

Technical Handbook

We keep people and infrastructure safe from harm, enhance building performance and bring comfort into the home.





BUILDING & INFRASTRUCTURE SOLUTIONS

We provide quality solutions for winter safety, comfort and performance to building and infrastructure design, construction, operation and maintenance professionals. From pipe freeze protection to maintaining fluid temperatures and melting snow, detecting leaks or heating floors, you can rely on Chemelex for greater safety, comfort and performance.

THE HEART OF OUR SOLUTIONS

In 1970, Raychem first developed and launched self-regulating electric heating cables.

The cable delivers the right amount of heat exactly when and where it is needed. As the temperature drops, more heat is produced. Conversely, as the temperature rises, less heat is produced. But there are many more benefits:

- The smart cables can be overlapped without any risk of overheating.
- The heating cables can be cut to length 'in the field'. This means additional flexibility when plans do not correspond to the "real life" situation on site.
- The length of pipe corresponds to the length of cable that you need.

A Cold ambient = High power output

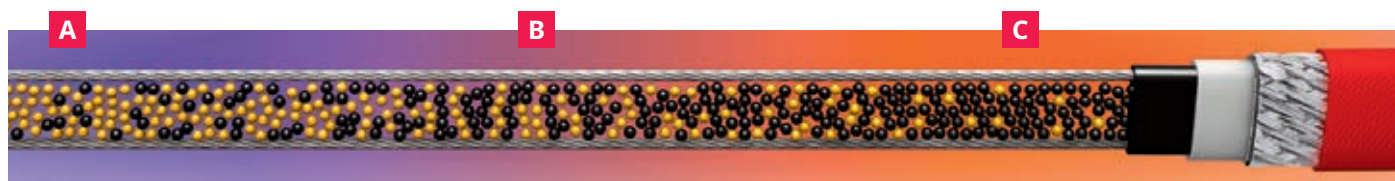
If the temperature in the immediate vicinity of the self-regulating heating cable is cold, the heat output from the heating cable is increased. The polymeric core of the cable contracts, which creates many electrical paths across the integrated carbon particles.

B Warm ambient = Low power output

In response to a warmer environment, the heat output of the self-regulating cable is reduced. The polymeric core of the cable expands, reducing the electrical paths.

C Hot ambient = Virtually no output

If the temperature in the environment of the self-regulating heating cable reaches a high temperature, the heat output is minimal. Due to the maximum expansion of the polymeric core of the cable, most of the electrical paths are broken



Tested and qualified

- Stringent production monitoring
- Approved BS EN 62395 (IEC62395:2013)
- VDE approved
- CE marked



Member of the European Radiant Floor Heating Association e.v.



Our products satisfy the requirements of the relevant European Directives.



Robust construction

- Long service life assured through modified polyolefin or fluoropolymer insulation and jacket materials.

Life time

- Intensive tests according to recognized scientific procedures. Results: self-regulating heating cables have a service life in excess of 20 years.

MORE THAN A HEATING CABLE

The combination of a self-regulating heating cable and a smart control unit allows for dynamic management of the heating cable's power output dependent on parameters such as ambient temperature and moisture. These will help you and your customers to comply with today's building regulations on energy savings. A complete Raychem system can result in energy savings of up to 80%!

Our control units

(e.g. HWAT-ECO) are designed for easy set-up and operation. They are easy to access for fast wiring. Ergonomic buttons, intuitive menu-driven operation and pre-installed programmes allow for quick set-up.



Specific connection systems

have been designed and configured to be fully compatible with our heating cables. The RayClic connection system cuts installation time by 80%. Inserting the stripped cable into the module and fastening is all it takes.



CUSTOMER SERVICE CENTRE AND TECHNICAL SUPPORT TEAM

Chemelex offers a set of tools and services that aim to simplify the professional's life. Not only do we offer the best quality products, we also support them with unrivalled services.

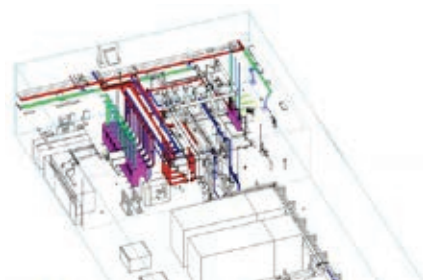
- Multi-lingual customer service representatives to answer all your questions.
- Fast order handling & shipment Europe-wide.
- Free documentation service
- "On demand" technical advice



- Design support and quotation
- Direct support to specifiers and installers
- Training upon request
- Complete after-sales service
- Also for non-standard applications our team can assist you in finding the right heating solution. Do not hesitate to get in touch with us. Free phone 0800 96 90 13.

RAYCHEM "TRACE-IT", ADD-IN SOFTWARE PACKAGE FOR AUTODESK REVIT MEP

- Heat loss calculations for piped services
- Product selection based upon actual systems designed in Revit
- Automatic calculation of BOM including accessories
- Circuit information, power requirements & circuit lengths
- Engineering specification content for installed products
- * Complete Trace Heating Revit Schedule direct in the BIM



 **Trace-It is available, free of charge from Autodesk SEEK.**

TRACECALC PRO FOR BUILDINGS, AN ONLINE PIPE HEAT TRACING SYSTEM DESIGN TOOL

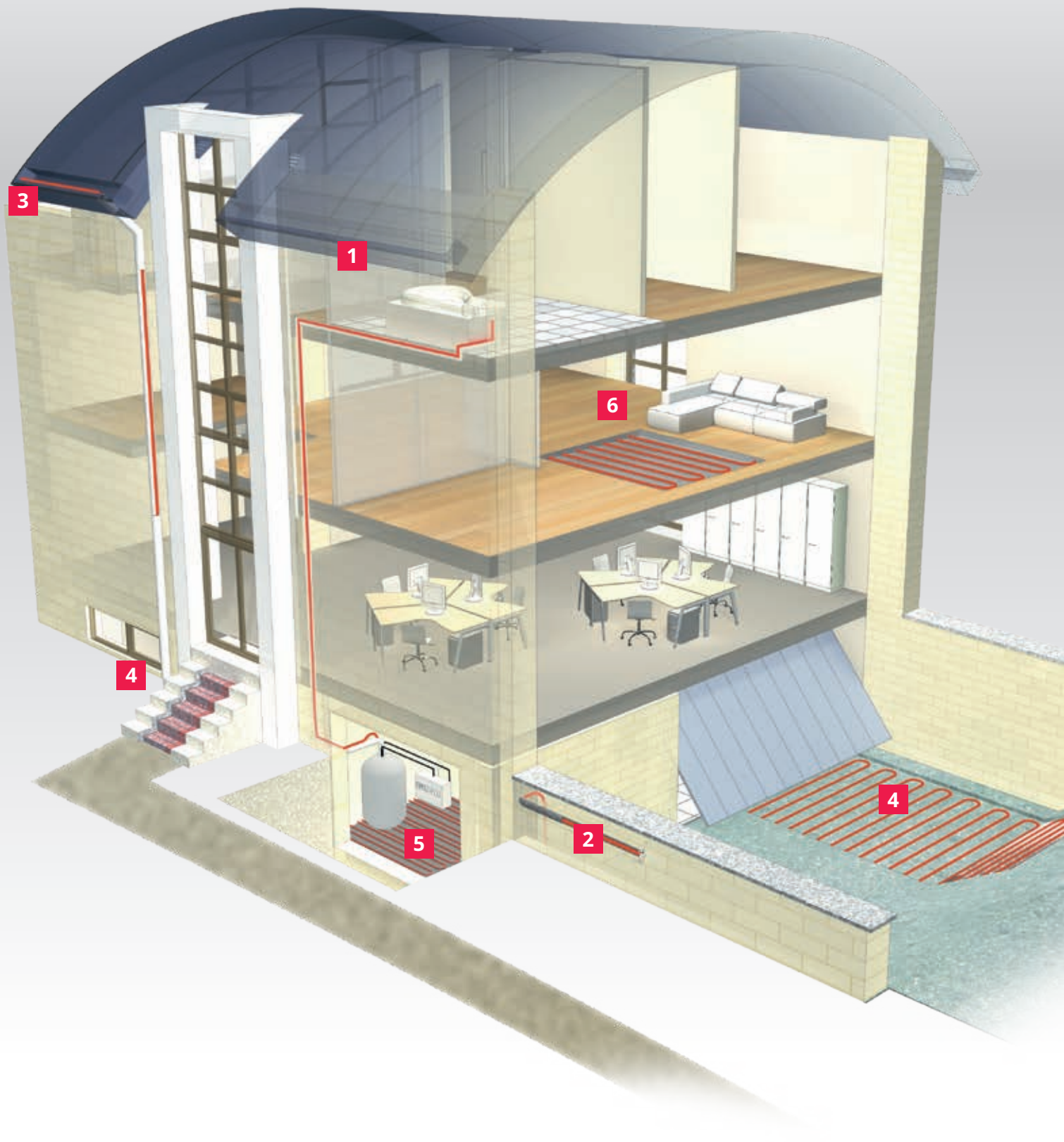
This intuitive, easy-to-use, online design tool lets you create heat-tracing designs for the following applications:

- Pipe Freeze Protection
- Hot Water Temperature Maintenance
- Flow maintenance / Grease line flow maintenance



Your design project can contain multiple applications, multiple circuits, and multiple pipe segments with different design parameters on a single circuit. Additionally, it lets you save your projects for future use.

Overview of applications



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Hot water temperature maintenance

Pipe freeze protection

Snow melting and deicing of gutters and downpipes

Snow melting of ramps, steps, footpaths and accessways

Leak detection

Electrical underfloor heating

Multiple application control & monitoring system

General installation instructions



Hot Water Temperature Maintenance

Providing the comfort of instant hot water is the key requirement of any modern hot water system. The Raychem single-pipe system keeps water at the right temperature in a building's water distribution pipe work. The intelligent system first keeps the investment cost low and then it operates economically and efficiently.

An hygienic system

Less water volume and less heat loss in the pipe work help prevent bacteriological problems.

A flexible and space-saving system

The space requirement for pipes has been reduced because there are no return pipes. Risers, shafts and openings can be optimised freeing space for other services.

Low investment costs

The heating cable is simply fixed on the supply pipe. There is no need for return pipe work, valves or pumps, nor for complex design and balancing work associated with return systems.

Lower power consumption

The heat loss in the system is significantly lower as only the heat loss from the feed pipe (and not from the return pipe) is to be compensated for. There is also no power requirement for circulation pumps.

The single-pipe system can be used with a smaller boiler and as there is no cold return water coming into the boiler, the heat-up of the water is more efficient.

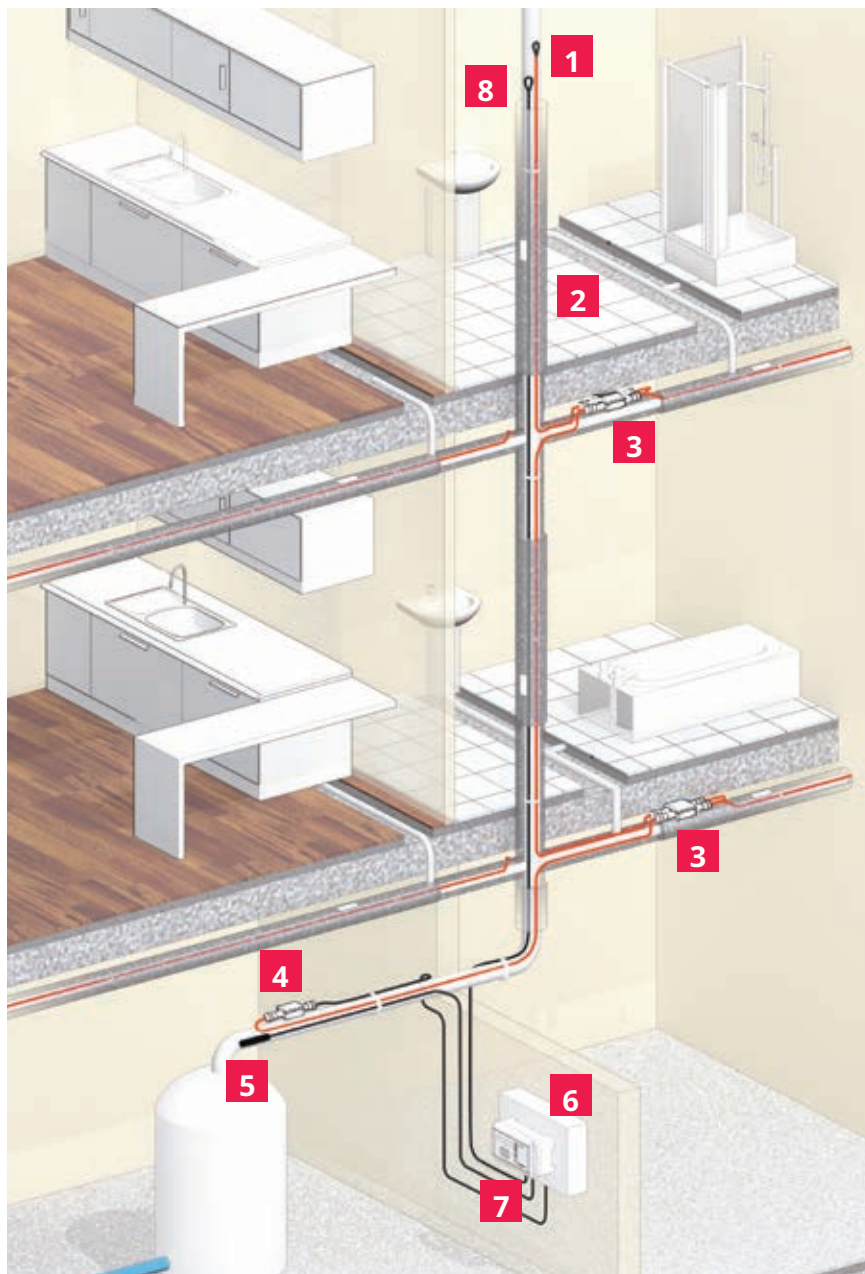
The intelligent HWAT-ECO control unit saves power e.g. it can lower the temperature or switch off during water consumption peaks.

No maintenance costs

The system has no mechanical parts such as a recirculation pump or control valves. There are no parts to wear out.

Long Lifetime

The self-regulating Raychem heating cable has a lifetime of over 40 years.



1 Gel-filled end seal (RayClic-E-02)

2 Heating cable (HWAT-L, M or R)

3 4-way connection (RayClic-X-02)

4 Power connection (RayClic-CE-02)

5 Sensor HWAT-ECO (incl.) An NTC temperature sensor can be installed optionally in an immersion pipe installed on site.

6 Residual current device (rcd) (30 mA) Circuit-breaker (C type)

7 Temperature control unit (HWAT-ECO)



8 Pipe sensor (optional) for monitoring pipe temperature

Design Guide, Control Units and Accessories

1 HEATING CABLE SELECTION

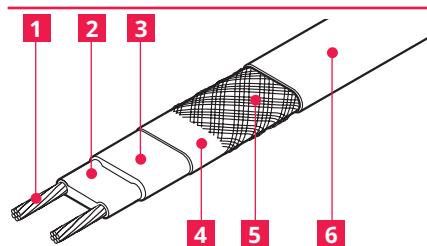
Optimum water temperature maintenance for single family houses, flats, offices, hotels, hospitals, convalescent homes, sports centres, ...

Heating cable type	HWAT-L	HWAT-M	HWAT-R (**)
PCN	258015-000	498639-000	266435-000
Power output	7W/m at 45°C	9 W/m at 55°C	12 W/m at 70°C
Max. exposure temperature	65°C	65°C	80°C
Outer jacket colour	yellow	orange	red
Control unit: HWAT-ECO 	ü	ü	ü
Control unit: HWAT-T55 *	ü	ü	ü
Control cabinet * SBS-R-HWAT SBS-xx-HV-ECO ACS30	ü	ü	ü
Legionella prevention			Possibility of thermal legionella prevention up to the draw-off points

* The right controller or control cabinet must be selected depending on the building project.

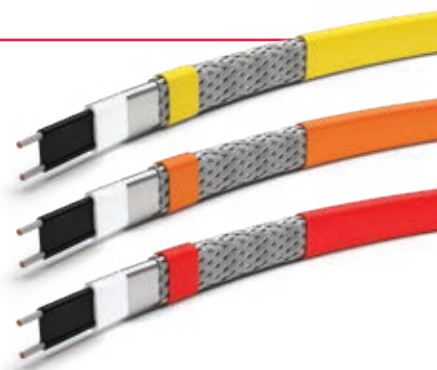
** When used on plastic pipes, the pipe material must have a heat resistance of at least 90°C!

2 COMPOSITION OF THE HWAT-L/M/R HEATING CABLE



- 1 Copper conductor (1.2 mm²)
- 2 Self-regulating heating element
- 3 Modified polyolefin insulation
- 4 Aluminium foil wrap
- 5 Protective tinned copper braid
- 6 Modified polyolefin protective outer jacket

Technical data: see page 79



3 PIPE AND INSULATION THICKNESSES

Pipe size (mm)	15	22	28	35	42	54
Insulation thickness (mm)	20	20	25	30	40	50

Ambient temperature: 18°C

Thermal conductivity $\lambda = 0.035 \text{ W/(m.K)}$

For other thermal conductivity insulation materials, contact your Raychem representative.

Thermal losses in W/m, pipe 55°C in 18°C ambient temp.

Insulation	DN 15	DN 20	DN 32	DN 40	DN 50
15 mm	10	12	16	18	21
20 mm	9	10	14	15	18
30 mm	7	8	11	12	14
40 mm	6	7	9	10	12
50 mm	6	7	8	9	10
60 mm	5	6	8	8	9

Thermal losses in W/m, pipe 55°C in 5°C ambient temp.

Insulation	DN 15	DN 20	DN 32	DN 40	DN 50
15 mm	13	16	21	24	28
20 mm	12	13	18	20	23
30 mm	10	11	14	16	18
40 mm	8	10	12	13	15
50 mm	8	9	11	12	13
60 mm	7	8	10	11	12

Calculations with TraceCalc PRO for Buildings

- Maintain temperature 55°C
- Building interior
- Safety factor 10%
- Mineral wool, thermal conductivity at 40°C 0.041 W/mk

4 HEATING CABLE LENGTH

The heating cable is installed in a straight line on the pipework

The heating cable can be traced right up to the draw-off points

Total length of pipe to be traced

+ approx. 0.3 m per connection

+ approx. 1.0 m per T-connection

+ approx. 1.2 m per 4-way connection

= required heating cable length

5 ELECTRICAL PROTECTION

- The total length of heating cable determines the number and size of the circuit breakers.
- Residual current device (rdd): 30 mA required
- Power cabling for the heating cables according to local regulations
- The power connection must be carried out by an approved electrical installer

Circuit-breaker to BSEN 60898 (type C): the maximum length of the heating circuit is based on a minimum start-up temperature of +12°C, 230 VAC.

	HWAT-L	HWAT-M	HWAT-R
10 A	80 m	50 m	50 m
13 A	110 m	65 m	65 m
16 A	140 m	80 m	80 m
20 A	180 m	100 m	100 m

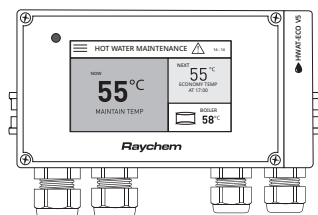
The maximum heating tape length is reduced when using ATE-180. Please contact the Raychem Service Team.

6 CHECKLIST FOR PLANNING THE INSTALLATION

The system design should take into account:

- Pipe diameter and material
- Insulation type and thickness
- Ambient temperature
- Circuits should divide the plumbing into logical segments
- Don't exceed the maximum circuit length
- Show connection locations on the drawings
- Locate power connections near the electrical panel
- Locate T-connections in accessible areas

HWAT-ECO-V5

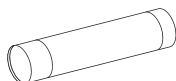


Electronic temperature control unit with integrated clock

- Building-specific programme
- Sensor 1: Boiler temperature monitoring (optional)
- Sensor 2: Pipe temperature monitoring (optional)
- 7 Economy building programmes, editable
- Password protection
- Intuitive Simple user interface for fast set-up and programming
- Compatible with HWAT-L/M/R heating cables
- 5" color touchscreen user interface
- Alarm outputs; Over and lower temperature alarms
- USB interface for external battery (power bank) for parameter input in the de-energized state
- PCN: 1244-019897

Technical data: see page 14

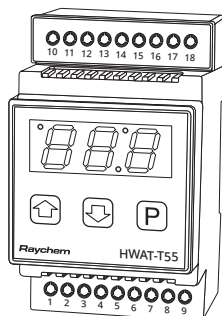
RAYCHEM-PB-POWERBANK



Accessory for HWAT-ECO V5

- For pre-setup in power-off mode
- Torch function
- USB cable type A-A
- PCN: 1244-020365

HWAT-T55

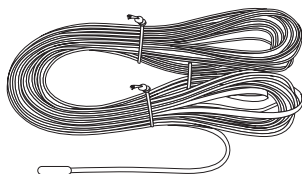


Thermostat with line sensor for hot-water branch lines and small hot-water pipe networks for HWAT-L, M and R (up to max. 50 m heating cable length)

- Temperature control with line sensor included
- DIN-Rail mounted (35 mm)
- Manual ON/OFF
- Digital temperature display
- 3 operation modes –ON/ ECO/ OFF
- 3 pre-set hot water maintain temperatures 55°C, 50°C, 45°C; editable
- Over and lower temperature alarm
- Timer function for energy saving mode/night reduction
- PCN: 1244-015722

Technical data: see page 16

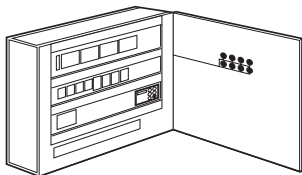
SENSOR-NTC-10M



Temperature line sensor for HWAT-T55 thermostat and HWAT-ECO V5 control unit for fixing on hot water pipe as additional sensor or as spare part

- NTC 2K - sensor Ohm @25°C
- Sensor length: 10 m
- Diameter sensor length: 4 mm
- Diameter sensor probe: 5 mm
- Length sensor probe: 20 mm
- Temperature range: 0°C to +90°C
- PCN: 1244-015847

8 CONTROL PANELS

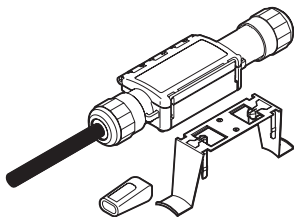


Control Panel: Steel plate housing, wall-mounted version, equipped with mains power switch, RCD/CB combination, inlet and outlet terminals. Completely assembled, turnkey condition wired and inspected cable guides in base of housing. The control panel contains a HWAT-ECO V5 temperature control.

Cabinet type			SBS-R-HWAT-3x16A	SBS-R-HWAT-3x20A	SBS-R-HWAT-6x16A	SBS-06-HV-ECO-10	SBS-09-HV-ECO-10
PCN			1244-021425	1244-016640	1244-021426	539268-000	294452-000
Number of heating circuits			3	3	6	6	9
Enclosure version			Metal Wall version	Metal Wall version	Metal Wall version	Metal Wall version	Metal Wall version
Dimensions	Width	mm	400	400	600	600	600
	Height	mm	600	600	600	600	600
	Depth	mm	210	210	210	210	210
Weight (ready to dispatch)	approx.	kg	32	32	32	45	55
Connected rating		kW	11	14	22	28	42
Fuse protection provided by customer	max.	A	3 x 20	3 x 25	3 x 40	3 x 40 A	3 x 63A
(take selectivity into account)						NH-00	NH-00
Power connection			400 V/230 V c.a., 50 Hz, 3-phase with N and PE	401 V/230 V c.a., 50 Hz, 3-phase with N and PE	402 V/230 V c.a., 50 Hz, 3-phase with N and PE	403 V/230 V c.a., 50 Hz, 3-phase with N and PE	404 V/230 V c.a., 50 Hz, 3-phase with N and PE
Power circuit breaker			3x 16 A	3 x 20 A	6 x 16 A	6 x 20 A	9 x 20 A
Activation delay			No	No	No	Yes	Yes
Installation location			Indoor	Indoor	Indoor	Indoor	Indoor
Exposure temperature			+5°C to +35°C	+5°C to +35°C	+5°C to +35°C	+5°C to +35°C	+5°C to +35°C
IP protection			IP 65	IP 65	IP 65	IP 65	IP 65
Enclosure color			Textured paint, RAL 7035, light grey	Textured paint, RAL 7035, light grey	Textured paint, RAL 7035, light grey	Textured paint, RAL 7035, light grey	Textured paint, RAL 7035, light grey

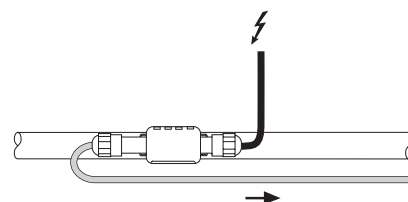
9 ACCESSORIES

RayClic-CE-02

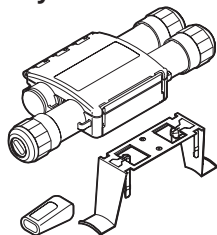


Power connection

- With 1.5 m power cable
- End seal and support bracket
- IP 68
- External dimension: L = 240 mm
W = 64 mm
H = 47 mm
- Max 20 A
- PCN: 235422-000

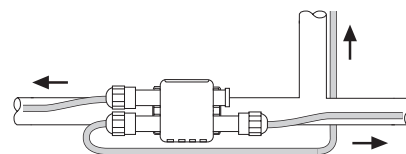


RayClic-T-02

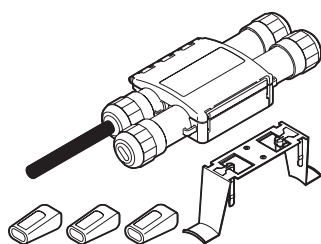


T-connection

- Connection for 3 cables
- End seal and support bracket
- IP 68
- External dimension: L = 270 mm
W = 105 mm
H = 42 mm
- PCN : 441524-000

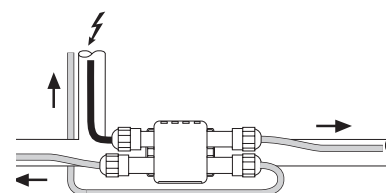


RayClic-PT-02

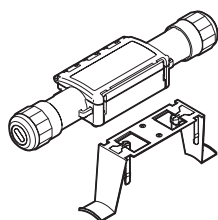


Power T-connection

- 3 connections with integral 1.5 m power cable
- 3 end seals and 1 support bracket
- IP 68
- External dimension: L = 270 mm
W = 105 mm
H = 42 mm
- PCN: 636284-000

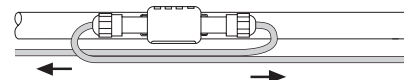


RayClic-S-02

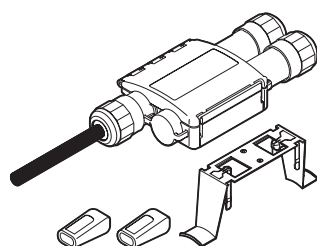


Splice for joining 2 lengths of heating cable

- Connection for 2 cables with 1 support bracket
- IP 68
- External dimension: L = 240 mm
W = 64 mm
H = 47 mm
- PCN : 364855-000

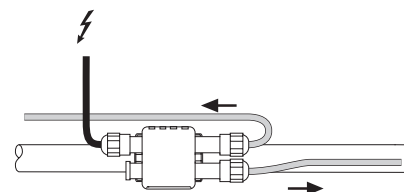


RayClic-PS-02

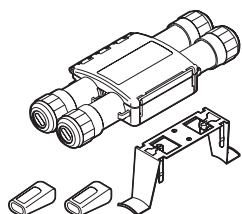


Powered splice

- Connection for 2 cables with integral 1.5 m power cable
- 2 end seals and 1 support bracket
- IP 68
- External dimension: L = 270 mm
W = 105 mm
H = 42 mm
- PCN : 716976-000

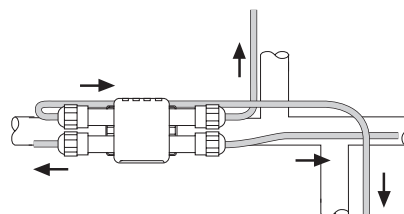


RayClic-X-02

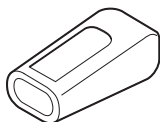


4-way connection

- Connection for 4 cables
- 2 end seals and 1 support bracket
- IP 68
- External dimension: L = 270 mm
W = 105 mm
H = 42 mm
- PCN : 001013-000



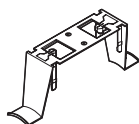
RayClic-E-02



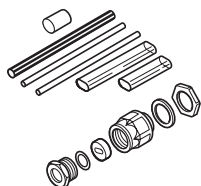
Gel-filled end seal

- For system extensions (to be ordered separately)
- IP 68
- PCN: 224727-000

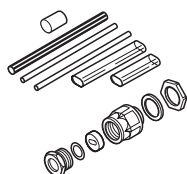


RayClic-SB-04**Support bracket for pipe installation**

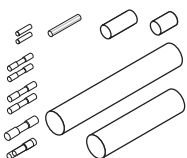
- PCN: 616809-000

CE20-01**Connection and end seal kit**

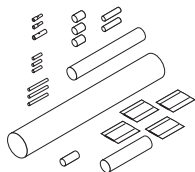
- An HWAT-L/M cable entry is required in the JB16-02 junction box
- Heat-shrink technique
- M20 gland with silicone grommet
- PCN: 734312-000

CE25-01**Connection kit for supply cable with end termination**

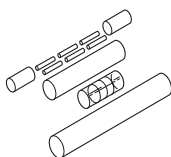
- An HWAT-R cable entry is required in the JB16-02 junction box
- Heat-shrink technique
- M25 gland with silicone grommet
- PCN: 040466-000

CCE-06-CR**Cold lead connection and end seal kit**

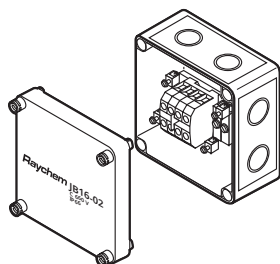
- Connection of 3 x 1.5 mm² or 3 x 2.5 mm² cold lead cable to self-regulating heating cables XL-Trace LSZH, FS-C10-2X, GM-2X and HWAT-L/M/R
- PCN: 1244-021907

TE-01-CR**Heat-shrink T-branch for 3 heating cables, including 2 end seals**

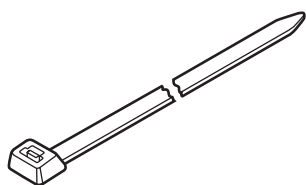
- Heat-shrink technique
- PCN: 1244-003202

S-06**In-line splice kit**

- Heat-shrink technique
- PCN: 054953-000

JB16-02**Temperature-resistant junction box**

- For power connection
- IP66
- 6 x 4 mm² terminals
- 4 x M20, 4 x M25 knock-out entries
- Silicone free
- PCN: 946607-000

KBL-10**Cable ties**

- One pack of 100 required for approx. 30 m of pipework
- Length: 370 mm
- Temperature range: -35°C to +110°C and UV resistant
- PCN: 102823-000

Use ATE-180 on plastic pipes

GT-66**Glass cloth tape for attaching heating cable to pipe**

- Not for stainless steel pipes or for installation temperature below 5°C
- 20 m roll 12 mm width
- PCN: C77220-000

GS-54**Glass cloth tape with silicone adhesive system for attaching heating cable to pipe**

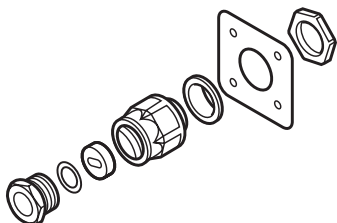
- For stainless-steel pipes or for any installation below 5°C
- 16 m per roll, 12 mm width
- PCN: C77221-000

Use ATE-180 on plastic pipes

ATE-180**Aluminium adhesive tape**

- Minimum installation temperature: 0°C
- Heat resistant up to 150°C
- 55 m roll, 63.5 mm width, for approx. 50 m of pipework
- PCN: 846243-000

On plastic pipes: the heating cable must be covered with aluminium adhesive tape along its entire length.

**IEK-20-M (for HWAT-L, -M)/
IEK-25-04 (for HWAT-R)****Insulation entry kit**

- Insertion of heating cable in metal cladding
- Consists of: metal fasteners, metric gland and joint seal
- PCN IEK-20-M: 1244-000965
- PCN IEK-25-04: 332523-000

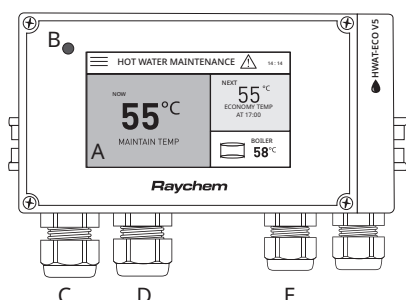
LAB-I-01**Electric traced label**

- To be placed at 5 m intervals on insulation surface
- PCN: 938947-000

HWAT-ECO V5 Temperature Control Unit



Module layout



A Colour touchscreen 5" size

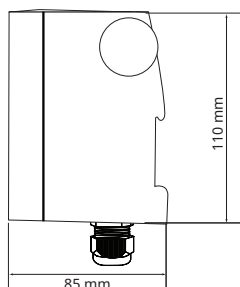
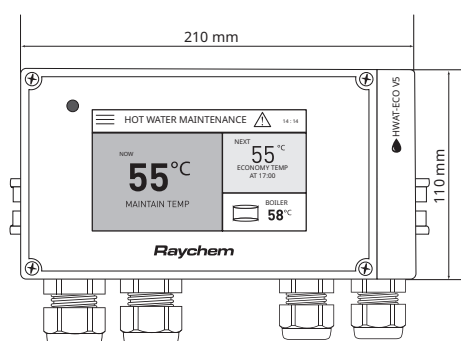
B LED GREEN: Flashing: Power to unit;
Fast Flashing: Error/Warning message

C M25 Gland Power cable

D M25 Heating cable

E M20 Gland: 2 Sensors Hotwater storage/ sensor pipe/external alarm signal

Technical data



(Dimensions in mm)

Product description	HWAT-ECO-V5
Use	Only use with HWAT-L/M/R heating cables
Selectable maintain temperature	37°C to 65°C in max. 24 timer blocs per day
Operating voltage	230 VAC (+10%, -15%), 50 Hz
Switching capacity	20 A / AC 230V
Internal power consumption	2,5 VA
Circuit breaker	Max. 20 A, C-Characteristic
Power cable section entry	1.5 - 4 mm ² for fixed wiring only
Auxiliary cable section entry	Up to 16 AWG (1.5 mm ²)
Weight	900 g
Mounting options	Wall mount with 2 screws or DIN rail
Cable glands (entries)	2 x M25 and 2 x M20 with 3 inputs for external wires of 3-5 mm
Protection level	IP 54
Ambient temperature	0°C to 40°C
Housing material	Polycarbonate
Internal temperature alarm	85°C
USB connection	For set-up & unit programming in power-off mode
Enclosure dimension	210 mm x 110 mm x 85 mm
Pipe sensor	Optional: For installation in the piping system to provide feedback on the pipe temperature. NTC 2 KOhm/ 25°C, 2 wire (optional; separate to be ordered) ; length 10 m; cable extension up to 100m, cross section extension cable 2 x1,5 mm ² ; shielded; temperature range -20°C to 90°C
Alarm relay contacts	Max. 24VDC or 24 VAC, 1 A, SPDT voltage free
Boiler temperature sensor	NTC 2 KOhm/ 25°C, 2 wire (in Box, optional); length 3 m
Power correction factor	60% to 140% (fine tuning of maintained temperature)
Clock back-up time	10 days
Clock accuracy	±10 minutes per year
Real time clock	Automatic summer/winter time and leap year correction
Parameters stored in non-volatile	All parameters, except date and time memory
Approval	VDE pending according to EN 60730
EMC	According to EN 50081-1/2 for emission and EN 50082-1/2 for immunity

PROGRAMME

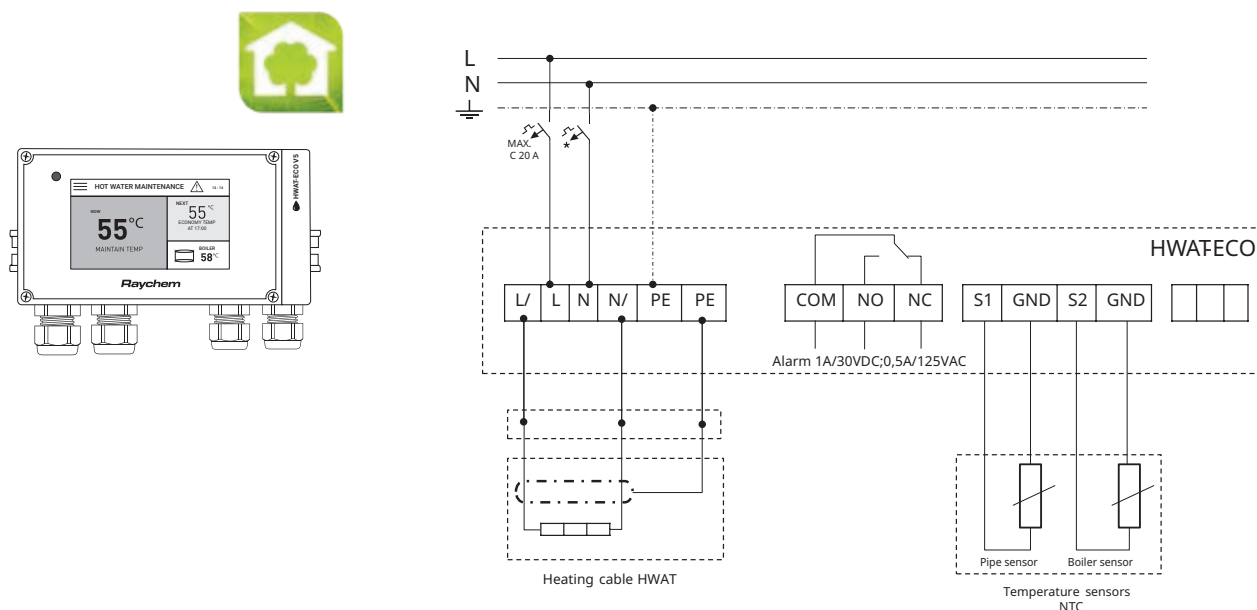
The HWAT-ECO V5 has 7 different building specific time/temperature programmes and one constant program. These programmes are based on our long experience for optimum comfort and energy saving and consider tap profiles per building type. For user specific changes in the programming, the Edit timer for each programm can be used.

Office; Sport center, Hotel, Hospital, Prison, Apartment, Nursing home

In addition, user specific programmes can be created

Temperature can be varied in 1 h blocks to any desired temperature between: OFF, ECONOMY MAINTAIN and HEAT UP (legionella prevention; 100% powered, increased risk of scalding).

Wiring Diagram for HWAT-L / HWAT-M / HWAT-R with HWAT-ECO V5 Temperature Control Unit



* Two- or four-pole electrical protection by circuit breaker may be needed for local standards and regulations.

** Depending on the application, one- or three-pole circuit-breakers or contactors may be used.

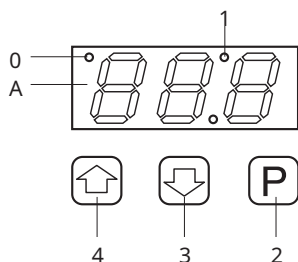
Chemelex requires the use of a 30 mA residual current device and a C-Characteristic circuit breaker to provide maximum safety and protection from fire.

The unit complies with EN 61000-3-3 (flicker) if installed in accordance with the standard. To avoid flicker install the unit in such a way that at the current value of the systems start-up temperature (max. 20 A per heating circuit) the voltage drop does not exceed 1% at the power supply of the lighting apparatus (normally subpanel).

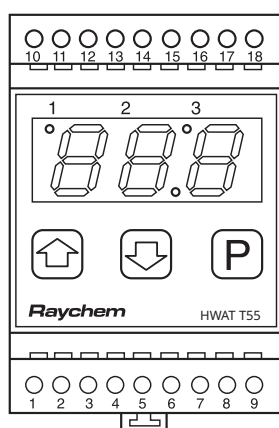
Thermostat HWAT-T55

Temperature control with (pipe) line sensor for Hot water Branch lines and small hot water pipe NETWORKS

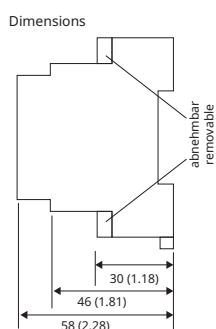
Display



Technical data



Housing



Temperature sensor

A LED display (parameter and error indications)

- 0 Control relay ON
- 1 Eco-Mode/night reduction activated
- 2 Programming/confirmation button
- 3 Reduce value
- 4 Increase value

Operating voltage AC 230V, +10% /-10%, 50 Hz

Power consumption <= 5VA

Control relay (heating) 230 VAC, max 16A

Connecting terminals 2,5 mm², screwed

Temperature setting range* 40°C - 60°C; factory settings: 55°C

*consider local hygienic standard

Switching hysteresis +/-2K

Accuracy +/- 1,5 K including temperature probe

Storage temperature -20°C to +55°C

Storage temperature -20°C to +55°C

Programmable parameter settings

3 pre-set temperatures 55°C ; 50°C, 45°C factory settings; editable

Timer 24 hour display, 1 min interval

Economy-mode/duration 3-8 hours interval per hour
factory settings 6 hours

Economy-mode/starting time 23:00 factory settings; editable

Error codes

- Hot water-temperature -monitoring
- Temperature exceeds 66°C
 - Temperature is too low (min 5K deviation from maintain temperature)

- Sensor
- Sensor-short circuit
 - Sensor-open loop / Sensor not connected

- Heating cable
- Power output relay defective
 - Heating cable not connected

Dimensions 51,5 mm x 87, 5 mm x 58 mm (B/H/T)

Material Housing ABS

IP rating IP 20 (IP 30 in panel)

Installation DIN 35 mm rail mounted

Minimum installation temperature 5°C

HWAT -T55- Sensor Type NTC 2K (2 wires)

Sensor length 10 m

Diameter sensor length 4 mm

Diameter sensor probe 5 mm

Length sensor 20 mm

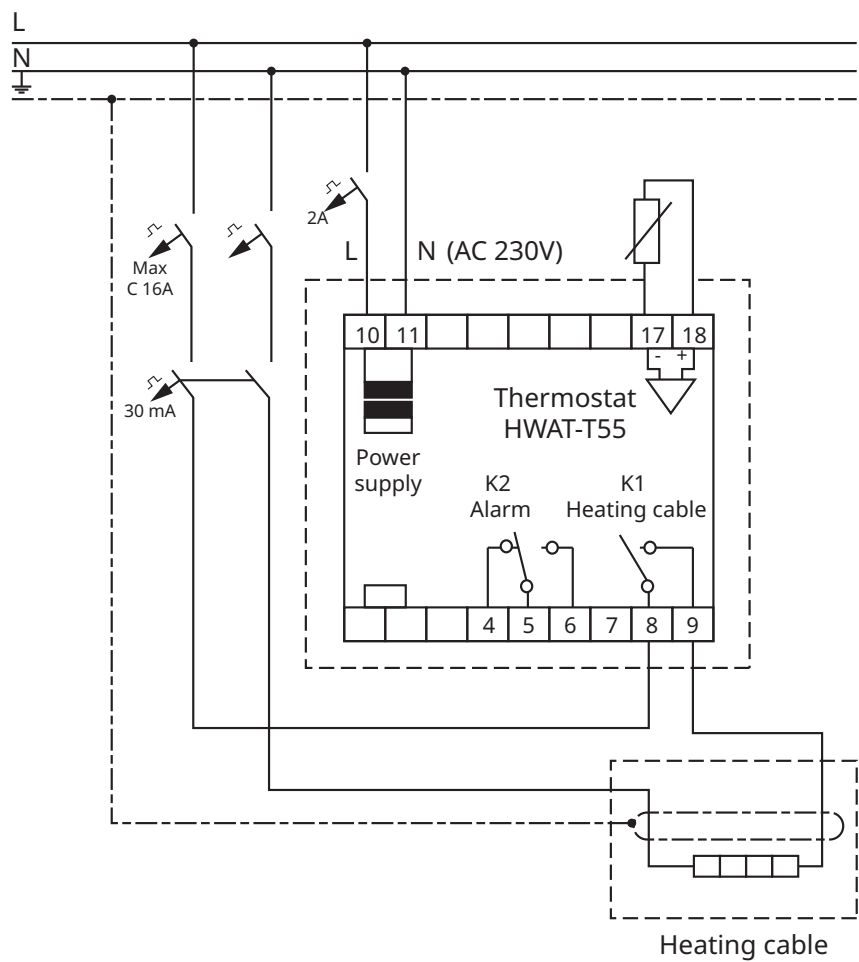
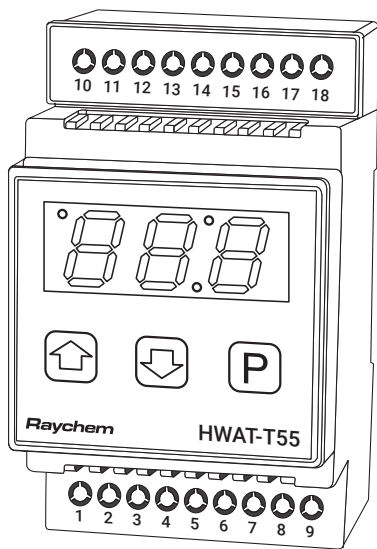
Temperature range -20°C to +90°C

Maximum sensor cable length

100 m with 2 × 1.0 mm² conductors or 150 m with 2 × 1.5 mm² conductors.

For cable extensions, the use of a shielded cable is recommended

Connection Schematic for Thermostat HWAT-T55



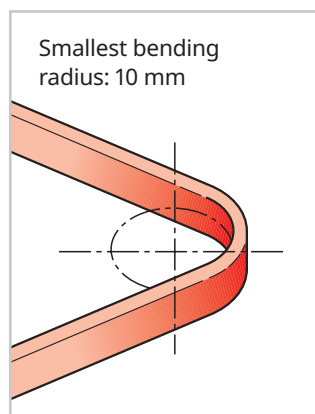
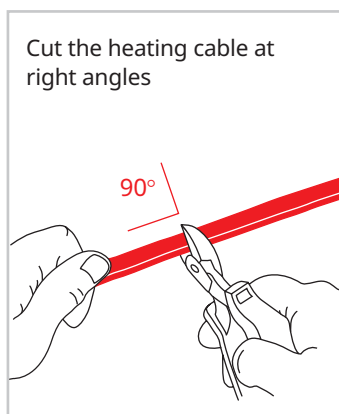
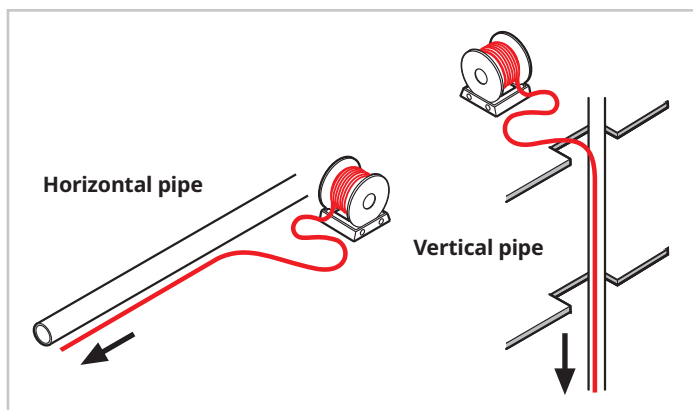
Hot Water Temperature Maintenance

GENERAL INSTALLATION INSTRUCTIONS

- See page 76
- General installation and operation information is also available from Chemelex in document reference: CDE-1547

INSTALLATION INSTRUCTIONS FOR HWAT-L/M/R CABLES

- The heating cable should be installed in a straight line on the pipework.
- Install on dry surfaces
- Minimum installation temperature: -10°C



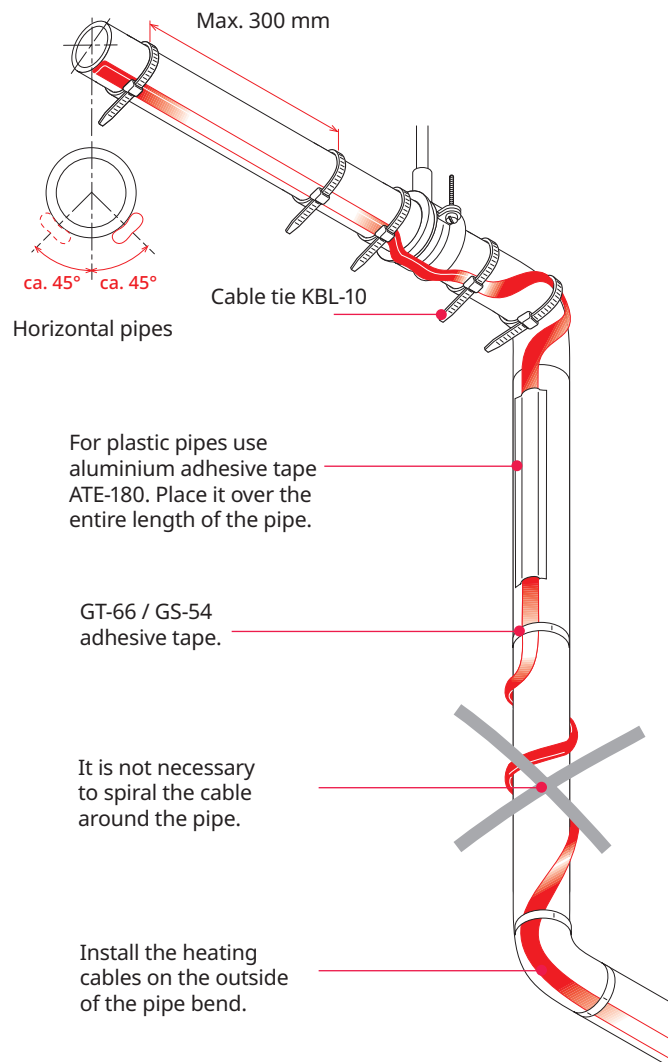
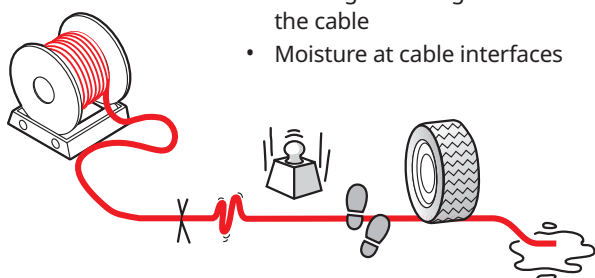
Installation of self-regulating heating cables

- Store in a dry and clean place.
- Temperature range: -40°C to $+60^{\circ}\text{C}$.
- Protect any cable ends with an end seal.



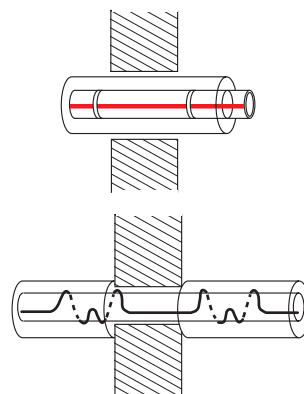
Avoid:

- Sharp edges
- High tractive force
- Kinking and crushing
- Walking or driving over the cable
- Moisture at cable interfaces

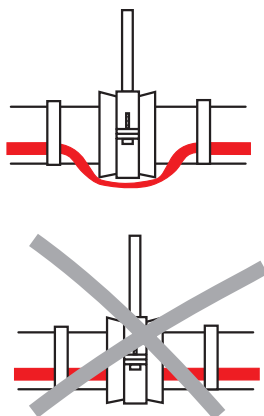


Wall/Floor transit

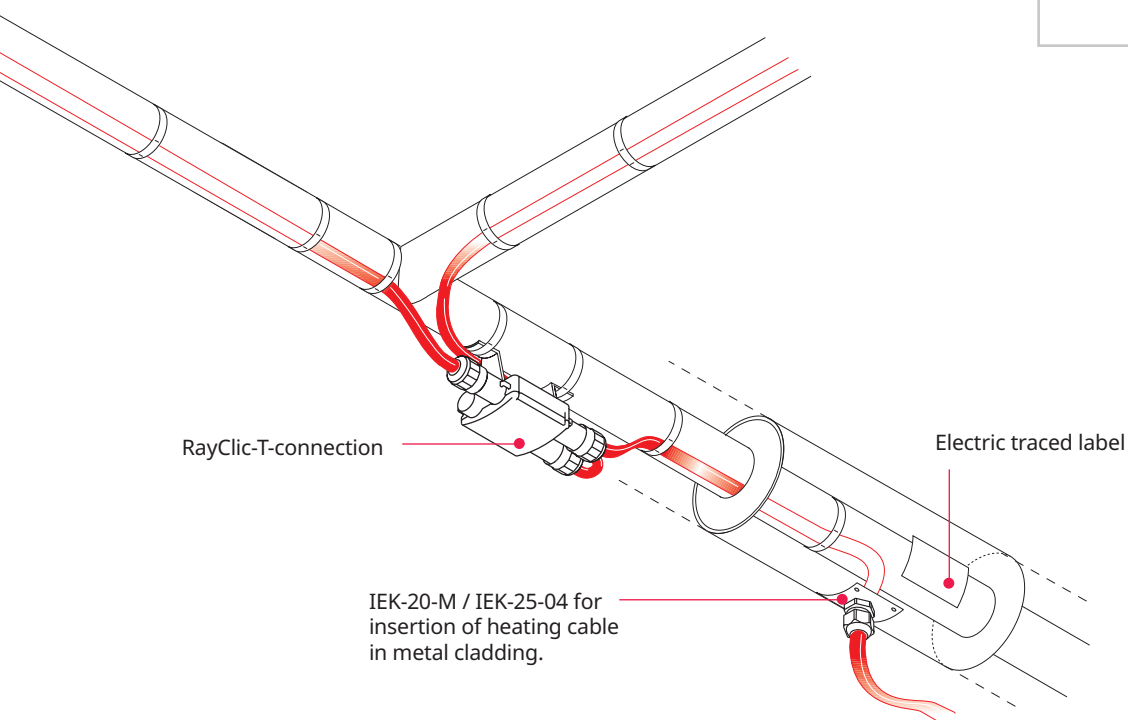
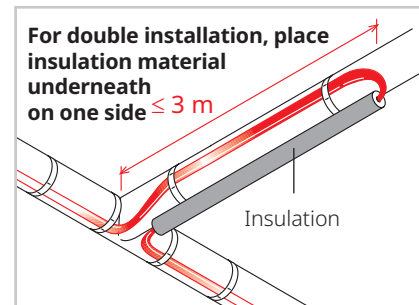
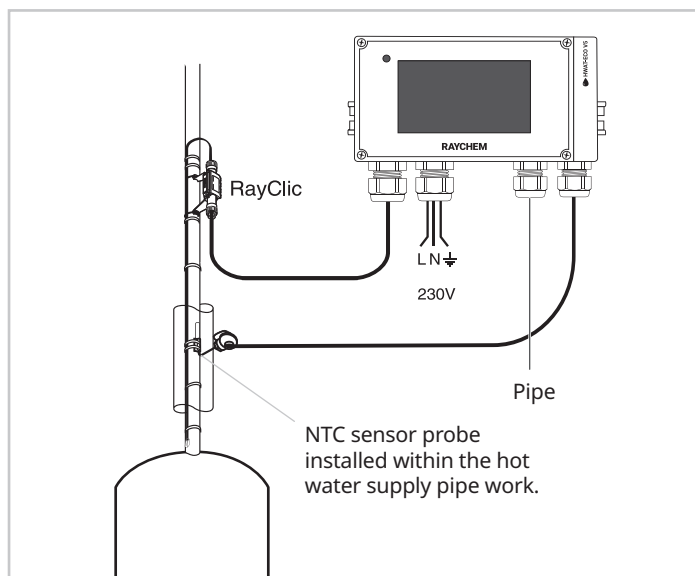
The thickness of thermal insulation must be continuous otherwise compensate by adding heating cable.



Standard Installation of NTC Sensor with in-pipe sensor probe.



- Run the cable over pipe suspensions
- Do not clamp the cable
- CAUTION: Do not install non-return valves in the hot water system.
- When using the heating tape with cold clamps, please contact Raychem representative!



Pipe Freeze Protection

Frozen pipes can be a costly problem. When pipes are exposed to sub-zero temperatures they can burst, leading to considerable damage and disruption. The Raychem frost protection system for pipes provides an efficient solution. The self-regulating heating cable, combined with insulation, prevents water pipes, fire mains, sprinkler systems and fuel oil lines from freezing.

Easy to install

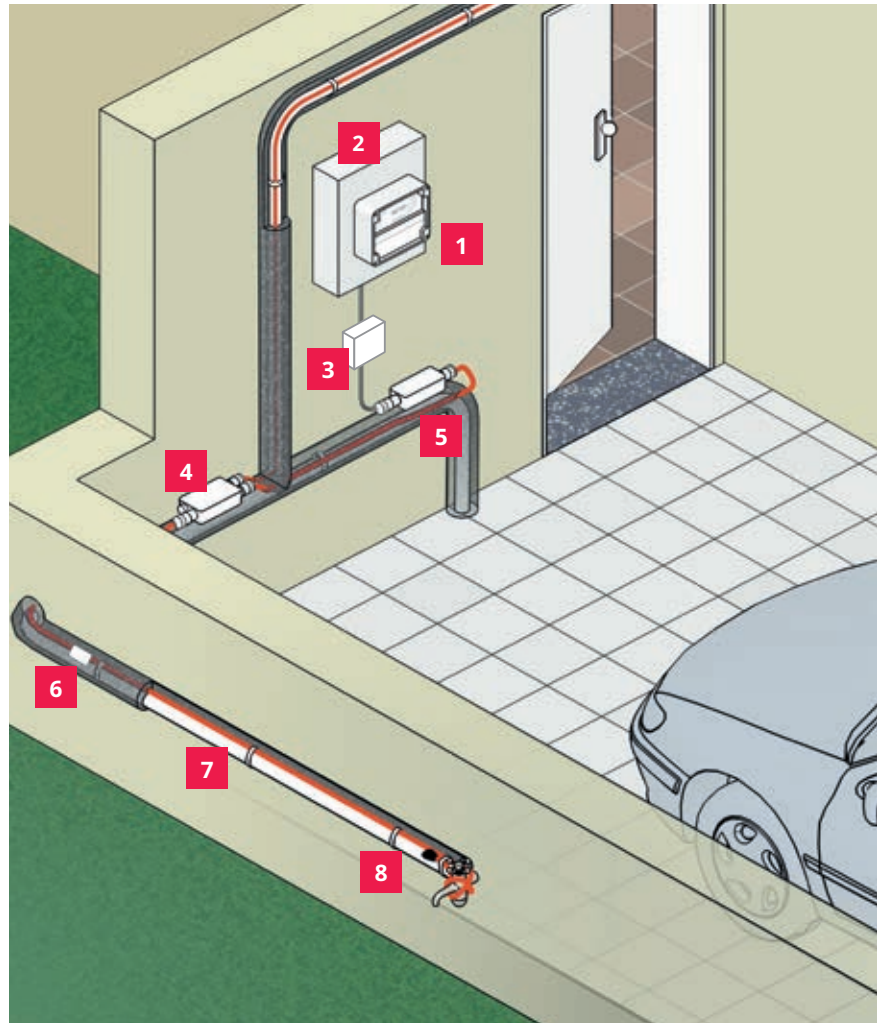
The heating cable is simply fixed onto the pipe – under the thermal insulation. Connections are quickly made with the fast RayClic connectors.

Durable and reliable

The cable's large copper conductors make it a reliable solution and XL-Trace's Low Smoke Zero Halogen (LSZH) materials provide increased safety in the event of a building fire: up to 90% less smoke emissions and improved self-extinguishing properties.

Low power consumption

The smart RAYSTAT V5 and ELEXANT 450c control unit calculates a duty-cycle proportional to the expected minimum temperature. Where a simple ambient thermostat would energize the heating cable for 100%, the "smart" controller would energize for a fraction of the time, resulting in significant extra savings.



- | | |
|--|---|
| 1 Thermostat with line or ambient temperature sensor. | 5 Power connection (RayClic-CE-02) (Not for FS-C10-2X). |
| 2 Residual current device (30 mA) Circuit-breaker (C type). | 6 Electrical traced label (LAB-I-01). |
| 3 Junction box (JB16-02). | 7 Frost protection heating cable FS-C10-2X and XL-Trace LSZH frost protection cable range. |
| 4 T-Connection (RayClic-T-02) (Not for FS-C10-2X). | 8 End seal (RayClic-E-02) (Not for FS-C10-2X). |

XL-Trace LSZH: Low Smoke Zero Halogen Self-Regulating Heating Cables

FS-C10-2X: High-temperature-resistant Self-Regulating Pipe Freeze Protection System

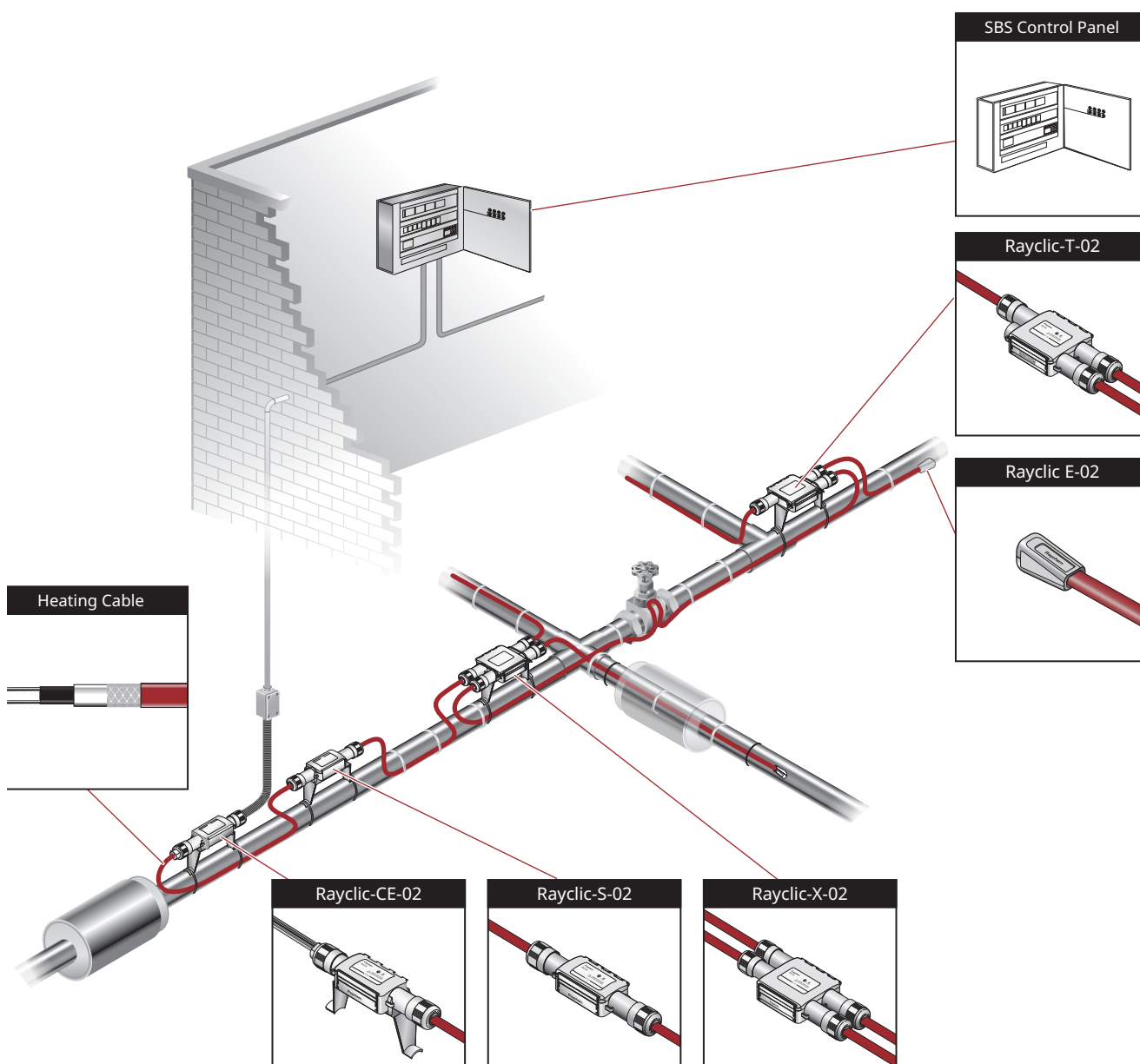
PIPE FREEZE PROTECTION

XL-Trace LSZH - Enhanced safety self-regulating heating cable

Raychem XL-Trace LSZH heating cables deliver unrivalled safety performance by using innovative materials technology. The new cable range increases resistance to and lowers reaction with fire, delivers low smoke performance, and contains no halogens. These increased safety features make it the safest solution in and around buildings. The unparalleled safety comes without compromise on product performance. The range is fully compatible with the RayClic fast connection devices which make installation quick and easy both onsite, and in modular off-site installations.

Raychem XL-Trace LSZH is simply the safest and most reliable choice for the engineer, for the installer, and for the building owner and occupier.

SYSTEM OVERVIEW

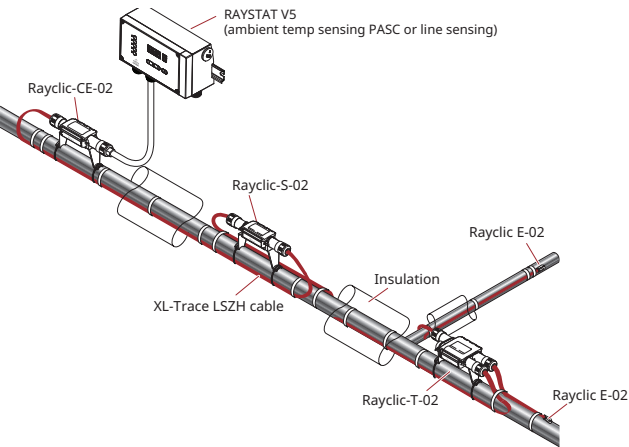


This is a sample overview of pipe freeze protection applications for illustration purposes only, with typical layouts shown on the following pages.

Please contact your local representative for any further design support.

Pipe Freeze Protection

SINGLE CIRCUIT



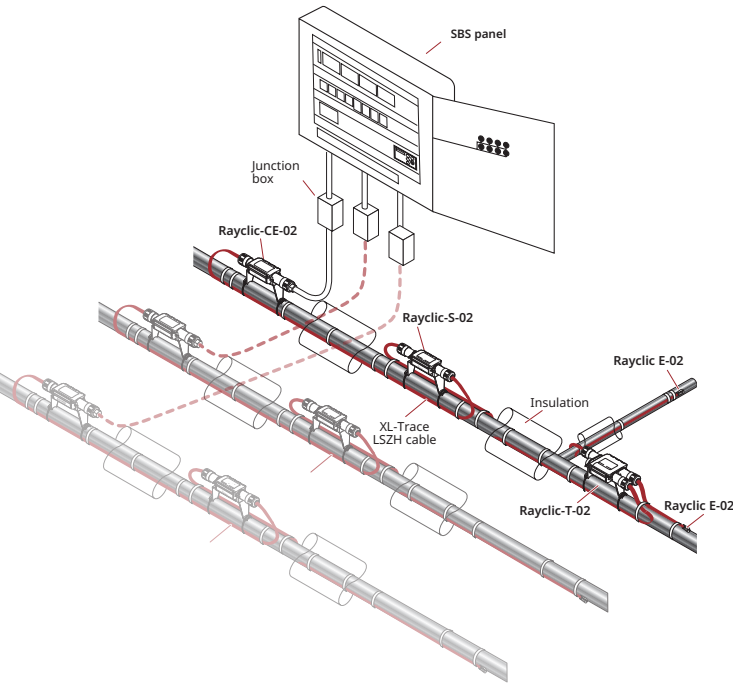
Frost protection on heating pipes with an operating temperature above 65°C, max. 90°C

XL-Trace LSZH cable		
10 W/m @ 5°C	15 W/m @ 5°C	26 W/m @ 5°C

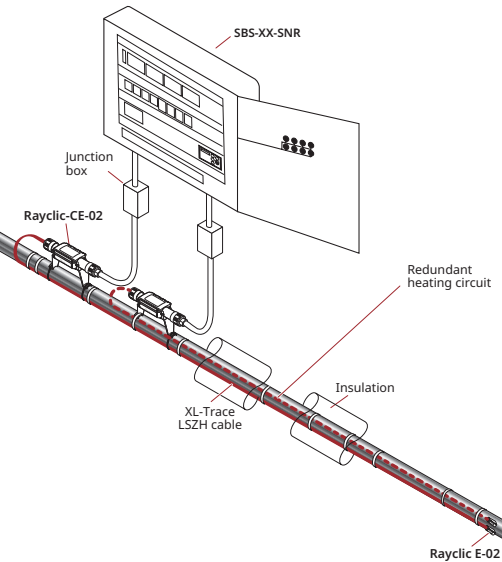
FS-C10-2X cable
10 W/m @ 5°C
Caution : non-compatible with the RayClac system

MULTIPLE CIRCUIT

Cold Water + LPHW Services



Fire Sprinkler Lines
(with redundant heat tracing according to EN12845 / VDS)



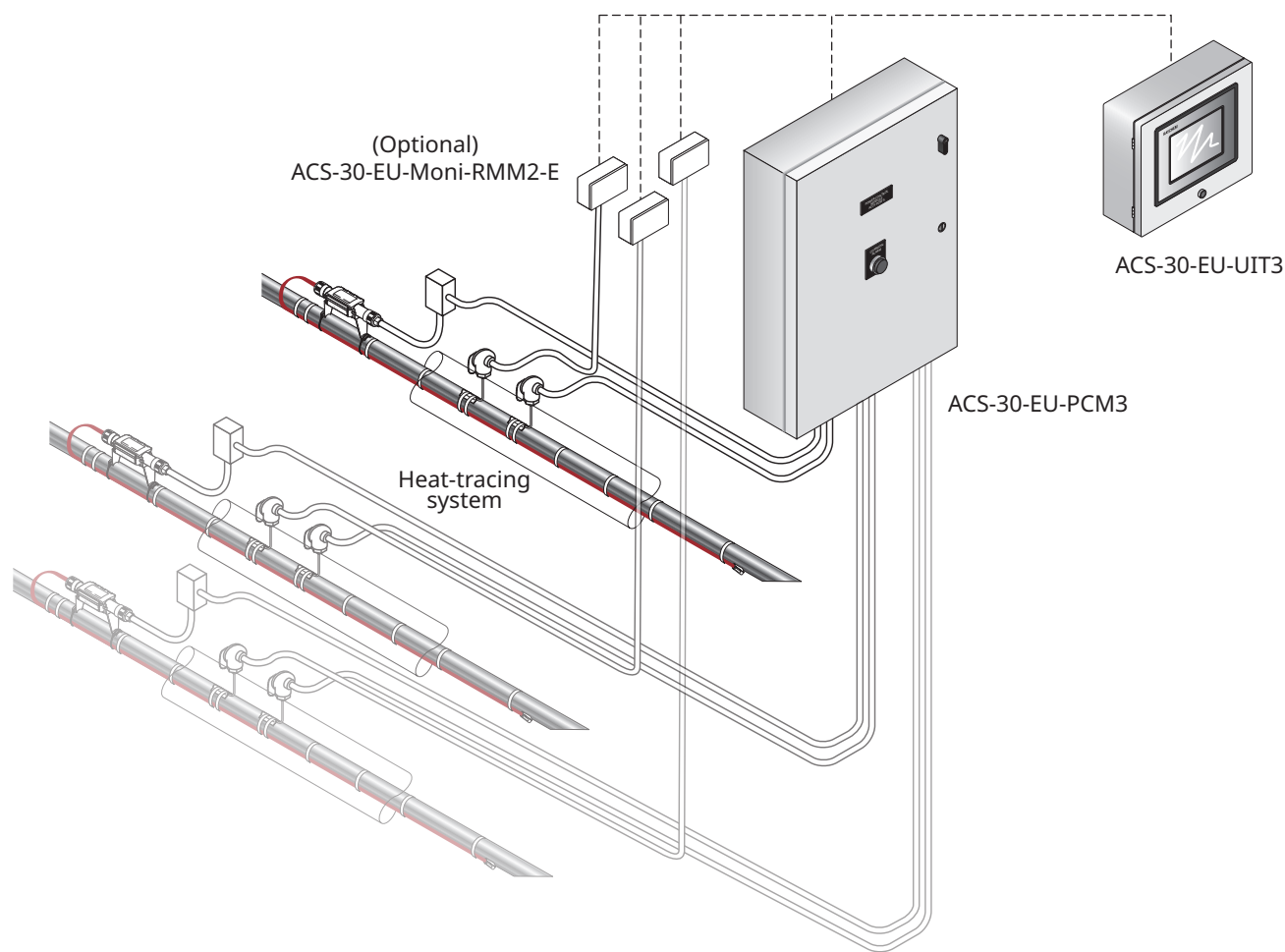
XL-Trace LSZH cable			
for cold water			for LPHW services
10 W/m @ 5°C	15 W/m @ 5°C	26 W/m @ 5°C	31 W/m @ 5°C

FS-C10-2X
For heating systems >65°C medium temperatures
10 W/m @ 5°C
Caution: RayClac components are not compatible with FS-C10-2X

XL-Trace LSZH cable		
for fire sprinkler lines		
10 W/m @ 5°C	15 W/m @ 5°C	26 W/m @ 5°C

Pipe Freeze Protection

Multiple Circuits or Multiple Applications

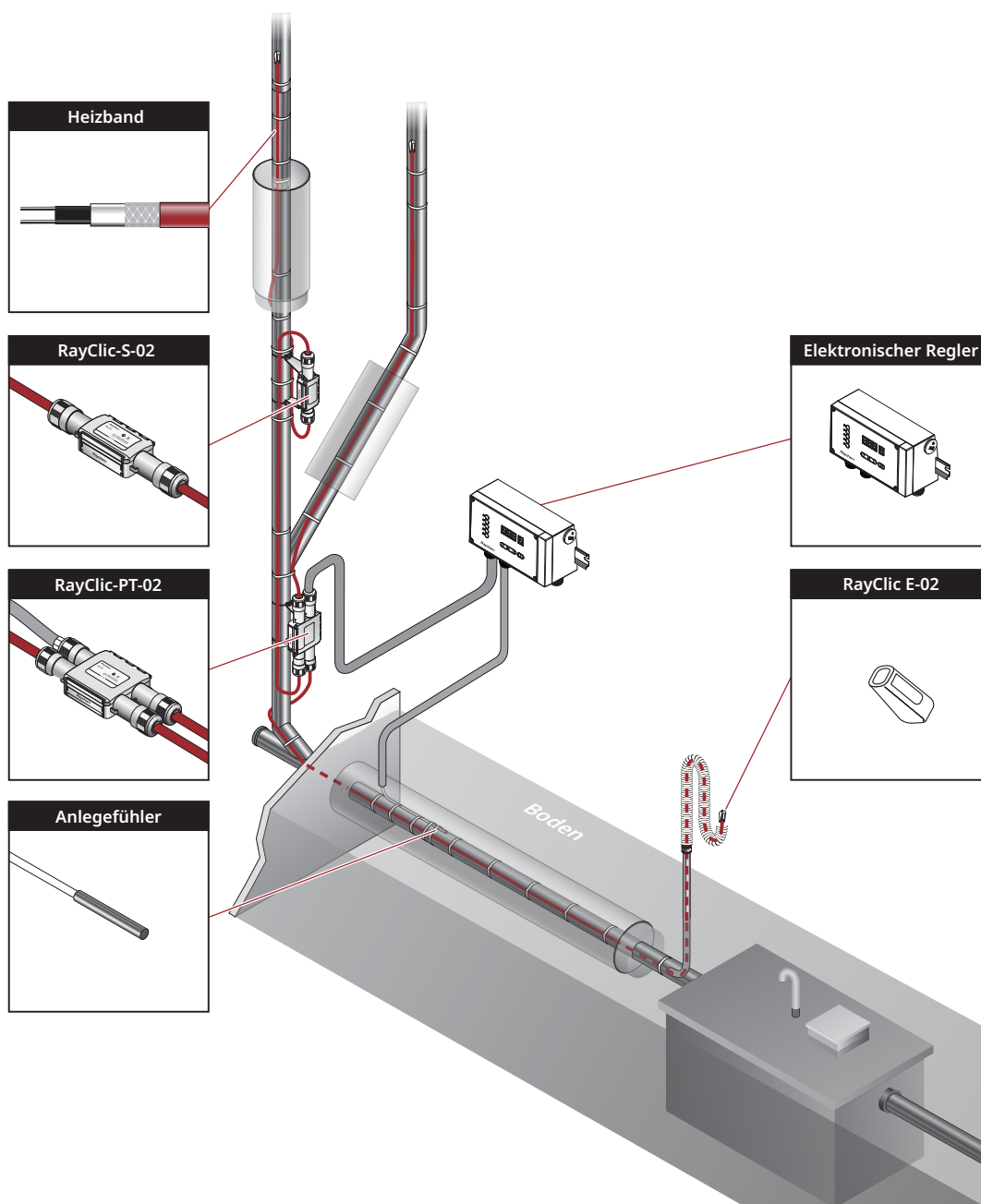


Pipe freeze protection

XL-Trace LSZH cable				FS-C10-2X
for cold water		for LPHW services		for heating systems
10 W/m @ 5°C	15 W/m @ 5°C	26 W/m @ 5°C	31 W/m @ 5°C	10 W/m @ 5°C
				

Flow Maintenance (Grease Line)

System Overview



This is a sample overview for flow maintenance of greasy waste pipes for illustration purposes only, with typical layouts shown on the following page.

Please contact your local representative for any further design support.

Pipe freeze protection

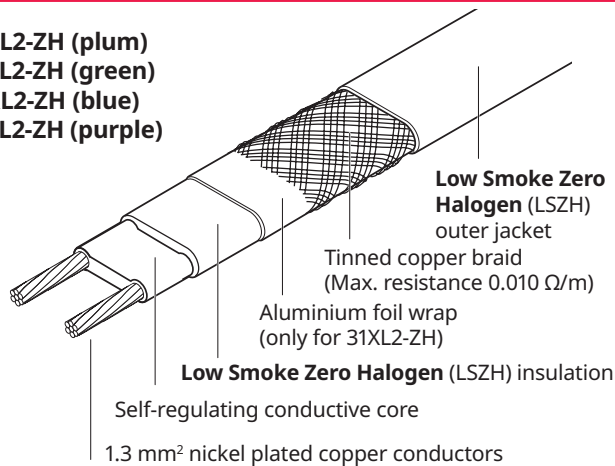


1 HEATING CABLE SELECTION

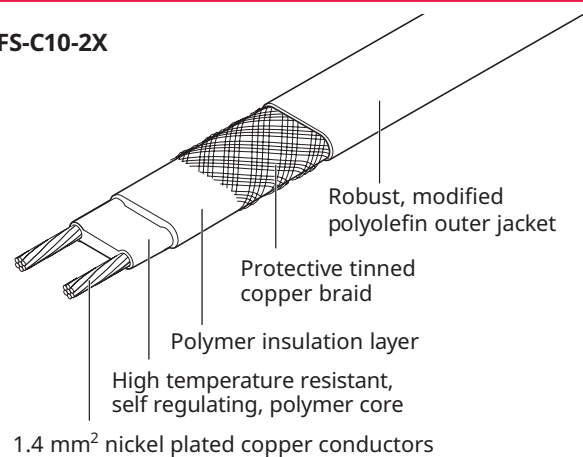
Application	
Pipe freeze protection of pipework. Maximum operating temperature 65°C.	
10XL2-ZH PCN: P000002113	10W/m @ 5°C.
15XL2-ZH PCN: P000002114	15W/m @ 5°C.
26XL2-ZH PCN: P000002115	26W/m @ 5°C.
Pipe freeze protection and temperature maintenance. Maximum operating temperature 85°C.	
31XL2-ZH PCN: P000002116	31W/m @ 5°C.
Pipe freeze protection and temperature maintenance. Maximum operating temperature 90°C	
FS-C10-2X PCN: P000000732	10W/m @ 5°C

2 HEATING CABLE CONSTRUCTION

10XL2-ZH (plum)
15XL2-ZH (green)
26XL2-ZH (blue)
31XL2-ZH (purple)



FS-C10-2X



3 PIPE AND INSULATION THICKNESSES

Pipe Freeze Protection at Minimum Ambient Temp -20°C

For more accurate product selection and installation specific data, please use TraceCalc Pro for Buildings.

Pipe diameter														
Insulation Thickness (mm)	DN15	DN20	DN25	DN32	DN40	DN50	DN65	DN80	DN100	DN125	DN150	DN200	DN 250	DN 300
	½"	¾"	1"	1¼"	1½"	2"	2½"	3"	4"	5"	6"	8"	9"	12"
10	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	15XL2-ZH 31XL2-ZH**	15XL2-ZH 31XL2-ZH**	15XL2-ZH 31XL2-ZH**	26XL2-ZH 31XL2-ZH**	26XL2-ZH 31XL2-ZH**	26XL2-ZH 31XL2-ZH**	31XL2-ZH**					
15	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	15XL2-ZH 31XL2-ZH**	15XL2-ZH 31XL2-ZH**	26XL2-ZH 31XL2-ZH**	26XL2-ZH 31XL2-ZH**	26XL2-ZH 31XL2-ZH**	26XL2-ZH 31XL2-ZH**	31XL2-ZH**			
20	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	15XL2-ZH 31XL2-ZH**	15XL2-ZH 31XL2-ZH**	15XL2-ZH 31XL2-ZH**	26XL2-ZH 31XL2-ZH**	26XL2-ZH 31XL2-ZH**	26XL2-ZH 31XL2-ZH**	31XL2-ZH		
25	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	15XL2-ZH 31XL2-ZH**	15XL2-ZH 31XL2-ZH**	15XL2-ZH 31XL2-ZH**	26XL2-ZH 31XL2-ZH**	26XL2-ZH 31XL2-ZH**	26XL2-ZH 31XL2-ZH**	31XL2-ZH	
30	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	15XL2-ZH 31XL2-ZH**	15XL2-ZH 31XL2-ZH**	15XL2-ZH 31XL2-ZH**	26XL2-ZH 31XL2-ZH**	26XL2-ZH 31XL2-ZH**	26XL2-ZH 31XL2-ZH**	31XL2-ZH
40	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	15XL2-ZH 31XL2-ZH**	15XL2-ZH 31XL2-ZH**	15XL2-ZH 31XL2-ZH**	26XL2-ZH 31XL2-ZH**	26XL2-ZH 31XL2-ZH**	26XL2-ZH 31XL2-ZH**
50	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	15XL2-ZH 31XL2-ZH**	15XL2-ZH 31XL2-ZH**	15XL2-ZH 31XL2-ZH**	26XL2-ZH 31XL2-ZH**	26XL2-ZH 31XL2-ZH**
60	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	15XL2-ZH 31XL2-ZH**	15XL2-ZH 31XL2-ZH**	15XL2-ZH 31XL2-ZH**	26XL2-ZH 31XL2-ZH**
70	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	15XL2-ZH 31XL2-ZH**	15XL2-ZH 31XL2-ZH**	15XL2-ZH 31XL2-ZH**
80	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	15XL2-ZH 31XL2-ZH**	15XL2-ZH 31XL2-ZH**
90	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	15XL2-ZH 31XL2-ZH**	15XL2-ZH 31XL2-ZH**
100	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	10XL2-ZH FS-C10-2X*	15XL2-ZH 31XL2-ZH**

* Frost protection on pipes with a medium temperature of 65°C or higher, but up to a max medium temperature of 90°C (e.g. heating systems) with FS-C10-2X heating cable.

** Frost protection on pipes with a medium temperature of 65°C or higher, but up to a maximum medium temperature of 85°C (e.g. heating systems) with 31XL2-ZH heating cable.

Table values based on calculations using TraceCalc Pro for buildings (online tool TraceCalc Pro for buildings)

Technical Parameters:

Maintain Temperature (frost protection) 5°C

Min. ambiente temperature -20°C

Safety Factor 10 %

Insulation type: Rockwool, heat conductivity at 5 °C : 0,035 W/mK

Pipe material steel / For **plastic pipes**, use ATE-180 aluminium adhesive tape. The pipe freeze protection cable should be covered along its entire length

Wind speed 10 m/s

Simple handling with heating tape

Note:

If conditions differ, please contact Chemelex

For plastic pipes, contact Chemelex

Pipe freeze protection cables XL-Trace LSZH are suitable for any pipe material (copper, threaded pipes, stainless steel pipes, plastic pipes and composite metal pipe) without restriction.

For insulation types containing solvents and/or bitumen coating, use the BTV2 - CT product

Insulation and pipe material must withstand min. 85°C

Fatty Waste pipe size and insulation table

Selection of min insulation thickness (in mm) for maintaining a temperature of 40°C with 31XL-ZH

Pipe diameter (DN)	40	50	65	80	100	125	150	200	250*
Ambient temperature									
-20°C	40	50	60	70	90	110	135	170	215
-10°C	30	40	50	60	80	100	125	150	175
0°C	25	30	35	45	55	65	80	100	130
+10°C	15	20	25	30	35	45	55	70	90
+15°C	15	15	20	25	30	35	45	60	75

Calculation with TraceCalc Pro for buildings

Maintenance temperature for +40°C

Safety factor 10%

Insulation Rockwool λ @40°C : 0,041 W/mk

Pipe material steel. For plastic pipes, please use aluminium adhesive tape ATE-180

* Double installation heating cable recommended

Temperature resistance of the used pipe material 85°C

4 CABLE LENGTH

The heating cable should be installed in a straight line on the pipework. Cable loops instead of T-connections can be made on short dead legs. (up to approx. 3 m)

Pipe length

+ approx. 0.3 m per connection

+ approx. 1.0 m per T-connection

+ approx. 1.2 m per 4-way connection

= required heating cable length

Additional cable required for heat sinks such as valves and pipe supports (approx. 1 m each)

5 ELECTRICAL PROTECTION

- The total length of heating cable determines the number and size of the fuses
- Residual current device (rcd): 30 mA required, max. 500 m heating cable per rcd
- Installation according to local regulations
- The power connections must be carried out by an approved electrical installer
- Use C type circuit-breakers

XL-Trace Maximum Circuit Lengths

10XL2-ZH (230 Vac)	Circuit Breaker (C Type characteristic CB Size)					
Switch-On Temperature (°C)	4 A	6 A	10 A	13 A	16 A	20 A
-20	24	36	60	79	97	121
-10	32	47	79	103	126	158
-5	36	55	91	118	146	182
0	43	64	107	140	172	215
5	51	77	128	166	204	238

15XL2-ZH (230 Vac)	Circuit Breaker (C Type characteristic CB Size)					
Switch-On Temperature (°C)	4 A	6 A	10 A	13 A	16 A	20 A
-20	24	36	61	79	97	121
-10	28	43	71	92	114	142
-5	31	47	78	101	125	156
0	35	52	86	112	138	173
5	38	58	96	125	153	188

26XL2-ZH (230 Vac)	Circuit Breaker (C Type characteristic CB Size)					
Switch-On Temperature (°C)	4 A	6 A	10 A	13 A	16 A	20 A
-20	19	28	47	62	76	95
-10	22	33	55	71	88	110
-5	24	36	60	78	96	120
0	26	40	66	86	105	132
5	29	44	73	94	116	142

31XL2-ZH (230 Vac)	Circuit Breaker (C Type characteristic CB Size)					
Switch-On Temperature (°C)	4 A	6 A	10 A	13 A	16 A	20 A
-20	18	27	45	59	73	91
-10	20	30	49	64	79	99
-5	21	31	52	67	83	104
0	22	33	55	71	87	109
5	23	34	57	74	91	114

FS-C10-2X (230 Vac)	Circuit Breaker (C Type characteristic CB Size)					
Switch-On Temperature (°C)	4 A	6 A	10 A	13 A	16 A	20 A
0	45	70	110	130	150	180

When using XL-Trace on metal pipes in combination with aluminium adhesive tape (ATE-180), the max permitted heating circuit lengths are reduced. In this case, please contact us.

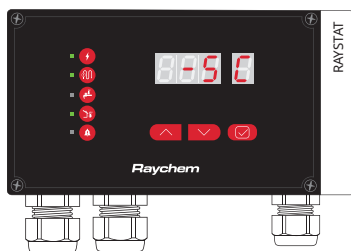
6 XL-TRACE LSZH INSTALLER PACKS



The contractor packs comprise a fixed length on heating cable supplied in an easy-to-use and carry spool box. The spool allows the installer to feed out the required length easily, cutting on installation time and effort. All the XL-Trace LSZH installer packs are compatible with the intuitive RayClic systems.

	Item Descriptions	PCN
	XL-Trace-InstallerPack-10XL-30m	1244-021262
	XL-Trace-InstallerPack-10XL-50m	1244-021263
	XL-Trace-InstallerPack-10XL-80m	1244-021264
	XL-Trace-InstallerPack-15XL-50m	1244-021265
	XL-Trace-InstallerPack-15XL-80m	1244-021266
	XL-Trace-InstallerPack-26XL-50m	1244-021267
	XL-Trace-InstallerPack-26XL-80m	1244-021268
	XL-Trace-InstallerPack-31XL-50m	1244-021269
	XL-Trace-InstallerPack-31XL-80m	1244-021270

RAYSTAT V5



Energy-saving control for frost protection application with alarm to Building Management System

Pipe temperature or PASC ambient sensing control. Digital display of temperatures and error messages. Programmable protective function in the event of sensor breakage and sensor short-circuit.

- Display for visual indication of parameters
- Two operation modes:
 - Operating mode 1: Proportional ambient sensing control (PASC) for enhanced energy efficiency, Operating mode 2: line sensing control
- Maximum and minimum temperature alarm features
- Programming possible without connection to the power supply
- NTC sensor
- Maximum 25 A switching capacity, 230 VAC
- Sensor error alarm with programmable protective function in the event of sensor breakage, Sensor short circuit
- Alarm relay to the BMS
- Keylock
- PCN: 1244-022440

ELEXANT 450c-Modbus



Electronic thermostat for 2 heating zones with independent control, 2 sensor inputs and 1 alarm relay output for DIN rail mounting in the control enclosure

The Elexant 450c-Modbus version allowing flexible Modbus connectivity for remote monitoring, configuration, and ease of integration in a Building Management System (BMS).

Temperature range 0°C to +65°C. 4.3" colour touchscreen with dashboard overview of temperatures and error messages.

Functions:

- Communication port: RS-485
- Protocol: Modbus RTU
- 2 heating modes - pipe or ambient temperature controlled
- Proportional Ambient Sensing Control (PASC algorithm) for a low energy consumption in ambient sensor mode
- Alarm relay to signal power, temperature or communications fault
- NTC sensor
- 2x 4A switching capacity
- Monitoring of the pipe temperature, with over and under temperature alarm
- Sensor failure alarm
- Programmable Fail Safe function in the event of a sensor break, sensor short circuit
- Alarm relay to the BMS
- Data logging file for system performance monitoring
- Keylock
- PCN: 1244-022623

ELEXANT 450c



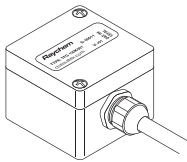
Electronic thermostat for 2 heating zones with independent control, 2 sensor inputs and 1 alarm relay output for DIN rail mounting in the control enclosure

Temperature range 0°C to +65°C. 4.3" colour touchscreen with dashboard overview of temperatures and error messages.

Functions:

- 2 heating modes - pipe or ambient temperature controlled
- Proportional Ambient Sensing Control (PASC algorithm) for a low energy consumption in ambient sensor mode
- Alarm relay to signal power, temperature or communications fault
- NTC sensor
- 2x 4A switching capacity
- Monitoring of the pipe temperature, with over and under temperature alarm
- Sensor failure alarm
- Programmable Fail Safe function in the event of a sensor break, sensor short circuit
- Alarm relay to the BMS
- Data logging file for system performance monitoring
- Keylock
- PCN: 1244-021970

GM-TA-AS

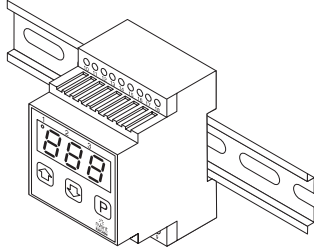


Spare sensor inclusive enclosure for the Elexant 450c / Elexant 450c-Modbus / Raystat V5 / GM-TA controllers, for the detection of ambient temperature

Sensor NTC in the enclosure for outdoor installation

- IP65
- PCN: 1244-017965

RAYSTAT-CONTROL-11-DIN

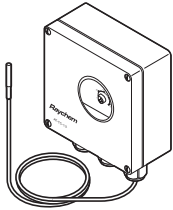


Line sensing thermostat with digital display for DIN rail mounting applications.

- Set temperature range: 0 + 63°C.
- Digital display of maintain temperature and alarm information.
- 16A switching.
- Low temperature alarm function
- DIN rail/Panel mountable control.
- Sensor type: PT100
- PCN: 1244-006265

Note: When selecting the thermostats for direct connection, ensure that the maximum circuit length for a 16A circuit is not exceeded.

AT-TS-13

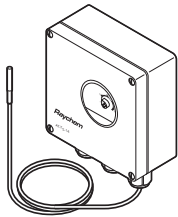


Thermostat

- Adjustable temperature range: -5°C to +15°C
- Ambient thermostat
- Max. switching current 16 A, 250 VAC
- PCN: 728129-000

Note: When selecting the AT-TS-** thermostats for direct connection, ensure that the maximum circuit length for a 16A circuit is not exceeded.

AT-TS-14



Thermostat

- Adjustable temperature range: 0°C to 120°C
- Temperature maintenance on pipelines for fatty waste water
- Line-sensing control thermostat
- Max. switching current 16 A, 250 VAC
- PCN: 648945-000

Note: When selecting the AT-TS-** thermostats, "for direct connection" ensure that the maximum circuit length for a 16A circuit is not exceeded.

SM-PT-100-1



Sensor module /Converter for RAYSTAT V5

- For conversion to PT100 sensor input
- Extension of temperature range up- to 250°C
- PCN: 1244-022442

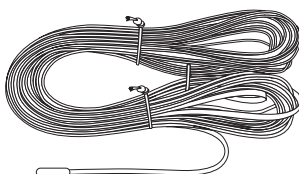
SM-PT-100-2



Sensor module /Converter for ELEXANT 450c

- For conversion to PT100 sensor input
- Extension of temperature range up- to 250°C
- PCN: 1244-022442

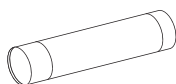
SENSOR-NTC-10M



Temperature line sensor for HWAT-T55 thermostat, HWAT ECO V5, RAYSTAT V5 and Elexant 450c / Elexant 450c-Modbus control unit for fixing on pipe as additional sensor or as spare part

- NTC 2K - sensor Ohm @25°C
- Sensor length: 10 m
- Diameter sensor length: 4 mm
- Diameter sensor probe: 5 mm
- Length sensor probe: 20 mm
- Temperature range: 0°C to +90°C
- PCN: 1244-015847

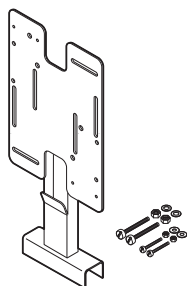
RAYCHEM-PB-POWERBANK



Accessory for RAYSTAT V5 and ELEXANT 450c / Elexant 450c-Modbus

- For pre-setup in power-off mode
- Torch function
- USB cable type A-A
- PCN: 1244-020365

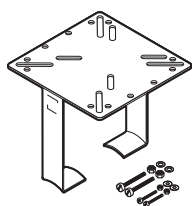
SB-100



Stainless steel support bracket

- Specially constructed to provide heating cable protection between pipe and junction box via a tubular leg.
- For use with AT-TS-13, AT-TS-14, JB16-02 and RAYSTAT V5
- PCN: 192932-000

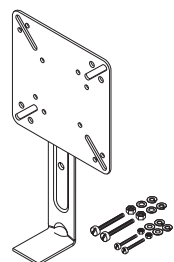
SB-101



Dual-leg support bracket, stainless steel

- Height leg: 160 mm
- For use with AT-TS-13, AT-TS-14, JB16-02 and RAYSTAT V5
- PCN: 990944-000

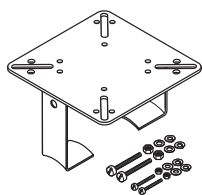
SB-110



Support bracket, stainless steel

- Height leg: 100 mm
- For use with AT-TS-13, AT-TS-14, and JB16-02
- PCN: 707366-000

SB-111



Support bracket, stainless steel

- Height leg: 100 mm
- For use with AT-TS-13, AT-TS-14, and JB16-02
- PCN : 579796-000

8 XL-TRACE LSZH PRE-TERMINATED KITS



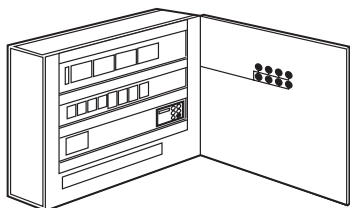
The XL-Trace LSZH kits comprise the 10XL2-ZH self-regulating heater cable with a pre-installed low smoke zero halogen cold lead cable of 4m, cold lead to heater cable splice and end seal - all factory terminated and electrically tested. The kits are available in fixed lengths between 3-30m.

Item Description	PCN
10XL2-ZH-KIT-3m	1244-021271
10XL2-ZH-KIT-5m	1244-021272
10XL2-ZH-KIT-8m	1244-021273
10XL2-ZH-KIT-12m	1244-021274
10XL2-ZH-KIT-16m	1244-021275
10XL2-ZH-KIT-20m	1244-021276
10XL2-ZH-KIT-25m	1244-021277
10XL2-ZH-KIT-30m	1244-021278

Pipe Freeze Protection

Design guide, control units and accessories

CONTROL PANELS FOR XL-TRACE LSZH AND FS-C10-2X



Steel plate housing, wall-mounted version, equipped with mains isolator, RCD/CB combination(s), power contactor(s), indicators for 'Operation and Fault', operating mode selector switch, inlet and outlet terminals. Completely assembled, turnkey condition, wired and inspected. Wiring schematics in panel housing. All control panels are delivered ex works with an Elexant 450c or Elexant 450c Modbus controller. Factory fitted. Manufactured in accordance with IEC61439. Please contact us for more information.

Technical data: see page 79

Panel type			SBS-FP-3x16A/-MODBUS-Version	SBS-FP-6x16A/-MODBUS-Version	SBS-FP-9x16A/-MODBUS-Version	SBS-FP-12x16A/-MODBUS-Version
PCN Version Standard			1244-022467	1244-022468	1244-022469	1244-022470
PCN Version MODBUS			1244-022628	1244-022629	1244-022630	1244-022631
Max. quantity of heating circuits			3	6	9	12
Quantity of contactors			2	2	3	4
Number of sensors in standard delivery			1	1	1	1
Max. quantity of controllers Elexant 450c / Elexant 450c-Modbus			1	1	2	2
Max. quantity of sensors			1	2	3	4
Enclosure mounting			Wall mounted	Wall mounted	Wall mounted	Wall mounted
Dimensions	Width	mm	400 (MODBUS: 600)	600	800	800
	Height	mm	600	600	800	800
	Depth	mm	210	210	210	210
Weight	approx.	kg	20 (MODBUS: 32)	32	54	56
Max. power output		kW	11	22	33	44
Circuit breaker on-site	max.	A	3 x 25 A NH-00	3 x 32 A NH-00	3 x 63 A NH-00	3 x 80 A NH-00
Electrical power connection			400 V/230 V c.a., 50 Hz, 3-phase with N and PE	401 V/230 V c.a., 50 Hz, 3-phase with N and PE	402 V/230 V c.a., 50 Hz, 3-phase with N and PE	403 V/230 V c.a., 50 Hz, 3-phase with N and PE
Installation location			Indoor	Indoor	Indoor	Indoor
Exposure temperatures			+5 °C to +35 °C	+5 °C to +35 °C	+5 °C to +35 °C	+5 °C to +35 °C
IP protection			IP 65	IP 65	IP 65	IP 65
Enclosure color			Textured paint, RAL 7035, light gray	Textured paint, RAL 7035, light gray	Textured paint, RAL 7035, light gray	Textured paint, RAL 7035, light gray

Control panels can also be custom-made. The following functions are available:

- Change in switching capacity
- Outdoor use
- Installation of a control panel heater
- Installation of additional controllers
- Vertical mounting

Please contact your Raychem representative.

Sprinkler Systems

Steel plate housing (colour: RAL 7035), wall-mounted version, equipped with mains power switch, low-voltage (LV) relay, RCD/ CB combination(s), buzzer, power contactor(s), auxiliary contactor(s), operating mode selector switch, Indicators for 'Operating and Fault', 'Mains power', inlet and outlet terminals. Completely assembled, wired and inspected. Wiring schematics included in housing 1 temperature controller is installed per heating circuit in the switch cabinet. Manufactured in accordance with IEC61439. Redundant heater circuit designed for compliance with EN12845.

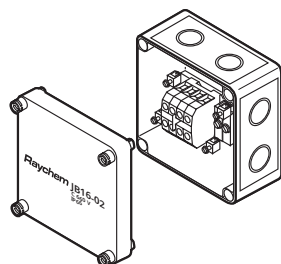
SBS-02-SNR	Control panel for 2 heating circuits (Inc. redundant). • PCN: 185780-000
SBS-04-SNR	Control panel for 4 heating circuits (Inc. redundant). • PCN: 278362-000
SBS-06-SNR	Control panel for 6 heating circuits (Inc. redundant). • PCN: 300074-000
SBS-08-SNR	Control Panel for 8 heating circuits (Inc. redundant). • PCN: 158834-000
SBS-10-SNR	Control panel for 10 heating circuits (Inc. redundant). • PCN: 012276-000
SBS-12-SNR	Control panel for 12 heating circuits (Inc. redundant). • PCN: 712998-000

Cabinet type			SBS-02-SNR	SBS-04-SNR	SBS-06-SNR	SBS-08-SNR	SBS-10-SNR	SBS-12-SNR
Number of pipes			1	2	3	4	5	6
Number of heating circuits (Including redundant heating circuit)			2	4	6	8	10	12
Dimensions	Width	mm	600	800	800	800	1000	1000
	Height	mm	600	800	800	1000	1000	1000
	Depth	mm	210	210	210	300	300	300
Weight		kg	45	90	90	115	140	140
Max. nominal current (InA)		Amps	32	32	32	63	63	63
Main isolator switch rating		Amps	32	32	32	63	63	63
Circuit breaker sizing		Amps	16	16	16	16	16	16
Short circuit current range (Icc)		kA	10	10	10	10	10	10
Controller setpoint (Primary)			+8C	+8C	+8C	+8C	+8C	+8C
Controller setpoint (Redundant)			+5C	+5C	+5C	+5C	+5C	+5C
Fuse protection provided by customer	Max		C25A	C25A	C25A	C40A	C40A	C40A

ACCESSORIES FOR XL-TRACE LSZH AND FS-C10-2X CABLES

For XL-ZH/FS-C10-2X					
Power connection	1 JB16-02	+	1 CE20-01	+	SB-110
Splice	1 JB16-02	+	2 CE20-01	+	SB-110
Powered splice	1 JB16-02	+	2 CE20-01	+	SB-110
T-connection	1 JB16-02	+	3 CE20-01	+	SB-110
Powered T-connection	1 JB16-02	+	3 CE20-01	+	SB-110
Four way connection	1 JB16-02	+	4 CE20-01	+	SB-110

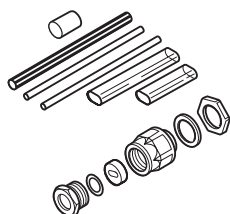
JB16-02



Temperature-resistant junction box

- For power connection
- IP66
- 6 x 4 mm² terminals
- 4 x M20, 4 x M25 knock-out entries
- Silicone free
- PCN: 946607-000

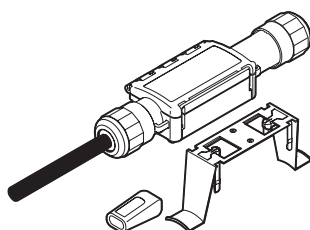
CE20-01



Connection and end seal kit for FS-C10-2X cables

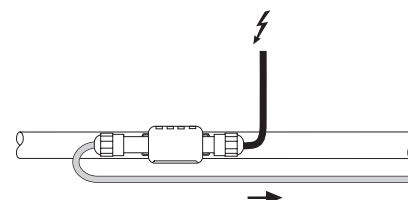
- Heat-shrink technique
- M20 gland with silicone grommet
- PCN: 734312-000

RayClic-CE-02



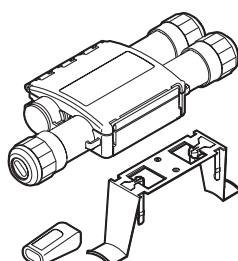
Power connection

- With 1.5 m power cable
- End seal and support bracket
- IP 68
- External dimension: L = 240 mm
W = 64 mm
H = 47 mm
- Max. 20 A
- PCN: 235422-000



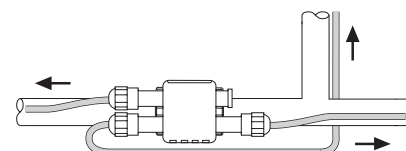
Note : RayClic components are not compatible with FS-C10-2X.

RayClic-T-02



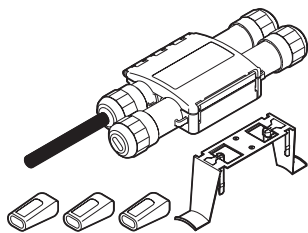
T-connection

- Connection for 3 cables
- End seal and support bracket
- IP 68
- External dimension: L = 270 mm
W = 105 mm
H = 42 mm
- PCN: 441524-000



Note : RayClic components are not compatible with FS-C10-2X.

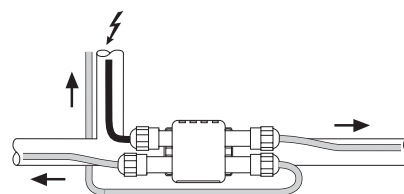
RayClic-PT-02



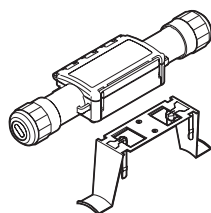
Power T-connection

- 3 connections with integral 1.5 m power cable
- 3 end seals and 1 support bracket
- IP 68
- External dimension: L = 270 mm
W = 105 mm
H = 42 mm
- PCN: 636284-000

Note : RayClic components are not compatible with FS-C10-2X.



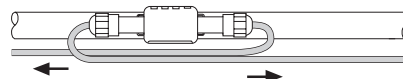
RayClic-S-02



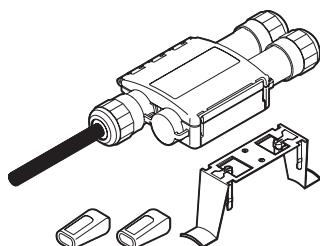
Splice for joining 2 lengths of heating cable

- Connection for 2 cables with 1 support bracket
- IP 68
- External dimension: L = 240 mm
W = 64 mm
H = 47 mm
- PCN: 364855-000

Note : RayClic components are not compatible with FS-C10-2X.



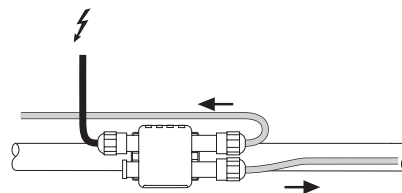
RayClic-PS-02



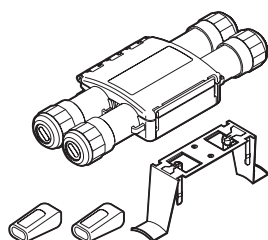
Powered splice

- Connection for 2 cables with integral 1.5 m power cable
- 2 end seals and 1 support bracket
- IP 68
- External dimension: L = 270 mm
W = 105 mm
H = 42 mm
- PCN: 716976-000

Note : RayClic components are not compatible with FS-C10-2X.



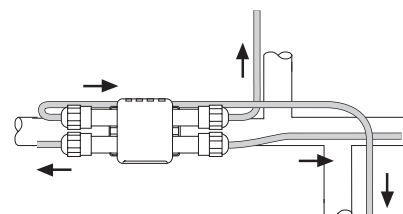
RayClic-X-02



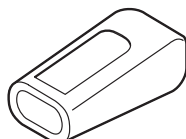
4-way connection

- Connection for 4 cables
- 2 end seals and 1 support bracket
- IP 68
- External dimension: L = 270 mm
W = 105 mm
H = 42 mm
- PCN: 001013-000

Note : RayClic components are not compatible with FS-C10-2X.



RAYCLIC-E-02

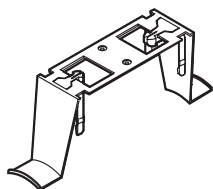


Gel-filled end seal

- For system extensions (to be ordered separately)
- IP 68
- PCN: 224727-000

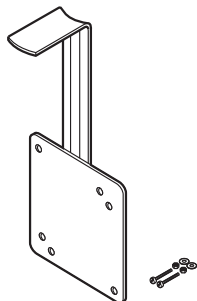
Note : RayClic components are not compatible with FS-C10-2X.



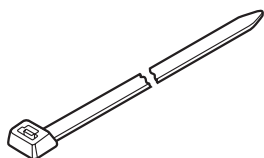
RAYCLIC-SB-04**RayClic Support Bracket, wall-mounted**

- PCN: 616809-000

Note : RayClic components are not compatible with FS-C10-2X.

JB-SB-08**Support Bracket, Single-Leg, Stainless Steel, Vertical**

- PCN : 084799-000

KBL-10**Cable ties**

- One pack of 100 required for approx. 30 m of pipework
- Length: 370 mm
- Temperature range: -35°C to +110°C and UV resistant
- PCN: 102823-000

Use ATE-180 on plastic pipes

GT-66**Glass cloth tape for attaching heating cable to pipe**

- Not for stainless steel pipes or for installation temperature below 5°C
- 20 m roll 12 mm width
- PCN: C77220-000

Use ATE-180 on plastic pipes

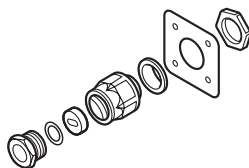
GS-54**Glass cloth tape with silicone adhesive system for attaching heating cable to pipe**

- For stainless-steel pipes or for any installation below 5°C
- 16 m per roll, 12 mm width
- PCN: C77221-000

ATE-180**Aluminium adhesive tape**

- Minimum installation temperature: 0°C
- Heat resistant up to 150°C
- 55 m roll, 63.5 mm width, for approx. 50 m of pipework
- PCN: 846243-000

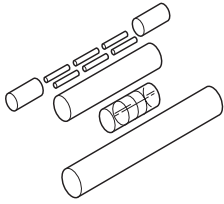
On plastic pipes: the heating cable must be covered with aluminium adhesive tape along its entire length. Suitable for stainless steel pipes. When using on metal pipes, note the reduced heating circuit lengths.

IEK-20-M**Insulation entry kit**

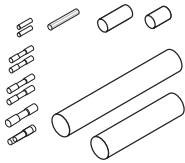
- Insertion of heating cable in metal cladding
- Consists of: metal fastener, metric gland and joint seal
- Silicone free
- PCN: 1244-000965

**Electric traced label**

- To be placed at 5 m intervals on insulation surface
- PCN: 938947-000

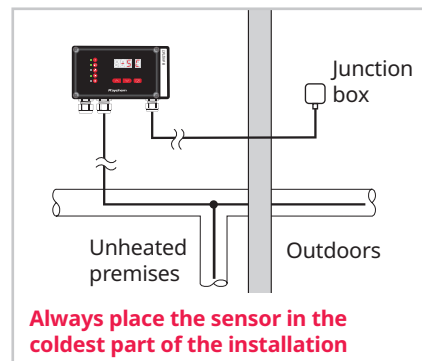
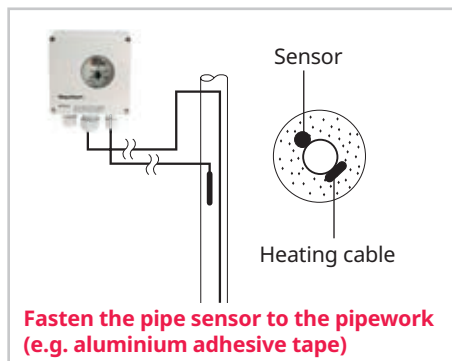
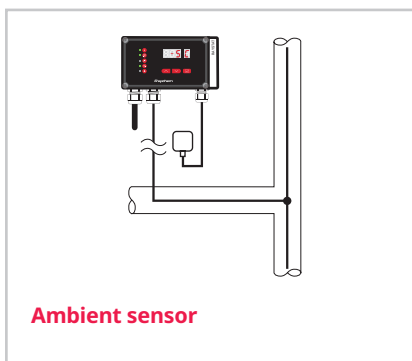
S-06**In-line splice kit**

- For XL-Trace LSZH/HWAT/GM-2X/FS-C10-2X
- Heat-shrinkable technique
- PCN: 054953-000

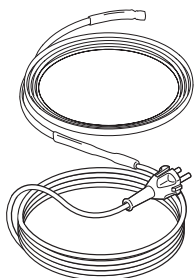
CCE-06-CR**Cold lead connection and end seal kit**

- Connection of 3 x 1.5 mm² or 3 x 2.5 mm² cold lead cable to self-regulating heating cables XL-Trace LSZH, FS-C10-2X, GM-2X and HWAT-L/M/R
- PCN: 1244-021907

SPECIAL INSTALLATION INSTRUCTIONS FOR XL-TRACE LSZH AND FS-C10-2X CABLES

PLACING OF SENSOR

FrostGuard: The pre-terminated cable kit for pipe freeze protection



- Self-regulating heating cable, power 12 W/m @5°C
- With 2 m connection cable and plug
- Available in 17 sizes to suit most application requirements.

PRODUCTS REFERENCES

Product Reference	Heater Length (m)	Power @5°C	Part Number	EAN Code
FrostGuard-2M	2	24 W	928206-000	7330957000307
FrostGuard-4M	4	48 W	524628-000	7330957000314
FrostGuard-6M	6	72 W	845612-000	7330957000321
FrostGuard-8M	8	96 W	493074-000	7330957000338
FrostGuard-10M	10	120 W	641438-000	7330957000345
FrostGuard-13M	13	156 W	108722-000	7330957000352
FrostGuard-16M	16	192 W	924248-000	7330957000369
FrostGuard-19M	19	228 W	468683-000	7330957000376
FrostGuard-22M	22	264 W	107442-000	7330957000383
FrostGuard-25M	25	300 W	768868-000	7330957000390
FrostGuard-30M	30	360 W	1244-022826	5414506024920
FrostGuard-35M	35	420 W	1244-022827	5414506024937
FrostGuard-40M	40	540 W	1244-022828	5414506024944
FrostGuard-50M	50	600 W	1244-022829	5414506024951
FrostGuard-60M	60	720 W	1244-022830	5414506024968
FrostGuard-80M	80	960 W	1244-022831	5414506024975
FrostGuard-100M	100	1200 W	1244-022832	5414506024982

FROSTGUARD-ECO



- The FrostGuard-ECO Controller provides temperature and energy control for the Raychem FrostGuard heating cable kits for pipe freeze protection.
- PCN: 1244-013338

RAYSTAT V5

Electronic controller for pipe freeze protection and temperature maintenance systems

PRODUCT OVERVIEW



The Raychem RAYSTAT V5 controller is designed for operation with the Raychem self-regulating heating cables.

Pipe freeze protection

FEATURES

- Easy set-up and programming of the unit
- Flexible temperature control of pipe freeze protection and temperature maintenance systems
- Line sensing and/or ambient sensing
- Proportional Ambient Sensing Control (PASC) algorithm for enhanced energy savings in ambient sensing mode
- Alarm relay with change over contact to signal power, temperature or communication problems
- Pipe temperature monitoring with high and low temperature alarm
- Offsite configurable – can be set up prior to final installation
- On wall mountable for outdoor location

GENERAL

Area of use	Non-hazardous locations; for RAYCHEM heating cables
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ELECTRICAL PROPERTIES

Supply voltage	180 – 253 VAC 50/60 Hz
Operating temperature	–40°C to +40°C ambient
Power consumption	Max. 3.5 VA
Switching capacity output relay	25 A 230 VAC
Size power supply terminals	3 x 6 mm² max.
Size heating cable terminals	3 x 6 mm² max.
Size alarm terminals	3 x 1.5 mm² max.
Size pipe sensor terminals	2 x 1.5 mm² max.
Alarm relay	Single pole double throw relay, volt-free; Max. switching capacity (resistive load only) 1 A/30 VDC 0.5 A/125 VAC, Max.: 60 VDC/125 VAC
Keylock	Password protection for parameter settings
USB port	For pre-setup in power off mode; for firmware upgrades

ENCLOSURE

Dimensions	210 mm x 110 mm x 85 mm
Ingress protection class	IP65
Enclosure material	Polycarbonate
Mounting option	On wall; mountable DIN rail 35 mm (included in the package)
Cable entries	2 x M25 and 1 x M20; 2 x M20 pre-punched
Storage temperature	-40°C to +50°C
Flammability class	DIN EN 60730/VDE 0631-1
Weight	990 g

MODULE LAYOUT



1. LED Display
2. LED Green: a - Power to the unit
b - Power to the heating cable
c - Line sensor connected or
d - Ambient sensor connected
e - Alarm/Error info
3. M25 Gland: Power cable
4. M25 Gland: Heating cable
5. M20 Gland: Sensor/Sensor pipe/External alarm

PROGRAMMING

Selectable set temperatures	0°C to +90°C (line sensing) and 0°C to +30°C (ambient sensing); optional 0°C to +250°C (line sensing, when used with SM-PT100-1)
Parameter	Operation modes, high and low temperature alarm, hysteresis

ENERGY SAVING WITH PROPORTIONAL AMBIENT SENSING CONTROL (PASC)

Duty cycle (power to heater on) depends on the ambient temperature. For example:

If minimum temperature= -20°C and if maintain temperature (set point)= +5°C

ambient t°	% ON	
-20	100	Min. Ambient
-10	60	
0	20	
5	0	Set point
Result: At ambient temperature of -5°C, 60% energy is saved		

SENSOR

	Standard (included in box)	With SM-PT100-1 Module	
		HARD-78	MONI-PT100-260/2
Temperature sensor type	NTC 2 KOhm / 25°C, 2-wire	PT100	PT100
Sensor tip dimensions	Ø 5 mm; length 20 mm	Ø 6 mm, length 50 mm	Ø 6 mm, length 50 mm
Sensor cable length	5 m	3 m	2 m
Cable extension	Up to 150 m, cross section extension cable: 2 x 1,5 mm ²	Up to 150 m, 3 x 1,5 mm ²	
Temperature range	-40°C to +90°C	-40°C to +150°C	-50°C to +260°C

MONITORING

Temperature alarm	High temperature alarm	Adjustable range: maintain temperature to +2°C to +250°C, OFF
	Low temperature alarm	Adjustable range: maintain temperature to -40°C to +245°C, OFF
Sensor alarm	Sensor open circuit Sensor short circuit	
Heating cable connection	Heating cable open circuit	

MEMORY

Parameters	All parameters are stored in nonvolatile memory
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APPROVALS

Approvals

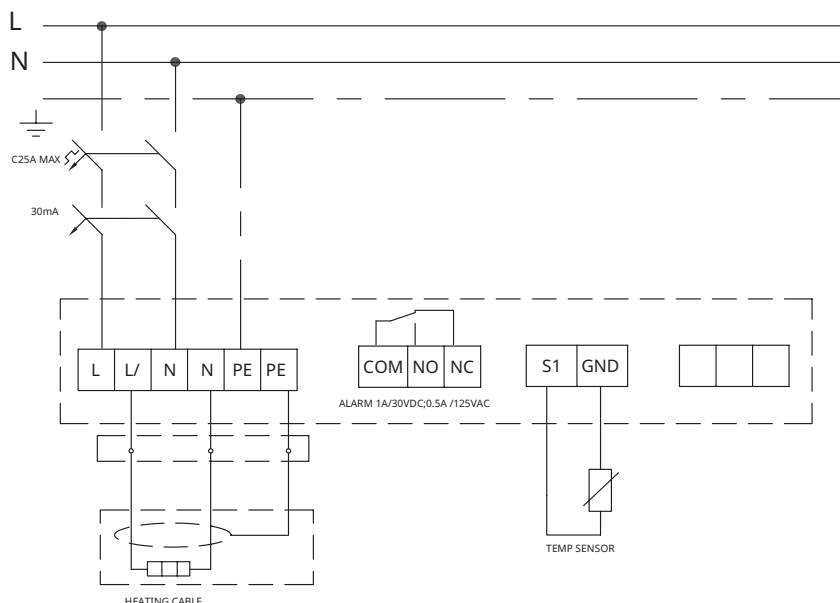
CE, ROHS, WEEE

Electromagnetic Compatibility (EMC)

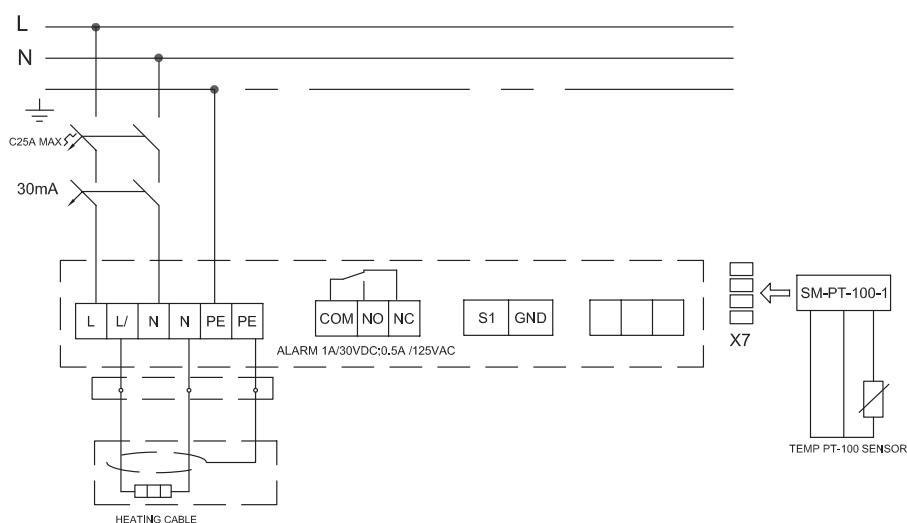
EN 61000-6-1: 2007; EN 61000-6-3:2007 + A1:2011

ELECTRICAL SCHEME

Standard: NTC Sensor



Option: PT100 Sensor



ORDERING DETAILS

Catalog number	RAYSTAT V5
Part number	1244-022440
Weight	990 g
In package	Control unit, Din-rail, 1 Line sensor

ACCESSORY

Product description	PCN number
SENSOR-NTC-10M (-40°C ... +90°C)	1244-015847
Sensor Module for PT 100 (up to +250°C) SM-PT100-1	1244-022441
PT-100 Sensor HARD-78 (-40°C ... +150°C)	213430-000
PT-100-Sensor MONI-PT100-260/2 (-50°C ... +260°C)	1244-006615
GM-TA-AS NTC-Sensor / Ambient sensor in enclosure	1244-017965
RAYCHEM PB-POWERBANK	1244-020365

Important: The Raychem RAYSTAT controller is for use with the Raychem heating cables only. The warranty and system listing will be invalidated if the RAYSTAT controller is used with other heating cables.

Elexant 450c-Modbus / Elexant 450c

Electronic controller for pipe freeze protection and temperature maintenance systems

PRODUCT OVERVIEW



The Raychem Elexant 450c controller is designed for operation with the Raychem heating cables.

The Elexant 450c is available in 2 versions:

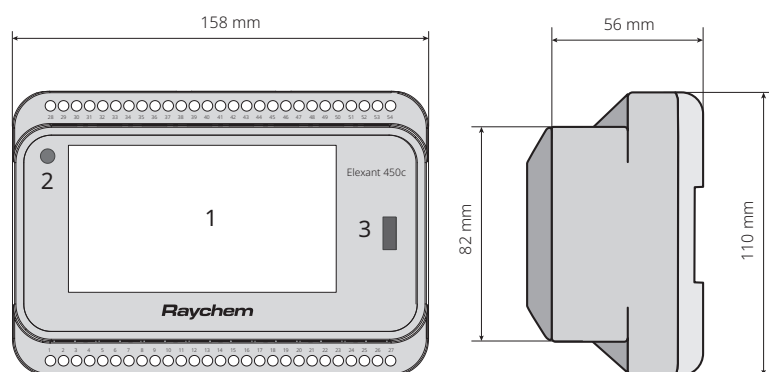
- **Elexant 450c** standard version
- **Elexant 450c-Modbus** version allowing flexible Modbus connectivity for remote monitoring, configuration, and ease of integration in a Building Management System (BMS).

FEATURES

- Intuitive set-up and programming of the unit with a 4,3" colour touch screen
- Flexible temperature control of pipe freeze protection and temperature maintenance systems
- Controls 2 independent heating circuits
- Pipe line sensing and/or ambient sensing
- Proportional Ambient Sensing Control (PASC) algorithm for enhanced energy savings in ambient sensing mode
- Alarm relay with change over contact to signal power, temperature or communication problems
- Pipe line temperature monitoring with high and low temperature alarm
- Offsite configurable - can be set up prior to final installation
- DIN rail panel mountable
- The Elexant 450c-Modbus is equipped with a RS485 port for Modbus communication to a BMS system which can be used for configuration, monitoring and alarm purposes.

PRODUCT SPECIFICATIONS

Typical enclosure dimensions and module layout



1. Touch screen, size 4.3"
2. LED: Flashes green in operation mode
3. USB port

ENCLOSURE

Dimensions	158 mm x 110 mm x 56 mm
Ingress protection class	IP20
Material	PPE
Mounting option	DIN-Rail mountable 35 mm, in panel
Storage temperature	-20°C to +50°C
Flammability class	D category (DIN EN60730/VDE0631-1)
Weight	550 g

TECHNICAL DETAILS

Supply voltage	230 VAC -15/+10%; 50 Hz
----------------	-------------------------

Power consumption	4 VA
Output relay / contactor / heating cable	2 x 4 A / 230 VAC
Power supply terminals	3 x 1.5 mm ²
Heating cables terminals contactor	2 x 2 x 1.5 mm ²
Alarm terminals	3 x 1.5 mm ²
Sensor terminals	2 x 2 x 1.5 mm ²
Modbus terminals	3 x 1.5 mm ²
Alarm relay	Single pole double throw relay, voltage – free, rating 2 A/250 VAC
Real time clock	Automatic summer/winter time and leap year connection
Clock back up	3 years
Clock accuracy	+/- 10 minutes per year
Keylock	Password protection for parameter settings
USB Port	For preset-up in power off mode and firmware upgrade
Settings	All settings are stored in non-volatile memory
Exposure temperature	0°C to +40°C

PROGRAMMING

Selectable temperature ranges	0°C to +80°C (when used with SM-PT100-2 up to +245°C)
Min and max temperature limit range	-40°C to +85°C (when used with SM-PT100-2 up to +250°C)
Operation modes	Pipe line sensing, Ambient sensing mode (P.A.S.C. Proportional Ambient Temperature Sensor Control); OFF

SENSOR

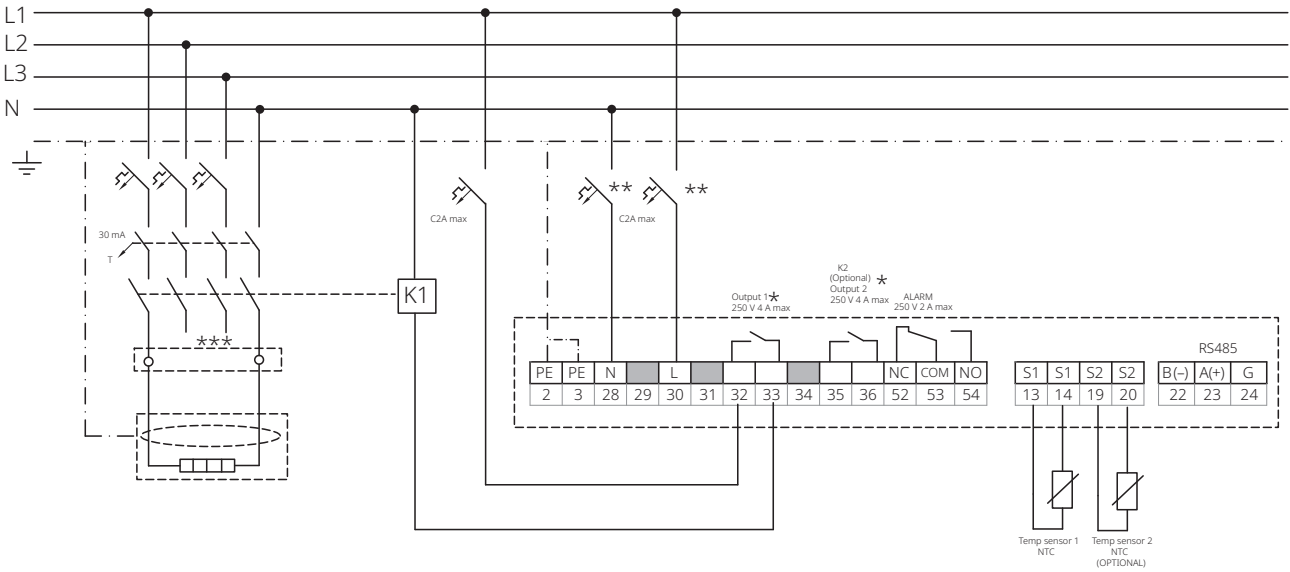
	Standard	With SM-PT100-2 Module	
	(included in box)	HARD-78	MONI-PT100-260/2
Temperature sensor type	NTC 2 KOhm / 25°C, 2-wire	PT100	PT100
Sensor tip dimensions	Ø5 mm, length 20 mm	Ø6 mm, length 50 mm	Ø6 mm, length 50 mm
Sensor cable length	5 m	3 m	2 m
Cable extension	Up to 150 m, cross section extension cable: 2 x 1,5 mm ²	Up to 150 m, 3 x 1,5 mm ²	Up to 150 m, 3 x 1,5 mm ²
Temperature range	-40°C to +90°C	-40°C to +150°C	-50°C to +260°C

MONITORING

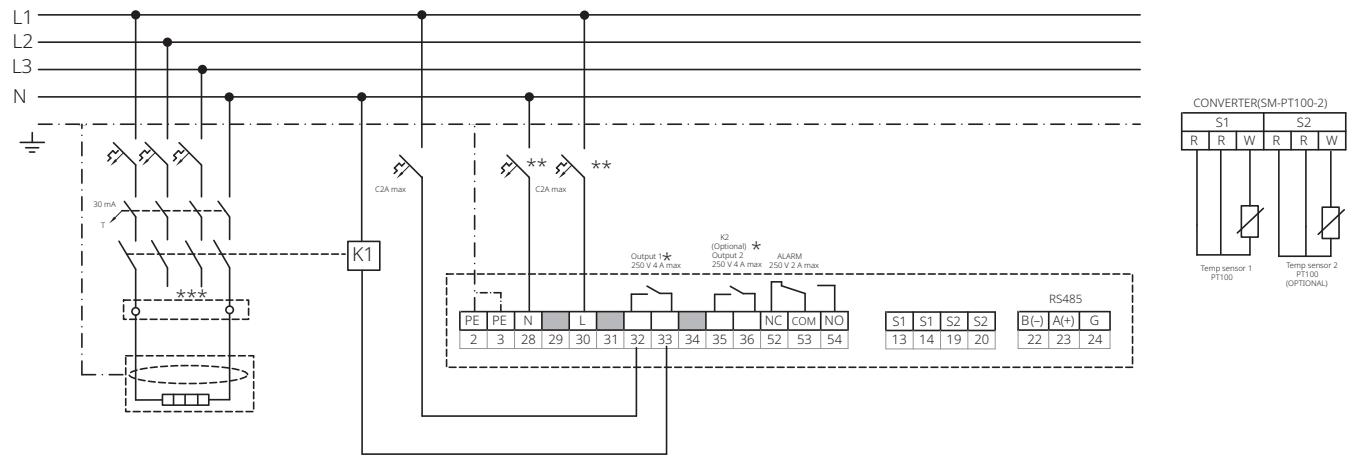
Pipe temperature alarm	High temperature alarm Low temperature alarm	Adjustable range set temperature to 250°C or OFF Adjustable range -40°C to 245°C or OFF
Sensor alarm	Sensor open circuit Sensor short circuit	
Parameter input	Each parameter input and event will be logged	

ELECTRICAL SCHEME

Standard: NTC Sensor



Option: PT100 Sensor



* Output 1 and output 2 can be used separately.
** 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.

COMMUNICATION (ELEXANT 450C-MODBUS)

Communication port	RS-485
Type	2-wire RS-485
Cable	One shielded twisted pair (not included)
Length	1,200 m (4,000 ft.) maximum
Quantity	Up to 247 devices per port
Data rate	2400, 4800, 9600, 19200 baud
Parity	None, even, odd
Stop bits	1, 2
Protocol	Modbus RTU

APPROVALS

For use in non-hazardous areas

Product certification

CE, VDE*, ROHS, WEE

*pending

Electromagnetic Compatibility (EMC)

EMC: EN 61000-6-3, EN 61000-6-2

ORDERING INFORMATION

	ELEXANT 450c	ELEXANT 450c-Modbus
Part number	1244-021970	1244-022623
EAN code	5414506021356	5414506022667
Weight	550 g	550 g
In package	1 control unit DIN rail, 1 line sensor 5 m	1 control unit DIN rail, 1 line sensor 5 m

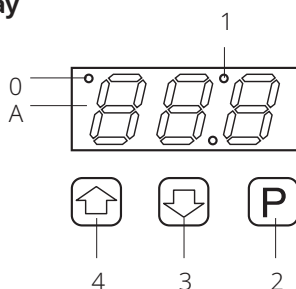
Accessories

Product description	PCN number
SENSOR-NTC-10M (–40°C ... +90°C)	1244-015847
Sensor Module for PT 100 (up to +250°C) SM-PT100-2	1244-022442
PT-100 Sensor HARD-78 (–40°C ... +150°C)	213430-000
PT-100 Sensor MONI-PT100-260/2 (–50°C ... +260°C)	1244-006615
GM-TA-AS NTC-Sensor / Ambient sensor in enclosure	1244-017965
RAYCHEM PB-POWERBANK	1244-020365

Important: The Raychem Elexant 450c / Elexant 450c-Modbus controller is for use with the Raychem heating cables only. The warranty and system listing will be invalidated if the Elexant 450c / Elexant 450c-Modbus controller is used with other heating cables.

RAYSTAT-CONTROL-11-DIN Line-Sensing Thermostat for Rack Mounting with Alarm Relay

Display



A LED display (parameter and error indications)

0 Control relay ON

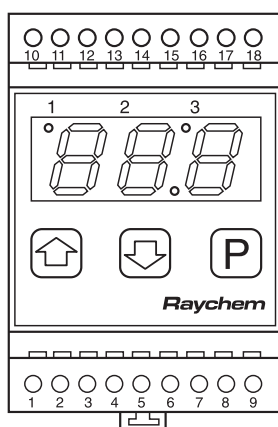
1 Alarm relay activated

2 Programming button

3 Reduce value

4 Increase value

Technical data



Operating voltage 230 Vac, +10%/-10%, 50/60 Hz

Power consumption ≤5 VA

Control relay (heating) I_{max} 16 A, AC 250 V, SPST

Connecting terminals 2.5 mm² screwed

Alarm relay I_{max} 8 A, AC 250 V, SPDT, voltage-free

Accuracy ±1 K at 0 to 50°C

Operating temperature -10°C to +55°C

Storage temperature -20°C to +60°C

Programmable parameter settings	Factory setting
Temperature setting	0°C to +63°C
Hysteresis	1 K to 5 K
Low temperature alarm	-15°C to 0°C or „Off“ position.
Heater operation if sensor error	ON or OFF
Voltage-free operation	YES

Housing

Diagnosed errors

Sensor error Sensor short-circuit / Sensor open-circuit / 3-wire sensor missing

Temperature error Low temperature

All parameters are stored in a non-volatile memory.

Dimensions 51.5 mm x 87.5 mm x 58 mm (W x H x D)

Material Housing in ABS

Ingress protection IP 20 (IP 30 installed in switchgear cabinet)

Mounting DIN 35 mm rack mounting

Temperature sensor

Type Pt 100 (3-wire technology) as per IEC class B

Sensor element 50 mm x Ø 6 mm stainless steel sheath

Protection rating IP 68

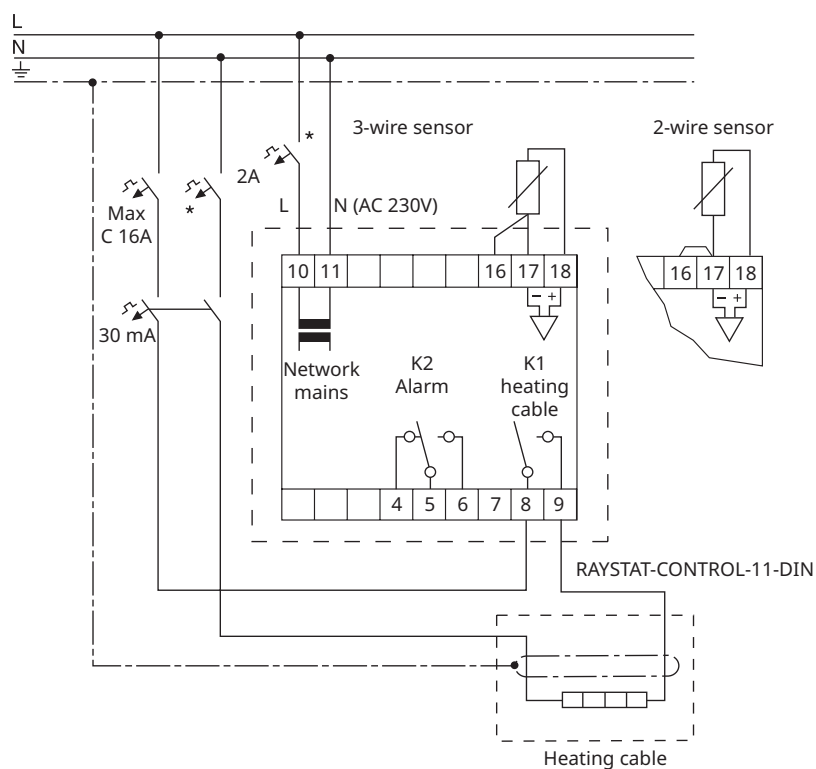
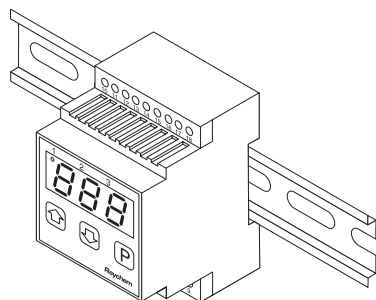
Sensor cable length 3 m x Ø 5 mm

Ambient temperature -50°C to 105°C

The sensor can be extended with a 3-wire shielded cable with max. 7.5 Ω per wire (with 3 x 1.5 mm² max. 150 m). The shielding should be earthed in the switchgear cabinet.

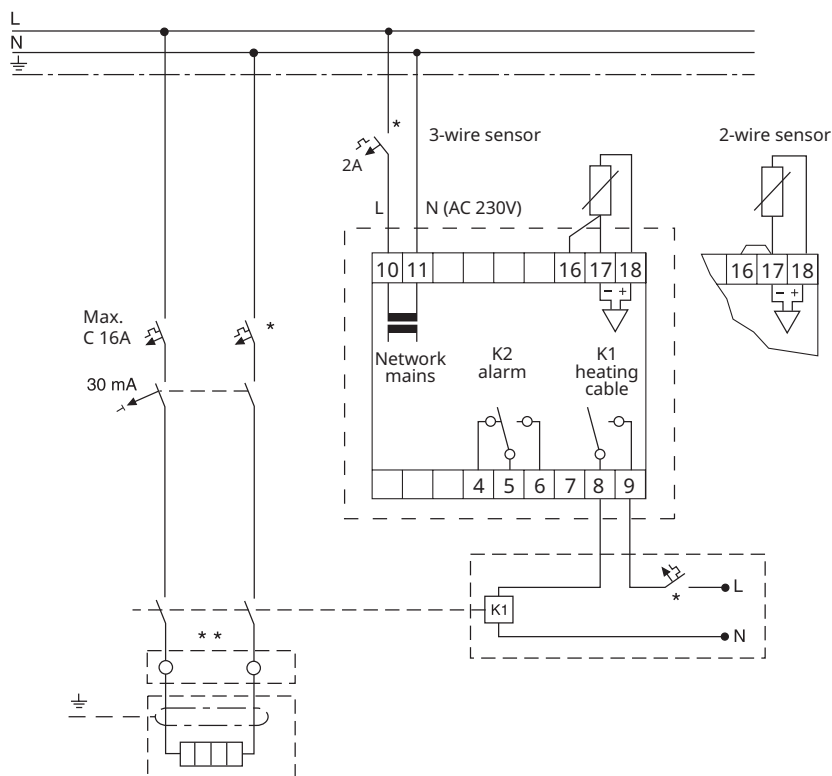
Wiring Diagram for RAYSTAT-CONTROL-11-DIN

NORMAL OPERATION



Pipe freeze protection

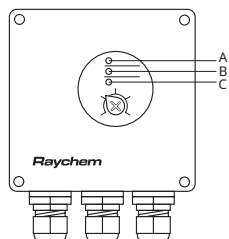
VOLTAGE-FREE OPERATION WITH POWER CONTACTOR



- * Regional factors, standards and regulations may require two to four-pole disconnection by circuit breakers/ground fault circuit interrupters.
- ** Depending on the application, both single and multipole contactors are possible.

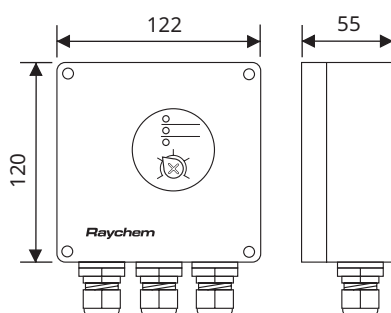
Line-Sensing Control and Ambient Thermostats (**AT-TS-13** and **AT-TS-14**)

Unit layout



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

Technical data



Supply voltage	230 VAC +10% -15% 50/60 Hz
Power consumption	≤ 1.8 VA
Approval	CE
Max. switching current	16 A, 250 VAC
Max. conductor size	2.5 mm ²
Switching differential	0.6 to 1 K
Switching accuracy	AT-TS-13 ±1 K at 5°C (calibration point)
	AT-TS-14 ±2 K at 60°C (calibration point)
Switch type	SPST (normally open)
Adjustable temperature range	AT-TS-13 -5°C to +15°C
	AT-TS-14 0°C to +120°C

Enclosure

Temperature setting	Inside
Exposure temperature	-20°C to +50°C
Ingress protection	IP65 according to EN 60529
Entries	1 x M20 for supply cable (Ø 8-13 mm) 1 x M25 for connection heating cable (Ø 11-17 mm) 1 x M16 for sensor
Weight (without sensor)	approx. 440 g
Material	ABS
Lid fixing	Nickel-plated quick release screws
Mounting	On wall or on support bracket SB-110/SB-111

Temperature sensing (HARD-69)

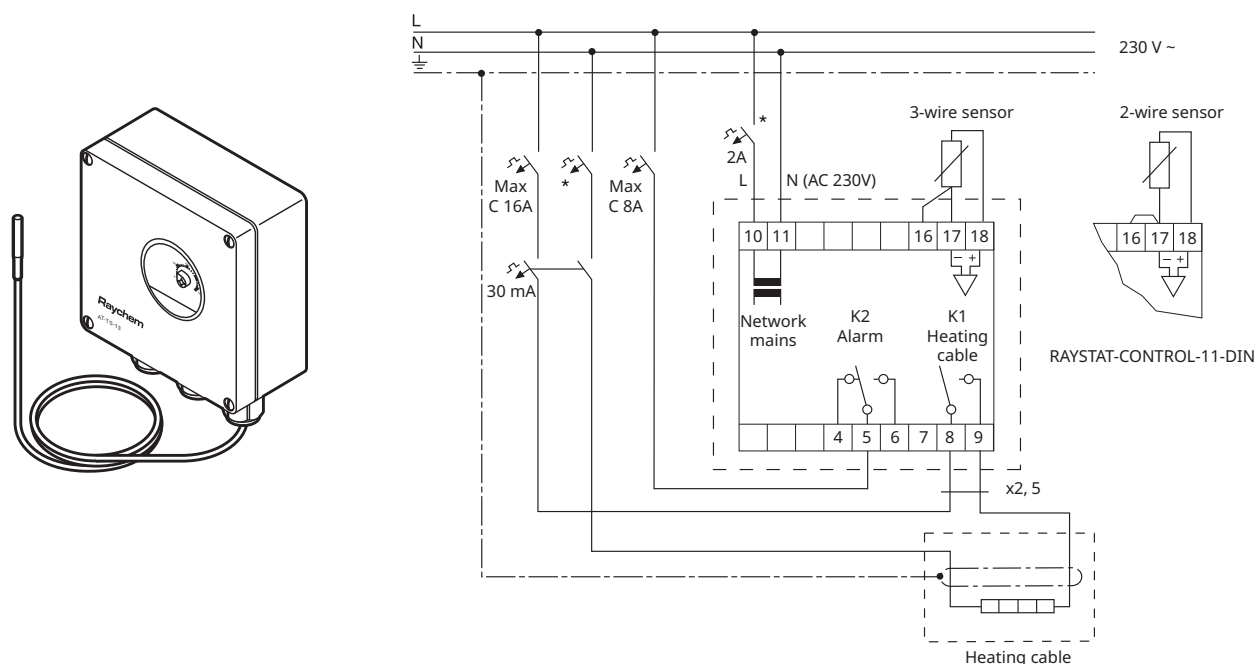
Type	PTC KTY 83-110
Length sensor cable	3 m
Diameter sensor cable	5.5 mm
Diameter sensor head	6.5 mm
Max. exposure temperature sensor cable	80°C (AT-TS-13; PVC sensor cable) 160°C (AT-TS-14 and HARD-69 spare sensor: silicone sensor cable)

The sensor cable may be extended up to 100 m using a cable with a cross-section of 1.5 mm².

The sensor cable should be shielded if it is laid in cable ducts or in the vicinity of high-voltage cables.

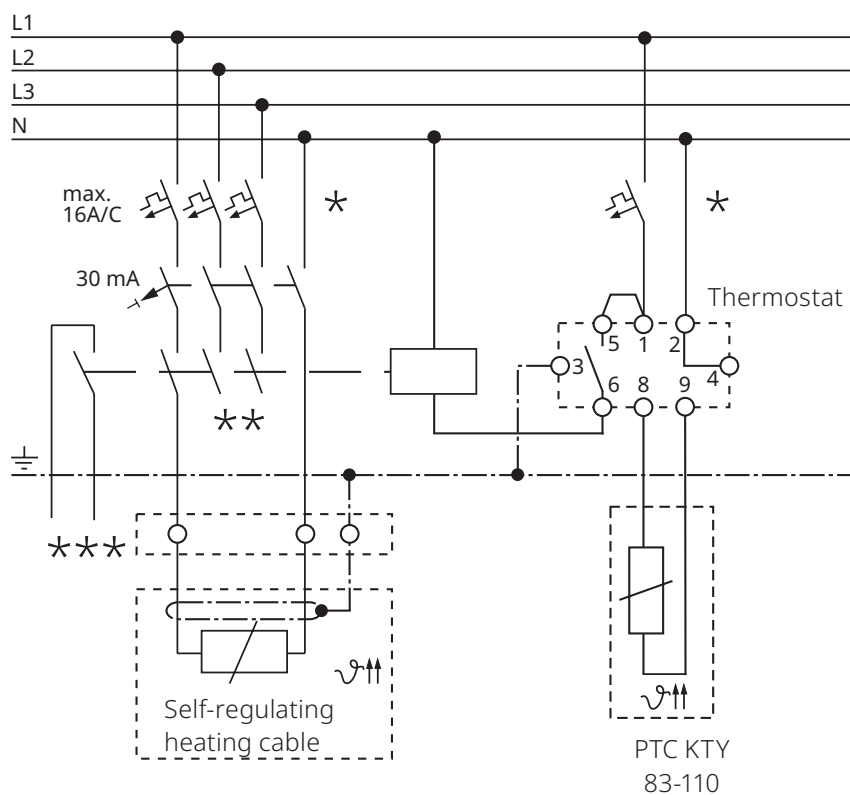
Wiring Diagram for Thermostat AT-TS-13 or AT-TS-14

AT-TS-13/14 DIRECT



Pipe freeze protection

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

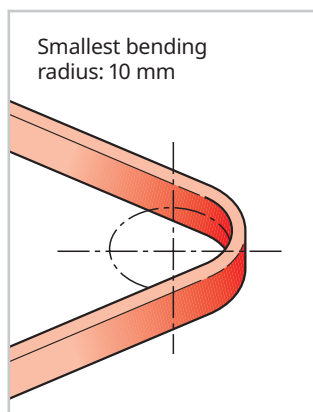
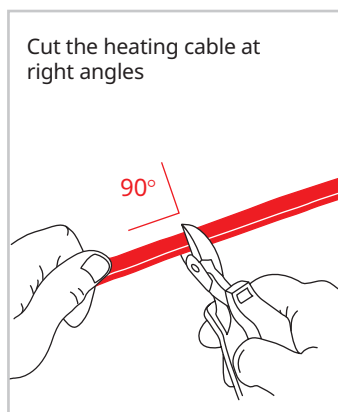
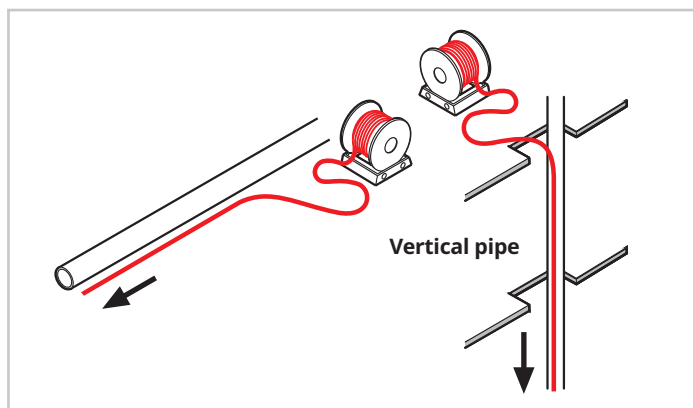
Pipe Freeze Protection

GENERAL INSTALLATION INSTRUCTIONS

- See page 76
- General installation and operation information is also available from Chemelex in document reference: CDE-1547

INSTALLATION INSTRUCTIONS FOR XL-TRACE LSZH AND FS-C10-2X CABLES

- The heating cable should be installed in a straight line on the pipework.
- Install on dry surfaces
- Minimum cable installation temperature: -20°C



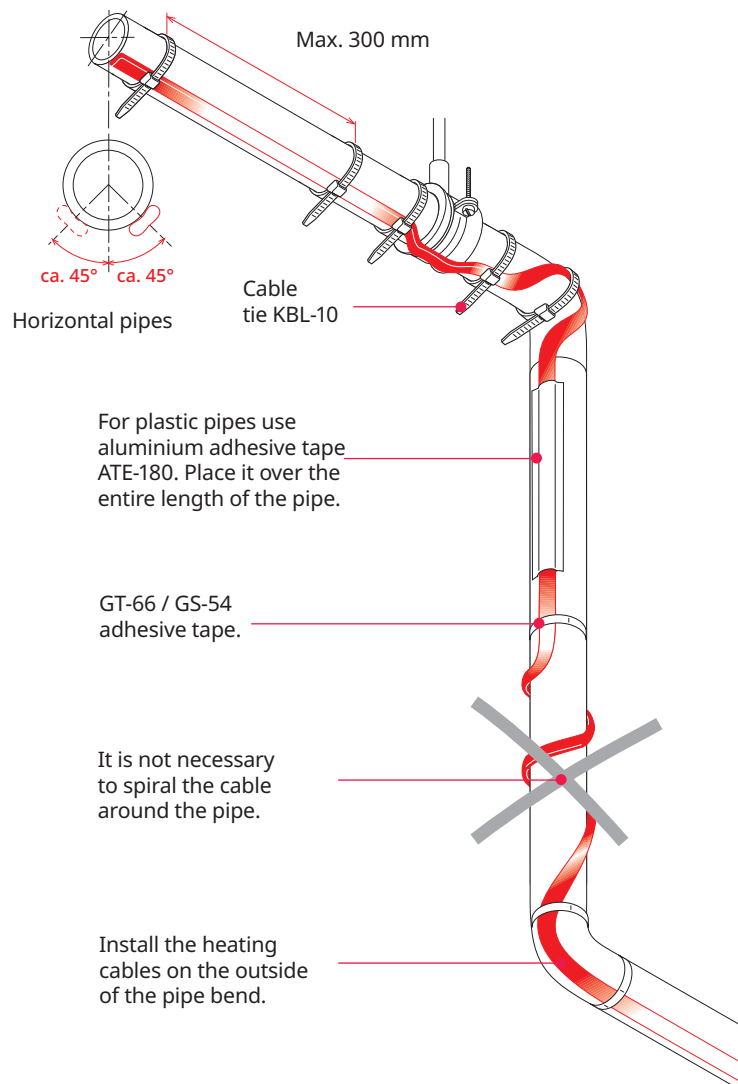
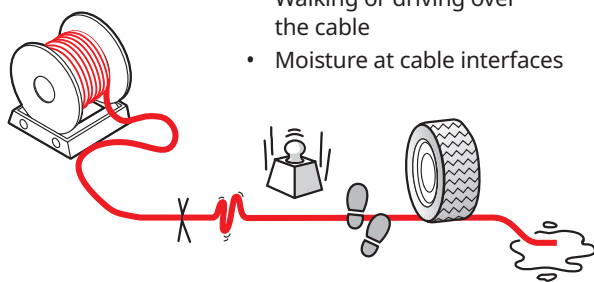
Installation of self-regulating heating cables

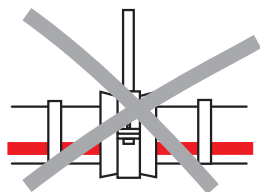
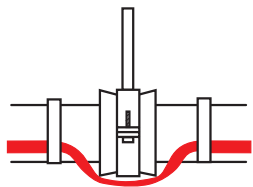
- Store in a dry and clean place
- Temperature range: -40°C to $+60^{\circ}\text{C}$
- Protect any cable ends with an end seal



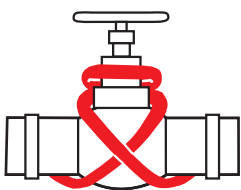
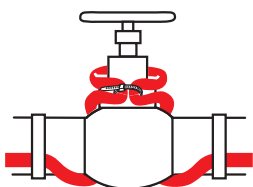
Avoid:

- Sharp edges
- High tractive force
- Kinking and crushing
- Walking or driving over the cable
- Moisture at cable interfaces





- Run the cable over pipe suspensions
- Do not clamp the cable
- When using the heating tape with cold clamps, please contact your Raychem representative

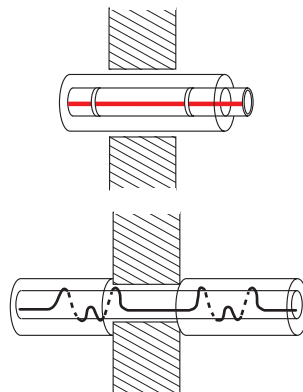


Frost protection at valves:

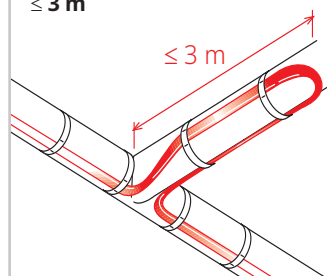
- Valves up to 2" (DN 50): install the frost protection heating cables in a straight line.
- $\geq 2"$: lay as shown.
- Always insulate valves.

Wall/Floor transit

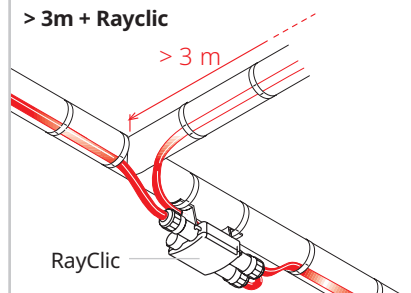
- The thickness of insulation must be continuous otherwise compensate by adding heating cable.



≤ 3 m



> 3 m + RayClic



RayClic-T-connection

Electric traced label

IEK-20-M for insertion of heating cable in metal cladding.

Snow Melting and Deicing of Gutters and Downpipes

Melting and refreezing of ice can damage roofs and gutters. Heavy icicles may fall and cause injury. Standing water can leak through interior walls damaging property. The Raychem self-regulating snow melting system maintains water flow in gutters and drain pipes, provides a path whereby melted ice and snow can drain safely off the roof, along the gutter and down the drain pipe.

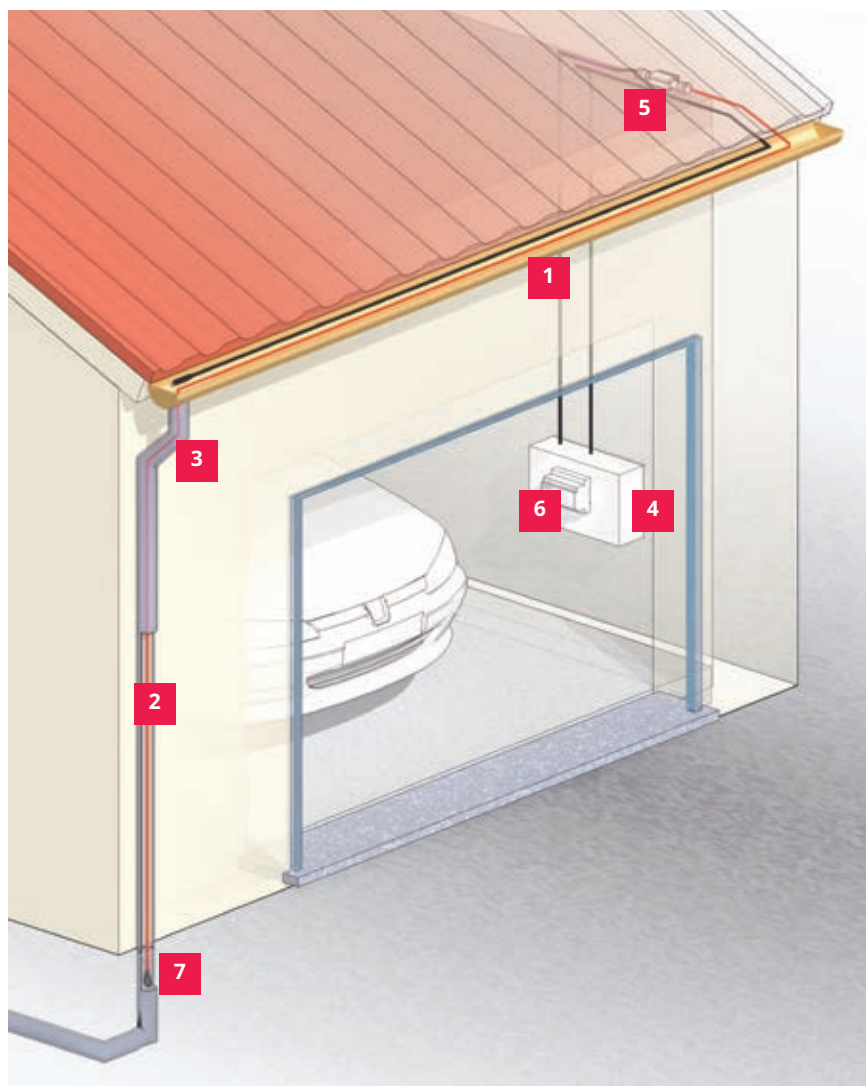
Practical to install

The self-regulating cable can be closely spaced in gutters without the risk for overheating or burn-outs. There is a cable for each type of roof material.

Economical to operate

The self-regulating effect saves energy by automatically increasing its heat output in icy water and decreasing its output in dry air.

The smart Elexant 650c-Modbus control unit only switches the heating cable on when necessary: after the detection of both low temperature and moisture.



1 Moisture sensor
Elexant 650c-Modbus (excl.)

2 Heating cable
GM-2X(T)

3 Fixing bracket
(GM-RAKE)

4 Elexant 650c-Modbus
Control unit

5 Connection
RayClic CE-02/CCE-06CR/CCE-04-CT

6 Residual current device (rcd 30 mA)
Circuit-breaker (C type)

7 End seal (RayClic-E-02)
Heating cable installation down to the
frost-free zone!

Design Guide, Control Units and Accessories

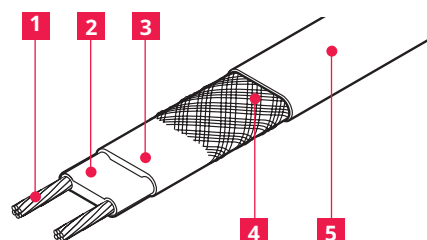
1 HEATING CABLE SELECTION

GM-2X, GM-2XT

Self-regulating heating cable for gutters, drain pipes and roof surfaces:

- 39 W/m in iced water and 18 W/m in air at 0°C

2 COMPOSITION OF GM-2X AND GM-2XT



- 1 Copper conductor (1.2 mm²).
- 2 Self-regulating heating element.
- 3 Insulation made of modified polyolefin.
- 4 Tinned copper braid.
- 5 Protective jacket (UV-resistant) (Modified polyolefin jacket for GM-2X and fluoropolymer jacket for GM-2XT).

Important note: When laying cables on asphalt, bitumen, roofing felt, etc., the cable with the special fluoropolymer jacket (GM-2XT) must be used.

Technical data: see page 80

GM-2X PCN: 446105-000

GM-2XT PCN: 092961-000

3 CABLE LENGTH

- The heating cable should be installed in a straight line in the gutter
- The cable lengths should be adjusted according to the geographical situation and the gutters.
- More than one cable should be laid in wide valley, parapet or box gutters.

Gutter length

+ drainpipe length

+ 1 m per connection

+ 1 m in the soil (frost line)

= required heating cable length

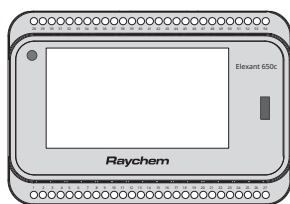
4 ELECTRICAL PROTECTION

- The length of heating cable determines the number and size of the circuit breakers.
- Residual current device (rcd): 30 mA required, max. 500 m heating cable per rcd.
- Installation according to local regulations.
- The power connections must be carried out by an approved electrical installer.
- Use C type circuit-breakers.

Max. length of the heating circuit is based on a minimum switch-on temperature of -10°C, 230 VAC.

	GM-2X, GM-2XT
6A	25 m
10 A	40 m
13 A	50 m
16 A	60 m
20 A	80 m

Elexant 650c-Modbus

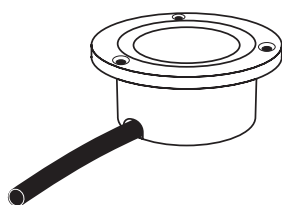


Electronic controller with color touchscreen and advanced alarm functions, capable of switching up to two independent heating circuits via external contactors.

- Intuitive set-up and programming of the unit with a 4.3" colour touch screen
- Moisture and temperature control of roof & gutter de-icing and surface snow melting systems
- Temperature with moisture sensing for enhanced energy savings
- Alarm relay with change over contact to signal power, sensor or communication problems (Modbus)
- Ambient temperature monitoring with high and low temperature alarm
- Offsite configurable – can be set up prior to final installation
- DIN-Rail panel mountable
- PCN: 1244-022835

Technical data: see page 62

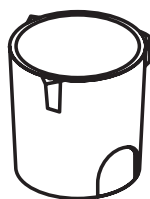
E650C-G



Moisture and temperature sensor for Elexant 650c-Modbus

- For surface snow melting, 20 m with housing and protective cover
- PCN: 1244-022794

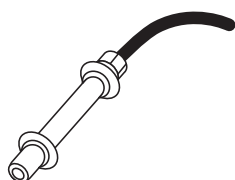
E650C-G-HOUSING



Spare housing and protective cover for surface snow melting sensor RAYSENS-SSM-20

- PCN: 1244-022796

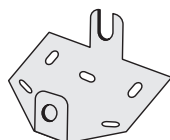
E650C-R



Moisture and temperature sensor for roof and gutter de-icing for Elexant 650c-Modbus, 6 m, with zinc mounting bracket

- PCN: 1244-022795

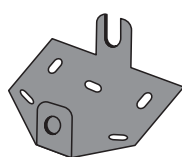
E650C-R-BRACKET-ZN



Spare mounting bracket for roof and gutter de-icing sensor E650C-R, zinc

- PCN: 1244-022798

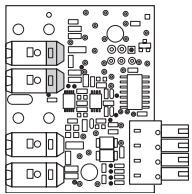
E650C-R-BRACKET-CU



Spare mounting bracket for roof and gutter de-icing sensor E650C-R, copper

- PCN: 1244-022799

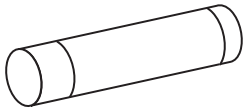
SM-TF130-DI



External module for the ice rain feature and panel alarm digital input

- PCN: 1244-022836

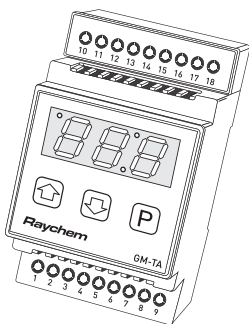
RAYCHEM-PB-POWERBANK



Accessory for Elexant 650c-Modbus

- For pre-setup in power-off mode
- Torch function
- USB cable type A-A
- PCN: 1244-020365

GM-TA



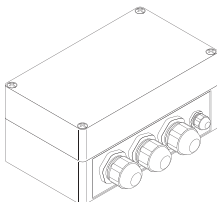
DIN-Rail mountable thermostat

Temperature control with ambient temperature sensor

- DIN-Rail mountable (35 mm)
- Easy-to-read digital display for temperature and alarm
- Double temperature set points; SP1: 0°C –6°C; SP2: –5 to –25°C
- Post heating time from, 30 min up to 3 hours selectable
- Read-out of actual ambient temperature
- PCN: 1244-017783

Technical data: see page 65

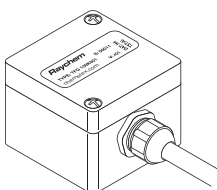
GM-TA-OUTDOOR-BOX



Accessory for GMTA

- Enclosure box for thermostat GM-TA for outdoor installation
- IP65
- Wall mounted
- Inclusive sensor and DIN-Rail
- PCN: 1244-017966

GM-TA-AS

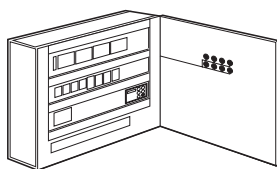


Spare sensor inclusive enclosure for the Elexant 450c / Elexant 450c-Modbus / Raystat V5 / GM-TA controllers, for the detection of ambient temperature

Sensor NTC in the enclosure for outdoor installation

- IP65
- PCN: 1244-017965

6 CONTROL PANEL



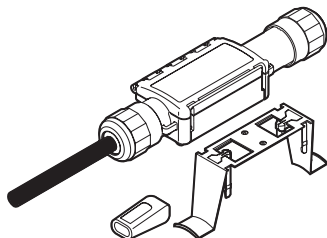
Steel plate housing, wall-mounted version, equipped with mains isolator, RCD/CB combination(s), indicators for 'Operation and Fault', inlet and outlet terminals. Completely assembled, wired and inspected. Cable guides in base of housing. An Elexant 650c-Modbus control unit is installed in each switch cabinet.

Product name	Item number	Product description	EAN numbers
SBS-SMDI-E650C-3X16A	2000003965	Control panel for max. 3 heating circuits, 16 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	5414506025040
SBS-SMDI-E650C-6X16A	2000003966	Control panel for max. 6 heating circuits, 16 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	5414506025057
SBS-SMDI-E650C-9X16A	2000003967	Control panel for max. 9 heating circuits, 16 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	5414506025064
SBS-SMDI-E650C-12X16A	2000003968	Control panel for max. 12 heating circuits, 16 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	5414506025071
SBS-SMDI-E650C-3X20A	2000003969	Control panel for max. 3 heating circuits, 20 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	5414506025125
SBS-SMDI-E650C-6X20A	2000003970	Control panel for max. 6 heating circuits, 20 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	5414506025132
SBS-SMDI-E650C-9X20A	2000003971	Control panel for max. 9 heating circuits, 20 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	5414506025149
SBS-SMDI-E650C-12X20A	2000003972	Control panel for max. 12 heating circuits, 20 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	5414506025156
SBS-MONT-ELEXANT-650C	2000004520	Optional additional electronic controller Elexant 650c-Modbus for SBS-SMDI-E650c-9XXXXA or SBS-SMDI-E650c-12XXXXA, with installation in the control panel; can operate 2-heating zones independently (This item must be ordered separately)	5414506025231

Panel type			SBS-SMDI-E650c-3xXXA	SBS-SMDI-E650c-6xXXA	SBS-SMDI-E650c-9xXXA	SBS-SMDI-E650c-12xXXA
Max. quantity of heating circuits			3	6	9	12
Quantity of contactors			2	2	3	4
Max. quantity of Elexant 650c-Modbus controllers			1	1	2	2
Max. power output kW			28	43	75	86
Circuit breaker on-site max. A			3 pole x 40 A	3 pole x 80 A	3 pole x 100 A	3 pole x 132 A
Enclosure mounting			Wall-mounted	Wall-mounted	Wall-mounted	Wall-mounted
Dimension	Width	mm	400	600	800	800
	Height	mm	600	600	800	800
	Depth	mm	210	210	210	210
Weight	Approx.	kg	32	32	54	56

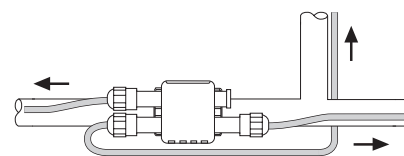
7 ACCESSORIES FOR GM-2X/GM-2XT

RayClic-CE-02

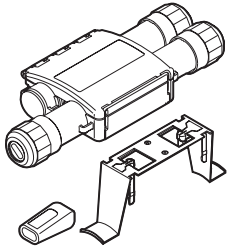


Power connection

- With 1.5 m power cable
- End seal and support bracket
- IP 68
- External dimension: L = 240 mm
W = 64 mm
H = 47 mm
- PCN: 235422-000

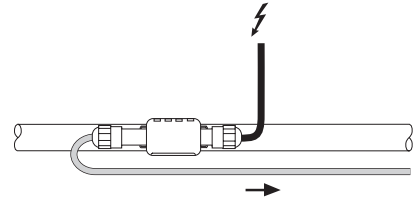


RayClic-T-02

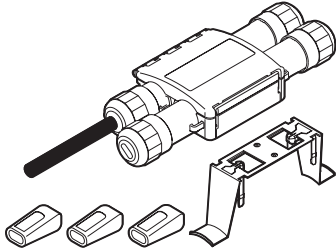


T-connection

- Connection for 3 cables
- 1 end seal and 1 support bracket
- IP 68
- External dimension: L = 270 mm
W = 105 mm
H = 42 mm
- PCN: 441524-000

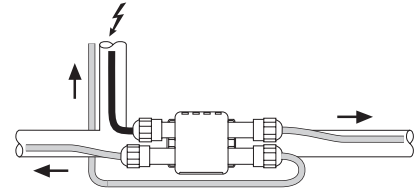


RayClic-PT-02

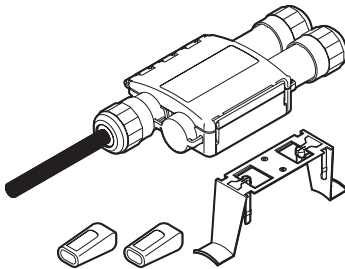


Power T-connection

- Connection for 3 cables with
- integral 1.5 m power cable
- 3 end seals and 1 support bracket
- IP 68
- External dimension: L = 270 mm
W = 105 mm
H = 42mm
- PCN: 636284-000

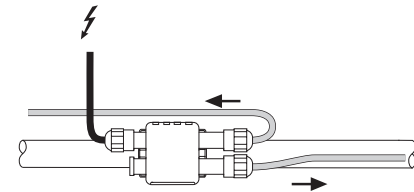


RayClic-PS-02

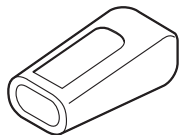


Powered splice

- Connection for 2 cables with
- integral 1.5 m power cable
- 2 end seals and 1 support bracket
- IP 68
- External dimension: L = 270 mm
W = 105 mm
H = 42 mm
- PCN: 716976-000



RayClic-E-02

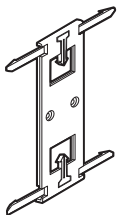


Gel-filled end seal

- For system extensions
- (to be ordered separately)
- IP 68
- PCN: 224727-000



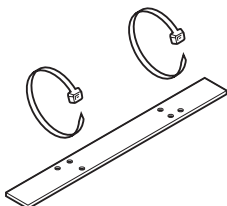
RayClic-SB-02



Wall-mounted support bracket

- PCN: 852001-000

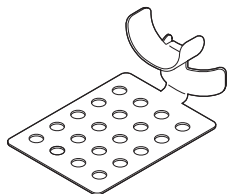
GM-RAKE



Fixing bracket/edge protection for drainpipes.

- Spacer for use in wide channels or gutters where more than one run of cable is required (a spacer is placed every 100 cm).
- VA steel with UV-resistant cable ties.
- Total length: 300 mm
- Distance between the holes: 150 mm
- PCN: 912791-000

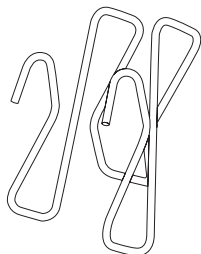
IceStop-GMK-RC



Roof clip to secure heating cables to roofs and gutters.

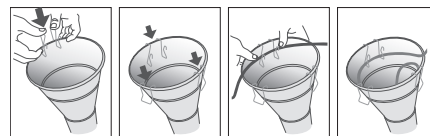
- Adhesive can be applied on the underside of the roof clip. After curing of the adhesive, the heating cable can be clipped between the clamps.
- PCN: 153651-000

GM-CLIP-S

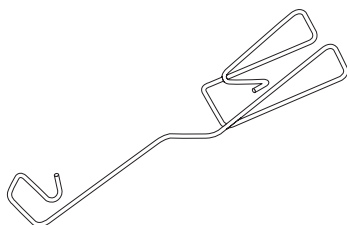


Clip for quick and reliable fixing of heating cable GM-2X and GM-2XT on wide down pipe funnel.

- Material: Stainless steel EN 1.4310
- Wire: Ø 2,5 mm
- Height: 55 mm
- Gutter type: wide funnel with max. Frame size of 10 mm.
- Box content: 10 Clips/box
- PCN: 1244-013849

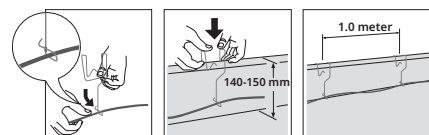


GM-CLIP-L

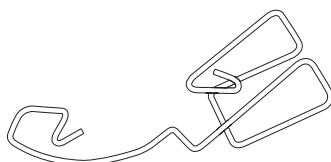


Clip for quick and reliable fixing of heating cable GM-2X and GM-2XT on gutters with L-profile.

- Material: Stainless steel EN 1.4310
- Wire: Ø 2,5 mm
- Height: 150 mm
- Gutter type: gutters with L-Profile 140-150 mm height with max. 15 m frame size.
- Box content: 10 Clips/box
- PCN: 1244-013851

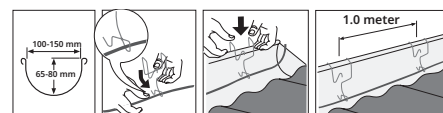


GM-CLIP-M

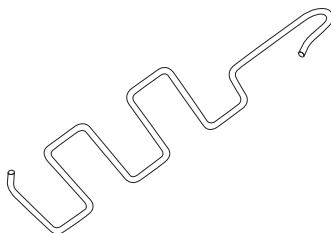


Clip for quick and reliable fixing of heating cable GM-2X and GM-2XT on half round gutters.

- Material: Stainless steel EN 1.4310
- Wire: Ø 2,5 mm
- Height: 100 mm
- Gutter type: gutters half-round;
- Width: 100-150 mm
- Depth: 65-80 mm
- Height with max. 17 m frame size.
- Box content: 10 Clips/box
- PCN: 1244-013850



GM-HANGAR

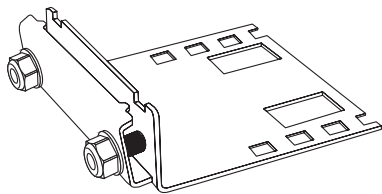


Structural support for wide roof inlet funnel for fast and easy installation of the heating cable GM-2X and GM-2XT.

- Material: Stainless steel EN 1.4301
- Wire: Ø 4,0 mm
- Height: 225 mm
- Gutter type: wide funnel with max. Frame size of 20 mm
- Suitable for: GM-2X, GM-2XT
- Content box: 5 pcs/box
- PCN: 1244-013852

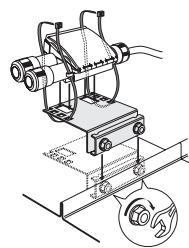


RAYCLIC-SB-GM-METAL

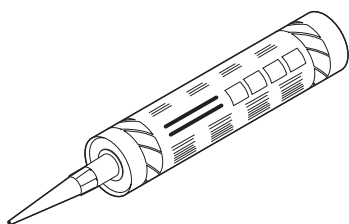


Bracket for mounting on metal standing seam roofs

- Material: Galvanized steel
- Thickness: 2,0 mm
- Dimension: L 120 x B 130 x H 42 mm
- Gutter type: metal standing seam roofs
- Suitable for: RayClic-CE, -S, -T, -PT, -PS and -X
- Box content: Unpacked; 1 pc
- PCN: 1244-013853



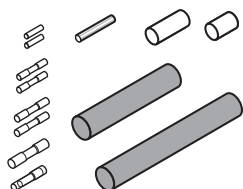
GM-SEAL-02



Adhesive for sticking and sealing construction materials with a base of polyurethane suitable for metal or plastic gutters, roofing tiles and asphalt and bitumen surfaces.

- 300 ml pack
- PCN: 1244-012310

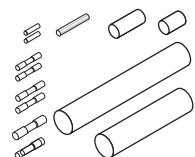
CCE-04-CT (for GM-2XT)



Cold lead connection and end seal kit

- Connection of 3 x 1,5 mm² or 3 x 2,5 mm² cold lead cable to self-regulating heating cables GM-2X(T).
- Heat shrink technique
- PCN: 243676-000

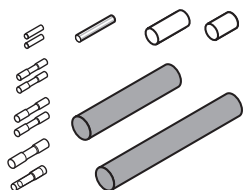
CCE-06-CR (for GM-2X)



Cold lead connection and end seal kit

- Connection of 3 x 1,5 mm² or 3 x 2,5 mm² cold lead cable to self-regulating heating cables
- XL-Trace LSZH, FS-C10-2X, GM-2X and HWAT-L/M/R
- PCN: 1244-021907

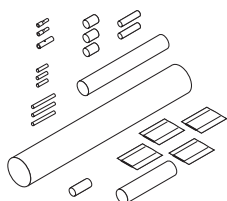
CCE-04-CT (for GM-2XT)



Kaltleiterverbindung und Endabschlussgarnitur, für GM-2XT, XL-Trace Warmschrumpftechnik

- Anschluss von 3 x 1,5-mm²- oder 3 x 2,5-mm²-Kaltleitern an selbstregelnde Heizbänder GM-2X(T).
- Warmschrumpftechnik
- PCN: 243676-000

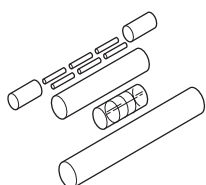
TE-01-CR



T-branch and end termination set for XL-Trace/GM-2X(T)/HWAT; for 3 heating cables incl. 2 end terminations or for 2 heating cables and one supply cable

- PCN: 1244-003202

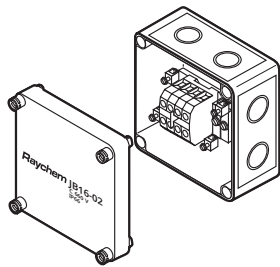
S-06



In-line splice kit

- For XL-Trace LSZH/HWAT/GM-2X/FS-C10-2X
- Heat-shrinkable technique
- PCN: 054953-000

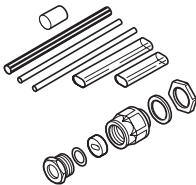
JB16-02



Temperature-resistant junction box

- For power connection
- IP66
- 6 x 4 mm² terminals
- 4 x M20, 4 x M25 knock-out entries
- Silicone free
- PCN: 946607-000

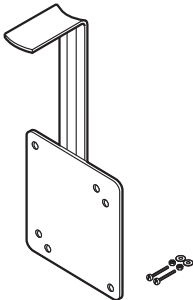
CE20-01



Connection and end seal kit for FS-C10-2X cables

- Heat-shrink technique
- M20 gland with silicone grommet
- PCN: 734312-000

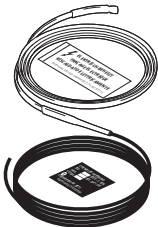
JB-SB-08



Support Bracket, Single-Leg, Stainless Steel, Vertical

- PCN: 084799-000

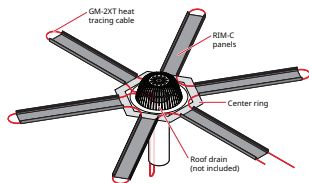
FIXED LENGTHS



Pre-assembled tapes with 8 m of 3 x 1.5 mm² power cable and a termination

PCN		
GM-2X-SA-5	191808-000	5 m GM-2X
GM-2X-SA-8	106160-000	8 m GM-2X
GM-2X-SA-12	159067-000	12 m GM-2X
GM-2X-SA-16	650854-000	16 m GM-2X
GM-2X-SA-20	973923-000	20 m GM-2X
GM-2X-SA-25	838627-000	25 m GM-2X
GM-2X-SA-30	925956-000	30 m GM-2X

RIM-DT-KIT

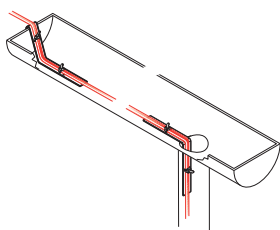


RIM-DRAINTRACE-KIT (RIM-DT-KIT) is a de-icing system for flat roof drains, ready for immediate use

- Star shaped laying; 6 aluminum panels (length: 600 mm; width 100 mm)
- 16 m heating cable GM-2XT, pre-assembled with 8 m connection cable and end termination;
- PCN: 1244-022477
- Technical data see page 67

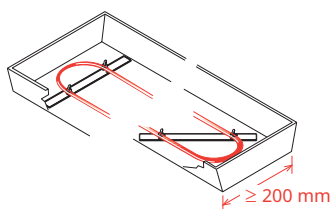
Snow Melting and Deicing of Gutters and Downpipes

INSTALLATION INSTRUCTIONS



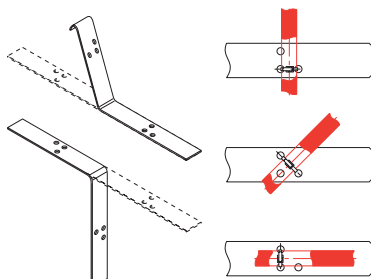
Box gutter < 200 mm

- One heating cable of GM-2X (T) only



Box gutter > 200 mm

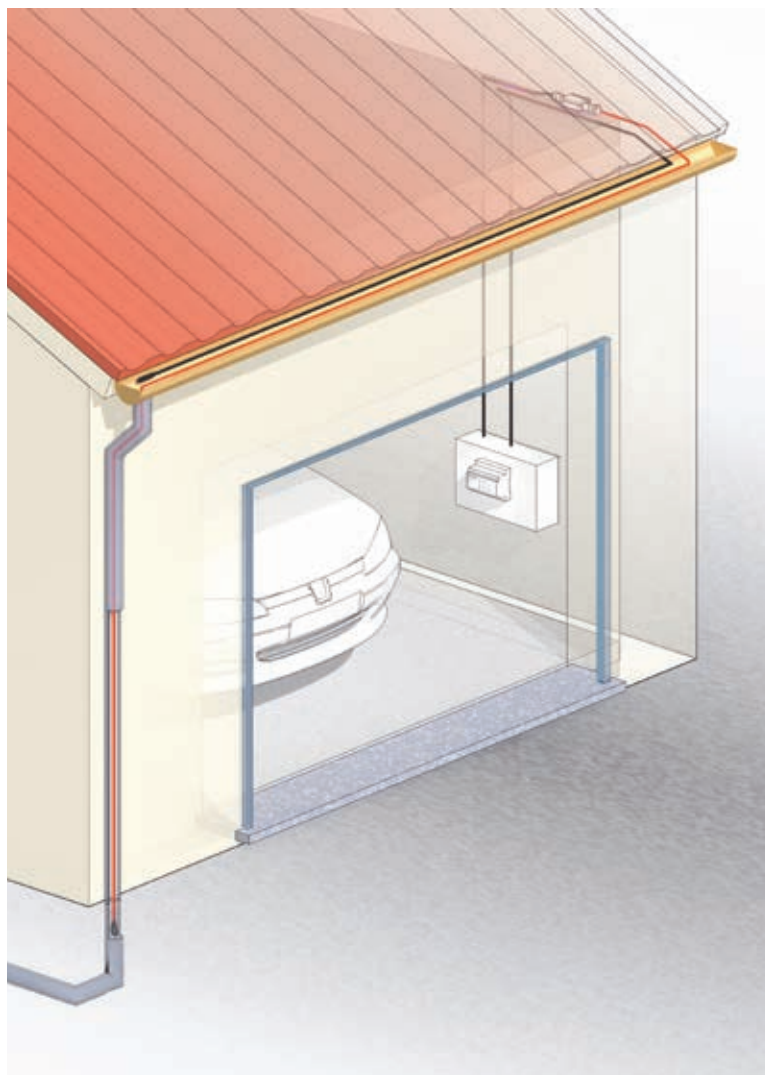
- Multiple heating cables of GM-2X(T)
- 2 pc spacer GM-RAKE per meter of gutter edges: GM-RAKE provides mechanical protection against damages



Fastening of the gutter cables

On the roof, eaves bricks, gutter and drainpipe with GM-RAKE edge protection brackets (incl. cable ties).

**Do not install RayClick immersed in water.
Do not bury RayClick in the ground.**



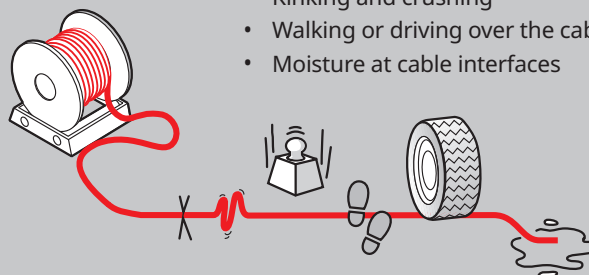
Snow melting and deicing
of gutters and downpipes

In the drainpipe: always install the cable as far as the frost-free area (approx. 1m deep)

Important note: When laying cables on asphalt, bitumen, roofing felt, etc., the cable with the special fluoropolymer jacket (GM-2XT) must be used.

Installation of self-regulating heating cables

- Store in a dry and clean place.
- Minimum installation temperature: -10°C
- Protect any cable ends with an end seal.



Avoid:

- Sharp edges
- High tractive force
- Kinking and crushing
- Walking or driving over the cable
- Moisture at cable interfaces

ELEXANT 650c-Modbus: Electronic controller for roof & gutter de-icing and surface snow melting systems

PRODUCT OVERVIEW



The Raychem Elexant 650c-Modbus controller is designed for operation with Raychem ramp, roof and gutter heating cables.

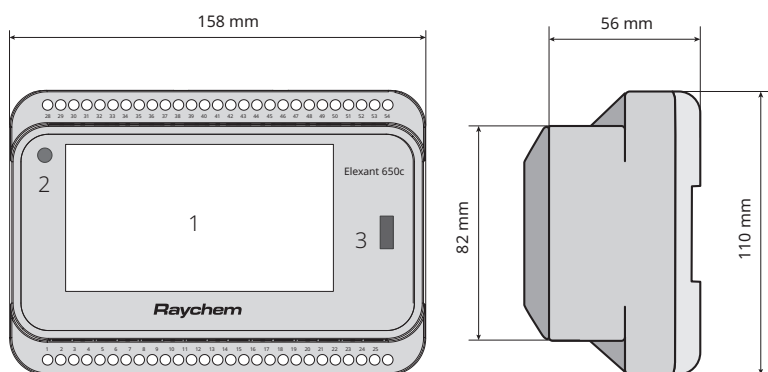
The Modbus connectivity allows for remote monitoring, configuration, and ease of integration in a Building Management System (BMS).

FEATURES

- Intuitive set-up and programming of the unit with a 4.3" colour touch screen
- Moisture and temperature control of roof & gutter de-icing and surface snow melting systems
- Controls 2 independent heating areas
- Temperature with moisture sensing for enhanced energy savings
- Alarm relay with change over contact to signal power, sensor or communication problems (Modbus)
- Ambient temperature monitoring with high and low temperature alarm
- Offsite configurable – can be set up prior to final installation
- DIN rail panel mountable
- The Elexant 650c-Modbus is equipped with a RS485 port for Modbus communication to a BMS system which can be used for configuration, monitoring and alarm purposes
- Ice rain feature – preheating the surface to prevent the issue of freezing rain (for surface snow melting application only)

PRODUCT SPECIFICATIONS

Typical enclosure dimensions and module layout



1. Touch screen, size 4.3"
2. LED: Flashes green in operation mode
3. USB Port

ENCLOSURE

Dimensions	158 mm x 110 mm x 56 mm
Ingress protection class	IP20
Material	PPE
Mounting option	DIN-Rail mountable 35 mm, in panel
Storage temperature	-20°C to +50°C
Flammability class	D category (DIN EN60730/VDE0631-1)

Snow melting and deicing of gutters and downpipes

SENSOR

*Not included in the box

Snow sensing threshold min. and max. temperature	Adjustable range 0°C to +5°C Adjustable range -30°C to -5°C or OFF
Sensor alarm	Sensor open circuit Sensor short circuit
Parameter input	Each parameter input and event will be logged in non-volatile memory

Standard: Moisture sensors



COMMUNICATION

Communication port	RS-485
Type	2-wire RS-485
Cable	One shielded twisted pair (not included)
Length	1,200 m (4,000 ft.) maximum
Quantity	Up to 247 devices per port
Data rate	2400, 4800, 9600, 19200 baud
Parity	None, even, odd
Stop bits	1, 2
Protocol	Modbus RTU

APPROVALS

For use in non-hazardous areas

Product certification



Electromagnetic Compatibility (EMC) EN 61000-6-3, EN 61000-6-2

ORDERING INFORMATION

Catalog description	ELEXANT 650c-Modbus
Part number	1244-022835
EAN code	5414506025002
Weight	550 g
In package	1 control unit with manual / no sensors included

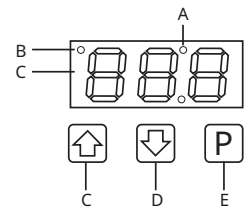
ACCESSORIES

Product name	Product description	PCN number	EAN number
E650C-G	Moisture and temperature sensor for surface snow melting, 20 m with housing and protective cover	1244-022794	5414506024661
E650C-G-HOUSING	Spare housing and protective cover for surface snow melting sensor	1244-022796	5414506024685
E650C-R	Moisture and temperature sensor for roof and gutter de-icing, 6 m with zinc mounting bracket	1244-022795	5414506024678
E650C-R-BRACKET-ZN	Spare mounting bracket for roof and gutter de-icing sensor, zinc	1244-022798	5414506024708
E650C-R-BRACKET-CU	Spare mounting bracket for roof and gutter de-icing sensor, copper	1244-022799	5414506024715
SM-TF130-DI	External module for the ice rain feature and panel alarm digital input	1244-022836	5414506025019
GM-TA-AS	Spare ambient NTC sensor in enclosure	1244-017965	5414506018387
SENSOR-NTC-10M	Spare ambient NTC sensor – 10 m	1244-015847	5414506015119
RAYCHEM PB-POWERBANK	Powerbank for pre-configuration of Elexant 650c-Modbus without mains voltage	1244-020365	5414506020458

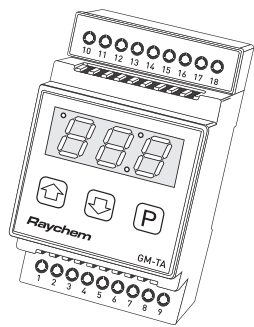
Important: The Raychem Elexant 650c-Modbus controller is for use with the Raychem heating cables only. The warranty and system listing will be invalidated if the Elexant 650c-Modbus controller is used with other heating cables.

Thermostat **GM-TA** for Temperature Control

DISPLAY



TECHNICAL DATA

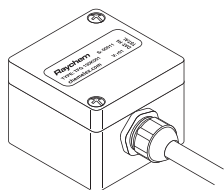


PROGRAMMABLE PARAMETER

ERROR MESSAGING

HOUSING

TEMPERATURE SENSOR



A-LED Display (Temperature and Alarm)
B-Heating system ON
C-Increase value (change of temperature)
D-Reduce value (change of temperatures)
E-Program mode selection ON/OFF and parameter settings

Supply voltage	230 Vac, +10%/-10%, 50 Hz
Relay output heating cable	230 Vac, max 16 A
Relay output alarm	230 Vac, max 8 A, switch-over contact, potential-free
Power consumption	Max. 5 VA
Terminal size	2,5 mm ² , screwed
Parameter settings	Programmable in non-volatile memory
Storage temperature	-20°C to +50°C
Switching hysteresis	+/-1K
Ambient temperature-range operation	-25°C to +40°C
Accuracy	+/- 1,5 K including temperature probe

Default Factory settings		
2 temperature setpoints	Range I: 0°C to +6°C, editable Range II: -25°C to -5°C	2°C Default value -10°C
Post heating time	0 to 3 hours 0,5 hours	
Sensor adjustment	-10 K to +10 K; 0	

Sensor	Sensor short circuit Sensor open loop
--------	--

Color	Black with red front
Dimensions	52,5 mm x 87, 5 mm x 58 mm (H/W/D)
Material	ABS
IP rating	IP 20 (IP 30 in panel)
Installation	DIN rail mountable 35 mm
Minimum installation temperature	5°C

Type	Sensor type 202AT +/-1% NTC 2 KOhm@25°C
Enclosure material	Polycarbonate
IP rating	IP 65
Enclosure dimensions	Width: 50 mm; Depth: 26 mm, length 52 mm
Cable diameter	4 mm
Exposure temperature	-30°C to +40°C
Accuracy	+/-1 K

Snow melting and deicing of gutters and downpipes

Maximum sensor cable length

100 m, 2 x 1,0 mm² or 150 m, 2 x 1,5 mm²

The use of a shielded cable is recommended for the cable extension.

APPROVALS

CE EN 60730 EMC EN 50081-1 (emission) and EN 50082-1 (immunity), RoHS & REACH

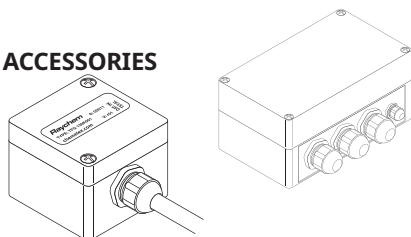
SYSTEM INFORMATION

Raychem GM-TA thermostat is designed for use with heating cables GM-2X(T).
Maximum circuit length: 30 m.

ORDERING INFORMATION

Product: GM-TA
PCN: 1244-017783

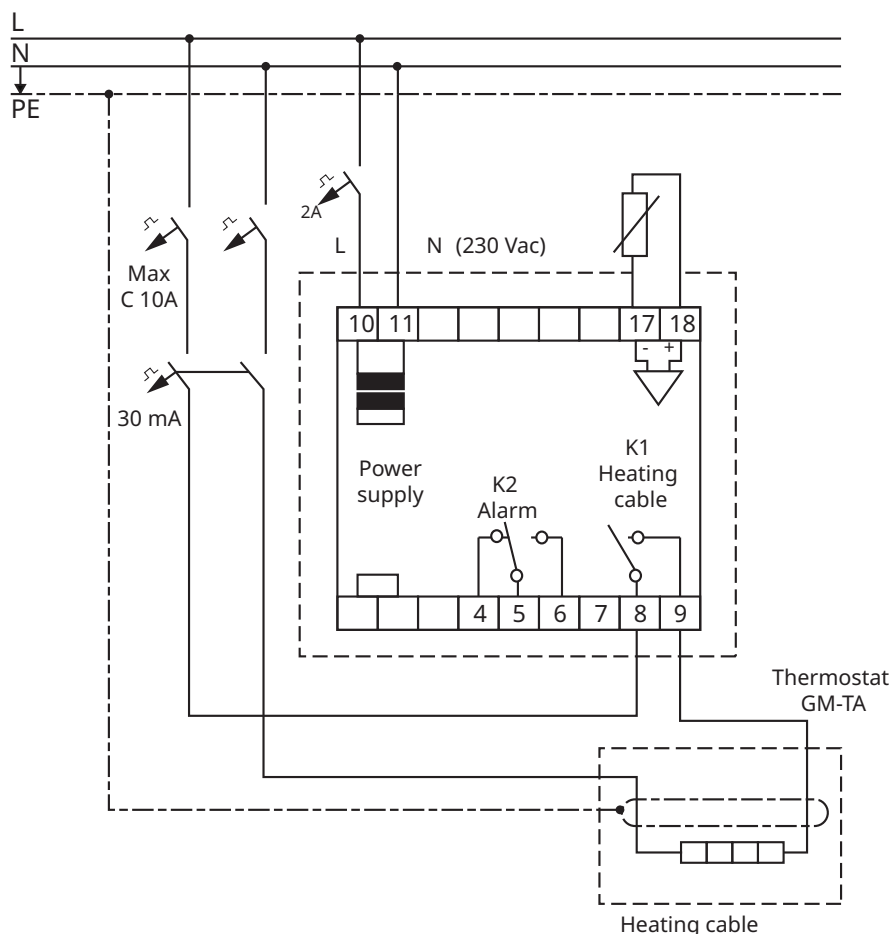
ACCESSORIES



Spare part: sensor type 202AT +/-1% NTC 2KOhm@25°C,
PCN 1244-017965

GM-TA-OUTDOOR Box (PCN: 1244-017966) Plastic enclosure for outdoor installation of GM-TA Thermostat for roof & gutter application.

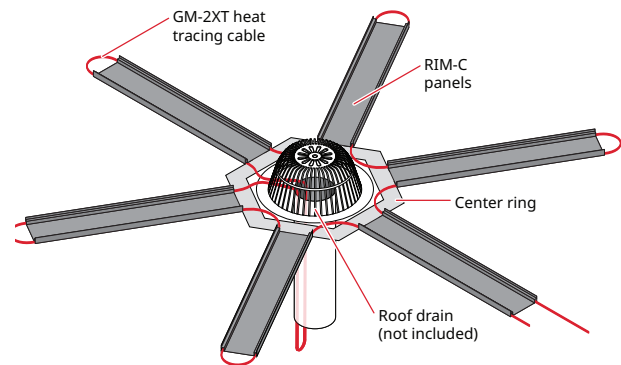
ELECTRICAL SCHEMATIC



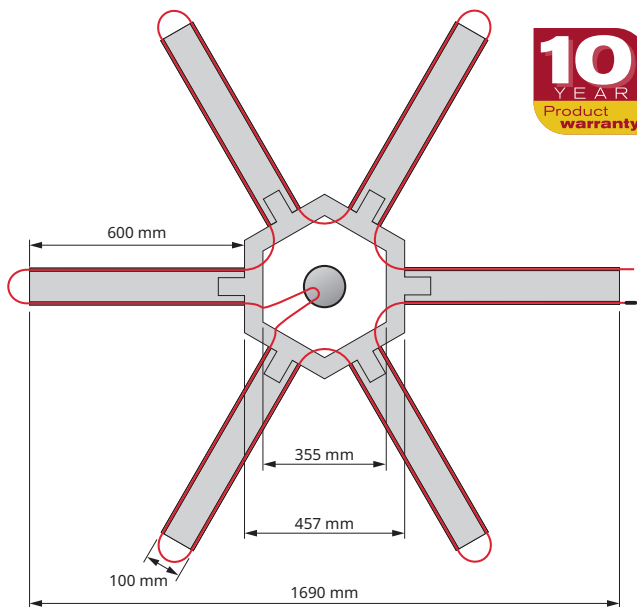
RIM-DRAINTRACE-KIT (RIM-DT-KIT) system is a turnkey roof ice melt unit for roof drains

GENERAL INFORMATION

RIM DrainTrace (RIM-DT-KIT)



Dimensions (nominal)



Raychem RIM-DRAINTRACE-KIT (RIM-DT-KIT) system is a turnkey roof ice melt unit for roof drains. It consists of a central flat aluminum heated ring around the roof drain. The ring consists of six channels each 600 mm long. 16 m of pre-terminated Raychem GM-2XT heating cable provide heat to the channel profiles. A power cable of 8 m is pre-terminated to the heating cable including an end seal.

Reliable System:

RM-DT-KIT efficiently transfers the heat to the snow and keeps the area around the roof drains snow free. The RIM-C channel panels mechanically protect the heat tracing cable and create melt channels for the snow melt to flow into the drain.

Lower Total Installed Cost:

RIM-DT parts snap together eliminating the need for any field riveting, roof penetrations, or complex cable layouts—thus, reducing the field installation time. The pre-terminated heating cable makes the installation quick and simple.

SPECIFICATION

System	Fully snap-fit system with no need for rivets/ screws/ nails/ adhesive in the field and with minimal number of assembly steps required in the field
Material Selection	Kynar® painted aluminum
Color Selection	Matte Black
Contents	Aluminum center ring with tabs, RIM-C channel panels, GM-2XT heat tracing cable, 16 m, pre-terminated power cable 8 m length, 3 x 1,5 mm ²
Heat Trace Cable Supplied	GM-2XT for 230 VAC applications
Dimensions	Inner size of center ring: 355 mm Channel panel length: 600 mm
PCN	1244-022477

Snow melting and deicing of gutters and downpipes

RIM-DRAINTRACE KIT installation



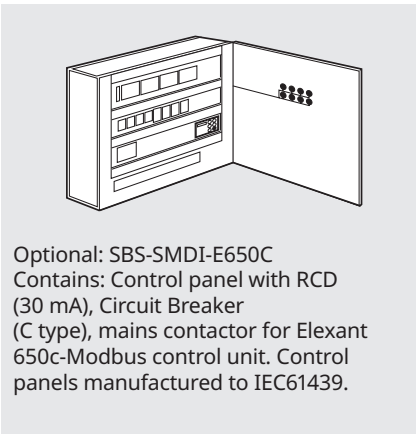
Snow Melting for Ramps, Access Ways, and Footpaths

Ice and snow on paths, loading bays, driveways, ramps, stairs and other access ways, can present a major problem causing accidents and delays. Raychem surface heating solutions prevent snow and ice formation.

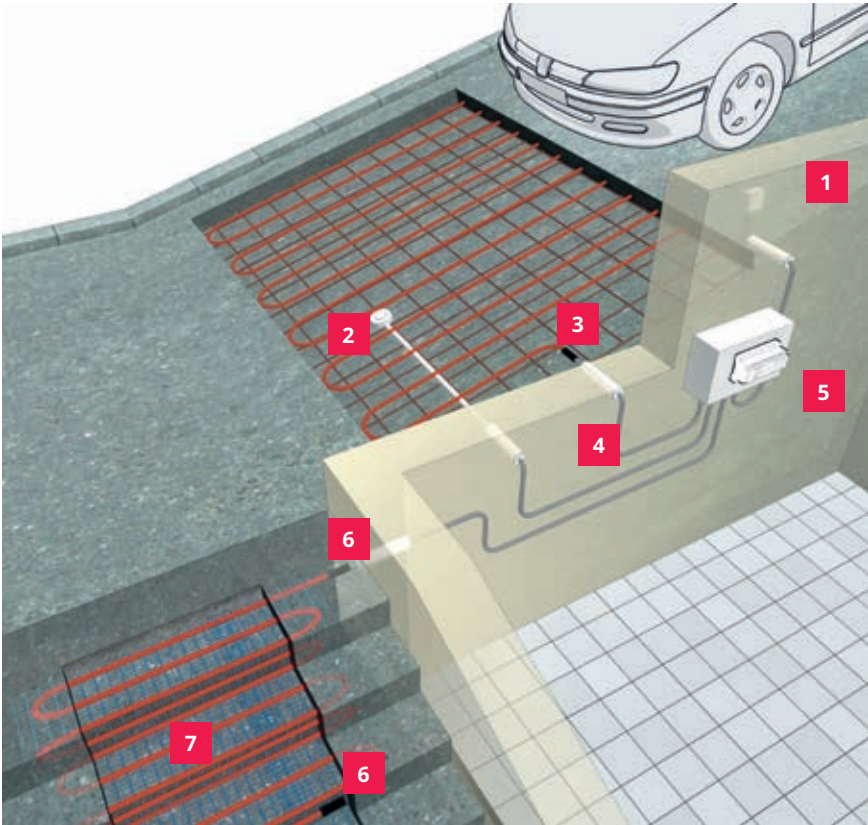
Application in concrete

Whether in concrete, sand, or asphalt, a Raychem system provides a fast, reliable, and easy install solution.

Each Raychem heating solution has a smart control and monitoring unit, providing useful user data and excellent energy efficient performance. The multi-sensor control and monitoring device (Elexant 650c-Modbus) is compatible with all ramp snow melting solutions.



Optional: SBS-SMDI-E650C
Contains: Control panel with RCD (30 mA), Circuit Breaker (C type), mains contactor for Elexant 650c-Modbus control unit. Control panels manufactured to IEC61439.



Snow melting of ramps, steps, footpaths and accessways

- 1

(Optional) Ambient temperature sensor SENSOR-NTC-10M or GM-TA-AS (excluded, additional module SM-TF130-DI required) *
- 2

Temperature and moisture sensor VIA-DU-S20
- 3

Connection and end seal kit (VIA-CE1)
- 4

Connection cable (VIA-L1)
- 5

Control unit (Elexant 650c-Modbus) 
- 6

Connection and end seal kit (VIA-CE1)
- 7

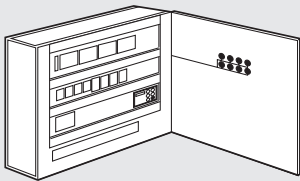
Self-regulating heating cable (EM2-XR) or constant output heating cable (WINTERGARD-CABLE) or heating mat (WINTERGARD-MAT)

* Optional, only in case of freezing rain warning.

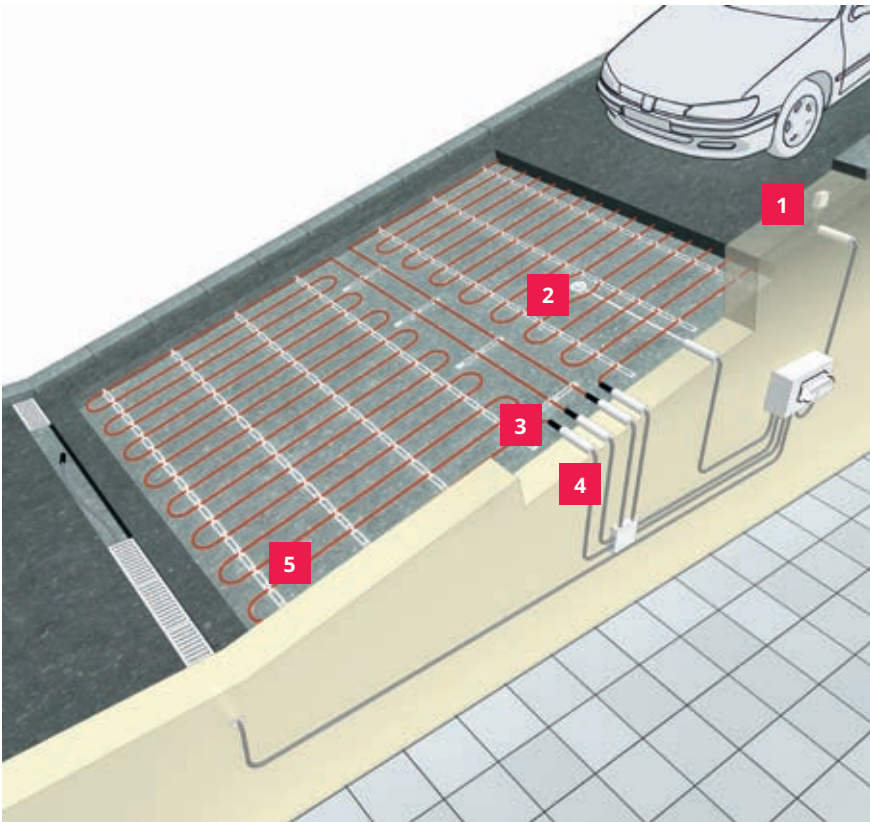
Raychem solutions for concrete

	Product	Description
Reinforced concrete surfaces	EM2-XR	Self-Regulating heating cable for reinforced concrete ramps
Domestic and light commercial ground heating applications.	WINTERGARD-MAT	Pre-terminated constant wattage heating mat for ramp, pavement and track heating
Stairs; wheelchair access ramps	WINTERGARD-CABLE	230V, 400V Pre-terminated constant wattage heating cable solution for larger concrete areas and stairs

Snow melting of ramps, steps, footpaths and accessways



Optional: SBS-SMDI-E650C (customisable upon request)
Contains: control panel with RCD (300 mA), circuit breaker (C characteristics)
Mains contactor for Elexant 650c-Modbus control unit.



- | | |
|--|---|
| 1 (Optional) Ambient temperature sensor SENSOR-NTC-10M or GM-TA-AS (excluded, additional module SM-TF130-DI required) * | 4 Pre-engineered cold lead |
| 2 Temperature and moisture sensor Elexant 650c-Modbus (excl.) | 5 Mineral-Insulated heating cable (EM2-MI / WINTERGARD-CABLE / WINTERGARD-MAT / EM-2XR) |
| 3 Connection between heater cable and cold lead (Pre-engineered) | 6 Control unit (Elexant 650c-Modbus)  |

* Optional, only in case of freezing rain warning.

For more information
Order the Surface Snow Melting Handbook (PCN 1244-010069) or go to chemelex.com

TraceTek – Water Leak Detection

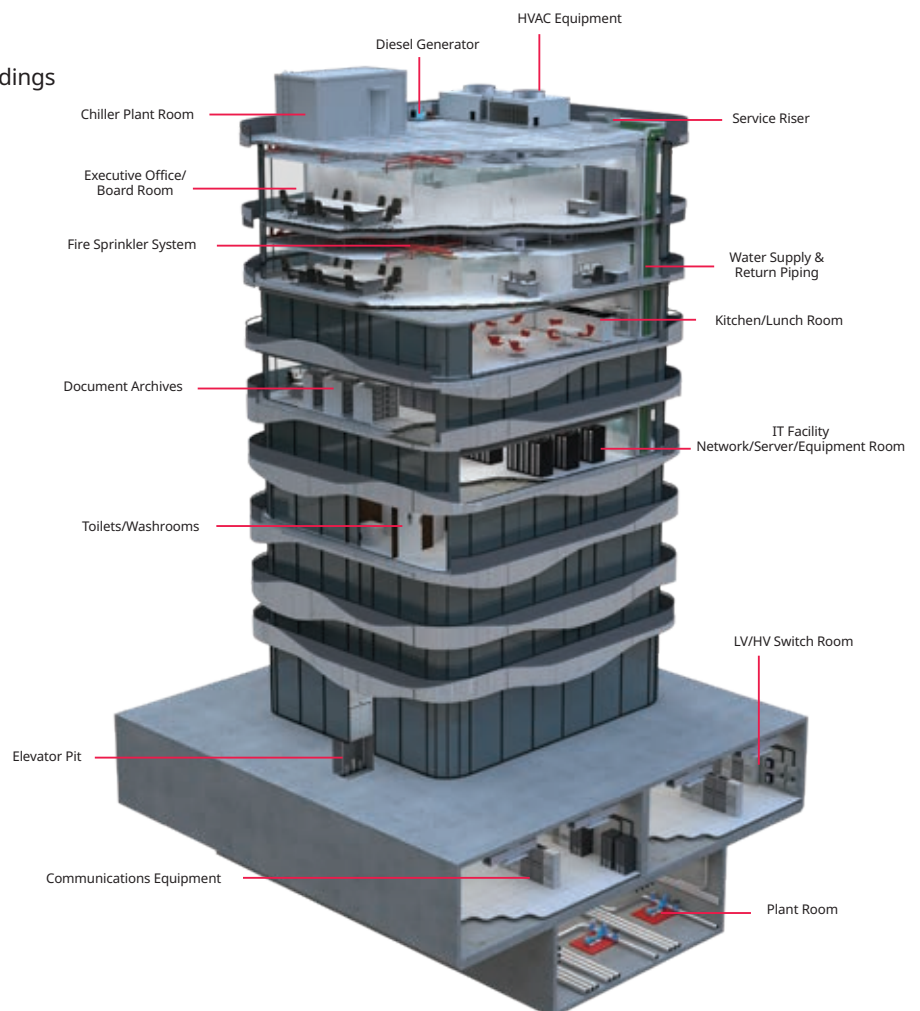
With many thousands of installed systems worldwide — from London's iconic 30 St Mary Axe building to Shanghai's World Financial Centre — TraceTek sensing cables and multifunction, multi-protocol digital alarm systems are the dominant solution to water leaks in buildings.

The Raychem TraceTek water leak detection system features detection cables, probes and monitoring devices that enable you to detect and identify the source of a leak, and take appropriate action before the leak causes damage to equipment, data or the owner's reputation.



OUR SYSTEMS CAN BE INSTALLED IN THE FOLLOWING LOCATIONS :

- Computer Rooms
- Server Equipment
- Communications Facilities
- Intelligent Buildings and Commercial Buildings
- Libraries and Archive Storage Facilities
- Museums, Heritage Sites and Aquariums



Leak detection

FOR MORE INFORMATION :

ask for the TraceTek Leak Detection Solutions Brochure (PCN 1244-022424) or go to chemelex.com

Electrical Underfloor Heating

Comfort is everything, especially in the home. With Raychem's smart electrical underfloor heating, you can offer your customers a beautiful warm floor, hassle free!

5 good reasons to choose Raychem smart underfloor heating

1. Comfortable and safe
2. Hassle free installation and maintenance free
3. Energy-efficient and cost saving
4. Can be installed under all floor coverings
5. Total care warranty

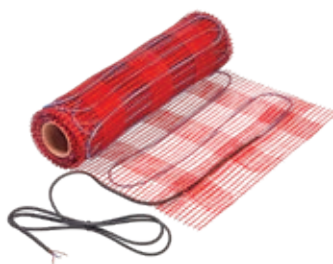


THE RAYCHEM UNDERFLOOR HEATING RANGE COMPRISES:

- T2Red with Reflecta: The energy-saving underfloor heating system. This system combines the self-regulating heating cable T2Red with Reflecta, the grooved, thermally insulated, aluminium-covered plate.
- QuickNet: The ultra thin heating mat (two power options available).
- T2Blue+: The robust, flexible, pre-terminated (dual wire, and screened) cable system.
- "Smart" thermostats which offer zoned, programmable heating control, a requirement of Part L of the building regulations.



T2Red with Reflecta



QuickNet



T2Blue+

Thermostats



Senz Wifi



Senz Wifi App



Green Leaf



NRG-DM

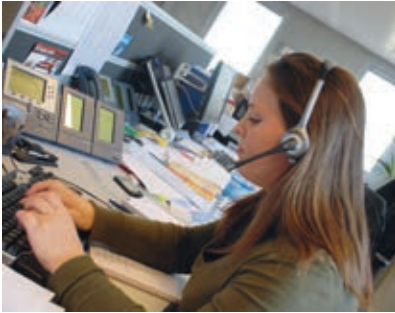
ONLINE SUPPORT

Design and specification tools are available at:

www.chemelex.com/Raychem

- Product selection guide
- A "We design it for you" e-request service.

LOCAL EXPERT TEAM SUPPORT



The Raychem systems and services are supported by a dedicated specifications team. We can provide sound design advice specific to your project needs.

We are also available to:

- Support consultants and architects at early design/concept stage and provide floor heating options.
- Visit the project site to survey the requirements and make recommendations for the consultant, client, and contractor.
- Provide contact details of local suppliers and installers of Raychem floor heating systems.

SAFETY AND RELIABILITY



Quality products - installed and checked by a professional electrician - assure home owners the comfort of a warm floor with Total Care. When installing Raychem floor heating systems, electricians can now offer a 12 Year Total Care Warranty to their customers.

Certified Pro installers can extend the Total Care Warranty up to 20 years.

Total Care = doing what it takes to assure a warm floor. In the rare event that our product would fail and we cannot repair it, we will not only provide you with a new product and pay the costs of installing it. We will also take care that the floor covering is repaired or replaced to the equivalent standard.

FOR MORE INFORMATION:

ask for the Floorheating handbook with reference PCN 1244-001291 or go to chemelex.com

Multiple Application Control and Monitoring System

Raychem ACS-30 Multi-circuit, multi-application Control & Monitoring system for commercial heat tracing applications.

Raychem ACS-30

The Raychem ACS-30 system provides electronic control & monitoring for multi-circuit heat tracing applications, including pipe frost protection, surface snow melting, hot water temperature maintenance, gutter & roof de-icing, temperature flow maintenance, and electrical underfloor heating.

The Raychem ACS-30 can control up to 260 heat tracing circuits of any application, from a single user interface, allowing building owners and facilities managers to monitor and manage their building's heat tracing systems from a single point.

ACS-30 is a modular control & monitoring solution which can be designed to exactly meet the needs of the building. Power and control modules (PCMs) can be positioned throughout the building in accordance with the building system requirements. Multiple PCMs can be connected together providing a complete view of the buildings heat tracing systems.



ACS-30-EU-UIT3



User Interface Terminal (UIT)

PCN: 1244-012864

- Panel mounted touchscreen display
- Control & Monitoring of 260 heating circuits
- 22 cm XGA colour touchscreen display.
- RS485, RS232, or 10/100 Base-T Ethernet communication ports to allow communication with external distributed control systems or building management systems (BMS).
- BACnet, Metasys N2 and LonWorks to Modbus protocol gateways with pre-programmed Modbus registration is also available.
- The ACS-30-EU-UIT3 unit is designed for indoor use in non-hazardous location installations.

ACS-30-EU-PCM2



(Power & Control Module)

6 Version available as standard:

- 5, 10, and 15 circuit control per panel
- 20A or 32A switching capacity per circuit available.
- Power connection, control, and power distribution to the heat tracing circuits.
- Robust enclosure is approved for non-hazardous installation indoor.
- PCM provides connection to the incoming power supply and power distribution & electrical protection to the heat tracing circuits.

The PCM module also provides:

- Ground fault monitoring
- Line current monitoring
- Alarm capability
- RTD (Resistance Temperature Detector) input capability for each individual heating circuit.

PCN	Product Name	Product Description	EAN Code
1244-012868	ACS-30-EU-PCM2-5-20A	Power Control Module for ACS-30 (5 circuit module with 20Amp electrical protection per circuit)	5414506014341
1244-012869	ACS-30-EU-PCM2-10-20A	Power Control Module for ACS-30 (10 circuit module with 20Amp electrical protection per circuit)	5414506014358
1244-012870	ACS-30-EU-PCM2-15-20A	Power Control Module for ACS-30 (15 circuit module with 20Amp electrical protection per circuit)	5414506014365
1244-012871	ACS-30-EU-PCM2-5-32A	Power Control Module for ACS-30 (5 circuit module with 32Amp electrical protection per circuit)	5414506014372
1244-012872	ACS-30-EU-PCM2-10-32A	Power Control Module for ACS-30 (10 circuit module with 32Amp electrical protection per circuit)	5414506014389
1244-012873	ACS-30-EU-PCM2-15-32A	Power Control Module for ACS-30 (15 circuit module with 32Amp electrical protection per circuit)	5414506014396

ACS-30-EU-RMM3 & ACS-30-EU-RMM3-24VDC



PCN: 2000003974 and 2000003975

- Collects sensor/temperature inputs for monitoring of the heat tracing.
- 1 RMM provides up to 8 sensor inputs per module with feedback to the ACS-30-EU-UIT3.
- Maximum 16 RMM devices per User interface terminal (UIT).
- Twisted pair RS-485 cable connects up to 16 RMM units providing 128 additional temperature monitoring sensor inputs.
- Remotely located adjacent to the desired measurement locations.
- ACS-30-EU-RMM3 and ACS-30-EU-RMM3-24VDC modules come pre-installed inside a compact enclosure.

ACS-30-EU-ELEXANT650C-SMDI-MOD



PCN: 2000003973

- External Sensor device for Gutter snow melting & de-icing applications and surface ramp heating.
- Provides smart sensor input for roof & gutter de-icing applications and surface ramp heating to protect from snow and ice formation.
- Provides ground or gutter temperature and moisture sensing for the ACS-30 control system.
- Module can be positioned near to the heated area and is connected to the PCM module via a 3-wire cable.
- External temperature and moisture sensor. For roof and gutter (E650C-R) and surface (E650C-G) to be ordered separately.
- The output from the ACS-30-EU-ELEXANT650C-SMDI-MOD module enables the switching of the heating circuits within the power & control module (PCM).

Protonode-RER-10K



PCN: 2000004257

The Raychem ProtoNode is an external, high performance protocol gateway for customers needing protocol translation between Building Management Systems (Native ModBus) using BACnet® and Raychem ACS-30 or TTSIM/TT-TS12B-E controllers.

- BACnet International's BTL Certification makes the ProtoNode-RER the most reliable gateway on the market.
- Flash upgradable.

General Installation Instructions

Note: Installation and operation information is separately available from Chemelex in document reference: CDE-1547.

Checklist for problem-free installation and safe operation

TYPICAL INSTALLATION SCHEDULE FOR WATER TEMPERATURE MAINTENANCE

General order of events

- The system is designed and the installation planned
- The pipework is pressure tested or otherwise checked for leaks
- The heating cable is tested and then installed on the designated pipes
- The components are installed and each circuit is tested.
- The correct thermal insulation is applied, without delay, labelled and the system test repeated.
- The supply voltage cables and circuit breakers are installed to each circuit
- The system is commissioned (see "System start-up" below)

CIRCUIT PROTECTION, TESTING AND OPERATION FOR ALL SYSTEMS

Circuit protection

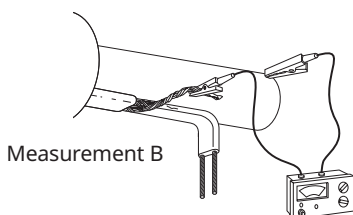
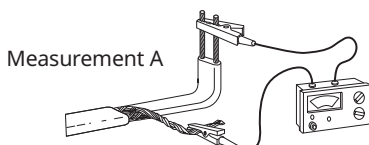
- Supply voltage 230 VAC, 50 Hz
- The required protective measures of the relevant regulations must be complied with.
- C type circuit breaker (anti-surge fuse)
- Residual current device (rcd 30 mA) required. Maximum approx. 500 m of self-regulating heating cable can be monitored per rcd.

Testing

- Visual inspection for damage and fault-free installation of the accessories
- Proper installation of the system
- Heating cable affixed to all necessary pipes
- No mechanical damage to heating cable (e.g. cuts, cracks, etc.)
- No thermal damage
- Proper connection of all components including power supplies
- Insulation resistance measurement when heating cable is received and before and after installation of the thermal insulation. The test voltage should be 2500 Vdc, but it must not be lower than 500 Vdc. The insulation resistance, irrespective of the cable length, must not be less than 100 Mohms.
- If the resistance falls below this value, the source of the fault must be investigated, eliminated, and re-tested.
- Measurement A: Phase and neutral to the braid
- Measurement B: Braid to the pipework
- After switching on, the cable ends must be warm after 5 to 10 minutes

Instructions for the placing of the heat insulation

- For problem-free operation of the self-regulating heating cables, the material quality and thickness of the thermal insulation should be in accordance with the design parameters, and this insulation must be installed correctly.
- All parts of the pipework, including valves, wall transit points, etc. must be fully insulated.



Operation/System start-up

- 1) For small installations, turn on the circuit breakers and preferably leave the system overnight for the water to warm up and stabilise.
- 2) For bigger installations or for a faster start-up, first turn on the main water heater and open the outlet/tap at the end of the pipework run until the water feels warm and then turn on the circuit breakers.
If the piping system is closed, such as by pressure-reducing valves or isolation valves, you must provide some method of pressure relief to allow for thermal expansion of the water during heat-up.
- Under normal operating conditions, the heating cables are maintenance-free. Chemelex recommend that the insulation resistance should be checked periodically and compared with the original values. If the reading falls below the minimum value (100 Mohms) determine the cause and rectify before re-use.
- The specified maximum ambient and operating temperatures should not be exceeded.
- In the event of repair to the pipework, the heating cable must be protected against damage. Correct function of the electrical protection system should be maintained. To prevent shock or personal injury, turn off the power at the circuit breaker before testing or working on the heating cable or piping.
- Following the completion of the repair work, the circuit should once again be tested (see above).
- All the important parts of the controls, thermostats, etc. must be checked for correct operation once a year, normally in the autumn.
- Measurement of current absorbed by heating circuit.

Only for hot water temperature maintenance

Newly installed heating cables have lower power at start-up of the installation. The nominal power will be reached after approximately 4 weeks of continuous operation.

- The maintenance temperature should be 5°C to 10°C below the hot water temperature in the boiler.

STANDARD INSTALLATION TIMES

The actual installation times achieved may deviate according to the conditions on site.

Pipework	
Installation of heating cable on pipes including fastening, standard installation:	25 metres/hour
Connection system (electrical connection)	
RayClic-CE-02	2 min/pc.
RayClic-S-02/RayClic-PS-02	4 min/pc.
RayClic-T-02/RayClic-PT-02	6 min/pc.
RayClic-X-02	8 min/pc.
RayClic-E-02	1 min/pc.
Heat-shrink connection system (electrical connection)	
CCE-04-CT	30 min/pc.
CE20-01	20 min/pc.
Other	
Testing, visual inspection, insulation resistance measurement (2x)	10 min/heating circuit
Connecting the heating circuit in the switch box	10 min/heating circuit

General Installation Instructions

TROUBLE SHOOTING GUIDE

Fault	Possible causes	Measures
Circuit-breaker trips:	Circuit breaker wrong type: e.g. type B instead of C:	Change to C Type
	Circuit breaker undersized	If the power supply cable permits, install a larger circuit breaker
	Circuit too long	Split the circuit on 2 circuit breakers
	Short-circuit/earth fault	Eliminate short-circuit/earth fault (cable ends should not be twisted)
	Circuit breaker faulty	Replace faulty circuit breaker
	No end seal	Install end seal
	Conductor (or cable) twisted	Un-twist and install end seal
RCD residual current device trips:	More than 500 m of frost protection heating cable installed per rcd	Install additional rcd residual current device
	Earth fault at connection or in end seal	Rectify earth fault
	Cable damaged	Repair cable where damaged
	Moisture in the junction box	Eliminate moisture
Pipeline does not become warm - Heating cable cold:	Circuit-breaker has tripped	See section circuit breaker
	Residual current device has tripped	See section residual current device
	No mains voltage	Switch on
	Cable or cold lead not connected	Connect cable or cold lead
	Cable not inserted correctly in connection system or end seal	Insert cable according to installation instructions (fully insert cable)
Water temperature is not maintained but the cable gives high output:	No insulation or insulation thickness insufficient	Insulation according to tables in design guides
	Insulation wet	Dry insulation
	Cold water is running from the boiler	Test boiler temperature
	Cold water is pumping through mixer tap into the hot water pipe. Insulation according to tables in design guides.	Test the mixer tap

Note: Installation and operation information is available from Chemelex in document reference: CDE-1547.

Technical Data

CHOICE OF HEATING CABLES

	Hot water temperature maintenance			Frost protection for pipes XL Trace LSZH			
Cable type	HWAT-L	HWAT-M	HWAT-R	10XL2-ZH	15XL2-ZH	26XL2-ZH	31XL2-ZH
Colour							
Nominal voltage	230 VAC	230 VAC	230 VAC	230 Vac	230 Vac	230 Vac	230 Vac
Nominal power output (*on insulated metal pipes)	7 W/m @ 45°C	9 W/m @ 55°C	12 W/m @ 70°C	10 W/m @ 5°C	15 W/m @ 5°C	26 W/m @ 5°C	31 W/m @ 5°C
C-type circuit-breaker according to selected kit	max. 20 A	max. 20 A	max. 20 A	max. 20A	max. 20A	max. 20A	max. 20A
Max. circuit length	180 m 20 A	100 m 20 A	100 m 20 A	238 m	188 m	142 m	114 m
Min. bending radius	10 mm	10 mm	10 mm	10 mm	10 mm	10 mm	10 mm
Max. continuous exposure temperature	65°C	65°C	80°C	65°C	65°C	65°C	85°C
Max. exposure temperature (power-on condition – 800 h. cumulative)	85°C	85°C	90°C	85°C	85°C	85°C	90°C
Max. dimensions in mm (W x H)	13.8 x 6.8	13.7 x 6.7	16.1 x 6.7	13.7 x 6.2 mm	13.7 x 6.2 mm	13.7 x 6.2 mm	13.7 x 6.2 mm
Weight	0.12 kg/m	0.12 kg/m	0.14 kg/m	0.13kg/m	0.13kg/m	0.13kg/m	0.13kg/m
Approvals	BS / ÖVE / VDE / SEV / CSTB / SVGW / DVGW / CE						
Control units *	HWAT-T55 (for branch lines up to 50m only)	HWAT Eco V5** HWAT-T55 (for branch lines up to 50m only)	HWAT Eco V5** HWAT-T55 (for branch lines up to 50m only)	RAYSTAT V5** ELEXANT 450c** SBS-FP-xx16A panels ACS 30 AT-TS-13* AT-TS-14*	RAYSTAT V5** ELEXANT 450c** SBS-FP-xx16A panels ACS 30 AT-TS-13* AT-TS-14*	RAYSTAT V5** ELEXANT 450c** SBS-FP-xx16A panels ACS 30 AT-TS-13* AT-TS-14*	RAYSTAT V5** ELEXANT 450c** SBS-FP-xx16A panels ACS 30 AT-TS-13* AT-TS-14*
Connection system:							
Junction box	–	–	–	–	–	–	–
Connection kit	RayClic	RayClic	RayClic	RayClic	RayClic	RayClic	RayClic
Support bracket	Included in the kit	Included in the kit	Included in the kit	Included in Kit	Included in Kit	Included in Kit	Included in Kit

* Note: Take into account the connection powers of the respective controllers when determining the maximum lengths of the heating circuits. **



STANDARD CONTROL PANEL

Technical data

The standard control panels for 3, 6, 9 or 12 heating circuits comprise a steel plate housing and are completely assembled, in turnkey condition, wired and inspected.

Paintwork	Structural paint, RAL 7035, light gray
Protection class	IP65 / IP 54 (HWAT)
Location	Interior
Ambient temperatures:	+10°C to +35°C
Cable inserts	Metal plate in base of housing with metric breakout apertures
Standard	EN IEC 61439-2
Mains power connection	3-phase 400V/230V, 50 Hz, with N and PE

Technical Data

CHOICE OF HEATING CABLES

	Frost protection for pipes	Frost protection for gutters and downpipes	Surface snow melting
Cable type	FS-C10-2X	GM-2X/GM-2XT	EM2-XR
Colour		Matt/Glossy	
Nominal voltage	230 VAC	230 VAC	230 VAC
Nominal power output (*on insulated metal pipes)	10 W/m at 5°C	36 W/m in ice and 18 W/m in air at 0°C	90 W/m at 0°C
C-type circuit-breaker according to selected kit	max. 20 A	max. 20 A	max. 50 A
Max. circuit length	180 m 20 A	80 m 20 A	85 m 50 A
Min. bending radius	10 mm	10 mm	50 mm
Max. continuous exposure temperature	90°C	65°C	100°C
Max. exposure temperature (power-on condition – 800 h. cumulative)	90°C	85°C	110°C
Max. dimensions in mm (W x H)	16 x 6.8	13.7 x 6.2	18.9 x 9.5
Weight	0.14 kg/m	0.13 kg/m	0.27 kg/m
Approvals	BS / ÖVE / VDE / SEV / CSTB / SVGW / DVGW / CE		
Control units*	RAYSTAT V5**, ELEXANT 450c**, SBS-FP-xx16A panels, ACS 30; AT-TS-13*; AT-TS-14*, RAYSTAT-CONTROL-11-DIN	Elexant 650c-Modbus** GM-TA model SBS-SMDI-E650C panels	Elexant 650c-Modbus** RAYSTAT-M2 SBS-SMDI-E650C panels
Connection system:			
Junction box	JB16-02	–	VIA-JB2
Connection kit	CE20-01	RayClic	VIA-CE1
Support bracket	JB-SB-08	Included in the kit	–

* Note: Take into account the connection powers of the respective controllers when determining the maximum lengths of the heating circuits.



DIMENSIONS OF POWER CABLES

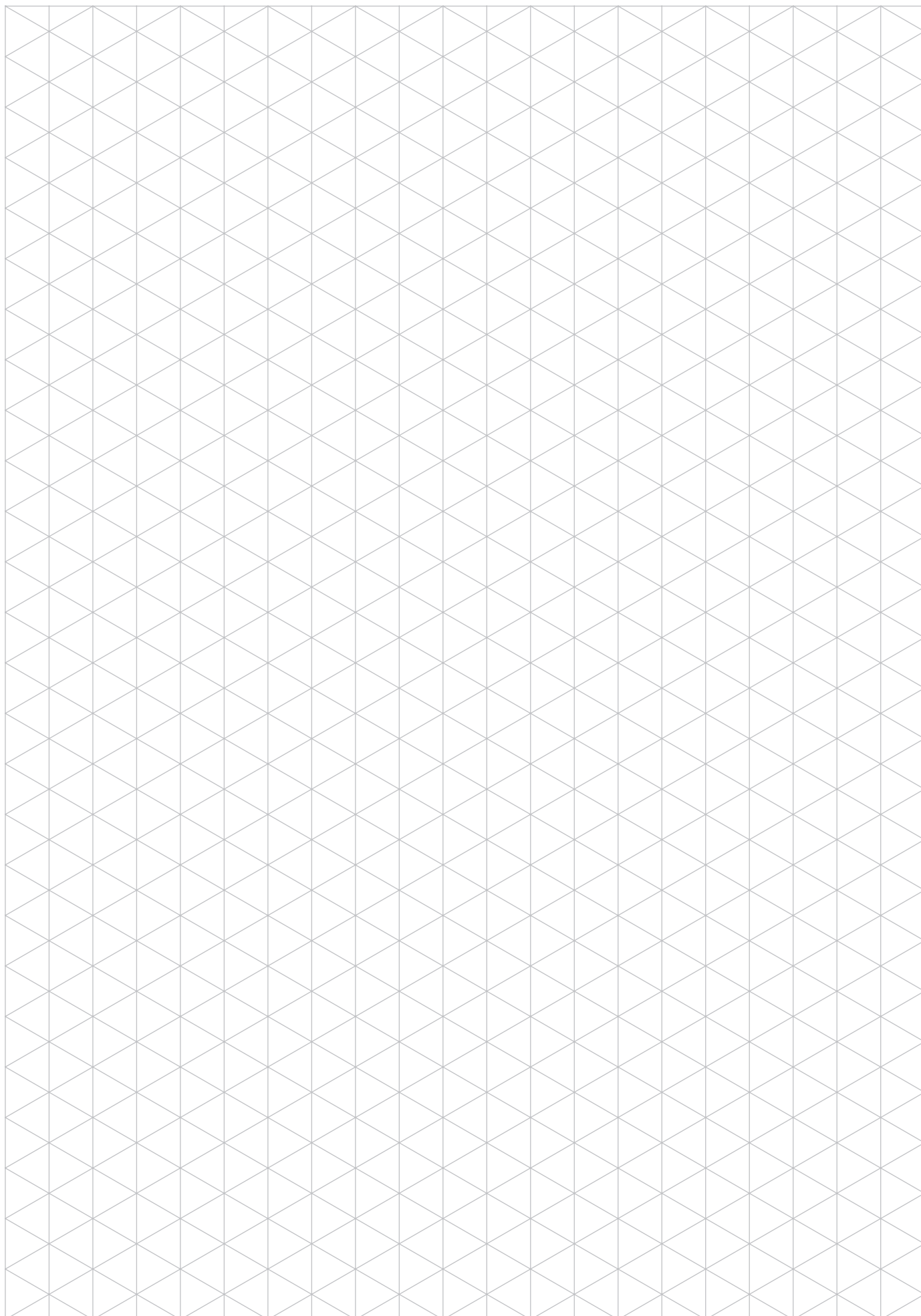
Maximum power (Cold Lead) cable lengths based on circuit breaker sizing and cable conductor cross sectional area.

C-type Circuit Breaker (Ampères)	Cable type	Max. Circuit length (m)	Max. length of the power cable					
			3 x 1,5 mm ²	3 x 2,5 mm ²	3 x 4 mm ²	3 x 6 mm ²	3 x 10 mm ²	3 x 16 mm ²
10	10XL2-ZH	128	51	85	136	203	n.a.	n.a.
	15XL2-ZH	96	46	77	123	184	n.a.	n.a.
	26XL2-ZH	73	35	58	93	140	n.a.	n.a.
	31XL2-ZH	57	38	63	199	151	n.a.	n.a.
	HWAT-L	80	120	205	325	490	n.a.	n.a.
	HWAT-M	50	185	310	490	740	n.a.	n.a.
	HWAT-R	50	135	220	355	535	n.a.	n.a.
	FS-C10-2X	110	50	85	135	205	n.a.	n.a.
	GM-2X/GM-2XT	40	45	70	115	175	n.a.	n.a.
	EM2-XR	17	50	85	135	205	n.a.	n.a.
	EM-MI-PACK-26M	26	n.p.	110	180	270	n.a.	n.a.
	EM-MI-PACK-36M	36	n.p.	80	130	195	n.a.	n.a.

C-type Circuit Breaker (Ampères)	Cable type	Max. Circuit length (m)	Max. length of the power cable					
			3 x 1,5 mm ²	3 x 2,5 mm ²	3 x 4 mm ²	3 x 6 mm ²	3 x 10 mm ²	3 x 16 mm ²
13	10XL2-ZH	166	40	66	106	159	n.a.	n.a.
	15XL2-ZH	125	35	59	94	141	n.a.	n.a.
	26XL2-ZH	94	27	45	72	108	n.a.	n.a.
	31XL2-ZH	74	29	48	77	116	n.a.	n.a.
	HWAT-L	110	95	155	250	375	n.a.	n.a.
	HWAT-M	65	120	200	325	485	n.a.	n.a.
	HWAT-R	65	115	190	300	455	n.a.	n.a.
	FS-C10-2X	130	45	70	115	175	n.a.	n.a.
	GM-2X/GM-2XT	50	35	60	95	140	n.a.	n.a.
	EM2-XR	22	40	65	105	160	n.a.	n.a.
	EM-MI-PACK-48M	48	n.p.	60	95	145	n.a.	n.a.
16	10XL2-ZH	204	33	54	87	130	n.a.	n.a.
	15XL2-ZH	153	29	48	77	116	n.a.	n.a.
	26XL2-ZH	116	22	37	59	89	n.a.	n.a.
	31XL2-ZH	91	24	39	63	94	n.a.	n.a.
	HWAT-L	140	70	115	185	280	n.a.	n.a.
	HWAT-M	80	105	175	280	420	n.a.	n.a.
	HWAT-R	80	90	150	245	370	n.a.	n.a.
	FS-C10-2X	150	40	65	100	150	n.a.	n.a.
	GM-2X/GM-2XT	60	n.p.	50	75	115	n.a.	n.a.
	EM2-XR	28	30	50	80	125	n.a.	n.a.
	EM-MI-PACK-60M	60	n.p.	45	75	115	195	n.a.
20	10XL2-ZH	238	n.p.	46*	74	112	n.a.	n.a.
	15XL2-ZH	188	n.p.	39*	63	94	n.a.	n.a.
	26XL2-ZH	142	n.p.	30*	48	72	n.a.	n.a.
	31XL2-ZH	114	n.p.	31*	50	75	n.a.	n.a.
	HWAT-L	180	n.p.	90	145	220	365	n.a.
	HWAT-M	100	n.p.	145	230	345	570	n.a.
	HWAT-R	100	n.p.	120	195	295	490	n.a.
	FS-C10-2X	180	n.p.	45	70	110	n.a.	n.a.
	GM-2X/GM-2XT	80	n.p.	35	60	85	145	n.a.
	EM2-XR	35	n.p.	40	65	100	165	n.a.
	EM-MI-PACK-70M	70	n.p.	40	65	100	165	n.a.
25	EM2-XR	45	n.p.	n.p.	50	75	130	n.a.
	EM-MI-PACK-88M	88	n.p.	n.p.	50	80	130	n.a.
32	EM2-XR	55	n.p.	n.p.	n.p.	65	105	n.a.

Parameters

- Max. power window W/m at 5°C (+20%)
- 3% acceptable voltage drop
- * Not permitted in Switzerland



Why Choose Raychem Solutions



TIME-TESTED QUALITY

QUALITY

We are the **inventor** of self-regulating heating technology. Our cables are designed & manufactured in USA since 1972.

We offer **complete systems**

20+ year design life

10-year product warranty

First low smoke zero halogen cable



100+ expert designers
15,000+ Certified installers

EXPERTISE

We have a **global network of technical experts** with design, installation, optimization and operation knowledge.

Design, calculation and modeling software

100+ expert designers

15,000+ trained installers

Installed in **iconic engineering landmarks**



600,000 km (2b ft) installed
= 15x around the globe

RELIABILITY

Our systems provide maximum performance with 600,000 km of cable installed in 100+ countries.

Reduction of carbon footprint

Reduction of energy, water, and landfill waste

Lower installed cost

Broad range of heating cable technologies

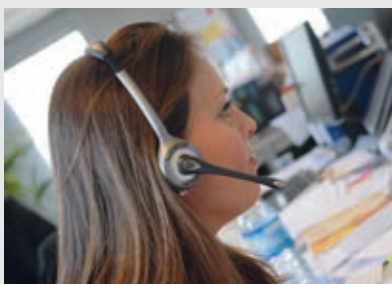
Highest **QUALITY** Products

+

EXPERTISE Optimal System Design & Installation

=

RELIABLE Protection, Performance & Energy Efficiency



We are proud to provide a set of tools and services that aim to simplify the professional's life. Not only do we offer the best quality products, we also support them with unrivalled services.

An efficient customer service centre:

- Multi-lingual customer service representatives to answer all your questions
- Fast order handling & shipment Europe-wide
- Free documentation service

Large technical support team:

- "On demand" technical advice and product selection
- Design support and cost estimates
- Specification support
- Training support
- Installation, test and commissioning support
- Complete after-sales service
- Online heat tracing design tool TraceCalc Pro for Buildings
- Online technical Support **chemelex.com/Raychem**
- Site Services (Contact Chemelex for more information)

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