Industrial Heat-Tracing Catalogue
Products and Project services

Raychem

HEW-THERM®

Pyrotenax BRAND

DigiTrace

TRACER

IEC / ATEX

For every heat-tracing need, rely on the undisputed **industry leader**

Tyco Thermal Controls stands as the world leader in heat-tracing solutions for industrial markets. An innovation company, Tyco Thermal Controls offers world class products and turnkey services under such industry renowned names as Raychem, Tracer, HEW-THERM, Pyrotenax and DigiTrace.

Tyco Thermal Controls' **Brands**

Raychem

Raychem is the leading brand for self-regulating and power-limiting systems that are ideal for the heat-tracing of complex pipework and equipment.

HEW-THERM®

HEW-THERM is a proven range of industrial polymer-insulated (PI) series heating systems and particularly suitable for heating circuits in excess of 250 metres.

Pyrotenax

Pyrotenax are mineral-insulated (MI) heating systems that withstand the harshest environments. They provide the most reliable systems for high-temperature applications up to 700°C.

DigiTrace

DigiTrace holds the industry's most complete range of dedicated heat-tracing control and monitoring systems. The DigiTrace range extends from simple thermostats to advanced networked systems.

TRACER

The **Tracer** project services organisation is widely regarded as the premier provider of turnkey heat-tracing solutions in the industrial market today, offering turnkey engineering, design, construction and maintenance.

Tyco Thermal Controls is capable of handling heat-tracing projects of any size and scope. By focusing on safety and utilising time-tested methods and solutions, Tyco Thermal Controls' heat-tracing designs and installations are timely, thorough and cost-effective.

TraceCalc Pro

TraceCalc Pro software is the universal design tool for electrical heat-tracing applications. The software can be downloaded for free from the website. It supports worldwide codes, standards and design practices, helping customers to select the ideal solution from the broad Tyco Thermal Controls product range.

TRACER LYNX

TRACERLYNX
Tracer's unique design and project controls software integrates heat management system designs with customers' 3D plant models.

BEFORE YOU BUY, WEIGH THE FACTS...

- ☑ Widest range of high quality products for any heat-tracing application
- ☑ Continuous innovation of our products and services
- ☑ Most advanced line of control and monitoring systems
- ☑ Highest excellence in operations with major logistic hubs and customer service centers worldwide
- ☑ Global company with local presence-more than 2500 employees in over 85 locations

We are the leading full-service integrator for Heat Management Systems (HMS) offering project services for complete construction, project management and maintenance and we provide total care in heat-tracing.

From product supply to full HMS projects services, Tyco Thermal Controls philosophy is:

WE CAN DO IT FOR YOU - WE CAN DO IT WITH YOU...!

We manage the heat you need

Table of **contents**

HEAT MANAGEMENT SYSTEMS

Heat-tracing

Pipes, equipment, instruments

Control and monitoring

Power distribution

Thermal insulation

Warm Pipe Warranty

By allowing Tyco Thermal Controls to handle all of the engineering, design, and construction of your complete heat-tracing system, we can provide you with a Warm Pipe Warranty, ensuring that the system operates as specified.

Heat Management Systems (HMS)

A Heat Management System (HMS)

Is an engineered system designed to maintain or protect process piping, equipment, vessels and instruments at defined temperatures and within specified design criteria.

Tyco Thermal Controls has more than 50 years of experience and supplied more than 500,000 km of heating cable for installations in more than 100 countries around the world.

These include applications involving processes in pipes, wells, tanks and vessels and meet the needs of many different industries.

In addition to pipe-tracing systems, there are standard (off-the-shelf) or customised solutions to meet a broad variety of needs.

Tyco Thermal Controls has the resources and expertise to provide complete Heat Management Systems for your projects everywhere in the world.

TRACER

PROJECT SERVICES

Front End Engineering and Design (FEED)

Detailed engineering

Procurement

Installation and construction

Commissioning

Maintenance

ZERO INCIDENTS tyco Thermal Controls BELIEVE IT!

Committed to safety through proactive safety management techniques

Safety

Safety is our number one concern for project services. We are recognised as a leader in the industry in safety performance by consistently challenging the norm through safety innovations including training and motivational programmes.

Project services

Tyco Thermal Controls' project service goes beyond product supply to system integration and right through to full turnkey project management. There are Tracer service centres in many countries enabling them to meet local requirements and reflect local practices while providing a full array of Heat Management System (HMS) services.

Tracer engineering teams can support all different stages of any size project or provide a full Engineering, Procurement and Construction (EPC) service. This ensures that the whole plant has the best possible system, with a single point of responsibility for its success, providing total care in heat-tracing.

Front End Engineering and Design (FEED)

Engaging Tyco Thermal Controls early in the planning process allows them to help you make decisions which can reduce overall installed cost of the heat management systems.

Procurement

Tyco Thermal Controls will manage all materials procurement and fabrication activities making sure the right materials get to the right work location at the right time.

Commissioning

Tracer commissioning services ensure that the heat management system is operating as expected. This includes full system audits, programming and set up of control panels and operational checks.

Detailed engineering

Tracer's experienced engineers apply product and optimisation strategies to design a heat management system which meets your specific requirements with the highest reliability and lowest total life cycle cost.

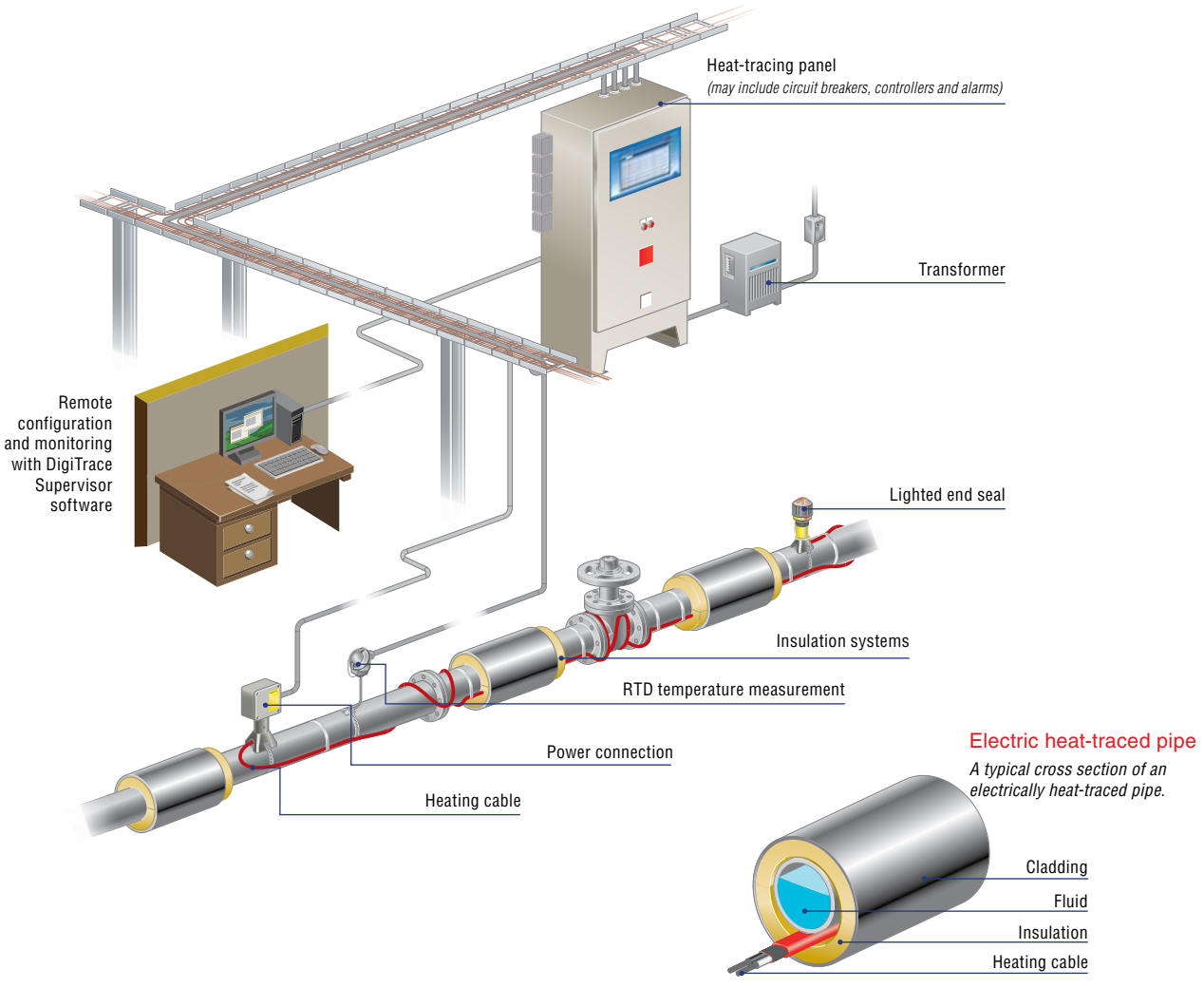
Installation & construction

Tracer construction teams are fully trained and experienced. Leverage our expertise to ensure timely and correct installation of your heat management system components, insulation and cladding.

Maintenance

Our maintenance and audit programmes provide you with the security of having your system regularly evaluated by experts allowing timely resolution of potential system problems.

Raychem



Electric heat-traced pipe

A typical cross section of an electrically heat-traced pipe.

Note: The illustrations on these pages do not necessarily depict actual applications and installations.

Electric heat-tracing systems

A complete electric heat-tracing (EHT) system is much more than just the heating cable

Tyco Thermal Controls' product range contains everything that's needed to create complete systems. Developed in response to the needs of Tyco Thermal Controls' customers worldwide, it includes all relevant components and accessories. These products offer the benefits of:

- ☑ Increased reliability for the complete EHT circuit
- ☑ Ease of installation
- ☑ Simple maintenance
- ☑ Simplified stocking/ordering and reduced parts storage through adaptability of components
- ☑ Increased safety and simplified documentation through relevant approvals, including complete systems

No heat-tracing system is complete without effective control and monitoring. Tyco Thermal Controls has developed a broad range of options to meet customer needs for maximising the efficiency of their EHT systems. This includes the unique option of local control with central monitoring that offers major benefits in reducing total operating costs.

Raychem

Innovation

Since the invention of Raychem self-regulating technology that revolutionised the industry, Tyco Thermal Controls' customers worldwide have benefited from constant developments and new product innovations that have enabled the use of parallel heating systems on an ever wider variety of industrial applications.

They've gained through the simpler, more efficient installation of unique fibre-wrap constructions; benefited from the higher power and higher exposure temperature resistance of power limiting technology, with the continuing reassurance that the systems they install contain the industry's most advanced technologies for parallel heating systems.

Completed by a full range of components design for easy installation and lowest maintenance, parallel heating systems provide the most flexible solution for any project. Changes between the engineering stage and the construction can be best accommodated with their cut-to-length feature and easy redesign.

1970s Invention of **self-regulating technology**

1990s Enhanced version of **monolithic cables** with QTVR family

2000 Introduction of **power limiting technology** for higher temperatures and high power output at elevated temperatures

1980s Introduction of **self-regulating fibre technology** for high temperature and steam cleaning

1997 Full range of **cold applied components** for easy installation and lowest maintenance

2006 Introduction of **Raychem FxT, an economic constant wattage system** with a highly reliable round heating cable construction

Product technology

From the inventor of self-regulating technology and with a installed base exceeding 500,000 km, Raychem self-regulating systems offer a proven and most reliable solution.

Parallel heating systems

Raychem

PARALLEL HEATING SYSTEMS

Self-regulating technology

We invented it forty years ago

Introduction

From the inventor of self-regulating technology and with installed base output exceeding 500,000 km, Raychem self-regulating systems offer a proven and most reliable solution.

Operating to voltages up to 277 V, the wide range of self-regulating products can provide:

Temperature maintenance up to 150°C

Exposure temperature up to 215°C

Circuit lengths up to 245 m

Construction

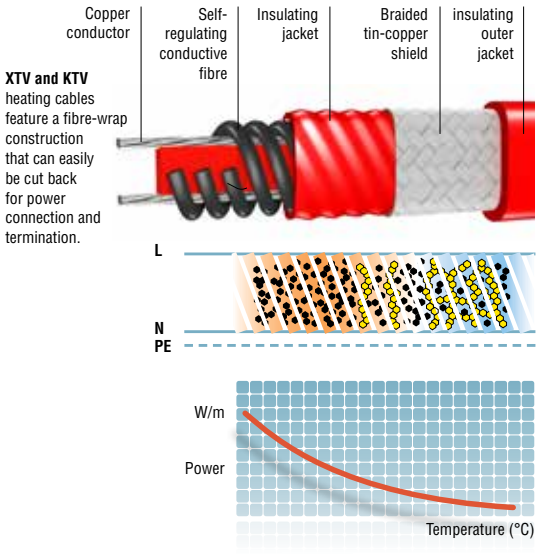
The most forgiving of all existing heat-tracing technologies, self-regulating heating cables incorporate a heating element made of polymers mixed with conductive carbon black. This special blend of materials extruded between the conductors creates electrical resistive paths. The number of electrical paths changes in response to temperature fluctuations.

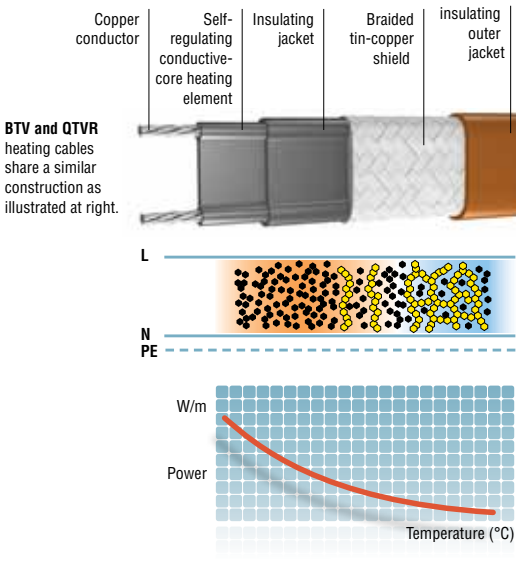
How it works

As the temperature surrounding the cable decreases, the conductive core contracts on a microscopical level, decreasing the electrical resistance and creating numerous electrical paths between the conductors. Current flows along these paths to warm the core.

As the temperature rises, the core expands on a microscopical level, increasing electrical resistance and decreasing the number of electrical paths.

As a result, the heating cable can be overlapped several times without risk of degradation, since the power is greatly reduced at high temperatures.





Benefits

Easy installation

Self-regulating heating cables may be cut-to-length on-site and can be overlapped multiple times at valves, flanges and instruments without the risk of local overheating.

More uniform temperatures

Because the heater senses and responds to actual conditions along the pipe, the system accommodates variations due to static fluid and differing elevations.

Predicted maximum generated temperatures

Raychem self-regulating heating cables offer unconditional T-ratings as specified by European norm EN 60079-30-1 (no requirement for sheath temperature calculations/controls).

When designed properly, the process medium won't exceed a certain temperature even when temperature controls fail.

Applications

Any process in pipes, tanks or vessels for freeze protection, temperature maintenance, viscosity control, or anti-condensation.
Typical industries include:
- Oil and gas (exploration, production, refining, distribution)
- Chemical and petrochemical
- Pharmaceutical and healthcare
- Power (bio-diesel, solar, hydro...)
- General industries

Power-limiting technology

A need for high power or temperature exposure?

Power-limiting heating cables (VPL) can be used for freeze protection and process temperature maintenance requiring high power output and/or high temperature exposure.

Operating to voltages up to 480 V, power-limiting heating cables can provide:

Temperature maintenance up to 235°C

Exposure temperature up to 260°C

Circuit lengths up to 450 m

Construction

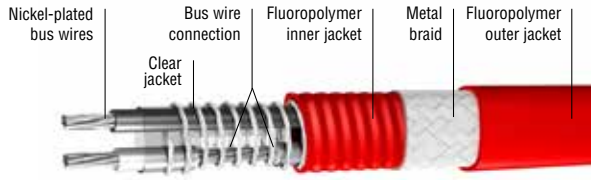
Power-limiting cables are formed by a coiled resistor alloy heating element wrapped around two parallel conductors. At a fixed distance the insulation is removed from one of the conductors and the process is repeated, removing the insulation from the other conductor. The distance between contact points forms the heating zone length.

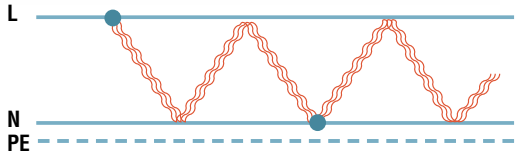
How it works

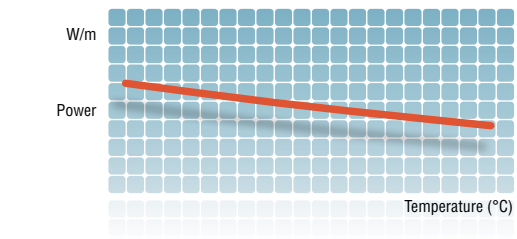
The positive temperature coefficient (PTC) of the alloy resistor heating element allows an adaptation of power in relation to the temperature of the system on which the heating cable is installed.

As the temperature surrounding the cable decreases, the resistance of the heating element reduces, resulting in an increase of power output. As the temperature rises, this resistance increases generating a limitation of the power output.

This effect allows the power-limiting cable to be overlapped once, since the power-output of the heating element is reduced at cross-over points.







Product technology
Parallel heating systems

Benefits

Reduced heating cable quantity

Power-limiting heating cables provide high power-output at elevated temperatures which can reduce the number of heating cable runs required.

Lower start-up current

The relatively flat power temperature curve ensures a lower start-up current.

Longer circuit lengths

When operating at higher voltages, the maximum circuit lengths increase and therefore the number of circuits and use of junction boxes, power cables and other components can be reduced.

Easy installation

Power-limiting heating cables may be cut-to-length on-site according to heating zone length and can be overlapped once at valves, flanges and instruments without the risk of local overheating.

Limited maximum generated temperatures

By their specific power-limiting technology, Raychem VPL heating cables offer the possibility of stabilised design T-ratings as specified by European norm EN 60079-30-2.

Applications

Typical applications include needs for high maintain temperatures or continuous high exposure temperatures in all industrial applications.

Constant wattage technology

A need for high power or high temperature exposure?

Constant wattage products are high-quality general-purpose heating cables that can be used for a wide variety of applications.

Operating to voltages up to 415 V, constant wattage heating cables can provide:

Temperature maintenance up to 235°C

Exposure temperatures up to 260°C

Circuit lengths up to 330 m

Construction

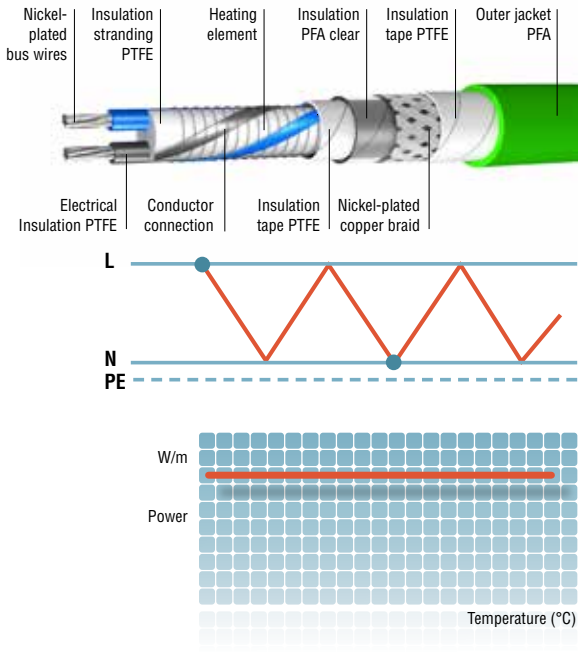
Constant wattage cables are formed by a Ni-Chrome resistor heating element wrapped around two parallel conductors. At a fixed distance the insulation is removed from one of the conductors and the process is repeated, removing the insulation from the other conductor. The distance between contact points forms the heating zone length.

How it works

This construction, with heating zones, generates a constant power on the entire length of the cable. As a result, surrounding temperature does not influence this power output, which remains constant.

Several standard ranges of power output are achieved during manufacturing by adaptation of heating element resistance and heating zone length.

Due to their mode of heat emission, constant wattage parallel heating cables cannot be overlapped as this could lead to a local degradation of the cable.



Benefits

Easy installation

Raychem constant-wattage zone heating cables with their unique round construction ensure a high flexibility of installation and limit risks of local overlapping at valves, flanges or other pipe fittings.

Economical solution

Increased range of temperature exposure while maintaining the benefits of cut-to-lengths cables.

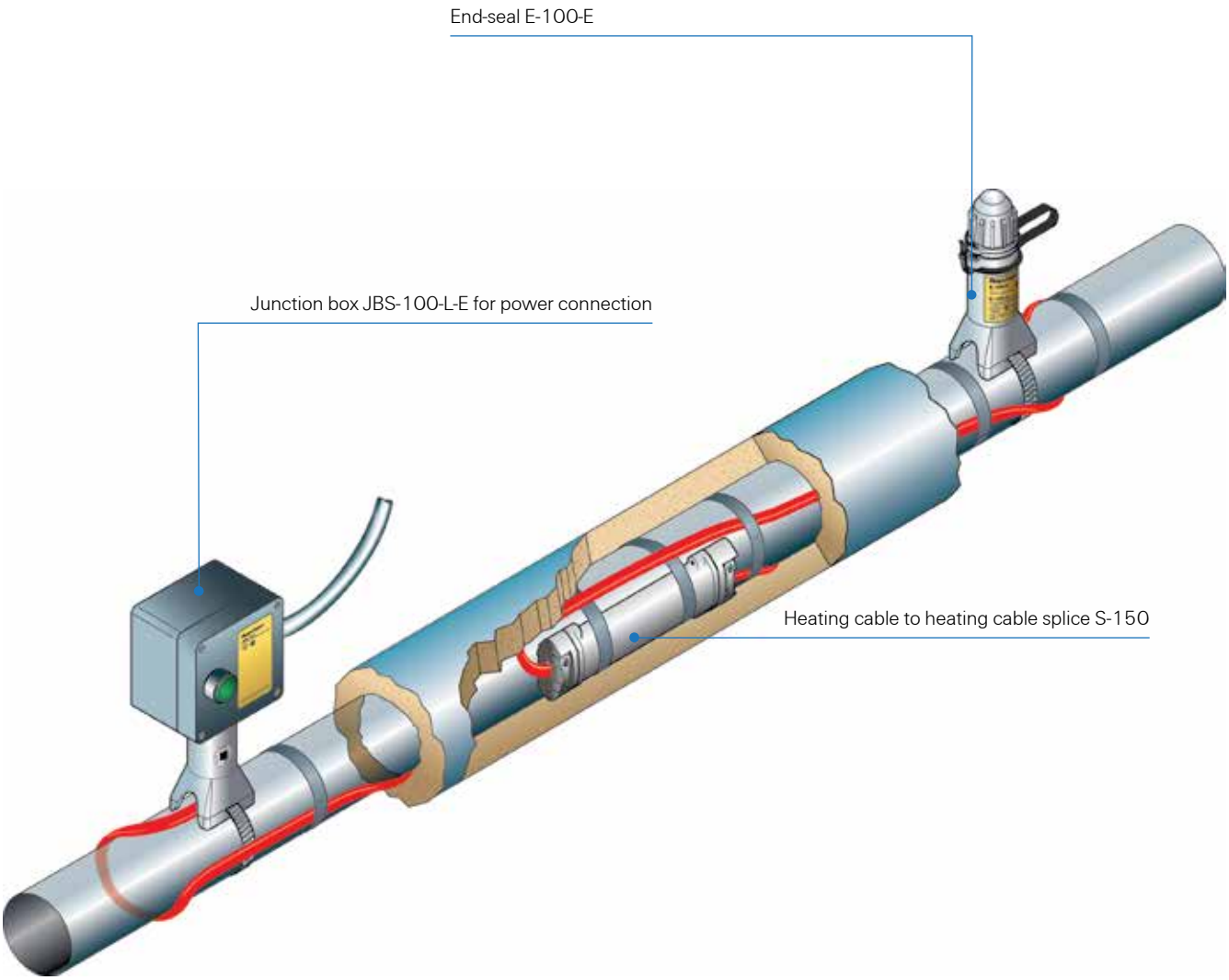
Reduced number of heating circuits

Due to the lower start-up current, the number of circuits or rating of circuit breakers can be reduced compared to self-regulating or power-limiting technologies.

Applications

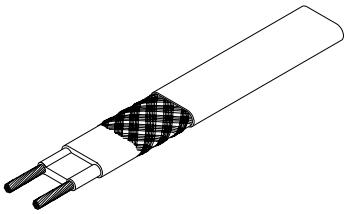
Simple piping systems, equipment where temperature control systems can easily be implemented in association with heating cables.

Typical configuration for Raychem self-regulating or power-limiting heating systems



Self-regulating and power-limiting heating cables

BTV

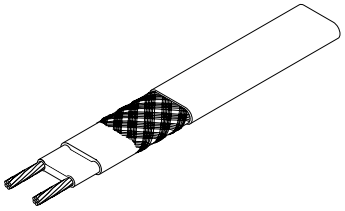


The Raychem BTV range of self-regulating heating cables is mainly used for frost protection of pipes and vessels but can also be used to maintain processes up to 65°C. These heating cables are available in two different outer jacket materials. The polyolefin outer jackets (-CR) are suitable for use in areas where the cables will only be exposed to mild inorganic solutions whereas the fluoropolymer outer jackets (-CT) offer a high general chemical resistance.

The products are approved for use in hazardous areas Zone 1, Zone 2 (Gas), Zone 21 and Zone 22 (Dust) and have an absolute temperature classification of T6 in accordance with European Standard EN 60079-30-1.

For full details please refer to the datasheet on page 86.

QTVR

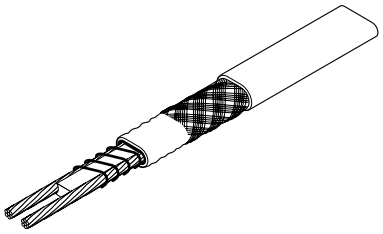


The Raychem QTVR range of self-regulating heating cables is mainly used for frost protection of pipes and vessels requiring a higher power output than the BTV heating cables can supply. They can also be used to maintain processes up to 110°C. These heating cables all have fluoropolymer outer jackets offering a high chemical resistance.

The products are approved for use in hazardous areas Zone 1, Zone 2 (Gas), Zone 21 and Zone 22 (Dust) and have an absolute temperature classification of T4 in accordance with European Standard EN 60079-30-1.

For full details please refer to the datasheet on page 88.

XTV

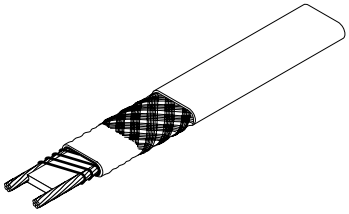


The Raychem XTV range of self-regulating heating cables is used for frost protection of pipes and vessels that require steam cleaning. They can also be used to maintain processes up to 120°C. These heating cables all have fluoropolymer outer jackets offering a high chemical resistance.

The products are approved for use in hazardous areas Zone 1, Zone 2 (Gas), Zone 21 and Zone 22 (Dust) and have an absolute temperature classification of T3 (except 20XTV2-CT-T2) in accordance with European Standard EN 60079-30-1.

For full details please refer to the datasheet on page 90.

KTV

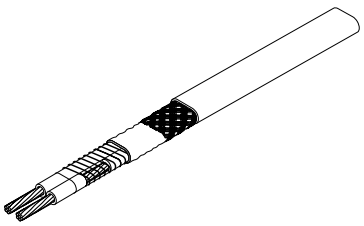


The Raychem KTV range of self-regulating heating cables is mainly used for frost protection of pipes and vessels that require steam cleaning . They can also be used to maintain processes up to 150°C. These heating cables all have fluoropolymer outer jackets offering a high chemical resistance.

The products are approved for use in hazardous areas Zone 1, Zone 2 (Gas), Zone 21 and Zone 22 (Dust) and have an absolute temperature classification of T2 in accordance with European Standard EN 60079-30-1.

For full details please refer to the datasheet on page 92.

VPL



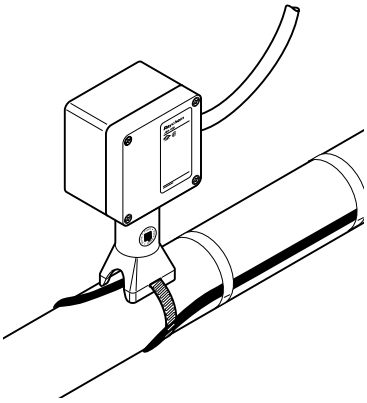
The Raychem VPL range of power-limiting heating cables is mainly used for temperature maintenance of processes and offers the advantage of a high power output at high temperatures which can reduce the number of heating cables required. They can also be used for frost protection of pipes and vessels that require steam cleaning. These heating cables all have fluoropolymer outer jackets offering a high chemical resistance. The VPL products are available in various voltages, 110 Vac, 230 Vac and 480 Vac. The 480 V version offers the further advantage of long circuit lengths potentially reducing the number of supply points required.

The products are approved for use in hazardous areas Zone 1, Zone 2 (Gas), Zone 21 and Zone 22 (Dust). Unlike the self-regulating heating cables the T-classification for these products has to be calculated and will depend on the design conditions, this may also result in the need to use a safety temperature limiter.

For full details please refer to the datasheet on page 94.

Components and accessories

JBS-100-E



Cold applied integrated power connection for 1 heating cable. One power cable gland included. Suitable for use with all Raychem industrial self-regulating or power-limiting heating cables in hazardous and non-hazardous areas. Requires 1 pipe strap, to be ordered separately.

Details on page 126.

Also available with a green light for basic monitoring,
order reference: **JBS-100-L-E**

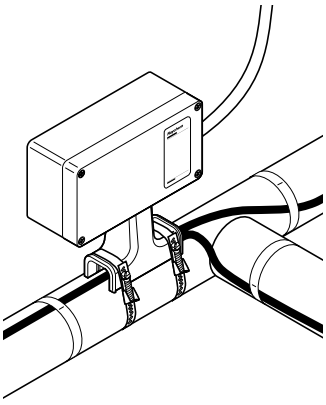
JBS-100-EP

Cold applied integrated power connection for 1 heating cable. Includes earth plate and earth stud for use with armoured cables. Suitable for use with all Raychem industrial self-regulating or power-limiting heating cables in hazardous and non-hazardous areas. Requires 1 pipe strap and 1 metal power cable gland to be ordered separately.

Details on page 126.

Also available with a green light for basic monitoring,
order reference: **JBS-100-L-EP**

JBM-100-E



Cold applied integrated power connection for up to 3 heating cables. May also be used for tee and splice connections. One power cable gland included. Suitable for use with all Raychem industrial self-regulating or power-limiting heating cables in hazardous and non-hazardous areas. Requires 2 pipe straps, to be ordered separately.

Details on page 129.

Also available with a green light for basic monitoring,
order reference: **JBM-100-L-E**

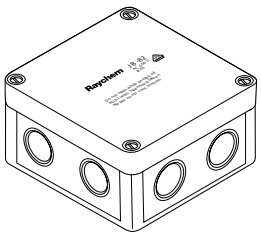
JBM-100-EP

Cold applied integrated power connection for up to 3 heating cables. Includes earth plate and earth stud for use with armoured cables. May also be used for tee and splice connections. Suitable for use with all Raychem industrial self-regulating or power-limiting heating cables in hazardous and non-hazardous areas. Requires 2 pipe straps and 1 metal power cable gland, to be ordered separately.

Details on page 129.

Also available with a green light for basic monitoring,
order reference: **JBS-100-L-EP**

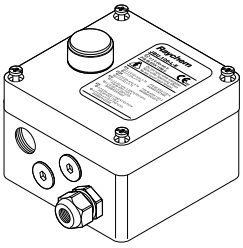
JB-82



The JB-82 is a standard, non-hazardous polycarbonate junction box. Up to four heating cables or three heating cables and the appropriate size power cable can be accommodated through the four entries and connected to the rail mounted terminals

Details on page 135.

JBU-100-E



This junction box provides four M25 threaded entries, stopping plugs and one plastic power cable gland. Suitable for use with all Raychem industrial self-regulating or power-limiting heating cables in hazardous and non-hazardous areas. Connection kits (M25), insulation entry kits and support bracket have to be ordered separately.

Details on page 132.

Also available with a green light for basic monitoring,
order reference: **JBU-100-L-E (shown)**

JBU-100-EP

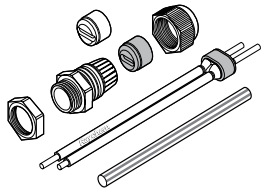
This junction box provides four M25 threaded entries, an earthing plate and an external earth stud. It is designed for use with armoured power cables and metal glands. Suitable for use with all Raychem industrial self-regulating or power-limiting heating cables in hazardous and non-hazardous areas.

Metal power cable gland, connection kits (M25), insulation entry kits and support bracket have to be ordered separately.

Details on page 132.

Also available with a green light for basic monitoring,
order reference: **JBU-100-L-EP (shown)**

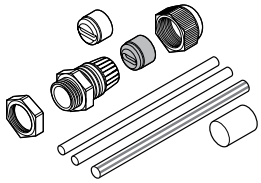
C25-100



This cold applied connection kit is designed for terminating all Raychem self-regulating and power-limiting industrial parallel heating cables to a junction box in hazardous and non-hazardous areas, whilst maintaining electrical insulation of the heating cable conductors and core.

Details on page 147.

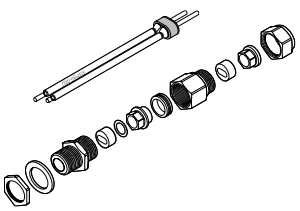
C25-21



This hot applied connection kit is designed for terminating all Raychem self-regulating and power-limiting industrial parallel heating cables to a junction box in hazardous and non-hazardous areas, whilst maintaining electrical insulation of the heating cable conductors and core.

Details on page 148.

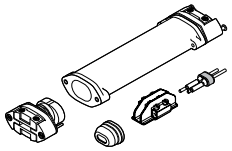
C25-100-METAL and C3/4-100-METAL



These cold applied connection kits are designed for terminating all Raychem self-regulating and power-limiting industrial parallel heating cables to a junction box with an internal earth plate, whilst maintaining electrical insulation of the heating cable conductors and core. These kits are made from brass, but are also available in a nickel plated version (contact Tyco Thermal Controls representative for more information).

Details on page 150.

C-150-E

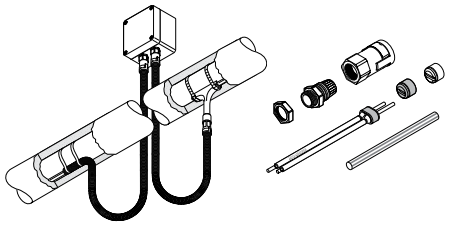


Cold applied low profile power connection for one heating cable for use in hazardous and non-hazardous areas. Maximum load of 25 A. Suitable for non-armoured power cables up to 2.5 mm^2 with stranded copper conductors C-150-E is used as a connection kit:

- Where connection to a junction box is difficult e.g. because of space limitations on instrument lines or loading arms
- Where installation of under insulation components is preferred as a cost effective alternative for JBS-100-E on short lines
- The kit is not suitable for use with VPL heating cables.

Details on page 152.

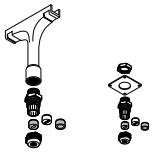
CCON2x-C.. and accessories



Conduit system for additional mechanical protection of accessories self-regulating and power-limiting heating cables when using off-pipe mounted junction boxes. Designed to allow for usage in hazardous areas and to provide additional mechanical protection of heating cables between the junction box and entry into the insulation. The conduit system is available in different materials for different temperatures and fully supported with all required accessories for different connection methods.

Details on page 159/149

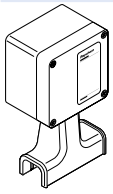
IEK-25-PIPE/IEK-25-04



Insulation entry kits for pipes, tanks and vessels usable for IEK-25-04 heating and power cables with outside diameter in the range of 8 - 17 mm. The IEK-25-PIPE has a high temperature stand that can be fixed to the pipe whereas the IEK-25-04 is mounted on the cladding.

Details on page 177.

T-100

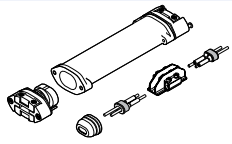


Cold applied kit for making tee or splice connections with crimps, above the insulation in hazardous and non-hazardous areas. Requires 2 pipe straps, to be ordered separately.

Required crimp tool, reference: **T-100-CT**
Suitable for use with all Raychem industrial self-regulating or power-limiting heating cables.

Details on page 166.

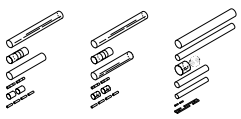
S-150



Cold applied low profile splice kit for making splice connections with terminals under the insulation in hazardous and non-hazardous areas. Not suitable for use with VPL heating cables

Details on page 162.

S-19/S-21/S-69



Hot applied under insulation splice kits for use in hazardous and non-hazardous areas. S-19 is for use with BTV heating cables, S-21 is for use with QTVR heating cables and the S-69 is for use with XTV and KTV heating cables.

Details on page 164.

E-100-E

Cold applied mechanical end seal for use in hazardous and non-hazardous areas, above insulation for easy access for testing. Requires 1 pipe strap, to be ordered separately. Suitable for use with all Raychem industrial self-regulating or power-limiting heating cables.

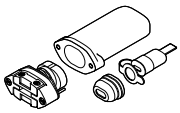
Details on page 168.

E-100-L2-E

Cold applied mechanical end seal with green LED light module for use in in hazardous and non-hazardous areas, above insulation for easy access for testing. Requires 1 pipe strap, to be ordered separately.
Suitable for use with all Raychem industrial self-regulating or power-limiting heating cables.

Details on page 168.

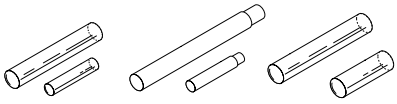
E-150



Cold applied low profile end seal for use in hazardous and non-hazardous areas.
Not suitable for use with VPL heating cables.

Details on page 171.

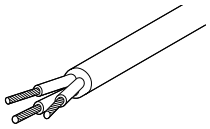
E-06/ E-19/ E-50



Hot applied under insulation end-seal kits for use in hazardous and non-hazardous areas. E-06 is for use with BTV and QTVR heating cables, the E-19 is for use with XTV and KTV heating cables and the E-50 is for use with the VPL heating cables.

Details on page 173.

C-150-PC



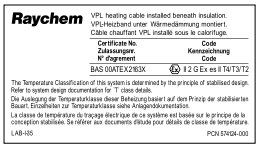
3-core flexible power cable for connection to C-150-E. 3 x 2.5 mm², silicone insulation, temperature range: –40°C to +180°C, short term: 215°C.

LAB-I-01

Self-adhesive warning label: For proper marking of electrical heat-tracing systems. One label per 5 m of traced pipe. Also available in other languages.

Refer to page 254 for other Languages.

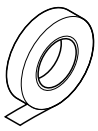
LAB-I-35



Self-adhesive warning label stabilised design for VPL, English, French and German.

Details on page 254.

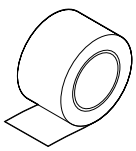
GT-66 and GS-54



GT-66: Glass fibre fixing tape for polymer insulated heating cables on pipes. Not suitable for use on stainless steel pipes. 20 m/roll, width: 12 mm.

GT-54: Glass fibre fixing tape for polymer insulated heating cables on stainless steel pipes. Low halogen, 16 m/roll, width: 12 mm.

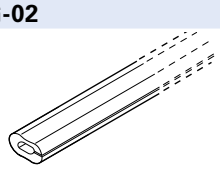
ATE-180



Aluminium adhesive tape, low halogen, for polymer insulated cables on tanks and pipes. Min. recommended installation temperature: 0°C.

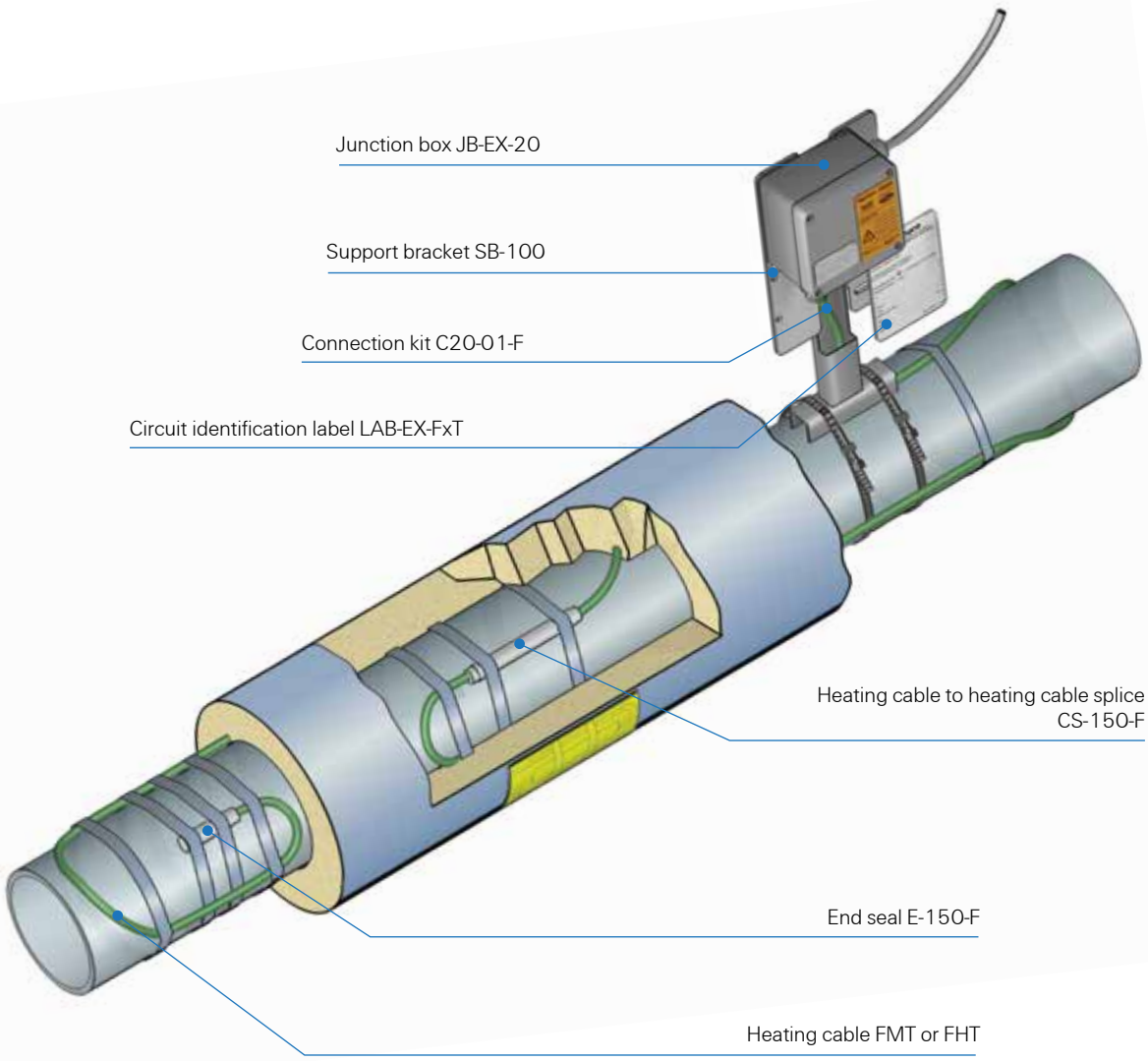
55 m/roll, width: 63.5 mm.

G-02



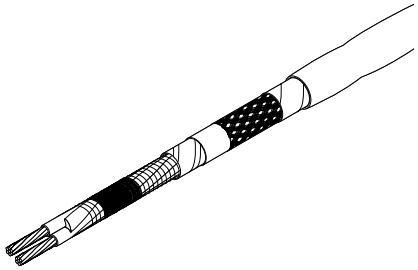
Silicone rubber sleeve, mechanically protects heating cables on edges, flanges, insulation cladding and end plates. Cut-to-length on-site. 1 m long. Temperature resistant up to 215°C.

Typical configuration for Raychem constant wattage parallel circuit heating systems



Constant wattage parallel circuit heating cables

FMT

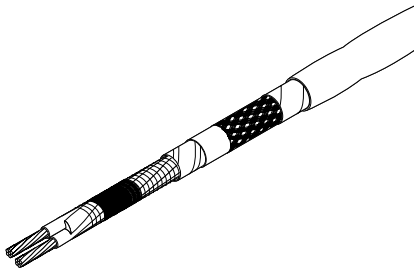


The Raychem FMT range of constant wattage parallel circuit heating cables is used for frost protection of pipes and vessels that are subject to steam cleaning but can also be used to maintain processes up to 150°C. They can withstand up to 200°C power-off. These heating cables all have fluoropolymer outer jackets offering a high chemical resistance.

The products are approved for use in hazardous areas Zone 1, Zone 2 (Gas), Zone 21 and Zone 22 (Dust). Unlike the self-regulating heating cables the T-classification for these products has to be calculated and will depend on the design conditions, this may also result in the need to use a safety temperature limiter.

For full details please refer to the datasheet on page 97.

FHT



The Raychem FHT range of constant wattage parallel circuit heating cables is used for frost protection of pipes and vessels that are subject to steam cleaning but can also be used to maintain processes up to 230°C. They can withstand up to 260°C power-off. These heating cables all have fluoropolymer outer jackets offering a high chemical resistance.

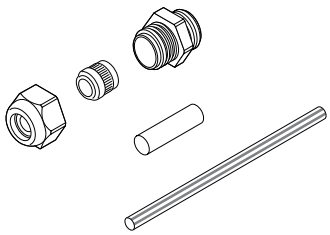
The FHT products are available in two voltages, 230 Vac and 400 Vac. The 400 Vac version offers the advantage of long circuit lengths potentially reducing the number of supply points required.

The products are approved for use in hazardous areas Zone 1, Zone 2 (Gas), Zone 21 and Zone 22 (Dust). Unlike the self-regulating heating cables the T-classification for these products has to be calculated and will depend on the design conditions, this may also result in the need to use a safety temperature limiter.

For full details please refer to the datasheet on page 97.

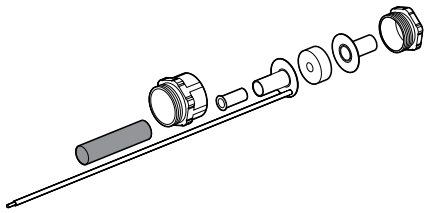
Product overview

C20-01-F



Hot applied connection kit designed for terminating Raychem FMT and FHT heating cables to a junction box, whilst maintaining electrical insulation of the heating cable. Uses a M20 plastic gland. Approved for use in hazardous areas.

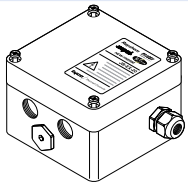
C20-02-F



Hot applied connection kit designed for terminating Raychem FMT and FHT heating cables to a junction box with an internal earth plate, whilst maintaining electrical insulation of the heating cable.

Uses a M20 metal gland. Requires crimp tool C20-02-CT.
Not approved for use in hazardous areas.

JB-EX-20

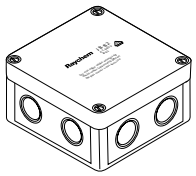


Junction box, 3 x M20 entries and 1 x M25 with power cable gland, approved for use in hazardous areas. For use with C20-01-F connection kits.

Also available with internal earth plate and earth stud for use with armored power cables, order reference: JB-EX-20-EP (not shown).

Details on page 137.

JB-82



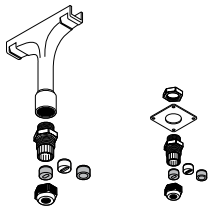
The JB-82 is a standard, non-hazardous polycarbonate junction box. Up to four heating cables or three heating cables and the appropriate size power cable can be accommodated through the four entries and connected to the rail mounted terminals.

Details on page 135.

HWA-PLUG-M20

Stopping plug EXe (M20), polyamide, spare part for various EXe junction boxes.

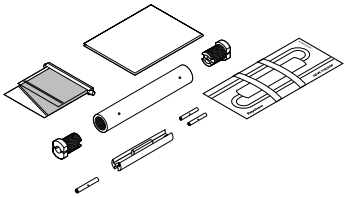
IEK-25-PIPE/IEK-25-04



Insulation entry kits for pipes, tanks and vessels usable for and IEK-25-04 heating and power cables with outside diameter in the range of 8-17 mm. The IEK-25-PIPE has a high temperature stand that can be fixed to the pipe whereas the IEK-25-04 is mounted on the cladding.

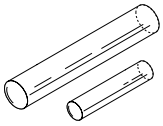
Details on page 177.

CS-150-F



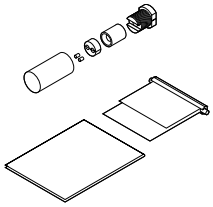
Cold-applied under insulation splice for Raychem FMT and FHT heating cables. Maximum continuous exposure temperature 180°C. Uses a PTFE housing filled with silicone for electrical and mechanical sealing. Approved for use in hazardous areas.

E-50-F



Hot-applied under insulation end seal for Raychem FMT and FHT heating cables. Uses high temperature heat shrink sleeves for electrical and mechanical sealing. Approved for use in hazardous areas (no picture shown).

E-150-F



Cold-applied under insulation end seal for Raychem FMT and FHT heating cables. Maximum continuous exposure temperature 180°C. Uses a PTFE housing filled with silicone for electrical and mechanical sealing. Approved for use in hazardous areas.

C20-02-CT

Crimp tool for braid connection on Raychem FMT and FHT heating cables. Only required when using C20-02-F connection kits.

LAB-I-01

Self adhesive warning label: For proper marking of electrical heat-tracing systems. One label per 5 m of traced pipe. Also available in other languages,

Refer to page 254 for other Languages.

LAB-EX-FxT

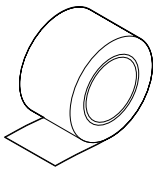
Circuit identification label for use in hazardous areas.

GT-66 + GS-54

GT-66: Glass fibre fixing tape for polymer insulated heating cables on pipes. Not suitable for use on stainless steel pipes. 20 m/roll, width: 12 mm

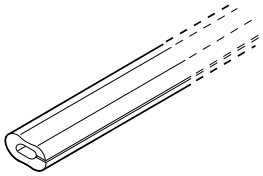
GS-54: Glass fibre fixing tape for polymer insulated heating cables on stainless steel pipes. Low halogen, 16 m/roll, width: 12 mm.

ATE-180



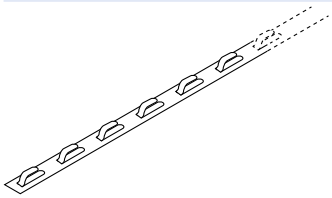
Aluminium adhesive tape, low halogen, for polymer insulated cables on tanks and pipes. Min. recommended installation temperature: 0°C, 55 m/roll, width: 63.5 mm.

G-02



Silicone rubber sleeve, mechanically protects heating cables on edges, flanges, insulation cladding and end plates. Cut-to-length on-site. 1 m long. Temperature resistant up to 215°C.

HARD-SPACER-



Pre-punched stainless steel strap, which allows fixed distances, SS-25MM-25M when heating cables are attached to surfaces of bigger pipes and vessels. Punch interval: 25 mm, length: 25 m.

Temperature Controls

See control and monitoring product range, on **page 69** including line sensing thermostats.

HEW-THERM®

POLYMER INSULATED

Innovation

Since Tyco Thermal Controls first introduced its high-performance XPI series heating cable in collaboration with Hew-Kabel (Germany), its customers have been able to take advantage of a series of innovative product developments that have made these systems yet simpler, more versatile and economical to use.

The development of XPI cables provided customers with highest quality series heating systems featuring higher temperature and power ratings than ever before.

They also benefited from improved flexibility of maintenance, through the development of a fully compatible range of components which also simplified circuit assembly. XPI heating cables were further developed, with an even more robust construction allowing easier termination and customers were able to select from a wider range of options where high impact resistance is vital. HEW-THERM XPI meets the highest standards for Polymer Insulated (PI) series heating cables.

2003

Joint development of **XPI heating system** with **Hew-Kabel**

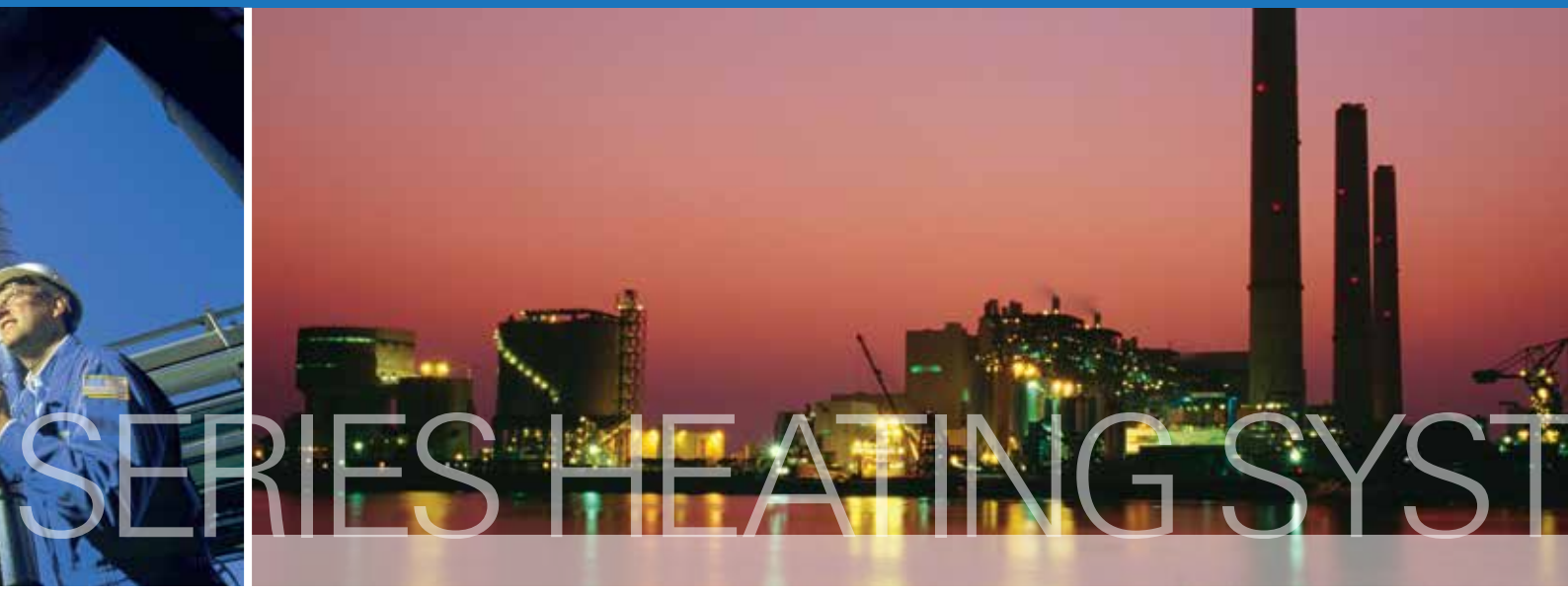
2011

IECEx approvals for entire range

2006

Improved construction of **XPI,** development of **XPI-NH & XPI-S**

Product technology



Polymer Insulated (PI) series heating systems

Polymer Insulated (PI) series constant watt technology

Introduction

The most proven and reliable range of HEW-THERM Polymer Insulated (PI) series heating systems is the industry-preferred solution when circuit lengths exceed the ratings of parallel heating cables and the number of power supply points is a constraint.

Operating to voltages up to 750 V, Pyrotenax are series resistance heating cables which can provide:

Temperature maintenance up to 200°C

Exposure temperatures up to 300°C

Circuit lengths from a few metres to approximately 5 kilometres

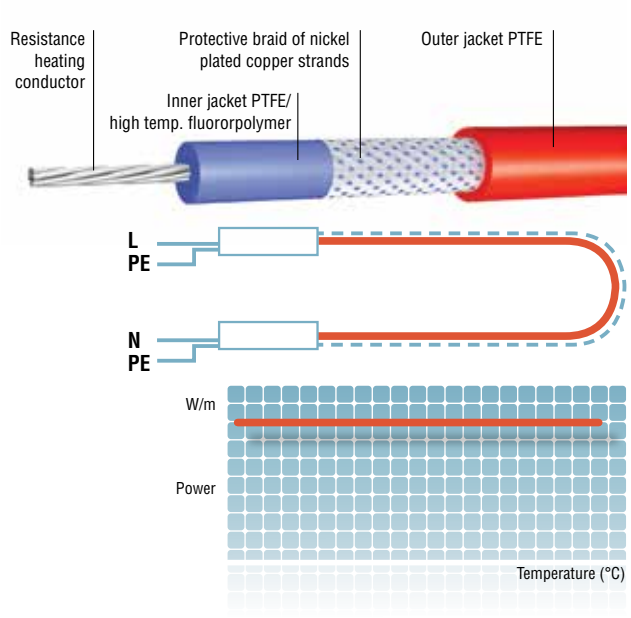
Construction

The stranded high temperature conductor is nickel plated to ensure a long life at elevated temperatures in corrosive environments. It is electrically isolated using an innovative sandwich construction of selected high-temperature fluoropolymers. A braid of nickel plated copper strands provides extra mechanical protection as well as a low Ohmic resistance earth path. A final PTFE jacket ensures optimum chemical resistance and highest temperature withstand capabilities.

How it works

Heat is generated in the central conductor through the principle of Ohmic resistance heating. A variety of conductor materials is used, depending on the specific resistance requirements.

Power output and temperature of a PI series heating system depend on the specific application. Design parameters including type/resistance used, circuit length, applied voltage and electrical configuration directly influence the performance of the heating system. Design and product selection should be carried out by qualified personnel using appropriate design software. Any change to these parameters can be critical and requires a re-validation of the design.



Benefits

Large variety of resistances

PI heating cables are available in a very wide resistance range to meet the requirements of the broadest range of applications.

Easy termination on-site

They can easily be terminated in the field. The fabrication method keeps the cables very flexible and allows for easy stripping while printed metre marks facilitate on-site handling.

Maximum chemical resistance of PTFE

The use of PTFE provides maximum chemical resistance and ensures the highest lifetime insulation resistance over the entire temperature.

Applications

PI heating systems can be used for applications involving maintain temperatures up to 200°C and exposure temperatures up to 300°C. Maximised circuit lengths can significantly reduce the total installed cost.

Control, monitoring and design tools

As PI heating cables do not adjust their power output with temperature and do not have an unconditional T-rating, they typically require the use of more sophisticated control and monitoring systems. Tyco Thermal Controls offers a vast range of control and monitoring products to suit every application's needs with respect to control, supervision and data analysis.

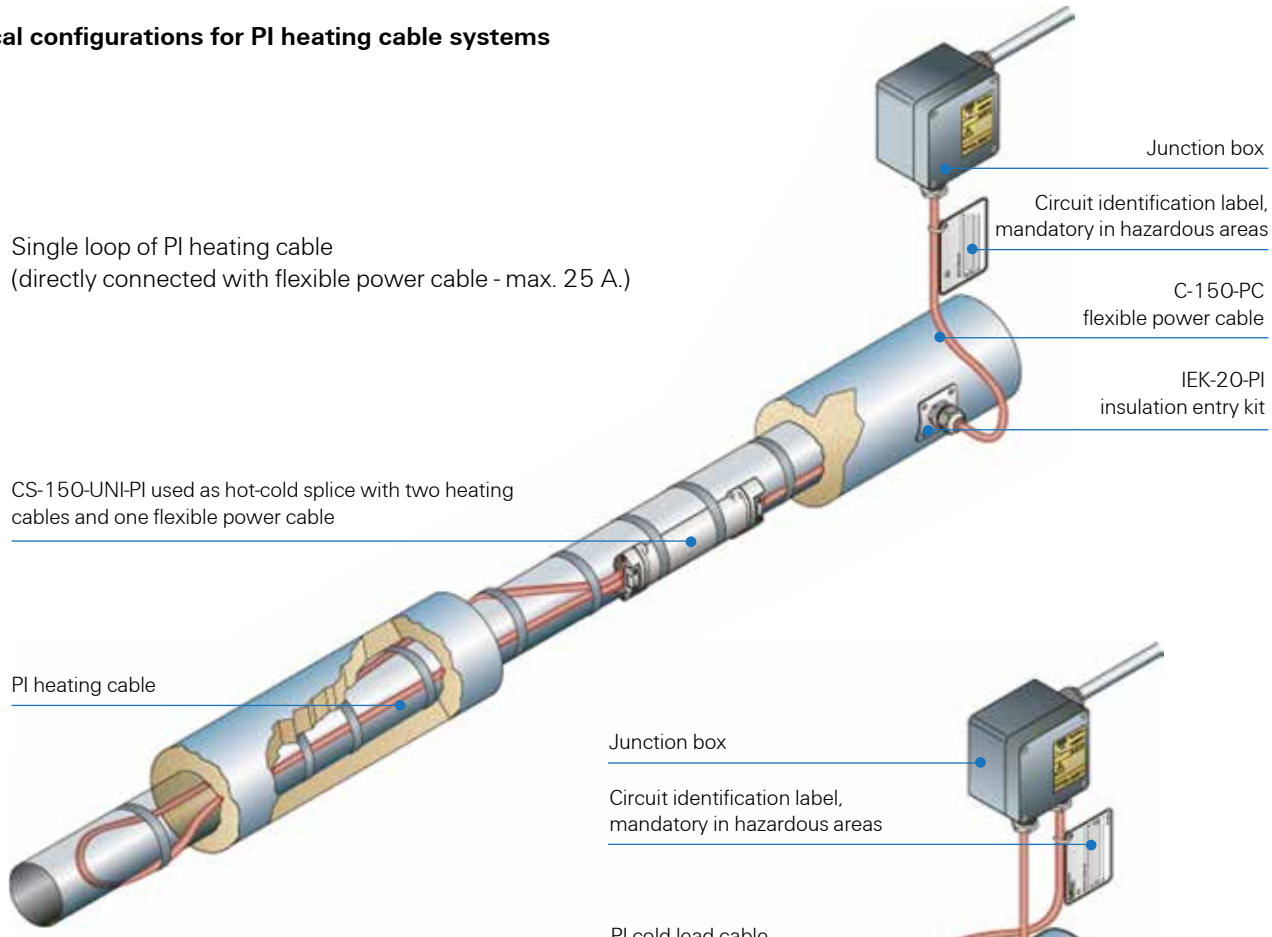
PI heating systems are also supported by our unique TraceCalc Pro design tool, a free, state of the art software, downloadable from **www.tycothermal.co.uk**

Refineries	Natural gas plants	General industrial facilities
Crude oil gathering lines (viscosity control)	Natural gas lines (condensation prevention)	Tank farms
Off-site crude oil lines	Sulphur lines (viscosity control & melting)	Storage facilities
Fuel oil lines	Transfer lines	Bitumen lines
Sulphur lines (viscosity control & melting)	Caustic soda lines	Product transfer lines
Transfer lines	Waste water lines	Frost protection of long transfer lines
Caustic soda lines		
Waste water lines		

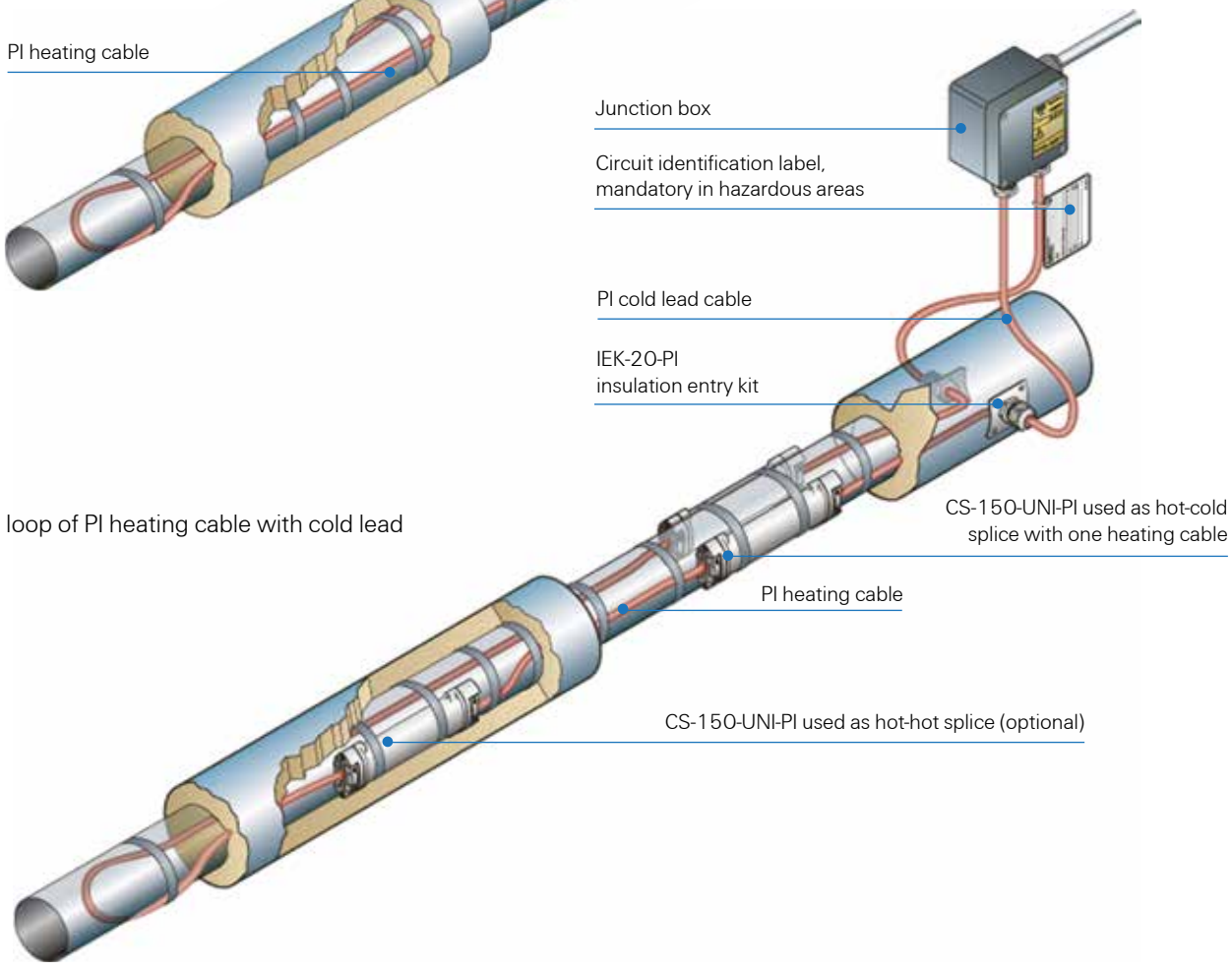
Overview of Polymer Insulated (PI) series heating systems

Typical configurations for PI heating cable systems

Single loop of PI heating cable
(directly connected with flexible power cable - max. 25 A.)



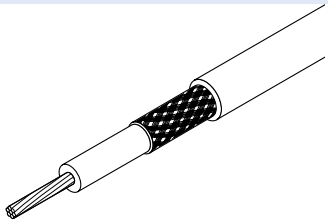
Single loop of PI heating cable with cold lead



Product technology
Polymer Insulated (PI) series heating systems

Tyco Thermal Controls offers Polymer Insulated heating cables in a very wide range of resistances as well as a complete range of components and accessories to build a complete heat-tracing system. All components are fully compatible across the three types and entire range of resistances.

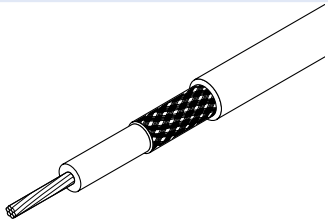
XPI-NH



HEW-THERM Polymer Insulated (PI) series heating cable for use in non-hazardous areas. The heating cable can be used for temperatures up to 260°C and provides the highest chemical resistance and good mechanical strength, particularly at elevated temperatures.

Details on page 99.

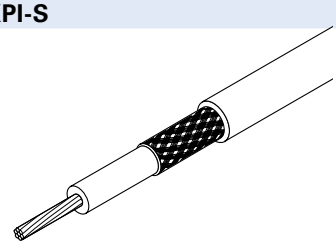
XPI



HEW-THERM Polymer Insulated (PI) series heating cable for use in hazardous areas (gas and dust environments). The heating cable can be used for temperatures up to 260°C with an intermittent exposure up to 300°C. The inner insulation layer consists of a sandwich construction of high temperature fluoropolymers and PTFE and the outer jacket is made of PTFE, providing a highly flexible, easy to terminate robust heating cable with the highest chemical resistance and excellent mechanical strength (4 J impact resistance), particularly at elevated temperatures.

Details on page 101.

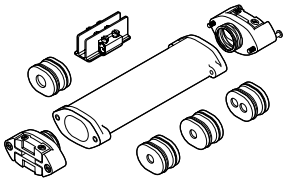
XPI-S



HEW-THERM Polymer Insulated (PI) series heating cable for use in hazardous areas (gas and dust environments). The heating cable can be used for temperatures up to 260°C with an intermittent exposure up to 300°C. The inner insulation layer consists of an extra thick sandwich construction of high temperature fluoropolymers and PTFE and the outer jacket is made of PTFE, providing a highly flexible, easy to terminate very robust heating cable with the highest chemical resistance and most excellent mechanical strength (7 J impact resistance), particularly at elevated temperatures.

Details on page 103.

CS-150-UNI-PI



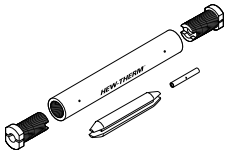
Universal under insulation connection kit for PI heating cables. Approved for use in hazardous areas, cold applied, using screw terminals.

For the splicing and the connection of PI heating cables to cold leads (max 32A) or a 3-core flexible power cable (max 25A).

Glands (M20) and appropriate insulation entry kits need to be ordered separately.

Details on page 154.

CS-150-2.5-PI



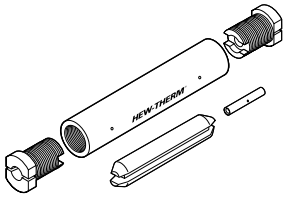
Under insulation splice/connection kit for PI heating cables.

Approved for use in hazardous areas, silicone filled, using crimp connectors.

For the splicing and the connection of PI heating cables to cold leads with a maximum cross section of 2.5 mm^2. Glands (M20) and appropriate insulation entry kits as well as the conductor crimp, need to be ordered separately.

Details on page 157.

CS-150-6-PI



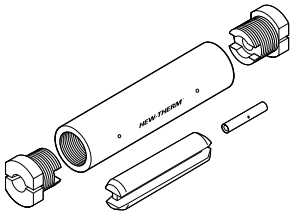
Under insulation splice/connection kit for PI heating cables.

Approved for use in hazardous areas, silicone filled, using crimp connectors.

For the splicing and the connection of PI heating cables to cold leads with a cross section from 4 to 6 mm^2. Glands (M20) and appropriate insulation entry kits as well as the conductor crimp, need to be ordered separately.

Details on page 157.

CS-150-25-PI



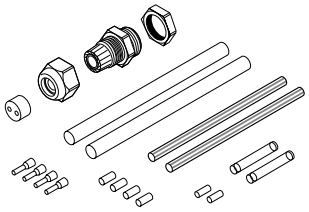
Under insulation splice/connection kit for PI heating cables.

Approved for use in hazardous areas, silicone filled, using crimp connectors.

For the splicing and the connection of PI heating cables to cold leads with a cross section from 10 to 25 mm^2. Glands (M20) and appropriate insulation entry kits as well as the conductor crimp, need to be ordered separately.

Details on page 157.

CS20-2.5-PI-NH



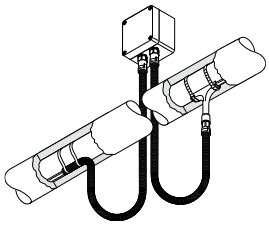
Non hazardous area under insulation splice/connection kit for PI heating cables.

For use in non-hazardous areas only. Heat shrink technology, using crimp connectors.

For the splicing and the connection of PI heating cables to cold leads with a maximum cross section of 2.5 mm^2. Kit includes material for connection of two cold leads and a dual hole grommet/gland (M20).

Details on page 161.

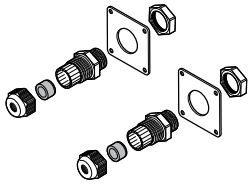
CCON2x.. and accessories



Conduit system for additional mechanical protection of PI heating cables. Designed to allow for usage in hazardous areas and to provide an additional mechanical protection of heating cables or cold lead cables between the junction box and entry into the insulation. Conduit system available in different materials for different temperatures and fully supported with all required accessories for different set ups.

Details on page 159.

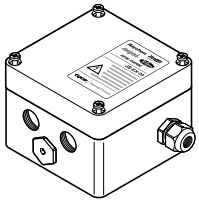
IEK-20-PI



Insulation entry kit for two PI cold leads. Includes two cable glands (M20) with mounting plates. Diameter range: 5-13 mm.

Details on page 178.

JB-EX-20 (-EP)

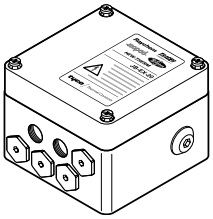


Junction box, 3 x M20 entries and 1 x M25 with gland, approved for use in hazardous areas.

Typical use as power-box for PI/MI heating cables. Also available with earth plate (reference JB-EX-20-EP).

Details on page 137.

JB-EX-21



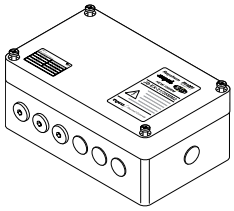
Junction box, 6 x M20 and 1 x M32 entries for use in hazardous areas.

Power cable gland (M32) must be purchased separately.

Typical use as power-, splice- and end-box for 3-phase systems with PI/MI heating cables.

Details on page 139.

JB-EX-21/35MM2



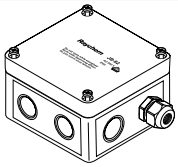
High load junction box, 6 x M20 and 1 x M40 entries, approved for use in hazardous areas.

Power cable gland (M40) must be purchased separately.

Typical use as power-, splice- and end-box for 3-phase systems with PI/MI heating cables.

Details on page 141.

JB-82

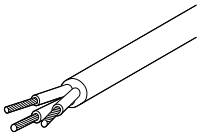


Junction box, 4 x M20/M25 pre-punched holes and M25 cable gland for use in non-hazardous areas.

Details on page 135.

Mounting brackets for junction boxes and pipe straps are also available, please refer to page 252.

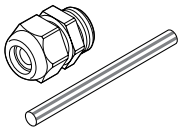
C-150-PC



3-core flexible power cable for connection to CS-150-UNI-PI,

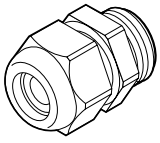
3 x 2.5 mm^2, silicone insulation, temperature range: –40°C to +180°C, short term: 215°C.

GL-44-M20-KIT



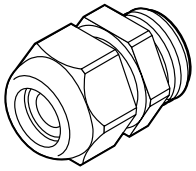
Cable gland Ex e (M20), polyamide, for use with PI cables with a diameter range of 5 - 13 mm. Also includes green/yellow sleeve (80 mm) for braid.

GL-45-M32



Cable gland Ex e (M32), polyamide, for use with power cables with a diameter range of 12 - 21 mm.

GL-51-M40

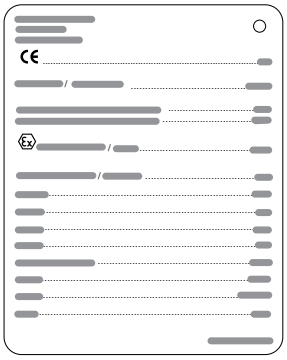


Cable gland Ex e (M40), polyamide, for use with power cables with a diameter range of 17 - 28 mm.

HWA-PLUG-M20-EXE-PLASTIC

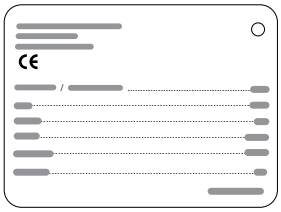
Stopping plug Ex e (M20), polyamide, spare part for various junction boxes.

PI-LABEL-EX



Circuit identification label for PI heating cables, aluminium, required for marking in hazardous area applications, includes cable tie.

PI-LABEL-NH



Circuit identification label for PI heating cables, aluminium, strongly recommended for marking in non-hazardous area applications, includes cable tie.

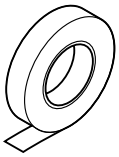
LAB-I-01

Self adhesive warning label: For proper marking of electric heat-tracing systems.

One label per 5 m of traced pipe.

Refer to page 254 for other Languages.

GT-66 and GS-54



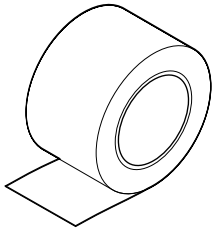
GT-66: Glass fibre fixing tape for polymer insulated heating cables on pipes. Not to be used on stainless steel.

20 m/roll, width: 12 mm.

GS-54: Glass fibre fixing tape for polymer insulated heating cables on stainless steel pipes.

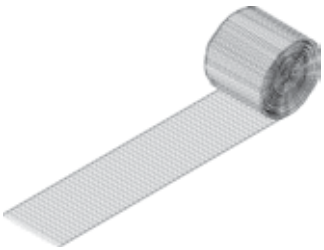
16 m/roll, width: 12 mm.

ATE-180



Aluminum adhesive tape, for polymer insulated cables on tanks and pipes, including stainless steel. 55 m/roll, width: 63.5 mm.

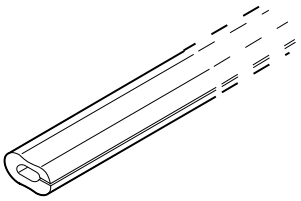
HWA-METAL-MESH-SS-50MM-10M



Stainless steel mesh for fixing heating cables on valves, pumps or other odd-shaped surfaces. This mesh provides optimum contact and heat transfer between heating cables and heated equipment and can be used for exposure temperatures of up to 400°C.

10 m/roll, width: 50 mm.

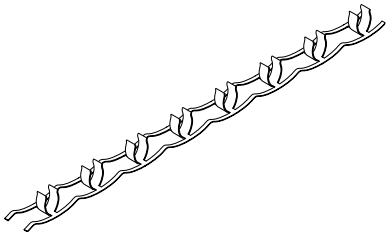
G-02



Silicone rubber sleeve, mechanically protects heating cables on edges, flanges, insulation cladding. Cut-to-length on-site.

1 m long, temperature resistant up to 215°C.

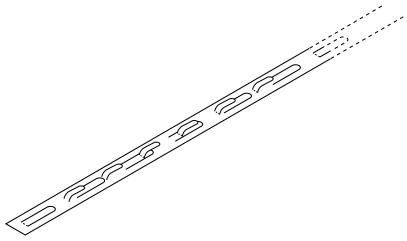
HWA-PI-FIX-SS-xMM-10M



Stainless steel clip band to attach polymer insulated series heating cables to pipes. Clips at regular distances to allow for even heater spacing. Band available in two sizes for different diameter ranges.

Rolls of 10 m.

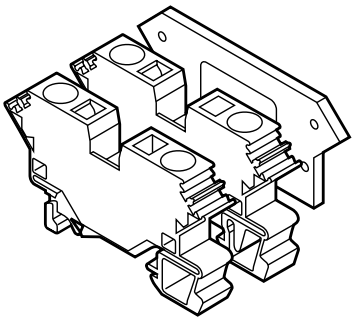
HARD-SPACER-SS-25MM-25M



Pre-punched stainless steel strap, which allows fixed distances, when heating cables are attached to surfaces of bigger pipes and vessels.

Punch interval: 25 mm, length: 25 m.

HWA-WAGO-PHASE



Phase/neutral terminal (Ex e), spare part for various junction boxes, max. 10 mm² solid/stranded.

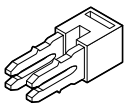
HWA-WAGO-EARTH

Earth terminal (Ex e), spare part for various junction boxes, max. 10 mm² solid/stranded.

HWA-WAGO-ENDPLATE

End plate for terminals HWA-WAGO-..., 10 mm² terminals, spare part.

HWA-WAGO-JUMPER



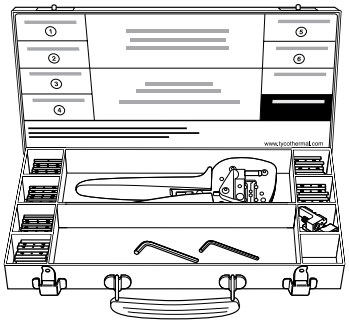
Jumper to bridge terminals HWA-WAGO-..., 10 mm² terminals, spare part.

Temperature controls

See control and monitoring product range, on **page 69** including line sensing thermostats.

Special tools

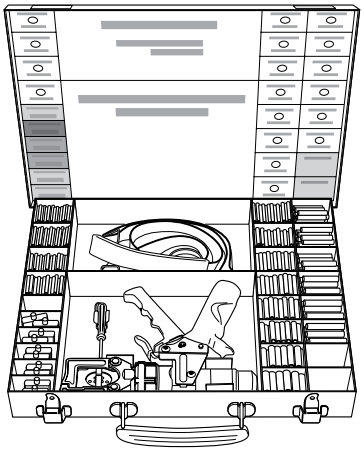
PI-TOOL-SET-01



Metal toolbox containing a mechanical crimp tool, crimping dies and the crimps required for the connection of PI heating cables and cold leads in conjunction with the connection/splice kit type CS-150-2.5-PI (cross section up to 2.5 mm^2). This tool is required for a reliable connection and is also recommended for maintenance purposes.

Details on page 179.

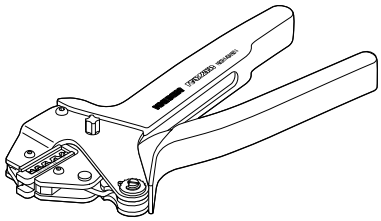
PI-TOOL-SET-02



Metal toolbox containing a hydraulic crimp tool, crimping dies and the crimps required for the connection of PI heating cables and cold leads in conjunction with the connection/splice kits type CS-150-6-PI (cross section 4 - 6 mm^2) and CS-150-25-PI (cross section 10 - 25 mm^2). This tool is required for a reliable connection and is also recommended for maintenance purposes.

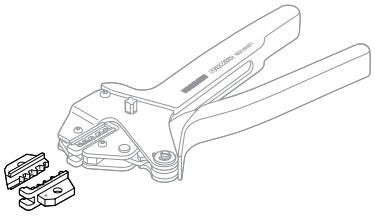
Details on page 179.

CW-CT-KIT



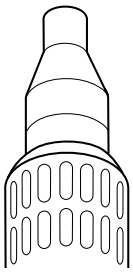
Crimp tool with dies for installation of crimps for the connection/splice kits type: CS-20-2.5-PI-NH.

CW-CT-DIE

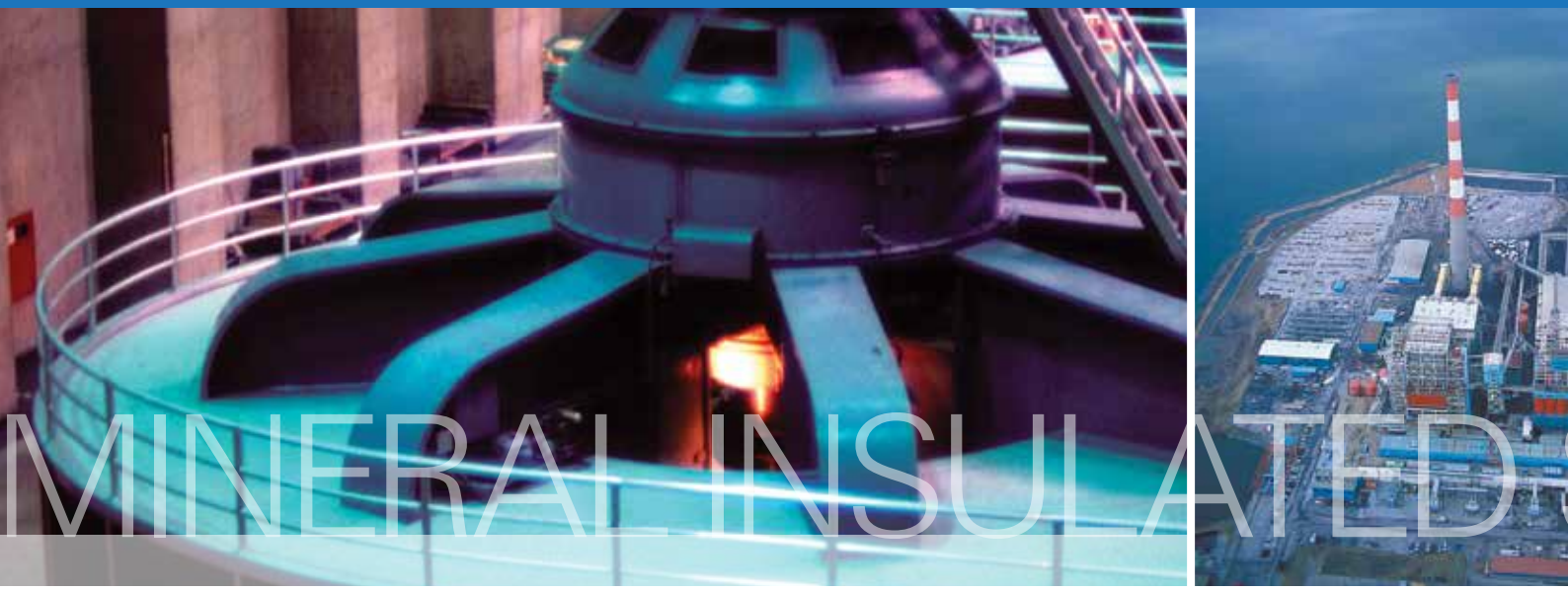


Spare set of dies for crimp tool CW-CT-KIT and crimps of 2.5 mm^2.

CV-1983-220V-3060W



High power heat gun for heat shrink based components. Power output: 3 kW.



Innovation

Industries worldwide have been benefiting from the unique high-performance capabilities of Pyrotenax MI heating cables for over 75 years. Over the past decade Tyco Thermal Controls' customers have been able to take advantage of a range of innovative developments that have further enhanced the flexibility, reliability and cost-effectiveness of these industry-leading systems.

Alloy 825 sheathed MI heating cables exceed by far the corrosion resistance of standard materials and are most suitable for heat-tracing applications.

The introduction of dual conductor heating cables offers economic advantages in particular for shorter circuits, as it requires only half of the length of the heating cable.

Laser welded joints give customers the assurance of the highest integrity and reliability in their heating systems even at highest temperatures and wattages.

2003/04

Introduction of **Alloy 825** sheath material and dual conductor elements

2005

Introduction of **laser welding capabilities**

Product technology

Mineral Insulated (MI) series heating systems

Mineral Insulated (MI) series constant watt technology

Introduction

The Pyrotenax brand has been synonymous with the production of the highest quality mineral insulated (MI) systems for decades. These heating systems provide the optimum solution when power outputs and/or temperatures exceed the limits of any polymeric heating cables.

Operating to voltages up to 600 V, Pyrotenax heating cables can provide:

Temperature maintenance up to 600°C

Exposure temperatures up to 1000°C

Circuit lengths from a few metres to several kilometres

Construction

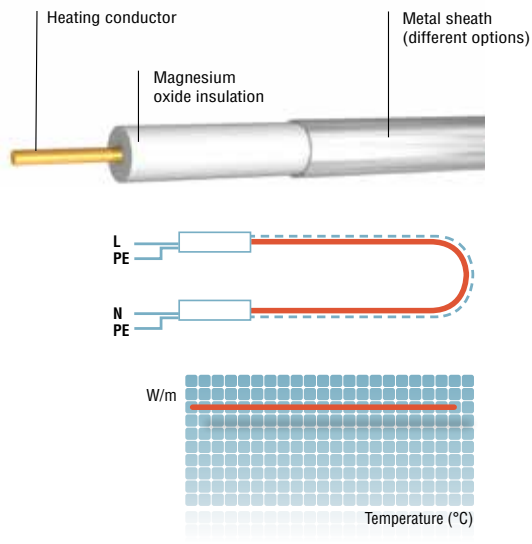
Pyrotenax mineral insulated (MI) heating cables consist of one (single core) or two (dual core) conductors embedded in a highly dielectric magnesium oxide insulation surrounded by a seamless metal sheath. The cables are terminated at the extremities with a non-heating section and seal.

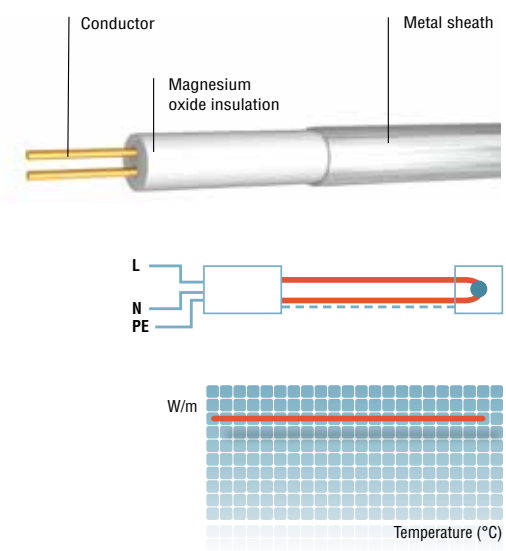
Heating elements are manufactured by brazing the heating cable with a cold lead, either on-site or at the factory.

How it works

Heat is generated in the conductor(s) through the principle of Ohmic resistance heating (Joule effect). A variety of central conductor materials is used, depending on the specific resistance requirements.

Power output and temperatures of a MI series heating system depend on the specific application. Design parameters including type/resistance used, circuit length, applied voltage and electrical configuration directly influence the performance of the heating system. Design and product selection has to be carried out by qualified personnel using appropriate software. Any change to these parameters can be critical and require a re-validation of the design.





Benefits

Large variety of sheath materials and resistances

The extended range of sheath materials ensures that you will find the product which will fit your particular applications perfectly considering temperature withstand capabilities, desired power output as well as corrosion resistance. The wide range of resistances will allow you to design the right heating circuit based on your pipe length or equipment dimensions.

Adaptable to all specific applications

Different available constructions and termination styles allow for a wide range of applications including small instrument lines exposed up to very high temperature to long transfer lines or even specific equipment shapes. High power output provides the solution for melting or vaporizing processes.

Factory terminated elements (optional with laser welding) for enhanced reliability

Factory-terminated and fully tested units guarantee a consistently high level of quality, providing significant saving on installation time and eliminating risk of re-work in the field. Tyco Thermal Controls also offers the possibility to have the joints assembled by laser welding. This technology, which is available for all stainless steel, Inconel 600 and Alloy 825 cables (single and dual core), allows maximum control of the welding process to result in a very high quality and extremely reliable joint with superior temperature ratings compared to hand-crafted silver solder joints.

Applications

Typical applications include needs for very high maintain temperatures or continuous very high exposure temperatures.

Refining crude distillation	(Petro-) chemical	Power generation	General
Hydrocracking	Phtalic anhydride	High-pressure feedwater	Condensation prevention in filters
Coking	Benzene/Styrene	Blowdown lines	Phase changes (melting,vaporizing)
Wax	Polypropylene	Instrument lines	Salts
Sulphur	Polyethylene	Stream lines	Reactors
Asphalt	Chlorine/Glycol	De-aerator lines	Nuclear industry
Bitumen	Acrylic & adipic acids	High-pressure condensate	
Heavy residue	Dimethyl terephthalate		
Gas condensate prevention	Synthetic fiber components		

Characteristics of Mineral Insulated (MI) cables

Due to their particular construction, based on a resistive heating element and metallic sheath material, the design of an application and selection of a relevant heating cable follows some specific rules:

- Evaluation of corrosive agents potentially existing in the environment in order to check compatibility of heating cable outer sheath (see table 1).
- Estimation of maximum sheath temperature and maximum output based on cable family and methodology of fabricating elements, brazing or laser welding (see table 2).
- Determination of the actual output power based on applied voltage, length and resistance of heating elements.

The cables are terminated at the extremities with a non-heating section and seal, a so called 'cold lead'. The connections and seals are critical factors for safe and reliable operation. Although on-site terminations are possible, they can only be executed by personnel experienced and trained in brazing techniques. Pyrotenax MI heating systems can be supplied as factory-terminated and tested units to guarantee a consistently high level of quality. (see Figure 1).

Stainless Steel, Inconel 600 and Alloy 825 MI heating cables can be laser-welded. This creates connections of the highest reliability and enables them to be used at higher temperatures and/or loadings.

Heating cables with Alloy 825 sheath are also available in a dual conductor version, which offers a significant technical advantage when space is limited or when high resistances are required, such as for high temperature instrumentation lines or short branches. They also significantly reduce installation times, as only half of the length of the heating cable is required (see Figure 2).

Our unique design software TraceCalc Pro provide support for simplifying the design and selection process.

MI heating unit type B (single conductor)

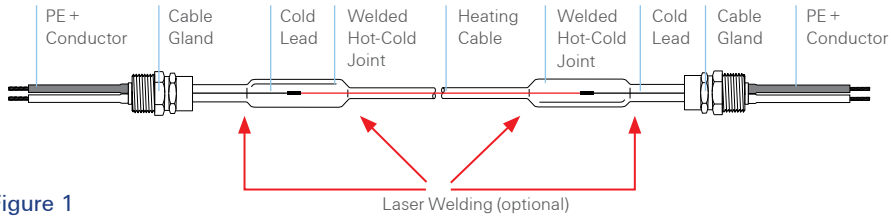


Figure 1

MI heating unit type D (dual conductor)

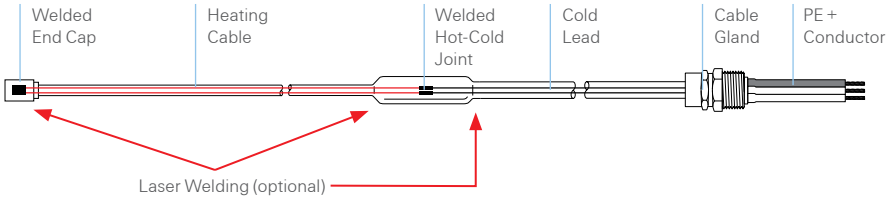


Figure 2

Product technology
Mineral Insulated (MI) series heating systems

This table gives an indication of the corrosion resistance of the available sheath materials against different corrosive agents.

Table 1

MI heating cable type	Sulphuric acid	Hydrochloric acid	Hydrofluoric acid	Phosphoric acid	Nitric acid	Organic acids	Alkalis	Salts	Sea water	Chlorides
HCC	NR	NR	A	A	NR	A	A	X	NR	X
HCCH	GE	GE	A	A	A	NR	A	A	A	A
HDC/HDF	NR	X	X	X	X	X	X	X	GE	GE
HSQ	NR	NR	NR	NR	X	GE	A	A	NR	NR
HIQ	X	X	A	X	X	GE	GE	GE	A	GE
HAx	GE	GE	GE	GE	GE	GE	GE	GE	GE	GE

GE *Good to excellent* A *Acceptable* X *Check for specific data* NR *Not recommended*

Table 2

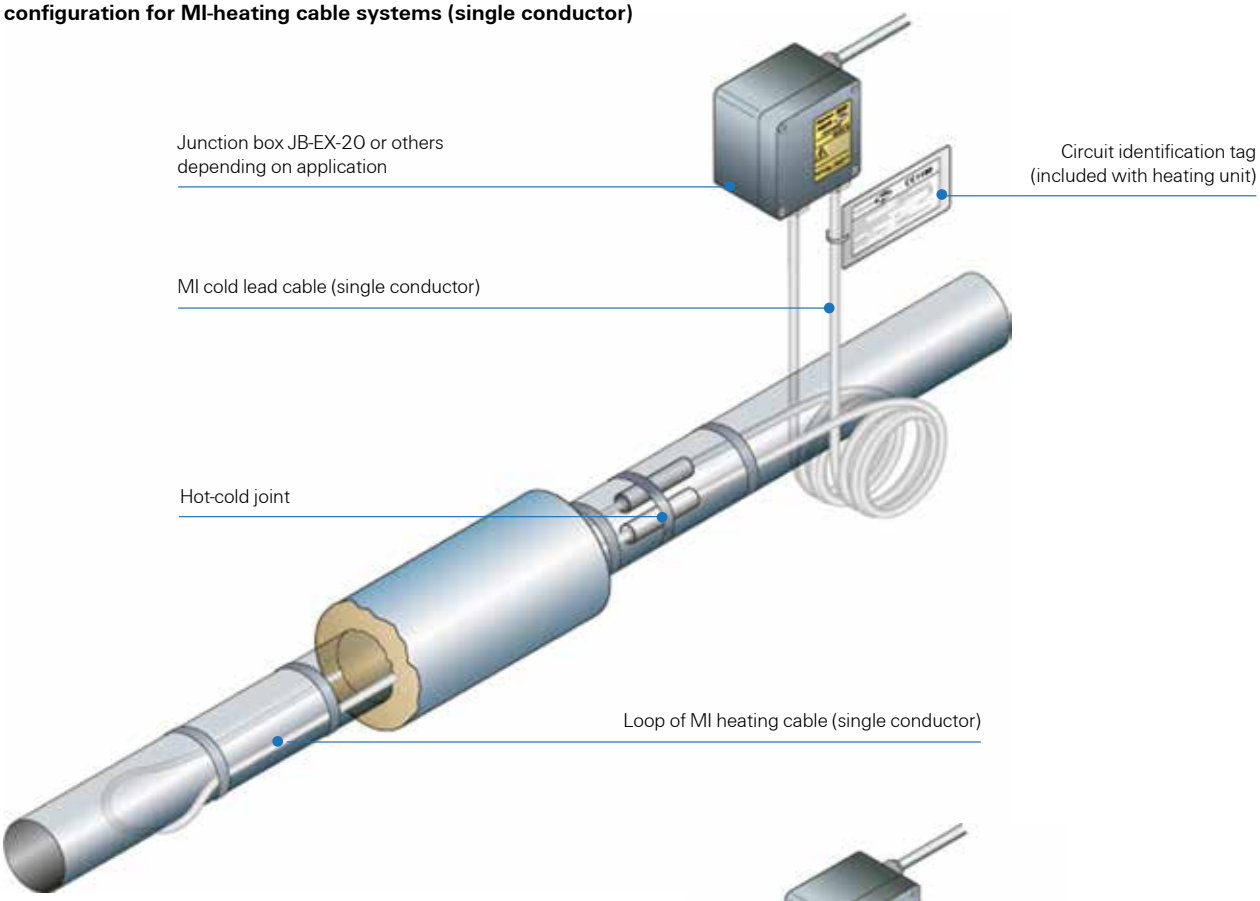
MI heating cable reference	Sheath material	Max. sheath temperature	Max. typical [1] power output
HCC (*)	Copper (*optional additional sheath "H" for HDEP)	200°C (limited to 80°C with HDPE)	50 W/m
HDC/HDF	Cupro-Nickel (70/30)	400°C	70 W/m
HSQ	Stainless Steel 321	450°C (750°C with laser welded joints)	150 W/m
HIQ	Inconel 600	450°C (750°C with laser welded joints)	300 W/m
HAx	Alloy 825	450°C (750°C with laser welded joints)	270 W/m

(*)*Corrosion resistance data is dependent on temperature and concentration*

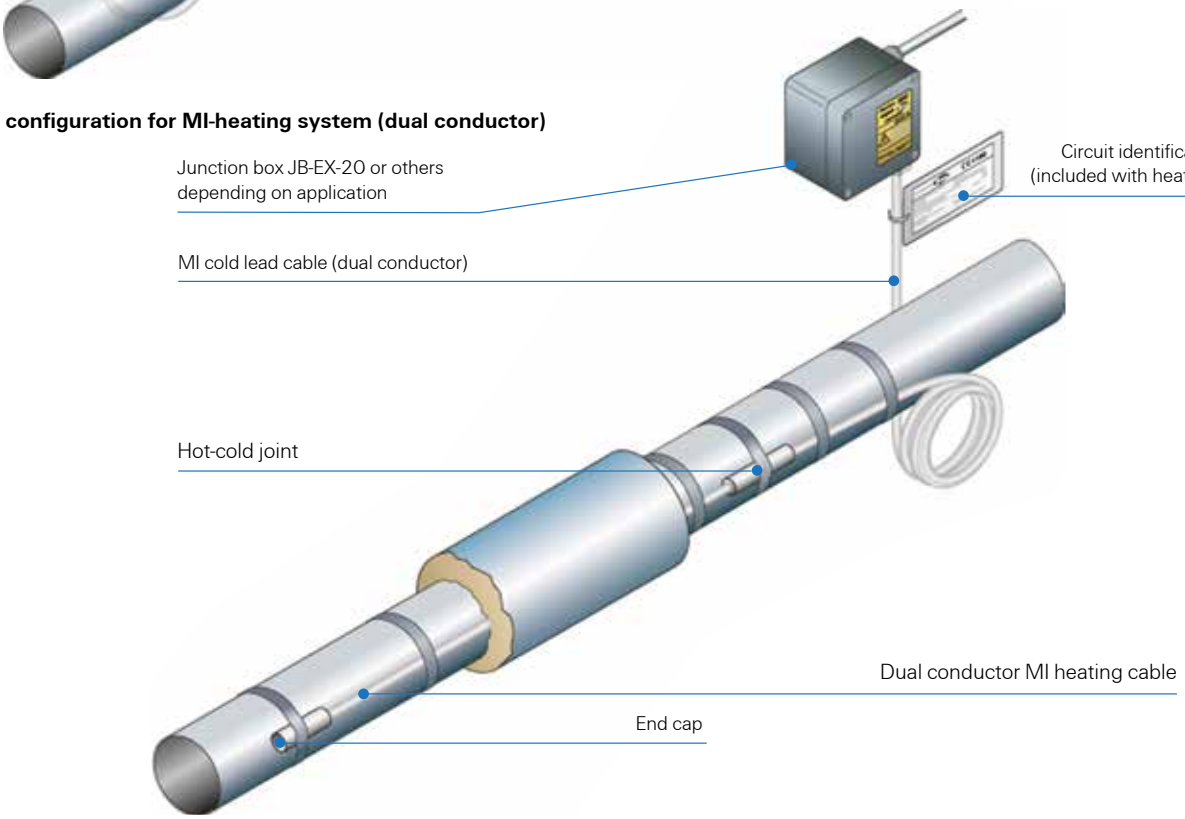
[1] *Typical value, allowed max. power output dependent on the application. Consult Tyco Thermal Controls for more information.*

Overview of Mineral Insulated (MI) heating cable systems

Typical configuration for MI-heating cable systems (single conductor)

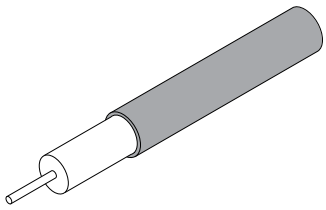


Typical configuration for MI-heating system (dual conductor)



Heating Cables

Cables, components and accessories for Mineral Insulated (MI) heating systems.



HCH/HCC

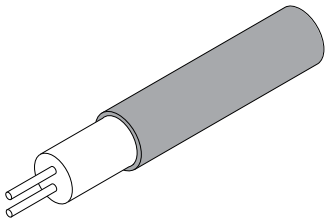
Copper sheathed Mineral Series (MI) heating cable approved for use in hazardous areas (gas and dust environments). The maximum exposure temperature of copper heating cables is 200°C and the typical maximum load is 50 W/m*. Copper cables are also available with an over-sheath in HDPE (max. 80°C) or FEP (max. 200°C) for enhanced corrosion protection.

Details on page 105.

HDF/HDC

Cupro-nickel (70/30) sheathed Mineral Series (MI) heating cable approved for use in hazardous areas (gas and dust environments). The maximum exposure temperature of Cupro-nickel heating cables is 400°C and the typical maximum load is 70 W/m*.

Details on page 108.



HSQ

Stainless steel (321) sheathed Mineral Series (MI) heating cable approved for use in hazardous areas (gas and dust environments). The maximum exposure temperature of Stainless steel heating units is dependent on the technology used for the hot-cold joint assembly. Silver solder joints allow for exposure temperatures up to 450°C while laser welded joints can withstand 600°C. The typical maximum load is 150 W/m*.

Details on page 110.

HAx

Alloy 825 sheathed Mineral Series (MI) heating cable approved for use in hazardous areas (gas and dust environments). HAx heating cables are available in both single and dual conductor versions. Dual conductor heating cables are available for voltage ratings of 300 Vac (HAx2M) and 600 Vac (HAx2N). The maximum exposure temperature of Alloy 825 heating units is dependent on the technology used for the hot-cold joint (and end cap) assembly.

Silver solder joints (and end caps) allow for exposure temperature up to 550°C while laser welded joints (and end caps) can withstand 650°C. The typical maximum load for single conductor cables is 210 W/m while dual conductors can be powered up to 270 W/m*.

Details on page 112.

HIQ

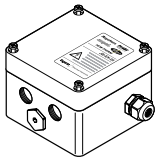
Inconel 600 sheathed Mineral Series (MI) heating cable approved for use in hazardous areas (gas and dust environments). The maximum exposure temperature of Inconel 600 heating units is dependent on the technology used for the hot-cold joint assembly. Silver solder joints allow for exposure temperature up to 450°C while laser welded joints can withstand 600°C. The typical maximum load is 300 W/m*.

Details on page 116.

**Typical power output dependent on the application and cable construction. Higher power outputs and/or higher exposure temperatures are possible. Contact Tyco Thermal controls for more information.*

Junction boxes

JB-EX-20 (-EP)

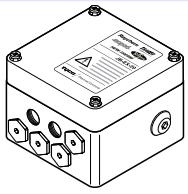


Junction box, 3 x M20 entries and 1 x M25 with gland, approved for use in hazardous areas.

Typical use as power-box for PI/MI heating systems.
Also available with earthing plate (ref. JB-EX-20-EP).

Details on page 137.

JB-EX-21

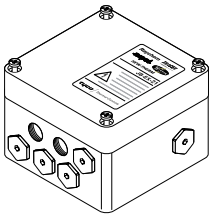


Junction box, 6 x M20 and 1 x M32 entries for use in hazardous areas. Power cable gland M32 must be purchased separately.

Typical use as power-, splice- and end-box for 3-phase systems with PI/MI heating systems.

Details on page 139.

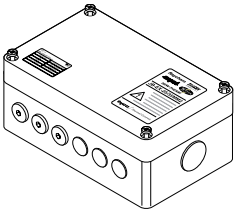
JB-EX-21/35MM2



High load junction box, 6 x M20 and 1 x M40 entries, approved for use in hazardous areas. Power cable gland (M40) must be purchased separately. Typical use as power-, splice- and end-box for 3-phase systems with PI/MI heating cables.

Details on page 141.

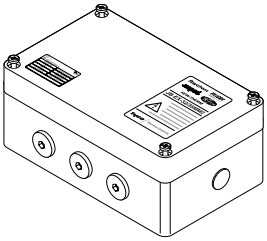
JB-EX-25/35MM2



High load junction box, 6 x M25 and 1 x M40 entries, approved for use in hazardous areas. Power cable gland (M40) must be purchased separately. Typical use as power-, splice- and end-box for 3-phase systems with MI heating cables.

Details on page 143.

JB-EX-32/35MM2



High load junction box, 3 x M32 and 1 x M40 entries, approved for use in hazardous areas.

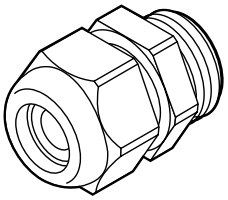
Power cable gland (M40) must be purchased separately.

Typical use as power-, splice- and end-box for 3-phase systems with MI heating cables, in particular for dual conductor heating elements.

Details on page 145.

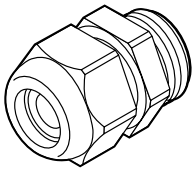
Mounting brackets for junction boxes and pipe straps are available, please refer to datasheets.

GL-45-M32



Cable gland Ex e (M32), polyamide for use with round power cables with a diameter range of 12 - 21 mm.

GL-51-M40

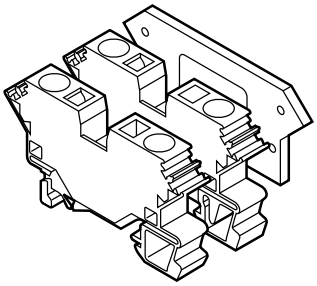


Cable gland Ex e (M40), polyamide, for use with power cables with a diameter range of 17 - 28 mm.

HWA-PLUG-M20-EXE-PLASTIC

Stopping plug Ex e (M20), polyamide, spare part for various junction boxes.

HWA-WAGO-PHASE



Phase/neutral terminal (Ex e), spare part for various junction boxes, max. 10 mm² solid/stranded.

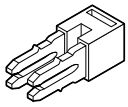
HWA-WAGO-EARTH

Earth terminal (Ex e), spare part for various junction boxes, max. 10 mm² solid/stranded.

HWA-WAGO-ENDPLATE

End plate for terminals HWA-WAGO-..., 10 mm² terminals, spare part.

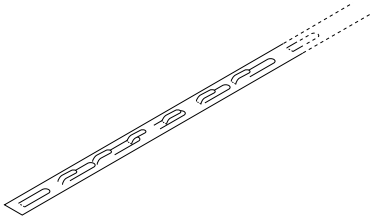
HWA-WAGO-JUMPER



Jumper to bridge terminals HWA-WAGO-..., 10 mm² terminals, spare part.

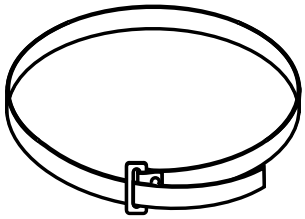
Fixing/Installation Materials

HARD-SPACER-SS-25MM-25M



Pre-punched strap in stainless steel, which controls spacing distances when heating cables are attached to surfaces of bigger pipes and vessels. Punch interval: 25 mm.

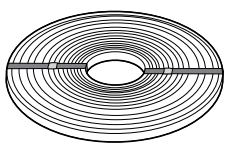
Available Pipe Straps



Stainless steel pipe straps for holding MI cable onto pipe. Tighten with pliers.
Allow one strap per 30 cm of pipe.

Part No.	Pipe Diameter	Packing Qty
PB 125	to 1 ¼" (32 mm)	50 pc
PB 300	1 ½" to 3" (38 - 75 mm)	35 pc
PB 600	3 ½" to 6" (89 - 150 mm)	25 pc
PB 1000	6" to 10" (150 - 250 mm)	1 pc
PB 1200	to 12" (300 mm)	1pc
PB 2400	to 24" (600 mm)	1pc
PB 3600	to 36" (900 mm)	1pc

SNLS

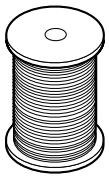


Plain stainless steel banding/strip for holding MI cables in place on pipes. 30 m roll.
Secured with buckles.

SNLK

Stainless steel buckles for use with metal banding strip type SNLS.

RMI-TW



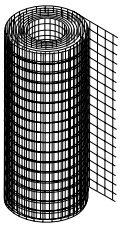
Tie wire for fastening steel heating cables on pipes. Especially suitable for irregular shaped objects such as pumps, valves, flanges. Supplied in 50 m reels.

Do not use with copper or cupro nickel sheathed heating cables; use straps wherever possible.

Allowances for tie wire and banding on pipes.

Pipe Size (mm)	25	40	50	100	150	200	250	300	350	400	450	500	600	750	900	1200
Required length (m) per m of pipe	0.8	1.1	1.2	1.6	2.1	2.8	3.5	4.2	4.6	5.2	5.9	6.5	7.9	9.8	11.8	15.7

FT-19/FT-20



Zinc-plated metal mesh (FT-19) or stainless steel metal mesh (FT-20) for holding MI heating cables in place on pipes, tanks or other equipment.

Supplied in 25 m rolls (approx. width 1 m).

HWA-MESH-SS-50MM-10M

Stainless steel mesh for fixing heating cables on valves, pumps or other odd-shaped surfaces. This mesh provides optimum contact and heat transfer between heating cables and heated equipment and can be used for exposure temperatures of up to 400°C, width: 50 mm, rolls of 10 m.

Warning labels

LAB-I-01

Self adhesive warning label: For proper marking of electrical trace heating systems. One label per 5 m of traced pipe.

Attach to outside of thermal insulation weather barrier on both sides of pipe and also at equipment such as valves, pumps requiring periodic maintenance.

Refer to page 254 for other Languages.

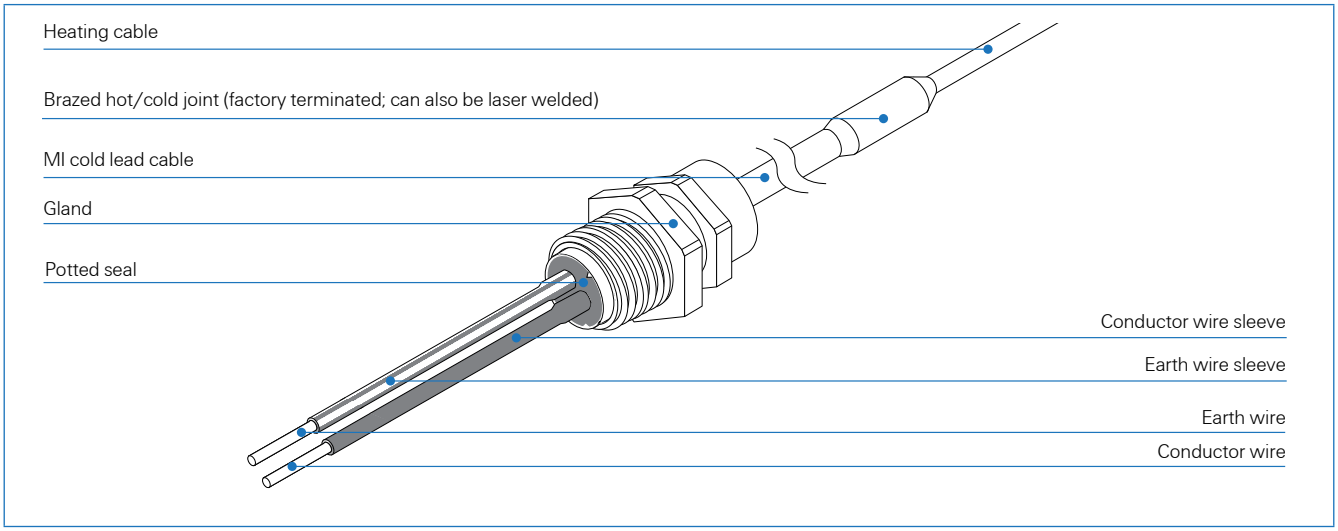
Temperature controls

See control and monitoring product range, on **page 69** including line sensing thermostats.

For the termination of bulk MI heating cables, a range of accessories is available. The termination of MI heating units requires adequate training and sufficient experience. In particular for hazardous area applications, factory termination of the MI heating units is strongly recommended.

For possible combinations and detailed order information of glands, seals, joints and other accessories also refer to datasheet for ***MI Termination Accessories*** (reference DOC-606), available on our website at www.tycothermal.co.uk or contact Tyco Thermal Controls.

Typical termination of MI heating cable



Pre-terminated MI double Cold Ends

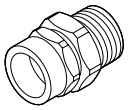
To facilitate occasional on-site termination and eventual repairs, Tyco Thermal Controls offers Pre-terminated MI double Cold Ends (PCE).
The standard PCEs consist of 4m of cold lead cable of the appropriate type which ends are pre-terminated with a factory seal, gland assembly and insulated flexible tails (see also page 122). The use of Pre-terminated Cold Ends (PCE) significantly increases the reliability of field-termination and repairs of cold leads since they are fully factory tested and assembled in a controlled manufacturing environment.

A PCE with a single conductor cable includes two terminations, sufficient for the termination of an MI heating unit type B. A PCE with dual conductor cable includes two terminations, sufficient for the termination of two MI heating unit type D or for one MI heating unit type E (also refer to page 119).

Any ingress of moisture is minimized, if the PCE is cut (typically in the middle) just before the connection to a heating cable. Unused ends can be sealed for storage using wax or other appropriate sealing methods. More details on the available types can be found in MI Termination Accessories (reference DOC-606).

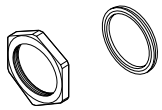
Glands, seals, joints, ferrules

RGM



Metric brass glands are standard – more details on accessories for mineral insulated heating cables, refer to datasheet for **MI Termination Accessories** (reference DOC-606).

RLM20



M20 brass lock nuts for securing glands

RLM25

M25 brass lock nuts for securing glands

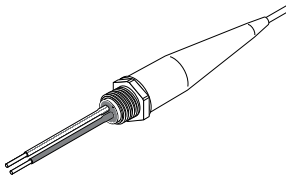
SATP20

Fibre washers for glands, M20

SATP25

Fibre washers for glands, M25

RHG20

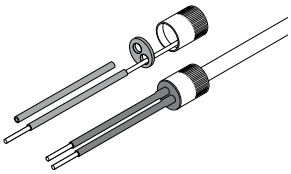


M20 gland shrouds for enhanced gland protection

RHG25

M25 gland shrouds for enhanced gland protection

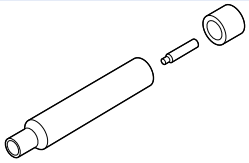
RPAL/RPSL



Hazardous and ordinary area seals are supplied with 300 mm tails including earth tail.

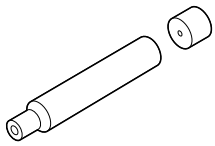
More details on mineral insulated accessories, refer to datasheet for ***MI Termination Accessories*** (reference DOC-606).

SJK..



Joint types SJK are made of brass, types SJKAS are made of stainless steel. For more details such as compatibility with various heating cables and order references, refer to datasheet for ***MI Termination Accessories*** (reference DOC-606).

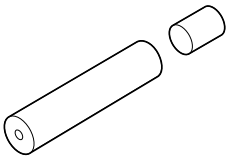
SJK..-PILOT-...



Universal hot/cold or hot/hot joint for brazed connection of MI heating cables and/or cold leads. Universal joints have two pilot holes (one for the joint body and one for the joint bush) that must be drilled to match the exact diameter of the heating cable and/or cold lead during the termination operation or field repair. Joint types SJK are made of brass, types SJKAS are made of stainless steel. For more details such as compatibility with various heating cables and order references, refer to datasheet for ***MI Termination Accessories*** (reference DOC-606).

The preferred solution to join two heating cables includes a short section of cold lead joined between the two MI heating cables with two hot/cold joints. Contact Tyco Thermal Controls for more information.

SPOT-PILOT



End cap for the termination of dual conductor MI heating cables. The end caps have a pilot hole that must be drilled to match the exact diameter of the heating cable during the termination operation. End cap types SPOT are made of brass, types SPOTAS are made of stainless steel. For more details such as compatibility with various heating cables and order references, refer to data-sheet for ***MI Termination Accessories*** (reference DOC-606).

SJK...F

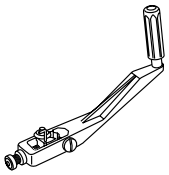
Ferrules (copper) for reliable connection of MI conductors in hot/cold joints. More details, refer to datasheet for ***MI Termination Accessories*** (reference DOC-606).

Fabrication consumables

SABAG13	Silver solder for brazed joints, use for conductor
SABAG14	Silver solder for brazed joints, use for joint body
SABF	Brazing flux (250g)
SMP-300	Magnesium oxide powder (250g)
RMX	Grey potting compound

Tools

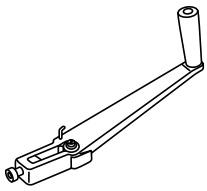
ZSU



Large stripping tool – all cable sizes, spare blades ZSUB.

For Copper and Cupro-Nickel cables.

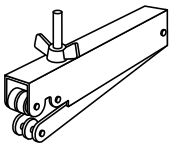
ZSUS



Small stripping tool – cable Ø < 9 mm, spare blades ZSUSB.

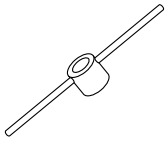
For Copper and Cupro-Nickel cables.

ZR



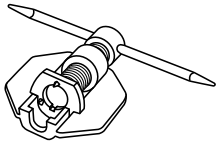
Ringing tool for cable Ø < 9 mm.

ZPM20, ZPM25



Potting tool, ensures quick and accurate screwing on of the brass pot and is used in conjunction with the appropriate RGM cable gland (M20 or M25).

ZDC20, ZDC25



Crimping tool for 20 and 25 mm seals.

DigiTrace

CONTROL AND MON

Innovation

Since the introduction of the MoniTrace 200 multi-circuit network system back in the last millennium, Tyco Thermal Controls has continued to lead the field in advanced control and monitoring technology. Ground fault and line current monitoring and alarms have made systems safer and reduced costs.

The ability to combine local and central control systems has enabled the optimisation of total installation and total operating costs.

The introduction and continuous development of our innovative DigiTrace NGC family, its associated software and touch-screen technology keeps us at the forefront of control and monitoring for industrial heat-tracing applications.

1995

MoniTrace 200 multi-circuit, networkable heat-tracing control and monitoring with PASC, line sensing etc.

2008

DigiTrace NGC-20-C-E first fully integrated EEx heat-tracing controller featuring **"local control-central monitoring".**

2011

DigiTrace NGC-40 Advanced panel mounted modular control, monitoring and power distribution system with a single control module per heat-tracing circuit architecture.

2006

DigiTrace NGC-30 adds a touchscreen and full integration with DigiTrace Supervisory Software.

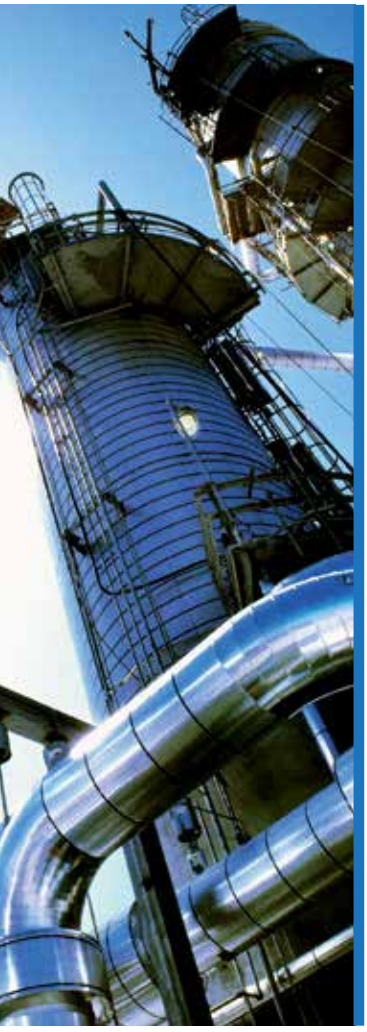
2008

DigiTrace NGC-20-CL-E first EEx SIL2 heat-tracing safety limiter.

Product technology

Discover the DigiTrace world that will change your vision on electrical heat-tracing controls

Control and monitoring systems



A variety of systems to serve your particular needs...

The DigiTrace product range completes Tyco Thermal Controls' offering with a wide range of various systems for the control and monitoring particularly suited to electric heat-tracing (EHT) applications. DigiTrace control and monitoring systems encompass products that range from most proven and economical simple mechanical thermostats to the very latest innovations in local control and central monitoring systems.

Many aspects can influence the selection of the most appropriate control and monitoring solution for each project and application. The most effective solutions are most often a blend of various combined technologies to achieve a balance between total installed costs (TIC) and long-term benefits associated with the entire heat management system,total operating cost (TOC), during the life of the plant.

What you should consider before selecting your system

Choose the objective for your control systems

Each of Tyco Thermal Controls' DigiTrace systems provides its own level of technical features and benefits, depending on the process requirements and the number of circuits. The objective of control in electrical heat-tracing can be:

Frost protection

Applied to fluids that must be kept above a minimum temperature - typically 5°C – e.g. for water lines and where moderate overheating of the fluid is not a major concern.

Broad temperature maintenance

Appropriate when the process temperature must be controlled within a moderate range. This is generally used for viscosity control to keep process fluids such as fuel oil flowing.

Narrow temperature maintenance

Applied to fluids that must be kept within a narrow temperature range to maintain viscosity and prevent fluid or pipe degradation. Typical examples include sulphur and acrylic acid lines.

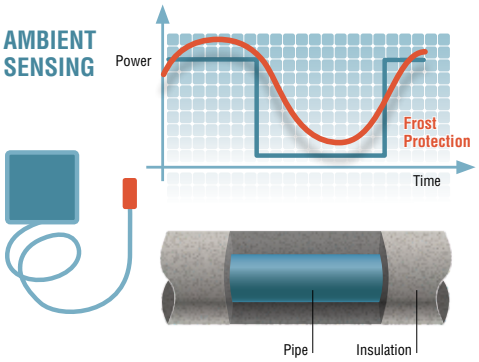
What you should consider before selecting your system

Select the appropriate method of control

The choice of the controller depends on whether the system is required to be controlled on the basis of ambient or pipe/equipment surface temperature, which is dependent on the process requirements and, possibly, the equipment limitations.

There are three methods of control for EHT systems.

Ambient sensing control

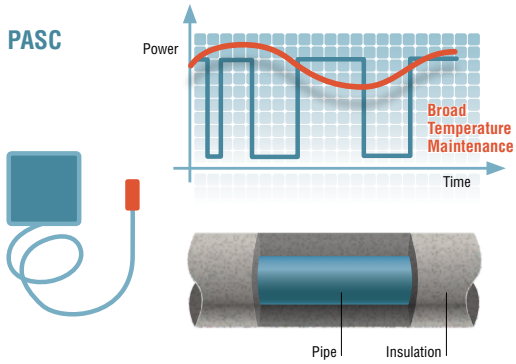


Uses a simple on-off algorithm based on ambient temperature. It is more energy efficient than just self-regulating control because the heating circuit is energised only when the temperature descend below the set point.

The control device can be either a mechanical thermostat or an electronic controller. Ambient thermostats are generally sufficiently accurate and reliable to provide an economical solution for most frost-protection applications.

Product technology
Control and monitoring systems

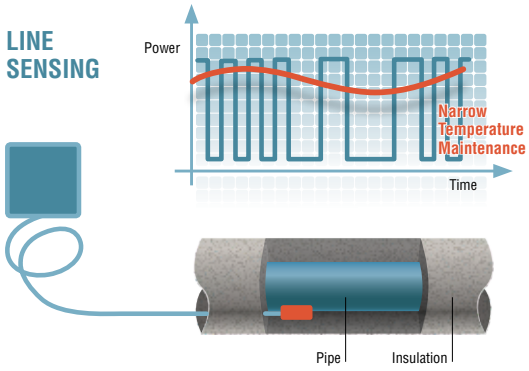
Proportional Ambient Sensing Control (PASC)



Uses an electronic controller that senses ambient temperature and continuously matches the heat input to the predicted heat loss that occurs due to changing ambient conditions.

A pre-programmed algorithm calculates the cycle time that the heating circuits will be energised to maintain the desired temperature. PASC is suitable for all broad temperature-control and many narrow temperature-control applications. Compared to line sensing, the use of PASC can significantly reduce the number of circuits, as flow paths don't need consideration and can help reducing total installed cost of a project whilst reducing energy consumption.

Line sensing control



Is based on the pipe/equipment temperature. With this option, each flow path has a separate circuit controlled by a mechanical line-sensing thermostat or electronic controller. The control unit turns on the heating circuit when the pipe temperature descend below the desired maintain temperature.

Line sensing offers the most accurate control for narrow temperature band applications. Total installed cost of line sensing systems can be considerably higher than systems based on ambient temperature, as the average circuit length of the EHT system is typically significantly lower based on pipe lengths and possible flow paths.

What you should consider before selecting your system

Determine the control and monitoring philosophy

An overarching control and monitoring philosophy must be established for a project before any products can be selected. Types and methods of control and monitoring need to be chosen based on various aspects:

- ☑ Process requirements
  (temperatures, flow path considerations,alarm requirements, upset conditions)
- ☑ Maintenance strategy
  (simplicity, local or central monitoring, location of installation)
- ☑ Power distribution parameters
  (location of panels, substations, cabling requirements)
- ☑ Economical considerations (optimisation of TIC, TOC)

It is also worth considering incorporating a variety of monitoring options into the system design. The use of monitoring of the circuit integrity increases the overall system reliability as failures in the heating and power distribution systems can be reported to operations and maintenance personnel locally or at a central location.

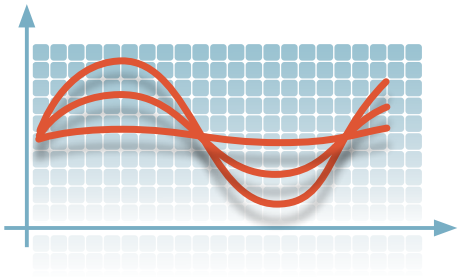
How to proceed with your selection

Objective

Frost protection

Broad temperature maintenance

Narrow temperature maintenance

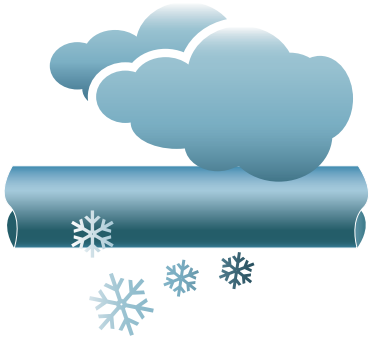


Methodology

Ambient sensing control

Proportional Ambient Sensing Control (PASC)

Line sensing control

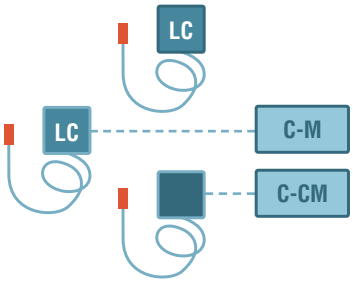


Philosophy of Controls

Local controls

Local controls with central monitoring

Central controls and monitoring



Select your product

For lowest installation cost

This employs locally-mounted thermostats that are installed in the field and typically directly switch the heat-tracing circuit. It offers the lowest installation cost but is limited in its applicability and makes a minimal contribution to lowering total operational costs (TOC). The cost and complexity of maintenance for this philosophy is high unless it is combined with the possibility of central monitoring.

There are mechanical and electronic options, depending on process requirements, each of which offers models for use in both hazardous and non-hazardous areas.

Mechanical thermostats are based on the bulb and capillary principle and are used for frost protection or temperature maintenance with a relatively narrow temperature band.

Benefits:

- Easy installation and commissioning
- Low installation cost
- Relatively accurate control

They are limited by:

- No temperature monitoring
- Imprecise setpoint setting
- No maintenance information available
- Limited temperature range

Product technology
Control and monitoring systems

Local control

Electronic thermostats measure temperature through an electronic circuit wired to a temperature sensor. More sophisticated models offer additional features such as a temperature display, high/low temperature alarms or proportional ambient sensing control. They are mainly used for temperature maintenance requiring a narrow temperature band.

Benefits:

- Easy installation and commissioning
- Low installation cost
- Accurate control
- Sensor leads can be extended

They are limited by:

- Monitoring capabilities only in the field
- No maintenance information centrally available, so maintenance can only be carried out reactively

Select your product

For increased reliability, minimised cabling and reduced total operating cost

Advanced field-mounted controllers offer the option for direct switching locally in the field with the monitoring and configuration capabilities of a centralised control system. The controllers communicate via a bus system to a central location and can be configured and monitored in the field, via a hand-held device or remotely, via a touch-screen user interface and supervisory software.

This control and monitoring philosophy offers advantages for critical processes, small pipe networks and for high hold-temperature applications by minimising cabling costs, reducing total operating cost and the project schedule by standardising panel design.

Although specific features can differ by controller type, generally they offer a wide range of features and benefits that make them ideal for narrow-band temperature control:

- ☑ Increased reliability of the heat-tracing system by permanent supervision of the integrity of the circuit.
- ☑ Detailed problem reporting simplifies maintenance and increases personnel safety. Touch screen user interface and DigiTrace Supervisor software provide information for analysis leading to predictive maintenance.
- ☑ Hand-held device offering a means of monitoring the heat-tracing system in the field without opening he control unit.
- ☑ Monitoring and alarming of temperatures, ground-fault currents, operating currents and voltages.
- ☑ Considerable cost savings by reduction of power cabling, RTD wiring and simplified power distribution.
- ☑ Direct heater connections reducing field junction boxes, lowering power cable and maintenance costs.

Product technology
Control and monitoring systems

Local control - Central monitoring

Benefits

- Permanent supervision of heat-tracing circuits
- Extended range of monitored parameters
- Accurate and detailed history logs
- Cost savings by simplified power distribution
- Lowered maintenance costs by reduction of field junction boxes
- Simplified maintenance activities with hand held device
- Support for predictive maintenance

Select your product

For assured reliability and reduced total operating cost

Central control and monitoring systems are typically installed in panels where they provide control and monitoring for several heat-tracing circuits or groups of circuits at the same time. They offer advanced features like measuring groundfault levels, operating currents and provide a wealth of other maintenance-related information.

Tyco Thermal Controls has a family of panel controllers with advanced control and monitoring capabilities specifically designed to meet the demands of industrial Heat Management Systems. The controllers can be installed in any combination to deliver an optimised system for specific applications.

DigiTrace central control and monitoring systems offer the advantages of:

- ☑ Increased reliability of the heat-tracing system by permanent supervision of the integrity of the circuit.
- ☑ Detailed problem reporting simplifies maintenance and increases personnel safety. Touch screen user interface and DigiTrace Supervisor software provide information for analysis leading to predictive maintenance.
- ☑ Monitoring and alarming of temperatures, ground-fault currents, operating currents and voltages.
- ☑ Very accurate measurements and control capabilities.
- ☑ Various levels of access for different user groups.
- ☑ Can be used with either Solid State Relays or mechanical contactors for 1 phase and 3 phase systems.

Product technology
Control and monitoring systems

Central control and monitoring

Benefits

- ☑ Highest reliability and control flexibility via 1-phase or 3-phase controllers
- ☑ Highest safety integrity level with the intelligent SIL 2 safety temperature limiter
- ☑ Full heat-tracing control via dedicated temperature, power and current control algorithms
- ☑ Permanent supervision of heat-tracing circuits
- ☑ Extended range of monitored parameters
- ☑ Accurate and detailed history logs
- ☑ Simplified maintenance activities with hand held device
- ☑ Increase of personnel safety and heat-tracing installation reliability via continues system integrity checks

Selection charts

Where permanent monitoring of a heat-tracing circuit's integrity is required, the initial selection can be made from the advanced DigiTrace controllers table

Capabilities	DigiTrace NGC-20	DigiTrace NGC-30	DigiTrace NGC-40	DigiTrace HTC-915	DigiTrace TCONTROL-CONT-03	DigiTrace TCON-CSD/20
Location of controller						
Panel mounted		x	x	x	x	x
Field mounted	x					
Hazardous area	x					
Control						
Ambient sensing	x	x	x	x	x	x
PASC	x	x	x	x		
Line sensing	x	x	x	x	x	x
Proportional		x	x		x	
Safety temperature limiter	x*2		x*2	x		
Adaptive current control			x	x		
Monitoring						
Ambient temp	x	x	x	x	x	
Pipe temp	x	x	x	x	x	x
Ground fault	x	x	x	x		
1-phase current measurement	x	x	x	x		
3-phase current measurement			x			
Voltage	x	x		x		
Communication						
Local display	x	x	x	x	x	x
Hand held wireless	x					
Remote display	x	x	x			
DigiTrace Supervisor	x	x	x	x		
DCS integration	x	x	x	x		
Temperature range controller	−80°C +700°C	−73°C +482°C	−80°C +700°C	−60°C +570°C	−200°C +2400°C	−200°C +500°C
Temperature range limiter	−60°C +599°C	-	+50°C +500°C	−20°C +450°C (T1 to T6)		
Number of circuits per controller						
1 circuit/controller	x	x	x	x	x	x
>1 circuit/controller		x	x			

***2: SIL2 certified**

Product technology
Control and monitoring systems

The controller selection table presents an overview of all basic product information enabling you to select the products that match your chosen control method and control philosophy.

Name	Field/Panel	Mechanical/ Electronic	Hazardous/ Non-Hazardous	Line Sensing	PASC	Ambient	Controller temperature setting	Sensor exposure temperature	Limiter temperature setting	Limiter Sensor Exposure Temperature
T-M-10-S/0+50C	Field	Mech.	Non-Haz.	*		*	0°C +50°C	−40°C +60°C		
T-M-10-S/0+200C	Field	Mech.	Non-Haz.	*			0°C +200°C	−20°C +230°C		
T-M-10-S/+50+300C	Field	Mech.	Non-Haz.	*			50°C +300°C	−20°C +345°C		
T-M-20-S/0+50C	Field	Mech.	Non-Haz.	*			0°C +50°C	−40°C +60°C	+20°C +150°C	−40°C +170°C
T-M-20-S/0+200C	Field	Mech.	Non-Haz.	*			0°C +200°C	−20°C +230°C	+130°C +200°C	−20°C +230°C
T-M-20-S/+50+300C	Field	Mech.	Non-Haz.	*			+50°C +300°C	−20°C +345°C	+20°C +400°C	−40°C +500°C
AT-TS-13	Field	Elec.	Non-Haz.	*		*	-5°C +15°C	−20°C +80°C		
AT-TS-14	Field	Elec.	Non-Haz.	*			0°C +120°C	0°C +160°C		
RAYSTAT-ECO-10	Field	Elec.	Non-Haz.		*		0°C +30°C	−40°C +150°C		
RAYSTAT-CONTROL-10	Field	Elec.	Non-Haz.	*			0°C +150°C	−40°C +150°C		
RAYSTAT-EX-02	Field	Mech.	Haz.	*			−4°C +163°C	−50°C +215°C		
RAYSTAT-EX-03	Field	Elec.	Haz.	*			0°C +499°C	−50°C +585°C		
RAYSTAT-EX-04	Field	Elec.	Haz.			*	0°C +49°C			
T-M-20-S/+5+215C/EX	Field	Mech.	Haz.	*			+5°C +215°C	−30°C +250°C	+40°C +300°C	−30°C +330°C
T-M-20-S/+70+350C/EX	Field	Mech.	Haz.	*			+70°C +350°C	−30°C +380°C	+70°C +350°C	−30°C +380°C
DigiTrace NGC-20-C-E	Field	Elec.	Haz.	*	*	*	−80°C +700°C	(*1)		
DigiTrace NGC-20-CL-E	Field	Elec.	Haz.	*	*	*	−80°C +700°C	(*1)	−60°C +599°C (*2)	(*1)
DigiTrace NGC-30	Panel	Elec.	Haz. *3	*	*	*	−73°C +482°C	(*1)		
DigiTrace NGC-40	Panel	Elec.	Haz. *3	*	*	*	−80°C +700°C	(*1)	−50°C +500°C (*2)	
DigiTrace HTC-915	Panel	Elec.	Haz. *3	*	*	*	−60°C +570°C	(*1)	−20°C +450°C	(*1)
TCONTROL-CONT-03	Panel	Elec.	Haz. *3	*		*	−200°C +2400°C	(*1)		
TCON-CSD/20	Panel	Elec.	Haz. *3	*		*	−200°C +500°C	(*1)		

***1: Sensor dependent | *2: SIL2 certified | *3: in combination with hazardous area approved sensor**
Mech.: Mechanical | Elec.: Electronic | Non-Haz.: Non-Hazardous | Haz.: Hazardous

SPECIAL APPLIC

Special applications and systems

TRAC-LOC FOR PIPES AND TANKS

Trac-Loc thermal insulation systems provide higher level of protection for large storage tanks and long transfer lines

When time comes to propose innovative solutions for thermal insulating systems, Tyco Thermal Controls' 50 years of continuous innovation sets the standard. Trac-Loc for tanks and Trac-Loc for pipes are advanced thermal insulation solutions dedicated to large storage tanks and transfer piping systems.

No need for scaffolding and less required manpower in the field provides the basis for compressed schedule and improved safety records.

Trac-Loc for tanks

Vertical lock-seam innovative insulation systems.

The Trac-Loc advanced interlock panel system consists of prefabricated panels of insulation and jacketing material.

These panels, fabricated to the height of the storage tank, include mating seams that are mechanically joined (folded).

This innovative seam creates a homogenous jacket that not only secures the panels to the storage tank, but also reduces moisture ingress, has superior bend resistance, and has inherent expansion and contraction properties.

Benefits

- ☑ **Safe and cost effective**
  Eliminating the need for scaffolding results in a lower installed cost, less time spent on the construction site, and improved safety records.
- ☑ **Superior structure**
  Unique interlocking seams and closed cell insulation material structure provide a high rigidity, reduce moisture ingress and therefore minimise under –insulation corrosion.
- ☑ **High energy savings**
  By using non-fibrous materials with closed cell structure the thermal insulation is superior and energy costs can be reduced drastically.
- ☑ **Maintenance free**
  Interlocking panels eliminate the use of external horizontal bands that require maintenance over time. Screws are not required, so jacket penetrations are eliminated.
- ☑ **Unique design**
  Trac-Loc panels offer a wide range of colors for a clean finished look.

Special applications and systems
Trac-Loc for pipes and tanks

Trac-Loc for pipes

Pre-traced pre-insulated piping systems for transfer lines of sensitive products.

When the worst conditions are to be considered, you need to rely on one system which will protect your investment. Transfer pipelines are vital to transport your high value products from manufacturing plants to export facilities. Trac-Loc provides the level of protection you are looking for.

A seaming machine creates a continuous casing into which is slid the product pipe equipped with heat-tracing tubes. Injection of last developed PIR foams creates the necessary thermal barrier to limit heat losses. Robustness of external cladding and density of foam allow clamping of pipe support brackets on the outer casing. Therefore no water ingress can occur.

Pipe supports installed over the cladding guarantee uniform thermal profile along the entire pipe length.

Benefits

- ☑ **Improved project schedule**
  By pre-fabricating the insulation on pipes the time on the construction site can be reduced drastically.
- ☑ **Improved safety records**
  By shifting the insulation works to a professional workshop, the operations on the construction site are reduced.
- ☑ **Superior structure**
  Multi-layer thermal insulation system with high temperature inner layer, load bearing out layer, and UV resistant out jacket. Engineered pipe supports, guide plates and anchors.
- ☑ **Uniform thermal profile**
  The rigid insulation structure allows the support brackets to be mounted on the outer cladding. This eliminates local thermal losses and moisture ingress.
- ☑ **Long life**
  By using superior closed cell insulation and unique seaming of the pipe sections moisture ingress is reduced drastically and internal corrosion can be eliminated. This guarantees a longer life of your equipment.

Frost heave prevention of cryogenic storage tanks

Tyco Thermal Controls is the unquestionable leader in electrical heat-tracing systems. Since the 1970's Tyco Thermal Controls has been involved in the frost heave prevention (FHP) of cryogenic storage tanks and was the pioneer in using self-regulating heating cable.

Viability of electrical heating cables in frost heave prevention applications of cryogenic tanks highlights the necessity using a design software, taking into account not only the thermodynamic model of heat transfer for these tanks, but also the specific behaviour of each type of heating cable technology and their related output curves within conduits buried in concrete.

Every LNG system that is evaluated has an infinite number of equations that define it. Making logical assumptions allows a designer to determine the likely reaction of a system. The closer the system is to reality, the more equations that define it. Tyco Thermal Controls' design tools includes from 2D steady state analysis up to 3D finite element analysis transient analysis.

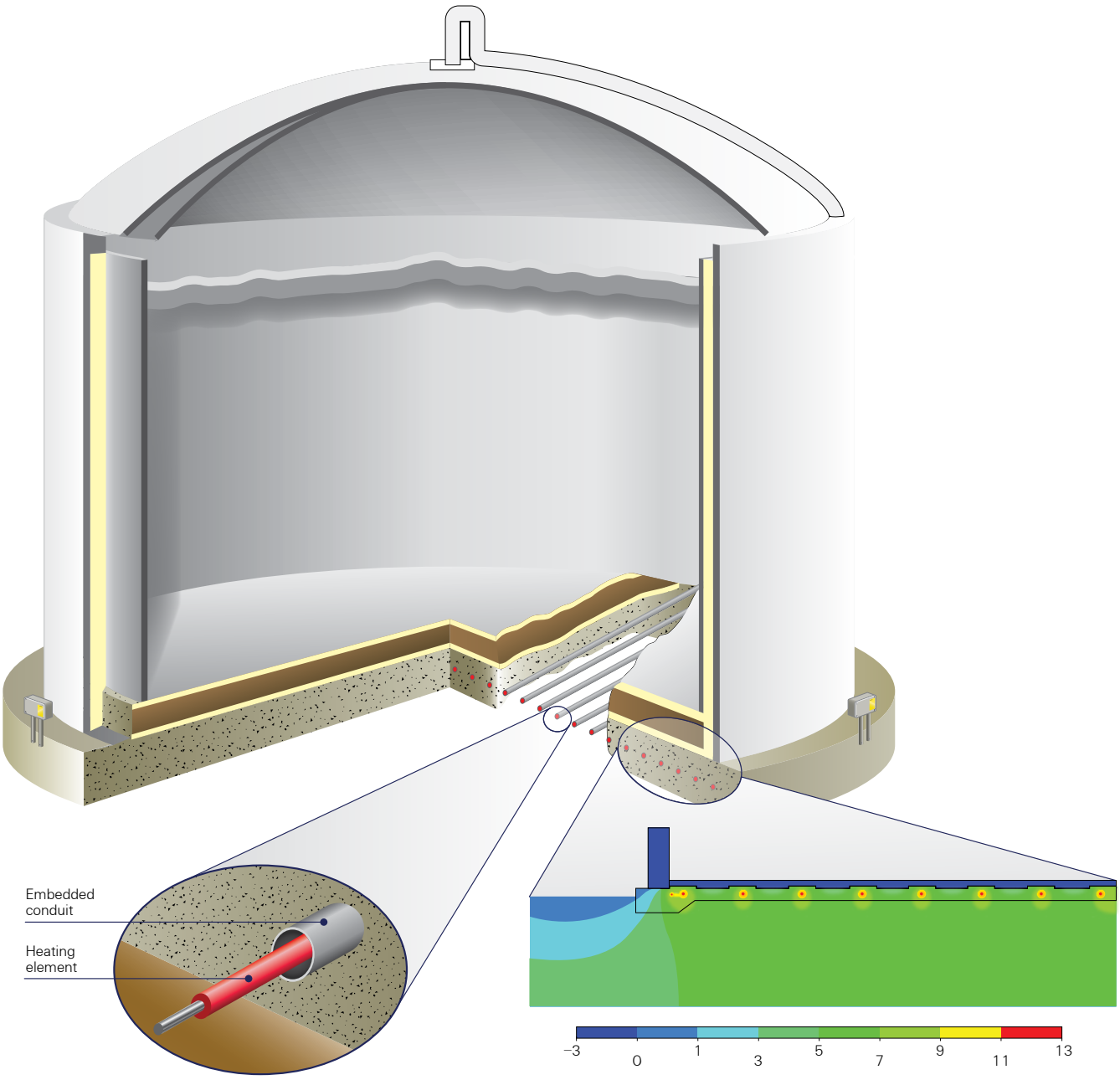
Thirty years experience creates the ground for evolution of heating products in order to adapt solutions to each specific client requirements. Depending on each application, numerous solutions can be evaluated based on the main three technologies that Tyco Thermal Controls proposes:

- ☑ Self-regulating heating system FHP
- ☑ Constant wattage zone heaters type FHP-C
- ☑ Skin effect heating system type STS

In addition offers a broad range of control and monitoring systems, from simple thermostats to state of the art Tyco Thermal Controls proposes also several solutions for temperature control systems and heat management systems. This starts from the single point single measure up to full electrical power controlsand monitoring multiple points field bus based Digitrace NGC systems.

Our design capabilities cover heat calculations, power distribution design, temperature control definition, etc. Documentation can cover a large field of requirements from the supply of data sheets up to a full manufacturer dossier dedicated to engineering contracting houses.

Services capabilities can include installation supervision, pre-commissioning, commissioning, start-up services but also full EPC scope of works from panelboard in sub-station to heating cable end caps on-site.



Embedded heating elements

Thermal profile for conditions 2D FEA with 82% duty cycle

STS - Skin-effect Tracing System

Why STS?

Longline capability
Circuit lengths up to 25 kilometers (15 miles) from a single power source.

Flexibility
Ideal for either factory fabricated, pre-insulated or field installed system.

Maintainable
Pull/splice boxes simplify access to the system without disturbing insulation.

Safe
Fully grounded system with zero electrical potential on pipe surfaces.

Rugged and reliable
Entire circuit is encapsulated within rugged heat tubes and steel boxes.

Accurate control
A closed loop control system includes redundant temperature sensing.

Engineered
Systems are custom engineered in accordance with ANSI/IEEE 844, NEC 426/427 and plant standards.

Simulation studies
Temperature profile plotting capability.

Computerised design
Runaway temperature, dynamic static heat-up/cool-down calculations available.

The Tracer STS System is a versatile engineered heat management system configured to deliver heat for medium to long pipelines.

Applications include: material transfer lines, snow and ice melting, tank foundation heating, subsea transfer lines and prefabricated, pre-insulated lines. The industry leader in offering single source responsibility in heat management, Tyco Thermal Controls and the Tracer brand are uniquely qualified to offer Skin-Effect Systems that combine system engineered expertise with proven procurement/ construction capabilities.

STS systems can be designed for:

- ☑ Circuit lengths up to 25 kilometers (15 miles)
- ☑ Power outputs up to 150 W/m (49.2 W/ft)
- ☑ Maintain temperatures up to 200°C (392°F)
- ☑ Exposure temperatures up to 250°C (482°F)

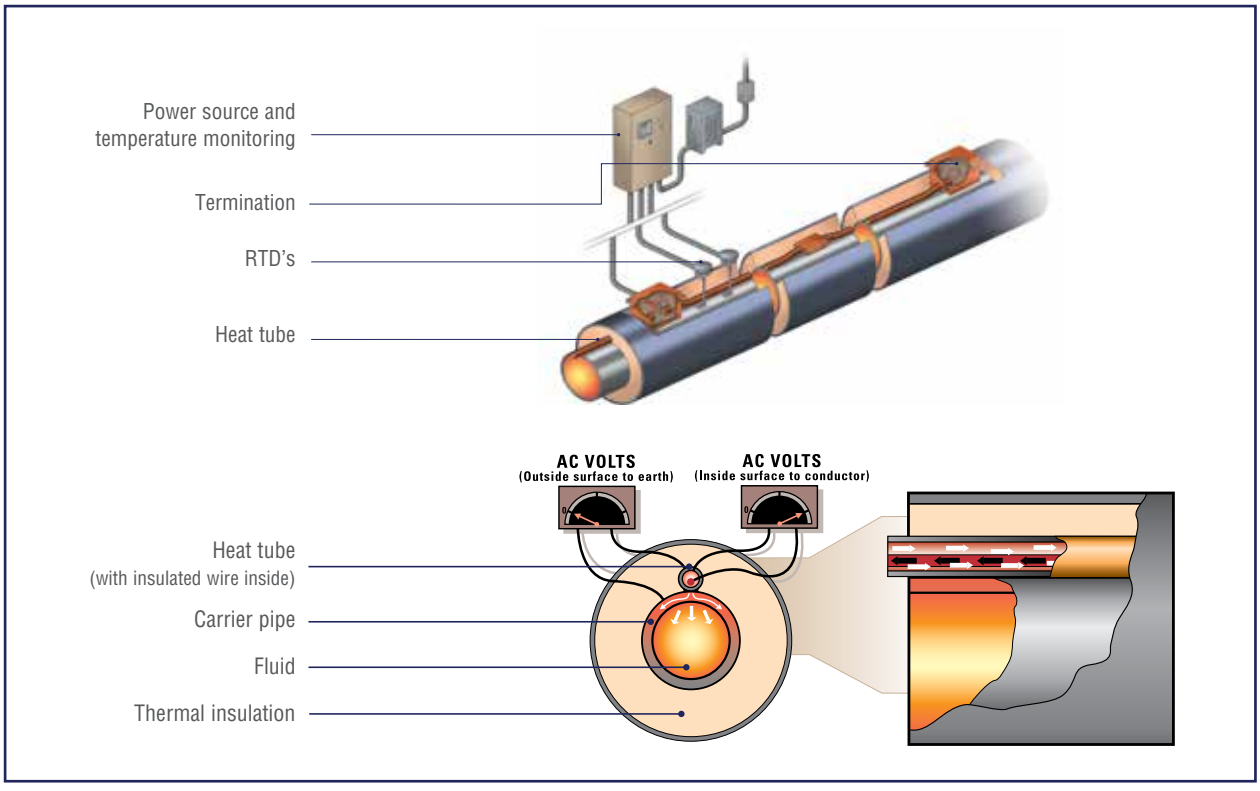
STS technology

The STS System consists of a thermally rated, electrically insulated wire installed inside a ferromagnetic heat tube. The insulated wire is connected to the heat tube at the end termination, and an AC voltage source is connected between the heat tube and insulated wire at the power connection. AC current flows down the wire, returning on the inside surface of the tube.

The STS system is electrically safe and produces heat in the ferromagnetic tube through the effects of two well-known electrical phenomena:
Skin Effect and Proximity Effect.

These phenomena cause the current flowing in the heat tube to be concentrated on the inner surface; the current concentration is so complete there is virtually no measurable voltage on the outer wall of the heat tube. Heat is also generated due to the resistance of the heat tube and STS wire, and through eddy currents and hysteresis in the heat tube. Since the heat tube is attached to the process pipe and completely within the thermal insulation system, heat is efficiently transferred into the process pipe. Circuit lengths are determined by a combination of cable size, cable voltage, temperature rating, heat tube size and attachment method. It is feasible to heat up to 25 kilometers (15 miles) from a single source using supply voltages approaching 5,000 volts. With the cable inside the tube and pull/splice boxes located along the line, any field modifications, cable replacements, troubleshooting, etc... becomes very simple. All can be accomplished without disturbing the insulation.

These systems can be provided as a pre-fabricated and pre-insulated piping system in which the steel tube is factory attached to the carrier pipe.



Leak detection and location system

TraceTek leak detection

for industrial, commercial and heritage applications

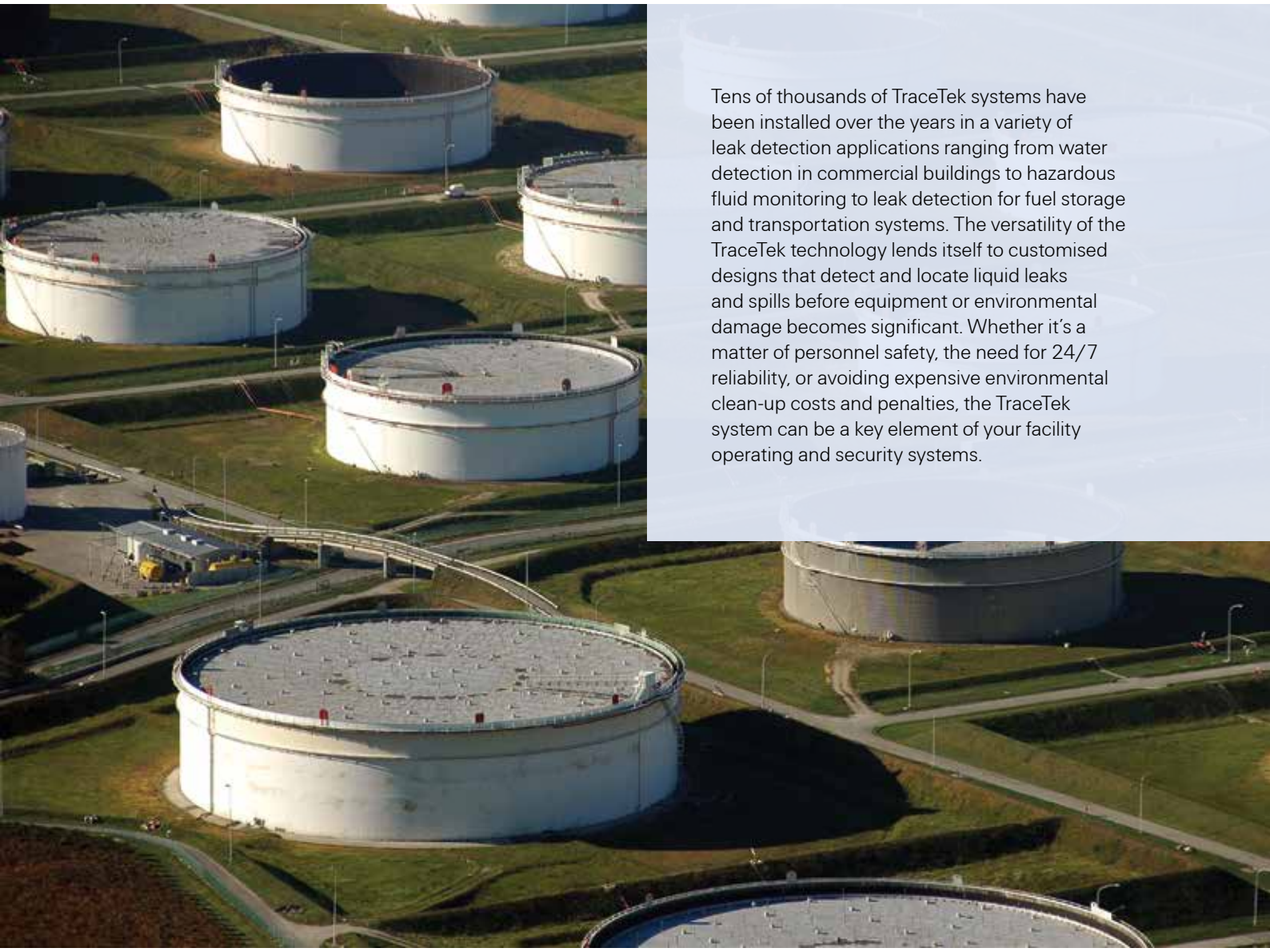
Detect a spill, locate the source of the leak and take corrective action before an incident becomes a "news story". The key is quick detection and accurate location at the source of the leak. TraceTek sensor cable and monitoring systems make it possible. If your business involves the transportation, storage, processing or consumption of hazardous fluids, the possibility of a leak must be considered. Whether your concern is gasoline, jet fuel, diesel, crude oil, acids, bases, contaminated water or any other hazardous liquid, TraceTek can provide a leak detection system tailored to your needs.
TraceTek leak detection systems can detect and pinpoint the source of a leak to help you take decisive action long before the spill can ruin your reputation.

Good reasons to select a TraceTek leak detection system

- ☑ Reliable and accurate fluid leak detection sensors for water, petroleum and acids - as used in thousands of installations worldwide
- ☑ Digital signals that provide local, networked and remote alarms and diagnostics
- ☑ Modular system so that simple or complex systems can be configured and allow for future expansion

TraceTek leak detection sensors: more than a sensing system, a complete solution to provide peace of mind in critical applications.

Special applications and systems
Leak detection system



Tens of thousands of TraceTek systems have been installed over the years in a variety of leak detection applications ranging from water detection in commercial buildings to hazardous fluid monitoring to leak detection for fuel storage and transportation systems. The versatility of the TraceTek technology lends itself to customised designs that detect and locate liquid leaks and spills before equipment or environmental damage becomes significant. Whether it's a matter of personnel safety, the need for 24/7 reliability, or avoiding expensive environmental clean-up costs and penalties, the TraceTek system can be a key element of your facility operating and security systems.

PRODUCT DATA

Product **Datasheets**

Heating cables

Components

Control and monitoring

Accessories

Contents

Raychem

Splices and tees

Pyrotenax

Nomenclature and accessories for Mineral insulated (MI) heating cable systems

DigiTrace

Thermostats

DigiTrace

Panel mount single-circuit electronic controllers

DigiTrace

Multi-circuit electronic control and monitoring systems

Controllers

Sensors

Raychem

Accessories

Product/Technology - Selection table

Typical maintain temperature range (°C)												Product	Technology
50	100	150	200	250	300	350	400	450	500	550	600		
65												BTV	Parallel self-regulating Field-terminated
110												QTVR	Parallel self-regulating Field-terminated
120												XTV	Parallel self-regulating Field-terminated
150												KTV	Parallel self-regulating Field-terminated
230												VPL	Parallel power-limiting Field-terminated
125												FMT	Parallel Constant Wattage Zone Field-terminated
200												FHT	Parallel Constant Wattage Zone Field-terminated
160												XPI-NH	Polymer Insulated (PI) Series, Constant Wattage Field-terminated
200												XPI	Polymer Insulated (PI) Series, Constant Wattage Field-terminated
200												XPI-S	Polymer Insulated (PI) Series, Constant Wattage Field-terminated
40												HCHH/HCCH (HDPE)	Mineral Insulated (MI) Series, Constant Wattage Factory-terminated
120												HCH/HCC	Mineral Insulated (MI) Series, Constant Wattage Factory-terminated
250												HDF/HDC	Mineral Insulated (MI) Series, Constant Wattage Factory-terminated
450												HSQ	Mineral Insulated (MI) Series, Constant Wattage Factory-terminated
550												HAx	Mineral Insulated (MI) Series, Constant Wattage Factory-terminated
600												HIQ	Mineral Insulated (MI) Series, Constant Wattage Factory-terminated
150												STS	Skin-effect Tracing System STS Engineered Product

Max. exposure temperature (°C) Continuous power on ♦ Power off	Temperature classification	T Class design method			Preferred control method				Chemical exposure		Mechanical resistance		Typical pipe length range (m)
		Unconditional	Stabilised design	Use of temperature limiter	No control	Ambient sensing	Broad temperature range (+/–10°C)	Tight temperature control (+/–3°C)	Organic	None	Normal	High	
65	T6	■			■	■	■	■	■	■	■	■	0 - 400
110	T4	■			■	■	■	■	■	■	■	■	0 - 400
120	T2-T3	■	*T4		■	■	■	■	■	■	■	■	0 - 400
150	T2	■	**T3-T4		■	■	■	■	■	■	■	■	0 - 400
260♦	T2-T4		■	■		■	■	■	■	■	■	■	0 - 450
200♦	T2-T4		■	■			■	■	■	■	■		0 - 400
260♦	T2-T4		■	■			■	■	■	■	■		0 - 450
260♦	Ordinary only						■	■	■	■	■		Up to 5000
260♦	T2-T6		■	■			■	■	■	■	■		Up to 5000
260♦	T2-T6		■	■			■	■	■	■	■	■	Up to 5000
80♦	T6		■	■			■	■	■	■	■	■	Up to 5000
200♦	T3-T6		■	■			■	■		■	■	■	Up to 5000
400♦	T1-T6		■	■			■	■	■	■	■	■	Up to 2500
700♦	T1-T6		■	■			■	■	■	■	■	■	Up to 500
700♦	T1-T6		■	■			■	■	■	■	■	■	Up to 5000
1000♦	T1-T6		■	■			■	■	■	■	■	■	Up to 500
250♦	T2-T6		■	■				■	■	■	■	■	400 - 30.000

*Stabilised design, T2-T3 -> unconditional/ **Stabilised design, T2 -> unconditional

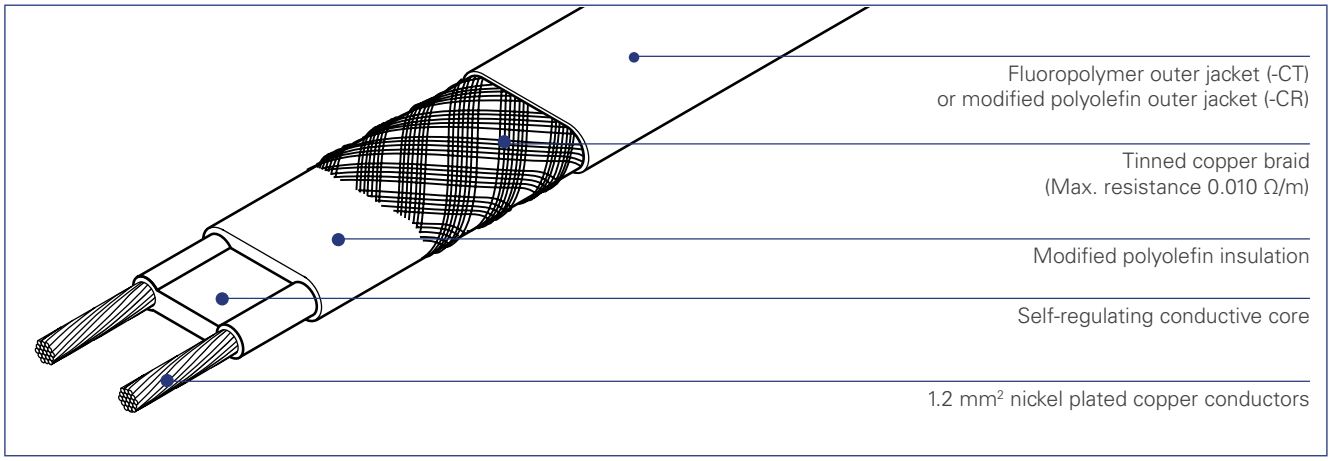
Self-regulating heating cable

Electrical heat-tracing for frost protection without steam cleaning.

The BTV-family of self-regulating, parallel circuit heating cables is used for frost protection of pipes and vessels.

It can also be used for process temperature maintenance up to 65°C.

Heating cable construction



Application

Area classification	Hazardous, Zone 1, Zone 2 (Gas), Zone 21, Zone 22 (Dust)
	Ordinary
Traced surface type	Carbon steel
	Stainless steel
	Plastic
	Painted or unpainted metal
Chemical resistance	For organic corrosives: use -CT (fluoropolymer outer jacket)
	For mild inorganic solutions: use -CR (modified polyolefin outer jacket)
	For aggressive organics and corrosives consult your local Tyco Thermal Controls representative

Supply voltage

230 Vac (Contact your local Tyco Thermal Controls representative for data on other voltages)

Approvals

The BTV heating cables are approved for use in hazardous areas by PTB and Baseefa Ltd.
PTB 09 ATEX 1115 X & Baseefa06ATEX0183X
Ⓔx II 2 G Ex e II T6 & Ⓔx II 2 D Ex tD A21 IP66 T80°C
IECEx PTB 09.0056X & IECEx BAS 06.0043X
Ex e II T6 & Ex tD A21 IP66 T80°C

The BTV heating cables are approved by DNV for use on ships and mobile offshore units.
DNV Certificate No. E-11564

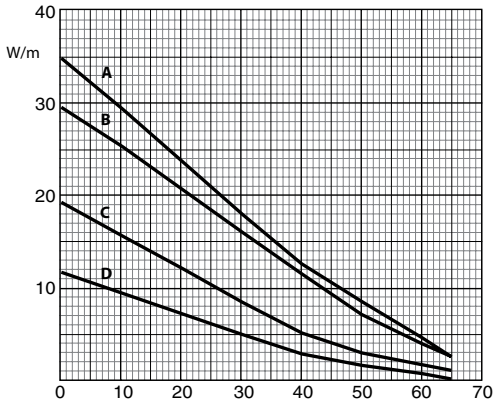
The products also have the required approvals for use in Kazakhstan, Russia and many other countries. Contact your local Tyco Thermal Controls representative for more details.

Specifications	
Maximum maintain or continuous exposure temperature (power on)	65°C
Maximum intermittent exposure temperature (power on)	85°C Maximum cumulative exposure 1000 hours
Temperature classification	T6
Minimum installation temperature	–60°C
Minimum bend radius	at 20°C: 13 mm at –60°C: 35 mm

Thermal output rating

Nominal power output at 230 Vac on insulated steel pipes

A **10BTV2-CT**
10BTV2-CR
B **8BTV-2-CT**
8BTV-2-CR
C **5BTV2-CT**
5BTV2-CR
D **3BTV2-CT**
3BTV2-CR



	3BTV2-CR 3BTV2-CT	5BTV2-CR 5BTV2-CT	8BTV-2-CR 8BTV-2-CT	10BTV2-CR 10BTV2-CT
Nominal power output (W/m at 10°C)	9	16	25	29
Product dimensions (nominal) and weight				
Thickness (mm)	5.5	5.5	5.5	5.5
Width (mm)	10.5	10.5	15.4	15.4
Weight (g/m)	110	110	153	153

Maximum circuit length based on type 'C' circuit breakers according to EN 60898

Electrical protection sizing	Start-up temperature	Maximum heating cable length per circuit (m)			
16 A	–20°C	155	110	70	45
	+10°C	200	160	110	65
20 A	–20°C	195	140	90	55
	+10°C	200	160	125	85
25 A	–20°C	200	160	110	70
	+10°C	200	160	125	105
32 A	–20°C	200	160	125	90
	+10°C	200	160	125	110

The above numbers are for circuit length estimation only. For more detailed information please use the Tyco Thermal Controls TraceCalc software or Contact your local Tyco Thermal Controls representative. Tyco Thermal Controls requires the use of a 30 mA residual current device to provide maximum safety and protection from fire. Where design results in higher leakage current, the preferred trip level for adjustable devices is 30 mA above any inherent capacitive leakage characteristic of the heater as specified by the trace heater supplier or alternatively, the next common available trip level for non adjustable devices, with a maximum of 300 mA. All safety aspects need to be proven.

Ordering details				
Part description	3BTV2-CR	5BTV2-CR	8BTV-2-CR	10BTV2-CR
Part No.	914279-000	414809-000	479821-000	677245-000
Part description	3BTV2-CT	5BTV2-CT	8BTV-2-CT	10BTV2-CT
Part No.	469145-000	487509-000	008633-000	567513-000

Components

Tyco Thermal Controls offers a full range of components for power connections, splices and end seals.
These components must be used to ensure proper functioning of the product and compliance with electrical requirements.

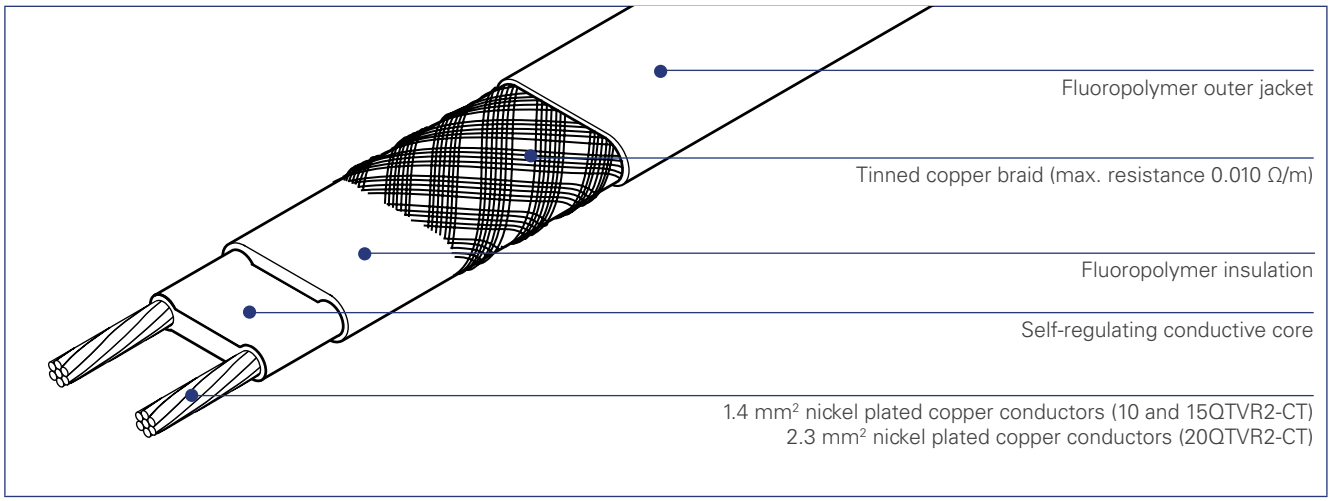
Self-regulating heating cable

Electrical heat-tracing for process temperature maintenance applications up to 110°C which are not subject to steam cleaning.

The QTVR family of self-regulating, parallel circuit heating cables is used for process temperature maintenance of pipes and vessels.

It can also be used for frost protection of large pipes and for applications requiring medium temperature exposure capability.

Heating cable construction



Application

Area classification	Hazardous, Zone 1, Zone 2 (Gas), Zone 21, Zone 22 (Dust) Ordinary
Traced surface type	Carbon steel Stainless steel Painted or unpainted metal
Chemical resistance	Organics and corrosives For aggressive organics and corrosives consult your local Tyco Thermal Controls representative

Supply voltage

230 Vac (Contact your local Tyco Thermal Controls representative for data on other voltages)

Approvals

The QTVR heating cables are approved for use in hazardous areas by PTB and Baseefa Ltd.
PTB 09 ATEX 1116 X & Baseefa06ATEX0185X
Ⓔx II 2G Ex e II T4 & Ⓔx II 2D Ex tD A21 IP66 T130°C
IECEx PTB 09.0057X & IECEx BAS 06.0045X
Ex e II T4 & Ex tD A21 IP66 T130°C

The QTVR heating cables are approved by DNV for use on ships and mobile offshore units.
DNV Certificate No. E-11564

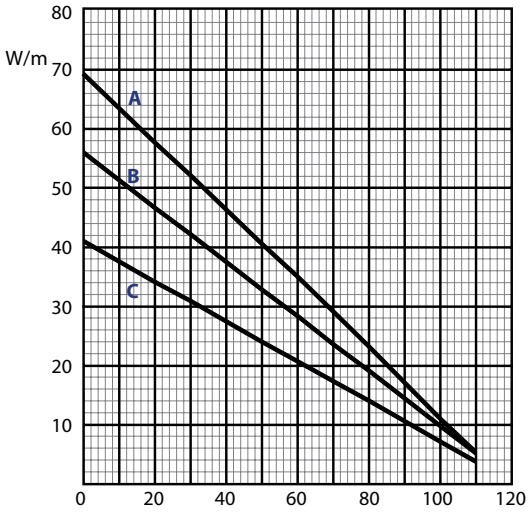
The products also have the required approvals for use in Kazakhstan, Russia and many other countries. Contact Tyco Thermal Controls representative for more details.

Specifications	
Maximum maintain or continuous exposure temperature (power on)	110°C
Temperature classification	T4
Minimum installation temperature	–60°C
Minimum bend radius	at 20°C: 13 mm at –60°C: 35 mm

Thermal output rating

Nominal power output at 230 Vac on insulated steel pipes

A 20QTVR2-CT
B 15QTVR2-CT
C 10QTVR2-CT



	10QTVR2-CT	15QTVR2-CT	20QTVR2-CT
Nominal power output (W/m at 10°C)	38	51	64
Product dimensions (nominal) and weight			
Thickness (mm)	4.5	4.5	5.1
Width (mm)	11.8	11.8	14.0
Weight (g/m)	126	126	180

Maximum circuit length based on type 'C' circuit breakers according to EN 60898

Electrical protection sizing	Start-up temperature	Maximum heating cable length per circuit (m)		
16 A	–20°C	65	63	47
	+10°C	80	63	47
25 A	–20°C	95	75	60
	+10°C	115	95	75
32 A	–20°C	115	100	75
	+10°C	115	100	95
40 A	–20°C	115	100	95
	+10°C	115	100	115

The above numbers are for circuit length estimation only. For more detailed information please use the Tyco Thermal Controls TraceCalc software or contact your local Tyco Thermal Controls representative.

Tyco Thermal Controls requires the use of a 30 mA residual current device to provide maximum safety and protection from fire.

Where design results in higher leakage current, the preferred trip level for adjustable devices is 30 mA above any inherent capacitive leakage characteristic of the heater as specified by the trace heater supplier or alternatively, the next common available trip level for non adjustable devices, with a maximum of 300 mA. All safety aspects need to be proven.

Ordering details			
Part description	10QTVR2-CT	15QTVR2-CT	20QTVR2-CT
Part No.	391991-000	040615-000	988967-000

Components

Tyco Thermal Controls offers a full range of components for power connections, splices and end seals.

These components must be used to ensure proper functioning of the product and compliance with electrical requirements.

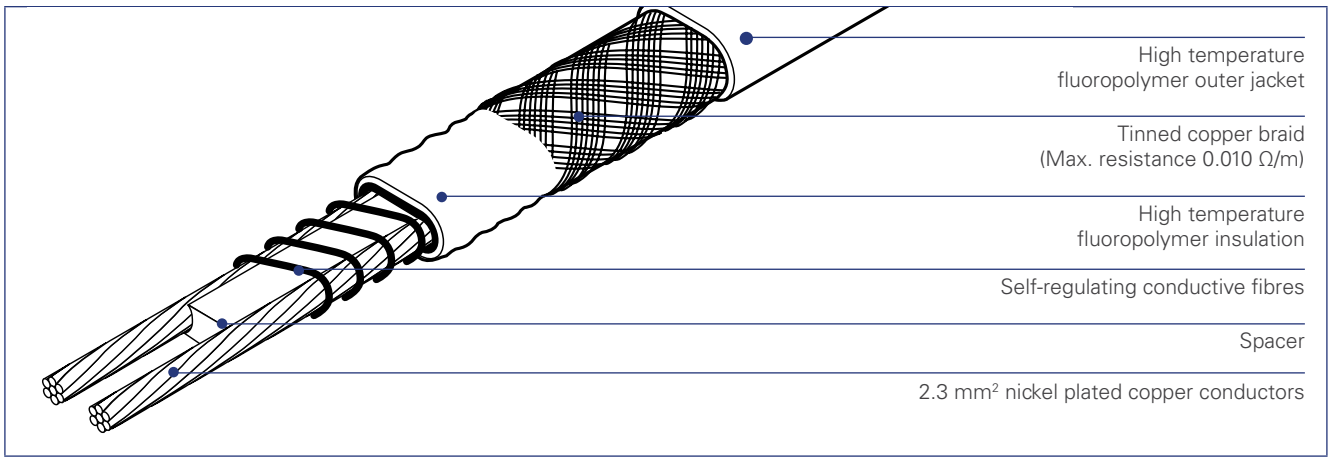
Self-regulating heating cable

Electrical heat-tracing for process temperature maintenance applications up to 120°C which may be subject to steam cleaning.

The XTV family of self-regulating, parallel circuit heating cables is used for process temperature maintenance of pipes and vessels.

It can also be used for frost protection of large pipes and for applications requiring high temperature exposure capability.

Heating cable construction



Application

Area classification	Hazardous, Zone 1, Zone 2 (Gas), Zone 21, Zone 22 (Dust)
	Ordinary
Traced surface type	Carbon steel
	Stainless steel
	Painted or unpainted metal
Chemical resistance	Organics and corrosives
	For aggressive organics and corrosives consult your local Tyco Thermal Controls representative

Supply voltage

230 Vac (Contact your local Tyco Thermal Controls representative for data on other voltages)

Approvals

The XTV heating cables are approved for use in hazardous areas by PTB and Baseefa Ltd.
PTB 09 ATEX 1118 X & Baseefa06ATEX0184X
Ⓔx II 2G Ex e II T* & Ⓔx II 2D Ex tD A21 IP66 T*
IECEx PTB 09.0059X & IECEx BAS 06.0044X
Ex e II T* & Ex tD A21 IP66 T*
**See approval schedule*

The XTV heating cables are approved by DNV for use on ships and mobile offshore units.
DNV Certificate No. E-8934

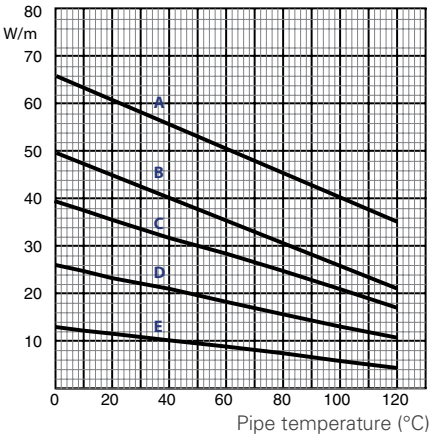
The products also have the required approvals for use in Kazakhstan, Russia and many other countries. Contact your local Tyco Thermal Controls representative for more details.

Specifications	
Maximum maintain or continuous exposure temperature (power on)	120°C
Maximum intermittent exposure temperature (power on)	215°C (20 bar saturated steam) Maximum cumulative exposure 1000 hours
Temperature classification	T2: 20XTV2-CT-T2 T3: 4XTV2-CT-T3, 8XTV2-CT-T3, 12XTV2-CT-T3, 15XTV2-CT-T3
Based on systems approach*	T3-T6 **Raychem XTV heat-tracing cables are approved for the listed temperature classifications by using the principles of stabilized design (as per system classification approach) or the use of a temperature limiting device. Use TraceCalc design software or contact Tyco Thermal Controls.*
Minimum installation temperature	–60°C
Minimum bend radius	at 20°C: 13 mm at –60°C: 51 mm

Thermal output rating

Nominal power output at 230 Vac on insulated steel pipes

A 20XTV2-CT-T2
B 15XTV2-CT-T3
C 12XTV2-CT-T3
D 8XTV2-CT-T3
E 4XTV2-CT-T3



	4XTV2-CT-T3	8XTV2-CT-T3	12XTV2-CT-T3	15XTV2-CT-T3	20XTV2-CT-T2
Nominal power output (W/m at 10°C)	12	25	38	47	63
Product dimensions (nominal) and weight					
Thickness (mm)	7.2	7.2	7.2	7.2	7.2
Width (mm)	11.7	11.7	11.7	11.7	11.7
Weight (g/m)	170	170	170	170	170

Maximum circuit length based on type 'C' circuit breakers according to EN 60898

Electrical protection sizing	Start-up temperature	Maximum heating cable length per circuit (m)				
16 A	–20°C	145	90	65	55	40
	+10°C	170	105	75	60	45
25 A	–20°C	225	145	105	85	65
	+10°C	245	165	120	95	70
32 A	–20°C	245	175	135	105	80
	+10°C	245	175	140	125	90
40 A	–20°C	245	175	140	135	110
	+10°C	245	175	140	135	110

The above numbers are for circuit length estimation only. For more detailed information please use the Tyco Thermal Controls TraceCalc software or Contact your local Tyco Thermal Controls representative. Tyco Thermal Controls requires the use of a 30 mA residual current device to provide maximum safety and protection from fire. Where design results in higher leakage current, the preferred trip level for adjustable devices is 30 mA above any inherent capacitive leakage characteristic of the heater as specified by the trace heater supplier or alternatively, the next common available trip level for non adjustable devices, with a maximum of 300 mA. All safety aspects need to be proven.

Ordering details

Part description	4XTV2-CT-T3	8XTV2-CT-T3	12XTV2-CT-T3	15XTV2-CT-T3	20XTV2-CT-T2
Part No.	002735-000	325059-000	427089-000	214999-000	849015-000

Components

Tyco Thermal Controls offers a full range of components for power connections, splices and end seals.
These components must be used to ensure proper functioning of the product and compliance with electrical requirements.

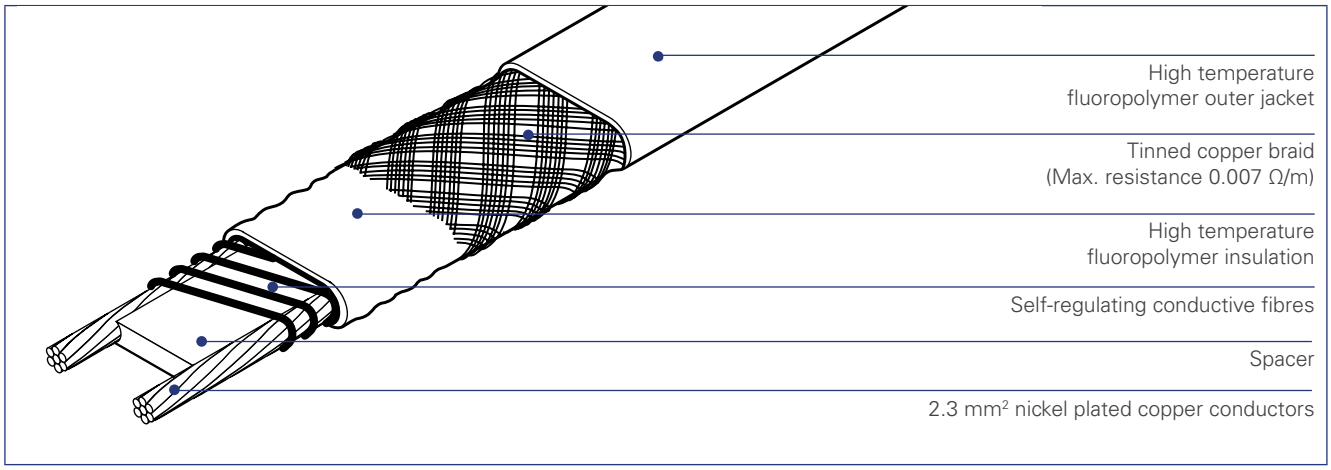
Self-regulating heating cable

Electrical heat-tracing for process temperature maintenance applications up to 150°C which may be subject to steam cleaning.

The KTV family of self-regulating, parallel circuit heating cables is used for process temperature maintenance of pipes and vessels.

It can also be used for frost protection of large pipes and for applications requiring high temperature exposure capability.

Heating cable construction



Application

Area classification	Hazardous, Zone 1, Zone 2 (Gas), Zone 21, Zone 22 (Dust) Ordinary
Traced surface type	Carbon steel Stainless steel Painted or unpainted metal
Chemical resistance	Organics and corrosives For aggressive organics and corrosives consult your local Tyco Thermal Controls representative

Supply voltage

230 Vac (Contact your local Tyco Thermal Controls representative for data on other voltages)

Approvals

The KTV heating cables are approved for use in hazardous areas by PTB and Baseefa Ltd.
PTB 09 ATEX 1117 X & Baseefa06ATEX0186X
Ⓔx II 2G Ex e II 226°C (T2) & Ⓔx II 2D Ex tD A21 IP66 T226°C
IECEx PTB 09.0058X & IECEx BAS 06.0046X
Ex e II 226°C (T2) & Ex tD A21 IP66 T226°C

The KTV heating cables are approved by DNV for use on ships and mobile off shore units.
DNV Certificate No. E-8934

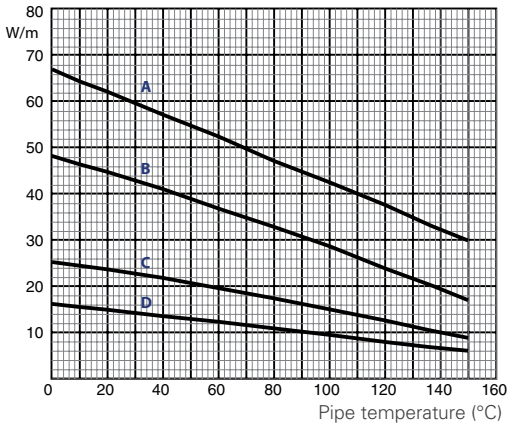
The products also have the required approvals for use in Kazakhstan, Russia and many other countries.Contact your local Tyco Thermal Controls representative for more details.

Specifications	
Maximum maintain or continuous exposure temperature (power on)	150°C
Maximum intermittent exposure temperature (power on)	215°C (20 bar saturated steam) Maximum cumulative exposure 1000 hours
Temperature classification	T2
Based on systems approach*	T3-T6 **Raychem KTV heat-tracing cables are approved for the listed temperature classifications by using the principles of stabilized design (as per system classification approach) or the use of a temperature limiting device. Use TraceCalc design software or contact Tyco Thermal Controls.*
Minimum installation temperature	–60°C
Minimum bend radius	at 20°C: 26 mm at –60°C: 51 mm

Thermal output rating

Nominal power output at 230 Vac on insulated steel pipes

A 20KTV2-CT
B 15KTV2-CT
C 8KTV2-CT
D 5KTV2-CT



	5KTV2-CT	8KTV2-CT	15KTV2-CT	20KTV2-CT
Nominal power output (W/m at 10°C)	16	25	47	65
Product dimensions (nominal) and weight				
Thickness (mm)	7.6	7.6	7.6	7.6
Width (mm)	13.3	13.3	13.3	13.3
Weight (g/m)	250	250	250	250

Maximum circuit length based on type 'C' circuit breakers according to EN 60898

Electrical protection sizing	Start-up temperature	Maximum heating cable length per circuit (m)			
16 A	–20°C	130	95	60	40
	+10°C	145	105	65	45
25 A	–20°C	205	150	90	65
	+10°C	230	165	100	75
32 A	–20°C	230	180	115	85
	+10°C	230	180	130	95
40 A	–20°C	230	180	130	105
	+10°C	230	180	130	110

The above numbers are for circuit length estimation only. For more detailed information please use the Tyco Thermal Controls TraceCalc software or contact your local Tyco Thermal Controls representative.

Tyco Thermal Controls requires the use of a 30 mA residual current device to provide maximum safety and protection from fire.

Where design results in higher leakage current, the preferred trip level for adjustable devices is 30 mA above any inherent capacitive leakage characteristic of the heater as specified by the trace heater supplier or alternatively, the next common available trip level for non adjustable devices, with a maximum of 300 mA. All safety aspects need to be proven.

Ordering details

Part description	5KTV2-CT	8KTV2-CT	15KTV2-CT	20KTV2-CT
Part No.	866752-000	196865-000	368748-000	790842-000

Components

Tyco Thermal Controls offers a full range of components for power connections, splices and end seals.
These components must be used to ensure proper functioning of the product and compliance with electrical requirements.

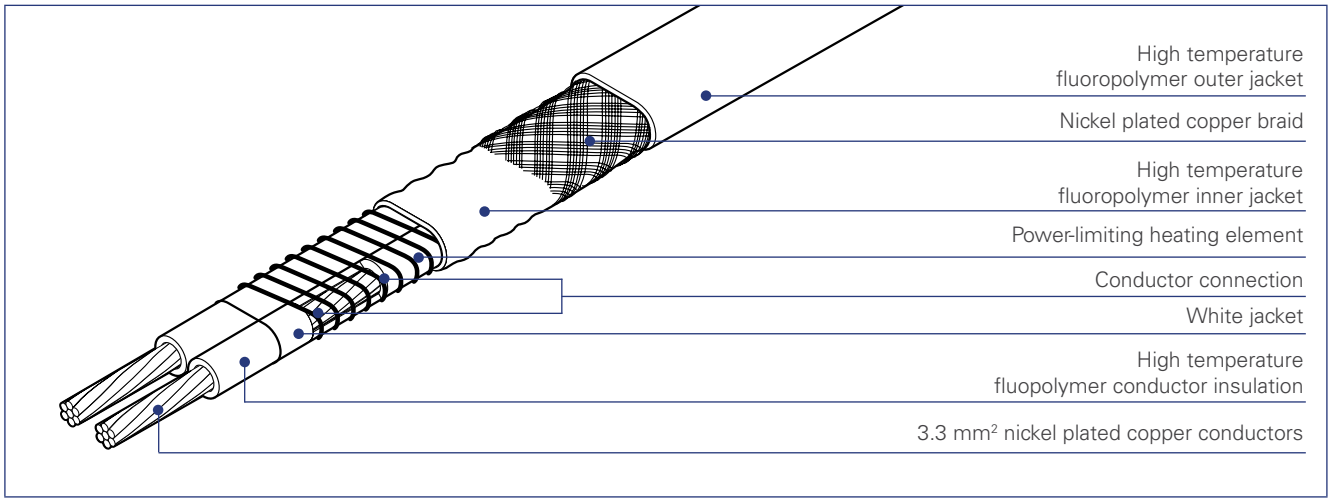
High-temperature power-limiting heating cable

VPL is a family of power limiting heating cables designed for pipe and equipment heat-tracing in industrial applications.

VPL can be used for frost protection and process temperature maintenance requiring high power output and/or high temperature exposure. VPL can provide process temperature maintenance up to 235°C (depending on cable type) and can withstand routine steam purges and temperature exposure to 260°C with power off.

Power-limiting cables are parallel heaters formed by a coiled resistor alloy heating element wrapped around two parallel conductors. The distance between conductor contact points forms the heating zone length. This parallel construction allows it to be cut-to-length and terminated on-site. The power output of VPL heating cables decreases with increasing temperature. VPL heating cables can be overlapped once. The relatively flat power temperature curve of VPL ensures a low start-up current and high output at elevated temperatures. VPL cables are approved for use in hazardous areas. Approvals are listed below.

Heating cable construction



Application

Area classification	Hazardous, Zone 1, Zone 2 (Gas), Zone 21, Zone 22 (Dust) Ordinary
Traced surface type	Carbon steel Stainless steel Painted or unpainted metal
Chemical resistance	Organics and corrosives For aggressive organics and corrosives consult your local Tyco Thermal Controls representative

Supply voltage

VPL2: 208-277 Vac
VPL4: 400-480 Vac

Approvals

The VPL heating cables are approved for use in hazardous areas by Baseefa Ltd.
Baseefa06ATEX0188X & IECExBAS06.0048X
Ex II 2GD & Exe II T* (see schedule) Ex tD A21 IP66
Ex e II T* (see schedule) Ex tD A21 IP66
**By design. Temperature classification (T-rating) has to be established by using the principles of stabilized design or the use of a temperature limiting device. Use TraceCalc design software or contact Tyco Thermal Controls.*

The VPL heating cables are approved by DNV for use on ships and mobile off-shore units.
DNV Certificate No. E-11181

The products also have the required approvals for use in Kazakhstan, Russia and many other countries. Contact your local Tyco Thermal Controls representative for more details.

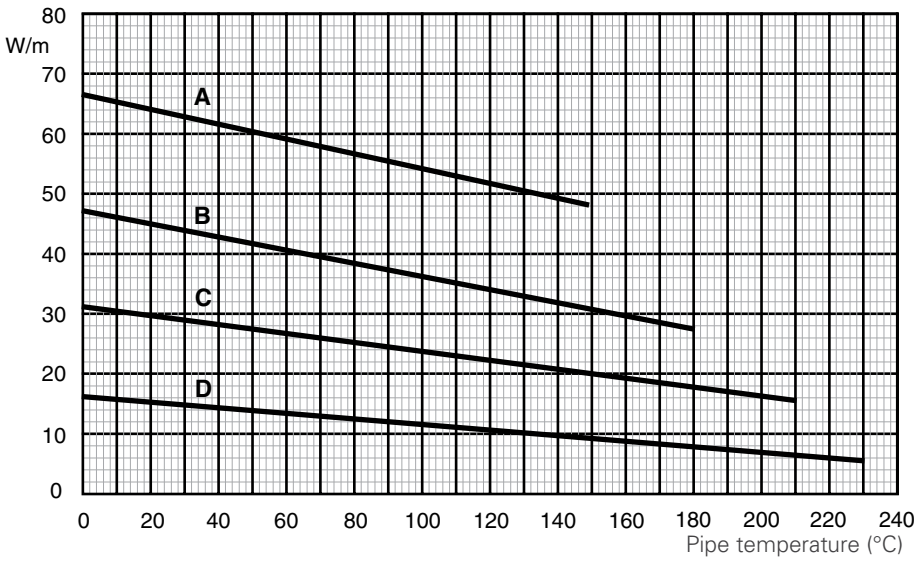
Specifications

	Cable	208 V	230 V	254 V	277 V	400 V	480 V
Maximum maintain or continuous exposure temperature (power on)	5VPL2-CT	235°C	230°C	225°C	225°C	–	–
	10VPL2-CT	220°C	210°C	200°C	195°C	–	–
	15VPL2-CT	200°C	180°C	145°C	105°C	–	–
	20VPL2-CT	150°C	150°C	–	–	–	–
	5VPL4-CT	–	–	–	–	230°C	230°C
	10VPL4-CT	–	–	–	–	215°C	205°C
	15VPL4-CT	–	–	–	–	195°C	160°C
	20VPL4-CT	–	–	–	–	150°C	150°C
Maximum intermittent exposure temperature (power off)	260°C						
Temperature classification	To be established using the principles of stabilized design or the use of a temperature limiting device. Use TraceCalc design software or contact Tyco Thermal Controls for assistance.						
Minimum installation temperature	–60°C						
Minimum bend radius	at –60°C: 20 mm | at +20°C: 20 mm						

Thermal output rating

Nominal power output rating on insulated steel pipes at 240 V and 480 V (power output of VPL4 at 400 V will be lower)

A 20VPL-CT
B 15VPL-CT
C 10VPL-CT
D 5VPL-CT



To choose the correct heating cable for application use the TraceCalc design software.

Adjustment Factors

		5VPL2-CT	10VPL2-CT	15VPL2-CT	20VPL2-CT
254 V	Power output	1.20	1.19	1.19	Not allowed
	Circuit length	1.05	1.04	1.04	Not allowed
277 V	Power output	1.30	1.28	1.26	Not allowed
	Circuit length	1.13	1.11	1.09	Not allowed
		5VPL4-CT	10VPL4-CT	15VPL4-CT	20VPL4-CT
400 V	Power output	0.72	0.73	0.74	0.75
	Circuit length	0.86	0.87	0.89	0.90

Nominal power output (W/m at 10°C)	5VPLx-CT	10VPLx-CT	15VPLx-CT	20VPLx-CT
VPL2 at 230 V	15	30	45	61
VPL2 at 240 V/VPL4 at 480 V	16	33	49	65
VPL4 at 400 V	12	24	36	49

Product dimensions (nominal) and weight

Thickness (mm)	7.9	7.9	7.9	7.9
Width (mm)	11.7	11.7	11.7	11.7
Nominal cold lead/ heating zone length (m)	1.2 (VPL2) 2.4 (VPL4)	0.9 (VPL2) 1.7 (VPL4)	0.6 (VPL2) 1.3 (VPL4)	0.5 (VPL2) 1.1 (VPL4)
Weight (g/m)	200	200	200	200

Maximum circuit length based on type 'C' circuit breakers according to EN 60898

VPL2 at 230 V		5VPL2-CT	10VPL2-CT	15VPL2-CT	20VPL2-CT
Electrical protection sizing	**Start-up temperature**	**Maximum heating cable length per circuit (m) at 230 Vac**			
16 A	–20°C	195	100	70	50
	+10°C	215	110	75	55
25 A	–20°C	220*	155*	105	80
	+10°C	220*	155*	115	85
32 A	–20°C	220*	155*	130*	100
	+10°C	220*	155*	130*	110*
40 A	–20°C	220*	155*	130*	110*
	+10°C	220*	155*	130*	110*

VPL4 at 480 V and 400 V		5VPL4-CT	10VPL4-CT	15VPL4-CT	20VPL4-CT
Electrical protection sizing	**Start-up temperature**	**Maximum heating cable length per circuit (m) at 480 Vac and (at 400 Vac)**			
16 A	–20°C	390 (335)	195 (170)	130 (115)	100 (90)
	+10°C	425 (365)	210 (185)	140 (125)	105 (95)
25 A	–20°C	450* (450)	310 (265)	205 (185)	155 (140)
	+10°C	450* (450)	320* (290)	220 (195)	165 (150)
32 A	–20°C	450* (450)	320* (320)	260* (235)	200 (180)
	+10°C	450* (450)	320* (320)	260* (250)	210 (190)
40 A	–20°C	450* (450)	320* (320)	260* (260)	225* (225)
	+10°C	450* (450)	320* (320)	260* (260)	225* (225)

** The maximum heating cable length must not exceed these values, even when voltage adjustment factors are used.*

The above numbers are for circuit length estimation only. For more detailed information please use the Tyco Thermal Controls TraceCalc software or contact your local Tyco Thermal Controls representative.

Tyco Thermal Controls requires the use of a 30 mA residual current device to provide maximum safety and protection from fire.

Where design results in higher leakage current, the preferred trip level for adjustable devices is 30 mA above any inherent capacitive leakage characteristic of the heater as specified by the trace heater supplier or alternatively, the next common available trip level for non adjustable devices, with a maximum of 300 mA. All safety aspects need to be proven.

Ordering details

Part description	5VPL2-CT	10VPL2-CT	15VPL2-CT	20VPL2-CT
Part No.	451828-000	892652-000	068380-000	589252-000
Part description	5VPL4-CT	10VPL4-CT	15VPL4-CT	20VPL4-CT
Part No.	P000000678	P000000679	P000000680	P000000681

Components

Tyco Thermal Controls offers a full range of components for power connections, splices and end seals.

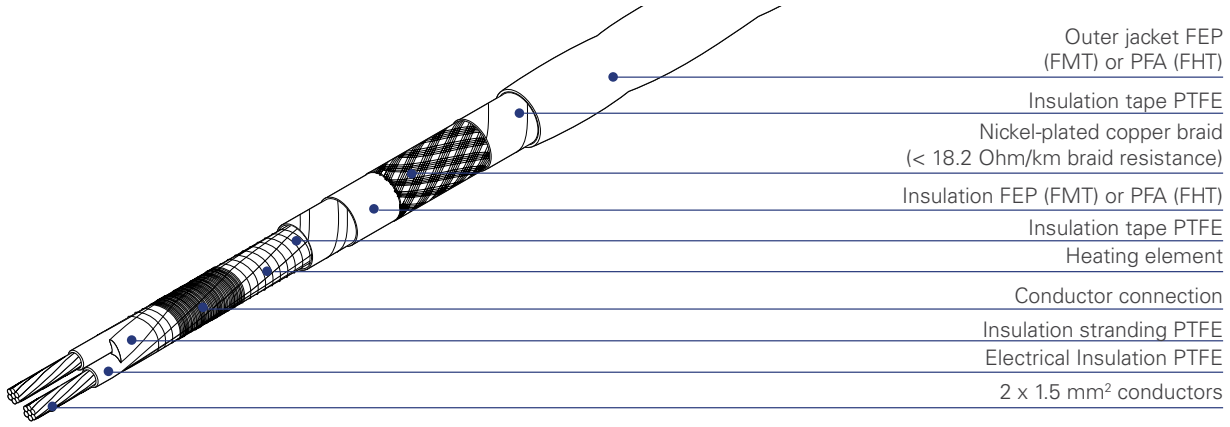
These components must be used to ensure proper functioning of the product and compliance with electrical requirements.

Constant wattage parallel circuit heating cable

FMT and FHT are constant wattage parallel circuit heating cables designed for pipe and equipment heat-tracing in industrial applications. This family offers an economical alternative to our self-regulating heating cables but requires more skill for installation and also requires more advanced control and monitoring systems. Its unique round geometry provides excellent flexibility during installation as it allows for bending in every direction. The heating element which is the most fragile part of any constant wattage parallel circuit heating cable is protected by a PTFE insulation tape that eliminates shear stresses during flexing and also acts as a shock absorber, thereby providing a high level of protection. The heating cables can be used for frost protection and process temperature maintenance requiring high power output. The heating cables are zone parallel heaters constructed from a heating element wrapped around two parallel conductors. The distance between conductor contact points forms the heating zone length. The parallel construction allows it to be cut-to-length and terminated in the field. FMT heating cables can withstand routine steam purges and temperature exposure to 200°C power off. They can be used to maintain temperatures up to 150°C (depending on cable type) and are only available in a 230 Vac version.

FHT heating cables can withstand routine steam purges and temperature exposure to 260°C power off. They can be used to maintain temperatures up to 230°C (depending on cable type) and are available for 230 Vac and 400 Vac supplies. The 400 Vac version offers a further advantage of long circuit lengths reducing the cost of the electrical installation.

Heating cable construction



Application

Area classification	Hazardous, Zone 1, Zone 2 (Gas), Zone 21, Zone 22 (Dust) Ordinary
Traced surface type	Carbon steel Stainless steel Painted or unpainted metal
Chemical resistance	Organics and corrosives For aggressive organics and corrosives consult your local Tyco Thermal Controls representative

Approvals

The FMT and FHT heating cables are approved for use in hazardous areas by Baseefa Ltd.
Baseefa08ATEX0050X & IECEx BAS 08.0019X
Ⓔx II 2GD Ex e II T* (See Schedule) Ex tD A21 IP66
Ex e II T* (See Schedule) Ex tD A21 IP66

**By design. Temperature classification (T-rating) has to be established by using the principles of stabilised design or the use of a temperature limiting device. Use TraceCalc design software or contact Tyco Thermal Controls.*

This product also has all required approvals for use in Kazachstan, Russia and other countries. Contact your local Tyco Thermal Controls representative for more details.

Specifications

	FMT2	FHT2	FHT4
Supply voltage	190 - 277 Vac	190 - 277 Vac	385 - 415 Vac
Maximum intermittent exposure temperature (power off)	200°C	260°C	260°C
Cold lead/heating zone length	1.5 m	1.5 m	2.5 m
Minimum installation temperature	–40°C	–60°C	–60°C
Size	Ø 7.5 mm	Ø 7.5 mm	Ø 7.5 mm
Minimum bend radius	25 mm	25 mm	25 mm
Minimum clearance	50 mm	50 mm	50 mm
Colour	White	Green	Violet

Maximum circuit lengths table in meters

Maximum circuit length based on 16 A type 'C' circuit breakers according to EN 60898.The use of larger circuit breaker sizes (up to 40 A) is permitted provided that the lengths of individual continuous lengths do not exceed the numbers below.

Voltage/Heating cable	10FxT2	20FxT2	30FxT2	40FHT2	10FHT4	20FHT4	30FHT4
230 Vac	200	150	120	85	-	-	-
400 Vac	-	-	-	-	330	235	190

The above numbers are for circuit length estimation only. For more detailed information please use the Tyco Thermal Controls' TraceCalc software or contact your local Tyco Thermal Controls representative.

Tyco Thermal Controls requires the use of a 30 mA residual current device to provide maximum safety and protection from fire.

Where design results in higher leakage current, the preferred trip level for adjustable devices is 30 mA above any inherent capacitive leakage characteristic of the heater as specified by the trace heater supplier or alternatively, the next common available trip level for non adjustable devices, with a maximum of 300 mA. All safety aspects need to be proven.

Hazardous area design tables

(for other voltages or non-hazardous areas use TraceCalc Pro or contact Tyco Thermal Controls representative)

The shaded temperature values listed in the table below represent the maximum design surface temperature permitted for a work piece for temperature classification T6, T5, T4, T3 and 260°C (FHT only).
Minimum clearance: 50 mm

				Temperature classification				
Heating Cable	Voltage (Vac)	Nominal Power output (W/m)	Max.Power Output (W/m)	T6 (85°C)	T5 (100°C)	T4 (135°C)	T3 (200°C)	T2 (260°C)
10FxT2-CT	230	10	12.7	8°C	26°C	69°C	147°C	225°C
20FxT2-CT	230	20	25.5	-	-	19°C	109°C	200°C
30FxT2-CT	230	30	38.2	-	-	-	65°C	169°C
40FHT2-CT	230	40	51.0	-	-	-	8°C	131°C
10FHT4-CT	400	10	12.7	30°C	48°C	90°C	169°C	247°C
20FHT4-CT	400	20	25.5	-	-	30°C	121°C	212°C
30FHT4-CT	400	30	38.2	-	-	-	95°C	195°C

Voltage adjustment factors

	230 Vac	254 Vac	277 Vac	385 Vac	400 Vac	415 Vac
FxT2-CT						
Circuit length	1.00	1.00	1.00	-	-	-
Power output	1.00	1.22	1.45	-	-	-
FHT4-CT						
Circuit length	-	-	-	1.00	1.00	1.00
Power output	-	-	-	0.93	1.00	1.08

Ordering details

Part description & Part No.	Part description & Part No.	Part description & Part No.
10FMT2-CT: 1244-006057	10FHT2-CT: 1244-006060	10FHT4-CT: 1244-006064
20FMT2-CT: 1244-006058	20FHT2-CT: 1244-006061	20FHT4-CT: 1244-006065
30FMT2-CT: 1244-006059	30FHT2-CT: 1244-006062	30FHT4-CT: 1244-006066
	40FHT2-CT: 1244-006063	

XPI-NH

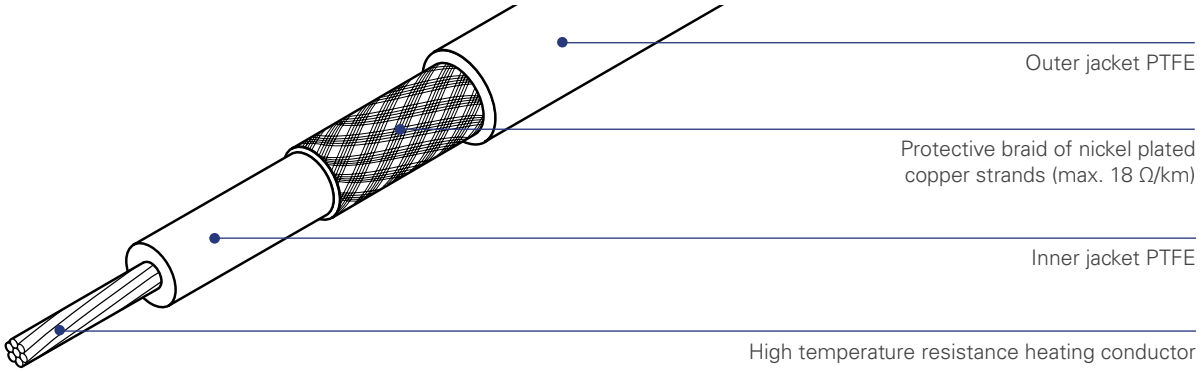
Polymer insulated (PI) series resistance heating cable for use in non-hazardous areas

XPI-NH is a polymer insulated (PI) series heating cable, for use in non-hazardous areas. It has been designed for use in freeze protection and temperature maintenance applications of pipes, tanks and other equipment. XPI-NH offers an economical solution for a wide variety of heat-tracing applications in non-hazardous areas, in particular for pipe lengths beyond the maximum circuit lengths of parallel heating cables.

The selection of PTFE for the inner and outer insulation makes XPI-NH a safe and reliable product. It provides highest chemical withstand and good mechanical strength, in particular at elevated temperatures.

XPI-NH heating cables can be used for temperatures up to 260°C. The heating cable is easy to install and has printed meter-marks. Tyco Thermal Controls offers XPI-NH heating cables in a very wide range of resistances, starting from 0.8 Ω/km up to 8000 Ω/km as well as a complete range of components for connection and splicing of the cables.

Heating cable construction



Application	
Area classification	Ordinary areas
Chemical resistance	Organics and corrosives

Technical Data	
Max. exposure temperature	260°C (power off, continuous)
Min. installation temperature	–60°C
Min. bend radius	2.5 x cable diameter at –25°C 6 x cable diameter at –60°C
Min. clearance	20 mm between heating cables
Max. power output	25 W/m (typical value, depending on application)
Nominal voltage	Up to 300/500 Vac (U_0/U)

XPI-NH heating cable references					
Order Reference	**Nominal resistance [Ω/km @ 20°C]**	**Temp. coefficient [x 10^{-3}/ K]**	**Outer diameter [mm nom.]**	**Nom. weight [kg/km]**	**Part Number PN**
XPI-NH-0.8	0.8	4.3	11.5	388	1244-003083
XPI-NH-1.1	1.1	4.3	9.7	284	1244-003084
XPI-NH-1.8	1.8	4.3	8.2	196	1244-003085
XPI-NH-2.9	2.9	4.3	6.5	127	1244-003086
XPI-NH-4.4	4.4	4.3	5.5	89	1244-003087
XPI-NH-7	7.0	4.3	4.9	65	1244-003088
XPI-NH-10	10.0	4.3	4.4	52	1244-003089
XPI-NH-11.7	11.7	4.3	4.2	48	1244-003090
XPI-NH-15	15.0	4.3	4.1	44	1244-003091
XPI-NH-17.8	17.8	4.3	3.9	42	1244-003092
XPI-NH-25	25.0	3.0	3.9	42	1244-003093
XPI-NH-31.5	31.5	1.3	4.3	50	1244-003094
XPI-NH-50	50	1.3	3.9	42	1244-003095
XPI-NH-65	65	1.3	3.8	38	1244-003096
XPI-NH-80	80	0.7	4.1	44	1244-003097
XPI-NH-100	100	0.4	4.2	48	1244-003098
XPI-NH-150	150	0.4	3.9	42	1244-003099
XPI-NH-180	180	0.33	3.7	36	1244-003100
XPI-NH-200	200	0.40	3.8	38	1244-003101
XPI-NH-320	320	0.18	3.9	40	1244-003102
XPI-NH-380	380	0.18	3.8	38	1244-003103
XPI-NH-480	480	0.18	3.7	36	1244-003104
XPI-NH-600	600	0.18	3.5	34	1244-003105
XPI-NH-700	700	0.18	3.5	32	1244-003106
XPI-NH-810	810	0.04	3.6	35	1244-003107
XPI-NH-1000	1000	0.04	3.5	34	1244-003108
XPI-NH-1440	1440	0.04	3.4	31	1244-003109
XPI-NH-1750	1750	0.04	3.4	30	1244-003110
XPI-NH-2000	2000	0.35	3.6	34	1244-003111
XPI-NH-3000	3000	0.35	3.4	31	1244-003112
XPI-NH-4000	4000	0.35	3.4	30	1244-003113
XPI-NH-4400	4400	0.1	3.4	30	1244-003114
XPI-NH-5160	5160	0.1	3.4	30	1244-003115
XPI-NH-5600	5600	0.1	3.4	30	1244-003116
XPI-NH-7000	7000	0.1	3.4	30	1244-003117
XPI-NH-8000	8000	0.1	3.4	30	1244-003118

Resistance tolerance: +10/–5%

In particular for cables < 31.5 Ω/km the resistance of the conductor materials is a function of temperature and the change must be considered for design purposes.

Recommended cold lead cables for XPI-NH (cold lead cables from XPI-S can be used alternatively)						
Nom. cross section [mm]	**Current rating [A]**	**Outer diameter [mm nom.]**	**Nominal resistance [Ω/km @ 20°C]**	**Temperature coefficient [x 10^{-3} /K]**	**Order reference**	**Part number PN**
2.5	32	5.5	7.0	4.3	XPI-7	1244-000203
4	42	6.1	4.4	4.3	XPI-4.4	1244-000190
6	54	6.9	2.9	4.3	XPI-2.9	1244-000202
10	73	8.6	1.8	4.3	XPI-1.8	1244-000182
16	98	10.1	1.1	4.3	XPI-1.1	1244-000201
25	129	11.9	0.8	4.3	XPI-0.8	1244-000189

Notes: Delivery length depends on type of resistance and is limited by max. weight of 120 kg/spool, respectively 1000 m/run. To ensure practical and safe on-site handling, it is strongly recommended to limit spool lengths to 25 - 30 kg. Not all resistances are standard items and as such may not be in stock. Contact Tyco Thermal Controls to confirm lead time. Tyco Thermal Controls requires the use of a 30 mA residual current device to provide maximum safety and protection from fire.

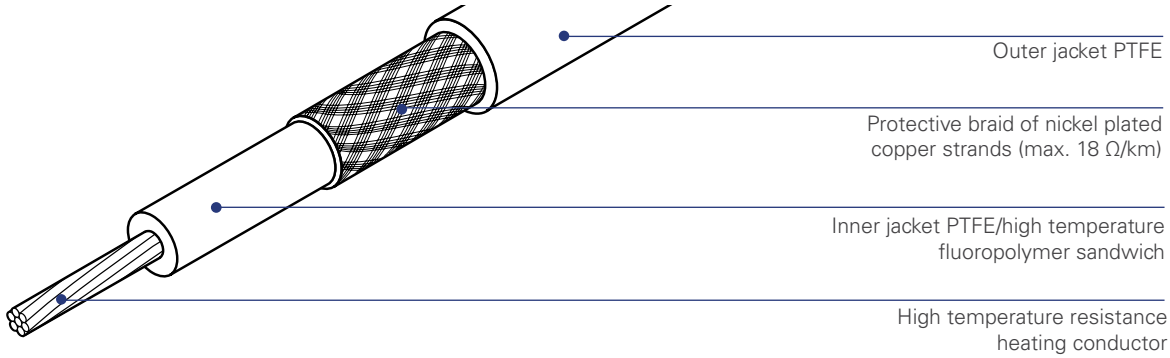
Where design results in higher leakage current, the preferred trip level for adjustable devices is 30 mA above any inherent capacitive leakage characteristic of the heater as specified by the trace heater supplier or alternatively, the next common available trip level for non adjustable devices, with a maximum of 300 mA. All safety aspects need to be proven.

Polymer insulated (PI) series resistance heating cable

XPI is a polymer insulated (PI) series heating cable, suitable for use in hazardous areas. It has been designed for use in freeze protection and temperature maintenance applications of pipes, tanks and other equipment. XPI offers an economical solution for a wide variety of heat-tracing applications, in particular for pipe lengths beyond the maximum circuit lengths of parallel heating cables.

The inner insulation is a sandwich construction of high temperature fluoropolymer and PTFE, the outer insulation is made of PTFE. This unique construction is very easy to terminate, highly flexible and makes XPI a very safe and reliable product. It provides highest chemical withstand and excellent mechanical strength, in particular at elevated temperatures. XPI heating cables can be used for temperatures up to 260°C (continuous) and 300°C (intermittent short-term exposure). XPI is easy to install and has printed meter-marks. Tyco Thermal Controls offers XPI heating cables in a very wide range of resistances, starting from 0.8 Ω/km up to 8000 Ω/km as well as a complete range of components for connection and splicing of the cables.

Heating cable construction



Application	
Area classification	Hazardous area, Zone 1 or Zone 2 (Gas) or Zone 21 or Zone 22 (Dust) Ordinary area
Chemical resistance	Organic and inorganic corrosives
Approvals	
System (heating units)	PTB 08 ATEX 1102X Ⓔx II 2G/D Ex e II T2...T6 / Ex tD A21 IP65 T290...T80°C IECEx PTB 08.0051X Ex II 2G/D Ex e II T2...T6 / Ex tD A21 IP65 T290...T80°C
Bulk cable	PTB 08 ATEX 1088 U Ⓔx II 2G/D Ex e II / Ex tD A21 IECEx PTB 08.0049 U Ex II 2G/D Ex e II / Ex tD A21 Temperature classification (T-rating) has to be established by using the principles of stabilised design or the use of a temperature limiting device. Use TraceCalc design software or contact Tyco Thermal Controls. This product also has all required approvals for use in Kazachstan, Russia and other countries. Contact your local Tyco Thermal Controls representative for more details.
Technical Data	
Max. exposure temperature	260°C (power off, continuous), 300°C (power off, intermittent for max 1000 h)
Min. installation temperature	–70°C
Min. bending radius at –70°C	2.5 x cable diameter for cable diameter ≤ 6 mm 6 x cable diameter for cable diameter > 6 mm
Max. power output	35 W/m (typical value, depending on application)
Nominal voltage	Up to 450/750 Vac (U0/U)
Min. impact resistance	4 Joule (as per EN 60079-30-1)
Min. clearance	20 mm between heating cables

XPI heating cable references					
Order Reference	**Nominal resistance [Ω/km @ 20°C]**	**Temp. coefficient [x 10-3/ K]**	**Outer diameter [mm nom.]**	**Nom. weight [kg/km]**	**Part Number PN**
XPI-0.8	0.8	4.3	11.9	404	1244-000189
XPI-1.1	1.1	4.3	10.1	306	1244-000201
XPI-1.8	1.8	4.3	8.6	208	1244-000182
XPI-2.9	2.9	4.3	6.9	143	1244-000202
XPI-4.4	4.4	4.3	6.1	112	1244-000190
XPI-7	7.0	4.3	5.5	83	1244-000203
XPI-10	10.0	4.3	5.4	76	1244-000204
XPI-11.7	11.7	4.3	5.2	65	1244-000183
XPI-15	15.0	4.3	5.1	61	1244-000191
XPI-17.8	17.8	4.3	4.9	57	1244-000178
XPI-25	25.0	3.0	4.9	57	1244-000192
XPI-31.5	31.5	1.3	5.3	67	1244-000205
XPI-50	50	1.3	4.9	57	1244-000184
XPI-65	65	1.3	4.8	53	1244-000206
XPI-80	80	0.7	5.1	61	1244-000193
XPI-100	100	0.4	5.2	67	1244-000207
XPI-150	150	0.4	4.9	57	1244-000185
XPI-180	180	0.33	4.7	51	1244-000194
XPI-200	200	0.40	4.8	53	1244-000195
XPI-320	320	0.18	4.9	56	1244-000653
XPI-380	380	0.18	4.8	53	1244-000180
XPI-480	480	0.18	4.7	51	1244-000208
XPI-600	600	0.18	4.5	48	1244-000196
XPI-700	700	0.18	4.5	46	1244-000186
XPI-810	810	0.04	4.6	50	1244-000209
XPI-1000	1000	0.04	4.5	48	1244-000197
XPI-1440	1440	0.04	4.4	45	1244-000211
XPI-1750	1750	0.04	4.3	43	1244-000198
XPI-2000	2000	0.35	4.6	49	1244-000187
XPI-3000	3000	0.35	4.4	45	1244-000212
XPI-4000	4000	0.35	4.2	42	1244-000199
XPI-4400	4400	0.1	4.3	43	1244-000181
XPI-5160	5160	0.1	4.3	42	1244-000654
XPI-5600	5600	0.1	4.2	41	1244-000188
XPI-7000	7000	0.1	4.2	40	1244-000213
XPI-8000	8000	0.1	4.1	40	1244-000200

Resistance tolerance: +10/–5%. In particular for cables < 31.5 Ω/km the resistance of the conductor materials is a function of temperature and the change must be considered for design purposes.

Recommended cold lead cables for XPI (cold lead cables from XPI-S can be used alternatively)						
Nom. cross section [mm²]	**Current rating [A]**	**Outer diameter [mm nom.]**	**Nominal resistance [Ω/km @ 20°C]**	**Temperature coefficient [x 10-3 /K]**	**Order reference**	**Part number PN**
2.5	32	5.5	7.0	4.3	XPI-7	1244-000203
4	42	6.1	4.4	4.3	XPI-4.4	1244-000190
6	54	6.9	2.9	4.3	XPI-2.9	1244-000202
10	73	8.6	1.8	4.3	XPI-1.8	1244-000182
16	98	10.1	1.1	4.3	XPI-1.1	1244-000201
25	129	11.9	0.8	4.3	XPI-0.8	1244-000189

Notes: Delivery length depends on type of resistance and is limited by max. weight of 120 kg/spool, respectively 1000 m/run. To ensure practical and safe on-site handling, it is strongly recommended to limit spool lengths to 25 - 30 kg.Not all resistances are standard items and as such may not be in stock. Contact Tyco Thermal Controls to confirm lead time. Tyco Thermal Controls requires the use of a 30 mA residual current device to provide maximum safety and protection from fire.

Where design results in higher leakage current, the preferred trip level for adjustable devices is 30 mA above any inherent capacitive leakage characteristic of the heater as specified by the trace heater supplier or alternatively, the next common available trip level for non adjustable devices, with a maximum of 300 mA. All safety aspects need to be proven.

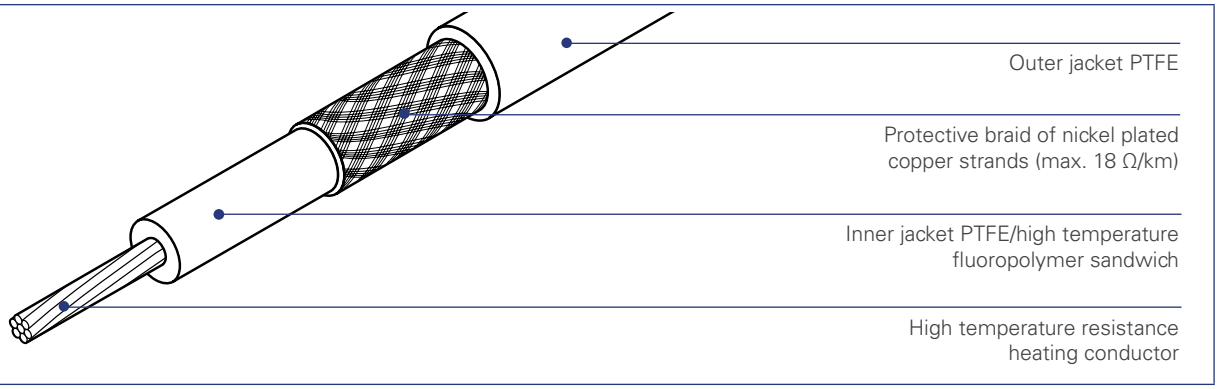
Polymer insulated (PI) series resistance heating cable

XPI-S is a polymer insulated (PI) series heating cable, suitable for use in hazardous areas. It has been designed for use in freeze protection and temperature maintenance applications of pipes, tanks and other equipment. XPI-S is a re-enforced version of XPI, particularly suitable for areas with high demands on mechanical abuse of the heating cable. XPI-S offers an economical solution for a wide variety of heat-tracing applications, in particular for pipe lengths beyond the maximum circuit lengths of parallel heating cables (e.g. 250 m).

The inner insulation is a sandwich construction of high temperature fluoropolymer and PTFE, the outer insulation is made of PTFE. This unique construction is very easy to terminate, highly flexible and makes XPI a very safe and reliable product. It provides highest chemical withstand and most excellent mechanical strength, in particular at elevated temperatures.

XPI-S heating cables can be used for temperatures up to 260°C (continuous) and 300°C (intermittent short-term exposure). XPI-S is easy to install and has printed meter-marks. Tyco Thermal Controls offers XPI-S heating cables in a very wide range of resistances, starting from 0.8 Ω/km up to 8000 Ω/km as well as a complete range of components for connection and splicing of the cables.

Heating cable construction



Approvals

System (heating units)	System (heating units) PTB 08 ATEX 1102X Ⓔx II 2G/D Ex e II T2...T6 / Ex tD A21 IP65 T290...T80°C IECEx PTB 08.0051X Ex II 2G/D Ex e II T2...T6 / Ex tD A21 IP65 T290...T80°C
Bulk cable	PTB 08 ATEX 1088 U Ⓔx II 2G/D Ex e II / Ex tD A21 IECEx PTB 08.0049 U Ex II 2G/D Ex e II / Ex tD A21 Temperature classification (T-rating) has to be established by using the principles of stabilised design or the use of a temperature limiting device. Use TraceCalc design software or contact Tyco Thermal Controls. This product also has all required approvals for use in Kazachstan, Russia and other countries. Contact your local Tyco Thermal Controls representative for more details.

Application

Area classification	Hazardous area, Zone 1 or Zone 2 (Gas) or Zone 21 or Zone 22 (Dust) Ordinary area
Chemical resistance	Organic and inorganic corrosives

Technical Data

Max. exposure temperature	260°C (power of, continuous), 300°C (power off, intermittent for max 1000 h)
Min. installation temperature	–70°C
Min. bending radius at –70°C	2.5 x cable diameter for cable diameter ≤ 6 mm 6 x cable diameter for cable diameter > 6 mm
Max. power output	35 W/m (typical value, depending on application)
Nominal voltage	Up to 450/750 Vac (U_0/U)
Min. impact resistance	7 Joule (as per EN 60079-30-1)
Min. clearance	20 mm between heating cables

XPI-S heating cable references					
Order Reference	**Nominal resistance [Ω/km @ 20°C]**	**Temp. coefficient [x 10^{-3}/ K]**	**Outer diameter [mm nom.]**	**Nom. weight [kg/km]**	**Part Number PN**
XPI-S-0.8	0.8	4.3	11.9	405	1244-003047
XPI-S-1.1	1.1	4.3	10.1	307	1244-003048
XPI-S-1.8	1.8	4.3	8.6	209	1244-003049
XPI-S-2.9	2.9	4.3	7.1	149	1244-003050
XPI-S-4.4	4.4	4.3	6.5	116	1244-003051
XPI-S-7	7.0	4.3	5.9	88	1244-003052
XPI-S-10	10.0	4.3	5.8	84	1244-003053
XPI-S-11.7	11.7	4.3	5.6	76	1244-003054
XPI-S-15	15.0	4.3	5.5	71	1244-003055
XPI-S-17.8	17.8	4.3	5.3	68	1244-003056
XPI-S-25	25.0	3.0	5.5	72	1244-003057
XPI-S-31.5	31.5	1.3	5.9	82	1244-003058
XPI-S-50	50	1.3	5.5	72	1244-003059
XPI-S-65	65	1.3	5.4	66	1244-003060
XPI-S-80	80	0.7	5.7	75	1244-003061
XPI-S-100	100	0.4	5.8	79	1244-003062
XPI-S-150	150	0.4	5.8	78	1244-003063
XPI-S-180	180	0.33	5.6	71	1244-003064
XPI-S-200	200	0.40	5.7	72	1244-003065
XPI-S-320	320	0.18	5.8	76	1244-003066
XPI-S-380	380	0.18	5.7	73	1244-003067
XPI-S-480	480	0.18	5.6	70	1244-003068
XPI-S-600	600	0.18	5.4	67	1244-003069
XPI-S-700	700	0.18	5.4	65	1244-003070
XPI-S-810	810	0.04	5.5	69	1244-003071
XPI-S-1000	1000	0.04	5.4	67	1244-003072
XPI-S-1440	1440	0.04	5.6	69	1244-003073
XPI-S-1750	1750	0.04	5.5	67	1244-003074
XPI-S-2000	2000	0.35	5.8	74	1244-003075
XPI-S-3000	3000	0.35	5.6	69	1244-003076
XPI-S-4000	4000	0.35	5.4	65	1244-003077
XPI-S-4400	4400	0.1	5.5	66	1244-003078
XPI-S-5160	5160	0.1	5.5	66	1244-003079
XPI-S-5600	5600	0.1	5.4	63	1244-003080
XPI-S-7000	7000	0.1	5.4	61	1244-003081
XPI-S-8000	8000	0.1	5.3	60	1244-003082

Resistance tolerance: +10/–5%. In particular for cables < 31.5 Ω/km the resistance of the conductor materials is a function of temperature and the change must be considered for design purposes.

Recommended cold lead cables for XPI-S						
Nom. cross section [mm^2]	**Current rating [A]**	**Outer diameter [mm nom.]**	**Nominal resistance [Ω/km @ 20°C]**	**Temperature coefficient [x10^{-3}/K]**	**Order reference**	**Part number PN**
2.5	32	5.9	7.0	4.3	XPI-S-7	1244-003052
4	42	6.5	4.4	4.3	XPI-S-4.4	1244-z003051
6	54	7.1	2.9	4.3	XPI-S-2.9	1244-003050
10	73	8.6	1.8	4.3	XPI-S-1.8	1244-003049
16	98	10.1	1.1	4.3	XPI-S-1.1	1244-003048
25	129	11.9	0.8	4.3	XPI-S-0.8	1244-003047

Notes: Delivery length depends on type of resistance and is limited by max. weight of 120 kg/spool, respectively 1000 m/run. To ensure practical and safe on-site handling, it is strongly recommended to limit spool lengths to 25 - 30kg. Not all resistances are standard items and as such may not be in stock. Contact Tyco Thermal Controls to confirm lead time.

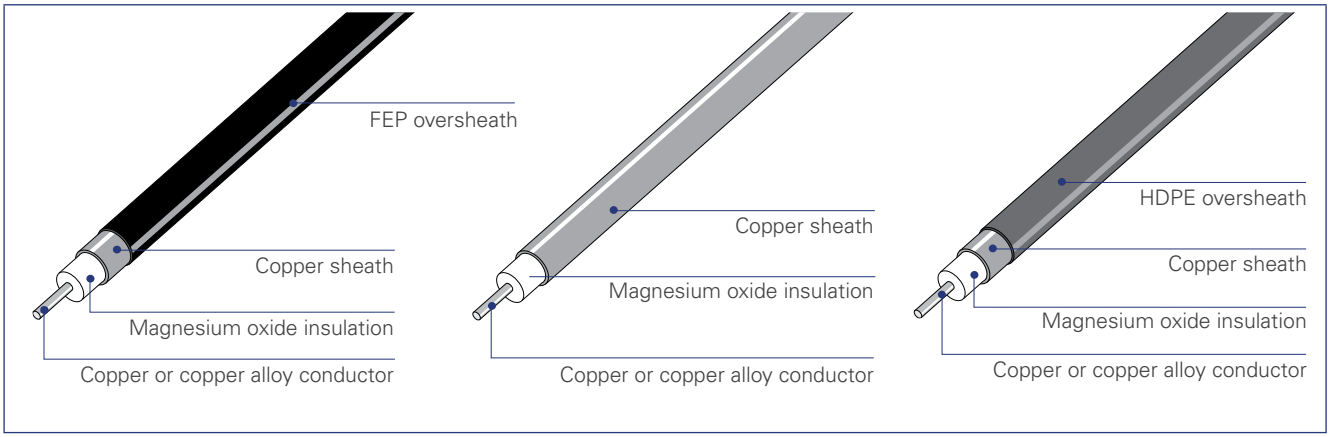
Tyco Thermal Controls requires the use of a 30 mA residual current device to provide maximum safety and protection from fire.

Where design results in higher leakage current, the preferred trip level for adjustable devices is 30 mA above any inherent capacitive leakage characteristic of the heater as specified by the trace heater supplier or alternatively, the next common available trip level for non adjustable devices, with a maximum of 300 mA. All safety aspects need to be proven.

Mineral insulated copper sheathed heating cable

Pyrotenax HCH/HCC mineral insulated (MI) Copper series heating cables are suited for use in hazardous areas. They are extensively used in a wide variety of industrial heat-tracing applications, such as long line heating or condensation prevention at low temperatures, and domestic applications, typically under floor or road and ramp heating applications. The copper heating cables with copper conductors (HCC) are available in very low resistances to allow for long line applications with a limited amount of supply points when the maximum operating sheath temperature does not exceed 200°C. The typical maximum power output goes up to 50 W/m. Optionally they are offered with an HDPE (High Density Polyethylene) over-sheath for enhanced corrosion protection up to 80°C, usually applied when buried in concrete. For temperatures in excess of 80°C, an FEP (Fluorinated Ethylene Propylene) over-sheath is available which can be used up to a maximum temperature of 200°C. The heating cables are offered as bulk cable as well as factory-terminated heating units to ensure optimum quality of the connections. The offering is completed with a full range of components for installation, connection and splicing of the heating cables.

Heating cable construction



Application

Area classification	Hazardous areas*, Zone 1 or Zone 2 (Gas) or Zone 21 or Zone 22 (Dust) Ordinary areas **cable types HCH1L2000 and HCH1L1250 can only be used in ordinary areas*

Approvals

System (heating units)	Baseefa02ATEX0046X Ⓔx II 2GD Ex e II T6 to T3 Ex tD A21 IP6X Actual T class temperature determined by design
Bulk cable	Baseefa02ATEX0045U Ⓔx II 2G Ex e II

Heating units are also approved for Dust environments. Temperature classification (T-rating) has to be established by using the principles of stabilised design or the use of a temperature limiting device. Use TraceCalc design software or contact Tyco Thermal Controls.

This product also has all required approvals for use in Kazakhstan, Russia and other countries. Contact your local Tyco Thermal Controls representative for more details.

Technical Data		
Cable sheath material	Copper	
Conductor material	Copper (HCC) or Copper Alloy (HCH)	
Max. exposure temperature	200°C**	
Min. installation temperature	–60°C	
Min. bending radius	6 x outer diameter at –60°C	
Max. supply voltage and power	Voltage (U_0/U)	Max. power output*
	300/500 Vac	50 W/m
		**typical value, depending on application*
Earth leakage	3 mA/100 m (nominal at 20°C, 230Vac, 50 - 60Hz)	
Min. cable spacing	25 mm for hazardous areas	

** **Note:** Cables available with optional additional oversheath for corrosion protection:

– HDPE (Max Sheath temp 80°C) – add H to ref. (ie. HCHH….)

– FEP (Max Sheath temp 200°C) – add P to ref. (ie. HCHP….)

For HDPE add 1.8 mm to cable OD. For FEP details available upon request.

MI series heating cables HCH/HCC

Order Reference	Nominal resistance (Ω/km @ 20°C)	Outer diameter (mm)	Temp. coefficient (x 10^{-3}/K)	Max. coil length [m]	Nom.weight (kg/km)
HCH1L2000(1)	2000	2.8	0.4	1200	31
HCH1L1250(1)	1250	2.8	0.4	1200	32
HCH1M800	800	3.5	0.4	900	50
HCH1M630	630	4.0	0.4	1100	65
HCH1M450	450	4.0	0.4	1000	67
HCH1M315	315	4.3	0.4	1000	77
HCH1M220	220	4.5	0.4	1000	85
HCH1M140	140	4.9	0.4	1000	102
HCH1M100	100	5.2	0.4	800	125
HCC1M63	63	3.2	3.9	2000	41
HCC1M40	40	3.4	3.9	2000	46
HCC1M25	25	3.7	3.9	1600	56
HCC1M17	17	4.6	3.9	500	85
HCC1M11	11	4.9	3.9	500	98
HCC1M7	7	5.3	3.9	400	118
HCC1M4	4	5.9	3.9	800	150
HCC1M2.87	2.87	6.4	3.9	650	170
HCC1M1.72	1.72	7.3	3.9	500	235
HCC1M1.08	1.08	8.3	3.9	400	326

Resistance tolerance: ±10%

(1) Not approved for hazardous areas, maximum 300 Vac.

Recommended cold leads for HCH/HCC MI series heating cables

Nom. cross section [mm²]	Order reference	Max. current (design B)	Outer diameter (mm)	Standard gland size
2.5	CC1H2.5	34	5.3	M20
6	CC1H6	57	6.4	M20
10	CC1H10	77	7.3	M25
16	CC1H16	102	8.3	M25
25	CC1H25	133	9.6	M32
35	CC1H35	163	10.7	M32

Brass glands are standard on all heating units. Other materials are possible, contact Tyco Thermal Controls for more information.

Delivery length of bulk cable on coil depends on type of resistance and is limited by max. coil length as indicated in the table on top. Factory terminated elements are limited by a max. weight of 50kg, however to ensure practical and safe on-site handling, it is strongly recommended to limit element lengths to 25 - 30kg. Not all resistances are standard items and as such may not be in stock. Contact Tyco Thermal controls to confirm lead time. Tyco Thermal Controls requires the use of a 30 mA residual current device to provide maximum safety and protection from fire.

Where design results in higher leakage current, the preferred trip level for adjustable devices is 30 mA above any inherent capacitive leakage characteristic of the heater as specified by the trace heater supplier or alternatively, the next common available trip level for non adjustable devices, with a maximum of 300 mA. All safety aspects need to be proven.

Also refer to the components section for more details on heating units, accessories and nomenclatures. Page 118.

Chemical resistance

Sheath Material	Maximum Cable Sheath Temp (°C)	Description	Sulphuric Acid	Hydro-chloric Acid	Hydro-fluoric Acid	Alkalis	Phosphoric Acid	Sea Water	Nitric Acid	Chloride	Organic Acid
Copper-DPE	80	Copper with high density polyethylene oversheath	GE	GE	A	A	A	NR	A	A	
Copper	200	Copper	NR	NR	A	A	NR	A	A	NR	X
Copper-FEP	200	Copper with fluorinated ethylene propylene oversheath	GE	GE	A	A	A	A	A	GE	GE

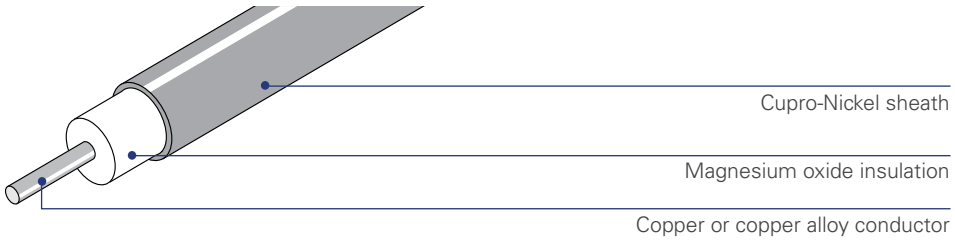
Note: NR Not recommended, A acceptable, GE Good to excellent, X Check for specific data.

Corrosion resistance data is dependent on temperature and concentration.

Mineral insulated copper sheathed heating cable

Pyrotenax HDC/HDF mineral insulated (MI) Cupro-Nickel series heating cables are suited for use in hazardous areas. They are extensively used for a wide variety of industries, such as oil and gas, chemical and petrochemical, power generation, gas storage and many other industrial applications. Cupro-Nickel heating cables with copper conductors (HDC) are available in very low resistances to allow for long line applications with a limited amount of supply points, in particular for applications exceeding the capabilities of Polymer Insulated (PI) series heating cables. The heating cables can be used for exposure temperatures up to 400°C and a typical power output up to 70 W/m. The heating cables are offered as bulk cable as well as factory-terminated heating units to ensure optimum quality of the connections. The offering is completed with a full range of components for installation, connection and splicing of the heating cables.

Heating cable construction



Application

Area classification	Hazardous areas, Zone 1 or Zone 2 (Gas) and Zone 21 or Zone 22 (Dust) Ordinary areas

Approvals

System (heating units)	Baseefa02ATEX0046X Ⓔx II 2GD Ex e II T6 to T1 Ex tD A21 IP6X Actual T class temperature determined by design
Bulk cable	Baseefa02ATEX0045U Ⓔx II 2G Ex e II

Heating units are also approved for Dust environments. Temperature classification (T-rating) has to be established by using the principles of stabilised design or the use of a temperature limiting device. Use TraceCalc design software or contact Tyco Thermal Controls.

This product also has all required approvals for use in Kazakhstan, Russia and other countries. Contact your local Tyco Thermal Controls representative for more details.

Technical Data

Cable sheath material	70/30 Cupro-Nickel
Conductor material	Copper (HDC) or Copper Alloy (HDF)
Max. exposure temperature	400°C
Min. installation temperature	–60°C
Min. bending radius	6 x outer diameter at –60°C
Max. supply voltage and power	Voltage (U_0/U) 300/500 Vac — Max. power output* 70 W/m ** typical value, depending on application*
Earth leakage	3 mA/100 m (nominal at 20°C, 230Vac, 50 - 60Hz)
Min. cable spacing	25 mm for hazardous areas

MI series heating cables HDF/HDC

Order Reference	Nominal resistance (Ω/km @ 20°C)	Outer diameter (mm)	Temp. coefficient (x 10-3/K)	Max. coil length [m]	Nom.weight (kg/km)
HDF1M1600	1600	3.2	0.04	625	40
HDF1M1000	1000	3.4	0.04	550	45
HDF1M630	630	3.7	0.04	465	55
HDF1M400	400	4.0	0.04	400	67
HDF1M250	250	4.4	0.04	330	84
HDF1M160	160	4.9	0.04	265	108
HDC1M63	63	3.2	3.9	620	39
HDC1M40	40	3.4	3.9	550	44
HDC1M25	25	3.7	3.9	440	55
HDC1M17	17	4.6	3.9	300	84
HDC1M11	11	4.9	3.9	265	98
HDC1M7	7	5.3	3.9	225	119
HDC1M4	4	5.9	3.9	180	155

Resistance tolerance: ±10%

Recommended cold leads for HDF/HDC MI series heating cables

Nom. cross section [mm²]	Order reference	Max. current (design B)	Outer diameter (mm)	Standard gland size
2.5	DC1H2.5	34	5.3	M20
6	DC1H6	57	6.4	M20
10	DC1H10	77	7.3	M25
16	DC1H16	102	8.3	M25

Brass glands are standard on all heating units. Other materials are possible, contact Tyco Thermal Controls for more information.

Delivery length of bulk cable on coil depends on type of resistance and is limited by max. coil length as indicated in the table on top. Factory terminated elements are limited by a max. weight of 50kg, however to ensure practical and safe on-site handling, it is strongly recommended to limit element lengths to 25 - 30kg. Not all resistances are standard items and as such may not be in stock. Contact Tyco Thermal controls to confirm lead time. Tyco Thermal Controls requires the use of a 30 mA residual current device to provide maximum safety and protection from fire.

Where design results in higher leakage current, the preferred trip level for adjustable devices is 30 mA above any inherent capacitive leakage characteristic of the heater as specified by the trace heater supplier or alternatively, the next common available trip level for non adjustable devices, with a maximum of 300 mA. All safety aspects need to be proven.

Also refer to the components section for more details on heating units, accessories and nomenclatures. Page 118.

Chemical resistance

Sheath Material	Maximum Cable Sheath Temp (°C)	Description	Sulphuric Acid	Hydrochloric Acid	Hydrofluoric Acid	Phosphoric Acid	Nitric Acid	Organic Acid	Alkalis	Sea Water	Chloride
Cupro-Nickel	400	Cupro-Nickel alloy 70% copper 30% nickel	NR	X	X	X	X	X	X	GE	GE

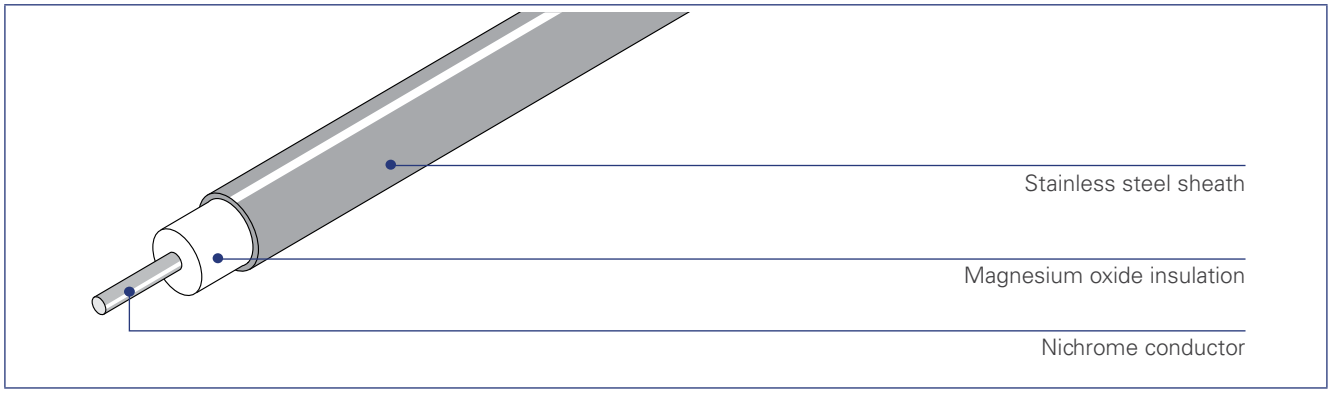
Note: NR Not recommended, A acceptable, GE Good to excellent, X Check for specific data

Corrosion resistance data is dependent on temperature and concentration.

Mineral insulated (MI) stainless steel sheathed heating cable

Pyrotenax HSQ mineral insulated (MI) Stainless steel series heating cables are suited for use in hazardous areas. The Stainless steel sheath offers excellent corrosive properties against a wide range of organic acids and alkalis in combination with a high temperature withstand capability. HSQ cables are typically used in bitumen plants, gas plants, oil refineries, reactors and vessels, sodium loops and a wide variety of other heat-tracing applications where temperature resistance, power output and durability are paramount. The heating cables can be used for exposure temperatures up to 700°C and a typical power output up to 150 W/m. Higher temperatures and power outputs can be achieved, contact Tyco Thermal Controls for assistance. The heating cables are offered as bulk cables as well as factory-terminated heating units employing brazing or laser welding techniques to ensure optimum quality of the connections. The offering is completed with a full range of components for installation, connection and splicing of the heating cables.

Heating cable construction



Application

Area classification	Hazardous areas, Zone 1 or Zone 2 (Gas) or Zone 21 or Zone 22 (Dust) Ordinary areas

Approvals

System (heating units)	Baseefa02ATEX0046X Ⓔx II 2GD Ex e II T6 to T1 Ex tD A21 IP6X Actual T class temperature determined by design
Bulk cable	Baseefa02ATEX0045U Ⓔx II 2G Ex e II

Heating units are also approved for Dust environments. Temperature classification (T-rating) has to be established by using the principles of stabilised design or the use of a temperature limiting device. Use TraceCalc design software or contact Tyco Thermal Controls.

This product also has all required approvals for use in Kazakhstan, Russia and other countries. Contact your local Tyco Thermal Controls representative for more details.

Technical Data		
Cable sheath material	321 Stainless steel	
Conductor material	Nichrome	
Max. exposure temperature	700°C* (heating cables) 450°C (brazed heating units) 700°C* (laser welded heating units) ** Higher temperatures can be realized, contact Tyco Thermal Controls*	
Min. installation temperature	–60°C	
Min. bending radius	6 x outer diameter at –60°C	
Max. supply voltage and power	Voltage (Uo/U) 300/500 Vac 460/800 Vac (laser welded heating units)	Max. power output* 150 W/m **typical value, depending on application*
Earth leakage	3 mA/100 m (nominal at 20°C, 230 Vac, 50 - 60 Hz)	
Min. cable spacing	25 mm for hazardous areas	

MI series heating cables HSQ

Order Reference	Nominal resistance (Ω/km @ 20°C)	Outer diameter (mm)	Temp. coefficient (x 10^{-3}/K)	Max. coil length [m]	Nom.weight (kg/km)
HSQ1M10K	10000	3.2	0.09	717	39
HSQ1M6300	6300	3.2	0.09	717	39
HSQ1M4000	4000	3.2	0.09	717	39
HSQ1M2500	2500	3.4	0.09	639	46
HSQ1M1600	1600	3.6	0.09	572	52
HSQ1M1000	1000	3.9	0.09	499	62
HSQ1M630	630	4.3	0.09	405	78
HSQ1M400	400	4.7	0.09	342	96
HSQ1M250	250	5.3	0.09	271	127
HSQ1M160	160	6.5	0.09	180	191

Resistance tolerance: ±10%

Recommended cold leads for HSQ MI series heating cables

Nom. cross section [mm²]	Order reference	Max. current (design B)	Outer diameter (mm)	Standard gland size
2.5	SC1H2.5	34	5.3	M20
6	SC1H6	57	6.4	M20

Brass glands are standard on all heating units. Other materials are possible, contact Tyco Thermal Controls for more information.

Delivery length of bulk cable on coil depends on type of resistance and is limited by max. coil length as indicated in the table on top. Factory terminated elements are limited by a max. weight of 50kg, however to ensure practical and safe on-site handling, it is strongly recommended to limit element lengths to 25 - 30kg. Not all resistances are standard items and as such may not be in stock. Contact Tyco Thermal controls to confirm lead time. Tyco Thermal Controls requires the use of a 30 mA residual current device to provide maximum safety and protection from fire.

Where design results in higher leakage current, the preferred trip level for adjustable devices is 30 mA above any inherent capacitive leakage characteristic of the heater as specified by the trace heater supplier or alternatively, the next common available trip level for non adjustable devices, with a maximum of 300 mA. All safety aspects need to be proven.

Also refer to the components section for more details on heating units, accessories and nomenclatures. Page 118.

Table 3 Chemical resistance

Sheath Material	Maximum Cable Sheath Temp (°C)	Description	Sulphuric Acid	Hydrochloric Acid	Hydrofluoric Acid	Phosphoric Acid	Nitric Acid	Organic Acid	Alkalis	Sea Water	Chloride
Stainless Steel 321 DIN 1.4541	600*	18/8 austenitic stainless steel with added titanium	NR	NR	NR	NR	X	GE	A	NR	NR

Note: NR Not recommended, A acceptable, GE Good to excellent, X Check for specific data
** Temperature limitation based on construction of heating element.*
Corrosion resistance data is dependent on temperature and concentration.

Mineral insulated (MI) Alloy 825 heating cable

Pyrotenax HAx mineral insulated (MI) Alloy 825 series heating cables are suitable for use in hazardous areas. They have been designed for use in freeze protection and temperature maintenance applications of pipes, tanks and other equipment.

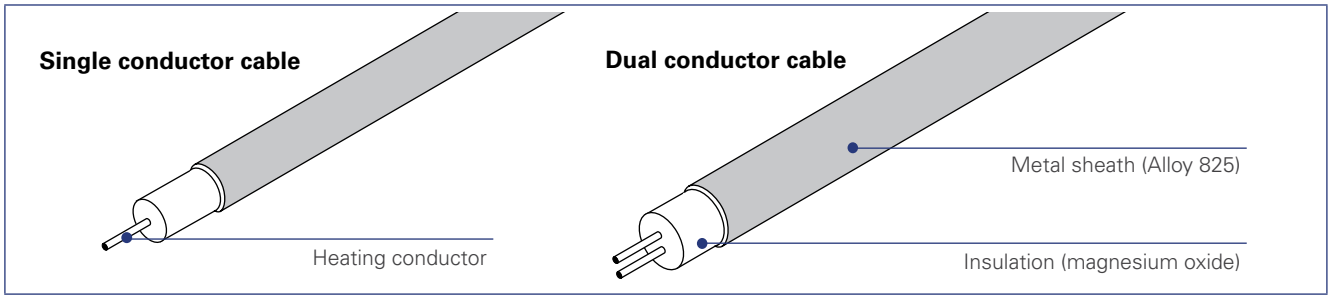
MI heating cables of the HAx-series offer an ideal combination of ruggedness, high temperature withstand capability and corrosion resistance and can therefore be used for a wide variety of heat-tracing applications, in particular for applications with high power requirements and for temperatures exceeding the capabilities of polymer insulated (PI) series heating cables.

The heating cables can be used for exposure temperatures of up to 700°C and a typical power output of up to 270 W/m. Higher temperatures and power outputs can be achieved, contact Tyco Thermal Controls for assistance.

HAx mineral insulated (MI) heating cables are available as single and dual conductor construction and in a very wide range of resistances. The use of dual conductor heating cables can significantly reduce total installed cost and simplifies installation, in particular for small pipes and instrument tubing.

The heating cables are offered as bulk cable as well as factory terminated heating units employing brazing and laser welding technology. The offering is completed with a full range of components for installation, connection and splicing of the heating cables.

Heating cable construction



Application	
Area classification	Hazardous area, Zone 1 or Zone 2 (Gas) or Zone 21 or zone 22 (Dust)
	Ordinary
Approvals	
System (heating units)	Baseefa02ATEX0046X Ⓔx II 2GD Ex e II T6 to T1 Ex tD A21 IP6X
Bulk cable	Baseefa02ATEX0045U Ⓔx II 2G Ex e II

Heating units are also approved for Dust environments. Temperature classification (T-rating) has to be established by using the principles of stabilised design or the use of a temperature limiting device. Use TraceCalc design software or contact Tyco Thermal Controls.

This product also has all required approvals for use in Kazachstan, Russia and other countries. Contact your local Tyco Thermal Controls representative for more details.

Technical Data			
Cable sheath material	Alloy 825		
Conductor material	Various alloys and copper		
Max. exposure temperature	700°C* (heating cable),		
	550°C (brazed heating units)		
	700°C* (laser welded heating units)		
	** Higher temperatures can be realized, contact Tyco Thermal Controls*		
Min. installation temperature	–60°C		
Min. bending radius	6 x OD (cable diameter) at –60°C		
Max. supply voltage and power	Voltage (U_0/U)	Max. power output*	Heating cable type
	600/600 Vac	210 W/m	HAx1N Single conductor cable, 600 V
	300/300 Vac	200 W/m	HAx2M Dual conductor cable, 300 V
	600/600 Vac	270 W/m	HAx2N Dual conductor cable, 600 V
		**typical value, depending on application*	
Earth leakage	3 mA /100 m (nominal at 20°C, 230 Vac, 50 - 60 Hz)		
Min. cable spacing	25 mm for hazardous areas		

Table 1 MI series heating cables HAx2M (Dual conductor cable, 300 V)

Order Reference	Nominal resistance (Ω/km @ 20°C)	Outer diameter (mm)	Temp. coefficient (x 10^{-3}/K)	Max. coil length [m]	Nom. weight (kg/km)	Part Number PN
HAF2M36K	36000	3.2	0.09	628	45.1	32SF1110
HAF2M29.5K	29500	3.6	0.09	542	52.2	32SF2900
HAF2M24.5K	24500	3.9	0.09	431	65.8	32SF2750
HAA2M19.7K	19700	3.4	0.09	632	49.3	32SA2600
HAA2M13.2K	13200	3.7	0.09	500	57.0	32SA2400
HAA2M9000	9000	3.7	0.09	501	57.9	32SA2275
HAA2M6600	6600	4.6	0.09	329	88.2	32SA2200
HAA2M5600	5600	4.5	0.09	384	75.9	32SA2170
HAB2M3750	3750	4.7	0.04	315	87.8	32SB2114
HAB2M2300	2300	4.1	0.04	419	71.4	32SB3700
HAQ2M1560	1560	4.7	0.5	317	85.6	32SQ3472
HAQ2M1240	1240	4.7	0.5	317	85.9	32SQ3374
HAQ2M965	965	4.7	0.5	314	87.4	32SQ3293
HAQ2M660	660	3.7	0.5	503	58.6	32SQ3200
HAQ2M495	495	4.1	0.5	419	71.3	32SQ3150
HAQ2M330	330	4.6	0.5	332	91.7	32SQ3100
HAP2M240	240	4.6	1.3	316	89.9	32SP4734
HAP2M190	190	4.7	1.3	317	91.2	32SP4583
HAP2M150	150	4.7	1.3	315	94.1	32SP4458
HAC2M105	105	4.6	3.9	315	87.5	32SC4324

Resistance tolerance: ±10%

Table 2 MI series heating cables HAx2N (Dual conductor cable, 600 V)

Order Reference	Nominal resistance (Ω/km @ 20°C)	Outer diameter (mm)	Temp. coefficient| (x 10^{-3}/K)	Max. coil length [m]	Nom. weight (kg/km)	Part Number PN
HAF2N36K	36000	5.2	0.09	229	119.1	62SF1110
HAF2N29.5K	29500	5.5	0.09	229	119.4	62SF2900
HAF2N19.7K	19700	5.5	0.09	230	119.9	62SF2600
HAA2N13.6K	13600	5.8	0.09	186	132.3	62SA2414
HAF2N6600	6600	6.3	0.09	177	158.8	62SF2200
HAT2N3750	3750	5.7	0.18	186	132.2	62ST2115
HAB2N2300	2300	6.8	0.04	151	186.9	62SB3700
HAQ2N1670	1670	5.7	0.5	194	127.2	62SQ3505
HAQ2N940	940	6.0	0.5	176	141.5	62SQ3286
HAQ2N660	660	6.3	0.5	177	157.7	62SQ3200
HAQ2N495	495	6.3	0.5	177	159.2	62SQ3150
HAQ2N330	330	6.7	0.5	152	189.4	62SQ3100
HAP2N255	255	6.4	1.3	151	166.1	62SP4775
HAP2N185	185	6.7	1.3	138	183.8	62SP4561
HAP2N130	130	7.1	1.3	124	206.4	62SP4402
HAP2N92	92	7.5	1.3	110	236.2	62SP4281
HAC2N66	66	7.5	3.9	131	217.4	62SC4200
HAC2N43	43	7.9	3.9	115	252.1	62SC4130
HAC2N27	27	8.7	3.9	98	297.2	62SC5818
HAC2N17	17	9.2	3.9	81	267.3	62SC5516
HAC2N10.5	10.5	10.2	3.9	67	468.0	62SC5324
HAC2N6.6	6.6	12.6	3.9	46	706.6	62SC5204
HAC2N4.3	4.3	13.8	3.9	143	837.1	62SC5128

Resistance tolerance: ±10%

Table 3 MI series heating cables HAx1N (Single conductor cable, 600 V)

Order Reference	Nominal resistance (Ω/km @ 20°C)	Outer diameter (mm)	Temp. coefficient (x 10-3/K)	Max. coil length [m]	Nom. weight (kg/km)	Part Number PN
HAA1N6565	6565	3.7	0.085	519	52.8	61SA2200
HAA1N5250	5250	4.1	0.085	436	67.3	61SA2160
HAA1N4300	4300	4.1	0.085	415	67.6	61SA2130
HAA1N3300	3300	4.0	0.085	416	68.0	61SA2100
HAA1N2800	2800	4.3	0.085	368	77.1	61SA3850
HAA1N2300	2300	4.1	0.085	417	69.1	61SA3700
HAA1N1640	1640	4.5	0.085	329	88.1	61SA3500
HAT1N920	920	4.6	0.18	317	87.1	61ST3280
HAB1N660	660	4.6	0.04	330	88.7	61SB3200
HAB1N500	500	4.6	0.04	331	90.6	61SB3150
HAQ1N390	390	4.7	0.5	317	86.5	61SQ3118
HAQ1N240	240	4.7	0.5	314	88.4	61SQ4732
HAQ1N190	190	4.6	0.5	315	89.1	61SQ4581
HAP1N155	155	4.7	1.3	317	87.1	61SP4467
HAP1N120	120	4.7	1.3	314	88.4	61SP4366
HAP1N95	95	4.7	1.3	315	89.1	61SP4290
HAP1N76	76	4.6	1.3	342	89.9	61SP4231
HAP1N60	60	4.7	1.3	316	91.1	61SP4183
HAP1N48	48	4.7	1.3	317	92.1	61SP4145
HAP1N37	37	4.7	1.3	335	96.0	61SP4113
HAC1N21.3	21.3	4.9	3.9	305	102.2	61SC5651
HAC1N13.5	13.5	5.1	3.9	294	107.3	61SC5409
HAC1N8.5	8.5	5.6	3.9	233	133.8	61SC5258
HAC1N5.3	5.3	6.9	3.9	158	214.6	61SC5162
HAC1N3.3	3.3	6.4	3.9	171	197.6	61SC5102
HAC1N2	2.0	8.1	3.9	115	311.0	61SC6640

Resistance tolerance: ±10%

Table 4 Recommended cold lead cables for HAx MI series heating cables

Nom. cross section [mm²]	Reference Single Conductor Cable	Reference Dual Conductor Cable	Max. Current Design B* (single cond.)	Max. Current Design D. E* (dual cond.)	Nominal Diameter Single cond. (mm)	Diameter Dual cond. (mm)
1.0	–	AC2H1.0	–	18	–	7.3
2.5	AC1H2.5	AC2H2.5	34	28	5.3	8.7
6.0	AC1H6	AC2H6	57	46	6.4	14.0
16	AC1H16	AC2H16	102	98	9.0	14.7
25	AC1H25	AC2H25	133	128	10	17.1

All cold lead cables can be used for up to 600 Vac and use copper conductors with a temperature coefficient of 3.9 x 10-3 1/K.

** For details on the different heating unit designs, refer to page 36.*

Delivery length of bulk cable on coil depends on type of resistance and is limited by max. coil length as indicated in the table on top. Factory terminated elements are limited by a max. weight of 50kg, however to ensure practical and safe on-site handling, it is strongly recommended to limit element lengths to 25 - 30kg. Not all resistances are standard items and as such may not be in stock. Contact Tyco Thermal controls to confirm lead time. Tyco Thermal Controls requires the use of a 30 mA residual current device to provide maximum safety and protection from fire.

Where design results in higher leakage current, the preferred trip level for adjustable devices is 30 mA above any inherent capacitive leakage characteristic of the heater as specified by the trace heater supplier or alternatively, the next common available trip level for non adjustable devices, with a maximum of 300 mA. All safety aspects need to be proven.

Table 5 Chemical resistance

Alloy	Maximum Cable Sheath Temp (°C)	Description	Nominal chemical composition, % (major elements)				High temperature resistance (+540°C)		Corrosion resistance										
			Nickel (+Cobalt)	Iron	Chromium	Other	Oxidation	Carburization	Sulfuric acid	Hydrochloric acid	Hydrofluoric acid	Phosphoric acid	Nitric acid	Organic acid	Alkalis	Salts	Seawater	Chloride cracking
INCOLOY Alloy 825 nickel-iron-chromium	550°C*	Excellent resistance to a wide variety of corrosives. Resists pitting and intergranular type corrosion, reducing acids and oxidizing chemicals	42.0	30.0	21.5	Mo 3.0 Cu 2.2	G-E	G-E	G-E	G-E	G-E	G-E	G-E	G-E	G-E	G-E	G-E	G-E

From Huntington Alloys Publication 78-348-2

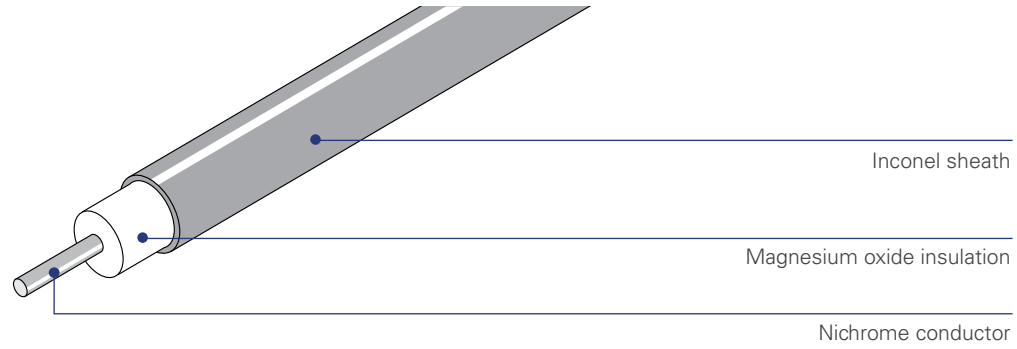
Note: NR Not recommended, A acceptable, GE Good to excellent, X Check for specific data

** Temperature limitation based on construction of heating element.*
Corrosion resistance data is dependent on temperature and concentration.

Mineral insulated (MI) stainless steel sheathed heating cable

Pyrotenax HIQ mineral insulated (MI) Inconel 600 series heating cables are suited for use in hazardous areas. The Inconel 600 sheath offers excellent corrosive properties against a wide range of organic acids and alkalis, as well as chloride stress-corrosion cracking, in combination with a high temperature withstand capability. HIQ cables are typically used in bitumen plants, gas plants, oil refineries, reactors and vessels, sodium loops and a wide variety of other heat-tracing applications where temperature resistance, power output and durability are required and exceed the limitations of stainless steel sheathed MI heating cables. The heating cables can be used for exposure temperatures up to 700°C and a typical power output up to 300 W/m. Higher temperatures and power outputs can be achieved, contact Tyco Thermal Controls for assistance. The heating cables are offered as bulk cables as well as factory-terminated heating units employing brazing or laser welding techniques to ensure optimum quality of the connections. The offering is completed with a full range of components for installation, connection and splicing of the heating cables.

Heating cable construction



Application

Area classification	Hazardous areas, Zone 1 or Zone 2 (Gas) or Zone 21 or zone 22 (Dust) Ordinary areas

Approvals

System (heating units)	Baseefa02ATEX0046X Ⓔx II 2GD Ex e II T6 to T1 Ex tD A21 IP6X Actual T class temperature determined by design
Bulk cable	Baseefa02ATEX0045U Ⓔx II 2G Ex e II Heating units are also approved for Dust environments. This product also has all required approvals for use in Kazakhstan, Russia and other countries. Contact your local Tyco Thermal Controls representative for more details.

Technical Data		
Cable sheath material	Inconel 600	
Conductor material	Nichrome	
Max. exposure temperature	700°C* (heating cables)	
	450°C (brazed heating units)	
	700°C* (laser welded heating units)	
	** Higher temperatures can be realized, contact Tyco Thermal Controls*	
=Min. installation temperature	–60°C	
Min. bending radius	6 x outer diameter at –60°C	
Max. supply voltage and power	Voltage (U_0/U)	Max. power output*
	300/500 Vac	300 W/m
	460/800 Vac (laser welded heating units)	** typical value, depending on application*
Earth leakage	3 mA/100 m (nominal at 20°C)	
Min. cable spacing	25 mm for hazardous areas	

MI series heating cables HIQ

Order Reference	Nominal resistance (Ω/km @ 20°C)	Outer diameter (mm)	Temp. coefficient (x 10^{-3}/K)	Max. coil length [m]	Nom.weight (kg/km)
HIQ1M10K	10000	3.2	0.09	772	39
HIQ1M6300	6300	3.2	0.09	774	39
HIQ1M4000	4000	3.2	0.09	776	39
HIQ1M2500	2500	3.4	0.09	689	46
HIQ1M1600	1600	3.6	0.09	617	52
HIQ1M1000	1000	3.9	0.09	528	62
HIQ1M630	630	4.3	0.09	437	78
HIQ1M400	400	4.7	0.09	368	96
HIQ1M250	250	5.3	0.09	292	127
HIQ1M160	160	6.5	0.09	194	191

Resistance tolerance: ±10%

Recommended cold leads for HIQ MI series heating cables

Nom. cross section [mm2]	Order reference	Max. current (design B)	Outer diameter (mm)	Standard gland size
2.5	IC1H2.5	34	5.3	M20
6	IC1H6	57	6.4	M20

Brass glands are standard on all heating units. Other materials are possible, contact Tyco Thermal Controls for more information.

Delivery length of bulk cable on coil depends on type of resistance and is limited by max. coil length as indicated in the table on top. Factory terminated elements are limited by a max. weight of 50kg, however to ensure practical and safe on-site handling, it is strongly recommended to limit element lengths to 25 - 30kg. Not all resistances are standard items and as such may not be in stock. Contact Tyco Thermal controls to confirm lead time. Tyco Thermal Controls requires the use of a 30 mA residual current device to provide maximum safety and protection from fire.

Where design results in higher leakage current, the preferred trip level for adjustable devices is 30 mA above any inherent capacitive leakage characteristic of the heater as specified by the trace heater supplier or alternatively, the next common available trip level for non adjustable devices, with a maximum of 300 mA. All safety aspects need to be proven.

Also refer to the components section for more details on heating units, accessories and nomenclatures. Page 118.

MI Heating cable sheath corrosion resistance and temperature data

Sheath Material	Maximum Cable Sheath Temp (°C)	Description	Sulphuric Acid	Hydrochloric Acid	Hydrofluoric Acid	Phosphoric Acid	Nitric Acid	Organic Acid	Alkalis	Sea Water	Chloride
Inconel 600 DIN 2.4816	600*	High nickel, high chromium content inconel alloy 600	X	X	A	X	X	GE	GE	A	GE

Note: NR Not recommended, A acceptable, GE Good to excellent, X Check for specific data

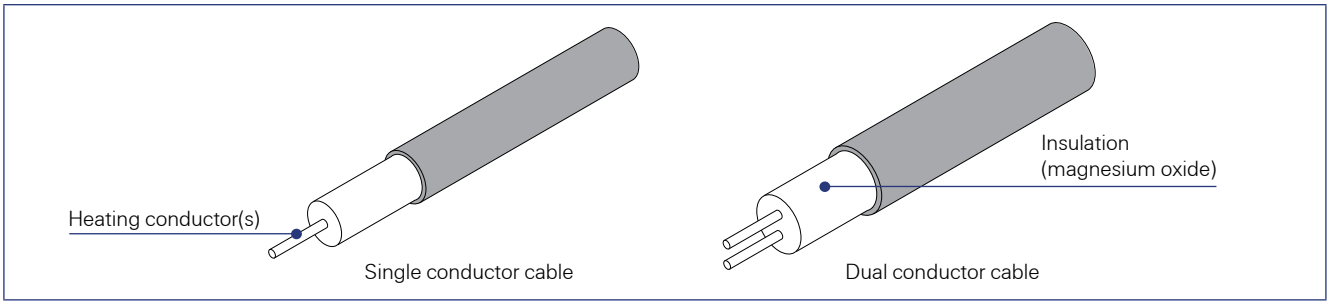
** Temperature limitation based on construction of heating element.*
Corrosion resistance data is dependent on temperature and concentration.

Nomenclature for MI heating systems - MI heating cables (bulk cables)

Pyrotenax MI heating cables are available for a wide range of applications.

For more details about the different MI heating cable types, also refer to the product datasheets.

Typical cable constructions



Various constructions of the MI bulk heating cables are available:

HCC/HCH: Copper sheathed MI heating cables

HDF/HDC: Cupro-nickel sheathed MI heating cables

HSQ: Stainless steel sheathed MI heating cables

HAx: Alloy 825 sheathed MI heating cables

HIQ: Inconel sheathed MI heating cables

MI Bulk heating cables are supplied in a range of different constructions, the product references use the following nomenclature:

Example: HCHH1L2000BK

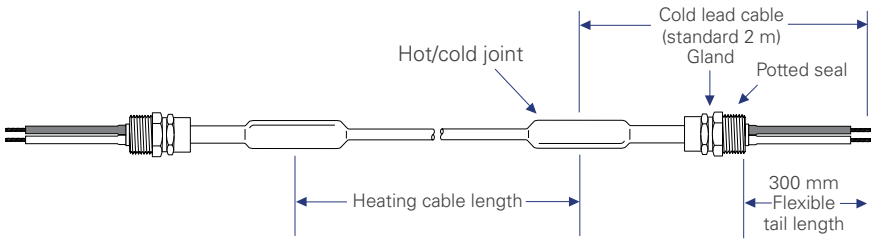
H	H denotes a heating cable	**H**=Heating Cable
C	Sheath material	**C**=Copper **D**=Cupro-Nickel **S**=Stainless steel **A**=Alloy 825 **I**=Inconel 600
H	Conductor material (examples)	**C**=Copper **H**=Copper Alloy and a variety of other metal alloys
H	Oversheath material (optional for copper cables only)	**H**=HDPE P=FEP
1	Number of conductors	1 or 2
L	Normal operating voltages	Refer to datasheets of individual heating cables
2000	Conductor resistance	in Ω/km - i.e. 2000=2000 Ω/km
BK	Oversheath colour (optional)	**BK**=Black OR=Orange

MI heating units consist of a heating cable, the hot-cold joint as well as the cold lead cables with an appropriate seal and gland. The connection and sealing of an MI heating unit is critical for a safe and reliable operation.

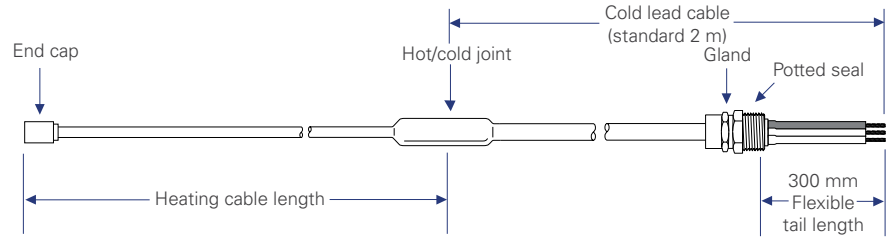
Tyco Thermal Controls strongly recommends the use of factory-terminated heating units, which guarantee a consistently high level of quality. The stainless steel (HSQ), Inconel 600 (HIQ) and Alloy 825 (HAx) can be delivered with laser welded joints and/or end caps to provide the optimum weld quality and highest reliability. We recommend the use of laser welded joints and/or end caps when the load or exposure temperatures cause element temperatures above 300°C. For use in hazardous areas, MI heating units need to be assembled by Tyco Thermal Controls or an authorized installer.

MI heating units are available in different configurations (unit types)

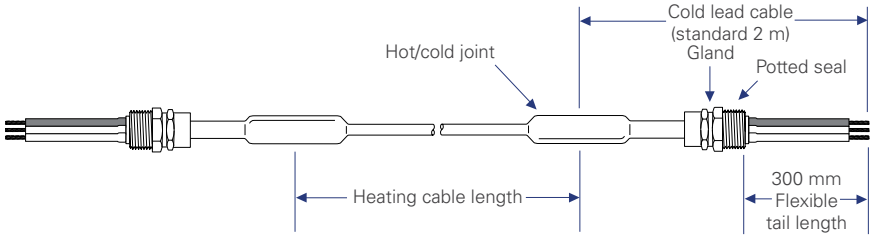
MI heating unit type B (single conductor)



MI heating unit type D (dual conductor)



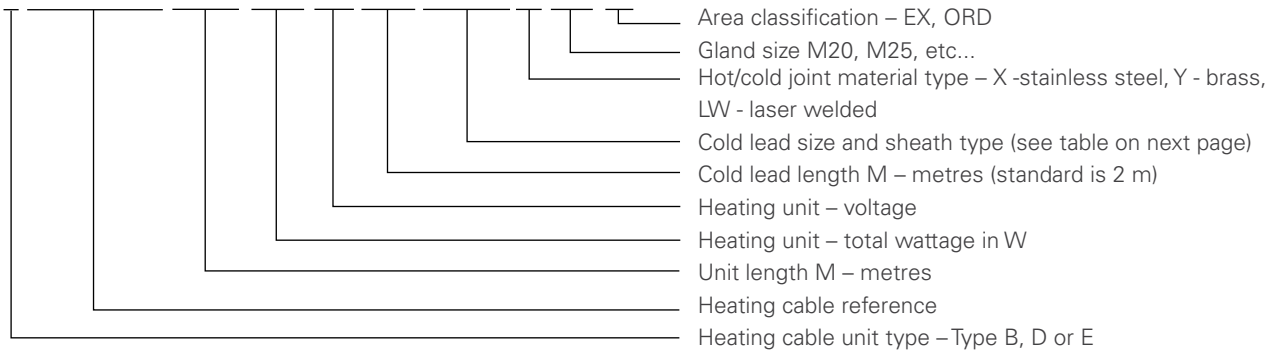
MI heating unit type E (dual conductor)



The cold lead length includes 300 mm long flexible tails. Earth tails are supplied as standard on all heating units. Glands are fitted with washers and locknuts. Other configurations available on request.

The order reference of MI heating units uses the following nomenclature

B/HSQ1M1000/43.0M/1217/230/2.0M/SC1H2.5/X/M20/EX



When ordering, the complete order reference of the MI heating unit needs to be provided. For hazardous areas, information must also be provided about the T-rating and temperature data relevant to the application (max. sheath temperature data) to enable the correct representation of data on hazardous area tags attached to the completed heating unit in the factory.

Any missing detail may lead to potential delays in order processing.

Selection of MI cold leads

Pyrotenax MI cold lead cables are available in different constructions:

CC: Copper sheath, copper conductor

CCH: HDPE jacketed copper sheath, copper conductor

DC: Cupro-Nickel sheath, copper conductor

SC: Stainless steel sheath, copper conductor

IC: Inconel 600 sheath, copper conductor

AC: Alloy 825 sheath, copper conductor

For selection of the MI cold lead, the environmental exposure (chemicals etc...), as well as the current rating need to be considered. Tyco Thermal Controls typically recommends using the same or superior sheath materials for the cold lead as used for the heating cable. Cold leads are normally selected based on the operating current of the heating unit at maintain temperature. For higher temperatures, the current can be significantly higher during the transitional start-up phase. If the application involves more frequent heat-up from lower temperatures, we recommend selecting the cold lead size based on the start-up current.

Hot cold joints

The connection between the heating cable and the cold lead (hot-cold joint) is one of the most critical elements for the reliability of a MI heating unit. Various types are available for different sheath materials of the heating cables and cold leads.

Sheath material for heating cable	Standard joint material for brazed units	Joint material for laser-welded units
Copper	Brass	N/A
Cupro-nickel	Brass for cupro-nickel cold lead	N/A
Cupro-nickel	Stainless for stainless steel cold lead	N/A
Stainless steel	Stainless steel	Stainless steel
Inconel	Stainless steel	Special alloy
Alloy 825	Stainless steel	Special alloy

The option for laser welded units is not available for MI heating cables with a copper or cupro-nickel sheath.

Cold lead selection table					
Cross section	**Number of conductors**	**Cold lead order reference**	**Diameter (mm)**	**Current rating (A)**	**Standard gland size**
1.0	2	AC2H1.0	7.3	18	M20
		CC1H2.5	5.3	34	M20
2.5	1	DC1H2.5	5.3	34	M20
		SC1H2.5	5.3	34	M20
2.5	2	AC1H2.5	5.3	34	M20
		AC2H2.5	8.7	28	M20
		CC1H6	6.4	57	M20
6.0	1	DC1H6	6.4	57	M20
		SC1H6	6.4	57	M20
		AC1H6	6.4	57	M20
6.0	2	AC2H6	14.0	46	M32
10.0	1	CC1H10	7.3	77	M25
		DC1H10	7.3	77	M25
16.0	1	CC1H16	8.3	102	M25
		DC1H16	8.3	102	M25
25.0	1	AC1H16	8.3	102	M25
		CC1H25	9.6	133	M32
		AC1H25	10	133	M32
35.0	1	CC1H35	10.7	163	M32

Brass glands are standard on all heating units.

The cold lead selection table does not show all possible combinations (other gland materials, sizes, optional PVC shrouds, etc.); contact Tyco Thermal Controls for more details.

For the on-site terminations and repair of cold leads, the use of Pre-terminated MI double Cold Ends (PCE) is strongly recommended. Refer to Accessories on page 122 for more information.

Accessories for the termination of MI heating units

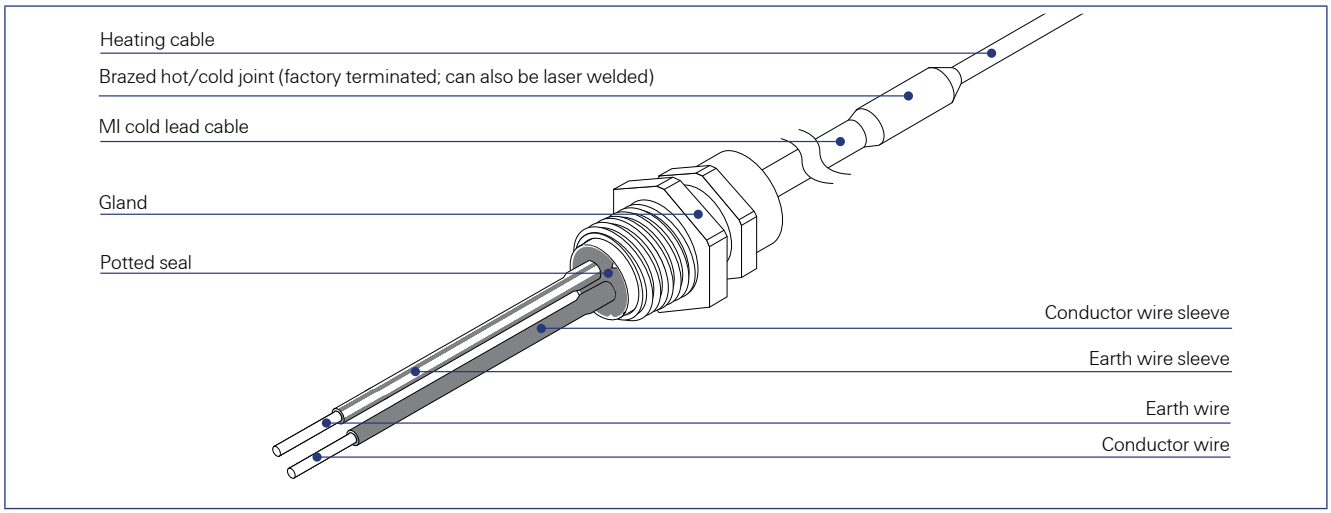
For the termination of bulk MI heating cables, a range of accessories is available. The termination of MI heating units requires adequate training and sufficient experience. In particular for hazardous area applications, factory termination of the MI heating units (as described on page 38) is strongly recommended.

For possible combinations and detailed order information of glands, seals, joints and other accessories also refer to datasheet for

MI Termination Accessories (reference DOC-606), available on our website at

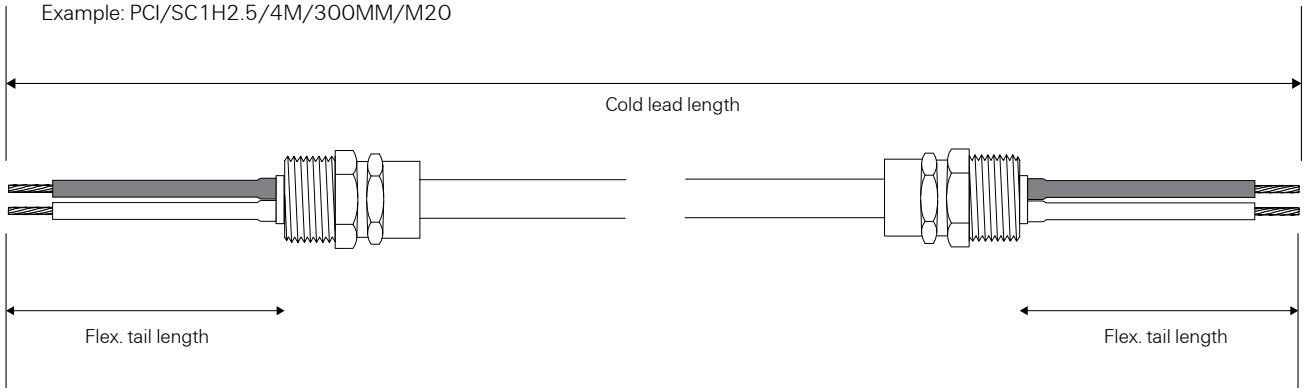
www.tycothermal.co.uk or contact Tyco Thermal Controls.

Typical termination of MI heating cable



Pre-terminated MI double cold ends

PCE/"cold lead type"/"cold lead length"/"flex. Tail length"/"gland type"
Example: PCI/SC1H2.5/4M/300MM/M20



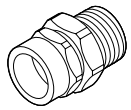
To facilitate occasional on-site termination and eventual repairs, Tyco Thermal Controls offers Pre-terminated MI double Cold Ends (PCE). The standard PCEs consist of 4m of cold lead cable of the appropriate type which ends are pre-terminated with a factory seal, gland assembly and insulated flexible tails. The use of Pre-terminated Cold Ends (PCE) significantly increases the reliability of field-termination and repairs of cold leads since they are fully factory tested and assembled in a controlled manufacturing environment.

A PCE with a single conductor cable includes two terminations, sufficient for the termination of an MI heating unit type B. A PCE with dual conductor cable includes two terminations, sufficient for the termination of two MI heating unit type D or for one MI heating unit type E (also refer to page 119).

Any ingress of moisture is minimized, if the PCE is cut (typically in the middle) just before the connection to a heating cable. Unused ends can be sealed for storage using wax or other appropriate sealing methods. More details on the available types can be found in MI Termination Accessoiries (reference DOC-606).

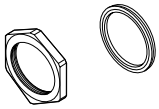
Glands, seals, joints, ferrules

RGM



Metric brass glands are standard – more details on accessories for mineral insulated heating cables, refer to datasheet for ***MI Termination Accessories*** (reference DOC-606).

RLM20



M20 brass lock nuts for securing glands

RLM25

M25 brass lock nuts for securing glands

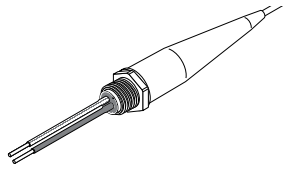
SATP20

Fibre washers for glands, M20

SATP25

Fibre washers for glands, M25

RHG20

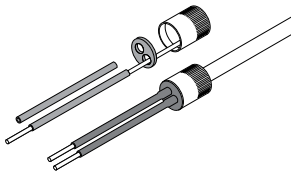


M20 gland shrouds for enhanced gland protection

RHG25

M25 gland shrouds for enhanced gland protection

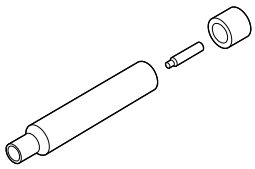
RPAL/RPSL



Hazardous and ordinary area seals are supplied with 300 mm tails including earth tail.

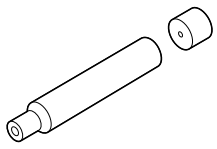
More details on mineral insulated accessories, refer to datasheet for ***MI Termination Accessories*** (reference DOC-606).

SJK



Joint types SJK are made of brass, types SJKAS are made of stainless steel. For more details such as compatibility with various heating cables and order references, refer to datasheet for ***MI Termination Accessories*** (reference DOC-606).

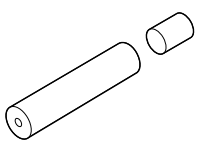
SJK-PILOT-...



Universal hot/cold or hot/hot joint for brazed connection of MI heating cables and/or cold leads. Universal joints have two pilot holes (one for the joint body and one for the joint bush) that must be drilled to match the exact diameter of the heating cable and/or cold lead during the termination operation or field repair. Joint types SJK are made of brass, types SJKAS are made of stainless steel. For more details such as compatibility with various heating cables and order references, refer to datasheet for ***MI Termination Accessories*** (reference DOC-606).

The preferred solution to join two heating cables includes a short section of cold lead joined between the two MI heating cables with two hot/cold joints. Contact Tyco Thermal Controls for more information.

SPOT...-PILOT



End cap for the termination of dual conductor MI heating cables. The end caps have a pilot hole that must be drilled to match the exact diameter of the heating cable during the termination operation. End cap types SPOT are made of brass, types SPOTAS are made of stainless steel. For more details such as compatibility with various heating cables and order references, refer to data-sheet for ***MI Termination Accessories*** (reference DOC-606).

SJKF

Ferrules (copper) for reliable connection of MI conductors in hot/cold joints. More details, refer to datasheet for ***MI Termination Accessories*** (reference DOC-606).

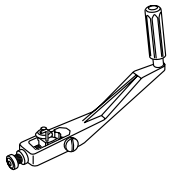
Fabrication Consumables

SABAG13	Silver solder for brazed joints, use for conductor
SABAG14	Silver solder for brazed joints, use for joint body
SABF	Brazing flux (250g)
SMP-300	Magnesium oxide powder (250g)
RMX	Grey potting compound

SMH Wax for temporary sealing of bulk MI heating cable ends or cold leads.
Minimum order quantity: 500 g, higher quantities per multiples of 100g.

Tools

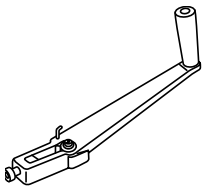
ZSU



Large stripping tool – all cable sizes, spare blades ZSUB.

For Copper and Cupro-Nickel cables.

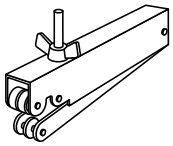
ZSUS



Small stripping tool – cable Ø < 9 mm, spare blades ZSUSB.

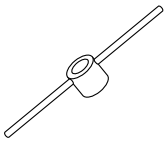
For Copper and Cupro-Nickel cables.

ZR



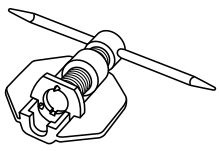
Ringing tool for cable Ø < 9 mm.

ZPM20, ZPM25



Potting tool, ensures quick and accurate screwing on of the brass pot and is used in conjunction with the appropriate RGM cable gland (M20 or M25).

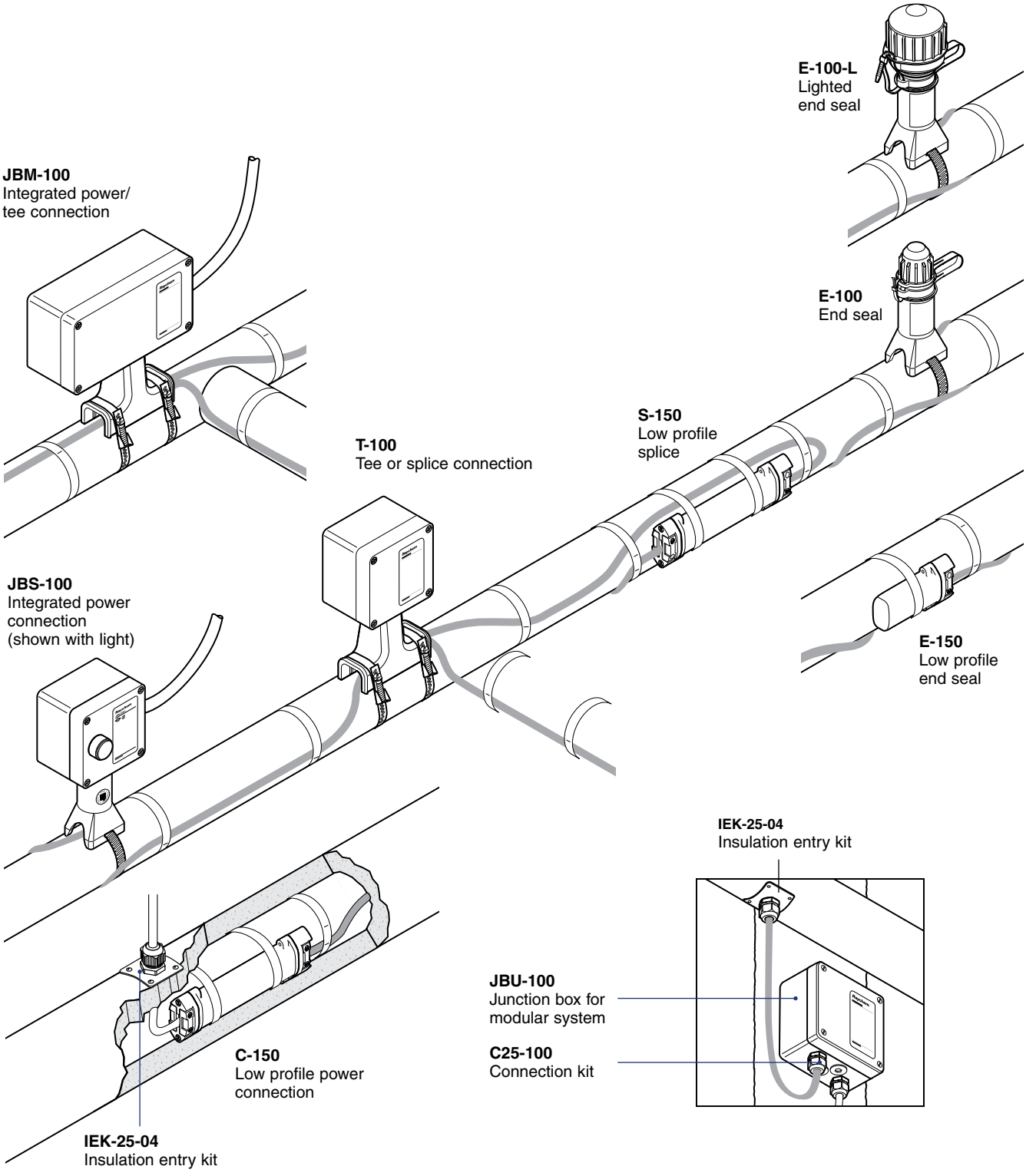
ZDC20, ZDC25



Crimping tool for 20 and 25 mm seals.

Raychem

Component overview of self-regulating and power-limiting heating cable system



Note: S-150, E-150 & C-150 Not available for VPL

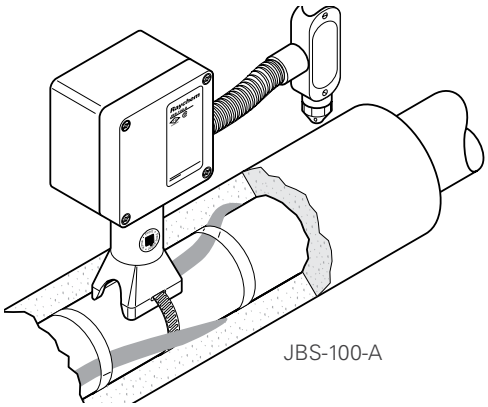
Single-entry power connection with junction box

The JBS-100 kit is designed to connect power to one Raychem BTV, QTVR, XTV, KTV or VPL industrial parallel heating cable. It is approved by FM, CSA, and PTB for use in hazardous locations.

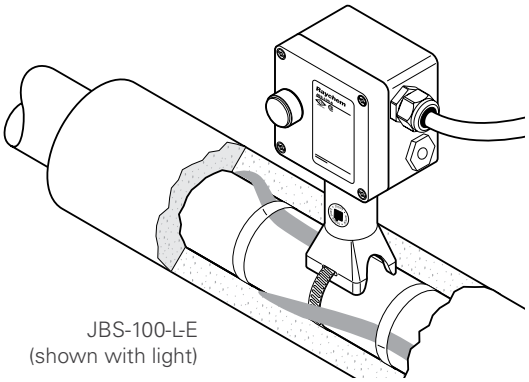
The JBS-100 integrates the functions of both connection kits and insulation entries. The rugged stand protects the heating cable and allows for up to 100 mm (4") of thermal insulation.

The core sealing boot does not require a heat gun or torch for the installation (no hot work permit necessary). The non-curing sealant (silicone free) in the boot allows easy installation and facilitates maintenance.

Spring-type terminals provide fast installation and safe, reliable, maintenance-free operation. This connection kit significantly reduces installation time. The kit is offered in three basic versions, customised for local installation practices. All kits are also available as a lighted version. These include a unique light module with a superbright LED that simply plugs into the terminals, and a lens in the lid. This provides indication that power is available in the box.



JBS-100-A



JBS-100-L-E
(shown with light)

	JBS-100-A JBS-100-L-A	JBS-100-E JBS-100-L-E	JBS-100-EP JBS-100-L-EP
Description	This kit is for use in North America and has one through-hole for use with 3/4" conduit.	This kit is for use in Europe and provides two M25 threaded entries, one stopping plug, and one plastic power cable gland.	This kit is for use in Europe and provides two M25 threaded entries, an earthing plate, and an external earthing stud. It is designed for use with armoured cables.
Kit contents	1 junction box with terminals 1 light module (for -L only) 1 stand 1 core sealer 1 green/yellow earthing sleeve 1 polywater sachet 1 cable tie	1 junction box with terminals 1 light module (for -L only) 1 stand 1 core sealer 1 green/yellow earthing sleeve 1 M25 gland for power cable 8–17 mm in diameter 1 M25 stopping plug 1 polywater sachet 1 cable tie	1 junction box with terminals, earth plate, and stud 1 light module (for -L only) 1 stand 1 core sealer 1 green/yellow earthing sleeve 1 M25 stopping plug 1 polywater sachet 1 cable tie

Approvals

Hazardous locations

Class I, Div. 2, Groups A, B, C, D Class II, Div. 1 & 2, Groups E, F, G Class III	PTB 09 ATEX 1059 U Ex II 2G Ex e (e mb) II Ex II 2D Ex tD (tD mbD) A21 IP66 IECEx PTB 09.0037U Ex e (e mb) II Ex tD (tD mbD) A21 IP 66	PTB 09 ATEX 1059 U Ex II 2G Ex e (e mb) II Ex II 2D Ex tD (tD mbD) A21 IP66 IECEx PTB 09.0037U Ex e (e mb) II Ex tD (tD mbD) A21 IP 66
[1] CLI, ZN1, AEx e II T* CLI, ZN1, AEx em II T* (for -L only)	Ex e II T* Ex em II T* (for -L only)	Ex e II T* Ex em II T* (for -L only)
Ex e II T* Ex em II T* (for -L only)	DNV approval DNV Certificates No. E-11564 and No. E-11565	DNV approval DNV Certificates No. E-11564 and No. E-11565

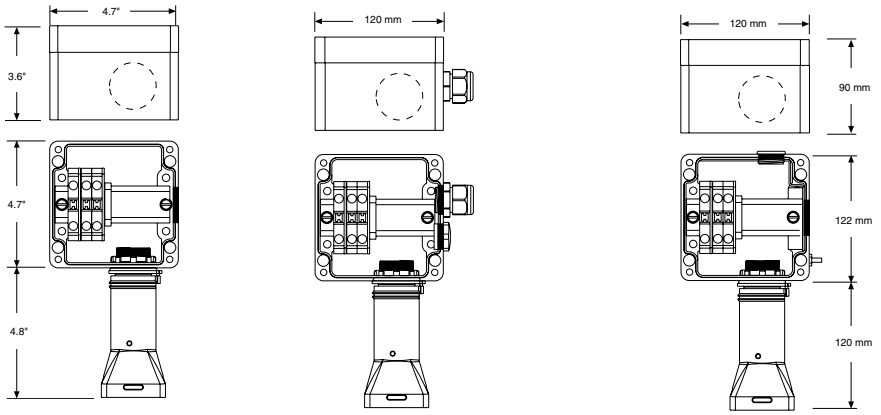
** For T-rating, see heating cable or design documentation*

[1] Except VPL

This product also has all required approvals for use in Kazachstan, Russia and other countries. Contact our your local Tyco Thermal Controls representative for more details.

	JBS-100-A JBS-100-L-A	JBS-100-E JBS-100-L-E	JBS-100-EP JBS-100-L-EP

Dimensions (nominal)



Product specifications

Heating cable capability	BTV-CR, BTV-CT, QTVR-CT, XTV-CT, KTV-CT, VPL-CT		
Ingress protection	NEMA Type 4X	IP66/IP67	IP66/IP67
Entries	1 x 3/4"	2 x M25 including power cable gland for diameter 8 - 17 mm	2 x M25
Ambient temperature range	–50°C to +40°C	–50°C to +56°C* (JBS-100-E) –40°C to +40°C (JBS-100-L-E)	–50°C to +56°C* (JBS-100-EP) –40°C to +40°C (JBS-100-L-EP)
	** Extra conditions for safe use apply for ambient temperatures above +40°C. Please refer to the summary on page 170, the certificate or installation instructions for full details.*		
Min. installation temperature	–50°C	–50°C	–50°C
Max. pipe temperature	Refer to heating cable specification		
Terminals	Spring-type terminals 2 line, 1 ground	Spring-type terminals 1 phase, 1 neutral, 1 earth	Spring-type terminals 1 phase, 1 neutral, 1 earth
Max. conductor size	8 AWG stranded	10 mm^2 stranded, 10 mm^2 solid	10 mm^2 stranded, 10 mm^2 solid
Max. operating voltage	277 Vac	480 Vac*	480 Vac*
	** JBS-100-L-E and JBS-100-L-EP are limited to 254 Vac. Extra conditions for safe use apply for voltages higher than 254 Vac. Please refer to the summary on page 170, the certificate or installation instructions for full details.*		
Max. continuous operating current	50 A heating cable circuit	40 A heating cable circuit	40 A heating cable circuit

Materials of construction			
Enclosure, lid, and stand	electrostatic charge-resistant glass-filled engineered polymer, black	electrostatic charge-resistant glass-filled engineered polymer, black	electrostatic charge-resistant glass-filled engineered polymer, black
Lid screws	Stainless steel	Stainless steel	Stainless steel
Lid gasket	Silicone rubber	Silicone rubber	Silicone rubber
Earth continuity plate	N/A	N/A	Steel, zinc plated, and blue chromated

Optional LED indicator light			
Colour	Red	Green	Green
Voltage rating	100-277 Vac	100-254 Vac	100-254 Vac
Power consumption	< 1 W	< 1 W	< 1 W

Ordering details Power connection			
Part Description	JBS-100-A	JBS-100-E	JBS-100-EP
PN (Weight)	085947-000 (2.5 lb)	829939-000 (1.2 kg)	158251-000 (1.3 kg)

Power connection with light			
Part Description	JBS-100-L-A	JBS-100-L-E	JBS-100-L-EP
PN (Weight)	944699-000 (3.5 lb)	054363-000 (1.6 kg)	075249-000 (1.7 kg)

Accessories	
Conduit drain 3/4"	JB-DRAIN-PLUG-3/4IN (prevents condensate from collecting in the box) ONLY FOR JBS-100-L-A
Small pipe adaptor	JBS-SPA, required for pipes ≤ 1" (DN 25) E90515-000 (bag of 5 adaptors)

Mutiple-entry power/tee connection with junction box

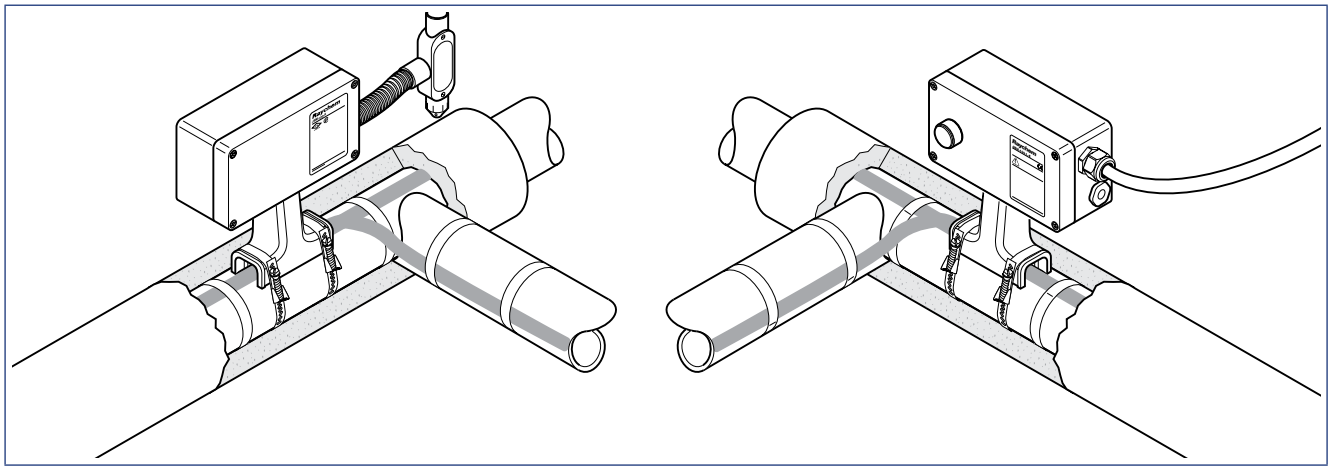
The JBM-100 kit is designed to connect power to up to three Raychem BTV, QTVR, XTV, KTV, or VPL industrial parallel heating cables and is approved by FM, CSA, and PTB for use in hazardous locations.

The JBM-100 integrates the functions of both connection kits and insulation entries. The rugged stand protects the heating cable and allows for up to 100 mm (4") of thermal insulation.

The core sealing boot does not require a heat gun or torch for the installation (no hot work permit necessary). The non-curing sealant (silicone free) in the boot allows easy installation and facilitates maintenance.

Spring-type terminals provide fast installation and safe, reliable, maintenance-free operation. This connection kit significantly reduces installation time.

The kit is offered in three basic versions, customised for local installation practices. All kits are also available as a lighted version. These include a unique light module with a superbright LED that simply plugs into the terminals, and a lens in the lid. This provides indication that power is available in the box.



	JBM-100-A JBM-100-L-A	JBM-100-E JBM-100-L-E	JBM-100-EP JBM-100-L-EP
Description	This kit is for use in North America and has two 3/4" through holes for use with 3/4" conduit. One stopping plug is supplied in the kit.	This kit is for use in Europe and provides two M25 threaded entries, one stopping plug, and one plastic power cable gland.	This kit is for use in Europe and provides two M25 threaded entries, an earthing plate, and an external earthing stud. It is designed for use with armoured cables.
Kit contents	1 junction box with terminals 1 light module (for -L only) 1 stand 3 core sealers 3 green/yellow earthing sleeve 1 3/4" stopping plug 1 polywater sachet 1 spanner 1 strain relief assembly 2 grommet plugs	1 junction box with terminals 1 light module (for -L only) 1 stand 3 core sealers 3 green/yellow earthing sleeve 1 M25 gland for power cable 8–17 mm in diameter 1 M25 stopping plug 1 polywater sachet 1 spanner 1 strain relief assembly 2 grommet plugs	1 junction box with terminals, earth continuity plate, and stud 1 light module (for -L only) 1 stand 3 core sealers 3 green/yellow earthing sleeve 2 M25 stopping plugs 1 polywater sachet 1 spanner 1 strain relief assembly 2 grommet plugs

Approvals

Hazardous locations

Class I, Div. 2, Groups A, B, C, D Class II, Div. 1 & 2, Groups E, F, G Class III	PTB 09 ATEX 1056U II 2G Ex e (e mb) II II 2D Ex tD (tD mbD) A21 IP66 IECEx PTB 09.0027U Ex e (e mb) II Ex tD (tD mbD) A21 IP 66	PTB 09 ATEX 1056U II 2G Ex e (e mb) II II 2D Ex tD (tD mbD) A21 IP66 IECEx PTB 09.0027U Ex e (e mb) II Ex tD (tD mbD) A21 IP 66
[1] CLI, ZN1, AEx e II T* CLI, ZN1, AEx em II T* (for -L only)	Ex e II T* Ex em II T* (for -L only)	Ex e II T* Ex em II T* (for -L only)
Ex e II T* Ex em II T* (for -L only)	DNV approval DNV Certificates No. E-11564 and No. E-11565	DNV approval DNV Certificates No. E-11564 and No. E-11565

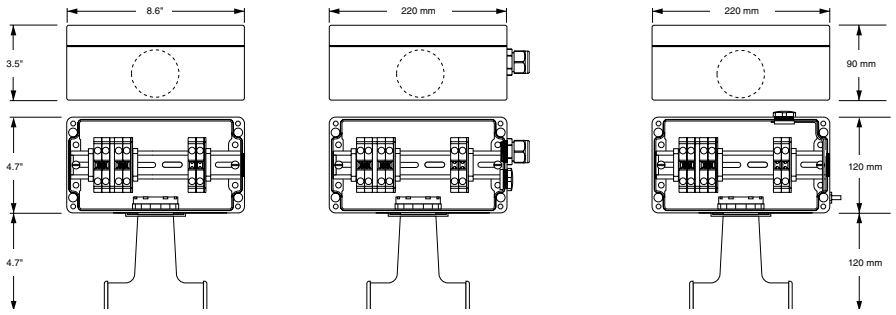
** For T-rating, see heating cable or design documentation*

[1] Except VPL

This product also has all required approvals for use in Kazachstan, Russia and other countries. Contact your local Tyco Thermal Controls representative for more details.

	JBM-100-A JBM-100-L-A	JBM-100-E JBM-100-L-E	JBM-100-EP JBM-100-L-EP

Dimensions (nominal)



Product specifications

Heating cable capability	BTV-CR, BTV-CT, QTVR-CT, XTV-CT, KTV-CT, VPL-CT		
Ingress protection	NEMA Type 4X	IP66	IP66
Entries	1 x 3/4"	2 x M25 including power cable gland for diameter 8-17 mm	2 x M25
Ambient temperature range	–50°C to +40°C	–50°C to +56°C* (JBM-100-E) –40°C to +40°C (JBM-100-L-E)	–50°C to +56°C* (JBM-100-EP) –40°C to +40°C (JBM-100-L-EP)
	** Extra conditions for safe use apply for ambient temperatures above +40°C. Please refer to the summary on page 170, the certificate or installation instructions for full details.*		
Min. installation temperature	–50°C	–50°C	–50°C
Max. pipe temperature	Refer to heating cable specification		
Terminals	Spring-type terminals line, 2 ground	Spring-type terminals 2 phase, 2 neutral, 2 earth	Spring-type terminals 2 phase, 2 neutral, 2 earth
Max. conductor size	8 AWG stranded	10 mm² stranded, 10 mm² solid	10 mm² stranded, 10 mm² solid
Max. operating voltage	277 Vac	480 Vac*	480 Vac*
	** JBM-100-L-E and JBM-100-L-EP are limited to 254 Vac. Extra conditions for safe use apply for voltages higher than 254 Vac. Please refer to the summary on page 170, the certificate or installation instructions for full details.*		
Max. continuous operating current	50 A heating cable circuit	40 A heating cable circuit	40 A heating cable circuit

Materials of construction			
Enclosure, lid, and stand	Electrostatic charge-resistant glass-filled engineered polymer, black	electrostatic charge-resistant glass-filled engineered polymer, black	electrostatic charge-resistant glass-filled engineered polymer, black
Lid screws	Stainless steel	Stainless steel	Stainless steel
Lid gasket	Silicone rubber	Silicone rubber	Silicone rubber
Earth continuity plate	N/A	N/A	Steel, zinc plated, and blue chromated
Optional LED indicator light			
Colour	Red	Green	Green
Voltage rating	100-277 Vac	100-254 Vac	100-254 Vac
Power consumption	< 1 W	< 1 W	< 1 W

Ordering details

Power connection			
Part Description	JBM-100-A	JBM-100-E	JBM-100-EP
PN (Weight)	179955-000 (4.3 lb)	831519-000 (1.9 kg)	986415-000 (2.1 kg)
Power connection with light			
Part Description	JBM-100-A	JBM-100-E	JBM-100-EP
PN (Weight)	656081-000 (5.3 lb)	395855-000 (2.3 kg)	300273-000 (2.5 kg)
Accessories			
Conduit drain 3/4"	JB-DRAIN-PLUG-3/4IN (prevents condensate from collecting in the box) *ONLY FOR JBM-100-L-A*		
Small pipe adaptor	JBM-SPA, required for pipes ≤ 1" (DN 25) D55673-000 (bag of 5 adaptors)		

Junction box for modular system

The JBU-100 kit is designed to connect power to up to three Raychem BTV, QTVR, XTV, KTV or VPL industrial parallel heating cables and is approved by PTB for use in hazardous locations.

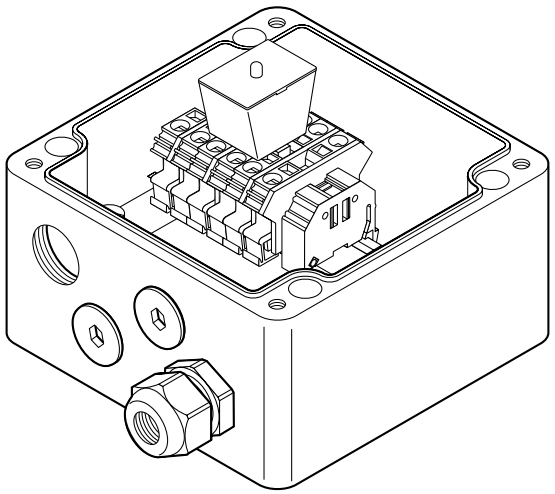
Innovative Spring-type terminals provide fast installation and safe, reliable, maintenance-free operation.

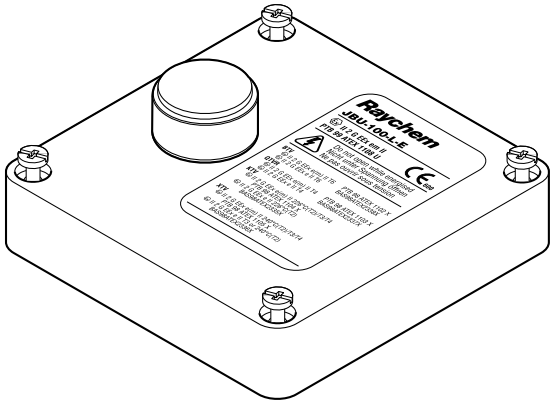
The box is part of the modular component system, it allows for maximum flexibility and can be either wall or pipe mounted.

Connection kits (M25) and insulation entry kits have to be ordered separately.

The box is offered in two basic versions customised to local installation practices.

All kits are also available as a lighted version (-L). These include a unique light module with a superbright green LED that simply plugs into the terminals, and a lens in the lid. This provides indication that power is available in the box.





(JBU-100-L-E shown with light)

	JBU-100-E JBU-100-L-E	JBU-100-EP JBU-100-L-EP
Description	This box is for use in Europe and provides four M25 threaded entries, stopping plugs and one plastic power cable gland.	This box is for use in Europe and provides four M25 threaded entries, an earthing plate and an external earth stud. It is designed for use with armoured power cables.
Kit contents	1 junction box with terminals 1 light module (for -L only) 1 M25 gland for 8-17 mm diameter power cable 2 M25 stopping plugs	1 junction box with terminals with earth plate and external earth stud 1 light module (for -L only) 2 M25 stopping plugs

Approvals

Hazardous locations

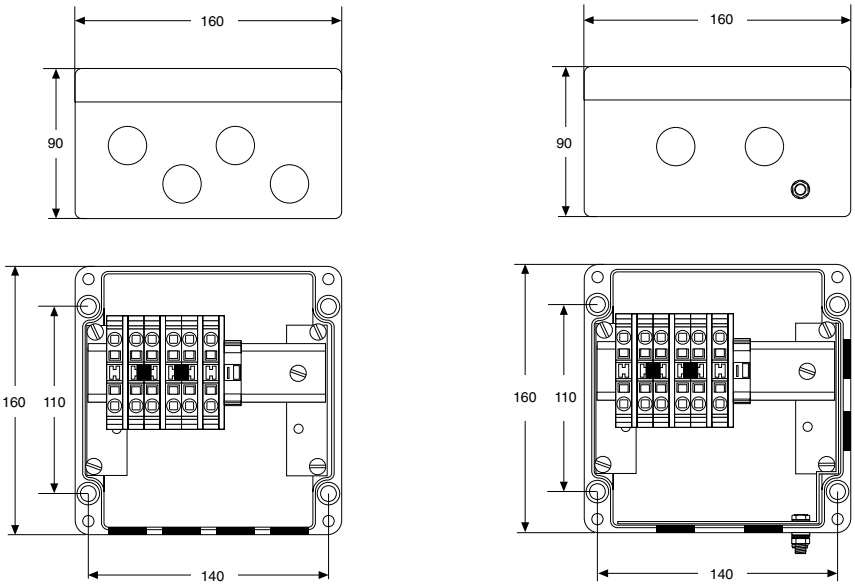
PTB 09 ATEX 1061 U	PTB 09 ATEX 1061 U
Ⓔx II 2G Ex e (e mb) II	Ⓔx II 2G Ex e (e mb) II
Ⓔx II 2D Ex tD (tD mbD) A21 IP66	Ⓔx II 2D Ex tD (tD mbD) A21 IP66
IECEx PTB 09.0039U	IECEx PTB 09.0039U
Ex e (e mb) II	Ex e (e mb) II
Ex tD (tD mbD) A21 IP 66	Ex tD (tD mbD) A21 IP 66
Ex e II T*	ex e II T*
Ex em II T* (for -L only)	Ex em II T* (for -L only)
DNV approval	DNV approval
DNV Certificates No. E-11564 and No. E-11565	DNV Certificates No. E-11564 and No. E-11565

**For T-rating, see heating cable or design documentation*

This product also has all required approvals for use in Kazachstan, Russia and other countries.
Contact your local Tyco Thermal Controls representative for more details.

	JBU-100-E JBU-100-L-E	JBU-100-EP JBU-100-L-EP

Dimensions (nominal)



Product specifications

Ingress protection	IP66	IP66
Entries	4 x M25	4 x M25
Ambient temperature range	–50°C to +56°C* (JBU-100-E) –40°C to +40°C (JBU-100-L-E) ** Extra conditions for safe use apply for ambient temperatures above +40°C. Please refer to the the summary on page 170, the certificate or installation instructions for full details.*	–50°C to +56°C* (JBU-100-EP) –40°C to +40°C (JBU-100-L-EP)
Terminals	Spring-type terminals	Spring-type terminals
	2 phase, 2 neutral, 2 ground	2 phase, 2 neutral, 2 ground
Max. conductor size	10 mm² stranded, 10 mm² solid	10 mm² stranded, 10 mm² solid
Max. operation voltage	480 Vac	480 Vac
Max. current rating	40 A	40 A

Materials of construction		
Enclosure, lid	Electrostatic charge-resistant glass-filled engineered polymer, black	Electrostatic charge-resistant glass-filled engineered polymer, black
Lid screws	Stainless steel	Stainless steel
Lid gasket	Silicone rubber	Silicone rubber
Earth continuity plate	N/A	Steel, zinc plated, and blue chromated
Optional LED indicator light		
Colour	Green	Green
Voltage rating	100-254 Vac	100-254 Vac
Power consumption	< 1 W	< 1 W

Ordering details

Junction box		
Part Description	JBU-100-E	JBU-100-EP
PN (Weight)	051976-000 (1.7 kg)	243948-000 (1.8 kg)
Junction box with light		
Part Description	JBU-100-L-E	JBU-100-L-EP
PN (Weight)	069262-000 (2.1 kg)	113974-000 (2.2 kg)
Accessories		
Heating cable connection kits	C25-100, C25-21, CCON25-100	C25-100, C25-21, CCON25-100, C25-100-METAL
Insulation entry kit	IEK-25-04 or IEK-25-PIPE	IEK-25-04 or IEK-25-PIPE
Power cable gland	GL-36-M25 (included)	GL-38-M25-METAL (optional)
Junction box support bracket (optional)	SB-100, SB-101	SB-100, SB-101

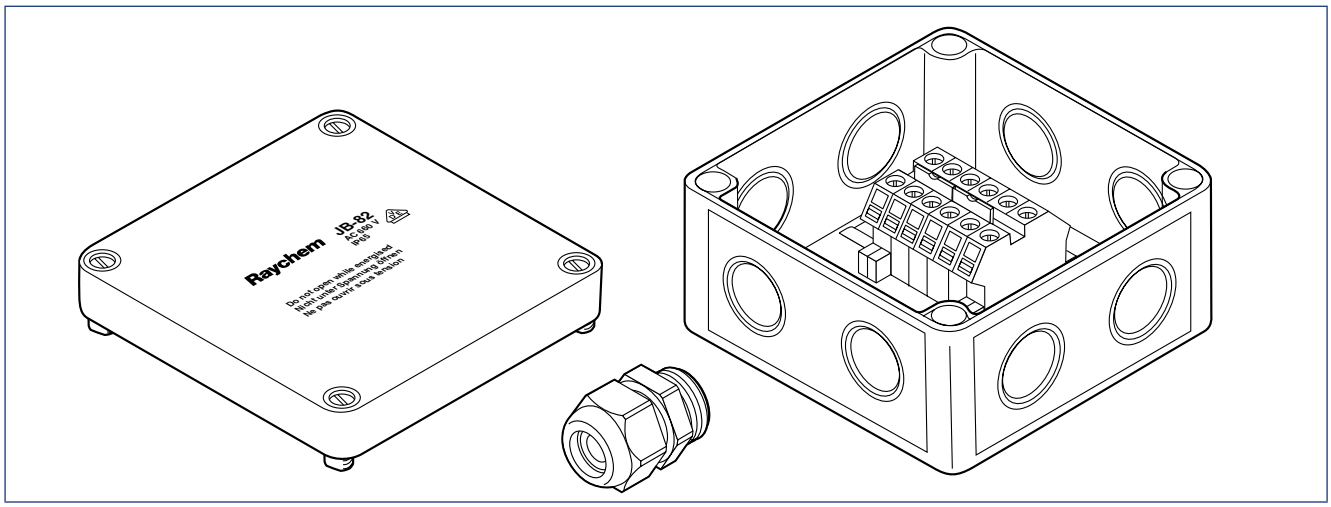
Junction box

The JB-82 is a standard, non-hazardous polycarbonate junction box.

It may be used to make a power connection, splice, powered splice, powered tee or simple tee, for use with Raychem industrial parallel heating cables.

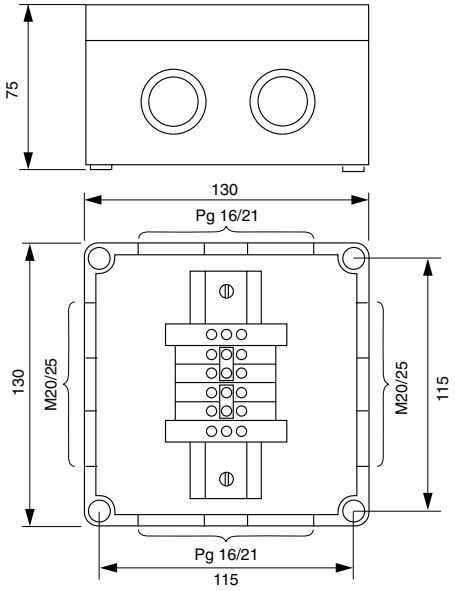
Up to four heating cables or three heating cables and the appropriate size power cable can be accommodated through the four entries and connected to the rail mounted terminals.

For pipe mounting, it is recommended that this box is used with a Raychem support bracket.



	JB-82
Enclosure	
Area of use	Ordinary (indoors and outdoors)
Protection	IP66
Entries	4 M20/25
Exposure temperature	–35°C to +115°C
Base	Grey glass filled polycarbonate
Lid	Grey polycarbonate
Lid gasket	Foamed polyurethane
Phase terminals	
Conta-Clip RK6-10	Din rail mounted
Voltage rating	750 Vac
Max. conductor size	0.5-10 mm^2 (solid and stranded)
Current rating	61 A
Quantity	Two cross-connected groups of two
Earth terminals	
	2 Conta-Clip SL10/35

Dimensions (in mm)



	JB-82
Mounting	
Through holes moulded in the base of the junction box	
Centres	115 x 115 mm
Size	5 mm diameter
Cable gland	Polyamide with locknut for cable diameters from 9 to 16 mm
Accessories	
Junction box support bracket	SB-100, SB-101, SB-110, SB-111
Ordering detail	
Part description	JB-82
PN (Weight)	535679-000 (0.47 kg)

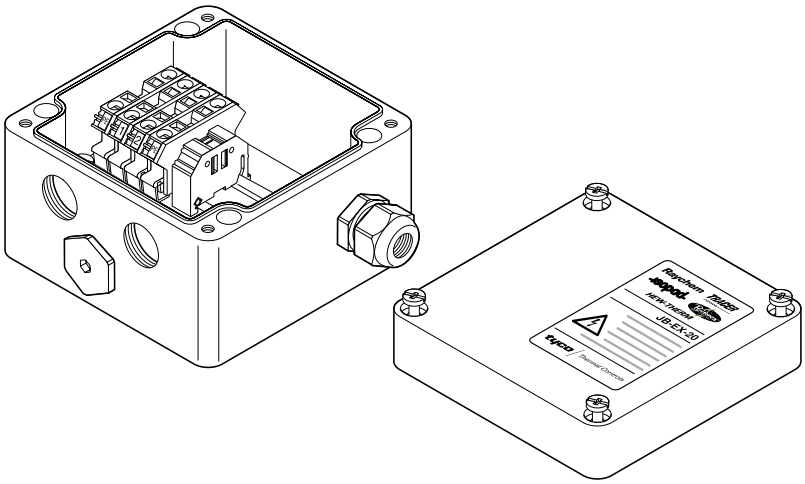
JB-EX-20 and JB-EX-20-EP

Multi purpose junction box

Industrial junction box for use in hazardous areas with FMT, FHT, PI and MI heating cables. This box can be used to make connections between power cables, heating cables and cold lead cables. Depending on the configuration of the system, the box can accommodate heating cables, cold leads and a power cable. M20 connection kits have to be ordered separately depending on the type of heating cable being used.

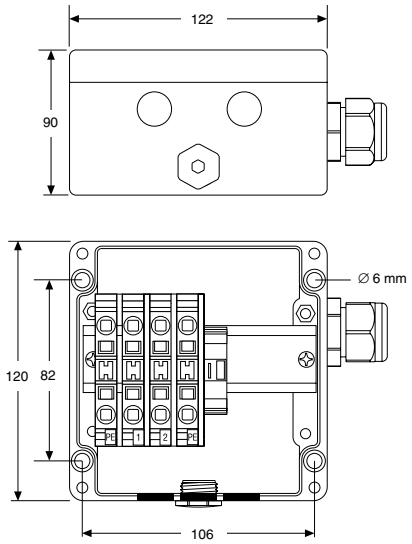
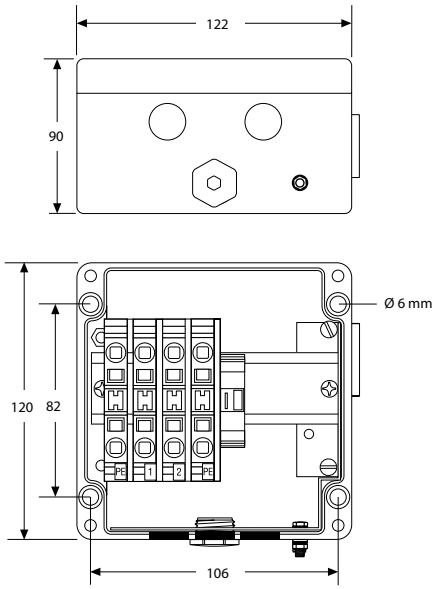
Cable connection is via DIN rail mounted Spring-type terminals to provide fast installation and safe, reliable, maintenance-free operation.

The box can be either wall or pipe mounted via the four holes moulded in the base of the box. For pipe mounting, use one of the standard support brackets.



	JB-EX-20	JB-EX-20-EP
Typical use		
	Power supply box for series heating cables (PI & MI) and constant wattage parallel heating cables (FMT & FHT) or end box (star) for series heating cables (PI & MI), when using M20 connection kits	
Entries		
	3 x M20 1 x M25	3 x M20 1 x M25
Kit contents		
	Junction box with spring-type terminals on DIN rail 1 x M20 stopping plug 2 x M20 rain plugs (temporary) 1 x M25 Hazardous area approved cable gland for power cables with Ø of 8 to 17 mm 1 x terminal jumper allowing various wiring configurations (remove terminal plate)	Junction box with spring-type terminals on DIN rail, earthing plate and an external earth stud 1 x M20 stopping plug 2 x M20 rain plugs (temporary) 1 x M25 rain plug (temporary)
Approvals		
	PTB 00 ATEX 1002	Ⓔx II 2G Ex edm ia [ia] IIC T6, T5 and T4 Ⓔx II 2D Ex tD A21 IP66 T85°C, T100°C and T135°C
	IECEx PTB 08.0004	Ex e ia II, IIC T6, T5, T4 Ex tD A21 IP66 T 85°C, T 100°C, T 135°C
	This product also has all required approvals for use in Kazachstan, Russia and other countries. Contact your local Tyco Thermal Controls representative for more details.	

Materials of construction		
Box & lid	Electrostatic charge-resistant glass-filled engineered polymer, black	Electrostatic charge-resistant glass-filled engineered polymer, black
Sealing gasket	Silicone rubber	Silicone rubber
Lid fixing screws	Stainless steel (captive)	Stainless steel (captive)
Earthing plate	N.A.	Steel, zinc plated and blue chromated

	JB-EX-20	JB-EX-20-EP
Dimensions (in mm)		
Ingress protection	IP66	IP66
Ambient temperature range	–55°C to +55°C	–55°C to +55°C

Terminals		
Quantity	4 pcs, spring-type	4 pcs, spring-type
Labeling	1, 2 + 2 x PE	1, 2 + 2 x PE
Maximum conductor size	10 mm^2 (solid & stranded)	10 mm^2 (solid & stranded)
Maximum operating voltage	590 Vac	590 Vac
Maximum operating current	53 A	53 A

Accessories (to be ordered separately)		
Support bracket	SB-100, SB-101, SB-110, SB-111	SB-100, SB-101, SB-110, SB-111
Power cable gland	GL-36-M25 (included)	GL-38-M25-METAL (optional)
Loose terminals (*)	Phase/neutral terminal: Earth terminal: End plate: Terminal jumper:	HWA-WAGO-PHASE HWA-WAGO-EARTH HWA-WAGO-ENDPLATE HWA-WAGO-JUMPER
Connection kit for FMT and FHT heating cables	C20-01-F hot applied connection kit with plastic gland	C20-02-F cold applied connection kit with metal gland
Insulation entry kit for FMT and FHT heating cables	IEK-25-04 or IEK-25-PIPE	IEK-25-04 or IEK-25-PIPE
Gland for PI cold leads	GL-44-M20-KIT hazardous area approved gland	GL-44-M20-KIT hazardous area approved gland
Insulation entry kit for PI cold leads	IEK-20-PI	IEK-20-PI
Gland for MI cold leads	Contact Tyco Thermal Controls or refer to DOC-606	Contact Tyco Thermal Controls or refer to DOC-606
Stopping plug	HWA-PLUG-M20-EXE-PLASTIC	HWA-PLUG-M20-EXE-PLASTIC

Ordering details		
Order reference	JB-EX-20	JB-EX-20-EP
Part number (Weight)	1244-000590 (0.9 kg)	1244-0006384 (1 kg)

(*) in total no more than 6 terminals of this type should be installed.

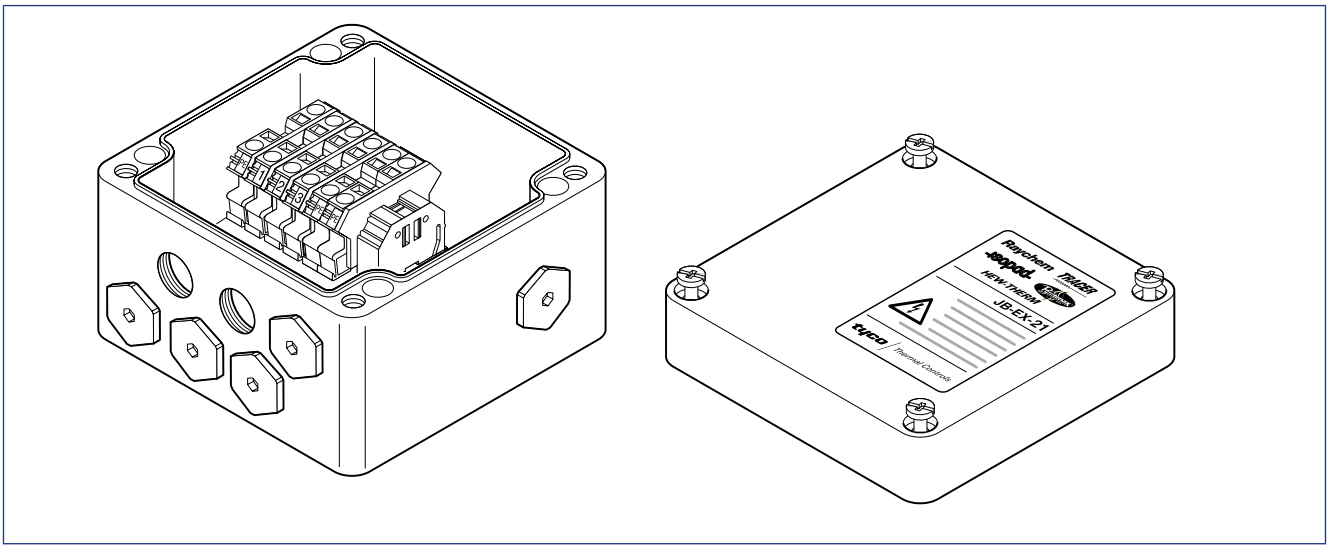
Raychem TRACER

Pyrotenax HEW-THERM

JB-EX-21

Multi purpose junction box

Industrial polyester junction box for use in hazardous areas. This box can be used to make connections between power cables, heating cables and cold lead cables using M20 connection kits. Depending on the configuration of the system, the box can accommodate six heating cables/cold leads and a power cable. M20 connection kits have to be ordered separately depending on the type of heating cable being used. Cable connection is accomplished via DIN rail mounted spring-type terminals. The box can be either wall or pipe mounted via the four holes moulded in the base of the box. For pipe mounting use one of the standard support bracket.



Typical use	
	Power supply box, end-box, splice box (3-phase and loop), marshalling box.
Entries	
	6 x M20 1 x M32
Kit contents	
	1 x junction box with terminals on DIN rail 4 x M20 stopping plugs 2 x M20 rain plug (temporary) 1 x M32 stopping plug 1 x terminal jumper allowing various wiring configurations (remove terminal plate)
Approvals	
	PTB 00 ATEX 1002 — Ex II 2G Ex edm ia [ia] IIC T6, T5 and T4 Ex II 2D Ex tD A21 IP66 T85°C, T100°C and T135°C IECEx PTB 08.0004 — Ex e ia II, IIC T6, T5, T4 Ex tD A21 IP66 T 85°C, T 100°C, T 135°C This product also has all required approvals for use in Kazachstan, Russia and other countries. Contact your local Tyco Thermal Controls representative for more details.

Materials of construction	
Box & lid	Electrostatic charge-resistant glass-filled engineered polymer, black
Sealing gasket	Silicone rubber
Lid fixing screws	Stainless steel (captive)

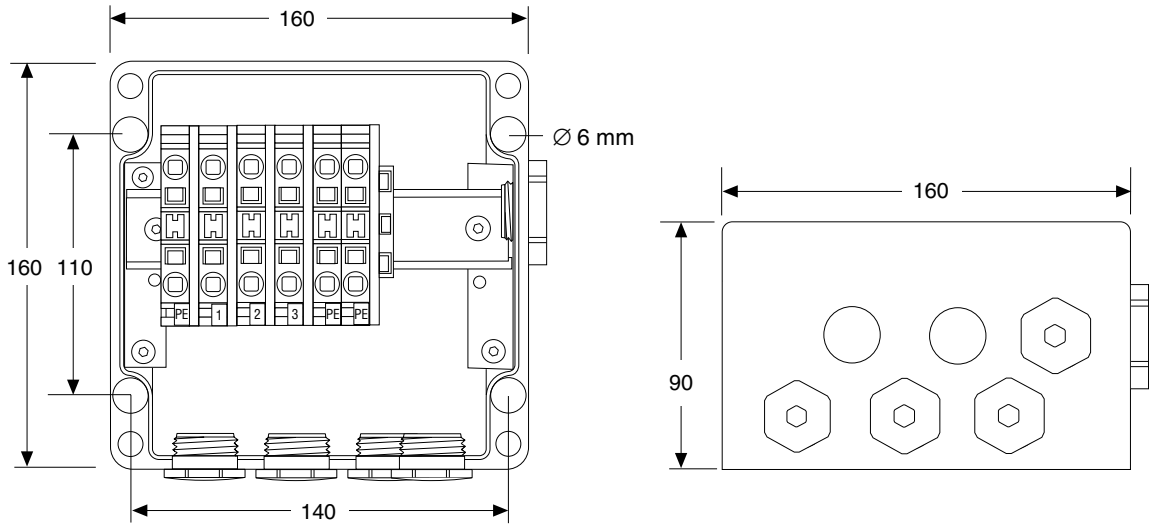
Ingress protection

IP66

Ambient temperature range

–55°C to +55°C

Dimensions (in mm)



Terminals

Quantity	6 pc.
Type	Spring-type
Labeling	1, 2, 3, 3 x PE
Maximum conductor size	10 mm² (solid & stranded)
Maximum operating voltage	550 Vac
Maximum operating current	53 A

Accessories (to be ordered separately)

Support bracket	SB-100, SB-101	
Gland for PI cold leads	GL-44-M20-KIT hazardous area approved gland for cables Ø 5-13 mm	
Gland for MI cold leads	Contact Tyco Thermal Controls or refer to DOC-606	
Gland for power cable	GL-45-M32 hazardous area approved gland for cables Ø 12-21 mm	
Loose terminals (*)	Phase/neutral terminal:	HWA-WAGO-PHASE
	Earth terminal:	HWA-WAGO-EARTH
	End plate:	HWA-WAGO-ENDPLATE
	Terminal jumper:	HWA-WAGO-JUMPER

Ordering details

Order reference	JB-EX-21
Part number (Weight)	1244-000579 (1.2 kg)

(*) in total no more than 10 terminals should be installed.

Raychem TRACER

Pyrotenax HEW-THERM

JB-EX-21/35MM2

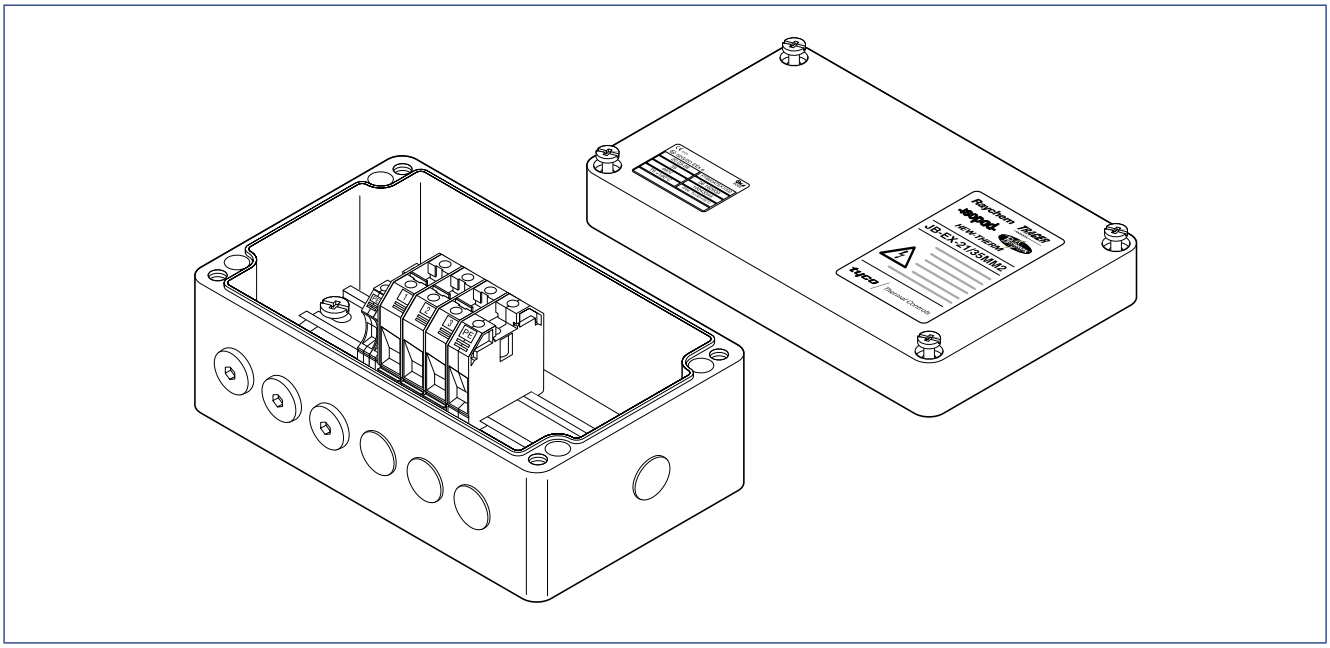
Multi purpose junction box

Industrial junction box for use in hazardous areas with PI and MI heating cables when large terminal sizes are required. This box can be used to make connections between power cables, heating cables and cold lead cables. Depending on the configuration of the system, the box can accommodate multiple heating cables/cold leads and a power cable.

The M20 connection kits have to be ordered separately depending on the type of heating cable being used.

Cable connection is accomplished via DIN rail mounted screw terminals from Weidmuller to provide safe, reliable and maintenance-free operation.

The box can be wall mounted via the four holes moulded in the base of the box.

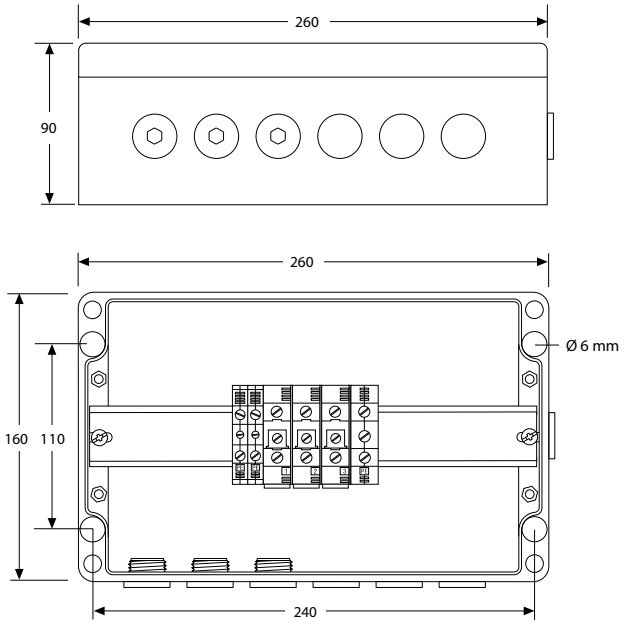


Typical use	
	Power supply box, end-box, splice box for series heating cables (PI & MI), when using M20 connection kits. Marshalling box for power cables.
Entries	
	6 x M20
	1 x M40
Kit contents	
	1 x Junction box with screw terminals on DIN rail
	3 x M20 stopping plugs
	3 x M20 rain plugs (temporary)
	1 x M40 stopping plug
Approvals	
PTB 00 ATEX 1002	Ⓔx II 2G Ex edm ia [ia] IIC T6, T5 and T4
	Ⓔx II 2D Ex tD A21 IP66 T85°C, T100°C and T135°C
IECEx PTB 08.0004	Ex e ia II, IIC T6, T5, T4
	Ex tD A21 IP66 T 85°C, T 100°C, T 135°C

This product also has all required approvals for use in Kazachstan, Russia and other countries. Contact your local Tyco Thermal Controls representative for more details.

Materials of construction	
Box & lid	Electrostatic charge-resistant glass-filled engineered polymer, black
Sealing gasket	Silicone rubber
Lid fixing screws	Stainless steel (captive)
Ingress protection	
	IP66
Ambient temperature range	
	–50°C to +55°C

Dimensions (in mm)



Terminals	
Quantity & type	3 pcs WDU35 screw terminals 2 pcs WPE10 earth terminals for heating cable earth leads 1 pc WPE35 earth terminal for power cable Junction box can accomodate up to 6 fully loaded phase/neutral terminals (maximum 10 terminals in total)
Labelling	1, 2, 3 + 3 x PE
Minimum conductor size	2.5 mm^2 stranded & solid
Maximum conductor size	35 mm^2 stranded & 16 mm^2 solid
Maximum operating voltage	690 Vac
Maximum operating current	100 A
Accessories (to be ordered separately)	
Glands for power cables	GL-51-M40 hazardous area approved gland for cables Ø 17-28 mm, GL-45-M32 hazardous area approved gland for cables Ø 12-21 mm, GL-50-M20 hazardous area approved gland for cables Ø 5.5-13 mm
Reducer	REDUCER-M40/32-EEXE hazardous area M40 male to M32 female reducer
Loose terminals	35 mm^2 phase/neutral terminal: HWA-WDM-PHASE-35 10 mm^2 earth terminal: HWA-WDM-EARTH-10 35 mm^2 earth terminal: HWA-WDM-EARTH-35 Endplate: HWA-WDM-PLATE Terminal jumper (2): HWA-WDM-JUMPER-35-2 Terminal jumper (3): HWA-WDM-JUMPER-35-3
Gland for PI cold leads	GL-44-M20-KIT hazardous area approved gland for cables Ø 5-13 mm
Insulation entry kit for PI cold leads	IEK-20-PI
Gland for MI cold leads	In case of factory terminated units, already present. For on-site assemblies, contact Tyco Thermal Controls or refer to DOC-606
Ordering details	
Order reference	JB-EX-21/35MM2
Part number (Weight)	1244-006653 (1.9 kg)

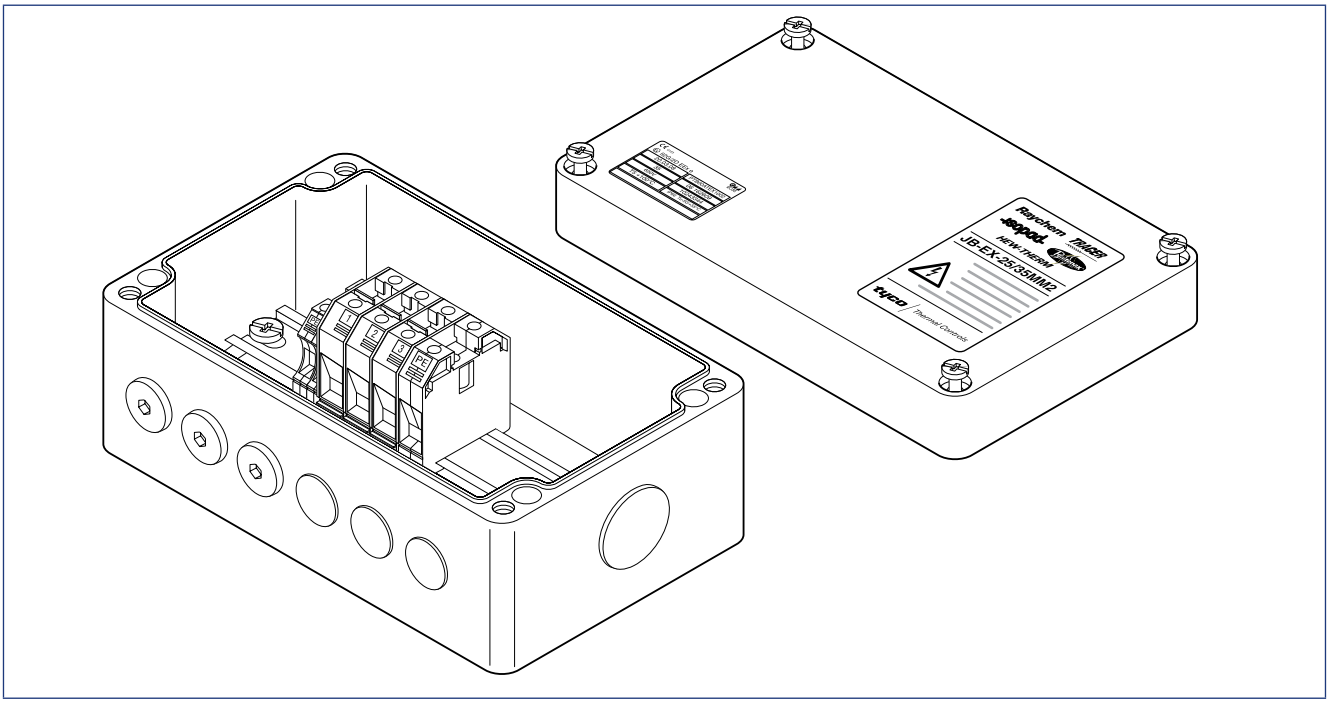
JB-EX-25/35MM2

Multi purpose junction box

Industrial junction box for use in hazardous areas with MI heating cables when larger terminal sizes are required. This box can be used to make connections between power cables, heating and cold lead cables. Depending on the configuration of the system, the box can accommodate multiple heating cables/cold leads and a power cable. The M25 glands are already present in the case of factory terminated MI heating units. In case of on-site assemblies, refer to DOC-606 for detailed information about the required accessories.

Cable connection is accomplished via DIN rail mounted screw terminals from Weidmüller to provide safe, reliable and maintenance-free operation.

The box can be wall mounted via the four holes moulded in the base of the box.

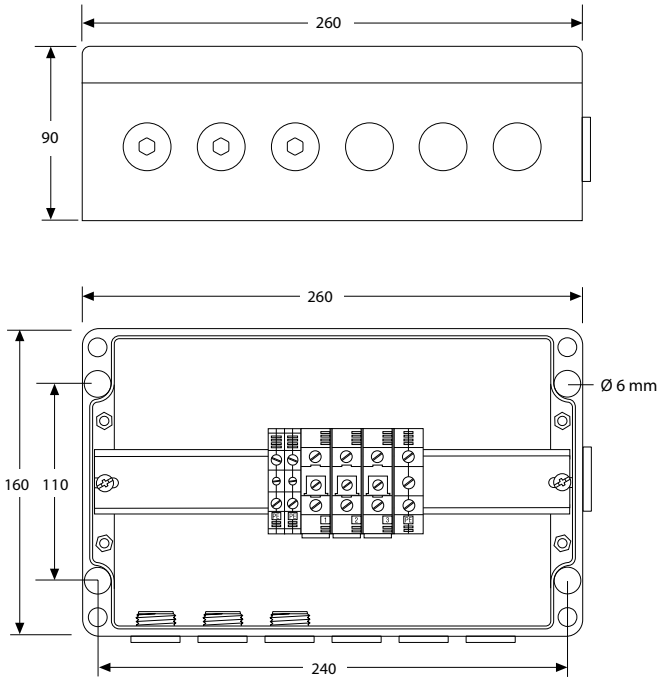


Typical use	
	Power supply box, end-box, splice box for series heating cables (MI), when terminated with M25 glands. Marshalling box for power cables.
Entries	
	6 x M25
	1 x M40
Kit contents	
	Junction box with screw terminals on DIN rail
	3 x M25 stopping plugs
	3 x M25 rain plugs (temporary)
	1 x M40 stopping plug
Approvals	
PTB 00 ATEX 1002	Ex II 2G Ex edm ia [ia] IIC T6, T5 and T4
	Ex II 2D Ex tD A21 IP66 T85°C, T100°C and T135°C
IECEx PTB 08.0004	Ex e ia II, IIC T6, T5, T4
	Ex tD A21 IP66 T 85°C, T 100°C, T 135°C

This product also has all required approvals for use in Kazachstan, Russia and other countries. Contact your local Tyco Thermal Controls representative for more details.

Materials of construction	
Box & lid	Electrostatic charge-resistant glass-filled engineered polymer, black
Sealing gasket	Silicone rubber
Lid fixing screws	Stainless steel (captive)
Ingress protection	
	IP66
Ambient temperature range	
	–50°C to +55°C

Dimensions (in mm)



Terminals	
Quantity & type	3 pcs WDU35 screw terminals 2 pcs WPE10 earth terminals for heating cable earth leads 1 pc WPE35 earth terminal for power cable Junction box can accomodate up to 6 fully loaded phase/neutral terminals (maximum 10 terminals in total)
Labelling	1, 2, 3 + 3 x PE
Minimum conductor size	2.5 mm^2 stranded & solid
Maximum conductor size	35 mm^2 stranded & 16 mm^2 solid
Maximum operating voltage	690 Vac
Maximum operating current	100 A
Accessories (to be ordered separately)	
Glands for power cables	GL-51-M40 hazardous area approved gland for cables Ø 17-28 mm, GL-45-M32 hazardous area approved gland for cables Ø 12-21 mm, GL-36-M25 hazardous area approved gland for cables Ø 8.5-16 mm
Reducer	REDUCER-M40/32-EEXE hazardous area M40 male to M32 female reducer
Loose terminals	35 mm^2 phase/neutral terminal: HWA-WDM-PHASE-35 10 mm^2 earth terminal: HWA-WDM-EARTH-10 35 mm^2 earth terminal: HWA-WDM-EARTH-35 Endplate: HWA-WDM-PLATE Terminal jumper (2): HWA-WDM-JUMPER-35-2 Terminal jumper (3): HWA-WDM-JUMPER-35-3
Gland for MI cold leads	In case of factory terminated MI heating units, supplied with MI units. For on-site assemblies, contact Tyco Thermal Controls or refer to DOC-606
Ordering details	
Order reference	JB-EX-25/35MM2
Part number (Weight)	1244-006654 (1.9 kg)

Raychem TRACER

Pyrotenax HEW-THERM

JB-EX-32/35MM2

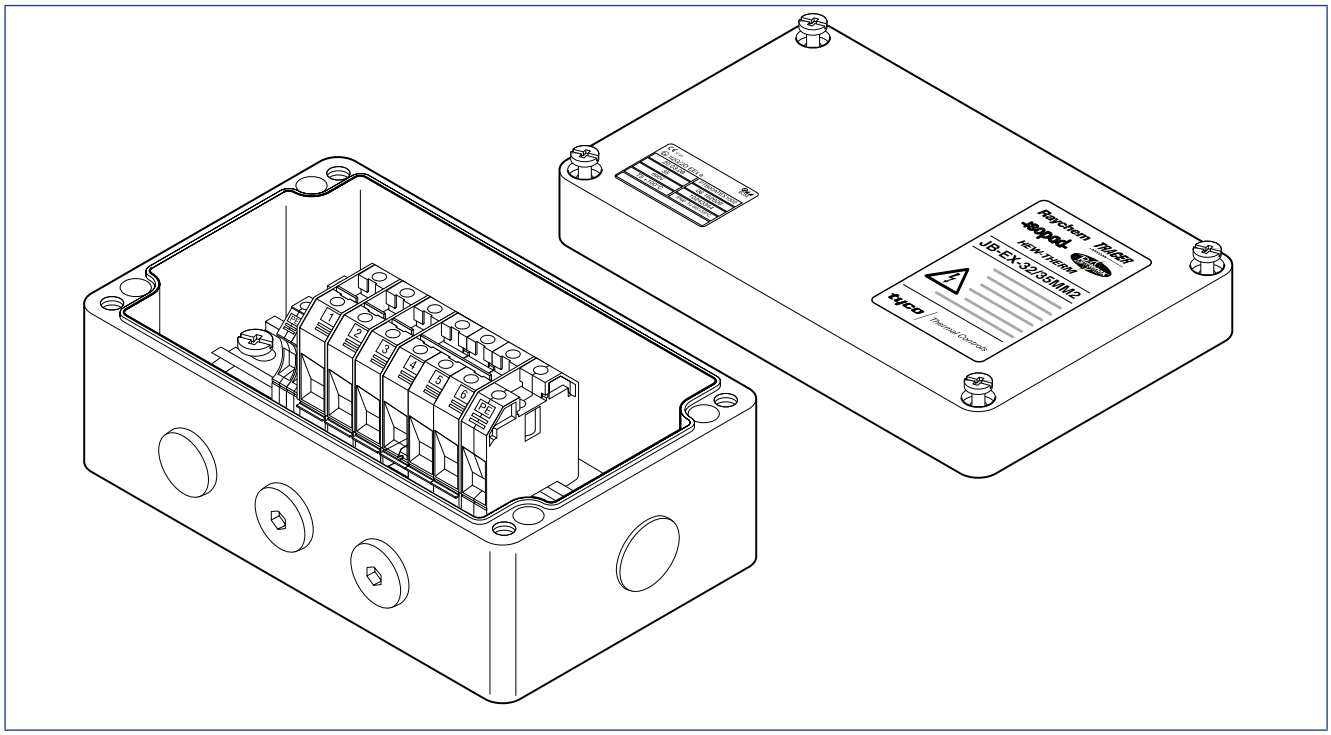
Multi purpose junction box

Industrial junction box for use in hazardous areas with MI heating cables when large terminal sizes are required. This box can be used to make connections between power cables, heating cables and cold lead cables. Depending on the configuration of the system, the box can accommodate multiple heating cables/cold leads and a power cable.

The M32 glands are already present in the case of factory terminated heating units. In case of on-site assemblies, refer to DOC-606 for detailed information about the required accessories.

Cable connection is accomplished via DIN rail mounted screw terminals from Weidmüller to provide safe, reliable and maintenance-free operation.

The box can be wall mounted via the four holes moulded in the base of the box.



COMPONENTS

Typical use

Power supply box, end-box, splice box for series heating cables (MI), when terminated with M32 glands. Marshalling box for power cables.

Entries

3 x M32
1 x M40

Kit contents

Junction box with screw terminals on DIN rail
2 x M32 stopping plugs
1 x M32 rain plug (temporary)
1 x M40 stopping plug

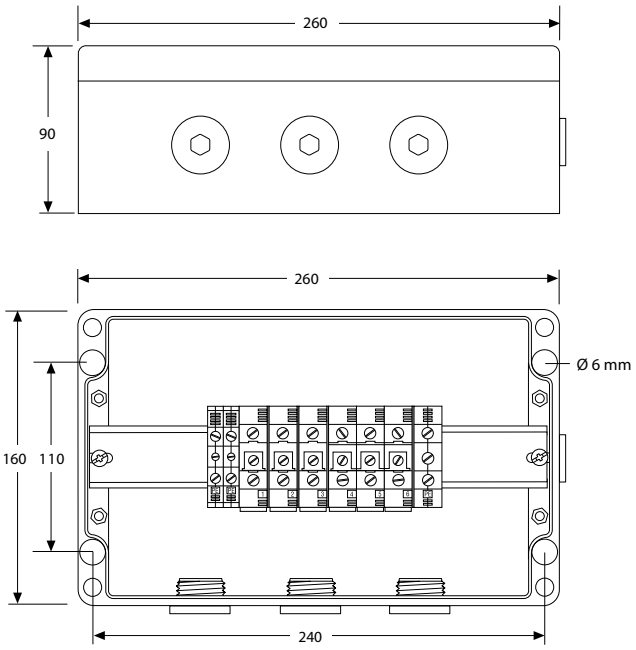
Approvals

PTB 00 ATEX 1002	Ex II 2G Ex edm ia [ia] IIC T6, T5 and T4
	Ex II 2D Ex tD A21 IP66 T85°C, T100°C and T135°C
IECEx PTB 08.0004	Ex e ia II, IIC T6, T5, T4
	Ex tD A21 IP66 T 85°C, T 100°C, T 135°C

This product also has all required approvals for use in Kazachstan, Russia and other countries. Contact your local Tyco Thermal Controls representative for more details.

Materials of construction	
Box & lid	Electrostatic charge-resistant glass-filled engineered polymer, black
Sealing gasket	Silicone rubber
Lid fixing screws	Stainless steel (captive)
Ingress protection	
	IP66
Ambient temperature range	
	–50°C to +55°C

Dimensions (in mm)



Terminals	
Quantity & type	6 pcs WDU35 screw terminals, 3 separate and 3 bridged, 2 pcs WPE10 earth terminals for heating cable earth leads, 1 pc WPE35 earth terminal for power cable, Junction box can accomodate up to 6 fully loaded phase/neutral terminals (maximum 10 terminals in total)
Labelling	1, 2, 3, 4, 5, 6 + 3 x PE
Minimum conductor size	2.5 mm^2 stranded & solid
Maximum conductor size	35 mm^2 stranded & 16 mm^2 solid
Maximum operating voltage	690 Vac
Maximum operating current	100 A
Accessories (to be ordered separately)	
Glands for power cables	GL-51-M40 hazardous area approved gland for cables Ø 17-28 mm GL-45-M32 hazardous area approved gland for cables Ø 12-21 mm
Reducer	REDUCER-M40/32-EEXE hazardous area M40 male to M32 female reducer REDUCER-M32/25-EEXE hazardous area M32 male to M25 female reducer
Loose terminals	35 mm^2 phase/neutral terminal: HWA-WDM-PHASE-35 10 mm^2 earth terminal: HWA-WDM-EARTH-10 35 mm^2 earth terminal: HWA-WDM-EARTH-35 Endplate: HWA-WDM-PLATE Terminal jumper (2): HWA-WDM-JUMPER-35-2 Terminal jumper (3): HWA-WDM-JUMPER-35-3
Gland for MI cold leads	In case of factory terminated units, already present. For on-site assemblies, contact Tyco Thermal Controls or refer to DOC-606
Ordering details	
Order reference	JB-EX-32/35MM2
Part number (Weight)	1244-006655 (1.9 kg)

Cold applied connection kit

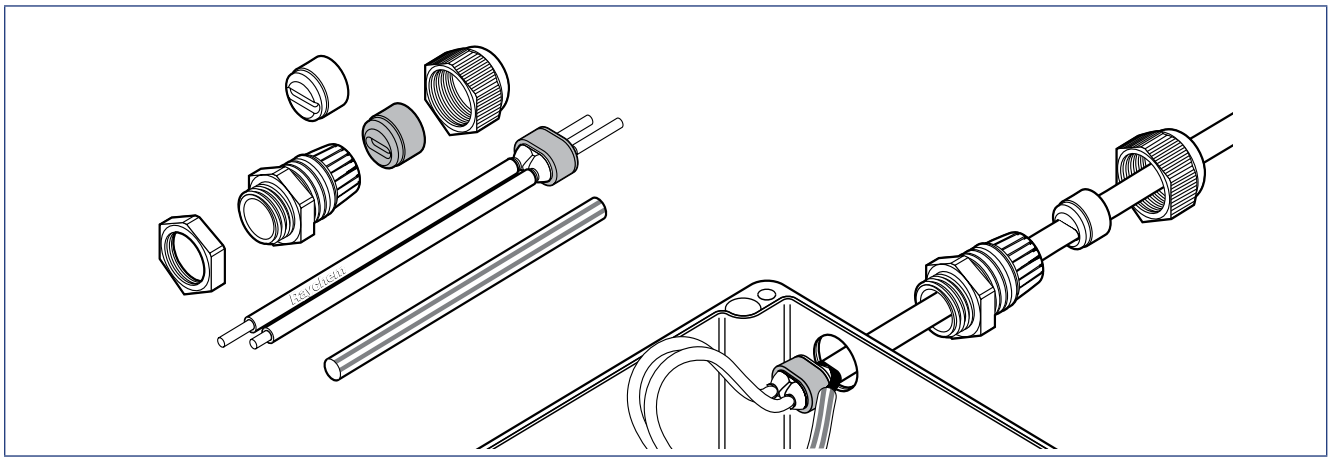
This connection kit is designed for terminating all Raychem BTV, QTVR, XTV, KTV and VPL industrial parallel heating cables to a junction box, whilst maintaining electrical insulation of the heating cable conductors and core.

It is approved for use in hazardous areas.

The core sealing boot does not require a heat gun or torch for the installation (no hot work permit necessary). The non-curing sealant (silicone free) allows easy installation and facilitates maintenance purposes.

Two grommets supplied in this kit enable the gland to maintain optimum sealing under various ambient conditions.

An additional locknut is provided for unthreaded entries.



Application

Connection kit for BTV, QTVR, XTV, KTV and VPL parallel heating cables.

Kit contents

1 gland, 2 grommets, 1 locknut, 1 core sealer, 1 green/yellow tube,
1 installation instruction (multilingual)

Approvals

PTB 09 ATEX 1063 U	Ⓔx II 2G Ex e II
	Ⓔx II 2D Ex tD A21 IP66
IECEx PTB 09.0040U	Ex e II
	Ex tD A21 IP66
	DNV Certificate No. E-11564 and E-11565

These products also have all required approvals for use in Kazachstan, Russia and other countries. Contact your local Tyco Thermal Controls representative for more details.

Product specification

Area classification	Hazardous, Zone 1, Zone 2 (Gas), Zone 21, Zone 22 (Dust) Ordinary
Type	Cold applied
Thread size	M25 x 1.5
Min. ambient temperature	–50°C
Max. exposure temperature (gland)	110°C

Ordering details

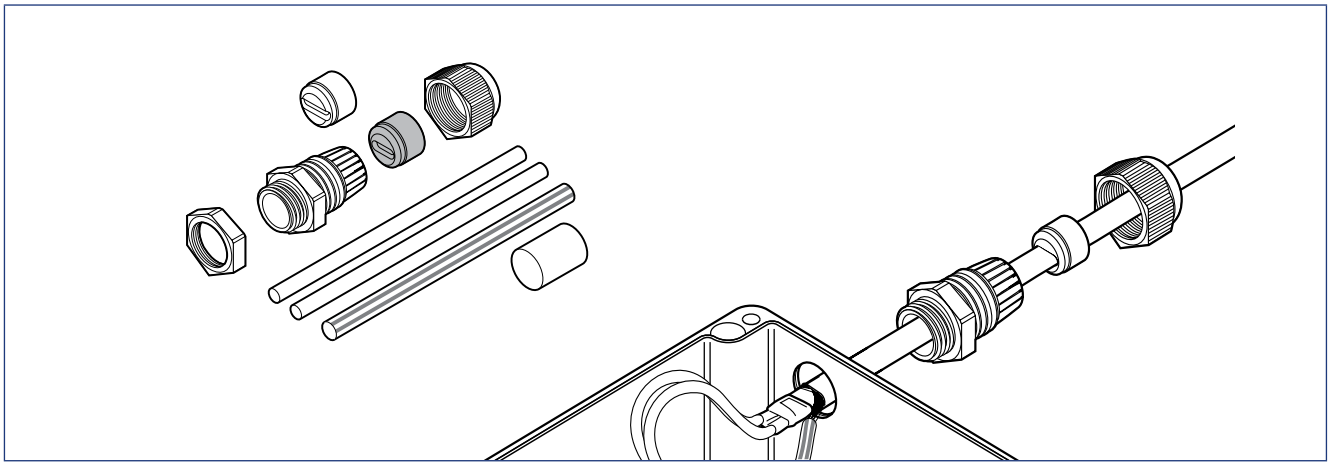
Part description	C25-100
PN (Weight)	263012-000 (0.07 kg)

Heat-shrink connection kit

This connection kit is designed for terminating all Raychem BTV, QTVR, XTV, KTV and VPL industrial parallel heating cables to a junction box, whilst maintaining electrical insulation of the heating cable conductors and core.

The sealing of the heating cable core is provided by Raychem heat-shrinkable sleeves. Two grommets supplied in this kit enable the gland to maintain optimum sealing under various ambient conditions.

An additional locknut is provided for unthreaded entries.



Application

Connection kit for BTV, QTVR, XTV, KTV and VPL parallel heating cables

Kit contents

1 gland,
2 grommets,
1 locknut,
1 green/yellow tube, heat-shrinkable sleeves for core sealing,
1 installation instruction (multilingual)

Approvals

The kit is certified as part of the system approval of the various heating cables.

BTV	QTVR	XTV	KTV	VPL
Baseefa06ATEX0183X	Baseefa06ATEX0185X	Baseefa06ATEX0184X	Baseefa06ATEX0186X	Baseefa06ATEX0188X
IECEx BAS 06.0043X	IECEx BAS 06.0045X	IECEx BAS 06.0044X	IECEx BAS 06.0046X	IECEx BAS 06.0048X

Ⓔx II 2G Ex e II II 2D Ex tD A21 IP66

Ⓔx Ex e II Ex tD A21 IP66

This product also has all required approvals for use in Kazachstan, Russia and other countries. Contact your local Tyco Thermal Controls representative for more details.

Product specification

Area classification	Hazardous, Zone 1, Zone 2 (Gas), Zone 21, Zone 22 (Dust) Ordinary
Type	Heat-shrinkable
Thread size	M25 x 1.5
Min. ambient temperature	-55°C to -50°C
Max. exposure temperature (gland)	110°C
IP ingress protection rating	IP66

Ordering details

Part description	C25-21
PN (Weight)	311147-000 (0.06 kg)

Raychem

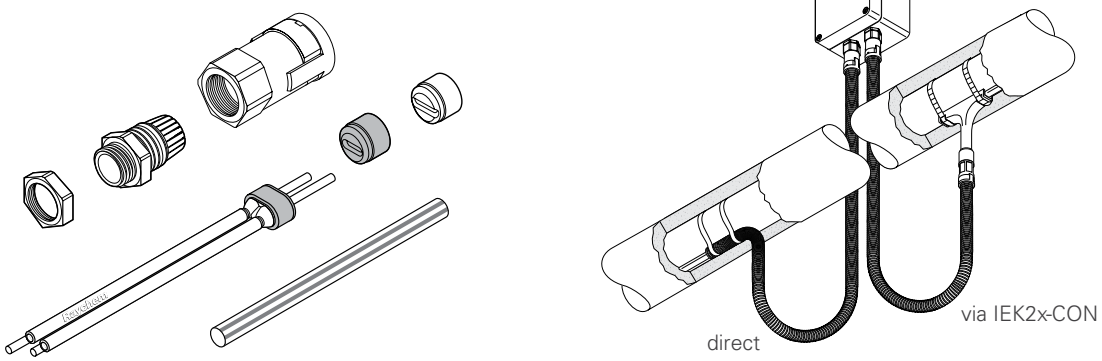
CCON25-100

Cold applied conduit connection kit

This connection kit is designed for terminating all Raychem BTV, QTVR, XTV, KTV and VPL parallel industrial heating cables to a junction box, whilst maintaining electrical insulation of the heating cable conductors and core as well as providing a reliable and sealed connection to a conduit system. It is approved for use in hazardous locations.

The conduit system will provide supplementary mechanical protection of the heating cable between a junction box and the entry into the insulation. The conduit connection is fast and reliable and allows simple installation whilst maintaining an IP66 seal. The kit can be used with various types of conduits which can be cut-to-length as required in the field. The core sealing boot for the heating cable does not require a heat gun or torch for the installation (no need for a hot work permit). The non-curing sealant (silicone free) allows easy installation and facilitates maintenance purposes.

The conduit and eventually required insulation entry kit needs to be purchased separately.



Application	
	Connection kit with conduit adaptor for BTV, QTVR, XTV, KTV and VPL parallel industrial heating cables
Kit contents	
	1 gland body, 1 conduit adaptor including safety retention clip, 2 grommets, 1 locknut, 1 core sealer, 1 green/yellow tube, 1 installation instruction (multilingual)
Approvals	
	SEV 05 ATEX 0147U II 2G Ex e IIC Ta -55...+40°C II 2D Ex tD A21 IP66 Ta - 55...+40°C This product also has all required approvals for use in Kazachstan, Russia and other countries. Contact local Tyco Thermal Controls representative for more details.
Product specification	
Area classification	Hazardous, Zone 1, Zone 2 (Gas), Zone 21, Zone 22 (Dust)
Thread size	M25 x 1.5
Conduit compatibility	ND 23 mm, Tyco Thermal Controls conduits type CCON25-C…
Ambient temperature	–55°C to +40°C
IP ingress protection rating	IP66
Surface resistance	< 1GΩ according to the requirements of EN 60079-0 and EN 61241-0 for use in hazardous areas
Ordering details	
Part description	CCON25-100
PN (weight)	1244-003272 (0.075 kg)
Accessories	
	For suitable conduits and insulation entry kits refer to the datasheet for CCON2x-C...

Cold applied metal connection kit

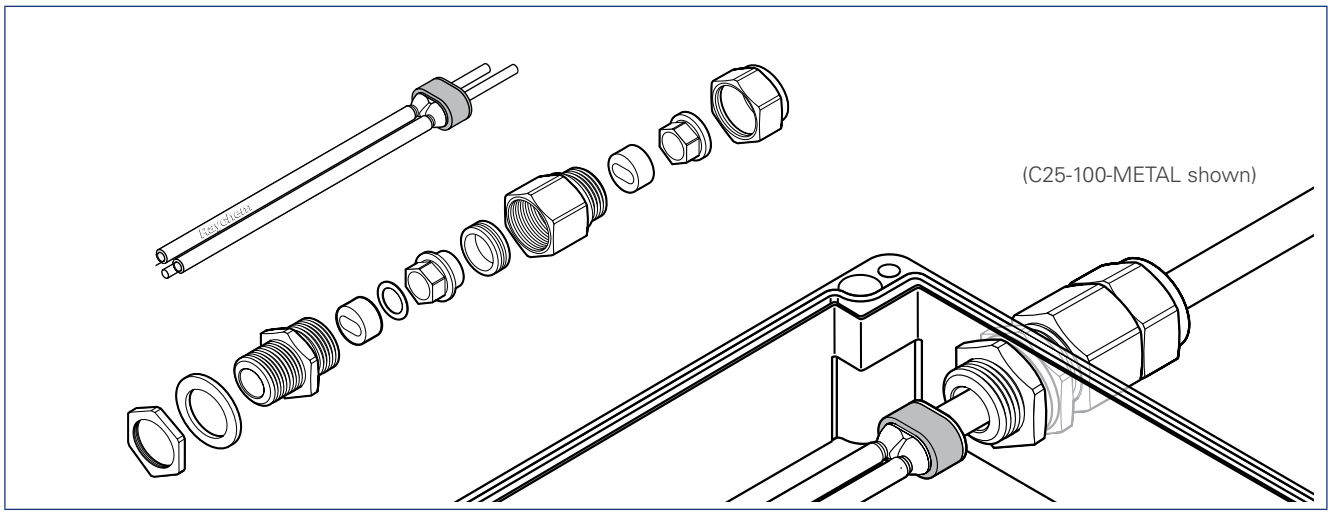
These connection kits are designed for terminating all Raychem BTV, QTVR, XTV, KTV and VPL industrial parallel heating cables to a junction box, whilst maintaining electrical insulation of the heating cable conductors and core.

The braid is directly connected to the metal gland body. The connection kits can be used with metal boxes or plastic boxes with internal earthing plate. They are approved for use in hazardous areas.

The core sealing boot does not require a heat gun or torch for the installation (no hot work permit necessary). The non-curing sealant (silicone free) allows easy installation and facilitates maintenance purposes.

The C25-100-METAL kit is designed for use with M25 entries, the C3/4-100-METAL for 3/4" NPT entries.

A metal locknut is provided for earth bonding in plastic junction boxes.



Application

Connection kit for BTV, QTVR, XTV, KTV and VPL parallel heating cables

Kit contents

1 gland,
2 grommets,
1 locknut and sealing washer (only M25),
1 core sealer,
1 installation instruction (multilingual).

Approvals

Sira 01ATEX1270X
II 2GD Ex d IIC Ex tD A21 IP68
II 2GD Ex e IIC Ex tD A21 IP68
IECEx SIR 05.0020X
Ex d IIC Ex e II Ex tD A21 IP6X
(complete kit also referred in heating cable system approvals)

This product also has all required approvals for use in Kazachstan, Russia and other countries. Contact your local Tyco Thermal Controls representative for more details.

	C25-100-METAL	C3/4-100-METAL
Specification for gland		
Area classification	Hazardous Zone 1 and 2 (Gas), Zone 21 and 22 (Dust), ordinary In- and outdoors	Hazardous Zone 1 and 2 (Gas), Zone 21 and 22 (Dust), ordinary In- and outdoors
Thread size	M25 x 1.5	3/4" NPT
Gland material	Brass	Brass
Min. ambient temperature	–60°C	–60°C
Max. exposure temperature	180°C	180°C
Ordering details		
Part description	C25-100-METAL	C3/4-100-METAL
PN (Weight)	875016-000 (0.31 kg)	440588-000 (0.3 kg)
Accessories		
Part description	C25-100-METAL-NP	C3/4-100-METAL-NP
PN (Weight)	1244-002296 (0.31 kg)	1244-001350 (0.3 kg)

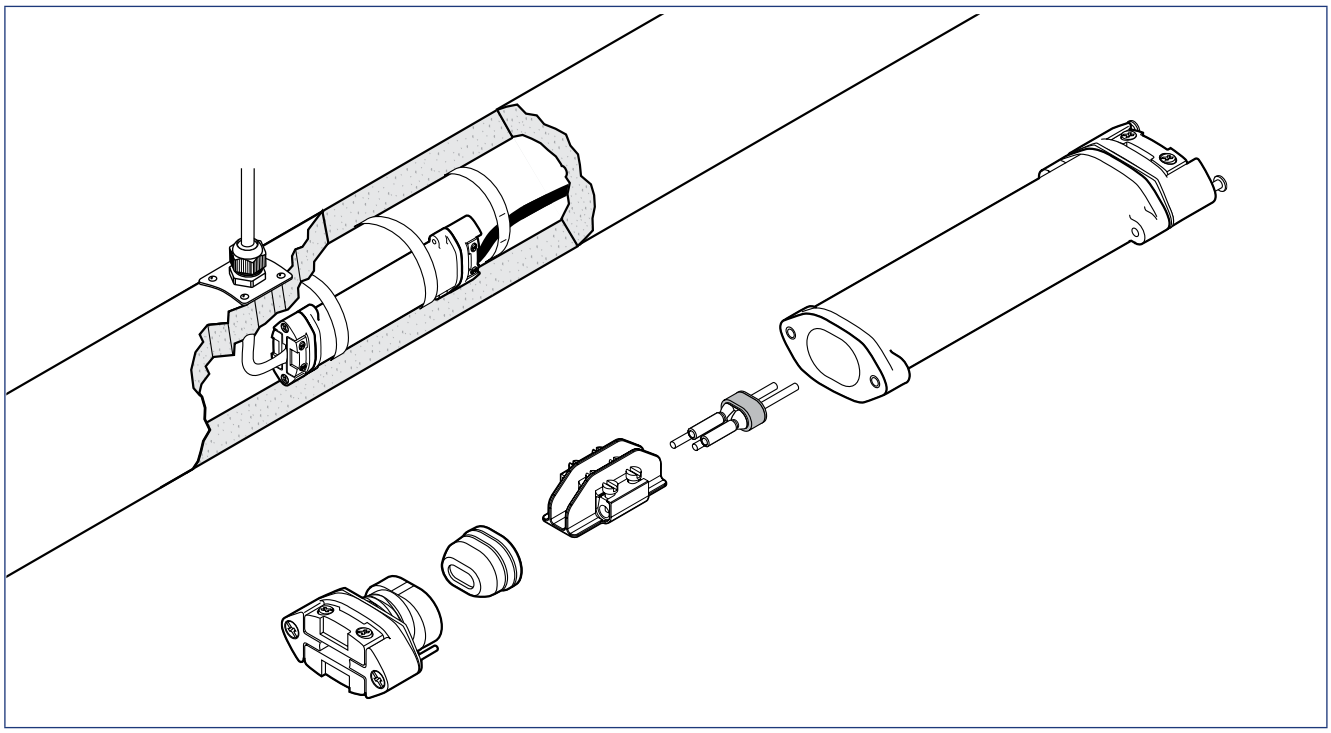
Cold applied low profile power connection

The C-150-E is a cold applied low profile power connection. The kit enables in line connection of Raychem industrial heating cables, BTV, QTVR, XTV and KTV, to a flexible power cable. It can be used in applications with temperature ratings from –50°C to 215°C. It is approved for use in hazardous areas.

A Raychem supplied power cable such as C-150-PC may be used or any suitable standard industrial power cable type 3 x 1.5 mm^2 or 3 x 2.5 mm^2 with stranded copper conductors and an outer insulation jacket. The power cable is connected by means of screw terminals to the conductors and the braid of the heating cable.

C-150-E is used as connector:

- where connection to a junction box is difficult e.g. because of space limitation
- on instrument lines or loading arms
- where installation of "under insulation" components is preferred
- as a cost effective solution for short heat-tracing lines as an alternative for JBS-100.



Description

Cold applied low profile splice for connection of BTV, QTVR, XTV and KTV heating cables to a power cable

Kit contents

1 splice housing assembly including
- 1 sealing grommet assembly for heater
- 1 pressure plate/strain relief assembly

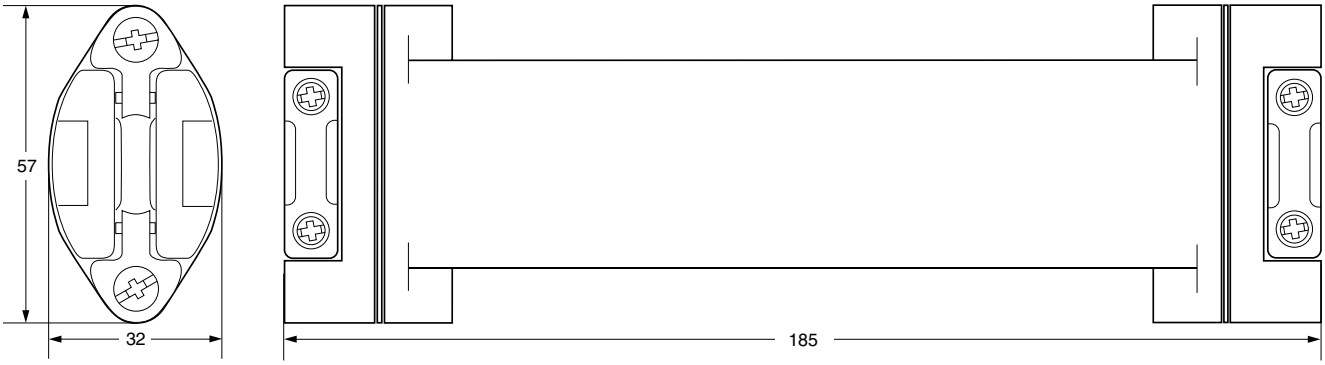
1 core sealer for heater
1 spacer including screw terminal
1 sealing grommet assembly for the power cable
1 pressure plate/strain relief assembly for the power cable
1 identification label
1 installation instruction

Approvals

Ex e II PTB 09 ATEX 1068 U
II 2G Ex e II
II 2D Ex tD A21 IP66
IECEx PTB 09.0043U
Ex e II
Ex tD A21 IP66
DNV approval
DNV Certificate No. E-11564 and E-11565

This product also has all required approvals for use in Kazachstan, Russia and other countries. Contact your local Tyco Thermal Controls representative for more details.

Dimensions (in mm)



Product specifications

Heating cable capability	BTV-CR, BTV-CT, QTVR-CT, XTV-CT, KTV-CT	
Power cable capability	For use with Raychem's high temperature power cable C-150-PC or for use with other flexible cable such as: H07RN-F, Silicone insulated cables. Minimum and maximum installation and operating temperatures, given by cable manufacturer, have to be considered by designer and installer.	
Power cable dimension	-> outer diameter range 7.8 mm - 12.5 mm -> 3 stranded copper conductors (3 x 2.5 mm^2 or 3 x 1.5 mm^2) -> temperature range depending on the application	
Maximum power cable length	Depending on power cable voltage drop and maximum current for Raychem power cable C-150-PC (3 x 2.5 mm^2):	
	CB 16 A	40 m
	CB 20 A	32 m
	CB 25 A	25 m
Ingress protection	IP66	
Minimum installation temperature	–50°C	
Maximum pipe temperature	refer to heating cable specification	
Maximum operating voltage	277 Vac	
Maximum current rating	depending on the power cable used and maximum current	

Construction Materials

Housing, end plate, shim and spacer	Engineering polymers, black
Sealing grommets	Silicone rubber
Screws, compression spring	Stainless steel

Ordering details

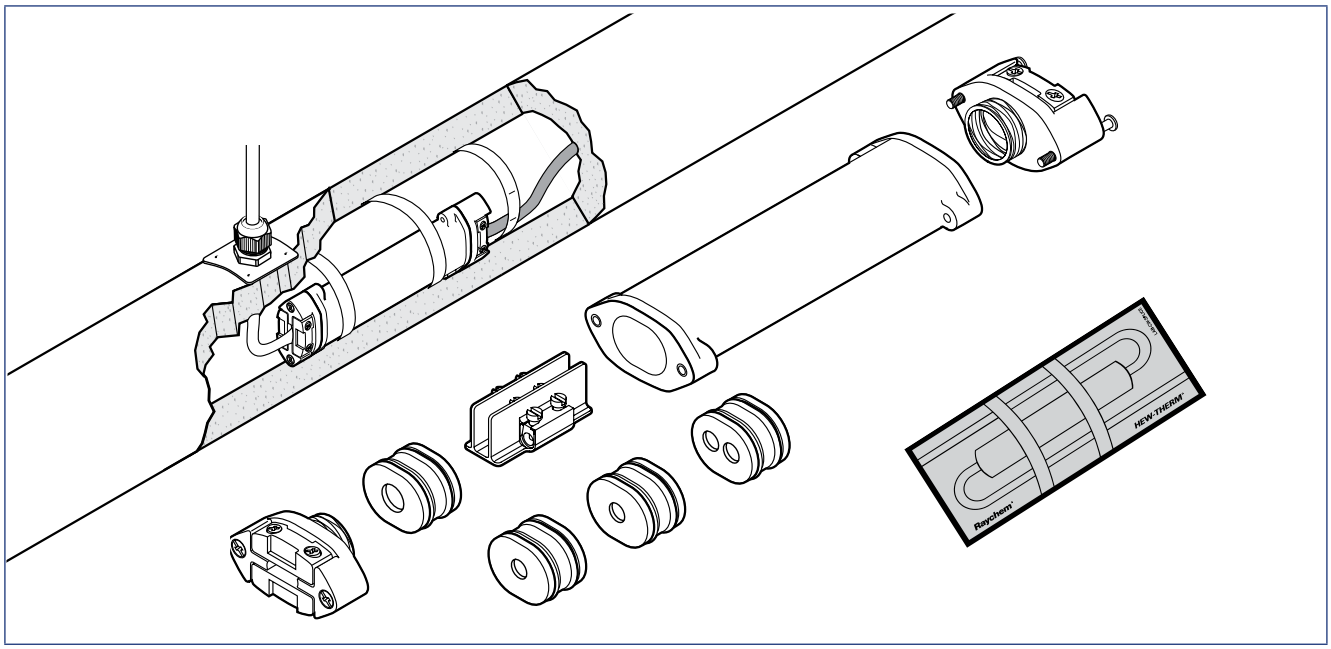
Part description	C-150-E
PN (Weight)	073704-000 (0.4 kg/0.8 lb)
Pack size	1 bag

Accessories

Power cable	C-150-PC 3-core flexible power cable for connection to C-150-E, 3 x 2.5 mm^2, silicone insulation, temperature range: –40°C to +180°C, short term: 215°C

Cold applied low profile power connection

The CS-150-UNI-PI is a universal low profile heating cable connector for the direct connection of single conductor Polymer Insulated (PI) series heating cables. It can be used in different configurations: for the connection of a cold lead to a heating cable (Variant C), as an under insulation connecting system for the connection of a three core power cable to a heating cable loop (Variant L), as well as for splicing two heating cables (Variant S). The connector is certified for use in hazardous areas and doesn't require a hot work permit. The electrical connection is realized by means of screw terminals, so no special crimp tools are required. If used as a connection kit, an additional gland needs to be ordered separately.



Application

"Cold" applied connection/splice for a single conductor polymer insulated (PI) series heating cables with an external diameter between 3.2 and 6.4 mm.

In hazardous area use only with ATEX approved heating cable.

The CS-150-UNI-PI can be used in different configurations:

- connection of a heating cable to a cold lead cable 1 x 2.5 mm^2 or 1 x 4 mm^2 (Variant C)
- connection of a heating cable to a power cable 3 x 2.5 mm^2 (Variant L)
- splice of two heating cables (Variant S)

Kit contents

1 x temperature resistant and impact proof body.
1 x screw terminal block
4 x rubber seals (to be used according to application)
2 x strain relieve clamps with screws
1 x identification label
1 x tube of lubricant
1 x installation instruction

Approvals

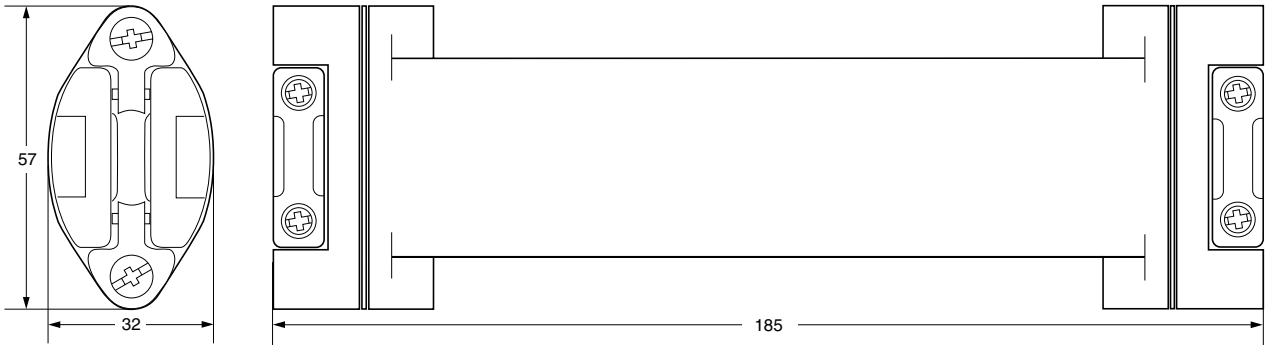
PTB 09 ATEX 1067U
Ⓔx II 2G Ex e II
Ⓔx II 2D Ex tD A21 IP66
IECEx PTB 09.0042U
Ex e II
Ex tD A21 IP 66
Ex e II / Ex tD A21 IP66

This product also has all required approvals for use in Kazachstan, Russia and other countries. Contact your local Tyco Thermal Controls representative for more details.

Particular measures to maintain the T-classification of polymer insulated heating cables are to be taken in accordance with the appropriate EC - Type examination certificate (also refer to installation instructions).

Type examination certification applies for the use of ATEX certified polymer insulated (PI) series heating cables.

Dimensions (in mm)



Heating cable types

Heating cable capability	XPI-NH, XPI and XPI-S polymer insulated (PI) series resistance cable, for other types contact Tyco Thermal Controls

Materials of construction

Housing, connection	Glass fibre reinforced temperature resistant engineering plastic
Support ring, spacer, screws and spring	Stainless steel
Cable seals	Silicon rubber

Maximum operating temperature (*)

Power on: 180°C (may be limited by the temperature resistance of the supply cable)
Power off: 210°C (using variant L, dependent on the type of supply cable e.g. 200°C for silicon cables, unless the power cable connection is bent sufficiently far away from the heated surface).

Minimum installation temperature

–50°C

Max. operating voltage

Variant C and S = 750 Vac
Variant L = 420 Vac

Max. allowed wattage

The max. allowed cable output is limited depending on the application. Refer to the installation instruction for details.

Max. permitted nominal current (*)

Variant S: 32 A
Variant C with 1 x 2.5 mm^2 supply cable: 25 A
Variant C with 1 x 4 mm^2 supply cable: 32 A
Variant L with 3 x 2.5 mm^2 supply cable up to 150°C: 25 A
Variant L with 3 x 2.5 mm^2 supply cable 151°C to 180°C: 20 A

Supply cable dimensions

-> Multi-stranded copper conductors 3 x 2.5 mm^2, Ø 7.8 -12.5 mm^2
-> Single conductor cold lead, max. 1 x 4 mm^2, Ø 3.2 - 6.4 mm

Supply cable requirements	
	The maximum permissible voltage drop is to be taken into consideration when selecting the cross-section of the power cable. The maximum working temperature of the CS-150-UNI-PI can be reduced through the maximum permitted continuous use temperature of the supply cable, unless the supply cable is laid (at a sufficient distance from the heated surface) so that the maximum permitted continuous use temperature will not be exceeded. A suitable power cable is the silicon insulated cable type C-150-PC.
Accessories	
Cable gland	GL-36-M25 hazardous area approved gland for 8-17 mm power cables diameter GL-44-M20-KIT hazardous area approved gland for PI cables.
Ordering details	
Order reference	CS-150-UNI-PI
Part number (Weight)	A45371-000 (0.4 kg)

(*) For the full range of technical design details of the CS-150-UNI-PI refer to the installation instructions (INSTALL-064)

Cold applied connection and splice kit with silicone sealing for Polymer Insulated (PI) heating cables

The kits CS-150-xx-PI are designed to connect a PI cold lead cable to a polymer insulated (PI) series heating cable as well as to splice two PI heating cables. The kit employs a two component silicone compound to provide durable and flexible moisture proof encapsulation.

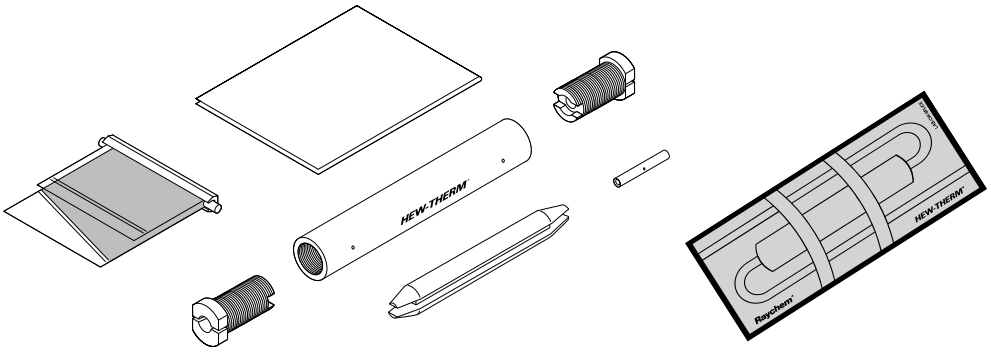
Electrical continuation is maintained via specially engineered crimps that provide a highly reliable electrical connection.

It is very important that the electrical crimp connections are performed with the correct crimp tool (PI-TOOL-xx).

Due to its low profile design, the connection can be easily installed under the insulation directly on the pipe. If used as a connection kit, a cable gland, an insulation entry kit as well as a crimp for the connection between the cold lead and the heating cable, need to be ordered separately. If used as a splice kit, just the heating cable conductor crimp is needed additionally.

For simplified installation- and maintenance work, we offer a crimp toolbox that contains the suitable installation tool, crimping dies and a variety of crimps exactly matching common cable types. For all details concerning the crimping system, refer to the datasheet of the electrical connection system for PI heating cables (PI-TOOL-SET-xx).

The conductor crimp is not included in the kit and has to be ordered separately.



Application

Cold applied silicone sealed connection/splice for PI heating cables.

Kit contents

1 x PTFE body
2 x PTFE plugs
1 x PTFE crimp separator
1 x two component silicone compound in plastic bag (shelf life is 12 months)
1 x identification label
1 x multilingual installation instruction

Approvals

PTB 08 ATEX 1101 U
II 2G Ex e II / II 2D EX tD A21 IP65
IECEx PTB 08.0050U
Ex e II 2G Ex e II / Ex tD A21 IP65

This product also has all required approvals for use in Kazachstan, Russia and other countries. Contact your local Tyco Thermal Controls representative for more details.

Dimensions

CS-150-2.5-PI: Overall length ~120 mm, Ø ~17 mm
CS-150-6-PI: Overall length ~120 mm, Ø ~26 mm
CS-150-25-PI: Overall length ~135 mm, Ø ~35 mm

Technical data			
	CS-150-2.5-PI	**CS-150-6-PI**	**CS-150-25-PI**
Max. operating temperature	200°C continuous, (260°C intermittent)		
Max. operating voltage	450 Vac nominal		
Max. operating current	Only limited by heating cable used		
Cable/Cold leads	Up to 2.5 mm^2	4 to 6 mm^2	10 to 25 mm^2
Ordering details			
Order reference	CS-150-2.5-PI	CS-150-6-PI	CS-150-25-PI
Part number (Weight)	1244-000586 (0.1 kg)	1244-000588 (0.2 kg)	1244-000587 (0.3 kg)
Accessories			
Cable gland for connection kit	GL-44-M20-KIT (one piece per cold lead connection; to be ordered separately)		

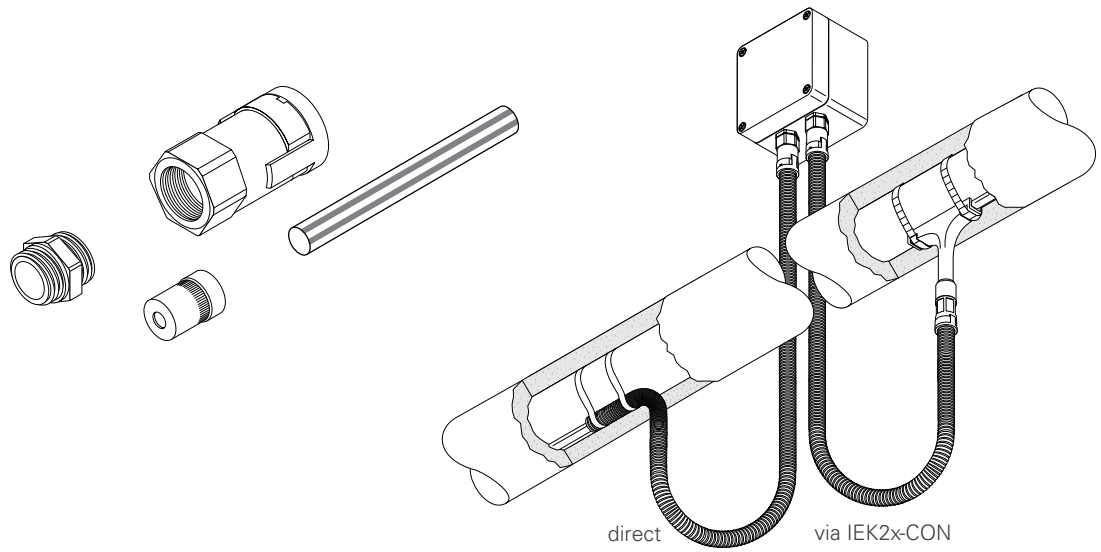
CCON20-100-PI

Cold applied conduit connection kit

This connection kit is designed for terminating the full range of HEW-THERM XPI polymer insulated series heating cables and cold leads in to a junction box, as well as providing a reliable and sealed connection to a conduit system.

It is approved for use in hazardous locations. The conduit system will provide supplementary mechanical protection of the heating cable or cold lead between a junction box and the entry into the insulation. The conduit connection is fast and reliable and allows simple installation whilst maintaining at all time an IP66 seal.

The kit can be used with various types of conduits which can be cut-to-length as required in the field. The kit exists in three different versions, depending on the outer diameter of the heating cable or cold lead to protect. The conduit and possibly required insulation entry kit need to be purchased separately.



Application

Connection kit with conduit adaptors for 2 PI series heating cables or cold lead cables

Kit contents

2 metal gland bodies,
2 conduit adaptors including safety retention clip,
2 grommets,
2 green/yellow tubes for braid,
1 installation instruction (multilingual)

Approvals

SEV 05 ATEX 0147U

II 2G Ex e IIC Ta -55...+40°C

II 2D Ex tD A21 IP66 Ta - 55...+40°C

This product also has all required approvals for use in Kazachstan, Russia and other countries. Contact your local Tyco Thermal Controls representative for more details.

Product specification			
Area classification	Hazardous, Zone 1, Zone 2 (Gas), Zone 21, Zone 22 (Dust)		
Thread size	M20 x 1.5		
Conduit compatibility	ND 17 mm, Tyco Thermal Controls conduits type CCON20-C.....		
Ambient temperature	–55°C to +40°C		
IP ingress protection rating	IP66		
Surface resistance	< 1GΩ according to the requirements of EN 60079-0 and EN 61241-0 for use in hazardous areas		
Technical data			
	CCON20-100-PI-A	**CCON20-100-PI-B**	**CCON20-100-PI-C**
PI cable diameter range	4.0 - 6.5 mm	6.5 – 9.5 mm	9.5 – 13 mm
Ordering details			
Part description	CCON20-100-PI-A	CCON20-100-PI-B	CCON20-100-PI-C
PN (Weight)	1244-003274 (0.1 kg)	1244-003276 (0.1 kg)	1244-003278 (0.1 kg)
Accessories			
	For suitable conduits and insulation entry kits refer to the datasheet for CCON2x-C...		

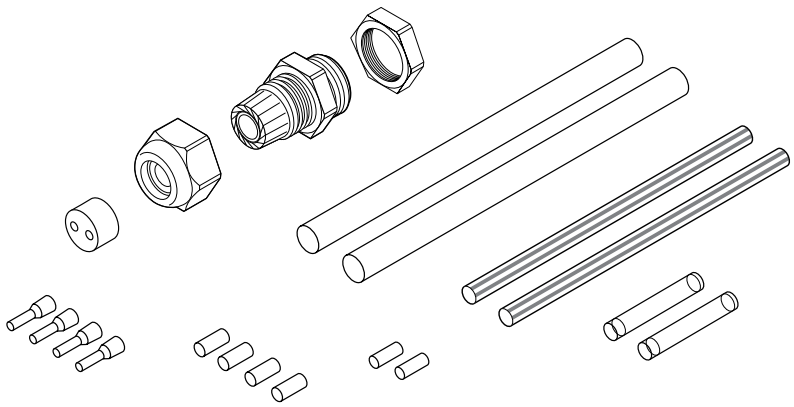
CS20-2.5-PI-NH

Heat-shrink connection or splice kit for PI heating cables

The CS20-2.5-PI-NH kit is designed for terminating polymer insulated (PI) series resistance heating cables.

The CS20-2.5-PI-NH may be used in non-hazardous areas only. The kit contains components required for the installation of either: a connection of (2) cold leads- to a heating cable or for (2) splices between two heating cables. The splice kit employs easy to use heat shrinkable tubing that after installation forms a semi-flexible moisture proof encapsulation. Electrical continuation is maintained via crimps for both conductor and braid. Thanks to its low profile design the finished connection can be easily installed under the insulation directly on the pipe. The kit is designed for use with junction boxes with M20 entries.

Each CS20-2.5-PI-NH kit contains 2 connection sets. The crimps must be installed using an appropriate crimp tool (CW-CT-KIT or equivalent).



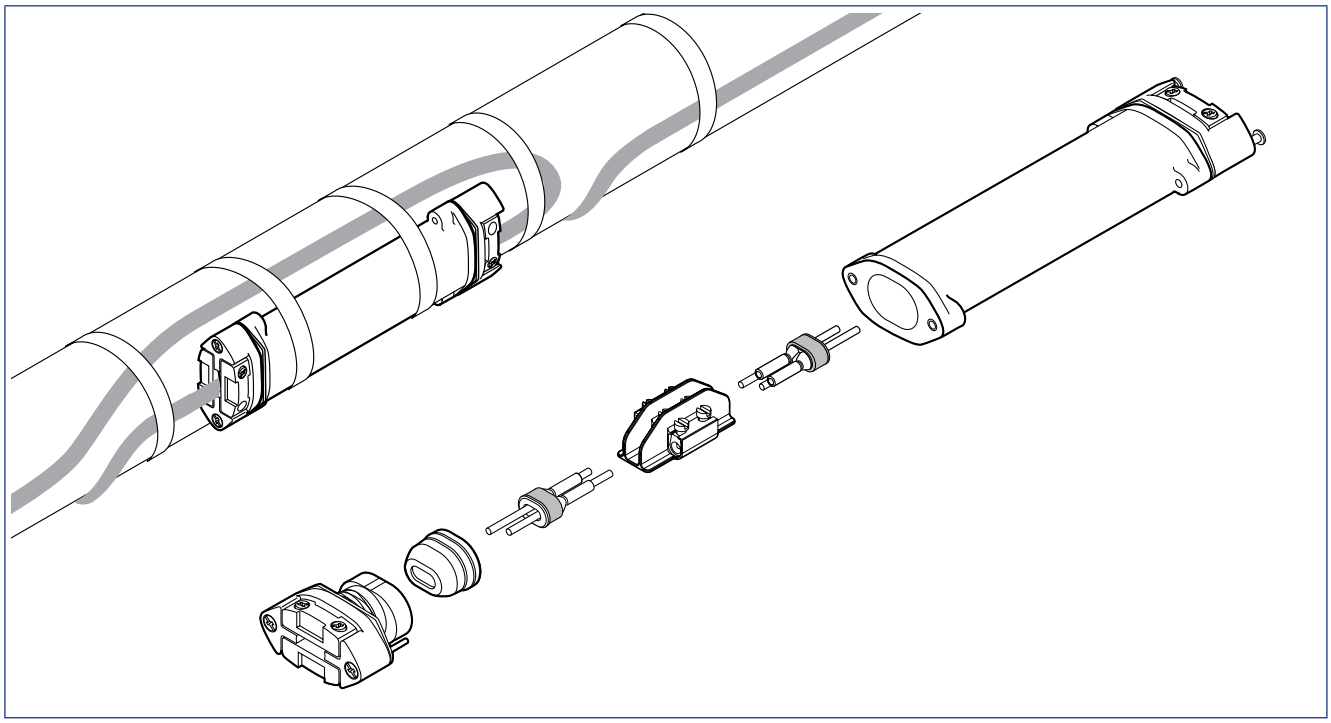
Application	
	Heat shrink based connection/splice kit for single core polymer series resistance heating cable.
Kit contents	
	4 x Heat shrinkable tubes (PTFE/FEP) 2 x green/yellow tube for the braid. 6 x Crimp connectors (crimp for conductor and braid) 1 x polyamide gland with dual hole sealing grommet M20 threaded, suitable for cables ranging from 4.8 to 7 mm diameter. 1 x Installation instruction
Approvals	
	Suitable for non hazardous area installation only.
Dimensions	
	Overall length ~130 mm, Ø ~10 mm
Technical data	
Max. cold lead size	2,5 mm^2
Max. operating temperature	205°C
Min. installation temperature	–50°C
Max. operating voltage	750 Vac
Max. operating current	25 A
Ordering details	
Order reference	CS20-2.5-PI-NH
Part number (Weight)	1244-000585 (0.1 kg)

Cold applied under insulation low profile splice

The S-150 is a cold applied low profile splice for in-line connection. This universal kit fits with all Raychem industrial heating cables, BTV, QTVR, XTV and KTV, meaning simplified product selection and reduced inventory to stock. It can be used in applications with temperatures ranging from –50°C to 215°C. It is approved for use in hazardous areas.

The unique design of the S-150 suits the demanding requirements of the industrial environment. The low profile housing can be installed on pipes and other surfaces. Spring loaded grommets make a first seal to maintain a water tight connection while the non-curing sealant (silicone free) used in Raychem's core sealer adds a second seal, providing additional protection. The rugged construction of the splice makes it resistant to impact and suitable for high temperature variations and aggressive chemical exposure. The connection is made using screw terminals. The splice is re-enterable. The S-150 is a safe under the insulation in-line splice that can be relied upon over time.

The splice requires no heat source for installation, making maintenance work fast and easy. Each kit contains all the necessary materials to do one in-line splice connection.



Description

Cold-applied in-line splice kit for use with BTV, QTVR, XTV and KTV heating cables.

Kit contents

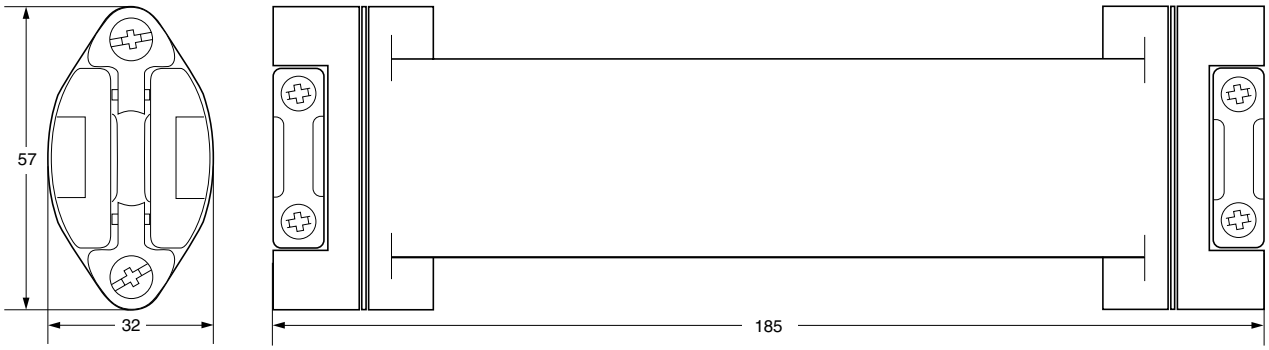
1 splice housing
2 sealing grommets
2 core sealers
1 spacer including screw terminals
1 identification label

Approvals

Ex e II PTB 09 ATEX 1068 U
II 2G Ex e II
II 2D Ex tD A21 IP66
IECEx PTB 09.0043U
Ex e II
Ex tD A21 IP66
DNV approval
DNV Certificate No. E-11564 and E-11565

This product also has all required approvals for use in Kazachstan, Russia and other countries. Contact your local Tyco Thermal Controls representative for more details.

Dimensions (in mm)



Product specifications	
Heating cable capability	BTV-CR, BTV-CT, QTVR-CT, XTV-CT, KTV-CT
Ingress protection	IP66
Minimum installation temperature	–50°C
Maximum pipe temperature	Refer to heating cable specification
Connection method	Screw terminals
Maximum operating voltage	277 Vac
Maximum current rating	40 A heating cable circuit for PTB

Materials of construction	
Housing, end plate, shim and spacer	Engineering polymers, black
Sealing grommets	Silicone rubber
Screws, compression spring	Stainless steel

Ordering details	
Splice connection	S-150
PN (Weight)	497537-000 (0.4 kg/0.8 lb.)

Heat-shrink under insulation in-line splice kit

These splice kits are designed for the in-line joining of Raychem selfregulating heating cables.

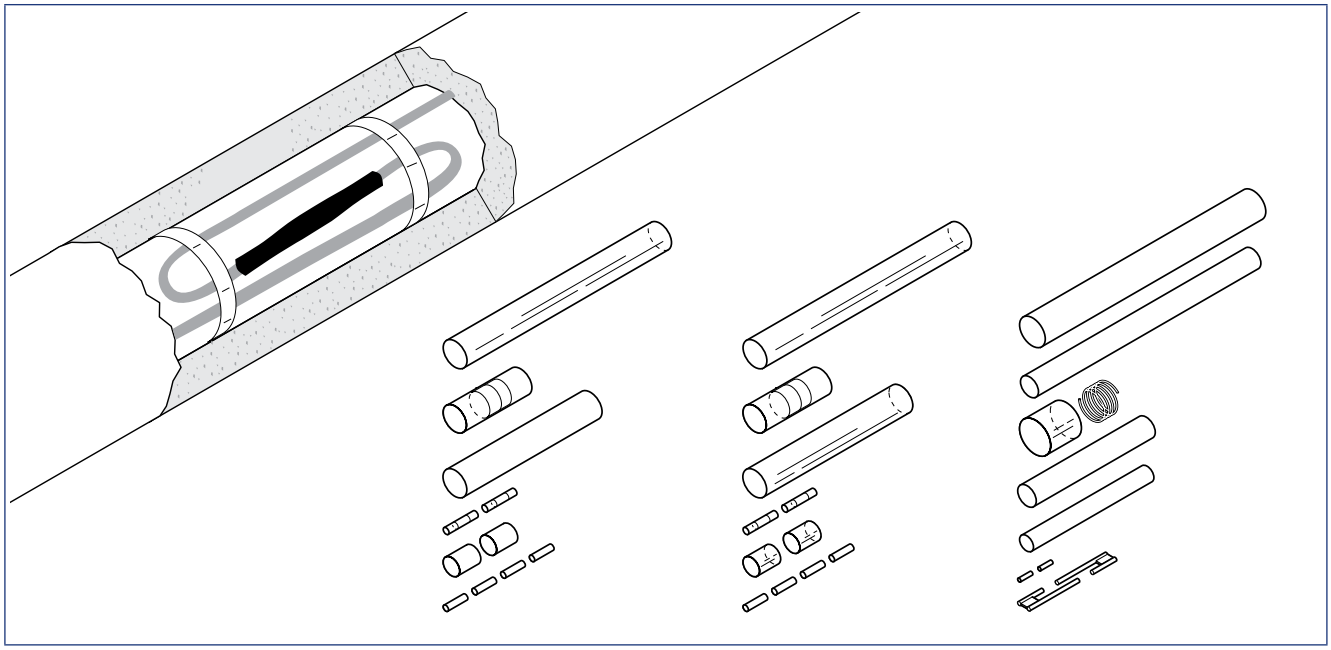
The kit S-19 is designed for use with BTV heating cables, the S-21 for QTVR and the S-69 is for use with XTV and KTV heating cables.

All kits are approved for use in hazardous areas.

The splice kits employ easy to use heat-shrinkable tubing with an adhesive, that when heated forms a semi-flexible moisture proof encapsulation.

Electrical continuation is maintained via crimps for the conductors and a solder connection for the braid of the heating cable.

Due to its low profile design the finished splice can be installed under the insulation, directly on the pipe.



	S-19	S-21	S-69
Application			
	In-line splice kit for BTV heating cables	In-line splice kit for QTVR heating cables	In-line splice kit for XTV and KTV heating cables
Kit contents			
	heat-shrinkable adhesive coated sleeves insulation sleeves solder sleeves crimps	heat-shrinkable adhesive coated sleeves insulation sleeves solder sleeves crimps	heat-shrinkable sleeves adhesive liners insulation sleeves high temperature solder crimps
Approvals			
	Ⓔx II 2G/D Ex e II by PTB and Baseefa Ltd. according to EN/IEC 60079-30-1 DNV Certificate No. E-11564 (S-19 & S-21) DNV Certificate No. E-11565 (S-69) This product also has all required approvals for use in Kazachstan, Russia and other countries. Contact your local Tyco Thermal Controls representative for more details.		

	S-19	S-21	S-69
Product specifications			
Max. exposure temperature	85°C	135°C	160°C
Maximum current rating	40 A	40 A	40 A
Dielectric strength	1.3 – 3.5 MV/m	2.2 MV/m	> 6 MV/m
Volume resistivity	10^{12} Ω cm	10^{13} Ω cm	10^{10} Ω cm
Final dimensions	length approx. 180 mm	length approx. 180 mm	length approx. 300 mm diameter approx. 20 mm
Installation details			
Heat shrinkable tubing	125°C and 175°C	125°C and 175°C	200°C
Solder	120°C	120°C	approx. 240°C
Gas torch or equivalent	min. 1460 W hot air gun	min. 1460 W hot air gun	min. 1460 W hot air gun
Ordering details			
Part description	S-19	S-21	S-69
PN (Weight)	669854-000 (0.05) kg	358745-000 (0.05 kg)	933309-000 (0.11 kg)

Splice or tee connection kit

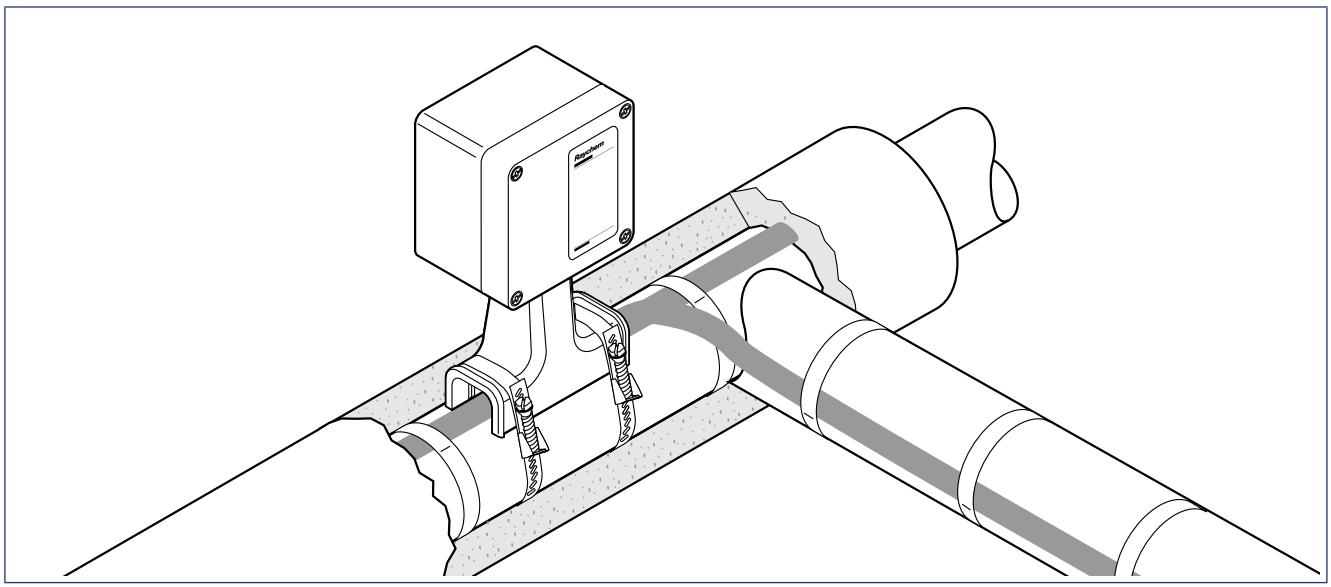
The T-100 is an above-insulation splice or tee kit, designed for use with up to three Raychem BTV, QTVR, XTV, KTV or VPL industrial parallel heating cables. It is approved for use in hazardous locations.

The rugged stand protects the heating cable and allows for up to 100 mm (4") of thermal insulation.

The core sealing boot does not require a heat gun or torch for the installation (no hot work permit necessary).

The non-curing sealant (silicone free) in the boot allows easy installation and facilitates maintenance.

The T-100 significantly reduces installation and maintenance time and effort.



Description

This kit is an above-insulation splice/tee, appropriate for use worldwide with no requirements for local customization.

Kit contents

1 splice/tee enclosure and lid
1 stand assembly
3 core sealers
3 green/yellow earthing sleeve
3 compression crimps
3 crimping insulating tubes
1 polywater sachet
1 spanner
1 strain relief assembly
2 grommet plugs
1 installation instruction

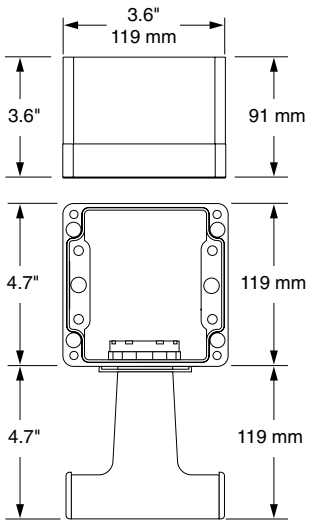
Approvals

Hazardous locations

FM APPROVED CSA -WS	Class I, Div. 2, Groups A, B, C, D Class II, Div. 1 & 2, Groups E, F, G Class III	PTB 09 ATEX 1043 U Ex II 2 G Ex e II Ex II 2 D tD A21 IP66 IECEx PTB 09.0023U Ex e II Ex tD A21 IP66
FM APPROVED	Class I, Zone 1, AEx e IIC	DNV approval DNV Certificates No. E-11564 and No. E-11565

This product also has all required approvals for use in Kazachstan, Russia and other countries. Contact your local Tyco Thermal Controls representative for more details.

Dimensions (in mm)

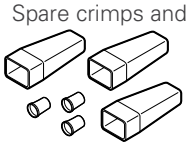


Product specifications	
Heating cable capability	BTV-CR, BTV-CT, QTVR-CT, XTV-CT, KTV-CT, VPL
Ingress protection	NEMA Type 4X IP66 and IP67
Min. installation temperature	–50°C
Max. pipe temperature	Refer to heating cable specification
Ambient temperature range:	–50°C to +56°C
Max. operating voltage	277 Vac for FM, CSA, 480 Vac for PTB
Max. continuous operating current	50 A heating cable circuit for FM, CSA 40 A heating cable circuit for PTB

Materials of construction	
Enclosure, lid, and stand	Electrostatic charge-resistant glass-filled engineered polymer, black
Lid screws	Stainless steel
Lid gasket	Silicone rubber

Ordering details	
Part description	T-100
PN (Weight)	447379-000 (2.5 lb /1.2 kg)

Accessories	
Crimp tool	T-100-CT (not included in the kit, equivalent to Panduit: CT-1570)
PN	954799-000
Spare crimps and insulating tubes	T-100-CRIMP-KIT (spare part only)



PN	577853-000
Small pipe adaptor	JBM-SPA, required for pipes ≤ 1" (DN 25), D55673-000 (bag of 5 adaptors)

Raychem

End seal and lighted end seal

Both the E-100-E and E-100-L2-E are accessible, re-entrable end seals, the E-100 without a light, the E-100-L with a signal light. Both end seals can be used with all Raychem BTV, QTVR, XTV, KTV or VPL industrial parallel heating cables. They are approved for use in hazardous areas. They are extremely rugged - made of a strong, moulded part with 4 mm wall thickness.

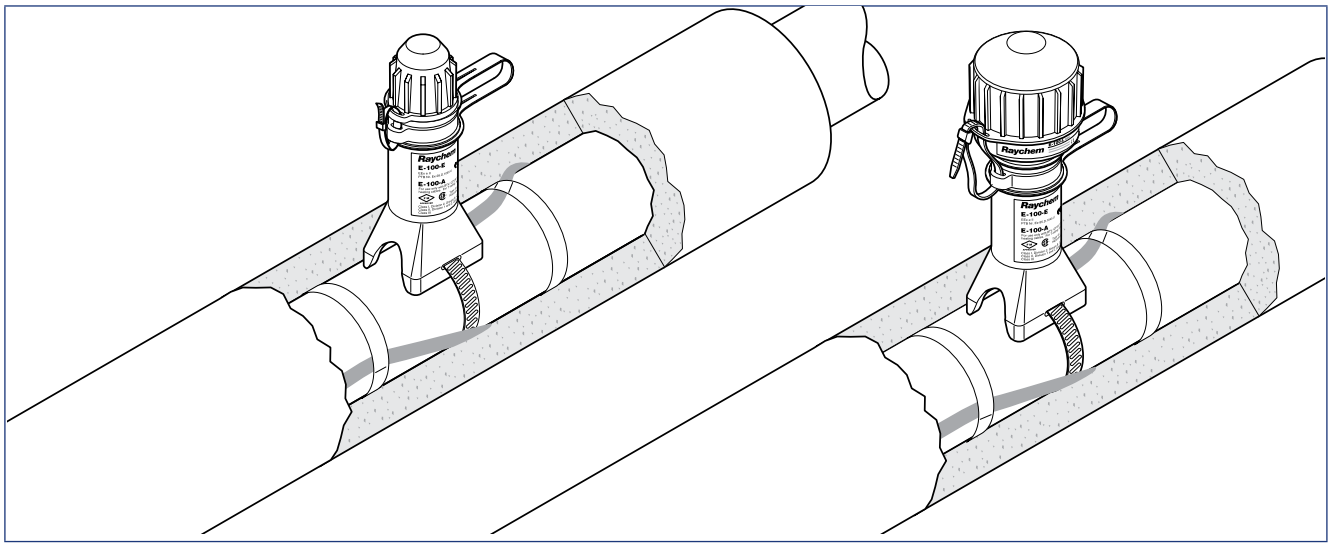
The heating cable is firmly kept in place by the integral strain relief.

Sealing is done twice. First a dry compartment for the heating cable is created, then a boot filled with a non-curing sealant (silicone free) is placed over the end of the heating cable inside the compartment.

The end seals are mounted on the pipe and project through the cladding.

The light module of the E-100-L2-E uses an array of super-bright green LEDs for long life and excellent visibility from almost any angle. The robust industrial-grade electronics are encapsulated to reliably seal out moisture.

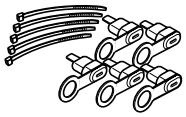
Extra sealant filled boots for the E-100-E end seal can be ordered separately.



	E-100-E	E-100-L2-E
Kit contents		
	1 end seal 1 cable tie 1 polywater sachet 1 installation instruction	1 end seal with indicator light 1 cable tie 1 polywater sachet 2 spare crimps 2 crimps for VPL 1 installation instruction
Approval data		
Area of use	Hazardous or ordinary (indoors and outdoors)	
Approvals		
	PTB 09 ATEX 1060 U Ex II 2G Ex e II Ex II 2D Ex tD A21 IP66 IECEx PTB 09.0038U Ex e II Ex tD A21 IP66 SP Ex e II T* DNV Certificate No. E-11564 and E-11565	PTB 09 ATEX 1060 U Ex II 2G Ex e (e mb) II Ex II 2D Ex tD (tD mbD) A21 IP66 IECEx PTB 09.0038U Ex e (e mb) II Ex tD (td mbD) A21 IP66 SP Ex em II T* DNV Certificate No. E-11564 and E-11565

** For T-rating, see heating cable or design documentation*

This product also has all required approvals for use in Kazachstan, Russia and other countries. Contact your local Tyco Thermal Controls representative for more details.

	E-100-E	E-100-L2-E
Product specifications		
Max. pipe temperature	Refer to heating cable specification (absolute maximum is 260°C)	
Max. operating voltage	480 V* ** Extra conditions for safe use apply for voltages above 277 V. Please refer to the summary on page 170, the certificate or installation instructions for full details.*	254 V
Ambient temperature range	–50°C to +56°C* ** Extra conditions for safe use apply for ambient temperatures above +40°C. Please refer to the summary on page 170, the certificate or installation instructions for full details.*	–40°C to +40°C
Min. installation temperature	–50°C	–50°C
Overall height	171 mm approx.	197 mm approx.
Outer diameter	46 mm approx. Usable with up to 100 mm thermal insulation	66 mm approx.
Ingress protection	IP66	IP66
Impact resistance	EN 60079-30-1, ≥ 7 joules	EN 60079-30-1, ≥ 7 joules
UV stability	No degradation after > 1000 h	No degradation after > 1000 h
Solvent resistance	Excellent	Excellent
Strain relief	> 250 N	> 250 N
Light source		
Type		Green LEDs
Voltage rating range		208-230 Vac, 50/60 Hz
Power consumption		< 2 W
Electromagnetic immunity/emissions		Complies with EN 50 082-2:1995, EN 50 081-1:1991
Vibration resistance		Complies with IEC 60068-2-6, 10-150 Hz, 20 m/s2
Shock resistance		Complies with IEC 60068-2-7, 50 g, 11 ms
Installation data		
Tools required	Cable knife, wire cutters, screwdriver	Cable knife, wire cutters, screwdriver, crimp tool (VIA-CTL-01), long nose pliers
Ordering details		
End seal		
Part description	E-100-E	E-100-L2-E
PN (Weight)	101255-000 (0.22 kg) Requires one pipe strap (not supplied)	726985-000 (0.63 kg) Requires one pipe strap (not supplied)
Accessories		
Small pipe adaptor	JBS- SPA, required for pipes ≤ 1" (DN 25), E 90515-000 (bag of 5 adaptors)	
Spare part		
Boot pack for E-100-E		
		
Part description	E-100-BOOT-5-PACK	
PN (Weight)	281053-000 (140 g)	
Pack size	5 sealant filled boots and 5 cable ties	

Selection table for high profile cold applied components at higher ambient temperatures or higher voltages.

Type	Ambient temperature range and rated Voltage range	Special conditions of safe use
JBS-100-E JBM-100-E	–50°C to +40°C and/or rated voltages < 254 V	No additional requirements. Please refer to certificate.
JBS-100-L-E JBM-100-L-E	–40°C to +40°C and/or rated voltages <254 V	No additional requirements. Please refer to certificate: PTB9ATEX1059U
JBS-100-E JBM-100-E	–50°C to +56°C and/or rated voltages as per table below: BTV, QTVR, XTV, KTV – Max. 277V VPL1 – Max. 110V VPL2 – Max. 230 / 254 V VPL4 – Max. 480 V	Additional conditions for use in environments with ambient temperatures exceeding +40°C and/ or rated voltages of 254 V • Use a power cable with continuous temperature resistance of minimum +90°C • Use a metallic power cable gland(s) (GL-33 or GL-34)

Type	Ambient temperature range and rated Voltage range	Special conditions of safe use
JBU-100-E	–50°C to +40°C and/or rated voltages < 254 V	No additional requirements. Please refer to certificate.
JBU-100-L-E	–40°C to +40°C and/or rated voltages <254 V	No additional requirements. Please refer to certificate.
JBU-100-E	–50°C to +56°C and/or rated voltages as per table below: BTV, QTVR, XTV, KTV – Max. 277V VPL1 – Max. 110V VPL2 – Max. 230 / 254 V VPL4 – Max. 480 V	Additional conditions for use in environments with ambient temperatures exceeding +40°C and/ or rated voltages of 254 V • Use a power cable with continuous temperature resistance of minimum +90°C • Use a metallic power cable gland(s) (GL-33 or GL-34) • Use a metallic connection kit for heating cable connection

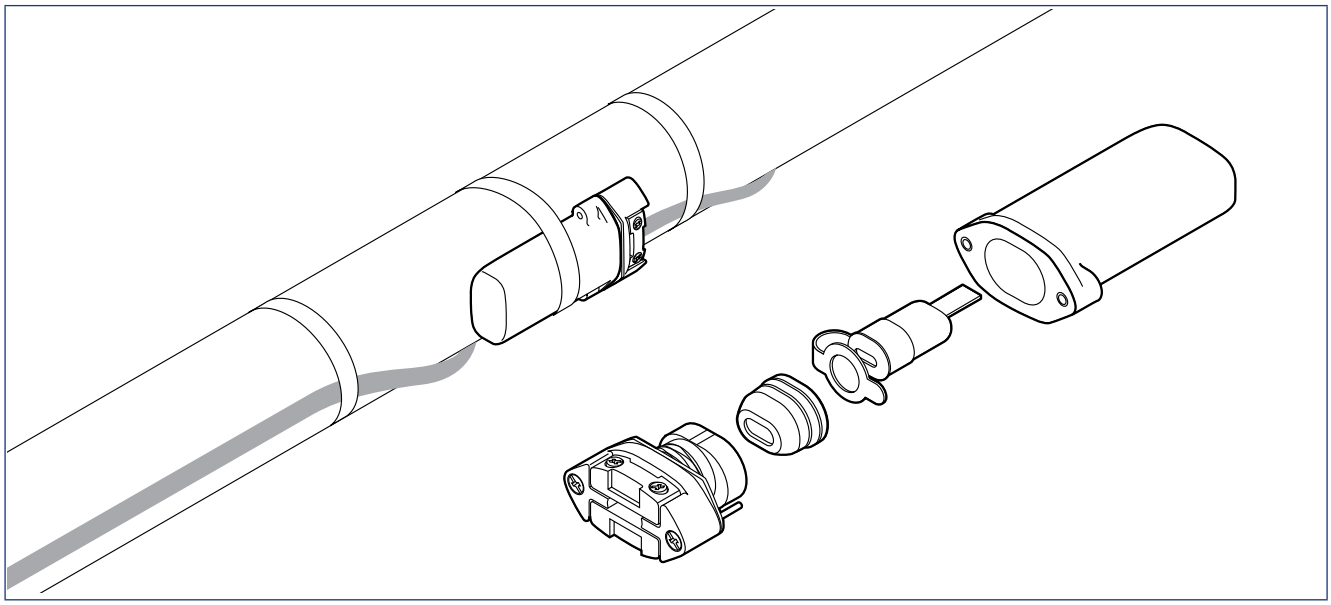
Type	Ambient temperature range and rated Voltage range	Special conditions of safe use
E-100-E	–50°C to +56°C and/or rated voltages as per table below: BTV, QTVR, XTV, KTV – Max. 275V VPL1 – Max. 110V VPL2 – Max. 230 / 254 V VPL4 – Max. 480V	Additional conditions for use in environments with ambient temperatures exceeding +40°C. Use metal tag plate with approval information (LAB-E-100-HT)
E-100-L2-E	–40°C to +56°C and/or rated voltages as per table below: BTV, QTVR, XTV, KTV – Max. 275V VPL1 – Max. 110V VPL2 – Max. 230 / 254 V VPL4 – Not Possible	Additional conditions for use in environments with ambient temperatures exceeding +40°C Use metal tag plate with approval information (LAB-E-100-HT)

Low profile end seal - Cold applied

The E-150 is a cold applied low profile end seal. This universal end seal is designed to fit with all Raychem industrial self-regulating heating cables; BTV, QTVR, XTV and KTV meaning simplified product selection and reduced inventory to stock. It can be used in applications with temperatures ranging from –50°C to 215°C. It is approved for use in hazardous areas.

The unique design of the E-150 suits the demanding requirements of the industrial environment. The low profile housing can be installed on pipes and other surfaces. A spring loaded grommet makes a first seal to maintain a water tight connection while the non-curing sealant (silicone free) used in Raychem's core sealing boot adds a second seal, providing additional protection. The rugged construction of the end seal makes it resistant to impact and suitable for high temperature variations and aggressive chemical exposure. The end seal is re-enterable. The E-150 design provides a safe under the insulation end seal that can be relied upon over time.

The end seal requires no heat source for installation, making maintenance fast and easy. Each kit contains all the necessary materials to do one end termination.



Description

Cold applied end seal for use with BTV, QTVR, XTV and KTV heating cables.

Kit contents

1 end seal enclosure housing
1 sealing grommet assembly
1 core sealing boot
1 identification label
1 installation instruction

Approvals

Hazardous locations

PTB 09 ATEX 1068 U

Ⓔx II 2G Ex e II

Ⓔx II 2D tD A21 IP66

IECEx PTB 09.0043U

Ex e II

Ex tD A21 IP66

DNV Certificates No. E-11564 and No. E-11565

FM APPROVED Class I, Div. 2, Groups A, B, C, D

Class II, Div. 2, Groups F, G

SA -WS Class III

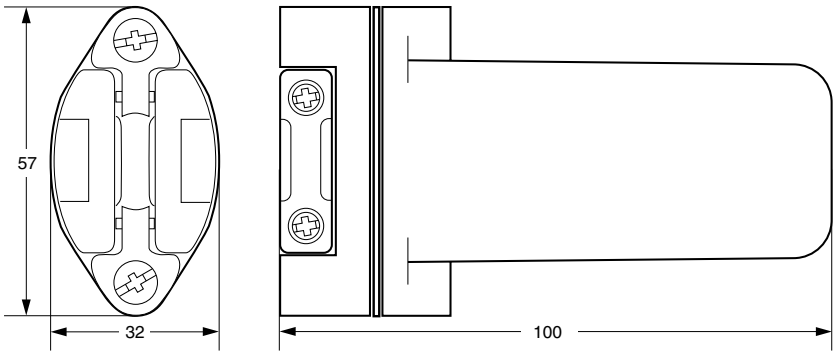
FM APPROVED CLI, ZN2, AEx e II T[1]

SA -WS Ex e II T[1]

[1] *For T-rating, see heating cable or design documentation*

This product also has all required approvals for use in Kazachstan, Russia and other countries. Contact your local Tyco Thermal Controls representative for more details.

Dimensions (in mm)



Product specifications	
Heating cable capability	BTV-CR, BTV-CT, QTVR-CT, XTV-CT, KTV-CT
Ingress protection	IP66
Minimum installation temperature	–50°C
Maximum pipe temperature	Refer to heating cable specification
Operating voltage	277 V

Materials of construction	
Enclosure, end plate, and shim	Engineering polymers, black
Sealing grommet and core sealer	Silicone rubber
Screws, compression spring, reinforcement plate	Stainless steel

Ordering details	
End seal	E-150
PN (Weight)	979099-000 (0.3 kg/0.6 lb.)

E-06, E-19 and E-50

Heat-shrink under insulation end seal kits

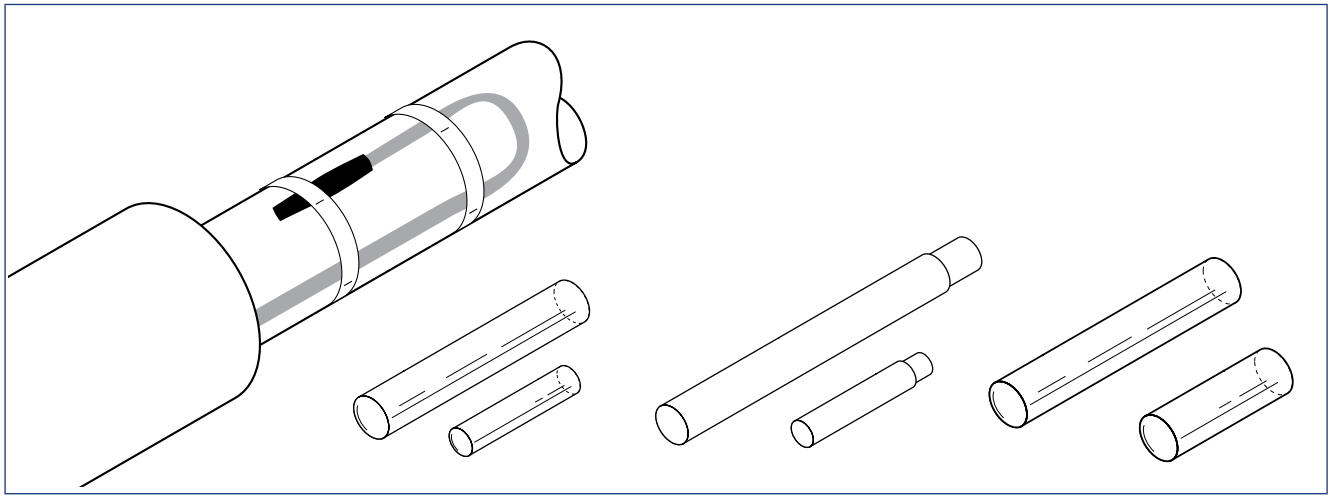
These end seal kits are designed for the termination of Raychem's industrial heating cables.

The E-06 is designed for use with BTV- and QTVR heating cables, the E-19 is designed for use with XTV- and KTV heating cables, and the E-50 is for use with VPL heating cables.

All kits are approved for use in hazardous areas.

The end seal kits E-06 and E-19 employ easy to use heat-shrinkable tubing with an adhesive, that when heated forms a semi-flexible moisture proof encapsulation. The end seal kit E-50 employs high temperature heat-shrinkable tubing with a plastic melt liner that when heated forms a semi-flexible moisture proof encapsulation. Due to the low profile design the finished termination can be installed directly on the pipe.

One end seal kit is required for each termination.



	E-06	E-19	E-50
Application			
	End seal for BTV and QTVR self-regulating heating cables	End seal for XTV and KTV self-regulating heating cables	End seal for VPL power-limiting heating cables
Kit contents			
	Heat-shrinkable Adhesive coated sleeves Installation instruction	Heat-shrinkable sleeves Adhesive liners Installation instruction	Heat-shrinkable sleeves Installation instruction
Approvals			
	ATEX certified by Baseefa and PTB Ⓔx II 2 GD Ex e II Ex tD A21 IP66 The temperature class depends on the design and the type of heating cable the end seal is used with DNV Certificate No. E-11564 DNV Certificate No. E-11565		

This product also has all required approvals for use in Kazachstan, Russia and other countries. Contact your local Tyco Thermal Controls representative for more details.

Product specifications			
Max. exposure temperature	175°C	200°C	260°C
Dielectric strength	2.2 MV/m	> 6 MV/m	> 40 MV/m
Volume resistivity	10^{13} Ω cm	10^{10} Ω cm	10^{18} Ω cm
Final dimensions	length approx. 120 mm	length approx. 135 mm	length approx. 120 mm

Installation details			
Heat shrinkable tubing	175°C	200°C	327°C
Gas torch or equivalent	min. 1460 W hot air gun	min. 1460 W hot air gun	min. 3000 W hot air gun*

Ordering information			
Part description	E-06	E-19	E-50
PN (Weight)	582616-000 (0.03 kg)	090349-000 (0.05 kg)	1244-002492 (0.06 kg)

** The installation of the E-50 requires a high power heat gun and an experienced installer.*

Raychem
HEW-THERM®

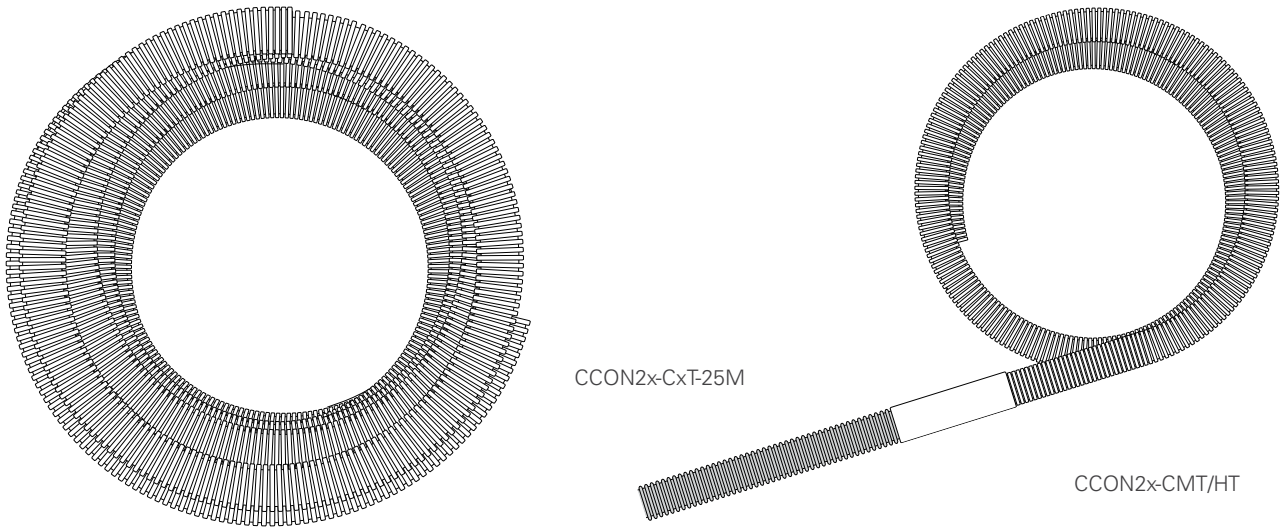
CCON2x-C...

Conduit for protection of heating cables

These conduits have been designed for use in combination with the conduit connection kits CCON2x-100-... They provide supplementary mechanical protection of the heating cable or cold lead between a junction box and the entry into the insulation. The conduit materials have been selected to meet the requirements for use in hazardous locations.

The resistance of the conduits to fuels, mineral oils, fats, alkalies, acids and bases is excellent.

The conduits can be cut-to-length as required in the field and can either be entered in the insulation directly or by use of an insulation entry kit.



Application		
	Conduit for protection of heating cables	
Approvals		
	Meets electrostatic requirements for ATEX in gas groups IIA and IIB. For gas group IIC special marking required. (Do not clean with a dry cloth)	
Product specification		
	M20	**M25**
Medium temperature conduit (150°C)		
	CCON20-CMT-...	**CCON25-CMT-...**
Conduit size	ND 17 mm	ND 23 mm
Outer diameter (nominal)	21.2 mm	28.5 mm
Bending radius (static)	40 mm	45 mm
Weight (kg/100 m)	5.7	9.9
Material	Modified polyamide	
Temperature range (continuous)	–40°C to +135°C (compatible with surface temperature of all heating cables)	
Exposure temperature	150°C (3000 h intermittent, cumulative)	
Impact strength	Minimum 6 J @ –40°C (empty conduit), min. 7 J with all heating cables	
Flame class	HB as per UL 94	

	M20	M25
High temperature conduit (260°C)		
	CCON20-CHT-…	**CCON25-CHT-…**
Conduit size	ND 17 mm	ND 23 mm
Outer diameter (nominal)	21.1 mm	28.8 mm
Bending radius (static)	15 mm	26 mm
Weight (kg/100 m)	8.3	14.8
Material	PFA	
Temperature range	–200°C to +260°C	
Impact strength	Minimum 2.5 J (empty conduit), min. 7 J with all heating cables	
Flame class	V0 as per UL 94	
Combined medium and high temperature conduit		
	CCON20-CMT/HT-1.67/0.33M	**CCON25-CMT/HT-1.67/0.33M**
Ideal for direct entry into cladding for high pipe temperatures	1.67 m length of medium temperature conduit for connection to the junction box connected to 33 cm of high temperature conduit for connection to the hot surface.	
Ordering details		
	M20	**M25**
Conduit size		
	ND 17 mm	**ND 23 mm**
Pack of 2 m of medium temperature conduit	CCON20-CMT-2M (PN: 1244-003286/Weight: 0.12 kg)	CCON25-CMT-2M (PN: 1244-003281/Weight: 0.20 kg)
Pack of 25 m of medium temperature conduit	CCON20-CMT-25M (PN: 1244-003285 Weight: 1.44 kg)	CCON25-CMT-25M (PN: 1244-003280/Weight: 2.25 kg)
Pack of 2 m of high temperature conduit	CCON20-CHT-2M (PN: 1244-003289/Weight: 0.16 kg)	CCON25-CHT-2M (PN: 1244-003284/Weight: 0.28 kg)
Pack of 25 m of high temperature conduit	CCON20-CHT-25M (PN: 124-003288/Weight: 2.24 kg)	CCON25-CHT-25M (PN: 1244-003283/Weight: 3.90 kg)
1 pc of combination med./high temperature conduit (1.67 m medium temperature with 0.33 m high temperature)	CCON20-CMT/HT-1.67/0.33M (PN: 1244-003475/Weight: 0.135 kg)	CCON25-CMT/HT-1.67/0.33M (PN: 1244-003474/Weight: 0.24 kg)
Accessories		
Insulation entry kit comprising of pipe stand with conduit connection system	IEK20-CON (PN: 1244-003291)	IEK25-CON (PN: 1244-003290)
Kit content		
	2 pipe stands 2 conduit connectors Pipe straps need to be ordered separately	1 pipe stand 1 conduit connector Pipe straps need to be ordered separately

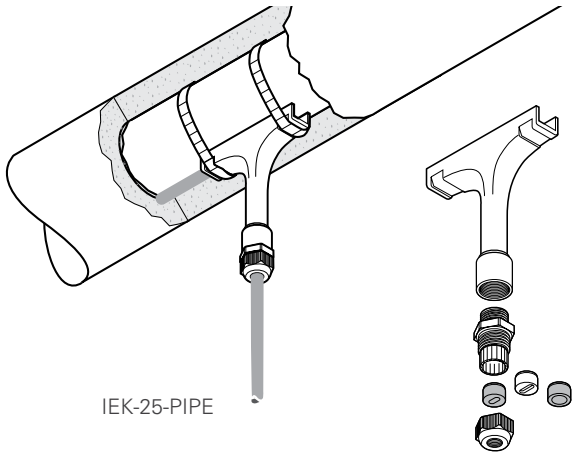
Insulation entry kit

Insulation entry kits are designed to protect cables when passing through the thermal insulation cladding. The IEK´s are suitable for all type of parallel heating cables as well as power cables. Insulation entry kits may be used in hazardous and non hazardous areas.

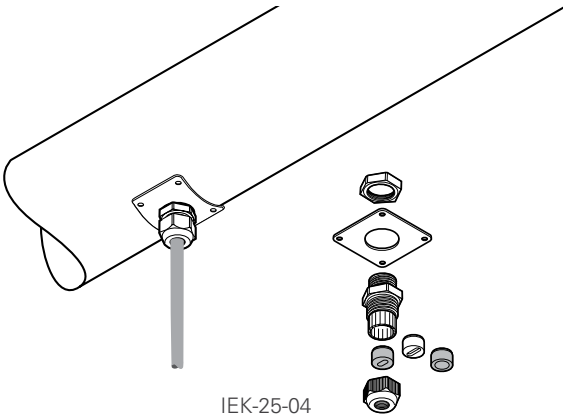
The gland and the grommet provided in the kit provide strain relief and environmental sealing to avoid water ingress in the insulation.

The IEK-25-PIPE contains a protective guiding tube which is fixed to the pipe and allows the heat-tracing installation to be completed independently from the insulation work. The IEK-25-04 contains a stainless steel plate which can be screwed to the cladding.

Insulation entry kits can be used for installations on pipes, tanks and vessels etc.



IEK-25-PIPE



IEK-25-04

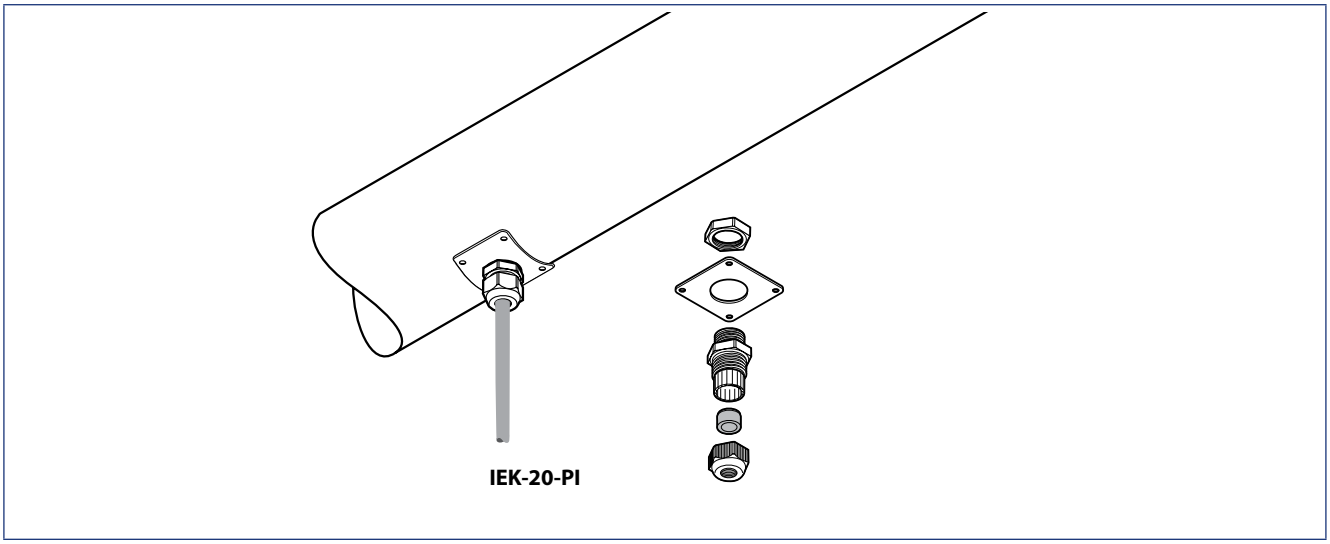
Description	IEK-25-PIPE	IEK-25-04
Application		
	Insulation entry kit for pipe mounting for heating- and power cables with an outside diameter in the range of 8 to 17 mm. Kit contains 1 pc.	Insulation entry kit for pipes, tanks and vessels. Usable for all types of polymer heating cables and power cables with an outside diameter in the range of 8 to 17 mm. Kit contains 1 pc.
Kit contents		
	1 x polymer "T" Tube 1 x plastic gland (M25) with round hole grommet for power cables 1 x bag with 2 silicon grommets for heating cables	1 x stainless steel fixing plate 1 x plastic gland (M25) with round hole grommet for power cables 1 x bag with 2 silicon grommets for heating cables 1 x locknut
Product specifications		
Max. exposure temp.		
gland	110°C	110°C
tube	260°C	–
Approvals		
	–	DNV Certificate No. E-11564 and E-11565
Dimensions		
	Height 135 mm, width 120 mm	Plate 60 x 60 mm (22SWG)
Ordering information		
Part number (Weight)	1244-001050 (0.13 kg)	332523-000 (0.06 kg)

Insulation entry kit

Insulation entry kits are designed to protect cables when passing through the thermal insulation cladding. The IEK-20-PI is suited for PI heating cables as well as for power cables.

Insulation entry kits may be used in hazardous and non hazardous areas.

The gland and the grommet included in the kit provide strain relief and environmental sealing to avoid water ingress in the insulation. They contain a stainless steel plate which can be screwed to the cladding. Insulation entry kits can be used for installations on pipes, tanks and vessels etc.



IEK-20-PI

Description	
	IEK-20-PI
Application	
	Two-pack insulation entry kit for pipes, tanks and vessels. Usable for all types of PI cold leads as well as all other round cables with an outer diameter in the range of 5 to 13 mm. Kit contains 2 pc.
Kit contents	
	2 x stainless steel fixing plates 2 x plastic glands (M20) with round hole grommet for power- or cold lead cables 2 x locknuts
Product specifications	
Max. exposure temp. gland	80°C
Dimensions	
	Plate 60 x 60 mm (22 SWG)
Ordering information	
Part number (Weight)	1244-000689 (0.08 kg)

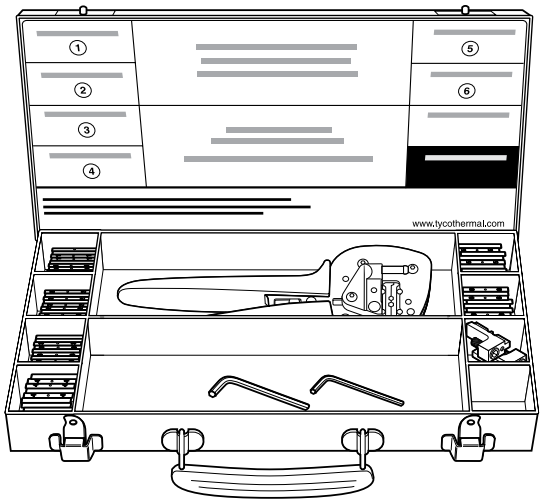
PI-TOOL-SET-xx

Toolbox for electrical connection system for PI heating cables

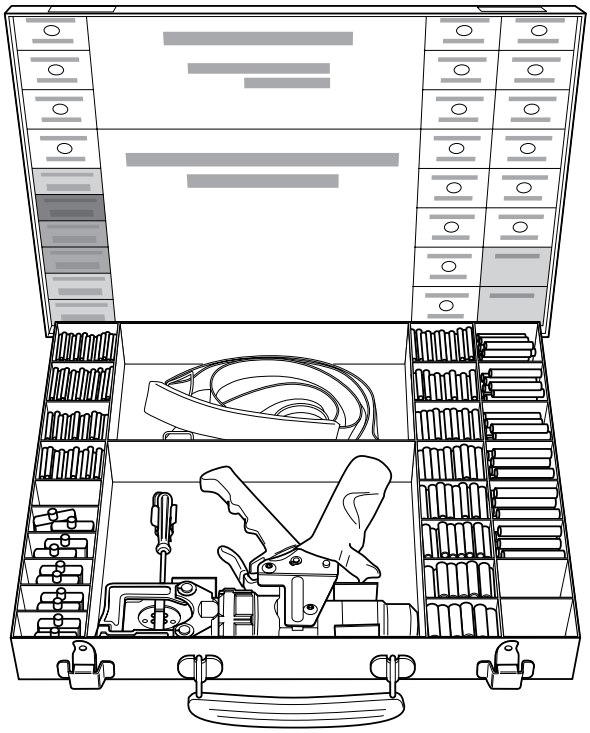
The PI-TOOL-SET-xx is a handy metal box containing all materials required to connect Polymer Insulated (PI) heating cables to a suitable cold lead and also to splice two PI heating cables. Electrical continuation is maintained via specially engineered crimps, which provide a highly reliable electrical (gas tight) connection.

In order to assure consistently reliable connections, the crimp is to be performed with the specified crimp tool (PI-TOOL-xx) equipped with the appropriate crimping dies (CD-PI-xx). Different tools are available: a mechanical tool for connecting small size cables (up to 2.5 mm^2) and an hydraulic tool for large size cables (from 4 to 25 mm^2).

Apart from the crimp tool and dies, the kit contains a variety of crimps (CRP-PI-xx). The tables on this datasheet are providing an overview of the possible combinations of tools, dies and crimps for various PI heating cables. Packs containing 10 pc of crimps are available as spare parts. Connection kits providing the insulation of the connection, have to be ordered separately.



PI-TOOL-SET-01



PI-TOOL-SET-02

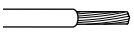
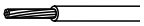
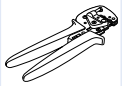
Application		
	Electrical connection system for Polymer Insulated (PI) heating cables.	
Kit contents		
	PI-TOOL-SET-01	**PI-TOOL-SET-02**
Crimp tool	PI-TOOL-01	PI-TOOL-02
Crimping dies	CD-PI-02	CD-PI-03, CD-PI-04, CD-PI-05, CD-PI-06
Crimps	CRP-PI-01N, CRP-PI-02N, CRP-PI-03N, CRP-PI-04 to CRP-PI-06 (50 pc each)	CRP-PI-07 to CRP-PI-17 (50 pc each) CRP-PI-18 to CRP-PI-24 (25 pc each)
Ordering details		
Part number (Weight)	1244-000583 (2.5 kg)	1244-000584 (12.5 kg)

General Accessories		
Crimp tool set with various inserts and crimps	**Part number**	
PI-TOOL-SET-01	1244-000583	Complete set for cold leads/heating cables up to 2.5 mm²
PI-TOOL-SET-02	1244-000584	Complete set for cold leads/heating cables from 4 to 25 mm²

Crimp tools (spare part)	Part number	Crimping dies (spare part)	Part number
PI-TOOL-01	1244-000549	CD-PI-02	1244-000554
PI-TOOL-02	1244-000551	CD-PI-03	1244-000552
		CD-PI-04	1244-000553
		CD-PI-05	1244-000555
		CD-PI-06	1244-000556

Compatibility- and selection chart and selection for crimps, dies and tools

Table 1: PI-TOOL-SET-01 for conductor size ≤ 2,5 mm²

Kit	Possible combinations for all XPI (XPI-NH, XPI, XPI-S) heating cables (Ω/km)	Crimp type	Part number		Spare tool & crimping dies	
	FROM	TO	(10 pieces per pack)		Die	Tool
						
CS-150-2.5-PI	65 / 180 / 200 / 380 / 480 / 600 / 700 / 810 / 1000 / 1440 / 1750 /2000 / 3000 / 4000 4400 / 5600 / 7000 / 8000	65 / 180 / 200 / 380 / 480 / 600 / 700 / 810 / 1000 / 1440 / 1750 / 2000 / 3000 / 4000 / 4400 / 5600 / 7000 / 8000	CRP-PI-01N	1244-006363	CD-PI-02 (black)	PI-TOOL-01
	11.7	65 / 180 / 200 / 380 / 480 / 600 / 700 / 810 / 1000 / 1440 / 1750 / 2000 / 3000 / 4000 / 4400 / 5600 / 7000 / 8000	CRP-PI-02N	1244-006364		
	11.7 / 15 / 17.8 / 25 / 50 / 80 / 100 / 150 / 320	11.7 / 15 / 17.8 / 25 / 50 / 80 / 100 / 150 / 320	CRP-PI-03N	1244-006365		
	7 / 10	65 / 180 /200 / 380 / 480 / 600 / 700 / 810 / 1000 / 1440 / 1750 / 2000 / 3000 / 4000 / 4400 / 5600 / 7000 / 8000	CRP-PI-04	1244-000560		
	7 / 10 / 11.7 / 31.5 / 100	15 / 17.8 / 25 / 50 / 80 / 150 / 320	CRP-PI-05	1244-000561		
	7 / 10 / 11.7 / 31.5	7 / 10 / 11.7 / 31.5 / 100	CRP-PI-06	1244-000562		

***Important**: The electrical insulation for the crimp connection has to be ordered separately (CS-150-xx-PI on page 105).*
If the inscriptions on crimps CRP-PI-01N, CRP-PI-02N and CRP-PI-03N do not contain 'N', please do no longer use.
Contact Tyco Thermal Controls for more information.

Crimp selection and installation table

Table 2: PI-TOOL-SET-02 for conductor size 4 to 25 mm²

Kit	Possible combinations for all XPI (XPI-NH, XPI, XPI-S) heating cables (Ω/km)		Crimp type	Part number		Spare tool & crimping dies	
	FROM	TO	(10 pieces per pack)			Die	Tool
							
CS-150-6-PI	4.4	11.7 / 15	CRP-PI-07	1244-000563		CD-PI-03 (Grey)	PI-TOOL-02
	4.4	7 / 10	CRP-PI-08	1244-000564			
	4.4	4.4	CRP-PI-09	1244-000546			
	2.9	11.7 / 31.5 / 100	CRP-PI-10	1244-000565		CD-PI-04 (Blue)	
	2.9	7 / 10	CRP-PI-11	1244-000566			
	2.9	4.4	CRP-PI-12	1244-000567			
	2.9	2.9	CRP-PI-13	1244-000568			
CS-150-25-PI	1.8	7	CRP-PI-14	1244-000569			
	1.8	7 / 4.4	CRP-PI-15	1244-000570			
	1.8	2.9	CRP-PI-16	1244-000571			
	1.8	1.8	CRP-PI-17	1244-000548			
	1.1	4.4	CRP-PI-18	1244-000572		(Red) V + N	
	1.1	2.9	CRP-PI-19	1244-000573			
	1.1	1.8	CRP-PI-20	1244-000574			
	1.1	1.1	CRP-PI-21	1244-000575			
	0.8	2.9	CRP-PI-22	1244-000576		CD-PI-06 (Yellow) V + N	
	0.8	1.8	CRP-PI-23	1244-000577			
	0.8	1.1	CRP-PI-24	1244-000578			

***Important**: The electrical insulation for the crimp connection has to be ordered separately. (CS-150-xx-PI on page 105)*

The crimp for the electrical connection of the braid is included in the CS-150-xx-PI kit

Table 3: CS-150-xx-PI braid crimps

Kit	Braid crimp	Partnumber	Die	Tool
CS-150-2.5-PI	CRP-BR-2.5	1244-000994	CD-PI-02	PI-TOOL-01
CS-150-6-PI	CRP-BR-6	1244-000996	CD-PI-03	PI-TOOL-02
CS-150-25-PI	CRP-BR-25	1244-000995	CD-PI-04	PI-TOOL-02

Surface sensing mechanical thermostat

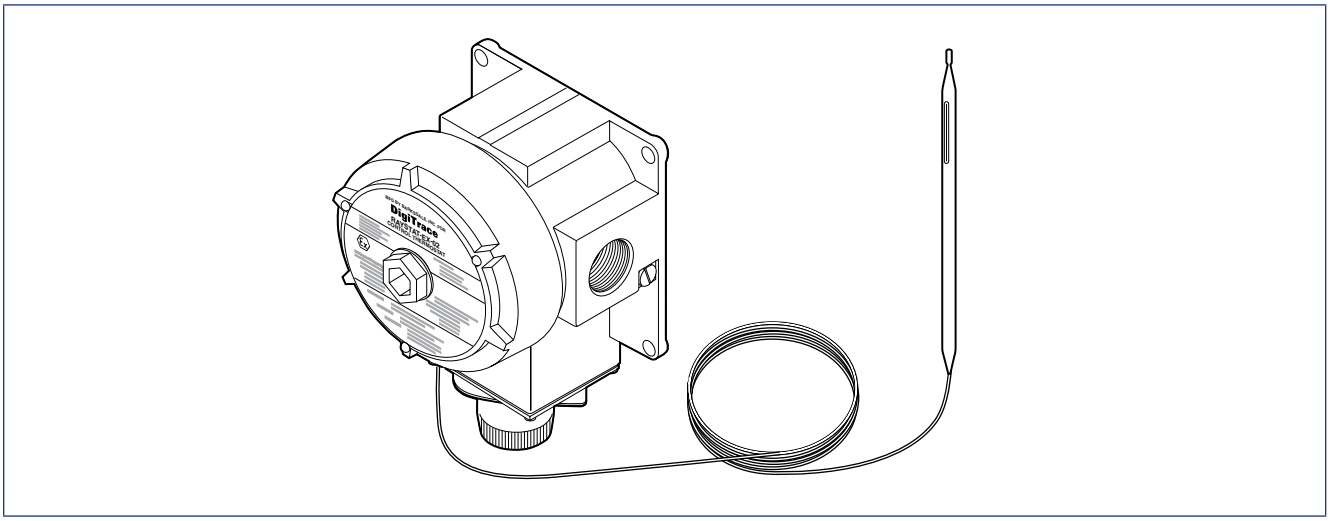
This EEx d approved surface sensing thermostat provides temperature control for all Raychem BTV, QTVR, KTV, VPL and XTV heating cables in hazardous areas. The switching temperature range is –4°C to +163°C and is adjustable externally to the Ex enclosure by a dial mounted under a bolted-on cover and seal.

The switching current capacity is 22 A. It has a single pole change-over switch with volt-free contacts.

Cable entry is through a single 3/4" NPT thread entry. Raychem cable glands are available to suit non-armoured and armoured cable.

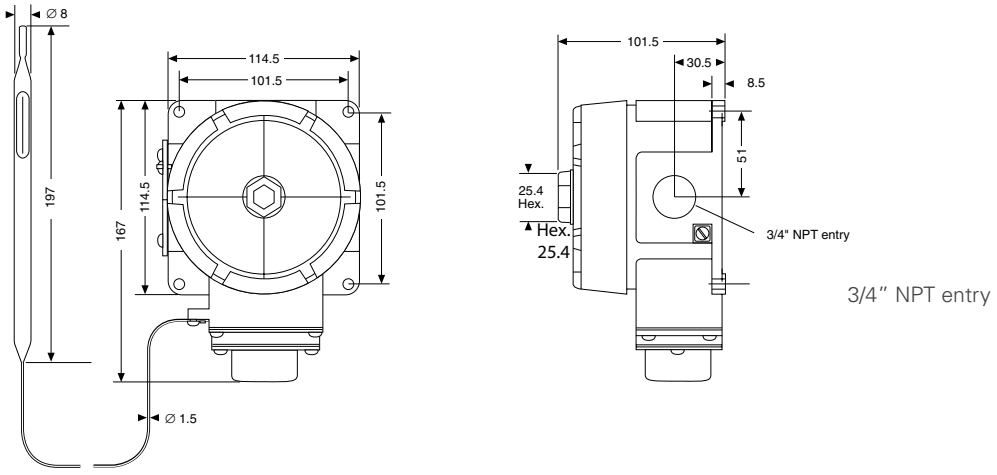
The 3 m long stainless steel fluid filled bulb and capillary give freedom to locate the enclosure remote from the bulb. The bulb exposure range is –50°C to +215°C.

The cast aluminium construction with stainless steel fittings gives a lightweight unit which can be pipe mounted using Raychem support brackets or surface mounted.



Thermostat	
Area of use	Hazardous area: Zone 1, Zone 2 (Gas), Zone 21, Zone 22 (Dust) Ordinary
Approvals	
	LCIE 08 ATEX 6095 X Ex II 2 G D IECEx LCI 08.0036X Ex d IIC T6 Ex tD A21 IP66 T80°C Special conditions for Safe Use –40°C < Ta < +60°C, Ta = Ambient Temperature This product also has all required approvals for use in Kazachstan, Russia and other countries. Contact your local Tyco Thermal Controls representative for more details.
Enclosure	
Body and lid	Lacquer coated cast aluminium with stainless steel fittings and nitrile rubber internal lid seal
Protection	IP 65 if installed with Raychem cable glands GL-33 or GL-34
Lid fixing	Screw thread lid locked in place by a 2 mm hexagonal key grub screw
Entry	1 x 3/4" NPT
Ambient operating temperature	–40°C to +60°C
Temperature sensing	
Type	Fluid filled bulb and capillary
Dimensions	Capillary 3 m long, bulb 197 mm x 8 mm
Material	Stainless steel (Type 55316)
Exposure temperature	–50°C to +215°C
Minimum bend radius	Do not bend bulb, 15 mm for capillary

Dimensions (in mm)



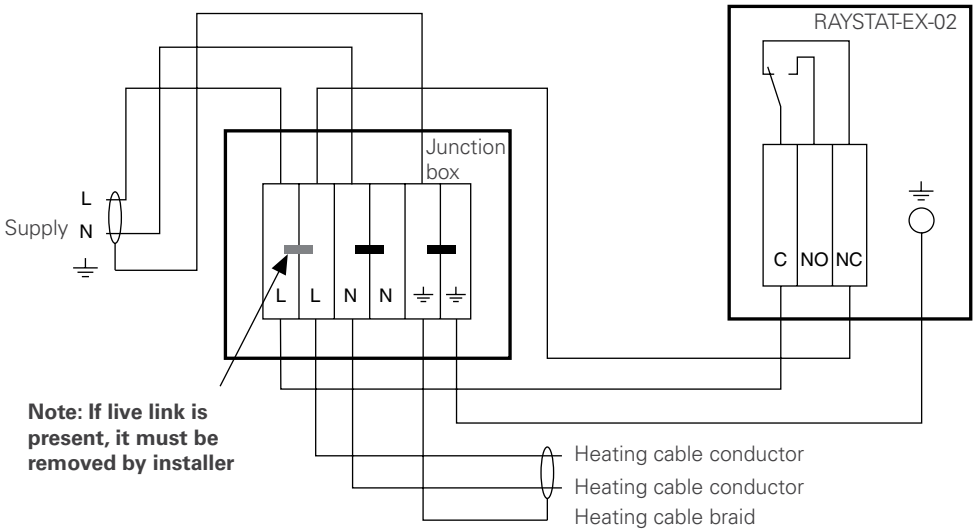
3/4" NPT entry

Switching	
Type	Single pole change over volt free contacts (SPDT)
Rating	22 A at 250 Vac, switching (100.000 cycles)

Setting	
Range	–4°C to +163°C
Repeatability	±1.7 K
Differential	5 K
Accuracy (switch on)	±4.5°C at 21°C ambient and 50°C sensor temperature
Method	External knob and dial

Connection terminals	
Supply	3 terminals for 1 to 4 mm² conductors
Internal earth	Single bolt for 1 to 4 mm² conductors
External earth	Single bolt and clamp for 1 to 4 mm² conductors

Connection details and thermostat control system



Maximum recommended heating cable lengths (230 V supply)

The maximum recommended heating cable length is restricted by the electrical protection sizing or the switching capacity of the RAYSTAT-EX-02.

For circuits and electrical protection rated up to and including 20 A

Use the maximum recommended heating cable lengths, mentioned in the cable datasheet.

For circuits and electrical protection rated above 20 A but less than or equal to 22 A

Use the shorter length of the values given in the cable datasheet and those given for your switching temperature in the table below.

For circuits and electrical protection rated above 22 A, RAYSTAT-EX-02 must NOT be connected for direct switching.

Heating- cable reference	3BTV2-CT/-CR	5BTV2-CT/-CR	8BTV2-CT/-CR	10BTV2-CT/-CR	10QTVR2-CT	15QTVR2-CT	20QTVR2-CT	4XTV2-CT-T3	8XTV2-CT-T3	12XTV2-CT-T3	15XTV2-CT-T3	20XTV2-CT-T2	5KTV2-CT	8KTV2-CT	15KTV2-CT	20KTV2-CT	5VPL2	10VPL2	15 VPL2	20VPL2
Switching temp. (°C)	**L max. (m) - Maximum recommended heating cable length**																			
5	200	165	120	105	110	85	65	230	145	105	85	65	200	145	90	65	220	145	95	70
10	200	165	120	105	110	90	65	235	150	110	85	65	205	145	90	65	220	150	95	70
15	200	165	120	105	115	90	70	245	155	110	85	65	210	150	95	65	220	150	95	70
20	200	165	120	105	115	95	75	250	160	115	90	65	215	155	95	70	220	150	100	70
25	200	165	120	105	115	95	75	250	165	120	90	70	220	160	100	70	220	155	100	75
30	200	165	120	105	115	95	80	250	170	125	95	70	225	160	100	70	220	155	100	75
35	200	165	120	105	115	95	85	250	180	130	95	75	225	165	105	75	220	155	100	75
40	200	165	120	105	115	95	90	250	180	135	100	75	225	170	105	75	220	155	105	75
45	200	165	120	105	115	95	95	250	180	140	100	75	225	175	110	80	220	155	105	75
50	200	165	120	105	115	95	105	250	180	145	105	80	225	180	115	80	220	155	105	75
55	200	165	120	105	115	95	110	250	180	145	110	80	225	180	115	85	220	155	105	80
60	200	165	120	105	115	95	110	250	180	145	110	85	225	180	120	85	220	155	110	80
65	200	165	120	105	115	95	110	250	180	145	115	85	225	180	125	90	220	155	110	80
70	–	–	–	–	115	95	110	250	180	145	120	90	225	180	130	95	220	155	110	80
75	–	–	–	–	115	95	110	250	180	145	120	90	225	180	130	95	220	155	115	80
80	–	–	–	–	115	95	110	250	180	145	125	95	225	180	130	100	220	155	115	85
85	–	–	–	–	115	95	110	250	180	145	130	100	225	180	130	105	220	155	115	85
90	–	–	–	–	115	95	110	250	180	145	130	100	225	180	130	110	220	155	120	85
95	–	–	–	–	115	95	110	250	180	145	130	105	225	180	130	110	220	155	120	85
100 to 110	–	–	–	–	115	95	110	250	180	145	130	110	225	180	130	110	220	155	120	85
115 to 120	–	–	–	–	–	–	–	250	180	145	130	110	225	180	130	110	220	155	125	90
125 to 150	–	–	–	–	–	–	–	–	–	–	–	–	225	180	130	110	220	155	125	95

Mounting method	
	Raychem support bracket SB-100, SB-101, SB-110, SB-111, SB-125 or surface mounting with 4 fixing holes (M6) on 101.5 x 101.5 mm centres

Setting		
Power cable gland for armoured cable	GL-33	493217-000
Power cable gland for non-armoured cable (to be ordered separately)	GL-34	931945-000

Ordering details	
Part description	RAYSTAT-EX-02
PN (Weight)	404385-000 (1.77 kg)

RAYSTAT-EX-03 and RAYSTAT-EX-04

Surface and ambient sensing, electronic

These electronic surface sensing and ambient thermostats provide accurate temperature control for heating cables.

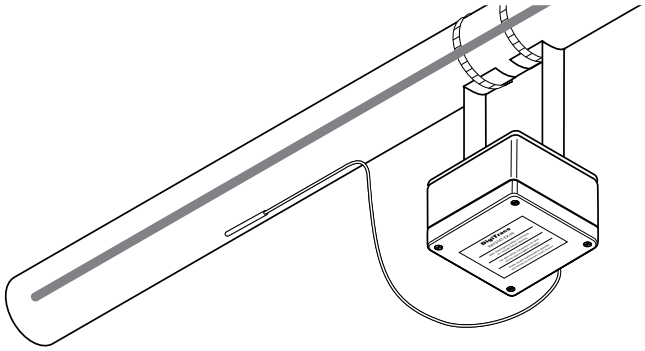
The units can be supplied at nominal voltages of either 110 V 50/60 Hz or 230 V 50/60 Hz and have a double pole switch rated at 16 A. The switch contacts can be arranged to be volt free. Temperature setting is accurate via digital thumb wheel switches inside the enclosure.

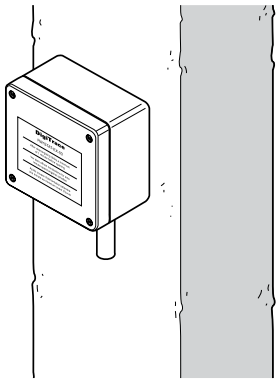
The surface sensing version is supplied with a Pt 100 sensor and a 2 m long stainless steel sheathed extension cable giving freedom to locate the electronics remote from the sensor.

The ambient version is supplied with a local Pt 100 sensor and a wind shield.

The enclosure is manufactured from high impact resistant glass filled polyester offering IP66 protection.

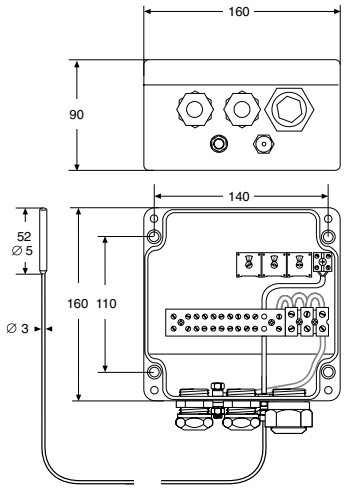
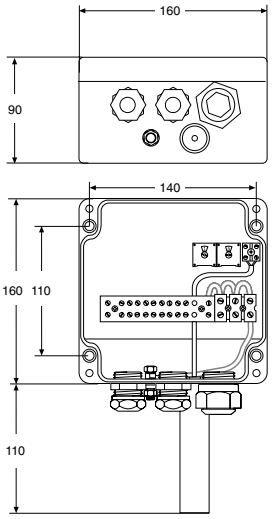
For pipe temperatures up to 215°C, the units can be mounted on the pipe using a support bracket.



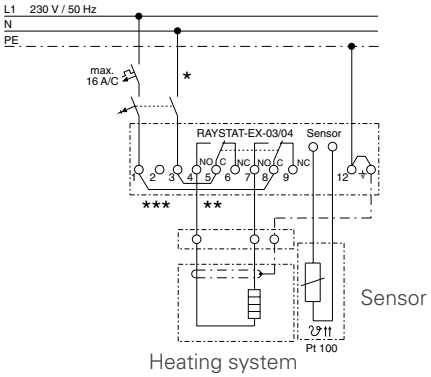


	RAYSTAT-EX-03	RAYSTAT-EX-04
Application		
	Surface sensing	Ambient sensing
Thermostat		
Area of use	Hazardous area: Zone 1 or Zone 2 (Gas) or Zone 21 or Zone 22 (Dust) Ordinary	
Approvals certification		
	Baseefa11ATEX0071X Ⓔx II 2 GD Ex e mb ia IIC T6 Ta -50°C to +60°C Gb Ex tb IIIC T85°C Ta -50°C Db IP66 IECEx BAS 11.0036X Ex e mb ia IIC T6 Ta -50°C to +60°C Gb Ex tb IIIC T85°C Ta -50°C to +60°C Db IP66 Above markings apply when the unit is powered at a supply voltage of 99-230Va.c. For higher supply voltages up to 253Va.c. refer to the hazardous area approval.	
Product specification		
Temperature range	0°C to 499°C	0°C to 49°C
Ingress protection	IP66	IP66
Deluge testing	Passed Shell UK requirements	Passed Shell UK requirements
Switching accuracy	±1 K at 5°C ±1 % of setpoint above 100°C	±1 K at 5°C
Switching differential (Hysteresis)	≈ 1°C at 100°C ≈ 2°C at 200°C ≈ 5°C at 499°C	≈ 1°C
Output relay	Dual pole change overtype (DPDT) (optional volt free)	Dual pole change over type (DPDT) (optional volt free)

Product specification (continued)		
Switching capacity	16 A 110 Vac ±10% 50/60 Hz 16 A 230/254 Vac ±10% 50/60 Hz resistive load	16 A 110 Vac ±10% 50/60 Hz 16 A 230/254 Vac ±10% 50/60 Hz resistive load
Ambient temperature range	+55 to +60	+55 to +60
Supply voltage	110 Vac ±10% 50/60 Hz 230/254 Vac ±10% 50/60 Hz	110 Vac ±10% 50/60 Hz 230/254 Vac ±10% 50/60 Hz
Internal power consumption	110 Vac ~ 4 VA, 230/254 Vac ~ 3 VA	
Terminal size	max. 4 mm²	max. 4 mm²

	RAYSTAT-EX-03	**RAYSTAT-EX-04**
Dimensions (in mm)		

Typical wiring diagram for direct switching



** Circuit breaker configurations may vary according to local standards/requirements*

*** Link 1-8 and/or 3-5 can be removed to provide potential-free contacts*

**** Terminal 2: 110 Vac input terminal*

Cable entries	2 x M20 glands (cable Ø 7.5 – 13 mm) 1 x M25 with M25(M)/M20(F) adaptor and (M20) plug	2 x M20 glands (cable Ø 7.5 – 13 mm) 1 x M25 with M25(M)/M20(F) adaptor and (M20) plug
Sensor	2 wire Pt 100, stainless steel sensor, 2 m long	2 wire Pt 100, stainless steel sensor, complete with wind shield
Mounting method		
	Raychem support bracket SB-100 or SB-101, SB125 or surface mounting with 4 fixing holes on 110x140 mm centres	Raychem support bracket SB-100 or SB-101, SB125 or surface mounting with 4 fixing holes on 110x140 mm centres
Ordering details		
Part Description	RAYSTAT-EX-03	RAYSTAT-EX-04
PN (Weight)	333472-000 (3.0 kg)	462834-000 (3.1 kg)

Surface sensing thermostat with safety limiter for hazardous area

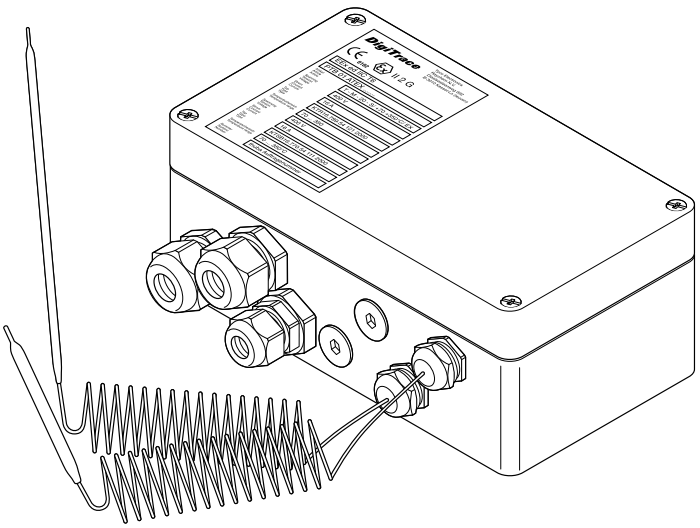
A surface sensing thermostat providing temperature control and temperature limit in hazardous areas.

The high limit cut-out prevents the heating system exceeding a preset maximum temperature should the control function fail to operate or an unsafe process temperature occur. The maximum rated voltage is 400 VAC. The switching current capacity is 16 A maximum via independent EEx d single pole change over micro switches with volt-free contacts.

The switches are mounted within an EExe enclosure together with a spring-type terminal block for fast easy connection. The sensors are 2 meter long stainless steel fluid filled bulb and capillary.

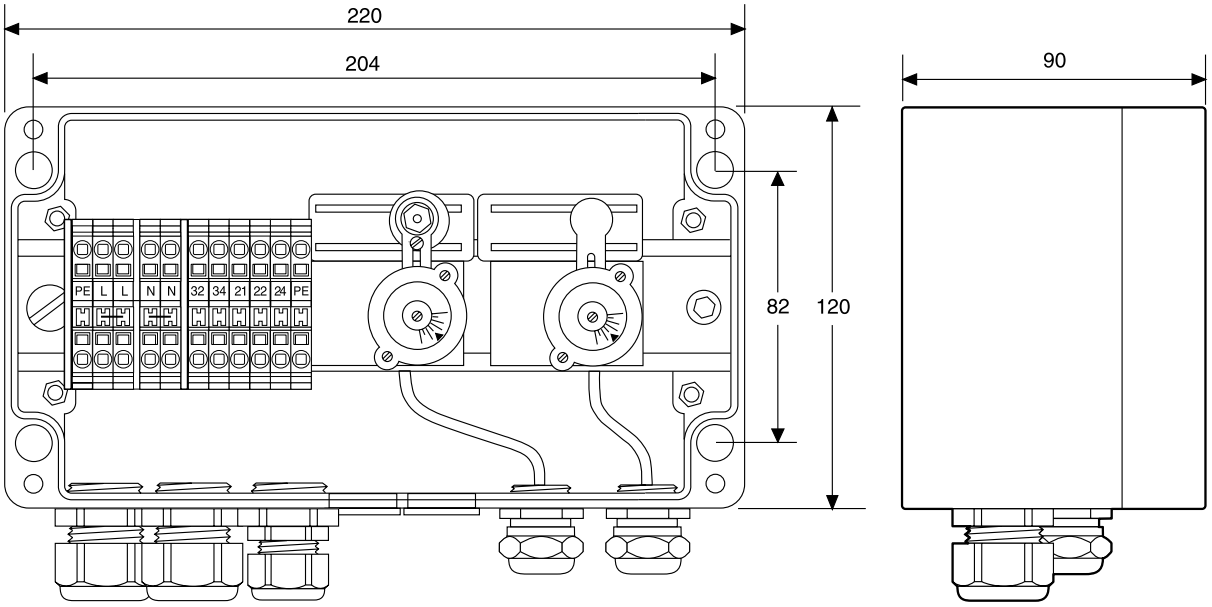
The thermostat is delivered with EEx approved power cable glands and plugs and the entries offer the possibility for a variety of connections such as: looping the power supply (daisy chaining) in order to save junction boxes, possibility to connect M25 and M20 glands for direct heating cable entry, alarm output.

The thermostat with limiter is available in 2 temperature ranges: +5°C +215°C and +70°C +350°C



		T-M-20-S/+5+215C/EX	T-M-20-S/+70+350C/EX
General			
Area of use		Hazardous area: Zone 1 or Zone 2 (Gas) or Zone 21 or Zone 22 (Dust)	
		Ordinary	
Approval certification			
		PTB 01 ATEX 1075 II 2G EEx ed IIC T6 II 2D IP 65 T80°C	PTB 01 ATEX 1075 II 2G EEx ed IIC T6 II 2D IP 65 T80°C
Product specification			
Temperature setting	Controller	+5°C to +215°C	+70°C to +350°C
	Limiter	+40°C to +300°C	+70°C to +350°C
Switching type		Single pole change over (SPDT) >100.000 cycles at I nom >50.000 cycles at 5 x I nom	Single pole change over (SPDT) >100.000 cycles at I nom >50.000 cycles at 5 x I nom
Switching capacity		Max 16 A at 400 Vac, resistive load	Max 16 A at 400 Vac, resistive load
Hysteresis/ Differential	Controller	< 6 K	< 6 K
	Limiter	< 4 K	< 4 K
Setting		Inside enclosure	nside enclosure
Reset limiter		Inside enclosure by means of a screwdriver	
Terminal size		4 mm^2	4 mm^2
Terminal type		spring-type terminals	spring-type terminals
Ambient operating temp. range		–30°C to +80°C	–30°C to +80°C

Dimensions (in mm)



		T-M-20-S/+5+215C/EX	T-M-20-S/+70+350C/EX
Output parameters			
Control relay		Change-over switch	Change-over switch
Limiter relay		Change-over switch with possibility for external alarm Capillary leakage detection system	
Enclosure			
Protection		IP65	IP65
Dimension		220 x 120 x 90 mm	220 x 120 x 90 mm
Materials body and lid		Black, glass filled polyester enclosure	Black, glass filled polyester enclosure
Lid fixing		4 captive screws, stainless steel	4 captive screws, stainless steel
Entries		7 entries: 1 x M25 gland (Ø 8-17 mm): power supply 1 x M25 gland with plug (Ø 8-17 mm): daisy chaining of power 1 x M25 reducer M25/M20 incl. M20 gland with plug (Ø 5-13 mm): output to heating cable or alarm output 2 x M20 plug: output to heating cables (possibility to connect single conductor heating element) 2 x M20: capillary sensors	
Temperature sensor			
Type		Fluid filled capillary, 2 m long	Fluid filled capillary, 2 m long
Dimensions	Controller	Ø 7 mm; length sensing element = 88 mm	Ø 7 mm; length sensing element = 88 mm
	Limiter	Ø 4.7 mm; length sensing element = 191 mm	Ø 4.7 mm; length sensing element = 191 mm
Material		1.4435 stainless steel	1.4435 stainless steel
Dimensions	Controller	–30°C +250°C	–30°C +380°C
	Limiter	–30°C +330°C	–30°C +380°C
Minimum bending radius		10 mm for capillary (not for sensor)	10 mm for capillary (not for sensor)
Temperature sensor			
Support bracket		SB-120, SB-125 or surface mounting via 4 fixing holes at 204 x 82 centres	
PN		165886-000	

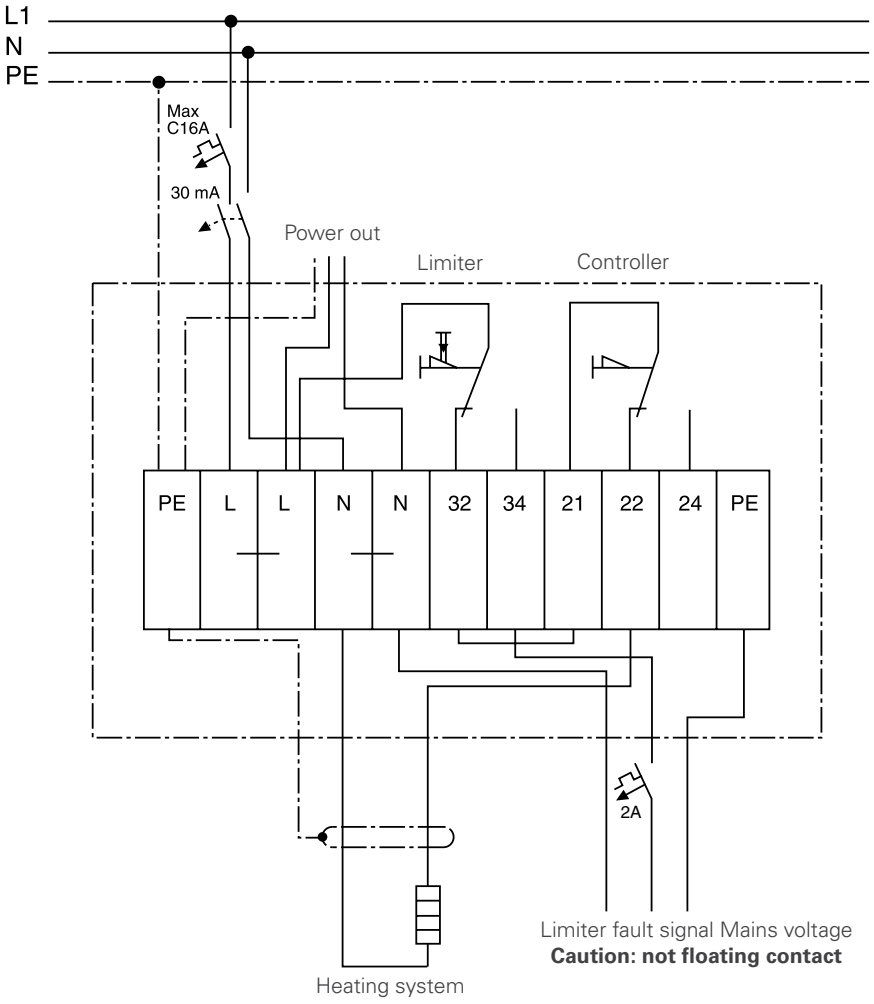
Ordering details

Ordering references:	PN Number	Weight
T-M-20-S/+5+215C/EX	576404-000	2 kg
T-M-20-S/+70+350C/EX	655212-000	2 kg

Meaning of reference: T-M-20-S/+x+y/EX

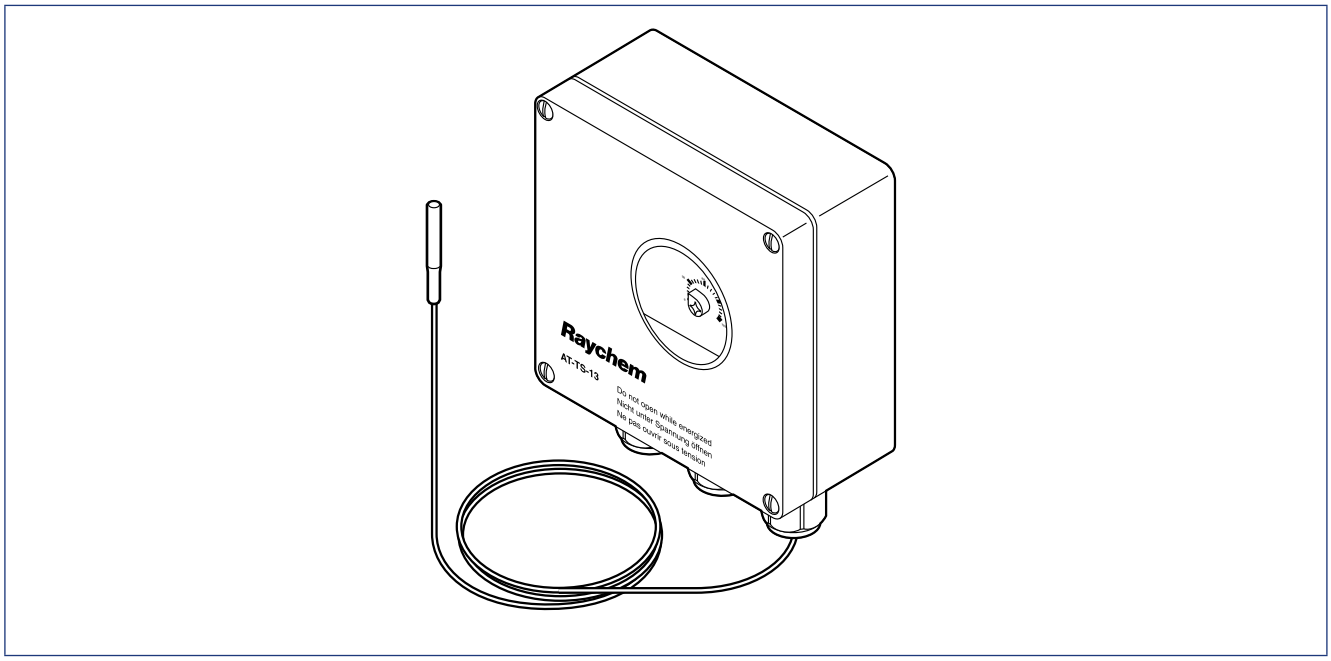
T = thermostat
M = mechanical thermostat
20 = control thermostat + limiter
S = surface sensing
x = min temperature of control range
y = max temperature of control range
Ex = hazardous area

Connection details



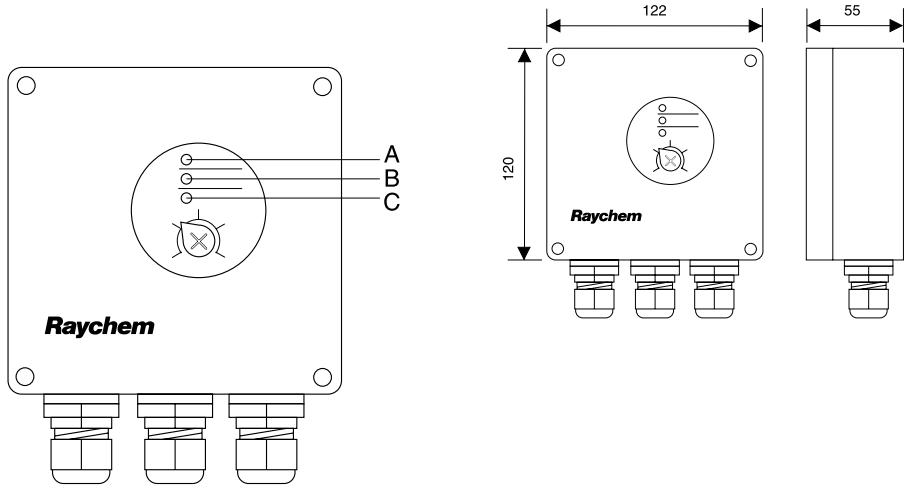
Surface sensing thermostat, electronic

AT-TS thermostats provide temperature control in safe area. The temperature set point can be checked through a window in the lid. LED´s are providing an indication when cables are energized (Heating ON) or when the temperature sensor is defect (sensor break or sensor short-circuit). The temperature sensor has a length of 3 meter and can be shortened for ambient sensing operating. Direct connection of the heating cable is possible. Connection kits need to be ordered separately. The thermostat is available in 2 temperature ranges.



	AT-TS-13	AT-TS-14
General		
Area of use	Ordinary area, outdoors	Ordinary area, outdoors
Supply voltage	230 Vac +10% –15% 50/60 Hz	230 Vac +10% –15% 50/60 Hz
Max. switching current	16 A, 250 Vac	16 A, 250 Vac
Max. conductor size	2.5 mm^2	2.5 mm^2
Switching differential	0.6 K to 1 K	0.6 K to 1 K
Switching accuracy	± 1 K at 5°C (calibration point)	2 K at 60°C (calibration point)
Switch type	SPST (normally open)	SPST (normally open)
Adjustable temperature range	–5°C to +15°C	0°C to +120°C
Housing		
Temperature setting	inside	inside
Exposure temperature	–20°C to +50°C	–20°C to +50°C
Ingress protection	IP65 according to EN 60529	IP65 according to EN 60529
Entries	1 x M20 for supply cable (Ø 8-13 mm) 1 x M25 for heating element (Ø 11-17 mm) 1 x M16 for the sensor	1 x M20 for supply cable (Ø 8-13 mm) 1 x M25 for heating element (Ø 11-17 mm) 1 x M16 for the sensor
Material	ABS	ABS
Lid fixing	nickel-plated quick release screws	nickel-plated quick release screws
Mounting	SB-110 and SB-111 or surface mount	SB-110 and SB-111 or surface mount

Dimensions (in mm)

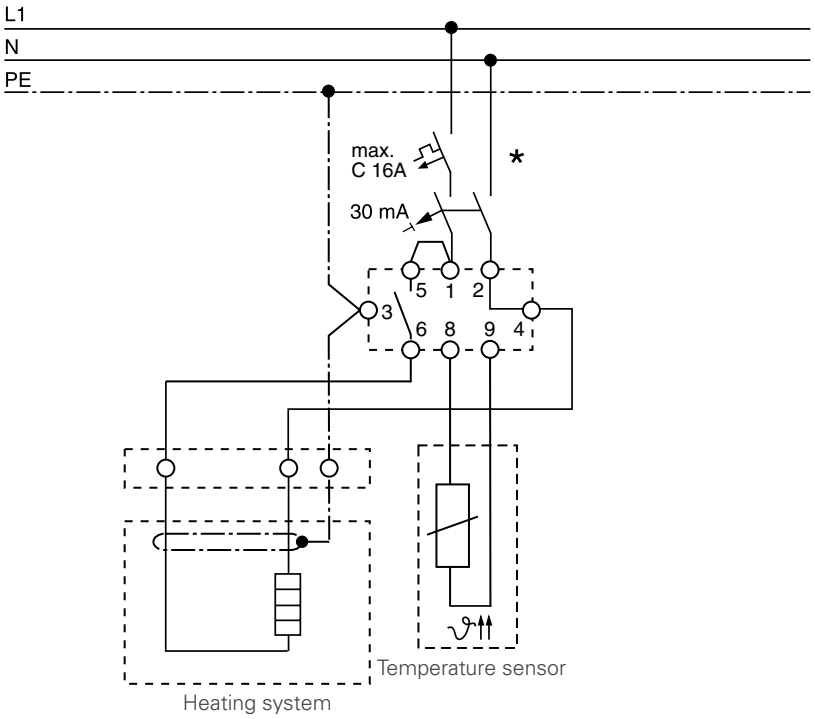


A	Green LED	Heating cable on
B	Red LED	Sensor break
C	Red LED	Sensor short-circuit

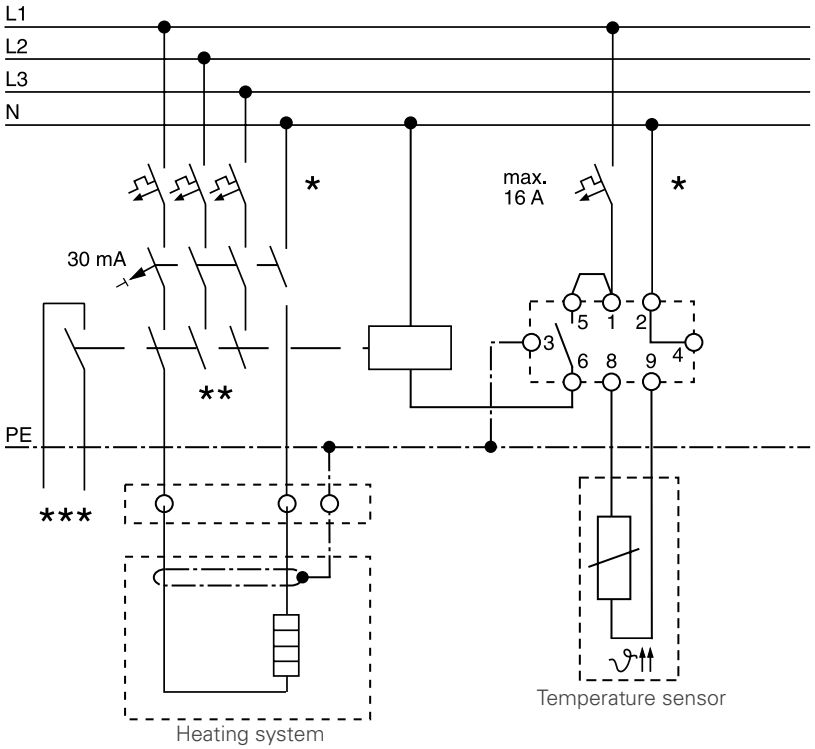
	AT-TS-13	AT-TS-14
Temperature sensor		
Type	PTC KTY 83-110	PTC KTY 83-110
Length sensor cable	3 m	3 m
Diameter sensor cable	5.5 mm	5.5 mm
Diameter sensor head	6.5 mm	6.5 mm
Sensor material	PVC	Silicone
Max. exposure temperature sensor cable	80°C	160°C
	The sensor cable may be extended to a maximum of 100 m using a 2-conductor wirE with a cross-section of 1.5 mm2. The sensor cable should be shielded if it is laid in cable ducts or in the vicinity of high-voltage carrying cables. The shield of the extension cable should be grounded at the controller end only.	
Output parameters		
Alarm on LED	Green LED: Heating Cable ON Red LED: Sensor break Red Led: Sensor short-circuit	Green LED: Heating Cable ON Red LED: Sensor break Red Led: Sensor short-circuit
Ordering details		
Part description	AT-TS-13	AT-TS-14
PN (Weight)	728129-000 (0.44 kg)	648945-000 (0.44 kg)
Accessories		
PA Reducer	Reducer M25 (M)/M20 (F)	Reducer M25 (M)/M20 (F)
PN	184856-000	184856-000
Spare temperature sensor	HARD-69	HARD-69
(AT-TS-13 and AT-TS-14)	(Max. exposure temperature 160°C)	
PN (Weight)	133571-000 (180 g)	133571-000 (180 g)

Wiring diagram for thermostat

AT-TS-13 or AT-TS-14



AT-TS-13/14 with contactor



** Two- or four-pole electrical protection by circuit-breaker may be needed for local circumstances, standards and regulations*

*** Depending on the application, one- or three-pole circuit-breakers or contactors may be used*

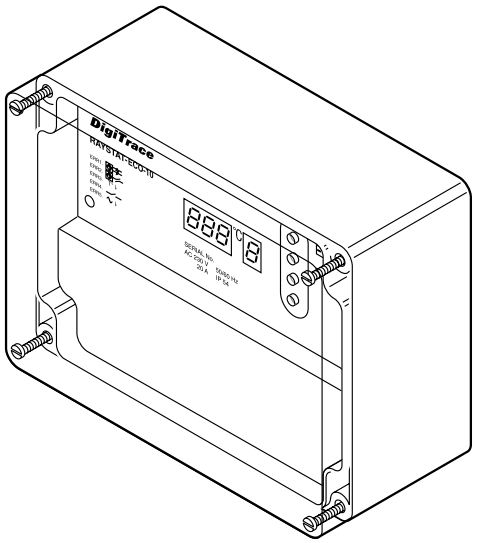
**** Optional: Potential-free circuit-breaker for connection to the BMS*

Ambient sensing
Energy saving frost protection controller

The RAYSTAT-ECO-10 temperature controller is designed to control heating cables used for frost protection applications. It continuously adjusts the heat-tracing output based on the ambient temperature. Using a proprietary algorithm, the RAYSTAT-ECO-10 controller measures ambient temperature and determines the appropriate cycle time during which the heating cables will be energised.

Since ambient temperatures in winter are often below freezing point, but well above the minimum designed ambient temperature, significant energy savings are realised. Parameters are displayed and can be set easily. The controller includes a 25 A relay which allows direct switching of the heating circuit. The enclosure can easily be installed outdoors. The unit includes a Pt 100 sensor for determining ambient temperature in ordinary area.

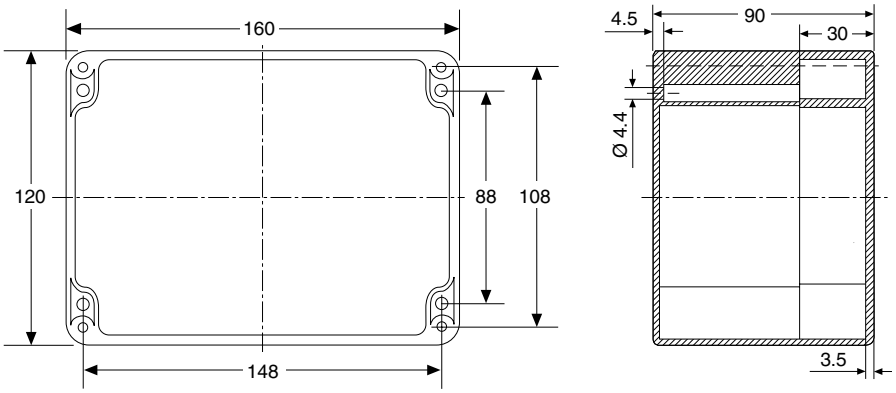
The RAYSTAT-ECO-10 controller is designed to provide trouble-free, long term operation. In addition to the display, the controller includes an alarm relay that switches either upon low supply voltage, upon output fault or upon RTD failure thus allowing remote indication of system status.



General	
Area of use	Ordinary area, outdoors
Ambient operating temperature range	–20°C to +40°C
Supply voltage (nominal)	230 V +10% –10%, 50/60 Hz
Internal power consumption	≤ 14 VA

Enclosure	
Protection	IP65
Base and lid	Grey polycarbonate base Transparent lid
Lid fixing	4 captive screws
Entries	2 x M25, 1 x M20, 1 x M16 Direct entry of heating cable into unit with M25 connection kit
Gland plug	1 x M20

Dimensions (in mm)



Temperature sensor

Type	3-wire Pt 100 according to IEC Class B
Area of use	Ordinary area

Sensor can be extended with a 3-wire shielded cable of max. 20 Ω per conductor (max. 150 m with a 3 x 1.5 mm^2 cable).

The sensor cable should be shielded if it is laid in cable ducts or in the vicinity of high-voltage carrying cables. The shield of the extension cable should be grounded at the controller end only.

Output relays

Control relay	Single pole single throw relay, rating: 25 A at 250 Vac
Alarm relay	Single pole double throw relay, rating: 2 A at 250 Vac, voltfree

Parameter settings

Maintain temperature set point	0°C to + 30°C (heating 0% powered)
Minimum ambient temperature	–30°C to 0°C (heating 100% powered)
Heater Operation if Sensor Error	ON (100%) or OFF, user defined ON or OFF
Voltage Free Operation	YES or NO

Parameters can be programmed without power supply (internal battery) and parameters are stored in non-volatile memory.

Energy saving with Proportional Ambient Sensing Control (PASC)

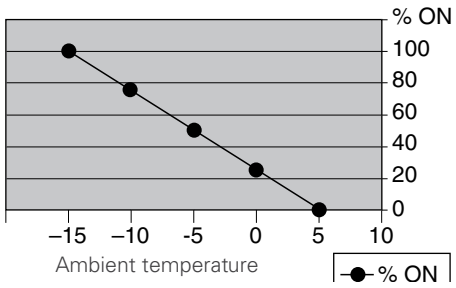
Duty cycle (power to heater ON) depends on the ambient temperature.

For example:

If minimum temperature= –15°C and if maintain temperature (set point)= +5°C

ambient t°	% ON	
–15	100	Min. Ambient
–10	75	
–5	50	
0	25	
5	0	Set point

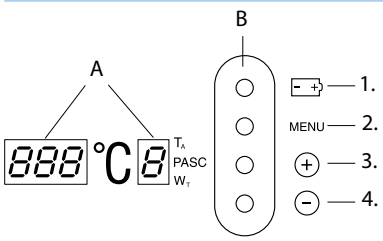
Result: At ambient temperature of –5°C, 50% energy is saved



Diagnosed alarms

Sensor errors	Sensor short/Sensor open circuit
Low temperature	Min. expected ambient temperature reached
Voltage errors	Low supply voltage/Output voltage fault

Display layout



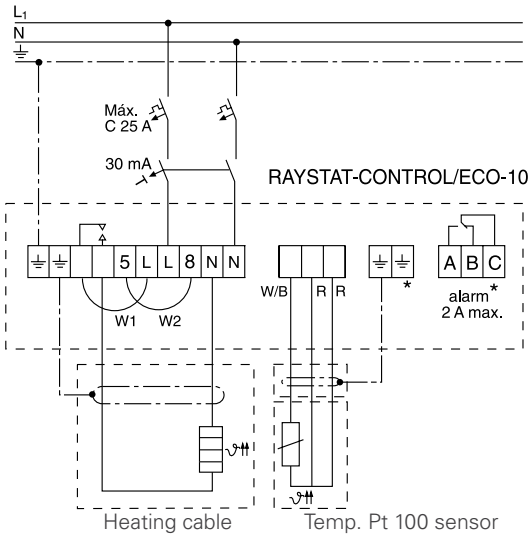
A. LED Display (parameter and error indications)

B. Push buttons

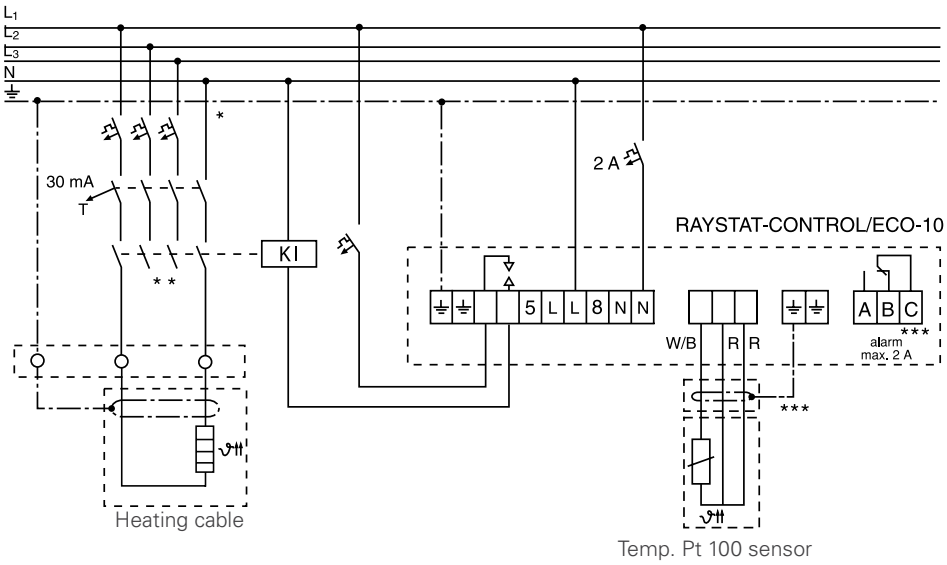
1. Battery activation
2. Parameter selection
3. Increase value
4. Decrease value

Connection details

Normal operation



Voltage free operation: Remove links W1 and W2



**Electrical protection by circuit-breaker may be needed for local circumstances, standards and regulations.*

***Depending on the application, one- or three-pole circuit-breakers or contactors may be used.*

****Optional*

Connection terminals	
Supply	3 terminals for 0.75 mm² to 4 mm²
Pt 100 connection	4 terminals for 0.75 mm² to 2.5 mm²
Control relay connection	3 terminals for 0.75 mm² to 4 mm²
Alarm relay connection	3 terminals for 0.75 mm² to 2.5 mm²

Mounting method	
	Surface mounting with 4 fixing holes on 148 x 108 mm centres, M4 clearance
Support bracket	SB-100, SB-101 (SB-110 or SB-111)

Ordering details	
Part description	RAYSTAT-ECO-10
PN (Weight)	145232-000 (0.8 kg)

Accessories	
PA Reducer	Reducer M25 (M)/M20 (F)
PN	184856-000

Surface sensing
Programmable thermostat with alarm relay

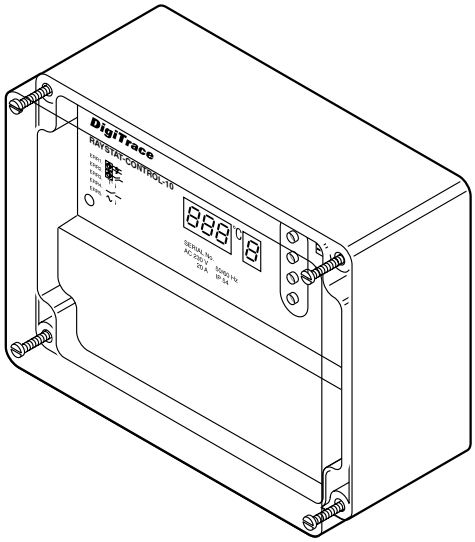
The RAYSTAT-CONTROL-10 surface sensing thermostat is designed to provide user friendly measurement and control for heating cables. The thermostat has a 25 A control relay (that can be arranged to be volt free) and a 2 A volt free SPDT alarm relay.

Parameter and eventual alarm conditions are shown on the digital display and settings can be programmed easily, even without power supply.

The RAYSTAT-CONTROL-10 thermostat is supplied with a Pt100 sensor. This sensor has a 3 m long silicone extension cable giving freedom to locate the electronics remote from the sensor.

Two M25 entries allow for the power cable and heating cable to be connected directly into the unit. The units can be mounted on the pipe using the

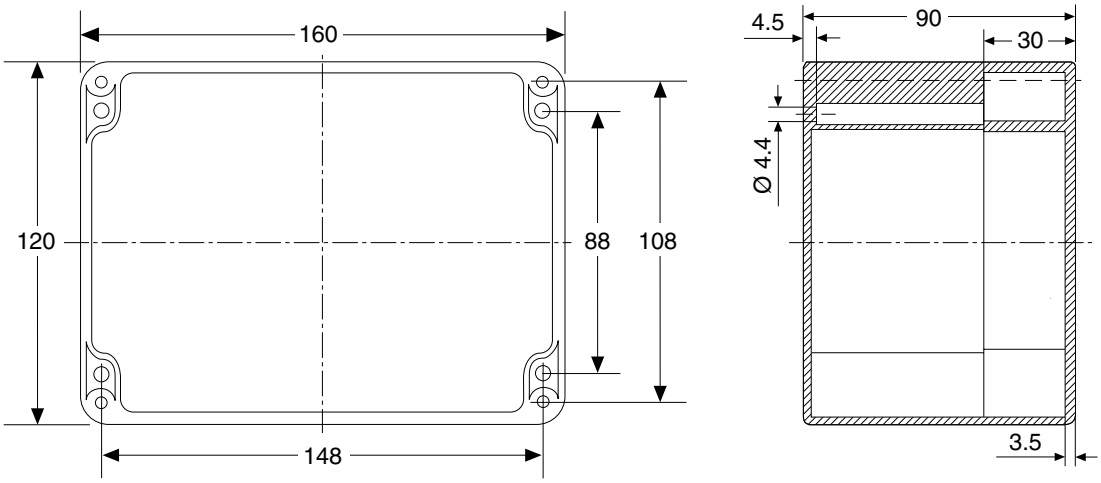
SB-100 or SB-101 support bracket.



General	
Application	Surface sensing
Area of use	Ordinary area (indoors, outdoors) Sensing in zone 1 or zone 2 possible with MONI-PT100-EXE (seperately available)
Ambient operating temperature range	–20°C to +40°C
Supply voltage (nominal)	230 V +10% –10%, 50/60 Hz
Internal power consumption	≤ 14 VA

Enclosure	
	IP65
Base and lid	Grey polycarbonate base Transparent lid
Lid fixing	4 captive screws
Entries	2 x M25, 1 x M20, 1 x M16 Direct entry of heating cable into unit with M25 connection kit
Gland plug	1 x M20

Dimensions (in mm)



Temperature sensor	
Type	3-wire Pt 100 according to IEC Class B
Maximum exposure temperature	200°C
Area of use	Ordinary area

Sensor can be extended with a 3-wire shielded cable of max. 20 Ω per conductor (max. 150 m with a 3 x 1.5 mm² cable).

Sensing in hazardous area zone 1 or zone 2 can be done with MONI-PT100-EXE.

The sensor cable should be shielded if it is laid in cable ducts or in the vicinity of high-voltage carrying cables. The shield of the extension cable should be grounded at the controller end only.

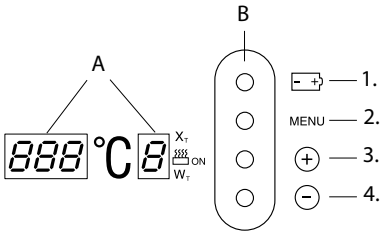
Output relays	
Control relay	Single pole single throw relay, rating: 25 A at 250 Vac
Alarm relay	Single pole double throw relay, rating: 2 A at 250 Vac, voltfree

Programmable parameter settings	
Temperature setting	0°C to +150°C
Hysteresis	1 K to 5 K
Low Temperature Alarm	–40°C to +148°C
High Temperature Alarm	+2°C to +150°C or switched OFF
Heater Operation if Sensor Error	ON or OFF
Volt Free Operation	YES or NO

Parameters can be programmed without power supply (internal battery) and parameters are stored in non-volatile memory.

Diagnosed alarms	
Sensor errors	Sensor short/Sensor open circuit
Low temperature	High temperature/Low temperature
Voltage errors	Low supply voltage/Output voltage fault

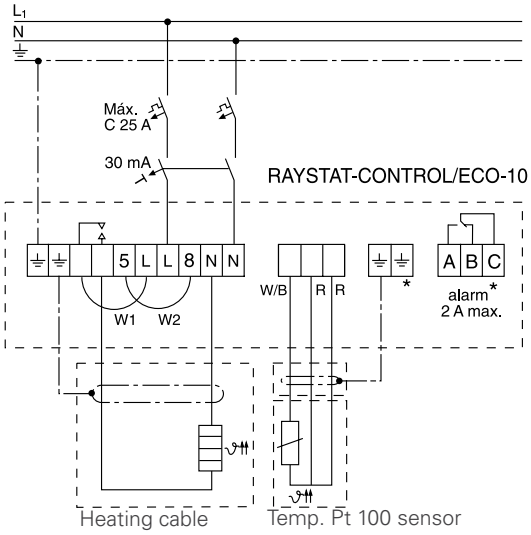
Display layout



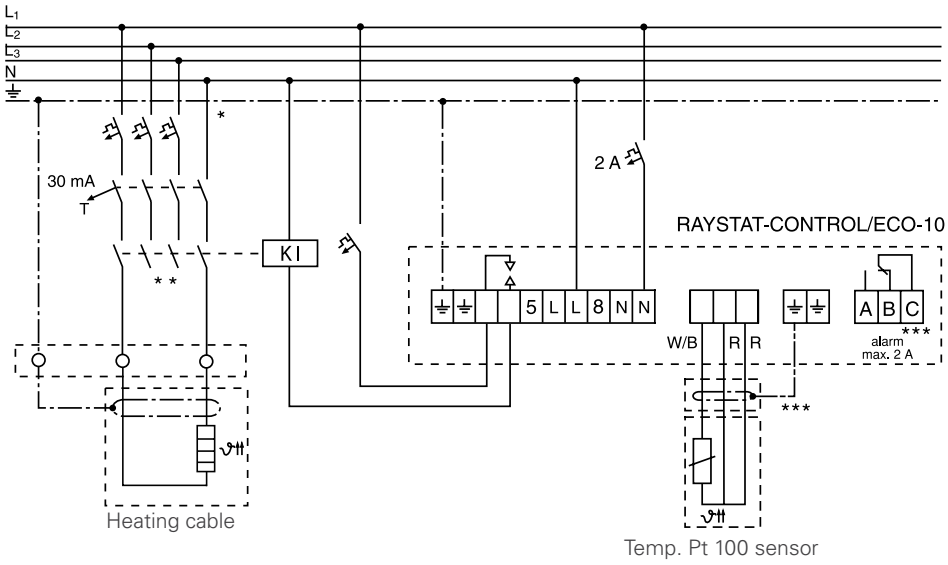
A. LED Display (parameter and error indications)
B. Push buttons
   1. Battery activation
   2. Parameter selection
   3. Increase value
   4. Decrease value

Connection details

Normal operation



Voltage free operation: Remove links W1 and W2.



** Electrical protection by circuit-breaker may be needed for local circumstances, standards and regulations.*

*** Depending on the application, one- or three-pole circuit-breakers or contactors may be used.*

**** Optional*

Connection terminals

Supply	3 terminals for 0.75 mm² to 4 mm²
Pt 100 connection	4 terminals for 0.75 mm² to 2.5 mm²
Control relay connection	3 terminals for 0.75 mm² to 4 mm²
Alarm relay connection	3 terminals for 0.75 mm² to 2.5 mm²

Mounting method

	Surface mounting with 4 fixing holes on 148 x 108 mm centres, M4 clearance
Support bracket	SB-100, SB-101

Ordering details

Part description	RAYSTAT-CONTROL-10
PN (Weight)	828810-000 0.8 kg)

Accessories

PA Reducer	Reducer M25 (M)/M20 (F)
PN	184856-000

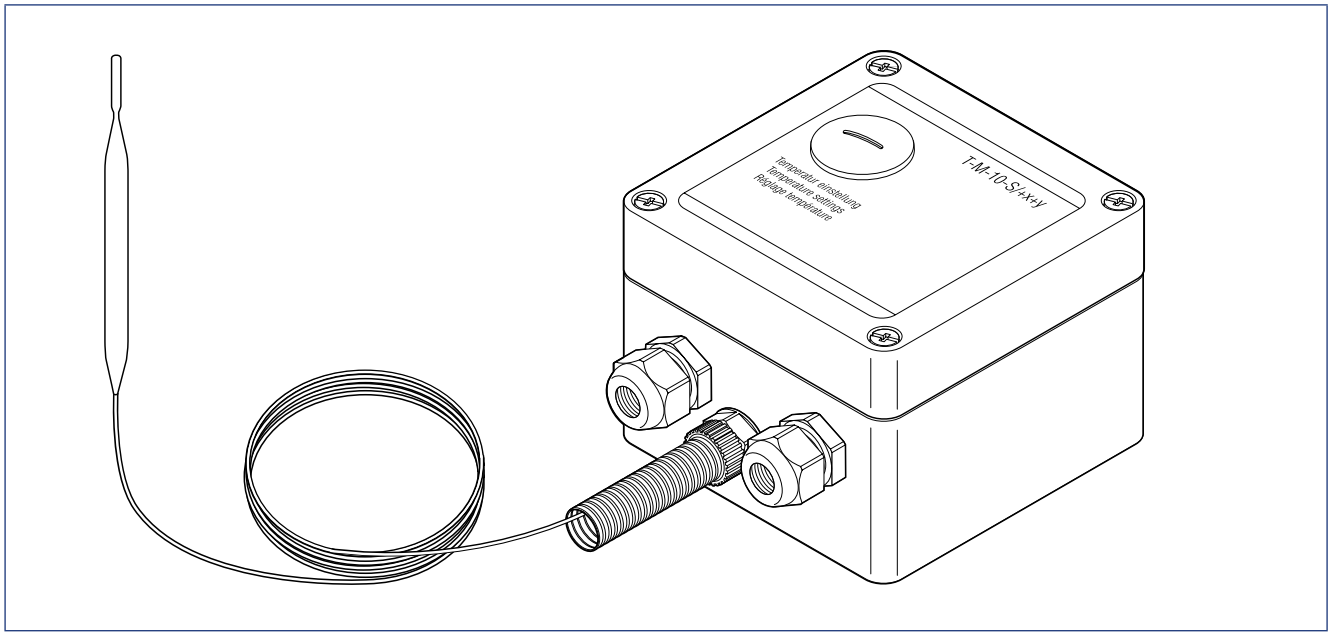
Surface sensing thermostat

A surface sensing thermostat providing temperature control in safe areas.

Temperature set point adjustment can be completed, without opening the enclosure, via a removable plug in the lid. The 2 meter long stainless steel capillary is protected at the enclosure by a flexible conduit.

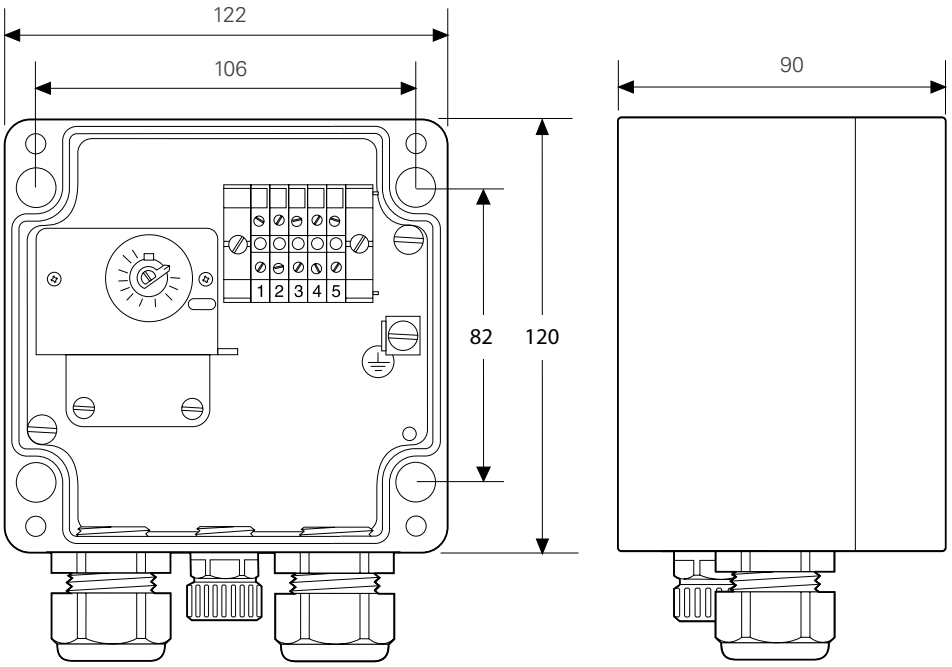
Direct connection of the heating cable is possible.

The thermostat is available in 3 temperature ranges: 0–50°C; 0–200°C; 50–300°C.



	T-M-10-S/0+50C	T-M-10-S/0+200C	T-M-10-S/+50+300C
General			
Area of use	Ordinary area	Ordinary area	Ordinary area
Product specification			
Max rated voltage (nom)	230 Vac	230 Vac	230 Vac
Temperature setting	0°C to +50°C	0°C to +200°C	+50°C to +300°C
Switching type	Single pole change over (SPDT) 100,000 cycles at 16 A	Single pole change over (SPDT) 100,000 cycles at 16 A	Single pole change over (SPDT) 100,000 cycles at 16 A
Switching capacity	Max 16 A	Max 16 A	Max 16 A
Hysteresis/Differential	2.5% of temperature range	2.5% of temperature range	2.5%of temperature range
Accuracy	±1.5% of setpoint for temperature setting in upper third of range (measured at 22°C)		
Setting	Internal dial, through lid	Internal dial, through lid	Internal dial, through lid
Terminal size	4 mm^2	4 mm^2	4 mm^2
Ambient operating temp. range	–20°C to +80°C	–20°C to +80°C	–20°C to +80°C
Output parameters			
Control relay	Change-over switch	Change-over switch	Change-over switch

Dimensions (in mm)



		T-M-10-S/0+50C	T-M-10-S/0+200C	T-M-10-S/+50+300C
Enclosure				
Protection		IP65	IP65	IP65
Dimension		122 x 120 x 90 mm	122 x 120 x 90 mm	122 x 120 x 90 mm
Materials body and lid		Grey, polyester enclosure		
Lid fixing		4 captive screws, stainless steel		
Entries		2 entries: 1 x M25 Reducer M25 (M)/M20 (F) incl. M20 gland (Ø 8-13 mm) 1 x M20 gland (Ø 8-13 mm)		
Temperature sensor				
Type		Fluid filled capillary, 2 m long		
Dimensions	Ø	8 mm	8 mm	8 mm
	Length sensing element	166 mm	78 mm	56 mm
Material		V4A Stainless Steel		
Exposure temperature		–40°C to +60°C	–20°C to +230°C	–20°C to +345°C
Minimum bending radius		10 mm for capillary, the sensor cannot be bent		
Mounting method				
Support bracket		SB-110 or SB-111 or surface mount	SB-110 or SB-111 or surface mount	SB-110 or SB-111 or surface mount

Ordering details

Ordering references	PN Number	Weight
T-M-10-S/0+50C	105336-000	1 kg
T-M-10-S/0+200C	337388-000	1 kg
T-M-10-S/+50+300C	607672-000	1 kg

Meaning of reference: T-M-10-S/+x+y

T = thermostat

M = mechanical thermostat

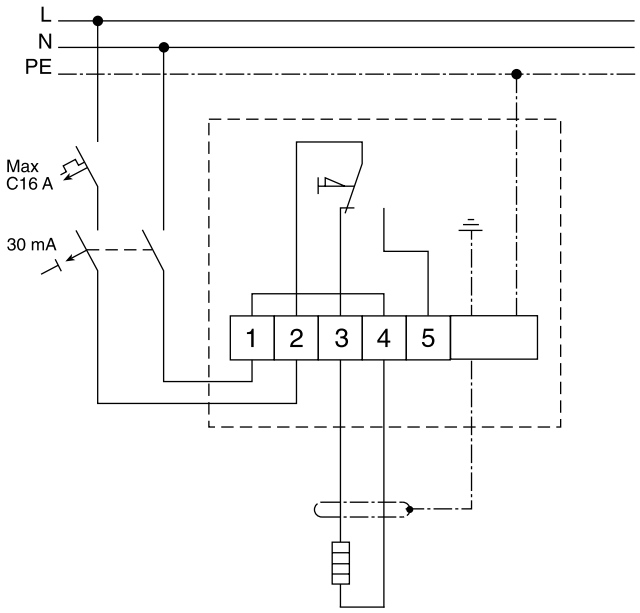
10 = control thermostat

S = surface sensing

x = min temperature of control range

y = max temperature of control range

Connection details



Heating system

Surface sensing Thermostat with limiter

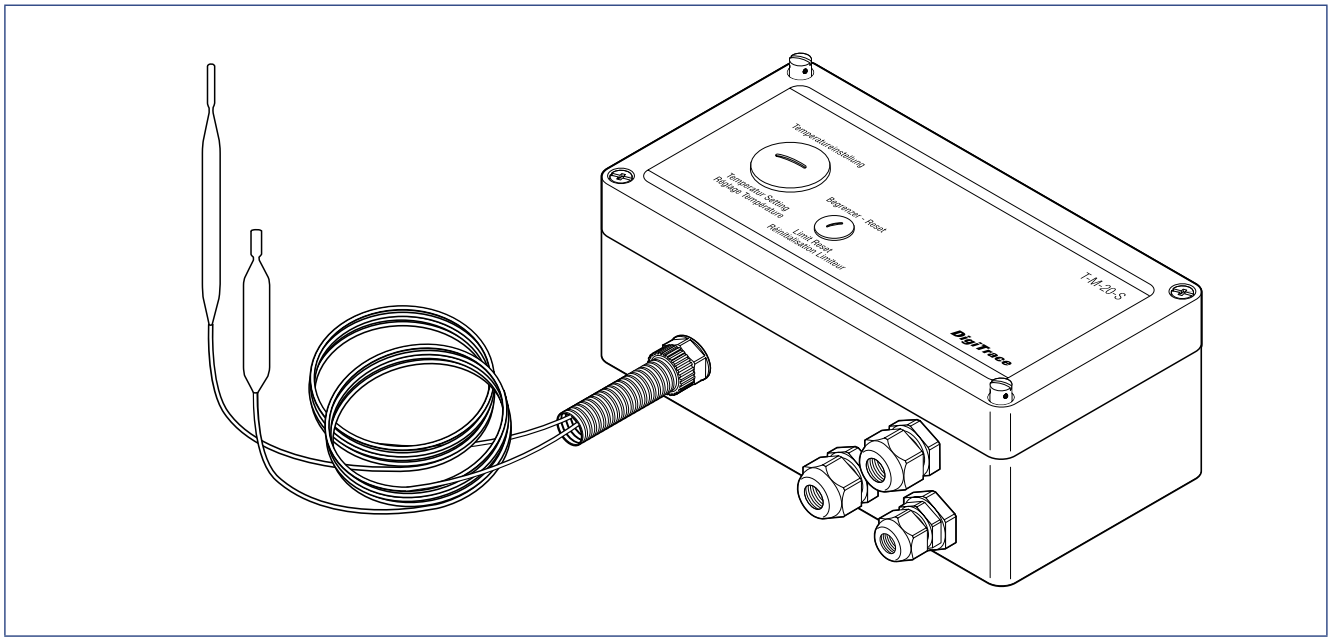
A surface sensing thermostat providing temperature control and temperature limiter in safe areas. The high limit cut-out prevents the heating system exceeding a preset maximum temperature should the control function fail to operate or an unsafe process temperature occur.

Temperature set point adjustment and limiter reset can be completed, without opening the enclosure, via removable plugs in the lid.

Both 2 meter long stainless steel fluid filled bulb and capillary are protected at the enclosure by a flexible conduit.

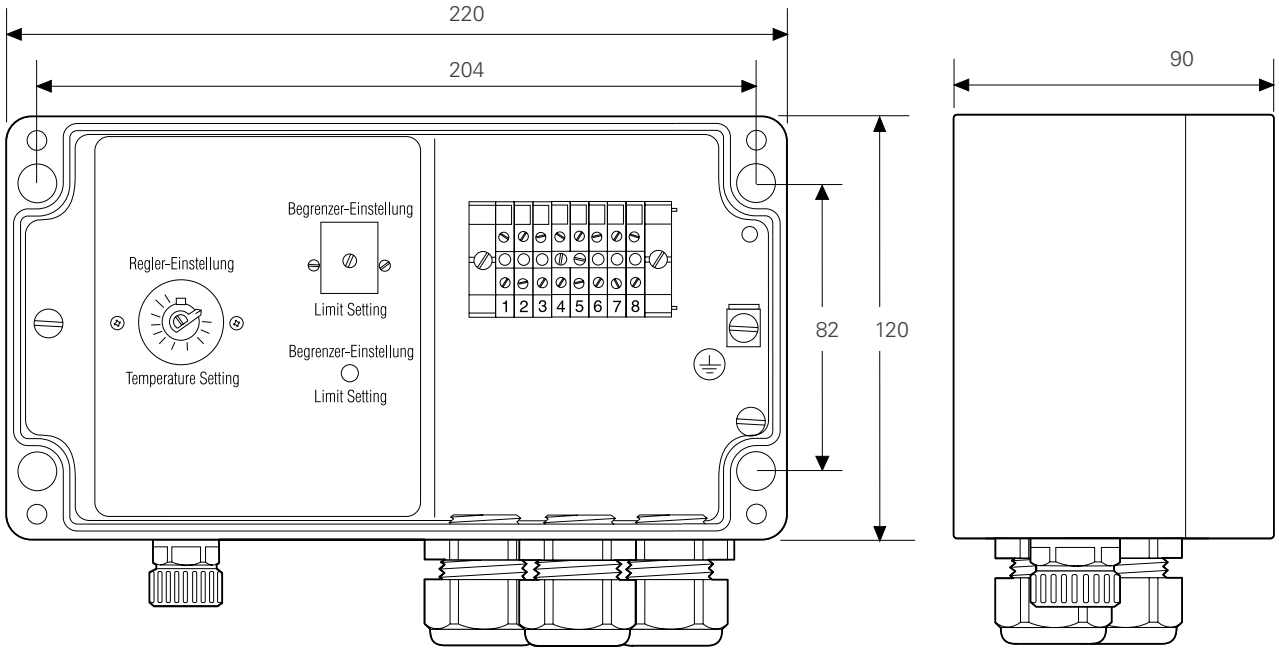
Direct connection of the heating cable is possible.

The thermostat is available in 3 temperature ranges. 0–50°C; 0–200°C; 50–300°C.



		T-M-20-S/0+50C	T-M-20-S/0+200C	T-M-20-S/+50+300C
General				
Area of use		Ordinary area	Ordinary area	Ordinary area
Product specification				
Max rated voltage (nom)		230 Vac	230 Vac	230 Vac
Temperature setting	Controller	0°C to +50°C	0°C to +200°C	+50°C to +300°C
	Limiter	+20°C to +150°C	+130°C to +200°C	+20°C to +400°C
Switching type		Single pole change over (SPDT) 100,000 cycles at 16 A (controller) 500 cycles at 10 A (limiter)		
Switching capacity	Controller	Max 16 A at 230 Vac	Max 16 A at 230 Vac	Max 16 A at 230 Vac
	Limiter	Max 10 A at 230 Vac	Max 10 A at 230 Vac	Max 10 A at 230 Vac
Breaking capacity	Controller	3700 VA	3700 VA	3700 VA
	Limiter	2300 VA	2300 VA	2300 VA
Hysteresis/Differential		2.5% of temperature range	2.5% of temperature range	2.5% of temperature range
Accuracy		±0.5% of setpoint in upper third of temperature range (at 22°C ambient)		
Setting		Internal dial, through lid	Internal dial, through lid	Internal dial, through lid
Terminal size		4 mm^2	4 mm^2	4 mm^2
Ambient operating temp. range		–20°C to +80°C	–20°C to +80°C	–20°C to +80°C

Dimensions (in mm)



		T-M-20-S/0+50C	T-M-20-S/0+200C	T-M-20-S/+50+300C
Output parameters				
Control relay		Change-over switch (SPDT)		
Limiter relay		Change-over switch with possibility for external alarm (SPDT)		
Enclosure				
Protection		IP65	IP65	IP65
Dimension		222 x 120 x 90 mm	222 x 120 x 90 mm	222 x 120 x 90 mm
Materials body and lid		Grey, polyester enclosure	Grey, polyester enclosure	Grey, polyester enclosure
Lid fixing		4 captive screws, stainless steel		
Entries		3 entries: 1 x M25 Reducer M25 (M)/M20 (F) incl. M20 gland (Ø 8–13 mm) 1 x M20 gland (Ø 8–13 mm) 1 x M20 gland (Ø 8–13 mm)		
Temperature sensor				
Type		Fluid filled capillary, 2 meter long		
Dimensions				
Controller	Ø	8 mm	8 mm	8 mm
	Length sensing element	166 mm	78 mm	56 mm
Limiter	Ø	6 mm	6 mm	6 mm
	Length sensing element	80 mm	78 mm	176 mm
Material		V4A Stainless Steel	V4A Stainless Steel	V4A Stainless Steel
Exposure temperature	Controller	–40°C to +60°C	–20°C to +230°C	–20°C to +345°C
	Limiter	–40°C to +170°C	–20°C to +230°C	–40°C to +500°C
Minimum bending radius		10 mm for capillary, the sensor cannot be bent		
Mounting method				
Support bracket		SB-120 or surface mount		

Ordering details

Ordering references	PN Number	Weight
T-M-20-S/0+50C	260448-000	1.9 kg
T-M-20-S/0+200C	750502-000	1.9 kg
T-M-20-S/+50+300C	608706-000	1.9 kg

Meaning of reference: T-M-20-S/+x+y

T= thermostat

M= mechanical thermostat

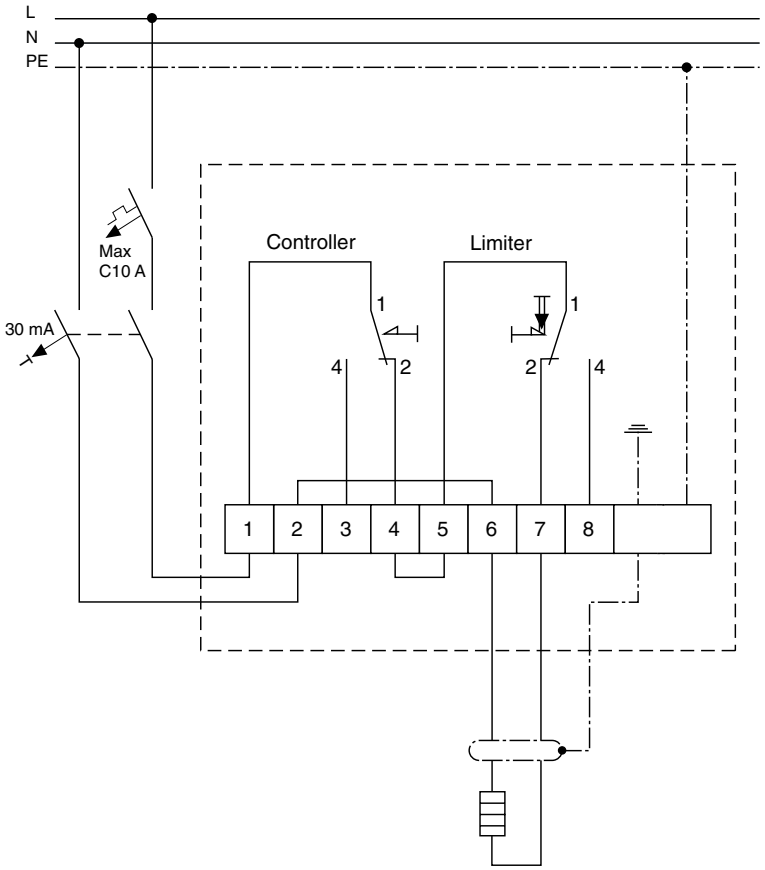
20= control thermostat + limiter

S= surface sensing

x= min temperature of control range

y= max temperature of control range

Connection details



Heating system

Single-circuit electronic controller with dual display

The DigiTrace TCONTROL-CONT-03 family of electronic controllers provide accurate temperature control and centralized monitoring for individual heat-tracing circuits.

The compact panel mount TCONTROL-CONT-03 has two displays for indicating the process value and the set point. During programming these displays provide user guidance and visual aid to simplify commissioning.

Alternatively, the optional and easy to use DigiTrace TCONTROL-CONT-03/CONFIG software can be used for computer aided configuration.

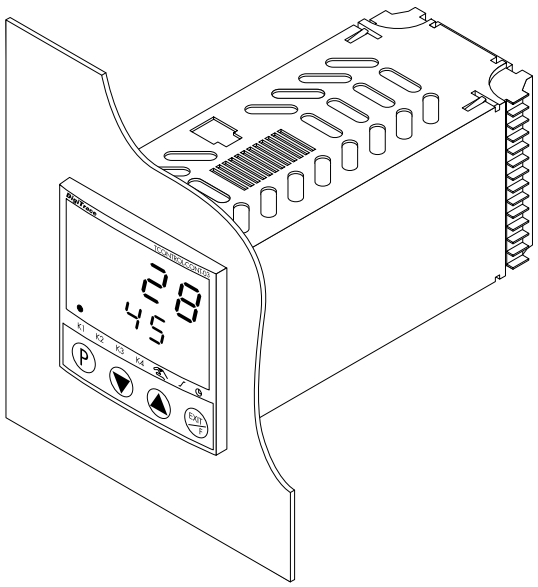
DigiTrace TCONTROL-CONT-03 units are factory configured for ON/OFF control and are suitable for most heat-tracing applications. Other types of control algorithms can be configured by the user.

Different hardware configurations are available: Units with a relay output for controlling electro-mechanical relays or solid state relays and TCONTROL-CONT-03/MA units with an analog output for driving other types of actuators like thyristors.

The health of the temperature input sensor is permanently monitored for failures. An alarm will appear in the event of sensor break or short circuit. In the event of a sensor failure the control output switches to a user defined state (ON or OFF)

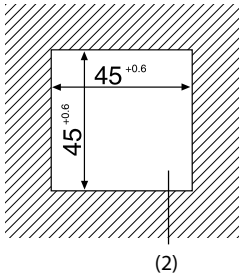
Specific features:

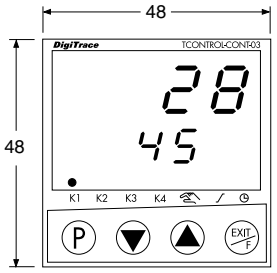
- Time delayed controller activation after initial power up (this can be used to avoid peak demands during start-up)
- Service counter included in order to count and eventually alarm on the number of relay operations.

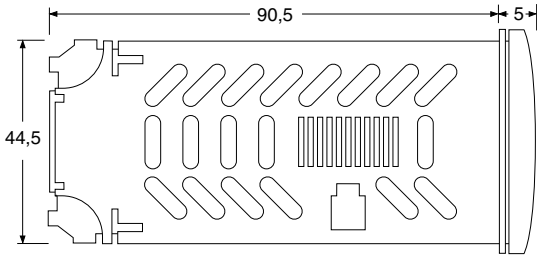


General		
Application	DigiTrace TCONTROL-CONT-03 units are panel mount controllers and are typically used for providing tight temperature control of individual heat-tracing circuits.	
Area of use	Non hazardous area indoors (panel mount – through the panel)	
Approvals/Certification	Electrical Safety to DIN EN 61010-1 over voltage category III, pollution degree 2 EMC DIN EN 61326, Class B to industrial requirements.	
Memory data backup	EEPROM based non-volatile memory. No loss of configuration data after power outage or long term shut down.	
Display	2 piece of 7-segment LED display with status indication LED´s (yellow/green)	
Supported control modes	ON/OFF, P, PI, PD or PID with auto-tuning are user selectable	
Measuring accuracy	Pt100 3-wire	error ≤ 0.1%,
	Pt100 2-wire	error ≤ 0.4%
	Thermocouples (incl. cold junction)	error ≤ 0.25%
	Voltage and current inputs	error ≤ 0.1%

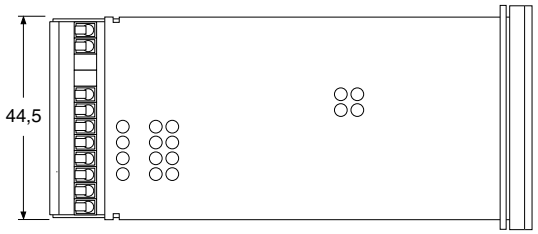
Dimensions (in mm)







Minimum spacing in between panel cut-outs		Horizontal spacing	Vertical spacing
TCONTROL-CONT-03 (all types)	Without Space for configuration connector	> 8 mm	> 8 mm
	With Space for configuration connector	> 8 mm	> 65 mm



(1) Connector for optional programming interface

(2) Panel cut-out

Electrical Properties

Supply Voltage & own power consumption	110 Vac to 240 Vac –15/+10%, 48 to 63 Hz & ~15 VA
Electrical connections	Via screw terminals on the back of the unit. Terminals are suitable for wires ranging from 1 to maximum 1.3 mm² solid core or 1 mm² stranded with cable shoe. Terminal strips are pluggable.
Supported output types (depending on model)	TCONTROL-TCONT-03: 3 relay outputs (SPST) + 1 logic output TCONTROL-CONT-03/MA: 2 relay outputs (SPST) + analog output TCONTROL-CONT-03/COM: 3 relay outputs (SPST) + 1 logic output + RS485 TCONTROL-CONT-03/COMA: 2 relay outputs (SPST) + analog output + RS485

Input options (all types)

Temperature sensor inputs	Pt 100, Pt 1000 RTD´s in 2- and 3 wire connection, KTY11-6 sensors Thermocouple types: L, J, U, T, K, E, N, S
Electrical input signals	0/4 .. 20 mA or 0/2 .. 10 V (Ri = 100 Kohm)
Temperature control range	From –200 to + 2400°C depending on the type of temperature sensor used

Output options and output ratings (depending on type)

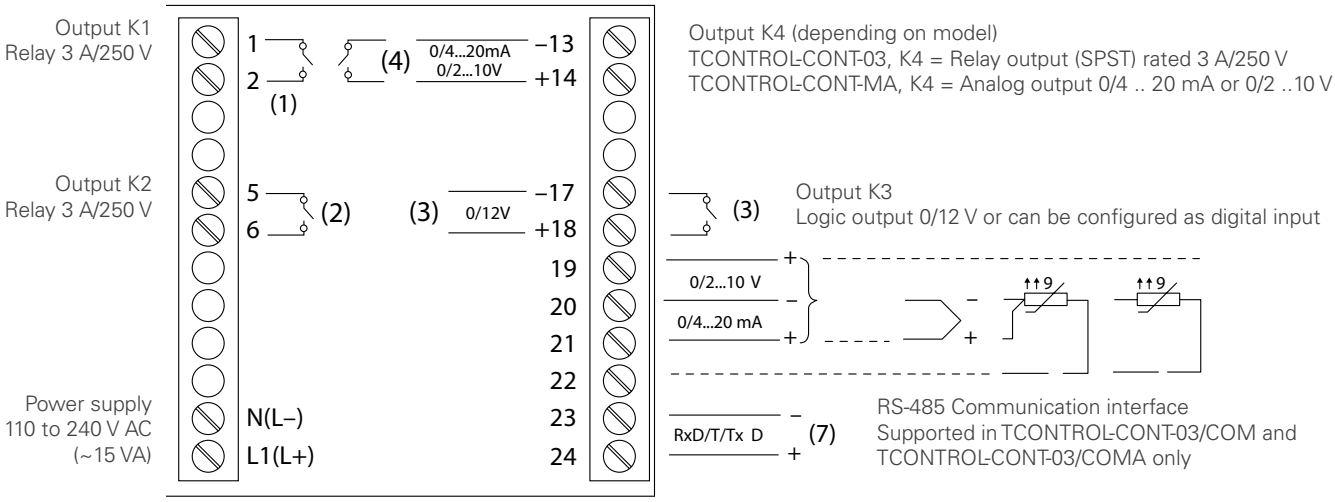
TCONTROL-CONT-03 TCONTROL-CONT-03/COM	Control and alarm relay contacts (SPST) are rated 3 A at 230 VAC. Expected lifetime: 350k operations at rated current or ~900K operations at 1 A Logic output 0 .. 12 V. Maximum current 20 mA
TCONTROL-CONT-03/MA TCONTROL-CONT-03/COMA	Control output, analog: 0/4 .. 20 mA Rload ≥ 500 Ohm Logic output 0 .. 12 V, maximum current 20 mA Alarm relay contacts (SPST) are rated 3 A at 230 VAC. Expected lifetime: 350k operations at rated current. 900k operations at 1 A
Communication options (*)	RS-485, Modbus at 9600, 19200 or 38400 BPS. Maximum up to 32 devices per network. (*)
Alarm options	2 independently configurable alarm relay outputs are provided. TCONTROL-CONT-03 units automatically alarm in case of sensor break or sensor short. On top of the input sensor driven alarms up to 8 different temperature triggered alarm functions can be defined. (see installation instructions for details)

Enclosure

Housing type	Plastic enclosure approved to IEC 61554 (ABS) Suitable for installation in electrical distribution panels
Environmental protection	Front IP65, rear IP20 to DIN EN60529
Max. operating temperature	–5 to +55°C
Max. storage temperature	–40 to +70°C
Relative humidity	90% maximum, no condensation
Installation position	All positions allowed.

(*) supported on TCONTROL-CONT-03/COMx units onl

Connection diagram



Wiring example			
Ordering details	**Part description**	**Product Number**	**Weight**
Control units	TCONTROL-TCONT-03	1244-006829	~ 0.125 kg
	TCONTROL-CONT-03/MA	1244-006830	
	TCONTROL-CONT-03/COM	1244-006982	
	TCONTROL-CONT-03/COMA	1244-006981	
Accessory selection table			
Configuration and setup interface + software	TCONTROL-CONT-03/CONFIG	1244-006983	~ 0.120 kg
Accessory selection table			
Sensors for hazardous area	MONI-PT100-EXE (1), (2)	967094-000	
	MONI-PT100-4/20MA	704058-000	
Sensor for non-hazardous area	MONI-PT100-NH	140910-000	
Support bracket for temperature sensors	JB-SB-26	338265-000	

Note 1: Sensor can be extended with a 3-wire shielded cable of max 30 Ohms per conductor (max. 150 m with a 1.5 mm² cable). The sensor cable should be shielded if it is laid in cable ducts or in the vicinity of high-voltage carrying cables. The shield of the extension cable should be grounded at the controller end only.

Note 2: MONI-PT100-EXE temperature sensors can be directly connected to the TCONTROL-CONT-03 input terminals. There is no need to use current limiting devices such as zener barriers or isolators.

Note 3: Installed in ordinary area.

DIN rail mountable electronic thermostat with display

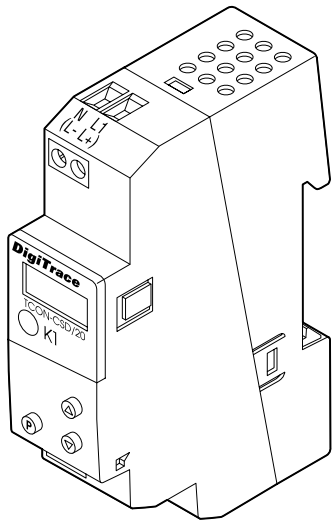
The TCON-CSD/20 is a compact digital thermostat for simple ON/OFF temperature control. The temperature is measured through a temperature sensor and shown on a LCD display. The actual status of the output relay is signaled via a LED.

The instrument is commissioned and operated via three soft key push buttons on the unit's front panel.

Through its compact design and robust construction the TCON-CSD/20 allows for simple and space-saving installation.

Specific features:

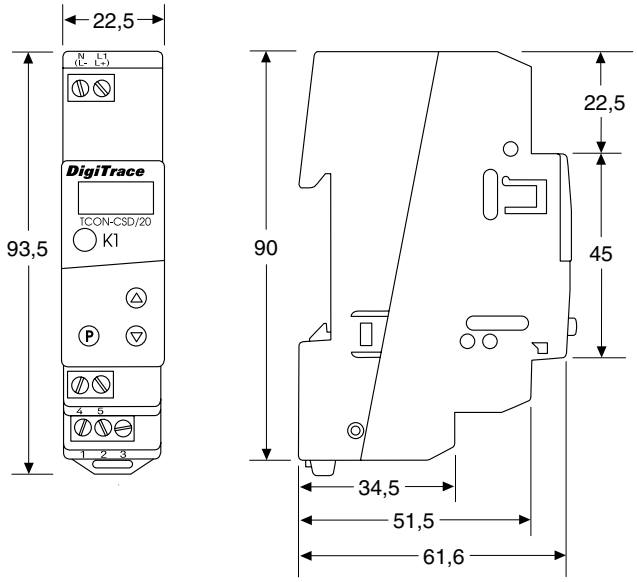
- Time-delayed controller activation after initial power up (can be used to avoid peak demands on power during start-up)
- Parameter level can be protected by means of a secret code
- Adjustable switching differential.
- Input sensors are permanently monitored for cable short or breakage.



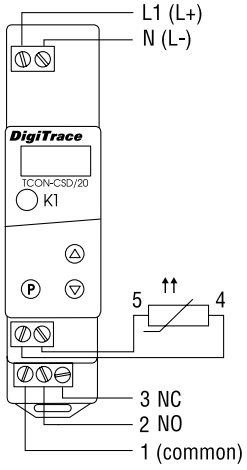
General	
Application	Usable for all applications requiring tight temperature control for either line sensing or ambient sensing control
Area of use	DIN rail mounting in panels or enclosures installed in non-hazardous area. Sensing temperature in hazardous area Zone 1 is possible when used in conjunction with MONI-PT100-EXE or MONI-PT100-EXE-SENSOR (separately available)
Temperature control range	–200°C to +500°C (accuracy 0.1%)
Ambient operating temperature	0°C to +55°C
Storage temperature	–40°C to +70°C
Climatic conditions	≤75% relative humidity, no condensation
LED indicator	The LED at the front of the unit lights up when the output relay is energized.

Enclosure	
Protection	IP 20 to EN 60529
Material	Polycarbonate
Installation	On 35 x 7.5 mm DIN rail
Installation position	Any position allowed
Flammability class	UL 94 VO

Dimensions (in mm)



Wiring Diagram



Supply
230 Vac +10/–15%

Measurement input
Pt 100

Relay output
changeover (floating)
10 A/250 Vac

Electrical data	
Power supply & own power consumption	230 Vac +10/–15%, 48 – 63 Hz < 1 VA
Connection terminals	Screw terminals for wires with a maximum cross-section of 2.5 mm^2
Relay output	10 A rated changeover contact (SPDT)
Contact lifetime	A minimum lifetime of 150 K operations at 10 A/250 Vac 50 Hz resistive load.

Temperature sensor	
	Pt100, Pt1000 or KTY2X-6 all connected in 2-wire circuit Sensor "open" and sensor "short" will be automatically detected and will cause the output to switch to the customer programmed default either permanently ON or OFF When using 2-wire temperature sensors there will be an error on the temperature readout of approximately 1°C per 0.39 Ohm lead resistance added. TCON-CSD/20 units are equipped with an option to compensate for the cable resistance added in order to improve the accuracy. Refer to the installation instructions for more details. When the sensor cable is laid in cable ducts or in the vicinity of high voltage carrying cables the sensor extension cable should be shielded. The shield of the extension cable should be grounded at the controller end only.
Switching point accuracy	±2% of range span
Switching differential	Adjustable from 0.25% to 5% (factory set at minimum value)
Zero point correction	Enables matching of the switching point and probe accuracy (offset)

Electromagnetic compatibility	
	To EN 61 326. Emission approved to Class B, immunity to industrial requirements

Electrical safety	
	To EN 61 010, Part 1, over voltage category III, pollution degree 2

Data backup	
	EEPROM (unit does not loose configuration settings after power outage)

Ordering details	
Order reference & weight	1244-001133 (0.11 kg)

Heat-Trace Control system

Product overview

The DigiTrace HTC-915 system is a compact, full-featured microprocessor-based single-point heat-trace controller. The HTC-915-CONT provides control and monitoring of electrical heat-tracing circuits for both freeze protection and temperature maintenance and can be set to monitor and alarm for high and low temperature, high and low current, ground fault level, and voltage. The DigiTrace HTC-915-CONT is provided with two outputs: one to drive an external contactor coil, and the other to drive an external solid-state relay (SSR). Communications capability is included for remote control and configuration, complete with Supervisor software capability.

Control

The DigiTrace HTC-915-CONT measures temperature via 3-wire platinum PT100 connected directly to the unit. When used with an Ex approved PT100 sensor (as is the MONI-PT100-EXE) the controller can measure temperatures in a hazardous area. Open, shorted, or out of range PT100 resistance is automatically detected. If an PT100 failure occurs, the control output trips open and an alarm is generated. The controller can be used in line sensing, ambient sensing, proportional ambient sensing, and power limiting mode.

Monitoring

A broad variety of parameters are measured including: temperature, voltage, power, contactor cycles, hours in use, load resistance, load current, and ground-fault current. To ensure system integrity, the system can be programmed to periodically check the heating cable for faults, alerting maintenance personnel of a heat-tracing problem. A potential free relay is provided for alarm annunciation back to a Distributed Control System (DCS) or alarm indicator.

Ground-fault Alarming

Optionally, the HTC-915-CONT can be programmed to measure ground-fault current. This option allows for the generation of early warnings before the ELCB trips. The trip level of the early alarm is user definable and can be set at any value between 10 and 250 mA. The ground fault alarms allow for preventive maintenance to be scheduled before the safety device trips and causes down time of important pipelines. Note that this alarm may only be used to generate a warning, it is not intended to replace the RCD (ELCB), which is mandatory for most applications.

Overtemperature prevention

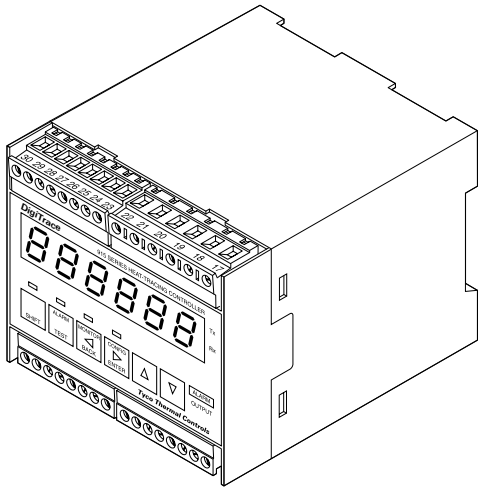
In order to assure that T class temperatures inside hazardous areas are not being exceeded the HTC-915-CONT can be equipped with the temperature limiter HTC-915-LIM. The HTC-915-LIM is a compact microprocessor based temperature limiter that provides protection against overtemperature of heating cables. (Refer to the installation instructions of the HTC-915-LIM for the full list of details.)

Installation

The DigiTrace HTC-915-CONT comes ready to install, and the DIN rail mount plastic enclosure is approved for use in indoor locations. The HTC-915-CONT operator interface includes LED displays and function keys that make it easy to set-up and maintain - no additional devices are needed. Alarm conditions and program settings are easy to interpret on the full-text front panel. Settings are stored in nonvolatile memory in the event of power failure.

Communications

Multiple DigiTrace HTC-915-CONT units may be networked to a host PC running Windows-based Supervisor software for central programming, status review, and alarm annunciation. The HTC-915-CONT supports the Modbus protocol and includes an RS-485 communications interface.

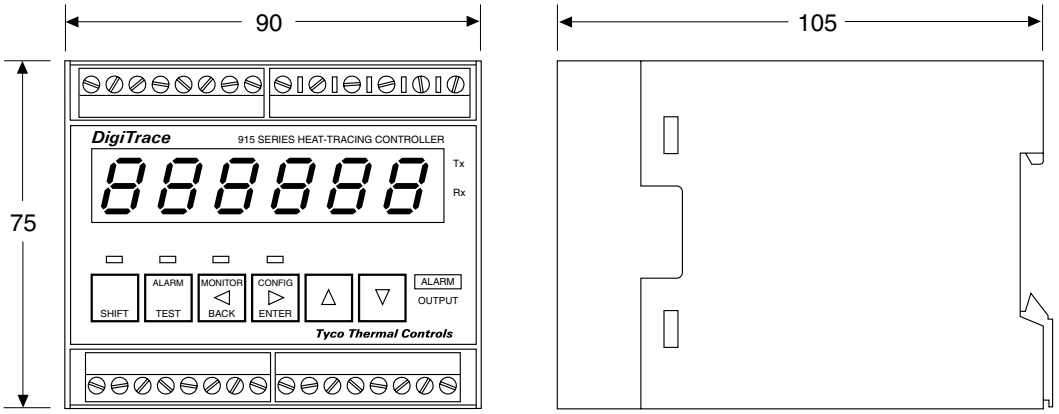


Application		
Type		Surface sensing/ambient sensing
Area of use		Non-hazardous area indoors, typically panel mounted
Approval certification		CE marked
Product specification		
Temperature range controller		–60°C to 570°C in steps of 1 K
Control algorithms		EMR: Line sensing on/off, proportional ambient SSR: Line sensing on/off, proportional, proportional ambient, power limiting, soft start
Switching accuracy		1 K
Electrical properties		
Connection terminals		Screw type terminals. All terminals suitable for stranded and solid core connection cables having a cross section between 0.5 and 2.5 mm^2 (24 to 12 AWG)
Supply voltage		100 Vac to 250 Vac, +10% -10%, 50/60 Hz, 0.15 A to 0.06 A
Power consumption		Max 20 VA with limiter connected
Control output	Contactor control output	(EMR) Electromechanical relay rated 3 A/250 Vac, 50/60 Hz
	Solid-state relay control output	(SSR) 12 VDC, 75 mA. max. to drive normally open Solid state relays. Depending on the application, one, two or three phase switching elements have to be used. (Solid state relays are not included)
Switching capacity		Depends on the type of switch element used (The switch element is external)
Alarm output relay		Relay contact rated 3 A/250 Vac, 50/60 Hz Output is user programmable to open or to close on alarm.
Power output		12 Vdc, 200 mA max.
Temperature sensor		
Type		100 Ω platinum Pt 100, 3-wire, α = 0.00385 Ω/°C. Can be extended with a three core shielded cable of maximum 20 Ω lead resistance per conductor.
Quantity		2 RTD inputs available
Communications		
Protocol		Modbus RTU or ASCII
Topology		Multidrop/daisychain
Cable		Single shielded twisted pair, 0.5 mm^2 (24 AWG) or larger
Length		Typical 2.7 km max @ 9600 Baud
Quantity		Up to 32 devices
Address		Programmable
Programming and setting		
Method		Via programmable keypad or via RS485 interface
Units of measure		°C or °F
Digital display		Actual temperature, control temperature, heater current, load power, voltage, resistance, ground fault level, alarm status, programming parameter values.
LED indicators		LEDs available for: display mode, heater ON, alarm condition, receive/transmit data.
Memory		Nonvolatile, restore after power loss.
Stored parameters (measured)		Minimum and maximum process temperature. Maximum ground fault current, maximum heater current. Power accumulator. Contactor cycle counter. Time in use clock.
Alarm conditions		Low/high temperature, Low/high current, Low/high voltage. Low/high resistance. Groundfault alarm/trip. RTD failure, loss of programmed values, switch failure.
Other		Multi language support, password protection.

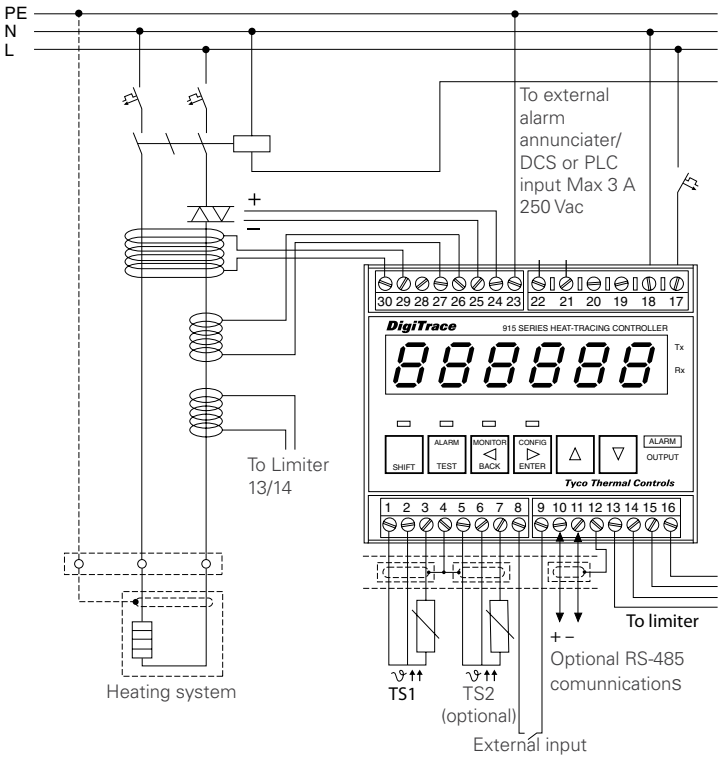
Monitoring	
Temperature	Low/High alarm range –60°C to 570°C or OFF
Ground fault (via external CT, optional)	Alarm/Trip range 10 mA to 250 mA or OFF
Load current (via external CT, optional)	Low/High alarm range 0.3 A to 100 A or OFF (can be ajusted to match heater current)
Voltage	Low/High alarm range 10 Vac to 330 Vac or OFF
Resistance	Low resistance range 1 to 100% deviation (can be ajusted to match heater current) High resistance range 1 to 250% deviation
Power	Power limit 3 W to 33 KW
Auto cycle	Diagnostic test interval adjustable from 1 to 240 minutes or 1 to 240 hours

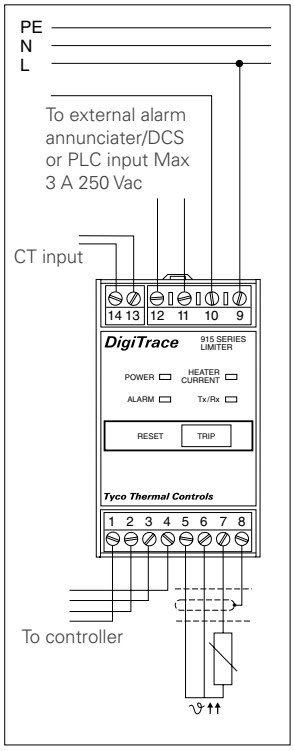
Enclosure	
Ambient operating temperature range	–40°C to +50°C
Ambient storage temperature range	–40°C to +85°C
Relative humidity	0% to 90% Non condensing
Ingress protection	Housing: IP40, Terminals: IP20
Material	ASA-PC, color: green
Flammability class	V0 (UL94)
Mounting method	Panel mounting on 35 mm DIN rail

Enclosure dimensions



Wiring Diagram





Limiter is optional and not included

Terminal assignments for the controller

1. RTD 1 source
2. RTD 1 sense
3. RTD 1 common
4. Shield
5. RTD 2 source
6. RTD 2 sense
7. RTD 2 common
8. External Input + (Inhibit/override)
9. External Input – (Inhibit/override)
10. Communications (RS-485+)
11. Communications (RS-485 –)
12. Shield
13. Digital common (to Limiter 1)
14. +12 Vdc out (to Limiter 2)
15. TX data (to Limiter 3)
16. RX data (from Limiter 4)
17. Mains Input (L1)
18. Mains Input (L2/neutral)
19. Control relay output
20. Control relay output
21. Alarm relay output
22. Alarm relay output
23. PE
24. SSR control output +
25. SSR control output –
26. Load Current CT input
27. Load Current CT input
28. Shield
29. GF CT input
30. GF CT input

Ordering details

Controller	Part description	HTC-915-CONT	
	PN (Weight)	10275-001 (0.4 kg)	
Limiter	Part description	HTC-915-LIM	
	PN (Weight)	10275-003 (0.2 kg)	
Current sensor (load current transformer)		HTC-915/CT	1244-000276 (0.15 kg)
Current sensor (earth leakage current transformer)		HTC-915/ELCT	1244-000277 (0.15 kg)
RTD for Hazardous area zone 1		MONI-PT100-EXE	967094-000 (0.44 kg)
RTD for non hazardous area		MONI-PT100-NH	140910-000 (0.22 kg)
RS485 Communication cable		See datasheet RS485-WIRE	
Solid state relays	20 A 230 Vac single phase	DT-SSR-1-23-20	1244-001468 (0.16 kg)
	50 A 480 Vac single phase	DT-SSR-1-48-50	1244-001467 (0.75 kg)

Temperature limiter

Product overview

The DigiTrace HTC-915-LIM is a compact, microprocessor-based temperature limiter that provides protection against over-temperature. The HTC-915-LIM has two output relays, one normally closed limiter relay (opening in occurrence of over temperature) and one alarm relay. The HTC-915-LIM is available in two versions: the first one is the base unit for use in conjunction with the HTC-915-CONT (Heat-Trace control system). The lock out temperature of this device can be programmed and altered via the front panel of the HTC-915 control unit. The limiter can be set at any value between 20 and 450°C in steps of 1K.

A second version of the HTC-915-LIM has a preprogrammed lock out temperature. HTC-915-LIM limiters are available for T1, T2, T3, T4 and T5 classified areas as indicated in table at the bottom of next page (*).

Operation

The DigiTrace HTC-915-LIM measures temperature via a 3-wire PT100 connected directly to the input terminals of the unit. In order to assure the hottest temperature is being measured the measuring tip of the PT100 needs to be installed at a representative location. When used with an Ex approved sensor (as is the MONI-PT100-EXE), the HTC-915-LIM can measure temperatures in hazardous area. Open, shorted or out-of-range PT100 resistance is automatically detected. As a result of that the control output will trip open and an alarm will be generated. When in normal operation the set point temperature of the limiter is exceeded the control output will trip open. Once tripped, the control output will remain open even if the measured temperature drops below the set point. The unit will not restart until manually reset. The HTC-915-LIM can be reset via the front panel of the unit by pressing and holding the reset button for 2 seconds or via the alarm menu of the HTC-915-CONT when the limiter is used in conjunction with a HTC-915-CONT Heat-Trace control system. Another possibility to reset the limiter is via the remote input of the HTC-915-CONT controller or via the optional DigiTrace Supervisor software.

Monitoring

When the limiter is used in conjunction with the DigiTrace HTC-915-CONT, the combination can be used as a fully featured control and monitoring system that measures a broad variety of parameters such as: temperature, voltage, power, contactor cycles, hours in use, load resistance, load current, and ground-fault current. To ensure system integrity, the controller can be programmed to periodically check the heating cable for faults, alerting maintenance personnel of a heat-tracing problem. Additional alarm outputs are available on the controller (refer to the controller datasheet for the full list of features).

Overtemperature allowance

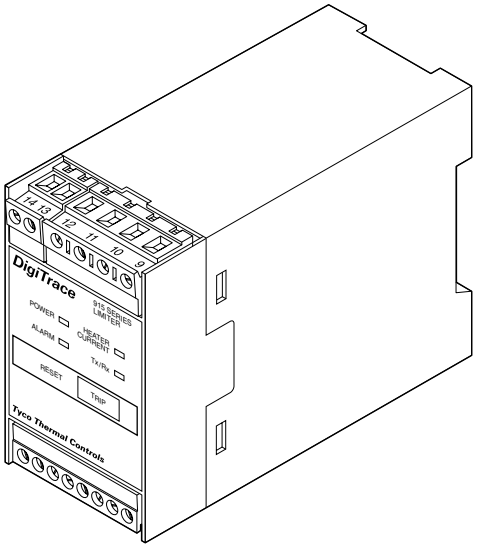
The DigiTrace HTC-915-LIM can be configured such that it will allow its setpoint temperature to be exceeded without tripping. In this instance, the unit is programmed to measure load current, and will allow a temporary over-temperature condition only when no current flows to the load. This feature shall only be used under certain, well-defined circumstances, such as when the process is heated by external heat sources, or when the installation is being steam cleaned.

Installation

The DigiTrace HTC-915-LIM can be used as a stand alone unit with a fixed preprogrammed lock-out temperature as well as in combination with a DigiTrace HTC-915-CONT control unit.

The DIN rail mount plastic enclosure is for use in safe area only.

The HTC-915-CONT operator interface includes all functions required to simplify set-up and integration of the limiter.

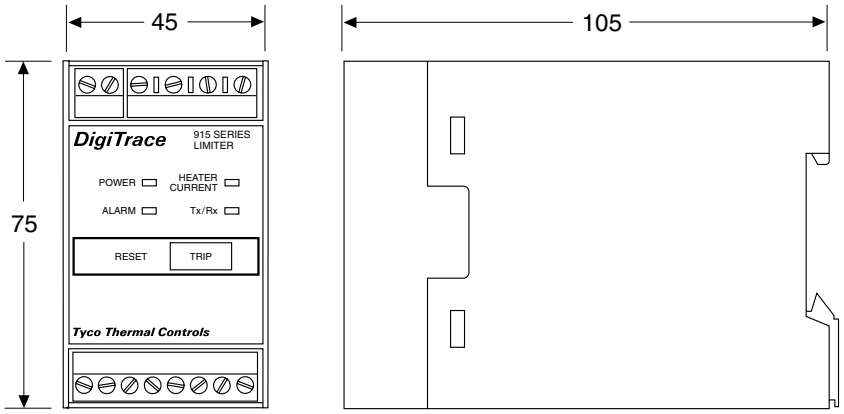


Application	
Type	Surface sensing electronic
Area of use	Ordinary area locations, indoors
Approval certification	CE marked
Product specification	
Temperature range limiter	20°C to 450°C in steps of 1 K
Switching accuracy	1 K
Electrical properties	
Connection terminals	Screw type terminals. All terminals suitable for stranded and solid core connection cables having a cross section between 0.5 and 2.5 mm2 (24 to 12 AWG)
Power supply	12 Vdc to 24 Vdc, 100 to 50 mA. Max. (can be directly obtained from a DigiTrace HTC-915-CONT)
Control output	NC relay contact rated 3 A 250 Vac, 50/60 Hz
Alarm output relay	Relay contact rated 3 A 250 Vac, 56/60 Hz (N.C. in operation opening on alarm or power outage)
Temperature sensor	
Type	100 Ω platinum RTD, 3-wire, α = 0.00385 Ω/°C.
Quantity	1 RTD input available
Cable extension	Can be extended with a three core shielded cable of maximum 20 Ω lead resistance per conductor. Open, shorted or out-of-range RTD resistance is detected. If an RTD failure is detected, the control output trips open.
Communications (to DigiTrace 915 controller)	
Topology	Point-point (limiter >< controller)
Cable	Four conductor cable, 0.5 mm^2 (24 AWG) or larger
Length	3 m max.
Programming and setting	
Method	Via the keypad of the DigiTrace HTC-915-CONT or Supervisory software
Units of measure	°C or °F, depending on the units setting of the programming device
Alarm conditions	Over-temperature, RTD failure, CT failure, loss of programmed values, limiter reset.
Monitoring	
LED indicators	LEDs available for: power, presence of heater current, limiter trip, Tx/Rx, alarm
Current (via external CT, optional)	Presence of Heater current, 0.2 A min.
Enclosure	
Ambient operating temperature range	–40°C to +50°C
Ambient storage temperature range	–40°C to +85°C
Relative humidity	0% to 90% Non condensing
Protection	Housing: IP40, Terminals: IP20
Materials	ASA-PC, color: green
Mounting	Panel mounting on 35 mm DIN rail

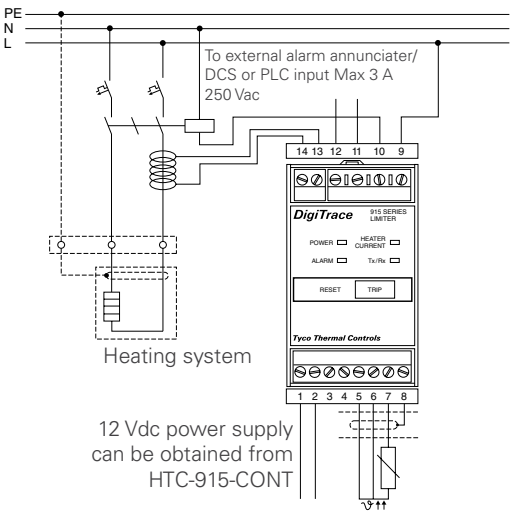
(*)	T1	T2	T3	T4	T5
Model	HTC-915-LIM-T1	HTC-915-LIM-T2	HTC-915-LIM-T3	HTC-915-LIM-T4	HTC-915-LIM-T5
Lock out temperature	450°C	300°C	200°C	135°C	100°C

When used in conjunction with the HTC-915-CONT (Heat-Trace control system) the pre programmed set point can be altered

Dimensions (in mm)



Wiring diagram



Terminal assignments of the limiter

1. Digital common (from HTC 13)
2. +12 Vdc in (from HTC 14)
3. RX data (from HTC 15)
4. TX data (to HTC 16)
5. RTD 1 source
6. RTD 1 sense
7. RTD 1 common
8. Shield
9. Control relay output
10. Control relay output
11. Alarm relay output
12. Alarm relay output
13. Load Current CT input
14. Load Current CT input

** Wiring for Communications with HTC-915-CONT Controller omitted for clarity Refer to installation instructions for details.*

*** Current sensor optional and not included*

Ordering details

Controller	Part description	HTC-915-CONT		
	PN (Weight)	10275-001 (0.4 kg)		
Limiter	Part description	HTC-915-LIM		
	PN (Weight)	10275-003 (0.2 kg)		
Limiter		HTC-915-LIM	base unit for use with HTC-915-CONT	10275-003
		HTC-915-LIM/T1	Preprogrammed to trip at 450°C (+0/–10°K)	10275-004
		HTC-915-LIM/T2	Preprogrammed to trip at 300°C (+0/–10°K)	10275-005
		HTC-915-LIM/T3	Preprogrammed to trip at 200°C (+0/–5°K)	10275-006
		HTC-915-LIM/T4	Preprogrammed to trip at 135°C (+0/–5°K)	10275-007
		HTC-915-LIM/T5	Preprogrammed to trip at 100°C (+0/–5°K)	10275-008
Current sensor (load current transformer)		HTC-915/CT		1244-000276 (0.15 kg)
RTD for Hazardous area zone 1		MONI-PT100-EXE		967094-000 (0.44 kg)

NGC-20-C-E and NGC-20-CL-E

Field-mounted
Electronic heat-tracing control unit

Product overview

The DigiTrace NGC-20 is an electronic heat-tracing control unit featuring the benefits of local control and the capability for central monitoring. DigiTrace NGC-20 control unit can be used for single phase circuits up to 25 A and is approved for use in hazardous areas. The DigiTrace NGC-20 can provide tight temperature control and is available with an IEC 61508-SIL 2 classified safety temperature limiter on board (NGC-20-CL-E). It measures the temperature with up to two RTD(s) connected to the unit. The Safety temperature limiter has a dedicated temperature input.

Control, monitoring and alarm capabilities

The DigiTrace NGC-20 offers several different control algorithms including PASC for an optimised electrical heat-tracing control. The DigiTrace NGC-20 offers alarms for high and low temperature, high and low current, ground-fault current and voltage. The trip and warning level of the ground-fault current is user configurable and can be used as a warning and to isolate circuits. The DigiTrace NGC-20 control unit provides a dry contact relay for alarm annunciation.

Automated heat-tracing system check

To ensure system integrity the DigiTrace NGC-20 control unit can be configured to periodically check dormant heating cables for faults. As a consequence maintenance is systematically informed about the status of the heat-tracing system and unexpected and usually expensive downtime of important pipelines can be reduced.

Communications and networking

The DigiTrace NGC-20 control unit is equipped with a RS-485 interface. Through this interface up to 247 DigiTrace NGC-20 units can be networked to a single DigiTrace NGC-UIT or to one serial port of standard PC running Tyco Thermal Controls´ DigiTrace Supervisor software.

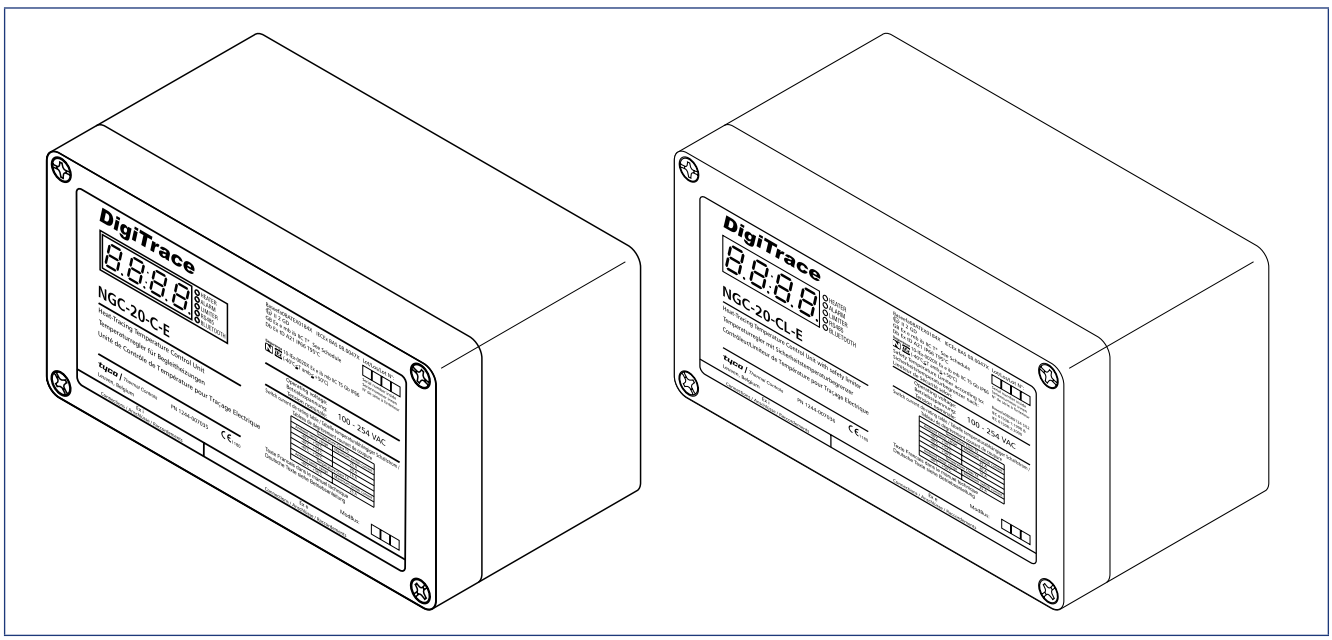
The DigiTrace NGC-20 control unit can as well be monitored and/or configured via the DigiTrace NGC-CMA wireless handheld device. This device is available for hazardous and non-hazardous areas.

Installation

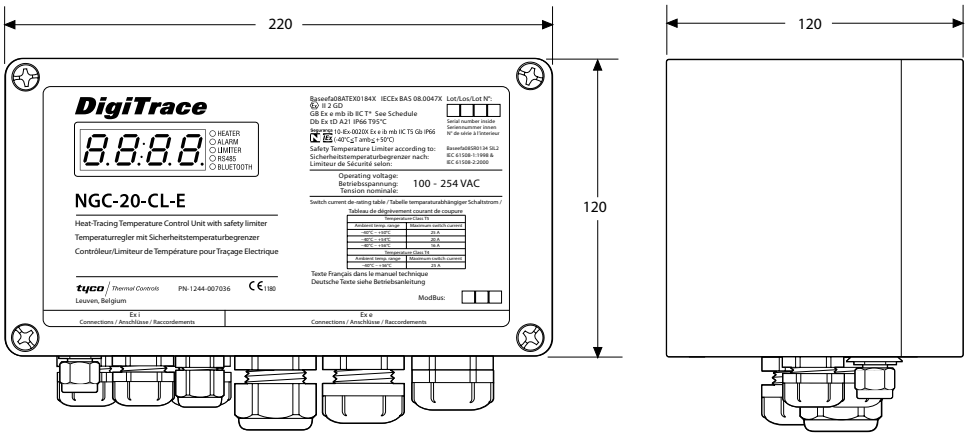
The DigiTrace NGC-20 control unit can be installed in the field near the heating application. The DigiTrace NGC-20 enclosures are manufactured from high impact-resistant, UV stabilized glass-filled polyester suitable for installation indoors or outdoors. One heating cable can be directly connected to the unit. The units can be mounted on the heated surface via an appropriate support bracket.

Configuration and commissioning

The DigiTrace NGC-20 control unit can be commissioned locally by means of a handheld programming device (DigiTrace NGC-CMA) or from a central location using the DigiTrace NGC-UIT or DigiTrace Supervisor Software. After programming, all settings are permanently stored in the non-volatile memory of the DigiTrace NGC-20 control unit, avoiding loss of data in the event of power failure or after a long term power shutdown. The DigiTrace NGC-20 control unit allows the heating and power cable to be connected directly to the unit.



Dimensions (in mm)



Sample shown is DigiTrace NGC-20-CL-E Gland included in scoop of delivery - 1 x M25 x 1,5

General

Application type	CE DigiTrace NGC-20-C(L)-E units are approved for use in Hazardous area Zone 1 or Zone 2 (Gas) or Zone 21 or Zone 22 (Dust) and non hazardous areas

Approvals

Baseefa08ATEX0184X

Ex II 2 GD

Gb Ex e mb ib IIC T* Db Ex tD A21 IP66 T95°C

IECEx BAS 08.0047X

Gb Ex e mb ib IIC T*

Db Ex tD A21 IP66 T95°C

T : The switching capacity depends on the hazardous area temperature classification (T-Class) and the maximum expected use temperature. Ratings as shown in table below*

Temperature Class T5		Temperature Class T4	
Maximum Ambient Temperature	**Maximum Switching Current**	**Maximum Ambient Temperature**	**Maximum Switching Current**
+50°C	25 A	Up to 56°C	25 A
+54°C	20 A		
+56°C	16 A		

All values as per hazardous area certification.

Current ratings are given for a supply voltage of 254 V +/-10%, 50/60 Hz and resistive loads only.

Functional safety approval[1]

Baseefa IEC 61508 Product

Baseefa08SR0134 SIL2

IEC 61508-1:1998 & IEC 61508-2:2000

Conditions of Safe Use	Refer to Hazardous Area Certificate or installation instructions

Environmental

Temperature range control unit	From –80°C to +700°C in steps of 1K
Temperature range limiter	From –60°C to +599°C in steps of 1K (NGC-20-CL-E only)
Ambient operating temperature	From –40°C to +56°C
Storage temperature	From –55°C to +80°C

Enclosure		
	DigiTrace NGC-20-C(L)-E units can be installed directly on the pipe via an appropriate support bracket as long as the maximum permitted ambient temperature is not exceeded. Alternatively, units can be mounted on any stable structure via the moulded holes in the enclosure.	
Protection	IP 66 per IEC-60529	
Material	Glass fibre reinforced enclosure with internal earth plate on the bottom	
Entries	3 x M25	1 x M25 gland Ø 8 – 17 mm: power IN/heating cable out 1 x M25 stopping plug: daisy chaining of power 1 x M25 rain plug: daisy chaining of power
	3 x M20	Digital communication IN/OUT and alarm (all with stopping plugs)
	2 X M16	Temperature sensor(s) 1 with stopping plug one with rain plug
Mounting & installation	Installation on an appropriate support bracket directly on the heated surface up to temperatures of 230°C. When the temperature of the heated surface is above 230°C, install the control unit to a stable structure nearby the application.	
Installation position	Any position allowed, typical use with glands facing down	

1 EC-61508 Safety related information is published in the NGC-20 installation instructions INSTALL-130. A copy of the INSTALL-130 can be downloaded from the literature section on http://www.tycothermal.co.uk or can be obtained via your local Tyco Thermal Controls representative.

Electrical data	
Power supply & own power consumption	100 Vac to 254 Vac +/-10 % 50/60 Hz 20 VA max.
Connection terminals	Spring-type
L, N and PE terminals	9 pc (cables with diameter ranging from 0.2 to 6 mm^2)
Alarm output terminals	3 pc (cables with diameter ranging from 0.2 to 2.5 mm^2)
Pt 100 (RTD) terminals	12 pc (cables with diameter ranging from 0.2 to 1.5 mm^2)
RS-485 communication	7 pc (0.2 to 1.5 mm^2)
Internal Earth stud for RTD shield	1 pc (Cable diameter max 6 mm^2)
Contact lifetime main switch	500k operations at 25 A/250 Vac (resistive load)
Alarm output relay	Contact rated 250 Vac/3 A Relay output is software programmable to open, close or to toggle in case of alarm
Electromagnetic compatibility	EN 61000-6-2:2005 (Gen. Immunity standard for industrial environments) EN 61000-6-3:2007 (Gen. Emission standard for residential, commercial and light industrial) EN 61000-3-2-2006 (Limits for harmonic current emissions) EN 61000-3-3:1995+A1:2001+A2:2005 (limitation of voltage fluctuations and flicker)
Electrical safety	EN 61010-1, Category III, Pollution degree 2
Vibration & Shock	Shock to EN 60068-2-27: 1/2 sine wave of 11 ms duration, 15 g Vibration to EN 60068-2-6/sine wave 10 to 150 Hz (p-p), 2 g
Temperature sensors	
Compatible types	100 Ω platinum, 3-wire, α = 0.00385 Ω/°C. Can be extended with a three core shielded or braided cable of maximum 20 Ω lead resistance per conductor.
Quantity	Two RTD inputs for the control unit plus one independent temperature input for the safety limiter. All temperature sensors are permanently monitored for "sensor short", "sensor break".
Communications	
Physical network	RS-485 and Bluetooth Class 1
Protocol/topology	Modbus RTU or ASCII. Multi drop/Daisy chain
Cable and maximum length	Shielded twisted pair cable, 0.5 mm^2 (AWG 24) or larger
	maximum cable length between should be no more than 1200 m
Maximum quantity of control units in one network	Max. of 247 units per DigiTrace NGC-UIT or per serial communication port
(Modbus) Network address	Software programmable via DigiTrace NGC-CMA-NH, DigiTrace NGC-CMA-EX or DigiTrace Supervisor

Programming and setting	
Method	Through handheld programming device DigiTrace NGC-CMA-NH, NGC-CMA-EX (hazardous area) and a wireless Bluetooth connection or via RS485 interface and DigiTrace Supervisor software or DigiTrace User Interface Terminal (NGC-UIT2-ORD) and DigiTrace software.
Units of measure	°C or °F, software selectable
Memory	Non-volatile, no loss of parameters after the event of power outage or long term shut down, data holding time ~10 years.
LED indicators	Status LEDS are available for:
NGC-20-C-E	Heater, Alarm, RS-485 communication, Bluetooth communication
NGC-20-CL-E	Heater, Alarm, Limiter Tripped, RS-485 communication and Bluetooth

Measuring ranges	
Temperature range control unit	From –80°C to +700°C in steps of 1K
Temperature range limiter	From –60°C to +599°C in steps of 1K (NGC-20-CL-E only)
Voltage	From 50 Vac to 305 Vac
Load Current	From 0.3 A to 30 A
Ground-fault current	From 10 mA to 250 mA (RCD/ELCB required due to IEC and/or local regulations)
Heater time alarm	From 1 to 1 x 10^6 hours
Relay cycle alarm	From 0 to 2 x 10^6 cycl

Ordering information

DigiTrace NGC-20 control units	
Product name	NGC-20-C-E (Hazardous area approved control unit without safety temperature limiter)
Part number & (weight)	1244-007035 (2.2 kg)
Product name	NGC-20-CL-E (Hazardous area approved control unit with integrated safety temperature limiter)
Part number & (weight)	1244-007036 (2.3 kg)

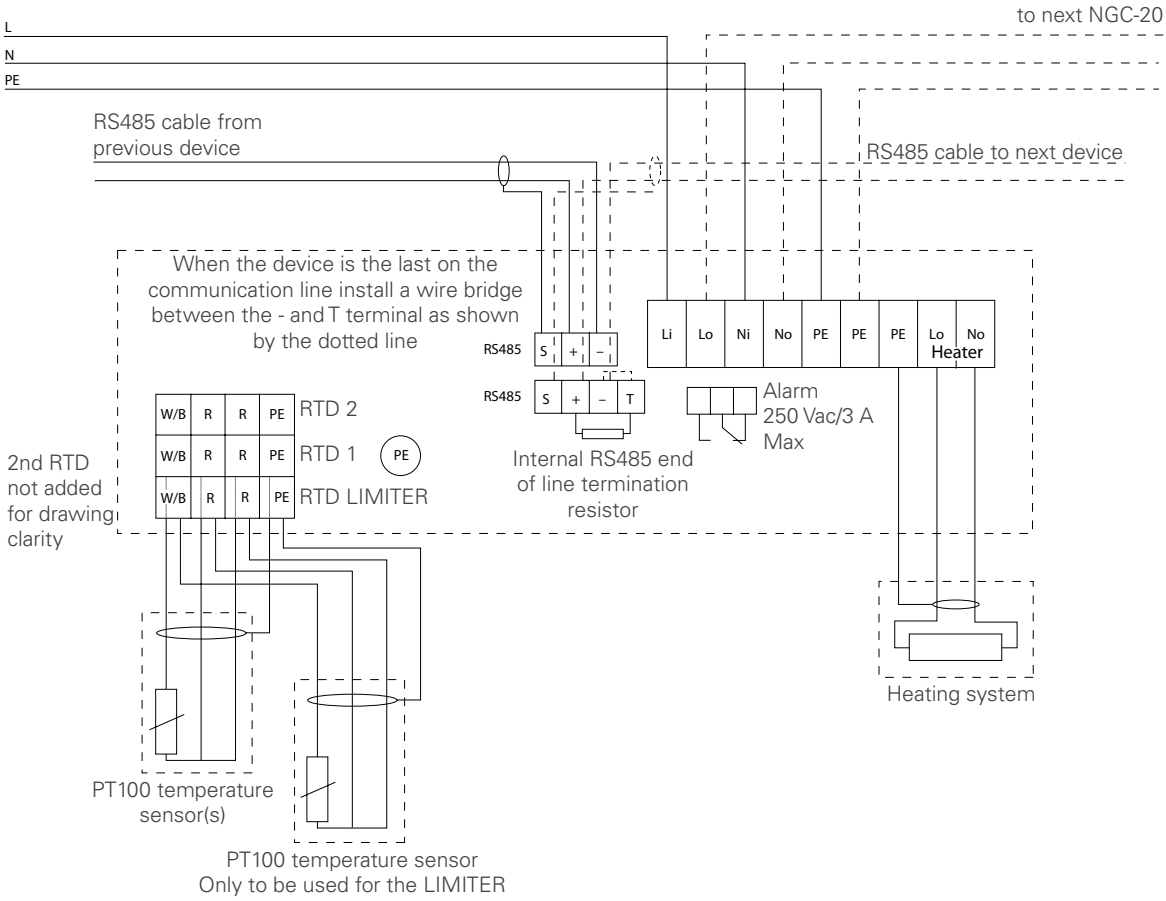
DigiTrace NGC-20 accessories

Temperature sensors	
Product name	MONI-PT100-260/2 or MONI-PT100-EXE-SENSOR

Support bracket for installation on pipe	
Product name	SB-125
Part number & (weight)	1244-06603 (0.5 kg)

Bluetooth enabled handheld programming device with customized DigiTrace software	
Product name	NGC-CMA-EX Ⓔx (Hazardous area approved device for use in Zone 1, 2, 21, 22)
Part number & (weight)	1244-006605 (1.2 kg)
Product name	NGC-CMA-NH (Industrial grade, not approved for use in hazardous area)
Part number & (weight)	1244-006606 (0.8 kg)

Connection diagram (typical)

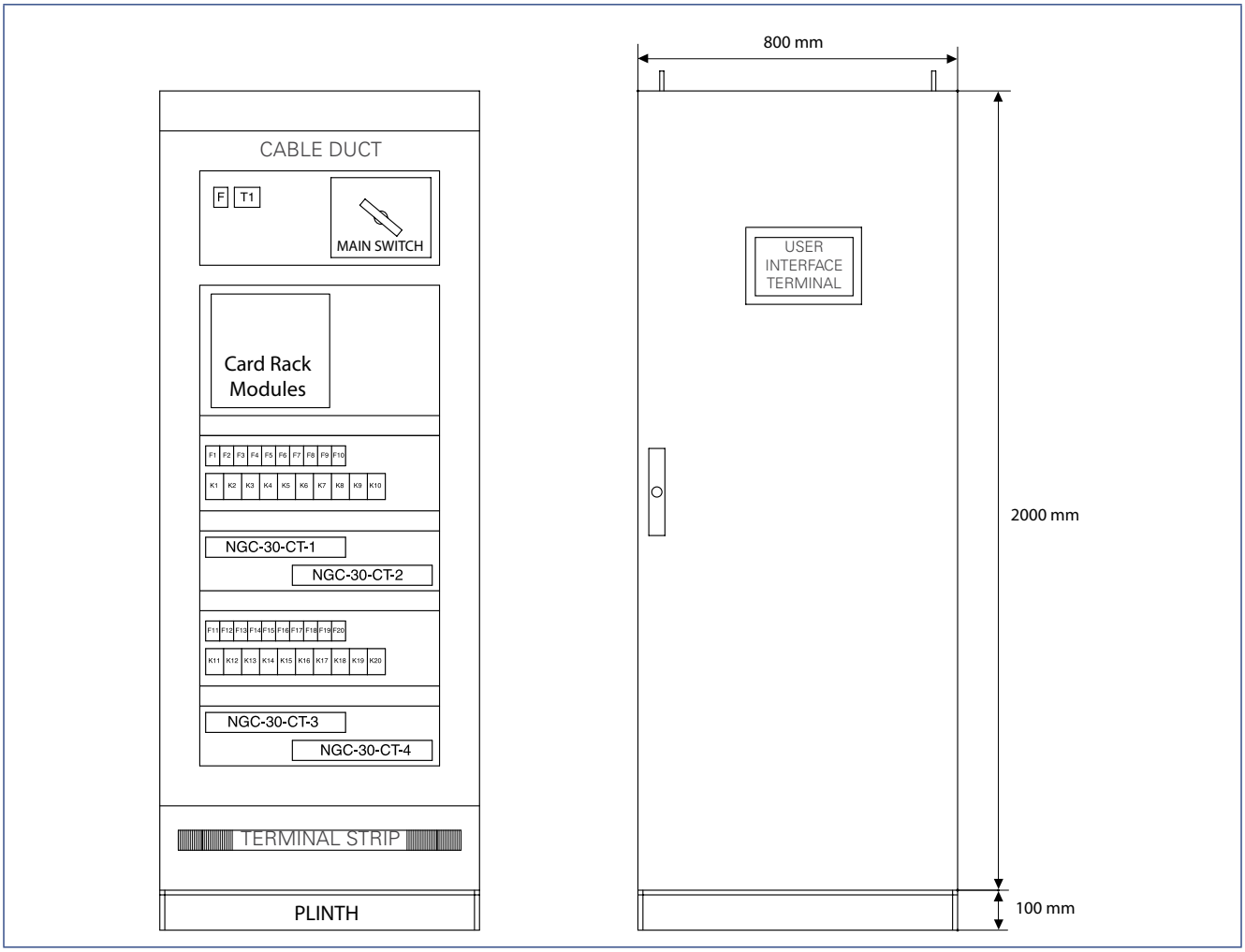


Panel mounted electronic multi-circuit heat-tracing control, monitoring and power distribution system

The DigiTrace NGC-30 is a multi circuit electronic control, monitoring and power distribution system for heat-tracing used in process temperature maintenance and freeze protection applications. The system consists of multiple components covering a broad range of requirements from simple temperature monitoring to ground fault, voltage and current measurement, bringing valuable information about the status and health of the heat-tracing circuits from the field into a central location. The DigiTrace NGC-30 system can minimise routine checks by transforming field data into valuable information for maintenance and operations.

DigiTrace NGC-30 Panel

The NGC-30 is available as a complete distribution panel system. Typical characteristics for these panels are easy access, pre-wired and all wiring landed on easy accessible terminals. The enclosure is based on industrial standards while the wiring is optimised for maintenance purposes. The panels are equipped with earth leakage circuit breakers and a main circuit breaker. In addition to these standard features the customer can select additional options based upon the heat-tracing monitoring and control requirements. For example the options include types of contactors (solid state or mechanical), number of circuits plus spare required, voltage monitoring, alarm light indications, panel size, cable entry location and other parameters. A DigiTrace NGC-30 panel system can consist of multiple cabinets which are interlinked via a dedicated communication link. In general the master panel contains the User Interface Terminal (UIT), typically built into the door.

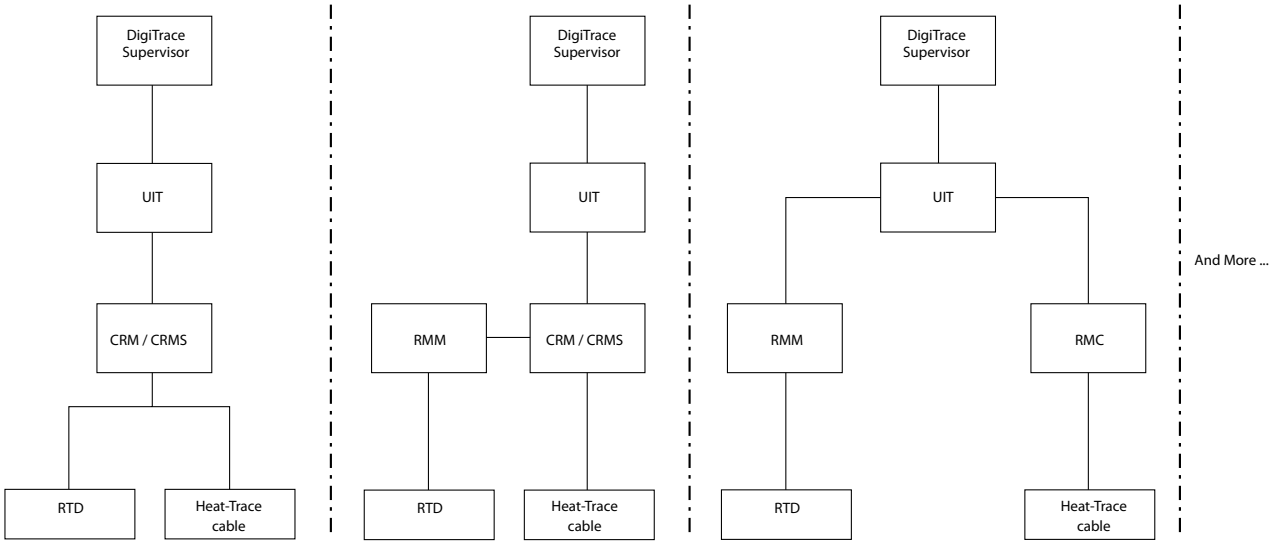


Typical DigiTrace NGC-30 20 circuit panel 8.4" monitoring

DigiTrace NGC-30 Components

Customers who wish to integrate the DigiTrace NGC-30 system into their own control panels can obtain the individual components separately. The DigiTrace NGC-30 system is configurable in different ways depending upon the requirements of the customer. The user interface for the DigiTrace NGC-30 is the User Interface Terminal (UIT). As soon as ground-fault measurement, line current measurements or distributed control requirements become important, the components Card Rack (CR), Card Rack Modules for mechanical relays (CRM) and/or solid state relays (CRMS), Current Transformer Modules (CTM) and Voltage Module (CVM) should be chosen. Users who want to build on the known and proven technology used in the MoniTrace 200N-E can continue using the fully compatible components; Remote Monitoring Modules (RMM) and Remote Modules for Control (RMC).

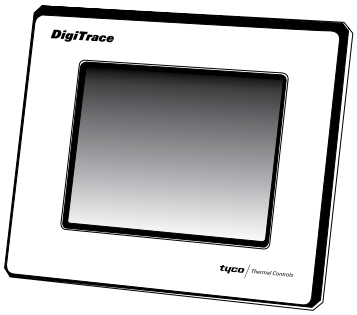
The powerful DigiTrace Supervisor (DTS) heat-tracing controller configuration and monitoring PC-software package completes the system. The Client - Server application enables the user to access all information from anywhere in the world, making DigiTrace Supervisor a strong management tool for the entire Heat Management System.



Examples of various DigiTrace NGC-30 configurations

The following section gives an overview of the different components used in the DigiTrace NGC-30 system.

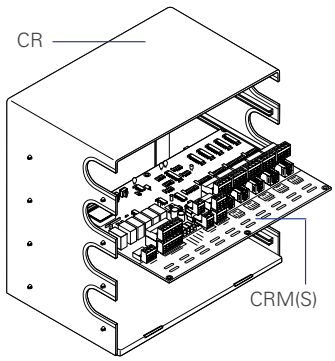
DigiTrace User Interface Terminal (UIT)



The DigiTrace User Interface Terminal (UIT) is the central part of the DigiTrace NGC-30 communication. The UIT can be used as well with the DigiTrace NGC-20 (for more information see the DigiTrace NGC-20 datasheet). It covers heat-tracing monitoring, configuration and maintenance purposes. The DigiTrace User Interface Terminal (UIT) consists of a 8.4" LCD colour display using touch screen technology. This provides an easy user interface for programming without the need for keyboards or cryptic labels. The DigiTrace UIT communicates via RS-485 to the field and via RS-232/RS-485/Ethernet (selectable) to the DigiTrace Supervisory Software package as well as the plant process control system. The user interface terminal is available in two different models; the DigiTrace NGC-UIT2-ORD, ideal for indoor applications, is for direct mounting on the DigiTrace NGC-30 panel door. The Remote User Interface Terminal (NGC-UIT2-ORD-R) is a panel mounted display (NGC-UIT2-ORD) for use with the DigiTrace NGC-30 panel that allows for the user interface to be mounted remotely.

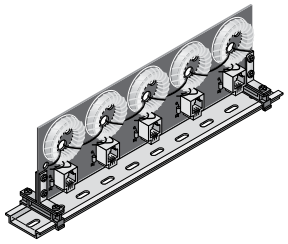
For detailed description see installation instruction NGC-UIT2-ORD: INSTALL-168.

Card Rack Module (CRM/CRMS)



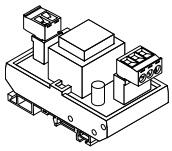
The DigiTrace Card Rack Module controls up to 5 heat-tracing circuits. The Card Rack Modules are available in two versions, the DigiTrace NGC-30 CRM (for mechanical relays) and the DigiTrace NGC-30 CRMS (for solid state relays). Up to four of these Card Rack Modules can be installed in a panel mounted Card Rack. RTD's are either directly connected to the DigiTrace CRM(S) or alternatively collected via RMM's locally or centralized in the field (distributed architecture). The CRM/CRMS solution can control up to 260 individual heat-tracing circuits and monitor up to 388 temperature inputs (including 128 temperature inputs via RMMs).

Current Transformer (CTM)



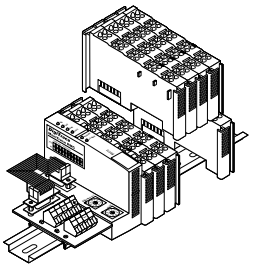
DigiTrace Current Transformers are an important part of the DigiTrace NGC-30 system. DigiTrace CRM in combination with current transformers offer the capability of monitoring and alarming on ground-fault and operating currents. Circuits can be tripped by the controller on high ground-fault currents.

Voltage Module (CVM)



DigiTrace Voltage modules (CVM), used in combination with a DigiTrace CRM(S) offer the option to monitor the voltage in the panel. The DigiTrace CVM module uses one channel on one DigiTrace CRM board in a panel.

Remote Modules for Control (RMC)

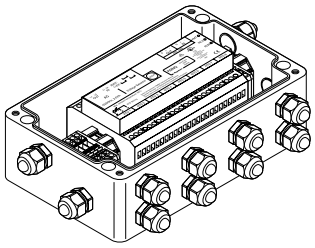


The DigiTrace NGC-30 system also includes integrated control functionality. Multiple relay outputs to operate contactors of each heat-tracing circuit will be provided by Remote Modules for Control (RMC). Temperature inputs will be provided by Remote Monitoring Modules (RMM) while the control is executed by the UIT.

DigiTrace RMC units are modular and may be configured with 2 to 40 relay outputs. Each RMC unit also includes two digital inputs (DI) to monitor the status of circuit breakers or power contactors. A single UIT control unit can communicate with up to 10 RMC modules via a single, twisted pair RS-485 cable to provide distributed control of up to 250 heating cable circuits with a maximum of 128 temperature inputs (see DigiTrace RMM below). For more information refer to the datasheet of DigiTrace MONI-RMC. Circuits controlled via RMCs, can't be combined with the current transformers (CTM).

The DigiTrace NGC-30 system also supports building mixed systems of relay outputs via CRM(S) and RMCs, individual circuits can therefore be configured in the most appropriate way.

Remote Monitoring Modules (RMM)



Remote Monitoring Modules (RMM) provide temperature monitoring capability for the DigiTrace NGC-30 system.

The RMM accepts inputs up to eight Pt 100 temperature sensors that measure pipe or ambient temperatures in a heat-tracing system. Up to 16 RMMs for a total monitoring capacity of 128 temperatures can be connected to the NGC-30 system.

There are two versions available. The RMM2-E is without an enclosure. The RMM2-EX-E is build into a Hazardous approved enclosure. For more details see the RMM2-E/RMM2-EX-E datasheet in Technical Databook.

DigiTrace Supervisory Software

The DigiTrace NGC-30 system integrates seamless with the DigiTrace Supervisor (DTS) heat-tracing controller configuration and monitoring software. It provides a graphical user interface for DigiTrace communication and heat-tracing controller products. The software supports the latest DigiTrace control systems via ModBus® protocol. DigiTrace Supervisor is a powerful client-server software package that gives the possibility to configure and monitor controllers from almost anywhere in the world, using the latest connectivity technologies. In addition to this functionality DigiTrace Supervisor includes the following functions:

- Logging & trending,
- Configuration of alarms
- Batch & recipe processing,
- Scheduled events,
- Group displays for monitoring multiple controllers at the same time
- Virtual Private Network (VPN) functionality for monitoring possibility on global basis
- Plant Reference Model for structuring controller on a logical way
- Support of plant documentation reports like plant group, location, line/equipment number, breaker panel, controller panel, user and roles are included.

For more detailed information see DigiTrace Supervisor datasheet.

Compatibility with MoniTrace 200N-E

The DigiTrace NGC-30 is an upgrade of Tyco Thermal Controls very successful MoniTrace-200N-E system. It provides a state-of-the-art user interface and an opportunity for existing 200N-E installations to benefit from the new features of the DigiTrace Supervisor software.

Using the new DigiTrace NGC-30 UIT2, circuits in existing MoniTrace 200 installations can now be upgraded to include monitoring functionality of ground fault and operating current and many other features as described in this document.

Technical Details

Application

Type	Surface Sensing/Ambient Sensing/PASC (Proportional Ambient Sensing Control)
Area of use	Non-hazardous area indoors or outdoors typically panel mounted

Approval certification

NGC-UIT2-ORD	CE All components for ordinary areas.

Electromagnetic compatibility

Immunity	All components tested for heavy industrial environments
Emissions	All components tested for residential/commercial/light industrial environments
Vibration	DigiTrace NGC-30 UIT: meets requirements of IEC-60068-2-6
Shock	DigiTrace NGC-30 UIT: meets requirements of IEC-60068-2-27

Enclosure

Protection	UIT: IP 65 (NEMA 4) when mounted in a panel door.
Ambient operating temperature range	UIT: –30°C to 60°C CRM(S): –40°C to 60°C, storage temp –40°C to 75°C

Electrical properties

Connection terminals	UIT and CRM both are equipped with 2.5 mm² Phoenix style connectors with retaining screws.
Power supply	The NGC-UIT2-ORD requires supply voltage of 9-30 V DC, 3.6-1.2 A. The CRM's powered by 12 V DC @ 400 mA per board. For more information about RMC and RMM see datasheets of individual components
Power consumption	UIT: 36 W max, CRM/CRMS: 5 W max.
Power output	CRM and CTM are calibrated for a maximum load of 60 A
Control output	Wired directly to contactor or SSR CRM: SPST 3 A @ 277 V AC max 50/60 Hz CRMS: 12 V DC @ 30 mA max per output

Communications

Hardware (UIT)

Local port/ remote port; Communication port 1 UIT	Isolated RS232/RS-485, selectable. Ports may be used to communicate with (DigiTrace Supervisor Software) or DCS. The local RS-232 is a non-isolated, 9 pin D sub male; Remote RS-485 #2 is 2-wire isolated, 9 pin D sub male; Data rate is 9600 to 57600 baud; Maximum cable length for RS-485 not to exceed 1200 m (4000 ft). Cable to be shielded twisted pair. Max number of devices 247, Fail safe design with optional termination resistors Max length 1200 m, Data rate to 9600 baud.
Field port; communication port 2 UIT	RS485, used to communicate with external devices like RMM, RMC and NGC-30. typical max. cable length 1200 m, cable to be shielded twisted pair. Fail safe design with optional termination resistors
LAN UIT	10/100 Base-T Ethernet port with link and activity status LEDs. Protocol Modbus via TCP/IP; can be used to communicate to DigiTrace Supervisor
USB Port UIT	USB 2.0 Host port type A receptable

Communications	
Temperature (UIT)	
Low alarm range	–73°C to 482°C or off
High Alarm range	–73°C to 482°C or off
Ground fault monitoring (UIT, CRM, CT)	
Alarm range	10 mA to 200 mA
Trip range	10 mA to 200 mA or off
Operating current (UIT, CRM, CT)	
Low alarm range	1 A to 60 A or off
High alarm range	1 A to 60 A or off
Voltage (CRM, CVM; optional)	Displays supply voltage to heat-tracing (Note: requires one operating current input)
Autocycle	Each loop can be programmed from 1 to 1000 or off
Temperature sensor inputs	One input standard per control point on CRM, optional temperature inputs via max. 16 RMMs (8 RTDs per RMM)

Communications	
Control modes	EMR: line sensing on/off, ambient on/off, PASC (proportional ambient sensing control)
	SSR: line sensing on/off, ambient on/off, PASC (proportional ambient sensing control), Proportional (includes soft start for all SSR control modes)
Units	°C or °F
Deadband	1°C to 10°C

Alarm outputs	
	UIT: 3 (3 open collector outputs, to be combined with external relays)

Control outputs	
Number of output relays	CRM: 3-pole mechanical CRMS: 1, 2 or 3 pole solid state, normally open (NO)
Current maximum, used in combination with CRM(S) and CTM	SSR: 60 A at 40°C EMR: 60 A at 40°C

Network Connection	
Number of RMM's	Up to 16, individually addressable, each with up to 8, 3 wire Pt 100 inputs
Number of CRM/CTM's	Up to 52 NGC-30-CRM may be connected to one NGC-30-UIT in combination with repeaters. 1 CRM has 5 circuits. In total 260 circuits per NGC-30 system.

Display	
Type	LCD is a XGA, colour TFT transflective device with integral LED backlight
Screen size	175 mm x 132 mm
Touchscreen	5-wire resistive touch screen interface for user entry, usable with gloved fingers

Programming and settings	
Method	Via touch screen or DigiTrace Supervisor 2.1 or higher
Language(s)	English, Russian, French, German, Spanish, Czech, Chinese
Memory	Non-volatile, restores after power loss

Ordering NGC-30 control system

The NGC-30 is offered as a complete solution, where the control system is already integrated into fully engineered control and power distribution panels. Using standard industrial enclosures, specific care has been taken to design the systems to highest safety standards by enabling optimum access for easy maintenance, as well a clear layout of the functional blocks and terminals. Customers desiring to build their own systems, can use the individual components of the DigiTrace NGC-30 and integrate them into their own power distribution panels. Below both options are described how to order the NGC-30 system.

Ordering details individual components

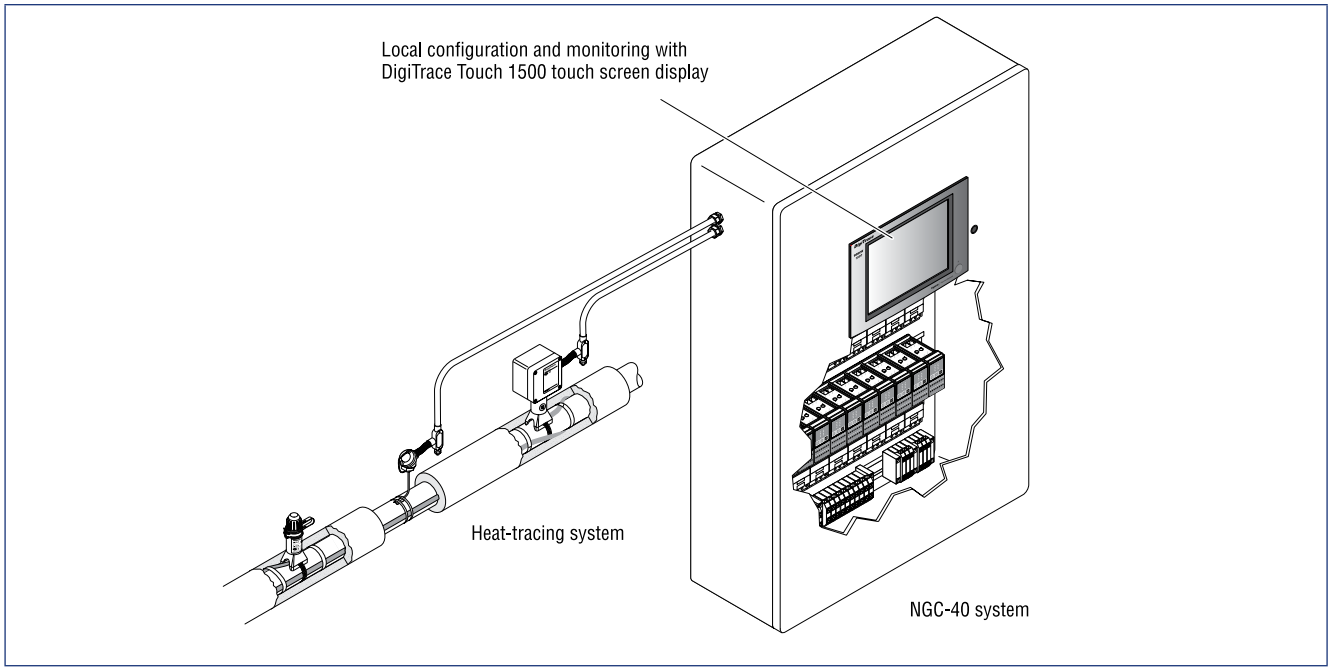
Product name	Description	Part Number (Weight)
NGC-UIT2-ORD	User Interface Terminal	10332-013 (1.78 kg)
NGC-UIT2-ORD-R	User Interface Terminal with enclosure	10332-016 (8.86 kg)
NGC-30-CRM-E	Card Rack Module (EMR)	10720-008 (0.68 kg)
NGC-30-CRMS-E	Card Rack Module (SSR)	10720-009 (0.50 kg)
NGC-30-CTM-E	Current Transformer Module	10720-010 (0.36 kg)
NGC-30-CVM-E	Voltage Monitoring Module (CVM)	10720-011 (0.20 kg)
NGC-30-CR-E	Card Rack	10720-012 (3.66 kg)
PS12	Transformer 12 V DC	1244-001505 (0.18 kg)

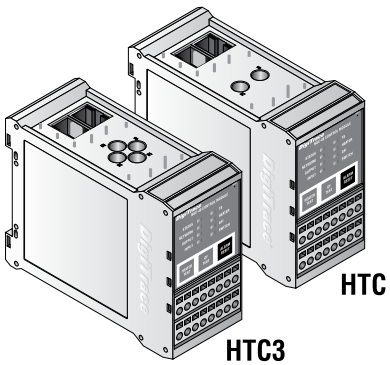
Panel mounted advanced modular heat-tracing control system

Product Overview

The DigiTrace NGC-40 is a multipoint electronic control, monitoring and power distribution system with a unique single-point controller architecture providing the most reliable central control and monitoring solution for your Heat Management System.

By taking advantage of innovative modular packaging techniques, the DigiTrace NGC-40 system provides configuration and component flexibility so that it may be optimised for a customer's project specific needs.



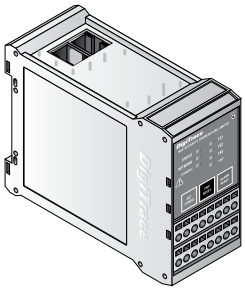


Control modules: NGC-40-HTC & NGC-40-HTC3

The DigiTrace NGC-40 uses a single controller module per heat-tracing circuit for maximum reliability. The DigiTrace NGC-40 control system can be powered between 100 to 240 Vac, while mechanical contactors (EMRs) or solid-state relays (SSRs) allow circuit switching up to 60 A at 600 Vac.

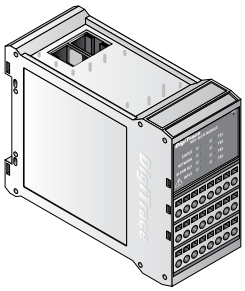
There are dedicated control modules available for single phase (NGC-40-HTC) and three-phase (NGC-40-HTC3) heat-tracing circuits. The DigiTrace NGC-40 control modules include ground-fault detection and protection. The control modules guarantee precise single phase and three-phase line current measurements. Up to eight (8) temperature sensors (RTDs) can be used for each heat-tracing circuit allowing a variety of temperature control, monitoring, and alarming configurations. The DigiTrace NGC-40 provides alarm outputs and digital inputs. The alarm output can be used to control an external annunciator.

The digital input is programmable and may be used for various functions such as forcing outputs on and off or generating alarms, making the system more flexible to match each customer's specific needs.



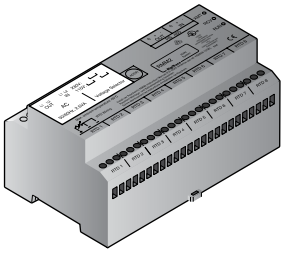
SIL2 Safety Temperature Limiter: NGC-40-SLIM

The DigiTrace NGC-40 has a SIL2 certified safety temperature limiter module.The module can be used with up to 3 temperature inputs for three phase heat-tracing circuits. The limiter can be associated with a DigiTrace NGC-40 controller and use current information for latching the trip functionality. The front panel of the limiter module has LED indicators for various status conditions. The front panel also provides a button to confirm new set trip point, a reset trip button and a reset alarm button. The module has one output for the contactor and one output for external alarm annunciation. The safety temperature limiter can be reset via the digital input, the user interface Touch 1500 and DigiTrace Supervisor.



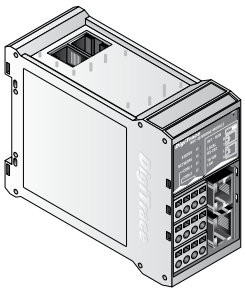
IO module: NGC-40-IO

In addition to hardwiring an RTD directly into a Heat Trace Control module, RTDs can be wired to Input/output modules (NGC-40-IO) within the panel and assigned to heat-tracing circuits through software. This means that a DigiTrace NGC-40 system can be optimised for the specific application needs. Each IO module accepts up to four additional RTD inputs.



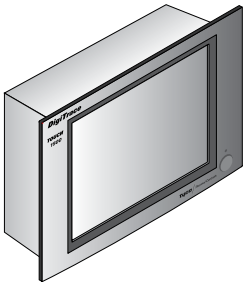
RMM2

The DigiTrace NGC-40 works with the MONI-RMM2 module. Each RMM2 module installed in the field can accept up to 8 RTDs. 16 RMM2 Modules can be daisy chained together via RS-485 for a total of 128 temperature inputs. Since multiple RMM2s can be networked over a single cable to the DigiTrace NGC-40, the cost of RTD field wiring will be significantly reduced.



Communication module: NGC-40-BRIDGE

The DigiTrace NGC-40 system supports multiple communications ports, allowing serial interfaces (RS-485 and RS-232) and network connections (Ethernet) to be used with external devices. All communications with the NGC-40 panel are accomplished through the NGC-40-BRIDGE module which acts as the central router for the system, connecting the panel's control modules, IO modules, safety limiter modules, RMM2 Modules, as well as upstream devices such as DigiTrace Touch 1500 touch screen, DigiTrace Supervisor (DTS) and Distributed Control System (DCS). Communications to devices external to the NGC-40 panel are done via Modbus® protocol over Ethernet, RS-485 or RS-232.



DigiTrace Touch 1500

The DigiTrace NGC-40 system has a user interface, DigiTrace Touch 1500, that is a state-of-the-art 15-inch color display with touch screen technology. The DigiTrace Touch 1500 touch screen allows convenient user access to all heat-tracing circuits and provides an easy user interface for programming without using keyboards. The DigiTrace Touch 1500 can be installed either locally on the panel door or in a remote location and communicates to the DigiTrace NGC-40 heat-tracing controllers via Ethernet or serial interface. In case of outdoor location, a window cover and a heater/cooler may be required. The DigiTrace Touch 1500 can be used for configuration and monitoring of all heat-tracing circuits. The software is multilingual, offers 4 levels of integrated security and records alarms and events for maintenance purposes.

DigiTrace Supervisor Software

The DigiTrace Supervisor (DTS) software package provides a remote, graphic interface for the DigiTrace NGC-40. The software allows the user to configure and monitor various NGC systems from a central location. It also provides an audible alarm tone, acknowledges and clears alarms; and contains advanced features such as data logging, trending, implement changes in batches, and other useful functions. Users can access all information from anywhere in the world, making DigiTrace Supervisor a powerful management tool for the entire Heat Management System.

General DigiTrace NGC-40 controller modules	
Application type	The DigiTrace NGC-40 units shall be installed in non-hazardous areas. Hazardous area approved sensors shall be used when the system is applied to heat-tracing circuits in hazardous areas.
Approval certification	CE 3128486 *ETL not for NGC-40-SLIM module*

Electromagnetic compatibility	
Emissions	EN 61000-6-3
Immunity	EN 61000-6-2
Supply voltage	24 Vdc +- 10%
Internal power consumption	< 2.4 W per module
Ambient operating temperature	–40°C to 65°C (–40°F to 149°F)
Ambient storage temperature	–40°C to 75°C (–40°F to 167°F)
Environment	PD2, CAT III
Maximum altitude	2,000 m (6,562 ft)
Humidity	5 – 90% non-condensing
Mounting	Din Rail – 35 mm

CAN Networking Port	
Type	2-wire isolated CAN-based peer to peer network. Isolated to 24 Vdc – verified by 500 Vrms dielectric withstand test
Connection	Two 8-pin RJ-45 connectors (both may be used for Input or Output connections) Protocol Proprietary NGC-40
Topology	Daisy chain
Cable length	10 m (33 ft) maximum
Quantity	Up to 80 HTC/HTC3 and IO modules per network segment
Address	Unique, factory assigned

Connection terminals and Housing	
Wiring terminals	Spring-type, 0.5 to 2.5 mm^2 (24 to 12 AWG)
Housing Size	45.1 mm (1.78 in) wide x 87 mm (3.43 in) high x 106.4 mm (4.2 in) deep

Module specific information

NGC-40-HTC/NGC-40-HTC3	
Temperature Sensors	Type 100 Ω platinum RTD, 3-wire,α = 0.00385 ohms/ohm/°C Can be extended with a 3-conductor shielded cable of 20 Ω maximum per conductor 100 Ω, Ni-Fe, 2-wire. Can be extended with a 2-wire shielded cable of 20 Ω maximum per conductor
Quantity Temperature sensors	One per NGC-40-HTC/HTC3 module
Measuring range	Temperature range from -80˚C to +700˚C (–112°F to 1292°F)
Current measurement	Internal to the module
Current measurement NGC-40-HTC	1 for single-phase line current measurements, 60A, +/- 2% of range
Current measurement NGC-40-HTC3	3 for three-phase line current measurements, 60A, +/- 2% of range
Ground-fault	1 for ground-fault measurements, 10-250 mA, +/- 2% of range
Alarm Relay	Dry contact relay (voltage free). Relay contact rated 250 V/3 A 50/60 Hz (EC) and 277 V/3 A 50/60 Hz (cCSAus). Alarm relay is programmable. N0 and NC contacts available.
Contactor Output Relay	Relay contact rated 250 V/3 A 50/60 Hz (EC) and 277 V/3 A 50/60 Hz (cCSAus).
SSR Output	12 Vdc @ 45 mA max per output
Digital Input	Multi-purpose input Multi-purpose input for connection to external dry (voltage-free) contact or DC voltage. May be user programmable for: not used/force off/force on functions. It can be configured to be active open or active closed.

NGC-40-SLIM	
Functional Safety Approval	Functional safety according to Baseefa10SR0109 SIL 2 IEC 61508-1-1998 & IEC 61508-2-2000
Conditions of use	See installation instructions
Measuring range	Temperature range limiter from +50˚C to +500˚C (-22˚F to 932˚F)
Temperature Sensor	Type: 100 Ω platinum RTD, 3-wire, α = 0.00385 ohms/ohm/˚C. Can be extended with a 3-conductor shielded cable of 20 Ω maximum per conductor. Quantity: 3 per NGC-40-SLIM module.
Digital Input	Used for resetting the safety temperature limiter remotely. The Digital Input will be for connection to external dry (voltage free) contactor or DC voltage. The input shall be 5 – 24 VDC/1mA max with 100 ohms of loop resistance and configured as active low.

NGC-40-IO	
Temperature Sensors	Type 100 Ω platinum RTD, 3-wire,α = 0.00385 ohms/ohm/ºC Can be extended with a 3-conductor shielded cable of 20 Ω maximum per conductor 100 Ω, Ni-Fe, 2-wire. Can be extended with a 2-wire shielded cable of 20 Ω maximum per conductor.
Quantity Temperature sensors	Up to four wired directly to each NGC-40-IO module
Alarm Relay	Dry contact relay (voltage free). Relay contact rated 250 V/3 A 50/60 Hz (EC) and 277 V/3 A 50/60 Hz (cCSAus). Alarm relay is programmable. N0 and NC contacts available.
Digital Input	Multi-purpose input Multi-purpose input for connection to external dry (voltage-free) contact or DC voltage. May be user programmable for: not used/force off/force on functions. It can be configured to be active open or active closed.

NGC-40-BRIDGE	
Communications COM1, COM2	
Type	2-wire RS-485
Cable	One shielded twisted pair
Length	1,200 m (4,000 ft) maximum
Quantity	Up to 255 devices per port
Data rate	9600, 19.2K, 38.4K, 57.6K, 115.2K baud
Data bits	7 or 8
Parity	None, even, odd
Stop bits	0, 1, 2
Tx delay	0 – 5 sec.
Protocol	Modbus RTU or ASCII
Connection terminals	Spring-type terminals
Communications COM3	
Type	RS-232
Cable	Custom TTC# 10332-005
Length	15 m (50 ft) maximum
Data rate	9600, 19.2K, 38.4K, 57.6K, 115.2K baud
Data bits	7 or 8
Parity	None, even, odd
Stop bits	0, 1, 2
Tx delay	0 – 5 sec.
Protocol	Modbus RTU or ASCII
Connection terminals	RJ-11
Ethernet	
Type	10/100 BaseT Ethernet network
Length	100 m (328 ft)
Data rates	10 or 100 MB/s
Protocol	Modbus/TCP
Connection terminals	Shielded 8-pin RJ-45 connector on front of module

NGC-40-PTM	
Connection terminals	Spring-type, 0.5 to 2.5 mm² (24 to 18 AWG). As the current to the modules require up to 2.05 A @ 24Vdc (20 modules - see CAN Bus connection diagrams) the minimum wire size to the module shall be 1.0 mm2 (AWG18)
CAN networking and module Power	Two RJ-45 connectors, one each IN and OUT. Provides CAN bus signals and 24 Vdc power.
TOUCH 1500	
General	
Area of use	Nonhazardous, Indoors (IP65, NEMA 4)
Supply voltage	10 – 30 Vdc
Amperage rating	Steady state 1.8 A
Surge current	16 A
Operating temperature	0°C to 50°C (32°F to 122°F) w/o space heater, –30°C to 50°C (–22°F to 122°F) using space heater and screen cover
Storage temperature	–20°C to 60°C (–4°F to 140°F)
Dimensions	449.9 mm (W) X 315.6 mm (H) X 141.7 mm (D)
Relay outputs	One Form C relay rated at 12 A @ 250 Vac. Relay is used as a common alarm. To be ordered separately
Display	LCD is a 15-in XGA, color TFT transflective device with integral CCFL backlight Touch Screen 4-wire resistive touch screen interface for user entry
Network Connection	
Local/Remote Port	RS-232/RS-485 ports may be used to communicate with host (DigiTrace Supervisor Software) or DCS 9 pin D sub male
Remote RS-485	2-wire isolated, 9 pin D sub male Data rate 9600 to 57600 baud Maximum cable length not to exceed 1200 m (4000 ft). Cable length to be shielded, twisted pair.
Field Port	RS-485, 2-wire isolated, used for communication with external devices, such as DigiTrace NGC-40-BRIDGE and DigiTrace NGC-20. Maximum cable length not to exceed 1200 m (4000 ft). Cable to be shielded twisted pair. Signals 2-wire isolated, 9 pin D sub male Data rate to 9600 baud
LAN	10/100 Base-T Ethernet port with Link and Activity Status LEDs (X2)
USB Ports	USB 2.0 Host port Type A receptacle (X4)

Part numbers:

Product name	Description	Part Number
NGC-40-HTC	NGC-40 single phase heat trace control module	10730-003
NGC-40-HTC3	NGC-40 three phase heat trace control module	10730-004
NGC-40-SLIM	NGC-40 Safety Temperature Limiter	1244-010700
NGC-40-IO	NGC-40 Input - Output Module	10730-001
NGC-40-BRIDGE	NGC-40 Communication Bridge Module	10730-002
NGC-40-PTM	NGC-40 Power Termination Module	10730-005
TOUCH1500	TOUCH1500 display kit– 15" Touch screen and Relay Output Module	10332-009
TOUCH1500R	Touch 1500 in enclosure for remote mounting on wall	10332-020
RELAY OUTPUT - TOUCH	Relay Output Module /w Modbus for Touch 1500	10332-017
NGC-40-CAN05	NGC-40 CAN Cable Length 5"	20578011-005
NGC-40-CAN48	NGC-40 CAN Cable Length 48"	20578011-048
NGC-40-TB	CANbus termination plug	10392-043
PS-24	24 Vdc Power supply	972049-000

Heat-tracing remote monitoring module

The Remote Monitoring Modules (RMM2) provide temperature monitoring capability for DigiTrace NGC controller family. The RMM2 accepts inputs from up to eight Pt 100 temperature sensors that measure pipe or ambient temperatures in a heat-tracing system. Multiple RMM2 units communicate with a single DigiTrace NGC User Interface Terminal (DigiTrace NGC-UIT) providing centralised monitoring of temperatures.

A single, twisted pair RS-485 cable connects up to 16 RMMs for a total monitoring capacity of 128 temperatures per DigiTrace NGC controller network.

Control and monitoring

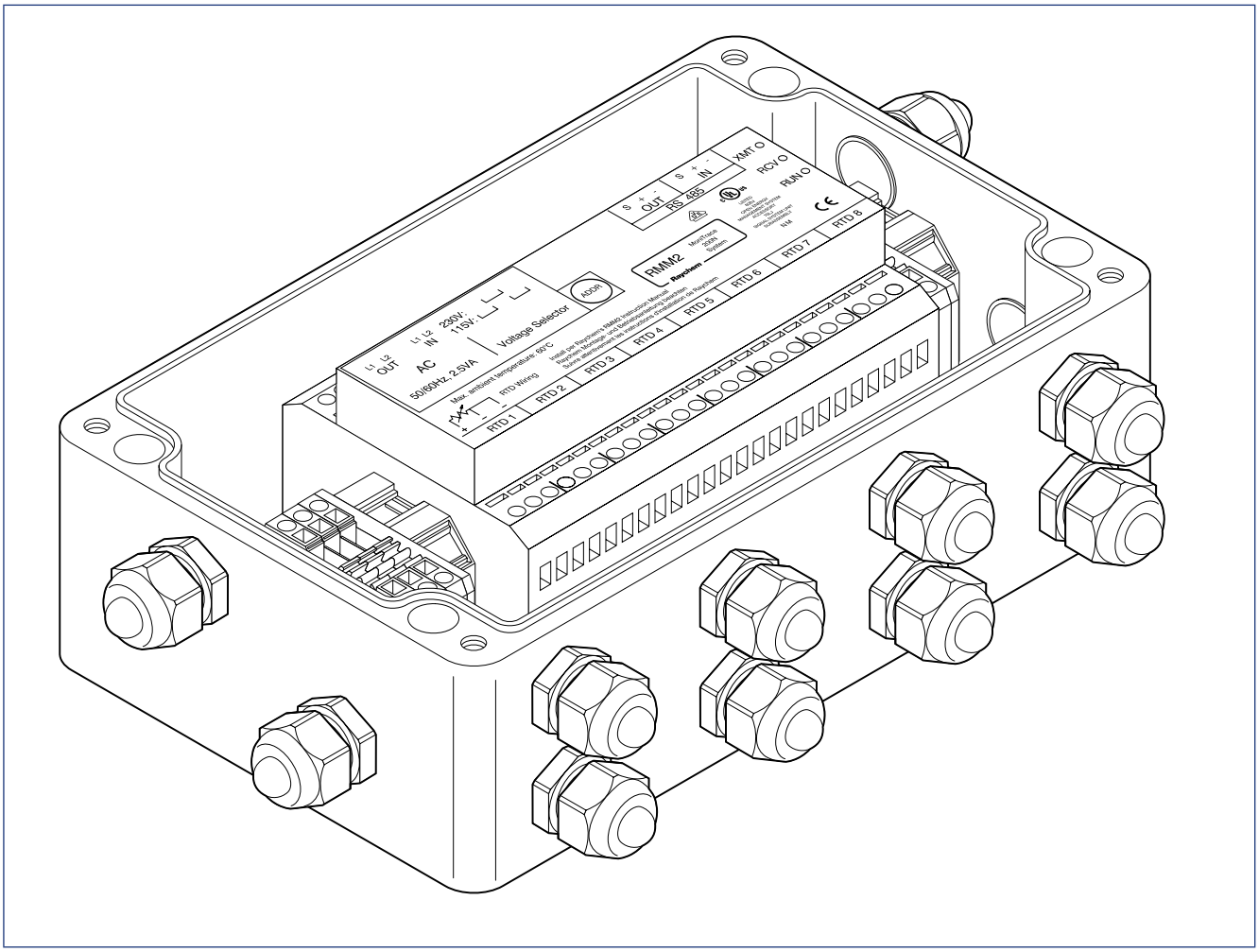
A DigiTrace NGC network controls up to 260 circuits of heat-tracing per system based on ambient or pipe temperatures. The RMM2 may be used to collect both ambient and pipe temperatures for control or for extensive monitoring of the heat-tracing system. The RMM2 units are placed near desired monitoring locations, even in hazardous areas (Zone 2). Multiple temperature sensor inputs are networked over a single cable, significantly reducing installation cost for temperature monitoring.

Alarms

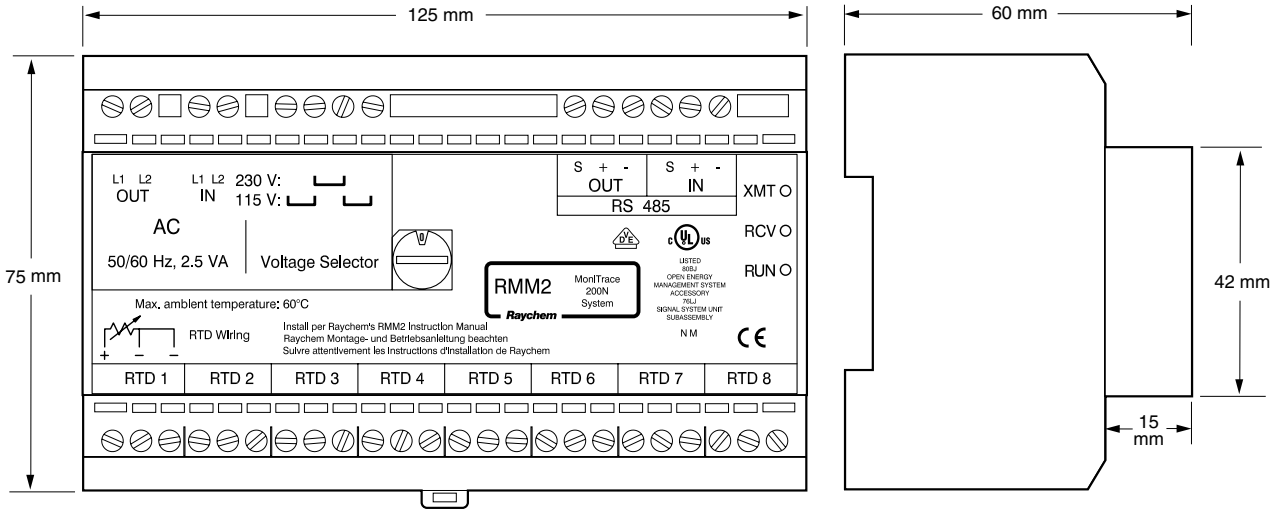
Low and high temperature alarms may be set for sensors connected to the DigiTrace NGC controllers via the RMM2. Alarm limits are set and alarm conditions are reported to the user. Additional alarms are triggered for failed temperature sensors and communication errors. Alarms may be reported remotely through an alarm relay in the DigiTrace NGC-UIT or via DigiTrace Supervisor.

Configurations

The RMM2 is an electronic device that clips to a DIN 35 rail. The complete kit for ordinary and hazardous areas (Zone 2) include an RMM2 mounted in a rugged polyester enclosure with appropriate terminals and cable glands. For other installation options, contact Tyco Thermal Controls.



Dimensions (in mm)



General

Area of use	Hazardous area (Zone 2) or non-hazardous area RMM2-EX-E hazardous area zone 2 or non-hazardous area RMM2-E panel mount, safe area

Approvals

	Baseefa03ATEX0739X Ⓔx II 3GD T70°C EEx nR II T6 (–20°C ≤ Ta ≤ 60°C)
Ambient operating temperature range	–40°C to +60°C
Ambient storage temperature range	–51°C to +60°C
Relative humidity	max. 95%, noncondensing
Supply voltage (nominal)	115/230 Vac +10% -10% 50/60 Hz (jumper selectable)
Internal power consumption	3 VA

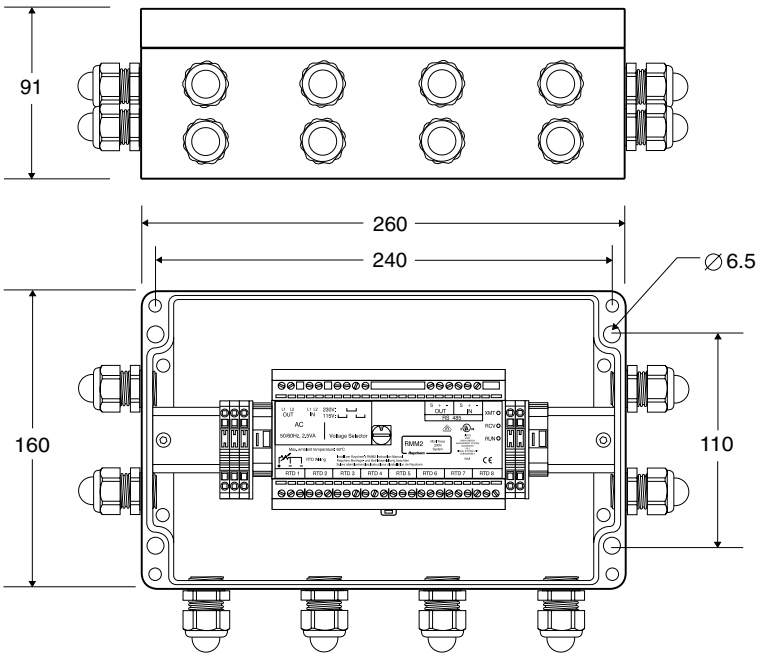
RMM2 hazardous area enclosure	MONI-RMM2-EX-E
Protection	IP66
Base and lid	Material: glassfibre-reinforced polyester, lid seal: silicone
Colour	Black
Ambient temperature range	–20°C to +60°C
Lid fixing	4 x M6, cheese-head, captive, stainless steel
Entries	12 x M20 for cable diameters ranging from 6 to 12 mm
Glands provided (EEx e)	12 x M20 with integral stopping plugs
Mounting	Surface mounting with 4 fixing holes on 240 x 110 mm centres hole diameter: 5 mm

Temperature sensors

Type	3 wire Pt 100, temperature coefficient per IEC 751-1983
Quantity to be connected	Up to 8 Pt 100 per RMM2 The sensor cable may be extended with a 3 (+PE)-wire signal cable adding 20 Ohms lead resistance maximum. When using 1.5 mm² cable this equals to ±150 m of cable. When the sensor cable is laid in cable ducts or in the vicinity of highvoltage carrying cables the sensor extension cable should be shielded. The shield of the extension cable should be grounded at the controller end only.
Area of use	Use sensors with the appropriate approvals required for the area of use

Enclosure details - Hazardous area enclosure RMM2-EX-E

Dimensions (in mm)



Communication to NGC-30-UIT DigiTrace NGC controllers	
Type	RS-485
Cable	1 shielded twisted pair
Length	1200 m max.
Quantity	Up to 16 RMM2 UIT per DigiTrace NGC network
Address	Switch-selectable on RMM2

Connection terminals	
Supply (in-out)	4 terminals for cables 0.2 mm^2 to 4 mm^2
Earth	10 terminals for cables up to 4 mm^2 aside the RMM2 unit
Pt 100 connections	8 x 3 terminals for cables 0.2 mm^2 to 2.5 mm^2
RS-485 connection	2 x 3 terminals for cables 0.2 mm^2 to 2.5 mm^2

Electromagnetic compatibility	
Immunity	Complies with EN 50 082-2 (heavy industrial)
Emissions	Complies with EN 50 081-1 (light industrial)

Ordering details	Part descriptions	Product Number	Weight
RMM2			
No enclosure, internal electronics module only	RMM2-E	307988-000	1.2 kg
With hazardous area enclosure	RMM2-EX-E	676040-000	3.2 kg
Pipe temperature sensors (Pt 100)			
Pt 100 temperature sensor for Zone 1	MONI-PT100-EXE	967094-000	0.6 kg
Pt 100 temperature sensor for ordinary areas	MONI-PT100-NH	140910-000	0.2 kg

Heat-tracing remote module for control

DigiTrace remote modules for control (RMC) provide multiple relay outputs for switching heating cable circuits controlled by the DigiTrace NGC User Interface Terminal (NGC-UIT). RMC units are modular and may be configured with 2 to 40 relay outputs. A single DigiTrace NGC-30-UIT can communicate with up to 10 RMC via a single, twisted pair RS-485 cable to provide distributed control of up to 260 heating cable circuits.

Control and monitoring

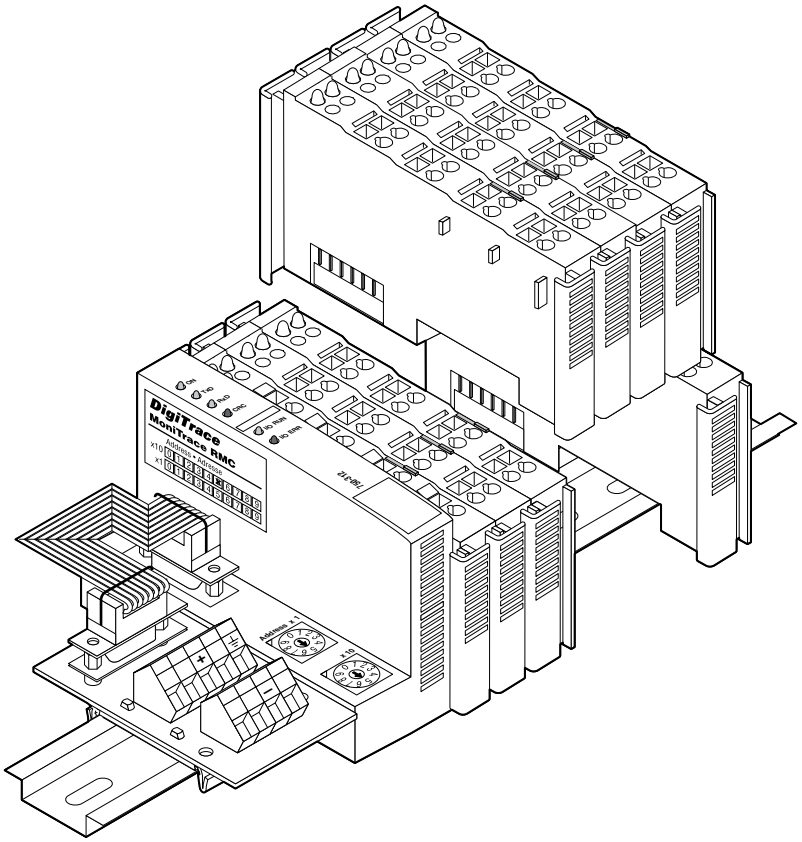
The DigiTrace NGC-30 controls and monitors multiple heat-tracing circuits based on pipe or ambient temperatures. These temperatures can collected locally by DigiTrace remote monitoring modules (RMM2) connected on the same RS-485 network. Based on temperature inputs from the RMM2, the DigiTrace NGC-UIT determines which heating cable circuits are to be energised and sends this information to RMC, which then turn on or off the heating cable power contactors. Because temperature inputs and control outputs are located near equipment to be sensed or controlled, wiring costs are reduced significantly.

Alarm inputs

Each RMC unit includes two inputs to monitor the status of circuit breakers or power contactors. For example, one input may be used for a common circuit breaker trip alarm, providing an alarm indication at the DigiTrace NGC-UIT if any circuits fail due to earth fault or overcurrent events. Alarms may be reported remotely through an alarm relay in the DigiTrace NGC-UIT or through an RS-485 connection to DigiTrace Supervisor. Up to 20 MONI-RMC-2DI 2 channel digital input moduls can be added if required.

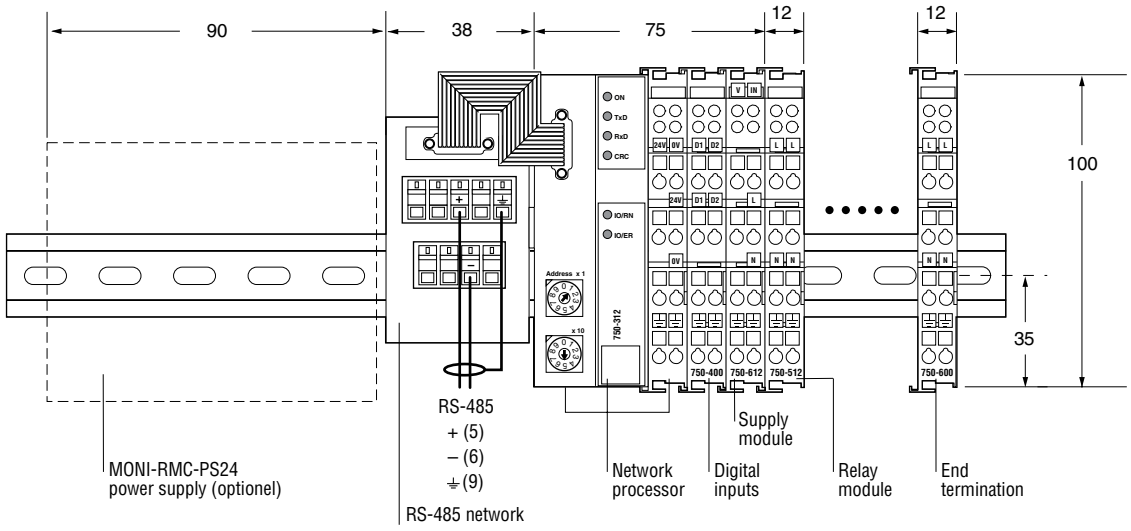
Configurations

The RMC are modular, electronic devices that mount on a DIN 35 rail. RMC units must be installed in panels or enclosures suitable for the area classification and environment. For each RMC installation, purchase one MONI-RMC-BASE kit, which includes the network processor, digital inputs, and end terminator; one MONI-RMC-PS24 24-Vdc power supply; and up to 16 MONI-RMC-2RO 2-channel relay output modules, as required.



MONI-RMC-BASE unit with four MONI-RMC-2RO modules removed

Dimensions (in mm)



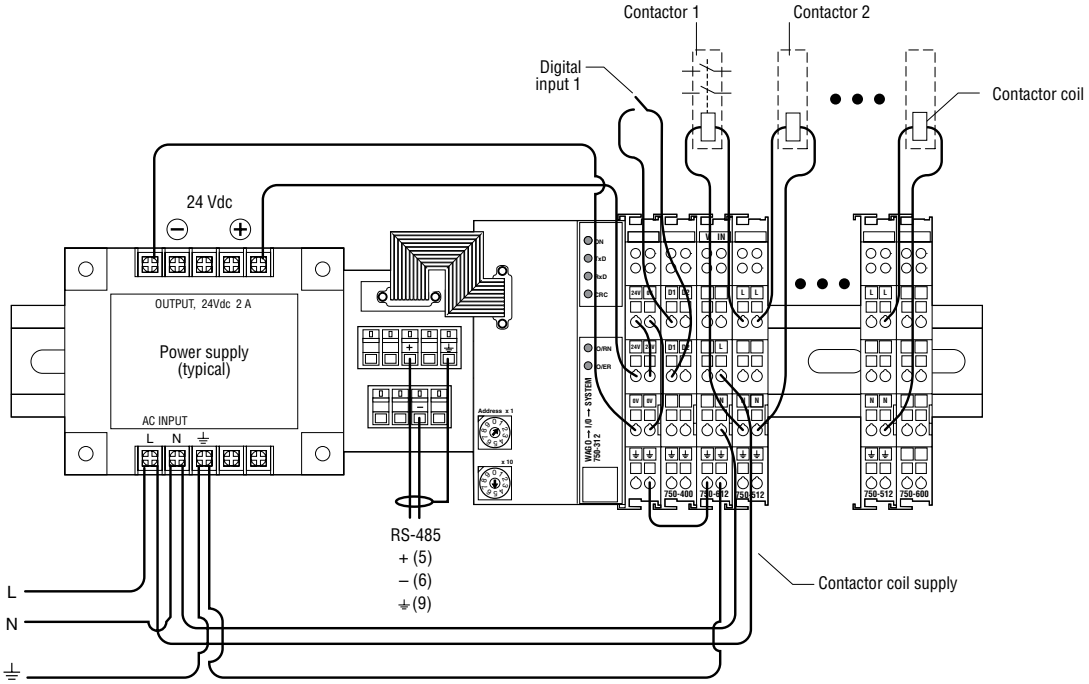
General	
Area of use	Ordinary areas
Ambient operating temperature range	0°C to 55°C
Ambient storage temperature range	–40°C to 70°C
Relative humidity	Max. 95%, noncondensing
Protection	IP2X per IEC 529
Supply voltage	24 Vdc
Supply current	< 2 A

Relay outputs	
Quantity per RMC	1 to 20 two-channel modules (2 to 40 relay outputs)
Total relay outputs via RMCs	260
Type	Mechanical, normally open, non-floating
Voltage, maximum	250 Vac, 30 Vdc
Current, maximum	AC/DC 2 A
Maximum power	60 W/500 VA (resistive)
Isolation	4 kV
Life (operations)	1 x 10^6 at 0.35 A to 0.2 x 10^6 at 2 A
Connection terminals	0.08 mm^2–2.5 mm^2, Spring-type

Supply module	
Voltage	230 Vac/dc
Current	10 A
Connection terminals	Spring-type for cables from 0.08 mm^2 to 2.5 mm^2

Digital inputs	
Quantity per RMC	Up to 20 two-channel modules (2 to 40 digital inputs)
Type	Solid-state, 24 Vdc source
Current consumption	5 mA
Isolation	500 V
Connection terminals	0.08 mm^2–2.5 mm^2 (Spring-type)

Connection details



Communication to DigiTrace NGC-UIT	
Type	RS-485
Connection terminals	0.08 mm² to 2.5 mm² (Spring-type)
Cable	1 shielded twisted pair
Length	1200 m max.
Quantity	Up to 10 RMC may be connected to one DigiTrace NGC-UIT
Address	Switch-selectable on RMC, 10 addresses, 1-99
Mounting method	
	Clips to DIN 35 rail
Electromagnetic compatibility	
Immunity	Complies with EN 50 082-2 (heavy industrial)
Emissions	Complies with EN 50 081-2 (heavy industrial)

Ordering details & weight	Part description	Product Number	Weight
Remote module for control (RMC)			
Base unit*	MONI-RMC-BASE	309735-000	0.5 kg
Two-channel relay output module**	MONI-RMC-2RO	920455-000	0.05 kg
Two-channel digital input module***	MONI-RMC-2DI	062367-000	0.05 kg
24 Vdc power supply	MONI-RMC-PS24	972049-000	0.7 kg

** Purchase one base for each RMC installation. Includes network processor, two digital inputs, end termination, and RS-485 connection module with ribbon cable.*

*** Purchase one module for each set of two relay outputs required. Minimum of one module (2 relay outputs), maximum of 20 (40 relay outputs) per RMC base.*

**** Purchase one module for each set of two digital inputs required. Minimum of one module (2 digital inputs), maximum of 20 (40 digital inputs) per RMC base. Additional module for each pair of digital inputs required. One MONI-RMC-2DI module is included in each MONI-RMC-BASE unit*

Configuration and Monitoring Assistant (CMA)

Product overview

The DigiTrace NGC-CMA is an easy-to-use wireless handheld device for configuration and monitoring of DigiTrace NGC-20 control units. The handheld device has an intuitive user interface eliminating the need for extensive training. The hand held device is available in two versions. For non-hazardous areas, use type handheld device: NGC-CMA-NH. For hazardous area Zone 1 (Zone 21) and Zone 2 (Zone 22), use type: NGC-CMA-EX.

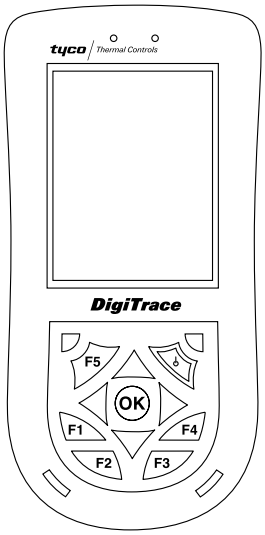
Hardware design

The DigiTrace NGC-CMA devices are designed for high productivity in an industrial environment. They are protected against humidity, dust, corrosion and extreme ambient temperatures. The high impact resistant TFT display with touch-screen functionality guarantees ease of use.

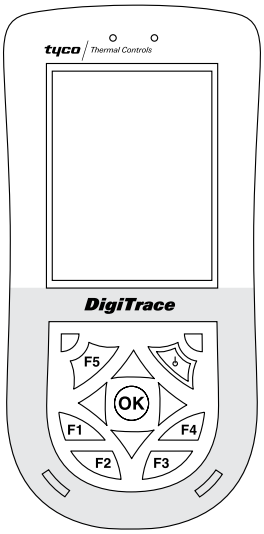
Software

The DigiTrace NGC-CMA software has been designed to provide full configuration and monitoring capabilities of the DigiTrace NGC-20 control units. The DigiTrace NGC-CMA allows wireless connectivity via Bluetooth® to any DigiTrace NGC-20 unit within range. The devices are based on HP iPAQ technology and are running a Windows Mobile® operating system.

DigiTrace NGC-CMA-NH



DigiTrace NGC-CMA-EX



General	DigiTrace NGC-CMA-NH	DigiTrace NGC-CMA-EX
Typical use	DigiTrace NGC-CMA-EX and DigiTrace NGC-CMA-NH units are used for the configuration and monitoring of DigiTrace NGC-20 of heat-tracing control units.	
Approvals/Certification	General industrial use as well indoors as outdoors. Non hazardous areas only.	Ex II 2G EEx ia IIC T4 II 2D T99°C IP65 ZELM 04 ATEX 0200
Conditions of safe use	Refer to user instructions	Refer to Hazardous Area Certification
Environmental protection	IP65, anti-static, non corrosive and shock proof housing (shock proof up to 1 m)	
Compatible control units	DigiTrace NGC-20-C-E, DigiTrace NGC-20-CL-E	

Product specification	DigiTrace NGC-CMA-NH	DigiTrace NGC-CMA-EX
Operating temperature	–20°C to +60°C	–20°C to +50°C
Charging temperature	0°C to +60°C	Devices may not be charged in hazardous areas
Storage temperature	–10°C to +60°C	
Relative humidity	Storage and operation up to 90% relative humidity	
Dimensions	178 x 85 x 39 mm	178 x 85 x 39 mm
Connectivity	Integrated WLAN 802.11b, Bluetooth™ Class II, IrDA. USB via charger cord and USB docking station	
Operating system	Windows® Mobile™ 5 Software for Pocket PC - Premium Edition	
Processor	520 MHz processor based on Intel® XScale™ technology	
Bluetooth interface	Integrated Bluetooth Class II chip (1 mW TX power). The range of the wireless connection may vary depending on the site conditions. Always try to be in direct line of sight when setting up a connection. Try to avoid obstacles. Range only guaranteed up to 2 meter distance	
Memory	Random Access Memory (RAM): 64 MB SDRAM	
	Read Only Memory (ROM): 128 MB flash ROM of which is minimum 80 MB user accessible depending on the operating system language	
Display	3.5" Transreflective TFT color display with 64,000 colors protected by means of a Makrolon™ protection foil (foil is not user replaceable). Unit can be set up to work in either landscape of portrait mode	
Audio	Integrated microphone and speaker	
Power supply	Rechargeable Lithium-Ion battery. Capacity variable depending on device type (NGC-PCMA-ORD = 2880 mAh and NGC-PCMA-ORD = 4000 mAh) *Note: Battery life depends upon user's operational habits, configuration, use of wireless functions and backlighting. Batteries are not replaceable by user*	
Charger	Input voltage: 100 ~ 240 Vac, 50/60 Hz. 0.3 A Output voltage: 5 Vdc, Max. 2 A (typical values)	
Software (included)	System tools: Pocket Word, Pocket Excel, Pocket Outlook, Internet Explorer, Jet Keys (virtual keyboard), Bluetooth Manager, File Store, (non-volatile data storage in Flash-ROM), iTask Manager Image Zone, Self test, Audio, Power Status and DigiTrace CMA software	
Keyboard & buttons	ON/OFF Power switch, reset keys and 5 user programmable function keys, 5-way navigation field	
Kit Content	DigiTrace NGC-CMA-xx unit with full featured DigiTrace configuration and monitoring software pre-installed. Charger, Operating Instructions, Safety Instructions, Software CD (Microsoft license and windows mobile. This CD does not contain Digitrace software)	

Ordering information & weight	NGC-CMA-NH (0.55 kg)	NGC-CMA-EX (0.7 kg)
PN	1244-006606	1244-006605
List of accessories and spare parts		
	NGC-CMA-LCC (Leather carrying holster case)	1244-006580 (0.13 kg)
	NGC-CMA-USB (USB data transmission set. This is not required in case the units are used with the NGC-CMA-BAY or the units are set up for wireless communication either via Bluetooth or Wireless LAN)	1244-006581 (0.19 kg)
	NGC-CMA-BAY (Docking station)	1244-006607 (0.35 kg)

Heat-tracing controller configuration and monitoring software

Overview

The DigiTrace Supervisor™ (DTS) heat-tracing controller configuration and monitoring software provides a graphical user interface for DigiTrace heat-tracing communication and controller products. Heat-trace system information can be accessed and managed from almost anywhere in the world, making DigiTrace Supervisor a powerful management tool for the entire Heat Management System (HMS).

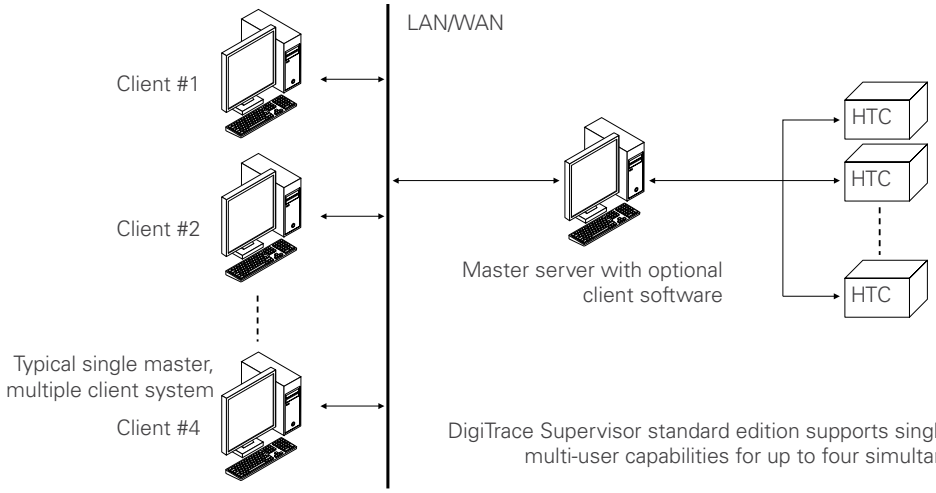
Network and connectivity

By using the latest network technologies costs can be reduced. Devices are no longer limited to simple hard-wired serial communications, but take advantage of existing network infrastructures including Ethernet LANs (Local Area Networks) and Internet-based WANs (Wide Area Networks).

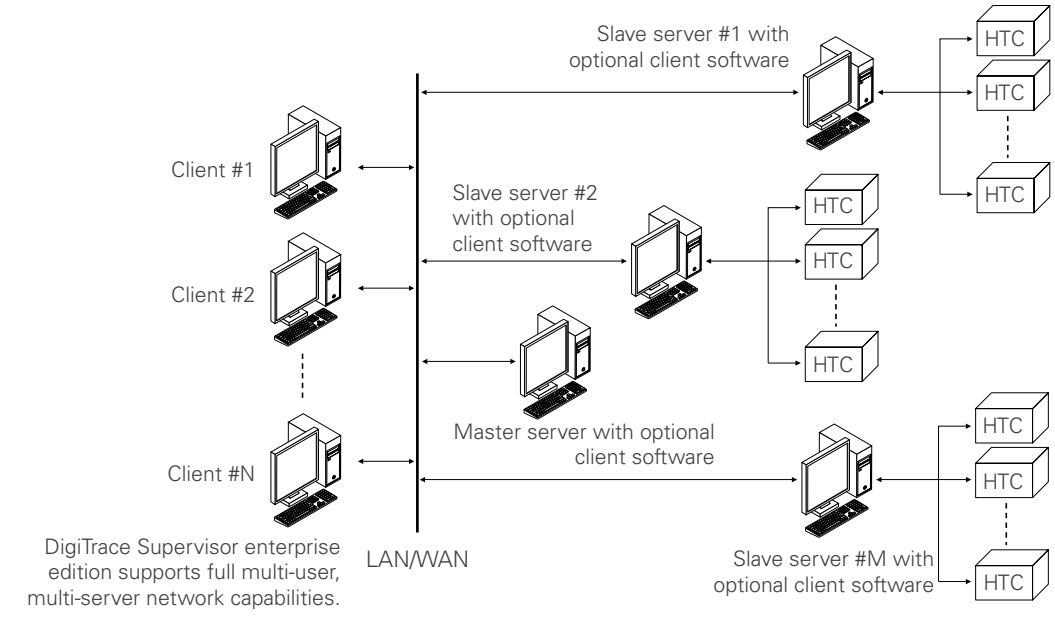
Scalability

DigiTrace Supervisor is available in two versions. The standard edition is a single server multi-user version and provides connectivity to several hundreds of control units in the field and can support up to four simultaneous users. The standard edition is available for download at http://www.tycothermal.co.uk. The Enterprise edition offers unlimited multi-user, multi-server network capabilities.

DigiTrace Supervisor standard edition



DigiTrace Supervisor enterprise edition



DigiTrace Supervisor functionality	
Device configuration	Individual devices can be configured in either offline or online mode. After confirmation data will be uploaded into heat-tracing control devices.
Online monitoring	DigiTrace Supervisor is capable of monitoring online signals like temperature, ground-fault current, current, voltage of individual controllers or sets of controllers into user-defined groups.
Trending & historical data storage	A trending tool offers user defined trending of heat-tracing data which can be stored into the database on a user-defined time interval and storage mechanism.
Alarm and events	Alarms and events are displayed in a pop-up window on the screen. These can be individually acknowledged by the user. All alarms and events are stored in the database for post-event analyses.
Plant reference model	Heat-tracing circuits can be organised via a model which represents the layout of the plant. It enables easy heat-tracing circuit finding in the entire heat-tracing system.
Enhanced documentation link to device configuration & monitoring utilities	DigiTrace Supervisor offers the possibility to link heat-tracing circuits to design and construction documentation and makes it easily accessible to the user (examples: P&IDs, heat-tracing isometrics).
Data import & export	The Export function allows the user to export system devices and plant documentation, and save the data in an XML-format file which can also be imported.
Reports	Numerous pre-defined reports are available like device configurations, alarms and events (historical and current), user roles etc.
Batch, recipes and event scheduler	Multiple pre-defined heat-trace setting changes can be executed at the same time by using the batch and recipe tool. Batches can be launched manually or automatic at a scheduled date and time or at regular intervals.
System wide data synchronisation	DigiTrace Supervisor synchronises continuously with the controllers in the field. Local changes in the controller will reflect in DigiTrace Supervisor and vice versa.
E-mail on alarm notification	An E-mail service is available for sending notifications to selected users when alarms occur.
Internal user messaging	A build-in messaging tool offers the possibility to have instantaneous communication between DigiTrace Supervisor clients connected to the same DigiTrace Supervisor network.
Multi level security and individual user defined preferences	DigiTrace Supervisor security is based on plant groups, users and roles which offers differentiation between each end-user responsibility, rights and preferences.
Languages	English

Controller compatibility

This software is compatible with any of the following controllers that have the appropriate communications interface installed:

- DigiTrace NGC-20 Direct
- DigiTrace NGC-20 via NGC-UIT2
- DigiTrace NGC-30
- DigiTrace NGC-40
- DigiTrace HTC-915 family

System requirements

General	• CD-ROM drive • 1 or more available serial ports (for master or slave computers that connect to field devices) • A mouse or other compatible pointing device • SVGA display with 800x600 resolution • Microsoft Windows® XP Pro, XP Home or 2000 (slave & client computers) • Microsoft Windows® Server 2000 thru 2008 (SQL Masters) • Microsoft SQL Server 2000 thru 2008 (SQL Masters) • Microsoft Windows® XP Pro SP3 or newer • Microsoft .NET Framework version 4.0 • Microsoft Windows 7/Vista compatible (32 or 64 bit) • Network connectivity
Master server computer	• Pentium® 4 – 2.4 GHz or faster (recommended), Pentium® III – 500 MHz (minimum) PC • A hard disk with at least 500 MB of free space (recommended), 150 MB (minimum) • 1 gigabyte of RAM (recommended), 256 MB of RAM (minimum)
Slave server computer(s) (optional)	• Pentium® 4 – 1 GHz or faster (recommended), Pentium® III – 300 MHz (minimum) PC • A hard disk with at least 150 MB of free space (recommended), 50 MB (minimum) • 256 MB of RAM (recommended), 128 MB of RAM (minimum)
Client computer(s)	• Pentium® III – 500 MHz or faster (recommended), Pentium® II – 300 MHz (minimum) PC • A hard disk with at least 50 MB of free space • 256 MB of RAM (recommended), 128 MB of RAM (minimum)
DTS Database (included in license)	DigiTrace Supervisor Standard edition runs on MSDE. DigiTrace Supervisor Enterprise edition runs on SQL Server 2000

Registration

DigiTrace Supervisor will run in TRIAL mode for up to 14 days.

For more information about how to register within this period, see the DigiTrace Supervisor Heat-Tracing Controller Configuration and Monitoring Software Installation and Operating Instructions (INSTALL-118) or visit http://www.tycothermal.co.uk/digitracesupervisor.

Communication

ModBus protocol via:

- TCP/IP
- RS-232
- RS-485

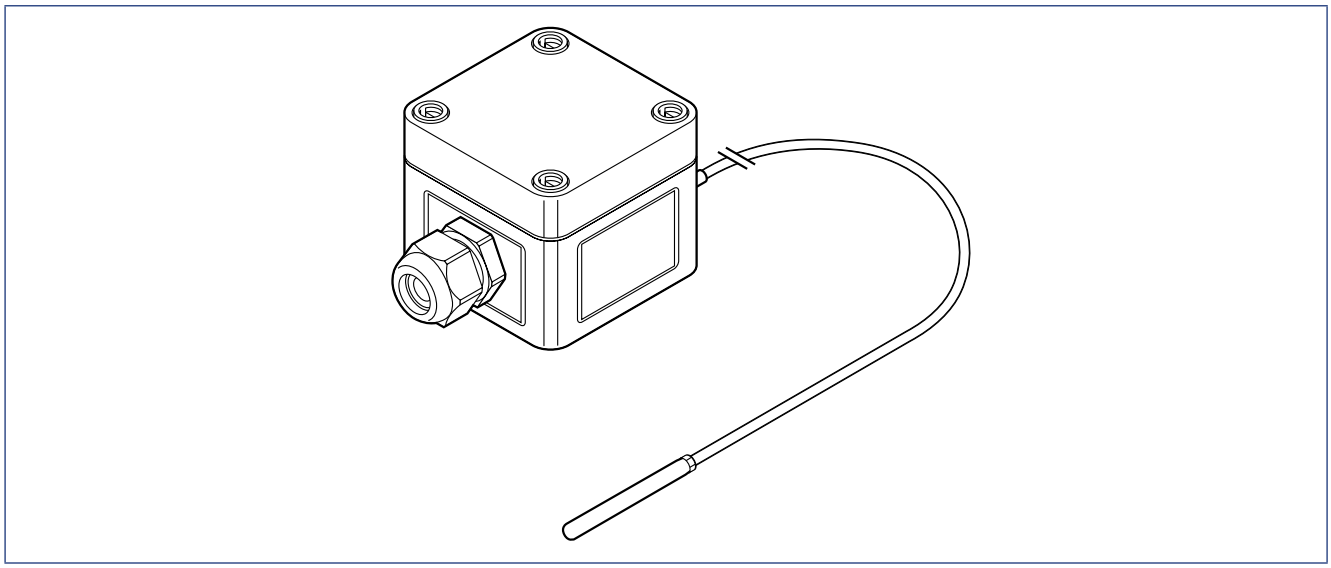
Ordering Details

Product Name	Description	Part Number	Remarks
DT2-Std	DTS V2.x – Standard Edition	1244-004645	registration required after 14 days
DT2-Enterprise	DTS V2.x – Enterprise - base package (master + 2 slaves + 5 users)	10391-010	license required
DT2-Upgrade/Slv	DTS V2.x – Slave server upgrade (two additional slave servers)	10391-011	license required
DT2-Upgrade/Usr	DTS V2.x – User upgrade (five additional users)	10391-012	license required

MONI-PT100-NH

Temperature sensor for ordinary area

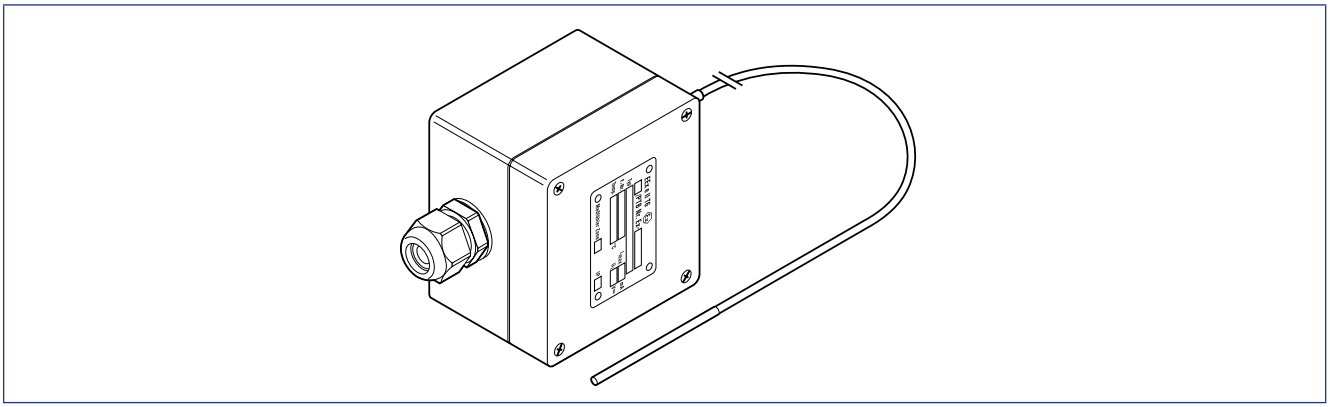
2 wire Pt 100 sensor with glass fiber reinforced polycarbonate junction box for installation in ordinary area.



Area of use	
	Ordinary area
Approvals	
	NA
Sensor	
Type	Pt 100 (2 wire)
	DIN IEC 751, Class B
Material	Tip: stainless steel
	Extension cable: silicone
Temperature measuring range	–50°C to +180°C
Temperature range extension cable	–50°C to +180°C (+215°C maximum 1000 hrs), max. exposure temp. tip: +400°C
Length	2 m
Diameter	Extension cable ca 4.6 mm, tip ca 6.0 mm
Minimum bending radius	Extension cable: 5 mm, the measuring tip should not be bent
Enclosure	
Ingress protection	IP66
Material	Glass fiber reinforced polycarbonate (gray)
Dimensions	With = 65 mm Height = 65 mm Depth = 57 mm
Cable gland	M20 (polyamide) suitable for cable diameters ranging from 10 mm to 14 mm
Operating temperature	–30°C to +80°C
Lid sealing gasket material	CFC-free Polyurethane
Cover screws	Plastic
Mounting	For pipe mount use JB-SB-26 wall mount surface mount via moulded holes at 50 x 50 mm
Installation and connection	
Terminals	3 front entry spring-type terminals (terminals 2 and 3 are bridged)
Terminal sizing	Terminals suitable for cables from 0.15 mm to 2.5 mm^2
Ordering details	
Part Description	MONI-PT100-NH
PN (Weight)	140910-000 (0.22 kg)

Temperature sensor for hazardous areas

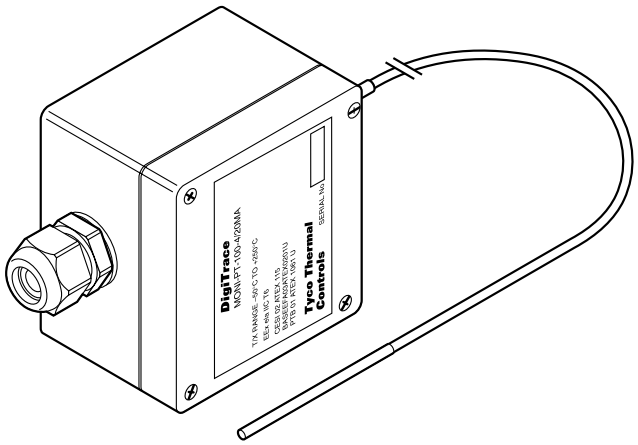
3 wire Pt 100 sensor connected to a black glass fiber reinforced polyester junction box with 4 front entry spring-type terminals. M20 EEx e cable gland preinstalled.



Area of use	
	Hazardous environment Zone I
Approvals	
	Baseefa11ATEX0068X Ⓔx II 2 GD Ex e IIC T6 Ta -50°C to + 60°C Gb Ex tb IIIC T85°C Ta -50°C to +60°C Db IP66 IECEx BAS 11.0033X Ex e IIC T6 Ta -50°C to +60°C Gb Ex tb IIIC T85°C Ta -50°C to +60°C Db IP66
Sensor	
Type	Pt 100 (3 wire) DIN IEC 751, Class B.
Material	extension cable and tip both stainless steel (MI)
Temperature measuring range	–100°C to +500°C
Maximum exposure temp. tip	+585°C
Length	2 m
Diameter	ca 3 mm
Minimum bending radius	extension cable: 20 mm, the measuring tip should not be bent
Enclosure	
Material	Glass fiber reinforced polyester (black)
Ingress protection	IP66
Dimensions	With = 80 mm Height = 75 mm Depth = 55 mm
Cable entry	M20 (EEx e) suitable for cable diameters ranging from 10 mm to 14 mm
Operating temperature	+55°C to +60°C
Sealing gasket material	tongue and groove system with silicone seal
Cover screws	Stainless steel M4 threaded
Mounting	For pipe mount use JB-SB-26 wall mount surface mount via moulded holes at 68 x 45 mm
Installation and connection	
Terminals	4 front entry spring-type terminals
Terminal sizing	suitable for cables from 0.5 mm^2 to 2.5 mm^2
Ordering details	
Part Description	MONI-PT100-EXE
PN (Weight)	967094-00 (0.44 kg)

3 Wire Pt 100 sensor with 4 to 20 mA transmitter for hazardous area

Pt 100 sensor connected to a 4-20 mA transmitter built in a black glass fiber reinforced polyester junction box with M20 cable gland (Blue).



Area of use	
	Hazardous environment Zone I
Approvals	
	CESI 02 ATEX 115, Ex II 1G EEX eia IIC T6 CE 0722 Baseefa03ATEX0201U, Ex II 2G EEx eII CE 1180 PTB 01 ATEX 1061U, Ex II 2G EEx eII T6 CE 0123
Sensor	
Type	Pt 100 (3 wire)
	DIN IEC 751, Class B.
Material	extension cable and tip both stainless steel (MI).
Temperature measuring range:	–50°C to +250°C (transmitter)
Maximum exposure temp. tip	+585°C
Length	2 m
Diameter	ca 3 mm
Minimum bending radius	extension cable: 20 mm, the measuring tip should not be bent
Enclosure	
Ingress protection	IP66
Material	Glass fiber reinforced polyester (black)
Dimensions	Width = 80 mm Heigth = 75 mm Depth = 55 mm
Cable gland	M20, blue (EEx e) suitable for cable diameters ranging from 10 mm to 14 mm
Operating temperature	–20°C to +55°C
Sealing gasket material	tongue and groove system with silicone seal
Cover screws	Stainless steel M4 threaded
For pipe mounting use	JB-SB-26
Installation and connection	
Terminals	2 screw terminals
Terminal sizing	suitable for cables from 0.5 mm^2 to 1.5 mm^2
Ordering details	
Part Description	MONI-PT100-4/20MA
PN (Weight)	704058-000 (0.46 kg)

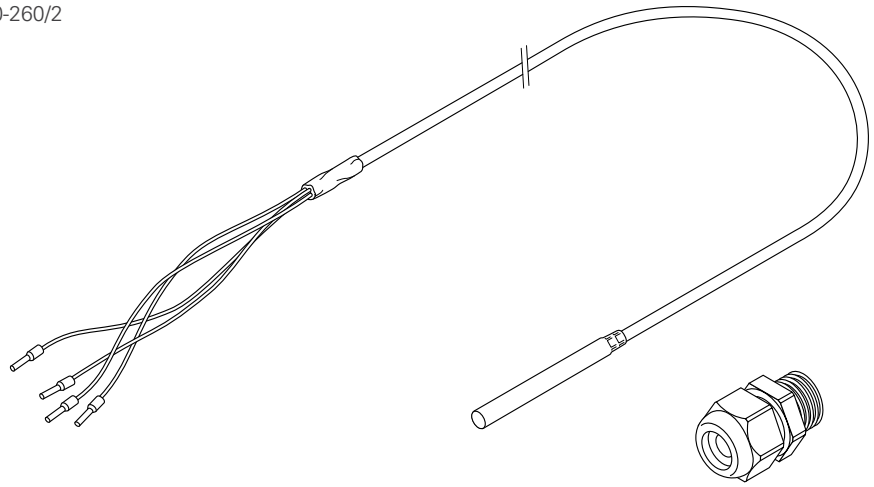
Temperature sensor with M16 gland

Product overview

MONI-PT100-260/2 temperature sensor is designed for providing accurate temperature measurements.

The MONI-PT100-260/2 sensor exhibits excellent mechanical, electrical and thermal properties what makes the sensor extremely useful for a broad range of applications. The sensor can be connected to the control device using 3-wire technology for providing highest accuracy and measuring stability.

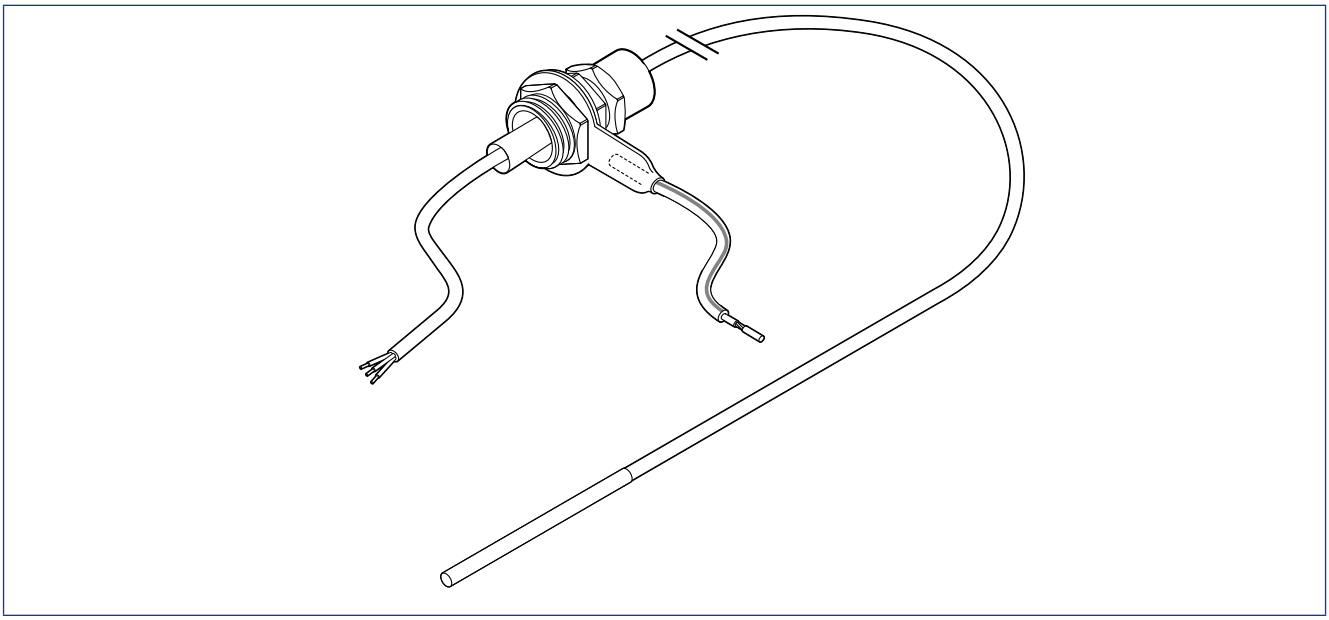
MONI-PT100-260/2



Area of use	
	Non hazardous area or hazardous area Zone 1, Zone 21 or Zone 2, Zone 22 when connected to intrinsic safe circuits
Sensor	
Type	Pt 100 (3 wire)
	DIN IEC 751, Class B
Jacket/Sheath Material	Extension cable PTFE (Fluoropolymer)
	Measuring tip stainless steel (316 Ti)
Cable construction	Braided
Measuring range	–50°C to 260°C
Maximum exposure temp. tip	400°C
Length	Total sensor length 2 m (other lengths are available on request) Length of the measuring tip ca 50 mm
Nominal Diameter (OD)	Diameter of the sensor cable 4.8 mm
	Diameter of the tip 6 mm.
Conductors	4 x 0.5 mm^2 (Red, Red, White and braid) PTFE insulated
Minimum bending radius	Sensor cable minimum 20 mm, The measuring tip should not be bent
Cable gland	
Approvals	II 2GD EEx e II
	PTB 05 ATEX 1068 X
Thread size (color)	M16 (Black)
Material	Polyamide (PA) Halogen-free
Temperature range	–40°C to +75°C
Cable acceptance size	Suitable for cables from 4 to 9 mm diameter
PN (Weight)	704058-000 (0.12 kg)

Temperature Sensor for Hazardous Area (without Junction box)

Certified EEx e II cable gland preinstalled on the sensor lead (M16, Brass, inclusive sealing washer, locknut and earth tag



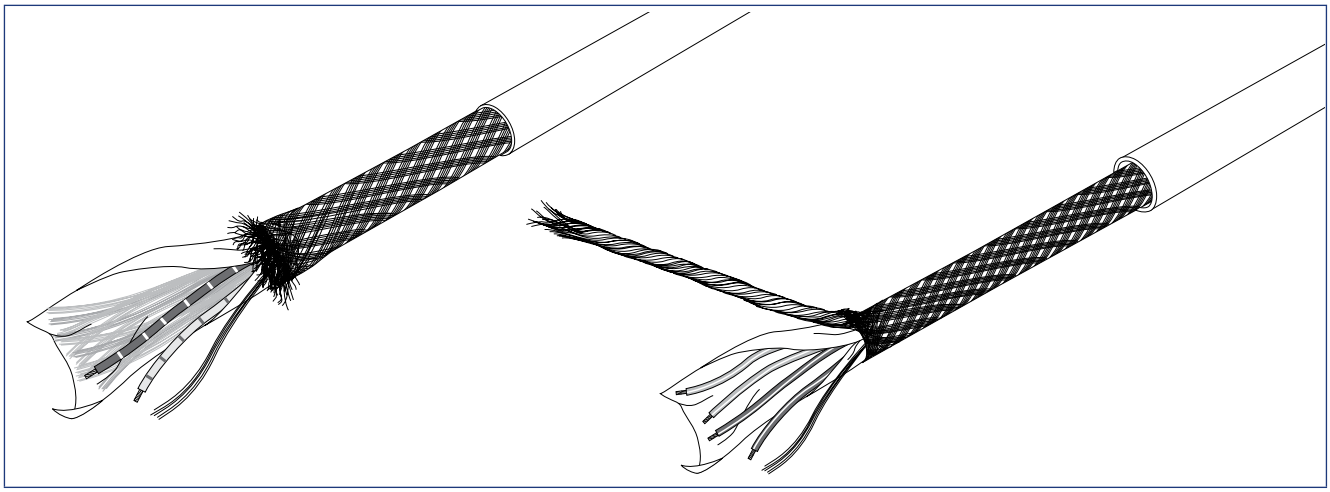
Area of use	
	Hazardous environment Zone I
Approvals	
	Baseefa11ATEX0070X
	Ex II 2 GD
	Ex e IIC T6 Ta -50°C to +60°C Gb
	Ex tb IIIC T85°C Ta -50°C to +60°C Db IP66
	IECEx BAS 11.0035X
	Ex e IIC T6 Ta -50°C to +60°C GB
	Ex tb IIIC T85°C Ta -50°C to + 60°C Db IP66
Sensor	
Type	Pt 100 (3 wire)
	DIN IEC 751, Class B.
Material	Stainless steel (MI).
Temperature measuring range	–100°C to +500°C
Maximum exposure temperature	+585°C
Length	2 m
Diameter	ca 3 mm
Minimum bending radius	extension cable: 20 mm, the measuring tip should not be bent
Installation and connection	
M16 (Brass) compression gland pre-installed on the sensor.	
Sealing washer, earth tag and locknut included.	
Maximum operating temperature (for the gland)	–50°C to +60°C
Ordering details	
Part Description	MONI-PT100-EXE-SENSOR
PN (Weight)	529022-000 (0.11 kg)

RS485 Communication cables

Product overview

RS485-WIRE are braided and shielded type cables suitable for RS485 data transmission. Screen continuity and polarity must be maintained throughout the entire communication network. Connections must be made at each panel in accordance with the details provided in the appropriate product manual. Do not share communication cables with other signals or power. Keep data cables away from fluorescent lights, power cables and heavy duty machinery.

Zero Halogen (Low Smoke) cables of the same construction are available on request. (Flame retardant to IEC 60332-3C).



Type	RS485-WIRE-B1 (Single pair construction)	RS485-WIRE-B2 (2-Pair construction)
General	**Cables suitable for IEA RS-485 communications.**	
Typical use	RS485 communications, In- and outdoors	
Approvals/Certification	UL 2919, VW-1	UL 2919, VW-1
Construction	**RS485-WIRE-B1** (Single pair construction)	**RS485-WIRE-B2** (Dual Pair construction)
Conductors	Two tinned Copper conductors	Four tinned Copper conductors
	24AWG (7 x 0.20 mm)	24AWG (7 x 0.20 mm)
Insulation	Polyethylene (PE)	Polyethylene (PE)
Pairing	One single twisted Pair	Two twisted pairs
Identification	Blue/white + White/blue	Pair 1: Blue/white + White/blue
	Pair 2: White/Orange + Orange/White	
Screening	Aluminium polyester tape	Aluminium polyester tape
	Tinned Copper Braid (90% coverage)	Tinned Copper Braid (90% coverage)
Jacket Type	RS485-WIRE-B1- and RS485-WIRE-B2 made of PVC (Polyvinylchloride)	
	RS485-WIRE-ZHB1- and RS485-WIRE-ZHB2 made of LSOH	
Colour	All type Grey	

Electrical properties		
Max operating voltage	300 V RMS	300 V RMS
Capacitance	45 Pf/m (measured between conductors)	45 Pf/m (measured between conductors)
Conductor resistance	80 Ohm/km @ 20°C	80 Ohm/km @ 20°C
Nominal Impedance	120 Ohm	120 Ohm
Velocity of Propagation	66%	66%
Max allowed Current	2.10 A @ 25°C	2.10 A @ 25°C
Physical Properties		
Nominal Diameter (OD)	5.90 mm (±0.2 mm)	8.64 mm (±0.2 mm)
Temperature range	–30°C to +80°C	–30°C to +80°C
Minimum Bend radius	63 mm	89 mm
Max continuous length	1000 m	1000 m
Polyvinylchloride types	RS485-WIRE-B1	RS485-WIRE-B2
Part number (Weight)	1244-006598 (55 kg/km)	1244-006599 (90 kg/km)
Zero Halogen types	RS485-WIRE-ZHB1	RS485-WIRE-ZHB2
Part number (Weight)	1244-006600 (55 kg/km)	1244-006601 (90 kg/km)

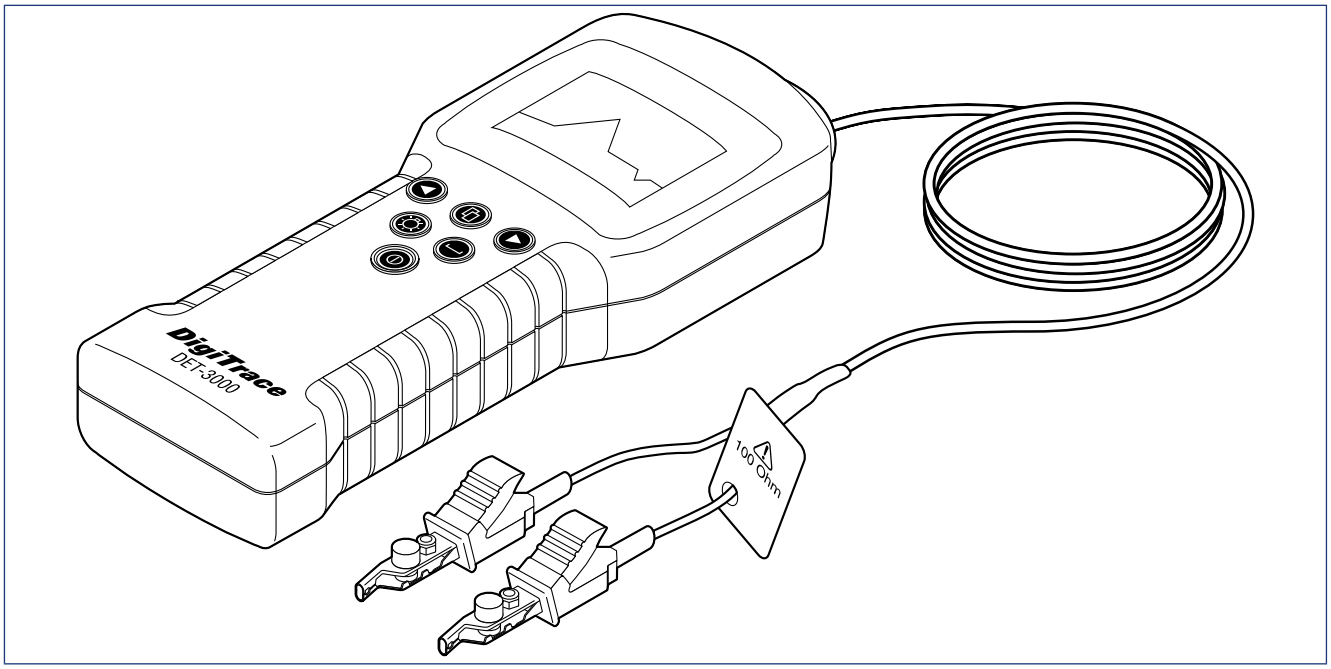
Hand held cable fault locator

The DET-3000 is a cable fault locater working on the principles of Time Domain Reflectrometry or TDR. The DET-3000 is a hand held cable fault locater from the latest generation. The DET-3000 gives genuine universal performance for short and long range applications on all types of metallic cable including many types of heating cable. Innovative features result in a versatile, cable-test instrument that is remarkably easy to use. Large back-lit display, tactile push buttons and ability to operate in temperatures as low as –20°C allow use in a vast range of locations and conditions. The DET-3000 operates accurate to 20 cm on shortest range. Automatic cable attenuation compensation ensures easy location of faults at all distances.

Principles of operation.

If a cable is metal and it has at least two conductors, it can be tested by a TDR. TDRs will troubleshoot and measure all types of cables. The TDR works on the same principle as radar. A pulse of energy is transmitted down the cable under test. When that pulse reaches the end of the cable, or a fault along the cable, part or all of the pulse energy is reflected back to the instrument. The TDR measures the time it takes for the signal to travel down the cable, see the problem, and reflect back. The TDR then converts this time to distance and displays the information as a waveform and/or distance reading.

The DET-3000 can be used to locate and identify faults in all types of metallic paired cables including heating cables. TDRs can locate both major or minor cabling problems including; sheath faults, broken conductors, water damage, loose connectors, crimps, cuts, smashed cables, shorted conductors, system components, and a variety of other fault conditions. In addition, TDRs can be used to test reels of cable for shipping damage, cable shortages, cable usage, and inventory management. The speed and accuracy of the DET-3000 makes it today's preferred method of cable fault location.



- Easy single-handed operation
- Light Hand-held instrument for long and short range applications
- Usable for high variety of metallic cables
- Cable attenuation compensation and narrow pulse for clear and simple trace display
- Large, high resolution display
- Back lit LCD effective down to –20°C
- Tactile push buttons
- Proven durability

Specifications		
Ranges (nominal)	10 m, 30 m, 100 m, 300 m, 1000 m, 3000 m	
Accuracy	±0.9% of range	
Resolution	1% of range	
Propagation velocity	Variable velocity factor, 0.2 to 0.99 pvf Unit remembers last figure used	
Pulse characteristics	Width	7 ns to 2 µs automatically selected to best suit the measuring range
	Amplitude	5 V nominal when unterminated (SQUARE pulses)
Output impedance	25, 50, 75 and 100 Ω switchable	
Measuring leads	The DET-3000 comes with 100 Ω testleads	
Output sockets	2 x 4 mm on 19 mm pitch	
Protection	The unit will not be damaged by inadvertent direct connection via the 100 Ohm testleads to 250 Vac. However it is unsafe to use the unit in this way. Installations should always be isolated from the mains supply prior of taking measurements with the DET-3000. *For safety reasons the DET-3000 should not be used on live installations.* *Always verify prior of starting the measurements that the complete installation is isolated from the mains.*	
Display	Liquid crystal, 128 x 64 pixels with back light	
Cursor	Single vertical line	
Units	meters or feet user selectable.	
Power	9 Vdc nominal 6 x AA size LR6 Alkaline batteries (not rechargeable) Battery live ±16 hours @20°C ambient no backlight	
Environment	Operation Temperature	–20°C to +55°C
	Storage temperature	–30°C to +70°C
	Humidity	93% RH at +40°C
Ingress protection	Water resistant to BS 2011, Part 2.1 R/IEC 68-2-18, Test Ra	
Safety	EC Directive 73/23/EEC, as amended by 3/68/EEC	
	BS EN 41003: 1997	
EMC	EC Directive 89/336/EEC, as amended by EC directive 93/68/EEC BS EN 50082-1: 1992 BS EN 55011: 1991 (Group 1 Class B) The equipment is specified for operation in residential, commercial and light industrial environments.	
Size (mm)	250 x 100 x 55 mm	
Weight (kg)	1.1 kg (including batteries, soft-case, testlead, manual)	

Ordering Details	
Part description	DET-3000
PN (Weight)	546866-000 (1.1 kg)

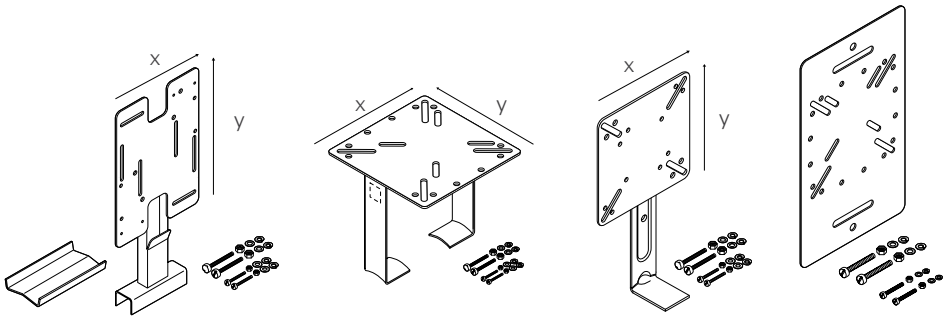
Accessories

Supports

Support brackets are used to fix equipment such as thermostats or junction boxes on pipes or cable trays. Support brackets require additional pipe straps which have to be ordered separately.

They include a set of M6 and/or M4 fixing screws, nuts, washers and spring lock washers for the fixation of one junction box or thermostat.

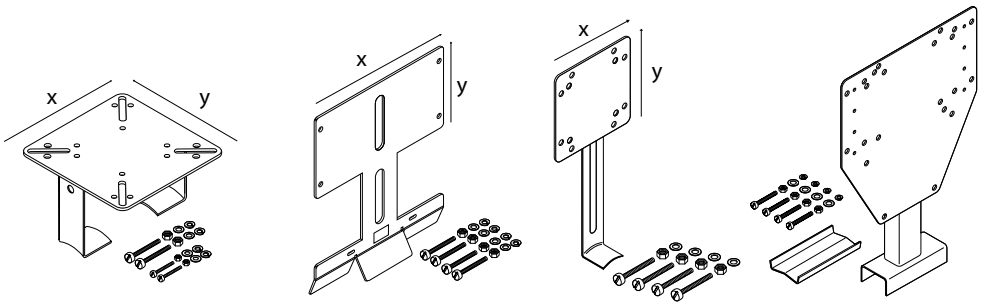
The table below outlines the typical compatibility of each bracket with relevant equipment, for other equipment please contact Tyco Thermal Controls representative.



	SB-100 192932-000	SB-101 990944-000	SB-110 707366-000	SB-130** 1244-006602
AT-TS-13	x	x	x	x
AT-TS-14	x	x	x	x
JB-82	x	x	x	x
JB-EX-20(-EP)	x	x	x	x
JB-EX-21	x	x		x
JB-EX-21/35MM2				
JB-EX-25/35MM2				
JB-EX-32/35MM2				
JBU-100(-L)-E(P)	x	x		x
MONI-PT100-EXE		x		x
MONI-PT100-NH		x		x
MONI-PT100-4/20mA		x		x
RAYSTAT-CONTROL-10	x	x		x
RAYSTAT-ECO-10	x	x		x
RAYSTAT-EX-02	x	x	x	x
RAYSTAT-EX-03	x	x		x
RAYSTAT-EX-04	x	x		x
NGC-20-C(L)-E				
T-M-10-S/+x+y	x	x		x
T-M-20-S/+x+y(/EX)			x	

** *Support bracket for fixation to cable trays*

Technical data				
Plate size (mm) X x Y	160 x 230	160 x 160	130 x 130	180 x 315
Distance pipe-plate (mm)	100	160	100	N.A.
Number of pipe straps required	2	2	1	2
Max. pipe temperature (°C)	230	230	230	N.A.
Weight (kg)	0.70	0.59	0.40	0.62



	SB-111 579796-000	SB-120 165886-000	JB-SB-26 338265-000	SB-125 1244-00603
AT-TS-13	x			
AT-TS-14	x			
JB-82	x			x
JB-EX-20(-EP)	x			
JB-EX-21				
JB-EX-21/35MM2	x*			
JB-EX-25/35MM2	x*			
JB-EX-32/35MM2	x*			
JBU-100(-L)-E(P)				x
MONI-PT100-EXE	x		x	
MONI-PT100-NH	x		x	
MONI-PT100-4/20mA	x		x	
RAYSTAT-CONTROL-10				x
RAYSTAT-ECO-10				x
RAYSTAT-EX-02	x			x
RAYSTAT-EX-03				x
RAYSTAT-EX-04				x
NGC-20-C(L)-E		x		x
T-M-10-S/+x+y	x			
T-M-20-S/+x+y(/EX)		x		x

* *Use 2 brackets per junction box*

Technical data				
Plate size (mm) X x Y	130 x 130	220 x 120	80 x 80	220 x 232
Distance pipe-plate (mm)	100	120	100	100
Number of pipe straps required	2	2	1	2
Max. pipe temperature (°C)	230	230	230	230
Weight (kg)	0.48	0.66	0.20	0.90

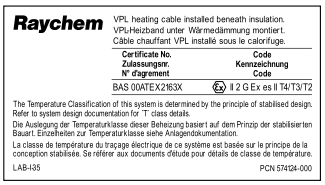
Labels and tags

Warning labels indicate the presence of electrical heat-tracing under the insulation of the pipe or other equipment. (min. of 1 label per 5 m of heat-tracing line)

Language	EHT label reference	Product number
Croatian	ETL-HR	938764-000
Czech	ETL-CZ	731605-000
Danish	ETL-DK	C97690-000
Dutch	LAB-I-23	749153-000
English	LAB-I-01	938947-000
Finnish	LAB-ETL-SF	756479-000
French	LAB-I-05	883061-000
German/French/Italian	LAB-ETL-CH	148648-000
German	ETL-G	597779-000
Hungarian	LAB-ETL-H	623725-000
Italian	ETL-I	C97688-000
Latvian	LAB-I-32	841822-000
Lithuanian	LAB-ETL-LIT	105300-000
Norwegian	ETL-N	C97689-000
Norwegian/English	LAB-ETL-NE	165899-000
Polish	ETL-PL	258203-000
Portugese	LAB-ETL-POR	945960-000
Romanian	ETL-RO	902104-000
Russian	LAB-ETL-R	574738-000
Russian/English	LAB-I-01/E/R	1244-001060
Slovenian	ETL-SLO	538156-000
Spanish	ETL-Spanish	C97686-000
Swedish	LAB-ETL-S	691703-000

Stabilized design labels

If compliance to the T-class or A.I.T. cannot be achieved by the unconditional T-rating of the heating cable, the hazardous area regulations require that cable sheath temperature is determined by the rules of stabilized design as per EN 60079-30 and the heating circuit is marked accordingly. The following labels are available for this purpose (min.1 label per heating circuit)



LAB-I-35

Stabilized design sticker. To be installed when power-limiting VPL heating cables are used in hazardous areas.

PN: 574124-000 Weight: 0,0015 kg

LAB-EX-XTV-KTV

Aluminum tag plate for XTV and KTV self-regulating heating cables. To be installed if T-class compliance was proven by stabilized design and not by unconditional T-rating.

PN: 1244-011961 Weight: 0.04 kg

LAB-EX-FxT

Aluminum tag plate. To be installed when parallel constant wattage FMT or FHT heating cables are used in hazardous areas.

PN: 1244-006953 Weight: 0.04 kg

PI-LABEL-EX

Aluminum tag plate. To be installed when series polymer insulated XPI & XPI-S heating cables are used in hazardous areas.

PN: 1244-006940 Weight: 0.04 kg

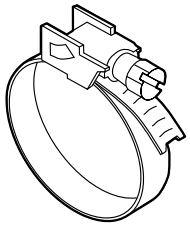
PI-LABEL-NH

Aluminum tag plate. To be installed when series polymer insulated XPI & XPI-S heating cables are used non hazardous areas. This label is not mandatory but highly recommended for future reference.

PN: 1244-006941 Weight: 0.04 kg

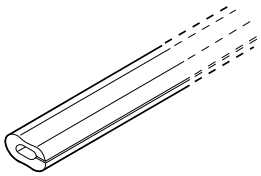
Pipe straps

Metal straps for pipe mounting of integrated power connections, above the insulation tees and end seals as well as support brackets and the tubular insulation entry.
Banding: stainless steel



Pipe outer diameter in mm	(inches)	Pipe strap	PN (Weight)
20 - 47	(1/2" - 11/4")	PSE-047	700333-000 (0.017 kg)
40 - 90	(11/4" - 3")	PSE-090	976935-000 (0.024 kg)
60 - 288	(2" - 10")	PSE-280	664775-000 (0.052 kg)
60 - 540	(2" - 20")	PSE-540	364489-000 (0.052 kg)

Protective grommet



G-02

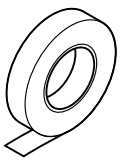
Silicone grommet that protects the heating cable at sharp edges such as endplates of insulation cladding, flanges etc. It can be cut-to-length and resists temperatures up to 215°C.

Sold in pieces of 1 m.

PN: 412549-000 Weight: 0.37 kg/m)

Fixing materials

Self-adhesive tape for fixing the heating cables on pipes or other equipment.



GT-66

Glass cloth tape for attaching heating cable to pipe.
Not for stainless steel pipes or for installation temperatures below 5°C.

20 m per roll, 12 mm width.

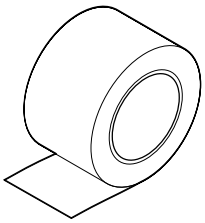
PN: C77220-000 Weight: 0.053 kg

GS-54

Glass cloth tape for attaching heating cable to pipe.
For stainless steel pipes or for any installation below 5°C.

16 m per roll, 12 mm width.

PN: C77221-000 Weight: 0.048 kg



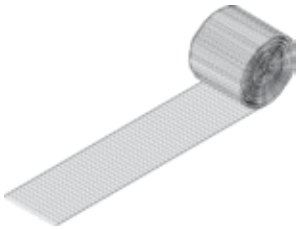
ATE-180

Aluminium tape* for attaching heating cables and thermostat sensors to pipes and tanks. Minimum installation temperature: 0°C.

55 m per roll, 63.5 mm width.

PN: 846243-000 Weight: 0.84 kg

** Power output of selfregulating heating cables might increase when installed with aluminium tape or other heat transfer aids. Please use TraceCalc or contact Tyco Thermal Controls representative for further details.*

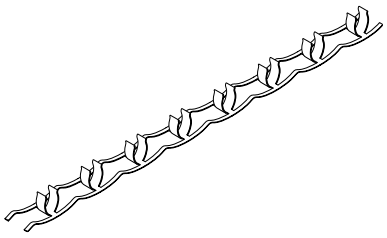


HWA-METAL-MESH-SS-50MM-10M

Stainless steel mesh for fixation of heating cables on valves, pumps or other odd-shaped surfaces. This mesh provides optimum contact and heat transfer between heating cables and heated equipment and can be used for exposure temperatures up to 400°C.

10 m per roll, 50 mm width.

PN: 1244-005772 Weight: 0.36 kg



HWA-PI-FIX- SS-xMM-10M

Stainless steel clip band to attach Polymer Insulated series heating cables to pipes. Clips at regular distances to allow for even heater spacing. Band available in two sizes for different diameter ranges.

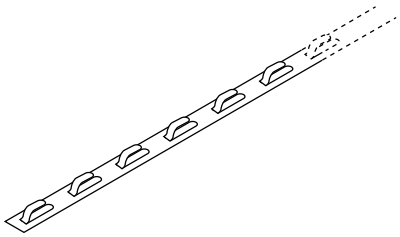
10 m per roll.

For diameters up to 5 mm, HWA-PI-FIX-SS-5MM-10M

PN: 1244-007768 Weight: 0.32 kg

For diameters up to 8 mm, HWA-PI-FIX-SS-8MM-10M

PN: 1244-007769 Weight: 0.52 kg



HARD-SPACER-SS-25MM-25M

Stainless steel spacer for fixing the heating cable on walls, tanks and vessels, etc.

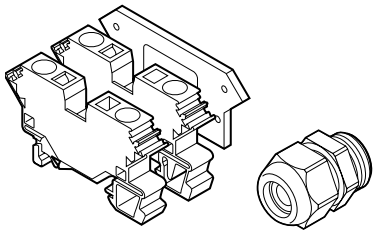
Width spacer: 12.5 mm.

Fixing distance for cables: each 25 mm.

25 m per roll.

PN: 107826-000 Weight: 1.10 kg

Terminals



HWA-WAGO-TSTAT-KIT

Thermostat kit with supplementary terminals to connect thermostats of type RAYSTAT-EX-02 to the junction boxes JBS, JBM and JBU.

The kit includes 2 terminals Spring-type terminals (1 x L, 1 x PE), 1 power cable gland GL-36-M25, 1 end plate and 1 installation instruction.

PN: 966659-000 Weight: 0.073 kg

PTB 98 ATEX 3133 U (Terminal)	Ⓔx II 2G Ex e II Ⓔx II 2D
	and
PTB 99 ATEX 3128 X (Gland)	Ⓔx II 2G Ex e II Ⓔx II 2D Ex tD A21 IP66

HWA-WAGO-PHASE

Phase/neutral terminal (Ex e), spare part for various junction boxes, max. 10 mm² solid/stranded.

PN: 633476-000 Weight: 0.019 kg

PTB 98 ATEX 3133 U	Ⓔx II 2G Ex e II Ⓔx II 2D

HWA-WAGO-EARTH

Earth terminal (Ex e), spare part for various junction boxes, max. 10 mm² solid/stranded.

PN: 911505-000 Weight: 0.027 kg

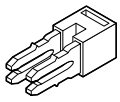
PTB 98 ATEX 3133 U	Ⓔx II 2G Ex e II Ⓔx II 2D

HWA-WAGO-ENDPLATE

End plate for HWA-WAGO-..., 10 mm² terminals, spare part.

PN: 983674-000 Weight: 0.003 kg

PTB 98 ATEX 3133 U	Ⓔx II 2G Ex e II Ⓔx II 2D



HWA-WAGO-JUMPER

Jumper to bridge HWA-WAGO-..., 10 mm² terminals, spare part.

PN: 550942-000 Weight: 0.0004 kg

PTB 98 ATEX 3133 U	Ⓔx II 2G Ex e II Ⓔx II 2D

HWA-WDM-PHASE-35

Phase/neutral screw terminal (Ex e), spare part for JB-EX-xx/35MM2 junction boxes, max. 35mm² solid/stranded.

PN: 1244-006990 Weight: 0.052 kg

KEMA 98 ATEX 1683 U	Ⓔx II 2G Ex e II Ⓔx II 2D

HWA-WDM-EARTH-35

Earth screw terminal (Ex e), spare part for JB-EX-xx/35MM2 junction boxes, max. 35 mm² solid/stranded.

PN: 1244-006992 Weight: 0.077 kg

KEMA 98 ATEX 1683 U	Ⓔx II 2G Ex e II Ⓔx II 2D

HWA-WDM-EARTH-10

Earth screw terminal (Ex e), spare part for JB-EX-xx/35MM2 junction boxes, max. 10 mm² solid/stranded.

PN: 1244-006992 Weight: 0.030 kg

KEMA 98 ATEX 1683 U Ⓔx II 2G Ex e II
Ⓔx II 2D

HWA-WDM-JUMPER-35-2

Jumper to bridge two HWA-WDM-… 35 mm² terminals, spare part

PN: 1244-006995 Weight: 0.013 kg

KEMA 98 ATEX 1683 U Ⓔx II 2G Ex e II
Ⓔx II 2D

HWA-WDM-JUMPER-35-3

Jumper to bridge three HWA-WDM-… 35 mm² terminals, spare part

PN: 1244-006996 Weight: 0.020 kg

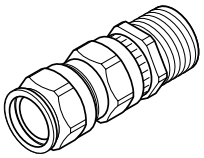
KEMA 98 ATEX 1683 U Ⓔx II 2G Ex e II
Ⓔx II 2D

HWA-WDM-PLATE

End plate for HWA-WDM-… 35 mm² terminals, spare part

PN: 1244-007004 Weight: 0.005 kg

Glands



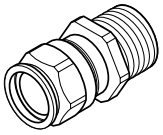
GL-33

3/4" NPT power cable gland for RAYSTAT-EX-02 (Ex d IIC)

Nickel plated brass.

For use with armoured power cables with outer sheath diameter of 12 - 21 mm and inner sheath diameter of 8.5 - 16 mm.

PN: 493217-000 Weight: 0.15 kg



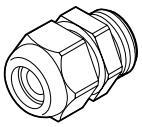
GL-34

3/4" NPT power cable gland for RAYSTAT-EX-02 (Ex d IIC)

Nickel plated brass.

For use with non-armoured power cables with outer sheath diameter of 8.5 - 16 mm.

PN: 931945-000 Weight: 0.07 kg



GL-36-M25

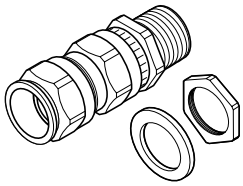
M25 power cable gland (Ex e)

Polyamide.

For use with non-armoured power cables with outer diameter range 8 - 17 mm.

Spare part for JBS-100, JBM-100 and JBU-100.

PN: 774424-000 Weight: 0.016 kg

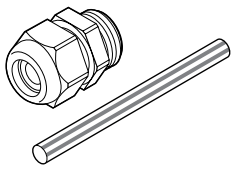


GL-38-M25-METAL

M25 power cable gland (Ex e II and Ex d IIC) for use with junction boxes with internal earth plate (-EP) or metal boxes.

For use with armoured power cables with sheath diameter of 12 - 21 mm and inner sheath diameter 8.5 - 16 mm.

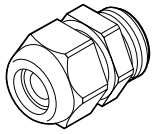
PN: 056622-000 Weight: 0.15 kg



GL-44-M20-KIT

M20 cable gland (Ex e), polyamide for use with PI cables with a diameter range of 5 -13 mm. With green/yellow sleeve.

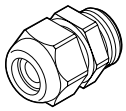
PN: 1244-000 848 Weight: 0.17 kg



GL-45-M32

M32 cable gland (Ex e), polyamide for use with power cables with a diameter range of 12 - 21 mm.

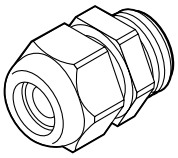
PN: 1244-000 847 Weight: 0.028 kg



GL-50-M20

M20 cable gland (Ex e), polyamide for use with power cables with a diameter range of 5.5 - 13 mm.

PN: 1244-007000 Weight: 0.009 kg



GL-51-M40

M40 cable gland (Ex e), polyamide for use with power cables with a diameter range of 17 - 28 mm.

PN: 1244-007003 Weight: 0.045 kg

Plugs

HWA-PLUG-M20-EXE-PLASTIC

M20 stopping plug Ex e.

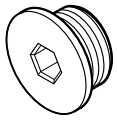
Polyamide.

Spare parts for various junction boxes.

PN: 1244-000 845 Weight: 0.003 kg

PTB 98 ATEX 3130 Ⓔx II 2G Ex e II
Ⓔx II 2D Ex tD A21 IP66

IECEx PTB 03.0000



HWA-PLUG-M25-EXE-PLASTIC

M25 stopping plug Ex e.

Polyamide.

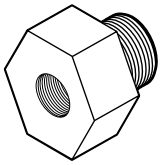
Spare parts for JBS-100, JBM-100 and JBU-100.

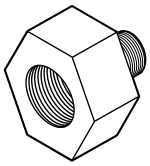
PN: 434994-000 Weight: 0.007 kg

PTB 98 ATEX 3130 Ⓔx II 2G Ex e II
Ⓔx II 2D Ex tD A21 IP66

IECEx PTB 03.0000

Adaptors/Reducers

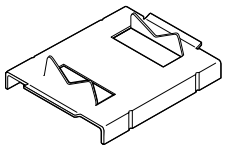




Prod Description	Male	Female	Hazardous area approved	Material	Extra accessories	Product Number (Weight)
REDUCER-M25/M20-EEXE	M25	M20	Ex e	Polyamide	None	1244-002089 (0.021 kg)
REDUCER-M32/M25-EEXE	M32	M25	Ex e	Polyamide	None	1244-000859 (0.009 kg)
REDUCER-M40/M32	M40	M32	Ex e	Polyamide	O-ring	1244-007007 (0.016 kg)
ADPT-PG16-M25-EEXE	M25	PG16	Ex e	Polyamide	O-ring	541892-000 (0.020 kg)
REDUCER-M25/20-EEXD	M25	M20	Ex d	Brass	O-ring	404287-000 (0.07 kg)
REDUCER-M25/20	M25	M20	Ex d	Brass	Locknut, Fibre washer, O-ring	630617-000 (0.07 kg)
REDUCER-M25/M20-EEXD-SS	M25	M20	Ex d	Stainless steel	O-ring	1244-002090 (0.028 kg)
REDUCER-1NPT/PG16-EEXD	1" NPT	PG16	Ex d	Stainless steel	None	414478-000 (0.10 kg)
REDUCER-1NPT/M25	1" NPT	M25	Ex d	Stainless steel	None	1244-000953 (0.55 kg)
REDUCER-M25/PG16-EEXE	PG16	M25	Ex e	Polyamide	O-ring	953780-000 (0.03 kg)
ADAPTOR-M20/25	M20	M25	Ex d	Brass	Locknut and O-ring	492799-000 (0.092 kg)
ADPT-M20/25-EEXD	M20	M25	Ex d	Brass	O-ring	684953-000 (0.09 kg)

Approvals	
REDUCER-M25/20-EEXD	
SIRA 00ATEX1094	Ⓔx I M2 II 2GD Ex d I/IIC Mb Gb Ex e I/IIC Mb Gb Ex tb IIIC Db IP6X
IECEx SIR 05.0042U	
REDUCER-M25/PG16-EEXE	
SIRA00ATEX3091	Ⓔx II 2GD Ex e IIC Gb Ex tb IIIC Db IP 6X
IECEx SIR 05.0042U	

Small pipe adaptors



JBS-SPA

Small pipe adaptor required for pipes ≤ 1" (DN25), applicable for JBS-100, E-100, E-100-L

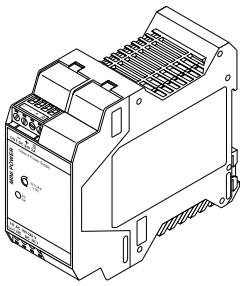
E90515-000 (bag of 5 adaptors) Weight: 0.14 kg

JBM-SPA

Small pipe adaptor required for pipes ≤ 1" (DN25), applicable for JBM-100, T-100

D55673-000 (bag of 5 adaptors) Weight: 0.40 kg

Power supply



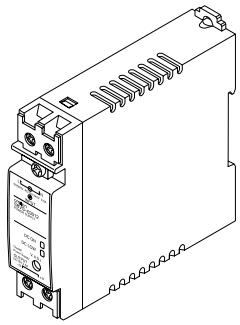
MONI-RMC-PS24

24 Vdc stabilized power supply

Wide range input (100 - 240 Vac) power supply to provide

24 Vdc input for MONI- RMC-BASE.
Surface or DIN 35 rail mounted.

PN: 972049-000 Weight: 0.28 kg



MONI-PS12

12 Vdc stabilized power supply

Wide range input (100 - 240 Vac) power supply to provide 12 Vdc input for the DigiTrace NGC-30-CRM-E and DigiTrace NGC-30-CRMS-E cards.
DIN 35 rail mountable.

PN: 1244-001505 Weight: 0.18 kg

Customer service, technical support and design tools

Tyco Thermal Controls offers a wide range of customer and project and services as well as various engineering software tools aiming to simplify the professional´s life.

A PROFESSIONAL CUSTOMER SERVICE CENTRE

- ☑ Multi-lingual customer service representatives to answer all your questions
- ☑ Fast order handling & shipment from our central warehouse in Leuven, Belgium
- ☑ Documentation services

LARGE TECHNICAL SUPPORT TEAM

- ☑ Technical advice and product selection
- ☑ Design support
- ☑ Specification guidance
- ☑ Cost estimation
- ☑ Project specific support

Raychem HEW-THERM Pyrotenax DigiTrace TRACER

Our **Capabilites**





Heat-tracing | **Project services** | **Control and monitoring** | **Engineered solutions** | **3D plant modeling**

Use our software design tools

For heat-tracing in industrial applications, TraceCalc Pro / TraceCalc Net provide design calculations such as pipe heat loss, number of circuits, electrical loads and maximum temperatures, automated heating cable and component selection, recommendations for control and monitoring selection, and much more. Both offer the possibility to do designs for use in hazardous or non-hazardous areas and for frost protection or temperature maintenance.

With TraceCalc Net selecting the appropriate industrial pipe heat-tracing products is easy.

Register for this online design tool at:
www.tycothermal.co.uk/TraceCalc

TraceCalc Pro

TraceCalc Net

Sales and technical support:
contact your local Tyco Thermal Controls representative

Visit our website at:
www.tycothermal.co.uk



Worldwide Headquarters
Tyco Thermal Controls
7433 Harwin Drive
Houston, TX 77036
USA
Tel: 800-545-6258
Tel: 650-216-1526
Fax: 800-527-5703
Fax: 650-474-7711
info@tycothermal.com
www.tycothermal.com

European Headquarters
Tyco Thermal Controls
Romeinse Straat 14
3001 Leuven
België / Belgique
Tel: +32 16 213 511
Fax: +32 16 213 603
info@tycothermal.com

België / Belgique
Tyco Thermal Controls
Romeinse Straat 14
3001 Leuven
Tel. +32 16 213 511
Fax +32 16 213 603

Bulgaria
ERZET Engineering
Kompl. Bratja Miladinovi/bl57/
vch.4A
BG-8000 Burgas
Tel./fax +359 (56) 86 68 86
Mobile +359 (88) 86 39 903
Fax (UK) +44 8701368787

Česká Republika,
Slovenská Republika
Tyco Thermal Control Czech,s.r.o.
Pražská 636
252 41 Dolní Břežany
Tel: +420 241 911 911
Fax: +420 241 911 100

Danmark
Tyco Thermal Controls Nordic AB
Flöjelbergsgatan 20B
SE-431 37 Mölndal
Tel. +45 70 11 04 00
Fax +45 70 11 04 01

Deutschland
Tyco Thermal Controls GmbH
Birlenbacher Strasse 19-21
D-57078 Siegen-Geisweid
Germany
Tel: +49 271 35600-0
Fax: +49 271 35600-28

España
Tyco Thermal Controls N.V.
Ctra. De la Coruña, km. 23,500
Edificio ECU I
28290 Las Rozas, Madrid
Tel. +34 902 125307
Fax +34 91 6402990

France
Tyco Thermal Controls SA
B.P. 90738
95004 Cergy-Pontoise Cedex
Tel: +33 1 34407330
Fax: +33 1 34407333

Hrvatska
ELGRI d.o.o.
S. Mihalica 2
10000 Zagreb
Tel. +385 (1) 6050188
Fax +385 (1) 6050187

Italia
Tyco Thermal Controls
Centro Direzionale Milanofiori
Palazzo B11
20090 Assago, Milano
Tel. +39 02 5776151
Fax +39 02 57761528

Lietuva/Latvija/Eesti
Tyco Thermal Controls Baltic
Smolensko str. 6
LT-03201 Vilnius
Lithuania
Tel: +370 5 2136634
Fax: +370 5 2330084

Magyarország
Szarka Ignác
Maroshévísz u. 8
1173 Budapest
Tel. +36 (1) 253 76 17
Mobile +36 30 93 30 837
Fax +36 (1) 253 76 18

Nederland
Tyco Thermal Controls b.v.
Van Heuven Goedhartlaan 117
1181 KK Amstelveen
Tel: +31 20 6400411
Fax: +31 20 6400469

Norge
Tyco Thermal Controls
Norway AS
Postboks 146
1441 Drøbak
Tel. +47 66 81 79 90
Fax +47 66 80 83 92

Österreich
Tyco Thermal Controls
Office Wien
Brown-Boveri Strasse 6/14
2351 Wiener Neudorf
Tel. +43 (0 22 36) 86 00 77
Fax +43 (0 22 36) 86 00 77-5

Polska
Tyco Thermal Controls
ul. Cybernetyki 19
02-677 Warszawa
Tel: +48 22 3312950
Fax: +48 22 3312951

Republic of Kazakhstan
Tyco Thermal Controls
4 “a”, Smagulova St.
Atyrau, 060005
Republic of Kazakhstan
Tel: +7 7122 325554
Fax: +7 7122 586017

Romania
Tyco Thermal Controls
3 Sinaii Street, 3rd Floor,
100357 Ploiesti PH,
Tel: +40 34 4802144
Fax: +40 34 4802141

Russia
Tyco Thermal Controls Russia
19, Panfilova Street, 12th floor
Country Park Business Center
141407, Moscow Region, Khimki
Tel: +7 495 9261885
Fax: +7 495 9261886

Schweiz / Suisse
Tyco Thermal Controls N.V.
Office Baar
Haldenstrasse 5
Postfach 2724
6342 Baar
Tel. +41 (041) 766 30 80
Fax +41 (041) 766 30 81

Serbia and Montenegro
Keying d.o.o.
Vuka Karadžića 79
23300 Kikinda
Tel. +381 (230) 401 770
Fax +381 (230) 401 790

Suomi
Tyco Thermal Controls Nordic AB
Flöjelbergsgatan 20B
431 37 Mölndal
Puh. 0800 11 67 99
Telekopio 0800 11 86 74

Sverige
Tyco Thermal Controls Nordic AB
Flöjelbergsgatan 20B
431 37 Mölndal
Tel: +46 31 3355800
Fax: +46 31 3355899

Türkiye
SAMM Dış Ticaret A.Ş.
Yeniyol Sk. Etap İş Merkezi C
Blok No: 10 Kat : 6
34722 Acıbadem - Kadıköy
İSTANBUL
Tel . +90-216-325 61 62 (Pbx)
Faks +90-216-325 22 24

United Kingdom
Tyco Thermal Controls (UK) Ltd
3 Rutherford Road
Stephenson Industrial Estate
Washington, Tyne & Wear
NE37 3HX
Tel: +44 191 4198200
Fax: +44 191 4198201