WARM THE SOLE UNDERFLOOR HEATING SYSTEMS

TECHNICAL MANUAL

"WTS-Design are among a rare collection of firms in existence nowadays. Their knowledge, experience and friendly approach is truly outstanding as I am sure many future clients will quickly come to realise. Bravo chaps! I thank you for all your time and patience and will definitely be using you again in the future"
Rodger Mitchell
Director - 2 Planks Ltd

Warm The Sole is part of the WTS-Design group

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Introduction

It is now certain that underfloor heating is here to stay, previous attempts at using the floor to heat badly insulated buildings have been well documented and thankfully we can now draw a line under those problems and move forward.

A modern well-insulated building, either domestic or commercial will readily accept a floor heating system and provide excellent comfort levels for the occupants. The simplicity of the system, and the fact that it is essentially the same equipment providing the same excellent results in either a conservatory or an aircraft hangar is an enormous advantage over convective methods of heating.

The basis of any well-designed heating system is to provide a comfortable environment for the occupants, so it is worth thinking more along the lines of heating the occupants- not the building.

Providing a comfort zone from the floor up to approximately 2.5 metres is an economical and sensible way to approach this, and is easily achieved by utilising the floor structure as the heat source.

The following sections in this manual will guide you through the various stages of planning and installing a quality **Warm The Sole** floor heating system, it is not difficult, just a little different to the heating systems normally used.

Warm The Sole is part of the WTS-design group, who supply heating and renewable systems across the British Isles. Component parts of the heating systems are sourced from well-established names in the UK, Europe and beyond, providing peace of mind for you and your clients. Any Warm The Sole system, providing it is correctly installed, will benefit from a ten-year system guarantee. The guarantee is insurance backed and covers all incidentals.

Principles & Benefits

The Thermal comfort of a buildings occupants is dependent on a number of factors causing heat loss from a body. Radiation, convection and evaporation losses must all be addressed to maintain comfort levels.

Radiant losses account for 45% of the total body loss, with convection and evaporation at 30% and 25%. It follows that the most efficient method of controlling comfort conditions is to provide an environment where the main form of heating is a radiant source.

Warming the floor produces radiant emissions; approximately 65% of the total energy from the floor is radiant and the remainder convective.

Radiant energy in the form of electromagnetic rays does not directly heat the air; it heats people and objects in its path. A body or object will partially absorb and partially reflect the energy depending on the colour and surface texture. Dark colours absorb more energy than light colours.

The floor is warmed by a network of pipes embedded in the floor structure, low temperature water at typically 50°C is pumped through the pipe circuits and the resultant heat energy is transferred to the floor.

General Overview

The **Warm The Sole** underfloor heating system offers the complete solution – creating the perfect comfort zone in any environment. A truly beautiful floorwarming system, Warm The Sole offers complete freedom in terms of interior design combined with the complete comfort that is provided by gentle even warmth throughout. It is also a system that puts you in complete control with both individual room temperature and weather compensation sensors available. And what's more, you'll find it makes complete sense – helping you to save money, while delivering environmental and health benefits. Indeed, constructed from the best of materials (life in excess of 50 years – 10 year system guarantee), Warm The Sole offers you complete peace of mind. And with packages designed to fit every application from flats to football pitches – we're also talking complete flexibility. It is the one heating system you really do need to consider.

Warm The Sole is a new way of looking at your heating needs. When you choose an underfloor heating system, your thinking is no longer dominated by where radiators are going to go – which walls are going to be sacrificed? Now you can have both heat and complete freedom in interior design. We all know that a typical radiator doesn't only occupy the area of the wall it covers. In fact, because its surface temperature can be so high, a radiator stops you from placing objects too close for fear of heat damage. So the actual reality with radiators is a 'furniture-free field' around each one – a no-go zone that extends at least 300mm in all directions. But an underfloor heating system has no such drawbacks. It has no fixed radiators. No restrictions on layout. No no-go zones! In fact, it will effectively allow you to increase the size of a room at no extra cost.

There are different kinds of heating systems – and different kinds of heat. With the **Warm The Sole** underfloor heating system, you get a heat that is most conducive to your comfort. A radiant heat that ensures you feel comfortable even at a lower air temperature than that produced by a more traditional convection system. With a Warm The Sole system, the floor structure is gently warmed throughout – typically 23-26°C – to create a large radiant surface. In contact with this surface, people and objects absorb the energy emitted without it directly heating the air first. This also means that there is no loss of air quality in the room. The result is that you experience warm feet – real comfort! – And a cool clear head.

When considering the cost of a heating system, you have to look at the capital cost plus the running costs over the life of the system.

Significantly, a **Warm The Sole** underfloor heating system can help you to save up to 20% on domestic fuel bills, and can cut a remarkable 50% or more off the heating costs for large commercial properties.

Savings in money also translate into savings in energy. Reducing energy consumption is now one of the major challenges facing our society. In this respect, you will find that floorwarming systems are inherently more efficient because they operate at a low temperature and utilise a thermal store. And, in addition to these economic and environmental benefits, there are also the health benefits to consider. Because the air is not heated directly, the humidity level in each room is not affected and dust-laden convection currents are virtually eliminated. Now, that has to be good news for asthma or hay fever sufferers.

General Overview - Continued

A **Warm The Sole** underfloor heating system inspires confidence. It has quality built-in from the initial design work right through to the innovative manifolds and pumps used in the control systems.

The foundation of this quality, however, is the pipe. We use 5 layer PERT pipe to carry the warm water in a continuous circuit under the floor. PERT is recognised worldwide as the foremost performer in this field and 5 layer WTS-PERT pipe is the highest grade in its class. It is flexible, easy to work with and durable – perfect for underfloor heating.

Reflecting the quality of all the components, a **Warm The Sole** system comes with a **10-year system guarantee** covering all incidentals for up to £800,000 on every project. In addition, we further guarantee the pipe for another 40 years – replacing any part of the pipework free of charge in the unlikely event that it fails. We believe this is the most comprehensive guarantee for any heating system in the UK.

Our system will warm to any challenge – no matter how many rooms, the type of floor or the size of the building. Whatever the project involves – from a city flat to a football pitch – we can supply a solution that is fit for its purpose. For both concrete floors and floating joist floors, we can design systems that will deliver a gentle, even warmth throughout the building. And in large buildings, especially in those with high ceilings, the use of underfloor heating will deliver real savings in both your installation and running costs. Our experience encompasses both the domestic and commercial markets. Indeed, we have extensive experience in commercial applications – large and small – having designed and installed systems in office blocks, churches, schools, sports halls, garage workshops and hotels.

Benefits of radiant heating

The feeling of warmth produced by radiant means has a greater effect on a body than that produced by convection methods, in addition comfort level can be achieved with a lower air temperature. In the workplace, providing a good comfort level at a lower air temperature gives a feeling of freshness, when people have the benefit of warm feet and a cool head they will feel more alert. Convection currents are kept to a minimum, therefore dust and carpet mites, which are known to induce respiratory problems, will not be carried around the building. The use of condensing boilers with a floor heating system is ideal; the low return water temperature will ensure that a condensing boiler is operating at the highest efficiency possible. In buildings such as schools, nurseries and residential homes for our senior citizens, the complete absence of high temperature pipes and heat emitters is a must for health and safety reasons. There is also the added benefit of a floor heating system being vandal proof.

How does UFH Work

When using a radiator system the heat output is a function of the surface area of the radiator and the mean water temperature flowing through the circuit.

The principal is the same for floor heating, but as the floor area is considerably greater than that of a radiator the mean water temperature can be reduced well below that of a radiator circuit.

The heat output from the floor is a function of the following factors:

- Mean water temperature
- Spacing between the pipes
- Floor structure
- Floor finish

A **Warm The Sole** floor heating system consists of circuits of pipe embedded in the floor; each of these circuits is connected to a distribution manifold onto individual pairs of valves. Room thermostats and actuators can then easily control the separate circuits.

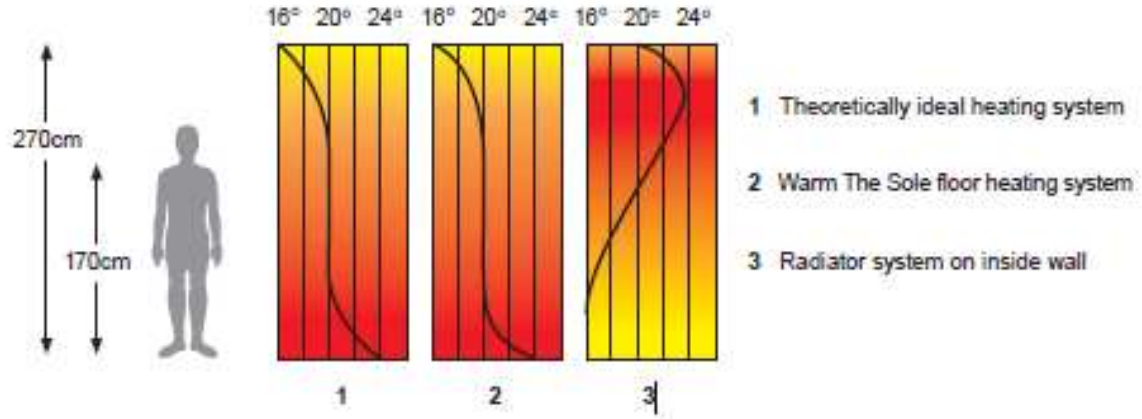
The **Warm The Sole** floor-heating pipe is PERT with an EVOH oxygen barrier built into the pipe wall. PERT is an incredibly durable material and accounts for about 60% of all UK floor heating installations. The actual life span of this material is unknown but mechanical testing at elevated pressures and temperatures have indicated an absolute minimum life of fifty years with a safety factor of 2.5 (in other words, the pipe should last as long as the life expectancy of the building).

Control of the water temperature is important; water at boiler temperature should not be allowed to enter the floor structure. This control is achieved by either a manually operated three port blending valve with a remote sensing control head, or by using a weather compensating control system.

The source of heated water is generally a standard boiler, either oil or gas. It is possible to use alternatives such as ground source heat pumps or solar devices, however care should be taken to ensure that the control systems match the requirements of the floor heating.

A more detailed technical breakdown of all aspects of floor heating is provided in the following pages.

Temperature Profile



When to Use UFH

The **Warm The Sole** underfloor heating system is suitable for a wide range of applications. However, the operation of floor heating is not suitable for buildings that are used intermittently or infrequently.

Domestic housing, offices, schools, nursing homes and hospitals are but a few examples that would greatly benefit from underfloor heating. In fact virtually everything from a conservatory to an aircraft hangar has benefited from floorheating.

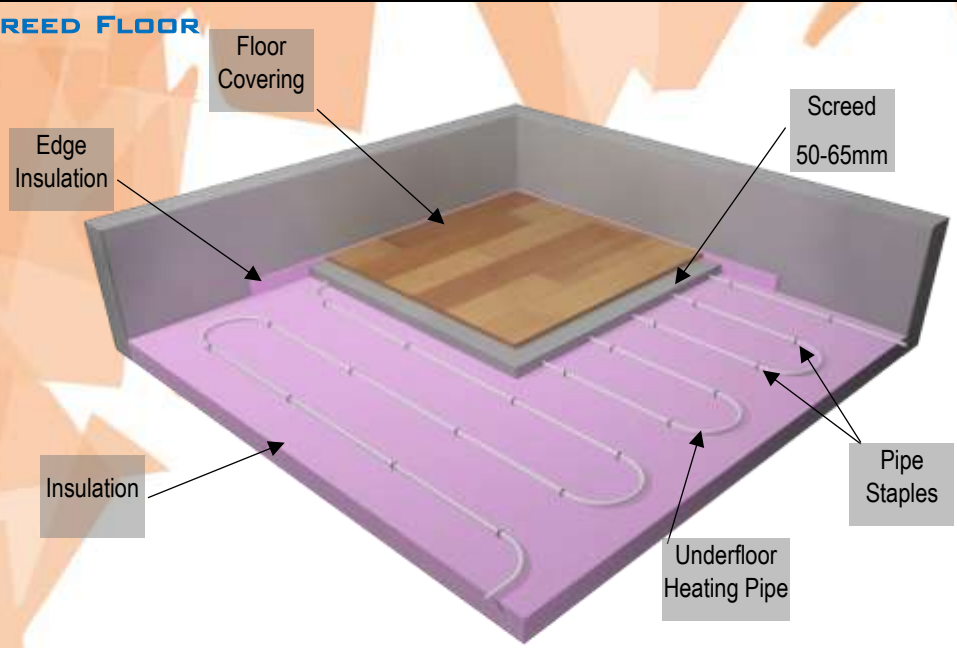
Floor heating is very effective when used in areas with high ceilings, the heat profile generated from a warmed floor provides a comfort level for the occupants without having to waste energy heating the total volume of the area. (See temperature profile above)

Areas where the floor is covered by either a tile or stone finish will provide the highest heat transfer rate into the occupied space, other floor finishes such as hardwood, laminate, vinyl or carpet can also be used.

It is important that the design engineer is aware of the proposed floor coverings, as the various correction factors have to be applied to the design.

Floor Structures

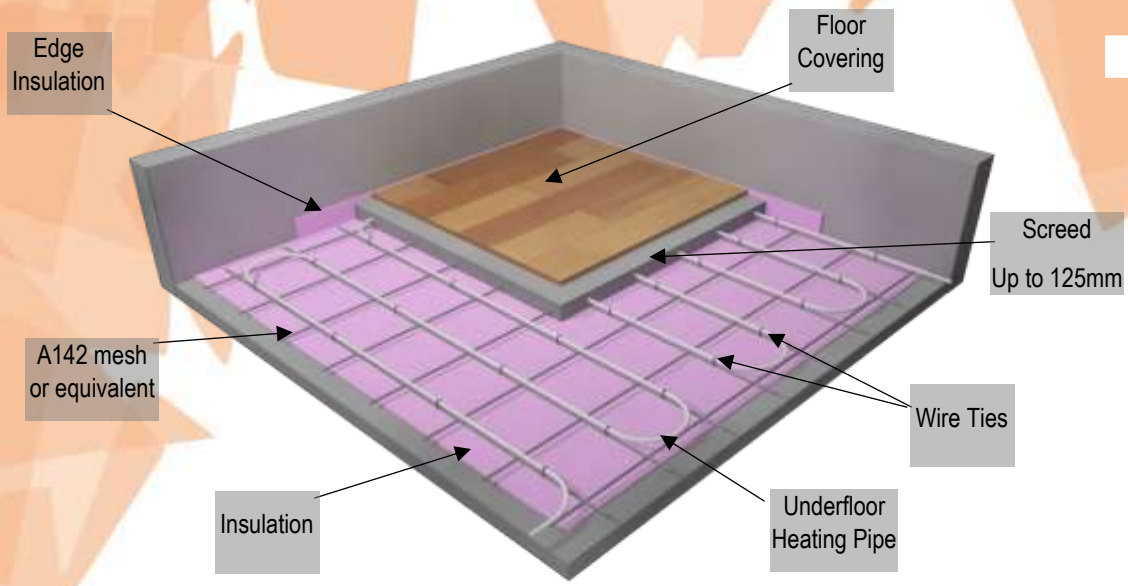
Screed Floor



The floorheating pipe is secured to the insulation and held in place with staples and clip rails before screed is poured.

Suitable for	☑	New Build	Heat Transfer	Via screed that immerses the pipes
	☑	Ground Floors	Pipe Size	12mm & 16 mm
	☑	Upper Floors	Full Height Build Up	50-65mm from insulation
	☑	Refurbishments	Heat output @ 45°C	Up to 120W/m²
	☑	Extensions	Drying Time	Approx. 24hrs per mm
	☑	Commercial		

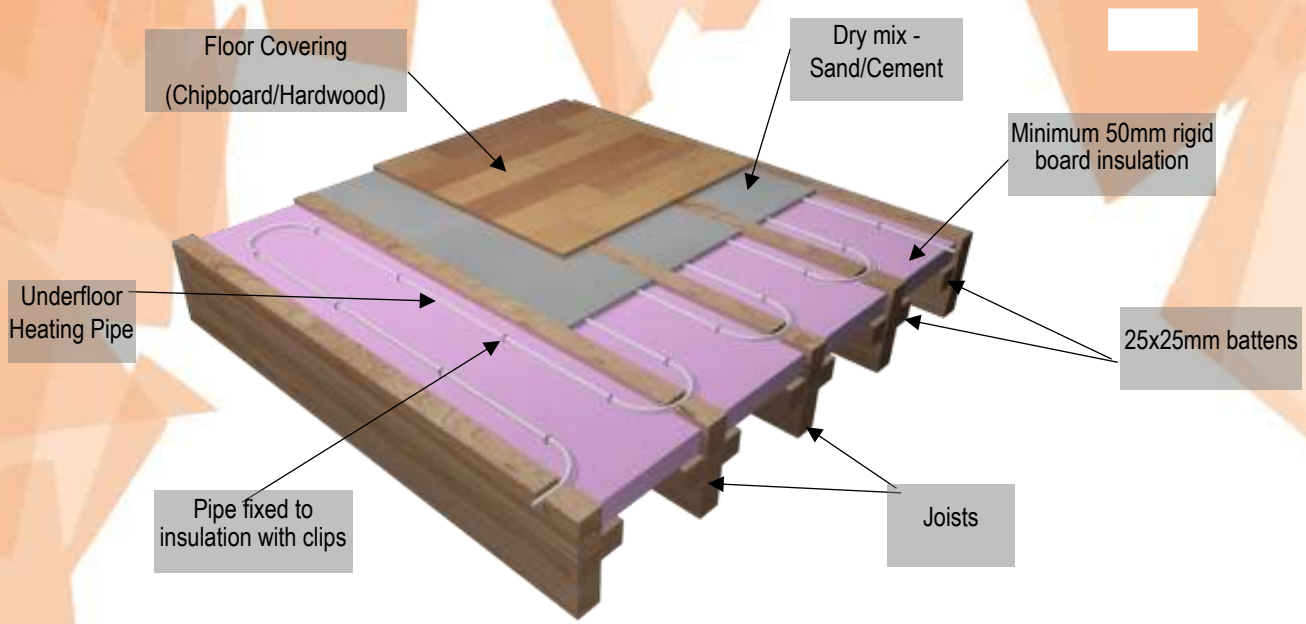
Slab Floor



The heating pipe is secured to mesh & held in place with wire ties before screed is poured. Best suited for industrial projects.

Suitable for				
	☐	New Build	Heat Transfer	Via screed that immerses the pipes
	☑	Ground Floors	Pipe Size	12mm & 16 mm
	☐	Upper Floors	Full Height Build Up	125mm from insulation
	☐	Refurbishments	Heat output @ 45°C	Up to 120W/m²
	☐	Extensions	Drying Time	Approx. 24hrs per mm
	☑	Commercial		

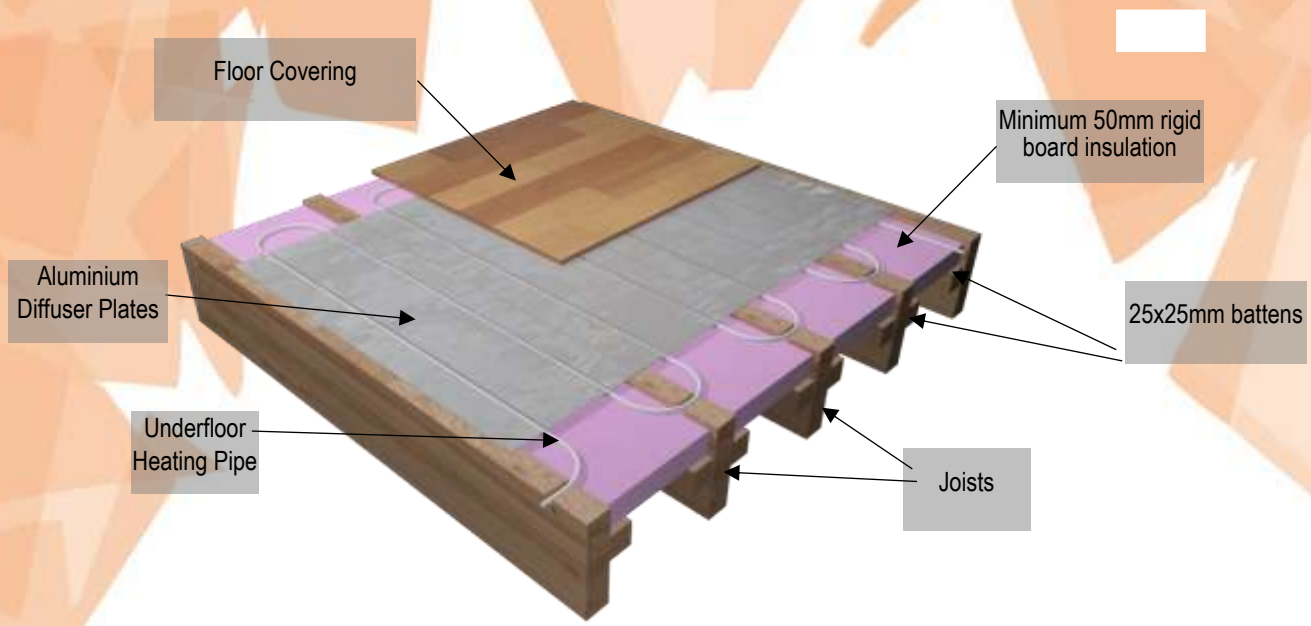
Timber/Biscuit Mix Floor



This floor construction is most commonly used on joisted floors, as it allows installation of the underfloor heating with no change in floor level.

Suitable for	☑	New Build	Heat Transfer	Via biscuit mix that immerses the pipes
	☑	Ground Floors	Pipe Size	16 mm
	☑	Upper Floors	Full Height Build Up	None – system is between joists
	☑	Refurbishments	Heat output @ 55°C	Up to 90W/m²
	☑	Extensions	Drying Time	None
	☐	Commercial		

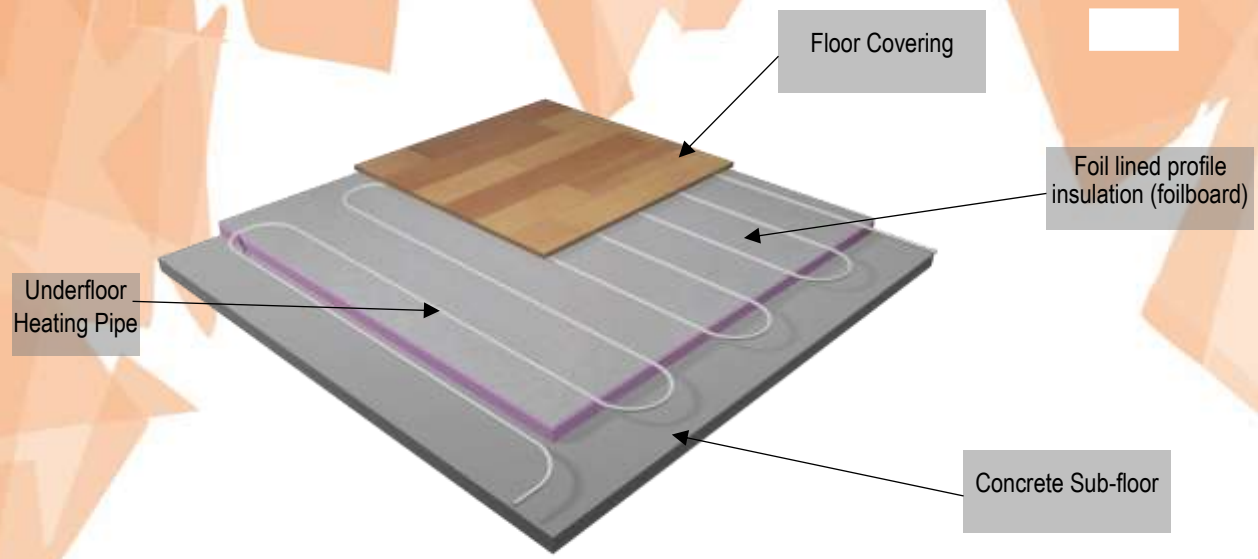
Alu Plate Floor



The floorheating pipe is clipped into the aluminium plates. System is fitted between joists so there is no change to floor level.

Suitable for					
	☑	New Build		Heat Transfer	Via aluminium diffuser plates
	☑	Ground Floors		Pipe Size	16 mm
	☑	Upper Floors		Full Height Build Up	None – system is between joists
	☑	Refurbishments		Heat output @ 45°C	Up to 77W/m²
	☑	Extensions		Drying Time	None
	☐	Commercial			

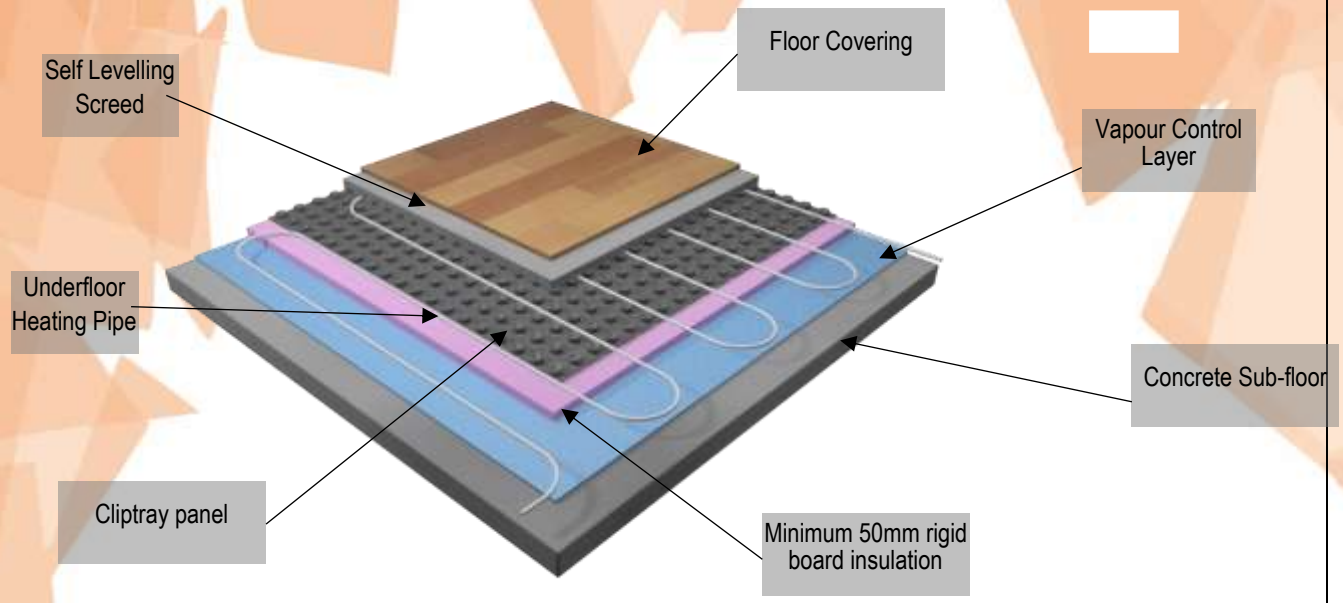
Foil Board Floor



The floorheating pipe fits snugly into the pre grooved channels, the foil distributes the heat.

Suitable for					
	☑	New Build		Heat Transfer	Via aluminium diffuser foil
	☑	Ground Floors		Pipe Size	12mm & 16 mm
	☑	Upper Floors		Full Height Build Up	25mm + floor finish
	☑	Refurbishments		Heat output @ 45°C	Up to 75W/m²
	☑	Extensions		Drying Time	None
	☑	Commercial			

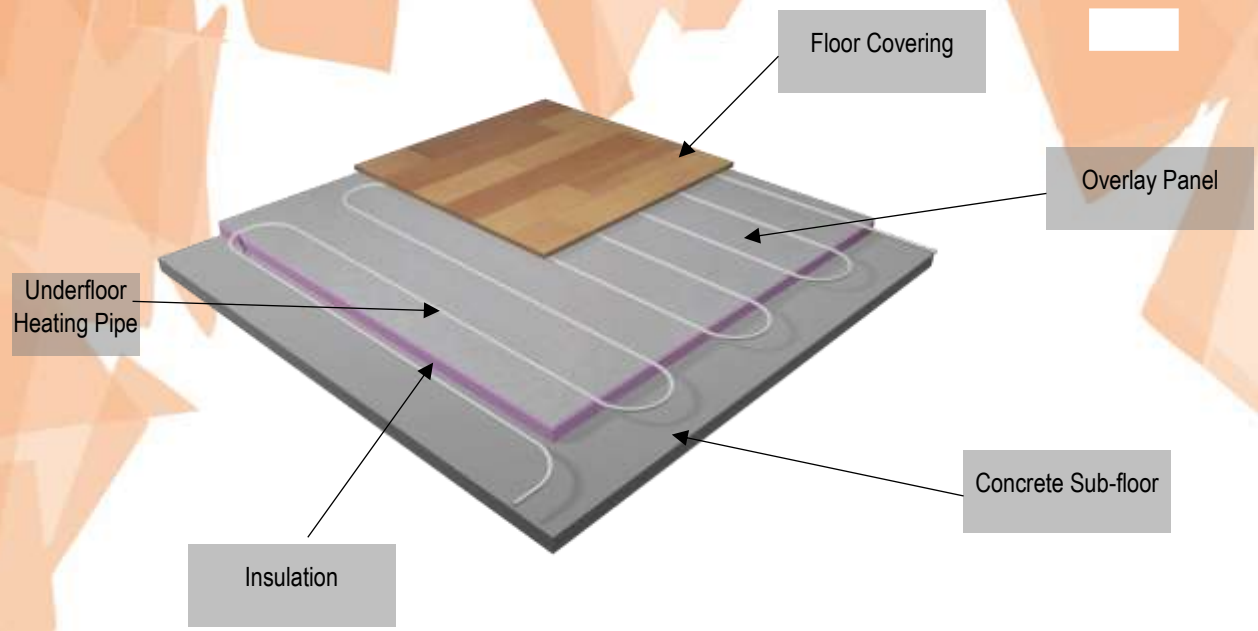
Clip Panel Floor



The floorheating pipe is clips easily into the clip trays. A self-levelling mix is then poured, and the finished flooring is added when the mix dried.

Suitable for					
	☑	New Build		Heat Transfer	Via self-levelling screed
	☑	Ground Floors		Pipe Size	16 mm
	☑	Upper Floors		Full Height Build Up	25mm plus floor finish
	☑	Refurbishments		Heat output @ 45ºC	Up to 120W/m²
	☑	Extensions		Drying Time	None
	☐	Commercial			

Overlay Panel Floor



The floorheating pipe fits snugly into the pre grooved channels, Option to tile directly onto panel or float laminate floor with no fuss.

Suitable for					
	☑	New Build		Heat Transfer	Via panel
	☑	Ground Floors		Pipe Size	12mm
	☑	Upper Floors		Full Height Build Up	18mm + floor finish
	☑	Refurbishments		Heat output @ 45°C	Up to 101W/m²
	☑	Extensions		Drying Time	None
	☑	Commercial			

Floor Coverings

It is important to remember that any material (except tiles) laid over a warmed floor will have an insulating effect. The insulating effect will reduce the output into the occupied space and raise the temperature of the floor structure beneath. This is easily compensated for at the design stage, thus the reason for needing to know the proposed final floor covering. Generally speaking any of the normal accepted floor coverings are suitable for use with underfloor heating, that is carpet and underlay, hardwood, laminates, vinyl and of course tiles.

Another important point that is very rarely considered is that floor heating opens up a new world with regard to floor coverings. All the traditionally "cold" coverings such as hardwood, laminate or tile are of course now warm underfoot. These materials are also a lot easier to keep clean and are less likely to harbour carpet mites and dust. The **Warm The Sole** system will always be designed with the final floor covering taken into consideration.

It is not recommended that softwood flooring or cork tiles are used over floor heating, ***If in doubt please get in touch.***

Before laying any final floor covering you should ensure that the floor structure is completely dry. Under normal conditions it can take as long as 6-9 months for the moisture to naturally be expelled from a concrete screed. This would obviously jeopardise your build schedule so you can speed this process up by running the floor heating for 2 weeks at a low temperature (25-30°C) after the screed has cured. This will help remove the remaining moisture from the screed.

Once you are happy that the screed is dried, you can then lay your final floor covering. Ensure the floor heating has been turned back off for at least two days before commencing this work. This will stop floor adhesive "going off" too quickly. Once the final floor covering has been laid, leave for another two days before warming the floor, again at the low temperature. The temperature can then be slowly increased up to the maximum for the type of floor construction over the course of a week.

Carpet and Underlay

The thermal resistance of carpets and underlay are measured in tog values, (1 tog= 0.1m²K/W). The higher the tog value, the higher the insulating effect, therefore it is preferable to choose carpet and underlay with low tog values.

Recent research has shown that the open weave of most carpets does not restrict the flow of heat from underfloor heating to any great degree. Underlay and foam backed carpets will restrict the flow of heat. When selecting an underlay or foam backed carpet for use over underfloor heating, the tog value should be ideally less than 1.5 tog.

Check with the carpet supplier regarding suitability for use over underfloor heating. It is worth noting that some carpets alone go to over 2.5 tog. Tog ratings of various underlays range from 0.36 tog to 1.01 tog (generally sponge types). Latex foam, heavy duty sponge can go as high as 2 tog while felt can be as high as 2.5 tog. **If in doubt, please get in touch.**

Vinyl sheet floor covering

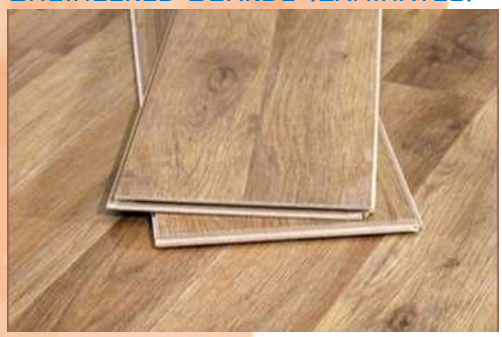
Always follow manufacturers' installation notes. Vinyl sheet will not allow moisture to pass through it, particular care must be taken to ensure that the screed has been properly warmed and dried out prior to laying vinyl. Turn the floor heating off for 2 days prior to sticking the vinyl down, leave off for a further 2 days to allow adhesive to set. The same applies to a tiled floor when using tile adhesive and tile grout. It is recommended that you use specific adhesive products which are suitable for use with underfloor heating. These products will have a higher temperature rating and will be flexible.

Solid Hardwood

Wood is a natural product and will be affected by both heat and humidity. When wood absorbs humidity it will swell, and subsequent drying will cause shrinkage. Timber flooring should be supplied kiln dried to approx. 6-9% moisture content, it is advisable to loose lay the timber in the area where it is to be fitted so that it can acclimatise. This will take approx 7 days. Before laying, check the moisture content of the screed with a moisture meter and ensure it is below 4%. The hardwood floor should be laid with the floor heating on giving a surface temperature of approx 20°C. If the hardwood is being glued down, this should be done on a cool floor and ensure the correct adhesive is used (one suitable for use with underfloor heating) **Warm The Sole** will always recommend that hardwood is floated over the screed instead of being glued down. This allows the hardwood to expand and contract.

When floating a hardwood floor most manufactures recommend a thin foam layer between the hardwood and screed, this is perfectly acceptable, do not use the thick foam type sheeting which is sometimes supplied. Always refer to the timber floor manufacturers fitting guides and if in doubt contact **Warm The Sole**.

Engineered Boards (Laminates)



This type of flooring is made up of layers of plywood or MDF under the hardwood finish. It is a much more thermally stable product and will not react to heat or humidity to the same degree as solid hardwood. Moisture readings and laying procedures are the same as hardwood, but always follow manufacturers' recommendations.

After installing a timber floor the underfloor heating can be slowly raised to full operating temperature. Final surface temperature of the timber floor should not exceed 27°C.

Always inform the floor covering supplier that his product is to go over underfloor heating.

Tiles

Floor tiles come in many different forms, the common types are ceramic, quarry, stone and marble. All of these materials are ideal for fitting over floor heating as the resistance to the flow of heat energy is insignificant.

As with all other floor finishes it is important that the floor screed has been properly dried by running the floor heating at a low temperature until all moisture is expelled. Before fixing the tiles the heating should be turned off and left to cool for two days, once the adhesive is set then the floor can be slowly raised up to temperature over a period of days.

Do not use cork or rubber tiles over floor heating.

Design Criteria

Producing a sensible and accurate floor heating design is very similar to any other heating system, all the information required must be gathered and calculations carried out to determine heat losses and pipe requirements.

There are subtle differences attached to some aspects of the calculation process that differ from those employed when calculating for convective systems, the main differences are downward losses from the floor heating system itself, and in the case of large volume buildings the actual volume requirement to be included in the calculation.

The radiant effect enables the designer to apply lower internal design temperatures with no decrease in comfort level, this point alone will mean a reduction of around 8% in fabric heat losses.

The most important point is that heat loss calculations must be done, and they are best done by the floor heating designer, it is after all the floor heating company that will be expected to guarantee the performance of the system.

Although the mechanical aspects of design are very important, control of the system is essential.

Floor heating systems require controls to set or modulate the mean water temperature and manage the room comfort levels, any equipment used to achieve this must be designed into the complete system in a way that allows interaction with any other units.

Warm The Sole floor heating designs always incorporate the correct controls, we understand and support the requirements of energy conservation in buildings, and have a programme of research and development for testing new methods and controls.

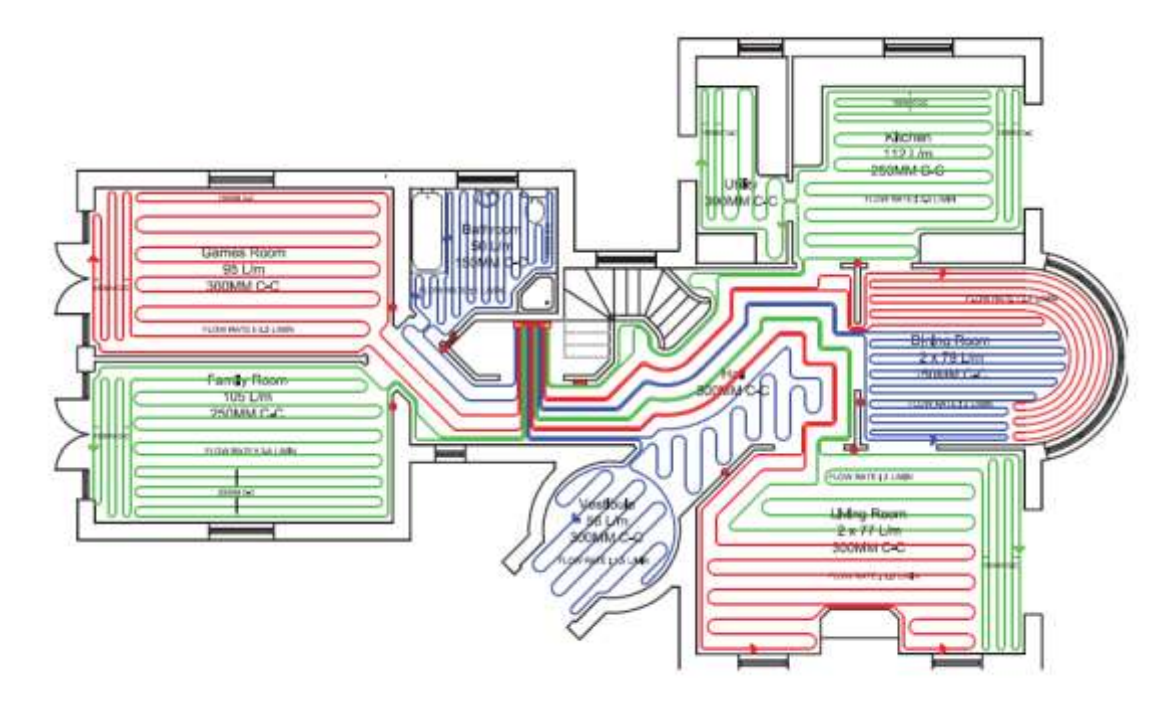
The information required to produce a design and specification is listed below.

- Scale floor plans
- Elevations
- Details of floor construction
- Floor coverings if known

Once a system design has been produced, it is important that the specifier or architect should inform the designer of any changes to the building plans. Even a small change can have a knock on effect to the floor heating.

Warm The Sole design work is indemnified.

All rooms or areas will be temperature controlled, except in some cases it may be necessary to link a very small room such as a toilet onto an adjoining area circuit.



The Importance of Forward Planning

Unlike convective heating systems, floor heating cannot be 'bolted on' after the building has been constructed. The floor-heating infrastructure is as much a part of the building as the base course or the roof, and must therefore be designed into the building process.

It is essential that insulation values in the floor, the floor construction and the effect on the building programme be considered. None of these points raise an onerous amount of extra work; it is simply a little more attention to details, which are probably of slightly less importance when fitting a convective heating system.

A floor heating system will normally be installed early on in the programme; the pipe layout will be fitted and connected to the manifold for filling and pressure testing prior to finishing the floor with a screed.

It is important to ensure that all other trades are fully aware that the floor structure has been fitted with underfloor heating pipe. **No fixing or cutting into the floor structure without prior consent.**

If the floor heating pipe is damaged, there are repair couplings available, but these should be used as a last resort and always made accessible.

In general floor heating is simply an additional component within the normal floor make up, pipe and fixings will fit within the normal thickness of either a screed or slab floor. The exception is a suspended joist floor where some adapting and possible increase in floor depth is required to accommodate the floor heating system. See floor cross-sections.

Floor heating needs to be designed into the building structure and can be fitted early on in the building schedule.

Sequence of Installation

As already mentioned, a **Warm The Sole** floor heating system is an integral part of the building structure. It is much easier to resolve all design issues prior to going on site as it invariably saves time and money. Especially important is the layout of bathrooms and kitchens, as the pipework will have been designed to avoid fixed units such as toilet pans, baths and kitchen units.

Any changes to the layout after the screed is laid will be a very costly exercise.

Programme in sufficient time for installation of the floor heating, with ideally a clear area free of other trades while the work is in progress.

Arrange to have the screed laid as soon as possible after the pipe system has been laid and tested, **Warm The Sole** floor heating pipe is very robust but heavy traffic over the pipes should be avoided.

Floor heating is generally installed early in the build programme, and of course should always be filled to pressure test prior to screeding. It will therefore be some time before the boiler and controls can provide heat to the system. It is advisable to add sufficient anti-freeze to the test fill to prevent damage should the build programme run over the winter months. A pressure test certificate should be signed by the project manager or another responsible person.

Depending on the type of structure, there may not be any internal walls to mount the manifold onto during first fix. It is a simple job to construct a temporary mounting board in the correct position to fix the manifold to, this can be dismantled once the internal walls are constructed.

At this stage the first fix control wiring and delivery pipework can be installed, reference to the **Warm The Sole** wiring and piping diagrams for the project will quickly guide the installer as to the correct method.

After the installation of boiler, delivery pipes and controls the system should be fired up and commissioned. First firing should be with a flow temperature into the floor no higher than 25°C or 15°C above the temperature of the unheated screed, whichever is the higher. (BS EN 1264 part 4)

Balancing of the system circuits can now be carried out to the design requirements, followed by a complete check of all controls to ensure that they operate in the correct sequence.

The end user should be instructed in the operation of the system and given all relevant documentation, this should include the pressure test and commissioning report.

Once all of the above steps have been completed, the installer should send copies of pressure test and commissioning certificates to **Warm The Sole Ltd** who will issue a system guarantee certificate for the project.

If you are installing the system yourself, you can self-certify the appropriate documentation found at the back of this book and return it to us for your guarantee issue.

Installation Instructions

The following instructions will guide you through fitting the manifold(s), installing the underfloor heating pipe work to the manifold(s) and filling/pressure testing the completed installation. The main reference for all the information you need to correctly install the manifold and pipe work is the CAD pipe layout drawing. To correctly interpret the CAD drawing, refer to the instructions “Reading a CAD Pipe Layout” (see below). Please note the installation instructions refer to the manifolds and floor heating pipe irrespective of what control system is being used. Please refer to the correct section regarding the controls for the electrical and plumbing details.

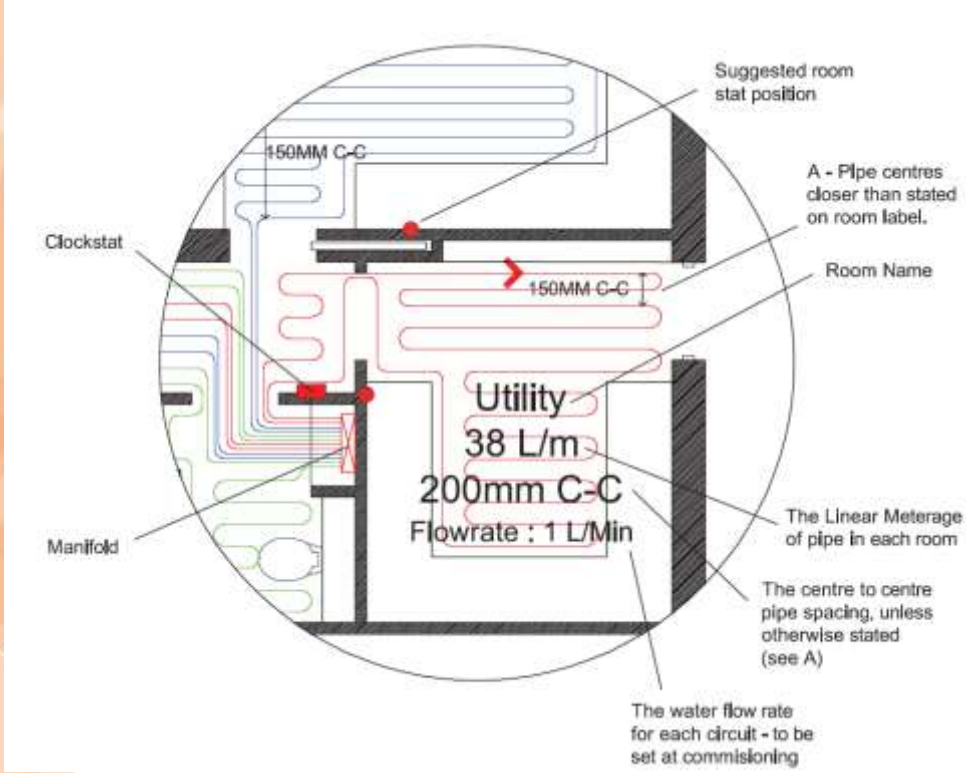
The first steps of fitting your underfloor heating system is to accurately check all the equipment that has been supplied as per the delivery note. This should be done as soon as you receive the equipment. This way you can familiarise yourself with all the various different components and also check that you have exactly what is stated on the delivery note. This should also be cross checked with the actual design. If there has been any errors, the supplier of the equipment should be contacted immediately. Queries raised weeks or months after the delivery, depending on the circumstances, may not be able to be rectified.

Familiarise yourself with all the installation instructions before starting the installation. If you have any queries, please raise them with your supplier.

Reading a CAD

The CAD Pipe Layout drawing supplied with each project shows all the essential information needed for correctly installing the underfloor pipework. It also shows information needed for commissioning and fitting the electrical controls. The pipe installer and electrician for the project will both require a copy.

Please ensure that the information shown on the drawing for your project matches site conditions. Any deviation to pipe layout should always be checked with your supplier.



Important points

- The positioning of permanent fixtures (kitchen units, baths, toilets etc.) must be decided prior to any floor heating pipe being installed.
- The roomstat positions shown on the CAD drawing are purely to show which room/area has a stat or other piece of control. Final positioning of stats should be done using manufacturer's instructions/recommendations.
- Keep pipe work 100mm in from all partitions, perimeter walls and permanent fixtures.

Fitting the Manifold

As it is necessary to fill and test the pipe work prior to the floor going down, the manifold must be fitted and all pipes connected to it. It is bad practice to only install the pipe work and then put the floor down. If you do this it is impossible to pressure test the pipe work and it also makes it very difficult to neatly and correctly fit the manifold at a later stage.

The manifold position will be indicated on the CAD layout drawing. If this has changed you must get back in touch with the supplier of the equipment as this can have an effect on the overall design.

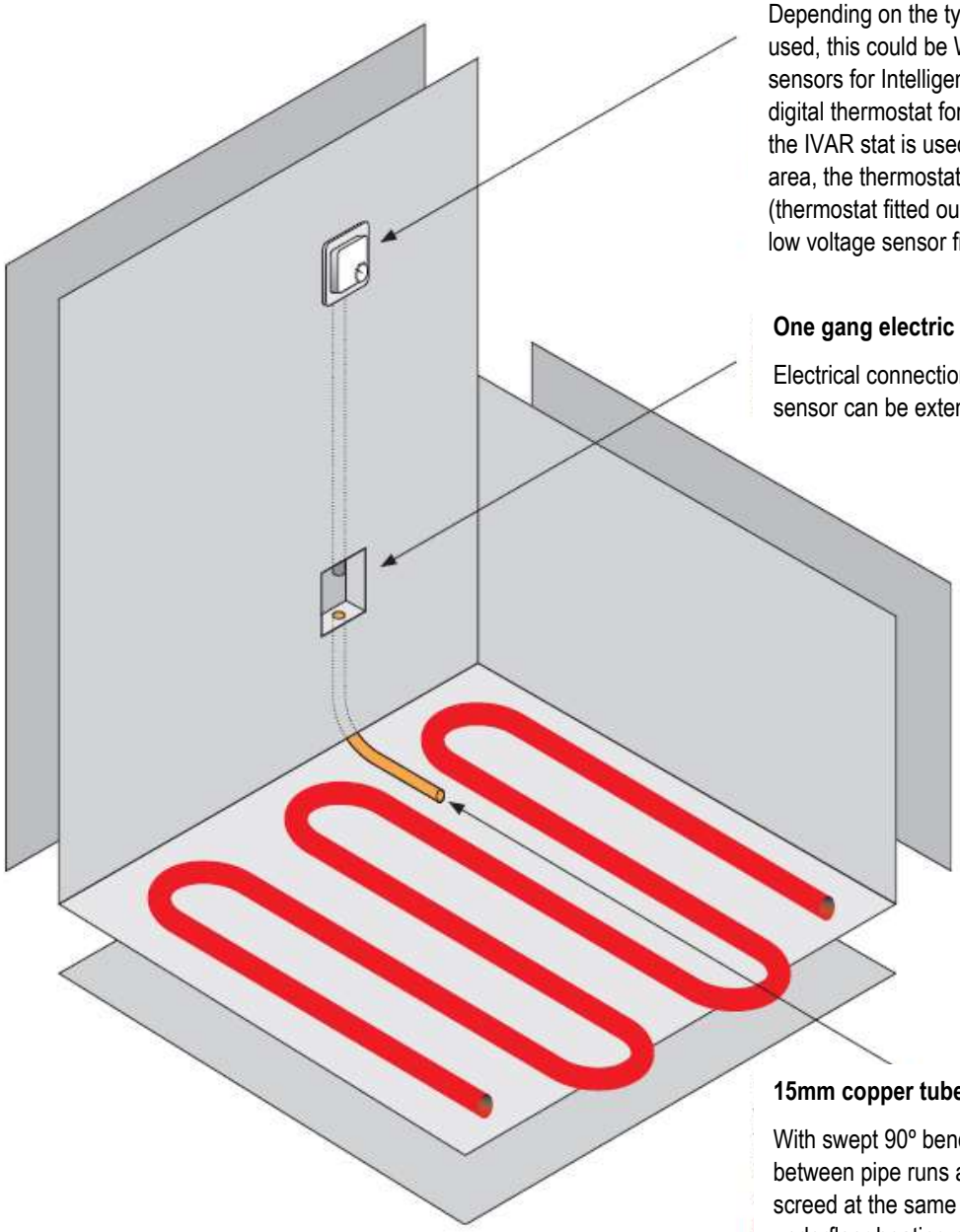
- To make installation quicker and easier it is recommended that you clearly mark out the floor plan on the floor to include all partitions, kitchen units, staircases, sanitary wear and any other fixed fittings. This will ensure that you do not put pipe where you are not meant to.
- Depending at what stage the floor heating is being installed in the build schedule, you may find that the wall/partition that the manifold is being fitted on has not been erected yet. If this is the case a simple temporary frame should be constructed. **(see photo on page 11)**
- The manifold should be attached to the wall/partition approx. 700mm from the top of the manifold to what is going to be the finished floor level.
- Once you have the manifold fitted, you are now ready to start fitting the pipe work. As you will see from the CAD, every effort is made not to "cross-over" pipes. With this in mind it is best to start from one side of the manifold, working either left to right or right to left. This ensures you do not end up crossing any of the floor heating groups.
- Choose the correct roll of pipe for the group you are starting with. The pipe allocation on the CAD will tell you which groups come off which roll.
- Connect the end of the pipe to the manifold, it is best to connect onto the top manifold block, install the group and finish by connecting onto the bottom manifold block. Before connecting the pipe onto the manifold fit a one metre length of the corrugated sleeving over the pipe. This sleeving protects the pipe as it enters the screed and also cuts down the heat output of the pipe so you do not have a hot spot in front of the manifold.
- Install the pipe as per the CAD pipe layout drawing taking care to use the correct pipe spacing. Extra special care is needed when installing the pipe at 200mm c-c or less as there is a greater chance of kinking the pipe. Always use a minimum turn diameter of 200mm, if need be, make a larger diameter turn and then bring the pipe back into the correct pipe centres.
- Use the correct method of pipe fixing as supplied, more information on pipe fixing methods are found in the floor construction section.
- Repeat for each group until all pipe work is installed.

The manifold and pipework are now ready for filling and testing.

Fitting of a Floor Thermostat

Follow the diagram below for the correct fitting of a floor sensor that is wired back to a thermostat.

You may or may not have this type of control in your system.



Thermostat

Depending on the type of control system used, this could be WLTD or WLCT type sensors for Intelligent Control or an IVAR digital thermostat for Standard Control. If the IVAR stat is used for controlling a wet area, the thermostat must be fitted remotely (thermostat fitted outside the room with the low voltage sensor fitted inside).

One gang electric box

Electrical connection made inside box so sensor can be extended back to

15mm copper tube

With swept 90º bend Tube to be placed between pipe runs and embedded in screed at the same depth as the underfloor heating pipework.

It is sometimes better to control the temperature of the floor than control the air temperature in the room. Typical situations where this would be advantageous include:

- Bathrooms which have an auxiliary heat source, such as a towel rail.
- Swimming pool areas
- Saunas

Filling & Pressure Testing

The instructions below detail how to fill and test your underfloor pipe work and manifold directly from a mains water supply. Using this method does not allow the addition of anti-freeze. **Anti-freeze should always be added if the system is in risk of being subjected to low air temperatures.** You would need to use a filling pump kit and reservoir tank to add anti-freeze. Alternatively you can test using air pressure, but remember to temporarily remove and plug off the automatic air vents first.

Filling your system directly from your mains water supply

For this you will need mains water supply and a garden hose with threaded tap connections. Follow the step by step instructions below.

1. Open the fill/drain point valves on flow and return manifolds (turn square head anti-clockwise, a key for this is built into the cap).
2. Shut both red and blue handled isolation valves.
3. Close (turn clockwise) all flow meter valves on flow manifold. To do this unclip the red plastic locking sleeve situated on the flow meter and turn the clear plastic tube accordingly.
4. Close (turn clockwise) all white plastic manual valves on return manifold. (top manifold block).
5. If you have a standard control Combimix manifold or an extension pack manifold, close top valve on pump fittings (slot indicator horizontal).
6. Starting from left side open the first group's valves on flow and return.
7. Connect mains water supply to fill point on flow manifold and another hose to the drain point on the return manifold. This latter hose should be taken to where the water can drain away safely.
8. Unscrew small caps on auto air eliminators so they are loose.
9. Turn on water–the water will enter the flow manifold and go round the group you have opened until it comes out the drain point on the return manifold.
10. Let this water run out for 2/3 minutes to get rid of any air.
11. Close the valves for the group you were filling and repeat this process for all groups until they are all filled.
12. Still with the mains water pressure on, now go back along the manifold opening all the group valves on return and flow manifolds.
13. If standard control Combimix or extension pack manifold, open top valve on pump fittings (slot indicator vertical).
14. Close (turn clockwise) drain point valve on return manifold, then fill point valve on flow manifold.

You now have a manifold and pipe filled and pressurised to mains pressure.

Turn off mains water supply and disconnect fill and drain hoses.

Check for any leaks at manifold and check that pipe is free from any kinks.

If the manifold has a pressure gauge take a note of the pressure. If it drops to zero you have a leak, if it drops and stabilises that is fine.
Close caps on auto air eliminators.

You can now go ahead and lay the rest of the floor, keep monitoring the pressure at the manifold. The pressure will fluctuate with ambient temperature.

Commissioning

Before starting the checks detailed below, ensure the power is on and all room stats are switched down (not calling for heat). Switch off the DHW and Radiator circuit.

- Allow sufficient time for solid floor to cure before applying heat.
- Set the clockstat to call for heat (a flame symbol will appear on the clockstats screen)
- Turn up one room stat so it is calling for heat. This will put power to the correct actuator(s) which is controlled by the room stat. The actuators can take up to 4 minutes to open. The manifold pump, boiler pump and boiler will also run via the wiring centre.
- Set the mixer valve to give a flow temperature of 25 - 30°C. The system should be left to run at this low temperature until the screed/concrete has thoroughly dried out. It can then be raised to its full operating temperature depending on what type of floor construction it is.
- Concrete full operating flow temperature is 55°C.
- Timber joist full operating temperature is 60°C.
- Check in turn that each room stat is operating the correct actuator(s) on the manifold. Remember that the actuators take 2-4 mins to open or close. Leave all stats calling for heat.
- Check the correct operation of the Radiator and/or the DHW circuits and that each of these systems can independently bring on the boiler and boiler pump.
- Set the clockstat time and temperature settings. The lower one to 16°C (night setback) and the higher one to 26°C. This is an artificially high setting to make sure that all the room stats receive power when the clients are wanting the house up to the room stat settings. It will not get as hot as the clockstat setting as every area has its own room stat and will be controlled to its setting.
- Set the times on the clockstat, bring the system on (high temp setting) two hours before they want the house up to temperature and switch it to its low temp setting two hours before they retire at night.
- Once the floor has dried (normally 2-3 weeks at low temperature) the mixer can be set to its correct operating temperature.
- For most of the heating season this temperature can be reduced by up to 20°C depending on the outside air temperature. This will aid overall comfort levels and increase the economy of your floor heating system.

Thus typical settings are:

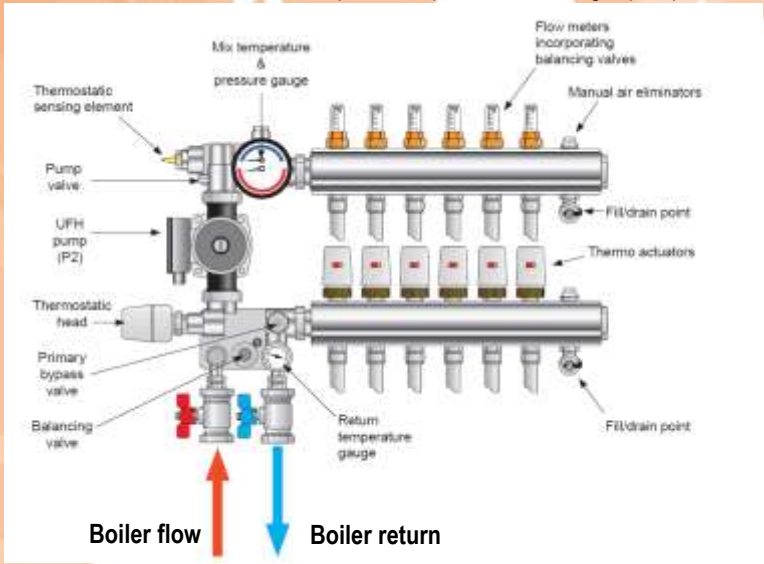
Going into heating season set mixer to 30°C - 40°C.
During the coldest spell set mixer to maximum for floor construction.
Coming out of heating season set mixer to 30°C - 40°C.

One of the main points to remember when controlling your system is that switching your system on and off several times a day is false economy. Keeping your floor at a constant temperature is more economical and will give you better comfort level.

System Components

Manifolds – TM Manifold

This is the standard manifold set up, full temperature blending & pump at each manifold, allowing precise control at point of use.



Thermo Actuators: Opens and shuts valve on each group. It is controlled by the room stat in each controllable area via the wiring centre, there may be more than one group/actuator per roomstat.

Manual Air Eliminators: Removes unwanted air from the system. **The air eliminators must be shut off once all the air is out of the system.**

Fill/Drain points: Used when filling and testing, also for maintenance.

Mix Temperature & System Pressure Gauge: Indicates the mix temperature and system pressure.

Boiler Return Temperature Gauge: Indicates boiler return temperature.

Flow Meters incorporating Balancing valves: Shows the flow rate through each group of pipe in litres per minute. By removing the red locking cap, the plastic indicator tube can be turned to set the required flow rate.

Thermostatic Head: Used to set the required mixed flow temperature entering the floor.

Thermostatic Sensing Element: Senses mixed water temperature and is attached to thermostatic head.

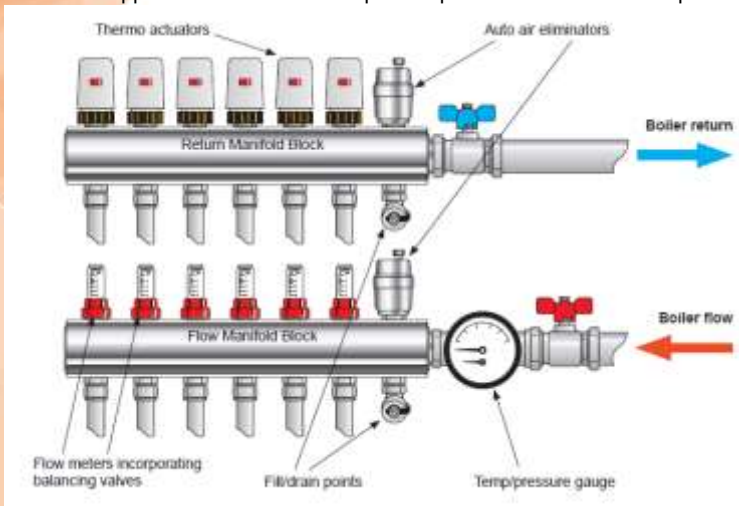
Balancing Valve: Gives the ability to balance the flow losses of the secondary circuit (UFH) with the primary circuit (e.g. radiators). The system is supplied with the balancing valve in position 2.5 which is the one that meets the requirements of most systems. For full details see UFHmix brochure (available from WTS Design).

Pump valve: Isolates manifold pump for maintenance/filling purposes.

Primary bypass valve: Used for balancing multiple manifold systems. Please consult a WTS Design technician.

Manifolds – TO Manifold

This is a stripped back manifold set up. It is specified for weather compensated or low temperature (eg heatpump) systems.



Thermo Actuators: Opens and shuts valve on each group. It is controlled by the room sensor in each controllable area via the wiring centre, there may be more than one group/actuator per room sensor. If the manifold is serving one area it maybe that there are no actuators supplied and the whole manifold is controlled via a motorised valve with no wiring centre.

Auto Air Eliminators: Removes unwanted air from the system. The air eliminators must be shut off once all the air is out of the system. Failure to do so could result in them letting by water (This will invalidate the system guarantee)

Fill/Drain points: Used when filling and testing, also for maintenance.

Pressure/Temperature Gauge: Shows flow temperature and system pressure.

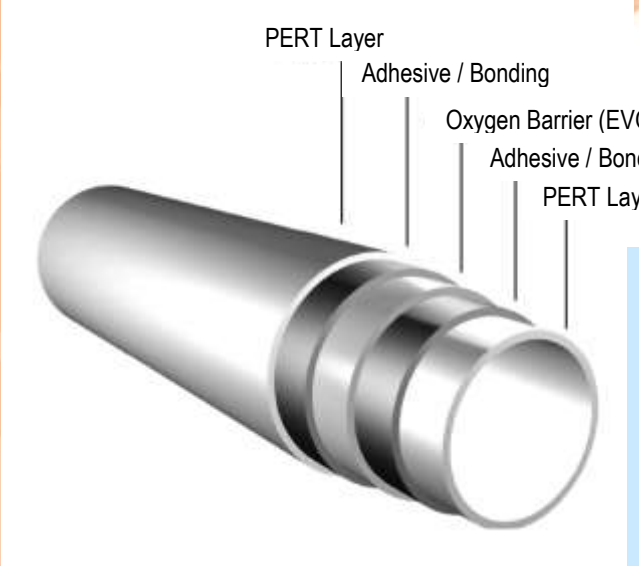
Flow Meters incorporating Balancing valves: Shows the flow rate through each group of pipe in litres per minute. By removing the red locking cap, the plastic indicator tube can be turned to set the required flow rate.

Return Manifold Block: Connects to the return side of the heating system.

Flow Manifold Block: Connects to the flow side of the heating system.

Pipe

Because only the best will do for your underfloor heating project. That's why there is no point in putting an EVOH oxygen barrier layer on the outside of a pipe where it is susceptible to Physical, Chemical & UV damage not allowing it to act effectively as an oxygen barrier at all. EVOH is a fabulous oxygen permeation barrier but is a delicate material which needs to be protected within the pipe wall to maintain its integrity for the life of the heating system. With **Warm The Sole** PERT you can be confident that the oxygen barrier will protect your heating system from corrosion.



Mechanical properties at 73°C	
Tensile strength (at break)	20 Mpa at 50 mm/min
Elongation of break (minimum)	150%
Impact strength (notched Izod)	900 J/m notch
Coefficient of linear expansion (73°C)	0.85 x 10-4/°F
Coefficient of linear expansion (180°C)	1.6 x 10-4/°F
Brittleness temperature	Below 0°F

The Importance of Control

It is a fair statement to say that any underfloor heating system is only as good as the control system attached to it. At **Warm The Sole** we place a huge importance on the controls which we specify and use. Underfloor heating is more difficult to control than a high temperature convection heating system because of the longer response time associated with underfloor heating. This is why it is imperative that the correct controls are always specified and used. The control system is an integral part of any underfloor heating system and should certainly never be considered as an "optional extra".

There are three main elements of control to consider with underfloor heating:

1. **Water temperature control of the underfloor heating pipe.**
2. **Individual room temperature control.**
3. **Time control for night/unoccupied setback.**

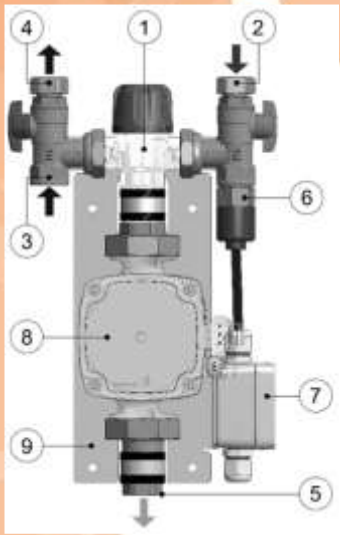
1. Underfloor heating works at a much lower flow temperature (typically 50°C) than a traditional radiator system. This means that you must have a mixing device in place before the manifold(s) to blend down the high temperature boiler flow. There are two accepted methods of doing this:
    a. a) By the use of a mechanical blending valve, this method is used in our standard control **TM Manifold system** and delivers a fixed water temperature as set on the valves head.
    b. b) By the use of an electro-mechanical 3 or 4 port blending valve, this method is used in our **Weather Compensation system** and delivers a variable water temperature governed by the prevailing climate conditions inside and outside the building.

The latter of these two options gives finer and more economical control and should be considered in any project over 80 square metres.

2. Individual rooms/areas within a building have different uses and varying influences acting on them (e.g. Amount of glazing, North or South facing, auxiliary heat sources, etc.) The temperature requirement for each room/area can also be slightly different. For these reasons we always recommend and specify an accurate digital room thermostat for every room/area. This is linked to the electric actuator which either opens or closes the valve(s) on the manifold serving that room/area. Wet areas where it is not allowed to put a mains operated thermostat are controlled using a thermostat which employs a low voltage remote sensor. This sensor can be used to sense the air temperature or the floor temperature. This level of individual room control is supplied with our standard control **TM Manifold system**. The **Weather Compensation** option utilises self-learning sensors giving even finer control.
3. Because it is uneconomical to run any heating system at the full comfort settings 24 hours a day there has to be a method of setting back the temperature during the night. With the standard control system a programmable clock thermostat is used along with all the individual room thermostats. The clockstat has time control along with two different temperature settings. One of the temperature settings is used to run the system at the room stat settings and the second temperature setting is used to provide a night setback setting (this allows the overall temperature to drop back overnight or when the building is not being used).

Linking all these room thermostats back to the manifold and integrating them with the other parts of the control system can be a confusing and costly exercise for any electrician. At **Warm The Sole** all our control systems are supplied with purpose made wiring centres with simplifies and speeds up the electrical installation.

Installing the manifold



The single circuit mixing unit is a distribution unit ensuring reliable flow temperature control, flexible installation and easy start-up. It is comes complete with pre-wired variable speed booster pump and it is secured to anti-vibration brackets. 2 x ø15 copper pipe screw fittings for boiler inlet and return connections are also included in the package.

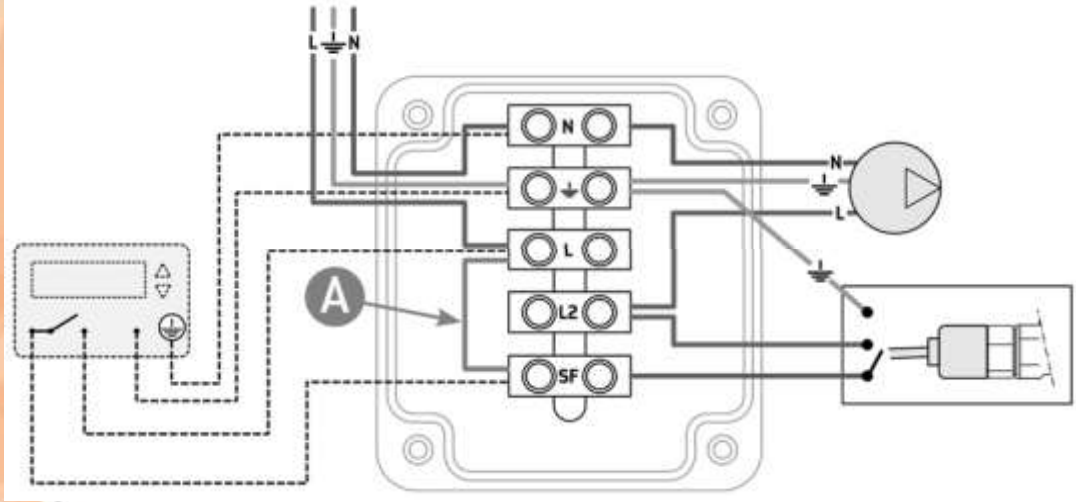
The Key is as follows

1. Thermostatic blender
2. Boiler hot water inlet (ø15 copper pipe screw fitting) + shut-off valve
3. Return cold water inlet + shut-off valve
4. Return to boiler (ø15 copper pipe screw fitting)
5. Flow to heating system
6. Heating water normally-open thermostat
7. Electrical terminal block
8. Booster pump (where provided)
9. Mounting bracket

Attach the manifold to the wall. The floorheating pipes are fitted to outlet 5 (the flow) and outlet 3 (the return). If the pack contains two splitters, fit these to the flow and return first. The pipes are installed as shown in the previous page.

To fill the system, attach a water source to valve inlet 2 ensuring that the thermostatic blender is wound down to low. The water will the fill the loops of pipe and return out through valve 4, this should have a length of hose emptying into a bucket or drain. Valves 2 & 4 should be in the open position. Note if using 2 loops an effort should be made to keep the loops as close to the same length as possible.

Electrical



- All wiring should be undertaken by qualified personnel in compliance with international and local regulations.
- A fused spur should be provided adjacent to Single circuit mixing unit to provide power.
- The connection box is supplied with a link instead of the room thermostat. In case a room thermostat is required, remove the link (A in diagram above) and connect the thermostat in its place.
- The pump comes pre-wired to the connection box.

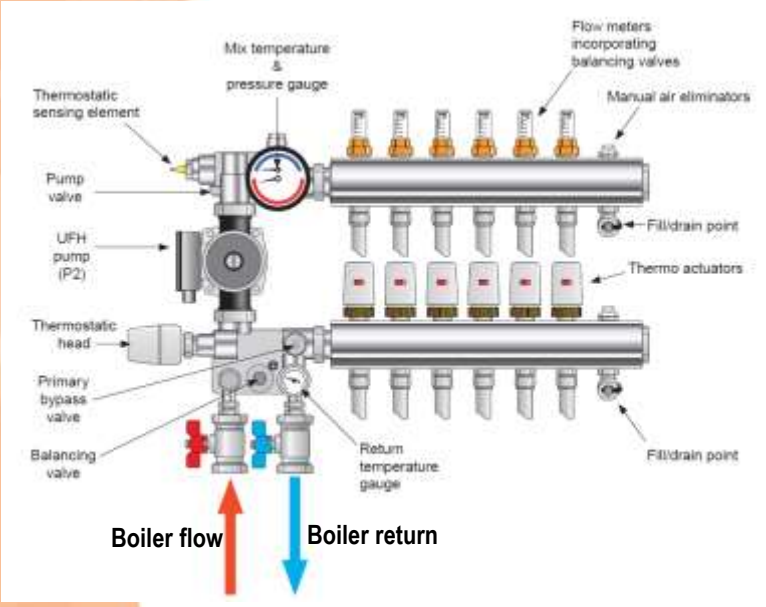
Control Systems - TM Manifold System

The following pages details the plant and wiring diagrams for a multi zone standard control TM Manifold System. If you are unsure if these are the correct set of plant and wiring diagrams to be using for your installation please contact the supplier of the equipment. The plant and wiring diagrams show one manifold set for simplicity but you may well have more than one manifold set. The wiring is as per the wiring centre diagram for each manifold set. Please ensure that you read all extra notes on the diagrams as they are important. It is imperative that both the electrician and heating installer completely understand what they are responsible for as it is very difficult to install cables and pipe work after a certain stage in the build schedule.

The plant layout details the flow and return pipe work needed to correctly connect up the manifold(s) to the heat source. The plant diagrams also show how to integrate a typical domestic hot water system and high temperature radiator system mechanically and electrically. As we do not know the length and route of flow and return pipe work, this has to be sized by the on-site heating engineer. Specific manifold loadings are available from your supplier - **please ask, do not guess.**

Manifolds – TM Manifold

This is the standard manifold set up, full temperature blending & pump at each manifold, allowing precise control at point of use.



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Pump valve: Isolates manifold pump for maintenance/filling purposes.

Primary bypass valve: Used for balancing multiple manifold systems. Please consult a WTS Design technician.

Notes for the Heating Installer

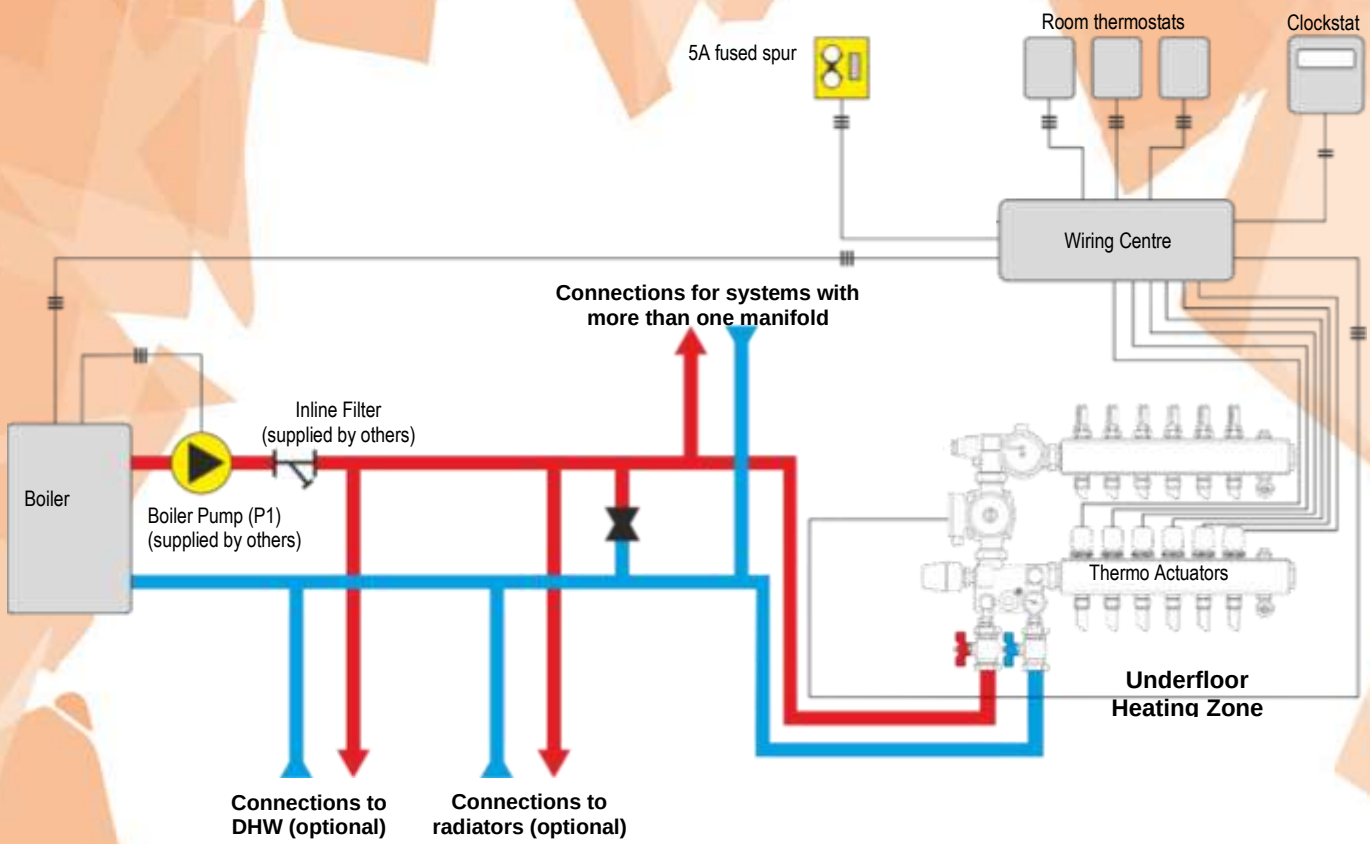
- Pay careful attention to flow and return connections onto the manifold. The flow from the boiler is indicated in **red** and the return to the boiler is indicated in **blue**.
- The automatic by-pass valve before the manifold is important and must be fitted (supplied by others).
- The floor heating manifold should be supplied by an uninterrupted flow and return from the boiler. Definitely not tapped off the end of a radiator system.
- As with all heating systems, the flow and return pipework and boiler system should be power flushed to remove any debris before it is connected and opened up to the manifold(s).
- It is also advisable to install an in-line filter on the main flow from the boiler. This will protect all equipment attached to the boiler system, in particular the UFH manifold(s).
- **If in doubt please get in touch with your supplier**

Notes for the Electrician

- Study the wiring diagrams and ensure you have enough cables in place at first fix stage. It is very difficult to add in cables once the build schedule has passed a certain stage.
- **The digital stats we supply only need a two core cable to them but it is strongly advisable to use 3 core and earth to all stat positions in case a different stat is used in the future which requires a neutral.**
- On most jobs, even with multiple manifolds, there will only be one clockstat. The signal from the clockstat has to be looped to all wiring centres as per the wiring diagram. On larger installations a clockstat will be supplied for each floor level or main grouped areas.
- Ensure you clearly mark-up which cable comes from which room stat back at the wiring centre. The manifold should be labelled as to which group serves which room. It should then be an easy process to ensure that the correct room thermostat is wired to the correct electric actuator(s) on the manifold.
- Please note that some rooms may have two or more groups of pipes in them and only the one room thermostat controlling them all. This means you can have more than one actuator wired to a single switch wire from a room stat.
- Please note that all heating controls should originate from a common spur/fuse and should have one point of isolation.
- **If in doubt please get in touch with your supplier.**

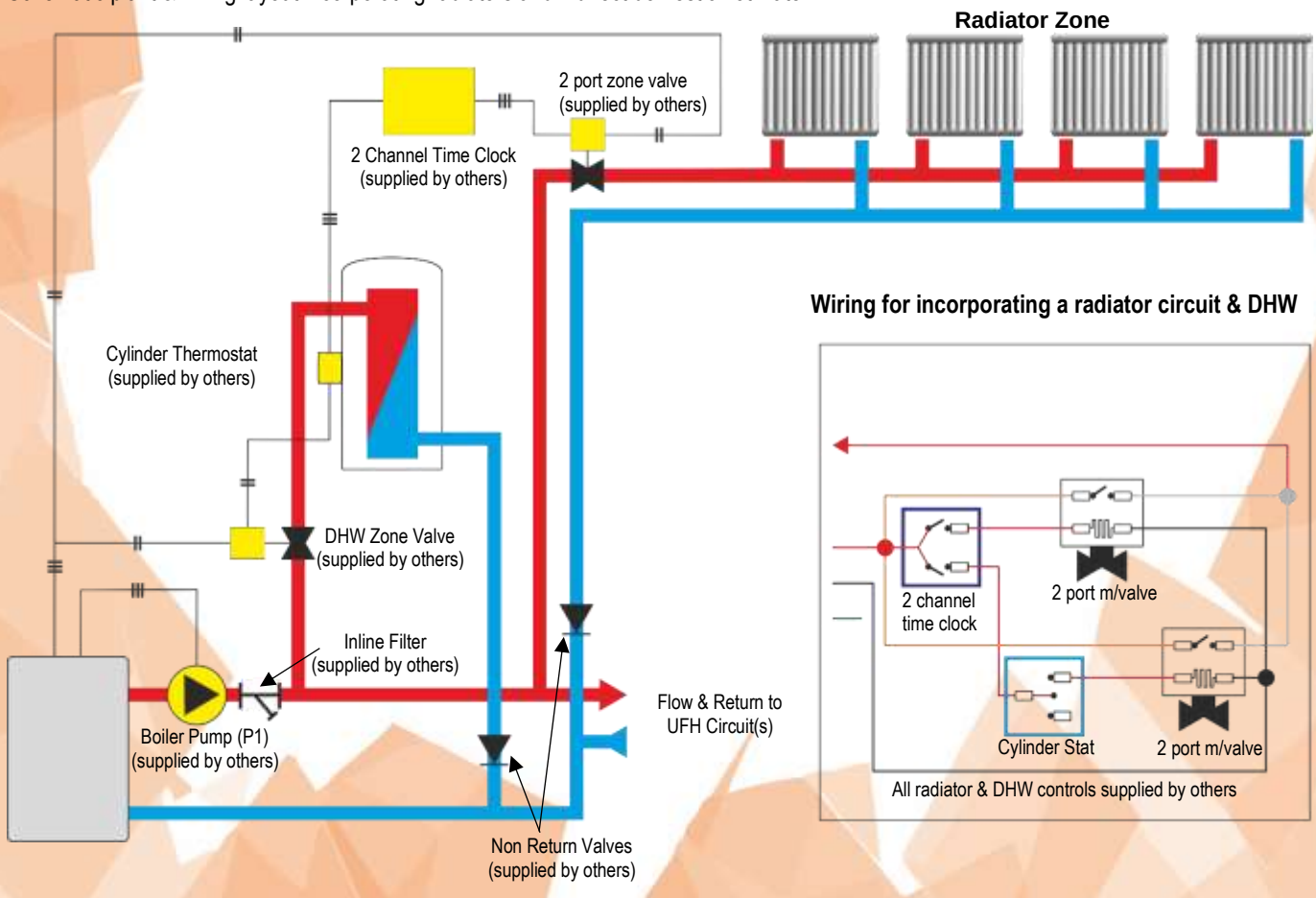
Control Systems – Standard System Plant Layout

If there is more than one wiring centre, link each wiring centre with one 2 core & earth and one 3 core & earth cables.

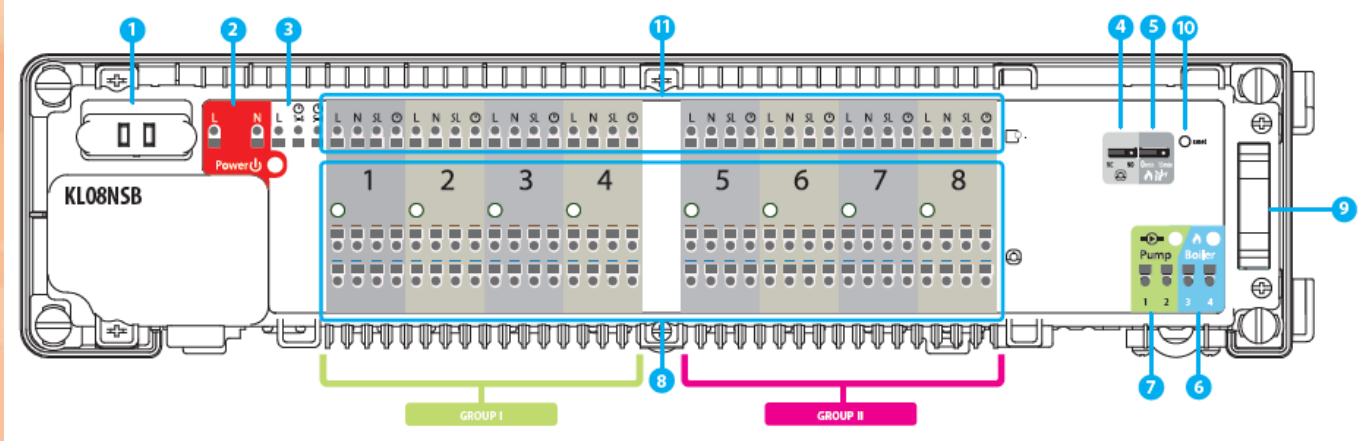


Control Systems – Standard System Plant & Wiring Layout

Schematic plant & wiring layout incorporating radiators and indirect domestic hot water.



Control Systems – Standard System Wiring Centre



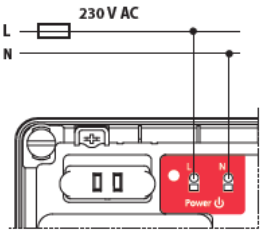
1. Cartridge fuse 5 x 20 mm 12 A
2. Power supply
3. NSB function terminals
4. NC/NO jumper (actuator type
5. Delay jumper
6. Boiler control output
7. Pump control output
8. Actuators connection
9. Serial connector for the KL04NSB extension
10. Reset button
11. Thermostats connection

1. Fuse

Note: Replace the fuse only when the wiring centre is disconnected from power supply (230V).

Main fuse is located under the housing cover next to power supply terminals and secures the wiring centre and the devices connected to it. Use ceramic tube fast blow 250V ROHS fuses (5x20mm) with nominal max current 12.5 A. To replace fuse remove the fuse holder with a flat screwdriver and pull out the fuse.

2. Power Supply



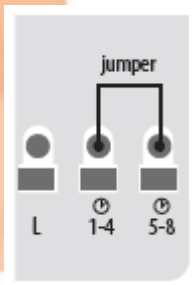
Power supply for wiring centre is 230 V ~ 50Hz.

Two wire installation should be made in accordance with the applicable regulations

3. NSB (Night Set Back reduction) Function and Thermostats Grouping

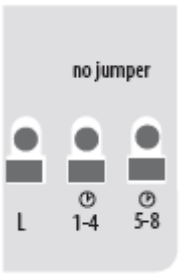
NSB function is activated in non-programmable Salus thermostats of the Expert NSB, HTR, BTR series via external signal. NSB 230 V signal (night-time temperature reduction) is sent via an external timer or programmable thermostat connected to the KL08NSB wiring centre. Non-programmable thermostats are receiving NSB signal and reducing setpoint temperature (by switching to eco mode). All thermostats have to be connected using a 4-wire cable (min. 4 x 0,75 mm2, max. 4 x 1.5 mm²)

Option 1



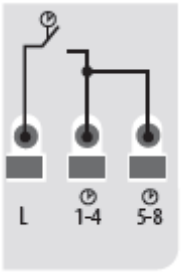
One Master thermostat which is common for thermostats from Group 1 and Group 2 (one programmable thermostat e.g. VS30, other thermostats are non-programmable e.g. VS35).

Option 2



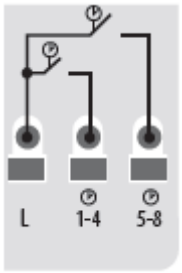
Two Master thermostats. One for Group 1 and one for Group 2 (two programmable thermostats e.g. VS30, other thermostats are non-programmable e.g., VS35).

Option 3



One external clock which is common for thermostats from Group 1and Group 2 (one external clock + daily regulators e.g. VS35).

Option 4



Two external clocks. One for Group 1 and one for Group 2 (two external clocks + non-programmable regulators e.g. VS35).

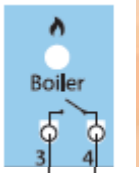
4. NC/NO Jumper

Select the type of the thermoelectric actuator connected to the wiring centre:
NC – actuator normally closed
NO – actuator normally opened
Jumper position change must be refreshed in the memory by pressing the Reset button (short press).

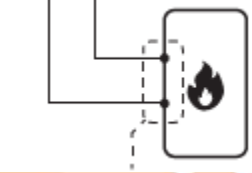
5. Delay Jumper

Boiler off delay time.
Note: Pump (Pump output) and boiler (Boiler output) always starts 3 minutes after receiving the heating signal from any thermostats connected to wiring centre. Pump stops 3 minutes after the last call for heating sent by the thermostat and the heat source (boiler) will turn off after the time set on Delay jumper.
Jumper position change must be refreshed in the memory by pressing the Reset button (short press).

6. Boiler Control Output



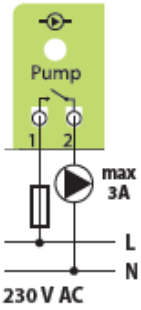
Boiler output - this is a volt free output (COM / NO) that controls the boiler in the heating system. The output closes and the boiler turns on but always after 3 minutes after receiving the heating signal from any of thermostats paired with wiring centre. The output opens and the boiler switches off when the last thermostat stops sending heat demand (after the time set on the Delay Jumper).



Boiler output is inactive in the cooling mode.

Boiler ON/OFF contacts (according to the boiler's manual)

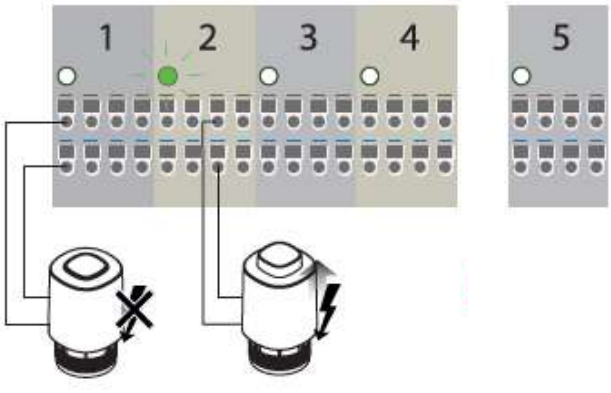
7. Pump Control Output



Pump output - this is a volt free output (COM / NO) that controls the circulation pump in the heating / cooling system. The output closes (pump starts) always after 3 minutes from the moment of receiving the heating / cooling signal from any of thermostats paired with wiring centre. The output opens (pump stops) 3 minutes after the last demand for heat/cool sent by the thermostat.

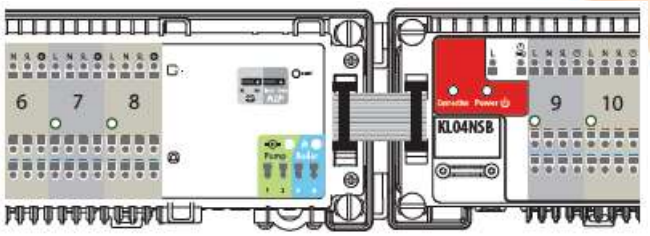
8. Actuators connection

The actuator wires should be secured with the self locking connectors in the appropriate zone. Up to 6 actuators with a load of up to 2 Watts each can be connected to a single zone. Should more than 6 actuators be required in a zone use an additional relay to relieve the output.



9. Connector For 4 Way Extension

The Serial connector is used to connect the KL08NSN with the KL04NSB extension module to add functionality and support up to12 zones.

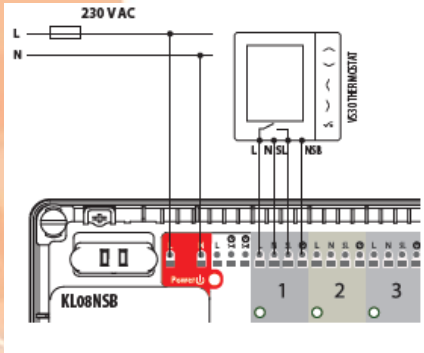


10. Reset Button

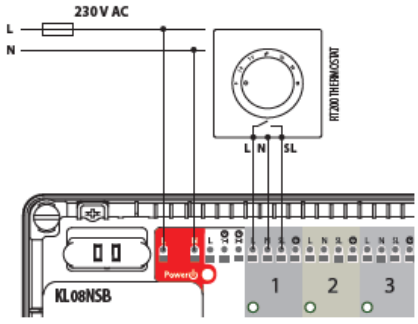
It is used to refresh the data, after switching jumpers 4 or 5.

11. Thermostats Connection

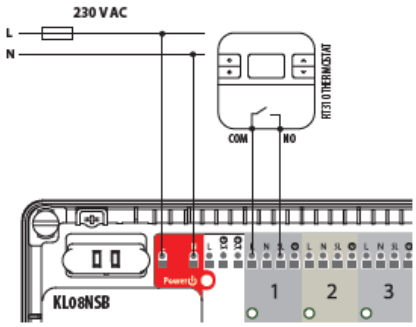
Connecting EXPERT NSB, HTR or BTR series thermostats



Connecting a 230 V thermostat to the KL08NSB wiring centre (e.g. RT200)



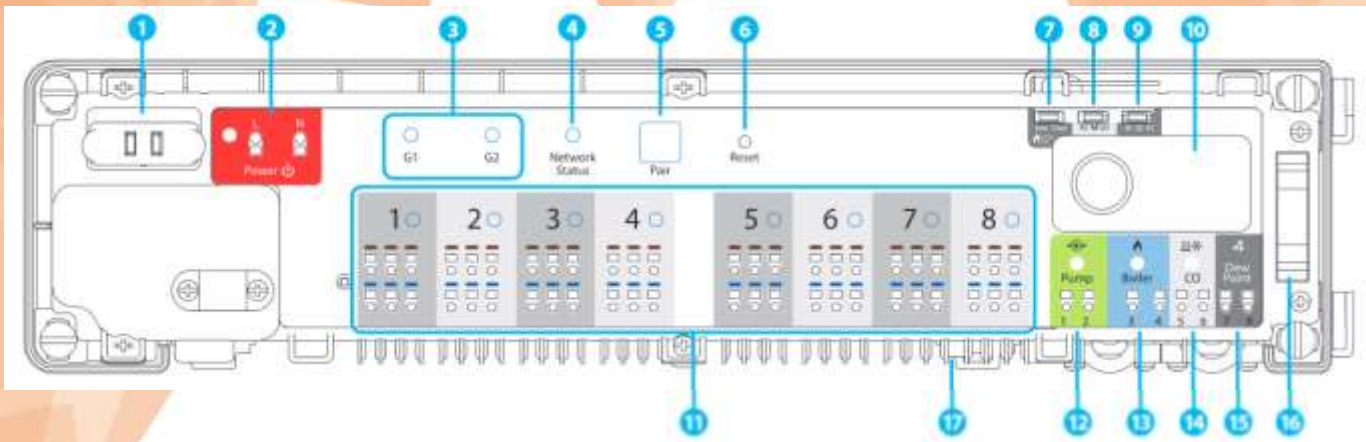
Connecting ON/OFF battery-powered thermostat with voltage-free COM / NO output contacts (e.g. 091FL, RT310, RT510)



L	230 V live terminal
N	Neutral
🕑	NSB function terminal
SL (↑)	230 V input signal

Wireless Control Smart Control System

The Warm the Sole Wireless System is set out pretty much as the standard system, there is no cabling between the stats and the wiring centre in this case though. The wiring centre itself has a few extra functions, detailed below.



1. Cartridge fuse 5 x 20 mm 12 A
2. Power Supply
3. Thermostat grouping status
4. Network Status diode
5. Pair button
6. Reset button
7. Delay jumper
8. INT/EXT antenna jumper
9. NC/NO actuators jumper
10. ZigBee network coordinator
11. Terminals for actuators
12. Pump control output
13. Boiler control output
14. CO terminal
15. Dew point sensor input (humidistat)
16. Serial connector for the KL04RF extension
17. External antenna connector

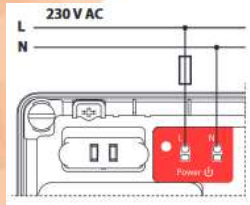
- **RX10RF (optional)**

1. Fuse

Note: Fuse replacement should be done when the wiring centre is disconnected from power supply 230 V AC.

The mains fuse is located under the housing cover, at the main terminals and protects the wiring centre and devices powered by it. Use cartridge fuse-type 5 x 20 mm - nominal burn rate 12 A. To remove the fuse, lift the socket with a flat screwdriver and pull out the fuse.

2. Power Supply



Power supply for wiring centre is 230 V ~ 50Hz.

Features of the installation:
-three-wire, with PE protective conductor,
-made in accordance with applicable regulations.

3. Thermostat grouping status

This function is only available in Offline mode (together with CO10RF coordinator) - it means MASTER thermostats will affect to SLAVE thermostats within specific group, which is possible only when thermostats are paired with one KL08RF wiring centre (optional + KL04RF) and have been assigned to gr. 1 or gr. 2.

Note: Within one group there may be only one MASTER thermostat (programmable) and the rest must be SLAVE thermostats (non-programmable).

How it works: If all thermostats of a given group will operate in automatic mode, then each of the thermostats in a given group will work in the same way as the MASTER of this group. For example, if the MASTER thermostat of Group 1 according to it's programmed schedule maintains a comfort mode - all SLAVE type thermostats from Group 1 will also maintain the comfort mode (the temperature is set individually for every thermostat). Similarly, if the MASTER thermostat is set to Party or Holiday mode - SLAVE thermostats in his group will also work in these modes.

The grouping function is optional - thermostats do not have to be grouped, they can operate independently.

4. Network Status diode

LED diode statuses:

- (LED diode is blinking) - it means wiring centre is not connected to the network, but it is ready for pairing with the coordinator (CO10RF) of the ZigBee network or the Internet gateway (UGE600)

- (LED is steady lit) - it means wiring centre is added to the ZigBee network and paired with CO10RF or UGE600

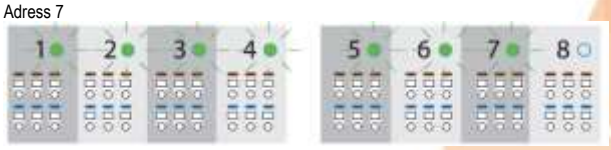
5. Pair Button

- Checking the address of the wiring centre in the Zigbee network. To check the address of the wiring centre in the ZigBee network (when using more than one) press the Pair button.
The wiring centre number is indicated by the number of LEDs at the zones:

Adress 1

Adress 2

Adress 7



Address 9 is indicated by lighting up 8 LEDs of all the zones and the Network

6. Reset button

- It is used to refresh the data, after moving jumpers 7,8 or 9. The Reset button does not remove the wiring centre from the ZigBee network.

7. Delay Jumper

Boiler off delay time.

Note: Pump (Pump output) and boiler (Boiler output) always starts 3 minutes after receiving the heating signal from any thermostats paired with wiring centre. Pump stops after 3 minutes, when the last thermostat stops sending demand for heat, while the heat source (Boiler) will turn off after the time set with the jumper.

Jumper position change must be refreshed in the memory by pressing the Reset button (short press).

8. INT/EXT antenna jumper

There is an option to connect the 08RFA external antenna to the wiring centre. If you use an additional antenna, place the jumper in the EXT position.

Jumper position change must be refreshed in the memory by pressing the Reset button (short press).

9. NC/NO Jumper

Select the type of the thermoelectric actuator connected to the wiring centre:
NC – actuator normally closed
NO – actuator normally opened
Jumper position change must be refreshed in the memory by pressing the Reset button (short press).

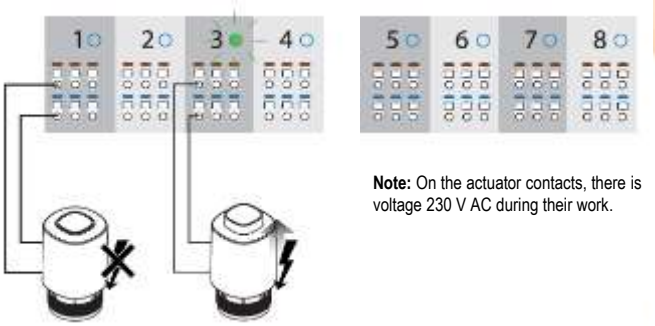
10. ZigBee network coordinator

The ZigBee network coordination unit CO10RF is used for Offline mode and it's included with the wiring centre. CO10RF enables wireless control of all devices installed in one network. Within one network can be connected max 9 wiring centres. It means that if in the network there are more than one wiring centre, you can use one coordinator and put the remaining ones in a safe place.

Note: Do not use CO10RF coordinator with UGE600 simultaneously.

11. Terminals for actuators

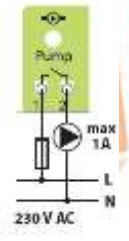
Wires of the thermoelectric actuators should be plugged into the self-locking connectors in the appropriate zones. You can connect 3 actuators directly to one zone. The current load of one zone is adapted to operate with up to 6 thermoelectric actuators with a power of 2 Watts. If there is a need to connect more than 6 actuators please use an additional relay to relieve the output of the zone.



Note: On the actuator contacts, there is voltage 230 V AC during their work.

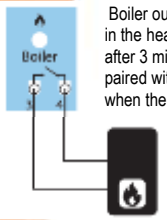
The operation was explained on the example of T30NC actuators.

12. Pump control output



Pump output - this is a volt free output (COM / NO) that controls the circulation pump in the heating / cooling system. The output closes (pump starts) always after 3 minutes after receiving the heating / cooling signal from any of thermostats paired with wiring centre. The output opens (pump stops) after 3 minutes, when the last thermostat stops sending heat / cold demand.

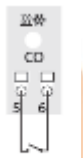
13. Boiler control output



Boiler output - this is a volt free output (COM / NO) that controls the boiler in the heating system. The output closes and the boiler turns on but always after 3 minutes after receiving the heating signal from any of thermostats paired with wiring centre. The output opens and the boiler switches off when the last thermostat stops sending heat demand (after the time set on the Delay jumper)

Note: Boiler output is inactive in the cooling mode.

14. CO terminal (input)



Opened CO input contacts (Changeover) means that whole system works in the heating mode. Short circuit at the input CO will automatically switch the whole system to cooling mode (wiring centre and paired thermostats).

CO terminal	Diode	Mode
Opened contacts	Red	Heating
Closed contacts	Blue	Cooling

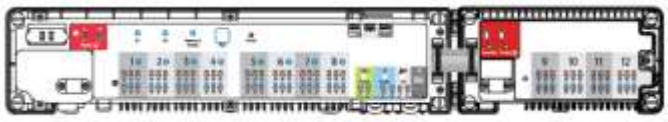
15. Dew point sensor input (humidistat)

Dew point sensor input is active only in cooling mode (with closed CO contacts).

Shorting the contacts at the dew point sensor input (too high humidity) causes switching off all zones in the wiring centre and Pump control outputs.

16. Serial connector for KL04RF extension

It is used for communication between the KL08RF wiring centre and the KL04RF extension module. KL04RFextension module increases functionality and expands support up to 12 zones.

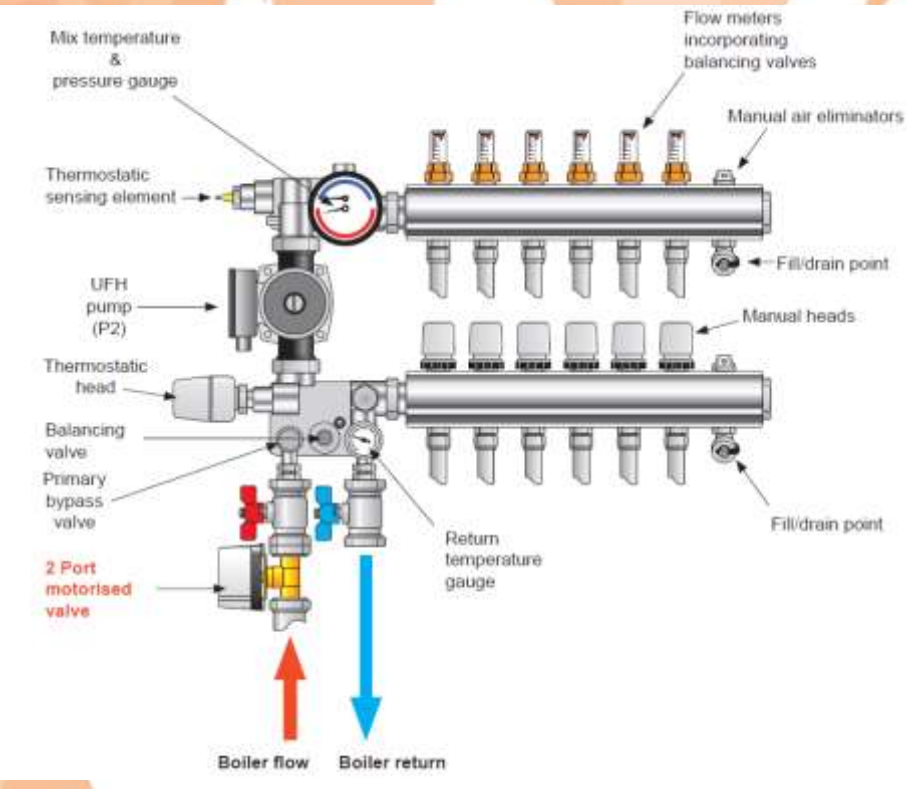


17. External antenna connector

The external antenna connector 08RFA is located underneath the wiring centre under zones 7 and 8. After connecting an additional antenna, place the jumper in the EXT position.

Jumper position change must be refreshed in the memory by pressing the Reset button (short press).

Single Zone System Using TM Manifold & 2 Port Motorised Valve



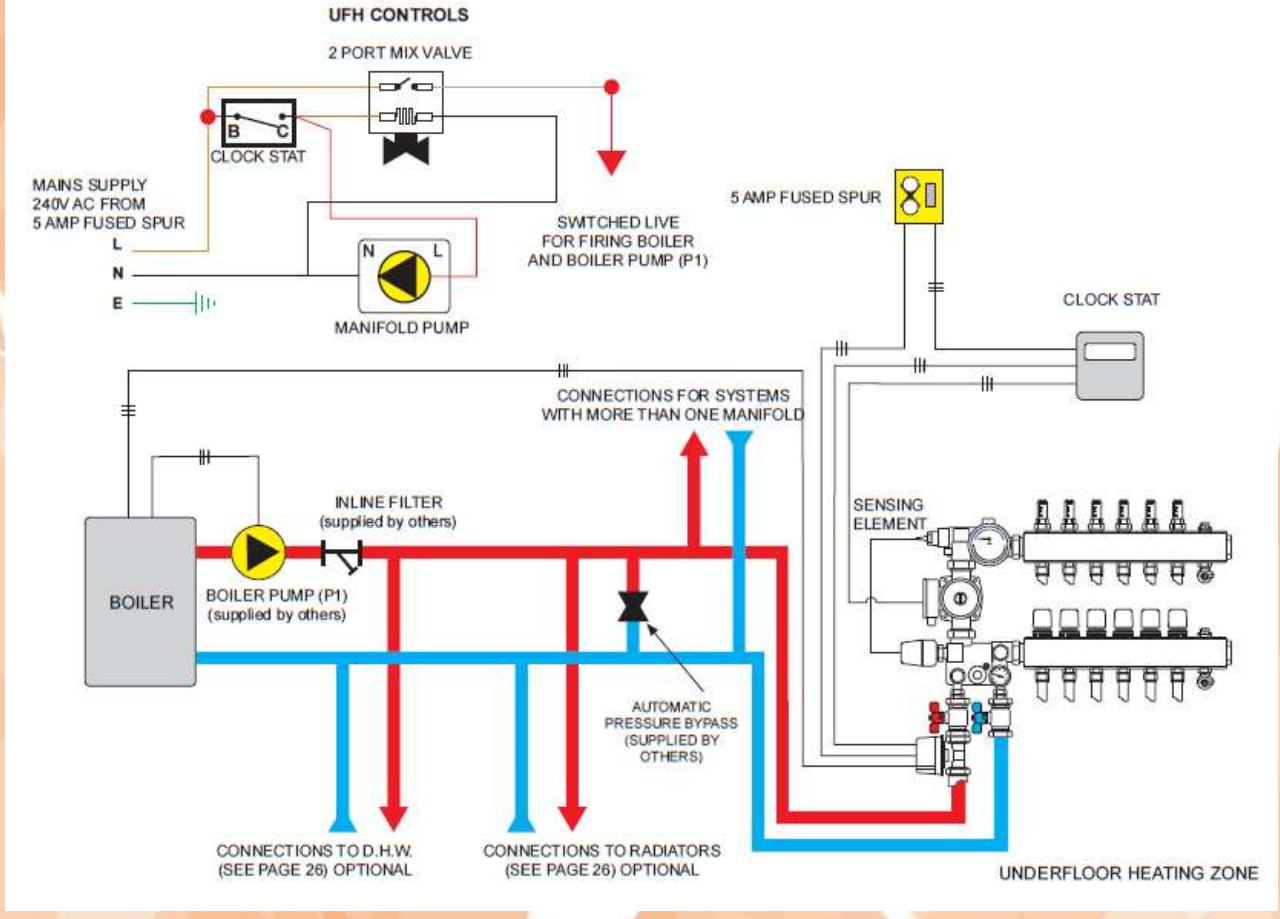
In certain situations you can have a large single area governed by one thermostat and one manifold. In this situation it is not necessary to have every zone on the manifold governed by an individual thermal actuator nor is it necessary to have a wiring centre above the manifold.

The solution is straightforward, by using a 2 port motorised valve on the incoming flow to the manifold. The valve provides mechanical on/off control of the flow to all the UFH circuits. The valve is directly operated by the thermostat governing this area (usually a clock thermostat). The clock thermostat also directly controls the pump on the manifold. The demand signal for the boiler and boiler pump are taken from the auxiliary end switches. The electrician should fit a small surface mounted joint box above the manifold. This can then be used to make the connections detailed on the following page.

As the manifold does not have individual actuators, the white plastic manual wheels are simply left on the top manifold block and left open. The individual flow rates are set in the normal fashion using the adjustable flow meter valves.

This set up can be used as a stand-alone system or integrated with other multi zone manifold sets.

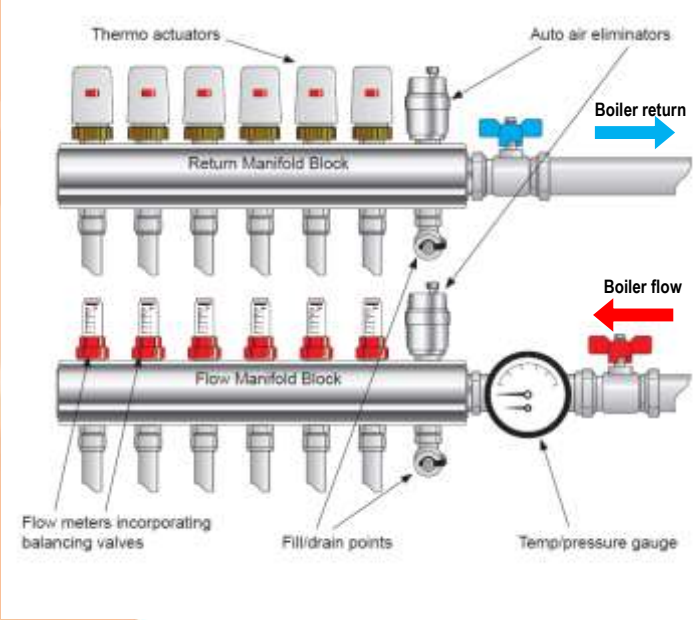
Single Zone System Using TM Manifold – Plant & Wiring Layout



Control Systems – T0 Manifold System

The following pages details the plant and wiring diagrams for a multi zone standard control T0 Manifold System. If you are unsure if these are the correct set of plant and wiring diagrams to be using for your installation please contact the supplier of the equipment. The plant and wiring diagrams show one manifold set for simplicity but you may well have more than one manifold set. The wiring is as per the wiring centre diagram for each manifold set. Please ensure that you read all extra notes on the diagrams as they are important. It is imperative that both the electrician and heating installer completely understand what they are responsible for as it is very difficult to install cables and pipe work after a certain stage in the build schedule.

The plant layout details the flow and return pipe work needed to correctly connect up the manifold(s) to the heat source. The plant diagrams also show how to integrate a typical domestic hot water system and high temperature radiator system mechanically and electrically. As we do not know the length and route of flow and return pipe work, this has to be sized by the on-site heating engineer. Specific manifold loadings are available from your supplier - **please ask, do not guess.**



- **Thermo Actuators:** Opens and shuts valve on each group. It is controlled by the room sensor in each controllable area via the wiring centre, there maybe more than one group/actuator per room sensor. If the manifold is serving one area it maybe that there are no actuators supplied and the whole manifold is controlled via a motorised valve with no wiring centre.
- **Auto Air Eliminators:** Removes unwanted air from the system. The air eliminators must be shut off once all the air is out of the system. Failure to do so could result in them letting by water (This will invalidate the system guarantee)
- **Fill/Drain points:** Used when filling and testing, also for maintenance.
- **Pressure/Temperature Gauge:** Shows flow temperature and system pressure.
- **Flow Meters incorporating Balancing valves**: Shows the flow rate through each group of pipe in litres per minute. By removing the red locking cap, the plastic indicator tube can be turned to set the required flow rate.
- **Return Manifold Block:** Connects to the return side of the heating system.
- **Flow Manifold Block:** Connects to the flow side of the heating system

Weather Compensation

Check the outside temperature, 12ºC.

And the bedroom temperature? 17ºC – what's the time? 17.46. Ah ok what's the flow temperature? 38ºC.

Is the bedroom thermostat open? Yes. Good.
How's the Sitting room doing? 21.3ºC, better close the thermostat here.
Is the pump still running? Check.
What's the outside temperature? Still 12ºC?

No it's up to 12.2ºC. That's the 4th such rise in 20 minutes. Keep an eye on that trend.
How's the kitchen? 20.8ºC. Better put a check on the thermostat.
The bathroom doing fine? 22.3ºC, yup better close that one down too.

Check on the outside temperature again. 12.3ºC. OK flow temperature? 38ºC.
Should slow it down a bit here, close the 4 port a notch…..what's the temperature now 37.8ºC.
Good heading down, that'll save a bit of money. Outside temperature is……..?

Or you could install a Warm The Sole Weather Compensation System to do all this for you.

Weather compensation adds another level of control to your underfloor heating system. Definitions for "weather compensation", or "weather compensator", vary, but basically the system monitors the outside temperature trends and adjusts the flow temperature from the heat source accordingly. Saving fuel & money and maintaining optimum comfort along the way.

In addition from April 2018, when a gas combination boiler is installed in existing dwellings in England, an additional energy efficiency measure will be required.
Weather compensation technology is listed as a suitable measure under the legally binding changes.

How it works

The weather compensation controller alters the boiler flow temperature directly as the outside temperature changes, ensuring timely changes in the heat delivered to the CH system, - avoiding situations sometimes experienced with “conventional” room-thermostats - where the house is either too cold (before the thermostat activates to create a demand), or too hot (residual heat released from floor after the thermostat is satisfied).

The weather compensation control runs the boiler at as low a flow temperature as possible, while still providing sufficient output to the floor to maintain comfort. This helps to optimise the boilers operation in condensing mode, saving energy and maximising boiler efficiency.

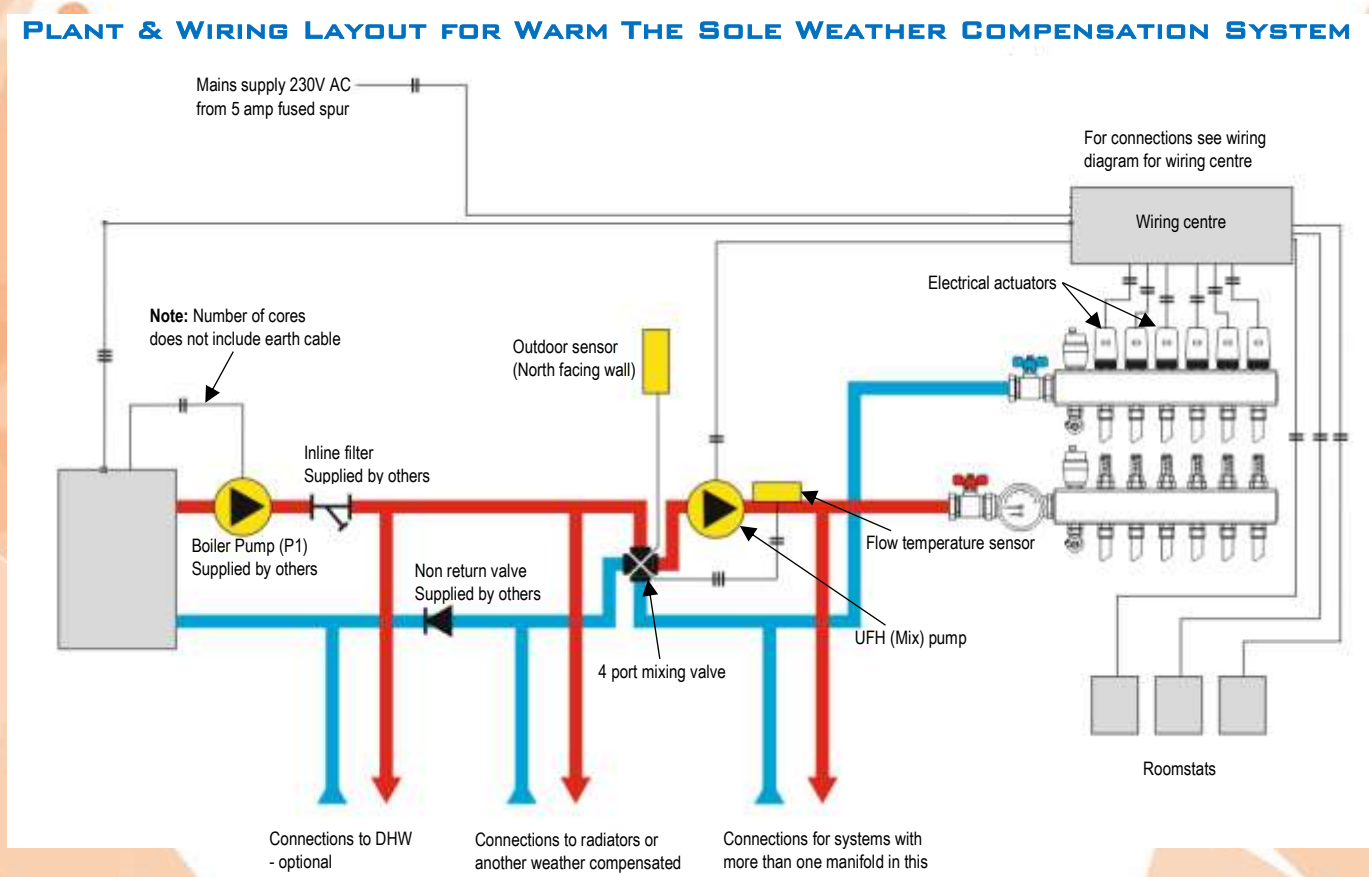
An external sensor may need to be installed on a north or west facing wall, or a wall that isn’t affected by solar gain.

The Smartcomfort Range

At Warm The Sole we have opted for the SmartComfort controllers. There are many options on the market for weather compensation, but none come near the quality and ease of use of these products

Depending on the heating systems chosen, the proposed usage and the heat sources, we have a version of the controller to suit. We can then match it with the correctly sized 4 port valve for the heating system and the perfect home comfort is yours. We size all of this for you as part of our free design service.

Plant & Wiring Layout for Warm The Sole Weather Compensation System

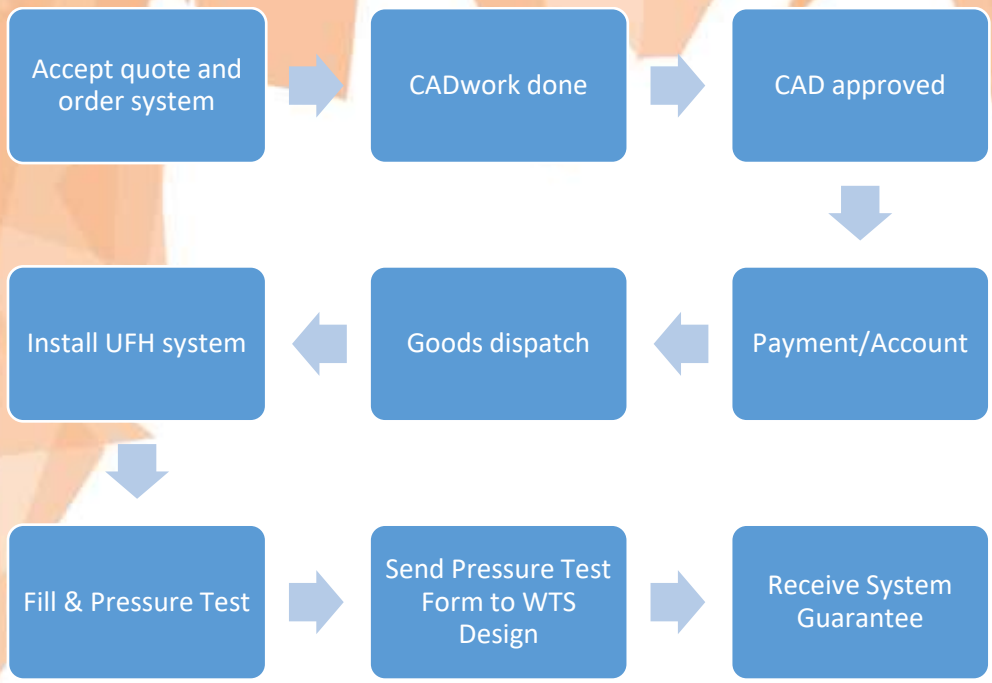


Help & Support

Underfloor Heating: Frequently Asked Questions

Q	Can I Install The System Myself Or Do I Need An Expert?
A	This manual provides all the information needed to install one of our underfloor heating systems. Most steps, no matter what the system type, can be installed on a DIY basis. Final electrical connection should be made by a qualified electrician.
Q	How long will it take to warm up?
A	A crucial thing to understand is that underfloor heating is not switched off and on in the conventional way. The system is 'set-back' when not in use for a short period. This allows the room to achieve ideal temperature within around half an hour of calling. Although the system is permanently on, the energy usage is a lot less than trying to heat a room from cold. Set back times and temperatures are easy to programme and adjust. Within a short time you will have a heating system suited to your desires that won't take any time to oversee at all.
Q	Will my floor get too hot?
A	Roomstats, flow rates and blending temperature all work together to prevent this from being a problem. The required temperature can be easily adjusted. Most of our customers like a floor temperature between 22 and 27°C. For specialist flooring we can add a floorstat that provides a high temperature limit.
Q	Can underfloor heating be used in a bathroom or a wet room?
A	Yes, the thermostat is located on a wall just outside the room in question. A low voltage sensor (wall or floor) is fed through the wall to the wetroom/bathroom where the heating is installed. This practice is also used even if the stats are low voltage or wireless, as the electronics may be affected by prolonged exposure to the moist atmosphere in these rooms
Q	Do I need to install insulation?
A	Yes. The heat from the pipes radiates up through the concrete into the room providing the heat required. It also radiates downwards and sideways from the pipe. Adding insulation below and at the side of the room prevents this. As much as 45% of heat can be lost downwards if the floor is not insulated. A proper layer as per our recommended drawings cuts this loss to virtually zero.
Q	Are Warm The Sole underfloor heating systems covered by a guarantee?
A	A: Of course they are! The manifold and pipe systems are covered by our 10 year replacement guarantee. Control systems come with manufacturers guarantees.
Q	Is underfloor heating suitable for heating a conservatory?
A	Underfloor heating systems perform far better than other heating systems in most cases. Conservatories, extensions, full houses, offices, schools. The list goes on. We advise against using underfloor in areas or buildings where use is sparse throughout the week/month/year. As mentioned above we don't advise turning UFH off and on as per radiator systems. So keeping the heating on setback for a long time without use is not an efficient use of fuel.
Q	What happens if I order a heating system that's too big or too small?
A	We offer a free design service for all our systems, it makes sense to use this to get the perfect system for your building. Consequently this problem would not arise in the normal run of things.
Q	Do I need special tools?
A	Short answer – no. We have a small range of tools to make installing one of our systems much easier. These are usually listed as optional extras on the quote. If you can't see something you desire, please call.
Q	Why Warm the Sole?
A	1st point is our knowledgeable staff, and the lengths we go to ensure your project runs smoothly. We value your business and will go the extra mile to provide a service second to none. (See page 2). 2nd point is the quality of goods we have sourced. Many of our suppliers have been dealing with us for more than 20 years. We wouldn't get the feedback we do if we just punted out the most basic of products. Quality is key, everything else will follow. 3rd point is the pricing. We are not interested in cutting the price further, nor are we in the same bed as Harrods! We have a good level that our customers love. ***In short Service-Quality-Value Pick any 3***
Q	Can I control my underfloor heating from a smartphone?
A	Yes, we offer a range of controls that allow this. The SmartHome system also allows for boiler control, home security and coming soon, CCTV. All monitored and controlled via a free downloadable app. Phone us for more details
Q	Can I use UFH with heat pump / combi boiler / electric boiler/ solar?
A	Underfloor heating works via a feed of hot/warm water. Any heat source can be used. We are also adept at designing integrated systems where there can be multiple heat sources into a thermal store. We will provide plant and wiring diagrams as part of the service. We have designed such systems to provide heating & hot water for around £150/year. The future is here, we've embraced it. We can help you to embrace it too.
Q	Can I lay underfloor heating underneath kitchen units and sanitary items?
A	British Standards recommend that heating underneath kitchen units and toilets/showers is to be avoided. When designing a system for your house we take into account all these regulations.
Q	Can I have different temperatures in different rooms with underfloor heating?
A	Yes. Thermostats in each room control that room. This allows total control over your heating and temperatures within individual rooms.
Q	Can you use underfloor heating on first floors?
A	Yes. UFH can be installed on any floor. We can advise and provide for any floor structure. If you can't see a suitable set up in the floor section of this brochure give us a call and we discuss a solution.
Q	Is underfloor heating more efficient than radiators?
A	Underfloor heating can be up to 30% more efficient than traditional radiator systems (depending on your heat source). Further savings can be made by adding weather compensation. Adding renewable heat sources such as solar or heat pumps can further condense those pesky heating bills.
Q	Is underfloor heating just for new builds
A	Underfloor heating lends itself to just about any property style old or new. As long as the building parameters are known it can be designed to suit. Call us for more details.
Q	We have a high ceiling. Are we going to lose heat to the vaulted ceiling area?
A	Underfloor heating like all radiant emission follows the inverse square law. Basically it means that as you move away from the source (the floor) the value (level of heat) drops away exponentially. So by the time you get to vaulted ceiling height you're at about 6.25% of floor emission. Things to bear in mind is that it is radiant heat, not convective heat, so there is minimal amounts of hot air rising.
Q	Why do I need another pump on the underfloor heating system?
A	The demand for the underfloor heating must be satisfied for optimum efficiency. The addition of the pump ensures that the area covered by the floor heating pipes are properly serviced

Project Pipeline



Pressure Test & Commissioning Certificate

Project Name	
Full Address	
Postcode	
Project Number	
Date	

Manifolds

Manifold Position/Size	Test Pressure	Flow Rates Checked/Adjusted	Site Agents Signature	Print Name
		❑		
		❑		
		❑		
		❑		
		❑		

Tick box if complete

- ❑ Floor structure is correct with sufficient insulation, including the perimeter
- ❑ Pipe installed as per CAD drawing
- ❑ All pipe work is free of kinks
- ❑ Flow and return connections to manifolds are correct
- ❑ Flow rates set with all groups open
- ❑ Correct room stat operating correct actuator(s)
- ❑ Suitable set-back times programmed into timer
- ❑ Water mixing device checked for correct operation
- ❑ Check UFH controls have been integrated correctly with other services (e.g. Rads & DHW)
- ❑ Controls and operation fully explained to end user

Commissioned	Date	Engineer	End User

Please complete this form in full for UFH system. Incomplete forms will be returned and will delay issue of guarantee.

I declare that the above information is true and complete

Signed……

Print Name……

A false declaration can result in guarantee being voided

For issue of System Guarantee
please return completed form to:
Warm The Sole Ltd
Castlebay Gardens
Inverness
IV3 8GF

Terms and Conditions

General

1) If not mentioned otherwise, all our offers are without commitment.
2) The buyers declare to have read the terms and conditions, & agree to them. These terms & conditions are superior to an individual's or company's purchase order terms & conditions.
3) Sales are made from Inverness, Scotland, & in case of delivery ex works, the goods are transported at the risk & cost of the buyers.
4) No payments to third parties can be done without our prior permission.
5) You may not transfer the contract between us, or any part of it to anyone else.

Quotations

6) A quotation by Warm The Sole Ltd shall constitute as an invitation to treat & not an offer. Warm The Sole Ltd may withdraw or amend any quotation at any time prior to Warm The Sole Ltd acceptance of the buyer's order.
7) A quotation is valid for sixty days from date of issue.

Ordering

8) We require written confirmation of the order and 14 days to process that order. It can be sent by post, fax or e-mail. Full address of location & any special requirements relating to that order, for example, additional requirements, CAD pipe layout drawing etc must also be detailed.
9) CAD charges relate to the CAD being prepared from plans supplied, if subsequent changes are made then a further charge will be incurred based on time taken to make the changes.
10) The delivery address will be the installer's address to enable the equipment to be checked prior to going on site. This is important as Warm The Sole Ltd will not enter into any dialogue regarding missing parts if the installer/agent has not checked the material.
11) Material will be dispatched as soon as possible after completion of order and preparation of supporting technical paperwork. The goods will be film wrapped on a pallet. If the wrapping is damaged or torn, special care should be taken when checking contents.
12) Warm The Sole Ltd will normally have in stock all equipment to satisfy an order, however if due to supply problems beyond our control an item (or items) of equipment are not available then that order delivery note will be clearly marked with the shortage(s).If payment of that invoice falls due before items are available, only material supplied is due for payment.
13) The buyer is expected to have accepted the goods upon delivery. All complaints should be made within 7 days after delivery, after this period, complaints will not be valid. We do not accept returns without prior agreement, all returns will be done free of charge to us. Only on receiving the returns will a credit note or refund be issued.
14) Warm The Sole Ltd agrees to repair or replace free of charge any goods, which in the opinion of Warm The Sole Ltd are defective due to a manufacturing fault but this must be brought to the attention within the guarantee period. Warm The Sole Ltd will not be responsible either for the cost of removing any defective goods from any place where the said goods are installed or affixed or will make good of the said place after removal.
15) Any cancellation of an order must be made in writing, however any work carried out for this project that has incurred charges & time will be billed appropriately.

Design

16) Warm The Sole Ltd will be responsible for the heat loss calculations, floor pipe calculations & specification of the floor heating system. To calculate & specify accurately we need the following information:
    a) Scale floor plans, elevations & if possible sections through the property.
    b) Details of floor constructions & floor coverings. If this information is not available then a provisional price & specification will be supplied based on the information given to us.
17) All parameters used in the calculations & specifications are clearly shown on the quotation & it is the responsibility of the installer to check these & ensure that there are no changes between design stage & installation.
18) Warm The Sole Ltd will size pumps capable of supplying the necessary flow rates against the calculated pressure loss of the index circuit on each manifold with a sensible allowance for pressure drop in the flow & return delivery pipe-work. Flow & return pipe work routes & installation are out of our control, should the pressure drop be excessive due to long runs or under-sizing we will not be responsible for under performance of the pump(s).
19) All delivery pipe-work should be sized & installed in accordance with good practice guides, to assist the engineer Warm The Sole Ltd will provide the heat load requirements for the circuit.
20) With regard to add-on floor heating to an existing system, we will endeavour to provide sufficient information & equipment to enable the installer to link the floor heating with whatever is already there. But unless we have all relevant information this may not be possible, remember that you the installer are there on site, we are not!

Training

21) Facilities are available for technical training in both mechanical & electrical aspects of floor heating installation. These facilities are in place to assist the installer company to fully understand the concept of a successful installation. We strongly advise installers to take advantage of this.
22) Warm The Sole Ltd supply all information required to enable the installer to complete an excellent heating system, however we have to assume that trades involved with an installation are knowledgeable in their respective disciplines. Floorwarming is not difficult, just different, and it is simply another way of heating a property.

Pricing

23) All prices are calculated according to the conditions at the time of the calculation & shall be honoured for 60 days from date of quotation or longer at the company's discretion, eventual price increases are totally at the buyer's expense.
24) The area & site must be prepared & ready for the installation team. Any delay or additional labour required to assist in preparation will be duly invoiced at £16.00 per man per hour. Additional visits will be invoiced on an hourly basis + travel. Payment for installation of floor heating equipment is due when the manifold & under-floor pipes are fitted, filled & tested. The client must ensure there is an adequate water supply available for the filling & pressure test.

VAT on new private dwellings

25) When Warm The Sole Ltd supply & install a floor heating system into a new private dwelling & the owner invoiced, this can be zero-rated.

VAT on buildings unoccupied for three years or more

26) Following recent rule change, any material supplied for a property that has been vacant for three years can be supplied at a reduced rate. Please check for current rate.

Invoicing

27) On receipt of your order being processed & sent, an invoice will be issued to cover the total cost of the system.

Payment

28) Payment must be made before collection or delivery. Except by companies who have approved accounts with Warm The Sole Ltd that are active & not suspended.
29) Account customers must make payment for an invoice within their agreed terms with Warm The Sole Ltd, these terms must be adhered to. Overdue invoices will be subject to The Bank of England base rate plus an additional 8% surcharge on the amount not contested should there be a dispute or query on part of an invoice.
30) Accounts that fall overdue by 7 days could result in that account being suspended unless communication has taken place to confirm the reasons why. If there proves to be no reason for non-payment then the account will be on hold until it is cleared in full.
31) It is the account customers responsibility to ensure payment is made on time, Warm The Sole Ltd will not be responsible for issuing reminders except for a statement issued in the first week of every month.
32) If there is any dispute over an invoice Warm The Sole Ltd accounts department must be notified within 7 days of the tax point date stated on the invoice.
33) The supplied goods remain the property of the seller until fully paid, even if the goods have been delivered to the buyer.
34) If not paid in time, the seller holds the right to retrieve the goods from wherever they may be located, even with third parties, without up front warning & at the entire cost of the buying party. Furthermore, the buyer commits himself to protecting the seller against any procedures & difficulties the latter could suffer whilst retrieving the goods from a third party.
35) The buyer shall not be entitled to withhold or off set payment of any amount due to Warm The Sole Ltd whether in respect of a claim by the buyer in respect of goods supplied by Warm The Sole Ltd or for any other reason which is contested or for which liability is not admitted by Warm The Sole Ltd. A credit note will be raised should an issue arise & has been agreed by Warm The Sole Ltd.
36) Should, at any time the buyer being a company alter it's constitution or being a sole trader or partnership become incorporated or amalgamated with others it shall be the duty of the buyer to give prior written notice to Warm The Sole Ltd of the intended change. Continuation of trading with a new entity shall be reviewed after relevant reference checks & acceptance by a director of Warm The Sole Ltd
37) Should the buyer sell on the goods to a third party (principal), the buyer shall be required to store the goods in such a way and clearly show the sellers ownership of them.
38) The buyer must also be able to notify Warm The Sole Ltd upon demand of the place or places where the goods are situated.
39) The buyer shall give Warm The Sole Ltd access to the goods during normal business hours whether the goods are upon land occupied by its customers or Warm The Sole Ltd. This allows Warm The Sole Ltd to deliver the goods to the seller's request & to remove the same. This in turn is granting by the buyer an irrevocable right to enter upon the said land.

Termination

40) Warm The Sole Ltd may suspend further supplies or deliveries, stop any goods in transit or terminate the contract by notice in writing to the buyer if the buyer is in breach of an obligation or become unable to pay it's debts when they fall due or proceedings are commenced by or against the buyer alleging bankruptcy or insolvency. Upon termination the debt owed to Warm The Sole Ltd becomes immediately due and Warm The Sole Ltd shall be under no further obligation to supply goods to the buyer.

Law

41) Any Contract between the company & the buyer shall be construed in accordance with the laws of Scotland. All parties shall agree to submit to the jurisdiction of the Scottish Courts.

Technical queries/site visits

42) In general, installations that follow the piping & wiring diagrams will present no problems If installers familiarise themselves with the various pieces of equipment then most on site problems can quickly be resolved by the installer. It is the installer's responsibility to ensure that the Warm The Sole system is correctly installed, other trades are aware of their responsibilities & the complete system is commissioned & explained to the end user.
43) Warm The Sole Ltd will freely give information to the best of our ability regarding aspects of a floor-warming installation. With regards to other trades' involvement with the installation, we must assume that general information given only serves to re-enforce general competence in that trade. For instance we cannot be held responsible if wood is laid on a screed that has not been properly dried, or if vast runs of under sized pipe-work are installed to serve a manifold.
44) Warm The Sole Ltd. will on request make a site visit to resolve a problem that the installer cannot rectify. Site visits by Warm The Sole Ltd will be made under the following conditions:
    a) Reasonable & sensible notice must be given due to possible distances & travel time involved.
    b) Assurances must be given that the installation conforms to Warm The Sole installation instructions.
    c) Trades involved with the installation will also be on site.
45) If a problem proves to be a faulty design or material then Warm The Sole Ltd will resolve the problem.
46) If the problem proves to be a faulty installation or control wiring then the fault should be advised to the contractor &/or plumber. Warm The Sole Ltd will invoice the company or individual for the full cost, time travel & equipment of the site visit.
47) Installation by Warm The Sole Ltd includes the placing and fixing of the heat pipes into the installation/concrete/reinforcement/timber sub-floor, the placing of the manifolds & the connecting of the pipes to the manifold. The filling & pressurizing of the system. Installation is a separate chargeable item. This is separate from the cost of materials supplied.
48) Installation by Warm The Sole Ltd excludes supplying & installing of insulation, reinforcement mesh or joiner/builder work the pipe work for flow and return connections from manifold to heat source and all electrical work.

Warranties & Guarantees

49) Warm The Sole Ltd provides a ten year system guarantee warranty in writing, from the date of delivery on the quality of the Warm The Sole piping & manifold systems. Pumps & controls are covered by individual manufacturer's guarantees.
50) Following the 1st 10 years of guarantee, Warm The Sole Ltd will guarantee the pipe for a further 40 years. In this instance the liability of Warm The Sole Ltd shall be limited to supplying the replacement pipe free of charge.

These conditions do not supersede statutory rights under the sale of goods act but are designed to clarify the principles & procedures by which Warm The Sole Ltd operate.

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