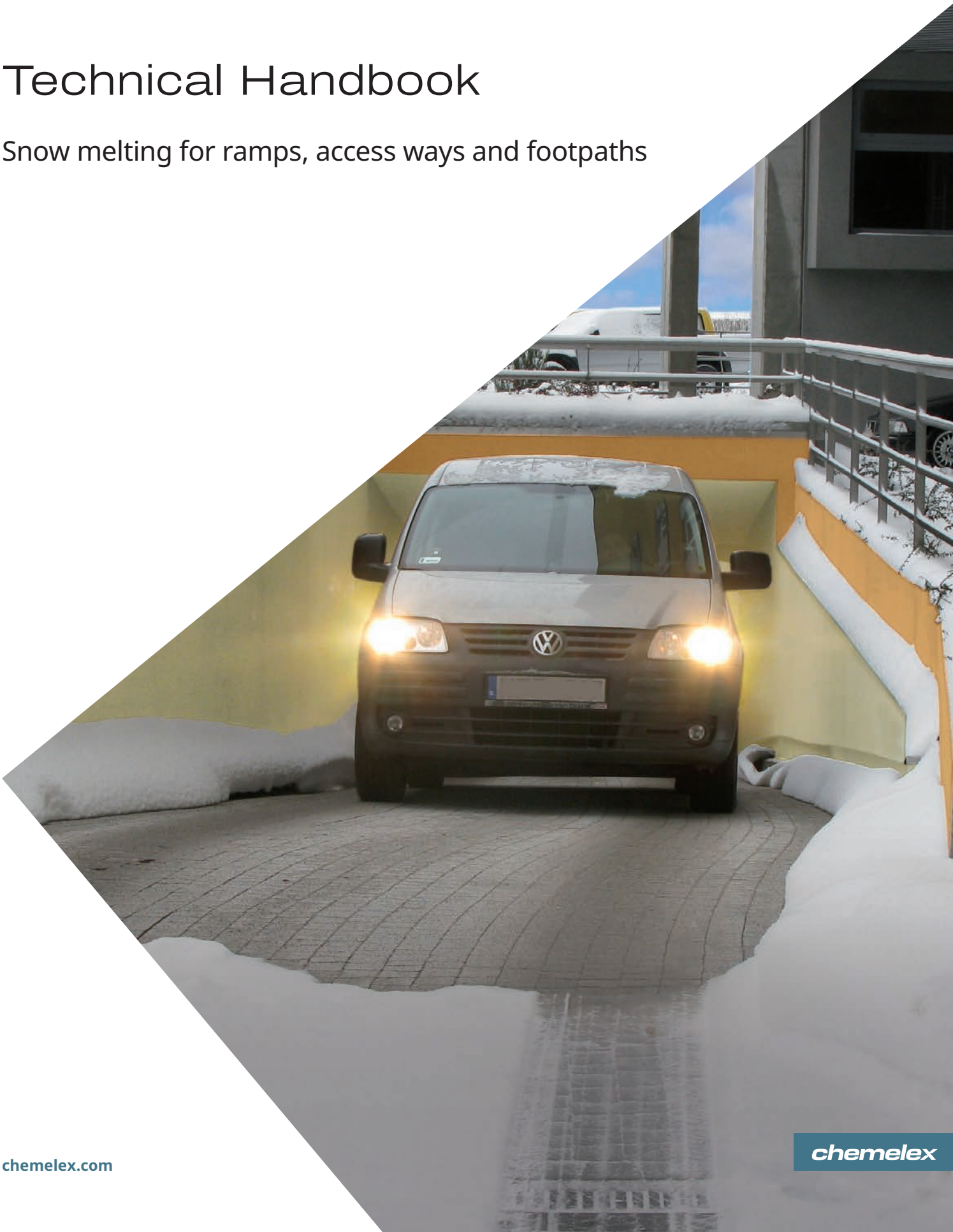
Raychem

excellence is everything

Technical Handbook

Snow melting for ramps, access ways and footpaths



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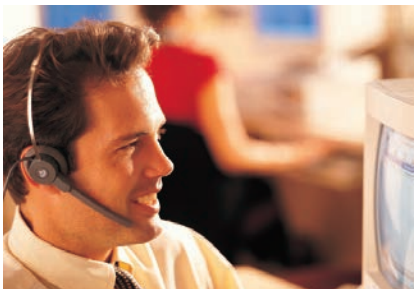
Why Raychem?

Raychem products and services simplify the design and specification of the highest quality products, broadest product portfolio and unrivalled customer support services.

LARGE TECHNICAL SUPPORT TEAM

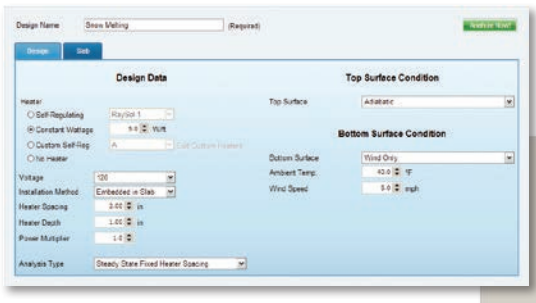
- Site services for efficient project execution.
- Building Information Modelling (BIM) content for system design, project execution, and asset management.
- “On demand” technical advice
- Free design and quotation
- Direct support to specifiers and installers
- Training support on request
- Complete 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.

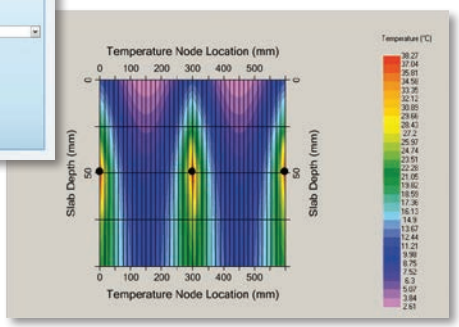


ENSURING A SNOW & ICE FREE SURFACE WITH ANY GROUND PROFILE

The ground profile of a heated surface can vary greatly from project to project. As a consequence, the system design and power requirements can also vary significantly.

To ensure the correct amount of power is installed in the ground surface for safety and energy efficiency, Raychem can provide a “Slabheat™” finite element analysis of the surface profile prior to installation. This allows the heater selection, spacing, and depth to be tailored to the precise needs of the ground profile.





Overview of Applications

Why Surface Heating Systems?

Ice and snow on paths, loading bays, driveways, ramps, stairs and other access ways, can present a major problem causing accidents and delays. To help prevent this liability, Raychem provides a complete range of surface heating solutions to prevent snow and ice formation.

The Raychem range of products has been specifically designed to meet the requirements of commercial, industrial, and residential applications. Whether in concrete, sand, or asphalt, a Raychem system exists to provide a fast, reliable, and easy-to-install solution.

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

APPLICATION IN CONCRETE

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

Temperature and moisture sensor E650C-G

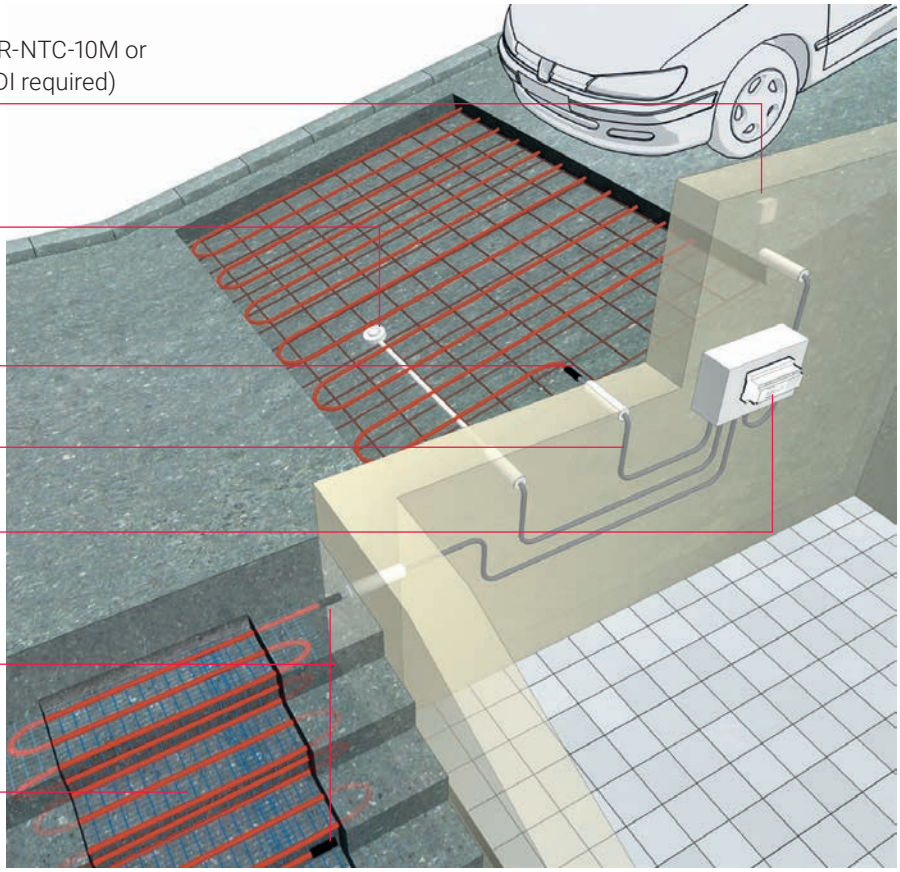
Connection and end seal kit (VIA-CE1)

Connection cable (VIA-L1)

Control unit (Elexant 650c-Modbus)

Connection and end seal kit (VIA-CE1)

Self-regulating heating cable (EM2-XR), constant wattage heating cable (WINTERGARD-CABLE), and constant wattage heating mat (WINTERGARD-MAT).



RAYCHEM SOLUTIONS FOR CONCRETE

	Product	Description
Reinforced concrete ramp	EM2-XR	Self-Regulating heating cable for reinforced concrete ramps
Domestic/private garage track heating	WINTERGARD-MAT	Pre-terminated constant wattage heating mat for ramp, pavement and track heating
Stairs; wheelchair access ramps	WINTERGARD-CABLE	Pre-terminated constant wattage heating cable solution for larger concrete areas and stairs

APPLICATION IN ASPHALT

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

Temperature and moisture sensor E650C-G

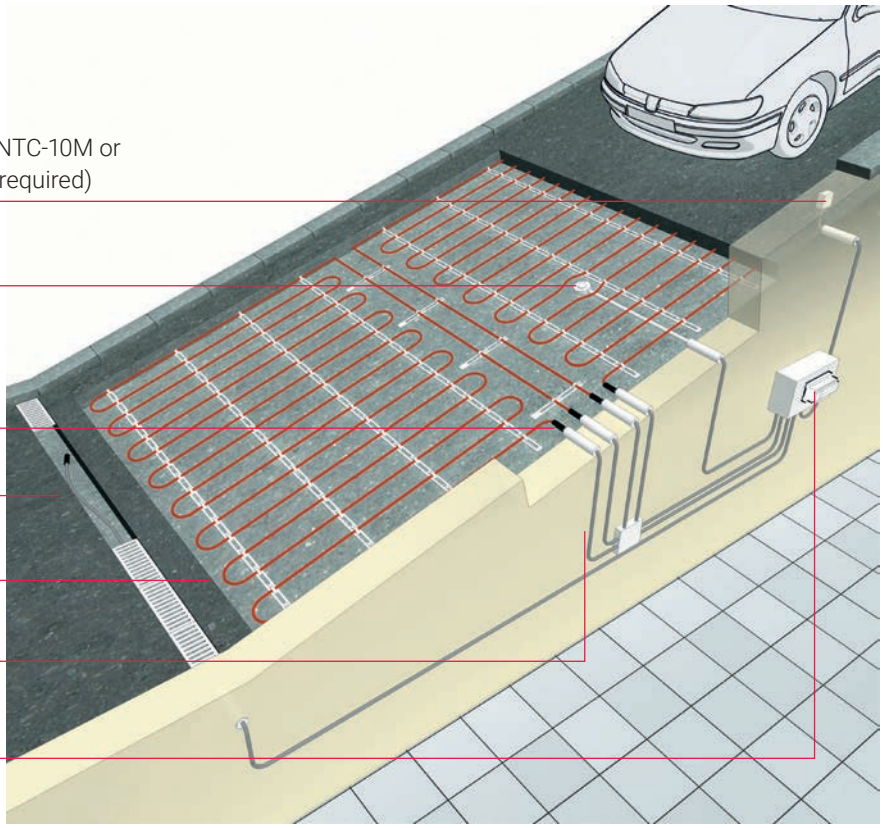
Connection between heater cable and cold lead (Pre-engineered)

Self-regulating drain heater (GM-2XT)

Mineral-Insulated heating cable (EM2-MI)

Pre-engineered cold lead

Control unit (Elexant 650c-Modbus)

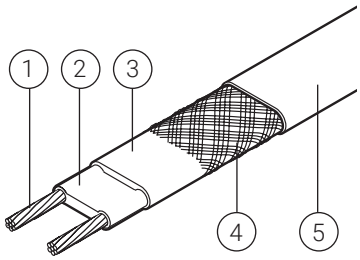


RAYCHEM SOLUTIONS FOR ASPHALT

	Product	Description
Loading bay and asphalt layer	EM2-MI	Mineral insulated, high temperature resistant heating cable for asphalt ramps for commercial and bigger areas
Domestic/private garage track heating - small areas	WINTERGARD-MAT WINTERGARD-CABLE	Pre-terminated constant wattage heating cable for small ramps, pavement and track heating

Self-Regulating Systems

1. APPLICATION



Footpaths, ramps, steps, basement garages, loading platforms.

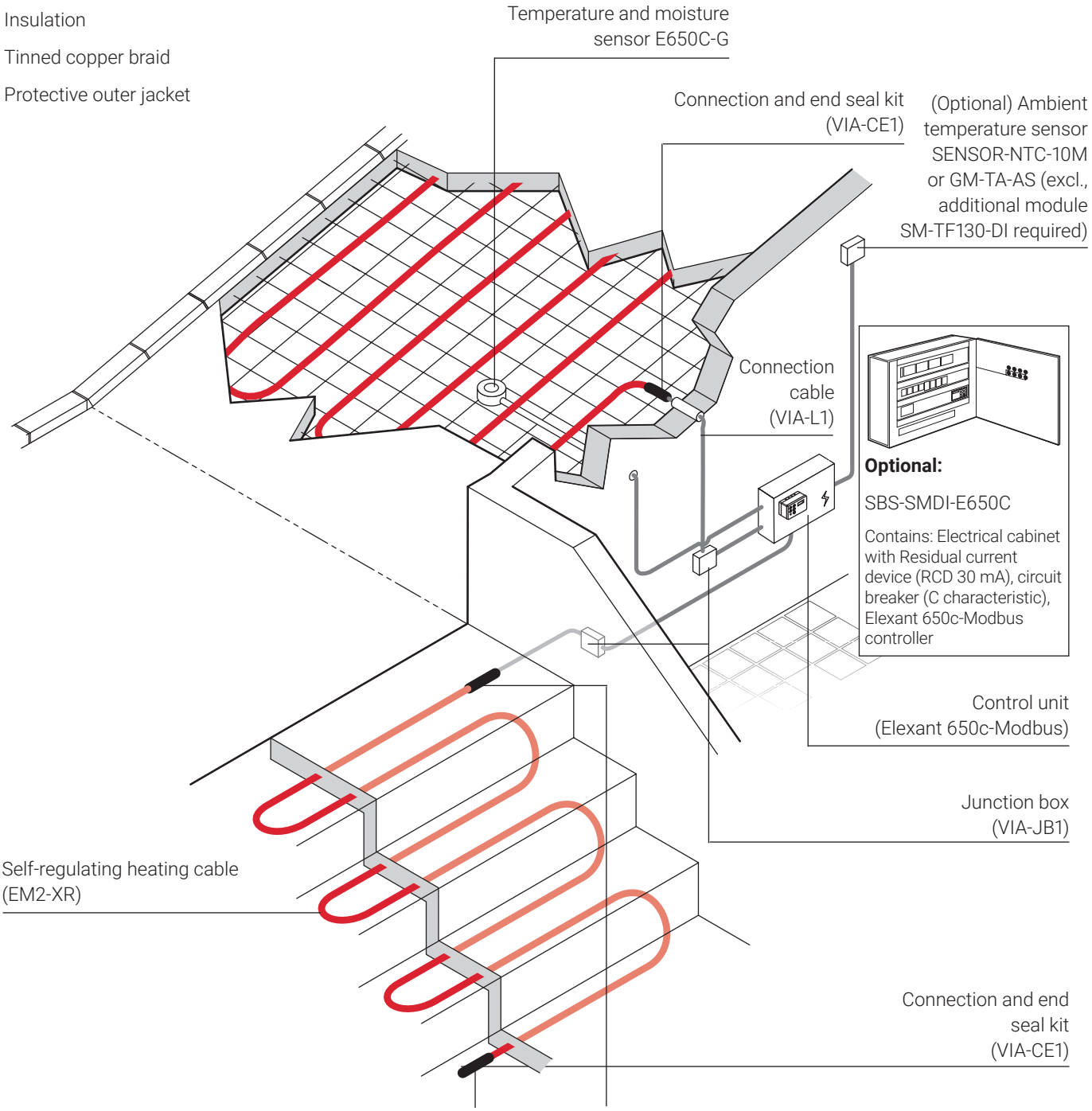
Cable type	EM2-XR
Control	Elexant 650c-Modbus / SBS-SMDI-E650C Control Panel / ACS-30
Power output	90 W/m @ 0°C.

* At design stage: verify power at start-up temperature

- Unsuitable for use in poured asphalt.
- When laying directly in concrete with a covering of at least 20 mm, an asphalt layer of max. 40 mm can be applied on the concrete surface (max. 250°C)

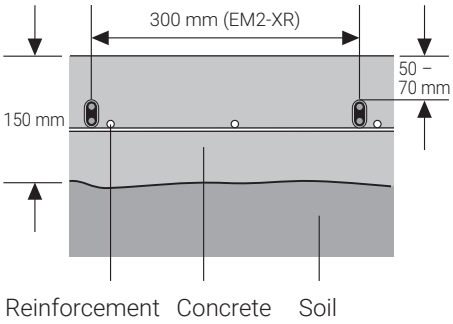
Composition

1. Large copper conductor
2. Self-regulating heating core
3. Insulation
4. Tinned copper braid
5. Protective outer jacket

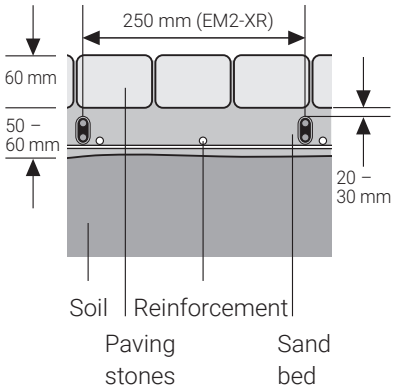


2. CABLE SPACING

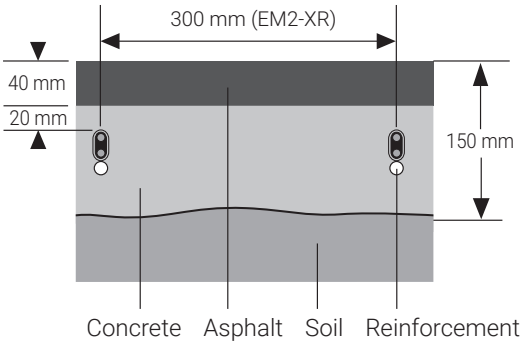
Concrete



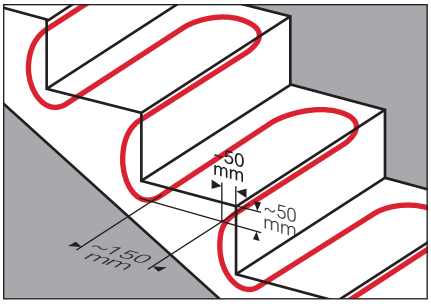
Sand bed



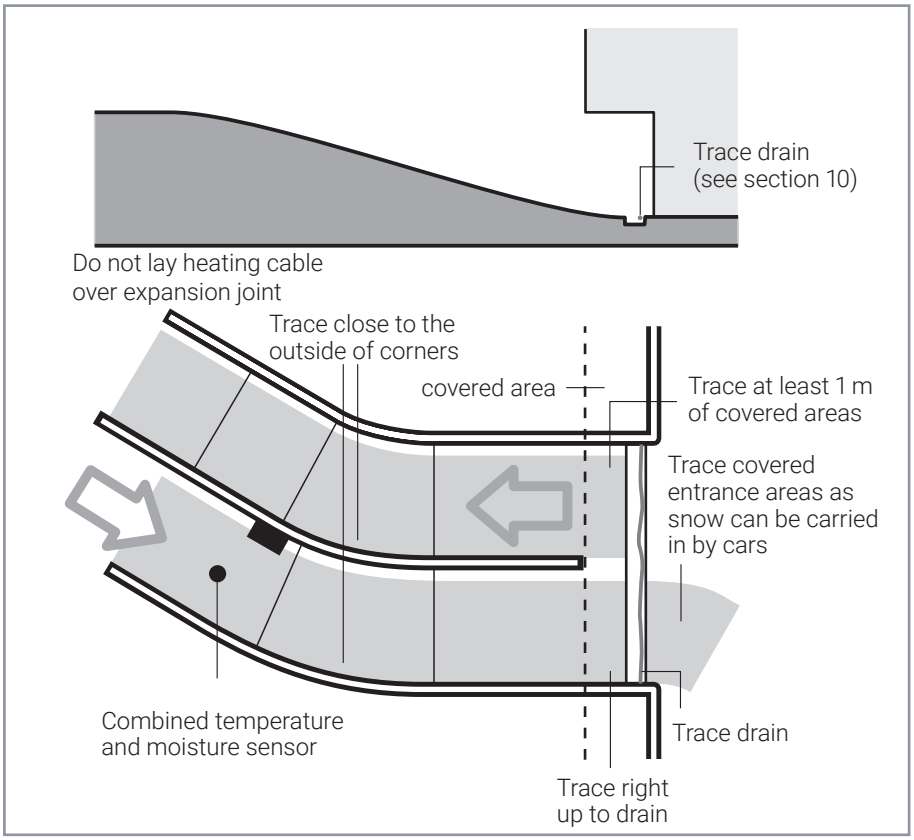
Asphalt



Concrete stairs



3. DETERMINE AREA TO BE HEATED



4. DETERMINE AREA TO BE HEATED

A. Ramps and paths

$$\text{Heating cable length (m)} = \frac{\text{Total surface to be heated}}{\text{Heating cable length (m)}}$$

B. Stairs

Heating cable length (m) = [2 x stair width (m) + 0.4] x number of stairs + 1 m (connection)

5. ELECTRICAL PROTECTION

Max. heating cable lengths

- According to local standards and regulations.
- Residual current device (rcd) 30 mA required, max. 500 m heating cable per rcd.
- Take into account the conductor size and max. permitted voltage drop.
  A higher voltage drop can occur at start-up of heating

Power at start-up

- To determine the installed power with the electrical system designer, the nominal current of the series connected fuse or the current value at the system start-up temperature must be taken into account (e.g. 32 A for 55 m of EM2-XR at –10°C).

Maximum circuit lengths

According to local standard and regulations
Residual current device (RCD) 30 mA required, max. 500 m heating cable length per RCD.
Take into account the conductor sizes and max. permitted voltage drop.

Circuit breaker sizing (MCBS to BS EN 60898, Type C)	Max. circuit length: EM2-XR (for start-up at –10°C)
10 A	17 m
16 A	28 m
20 A	35 m
25 A	45 m
32 A	55 m
40 A 50 A	Contact your Raychem representative for the most economical solution

6. NUMBER OF CIRCUITS

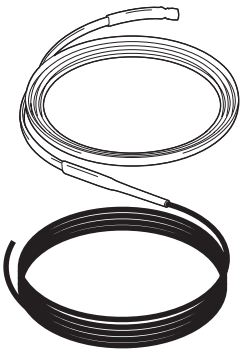
$$\text{Min. number of heating circuits} = \frac{\text{Heating cable length (see section 4)}}{\text{max. length of heating circuit (see section 5)}}$$

- The heating cable should not be laid over expansion joints.
- The heating cable should be distributed as symmetrically as possible.

7. ELECTRICAL CONNECTION

- According to local standards and technical regulations.
- The cross-section is determined according to the nominal current of the circuit-breakers and maximum permitted voltage drop.

8. PRE-CONFIGURED HEATING UNITS



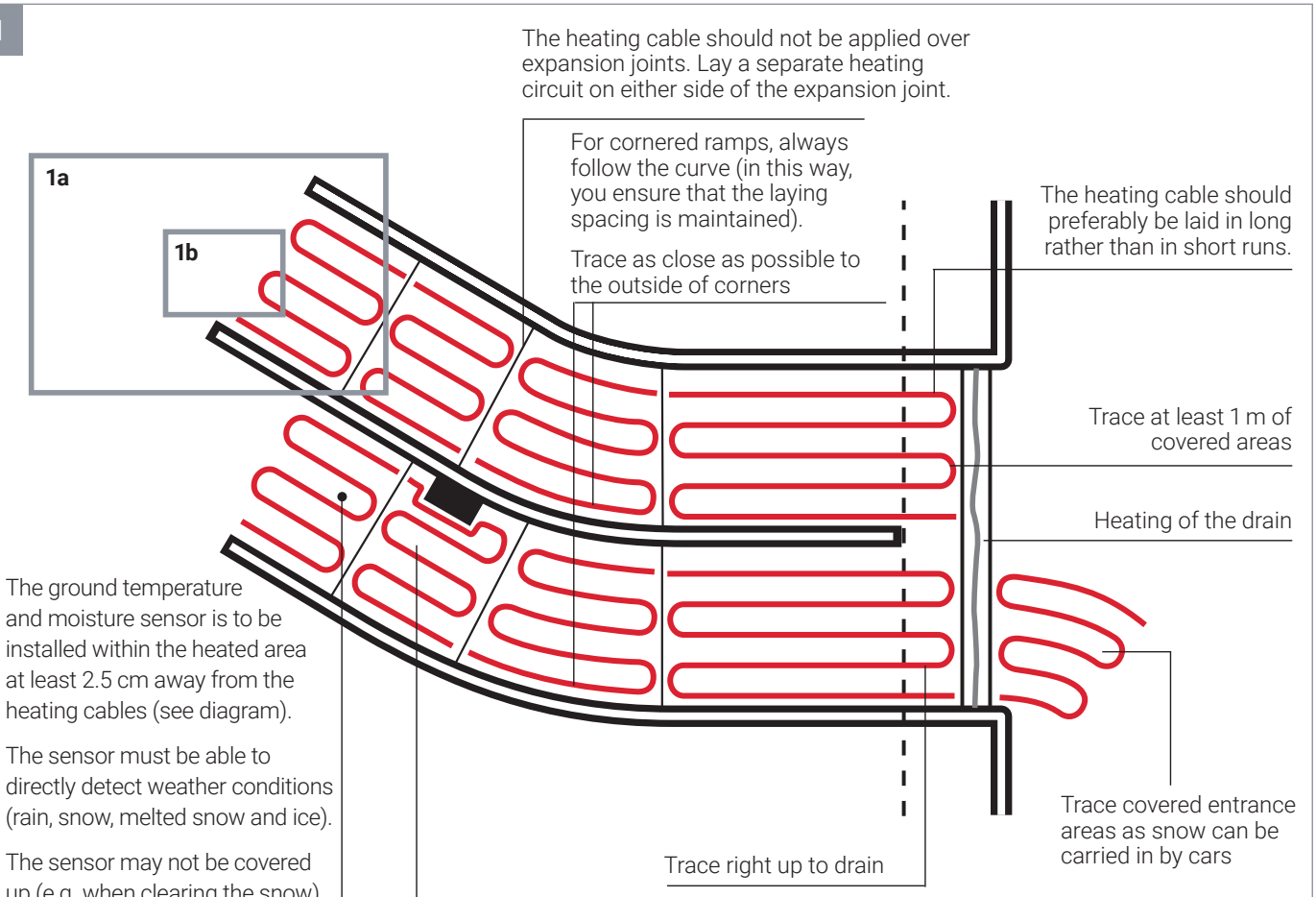
- For faster on-site installation, we recommend using prepackaged EM2-XR kits
- A pre-configured kit includes.
  - X m (required length) of EM2-XR heating cable
  - X m connection cable, suited for heavy duty - VIA-L1 (Maximum of 5 m cold lead connection cable with heater cable lengths over 50 meters.)
  - Connection and end seal pre-installed
  - 1 label with info about product name, length and voltage
  - Heating cable - factory quality tested with warranty for the entire EM2-XR-Kit

Product name	Article number	Length range
EM2-XR-10-17m	1244-001512	10 m to 17 m
EM2-XR-18-28m	1244-001513	18 m to 28 m
EM2-XR-29-35m	1244-001514	29 m to 35 m
EM2-XR-36-45m	1244-001515	36 m to 45 m
EM2-XR-46-55m	1244-001516	46 m to 55 m
EM2-XR-56-70m *	1244-001517	56 m to 70 m
EM2-XR-71-85m *	1244-001518	71 m to 85 m
EM2-XR Pack	1244-005360	Configured heating unit (Pre-terminated) with customer specified heater and cold lead length

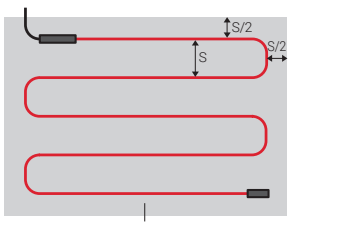
* on request for connection in customized panels

9. INSTALLATION INSTRUCTIONS

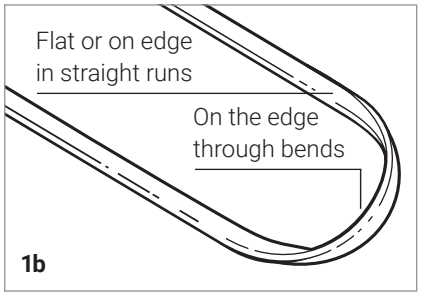
1



*** Take care that E650C-G is NOT installed in an area which is continuously flooded with water (e.g. drain line), or in an area which is continuously under ice due to external parameters (e.g. freezing of condensation water in cool room).**

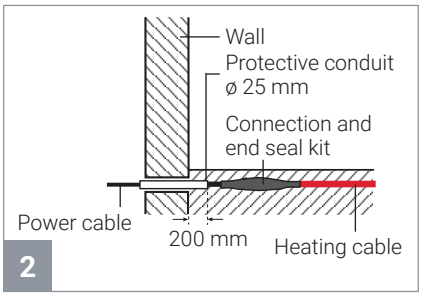


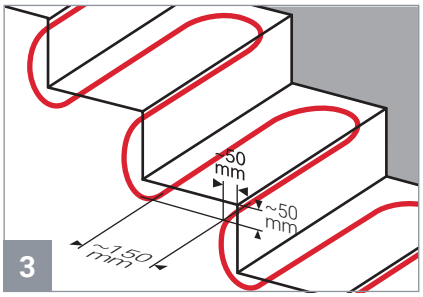
1a



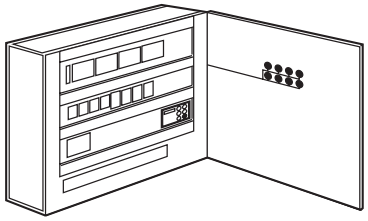
1b

Spacing (S)	Concrete	Sand
EM2-XR	300 mm	250 mm





10. CONTROL PANELS



Steel enclosure in wall-mounted construction, equipped with master power switch. RCD(s) 30 mA, circuit breaker(s), "On" and "Alarm" warning lights. Completely assembled, cabled ready connected and tested. Cable entry points in enclosure floor. E650C-G to be ordered separately.

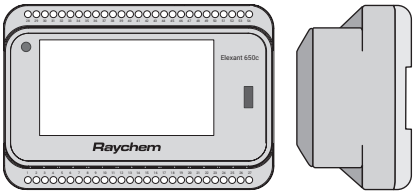
SBS-SMDI-E650C-3X16A	Control panel for max. 3 heating circuits, 16 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003965
SBS-SMDI-E650C-6X16A	Control panel for max. 6 heating circuits, 16 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003966
SBS-SMDI-E650C-9X16A	Control panel for max. 9 heating circuits, 16 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003967
SBS-SMDI-E650C-12X16A	Control panel for max. 12 heating circuits, 16 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003968
SBS-SMDI-E650C-3X32A	Control panel for max. 3 heating circuits, 32 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003961
SBS-SMDI-E650C-6X32A	Control panel for max. 6 heating circuits, 32 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003962
SBS-SMDI-E650C-9X32A	Control panel for max. 9 heating circuits, 32 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003963
SBS-SMDI-E650C-12X32A	Control panel for max. 12 heating circuits, 32 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003964
SBS-SMDI-E650C-3X20A	Control panel for max. 3 heating circuits, 20 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003969
SBS-SMDI-E650C-6X20A	Control panel for max. 6 heating circuits, 20 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003970
SBS-SMDI-E650C-9X20A	Control panel for max. 9 heating circuits, 20 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003971
SBS-SMDI-E650C-12X20A	Control panel for max. 12 heating circuits, 20 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003972

* For ACS-30 Control & Monitoring system, please contact us.

11. CONTROL UNITS

The Raychem Elexant 650c-Modbus controller is designed for operation with Raychem ramp, roof and gutter heating cables. The Modbus connectivity allows for remote monitoring, configuration, and ease of integration in a Building Management System (BMS).

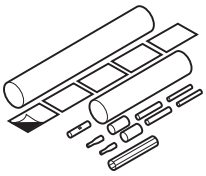
Elexant 650c-Modbus



- Intuitive set-up and programming of the unit with a 4.3" colour touch screen
- Moisture and temperature control of surface snow melting systems (E650C-G to be ordered separately).
- Controls 2 independent heating areas
- Temperature with moisture sensing for enhanced energy savings
- Alarm relay with change over contact to signal power, sensor or communication problems (Modbus)
- Ambient temperature monitoring with high and low temperature alarm
- Offsite configurable – can be set up prior to final installation
- DIN rail panel mountable
- The Elexant 650c-Modbus is equipped with a RS485 port for Modbus communication to a BMS system which can be used for configuration, monitoring and alarm purposes
- Ice rain feature – preheating the surface to prevent the issue of freezing rain (separate SM-TF130-DI module required)

12. COMPONENTS AND ACCESSORIES

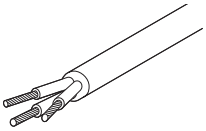
VIA-CE1



Waterproof connection and end seal

- Sealing compound and heat-shrinkable sleeve
- One kit required per heating cable circuit
- Connection of the heating cable and cold lead cable VIA-L1

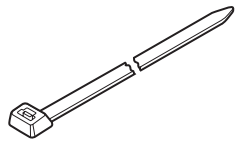
VIA-L1



Temperature-resistant cable (cold lead), 3 x 6 mm^2 copper conductors

- To be installed in conduit
- Maximum length of cold lead for standard connection boxes: 65 m
- Maximum length of cold lead with C 40 A and C 50 A circuit breakers: 5 m (VDE standard)

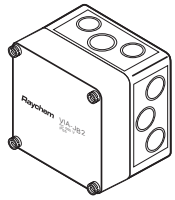
KBL-09



Cable ties for fixing heating cable to reinforced mesh

- One pack required for 30 m of self-regulating heating cable
- Pack of 100 pc
- Length 200 mm
- Width: 3,4 mm

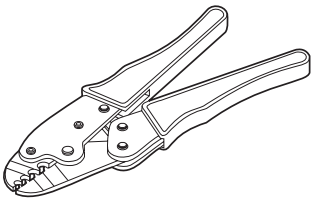
VIA-JB2



Temperature-resistant junction boxes

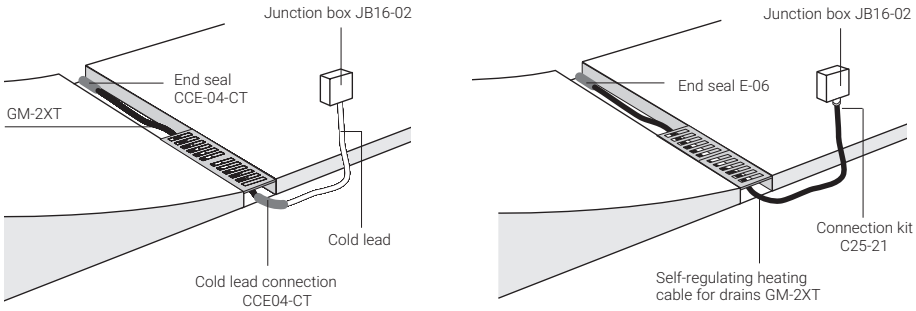
- For heating circuits up to C 50 A circuit-breakers
- Dimensions: 125 x 125 x 100 mm
- Terminals 3 x 16 mm^2
- IP 66
- 4 x M20/25 + 2 x M32 at opposite sides and 6 x M20/25 at opposite sides

VIA-CTL-01



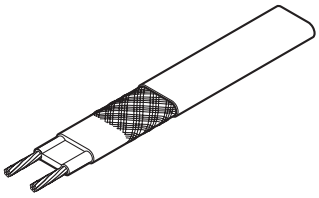
Crimping tool for connectors in VIA-CE1 connection and end seal kit

13. DRAIN TRACING



GM-2XT

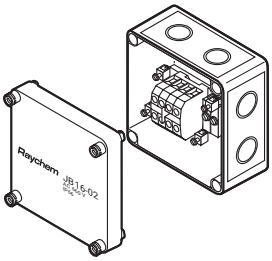
Drain heating cable with oil- and UV-resistant fluoropolymer outer jacket



JB16-02

Temperature-resistant junction and connection box
Dimensions: 94 x 94 x 57 mm

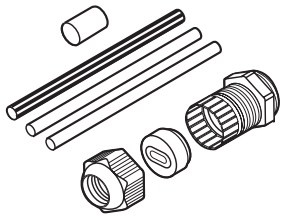
- IP66
- 6 x 4 mm² terminals
- 4 Pg 11/16 and 4 M20/25 knock-out entries



C25-21

Connection kit for GM-2XT

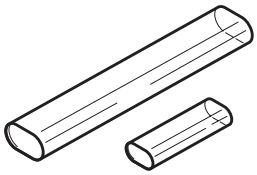
- Heat-shrink system (M25)



E-06

End seal kit for GM-2XT

- Heat-shrink system



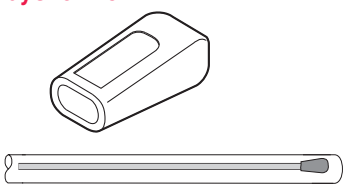
The drain heating system can be switched via the same control unit as the surface heating system.

- Max. 70 m of GM-2XT can be connected to a 16 A C-type circuit-breaker.
- Residual current device (rcd) 30 mA required.

RayClic-E-02

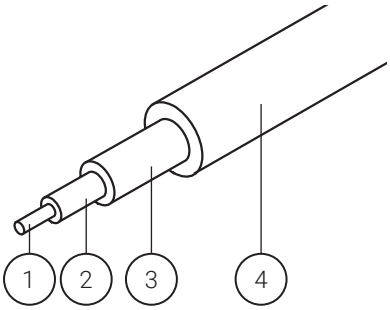
Gel-filled end seal

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



Mineral Insulated Systems

1. APPLICATION



Construction:

1. Heating element
2. Mineral insulation
3. Protective jacket, copper alloy
4. Heat resistant outer jacket (PVC free)

Surface heating in asphalt applications.

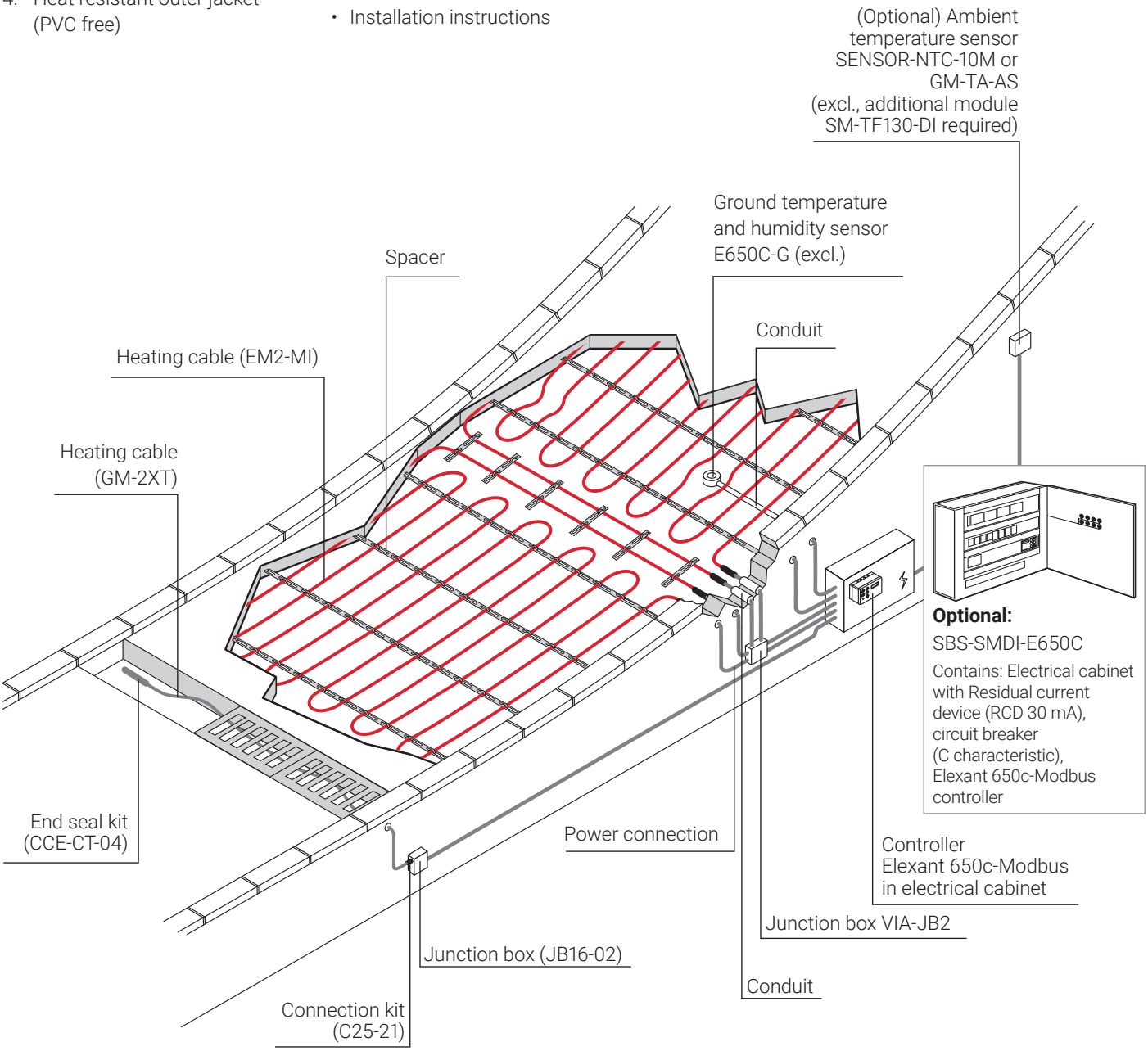
- Extremely robust
- Long life expectancy
- Installation-ready heating cable
- Proven quality: high temperature withstand capabilities

	Small areas, Footpaths	Large areas, Garage entrances
Typical output requirement	180 W/m² (50 W/m)	300 W/m² (50 W/m)
Spacing	275 mm	165 mm

Heating cable configuration from 26 m to 88 m.
Cable power output = 50 W/m

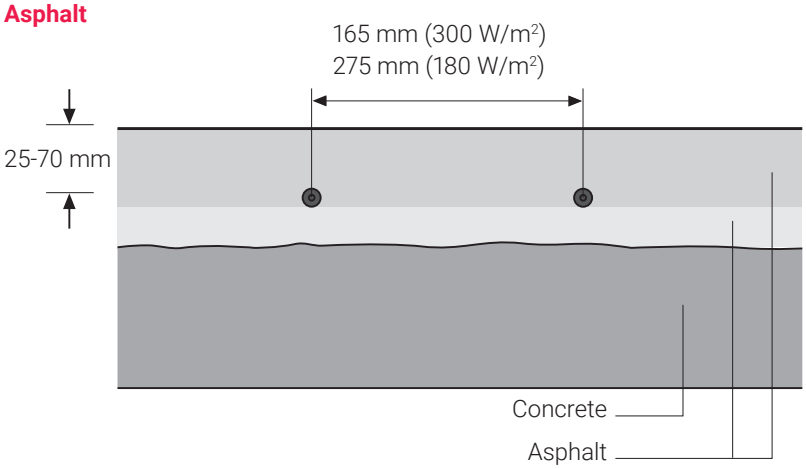
Package contents

- Heating cable with pre-installed power cables (2 x 3 m)
- Installation instructions



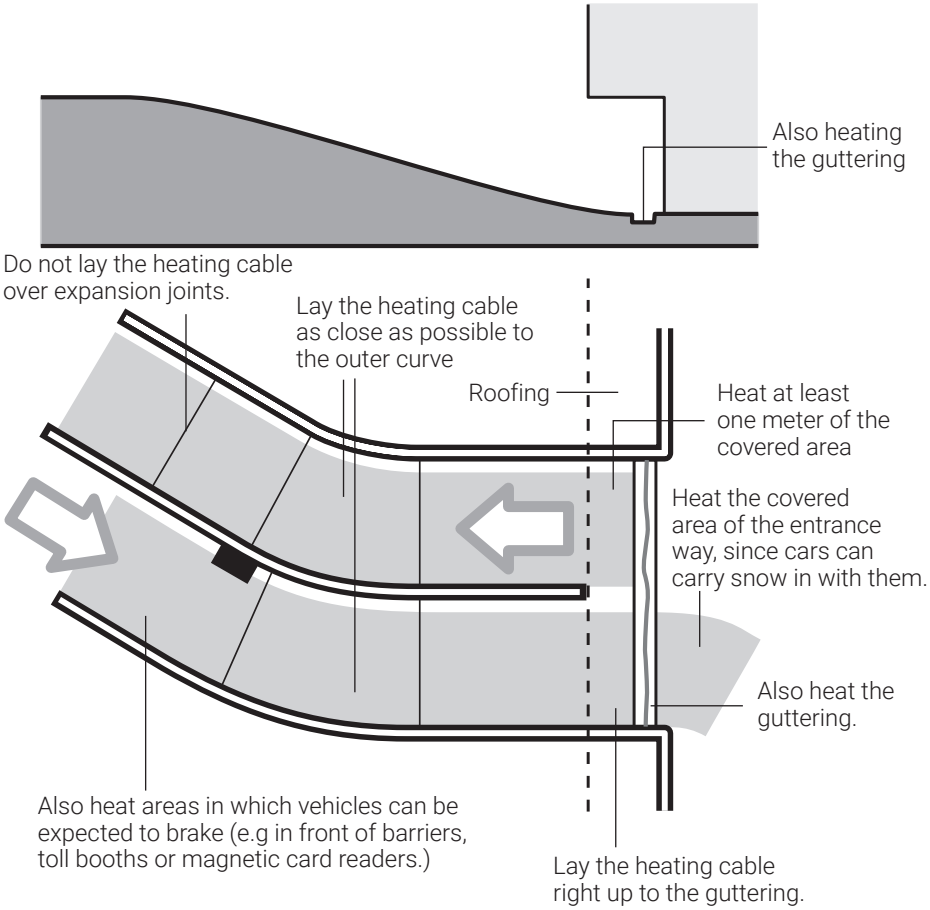
2. CABLE SPACING

Asphalt



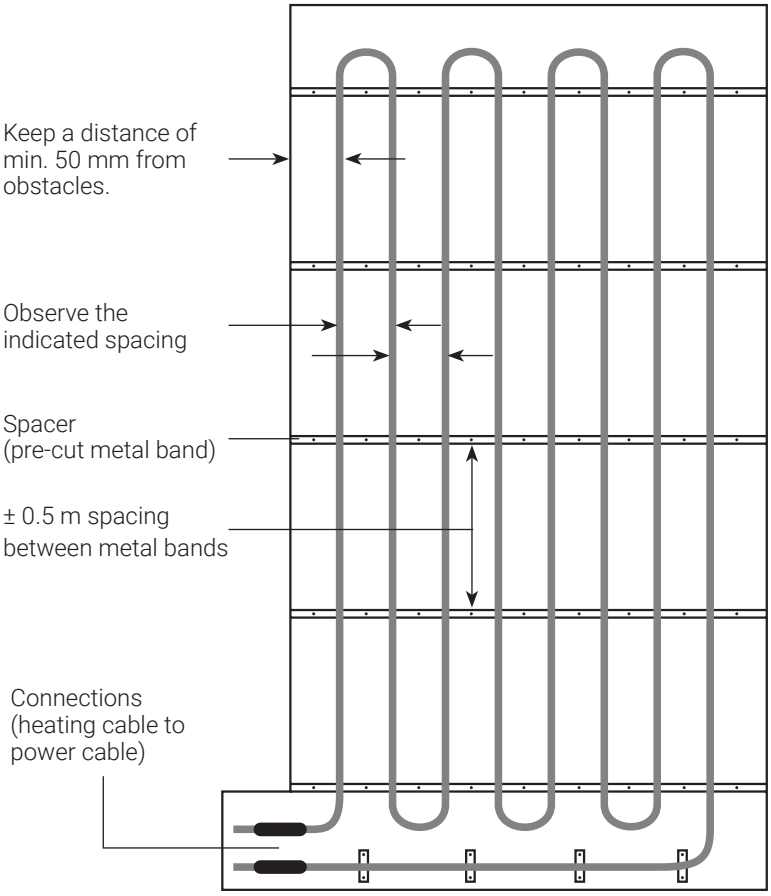
The VIA-SPACER enables correct and even spacing of the heater cable.

3. DETERMINE AREA TO BE HEATED



4. LAYING THE HEATING CABLE

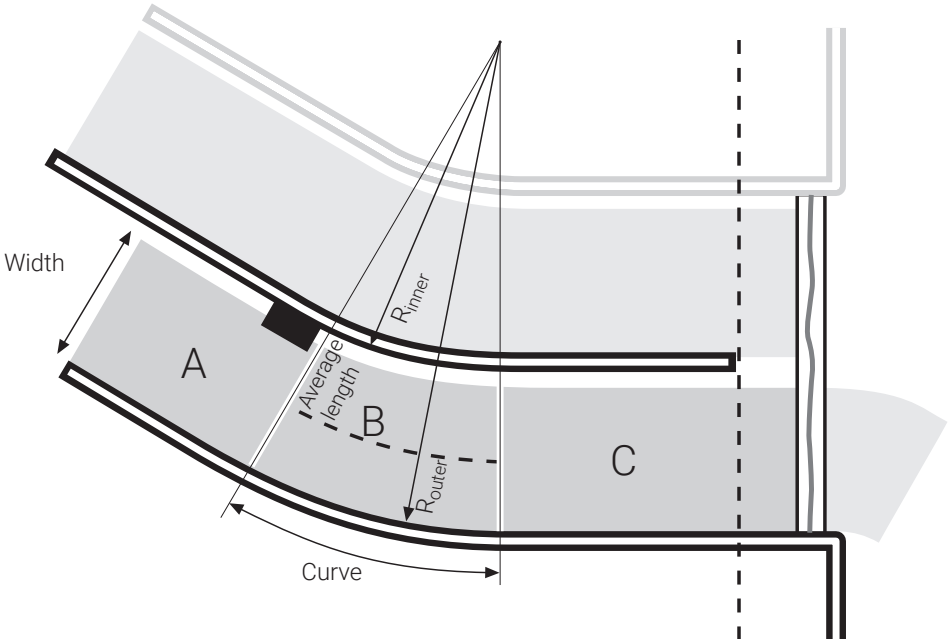
- The spacer rail should be secured to the substrate at 0.5 m intervals.
- The heating cable should be laid parallel to the direction of traffic.
- The spacing should be at least 50 mm. The heating cables must not overlap or crossed.
- Do not shorten or splice the heating cable.
- Do not lay the heating cable over expansion joints.
- Lay the cable in runs to allow both heating cable ends to connect to the same point.
- The heating cable must be completely covered with asphalt, while the power cable must not be in contact with asphalt (lay it in sand or with protective conduit).



5. PACKAGE SELECTION

- Divide the heated area into sections.
- Do not lay the heating cable over expansion joints.
- Calculate the surface area of the individual sections.
- Select one or more packages from the table according to the size of the surface.

Example



- Calculation of the area of sections A, B and C:
  A: Length x width = 6 m x 3 m = 18 m^2
  C: Length x width = 8 m x 3 m = 24 m^2
  B: Average length x width = 3.53 m x 3 m = 10.6 m^2
- Determine the number of strips for a nominal output of 300 W/m^2
  Spacing = 0.165 m
  Ramp width = 3 m
  Number of strips = 3 / 0.165 => 18 strips
- Selecting the package size
  Rectangular areas: Necessary min. length = length x number of strips
  A = 6 m x 18 = 108 m (EM-MI-PACK-48M + EM-MI-PACK-60M)
  C = 8 m x 18 = 144 m (EM-MI-PACK-60M + EM-MI-PACK-48M + EM-MI-PACK-36M or EM-MI-PACK-60M + EM-MI-PACK-88M (if the area is not broken up by expansion joints))
- Curves:
  B = EM-MI-PACK-60M or EM-MI-PACK-26M + EM-MI-PACK-36M

6. ELECTRICAL PROTECTION

- Observe local standards and regulations.
- Residual current device required. (RCD)
- Take the cable cross-section and max. permitted voltage drop into account.

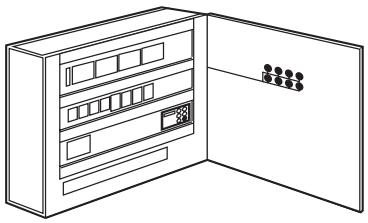
Order references

	Nominal power (W)	300 W/m² spacing 165 m		180 W/m² spacing 275 m		Connection cable Cross section (mm²)
		Area (m²)	Required spacer *(m)	Area (m²)	Circuit breaker switch (C Characteristic)	
EM-MI-PACK-26M	1270	4,5	10	7,0	10 A	2,5
EM-MI-PACK-36M	1835	6,0	10	10,0	10 A	2,5
EM-MI-PACK-48M	2450	8,0	25	13,0	13 A	2,5
EM-MI-PACK-60M	2800	10,0	25	15,0	16 A	2,5
EM-MI-PACK-70M	3435	11,5	25	19,0	20 A	2,5
EM-MI-PACK-88M	4290	14,5	25	24,0	25 A	6,0

Min. Activation temperature –10°C, AC 230 V.

When using standard electrical cabinets, use only EM-MI-PACK 26M to 70M (for circuit breaker up to 20A, C characteristic).

7. CONTROL PANEL



Steel enclosure in wall-mounted construction, equipped with master power switch. RCD(s) 30 mA, circuit breaker(s), "On" and "Alarm" warning lights. Completely assembled, cabled ready connected and tested. Cable entry points in enclosure floor. E650C-G to be ordered separately.

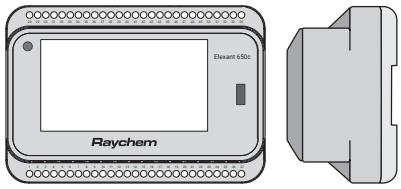
SBS-SMDI-E650C-3X16A	Control panel for max. 3 heating circuits, 16 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003965
SBS-SMDI-E650C-6X16A	Control panel for max. 6 heating circuits, 16 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003966
SBS-SMDI-E650C-9X16A	Control panel for max. 9 heating circuits, 16 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003967
SBS-SMDI-E650C-12X16A	Control panel for max. 12 heating circuits, 16 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003968
SBS-SMDI-E650C-3X32A	Control panel for max. 3 heating circuits, 32 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003961
SBS-SMDI-E650C-6X32A	Control panel for max. 6 heating circuits, 32 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003962
SBS-SMDI-E650C-9X32A	Control panel for max. 9 heating circuits, 32 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003963
SBS-SMDI-E650C-12X32A	Control panel for max. 12 heating circuits, 32 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003964
SBS-SMDI-E650C-3X20A	Control panel for max. 3 heating circuits, 20 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003969
SBS-SMDI-E650C-6X20A	Control panel for max. 6 heating circuits, 20 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003970
SBS-SMDI-E650C-9X20A	Control panel for max. 9 heating circuits, 20 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003971
SBS-SMDI-E650C-12X20A	Control panel for max. 12 heating circuits, 20 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003972

* For ACS-30 Control & Monitoring system, please contact us.

8. CONTROL UNITS

The Raychem Elexant 650c-Modbus controller is designed for operation with Raychem ramp, roof and gutter heating cables. The Modbus connectivity allows for remote monitoring, configuration, and ease of integration in a Building Management System (BMS).

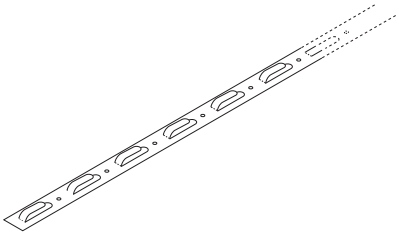
Elexant 650c-Modbus



- Intuitive set-up and programming of the unit with a 4.3" colour touch screen
- Moisture and temperature control of surface snow melting systems (E650C-G to be ordered separately)
- Controls 2 independent heating areas
- Temperature with moisture sensing for enhanced energy savings
- Alarm relay with change over contact to signal power, sensor or communication problems (Modbus)
- Ambient temperature monitoring with high and low temperature alarm
- Offsite configurable – can be set up prior to final installation
- DIN rail panel mountable
- The Elexant 650c-Modbus is equipped with a RS485 port for Modbus communication to a BMS system which can be used for configuration, monitoring and alarm purposes
- Ice rain feature – preheating the surface to prevent the issue of freezing rain (separate SM-TF130-DI module required)

9. COMPONENTS AND ACCESSORIES

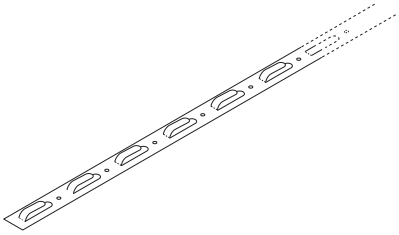
VIA-SPACER-10 M



Spacer and mounting band (10 m)

- Required for:
  EM-MI-PACK-26M
  EM-MI-PACK-36M
- Requirement: 2 m/m^2
- Pre-cut metal strip

VIA-SPACER-25 M

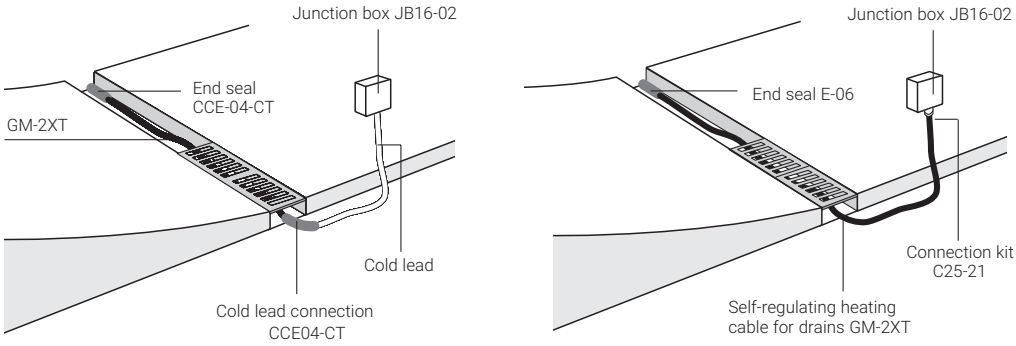


Spacer and mounting band (25 m)

- Required for:
  EM-MI-PACK-48M
  EM-MI-PACK-60M
  EM-MI-PACK-70M
  EM-MI-PACK-88M
- Requirement: 2 m/m^2
- Pre-cut metal strip

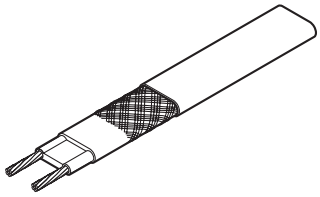
Refer to section 14 on page 30 regarding the drain heating.

10. DRAIN TRACING



GM-2XT

Drain heating cable with oil- and UV-resistant fluoropolymer outer jacket

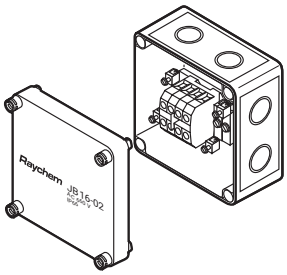


JB16-02

Temperature-resistant junction and connection box

Dimensions: 94 x 94 x 57 mm

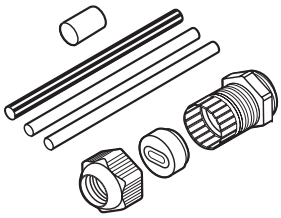
- IP66
- 6 x 4 mm² terminals
- 4 Pg 11/16 and 4 M20/25 knock-out entries



C25-21

Connection kit for GM-2XT

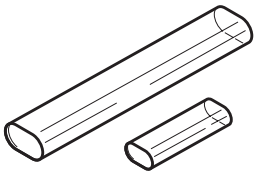
- Heat-shrink system (M25)



E-06

End seal kit for GM-2XT

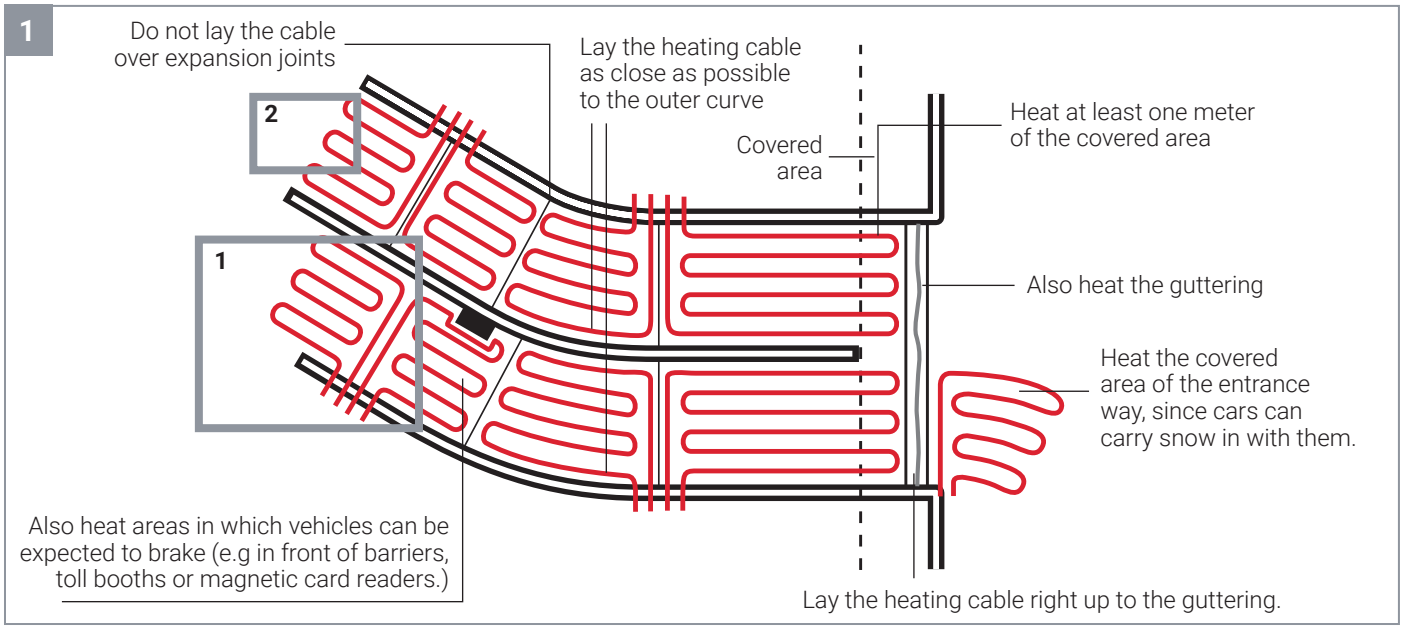
- Heat-shrink system

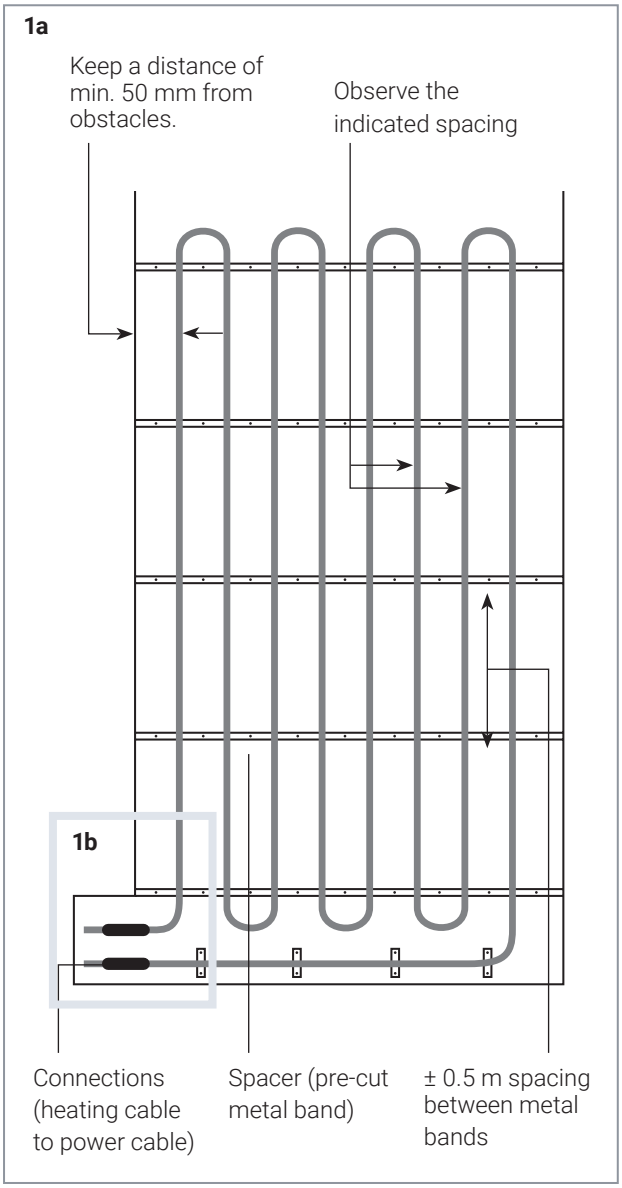


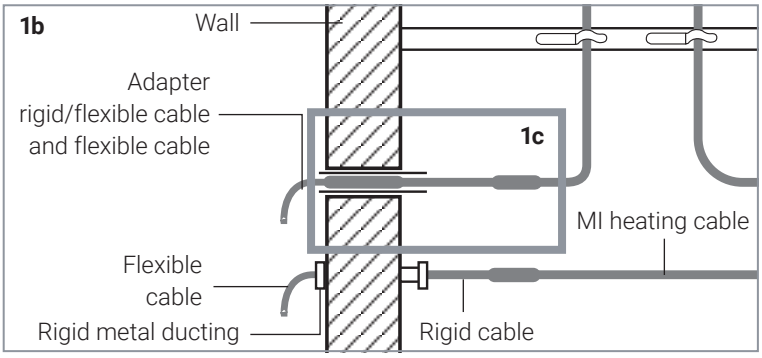
The drain heating system can be switched via the same control unit as the surface heating system.

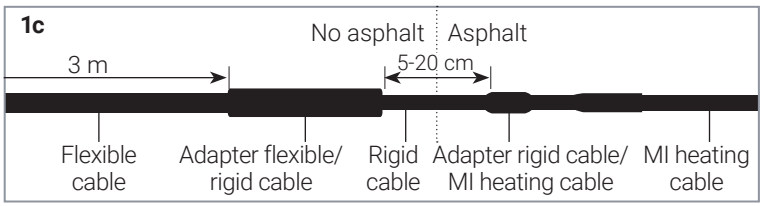
- Max. 60 m of GM-2XT can be connected to a 16 A C-type circuit-breaker.
- Residual current device (rcd) 30 mA required.

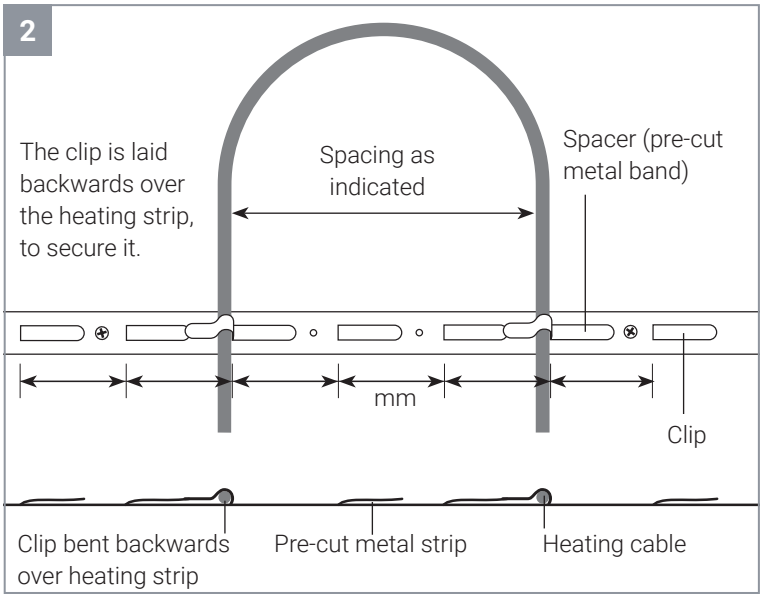
Refer to section 14 on page 30 regarding the drain heating.


1
Do not lay the cable over expansion joints
2
1
Lay the heating cable as close as possible to the outer curve
Covered area
Heat at least one meter of the covered area
Also heat the guttering
Heat the covered area of the entrance way, since cars can carry snow in with them.
Also heat areas in which vehicles can be expected to brake (e.g in front of barriers, toll booths or magnetic card readers.)
Lay the heating cable right up to the guttering.


1a
Keep a distance of min. 50 mm from obstacles.
Observe the indicated spacing
1b
Connections (heating cable to power cable)
Spacer (pre-cut metal band)
± 0.5 m spacing between metal bands

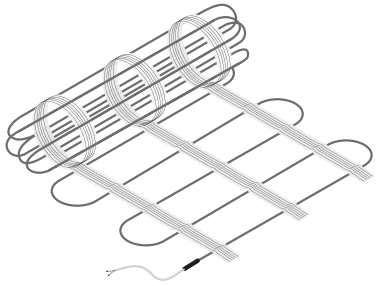

1b
Wall
Adapter rigid/flexible cable and flexible cable
1c
MI heating cable
Flexible cable
Rigid metal ducting
Rigid cable


1c
No asphalt
Asphalt
3 m
5-20 cm
Flexible cable
Adapter flexible/ rigid cable
Rigid cable
Adapter rigid cable/ MI heating cable
MI heating cable


2
The clip is laid backwards over the heating strip, to secure it.
Spacing as indicated
Spacer (pre-cut metal band)
mm
Clip
Clip bent backwards over heating strip
Pre-cut metal strip
Heating cable

Polymer Solutions
Heating WINTERGARD-MAT

1. APPLICATION



WINTERGARD-MAT is a constant wattage heating mat for simple, fast, and effective ramp and accessway heating to prevent snow and ice formation. The WINTERGARD-MAT is particularly suited for track heating of ramps, loading bays, and driveways, but also emergency escape routes and pedestrian walkways.

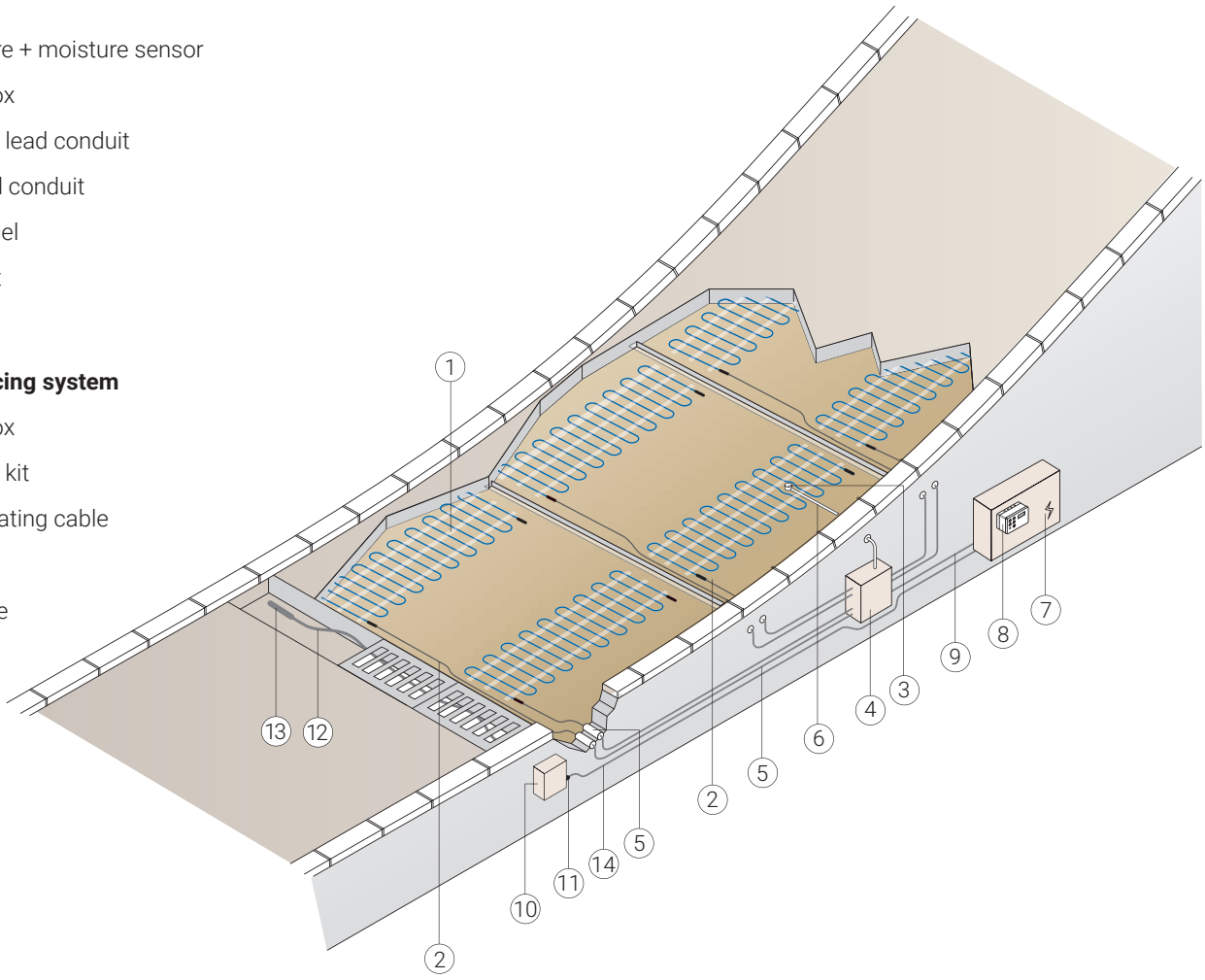
Nominal power	300 W/m²
Voltage	230 Vac
Maximum exposure temperature	65°C (in operation)
Rated temperature non-operation	105°C
Short-term temperature resistance	240°C (15 min; for asphalt)
Cable construction	Twin core, constant wattage heating mat, 1 cold lead (5 m)
Control unit	Elexant 650c-Modbus
Certification	CE

2. DETERMINE AREA TO BE HEATED - TRACK HEATING

1. Surface heating mat
2. Cold lead
3. Temperature + moisture sensor
4. Junction box
5. Connection lead conduit
6. Sensor lead conduit
7. Control panel
8. Control unit
9. Supply lead

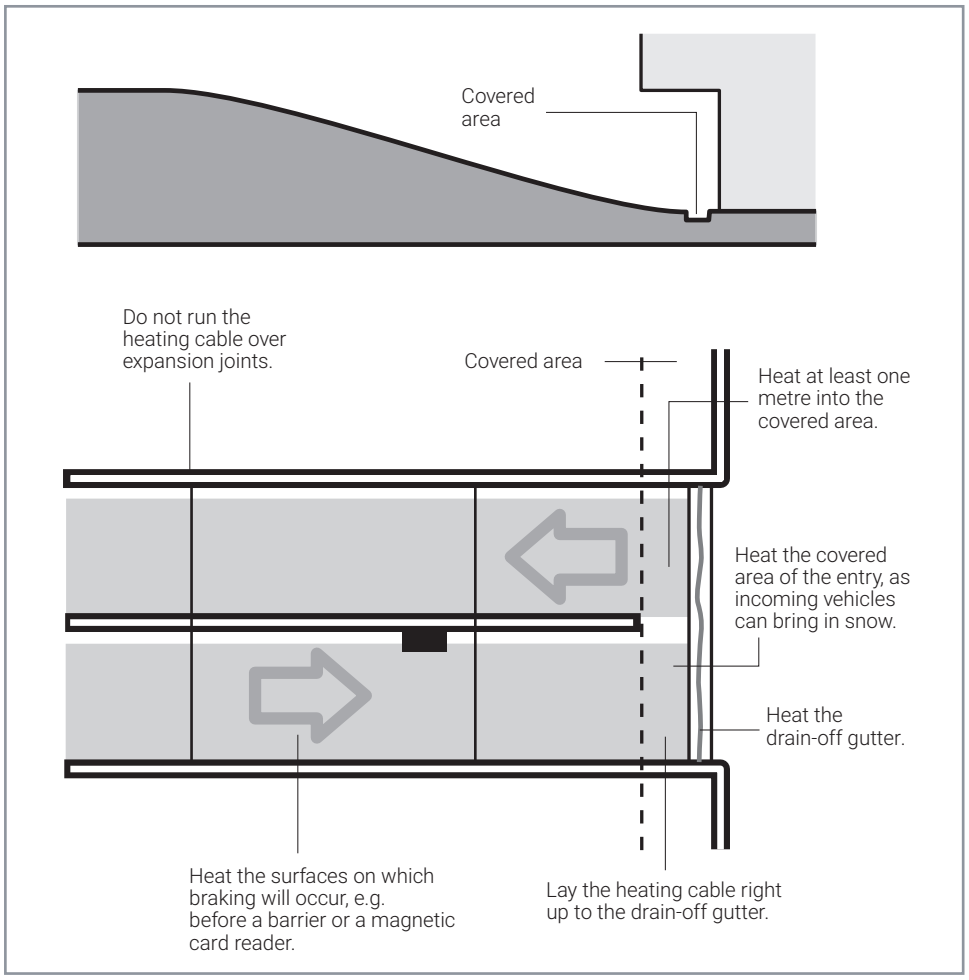
Drain heat-tracing system

10. Junction box
11. Connection kit
12. GM-2XT heating cable
13. End seal
14. Power cable

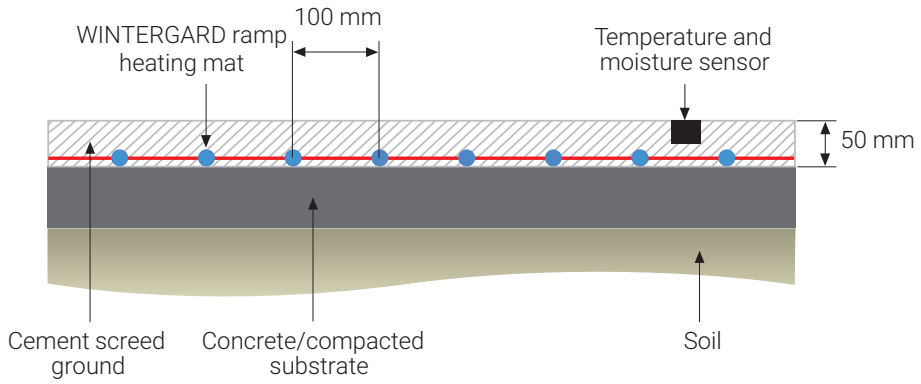


3. AREA TO BE HEATED

Determine the exact area to be heated, e.g. wheel tracks. Consider following factors:

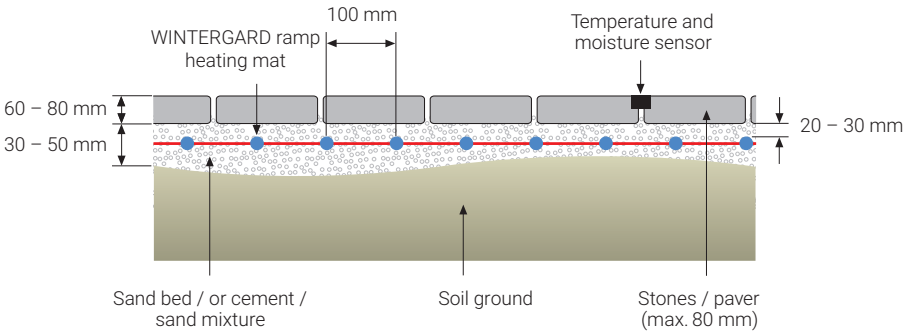


4. EMBEDDING IN SCREED, CONCRETE OR ASPHALT



When laying in concrete with a covering of least 25 mm

5. EMBEDDING IN SAND BED/PAVERS



Recommended split/gravel sizes for sand bed or cement concrete:
Round grain gravel: Ø 8-16 mm
Grit/Broken grain: Ø 4-8 mm

6. PACKAGING AND ORDERING REFERENCES

WINTERGARD ramp heating mat is available in the sizes given below.

- For a quick and easy installation on site
- the pre-terminated kit contains:
  – X m (heating mat length)
  – 5 m power cable
  – Installation manual; commissioning report

Product name	Reference number	Mat size	Surface	Power output @230 V	Cable resistance (Ω) Min./Max.	EAN code
WINTERGARD-MAT-230V-2M	1244-022751	2 m x 0,6 m	1,2 m²	360 W	139.6/161.6	5414506024074
WINTERGARD-MAT-230V-3M	1244-022752	3 m x 0,6 m	1,8 m²	540 W	93.1/107.8	5414506024081
WINTERGARD-MAT-230V-4M	1244-022753	4 m x 0,6 m	2,4 m²	720 W	69.8/80.8	5414506024098
WINTERGARD-MAT-230V-5M	1244-022754	5 m x 0,6 m	3,0 m²	900 W	55.8/64.7	5414506024104
WINTERGARD-MAT-230V-7M	1244-022755	7 m x 0,6 m	4,2 m²	1260 W	39.9/46.2	5414506024111
WINTERGARD-MAT-230V-10M	1244-022756	10 m x 0,6 m	6,0 m²	1800 W	27.9/32.3	5414506024128
WINTERGARD-MAT-230V-13M	1244-022757	13 m x 0,6 m	7,8 m²	2340 W	21.5/24.9	5414506024135
WINTERGARD-MAT-230V-16M	1244-022758	16 m x 0,6 m	9,6 m²	2880 W	17.4/20.2	5414506024142
WINTERGARD-MAT-230V-21M	1244-022759	21 m x 0,6 m	12,6 m²	3780 W	13.3/15.4	5414506024159

Ramp lanes and footpaths

Track heating: Determine the length of the lanes and select the closest (but smaller) size

7. ELECTRICAL PROTECTION

Maximum heating mat sizes

- According to local standard and regulations.
- Residual current device (RCD) 30 mA required, max. 50 m heating mat length per RCD.
- Take into account the conductor sizes and max. permitted voltage drop.

Circuit breaker sizing (MCBS to BS EN 60898, Type C)	Max. mat length per heating circuit
10 A	10 m
16 A	16 m
20 A	21 m

8. NUMBER OF CIRCUITS

$$\text{Min. number of heating circuits} = \frac{\text{Total heating mat length}}{\text{Max. mat length of heating circuit}}$$

Selection of the mat size

- The heating mat should be not be laid over expansion joints
- The heating mat should be distributed as symmetrically as possible
- Calculate the obstacle-free length and select the mat or a combination of mats with the closest, but a smaller length size

Example 1

16 m track heating for 2 tracks = 2 x 8 m; Circuit breaker size 16 A Max.:

$$\text{Min. number of heating circuits} = \frac{16\ \text{m}}{16\ \text{m}} = 1\ \text{heating circuit}$$

Selection heating mats:

Track 1 + 2: EM2-CM-Mat-16 m

Example 2

Circuit breaker sizes 20 A

50 m track heating for 2 tracks = 2 x 25 m

$$\text{Min. number of heating circuits} = \frac{50\ \text{m}}{21\ \text{m}} = 3\ \text{heating circuits}$$

Selection heating mats:

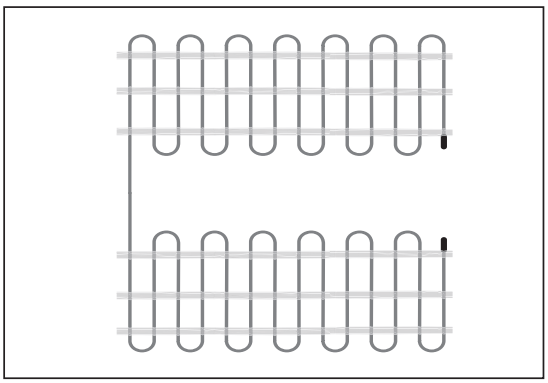
Heating circuit 1 Track 1+2:	2 x WINTERGARD-MAT-4 m = 8 m
Heating circuit 2 Track 1:	WINTERGARD-MAT-21 m = 21 m
Heating circuit 3 Track 2:	WINTERGARD-MAT-21 m
Total:	50 m

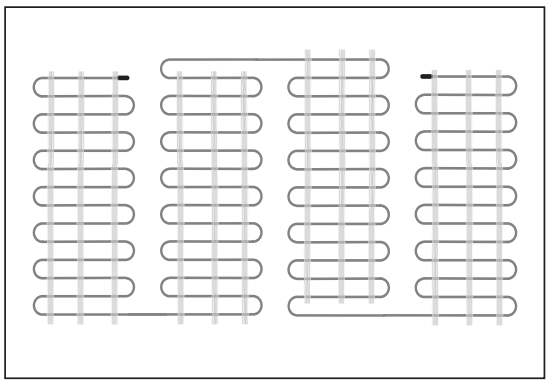
9. ELECTRICAL CONNECTION

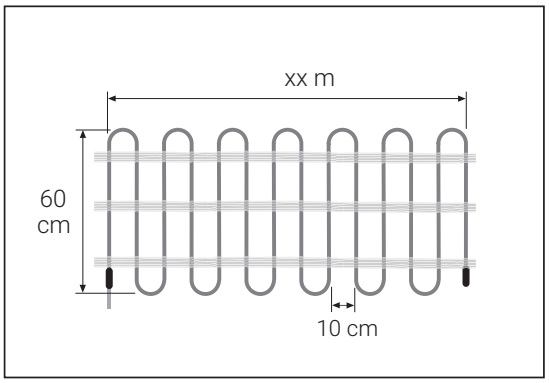
- According to local standards and electrical regulations.
- The cross-section of the power cable conductors is determined according to the nominal current of the circuit breaker and max. permitted voltage drop.

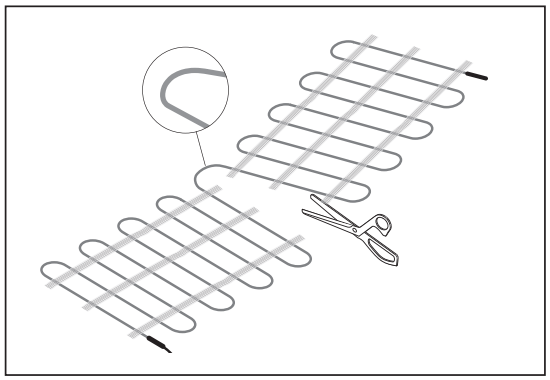
10. INSTALLATION

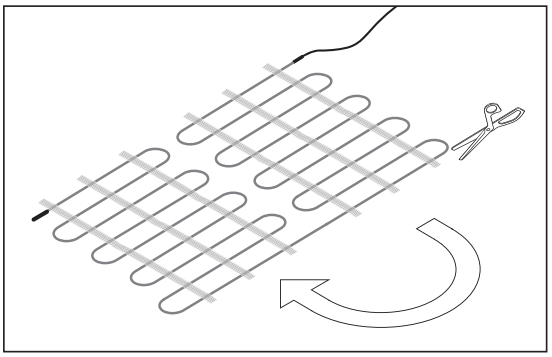
If the heating cable has to be loosened from the mat it is recommended to use the plastic spacer to keep the cable spacing consistent.

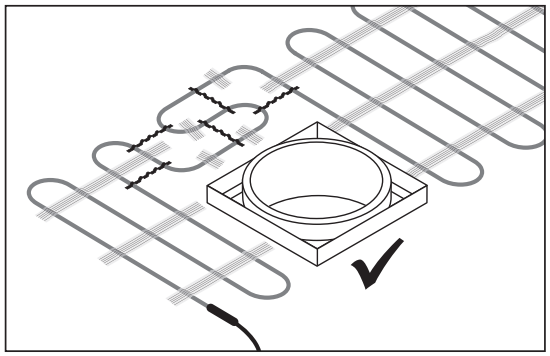


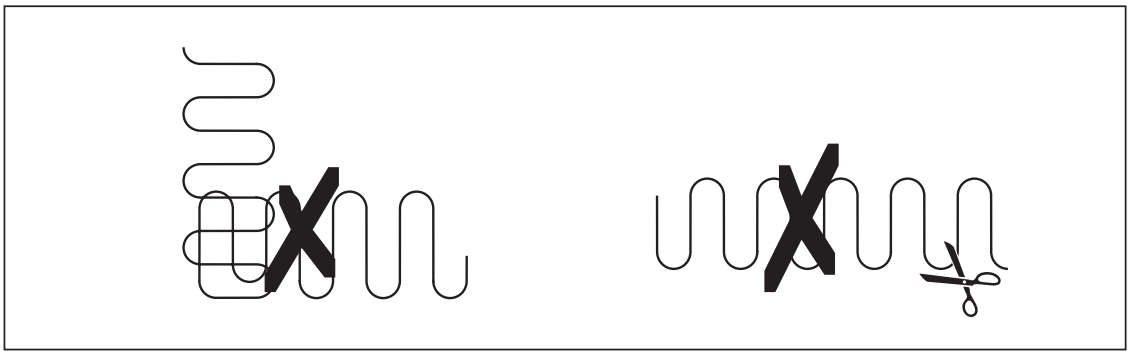




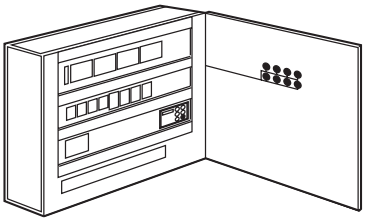








11. CONTROL PANELS



Steel enclosure in wall-mounted construction, equipped with master power switch. RCD(s) 30 mA, circuit breaker(s), "On" and "Alarm" warning lights. Completely assembled, cabled ready connected and tested. Cable entry points in enclosure floor. E650C-G to be ordered separately.

SBS-SMDI-E650C-3X16A	Control panel for max. 3 heating circuits, 16 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003965
SBS-SMDI-E650C-6X16A	Control panel for max. 6 heating circuits, 16 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003966
SBS-SMDI-E650C-9X16A	Control panel for max. 9 heating circuits, 16 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003967
SBS-SMDI-E650C-12X16A	Control panel for max. 12 heating circuits, 16 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003968
SBS-SMDI-E650C-3X32A	Control panel for max. 3 heating circuits, 32 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003961
SBS-SMDI-E650C-6X32A	Control panel for max. 6 heating circuits, 32 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003962
SBS-SMDI-E650C-9X32A	Control panel for max. 9 heating circuits, 32 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003963
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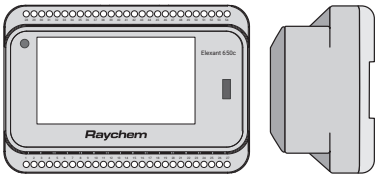
SBS-SMDI-E650C-9X20A	Control panel for max. 9 heating circuits, 20 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003971
SBS-SMDI-E650C-12X20A	Control panel for max. 12 heating circuits, 20 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003972

12. CONTROL UNITS

The Raychem Elexant 650c-Modbus controller is designed for operation with Raychem ramp, roof and gutter heating cables. The Modbus connectivity allows for remote monitoring, configuration, and ease of integration in a Building Management System (BMS).

Elexant 650c-Modbus

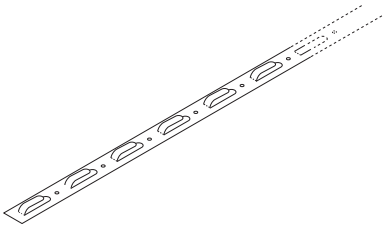


- Intuitive set-up and programming of the unit with a 4.3" colour touch screen
- Moisture and temperature control of surface snow melting systems (E650C-G to be ordered separately)
- Controls 2 independent heating areas
- Temperature with moisture sensing for enhanced energy savings
- Alarm relay with change over contact to signal power, sensor or communication problems (Modbus)
- Ambient temperature monitoring with high and low temperature alarm
- Offsite configurable – can be set up prior to final installation
- DIN rail panel mountable
- The Elexant 650c-Modbus is equipped with a RS485 port for Modbus communication to a BMS system which can be used for configuration, monitoring and alarm purposes
- Ice rain feature – preheating the surface to prevent the issue of freezing rain (separate SM-TF130-DI module required)

13. COMPONENTS AND ACCESSORIES

EM-SPACER-PL

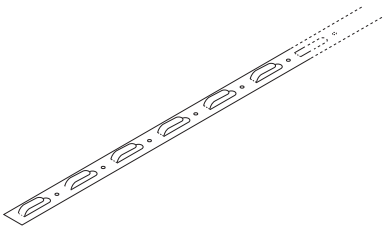
Heating cable spacer



- Length: 5 m; 25 mm grid
- Plastic (for concrete and sand bed installation)

VIA-SPACER-10M

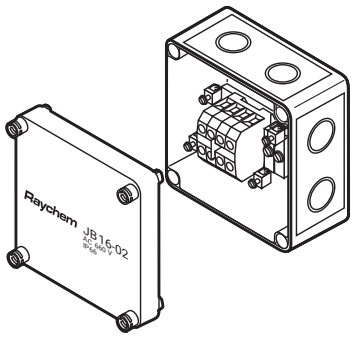
Spacer and mounting band (10 m)



- Required for: asphalt installation
- Pre-cut metal strip

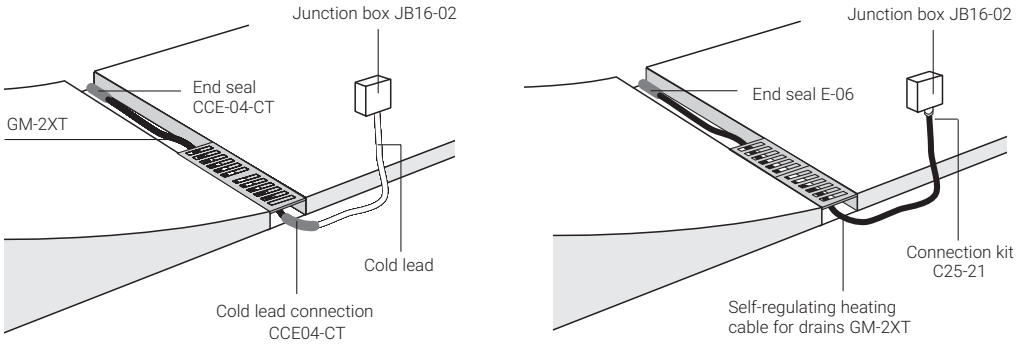
JB16-02

Temperature-resistant junction and connection box
Dimensions: 94 x 94 x 57 mm



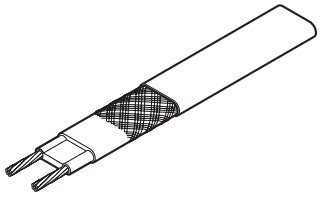
- IP66
- 6 x 4 mm² terminals
- 4 Pg 11/16 and 4 M20/25 knock-out entries

14. DRAIN TRACING



GM-2XT

Drain heating cable with oil- and UV-resistant fluoropolymer outer jacket



JB16-02

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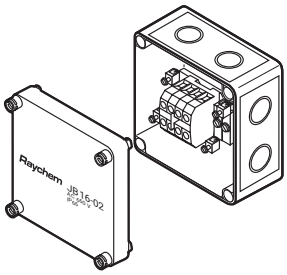
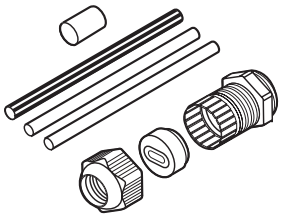


C25-21

Connection kit for GM-2XT

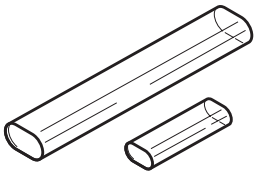
- Heat-shrink system (M25)



E-06

End seal kit for GM-2XT

- Heat-shrink system

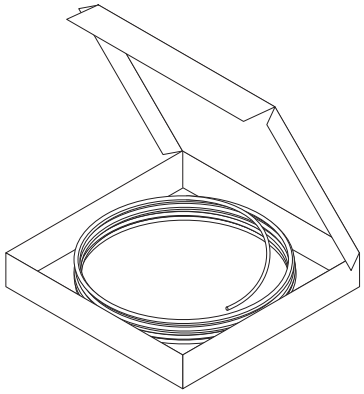


The drain heating system can be switched via the same control unit as the surface heating system.

- Max. 60 m of GM-2XT can be connected to a 16 A C-type circuit-breaker.
- Residual current device (rcd) 30 mA required.

Polymer Solutions
Heating WINTERGARD-CABLE

1. APPLICATION



WINTERGARD-CABLE is a constant wattage heating cable for simple, fast, and effective ramp and accessway heating to prevent snow and ice formation. Simply install the heater over the required area and connect the cold lead to the power junction box and “Smart” control unit.

The WINTERGARD heating cable is designed for applications where a 3 phase (400 V) supply is available.

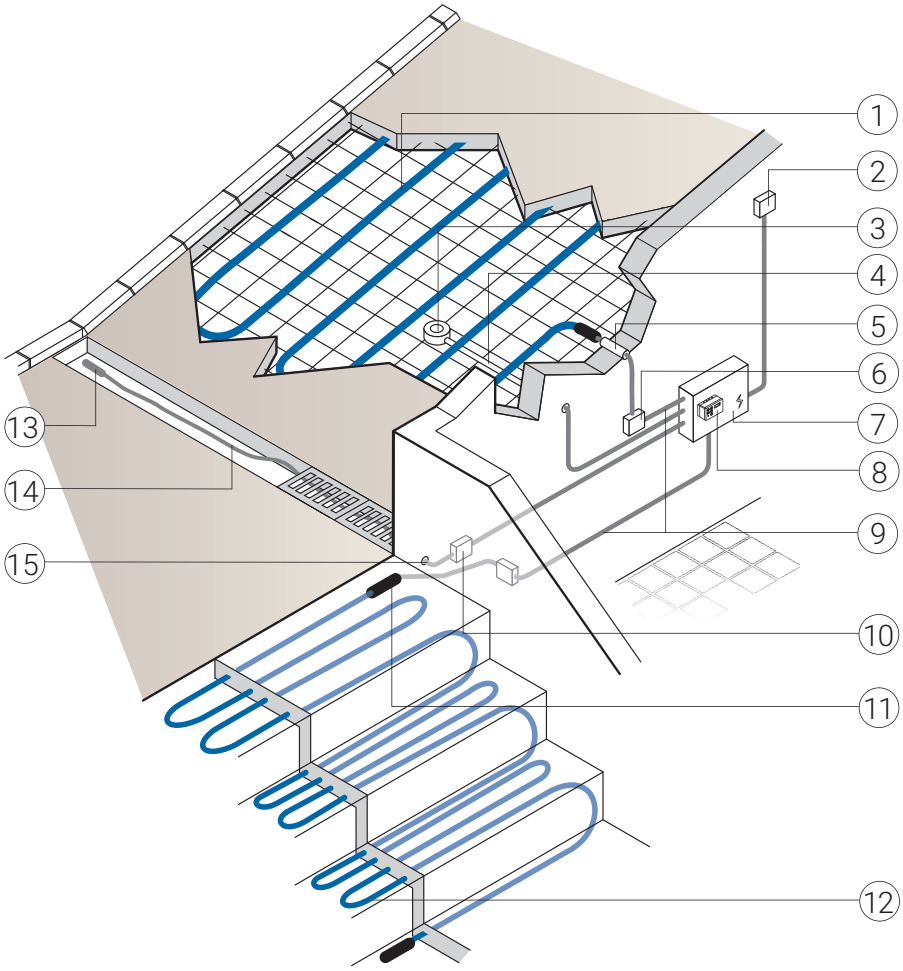
Nominal power	30 W/m
Voltage	230 VAC and 400 VAC
Maximum exposure temperature	65°C (in operation)
Rated temperature non-operation	105°C
Short-term temperature resistance	240°C (15 min.; for asphalt)
Cable construction	Twin core, constant wattage heating cable. Pre-terminated with a 4 m 3 core cold lead cable.
Control unit	Elexant 650c-Modbus
Certification	CE, VDE

2. DETERMINE AREA TO BE HEATED - TRACK HEATING

1. Surface heating cable
2. Junction box
3. Temperature + moisture sensor
4. Sensor lead conduit
5. Power cable conduit
6. Junction box
7. Control panel
8. Smart control unit
9. Supply lead
10. Junction box
11. Power cable - heating cable connection
12. WINTERGARD heating cable

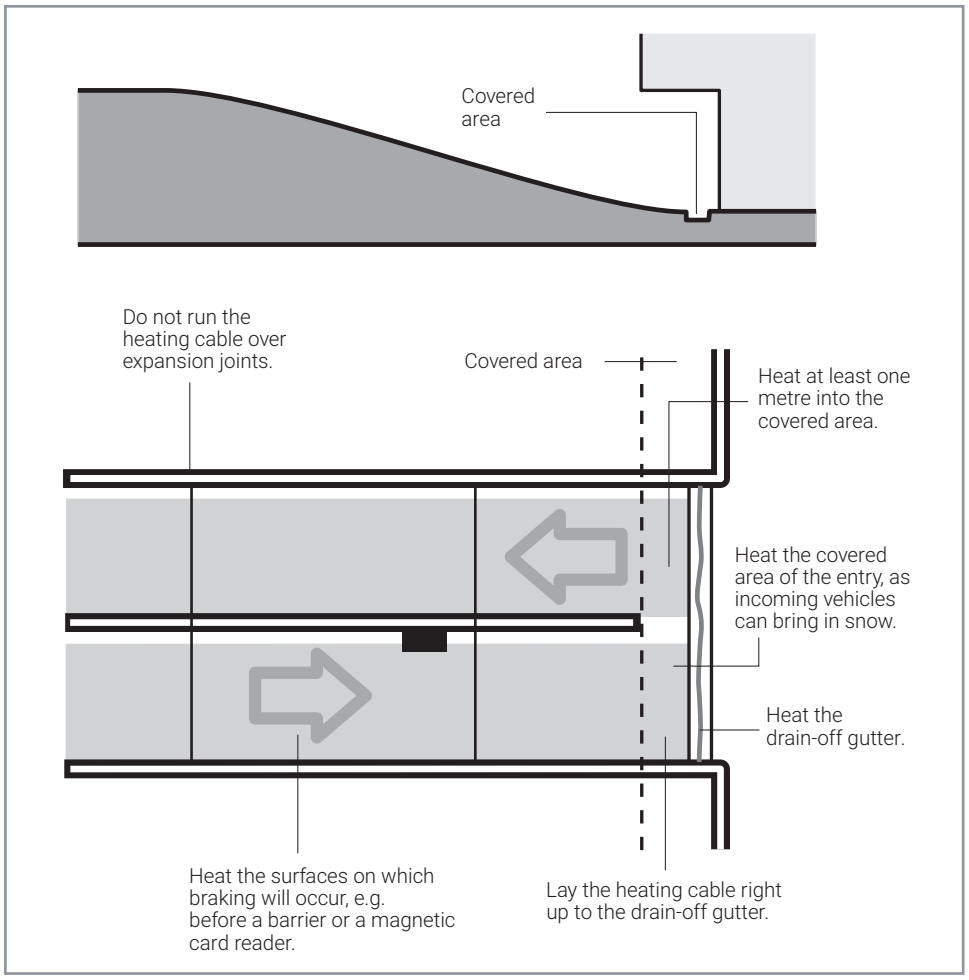
Drain trace heating system

13. End seal
14. GM-2XT heating cable
15. Connection kit

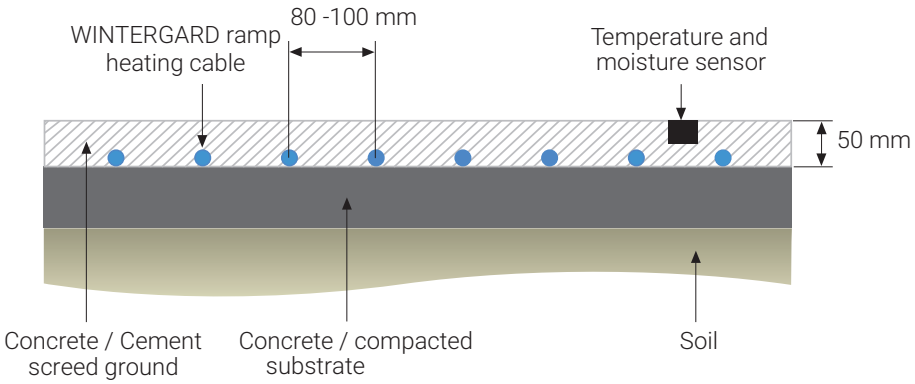


3. AREA TO BE HEATED

Determine the exact area to be heated, e.g. wheel tracks. Consider following factors:

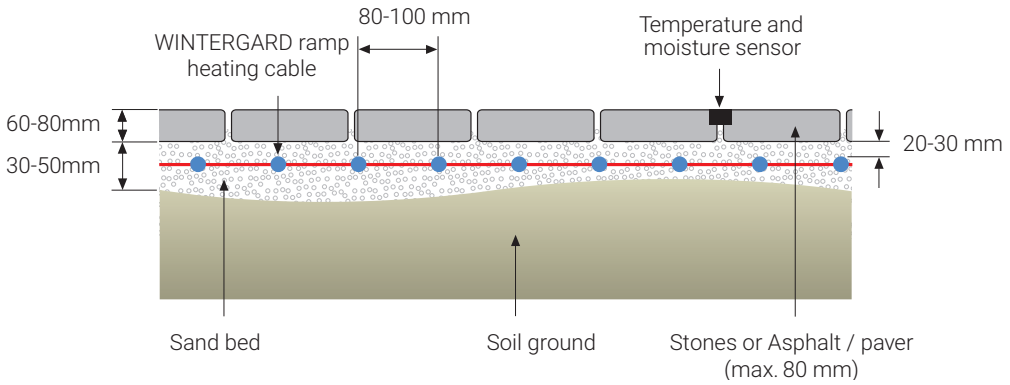


4. EMBEDDING IN SCREED, CONCRETE OR ASPHALT



When laying in concrete with a covering of least 25 mm

5. EMBEDDING IN SAND BED/PAVERS



Recommended split/gravel sizes for sand bed or cement concrete:
Round grain gravel: Ø 8-16 mm
Grit/Broken grain: Ø 4-8 mm

6. PACKAGING AND ORDERING REFERENCES

WINTERGARD ramp heating cable is available in the sizes given below.

- Supply voltage 230 V and 400 V
- Pre-terminated kit contains:
- Heating cable length;
- Cold lead length;
- Installation manual; commissioning report.

Product name - 230 VAC	Reference number	Length (m)	Power output @230V	Cable resistance (Ω) Min./Max.	Cold lead conductor	EAN code
WINTERGARD-CABLE-230V-20M	1244-022769	20	600 W	83.8/97.0	3G x 1,5 mm²	5414506024241
WINTERGARD-CABLE-230V-29M	1244-022770	29	850 W	59.1/68.5	3G x 1,5 mm²	5414506024258
WINTERGARD-CABLE-230V-38M	1244-022771	38	1100 W	45.7/52.9	3G x 1,5 mm²	5414506024265
WINTERGARD-CABLE-230V-47M	1244-022772	47	1400 W	35.9/41.6	3G x 1,5 mm²	5414506024272
WINTERGARD-CABLE-230V-57M	1244-022773	57	1700 W	29.6/34.2	3G x 1,5 mm²	5414506024289
WINTERGARD-CABLE-230V-67M	1244-022774	67	2000 W	25.1/29.1	3G x 1,5 mm²	5414506024296
WINTERGARD-CABLE-230V-75M	1244-022775	75	2250 W	22.3/25.9	3G x 1,5 mm²	5414506024302
WINTERGARD-CABLE-230V-84M	1244-022776	84	2500 W	20.1/23.3	3G x 1,5 mm²	5414506024319
WINTERGARD-CABLE-230V-94M	1244-022777	94	2800 W	17.9/20.8	3G x 1,5 mm²	5414506024326
WINTERGARD-CABLE-230V-112M	1244-022778	112	3350 W	15.0/17.4	3G x 1,5 mm²	5414506024333
WINTERGARD-CABLE-230V-134M	1244-022779	134	4000 W	12.6/14.5	3G x 2,5 mm²	5414506024340
WINTERGARD-CABLE-230V-150M	1244-022780	150	4500 W	11.2/12.9	3G x 2,5 mm²	5414506024357
WINTERGARD-CABLE-230V-168M	1244-022781	168	5000 W	10.1/11.6	3G x 2,5 mm²	5414506024364

Product name - 400 VAC	Reference number	Length (m)	Power output @400V	Cable resistance (Ω) Min./Max.	Cold lead conductor	EAN code
WINTERGARD-CABLE-400V-26M	1244-022761	26	780 W	194.9/225.6	3G x 1,5 mm²	5414506024166
WINTERGARD-CABLE-400V-35M	1244-022762	35	1050 W	144.8/167.6	3G x 1,5 mm²	5414506024173
WINTERGARD-CABLE-400V-62M	1244-022763	62	1860 W	81.7/94.6	3G x 1,5 mm²	5414506024180
WINTERGARD-CABLE-400V-121M	1244-022764	121	3630 W	41.9/48.5	3G x 1,5 mm²	5414506024197
WINTERGARD-CABLE-400V-172M	1244-022765	172	5160 W	29.5/34.1	3G x 1,5 mm²	5414506024203
WINTERGARD-CABLE-400V-210M	1244-022766	210	6300 W	24.1/27.9	3G x 1,5 mm²	5414506024210
WINTERGARD-CABLE-400V-250M	1244-022767	250	7500 W	20.3/23.5	3G x 2,5 mm²	5414506024227

7. HEATING CABLE LENGTHS

Tracks and footpaths

$$\text{Heating cable length (m)} = \frac{\text{Total surface to be heated (m}^2\text{)}}{\text{Heating cable spacing (m)}}$$

Calculate the obstacle-free area and select the cable or a combination of cables with a smaller length, but closest in size.

Stairs

- Heating cable length per step = 300 W/m² / 25 W/m x width x length
- Total heating cable length = Number of steps x heating cable lengths per step + number of steps x step height

8. ELECTRICAL PROTECTION

WinterGard-Cable-230V					
Type - Length WinterGard-Cable-230V-xM	Length (M)	Conductor Resistance +/−10% (Min./Max.)	Rated Power (230 Vac)	Cold lead connection	Circuit Breaker (230 Vac)
WinterGard-Cable-230V-10 m	10	167.5/194.0 Ω	300	3G x 1,5 mm²	10 A
WinterGard-Cable-230V-20 m	20	83.8/97.0 Ω	600	3G x 1,5 mm²	10 A
WinterGard-Cable-230V-29 m	29	59.1/68.5 Ω	850	3G x 1,5 mm²	10 A
WinterGard-Cable-230V-38 m	38	45.7/52.9 Ω	1100	3G x 1,5 mm²	10 A
WinterGard-Cable-230V-47 m	47	35.9/41.6 Ω	1400	3G x 1,5 mm²	10 A
WinterGard-Cable-230V-57 m	57	29.6/34.2 Ω	1700	3G x 1,5 mm²	10 A
WinterGard-Cable-230V-67 m	67	25.1/29.1 Ω	2000	3G x 1,5 mm²	10 A
WinterGard-Cable-230V-75 m	75	22.3/25.9 Ω	2250	3G x 1,5 mm²	10 A
WinterGard-Cable-230V-84 m	84	20.1/23.3 Ω	2500	3G x 1,5 mm²	16 A
WinterGard-Cable-230V-94 m	94	17.9/20.8 Ω	2800	3G x 1,5 mm²	16 A
WinterGard-Cable-230V-112 m	112	15.0/17.4 Ω	3350	3G x 1,5 mm²	16 A
WinterGard-Cable-230V-134 m	134	12.6/14.5 Ω	4000	3G x 2,5 mm²	20 A
WinterGard-Cable-230V-150 m	150	11.2/12.9 Ω	4500	3G x 2,5 mm²	20 A
WinterGard-Cable-230V-168 m	168	10.1/11.6 Ω	5000	3G x 2,5 mm²	25 A

WinterGard-Cable-400V			
Type - Length WinterGard-Cable-400V-xM	Conductor Resistance +/−10% (Min./Max.)	Rated Power (400 Vac)	Circuit Breaker
WinterGard-Cable-400V-26 m	194.9/225.6 Ω	780 W	10 A
WinterGard-Cable-400V-35 m	144.8/167.6 Ω	1050 W	10 A
WinterGard-Cable-400V-62 m	81.7/94.6 Ω	1860 W	10 A
WinterGard-Cable-400V-121 m	41.9/48.5 Ω	3630 W	10 A
WinterGard-Cable-400V-172 m	29.5/34.1 Ω	5160 W	16 A
WinterGard-Cable-400V-210 m	24.1/27.9 Ω	6300 W	16 A
WinterGard-Cable-400V-250 m	20.3/23.5 Ω	7500 W	20 A

9. NUMBER OF CIRCUITS

$$\text{Min. number of heating circuits} = \frac{\text{Total heating cable length}}{\text{Max. cable length of heating circuit}}$$

Example 1

20 m² ramp with 300 W/m² output requirement

Cable Spacing = 300 W / 30 W/m = 10 m of cable per 1 m² = 100 mm cable spacing

10 meters of cable per m² means 10 x 20 m² = 200 m of cable required = 6 kW

Therefore cables required: 1 x 172 m cable

1 x 26 m cable (or optional 35 m cable)

Total cable length 198 m (or 208 m if 35 m cable option is taken)

Example 2

15 m² walkway with 300 W/m² output requirement

Cable Spacing = 300 W / 30 W/m = 10 m of cable per m² of ramp = 100 mm (approx.) cable spacing

10 m per m² means 10 x 15 m² = 150 m of cable = 4.5 kW

Therefore cables required: 1 x 121 m + 1 x 35 m = 156 m

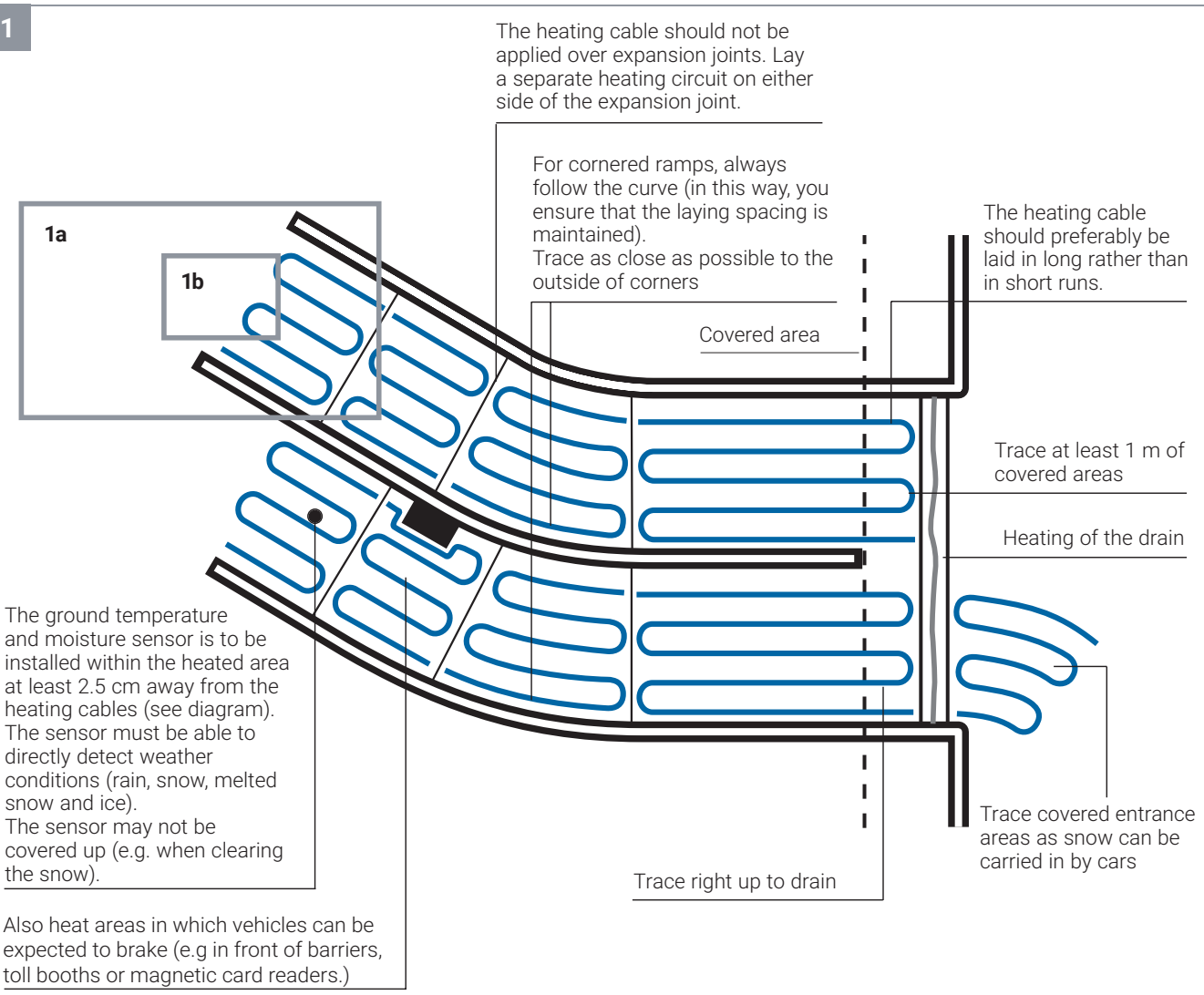
10. ELECTRICAL CONNECTION

- According to local standards and electrical regulations.
- The cross-section of the power cable conductors is determined according to the nominal current of the circuit breaker and max. permitted voltage drop.

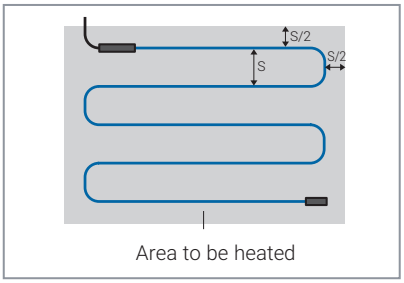
11. INSTALLATION

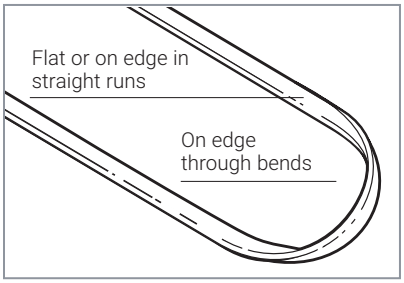
Minimum cable spacing is 8 cm. The heating cable must be secured to the underlying surface to prevent movement during the installation. The cold lead cable should be protected in a conduit. The entire length of heating cable should be covered by wet sand-cement mixture, screed, or dry sand depending on the selected top surface.

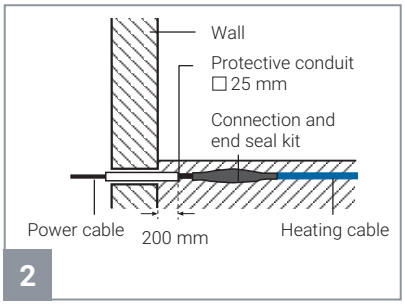
1



* *Take care that E650C-G is NOT installed in an area which is continuously flooded with water (e.g. drain line), or in an area which is continuously under ice due to external parameters (e.g. freezing of condensation water in cool room).*







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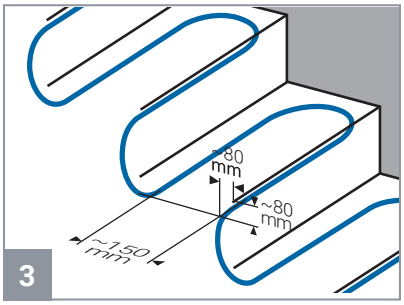
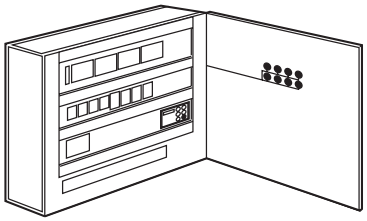


3

12. CONTROL PANELS



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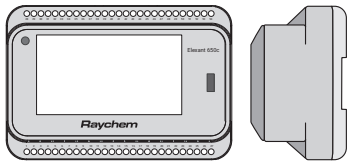
SBS-SMDI-E650C-3X20A	Control panel for max. 3 heating circuits, 20 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003969
SBS-SMDI-E650C-6X20A	Control panel for max. 6 heating circuits, 20 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003970
SBS-SMDI-E650C-9X20A	Control panel for max. 9 heating circuits, 20 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003971
SBS-SMDI-E650C-12X20A	Control panel for max. 12 heating circuits, 20 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	2000003972

For 400 VAC panels please contact our Raychem technical support team

13. CONTROL UNITS

The Raychem Elexant 650c-Modbus controller is designed for operation with Raychem ramp, roof and gutter heating cables. The Modbus connectivity allows for remote monitoring, configuration, and ease of integration in a Building Management System (BMS).

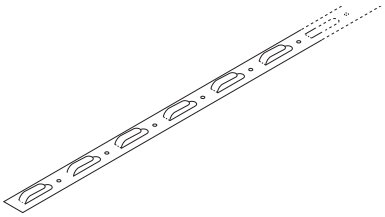
Elexant 650c-Modbus



- Intuitive set-up and programming of the unit with a 4.3" colour touch screen
- Moisture and temperature control of surface snow melting systems (E650C-G to be ordered separately)
- Controls 2 independent heating areas
- Temperature with moisture sensing for enhanced energy savings
- Alarm relay with change over contact to signal power, sensor or communication problems (Modbus)
- Ambient temperature monitoring with high and low temperature alarm
- Offsite configurable – can be set up prior to final installation
- DIN rail panel mountable
- The Elexant 650c-Modbus is equipped with a RS485 port for Modbus communication to a BMS system which can be used for configuration, monitoring and alarm purposes
- Ice rain feature – preheating the surface to prevent the issue of freezing rain (separate SM-TF130-DI module required)

14. COMPONENTS AND ACCESSORIES

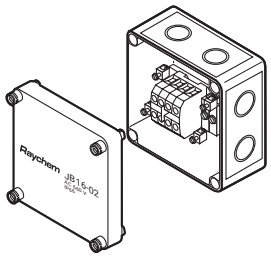
VIA-SPACER-10M, VIA-SPACER-25M



Heating cable spacer

- 2 lengths: 10 m and 25 m (2 m/m²)
- Metal band

JB16-02

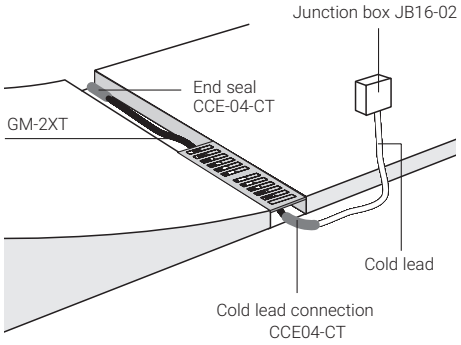


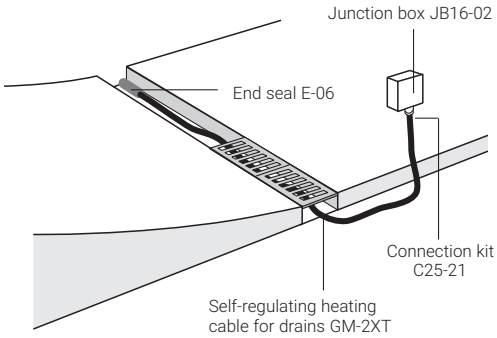
Temperature-resistant junction and connection box

Dimensions: 94 x 94 x 57 mm

- IP66
- 6 x 4 mm² terminals
- 4 Pg 11/16 and 4 M20/25 knock-out entries

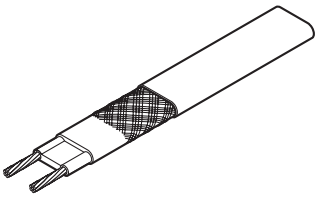
15. DRAIN TRACING





GM-2XT

Drain heating cable with oil- and UV-resistant fluoropolymer outer jacket

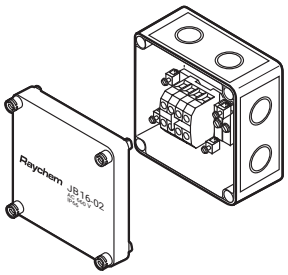


JB16-02

Temperature-resistant junction and connection box

Dimensions: 94 x 94 x 57 mm

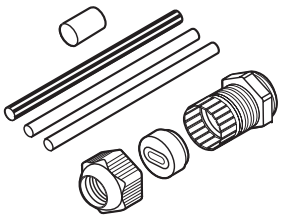
- IP66
- 6 x 4 mm² terminals
- 4 Pg 11/16 and 4 M20/25 knock-out entries



C25-21

Connection kit for GM-2XT

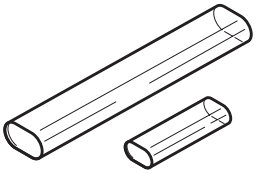
- Heat-shrink system (M25)



E-06

End seal kit for GM-2XT

- Heat-shrink system

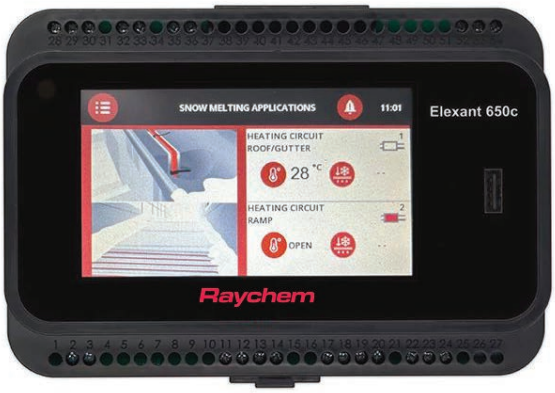


The drain heating system can be switched via the same control unit as the surface heating system.

- Max. 60 m of GM-2XT can be connected to a 16 A C-type circuit-breaker.
- Residual current device (rcd) 30 mA required.

Electronic Controller for Roof & Gutter De-Icing and Surface Snow Melting Systems

PRODUCT OVERVIEW



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

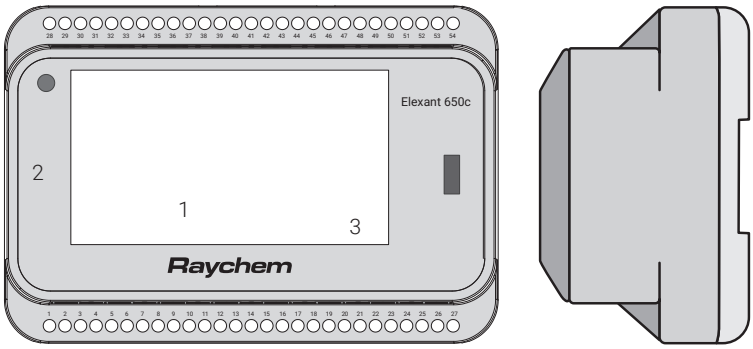
The Modbus connectivity allows for remote monitoring, configuration, and ease of integration in a Building Management System (BMS).

Features

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

PRODUCT SPECIFICATIONS

Typical enclosure dimensions and module layout



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

Enclosure

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

Technical details

Supply voltage	230 VAC –15/+10%; 50/60 Hz
Power consumption	Max. 25 VA
Output relay / contactor / heating cable	2 x 4 A / 230 VAC
Power supply terminals	3 x 1.5 mm²

Heating cables contactor terminals	2 x 2 x 1.5 mm²
Alarm terminals	3 x 1.5 mm²
Sensor terminals	2 x 2 x 1.5 mm²
Modbus terminals	3 x 1.5 mm²
Alarm relay	Single pole double throw relay, voltage – free, rating 2 A/250 VAC
Real time clock	Automatic summer/winter time and leap year correction
Clock back up	3 years
Clock accuracy	Typ. +/–10 minutes per year
Keylock	Password protection for parameter settings
USB Port	For preset-up in power off mode and firmware upgrade
Settings	All settings are stored in non-volatile memory, except date and time
Exposure temperature in operation	0°C to +40°C

Sensor

	Roofs and gutters	Surfaces	With SM-TF130-DI Module	
	E650C-R *	**E650C-G ***	**GM-TA-AS ***	**NTC-SENSOR-10M ***
Temperature sensor type	NTC	NTC	NTC 2 KOhm / 25°C, 2 wire	NTC 2 KOhm / 25°C, 2 wire
Sensor cable length	6 m	20 m	Sensor in a box (no cable attached)	10 m
Temperature range	–30°C to +30°C (for moisture measurement)	–30°C to +30°C (for moisture measurement)	–30°C to +40°C	–40°C to +90°C

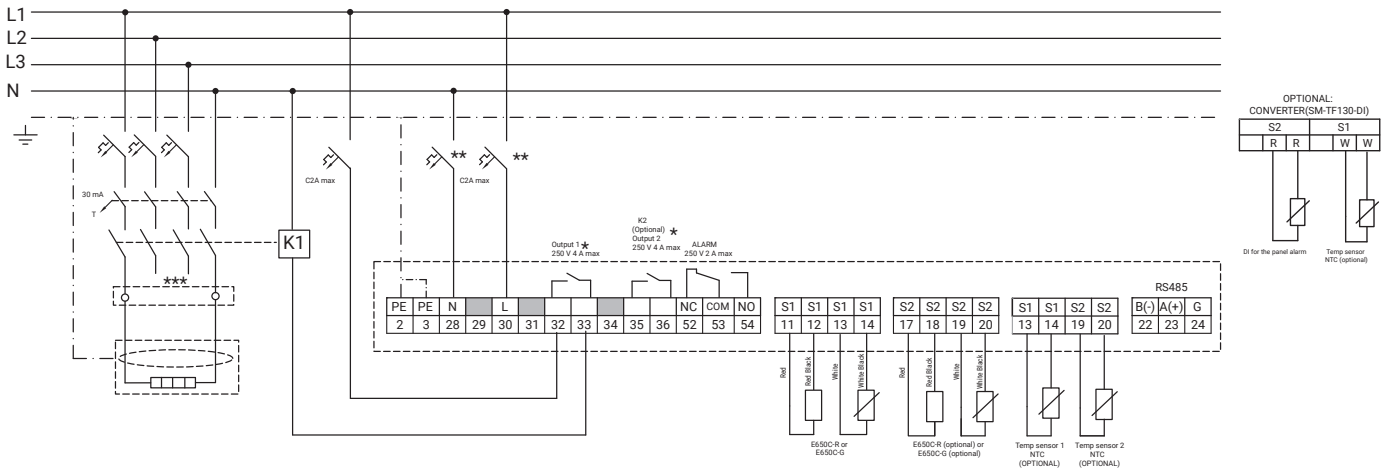
*Not included in the box

Monitoring

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

Electrical scheme

Standard: Moisture sensors



Communication

Communication port	RS-485
Type	2-wire RS-485
Cable	One shielded twisted pair (not included)
Length	1,200 m (4,000 ft.) maximum
Quantity	Up to 247 devices per port

Data rate	2400, 4800, 9600, 19200 baud
Parity	None, even, odd
Stop bits	1, 2
Protocol	Modbus RTU

APPROVALS

For use in non-hazardous areas

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

ORDERING INFORMATION

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

Accessories

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

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

Panels for Roof and Gutter De-Icing and Surface Snow Melting and for connection to Building Management System (BMS)

DESCRIPTION

The Raychem SBS control panel range provides a complete solution for Raychem self-regulating heating cables for roof and gutter de-icing and surface snow melting.

The models in this series control up to 12 heating circuits. To ensure safe operation, the control panel is equipped with circuit breakers (C-type) and 30 mA residual current protection for safe operation. The pre-installed Elexant 650c-Modbus control unit can operate 2 zones with different parameters independently of one another. The Elexant 650c-Modbus is also allowing flexible Modbus connectivity for remote monitoring, configuration, and ease of integration in a Building Management System (BMS).

The control panel is pre-wired and only needs to be connected to a main power supply (400 VAC, 3P/N/PE). Sensors are to be ordered separately.

ADVANTAGES

- Fast connection of multiple heating circuits directly to the control panel
- No additional connections or junction boxes required
- Connection of 3–12 heating circuits to a single control panel
- Circuit over-current and RCD protection integrated directly into the control panel
- No separate safety devices required
- Complete system directly from the manufacturer
- The system and components have been selected for optimal use as a pipe freeze protection and temperature maintenance system
- Collective error/alarm
- The panel is equipped with a RS485 port for Modbus communication to a BMS system which can be used for configuration, monitoring and alarm purposes.

TECHNICAL DATA

Control setting	Each Elexant 650c-Modbus controller can control up to 2 separate groups of 3 circuits with independent parameters and control mode.
Panel supply voltage	400 VAC 3P/N/PE
Heater circuit supply voltage	230 VAC
Sensor	NTC-Type is used as ambient temperature sensor (PASC) and/or pipe line sensor
Approvals	CE (IEC61439-2), UKCA
Main switch	According to selected model (32–100 A)
RCD	30 mA
Line circuit breakers	According to selected model, C-type, per heating circuit
Panel material	Coated metal
IP rating	IP65
Ambient temperatures	+10°C to +35°C
Colour	RAL 7035 (Light Grey)
Installation location	Indoor
Alarm function	1 potential free alarm contact in panel; 1 alarm light in the door
Operation mode switch	Auto/Manual Auto = Control in function (standard mode) Manual = all heating circuits switched on (uncontrolled operation)

COMMUNICATION (ELEXANT650C-MODBUS)

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

RELATED PRODUCTS

The control panel S-SMDI-E650c can be operated with the following Raychem roof and gutter de-icing and surface snow melting heating cables:

EM2-XR Self-regulating heater cable (90 W/m @ 0°C)

IceStop GM-2X (T)

WINTERGARD Cable & Mat

FroStop Black

Customized versions of the SBS-SMDI-E650c panels can be also operated with the GM2-CW and EM2-MI cables.

TECHNICAL DATA PANEL

Panel type			SBS-SMDI-E650c-3xXXA	SBS-SMDI-E650c-6xXXA	SBS-SMDI-E650c-9xXXA	SBS-SMDI-E650c-12xXXA
Max. quantity of heating circuits			3	6	9	12
Quantity of contactors			2	2	3	4
Max. quantity of Elexant 650c-Modbus controllers			1	1	2	2
Max. power output		kW	28	43	75	86
Circuit breaker on-site		max. A	3 pole x 40 A	3 pole x 80 A	3 pole x 100 A	3 pole x 132 A
Enclosure mounting			Wall-mounted	Wall-mounted	Wall-mounted	Wall-mounted
Dimension	Width	mm	400	600	600 (SBS-SMDI-E650c-9x32A - 800)	800
	Height	mm	600	600	600 (SBS-SMDI-E650c-9x32A - 800)	800
	Depth	mm	210	210	210	210
Weight	Approx.	kg	32	32	54	56

REFERENCE DATA

Product name	Item number	Product description	EAN numbers
SBS-SMDI-E650C-3X16A	2000003965	Control panel for max. 3 heating circuits, 16 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	5414506025040
SBS-SMDI-E650C-6X16A	2000003966	Control panel for max. 6 heating circuits, 16 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	5414506025057
SBS-SMDI-E650C-9X16A	2000003967	Control panel for max. 9 heating circuits, 16 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	5414506025064
SBS-SMDI-E650C-12X16A	2000003968	Control panel for max. 12 heating circuits, 16 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	5414506025071
SBS-SMDI-E650C-3X32A	2000003961	Control panel for max. 3 heating circuits, 32 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	5414506025088
SBS-SMDI-E650C-6X32A	2000003962	Control panel for max. 6 heating circuits, 32 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	5414506025095
SBS-SMDI-E650C-9X32A	2000003963	Control panel for max. 9 heating circuits, 32 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	5414506025101
SBS-SMDI-E650C-12X32A	2000003964	Control panel for max. 12 heating circuits, 32 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	5414506025118
SBS-SMDI-E650C-3X20A	2000003969	Control panel for max. 3 heating circuits, 20 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	5414506025125
SBS-SMDI-E650C-6X20A	2000003970	Control panel for max. 6 heating circuits, 20 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	5414506025132
SBS-SMDI-E650C-9X20A	2000003971	Control panel for max. 9 heating circuits, 20 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	5414506025149
SBS-SMDI-E650C-12X20A	2000003972	Control panel for max. 12 heating circuits, 20 A (including 1 controller Elexant 650c-Modbus with Modbus connectivity)	5414506025156
SENSOR-NTC-10M	1244-015847	Additional sensor for 2nd heating zone (to be ordered separately)	5414506015119
GM-TA-AS	1244-017965	Ambient sensor in plastic enclosure, NTC type	5414506018387
E650C-G	1244-022794	Moisture and temperature sensor for surface snow melting, 20 m, with housing and protective cover	5414506024661
E650C-G-HOUSING	1244-022796	Spare housing and protective cover for surface snow melting sensor	5414506024685
E650C-R	1244-022795	Moisture and temperature sensor for roof and gutter de-icing, 6 m, with zinc mounting bracket	5414506024678
E650C-R-BRACKET-ZN	1244-022798	Spare mounting bracket for roof and gutter de-icing sensor, zinc	5414506024708
E650C-R-BRACKET-CU	1244-022799	Spare mounting bracket for roof and gutter de-icing sensor, copper	5414506024715
SM-TF130-DI	1244-022836	External module for the ice rain feature and panel alarm digital input	5414506025019
GM-SEAL-02	1244-012310	Adhesive for roof and gutter brackets, polyurethane glue, 300 ml bottle	5414506014440

Note: customized panels can be ordered, please contact Chemelex.

MOST COMMON POSSIBLE ADDITIONAL OPTIONS

- Installation outdoors
- Installation of a heater
- Rain sheet cover
- Lightning protection

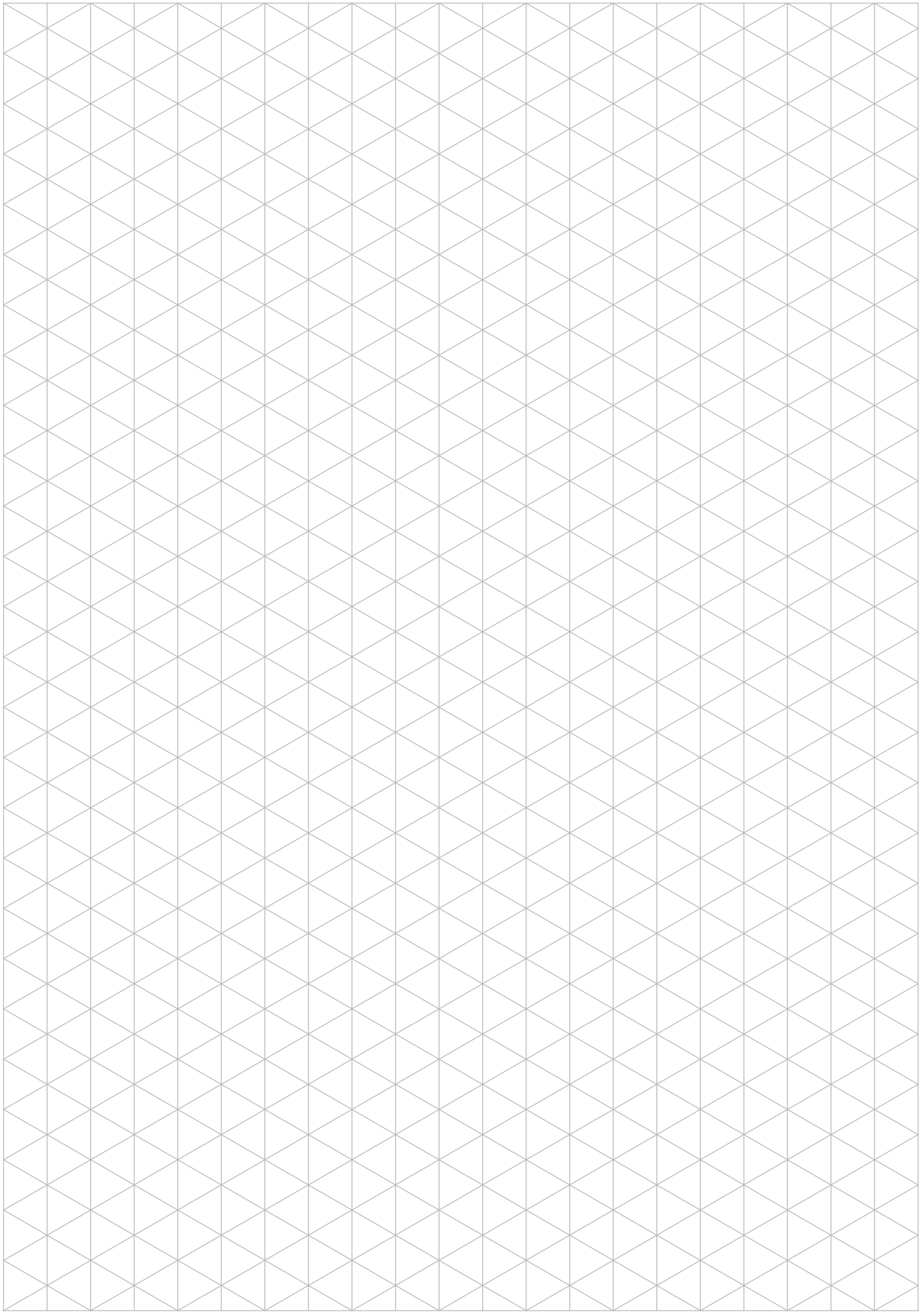
INSTALLATION INSTRUCTION

The panel is supplied with complete circuit and connection diagrams. A qualified electrician must carry out all work on electrical systems in compliance with the applicable regulations and standards.

Product Selection

PRODUCT FEATURES & SELECTION GUIDE

Product Features	EM2-XR	EM2-MI	WINTERGARD-MAT	WINTERGARD-CABLE
				
Product Description	Self-regulating heating cable	Mineral Insulated constant wattage heating cable	Constant wattage polymeric pre-terminated ramp heating mat system	Constant wattage polymeric pre-terminated heating cable system
Features	Extremely robust self-regulating heating cable for flexible installation under severe site conditions.	Pre-terminated heating cable with exceptional resistance to high temperature asphalt surfaces.	Pre-terminated ramp, walkway, and track heating (roll-out) mat for fast and simple installation.	Pre-terminated constant power heating cable for larger areas & 230 V and 400 V power supplies.
Voltage Rating	230 Vac	230 Vac	230 Vac	230 Vac or 400 Vac
Nominal power output	90 W/m @ 0°C.	50 W/m	300 W/m^2	30 W/m
Maximum circuit length	85 m	136 m	12.6 m^2 (Mat size = 21 m x 0,60 m)	250 m
Maximum exposure temperature	100°C	250°C	65°C in operation; 105°C rated non-operation, short-term: 240°C (15 min)	65°C; in operation; 105°C rated non operation, short-term: 240°C (15 min)
Connections & termination	Cut-to-length system for flexible field termination (using Raychem heat-shrink components). Pre-terminated cable lengths (fixed or configured) available. Contact us.	Factory pre-terminated	Factory pre-terminated	Factory pre-terminated
Compatible Controller / Control Panel	SBS-SMDI / ACS-30	SBS-SMDI / ACS-30	SBS-SMDI / ACS-30	SBS-SMDI (standard or customized for 400 Vac) / ACS-30
Approvals	VDE / CE	VDE / CE	CE	CE
Suitable for installation on reinforcement bar	Highly recommended	Recommended	Not applicable	Recommended
Suitable for installation in direct contact with hot poured asphalt	Not applicable	Highly recommended	Recommended	Recommended
Suitable for embedding in sand sub-level	Recommended	Recommended	Highly recommended	Highly recommended
Cold lead included	When ordered as a pre-configured heating unit. See Page 10 for more information.	3 m (at each end of heater cable)	5 m	5 m
Dual Wire / Single Wire construction	Dual	Single	Dual	Dual



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RAYCHEM-TH-CDE1540-RampHeating-EN-2504

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