

Raychem

EM2-CM-Mat

Electrical heating mat for ramp snow melting and track heating

System EM2-CM-Mat

Freiflächenheizmatte für schnee- und eisfreie Garagenzufahrten, Rampen und Gehwege

System EM2-CM-Mat

Elektryczna mata grzewcza do ochrony przed oblodzeniem i zaleganiem śniegu na rampach i podjazdach

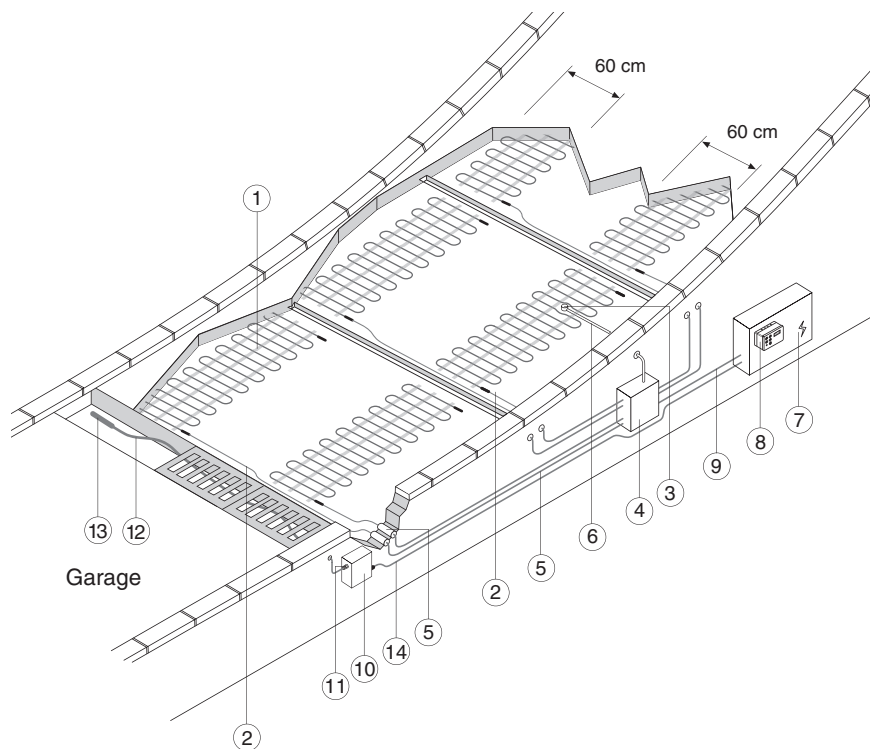
EM2-CM-Mat

Электрические греющие маты для стаивания снега на подъездных площадках и подогрева дорожного полотна

EM2-CM-Mat

Elektrische verwarmingsmat voor toegangen en opritten

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- ① Ramp heating mat
- ② Cold lead
- ③ Control unit temperature + moisture sensor
- ④ Junction box
- ⑤ Connection lead conduit
- ⑥ Sensor lead conduit
- ⑦ Control panel
- ⑧ Control unit
- ⑨ Supply lead
- Drain trace heating system
- ⑩ Junction box
- ⑪ Connection kit
- ⑫ 8BTV2-CT heating cable
- ⑬ End seal
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- ③ Temperatur- und Feuchtefühler der Steuerungseinheit
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- ⑤ Schutzrohr für Anschlusskabel
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- ⑩ Anschlußkasten
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- ⑭ Zuleitung

- ① Mata grzewcza do ogrzewania pojazdów
- ② Przewód zasilający
- ③ Czujnik temperatury i wilgotności gruntu
- ④ Skrzynka przyłączeniowa
- ⑤ Rurka ochronna przewodu zasilającego
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- ⑧ Sterownik
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- ⑫ Przewód grzejny 8BTV2-CT
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- ① Греющий мат
- ② Холодный ввод
- ③ датчик температуры и влажности
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- ⑦ Панель управления
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- Система обогрева дренажа
- ⑩ Соединительная коробка
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- ① Verwarmingsmat
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- ⑥ Buis voor sensor kabel
- ⑦ Schakelkast
- ⑧ Besturing
- ⑨ Voedingskabel
- ⑩ Aansluitdoos
- ⑪ Verbindingskit
- ⑫ 8BTV2-CT verwarmingskabel
- ⑬ Eindafsluiting
- ⑭ Voedingskabel

EN	Type - Mat length (230 Vac - 300 W/m ²)	Dimensions	Area	Conductor Resistance (+/-10%)	Power output (230 Vac)	Electrical protection (C Type)
DE	Typ - Heizmatte (230 Vac - 300 W/m ²)	Abmessungen	Fläche	Leitungs- Widerstand (+/-10%)	Leistung (230 Vac)	Ausgang Elektrische Absicherung (C Typ)
PL	Typ maty grzewczej - długość (230 Vac - 300 W/m ²)	Wymiary	Pow. maty	Rezystancja w omach (+/-10%)	Moc (230 V AC)	Zabezpieczenie elektryczne (Charaktery- styka C)
RUS	Тип - Греющий мат для стаивания снега длиной (230 Vac - 300 W/m ²)	Размеры	Площадь	Сопротивление (+/-10%)	Мощ- ность (230 Vac)	Электрическая защита (C Тип)
NL	Type - Verwarmingsmat lengte (230 Vac - 300 W/m ²)	Afmetingen	Oppervlak	Geleiderweer- stand (+/-10%)	Vermogen (230 Vac)	Elektrische zekering (Type C)
		m x m	m ²	Ohm	W	A
	EM2-CM-Mat-2m	2 x 0,6	1,2	130,3	400	10 A
	EM2-CM-Mat-3m	3 x 0,6	1,8	102,5	520	10 A
	EM2-CM-Mat-4m	4 x 0,6	2,4	79,9	670	10 A
	EM2-CM-Mat-5m	5 x 0,6	3	57,1	930	10 A
	EM2-CM-Mat-7m	7 x 0,6	4,2	47,5	1140	10 A
	EM2-CM-Mat-10m	10 x 0,6	6	28,9	1860	10 A
	EM2-CM-Mat-13m	13 x 0,6	7,8	22,1	2560	16 A
	EM2-CM-Mat-16m	16 x 0,6	9,6	18,5	2890	16 A
	EM2-CM-Mat-21m	21 x 0,6	12,6	13,8	3730	20 A

EM2-CM-Mat Installation Manual

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General

Important

All the instructions provided in this manual must be followed carefully to ensure that the heating system operates correctly. The installation must also be compliant with local requirements applicable to electrical heating systems.

Warning

The EM2-CM-Mat is an electrical device which must be designed and installed correctly. Follow all design, installation,

test and operating instructions to ensure proper operation and to prevent electrical or fire hazard.

Scope

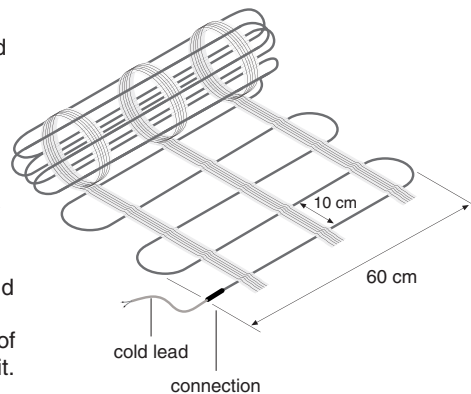
This manual focuses on the installation of EM2-CM-Mat in screed and sand for long-term structural stability. Tyco Thermal Controls can supply a different series of suitable products for laying in screed/concrete, asphalt or other applications.

EM2-CM-Mat Heating System (1)

The heating mat “EM2-CM-Mat” is a constant wattage heating device for a permanent installation in screed or sand under paving slabs.

It is a 230Vac system regulated by a control unit. (Control unit provided separately.)

EM2-CM-Mat is a preterminated and ready to install heating mat with 1 cold lead connection and a power output of approx. 300 W/m² or 25 W/m of heating cable. All mats have a width of 0.6 m and are available in lengths from 2 m up to 21 m. The cold lead cable has a length of 4 m, and should be installed in a conduit.



The minimum cable spacing is 10 cm. With 10 cm spacing the power output will be 300 W/m².

Spacer, Junction box (4) and supply lead (9)

When it is necessary to loosen the heating cable from the mat, the plastics strips (VIA-Strips-PL) will help maintain the correct spacing (10 cm).

Extension of the cold leads needs to be done in a junction box. The connection between the control panel and the junction box is made by a suitable supply lead.

Controller (8)

Tyco Thermal Controls offers control units specially designed for ramp heating applications. They incorporate combined temperature and moisture sensors to ensure efficient operation of the system.

Panels (7)

Tyco Thermal Controls offers a range of standard panels specifically designed for ramp heating applications. Each panel contains a built in control unit, plus circuit breakers and a residual current device (rcd).

Additional Items

Conduits (5, 6)

Conduits (not included) are required to protect the

- cold lead
- sensor connection lead.

Electrical Control Equipment

If Tyco Thermal Controls standard panels are not used, further items will be required to complete the system:

- contactors
- circuit breakers
- residual current device (rcd) 30 mA.

Storage of the mat

- Storage temperature range: -40°C to $+45^{\circ}\text{C}$
- Store all system elements in a clean, dry place.

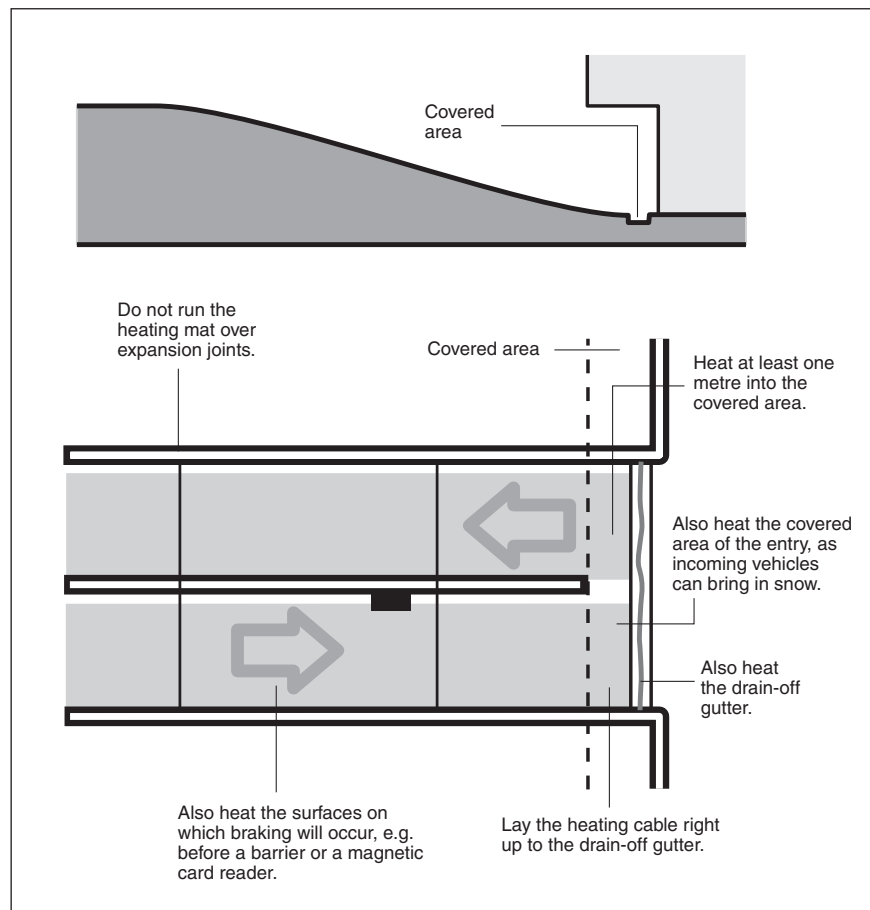
Test Equipment

- 2500 Vdc insulation resistance tester (min. 500 Vdc)
- Ohmmeter

Layout Considerations

Area to be heated

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



First make sure that the area to be heated complies with the data in the design instructions. Establish where the junction boxes are to be installed and check that the connection leads are long enough.

The length is 4 m. Thoroughly clean the substratum before starting to install the heating mat, as sharp objects can damage the heating cable.

The EM2-CM-Mat must not be shortened or spliced.

Preparing subsurface

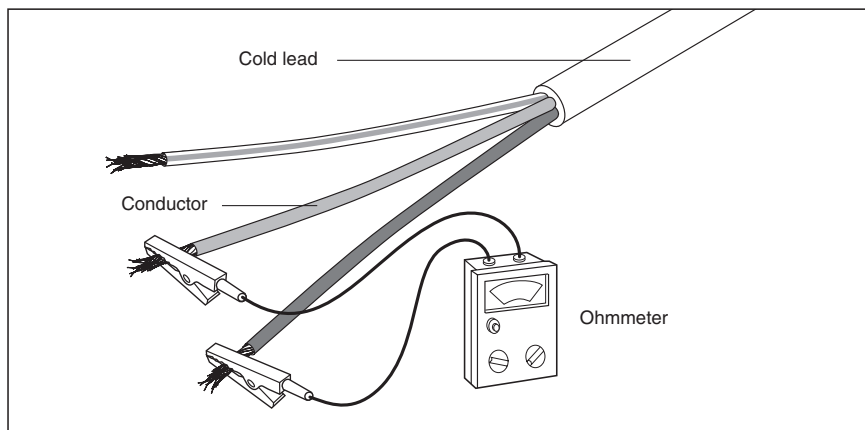
The heating mat should be installed on a stable subsurface. In suspended structures the substratum may consist of finished slabs, prestressed concrete or a suspended structure with poured concrete. The heating mat can be laid on all sub-surfaces. In the case of poured concrete,

it should be ensured that the surface is smooth and all sharp objects are removed. Ramps on a solid substratum do not require any additional thermal insulation. Appropriate preparations should be made for installing the temperature and moisture sensor.

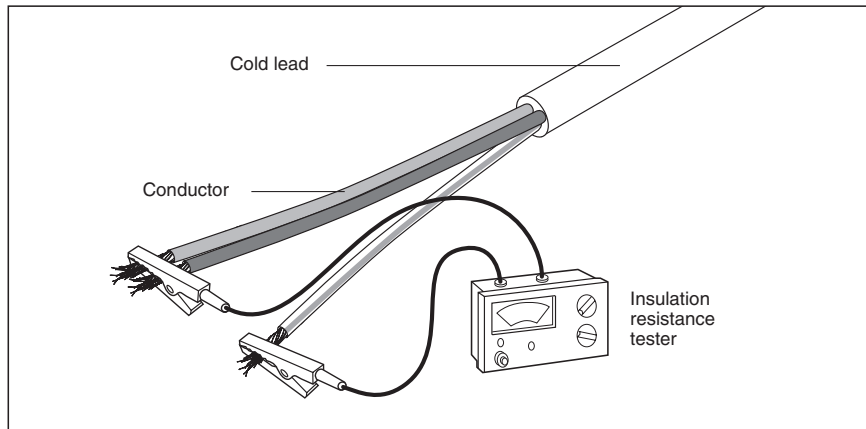
Cable resistance and insulation resistance test

Testing the heating mat involves the measuring of the conductor resistance and the cable electrical insulation resistance. The conductor resistance is

measured with an ohmmeter. A deviation of up to 10% from the nominal resistance is permissible. See table on page 3.



The insulation resistance should be measured with the aid of a 2500 Vdc (500 Vdc minimum) insulation resistance tester. The reading should be 100Mohms min.



Record all the measured values on the Installation Test Record provided.

Heating mat installation

All connections and electrical testing should be carried out by a qualified electrician. The heating mats should be installed for ramp and driveway heating. For irregular shaped areas, it is acceptable to cut the tape of the mat (not the heating cable) in order to cover the entire area.

However, the heating cable within the mat should:

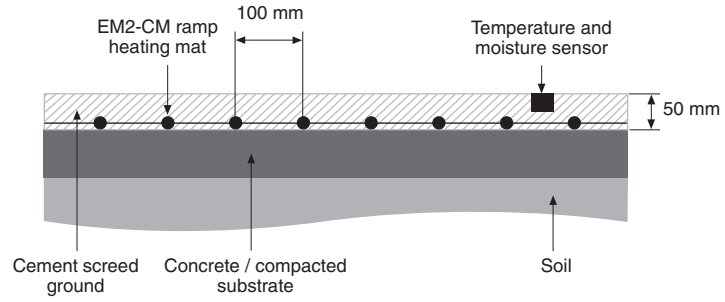
- not be cut or damaged,
- not be crossed over
- not be installed within 10 cm of another section of heater,
- not be installed across expansion joints or separate concrete slabs.

Minimum cable spacing is 10 cm

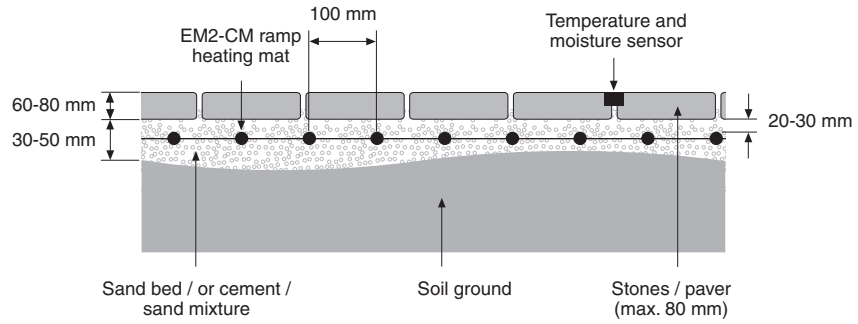
The heating mats must be secured to the underlaying surface to prevent movement during the installation.

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.

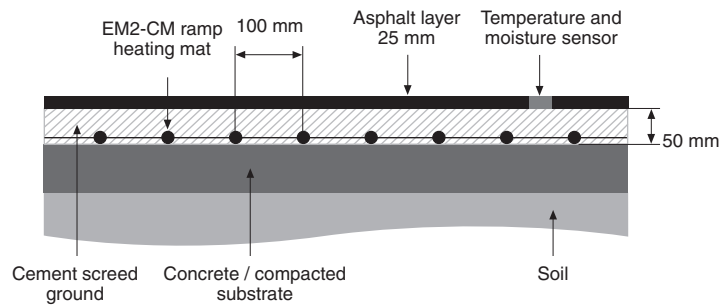
Ramp heating embedded in cement screed



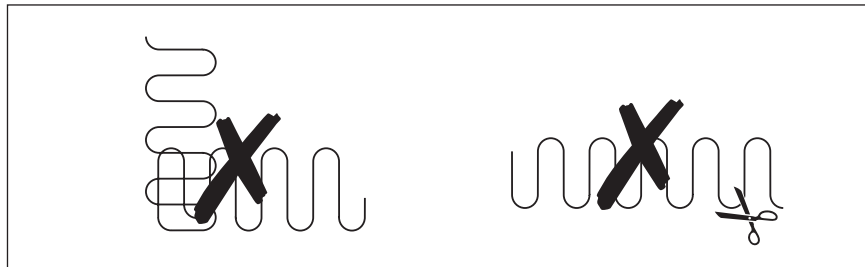
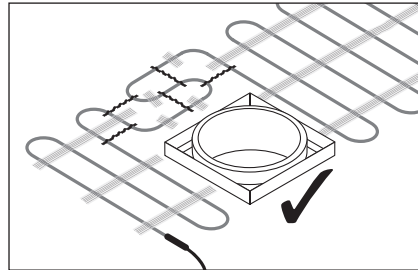
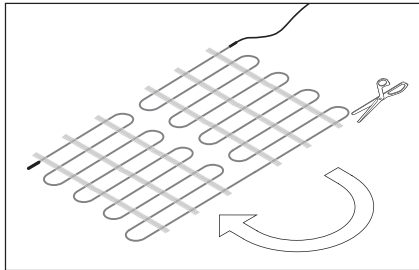
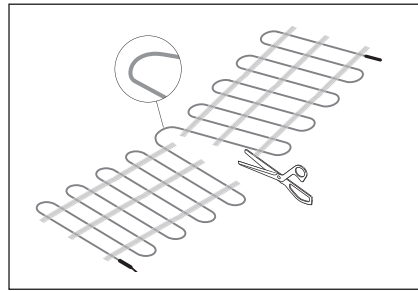
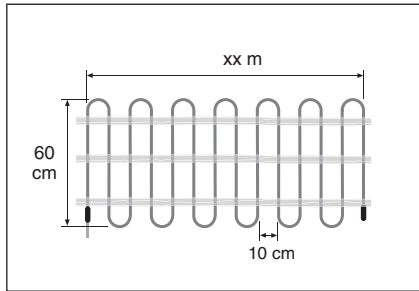
Ramp heating with top floor stones or pavers



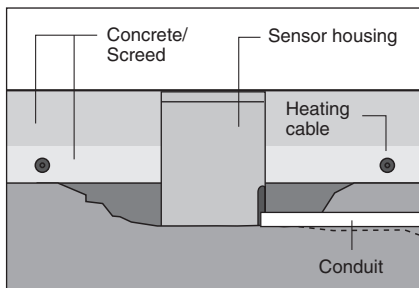
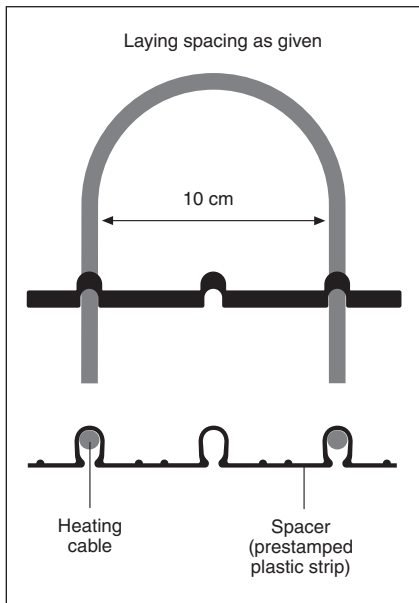
Ramp heating mat embedded in concrete / cement screed under asphalt layer



If the heating cable has to be loosened from the mat, the installer should use the plastic spacer to keep the cable spacing consistent.

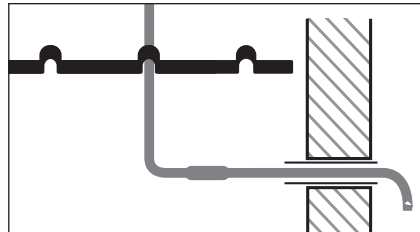


Use Spacers to arrange loose heating cable



- The sensor lead should be routed under the layer with the heating mat.

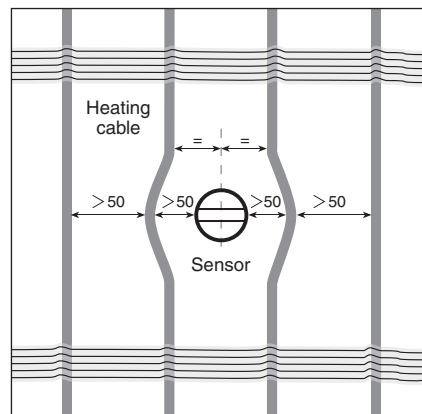
Installation of Conduit



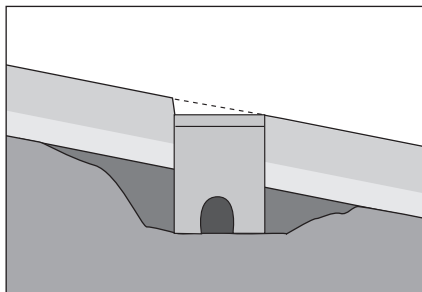
Installing the Temperature and Moisture Sensor (3)

Install the temperature and moisture sensor in accordance with the instructions supplied with the unit. Ensure that it is supported at the correct height. For sensors comprising a separate housing and sensor, install only the housing at this stage.

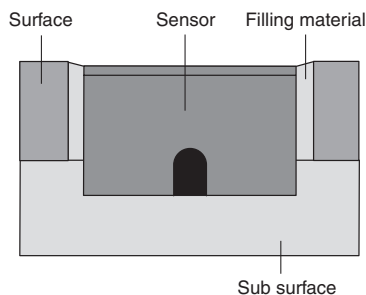
- The sensor should be placed mid-way between heating cable runs.



- The sensor lead should be protected by a metal conduit (6).
- The sensor must be mounted vertically, even on inclined surfaces.



Sensor



Check the Installation

Check Heating Mat

- Visually check the heating mat for damage.
- Verify that the loosened heating cable has been fastened to the spacers.
- Verify that the laying spacing has been maintained and that the heating mat has been kept away from expansion joints, sharp edges, etc.
- Verify that the heating mat has been installed at the correct depth.
- Visually check the connection leads for correct installation.

Do a Layout Sketch

Record the layout of each circuit, with particular reference to the position of the connection leads.

Perform the Resistance Tests

Carry out the resistance tests on each circuit to detect any damage that may have occurred during or after installation. The insulation resistance reading must be greater than 100 MΩ. Record the value for each circuit on the Installation Test Record.

Top surface installation

Checks

Perform the following checks before applying the top layer:

- Check for signs of heating cable damage.
- Check the spacing and below-surface depth of the heating cable, if applicable.

Resistance Tests

It is advisable to perform resistance tests on all the heating circuits immediately before top surface works to detect any damage which may have occurred after installation. Record the resistance values of each heating circuit on the Installation Test Record.

Before commencing top layer works, ask the installation team to verify the resistance results, record the measured values and sign the Installation Test Record.

Top surface works

After completion of all surface works, perform the resistance tests and record the values on the Installation Test Record.

Drain Tracing System with Self-Regulating Heating cable 8BTV2-CT

Purpose

The drain tracing system ensures that melt water can drain away.

Note: the drain tracing circuit should be controlled by the same control system as the other heating circuits.

Install Junction box (10)

Choose a position:

- close to the drain
- indoors if possible.

Install Connection Kit (11)

Terminate the 8BTV2-CT heating cable into the junction box in accordance with the instructions provided with the Connection Kit.

Lay out the Heating cable (12)

Protect the heating cable with conduit between the junction box and the drain. Trace the entire length of the drain to ensure that melt water will always have a drain-off path.

Install the End Seal (13)

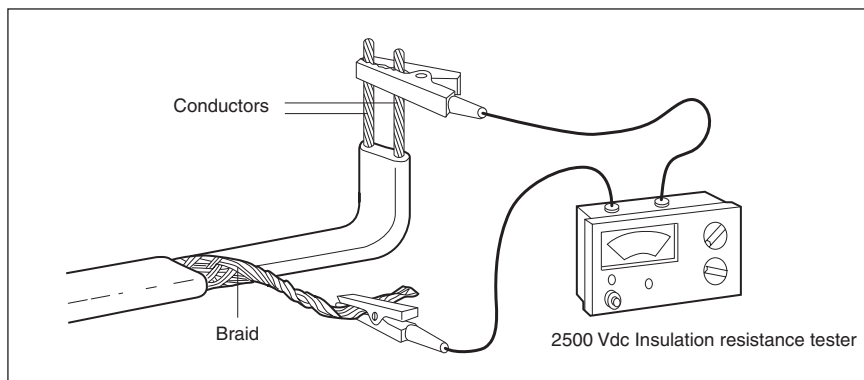
Install the end seal following the instructions provided with the End Seal kit.

Perform an Insulation Resistance Test

The insulation resistance test detects damage to the heating cable such as cuts or punctures. It should be carried out using a 2500 Vdc instrument. Lower voltage instruments are less sensitive and are not recommended. The instrument should have a test voltage of not less than 500 Vdc.

Proceed as follows:

- Connect one lead to the heat strip braid.
- Connect the other lead to both heat strip conductors together.
- Apply voltage. The resistance reading must be greater than 100 M Ω .
- If the insulation resistance is less than this, the heat strip is damaged. Where possible, locate the fault and rectify. Record the insulation resistance value on the Installation Test Record.



Finishing

Install a grid over the drain to ensure that the heat strip is protected from damage.

Note: A 30 mA residual current device (rcd) is required for the drain tracing. Ensure that there are no more than 60 m of heating cable connected to each 30 mA rcd.

Finishing

Complete Sensor

Complete the installation of the sensor (where necessary).

control units, thermostats and manual control equipment in accordance with the manufacturers' instructions.

Install Panel and Controls

Install the electrical panels according to the manufacturer's instructions. Install

Complete Wiring and System

Follow applicable local regulations.

Operation

Initial Start-up

Electrical Requirements

Complete all electrical testing following applicable local codes and practices. Inspect all wiring for conformance to design drawings. Check for correct rating on all protection devices.

Controller Checks

Check controller in accordance with the instructions provided with the unit.

Resistance Tests

Perform final resistance test to ensure that the connection lead and supply cable have not been damaged since installation.

General Operation and Maintenance

The system has no moving parts and therefore requires minimum maintenance. Local maintenance codes and requirements for electrical equipment should be complied with.

Circuit breakers should be checked periodically. Residual current devices (rcd) should be tested at least annually. Periodically inspect the system controls. Operate the controls to ensure that they function correctly.

Max. exposure temperature for heating mat: 65°C. Installer must supply operator/owner with the layout drawing.

Trouble Shooting Guide

Warning: Isolate supply before working on any part of the electrical system.

Problem A : Over-current protection (circuit breaker) trips or blows

Probable causes	Correction
Electrical fault at: <ul style="list-style-type: none">• connection lead• damaged heating cable	Locate and rectify the fault and reset or replace protection.
Protection undersized	Re-establish what the current loads are going to be and install new protection (NB: if protection is replaced, ensure it is compatible with the supply cable).
Defective protection	Replace

Problem B: residual current device trips

Probable causes	Correction
Excessive moisture in junction box	Dry out and check seal; replace if necessary. Perform an insulation resistance test.
Earth fault at: <ul style="list-style-type: none">• connection• damaged heating cable	Locate and rectify the fault and reset or replace rcd.
Leakage current too high: power cable or heating cable too long	Correct problem and re-design.
Contactors bouncing	Replace with higher quality contactor
Voltage spikes in power supply network	Reset rcd. If condition persists, use clean power supply.
Defective rcd	Replace

Problem C: Ice/snow not melting

Probable causes	Correction
Loss of supply current due to over-current or residual current device operating.	Follow procedures outlined in A and B above.
Loss of supply cable continuity	Locate and rectify fault.
Incorrect setting or operation of system controls	Repair system controls or set system controls correctly
Incorrect contactor sizing or damaged contactor	Rectify

Problem D: Ice/snow begins to melt, but system turns off too soon

Probable causes	Correction
Incorrect setting or operation of system controls.	Repair system control unit or set system controls correctly.