nVent

RAYCHEM

Technical Handbook

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

CONNECT AND PROTECT

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 nVent for greater safety, comfort and performance.

THE HEART OF OUR SOLUTIONS

In 1970, nVent 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

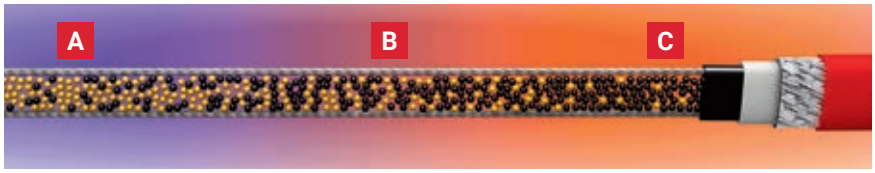
If the temperature in the immediate vicinity of the self-regulating heating cable is cold, the heat output from the heating cable is increased. The polymeric core of the cable contracts, which creates many electrical paths across the integrated carbon particles.

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)
- 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 fluorpolymer 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.

IT'S NOT ONLY THE 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 nVent 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 a few screws is all it takes.

CUSTOMER SERVICE CENTRE AND TECHNICAL SUPPORT TEAM

nVent 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

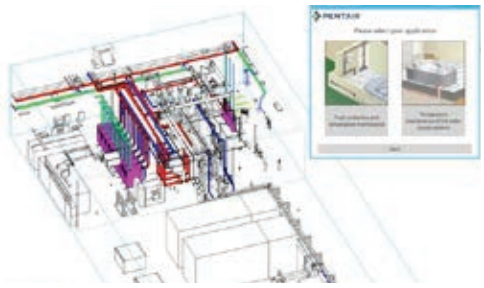
- "On demand" technical advice
- Free designs and quotations
- Direct support to specifiers and installers
- Training support upon request
- Complete after-sales service
- Also for non-standard applications our team can assist you in finding the right heating solution. Do not hesitate to get in touch with us.
  Free phone 0800 96 90 13 or Free fax 0800 96 86 24.

NVENT 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 simple or complex heat-tracing designs for pipes for the following applications:

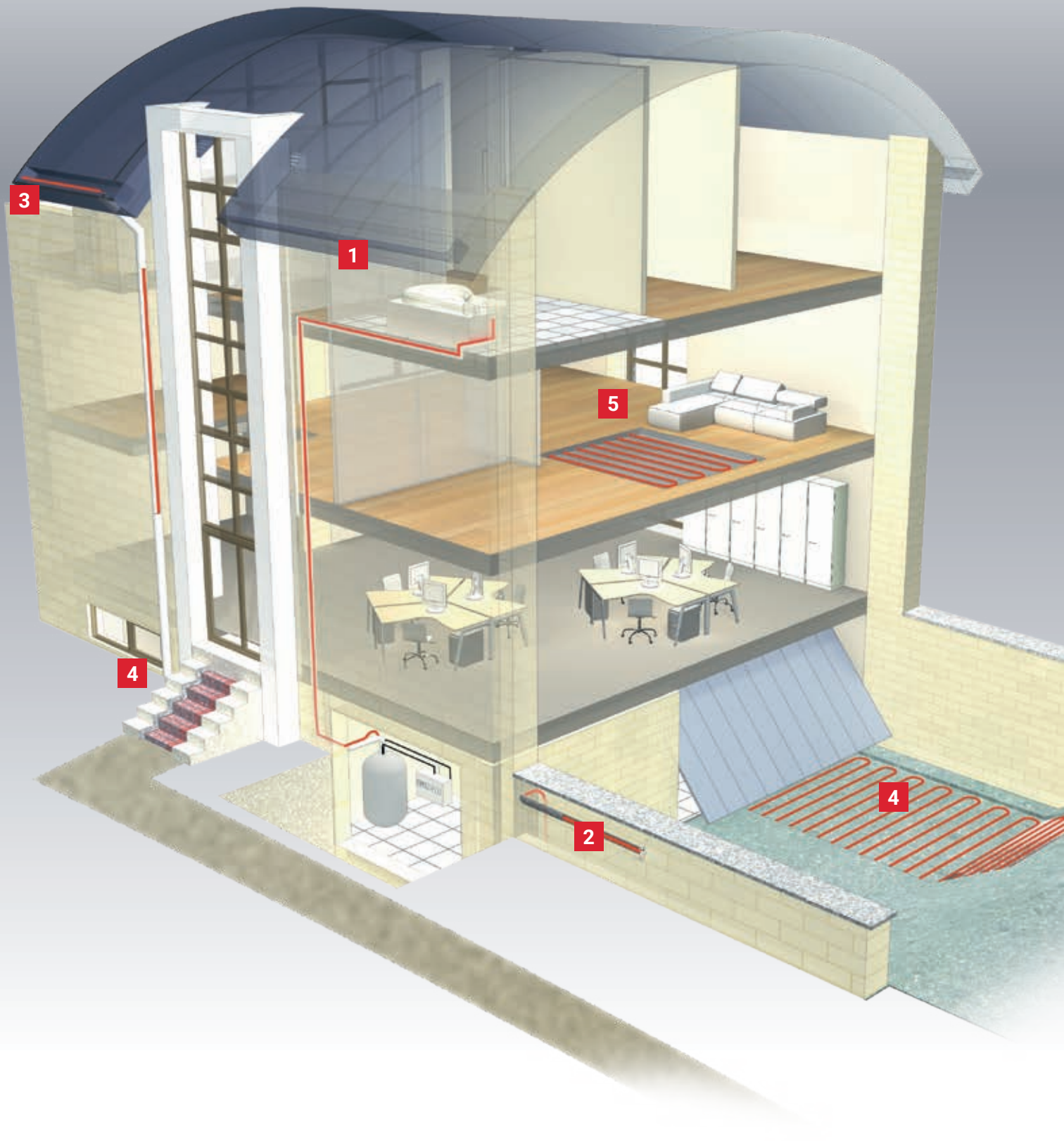
- Pipe Freeze Protection
- Hot Water Temperature Maintenance
- Flow maintenance / Grease line flow maintenance

TraceCalc Pro

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.

You can start your project on **nVent.com** under Resources/Design Tools

Overview of applications



Contents

Hot Water Temperature Maintenance

Providing the comfort of instant hot water is the key requirement of any modern hot water system. The nVent 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.

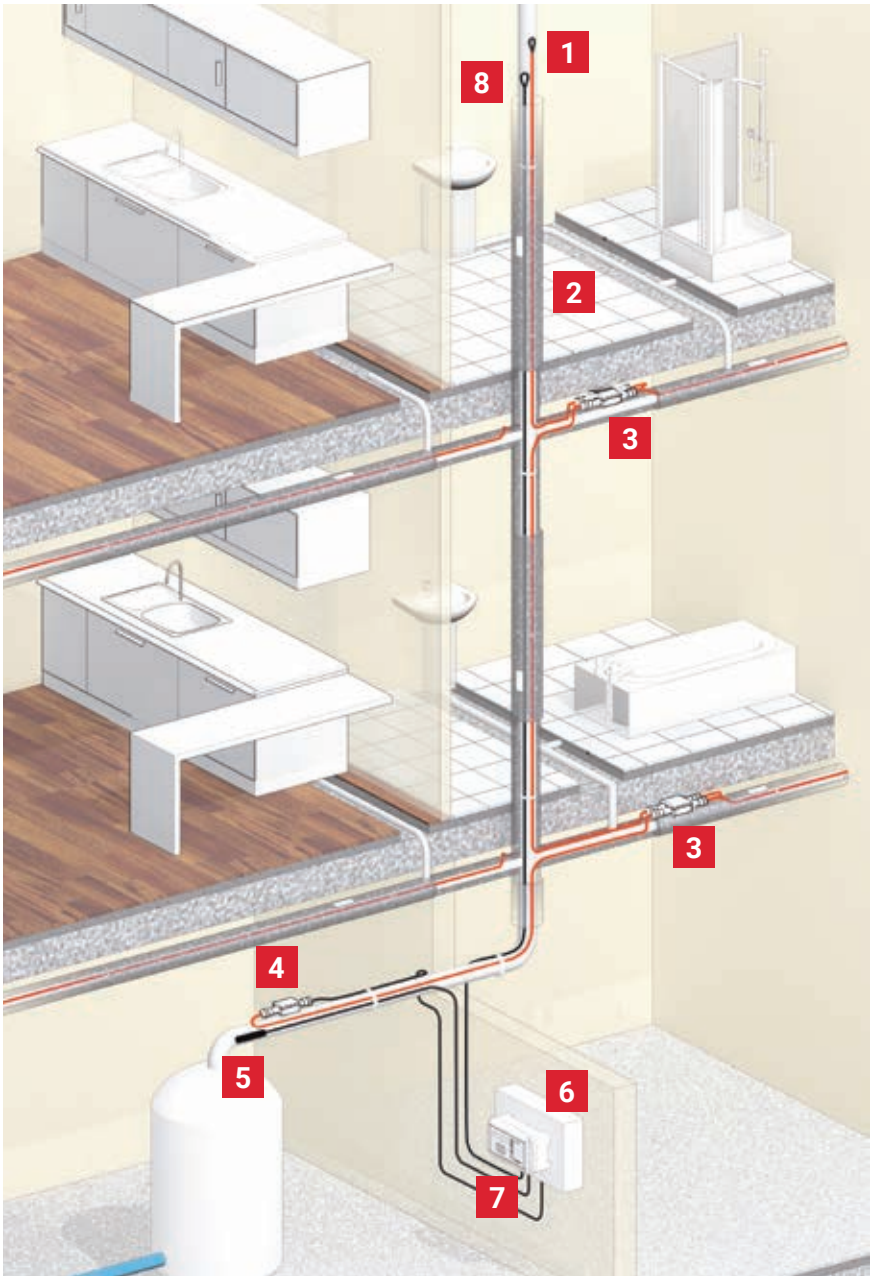
The intelligent HWAT-ECO control unit saves power e.g. it can lower the temperature or switch off during water consumption peaks.

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 selfregulating nVent 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.) A 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

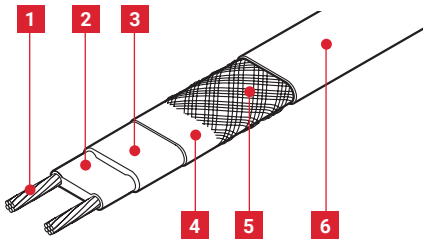
Design Guide, Control Units and Accessories

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
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	–	recommended for enhanced energy - efficiency	essential
Control unit: HWAT-T55	recommended	recommended	mandatory
Control Unit: SBS--HV-ECO control panel or ACS-30 system**	–	recommended (project size > 300m); see page 72	recommended (project size >300m); see page 72
Legionella prevention			Possibility of thermal legionella prevention up to the draw-off points

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 77

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 λ = 0.035 W/(m.K)
For other thermal conductivity insulation materials, contact your nVent 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 (rcd) : 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

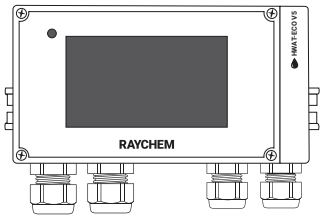
6 CHECKLIST FOR PLANNING THE INSTALLATION

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

7 CONTROL UNITS

HWAT-ECO

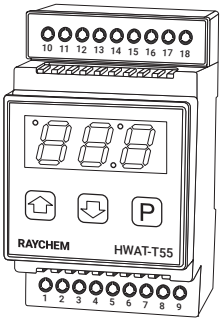


Electronic temperature control unit with integrated clock

- Building-specific programme
- Boiler temperature monitoring
- Pipe temperature monitoring
- 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
- PCN: 1244-019897

Technical data: see page 13

HWAT-T55

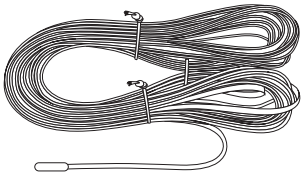


Thermostat with line sensor for hot-water branch lines and small hot-water pipe networks for HWAT-L, M and R (up to max. 50 m heating cable length)

- 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

HWAT-SENSOR-NTC-10M

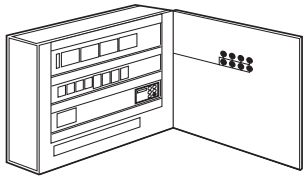


Temperature line sensor for HWAT-T55 thermostat and HWATECO V5 control unit for fixing on hot water pipe as addional sensor or as spare part

- NTC 2K - sensor
- Sensor length: 10 m
- Diameter sensor length: 4 mm
- Diameter sensor probe: 5 mm
- Length sensor probe: 20 mm
- Temperature range: 0°C to +70°C
- PCN: 1244-015847

Technical data: see page 16

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 temperature control.

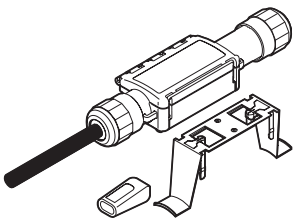
Technical data: see page 77

SBS-01-HM-ECO-10	**Control panel for 1 heating circuit.** • PCN: 390056-000
SBS-03-HV-ECO-10	**Control panel for up to 3 heating circuits.** • PCN: 035958-000
SBS-06-HV-ECO-10	**Control panel for up to 6 heating circuits.** • PCN: 539268-000
SBS-09-HV-ECO-10	**Control panel for up to 9 heating circuits.** • PCN: 294452-000

Cabinet type			SBS-01-HM-ECO-10	SBS-03-HV-ECO-10	SBS-06-HV-ECO-10	SBS-09-HV-ECO-10
Number of heating circuits			1	3	6	9
Enclosure version			Wall version	Wall version	Wall version	Wall version
Dimensions	Width	mm	380	380	600	600
	Height	mm	600	600	600	600
	Depth	mm	210	210	210	210
Weight (ready to dispatch)	approx.	kg	21	22	32	33
Connected rating		kW	4,5	14	28	42
Fuse protection provided by customer	max.	A	1 x 25A NH-00	3 x 32A NH-00	3 x 40A NH-00	3 x 63A NH-00

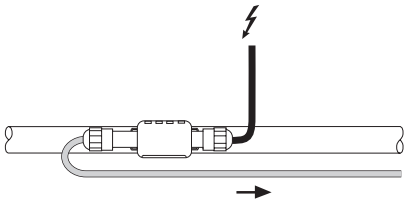
9 ACCESSORIES

RAYCLIC-CE-02

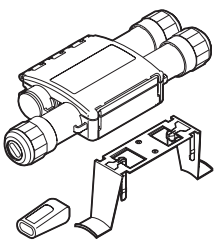


Power connection

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

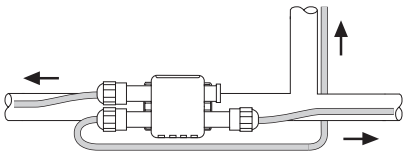


RAYCLIC-T-02

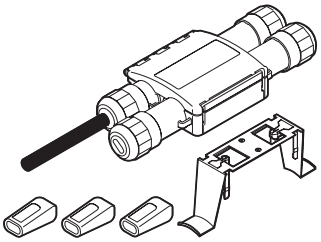


T-connection

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

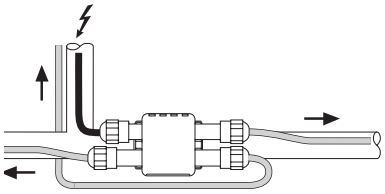


RAYCLIC-PT-02

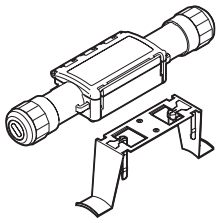


Power T-connection

- 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

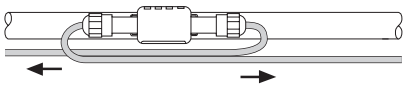


RAYCLIC-S-02

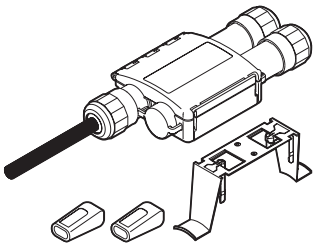


Splice for joining 2 lengths of heating cable

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

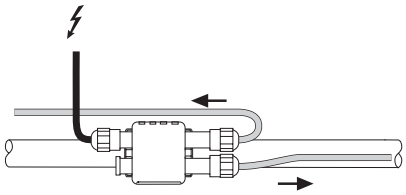


RAYCLIC-PS-02

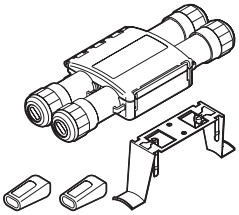


Powered splice

- 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

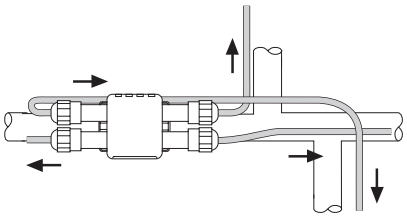


RAYCLIC-X-02

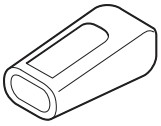


4-way connection

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



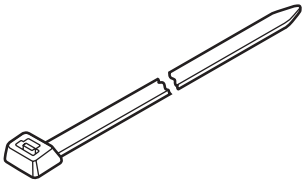
RAYCLIC-E-02



Gel-filled end seal

- For system extensions (to be ordered separately)
- IP 68

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

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

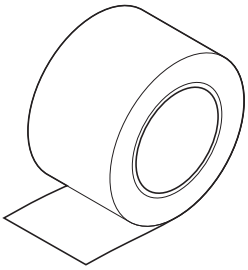
Use ATE-180 on plastic pipes

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

ATE-180

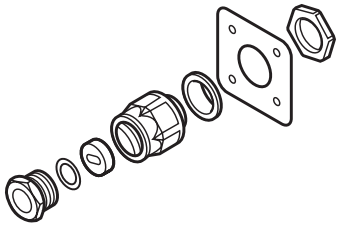


Aluminium adhesive tape

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

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

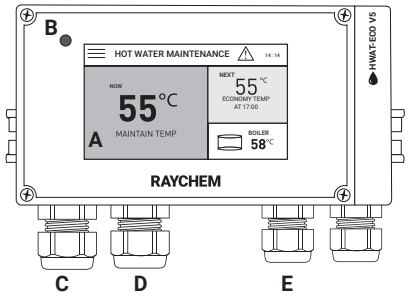
LAB-I-01

Electric traced label

- To be placed at 5 m intervals on insulation surface

HWAT-ECO Temperature Control Unit

MODULE LAYOUT



A Coloured touchscreen 5" size

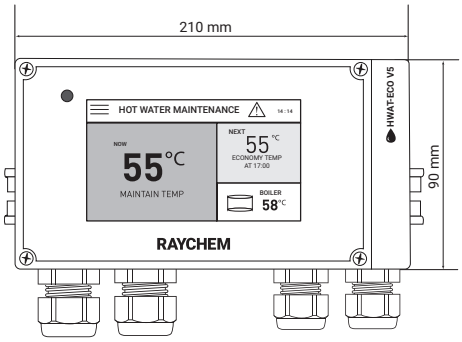
B LED GREEN: Blinking: Power to unit;
Fast Blinking: Error/Warning message

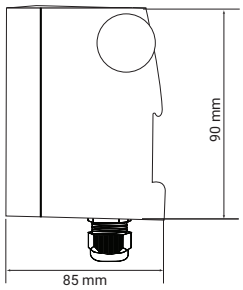
C M25 Gland Power cable

D M25 Heating cable

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

TECHNICAL DATA





(Dimensions in mm)

Product description	HWAT-ECO-V5
Use	Only for 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	Polycarbonat
Internal temperature alarm	85°C
USB connection	For set-up & unit programming in power-off mode
Enclosure dimension	210 mm x 90 mm x 85 mm
Pipe sensor	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

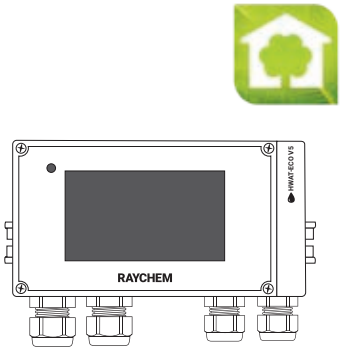
PROGRAMME

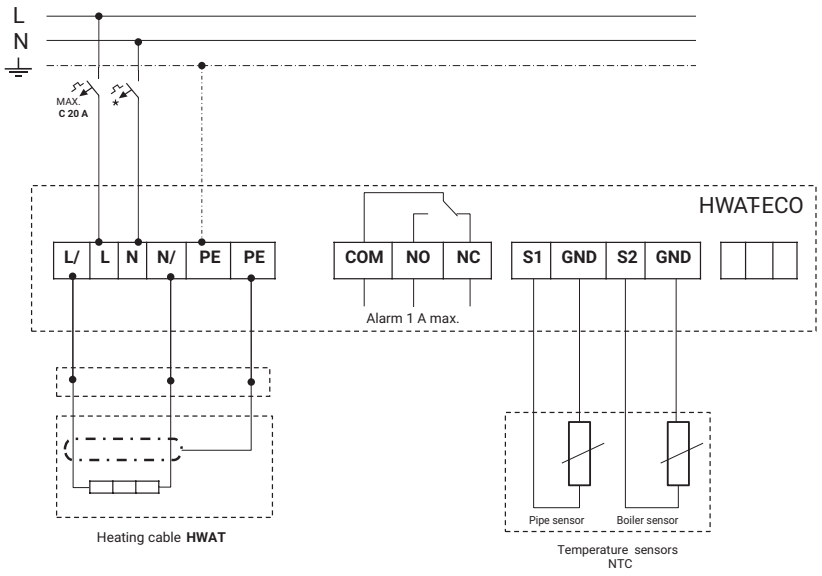
The HWAT-ECO has 7 different building specific time/temperature programmes and one constant program. These programmes are based on our long experience for optimum comfort and energy saving and consider tap profiles per building type. For user specific changes in the programming, the Edit timer for each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





* 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.

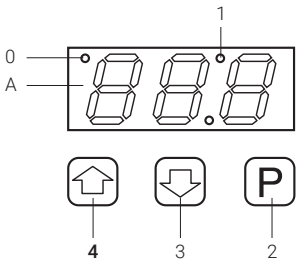
nVent requires the use of a 30 mA residual current device and a C-Characteristic circuit breaker to provide maximum safety and protection from fire.

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

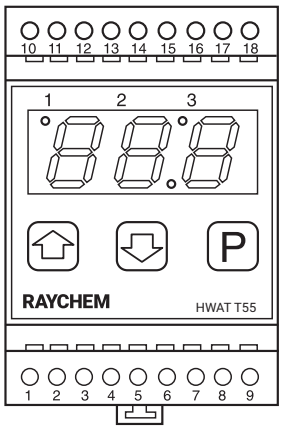
TEMPERATURE CONTROL WITH (PIPE) LINE SENSOR FOR HOT WATER BRANCH LINES AND SMALL HOT WATER PIPE NETWORKS

DISPLAY



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	

TECHNICAL DATA

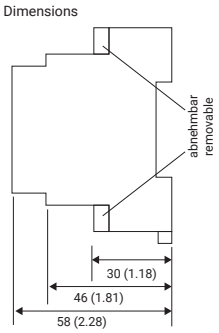


Operating voltage	AC 230V, +10% /-10%, 50 Hz
Power consumption	<= 5VA
Control relay (heating)	230 VAC, max 16A
Connecting terminals	2,5 mm², screwed
Temperature setting range* *consider local hygienic standard	40°C - 60°C; factory settings: 55°C
Switching hysteresis	+/–2K
Accuracy	+/- 1,5 K including 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

HOUSING

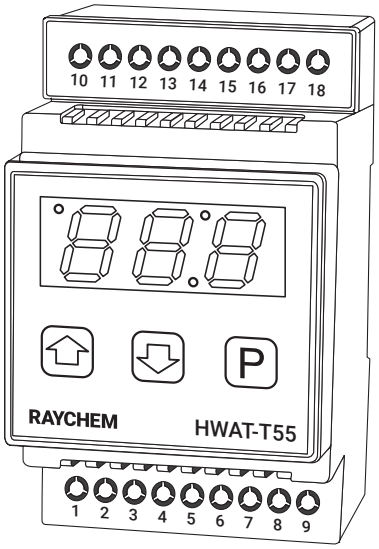


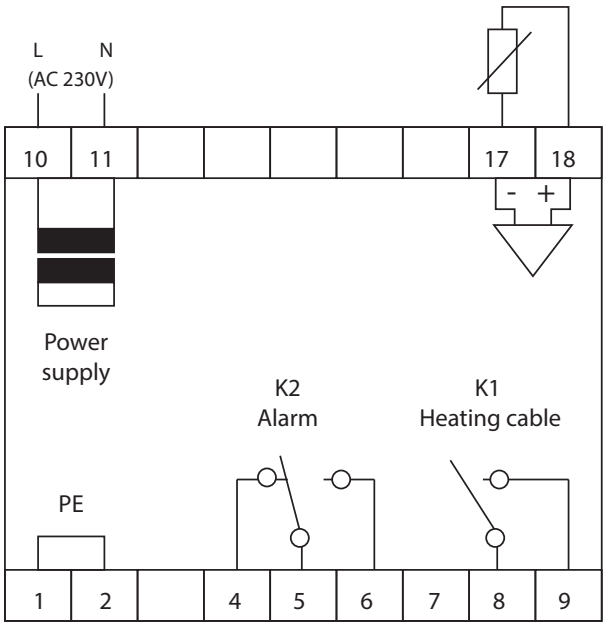
Dimensions	51,5 mm x 87, 5mm x 58mm (B/H/T)
Material	Housing ABS
IP rating	IP 20 (IP 30 in panel)
Installation	DIN 35 mm rail mounted
Minimum installation temperature	5°C

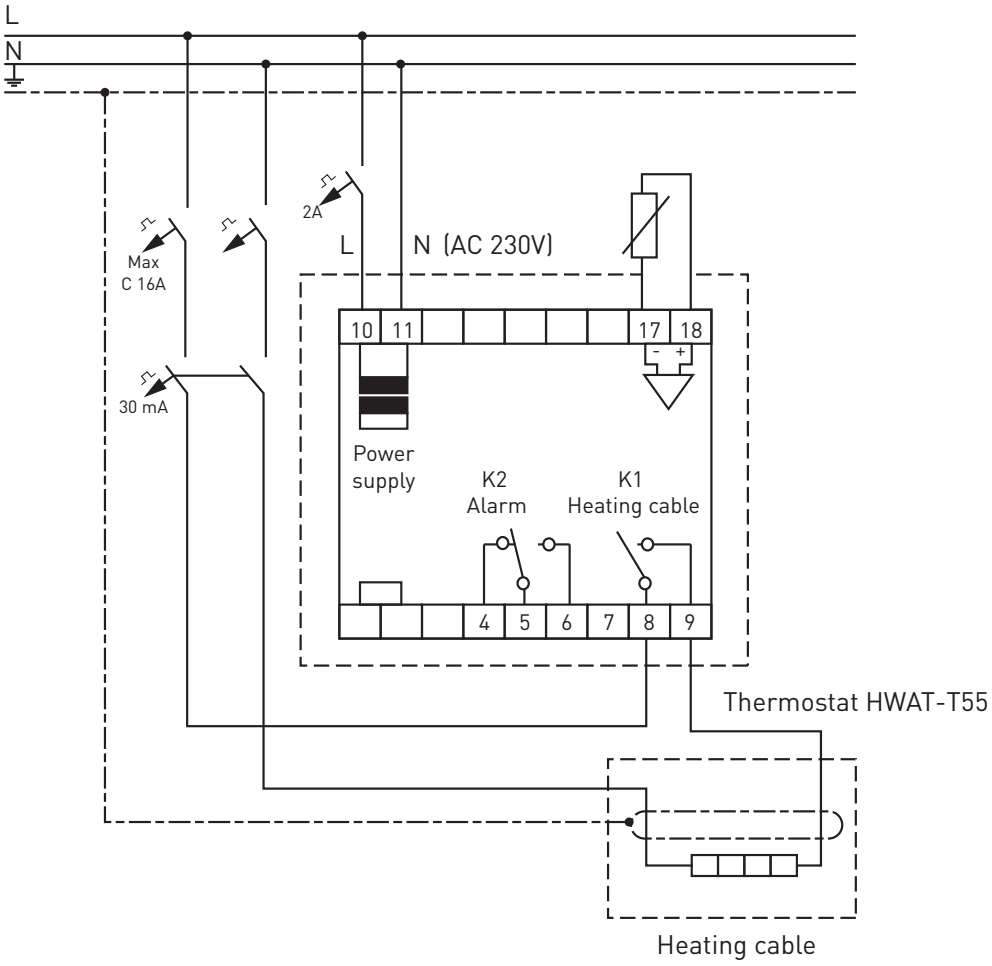
TEMPERATURE SENSOR

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

Connection Scheme for Thermostat HWAT-T55







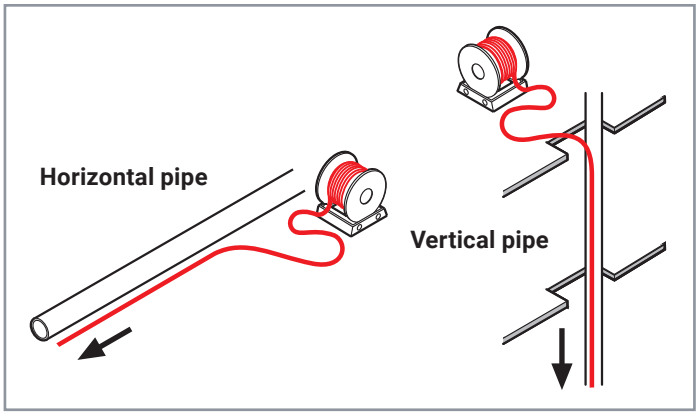
Hot Water Temperature Maintenance

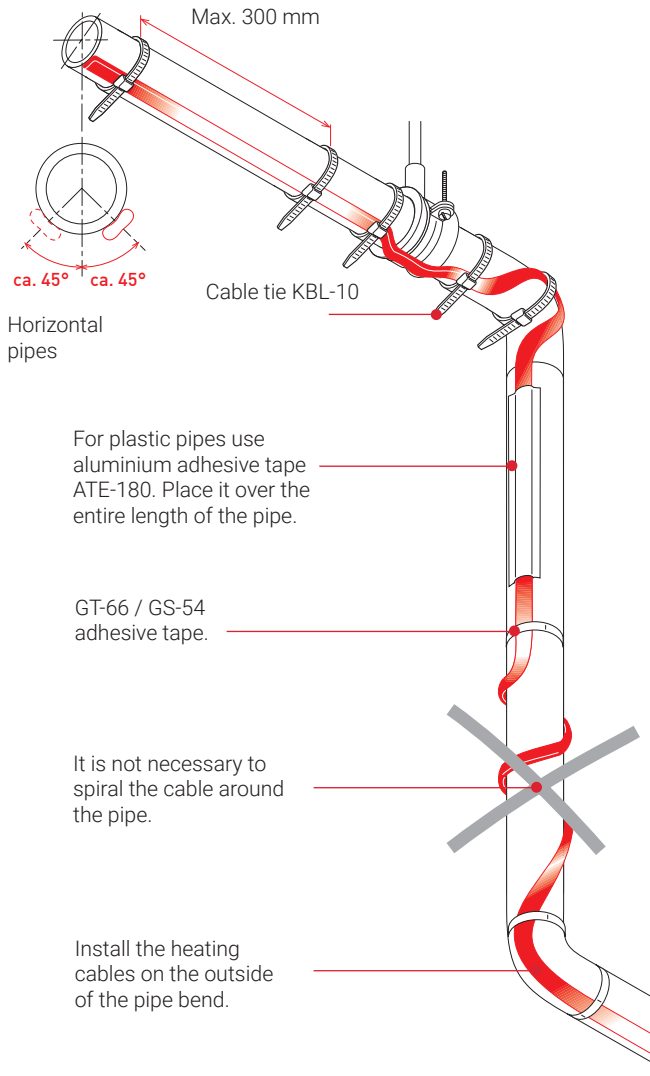
GENERAL INSTALLATION INSTRUCTIONS

- See page 74
- General installation and operation information is also available from nVent in document reference: CDE-1547

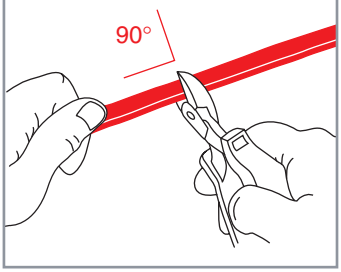
INSTALLATION INSTRUCTIONS FOR HWAT-L/M/R CABLES

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

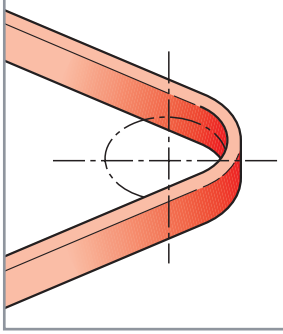




Cut the heating cable at right angles

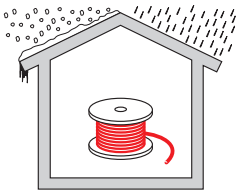


Smallest bending radius: 10 mm



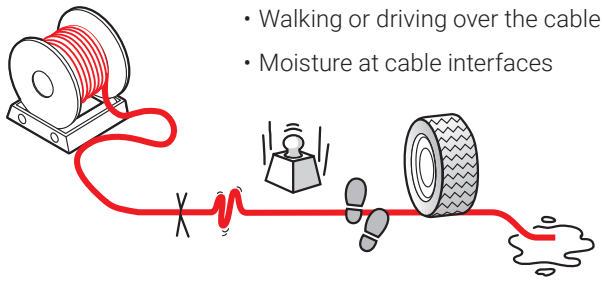
Installation of self-regulating heating cables

- Store in a dry and clean place.
- Temperature range: –40°C to +60°C.
- Protect any cable ends with an end seal.



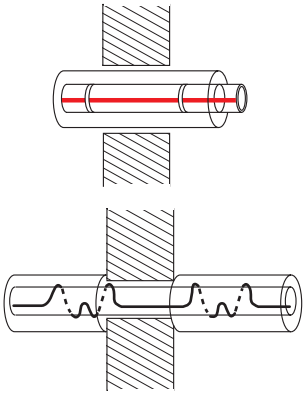
Avoid:

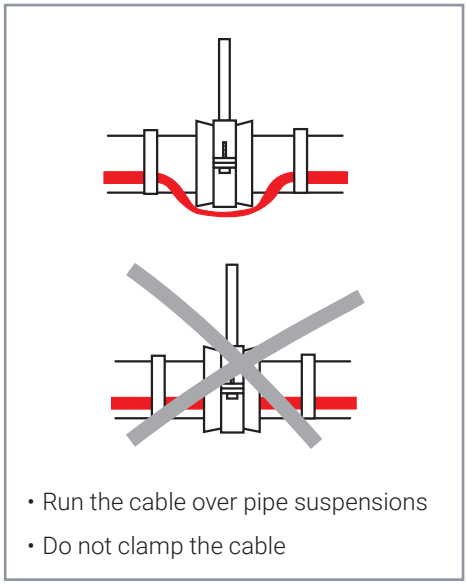
- Sharp edges
- High tractive force
- Kinking and crushing
- Walking or driving over the cable
- Moisture at cable interfaces



Wall/Floor transit

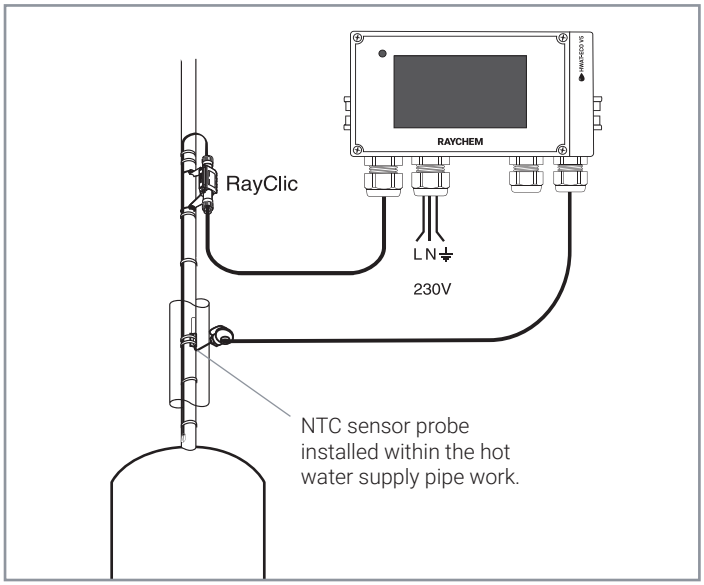
The thickness of thermal insulation must be continuous otherwise compensate by adding heating cable.

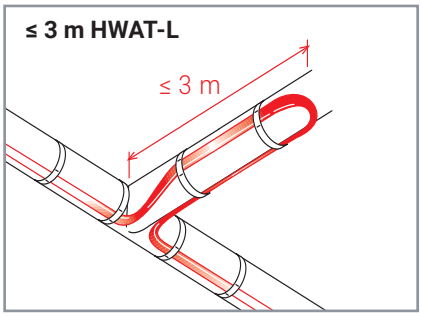


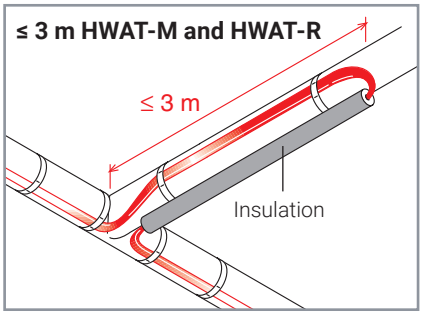


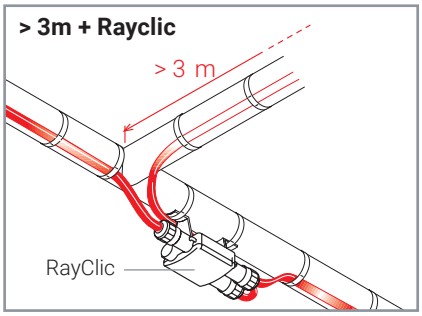
- Run the cable over pipe suspensions
- Do not clamp the cable

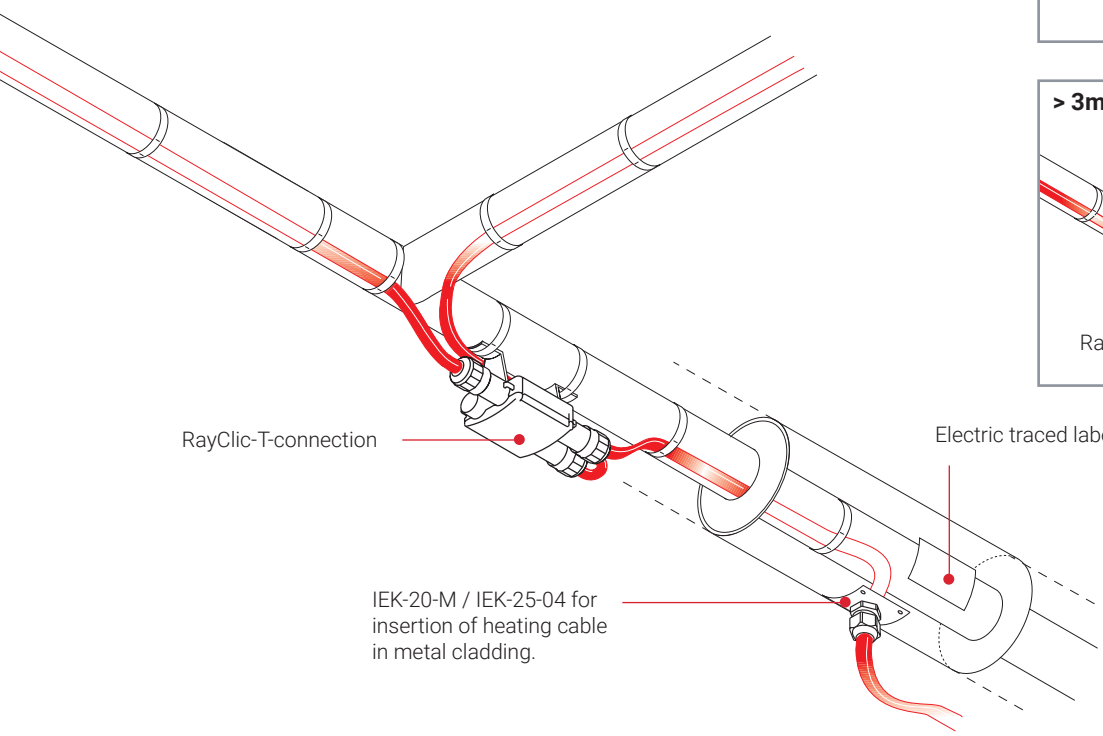
STANDARD INSTALLATION OF NTC SENSOR WITH IN-PIPE SENSOR PROBE.











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 nVent 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

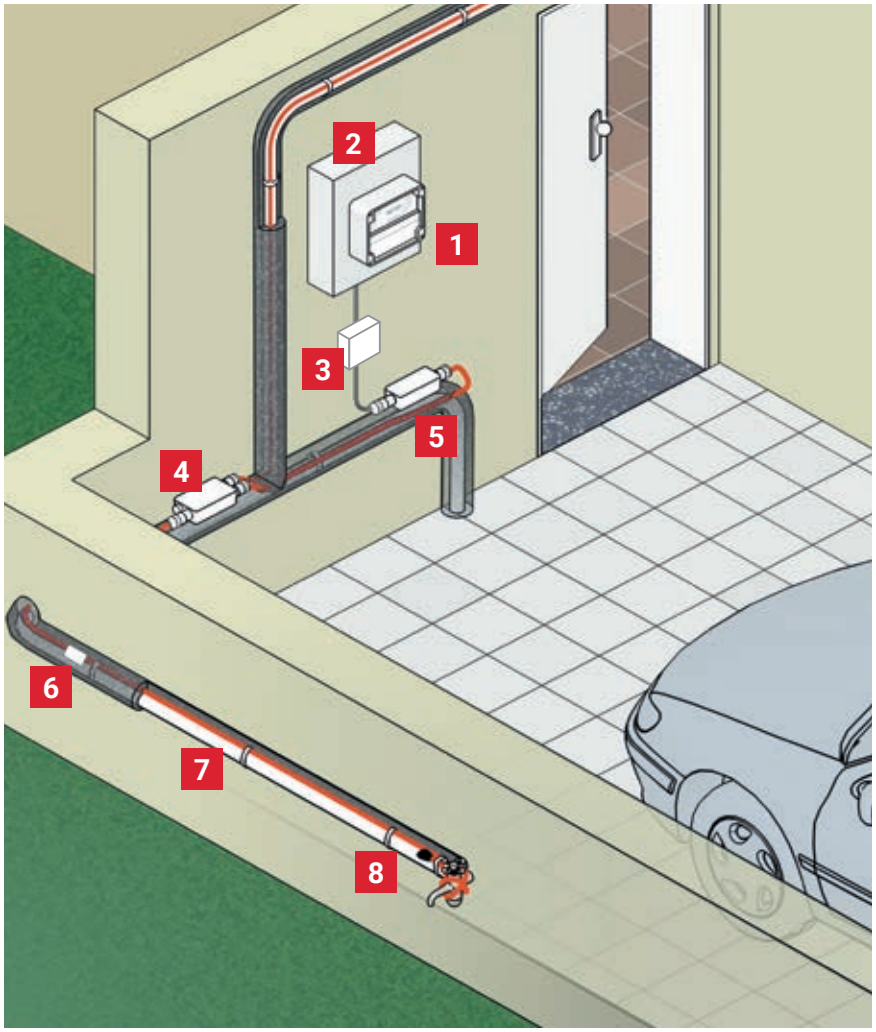
The cable's large copper conductors make it a reliable solution and XL-Trace's Low Smoke Zero Halogen (LSZH) materials provide increased safety in the event of a building fire: up to 90% less smoke emissions and improved self-extinguishing properties.

LOW POWER CONSUMPTION

The smart RAYSTAT-ECO-10 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.

XL-TRACE LSZH system design: see pages 21-43

FS system design: see pages 44-55



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

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

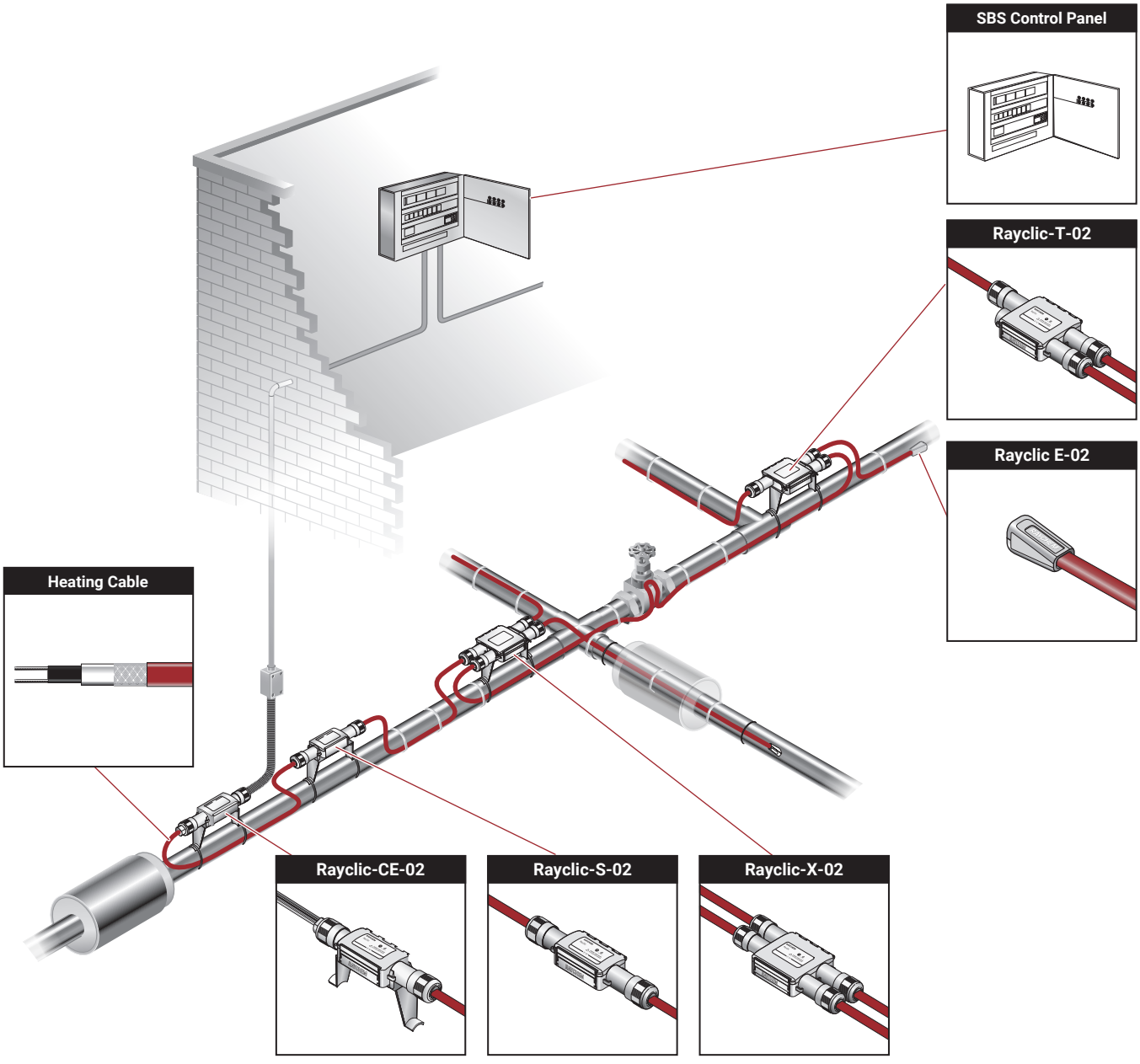
PIPE FREEZE PROTECTION

XL-TRACE LSZH – ENHANCED SAFETY SELF-REGULATING HEATING CABLE

nVent 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.

nVent 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



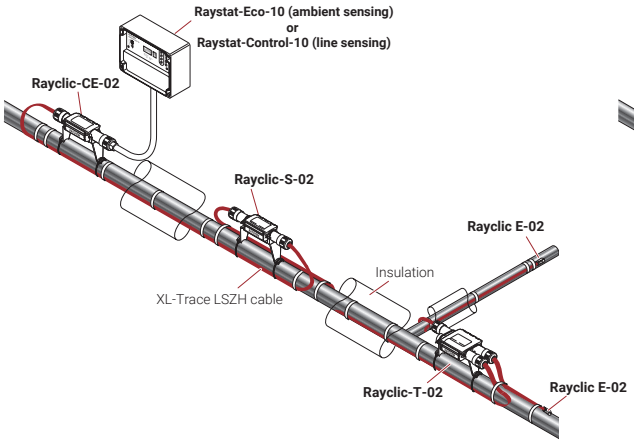
This is a sample overview of pipe freeze protection applications for illustration purposes only, with typical layouts shown on the following pages.

Please contact your local representative for any further design support.

Pipe Freeze Protection

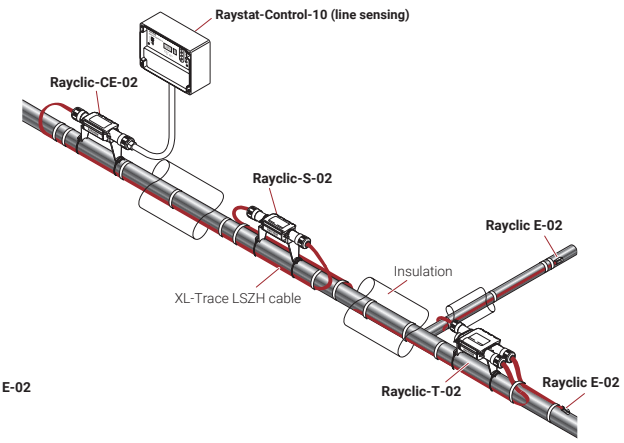
SINGLE CIRCUIT

Cold Water Services



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

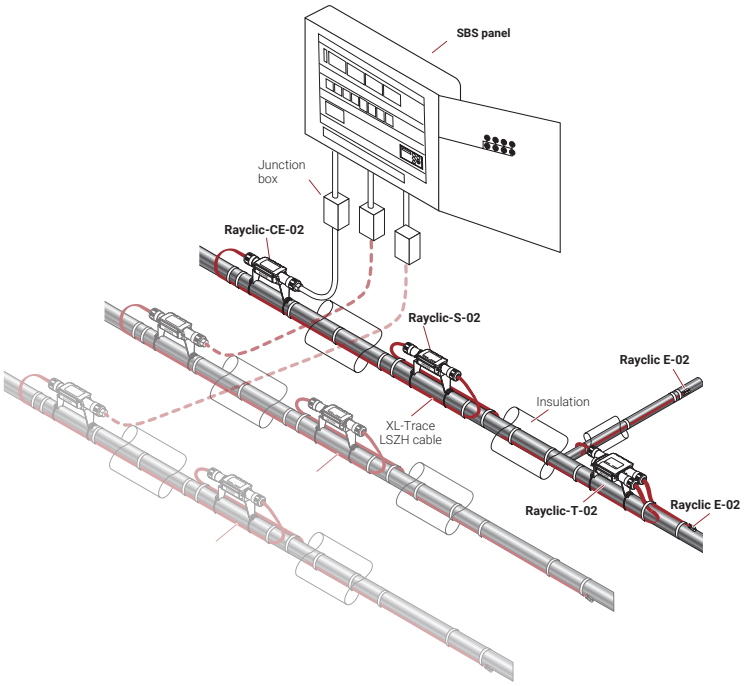
Low Pressure Hot Water Services (LPHW)



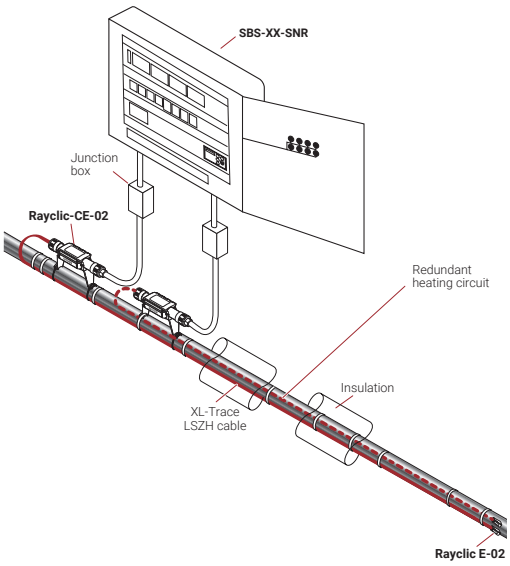
XL-Trace LSZH cable
31 W/m @ 5°C


MULTIPLE CIRCUIT

Cold Water + LPHW Services



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

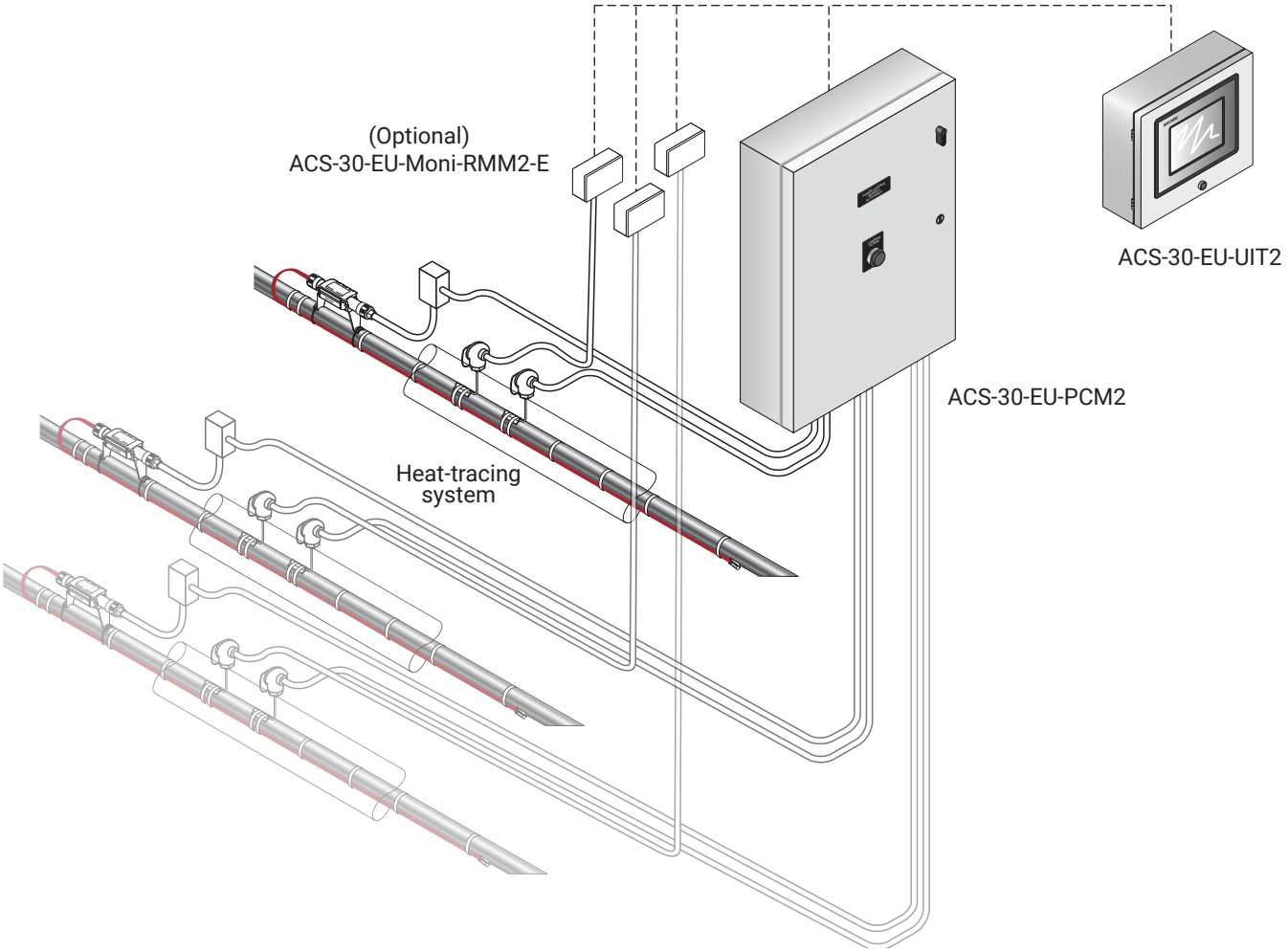


XL-Trace LSZH cable			
for cold water			for LPHW services
10 W/m @ 5°C	15 W/m @ 5°C	26 W/m @ 5°C	31 W/m @ 5°C
			

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

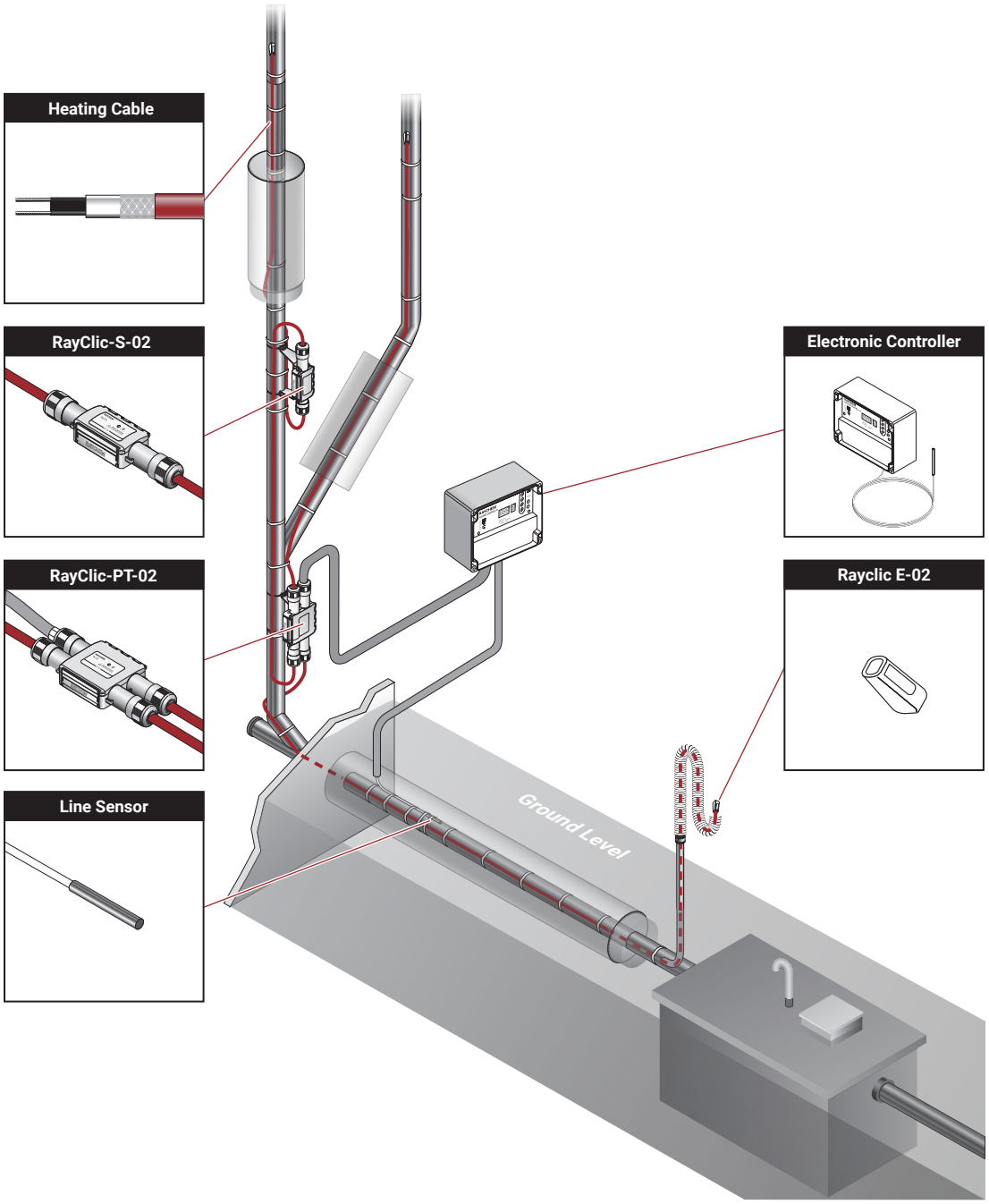
MULTIPLE CIRCUITS OR MULTIPLE APPLICATIONS



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
			

Flow Maintenance (Grease Line)

SYSTEM OVERVIEW

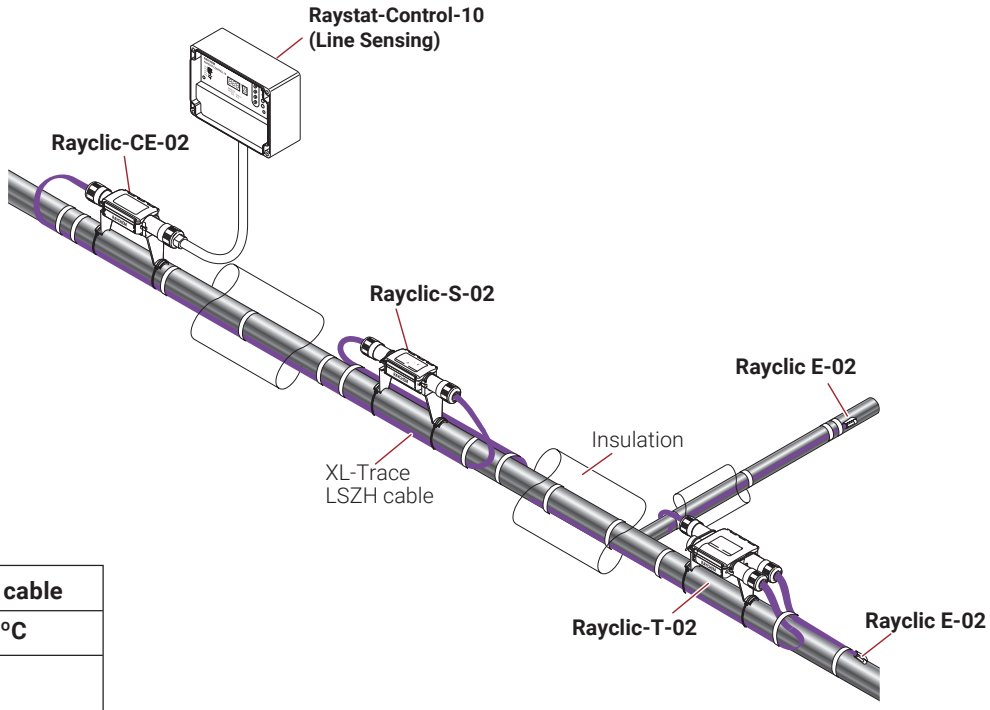


This is a sample overview for flow maintenance of greasy waste pipes for illustration purposes only, with typical layouts shown on the following page.

Please contact your local representative for any further design support.

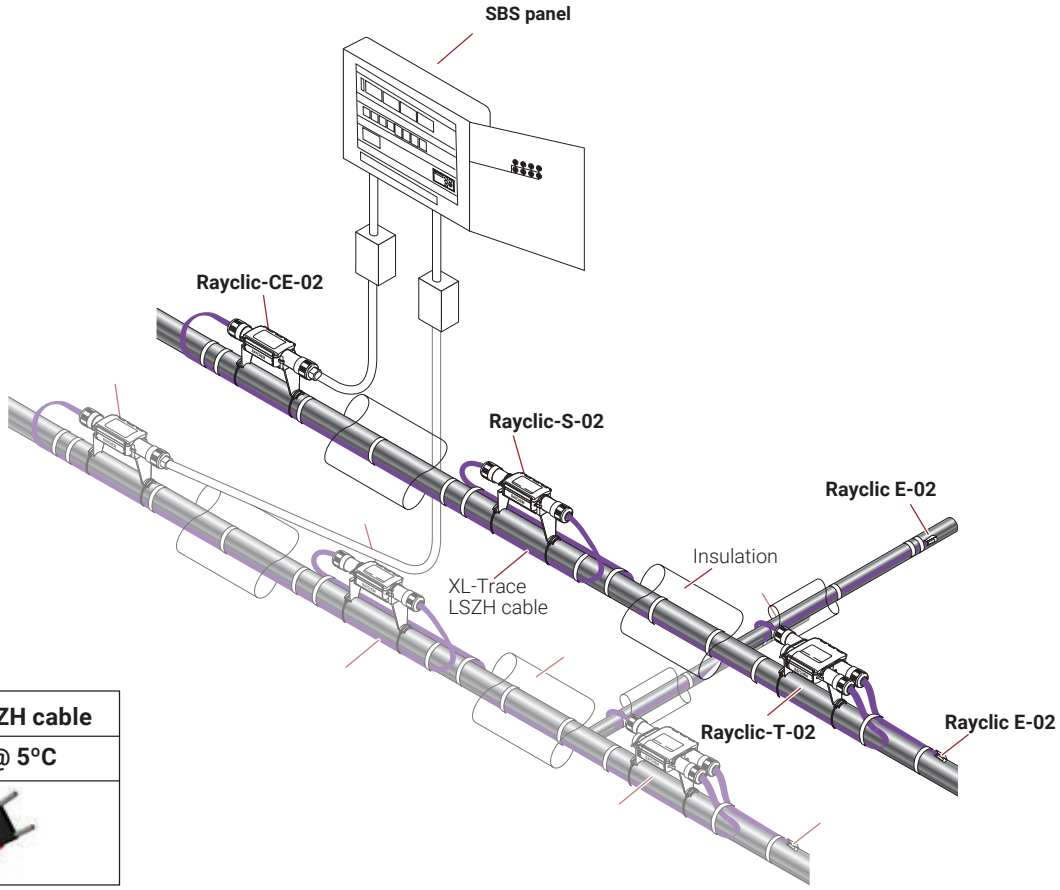
Flow Maintenance (Grease Line)

SINGLE CIRCUIT



XL-Trace LSZH cable
31 W/m @ 5°C


MULTIPLE CIRCUIT (UP TO 12)



XL-Trace LSZH cable
31 W/m @ 5°C


1 HEATING CABLE SELECTION

Application	
Pipe freeze protection of pipework. Maximum operating temperature 65°C.	
10XL2-ZH	10W/m @ 5°C.
15XL2-ZH	15W/m @ 5°C.
26XL2-ZH	26W/m @ 5°C.
Pipe freeze protection and temperature maintenance. Maximum operating temperature 85°C.	
31XL2-ZH	31W/m @ 5°C.

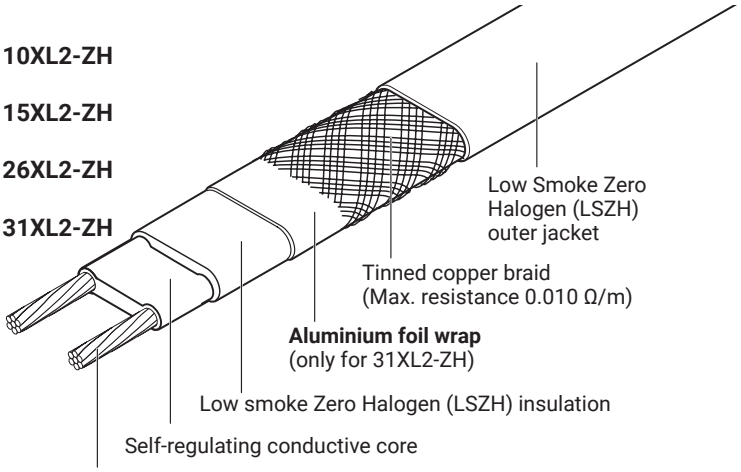
2 HEATING CABLE CONSTRUCTION

10XL2-ZH

15XL2-ZH

26XL2-ZH

31XL2-ZH



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 (mm)											
Insulation thicknesses (mm)	15	22	28	35	42	54	67	76	108	125	150	200
10	10XL2-ZH	15XL2-ZH	15XL2-ZH	26XL2-ZH	26XL2-ZH	26XL2-ZH	26XL2-ZH	31XL2-ZH	31XL2-ZH	31XL2-ZH	31XL2-ZH	31XL2-ZH
15	10XL2-ZH	10XL2-ZH	10XL2-ZH	10XL2-ZH	15XL2-ZH	15XL2-ZH	26XL2-ZH	26XL2-ZH	26XL2-ZH	31XL2-ZH	31XL2-ZH	31XL2-ZH
20	10XL2-ZH	10XL2-ZH	10XL2-ZH	10XL2-ZH	10XL2-ZH	15XL2-ZH	15XL2-ZH	26XL2-ZH	26XL2-ZH	31XL2-ZH	31XL2-ZH	31XL2-ZH
25	10XL2-ZH	10XL2-ZH	10XL2-ZH	10XL2-ZH	10XL2-ZH	10XL2-ZH	15XL2-ZH	15XL2-ZH	26XL2-ZH	26XL2-ZH	26XL2-ZH	31XL2-ZH
30	10XL2-ZH	10XL2-ZH	10XL2-ZH	10XL2-ZH	10XL2-ZH	10XL2-ZH	10XL2-ZH	15XL2-ZH	15XL2-ZH	26XL2-ZH	26XL2-ZH	26XL2-ZH
40	10XL2-ZH	10XL2-ZH	10XL2-ZH	10XL2-ZH	10XL2-ZH	10XL2-ZH	10XL2-ZH	10XL2-ZH	15XL2-ZH	15XL2-ZH	26XL2-ZH	26XL2-ZH
50	10XL2-ZH	10XL2-ZH	10XL2-ZH	10XL2-ZH	10XL2-ZH	10XL2-ZH	10XL2-ZH	10XL2-ZH	10XL2-ZH	15XL2-ZH	26XL2-ZH	26XL2-ZH

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

For plastic pipes, please use aluminium adhesive tape ATE-180. The pipe freeze protection cable should be covered along its entire length. Heat insulation λ = 0.035 W/(m.K) or better.

Note: For insulation types containing solvents and/or bitumen coating, use the 31XL2-ZH product.

Fatty Waste pipe size and insulation table

40°C Temperature Maintenance on pipelines for Fatty waste water (Ambient = -10°C)

	Pipe diameter (mm)							
Insulation thicknesses (mm)	42	54	67	76	108	125	150	200
30mm	31XL							
40mm	31XL	31XL						
50mm	31XL	31XL	31XL					
60mm	31XL	31XL	31XL	31XL				
80mm	31XL	31XL	31XL	31XL	31XL			
100mm	31XL	31XL	31XL	31XL	31XL	31XL		
125mm	31XL	31XL	31XL	31XL	31XL	31XL	31XL	
150mm	31XL	31XL	31XL	31XL	31XL	31XL	31XL	31XL

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

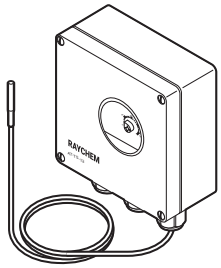
- The total length of heating cable determines the number and size of the fuses
- Residual current device (rcd) : 30 mA required, max. 500 m heating cable per rcd
- Installation according to local regulations
- The power connections must be carried out by an approved electrical installer
- Use C type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

XL-Trace Maximum Circuit Lengths						
10XL2-ZH (240 Vac)	**Circuit Breaker (C Type characteristic CB Size)**					
Switch-On Temperature (°C)	4	6	10	13	16	20
–20	25	40	75	100	140	180
–10	30	50	90	130	170	190
–5	40	60	110	150	190	200
0	45	70	125	170	210	210
5	50	80	140	195	215	215
15XL2-ZH (240 Vac)	**Circuit Breaker (C Type characteristic CB Size)**					
Switch-On Temperature (°C)	4	6	10	13	16	20
–20	10	25	50	70	90	120
–10	12	30	60	85	110	145
–5	25	40	70	95	120	155
0	29	45	80	110	135	160
5	35	50	90	120	155	160
26XL2-ZH (240 Vac)	**Circuit Breaker (C Type characteristic CB Size)**					
Switch-On Temperature (°C)	4	6	10	13	16	20
–20	12	12	40	55	80	110
–10	12	25	50	70	100	125
–5	12	30	55	85	110	130
0	12	35	70	100	125	135
5	20	40	80	110	135	135

XL-Trace Maximum Circuit Lengths						
31XL2-ZH (240 Vac)	**Circuit Breaker (C Type characteristic CB Size)**					
Switch-On Temperature (°C)	4	6	10	13	16	20
–20	15	25	50	65	80	105
–10	20	30	55	75	90	115
–5	22	35	59	79	100	118
0	24	38	64	85	105	118
5	26	40	67	88	110	118

6 THERMOSTATS

AT-TS-13

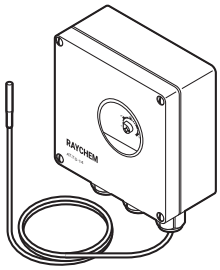


Thermostat

- 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

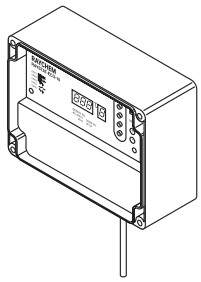


Thermostat

- 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.**

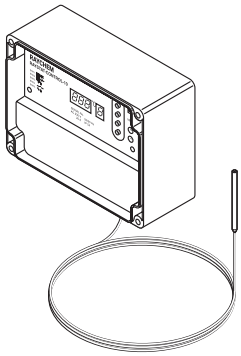
RAYSTAT-ECO-10



Ambient temperature thermostat

- Adjustable temperature range: 0°C to 30°C
- Max. switching current 25 A, 250 VAC
- PASC (Proportional Ambient Sensing Control) for energy saving
- Alarm relay: 2 A voltfree with indication of sensor errors, voltage errors and low or high temperature alarm.
- Display for visual indication of parameters
- PCN: 145232-000

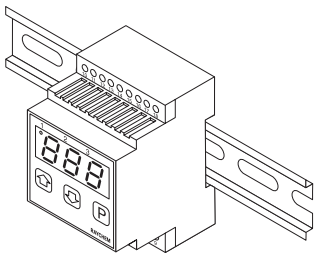
RAYSTAT-CONTROL-10



Line-sensing thermostat

- Adjustable temperature range: 0°C to 150°C
- Max. switching current 25 A, 250 VAC
- Alarm relay: 2 A voltfree with indication of sensor errors, voltage errors and low or high temperature alarm.
- Display for visual indication of parameters
- PCN: 828810-000

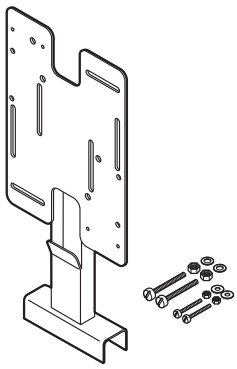
RAYSTAT-CONTROL-11-DIN



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

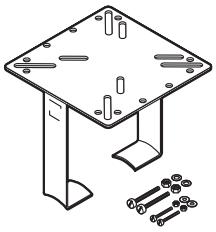
SB-100



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-CONTROL-10

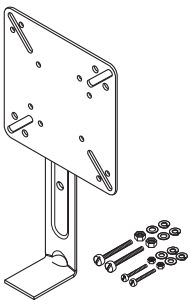
SB-101



Dual-leg support bracket, stainless steel

- Height leg: 160 mm
- For use with AT-TS-13, AT-TS-14, JB16-02 and RAYSTAT-CONTROL-10

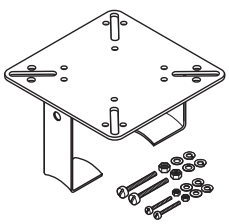
SB-110



Support bracket, stainless steel

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

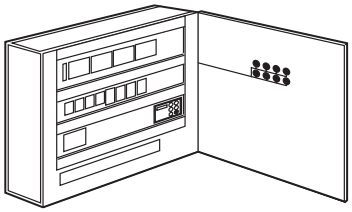
SB-111



Support bracket, stainless steel

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

7 CONTROL PANELS



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. An installation slot is provided for a RAYSTAT-CONTROL-11-DIN, RAYSTAT-CONTROL-10 and/or RAYSTAT-ECO-10 thermostat, each serving 3 heating circuits. Factory fitted. Please contact us for more information.

Technical data: see page 77

SBS-03-SV — **Control panel for 1 to 3 heating circuits.**

- PCN: 355825-000

SBS-06-SV — **Control panel for 4 to 6 heating circuits.**

- PCN: 778308-000

SBS-09-SV — **Control panel for 7 to 9 heating circuits.**

- PCN: 767989-000

SBS-12-SV — **Control panel for 10 to 12 heating circuits.**

- PCN: 1244-000025

Cabinet type			SBS-03-SV	SBS-06-SV	SBS-09-SV	SBS-12-SV
Max. number of heating circuits			3	6	9	12
Enclosure version			Wall version	Wall version	Wall version	Wall version
Dimensions	Width	mm	400	600	800	800
	Height	mm	600	600	800	800
	Depth	mm	210	210	210	210
Weight	approx.	kg	20	30	50	52
Connected rating		kW	11	22	33	42
Fuse protection provided by customer	max.	A	3 x 25A NH-00	3 x 32A NH-00	3 x 63A NH-00	3 x 80A NH-00

When using standard control panels for pipe freeze protection additional control devices need to be installed. Factory fitting is possible. Please contact nVent.

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.

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

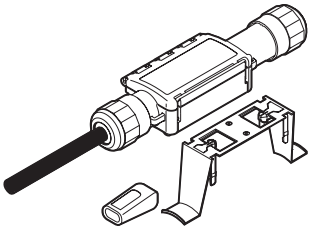
SBS-12-SNR — **Control panel for 12 heating circuits (Inc. redundant).**

- 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

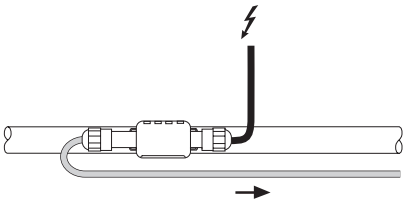
8 ACCESSORIES

RAYCLIC-CE-02

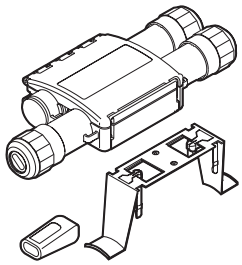


Power connection

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

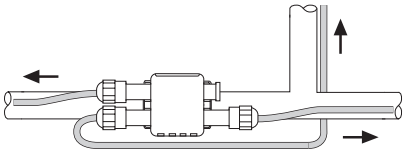


RAYCLIC-T-02

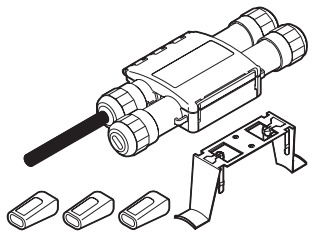


T-connection

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

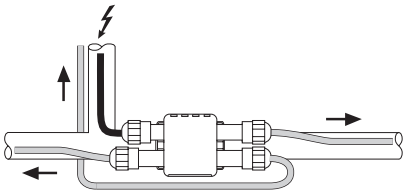


RAYCLIC-PT-02

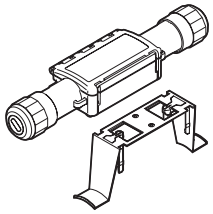


Power T-connection

- 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

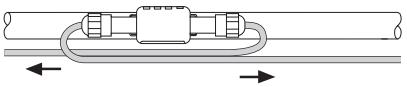


RAYCLIC-S-02

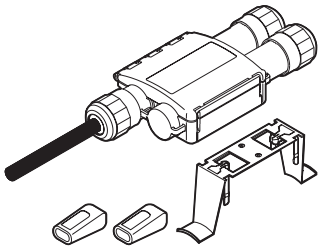


Splice for joining 2 lengths of heating cable

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

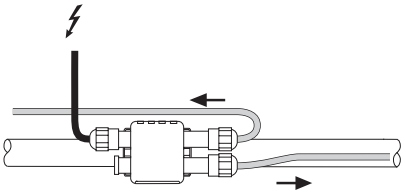


RAYCLIC-PS-02

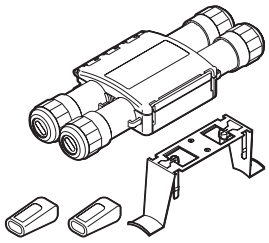


Powered splice

- 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

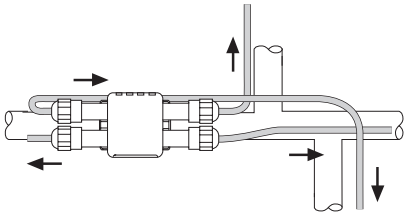


RAYCLIC-X-02

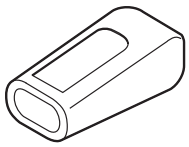


4-way connection

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



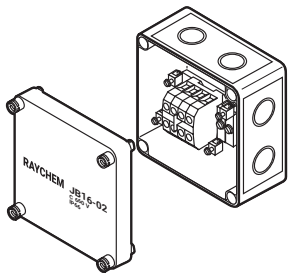
RAYCLIC-E-02



Gel-filled end seal

- For system extensions (to be ordered separately)
- IP 68

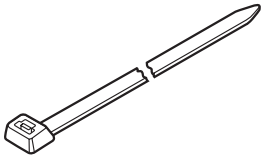
JB16-02



Temperature-resistant junction box

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

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

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

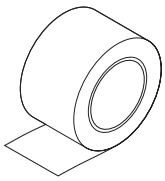
Use ATE-180 on plastic pipes

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

ATE-180

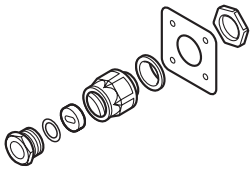


Aluminium adhesive tape

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

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

IEK-20-M



Insulation entry kit

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

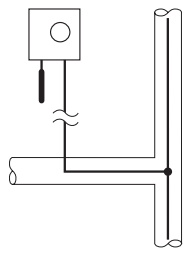
LAB-I-01

Electric traced label

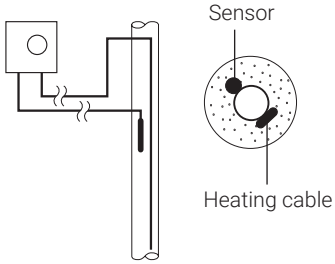
- To be placed at 5 m intervals on insulation surface

9 SPECIAL INSTALLATION INSTRUCTIONS

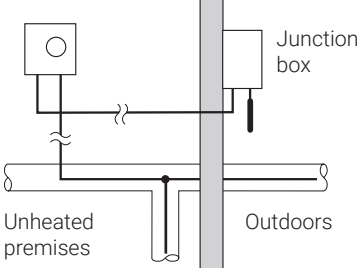
PLACING OF SENSOR



Ambient sensor



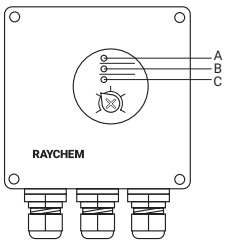
Fasten the pipe sensor to the pipework (e.g. aluminium adhesive tape)



Always place the sensor in the coldest part of the installation

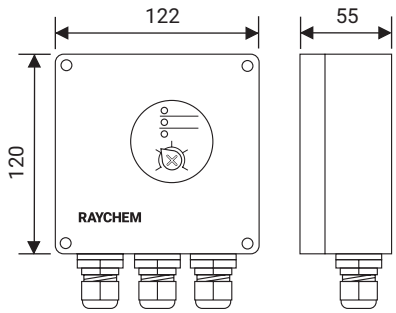
Line-Sensing Control and Ambient Thermostats (AT-TS-13 and AT-TS-14)

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 mm²	
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 (∅ 8-13 mm) 1 x M25 for connection heating cable (∅ 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

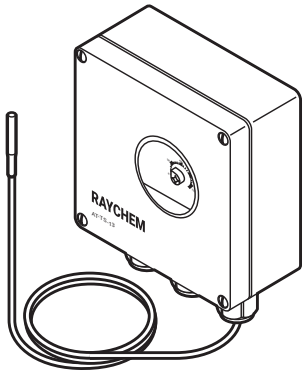
TEMPERATURE SENSING (HARD-69)

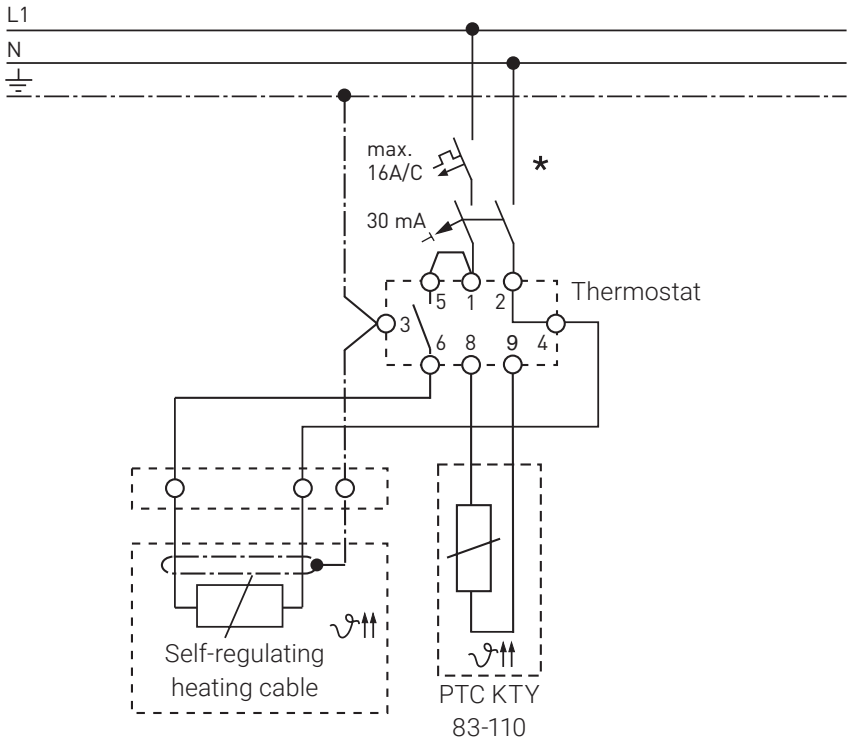
Type	PTC KTY 83-110
Length sensor cable	3 m
Diameter sensor cable	5.5 mm
Diameter sensor head	6.5 mm
Max. exposure temperature sensor cable	80°C (AT-TS-13: PVC sensor cable) 160°C (AT-TS-14 and HARD-69 spare sensor: silicone sensor cable)

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.

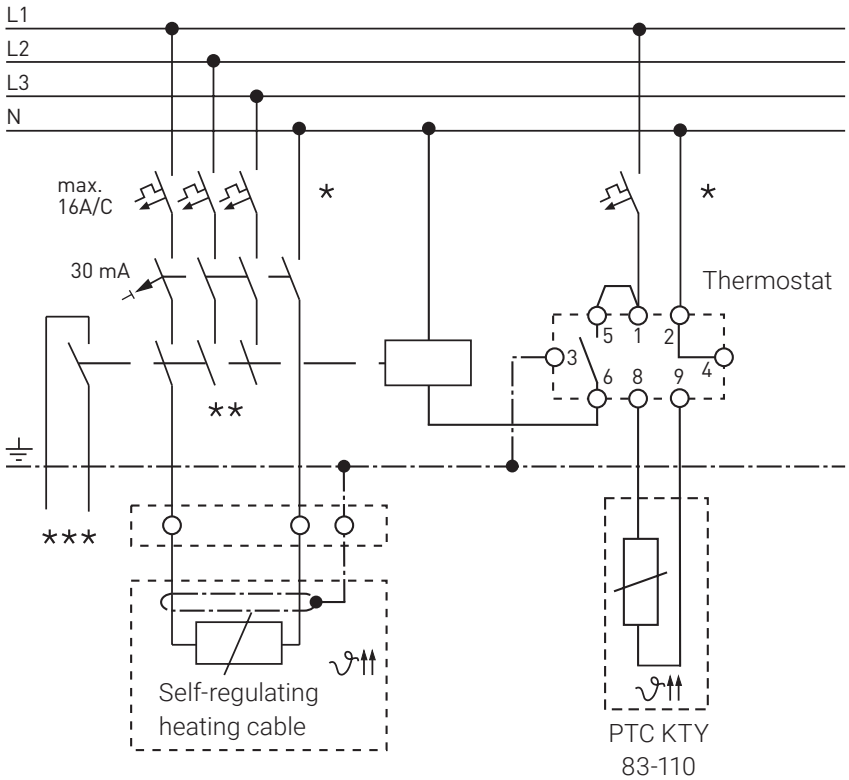
Wiring Diagram for Thermostat AT-TS-13 or AT-TS-14

AT-TS-13/14 DIRECT





AT-TS-13/14 WITH CONTACTOR



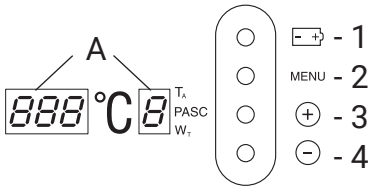
* Two-or four-pole electrical protection by circuit-breaker may be needed for local circumstances, standards and regulations.

** 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

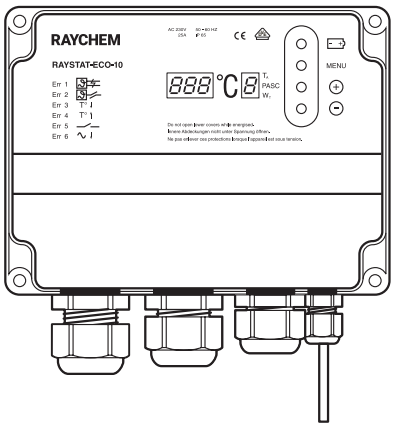
Energy Saving Frost Protection Controller RAYSTAT-ECO-10

DISPLAY



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

TECHNICAL DATA



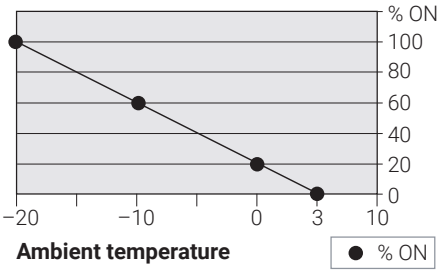
Operating Voltage	230 VAC, +10%/–10%, 50/60 Hz
Power Consumption	≤ 14 VA
Main Relay (heating)	I_{max} 25 A, 250 VAC, SPST
Main Terminals	3 x 0.75 mm² to 4 mm²
Alarm Relay	I_{max} 2 A, 250 VAC, SPDT, voltfree
Alarm Terminals	(3 + ⏚) x 0.75 mm² to 2.5 mm²
Accuracy	±0.5 K at 5°C
Main parameter settings	
Energy Saving Algorithm	Proportional Ambient Sensing Control (PASC) active below setpoint
Temperature Setpoint	0°C to + 30°C (switch off temperature)
Minimum Expected Ambient	–30°C to 0°C
Heater Operation if Sensor Error	ON (100%) or OFF
Voltage Free Operation	YES or NO

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	
3	0	Set point

Result: At ambient temperature of –10°C, 50% energy is saved



Diagnosed alarms

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

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

HOUSING

Size	120 mm x 160 mm x 90 mm
Material	Grey polycarbonate
Exposure Temperature Range	–40°C to +80°C
Ingress Protection	IP 65
Entries	2 x M25, 1 x M20, 1 x M16
Weight	Approx. 800 g
Lid	Transparent with 4 captive screws
Mounting	On wall or on support bracket SB-100/SB-101

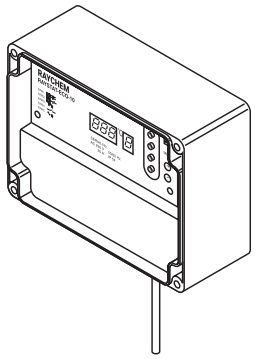
TEMPERATURE SENSOR

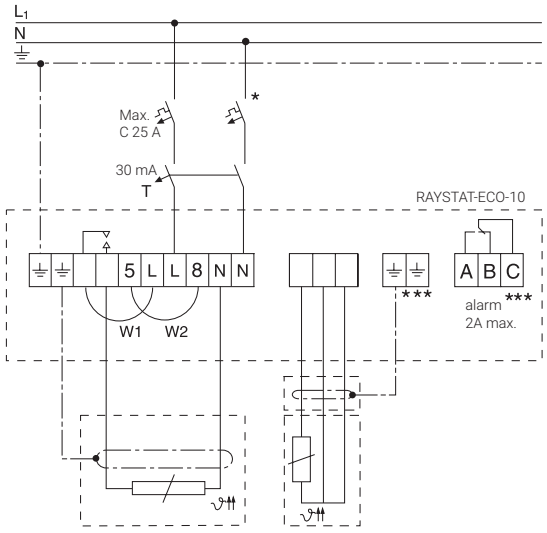
Sensor Type	3-wire Pt100 according to IEC Class B
Sensor Head	6 mm

Sensor cable can be extended up to 150 m when a cross-section of 3 x 1.5 mm² is used. The sensor cable should be shielded if it is laid in cable ducts or in the vicinity of high-voltage cables.

Wiring Diagram for RAYSTAT-ECO-10

NORMAL OPERATION

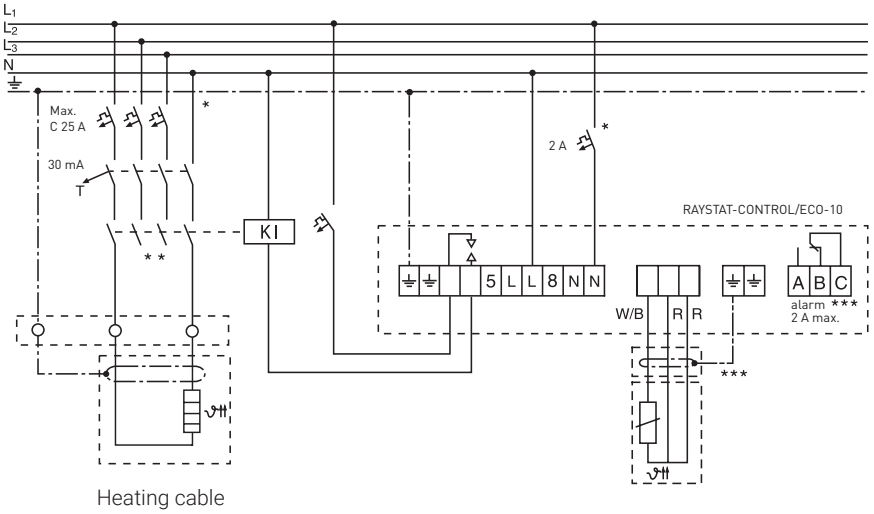




Heating cable

Temp. Pt 100 sensor

VOLTAGE FREE OPERATION: REMOVE LINKS W1 AND W2



Heating cable

Temp. Pt 100 sensor

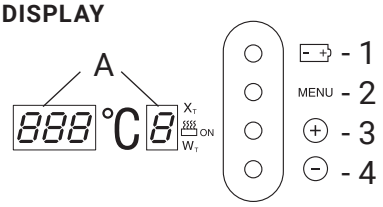
* Electrical protection by circuit breaker may be needed for local circumstances, standards and regulations.

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

*** Optional

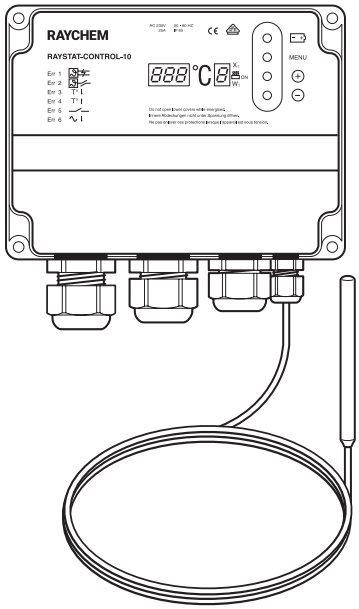
Line-Sensing Thermostat with Alarm Relay RAYSTAT-CONTROL-10

DISPLAY



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

TECHNICAL DATA



Operating Voltage	230 VAC, +10%/–10%, 50/60 Hz
Power Consumption	≤ 14 VA
Main Relay (heating)	I_{max} 25 A, 250 VAC, SPST
Main Terminals	3 x 0.75 mm² to 4 mm²
Alarm Relay	I_{max} 2 A, 250 VAC, SPDT, voltfree
Alarm Terminals	(3 + ⏚) x 0.75 mm² to 2.5 mm²
Accuracy	±0.5 K at 5°C
Ambient temperature	–40°C to +40°C
Parameter settings	
Temperature Setting	0°C to +150°C
Hysteresis	1 K to 5 K
Low Temperature Alarm	–40°C to +148°C
High Temperature Alarm	+2°C to +150°C or switched OFF
Heater Operation if Sensor Error	ON or OFF
Voltage Free Operation	YES or NO
Diagnosed errors	
Sensor Errors	Sensor short / Sensor open circuit
Temperature Extremes	High temperature / Low temperature
Voltage Errors	Low supply voltage / Output fault

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

HOUSING

Size	120 mm x 160 mm x 90 mm
Material	Grey polycarbonate
Ingress Protection	IP 65
Entries	2 x M25, 1 x M20, 1 x M16
Weight	Approx. 800 g
Lid	Transparent with 4 captive screws
Mounting	On wall or on support bracket SB-100/SB-101

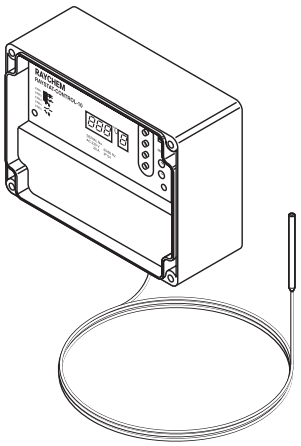
TEMPERATURE SENSOR

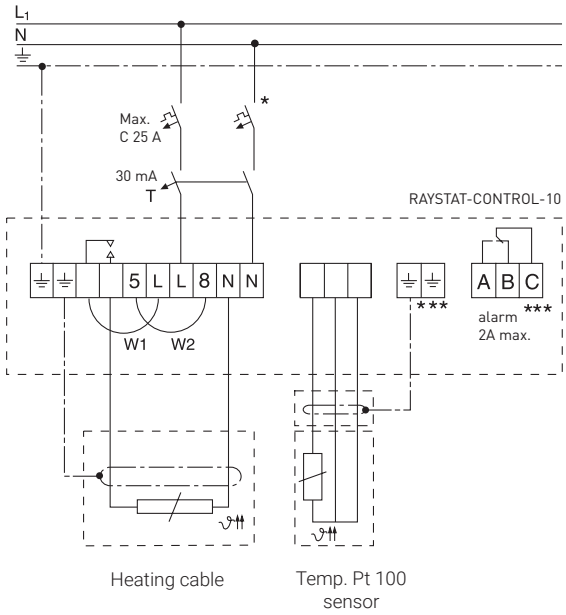
Sensor Type	3-wire Pt100 according to IEC / Class B
Sensor Head	50 mm x ∅ 6 mm
Sensor Cable	Silicone 3 m x ∅ 4 mm
Cable Exposure Temperature	–40°C to +150°C (+215°C, 1000 h max.)

Sensor cable can be extended up to 150 m when a cross-section of 3 x 1.5 mm² is used. The sensor cable should be shielded if it is laid in cable ducts or in the vicinity of high-voltage cables.

Wiring Diagram for RAYSTAT-CONTROL-10

NORMAL OPERATION

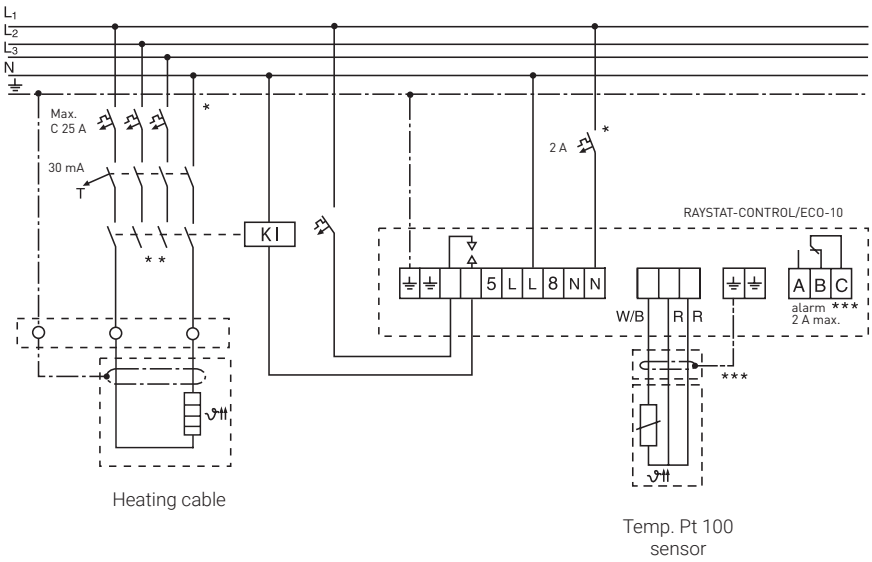




Heating cable

Temp. Pt 100 sensor

VOLTAGE FREE OPERATION: REMOVE LINKS W1 AND W2



Heating cable

Temp. Pt 100 sensor

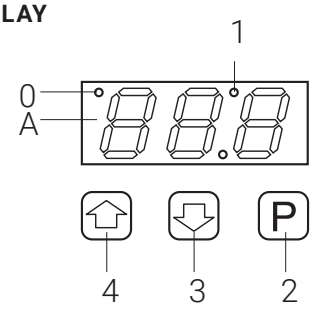
* Electrical protection by circuit breaker may be needed for local circumstances, standards and regulations.

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

*** Optional.

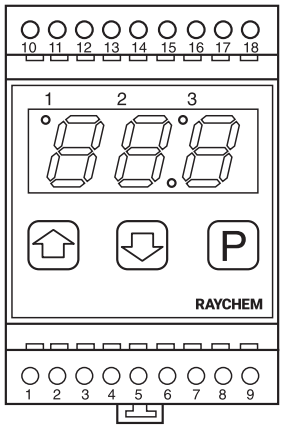
RAYSTAT-CONTROL-11-DIN Line-Sensing Thermostat for Rack Mounting with Alarm Relay

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	5°C
Hysteresis	1 K to 5 K	1 K
Low temperature alarm	–15°C to 0°C or „Off“ position.	0°C
Heater operation if sensor error	ON or OFF	ON
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

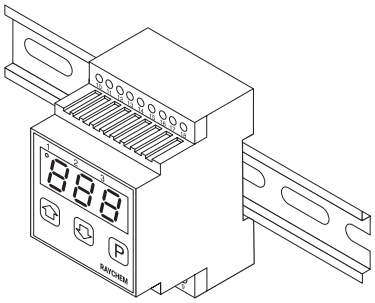
TEMPERATURE SENSOR

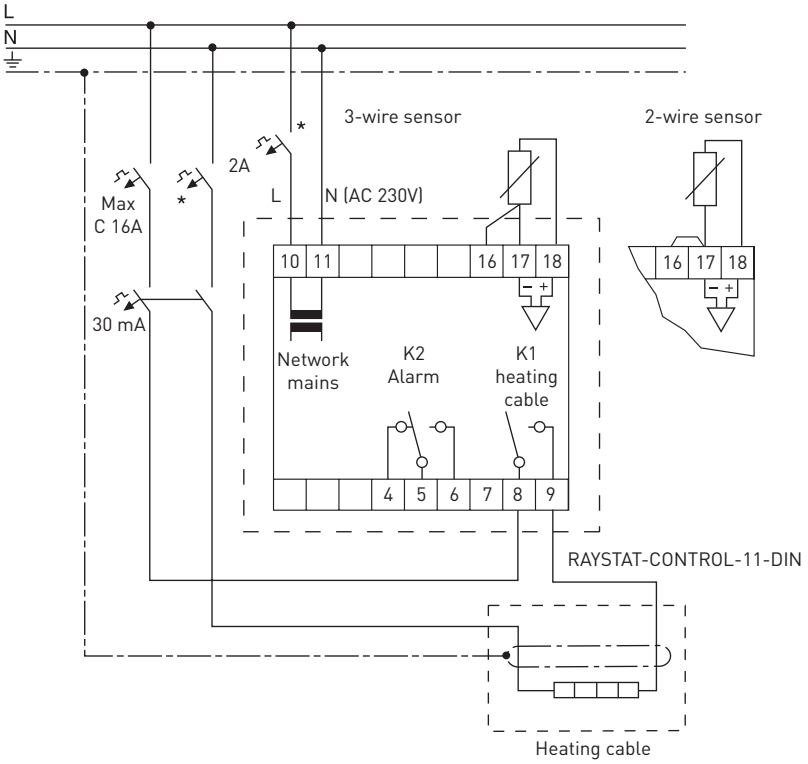
Type	Pt 100 (3-wire technology) as per IEC class B
Sensor element	50 mm x ∅ 6 mm stainless steel sheath
Protection rating	IP 68
Sensor cable length	3 m x ∅ 5 mm
Ambient temperature	–50°C to 105°C

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.

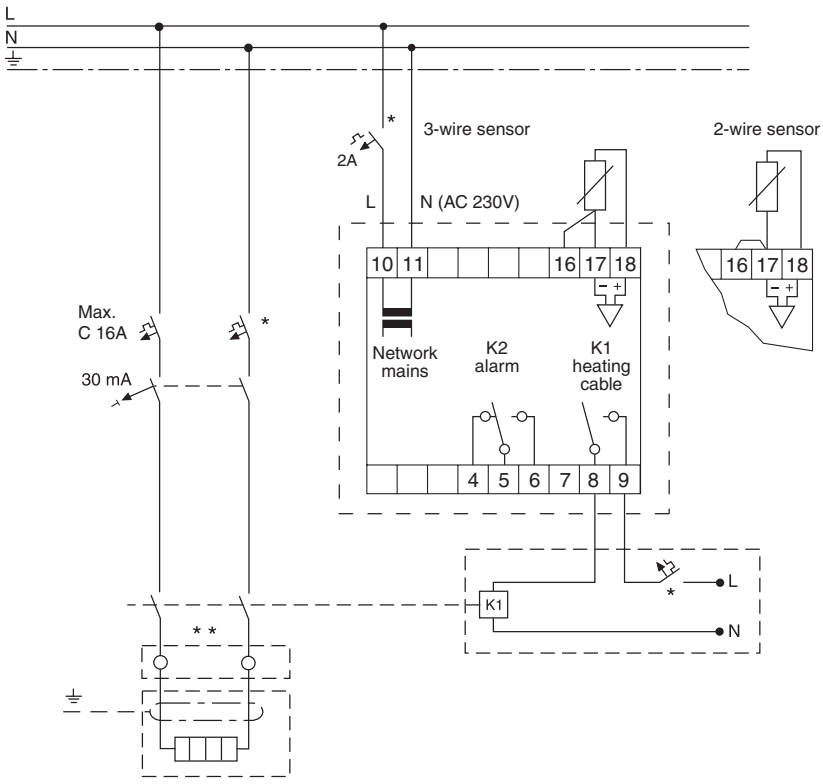
Wiring Diagram for RAYSTAT-CONTROL-11-DIN

NORMAL OPERATION





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.

Pipe Freeze Protection

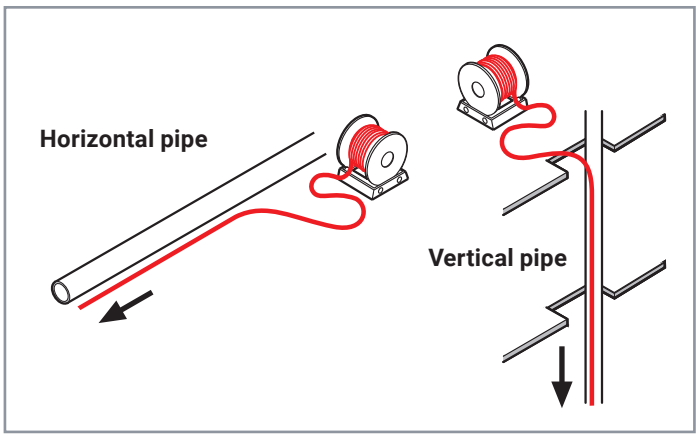
GENERAL INSTALLATION INSTRUCTIONS

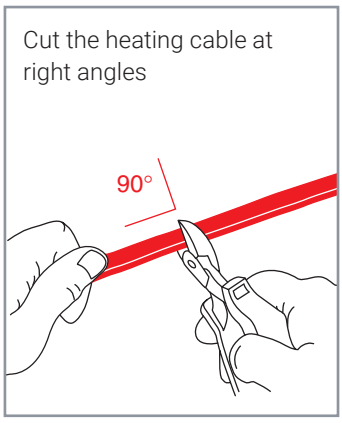
– See page 74

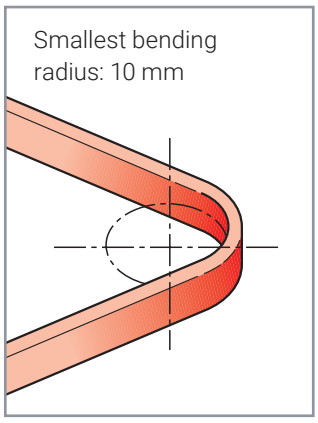
– General installation and operation information is also available from nVent in document reference: CDE-1547

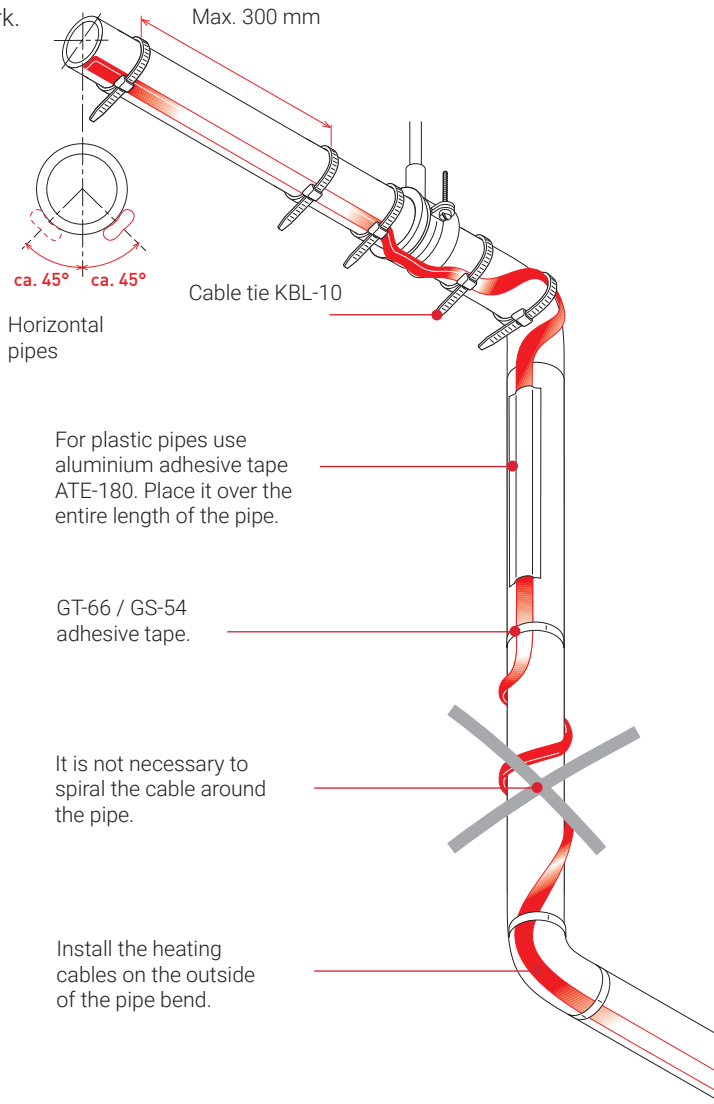
INSTALLATION INSTRUCTIONS FOR XL-TRACE LSZH CABLES

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







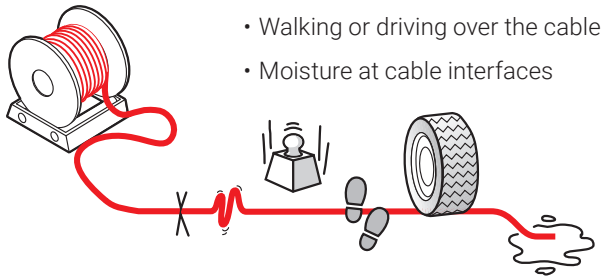


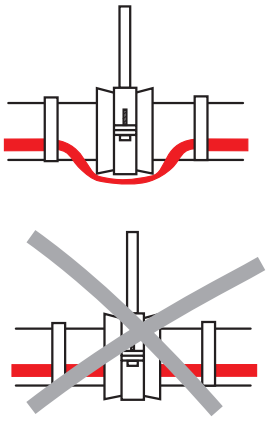
Installation of self-regulating heating cables

- Store in a dry and clean place
- Temperature range: –40°C to +60°C
- Protect any cable ends with an end seal

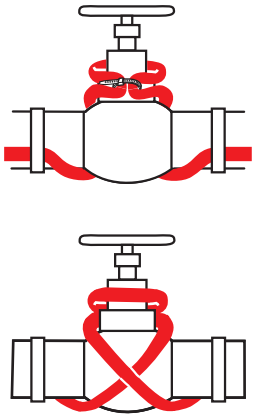
Avoid:

- 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

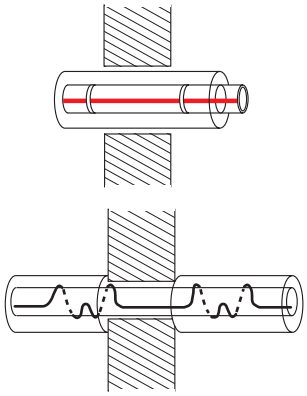


Frost protection at valves:

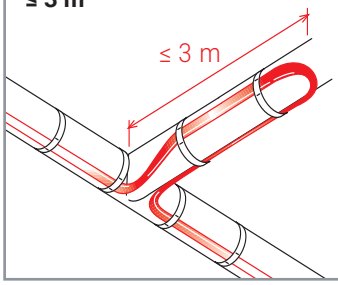
- Valves up to 2" (DN 50) : install the frost protection heating cables in a straight line.
- ≥ 2" : lay as shown
- Always insulate valves

Wall/Floor transit

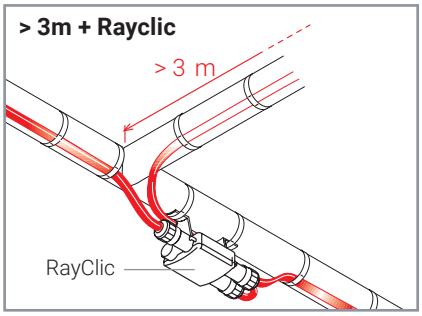
The thickness of insulation must be continuous otherwise compensate by adding heating cable.

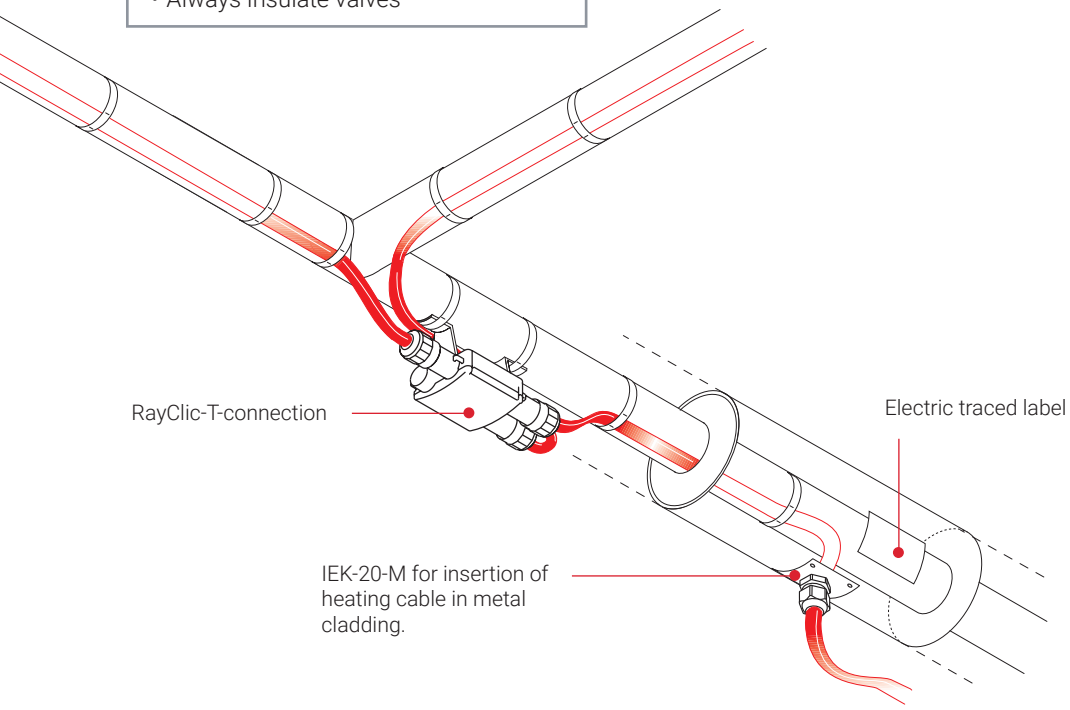


≤ 3 m



> 3m + Rayclic





Frost Protection for Pipes: FS Cables

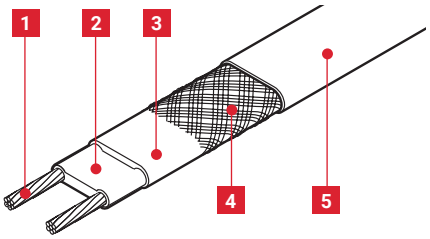
DESIGN GUIDE, CONTROL UNITS AND ACCESSORIES

1 HEATING CABLE SELECTION

Application	
Frost protection for pipework at max. 65°C operating temperature	
FS-A-2X	10 W/m at 5°C
FS-B-2X	26 W/m at 5°C
Frost protection for pipework at max. 95°C operating temperature and temperature maintenance for metal waste pipes with fatty waste water	
FS-C-2X	31 W/m at 5°C
	22 W/m at 40°C
Frost Protection for pipework to maximum 90°C operating temperature. For long circuit applications and central heating pipework.	
FS-C10-2X	10 W/m at 5°C

TraceCalc.Net Construction is a software tool for product selection based on actual project data.

2 COMPOSITION OF THE FS-A/B/C/C10-2X HEATING CABLE



1. Copper conductor (1.2 mm²)
2. Self-regulating heating element
3. Modified polyolefin insulation (FS-C-2X: Fluoropolymer)
4. Protective tinned copper braid
5. Modified polyolefin protective outer jacket.

Note: FS-C10-2X comprises copper conductors (1.4 mm²)

3 PIPE AND INSULATION THICKNESSES

FROST PROTECTION DOWN TO –20°C.

		Pipe diameter											
Insulation	mm	15	22	28	35	42	54	67	76	108	125	150	200
thicknesses	Inches	1/2"	3/4"	1"	5/4"	11/2"	2"	21/2"	3"	4"	5"	6"	8"
10 mm		FS-A-2X FS-C10-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X					
15 mm		FS-A-2X FS-C10-2X	FS-A-2X FS-C10-2X	FS-A-2X FS-C10-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X			
20 mm		FS-A-2X FS-C10-2X	FS-A-2X FS-C10-2X	FS-A-2X FS-C10-2X	FS-A-2X FS-C10-2X	FS-A-2X FS-C10-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X		
25 mm		FS-A-2X FS-C10-2X	FS-A-2X FS-C10-2X	FS-A-2X FS-C10-2X	FS-A-2X FS-C10-2X	FS-A-2X FS-C10-2X	FS-A-2X FS-C10-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X	
30 mm		FS-A-2X FS-C10-2X	FS-A-2X FS-C10-2X	FS-A-2X FS-C10-2X	FS-A-2X FS-C10-2X	FS-A-2X FS-C10-2X	FS-A-2X FS-C10-2X	FS-A-2X FS-C10-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X
40 mm		FS-A-2X FS-C10-2X	FS-A-2X FS-C10-2X	FS-A-2X FS-C10-2X	FS-A-2X FS-C10-2X	FS-A-2X FS-C10-2X	FS-A-2X FS-C10-2X	FS-A-2X FS-C10-2X	FS-A-2X FS-C10-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X
50 mm		FS-A-2X FS-C10-2X	FS-A-2X FS-C10-2X	FS-A-2X FS-C10-2X	FS-A-2X FS-C10-2X	FS-A-2X FS-C10-2X	FS-A-2X FS-C10-2X	FS-A-2X FS-C10-2X	FS-A-2X FS-C10-2X	FS-A-2X FS-C10-2X	FS-**B**-2X	FS-**B**-2X	FS-**B**-2X

Frost protection cables FS-A-2X, FS-B-2X and FS-C10-2X are suitable for any pipe material (copper, threaded pipes, stainless steel pipes, plastic pipes and composite metal pipes without restriction).

For plastic pipes, please use aluminium adhesive tape ATE-180. The frost protection cable should be covered along its entire length. Heat insulation λ = 0.035 W/(m.K) or better.

Important note: frost protection heating cables with fluorpolymer protective jacket must be used for solvent-containing, mixed and/or bitumen-coated heat insulation.

40°C TEMPERATURE MAINTENANCE ON PIPELINES FOR FATTY WASTE WATER

	Pipe diameter (mm)							
Insulation	42	54	67	76	108	125	150	200
thicknesses	11/2"	2"	21/2"	3"	4"	5"	6"	8"
30 mm	FS-**C**-2X							
40 mm	FS-**C**-2X	FS-**C**-2X	FS-**C**-2X					
50 mm	FS-**C**-2X	FS-**C**-2X	FS-**C**-2X	FS-**C**-2X				
60 mm	FS-**C**-2X	FS-**C**-2X	FS-**C**-2X	FS-**C**-2X	FS-**C**-2X	FS-**C**-2X	FS-**C**-2X	FS-**C**-2X

Min. ambient temperature –10°C. Heat insulation λ = 0.035 W/(m.K) or better.

Cable type FS-C-2X should only be used in conjunction with pipework with a minimum continuous temperature resistance of 90°C. A line-sensing control thermostat (type AT-TS-14, RAYSTAT-CONTROL-10 or RAYSTAT-CONTROL-11-DIN) must be used on plastic pipework (setting approx. 40°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
Additional cable required for increased heat sinks at valves from 2" and for uninsulated pipe supports (approx.1 m).

= required heating cable length

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

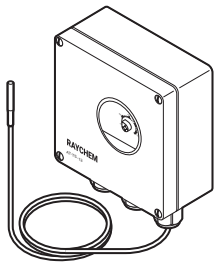
Max. length of the heating circuit is based on a minimum switch-on temperature of 0°C, 230 VAC.

	FS-A-2X	FS-B-2X	FS-C-2X	FS-C10-2X
4 A	45 m	25 m	20 m	45 m
6 A	70 m	35 m	30 m	70 m
10 A	110 m	65 m	55 m	110 m
13 A	130 m	85 m	70 m	130 m
16 A	150 m	105 m	90 m	150 m
20 A	–	–	–	180 m

Note: A splice can also be made using an S-06

6 THERMOSTATS

AT-TS-13

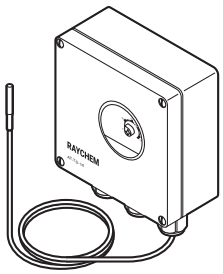


Thermostat

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

Technical data: see page 34

AT-TS-14

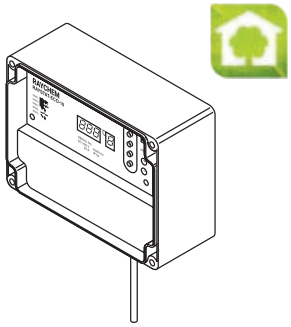


Thermostat

- 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

Technical data: see page 34

RAYSTAT-ECO-10

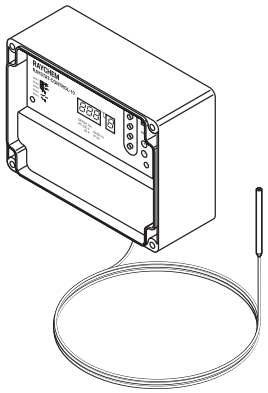


Ambient temperature thermostat

- Adjustable temperature range: 0°C to 30°C
- Max. switching current 25 A, 250 VAC
- PASC (Proportional Ambient Sensing Control) for energy saving
- Alarm relay: 2 A voltfree with indication of sensor errors, voltage errors and low or high temperature alarm.
- Display for visual indication of parameters

Technical data: see page 36

RAYSTAT-CONTROL-10

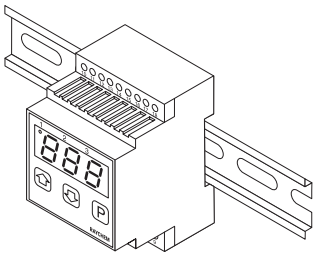


Line-sensing thermostat

- Adjustable temperature range: 0°C to 150°C
- Max. switching current 25 A, 250 VAC
- Alarm relay: 2 A voltfree with indication of sensor errors, voltage errors and low or high temperature alarm.
- Display for visual indication of parameters

Technical data: see page 38

RAYSTAT-CONTROL-11-DIN

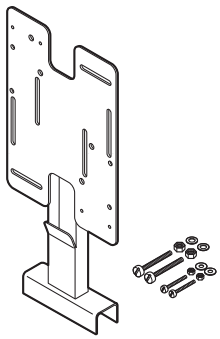


Line sensing thermostat with digital display for DIN rail mounting applications.

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

Technical data: see page 40

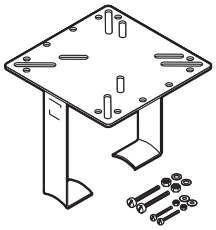
SB-100



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-CONTROL-10

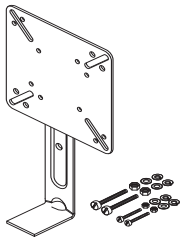
SB-101



Dual-leg support bracket, stainless steel

- Height leg: 160 mm
- For use with AT-TS-13, AT-TS-14, JB16-02 and RAYSTAT-CONTROL-10

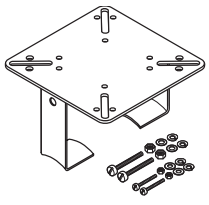
SB-110



Support bracket, stainless steel

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

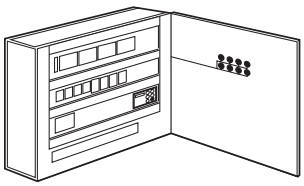
SB-111



Support bracket, stainless steel

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

7 CONTROL PANELS



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. An installation slot is provided for a RAYSTAT-CONTROL-11-DIN, RAYSTAT-CONTROL-10 and/or RAYSTAT-ECO-10 thermostat, each serving 3 heating circuits. Factory fitted. Please contact us for more information.

Technical data: see page 77

SBS-03-SV — **Control panel for 1 to 3 heating circuits.**

- PCN: 355825-000

SBS-06-SV — **Control panel for 4 to 6 heating circuits.**

- PCN: 778308-000

SBS-09-SV — **Control panel for 7 to 9 heating circuits.**

- PCN: 767989-000

SBS-12-SV — **Control panel for 10 to 12 heating circuits.**

- PCN: 1244-000025

Cabinet type			SBS-03-SV	SBS-06-SV	SBS-09-SV	SBS-12-SV
Max. number of heating circuits			3	6	9	12
Enclosure version			Wall version	Wall version	Wall version	Wall version
Dimensions	Width	mm	400	600	800	800
	Height	mm	600	600	800	800
	Depth	mm	210	210	210	210
Weight	approx.	kg	20	30	50	52
Connected rating		kW	11	22	33	42
Customer fuse protection	max.	A	3 x 25A NH-00	3 x 32A NH-00	3 x 63A NH-00	3 x 80A NH-00

When using standard control panels for pipe freeze protection additional control devices need to be installed. Factory fitting is possible. Please contact nVent.

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 control panel.

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

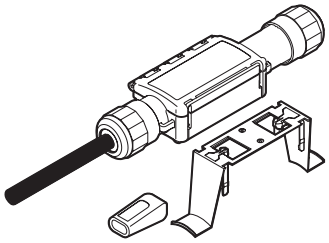
Cabinet type			SBS-02-SNR	SBS-04-SNR	SBS-06-SNR	SBS-08-SNR	SBS-10-SNR	SBS-12-SNR
Number of pipes			1	2	3	4	5	6
Number of heating circuits (Including redundant heating circuit)			2	4	6	8	10	12
Dimensions	Width	mm	600	800	800	800	1000	1000
	Height	mm	600	800	800	1000	1000	1000
	Depth	mm	210	210	210	300	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

8 ACCESSORIES FOR FS-A-2X AND FS-B-2X CABLES

	FS-A-2X / FS-B-2X
Power connection	RayClic-CE-02
Splice	RayClic-S-02
Powered splice	RayClic-PS-02
T-connection	RayClic-T-02
Powered T-connection	RayClic-PT-02
Four way connection	RayClic-X-02

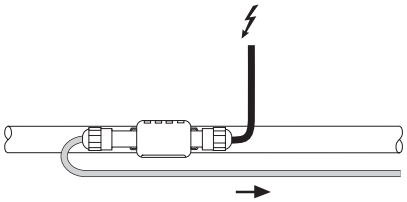
Note: A splice can also be made using an S-06

RAYCLIC-CE-02



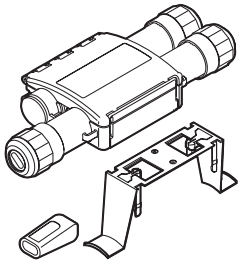
Power connection

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



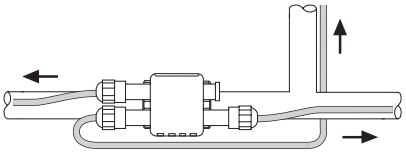
Note: RayClic components are not compatible with FS-C-2X /FS-C10-2X

RAYCLIC-T-02



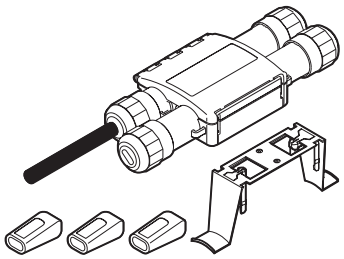
T-connection

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



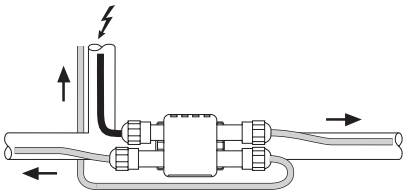
Note: RayClic components are not compatible with FS-C-2X /FS-C10-2X

RAYCLIC-PT-02



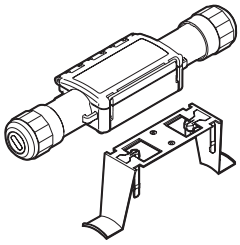
Power T-connection

- 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



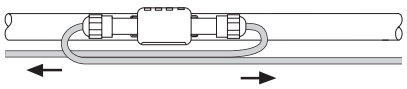
Note: RayClic components are not compatible with FS-C-2X /FS-C10-2X

RAYCLIC-S-02



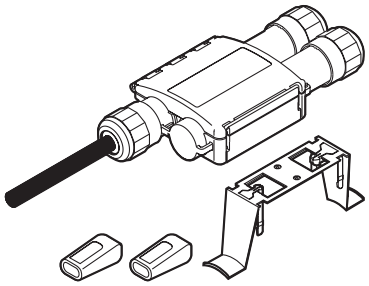
Splice for joining 2 lengths of heating cable

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



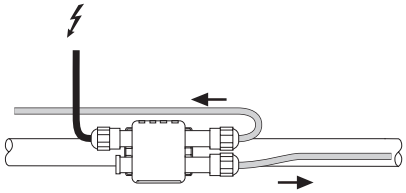
Note: RayClic components are not compatible with FS-C-2X /FS-C10-2X

RAYCLIC-PS-02



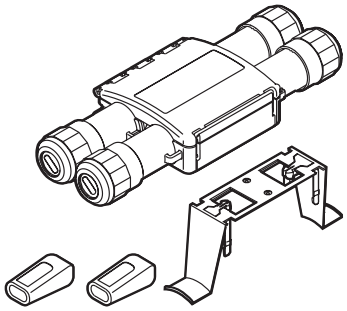
Powered splice

- 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



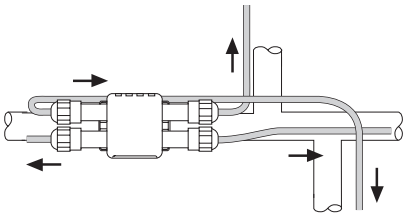
Note: RayClic components are not compatible with FS-C-2X /FS-C10-2X

RAYCLIC-X-02



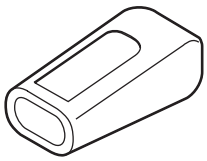
4-way connection

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



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

RAYCLIC-E-02



Gel-filled end seal

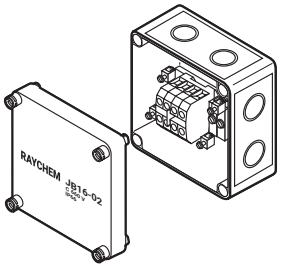
- For system extensions (to be ordered separately)
- IP 68

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

9 ACCESSORIES FOR FS-C-2X AND FS-C10-2X CABLES

			For FS-C-2X/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

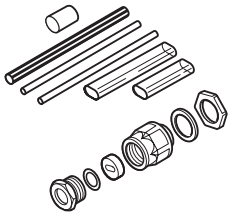
JB16-02



Temperature-resistant junction box

- For power connection
- IP66
- 6 x 4 mm^2 terminals
- 4 x M20, 4 x M25 knock-out entries
- Silicone free

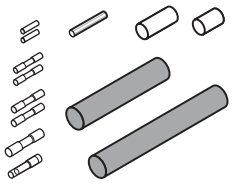
CE20-01



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

- Heat-shrink technique
- M20 gland with silicone grommet

CCE-04-CT

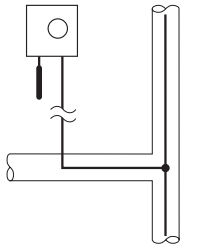


Cold lead connection and end seal kit

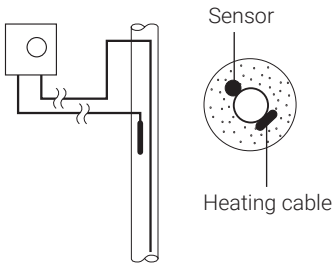
- Connection of 3 x 1.5 mm^2 or 3 x 2.5 mm^2 cold lead cable to self-regulating heating cables FS-C -2X and FS-C10-2X.

10 SPECIAL INSTALLATION INSTRUCTIONS

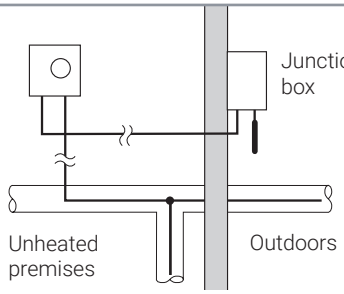
PLACING OF SENSOR



Ambient sensor



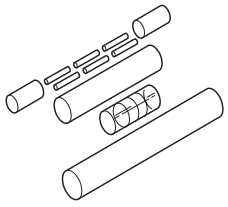
Fasten the pipe sensor to the pipework (e.g. aluminium adhesive tape)



Always place the sensor in the coldest part of the installation

11 GENERAL ACCESSORIES

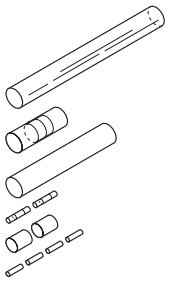
S-06



In-line splice kit

- for FS-A-2X and FS-B-2X

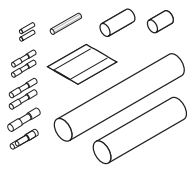
S-19



In-line splice kit

- for FS-C-2X and FS-C10-2X

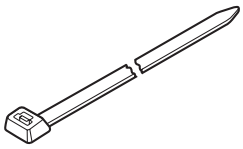
CCE-03-CR



Cold lead connection and end seal kit

- Connection of 3 x 1.5 mm^2 or 3 x 2.5 mm^2 cold lead cable to self-regulating heating cables FS-A-2X and FS-B-2X.

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.

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

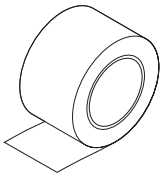
Use ATE-180 on plastic pipes

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

ATE-180

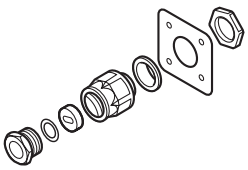


Aluminium adhesive tape

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

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

IEK-20-M



Insulation entry kit

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

LAB-I-01

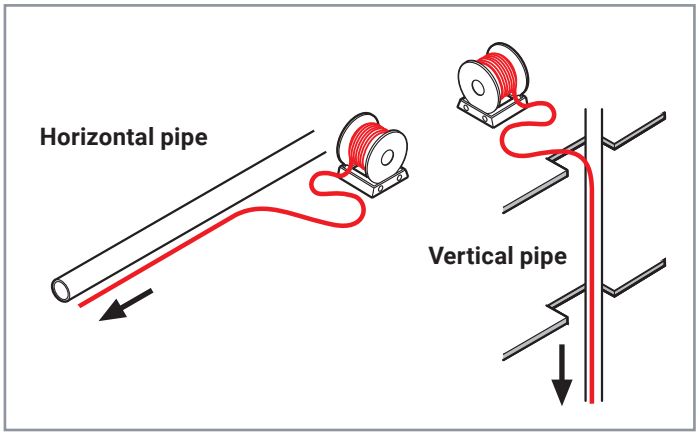
Electric traced label

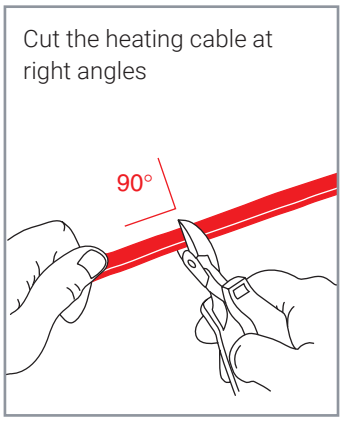
- To be placed at 5 m intervals on insulation surface

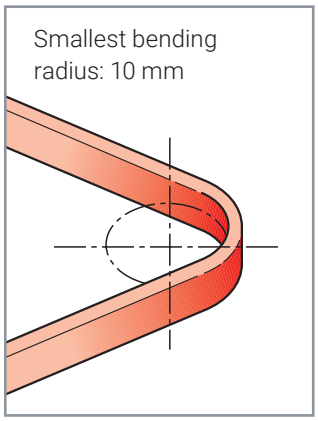
Frost Protection for Pipes

INSTALLATION INSTRUCTIONS FOR FS-A/B/C/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

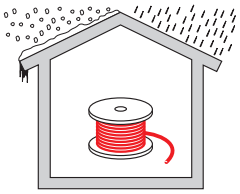






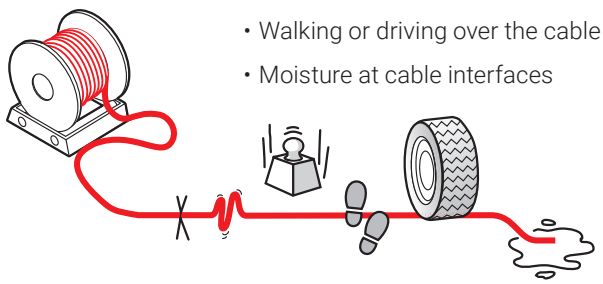
Installation of self-regulating heating cables

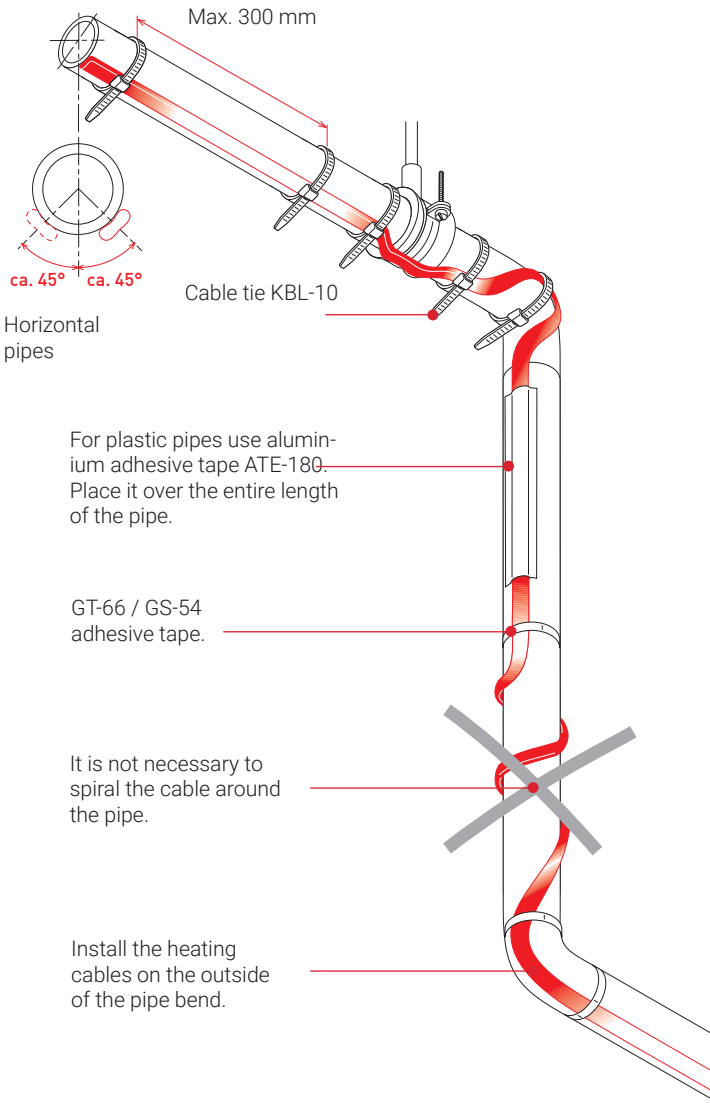
- Store in a dry and clean place
- Temperature range: –40°C to +60°C
- Protect any cable ends with an end seal

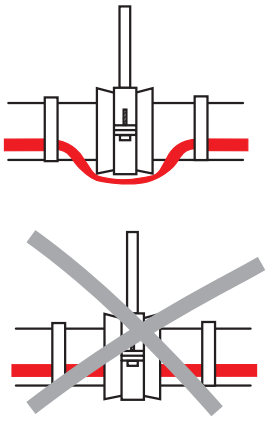


Avoid:

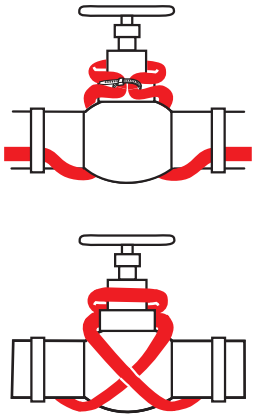
- Sharp edges
- High tractive force
- Kinking and crushing
- Walking or driving over the cable
- Moisture at cable interfaces







- Run the cable over pipe suspensions
- Do not clamp the cable

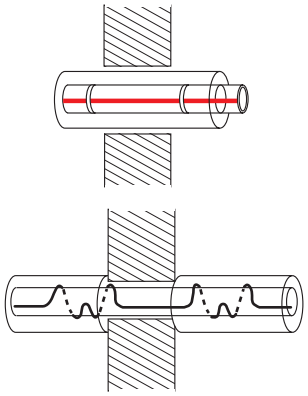


Frost protection at valves:

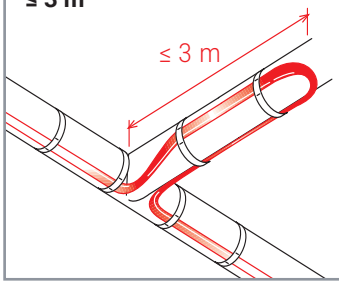
- Valves up to 2" (DN 50) : install the frost protection heating cables in a straight line.
- ≥ 2" : lay as shown.
- Always insulate valves.

Wall/Floor transit

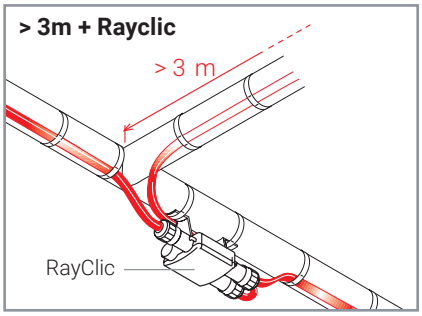
- The thickness of insulation must be continuous otherwise compensate by adding heating cable.

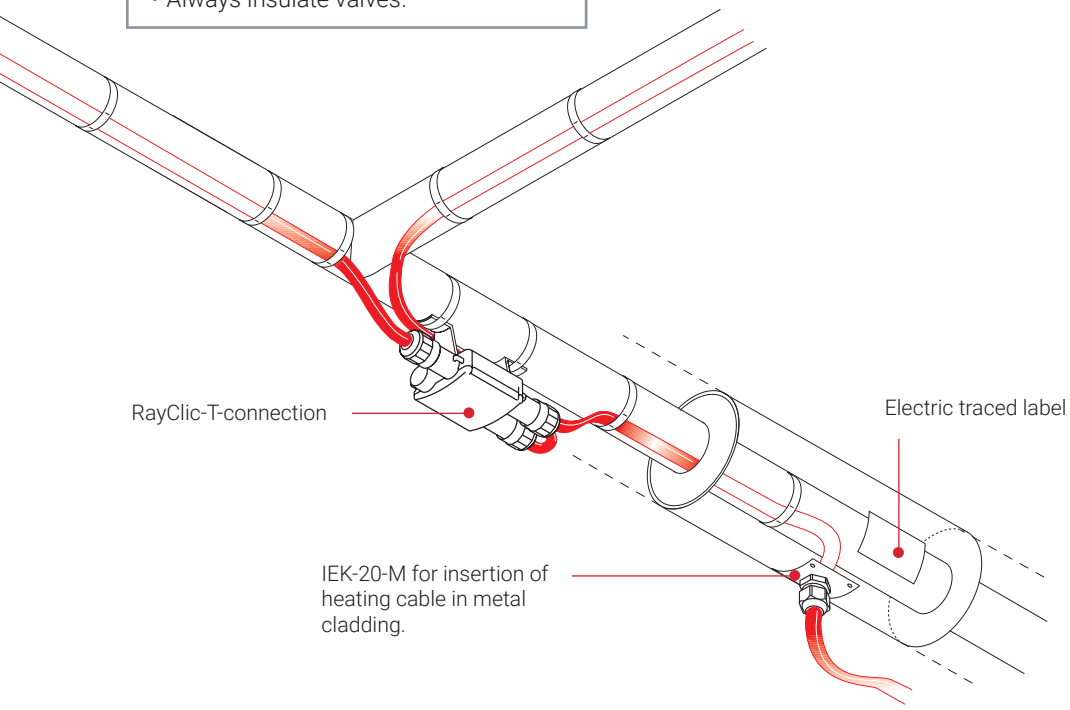


≤ 3 m



> 3m + Rayclic





Snow Melting and Deicing of Gutters and Downpipes

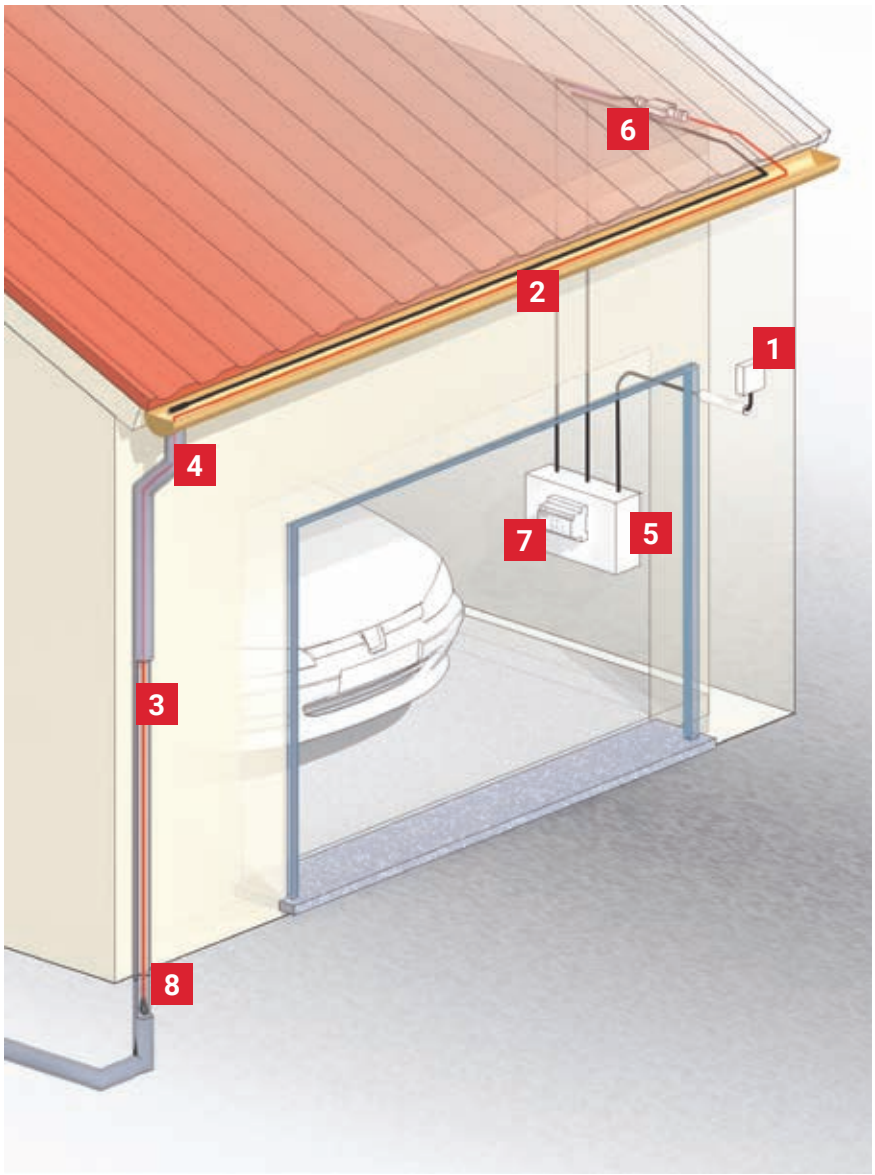
Melting and refreezing of ice can damage roofs and gutters. Heavy icicles may fall and cause injury. Standing water can leak through interior walls onto furnishings. The nVent RAYCHEM self-regulating snow melting system maintains water flow in gutters and drain pipes and provides a path whereby melting 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 EMDR-10 control unit only switches the heating cable on when necessary: after the detection of both low temperature and moisture.



1. Ambient sensor EMDR-10 (incl.)
2. Moisture sensor EMDR-10 (Incl.)
3. Heating cable GM-2X(T)
4. Fixing bracket (GM-RAKE)
5. EMDR-10 Control unit
6. Connection RayClic CE-02
7. Residual current device (rcd 30 mA) Circuit-breaker (C type)
8. End seal (RayClic-E-02)

Design Guide, Control Units and Accesso

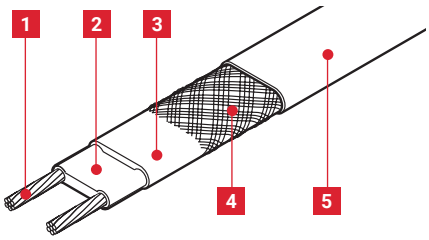
1 HEATING CABLE SELECTION

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 mm^2).
2. Self-regulating heating element.
3. Insulation made of modified polyolefin.
4. Tinned copper braid.
5. Protective jacket (UV-resistent) (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 78

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

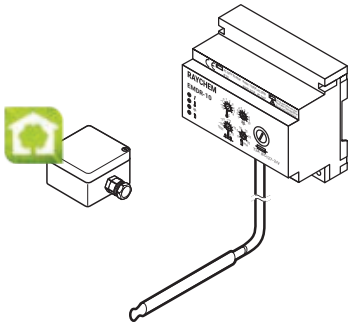
4 ELECTRICAL PROTECTION

- 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

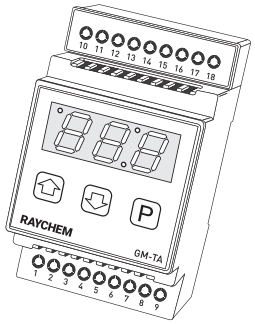
EMDR-10



- With temperature and humidity sensor
- Saves up to 80% energy
- Max. permitted switching current 10 A (otherwise switch via power contactor)
- Alarm relay contact for sensor break, sensor short circuit and power failure.
- PCN: 449554-000

Technical data: see page 77

GM-TA

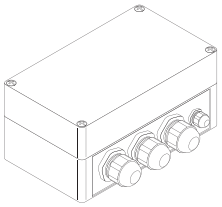


DIN RAIL MOUNTABLE THERMOSTAT

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

GM-TA-OUTDOOR-BOX

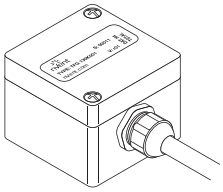


DIN RAIL MOUNTABLE THERMOSTAT

Enclosure box for thermostat GM-TA for outdoor installation

- IP65
- Wall mounted
- Inclusive sensor and DIN-Rail
- PCN: 1244-017966

GM-TA-AS

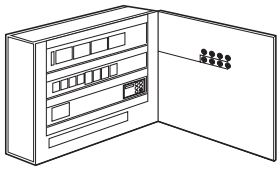


Spare sensor inclusive enclosure for Thermostat GM-TA

Enclosure box for thermostat GM-TA for outdoor installation

- IP65

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 EMDR-10 control unit is installed in each switch cabinet.

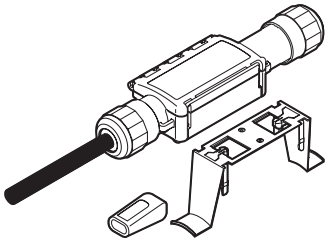
Technical data: see page 77

SBS-03-EV-10	**Control panel up to 3 heating circuits** • PCN: 295014-000
SBS-06-EV-10	**Control panel up to 6 heating circuits** • PCN: 458484-000
SBS-09-EV-10	**Control panel up to 9 heating circuits** • PCN: 206336-000
SBS-12-EV-10	**Control panel up to 12 heating circuits** • PCN: 282458-000

Cabinet type			SBS-03-EV-10	SBS-06-EV-10	SBS-09-EV-10	SBS-12-EV-10
Max. number of heating circuits			3	6	9	12
Enclosure version			Wall version	Wall version	Wall version	Wall version
Dimensions	Width	mm	400	400	600	800
	Height	mm	600	600	600	800
	Depth	mm	210	210	210	210
Weight	approx.	kg	20	30	32	52
Connected rating		kW	14	28	42	56
Fuse protection provided by customer	max.	A	3 x 32A NH-00	3 x 40A NH-00	3 x 63A NH-00	3 x 80A NH-00

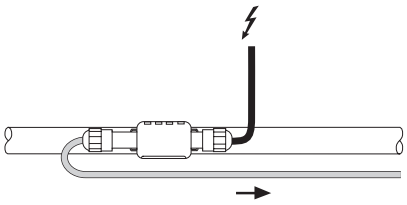
7 ACCESSORIES FOR GM-2X/GM-2XT

RAYCLIC-CE-02

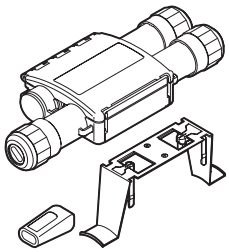


Power connection

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

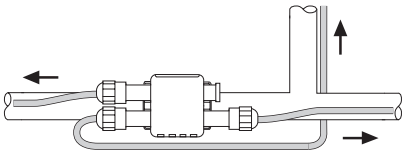


RAYCLIC-T-02

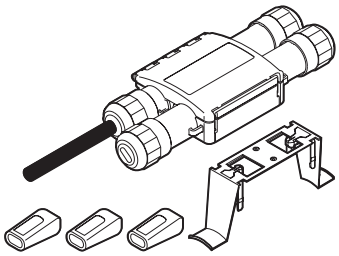


T-connection

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

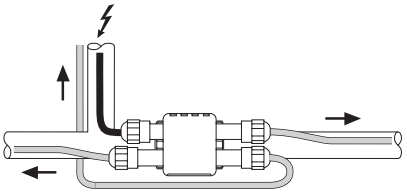


RAYCLIC-PT-02

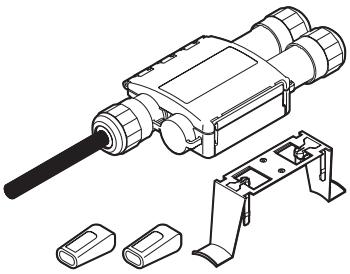


Power T-connection

- 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

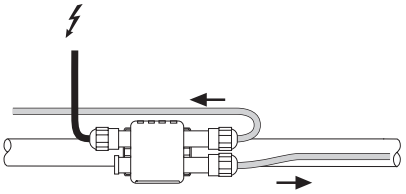


RAYCLIC-PS-02

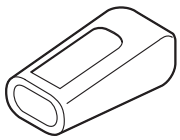


Powered splice

- 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



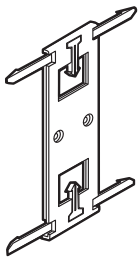
RAYCLIC-E-02



Gel-filled end seal

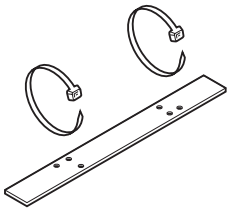
- For system extensions
  (to be ordered separately)
- IP 68

RAYCLIC-SB-02



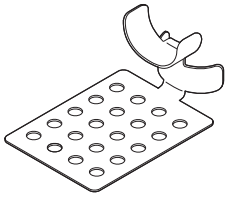
Wall-mounted support bracket

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.

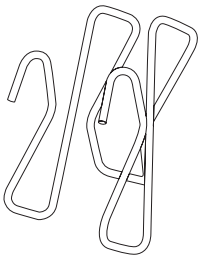
ICESTOP-GMK-RC



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.

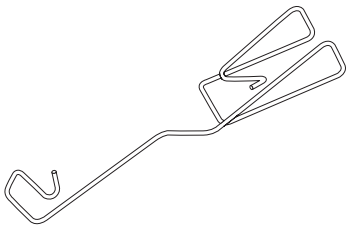
GM-CLIP-S



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

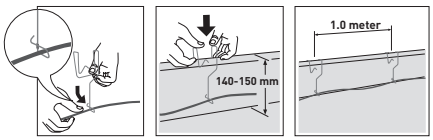
- Material: Stainless steel EN 1.4310
- Wire: Ø 2,5 mm
- Height: 55 mm
- Gutter type: wide funnel with max. Frame size of 10 mm.
- Box content: 10 Clips/box
- PCN: 1244-013849

GM-CLIP-L

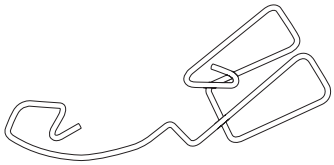


Clip for quick and reliable fixing of heating cable GM-2X and GM-2XT on gutters with L-profile.

- 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



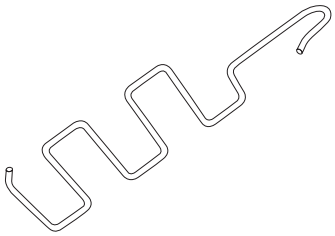
GM-CLIP-M



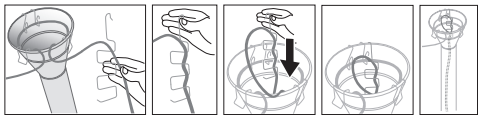
Clip for quick and reliable fixing of heating cable GM-2X and GM-2XT on half round gutters.

- 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

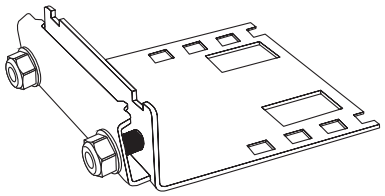


Structural support for wide roof inlet funnel for fast and easy installation of the heating cable GM-2X and GM-2XT.

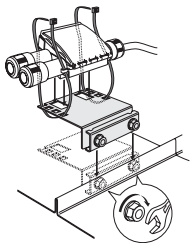


- Material: Stainless steel EN 1.4301
- Wire: Ø 4,0 mm
- Height: 225 mm
- Gutter type: wide funnel with max.
- Frame size of 20 mm
- Suitable for: GM-2X, GM-2XT
- Content box: 5 pcs/box
- PCN: 1244-013852

RAYCLIC-SB-GM-METAL

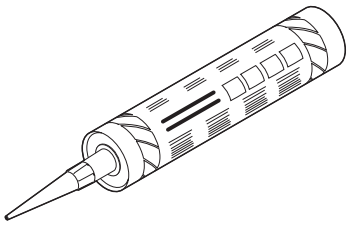


Bracket for mounting on metal standing seam roofs



- 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

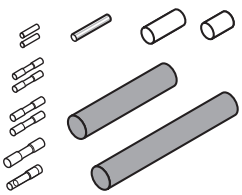
GM-SEAL-02



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

CCE-04-CT

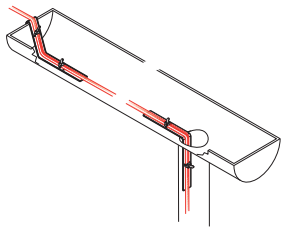


Cold lead connection and end seal kit

- Connection of 3 x 1.5 mm^2 or 3 x 2.5 mm^2 cold lead cable to self-regulating heating cables GM-2X(T).

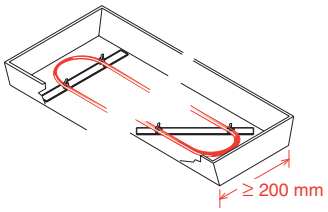
Snow Melting and Deicing of Gutters and Downpipes

INSTALLATION INSTRUCTIONS



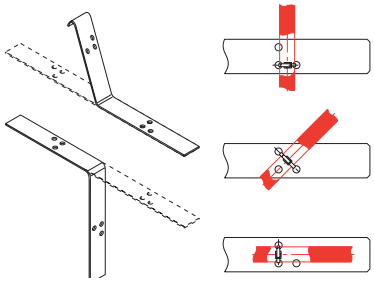
Box gutter < 200 mm

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



Box gutter > 200 mm

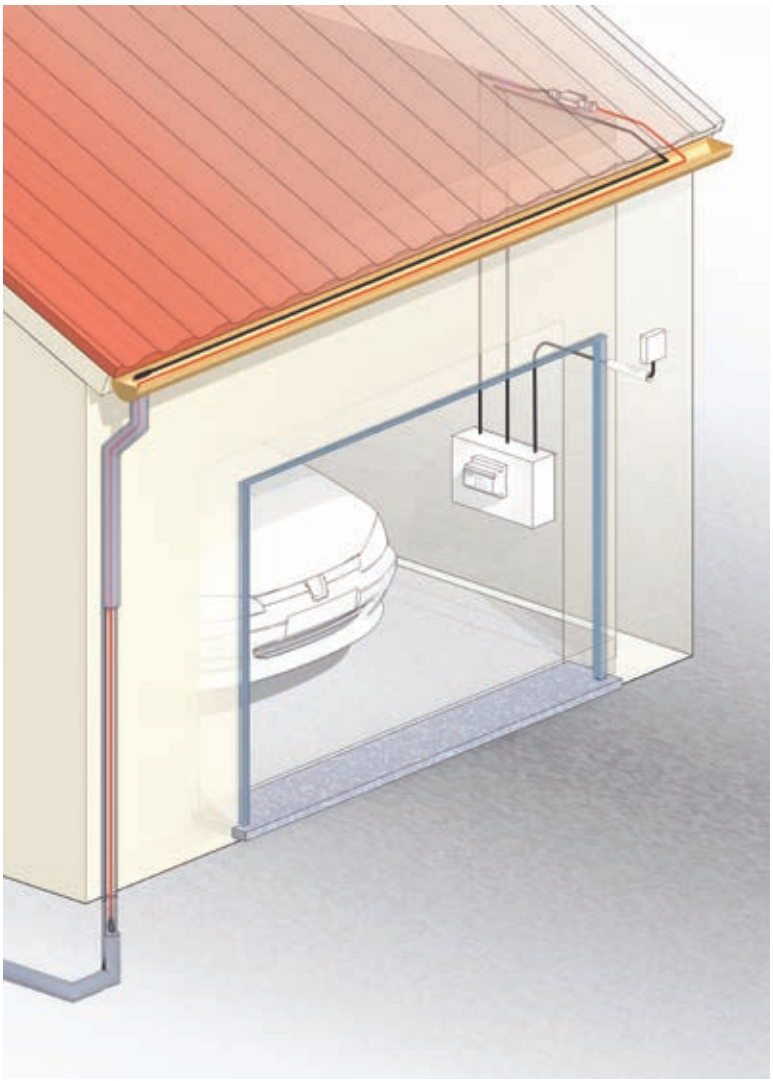
- Multiple heating cables of GM-2X(T)
- 2 pc spacer GM-RAKE per meter of gutter edges: GM-RAKE provides mechanical protection against damages



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 RayClic immersed in water.
Do not bury RayClic in the ground.

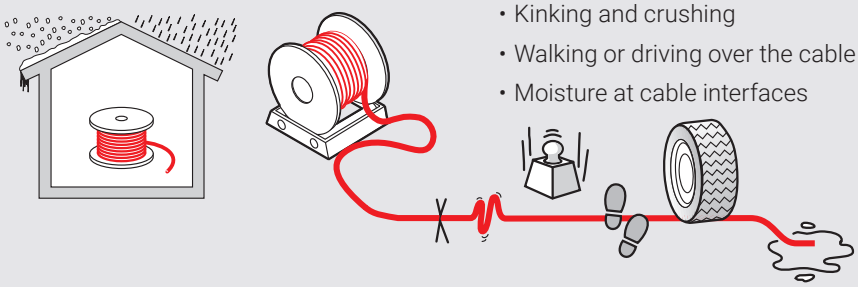


In the drainpipe: always install the cable as far as the frost-free area (approx. 1m deep)

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.
- Temperature range: –40°C to +60°C.
- Protect any cable ends with an end seal.

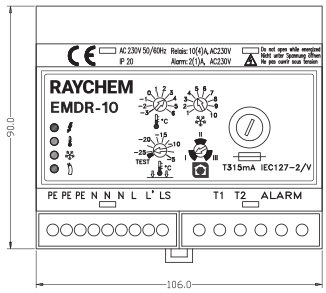


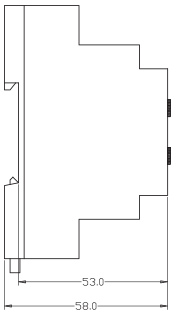
Avoid:

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

Temperature and moisture control unit EMDR-10

TECHNICAL DATA





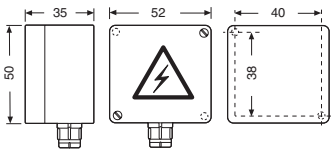
(Dimensions in mm)

Supply voltage	230 VAC, ±10%, 50Hz
Power consumption	Max. 4 VA
Max. switching capacity	I_{max} 10(4)A / 230 VAC, SPST, potential 230 VAC
Temperature adjustment range	–3°C to +6°C (factory setting +2°C)
Lower limit temperature	Test, –25°C to –5°C (factory setting adjustment range –15°C)
Operating differential	±0.5 K
Measuring accuracy	±1.5 K
Moisture adjustment range	1 (max. sensibility) to 10 (min. sensibility) (factory setting 5)
Post heating time	60 minutes (only in temperature range < +1,5°C)
Alarm relay	Imax 2(1)A / 230 VAC, SPDT, potential-free
Moisture sensor (output)	230 VAC, with fuse 5 x 20mm T 315mA according to IEC127-2/V
Mounting	DIN rail according to DIN EN 50022-35
Low voltage directive	EN 60730
EMC	EN 50081-1 (emission) and EN 50082-1 (immunity)
Terminals	2.5 mm² (stranded conductors), 4 mm² (solid conductors)
Protection class	II (panel mounted)

HOUSING

Ambient temperature range	0°C to +50°C
Ingress protection	IP20
Housing material	Noryl (self-extinguishing according to UL 94 V-0)
Weight	Approx. 350 g

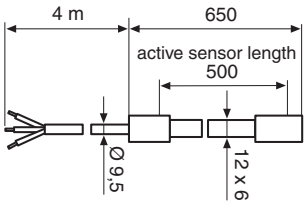
AMBIENT TEMPERATURE SENSOR (VIA-DU-A10)



PG9 (Dimensions in mm)

Sensor type	PTC (FL 103)
Ingress protection	IP54
Terminals	2.5 mm²
Sensor cable	2 x 1.5 mm², max. 100 m (not included)
Exposure temperature	–30°C to +80°C
Mounting	Wall mounting

MOISTURE SENSOR (HARD-45)

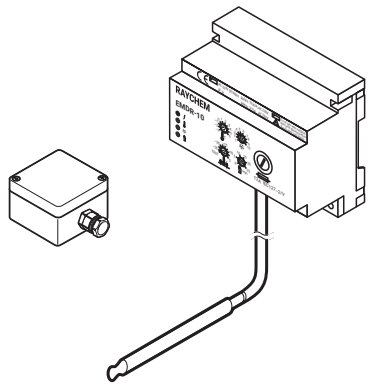


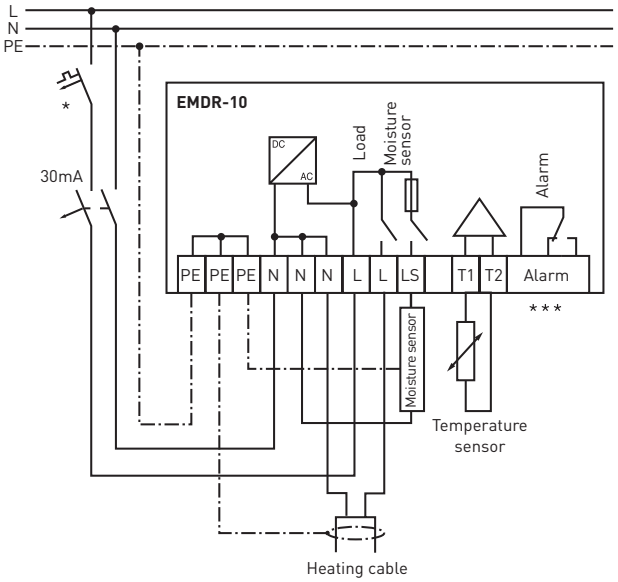
(Dimensions in mm)

Sensor type	PTC
Power consumption	9 W to 18 W
Ambient temperature range	–30°C to +65°C continuous
Supply voltage	230 VAC, ±10%, 50Hz
Connection cable	3 x 1.5 mm², 4 m, the connection cable can be extended to max. 100 m at 3 x 1.5 mm

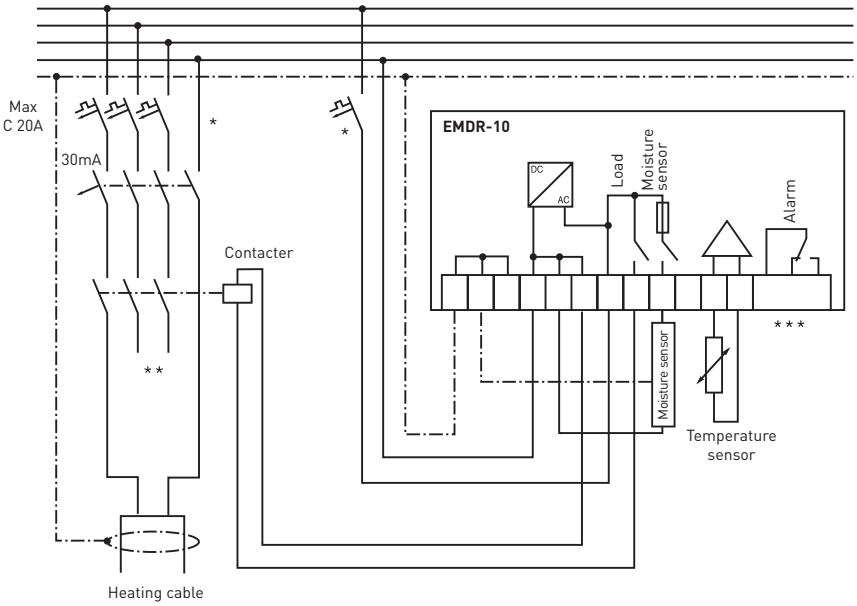
Wiring Diagram for EMDR-10

EMDR-10 WITHOUT CONTACTOR





EMDR-10 WITH CONTACTOR



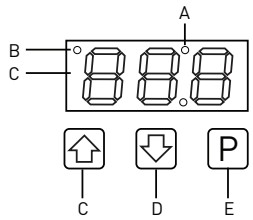
* Two- or four-pole electrical protection by circuit breaker may be needed for local circumstances, standards and regulations.

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

*** Potential-free alarm contacts for connection to the BMS.

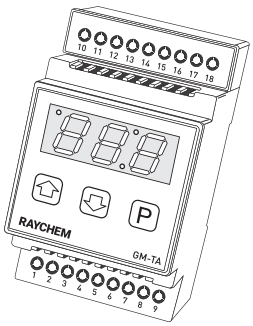
Thermostat GM-TA for Temperature Control

DISPLAY



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

TECHNICAL DATA



Supply voltage	230 Vac, +10%/–10%, 50 Hz
Relay output heating cable Relay output alarm	230 Vac, max 16 A 230 Vac, max 8 A, switch-over contact, potential-free
Power consumption	Max. 5 VA
Terminal size	2,5 mm², 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

PROGRAMMABLE PARAMETER

		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	

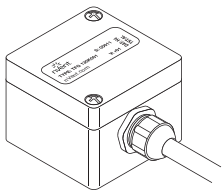
ERROR MESSAGING

Sensor	Sensor short circuit Sensor open loop

HOUSING

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

TEMPERATURE SENSOR



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

APPROVALS

CE, RoHS & REACH

SYSTEM INFORMATION

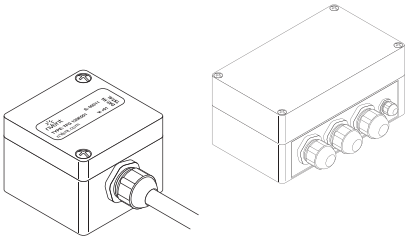
nVent RAYCHEM GM-TA thermostat is designed for use with heating cables GM-2X(T).
Maximum circuit length: 30 m.

ORDERING INFORMATION

Product: GM-TA
PCN: 1244-017783

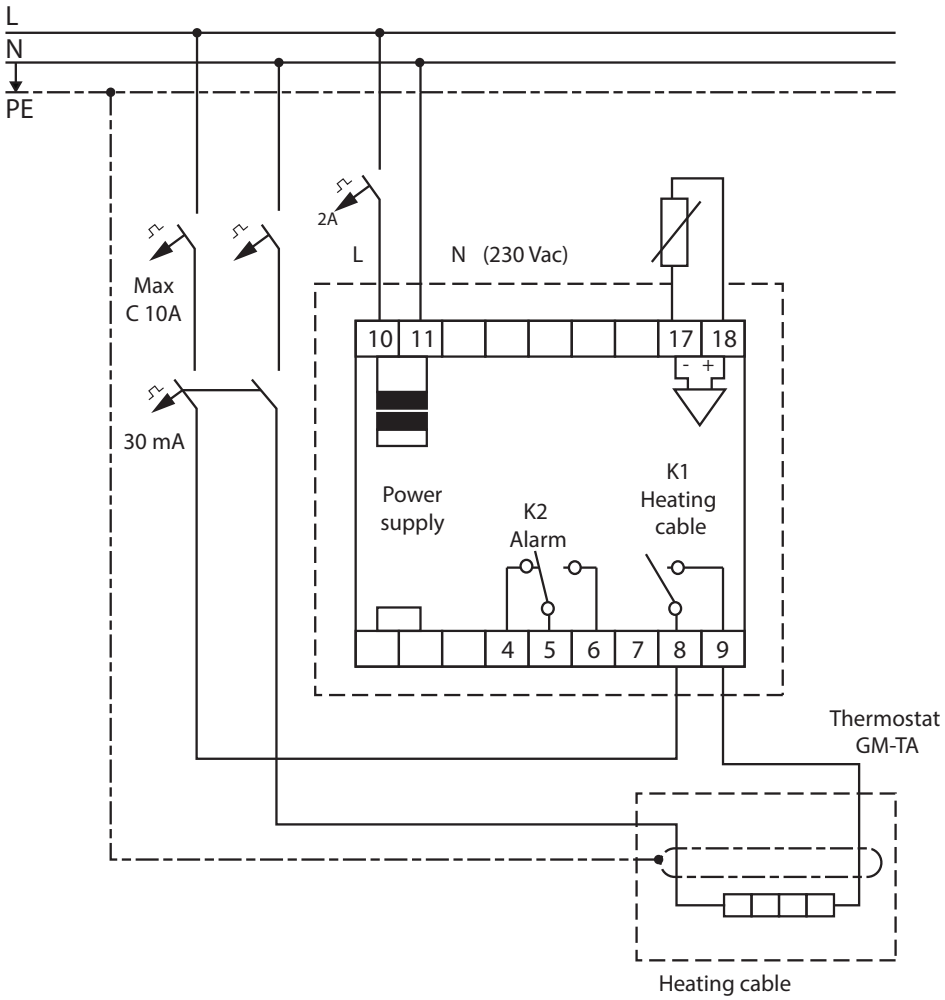
ACCESSORIES

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 SCHEME



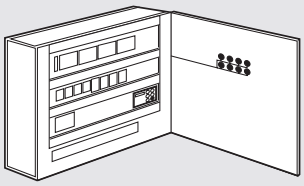
Snow Melting for Ramps, Access Ways, and Footpaths

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

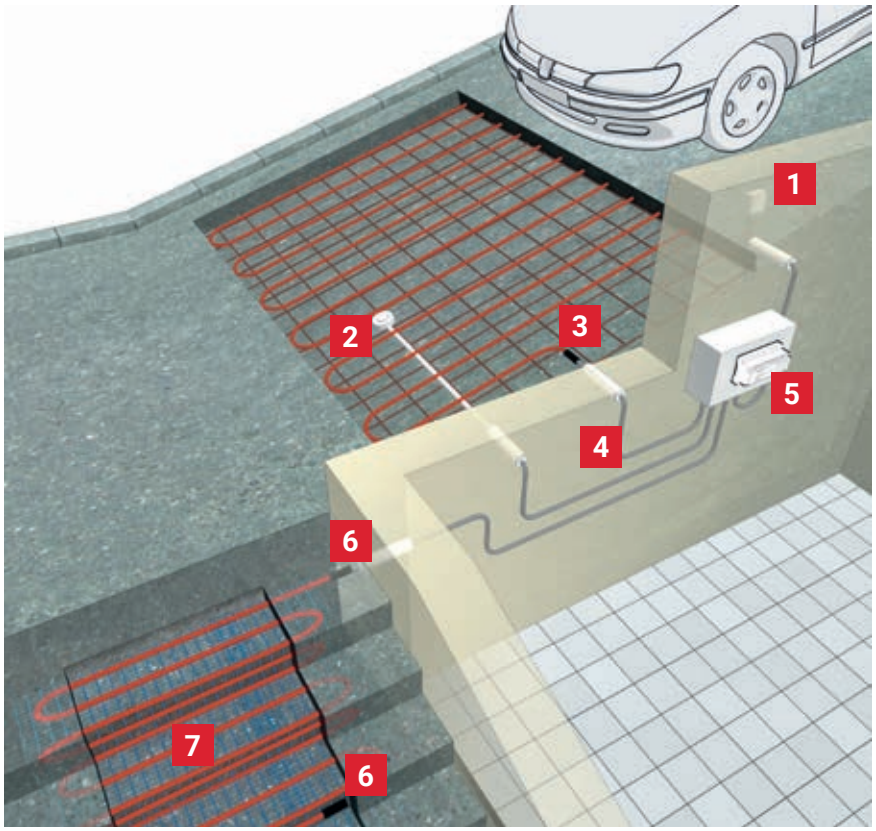
APPLICATION IN CONCRETE

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

Each nVent 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 (VIA-DU-20) is compatible with all ramp snow melting solutions.



Optional: SBS-xx-VV-20/SBS-xx-CW-40/ SBS-xx-CM-20
Contains: Control panel with RCD (30 mA), Circuit Breaker (C type), mains contactor for VIA-DU 20 control unit.



1 Ambient temperature sensor* VIA-DU-A10 (incl.)

2 Temperature and moisture sensor VIA-DU-S20

3 Connection and end seal kit (VIA-CE1)

4 Connection cable (VIA-L1)

5 Control unit (VIA-DU-20)

6 Connection and end seal kit (VIA-CE1)

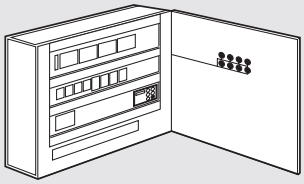
7 Self-regulating heating cable (EM2-XR) or constant power heating cable (EM4-CW)

* Optional, only needed when “local detection” is selected.

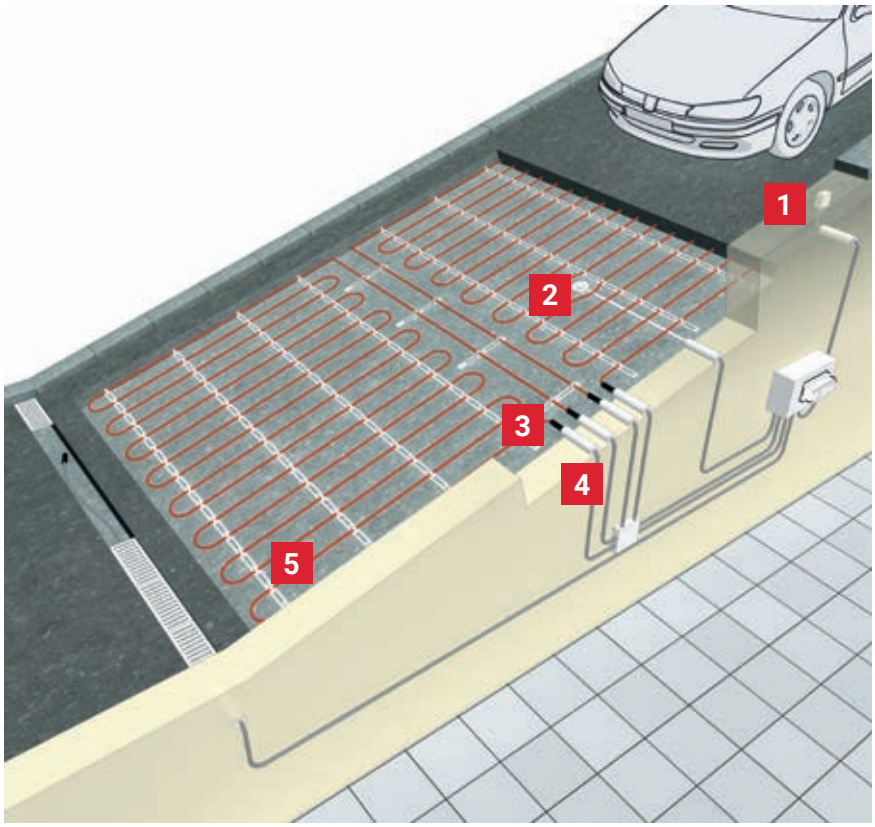
NVENT RAYCHEM SOLUTIONS FOR CONCRETE

	Product	Description
Reinforced concrete surfaces	EM2-XR	Self-Regulating heating cable for reinforced concrete ramps
Domestic and light commercial ground heating applications.	EM2-CM	Pre-terminated constant wattage heating mat for ramp, pavement and track heating
Stairs; wheelchair access ramps	EM4-CW	400V Pre-terminated constant wattage heating cable solution for larger concrete areas and stairs

APPLICATION IN ASPHALT



Optional: SBS-xx-MV-20
Contains: control panel with RCD (300 mA), circuit breaker (C characteristics) Mains contactor for VIA-DU-20 control unit.



1 Ambient temperature sensor* VIA-DU-A10 (incl.)

2 Temperature and moisture sensor VIA-DU-S20

3 Connection between heater cable and cold lead (Pre-engineered)

4 Pre-engineered cold lead

5 Mineral-Insulated heating cable (EM2-MI)

6 Control unit (VIA-DU-20)

* Optional, only needed when “local detection” is selected.

FOR MORE INFORMATION

Order the Surface Snow Melting Handbook **(Pcn 1244-010069)** or go to **nVent.com**

Electrical Underfloor Heating

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

5 GOOD REASONS TO CHOOSE NVENT 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 NVENT RAYCHEM UNDERFLOOR HEATING RANGE COMPRISES:

- T2Red: The innovative and unique self-regulating floor heating cable.
- 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.
- T2Green: the low output heating cable designed specially for very well insulated and near zero energy houses.
- CeraPro: The ultra thin, robust, under tile heating cable solution with "Tape & Mesh" fixing accessories included.
- "Smart" thermostats which offer zoned, programmable heating control, a requirement of Part L of the building regulations.
- A complete range of installation accessories and components including:
  - Floor primers
  - Adhesives
  - Fixing accessories

SMART SERVICES FOR FLOOR HEATING DESIGN AND SPECIFICATION

nVent offers a comprehensive design and specification service for consultants and architects, free of charge.

Using bespoke floor heating design software, we provide:

- Optimised installation plans for the designer and installer in 2 & 3 dimensional views.
- Zone by zone product data including heat output per room and per m^2 in the room.
- Detailed bill of materials, optimised by the software to minimise waste.

With a design proposal complete, we provide specification support to ensure quality procurement.

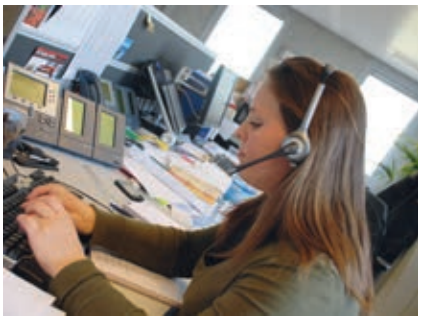
ONLINE SUPPORT

Design and specification tools are available at:

www.raychemfloorheating.co.uk

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

LOCAL EXPERT TEAM SUPPORT



The nVent 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 nVent 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 nVent 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 **nVent.com**

Multiple Application Control & Monitoring System

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

NVENT RAYCHEM ACS-30

The nVent 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 nVent 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-UIT2

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-UIT2 unit is designed for indoor use in non-hazardous location installations.

ACS-30-EU-PCM2

(Power & Control Module)

6 Version available as standard:

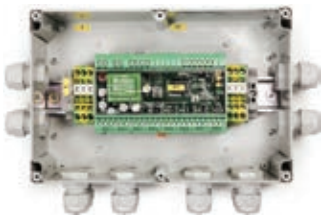
- 5, 10, and 15 circuit control per panel
- 20A or 32A switching capacity per circuit available.
- Power connection, control, and power distribution to the heat tracing circuits.
- Robust enclosure is approved for non-hazardous installation indoor.
- PCM provides connection to the incoming power supply 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-MONI-RMM2-E



PCN: 1244-012867

- 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-UIT2.
- 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-MONI-RMM2-E module comes pre-installed inside a compact enclosure.

ACS-30-EU-EMDR-10-MOD

PCN: 1244-012865

- External Sensor device for Gutter snow melting & de-icing applications.
- Provides smart sensor input for roof & gutter de-icing applications.
- Temperature & moisture sensing input 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.
- 4 m external temperature and moisture sensor to be positioned at the heated surface. The sensor cold lead cable can be extended to a maximum length of 100 m (using 3 x 1.5 mm^2 cable.)
- The output from the ACS-30-EU-EMDR-10 module enables the switching of the heating circuits within the power & control module (PCM).

ACS-30-EU-VIA-DU-20-MOD

PCN: 1244-012866

- External Sensor device for ground surface snow melting applications.
- Provides smart sensor input for surface snow melting and de-icing applications.
- The module provides ground temperature and moisture sensing for the ACS-30 control system.
- Positioned near to the heated area and is connected to the PCM module via a 3-wire cable.
- Provided with a 15 m external ground temperature and moisture sensor to be positioned at the heated surface.
- The output from the ACS-30-EU- VIA-DU-20-MOD enables the switching of the heating circuits within the power & control module (PCM).

PROTONODE-RER-10K

PCN: P000001983

The nVent RAYCHEM ProtoNode is an external, high performance multi-protocol gateway for customers needing protocol translation between Building Management Systems (BMS) using BACnet® or Metasys® N2 and the nVent RAYCHEM ACS-30 or TTSIM controllers.

- The most flexible and versatile multi-protocol device server on the market.
- BACnet International's BTL Certification makes the ProtoNode-RER the most reliable gateway on the market.
- Multi-client and multi-server support ensures interoperability between any Industrial and or Building Automation protocols.
- Flash upgradable.

General Installation Instructions

Note: Installation and operation information is separately available from nVent 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)

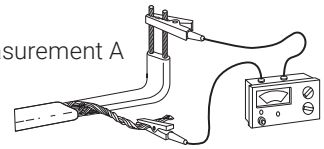
CIRCUIT PROTECTION, TESTING AND OPERATION FOR ALL SYSTEMS

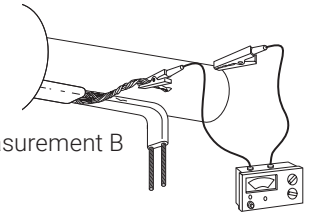
Circuit protection

- 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


Measurement A


Measurement B

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. nVent 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.

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 nVent 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 at 45°C	9 W/m at 55°C	12 W/m at 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	215 m	160 m	135 m	115 m
Min. bending radius	10 mm	10 mm	10 mm	10 mm	10 mm	10 mm	10 mm
Max. continous 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 / VDE						
Control units	HWAT-T55 (for branch lines up to 50m only)	HWAT-ECO** HWAT-T55 (for branch lines up to 50m only)	HWAT-ECO** HWAT-T55 (for branch lines up to 50m only)	AT-TS-13, AT-TS-14, RAYSTAT-ECO-10, RAYSTAT-CONTROL-10, RAYSTAT-CONTROL-11-DIN, SBS-xx-SV panels, ACS-30	AT-TS-13, AT-TS-14, RAYSTAT-ECO-10, RAYSTAT-CONTROL-10, RAYSTAT-CONTROL-11-DIN, SBS-xx-SV panels, ACS-30	AT-TS-13, AT-TS-14, RAYSTAT-ECO-10, RAYSTAT-CONTROL-10, RAYSTAT-CONTROL-11-DIN, SBS-xx-SV panels, ACS-30	AT-TS-13, AT-TS-14, RAYSTAT-ECO-10, RAYSTAT-CONTROL-10, RAYSTAT-CONTROL-11-DIN, SBS-xx-SV panels, ACS-30
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

* For max circuit, Raystat controller will be required. **

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	IP54
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 to 400V/230V, 50 Hz, with N and PE

Technical Data

CHOICE OF HEATING CABLES

	Frost protection for pipes FS cables				Frost protection for gutters and downpipes	Surface Snow Melting
Cable type	FS-A-2X	FS-B-2X	FS-C-2X	FS-C10-2X	GM-2X/GM-2XT	EM2-XR
Colour					Matt/Glossy	
Nominal voltage	230 VAC	230 VAC	230 VAC	230 VAC	230 VAC	230 VAC
Nominal power output (*on insulated metal pipes)	10 W/m at 5°C	26 W/m at 5°C	31 W/m at 5°C 22 W/m at 40°C	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. 16 A	max. 16 A	max. 16 A	max. 20 A	max. 20 A	max. 50 A
Max. circuit length	150 m 16 A	105 m 16 A	90 m 16 A	180 m 20 A	80 m 20 A	85 m 50 A
Min. bending radius	10 mm	10 mm	10 mm	10 mm	10 mm	50 mm
Max. continous exposure temperature	65°C	65°C	95°C	90°C	65°C	100°C
Max. exposure temperature (power-on condition – 800 h. cumulative)	85°C	85°C	95°C	90°C	85°C	110°C
Max. dimensions in mm (W x H)	13.7 x 6.2	13.7 x 6.2	12.7 x 5.3	16 x 6.8	13.7 x 6.2	18.9 x 9.5
Weight	0.13 kg/m	0.13 kg/m	0.13 kg/m	0.14 kg/m	0.13 kg/m	0.27 kg/m
Approvals	BS / ÖVE / VDE / SEV / CSTB / SVGW / DVGW / CE / VDE					
Control units	AT-TS-13 AT-TS-14 RAYSTAT-CONTROL-10 RAYSTAT-ECO-10** RAYSTAT-CONTROL-11-DIN	AT-TS-13 AT-TS-14 RAYSTAT-CONTROL-10 RAYSTAT-ECO-10** RAYSTAT-CONTROL-11-DIN	AT-TS-13 AT-TS-14 RAYSTAT-CONTROL-10 RAYSTAT-CONTROL-11-DIN	AT-TS-13 AT-TS-14 RAYSTAT-CONTROL-10* RAYSTAT-ECO-10** RAYSTAT-CONTROL-11-DIN	EMDR-10** GM-TA model	VIA-DU-20** RAYSTAT-M2
CONNECTION SYSTEM:						
Junction box	–	–	JB16-02	JB16-02	–	VIA-JB2
Connection kit	RayClic	RayClic	CE20-01	CE20-01	RayClic	VIA-CE1
Support bracket	Included in the kit	Included in the kit	JB-SB-08	JB-SB-08	Included in the kit	–

* For max circuit, Raystat controller will be required. **

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 mm²	3 x 2,5 mm²	3 x 4 mm²	3 x 6 mm²
10	10XL2-ZH	140	40	66	106	159
	15XL2-ZH	90	41	69	110	165
	26XL2-ZH	80	27	45	71	107
	31XL2-ZH	67	27	45	72	107
13	10XL2-ZH	195	29	48	76	114
	15XL2-ZH	120	31	52	83	124
	26XL2-ZH	110	19	32	52	78
	31XL2-ZH	88	20	34	54	82

C-type Circuit Breaker (Ampères)	Cable type	Max. Circuit length (m)	Max. length of the power cable			
			3 x 1,5 mm²	3 x 2,5 mm²	3 x 4 mm²	3 x 6 mm²
16	10XL2-ZH	215	11	43	69	104
	15XL2-ZH	155	24	40	64	96
	26XL2-ZH	135	16	26	42	64
	31XL2-ZH	110	16	27	44	65
20	10XL2-ZH	215	11	43	69	104
	15XL2-ZH	160	23	39	62	93
	26XL2-ZH	135	16	26	42	64
	31XL2-ZH	118	15	25	41	61

Parameters

- Power max window W/m at 5°C (+20%)
- 3% acceptable voltage drop

C-type Circuit Breaker (Ampères)	Cable type	Max. Circuit length (m)	Max. length of the power cable					
			3 x 1,5 mm²	3 x 2,5 mm²	3 x 4 mm²	3 x 6 mm²	3 x 10 mm²	3 x 16 mm²
10	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-A-2X/FS-C10-2X	110	50	85	135	205	n.a.	n.a.
	FS-B-2X	65	40	70	110	165	n.a.	n.a.
	FS-C-2X	55	45	75	115	175	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.
13	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-A-2X/FS-C10-2X	130	45	70	115	175	n.a.	n.a.
	FS-B-2X	85	30	55	85	125	n.a.	n.a.
	FS-C-2X	70	35	60	95	140	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	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-A-2X/FS-C10-2X	150	40	65	100	150	n.a.	n.a.
	FS-B-2X	105	25	45	70	105	n.a.	n.a.
	FS-C-2X	90	30	45	70	110	n.a.	n.a.
	GM-2X/GM-2XT	60	30	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	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.

n.a. = Not applicable

n.p. = Not permitted

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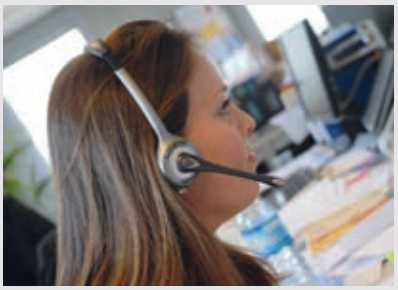

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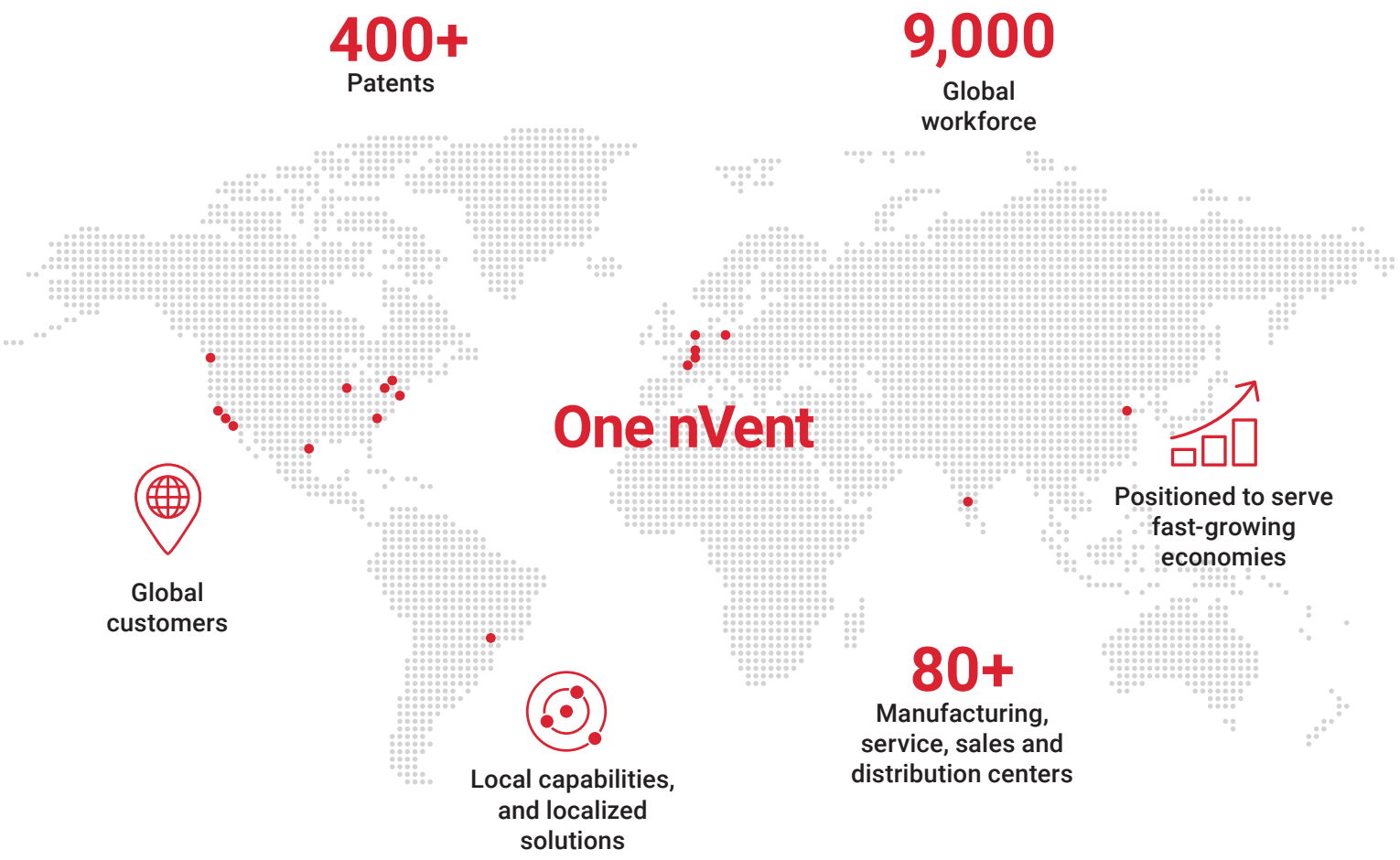

United Kingdom
Tel 0800 969 013
Fax 0800 968 624
salesthermaluk@nvent.com

Ireland
Tel 1800 654 241
Fax 1800 654 240
salesie@nvent.com

South East Asia
Tel: +65 67685800
Fax: +65 67322263

Australia
Tel: +61 2 97920250
Fax:+61 2 97745931

India - Noida
Tel: +91 120 464 9500
Fax: +91 120 464 9548
ntminfome@nvent.com

India - Mumbai
Tel: +91 22 6775 8800/01
Fax: +91 22 2556 1491
ntminfome@nvent.com

UAE
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