

**Raychem**<sup>®</sup>

Snow melting for ramps, access ways and footpaths

**Technical handbook 2010-2012**



**tyco**

*Thermal Controls*

# Why Tyco Thermal Controls?

## Raychem®

Raychem offers a set of tools and services that aim to simplify the system design and specification process. Not only do we offer the best quality and broadest range of products, we also support them with an unrivalled service package.

### Large technical support team

- » “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:

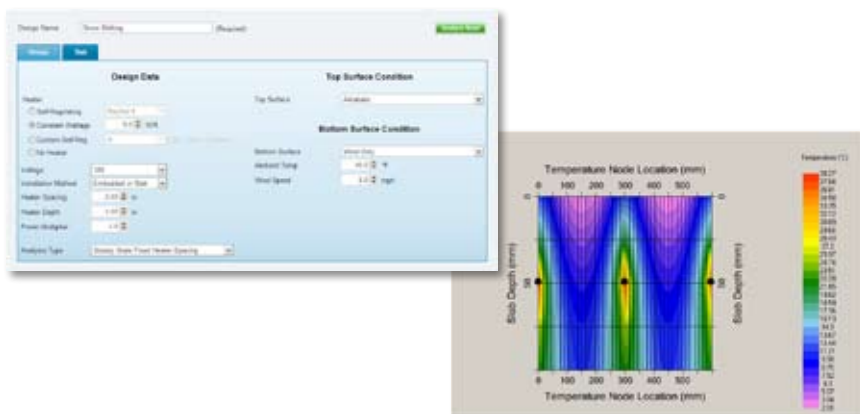


Free phone 0800 96 90 13 or Free fax 0800 96 86 24

### 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 ground heating systems?**

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**Self Regulating systems**

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# Why ground 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 ground 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 (VIA-DU-20) is compatible with all ramp snow melting solutions.

## Application in concrete

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

Temperature and moisture sensor  
VIA-DU-S20

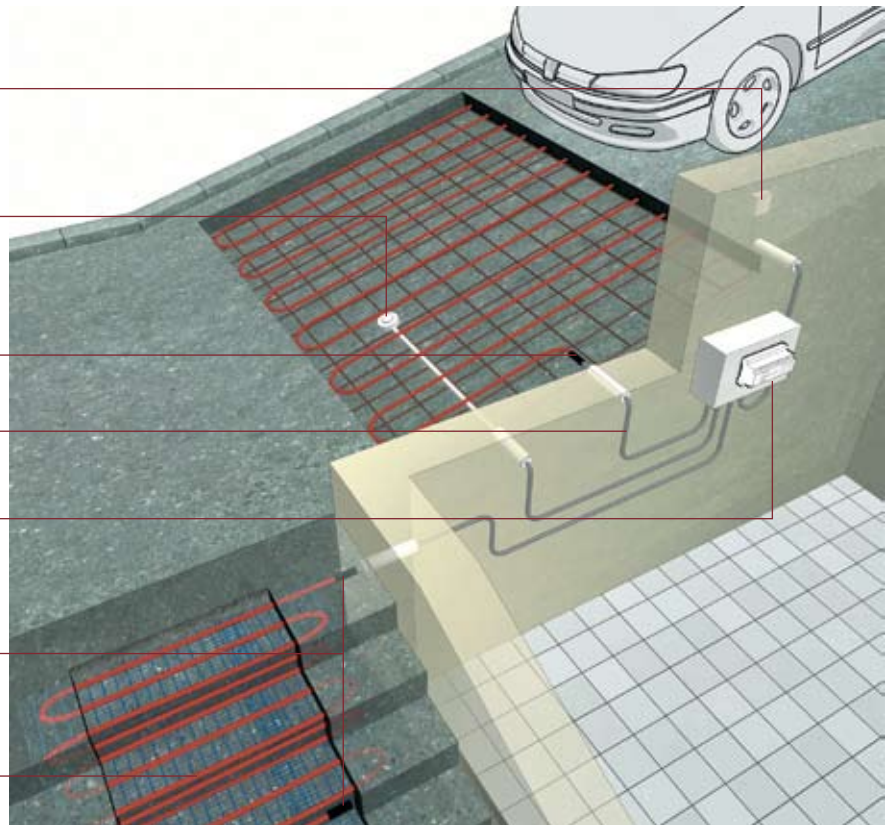
Connection and end seal kit  
(VIA-CE1)

Connection cable (VIA-L1)

Control unit (VIA-DU-20)

Connection and end seal kit (VIA-CE1)

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



\* Optional, only needed when "local detection" is selected.

## Raychem Solutions for concrete

|                                      | Product | Description                                                                                      |
|--------------------------------------|---------|--------------------------------------------------------------------------------------------------|
| Reinforced concrete ramp             | EM2-XR  | Self-Regulating heating cable for reinforced concrete ramps                                      |
| Domestic/private garagetrack heating | 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

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

Temperature and moisture sensor  
VIA-DU-S20

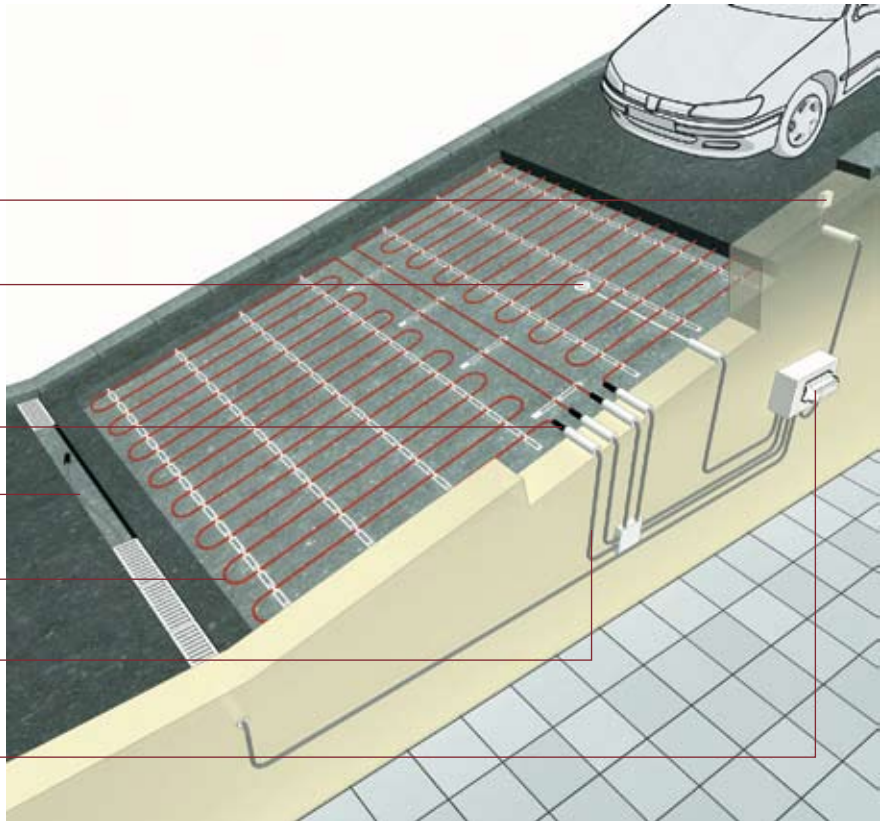
Connection between heater cable and  
cold lead (Pre-engineered)

Self regulating drain heater (8BTV2-CT)

Mineral-Insulated heating cable (EM2-MI)

Pre-engineered cold lead

Control unit (VIA-DU-20)



\* Optional, only needed when "local detection" is selected.

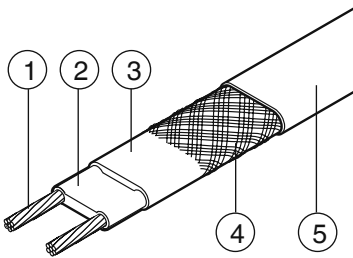
## Raychem Solutions for asphalt

|                               | Product | Description                                                                   |
|-------------------------------|---------|-------------------------------------------------------------------------------|
| Loading bay and asphalt layer | EM2-MI  | Mineral insulated, high temperature resistant heating cable for asphalt ramps |

# Self-regulating systems

## 1. Application

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



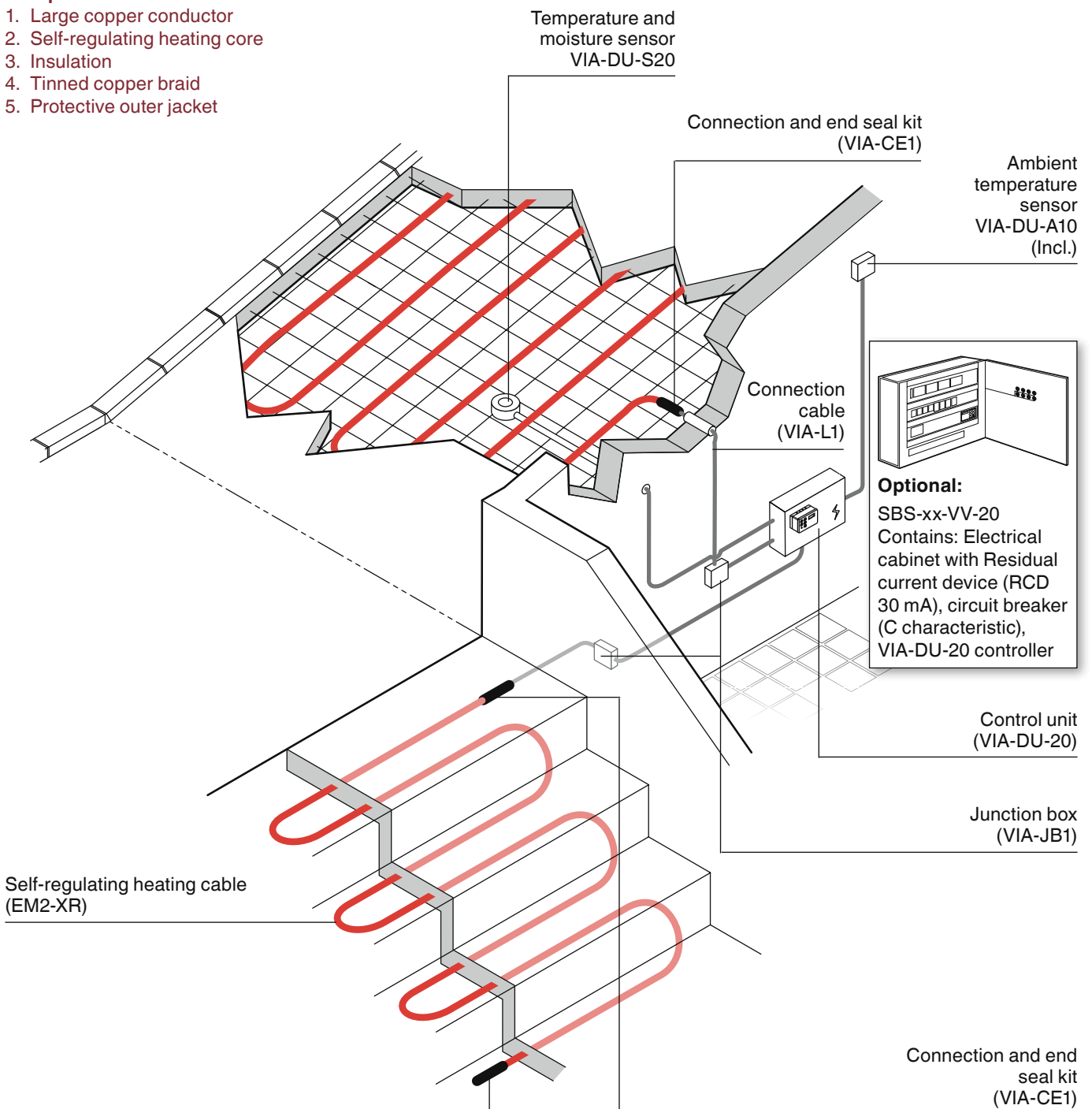
### Composition

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

|              |                                        |
|--------------|----------------------------------------|
| Cable type   | EM2-XR                                 |
| Control      | VIA-DU-20 / SBS-XX-VV-20 Control Panel |
| 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)

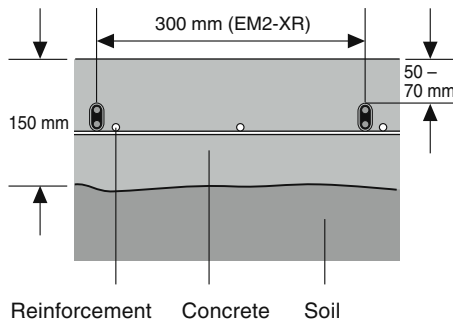




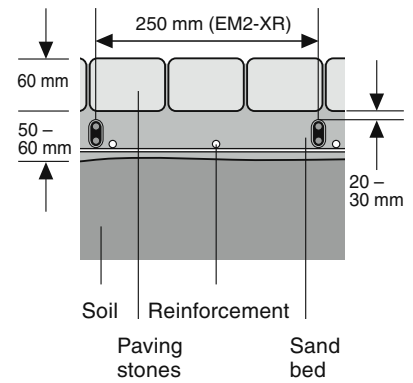
# Self-regulating systems

## 2. Cable spacing

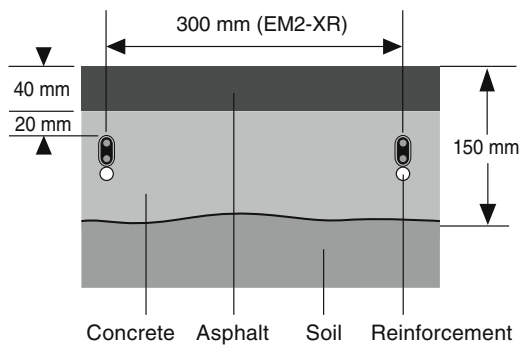
### Concrete



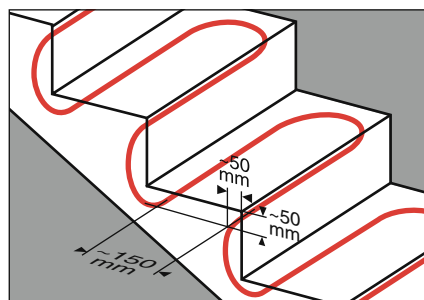
### Sand bed



### Asphalt

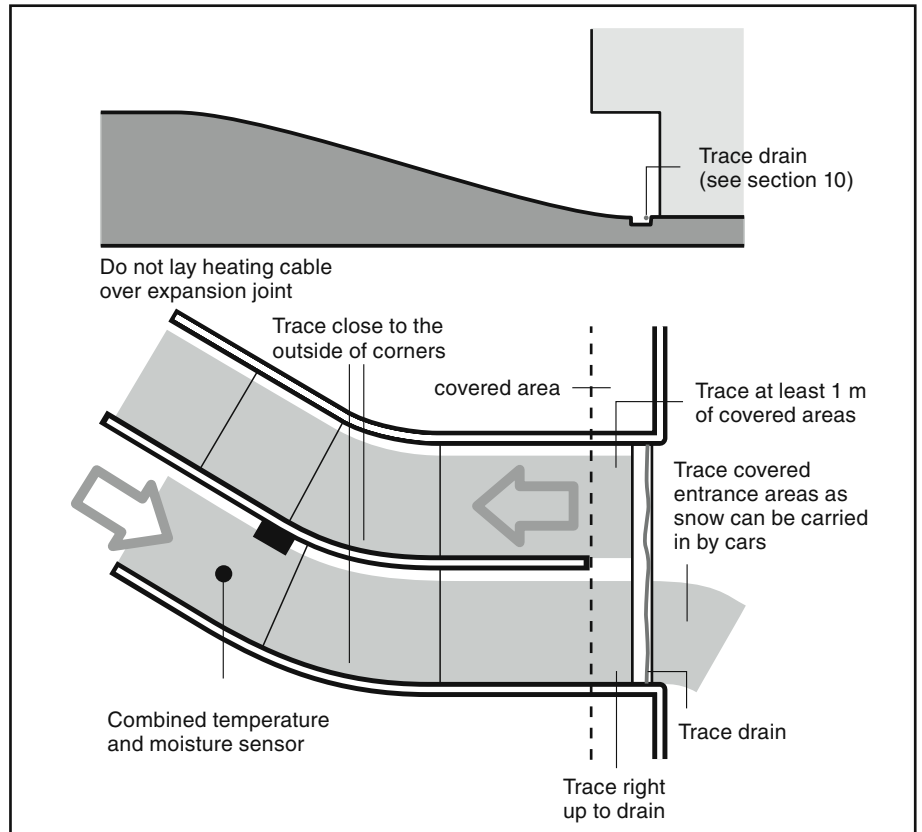


### Concrete stairs





### 3. Determine area to be heated



### 4. Determine area to be heated

#### A. Ramps and paths

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

#### B. Stairs

$$\text{Heating cable length (m)} = [2 \times \text{stair width (m)} + 0.4] \times \text{number of stairs} + 1 \text{ m (connection)}$$

### 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  $-10^{\circ}\text{C}$ ).

# Self-regulating systems

## 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<br>(MCBS to BS EN 60898, Type C) | Max. circuit length: EM2-XR<br>(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                                                    | Contact your Tyco Thermal Controls representative      |
| 50 A                                                    | for the most economical solution                       |

**Provide the electrical system designer with all the necessary data.**

## 6. Number of circuits

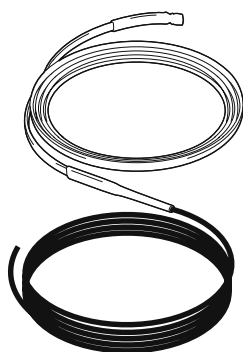
Min. number of heating circuits =  $\frac{\text{Heating cable length (see section 4)}}{\text{max. length of heating circuit (see section 5)}}$

- » 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 metres.)
  - Connection and end seal pre-installed

| Product name                 | Order reference |
|------------------------------|-----------------|
| Heating unit Raychem Viagard | 1244-005360     |

## 9. Installation instructions

**1**

The heating cable should not be applied over expansion joints. Lay a separate heating circuit on either side of the expansion joint.

For cornered ramps, always follow the curve (in this way, you ensure that the laying spacing is maintained). Trace as close as possible to the outside of corners

The heating cable should preferably be laid in long rather than in short runs.

Trace at least 1 m of covered areas

Heating of the drain

Trace covered entrance areas as snow can be carried in by cars

Trace right up to drain

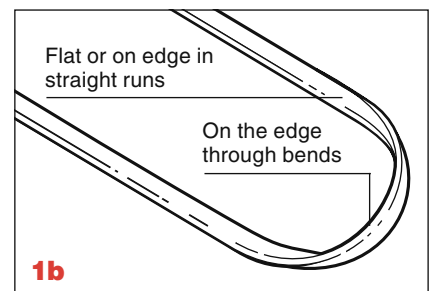
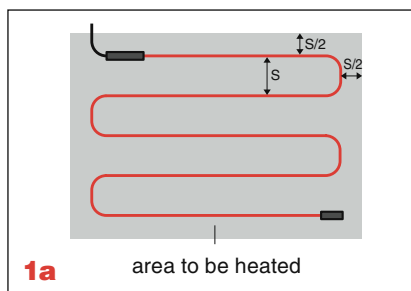
**1a**

**1b**

The ground temperature and moisture sensor is to be installed within the heated area at least 2.5 cm away from the heating cables (see diagram).  
The sensor must be able to directly detect weather conditions (rain, snow, melted snow and ice).  
The sensor may not be covered up (e.g. when clearing the snow).

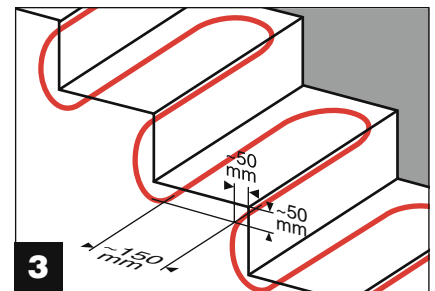
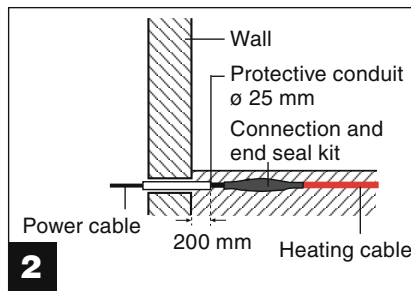
Also heat areas in which vehicles can be expected to brake (e.g. in front of barriers, toll booths or magnetic card readers.)

**\* Take care that VIA-DU-S20 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).**

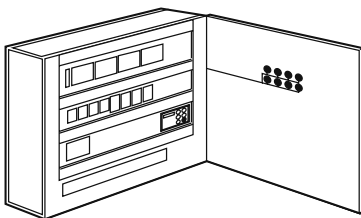


| Spacing (S) | Concrete | Sand   |
|-------------|----------|--------|
| EM2-XR      | 300 mm   | 250 mm |

# Self-regulating systems



## 10. Control Panels



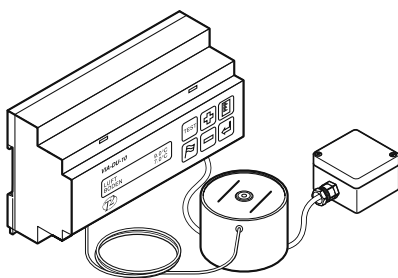
Steel enclosure in wall-mounted construction, equipped with master power switch. Combination(s) 30 mA / C32 A, circuit breaker(s), "On" and "Alarm" warning lights. Completely assembled, cabled ready connected and tested. Cable entry points in enclosure floor. Each cabinet is equipped with VIA-DU-20 multi-sensor controller.

|                     |                                                   |                  |
|---------------------|---------------------------------------------------|------------------|
| <b>SBS-03-VV-20</b> | Cabinet for 1 to 3 heating circuits (3 x 32 A)    | PCN: 1244-000215 |
| <b>SBS-06-VV-20</b> | Cabinet for 4 to 6 heating circuits (6 x 32 A)    | PCN: 1244-000216 |
| <b>SBS-09-VV-20</b> | Cabinet for 7 to 9 heating circuits (9 x 32 A)    | PCN: 1244-000217 |
| <b>SBS-12-VV-20</b> | Cabinet for 10 to 12 heating circuits (12 x 32 A) | PCN: 1244-000218 |

## 11. Control units

The electronic control unit ensures that the surface heating only starts when the temperature falls below a certain threshold and moisture is detected on the relevant surfaces, ensuring efficient energy use.

### VIA-DU-20

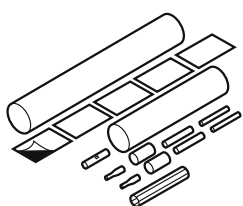


Control unit with combined moisture and temperature sensor and optional ambient temperature sensor.

- » DIN-rail mounting
- » Sensor cable length: 15 m
- » Freezing rain precaution
- » Optional BMS connection
- » Alarm relay contacts

## 12. Components and accessories

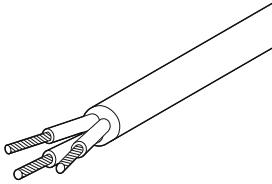
### VIA-CE1



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

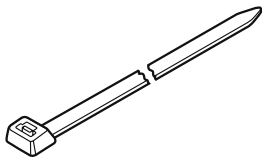
### VIA-L1



Temperature-resistant cable (cold lead), 3 x 6 mm<sup>2</sup> 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)

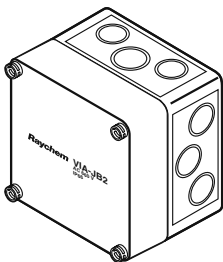
### KBL-09



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

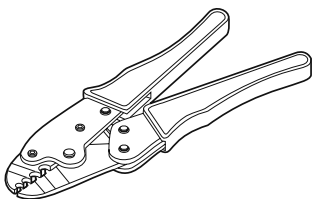
### VIA-JB2



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<sup>2</sup>
- » IP 66
- » 4 x M20/25 + 2 x M32 at opposite sides and 6 x M20/25 at opposite sides

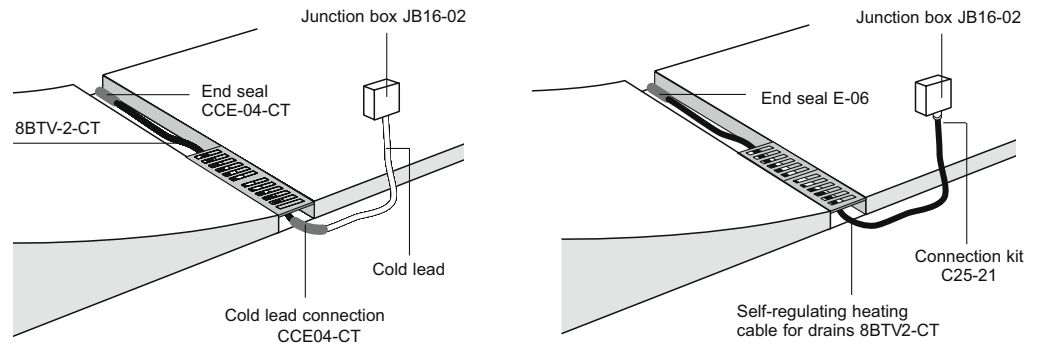
### VIA-CTL-01



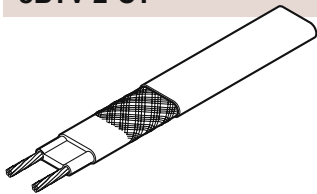
Crimping tool for connectors in VIA-CE1 connection and end seal kit

# Self-regulating systems

## 13. Drain tracing

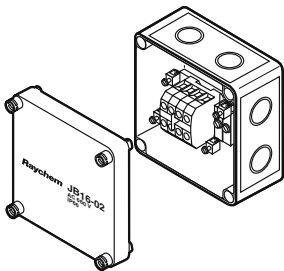


### 8BTV-2-CT



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

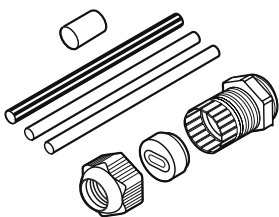
### JB16-02



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

- » IP66
- » 6 x 4mm<sup>2</sup> terminals
- » 4 Pg 11/16 and 4 M20/25 knock-out entries

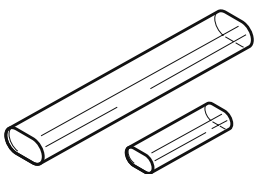
### C25-21



Connection kit for BTV-CT

- » Heat-shrink system (M25)

### E-06



End seal kit for BTV-CT

- » Heat-shrink system

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

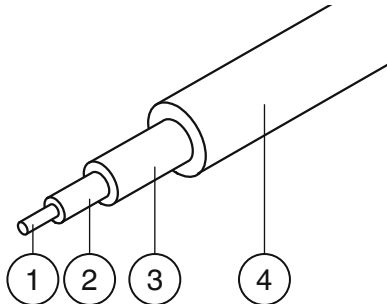
- » Max. 70 m of 8BTV-2-CT can be connected to a 16 A C-type circuit-breaker.
- » Residual current device (rcd) 30 mA required.

# Mineral insulated systems

## 1. Application

Surface heating in asphalt applications.

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



### Construction:

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

### Small areas, Footpaths

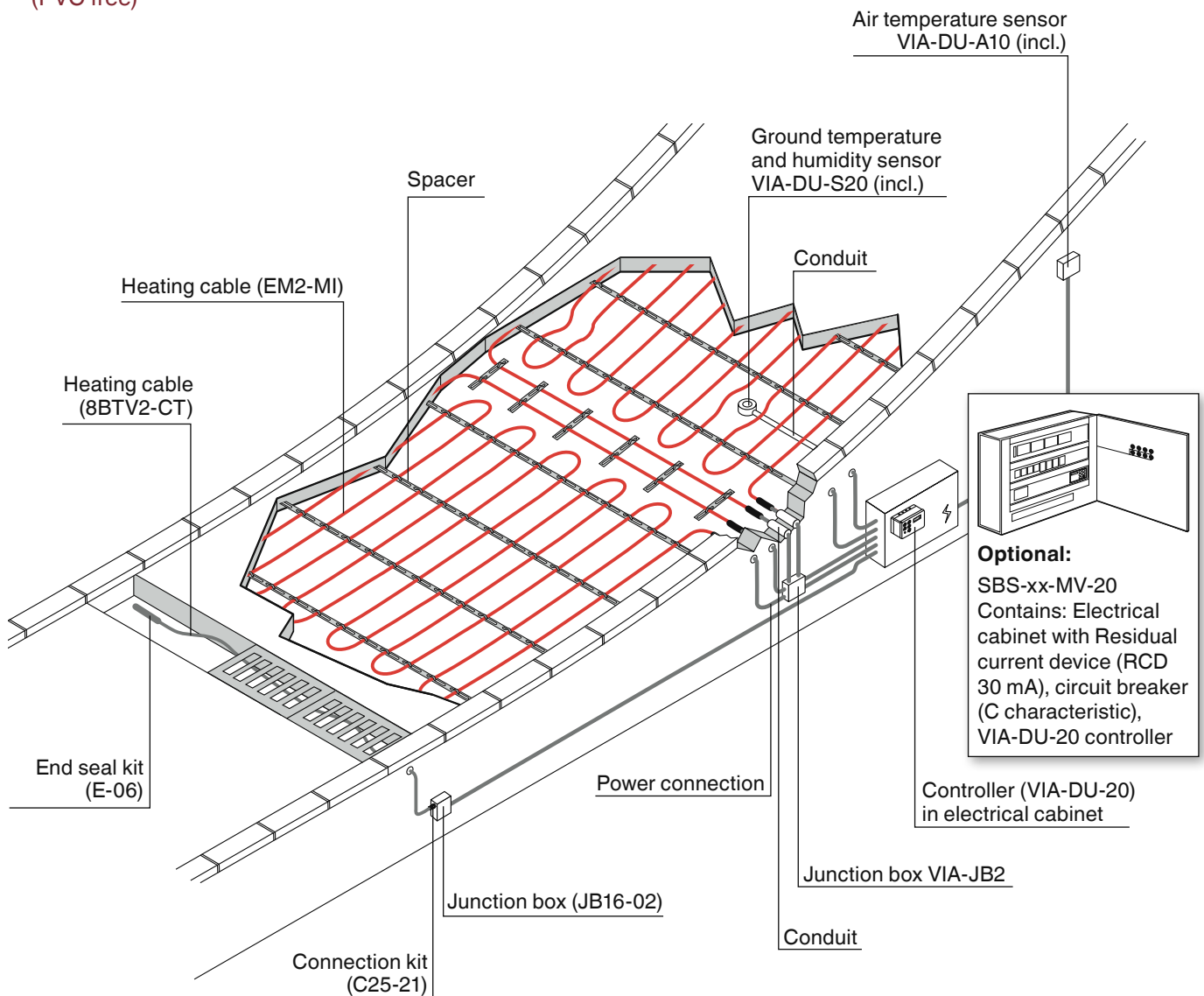
### Large areas, Garage entrances

|                            | Small areas, Footpaths        | Large areas, Garage entrances |
|----------------------------|-------------------------------|-------------------------------|
| Typical output requirement | 180 W/m <sup>2</sup> (50 W/m) | 300 W/m <sup>2</sup> (50 W/m) |
| Spacing                    | 275 mm                        | 165 mm                        |

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

### Package contents

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



#### Optional:

SBS-xx-MV-20  
Contains: Electrical cabinet with Residual current device (RCD 30 mA), circuit breaker (C characteristic), VIA-DU-20 controller

Controller (VIA-DU-20) in electrical cabinet

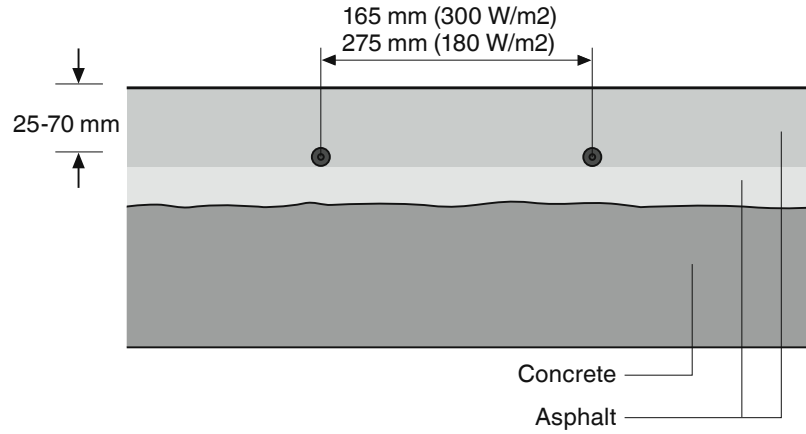
# Mineral insulated systems





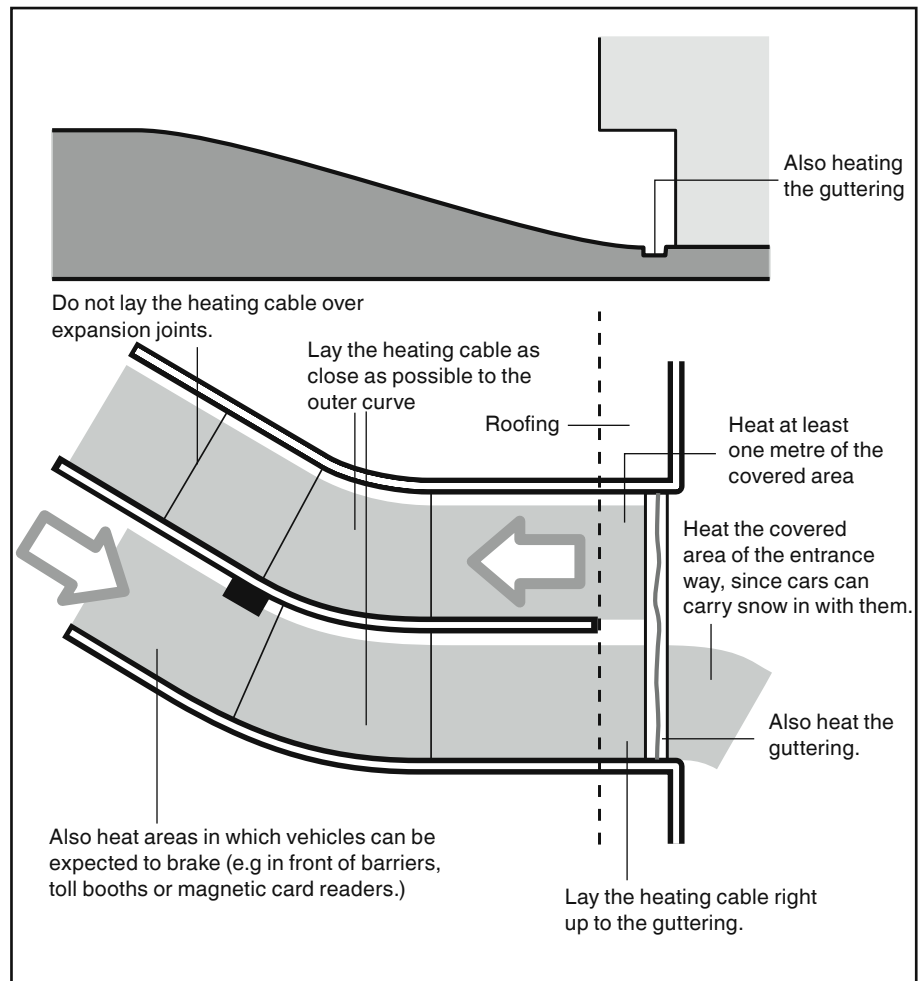
## 2. Cable spacing

### Asphalt



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

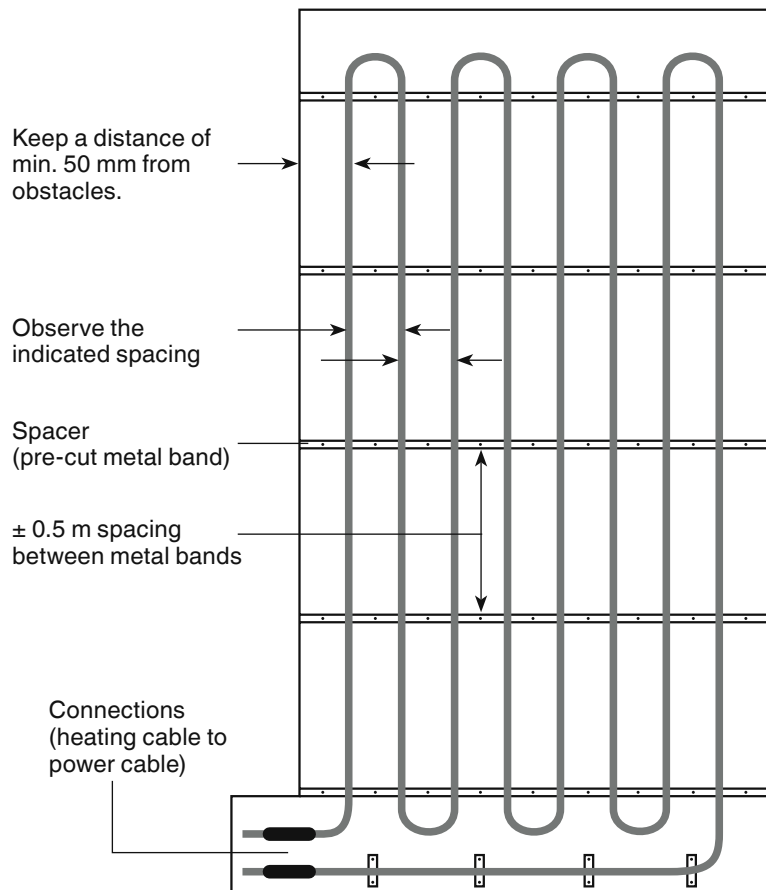
## 3. Determining the heated area



# Mineral insulated systems

## 4. Laying the heating cable

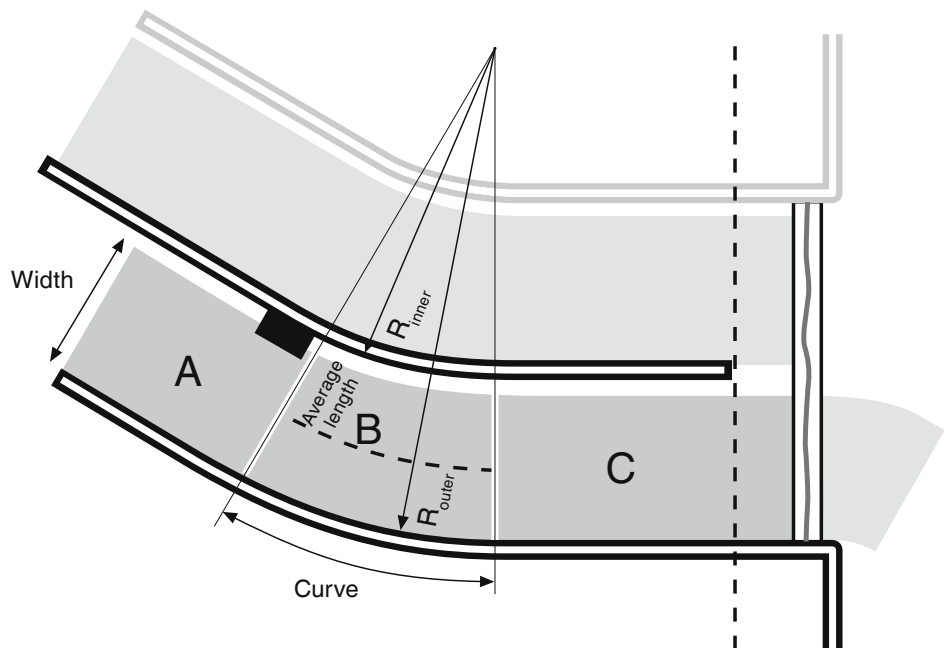
- » The spacer rail should be secured to the substrate at 0.5 m intervals.
- » The heating cable should be laid parallel to the direction of traffic.
- » The spacing should be at least 50 mm. The heating cables must not overlap or crossed.
- » Do not shorten or splice the heating cable.
- » Do not lay 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



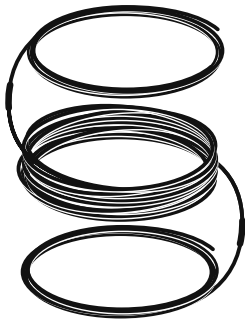
- » Calculation of the area of sections A, B and C:  
A: Length x width = 6 m x 3 m = 18 m<sup>2</sup>  
C: Length x width = 8 m x 3 m = 24 m<sup>2</sup>  
B: Average length x width = 3.53 m x 3 m = 10.6 m<sup>2</sup>
- » Determine the number of strips for a nominal output of 300 W/m<sup>2</sup>  
Spacing = 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 oder EM-MI-PACK-26M + EM-MI-PACK-36M

# Mineral insulated systems

## 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.

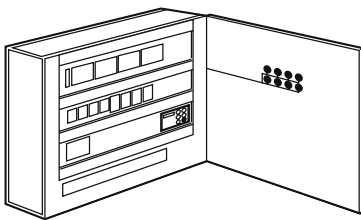
### Order references

|                | 300 W/m <sup>2</sup><br>spacing 165m |                        |                      | 180 W/m <sup>2</sup><br>spacing 275m |                                           |                                                   |
|----------------|--------------------------------------|------------------------|----------------------|--------------------------------------|-------------------------------------------|---------------------------------------------------|
|                | Nominal power (W)                    | Area (m <sup>2</sup> ) | Required spacer *(m) | Area (m <sup>2</sup> )               | Circuit breaker switch (C characteristic) | Connection cable Cross section (mm <sup>2</sup> ) |
| 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 Panels



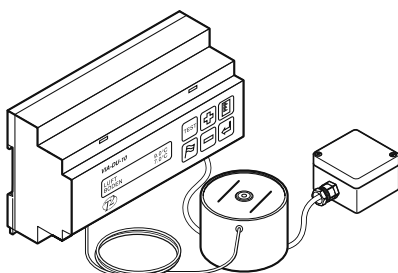
Steel enclosure in wall-mounted construction, equipped with master power switch. Combination(s) 30 mA / C32 A, circuit breaker(s), "On" and "Alarm" warning lights. Completely assembled, cabled ready connected and tested. Cable entry points in enclosure floor. Each cabinet is equipped with VIA-DU-20 multi-sensor controller.

|                     |                                                   |                  |
|---------------------|---------------------------------------------------|------------------|
| <b>SBS-03-MV-20</b> | Cabinet for 1 to 3 heating circuits (3 x 32 A)    | PCN: 1244-000219 |
| <b>SBS-06-MV-20</b> | Cabinet for 4 to 6 heating circuits (6 x 32 A)    | PCN: 1244-000220 |
| <b>SBS-09-MV-20</b> | Cabinet for 7 to 9 heating circuits (9 x 32 A)    | PCN: 1244-000221 |
| <b>SBS-12-MV-20</b> | Cabinet for 10 to 12 heating circuits (12 x 32 A) | PCN: 1244-000222 |
| <b>SBS-15-MV-20</b> | Cabinet for 13 to 15 heating circuits (12 x 32 A) | PCN: 1244-000223 |
| <b>SBS-18-MV-20</b> | Cabinet for 16 to 18 heating circuits (12 x 32 A) | PCN: 1244-000224 |

## 8. Control units

The electronic control unit ensures that the surface heating only starts when the temperature falls below a certain threshold and moisture is detected on the relevant surfaces, ensuring efficient energy use.

### VIA-DU-20

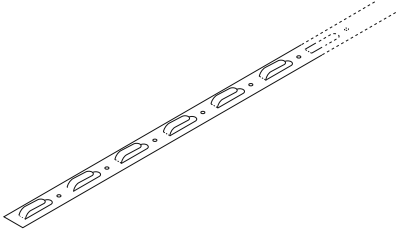


Control unit with combined moisture and temperature sensor and optional ambient temperature sensor.

- » DIN-rail mounting
- » Sensor cable length: 15 m
- » Freezing rain precaution
- » Optional BMS connection
- » Alarm relay contacts

## 9. Components and accessories

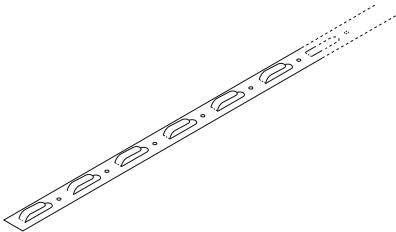
### VIA-SPACER-10 M



Spacer and mounting band (10 m)

- » Required for:  
EM-MI-PACK-26M  
EM-MI-PACK-36M
- » Requirement: 2 m/m<sup>2</sup>
- » Pre-cut metal strip

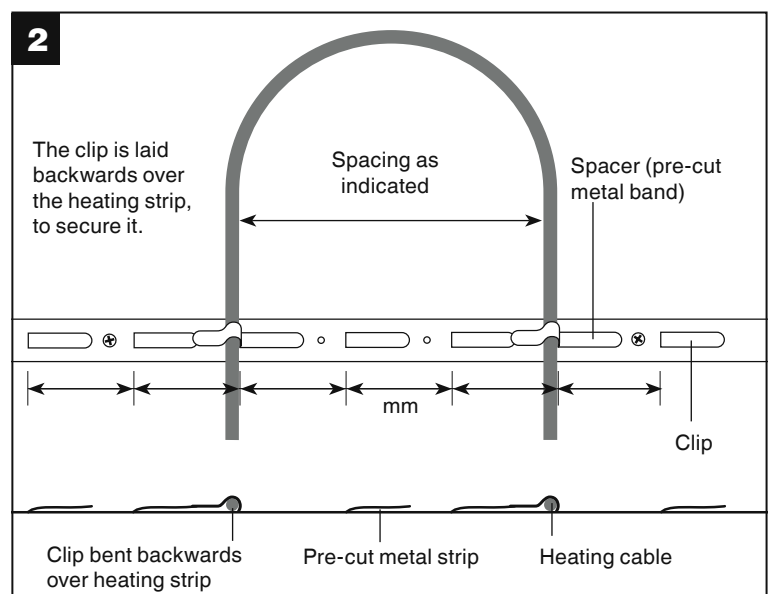
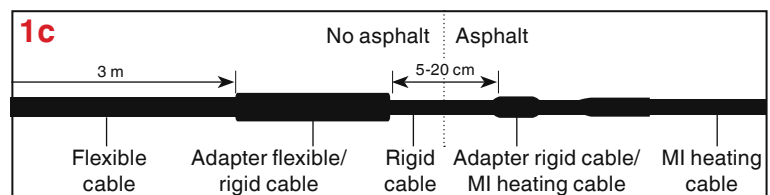
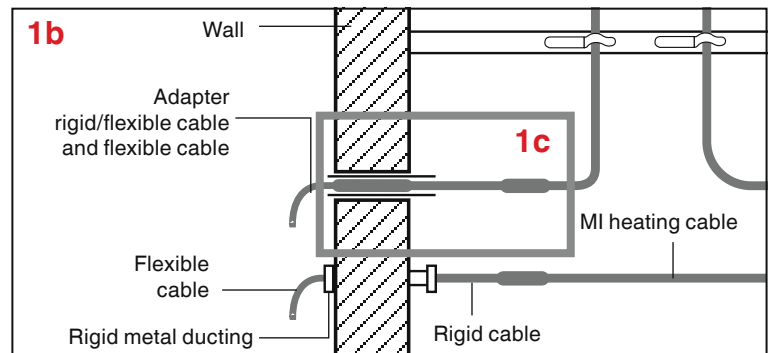
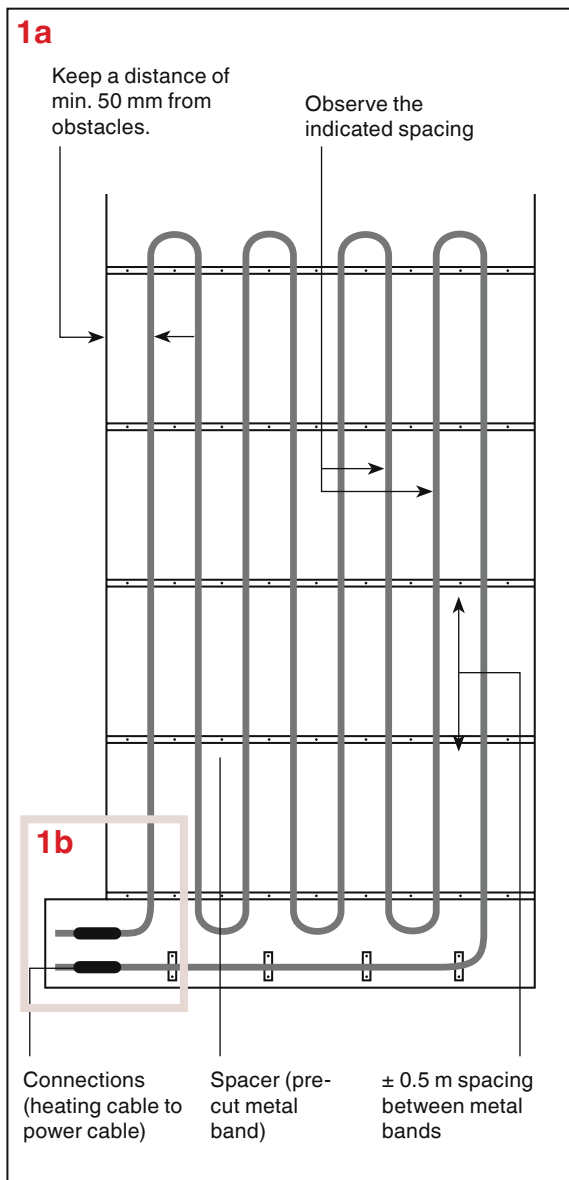
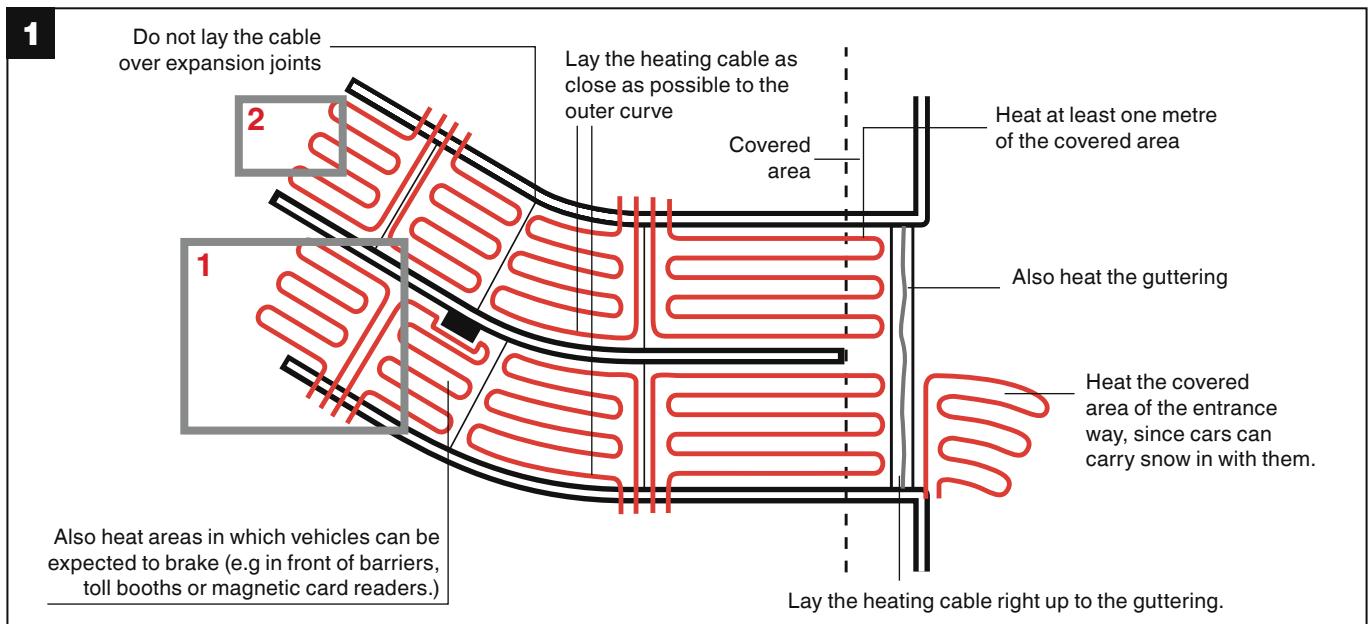
### VIA-SPACER-25 M



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<sup>2</sup>
- » Pre-cut metal strip

# Mineral insulated systems

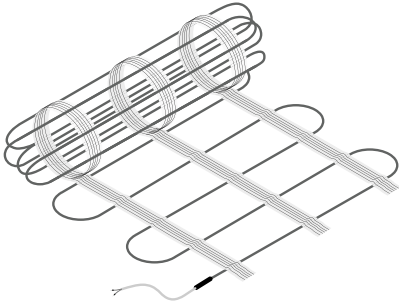


# Polymer solutions

## Heating mat EM2-CM

### 1. Application

EM2-CM is a constant wattage heating mat for simple, fast, and effective ramp and accessway heating to prevent snow and ice formation. The EM2-CM mat is particularly suited for track heating of ramps, loading bays, and driveways, but also emergency escape routes and pedestrian walkways.



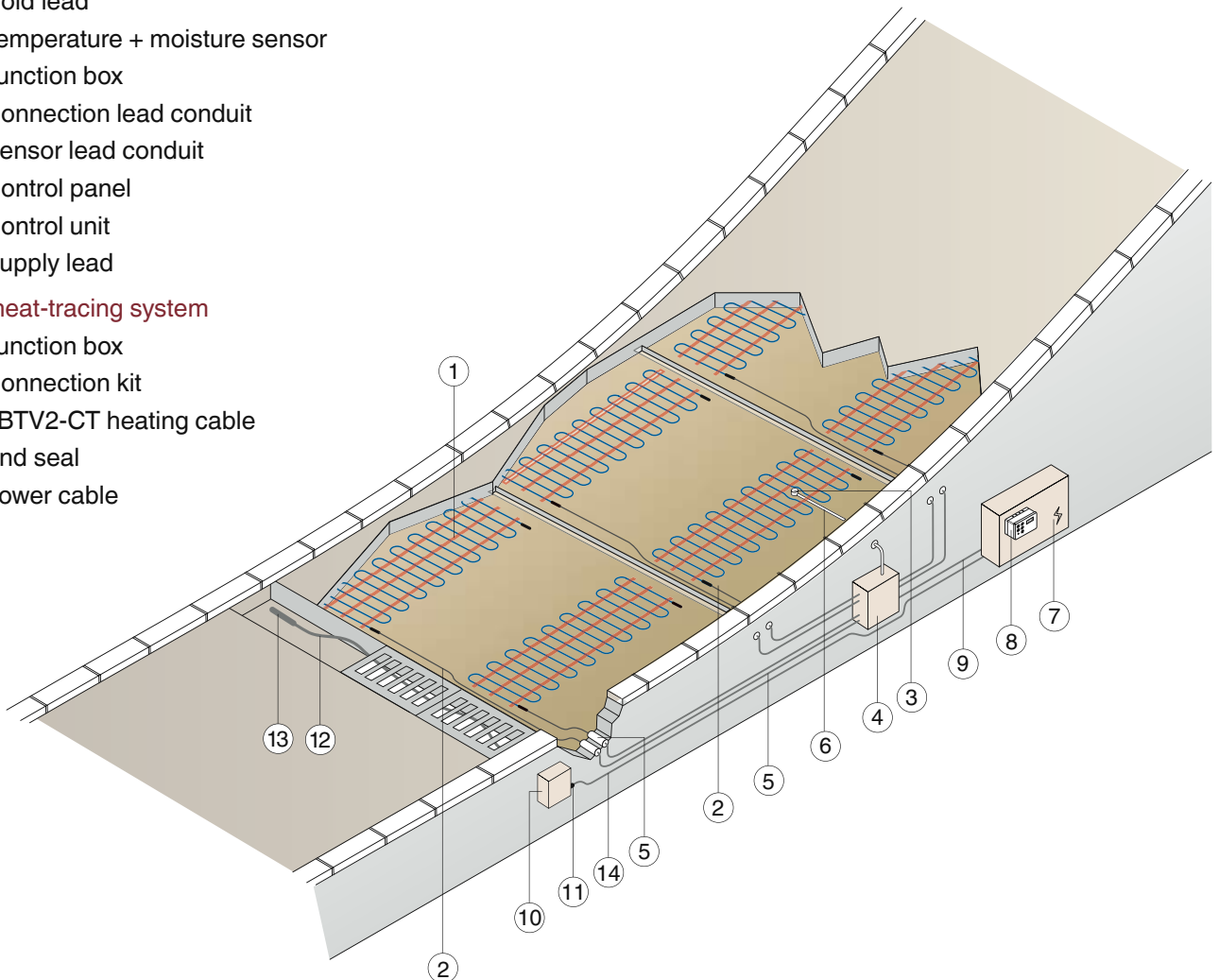
|                              |                                                            |
|------------------------------|------------------------------------------------------------|
| Nominal power                | 300 W/m <sup>2</sup>                                       |
| Voltage                      | 230 Vac                                                    |
| Maximum exposure temperature | 65°C                                                       |
| Cable construction           | Twin core, constant wattage heating mat, 1 cold lead (4 m) |
| Control unit                 | VIA-DU-20                                                  |
| Certification                | CE, VDE                                                    |

### 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. 8BTV2-CT heating cable
13. End seal
14. Power cable

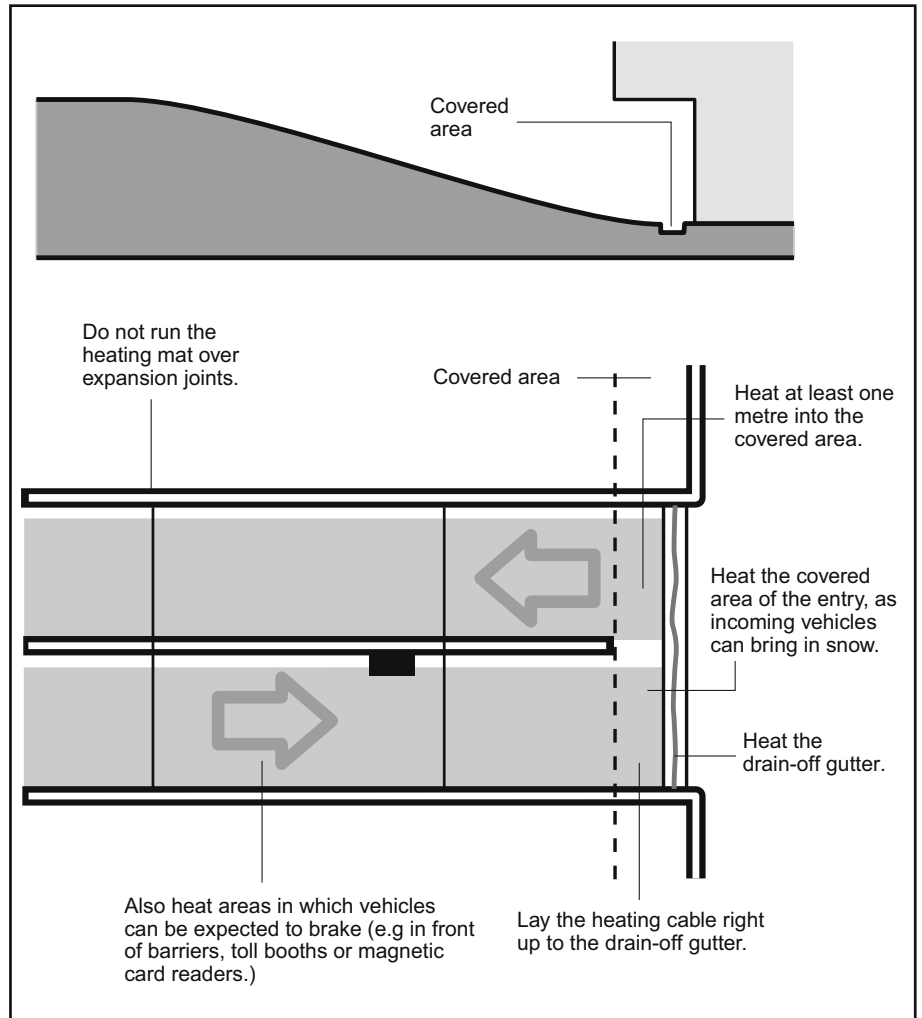


# Polymer solutions

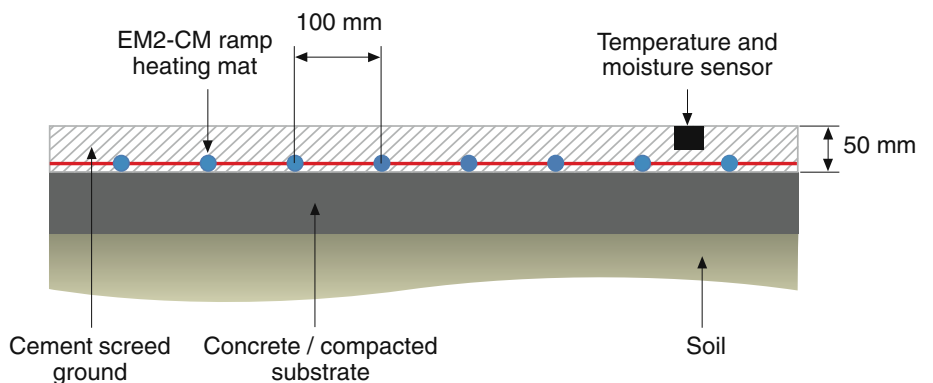
## Heating mat EM2-CM

### 3. Area to be heated

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



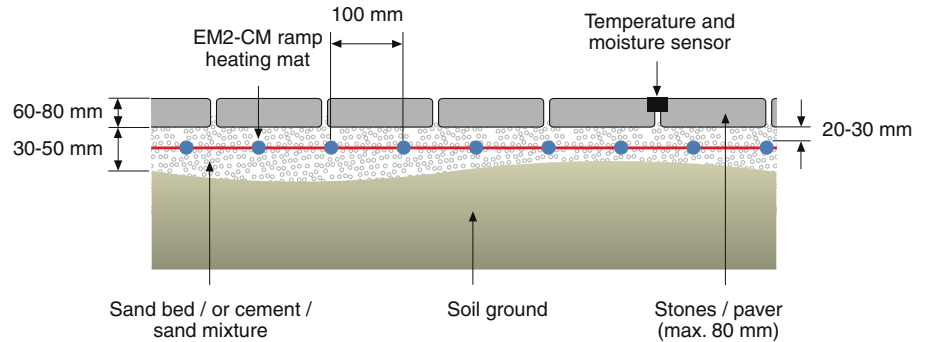
### 4. Embedding in screed or concrete



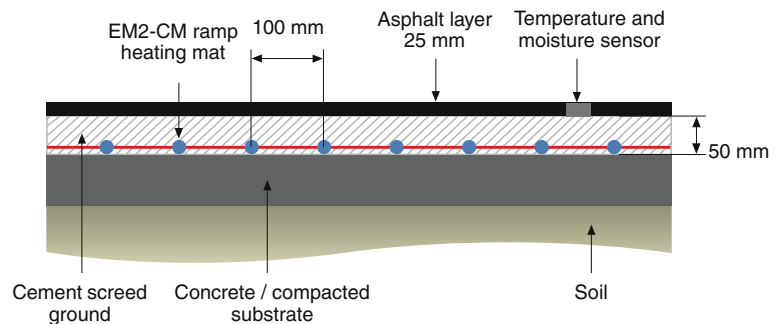
- When laying in concrete with a covering of least 25 mm



## 5. Embedding in sand bed/pavers



## 6. Embedding in concrete / cement screed under asphalt layer



- » An asphalt layer of min. 25 mm can be applied on the concrete surface (max. 300 W/m<sup>2</sup>)
- » The product is unsuitable for direct use in poured asphalt or on reinforcement in concrete

## 7. Packaging and ordering references

EM2-CM 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)
  - 4 m power cable
  - Installation manual; commissioning report

| Product name   | Mat size     | Surface             | Power output | Order reference |
|----------------|--------------|---------------------|--------------|-----------------|
| EM2-CM-Mat-2m  | 2 m x 0.6 m  | 1.2 m <sup>2</sup>  | 400 W        | 1244-004887     |
| EM2-CM-Mat-3m  | 3 m x 0.6 m  | 1.8 m <sup>2</sup>  | 520 W        | 1244-004888     |
| EM2-CM-Mat-4m  | 4 m x 0.6 m  | 2.4 m <sup>2</sup>  | 670 W        | 1244-004889     |
| EM2-CM-Mat-5m  | 5 m x 0.6 m  | 3.0 m <sup>2</sup>  | 930 W        | 1244-004890     |
| EM2-CM-Mat-7m  | 7 m x 0.6 m  | 4.2 m <sup>2</sup>  | 1140 W       | 1244-004891     |
| EM2-CM-Mat-10m | 10 m x 0.6 m | 6.0 m <sup>2</sup>  | 1860 W       | 1244-004892     |
| EM2-CM-Mat-13m | 13 m x 0.6 m | 7.8 m <sup>2</sup>  | 2560 W       | 1244-004893     |
| EM2-CM-Mat-16m | 16 m x 0.6 m | 9.6 m <sup>2</sup>  | 2890 W       | 1244-004894     |
| EM2-CM-Mat-21m | 21 m x 0.6 m | 12.6 m <sup>2</sup> | 3730 W       | 1244-004895     |

### Ramp lanes and footpaths

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

### 8. 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<br>(MCBS to BS EN 60898, Type C) | Max. mat length<br>per heating circuit |
|---------------------------------------------------------|----------------------------------------|
| 10 A                                                    | 10 m                                   |
| 16 A                                                    | 16 m                                   |
| 20 A                                                    | 21 m                                   |

### 9. 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 EM2-CM-Mat-4m = 8 m

Heating circuit 2 Track 1: EM2-CM-Mat-21 m = 21 m

Heating circuit 3 Track 2: EM2-CM-Mat-21 m

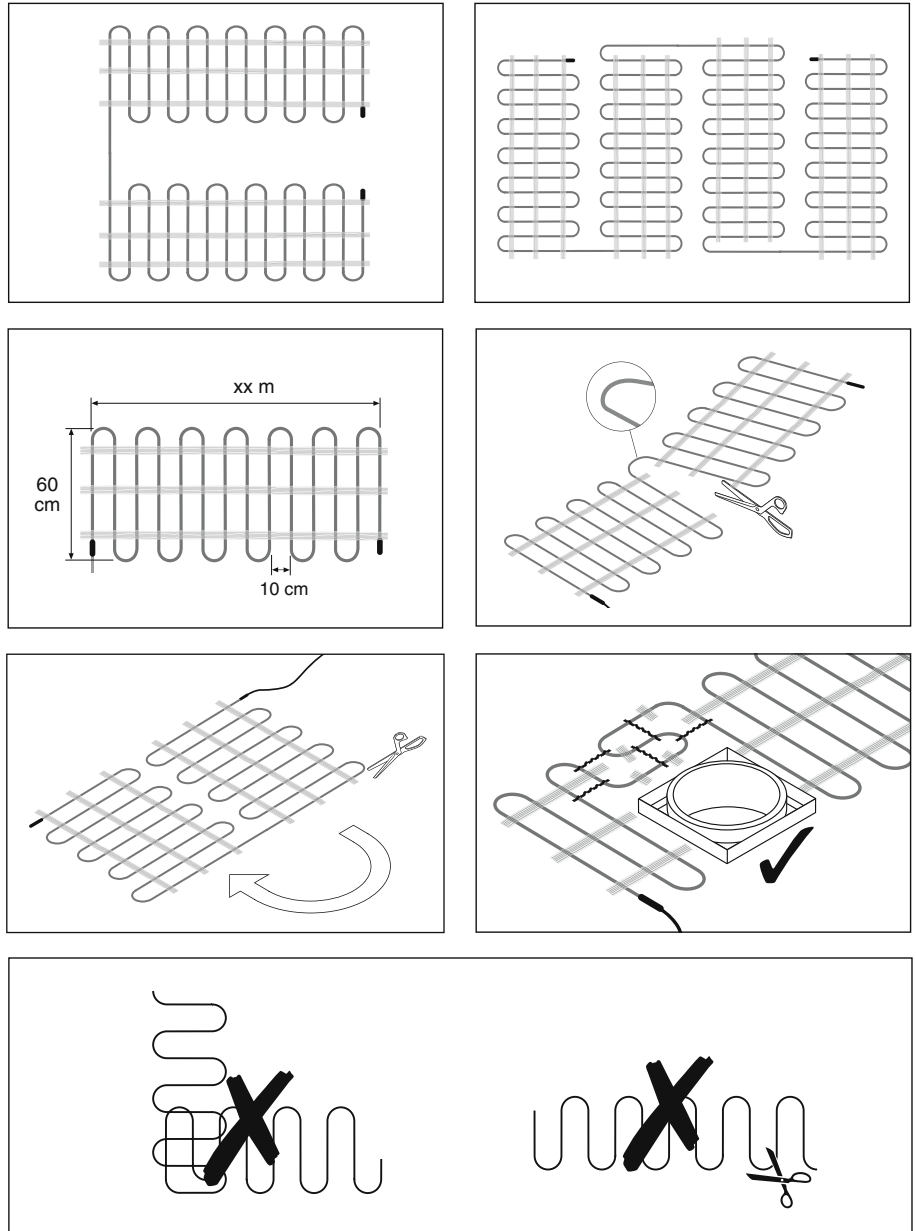
Total: 50 m

### 10. Electrical connection

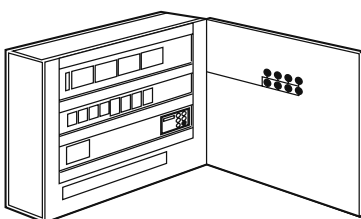
- » According to local standards and electrical regulations.
- » The cross-section of the power cable conductors is determined according to the nominal current of the circuit breaker and max. permitted voltage drop.

## 11. Installation

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.



## 12. Control Panels



Steel enclosure in wall-mounted construction, equipped with master power switch. Combination(s) 30 mA / C32 A, circuit breaker(s), "On" and "Alarm" warning lights. Completely assembled, cabled ready connection and testing. Cable entry points in enclosure floor. Each cabinet is equipped with VIA-DU-20 multi-sensor controller.

|                     |                                                   |                  |
|---------------------|---------------------------------------------------|------------------|
| <b>SBS-03-CM-20</b> | Cabinet for 1 to 3 heating circuits (3 x 32 A)    | PCN: 1244-006430 |
| <b>SBS-06-CM-20</b> | Cabinet for 4 to 6 heating circuits (6 x 32 A)    | PCN: 1244-006431 |
| <b>SBS-09-CM-20</b> | Cabinet for 7 to 9 heating circuits (9 x 32 A)    | PCN: 1244-006432 |
| <b>SBS-12-CM-20</b> | Cabinet for 10 to 12 heating circuits (12 x 32 A) | PCN: 1244-006433 |

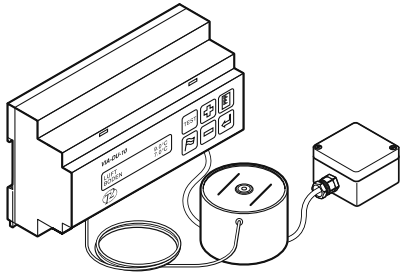
# Polymer solutions

## Heating mat EM2-CM

### 13. Control units

The electronic control unit ensures that the surface heating only starts when the temperature falls below a certain threshold and moisture is detected on the relevant surfaces, ensuring efficient energy use.

#### VIA-DU-20

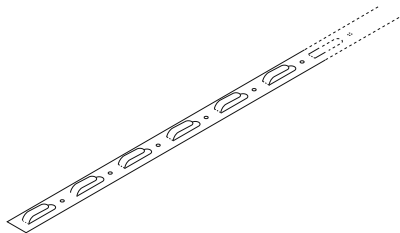


Control unit with combined moisture and temperature sensor and optional ambient temperature sensor.

- » DIN-rail mounting
- » Sensor cable length: 15 m
- » Freezing rain precaution
- » Optional BMS connection
- » Alarm relay contacts

### 14. Components and accessories

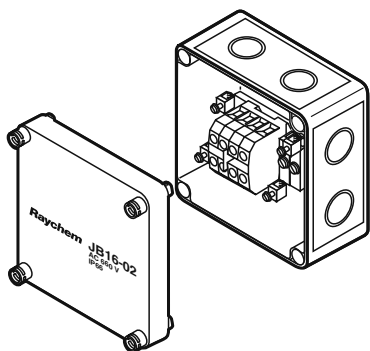
#### EM-SPACER-PL



Heating cable spacer

- » Length: 5 m; 25 mm grid
- » Plastic

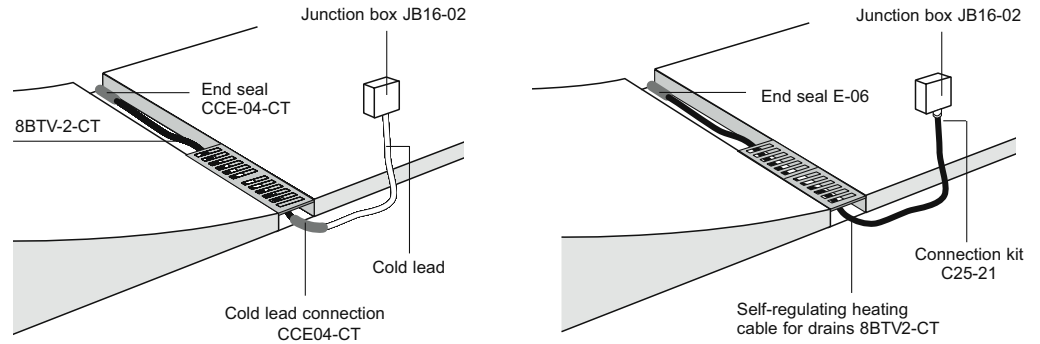
#### JB16-02



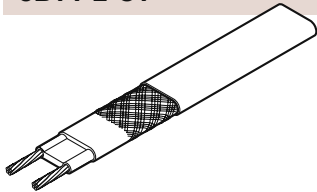
Temperature-resistant junction and connection box  
Dimensions: 94 x 94 x 57 mm

- » IP66
- » 6 x 4 mm<sup>2</sup> terminals
- » 4 Pg 11/16 and 4 M20/25 knock-out entries

## 15. Drain tracing

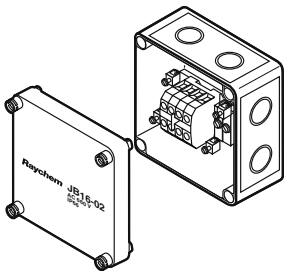


### 8BTV-2-CT



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

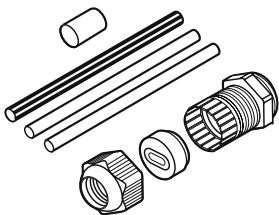
### JB16-02



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

- » IP66
- » 6 x 4mm<sup>2</sup> terminals
- » 4 Pg 11/16 and 4 M20/25 knock-out entries

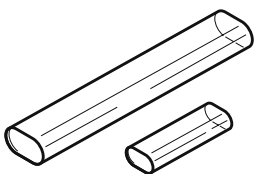
### C25-21



Connection kit for BTV-CT

- » Heat-shrink system (M25)

### E-06



End seal kit for BTV-CT

- » Heat-shrink system

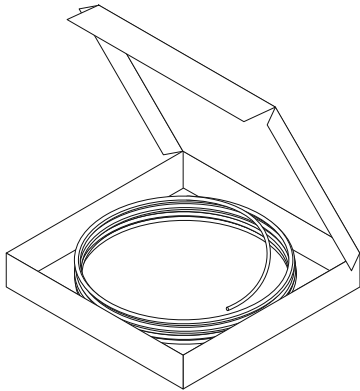
The drain heating system can be switched via the same control unit as the surface heating system.

- » Max. 60 m of 8BTV-2-CT can be connected to a 16 A C-type circuit-breaker.
- » Residual current device (rcd) 30 mA required.

# Polymer solutions

## Heating cable EM4-CW

### 1. Application



EM4-CW 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 EM4-CW heating cable is designed for applications where a 3 phase (400V) supply is available.

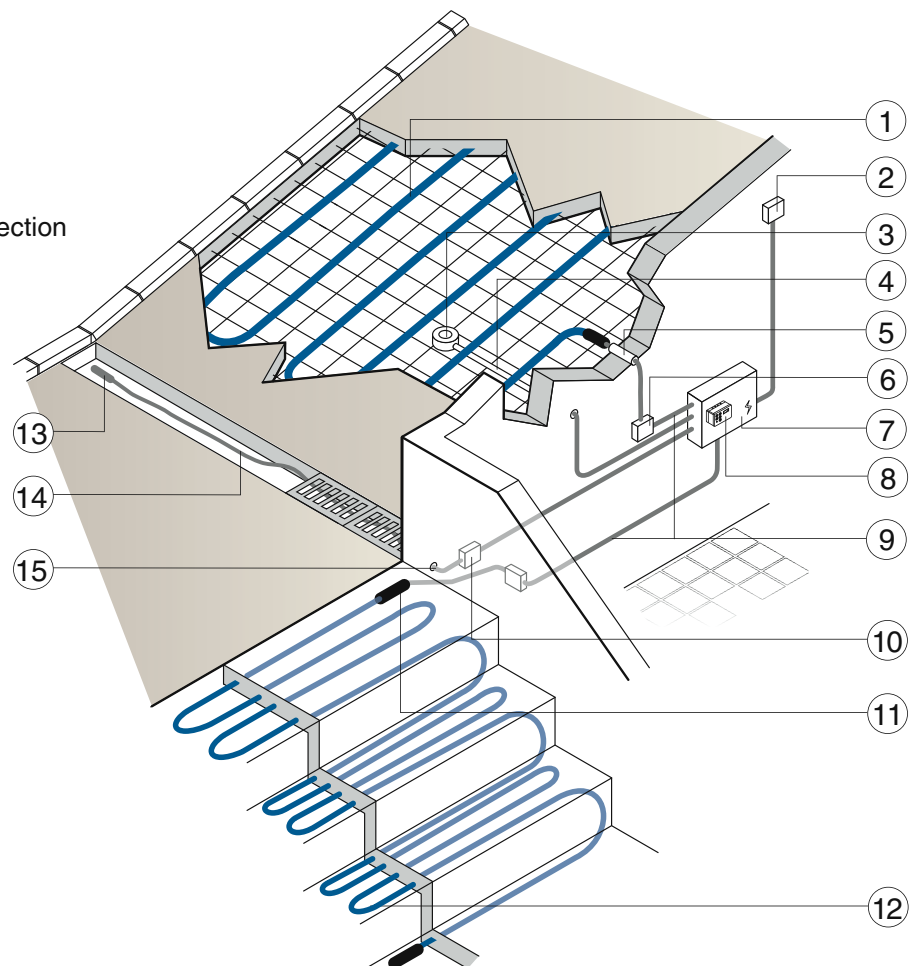
|                              |                                                                                              |
|------------------------------|----------------------------------------------------------------------------------------------|
| Nominal power                | 25 W/m                                                                                       |
| Voltage                      | 400 V AC                                                                                     |
| Maximum exposure temperature | 65°C                                                                                         |
| Cable construction           | Twin core, constant wattage heating cable. Pre-terminated with a 4 m 3 core cold lead cable. |
| Control unit                 | VIA-DU-20                                                                                    |
| 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. EM4-CW heating cable

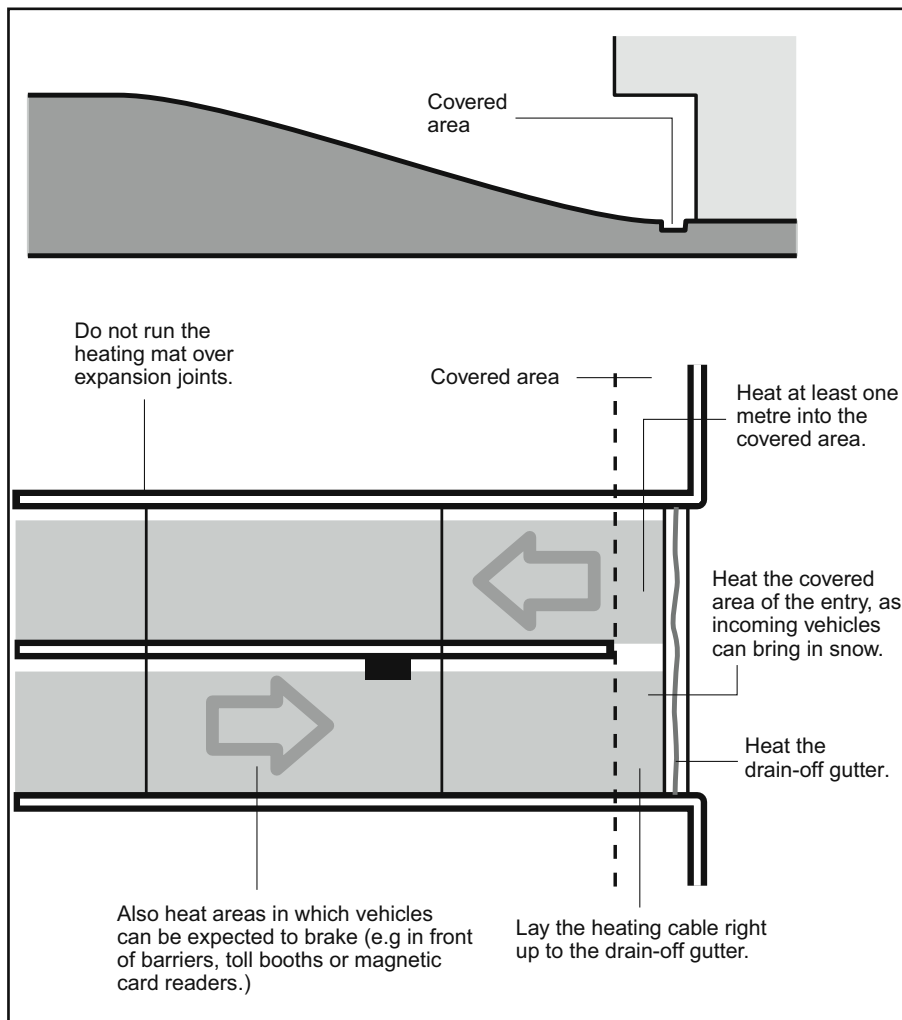
#### Drain trace heating system

13. End seal
14. 8BTV2-CT heating cable
15. Connection kit

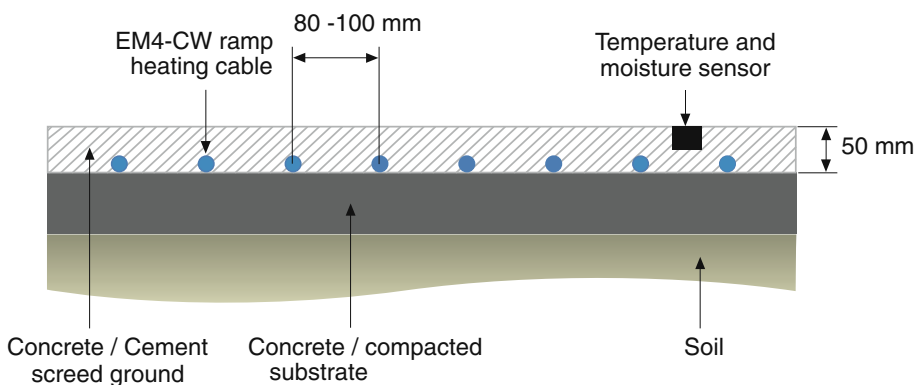


### 3. Area to be heated

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



### 4. Embedding in screed or concrete

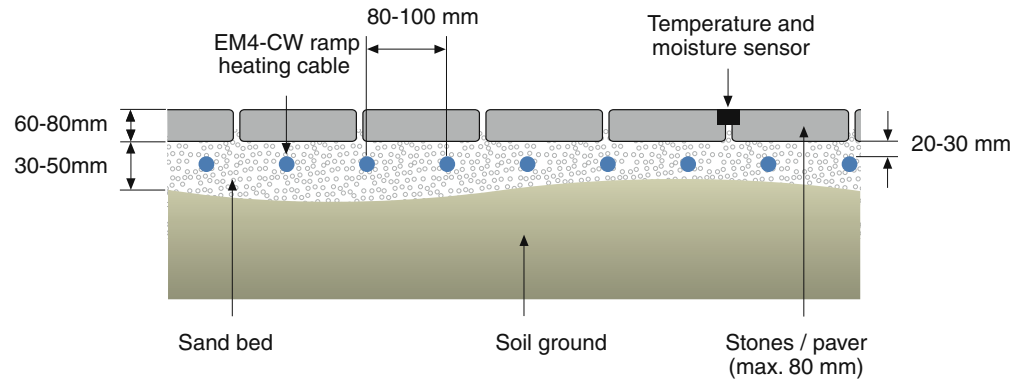


» When laying in concrete with a covering of least 25 mm

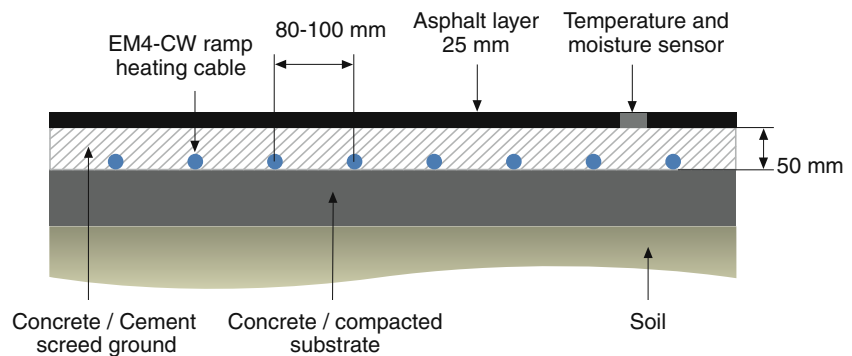
# Polymer solutions

## Heating cable EM4-CW

### 5. Embedding in sand bed/pavers



### 6. Embedding in concrete / cement screed under asphalt layer



- » An asphalt layer of min. 25 mm can be applied on the concrete surface ( max. 300 W/m<sup>2</sup> )
- » The product is unsuitable for direct use in poured asphalt or on reinforcement in concrete

### 7. Packaging and ordering references

EM4-CW ramp heating cable is available in the sizes given below.

- » Supply voltage 400 V
- » Pre-terminated kit contains:
  - heating cable length;
  - cold lead length;
  - Installation manual; commissioning report.

| Product name | Cable length | Power output | Order reference |
|--------------|--------------|--------------|-----------------|
| EM4-CW-26M   | 26 m         | 650 W        | 1244-005182     |
| EM4-CW-35M   | 35 m         | 875 W        | 1244-005184     |
| EM4-CW-62M   | 62 m         | 1525 W       | 1244-005188     |
| EM4-CW-121M  | 121 m        | 3050 W       | 1244-005191     |
| EM4-CW-172M  | 172 m        | 4325 W       | 1244-005194     |
| EM4-CW-210M  | 210 m        | 5275 W       | 1244-005196     |
| EM4-CW-250M  | 250 m        | 6250 W       | 1244-005198     |



## 8. 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 =  $300 \text{ W/m}^2 / 25 \text{ W/m} \times \text{width} \times \text{length}$
- » Total heating cable length = Number of steps x heating cable lengths per step + number of steps x step height

## 9. Electrical protection

| Product name | Conductor Resistance +/-10% | Rated Power (400 Vac) | Circuit Breaker (400 Vac) |
|--------------|-----------------------------|-----------------------|---------------------------|
| EM4-CW-26M   | 246 $\Omega$                | 650 W                 | 10 A                      |
| EM4-CW-35M   | 183 $\Omega$                | 875 W                 | 10 A                      |
| EM4-CW-62M   | 105 $\Omega$                | 1525 W                | 10 A                      |
| EM4-CW-121M  | 52 $\Omega$                 | 3050 W                | 10 A                      |
| EM4-CW-172M  | 37 $\Omega$                 | 4325 W                | 16 A                      |
| EM4-CW-210M  | 30 $\Omega$                 | 5275 W                | 20 A                      |
| EM4-CW-250M  | 26 $\Omega$                 | 6250 W                | 20 A                      |

## 10. 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 m<sup>2</sup> ramp with 250 W/m<sup>2</sup> output requirement

Cable Spacing =  $250 \text{ W} / 25 \text{ W/m} = 10 \text{ m}$  of cable per  $1 \text{ m}^2 = 100 \text{ mm}$  cable spacing  
10 metres of cable per m<sup>2</sup> means  $10 \times 20 \text{ m}^2 = 200 \text{ m}$  of cable required = 5 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 m<sup>2</sup> walkway with 300 W/m<sup>2</sup> output requirement

Cable Spacing =  $300 \text{ W} / 25 \text{ W/m} = 12 \text{ m}$  of cable per m<sup>2</sup> of ramp = 80 mm (approx.) cable spacing

12 m per m<sup>2</sup> means  $12 \times 15 \text{ m}^2 = 180 \text{ m}$  of cable = 4.5 kW

Therefore cables required:           3 x 62 m cable = 186 m

## 11. 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.

## 12. 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.

# Polymer solutions

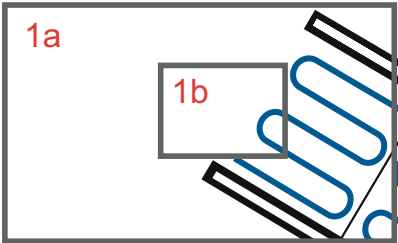
## Heating cable EM4-CW

1

The heating cable should not be applied over expansion joints. Lay a separate heating circuit on either side of the expansion joint.

For cornered ramps, always follow the curve (in this way, you ensure that the laying spacing is maintained). Trace as close as possible to the outside of corners

The heating cable should preferably be laid in long rather than in short runs.



Covered area

Trace at least 1 m of covered areas

Heating of the drain

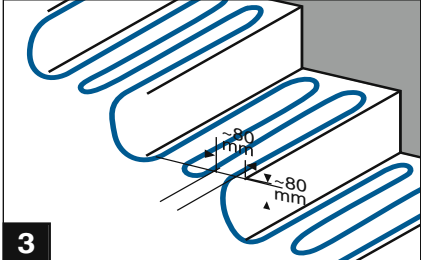
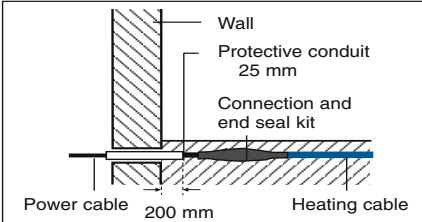
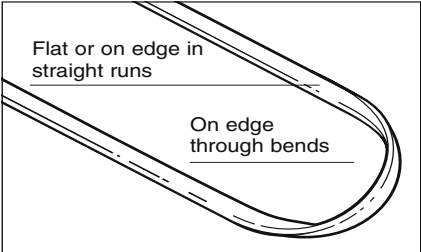
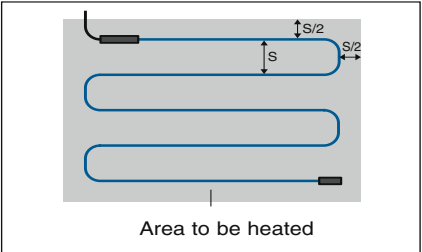
The ground temperature and moisture sensor is to be installed within the heated area at least 2.5 cm away from the heating cables (see diagram). The sensor must be able to directly detect weather conditions (rain, snow, melted snow and ice). The sensor may not be covered up (e.g. when clearing the snow).

Trace covered entrance areas as snow can be carried in by cars

Trace right up to drain

Also heat areas in which vehicles can be expected to brake (e.g. in front of barriers, toll booths or magnetic card readers.)

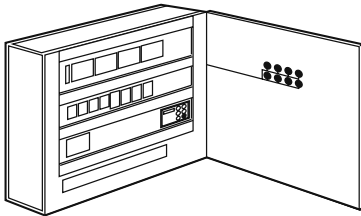
**\* Take care that VIA-DU-S20 is NOT installed in an area which is continuously flooded with water (e.g. drain line), or in an area which is continuously under ice due to external parameters (e.g. freezing of condensation water in cool room).**



2

3

### 13. Control Panels



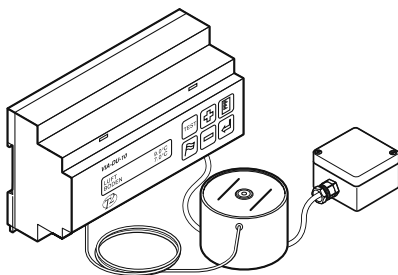
Steel enclosure in wall-mounted construction, equipped with master power switch. Combination(s) 30 mA / C32 A, circuit breaker(s), "On" and "Alarm" warning lights. Completely assembled, cabled ready connected and tested. Cable entry points in enclosure floor. Each cabinet is equipped with VIA-DU-20 multi-sensor controller.

|                     |                                                   |                  |
|---------------------|---------------------------------------------------|------------------|
| <b>SBS-03-CW-40</b> | Cabinet for 1 to 3 heating circuits (3 x 32 A)    | PCN: 1244-006434 |
| <b>SBS-06-CW-40</b> | Cabinet for 4 to 6 heating circuits (6 x 32 A)    | PCN: 1244-006435 |
| <b>SBS-09-CW-40</b> | Cabinet for 7 to 9 heating circuits (9 x 32 A)    | PCN: 1244-006436 |
| <b>SBS-12-CW-40</b> | Cabinet for 10 to 12 heating circuits (12 x 32 A) | PCN: 1244-006437 |
| <b>SBS-15-CW-40</b> | Cabinet for 13 to 15 heating circuits (12 x 32 A) | PCN: 1244-006438 |
| <b>SBS-18-CW-40</b> | Cabinet for 16 to 18 heating circuits (12 x 32 A) | PCN: 1244-006439 |

### 14. Control units

The electronic control unit ensures that the surface heating only starts when the temperature falls below a certain threshold and moisture is detected on the relevant surfaces, ensuring efficient energy use.

#### VIA-DU-20

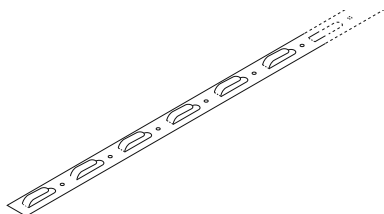


Control unit with combined moisture and temperature sensor and optional ambient temperature sensor.

- » DIN-rail mounting
- » Sensor cable length: 15 m
- » Freezing rain precaution
- » Optional BMS connection
- » Alarm relay contacts

### 15. Components and accessories

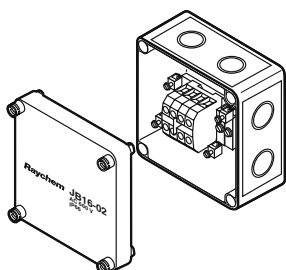
#### VIA-SPACER-10M, VIA-SPACER-25M



Heating cable spacer

- » 2 lengths: 10 m and 25 m (2 m/m<sup>2</sup>)
- » Metal band

#### JB16-02



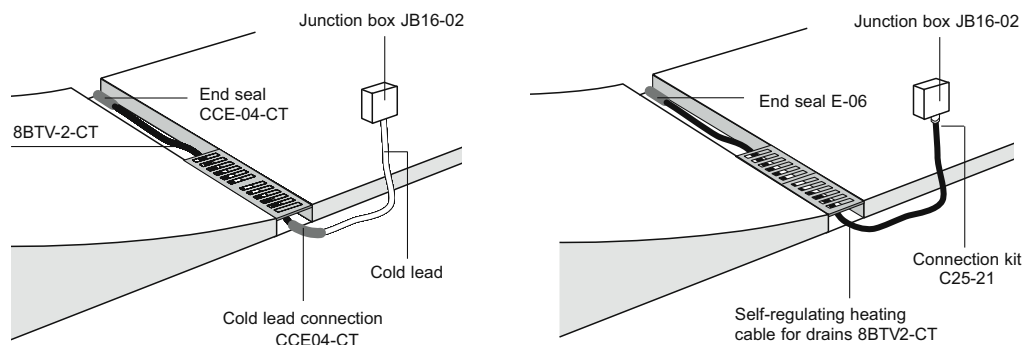
Temperature-resistant junction and connection box  
Dimensions: 94 x 94 x 57mm

- » IP66
- » 6 x 4mm<sup>2</sup> terminals
- » 4 Pg 11/16 and 4 M20/25 knock-out entries

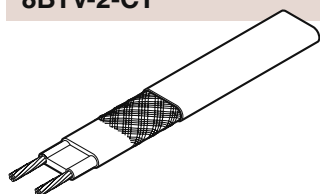
# Polymer solutions

## Heating cable EM4-CW

### 16. Drain tracing

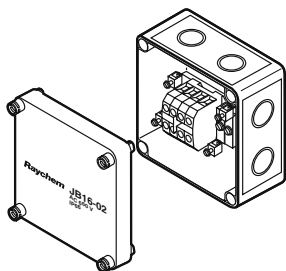


#### 8BTV-2-CT



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

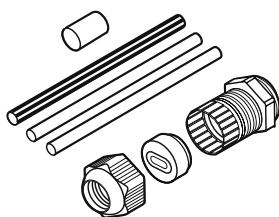
#### JB16-02



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

- » IP66
- » 6 x 4mm<sup>2</sup> terminals
- » 4 Pg 11/16 and 4 M20/25 knock-out entries

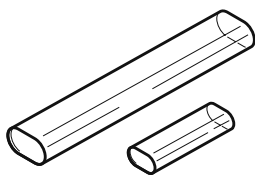
#### C25-21



Connection kit for BTV-CT

- » Heat-shrink system (M25)

#### E-06



End seal kit for BTV-CT

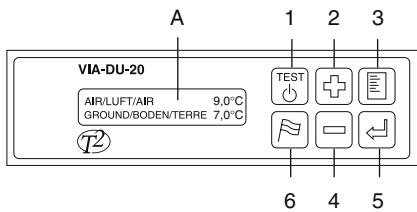
- » Heat-shrink system

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

- » Max. 60 m of 8BTV-2-CT can be connected to a 16 A C-type circuit-breaker.
- » Residual current device (rcd) 30 mA required.

# Control unit VIA-DU-20

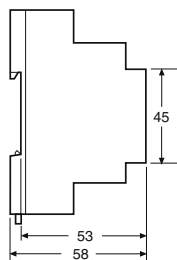
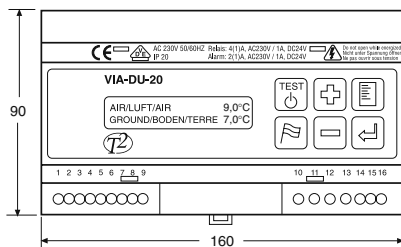
## 1. Layout



### A. Display, illuminated (parameter and fault conditions)

1. Testing the device / switch on the heating output
2. Increasing the value selected, changing settings (forwards)
3. Selecting a menu
4. Selecting a language
5. Reducing the value selected, changing settings (backwards)
6. Confirm the value selected, select the next value and responding to fault messages

## 1. Technical data



(Dimensions in mm)

### Operating voltage

**230 Vac, ±10 %, 50/60 Hz**

Power consumption

14 VA max.

Main relay (heating)

$I_{max}$  4(1)A, 250 Vac  
SPST, voltfree

Alarm relay

$I_{max}$  2(1)A, 250 Vac  
SPDT, voltfree

Switching accuracy

±1 K

Display

Point matrix, 2 x 16 places

Assembly

DIN rail

Housing material

Noryl

Terminals

0.5 mm<sup>2</sup> to 2.5 mm<sup>2</sup>

Protection

IP20/class II (Panel mounted)

Weight

750 g

Temperature resistance

0°C to +50°C

### Main parameters

Temperature at which device comes on

1°C to +6°C

Moisture at which device switches on

Off, 1 (moist) to 10 (very wet)

Post-heating period

30 to 120 min. (heating on)

Base temperature

Off, -15°C to -1°C

Freezing rain warning

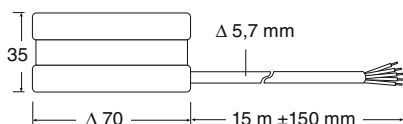
Local detection, weather service, off

Overruling

Off, on, BMS

*If there is a power failure, all parameters remain saved in the memory*

## 2. Ground temperature and moisture sensor VIA-DU-S20



Voltage

8 Vdc (via control device)

Type of sensor

PTC

Protection

IP65

Diameter of lead

5 x 0.5 mm<sup>2</sup>, 5.7 mm diameter.

Length of lead

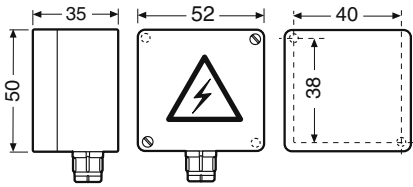
15 m, can be extended to 50 m  
(5 x 1.5 mm<sup>2</sup>)

Temperature resistance

-30°C to +80°C

# Control unit VIA-DU-20

## 3. Ambient temperature sensor\* VIA-DU-A10

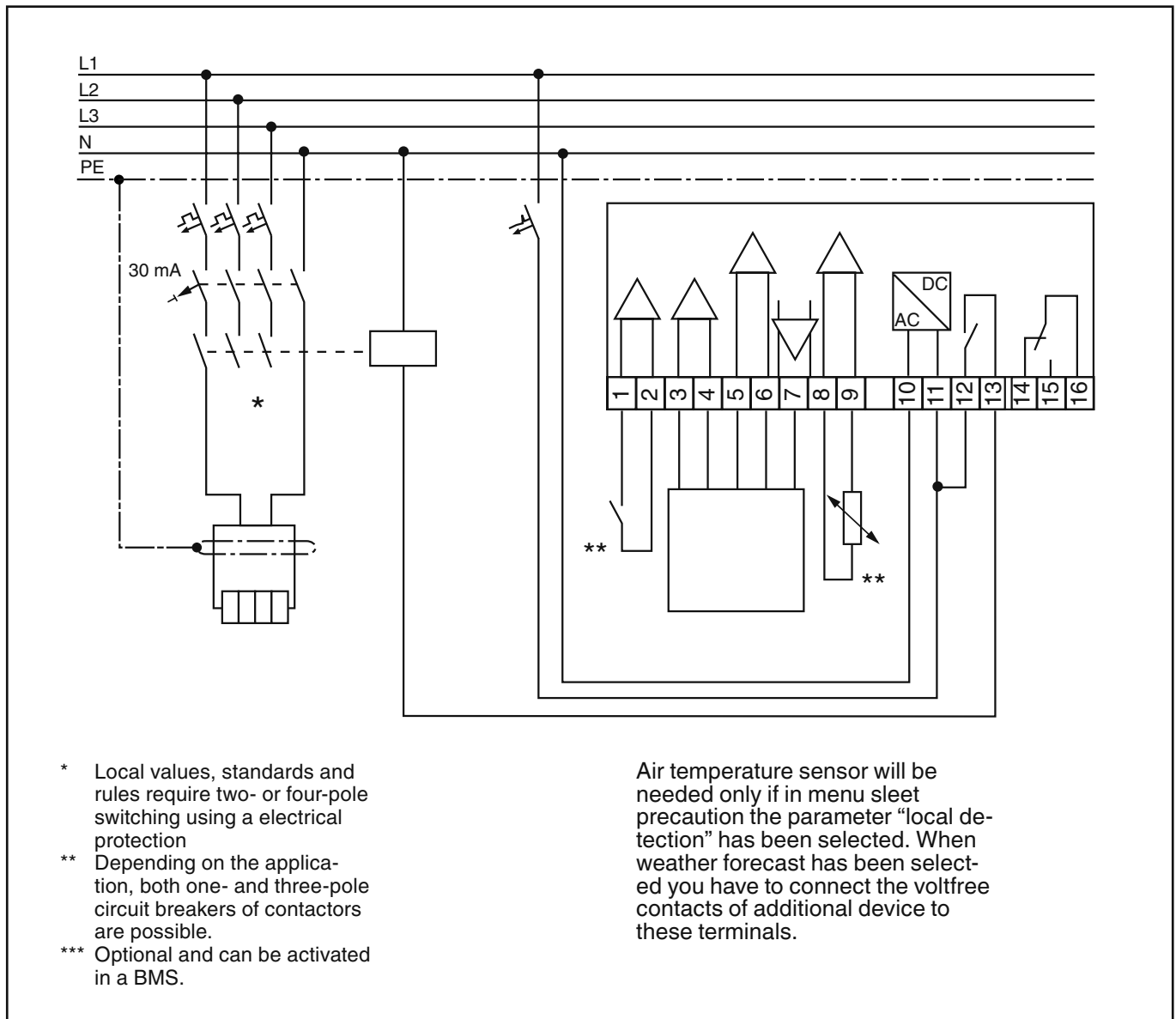


PG9  
(Dimensions in mm)

|                      |                                                     |
|----------------------|-----------------------------------------------------|
| Sensor type          | PTC                                                 |
| Ingress protection   | IP54                                                |
| Terminals            | 1.5 to 2.5 mm <sup>2</sup>                          |
| Sensor cable         | 2 x 1.5 mm <sup>2</sup> , max. 100 m (not included) |
| Exposure temperature | -30°C to +80°C                                      |
| Mounting             | Wall mounting                                       |





\* Installation not mandatory if "Sleet precaution" is not set to "Auto".

## 4. VIA-DU-20 with contactor



# Product selection

## Product Features & Selection Guide

| Product Features                                                    |                                                                                      |               |                |   |
|---------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 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 & 400 V power supplies. |
| Voltage Rating                                                      | 230 Vac                                                                                                                                                               | 230 Vac                                                                                        | 230 Vac                                                                                          | 400 Vac                                                                              |
| Nominal power output                                                | 90 W/m @ 0°C.                                                                                                                                                         | 50 W/m                                                                                         | 300 W/m <sup>2</sup>                                                                             | 25 W/m                                                                               |
| Maximum circuit length                                              | 85 m                                                                                                                                                                  | 136 m                                                                                          | 12.6 m <sup>2</sup> (Mat size = 21 m x 0,60 m)                                                   | 250 m                                                                                |
| Maximum exposure temperature                                        | 100°C                                                                                                                                                                 | 250°C                                                                                          | 65°C                                                                                             | 65°C                                                                                 |
| 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 control unit                                             | VIA-DU-20                                                                                                                                                             | VIA-DU-20                                                                                      | VIA-DU-20                                                                                        | VIA-DU-20                                                                            |
| Approvals                                                           | VDE / CE                                                                                                                                                              | VDE / CE                                                                                       | VDE / CE                                                                                         | VDE / CE                                                                             |
| Suitable for installation on reinforcement bar                      | Highly recommended                                                                                                                                                    | Recommended                                                                                    |                                                                                                  | Recommended                                                                          |
| Suitable for installation in direct contact with hot poured asphalt |                                                                                                                                                                       | Highly recommended                                                                             |                                                                                                  |                                                                                      |
| Suitable for embedding in sand sub-level                            | Recommended                                                                                                                                                           | Recommended                                                                                    | Highly recommended                                                                               | Highly recommended                                                                   |
| Cold lead included                                                  | Not as standard. Contact Tyco Thermal Controls for information on configured EM2-XR heating elements.                                                                 | 3 m (at each end of heater cable)                                                              | 4 m                                                                                              | 4 m                                                                                  |
| Dual Wire / Single Wire construction                                | Dual                                                                                                                                                                  | Single                                                                                         | Dual                                                                                             | Dual                                                                                 |

### Also available:

Technical handbook CDE-0517



Technical handbook on underfloor heating CDE-0695



Tyco Thermal Controls, a part of Tyco International, is a global supplier of complete systems and related services for heat-tracing, underfloor heating, snow melting & de-icing, leak detection, temperature measurement, specialty heating, and fire performance wiring products. The company's range of products and services include consultation, design, installation, and maintenance solutions for applications in the industrial, commercial and residential markets. Employing thousands of people in 50 countries, we offer products and services on a global scale under the renowned brands such as Raychem, T2, HEW-THERM, Pyrotenax, DigiTrace, Isopad, TraceTek and Tracer.



For further information about Tyco Thermal Controls go to [www.tycothermal.com](http://www.tycothermal.com)

### A proven track record

Over the past 35 years, just under 1 billion feet - 305 million metres of Raychem cable were installed. This means if all the supplied heat tracing cables were in a straight trace towards the moon, the cable would be 80% of the way there! Some of our references: Royal Opera House London ( hot water temperature maintenance system), Eiffel Tower Paris ( frost protection), Houses of Parliament (fire performance cables), Four Seasons Hotel Hampshire (Underfloor heating), Terminal 5 Heathrow Airport (hot water temperature maintenance, frost protection, walkway heating, underfloor heating).

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