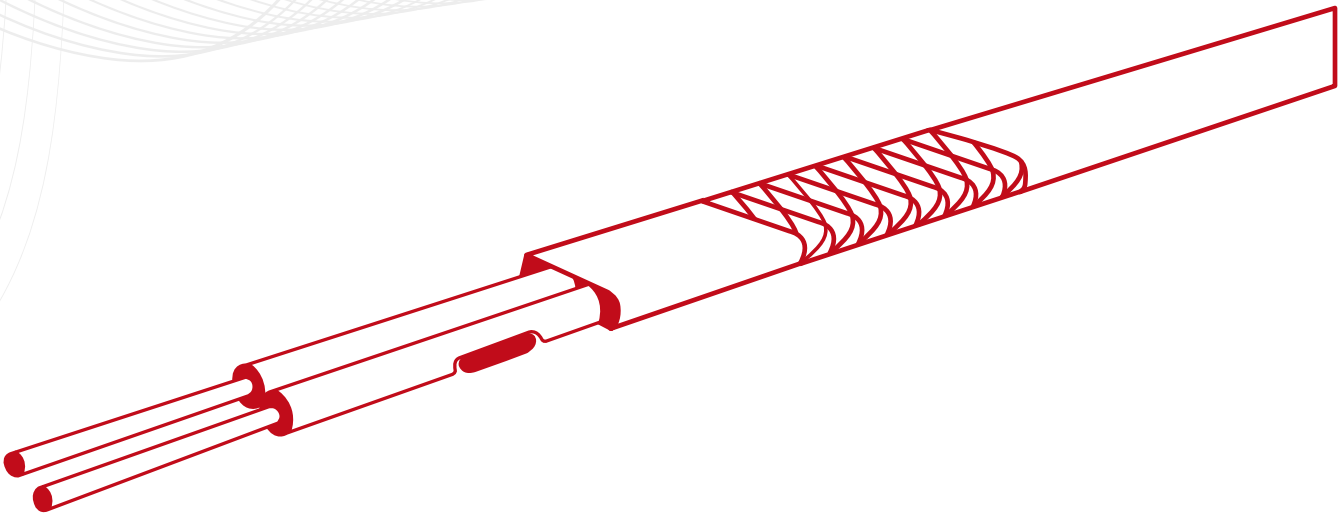
OPERATION MANUAL



Heat Tracing System
ELP/PFA

Parallel trace heaters and their associated system components for North America

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CONTENT

Reservation

Subject to technical changes. Changes, errors and misprints do not constitute grounds for claims for damages.
For safety components and systems, the assembly instructions as well as the relevant and currently valid standards and regulations must be observed.

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Document: 864304BA332XX **QAA-181-A**		**OPERATION MANUAL Heat Tracing System ELP/PFA**	
Author:	Peter Schmidt	Date:	28.11.2024
Revision: **0**	Jonas Schmidt	Date:	28.11.2024

INTRODUCTION

The Heat Tracing System ELP/PFA is suitable for industrial use on piping, vessels, instrumentation and related equipment in non-classified (ordinary) areas, in outdoor exposed areas, in wet areas and in areas where combustible gases, dust or fibers may be present.

All electrical connections must be made to a suitable junction box approved for use in the above listed areas. The use of applicable eltherm power connection and termination kits is required

For proper and safe use of the trace heating system ELP/PFA, please follow these instructions.
Please keep these instructions for future reference (e.g. in the system documentation).

General display conventions

Particularly important points in these instructions are indicated by the following symbols:

DANGER

indicates an extremely dangerous situation.
If it is not avoided, there is a danger to life or at least a high risk of serious injury.

ATTENTION

indicates a potentially dangerous situation.
If not avoided, there is a risk of damage or malfunction.

WARNING

indicates a potentially dangerous situation.
If it is not avoided, there is a risk of injury or at least a high risk of damage.

NOTE

important information and instructions for safe, effective and environmentally sound use.

RECEIPT OF GOODS

After receipt of goods, check the trace heater and all supplied accessories and compare with the data on the delivery note to ensure that the correct material was supplied. Verify the integrity of the electrical insulation as described under "TEST AND COMMISSIONING". If the trace heater is to be stored for installation at a later date, it is recommended that the exposed wires and braid are trimmed and that the end is sealed against possible ingress of water.

Class I Div 1 installations: also verify the continuity of the braid of the trace heater. Visually examine heater and accessories for possible shipping and handling damage.

STORAGE

NOTE

The goods have to be stored in a dry environment at an ambient temperature of -4°F…+140°F (-20°C … +60°C). If a dry storage is impossible, the trace heater must be closed with an end termination set. This is also necessary if a heating circuit cannot be finished at the end of a shift..

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SYSTEM COMPONENTS

The Heat Tracing System ELP/PFA comprises the following components:

Component	Voltage 1 in VAC	Nominal Power 1	Voltage 2 in VAC	Nominal Power 2
Trace heater ELP/PFA-6-120	120	1,8 W/ft (6 W/m)	-	-
Trace heater ELP/PFA-10-120	120	3 W/ft (10 W/m)	-	-
Trace heater ELP/PFA-15-120	120	4,6 W/ft (15 W/m)	-	-
Trace heater ELP/PFA-20-120	120	6,1 W/ft (20 W/m)	-	-
Trace heater ELP/PFA-25-120	120	7,6 W/ft (25 W/m)	-	-
Trace heater ELP/PFA-30-120	120	9,1 W/ft (30 W/m)	-	-
Trace heater ELP/PFA-10-208	208	3 W/ft (10 W/m)	-	-
Trace heater ELP/PFA-30-208	208	9,1 W/ft (30 W/m)	-	-
Trace heater ELP/PFA-10-240	240	3 W/ft (10 W/m)	277	4 W/ft (13 W/m)
Trace heater ELP/PFA-15-240	240	4,6 W/ft (15 W/m)	277	6,1 W/ft (20 W/m)
Trace heater ELP/PFA-20-240	240	6,1 W/ft (20 W/m)	277	8,2 W/ft (27 W/m)
Trace heater ELP/PFA-25-240	240	7,6 W/ft (25 W/m)	277	10 W/ft (33 W/m)
Trace heater ELP/PFA-30-240	240	9,1 W/ft (30 W/m)	277	12,2 W/ft (40 W/m)
Trace heater ELP/PFA-40-480	480	12,2 W/ft (40 W/m)	-	-
Trace heater ELP/PFA-15-600	600	4,6 W/ft (15 W/m)	-	-
Trace heater ELP/PFA-20-600	600	6,1 W/ft (20 W/m)	-	-

Component	Voltage in VAC	Max. current in A
End Termination Kit EL-ECP	600	40
Power Termination Kit ELVB-SRAP-¾" ST	600	40
Power Termination Kit ELVB-SRAP-Ex M20 BR	600	40
Power Termination Kit ELVB-SRAP-½" BR	600	40
Heater Entry Kit EL-HAZELECT-ELP (Class I Div 1)	600	40

MECHANICAL PROPERTIES

All system components are suitable for use in areas with high risk of mechanical damage and exposure to light.

RESTRICTIONS OF THERMAL INSULATION

Flexible (soft) materials: no restrictions (needs to be compatible with heater temperature)
Rigid materials: groove to be provided to accommodate trace heater

HEATING CIRCUIT DESIGN

If a trace heater ELP/PFA is used in hazardous locations, the heating circuit design needs to be done by eltherm based on the complete set of application data provided by the user.
Alternatively, if eltherm design software is used ("eltherm designer"), the design can be made by the user. In this case, design results need to be submitted to eltherm for verification and for issuance of heating circuit labels.

RATING OF TRACE HEATER AND INTEGRAL COMPONENTS

ELP/PFA…: heaters and ther integral components are rated "-WS"

VOLTAGE LIMITS OF TRACE HEATER AND COMPONENTS

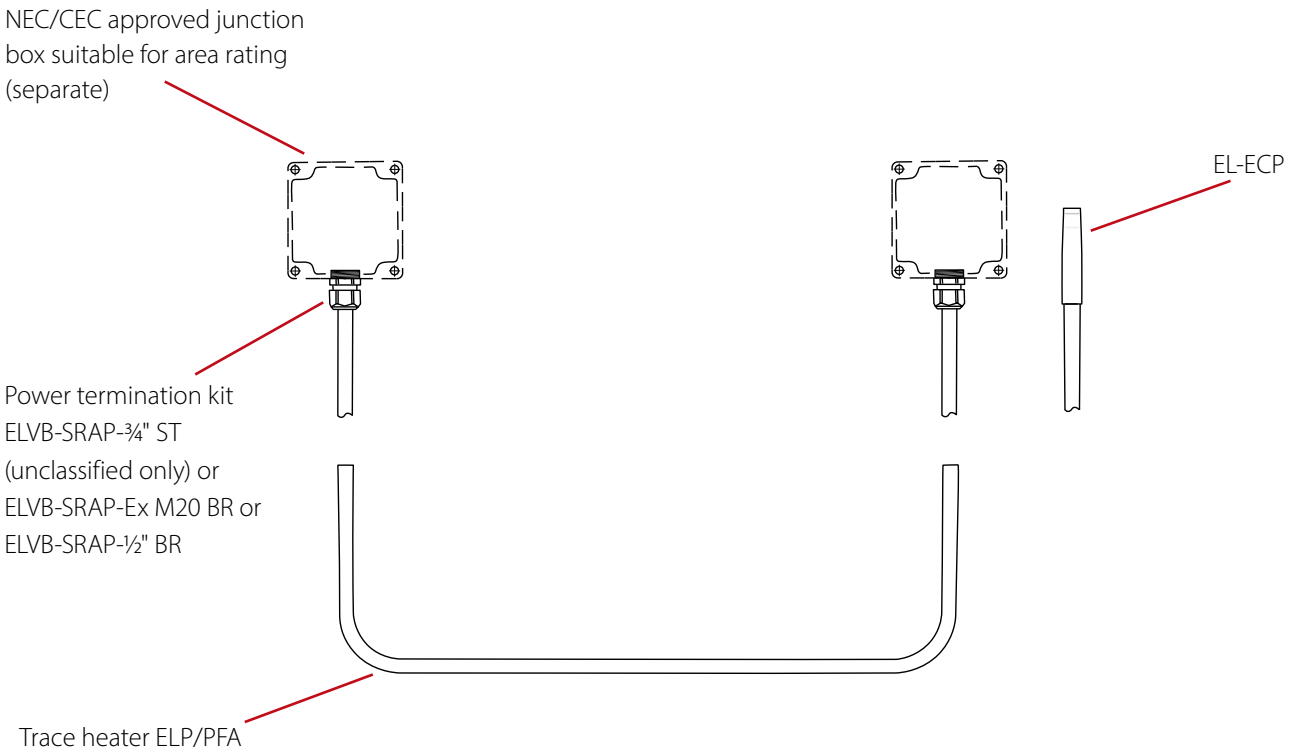
EL/PFA…: heaters and ther integral components may be operated at voltages stated in the heater print or in the heating circuit label.

POSSIBLE COMBINATIONS OF TRACE HEATER AND COMPONENTS

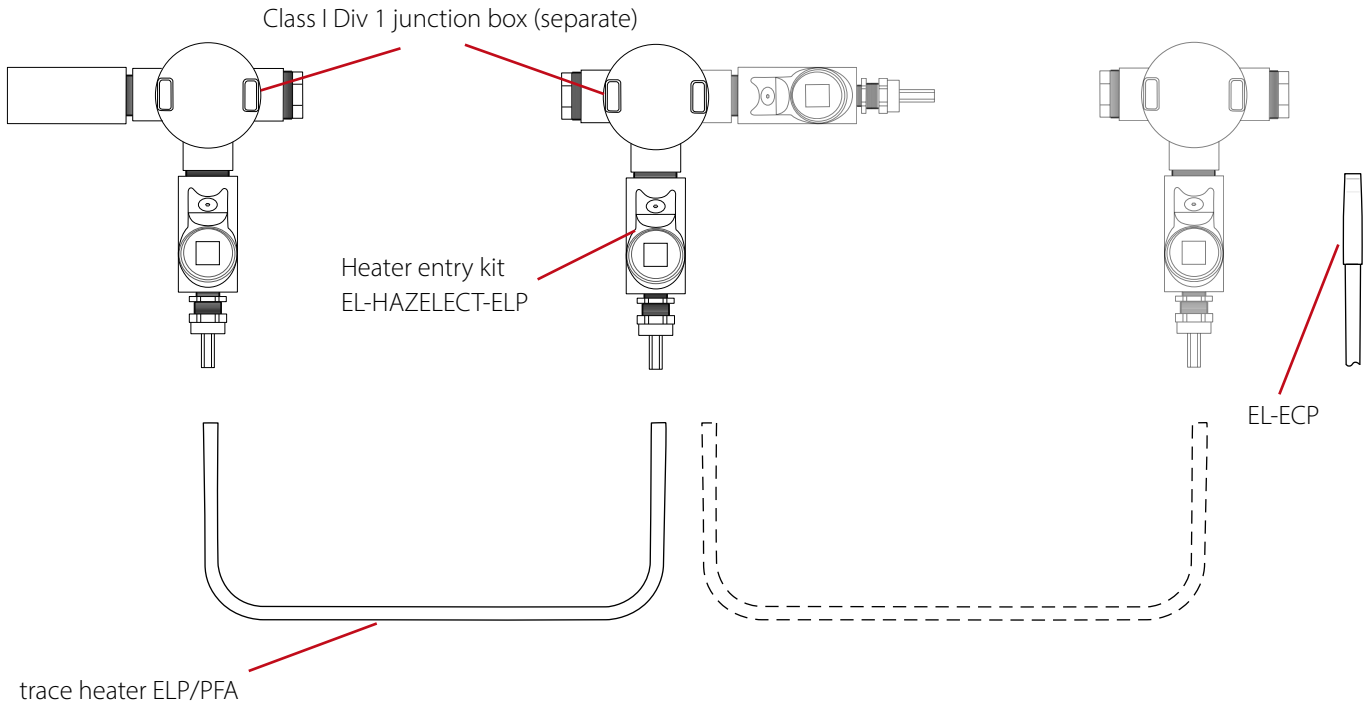
Component	System ELP/PFA-AEx Class I Zone 1, Zone 21	System ELP/PFA-D1 Class I Div 1, 2	System ELP/PFA-CII Class II, III Div 1	System ELP/PFA-NA unclassified
ELP/PFA trace heater	+	+	+	+
ELVB-SRAP-¾" ST pwr kit	-	-	-	+
ELVB-SRAP-Ex M20 BR pwr kit	+	-	+	(+)
ELVB-SRAP-½" BR pwr kit	+	-	+	(+)
EL-HAZELECT-ELP Class I Div 1 pwr kit	-	+	(+)	(+)
EL-ECP end termination kit	+	+	+	+

Table 1: Possible combinations of system components; "-" not suitable, "+" suitable, preffered, "(+)" suitable, optional

NON CLASS I DIV 1, 2 APPLICATION



CLASS I DIV 1, 2 APPLICATION



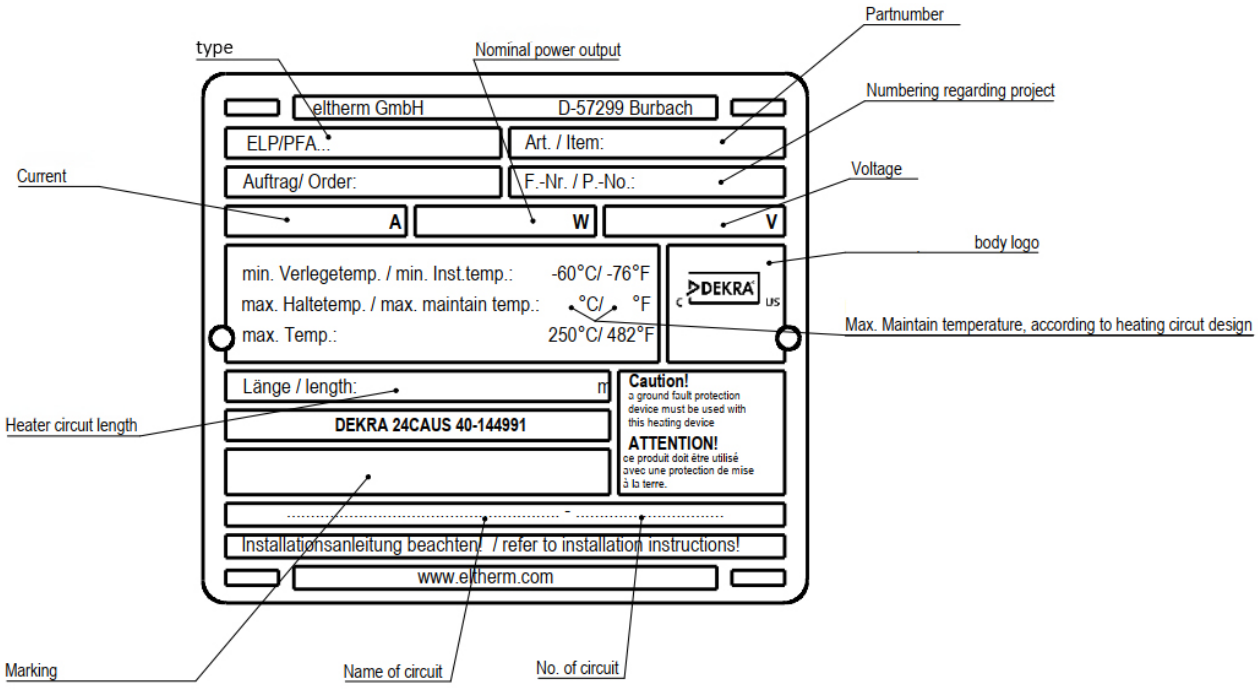
MARKING OF THE HEAT TRACING SYSTEM ELP/PFA

Trace heaters ELP/PFA… are marked as follows:

eltherm GmbH <type> <power> W/ft <power> W/m <voltage1> VAC <power> W/ft <power> W/m <voltage2> VAC Parallel-WS Trace Heater 40 A min. install. Temp -60°C (-76°F) -60°C (-76°F)<= Tp <= 250°C (482°F) <lot-No.> <hazardous area marking><continuous length marking> => see cable reel label for Dekra logo ! CAUTION: a ground fault protection device must be used with this heating device ATTENTION : ce produit doit etre utilise avec une protection de mise a la terre

Example ELP/PFA 10-240:
eltherm GmbH ELP/PFA 10-240 3 W/ft 20 W/m 240VAC 4 W/ft 13 W/m 277VAC Parallel-WS Trace Heater 40A min. install. Temp -60°C (-76°F) -60°C (-76°F) <= Tp <= 250°C (482°F) E11936 Zone 1 AEx/Ex 60079-30-1 IIC Gb T6…T2
Zone 21 AEx/Ex 60079-30-1 IIC Db T85°C…T300°C / Class I Div 1, 2 Group A,B,C,D Class II Div 1 Group E,F,G Class III Div 1 T6… T2 0158m => see cable reel label for Dekra logo ! CAUTION: a ground fault protection device must be used with this heating device ATTENTION : ce produit doit etre utilise avec une protection de mise a la terre

The entire installed system is marked by separate label as follows:



APPLICABLE TEMPERATURE RANGE

The System is in general suitable for ambient temperature from -76 °F (-60 °C) to +158 °F (+70 °C), in case of Class I Div 1 and 2 from -13 °F (-25 °C) to +104 °F (+40 °C) (USA) and -58 °F (-50 °C) to +104 °F (+40 °C) (Canada).
The cable glands included in kits "ELVB-SRAP...BR", when installed into devices which are not subject to overloading (Class II), should not be used where the surface temperature exceeds +329 °F (+165 °C).

The maximum permissible heater temperature is +482 °F (+250 °C).
The maximum permissible maintain temperature is +392 °F (+200 °C).
Further restrictions can result from the applicable T-Class temperature limits.

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LOCATION OF TEMPERATURE SENSORS

Temperature controllers

Temperature sensors may be used either as ambient sensing devices or attached directly to the equipment/device that is to be heated.

In case of ambient sensing, place the sensor in the coldest expected spot of the area where the heated equipment is located. This is typically a shaded place (e.g. on the northern side of buildings) on low ground. However, ambient sensing is recommended only for frost protection applications and when the permissible temperature band of the equipment to be heated and its contents is considerably wide (approx. 50K). Please consult the eltherm project department if further assistance is required.

In cases where sensors are directly attached to the heated equipment/device, two different applications need to be considered:

- heated pipes
  Place the sensor on the anticipated coldest section of the pipe. Avoid direct contact between sensor and trace heater. Branched piping systems may require more than one heating circuit (with a sensor each) or implementation of the "dead leg" technique depending on the flow pattern of the piping system. If help is required, please consult the eltherm project department for further assistance.

- heated vessels
  Place the heating on surfaces that always have contact to the contents of the vessel (typically the bottom of the vessel and/or lower section). Then place the temperature sensor in the heated area. Avoid direct contact between sensor and trace heater. Large vessels may require more than one heating circuit, especially when they need to be heated up at various fill levels. If help is required, please consult the eltherm project department for further assistance.

Be aware of the fact that temperature sensors mounted on the surface of the heated equipment never provide readings of the exact temperatures of the medium inside the device that is being heated. Therefore, temperature settings may need to be determined in an empirical way when exact temperatures are crucial for the process.

Temperature limiters

The use of temperature limiters is recommended to prevent excessive temperatures in case of a failure of the temperature control. For controlled design of heating circuits in Hazardous Areas that are not Zone 2 or 22, a temperature limiter is mandatory. Temperature limiter sensors are to be installed in the same way as controller sensors, however the anticipated hottest area of the heated equipment needs to be chosen as sensor location. Avoid direct contact between sensor and trace heater. A temperature offset between the equipment and heater sheath is reflected in the maximum maintain temperature stated on the heating circuit label. Unless otherwise noted, the limiter set point should be 5K above the actual maintain temperature. Please consult the eltherm project department if further assistance is required.

Further documents

In addition to this manual, the following documents apply:

- Data sheet trace heater ELP/PFA

- Documents provided with the kits listed under "SYSTEM COMPONENTS"

SPECIFIC REQUIREMENTS AS PER IEC/IEEE 60079-30-1 7.4 AND D7

- earth-fault equipment protection is required for each circuit (earth-fault equipment protective devices intended for use with trace heating circuits in Division areas shall be appropriately identified for use in Division areas).
- de-energize circuits before installation or servicing.
- keep ends of trace heaters and kit components dry before and during installation.
- the electrically conductive covering of this trace heater shall be connected to a suitable earthing terminal.
- the presence of the trace heaters shall be made evident by the posting of caution signs or markings at appropriate location and/or at frequent intervals along the circuit.
- retain the heat tracing documentation throughout the entire service life of the heated installation.
- Division 1 installations: the person(s) responsible for the installation shall complete and retain a document similar in format to the installation checklist in Annex B at the installation for future reference during maintenance and repair.

MISCELLANEOUS

Prior to work on pipes, vessels and associated equipment make sure it has sufficiently cooled down to avoid burns.

INSTALLATION OF THE EX HEAT TRACING SYSTEM ELP/PFA-...

Protective Measures

the minimum requirements for trace heating systems for use in explosive atmospheres are as follows:

a) a means of isolating all line conductors from the supply;
b) over-current protection provided for each branch circuit;
c) a means of protecting against earth faults by disconnecting all line conductors.

1) For TT and TN systems, each trace heater or trace heater branch circuit, the electrical protection shall be capable of interrupting high impedance earth faults as well as short circuit faults. This shall be accomplished by an earth-fault protective device, or a controller with earth-fault interruption capability for use in conjunction with suitable circuit protection. The preffered trip level is nominal 30 mA or 30 mA above any inherent capacitive leakage characteristic of the heaer as specified by the trace heater supplier.

2) For IT systems, an electrical insulation monitoring device shall be installed to disconnect the supply whenever the electrical resistance is not greater than 50 Ohm/V of rated voltage. Exception: Where conditions of maintenance and supervision ensure that only qualified persons service the installed systems, and continued circuit operation is necessary for the safe operation of the equipment or processes, earth-fault detection without interruption is acceptable if alarmed in a manner to assure an acknowledged response. The requirements of **a)**, **b),** and **c)** may be performed by one device.

The design of electrical resistance trace heating systems shall be overseen by persons knowledgeable of trace heating following the design methodology for explosive atmospheres as specified by the manufacturer.

Persons involved in the installation and testing of electirc trace heating systems shall be suitably trained in all special techniques required. Installation shall be carried out under the supervision of a qualified person.

The trace heating system documentation shall be retained for each trace heating circuit for as long as the system is in use.

Division 1 or Division 2 applications: The manufacturer's documentation shall be reviewed for specific installation requirements and the proposed installation shall be verified that the heating system is compatible with the environment.

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Heating Circuit Length

The maximum heating circuit length is based on the information given in the data sheet of the delivered trace heater type. It depends on the chosen voltage drop (max. 10% recommended) and on the utilisation of the installed circuit breaker.

Installation instructions

- Installation and connections must be made in compliance with NEC, CEC and local wiring regulations and electrical codes.
- **Class I Div 1 installations:** only to be done by personnel that is trained, qualified and knowledgeable in Class I Div 1 trace heating systems.
- remove any sharp objects on the surface to be heated.
- clean and degrease the surface.
- the installation of a heating circuit has to be carried out using original eltherm accessories according to eltherm installation instructions.
- maintain minimum bend radius of 25mm with all heaters.
- installed trace heater is to be fully covered (the entire lenght) with (adhesive) aluminium foil in order to prevent insulation material slipping between the heater and surface to be heated. If the insulation is covered with metal cladding, an insulation entry kit has to be used to avoid mechanical damage of the trace heater.
- The connection and end termination of the fee trac e heater ends has to be carried out using eltherm power and end termination kits. Required air gaps and creeping distances need to be observed (see eltherm termination instructions).
- The free heater end is to be connected either outside a Hazardous Area or to a connection box which is approved according to a standardised type of protection.
- Make sure to attach the trace heater - especially the area next to the electrical connection - to its surroundings in a proper way to avoid pulling stress or torsion on the electrical connection.
- Upon completion of the installation, the heating circuit needs to be marked by fitting an appropriate label to the associated junction box. The label shall be weatherproof and bear relevant information of the installed system including Ex marking.
- Electrically heated parts have to be identified in reasonable distances with warning labels "Electrical Heating" on the thermal insulation (approx. 5 m distance between each label on pipelines or at least 1 warning label per pipe-branch respectively).

⚠ ATTENTION

- To avoid short circuit, do not connect the two bus wires of the trace heater to each other. Under all circumstances observe the termination and maintenance instructions for the connection and termination of the trace heaters.
- Do not use adhesive tape with emollients (i.e. PVC)!
- Installed heaters must not touch or overlap. Risk of overheating!

TEST AND COMMISSIONING

After completion of a heating circuit but prior to the associated wiring and the installation of the thermal insulation (and prior to the pouring of seals in Class 1 Div 1 applications) the following steps shall be taken:

› A verification of the following heating circuit design paramaters:
a) temperature to be maintained or the maximum process / exposure temperature
b) maximum ambient temperature
c) trace heater type
d) operating voltage
e) trace ratio
f) length and resistance of trace heater
g) temperature class or maximum sheath temperature

in case of controlled desing also:

h) location of the sensor of the temperature controller on the heated workpiece
i) sensor mounting details
j) temperature set points
k) monitoring and failure announciation methods

in case of stabilized design also

h) workpiece dimensions
i) thermal insulation specification
j) cladding specification
k) maximum workpiece temperature

› Perform visual inspection of the trace heater for possible mechanical damage or improper installation.

› Insulation resistance test:
- the insulation resistance of each trace heater is to be measured between each single braid or screen. The measured values are to be noted.
- Test voltage: min 500 VDC, preferably 2500 VDC.
- Independent of the heating circuit length, the insulation resistance must not be lower than 20 MOhm. In case of a lower insulation resistance, the source of defect has to be determined and eliminated.
- the insulation resistance of the entire branch circuit (trace heater with junction box etc., disconnected at the circuit breaker) should not be lower than 5 MOhm

› Check of the function of the heating circuit (only in connection with the required temperature controller and/or limiter).

› Damages must be repaired/replaced immediately. With short heating circuits, the trace heater may be replaced completely. With longer heating circuits, the defect is to be eliminated by cutting out the damaged part and replacing it by a new piece of trace heater according to the termination instructions.

› Repeat the tests after the thermal insulation has been applied. In Class 1 Div 1 applications, also measure the insulation resistance of braid vs. workpiece to verify integrity of the outer jacket.

OPERATION AND MAINTENANCE

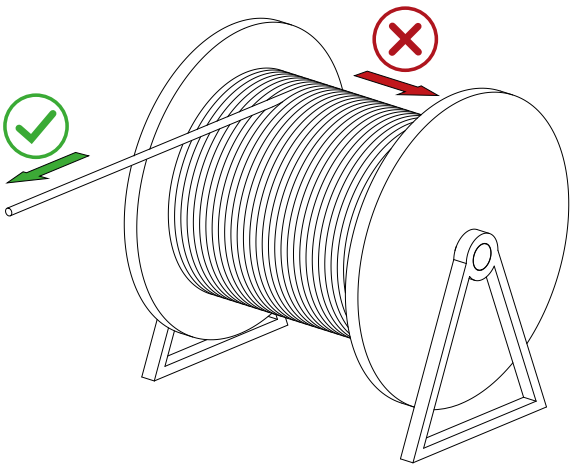
› During operation of the system, local laws and regulations for the use of electrical trace heaters in hazardous areas as well as all other applicable standards and safety regulations are to be followed.

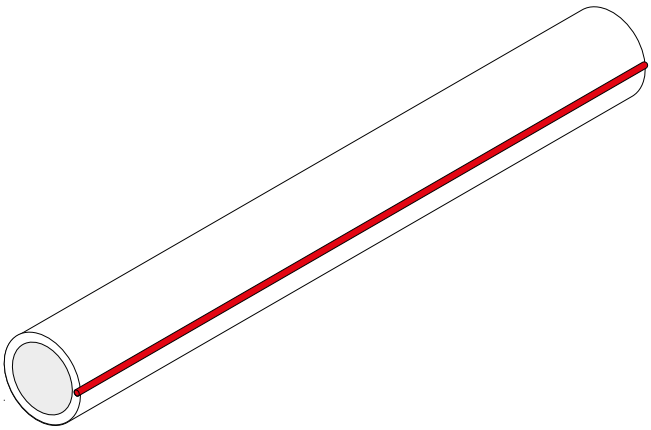
› The permissible operating conditions as stated on the type plate, print or in the datasheet (i.e. voltage, amperage, exposure temp., operating temp., IP protection classification) are to be followed accordingly.

- The permissible temperatures given in section "Applicable temperature range" must not be exceeded.
- In order to preserve energy, to obtain accurate temperatures or to protect the heaters use of temperatures controllers can be appropriate. If in doubt, please contact the eltherm project department.
- The sheath temperature of ELP heaters needs to be limited by controlled or stabilized design in accordance with EN 60079-30-2. The related designs are to be made by eltherm (this includes confirmation of designs made by third parties).
- The system ELP/PFA generally operates maintenance free. However, it is recommended that the system be checked by qualified personnel in regular intervals for visual damages and insulation resistance.
- Read the heat tracing documentation prior to any maintenance or repair work.
- The opening of controllers, junction boxes and terminations is permitted only when the heating system is not energised.
- Installed trace heater has to be protected against damage that may occur during repair work on heated components.
- After completion of the repair, the heating circuit will once again need to be tested as shown in paragraph "TEST AND COMMISSIONING". Also, test the operation of the earth-fault device of each affected circuit.
- Damaged heating circuits shall not be operated. In the event of an earth fault or over current interruption, the device shall not be reset until the cause of the trip has been investigated by qualified personnel.
- Temperature control units and control devices are to be checked at least annually by trained workers or authorized persons.

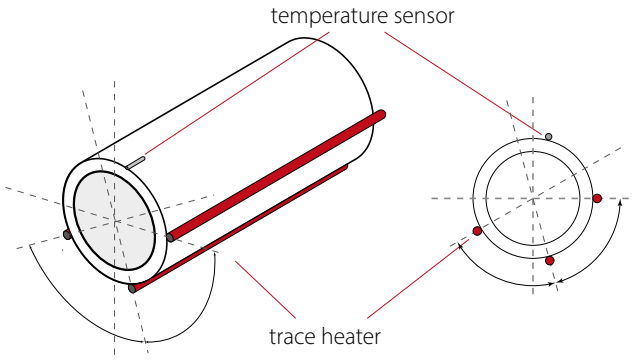
INSTALLATION OF TRACE HEATERS

INSTALLATION OF TRACE HEATERS ON PIPES

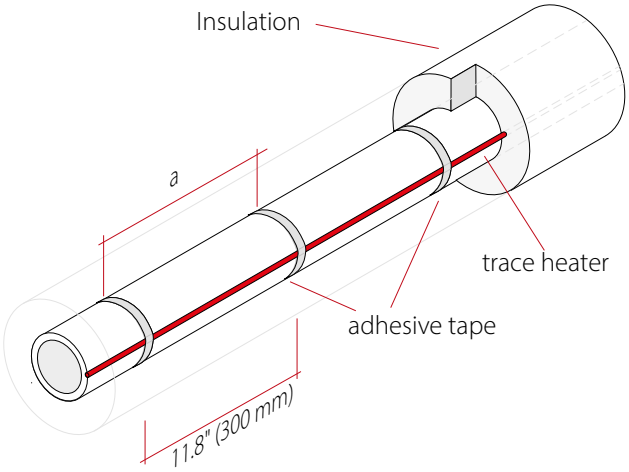




- Use a stable holder to unwind the trace heater.
- Ensure that the unwinding device runs smoothly to prevent damage to the trace heater due to excessive tensile force.
- Unroll the trace heater straight over the edge of the drum, not off to the side.
- Normally the trace heater is laid streched out along the pipe. Lay trace heaters in a spiral pattern only if the projects planning explicity calls for it.



- Do not lay the trace heater on the lowest point of the horizontal pipeline.
- Laying the trace heater on the top half of a horizontal pipeline is unfavourable for reasons of heat distribution and should only be done if the project planning calls for it.



The heater is traced and fixed parallel to the pipe axis.

Hazardous area:

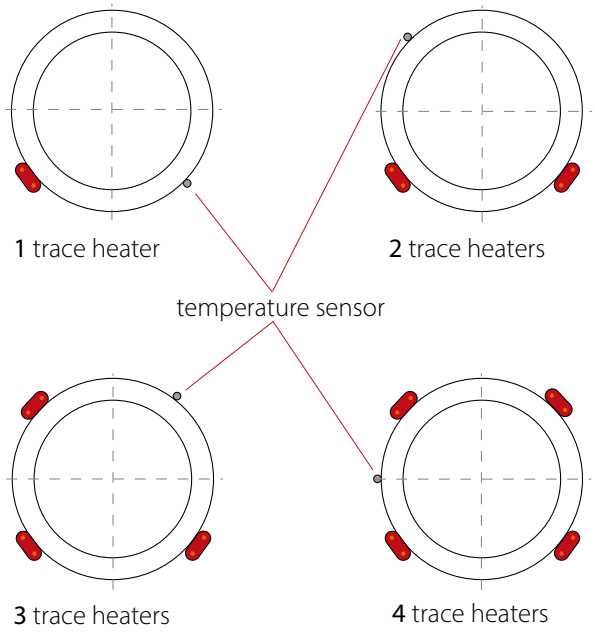
a = max. 11.8" (300 mm)

- Use only fastening materials that have been defined as suitable accessories by the manufacturer and that were selected in the design documents.
- Make certain that the selected materials meet the requirements (for temperature, mechanical and chemical resistance).
- Check whether the use of other elements (such as aluminium adhesive tape for better heat transfer) is required in the design documents.

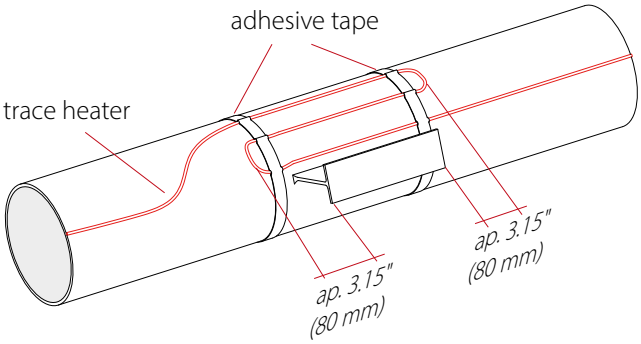
NOTE

- We recommend covering the entire surface of the trace heater on plastic containers or pipes (PE/PP/PVC/GRP/GRP or similar) with aluminium foil.
- To save energy and to keep process temperatures constant, the application of superior control units are recommended. Please ask our project engineers when in doubt.

- When installing several trace heaters on one pipe please refer to the following sketch.



Installation of trace heaters on pipe supports

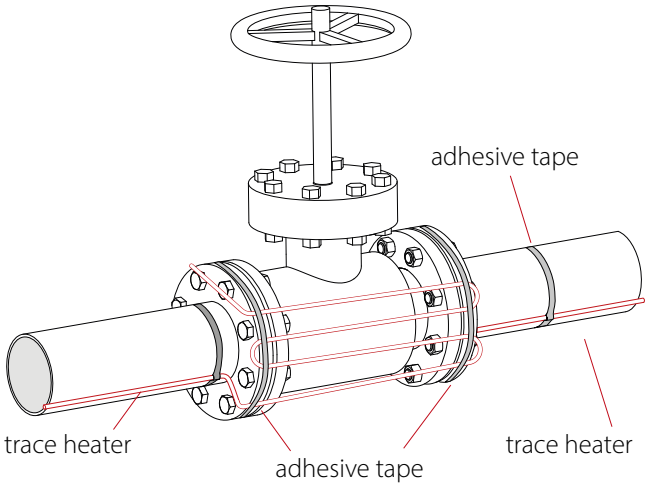


- In areas of pipe supports, trace heaters must be laid in a looped manner in order to be able to provide sufficient power at this point.

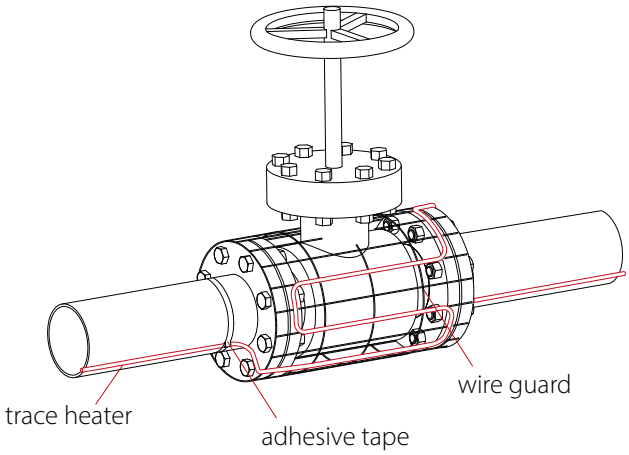
ATTENTION

- Observe the specified length allowances in project planing or design (for example in eltherm Designer).

INSTALLATION OF TRACE HEATERS ON VALVES



- In areas with large pipe diameters, trace heaters must be laid in a loop.
- A Special mounting variant consists of fastening the trace heater onto wire guard. This variant is used mainly for heating geometrically complex shapes. This variant is also used if fittings (such as valves and pumps) have to be heated and easy access to the fittings is especially important (for maintenance purpose, etc.) This ensures that the wire guard will be easy to open and close again without having to remove the trace heater first.

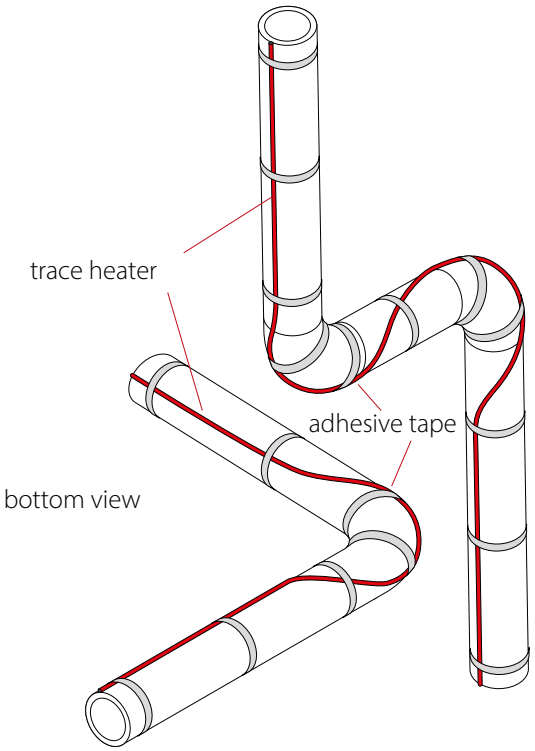


⚠ ATTENTION

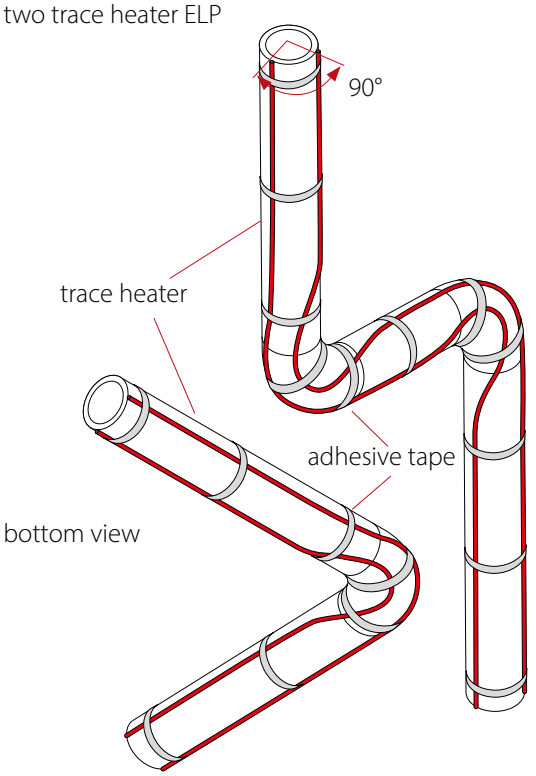
- Make certain the wire quard has the best possible contact with the surface of the fitting.
- Only fasten the trace heater with the fastening material provided by the manufacturer and follow the recomendations for fastenings.

INSTALLATION OF TRACE HEATERS ON ELBOWS

one trace heater ELP

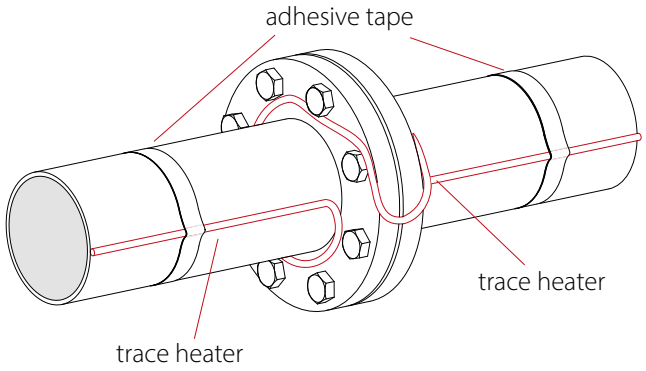


two trace heater ELP



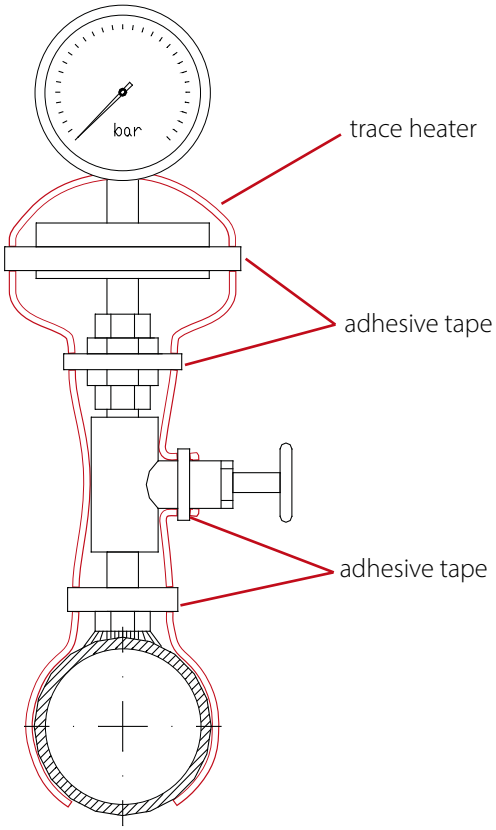
- When laying a trace heater around a pipe bend, the trace heater must be laid on the outside of the pipe bend. If it is laid on the inside, the flow medium may be deposited in the pipe due to the lower heat input to the pipe.

INSTALLATION OF TRACE HEATERS ON FLANGES

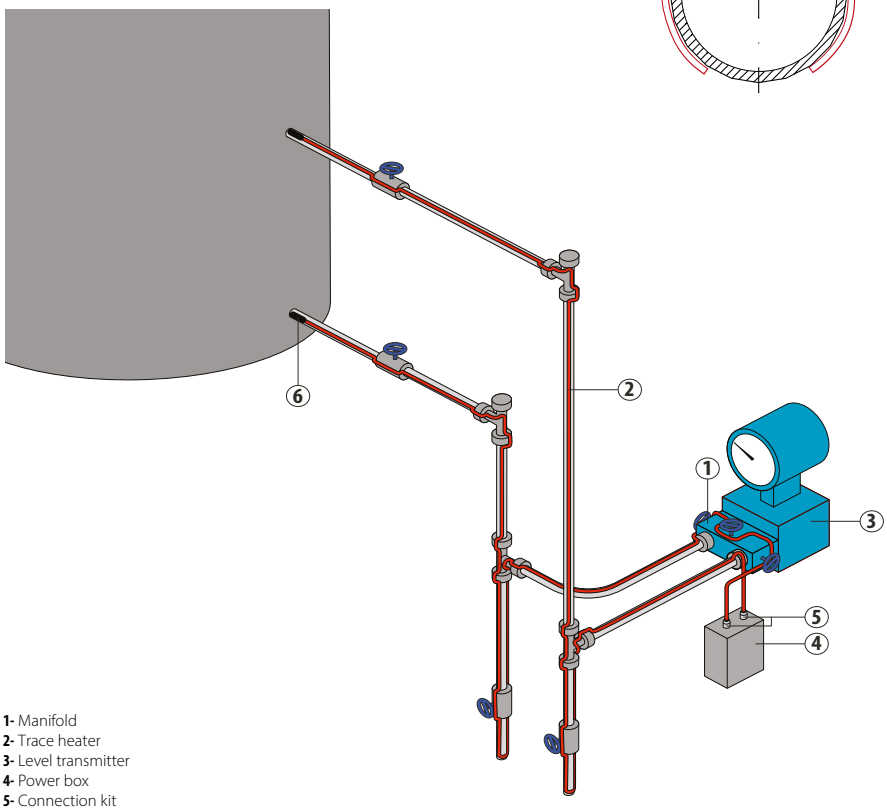


- When laying a trace heater around a flange connection, it must be ensured that the trace heater is laid once around the pipe directly in front of the flange connection. More power must be applied to the pipe at this point due to higher thermal expansion.

INSTALLATION OF TRACE HEATERS ON FITTINGS



INSTALLATION OF TRACE HEATERS ON LEVEL INDICATORS



1- Manifold
2- Trace heater
3- Level transmitter
4- Power box
5- Connection kit
6- End seal

⚠ ATTENTION

Fittings and level indicators must be installed all round to ensure uniform thermal expansion.

DOWNLOADS

You can find helpful downloads for this or other products under the following link:

https://eltherm.com/downloads

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