Remeha Gas 3002 ECO

Technical information

# Remeha Gas 3002 ECO

- High efficiency condensing boiler with Low NOx emission
- Range 177 - 531 kW
- mbc 3.0

remeha
Clean Heat

CONTENTS

**Preface** 3

**1. Description of the boiler** 4

**2. Constructional data** 5
2.1 General 5
2.2 Burners 5

**3. Technical data and dimensions** 6

**4. Efficiency information** 7
4.1 Combustion efficiency 7
4.2 Efficiency 7
4.3 Standing losses 7
4.4 Annual efficiency 7

**5. Application data** 8
5.1 Delivery and positioning 8
5.1.1 General 8
5.1.2 Location 8
5.1.3 Support 10
5.2 L.P.H.W. configuration 10
5.2.1 Water temperature 10
5.2.2 Water pressure 10
5.2.3 Water circulation 11
5.2.4 Water treatment 11
5.2.5 Noise levels 11
5.3 Hydraulic circuits with Low Loss Header 12
5.3.1 Single boiler installation 12
5.3.2 Modular boiler installation 12
5.4 Installation instructions 12
5.5 Condensate discharge 12
5.6 Flue gas discharge and air supply 13
5.6.1 General 13
5.6.2 Requirements 13
5.6.3 Conventional room ventilated 13
5.6.4 Room sealed operation 14

**6. Principle of the boiler installation** 16

**7. Control and safety equipment** 17
7.1 General 17
7.2 Instrument panel 17
7.2.1 General 17
7.2.2 Lay-out of the instrument panel 17
7.3 The control unit 17
7.3.1 General 17
7.3.2 User level 17
7.3.3 Service level 18
7.3.4 Overview of the different menus 20
7.4 Standard electronic gas train 21
7.4.1 Schematic construction 21
7.4.2 Specification 21
7.5 Functions 21
7.5.1 General 21
7.5.2 Flame protection (lock out) 21
7.5.3 Low-water protection 21
7.5.4 Temperature protection 21
7.5.5 Flue gas transport protection 21

**8. Assembly guidelines and installation instructions for the heating engineer** 22
8.1 General 22
8.2 Water connections 22
8.3 Water pressure 22
8.4 Safety valve 22
8.5 Filling, refilling and venting of the installation 22
8.6 Boiler draining 22

**9. Gas supply** 22
9.1 General 22
9.2 Pressure test of the gas installation 22
9.3 Gas pressures 22

**10. Electrical supply** 23
10.1 General 23
10.2 Electrical connections 23
10.3 Electrical data 23
10.4 Boiler control 23
10.4.1 General 23
10.4.2 Modulating 23
10.4.3 High/low control 24
10.5 Connections 24
10.5.1 Other inputs 24
10.5.2 Blocking inputs 24
10.5.3 Locking inputs 24
10.5.4 Gas leak check 24
10.6 Outputs 25
10.6.1 Alarm output 25
10.6.2 Operating message 25
10.6.3 External gas valve 25
10.6.4 Shunt pump connection 25
10.6.5 Extra 230V connection 25
10.7 Building Management System 25
10.8 Frequency changer 25
10.9 Electrical wiring diagram 26

**11. Commissioning** 28
11.1 Technical data 28
11.2 Initial lighting 28
11.3 Shut down the boiler 31

**12. Fault-Finding** 31
12.1 General 31
12.2 Faults 31

**13. Inspection and servicing** 35
13.1 General 35
13.2 Servicing 35

## PREFACE

These technical instructions contain useful and important information for the correct operation and maintenance of the Remeha central heating boiler, model Gas 3002 ECO. Furthermore, important instructions are given to prevent accidents and serious damage before commissioning and during operation of the boiler, to ensure safe and trouble free boiler operation.
Read these instructions carefully before putting the boiler into operation, familiarize yourself with its operation and control and strictly observe the instructions given.

If you have any questions, or if you need more information about specific subjects relating to this boiler, please do not hesitate to contact us.
The data published in these technical instructions is based on the latest information and is subject to revisions. We reserve the right to modify the design and/or construction of our products at any moment, without being obliged to adjust earlier supplies accordingly.

## 1. DESCRIPTION OF THE BOILER

The Remeha Gas 3002 ECO is a high efficiency condensing boiler with a very low NOx emission.
The boiler consists of two heat exchangers, the first being made of cast iron and the second of aluminium. The latter is suited for recovering both the sensible and the latent (condensation) heat. Premix burners ensure a very low NOx emission (< 25 ppm at $O_2$ = 0%, or < 43 mg/kWh at $O_2$ = 3%) and low level noise production.
It is supplied disassembled and has a red and grey sheet steel casing. Its compact construction and the fact that the boiler is suitable for room sealed or room ventilated operation, makes it suitable for an unprecedented range of applications.

The boiler meets the requirements of the CE regulations at the following directives:
- Gas appliance directive no. 90/396/EEC
- Efficiency directive no. 92/ 42/EEC
- Electrical low voltage directive no. 73/ 23/EEC
- Machinery directive no. 89/392/EEC
- E.M.C. directive no. 89/336/EEC.

Suitable for all qualities of natural gas (category I 2 H 17 - 30 mbar).
Classification type for evacuation of the combustion products: B23, C33, C53 or C63.
For further advice or information contact Broag Ltd.

## 2. CONSTRUCTIONAL DATA

### 2.1 General

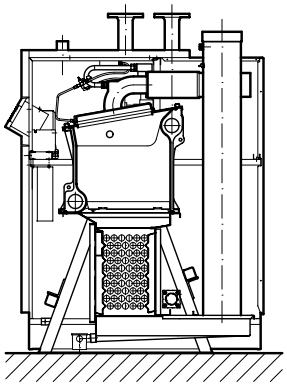
- The first heat exchanger consists of cast iron sections assembled with conical nipples.
- The second heat exchanger (economiser) is constructed from finned tubes and made of aluminium.
- A fan supplies the combustion air and transports the exhaust gases through the boiler and flue.
- The control and safety equipment is fitted behind the casings.
- The boiler is entirely prewired.
- The casings are clear of the ground to avoid any corrosion as a result of moisture.
- The boiler is provided with an integrated instrument panel in which a ***rematic***® weather-compensated boiler control can be incorporated.
- The boiler is available for either "room sealed" or conventionally "room ventilated" operation.
- It is supplied disassembled, to facilitate transportation.
- A modulating or high/low load control by means of a gas/air ratio control always ensures optimal combus tion.
- Advanced menu-driven microprocessor boiler control, with extensive operational and fault diagnostics.
- RS232-connection for a two-way connection to a computer, modem or Building Management System.

### 2.2 Burners

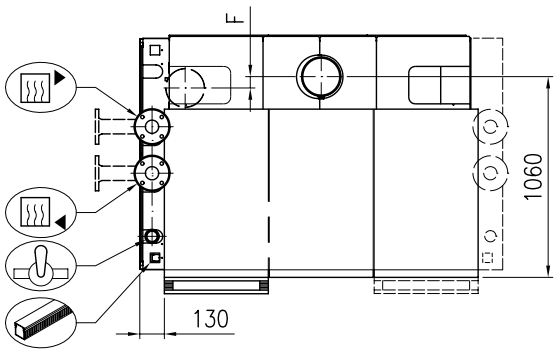
The premix burners have a metal fibre cover and guarantee low-noise operation and a very low NOx emission.

*Fig. 01 Remeha Gas 3002 ECO*

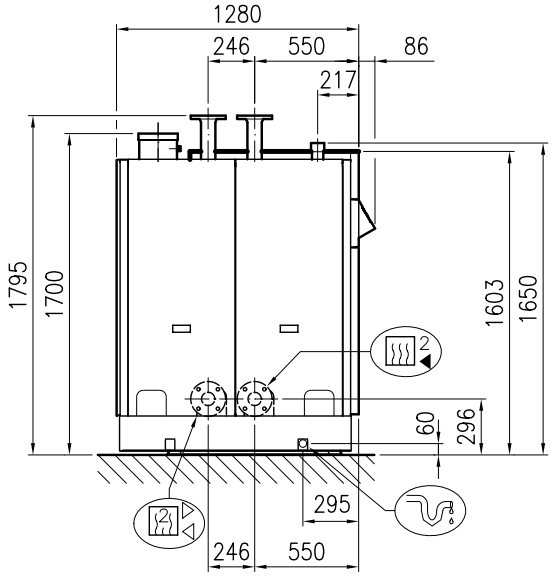
## 3. TECHNICAL DATA AND DIMENSIONS



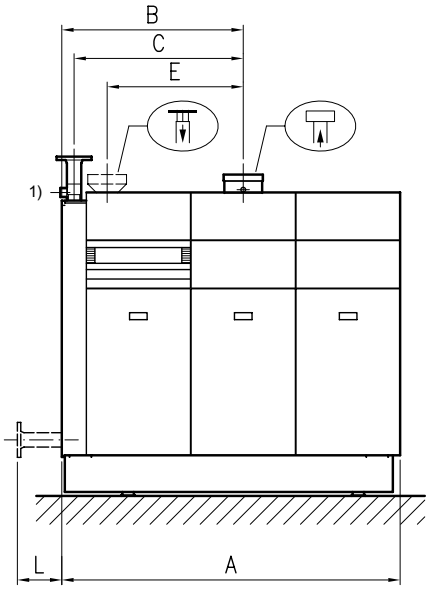
*Cross section*




*Top view*




*Left side view*




*Front view*

*Fig. 02 Dimensions*

| Number of sections | Output 80/60 °C | Output 40/30 °C | Input (Hs) | Dimensions A | B | C | ØD/Ød 1) | E | F | X | Y 2) | L | Flue gas mass | Water resistance Δ t = 20°C | Δ t = 10°C | Water contents ca. | Assembly weight |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | kW | kW | kW | mm | mm | mm | mm | mm | mm | inch | | mm | kg/h | mbar | mbar | ltr. | kg |
| 7 | 177 | 193 | 201 | 1235 | 683 | 618 | 200 | 450 | 20 | 1 1/2 | NW 65 | 313 | 320 | 80 | 320 | 90 | 893 |
| 9 | 235 | 256 | 268 | 1790 | 960 | 895 | 200 | 550 | 20 | 1 1/2 | NW 65 | 235 | 427 | 95 | 380 | 108 | 1092 |
| 11 | 294 | 320 | 335 | 1790 | 960 | 895 | 200 | 720 | 60 | 2 | NW 65 | 235 | 535 | 119 | 476 | 121 | 1228 |
| 13 | 354 | 382 | 402 | 2035 | 1083 | 1018 | 250 | 820 | 60 | 2 | NW 80 | 312 | 641 | 145 | 580 | 141 | 1380 |
| 15 | 413 | 445 | 469 | 2345 | 1238 | 1173 | 250 | 920 | 60 | 2 | NW 80 | 156 | 747 | 177 | 708 | 158 | 1520 |
| 17 | 471 | 507 | 536 | 2495 | 1360 | 1295 | 250 | 1060 | 60 | 2 | NW 80 | 233 | 853 | 220 | 880 | 171 | 1659 |
| 19 | 531 | 570 | 603 | 2645 | 1483 | 1418 | 250 | 1160 | 60 | 2 | NW 80 | 110 | 961 | 285 | 1140 | 188 | 1799 |

- *Return NW Y*
- *Flow NW Y*
- *Gasconnection Rp X" int.*
- *Cabel trough 40 x 40 mm*
- *Flue gas connection Ø D int.*
- *Air supply connection only for room sealed operation (specify when ordering.*
- *Knockouts in the right and left sides of the boiler for condensate discharge, Ø 32 mm.*
- *Return Eco NW 65, with option for seperate connections for second heat exchanger (ECO)*
- *Flow Eco NW65, with option for seperate connections for second heat exchanger (ECO), or second return with "second return" option.*

*1) $1^1/_4$ connection for installation of a safety valve.*
*2) Flanges according to DIN 2576*

## 4. EFFICIENCY INFORMATION

### 4.1 Combustion efficiency
Up to 98.5% at Hi (88.7% at Hs) at 80/60°C.

### 4.2 Efficiency
Up to 98% at Hi (88.3% at Hs) at 80/60°C and up to 108.1% at Hi (97.4% at Hs) at 40/30°C.

### 4.3 Standing losses
On average 0.38% at Hi (0.34% at Hs) at an average boiler water temperature of 45°C.

### 4.4 Annual efficiency
On average 108% at Hi (97.2% at Hs) at an average boiler water temperature of 35°C.

## 5. APPLICATION DATA

### 5.1 Delivery and positioning

#### 5.1.1 General

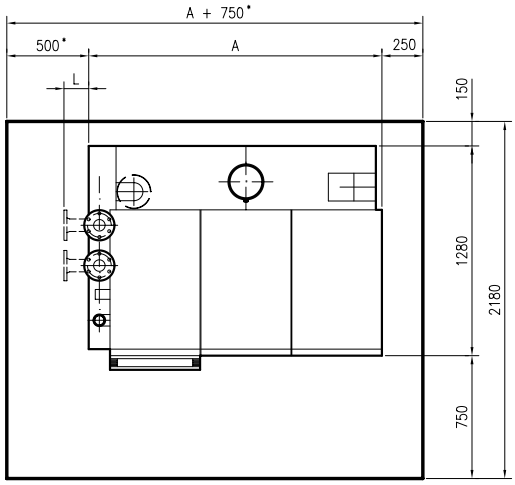
All parts to be assembled on the site can be transported using normal access doors.
The vulnerable parts are packed. If required, the casings can be mounted after the boiler block has been connected on water side and after any temporary start-up (construction phase), without it being necessary to drain the boiler block.

#### 5.1.2 Location

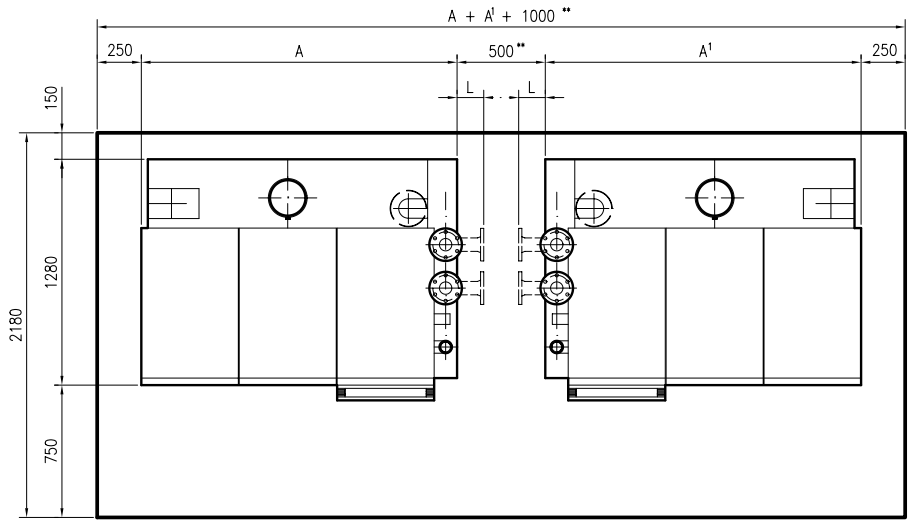
The drawings on the next page show a number of possible arrangements with the required space all round. The Remeha Gas 3002 ECO is supplied as standard with connections at the top left side. If specified when ordering, it is possible to have the connections installed top right.

**Installation 1**
One boiler in the boiler room

| Number of sections | A mm | L mm |
|---|---|---|
| 7 | 1235 | 313 |
| 9 | 1790 | 235 |
| 11 | 1790 | 235 |
| 13 | 2035 | 312 |
| 15 | 2345 | 156 |
| 17 | 2495 | 233 |
| 19 | 2645 | 110 |




**Installation 2**
Two boilers in the boiler room




**Installation 3**
Two boilers in the boiler room, back to back

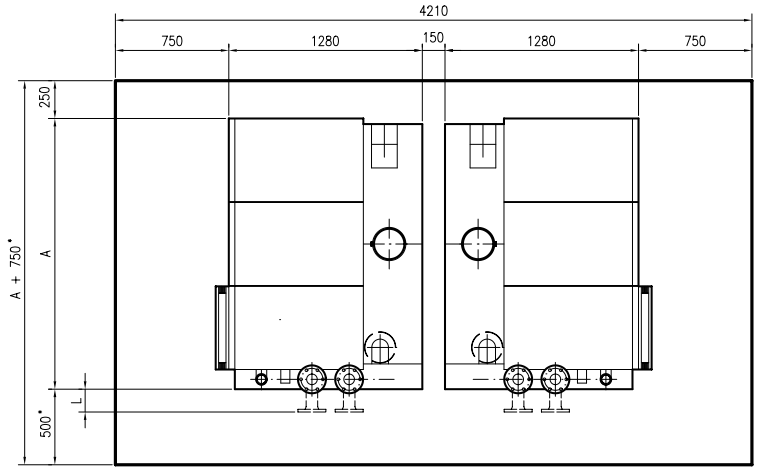


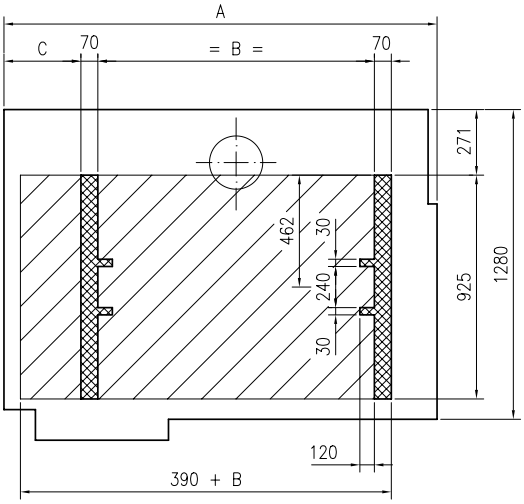

*Fig. 03 Typical boiler installations*

** When using the seperate connections for the ECO, this distance + 2 x L

* When using the seperate connections for the ECO, this distance + L

### 5.1.3 Support

The drawing below shows the support surface of the boiler with connections to the left (standard construction). This drawing can be mirrored for the model with connections to the right (specify when ordering).




▨ *Minimum required floor surface*
▩ *Support surface boiler*
* *Only for 7, 11, 15 and 19 sections.*

*Fig. 04 Support surface Remeha Gas 3002 ECO*

| Number of sections | A | B | C |
|---|---|---|---|
| 7 | 1235 | 745 | 240 |
| 9 | 1790 | 944 | 418 |
| 11 | 1790 | 1143 | 318 |
| 13 | 2035 | 1342 | 341 |
| 15 | 2345 | 1541 | 397 |
| 17 | 2495 | 1740 | 420 |
| 19 | 2645 | 1939 | 443 |

## 5.2 L.P.H.W. configuration

### 5.2.1 Water temperature

The maximum water temperature is 110°C (sealed installation). The maximum operating temperature is 95°C. The minimum return water temperature is 20°C with a waterflow corresponding to a $\Delta$t of 20°C at rated output. With optimised installations the installation water temperature can drop below 20°C during the night or the weekend. In this situation, for heat supply to the installation the return water temperature of the boiler must first be restored to at least 25°C before releasing it to the rest of the installation.

### 5.2.2 Water pressure

Each boiler section undergoes a test pressure of 12 bar. The boiler can operate at an operating pressure from 0.8 up to 6 bar.

**5.2.3 Water circulation**

The water flow through the boiler is limited to an amount corresponding with a differential temperature across the boiler of 45°C. If the differential temperature exceeds 45°C the boiler is turned off and blocked.
See also para. 7.5.3. As soon as the flow is again sufficient, the boiler will automatically restart.The minimum water circulation in the boiler is determined by the following formula:

$$\frac{\text{Output boiler in (kW)}}{81} = \text{..... } m^3/h$$

This circulation prevents, for example, activation of the high limit thermostat when the mixing valves of the installation close when the boiler is in operation (to dissipate residual heat).

The maximum water circulation in the boiler is determined by the formula:

$$\frac{\text{Output boiler in (kW)}}{9.3} = \text{..... } m^3/h$$

**5.2.4 Water treatment**

The system should be filled with mains cold water (for the UK this will usually have a pH of between 7 and 8). Pressurised installations with a boiler/system content ratio of 1:10 or less should not require water treatment, provided that the following conditions apply:

1. The system is flushed thoroughly to remove all fluxes and debris and filled completely once.
2. Make up water is limited to 5% per annum.
3. The hardness of the water does not exceed 360 ppm. ($20^0$D).

All scale deposits will reduce the efficiency of the boiler and should be prevented. However provided the above is complied with any scale produced will not be too detrimental to the boiler efficiency and will not reduce the anticipated life expectancy of the boiler.

**NOTE:** Scale desposits in excess of 5mm will reduce boiler efficiency and greatly increase the risk of premature casting failure

As most systems contain a variety of metals wich can react with each other to cause corrosion. It is considered good practice to provide some form of water treatment (especially in open vented systems) in order to prevent or reduce the following.

a) Metallic corrosion
b) Formation of scale and sludge
c) Microbiological contamination
d) Chemical changes in the untreated system water

Suitable chemicals and their use should be discussed with a specialist water treatment company prior to carrying out any work.

The specification of the system and manufacturers recommendations must be taken into account, along with the age and codition of the system. New systems should be flushed thoroughly to remove all traces of flux, debris, grease and metal swarf generated during installation. Care to be taken with old systems to ensure any black metallic iron oxide sludge and other corrosive residues are removed, again by thoroughly flushing, ensuring that the system is drained completely from all low points.

**NOTE:** Please ensure that the new boiler plant is not in circuit when the flushing takes place, especially if cleansing chemicals are used to assist the proces.

**Under no circumstances is the boiler to be operated with cleaning chemicals in the system**

**To Summarise:** Minimise water loss
Prevent pumping over in open vented systems
Provide adequate air venting at all high points
Maximum chlorine content of 200 mg/1
Take advice on suitability of inhibitors for use with aluminium
**MAX pH of 9 when using additives**

If water treatment is used then we recommend that the following products be used:

'Copal' manufactured by

Fernox Manufacturing Company Ltd.
Britannia Works
Clavering
Essex, CB1L 4QZ
Tel No: 0179 955 0811
Fax No: 0179 955 0853

or
Sentinal 'X100' manufactured by

BetzDearborn
Sentinal
Foundry Lane
Widnes
Cheshire WA8 8UD
Tel No: 051 495 5351
Fax No: 0151 420 5447

For the correct dosage and for further information on water treatment or system cleaning we advise direct contact either of the above companies.

**5.2.5 Noise levels**

The noise level in the boiler house, measured at a distance of 1 meter around the boiler, is approx. 60 dBA, which means that it is usually not necessary to use sound absorbent material.

### 5.3 Hydraulic circuits with Low Loss Header

#### 5.3.1 Single boiler installation

The boiler is directly weather compensated and the circuits are also weather compensated. The heating curve of the boiler is then set approx. 5°C higher than the highest demanding circuit. Each circuit has its own pump. The water flow is handled by a boiler pump.

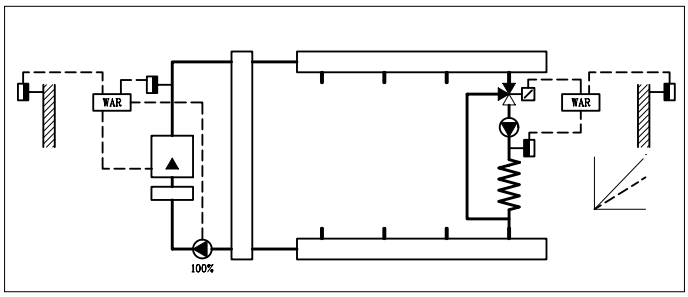



*Fig. 05 L.L.H. with boiler pump with a single boiler installation*

#### 5.3.2 Modular boiler installation

Example: 1 x condensing boiler + 1 x standard boiler in modular arrangement with water-side shutdown of the boiler which is out of operation, by means of a butterfly valve. The boilers are directly weather compensated. The heating curve of the boiler is then set approx. 5°C higher than the highest demanding circuit.

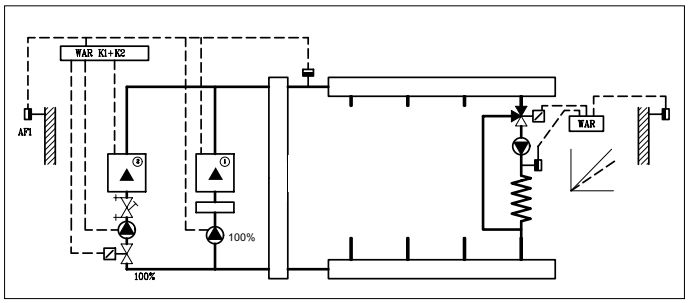



*Fig. 06 L.L.H. with boiler pump in a modular boiler installation*

For more information concerning hydraulic diagrams contact our technical sales department.

Please note:
1)If the water resistance of boilers 1 and 2 is not the same, the boiler with the less resistance should have a regulating valve.
2)The condensing boiler is always the lead boiler.

### 5.4 Installation instructions

The following instructions must be adhered to when the Remeha Gas 3002 ECO is installed:
Gas Safety (Installation and Use) Regulations 1984 (as amended).
All gas appliances must, by law, be installed by competent persons (e.g. Corgi) in accordance with the above regulations. Failure to install appliances correctly could lead to prosecution.
It is in your own interest and that of safety to ensure that the law is complied with.
In addition to the above regulations, this appliance must be installed in compliance with the current I.E.E. Regulations for electrical installation, local building regulations, the Building Standards (Scotland), Consolidation Regulations, by laws of the local water undertaking and Health and Safety Document No. 635 'The Electricity at Work Regulations 1989'. It should also be in accordance with the relevant recommendations in the current editions of the following British Standards and Codes of Practice, viz. BS 5440 Pt 1 and 2, BS 5449, BS 5546, BS 6798, BS 6891 and BG.DM2.

**Important:**
The Remeha Gas 3002 ECO is a certified appliance and must not be modified or installed in any way contrary to these "Installation and Servicing Instructions". Manufacturers Instructions must NOT be taken in any way as overriding statutory obligations.

### 5.5 Condensate discharge

The condensate produced by the condensing boiler, which is formed at a return water temperature below approx. 55˚C, should be discharged to the drain. Considering the acidity of this condensate (ph 3 to 5), only hard pvc materials must be used for connecting piping.
The condensate collector of the secondary heat exchanger has a plastic discharge connection with a pvc pipe coupling, inside diameter 32 mm, at the end.
The syphon (despatched as a loose item) should be glued to the pipe coupling with standard pvc glue and to the supplied 90˚C bend made of pvc. The connection can be made either to the right or left. The joint between the syphon and the condensate discharge piping should be made with a pvc coupling, to facilitate repair jobs.

When using a stainless steel or plastic flue gas discharge pipe, between this pipe and the flue gas connection of the boiler, a condensate collector with separate discharge has to be installed

The condensate discharge piping must slope at least 5 mm/m. This piping should freely discharge to the drain by means of a trap. If possible, this trap should be instal-

## 5.6 Flue gas discharge and air supply

### 5.6.1 General

The Remeha Gas 3002 ECO is available in either a conventional room ventilated or a room sealed (Type B13, C33, C53 or C63) construction. Specify at the time of ordering if the boiler is required to be supplied for room sealed operation. In that case, the boiler will be supplied with an air supply connection and a clamping band.
This connection must be fixed to the fan inlet (remove the cover plate on the rear top casing).

- *Conventional room ventilated operation:*
  The open boilers use ambient air as combustion air.
  See para. 5.6.3 for a flue gas discharge table of the Remeha Gas 3002 ECO in room ventilated construction.
- *Room sealed operation:*
  A sealed system is obtained by using an air supply pipe. Because of this, the number of potential boiler locations within the building is increased and less stringent requirements are imposed on the discharge location, since the air supply and the flue gas discharge are in the same pressure area.
  Besides, open air is generally cleaner, and this has a positive influence on the effective life of the unit.
  See para. 5.6.4 for a flue gas discharge/air supply table of the remeha Gas 3002 ECO in room sealed construction.

### 5.6.2 Requirements

The horizontal components in the flue gas discharge system should slope towards the boiler.

- Material:
  a. Flues: Single-walled aluminium or stainless steel (316)
  Flexible stainless steel (316) or plastic.
  b. Air supply: Single-walled aluminium or stainless steel or flexible aluminium or flexible stainless steel or plastic. Discharge condensate out of the flue seperately
- Construction:
  The flue must be airtight and watertight at the seams and joints.

### 5.6.3 Conventional room ventilated

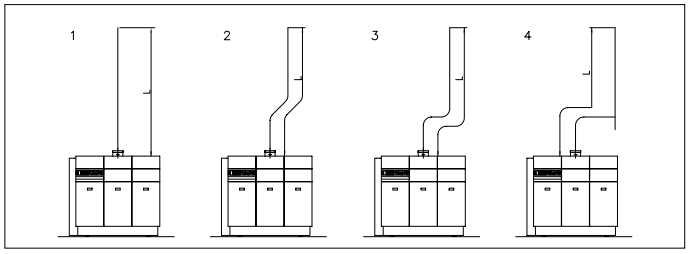



*Fig. 07 Conventional room ventilated*

*Construction of the flue*

*1 = flue without bends*
*2 = flue with 2 off 45° bends*
*3 = flue with 2 off 90° bends*
*4 = flue with a 90° bend, or a flue with 2 off 45° bends, with a T-inlet.*

The table indicates the maximum distance to be bridged to the outlet, depending on section size, version and diameter of the flue gas discharge pipe.

**Maximum allowable lengths of flue gas discharge piping in (L) m**

| D (in mm) | Outlet without Terminal 'free outlet' | | | | Outlet with Terminal | | | |
|---|---|---|---|---|---|---|---|---|
| **7 sect.** | **1** | **2** | **3** | **4** | **1** | **2** | **3** | **4** |
| Ø 130 | 19 | 17 | 16 | 13 | 14 | 12 | 11 | 8 |
| Ø 150 | + | 40 | 38 | 34 | 35 | 34 | 32 | 28 |
| Ø 180 | + | + | + | + | + | + | + | + |
| Ø 200 | + | + | + | + | + | + | + | + |
| **9 sect.** | | | | | | | | |
| Ø 130 | 9 | 8 | 7 | 3 | 4 | 3 | 2 | - |
| Ø 150 | 21 | 20 | 19 | 14 | 16 | 14 | 13 | 9 |
| Ø 180 | + | + | + | + | + | + | + | + |
| Ø 200 | + | + | + | + | + | + | + | + |
| **11 sect.** | | | | | | | | |
| Ø 150 | 12 | 11 | 10 | 5 | 7 | 5 | 4 | - |
| Ø 180 | 35 | 34 | 32 | 27 | 29 | 27 | 25 | 20 |
| Ø 200 | + | + | + | + | + | + | + | + |
| Ø 250 | + | + | + | + | + | + | + | + |
| **13 sect.** | | | | | | | | |
| Ø 150 | 7 | 6 | 5 | 0 | 2 | 0 | - | - |
| Ø 180 | 23 | 21 | 20 | 15 | 16 | 15 | 13 | 8 |
| Ø 200 | + | 40 | 38 | 33 | 34 | 32 | 31 | 25 |
| Ø 250 | + | + | + | + | + | + | + | + |
| **15 sect.** | | | | | | | | |
| Ø 150 | 4 | 3 | 2 | - | - | - | - | - |
| Ø 180 | 16 | 14 | 13 | 8 | 9 | 7 | 6 | 1 |
| Ø 200 | 29 | 27 | 26 | 20 | 22 | 20 | 18 | 13 |
| Ø 250 | + | + | + | + | + | + | + | + |
| **17 sect.** | | | | | | | | |
| Ø 180 | 11 | 9 | 8 | 3 | 4 | 3 | 1 | - |
| Ø 200 | 21 | 19 | 18 | 12 | 14 | 12 | 10 | 5 |
| Ø 250 | + | + | + | + | + | + | + | + |
| Ø 300 | + | + | + | + | + | + | + | + |
| **19 sect.** | | | | | | | | |
| Ø 180 | 8 | 6 | 5 | - | 1 | - | - | - |
| Ø 200 | 16 | 14 | 12 | 7 | 8 | 6 | 5 | - |
| Ø 250 | + | + | + | + | + | + | + | 36 |
| Ø 300 | + | + | + | + | + | + | + | + |

\+ *Length upto 40 m applicable.*
*For longer lenghts contact our technical departement*
\- *Not applicable*

**Note:**
For every extra bend of 90° resp. 45°, deduct lengths according to the following table:

| D | length | |
|---|---|---|
| mm | m | |
| | 90° bend | 45° bend |
| Ø 130 | 1.8 | 1 |
| Ø 150 | 2.1 | 1.2 |
| Ø 180 | 2.5 | 1.4 |
| Ø 200 | 3 | 1.6 |
| Ø 250 | 3.5 | 2 |
| Ø 300 | 4 | 2.4 |

### 5.6.4 Room sealed operation

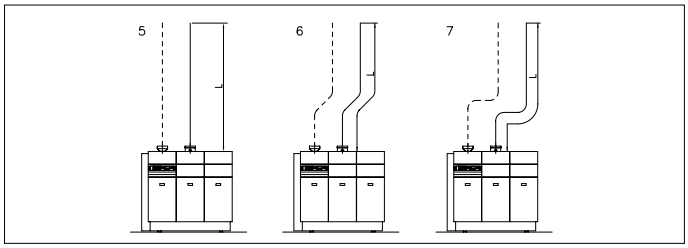



*Fig. 08 Room sealed operation*

*5 = Air supply and flue gas discharge piping without bends*

*6 = Air supply and flue gas discharge piping with two 90° bends, maximum connection length to vertical length 1.5 m of both the supply and discharge pipes.*

The adjacent table indicates the maximum distance between the boiler and the room sealed GVRS terminal (supplied by Broag) depending on the route, No. of bends and the diameter of the flue and air inlet pipework.

| Maximum allowable lengths of flue gas discharge and air supply piping in (L) m | | | |
|---|---|---|---|
| **D (in mm)** | | | |
| **7 sect.** | **5** | **6** | **7** |
| Ø 180 * | + | 40 | 37 |
| Ø 200 | + | + | + |
| Ø 250 | + | + | + |
| Ø 300 | + | + | + |
| **9 sect.** | | | |
| Ø 200 | + | + | 21 |
| Ø 250 | + | + | + |
| Ø 300 | + | + | + |
| **11 sect.** | | | |
| Ø 200 | 32 | 30 | 27 |
| Ø 250 | + | + | + |
| Ø 300 | + | + | + |
| **13 sect.** | | | |
| Ø 200 | 24 | 9 | 7 |
| Ø 250 | + | + | + |
| Ø 300 | + | + | + |
| **15 sect.** | | | |
| Ø 200 | - | - | - |
| Ø 250 | + | + | + |
| Ø 300 | + | + | + |
| **17 sect.** | | | |
| Ø 200 | - | - | - |
| Ø 250 | 38 | 35 | 30 |
| Ø 300 | + | + | + |
| **19 sect.** | | | |
| Ø 200 | - | - | - |
| Ø 250 | 21 | 17 | 13 |
| Ø 300 | + | + | + |

* *Calculated with a concentric outlet, type Ø 150 mm*

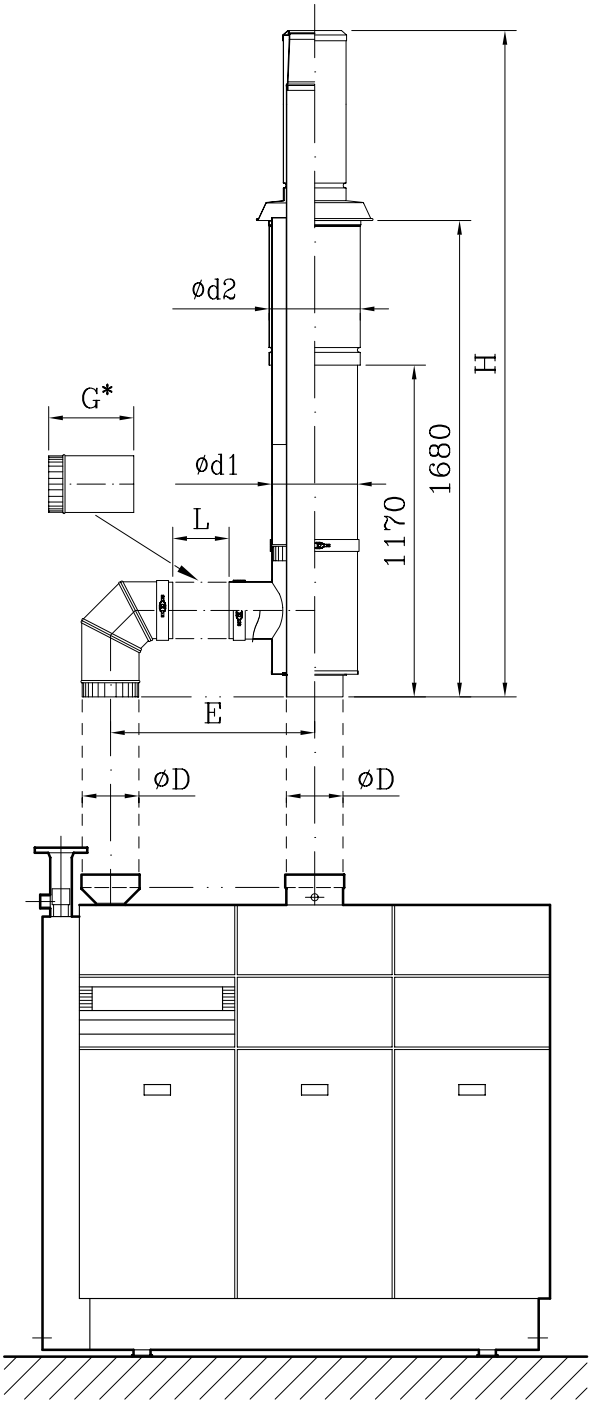
\+ *Lengths upto 40 m applicable. For longer lenghts contact our technical departement*

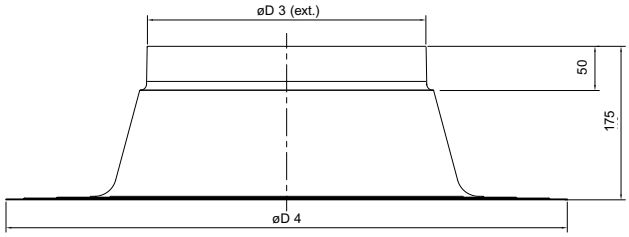
\- *Not applicable*

**Note:**
For every extra bend of 90° resp. 45° in the air supply or the flue gas discharge piping, deduct lengths according to the following table:

| **D** | **length** | |
|---|---|---|
| mm | m | |
| | 90° bend | 45° bend |
| Ø 180 | 2.5 | 1.4 |
| Ø 200 | 3 | 1.6 |
| Ø 250 | 3.5 | 2 |
| Ø 300 | 4 | 2.4 |

For room sealed operation combined vertical roof outlets (GVRS) are available as outlined below *(fig. 09)*.




| Dimensions | 7-11 sections | 13-19 sections |
|---|---|---|
| | mm | mm |
| øD 3 | 318 | 368 |
| øD 4 | 640 | 690 |

--- Not supplied and mounted by Broag
* Correct lengths for 11 and 19 sections; for the 9, 13, 15 and 17 sections, the pipe supplied must be shortened. This pipe is not suitable for the 7 section boiler.

| Number of sections | L | E | ØD | G* | H | Ød1 | Ød2 |
|---|---|---|---|---|---|---|---|
| | mm | mm | mm | mm | mm | mm | mm |
| 7 | 0 | 450 | 200 | 0 | 2350 | 300 | 320 |
| 9 | 30 | 550 | 200 | 130 | 2350 | 300 | 320 |
| 11 | 200 | 720 | 200 | 300 | 2350 | 300 | 320 |
| 13 | 260 | 820 | 250 | 360 | 2500 | 350 | 370 |
| 15 | 360 | 920 | 250 | 460 | 2500 | 350 | 370 |
| 17 | 500 | 1060 | 250 | 600 | 2500 | 350 | 370 |
| 19 | 600 | 1160 | 250 | 700 | 2500 | 350 | 370 |

*Fig. 09 Example of concentric outlet*

## 6. PRINCIPLE OF THE BOILER INSTALLATION

The required combustion air is blown into the air channel *(2)* by the fan *(1)* via a non-return valve.
This valve is installed to prevent accumulated heat from escaping when the boiler is out of operation.
Standing losses are reduced considerably this way.
The boiler is provided with a number of separate burner compartments *(see fig. 1, chapter 2)*, each provided with a curved mixing section *(3)* with gas injection *(4)*.
The combustion air is uniformly distributed over the various curved mixing sections in the air channel.
The injectors blow the gas radially into the air flow.
This gas injection method ensures proper mixing of air and gas, thus creating a homogenous mixture.
The curved mixing sections are connected to the distribution chambers *(5)* to distribute the mix evenly across the burnerhead.
A throttle plate is fitted in the distribution chamber of the burner compartment on the gas connection side. This throttle plate has to build up the control pressure for the gas control block for the gas/air ratio control.
This control ensures optimal combustion under all circumstances. Furthermore, each mixing chamber is provided with a distribution plate. This slotted plate serves to distribute the mixture over the burner *(6)*.
The burners have a metal fibre cover in which a burner pattern is punched. The gas/air mixture is ignited and combustion takes place. Premix combustion ensures a very low NOx emission.
The flue gases then flow through both heat exchangers *(7+8)* and are cooled to a temperature which is only a few degrees higher than the return water temperature.
If the return water temperatures drop below approximately 55°C, the flue gases will be cooled down to below the dew point, i.e. the temperature at which the water vapour in the flue gases begin to condense.
The heat released by this condensation process (the so-called latent heat or condensation heat) is transmitted to the heating water.
The condensate is collected in a collector *(9)* and discharged to the drains via a syphon *(10)* (despatched as a loose item).
The flue gases are reversed and discharged through the flue gas discharge pipe *(11)* (included in the supply) to the flue gas discharge pipe.

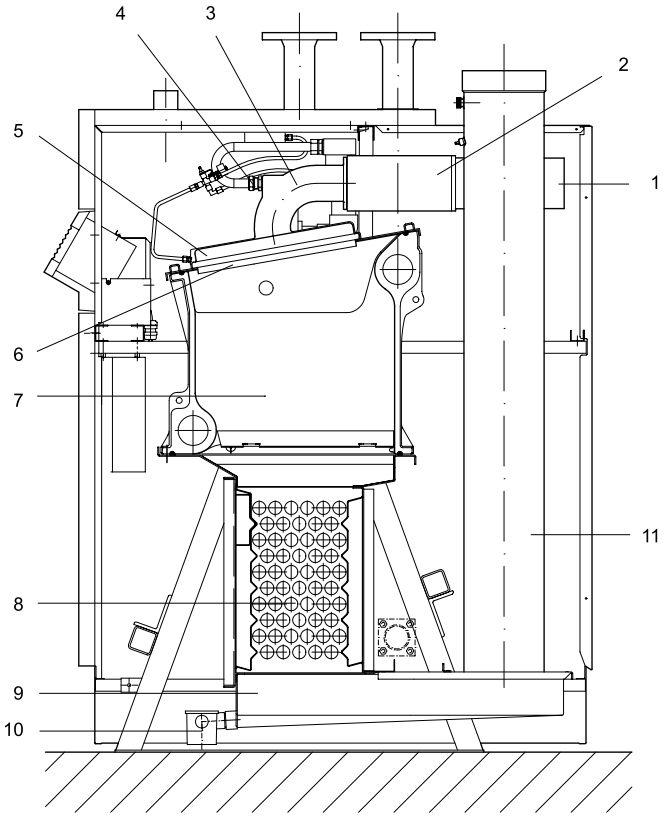



*Fig. 10 Right side, cross section*

## 7. CONTROL AND SAFETY EQUIPMENT

### 7.1 General

The Remeha Gas 3002 ECO comes complete with electronic control and safety equipment, with ionization flame protection. As a standard procedure, the boiler has been designed to meet the CE and other relevant inspection requirements. The boiler can be controlled either high/low or modulating.

### 7.2 Instrument panel

#### 7.2.1 General

The Remeha Gas 3002 ECO comes with an instrument panel.
This instrument panel is provided with an advanced microprocessor control unit with an alphanumeric LCD-display. This display is composed of 4 lines of 20 characters each and is used for displaying operational or fault conditions, measured values and instructions. Using the buttons, different menus can be accessed, various values can be read and settings made (see para. 7.3).

#### 7.2.2 Lay-out of the instrument panel

The instrument panel consists of the following components:

1. main switch
2. facility for incorporating a ***rematic***® weather-compensated boiler control
3. central fault warning light
4. LCD-display, composed of 4 lines of 20 characters each
5. **'Reset'** button, for resetting of a failure

6,7. **'Step'** buttons, for changing a preset value or for selection from a menu

8. **'Enter'** button, for confirmation of a modified setting or code entered
9. **'Escape'** button, for switching from one menu to another.

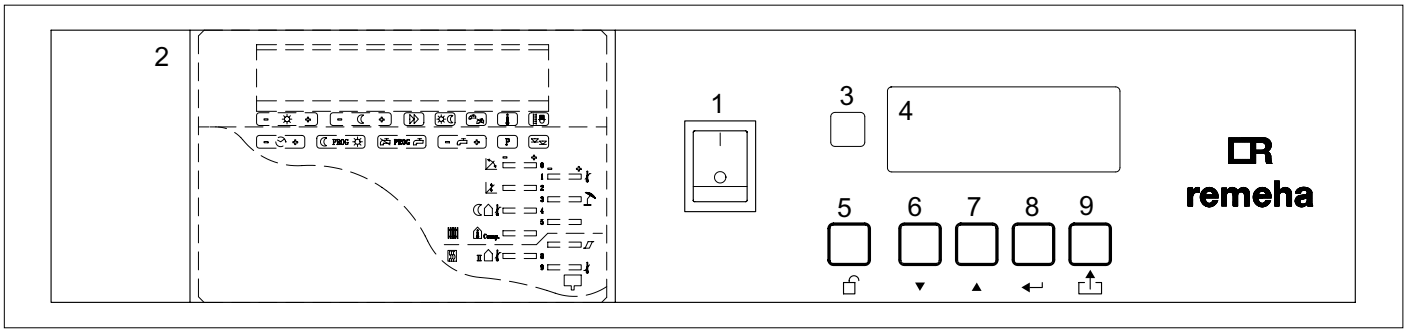



*Fig. 11 Instrument panel Remeha Gas 3002 ECO*

### 7.3 The control unit

#### 7.3.1 General

The Remeha Gas 3002 ECO is supplied as standard with a highly sophisticated menu-driven micro-processor boiler control with extensive operational and fault finding diagnostics.
Using the buttons different menus can be called up various values can be read and settings made.

The readout and setting options are divided into various levels:

| | | |
|---|---|---|
| User level | - | freely accessible |
| Service level | - | accessible using service code |
| Factory level | - | not accessible. |

#### 7.3.2 User level

The user level comprises a number of menus, which can be called up using the '⏏' button.
The main menu continuously displays the operating condition the flow and return water temperatures as well as the ionization current of the first ionisation probe.
By pressing the '⏏' button, the next menu is displayed.
Now the water temperature measured at the position in the boiler block where it can best be measured the flue gas temperature, the air differential pressure and the ionization current of the second ionisation probe are displayed. When the '⏏' button is pressed again, the third menu is called up. Here the preset maximum (flow) operating temperature (default setting 80°C) and the number of running hours are displayed.
The fourth menu displays the high limit temperature (default setting 110°C). Furthermore, the maximum operating temperature can be changed in this menu using the '▲' and '▼' buttons.
This temperature can be adjusted to 90°C maximum which means that the switch-off temperature is 95°C.
When the '↵' button is pressed after the modification, the modification is confirmed. By pressing the '⏏' button the fifth menu is accessed. In the fifth menu the user is prompted for a code to access the service level.
By pressing the '⏏' button, the main menu appears again.
By pressing the '↵' button after entering the service code, the service level can be accessed.

### 7.3.3 Service level

To prevent unwanted settings by non-experts the service level can only be accessed after entering a security code. The security code for this level is 0012.
After entering this code using the '▲' and '▼' buttons in menu 5 and confirming it by pressing the '↵' button, the service level is accessed.
Now, a selection can be made from 4 options:

1) Service settings
2) Service test
3) History data
4) Service level II (factory level).

Select the desired option using the '▼' button and confirm it by pressing the '↵' button.

**To 1) Service settings**

Various settings can now be made (select desired option using '▲' and '▼' button and confirm it by pressing the '↵' button.

**Option 1: Input selection**

Offers the posibility of an internal PI-regulation, by which the boiler regulates its output based on flow temperature and the possibility of an external PI-regulation, by which the boiler output is regulated by means of an external regulation.

The selection of the options can be obtained by placing the cursor onto the chosen line by means of the '▼' and '▲' buttons and by pushing next the '↵' button. The choice is confirmed by the two arrow heads which appear on the selected line. Using the '⇧' key, you switch to the next screen, where it is possible to select the method according to which the required temperature or required power can be passed on to the boiler control. There are three possibilities:

**A. Contacts**

**A.1 Internal control**

Via a potential-free contact, the boiler receives a heat demand command. At the user level, the required flow temperature can be set. The boiler now will modulate on base of this temperature.

**A.2 External control**

Via two potential-free contacts, the boiler can be switched to minimum or maximum power. At the user level, the maximum flow temperature can be set.

**B. Analog**

**B.1 Internal control**

The required flow temperature is passed on to the boiler control via a 0-10V analog signal. As standard, this signal is set to a temperature of 0°C at 0V and 100°C at 10V (see figure 12), but via the two following screens it is possible to allocate different values to the tarting and finishing points, depending on the type of control used. At 0V, a temperature of between -50°C and +50°C can be selected, and at 10V, a temperature of between +50°C and +300°C. Via a linear line, the control will convert the voltage into the required flow temperature, higher than the measured flow temperature. At the user level, it is possible to set the maximum operating temperature. The setpoint will be limited to this level, irrespective of whether the analog input calls for a higher temperature.

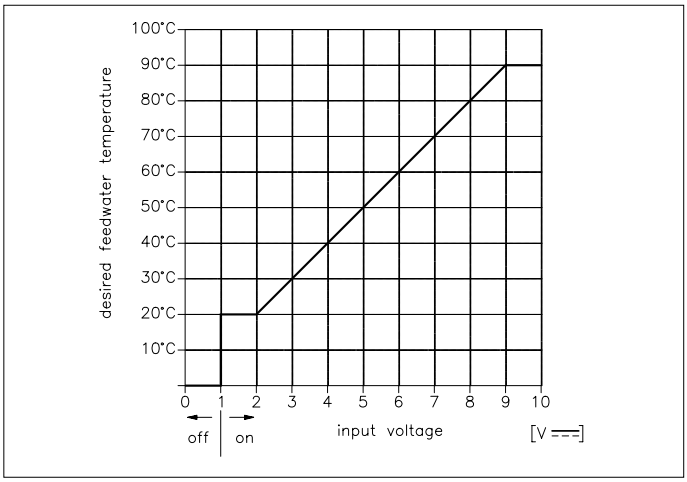



*Fig. 12 Internal boiler control by analog (0-10 Volt) signal.*

**B.2 External control**

The required power is 0% at 0V and 100% at 10V (see figure 13). As soon as the voltage exceeds 1V, the boiler will switch on. As soon as the voltage falls below 0,5V the boiler will switch off. The maximum operating temperature can be set at the user level.

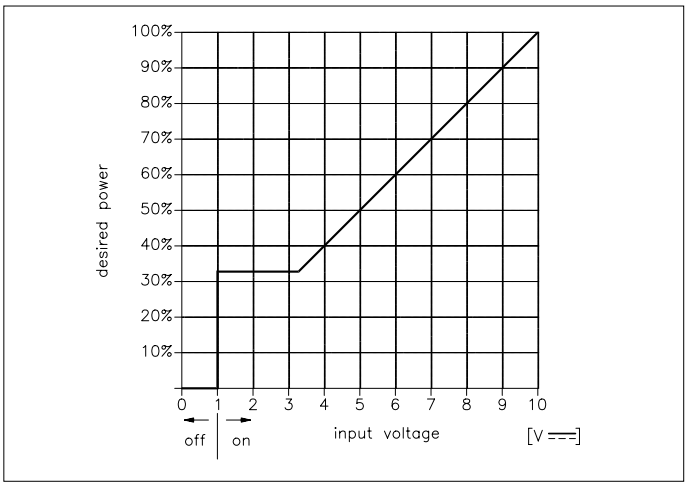



*Fig. 13 External boiler control by analog (0-10 V) signal.*

**C. Computer**

**C.1 Internal control**

The boiler can also be controlled using a computer, modem or GBS system. The switch-on command and the required flow temperature is passed on to the boiler via the RS 232 connection. All values, settings, etc. can now also be read via the RS 232 connection.

**C.2 External control**

In this structure, the switch-on and switch-off commands and the required power are transmitted via the RS 232 connection. Here too, all measurement values and set tings can be passed on through this connection.

**Option 2 Language:**
A choice of English, Dutch, French or German.

**Option 3 Setpoint hysteresis:**
Using this parameter, the switch hysteresis can be set at the flow temperature. As standard, this value is set at 10°C. The boiler will always issue a control stop when the flow temperature equals the preset maximum flow temperature +5°C. The switch hysteresis determines when the boiler will switch on. A setting of 10°C means that the temperature must fall 10°C below the preset maximum operating temperature +5°C before the boiler switches on. This setting can be varied between 5 and 15°C.

**Option 4 Maximum flue gas temperature:**
The maximum flue gas temperature can be set between 80 and 230°C (standard setting is 230°C).

**Option 5 Pressure settings:**
With this option, it is possible to set the maximum and minimum differential pressures of the boiler. The maximum differential pressure is set as standard at the setting for 100% load (see the label on the boiler, adjacent to the type plate). This setting can be reduced in order to lower the maximum boiler load. This means that the maximum boiler load can be perfectly adjusted to comply with the heat requirements of the building. Consult our technical department. The minimum differential air pressure is set as standard at 50% load. This setting can be reduced down to the value for a minimum load of 33%
(see label on the boiler, adjacent to the type plate).

**Option 6 Relay switch:**
The control system has two operation sensor relays, one for sensing low power, and one for sensing high power. The change-over point from low to high can be set using these parameters. As standard, the setting is 95%.
In other words, at a power below 95%, the operating message ‘low power’ is issued, and at a power exceeding 95%, an operating message ‘high power’ is issued.
The change-over point can be set between 10 and 99% and, if required, altered.

**Option 7 Gas leak detection:**
If a gas leak control is built in, this can be announced to the control unit via this screen.

**Option 8 Set hours:**
If the display print has to be replaced, it is possible to transfer boiler service hours onto the new print.
Low flame and high flame hours need to be noted. After which it is possible to set these hours onto the new print by using option nr. 8.

**Option 9 High limit temperature:**
If desired, it is possible to decrease the high limit temperature of the boiler.
**Attention: This setting can only be lowered.**
If you do so, please also lower the maximum service temperature in order to avoid an boiler lock-out.

**Option 10 Stabilisation time:**
After ignition, the boiler will function on maximal load during a lapse of time to be choosen.
This period can be set between 40 and 600 seconds (standard setting 180 seconds)

**To 2) Service test**
This option enables direct manual control of the boiler by the service engineer. All outside influences are overridden (except for the safety devices) at the moment the service engineer uses the available options.
The following settings are possible (always select the desired option using the '▼' button and confirm with the '↵' button).
When the boiler is in operation:
- Turn off the boiler.
- Switch the boiler from minimum to maximum load (or the other way around, depending on the situation).

When the boiler is out of operation:
- Start the boiler.
- Switch the fan on or off.
- Switch the fan to maximum or minimum speed.
- Activate the ignition for 5 seconds (first the fan will prepurge for 30 seconds).

**To 3) Failure data**
Five shut down and five lock out failures can be stored in the memory of the control unit. If a failure is repeated several times, it is stored only once. For every failure stored the operational condition at the moment of failure can also be displayed. This facilitates easy trouble shooting. The locking or the blocking failure memory can be selected in the main menu of the "History data" option, using the '▲' and '▼' buttons. Confirm with the '↵' button. Depending on the option selected, the number of blocking or lock out failures stored in the memory (maximum 5 of each) is displayed. Failure No. 1 is the most recent failure, failure No. 2 the last but one, etc. To know which failure occurred last, the failure counter must be set to 1 using the '▲' and '▼' buttons. When the '↵' button is pressed for confirmation, the failure in question is seleced. Using the '⏏' button, various menus can now be called up, all indicating the operational condition of the boiler at the moment of failure (see also para. 12).
The memory of the blocking failures is lost when the line voltage is lost, the memory of lock out failures is saved.

**To 4) Service level II (factory level)** Not accessible.
From every menu within the service level the user level can be accessed by pressing the '⏏' button once or several times, depending on the position within the menu structure at that time. If the service level is exited, the service code entered remains active for another 30 minutes. The service level can therefore automatically be accessed from the user level during these 30 minutes without having to enter the code again.
Furthermore, the control unit will automatically switch back to the user level after 30 minutes.

### 7.3.4 Overview of the different menus

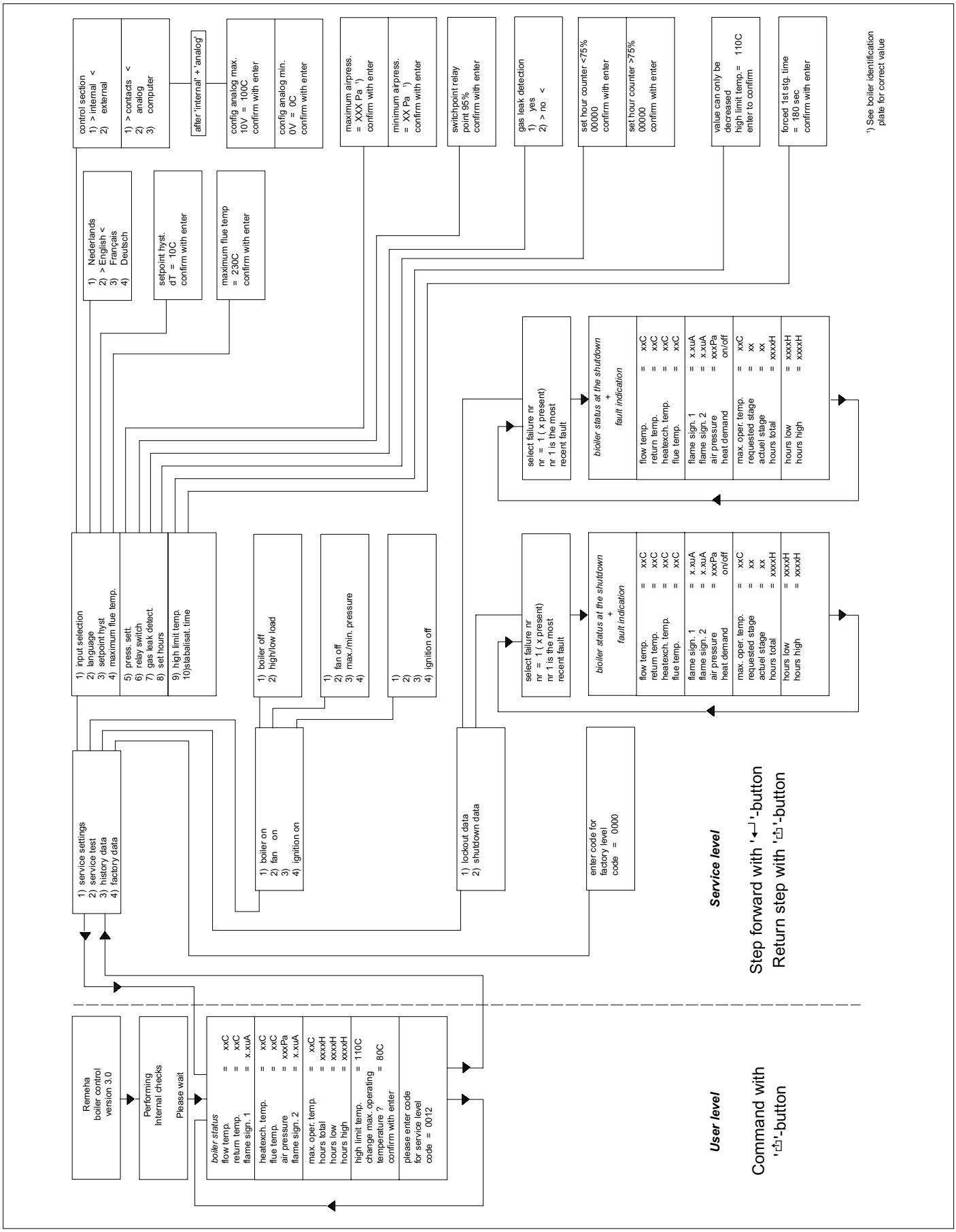



*Fig. 14 Boiler control*

### 7.4 Standard electronic gas train

#### 7.4.1 Schematic construction

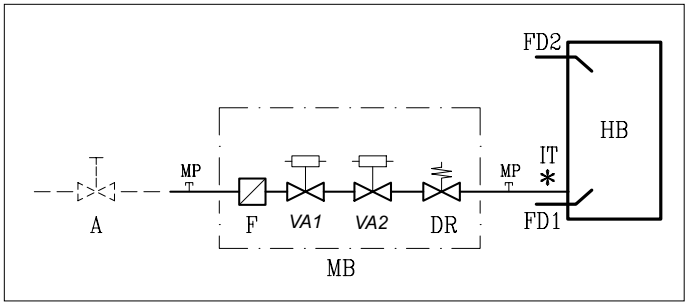



*Fig. 15 Schematic construction of gas train, 7 and 9 sections*

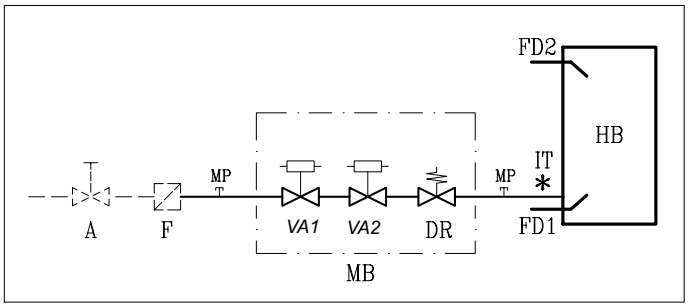



*Fig. 16 Schematic constr. of gas train, 11 to 19 sections*

***Legend***

| | |
|---|---|
| *A* | Gas cock (hand-operated) |
| *MP* | Measuring point |
| *F* | Gas filter |
| *VA* | Safety valve |
| *DR* | Gas governor |
| *MB* | Multibloc |
| *IT* | Ignition transformer |
| *HB* | Main burner |
| *FD* | Flame control |
| --- | Not supplied as a standard feature. |

#### 7.4.2 Specification

Multibloc with gas/air ratio control consisting of:
- Gas filter (7 and 9 sections only)
- Two safety valves
- Pressure regulator for gas/air ratio.

### 7.5 Functions

#### 7.5.1 General

The equipment supplied ensures that the following functions are monitored and locked or blocked in case a failure has occured.

#### 7.5.2 Flame protection (lock out)

Flame protection with two ionization probes.

#### 7.5.3 Low-water protection

Low-water protection is ensured with three temperature sensors: a flow temperature sensor, a return temperature sensor and a water temperature sensor installed in the boiler block at the most sensitive spot (heat exchange temperature sensor).
The sensors monitor the rate of increase in water temperature and the differential temperature across the boiler. If for instance one of the sensors signals a water temperature increase which is too rapid, the boiler will be shut down.
If the differential temperature across the boiler exceeds 45°C, the boiler will go into a control stop.

#### 7.5.4 Temperature protection

Water temperature protection is ensured with three water temperature sensors: a flow temperature sensor, a return temperature sensor and a water temperature sensor installed in the boiler block at the sensitive spot (heat exchanger temperature sensor).
If the flow sensor signals a temperature which exceeds or threatens to exceed the preset maximum operating temperature + 5°C (see para. 7.3.2), the boiler is switched off (control stop).
At the same time the rate of increase in the water temperature is monitored, so that the boiler is switched off in time and heat transfer is prevented.
If one of the sensors still signals a water temperature higher than 110°C, the boiler will lock out.
The flue gas temperature is limited by a flue gas temperature sensor (locking) with a default setting of 230°C.

#### 7.5.5 Flue gas transport protection

The flue gas transport is protected by a pressure differential sensor.

## 8. ASSEMBLY GUIDELINES AND INSTALLATION INSTRUCTIONS FOR THE HEATING ENGINEER

### 8.1 General
The Remeha Gas 3002 ECO is delivered unassembled. The dimensions allow for transportation of all parts to the boiler room through normal access doors.
The casing and equipment parts are packed.

### 8.2 Water connections
The water connections consist of flanges to DIN 2633, BS 4504 PN16 (DN 65 for boilers with 7 to 11 sections and DN 80 for boilers with 13 to 19 sections) and are located at the same side as the gas and air supply connections (in room sealed construction). The standard location of these connections is the top left on the boiler. If specified when ordering, it is possible to have the connections installed at the top right side.
**The water connections, the gas connection, the air supply connection (in room sealed form) and the control panel are always located at the same side.**
Just below the flange of the flow connection there is a 1¼" welding socket for fitting of a safety valve (see para. 8.4). Furthermore, a pocket (Ø 15 mm) for installation of a weather compensated boiler control is located in the flow piping underneath the boiler casing.
As an option, it is also possible to get the boiler delivered with separate flow and return connections (DN 65) for the second heat exchanger (ECO).

### 8.3 Water pressure
Each boiler section undergoes a test pressure of 12 bar. The max. test pressure of an assembled boiler is 6 bar. The boilers are designed for operating pressures between 0.8 bar and 6 bar.

### 8.4 Safety valve
The size and location of the safety valve must comply with the relevant requirements. A 1¼" connection for fitting of
a safety valve is located underneath the flange of the flow connection.
**Note:**
To enable disassembly of the side panel casing, the safety valve must not be installed directly next to the boiler.

### 8.5 Filling, refilling and venting of the installation
Initial filling of an installation can be done via the boiler fill and drain off cock. Refilling must be done at another place, to avoid thermal stresses in the boiler.
Before filling, open the caps of the automatic vents installed on the opposite side of the connections on the end section of the primary heat exchanger and on the return box of the secondary heat exchanger. The installation must be vented at the highest point, when the entire installation has been heated to approximately 80°C and the pumps have been switched off.

### 8.6 Boiler draining
The boiler should be drained via the fill and drain off cocks of the boiler. It is recommended to drain the entire instal- lation at another place to avoid the penetration of any dirt from the installation into the boiler.

## 9. GAS SUPPLY

### 9.1 General
The local Gas authority should be consulted to ensure that an adequate pressure and supply is available, at the boilers maximum output. The gas supply should be conform to the British Gas Safety regulations.
The gas connection of the boiler (1¼" for boilers with 7 and 9 sections, 2" for boilers with 11 to 19 sections) is located at the same side as the water connections and the air supply connection (in room sealed form).
The standard location of these connections is top left on the boiler. If specified when ordering, it is possible to have the connections installed at the top right side.
**The water connections, the gas connection, the air supply connection (in room sealed form) and the control panel are always located at the same side.**
The gas multibloc of the 7 and 9 section boilers include a gas filter. Therefore, no extra filters are needed in the gas supply pipe.
**The 11 to 19 section boilers have no filter mounted in the gas multi bloc. A gas filter with the fineness of 50 microns has to be installed in the gas supply pipe.**

### 9.2 Pressure test of the gas installation
Gas installations must be gas tight and tested to current safety standards.
During the pressure test, the boiler equipment must be isolated from the main gas pipe.

### 9.3 Gas pressures
Gas supply pressure: 17-30 mbar.
Higher gas supply pressures only in consultation with the gas company.
Maximum gas pressure at inlet:
- 7 and 9 sections: 50 mbar
- 11 to 19 sections: 100 mbar

Minimum gas pressure at inlet: 17 mbar.

## 10. ELECTRICAL SUPPLY

### 10.1 General
The electrical installation must be conform to the I.E.E. regulations and also to the local authority requirements.

### 10.2 Electrical connections
The boiler is entirely prewired. The installation contractor only has to provide for the electric power supply (230V, 50 Hz) and the external wiring (cut-in commands, messages, etc.). The electrical connections must comply with the supplied wiring diagram.
On top of the boiler local to the connections (standard left) a passage for the cabling (cable trunking 40x40 mm) is provided.

### 10.3 Electrical data
Power supply: 230V-50 Hz (phase/neutral)
Maximum input power:

| Number of sections | Maximum load | Minimum load |
|---|---|---|
| 7 | 300 VA (250 W) | 140 VA (100 W) |
| 9 | 310 VA (260 W) | 120 VA (70 W) |
| 11 | 580 VA (380 W) | 140 VA (90 W) |
| 13 | 725 VA (490 W) | 150 VA (100 W) |
| 15 | 800 VA (550 W) | 140 VA (90 W) |
| 17 | 820 VA (570 W) | 150 VA (100 W) |
| 19 | 880 VA (610 W) | 170 VA (110 W) |

Installed fuse value:

| | |
|---|---|
| Weather-compensated control | 6,3 A, slow blow |
| Electronics | 1 A, fast blow |
| Fan/gas block | 4 A, slow blow |

Connecting cable: $1^1/_2$ mm$^2$ VMvK.

When using an automatic fuse, the following minimum values have to be used:
- 7 to 15 sections: 10A
- 17 and 19 sections: 16A .

Reference to good earth connections required.

### 10.4 Boiler control

#### 10.4.1 General
The Remeha Gas 3002 ECO can operate fully modulating (between 33 and 100%) or high/low.

#### 10.4.2 Modulating
The Remeha Gas 3002 ECO modulation can be controlled internally or externally.

**A. Internal control**
The control unit has an advanced PI control, which can modulate the boiler control, based on the desired flow temperature. To do so select in the service level the option 'Control selection: internal' (see para. 7.3.3).

There are several options to set the required flow temperature and the start command to the boiler.
**A1. Start/stop through a volt free contact.**
Select in the service level the option 'Input selection: relay contacts'.
The start command to the boiler comes free when relay contacts close. The power for this input is supplied by the boiler at a level of 24V DC.
This start command should be connected to the terminals 23 and 24 of the terminal strip in the boiler control panel (behind the front casing, underneath the instrument panel). This input is indicated by the following symbol:

The current through the contacts is approx. 6 mA (see the electrical wiring diagram at para. 10.9).
The required flow temperature can be set manually by means of the instrument panel. Go to the fifth menu of the user level, using the '↵' button, for setting the maximum flow temperature (see para. 7.3.2).
**A2. Start/stop through the option 'analog'.**
Select in the service level the option 'Input selection: analog". This analog signal (0-10V) should be connected to the terminals 27 (-) and 28 (+) on the terminal strip in the boiler control panel and is indicated by the following symbol:


The input resistance at the analog input is approx. 10 kΩ (see also electrical wiring diagram at para. 10.9).
This signal represents the start command and the required flow temperature according to fig. 15.
**A3. Start/stop through the RS 232 bus.**
Select in the service level the option 'Input selection: computer'. Through a PC or BMS the start/stop command and the required flow temperature are now transmitted to the boiler.
Contact our technical department for more information about RS 232 connection.

**B. External control**
Select in the service level the option 'Control selection: External' (see para. 7.3.3). Now you can choose the output of the boiler, there are two choices.
**B1. Through an analog signal**
Select in the service level the option 'Input selection: analog'. This analog signal (0-10V) should be connected to the terminals 27 (-) and 28 (+) on the terminal strip in the boiler control panel and is indicated by the following symbol:

The input resistance at the analog input is approx. 10 kΩ (see also electrical wiring diagram at para. 10.9). This signal represents the start command and the required output of the boiler according to fig. 16.

**B2. Through the RS 232 bus.**

Select in the service level the option 'Input selection: computer'. Through a PC or BMS the start/stop command and the required flow temperature are now transmitted to the boiler.

Contact our technical department for more information about RS 232 connection.

### 10.4.3 High/low control

It is also possible to control the boiler high/low.

The internal PI control cannot be used for high/low control. Switch off the internal control to select in the service level the option 'Control selection: external' (see para. 7.3.3). The boiler now can operate on two volt free contacts. The first step should be connected to terminal 23 and 24 and is indicated by the following symbol:

The current through the contacts is approx. 6 mA. And the second step to 25 and 26 is indicated by the following symbol:

The power for this input is supplied by the boiler at a level of 24V DC. The current through the contacts is approx. 6 mA. The terminal strip is in the boiler control panel (see the electrical wiring diagram at para. 10.9).

## 10.5 Connections

### 10.5.1 Other inputs

General:

All inputs (with the exception of the analog input) are powered via the boiler with a voltage of 24 V DC.

The current is approx. 6 mA per input. No connection whatsoever may be connected in any way with the phase, zero or earth of the mains power circuit. All connections must be made with potential-free contacts.

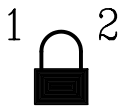
### 10.5.2 Blocking inputs

The control system is equipped with two blocking inputs which can switch off the boiler. These inputs can be used, for example, in combination with the limit switches of

throttling valves, minimum gas pressure switches, etc.

Blocking input 1 is fitted on terminals 29 and 30, whilst blocking input 2 is fitted on terminals 31 and 32.

The symbol for both inputs is:




If you wish to use either input, the wire bridge must first be removed. As long as the input is opened, the relevant message will appear on the display until the contact is made.

### 10.5.3 Locking input

The control system is equipped with one input which may lock the boiler. These input can be used, for example, in combination with the maximum gas pressure switch, the locking input is fitted on terminals 33 and 34.

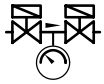
The symbol for the input is:


If you wish to use the input, the wire bridge must first be removed. As long as the input is opened, the boiler will be locked, and the relevant message will appear on the display. Once the contact is closed, the boiler must once again be released via the reset button.

### 10.5.4 Gas leak check

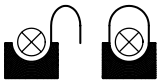
A gas leak check, to be supplied by Remeha, can be connected to inputs 37 and 38. In this case, the control must be adjusted for the presence of the gas leak check at the service level (see para. 7.3.3, option 7).

The symbol for this input is:



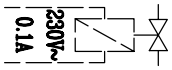
### 10.6 Outputs

#### 10.6.1 Alarm output
The boiler is fitted with a potential-free two-way contact for the alarm or ready message. When the boiler is locked or dead, contact 11 and 12 will be made. When the boiler is ready, contacts 11 and 10 will be made.
The maximum load on the contact is 250V/2A.
This output is indicated by the following symbol:



#### 10.6.2 Operating message
The boiler is fitted with two potential-free closed-circuit contacts for the low operating message and the high operating message. Contacts 13 and 14 are for the low operating message, and contacts 15 and 16 for the high operating message. The moment at which a switch is made from low to high can be programmed at the service level (see paragraph 7.3.3, option 6).
The symbol for this output is:

#### 10.6.3 External gas valve
If required, an external gas valve can be connected to terminals 17 and 18. 230V is applied to these terminals as soon as the fan starts to operate. When the fan switched off, the voltage is also disconnected.
The maximum power take-up for the gas valve is 0.1A.
The symbol for this output is:




#### 10.6.5 Extra 230V connection
On terminals 8 and 9, the external power supply is once again diverted outwards for the connection of external components such as relays and pumps. The voltage on these terminals is **not switched off by the main switch on the panel**. This voltage is also neither fused nor filtered.
The maximum current across these terminals is 10A, but will depend on the value for which the power supply to the boiler is fused. In the switch panel there is a little free
space for the possible installation of an extra relay.
The symbol for this output is:


### 10.7 Building Management System

For connection to a Building Management System the Remeha Gas 3002 ECO is delivered as standard with a RS 232 connection.
The boiler is also provided with the following potential-free contacts:
- signal "low"
- signal "high"
- central alarm.

Standard the signal "low" is activated if the boiler load is between minimum and 95% and the signal "high" is activated if the boiler load is between 95% and maximum.
See also Option 6, page 16.

### 10.8 Frequency changer
The frequency changer controls and delivers a 3-phase supply of 230V, by which the frequency can vary from 0 to a maximum of 60Hz. This alternation in frequency controls the speed of the fan motor. The frequency changer is fitted in the control panel behind the front casing.
Inside the frequency changer there are two L.E.D.'s, a green one for 'ready' and a red one for 'fault' indication.
Blinking green L.E.D. means the frequency changer is not ready. In that case, check the link between terminal 7 and 39, and the link between terminal 20 and 28 (see wiring diagram).
If the red L.E.D. is blinking the frequency changer fails. This is caused by:
- Short circuit on the windings of the motor or in the wiring to the motor.
  - Check the wiring of the motor and measure the windings of the motor.
- The motor runs heavy, through which the current increases.
  - Check if the fan runs free.
- Frequency changer is too hot.
  - Check if the cooling rib is too hot and if the frequency changer is fitted correctly to the control panel.

By switching on/off the frequency changer will be reset.

### 10.9 Electrical wiring diagram

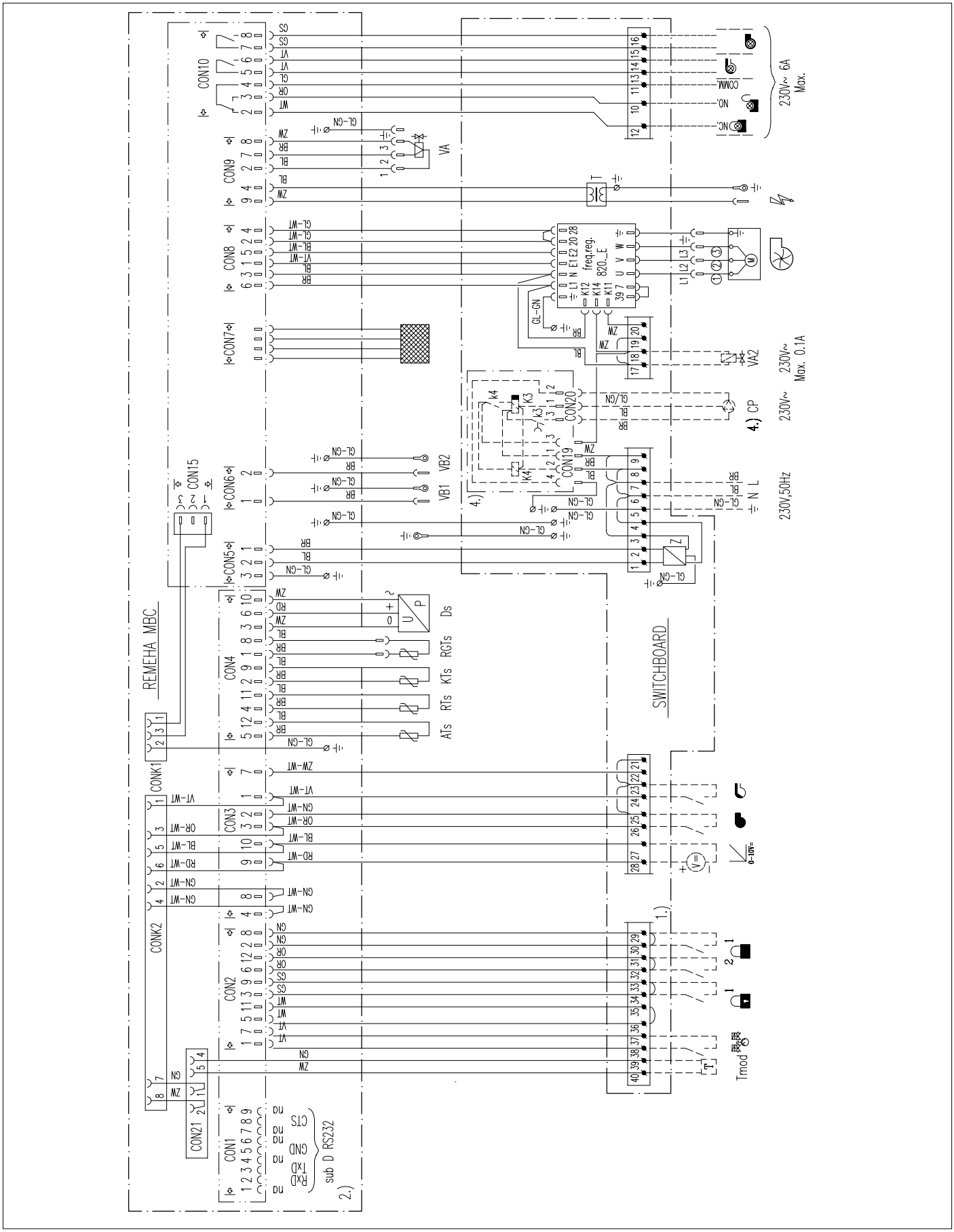



*Fig. 17 Electrical wiring diagram*

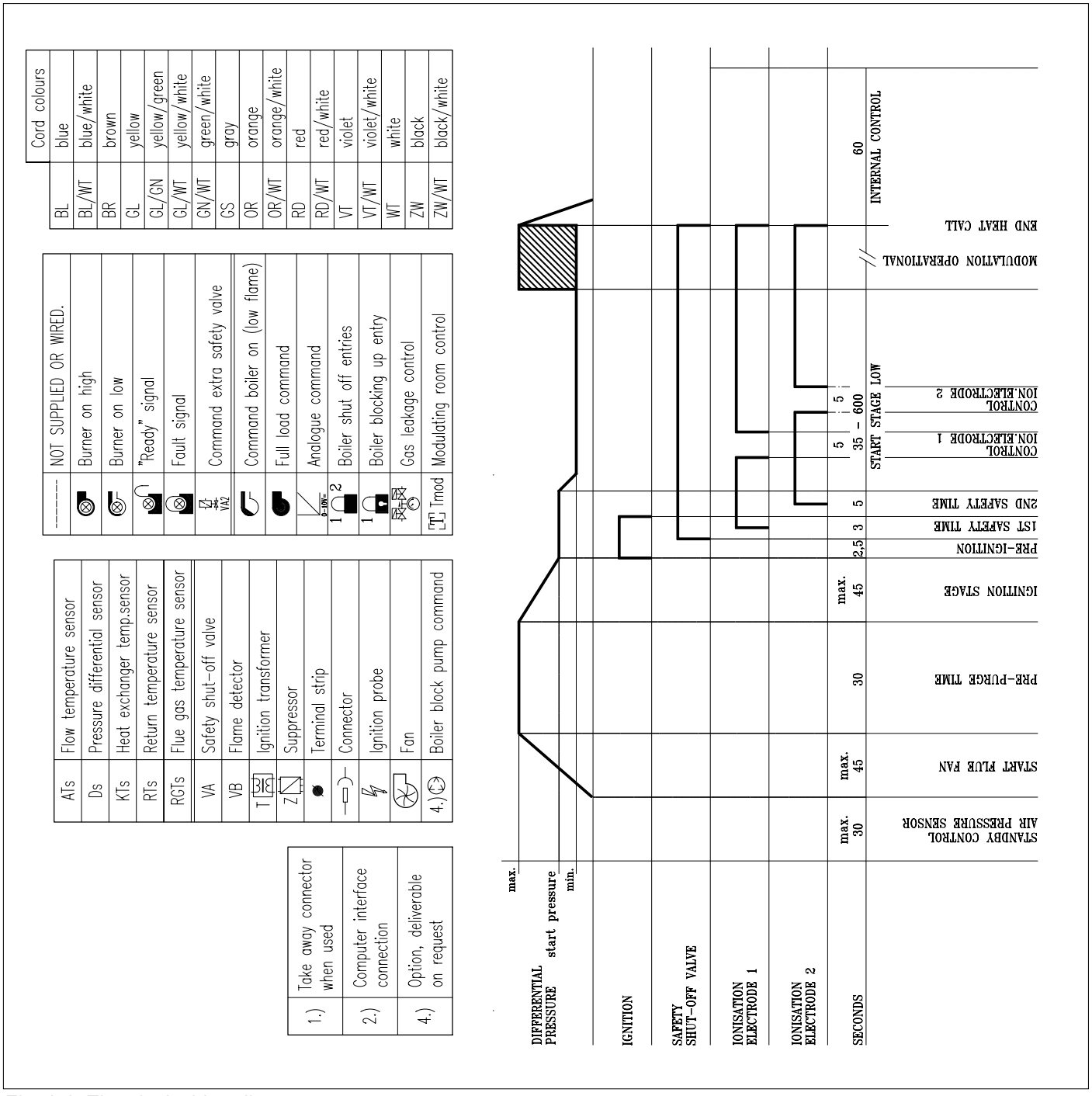



*Fig. 17b Electrical wiring diagram*

## 11. COMMISSIONING

### 11.1 Technical data

| | |
|---|---|
| Control box: | Remeha mbc 3.0 |
| Mains voltage: | 230V - 50Hz |
| Minimum ionization current: | 1.0 µA DC |
| Reaction time of flame protection: | 1 sec. |
| Safety time: | 3 sec. |
| Max. allowable ambient temperature: | 60°C |
| Number of start attempts: | 5 |
| Cut-out differential pressure: | 50 Pa. |

**The control box is sensitive to phase/neutral!**

The control panel comes with an alphanumeric LCD-display. The entire starting cycle can be followed on this display. Using the code connector (boiler recognition connector) the control unit automatically recognizes the boiler type. During initial commissioning the control unit will indicate that it recognizes the boiler type code (if not: see para. 12). Still, it will ask you to check the type indicated on the sticker placed on the boiler (next to the boiler data batch, behind the front panel casing).
See also point 8, para. 11.2.

**Attention:**
If the boiler takes it's combustion air from the boiler room and is commissioned before building works are completed on the site, particular care must be taken to avoid dust and dirt particles from the site being drawn into the boiler house and into the boiler during operation. Special inlet filters are available for use on the boiler if the need arises (please contact our technical department for further information on their use).

### 11.2 Initial lighting

1. Check the gas connections.
2. Check the electrical connections, phase-neutral-earth and all earth wires.
3. Check the water level.
4. Check the presetting of the N- and V- controllers (see fig. 21 for 7 and 9 sections, and fig. 22 for 11 to 19 sections):

| Controllers | Presetting |
|---|---|
| N | 0 |
| V | 1,0 |

5. Switch on the circulation pump and check assembly position and direction of rotation.
6. Switch on the power supply to the boiler.
7. Activate the main switch on the instrument panel.

| | | | |
|---|---|---|---|
| *Boiler execution* | | Nr. of probes | 2 |
| Fan | yes | HDL | no |
| Stages >1 | yes | Pilot cont. | no |
| pilot burn. | no | Min. airpress. | 50 |
| Gasleak test | no | Premix | yes |

*Fig. 18 Boiler type label*

8. **Only at initial commissioning:**
   Select the language in which the texts should appear on the display using the '▲'- and '↵' buttons and confirm the selection with the '↵' button.
   Check the boiler type. Spread over a number of menus, the boiler type specifications will appear on the display of the control unit. Compare these with the specifications on the boiler type label (next to the boiler data batch, behind the front casing, figure 18). By always confirming the correctness of the specifications mentioned in a specific menu with the '↑' button, you will travel down the menus until you get to the main menu (see para. 7.3).
9. Select the service level by travelling down the user menus using the '▲' button. Enter code 00 12 using the '▼'- and '↵' buttons and confirm it with the '▼' button.
10. Now select the option "Service tests" with the '↵' button and confirm it with the '↵' button.
    The cursor now can be placed on the following options:
    1.) Boiler on?
    2.) Fan on?
    3.) Ignition on?
    Set the cursor on "Ignition on?" and confirm with the '↵'-button. The boiler will now simulate a start, with closed gas valve. Check the ignition by looking through the looking glas in the end sections of the boiler. If you don't see the sparks clearly, check the position of the ignition electrode.

11. Now select the option "Fan on?" and confirm with the '↵'-button. The fan will start now. Switch the fan to maximum speed by selecting this option. Confirm with the '⍓'-button. Now press the '↵'-button. Select the option "Service settings" and confirm with the '⍓'-button. Press the '↵'-button. Select the option "Pressure settings"; confirm with the '▲'-button. Set the maximum differential pressure at 900 Pa, using the '↵'-button. Confirm with the '⍓'-button. Now press several times the '↵'-button until you reach the menu where you can read out the air differential pressure.
    A differential pressure of 900 Pa has to be reached. If not, check the dimensions of the flue gas discharge system. Set the maximum differential pressure in the service level back at the standard level of 840 Pa. Confirm with the '⍓'-button. Set the minimum differential pressure at 110 Pa for the minimum load of 33%.
12. Check the opening pressure of the gas block. Connect a pressure differential device to the measuring points pG and pF (see fig. 19 for 7 and 9 sections and fig. 20 for 11 to 19 sections). Open the main gas cock (vent the gas line). Disconnect the ignition device from the ignition electrode.
    Press several times the '↵'-button, until you reach the menu with the selecting option "Service settings". Select this option and confirm with the '↵'-button. Now select "Boiler on?"; confirm with the '↵'-button. The boiler now will make a start attempt without ignition. As soon as the gas valve opens, the opening pressure can be read out on the pressure differential device. The opening pressure should be between 1 and 3 mbar. When you read out a higher pressure, turn the N-controller to the left. Repeat point 12 after resetting the boiler. When the openings pressure lies between 1 and 3 mbar, a correct presetting is assured. Connect the ignition device again to the ignition electrode and reset the boiler. Select in the service level again the option "Service tests" and confirm with the '↵'-button.
13. The cursor is now placed on option “Boiler on?”. Press the '↵'-button. The control unit will now start from neutral position. After an internal check and a check of the differential air pressure, the fan will start. As soon as the differential air pressure is sufficiently high, the pre-purge time is started. The fan now pre-purges for 30 seconds at full load. Then the fan slows to minimum load. The pre-ignition is activated and the gas valve opened. If, at the end of the safety time, there is a sufficient signal from the pilot flame (the flame is checked with a second ionisation probe) the boiler will start operating at part load (minimum load).

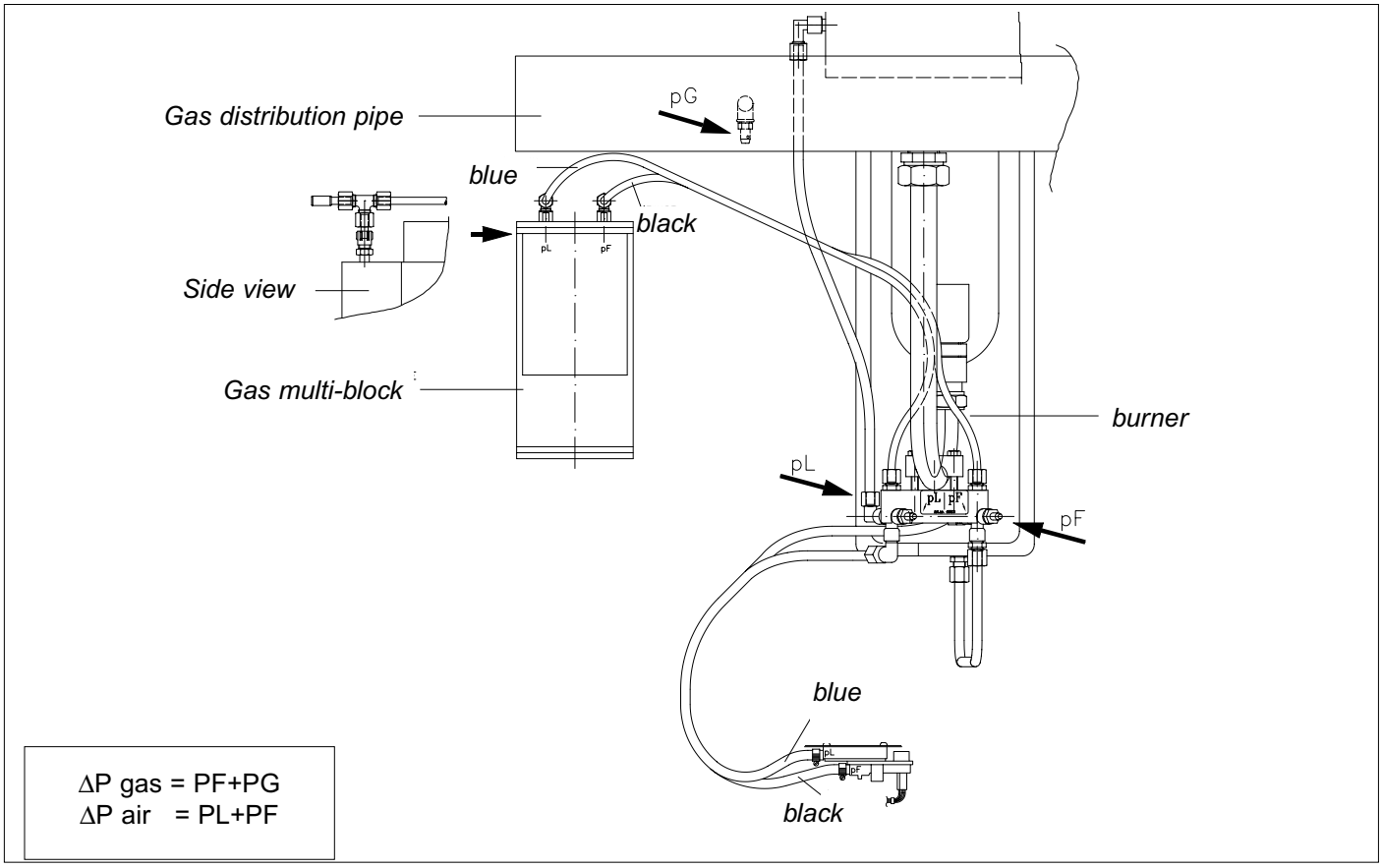



*Fig. 19 Differential pressure measuring points (boiler with 7 and 9 sections)*

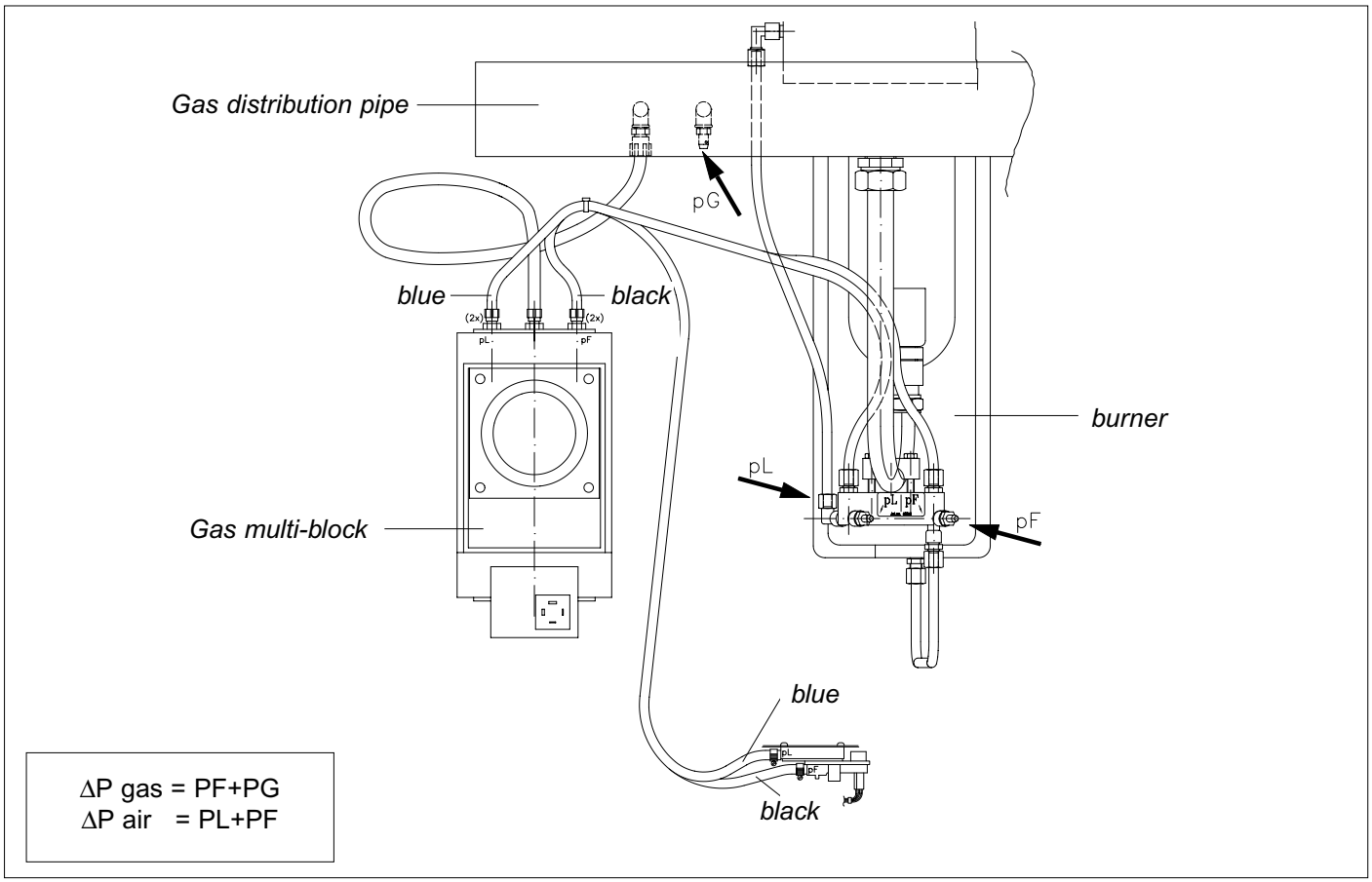



*Fig. 20 Differential pressure measuring points (boiler with 11 to 19 sections)*

14. Measure the $CO_2$ percentage at full load, in the flue gas discharge pipe, directly above the casing. The measured value must be compared with the value indicated in the table. If the measured value deviates from the value mentioned in the table, it can be adjusted by turning the V-controller (see figure 21 or 22) on the gas multi-block.
    **Please note:**
    **Only turn the V-controller at full load and only turn the N-controller at part load. Turning the controller slightly may have a large influence on the load and the $CO_2$ percentage.**
    The $CO_2$ percentage increases by turning this control ler clockwise. If, after turning the V-controller, the value corresponds with the table value, or falls at least within the specified tolerance, check the following points:
    a) the combustion quality by looking through the sight holes in the end sections.
    Check that - the flames do not blow off,
    - the burner surface is not red-hot.
    b) the differential pressure between the measuring points pF and pG (see fig. 19 for 7 and 9 sections and fig. 20 for 11 to 19 sections). See table on the boiler for value.
    If, when checking the points mentioned under a) and b), major deviations are found, these can be corrected by turning the V-controller.
    The $CO_2$ percentage should remain within the tolerance mentioned in the table on the boiler.
15. Switch the boiler to part load by selecting option "Load minimum" with the '▼' button and confirming it with the '↵' button.
    Measure the $CO_2$ percentage, compare the measured value with the table value. If it deviates more from the desired value than the tolerance mentioned in the table, this value may be adjusted by turning the N-controller (figure 21 or 22) on the gas multi-block.
    If, after turning the N-controller, the $CO_2$ percentage corresponds with the table value or in any case remains within the mentioned tolerance, check the following points:
    a) the combustion quality by looking through the sight holes in the end sections.
    Check that the flames do not blow off ( the burner surface may evenly burn red-hot.
    b) the differential pressure between the measuring points pF and pG (see fig. 19 or 20). See table on the boiler for value.
    If, when checking the points mentioned under a) and b), major deviations are found, these can be corrected by turning the N-controller.
    The $CO_2$ percentage should remain within the tolerance mentioned in the table on the boiler.

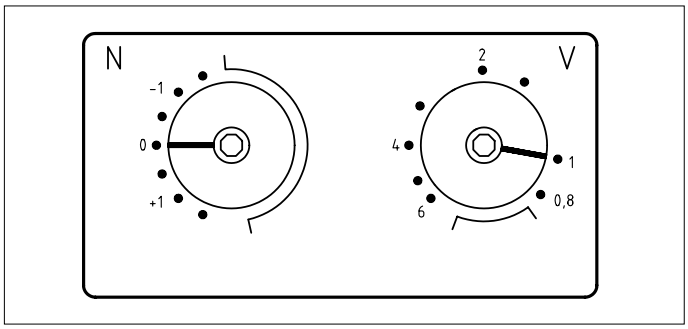



*Fig. 21 N - V controller, boiler with 7 and 9 sections*

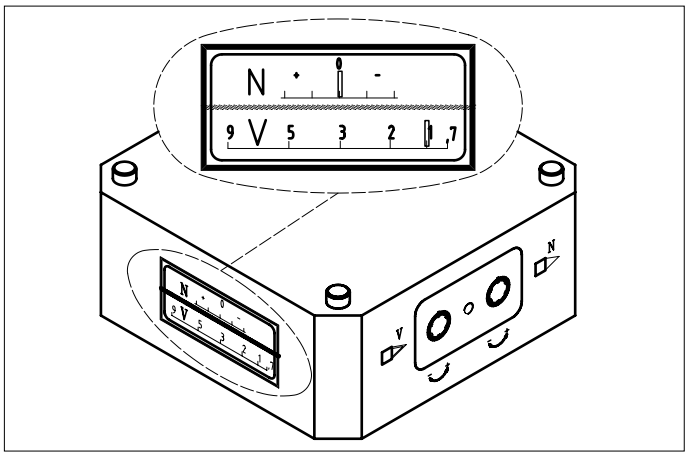



*Fig. 22 N - V controller, boiler with 11 to 19 sections*

16. Switch the boiler to full load by selecting option "Load maximum" with the '▼' button and confirming it with the '↵' button.
    Compare the $CO_2$ percentage with the value men tioned in the table. Adjust, if necessary, this $CO_2$ percentage with the V-controller. Switch the boiler to part load, measure and compare the $CO_2$ percentage with the value mentioned in the table and adjust, if necessary, the value with the N-controller.
17. Repeat this full load/part load switching until the $CO_2$ percentages at full load/part load come within the tolerances mentioned in the table.
18. By pressing the '⏏' button, the main menu of the service level reappears. Now set the desired boiler control, as described in para. 7.3.3.
    By pressing the '⏏' button three times, you return to the main menu of the user level.
19. After commissioning, enter the preset values in the table on the boiler.
20. Send the CE commissioning report to Broag.

### 11.3 Shut down the boiler

1. Turn off the power supply to the boiler.
2. Close the main gas cock.
3. Turn off the boiler control.

**Please note!** Frost protection may be required.

## 12. FAULT-FINDING

### 12.1 General

For troubleshooting use the wiring diagram and the switching sequence diagram in paragraph 10.9. The instrument panel is provided with an alphanumeric LCD-display. In the case of failure, the display indicates the cause of the failure and how long ago the boiler went into failure mode. The failure and the operating condition at the time of failure are stored in the memory of the control unit. Five blocking and five locking failures can be stored in this memory. If a failure in a boiler repeats itself several times in rapid succession, this failure is stored only once. Locking failures can be reset using the reset button on the instrument panel ('⏏').

### 12.2 Faults

In the case of failure, the LCD-display indicates the cause of the failure. It also indicates whether it is a blocking or locking failure and how long ago it occurred. In the case of a blocking failure, the boiler will automatically restart when the cause of the failure has been eliminated. If the same blocking failure has occurred 5 times in rapid succession, the boiler will lock out. Displaying the operational condition at the time when the failure occurred speeds up the search for the cause of failure.
Proceed as follows:

- Select the service level by travelling down the user menus using the '⏏' button. Enter code 00 12 using the '▲' and '▼' buttons and confirm it with the '↵' button.
- Now select the option “History data” with the '▼' button and confirm it with the '↵' button.
- Now select the lock out or shut down failure memory using the '▼' button. Confirm with the '↵' button.
  Depending on the option selected, the number of locking failures stored in the memory (maximum 5 of each) is now displayed.
  Failure No. 1 is the failure which occurred last, failure No. 2 the last but one, etc.
  To know which failure occurred last, the failure counter must be set to 1 using the '▲' and '▄' buttons. When the '↵' button is pressed for confirmation, the failure in question is indicated. Using the '⏏' button, various menus can now be called up, all indicating the operational condition of the boiler at the moment of failure.

In the table below the various failure messages are displayed which may appear on the LCD-display, followed by the instructions to eliminate the failure.
For possible measurement methods see chapter 11: "Commissioning". When a failure message appears that is not selfexplanitory, and is not displayed in the table, then contact our service department.

**Note:**
When reporting a failure code, write down the exact message and the parameters at which the failure occured.

| Failure message on LCD-display | Instructions |
|---|---|
| live and neutral inversion<br>switch off power, and change connections. | Switch off power and change connections. |
| code not valid.<br>check wiring. | The control unit does not recognize the boiler through the code connector.<br>Check the wiring. |
| code not accepted.<br>please contact qualified personnel. | A wiring error has been made or a failure has occurred in the control unit.<br>Contact our service department. |
| flow sensor short circuit.<br>return sensor short circuit.<br>heatexch. sensor short circuit.<br>flue sensor short circuit.<br>flow sensor open circuit.<br>return sensor open circuit.<br>heatexch. sensor open circuit.<br>flue gas sensor open circuit. | Check the wiring of the respective temperature sensor.<br>If wired correctly, replace the respective sensor and/or wiring. |
| flow sensor overheat<br>return sensor overheat<br>heatexch. sensor overheat | Too high temperature has been signalled.<br>Check: - the water flow through the boiler/installation<br>- the water level in the boiler<br>- the operating pressure (0.8 bar min.). |
| flue gas temperature too high | Check: - the set maximum flue gas temperature (see par. 7.3.3, option no. 4)<br>Minimum setting: 15°C above maximum return water temperature<br>- the boiler setting<br>- the boiler for fouling |
| return temp. higher than heat exch. temp. | The return water temperature exceeds the first heat exchanger temperature.<br>Check: - if the wiring of heat exchanger and return sensors have been inverted<br>- if the flow direction through the boiler is correct |
| return temp. higher than flow temp. | The return water temperature exceeds the flow water temperature.<br>Check: - if the wiring of the flow and return sensors have been inverted<br>- if the flow direction through the boiler is correct |
| purge airpress. not reached<br><br>airpress. lost during purge | During pre-ventilation the required min. air pressure differential across the boiler is not obtained.<br>Check: - the flue gas discharge, air supply, boiler and/or syphon for fouling<br>- the diameter of the flue gas discharge/air supply pipes, using the tables of par. 5.6<br>- measurement tubes for fouling/humidity |
| insufficient airpress. during stage 1 burning<br>airpress. start not reached<br>airpress. start lost | The air pressure differential at low load is too low. It should be 50 Pa at least.<br>Check: - flue gas discharge, air supply, boiler and/or syphon for fouling<br>- fan, frequency regulator (see par. 10.9) and air pressure sensor<br>- measurement tubes |
| insufficient airpress. during stage 2 burning | The air pressure differential at high load is too low.<br>Check: - flue gas discharge, air supply, boiler and/or syphon for fouling<br>- fan, frequency regulator (see par. 10.9) and air pressure sensor<br>- measurement tubes |
| airpress. too high at stage 1<br><br>airpress. detected when fan is off | The air pressure differential is too high.<br>Check: - fan, frequency regulator (see par. 10.9) and air pressure sensor<br><br>During standstill of the boiler too high a standstill draught is signalled (> 70 Pa).<br>Install a resistance in the flue gas discharge or air supply.<br>Check connections on air pressure differential switch (LDS). |

| | |
|---|---|
| false flame at flame guard 1<br><br>false flame at flame guard 2 | Check: - if the gas valve circuit is interrupted<br>- if the electrode is not in contact with the burner |
| flame 1 lost<br>during burning<br><br>flame 2 lost<br>during burning<br><br>no flame 1<br>during full ignition<br><br>no flame 2<br>during full ignition<br><br>no flame 1<br>during main ignition<br><br>no flame 2<br>during main ignition<br><br>flame 1 lost<br>in startpart. load<br><br>flame 2 lost<br>in startpart. load | Check: - wiring of the first and second ionization electrode<br>- position of the first and second ionization electrode; distance from electrode to burner: approx. 11 mm<br>- the gas pressure to the boiler<br>- gas valve opening |
| shutdown input 1 is activated<br>shutdown input 2 is activated | Check: - whether any connected contacts are closed<br>- the wiring to the input<br>- correct connector connection |
| locking input 1 is activated<br>locking input 2 is activated | Check: - whether any connected contacts are closed<br>- the wiring to the input<br>- correct connector connection |
| output relay<br>failure | Check: - print wiring<br>- fuse F3 on outgoing print (4,0 AT)<br>If OK, replace outgoing print. |
| gas leak VA1<br>detected<br><br>gas leak VA2<br>detected | A gas leak has been detected (only with gas leak control fitted).<br>Check: - Gas connections, gas pipes, measuring nipples<br>If OK, replace gas block.<br>Attention: When no gas leak control mounted, check whether programmation of gas leak control option shows "no" (see par. 7.3.3, option no. 4) |
| excessive airpress. during stg 1 burning | Air pressure differential too high.<br>Check: - the wiring to the frequency regulator<br>- the frequency regulator<br>- connection to air pressure differential switch (LDS) |
| airflow signal fault | The air pressure differential sensor gives out a signal < 0,5 Volt.<br>Check: - the wiring to the frequency regulator<br>- the air pressure differential sensor<br>- connection to air pressure differential switch (LDS) |

| Controlstop | Instructions |
|---|---|
| boiler diff. temp.<br>too high | Boiler temperature differential is getting too high.<br>Check: - boiler/installation water flow<br>- boiler water level<br>- working pressure (min. 0.8 bar) |
| heat exch. temp. rise<br>too fast | Boiler temperature rise faster than usual.<br>Check: - boiler/installation water flow<br>- boiler water level<br>- working pressure (min. 0.8 bar) |
| flue gas temp. too high | Flue gas temperature threatens to rise above the set maximum value.<br>Check: - the set maximum flue gas temperature (see par. 7.3.3, option no. 4)<br>Minimum setting: 15°C above maximum return water temperature<br>- boiler setting<br>- boiler fouling |
| main supply voltage<br>too low<br><br>main supply voltage<br>too high | Mains supply too low or too high.<br>Check mains supply.<br><br>Take off fan cable from cable channel |

| Other messages | Instructions |
|---|---|
| flue resistance high, check heat exchanger<br>preventive message see documentation | For the necessary air differential pressure a higher fan speed than normal is required.<br>This could indicate that boiler, flue gas discharge line and air intake pipe and/or siphon fouling. |

## 13. INSPECTION AND SERVICING

### 13.1 General

To ensure optimal combustion, the boiler, associated equipment and the boiler room must be cleaned at least once a year. This is to avoid fouling of the burners and the boiler during operation as a consequence of dust in-take, especially with the Remeha Gas 3002 ECO in room ventilated form. This will ultimately result in poor combustion and the possible formation of soot.

### 13.2 Servicing

Before boiler maintenance is started, the following parts must be removed:

- Top and front casings, as well as the top side casing at the side of the connections.

Maintenance work includes:

a. Cleaning the flue gas part of the boiler and the ECO.
   - Inspection for fouling of the boiler block by removing of one or two burner units (incl. mixing section, see fig. 23). If cleaning is required, all burner units must be removed. Next remove the front plate of the transition piece between the first and the second heat exchanger (see part A, fig. 24). Having removed the supports (see part D, fig. 24) which hold down the flue gas drawers (see part C, fig. 24) between the sections, remove the flue gas drawer downwards at an angle. The boiler block can now be cleaned from the top using a cleaning brush.
     To avoid dirt from falling on the second heat exchanger, we recommend placing a sheet of cardboard between the first and second heat exchanger.
   - Checking the burners.
     **The burner surface must not be mechanically cleaned.**
     When cleaning is necessary, this can be done using low pressure air.
   - Check the ECO for fouling through the inspection covers (see part B, fig. 24) in the front plate of the ECO (boiler with 7 sections only has 1 inspection cover).
     If cleaning is required, the front plate of the ECO must be removed. Clean with water and, if necessary, with a nylon brush.

b. External cleaning of the boiler casing.

c. External cleaning of the equipment: ignition device, ionization electrode, cabling and gas equipment.

d. Cleaning of the fan.

Reassemble the parts. Special attention should be paid to the various seals (boiler is pressurised). Any damaged or hardened (powdery white appearance) seals must be replaced.

e. Checking the control and the safety signalling of the flame monitoring device.

f. Checking the load control.

g. Determining the efficiency.

h. Checking the overall condition of the installation (leak detection, etc.).

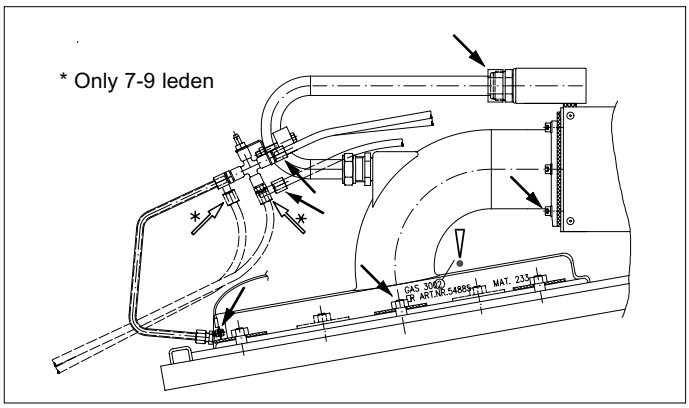



*Fig. 23 Fastening points of burner unit*

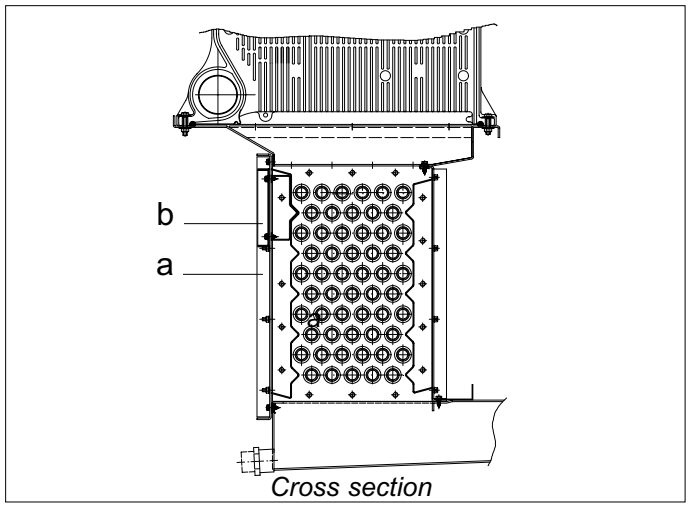



*Fig. 24 Sectional drawing of the ECO*

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