MURELLE EQUIPE
100-150 BOX

Installation and servicing instructions

Please read the Important Notice within this guide regarding your boiler warranty
SAFE HANDLING

This boiler may require 2 or more operatives to move it into its installation site, remove it from its packaging and during movement into its installation location. Manoeuvring the boiler may include the use of a sack truck and involve lifting, pushing and pulling.

Caution should be exercised during these operations.

Operatives should be knowledgeable in handling techniques when performing these tasks and the following precautions should be considered:
- Grip the boiler at the base
- Be physically capable
- Use personal protective equipment as appropriate e.g. gloves, safety footwear.

During all manoeuvres and handling actions, every attempt should be made to ensure the following unless unavoidable and/or the weight is light.
- Keep back straight
- Avoid twisting at the waist
- Always grip with the palm of the hand
- Keep load as close to the body as possible
- Always use assistance

WARNING

Caution should be exercised when performing any work on this appliance.

Protective gloves and safety glasses are recommended.
- Avoid direct contact with sharp edges.
- Avoid contact with any hot surfaces.

NOTICE

Please be aware that due to the wet testing of the appliance, there may some residual water in the hydraulic circuit.
- Protect any surfaces, carpets or floorings.
- Use a suitable container to catch any water that escape when removing the protective caps from the connections.

All descriptions and illustrations provided in this manual have been carefully prepared but we reserve the right to make changes and improvements in our products that may affect the accuracy of the information contained in this manual.
Important Information

IT IS A STATUTORY REQUIREMENT THAT ALL GAS APPLIANCES ARE INSTALLED BY COMPETENT PERSONS, IN ACCORDANCE WITH THE GAS SAFETY (INSTALLATION AND USE) REGULATIONS (CURRENT EDITION). The manufacturer’s instructions must not be taken as overriding any statutory requirements, and failure to comply with these regulations may lead to prosecution.

No modifications to the appliance should be made unless they are fully approved by the manufacturer.

GAS LEAKS: DO NOT OPERATE ANY ELECTRICAL SWITCH, OR USE A NAKED FLAME. TURN OFF THE GAS SUPPLY AND VENTILATE THE AREA BY OPENING DOORS AND WINDOWS contact the gas emergency service on 0800111999.

Please refer to commissioning instructions for filling in the checklist at the back of this installation guide.

Note: All Gas Safe registered installers carry a ID Card.

You can check your installer is Gas Safe Registered by calling 0800 408 5577

IMPORTANT

Prior to switching on the boiler for the first time, check the following:
- Make sure that there are no liquids or inflammable materials in the immediate vicinity of the boiler.
- Make sure that the electrical connections have been made correctly and that the earth wire is connected to a good earthing system.
- Ensure that tightness and let by test have been conducted, including the internal gas pipe work.
- Make sure that the boiler is set for operation for the type of gas supplied.
- Check that the flue pipe for the outlet of the products of the combustion is unobstructed and has been properly installed.
- Make sure that any isolation valves are open.
- Make sure that the system is filled with water and is thoroughly vented.
- Check that the circulating pump is not jammed.
- Purge the gas supply pipe work.
- Ensure that the checklist is filled in when the commissioning has been completed.
1 DEVICE DESCRIPTION

1.1 INTRODUCTION

"MURELE EQUIPE 100-150 BOX (M)" are pre-mixed condensation heating modules intended only for heating, designed to work in sequence/cascade. They are designed and constructed to meet European directives 2009/142/CEE, 2004/108/CEE, 2006/95/CEE, 92/42/CEE.

1.2 DIMENSIONS MODULES

1.2.1 "MURELLE EQUIPE 100 BOX (M)"

NOTE: The installation must incorporate a hydraulic separator or plate heat exchanger. The hydraulic separator available from Sime Ltd is supplied with modules in a kit code 8101550 and the tubes connecting the hydraulic separator in the kit code 8101534. It can be assembled on the left-hand side by moving the system supply/return manifold blind flanges.
1.2.2 “MURELLE EQUIPE 150 BOX (M)”

**FIXTURES**
- **M** System supply G 2" (UNI-ISO 7/1)
- **R** System return G 2" (UNI-ISO 7/1)
- **G** Gas (Flange PN6-DN50)
- **S3** Condensation drain ø 40

**NOTE:** The installation must incorporate a hydraulic separator or plate heat exchanger. The hydraulic separator available from Sime Ltd is supplied with modules in a kit code 8101550 and the tubes connecting the hydraulic separator in the kit code 8101534. It can be assembled on the left-hand side by moving the system supply/return manifold blind flanges.
## 1.3 TECHNICAL SPECIFICATIONS

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<td>WEIGHT</td>
<td>kg</td>
<td>233</td>
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1.4 OPERATING DIAGRAM

KEY

1 Cascade delivery supply probe (SMC)
2 Hydraulic compensator
3 Antifreeze siphon sensor (SB/ SA)
4 Safety valve 3.5 bar
5 Condensation drain siphon
6 Gas valve
7 8 litre expansion tank
8 Fan
9 Heating supply probe (SM)
10 Safety thermostat 95 ºC
11 Exhaust temperature probe (SF)
12 Heat exchanger
13 Gas isolation valve
14 Heating return probe (SR)
15 Pressure transducer
16 Single module drain
17 Non return valve
18 Shunt pump with air release vent
19 3-way isolation/ drain valve
20 Isolation valve

FIXTURES

M System supply
R System return
G Gas
S3 Condensation drain

Fig. 2
1.5 MAIN COMPONENTS

KEY
1  System return manifold
2  Gas isolation valve
3  System supply manifold
4  Gas valve
5  Fan
6  Safety thermostat 95°C
7  Heating supply probe (SM)
8  Ignition electrode
9  Control panel
10 Ionisation electrode
11 Pressure transducer
12 Single module drain
13 Safety valve 3.5 bar
14 Shunt pump with air release vent
15 Isolation valve
16 3-way isolation/ drain valve
17 Gas manifold

CAUTION: To access the control panel (9) remove the two screws which secure it to the support bracket and turn the panel downwards.

Fig. 3
The unit is suitable for external installation in a fixed location. It must be installed by qualified engineers in compliance with all instructions contained in this manual. Furthermore, the installation must be in accordance with current standards and regulations.

2.1 SUPPLY (fig. 4)

"MURELLE EQUIPE 100-150 BOX (M)" heat modules are interconnected with flange and gaskets. The cabinet is pre painted, zinc coated. They are supplied complete with flow and return, gas and condensate manifolds, external temperature probe kit, cascade supply and RS-485 code 8092250 board connection cable. Available separately:
- Connection kit for the hydraulic separator code 8101534.
- Single box (size: 630 x 640 x 1600) for hydraulic separator, code 8101517 (figure 4)
- Hydraulic separator kit code 8101550.
- Polypropylene exhaust manifold kit for indoor installation (purposely treated to resist weathering when installed outdoors):
  - Exhaust terminal code 8089530 (1 per generator) for outdoor installations.

To electrically connect the modules and to assemble the exhaust for indoor or outdoor installations, see points 2.6, 2.7 and 2.10 in this manual.

2.2 INSTALLATION

2.2.1 Indoors

"MURELLE EQUIPE 100-150 BOX (M)" heat modules can be installed in boiler rooms whose size and requirements meet current regulations.

VENTILATION

The following is provide for your guidance only, and assumes the ventilation air is taken directly from outside. The sizes of the vents may need to be increased in respect of other appliances installed in the same area, and seasonal use. Take care that the position of low level vents would not subject to adverse weather conditions, ie flooding.

Ventilation requirements for Murelle HE 110 R boilers and cascade systems.

BS6644 has a requirement that the temperatures in a room or compartment do not exceed certain levels:
- 25°C at floor level (0-100mm)
- 32°C at mid level (1.5M above the floor level)
- 40°C at ceiling level (0-100mm from ceiling)

Installed as a class B appliance (open flued).

Installed in a room

High level (within 15% of the room height from ceiling) -2cm²/ KW of net heat input

NOTICE: The supply and return of the hydraulic compensator can be positioned on the right or left-hand side of the box by moving the connection flange secured with six screws.
Low level (low as possible within 1 metre from floor natural gas, 250mm LPG) – 4 cm²/KW of net heat input

A single generator (48KW net input) would require 96 cm² at high level and 192 cm² at low level.

*Installed in a compartment or enclosure*

High level (within 15% of the room height from ceiling) - 5 cm²/KW of net heat input

Low level (low as possible within 1 metre from floor natural gas, 250mm LPG) – 10 cm²/KW of net heat input.

A single generator (48KW net input) would require 240 cm² at high level and 1480 cm² at low level.

### 2.2.2 Outdoors

"MURELLE EQUIPE 100-150 BOX (M)" heat modules can also be installed outdoors with the specific exhaust for single module code 8089530.

### 2.3 SYSTEM REQUIREMENTS

#### 2.3.1 Condensation drain connection

The condensate drain must be connected to the civil drain by a pipe with minimum 5 mm per meter gradient for condensation collection.

*Only stainless steel or plastic pipes are suitable to convey condensate.*

#### 2.3.2 Filter on the gas pipe

The gas valve on each generator is supplied ex factory with an inlet filter, which, however, is not adequate to entrap all the impurities in the gas or in gas main pipes. To prevent malfunctioning of the valve, or in certain cases even to cut out the safety device with which the valve is equipped, install an adequate filter on the gas pipe.

### 2.5 FILLING THE SYSTEM

Cold system filling pressure must be 1 bar. The system must be filled slowly so that air bubbles are released through the specific escapes.
2.6 EXHAUST FOR OUTDOOR INSTALLATION (fig. 5)

The exhaust terminal for single module code 8089530 is required for this type of installation. For separately supplied accessory assembly see fig. 5.

2.7 INDOOR INSTALLATION EXHAUST KIT (fig. 6)

Refer to fig. 6 for this type of installation. The indicated solutions have the exhaust manifold positioned both on the modules. It is however possible to move the exhaust of the left by simply rotating the manifold 180°.

NOTE: The kits are purposely treated also to resist weathering when installed outdoors.

<table>
<thead>
<tr>
<th>MODEL</th>
<th>D</th>
<th>H</th>
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<tr>
<td>Murelle Equipe 150 BOX (M)</td>
<td>160</td>
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2.8 TUBES CONNECTING THE HYDRAULIC SEPARATOR KIT (fig. 7)

The connecting pipes for the hydraulic separator are supplied in kit 8101534. The kit is made up of the following components (fig. 7):
- System supply flanged section code 6291965
- System return flanged section code 6291965
- Gaskets, nuts and fastening screws M16
- Expansion vessel 8 liters code 6245108 (Preload pressure 1.5 bar – Maximum pressure 10 bar) and connection pipe code 6227661.

WARNING: In models “100-150 BOX (M)” the tubes connecting hydraulic separator kit can be inserted in a specific protective box code 8101517 supplied separately (see fig 4).

2.9 RS-485 BOARD (fig. 8)

Each generator is supplied with the RS-485 board which allows you to manage the boilers in sequence/cascade (see fig 8).

2.9.1 MODBUS mode (fig. 8/ a)

This mode allows for MODBUS communication of at least two boilers in cascade and is performed by requesting another RS-485 board provided in the kit code 8092244.

ATTENTION: Communication will occur only with the MASTER generator, (generator with PAR 15 = 0), interpreting the cascade as a single heat capacity generator:
\[ P_{\text{CASCADE}} = P_{\text{GENERATOR}} \times \text{No. GENERATORS}. \]

To install the second board, proceed as follows:
- Remove the cover and electrically connect the second RS-485 board equipped with lid to the RS-485 board already installed in the MASTER boiler (boiler with PAR 15 = 0) with the wired connector provided in the kit.
CAUTION: Insert the wired connector with caution.
- Set the DIP SWITCH of the new board in MODBUS mode.
- Close the lid of the second board.
- Choose the communication configuration suited to the MODBUS network (PAR 17 INST) according to Table PAR 17 INST.
**INSTALLER PARAMETER SETTING:**

**PAR 16 MODBUS ADDRESS**
- = Not enabled
1...31 = Slave from 1 to 31

(ATTENTION: Avoid calling the generator with the same number assigned to either generators)

**PAR 17 MODBUS CONFIGURATION**
- = Not enabled
1...30 = Default value: 25

(See Table PAR 17 INST)

ATTENTION: Upon setting the parameters, we recommend turning the generator off and then back on again.

---

**TAB. PAR 17 INST**

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Fig. 8/a
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<td>0</td>
<td>1</td>
<td>State CH zone 1</td>
</tr>
<tr>
<td>33</td>
<td>Boiler DHW Mode</td>
<td>D</td>
<td>R</td>
<td></td>
<td>0</td>
<td>1</td>
<td>State preparation DHW</td>
</tr>
<tr>
<td>34</td>
<td>Boiler Flame Status</td>
<td>D</td>
<td>R</td>
<td></td>
<td>0</td>
<td>1</td>
<td>State presence flame</td>
</tr>
<tr>
<td>35</td>
<td>Boiler Alarm Status</td>
<td>D</td>
<td>R</td>
<td></td>
<td>0</td>
<td>1</td>
<td>State presence alarm</td>
</tr>
</tbody>
</table>

#### Analog variables

| 1 | Boiler CH Primary Setpoint | A | R / W | 0.1°C | 20.0 | 80.0 | Setpoint CH zone 1. |
| 2 | Boiler DHW Primary Setpoint | A | R / W | 0.1°C | 20.0 | 80.0 | Setpoint CH during ACS preparation (for PAR 66 installer parameters) |
| 3 | Boiler DHW Setpoint       | A | R / W | 0.1°C | 10.0 | 80.0 | Setpoint ACS. |
| 4 | Outside Temperature MB    | A | R / W | 0.1°C | -55.0 | 95.0 | External value of temperature by Modbus. |
| 5 | Boiler CH Curve Slope     | A | R / W | 0.1 | 3.0 | 40.0 | Slope of heating curve of zone 1 (it is used instead of the curve set in the boiler). |
| 6 | Boiler CH Curve Displacement | A | R / W | 0.1 | -5.0 | 5.0 | Shift value of room zone 1 set (it is used instead of the shift set in the boiler). |
| 64 | Boiler DHW Water Temperature | A | R | 0.1°C | 0.0 | 100.0 | DHW temperature sensor (Delivery) |
| 65 | Boiler Primary Water Temperature | A | R | 0.1°C | 0.0 | 100.0 | CH temperature sensor (Delivery) |
| 66 | Boiler Return Water Temperature | A | R | 0.1°C | 0.0 | 100.0 | CH temperature sensor (Return) |
| 67 | Boiler Flue Gas Temperature | A | R | 0.1°C | 0.0 | 200.0 | Smoke temperature sensor |
| 68 | Boiler Relative Modulation Level | A | R | 0.1% | 0.0 | 100.0 | Modulation level: (0% = minimum boiler power; 100% = maximum boiler power) |
| 69 | Boiler Primary Water Pressure | A | R | 0.1 bar | 0.0 | 6.0 | Pressure value water CH |
| 70 | Boiler Outside Temperature | A | R | 0.1°C | -100.0 | 100.0 | Outside temperature read from the boiler through the probe connected to it. |

#### Integer variables

| 129 | Boiler Current Minute | I | R / W | - | 0 | 59 | Not used |
| 130 | Boiler Current Hour | I | R / W | - | 0 | 23 | Not used |
| 131 | Boiler Current Day of the Week | I | R / W | - | 1 = Lun | 7 = Dom | Not used |
| 132 | Boiler Current Day of the Month | I | R / W | - | 1 | 31 | Not used |
| 133 | Boiler Current Month | I | R / W | - | 1 | 12 | Not used |
| 134 | Boiler Current Year | I | R / W | - | 2000 | 2200 | Not used |
| 192 | Boiler Alarm Code | I | R | - | 0 | 100 | Numeric code shown during boiler error (if Master is in cascade) |
| 193 | Boiler Slave 1 Alarm Code | I | R | - | 0 | 100 | Numeric code shown during slave 01 error |
| 194 | Boiler Slave 2 Alarm Code | I | R | - | 0 | 100 | Numeric code shown during slave 02 error |
| 195 | Boiler Slave 3 Alarm Code | I | R | - | 0 | 100 | Numeric code shown during slave 03 error |
| 196 | Boiler Slave 4 Alarm Code | I | R | - | 0 | 100 | Numeric code shown during slave 04 error |
| 197 | Boiler Slave 5 Alarm Code | I | R | - | 0 | 100 | Numeric code shown during slave 05 error |
| 198 | Boiler Slave 6 Alarm Code | I | R | - | 0 | 100 | Numeric code shown during slave 06 error |
| 199 | Boiler Slave 7 Alarm Code | I | R | - | 0 | 100 | Numeric code shown during slave 07 error |
| 200 | Boiler Combustion Parameter (Par 1) | I | R | - | 0 | 199 | PAR 1 value |
| 201 | Boiler Hydraulic Parameter (Par 2) | I | R | - | 0 | 199 | PAR 2 value |
2.10 HYDRAULIC SEPARATOR

The hydraulic separator (available from Sime Ltd) is supplied separately in a kit code 8101550 complete with gaskets, nuts and fastening screws (figure 9). It is mandatory to include a hydraulic separator in the assembly of the 100-150 BOX (M).

**WARNING:** The hydraulic separator can be inserted in a specific protective box code 8101517 supplied separately.

2.10.1 Load loss hydraulic separator (fig. 10)

Hydraulic separator load losses are indicated in the diagram in figure 10.
2.11 ELECTRICAL CONNECTIONS

Each module is supplied with a power cord which, if replacement is required, it must be replaced with one of similar type and dimensions.

230 V – 50 Hz single phase voltage is required using a fuse protected main switch with at least 3 mm. between contacts. Observe the L – N polarity and grounding connection. Each generator should be fused at 3 A.

NOTE: Sime declines all responsibility for injury or damage to persons, animals or property resulting from the failure to provide for proper earthing of the appliance.

2.11.1 Wiring diagram single generator (fig. 11)

For BMS (0-10V) operation:
- Remove the jumper JP1 and ensure that TA1 link is fitted
- Connect the positive signal at terminal 10 of CN6
- Connect the negative signal at terminal 4 of CN4.

KEY
- F1-2: Fuse (4 AT)
- TRA: Ignition transformer
- PI: System pump
- V: Fan
- EA: Ignition electrode
- ER: Ignition electrode
- EV1-2: Gas valve coil
- TS: Safety thermostat
- SF: Exhaust temperature sensor
- TFU: Thermal fuse
- SM: Flow temperature sensor
- SR: Return temperature sensor
- TPA: Pressure transducer
- TA1: Zone 1 environment thermostat
- TA2: Zone 2 environment thermostat
- JP1: Selection TA2 or 0-10 VDC
- SB/SA: Antifreeze siphon sensor
- CR: Remote control CR73 (optional)
- SE: External sensor (optional)
- OP: Programming clock (optional)
- AR: Remote alarm
- VZ: Zone valve
- AUX: Auxilary connection
- RS-485: CASCADE/ MODBUS board

NOTE: Connect TA1 to the clamps 7-8 after having removed the bridge.

CONNECTOR SPARE PART CODES:
- CN1: code 6319162
- CN2: code 6319170
- CN3: code 6319164
- CN4: code 6316203
- CN5: code 6316202
- CN6: code 6316204
- CN7: code 6316204
- CN8: code 6319171
- CN9: code 6319172
- CN10: code 6319121
- CN11: code 6319179 (M)
2.11.2 Electrical connection of generators in sequence/cascade (fig. 11/a)

**KEY**
- **L** = Line
- **N** = Neutral
- **TS** = Safety thermostat 100°C
- **Pmin** = Water pressure switch min. 0.9 bar
- **Pmax** = Water pressure switch max. 3 bar
- **SE** = External sensor
- **SMC** = Cascade supply probe
- **RS-485** = Cascade management board

**NOTICE:** The external temperature probe (SE) must be connected to the MASTER generator and the cascade supply probe (SMC) to the SLAVE 1 generator.

The SE, SMC probes and the RS-485 board connection cable are supplied together with the modules in the probe kit code 8092250.

The RS-485 board for management in sequence/cascade is placed at the rear of the control panel of each individual generator as shown in the figure.

**CONFIGURATION OF CASCADE PARAMETERS**
Sequence/cascade installations must have the following INST parameter set on all connected generators:
- **PAR 15 = 0** for the first generator (MASTER)
- **1 ... 7** for the other generators (SLAVE)
(Avoid assigning the same number to SLAVE generators)

Set the following INST parameter if polypropylene smoke collectors with a clapet valve are used in sequence/cascade installations:
- **PAR 1 = 6** (for NATURAL GAS generators)
- **14** (for PROPANE generators)

To access the INST parameters, see point 3.3.

In addition, when the number of connected generators in cascade is more than two, parameter OEM A1 of the MASTER generator must be configured as well.

To access the OEM parameters press simultaneously the buttons ( and ) for 2 seconds.

Having entered the INST level, press ( and ) simultaneously for another 2 seconds. At this point insert the access code formed by this sequence of INSTALLATOR BUTTONS: 

```
+ / - / < / > / < 
```

Set the parameter:
- **PAR A1 = Number of cascade generators (3 ... 8)**
2.11.3 Room Thermostat and/or Timer (clean contact)

The heating demand can be controlled by a thermostat and/or timer (TA) connected to CN6 terminals 7-8 (see fig 11), after having removed the existing bridge. The control being used must be of a class conforming to the standard EN 607301 (clean electrical contact).

2.11.4 Climatic regulator CR53 connection (optional)

The heating demand can be controlled by use of a climatic regulator (code 8092227), for the management of the heating circuit. The generators will still display information. For installation and use of the regulator, follow the instructions included in the packaging.

**NOTE:** reset parameter 10 to 2 (PAR 10 = 2)

2.11.5 Remote control CR 73 connection (optional)

The heating demand can be controlled by use of remote control unit CR 73 (code 8092226)

The remote control unit allows for complete control, except lockout reset.

The generator will display CR.

For installation and use of the control follow the instructions in the package.

**NOTE:** Ensure PAR 10 set to 1 (PAR 10 = 1)

2.11.6 External Sensor (8094101)

An external sensor (code 8091401) can be connected, which can automatically regulate the flow temperature value of the cascade delivery according to the external temperature.

For installation follow the instructions in the package. It is possible to make corrections to the values by adjustment of PAR 11.

2.11.7 Heat Demand by 230v

The heat demand can be controlled by 230v applied to terminal 14 of CN7, and removal of the bridge on CN6 terminals 7 & 8.

2.11.8 BMS (Building Management Systems)

The cascade of generators can be controlled by a BMS signal, and should be connected as shown in fig 11.

Set PAR 14 according to the maximum (10v) flow temperature required.
3 CHARACTERISTICS

3.1 CONTROL PANEL (fig. 12)

1 - DESCRIPTION OF DISPLAY ICONS

- SUMMER MODE ICON
- WINTER MODE ICON
- D.H.W. MODE ICON
- HEATING DEMAND ICON
- GRADED POWER SCALE
  The segments of the bar light up in proportion to boiler power output.
- BURNER FUNCTIONING AND LOCKOUT ICON
- RESET REQUIRED ICON
- CHIMNEY SWEEP ICON

2 - DESCRIPTION OF CONTROLS

- ON/OFF KEYS
  ON = Electricity supply to boiler is on
  OFF = Electricity supply to boiler is on but not ready for functioning. However, the protection functions are active.

- SUMMER MODE KEY
  When this key is pressed, the boiler functions only when D.H.W. is requested (function not available)

- WINTER MODE KEY
  When this key is pressed, the boiler provides heating and D.H.W.

- D.H.W. TEMP KEY
  When this key is pressed, the temperature of the D.H.W. is shown on the display (function not available)

- HEATING TEMP KEY
  The first time the key is pressed, the temperature of heating circuit 1 is shown.
  The second time the key is pressed, the temperature of heating circuit 2 is shown.
  The third time the key is pressed, the temperature of heating circuit 3 is shown (Three zones).

- RE-SET KEY
  This allows for restoring functioning after a functioning error.

- INCREASE AND DECREASE KEY
  By pressing this key the set value increases or decreases.

3 - KEYS RESERVED FOR THE INSTALLER

(access to INST and OEM parameters)

- PC CONNECTION
  To be used only with the SIME programming kit and only by authorised personnel. Do not connect other electronic devices (cameras, telephones, mp3 players, etc.)
  Use a tool to remove the cap and reinsert after use.
  ATTENTION: Communication port sensitive to electrostatic charges.
  Before use, it is advisable to touch an earthed metallic surface to discharge static electricity.

- INFORMATION KEY
  This key can be pressed several times to view the parameters.

- CHIMNEY SWEET KEY
  This key can be pressed several times to view the parameters.

- DECREASE KEY
  This key changes the default settings.

- INCREASE KEY
  This key changes the default settings.

4 - LUMINOUS BAR
- Blue = Functioning
- Red = Functioning error

5 - PROGRAMMING CLOCK (optional)
- Mechanical clock (code 8092228) or digital clock (code 8092229) to program heating (single zone only).

Fig. 12
3.2 ACCESS TO INSTALLER'S INFORMATION

For access to information for the installer, press the key \( \text{C} \) (fig. 12). Every time the key is pressed, the display moves to the next item of information. If the key \( \text{C} \) is not pressed, the system automatically quits the function. If there is no expansion board (MIXED ZONE or INSOL) the relative info will not be displayed. List of information:

1. Display of external temperature, only with external sensor connected

2. Display of Heating flow sensor (SM)

3. Display of D.H.W. temperature sensor (SS) only for instantaneous boilers

4. Display of auxiliary temperature sensor or D.H.W. sensor (SB)

5. Display of exhaust temperature sensor (SF)

6. Display of heating temperature of first circuit

7. Display of heating temperature of second circuit

8. Display of ionisation current in µA

9. Display of fan speed in rpm x 100 (e.g. 4800 and 1850 rpm)

10. Display of hours of functioning of the burner in h x 100 (e.g. 14000 and 10)

11. Display of number of times the burner has ignited x 1000 (e.g. 97000 and 500)

12. Display of total number of errors

13. Parameter access counter–Installer (i.e. 140 accesses)

14. Parameter access counter–OEM (i.e. 48 accesses)

15. Parameter access counter–CASCADE OEM (i.e. 05 accesses)

16. Display of D.H.W. flowmeter load (i.e. 18 l/min and 0.3 l/min) or flow switch (respectively ON and OFF) (Not this boiler)
18. Display of Heating return sensor value (SR)

19. Display of cascade delivery sensor (SMC) value

20. Display of delivery probe value mixed with board MIXED ZONE 1 (input S1)

21. Display of safety thermostat MIXED ZONE (input S1) respectively ON and OFF

22. Display of pump with board MIXED ZONE 1 (respectively ON and OFF)

23. Display of valve opening control with board MIXED ZONE 1 (respectively ON and OFF)

24. Display of valve closing control with board MIXED ZONE 1 (respectively ON and OFF)

25. Display of the plant delivery probe mixed with board MIXED ZONE 2

26. Display of safety thermostat with board MIXED ZONE 2 (input S1) respectively ON and OFF

27. Display of pump with board MIXED ZONE 2 (respectively ON and OFF)

28. Display of valve opening control with board MIXED ZONE 2 (respectively ON and OFF)

29. Display of valve closing opening control with board MIXED ZONE 2 (respectively ON and OFF)

30. Display of solar probe temperature value S1 with solar board INSOL

31. Display of solar probe temperature value S2 with solar board INSOL

32. Display of solar probe temperature value S3 with solar board INSOL

33. Display of solar relay R1 with solar board INSOL (respectively ON and OFF)

34. Display of solar relay R2 with solar board INSOL (respectively ON and OFF)

35. Display of solar relay R3 with solar card INSOL (respectively ON and OFF)

36. Display of solar flow meter state (respectively ON and OFF)

37. Display of % value pump control PWM

40. Display of % value pump control PWM

60. Display of code of last error

61. Display of code of penultimate error

70. Code warning

90. Software version on RS-485 (e.g. version 01)

91. Software version on EXP (configuration MIXED ZONE)

92. Software version on second EXP (configuration MIXED ZONE)
3.3 ACCESS TO INSTALLER’S PARAMETERS

For access to the installer’s parameters, press simultaneously the keys 3 and 4 or 2 seconds (3 fig. 12).

For example, the parameter PAR 23 is displayed on the display of the control panel in the following way:

The parameters scroll forwards and backwards with the keys 3 and 4 and the default parameters can be changed with the keys 5 and 6.

The standard visualisation returns automatically after 60 seconds, or by pressing one of the control keys (2 fig. 12).

3.3.1 Replacing the board or RESETTING parameters

If the PCB is replaced or reset, it is necessary to configure PAR 1 and PAR 2 by associating the following values to each type of boiler to be able to restart the boiler:

<table>
<thead>
<tr>
<th>GAS</th>
<th>MODEL</th>
<th>PAR 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>METHANE (G 20)</td>
<td>100 BOX 150 BOX</td>
<td>6</td>
</tr>
<tr>
<td>PROPANE (G 31)</td>
<td>100 BOX 150 BOX</td>
<td>14</td>
</tr>
</tbody>
</table>

### PARAMETERS INSTALLER

<table>
<thead>
<tr>
<th>FAST CONFIGURATION</th>
<th>PAR DESCRIPTION</th>
<th>RANGE</th>
<th>UNIT OF MEASUREMENT</th>
<th>INC/ DEC</th>
<th>DEFAULT SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Combustion configuration</td>
<td>= ND 1 31</td>
<td>=</td>
<td>=</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2 Hydraulic configuration</td>
<td>= ND 1 34</td>
<td>=</td>
<td>=</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3 Timetable 2 programmer</td>
<td>1 = DHW + Recirc. pump 2 = DHW 3 = Recirculation pump</td>
<td>=</td>
<td>=</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4 Pressure transducer disabler</td>
<td>0 = Disabled 1 = Enabled 0 4 BAR 2 = Enabled 0 6 BAR 3 = Enabled 0 4 BAR (NO ALL 09) 4 = Enabled 0 6 BAR (NO ALL 09)</td>
<td>=</td>
<td>=</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5 Assignment of auxiliary relay AUX</td>
<td>1 = Remote alarm NO 2 = Recirculation pump 3 = Automatic load. 4 = Remote alarm NC 5 = Heat pump 6 = Zone 2 valve</td>
<td>=</td>
<td>=</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6 Luminous bar indicating presence of voltage</td>
<td>0 = Disabled 1 = Enabled</td>
<td>=</td>
<td>=</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7 Allocation of CR73 channels</td>
<td>0 = Not assigned 1 = Circuit 1 2 = Three-zone circuit</td>
<td>=</td>
<td>=</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8 Fan rpm Step ignition</td>
<td>0,0 ... 81 rpmx100 0,1 from 0,1 to 19,9 0,0 1 from 20 to 81</td>
<td>=</td>
<td>=</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>9 Long chimney</td>
<td>0 ... 20</td>
<td>%</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>10 Remote control option setting</td>
<td>1 = CR 73 2 = CR 53 3 = RVS 43.143 4 = RVS 46.330 5 = RVS 61.843</td>
<td>=</td>
<td>=</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>11 Correction values external sensor</td>
<td>5 ... 45 °C</td>
<td>=</td>
<td>=</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>12 Backlighting duration</td>
<td>0 = Never 1 ... 199</td>
<td>sec. x 10</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>13 Modulating pump speed</td>
<td>= None AU = Automatic mod. 30...100 = % Settable modulation</td>
<td>%</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 Setting second input TA</td>
<td>= Contact TA 5...160 = Input 0...10VDC</td>
<td>=</td>
<td>=</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 Cascade address</td>
<td>= Not enabled 0 = Master 1...7 = Slaves</td>
<td>=</td>
<td>=</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>16 Modbus address</td>
<td>= Not enabled 1...31 = Slaves</td>
<td>=</td>
<td>=</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>17 ModBus communication configuration</td>
<td>1 ... 30</td>
<td>=</td>
<td>=</td>
<td>1 25</td>
<td></td>
</tr>
<tr>
<td>18 Type circuit</td>
<td>0 = Two zones 1 = Three zones</td>
<td>=</td>
<td>=</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

### D.H.W. - HEATING

<table>
<thead>
<tr>
<th>PAR DESCRIPTION</th>
<th>RANGE</th>
<th>UNIT OF MEASUREMENT</th>
<th>INC/ DEC</th>
<th>DEFAULT SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 Minimum heating temperature Zone 1</td>
<td>PAR 64 OEM ... PAR 21 °C</td>
<td>1</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>21 Maximum heating temperature Zone 1</td>
<td>PAR 20 ... PAR 65 OEM °C</td>
<td>1</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>22 Heating curve slope Zone 1</td>
<td>3 ... 40</td>
<td>°C</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>23 Minimum heating temperature Zone 2</td>
<td>PAR 64 OEM ... PAR 24 °C</td>
<td>1</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>24 Maximum heating temperature Zone 2</td>
<td>PAR 23 ... PAR 65 OEM °C</td>
<td>1</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>25 Heating curve slope Zone 2</td>
<td>3 ... 40</td>
<td>°C</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>26 Minimum heating temperature Zone 3</td>
<td>PAR 64 OEM ... PAR 27 °C</td>
<td>1</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>27 Maximum heating temperature Zone 3</td>
<td>PAR 26 ... PAR 65 OEM °C</td>
<td>1</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>28 Heating curve slope Zone 3</td>
<td>3 ... 40</td>
<td>°C</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>29 Min heating circuit</td>
<td>5 ... 40</td>
<td>°C</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>30 Post-circulation heating time</td>
<td>0 ... 199 Sec.</td>
<td>10</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>31 Maximum heating capacity</td>
<td>30 ... 100</td>
<td>%</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>32 Zone 1 pump activation delay</td>
<td>0 ... 199</td>
<td>10 sec.</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>33 Start-up delay</td>
<td>0 ... 10 Min.</td>
<td>=</td>
<td>=</td>
<td></td>
</tr>
<tr>
<td>34 Additional source activation threshold</td>
<td>= -- -- --</td>
<td>°C</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>35 Boiler antifreeze</td>
<td>0 ... +20 °C</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>36 External sensor antifreeze</td>
<td>= -- -- --</td>
<td>°C</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>37 Band saturation</td>
<td>= -- -- --</td>
<td>%</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>38 Radiometer modulation</td>
<td>= -- -- --</td>
<td>°C</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>39 D.H.W. post-circulation time</td>
<td>0 ... 199 Sec.</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>
NOTE: the inside of the upper door of the generator panel has a label with the values that have to be set for PAR 1 and PAR 2 (fig. 19).

### 3.3.2 Warning

Should the generator operation not be optimal but no alarm sets off, press the button until info 70 and the warning code associated to the ongoing event are displayed. Once optimal operation is restored, info 70 will display: "- -".

Below is the table of warning codes:

<table>
<thead>
<tr>
<th>CODE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>E0</td>
<td>Reduced capacity operation (Δt between delivery and return over 40°C)</td>
</tr>
<tr>
<td>E1</td>
<td>Shorted external sensor (SE)</td>
</tr>
<tr>
<td>E2</td>
<td>Preheating function active</td>
</tr>
<tr>
<td>E3</td>
<td>TBD</td>
</tr>
<tr>
<td>E4</td>
<td>TBD</td>
</tr>
<tr>
<td>E5</td>
<td>TBD</td>
</tr>
<tr>
<td>E6</td>
<td>TBD</td>
</tr>
<tr>
<td>E7</td>
<td>TBD</td>
</tr>
<tr>
<td>E8</td>
<td>TBD</td>
</tr>
<tr>
<td>E9</td>
<td>TBD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CODE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>E10</td>
<td>TBD</td>
</tr>
<tr>
<td>E11</td>
<td>TBD</td>
</tr>
<tr>
<td>E12</td>
<td>TBD</td>
</tr>
<tr>
<td>E13</td>
<td>TBD</td>
</tr>
<tr>
<td>E14</td>
<td>TBD</td>
</tr>
</tbody>
</table>

### Expansion Card

<table>
<thead>
<tr>
<th>PAR DESCRIPTION</th>
<th>RANGE</th>
<th>UNIT OF MEASUREMENT</th>
<th>INC/DEC</th>
<th>DEFAULT SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 Number of expansion boards</td>
<td>0 .. 3</td>
<td>=</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>41 Mix valve stroke time</td>
<td>0 .. 199</td>
<td>10 sec.</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>42 Priority of D.H.W. over mixed zone</td>
<td>0</td>
<td>Parallel</td>
<td>=</td>
<td>=</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Absolute</td>
<td></td>
<td></td>
</tr>
<tr>
<td>43 Floor drying</td>
<td>0</td>
<td>No activated</td>
<td>=</td>
<td>=</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Curve A</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Curve B</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Curve A+B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>44 Type of solar system</td>
<td>1 .. 8</td>
<td>=</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>45 At solar collector pump 1</td>
<td>PAR74 OEM - 1..50 °C</td>
<td>1</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>46 Solar integration delay</td>
<td>&quot;-&quot;, 0 .. 199 Min.</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>47 Tmin solar collector</td>
<td>&quot;-&quot;, 30 .. 0 °C</td>
<td>1</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>48 Tmax solar collector</td>
<td>&quot;-&quot;, 80 .. 199 °C</td>
<td>1</td>
<td>120</td>
<td></td>
</tr>
</tbody>
</table>

### Parameters Installer

<table>
<thead>
<tr>
<th>PAR DESCRIPTION</th>
<th>RANGE</th>
<th>UNIT OF MEASUREMENT</th>
<th>INC/DEC</th>
<th>DEFAULT SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>49 * Reset default parameters</td>
<td>- .1</td>
<td>=</td>
<td>=</td>
<td>=</td>
</tr>
</tbody>
</table>

* In case of difficulty in understanding the current setting or in case of an anomalous or incomprehensible conduct of the generator, we suggest to restore the initial values of the parameters setting PAR 49 = 1 and the PAR 1 and PAR 2 as specified at point 3.3.1.

### Cascade Connection Parameters

When the appliance is installed in sequence/cascade (modular system with several generators) it is necessary to set on all the generators the following INST PAR parameters:

PAR 15 = 0 for the first generator (MASTER)

1 .. 7 for the other generators (SLAVE)

(Avoid assigning the same number to SLAVE generators)

Set the following INST parameter if polypropylene smoke collectors with a clapet valve are used in sequence/cascade installations:

PAR 1 = 6 (for NATURAL GAS generators)

14 (for PROPANE generators)

In addition, when the number of generators in cascade is more than two, configure the parameters OEM A1 of the MASTER generator. To access the OEM parameters press simultaneously the buttons and for 2 seconds. Entered in the INST level again press simultaneously he buttons and for another 2 seconds. At this point insert the access code formed by this sequence of INSTALLATOR BUTTONS: "+/ -/ < / >/ <”.

Set the parameter:

PAR A1 = Number of cascade generators (3 .. 8)
3.4 EXTERNAL SENSOR (fig. 13)

If there is an external sensor, the heating settings SET can be taken from the climatic curves according to the external temperature and, in any case, limited to with the range values described in point 3.3 (parameters PAR 22 for zone 1, PAR 25 for zone 2 and PAR 28 for zone 3).

The climatic curve to be set can be selected from a value of 3 and 40 (at step 1). Increasing the steepness of the curves of fig. 13 will increase the output temperature as the external temperature decreases.

3.5 CARD FUNCTIONING

The electronic card has the following functions:
- Antifreeze protection of the heating and sanitary water circuits (ICE).
- Ignition and flame detection system.
- Control panel setting for the power and the gas for boiler functioning.
- Anti-jamming for the pump which is fed for a few seconds after 24 hours of inactivity.
- Antifreeze protection for boilers with an accumulation boiling unit.
- Chimney sweep function which can be activated from the control panel.
- Temperature which can be shifted with the external sensor connected.

It can be set from the control panel and is active on the heating systems of both circuit 1 and circuit 2 and 3.
- Management of 3 independent heating circuit systems.
- Automatic regulation of the ignition power and maximum heating.

Adjustments are managed automatically by the electronic card to guarantee maximum flexibility in use of the system.
- Interface with the following electronic systems: climatic regulator CR 53, remote control CR 73, thermal regulator RVS, connected to a management card of a MIXED ZONE code 8092234, card solar INSOL code 8092235 and to board RS-485 for managing up to 8 boilers in cascade or implement a communication type Modbus (slave RTU-RS485, Reference Guide PHMBUS-300 Rev J) cod. 8092243.

NOTE: If using CR 53 set parameter 10 to 2 (PAR 10 = 2).

3.6 TEMPERATURE DETECTION SENSOR

Table 4 shows the resistance values of the heating, DHW and exhaust fumes thermistors.

If the heating flow sensor (SM), heating return sensor (SR) or the exhaust fumes sensor (SF) is faulty or open circuit, the generator will not function.

ATTENTION: curves are calculated at an ambient temperature of 20°C. The user can act on the boiler controls to change the environment set for which the bend has been calculated by ±5°C.

3.7 ELECTRONIC IGNITION

Ignition and flame detection is controlled by electrodes on the burner which guarantees reaction in the case of accidental extinction or lack of gas within one second.

3.7.1 Functioning cycle

Burner ignition should occur within max. 10 seconds after the opening of the gas valve. Ignition failure with consequent activation of block can be due to:

- Lack of gas
  The ignition electrode persists in discharging for max. 10 seconds. If after 3 attempts to light the ignition is not detected the generator will lockout.

This can happen the first time the boiler is switched on after a long period of inactivity due to the presence of air in the gas pipes.

- No Ionisation
  The boiler will make three attempts to light. If after the third attempt the flame has not been recognised, the generator will lockout, ALL 06.

This may be due to a disconnected, worn or distorted ionisation electrode.

In the case of a sudden loss of voltage, the burner will immediately switch off. When voltage returns, the generator will automatically start up again.

### Table 4 (SM - SR - SF sensors)

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>Resistance (Ω)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>12.090</td>
</tr>
<tr>
<td>30</td>
<td>8.313</td>
</tr>
<tr>
<td>40</td>
<td>5.828</td>
</tr>
<tr>
<td>50</td>
<td>4.161</td>
</tr>
<tr>
<td>60</td>
<td>3.021</td>
</tr>
<tr>
<td>70</td>
<td>2.229</td>
</tr>
<tr>
<td>80</td>
<td>1.669</td>
</tr>
</tbody>
</table>

NOTE: If using CR 53 set parameter 10 to 2 (PAR 10 = 2).
3.8 HEAD AVAILABLE TO SYSTEM (fig. 14)

Residual head for the heating system is shown as a function of rate of flow in the graph in fig. 14.

The speed of the modulating pump system is set as default (installation parameter PAR 13 = - -).

<table>
<thead>
<tr>
<th>Flow rate (l/h)</th>
<th>FIXED PUMP (mbar)</th>
<th>MODULATING PUMP AT VARIABLE SPEED (M) (mbar)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>633</td>
<td>648</td>
</tr>
<tr>
<td>200</td>
<td>621</td>
<td>639</td>
</tr>
<tr>
<td>400</td>
<td>600</td>
<td>623</td>
</tr>
<tr>
<td>600</td>
<td>567</td>
<td>601</td>
</tr>
<tr>
<td>800</td>
<td>524</td>
<td>568</td>
</tr>
<tr>
<td>1000</td>
<td>478</td>
<td>528</td>
</tr>
<tr>
<td>1200</td>
<td>417</td>
<td>482</td>
</tr>
<tr>
<td>1400</td>
<td>345</td>
<td>429</td>
</tr>
<tr>
<td>1600</td>
<td>266</td>
<td>367</td>
</tr>
<tr>
<td>1800</td>
<td>173</td>
<td>300</td>
</tr>
<tr>
<td>2000</td>
<td>78</td>
<td>217</td>
</tr>
</tbody>
</table>

Fig. 14
COMMISSIONING INSTRUCTIONS

A Commissioning checklist is included in this manual and must be completed by the engineer at the time of commissioning.

General

Please note: the combustion for this appliance has been checked, adjusted and preset at the factory for operation on the gas type defined on the appliance data plate. However, it is advisable to check for correct combustion having first checked the following:

- That the boiler has been installed in accordance with these instructions
- The integrity of the flue system and the flue seals
- That PAR 9 has been set according to the calculated flue head losses (single boilers)
- That PAR 1 is set correctly for boilers connected to cascade flues
- The integrity of the boiler combustion circuit

Proceed to put the boiler into operation as follows:

1. **Check the operational (working) gas inlet pressure.**
   - Set up the boiler(s) to operate at maximum rate as described in 4.5.1 (chimney sweep)
   - With the boiler operating in the maximum rate condition check that the operational (working) gas pressure at the inlet gas pressure test point (see fig 16 item 1) complies with the requirements of table 1.3.
   - Ensure that this inlet pressure can be obtained with all other gas appliances in the property working.

2. **Competence to carry out the check of combustion performance**
   - The person carrying out a combustion measurement should have been assessed as competent in the use of a flue gas analyser and the interpretation of the results.
   - The flue gas analyser used should be one meeting the requirements of BS7927 or BS-EN50379-3 and be calibrated in accordance with the analyser manufacturer's requirements, and
   - Competence can be demonstrated by satisfactory completion of the CPA1 ACS assessment, which covers the use of electronic portable gas analysers in accordance with BS 7967, parts 1 to 4.

3. **Combustion check**
   - Connect the flue gas analyser to the flue gas sampling point as shown in the diagram (fig. 15/a).
   - Procedure for checking the combustion:
     - Operate the boilers in “Chimney Sweep” mode as described in section 4.5.1 and record the measurements from the flue gas analyser on both minimum and maximum output. Compare the results to the following:
       - CO less than 200 ppm
       - CO2 between 8.9% and 9.7% natural gas, and 9.9% and 10.5% LPG. Ratio less than 0.004.
     - If the combustion reading is greater than the acceptable value AND the integrity of the complete flue system, combustion circuit seals have been verified, AND the gas inlet pressure has been verified, AND the boiler parameter settings are correct, proceed as shown in 4.2.2.
     - Any adjustments should be done in small steps and adjustments of no more than 1/8th of a turn should be made, waiting at least 1 minute between adjustments to allow the settings to stabilise. Using the CO2 reading, adjustments should be made to the “OFF-SET” screw (6 fig 16) if it is incorrect at the minimum output, or to the “SHUT-TER” (5 fig 16) if it incorrect at the maximum output.
     - If an acceptable setting level cannot be achieved, re-confirm that the integrity of the flue system, combustion circuit and working gas supply pressure. If required contact Sime Ltd for further assistance.
4.1 GAS VALVE (fig. 16)

The generator is supplied as standard with a gas valve, model SIT B22 NOVAMIX (fig. 16).

4.2 GAS CONVERSION (fig. 17)

This operation must be performed by authorised personnel using original Sime components.

To convert from natural gas to LPG or vice versa, perform the following operations:
- Close the gas cock.
- Replace the nozzle gasket OR (1) with the one supplied in the kit.
- On completion of the conversion, test all gas connections using a suitable leak detection fluid. Do not use naked flames.
- Apply the nameplate with the new gas flow layout.
- Re configure PAR 1 as shown in 4.2.1. and check the combustion performance as described in 4.2.2.

4.2.1 New fuel configuration

For access to the installer’s parameters, press simultaneously keys and for 5 seconds (fig. 12).

The parameters will scroll up and down with the keys and .

The display pane will show the values of the parameter PAR 1. If the generator is a methane (G20) model, SET 6 will be displayed:

To change the fuel to propane (G31), it is necessary to set SET 14, by pressing the key .

The standard display will automatically return after 10 seconds.

The table below shows the SET settings to enter when the type of gas fuel is changed.

<table>
<thead>
<tr>
<th>GAS</th>
<th>MODEL</th>
<th>PAR 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>METHANE (G20)</td>
<td>100 BOX</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>150 BOX</td>
<td></td>
</tr>
<tr>
<td>PROPANE (G31)</td>
<td>100 BOX</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>150 BOX</td>
<td></td>
</tr>
</tbody>
</table>

4.2.2 Calibrating the gas valve pressures

This can only be done using a flue gas analyser. If the combustion reading is greater than the acceptable value AND the integrity of the complete flue system and combustion seals have been verified AND the inlet working gas pressure has been verified, adjustments to the gas valve can be made as described below. Make only small adjustments (1/8 turn max), and allow time for the combustion analysis to be made before making further adjustments.

Sequence of operations:

1) Press and hold the button down for a few seconds .
2) Press the button for a few seconds .
3) Identify the CO₂ values at max. power by adjusting the shutter (5 fig. 16):

<table>
<thead>
<tr>
<th>MAX power</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO₂ (Methane)</td>
</tr>
<tr>
<td>9,2 ±0,2</td>
</tr>
</tbody>
</table>

4) Press the button for a few seconds .
5) Identify the CO₂ values at min. power by adjusting the OFF-SET regulation screw (6 fig. 16):

<table>
<thead>
<tr>
<th>MIN power</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO₂ (Methane)</td>
</tr>
<tr>
<td>9,5 ±0,2</td>
</tr>
</tbody>
</table>

6) Press the buttons several times to check the pressures and change them if required.
7) Press the button once more to quit the function.

4.3 CO / CO₂ RATIO

<table>
<thead>
<tr>
<th>CO ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
</tr>
<tr>
<td>NG 9%</td>
</tr>
<tr>
<td>LPG 10%</td>
</tr>
</tbody>
</table>
4.5 MAINTENANCE (fig. 20)

To ensure correct operation and efficiency it is important that the boiler is serviced at regular intervals, at least once a year (this may also be a condition of the warranty). Servicing must only be done by a qualified technician. During the routine service the condensate drain can be checked, by carefully pouring water into the combustion chamber, while the burner is removed. Should the boiler not be used for long periods of time, it is important that the condensate trap is checked and filled if required. It can be filled via the filling vent (see fig. 20).

4.5.1 Chimney sweep function (fig. 21)

To check boiler combustion, press the installer’s key \( \textcolor{red}{\text{KEY}} \) for a few seconds. The chimney sweep function will switch on and will continue for 15 minutes. From that moment, the boiler will start working in heating mode at maximum power, with cut off at 80°C and re-ignition at 70°C (ATTENTION! Ensure adequate circulation to the heating system is available before activating chimney sweep).

If the key \( \textcolor{red}{\text{KEY}} \) and \( \textcolor{red}{\text{OFF}} \) are pressed during the 15 minutes of the chimney sweep function, the boiler will be brought respectively to maximum and minimum power.

The chimney sweep function will automatically switch off after 15 minutes or when the key \( \textcolor{red}{\text{KEY}} \) is pressed again.

ATTENTION:
- Observe the relevant standards and regulations of the floor manufacturer!
- Proper functioning is ensured only when the plant is correctly installed (hydraulic system, electrical installation, settings)! If not observed, the floor might get damaged!

4.5.2 Operation floor drying (fig. 22)

The operation floor drying keeps the floor at a pre-established temperature profile and it is activated only for those systems combined with the mixed zone card MIXED ZONE code 8092234. The temperature profiles can be selected by means of the installer parameter PAR 43:

- 0 = Not activated function
- 1 = Curve setting A
- 2 = Curve setting B
- 3 = Curve setting A + B

The turning off of the function happens clicking on the button OFF (return of PAR 43 to the value 0) or automatically at the end of the function. The set of the mixed zone follows the development of the selected curve and reaches a maximum of 55°C.

During the function all the other heating demands are ignored (heating, sanitary, antifreeze and chimney sweep).

During the functioning the display shows the remaining days for the completion of the function (example mains digits -15 = 15 days lack to the end of the function). The diagram fig. 22 reports the development of the curve.
4.6 FUNCTIONING ERRORS

When there is a functioning error, an alarm appears on the display and the blue luminous bar becomes red.

Descriptions of the errors with relative alarms and solutions are given below:

- **LOW WATER PRESSURE ERROR ALARM 02 (fig. 23/1)**
  If the pressure detected by the transducer is lower than 0.5 bar, the generator stops and the display shows the alarm ALL 02. Using the external filling device, fill the system until the pressure indicated by the transducer is between 1 and 1.5 bars.

  If the refilling procedure has to be repeated several times, it is advisable to check that the soundness of the heating circuit is intact (check that there are no leaks).

- **HIGH WATER PRESSURE ERROR ALARM 03 (fig. 23/2)**
  If the pressure detected by the transducer is more than 2.8 bar, the generator stops and the display shows error ALL 03.

- **HEATING FLOW SENSOR ERROR ALARM 05 (fig. 23/4)**
  If the heating flow sensor (SM) is open or short circuited, the generator will not function and the display will show the alarm ALL 05.

- **LOCKOUT ALARM 06 (fig. 23/5)**
  If a flame has not been detected after a complete ignition sequence, or for any other reason the card cannot "see" the flame, the generator will stop and the display will show the alarm ALL 06.

  Press the key of the controls (2) to start up the generator again.
1. **SAFETY LIMIT THERMOSTAT ERROR ALARM 07 (fig. 23/6)**

   If either the 95 degree stat or the heat exchanger safety stat opens, the burner will turn off and ALL 07 will be displayed.

   Press the key of the controls (2) to start up the boiler again.

2. **PARASITE FLAME ERROR ALARM 08 (fig. 23/7)**

   If the flame control section recognises the presence of a flame in phases when one should not be present, it means there is a breakdown in the flame detection circuit; the generator will stop and the display will show error ALL 08.

3. **WATER CIRCULATION ERROR ALARM 09 (fig. 23/8)**

   1. Water circulation has not been detected in the primary (generator) circuit. If this error is detected the generator will make two further attempts. If the circulation is not detected it will stop and indicate ALL 09.

   Note: circulation is detected by a small rise in the system pressure when the pump is energised. In large systems this may not be detected, and can be disabled by alteration of PAR 4.

   2. The flow temperature sensor has detected a rise in excess of 5 degrees per second.

4. **AUXILIARY SENSOR ALARM 10 (fig. 23/9)**

   When the antifreeze siphon sensor (SA) is open or short circuited, the display will show anomaly ALL 10.

5. **ACTIVATION OF THE “ALL 13” EXHAUST TEMPERATURE SENSOR (fig. 23/10)**

   The activation of this probe causes the boiler to stop and error message ALL 13 to display.

   Press the key of the controls (2) to start up the boiler again.

6. **“ALL 14” EXHAUST TEMPERATURE SENSOR ERROR (fig. 23/11)**

   If the exhaust temperature sensor is open or short-circuited, the boiler stops and error message ALL 14 displays.
- **“ALL 15” FAN ERROR** (fig. 23/12)
The fan speed does not fall within the rated speed range.
If the error conditions persists for two minutes, the generator activates a forced stop for thirty minutes.
A new start attempt is repeated after the expiry of this interval of time.

- **EXTERNAL PROBE ERROR** 
  "FLASHING" (fig. 23/13)
When the external probe (SE) is short-circuited, the display the symbol flashes.
During such error the boiler continues normal functioning.

- **SAFETY THERMOSTAT INTERVENTION FIRST MIXED ZONE “ALL 20”** (fig. 23/14)
When it results that the MIXED ZONE board is connected to the boiler the safety thermostat intervention switches the mixed zone plant pump, the mix zone valve closes and on the display the anomaly ALL 20.
During this anomaly the generator continues to function normally.

- **DELIVERY PROBE BREAKDOWN ANOMALY SECOND MIXED ZONE “ALL 23”** (fig. 23/17)
When it results that the MIXED ZONE board is connected to the boiler and the delivery probe is open or short circuit-ed on the display the anomaly ALL 23 appears. During this anomaly the boiler continues to function normally.

- **SOLAR COLLECTOR SENSOR ANOMALY (S1) “ALL 24”** (fig. 23/18)
When the solar probe is open or short circuited, on the display the anomaly ALL 24 appears. During this anomaly the boiler continues to function normally but loses the solar function that is no longer available.

- **COMPATIBILITY INPUT (S3) ANOMALY ONLY FOR SYSTEM 7 “ALL 28”** (fig. 23/22)
When a probe is connected instead of a clean contact on entry S3 the board on display shows the anomaly ALL 28. During this anomaly the boiler continues to function normally but for the board is active in the solar anomaly, the function is only available antifreeze collector.

- **ANOMALY NUMBERS RELATED BOARD “ALL 29”** (fig. 23/23)
When one of the board MIXED ZONE / INSOL failure or does not communicate, the display shows anomaly ALL 29. The boiler functional excluding the function MIXED ZONE / INSOL.
- HEATING RETURN SENSOR ERROR
  "ALL 30" (fig. 23/24)
  When the heating return sensor (SR) is open or short-circuited, the display shows anomaly ALL 30. During such anomaly the generator continues normal functioning.

- CASCADE DELIVERY SENSOR ERROR
  "ALL 31" (fig. 23/25)
  When the cascade delivery sensor (SMC) is open or shorted, ALL 31 will be displayed.

- THREE-ZONE SYSTEM CONFIGURATION ANOMALY "ALL 32" (fig. 23/26)
  When the boards connected to the RS-485 are not enough and/or at least one of them it is not mixing zone board, the boiler stops and anomaly ALL 32 is displayed.
  The boiler restarts when the boiler three-zone system configuration is activated.

- RS-485 BOARD COMMUNICATION ANOMALY IN CASCADE MODE "ALL 34" (fig. 23/28)
  When PAR 15 is different from ".-." and there is no communication between the boiler board and the RS-485 board in CASCADE mode, the boiler stops and anomaly ALL 34 is displayed. The boiler restarts when communication is restored or when PAR 15 = ".-." is set.

- RS-485 BOARD COMMUNICATION ANOMALY IN MODBUS MODE "ALL 33" (fig. 23/27)
  When PAR 16 is different from ".-." and there is no communication between the boiler board and the RS-485 board in MODBUS mode for at least four minutes, the boiler stops and anomaly ALL 33 is displayed.
  The boiler restarts when communication is restored or when PAR 16 = ".-." is set.

- RS-485 AND RS-485 COMMUNICATION ANOMALY "ALL 35" (fig. 23/29)
  When PAR 15 is different from ".-." and there is no communication between the two RS-485 boards, the boiler stops and anomaly ALL 35 is displayed. The boiler restarts when communication is restored or when PAR 15 = ".-." is set.

CAUTION: In the event of sequence/cascade connection, error codes 70 and 71 will appear on the CR 73 remote control display:
- ALARM 70
  When an anomaly affects cascade operation (cascade delivery sensor ALL 31), CR 73 remote control display will show alarm 70. Verify the anomaly in the cascade.
- ALARM 71
  When an anomaly occurs in one of the modules and the others keep operating to the extent permitted, the CR 73 remote control display will show alarm 71. Verify the anomaly in the cascade.
Service Record

It is recommended that your heating system is serviced regularly and that the appropriate Service Interval Record is completed. This is also a condition of any extended warranty offered.

Service Provider

Before completing the appropriate Service Record below, please ensure you have carried out the service as described in the manufacturer’s instructions.

Always use the manufacturer’s specified spare part when replacing controls.

<table>
<thead>
<tr>
<th>Service 1</th>
<th>Date:</th>
<th>Engineer Name:</th>
<th></th>
<th>Company Name:</th>
<th>Telephone No.</th>
<th>Gas Safe Register No.</th>
<th>Comments:</th>
<th>Signature:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Service 2</th>
<th>Date:</th>
<th>Engineer Name:</th>
<th></th>
<th>Company Name:</th>
<th>Telephone No.</th>
<th>Gas Safe Register No.</th>
<th>Comments:</th>
<th>Signature:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
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<th>Comments:</th>
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INSTALLATION CHECKLIST

SINGLE GENERATOR INSTALLATION

PAR 14 (see section 2.11.8) When BMS input used, and input is 10v, the required flow temperature = °C Set value of PAR 14

GENERATORS INSTALLED IN CASCADE

ALL GENERATORS IN THE CASCADE

PAR 15 (see fig 4/b) The cascade address must be set in each generator in the cascade, denoting the master and each slave (Master = 0)

<table>
<thead>
<tr>
<th>Boiler 1</th>
<th>Boiler 2</th>
<th>Boiler 3</th>
<th>Boiler 4</th>
<th>Boiler 5</th>
<th>Boiler 6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

Set value of PAR 15

PAR 1 (see section 2.2.2) When installed with a cascade flue, incorporating a clappet (non return) valve, PAR 1 must be set accordingly on each generator in the cascade

<table>
<thead>
<tr>
<th>Boiler 1</th>
<th>Boiler 2</th>
<th>Boiler 3</th>
<th>Boiler 4</th>
<th>Boiler 5</th>
<th>Boiler 6</th>
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<tr>
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</table>

Set value of PAR 1

MASTER GENERATOR

OEM A1 (see section 2.2.2) When the number of generator in the cascade is greater than two, the OEM A1 on the MASTER generator (generator with PAR 15 = 0), must be set to the same value as the number of generators in the cascade. This can only be done after PAR 15 has been set.

Number of generators in cascade
Set value of OEM A1 on generator number

PAR 14 (see section 2.11.8) When BMS input used, and input is 10v, the required flow temperature = °C Set value of PAR 14 on the master generator
### Commissioning Checklist for Generators in Cascade

This checklist is for guidance only, and is not a full installation safety check.

**Address:**

<table>
<thead>
<tr>
<th>Satisfactory visual check of flue Y/N</th>
<th>Flue within allowable length and correctly terminated Y/N</th>
<th>Confirm Tighness of installation pipework downstream of isolating valve</th>
<th>Using leak detection fluid Y/N</th>
<th>Carry out ignition test of generator with gas isolated to ensure boiler fails safe Y/N</th>
<th>Turn on gas supply to the generator and isolate main burner (disconnect gas valve) and ensure generator goes to lockout Y/N</th>
<th>Reconnect gas valve, reset generator lockout, and ensure generator lights and is stable Y/N</th>
<th>Test safety devices Y/N</th>
<th>Safety test (TS) - Disconnect - the generator locks out Y/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

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**Output Min Max Min Max Min Max Min Max Min Max Min Max Min Max Min Max**

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<thead>
<tr>
<th>Generator 1</th>
<th>Generator 2</th>
<th>Generator 3</th>
<th>Generator 4</th>
<th>Generator 5</th>
<th>Generator 6</th>
<th>Generator 7</th>
<th>Generator 8</th>
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</thead>
<tbody>
<tr>
<td>CO ppm</td>
<td>CO ppm</td>
<td>CO ppm</td>
<td>CO ppm</td>
<td>CO ppm</td>
<td>CO ppm</td>
<td>CO ppm</td>
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<tr>
<td>Generator size</td>
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<tr>
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<td>Serial Number</td>
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<tr>
<td>Completed by</td>
<td>Completed by</td>
<td>Completed by</td>
<td>Completed by</td>
<td>Completed by</td>
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</tbody>
</table>

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**Flue analysis**

<table>
<thead>
<tr>
<th>Output</th>
<th>CO ppm</th>
<th>CO2 %</th>
<th>Ratio</th>
<th>Generator size</th>
<th>Serial Number</th>
<th>Completed by</th>
<th>Date</th>
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</thead>
<tbody>
<tr>
<td>Min</td>
<td>Max</td>
<td>Min</td>
<td>Max</td>
<td>Min</td>
<td>Max</td>
<td>Min</td>
<td>Max</td>
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</tbody>
</table>
If an electrical fault occurs on the appliance, the preliminary electrical system checks must be carried out first. When any service or replacement of electrical components which has required the breaking and re-making of electrical connections has taken place, the following tests must be repeated:
- earth continuity;
- short circuit;
- polarity;
- resistance to earth.

5.1 EARTH CONTINUITY CHECK

Appliances must be electrically disconnected, meter set on Ω (ohm) x 1 scale and adjust zero if necessary. Tests leads from any appliance earth point (e.g. inside control box) see wiring diagrams (section 7) to earth pin on plug.

Resistance should be less than 1 Ω (ohm). If the resistance is greater than 1 Ω (ohm) check all earth wires for continuity and all contacts are clean and tight. If the resistance to earth is still greater than 1 Ω (ohm) then this should be investigated further.

5.2 SHORT CIRCUIT CHECK

Switches turned FULL ON - meter set on Ω (ohms) x 1 scale. Test leads from L to N on appliance terminal block, if meter reads 0 then there is a short circuit.

Meter set on Ω (ohm) x 100 scale. Repeat it with leads from L to E. If meter reads less than infinity (?) there is a fault.

NOTE: Should it be found that the fuse has failed but no fault is indicated, a detailed continuity check (i.e. by disconnecting and checking each component) is required to trace the faulty component. It is possible that a fault could occur as a result of local burning/ arcing but no fault could be found under test. However, a detailed visual inspection should reveal evidence of burning around the fault.

5.3 POLARITY CHECK

Appliance reconnected to mains supply and meter set on 300 V ac scale. Test at appliance terminal block.
- Test leads from L to N meter reads approx. 240 V ac.
- Test leads from L to E meter reads approx. 240 V ac.
- Test leads from N to E meter reads from 0 to 15 V ac.

5.4 RESISTANCE TO EARTH CHECK

Appliance must be disconnected from main supply and meter on Ω (ohm) x 100 scale. All switches including thermostat on test leads from L to E - if meter reads other than infinity (?) there is a fault which should be isolated.

A detailed continuity check is required to trace the faulty component.

IMPORTANT:
These series of checks are the first electrical checks to be carried out during a fault finding procedure. On completion of the service/fault finding task which has required the breaking and remaking of electrical connections then the checks 5.1 Earth continuity, 5.3 Polarity and 5.4 Resistance to earth must be repeated.
INDUSTRY GUIDANCE FOR INSTALLERS ON CONDENSATE DRAINAGE PIPE INSTALLATION

This guidance is endorsed by HHIC members.

1. BACKGROUND

During recent winters the UK has experienced prolonged spells of extremely cold weather - down to minus 20°C and below in many areas. This resulted in a significant increase in the number of calls to boiler manufacturers and heating engineers from householders with condensing (high efficiency) boilers where the condensate drainage pipe had frozen and become blocked with ice, causing the boiler to shut down. In the vast majority of cases such problems occur where the condensate drainage pipe is located externally to the building for some part of its length.

British Standards, Building Regulations etc. currently allow condensate drainage pipes to be run either internally or externally, or a combination of these. These documents give guidance on how to install the pipes in order to reduce the possibility of freezing. However this guidance may not be sufficient to prevent freezing in extreme conditions - with widespread and prolonged very low temperatures.

In view of the possibility that UK weather patterns will show more “extremes” in future due to the effects of global climate change, the following guidance updates previous recommendations on condensate drainage pipe installation. All other technical requirements for condensate drain installation given in British Standard BS 6798:2009, or in boiler manufacturers’ installation instructions should still be followed.

2. REVISED GUIDANCE ON CONDENSATE DRAINAGE PIPE INSTALLATION

Where a new or replacement boiler is being installed, access to an internal “gravity discharge” termination should be one of the main factors considered when determining potential boiler locations, so that the condensate drainage pipe can be terminated as recommended below. On an existing installation, the guidance below should also be followed if work is carried out to “upgrade” the condensate drainage system to reduce the risk of freezing in extreme conditions.

Internal condensate drainage pipework must be a minimum of 19mm ID (typically 22mm OD) plastic pipe and this should “fall” at least 45 mm per metre away from the boiler, taking the shortest practicable route to the termination point.

In order to minimise the risk of freezing during prolonged very cold spells, one of the following methods of terminating condensate drainage pipe should be adopted -
2.1 INTERNAL TERMINATION:

Wherever possible, the condensate drainage pipe should be terminated at a suitable internal foul water discharge point such as (a) an internal soil and vent stack or (b) an internal kitchen or bathroom waste pipe, washing machine waste pipe etc. A suitable permanent connection to the foul waste pipe should be used. Figures 1, 2(a), 2(b) show appropriate connection methods.

The possibility of waste pipes freezing downstream of the connection point should be considered when determining a suitable connection point - e.g. a slightly longer pipe run to an internal soil stack may be preferable to a shorter run connecting into a kitchen waste pipe discharging directly through the wall to an external drain.

Where “gravity discharge” to an internal termination is not physically possible (e.g. the discharge point is above the appliance location, or access is obstructed by a doorway), or where very long internal pipe runs would be required to reach a suitable discharge point, the following measures may be adopted -

2.2 USE OF A CONDENSATE PUMP (TO AN INTERNAL TERMINATION):

Condensate can be removed using a proprietary condensate pump, of a specification recommended by the boiler or pump manufacturer.

The pump outlet should discharge to a suitable internal foul water discharge point, such as (a) an internal soil and vent stack or (b) an internal kitchen or bathroom waste pipe, washing machine waste pipe etc. Figure 3 shows a typical connection method.

A suitable permanent connection to the foul waste pipe should be used and the manufacturer’s detailed installation instructions for the pump should be followed.

2.3 EXTERNAL TERMINATION:

The use of an externally-run condensate drainage pipe, terminating at a suitable foul water discharge point or purpose-designed soakaway, may be also be considered; however if this termination method is chosen then the following measures should be adopted -

- The pipe should be run internally as far as possible before going externally and the pipe diameter should be increased to a minimum of 30mm ID (typically 32mm OD) before it passes through the wall.
- The external run should be kept as short as possible, taking the most direct and “most vertical” route possible to the discharge point, with no horizontal sections in which condensate might collect.
- The external pipe should be insulated using suitable waterproof and weatherproof insulation (“Class O” pipe insulation is suitable for this purpose).
The use of fittings, elbows etc should be kept to a minimum and any internal “burrs” on cut pipework should be removed so that the internal pipe section is as smooth as possible.

The customer/householder should be advised that even with the above measures this type of installation could freeze, and that if this were to occur then boiler shutdown could result, requiring remedial action - possibly involving a chargeable engineer call-out.

Where there are likely to be extremes of temperature or wind-chill, the use of a proprietary trace-heating system for external condensate drainage pipework, incorporating an external frost thermostat, should therefore be considered. If such a system is used then the installation instructions of the trace heating manufacturer and any specific recommendations regarding pipe diameter, insulation, etc. should be followed. All other relevant guidance on condensate drainage pipe installation should also be followed.

Other cold weather protection methods approved or endorsed by boiler manufacturers and/or service organisations may be adopted if these are considered suitable by the parties involved.

If an external soil/vent stack is used as the external termination then the connection method shown in Figure 4 should be used, together with the measures on insulation etc. as described above and shown in the diagram.

When a rain water downpipe is used as the termination (NB only permissible if this downpipe passes to a combined foul and rainwater drainage system) an air break must be installed between the condensate drainage pipe and the downpipe to avoid reverse flow of rainwater into the boiler should the downpipe itself become flooded or frozen. Figure 5 shows a suitable connection method.

Where the condensate drainage pipe is terminated over an open foul drain or gully, the pipe should terminate below the grating level, but above water level, in order to minimise “wind chill” at the open end. Pipe drainage will be improved if the end is cut at 45° as opposed to a straight cut. The use of a drain cover (such as those used to prevent blockage by leaves) may offer further protection from wind chill. Figure 6 shows a suitable connection method.

Where the condensate drain pipe terminates in a purpose-designed soakaway (see BS 6798:2009 or boiler installation manual for soakaway design requirements) any above-ground section of condensate drainage pipe should be run and insulated as described above. Figure 7 shows a suitable connection method.

3. UNHEATED INTERNAL AREAS:

Internal condensate drainage pipes run in unheated areas such as lofts, basements and garages should be treated as external pipe.
The Benchmark Commissioning Checklist (located at the back of the boiler installation manual) should be completed as required to record details of the condensate drainage pipe installation.

Where an external condensate drainage pipe is installed, the customer should be made aware of the risks and consequences of its freezing and offered the option to fit trace heating (or other measures approved by the boiler manufacturer or service organisation).

Separate guidance has been published for householders on remedial actions which can be taken if a condensate drainage pipe freezes. This may result in requests for alteration to condensate drainage pipework, in which case the guidance above should be followed.

In some instances (e.g. where an elderly person’s heating needs to be reinstated as an emergency measure) condensate drainage pipes may have been cut in order to bypass any blockage and allow re-ignition of the boiler, with condensate being collected in a suitable container as a temporary solution.

While not unsafe, this is not recommended practice and if such action has been taken then the condensate drainage pipe must be reinstated as soon as possible, using the above guidance to reduce risk of freezing in future.
Figure 1 – Connection of condensate drainage pipe to internal soil and vent stack

Key
1. Boiler
2. Visible air break
3. 75 mm trap
4. Visible air break and trap not required if there is a trap with a minimum condensate seal of 75 mm incorporated into the boiler
5. Soil and vent stack
6. Invert
7. 450 mm minimum up to three storeys
8. Minimum internal diameter 19 mm
Figure 2(a) – Connection of a condensate drainage pipe downstream of a sink, basin, bath or shower waste trap

Key
1 Boiler
2 Visible air break
3 75 mm trap
4 Visible air break and trap not required if there is a trap with a minimum condensate seal of 75 mm incorporated into the boiler. In this case the 100 mm is measured to the trap in the boiler.
5 Sink, basin, bath or shower
6 Open end of condensate drainage pipe direct into gully 25 mm min below grating but above water level; end cut at 45 °
7 Sink lip
8 Minimum internal diameter 19 mm
9 Pipe size transition
10 Minimum internal diameter 30 mm
11 Water/weather proof insulation
Figure 2(b) – Connection of a condensate drainage pipe upstream of a sink, basin, bath or shower waste trap

Key
1  Boiler
2  Visible air break at plug-hole
3  75 mm sink, basin, bath or shower waste trap
4  Sink, basin, bath or shower with integral overflow
5  Open end of condensate drainage pipe direct into gully 25 mm min below grating but above water level; end cut at 45°
6  Minimum internal diameter 19 mm
7  Pipe size transition
8  Minimum internal diameter 30 mm
9  Water/weather proof insulation
Figure 3 – Connection of a condensate pump - typical method (NB manufacturer’s detailed instructions should be followed).
Figure 4 – Connection of condensate drainage pipe to external soil and vent stack

Key
1 Boiler
2 Visible air break
3 75 mm trap
4 Visible air break and trap not required if there is a trap with a minimum condensate seal of 75 mm incorporated into the boiler.
5 Soil and vent stack
6 Invert
7 450 mm minimum up to three storeys
8 Minimum internal diameter 19 mm
9 Pipe size transition point
10 Minimum internal diameter 30 mm
11 Water/weather proof insulation
Figure 5 – External termination to rainwater downpipe (NB only combined foul/rainwater drain)

Key
1. Condensate discharge pipe from boiler
2. Pipe size transition point
3. Water/weather proof insulation
4. 43 mm 90° male/female bend
5. External rain water pipe into foul water
6. External air break
7. Air gap
8. 68 mm Ø PVCu strap-on fitting
9. Minimum internal diameter 19 mm
10. Minimum internal diameter 30 mm
11. End cut at 45 °
Figure 6 – External drain, gully or rainwater hopper

Key
1. Boiler
2. Visible air break
3. 38 mm minimum trap
4. Visible air break and trap not required if there is a trap with a minimum condensate seal of 38 mm incorporated into the boiler
5. External length of pipe 3 m maximum
6. Open end of condensate drainage pipe direct into gully 25 mm min below grating but above water level; end cut at 45°
7. Minimum internal diameter 19 mm
8. Pipe size transition point
9. Minimum internal diameter 30 mm
10. Water/weather proof insulation
Figure 7 – Example of a purpose-made soakaway

Key
1. Condensate discharge pipe from boiler
2. Ground (this section of the condensate drainage pipe may be run either above or below ground level); End cut at 45°
3. Diameter 100 mm minimum plastic tube
4. Bottom of tube sealed
5. Limestone chippings
6. Two rows of three 12 mm holes at 25 mm centres, 50 mm from bottom of tube and facing away from house
7. Hole depth 400 mm minimum by 300 mm diameter
8. Minimum internal diameter 19 mm
9. Pipe size transition point
10. Minimum internal diameter 30 mm
11. Water/weather proof insulation