



Underfloor Heating (UK)
Industrial - Commercial - Domestic

Devi Underfloor Heating Complete Guide

Product Manual

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**Heating Cable
Compendium**

Part 1:deviheat®



General information about floor heating

New concrete floors:
Direct acting mode
Storage heating mode

Wooden floors:
Direct acting mode

**Existing concrete
floors:**
Direct acting mode

Warm floors

Towel rails

Product range details

**Calculating heat loss,
cable load and energy
consumption**

Installation guide

It is our hope that this **deviheat**[®] compendium, will serve our work associates as an effective tool and support them in their attempts to market and install **deviflex**[®] heating cables, **devireg**[®] thermostats and **devifast** installation material - jointly called **deviheat**[®].

This **deviheat**[®] compendium is built up as a short introduction to the heating system and includes the

major sales arguments as well as detailed technical descriptions about application, installation and various floor types.

The compendium is limited to a variety of standard installations which we have encountered through our many years of experience. If these descriptions are followed, we can guarantee a successful installation with a very long life.

Naturally, we are always open to new suggestions and ways of improvement so that our many work associates can obtain the maximum benefits from our products.

DEVI

4 Tomorrows heating system today

A heating system that is suited to our time and age yet technically advanced can be recognised by several factors.

It is flexible.

It is comfortable.

It is inexpensive to install.

It uses the full potential of its energy source and therefore uses less energy.

It is an environmentally friendly product.

deviheat® is precisely such a system.

deviheat® is flexible....!

deviheat® consists of **deviflex®** heating cables, **devireg®** tempera-

ture control systems and **devifast** installation material.

deviheat® ensures effective room heating, be it at home, at the office, in a work shop, sports hall or virtually anywhere that requires a comfortable warmth. Equally important is the fact that **deviheat®** can be installed in all types of floor whether they are new concrete floors, renovated bathroom floors or new or renovated wooden floors.

deviheat® is invisible. By being hidden under the floor it gives exciting new possibilities for furnishing and interior design and the problem of space consuming

and unattractive radiators no longer has to be considered.

deviheat® provides a comfortable warmth...!

All warmth rises upwards! This simple fact explains why **deviheat®** provides a more comfortable warmth than alternative radiator systems. A radiator system throws heat up at head height which then rises further up to the ceiling only to travel downwards and return as a cold draft around the feet.

deviheat®, on the other hand, provides an appropriately pleasant warmth for your feet, body and head. As it produces only a very gentle air circulation, the amount of travelling dust particles is reduced considerably which is naturally a great relief for people with allergies or asthma.

deviheat® is a good all round economical investment.

deviheat® is above all else a heating system which offers the lowest possible loss of energy. Thanks to an optimal thermal positioning in the floor and an extremely precise temperature control system with a **devireg®** thermostat, the average room temperature of 22°C can be reduced to 19°C. This means that the energy loss is reduced by approximately 15% which is both economically and environmentally beneficial.

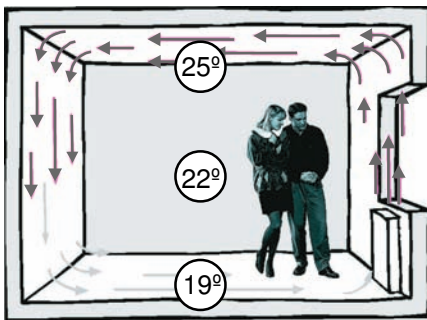


DEVI

Generally speaking, **deviheat**[®] is more inexpensive to install than other heating systems with similar abilities. As a rule, **deviheat**[®] is 20 - 40% cheaper to install.

deviheat[®] has a long life. Practically speaking, **deviflex**[®] heating cables last as long as the house in which they are installed - and even without having to maintain them!

devireg[®] thermostats have a life expectancy which is in accordance with their stage of technical development at the time of installation. It is, however, estimated that there will be a need for renewal as often as it would be necessary to change a burner in a traditional boiler. On the other hand it is considerably inexpensive and a lot simpler to change a thermostat every ten years or so than it is to replace an entire heating system consisting of radiators, boiler, etc.



deviheat[®] is environmentally friendly.

deviheat[®] uses energy in a more effective manner than traditional radiator heating systems do, due to the thermal effect and the electronic **devireg**[®] thermostat which ensure an exceptionally accurate control of energy consumption. This means that **deviheat**[®] uses approximately 15% less energy to achieve the same temperature than an average home has and does it with an equally reduced strain on the environment.

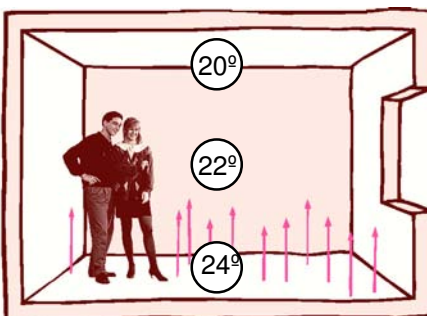
There are also other points in favour of electricity as a sensible solution with respect to the environment.

Electrical energy is distributed via a distribution network to all homes, offices, company buildings and factories.

Electricity is the most effective energy which can be distributed and at the same time it does not pollute the environment during transportation.

It is also the most controllable form of energy as it is produced in single measurable units at power stations and can therefore be limited production to satisfy the demand.

*Obviously, there are many good reasons to recommend **deviheat**[®] to your customers.*



Description of the system:

deviheat[®] for floor heating in concrete floors creates, whether it is total heating or supplementary comfort heating, the basis of the entire floor heating programme.

deviheat[®] can be used in all floor types (see illustration on page 8). The best results are achieved when the floor is well insulated.

Areas of use:

deviheat[®] for floor heating in concrete floors can without exception be used in all room types both at home and in the office.

The advantages of **deviheat**[®]:

- High standard of comfort.
- A warm floor.
- A strong and maintenance free floor construction.
- Energy saving control.
- Wide range of applications.
- Lower need for ventilation.
- A dry floor.
- A deterrent against damp.

Measurements of total and required effect:

When installing **deviheat**[®] in concrete floors, heating cables with a maximum rating of 18 W/m are used. In the average home, the cables will be installed to give an effect of 60 - 100 W/m² depending on the climatic conditions and how well the house is insulated. It is however recommended to install at least 100 W/m² in bathrooms as it is often desired to have a relatively high temperature in bathrooms floors. The available floor area is often smaller than the total area (due to cupboards, bath tubs, lavatories, etc.) and the required installed effect should therefore be proportionally

higher on the usable floor area. It should also be noted that the required installed effect should be approximately 30% higher than the total effect. This is to ensure a heating system that reacts just as quickly at low temperatures.

Example:

In a 20 m² kitchen the total effect is 1200 W, (60 W/m²). The usable floor space on the other hand is only 15 m². The result is a required installed effect of 80 W/m² of usable floor space. In houses with large glass and door areas we recommend the use of rim zone heating. The recommended effect in a rim zone area is 200 W/m².

Installation:

Heating cables should be installed approx. 5 cm below the floor surface and with a C-C distance of 10 - 20 cm. In an average house the C-C distance should not exceed 20 cm as it is likely to create cold zones on the surface of the floor.

To ensure that the heating cables are correctly mounted, we recommend the use of **devifast** fitting bands. These bands are designed so that the C-C distance can be chosen at regular intervals of 2.5 cm, e.g. 10 cm, 12.5 cm, 15 cm, 17.5 cm....etc.

The cables can also be mounted on mesh netting (armour). The bending diameter for a cable must not be less than 6 x the cable diameter.



It is important that the ground construction is well insulated so that the downward heat loss is kept to a minimum. Insulation material can for example be: - Styropor, stonewool, rockwool, insulating stone types or other forms of insulation. (The Danish building norm for U-value is 0.20, i.e. there must be an insulation layer of 100 mm.)

Another important element is the rim zone insulation. This must be effective so that heat is not transported to the brick work or adjoining rooms. In connection with wet rooms (bathrooms etc.) there should always be laid a damp proof membrane to stop any damp from moving down into the floor construction. Please look at the SBI recommendations for floors and walls in wet rooms.

When the cable is laid, special care must be taken that it is not pressed down into the insulating material or that it becomes enveloped by it in any other way.

The concrete around the cable must not contain sharp objects and it should have a consistency that enables it to surround the cable completely and without air pockets.

The concrete requires about 30 days to harden before the heating system can be switched on.

The ohmic value of the heating cables should be measured before and after pouring the concrete.

Floor surfaces:

Nearly all types of floor surfaces can be laid on a floor where heating cables have been installed but the supplier of the floor surface should always be consulted first with regards to which adhesives are to be used etc. The suppliers instructions must be very carefully followed when laying wooden floors directly on concrete constructions where **deviheat**[®] has been installed. Especially information concerning the maximum temperature, where the process of laying the surface etc. can be vital for the final result.

Regulating:

To control the temperature of **deviheat**[®], a **devireg**[®] thermostat is required. There is a wide variety of **devireg**[®] thermostats: with a built-in room sensor, with floor sensor or with a combination of both.

You can also choose a thermostat that is designed to be fitted flush with the wall, on the wall or where it can be mounted on a DIN rail.

When choosing a thermostat it is important to consider whether it is to be used in connection with a total heating solution or with comfort heating.

In connection with total heating solutions, a **devireg**[®] thermostat with a room sensor is used. Except in bathrooms or other places where the floor temperature should be higher. With comfort heating a **devireg**[®] thermostat with a floor sensor is used.

Heat loss:

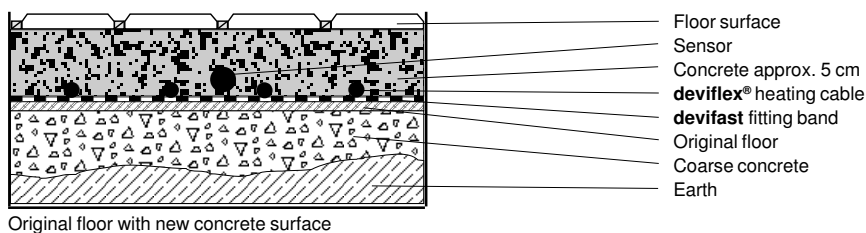
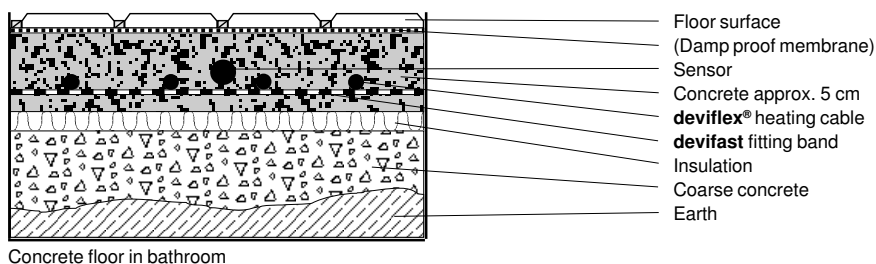
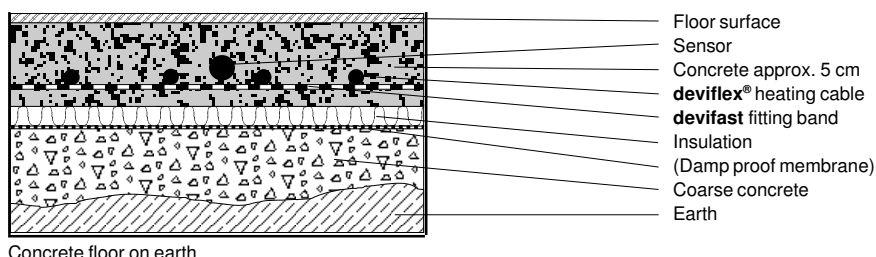
Please see page 27.

Choosing the product:

Please see chart on page 17 and list of products on pages 18-26.

Calculating the cable spacing:

Please see page 29.



Description of the system:

deviheat[®] storage heating is designed for use in the floor of houses, offices and factories where the opportunity to use the off-peak tariff periods from the electricity companies is available.

The storage heating system typically charges up the floor during the off-peak periods and supplies the room with heat during the day. You may think that this principle results in the room being cold by the end of the day, but as the whole floor is the heat emitter and as the floor has a low surface temperature (unlike storage heaters) the heat flow into the room is controlled and sufficient for the days heating requirement.

The storage system can be used with a **devireg**[®] 700 series thermostat, which calculates how much of the off-peak tariff (a period with inexpensive electricity) it needs to use to reach the required result before switching on. In this manner even more energy is saved.

The heating cables are embedded in a thick layer of concrete (min. 10 cm.) that stores the heat produced by the cables during the off-peak period. The heat is then gently released during the day. The **devireg**[®] thermostats and **deviflex**[®] cables ensure the best results with regard to both economy and comfort.

Off-peak electricity

The full capacity of an electrical power stations resources are used during the day time hours. This is because most offices, factories etc. are using a considerable amount of electrical equipment and machinery. At night time however - and some periods during the day, there is a large decrease in the use of electricity, therefore these periods are made available at cheaper rates. These periods are called off-peak periods.



Areas of use:

Houses
Offices
Shops
Factories
Blocks of flats

The advantages of the product:

High standard of comfort.
A warm floor.
A strong and maintenance free floor construction.
Energy saving control.
Wide range of applications.
Lower need for ventilation.
A dry floor.
A deterrent against damp.

Measurements of heat loss and required effect:

When installing a storage heating system the maximum effect is 250 W/m². Where 250 W/m² is not enough due to the heat loss, supplementary heating will be necessary. Supplementary heating can be provided by rim zone heating or **devifoil** ceiling heating.

A rim zone is where a secondary cable is installed in a room, acting on a direct acting basis. The rim zone is normally installed in front of windows and doors to counter-act the cold which is greater in these areas.

Depending on the demands made to the storage heating system, a choice from the **devireg**[®] 700 series can be used in combination with either **deviflex**[®] DTIP-18 twin conductor or DSIG-17 cables.

To assess the amount of heat required to heat a room with storage heating, it is important to determine the heat loss from the room. The method of calculating heat loss is described on page 27. See also examples given under **Dimensioning of the installed effect.**

Rim Zone Heating:

In houses with large glass and door areas we recommend the use of rim zone heating. A rim zone area is where the effect per square meter is increased so that more heat is generated in the rim zone area. This is done for example, by laying the cable in front of large glass areas and decreasing the C-C distance until the required effect is achieved. Rim zone areas require separate thermostats and sensors to control them. The rim zone **must** have a combination of room and floor sensor. With a floor sensor it is possible to control and limit the amount of heat given off in the rim zone area and avoid overheating. The recommended effect in a rim zone area is max. 250 W/m².

Installation:

Storage heating cables must have a minimum load of 18 W/m and the maximum effect must not exceed 250 W/m². A suitable insulation of approximately 100 mm and not less than 50 mm should be laid below the cables. In all rooms with floor in contact with the ground a damp-proof membrane should be laid between the hard core foundation and the insulation. The heating cables must not come into direct contact with the insulation. The cables are fastened with **devifast** fitting bands or steel reinforcement with the appropriate C-C distance. The concrete is poured over the cables so that there is a minimum of 5 cm from the top of the cable to the top of the concrete. The concrete must be carefully applied to the cables ensuring that they are not damaged and that no air pockets arise.

The concrete should be allowed to dry for 30 days before switching on the heat.

Floor surfaces:

Nearly all types of floor surfaces can be laid on a floor where storage heating has been installed, but the suppliers of the floor surface should always be consulted first with regard to temperature tolerance and which adhesives are to be used, etc. The suppliers instructions must be very carefully followed when laying wooden floors directly onto concrete constructions where storage heat has been installed. Especially information concerning the maximum temperature, where the process of laying the surface can be vital for the final result.

Regulating:

To control the temperature of storage heating, a choice from **devireg**[®] 710 and 700/750-754 is required.

The **devireg**[®] 700 series include electronic controls designed to save energy and regulate floor storage heating during low tariff periods. The **devireg**[®] 700 series consist of two types of thermostat which work together. The first type is the master unit. The master unit is connected to an outdoor sensor so that it is constantly measuring the outdoor temperature.

The master unit is connected to slave units. Slave units have floor sensors which measure the amount of remaining heat in the floor.

The master unit calculates with the outside temperature and the low tariff periods, to find how much time in a low tariff period the floor requires to charge up to achieve the optimal result.

The **devireg**[®] 700 is a master unit and when connected to one or more slave units it can control the temperature (in the manner described above) in as many as 400 different rooms or areas.

The **devireg**[®] 750 is a master unit that has a built-in slave unit and can therefore control one area on its own without being connected with other slave units.

devireg[®] 751 and 754 are all slave units which, when connected to a master unit, each can control 1 to 4 different rooms or areas at the same time.

Another master unit is the **devireg**[®] 710 which also has a built-in slave unit which enables it to control one area on its own or a number of rooms as one zone. This master unit varies from the others by not being able to measure the remaining heat in the floor. However it acts as a floor temperature limiter.

The **devireg**[®] 700 series is designed to be mounted on DIN rails.

Heat loss:

Please see page 27.

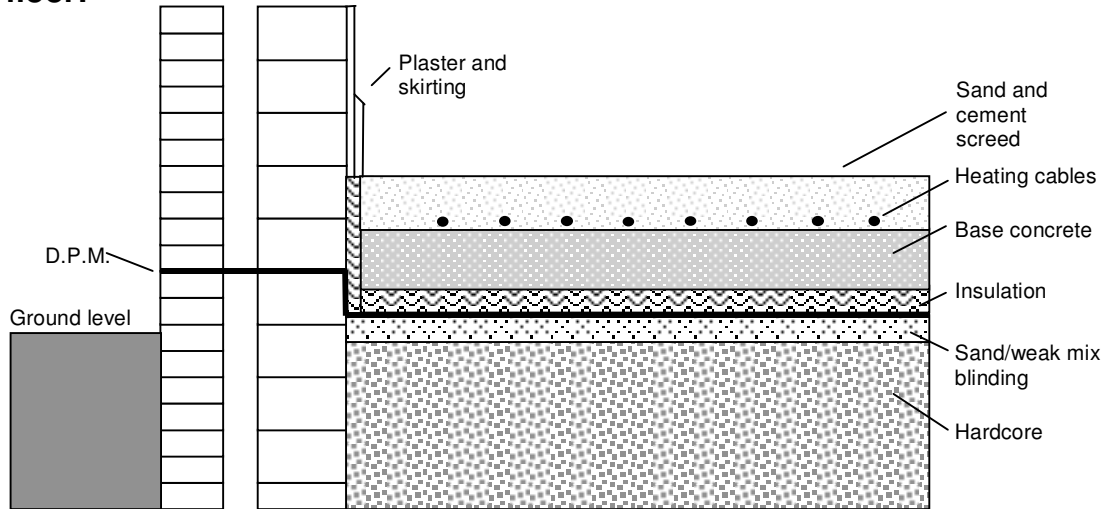
Choosing the product:

Please see chart on page 17 and list of products on pages 18-26.

Calculating the cable spacing:

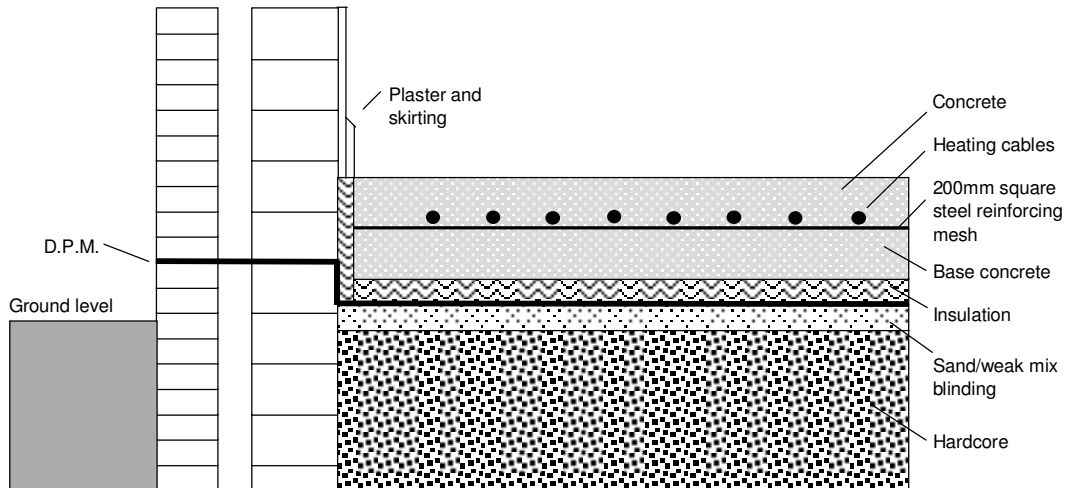
Please see page 29.

Solid ground floor:



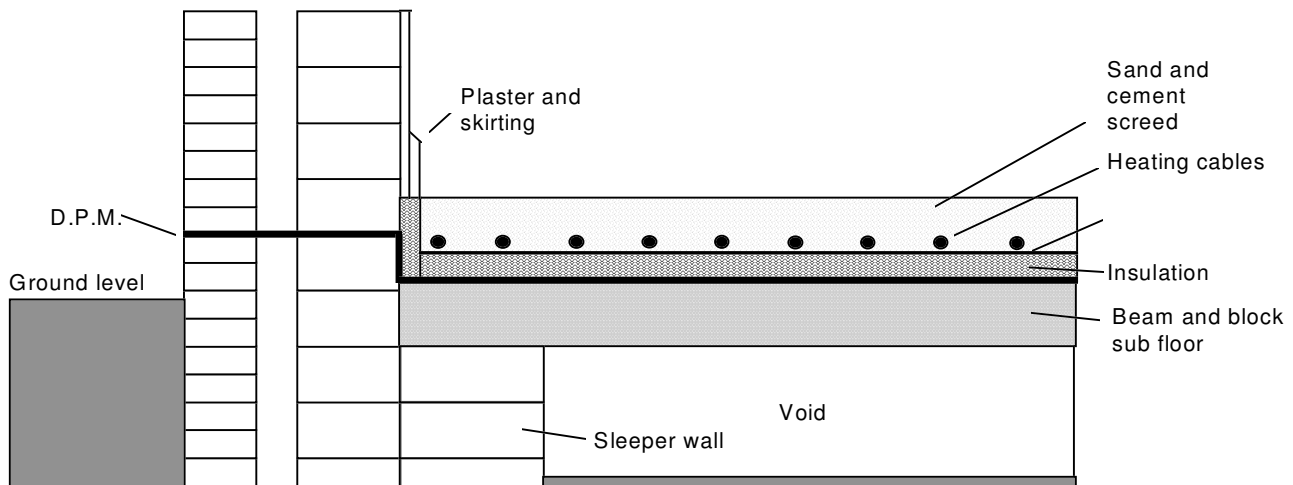
A floor which is laid directly on the ground must have a minimum of 50mm of high density polystyrene or polyurethane (min. resistance 1.35 m² K/W), laid over the damp proof membrane and under the oversite concrete slab, with a minimum of 25mm upstand at the perimeter of the building for the full depth of the floor. The heating cables are fixed to the concrete slab using the devifast galvanised steel spacer strips at the designed spacing. When the cables have been checked for continuity resistance and insulation resistance, the final screeding may commence - recommended 75mm thickness with a minimum of 50mm.

Solid ground floor-monolithic construction:



The monolithic floor, unlike the traditional floor which is constructed in two stages (base and screed), is laid in one operation above the damp proof membrane. This method has the benefit of less risk of curling or cracking and larger bay sizes. However, as the cables have to be laid quickly once the re-inforcing is placed, this method requires better site supervision. The cables are attached to the 200mm. square steel re-inforcing mesh which needs fixing in a position such that the heating cables are 75-100mm. below the finished floor surface. The heating cables used with this method of construction will be of the screened type to provide protection against the possibility of damage from stones in the concrete mix when the floor is mechanically tamped.

Suspended ground floor-beam and block:



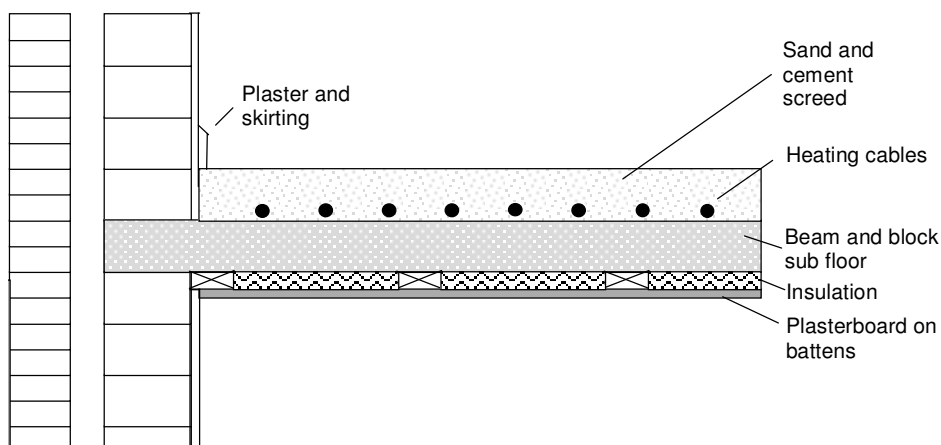
With this construction, there are two methods of installing heating cables above the thermal insulation laid over the suspended sub floor with the perimeter upstand for the depth of the screed.

(i) The sheet insulation is covered by a 50mm. square 12 swg steel wire mesh to which the devifast fixing strip is attached by plastic cable ties (or similar) and the cables are then placed at the calculated spacing.

(ii) An alternative method is to use aluminium foil backed insulation. In this case it is not necessary to use the steel mesh as the fixing strip can be attached by using suitable nails and the cables can then be placed at the calculated spacing.

In both cases after checking the continuity and insulation resistance, the final screed can be laid at the recommended 100mm. thickness (minimum 75mm). Both of the above methods thermally isolate the cable from the insulation preventing any unwanted temperature rise through contact with the insulation. There is also no possibility of chemical reaction with polystyrene products.

Solid Intermediate Floor:



With an intermediate floor construction the insulation is fixed between the battens, below the concrete floor. The heating cables are then fixed directly on the concrete floor using the devifast fixing strip. Once the cables have been checked for continuity and insulation resistance, the screed is then laid over the cables at a recommended thickness of 75mm. (50mm. minimum).

Description of the system:

deviheat[®] can be installed in all wooden floor types without any problems, as long as the installation prefaces are followed. The **devireg**[®] electronic thermostat with floor sensor ensures that the temperature in the floor construction is always in accordance with the tolerance level that the manufacturer of the floor surface has recommended.

Areas of use:

The system can be used anywhere in the house where the floor is constructed with floor boards or laminated wood supported by sleepers. It is important that the floor is well insulated below.

The advantages of the product:

- A warm wooden floor
- High standard of comfort
- High standard of safety
- Maintenance free
- A healthy and dry floor construction.

Measurements of total and required effect:

Heating cables for wooden floors should have an output of 10 W/m. However the manufacturers recommendations for maximum temperature concerning floor surfaces should always be followed.

Example:

In a 20 m² kitchen the total installed load is 1200 W (60 W/m²). The usable floor space on the other hand is only 15 m². The result is a required installed effect of 80 W/m² of usable floor space. The installed effect should be approximately 30% higher than the calculated heat loss. This is to ensure a heating system that reacts just as quickly at low temperatures.



Installation:

When installing electrical heating in connection with wooden floors, either on an existing wooden floor or in a floor with a wooden surface, the surface temperature should not exceed 27°C.

When installing heating in wooden floors supported on joists, the heating cables should not exceed 10 W/m and an effect of 80-100 W/m². The heating cable is laid on mesh netting (chicken wire) which is fastened to the joists. The mesh netting is placed so that there is minimum 30 mm between the netting and the underneath of the floor surface.

The heating cable must not come in direct contact with the insulation and the woodwork. A path should be made where it is necessary for the cable to cross a sleeper, and the path should be covered with metal. There must never be more than one cable in each path. The bending diameter for a cable must not be less than 6 x the cables diameter. The cable should be attached to the mesh netting at intervals of 30 cm.

The floor sensor is connected to an electronic thermostat with a temperature limiting function, where the maximum floor temperature can be set, for example with the **deviheat**[®] 550.

The floor sensor should always be placed in a plastic tube, in case the floor sensor needs to be changed at a later date.

The installed effect should not exceed 100W/m², with the heating evenly spread across the floor. The heating should not come into direct contact with the woodwork.

A sensor should always be installed in the floor to ensure control of the floor temperature.

Types of floor surfaces:

When choosing the wooden floor, the supplier of the floor should always be informed about the installation of the floor heating due to choice of adhesive, etc.

It is important that the manufacturer's recommendations for maximum temperatures underneath wooden floors are carefully followed.

Note: Special procedures in concerning the switching on of the heating system may be required in connection with applications underneath wooden floors.

For example:

- The heating system should be in operation for at least three weeks.
- The floor heating system should, for a period of at least four days and nights, have been operating with maximum effect.
- Prior to laying the floor the temperature should be below 18°C.

Regulating:

The three best suited thermostats for this type of deviheat are those with air and floor sensors, the **devireg**[®] 122, **devireg**[®] 522 and **deviheat**[®] 550.

These thermostats are both equipped with a built-in room sensor which registers the temperature of the room and a floor sensor which, when placed under the floor, registers and limits the floor temperature to the maximum of a chosen setting.

devireg[®] 122 is for mounting on the wall and **devireg**[®] 522 is for mounting flush with the wall and requires a wall box. It is also possible to choose from a variety of various DIN mounting thermostats.

All thermostats for controlling of room temperatures are supplied with a night set-back function.

Heat loss:

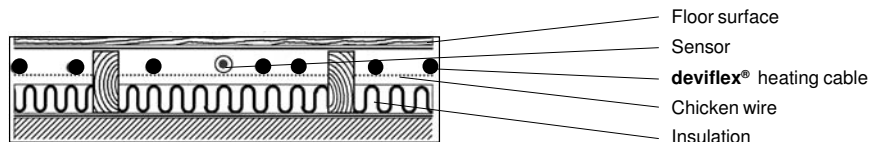
Please see page 27.

Calculating the cable spacing:

Please see chart on page 17 and list of products on pages 18-26.

Choosing the product:

Please see page 29.



Description of the system:

deviheat[®] is specially designed for use in connection with house renovations where there is a demand for a low floor construction height. The heating cables are covered with a thin layer of concrete or an adhesive mixture. When it is a low floor construction, requiring no more than 20-25 mm in height including the floor surface, the **devireg**[®] thermostat and heating cables form an effective heating system whether it is a total heating solution or a • comfort heating solution.

Areas of use:

Typical areas of use are the kitchen and the bathroom but the heating system can of course be used anywhere in the house in connection with renovations.

The advantages of the product:

- A warm floor
- High standard of comfort
- A low floor construction
- Energy saving
- A dry floor
- No mould

Measurements of total and required effect:

Generally speaking, it is necessary to install an effect of 100 W/m², although in some situations the effect may be higher depending on the climate and the insulation conditions.

In bathrooms there is usually a desire for a reasonably high temperature and thus a minimum of 100 W/m² should be installed.

In old houses with poorly insulated floors we recommend 150 W/m².

Although the above effects per m² may seem high it does not affect the



energy consumption as this is controlled by an electronic **devireg**[®] thermostat.

Installation:

When installing heating cables in thin floors, a cable with an effect of 10 W/m is used with a maximum C-C distance of 10 cm so that cold zones on the floor surface are avoided. When laying **deviflex**[®] heating cables we recommend the use of **devifast** fitting bands.

devifast are designed so that the C-C distance can be chosen with

intervals of 2.5 cm. e.g. 5 cm, 7.5 cm, or 10 cm.

The bending diameter for a heating cable must not exceed 6 x the cable diameter.

It is also possible to mount the cables directly on wire mesh netting, Ø 1 mm, with a masking size of 20 x 20 mm which is attached to the existing floor.

Alternatively, the cable can be glued to the net with a glue gun. If a thermostat with a floor sensor is being used the sensor must be placed in a protection pipe. The pipe

should be sealed at the end to prevent the concrete from entering. Thermostats with built-in room sensors or separate room sensors should always be positioned at a height of approximately 1.4 m and so that they are not effected by direct sun light or draughts. Having laid the cable and the pipe the floor is now prepared for the concrete to be poured. The manufacturers instructions for mixing and laying the concrete should be followed. In connection with wet room floors a damp proof membrane should always be laid, to avoid damp moving down into the floor construction. The damp proof membrane must be treated very carefully and any damage to it must be repaired.

If a thin floor is laid on an existing wooden floor, it will be necessary to ensure that the construction is stable even when heavy load is applied.

A fire resistant layer must be placed below the cables. This could be a 5 mm layer concrete, a 6 mm chalk board, fire resistant plastic sheeting or wire mesh, Ø 1 mm masking size 20 x 20 mm.

Floor surfaces:

All floor surfaces are well suited for floor heating although there must be a minimum of 10 mm of concrete covering the cables in connection with wood or plastic covering materials. The manufacturer of the floor surface should be informed that heating cables are installed and consulted with regard to choice of glue etc. Manufacturers instructions must be followed very carefully when installing **deviheat**® in wooden floors. Particular attention should be paid to the mounting and the maximum temperature allowed

below the floor. The maximum temperature permitted for a wooden floor mounted directly on top of a concrete base is 27°C.

Regulating:

To control the temperature of **deviheat**®, a **devireg**® thermostat is required. There are a wide variety of **devireg**® thermostats: with built-in room sensor, with floor sensor or with a combination of both. You can also choose between a thermostat that is designed to be fitted flush with the wall, on the wall or where it can be mounted on a DIN rail. When choosing a thermostat it is important to consider whether **deviheat**® is to be used in connection with a total heating

solution or with comfort heating. In connection with total heating solutions, a **devireg**® thermostat with a room sensor is used. Except in bathrooms or other places where the floor temperature should be higher. With comfort heating a **devireg**® thermostat with a floor sensor is used.

Heat loss:

Please see page 27.

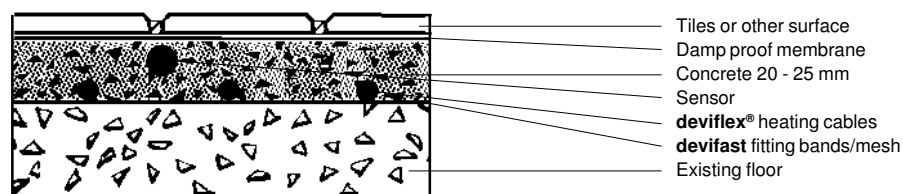
Calculating the cable spacing:

Please see chart on page 17 and list of products on pages 18-26.

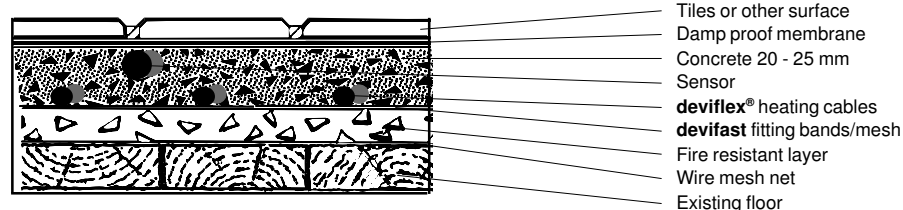
Choosing the product:

Please see page 29.

Thin floor on existing concrete floor



Thin floor on existing wooden floor



Description of the system:

devimat[®] is a thin heating mat specifically designed to be installed within a tile adhesive layer to eliminate the cold chill associated with floor tiles or other floor coverings.

The **devimat**[®] can be installed beneath other surfaces such as laminated floors and vinyl.

devimat[®] is a prefabricated mat with a thin heating cable ready mounted, all within 2.5mm thickness.

The mat is an open mesh design allowing the tile adhesive to still bond to the existing floor.

The mats are available in a range of sizes from 1-10m², each mat is 0.5m. in width. For example, a 5m² mat is 0.5m. wide and 10m. long.

Areas of use:

Bathroom/En-Suite
Kitchen

In fact, this system can be used in any room as long as the heating mat is covered by a flexible tile adhesive/self-levelling compound.

The advantages of the product:

The luxury of a comfortable warm tiled floor
High standard of comfort
Provides even heat across the floor
Economical
No significant floor height increase
Simple to install
A dry floor
No mould

Mat types:

There are two different types of **devimat**[®] available, one for timber based floors and one for concrete based floors:

100W/m² Timber based floors
150W/m² Concrete based floors

Installation:

The first step is to install the floor sensor into the floor, this will monitor the floor temperature to the required level.

The sensor is installed within a tube within the floor, so in the unlikely event of the sensor failing, the sensor can be withdrawn and replaced.

The mat is then rolled out on the floor in 0.5m. strips, upon reaching the end of the room the mat is simply cut between one of the cable loops and turned, laying the next piece parallel to the first.

The mat can be fixed to a timber floor using a staple gun or to a concrete floor using devipins, which are drilled into the floor or double sided tape.

Once in place the mat can be covered with adhesive or self-leveling compound, these must contain a flexible additive.

Regulating:

The **devimat**[®] can be regulated by a **devireg**[®] thermostat or the **deviheat**[®] 550 controller.

There are a wide variety of **devireg**[®] thermostats: one that is designed to be fitted flush with the wall, on the wall or where it can be mounted on a DIN rail.

See list of products on pages 17-25.

	Area of use	Choice of effect		Choice of cable				Choice of sensor
		Normal effect/m ²	Max. effect/m ²	DTIP 18	DTIP 8/10	DSIG/DSIO 17	DSIG 20	devireg [®] with
Room heating	Bathroom	100 - 150	200	X	X	X		floor
	Sitting room	80 - 100	150	X	X	X		room
	Entry hall	70 - 120	200	X	X	X		floor
	Hall	70 - 120	200	X	X	X		floor
	Lavatory	70 - 100	200	X	X	X		floor
	Bedroom	60 - 100	100	X	X	X		room
	Hallway	50 - 100	200	X	X	X		room
	Children's room	70 - 100	100	X	X	X		room
	Cellar	50 - 100	200	X	X	X		floor
	Washing room	70 - 150	200	X	X	X		floor
	Basic heat	40 - 60		X	X	X		floor
	Wooden floor construction on sleepers	60 - 80	80		X			combo
	Thin floor	100 - 120	150		X			combo/floor
	Office	60 - 100	200	X	X	X		room
	Store room	60 - 100	200	X	X	X		room
	Warm floor	100/150	100/150	devimat [®]	devimat [®]	devimat [®]	devimat [®]	floor
Storage heat	150 - 250	250	X		X	X	special	
Snow melting	Steps	200 - 250	300	X		X	X	floor/ice-snow
	Terraces	200 - 250	300	X		X	X	floor/ice-snow
	Paths	200 - 250	300	X		X	X	ice-snow
	Pavements	200 - 250	300	X		X	X	ice-snow
	Ramps	200 - 250	300	X		X	X	ice-snow
	Roof gutters	25 - 40		X		X	X	floor/ice-snow
Frost-protection	Freezer room flo.	10 - 20			X			floor
	On pipes	7 - 40			X			wire
	In drinking-water pipes	9 - 10	10					wire
Various	Garages	100 - 200	200	X		X	X	floor
	Churches	100 - 200	200	X		X	X	room/floor
	Work shops	80 - 100	200	X	X	X	X	room
	Sports centre	50 - 80		X	X	X	X	ground
	Greenhouses	50 - 100	100	X	X	X	X	ground
	Current over 240 V						X	
	Drying out of concrete	75 - 100	150	X		X	X	floor

This table can be considered as a guide with regards to choosing products.

Areas of use: This is where the cables can be used.

Effect: The column marked normal effect is the effect that should be installed per m².
The column marked maximum effect is the maximum effect that can be installed per m².

Choice of cable: These are the cables which can be used in the in the designated areas. When the cable type has been chosen, the specifications for it can be found on pages 24 - 25.

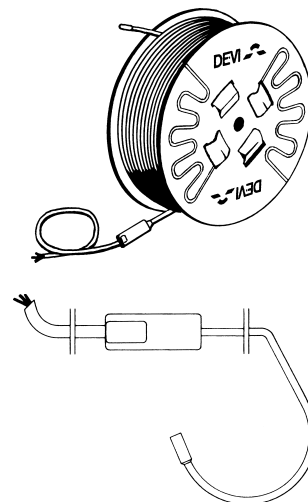
Choice of sensor: This section indicates which type of sensor is recommended for each area of use.
The type of thermostat can be found on pages 18 - 20.

18 Stock programme for deviflex®

deviflex® heating cables type DTIP-10 are designed for heating of renovated floors. When renovating older buildings it is often a wish to install floor heating in kitchens, bathrooms, etc.

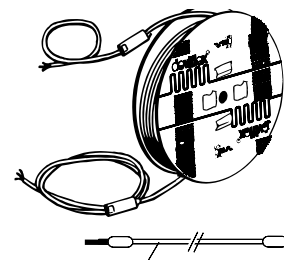
The heating cable can be used on fire proof and flammable floors.

Order no.	Output			Length m
	220 V~ 9 W/m	230 V~ 10 W/m	240 V~ 11 W/m	
89824550	85	100	100	10
89824552	185	200	220	20
89824554	265	300	315	30
89824556	355	400	425	40
89824558	460	500	550	50
89824560	530	600	630	60
89824562	635	700	755	70
89824564	725	800	860	80
89824566	845	900	1000	90
89824568	905	1000	1080	100
89824570	1115	1200	1325	120
89824572	1290	1400	1535	140



deviflex® heating cables type DSIG-17 with screen for installation in concrete floors. The typical applications of the heating cable are: accumulating underfloor warming systems, direct acting underfloor warming systems and comfort underfloor warming systems.

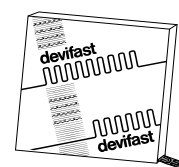
Order no.	Output			Length m
	220 V~ 16 W/m	230 V~ 17 W/m	240 V~ 19 W/m	
84004232	140	155	170	10
84004234	225	245	265	15
84004236	310	340	370	20
84004238	445	490	530	28
84004240	550	600	655	34
84004242	680	750	805	42
84004244	910	1000	1080	57
84004246	1085	1200	1290	67
84004248	1270	1350	1515	78
84004250	1565	1700	1860	97
84004252	1890	2050	2250	118
84004254	2260	2450	2690	140
84004256	2710	3000	3225	170
84004258	3300	3600	3930	205
84004260	3970	4260	4725	240



deviflex® heating cables are approved according to the IEC 800 norm.

Accessories

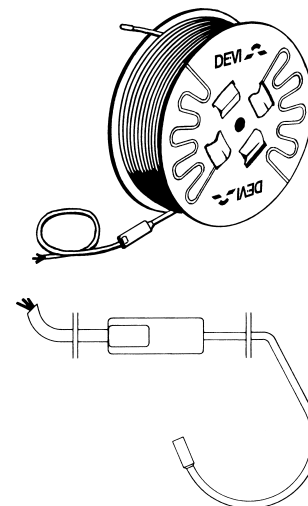
- 19808195 **devifast** 25 m. fitting bands are used to attach the heating cables to in concrete floors, on wooden floors, in outdoor areas etc. It is a heat resistant galvanised steel band.
DIN 17162. C-C distance 25 mm.
- 18055442 Repair kit for use with deviflex DSIG-17, single conductor heating cables.
- 18055420 Repair kit for deviflex DTIP-10 and DTIP-18, twin conductor heating cables.
- 18055240 Repair kit for deimat DSVF, single conductor heating mats.
- 19805907 devipins for fixing deimat to concrete floors, bag of 50
- 19805905 devipins for fixing deimat to concrete floors, bag of 100



DEVI

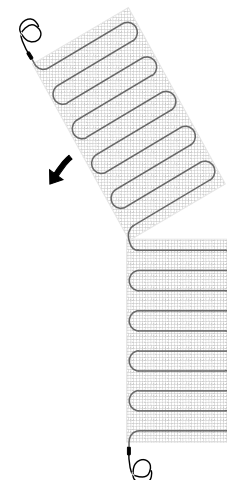
deviflex® heating cables type DTIP-18 for floor heating and frost protection of roof gutters and down pipes. The typical areas of usage for this **deviflex®** heating cable are: direct acting floor heat, storage floor heat, comfort heating, frost protection of roofs/gutters and down pipes, frost protection of ramps, driveways etc.

Order no.	Output			Length m
	220 V~ 16,5 W/m	230 V~ 18 W/m	240 V~ 19,5 W/m	
89835100	125	135	145	7
89835102	250	270	295	15
89835104	360	395	430	22
89835106	490	535	585	29
89835108	625	680	740	38
89835110	725	790	860	44
89835112	855	935	1015	52
89835114	980	1075	1170	59
89835116	1115	1220	1325	68
89835118	1225	1340	1455	74
89835120	1360	1485	1620	82
89835122	1485	1625	1770	90
89835124	1720	1880	2045	105
89835126	1955	2135	2325	118
89835128	2100	2295	2500	138
89835130	2535	2775	3015	155



devimat® heating mats for installation within flexible tile adhesive. Typically the heating mats are used to eliminate the chill associated with floor tiles, operating as a direct acting underfloor warming system.

Order no.	Output W 230 V	Area m ²	Length m	Effect W/m ²
83000502	100	1.0	2.0	100
83000504	150	1.5	3.0	100
83000506	200	2.0	4.0	100
83000508	250	2.5	5.0	100
83000510	300	3.0	6.0	100
83000512	350	3.5	7.0	100
83000514	400	4.0	8.0	100
83000516	500	5.0	10.0	100
83000518	600	6.0	12.0	100
83000519	700	7.0	14.0	100
83000520	800	8.0	16.0	100
83000521	900	9.0	18.0	100
83000522	1000	10.0	20.0	100
83000530	150	1.0	2.0	150
83000532	225	1.5	3.0	150
83000534	300	2.0	4.0	150
83000536	375	2.5	5.0	150
83000538	450	3.0	6.0	150
83000540	525	3.5	7.0	150
83000542	600	4.0	8.0	150
83000544	750	5.0	10.0	150
83000546	900	6.0	12.0	150
83000547	1050	7.0	14.0	150
83000548	1200	8.0	16.0	150
83000526	1350	9.0	18.0	150
83000549	1500	10.0	20.0	150



devimat® heating mat are approved according to the IEC 335 norm. The 100W/m² mats are recommended for timber based floors, the 150W/m² for concrete based floors. All **devimat®** 0.5m. in width.

Control and regulation:

The optimal control for floor heating, both comfort and economy, is achieved by using an electronic **devireg®** thermostat.

Electronic thermostats regulate the temperature quickly and precisely. All **devireg®** thermostats are equipped with a night set-back function which gives a sensible operative cost.

devireg® thermostats are specially designed for use with floor heating systems. The thermostats can of course also be used in connection with other heating systems and ventilation systems such as ceiling foil or panel radiators.

devireg® is designed to be fitted flush with the wall, on the wall or for mounting on a DIN rail.

The external room sensor and the wire sensor have the same ohm values and can therefore both be used with the **devireg®** range (the ohm value is 15 kOhm @ 25°C).

There is a wide variety of **devireg®** thermostats: with built-in room sensor, with an external room sensor, with floor sensor or with combinations.

For applications where the heating operates on a direct acting basis and requires programmed room heating/ floor warming, the **devireg®** 550 can be used.

The **devireg®** 550 is a combined thermostat and timer that learns the heat characteristics of a room/floor. The controller then switches on at the appropriate time to ensure the heating is on at the correct level at the required time. It can be programmed to use either the in-built air sensor, a floor sensor or both according to the DEVI system installed.

Areas of use for devireg®:

Floor sensors are used with systems that ensure a pleasant floor temperature in bathrooms, kitchens, washing rooms, wardrobes, etc.

Floor heating that is controlled with a floor sensor reacts slowly to external heat from e.g. stoves or sun rays etc.

In situations where the heating should be controlled remotely, for example in hotels, schools and nursing homes, remote sensors can be used.

A built-in room sensor is used to control the temperature of living rooms where there is a demand for an exact control of the room temperature. Thermostats with a built-in room sensor will quickly register external heat from people, the sun etc.

devireg® thermostats with an inbuilt room sensor combined with a floor sensor are used in places where the floor temperature needs to be limited, e.g. wooden floors, or floors with a surface that have a maximum temperature limit.

The **devireg®** series is equipped with a relay and can therefore control a contactor.

All of the **devireg®** series are equipped with a night set-back function which can be activated via a timer, this is not necessary with the **devireg®** 550.

Regulation of storage heating:

The **devireg®** 700 - 754 series is a universal control system used in the regulating of systems for storage heating.

The **devireg®** 700 - 754 series automatically adjusts itself to low tariff periods.

devireg® 700 - 754 are a series of electronic controls designed to save energy and regulate floor heating during low tariff periods in connection with the outside temperature and the quantity of stored heat in the floor. As a result of this only the exact required amount of energy is used.

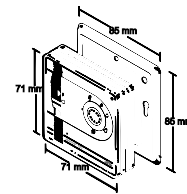
The **devireg®** 700 - 754 series is designed to be mounted on DIN rails.

The devireg® 120 series, for mounting on the wall

devireg® 120 with floor sensor - devireg® 121 with built-in room sensor - devireg® 122 with built-in room sensor and floor sensor

Order no.	Voltage	Type	Temp. field	Sensor A	Sensor B	Night set back	Colour	Temp. Limit
19111418	180-250 V	120	5°C - 50°C	wire		5°C	polar white	
19111434	180-250 V	121	5°C - 35°C	built in		5°C	polar white	
19111459	180-250 V	122	5°C - 35°C	built in	wire	5°C	polar white	20°C - 60°C

The devireg® 120 series is delivered with a wire sensor.

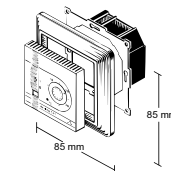


The devireg® 520 series, for mounting flush with the wall

devireg® 520 with floor sensor - devireg® 521 with built-in room sensor - devireg® 522 with built-in room sensor and floor sensor

Order no.	Voltage	Type	Temp. field	Sensor A	Sensor B	Night set back	Colour	Temp. Limit
19115906	180-250 V	520	5°C - 45°C	wire		5°C	polar white	
19115922	180-250 V	521	5°C - 45°C	built in		5°C	polar white	
19115930	180-250 V	522	5°C - 30°C	built in	wire	5°C	polar white	20°C - 60°C

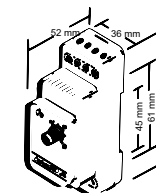
The devireg® 520 series is delivered with a wire sensor.



The devireg® 330, for mounting on DIN rails

Order no.	Voltage	Type	Temp. field	Sensor A	Sensor B	Night set back	Colour	Temp. Limit
19113638	180-250 V	330	5°C - 45°C	wire		5°C	grey	
19113646	180-250 V	330	15°C - 30°C	room		5°C	grey	

The devireg® 330 is delivered with a sensor



devireg® 550 combined thermostat/timer

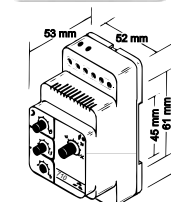
Order no.	Voltage	Type	Temp. field	Sensor A	Sensor B	Night set back	Colour	Temp. Limit
19150028	180-250 V	550	5°C - 50°C	built in	wire	-15°C	polar white	20°C - 60°C



The devireg® 710, for mounting on DIN rails

Order no.	Voltage	Type	Sensor A	Sensor B
19117001	180-250 V	710	wire	outdoor

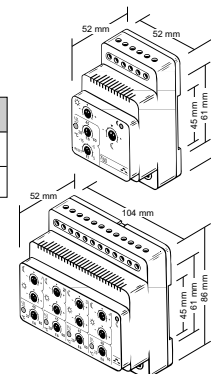
The devireg® 710, is delivered with a floor sensor and an outdoor sensor



The devireg® 750 - 754, for mounting on DIN rails

Order no.	Voltage	Type	Sensor A	Sensor B	Zones
19117010	180-250 V	750	wire	outdoor	Master + 1
19117011	180-250 V	754	wire		4

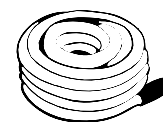
The devireg® 750 - 754 is delivered without sensors



Sensors

devireg® wire sensors

Order no.	Voltage	Temp. field	Sensor	Material	Length	Moisture proof
19110641	180-250 V	-10°C - +50°C	15 kOhm/ 25°C	PVC	2.5 m	IP 65
19110831	180-250 V	-10°C - +50°C	15 kOhm/ 25°C	PVC	6.0 m	IP 65
19111037	180-250 V	-10°C - +50°C	15 kOhm/ 25°C	PVC	10.0 m	IP 65



devireg® room sensor

Order no.	Voltage	Temp. field	Sensor	Material	Measures	Moisture proof
19114022	180-250 V	10°C - +50°C	15kOhm/25°C	PVC	50 x 50	IP 20



devirail electric towel rails are an energy saving product which use no more energy than a normal lamp.

devirail electric towel rails are easy to install and are well suited in bathrooms, kitchens, washing rooms, weekend houses, hotels, etc.

devirail towel rails

Stock programme

Order no.	Output	Tension	Colour	Model
98 80 61 44	20 W	230 V~	white	small
98 80 61 51	20 W	230 V~	chrome	small

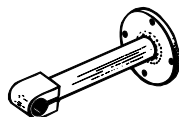
Order no.	Output	Tension	Colour	Model
98 80 49 41	40 W	230 V~	white	S-model
98 80 49 58	40 W	230 V~	chrome	S-model

Order no.	Output	Tension	Colour	Model
98 80 81 40	60 W	230 V~	white	large
98 80 81 57	60 W	230 V~	chrome	large

Extra wall fittings for towel rails

Stock programme

Order no.	Colour
98 80 52 03	white
98 80 51 95	chrome





With the DEVI mirror heating pads installed behind a mirror, the inconvenience of a misted mirror is gone.

No more wiping mirrors in the morning and no water marks which would appear once the mirror dries.

The mirror mat produces a gentle heat to warm the mirror and prevent the formation of mist and condensation.

The mirror mat can be connected to the light switch in the bathroom, giving a mist free mirror when you want at the same running cost as a light bulb.

Stock Code	Dimension	Wattage	Voltage
83000300	0.8m x 0.6m	75W	230V
83000301	0.5m x 0.7m	50W	230V
83000302	0.6m x 0.6m	48W	230V

Installation:



Measure the mirror and mark the area on the wall.



Mount a flex pipe in the wall from mirror to connection box.



Cover the area with adhesive- check suitability of adhesive for mirrors.



Press the mat into the adhesive until flat and secure.



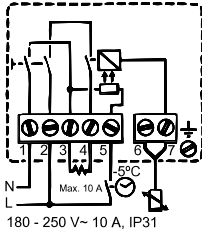
Cover with second layer to give smooth finish. Push connection tails into flex pipe.



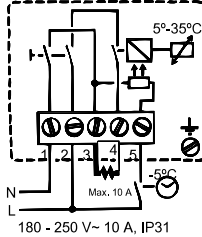
Mount mirror either into adhesive or with acid free silicone once adhesive is dry.



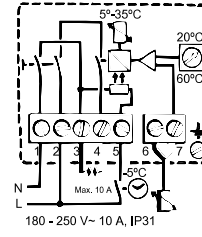
devireg® 120



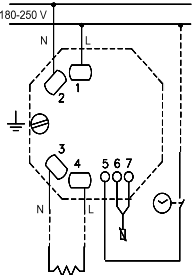
devireg® 121



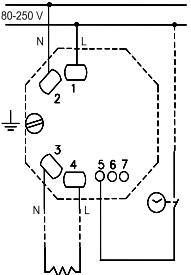
devireg® 122



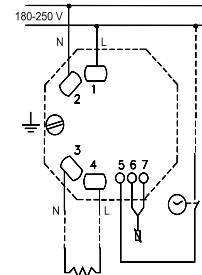
devireg® 520



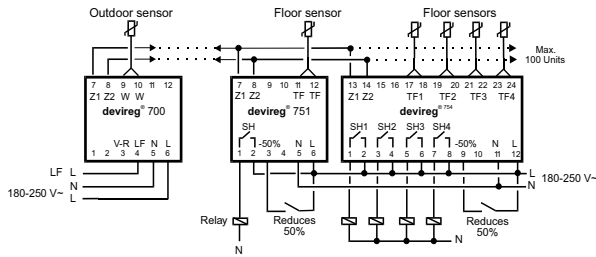
devireg® 521



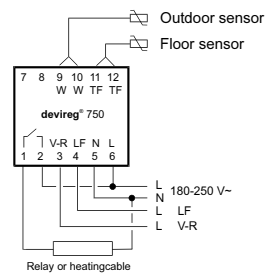
devireg® 522



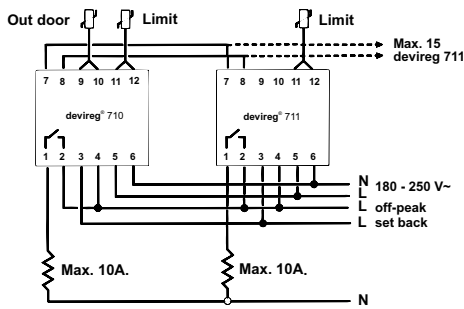
devireg® 700



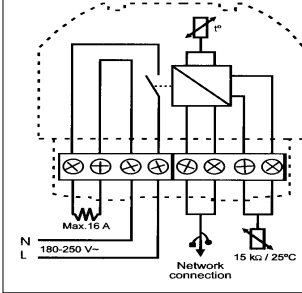
devireg® 750



devireg® 710



deviheat® 550



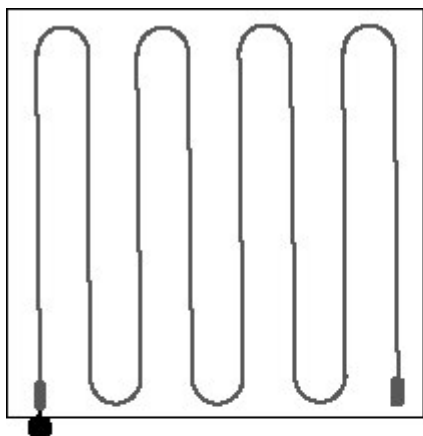


Fig. 1 One twin conductor cable.

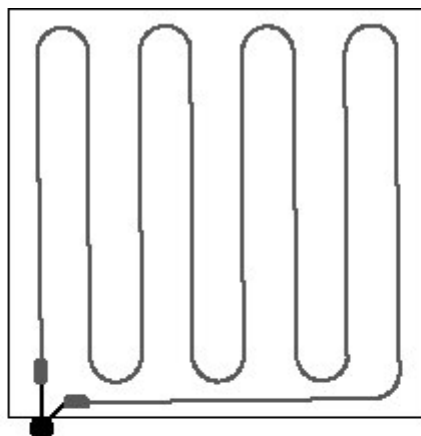


Fig. 2 One single conductor cable.

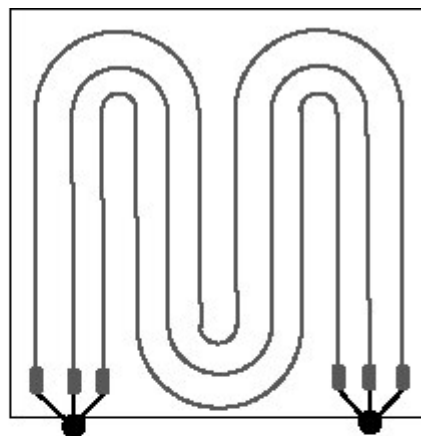


Fig. 3 Three single conductor cables, three phase system in connection with a star/triangle exchange.

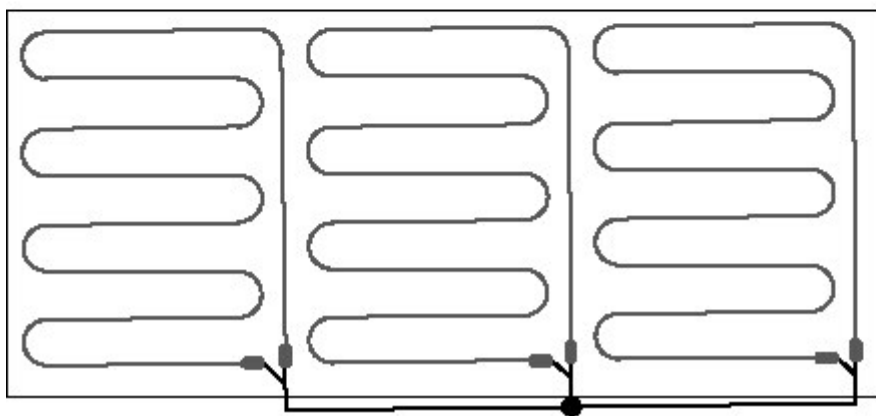


Fig. 4 Three single conductor cables, three phase system in connection with star/triangle.

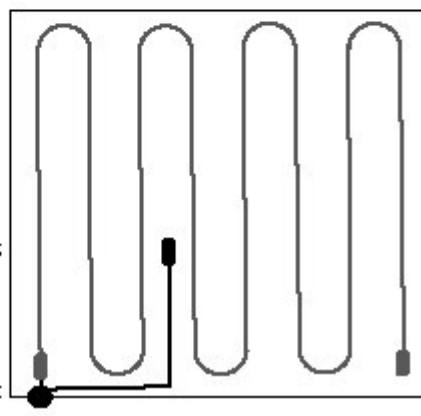


Fig. 5 Position of sensor

Fig. 1 and 2.
A typical method of installing single and twin conductor cables in a room regulated by a thermostat.

Fig. 3.
A method of installing cables on a large floor area where the effect is spread over three phases. The system is controlled by a **devireg**® ther-

mostat in connection with a contactor. A star/triangle exchange can be used in connection with regulation. Should it be the case that a 400 volt system is being used, then the cables should be designated for 400 V.

Fig. 4.
As in fig. 3.

Fig. 5.
The floor sensor must be placed inside a tube, with a minimum inside diameter of 10 mm and sealed at the end. The sensor is cast in the top area of the concrete above the open end of a cable loop and should be positioned at least 0.5 m out from the wall.

26 Calculating dimensional heat loss

By using the following calculation method it is possible to deduce the heat loss in a building. This heat loss calculation is not documented and should therefore only be considered as a guide.

Heat losses from a building are calculated by the elemental method, in accordance with the CIBSE guide. They can be expressed as:

$$Q_t = A \cdot U \cdot (t_i - t_e)$$

where:

Q_t = Quantity of heat lost from dwelling per hour in watts.

A = Area m^2 of each component of the structure e.g external walls, glazing, floor, roof etc.

U = Thermal transmittance of structural element ($W/m^2.K$). 'U' values can be found in the CIBSE guide section A3, but lists of the more common 'U' values can be found in Table 1 under.

$t_i - t_e$ = The difference between the internal temperature required and the outside external design temperature. External temperatures are usually taken as $-1^\circ C$ in the Midlands and South and $-4^\circ C$ in the North of UK.

Table 1

U-value W/m^2C	Enhanced	Standard	Approx. insulation thickness in mm.
Ground Floor	0.45	0.45	29mm Celotex or Equivalent
Intermediate Floor	1.60	1.60	-
External Wall	0.45	0.45	-
Internal Wall	1.70	1.70	-
Roof	0.25	0.25	150
Windows, doors	2.90	4.70	-
Roof Glazing	3.80	3.80	-

Table 2

Room	Room Air Temperature	Air Changes Per Hour	Infiltration Heat Loss ($W/m^2.K$)
Living Room	21	1	0.33
Dining Room	21	1	0.33
Study	21	1	0.33
Dining/Kitchen	21	1.5	0.50
Kitchen	18	2	0.67
Bathroom	22	2	0.67
Bedroom	18	0.5	0.17
Hall	18	1.5	0.50
Landing	18	1.5	0.50
WC/Cloakroom	18	2	0.67

NB. Infiltration losses in commercial/industrial buildings may be found in CIBSE guide section A4.

To Take a Dining Room of a typical bungalow 4m x 3m built to current (April 90) Building Regulations, the heat loss would be:

Table 3

Room	Dining Room						21
Surface	Length	Width	Height	Area	U-value	T	Watts
Ext. Wall	7.0		2.4	14.64	0.45	22	145
Glass	1.8	1.2		2.16	2.90	22	138
Floor	4.0	3.0		12.0	0.45	22	119
Roof	4.0	3.0		12.0	0.25	22	66
Vent	4.0	3.0	2.4	28.8	0.33	22	207
Totals							677W

Further heat losses would be carried out for the remaining rooms to end up with a total dwelling heat loss.

Calculating the cable loads:

A low tariff period of for example eight hours, means that the cables have eight hours to generate the required amount of heat to be given off over approximately the next 16 hours before the next low tariff period occurs. However, as low tariff periods can also occur during the day period we have chosen to show an example representing two low tariff periods: the night period (typically between 11 p.m. and 7 a.m.) of eight hours and the day period (typically between 1 p.m. and 3 p.m.) of two hours. This gives a total of ten hours of low tariff periods in one day. This is illustrated by O in the following equation.

To ensure that the system reacts quickly and effectively during cold weather a security factor is included in the calculation. This security factor (which is pre-determined to 1.2) is illustrated as C in the following equation.

The following equation is used to calculate the required effect once the heat loss has been determined;

Where

- T = hours of use
- C = Security factor 1.2
- O = Period of generating

$$\frac{\text{Calculated heat loss (Watts)} \times T \times C}{O}$$

Example:

Heating design utilising 100% storage system for rooms intermittently occupied with small heat grains e.g. Bedrooms & Hallways.

A sitting room is 25 m² and the usable floor space is 20 m². The heat loss has been calculated to 60 W/m².

The heat loss is therefore
60 W/m² x 25 m² = 1500 Watts

The required loading will be:
 $\frac{1500 \times 24 \text{ hours} \times 1.2}{10 \text{ hours}} = 4320 \text{ W}$

The calculated heating density will be 216 W/m². The actual heating density will be calculated from the nearest cable size to match the required load.

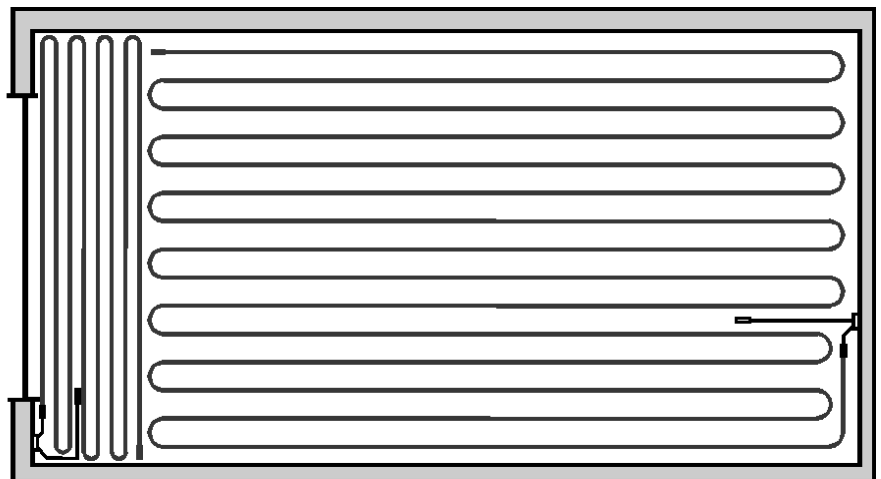
Heating design utilising a mixed storage and supplementary direct acting heating system for rooms with a high occupancy level and varying heat gains e.g. Living Rooms.

In living rooms where varying heat gains can make stable temperature control more difficult, it is recommended to design the storage heating to provide a high background room temperature, and to supplement this with a separate direct acting cable (available 24 hours a day) to maintain the room temperature at the required level. The direct acting cable would normally be laid near the coldest part of the room e.g. near the

external windows. The recommended minimum rating for the supplementary heating should incorporate an overload factor to give a satisfactory response to heating demands. This factor would be:-

1. 130% of the short fall (in Watts) for rooms where the heat loss is so high that the storage cable cannot raise the room to a high background temperature. In this case it may be necessary to release free floor area for the supplementary heating by reducing the storage cable rating so that the floor space is available for the direct acting cable which will then maintain the room temperature.
2. For rooms where the supplementary heating is installed to provide better control where there are varying heat gains or where there are large external glazing areas, the overload factor would be approx. 50% of the room heat loss.

In both 1. and 2. the maximum heating density should not exceed 250 W/m².



In this example a 230 volt cable type DTIP-18 controlled by a devireg® 750 could be chosen as an appropriate storage heating system.

The rim zone can be controlled by a devireg® 522,122 or even a deviheat® 550 with a deviflex® 230 volt cable type DTIP-18.

Calculating the yearly energy consumption with transmission and ventilation loss.

$$Q[\text{KWh}] = \frac{Q_n}{t_i - t_u} \times 24 \times \text{Degree days}$$

$$Q[\text{KWh}] = \text{KW/h per year}$$

$Q_n[\text{KW}]$ = the dimensional heat loss

$t_i[^\circ\text{C}]$ = the dimensional indoor temp.

$t_u[^\circ\text{C}]$ = the dimensional outdoor temp.

Dd = the 24 hour daily rate. These figures can be obtained from a meteorological institute. A typical figure for an average year in Denmark is 2600 Dd.

When calculating the yearly energy consumption, the external heat influence should be deducted. The amount of external heat to be deducted, depends on the following factors:

1. Heat from people.
2. Heat from ovens, washing machines, tumblers, light, etc.

3. The amount of sunshine.
4. The extent of heat recovery in connection with ventilation systems.

Normally it is possible to deduct the calculated energy consumption Q with approximately 20% from points 1 - 3.

If free heat is taken into consideration when calculating the dimensional heat loss, 20% should not be deducted from Q .

Example

Dimensional heat loss for Q_n is: 7.5 [KW]

Dimensional outdoor temperature t_u is: $-12[^\circ\text{C}]$

Dimensional indoor temperature t_i is: $+20[^\circ\text{C}]$

The daily rate is: 2600

$$Q[\text{KWh}] = \frac{7.5}{20 - (-12)} \times 24 \times 2600 \text{ KWh}$$

$$Q[\text{KWh}] = 14625 \text{ KWh} - \text{free heat } 20\%$$

$$Q[\text{KWh}] = 11700 \text{ KWh}$$

deviflex[®] heating cables and **devireg**[®] thermostats must be installed in accordance with the electrical I.E.E Wiring Regulations. The cable and the thermostat must be connected by an authorised electrician.

The foundation must be clean and free of sharp objects.

Attaching the cables to the foundation must be carried out in a manner that does not damage the cables.

The cable must be evenly spread over the floor and guided around elevated objects such as bath tubs, etc. To ensure an accurate and easy installation of the cable, **devifast** fitting bands can be used. **devifast** fitting bands have attachment clips at intervals of 2.5 cm so that the distance between the cable loops will be: 5, 7.5, 10, 12.5, 15, etc.

The **devireg**[®] thermostat sensor wire must be protected by a pipe with a minimum inside diameter of 9 mm. The sensor must be positioned in the centre at an open end of a cable loop and approx. 10 mm below the floor surface. Where the pipe is bent between the floor and the wall, the minimum bending radius is 6 cm. The pipe must be sealed at the end to avoid concrete from entering.

The concrete which is used must not contain sharp stones. When laying the concrete it is important not to damage the cables.

Should the cable become damaged while laying it or later on in the building process, it is a great advantage when trying to locate the fault to know where the connection box between cable and cold tail and the end of the cable are situated. It is therefore important to make a sketch showing the position of these.

The cable and the connection box must both be cast in concrete. If the

cable is pressed down into the insulation material or in any other way becomes covered by it, the surface temperature can become too high which may lead to a cable defect.

THEREFORE, BE EXTREMELY CAREFUL WHEN LAYING THE CABLE.

The cable must not be subjected to a strain of more than 25 kg.

At low temperatures the cable can become difficult to lay due to the sheath. This problem can be overcome by connecting the cables for a short period.

THE CABLE MUST BE ROLLED OUT! When the cable has become flexible the power should be disconnected. It is not recommended to lay cables at a temperature below -5°C.

The floor heating must not be turned on before the concrete has fully hardened. Approx. 30 days for concrete and 7 days for moulding compound.

The ohm value of cable and screen must be checked before and after casting.

Calculating the C - C distance:

$$\frac{\text{Effect per m cable} \times 100}{\text{Effect per m}^2 \text{ usable floor space}} = \text{C - C distance in cm}$$

With a cable type DSIG-17, where the effect is 17 W per m cable and the usable floor area is 200 W/m².

$$\frac{17}{200} = 0,085 \text{ m} \sim \text{C - C distance is 8,5 cm.}$$

or

$$\frac{\text{Total m}^2 \text{ usable floor space} \times 100}{\text{Cable length}} = \text{C - C distance in cm.}$$

The table shows the C - C distance for various effects per m² when using a cable with an effect of 17 W/m

Effect per m ²	C - C distance
50 W	34.0 cm
75 W	22.6 cm
100 W	17.0 cm
125 W	13.6 cm
150 W	11.0 cm
175 W	9.7 cm
200 W	8.5 cm

The table shows the C - C distance for various effects per m² when using a cable with an effect of 10 W/m

Effect per m ²	C - C distance
50 W	20.0 cm
75 W	13.0 cm
100 W	10.0 cm
125 W	8.0 cm
150 W	6.8 cm
175 W	5.7 cm
200 W	5.0 cm

IMPORTANT

Installations must be made in accordance with the current Edition of the I.E.E Wiring Regulations.

