



## Bivalent Space Heating with Underfloor

### Principle of Operation

[Bivalent systems](#) utilise a secondary boiler, which is designed to provide heat into the distribution system when the heat pump isn't sized for 100% of the peak load.

They are generally found in [retro-fit applications](#) where insulation levels of the building are not sufficient and a heat pump cannot meet all of the heating load effectively.

[Bivalent systems](#) have to be carefully designed to avoid the return temperature of the heating circuit being too high. If this return temperature is above the in-built temperature set point at which the heat pump turns off, the heat pump will never actually turn on and the whole of the load will be taken by the secondary boiler, resulting in higher than expected energy bills and carbon emissions.

The simplest and most effective way to achieve the maximum efficiency for a [bivalent heating system](#), while retaining the clients comfort, is to use 'either / or' control logic. Simply put either the heat pump or the secondary boiler operates, but not both together

The system operates by use of an external temperature sensor (TS). This is set at to an external temperature above which the heating load is satisfied by the heat pump alone. If the external ambient temperature drops below this set point then the heat pump is switched off and the secondary boiler is switched on to supply heat into the heating distribution system. Due to the higher output temperature of the secondary boiler it is important that the boilers flow is mixed via a mixing valve (MV) with the return flow to lower the temperature to a suitable level for the heating distribution system.

#### Facts at a glance:

- Highest possible efficiency

Utilises the heat pump's high efficiency to produce the majority of space heating.

- 'Either / or' control logic

Control logic avoids the secondary boiler taking the whole heating load resulting in the heat pump never operating.

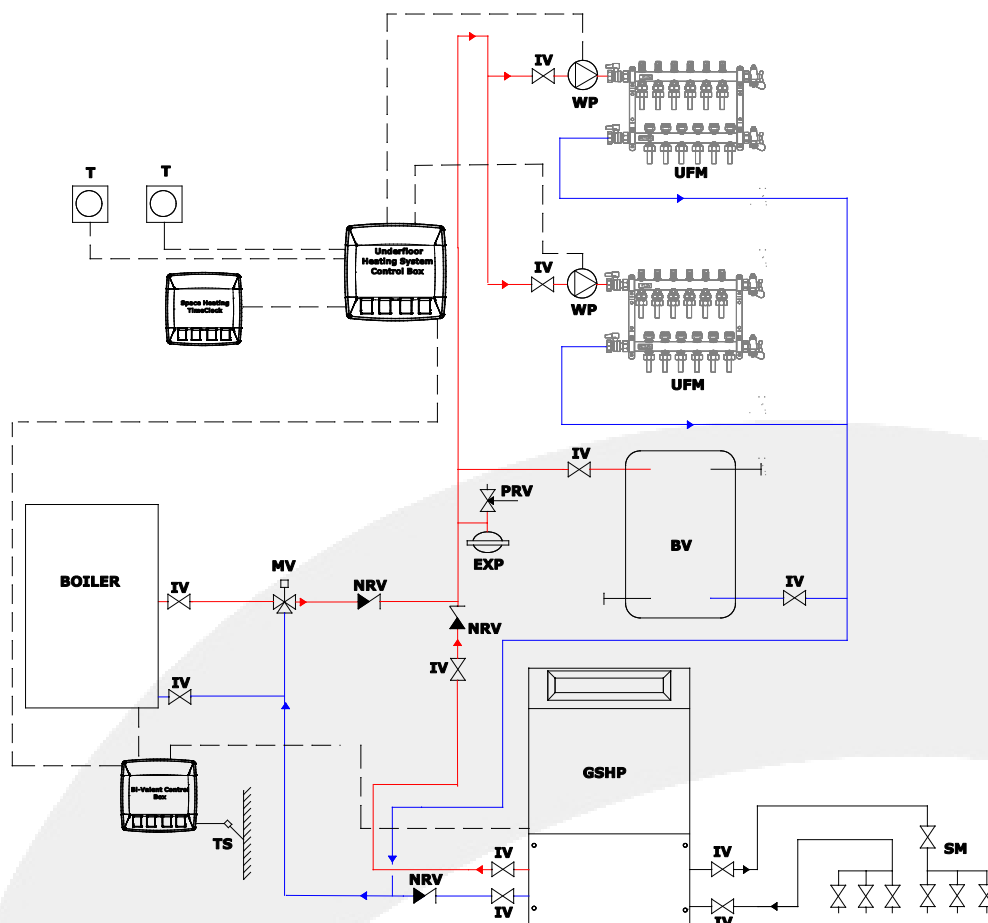
- Simple Installation

Designed to simplify installation by removing the need for complicated control logic.

- Easily adjustable

The point at which the secondary boiler takes over from the heat pump can easily be adjusted by use of the outside temperature sensor.

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**Please note:** The above drawing is a schematic only and additional valves and fittings maybe required.

**Please note:** Kensa supplies the ground source heat pump and slinky manifold . Kensa also supplies the horizontal ground arrays and antifreeze (not shown above).

The buffer vessel (BV) is an optional item and can be fitted to reduce short cycling of the heat pump. If 25% of the underfloor zones are left open this is not required.

### Abbreviations

BV	- Buffer vessel
EXP	- Expansion vessel
GSHP	- Ground source heat pump
IH	- Immersion heater
IV	- Isolation valve
MV	- Mixing valve
NRV	- Non return valve
PRV	- Pressure relief valve
SM	- Slinky manifold
T	- Thermostat
TS	- Temperature Sensor
UFM	- Underfloor manifold
WP	- Water pump