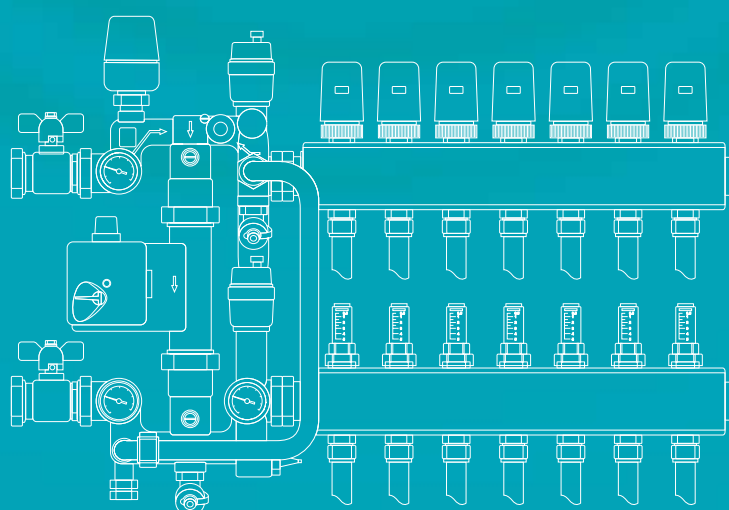




BEGETUBE UK UNDERFLOOR HEATING SYSTEMS

TECHNICAL MANUAL

VERY IMPORTANT POINTS TO ASK YOUR SUPPLIER

Is your supplier a full member of the Underfloor Heating Manufacturers Association (UHMA)?

Begetube is

Is your supplier a well-established business within the floor heating industry?

Begetube is

Does your supplier carry out full and proper heat loss calculations that guarantees room temperatures?

Begetube does

Does your supplier offer a comprehensive insurance backed 10-year guarantee covering all incidentals on the pipe, manifold and all mechanical components?

Begetube does

Does your supplier use a one-piece manifold for distribution and a sensibly sized diameter of floor heating pipe? Good practice is to use a pipe diameter between 16mm and 20mm (Output is governed by surface area of pipe).

Begetube does

Does your supplier use a pex-based pipe with oxygen diffusion barrier?

Begetube does

Does your supplier specify a full and proper control system that controls **every** room/area individually, including wet areas?

Begetube does

Does your supplier offer you the industry leading Combimix which offers precise fixed water temperature control and promotes a low return water temperature, ideal for today's modern condensing boilers?

Begetube does

Does your supplier offer you the option of full weather compensation control linked to intelligent sensors, the most precise and efficient underfloor heating control system on the market today?

Begetube does

Does your supplier have a network of approved installers throughout the UK that all work to a very high standard?

(see picture below)

Begetube does

Does your supplier offer FREE immediate technical help 7 days a week?

Begetube does, put us to the test now, phone 01463 246600 or 07771 773618 (ask for technical help)

Does your supplier continually phone you and ask for your order?

Begetube does not! we are however here to help, please phone the above numbers.

Please bear in mind that a quality underfloor heating system is an integral part of your house and it should be designed up to a high standard, not down to a price.

The cheapest bottom line price will not always, in the long run, be the "cheapest".

Please ensure you fully understand what you are getting for your money and always ask if you are unsure.

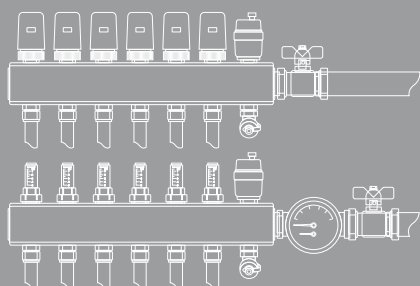
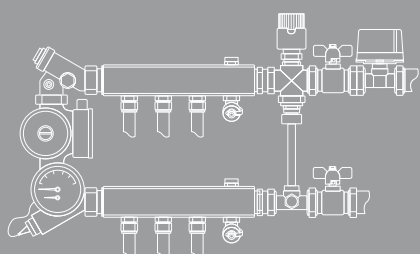
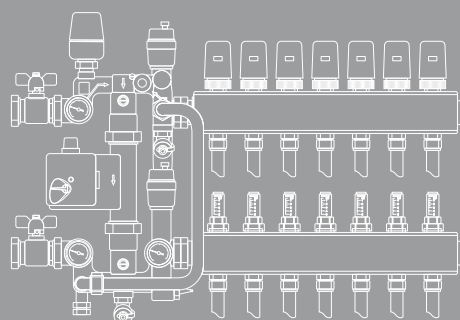


A typical example of a Begetube installation, all our approved installers are carefully selected to ensure a high level of workmanship and after sales care.

*Please note from the photograph that a Begetube system always uses a main distribution manifold and **not** several smaller manifold sets with smaller pipe. This ensures all joints are accessible and above floor level.*



THE MARKED BOXES ARE THE PAGES
RELEVANT TO YOUR JOB REFERENCE:



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GENERAL OVERVIEW

The **Begetube** underfloor heating system offers the complete solution – creating the perfect comfort zone in any environment. A truly beautiful floorwarming system, Begetube 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), Begetube 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.

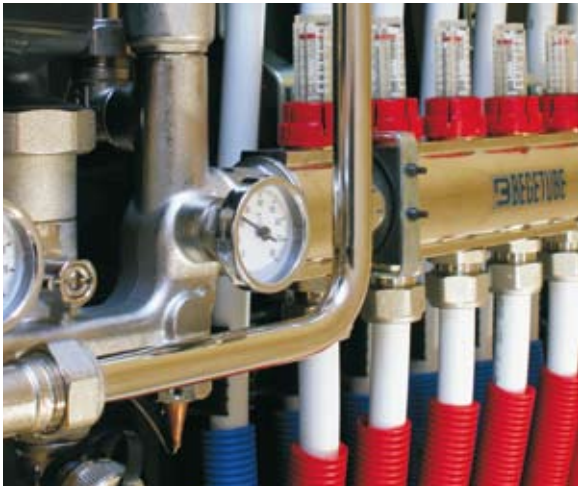
Begetube is a new way of looking at your heating needs. When you choose an underfloor heating system, your thinking is no longer dominated by where radiators are going to go – which walls are going to be sacrificed? Now you can have both heat and complete freedom in interior design. We all know that 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 **Begetube** 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 Begetube 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 **Begetube** 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 economical 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.

New Skoda dealership - 1200 sq. metres



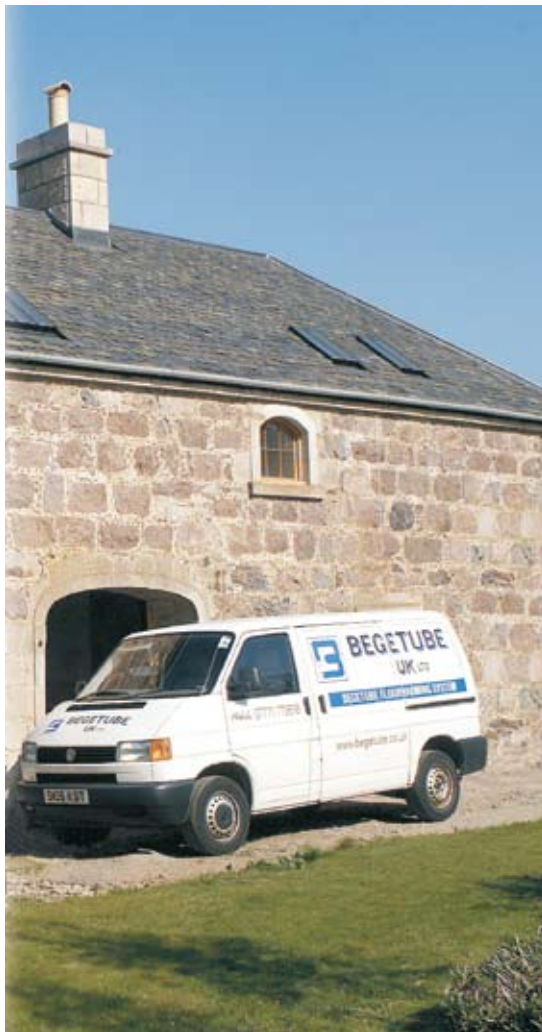
A **Begetube** underfloor heating system inspires confidence. It has quality built-in from the initial design work right through to the innovative manifolds and pumps used in the control systems.

The foundation of this quality, however, is the pipe. We use 5 layer IVAR-PEX pipe to carry the warm water in a continuous circuit under the floor. PEX (or cross-linked polyethylene) is recognised worldwide as the premier performer in this field and 5 layer IVAR-PEX 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 **Begetube** 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.

A **Begetube** underfloor heating system can be installed by one of our approved installers, your own plumber or heating engineer – or by yourself. From your initial enquiry through to final commissioning, our technical team is always available to give expert advice on any aspect of your system. Accurate design is an essential foundation – and our design staff are fully qualified to ensure that the system supplied will match all the requirements of your property. All our design work is fully indemnified and carries a guarantee without limit of time.



Installation will most likely be completed by one of the Begetube UK approved installers. Our network of installers is growing rapidly across the UK and Ireland – reflecting our unrivalled service, quality and price. Once a contract is agreed, we will immediately supply all the necessary equipment and piping and wiring diagrams needed to complete the project as quickly and efficiently as possible.



Self-installation of a Begetube underfloor heating system is an option you may wish to consider. If it is your preferred option, then we will give you all the support you require to ensure that the project is a success.

Contained in this technical manual are full installation instructions and plant & wiring diagrams for all our main types of underfloor heating systems. This information will give you a comprehensive insight into underfloor heating and allow you to:

- **Successfully choose the correct system.**
- **Successfully install, commission & operate your chosen system.**

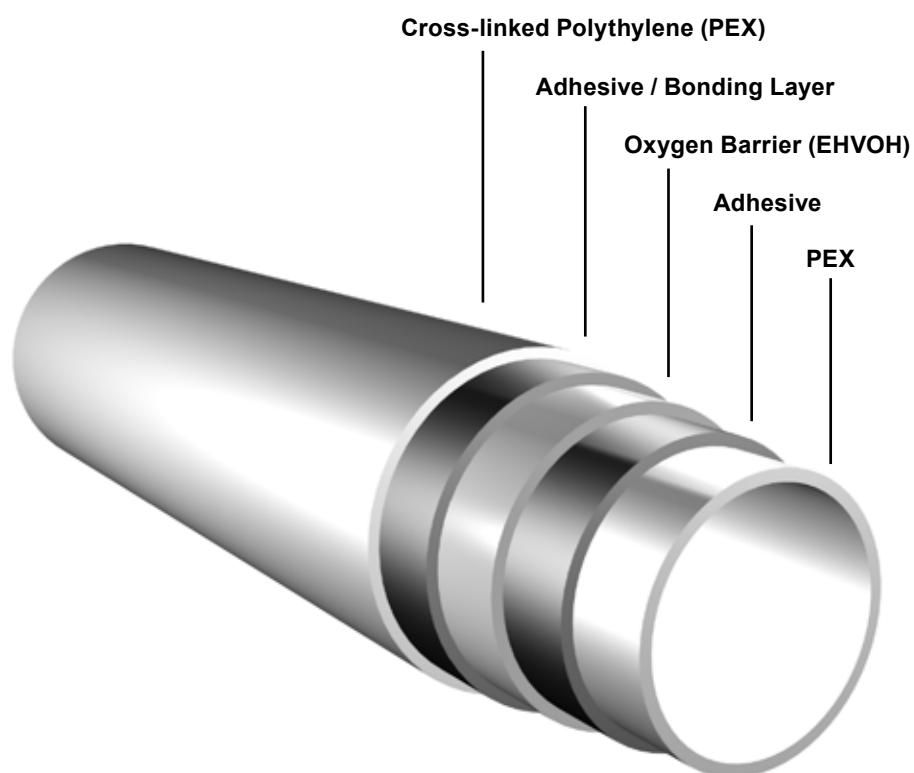
Our technical team will provide support – answering any questions you may have. If you want to consider the pros and cons – then do get in touch and we'll be happy to talk it through with you.

Whether we install the system for you – or assist you with self-installation – our aim is to ensure that the end result is a heating system which is unequalled in terms of performance, control and the quality of its components. If that sounds like the complete solution to all your heating needs – **then do call us today.**

PIPE

WHY 5 LAYERS?

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 IVAR-PEX 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)	$0.85 \times 10^{-4}/^{\circ}\text{F}$
Coefficient of linear expansion (180°C)	$1.6 \times 10^{-4}/^{\circ}\text{F}$
Brittleness temperature	Below 0°F

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.

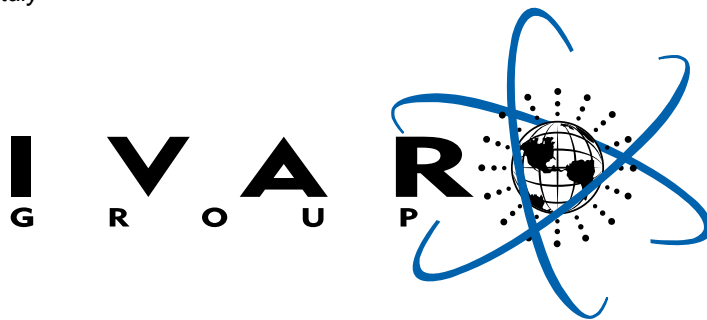
The basis of any well-designed heating system is to provide a comfortable environment for the occupants, so it is worth thinking more along the lines of heating the occupants- not the building.

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 **Begetube** floor heating system, it is not difficult, just a little different to the heating systems normally used.



Ivar Factory, Brescia Italy



Begetube UK Ltd. is part of the Ivar group of companies, the group operates Worldwide and Ivar in their own factory manufactures all the mechanical components used. Any Begetube system providing it is correctly installed, will benefit from a ten-year system guarantee. The guarantee is insurance backed and covers all incidentals.

THE
UNDERFLOOR
HEATING
MANUFACTURERS' ASSOCIATION

Begetube UK Ltd. is a full member of the Underfloor Heating Manufacturers Association (UHMA)

PRINCIPALS & BENEFITS

Thermal comfort of building occupants is dependant 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 electro magnetic 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.



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.

GENERAL DESCRIPTION

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 **Begetube** 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.

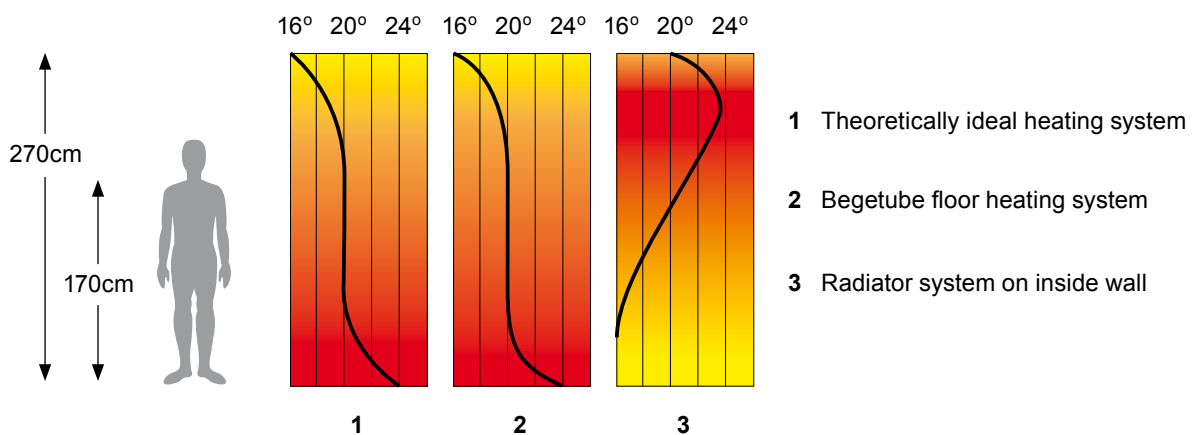
The **Begetube** floor-heating pipe is cross-linked polyethylene with an EVOH oxygen barrier built into the pipe wall. Pex is an incredibly durable material and accounts for about 60% of all UK floor heating installations. The actual life span of this material is unknown but mechanical testing at elevated 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 UNDERFLOOR HEATING

The **Begetube** 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 page 7)



For detailed information regarding suitable floor coverings see page 57



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.

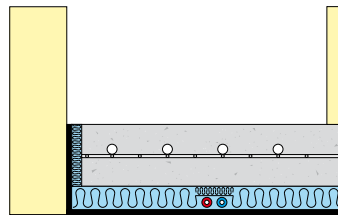
HOW TO USE FLOOR HEATING

When the decision is made to use floor heating, the first consideration should be the floor construction.

The three common types of floor construction are:

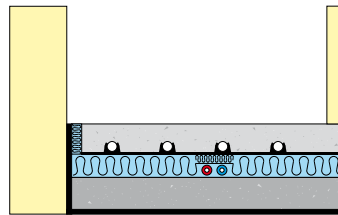
- **Solid ground bearing slab floor**
- **Screeded floor**
- **Suspended timber joist floor**

Solid slab floors would normally be used in commercial buildings with high floor loads, such as warehouses and garages, but can also be used in domestic situations. The build up of this type of floor provides a large amount of thermal mass; subsequently the floor structure will be slower to respond to different heat requirements. This is not a problem as long as a sensible control system is applied to the project. **Begetube** systems will always have an appropriate control set available for all projects.



Solid ground bearing slab floor
(see page 14)

Screeded floors are commonly used in domestic applications; other buildings that would benefit are schools, hospitals, offices and nursing homes. The response time with this floor structure is more suited to buildings that are permanently occupied and require a day/night set back system.

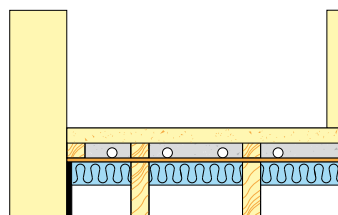


Screeded floor
(see page 15)

Timber joist floors, either ground or intermediate, can be addressed in different ways. A timber floor has no thermal mass and some adapting is required to the structure to enable floor heating to be installed and operate successfully.

The best results are obtained by fixing the pipes between battens and infilling with a sand cement mix, the floor panels are then fixed to the battens. This method can be used either on top of the joists, or by fitting battens between the joists it can be lowered so that the floor panels are still fitted onto the joists with no increase in floor structure height.

Another method is to use profiled metal plates as a means of spreading the heat energy under the floor panels, this method does not impose a weight penalty but the energy output is lower than the batten and screed method.



Suspended timber joist floor
(see page 17)

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.

Begetube 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.

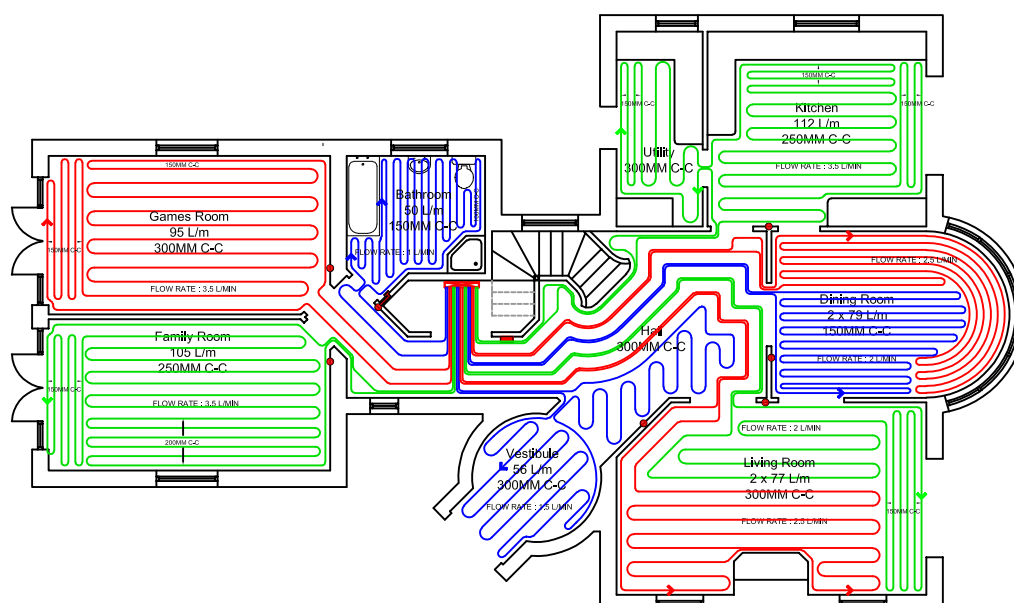
The information required to produce a design and specification is listed below.

- **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.

Begetube 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.



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.

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 **Begetube** 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 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) By the use of a mechanical blending valve, this method is used in our standard control **Combimix** system and delivers a fixed water temperature as set on the valves head. b) By the use of an electro-mechanical 3 or 4 port blending valve, this method is used in our **Intelligent Control** system and delivers a variable water temperature governed by the prevailing climate conditions inside and outside the building. The **Intelligent Control** also has the benefit of self learning individual room sensors. These sensors provide the most precise control available in the underfloor heating industry. 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 or 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 **Combimix** system. The **Intelligent Control** 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). With the **Intelligent Control** option one or more fully programmable sensors are used within the system, this gives the ability to have a wide programme of time and temperature settings in all areas.



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 **Begetube** all our control systems are supplied with purpose made wiring centres with simplifies and speeds up the electrical installation.

IMPORTANT POINT: The cost of wiring the **Intelligent Control** system is considerably cheaper than normal underfloor heating control systems as it utilises a 5 volt bus system to connect all the room sensors together.

SEQUENCE OF INSTALLATION

As already mentioned, a **Begetube** 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, **Begetube** 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 **Begetube** 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)

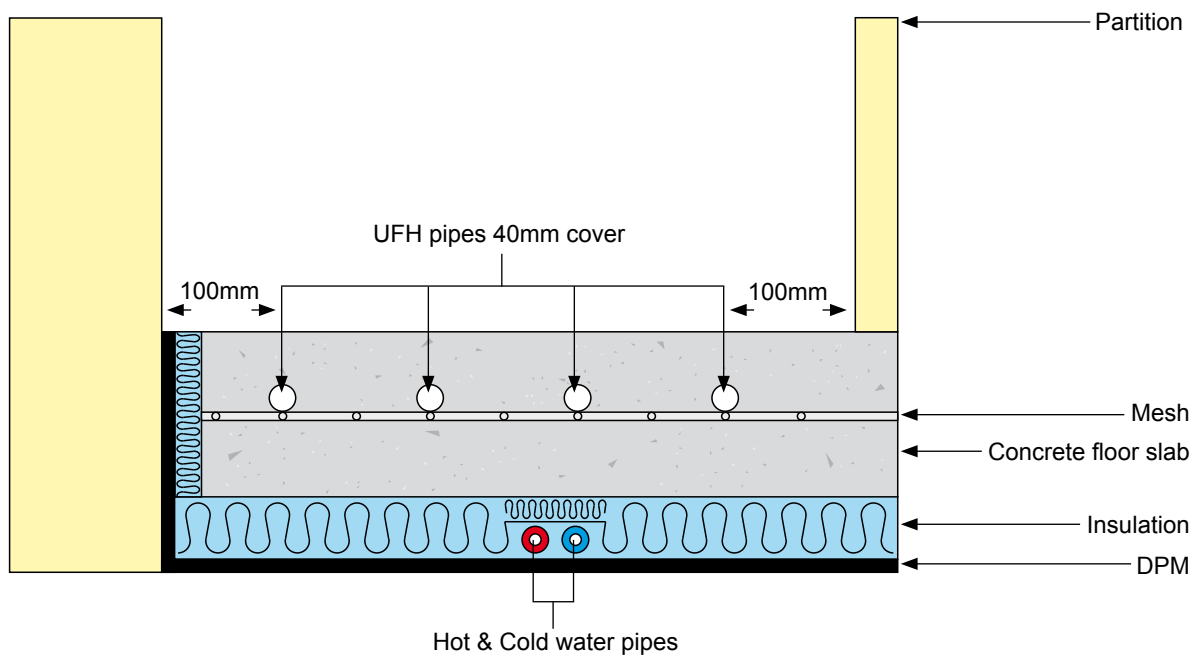
Balancing of the system circuits can now be carried out to the design requirements, followed by a complete check of all controls to ensure that they operate in the correct sequence.

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 **Begetube UK 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.

STRUCTURAL SLAB FLOOR



Structural Slab Floor

This floor construction consists of 100 to 125mm concrete incorporating builders mesh (normally A142) with UFH pipes tied to the mesh, over extruded polystyrene insulation, on DPM, sand and compacted hardcore. Insulation is also required around the perimeter of the slab. Due to the large mass of the concrete, this type of floor structure will have a longer initial heat up time but benefits from having more thermal inertia.

Method of Fitting the UFH Pipe

Lay mesh onto insulation so it completely covers the whole floor area. The neater the mesh is laid, the easier the pipe installation will be, this is because you use the mesh grid work as a guide to install the pipes at the correct centres. Try and line up the individual mesh grid work as best as possible and tie it together using the pipe fixings.

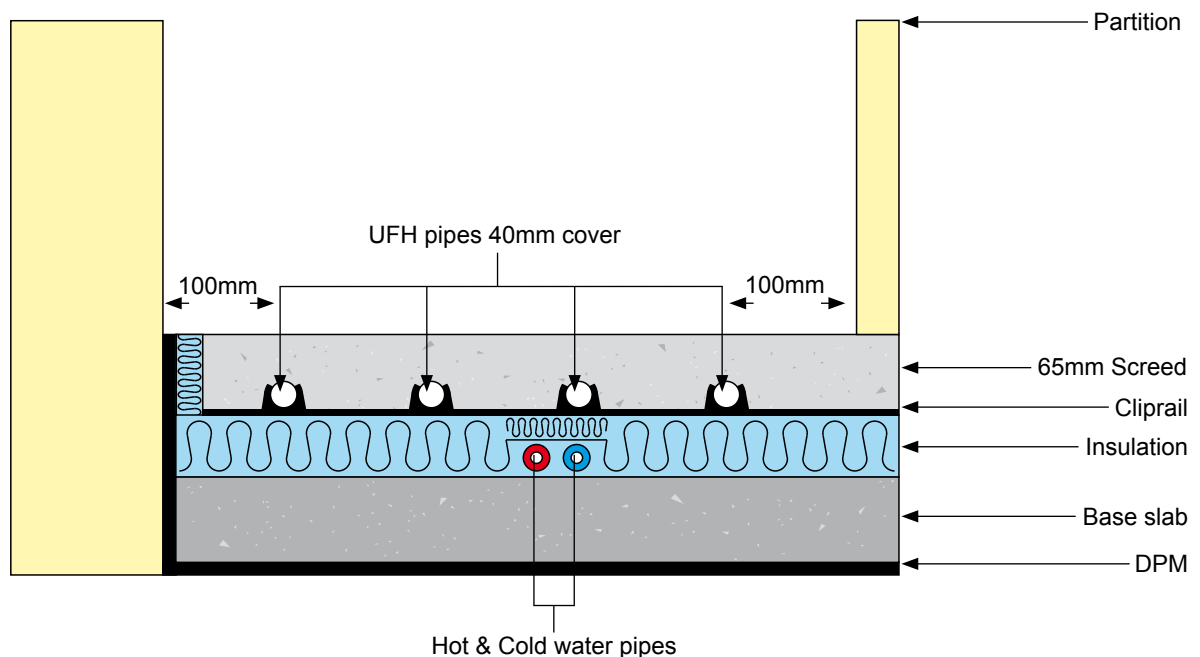
Following the CAD pipe layout drawing tie the pipes to the mesh following the spacing and pattern shown. The plastic coated tie wires are best tied using the tie wire tool available from Begeube. When all pipe work has been installed and connected back to the manifold, the completed installation is ready for pressure testing (see pressure testing section page 19).

Before the concrete is poured the mesh and pipe should be raised up on spacers to give 40mm cover over the top of the UFH pipes.

Note:

Insulation thickness will be determined by current building regulations, but it is worth noting that as the floor is being warmed heat will be lost down wards as well as up into the occupied space. It therefore makes good sense to apply as much insulation under the floor structure as the build budget can manage. Generally 75mm of extruded or 100mm of expanded polystyrene will suffice. If you have any queries regarding insulation please contact us.

SCREEDED FLOOR



Screeded Floor (Standard Sand & Cement)

This floor construction consists of 65-70mm screed on extruded polystyrene insulation over base slab on DPM, sand and compacted hardcore.

This type of floor construction gives excellent results with UFH and is more responsive than the slab floor.

Method of Fitting the UFH Pipe

There are various fixings available for this type of floor; self-adhesive clip rail, plastic staples (staple gun required) and metal push in clips (no tool required).

Normally the rails are used in conjunction with one type of the individual fixings.

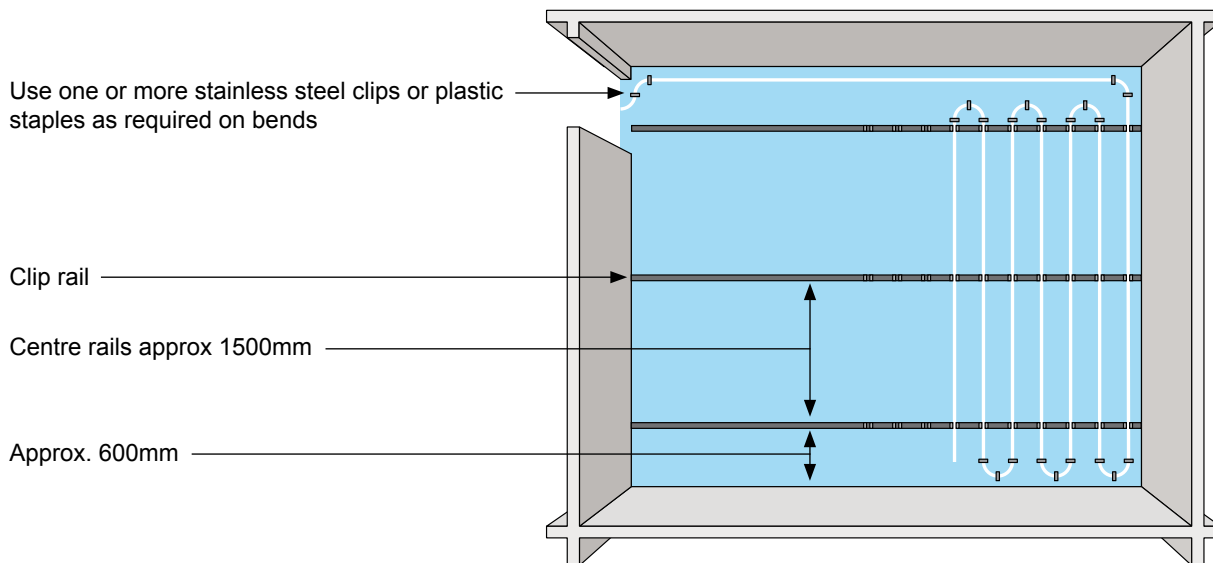
Rails are placed across the room in rows (see section on clip rails, page 16) Starting 600mm in from one end of the room the rails are spaced at 1-1.5m apart along the room and finish at the opposite end 600mm from the end of the wall. Using the clip rail cut outs as your guide, lay the pipe and "tread" into the rail cut outs. Finish off by using the individual fixings to secure all the pipe turns and any other bits of pipe work that are not secured to the insulation. When all pipe work has been installed and connected back to the manifold, the completed installation is ready for pressure testing (see pressure testing section page 19).

Note:

If using self levelling liquid screed it is important that all joints in the insulation panels are taped including around the perimeter. Pipe fixings will also have to be doubled as this type of screed is very dense and could cause the pipe to "float" to the surface.

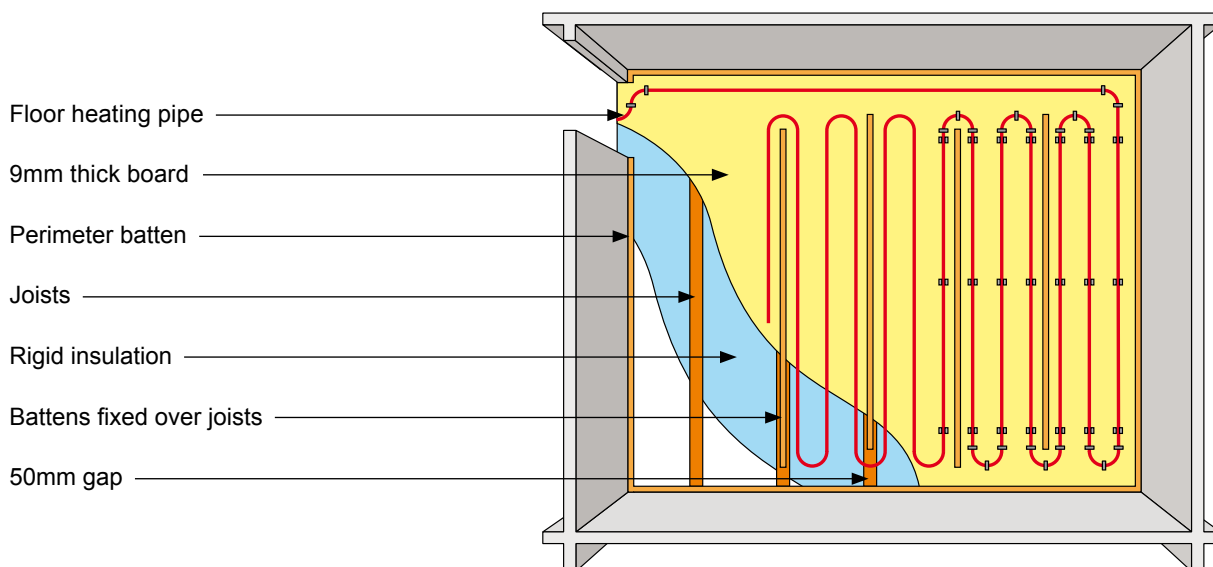
CLIP RAIL & BATTEN LAYOUT

TYPICAL CLIP RAIL LAYOUT
(VIEWED FROM ABOVE)

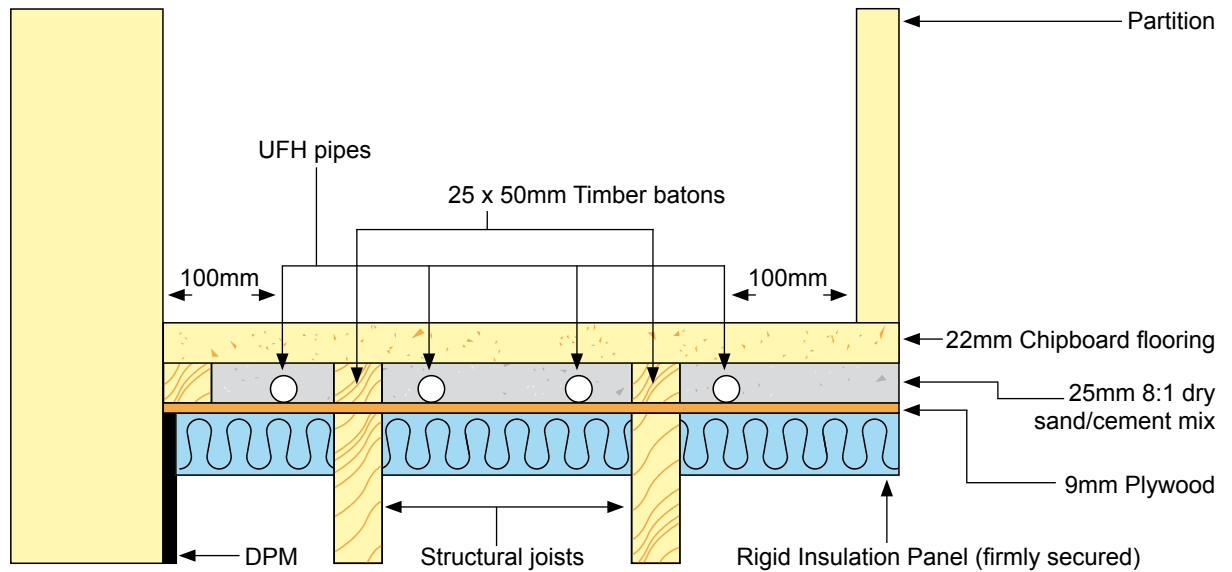


Clip rails are designed to stick onto smooth finish insulation boards
They can be screwed down if required
Clean floor thoroughly before fixing rails

SAMPLE VIEW OF BATTENS (25mm x 50mm) OVER 9mm PLYWOOD FOR JOIST FLOOR CONSTRUCTION
(VIEWED FROM ABOVE)



SUSPENDED TIMBER FLOOR



Suspended Timber Joist Floor

Timber joist floors have no thermal mass, for best results with UFH a small amount (25mm thick) of weak sand and cement can be laid between the battens to surround the UFH pipes. The sand and cement should be up flush with the top of the battens to ensure good contact with the underside of the flooring panels. It is essential that a rigid insulation board (**not glass wool**) be used to insulate hard up the underside of the plywood (see diagram). Using this method the floor is raised by 34mm higher than it would have normally been and adds approximately 25kg/m² in weight.

Method of Fitting the UFH Pipe

Make up the floor construction as per the floor section to batten level. Follow the diagram as per the fitting of the battens, (see page 16) please ensure that 25x50 battens are used and not 2"x1"s.

Clip pipes using the plastic and nail hammer clips provided, following the CAD drawing layout. When all pipe work has been installed and connected back to the manifold, the completed installation is ready for pressure testing (see pressure testing section page 19).

Note:

Before closing the floor down ensure the pipes are pressure tested and that any remaining moisture has been given time to come out of the weak dry sand and cement mix.

Also ensure that the sand and cement mix is flush with the top of the battens, top up if necessary.

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 page 21). 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 your self with all the installation instructions before starting the installation. If you have any queries, please raise them with your supplier.

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. (see next page)

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 your 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.

FLOOR STRUCTURES



SCREED FLOOR



SLAB FLOOR

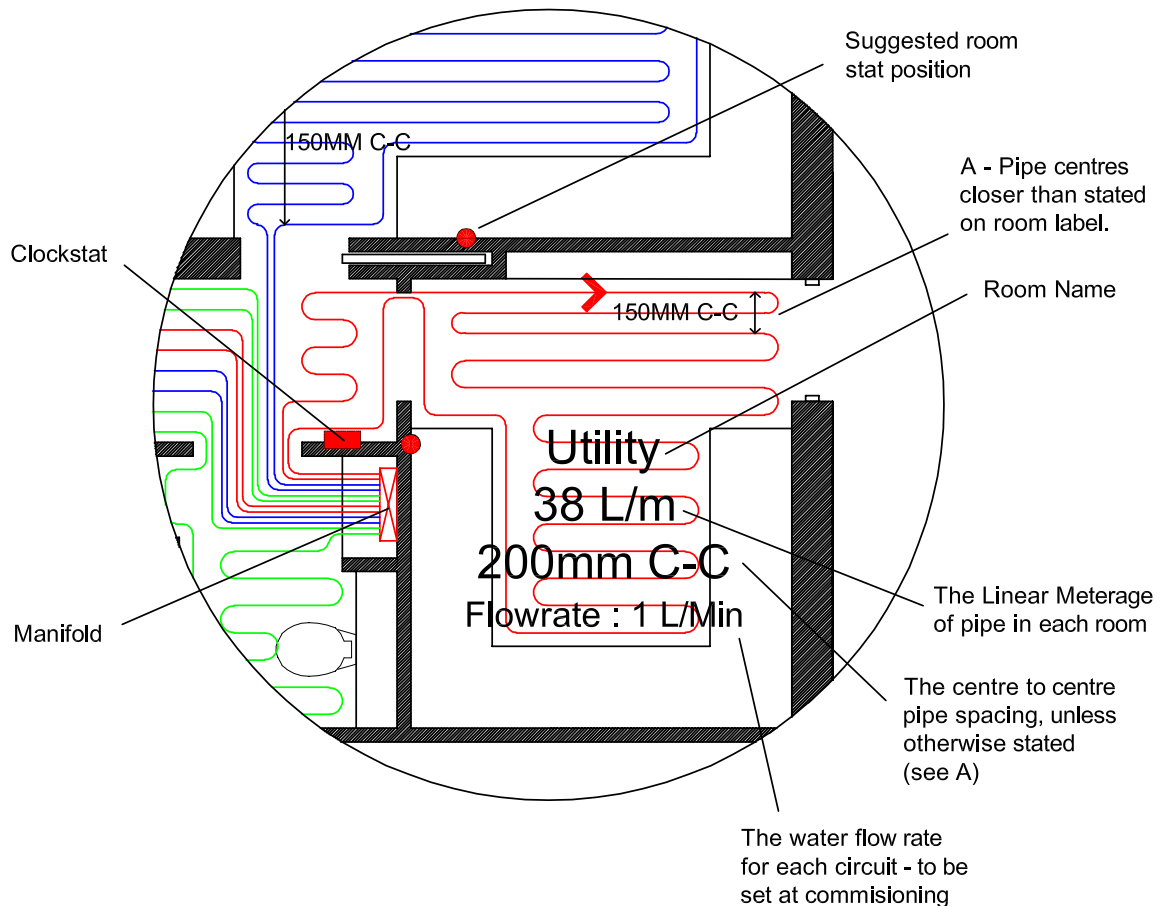


TIMBER JOIST FLOOR

READING A CAD *PIPE LAYOUT DRAWING*

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.

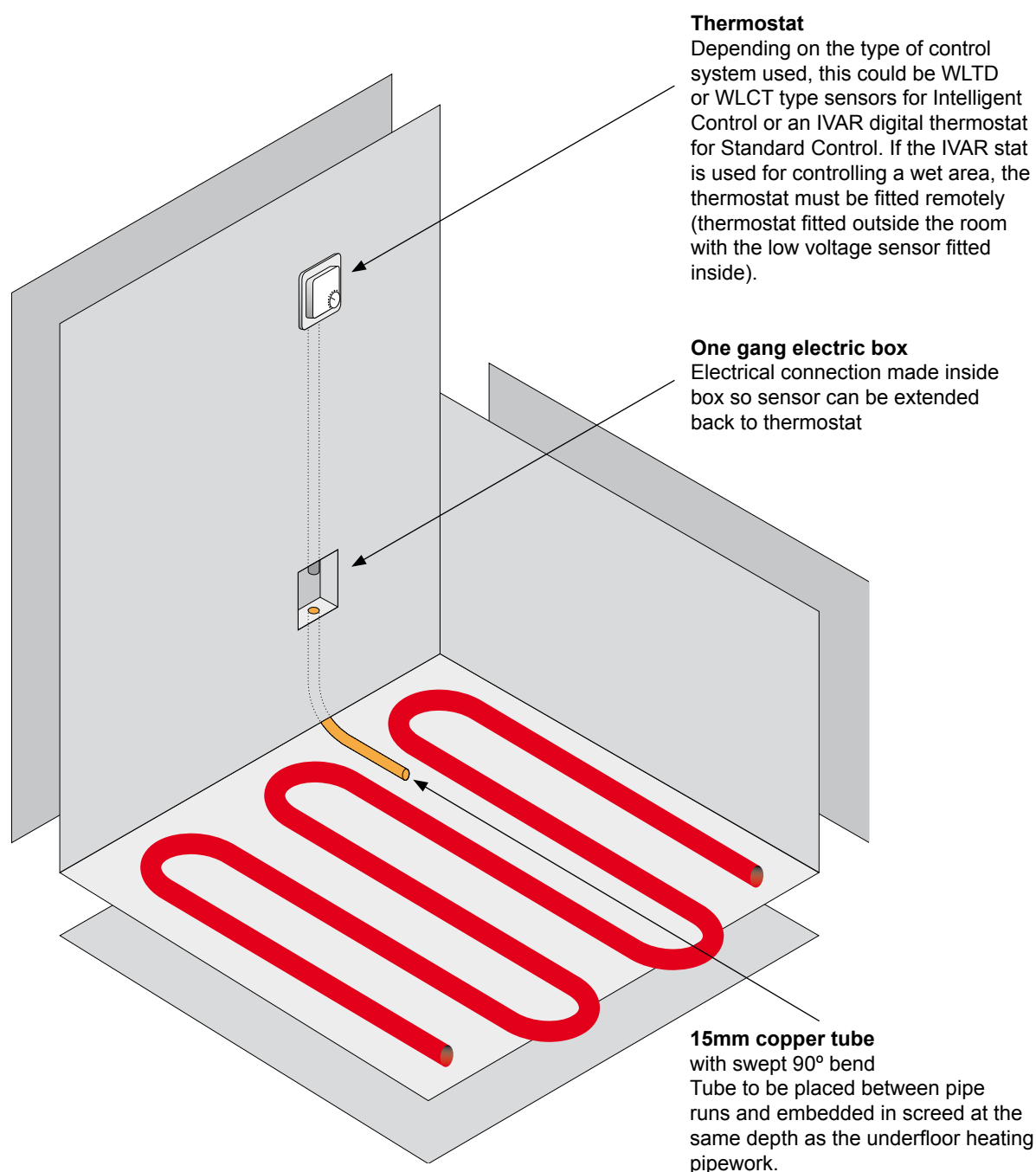


Important points

- 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 manufacturers instructions/recommendations.
- Keep pipe work 100mm in from all partitions, perimeter walls and permanent fixtures.

FITTING OF 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.



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

STANDARD CONTROL COMBIMIX

The following pages details the plant and wiring diagrams for a multi zone standard control Combimix 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.**

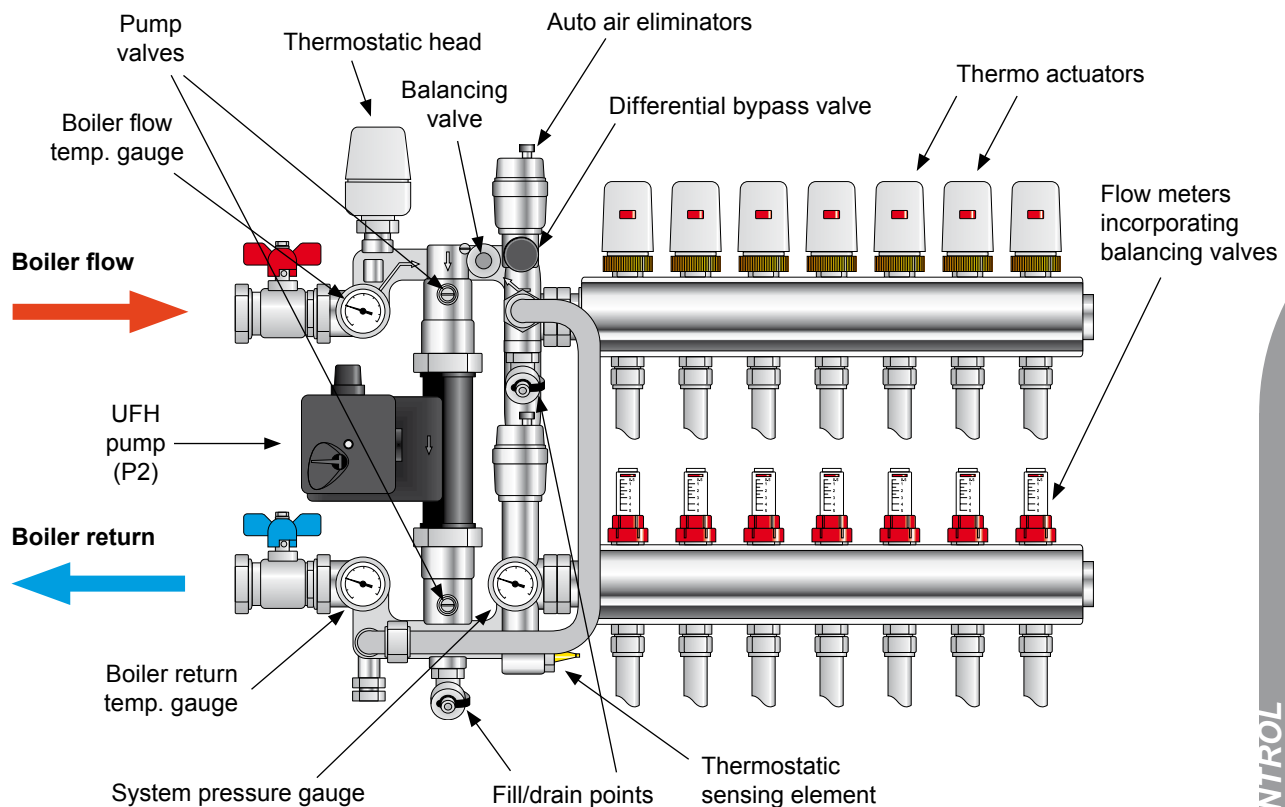
Notes for the Heating Installer

- 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.**

ABOUT THE MANIFOLD COMBIMIX



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.

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.

System Pressure Gauge: Indicates the system pressure.

Boiler Flow Temperature Gauge: Indicates boiler flow temperature.

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.

Differential Bypass Valve: Adjustable from 0.2 - 0.6 bar, this valve protects the manifold pump in case of simultaneous closing of all individual circuits.

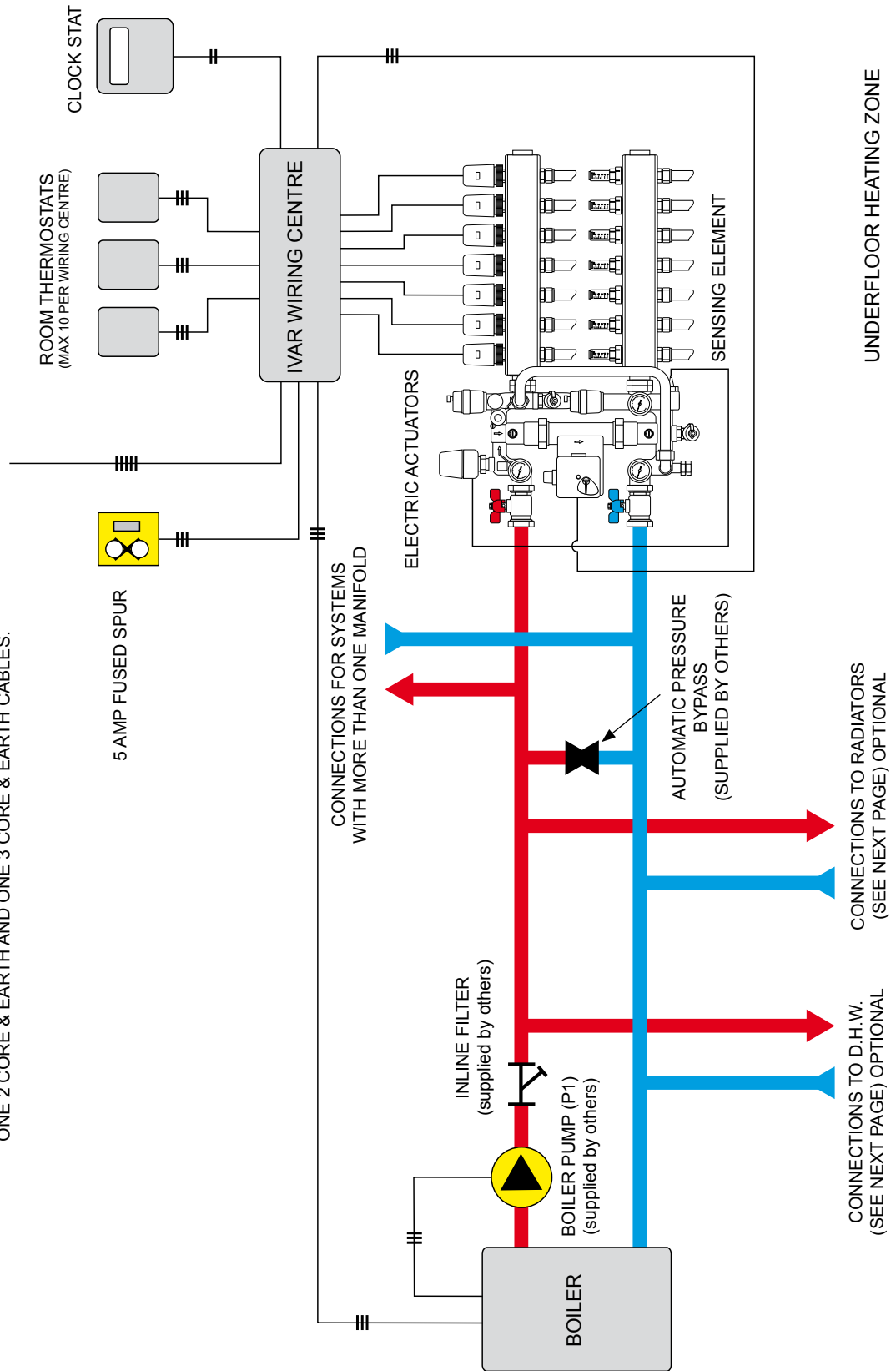
Balancing Valve: Gives the ability to balance the flow losses of the secondary circuit (UFH) with the primary circuit (e.g. radiators). The system is supplied with the balancing valve in position 2.5 which is the one that meets the requirements of most systems. For full details see Combimix brochure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

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

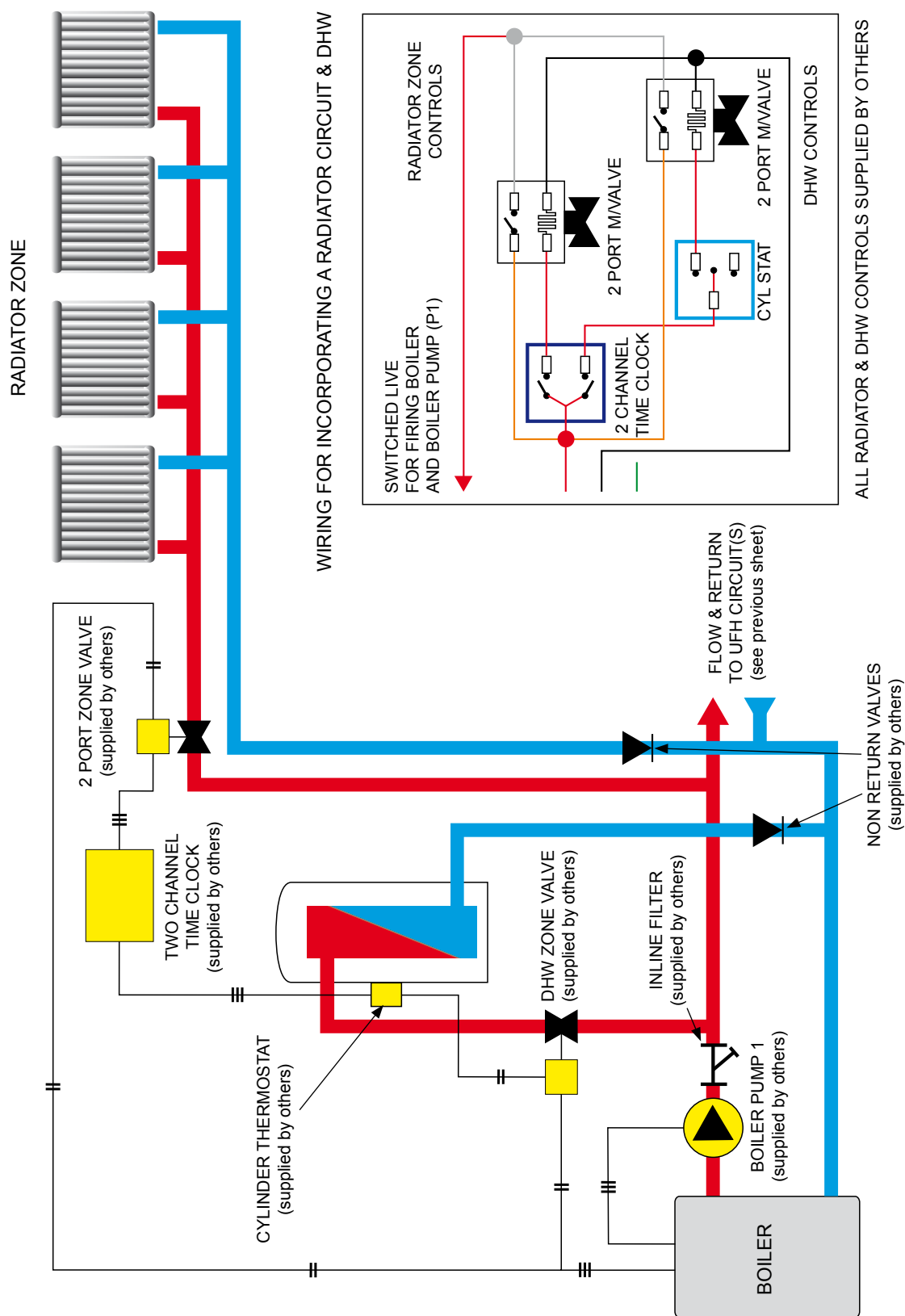
STANDARD CONTROL PLANT LAYOUT

25

IF THERE IS MORE THAN ONE WIRING CENTRE, LINK EACH WIRING CENTRE WITH ONE 2 CORE & EARTH AND ONE 3 CORE & EARTH CABLES.



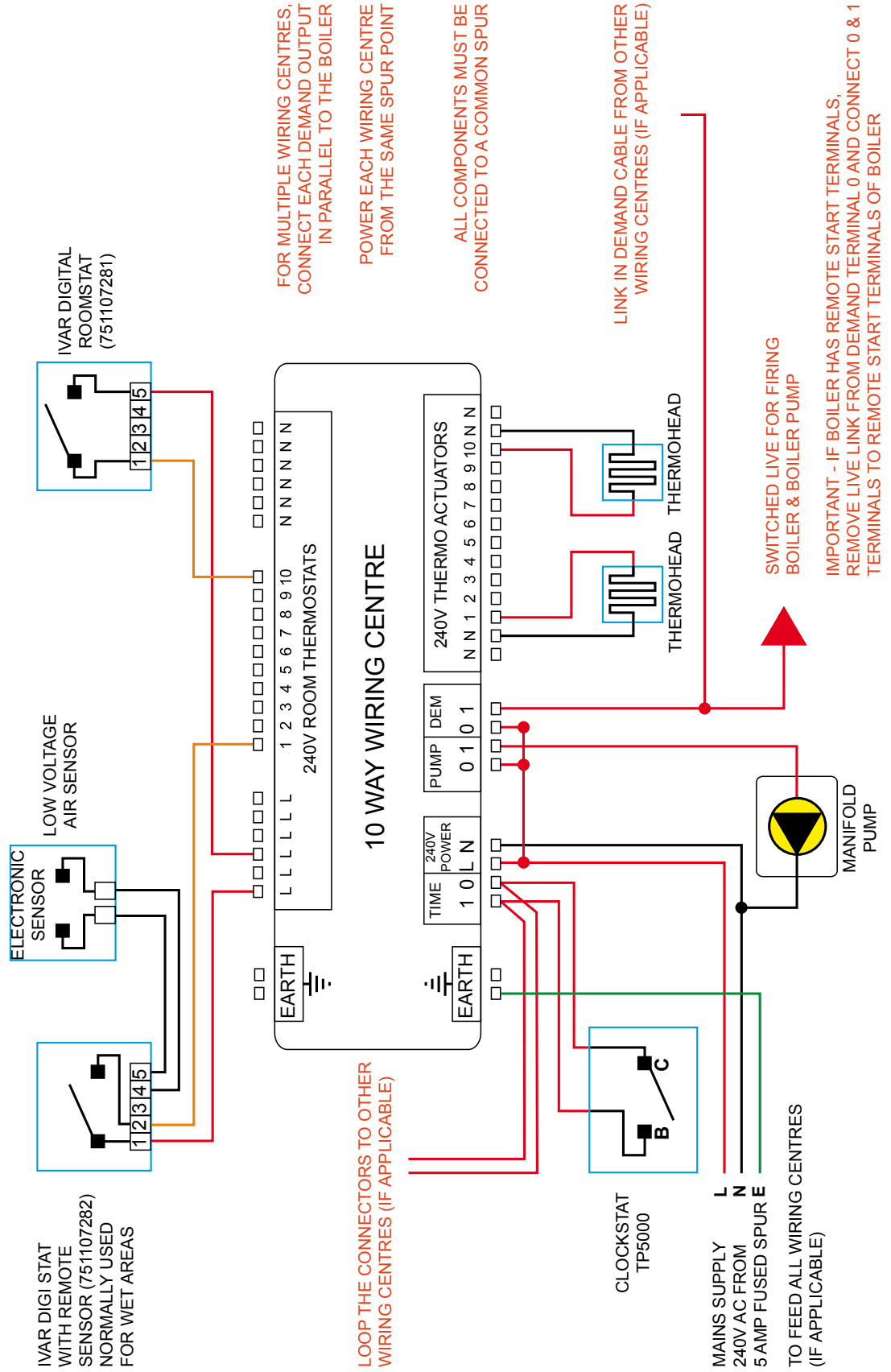
SCHEMATIC PLANT & WIRING LAYOUT INCORPORATING RADIATORS AND INDIRECT DOMESTIC HOT WATER



STANDARD CONTROL WIRING CENTRE

27

THE ROOM THERMOSTAT CONNECTIONS BELOW SHOW ONE EXAMPLE OF EACH STAT NORMALLY USED. DIFFERENT STATS CAN BE USED BUT PLEASE CHECK WITH SYSTEM SUPPLIER



COMMISSIONING *COMBIMIX STANDARD CONTROL*

This system utilises the Combimix to control the temperature of the water in the floor heating system.

The plant layout and wiring diagrams also show how to connect this type of floor heating system in with a radiator system and domestic hot water system. If one or both of these systems are not in the installation simply ignore the plumbing and wiring for the non-relevant part. 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.**

OPERATING INSTRUCTIONS STANDARD CONTROL

Floor Heating requires a different approach to control compared to conventional heating systems. There are three main elements of control for your **Begetube Underfloor Heating System** :

- 1 **Individual Room Stat control**
- 2 **Programmable Clock Stat for Night Setback control**
- 3 **Combimix for Water Temperature Control**

Room Stats: Set all your room stats to your required comfort temperature (typically 16°C - 22°C). Once you are happy with your setting do not make further adjustments. The room stats directly control the actuators on the manifold, opening or closing the appropriate group(s). As you do not need to have your house at full working temperature 24 hours a day.

We also utilise a **Programmable Clock Stat for Night Setback Control:** This Unit gives you the ability to set overall time temperature control with two different temperature settings. When you want your house to be at the room stat settings you time the clockstat to call for the higher temperature setting which you set artificially high (typically 26°C, as the rooms will only get as warm as the individual room stat settings). When you want your house to be at the night setback temperature you time the clock stat to call for the lower temperature setting (typically 16°C). Setting the clockstat to the night setback temperature will turn the boiler and pumps off until the temperature drops to 16°C at the clockstat. The temperature will only drop to 16°C if you have a lot of heat loss from your building (i.e. a very cold night). By having this setback control, it stops the house cooling right down during the night so it is not then struggling to bring the house up to a working temperature in the morning. To set the time and temperatures on the clockstat refer to the user instructions for the clockstat. If you want your house up to temperature by 08:00 set the clockstat to the higher temperature setting at 06:00. If you retire to bed at 23:00 you can set the clockstat to the lower temperature setting at 21:00. There is approximately a two hour lead time and a two hour lag out time.

Combimix for Water Temperature Control: This unit is attached to the manifold and its purpose is to blend down the high temperature water from your boiler to a lower temperature suitable for underfloor heating. The maximum temperature setting on the thermostatic head of the Combimix is dependant on the floor construction:

Timber Joist Floors have a maximum flow temperature of 60°C.

Concrete Floors have a maximum flow temperature of 55°C.

For most of the heating season these temperatures 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.

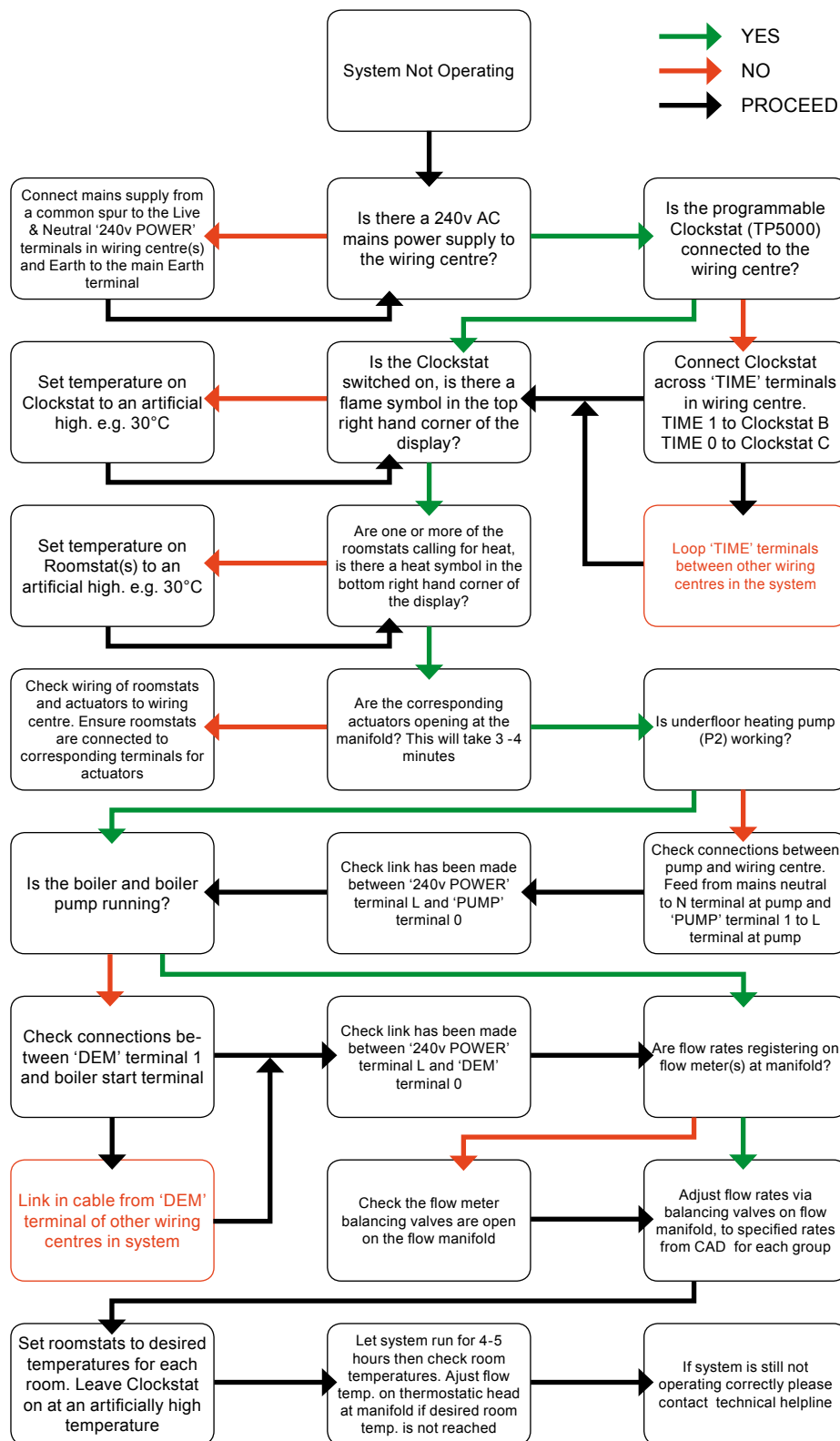
During the coldest spell set mixer to maximum for floor construction.

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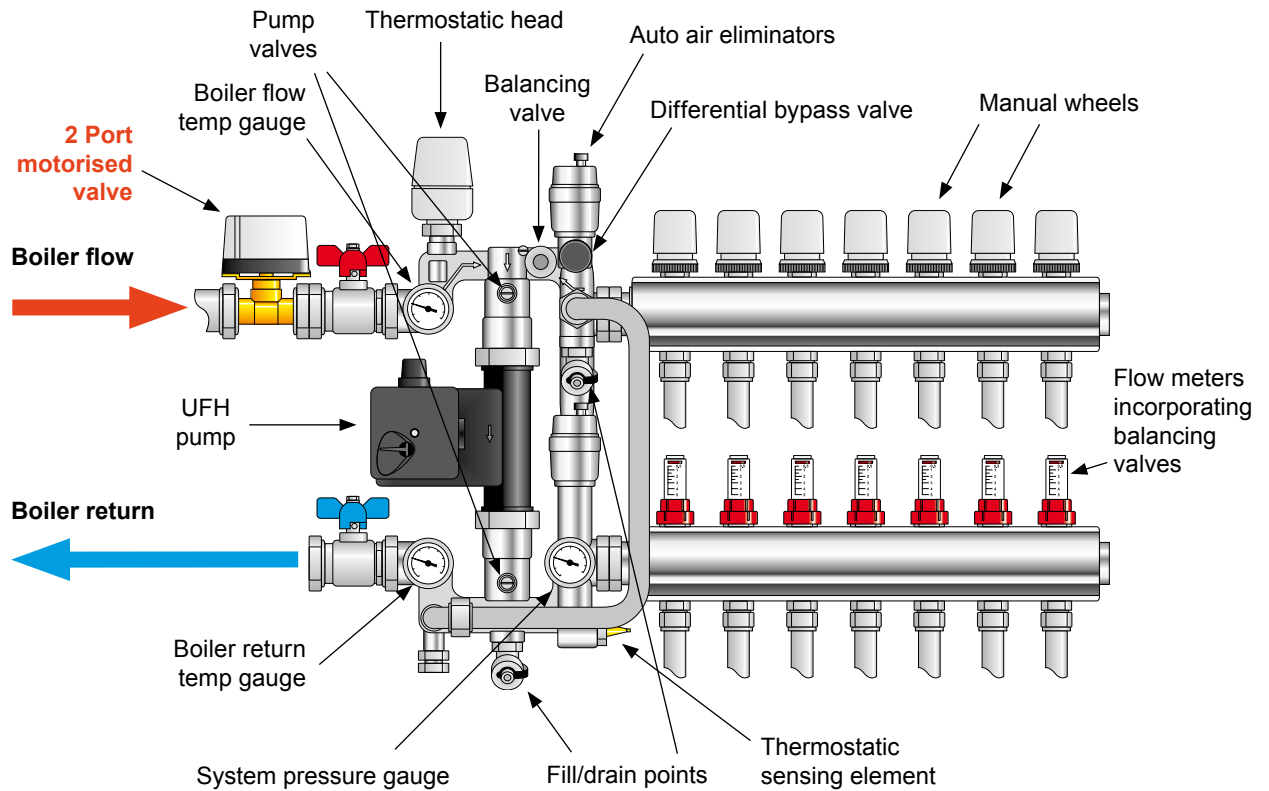
One of the main points to remember when controlling your system is that switching your system on and off several times a day is false economy. Keeping your floor at a constant temperature is more economical and will give you better comfort level.

STANDARD CONTROL COMBIMIX PROBLEM SOLVING

IMPORTANT NOTE: Before wiring anything switch off mains power supply at common spur.



The boxes marked in **RED** are only relevant to systems using more than one wiring centre.



Single Zone using the Combimix

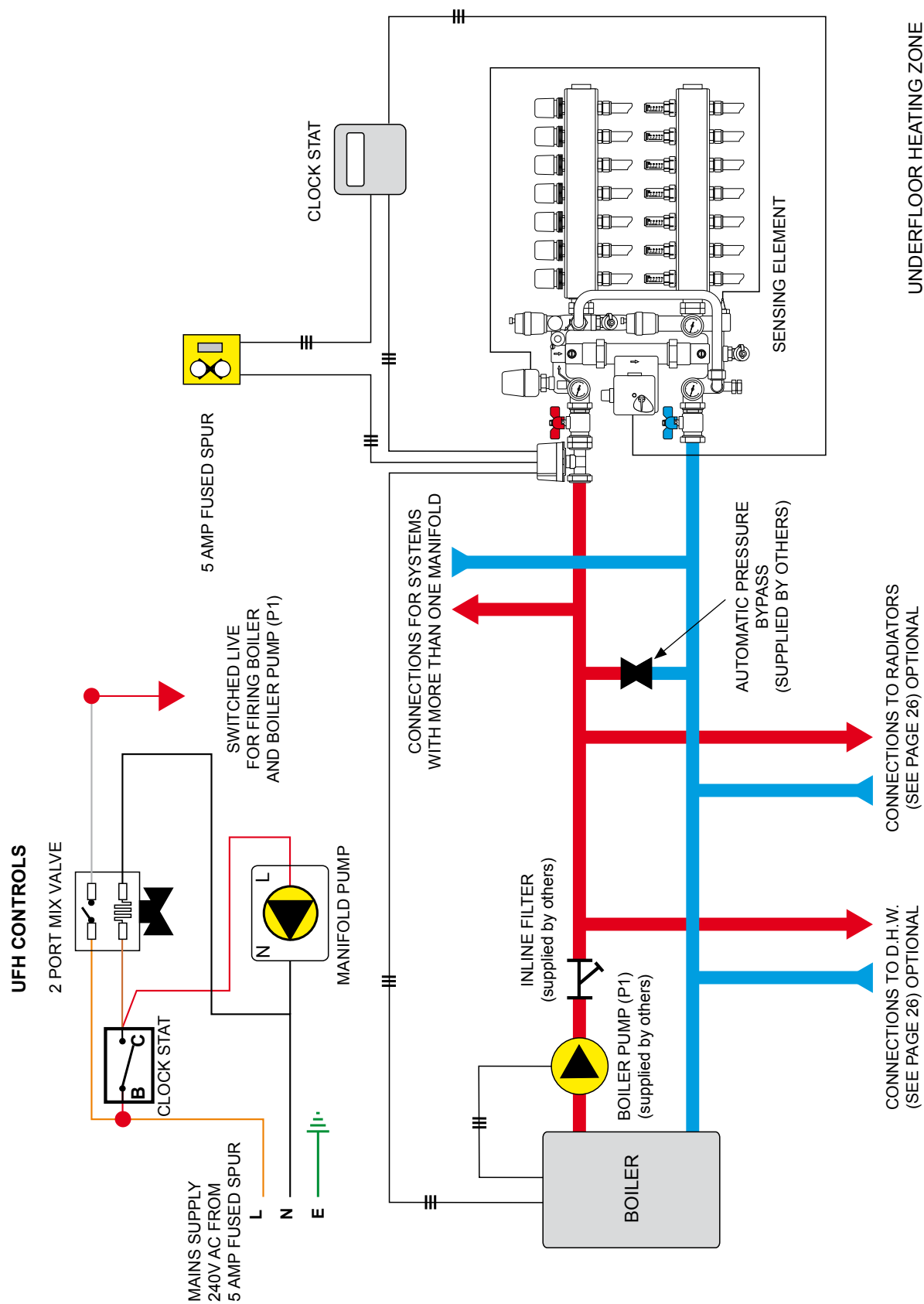
In certain situations you can have a large single area governed by one thermostat and one manifold. In this situation it is not necessary to have every zone on the manifold governed by an individual thermal actuator nor is it necessary to have a wiring centre above the manifold.

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 COMBIMIX PLANT LAYOUT & WIRING



SINGLE ZONE COMBIMIX PLANT LAYOUT & WIRING

EXTENSION PACK

The following pages details the plant and wiring diagrams for Extension Packs A & B. 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 wiring is as per the wiring diagram shown connecting the clockstat, motorised valve, underfloor pump and boiler. 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 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.**

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 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.**

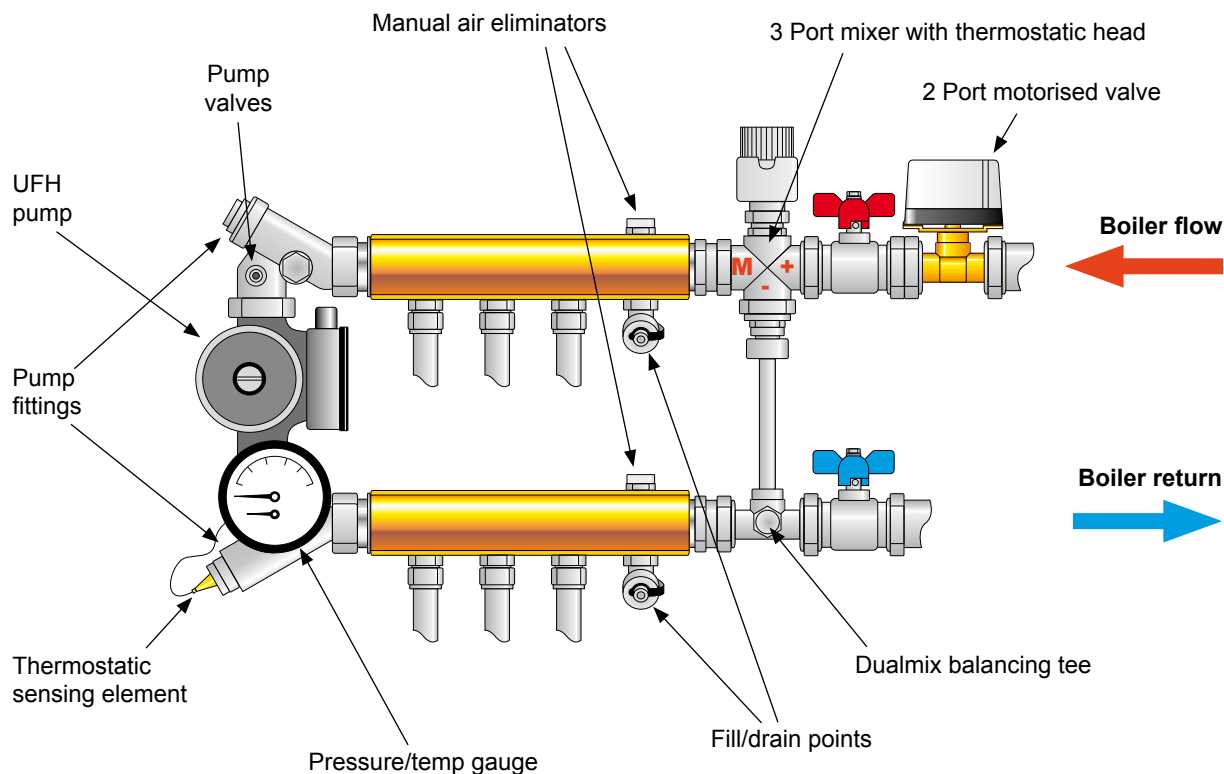
Notes for the Electrician

- 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 clock stat we supply only needs a two core cable to it 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.
- It is advisable to fit a small surface mounted joint box at the manifold position. This will provide a termination space for the clockstat, motorised valve, pump and cabling back to the boiler.

The sequence of operation for this system is as follows:

- The clockstat supplies a switched live to the motorised valve and manifold pump.
- The motorised valve, using its auxiliary switch, then provides a switched live to the boiler and boiler pump.
- 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.**

EXTENSION PACK ABOUT THE MANIFOLD



Manual Air Eliminators: Used to vent 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.

Pressure/Mix Temperature Gauge: Indicates the mixed flow temperature and system pressure.

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

3 Port Mixer with Thermostatic Head: Used to blend the high temperature boiler flow to the correct mixed water temperature as set on the thermostatic head.

2 Port Motorised Valve: Used to control the flow of water to the manifold set. It is controlled by the clock thermostat, it also provides the 'go' signal for the boiler/boiler pump.

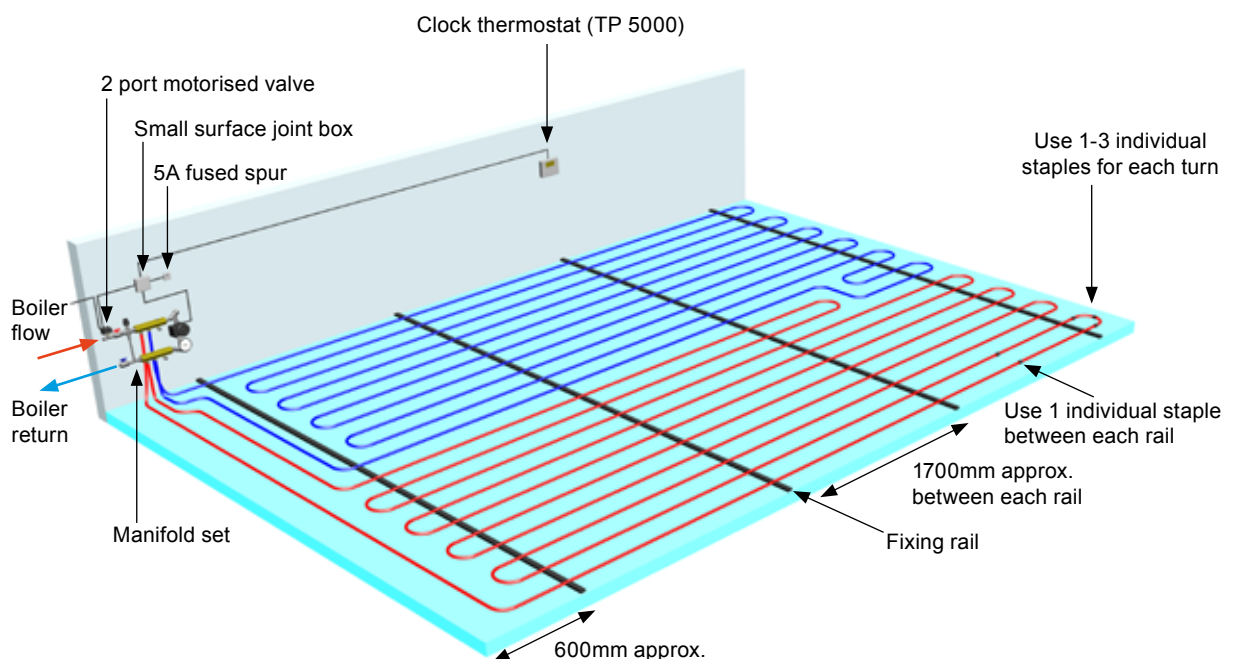
Dualmix Balancing T: Used to connect the 3 Port mixer into the boiler return and for limiting the boiler return, thus increasing the overall flow rates through all floorheating groups.

EXTENSION PACK A

Extension Pack A covers up to 24 m² (as shown) at 200mm C-C (centre to centre). This will produce approx. 100W/m² when used with a tiled floor finish. By reducing the pipe spacings to 150mm C-C you will increase the floor output to approx. 140W/m², this will however reduce the maximum coverage area to 17m².

Pack A is supplied with a 2 way manifold and the area should be divided by laying 2 circuits of equal pipe length from the 120m coil of pipe supplied. This ensures an equal flow rate through each circuit and thus an even spread of heat throughout the room. In rooms with 1 or 2 exterior walls featuring a high percentage of glazing, the pipe spacings should be reduced in these areas to counteract the cold fall of air from the glazing. (NOTE: This will reduce the achievable maximum coverage area).

The pipe layout below shows a typical installation at 200mm C-C. Obviously the size and shape of any one particular installation may be different, but providing the pipe centres and the equal lengths for the 2 circuits are adhered to, the end result will be the same.



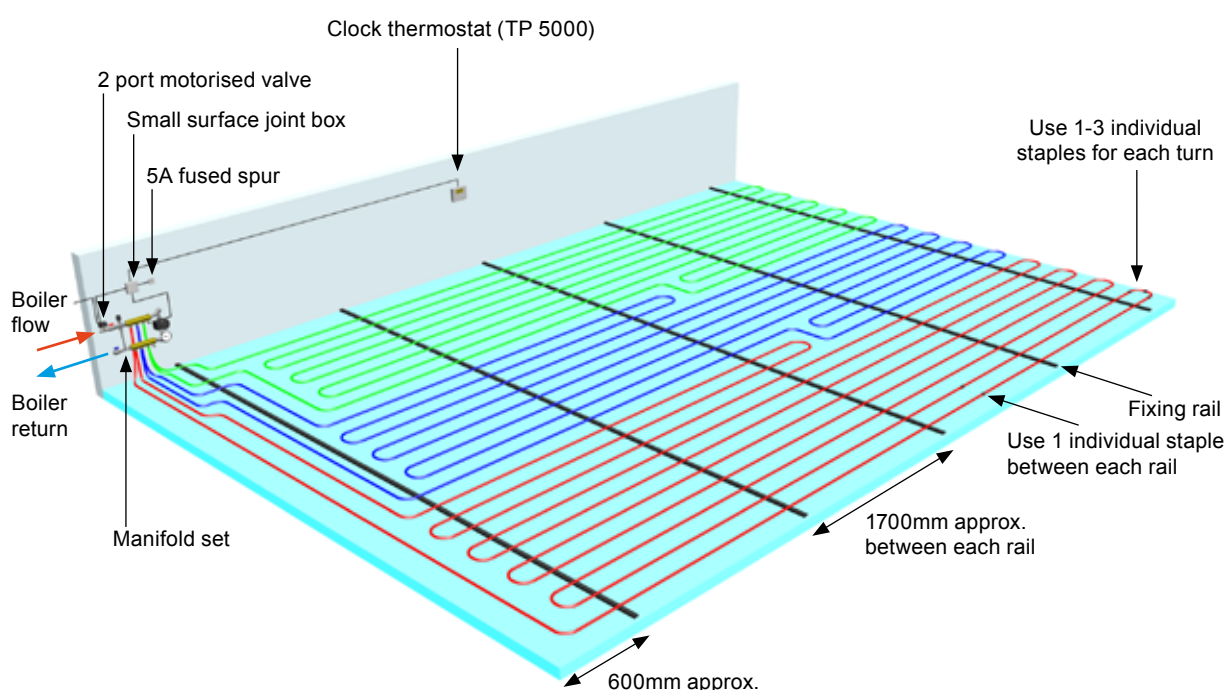
- Use corrugated sleeving near the manifold to protect each pipe as it exits the screed.
- Use the detailed plant and wiring diagrams (see following pages).
- Always use as much of the pipe supplied as possible.
- If an anhydride pouring screed is used, the number of fixings should be doubled (contact Begetube for advice)
- For pipe spacings of 150mm c-c, please ensure that a minimum radius of 100mm is maintained (see diagram below).



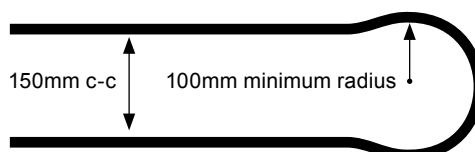
EXTENSION PACK B

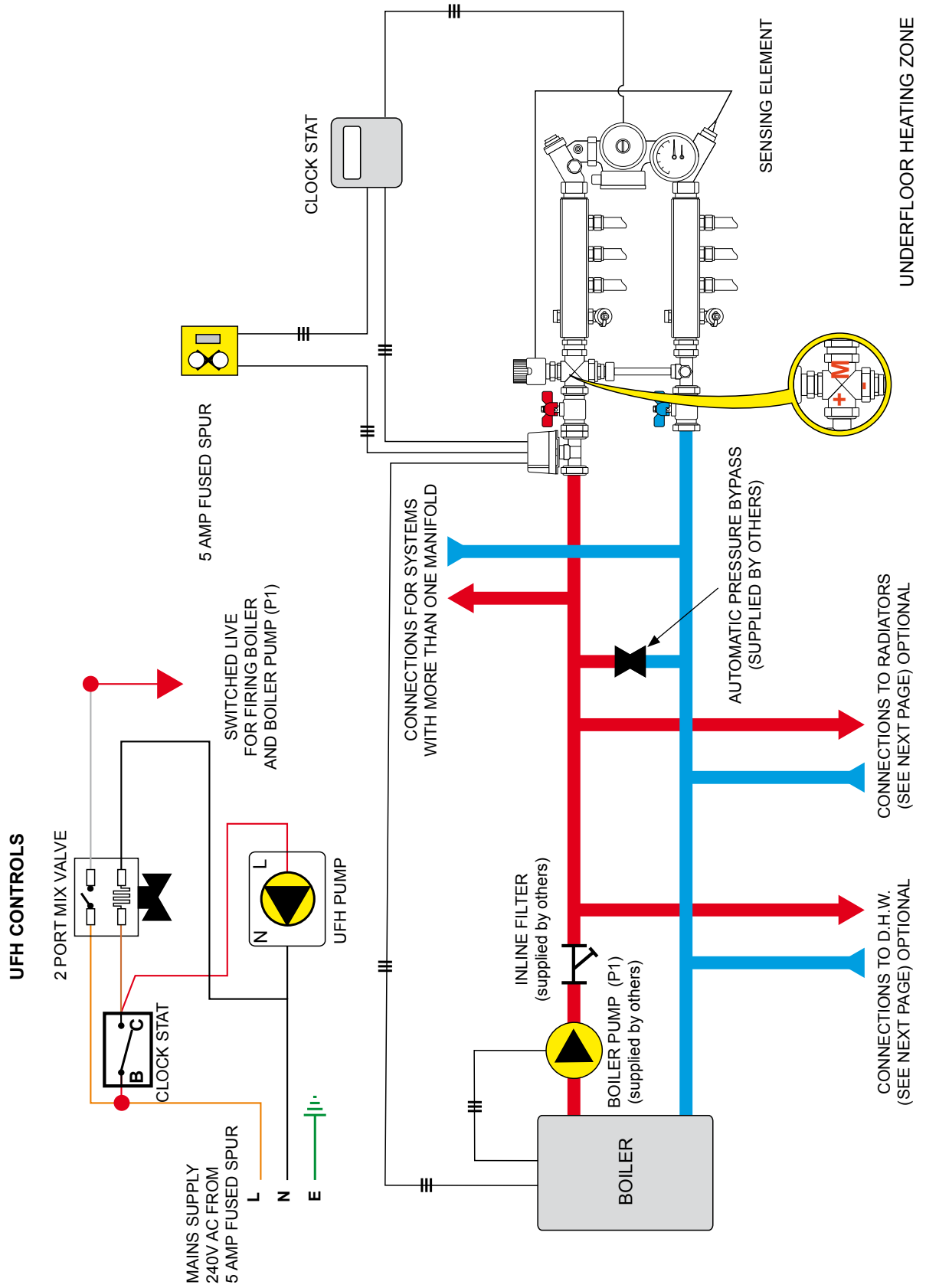
Extension Pack B covers up to 40 m² (as shown) at 200mm C-C (centre to centre). This will produce approx. 100W/m² when used with a tiled floor finish. By reducing the pipe spacings to 150mm C-C you will increase the floor output to approx. 140W/m², this will however reduce the maximum coverage area to 28m². Pack B is supplied with a 3 way manifold and the area should be divided by laying 3 circuits of equal pipe length from the 200m coil of pipe supplied. This ensures an equal flow rate through each circuit and thus an even spread of heat throughout the room. In rooms with 1 or 2 exterior walls featuring a high percentage of glazing, the pipe spacings should be reduced in these areas to counteract the cold fall of air from the glazing. (NOTE: This will reduce the achievable maximum coverage area).

The pipe layout below shows a typical installation at 200mm C-C. Obviously the size and shape of any one particular installation may be different, but providing the pipe centres and the equal lengths for the 3 circuits are adhered to, the end result will be the same.

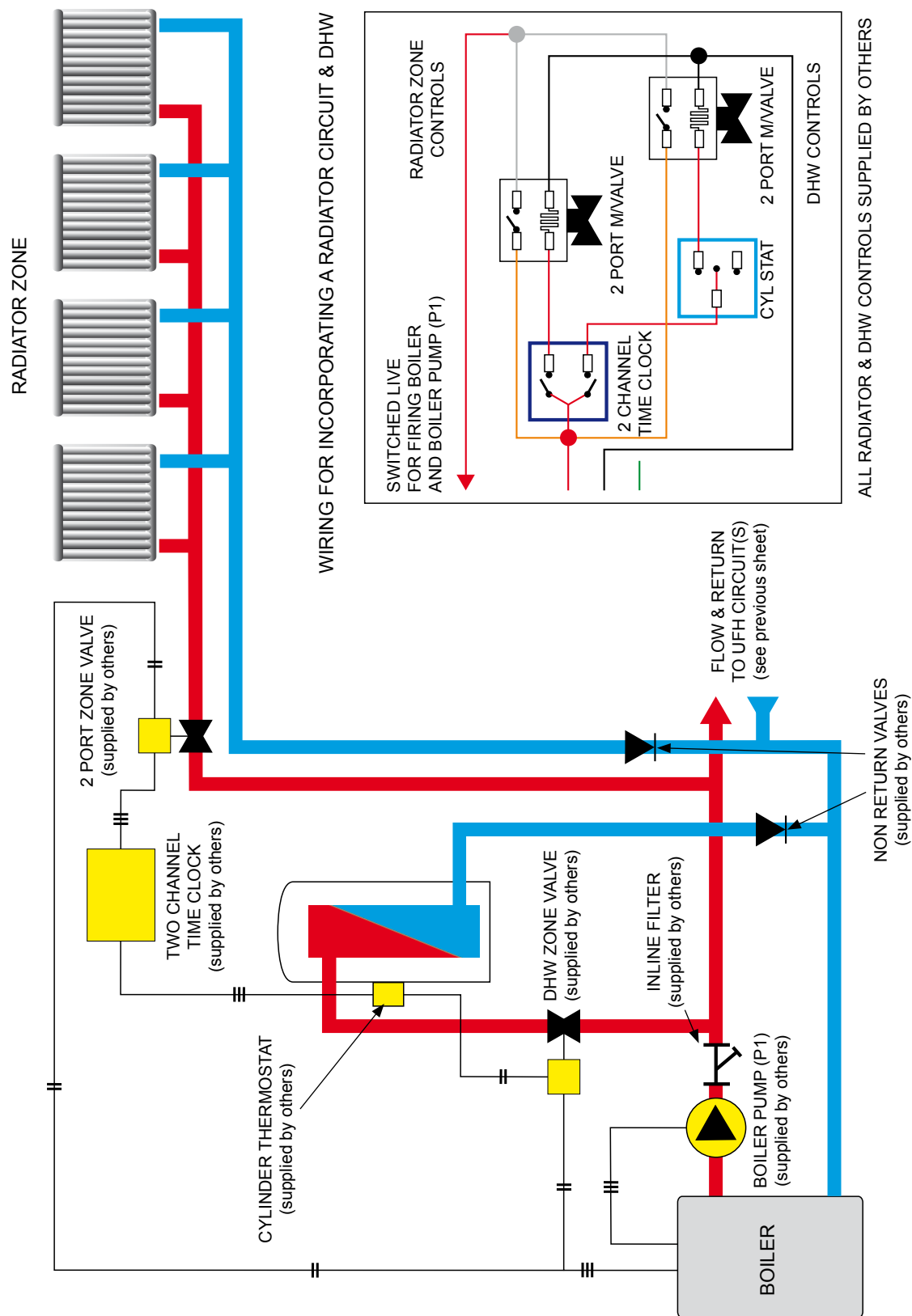


- Use corrugated sleeving near the manifold to protect each pipe as it exits the screed.
- Use the detailed plant and wiring diagrams (see following pages).
- Always use as much of the pipe supplied as possible.
- If an anhydride pouring screed is used, the number of fixings should be doubled.(contact Begetube for advice)
- For pipe spacings of 150mm c-c, please ensure that a minimum radius of 100mm is maintained (see diagram below).





SCHEMATIC PLANT & WIRING LAYOUT INCORPORATING RADIATORS AND INDIRECT DOMESTIC HOT WATER



This system utilises a manual 3 port mixer to control the temperature of the water in the floor heating system.

The plant layout and wiring diagrams also show how to connect this type of floor heating system in with a radiator system and domestic hot water system. If one or both of these systems are not in the installation simply ignore the plumbing and wiring for the non-relevant part. Before starting the checks detailed below, ensure the power is on and the clockstat is switched down (not calling for heat). Switch off the DHW and Radiator circuit.

- Set the clockstat to call for heat (a flame symbol will appear on the clockstats screen)
- This will put power to the motorised valve and the manifold pump.
- Once the motorised valve has opened, this in turn will put power to the boiler and boiler pump
- 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 dried. It can then be raised to its full operating temperature depending on what type of floor construction it is.
- Screeded floor full operating flow temperature is 55°C.
- 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 clockstats two temperature settings. The lower one to 16°C (night setback) and the higher one to 21°C. These settings can be altered to suit the clients own preferences.
- 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 cured (normally 2-3 weeks at low temperature) the 3 port 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.**

OPERATING INSTRUCTIONS EXTENSION PACK

Floor Heating requires a different approach to control compared to conventional heating systems.

There are two main elements of control for your **Begetube** Underfloor Heating System :

- 1 **Programmable Clock Stat for Night Setback control**
- 2 **3 Port Mixer for water Temperature control.**

Programmable Clock Stat: This Unit gives you the ability to set overall time temperature control with two different temperature settings. When you want your room to be at full comfort settings you programme the clockstat to call for the temperature you want (typically 21°C). When you want your house to be at the night setback temperature you programme the clock stat to call for a setback temperature (typically 16°C). Setting the clockstat to the night setback temperature will turn the boiler and pumps off until the temperature drops to 16°C at the clockstat. The temperature will only drop to 16°C if you have a lot of heat loss from your building (i.e. a very cold night). By having this setback control, it stops the room cooling right down during the night so it is not then struggling to bring the room up to a working temperature in the morning. To set the time and temperatures on the clockstat refer to the user instructions for the clockstat. If you want your room up to temperature by 08:00 set the clockstat to the higher temperature setting at 06:00. If you retire to bed at 23:00 you can set the clockstat to the lower temperature setting at 21:00. There is approximately a two hour lead time and a two hour lag out time.

3 Port Mixer for Water Temperature Control: This piece of equipment is situated at the manifold and its purpose is to blend down the high temperature water from your boiler to a lower temperature suitable for underfloor heating. The maximum temperature setting for the 3 Port Mixer is dependant on the floor construction:

Screeded Floors have a maximum flow temperature of 55°C.

For most of the heating season these temperatures 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:

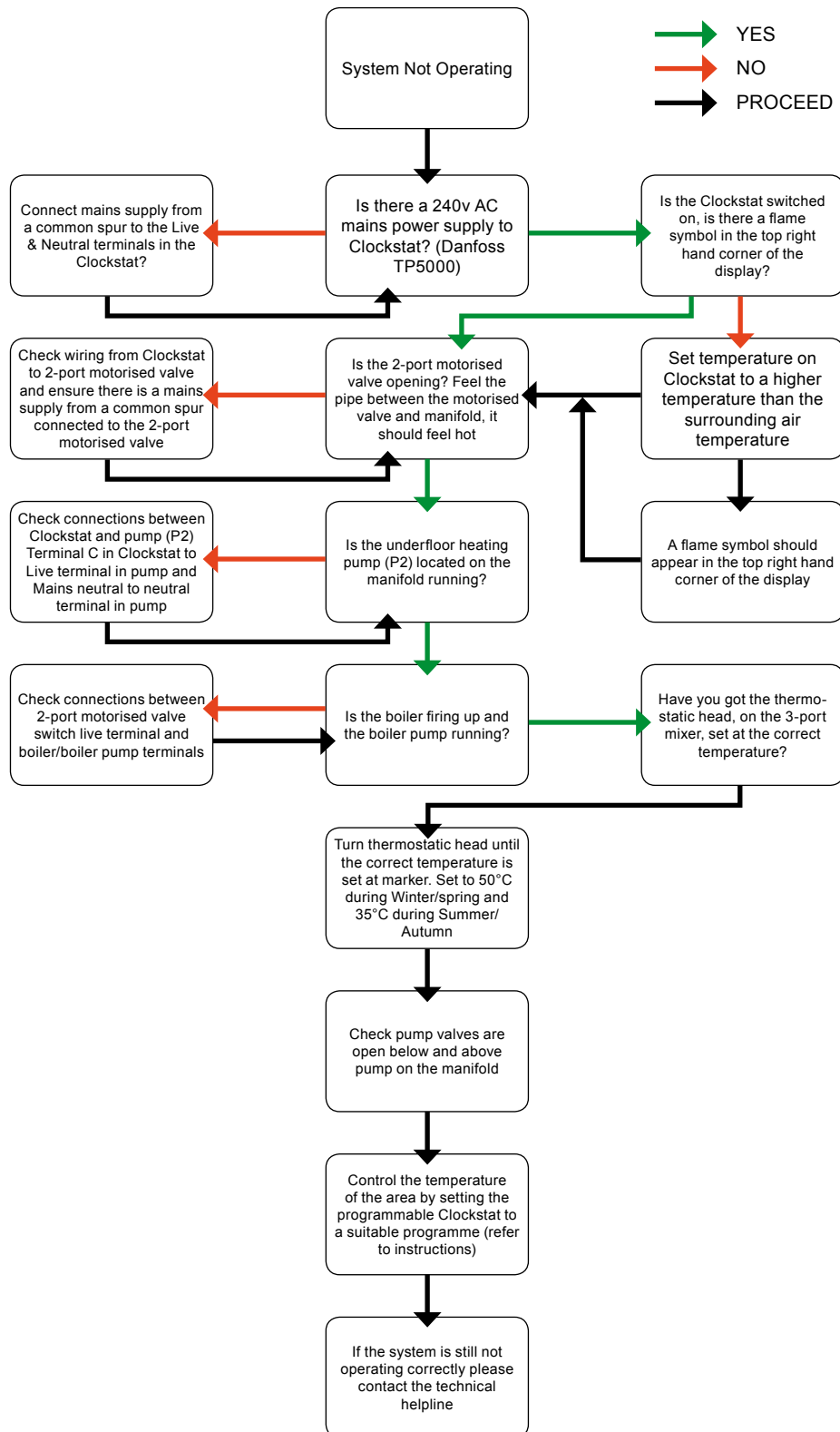
Going into heating season set mixer to 30°C - 40°C.

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.

IMPORTANT NOTE: Before wiring anything switch off mains power supply at common spur.



INTELLIGENT CONTROL

Intelligent Control Multi Zone System - Incorporating Weather Compensated flow temperature.

The following pages detail a typical intelligent control system with reference to plant and wiring diagrams. Since there are many different ways that this control system can be configured, **Begetube UK** will always supply as fitted CAD, plant & wiring diagrams specific to the job supplied. Ensure that you have these specific diagrams and use them along with the following section which is designed to give the electrician, heating engineer and end user a good overview of the complete installation. **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 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.**

After the plant and wiring diagrams there is a page which details the correct fitting of the 4 port mixing device. This information should be studied prior to any flow and return pipe work being installed.

General Overview

The Intelligent Control System is designed to accurately manage a multi zone underfloor heating system. The controls consist of a master control box and up to a further 2 add on modules giving the ability to control a total of 14 individual areas. The WLM Master Module can control up to 6 outputs (1 to 6), each WLM ADD ON Module can control another 4 (7 to 10 on ADD ON 1, and 11 to 14 on ADD ON 2).

The positioning of the Master Module and ADD ON Modules will be clearly marked on the CAD pipe layout drawing specific to the project. These are normally always shown and fitted adjacent to the underfloor heating manifold(s) so that thermal actuators can be directly connected to the module terminals.

The Master Control Box comes in two versions. The full system master (WLM-1FS) is the version which is capable of also controlling the supply water temperature to the underfloor heating manifolds. The basic master (WLM-1BA) only controls the individual room sensors and zoning. The following typical scheme in this section shows the full system master version with two add on modules complete with the outside air sensor. This system provides a compensated flow temperature to the underfloor heating manifold(s). As stated before **Begetube UK** will always supply as fitted wiring and plant diagrams specific to the project.

Unlike previous underfloor heating control systems, the Intelligent Control utilises a 5 Volt, 2 core bus system to connect all room sensors together. The room sensors are simply 'daisy chained' together using a 2 core light duty cable (bell wire or speaker cable is acceptable). The core size should not exceed 1 mm² but preferably 0.25 - 0.5mm² stranded cable with the two cores identified. This 2 core bus system is then connected back to the Master Control box. The daisy chain can be made into a ring, with both ends connected to the Master, or can be run as two or more separate chains, each connected to the Master. It is also possible to use conventional star wired systems, but you may need to employ separate connector strips to connect into the Master. In either system the thermostats must only be connected to the Master module and **not to any add on modules**. The outside weather sensor can also be connected to any point on the chain or directly back to the Master.



Full System Master Module (WLM-1FS)

INTELLIGENT CONTROL

"Intelligent people make intelligent choices" At **Begetube** we believe the overall quality and efficiency of an underfloor heating system is only as good as the control system attached to it. The standard off-the-shelf control products used by the majority of other suppliers do not address the controllability issues associated with floor heating. **Begetube UK** is proud to introduce 'INTELLIGENT CONTROL', the next generation of floor heating controls. The INTELLIGENT CONTROL has been specifically designed to accurately manage a complete underfloor heating system to a far higher level of efficiency. The system is easy to install and easy to use, with its flexible and modular design, it can be tailored to suit your lifestyle. Fuel prices and global warming are both serious issues; by using the INTELLIGENT CONTROL, you have made the intelligent choice.



Max. temperature control

As well as accurately controlling the air temperature, this control gives the end user the ability to set a maximum temperature within the floor. This is ideal for protecting areas with expensive hardwood flooring.

Features

- Easy to install, easy to use
- Modern European design
- Weather compensated
- Silent operation
- Wired or wireless
- Wide range of thermostats
- Self learning optimising sensors
- Flexible & modular design



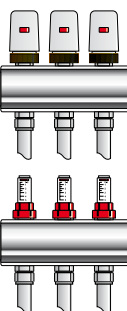
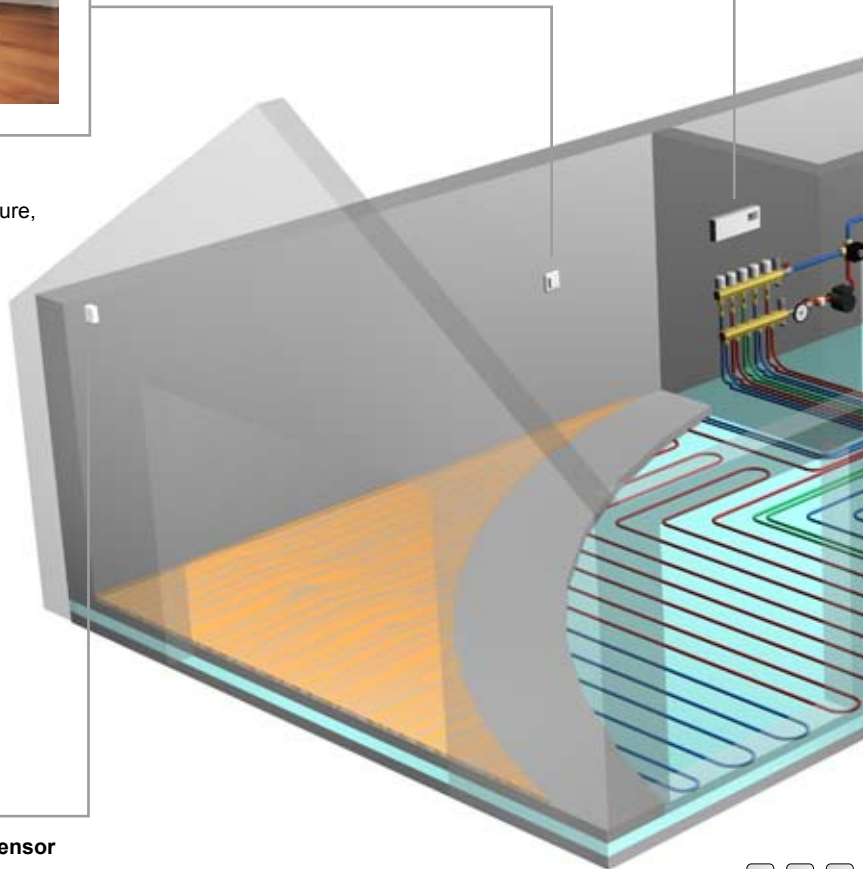
Outside temperature sensor

The rate of heat loss from any building is governed by the temperature difference from inside to out. By using the outside sensor, the supply water temperature to the system is constantly and automatically adjusted to give the most efficient and optimum control.

Unlike most other underfloor heating suppliers, **Begetube UK** has always promoted the use of weather compensated controls. The Intelligent control uses this feature along with self learning room sensors to provide the most comprehensive underfloor heating control system available in the UK today.



The Intelligent Master Control box communicates with all the individual room sensors to achieve the most effective and efficient operation of the zone actuators. It also provides outputs for the systems mixer, pumps and heat source.





Min. temperature control

For optimal comfort temperature of tiled floors. As well as accurately controlling the air temperature, this control gives the end user the ability to keep a minimum temperature within the floor. This is ideal for bathrooms or areas with other heat sources (e.g. open fires or kitchen ranges).



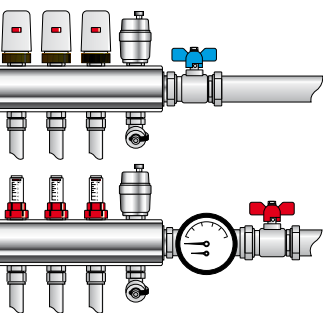
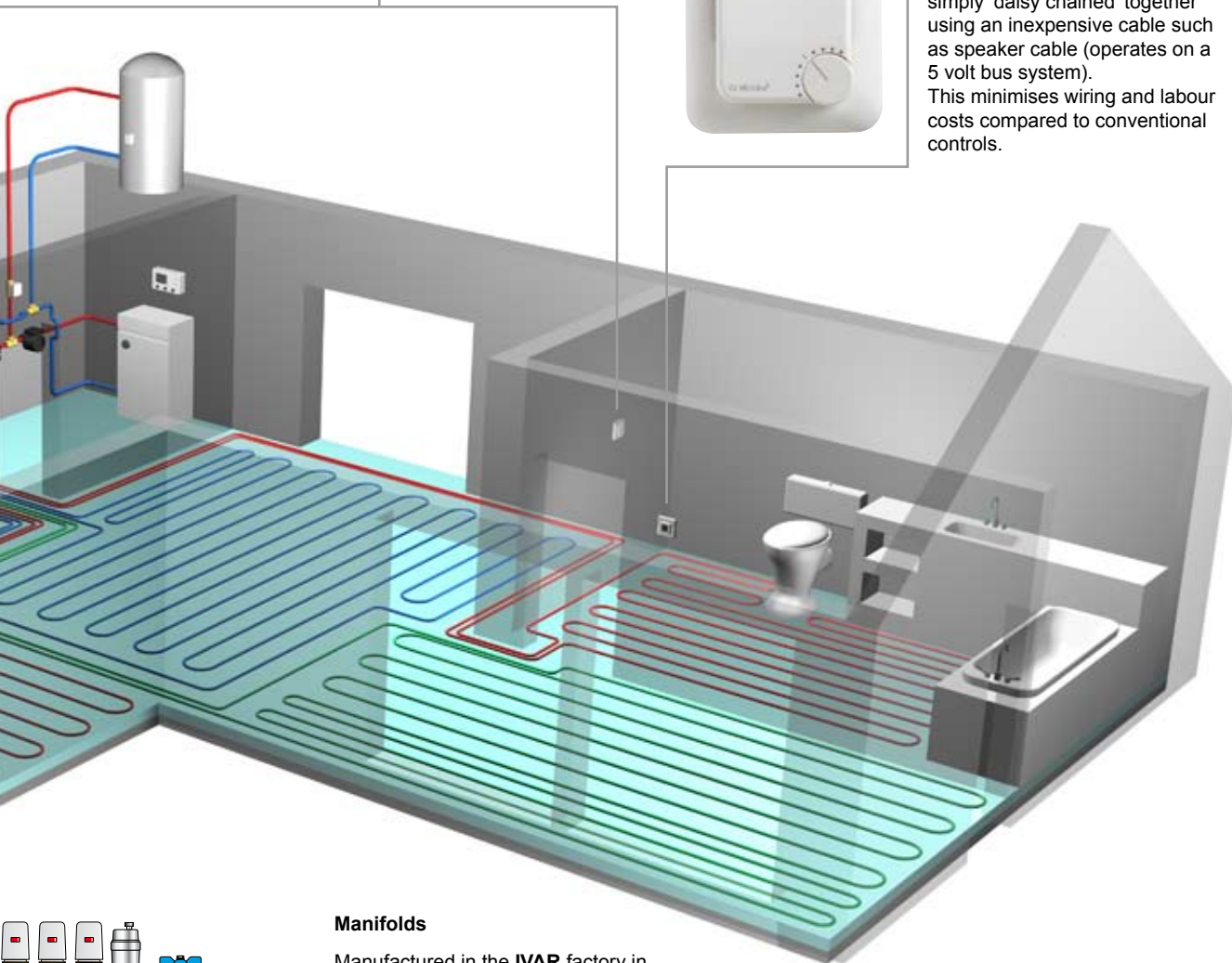
Thermostats

A full range of thermostats is available depending on the application. Each thermostat has self learning circuitry which eliminates temperature overshoot and undershoot, a problem all too common in conventional floorheating controls.

For larger open plan areas two thermostats can be used. The temperature control will then work according to the average temperature of both thermostats.

Installation of this system is very simple and safe. All sensors are simply 'daisy chained' together using an inexpensive cable such as speaker cable (operates on a 5 volt bus system).

This minimises wiring and labour costs compared to conventional controls.



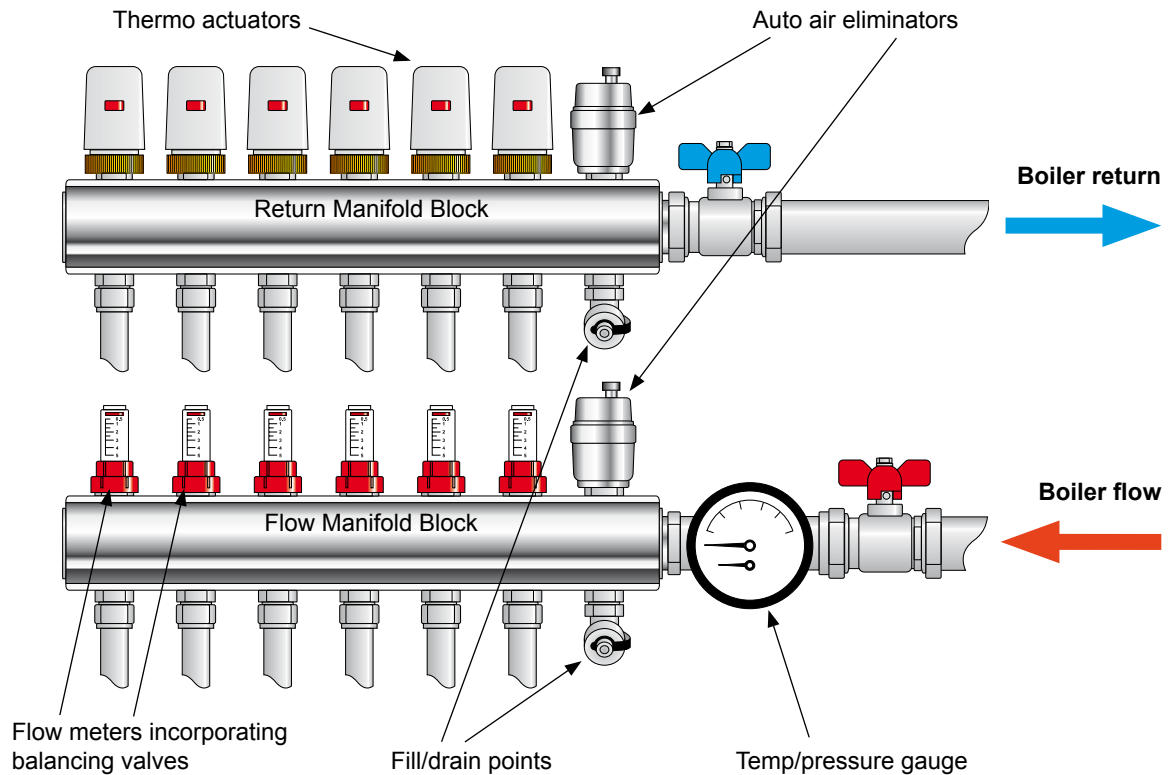
Manifolds

Manufactured in the **IVAR** factory in Italy, all our large bore nickel plated 1 1/4 " manifolds are sized specifically for each project.

Adjustable flow meters are fitted allowing accurate balancing of the individual circuits.

The specification surpasses all EU regulations and the quality control systems have been granted ISO 9001.

ABOUT THE MANIFOLD INTELLIGENT CONTROL



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.

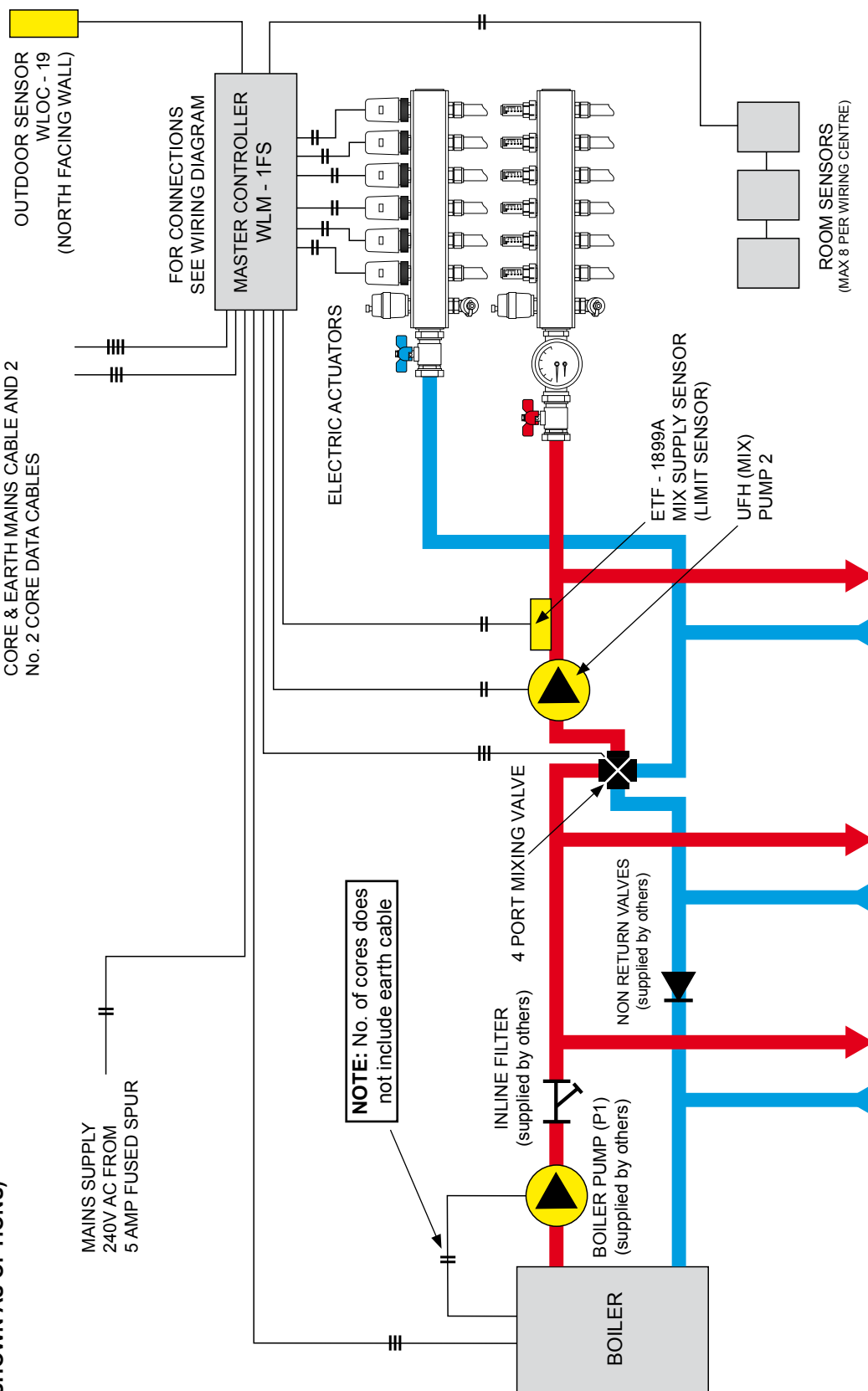
Flow Meters incorporating Balancing valves: Shows the flow rate through each group of pipe in litres per minute. By removing the red locking cap, the plastic indicator tube can be turned to set the required flow rate.

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

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

PLANT & WIRING LAYOUT FOR INTELLIGENT CONTROL SYSTEM CONTROLLING ONE OR MORE MANIFOLDS (DHW & RADIATORS SHOWN AS OPTIONS)

IF THERE ARE ANY ADD-ON MODULES LINK EACH MODULE IN SERIES TO THE MASTER CONTROLLER, WITH A 3 CORE & EARTH MAINS CABLE AND 2 No. 2 CORE DATA CABLES

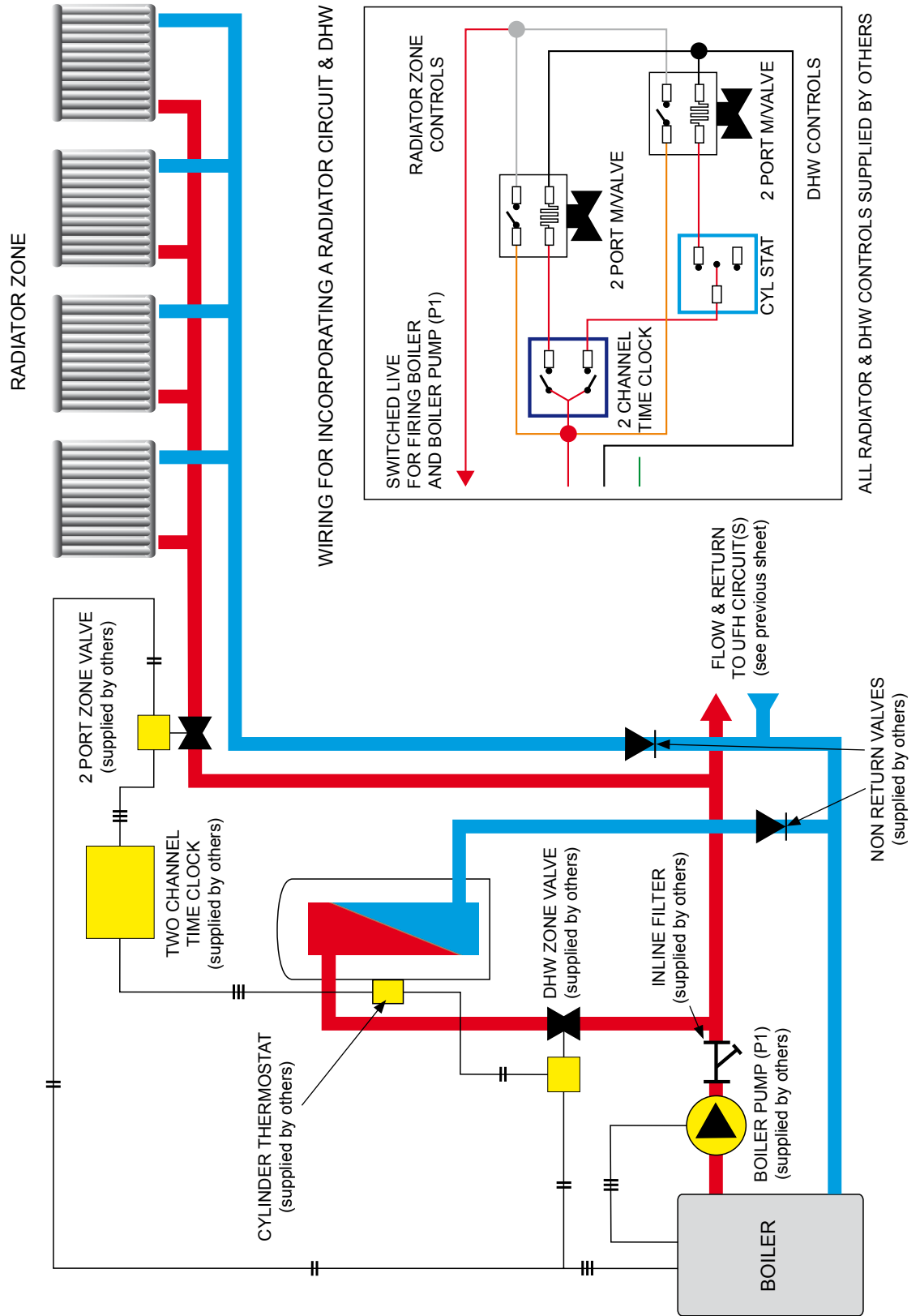


CONNECTIONS TO D.H.W. (SEE NEXT PAGE) OPTIONAL CONNECTIONS TO RADIATORS (SEE NEXT PAGE) OPTIONAL CONNECTIONS FOR SYSTEMS WITH MORE THAN ONE MANIFOLD

INTELLIGENT CONTROL *PLANT & GLAYOUT*

INTELLIGENT CONTROL PLANT & WIRING LAYOUT

SCHEMATIC PLANT & WIRING LAYOUT INCORPORATING RADIATORS AND INDIRECT DOMESTIC HOT WATER



ALL RADIATOR & DHW CONTROLS SUPPLIED BY OTHERS

INTELLIGENT CONTROL WIRING

The chart below details the first fix wiring for a system which is using a Master control box along with a further two ADD ON modules. You will find a specific first fix wiring schedule on the 'as fitted' wiring diagram supplied with the job. Details on how to wire the sensors together is as previously explained (see page 42, general overview).

All other connections are carried out as normal. The boiler output B1 and B2 is volt free, to suit virtually all boilers, an extra wiring diagram is shown on the as fitted wiring diagram detailing how it can be made into a 240V switched live. Main pump and secondary pump connections are Live/Neutral.

Provision is made on the master module for connecting a boiler or primary pump, and also the underfloor circulating pump. These are termed main and secondary pumps respectively (P1 & P2). The boiler pump does not have to be used if the boiler has an integral pump within its own system.

Each add on module also has a separate output for a local circulating pump if the system is using multiple manifolds, and local pumping is included. However, if only a single UFH circulating pump is employed, with multiple manifolds, and add on modules are used for the room control, then the single UFH pump (P2) should be connected to the MAIN pump terminals of the master and not to the SECONDARY. If the main pump is already being used for "primary" pump control, an alternative connection method is to use the secondary pump output on the master, but also connect from the pump L terminal from each add on module to the secondary pump L terminal on the master. This ensures that a demand from a zone within the-add on module group will also start the single circulating pump. The 'as fitted' wiring diagram will clarify which method to use.

Full range of sensors



WLCT Clock sensor



WLTD Sensor with setting mode and limit sensor



WLTA Sensor with $\pm 4^{\circ}\text{C}$ local adjustment



WLTP Tamperproof sensor

FIRST FIX WIRING SCHEDULE (240 volt CABLING)

Heating System Spur to MASTER	1mm ² 2 core + E
MASTER to 1st add on Module	1mm ² 3 core + E
1st add on Module to 2nd add on Module	1mm ² 3 core + E
MASTER to Mixing Valve Actuator	1mm ² 3 core + E
MASTER to UFH Pump P2	1mm ² 2 core + E
MASTER to Boiler Pump P1	1mm ² 2 core + E
MASTER to Limit Sensor (mix supply see CAD)	1mm ² 2 core
MASTER to Boiler	1mm ² 2 core + E

5 VOLT BUS CABLING: From Master Module link all sensors together using 2 core 0.25mm² speaker cable along with the outside sensor.

From the Master Module to the 1st add on Module link with 4 core 0.25mm², link 1st add on Module to 2nd add on Module with 4 core 0.25mm².

INTELLIGENT CONTROL ZONE SCHEDULE

The following Zone Schedule is an example of the 'as fitted' zone schedule which will be found on the 'as fitted' wiring diagram. It is to be used in conjunction with the CAD pipe layout drawing. You will see that it exactly ties up with the sequence of the individual pipe circuits 'as fitted' back to the manifold(s). For ease of understanding, the sequence of the controllable areas are numbered from left to right on the manifold(s).

Below the exemplified zone schedule, there is a brief description of each of the headings. The most important piece of information that the zone schedule gives is which channel number to set each room sensor to. This is normally done at the commissioning stage.

ZONE SCHEDULE

ROOM NAME	OUTPUT NUMBER	MODULE TYPE	SENSOR TYPE	SET TO CHANNEL	USE
	1	WLM 1FS	WLTA	1	1 ACTUATOR
	2	WLM 1FS	WLTA	2	2 ACTUATOR
	3	WLM 1FS	WLTA	3	1 ACTUATOR
	4	WLM 1FS	WLCT	4	2 ACTUATOR
	5	WLM 1FS	WLTA	5	1 ACTUATOR
	6	WLM 1FS	WLTA	6	1 ACTUATOR
	7	1 WLM 1AO	WLTD	7	1 ACTUATOR
	8	1 WLM 1AO	WLCT	8	1 ACTUATOR
	9	1 WLM 1AO	WLTA	9	1 ACTUATOR
	10	1 WLM 1AO	WLTA	10	1 ACTUATOR
	11	2 WLM 1AO	WLTD	11	1 ACTUATOR
	12	2 WLM 1AO	WLTA	12	1 ACTUATOR
	13	2 WLM 1AO	WLTA	13	1 ACTUATOR
	14	2 WLM 1AO	WLTA	14	1 ACTUATOR

ROOM NAME - Description of the room allocated to that output.

OUTPUT NUMBER - Relates to the output number serving the thermal actuator(s).

MODULE TYPE - Describes which module the output comes from.

SENSOR TYPE - Describes what type of sensor is allocated to that room.

SET TO CHANNEL - Instructs what channel number to set inside the sensor.

USE - States how many actuators are connected to that output.

Points to note:

- More than one actuator can be connected to the same output. This happens in larger areas that have two or more pipe circuits.
- In large areas two or more sensors may be specified. These sensors will be set to the same output number, the controller will take an average of the measurements and control the output accordingly.
- You may also have two separate rooms that have also been averaged. This will be apparent in the zone schedule; two separate areas will have the same "set to channel" number and the same "output number".
- Inside each sensor there is a setting pot which is numbered 0 to 9 and A to F. 1 to 9 on the pot corresponds to outputs 1 to 9 and A to E corresponds to outputs 10 to 14. Make sure that the sensor is set to the correct output number.
- Position 0 on the sensor is used for any clock sensor which is situated in a central position, is not sensing its own zone, but is being used for time and temperature settings of other zones. Position F is not used.

INTELLIGENT CONTROL WIRING

At Begetube UK we always promote the use of Weather compensated systems. If you have a full system master control box (WLM-1FS) an outside air sensor (WLOC) will have also been specified and supplied. The outside air sensor is wired into the 5 Volt bus system the same as all the room sensors. This gives the system the ability to provide a compensated flow temperature to the underfloor heating circuits further enhancing the overall operation. This sensor should be fitted on an outside north facing wall ensuring that it does not receive direct sunlight. Also ensure that this sensor is not fitted close to any other heat sources ie. flue outlets, bathroom extract vents or exterior halogen lamps.

WLOC Outside air sensor



ETF1899A
Floor limit sensor



WLTD Thermostat
with setting mode
and limit sensor

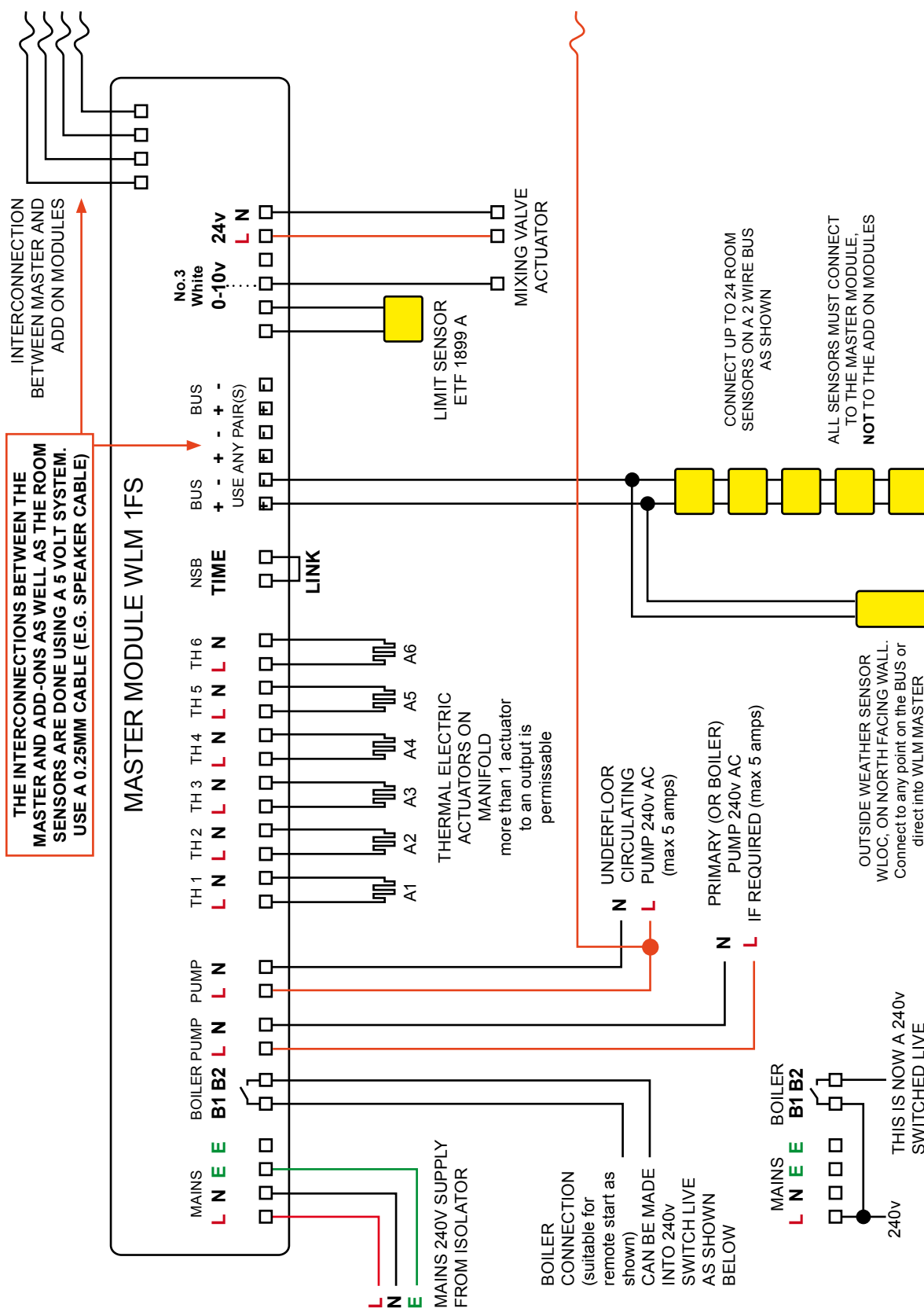
The WLTD Sensor is preferred for bathroom use because it has an extra floor sensor, in addition to the room sensor. The purpose of the floor sensor is to act as a maximum or minimum limit for the floor surface temperature. Max or Min is chosen by a jumper position on the sensor pcb. It is the minimum function that is used when controlling a 'wet room', this gives the end user the ability to have a warm tiled floor all year round irrespective of the air temperature. The limit temperatures are set on the master, or if the zone is being controlled as part of a group via a WLCT clock sensor, the limit settings can be changed via the Hi Li menu on that clock thermostat. Refer to page 22 for correct fitting of the floor sensor. The maximum temperature limitation function can be used to protect the floor area from becoming too warm. This may be required if special floor surfaces (real wood) are used.

Notes for the Heating Installer

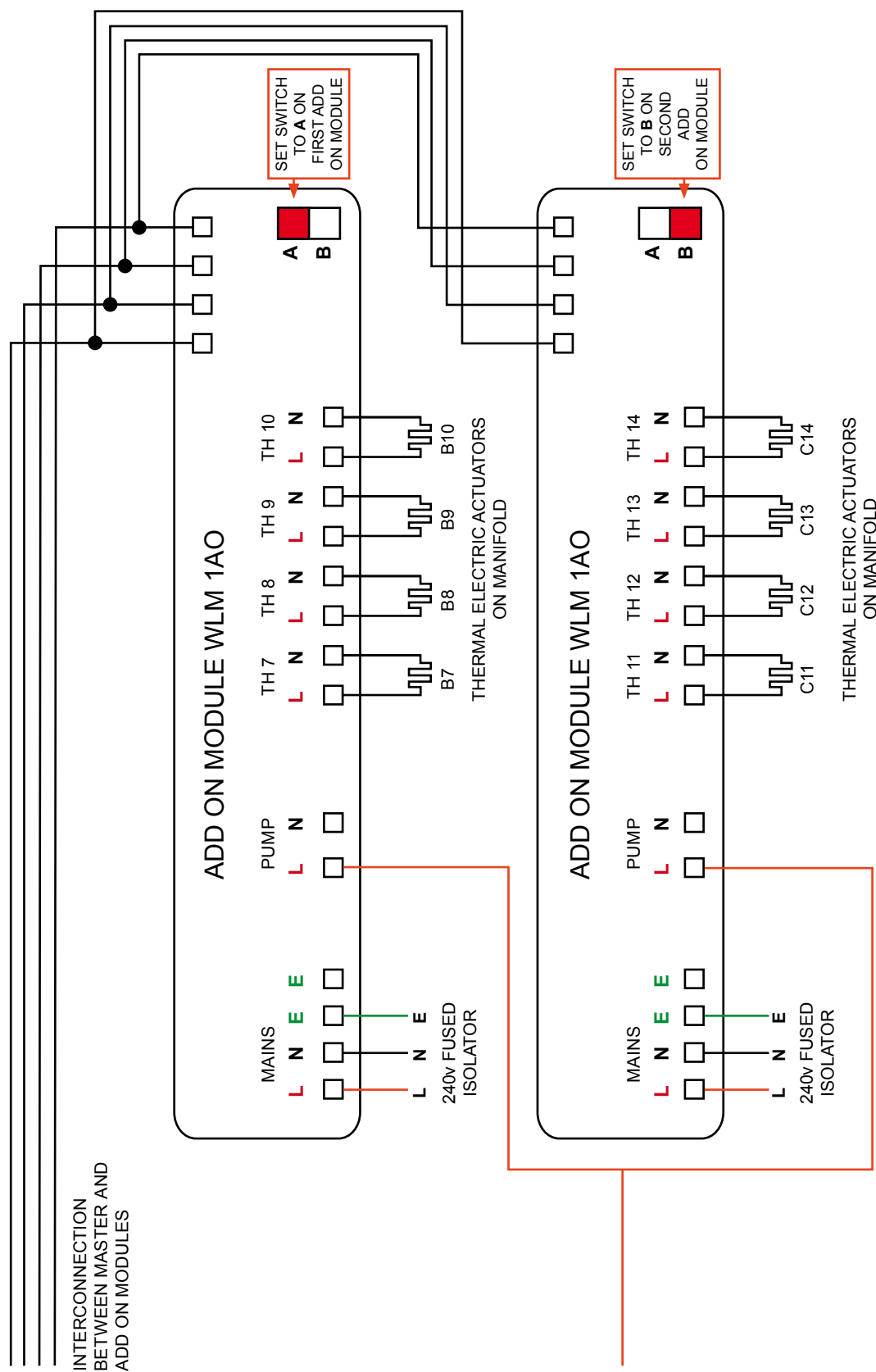
- Pay careful attention to flow and return connections onto the manifold. The flow from the boiler is indicated in **red** and the return to the boiler is indicated in **blue**.
- The floor heating 4 port mixer should be supplied by an uninterrupted flow and return from the boiler. Definitely not tapped off the end of a radiator system. Please refer to the instructions for this which appear after the plant and wiring diagrams.
- The size of the connections onto the 4 port mixer supplied **is not** a guide to the size of your flow and return pipe work. For example, if we have supplied a 3/4" valve it may well still need 1" flow and return pipe work. Please size pipe work in accordance to the size of the heating load and the length and nature of the pipe run.
- 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.
- 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 output from the master control box or add on modules.
- 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.**



WIRING DIAGRAM FOR ADD ON MODULE(S) WLM 1AO



CORRECT FITTING OF IVAR 4 PORT VALVE AND ACTUATOR

There are several different ways that the valve body can be piped and several different ways that the electric actuator can fit onto the valve body. This can cause confusion and as it is imperative that the valve and actuator are "married" together in the correct position, please use the following instructions and diagrams to ensure correct fitting.

The following diagrams on the next two pages show all eight ways of piping the 4-port valve. Choose the best-fit solution for your particular situation and follow the connections. You will see that the connections on the valve always follow the same sequence:

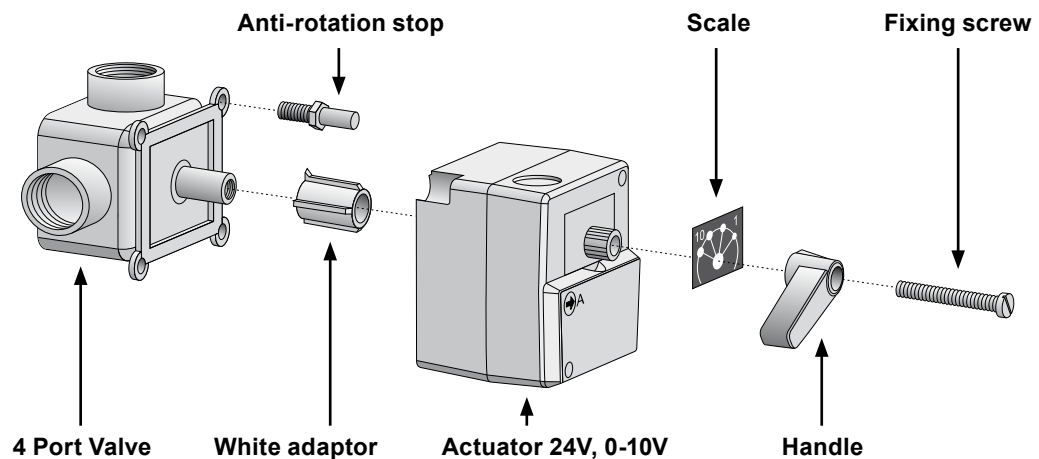
- Flow from boiler
- Flow to underfloor heating manifold(s)
- Return from underfloor heating manifold(s)
- Return to boiler

This sequence can start on any port and go clockwise or anti-clockwise round the 4-port valve. All eight possibilities are detailed in the diagrams that follow.

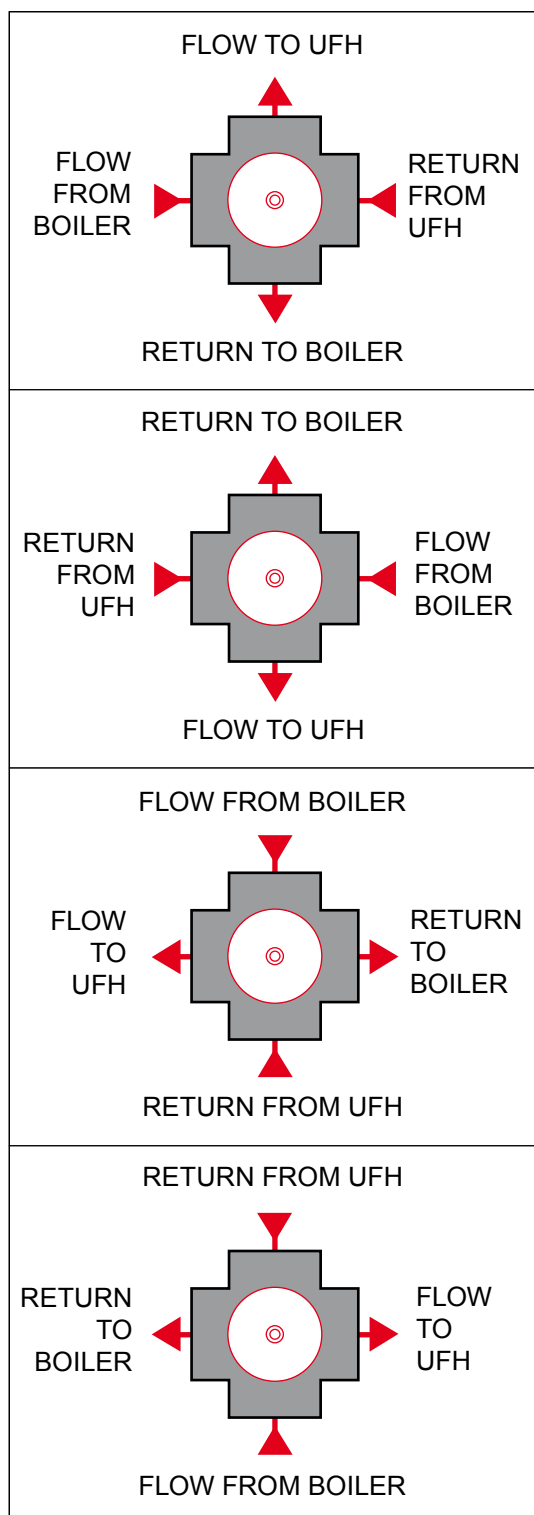
Once you have the 4-port valve fitted, you then have to fit the actuator to the valve. To correctly do this follow the step-by-step guide below.

- Pick the diagram which matches the way the valve has been piped (on left of page).
- Remove the manual handle which comes fitted to the valve.
- Fit the **WHITE** adaptor to the valve spindle. Note the flat on the shaft matches up to the flat inside the white adaptor and is pushed hard on.
- Use the diagram to the right of the valve diagram which you have selected.
- This shows you where to turn the valve spindle to and the white adaptors pointer.
- Change the position of the number plate to suit the diagram if necessary.
- You will now have the valve in a fully shut position.
- You are now ready to connect the actuator to the valve
- Turn the selector switch on the actuator to the "hand symbol" and fit the long black handle
- Turn the handle fully clockwise until it stops.
- The handle pointer should be pointing to between 12 o'clock and 3 o'clock with the drive turned fully clockwise.
- The valve and actuator are now both in the fully shut position and are ready to fit together.
- Connect as detailed below.
- Turn the selector switch back to "A" on the actuator.

The valve and actuator are now ready for operation. The Intelligent Controller will drive open or close the valve to control the temperature going to the manifold(s). This should always be checked at commissioning for correct operation. Ensure you connect the **white control cable No.3** to the 0-10 Volt output of the master box.



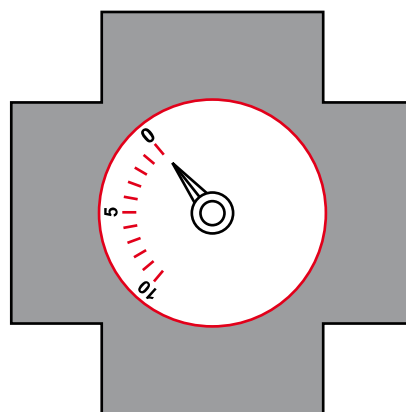
CORRECT FITTING OF IVAR 4 PORT VALVE AND ACTUATOR



For the four options shown on the left, use the diagram below.

This shows the correct position to set the pointer on the white drive adaptor.

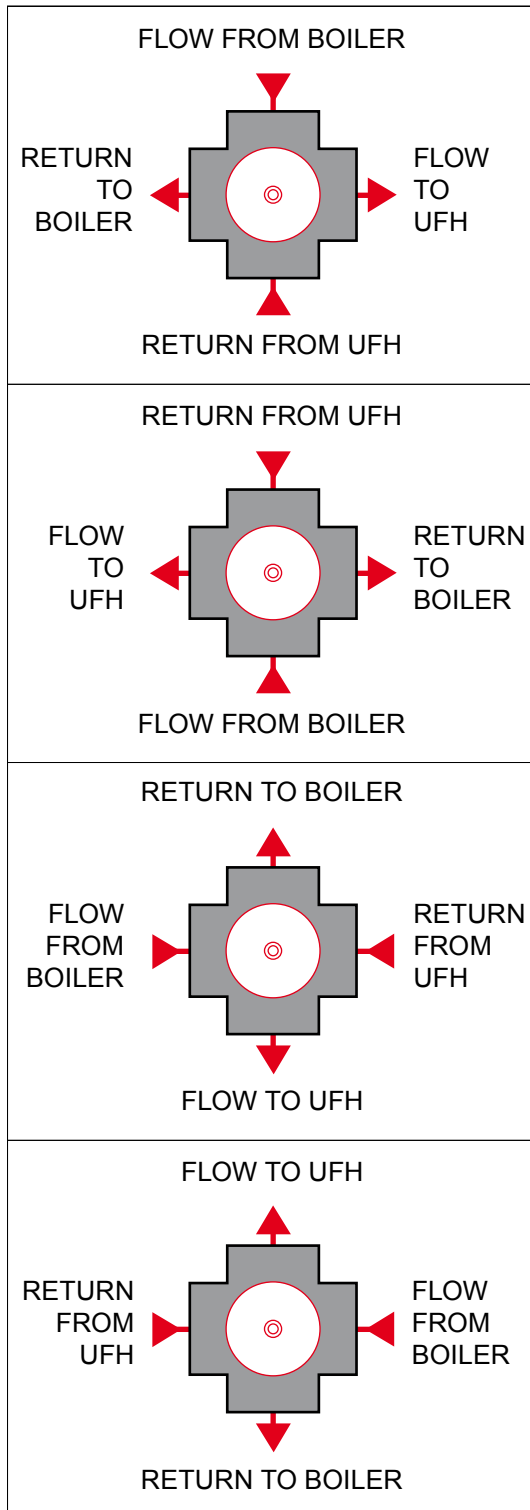
Also fit the number plate as per the diagram below (note: the plate is reversible).



With the valve set in this position it is directing all of the 'flow from boiler' through to 'return from boiler' (i.e. fully shut).

Once the actuator has been put in its fully shut position, the valve and actuator can be fitted together.

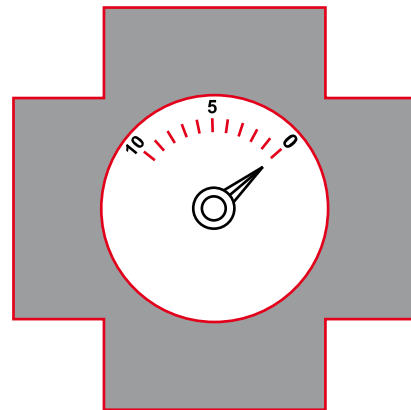
CORRECT FITTING OF IVAR 4 PORT VALVE AND ACTUATOR



For the four options shown on the left, use the diagram below.

This shows the correct position to set the pointer on the white drive adaptor.

Also fit the number plate as per the diagram below (note: the plate is reversible).



With the valve set in this position it is directing all of the 'flow from boiler' through to 'return from boiler' (i.e. fully shut).

Once the actuator has been put in its fully shut position, the valve and actuator can be fitted together.

COMMISSIONING INTELLIGENT CONTROL

As previously explained, the Intelligent Control system can be configured in several different ways. The following section will deal with the commissioning of a full system master (WLM - 1FS) linked to add-on modules (WLM - 1AO). We will assume that there is also the outside Weather Compensation module (WLOC) and at least one fully programmable clockstat sensor (WLCT). This particular setup will cover the majority of installations which have been designed and specified by Begetube UK Ltd. The one main difference which can occur is when a basic master (WLM - 1BA) has been used. In this case the basic master is purely operating the individual zones via their thermostats and not controlling the water temperature. A typical example of this is when there is already a dedicated low temperature circuit suitable for underfloor heating (i.e. ground source heat pump or dedicated circuit from a boiler management system).

There are two main aspects to commissioning the Intelligent Control system: The settings within the Master Control box and the settings of the individual room thermostats, in particular the fully programmable clockstat sensor.

Master Control Box

The WLM-1FS Master Control box has a graphic display to enable simple programming using simple to understand icons and symbols. Full details and explanations of the symbols can be found in the user manual that comes with the control box and this should be studied in detail. All the preset factory settings (which are highlighted in the user manual) are applicable to a Begetube design and specification, but can be altered once the system is up and running to maximise economy and comfort levels. For example, the settings relating to the compensation curve can be changed to increase or decrease the output of the system.

During commissioning, the Master Control box is very useful for checking the correct operation of all the room thermostats and monitoring the read-outs of the various sensors. To view this information, access the service menu indicated by the spanner symbol and detailed on page 3 of the WLM user manual.

First check that all thermostats are communicating with the Master Control box, this is found in sub-menu 2a (thermostat listing 00 through to 15). Use the zone schedule found on your 'as fitted' wiring diagram to determine how many thermostats there are, if they are all fitted correctly, an 'OK' symbol will appear beside each numbered thermostat. If there is a problem with one or more thermostats, an error number will appear (E1 - E9). A full explanation of all error codes is given on page 4 of the WLM user manual. Any error codes have to be cleared thus resulting with an OK symbol beside each thermostat connected. The most common problem that results in error codes being the incorrect wiring of the 5 volt bus system. The polarity of the bus must be maintained throughout the system. If the polarity is not maintained this will result in communication being lost between the thermostats, the Master Control box and add-on modules.

IMPORTANT POINTS:

- Ensure every thermostat has been set to the correct channel number as per the zone schedule shown on the 'as fitted' wiring diagram particular to the project. Inside each thermostat there is a setting pot which is numbered 0 to 9 and A to F. 1 to 9 on the pot corresponds to outputs 1 to 9 and A to E corresponds to outputs 10 to 14. Position 0 on the thermostat is used for any clock thermostat which is situated in a central position, is not sensing its own zone, but is being used for time and temperature settings of other zones. Position F is not used.
- **Begetube UK** will always specify and supply a thermostat which includes a floor sensor (WLTD) for use in wet areas e.g. bathrooms, shower rooms etc. This gives the ability to keep a minimum temperature within the tiled floor whilst still controlling the room air temperature. To choose the minimum temperature control function you must remove the 'jumper' from the circuit board within the thermostat (see detailed instruction supplied with the thermostat). Leaving the jumper fitted gives the ability to set a maximum floor temperature, which can be used to protect areas with expensive hardwood flooring.

Clock Thermostats

WLCT clock thermostats can be used, either as a room control, or as a customer interface where it is acting as a control point, and not sensing its own zone. In either case, the WLCT can be told, via the menu, to control any of the 14 zones of heating, at the times and temperatures that it is set for. For example, bedrooms may need to be brought up to temperature at different times to living rooms. If two WLCT's are employed, one can be programmed to operate all the bedroom zones, and the other to control the living zones. Generally one WLCT clock thermostat will have been supplied per floor or per main area. In this case, the WLCT for each group of zones can either be one of the room controls, or they can be remotely mounted in, for example, the kitchen, and then the whole house heating can be operated from one position. Refer to the CAD drawing for information on sighting each type of sensor, it will show which type of sensor is used in each controllable area. The final positioning of each sensor should be done taking the normal rules into account. As many clock thermostats as are required can be used, up to a maximum of 9 over and above the 14 individual room thermostats.

Each WLCT can be set to carry out two or four switching events per day, i.e. one or two events to increase the temperature and one or two events to decrease the temperature. A different temperature can be set at each event. If the clock thermostats are being allocated to a group of sensors, as is normally the case, the sensors within that group then have the ability to give the end user a further $\pm 4^{\circ}\text{C}$ control over the settings in the clock stat.

To ensure the maximum efficiency of the system the end user should program in appropriate time and temperature settings into the clock stat(s) and allocate these settings to the other sensors in its area/floor level.

Full operating and setup instructions for the clock thermostat (WLCT) can be found in the following section (operating instructions) With regards commissioning the system, the following procedures must be carried out.

- Set the correct channel number inside every thermostat (1 to 9 corresponds to channel 1 to 9 and A to E is 10 to 14)
See zone schedule on 'as fitted' wiring diagram for the particular project.
- Set the day and time (see operating instructions, item 1)
- Programme the heating operating times and temperature (see operating instructions, item 3)
- Allocate the correct sensors to the clock thermostat (see operating instructions, item 4, ArEA)
- Set minimum and maximum floor temperature limits (see operating instructions, item 4, HiLi)

OPERATING INSTRUCTIONS INTELLIGENT CONTROL

Although the Master Control Box has some end user functions with regards operating temperatures, when a clock thermostat is used within the system, the controls will work to the settings programmed at the clock thermostat. Please note when programming the underfloor heating event times an allowance should be made for the heat up time between the setback temperature and the normal operating temperature e.g. if the room is set back to 17°C and has to rise in temperature to 20°C by 8 o'clock then the system will need to start at 6 o'clock. You can however time the system into setback 2 hours before the desired temperature change.



The following instructions will provide a good overview of the clock thermostat with regards setting and operation.

WLCT Clock Thermostat

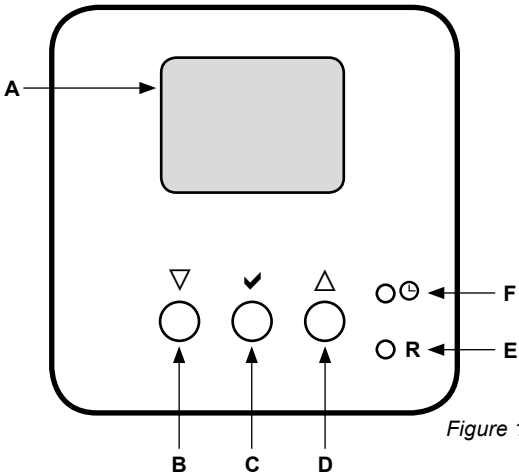
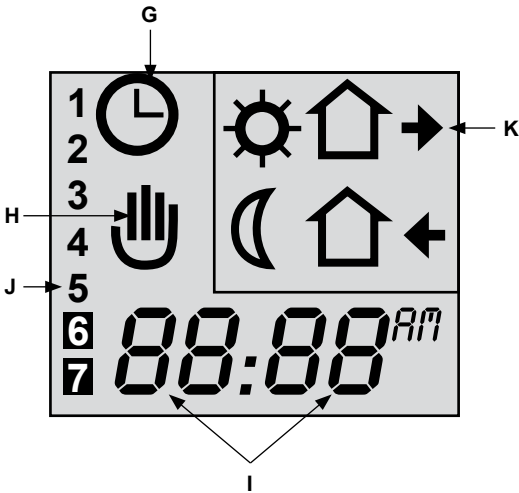


Figure 1 - buttons

A:	B: ▽	C: ✓
Display	Adjustment down	OK - accept

D: △	E: ☀	F: ☾
Adjustment up	Reset to factory setting	Pin button to adjust clock

Display Symbols



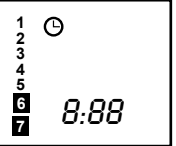
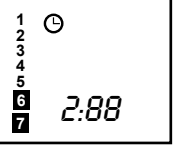
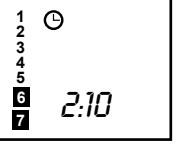
G:	H:	I:
Automatic mode	Manual mode	Time and temperature

J:	K:
Day number	4-event symbol
	☀ Wake ☀ → Out
	☾ Night ☾ ← Home

OPERATING INSTRUCTIONS INTELLIGENT CONTROL

1. Setting the Time and Day

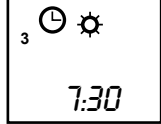
First time power is connected the clock and day will be flashing and must be set. If you need to adjust the time of the thermostat at a later date, insert a pin into the hole marked  (see fig. 1) for setting of time and day. Adjustment should be made for change in summer and winter time.

		Press the UP (Δ) or DOWN (▽) buttons to select the correct hours and press OK button (✓) .	
		Press the UP (Δ) or DOWN (▽) buttons to select the correct minutes and press OK button (✓) .	
		Press the UP (Δ) or DOWN (▽) buttons to select the correct day and press OK button (✓) .	1-7

2. Daily use of the thermostat

4-event clock mode

The day has been split into 4 events describing a typical day. When the thermostat is in this 4-event mode it will change the temperature to the required level automatically at the programmed times. As standard the thermostat has 5 days with 4 events (two ON's and two OFF's), and 2 days with 2 events (one ON and one OFF). For programming see section 3 below. Please refer to item4-PRO to alter the daily event sequence.

4-event clock mode/ automatic mode:		In automatic mode, the clock function symbol (⌚) and one of the 4-event symbols (☀️ 🏠➡️🏠⬅️ 🌙) will be indicated. For programming see section 3
Comfort mode:  Δ ▽  5 seconds		Temporary override To temporarily override any temperature in the 4-event schedule programme, press the UP (Δ) button once, to show the temperature in the display, and press UP (Δ) or DOWN (▽) again to increase or decrease the temperature. The display will flash for 5 seconds, and will then revert to time. The override will operate until the next programmed event when the thermostat will resume the automatic programme.
 ✓ ✓		Cancel comfort mode To cancel the temporary override, press the OK (✓) button twice.
Manual mode:  ✓ Δ ▽  5 seconds		Permanent override During holidays, the scheduled 4-event programme can be overridden. Press the OK (✓) button and then the UP (Δ) or DOWN (▽) button until the override temperature is set. The set temperature will remain in the display and the unit will now operate to this temperature permanently.
 ✓		Cancel manual mode To cancel the permanent override state press the OK (✓) button once, and the unit will resume automatic function.

3. Programming the 4 - event time and temperature

For each event, the start time and required temperature needs to be set. The diagram below shows the factory preset times and temperatures. These settings will normally have to be altered to your requirements. For example, in the morning you wish the heating to start at 06:00 and the temperature to rise to 20°C. Press OK (✓) button for 3 seconds and the start time is displayed. Change this to 06:00 with the UP (Δ) or DOWN (∇) button. Press OK (✓) to confirm.

The temperature is now displayed. Change this to 20°C with the UP (Δ) or DOWN (∇) button. Press OK (✓) to confirm. This action can now be repeated for the second, third and fourth event. If you require the property to remain at this temperature throughout the day, simply choose 20°C for the second and third events. For the fourth event (night setback) set the temperature to typically 4°C lower than your day time comfort temperature. This can be programmed typically two hours before you normally retire.

These settings will be valid for days 1-5 showing on the display. To programme the days 6 and 7, repeat the above. Days 6 and 7 are usually Saturday and Sunday, and only have two events (generally morning ON and evening OFF).

The temperature can be set within the range of +5°C to +35°C. It is also possible to select the heating OFF at that event by reducing the event to 5°C, and then pressing the DOWN (∇) button once more.

Note that when programming the "Sleep" time (event 4), please ensure that this time is before midnight (00:00).

Press OK (✓) button for 3 seconds to begin programming		
Day 1- 5 (Monday, Tuesday, Wednesday, Thursday, Friday)		
1 2 3 4 5 6:00 Hand icon, Δ, ∇, ✓	1 2 3 4 5 20.0°C Hand icon, Δ, ∇, ✓	:Time and temperature
1 2 3 4 5 8:00 Hand icon, Δ, ∇, ✓	1 2 3 4 5 15.0°C Hand icon, Δ, ∇, ✓	:Time and temperature
1 2 3 4 5 16:00 Hand icon, Δ, ∇, ✓	1 2 3 4 5 22.0°C Hand icon, Δ, ∇, ✓	:Time and temperature
1 2 3 4 5 22:30 Hand icon, Δ, ∇, ✓	1 2 3 4 5 15.0°C Hand icon, Δ, ∇, ✓	:Time and temperature
Day 6 - 7 (Saturday, Sunday)		
6 7 8:00 Hand icon, Δ, ∇, ✓	6 7 22.0°C Hand icon, Δ, ∇, ✓	:Time and temperature
6 7 23:00 Hand icon, Δ, ∇, ✓	6 7 15.0°C Hand icon, Δ, ∇, ✓	:Time and temperature

OPERATING INSTRUCTIONS *INTELLIGENT CONTROL*

4. Advanced settings and read-out

	Press both UP (Δ) or DOWN (▽) buttons together for 3 seconds. INFO is displayed. Continue pressing the UP (Δ) button until you reach one of the desired sub menus, PRO, HiLi, Scal, and ArEA (for explanations, see below). Select the sub menu with the OK (✓) button.
	INFO - Information The values of the actual measured room temperature and the floor temperature can be seen. The floor temperature is only shown if a floor sensor is installed. software version → 1.00 Room temperature → 22.8°C Floor temperature → 26.0°C 7:30 Press UP (Δ) or DOWN (▽) button to show the different readouts. No changes can be made here. Use the OK (✓) button to end
	PRO - 4-event sequence It is possible to change the factory event sequence of days 1-5 4-event, and days 6&7 2-event. Days 1-5 are usually Monday to Friday, whilst days 6&7 are usually Saturday & Sunday. An Event is either an ON or a OFF operation. You can select from the following sequences Which are displayed in the form of a code. 4 events 5 days, 2 events 2 days indicated by Code 4:52 4 events 6 days, 2 events 1 days indicated by Code 4:61 4 events 7 days indicated by Code 4:70 2 events 7 days indicated by Code 2:70 2 events 5 days, 2 events 2 days indicated by Code 2:52 Select the required sequence with the OK (✓) button.
	Hi Li - Floor sensor. Maximum and Minimum allowed temperature of the floor surface A limit sensor can be connected to the clockstat. Max limitation is used for safety to prevent high floor temperatures. For example, wooden floor constructions which should not exceed a maximum temperature of 27°C. The value can be set from 5°C up to 55°C. The value can also be set to OFF (adjust the temperature to 55°C and push UP (Δ) button once more). Low limitation is used where the temperature of the floor is required never to fall below the minimum set temperature. For example in kitchens and bathrooms with tiles. The value can be set from 5°C up to 55°C. The value can also be set to OFF (adjust the temperature to 5°C and push DOWN (▽) button once more). Remember the max limit temperature must be set higher than the min limit temperature. The limit temperatures defined in the clock thermostat will be valid for all the thermostats with limit sensor (type WLTD-19) which are part of the group of thermostats allocated to the WLCT unit. 27.0°C LoLi 17.0°C The maximum allowable floor temperature setting is shown. Use the UP (Δ) and DOWN (▽) button to increase or reduce, and OK (✓) button to confirm. The display will now show LoLi. Press OK (✓) button to continue. The minimum allowable floor temperature setting. Use the UP (Δ) and DOWN (▽) button to increase or reduce, and OK (✓) button to confirm.
	SCAL - Time and temperature scale selection 24. °C 24. °F 12. °C 12. °F 7:30 You can select either °C or °F scale, and 12 or 24 hour clock as follows: Press UP (Δ) or DOWN (▽) button to change settings. confirm the required scale with the OK (✓) button.

4. Advanced settings and read-out continued

	ArEA - Zone Begetube UK will always specify and supply one or more clock thermostat(s) per project. The clock thermostat, unless used remotely*, will control the area it is in but can also have its time and temperatures allocated to one or more thermostats within the property. For example, if you have several main living areas and several bedrooms, two clock thermostats would be used. In this case, allocate all the bedroom areas to one of the clock thermostats and allocate all the living areas to the other. This provides the ability to have different time and temperature settings for the two different areas whilst also still having $\pm 4^{\circ}\text{C}$ control over the base settings on a room by room basis. To do this, enter the ArEA sub-menu and press OK (✓) button. CH 1 will be displayed; use the OK (✓) button and then the UP (Δ) button to change the setting to ON if this thermostat is to be allocated to the clock thermostat or leave the setting at OFF if it is not being allocated to the clock thermostat. Repeat this process for all channels and clock thermostats, referring to the zone schedule on the 'as fitted' wiring diagram for guidance. In total, up to 14 channels can be programmed in this way using a maximum of 6 clock thermostats, each with its own sub-thermostats operating to its schedule and temperatures. * By setting a clock thermostat to channel 0 it will not control the area it is in and only operate the thermostats which have been allocated to it.
	Set the Channels/Rooms (Ch) to ON if they should follow the settings of this clock thermostat. In total 14 channels / rooms can be controlled.
	Press OK (✓) button to end programming to return to scheduled programme.

Once all the parameters have been set, the system will work to its programmed times and temperatures. At this time it is advisable to check the correct operation of the 4-port mixing device (ref. page 51-53). The calculated flow temperature and actual flow temperature can be displayed within the menu screen of the full system Master control box (WLM-1FS). Once the system has stabilised, these two values should be the same or very similar if the mixer is working correctly.

5. Reset to factory settings

	Press the pin button for 3 seconds and the thermostat returns to factory settings. Remember to set the time, day and area zone.
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OPERATING INSTRUCTIONS *INTELLIGENT CONTROL*

The following tables provide you with a space to record your own preferred settings. These tables should be filled in and up-dated where necessary for the purposes of future reference.

Factory settings

Insert your own time and temperature settings in the table below.

4-event time and temperature, factory settings and your own settings				
Day 1-5	Time	Own settings	Temperature	Own settings
	06:00		20°C	
	08:00		15°C	
	16:00		22°C	
	22:30		15°C	
Day 6-7	Time	Own settings	Temperature	Own settings
	08:00		22°C	
	23:00		15°C	
4-event sequence	4:52			
High limit temperature	27°C			
Low limit temperature	17°C			

Insert the room name and the allocated clock thermostat in the boxes next to each channel number in the table below.

Group	Room	Allocated WLCT	Group	Room	Allocated WLCT
ch 1			ch 8		
ch 2			ch 9		
ch 3			ch 10		
ch 4			ch 11		
ch 5			ch 12		
ch 6			ch 13		
ch 7			ch 14		

As always, if you require any help or advice with regards installation, commissioning or operating your underfloor heating system, please get in touch with your supplier.

FLOOR COVERINGS DO'S & DON'TS

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 **Begetube** 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.

Hardwood Floor Coverings

Can be either solid hardwood or engineered boards with hardwood laminate.

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) **Begetube** 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 **Begetube UK**.

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.

THE
**UNDERFLOOR
HEATING**
MANUFACTURERS' ASSOCIATION



Begetube Pressure Test & Commissioning Certificate

Project Name	
Full Address	
Postcode	
Project No.	
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

If the guarantee certificate has to be sent to a different address to the one above, please state where:

.....

For issue of System Guarantee
please return completed form to:

Begetube UK Ltd
8 Carsegate Road South
Inverness
IV3 8LL

TERMS & 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 Begetube UK Ltd shall constitute as an invitation to treat & not an offer. Begetube UK Ltd may withdraw or amend any quotation at any time prior to Begetube UK 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 Begetube UK 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) Begetube UK 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) Begetube UK Ltd agrees to repair or replace free of charge any goods, which in the opinion of Begetube UK Ltd are defective due to a manufacturing fault but this must be brought to the attention within the guarantee period. Begetube UK 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) Begetube UK 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) Begetube UK 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 Begetube UK 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) Begetube UK 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 Begetube UK 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 Begetube UK Ltd that are active & not suspended.
- 29) Account customers must make payment for an invoice within their agreed terms with Begetube UK 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, Begetube UK 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 Begetube UK 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 Begetube UK Ltd whether in respect of a claim by the buyer in respect of goods supplied by Begetube UK Ltd or for any other reason which is contested or for which liability is not admitted by Begetube UK Ltd. A credit note will be raised should an issue arise & has been agreed by Begetube UK 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 Begetube UK Ltd of the intended change. Continuation of trading with a new entity shall be reviewed after relevant reference checks & acceptance by a director of Begetube UK 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 Begetube UK Ltd upon demand of the place or places where the goods are situated.
- 39) The buyer shall give Begetube UK Ltd access to the goods during normal business hours whether the goods are upon land occupied by its customers or Begetube UK Ltd. This allows Begetube UK 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) Begetube UK 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 Begetube UK Ltd becomes immediately due and Begetube UK 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 Begetube system is correctly installed, other trades are aware of their responsibilities & the complete system is commissioned & explained to the end user.
- 43) Begetube UK 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) Begetube UK Ltd. will on request make a site visit to resolve a problem that the installer cannot rectify. Site visits by Begetube UK 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 Begetube 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 Begetube UK 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. Begetube UK Ltd will invoice the company or individual for the full cost, time travel & equipment of the site visit.
- 47) Installation by Begetube UK 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 Begetube UK 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.

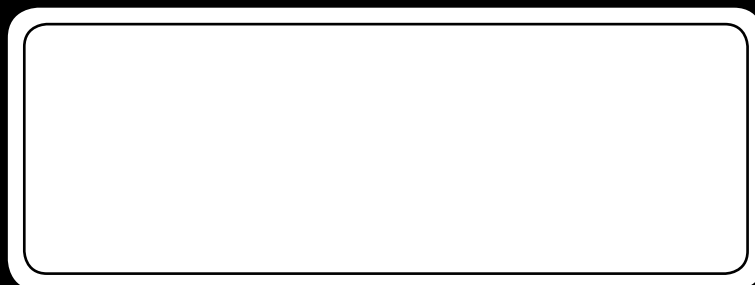
Warranties & Guarantees

- 49) Begetube UK Ltd provides a ten year system guarantee warranty in writing, from the date of delivery on the quality of the Begetube piping & manifold systems. Pumps & controls are covered by individual manufacturer's guarantees.
- 50) We agree to reimburse all costs & damages which are a direct consequence of a production error to the pipes or the accessories.
- 51) In order to accomplish this, we have taken out a product liability insurance, which covers up to £800,000 per case.
- 52) Following the 1st 10 years of guarantee, Begetube UK Ltd will guarantee the pipe for a further 40 years. In this instance the liability of Begetube UK Ltd shall be limited to supplying & installing the replacement pipe free of charge into a prepared floor.

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



Your local Begetube approved installer



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