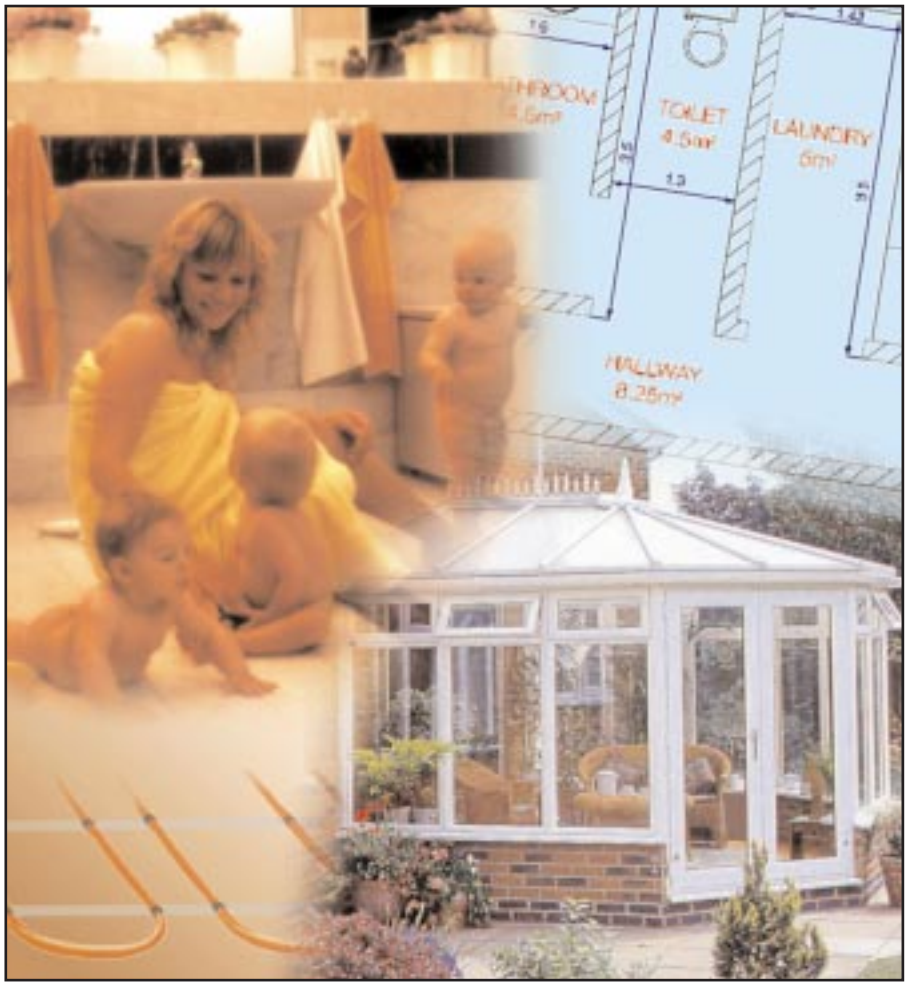
ibemo Kazakhstan Ltd.
ӨНЕРКӘСІП ЖӘНЕ ЭЛЕКТР МАТЕРИАЛДАРДЫН ЖАБДЫҚТАУШЫСЫ
ПОСТАВЩИК ИНДУСТРИАЛЬНОГО И ЭЛЕКТРИЧЕСКОГО ОБОРУДОВАНИЯ И МАТЕРИАЛОВ
SUPPLIER OF INDUSTRIAL & ELECTRICAL EQUIPMENT and MATERIALS
Tel. +7 (71133) – 93077
Fax +7 (71133) – 93074
E-Mail: info-kz@ibemo.de

FLOORWARM

Self-Regulating Electric Underfloor Heating System



Comfort Heating

New and Retrofit Applications

Concrete and Timber Floors

The Applications

Floor warming is generally provided as supplementary heating to an existing heat source in order to keep floor surfaces at a comfortable temperature.

FLOORWARM is suitable for domestic, commercial and industrial buildings. It may be incorporated into new buildings and extensions, or retro-fitted to existing floors. FLOORWARM can be safely used with wooden and concrete floors

How it Works

FLOORWARM self-regulating heating cable is installed beneath the floor, often embedded in the concrete, or in a screed, although it can also be safely used with wooden floors.

Bathroom Floors

The principle of FLOORWARM, when used with a concrete floor, is to utilise the high thermal capacity of the floor slab as a heat reservoir which stores and emits heat on a continuous basis.

When initially energised the heater works to its maximum output, reducing as the slab temperature rises, until the required optimum heat output is achieved.

By installing a self-regulating heating cable, that varies its output relative to the floor temperature, it is possible to achieve an even heat distribution without localised overheating.

Floor Warming Principles

A comfortable room temperature largely depends on the mean effective temperature, which is a function of the ambient air temperature and the average radiant surface temperature. Where large warm surfaces such as the floor exist, it is possible to achieve comfortable conditions with a cooler air temperature. This results in a "fresher" environment and will mean reduced heat losses from the building with subsequent savings in energy costs.

It is more comfortable and far safer to have an evenly distributed lower temperature of between 20 - 30°C, than it is to have a single high temperature heat source of around 100°C, or more, in one area of the room, distributing heat by radiation and convection. It is also more efficient and safer to generate heat at the required floor temperature, rather than to generate excessive temperatures and allow distribution to reduce the temperature to the required comfort level.

Ideal living room temperature gradients are considered to be about 24°C at floor level and around 18-20°C at head level. FLOORWARM allows the latent heat stored in the floor to be released in such a way as to achieve these conditions more effectively. The self-regulating characteristic of FLOORWARM ensures that, as the room reaches the desired temperature, the capability of the floor to emit heat diminishes. Furthermore, lying on the floor will not result in over heating - making it perfectly safe for children and pets.

Efficiency

For greater efficiency, heat input to the floor may be provided via off peak, low tariff electricity if, and when, it is available. Additional thermostat and timer controls may also be utilised for additional energy savings. An insulated floor is recommended where possible.

Flexibility

FLOORWARM'S self-regulating capability also ensures that the system responds to localised additional heat losses that may occur at open windows, doors, etc., by automatically increasing the heat output from the floor in that area. This self-regulating capability also ensures that the floor cannot overheat, thus protecting against discomfort and inefficient use of energy.

The installed heating load determines the ability of the system to achieve the required floor operating temperature.

Conservatory Floor

The heat output from FLOORWARM is sufficiently low to enable the heater to be used with a waterproof membrane in floors subject to moisture, for example in bathrooms, shower rooms, etc.

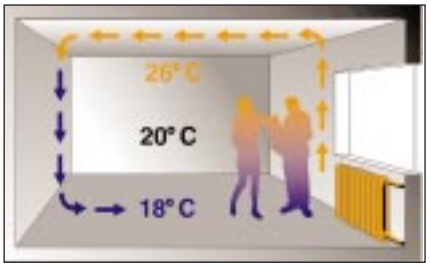
Other Uses

In addition to domestic applications such as conservatories, bathrooms, living rooms, bedrooms, loft areas, etc., FLOORWARM offers equal benefits for commercial premises such as offices, atria, reception areas, rest rooms, etc.

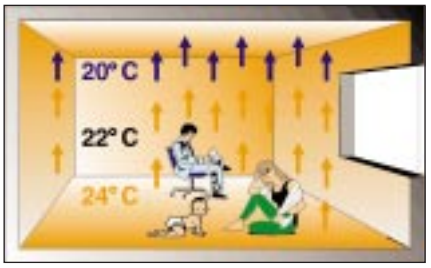
Traditional Heating vs. FLOORWARM

With traditional central heating, the air immediately around the radiator is heated and, as the warm air rises, the heat is concentrated high in the room whilst the floor area remains colder.

FLOORWARM, however, radiates heat upwards from the floor - resulting in a much more comfortable and even heat distribution throughout the whole room.



Room heating using traditional methods



Room heating using FLOORWARM system

"Self-regulating heaters cannot overheat or burn out"

Applications

Applications for FLOORWARM are extensive as the system is suitable for most domestic, commercial and industrial buildings.

- *bathroom*
- *hallway*
- *living room extension / conservatory*
- *gymnasium*
- *retirement home*
- *common room / offices*
- *reception area*
- *factory / warehouse*

... plus many more

FLOORWARM may be used in new buildings, or in retro-fit applications.

Floor Construction

A variety of different floor constructions may be found in floor warming applications:-

- *concrete*
- *sand / cement screed*
- *timber*

The floor may be provided with any one of a number of floor finishes, ie:-

- *tile / marble*
- *parquet blocks*
- *cork*
- *linoleum*
- *carpet*

Where possible, particularly in new applications, thermal insulation will minimise downward and edge heat losses.

Common Room

Gymnasium

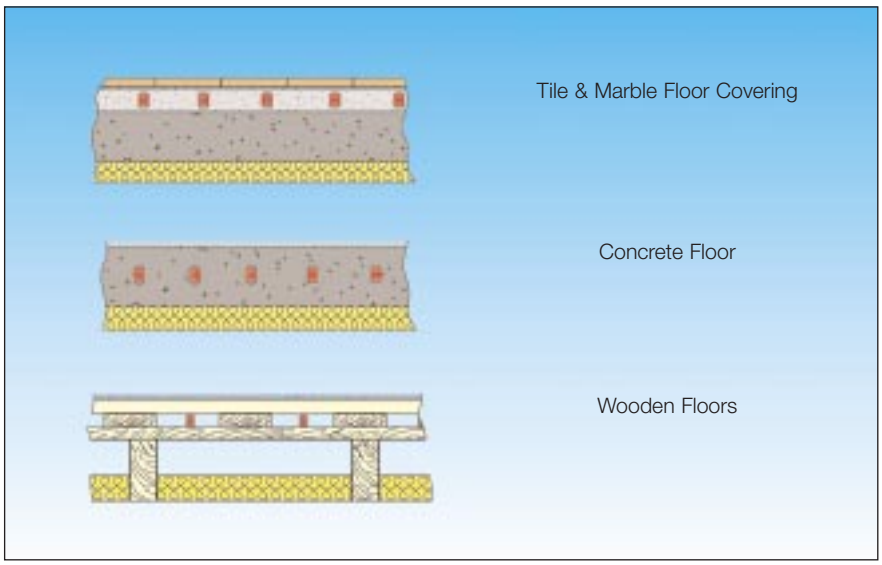
Retirement Home

Living Room Extension

Installation Method

Installation of the heating cables may be carried out in a number of ways:-

a) embedded in the concrete slab
b) embedded in a sand/cement screed prior to laying tiles
c) placed between timber battens below a wood floor, either floorboards or parquet flooring tiles



Applications

FLOORWARM Comfort Heating

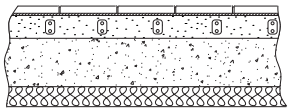
FLOORWARM is used to maintain floor surface temperatures at a level on which it is comfortable to walk.

Typically the systems may be used for tiled or marble floors in bathrooms, changing rooms, foyers and shopping malls, swimming pool areas, etc. FLOORWARM heaters are either embedded in the concrete slab, or in a sand/cement screed beneath the tiles, or placed beneath a timber floor finished surface.

Concrete Constructed Floors

Target Floor Temperature	24°C to 29°C
Typical Room Temperature	18°C to 22°C

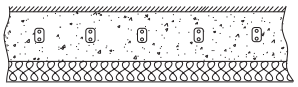
Embedded in sand/cement screed (typical installation)



New and retro-fit applications

Floor Construction A (typical)	Tile/marble cover Sand & cement screed Concrete sub-floor Thermal insulation

Embedded in concrete floor slab (typical installation)



New applications

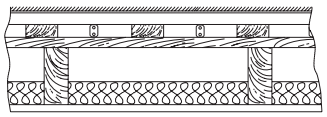
Floor Construction B (typical)	Finished floor covering Concrete slab Thermal insulation

Control	PT007 Thermostat or PRO TIMER
Heater	FW-C
Pitch (typical)	150mm - 280mm
Cable Location	In screed, beneath tiles, or within the monolithic pour of concrete.

Timber Constructed Floors

Target Floor Temperature	24°C to 29°C
Ambient Temperature	18°C to 22°C

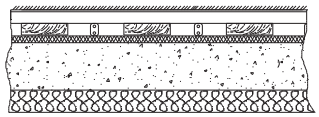
Wooden floor finish on timber joists (typical installation)



New and retro-fit applications

Floor Construction A (typical)	Wooden finish - floorboards, parquet, etc Timber battens Flooring chipboard Timber joists Thermal insulation

Wooden floor finish on concrete slab (typical installation)



New and retro-fit applications

Floor Construction B (typical)	Wooden finish - floorboards, parquet, etc Timber battens Flooring chipboard Concrete slab Thermal insulation

Control	PT007 Thermostat or PRO TIMER
Heater	FW-A
Pitch (typical)	75mm - 145mm
Cable Location	Beneath wooden floor surface.

IMPORTANT
The above are examples only of the types of floor warming applications normally found. Therefore the data shown is intended as a guide only and may vary depending on geographical location, building structure, heating requirements and floor construction, etc. The diagrams are intended to be for illustrative purposes only.

For more details on specific applications, contact your local Heat Trace Representative.

Design Guide

Certain information is required prior to commencing the system design

a) Size and layout of area concerned
b) Room/space ambient temperature
c) Details of sub-floor construction
d) Final floor covering (tiles, carpet, etc.)
e) Thermal insulation
f) Desired floor temperature
g) Method of installation
h) Supply voltage
i) Preferred temperature control

STEP 1

Determine the application, system requirements and style of heating cable

FW-A heating cable - for use with timber floors.

	Target Floor Temp	Typical Room Temp	Heater Pitch FW-A	Approx W/m² Output
Bathroom, sauna, etc.	29°C	22°C	75mm	110W/m²
Living area, conservatory, etc.	27°C	20°C	95mm	90W/m²
Hallway, reception area, etc.	24°C	18°C	120mm	75W/m²
Gymnasium, sports hall, etc.	21°C	16°C	145mm	60W/m²

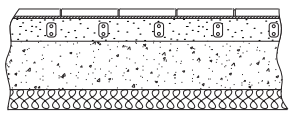
FW-C heating cable - for use with concrete floors.

	Target Floor Temp	Typical Room Temp	Heater Pitch FW-C	Approx W/m² Output
Bathroom, sauna, etc.	29°C	22°C	160mm	110W/m²
Living area, conservatory, etc.	27°C	20°C	185mm	90W/m²
Hallway, reception area, etc.	24°C	18°C	230mm	75W/m²
Gymnasium, sports hall, etc.	21°C	16°C	275mm	60Wm²

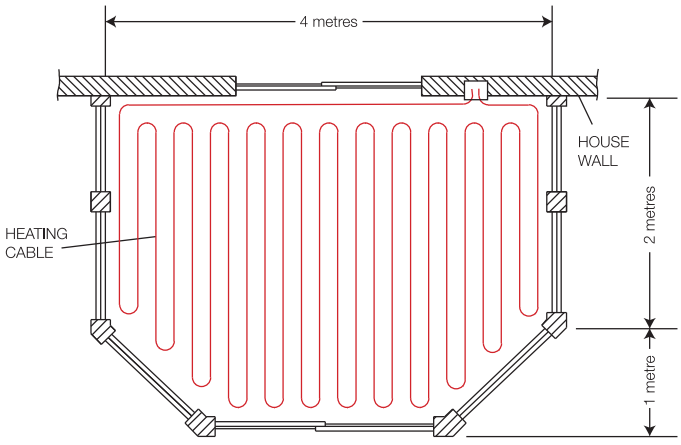
IMPORTANT - FW-A and FW-C heating cables are NOT interchangeable and should only be used as recommended above. If in doubt, contact your local Heat Trace Representative.

STEP 2

Define the size of the area to be heated, the layout of heating cable and the floor construction



Example - Area to be heated: 4m x 3m conservatory floor with tiled surface.



Total Area = 11m²

STEP 3

Determine FLOORWARM cable length

Total area = 11m²

$$\text{FLOORWARM cable length} = \frac{\text{Area to be heated (m}^2\text{)}}{\text{Heater cable pitch (mm)}} \times 1000$$

Add 1 metre for each connection. Allow 2.5% for cutting allowance/wastage.

ibemo Kazakhstan Ltd. 09302 Republic of Kazakhstan , West Kazakhstan Oblast, Aksai, Pramzone, BKKS office complex
Tel.: +7(71133) - 93077 ; Fax: +7 (71133) - 93074; e-mial: info-kz@ibemo.de

STEP 4

Determine the number of heating circuits and the electrical protection requirements

Circuit protection is provided by Type C or D circuit breakers to EN60898:1991 or equal, sized as per the following table (based on 20°C start-up).

Circuit Breaker Size	Supply Voltage	Maximum Circuit Length (for 20°C start-up) FW-C	FW-A
20A	115VAC	52m (58m)	92m (113m)
20A	230VAC	102m (116m)	184m (226m)

(Figures in parenthesis are maximum circuit lengths when both ends are connected to the electrical supply ie. reduced volt drop).

A residual circuit breaker (rcd), 30mA sensitivity must be provided. This is provided as standard with the Heat Trace's Local Distribution Panel (LDP) which is available with 3, 6 or 9 circuit capacities, each fitted with 20 amp MCB/RCDs as standard.

More than one heating circuit may be connected to a single circuit breaker provided that the maximum heater length does not exceed the breaker capacity.

If a number of rooms are being heated, it is recommended that each room should have individual circuits and be controlled separately.

STEP 5

Determine the method of control

Simple ON/OFF control may be achieved by using a FLOORWARM PT007 Thermostat, which can be adjusted to suit the desired floor temperature.

Alternatively, energy efficiency may be improved by utilising the FLOORWARM PRO TIMER programmable timer control. This enables automatic day/week timer settings to be programmed into the system, de-energising the system during periods when the building, or room is unoccupied.

Additional operating cost savings may achieved when the FLOORWARM PRO TIMER is programmed to take advantage of off-peak tariffs when they are available.

Electronic controllers are recommended because of their accurate regulation and narrow switch differential.

STEP 6

Connection to suitable electrical supply

The heating circuits may be connected to an existing electrical supply only if provided with a correctly rated over-current and earth leakage protection device (MCB/RCD).

The heating cable is terminated using the TK/FW supplied complete with a 2 metre cold lead. The cold lead is terminated into a suitable junction box mounted on the wall.

This junction box is fed from the Local Distribution Panel (LDP). Where total loads exceed the rated switch capacity of the chosen controller a suitably rated contactor box shall be used.

STEP 7

Determine power feed cable requirements

Connecting cables from the controller to each circuit power connection, and from the controllers to the power supply, must be correctly sized to satisfy Electrical Wiring Regulations and local/national standards or codes. Sizing is determined by the maximum allowable volt drop and the current carried by the supply cable.

Generally, supply cables may be sized according to the following table:

MCB Type C or D Rating	Heater Type	Supply Cables Size (min)	Max. Supply Cable Length 115V	230V
20A	FW-A	2.5mm^2	35m	71m
20A	FW-C	2.5mm^2	33m	68m

Important: a residual current device (rcd), 30mA is required.

Design Guide / Worked Example 1

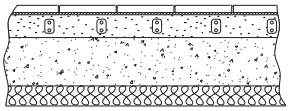
EXAMPLE 1 - Conservatory

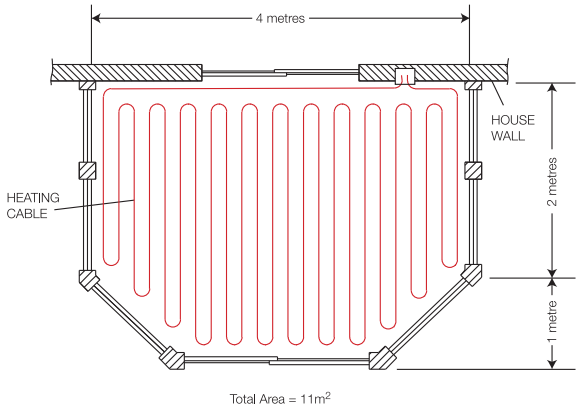
This is the example depicted on page 5, a new conservatory requiring a FLOORWARM comfort heating system. The floor is concrete with a ceramic tile finish. The heater will be laid in the sand/cement screed below the finished surface.

STEPS 1 - 2

Determine system requirements and define area to be heated

Desired floor temperature	27°C
Floor construction / finish	Concrete with ceramic tile finish
Total area	11m²
Typical room temperature	20°C
Heater spacing / pitch	185mm
Supply Voltage	230VAC





STEP 3

Calculate FLOORWARM cable length

FLOORWARM **FW-C** cable length

A Floor area 4m x 2.75 = 11m²

$$\frac{\text{area (m}^2\text{)}}{\text{pitch (mm)}} = \frac{11}{185} \times 1000 = 60\text{m}$$

B Two connections (1m each) = 2m

C Spare / cutting allowance (2.5%) = 2m

Total FLOORWARM FW-C cable length = 64m

STEP 4

Determine number of circuits and electrical protection

Referring to the table shown in STEP 5 on page 6, it can be seen that the heater is length is within the maximum recommended length for the standard circuit breaker size.

Heated Area	Heating Circuit Length (m)	MCB/RCB Rating
Conservatory floor	64	20A

STEP 5

Determine the method of control

For this small area, a PT007 Thermostat was selected to sense the floor temperature.

STEP 6

Connection to the electrical supply

The heating cable should be terminated using an **TK/FW** termination kit and end seal. The cold lead supplied should then be terminated into a wall mounted junction box.

Power to the junction box will be supplied from a LDP-03 Local Distribution Panel (LDP).

Connecting cables from the junction box or controller to the LDP must be correctly sized to satisfy Electrical Wiring Regulations and local/national standards or codes. Sizing is determined by the maximum allowable volt drop and the current carried by the supply cable.

STEP 7

Power feed cables

The junction box was within 68 metres of the LDP and was therefore wired back using 2.5mm², 3 core cable.

EXAMPLE 2 - Hallway, Bathroom, Toilet, Laundry

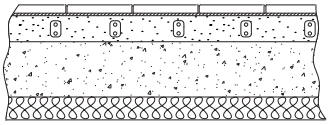
For this example a number of existing ground floor rooms require FLOORWARM systems to be retro-fitted. Each room has different heating requirements and floor finishes.

- The bathroom and toilet are marble tiles on a concrete floor - required floor temperature is 29°C.
- The laundry is linoleum finish on a concrete floor - required floor temperature is 21°C.
- The hallway is parquet tiles on a timber floor - required floor temperature is 24°C.

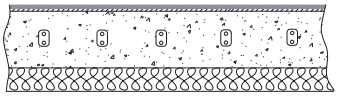
STEPS 1 - 2

Determine system requirements and define areas to be heated.

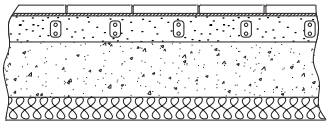
Hallway
Timber Floor with Parquet Blocks



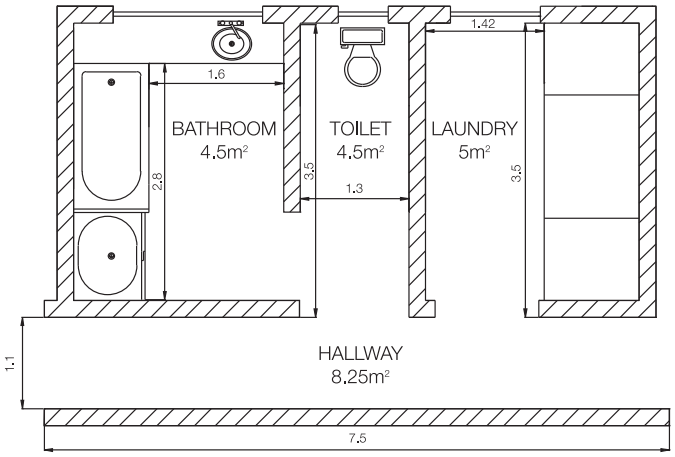
Laundry
Concrete Slab with Linoleum Finish



Bathroom & Toilet
Concrete Slab with Marble Tile



	Hallway	Laundry	B/room & WC
Desired floor temperature	24°C	21°C	29°C
Floor construction / finish	parquet	linoleum	marble tile
Total area	8.25sq.m	5sq.m	9sq.m
Typical room temperature	18°C	16°C	22°C
Heater spacing / pitch	120mm	275mm	160mm
Style of heater cable	FW-A	FW-C	FW-C



STEP 3

Calculate FLOORWARM cable lengths

	FLOORWARM cable type	Hallway FW-A	Laundry FW-C	B/room & WC FW-C
A	Floor area	8.25m²	5m²	9m²
B	length = area (m²) / pitch (mm) x 1000	69m	19m	57m
B	Two connections (1m each)	2m	2m	2m
C	Spare / cutting allowance (2.5%)	2m	1m	2m
	Total cable length	**73m**	**22m**	**61m**

STEP 4

Determine number of circuits and electrical protection

Referring to the relevant table on page 6, it can be seen that each circuit is within the maximum recommended circuit length for the standard 20A MCB.

Heated Area	Heating Circuit Length (m)	Heater Cable Type
Hallway	73m	FW-A
Laundry	22m	FW-C
Bathroom/Toilet	61m	FW-C

STEP 5

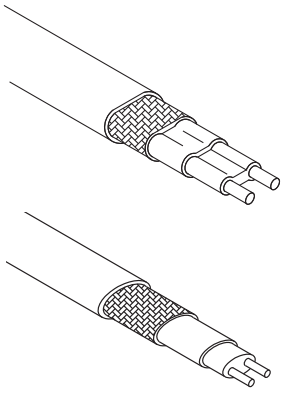
Determine method of control

Each of the areas would be controlled by PT007 Thermostat.

A PRO TIMER may be chosen if timer control is required. This would operate via a suitably rated contactor, ensuring that the system is only energised when required.

STEP 6 Connection to electrical supply	The heating cables are terminated using **TK/FW** termination kits, complete with cold leads. Each cold lead is terminated into the wall mounted junction box using the plastic conduit ordered separately. Circuits may be connected to an electrical supply only if provided with a correctly rated over-current and earth leakage protection device (MCB / RCD). In this instance, a Heat Trace 3 way Local Distribution Panel (LDP03) is selected.
STEP 7 Determine power feed cable requirements	Determine power feed cables using the table provided in STEP 7 on page 6.

FLOORWARM Heating Cable



Catalogue Ref: FW-A

For use where FLOORWARM cable is laid beneath timber floors.

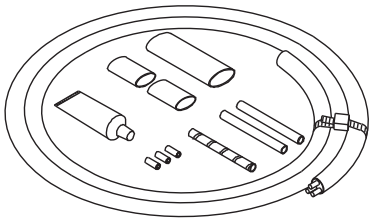
Quantity required - see step Step 4

Catalogue Ref: FW-C

For use where FLOORWARM cable is laid in monolithic concrete slab, or in a sand/cement screed.

Quantity required - see step Step 4

Termination Kit

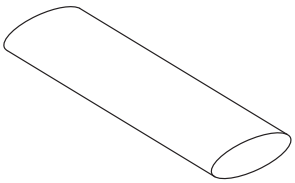


Catalogue Ref: TK/FW

Cold lead termination kit comprises heat shrink tubing, cable crimps, 2 metre length of 2.5 sq.mm power cable, glue, and double heat shrink tubing end seal.

Number required:
1 per termination

Plastic Conduit

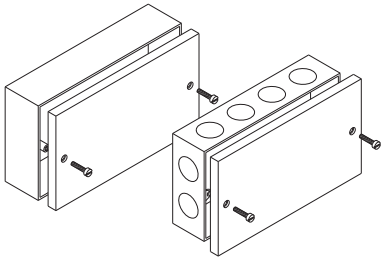


Catalogue Ref: PC-02

Plastic conduit available in 2m pieces. The cold lead provided in the TK/FW termination kit is taken through the conduit, which is then fixed into/behind the wall, and terminated into the junction box detailed below.

Number required:
1 per TK/FW

Junction Box

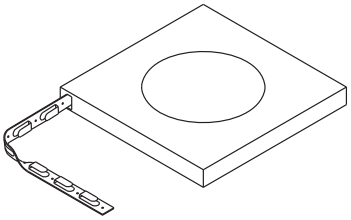


Catalogue Ref: JB/FW*x*

Moisture resistant junction box suitable for up to three cold lead connections and one power supply connection. Available as surface mounted (S) or flush fitting (F).

Number required:
to suit number of circuits
x denotes (S)urface, or (F)lush mounted box

Pre-punched strip

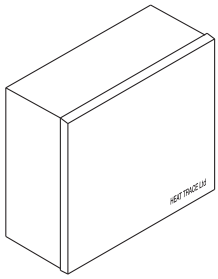


Catalogue Ref: PPS/A

25m roll of pre-punched strip for securing heater at correct pitch.

Number required:
3m per square metre.

Contactor Box

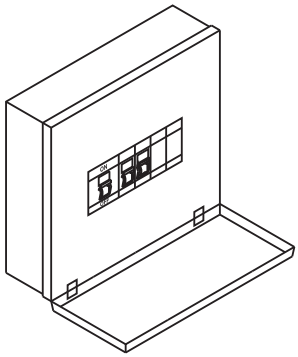


63A Contactor box for up to 9 circuits. The start up load should not exceed 63A on each of 3 phases. The C63*x*/1 (110V coil), and C63*x*/2 (230V coil) units comprises a metal enclosure 400 x 300 x 150mm incorporating the contactor. Used in conjunction with Local Distribution Panel (LDP).

110-120V - Maximum 205m x FW-A, or 95m x FW-C
220-240V - Maximum 397m x FW-A, or 205m x FW-C

Number required:
1 per FLOORWARM system
x detailed above denotes single phase (1), or three phase (3) contactors

Local Distribution Panel (LDP)



The distribution panel is selected according to the number of circuits determined in STEP 5. Each panel is fitted with 20A circuit breakers for each outgoing circuit. A ground fault protection device is fitted, sensitivity 30mA, 30ms for the protection of all circuits. The LDP is also fitted with an main incoming isolator.

Standard panels are:

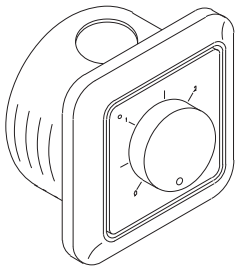
LDP-03/1P/20 for up to 3 x 20A, 230VAC circuits, single phase incoming feed
LDP-06/3P/20 for up to 6 x 20A, 230VAC circuits, 3 phase & neutral incoming feed
LDP-09/3P/20 for up to 9 x 20A, 230VAC circuits, 3 phase & neutral incoming feed

The LDP is rated IP54 for internal use. Suitable weather protection is required if installed outdoors.

Above LDPs also suitable for 115VAC.

Number required:
as detailed above

FLOORWARM Thermostat



Catalogue Ref: PT007/LA/20/M

Flush fitting, wall mounted ON/OFF PT007 Thermostat, complete with floor sensor and 2 metre connecting cable.

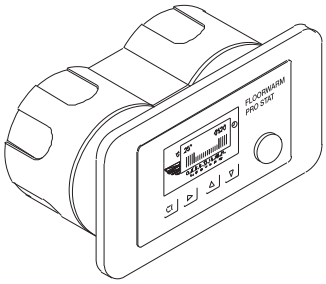
Range: +10°C to +35°C.

Maximum direct switching capacity at +20°C start up :-

Heating Cable	Supply Voltage 115V	230V
FW-A	65m	126m
FW-C	30m	65m

Number required:
1 per circuit/area

FLOORWARM PRO TIMER



Catalogue Ref: FW550x

Flush fitting or surface mounted FLOORWARM PRO TIMER. Multi purpose controller for use as a stand alone timer, or a timer and floor thermostat for floor warming systems.

Completely programmable, the PRO TIMER maintains the settings programmed into the unit by the user.

Graphic indication shows day/week timings and if necessary preset temperatures, for one day, or seven day period. Supplied complete with floor sensor and 2 metre of connecting cable if used as timer *and* thermostat (Order ref: FW550xS)

Temperature range +5°C to +50°C.

Maximum direct switching capacity at +20°C start up :-

Heating Cable	Supply Voltage 115V	230V
FW-A	65m	126m
FW-C	30m	65m

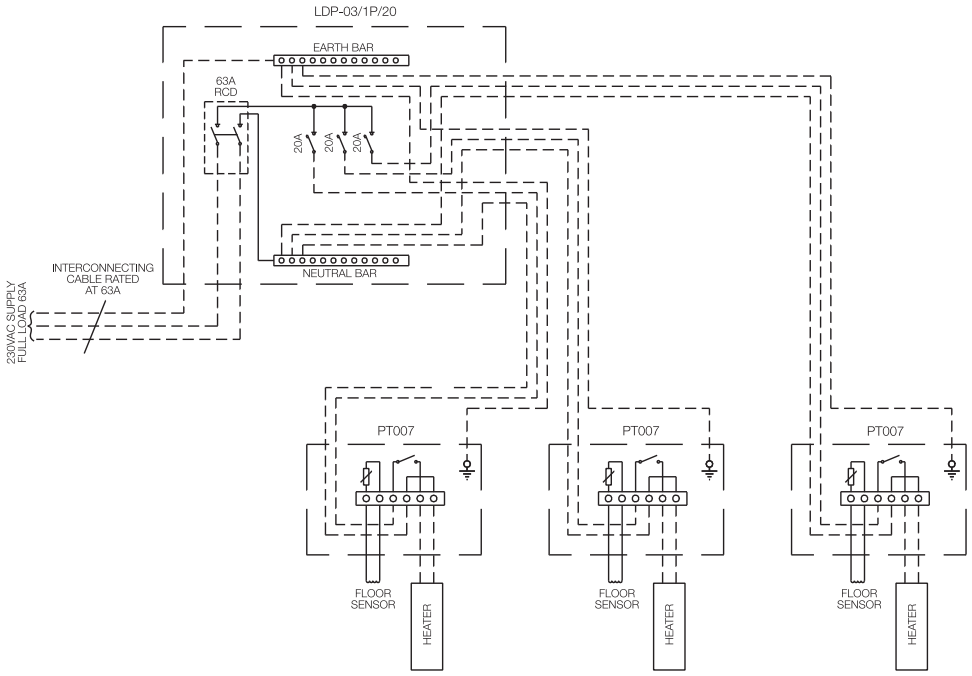
Number required:
1 per circuit/area when used with floor sensor for direct switching, or ...

1 per system when used solely as timing device with suitably rated contactor and LDP.

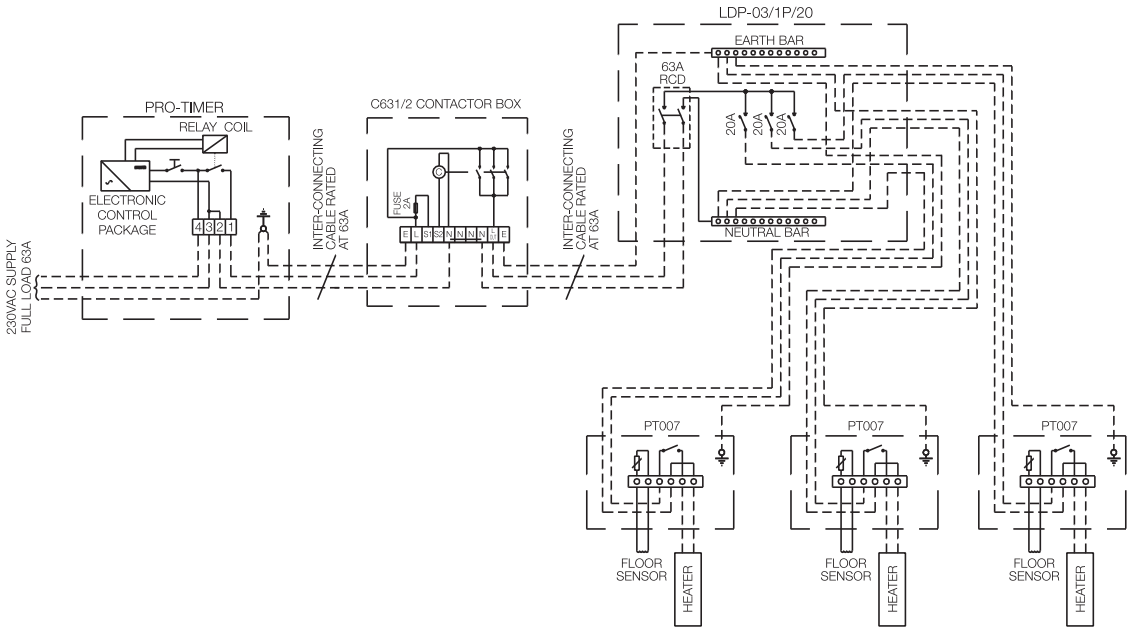
x detailed above denotes (F)lush fitting, or (S)urface mounting.

Typical Wiring Arrangement Schematics

Typical FLOORWARM System
Without Timer Control



Typical FLOORWARM System
With Timer Control



Bill of Materials - Order Form

CUSTOMER NAME AND ADDRESS:

Contact:
Tel:
Fax:
Order Number
Order Date / / Date Required / /

SUPPLIER DETAILS:

Heat Trace Limited
Tracer House, Cromwell Road,
Bredbury, Stockport
Cheshire, SK6 2RF
England

Contact: Sales Department
Tel: +44 (0)161 430 8333
Fax: +44 (0)161 430 8654

QUANTITY	TYPE REF.	DESCRIPTION	UNIT PRICE	EXTENDED
m	FW-A1	FLOORWARM Cable, Timber Floor, 100 -120V	_____	_____
m	FW-C1	FLOORWARM Cable, Concrete Floor, 100 - 120V	_____	_____
m	FW-A2	FLOORWARM Cable, Timber Floor, 220 - 240V	_____	_____
m	FW-C2	FLOORWARM Cable, Concrete Floor, 220 - 240V	_____	_____
ea	JB/FWS	FLOORWARM Junction Box, Surface mounted	_____	_____
ea	JB/FWF	FLOORWARM Junction Box, Flush fitting	_____	_____
ea	TK/FW	Termination Kit & End Seal *with* 2m cold Lead	_____	_____
ea	PC-02	2m length of plastic conduit	_____	_____
ea	PPS/A	Pre-Punched Strip	_____	_____
ea	PT007/LA/20/M	Floor Sensing Thermostat *with* Floor Sensor	_____	_____
ea	FW550F	Flush fitting Programmable Control *without* Sensor	_____	_____
ea	FW550S	as above, but surface mounting controller	_____	_____
ea	FW550FS	Flush fitting Programmable Control *with* Sensor	_____	_____
ea	FW550SS	as above, but surface mounting controller	_____	_____
ea	LDP-03/1P/20	3 x 20A SP circuits, single phase incoming feed	_____	_____
ea	LDP-06/3P/20	6 x 20A SP circuits, TP&N incoming feed	_____	_____
ea	LDP-09/3P/20	9 x 20A SP circuits, TP&N incoming feed	_____	_____
ea	C631/1	Contactor Box, 63A single phase, 100 - 120V coil	_____	_____
ea	C631/2	Contactor Box, 63A single phase, 220 - 240V coil	_____	_____
ea	C633/1	Contactor Box, 63A per pole, 100 - 120V coil	_____	_____
ea	C633/2	Contactor Box, 63A per pole, 220 - 230V coil	_____	_____
			SUBTOTAL	£_____
			C & P	£_____
			VAT	£_____
			TOTAL PRICE	£_____

Note:
TP&N: Thee phase and neutral

Additional materials needed to complete the heat tracing installation:

- All mains and interconnecting cables/glands

Fax this order form to our head office on +44(0)161-430 8654

Presented by:

ibemo Kazakhstan Ltd.

Tel. +7 (71133) – 93077
Fax +7 (71133) – 93074
E-Mail: info-kz@ibemo.de

ӨНЕРКӘСІП ЖӘНЕ ЭЛЕКТР МАТЕРИАЛДАРДЫН ЖАБДЫҚТАУШЫСЫ
ПОСТАВЩИК ИНДУСТРИАЛЬНОГО И ЭЛЕКТРИЧЕСКОГО ОБОРУДОВАНИЯ И МАТЕРИАЛОВ
SUPPLIER OF INDUSTRIAL & ELECTRICAL EQUIPMENT and MATERIALS

BS EN ISO 9001 Certificate No. 0160