

# Technical Bulletin

## Installation Advice: Cascading up to 4 Greenstar Utility Oil Boilers

### Guidance for design and installation oil cascades

For heating and hot water systems which require an output above 70kW, multiple Greenstar Utility 50/70 oil boilers, up to a maximum of 4, can be linked together in a cascade.

This Technical Bulletin will help the designer and installer ensure they have an efficient and compliant installation.

### Initial assessment

Cascaded boilers give a flexible option and can help where access is limited to a boiler room or plant room. However floor footprint and service clearances must be taken into consideration. The requirements of the building regulations, BS5410 part 2 and all other local regulations and standards must be considered at the design stage.

### Hydraulic arrangement

For condensing boilers, design of the system flow rates should be based on  $\Delta T$  20K to give lower return temperatures. This may require re-balancing of the existing heating circuits for older systems operating at 82/71. It is generally accepted that older systems have radiators which are oversized, meaning that most systems can be re-balanced to 80/60.

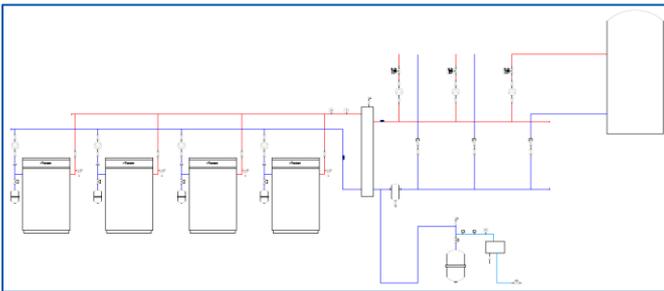


Fig. 1) Hydraulic example for a sealed cascade system, see attached schematic LSS-DR-Y-0090 (Fig. 5) for full detail

Cascade systems must use a low loss header to give hydraulic separation and aid efficient control. The following Low Loss headers can be used:

120/80 2 boilers      8-920-097-2      1 1/2" connections

200/120 3&4 boilers    7-716-150-013    DN80 connections

Each boiler must have a separate primary pump and non-return valve as shown in the hydraulic example. A strainer in the secondary return is recommended, especially for older systems.

### Open vented systems

For open vented system, the open vent should be taken from each boiler before any isolation valves. The open vents can run separately from each boiler to above the expansion tank. Where a single open vent is used with separate connection to each boiler, the use of three way isolating valves will be necessary to ensure an individual boiler can be isolated if

required. The cold feed can enter the common return to the boilers on the primary side of the low loss header and should incorporate a lock shield isolating valve.

Open vent and cold feed pipe sizes should be in accordance with BS5410 part 2. The example sizes below relate to the Greenstar Utility 50/70 boiler:

Cold feed pipes for two boilers should be a minimum of 25mm bore and for 3 & 4 boilers they should be a minimum of 32mm bore. Open vent pipes for individual boilers should have a minimum bore of 25mm. For 2 boilers they should have a minimum bore of 32mm. For 3 & 4 boilers they should have a minimum bore of 38mm.

Each boiler must have a safety valve rated at 3bar. If the static head is likely to exceed this maximum pressure, see guidance for sealed systems

Each boiler must have a means of reading the temperature and pressure at the boiler.

### Sealed systems

For sealed systems, the main expansion vessel can be connected into the secondary return adjacent to the low loss header. Attention must be drawn to the requirements of the Water Regulations when connecting heating systems above 45kW in a "non-house" situation. This will generally require a method of filling and maintaining system pressure which incorporates an RPZ valve or air break. A filler loop does not give adequate protection and the use of an auto fill system will generally be required.

Each boiler will require its own small expansion vessel, which must be situated before any isolating valves. The small expansion vessel must be sized to accommodate the expansion in water capacity of the boiler and any pipe work up to the isolation valves.

Example: For a system with 20m static head and a combined boiler and pipe work volume of 60 litres, a 40 litre expansion vessel can be used (based on high limit of 100°C).

The boilers should be interlocked with minimum and maximum system water pressure switches, to ensure safe operation.

Each boiler must have a safety valve rated at 3bar. If the static head is likely to exceed this maximum, the boilers should be separated by a suitably sized plate heat exchanger in place of the Low Loss header. In these circumstances, both the primary and secondary sides of the system will require separate sealed system equipment and expansion vessels. We advise you contact Worcester Bosch Technical team for guidance.

Each boiler must have a means of reading temperature and pressure at the boiler.

Whilst it is always our intention to fully assist, it is essential to recognise that all information given by the company in response to an enquiry of any nature is provided in good faith and based upon the information provided with the enquiry. We recommend that advice should always be checked with your installer or contract partner. Consequently, the company cannot be held responsible for any liability relating to the use or repetition of such information or part thereof. In addition, whilst making every reasonable effort to monitor the performance and quality of our supply, installation and service network, we do not accept responsibility for the workmanship or operation of any third party company that the company may have promoted either in conversation, e-mail, or other communication. Similarly, the views and opinions expressed in communication with individuals within the company may not reflect that of the business as a whole.

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### Flue systems

The boilers must be served by individual flue systems. Combined flue systems are not recommended for the use with Greenstar oil fired boilers.

Room sealed flue options can use the standard Worcester flue kits following the guidance within the installation manual.

For open flue systems, the guidance within the installation manual and the requirements of BS5410 part 2 must be followed.

Open flue systems using third party flues should be sized and installed by a competent person with the necessary skills and experience.

### Ventilation

The requirements for ventilation within boiler rooms must follow the requirements of BS5410 part 2.

For open flue boilers with natural ventilation, 6.7cm<sup>2</sup> for each 1kW of boiler capacity are required at low level and 3.3cm<sup>2</sup> for each 1kW of boiler capacity are required at high level.

Openings must not be less than 120cm<sup>2</sup>.

For room sealed boilers with natural ventilation 2cm<sup>2</sup> for each 1kW of boiler capacity are required both at high and low level.

The above figures represent standard situations and it is important that the full requirements of BS5410 part 2 are met and referred to.

### Oil supply

The oil supply arrangement must follow the requirements of BS5410 part 2. The Greenstar Utility 50/70 boiler is suitable for operation with Kerosene only. See Fig. 2, Fig. 3 and Fig. 4 for more information.

Galvanised tubing must not be used. The use of black iron or copper pipe is preferred.

### Wiring and controls

The cascade should be wired using the *Kanmor 264e* cascade wiring centre sold by Radiant Controls Ltd.

[www.radiantcontrol.co.uk](http://www.radiantcontrol.co.uk)

The wiring connections should be as shown in accompanying Worcester Bosch schematic LSS-DR-Y-0090.

Individual time and temperature control should be used for each circuit.

The Cascade control sensors must be positioned as shown in the schematic LSS-DR-Y-0090 securely to the pipework using a method which will not deteriorate over time due to heat, such as metallic straps.

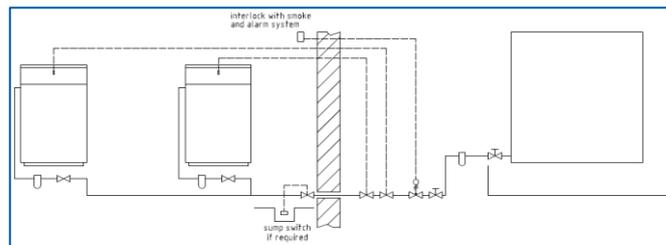


Fig. 2) Example gravity oil supply arrangement

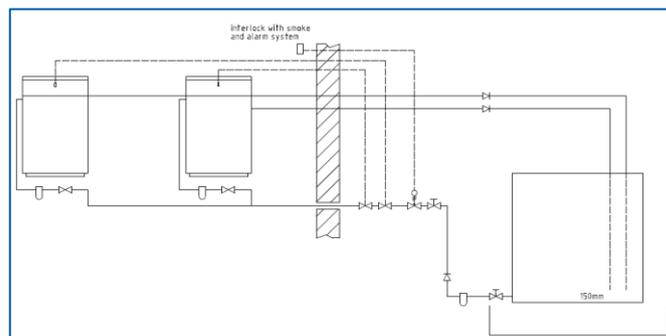


Fig. 3) Example two-pipe oil supply

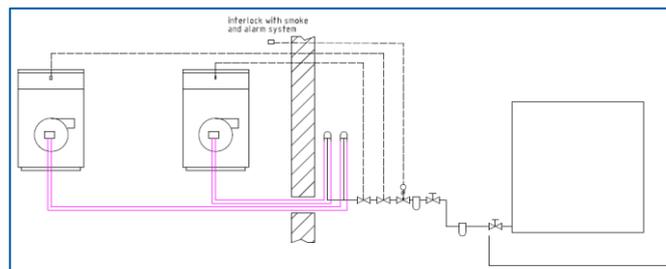
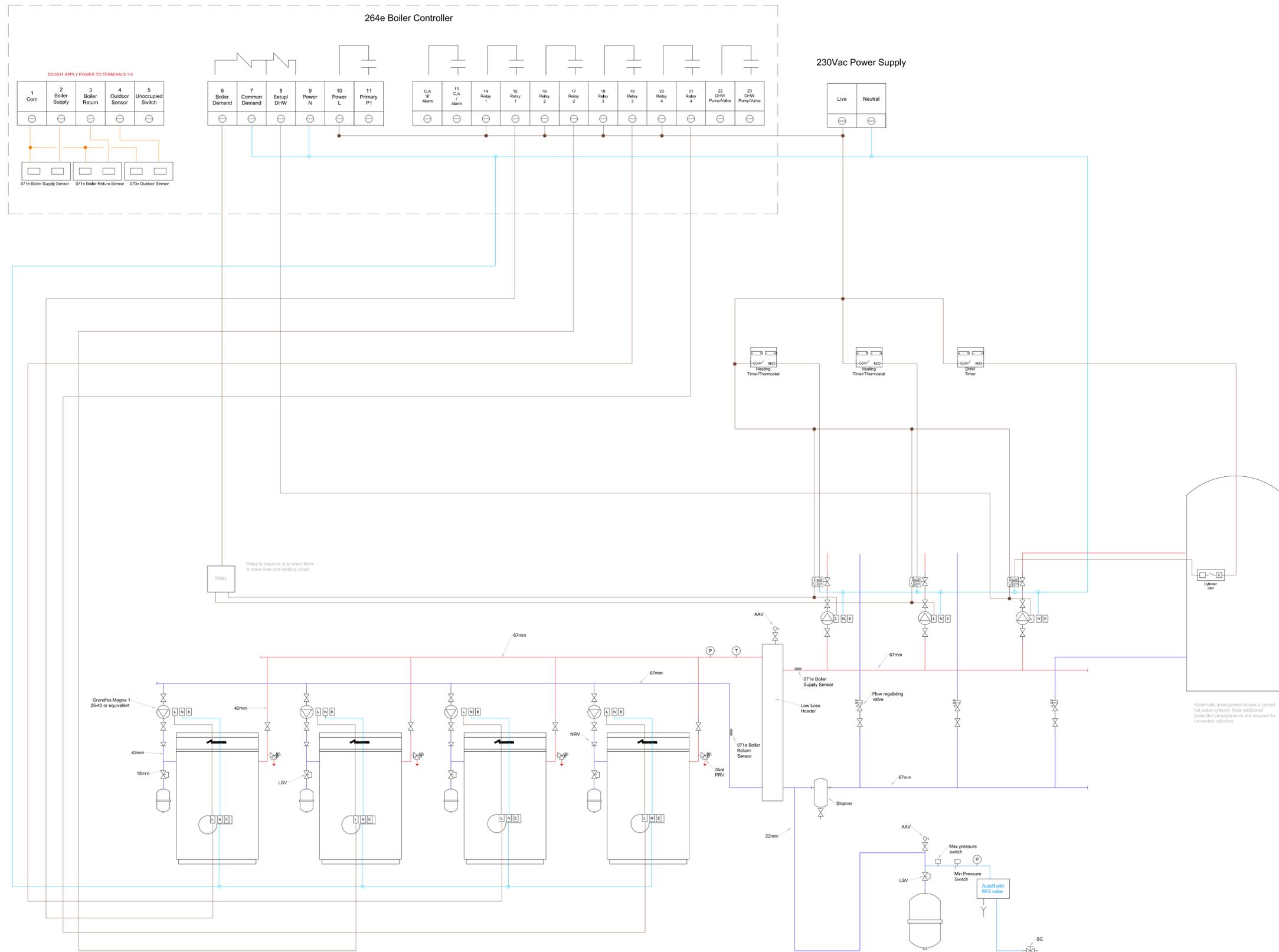


Fig. 4) Example single pipe suction and de-aerator

Fig. 5) Attached below: Schematic LSS-DR-Y-0090

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**NOTES**

- 1 - Hydraulic schematic has been simplified for clarity. There may be other components required which are not shown.
- 2 - Schematic shows a standard open vented hot water cylinder. For un-vented hot water cylinders, safety equipment and interlocks as required by Building Regulation G3 will be required. In particular the energy supply to the cylinder coil must be interlocked via a high limit thermostat (not shown).
- 3 - No Earth connections or wiring have been shown for clarity. Earth connections in line with current wiring regulations will be required.
- 4 - For multiple heating circuits, a separate relay will be required to avoid back feeds (as shown).
- 5 - All pipe sizes and pump selections are for guidance only and should be verified by the Design Engineer before installation.

|   |                         |  |                         |
|---|-------------------------|--|-------------------------|
| Product Type / Model<br><b>Worcester Greenstar Utility 50/70 Cascade - 4 Boilers</b>  |                         |   |                         |
| <small>This drawing is our property and without our written approval it must not be copied or duplicated, nor be made available to third parties.</small> |                         | <small>This drawing has been simplified for clarity and only shows the product's main dimensions, connections, hydraulic and/or electrical representation where applicable. Please ensure that all equipment supplied is installed and commissioned in line with the relevant standards and regulations.</small> |                         |
| Department Responsible<br><b>TT/SGB-LSS</b>   | Drawn by<br>MIP1WO      | <small>This drawing is not a full design drawing and should be seen as a proposal for the designer to consider in the final system layout. It is the ultimate responsibility of the design engineer to ensure the system works to the parameters specified by the end customer.</small>                          |                         |
|    | Checked by<br>MIP2WO    | Drawing / Project Name<br><b>Example Schematic Layout</b>  |                         |
|   | Authorised by<br>MIP1WO | Format<br>A1   | Scale<br>N.T.S.         |
| Document Type<br>Example only   | Released                | Project / Product No.<br>LSS-DR-Y-0090   | Drawing No.<br>1        |
| Revision Status<br>-  | Index<br>01             | Date Created: 20/07/2016   | Date Issued: 01/08/2016 |
|   |                         | Valid to Date: 01/01/2018  | Sheet<br>1              |

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