Technical Databook for Industrial Heat-Tracing Systems 2009

Raychem®

HEW-THERM

Pyrotenax® BRAND

DigiTrace

isopad

TraceTek

TRACER

tyco

Thermal Controls

tyco

Thermal Controls

Tyco Thermal Controls brings together the knowledge, expertise, products and services of the leading brands in industrial heat-tracing: Raychem, HEW-THERM, Pyrotenax, DigiTrace, Isopad, TraceTek and Tracer.

Our heat-tracing systems cover the complete range of applications: from frost protection of water lines for general industrial operations, to temperature maintenance up to 800°C in many types of process plants. Tyco Thermal Controls offers the most appropriate technology for every application. With more than 50 years of experience, we have delivered more than 500,000 km of heating cable worldwide.

Tyco Thermal Controls employs over 2500 people around the world, with operations in 48 countries; we can provide solutions for all of your heat-tracing needs, backed up with a flexible approach on a global scale.

TRACER

Total care in heat-tracing

Heat-tracing projects require special care. Tyco Thermal Controls also provides a complete service for detailed engineering and installation of turnkey projects. Utilising the entire product bag of Tyco Thermal Controls, Tracer can provide the most technologically appropriate and economical heat-tracing solution for each project.
Offering a full range of heating system options is just one part of our full-service “turnkey commitment” to you. When you’re ready to obtain the optimal heat-tracing system for your needs, Tyco Thermal Controls will be there.

We can assist with every phase of the project, including:

- Project Management
- Feasibility studies/budget quotes
- Design
- Installation
- Supervision
- Start-Up and Maintenance

as well as conducting complete audits of existing installations.

On a worldwide basis, we have provided a very large number of designs, fit-for-purpose material selections, and construction services (Engineering, Procurement, Construction) for complete heat-tracing systems. You’ll benefit through:

System optimisation: Years of experience in design, product selection, and construction enables us to design it correctly, choose the right heat-tracing system, and install it properly.

Construction services: Our global and regional services include pre-construction, mobilisation, construction, installation, post-construction, and operational support

Flexible contracting services: We can act as general contractor, manage factory-trained labour force subcontractors; help you employ local sub-contractors; or act as your heat-tracing and insulation construction manager.

Raychem®

Raychem is our leading brand for self-regulating and power-limiting systems which are ideal for the heat-tracing of complex pipe work and equipment. Raychem offers the most complete heat-tracing system for temperatures up to 250°C and a typical system length up to 250 m. Raychem parallel heating cables are cut-to-length and can be terminated in the field; they are easy to design, install and maintain. Raychem self-regulating and power-limiting heating cables and associated components offer the highest reliability with the most forgiving technology.

HEW-THERM

HEW-THERM industrial polymer-insulated (PI) series heating systems have been used successfully for many years. They are particularly suitable for longer heating circuits (i.e. >250 m) and withstand temperatures up to 300°C. Similar to our Raychem branded heating cables, HEW-THERM heating systems can be terminated in the field.

Pyrotenax BRAND

Pyrotenax constant-wattage, mineral-insulated (MI) systems are recommended for high-temperature applications up to 600°C. Mineral insulated (MI) cables come in a variety of constructions that withstand the harshest environments. Pyrotenax also provides a complete range of components and accessories that ensure highest system reliability.

DigiTrace

Tyco Thermal Controls' DigiTrace brand offers the most complete line of heat-tracing control and monitoring systems; from single circuit mechanical thermostats to multi-circuit, micro-processor based networked systems. Our supervisory software links your control and monitoring system back to a PC for centralized control system monitoring.

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isopad

Isopad specialty heating systems are designed and tailor-made to provide the benefits of heat-tracing across a range of unique applications. Specialty heating systems include mineral insulated heating solutions such as radiant heater, heating tapes, silicone and soft lagged jackets, silicone and glass fibre panels, heated hoses, labaratory heating equipment, and complete heating systems such as drum heaters, gas-bottle heaters, heaters for satellite dishes etc. Isopad can supply a solution to any customer heating requirements. The products allow temperature maintenance or heat-up for all objects and processes (eg. vessels, pipelines, containers, gas analysis systems, etc.) that may contain either hazardous or non-hazardous product. Isopad solutions are able to heat processes with temperature requirement up to 1000°C.

TraceTek

TraceTek leak detection products include various sensor cables, probes and electronic monitoring instruments that combine to provide our customers with state-of-the-art monitoring capabilities for virtually all liquid handling and transportation systems. Applications range from detecting water leaks in modern "intelligent buildings" to detecting jet fuel leaking from underground pipe and above and below ground storage tanks. All TraceTek systems can locate any detected spill to within one meter even on pipelines thousand of meters long.

TraceCalc Pro

With TraceCalc Pro software, Tyco Thermal Controls provides you with the industry standard, universal design tool for heat-tracing applications that helps you in selecting the optimum heat-tracing solution from Tyco Thermal Controls large product offering. TraceCalc Pro provides a common platform for users in different countries in the language of preference: English, French and German, and supports worldwide codes and design practices.
TraceCalc Pro sets new standards for simple or sophisticated designs of industrial heat-tracing applications.

Contents

Selection table

Typical maintain temperature range (°C)	Product	Technology
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	IHT	Parallel Constant Wattage Zone Field-terminated
200	FHT	Parallel Constant Wattage Zone Field-terminated
160	XPI-NH	Series Constant Wattage PI Field-terminated
180	XPI	Series Constant Wattage PI Field-terminated
180	XPI-S	Series Constant Wattage PI Field-terminated
40	HCHH/HCCH (HDPE)	Series Constant Wattage MI Factory-terminated
120	HCH/HCC	Series Constant Wattage MI Factory-terminated
250	HDF/HDC	Series Constant Wattage MI Factory-terminated
450	HSQ	Series Constant Wattage MI Factory-terminated
550	HAx	Series Constant Wattage MI Factory-terminated
600	HIQ	Series Constant Wattage MI Factory-terminated
150	STS	Skin effect System STS Engineered Product

50 100 150 200 250 300 350 400 450 500 550 600

Max. exposure temperature (°C) Continuous power on ♦ Power off	Area classification	T Class design method			Preferred control method				Chemical exposure		Mechanical resistance		Typical pipe length range (m)	Page
		Unconditional	Stabilised design	Use of temperature limiter	No control	Ambient sensing	Broad temperature range (+/-10°C)	Tight temperature control (+/-3°C)	Organic	No	Normal	High		
65	T6	■			■	■	■	■	■	■	■		0 - 400	6
110	T4	■			■	■	■	■	■	■	■		0 - 400	8
120	T2-T3	■	*T4		■	■	■	■	■	■	■		0 - 400	10
150	T2	■	**T3-T4		■	■	■	■	■	■	■		0 - 400	12
250♦	T2-T4		■	■	■	■	■	■	■	■	■		0 - 450	14
200♦	Ordinary only					■	■	■	■	■	■		0 - 400	16
260♦	T2-T4		■	■		■	■	■	■	■	■		0 - 450	18
260♦	Ordinary only					■	■	■	■	■	■		Up to 5000	20
260♦	T2-T6		■	■		■	■	■	■	■	■		Up to 5000	22
260♦	T2-T6		■	■		■	■	■	■	■	■	■	Up to 5000	24
80♦	T6		■	■		■	■	■	■	■	■	■	Up to 5000	26
200♦	T3-T6		■	■		■	■	■		■	■	■	Up to 5000	26
400♦	T1-T6		■	■		■	■	■	■	■	■	■	Up to 2500	28
600♦	T1-T6		■	■		■	■	■	■	■	■	■	Up to 500	30
670♦	T1-T6		■	■		■	■	■	■	■	■	■	Up to 5000	32
1000♦	T1-T6		■	■		■	■	■	■	■	■	■	Up to 500	36
250♦	T2-T6		■	■				■	■	■	■	■	400 - 30.000	Contact us

* Stabilised design, T2-T3 → unconditional
** Stabilised design, T2 → unconditional

Raychem®

BTV

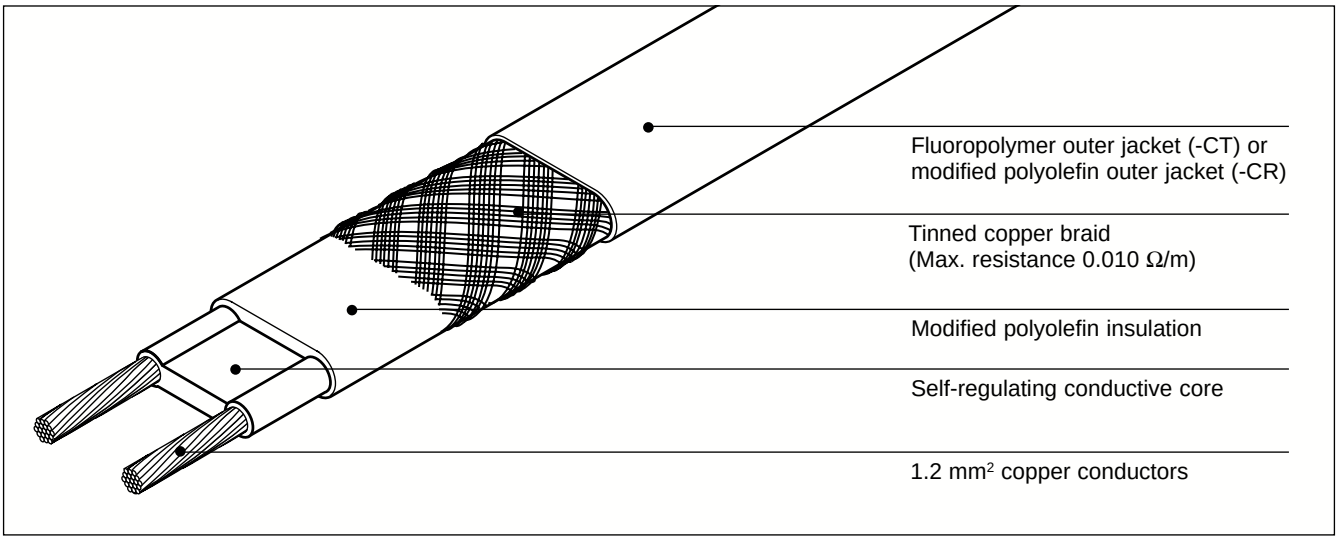
Self-regulating heating cable

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

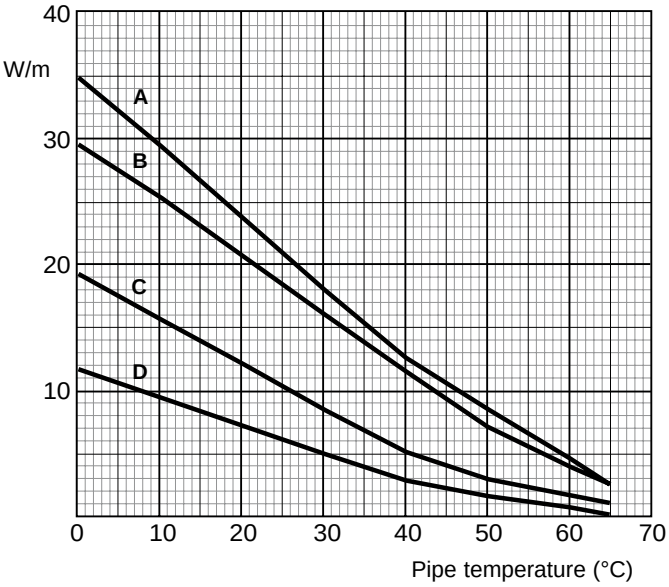


Application	
Area classification	Hazardous, Zone 1, Zone 2 (Gas), Zone 21, Zone 22 (Dust) Ordinary
Traced surface type	Carbon steel Stainless steel Plastic Painted or unpainted metal
Chemical resistance	For organic corrosives: use -CT (fluoropolymer outer jacket) For mild inorganic solutions: use -CR (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 2001 Ltd. PTB 98 ATEX 1102 X — BAS98ATEX2338X Ⓔx II 2 G/D EEx e(m) II T6 IP66 T80°C — Ⓔx II 2 GD EExe II T6 The BTV heating cables are approved by DNV for use on ships and mobile off shore units. DNV Certificate No. E-6967 They are also VDE approved.
Specifications	
Maximum exposure temperature (Continuous power on)	65°C
Maximum exposure temperature (Intermittent power on)	85°C Maximum cumulative exposure 1000 hours
Temperature classification	T6 in accordance with European Standard EN 50 014
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 8BTV2-CT
8BTV2-CR
C 5BTV2-CT
5BTV2-CR
D 3BTV2-CT
3BTV2-CR



	3BTV2-CR 3BTV2-CT	5BTV2-CR 5BTV2-CT	8BTV2-CR 8BTV2-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)			
16A	–20°C	155	110	70	45
	+10°C	200	160	110	65
20A	–20°C	195	140	90	55
	+10°C	200	160	125	85
25A	–20°C	200	160	110	70
	+10°C	200	160	125	105
32A	–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 a higher leakage current, a maximum 300 mA residual current device may be used. All safety aspects need to be proven.

Ordering details

Part description	3BTV2-CR	5BTV2-CR	8BTV2-CR	10BTV2-CR
Part No.	914279-000	414809-000	479821-000	677245-000
Part description	3BTV2-CT	5BTV2-CT	8BTV2-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.

Raychem®

QTVR

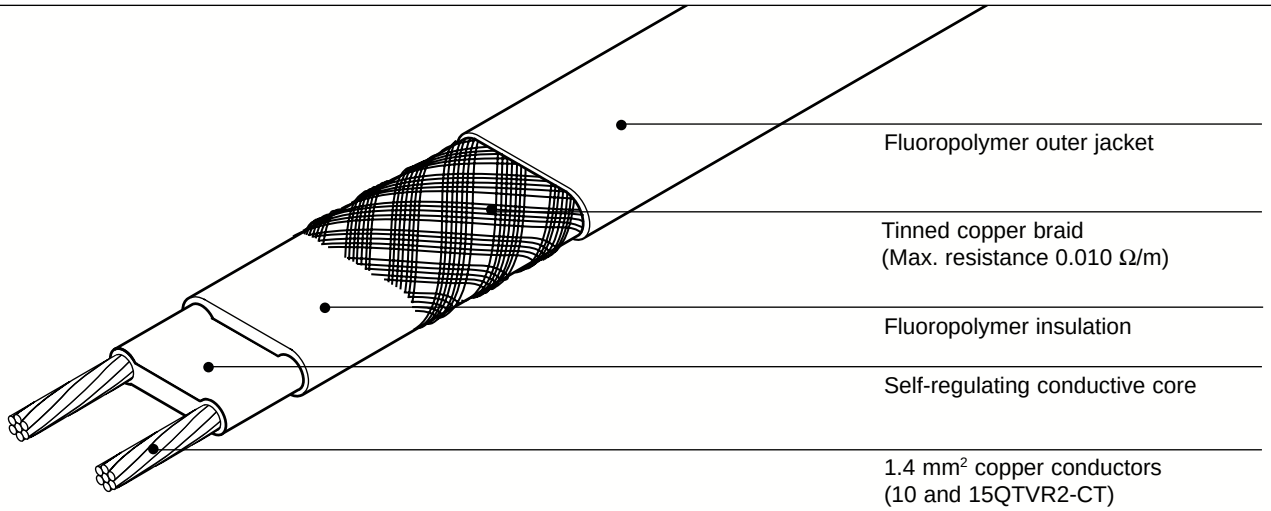
Self-regulating heating cable

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

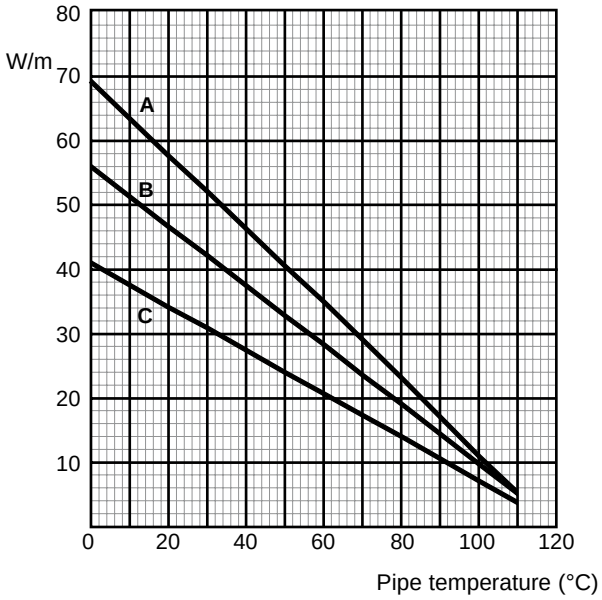


Application	
Area classification	Hazardous, Zone 1, Zone 2 (Gas), Zone 21, Zone 22 (Dust) Ordinary
Traced surface type	Carbon steel Stainless steel Painted or unpainted metal
Chemical resistance	Organics and corrosives For aggressive organics and corrosives consult your local Tyco Thermal Controls Representative
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 2001 Ltd. PTB 98 ATEX 1103 X Ex II 2 G/D EEx e(m) II T4 IP66 T130°C BAS98ATEX2337X Ex II 2 GD EEx e II T4 The QTVR heating cables are approved by DNV for use on ships and mobile off shore units. DNV Certificate No. E-6967 They are also VDE approved.
Specifications	
Maximum exposure temperature (Continuous power on)	110°C
Temperature classification	T4 in accordance with European Standard EN 50 014
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)		
25A	–20°C	95	75	60
	+10°C	115	95	75
32A	–20°C	115	100	75
	+10°C	115	100	95
40A	–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 a higher leakage current, a maximum 300 mA residual current device may be used. 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.

Raychem®

XTV

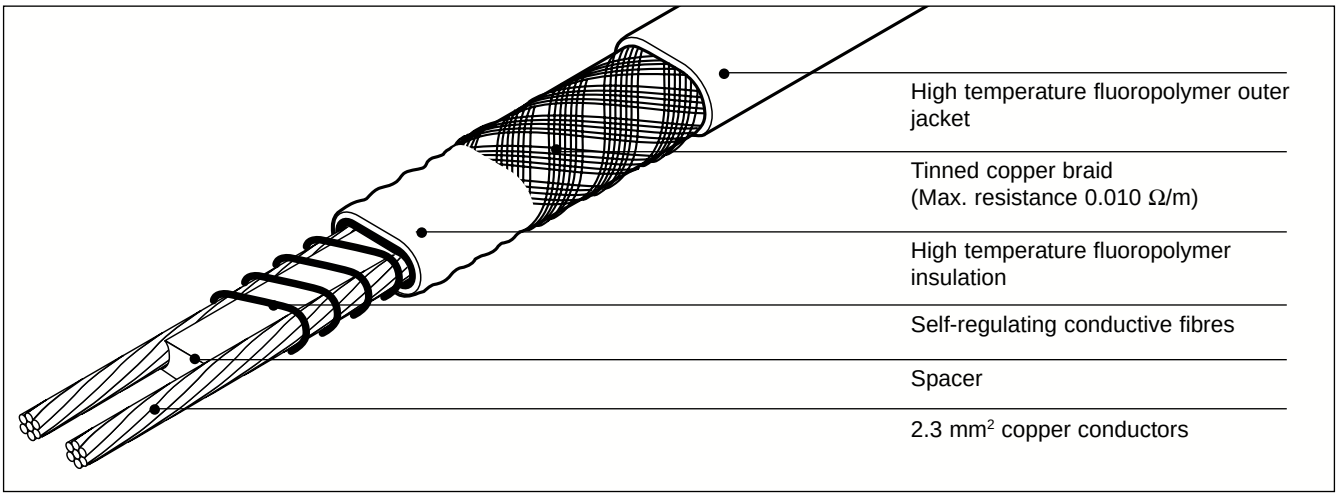
Self-regulating heating cable

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

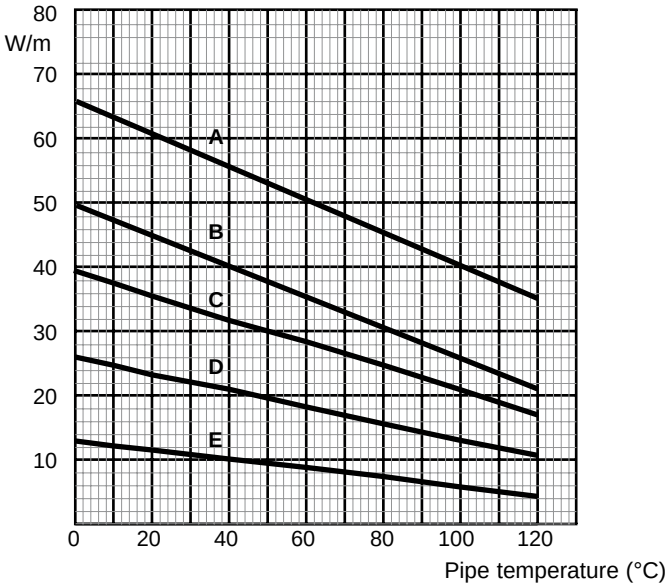


Application	
Area classification	Hazardous, Zone 1, Zone 2 (Gas), Zone 21, Zone 22 (Dust) Ordinary
Traced surface type	Carbon steel Stainless steel Painted or unpainted metal
Chemical resistance	Organics and corrosives For aggressive organics and corrosives consult your local Tyco Thermal Controls representative
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 2001 Ltd. PTB 98 ATEX 1105 X Ⓔx II 2 G/D EEx e(m) II T4/T3/250°C(T2) IP66 T130°C, T195°C, T250°C BAS98ATEX2336X Ⓔx II 2 GD EEx e II T3 and 240°C (T2) The XTV heating cables are approved by DNV for use on ships and mobile off shore units. DNV Certificate No. E-6968 They are also VDE approved.
Specifications	
Maximum exposure temperature (continuous power on)	120°C
Max. exposure temperature (intermittent power on and off)	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 in accordance with European Standard EN 50 014
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)				
16A	–20°C	145	90	65	55	40
	+10°C	170	105	75	60	45
25A	–20°C	225	145	105	85	65
	+10°C	245	165	120	95	70
32A	–20°C	245	175	135	105	80
	+10°C	245	175	140	125	90
40A	–20°C	245	175	140	135	105
	+10°C	245	175	140	135	105

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 a higher leakage current, a maximum 300 mA residual current device may be used. 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.

Raychem®

KTV

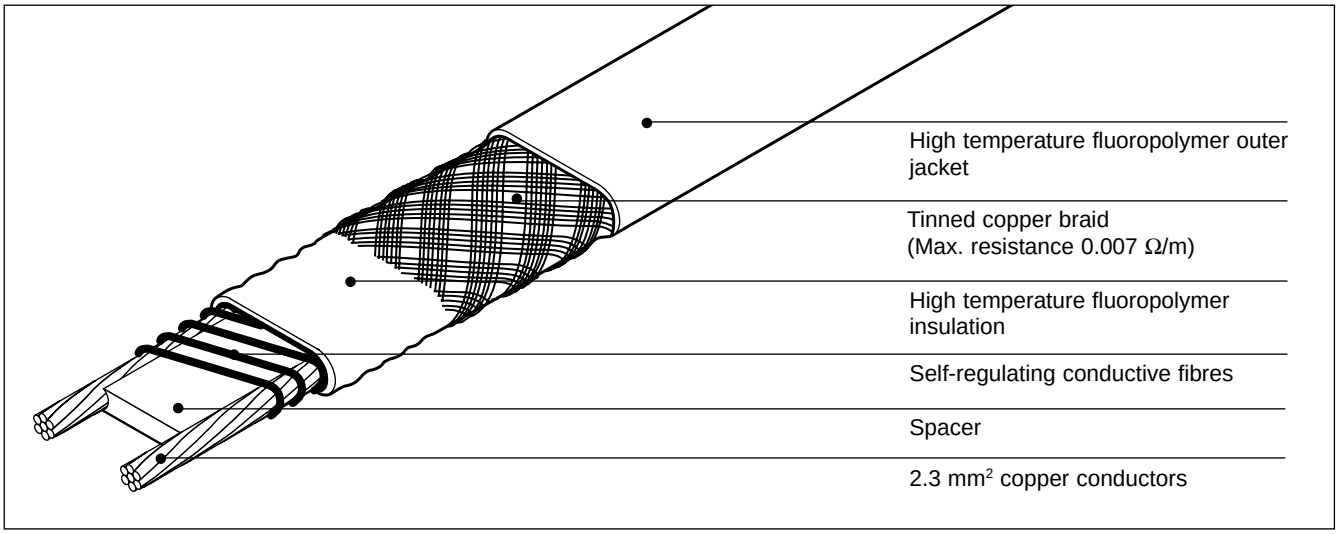
Self-regulating heating cable

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

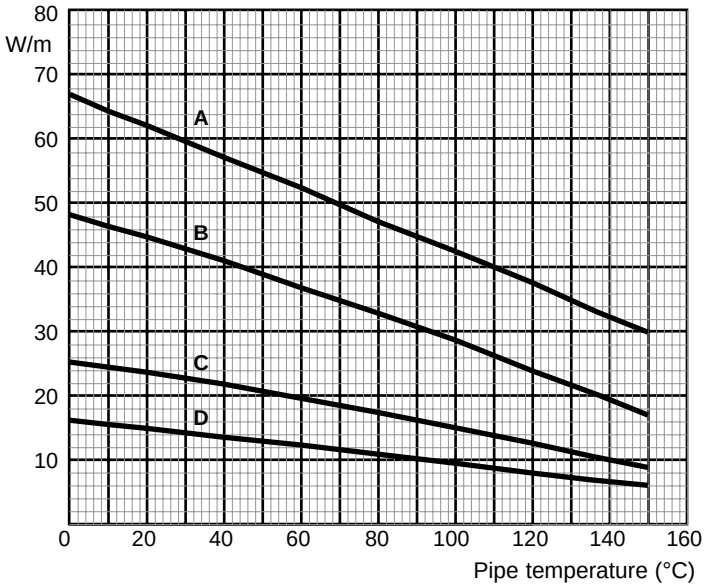


Application	
Area classification	Hazardous, Zone 1, Zone 2 (Gas), Zone 21, Zone 22 (Dust) Ordinary
Traced surface type	Carbon steel Stainless steel Painted or unpainted metal
Chemical resistance	Organics and corrosives For aggressive organics and corrosives consult your local Tyco Thermal Controls representative
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 2001 Ltd. PTB 98 ATEX 1104 X — BAS98ATEX2335X Ⓔx II 2 G/D EEx e(m) II T4/T3/226°C (T2) — Ⓔx II 2 GD EEx e II 226°C (T2) IP66 T130°C, T195°C, T226°C The KTV heating cables are approved by DNV for use on ships and mobile off shore units. DNV Certificate No. E-6968 They are also VDE approved.
Specifications	
Maximum exposure temperature (continuous power on)	150°C
Max. exposure temperature (intermittent power on and off)	215°C (20 bar saturated steam) Maximum cumulative exposure 1000 hours
Temperature classification	T2 in accordance with European Standard EN 50 014
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)			
16A	–20°C	130	95	60	40
	+10°C	145	105	65	45
25A	–20°C	205	150	90	65
	+10°C	230	165	100	75
32A	–20°C	230	180	115	85
	+10°C	230	180	130	95
40A	–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 a higher leakage current, a maximum 300 mA residual current device may be used. 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.

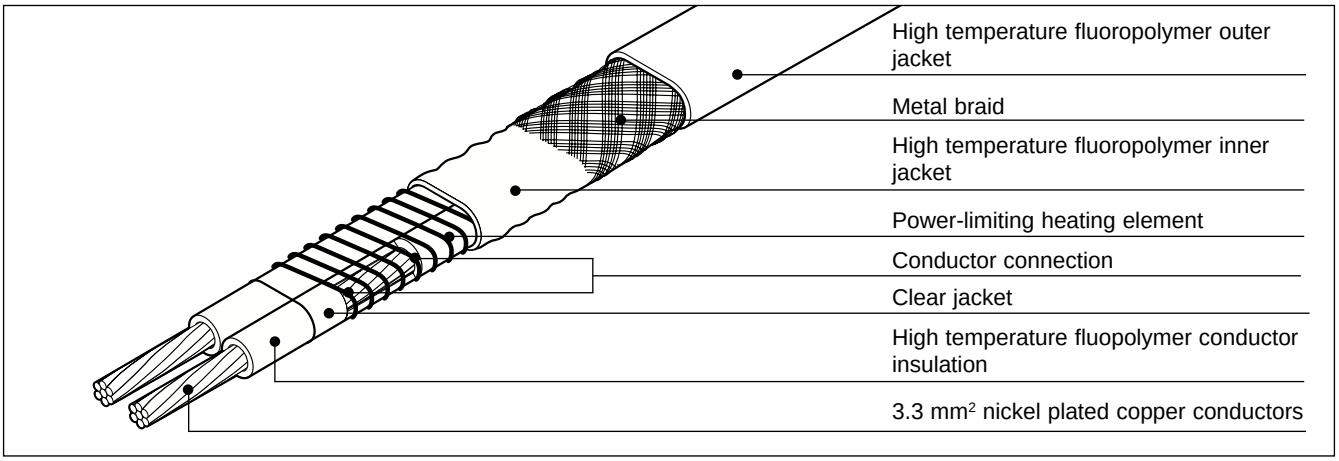
Raychem®

VPL

⟨Ex⟩ 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 230°C and can withstand routine steam purges and temperature exposure to 250°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. 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	230 or 254 Vac (Contact your local Tyco Thermal Controls representative for data on other voltages)
Approvals	The VPL heating cable is approved for use in hazardous areas by Baseefa 2001 Ltd. BAS00ATEX2163X ⟨Ex⟩ II 2 GD Ex es II T* * By design

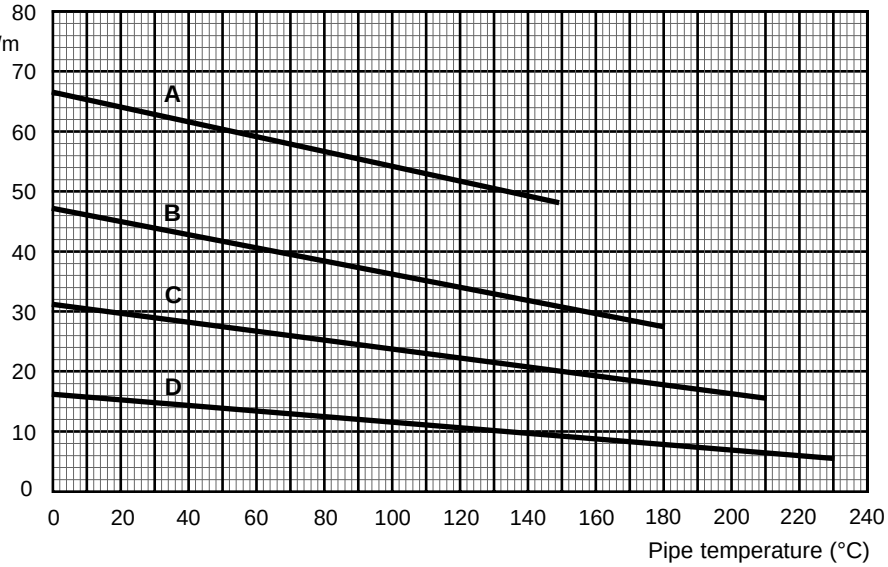
Specifications

Maximum maintain temperature (continuous power on)	**Cable**	**230V**	**254V**
	5VPL2-CT	230°C	225°C
	10VPL2-CT	210°C	200°C
	15VPL2-CT	180°C	145°C
	20VPL2-CT	150°C	Not allowed
Max. exposure temperature (continuous power off)	250°C		
Temperature classification	To be established using the principles of stabilized design. Use TraceCalc design software or contact Tyco Thermal Controls for assistance.		
Minimum installation temperature	–60°C		
Minimum bend radius	at –60°C: 20 mm		

Thermal output rating

Nominal power output rating on metal pipes at 230 V

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



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

Adjustment Factors for 254V

	Power Output	Circuit Length
5VPL2-CT	1.20	1.05
10VPL2-CT	1.19	1.04
15VPL2-CT	1.19	1.04
20VPL2-CT	Not allowed	

	5VPL2-CT	10VPL2-CT	15VPL2-CT	20VPL2-CT
Nominal power output (W/m at 10°C)	15	30	45	61
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 (mm)	1219	914	610	508
Weight (g/m)	200	200	200	200

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

230V		5VPL2-CT	10VPL2-CT	15VPL2-CT	20VPL2-CT
Electrical protection sizing	Start-up temperature	Maximum heating cable length per circuit (m)			
16A	–20°C	195	100	70	50
	+10°C	215	110	75	55
25A	–20°C	220	155	105	80
	+10°C	220	155	115	85
32A	–20°C	220	155	130	100
	+10°C	220	155	130	110
40A	–20°C	220	155	130	110
	+10°C	220	155	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 a higher leakage current, a maximum 300 mA residual current device may be used. 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

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.

IHT

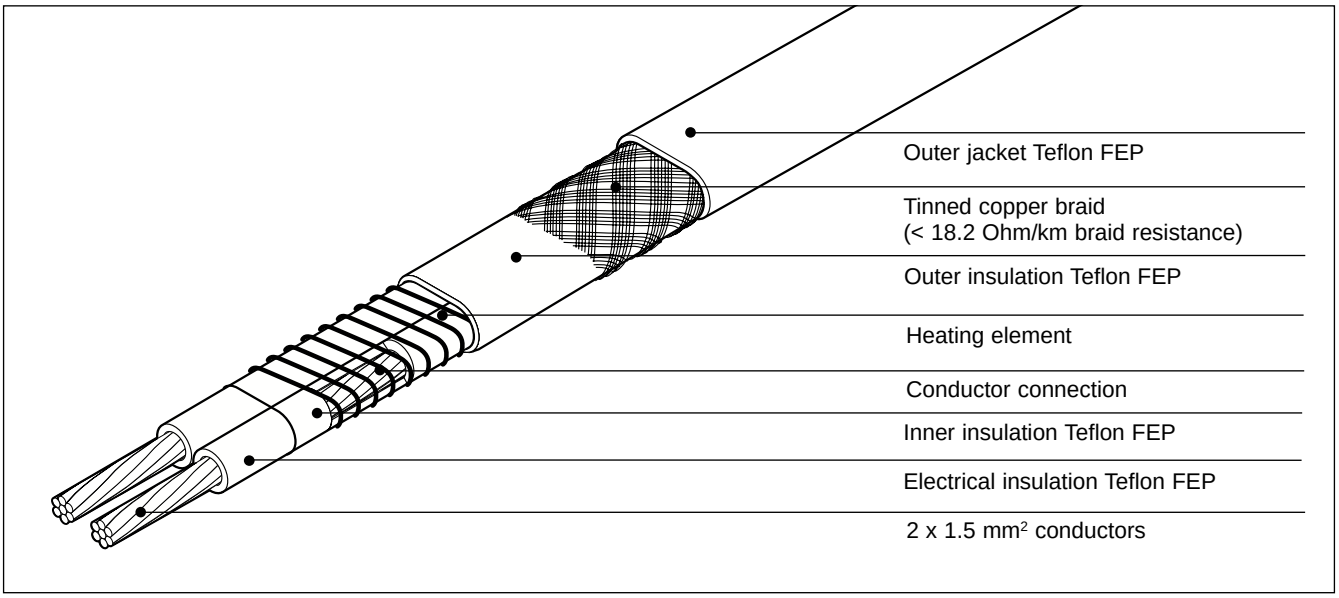
Constant wattage parallel circuit heating cable (for ordinary area use)

IHT is a parallel circuit, medium powered constant output tracer which can be cut to any length. IHT incorporates an FEP outer jacket which makes it ideal for use in chemically aggressive industrial applications.

It is designed for high temperature process maintenance applications in chemically aggressive environments such as animal fats.
It can be used also for freeze protection and the heating of pipelines, valves, pumps, containers etc.

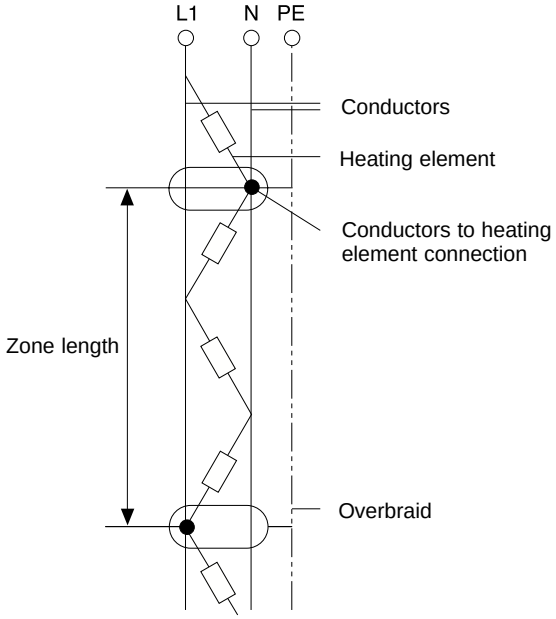
It has twin conductors with extruded high quality Teflon FEP primary and inner insulation. The heating element is zone connected to the bus wires. FEP outer insulation, tinned copper overbraid and FEP outer jacket complete the construction.

Heating cable construction



	IHT/2/10-CT	IHT/2/20-CT	IHT/2/30-CT
Size	5.5 mm x 7.7 mm	5.5 mm x 7.7 mm	5.5 mm x 7.7 mm
Specification			
Nominal power output	10/12 W/m	20/24 W/m	30/36 W/m
Supply voltage (AC)	220-240 V	220-240 V	220-240 V
Area classification	Ordinary	Ordinary	Ordinary
Max. circuit length	120 m	90 m	75 m
Max. withstand temperature (power-off)	200°C	200°C	200°C
Max. work piece temperature (power on)	125°C	100°C	75°C
Min. installation temperature	–40°C	–40°C	–40°C
Min. bend radius	25 mm	25 mm	25 mm
Min. clearance	10 mm	10 mm	10 mm
Colour	White	Red	Green
Cold lead / heating zone length	1 m	1 m	1m

Wiring diagram



Ordering details

Part description	IHT/2/10-CT	IHT/2/20-CT	IHT/2/30-CT
Part No.	936326-000	857548-000	937144-000

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.

Accessories

Termination kit	
Part description	TSL-TTK1/BS/M20 (hot applied connection and end seal kit - M20 version)
Part No.	162084-000
Installation entry kit	
Part description	IEK-25-06
Part No.	566578-000

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 a higher leakage current, a maximum 300 mA residual current device may be used. All safety aspects need to be proven.

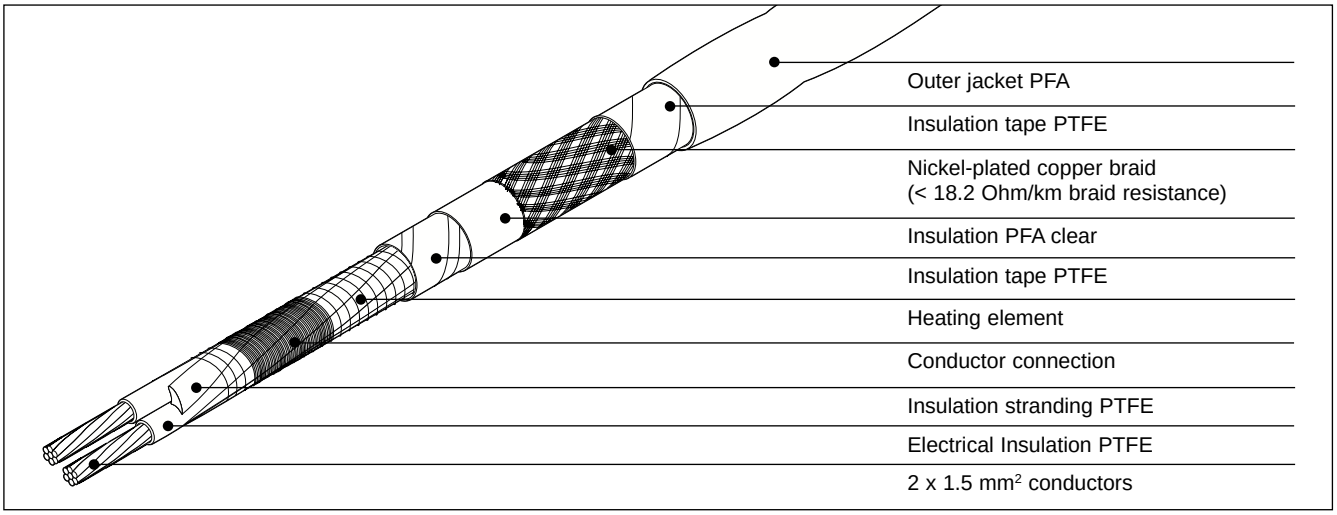
FHT

Ⓔx Constant wattage parallel circuit heating cable

FHT is a family of constant wattage parallel circuit heating cables designed for pipe and equipment heat-tracing in industrial applications. FHT can be used for frost protection and process temperature maintenance requiring high power output and/or high temperature exposure.

FHT can provide process temperature maintenance up to 200°C and can withstand routine steam purges and temperature exposure to 260°C power off. FHT 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. This parallel construction allows it to be cut to any length and terminated in the field. Its round shape provides excellent flexibility during installation as it allows for bending in every direction. FHT heating cables are approved for use in hazardous areas. Approvals are listed below.

Heating cable construction



	FHT/2/10-CT	FHT/2/20-CT	FHT/2/30-CT
Size	∅ 7.5 mm	∅ 7.5 mm	∅ 7.5 mm
Specification			
Nominal power output	10 W/m	20 W/m	30 W/m
Supply voltage (AC)	230 V	230 V	230 V
Area classification	Hazardous Area, Zone 1 or Zone 2 Ordinary		
Approvals	The FHT heating cable is approved for use in hazardous areas Zone 1 and Zone 2 by KEMA KEMA 01ATEX2085X Ⓔx II 2 G EEx e II T6 to 230°C (T2) (Where T is the applicable temperature classification in accordance with the certificate schedule)		
Max. circuit length	200 m	150 m	120 m
Max. withstand temperature (power off)	260°C	260°C	260°C
Max. work piece temperature (power on)	Refer to stabilised design tables		
Min. installation temperature	–65°C	–65°C	–65°C
Min. bend radius	20 mm	20 mm	20 mm
Min. clearance	40 mm	40 mm	40 mm
Colour	White	Red	Green
Cold Lead / heating zone length	1.5 m	1.5 m	1.5 m

Stabilised design tables

The temperature values listed represent the maximum stabilised design surface temperature permitted for a work piece for temperature classification T6, T5, T4, T3 and 230°C (T2).

FHT/2/xxx heating tape with 100 mm clearance when spirally wound on a surface to be heated:

Nominal Power (W/m)	Power Density (Q) (W/m)	Temperature classification (°C)				
		T6	T5	T4	T3	230°C (T2)
10	12.7	50	67	104	170	200
20	25.5	18	40	82	151	178
30	38.2	X	X	35	114	144

FHT/2/xxx heating tape with 40 mm clearance when spirally wound on a surface to be heated:

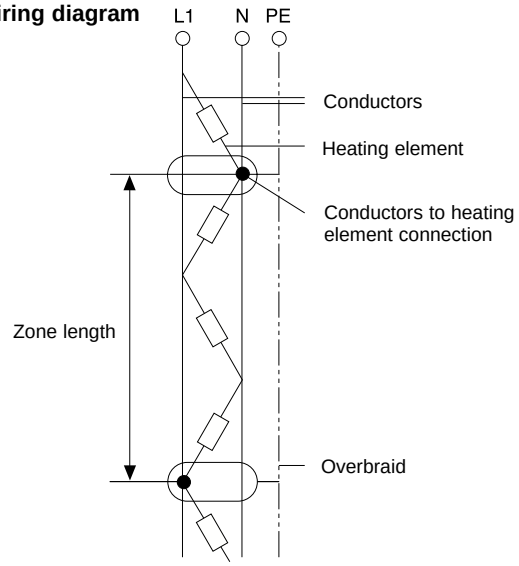
Nominal Power (W/m)	Power Density (Q) (W/m)	Temperature classification (°C)				
		T6	T5	T4	T3	230°C (T2)
10	12.7	45	63	102	167	196
20	25.5	X	17	70	145	172
30	38.2	X	X	X	93	127

X = Not permitted

Ordering details

Part description	FHT/2/10-CT	FHT/2/20-CT	FHT/2/30-CT
Part No.	008144-000	124236-000	109452-000

Wiring diagram



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.

Accessories

Termination kit	
Part description	TSL-TTK/F/2/M20 (hot applied connection and end seal kit – M20 version)
Part No.	542340-000
Crimp tools (both crimp tools are required for TSL-TTK/F/2/M20)	
Part description	TSL-TTK/F-01-CT (Crimp tool for use with TSL-TTK/F/2/M20 FHT heating cable connection kits)
Part No.	463026-000
Part description	TSL-TTK/F-02-CT (Crimp tool for use with TSL-TTK/F/2/M20 FHT heating cable connection kits)
Part No.	322998-000
Installation entry kit	
Part description	IEK-25-06
Part No.	566578-000

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 a higher leakage current, a maximum 300 mA residual current device may be used. All safety aspects need to be proven.

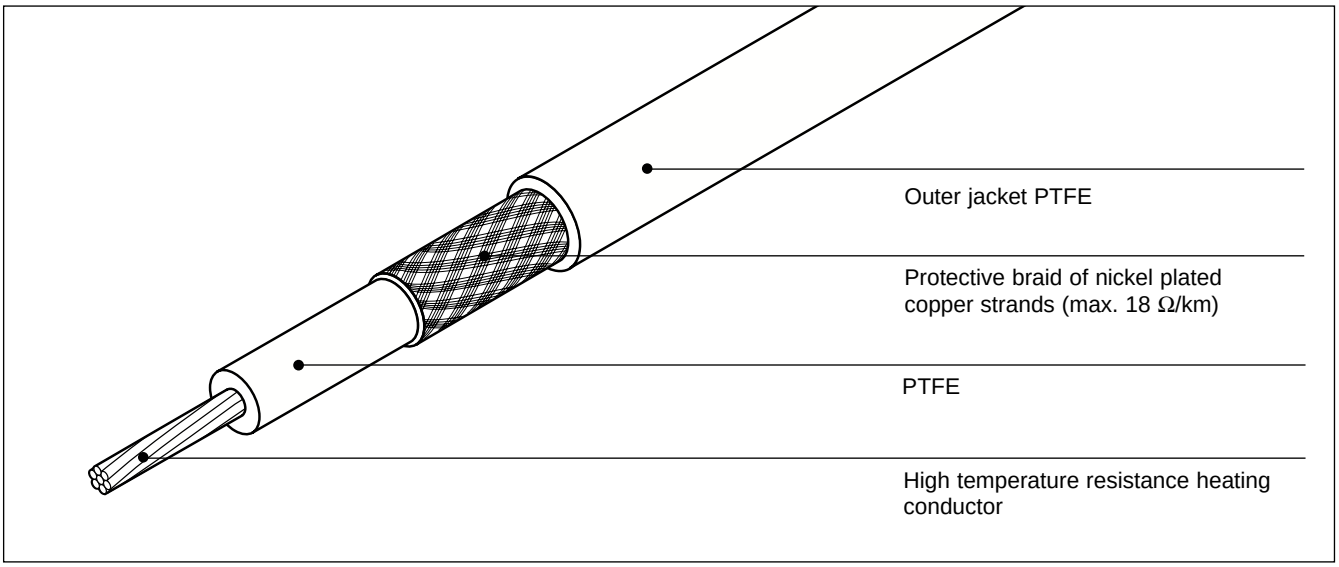
HEW-THERM XPI-NH

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 (e.g. 250 m). 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 (continuous, power off)
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 V AC (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^2]	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	4.9	7.0	4.3	XPI-7	1244-000203
4	42	5.5	4.4	4.3	XPI-4.4	1244-000190
6	54	6.5	2.9	4.3	XPI-2.9	1244-000202
10	73	8.2	1.8	4.3	XPI-1.8	1244-000182
16	98	9.7	1.1	4.3	XPI-1.1	1244-000201
25	129	11.5	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. 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 a higher leakage current, a maximum 300 mA residual current device may be used. All safety aspects need to be proven.

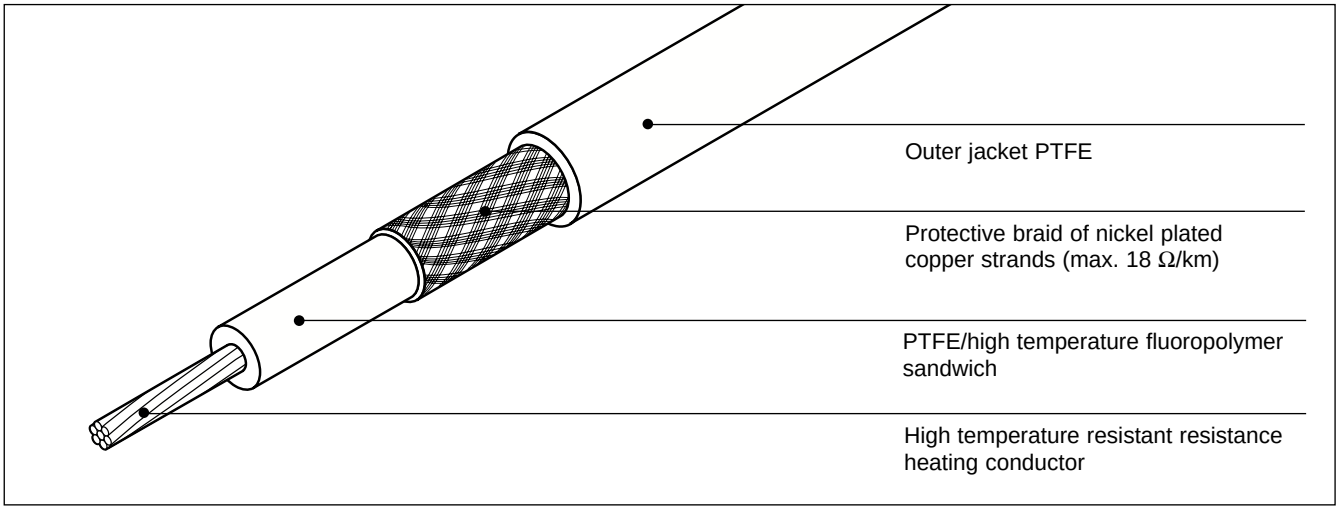
HEW-THERM XPI

Ⓔx Polymer insulated (PI) series resistance heating cable

XPI is a polymer insulated (PI) series heating cable, suitable for use in hazardous areas (ATEX, for gas and dust atmosphere). 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 (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 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	
Chemical resistance	Organic and inorganic corrosives	
Approvals	System (heating units)	PTB 03 ATEX 1218X Ⓔx II 2 G/D EEx e II T6 to T2 IP 65 T 80°C...T 290°C
	Bulk cable	PTB 05 ATEX 1060 U Ⓔx II 2 G/D EEx e II T_p 260°C
	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.	
Technical data		
Max. exposure temperature	260°C (continuous power off), 300°C (intermittent power off, 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	30 W/m (typical value, depending on application)	
Nominal voltage	Up to 450/ 750 V AC (U_0 / U)	
Min. impact resistance	4 Joule (as per EN 50019)	
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 [mm^2]	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

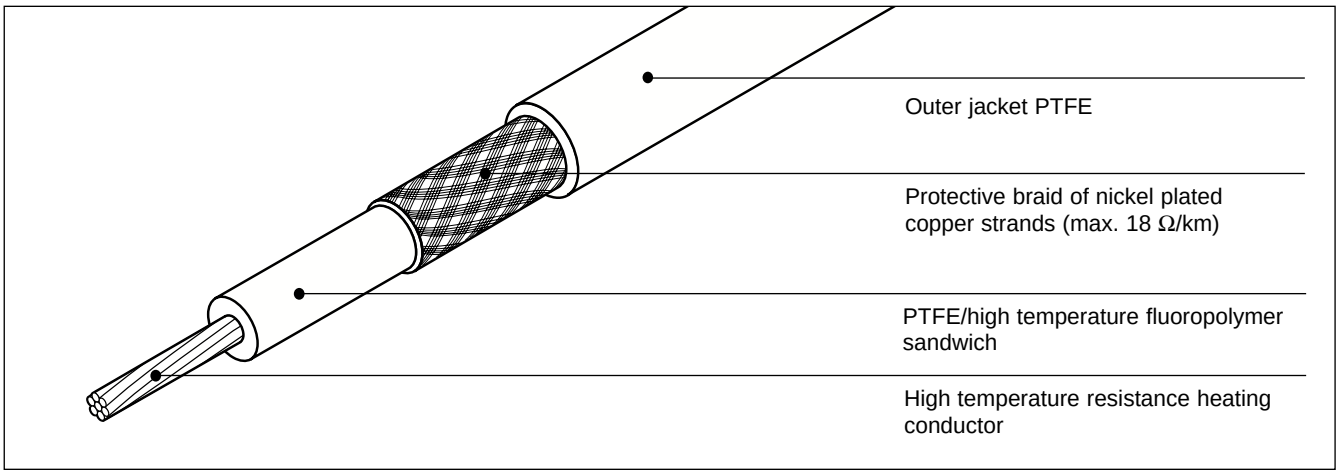
Notes: Delivery length depends on type of resistance and is limited by max. weight of 120 kg/spool, respectively 1000 m/run. Not all resistances are standard items and as such may not be in stock. Contact Tyco Thermal Controls to confirm lead time. Tyco Thermal Controls requires the use of a 30 mA residual current device to provide maximum safety and protection from fire. Where design results in a higher leakage current, a maximum 300 mA residual current device may be used. All safety aspects need to be proven.

HEW-THERM XPI-S

Ⓔx Polymer insulated (PI) series resistance heating cable

XPI-S is a polymer insulated (PI) series heating cable, suitable for use in hazardous areas (ATEX, for gas and dust atmosphere). 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



Application		
Area classification	Hazardous area, Zone 1 or Zone 2 (Gas) or Zone 21 or Zone 22 (Dust) Ordinary	
Chemical resistance	Organic and inorganic corrosives	
Approvals	System (heating units)	PTB 03 ATEX 1218X Ⓔx II 2 G/D EEx e II T6 to T2 IP 65 T 80°C...T 290°C
	Bulk cable	PTB 05 ATEX 1060 U Ⓔx II 2 G/D EEx e II T_p 260°C
	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.	
Technical data		
Max. exposure temperature	260°C (continuous power off), 300°C (intermittent power off, 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	30 W/m (typical value, depending on application)	
Nominal voltage	Up to 450/ 750 V AC (U_0 / U)	
Min. impact resistance	7 Joule (as per EN 50019)	
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 [x 10^{-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	1244-003051
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. 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 a higher leakage current, a maximum 300 mA residual current device may be used. All safety aspects need to be proven.

HCH/HCC

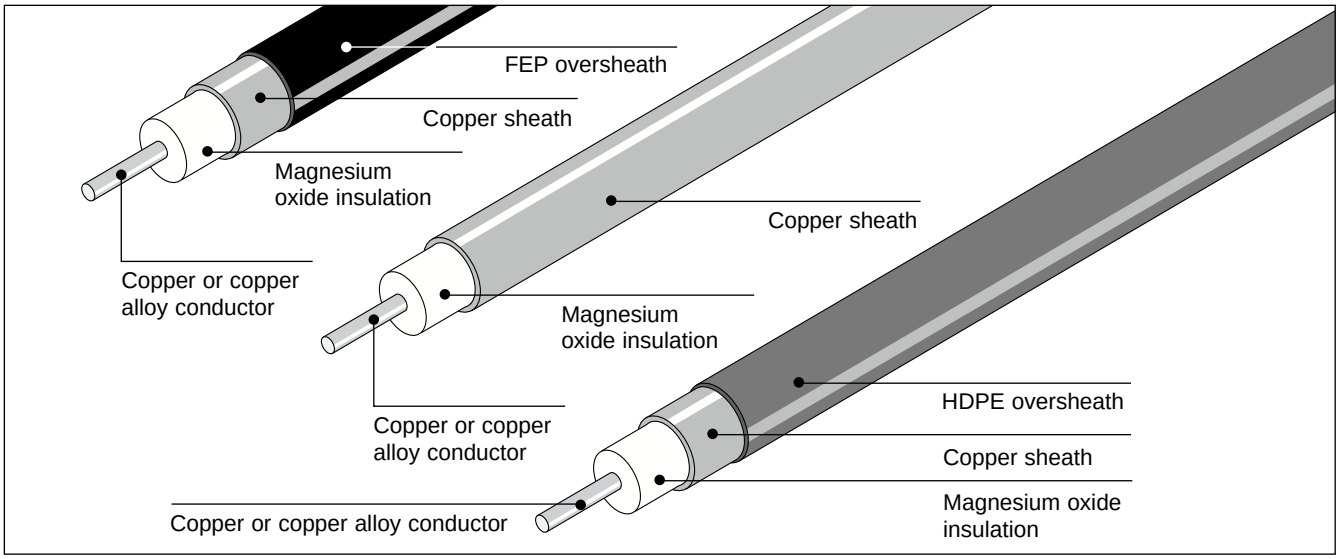
Ex Mineral insulated copper sheathed heating cable

Mineral insulated copper sheathed heating cable is suitable for use within a wide variety of industrial heat-tracing and domestic heating applications. The copper cable offers a long line heating capability where the maximum operating sheath temperature does not exceed 200°C.

Copper MI heating cables are extensively used in underfloor, road and ramp heating applications and are offered with HDPE (High Density Polyethylene) oversheathing for enhanced corrosion protection up to 80°C. For temperatures in excess of 80°C FEP oversheathing is available to a maximum of 200°C.

MI cable features:
- Corrosion resistance
- High performance output
- High resistance to mechanical abuse
- Safety and fire resistance

Heating cable construction



Copper Sheathed Heating Cable

Cable sheath material	Copper	
Cable insulation material	Magnesium oxide (MgO)	
Cable conductor material	Copper or copper alloy	
Supply voltage	Up to 300/500 V AC	
Withstand voltage	2.0 kV rms AC	
Insulation resistance	1000 MΩ/1000 m (factory pass level)	
Maximum allowable sheath temperature	200°C**	
Earth leakage	3mA/100 m (nominal at 20°C)	
Minimum installation temperature	–60°C	
Minimum bending radius	6 x O.D. (cable outside diameter) at –60°C	
Approvals	System (heating units)	Baseefa02ATEX0046X Ex II 2 G EEx e II T6 to T3 CE 1180 Actual T class temperature determined by design
	Bulk cable	Baseefa02ATEX0045U Ex II 2 G EEx e II
Area classification	Hazardous area, Zone 1 and Zone 2, Ordinary	
Minimum cable spacing	25 mm for hazardous areas	
Resistance correction factor	Temperature coefficient of resistance for copper conductor - α = 0.00393 per °C	

**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.

Technical Data

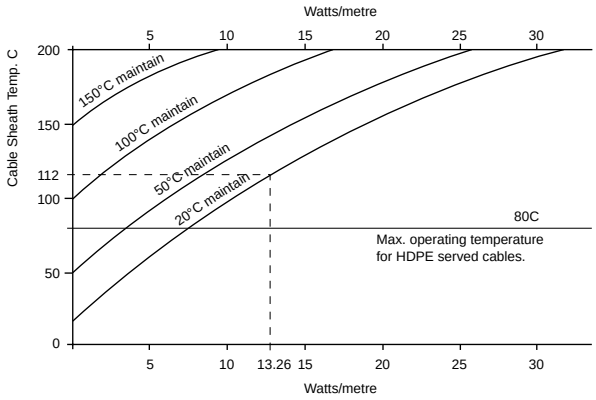
Cable Reference	Cable Diameter (mm)	Conductor Material	Conductor Diameter (mm)	Nominal Resistance (Ω/km @ 20°C)	Nominal Coil Length (m)	Coil Diameter (mm)	Approx Weight (kg/km)
HCH1L2000(1)	2.8	Copper Alloy	0.51	2000	1200	610	31
HCH1L1250(1)	2.8	Copper Alloy	0.65	1250	1200	610	32
HCH1M800	3.5	Copper Alloy	0.81	800	900	915	50
HCH1M630	4.0	Copper Alloy	0.91	630	1100	915	65
HCH1M450	4.0	Copper Alloy	1.08	450	1000	915	67
HCH1M315	4.3	Copper Alloy	1.29	315	1000	915	77
HCH1M220	4.5	Copper Alloy	1.54	220	1000	915	85
HCH1M140	4.9	Copper Alloy	1.93	140	1000	915	102
HCH1M100	5.2	Copper Alloy	2.29	100	800	915	125
HCC1M63	3.2	Copper	0.59	63	2000	915	41
HCC1M40	3.4	Copper	0.74	40	2000	915	46
HCC1M25	3.7	Copper	0.94	25	1600	915	56
HCC1M17	4.6	Copper	1.14	17	500	915	85
HCC1M11	4.9	Copper	1.41	11	500	915	98
HCC1M7	5.3	Copper	1.77	7	400	915	118
HCC1M4	5.9	Copper	2.34	4	800	915	150
HCC1M2.87	6.4	Copper	2.76	2.87	650	915	170
HCC1M1.72	7.3	Copper	3.57	1.72	500	915	235
HCC1M1.08	8.3	Copper	4.51	1.08	400	915	326

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

Note: Tyco Thermal Controls requires the use of a 30 mA residual current device to provide maximum safety and protection from fire. Where there is a marked increase in nuisance tripping, a maximum 300 mA residual current device may be used.

Also refer to the components section (page 82) for more details on heating units, accessories and nomenclatures.

Maximum operating temperatures



Follow steps below to obtain sheath temperature guidelines from the graph, for ordinary area applications.

Step 1: By design, identify cable reference to be used and calculate watts/metre rating of cable/element e.g. HCH1M100 (bare cable), 20 W/m.

Step 2: Refer to rating factor table and multiply watts/metre rating of cable/element by rating factor to obtain adjusted watts/metre value. (20 W/m x 0.663 = 13.26 W/m)

Step 3: Using adjusted value, enter graph on watts/metre axis and obtain cable sheath temperature for application maintain temperature. Cable sheath temperature = 112°C for 20°C maintain - see graph.

Rating factor table

Cable Ref.	Rating factor		
	Bare	HDPE	FEP
HCH1L2000	1.076	.714	–
HCH1L1250	1.076	.714	–
HCH1M800	.928	.634	.735
HCH1M630	.829	.588	.671
HCH1M450	.829	.588	.671
HCH1M315	.780	.564	.637
HCH1M220	.751	.548	.617
HCH1M140	.698	.521	.581
HCH1M100	.663	.502	.556
HCC1M63	1.000	.666	.781
HCC1M40	.950	.644	.752
HCC1M25	.886	.615	.709
HCC1M17	.727	.541	.610
HCC1M11	.698	.521	.581
HCC1M7	.649	.496	.549
HCC1M4	.597	.463	.508
HCC1M2.87	.558	.445	.500
HCC1M1.72	.500	.406	.450
HCC1M1.08	.445	.384	.406

MI Heating cable sheath corrosion resistance and temperature data

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-HDPE	80	Copper sheathed cable with high density polyethylene oversheath	GE	GE	A	A	A	NR	A	A	A
Copper	200	Copper sheathed cable	NR	NR	A	A	NR	A	A	NR	X
Copper-FEP	200	Copper sheathed cable with FEP 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.

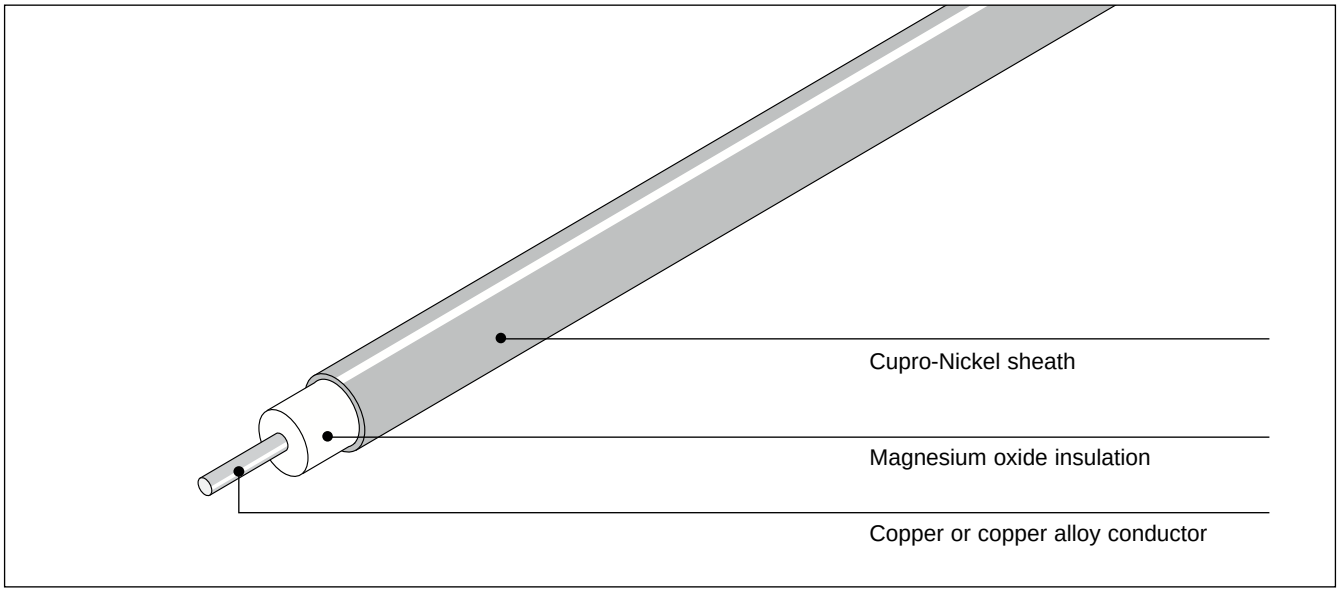
HDF/HDC

Ⓔx Mineral insulated (MI) Cupro-Nickel sheathed heating cable

Mineral insulated (MI) Cupro-Nickel sheathed heating cable is suitable to operate to a maximum sheath temperature of 400°C. MI Cupro-Nickel cables are widely used within a range of industrial applications, oil and gas, chemicals and petrochemicals, power generation, gas storage and many other industrial applications. The Cupro-Nickel copper conductor range (HDC) has been developed to combat severe on-site corrosive conditions. This range has low electrical resistance values required for long pipeline applications.

MI cable features:
- Corrosion resistance
- High performance output
- High resistance to mechanical abuse
- Safety and fire resistance

Heating cable construction



Cupro-Nickel Sheathed Heating Cable

Cable sheath material	70/30 Cupro-Nickel	
Cable insulation material	Magnesium oxide (MgO)	
Cable conductor material	Copper or copper alloy	
Supply voltage	Up to 300/500 V AC	
Withstand voltage	2.0 kV rms AC	
Insulation resistance	1000 MΩ/1000 m (factory pass level)	
Maximum allowable sheath temperature	400°C	
Earth leakage	3mA/100 m (nominal at 20°C)	
Approvals	System (heating units)	Baseefa02ATEX0046X Ⓔx II 2 G EEx e II T6 to T1 CE 1180 Actual T class temperature determined by design
	Bulk cable	Baseefa02ATEX0045U Ⓔx II 2 G EEx e II
Area classification	Hazardous area, Zone 1 and Zone 2, Ordinary	
Minimum installation temperature	–60°C	
Minimum bending radius	6 x O.D. (Cable outside diameter) at –60°C	
Minimum cable spacing	25 mm for hazardous areas	
Resistance correction factor	Temperature coefficient of resistance for copper conductor - α = 0.00393 per °C	

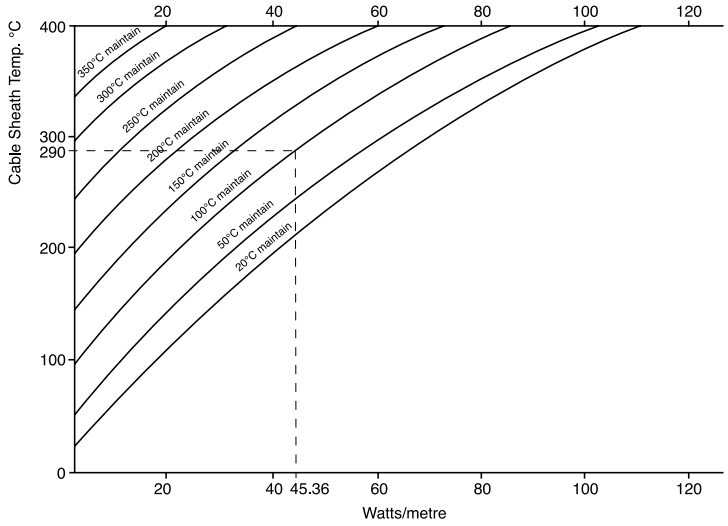
Technical Data

Cable Reference	Cable Diameter (mm)	Conductor Material	Conductor Diameter (mm)	Nominal Resistance (Ω/km @ 20°C)	Nominal Coil Length (m)	Coil Diameter (mm)	Approx Weight (kg/km)
HDF1M1600	3.2	Copper Alloy	0.62	1600	625	850	40
HDF1M1000	3.4	Copper Alloy	0.79	1000	550	850	45
HDF1M630	3.7	Copper Alloy	1.00	630	465	850	55
HDF1M400	4.0	Copper Alloy	1.25	400	400	850	67
HDF1M250	4.4	Copper Alloy	1.58	250	330	850	84
HDF1M160	4.9	Copper Alloy	1.97	160	265	850	108
HDC1M63	3.2	Copper	0.59	63	620	850	39
HDC1M40	3.4	Copper	0.74	40	550	850	44
HDC1M25	3.7	Copper	0.94	25	440	850	55
HDC1M17	4.6	Copper	1.14	17	300	850	84
HDC1M11	4.9	Copper	1.41	11	265	850	98
HDC1M7	5.3	Copper	1.77	7	225	850	119
HDC1M4	5.9	Copper	2.34	4	180	850	155

Note: Tyco Thermal Controls requires the use of a 30 mA residual current device to provide maximum safety and protection from fire. Where there is a marked increase in nuisance tripping, a maximum 300 mA residual current device may be used.
Also refer to the components section (page 82) for more details on heating units, accessories and nomenclatures.

Maximum operating temperatures

Follow steps below to obtain sheath temperature guidelines from the graph, for ordinary area applications.



Rating factor table

Cable Ref.	Rating factor
HDF1M1600	1.000
HDF1M1000	.948
HDF1M630	.880
HDF1M400	.822
HDF1M250	.756
HDF1M160	.688
HDC1M63	1.000
HDC1M40	.948
HDC1M25	.880
HDC1M17	.727
HDC1M11	.688
HDC1M7	.644
HDC1M4	.590

Step 1: By design, identify cable reference to be used and calculate watts/metre rating of cable/element e.g. HDF1M250, 60W/m.
Step 2: Refer to rating factor table and multiply watts/metre rating of cable/element by rating factor to obtain adjusted watts/metre value. (60 W/m x 0.756 = 45.36 W/m)
Step 3: Using adjusted value, enter graph on watts/metre axis and obtain cable sheath temperature for application maintain temperature. Cable sheath temperature = 290°C for 100°C maintain - see graph.

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
Cupro-Nickel	400	Cupro-Nickel sheathed cable 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.

HSQ

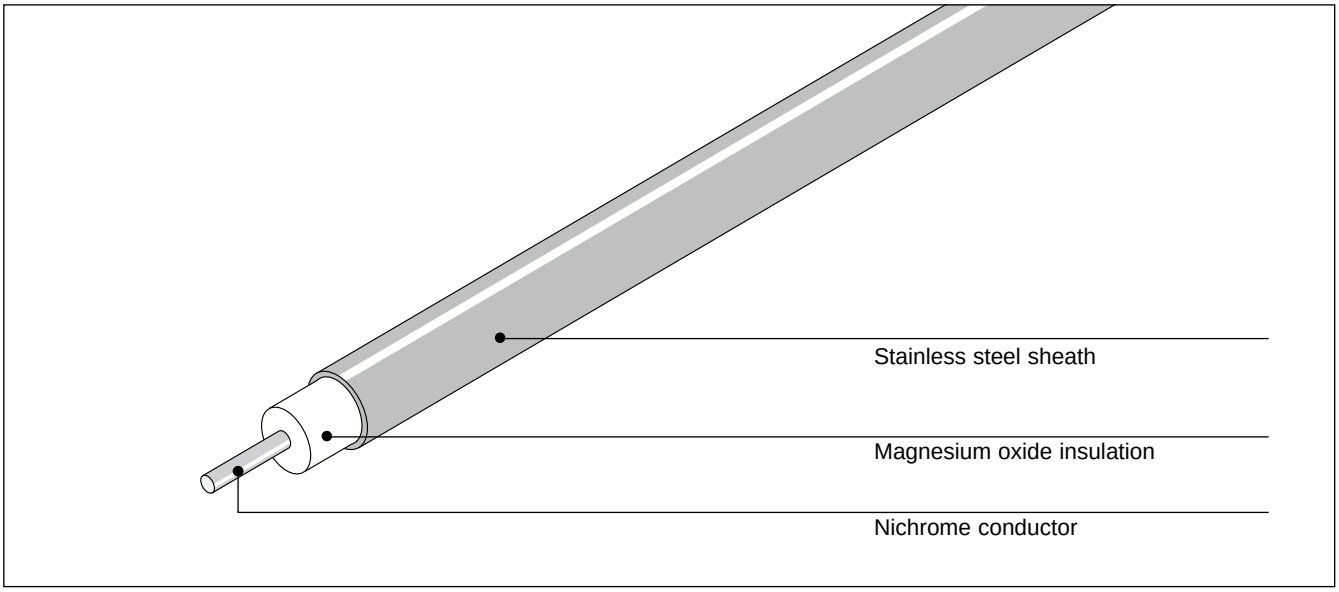
Ⓔx Mineral insulated (MI) stainless steel sheathed heating cable

Mineral insulated (MI) stainless steel sheathed cables can operate to a maximum sheath temperature of 600°C. MI stainless steel cables offer the industrial heat-tracing market excellent corrosive properties against a range of harsh environments with a high temperature capability.

HSQ cables are typically used in bitumen plants, gas plants, oil refineries, reactors and vessels, sodium loops and a variety of other heat-tracing applications where temperature, efficiency, durability and cable safety is paramount.

MI cable features:
- Corrosion resistance
- High performance output
- High resistance to mechanical abuse
- Safety and fire resistance

Heating cable construction



Stainless Steel Sheathed Heating Cable		
Cable sheath material	321 stainless steel	
Cable insulation material	Magnesium oxide (MgO)	
Cable conductor material	Nichrome	
Supply voltage	Up to 300/500 V AC	
Withstand voltage	2.0 kV rms AC	
Insulation resistance	1000 MΩ/1000 m (factory pass level)	
Maximum allowable sheath temperature	600°C (for higher temperatures please contact Tyco Thermal Controls)	
Earth leakage	3mA/100 m (nominal at 20°C)	
Minimum installation temperature	–60°C	
Minimum bending radius	6 x O.D. (cable outside diameter) at –60°C	
Approvals	System (heating units)	Baseefa02ATEX0046X Ⓔx II 2 G EEx e II T6 to T1 Actual T class temperature determined by design
	Bulk cable	Baseefa02ATEX0045U Ⓔx II 2 G EEx e II
Area classification	Hazardous area, Zone 1 or Zone 2, Ordinary	
Minimum cable spacing	25 mm for hazardous areas	

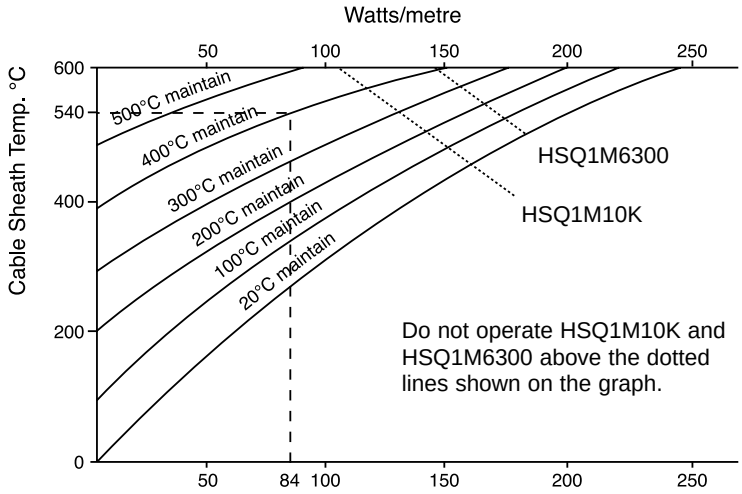
Technical Data

Cable Reference	Cable Diameter (mm)	Conductor Material	Conductor Diameter (mm)	Nominal Resistance (Ω/km @ 20°C)	Nominal Coil Length (m)	Coil Diameter (mm)	Approx Weight (kg/km)
HSQ1M10K	3.2	Nichrome	0.37	10000	717	610	39
HSQ1M6300	3.2	Nichrome	0.47	6300	717	610	39
HSQ1M4000	3.2	Nichrome	0.59	4000	717	610	39
HSQ1M2500	3.4	Nichrome	0.74	2500	639	610	46
HSQ1M1600	3.6	Nichrome	0.93	1600	572	610	52
HSQ1M1000	3.9	Nichrome	1.17	1000	499	610	62
HSQ1M630	4.3	Nichrome	1.48	630	405	610	78
HSQ1M400	4.7	Nichrome	1.85	400	342	610	96
HSQ1M250	5.3	Nichrome	2.35	250	271	610	127
HSQ1M160	6.5	Nichrome	2.93	160	180	915	191

Note: Tyco Thermal Controls requires the use of a 30 mA residual current device to provide maximum safety and protection from fire. Where there is a marked increase in nuisance tripping, a maximum 300 mA residual current device may be used.
Also refer to the components section (page 82) for more details on heating units, accessories and nomenclatures.

Maximum operating temperatures

Follow steps below to obtain sheath temperature guidelines from the graph, for ordinary area applications.



Rating factor table

Cable Ref.	Rating factor
HSQ1M10K	1.000
HSQ1M6300	1.000
HSQ1M4000	1.000
HSQ1M2500	0.952
HSQ1M1600	0.901
HSQ1M1000	0.840
HSQ1M630	0.769
HSQ1M400	0.714
HSQ1M250	0.645
HSQ1M160	0.538

Step 1: By design, identify cable reference to be used and calculate watts/metre rating of cable/element e.g. HSQ1M1000, 100 W/m.

Step 2: Refer to rating factor table and multiply watts/metre rating of cable/element by rating factor to obtain adjusted watts/metre value. (100 W/m x 0.840 = 84 W/m)

Step 3: Using adjusted value, enter graph on watts/metre axis and obtain cable sheath temperature for application maintain temperature. Cable sheath temperature = 540°C for 400°C maintain - see graph.

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
Stainless Steel 321 DIN 1.4541	600*	18/8 austenitic stainless steel with added titanium	NR	NR	NR	NR	X	GE	A	NR	NR

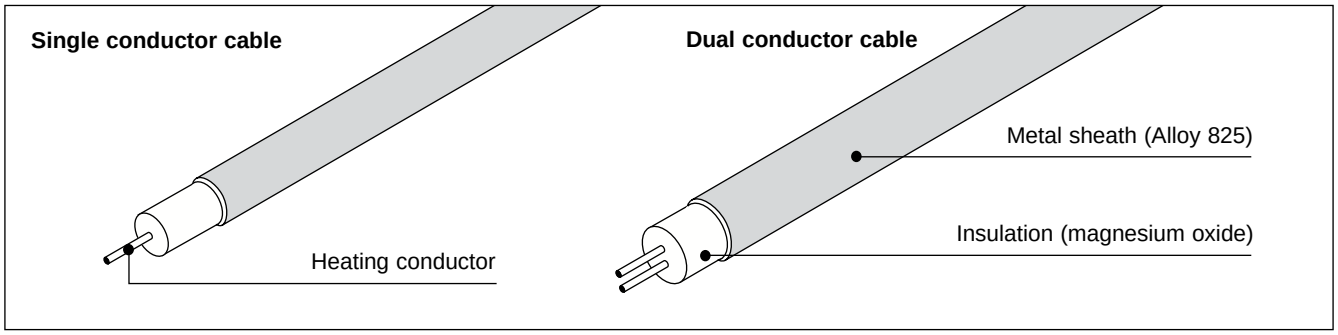
Note: NR Not recommended, A acceptable, GE Good to excellent, X Check for specific data
* Temperature limitation based on construction of heating element.
Corrosion resistance data is dependent on temperature and concentration.

HAx

Ⓔx Mineral insulated (MI) Alloy 825 heating cable

Pyrotenax HAx mineral insulated (MI) Alloy 825 series heating cables are suitable for use in hazardous areas (ATEX). 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 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 650°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 Ordinary
Approvals	System (heating units) Baseefa02ATEX0046X Ⓔx II 2 G EEx e II T6 to T1 CE 1180 Bulk cable Baseefa02ATEX0045U Ⓔx II 2 G EEx e II
	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

Technical data

Cable sheath material	Alloy 825
Conductor material	Various alloys and copper
Max. exposure temperature	650°C* (heating cable) 550°C (brazed heating units) 650°C* (laser welded heating units) * higher temperatures can be realised, 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 output	**Voltage (U_0/U)**	**Max. power output***	**Heating cable type**
	600/600 V AC	210 W/m	HAx1N Single conductor cable, 600 V
	300/300 V AC	200 W/m	HAx2M Dual conductor cable, 300 V
	600/600 V AC	270 W/m	HAx2N Dual conductor cable, 600 V
		*typical value, depending on application	

Earth leakage	3mA /100m (nominal at 20°C)
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. Segment 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	0.085	632	49.3	32SA2600
HAA2M13.2K	13200	3.7	0.085	500	57.0	32SA2400
HAA2M9000	9000	3.7	0.085	501	57.9	32SA2275
HAA2M6600	6600	4.6	0.085	329	88.2	32SA2200
HAA2M5600	5600	4.5	0.085	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. Segment 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. Segment 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

Nominal Cross section (mm^2)	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)	Nominal 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	9.6	17.1

All cold lead cables can be used for up to 600 V AC and use copper conductors with a temperature coefficient of 3.9 x 10^{-3} 1/K.
* For different heating unit designs refer to page 86.

Notes:
Delivery length depends on type of resistance and is limited by max. segment length. 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 a higher leakage current, a maximum 300 mA residual current device may be used. All safety aspects need to be proven.

Table 5 Chemical resistance

Alloy	Description	Nominal chemical composition, % (major elements)				Thermal conductivity Btu-in W/m-C		High temperature resistance (+540°C)		Corrosion resistance G-E = Good to excellent A = Acceptable NR = Not recommended X = Check for specific data									
		Nickel (+Cobalt)	Iron	Chromium	Other	20°C	815°C	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	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	11.1	23.6	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
Corrosion resistance data is dependent on temperature and concentration.

HIQ

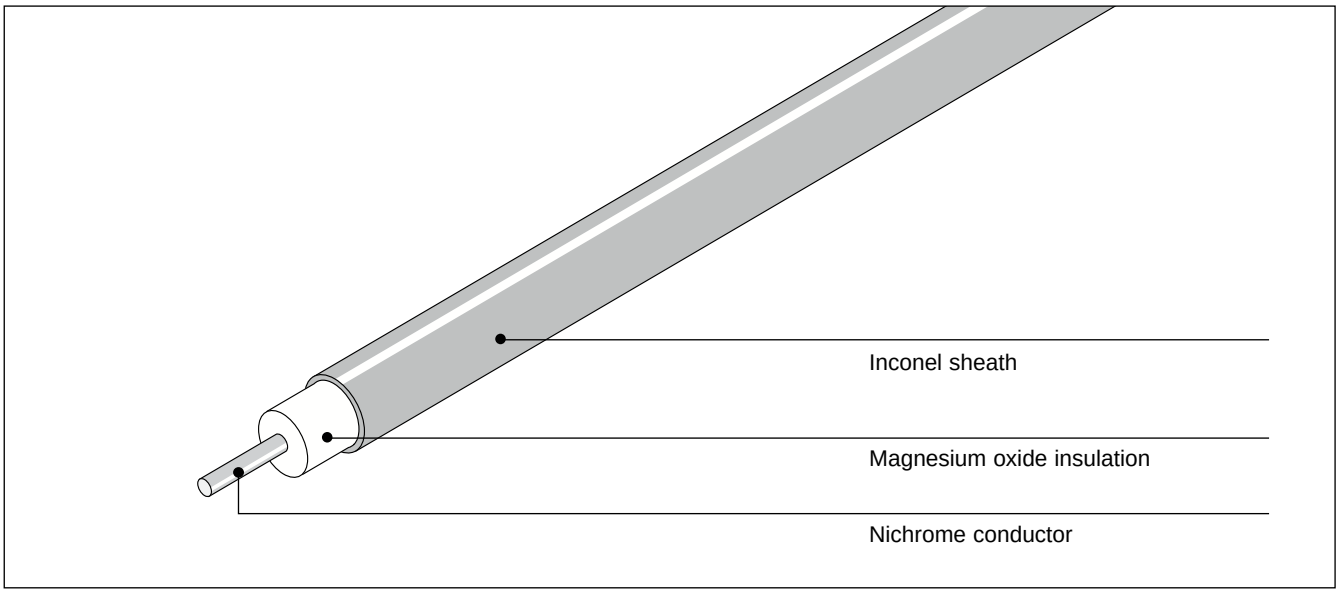
Mineral insulated (MI) Inconel sheathed heating cable

Mineral insulated (MI) Inconel sheathed heating cables can operate to a maximum sheath temperature of 600°C. MI inconel cables offer the industrial heat-tracing market excellent corrosive properties against a range of harsh environments with a high temperature capability.

HIQ cables are typically used in bitumen plants, gas plants, oil refineries, reactors and vessels, sodium loops and a variety of other heat-tracing applications where temperature, efficiency, durability and cable safety is paramount.

MI cable features:
- Corrosion resistance
- High performance output
- High resistance to mechanical abuse
- Safety and fire resistance

Heating cable construction



Inconel 600 Sheathed Heating Cable

Cable sheath material	Inconel 600	
Cable insulation material	Magnesium oxide (MgO)	
Cable conductor material	Nichrome	
Supply voltage	Up to 300/500 V AC	
Withstand voltage	2.0 kV rms AC	
Insulation resistance	1000 MΩ/1000 m (factory pass level)	
Maximum allowable sheath temperature	600°C (for higher temperatures please contact Tyco Thermal Controls)	
Earth leakage	3mA/100 m (nominal at 20°C)	
Minimum installation temperature	–60°C	
Minimum bending radius	6 x O.D. (cable outside diameter) at –60°C	
Approvals	System (heating units)	Baseefa02ATEX0046X Ⓔx II 2 G EEx e II T6 to T1 CE 1180 Actual T class temperature determined by design
	Bulk cable	Baseefa02ATEX0045U Ⓔx II 2 G EEx e II
Area classification	Hazardous area, Zone 1 or Zone 2, Ordinary	
Minimum cable spacing	25 mm for hazardous areas	

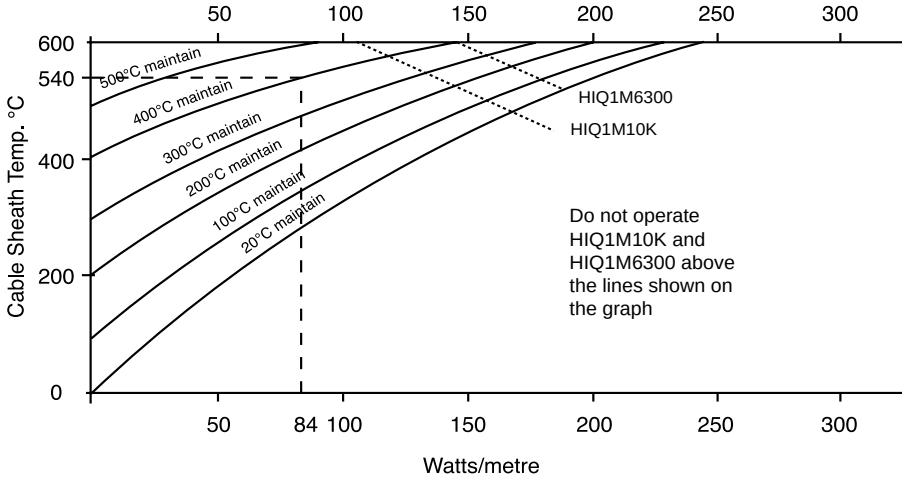
Technical Data

Cable reference	Cable Diameter (mm)	Conductor Material	Conductor Diameter (mm)	Nominal Resistance (Ω/km at 20°C)	Nominal Coil Length (m)	Coil Diameter (mm)	Approx Weight (kg/km)
HIQ1M10K	3.2	Nichrome	0.37	10000	772	610	39
HIQ1M6300	3.2	Nichrome	0.47	6300	774	610	39
HIQ1M4000	3.2	Nichrome	0.59	4000	776	610	39
HIQ1M2500	3.4	Nichrome	0.74	2500	689	610	46
HIQ1M1600	3.6	Nichrome	0.93	1600	617	610	52
HIQ1M1000	3.9	Nichrome	1.17	1000	528	610	62
HIQ1M630	4.3	Nichrome	1.48	630	437	610	78
HIQ1M400	4.7	Nichrome	1.85	400	368	610	96
HIQ1M250	5.3	Nichrome	2.35	250	292	610	127
HIQ1M160	6.5	Nichrome	2.93	160	194	915	191

Note: Tyco Thermal Controls requires the use of a 30 mA residual current device to provide maximum safety and protection from fire. Where there is a marked increase in nuisance tripping, a maximum 300 mA residual current device may be used.
Also refer to the components section (page 82) for more details on heating units, accessories and nomenclatures.

Maximum operating temperatures

Follow steps below to obtain sheath temperature guidelines from the graph, for ordinary area applications.



Rating factor table

Cable Ref.	Rating factor
HIQ1M10K	1.000
HIQ1M6300	1.000
HIQ1M4000	1.000
HIQ1M2500	0.952
HIQ1M1600	0.901
HIQ1M1000	0.840
HIQ1M630	0.769
HIQ1M400	0.714
HIQ1M250	0.645
HIQ1M160	0.538

Step 1: By design, identify cable reference to be used and calculate watts/metre rating of cable/element e.g. HIQ1M1000, 100 W/m.

Step 2: Refer to rating factor table and multiply watts/metre rating of cable/element by rating factor to obtain adjusted watts/metre value. (100 W/m x 0.840 = 84 W/m)

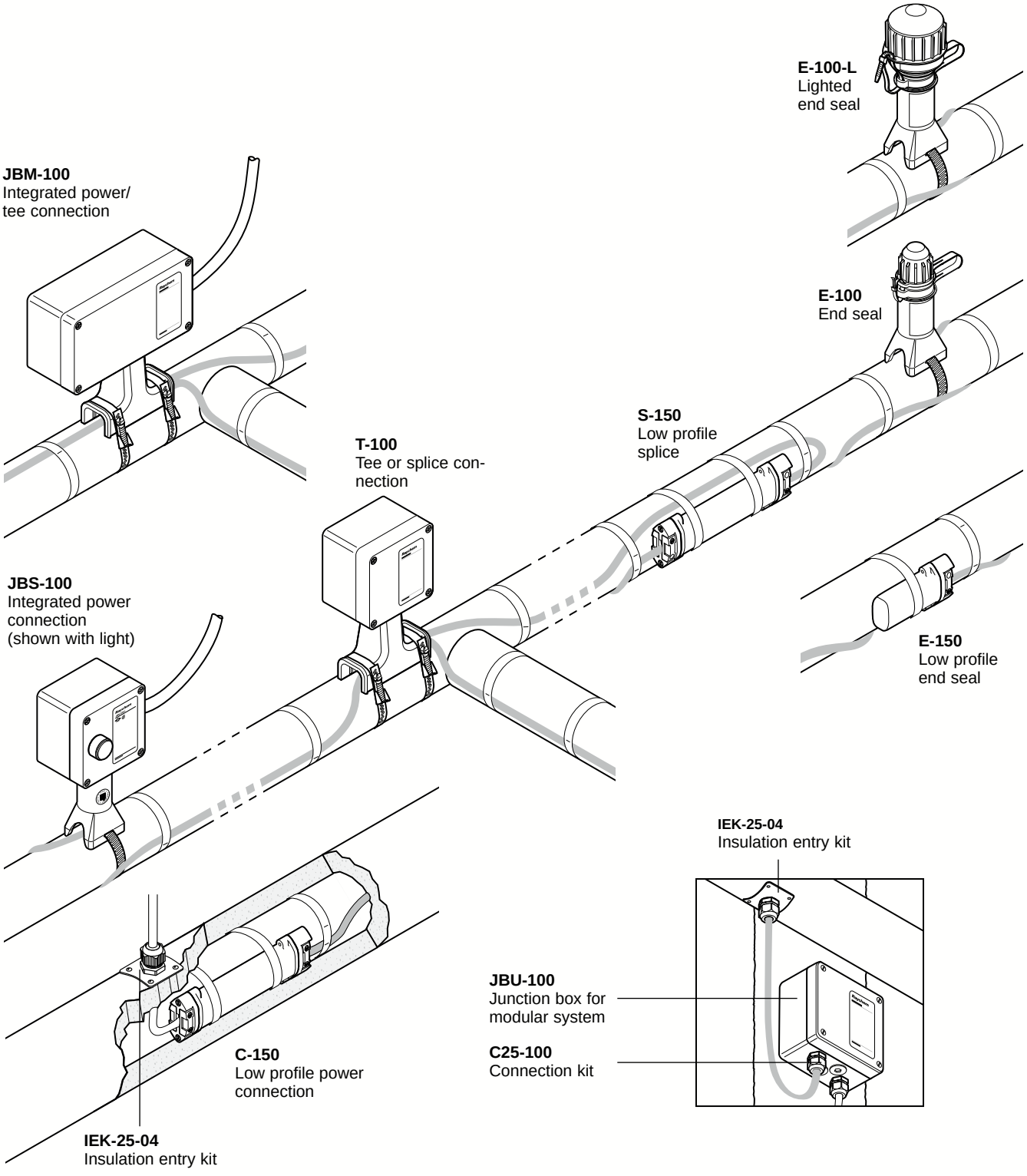
Step 3: Using adjusted value, enter graph on watts/metre axis and obtain cable sheath temperature for application maintain temperature. Cable sheath temperature = 540°C for 400°C maintain - see graph.

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.

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



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

JBS-100

Ⓔx Single-entry power connection with junction box

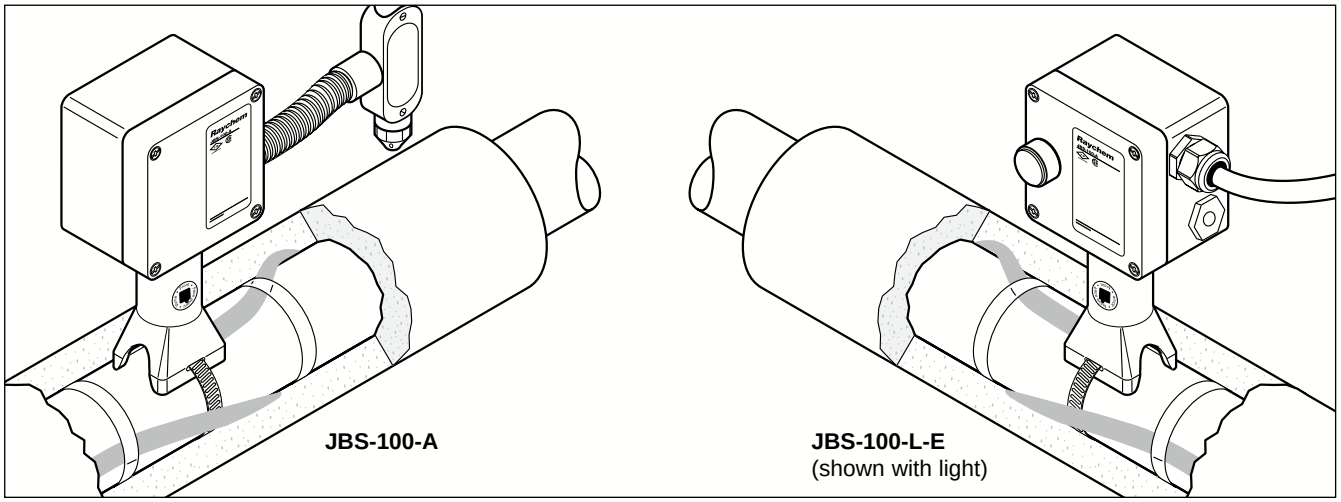
The JBS-100 kit is designed to connect power to one Raychem BTV, QTVR, XTV, KTV or VPL industrial parallel heating cable. It is approved by FM, CSA, and PTB for use in hazardous locations.

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.

Innovative CAGE CLAMP® terminals from WAGO provide fast installation and safe, reliable, maintenance-free operation. Compared to existing systems, 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.

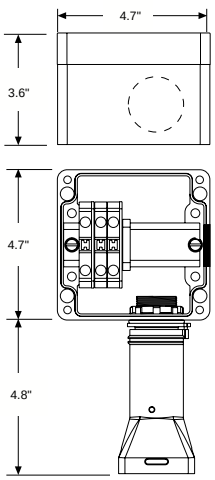
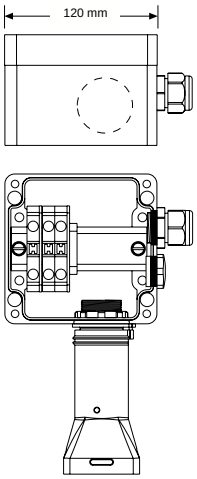
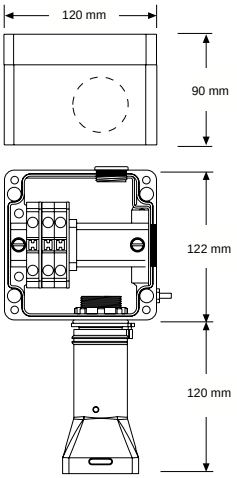


JBS-100-A

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 FM APPROVED: Class I, Div. 2, Groups A, B, C, D; Class II, Div. 1 & 2, Groups E, F, G; Class III CSA® FM APPROVED[1]: CLI, ZN1, AEx e II T*; CLI, ZN1, AEx em II T* (for -L only) CSA®: Ex e II T*; Ex em II T* (for -L only)	PTB 97 ATEX 1058 U Ⓔx II 2 G/D EEx e II IP 66 Ⓔx II 2 G/D EEx em II IP 66 CSA®: Ex e II T*; Ex em II T* (for -L only) DNV approval DNV Certificates No. E-6967 and No. E-6968	PTB 97 ATEX 1058 U Ⓔx II 2 G/D EEx e II IP 66 Ⓔx II 2 G/D EEx em II IP 66 CSA®: Ex e II T*; Ex em II T* (for -L only) DNV approval DNV Certificates No. E-6967 and No. E-6968

* For T-rating, see heating cable or design documentation
[1] Except VPL

	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 +40°C (JBS-100-E) –40°C to +40°C (JBS-100-L-E)	–50°C to +40°C (JBS-100-EP) –40°C to +40°C (JBS-100-L-EP)
Min. installation temperature	–50°C	–50°C	–50°C
Max. pipe temperature	Refer to heating cable specification		
Terminals	WAGO 284 series (EEx e) 2 line, 1 ground	WAGO 284 series (EEx e) 1 phase, 1 neutral, 1 earth	WAGO 284 series (EEx e) 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	254 Vac	254 Vac
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	Engineering polymers, black	Engineering polymers, black	Engineering polymers, 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)		

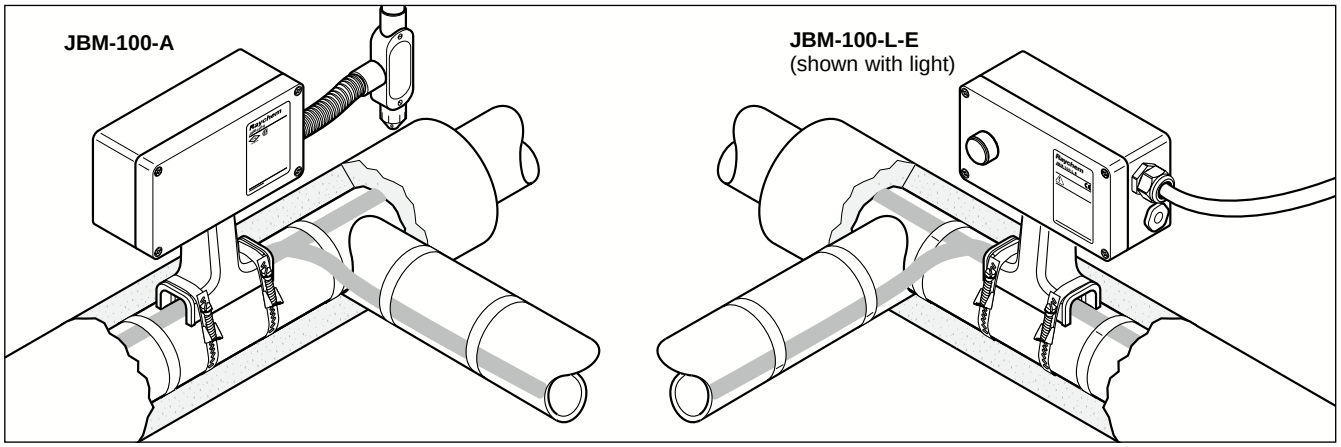
JBM-100

Ⓔx 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. Innovative CAGE CLAMP® terminals from WAGO provide fast installation and safe, reliable, maintenance-free operation. Compared to existing systems, 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.

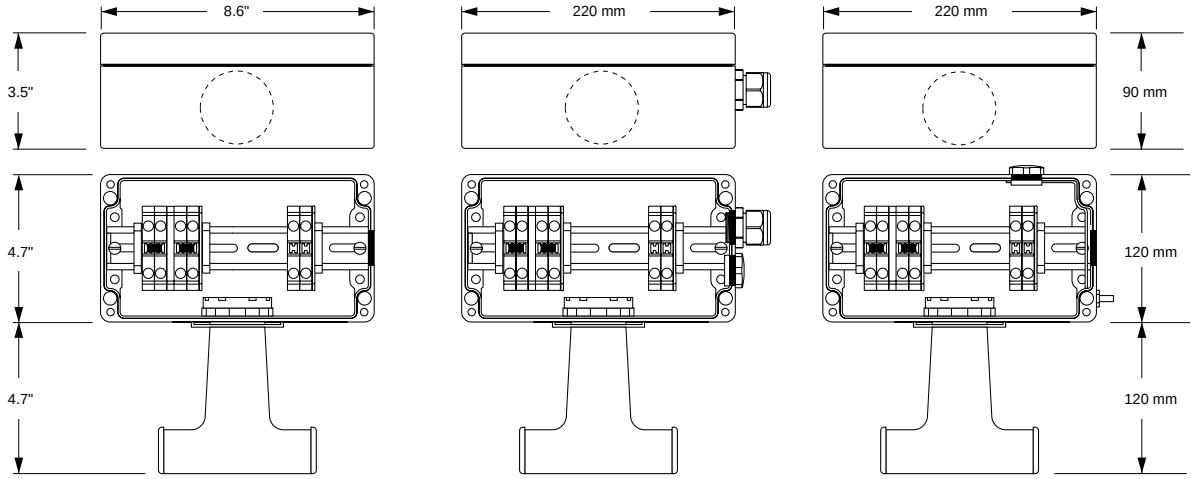


	JBM-100-A JBM-100-L-A	JBM-100-E JBM-100-L-E	JBM-100-EP JBM-100-L-EP
Description	This kit is for use in North America and has two 3/4” through holes for use with 3/4” conduit. One stopping plug is supplied in the kit.	This kit is for use in Europe and provides two M25 threaded entries, one stopping plug, 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 FM APPROVED: Class I, Div. 2, Groups A, B, C, D; Class II, Div. 1 & 2, Groups E, F, G; Class III FM APPROVED[1]: CLI, ZN1, AEx e II T*; CLI, ZN1, AEx em II T* (for -L only) CSA: Ex e II T*; Ex em II T* (for -L only)	PTB 98 ATEX 1021 U Ⓔx II 2 G/D EEx e II IP 66 Ⓔx II 2 G/D EEx em II IP 66 CSA: Ex e II T*; Ex em II T* (for -L only) DNV approval DNV Certificates No. E-6967 and No. E-6968	PTB 98 ATEX 1021 U Ⓔx II 2 G/D EEx e II IP 66 Ⓔx II 2 G/D EEx em II IP 66 CSA: Ex e II T*; Ex em II T* (for -L only) DNV approval DNV Certificates No. E-6967 and No. E-6968

* For T-rating, see heating cable or design documentation
[1] Except VPL

	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 +40°C (JBM-100-E) –40°C to +40°C (JBM-100-L-E)	–50°C to +40°C (JBM-100-EP) –40°C to +40°C (JBM-100-L-EP)
Min. installation temperature	–50°C	–50°C	–50°C
Max. pipe temperature	Refer to heating cable specification		
Terminals	WAGO 284 series (EEx e) line, 2 ground	WAGO 284 series (EEx e) 2 phase, 2 neutral, 2 earth	WAGO 284 series (EEx e) 2 phase, 2 neutral, 2 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	254 Vac	254 Vac
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	Engineering polymers, black	Engineering polymers, black	Engineering polymers, 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-L-A	JBM-100-L-E	JBM-100-L-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)		

JBU-100

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.

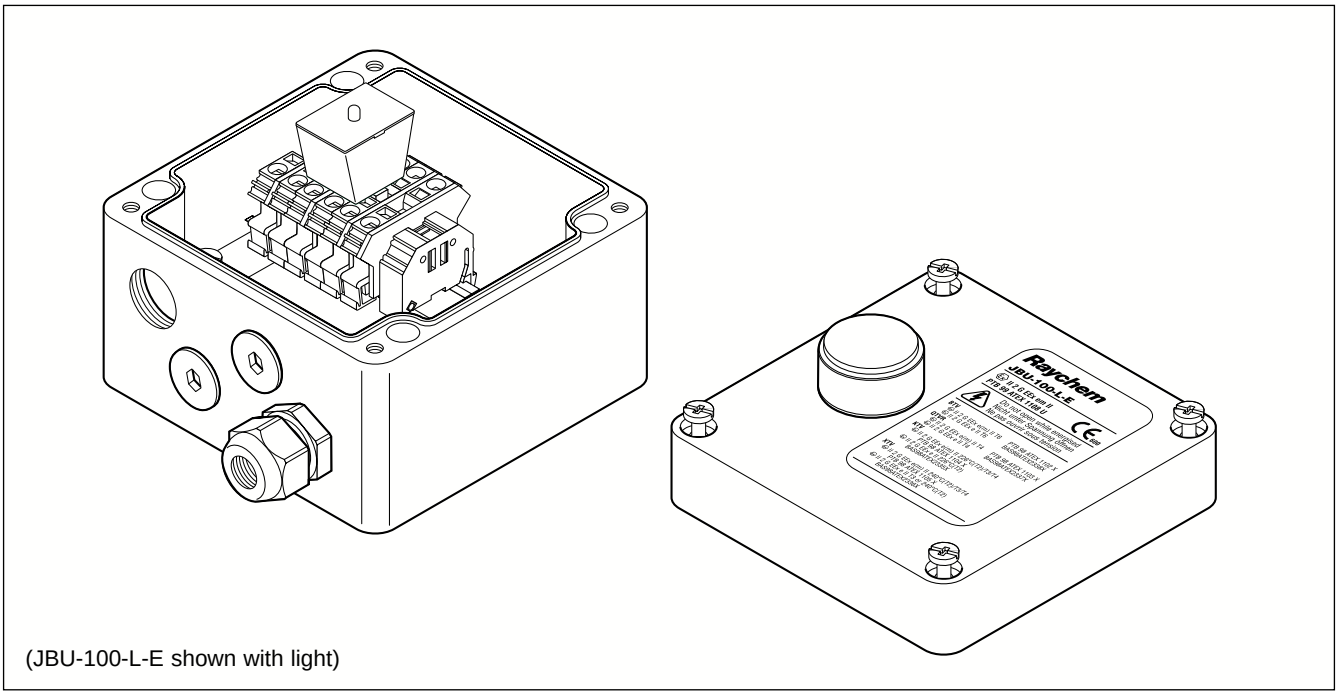
Innovative CAGE CLAMP® terminals from WAGO provide fast installation and safe, reliable, maintenance-free operation.

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.

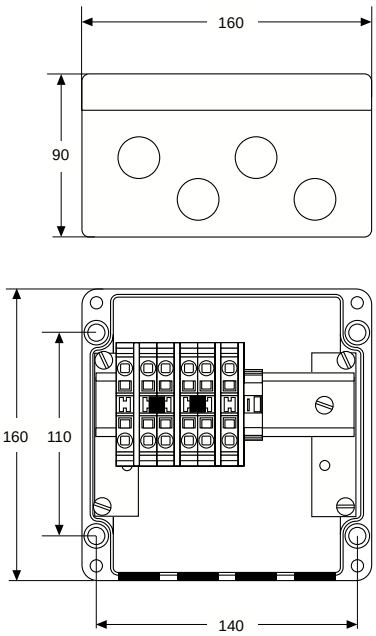
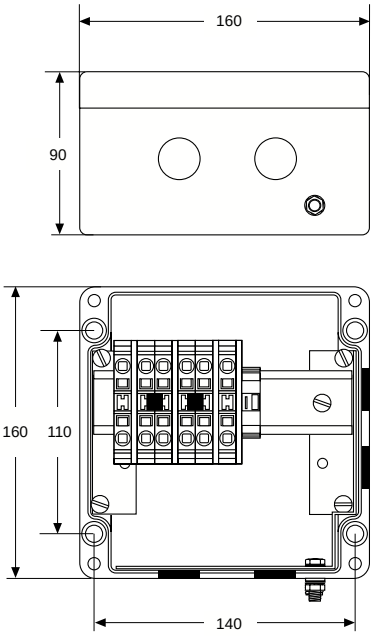
All kits are also available as a lighted version (-L). These include a unique light module with a superbright green LED that simply plugs into the terminals, and a lens in the lid. This provides indication that power is available in the box.



(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 entries, an earthing plate and an external earth stud. It is designed for use with armoured power cables and metal glands.
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	PTB 99 ATEX 1108 U Ⓔx II 2 G/D EEx e II IP 66 Ⓔx II 2 G/D EEx em II IP 66 SP® Ex e II T* Ex em II T* (for -L only) DNV approval DNV Certificates No. E-6967 and No. E-6968	PTB 99 ATEX 1108 U Ⓔx II 2 G/D EEx e II IP 66 Ⓔx II 2 G/D EEx em II IP 66 SP® Ex e II T* Ex em II T* (for -L only) DNV approval DNV Certificates No. E-6967 and No. E-6968

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

	JBU-100-E JBU-100-L-E	JBU-100-EP JBU-100-L-EP
Description (nominal)		
Product specifications		
Ingress protection	IP66	IP66
Entries	4 x M25	4 x M25
Min. ambient temperature	–50°C to +40°C (JBU-100-E) –40°C to +40°C (JBU-100-L-E)	–50°C to +40°C (JBU-100-EP) –40°C to +40°C (JBU-100-L-EP)
Terminals	WAGO 284 series (EEx e) 2 phase, 2 neutral, 2 ground	WAGO 284 series (EEx e) 2 phase, 2 neutral, 2 ground
Max. conductor size	10 mm^2 stranded, 10 mm^2 solid	10 mm^2 stranded, 10 mm^2 solid
Max. operation voltage	AC 550 V	AC 550 V
Max. current rating	40 A	40 A
Materials of construction		
Enclosure, lid	Glass filled engineering polymers, carbon filled, black	Glass filled engineering polymers, carbon filled, black
Lid srewcs	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
Accessories		
Heating cable connection kits	C25-100, C25-21	C25-100, C25-21, 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
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)

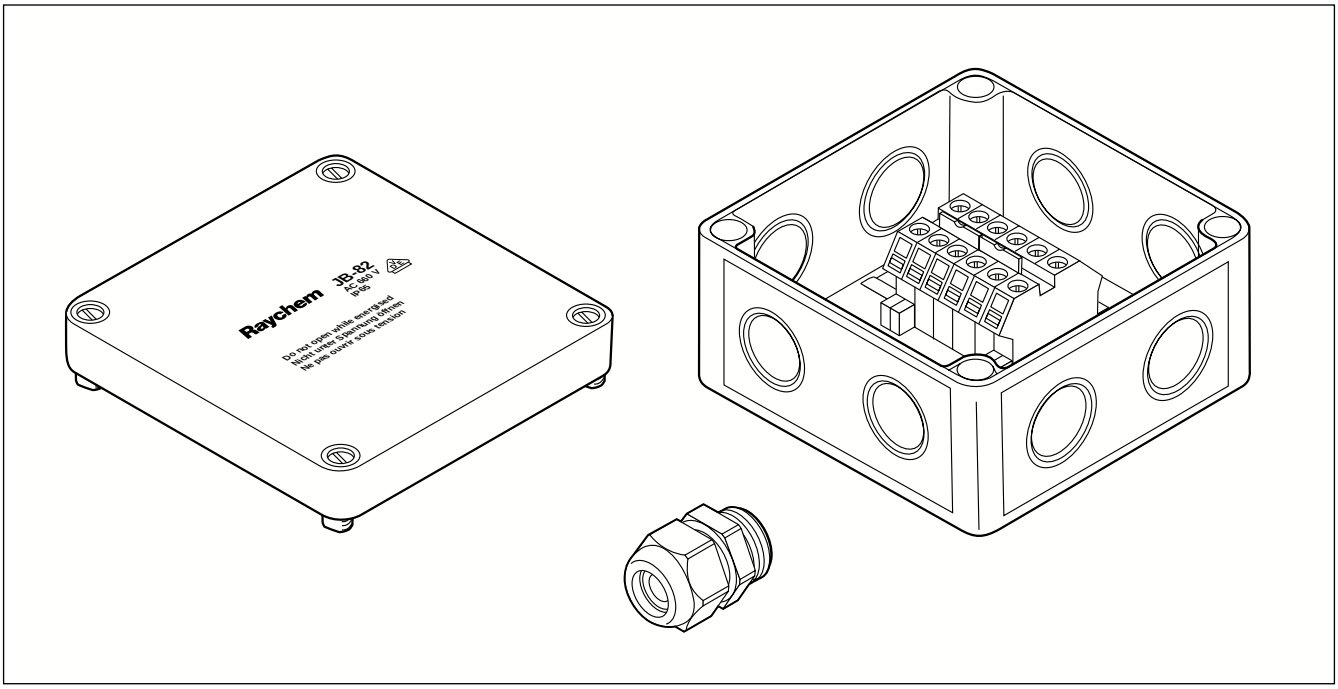
JB-82

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 self-regulating 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.

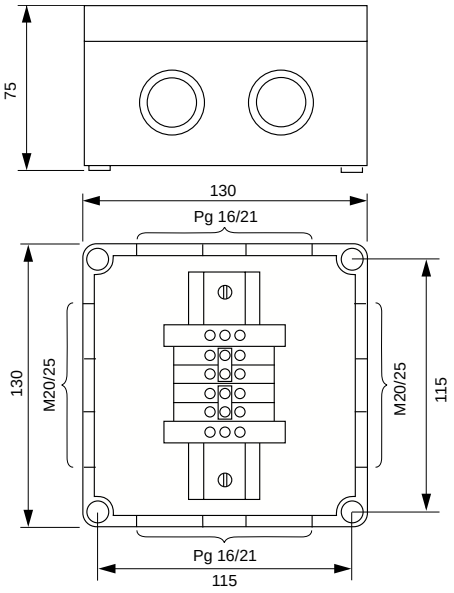
For pipe mounting, it is recommended that this box is used with a Raychem support bracket.



	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 V
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

JB-82

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 details	
Part description	JB-82
PN (Weight)	535679-000 (471 g)

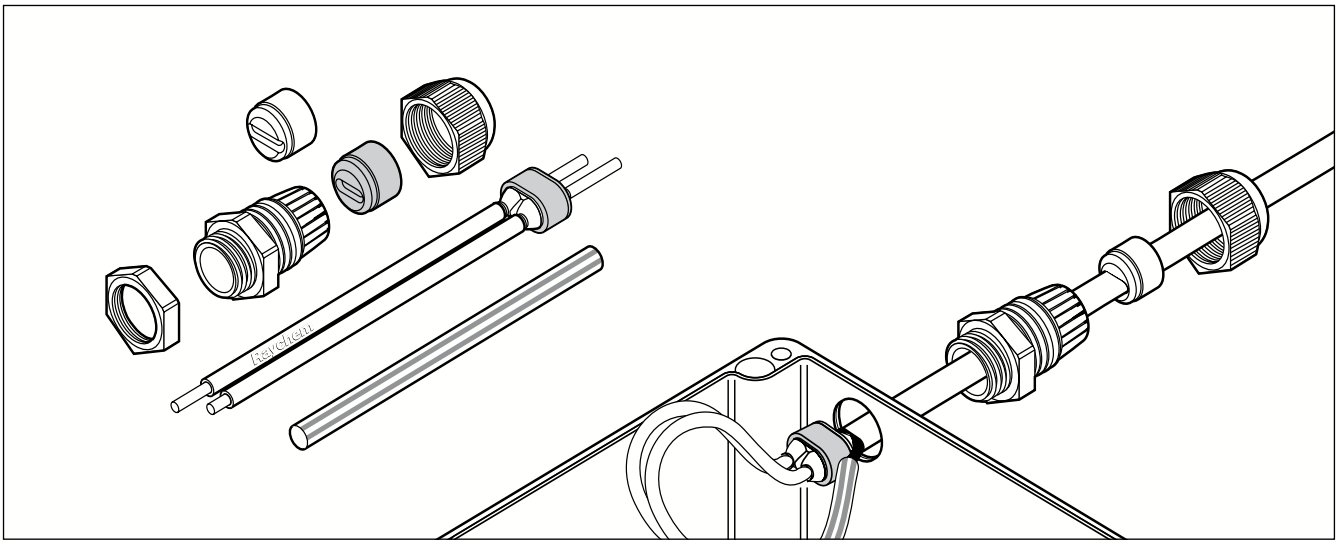
C25-100

Ⓔx 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 98 ATEX 1015 U Ⓔx II 2 G/D EEx e II by PTB according to EN 50 014, EN 50 019 DNV Certificate No. E-6967 and E-6968

	C25-100
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 (70 g)

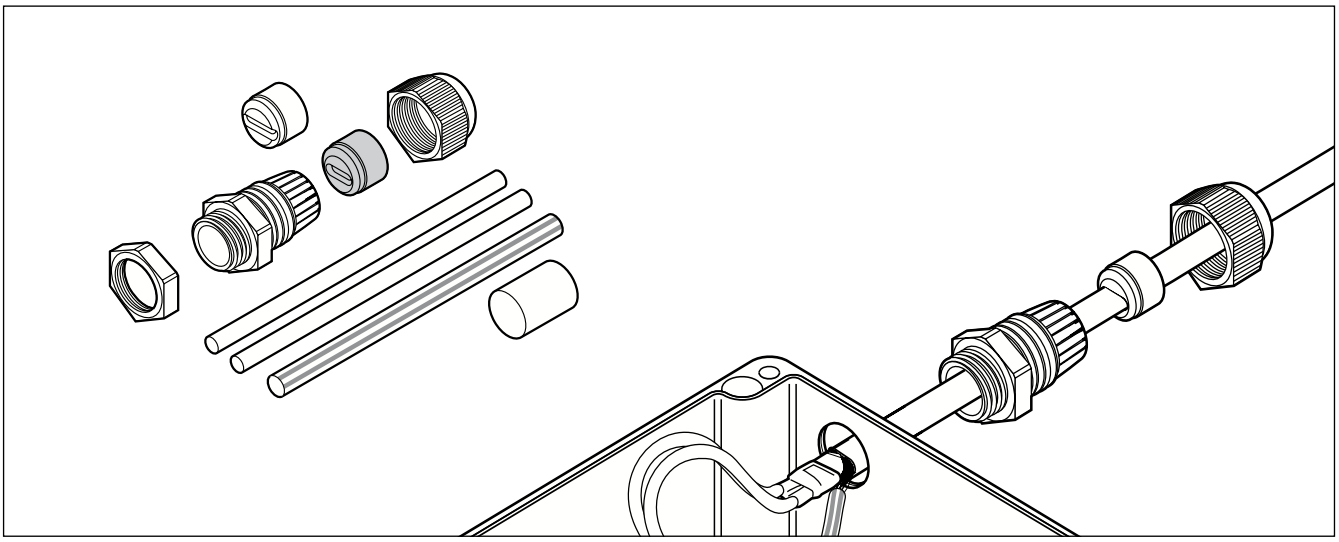
C25-21

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 kits 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	PTB 99 ATEX3128X Ex II 2 G/D EEx e II IP66 by PTB according to EN 50 014, EN 50 019 (complete kit referred in heating cable system approvals) DNV Certificate No. E-6967 and E-6968

	C25-21
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
Max. exposure temperature (gland)	110°C
Ordering details	
Part description	C25-21
PN (Weight)	311147-000 (60 g)

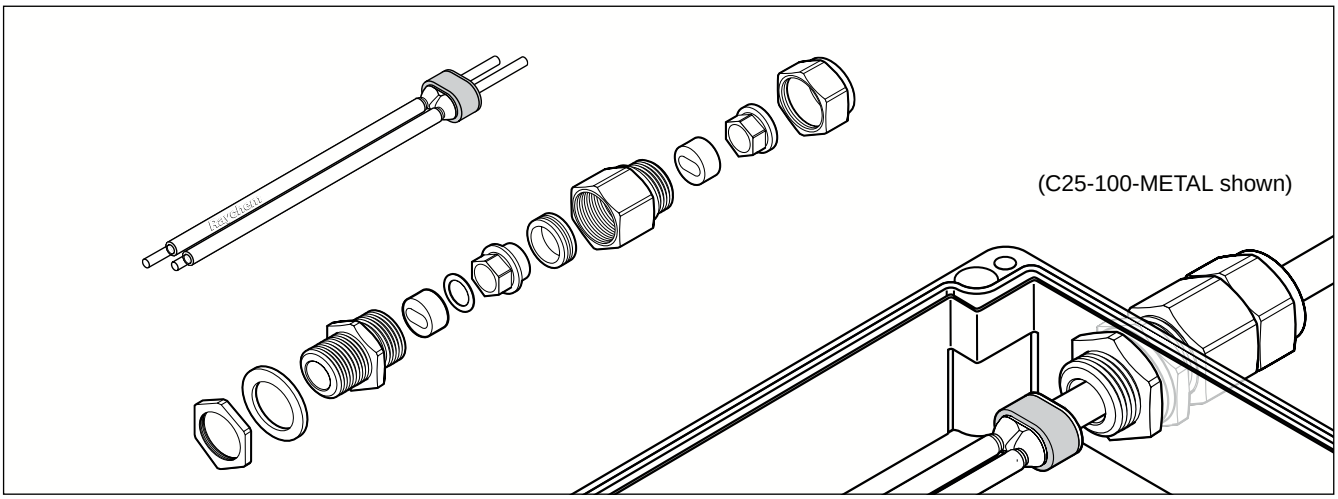
C25-100-METAL and C3/4-100-METAL

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 Ⓔx II 2 GD EEx d IIC / EEx e II (Ta = –60°C to +180°C) according to EN 50 014, EN 50 018, EN 50 019 (complete kit also referred in heating cable system approvals)

	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 (310 g)	440588-000 (304 g)
Also available in nickel plated brass		
Part description	C25-100-METAL-NP	C3/4-100-METAL-NP
PN (Weight)	1244-002296 (310 g)	1244-001350

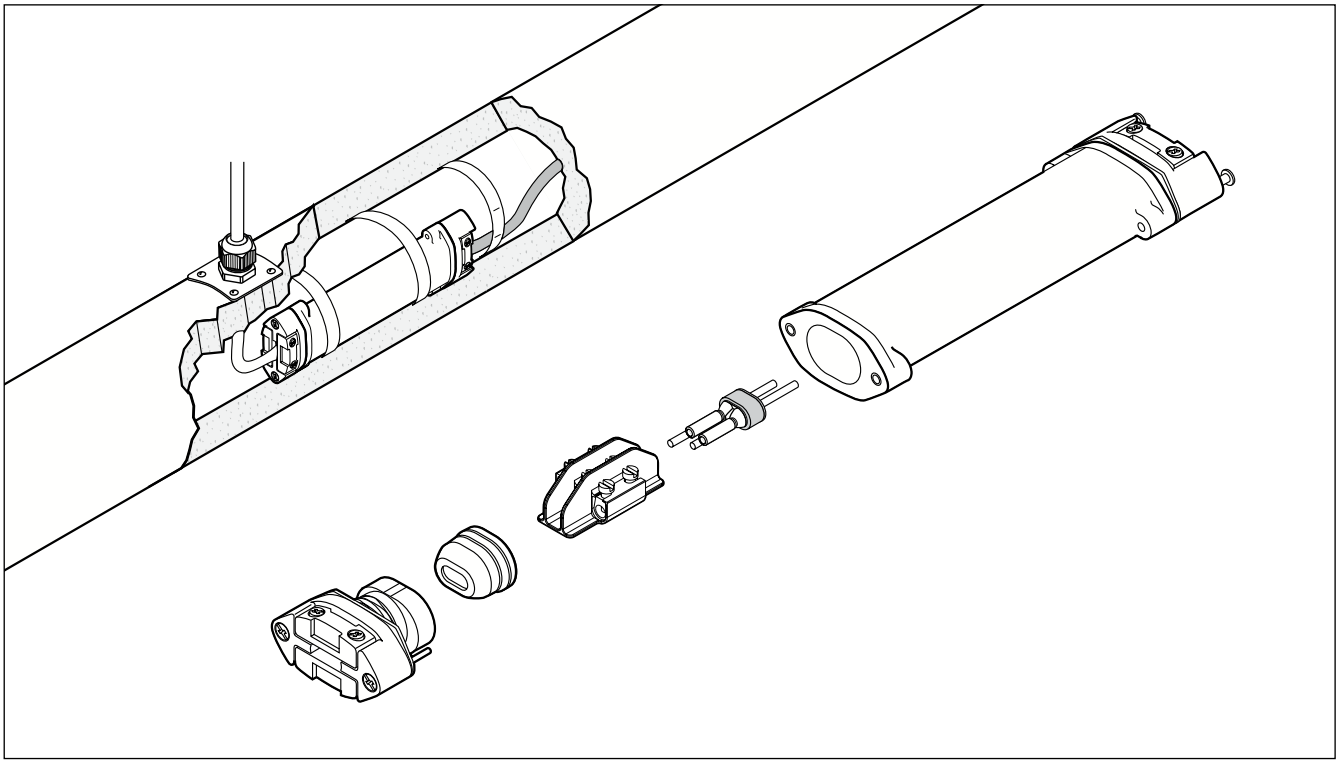
C-150-E

Low profile power connection - cold applied

The C-150-E is a cold applied low profile power connection. This 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.

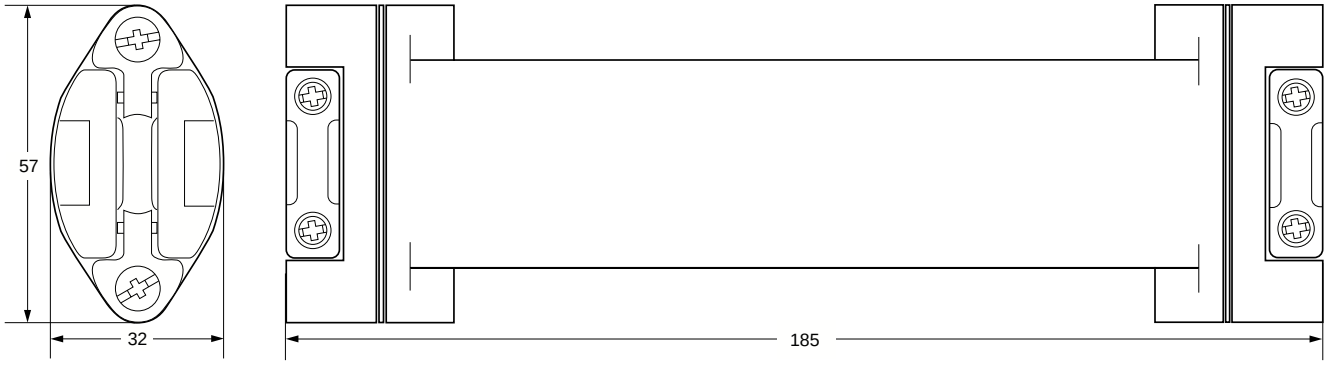
A Raychem supplied power cable such as C-150-PC may be used or any suitable standard industrial power cable type 3 x 1.5 mm^2 or 3 x 2.5 mm^2 with stranded copper conductors and an outer insulation jacket. The power cable is connected by means of screw terminals to the conductors and the braid of the 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	PTB 98 ATEX 1121 U Ex II 2 G/D EEx e II IP 66

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	215°C (possible limitation because of maximum temperature rating of power cable)
Maximum operating voltage	254 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

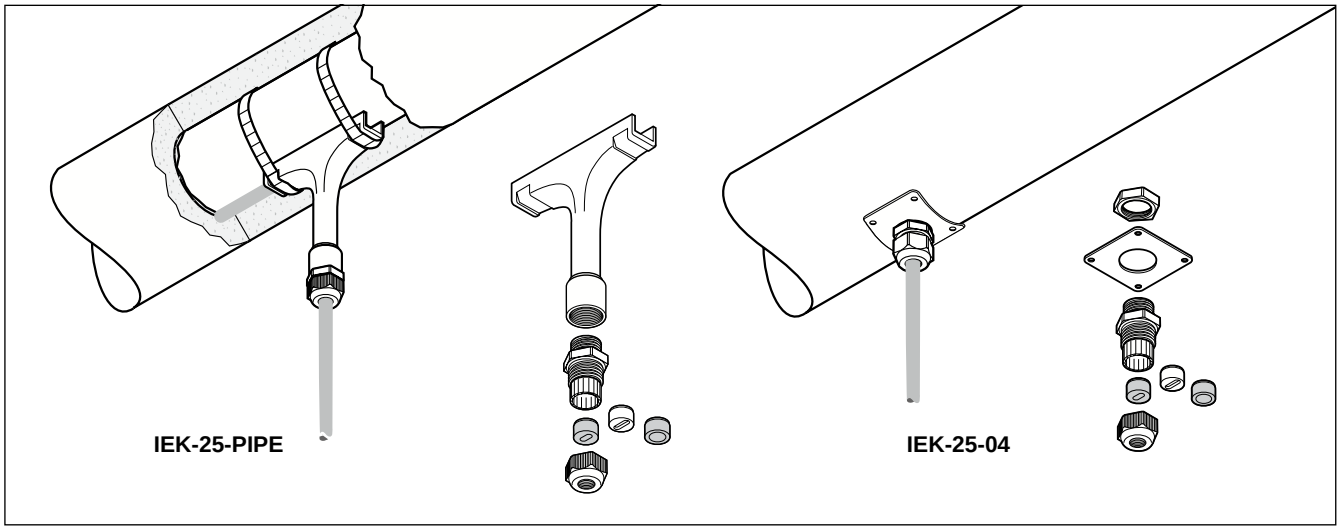
Accessories	
Power cable	C-150-PC 3-core flexible power cable for connection to C-150-E, 3 x 2.5 mm^2, silicone insulation, temperature range: –40°C to +180°C, short term: 215°C.

IEK-25-PIPE and IEK-25-04

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 other type 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.

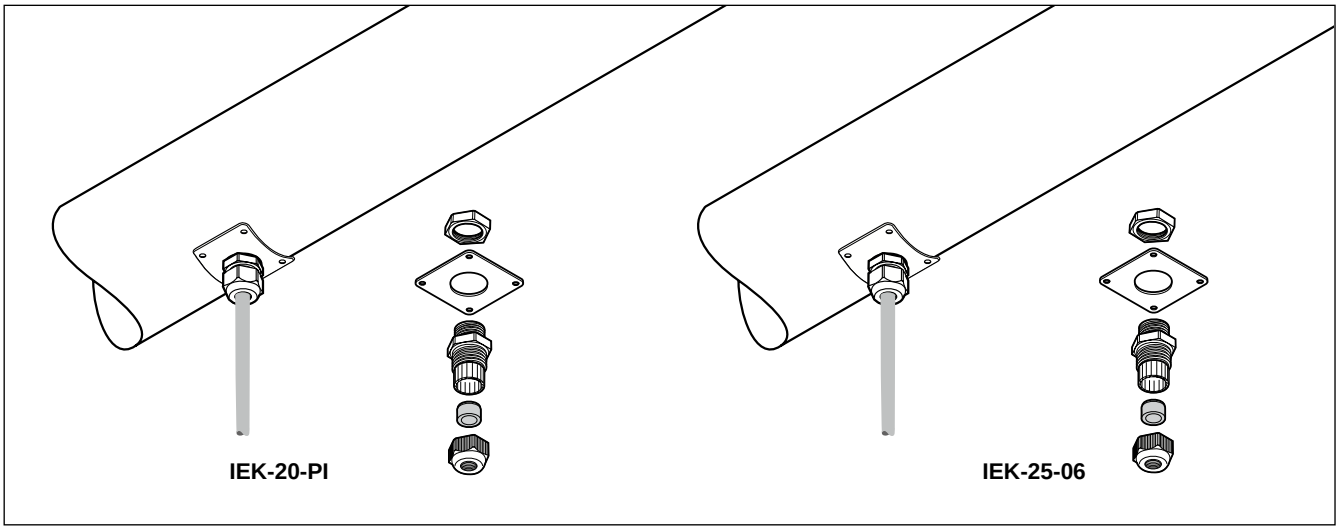


Description	IEK-25-PIPE	IEK-25-04
Application	Insulation entry kit for pipe mounting for heating- and power cables with an outside diameter in the range of 8 to 17 mm. Kit contains 1 pc.	Insulation entry kit for pipes, tanks and vessels. Usable for all types of polymer heating cables and power cables 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-6967 and E-6968
Dimensions	Height 135 mm, width 120mm	Plate 60 x 60 mm (22SWG)
Ordering information		
Part number (Weight)	1244-001050 (130 g)	332523-000 (60 g)

Insulation entry kit

Insulation entry kits are designed to protect cables when passing through the thermal insulation cladding. The IEK´s are suitable for various heating and cold lead cables; IEK-20-PI for PI heating cables, IEK-25-06 for IHT and FHT 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 provided in the kit provide strain relief and environmental sealing to avoid water ingress in the insulation. Both types 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

IEK-25-06

Description	IEK-20-PI	IEK-25-06
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.	Insulation entry kit for pipes, tanks and vessels. For use with all IHT and FHT heating cable types. Kit contains 1 pc.
Kit contents	2 x stainless steel fixing plates 2 x plastic glands (M20) with round hole grommets for power- or cold lead cables 2 x locknuts	1 x stainless steel fixing plate 1 x plastic gland (M25) with round hole grommet 1 x locknut
Product specifications		
Max. exposure temp. gland	80°C	110°C
Dimensions	Plate 60 x 60 mm (22 SWG)	Plate 60 x 60 mm (22SWG)
Ordering information		
Part number (Weight)	1244-000689 (80 g)	566578-000 (60 g)

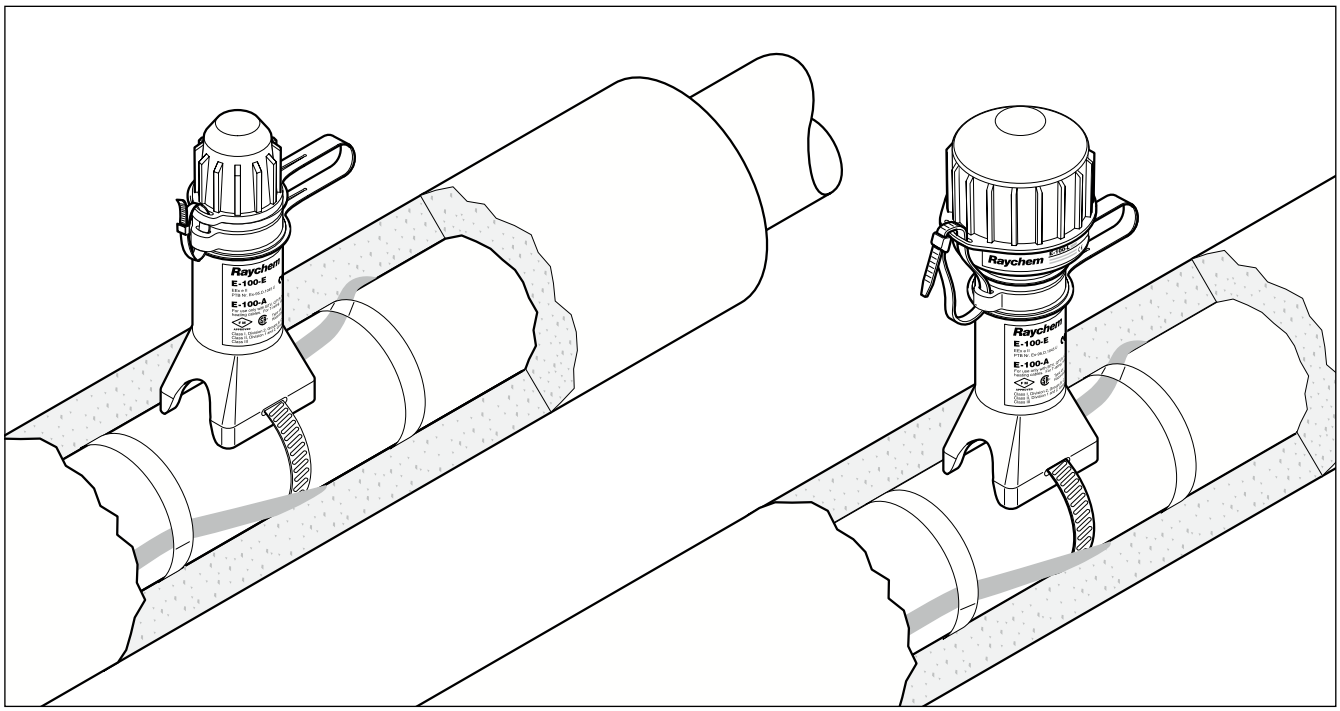
End seal and lighted end seal

Both the E-100-E and E-100-L-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.

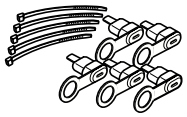
The light module of the E-100-L-E uses an array of super-bright green LEDs for long life and excellent visibility from almost any angle. The robust industrial-grade electronics are encapsulated to reliably seal out moisture.

Extra sealant filled boots for the E-100-E end seal can be ordered separately.



	E-100-E	E-100-L-E
Kit contents	1 end seal 1 cable tie 1 polywater sachet	1 end seal with indicator light 1 cable tie 1 polywater sachet 2 spare crimps 2 crimps for VPL
Approval data		
Area of use	Hazardous or ordinary (indoors and outdoors)	
Approvals	PTB 98 ATEX 1101 U Ⓔx II 2 G/D EEx e II IP 66 SP Ex e II T* DNV Certificate No. E-6967 and E-6968	PTB 98 ATEX 1101 U Ⓔx II 2 G/D EEx em II IP 66 SP Ex em II T* DNV Certificate No. E-6967 and E-6968

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

	E-100-E	E-100-L-E
Product specifications		
Max. pipe temperature	Refer to heating cable specification	
Max. operating voltage	254 V	254 V
Ambient temperature range	–50°C to +40°C	–50°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	IP65	IP65
Impact resistance	EN 50 014, ≥ 7 joules	EN 50 014, ≥ 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, long nose pliers
Ordering details		
End seal		
Part description	E-100-E	E-100-L2-E
PN (Weight)	101255-000 (220 g) Requires one pipe strap (not supplied)	726985-000 (630 g) 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	

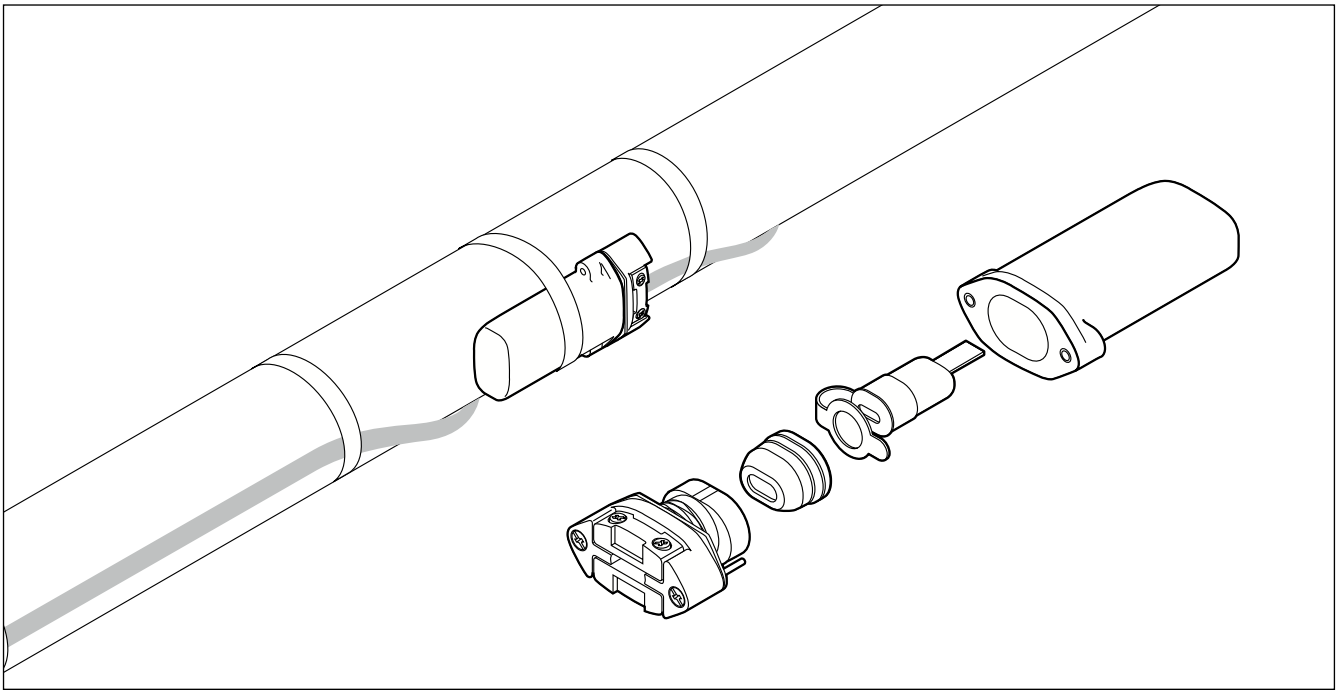
E-150

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 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.

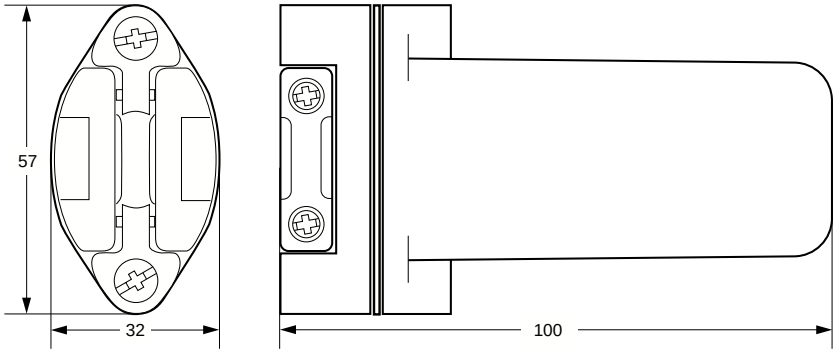
The unique design of the E-150 suits the demanding requirements of the industrial environment. The low profile housing can be installed on pipes and other surfaces. A spring loaded grommet makes a first seal to maintain a water tight connection while the non-curing sealant (silicone free) used in Raychem's 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	PTB 98 ATEX 1121 U Ex II 2 G/D EEx e II IP 66 DNV Certificates No. E-6967 and No. E-6968 FM APPROVED Class I, Div. 2, Groups A, B, C, D Class II, Div. 2, Groups F, G CSA Class III FM APPROVED CLI, ZN2, AEx e II T(1) CSA Ex e II T(1) (1)For T-rating, see heating cable or design documentation

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	215°C
Operating voltage	277 V for FM and CSA, 254 V for PTB

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

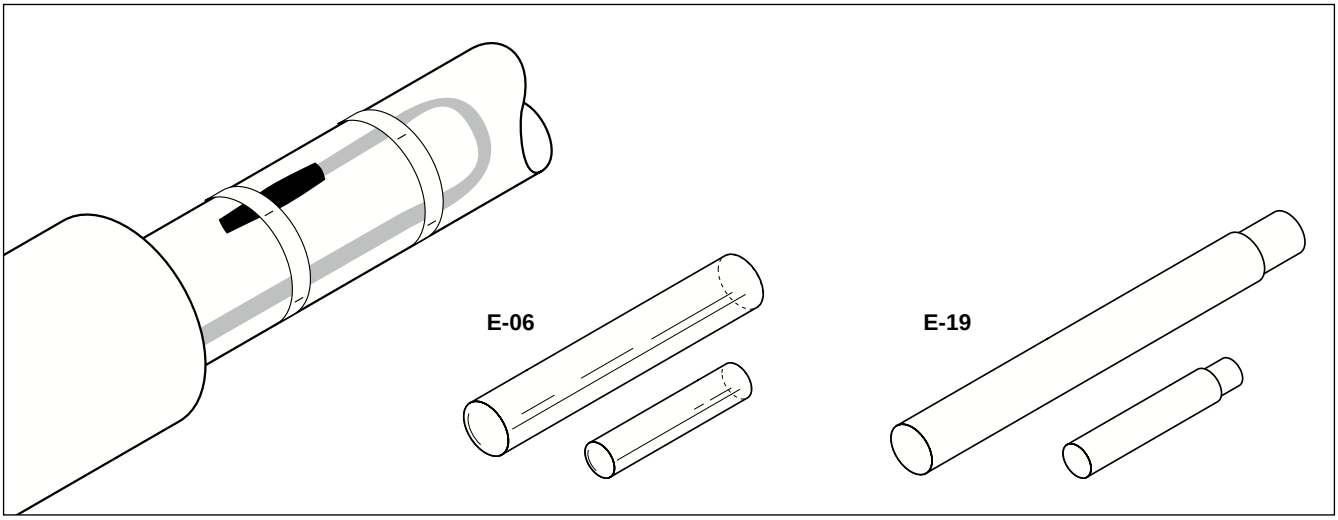
Ordering details	
End seal	E-150
PN (Weight)	979099-000 (0.3 kg/0.6 lb.)

End seal kits - heat-shrink

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, where as the E-19 is designed for use with XTV- and KTV heating cables.

All kits are approved for use in hazardous areas.
The end seal kits employ easy to use heat-shrinkable tubing with an adhesive, that when heated forms a semi-flexible moisture proof encapsulation.

Due to its 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
Application	End seal for BTV and QTVR self-regulating heating cables	End seal for XTV and KTV self-regulating heating cables
Kit contents	Heat-shrinkable Adhesive coated sleeves Installation instruction	Heat-shrinkable sleeves Adhesive liners Installation instruction
Approvals	Ⓔx II 2 G/D EEx e II by PTB and Baseefa 2001 Ltd. according to EN 50 014, EN 50 019 DNV Certificate No.E-6967	Ⓔx II 2 G/D EEx e II by PTB and Baseefa 2001 Ltd. according to EN 50 014, EN 50 019 DNV Certificate No.E-6968
Product specifications		
Max. exposure temperature	175°C	200°C
Dielectric strength	2.2 MV/m	> 6 MV/m
Volume resistivity	10^{13} Ω cm	10^{10} Ω cm
Final dimensions	length approx. 120 mm	length approx. 135 mm
Installation details		
Heat shrinkable tubing	175°C	200°C
Gas torch or equivalent	min. 1460 W hot air gun	min. 1460 W hot air gun
Ordering information		
Part description	E-06	E-19
PN (Weight)	582616-000 (30 g)	090349-000 (50 g)

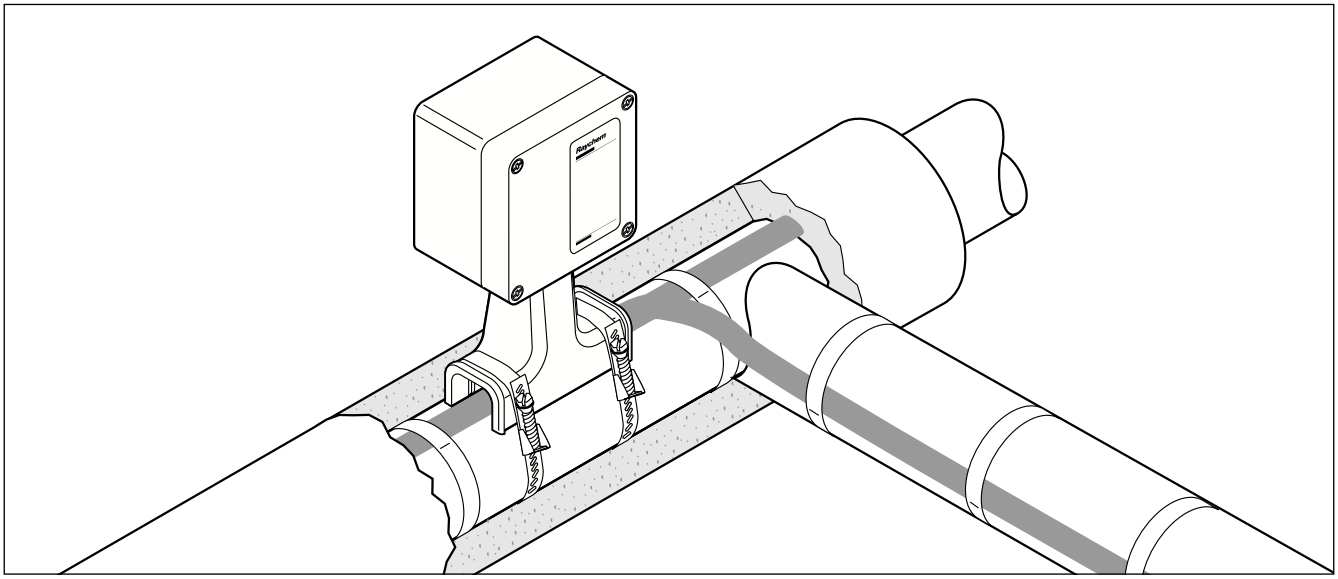
T-100

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.

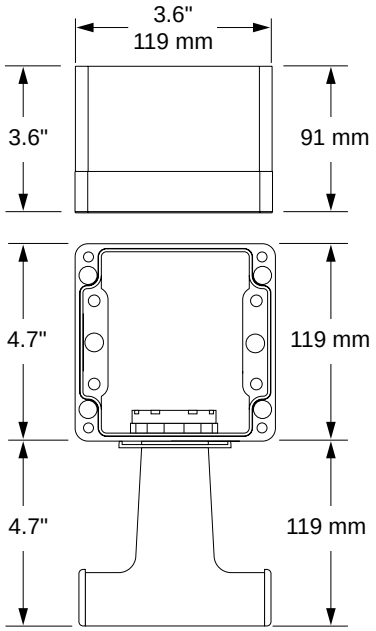
The rugged stand protects the heating cable and allows for up to 100 mm (4”) of thermal insulation.
The core sealing boot does not require a heat gun or torch for the installation (no hot work permit necessary).

The non-curing sealant (silicone free) in the boot allows easy installation and facilitates maintenance.
Compared to existing systems, 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 Class I, Div. 2, Groups A, B, C, D Class II, Div. 1 & 2, Groups E, F, G Class III PTB 98 ATEX 1020 U Ex II 2 G/D EEx e II IP 66 DNV approval DNV Certificates No. E-6967 and No. E-6968 FM APPROVED Class I, Zone 1, AEx e IIC

Dimensions (in mm)

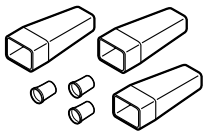


Product specifications	
Heating cable capability	BTV-CR, BTV-CT, QTVR-CT, XTV-CT, KTV-CT, VPL
Ingress protection	NEMA Type 4X IP66 and IP67
Min. installation temperature	–50°C
Max. pipe temperature	Refer to heating cable specification
Max. operating voltage	277 Vac for FM, CSA 254 Vac for PTB
Max. continuous operating current	50 A heating cable circuit for FM, CSA 40 A heating cable circuit for PTB

Materials of construction	
Enclosure, lid, and stand	Engineering polymers, 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)



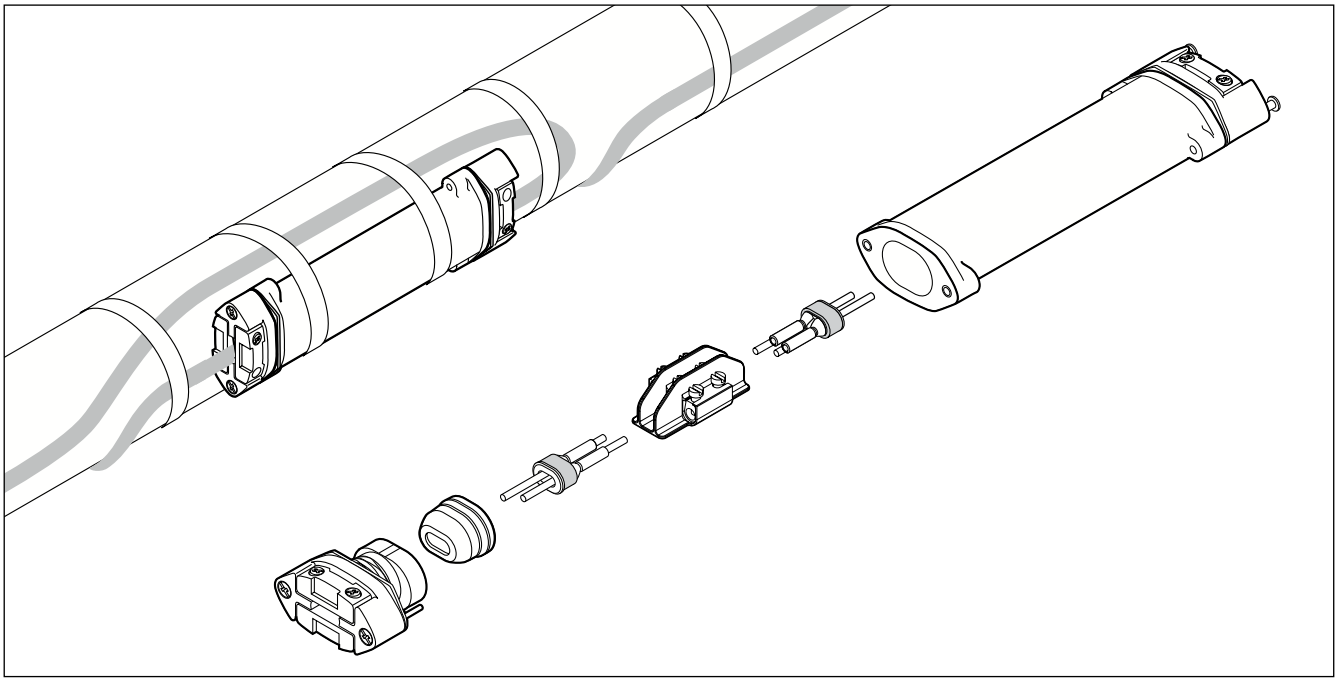
PN	577853-000
Small pipe adaptor	JBM-SPA, required for pipes ≤ 1" (DN 25), D55673-000 (bag of 5 adaptors)

Low profile splice - cold applied

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.

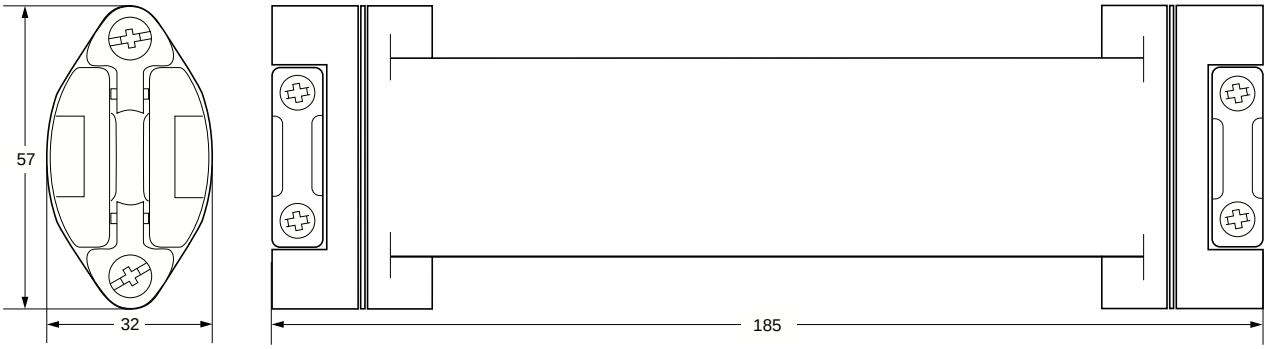
The unique design of the S-150 suits the demanding requirements of the industrial environment. The low profile housing can be installed on pipes and other surfaces. Spring loaded grommets make a first seal to maintain a water tight connection while the non-curing sealant (silicone free) used in Raychem's 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	Hazardous locations	
	FM APPROVED Class I, Div. 2, Groups A, B, C, D Class II, Div. 2, Groups F, G Class III	PTB 98 ATEX 1121 U Ex II 2 G/D EEx e II IP 66
	CSA	DNV Certificate No.E-6967 and E-6968
	FM APPROVED Class I, Zone 2, AEx e II T*	* For T-rating, see heating cable or design documentation
	CSA Ex e II T*	

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 for FM, CSA – 254 Vac for PTB
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.)

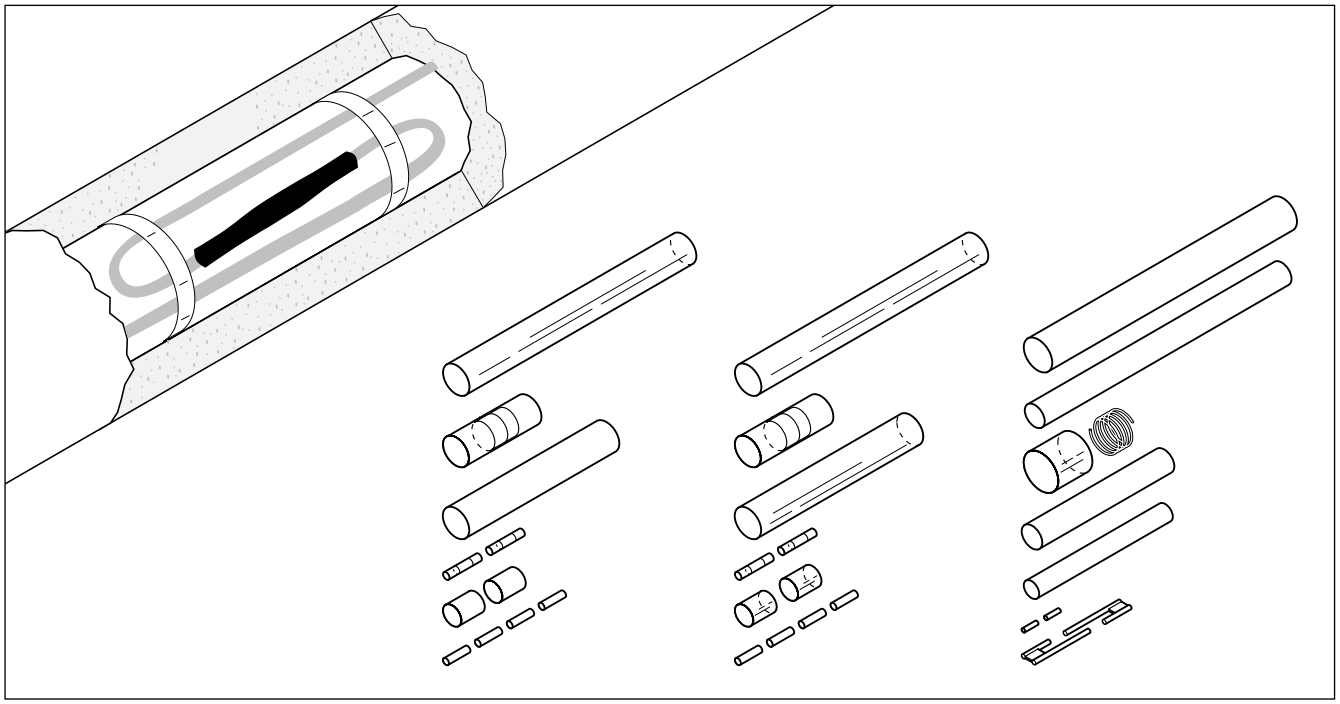
S-19, S-21 and S-69

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 employs 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.

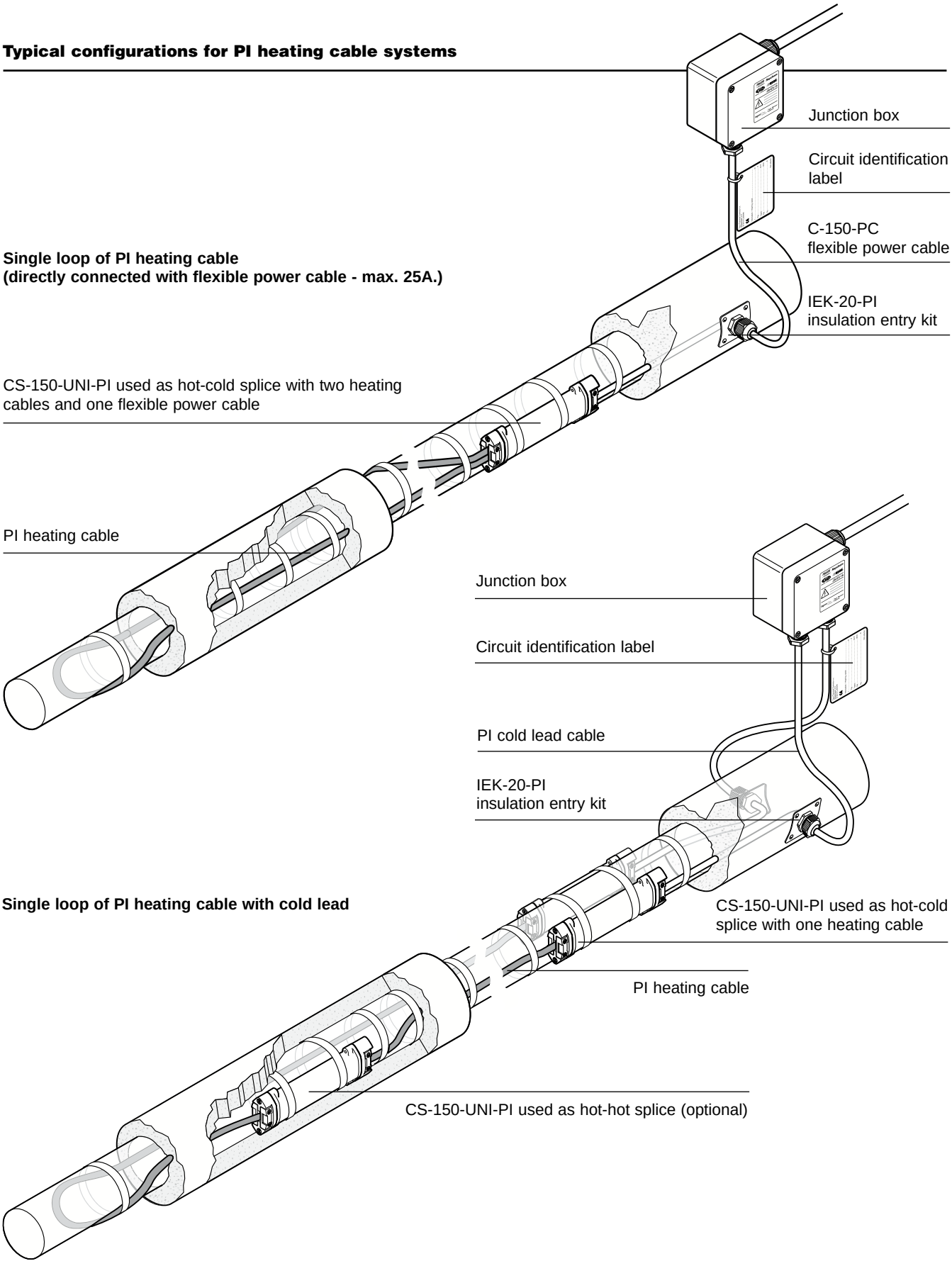


	S-19	S-21	S-69
Application	In-line splice kit for BTV heating cables	In-line splice kit for QTVR heating cables	In-line splice kit for KTV and XTV heating cables
Kit content	heat-shrinkable adhesive coated sleeves insulation sleeves solder sleeves crimps	heat-shrinkable adhesive coated sleeves insulation sleeves solder sleeves crimps	heat-shrinkable sleeves adhesive liners insulation sleeves high temperature solder crimps
Approvals	Ⓔx II 2 G/D EEx e II by PTB and Baseefa 2001 Ltd. according to EN 50 014, EN 50 019 DNV Certificate No.E-6967 (S-19 & S-21) DNV Certificate No.E-6968 (S-69)		

	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 information			
Part description	S-19	S-21	S-69
PN (Weight)	669854-000 (50 g)	358745-000 (50 g)	933309-000 (115 g)

Component overview of Polymer Insulated (PI) Heating Cable System

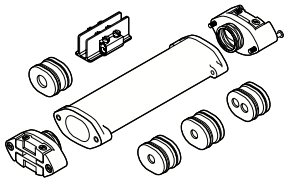
Typical configurations for PI heating cable systems



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

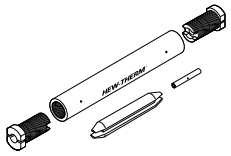
Single loop of PI heating cable with cold lead

Components and accessories for Polymer Insulated (PI) heating system



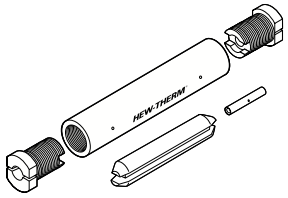
CS-150-UNI-PI

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 71.



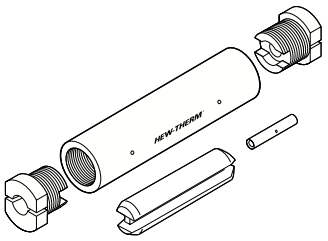
CS-150-2.5-PI

Under insulation 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 73.



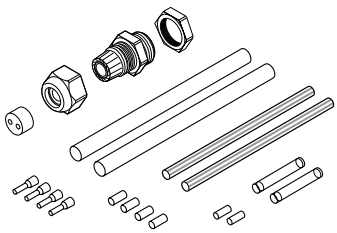
CS-150-6-PI

Under insulation 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 73.



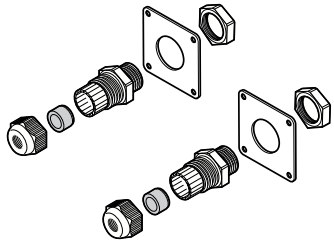
CS-150-25-PI

Under insulation 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 73.



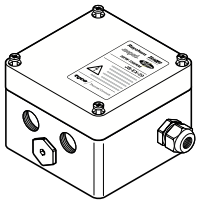
CS20-2.5-PI-NH

Non hazardous area under insulation 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 74.

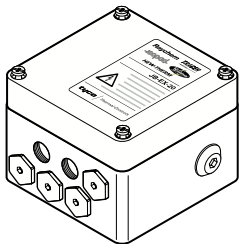


IEK-20-PI

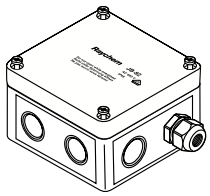
Insulation entry kit for two PI cold leads. Includes two cable glands (M20) and a mounting plate. Diameter range: 5-13 mm. Details on page 53.



JB-EX-20 — 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. Details on page 75.

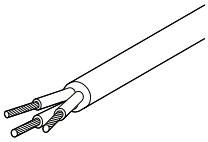


JB-EX-21 — Junction box, 6 x M20 and 1 x M32 entries for use in hazardous areas.
Power cable gland (M32) must be purchased separately.
Typical use as power-, splice- and end-box for 3-phase systems with PI/MI heating cables. Details on page 77.

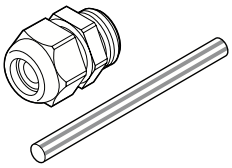


JB-82 — Junction box, 4 x M20/M25 pre-punched holes and M25 cable gland for use in non-hazardous areas. Details on page 45.

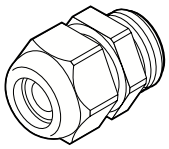
Mounting brackets for junction boxes and pipe straps are available, please refer to page 142.



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

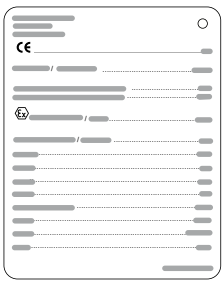


GL-44-M20-KIT — Cable gland EExe (M20), polyamide for use with PI cables with a diameter range of 5-13 mm. Also includes green/yellow sleeve (80mm) for braid.

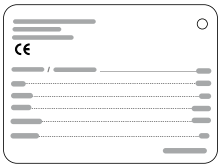


GL-45-M32 — Cable gland EExe (M32), polyamide for use with power cables with a diameter range of 12-21 mm.

HWA-PLUG-M20-EXE-PLASTIC — Stopping plug EExe (M20), polyamide, spare part for various junction boxes.

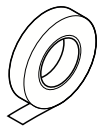


CW-LAB-EX-KIT — Circuit identification label for PI heating cables, aluminium, required for marking in hazardous area applications, includes cable tie.



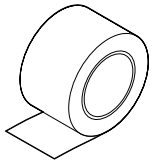
CW-LAB-NH — Circuit identification label for PI heating cables, aluminium, strongly recommended for marking in non-hazardous area applications.

LAB-I-01 — Self adhesive warning label: “Electrically traced” for proper marking of electrical heat-tracing systems. One label per 5 m of traced pipe.

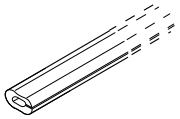


GT-66 — Glass fiber fixing tape for polymer insulated heating cables on pipes.
20 m/roll, width: 12 mm

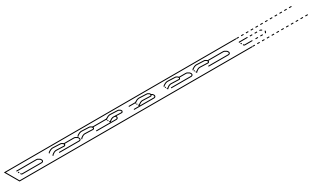
GS-54 — Glass fiber fixing tape for polymer insulated heating cables on pipes.
Low halogen, 16 m/roll, width: 12 mm



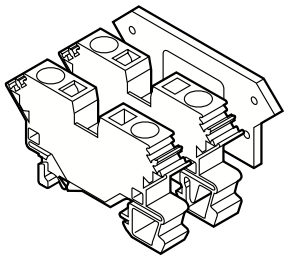
ATE-180 — Aluminium adhesive tape, low halogene, for polymer insulated cables on tanks and pipes. Min. installation temperature: 0°C.
55 m/roll, width: 63.5 mm.



G-02 — Silicone rubber sleeve, mechanically protects heating cables on edges, flanges, Insulation cladding. Cut to length on site.
1 m long, Temperature resistant up to 215°C.



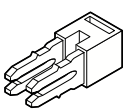
HARD-SPACER-SS-25MM-25M — Pre punched stainless steel strap, which allows fixed distances, when heating cables are attached to surfaces of bigger pipes and vessels.
Punch interval: 25 mm, length: 25 m.



HWA-WAGO-PHASE — Phase/neutral terminal (EEx e), spare part for various junction boxes, max. 10 mm^2 solid/stranded.

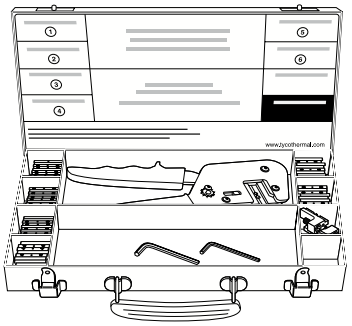
HWA-WAGO-EARTH — Earth terminal (EEx e), spare part for various junction boxes, max. 10 mm^2 solid/stranded.

HWA-WAGO-ENDPLATE — End plate for terminals HWA-WAGO-…, 10 mm^2 terminals, spare part.

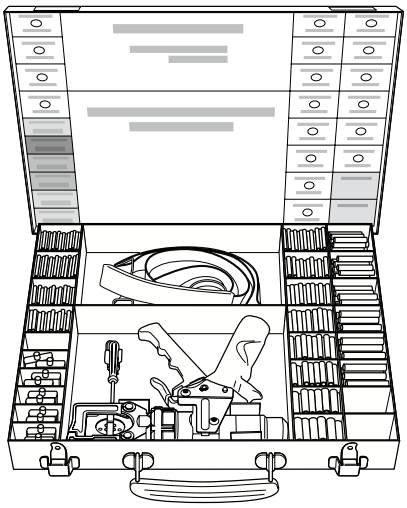


HWA-WAGO-JUMPER — Jumper to bridge terminals HWA-WAGO-…, 10 mm^2 terminals, spare part.

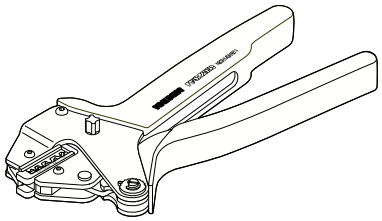
Special tools:



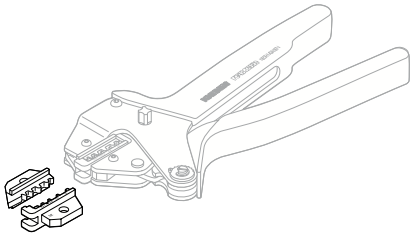
PI-TOOL-SET-01 — Metal toolbox containing a mechanical crimp tool, crimping dies and the crimps required for the connection of PI heating cables and cold leads in conjunction with the connection/splice kit type CS-150-2.5-PI (cross section up to 2.5 mm²). This tool is required for a reliable connection and is also recommended for maintenance purposes. Details on page 79.



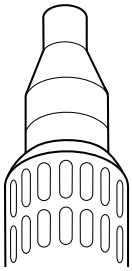
PI-TOOL-SET-02 — Metal toolbox containing a hydraulic crimp tool, crimping dies and the crimps required for the connection of PI heating cables and cold leads in conjunction with the connection/splice kits type CS-150-6-PI (cross section 4-6 mm²) and CS-150-25-PI (cross section 10-25 mm²). This tool is required for a reliable connection and is also recommended for maintenance purposes. Details on page 79.



CW-CT-KIT — Crimp tool with dies for installation of crimps for the connection/ splice kits type: CS20-2.5-…



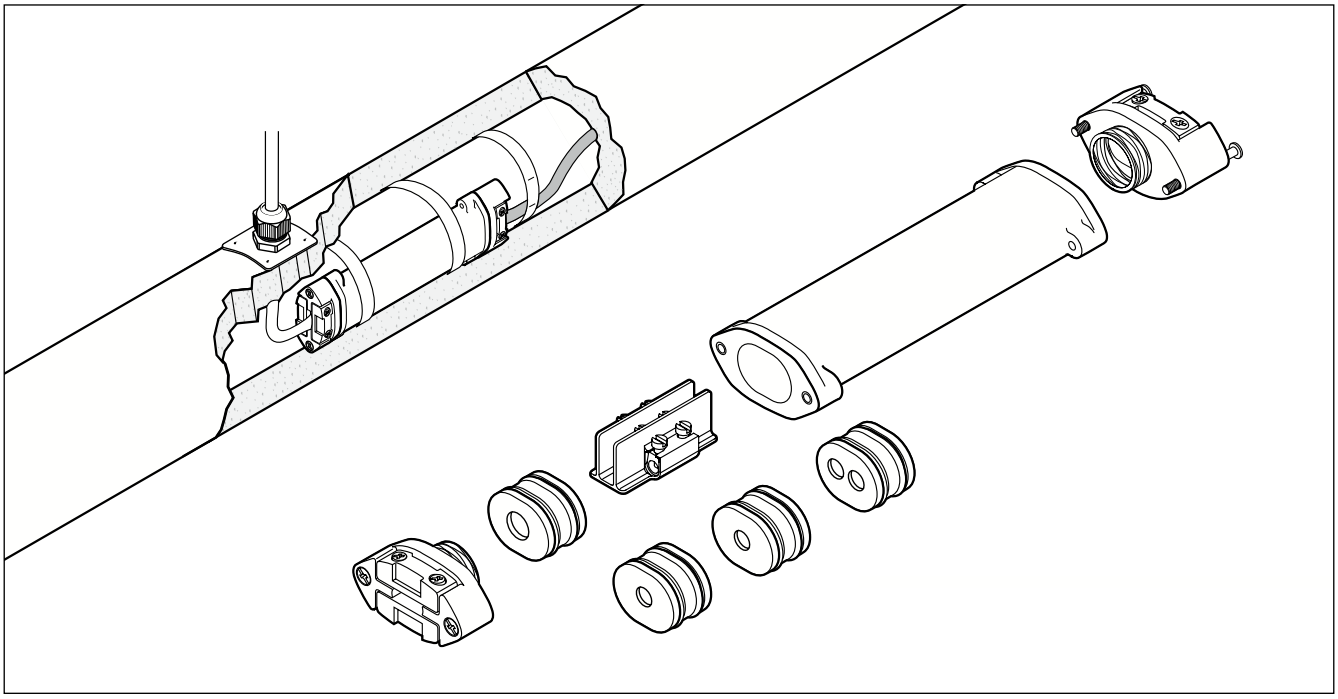
CW-CT-DIE — Spare set of dies for crimp tool CW-CT-KIT and crimps of 2.5 mm².



CV-1983-220V-3060W — High power heat gun for heat shrink components such as CS20-2.5-PI-NH
Power output: 3 kW

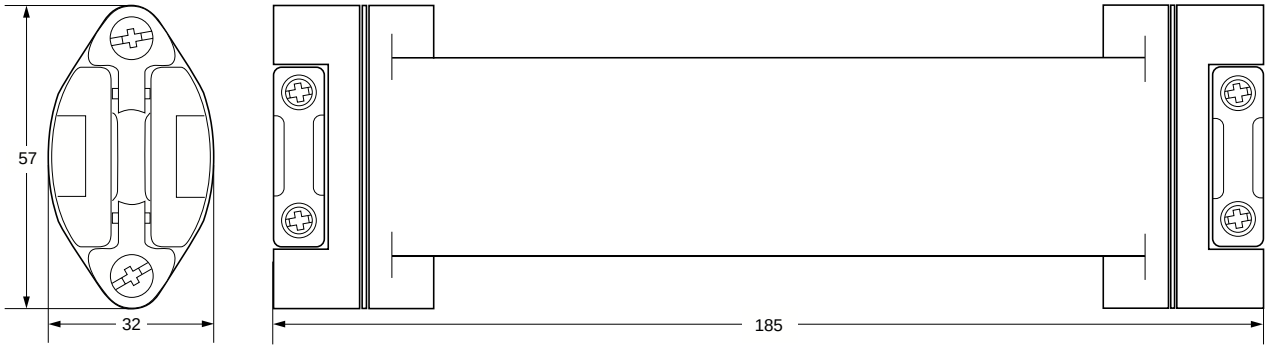
Low profile connection for PI heating cables

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 01 ATEX 1120 U Ex II 2 G/D EEx e II IP 66 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)



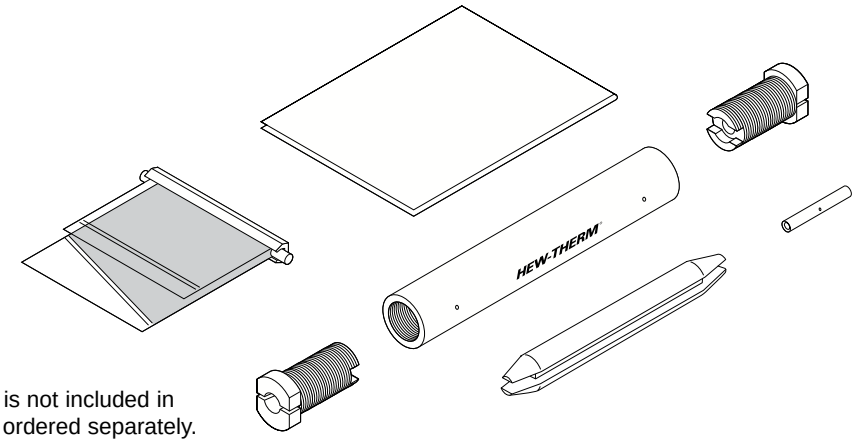
Heating cable types	XPI-NH, XPI-S polymer insulated (PI) series resistance cable, for other types contact Tyco Thermal Controls
Materials of construction	
Housing, connection	Glass fibre reinforced temperature resistant engineering plastic
Support ring, spacer, screws and spring	Stainless steel
Cable 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 V Variant L = 420 V
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, ∅ 7.8 - 12.5 mm^2 -> Single conductor cold lead, max. 1 x 4 mm^2, ∅ 3.2 to 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 cables diameter
	GL-44-M20-KIT hazardous area approved gland for 5-13 mm cables diameter
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)

CS-150-xx-PI

Ⓔx 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 (gas tight). 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).



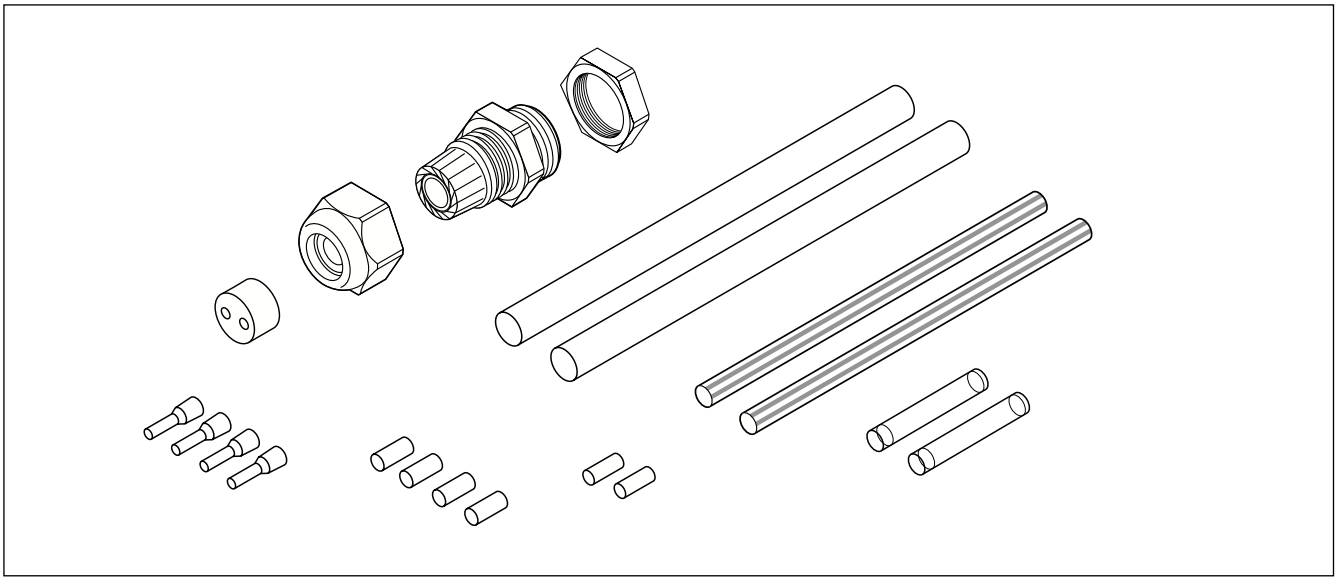
The conductor crimp is not included in the kit and has to be ordered separately.

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) multilingual installation instruction		
Approvals	PTB 03 ATEX 1128 U Ⓔx II 2 G/D EEx e II IP 65		
Dimensions	CS-150-2.5-PI: Overall length ~120 mm, ∅ ~17 mm CS-150-6-PI: Overall length ~120 mm, ∅ ~26 mm CS-150-25-PI: Overall length ~135 mm, ∅ ~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 V 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)		

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 as equivalent).

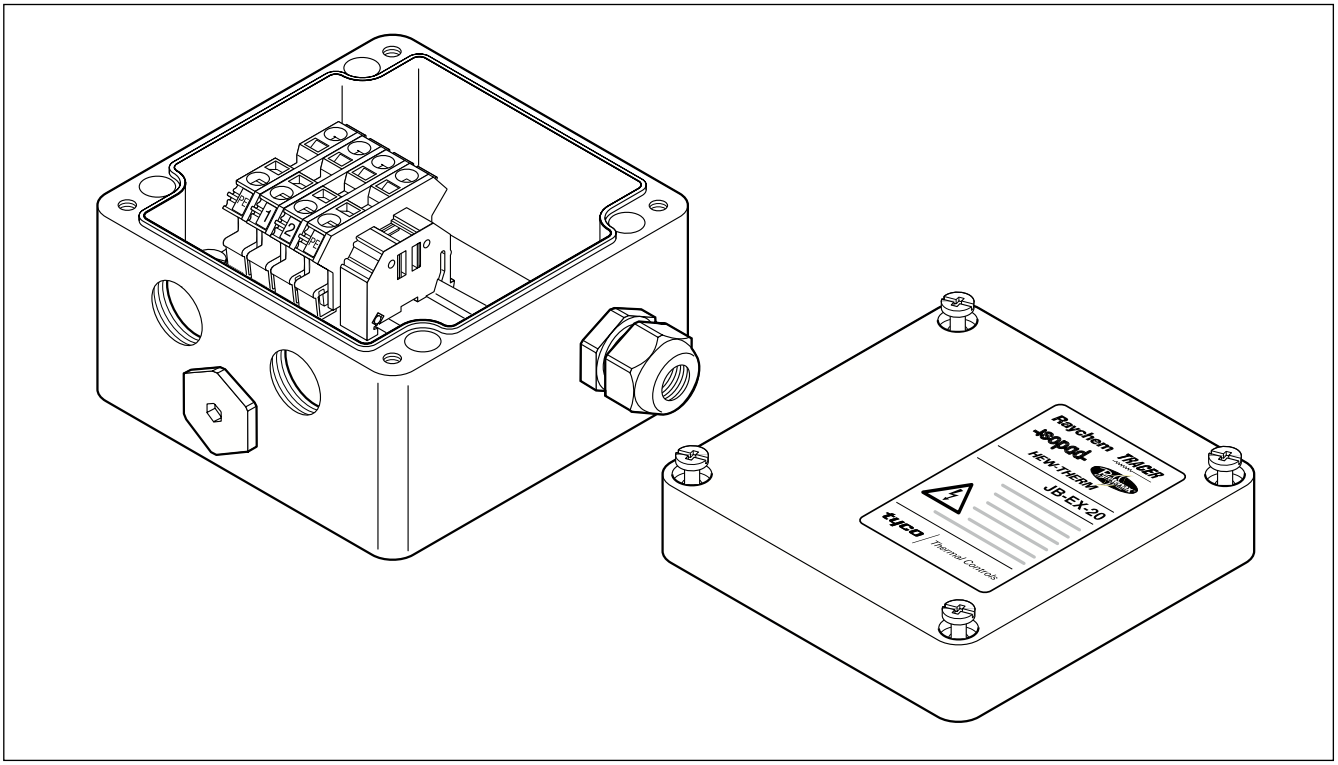


Application	Heat shrink based connection / splice kit for single core polymer series resistance heating cable.
Kit contents	4 x Heat shrinkable tubes (PTFE/FEP) 2 x green/yellow tube for the braid. 6 x Crimp connectors (crimp for conductor and braid) 1 x polyamide gland with dual hole sealing grommet M20 threaded, suitable for cables ranging from 4.8 to 7 mm diameter. Installation instruction
Approvals	Suitable for non hazardous area installation only.
Dimensions	Overall length ~130 mm, ∅ ~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 V
Max. operating current	25 A
Ordering details	
Order reference	CS20-2.5-PI-NH
Part number (Weight)	1244-000585 (0.1 kg)

JB-EX-20

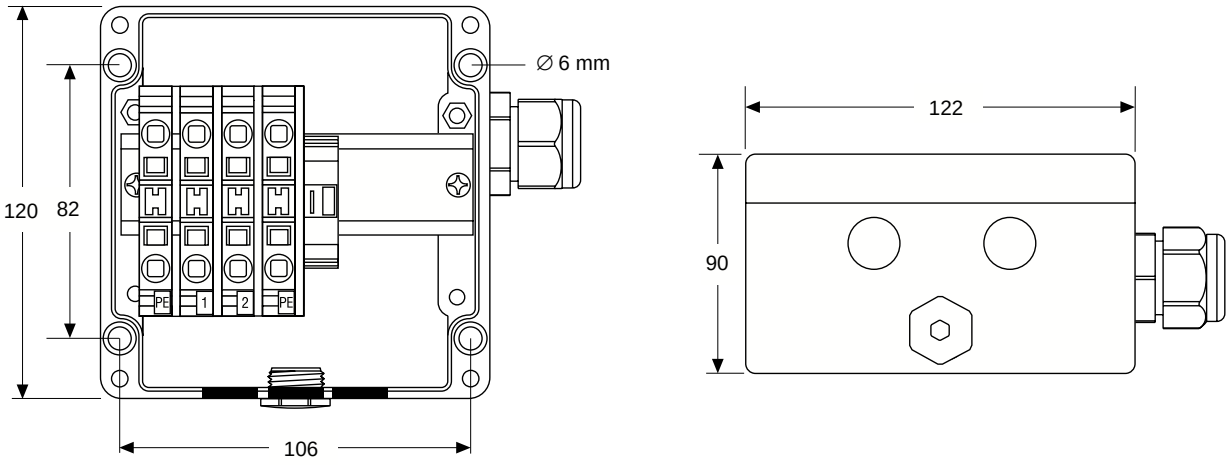
Multi purpose junction box

ATEX approved 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. Depending on the configuration of the system, the box can accommodate multiple 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 cage clamp terminals. The box can be either wall or pipe mounted via the four holes molded in the base of the box. For pipe mounting use one of the standard support brackets.



Typical use	Power supply box, end box (star) for heating cables using M20 connection kits
Entries	3 x M20 1 x M25
Kit contents	Junction box with cage clamp terminals on DIN rail 1 x M20 stopping plugs 2 x M20 rain plug (temporary) 1 x terminal jumper allowing various wiring configurations (remove terminal plate) 1 x M25 Hazardous area approved cable gland for power cables with ∅ of 8 to 17 mm
Approvals	PTB 00 ATEX 1002 Ex II 2 G/D EEx e II T6 IP 66
Materials of construction	
Box & lid	Glass filled polyester
Sealing gasket	Silicone rubber
Lid fixing screws	Stainless steel (captive)
Ingress protection	IP66
Ambient temperature range	–55°C to +55°C

Dimensions (in mm)



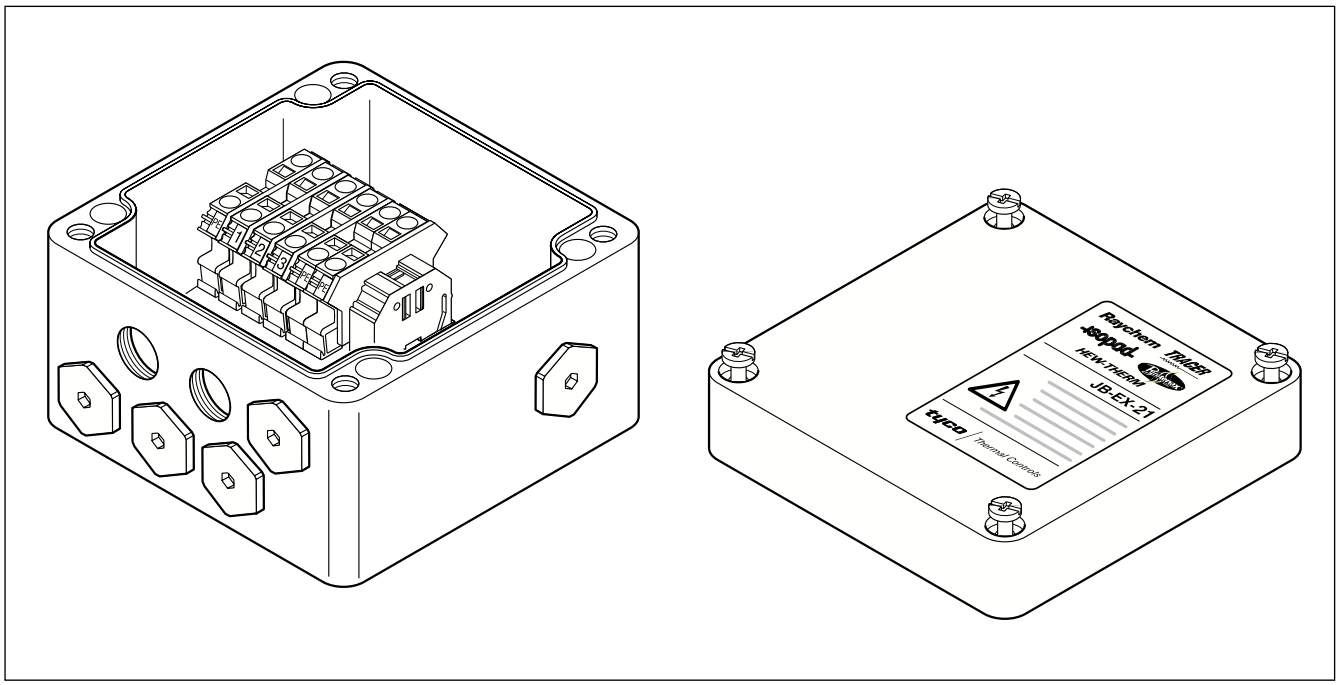
Terminals		
Quantity	4 pc. cage clamp	
Labeling	1, 2 + 2 x PE	
Maximum conductor size	10 mm^2 (solid & stranded)	
Maximum operating voltage	AC 550 V	
Maximum operating current	53 A	
Accessories (to be ordered separately)		
Support bracket	SB-100, SB-101	
Gland for PI cold leads	GL-44-M20-KIT hazardous area approved gland for cables ∅ 5-13 mm	
Gland for power cable	GL-45-M32 hazardous area approved gland for cables ∅ 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-20	
Part number (Weight)	1244-000579 (1.2 kg)	

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

JB-EX-21

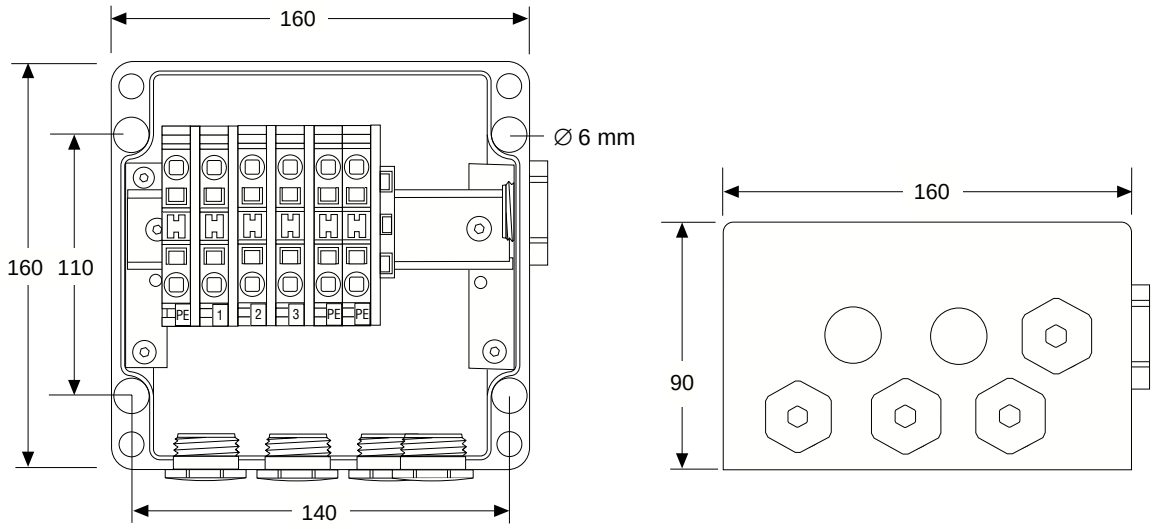
Ⓔx Junction box

ATEX approved 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 cage clamp terminals.
The box can be either wall or pipe mounted via the four holes molded 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 Ⓔx II 2 G/D EEx e II T6 IP 66
Materials of construction	
Box & lid	Glass filled polyester
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	Cage clamp	
Labeling	1, 2, 3, 3 x PE	
Maximum conductor size	10 mm² (solid & stranded)	
Maximum operating voltage	AC 550 V	
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 ∅ 5-13 mm	
Gland for power cable	GL-45-M32 hazardous area approved gland for cables ∅ 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

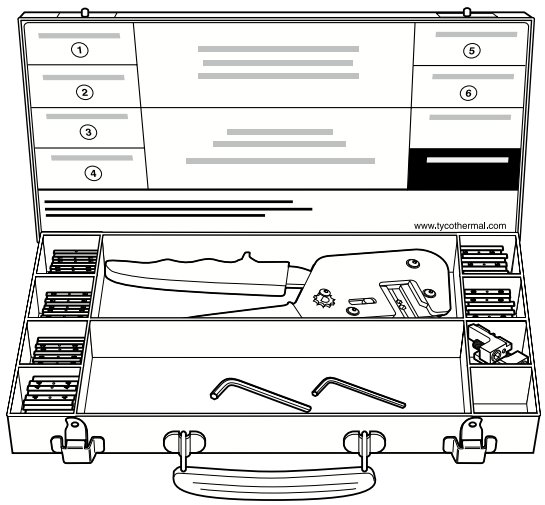
Ordering details	
Order reference	JB-EX-21
Part number (Weight)	1244-000579 (1.2 kg)

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

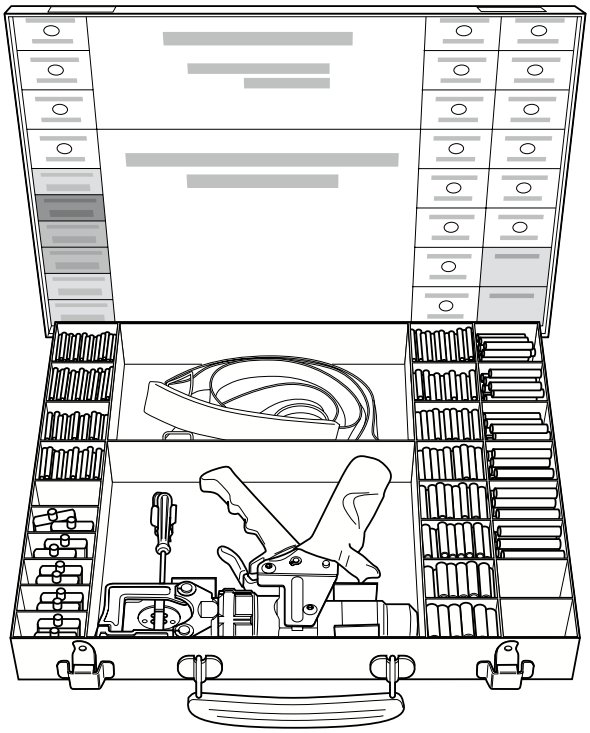
PI-TOOL-SET-xx

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 as well as to splice two PI heating cables. Electrical continuation is maintained via specially engineered crimps, that 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 ratcheting type 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 die	CD-PI-01, CD-PI-02	CD-PI-03, CD-PI-04, CD-PI-05, CD-PI-06
Crimps	CRP-PI-01 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		
Order reference (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-01 CD-PI-02	1244-000550 1244-000554
PI-TOOL-02	1244-000551	CD-PI-03 CD-PI-04 CD-PI-05 CD-PI-06	1244-000552 1244-000553 1244-000555 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 / 200 / 380 / 480 600 / 700 / 810 1000 / 1440 / 1750 2000 / 3000 / 4000 4400 / 5600 / 7000 8000	65 / 200 / 380 / 480 600 / 700 / 810 1000 / 1440 / 1750 2000 / 3000 / 4000 4400 / 5600 / 7000 8000	CRP-PI-01	1244-000558	CD-PI-01 (white)	PI-TOOL-01
	11.7	65 / 200 / 380 / 480 600 / 700 / 810 1000 / 1440 / 1750 2000 / 3000 / 4000 4400 / 5600 / 7000 8000	CRP-PI-02	1244-000559		
	11.7 / 15 / 17.8 / 25 50 / 80 / 100 / 150 320	11.7 / 15 / 17.8 / 25 50 / 80 / 100 / 150 320	CRP-PI-03	1244-000544		
	7 / 10	65 / 200 / 380 / 480 600 / 700 / 810 1000 / 1440 / 1750 2000 / 3000 / 4000 4400 / 5600 / 7000 8000	CRP-PI-04	1244-000560	CD-PI-02 (black)	
	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 73)

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	10 / 11.7 / 15	CRP-PI-07	1244-000563	CD-PI-03 (Grey)	PI-TOOL-02
	4.4	7	CRP-PI-08	1244-000564		
	4.4	4.4	CRP-PI-09	1244-000546		
	2.9	10 / 11.7 / 31.5 / 100	CRP-PI-10	1244-000565	CD-PI-04 (Blue)	
	2.9	7	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	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	CD-PI-05 (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 73)

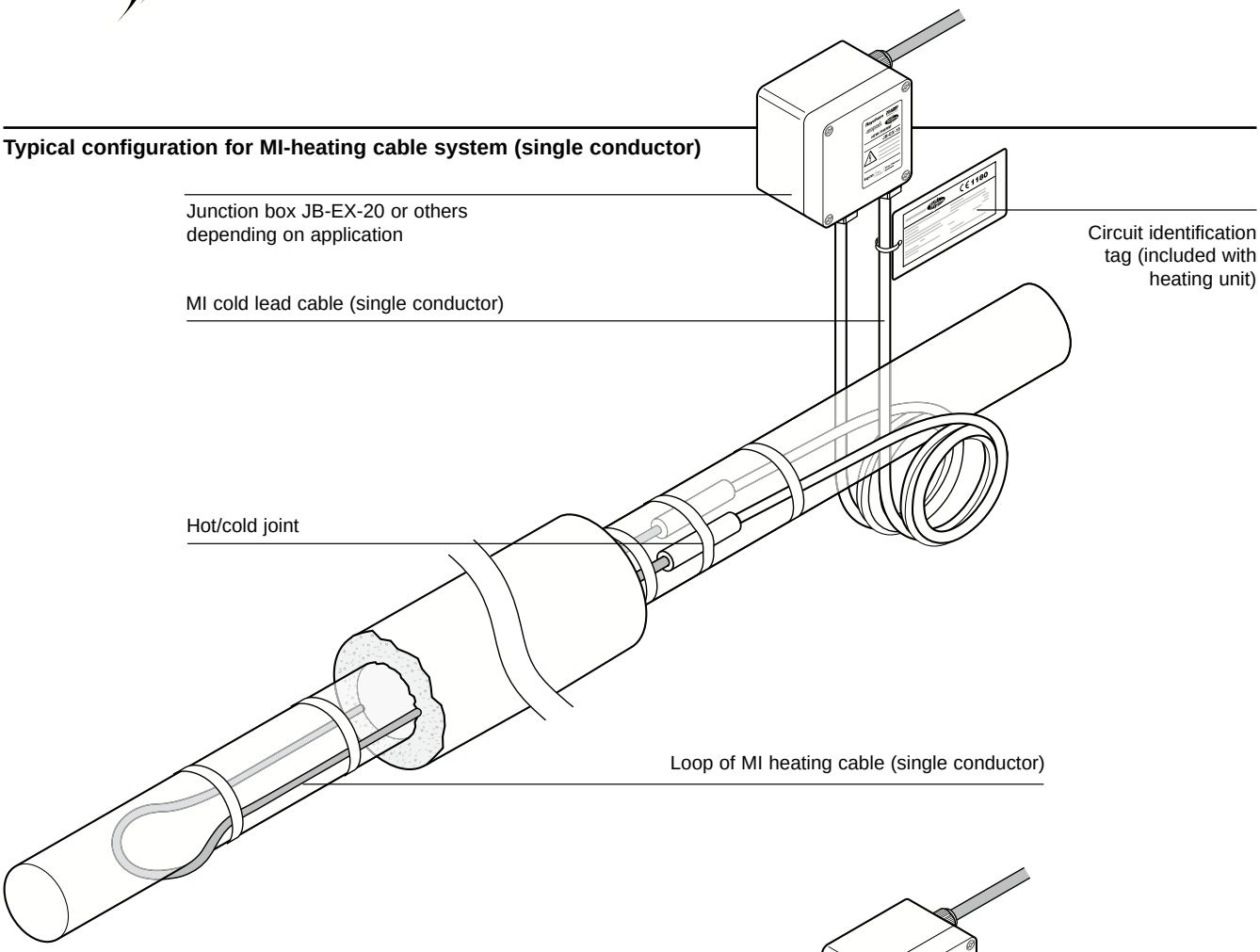
The crimp for the electrical connection of the braid is included in the CS-150-xx-PI kit

Table 3: CS-150-xx-PI braid crimps

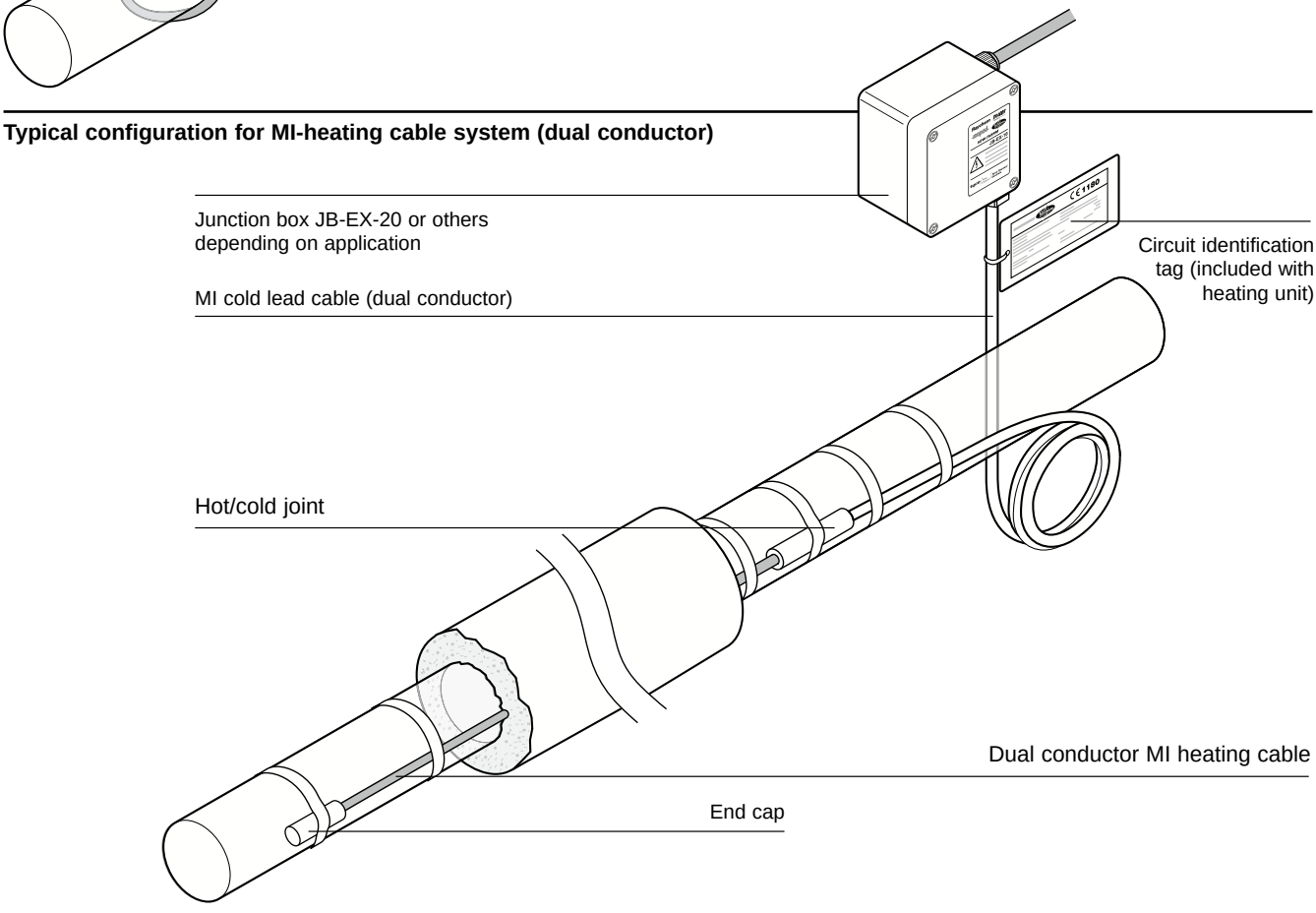
Kit	Braid crimp	Partnumber	Die	Tool
CS-150-2.5-PI	CRP-BR-2.5	1244-000994	CD-PI-02	PI-TOOL-01
CS-150-6-PI	CRP-BR-6	1244-000996	CD-PI-03	PI-TOOL-02
CS-150-25-PI	CRP-BR-25	1244-000995	CD-PI-04	PI-TOOL-02

Component overview of Mineral Insulated (MI) heating cable system

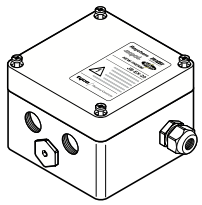
Typical configuration for MI-heating cable system (single conductor)



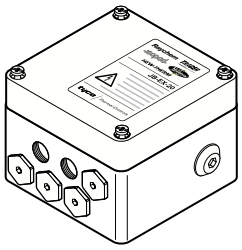
Typical configuration for MI-heating cable system (dual conductor)



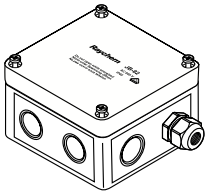
Junction boxes



JB-EX-20 — 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. Details on page 75.

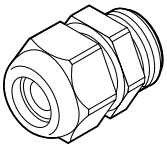


JB-EX-21 — Junction box, 6 x M20 and 1 x M32 entries for use in hazardous areas. Power cable gland M32 must be purchased separately.
Typical use as power-, splice- and end-box for 3-phase systems with PI/MI heating systems. Details on page 77.



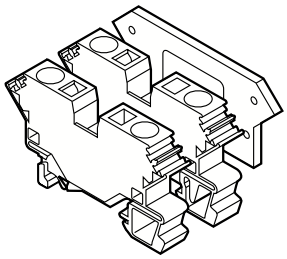
JB-82 — Junction box, 4 x M20/M25 pre-punched holes and M25 cable gland for use in non-hazardous areas. Details on page 45.

Mounting brackets for junction boxes and pipe straps are available, please refer to page 142.



GL-45-M32 — Cable gland EExe (M32), polyamide for use with power cables with a diameter range of 12-21 mm.

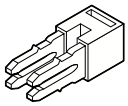
HWA-PLUG-M20-EXE-PLASTIC — Stopping plug EExe (M20), polyamide, spare part for various junction boxes.



HWA-WAGO-PHASE — Phase/neutral terminal (EEx e), spare part for various junction boxes, max. 10 mm² solid/stranded.

HWA-WAGO-EARTH — Earth terminal (EEx e), spare part for various junction boxes, max. 10 mm² solid/stranded.

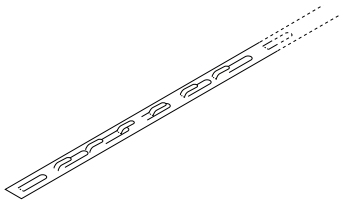
HWA-WAGO-ENDPLATE — End plate for terminals HWA-WAGO-…, 10 mm² terminals, spare part.



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

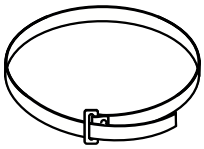
Fixing / Installation Materials

Pre punched strap, which controls spacing distances when heating cables are attached to surfaces of bigger pipes and vessels. Punch interval: 25 mm
Available in different materials – copper, mild steel and stainless steel. Only use stainless steel strap on stainless steel pipes/vessels.



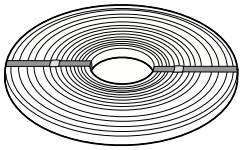
References	Material, length
SNMC	Copper 20 m
SNM	Mild steel 20 m
HARD-SPACER-SS-25mm-25m	Stainless steel 25 m

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



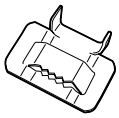
Available Pipe Straps

Part No.	Pipe Diameter	Packing Qty
PB 125	to 1 1/4” (32 mm)	50 pc
PB 300	1 1/2” to 3” (38-75 mm)	35 pc
PB 600	3 1/2” 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

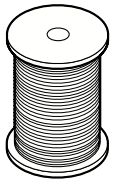


SNLS — Plain stainless steel banding / strip for holding MI cables in place on pipes. 30 m roll. Secured with buckles.

Allowances as per table below.



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

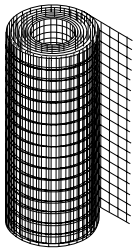


RMI-TW — Tie wire for fastening steel heating cables on pipes. Especially suitable for irregular shaped objects such as pumps, valves, flanges. Supplied in 50 m reels.
Do not use with copper or cupro nickel sheathed heating cables; use straps wherever possible.

Allowances as per table below.

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 — Zinc-plated Metal Mesh for holding MI heating cables in place on pipes, tanks or other equipment.
Supplied in 25 m rolls (approx. width 1m)

FT-20 — Stainless-steel Metal Mesh for holding MI heating cable in place on pipes, tanks or other equipment.
Supplied in 25 m rolls (approx. width 1m)

Warning Labels

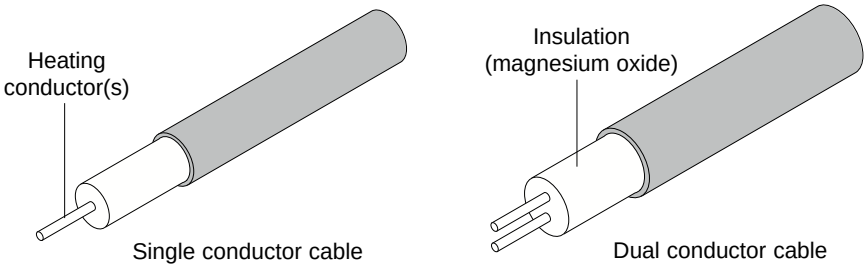
LAB-I-01 — Self adhesive warning label: “Electrically traced” for proper marking of electrical trace heating systems. One label per 5 m of traced pipe.
Attach to outside of thermal insulation weather barrier on both sides of pipe and also at equipment such as valves, pumps requiring periodic maintenance.
Labels in other languages are available, refer to page 144

Temperature Controls — See control and monitoring product range, on page 90 including line sensing thermostats.

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 on pages 26-37.

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
H	Conductor material: (examples)	C=Copper H=Copper Alloy Q=Nichrome and a variety of other metal alloys
H	Oversheath material (optional):	H=HDPE P=FEP
1	Number of conductors:	1 or 2
L	Normal operating voltages:	L=up to 300 VAC M=up to 300/500 VAC N=up to 600 VAC
2000	Conductor resistance	in Ω/km - i.e. 2000=2000 Ω/km
BK	Oversheath colour (optional):	BK=Black OR=Orange

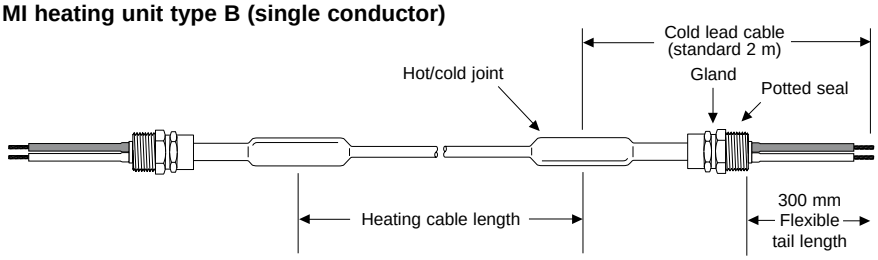
Nomenclature for MI heating systems - MI heating units

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 very critical for a safe and reliable operation.

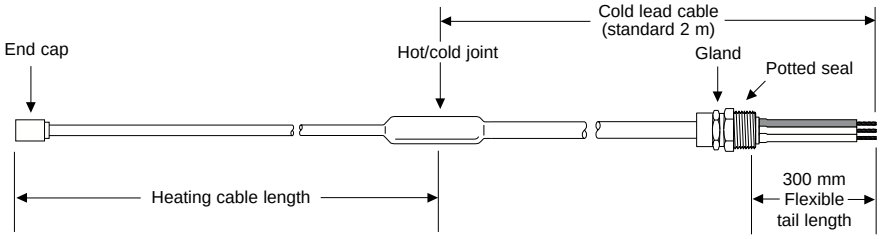
Tyco Thermal Controls strongly recommends the use of factory-terminated heating units, which guarantee a consistently high level of quality. For use in hazardous areas, MI heating units need to be assembled by Tyco Thermal Controls or an authorized sub-manufacturer.

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

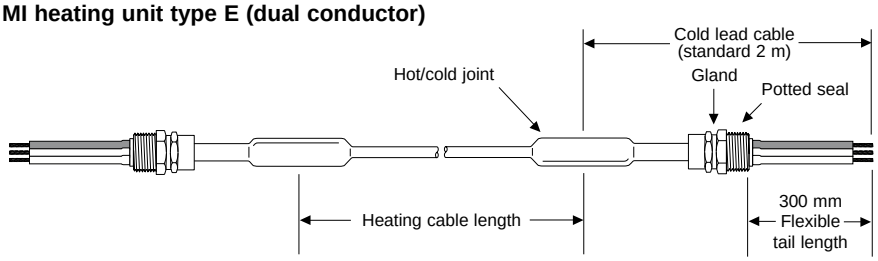
MI heating unit type B (single conductor)



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

- Area classification – EX, ORD
- Gland size M20, M25, etc...
- Hot/cold joint material type – X -stainless steel, Y - brass, LW - laser welded
- Cold lead size and sheath type (see table on next page)
- Cold lead length M – metres (standard is 2m)
- Heating unit – voltage
- Heating unit – total wattage in W
- Unit length M - metres
- Heating cable reference
- Heating cable unit type - Type B, D or E

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
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
2.5	1	CC1H2.5	5.3	34	M20
		DC1H2.5	5.3	34	M20
		SC1H2.5	5.3	34	M20
		AC1H2.5	5.3	34	M20
2.5	2	AC2H2.5	8.7	28	M20
6.0	1	CC1H6	6.4	57	M20
		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
		AC1H16	8.3	102	M25
25.0	1	CC1H25	9.6	133	M32
		AC1H25	9.6	133	M32
35.0	1	CC1H35	10.7	163	M32

Brass glands are standard on all heating units.

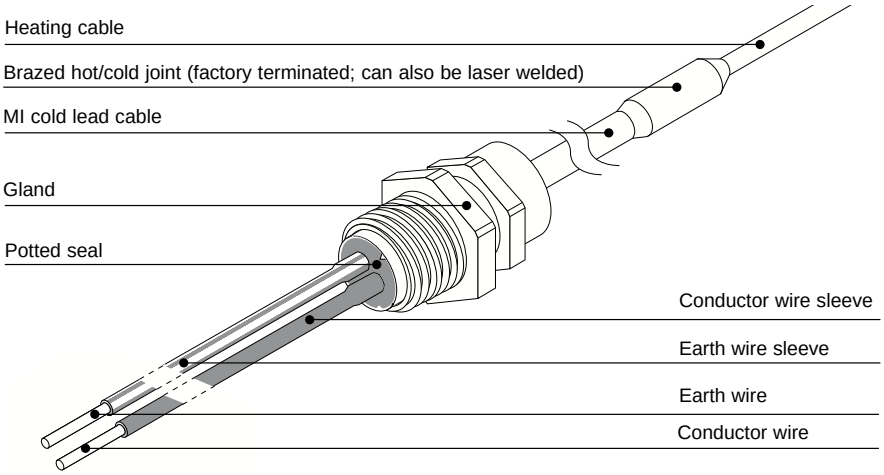
The cold lead selection table does not show all possible combinations (other gland materials, sizes, optional PVC shrouds, etc.); contact Tyco Thermal Controls for more details.

Accessories for the termination of MI heating units

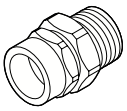
For the termination of bulk MI heating cables, a range of accessories is available. The termination of MI heating units requires adequate training and sufficient experience. In particular for hazardous area applications, factory termination of the MI heating units (as described on page 86) is strongly 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.com or contact Tyco Thermal Controls.

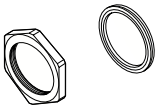
Typical termination of MI heating cable



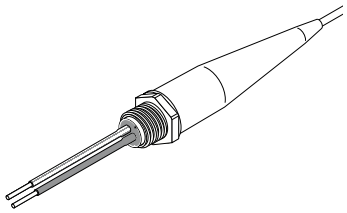
Glands, seals, joints, ferrules



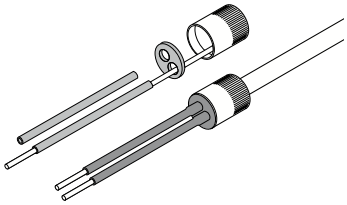
RGM — Metric brass glands are standard – more details on accessories for mineral insulated heating cables, refer to datasheet for ***MI Termination Accessories*** (reference DOC-606).



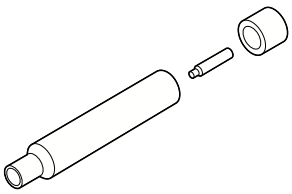
RLM20	M20 brass lock nuts for securing glands
RLM25	M25 brass lock nuts for securing glands
SATP20	Fibre washers for glands, M20
SATP25	Fibre washers for glands, M25



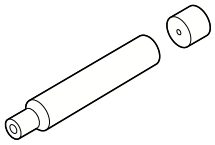
RHG20	M20 gland shrouds for enhanced gland protection
RHG25	M25 gland shrouds for enhanced gland protection



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	Hot/cold joint for brazed connection of MI heating cables and cold leads. Joints are factory drilled for best fit of cable diameters. More details, refer to datasheet for ***MI Termination Accessories*** (reference DOC-606).



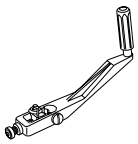
SJK-PILOT-...	Universal hot/cold joint for brazed connection of MI heating cables and cold leads. Universal joints have a pilot hole and must be drilled to diameter during termination operation to match exact size. For more details, refer to datasheet for ***MI Termination Accessories*** (reference DOC-606). 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.

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).

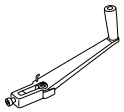
Fabrication Consumables

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

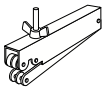
Tools



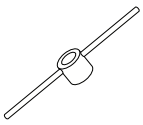
ZSU	Large stripping tool – all cable sizes, spare blades ZSUB. For Copper and Cupro-Nickel cables.



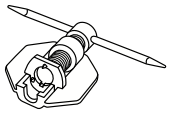
ZSUS	Small stripping tool – cable ∅ < 9 mm, spare blades ZSUSB. For Copper and Cupro-Nickel cables.



ZR	Ringing tool for cable ∅ < 9 mm.

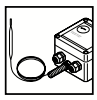


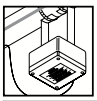
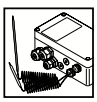
ZPM20 ZPM25	Potting tool, ensures quick and accurate screwing on of the brass pot and is used in conjunction with the appropriate RGM cable gland (M20 or M25).



ZDC20 ZDC25	Crimping tool for 20 and 25 mm seals

SURFACE SENSING

Non-hazardous	Description	Temp. Setting Controller	*Exposure Temp. sensor*	Temp. Setting Limiter	*Exposure temp. sensor*	Page
 **Electronic**	AT-TS-13	–5°C +15°C	*–20°C +80°C*			99
	AT-TS-14	0°C +120°C	*–20°C +160°C*			99
	RAYSTAT-CONTROL-10	0°C +150°C	*–40°C +150°C*			102
 **Panelmount**	TCONTROL-CONT-02	configurable between –1999 and +9999	*depending on type of sensor used **			114
	TCON-CSD/20	–200°C +500°C	*depending on type of sensor used **			117
	HTC-915-CONT	–60°C to +570°C	*depending on type of sensor used **			119
	HTC-915-LIM	–	*depending on type of sensor used **	+20°C to +450°C (T1 to T6)		123
 **Mechanical**	T-M-10-S/0+50C	0°C +50°C	*–40°C +60°C*			111
	T-M-10-S/0+200C	0°C +200°C	*–20°C +230°C*			111
	T-M-10-S/+50+300C	+50°C +300°C	*–20°C +345°C*			111
 **Mechanical** Dual sensing	T-M-20-S/0+50C	0°C +50°C	*–40°C +60°C*	+20°C +150°C	*–40°C +170°C*	108
	T-M-20-S/0+200C	0°C +200°C	*–20°C +230°C*	+130°C +200°C	*–20°C +230°C*	108
	T-M-20-S/+50+300C	+50°C +300°C	*–20°C +345°C*	+20°C +400°C	*–40°C +500°C*	108

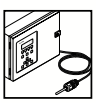
Hazardous	Description	Temp. Setting Controller	*Exposure Temp. sensor*	Temp. Setting Limiter	*Exposure temp. sensor*	
 **Electronic**	RAYSTAT-EX-03	0°C +499°C	*–50°C +585°C*			94
Mechanical	RAYSTAT-EX-02	–4°C +163°C	*–50°C +215°C*			91
 **Mechanical** Dual sensing	T-M-20-S/+5+215C/EX	+5°C +215°C	*–30°C +250°C*	+40°C +300°C	*–30°C +330°C*	96
	T-M-20-S/+70+350C/EX	+70°C +350°C	*–30°C +380°C*	+70°C +350°C	*–30°C +380°C*	96

AMBIENT SENSING

Non-hazardous	Description	Temp. Setting Controller	
 **Electronic**	AT-TS-13	–5°C +15°C	99
	RAYSTAT-ECO-10	0°C +30°C	105
 **Mechanical**	T-M-10-S/0+50C	0°C +50°C	111

Hazardous	Description	Temp. Setting Controller	
 **Electronic**	RAYSTAT-EX-04	0°C +49°C	94

MULTI CIRCUIT TRACE HEATING CONTROLLER

	Description	Temp. Setting Controller	*Exposure Temp. sensor*	
	MoniTrace system	selectable depending configuration between –7°C and 316°C	*depending on the control mode chosen and the type of sensor used. **	126

(*) These systems can depending on the application be used with the following sensors: MONI-PT100-EXE and MONI-PT100-EXE-SENSOR (hazardous area), MONI-PT100-NH (ordinary area), MONI-PT100-4/20MA (intrinsic safe, TCONTROL-CONT-02 only)

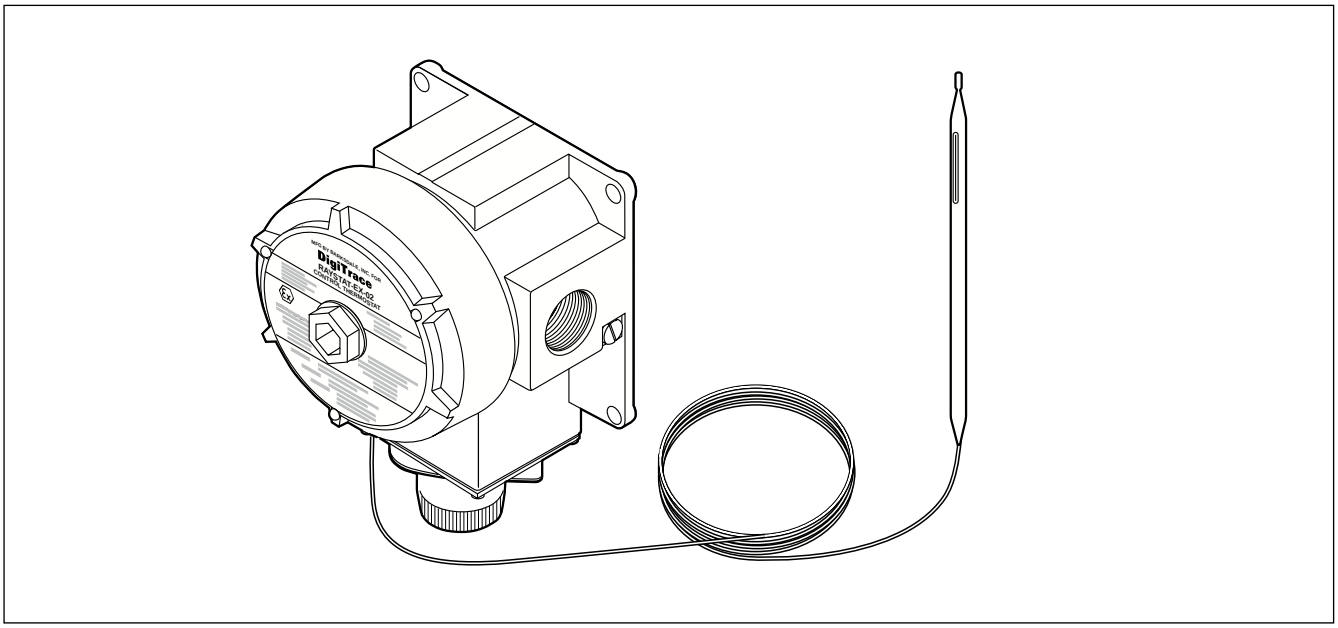
RAYSTAT-EX-02

Surface sensing mechanical thermostat

This EEx d approved surface sensing thermostat provides temperature control for all Raychem BTV, QTVR, KTV 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.

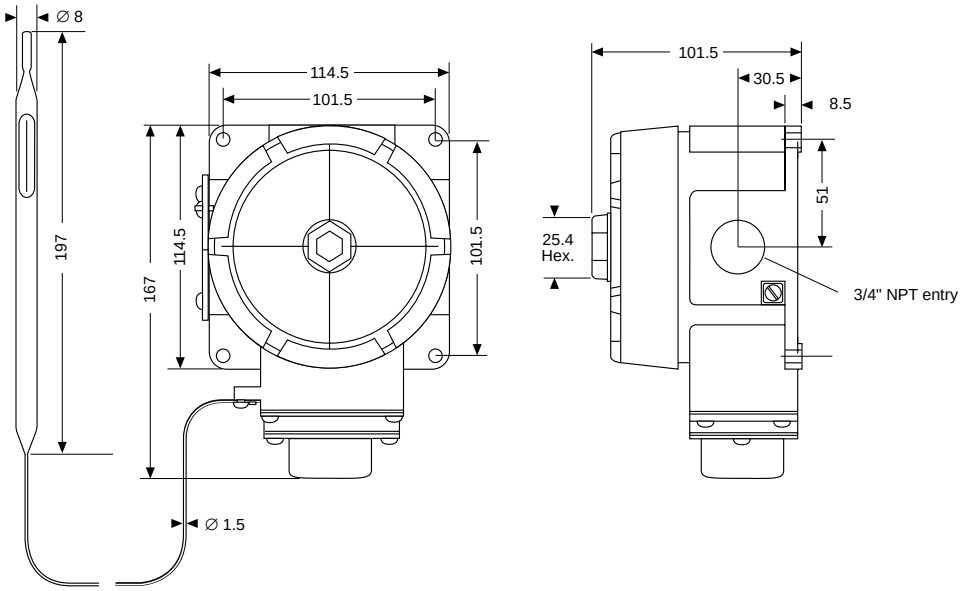
The switching current capacity is 22 A, but this thermostat has a continuous current limit of 32 A allowing it to be used with longer lengths of self-regulating heating cable. It has a single pole change-over switch with volt-free contacts. Cable entry is through a single 3/4” NPT thread entry. Raychem 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
Approval certification	LCIE02ATEX6026 Ex II 2 G/D EExd II C, IP 65, T80°C
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)

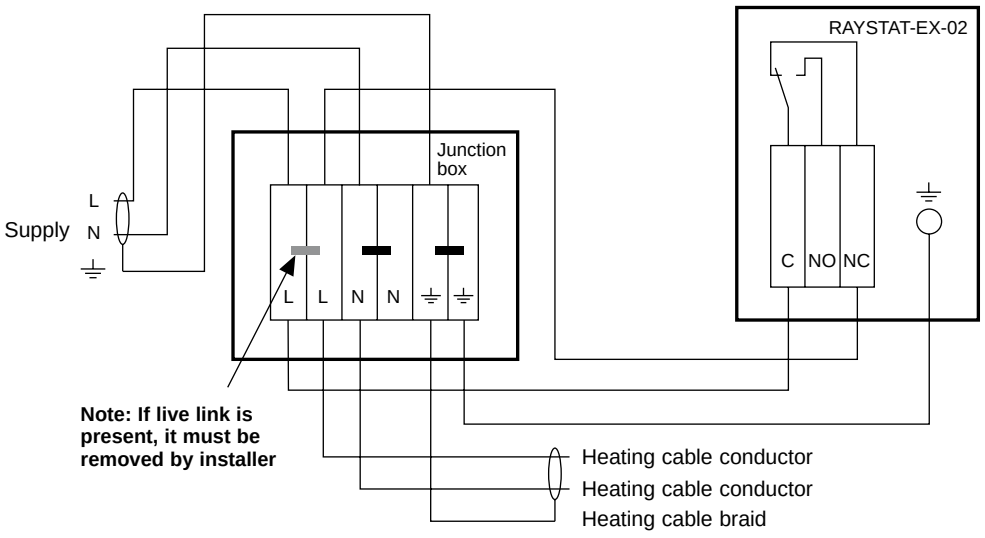


Switching	
Type	Single pole change over volt free contacts (SPDT)
Rating	22 A at 250 VAC, switching (100.000 cycles), 32 A continuous current limit

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 mm^2 conductors
Internal earth	Single bolt for 1 to 4 mm^2 conductors
External earth	Single bolt and clamp for 1 to 4 mm^2 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 32 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 32 A, RAYSTAT-EX-02 must NOT be connected for direct switching.

Heating cable reference

Switching temp. (°C)	3BTV2-CTI-CR	5BTV2-CTI-CR	8BTV2-CTI-CR	10BTV2-CTI-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
	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 or surface mounting with 4 fixing holes (M6) on 101.5 x 101.5 mm centres

Accessories

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

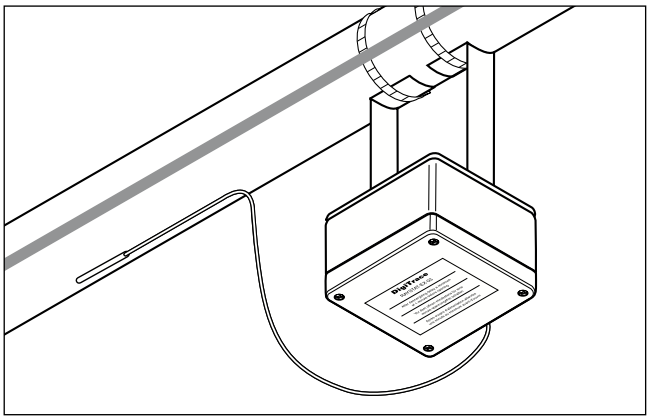
Part description	RAYSTAT-EX-02
PN (Weight)	404385-000 (1770 g)

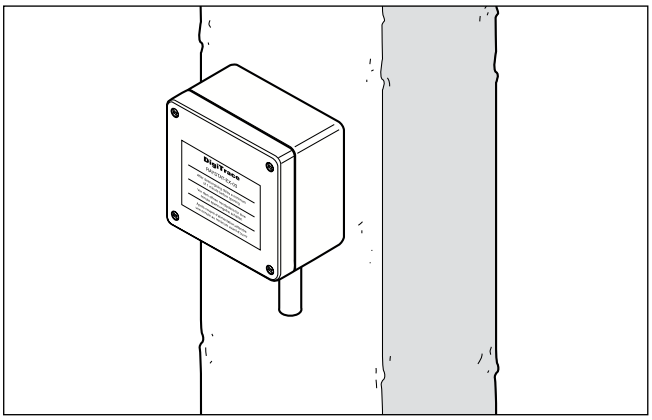
Electronic thermostats

These electronic surface sensing and ambient thermostats provide accurate temperature control for heating cables. The thermostats are approved to the requirements of EN 50 014, EN 50 019, EN 50 020 and EN 50 028. The units can be supplied at nominal voltages of either 110V 50/60 Hz or 230V 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.

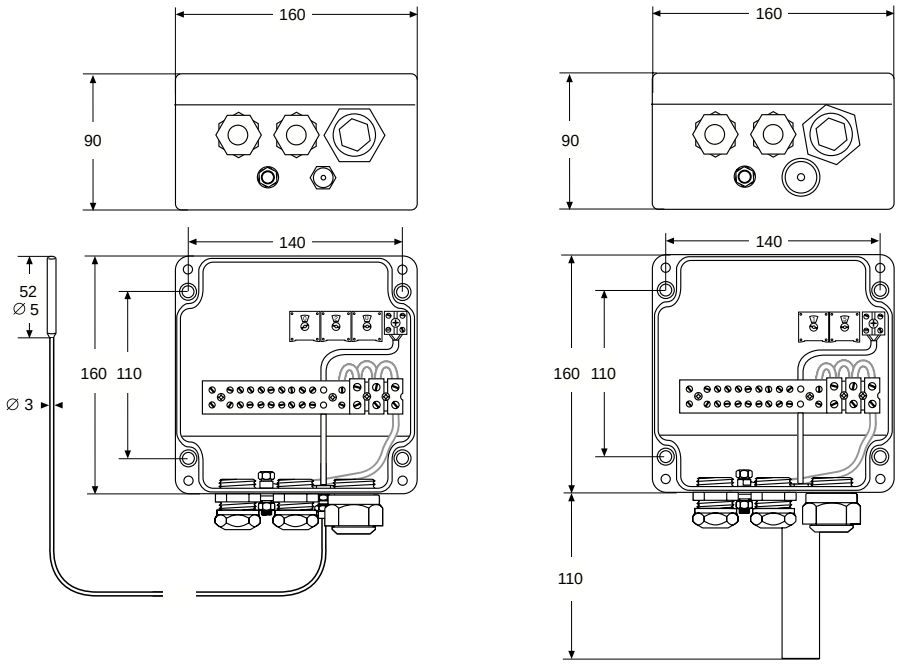




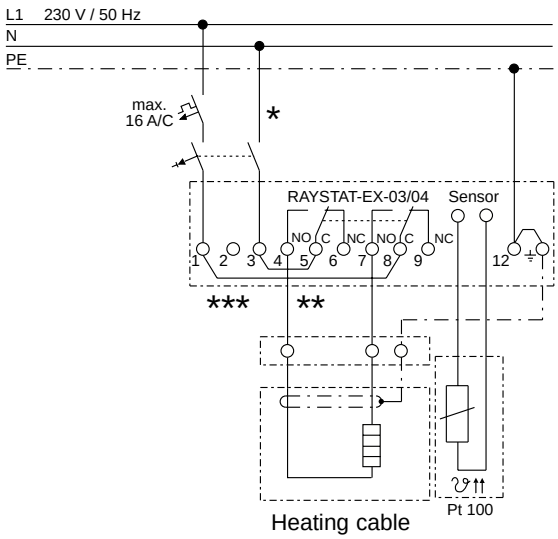
	RAYSTAT-EX-03	RAYSTAT-EX-04
Application	Surface sensing	Ambient sensing
Thermostat		
Area of use	Hazardous area: Zone 1 or Zone 2 (Gas) or Zone 21 or Zone 22 (Dust) Ordinary	
Approval certification	Baseefa03ATEX0695X Ⓔx II 2 G/D T=85°C EEx emia IIC T6 (Ta –50°C to +55°C)	
Product specification		
Temperature 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)
Switching capacity	16 A 110 V +/-10% 50/60 Hz 16 A 230/254 V +/-10 % 50/60 Hz resistive load	16 A 110 V +/-10% 50/60 Hz 16 A 230/254 V +/-10 % 50/60 Hz resistive load
Ambient temperature range	–50°C to +55°C	–50°C to +55°C
Supply voltage	110 V +/-10 % 50/60 Hz 230/254 V +/-10 % 50/60 Hz	110 V +/-10 % 50/60 Hz 230/254 V +/-10 % 50/60 Hz
Internal Power Consumption	110V ~ 4 VA 230/254 V ~ 3 VA	
Terminal size	max. 4 mm^2	max. 4 mm^2

	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

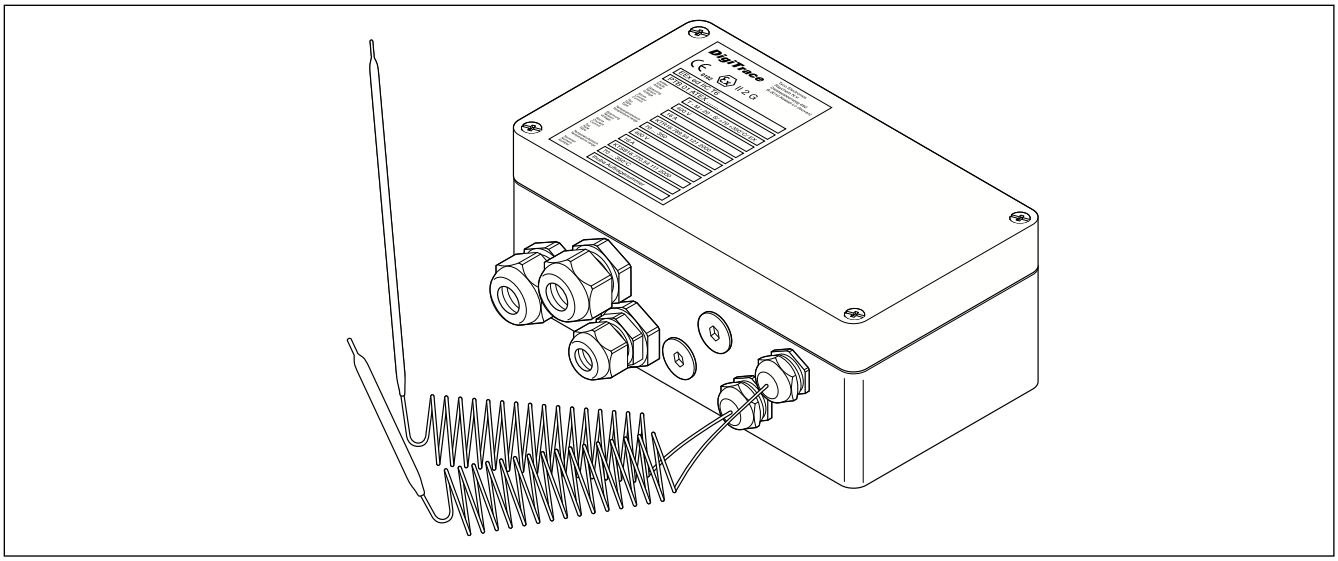
Cable entries	2 x M20 glands (cable ∅ 7.5 – 13 mm) 1 x M25 with M25(M) / M20(F) adaptor and (M20) plug	2 x M20 glands (cable ∅ 7.5 – 13 mm) 1 x M25 with M25(M) / M20(F) adaptor and (M20) plug
Sensor	2 wire Pt 100, stainless steel sensor, 2 m long	2 wire Pt 100, stainless steel sensor, complete with wind shield
Mounting method	Raychem support bracket SB-100 or SB-101 or surface mounting with 4 fixing holes on 110x140 mm centres	Raychem support bracket SB-100 or SB-101 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)

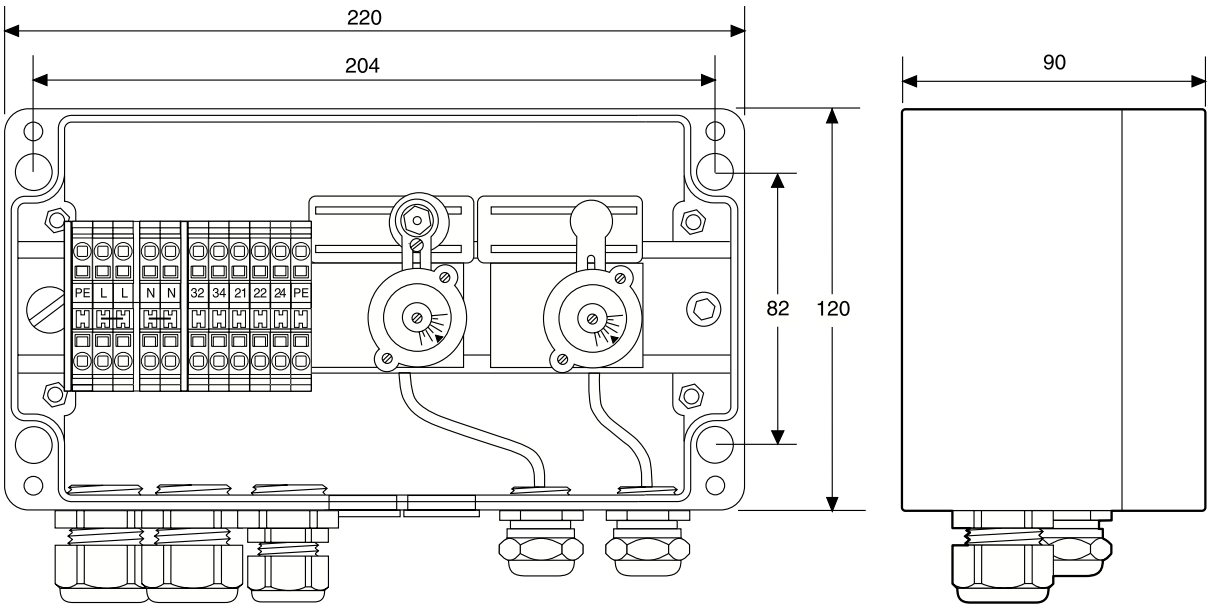
Ⓔx Surface sensing thermostat with safety limiter for hazardous area (Zone 1, Zone 2)

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 cage clamp 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 Ⓔx II 2 G EEx ed IIC T6 Ⓔx II 2 D IP 65 T80°C	PTB 01 ATEX 1075 Ⓔx II 2 G EEx ed IIC T6 Ⓔx II 2 D IP 65 T80°C
Product specification			
Max rated voltage (nom)		400 VAC	400 VAC
Temperature setting	Controller Limiter	+5°C to +215°C +40°C to +300°C	+70°C to +350°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 Limiter	<= 6 K <= 4 K	<= 6 K <= 4 K
Setting		Inside enclosure	Inside enclosure
Reset limiter		Inside enclosure by means of a screwdriver	
Terminal size		4 mm^2	4 mm^2
Terminal type		cage clamp terminals	cage clamp 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 (∅ 8-17 mm): power supply 1 x M25 gland with plug (∅ 8-17 mm): daisy chaining of power 1 x M25 reducer M25/M20 incl. M20 gland with plug (∅ 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	∅ 7 mm; length sensing element = 88 mm	∅ 7 mm; length sensing element = 88 mm
	Limiter	∅ 4.7 mm; length sensing element = 191 mm	∅ 4.7 mm; length sensing element = 191 mm
Material		1.4435 stainless steel	1.4435 stainless steel
Exposure temperature	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)
Mounting method			
Support bracket		SB-120 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

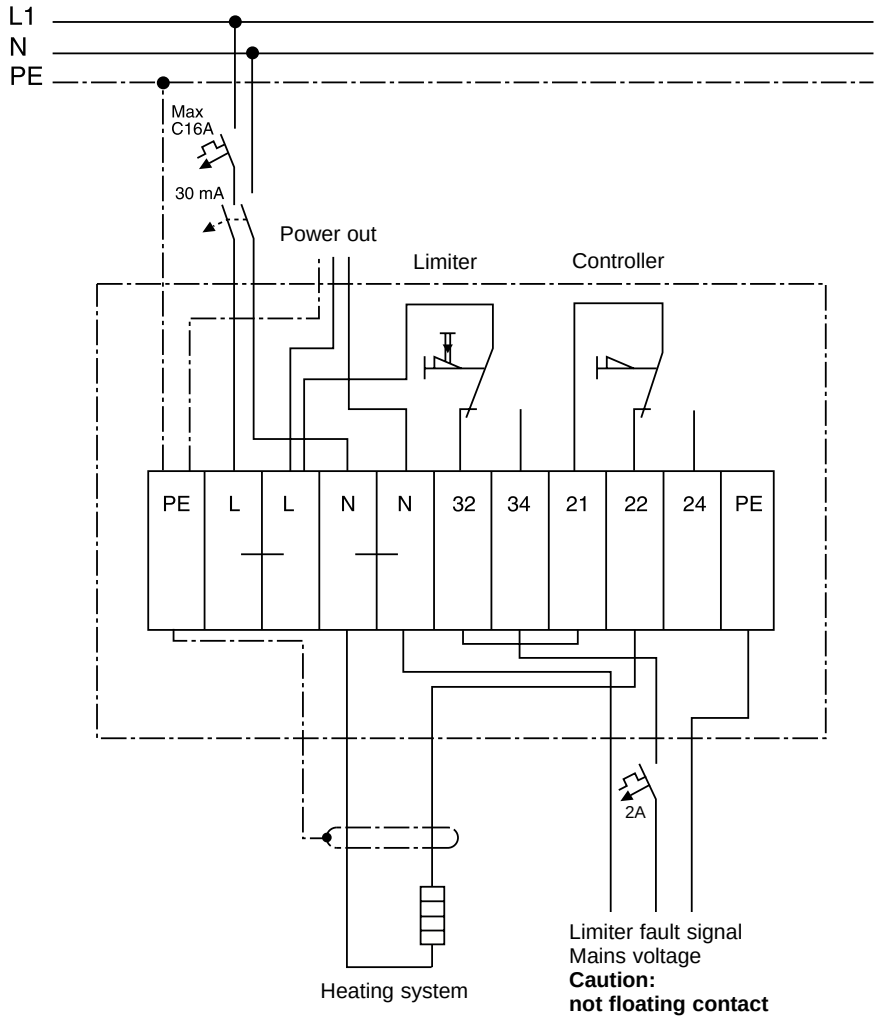
S = surface sensing

x = min temperature of control range

y = max temperature of control range

Ex = hazardous area

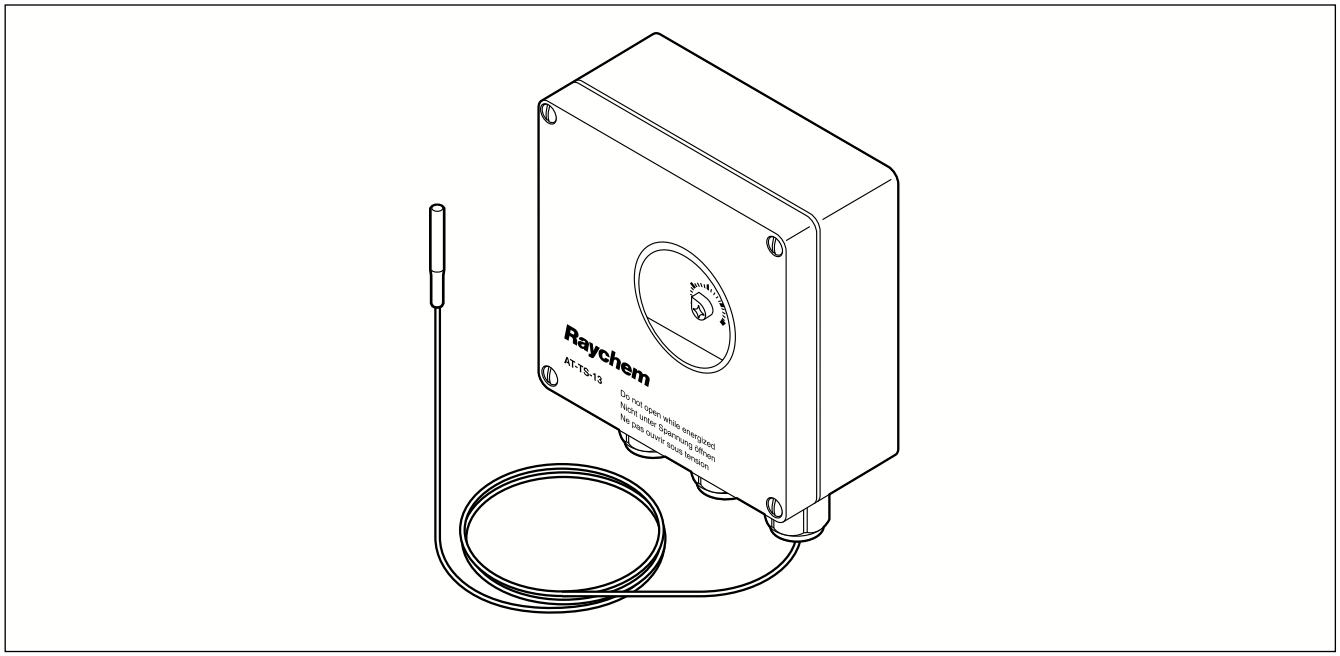
Connection details



AT-TS-13 and AT-TS-14

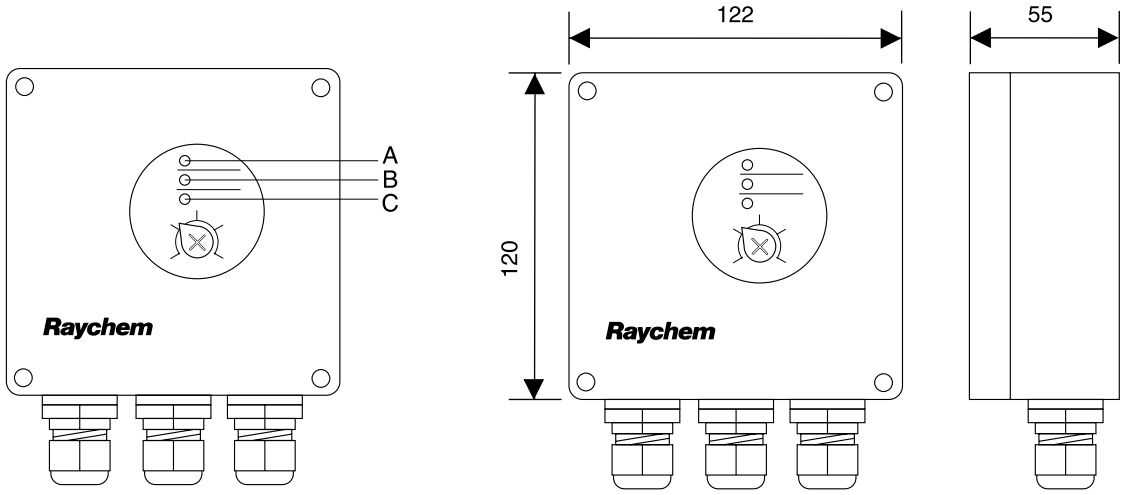
Surface sensing thermostat, electronic

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 V +10% –15% 50/60 Hz	230 V +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 (∅ 8-13 mm) 1 x M25 for heating element (∅ 11-17 mm) 1 x M16 for the sensor	1 x M20 for supply cable (∅ 8-13 mm) 1 x M25 for heating element (∅ 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)

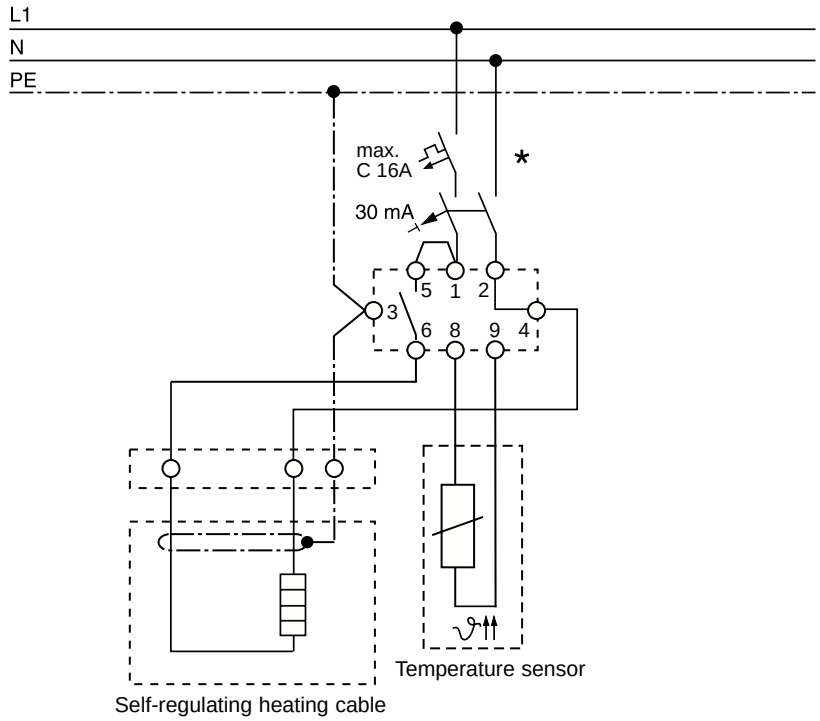


A	Green LED	Heating cable on
B	Red LED	Sensor break
C	Red LED	Sensor short-circuit

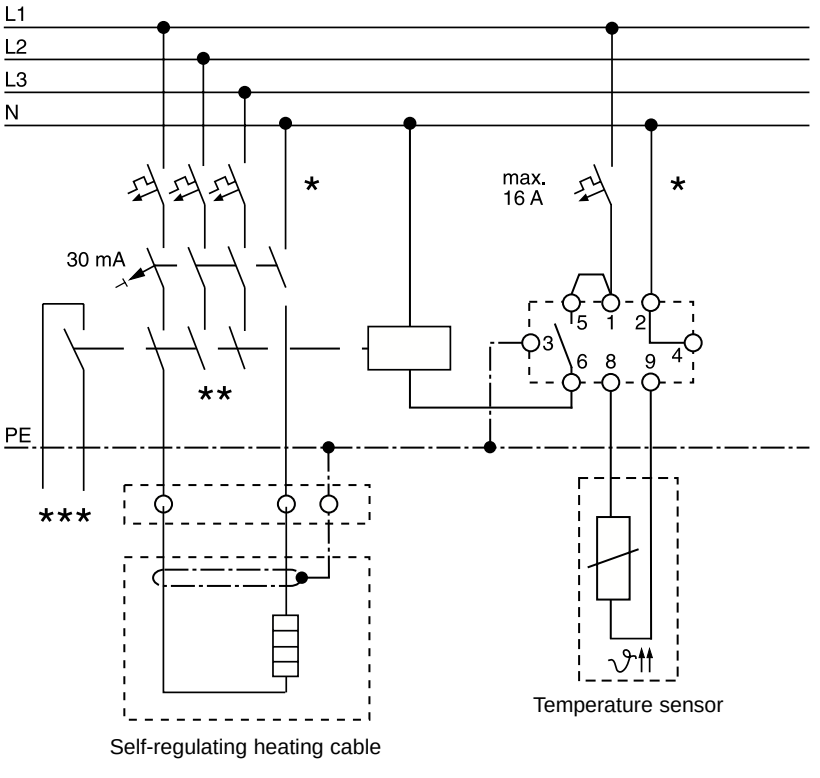
	AT-TS-13	AT-TS-14
Temperature sensor		
Type	PTC KTY 83-110	PTC KTY 83-110
Length sensor cable	3 m	3 m
Diameter sensor cable	5.5 mm	5.5 mm
Diameter sensor head	6.5 mm	6.5 mm
Sensor material	PVC	Silicone
Max. exposure temperature sensor cable	80°C	160°C
	The sensor cable may be extended to a maximum of 100 m using a 2-conductor wire with a cross-section of 1.5 mm^2. 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 (440 g)	648945-000 (440 g)
Accessories		
PA Reducer	Reducer M25 (M) / M20 (F)	Reducer M25 (M) / M20 (F)
PN	184856-000	184856-000
Spare temperature sensor (AT-TS-13 and AT-TS-14)	HARD-69 (Max. exposure temperature 160°C)	HARD-69
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 direct



AT-TS-13/14 with contactor

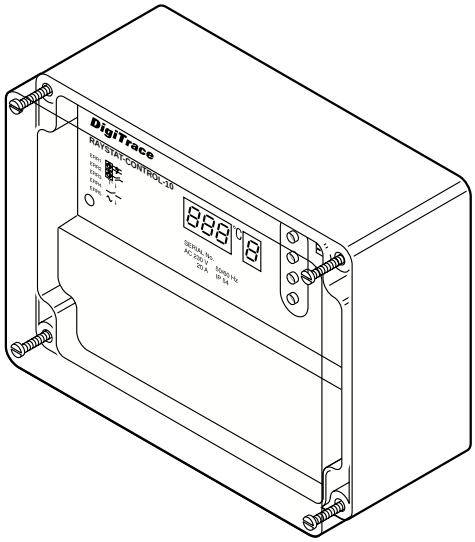


* Two- or four-pole electrical protection by circuit-breaker may be needed for local circumstances, standards and regulations
** Depending on the application, one- or three-pole circuit-breakers or contactors may be used
*** Optional: Potential-free circuit-breaker for connection to the BMS

Surface sensing
Programmable thermostat with alarm relay

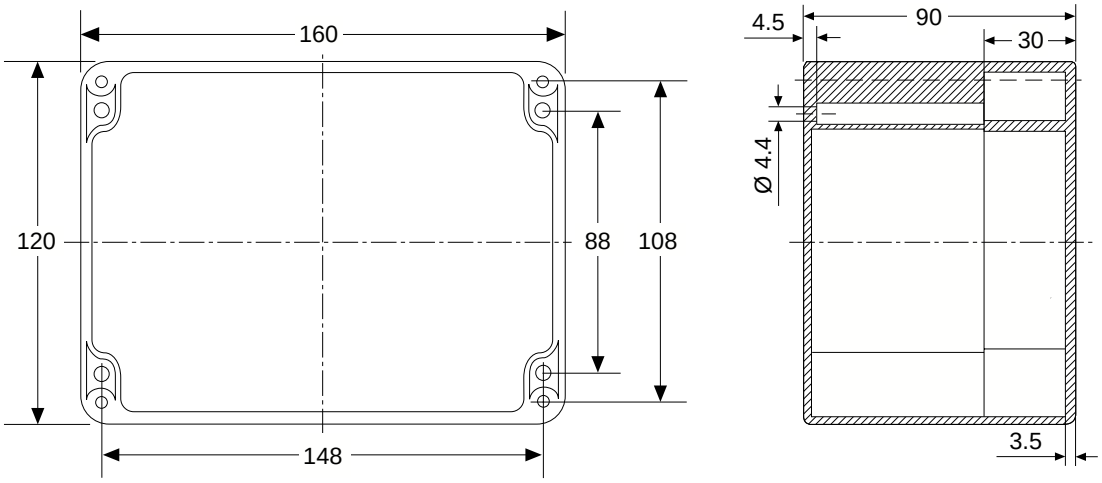
The RAYSTAT-CONTROL-10 surface sensing thermostat is designed to provide user friendly measurement and control for heating cables. The thermostat has a 25 A control relay (that can be arranged to be volt free) and a 2 A volt free SPDT alarm relay.

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	–40°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
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.

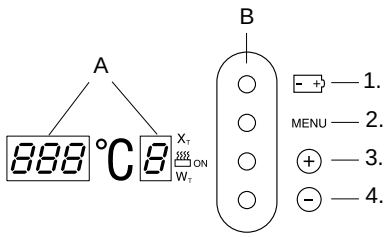
Output relays	
Control relay	Single pole single throw relay, rating: 25 A at 250 VAC
Alarm relay	Single pole double throw relay, rating: 2 A at 250 VAC, voltfree

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

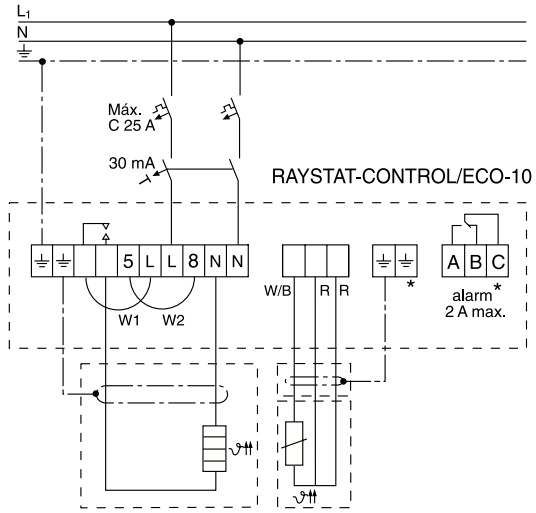
Display layout



A. LED Display (parameter and error indications)
B. Push buttons
   1. Battery activation
   2. Parameter selection
   3. Increase value
   4. Decrease value

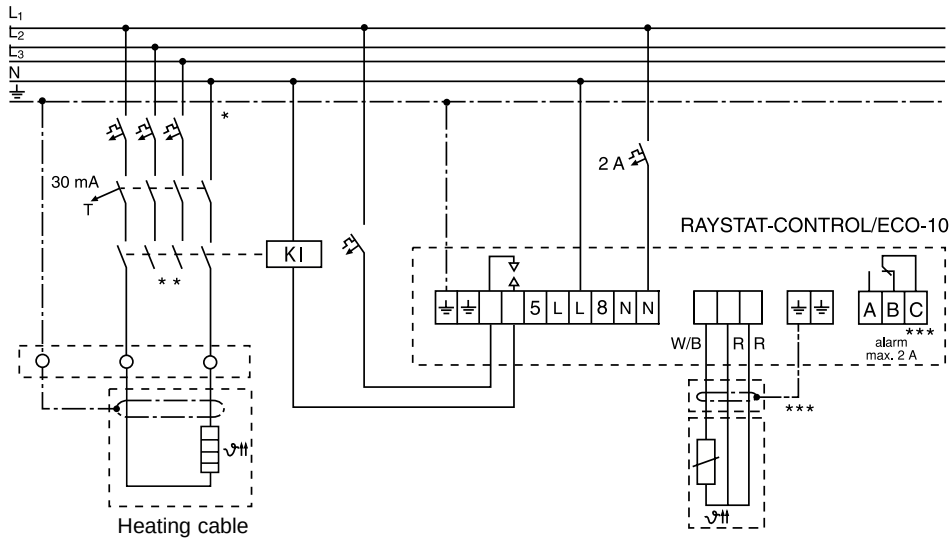
Connection details

Normal operation



Heating cable Temp. Pt 100 sensor

Voltage free operation: Remove links W1 and W2.



Heating cable

Temp. Pt 100 sensor

* 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

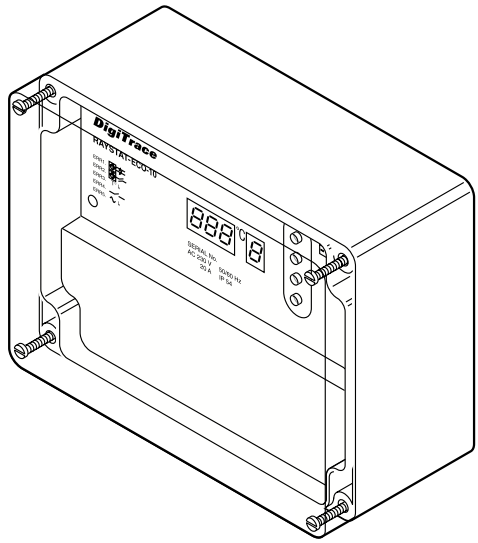
Connection terminals	
Supply	3 terminals for 0.75 mm² to 4 mm²
Pt 100 connection	4 terminals for 0.75 mm² to 2.5 mm²
Control relay connection	3 terminals for 0.75 mm² to 4 mm²
Alarm relay connection	3 terminals for 0.75 mm² to 2.5 mm²
Mounting method	Surface mounting with 4 fixing holes on 148 x 108 mm centres, M4 clearance
Support bracket	SB-100, SB-101
Ordering details	
Part description	RAYSTAT-CONTROL-10
PN (Weight)	828810-000 (800 g)
Accessories	
PA Reducer	Reducer M25 (M) / M20 (F)
PN	184856-000

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 trace-heating 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.

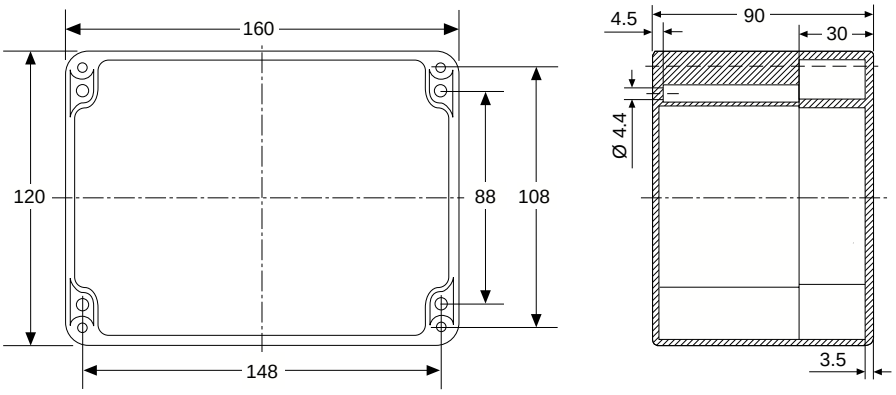
Since ambient temperatures in winter are often below freezing point, but well above the minimum designed ambient temperature, significant energy savings are realised. Parameters are displayed and can be set easily. The controller includes a 25A relay which allows direct switching of the heating circuit. 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	–40°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 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.

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

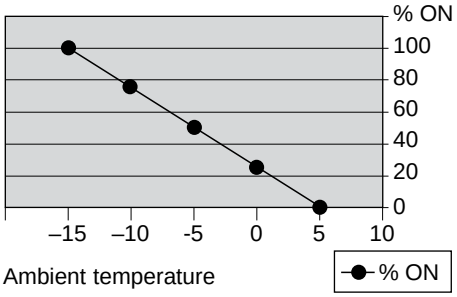
Parameters can be programmed without power supply (internal battery) and parameters are stored in non-volatile memory.

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**

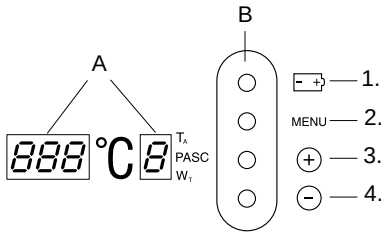
Result: At ambient temperature of –5°C, 50% energy is saved



Diagnosed alarms

Sensor errors	Sensor short / Sensor open circuit
Low temperature	Min. expected ambient temperature reached
Voltage errors	Low supply voltage / Output voltage fault

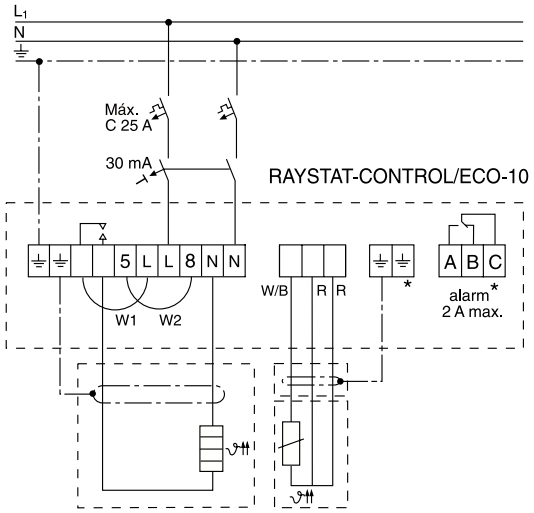
Display layout



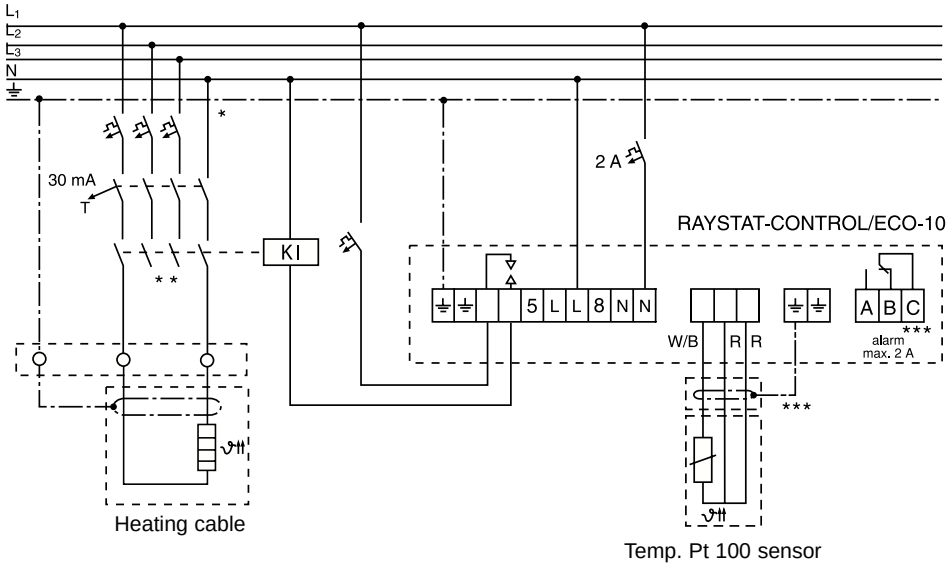
A. LED Display (parameter and error indications)
B. Push buttons
   1. Battery activation
   2. Parameter selection
   3. Increase value
   4. Decrease value

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

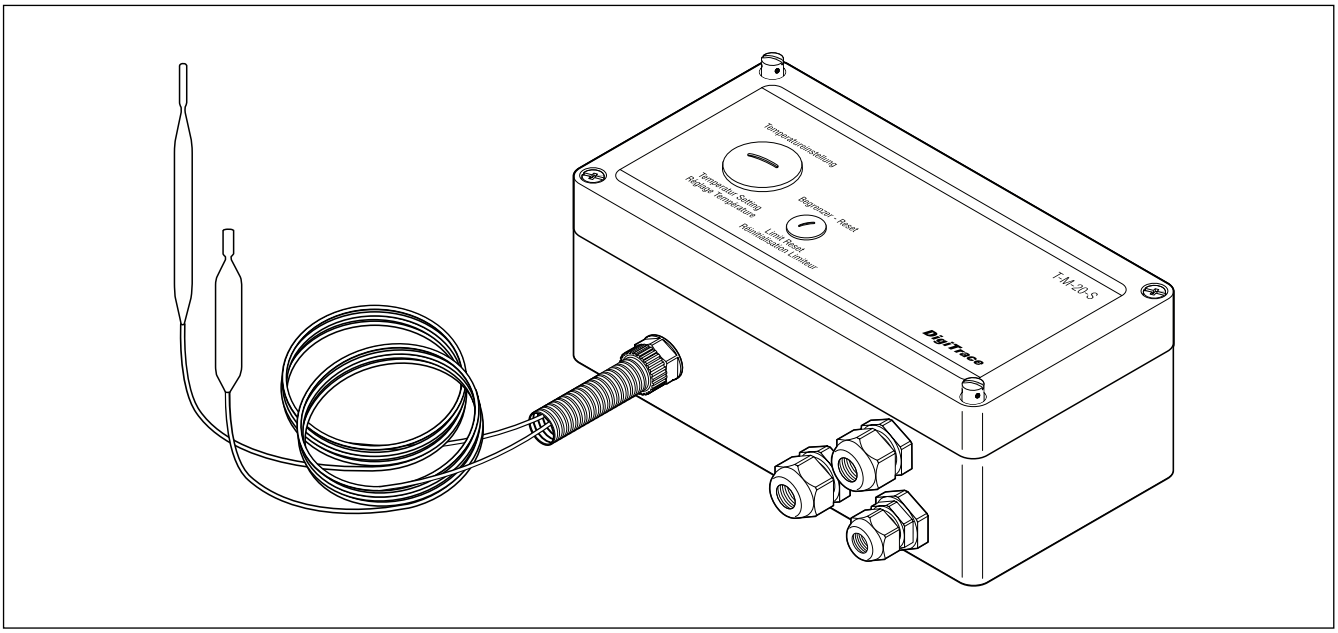
Connection terminals	
Supply	3 terminals for 0.75 mm² to 4 mm²
Pt 100 connection	4 terminals for 0.75 mm² to 2.5 mm²
Control relay connection	3 terminals for 0.75 mm² to 4 mm²
Alarm relay connection	3 terminals for 0.75 mm² to 2.5 mm²
Mounting method	**Surface mounting with 4 fixing holes on 148 x 108 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 (800 g)
Accessories	
PA Reducer	Reducer M25 (M) / M20 (F)
PN	184856-000

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.

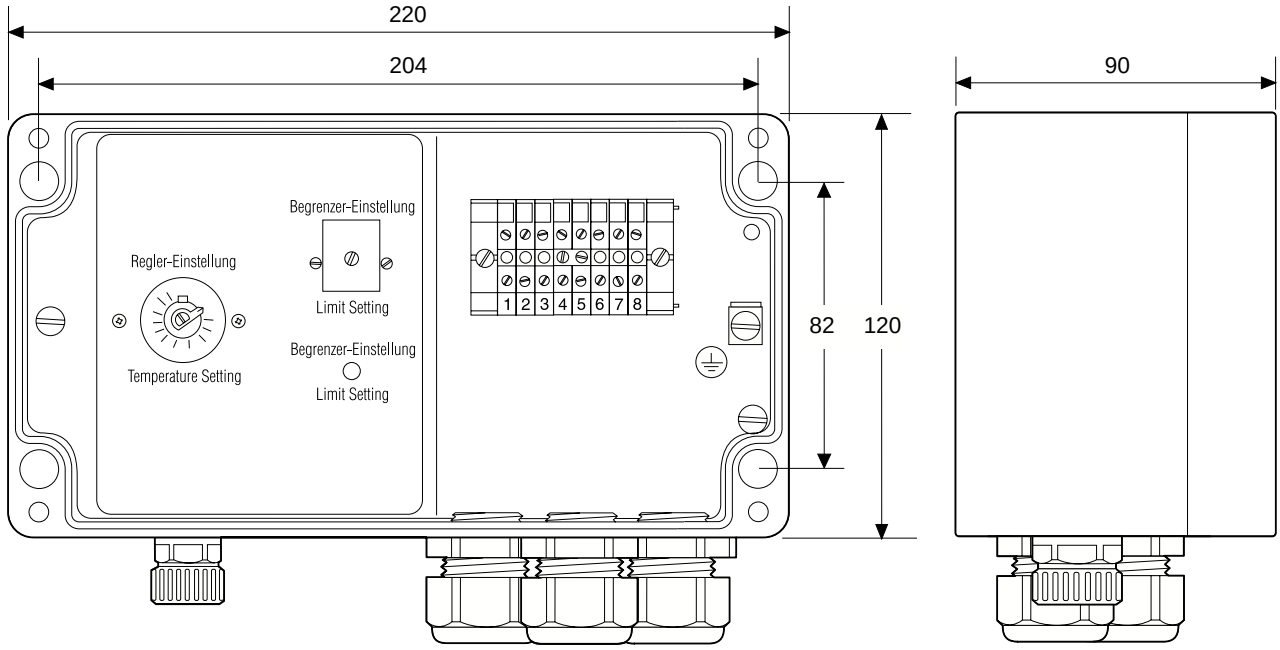
Temperature set point adjustment and limiter reset can be completed, without opening the enclosure, via removable plugs in the lid.
Both 2 meter long stainless steel fluid filled bulb and capillary are protected at the enclosure by a flexible conduit.

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 Limiter	0°C to +50°C +20°C to +150°C	0°C to +200°C +130°C to +200°C	+50°C to +300°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 cap	Controller Limiter	Max 16 A at 230 VAC Max 10 A at 230 VAC	Max 16 A at 230 VAC Max 10 A at 230 VAC	Max 16 A at 230 VAC Max 10 A at 230 VAC
Breaking capacity	Controller Limiter	3700 VA 2300 VA	3700 VA 2300 VA	3700 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)



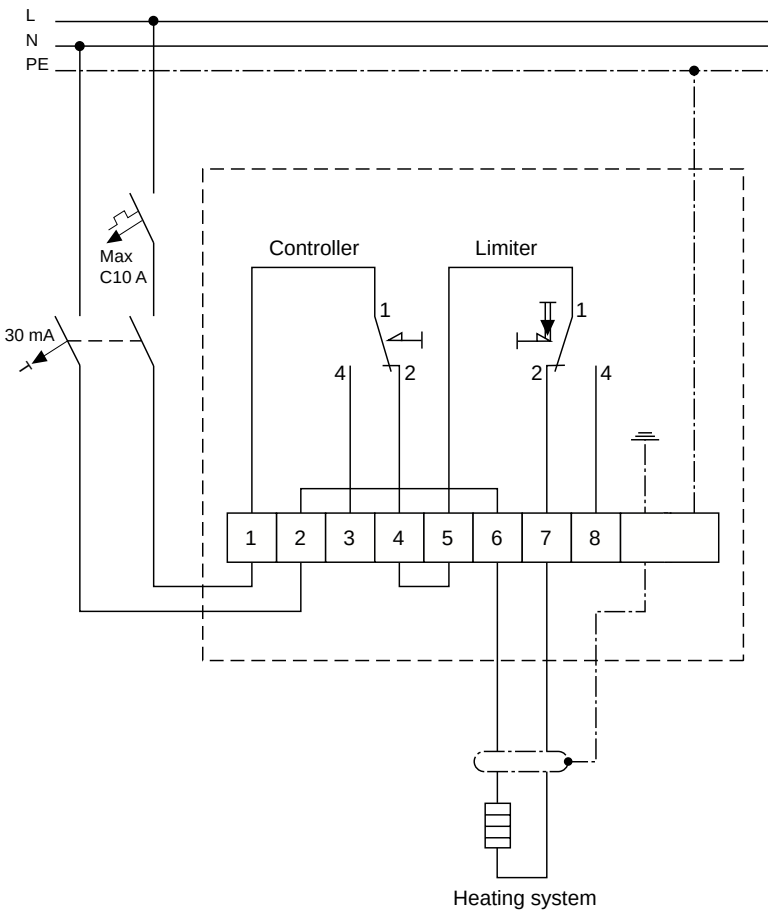
	T-M-20-S/0+50C	T-M-20-S/0+200C	T-M-20-S/+50+300C
Output parameters			
Control relay	Change-over switch (SPDT)		
Limiter relay	Change-over switch with possibility for external alarm (SPDT)		
Enclosure			
Protection	IP65	IP65	IP65
Dimension	222 x 120 x 90 mm	222 x 120 x 90 mm	222 x 120 x 90 mm
Materials 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 (∅ 8–13 mm) 1 x M20 gland (∅ 8–13 mm) 1 x M20 gland (∅ 8–13 mm)		
Temperature sensor			
Type	Fluid filled capillary, 2 meter long		
Dimensions: Controller ∅:	8 mm	8 mm	8 mm
length sensing element:	166 mm	78 mm	56 mm
Limiter ∅:	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	525 g
T-M-20-S/0+200C	750502-000	525 g
T-M-20-S/+50+300C	608706-000	525 g

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



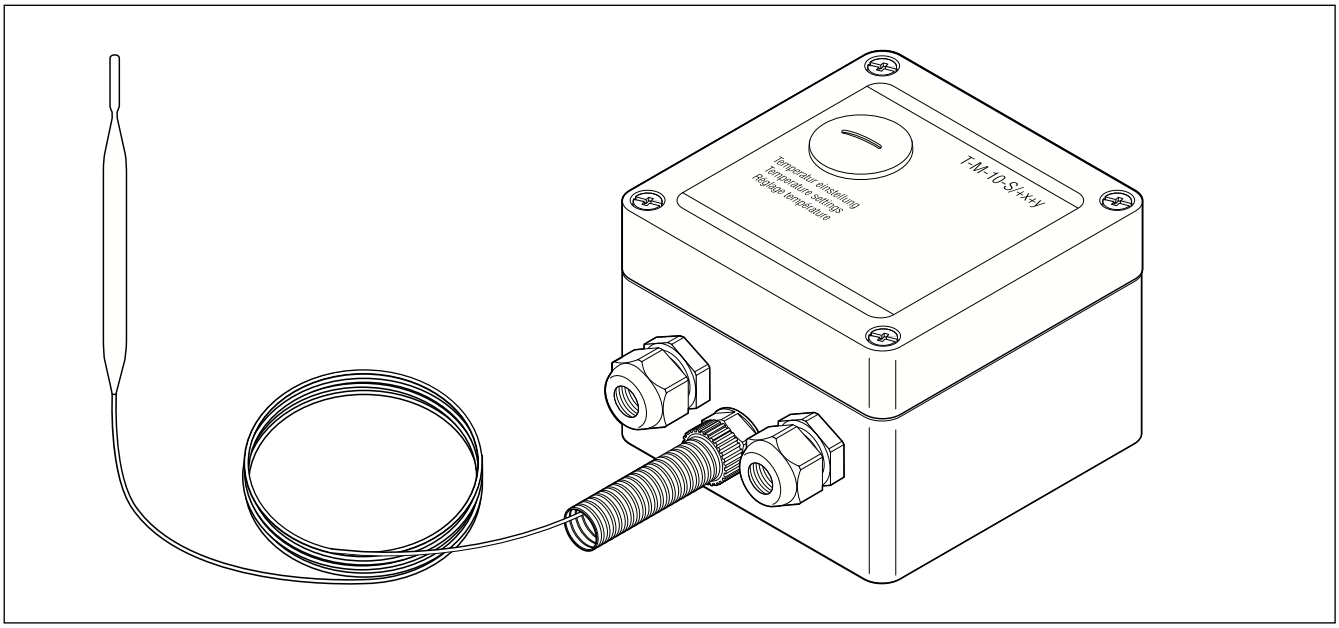
T-M-10-S/+x+y

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.

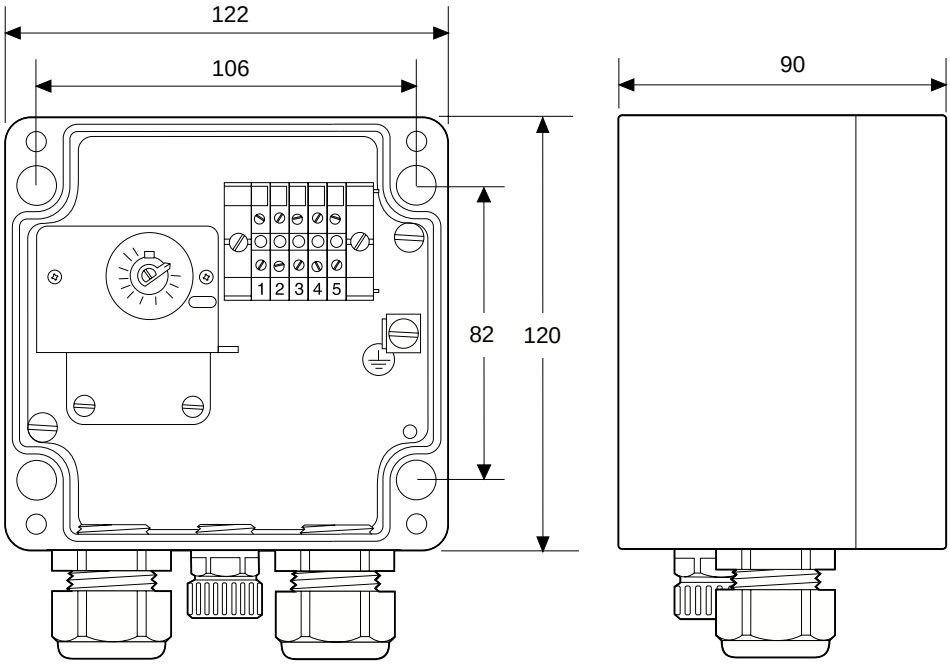
The 2 meter long stainless steel capillary is protected at the enclosure by a flexible conduit.
Direct connection of the heating cable is possible.

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 (∅ 8-13 mm) 1 x M20 gland (∅ 8-13 mm)		
Temperature sensor			
Type	Fluid filled capillary, 2 m long		
Dimensions ∅: length sensing element:	8 mm 166 mm	8 mm 78 mm	8 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 description

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

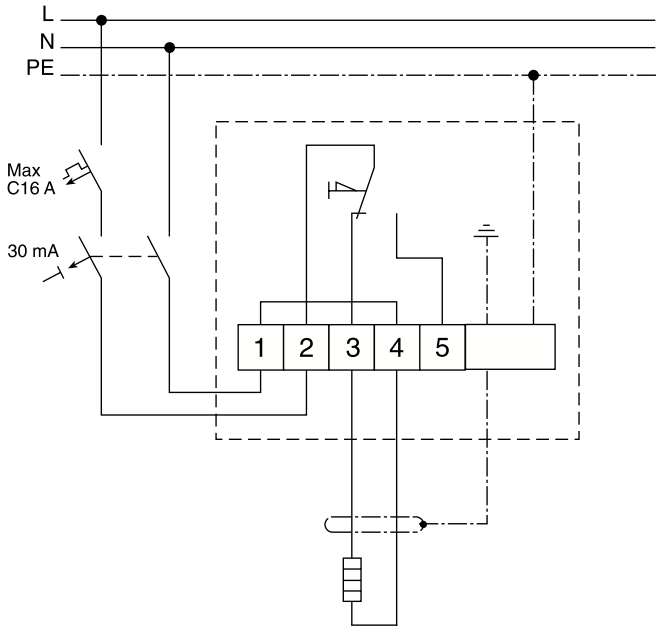
10 = control thermostat

S = surface sensing

x = min temperature of control range

y = max temperature of control range

Connection details



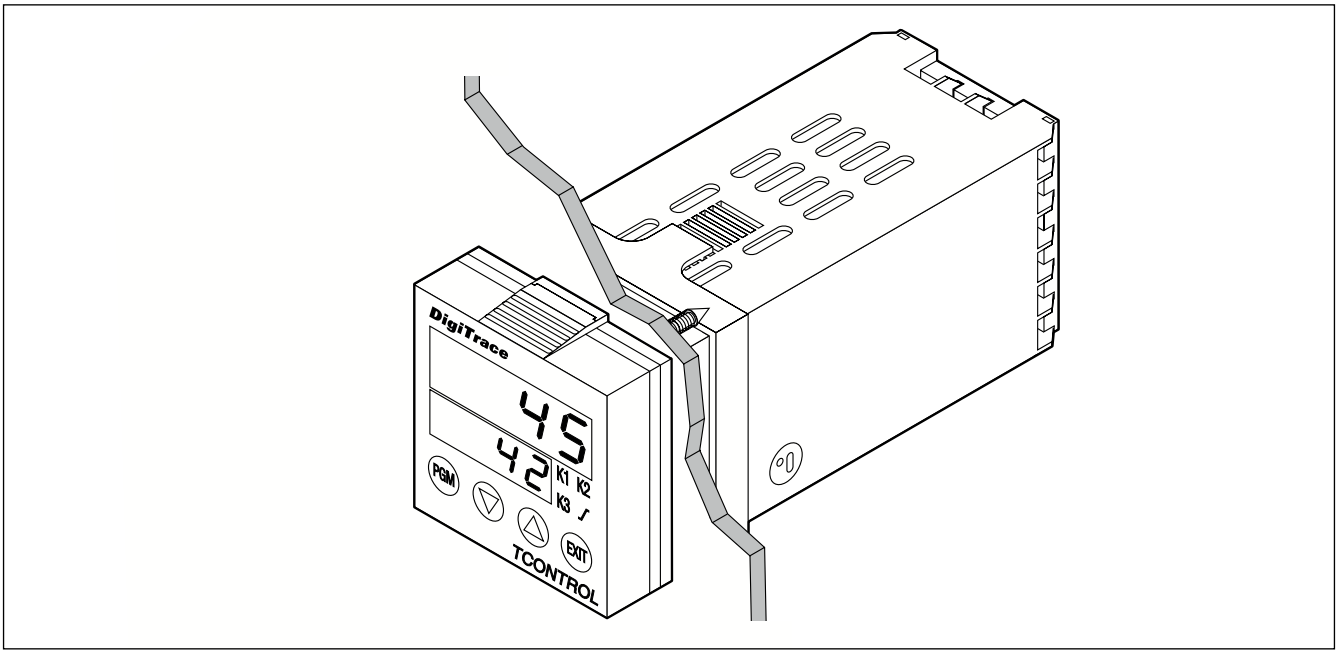
Heating load

TCONTROL-CONT-02

Single-circuit electronic controller

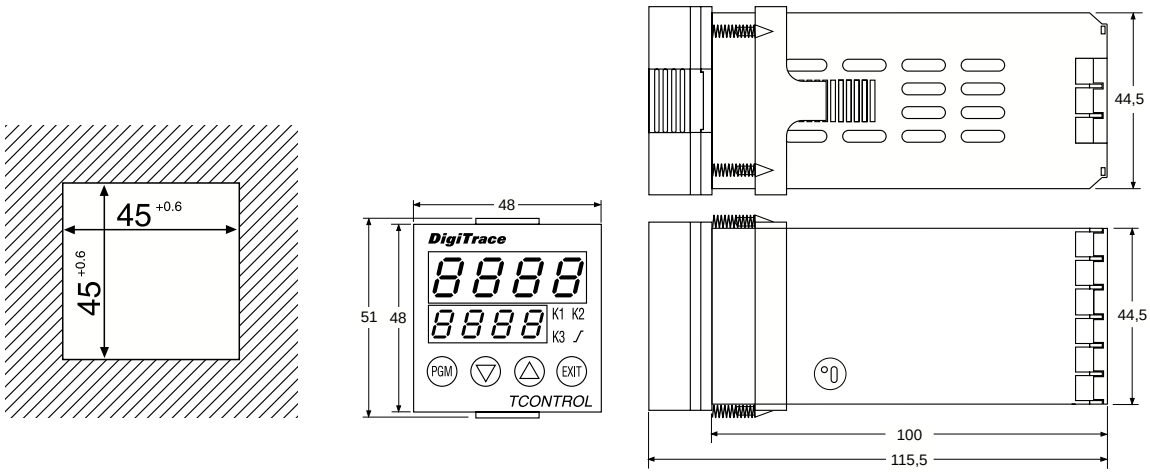
The DigiTrace TCONTROL-CONT-02 microprocessor based electronic controller provides accurate control and monitoring for individual trace-heating circuits. The compact panel mounted temperature controller has two 4-digit 7 segment displays for process value (red) and set point (green). During programming the displays are providing comments and visual aid to simplify set-up.

All configuration is done via the 4 front panel touch keys. The unit is factory configured as an ON/OFF controller suitable for most trace-heating applications. Other type of control algorithm such as Proportional control (P) and PID can be selected by simply changing the configuration code. Upon arrival the controller is configured for PT100 input (3 wire) with three output relays from which one is used as the controller output and the others for alarm. Solid state outputs can be controlled via one of the logic outputs. The PT100 resistance sensor and the connection cable are monitored for break and short circuit. In the event of a fault the output switches to a defined state (ON or OFF) depending on the users preference.



General	
Area of use	Ordinary area (indoors, panel mounted)
Supply voltage	110 to 240 V, +10% / –15%, 50/60 Hz
Power consumption	6 VA
Electrical connection	Screw terminals (1.5 mm^2)
Data back-up	Non volatile memory; no data loss on power outage
Display	2 temperature displays; actual value (red) and set point (green); 4 keys for setting changes LED for status indication
Enclosure	
Protection	Front IP65, rear IP20
Ambient operating temperature	0°C to +55°C
Ambient storage temperature	–40°C to +70°C
Relative humidity	75% max., no condensation
Casing material	ABS

Dimensions (in mm)



Inputs and Outputs	
Input	Pt 100, Pt 1000, 0/4...20 mA, 0/2...10 V, common thermocouples
Output	3 Mechanical, single pole contacts, rated 3 A at 250 VAC, life >5 x 10^5 cycles. The relays are default configured as (K1) control relay, (K2) low temperature alarm, (K3) high temperature alarm.
Alarms	High, low, band and sensor break / sensor short

Parameters and factory settings	
Parameter	**Factory settings**
Control modes	On/Off (selectable PID with auto tuning)
Control set point	5°C (selectable –199.9°C to 999.9°C)
Hysteresis	2°C (selectable 0°C to 999.9°C)
Band alarm	±3°C (selectable –199.9°C to 999.9°C)
Input	Pt 100, 3 wire (selectable; see list above)
Display format	XXXX (Selectable: XXX.X, XX.XX)
Electromagnetic compatibility (EMC)	Conform to EN 50 082-2 (heavy industrial) and EN 50 081-1 (light industrial)
Mounting	Panel mount (through the panel)

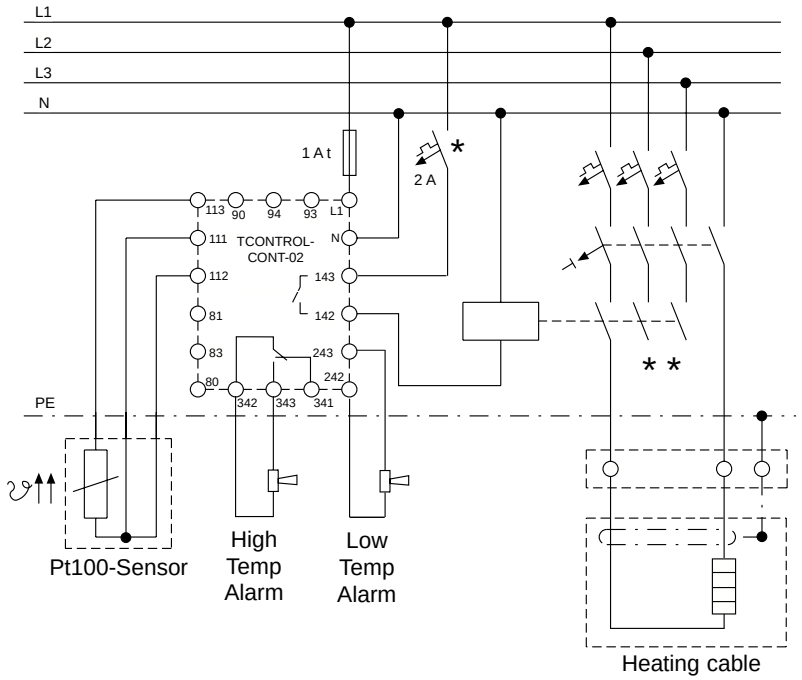
Accessory selection table

Select the appropriate accessories based on the specifics of the application. More details about the accessories can be found in the accessories section of this databook.

Input sensors	Ordinary area	Hazardous area
Pt 100, 3 wire (Note 1)	• MONI-PT100-NH • JB-SB-26	• MONI-PT100-EXE (Note 2) • JB-SB-26
Pt 100 with 4...20 mA transmitter (EEx i) (Note 3)	• TCONTROL-CONT-02 • MONI-RMC-PS24 • MONI-PT100-4/20MA • JB-SB-26	• TCONTROL-CONT-02 (Note 4) • TCONTROL-ISOL-01 (Note 4) • MONI-RMC-PS24 (Note 4) • MONI-PT100-4/20MA • JB-SB-26

Note 1: Sensor can be extended with a 3-wire shielded cable of max 20 Ohms per conductor (max. 150 m with a 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.
Note 2: The MONI-PT100-EXE temperature sensor can be directly connected to the TCONTROL-CONT-02. There is no need to use current limiting devices such as zener barriers or isolators.
Note 3: For connection details see TCONTROL-ISOL-01 in accessories section.
Note 4: Installed in ordinary area.

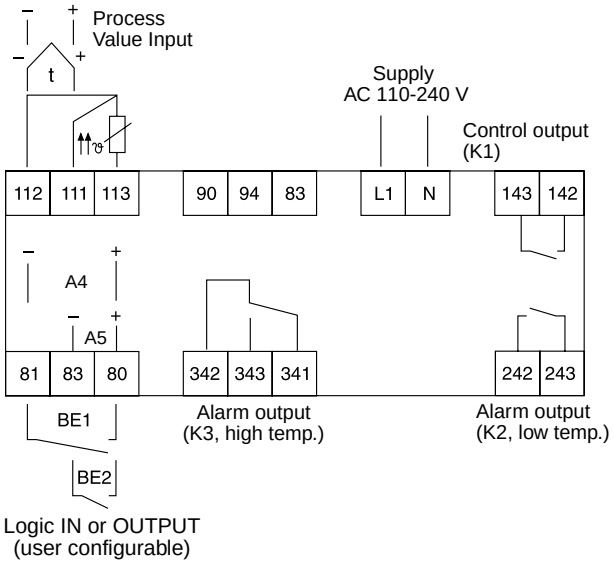
Wiring diagram



* 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.

Connection details



Ordering details	Part description	PN	Weight
Temperature controller	TCONTROL-CONT-02	330714-000	0.4 kg
Isolator	TCONTROL-ISOL-01	670021-000	0.1 kg
24 Vdc Power supply	MONI-RMC-PS24	972049-000	0.7 kg
Temperature sensors			
Pt 100, ordinary area	MONI-PT100-NH	140910-000	0.2 kg
Pt 100, hazardous area (EEx e)	MONI-PT100-EXE	967094-000	0.6 kg
Pt 100 with 4-20 mA transmitter, hazardous area (EEx i)	MONI-PT100-4/20MA	704058-000	0.6 kg
Pt 100, hazardous area sensor without enclosure	MONI-PT-100-EXE-SENSOR	529022-000	0.2 kg
Support bracket for sensor	JB-SB-26	338265-000	0.2 kg

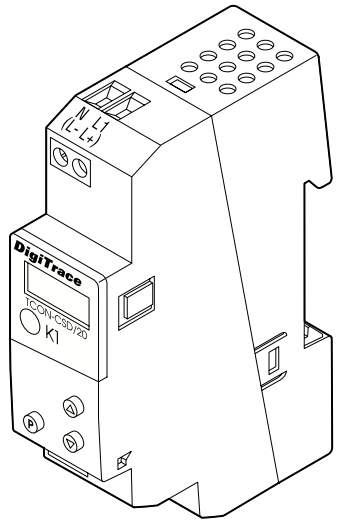
TCON-CSD/20

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.

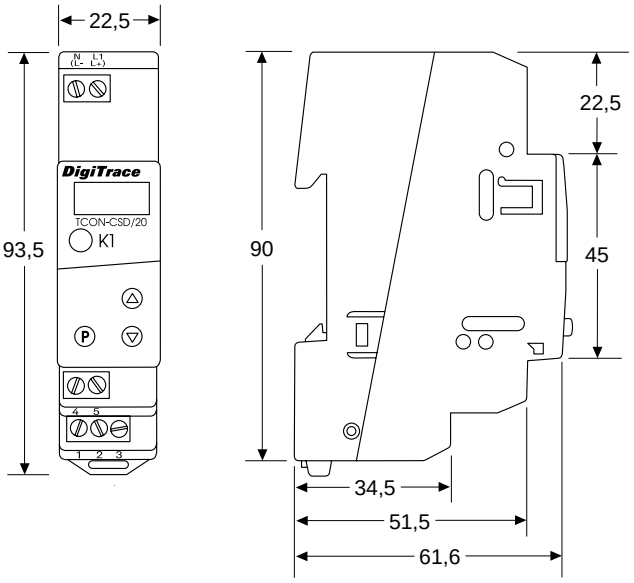
The instrument is commissioned and operated via three soft key push buttons on the unit's front panel.
Through its compact design and robust construction the TCON-CSD/20 allows for simple and space-saving installation.

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.

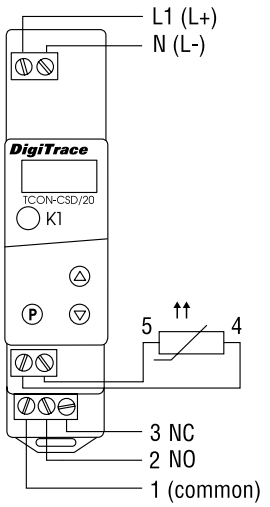


General	
Application	Usable for all applications requiring tight temperature control for either line sensing or ambient sensing control
Area of use	DIN rail mounting in panels or enclosures installed in non-hazardous area. Sensing temperature in hazardous area Zone 1 is possible when used in conjunction 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 V AC +10/–15%

Measurement input
Pt 100

Relay output
changeover (floating)
10 A / 250 VAC

Electrical data	
Power supply & own power consumption	230 V +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 / 250V 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 (0.11kg)

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.

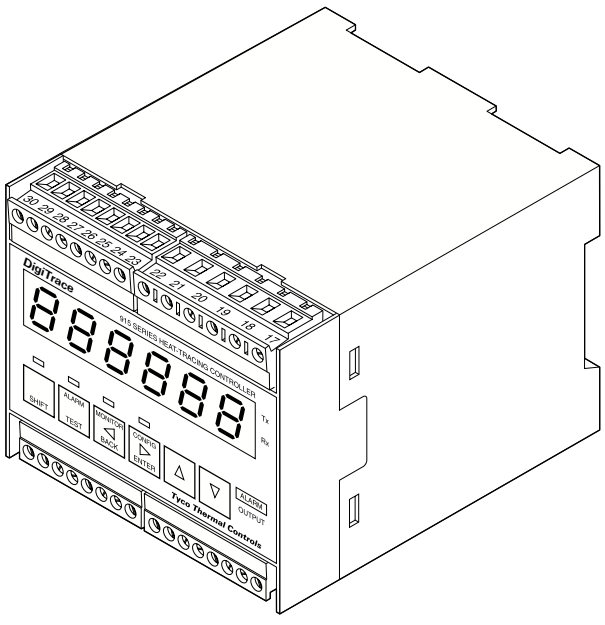
Monitoring
A broad variety of parameters are measured including: temperature, voltage, power, contactor cycles, hours in use, load resistance, load current, and ground-fault current. To ensure system integrity, the system can be programmed to periodically check the heating cable for faults, alerting 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 leakage 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 250mA. 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.

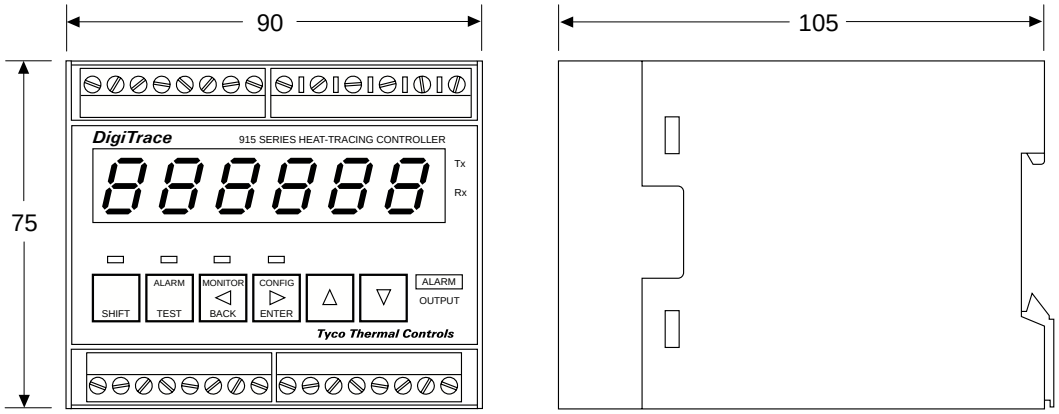
Communications
Multiple DigiTrace HTC-915-CONT units may be networked to a host PC running Windows-based Supervisor software for central programming, status review, and alarm annunciation.
The HTC-915-CONT supports the Modbus protocol and includes an RS-485 communications interface.



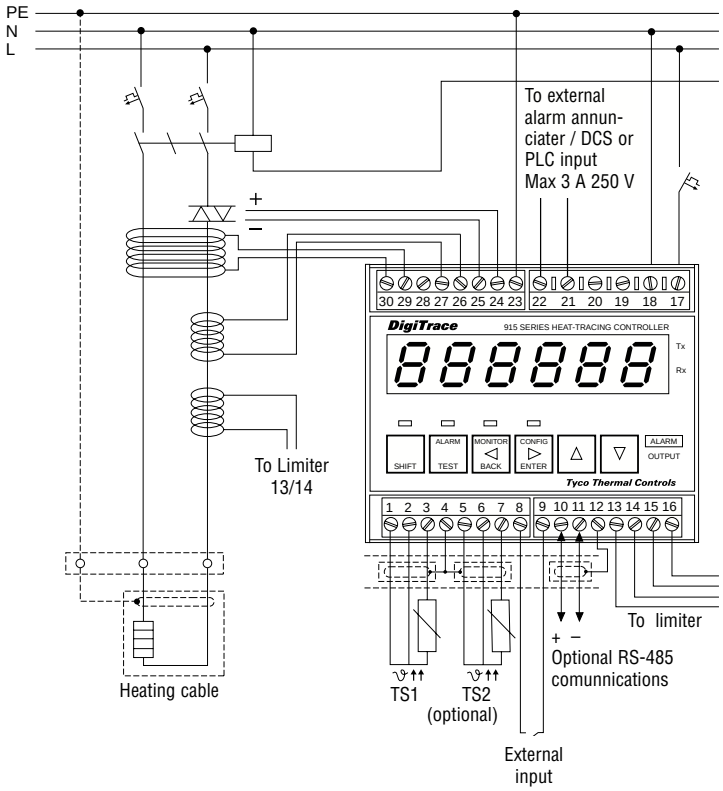
Application	
Type	Surface sensing/ambient sensing
Area of use	Non-hazardous area indoors, typically panel mounted
Approval certification	CE marked
Product specification	
Temperature range controller	–60°C to 570°C in steps of 1 K
Control algorithms	EMR: Line sensing on/off, proportional ambient SSR: 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 to 250 V, +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 V, 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 V, 50/60 Hz Output is user programmable to open or to close on alarm.
Power output	12 VDC, 200 mA max.
Temperatur 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.

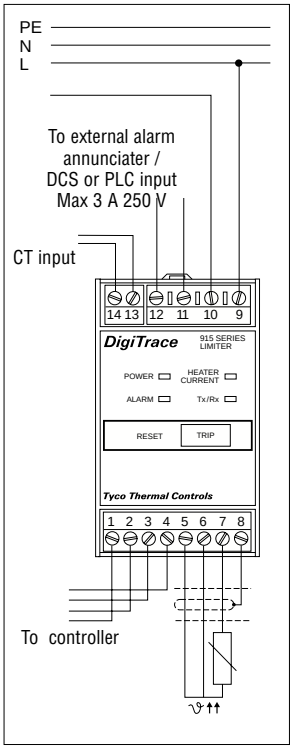
Monitoring	
Temperature	Low / High alarm range –60°C to 570°C or OFF
Ground fault (via external CT, optional)	Alarm / Trip range 10 mA to 250 mA or OFF
Load current (via external CT, optional)	Low / High alarm range 0.3 A to 100 A or OFF (can be ajusted to match heater current)
Voltage	Low / High alarm range 10 V to 330 V 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. +12Vdc 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)	8550-000002 (400 g)	
Limiter		
Part description	HTC-915-LIM	
PN (Weight)	8550-000001 (200 g)	
Current sensor (load current transformer)	HTC-915/CT	1244-000276
Current sensor (earth leakage current transformer)	HTC-915/ELCT	1244-000277
RTD for Hazardous area zone 1	MONI-PT100-EXE	967094-000
RTD for non hazardous area	MONI-PT100-NH	140910-000
RS485 Communication cable	MONI-RS485-WIRE	549097-000
Solid state relays		
20 A 230 VAC single phase	DT-SSR-1-23-20	1244-001468
50 A 480 VAC single phase	DT-SSR-1-48-50	1244-001467

HTC-915-LIM

Temperature limiter

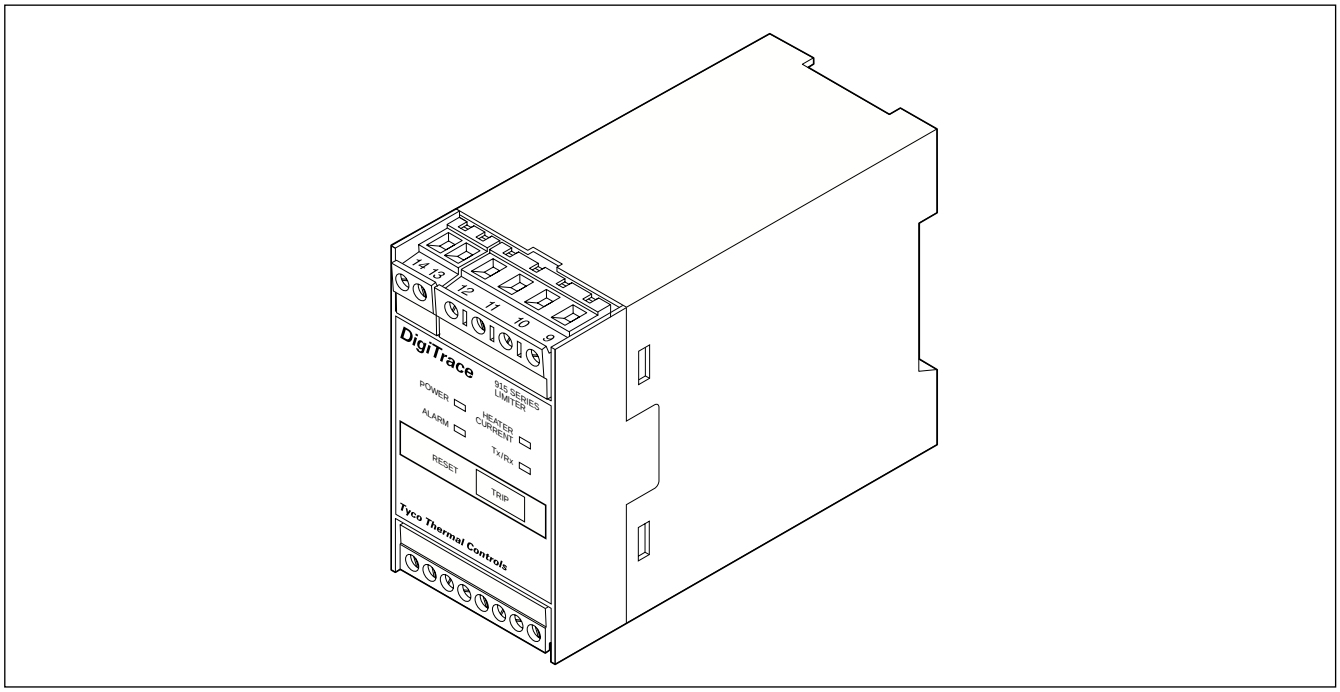
Product overview
The DigiTrace HTC-915-LIM is a compact, microprocessor-based temperature limiter that provides protection against over-temperature. The HTC-915-LIM has two output relays, one normally closed limiter relay (opening in occurrence of over temperature) and one alarm relay.
The HTC-915-LIM 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.

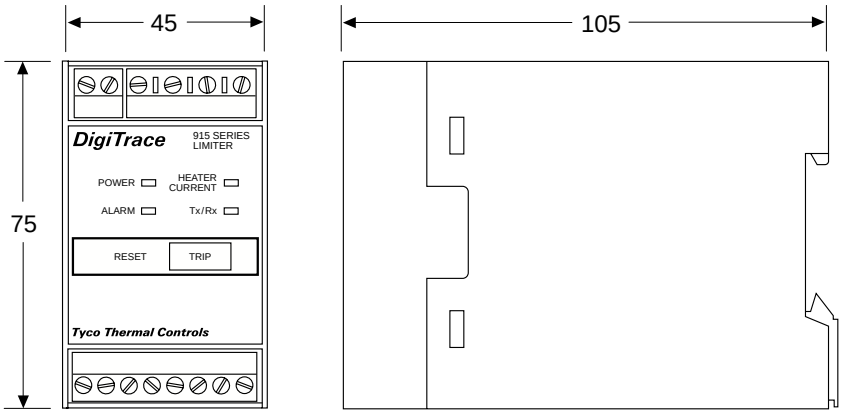


Application	
Type	Surface sensing electronic
Area of use	Ordinary area locations, indoors
Approval certification	CE marked
Product specfication	
Temperature range limiter	20°C to 450°C in steps of 1 K
Switching accuracy	1 K
Electrical properties	
Connection terminals	Screw type terminals. All terminals suitable for stranded and solid core connection cables having a cross section between 0.5 and 2.5 mm^2 (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 V, 50/60 Hz
Alarm output relay	Relay contact rated 3 A 250 V, 56/60 Hz (N.C. in operation opening on alarm or power outage)
Temperatur 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

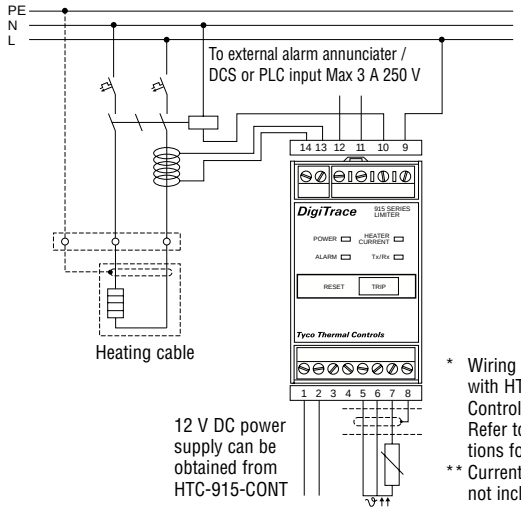
(*)	**T1**	**T2**	**T3**	**T4**	**T5**
Model	HTC-915-LIM-T1	HTC-915-LIM-T2	HTC-915-LIM-T3	HTC-915-LIM-T4	HTC-915-LIM-T5
Lock out temperature	450°C	300°C	200°C	135°C	100°C

When used in conjunction with the HTC-915-CONT (Heat-Trace control system) the pre programmed set point can be alterd

Dimensions (mm)



Wiring diagram



* Wiring for Communications with HTC-915-CONT Controller omitted for clarity. Refer to installation instructions for details.

** Current sensor optional and not included

Terminal assignments of the limiter

1. Digital common (from HTC 13)
2. +12Vdc 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

Ordering details

Controller			
Part description	HTC-915-CONT		
PN (Weight)	8550-000002 (400 g)		
Limiter			
Part description	HTC-915-LIM		
PN (Weight)	8550-000001 (200 g)		
Limiter	HTC-915-LIM	base unit for use with HTC-915-CONT	8550-000001
	HTC-915-LIM/T1	Preprogrammed to trip at 450°C (+0/–10°K)	8550-000008
	HTC-915-LIM/T2	Preprogrammed to trip at 300°C (+0/–10°K)	8550-000009
	HTC-915-LIM/T3	Preprogrammed to trip at 200°C (+0/–5°K)	8550-000010
	HTC-915-LIM/T4	Preprogrammed to trip at 135°C (+0/–5°K)	8550-000011
	HTC-915-LIM/T5	Preprogrammed to trip at 100°C (+0/–5°K)	8550-000012
Current sensor (load current transformer)	HTC-915/CT		1244-000276
RTD for Hazardous area zone 1	MONI-PT100-EXE		967094-000

Multi-circuit trace-heating control and monitoring unit

The MoniTrace 200N-E unit is the central element of a multi-circuit electronic control and monitoring system for trace-heating used in process temperature maintenance and frost protection applications. The unit controls up to 130 trace-heating circuits in either surface sensing, ambient sensing, or PASC.

PASC
The proportional ambient sensing control (PASC) mode uses a proprietary algorithm that measures ambient temperature and calculates the cycle time during which the trace-heating will be energised. On cold days, the heating cables are energised frequently. On warm days, they are energised less frequently, or not at all.

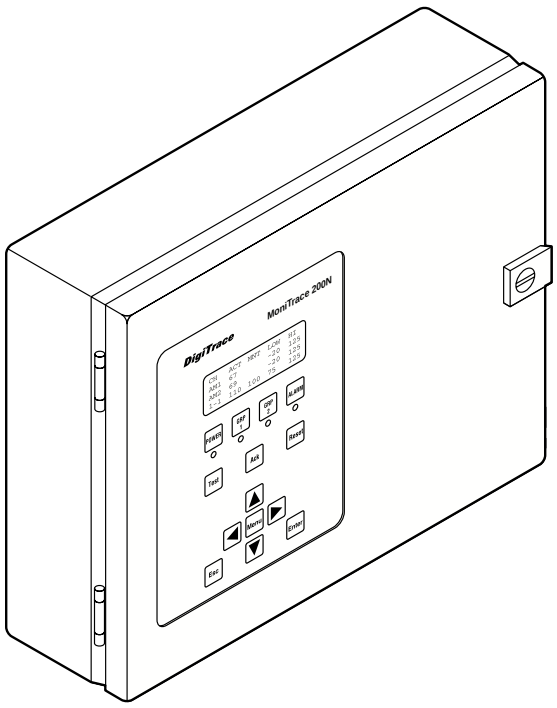
Using PASC, the MoniTrace 200N-E unit can be used to control groups of trace-heating circuits based solely on ambient temperature. Therefore, flow path design considerations can be eliminated, greatly reducing the number of circuits required, thus saving circuit breakers, panel space, wiring, and controllers. The result is a simpler, more reliable system.

Control
Heating cable circuits are switched ON and OFF using up to 10 remote modules for control (RMCs) typically located in trace-heating power distribution panels. Each RMC unit can be configured for 2 to 32 relay outputs, which are wired directly to heating cable power contactors. RMCs are connected via a single, twisted pair RS-485 cable to the MoniTrace 200N-E.

Monitoring
The MoniTrace 200N-E monitors up to 16 remote monitoring modules (RMMs) that each have inputs for eight three wire Pt 100 temperature sensors. The RMMs are typically located as close as possible to the application in order to minimize the amount of RTD wires required. RMM2 units are connected to the MoniTrace 200N-E control unit using the same RS-485 network as being used by the RMC´s and are connected by the same RS-485 cable to the MoniTrace 200N-E. Additional monitoring of the status of RCDs and contactors is provided through inputs in the MoniTrace 200N-E unit and in RMCs.

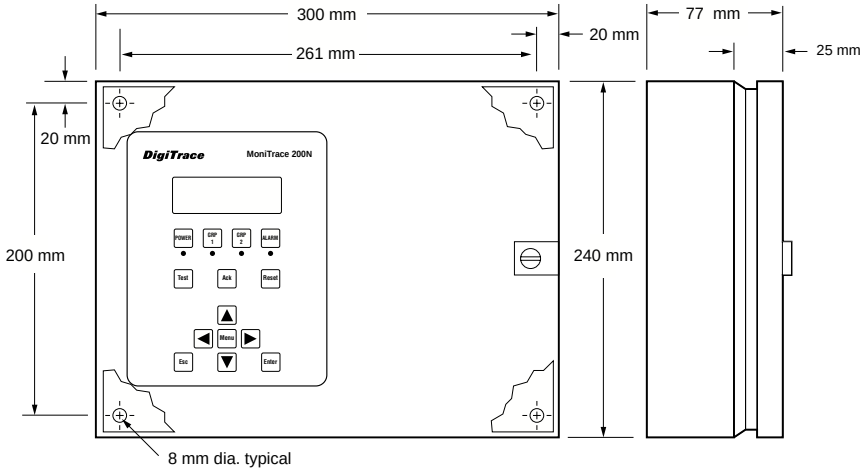
Based on temperature inputs from RMMs, the MoniTrace 200N-E determines which heating cable circuits are to be energised and sends this information to RMCs that then turn the heating cable power contactors ON or OFF. Because RMMs are local to temperature sensors and RMCs are local to contactors in distribution panels, wiring costs and complexity are reduced significantly.

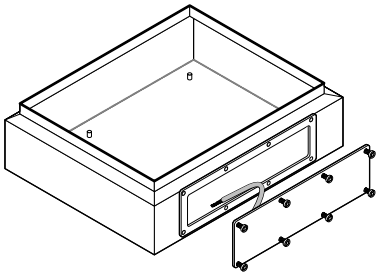
User interface
Set-up parameters, system status, and alarm conditions are available locally at the MoniTrace 200N-E panel or remotely via an RS-232/RS-485 link to a host system supporting the Modbus protocol, such as a PC running Raychem's MoniTrace Supervisor software. For local use, the MoniTrace 200N-E features a function keypad and 4-line LCD display that make controller set-up and system status review simple.



MoniTrace 200N-E

Dimensions (in mm)





Removable gland plate on bottom of enclosure for entries.

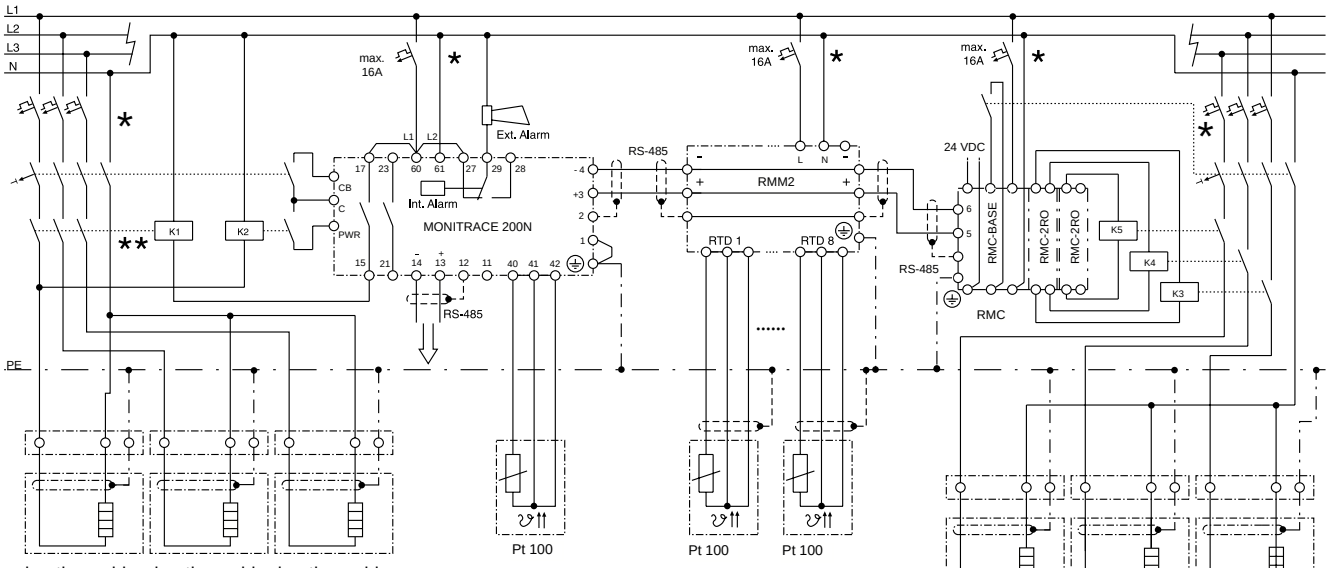
General	
Area of use	Ordinary area, indoors
Approvals	
Supply voltage (nominal)	100 / 120 V, 208 / 240 V +10% -10%, 50/60 Hz switch selectable
Internal power consumption	≤ 5 W

Enclosure	
Protection	IP54
Base and lid	Material: steel, coating: powder painted, lid seal: neoprene
Lid fixing	1 flathead screw
Entries	None provided, space for 6 x M20 entries on removable gland plate
Power cable gland	1 x M20, 6-12 mm cable, IP54 min.
Control cable gland	1 x M20, 5-9 mm cable, IP54 min.
Sensor/network cable glands	3 x M16, 2-6 mm cable, IP54 min.
Ambient operating temperature range	0°C to +50°C
Ambient storage temperature range	–20°C to +60°C
Relative humidity	Max. 95%, noncondensing
Climate class	3K3, per EN 60 721
Also available as panel mount version suitable for custom panel applications (MONI-200N-PM)	

Monitoring inputs	
Ambient or pipe temperatures	One or two Pt 100 sensors directly connected to MoniTrace 200N-E The sensor cable may be extended with a 3 (+PE)-wire signal cable adding 20 Ohms lead resistance maximum. When using 1.5 mm^2 cable this equals to ±150 m of cable. 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. Up to 128 Pt 100 sensors connected via Remote Monitoring Modules (RMMs)
RCD trip alarm	2 digital inputs per MoniTrace 200N-E or optional one per circuit via MONI-RMC and MONI-RMC-2DI
Contactor actuation monitor	2 digital inputs per MoniTrace 200N-E or optional one per circuit via MONI-RMC and MONI-RMC-2DI

Control outputs	
Number of output relays	Two independently switching control relays (internal) Up to 128 control relays connected via RMCs and MONI-RMC-2RO One alarm relay (internal)
Control relay	Double pole change over, NC. Rating: 5 A, 120 / 240 VAC, 24 VDC Closes to energise trace-heating
Alarm relay	Double pole change over. Rating: 5 A, 120 / 240 VAC, 24 VDC Normally energised; closes in alarm mode
Number of relay operations	5 x 10^4 at rated current

Connection details



trace-heating system group control (or individual control, not shown)

K1 = Control contactort for Group 1
K2 = Power monitor contactor for Group 1
K3 = Control contactor for individual control heating circuit 1
K4 = Control contactor for individual control heating circuit 2
K5 = Control contactor for individual control heating circuit 13

trace-heating system individual control or group control

* 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.

Network connections	
Connection to RMMs and RMCs	RS-485 shielded twisted pair network cable, maximum length 1200 m (MONI-RS485-WIRE)
Number of RMM2s	Up to 16, individually addressable, each with up to 8, 3 wire Pt 100 inputs
Number of RMCs	Up to 10, individually addressable, each with 2 to 32 relay outputs.
Host communication connection	Serial port, RS-232 (default) or RS-485, max. 19200 baud rate
Host communication protocol	Modbus, RTU or ASCII
Programming and setting	
Method	10 touch keys on front panel (Test, Reset, Ack, Menu, Esc, Enter, ←, →, ↑, ↓) Four-line, 20-character back-lit LCD display
Language	English, French, German
Stored parameters	Control settings, system settings, time- and date-stamped event log
Memory	Nonvolatile, restored after power loss
Set points	Pipe maintain temperature range: –7°C to +315°C Minimum ambient temperature range: –73°C to +52°C
Control modes	User-selectable for each circuit: Line (surface) sensing PASC (proportional ambient sensing) Ambient sensing ON/OFF Fixed duty cycle (0-100%)
Alarm conditions	High/low pipe or ambient temperature Sensor failure Communications failure RCD trip Contactor failure
Maintenance assistance	Daily power test (user-defined time of day) Contactor on/off cycle counter and alarm Heating cable hourly usage counter
Timed start up	With the timed start-up function the MONI-200N-E controller can be programmed such that the control circuits are switched ON one after another with in between a programmable delay. The function is integrated as 2 user definable timers " LoadShed Start" and "LoadShed Int". Using the LoadShed functions can avoid peak demands in electrical power when the system is started-up at low ambient temperature.

Connection terminals	
Supply	2 terminals for 0.2 mm^2 to 4 mm^2
Internal earth	1 clamp for 0.2 mm^2 to 10 mm^2
Pt 100 connections	2 x 3 terminals for 0.2 mm^2 to 2.5 mm^2
Control relay connection	2 x 2 terminals for 0.2 mm^2 to 2.5 mm^2
RCD alarm relay connection	2 x 2 terminals for 0.2 mm^2 to 2.5 mm^2
Contactor relay connection	2 x 2 terminals for 0.2 mm^2 to 2.5 mm^2
Alarm relay connection	3 terminals for 0.2 mm^2 to 2.5 mm^2
RS-485 connection to RMM and RMC	3 terminals for 0.2 mm^2 to 2.5 mm^2
RS-485 connection to host computer	RS-485: 3 terminals for 0.2 mm^2 to 2.5 mm^2 RS-232: 6 terminals for 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)

Mounting method	Surface mounting with 4 fixing holes on 261 mm x 200 mm centres Hole diameter: 8 mm

Ordering details (Weight)	Part description	PN	Weight
MoniTrace 200N-E controller including supervisory software on CD	MONI-200N-E	266429-000	3.9 kg
Panel mount version without enclosure	MONI-200N-PM	746245-000	3.2 kg
Pt 100 temperature sensor for Zone 1	MONI-PT100-EXE	967094-000	0.6 kg
Pt 100 temperature sensor for non-hazardous areas	MONI-PT100-NH	140910-000	0.2 kg
RS485 Communication cable	MONI-RS485-WIRE	549097-000	75 kg (300 m reel)

note: Easy to use windows based configuration software (MoniTrace Supervisor) included for confortable configuration and supervision.

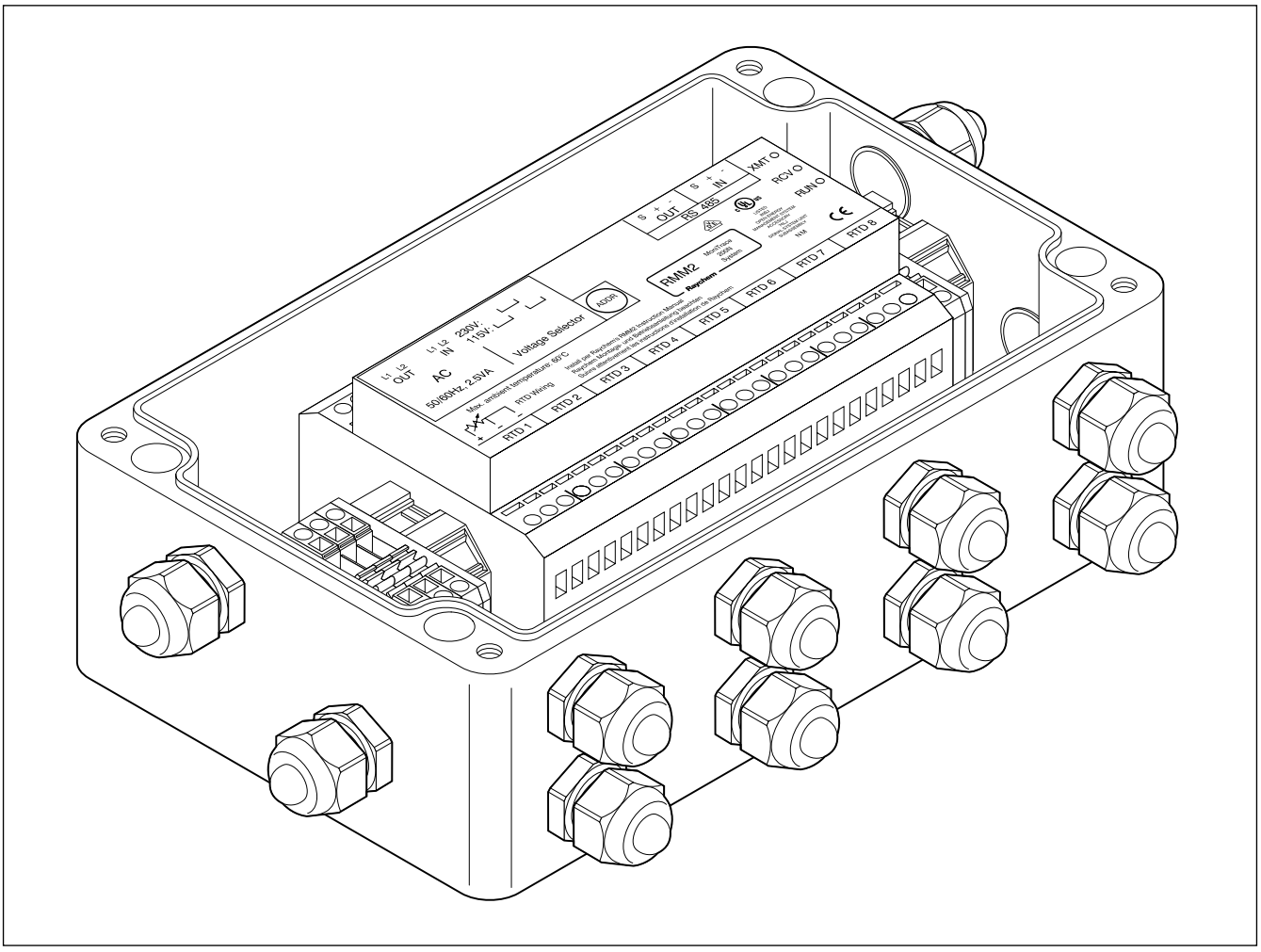
Trace-heating remote monitoring module

MoniTrace Remote Monitoring Modules (RMM2) provide temperature monitoring capability for the MoniTrace 200N trace-heating control and monitoring unit. The RMM2 accepts inputs from up to eight Pt 100 temperature sensors that measure pipe or ambient temperatures in a trace-heating system. Multiple RMM2 units communicate with a single MoniTrace 200N unit to provide 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 MoniTrace 200N.

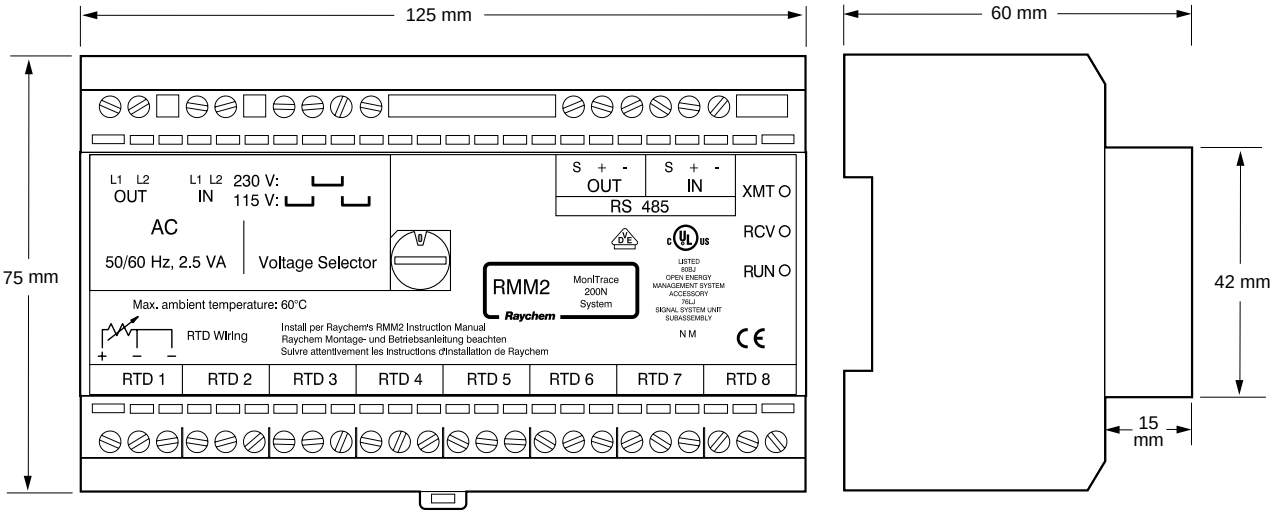
Control and monitoring
The MoniTrace 200N controls up to 130 circuits of trace-heating based on ambient or pipe temperatures. MoniTrace RMM2 may be used to collect both ambient and pipe temperatures for control or for extensive monitoring of the trace-heating system. MoniTrace RMM2 units are placed near 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 MoniTrace RMM2. Alarm limits are set and alarm conditions are reported at the MoniTrace 200N panel. Additional alarms are triggered for failed temperature sensors and communication errors. Alarms may be reported remotely through an alarm relay in the MoniTrace 200N or through a RS-485 connection to a host computer supporting the Modbus protocol.

Configurations
The MoniTrace 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.



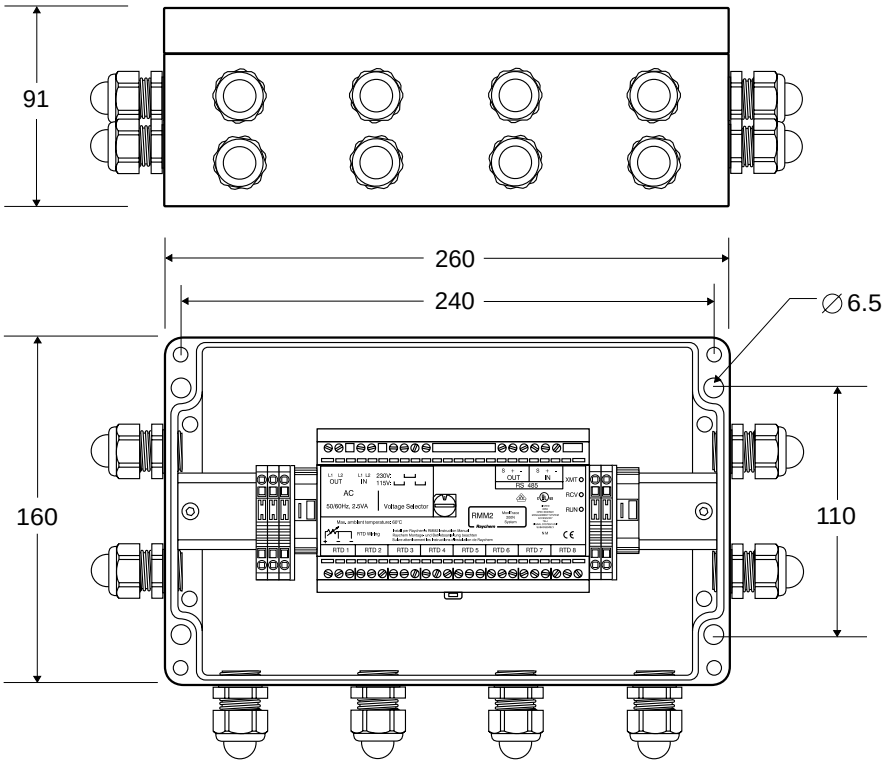
Dimensions (in mm)



General	
Area of use	Hazardous area (Zone 2) or non-hazardous area MONI-RMM2-EX-E hazardous area zone 2 or non-hazardous area MONI-RMM2-E panel mount, safe area
Approvals	Baseefa03ATEX0739X Ⓔx II 3 G/D EEx n R T6 IP66 T=70°C EN 50 021 CE Ordinary areas: DVE
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 V +10% 50/60 Hz (jumper selectable)
Internal power consumption	3 VA
RMM2 hazardous area enclosure	**MONI-RMM2-EX-E**
Protection	IP66
Explosion protection	II 3 G/D EEx n R T6 IP66 T=70°C per EN 50 021
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 mm^2 cable this equals to ±150 m of cable. 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.
Area of use	Use sensors with the appropriate approvals required for the area of use

Enclosure details Dimensions (in mm)

Hazardous area enclosure
MONI-RMM2-EX-E



Communication to 200N	
Type	RS-485
Cable	1 shielded twisted pair
Length	1200 m max.
Quantity	Up to 16 RMM2 connected to one 200N
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	PN	Weight
MoniTrace RMM2			
No enclosure, internal electronics module only	MONI-RMM2-E	307988-000	1.2 kg
With hazardous area enclosure	MONI-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

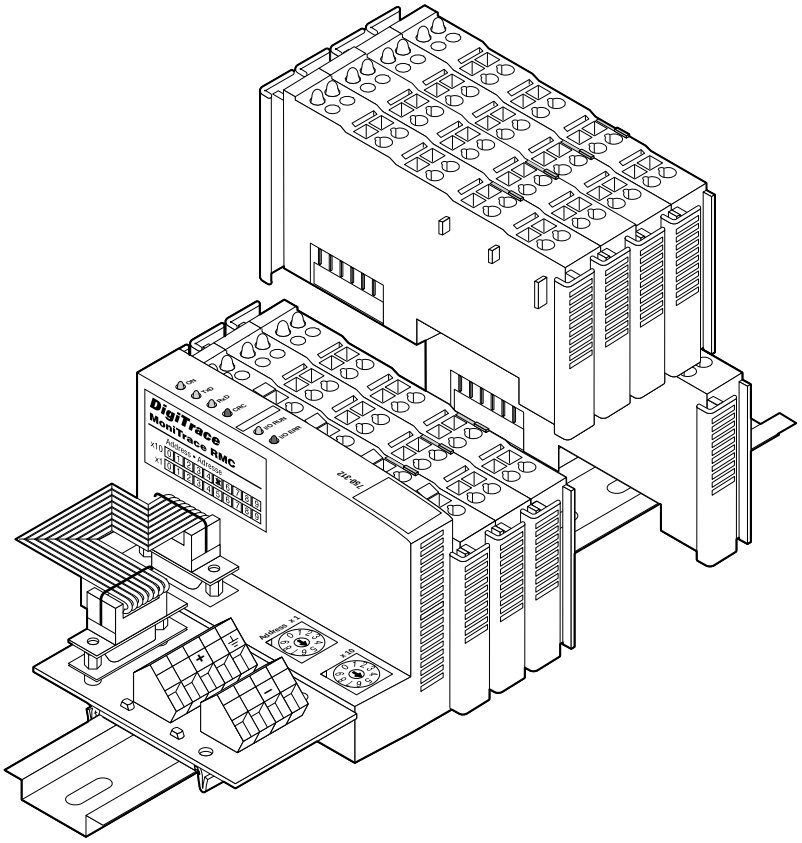
Trace-heating remote module for control

MoniTrace remote modules for control (RMC) provide multiple relay outputs for switching heating cable circuits controlled by the MoniTrace 200N trace-heating control and monitoring unit. RMC units are modular and may be configured with 2 to 32 relay outputs. A single MoniTrace 200N unit communicates with up to 10 RMC via a single, twisted pair RS-485 cable to provide distributed control of up to 128 heating cable circuits.

Control and monitoring
The MoniTrace 200N controls and monitors multiple trace-heating circuits based on pipe or ambient temperatures. These temperatures are collected locally by MoniTrace remote monitoring modules (RMM) connected on the same RS-485 network. Based on temperature inputs from RMM, the MoniTrace 200N 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.

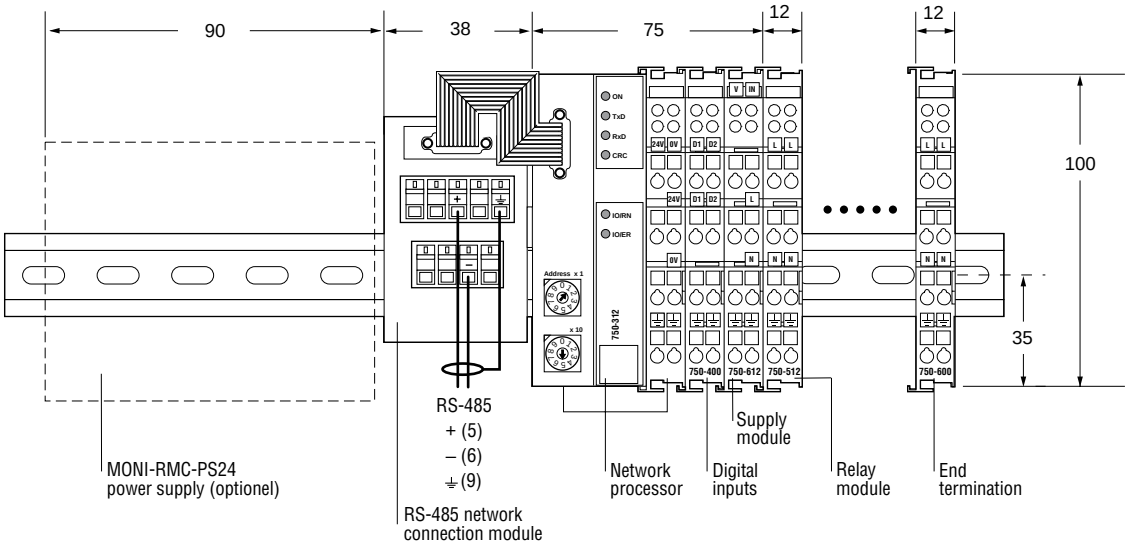
Alarm inputs
Each RMC unit includes two inputs to monitor the status of circuit breakers or power contactors. For example, one input may be used for a common circuit breaker trip alarm, providing an alarm indication at the MoniTrace 200N panel if any circuits fail due to earth fault or overcurrent events. Alarms may be reported remotely through an alarm relay in the MoniTrace 200N or through an RS-485 connection to a host computer supporting the Modbus protocol. Up to 16 MONI-RMC-2DI 2 channel digital input moduls can be added if required.

Configurations
The MoniTrace 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

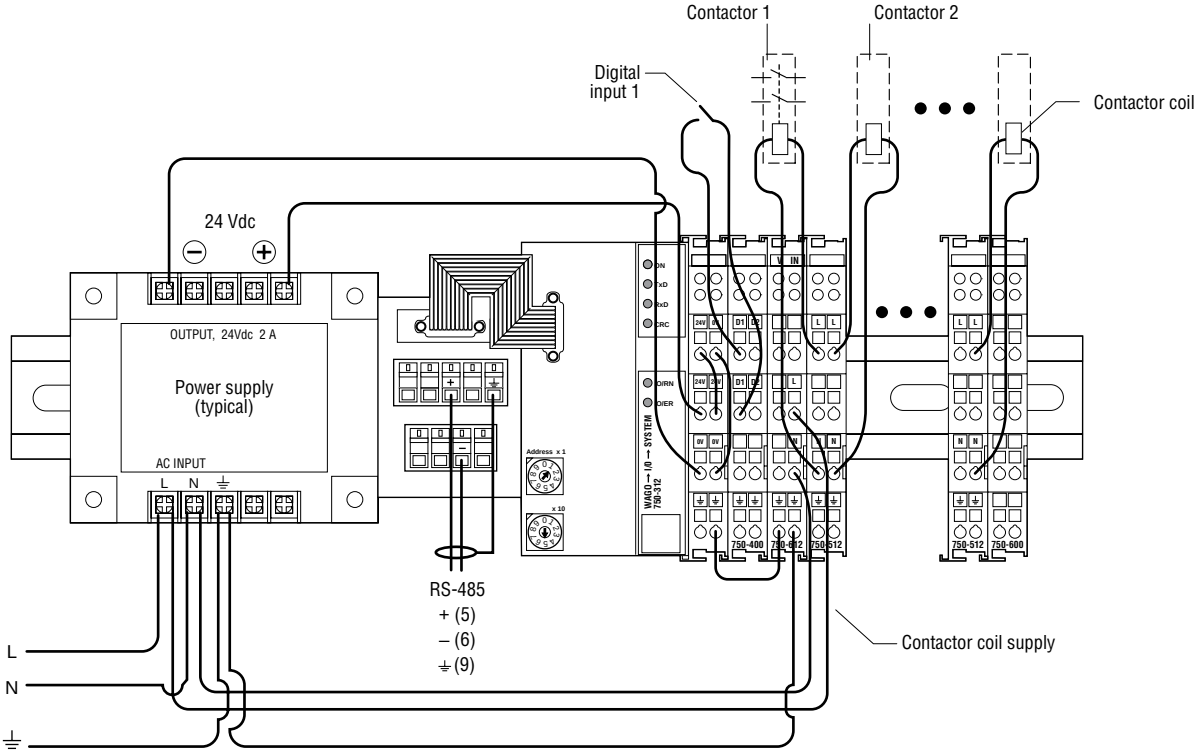
Dimensions (in mm)



Overall width = 125 mm + 12 mm per relay module
(+90 mm for optional power supply)

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 16 two-channel modules (2 to 32 relay outputs)
Total relay outputs via RMCs	128
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 (cage clamp)
Supply module	
Voltage	230 V AC/DC
Current	10 A
Connection terminals	Cage clamp type for cables from 0.08 mm^2 to 2.5 mm^2
Digital inputs	
Quantity per RMC	Up to 16 two-channel modules (2 to 32 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 (cage clamp)

Connection details



Communication to MONI-200N-E	
Type	RS-485
Connection terminals	0.08 mm^2 to 2.5 mm^2 (cage clamp)
Cable	1 shielded twisted pair
Length	1200 m max.
Quantity	Up to 10 RMC may be connected to one 200N
Address	Switch-selectable on RMC, 10 addresses, 50–59
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	PN	Weight
MoniTrace 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	55 g
Two-channel digital input module***	MONI-RMC-2DI	062367-000	50 g
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.

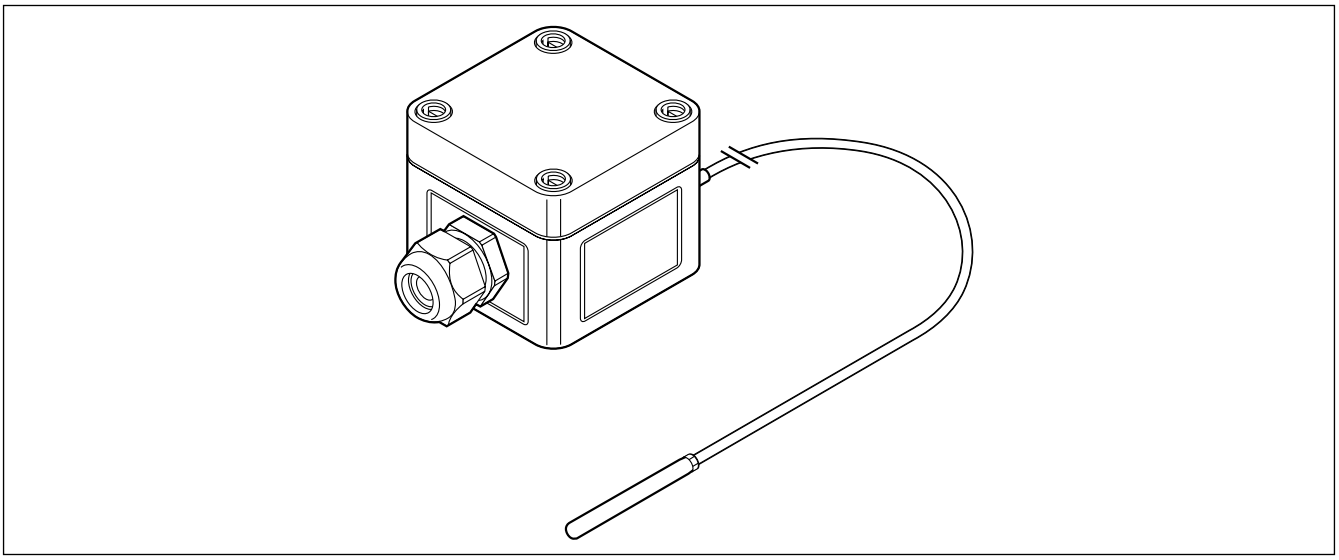
** Purchase one module for each set of two relay outputs required. Minimum of one module (2 relay outputs), maximum of 16 (32 relay outputs) per RMC base.

*** Purchase one module for each set of two digital inputs required. Minimum of one module (2 digital inputs), maximum of 16 (32 digital inputs) per RMC base. Additional module for each pair of digital inputs required. One MONI-RMC-2DI module is included in each RMC-BASE unit

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.

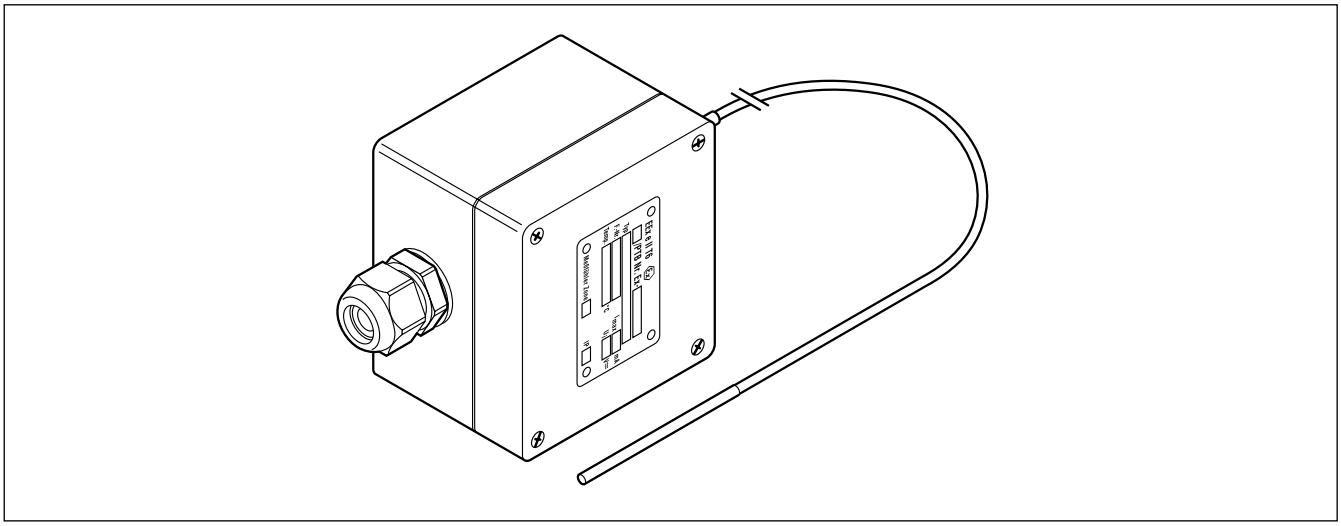


Area of use	**Ordinary area**
Approvals	NA
Sensor	
Type	Pt 100 (2 wire) DIN IEC 751, Class B
Material	Tip: stainless steel Extension cable: silicone
Temperature measuring range	–50°C to +180°C
Temperature range extension cable	–50°C to +180°C (+215°C maximum 1000 hrs), max. exposure temp. tip: +400°C
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 molded holes at 50 x 50 mm
Installation and connection	
Terminals	3 front entry cage clamp 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	140910-000

MONI-PT100-EXE

Ⓔx Temperature sensor for hazardous areas (Zone 1/ zone 2 or safe area)

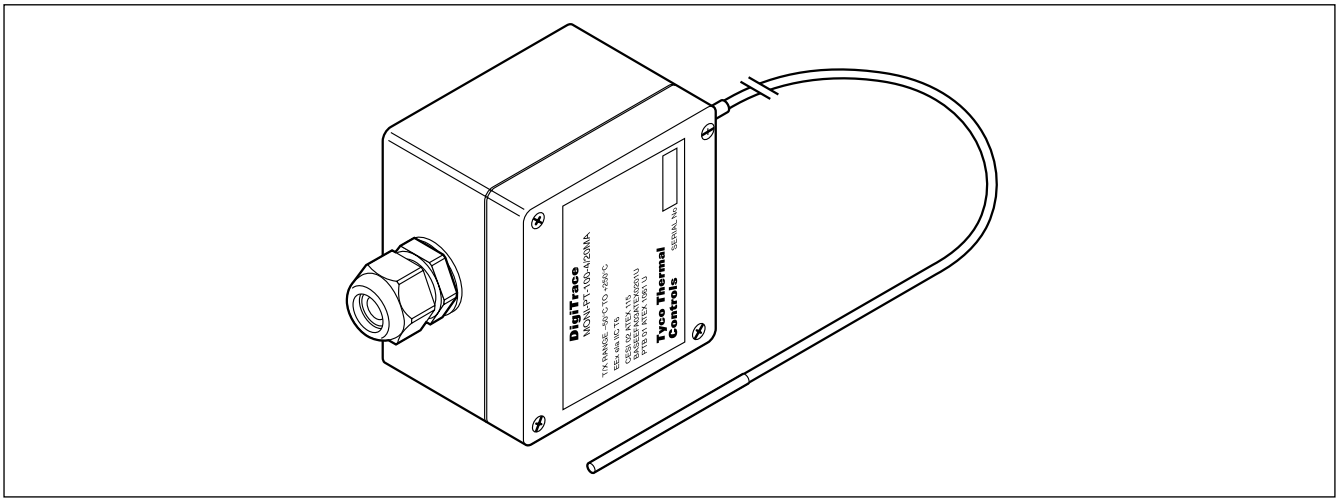
3 wire Pt 100 sensor connected to a black glass fiber reinforced polyester junction box with 4 front entry cage clamp terminals. M20 EEx e cable gland preinstalled.



Area of use	Hazardous environment Zone I
Approvals	Baseefa03ATEX0697X Ⓔx II 2 G/D T=85°C EEx e II T6 (Ta –50°C to +55°C)
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	–50°C to +55°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 molded holes at 68 x 45 mm
Installation and connection	
Terminals	4 front entry cage clamp terminals
Terminal sizing	suitable for cables from 0.5 mm^2 to 2.5 mm^2
Ordering details	
Part Description	MONI-PT100-EXE
PN	967094-000

3 Wire Pt 100 sensor with 4 to 20 mA transmitter for hazardous area (Zone 1)

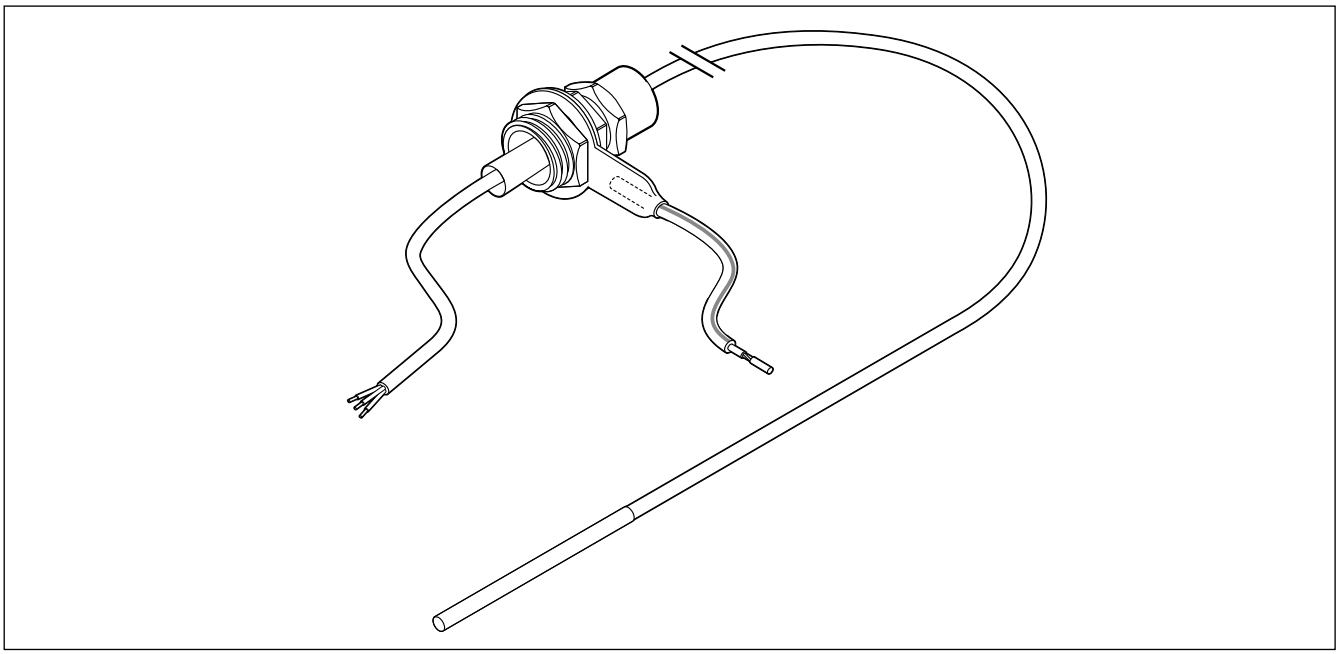
Pt 100 sensor connected to a 4-20 mA transmitter built in a black glass fiber reinforced polyester junction box with M20 cable gland (Blue).



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	704058-000

Ⓔx Temperature sensor without junction box for hazardous area (Zone 1, zone 2 or safe area)

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	Baseefa03ATEX0201U Ⓔx EEx e II
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 +55°C
Ordering details	
Part Description	MONI-PT100-EXE-SENSOR
PN	529022-000

DET-3000

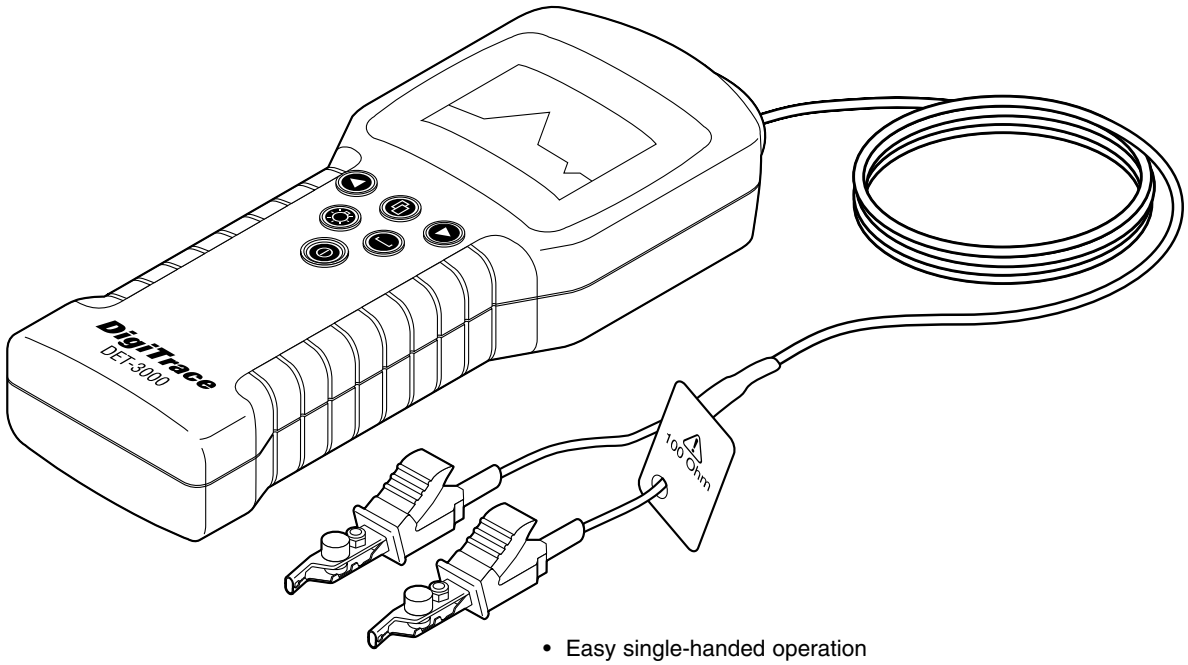
Hand held cable fault locator

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.

Key features



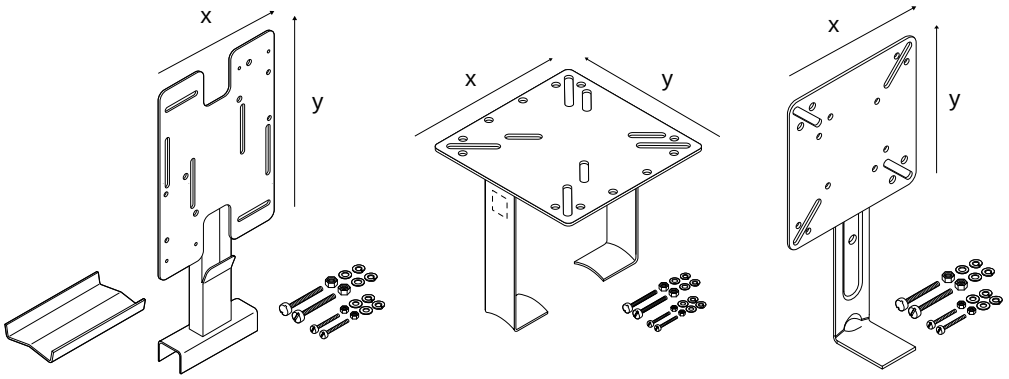
- Easy single-handed operation
- Light Hand-held instrument for long and short range applications
- Usable for high variety of metallic cables
- Cable attenuation compensation and narrow pulse for clear and simple trace display
- Large, high resolution display
- Back lit LCD effective down to –20°C
- 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	With	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 Ohm 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
	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	546866-000

Supports

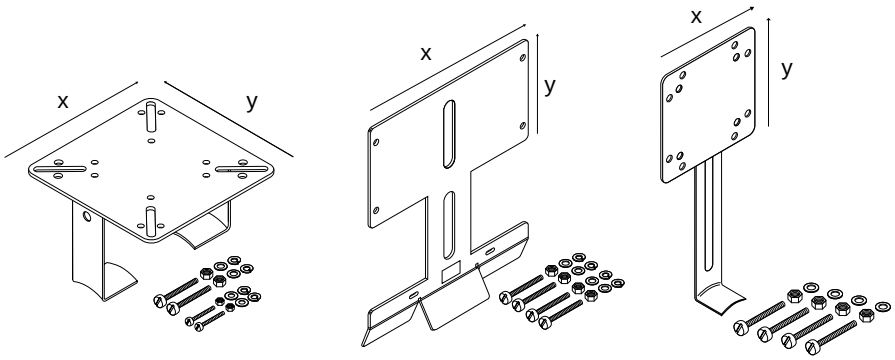
Support brackets are used to fix equipment such as thermostats or junction boxes on pipes. Support brackets require additional pipe straps which are to be ordered separately.
They include a set of M6 and/or M4 fixing screws, nuts, washers and spring lock washers for the fixation of one junction box or thermostat.
The table below outlines the typical compatibility of each bracket with relevant equipment, for other equipment please contact your Tyco Thermal Controls representative.



	SB-100 192932-000	SB-101 990994-000	SB-110 707366-000
AT-TS-13	x	x	x
AT-TS-14	x	x	x
JB16-02	x	x	x
JB-82	x	x	x
JB-EX-20	x	x	x
JB-EX-21	x	x	
JBU-100-E	x	x	
JBU-100-EP	x	x	
MONI-PT100-EXE		x	
MONI-PT100-NH		x	
MONI-PT100-4/20MA		x	
RAYSTAT-CONTROL-10	x	x	
RAYSTAT-ECO-10	x	x	
RAYSTAT-EX-02	x	x	x
RAYSTAT-EX-03	x	x	
RAYSTAT-EX-04	x	x	
T-M-10-S/+x+y	x	x	x
T-M-20-S/+x+y			

Technical data

plate size (mm) x x y	160 x 230	160 x 160	130 x 130
distance pipe-plate (mm)	100	160	100
number of pipe straps required	2	2	1
max. pipe temperature (°C)	230	230	230



	SB-111 579796-000	SB-120 165886-000	JB-SB-26 338265-000
AT-TS-13	x		
AT-TS-14	x		
JB16-02	x		
JB-82	x		
JB-EX-20	x		
JB-EX-21			
JBU-100-E			
JBU-100-EP			
MONI-PT100-EXE	x		x
MONI-PT100-NH	x		x
MONI-PT100-4/20MA	x		x
RAYSTAT-CONTROL-10			
RAYSTAT-ECO-10			
RAYSTAT-EX-02	x		
RAYSTAT-EX-03			
RAYSTAT-EX-04			
T-M-10-S/+x+y	x		
T-M-20-S/+x+y		x	

Technical data			
plate size (mm) x x y	130 x 130	220 x 120	80 x 80
distance pipe-plate (mm)	100	120	100
number of pipe straps required	2	2	1
max. pipe temperature (°C)	230	230	230

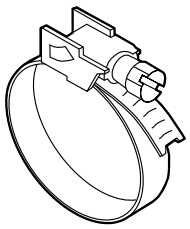
Warning labels

Warning labels indicate the presence of electrical trace-heating under the insulation of the pipe or other equipment. (min. of 1 label per 6 m of trace-heating line)

Language	Label reference	PN
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
Slovenian	ETL-SLO	538156-000
Spanish	ETL-Spanish	C97686-000
Swedish	LAB-ETL-S	691703-000

Pipe straps

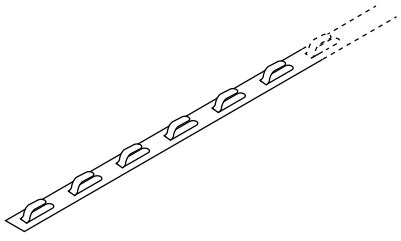
Metal straps for pipe mounting of integrated power connections, above the insulation tees and end seals as well as support brackets and the tubular insulation entry.
Banding: stainless steel



Pipe outer diameter in mm	(inches)	Pipe strap	PN
20-47	($^1/_2$" - 1$^1/_4$")	PSE-047	700333-000
40-90	(1$^1/_4$" - 3")	PSE-090	976935-000
60-288	(2" - 10")	PSE-280	664775-000
60-540	(2" - 20")	PSE-540	364489-000

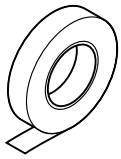
HARD-SPACER-SS-25MM-25M

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
Length: 25 m/roll
PN 107826-000

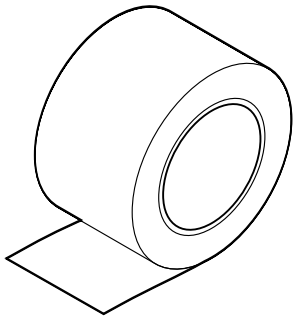


Fixing tapes

Self-adhesive tape for fixing the heating cables on pipes or other equipment.



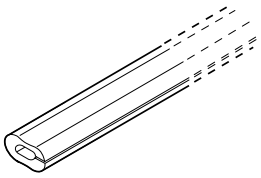
GT-66	Glass cloth tape for attaching heating cable to pipe. Not for stainless-steel pipes or for installation temperatures below 4.4°C. 20 m per roll, 12 mm width PN C77220-000
GS-54	Glass cloth tape for attaching heating cable to pipe. For stainless-steel pipes or for any installation below 4.4°C. 16 m per roll, 12 mm width PN C77221-000



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

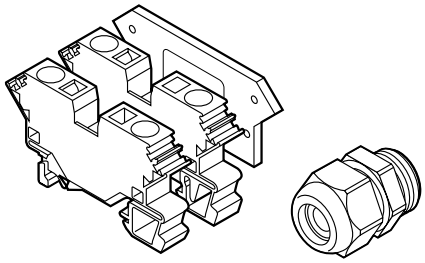
* Power output of selfregulating heating cables might increase when installed with aluminium tape or other heat transfer aids. Please use TraceCalc or contact your Tyco Thermal Controls representative for further details.

Protective grommet

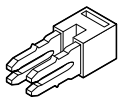


G-02	Silicone grommet that protects the heating cable at sharp edges such as endplates of insulation cladding, flanges etc. It can be cut-to-length and resists temperatures up to 215°C. PN 412549-000

Terminals

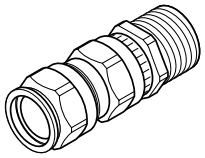


HWA-WAGO-TSTAT-KIT	Thermostat kit with supplementary terminals to connect thermostats of type RAYSTAT-EX-02 to the junction boxes JBS, JBM and JBU. The kit includes 2 terminals WAGO 284 series (1 x L, 1 x PE), 1 power cable gland GL-36-M25, 1 end plate and 1 installation instruction PN 966659-000
HWA-WAGO-PHASE	Phase/neutral terminal (EEx e), spare part for various junction boxes, max. 10 mm^2 solid/stranded. PN 633476-000
HWA-WAGO-EARTH	Earth terminal (EEx e), spare part for various junction boxes, max. 10 mm^2 solid/stranded. PN 911505-000
HWA-WAGO-ENDPLATE	End plate for HWA-WAGO-..., 10 mm^2 terminals, spare part. PN 983674-000

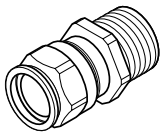


HWA-WAGO-JUMPER	Jumper to bridge HWA-WAGO-..., 10 mm^2 terminals, spare part. PN 550942-000

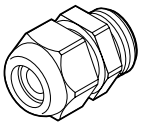
Glands



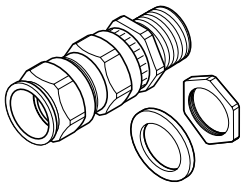
GL-33
3/4” NPT power cable gland for RAYSTAT-EX-02 (EEx d II C)
Nickel plated brass
For use with armoured power cables with outer sheath diameter of 12 mm - 21 mm and inner sheath diameter of 8.5 mm - 16 mm
PN 493217-000



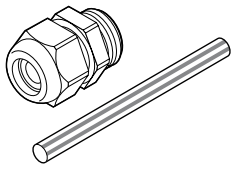
GL-34
3/4” NPT power cable gland for RAYSTAT-EX-02 (EEx d II C)
Nickel plated brass
For use with non-armoured power cables with outer sheath diameter of 8.5 mm - 16 mm.
PN 931945-000



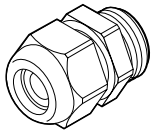
GL-36-M25
M25 power cable gland (EEx e)
Polyamide
For use with non-armoured power cables with outer diameter range 8 mm - 17 mm
Spare part for JBS-100, JBM-100 and JBU-100
PN 774424-000



GL-38-M25-METAL
M25 power cable gland (EEx e II and EEx d II C) for use with junction boxes with internal earth plate (-EP) or metal boxes.
For use with armoured power cables with sheath diameter of 12 mm - 21 mm and inner sheath diameter of 8.5 mm - 16 mm.
PN 056622-000

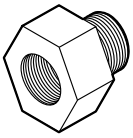


GL-44-M20-KIT
Cable gland EExe (M20), polyamide for use with PI cables with a diameter range of 5-13 mm. With green / yellow sleeve.
PN 1244-000 848

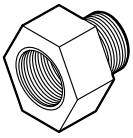


GL-45-M32
Cable gland EExe (M32), polyamide for use with power cables with a diameter range of 12-21 mm.
PN 1244-000 847

Adaptors

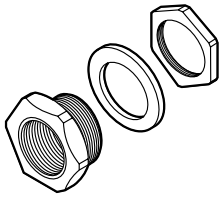


ADPT-PG16-M25-EEXE
Pg16 (female) to M25 (male) adaptor (EEx e)
Polyamide, ATEX approved adaptor with captive sealing ring (“o”-ring)
For use with cables with outer diameters up to 15 mm
PN 541892-000

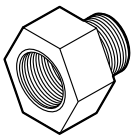


REDUCER-M25/PG16-EEXE
M25 (female) to Pg16 (male) reducer (EEx e)
Polyamide, ATEX approved reducer with captive sealing ring (“o”-ring)
For use with cables with outer diameters up to 13 mm
PN 953780-000

REDUCER-M25/20-EEXD
M25 (male) to M20 (female) reducer EExd
Brass, ATEX approved reducer with captive sealing ring (“o”-ring)
PN 404287-000

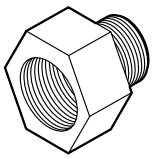


REDUCER-M25/20
M25 (male) to M20 (female) reducer EEx d including a locknut and fibre washer
Brass, ATEX approved reducer with captive sealing ring (“o”-ring)
PN 630617-000



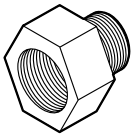
REDUCER-M25/M20-PA

M25 (male) to M20 (female) reducer for ordinary area
Polyamide
PN 184856-000



REDUCER-M32/M25-EEXE

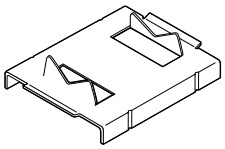
M32 (male) to M25 (female) reducer (EEx e)
ATEX approved reducer. Polyamide.
PN 1244-000 859



ADPT-M20/25-EEXD

M20 (male) to M25 (female)
Brass, ATEX approved adaptor with captive sealing ring ("o"-ring)
For use with cables with outer diameters up to 14 mm
PN 684953-000

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)

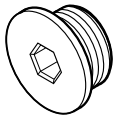
JBM-SPA

Small pipe adaptor required for pipes ≤ 1" (DN25), applicable for JBM-100, T-100
D55673-000 (bag of 5 adaptors)

Plugs

HWA-PLUG-M20-EXE-PLASTIC

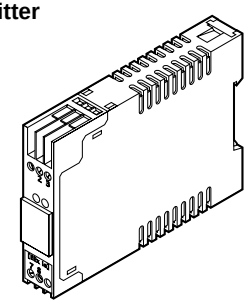
M20 stopping plug EExe
Polyamide
Spare parts for various junction boxes.
PN 1244-000 845



HWA-PLUG-M25-EXE-PLASTIC

M25 stopping plug
Polyamide
Spare parts for JBS-100, JBM-100 et JBU-100
PN 434994-000

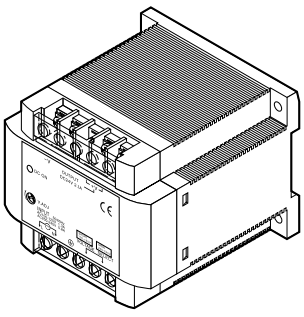
Transmitter



TCONTROL-ISOL-01

ATEX approved isolator for MONI-PT100-4/20MA
Galvanically isolated module for EEx ia protection of MONI-PT100-4/20MA sensor between the hazardous area and the ordinary area. DIN 35 rail mounted.
A seperate 24 VDC power supply such as MONI-RMC-PS24 is required.
PN 670021-000

Power supply



MONI-RMC-PS24

24 VDC power supply
Wide range input (100-240 VAC) power supply to provide 24 VDC input for MONI-RMC-BASE or TCONTROL-ISOL-01 products. Surface or DIN 35 rail mounted.
PN 972049-000

tyco
Thermal Controls

Tyco Thermal Controls brings together the knowledge, expertise, products and services of leading brands such as Raychem, HEW-THERM, Pyrotenax, DigiTrace, Isopad, TraceTek and Tracer.

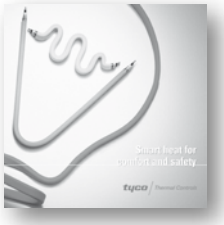
From heat-tracing and floor heating to safety security wiring, temperature measurement and leak detection, Tyco Thermal Controls offers an innovative range of products and services for industrial, commercial and residential construction applications. Below is a brief overview of its presence in various markets.

Commercial construction

Raychem®

As the world leader in heat-tracing systems, Tyco Thermal Controls has the heat-tracing systems that you need - from pipe-freezing prevention or maintaining fluid temperatures, to melting snow and heating floors. For commercial or residential applications, new construction or renovation, its smart solutions will perform perfectly for greater comfort and safety.

Available literature: *'Smart heat for comfort and safety'* (CDE-0716)

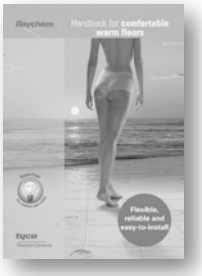


Floor heating

Raychem®

Raychem electrical floor heating systems can be used for new construction and they are ideal for refurbishment projects. Raychem electrical underfloor heating systems are an ideal heating solution for both new build and refurbishment projects. They are designed to increase comfort at home whilst saving on heating costs.
For more information visit our website www.tycothermal.com

Available literature: *'Handbook for comfortable warm floors'* (CDE-0695)

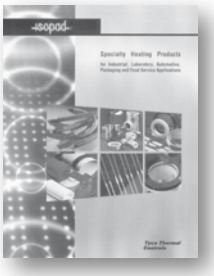


Specialty heating

isopad

Isopad specialty heating systems are designed and tailor-made to provide the benefits of heat-tracing across a range of unique applications. Specialty heating systems include heating tapes, jackets and panels, but also drum heaters and heated hoses.

Available literature: *'Specialty heating products for industrial, laboratory, automotive, packaging and food service applications'*



Wiring

Pyrotenax® BRAND

For over 60 years the Pyrotenax name has been synonymous with high performance mineral insulated (MI) fire survival wiring cable systems. Now, fully integrated within Tyco Thermal Controls, the range of Pyrotenax brand fire performance cables has been extended to include fire resistant polymeric cable technology.

Available literature: *'Pyro MI enhanced Grade MI Wiring Cable System'* (CDE-0801)

Temperature measurement

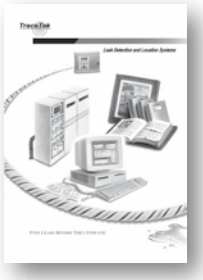
Pyrotenax temperature measurement solutions consist of mineral insulated thermocouple and RTD cables and sensors which can be used for a variety of temperature measurement applications in many industries such as aerospace, power generation, metal manufacturing, food and beverage...

Available literature: *'Sensors and assemblies for extreme environments'* (CDE-0940)

Leak detection

Leak detection systems provide early detection of leaks in a piping network or tank farm. The detection applications range from environmental to industrial usage. TraceTek leak detection products include various sensor cables, probes and electronic monitoring instruments that provide customers with state-of-the-art monitoring capabilities for virtually all liquid handling and transportation systems.

Available literature: *'Leak Detection and Location Systems*'



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