Clyde BOILERS

Natural gas
Propane Gas

100 kW
to
900 kW

# *Unical Modulex*

Modular condensing gas boiler

Contents Page




Engineering Data Sheet 789/2
December 2007

## Operating principles

Modulex is a cast aluminium condensing boiler, with each section a self-contained heat generating module. Each module has a down-firing pre-mix gas burner with its own control and safety (limit) thermostats. The in-built *BCM* (*Boiler Cascade Manager*) will modulate the boiler on a cascade down to a minimum output of 12 kW for models 100 to 340 and 22 kW for models 440 to 900 - the minimum output of a single module. If any of the modules fail, the others will continue to operate. Multiple boilers can be cascaded by an external BCM or BMS. An *E8 Regulator* is mounted on each boiler to give local control of parameters and settings and control external pumps, sensors and valves. In the event of failure of the E8 Regulator, a rocker switch on the BCM will run the boiler at 50% output until a service engineer can attend.

Pre-mix burners use an air intake fan coupled to a venturi to control the volume of gas being entrained. The modulating control sets the speed of the fan, which accurately governs the volume of gas admitted through the gas valve. This ensures an optimum mixture of gas and air at any output rating, together with thorough mixing before ignition. Consequently, thermal efficiencies of up to 109% net are achieved.

Each module is a counter flow heat exchanger, to maximise heat transfer. Hot exhaust gases travel downwards under positive pressure of the air intake fan. The number of conical heat transfer pins increases towards the flue outlet at the bottom, maintaining an even heat transfer rate as the exhaust gases cool. The system water travels upwards through the modules to create the counter flow.

The modules are hydraulically connected in a reverse-return arrangement. Models 100 to 340 have water and gas connections handed on the right as standard, but can be changed on site to the left. The connections are handed on the left for models 440 to 900. A choice of flue connection positions are available - see pages 4 to 6.

The modules are cast from an aluminium / magnesium / silicon alloy that is light, strong and resistant to acid corrosion.

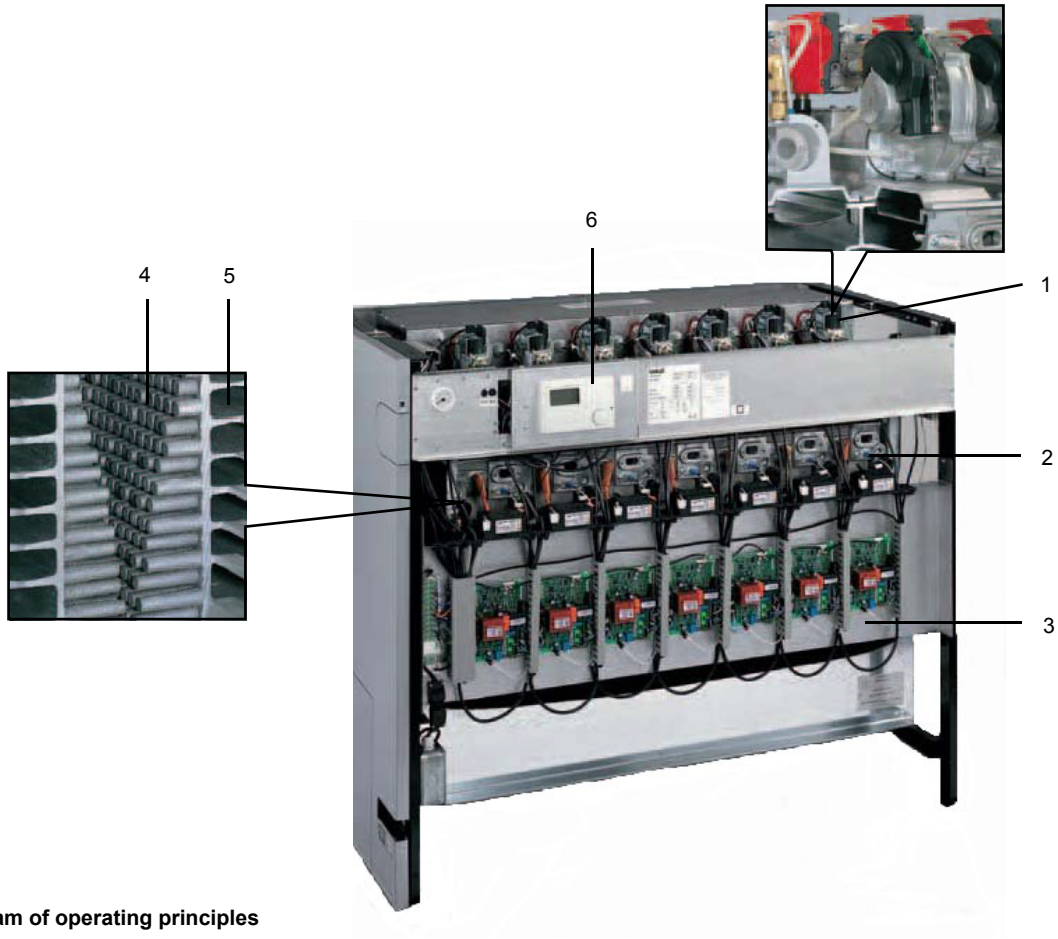



**Fig 1 Diagram of operating principles**

**Key to Fig 1**

1 Pre-mix gas burner
2 Ignition / ionisation probe assembly
3 Single module
4 Heat transfer pins
5 Module waterways
6 E8 Regulator

# General information

## Application

Modulex boilers are manufactured and tested in accordance with the Gas Appliances Directive 90/396/EEC, the Boiler Efficiency Directive 92/42/EEC, the EMC Directive 89/336/EEC, the LVD 73/23EEC and the Machinery Directive 89/392EEC and CE marked accordingly. They are suitable for use in LTHW heating systems with a maximum operating pressure of 6.0 bar and a maximum working temperature of 90°C (see Technical data on pages 4 to 6).

Modulex boilers are suitable for use with Natural gas (G20) or Propane (G31).

The boiler is suitable for use in pressurised (sealed) or open vented heating systems with a minimum static head of 0.5 bar. It is not suitable for use as a direct water heater. Where potable water is required, a matching calorifier or plate heat exchanger must be provided in the system. Modulex is designed to operate with a Type B conventional flue, but models 100 to 340 can be installed as Type C room sealed twin flue appliances, with the air intake connected to the boiler casing.

## Statutory requirements

The installation and commissioning of the boiler must be carried out by a qualified engineer in accordance with the instructions provided.

Gas supplies and gas burners must be installed, serviced and commissioned by a qualified person, eg. a CORGI registered engineer.

## Handling

Offloading, dry storing and placing of equipment in the boiler room is the responsibility of the installer.

Equipment must be dry stored and protected from frost. Cartons must not be crushed or otherwise damaged.

## Commissioning

Clyde undertake commissioning of boilers. Commissioning charges do not include servicing during the guarantee period, although this may be carried out under service contract or to specific order. Boilers should be commissioned in line with CIBSE Commissioning Code B.

## Servicing

The importance of regular maintenance cannot be over-emphasised if maximum efficiency is to be maintained. Customers are strongly advised to place the equipment under service contract immediately commissioning is complete.

## Guarantee

Subject to correct handling, installation and operation, the boilers are guaranteed for two years from the date of despatch.

The guarantee is not valid if the boiler is not installed in accordance with these instructions (please refer to page 6), becomes blocked with debris and/or carbonate deposits from the system water and/or there is no documented evidence of commissioning by Clyde or their appointed engineer.

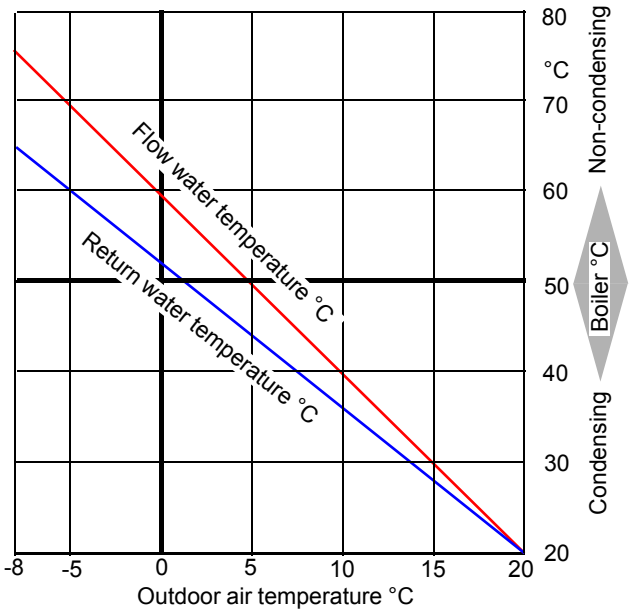
## Boiler Log book

A boiler log book that provides a permanent record of commissioning and servicing data and measurements is supplied with every boiler. It is recommended that the owner ensures that this log book is kept safe and brought up to date on every occasion that routine or emergency work is carried out on the boiler.

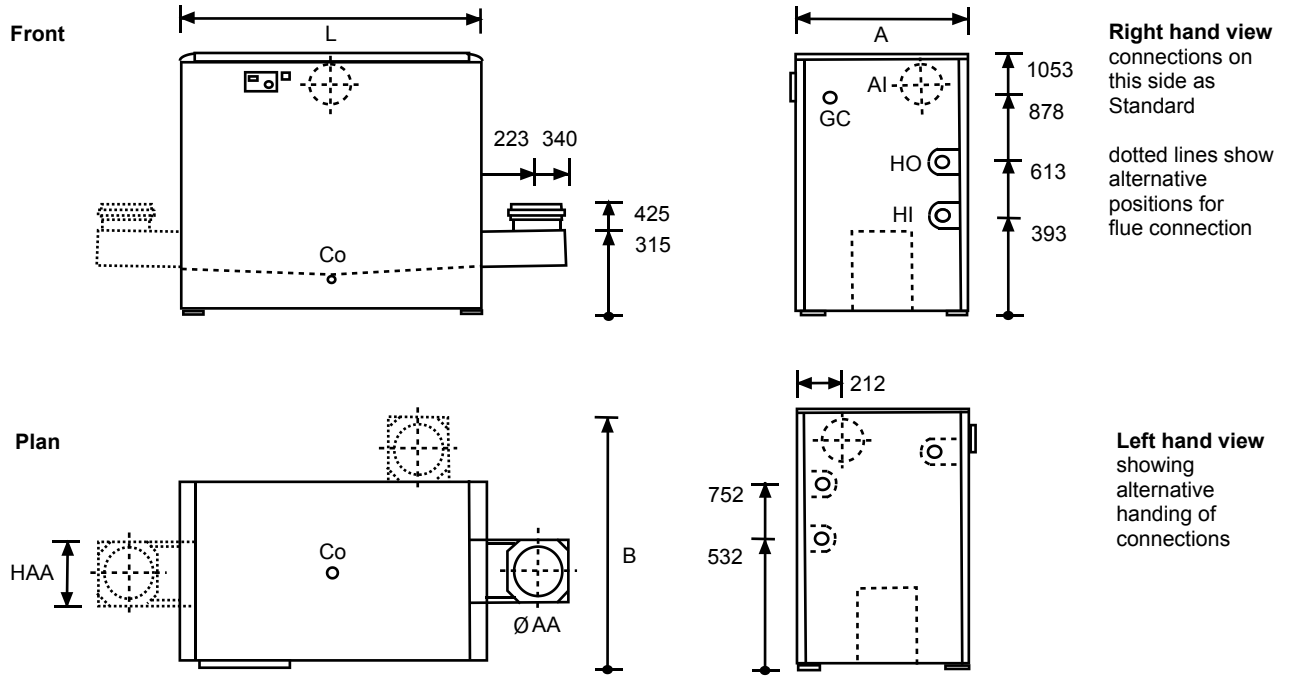
## Emitter sizing (radiators)

The boiler will operate in condensing mode whenever the return water is below 50°C and will reach its full potential if the flow water temperature is also below 50°C. However, the latter condition will mainly occur when the boiler is heating an underfloor heating scheme or transiently when recharging a DHW storage tank from cold. By careful design of a traditional heating system with radiators, and with weather compensating control in operation, the return water temperature can be held below 50°C for most of the heating season, only rising above this figure when outdoor temperatures are below zero.

For optimum performance, calculate heat losses on the basis of a 20°C internal temperature and a -8°C outdoor air temperature. With no added factors, size the radiators on the basis of published EN 442 data (ΔT50) and size the system pump for a 10°C temperature drop. In most cases this will ensure that the boiler begins to operate in condensing mode when the outdoor air temperature rises above 1°C and becomes fully condensing when the temperature is above 5°C. For heating schemes in buildings where the occupants have special needs, different environmental conditions may apply and further advice must be sought.



# Dimensions and technical data




**Dimensions**

| Boiler model | | | 100 | 145 | 190 | 240 | 290 | 340 |
|---|---|---|---|---|---|---|---|---|
| Number of modules | | | 2 | 3 | 4 | 5 | 6 | 7 |
| Overall length | L | mm | 695 | 695 | 834 | 968 | 1102 | 1236 |
| Overall width | A | mm | 695 | 695 | 695 | 695 | 695 | 695 |
| Overall width with rear flue connection | B | mm | 820 | 820 | 820 | 820 | 820 | 820 |
| Boiler flow connection | HO | Rp | 2 | | | | | |
| Boiler return connection | HI | Rp | 2 | | | | | |
| Gas connection | GC | R | 1½ | | | | | |
| Flue spigot (inside dimension) | AA | DN | 150 | 150 | 150 | 200 | 200 | 200 |
| Flue diameter | HAA | mm | 240 | | | | | |
| Air intake | AI | mm | 150 | | | | | |
| Condensate drain | Co | mm | 40 | | | | | |

**Technical data**

| Nominal heat output at; | 30/50°C | kW | 96 | 144 | 192 | 241 | 290 | 339 |
|---|---|---|---|---|---|---|---|---|
| | 60/80°C | kW | 93 | 140 | 187 | 235 | 282 | 330 |
| Efficiency at 100% load (ncv) | 30/50°C | % | 99.9 | 101.1 | 100.2 | 100.4 | 100.7 | 101 |
| Efficiency at 30% load (ncv) | 30/50°C | % | 106.2 | 106.2 | 106.2 | 106.2 | 106.2 | 106.2 |
| Boiler seasonal efficiency (1) | | % | 94.6 | 94.8 | 94.6 | 94.7 | 94.7 | 94.8 |
| Input (ncv) | | kW | 96 | 144 | 192 | 240 | 288 | 336 |
| Natural gas consumption (gross cv) | | m³/h | 10 | 14.9 | 19.9 | 24.9 | 29.9 | 34.9 |
| Dry weight | | kg | 150 | 185 | 225 | 260 | 305 | 345 |
| Water content | | l | 10.1 | 14.2 | 18.3 | 22.4 | 26.5 | 30.6 |
| Max flue resistance | | Pa | 100 | | | | | |
| Flue gas temperature rise (Max) | 30/50°C | °C | 49.1 | 47.2 | 44.8 | 43.1 | 41.2 | 40.1 |
| Flue gas mass flow (Max) | 30/50°C | kg/h | 158.4 | 237.6 | 317 | 396 | 475 | 554.3 |
| Flue gas temperature rise (Min) | 30/50°C | °C | 30.4 | 30.4 | 30.4 | 30.4 | 30.4 | 30.4 |
| Flue gas mass flow (Min) | 30/50°C | kg/h | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 |
| $CO_2$ in flue gas (min / max) | | % | 8.6 / 9.1 | | | | | |
| N0x (based on EN 297/A3) | | Mg/kWh | 52 | | | | | |
| Maximum hydraulic working pressure | | bar | 6 | | | | | |
| Minimum hydraulic working pressure | | bar | 0.5 | | | | | |
| Sound level | | dBA | <49 | | | | | |

Notes: (1) Calculated from the non-domestic heating and cooling compliance guide for conformance with ADL2A and ADL2B 2006 using the formula $\eta$ **seasonal = 0.81**$\eta_{30\%}$ **+ 0.19**$\eta_{100\%}$

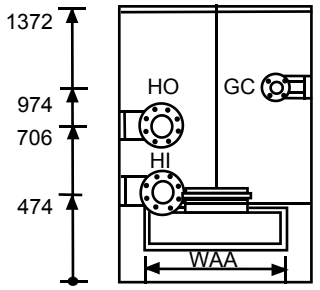
(2) Refer to Clyde for data on Propane (G31) operation

**Water flow rates and hydraulic resistances**

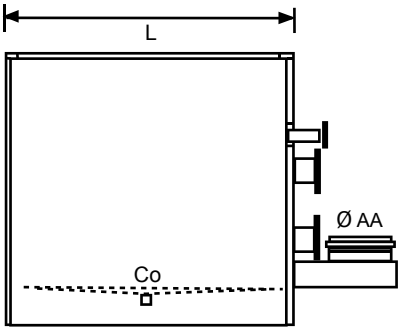
| Water flow rate at 11°C temp. rise | l/s | 2.09 | 3.13 | 4.17 | 5.24 | 6.3 | 7.37 |
|---|---|---|---|---|---|---|---|
| Hydraulic resistance at 11°C temp. rise | kPa | 35 | 44 | 55 | 68 | 90 | 120 |
| Water flow rate at 20°C temp. rise | l/s | 1.14 | 1.71 | 2.29 | 2.87 | 3.45 | 4.04 |
| Hydraulic resistance at 20°C temp. rise | kPa | 10 | 15 | 18 | 25 | 30 | 35 |

# Dimensions and technical data

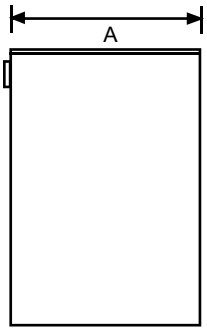
**Modulex 440 only**




Left hand side

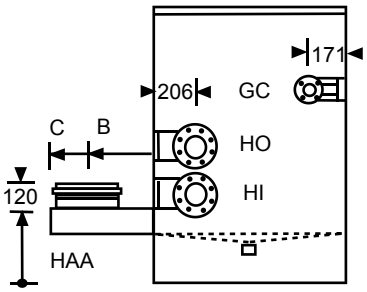



Rear

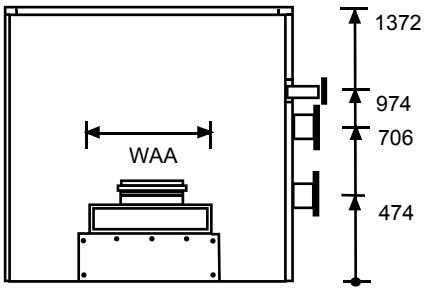



Right hand side

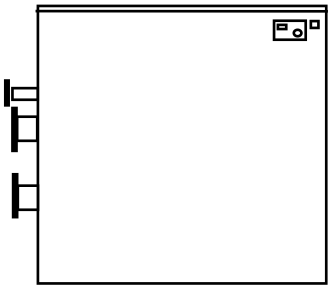
**Modulex 550 to 770**




Left hand side




Rear



Front

**Dimensions**

| Boiler model | | | 440 | 550 | 660 | 770 |
|---|---|---|---|---|---|---|
| Number of modules | | | 4 | 5 | 6 | 7 |
| Overall length | L | mm | 1122 | 1122 | 1256 | 1390 |
| Overall width | A | mm | 920 | 920 | 920 | 920 |
| Centre line of flue | B | mm | 390 | 425 | 425 | 425 |
| Flue connection projection | C | mm | 545 | 600 | 600 | 600 |
| Boiler flow connection | HO | mm | DN80 | DN80 | DN100 | DN100 |
| Boiler return connection | HI | mm | DN80 | DN80 | DN100 | DN100 |
| Gas connection | GC | mm | DN50 | | | |
| Flue spigot (inside dimension) | AA | DN | 250 | 250 | 300 | 300 |
| Flue connector width | WAA | mm | 615 | 615 | 721 | 855 |
| Flue connector height | HAA | mm | 310 | 310 | 310 | 310 |
| Condensate drain | Co | mm | 40 | | | |

**Technical data**

| Nominal heat output at; | 30/50°C | kW | 442 | 554 | 667 | 781 |
|---|---|---|---|---|---|---|
| | 60/80°C | kW | 422 | 528 | 633 | 739 |
| Efficiency at 100% load (ncv) | 30/50°C | % | 102.4 | 102.6 | 103 | 103.3 |
| Efficiency at 30% load (ncv) | 30/50°C | % | 108.8 | 108.8 | 108.8 | 108.8 |
| Boiler seasonal efficiency (1) | | % | 96.9 | 97.0 | 97.0 | 97.1 |
| Input (ncv) | | kW | 432 | 540 | 648 | 756 |
| Natural gas consumption (gross cv) | | m³/h | 44.8 | 56 | 67.2 | 78.4 |
| Dry weight | | kg | 430 | 510 | 620 | 680 |
| Water content | | l | 73 | 88 | 103 | 118 |
| Max flue resistance | | Pa | 100 | | | |
| Flue gas temperature rise (Max) | 30/50°C | °C | 52 | 51 | 50.6 | 52 |
| Flue gas mass flow (Max) | 30/50°C | kg/h | 700 | 875 | 1049 | 1224 |
| Flue gas temperature rise (Min) | 30/50°C | °C | 31 | 31 | 31 | 31 |
| Flue gas mass flow (Min) | 30/50°C | kg/h | 36.4 | 36.4 | 36.4 | 36.4 |
| $CO_2$ in flue gas (min / max) | | % | 9.0 / 9.2 | | | |
| N0x (based on EN 297/A3) | | Mg/kWh | 47 | | | |
| Maximum hydraulic working pressure | | bar | 6 | | | |
| Minimum hydraulic working pressure | | bar | 0.5 | | | |
| Sound level | | dBA | <49 | | | |

Notes: (1) Calculated from the non-domestic heating and cooling compliance guide for conformance with ADL2A and ADL2B 2006 using the formula $\eta$ **seasonal = 0.81**$\eta_{30\%}$ **+ 0.19**$\eta_{100\%}$

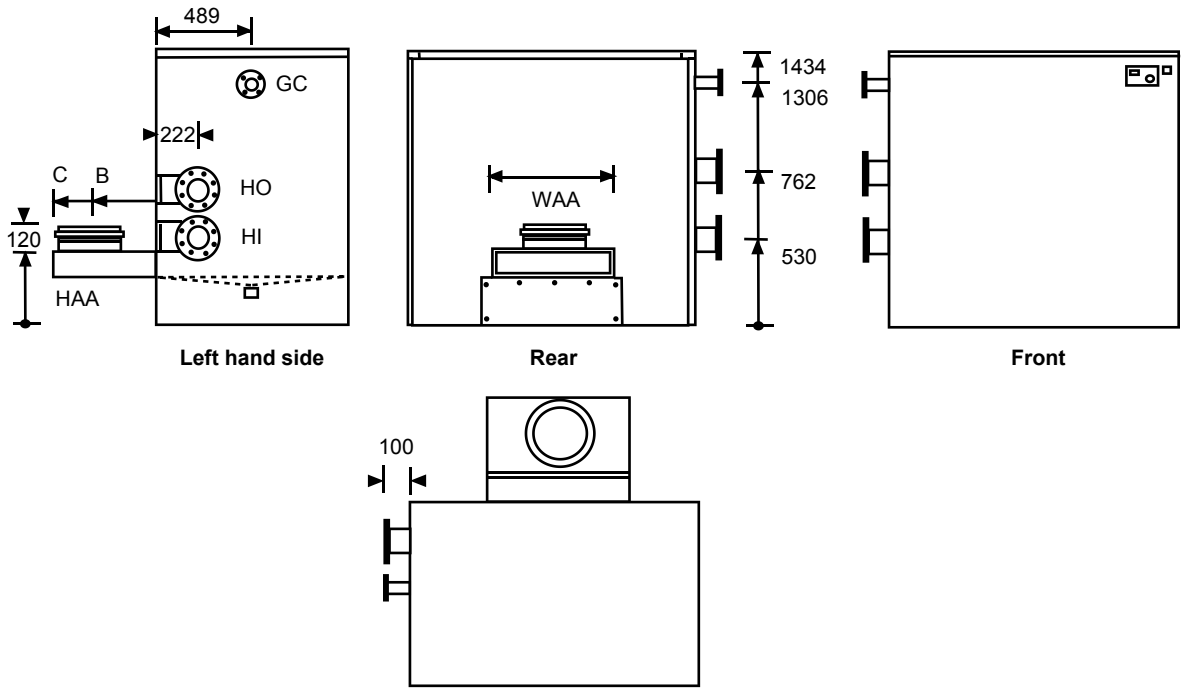
(2) Refer to Clyde for data on Propane (G31) operation

**Water flow rates and hydraulic resistances**

| Water flow rate at 15°C temp. rise | l/s | 7.04 | 8.82 | 10.62 | 12.44 |
|---|---|---|---|---|---|
| Hydraulic resistance at 15°C temp. rise | kPa | 28 | 34 | 38 | 52 |
| Water flow rate at 20°C temp. rise | l/s | 5.26 | 6.6 | 7.94 | 9.3 |
| Hydraulic resistance at 20°C temp. rise | kPa | 16 | 15 | 21 | 23 |

# Dimensions and technical data

**Modulex 900**




| Dimensions | | | |
|---|---|---|---|
| Boiler model | | | 900 |
| Number of modules | | | 8 |
| Overall length | L | mm | 1674 |
| Overall width | A | mm | 961 |
| Centre line of flue | B | mm | 410 |
| Flue connection projection | C | mm | 585 |
| Boiler flow connection | HO | mm | DN100 |
| Boiler return connection | HI | mm | DN100 |
| Gas connection | GC | mm | DN80 |
| Flue spigot (inside dimension) | AA | DN | 300 |
| Flue connector width | WAA | mm | 986 |
| Flue connector height | HAA | mm | 310 |
| Condensate drain | Co | mm | 40 |

| Technical data | | | |
|---|---|---|---|
| Nominal heat output at; | 30/50°C | kW | 894 |
| | 60/80°C | kW | 844 |
| Efficiency at 100% load (ncv) | 30/50°C | % | 103.5 |
| Efficiency at 30% load (ncv) | 30/50°C | % | 108.8 |
| Boiler seasonal efficiency (1) | | % | 97.1 |
| Input (ncv) | | kW | 864 |
| Natural gas consumption (gross cv) | | $m^3/h$ | 89.5 |
| Dry weight | | kg | 830 |
| Water content | | l | 133 |
| Max flue resistance | | Pa | 100 |
| Flue gas temperature rise (Max) | 30/50°C | °C | 52 |
| Flue gas mass flow (Max) | 30/50°C | kg/h | 1399 |
| Flue gas temperature rise (Min) | 30/50°C | °C | 31 |
| Flue gas mass flow (Min) | 30/50°C | kg/h | 36.4 |
| $CO_2$ in flue gas (min / max) | | % | 9.0 / 9.2 |
| N0x (based on EN 297/A3) | | Mg/kWh | 47 |
| Maximum hydraulic working pressure | | bar | 6 |
| Minimum hydraulic working pressure | | bar | 0.5 |
| Sound level | | dBA | <49 |

Notes: (1) Calculated from the non-domestic heating and cooling compliance guide for conformance with ADL2A and ADL2B 2006 using the formula $\eta$ **seasonal = 0.81**$\eta_{30\%}$ **+ 0.19**$\eta_{100\%}$

(2) Refer to Clyde for data on Propane (G31) operation

| Water flow rates and hydraulic resistances | | |
|---|---|---|
| Water flow rate at 15°C temp. rise | l/s | 14.23 |
| Hydraulic resistance at 15°C temp. rise | kPa | 52 |
| Water flow rate at 20°C temp. rise | l/s | 10.64 |
| Hydraulic resistance at 20°C temp. rise | kPa | 26.5 |

## Regulations governing installation

Modulex boilers should be installed in accordance with all prevailing regulations and codes of practice, including the Building Regulations, Health and Safety Regulations PM5, Water Bylaws and the current Gas Safety (Installation and Use) Regulations. Detailed relevant guidance will also be found in;

| | |
|---|---|
| BS 6644 :2005 | Installation of appliances exceeding 70 kW net input |
| BS 6880 | Code of practice for installation of low temperature hot water heating systems of output exceeding 45 kW |

CIBSE Guides B and C and Commissioning Code B
Institution of Gas Engineers Utilization Procedures 1, 1A, 2, 4, 7 and 10.

## Water treatment

Modulex boilers have an aluminium alloy heat exchanger and care must be exercised to ensure that the system water and any water treatment is compatible.
Whenever a new boiler is connected to an existing system, the pipework must be thoroughly cleaned and flushed. This is to remove debris, rust particles, carbonate deposits and any existing water treatment that might be incompatible with the heat exchanger. New systems must also be thoroughly flushed to remove debris and flux deposits. Clyde recommend that a permanent means of filtration be fitted into the return pipework, such as a sludge trap, hydrocyclone or full flow duplex filters. The boiler guarantee will be invalid if waterways are blocked by debris or carbonate deposits.
The pH value of the system water should be measured to ensure that it is between 6.5 and 8. Temporary hardness (calcium carbonate and magnesium carbonate) can be removed by boiling and its effects limited by preventing ingress of fresh, untreated water. Permanent hardness (eg sulphates and chlorides) must not exceed 50 mg/litre. The boiler guarantee will be invalidated by the use of incorrect or incompatible water treatment. Specialist advice should be obtained, eg from;

Fernox Tel. 01483 793200

For full information on cleaning, flushing and protecting hot water systems, refer to BSRIA Application Guide AG 1/2001.

## Deaeration

It is essential that there is effective air removal from the system to avoid corrosion of the heat exchanger. If there is underfloor heating, oxygen-barrier pipe should be used or the boiler separated from the system by a plate heat exchanger.

## Boiler condensate

Modulex boilers have a 40mm condensate drain that is compatible with standard plastic waste pipe (ABS or PVCu). Do not use other materials, as they will corrode. The pipe size must not be reduced and there must be a continuous fall of at least 1:30 to drain. A condensate trap must be provided external to the boiler. As a further precaution against freezing, condensate pipes should be run internally whenever possible and lagged when run externally.

## Pressurisation of systems

Modulex boilers should be installed as part of a pressurised (sealed) or open vented system with a minimum pressure of 0.5 bar. The maximum allowable pressure for the boilers is 6 bar. They are not to be used with a gravity system. If an open vented system is being used, it must be confirmed that static head and operating conditions will maintain the anti-flash margin.

## Boiler location

Modulex boilers will normally be installed inside a building. The boiler must be mounted on a sound, level and non-combustible raised plinth of at least 100mm, capable of supporting its weight. The boiler location must be frost-free and adequately ventilated (see below). Contamination of the combustion air by inflammable vapours, high dust levels or halogenated hydrocarbons will constitute a safety hazard and will damage the boiler.
The following minimum clearances around the boiler should be observed;

| | |
|---|---|
| Front | 600 mm |
| Sides | 50 mm min on one side, flue connector depth (if fitted) + 300 mm on other |
| Rear | Flue connector depth (if fitted) + 300 mm |
| Above | 600 mm |

Alternatively, Modulex boilers may be installed external to the building, using a proprietary stainless steel shroud - refer to Clyde for details.

## Air supply and ventilation

Adequate air for combustion and ventilation is essential to the safe operation of a boiler. If the boiler is installed with a Type C room sealed flue, BS 6644:2005 calls for minimum ventilation of 2 $cm^2$ free area per kW net input at both high and low level unless the ambient temperature of the plant room ceiling exceeds 40°C.
When the installation comprises multiple boilers or single boilers above 70 kW net input with Type B flues, the ventilation requirements of either BS 6644:2005 or IGEM/UP/10 must be met. Table 1 shows the requirements of BS 6644:2005. This standard requires natural ventilation at both high and low levels to the outside air, and is based on the net input of the boilers.

| Ventilation direct to outside air | Total kW input (net) |
|---|---|
| Low level | 4 $cm^2$ per kW of total rated net input |
| High level | 2 $cm^2$ per kW of total rated net input |

**Table 1 Ventilation for single or multiple boiler installations in a boiler room complying with BS 6644:2005**

### Heat exchanger hydraulic resistance

The Modulex boiler has a high resistance heat exchanger. The boiler does not have an integral pump, but does require a minimum flow rate equivalent to ΔT 20, as shown in the tables on pages 4 to 6. The boilers should be hydraulically separated from the heating distribution system by either a low velocity header or a plate heat exchanger and each boiler has an individual circulating pump. This will ensure the minimum flow rate at all times. With this arrangement, the boiler pump can be located in the return (where water temperature is lowest) regardless of the location of the system distribution pumps. A pump over-run should be provided via a relay.

### Low velocity headers

Low velocity headers are used to separate hydraulically the boilers from the rest of the system. In addition to helping maintain a minimum flow through the boiler, they create a low velocity region for system dirt to be deposited and separation of air from the system water. Used in conjunction with a system filter (refer page 7), they are invaluable when connecting a new boiler to an existing system.

Low velocity headers should always be vertical and sized for a maximum water velocity of 0.5 m/s. Modulex low velocity headers are designed to ensure a water velocity of 0.2 m/s or less and for ΔT 10 or 20, so will be suitable for most systems. Fig 2 proposes dimensions for the design of a low velocity header, and Table 2 shows dimensions for a ΔT 10 or 20 system.

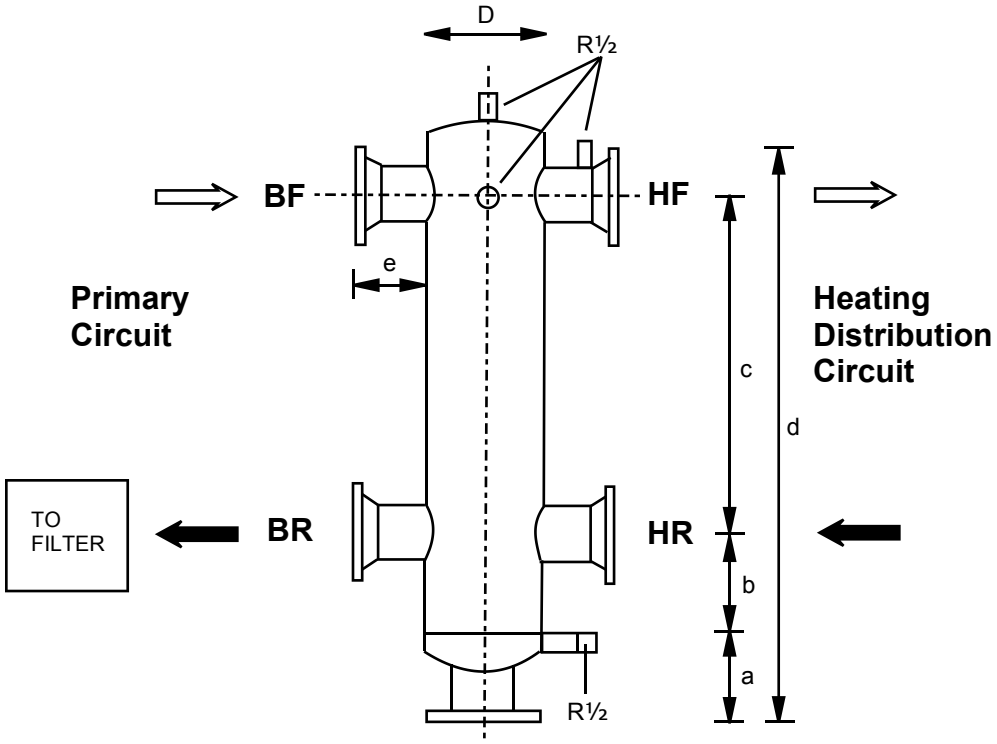



**Fig 2 Design for a low velocity header**

| Max output (kW) ΔT 20 / ΔT 10 | D mm ΔT 20 | D mm ΔT 10 | BF / BR DN ΔT 20 / ΔT 10 | HF / HR DN ΔT 20 / ΔT 10 | a mm | b mm | c mm | d mm | e mm |
|---|---|---|---|---|---|---|---|---|---|
| 100 | 100 | 150 | 50 / 65 | 50 / 65 | 200 | 300 | 1000 | 1650 | 200 |
| 190 / 145 | 200 | 200 | 80 | 80 | 200 | 300 | 1000 | 1650 | 200 |
| 290 | 200 | 200 | 100 | 100 | 200 | 300 | 1000 | 1650 | 200 |
| 440 | 250 | N/A | 125 | 125 | 200 | 300 | 1000 | 1650 | 200 |
| 550 | 300 | N/A | 150 | 150 | 250 | 300 | 1000 | 1700 | 200 |
| 900 | 400 | N/A | 200 | 200 | 250 | 300 | 1500 | 2250 | 200 |
| < 3500 / 1750 | 500 | 500 | 250 | 250 | 300 | 400 | 1500 | 2500 | 200 |
| < 4600 / 2300 | 600 | 600 | 300 | 300 | 300 | 400 | 1800 | 2800 | 200 |

**Table 2 Low velocity header dimensions for ΔT 10 or 20 system**

# Boiler wiring

## E8 Regulator

Each Modulex boiler has an E8 Regulator, from which boiler functions and auxiliary equipment are controlled. It is divided into a 230V block for pumps, mixing valves, etc and a 24V block for sensors and internal cascade control (see Fig 3). Auxiliary equipment run from the 230V block must be connected via a relay. In addition to modular control of the boiler, the E8 can directly compensate the boiler flow temperature via an Outdoor Air Sensor.

## Mains connection

This boiler requires a permanent mains supply of 230V 50Hz, protected by a 3 Amp fuse. Connection is made with a Weiland socket and plug. The electrical supply to the boiler must be installed in accordance with current IEE (BS 7671) Regulations. A separate supply and isolating switch is required for each boiler.

Controls wiring for Modulex boilers is 24V and must be kept separate from 230V supplies (incoming mains and boiler pump overrun) in the conduits supplied.

## Modulating boiler pump

A modulating pump can be controlled by 0 - 10V signal (3V is minimum speed, 10V maximum) from the BCM (terminals 5 and 6 on block Y2)

## External control of the boilers

There are a number of ways to externally control, monitor and cascade multiple boilers;

- ❑ An external E8 Regulator designated as the Master and connected in parallel to terminals **IX 1,2,3 and 4** on the sensor block of each individual boiler E8.
- ❑ As above, but with an additional facility for a BMS to monitor each boiler by connection in parallel to terminals **Y2 1 and 2** on each boiler BCM.
- ❑ An external BCM is designated as cascade manager. This receives an enabling signal on the modbus connection from an external BMS and is connected in parallel to terminals **Y2 3 and 4** on each boiler BCM.
- ❑ No external E8 or BCM is used. An external BMS switch circuit is connected in parallel to terminals **Y2 1 and 2** on each boiler BCM.

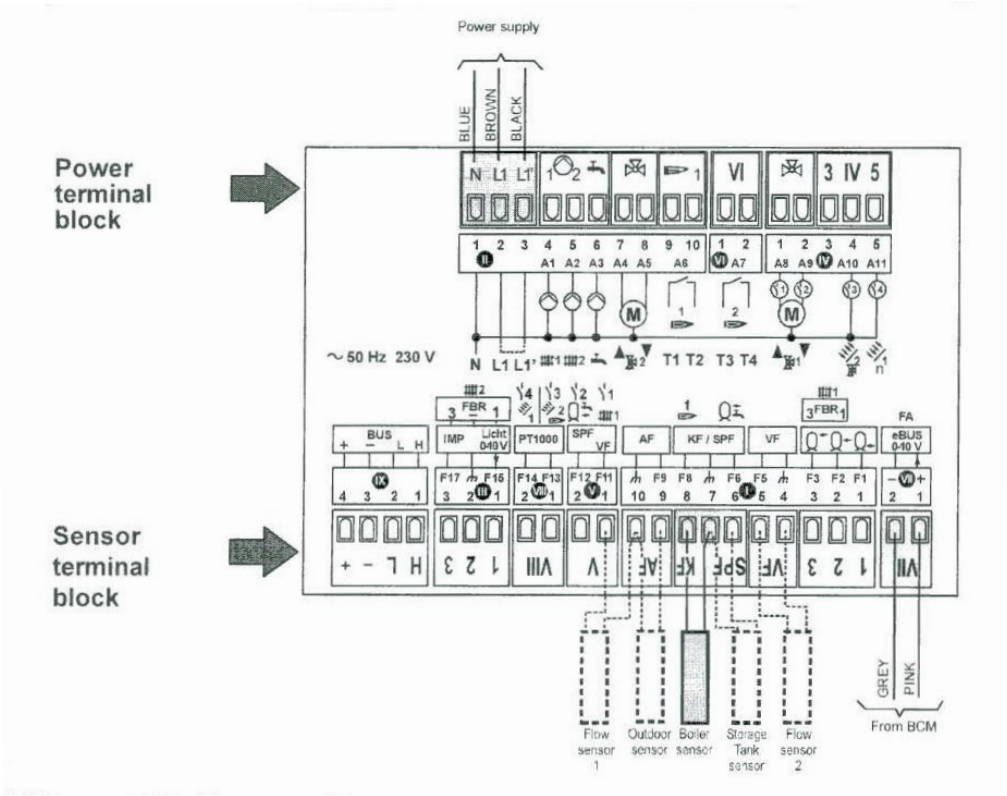



**Fig 3 E8 Regulator**

## Hydraulic system design

### General

Modulex boilers should be hydraulically separated from the heating system by either a low velocity header or plate heat exchanger. Any plastic pipework without an oxygen barrier should be separated from the boiler by a plate heat exchanger.

DHW calorifiers can be connected either side of the LVH, controlled by a loading pump on the primary or high temperature side (fig 4) or a loading pump on the distribution or low temperature side (fig 5). Alternatively, Modulex boilers can be used for heating-only applications, with external control of heating zones. Figs 4 and 5 show examples of connection to the E8 Regulator. More schematics are shown in the Installation and Servicing Instructions.

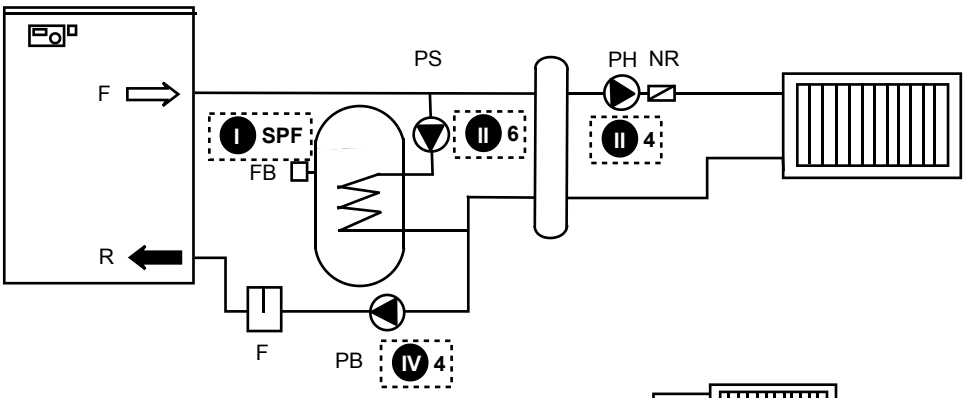



**Fig 4 DHW calorifier on high temperature side**

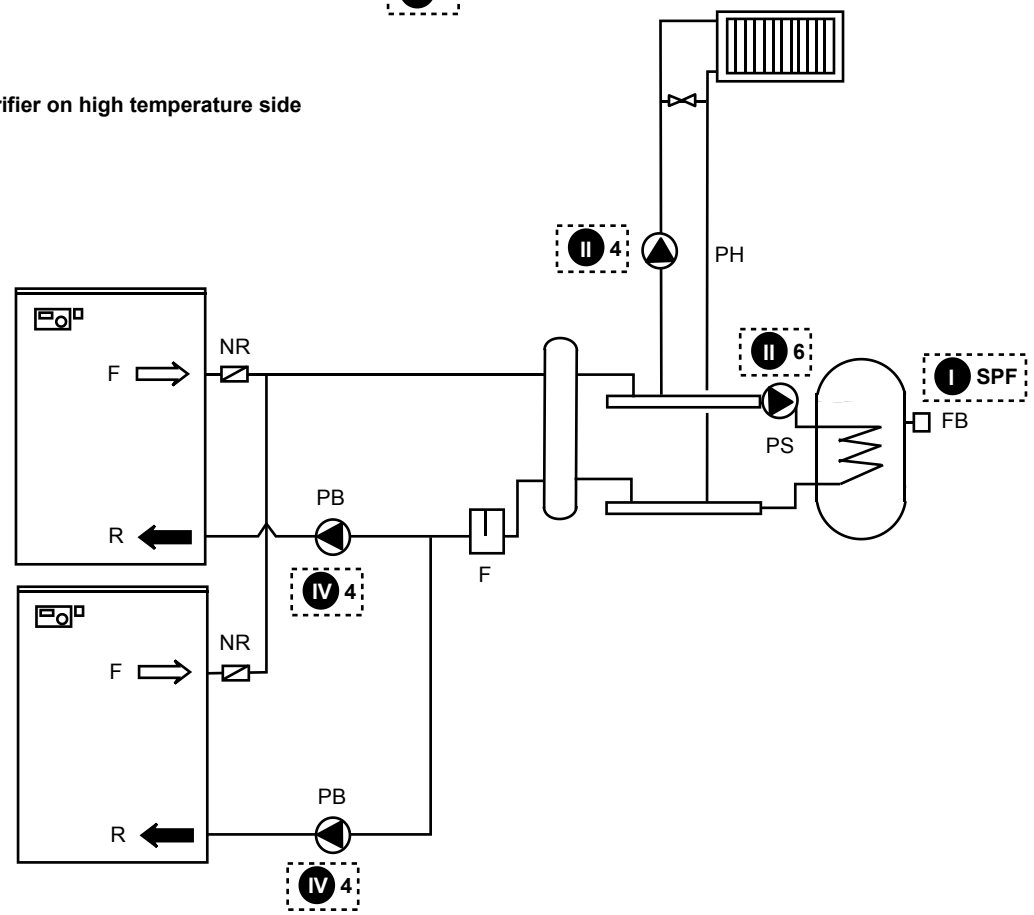



**Fig 5 DHW calorifier on low temperature side**

**Key to figs 4 and 5**

| | |
|---|---|
| F | Filter |
| FB | DHW sensor |
| NR | Non-return valve |
| PB | Boiler pump |
| PH | Heating Pump |
| PS | DHW loading pump |










**Clyde Energy Solutions Ltd**

Unit 10 Lion Park Avenue
Chessington
Surrey KT9 1ST
t : 020 8391 2020
f : 020 8397 4598
e : info@clyde-nrg.com
w : www.clyde-nrg.com

EDS 789/2
December 2007