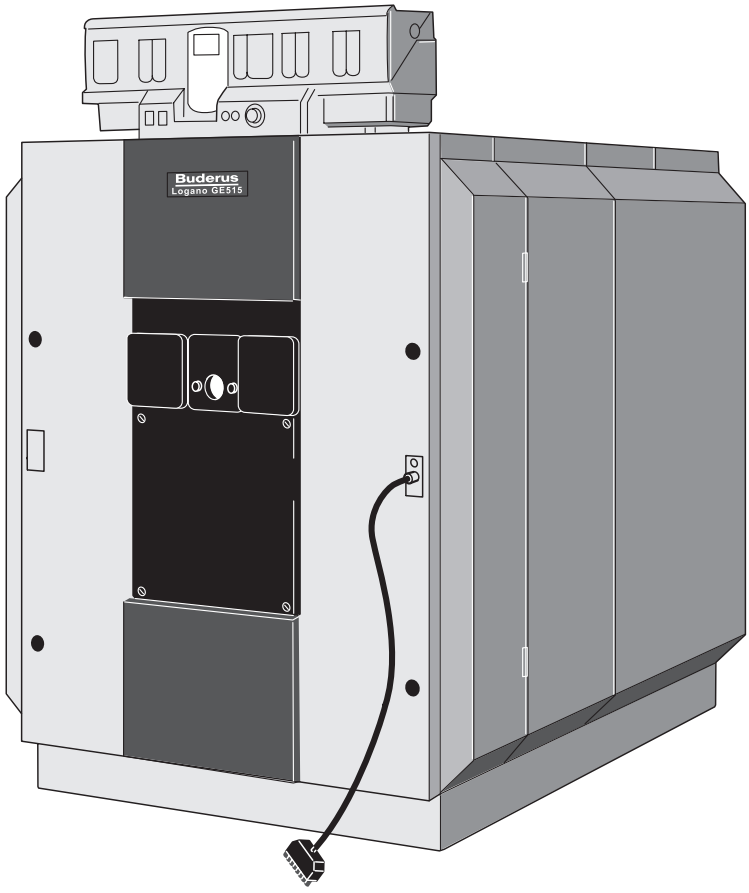
Assembly, installation and maintenance instructions

Logano GE515
hot water boilers for
forced-draught oil/gas burners



Buderus

Foreword

Important general operating instructions

Use this item of equipment only for its intended purpose and only as directed in the assembly, installation and maintenance instructions. Maintenance and repair should be undertaken only by authorised trained staff.

The item of equipment should be operated only in the combinations, and with the accessories and spares, which are specified in the assembly, installation and maintenance instructions. Other combinations, accessories or wearing parts may be used only when they are explicitly intended for the planned application and do not detract from performance characteristics or interfere with safety requirements.

We reserve the right to make technical changes without prior notice.

Development is an ongoing process and as a result there may be minor discrepancies in illustrations, stages of processes described or technical data.

Table of contents

1 Rules, regulations and directives

1.1 General

The design and operating characteristics of Buderus Logano GE515 hot water boilers for forced-draught oil/ gas burners meet the requirements of DIN EN 303.

They also comply with the following European directives:

- 90/396/EEC – Gas-consuming equipment
- 92/42/EEC – Efficiencies
- 73/23/EEC – Low-voltage equipment
- 89/336/EEC – EMC
- 97/23 EC – Pressurised equipment

When installing and operating the system, normal rules of good practice, building regulations and provisions of the law must be observed.

Installation, connection of the fuel supply and flue pipe, commissioning, connection of the electrical supply, and servicing and repair must always be carried out by a firm of specialist heating engineers. Any work on items which carry gas must be carried out only by approved specialist firms.

The system should be cleaned and serviced once a year. At the same time the entire system must be checked to ensure that it is operating properly. Any faults found must be remedied immediately.

1.2 Conditions governing the use of the boiler

– Max. flow temperature	100 °C
– Max. operating pressure (gauge)	6 bar
Maximum time constants T for:	
– Temperature controllers and thermostats	40 sec.
– Monitors/shut-off switches	40 sec.

The details given on the boiler rating plate are authoritative and must be followed.

Fuels

Logano GE515:

– BS2869 Class D heating oil (UK specification)
– Natural gas, LPG

For the requirements to be met by boiler water and feed water, see the supplementary instructions entitled “Water treatment” and VDI 2035 “Guidelines for water treatment”.

To protect the system as a whole, we advise fitting a dirt trap and blow-down device in the return line.

All type-tested oil and gas burners complying with DIN EN 267 and DIN EN 676 respectively can be used.

Please keep this document in a safe place; it will be needed for the annual service.

2 Installation and assembly

2.1 Supply schedule

The Logano GE515 can be supplied either as a block (already assembled) or loose (as individual sections).

2.1.1 Supply as a block (already assembled)

1 Pallet: boiler block plus burner door and flue socket

1 Cardboard box: other parts (longitudinal rails and sparge pipe)

2 Cardboard boxes: casing packs A, B, C (depending on size of boiler)

1 Package wrapped in plastic film: thermal insulation

2.1.2 Supply in sections

1 Pallet: front and rear sections and burner door

2 – 4 Pallets: middle sections – number varies with size of boiler

1 Cardboard box: fittings

1 Cardboard box: flue socket

1 Bundle: tie rods

1 Cardboard box: other parts (longitudinal rails and sparge pipe)

2 Cardboard boxes: casing packs A, B, C (depending on size of boiler)

1 Package wrapped in plastic film: thermal insulation

2.2 Tools and ancillary items for boilers supplied in sections

You will need the following tools and ancillary items to assemble and install the boiler (the articles listed are not included in the supply schedule):

- Boiler compression tool 2.2 (Fig. 1) **or** 2.3 (Fig. 2)
- Assembly frame (available on enquiry)
- Steel hammer and mallet or rubber hammer
- Smooth half-round file
- Screwdrivers (for crosshead and slot-head screws)
- Cold chisel
- 13, 19, 24 and 36 mm AF spanners and 19 mm AF socket spanner
- Packing pieces, shim strips
- Cotton waste and cleaning rags
- Fine emery paper
- Wire brush
- Machine oil
- Solvent (white spirit or thinners)
- Spirit level, ruler or measuring tape, chalk, straight-edge for lining up
- Flange with air-venting device (for pressure test)

2.2.1 Size 2.2 boiler compression tool

Sections	Compression tools for each set of nipple ports	Extensions for each set of nipple ports	Length (total) [mm]
7 – 10	1	0	2160
11 – 12	1	1	2760

2.2.2 Size 2.3 boiler compression tool (complete in box)

Sections	Compression tools for each set of nipple ports	Extensions for each set of nipple ports	Length (total) [mm]
7 – 12	1	3	3080

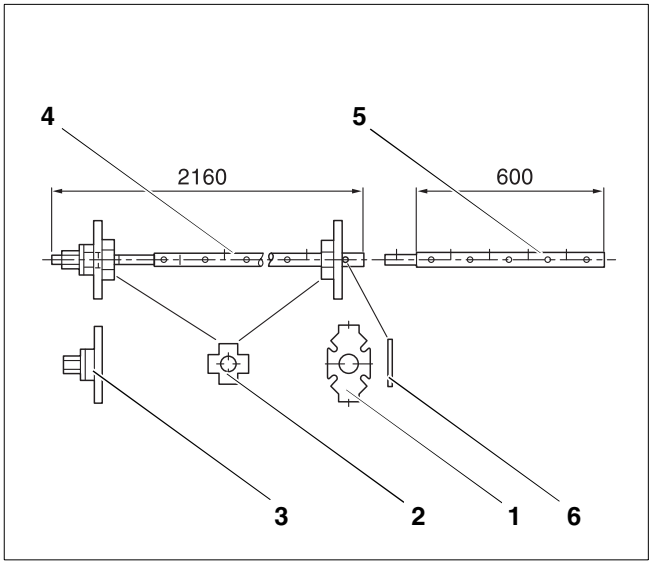


Fig. 1 Size 2.2 boiler compression tool

Legend (Fig. 1 and Fig. 2):
Ref. 1: Back flange
Ref. 2: Locator
Ref. 3: Compression flange
Ref. 4: Tie bar
Ref. 5: Extension
Ref. 6: Dowel pin (with size 2.2 tool)
Ref. 7: Wedge (with size 2.3 tool)

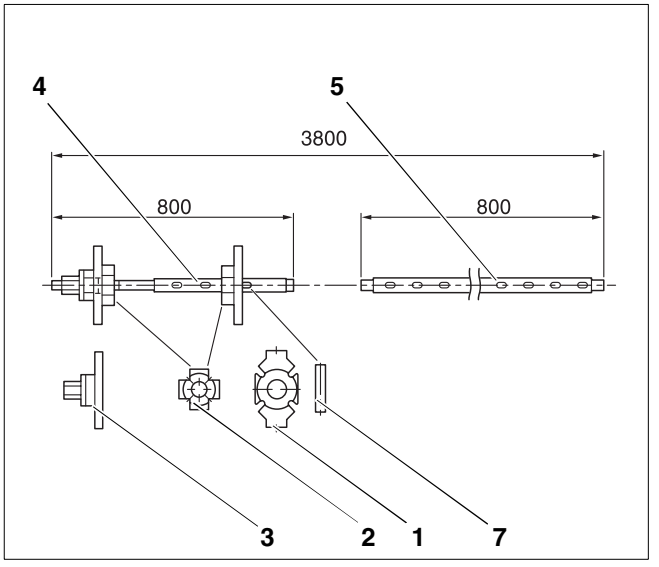


Fig. 2 Size 2.3 boiler compression tool

2.3 Installation

2.3.1 Foundations

When installing the boiler, we advise you to ensure that it is placed the specified distances away from walls (Fig. 4).

It is best for the boiler to be installed on a 5 – 8 cm high plinth (Fig. 5, **ref. 1** and Fig. 3, **ref. 1**). The plinth should be absolutely flat and horizontal. The front face of the boiler should line up with the front edge of the plinth.

Note:
Buderus can supply a boiler base for damping solid-borne sound as an additional item.

If the boiler base is not used, a concrete plinth can be laid on site. When laying the plinth, 100 x 50 x 8 mm strips of angle steel or even 100 x 5 mm flat steel strips should be laid in it to act as slides for the boiler sections when the boiler is being assembled (see Fig. 3 and the table below).

Number of sections	L_1 (plinth) [mm]	L_2 (lengths of steel strips) [mm]
7	1360	1190
8	1530	1360
9	1700	1530
10	1870	1700
11	2040	1870
12	2210	2040

Dimensions of plinth and lengths of steel strips

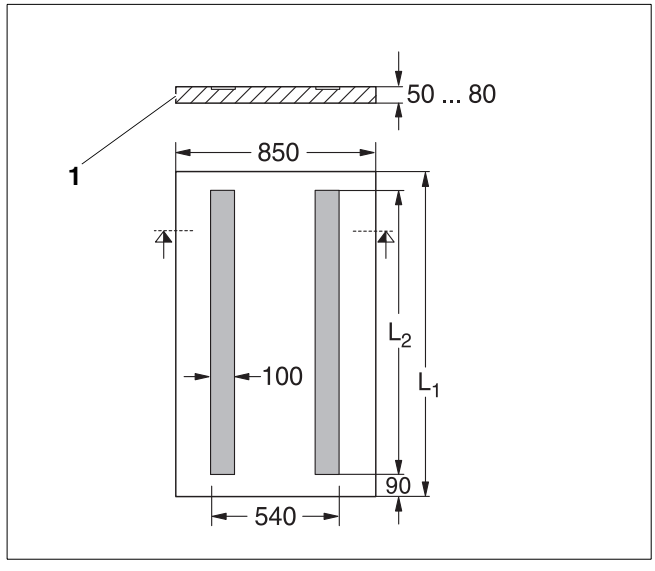


Fig. 3 Dimensions of plinth

2.3.2 Recommended distances from walls

The recommended distances should be observed to allow the boiler to be installed, cleaned and maintained and to allow the boiler door to be opened (see Fig. 4 and table below).

The boiler door can be hung and opened to either left or right.

The minimum distances (bracketed) must be observed to allow the boiler to be installed, but the recommended distances should be observed to make installation, maintenance and servicing easy and convenient.

The distance from the wall on the hinge side must be at least equal to the sideways reach of the burner (AB). The distance recommended however is AB + 100 mm.

Boiler size		Distance A [mm]	
[kW]	Sections	Recommended	Minimum
240 – 350	7 – 9	1700	1000
400 – 510	10 – 12	2200	1000

If the distances from the walls are less than those recommended, it will not be possible for the boiler to be cleaned with the brushes supplied by the manufacturer. The alternative we recommend in this case is for brushes assembled from shorter sections (approx. 1 m in length) to be used or for the boiler to be cleaned wet.

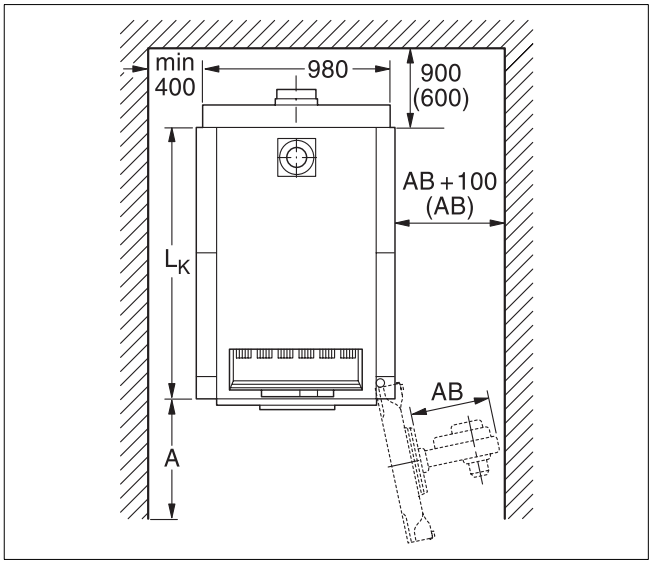


Fig. 4 Boiler room with boiler in place

2.4 Assembling boilers supplied in sections

A distinction is made between boilers **supplied in sections** and boilers **supplied as blocks**. Where boilers are supplied as blocks, they have already been assembled and checked for leaks in the factory. If the conditions on site mean that a boiler cannot be installed as a complete block, it can be supplied in sections and assembled on site.

For **further installation directions for boilers supplied as blocks** see section 2.4.3 “Lining up a boiler supplied as a block (already assembled)”, p. 16.

WARNING!
There is a risk of injury from improperly secured boiler sections!
For your own safety, always use suitable equipment for moving the sections, e.g. a hand cart with a securing strap. When moving boiler sections, secure them to the equipment used to move them so that they cannot slip off.

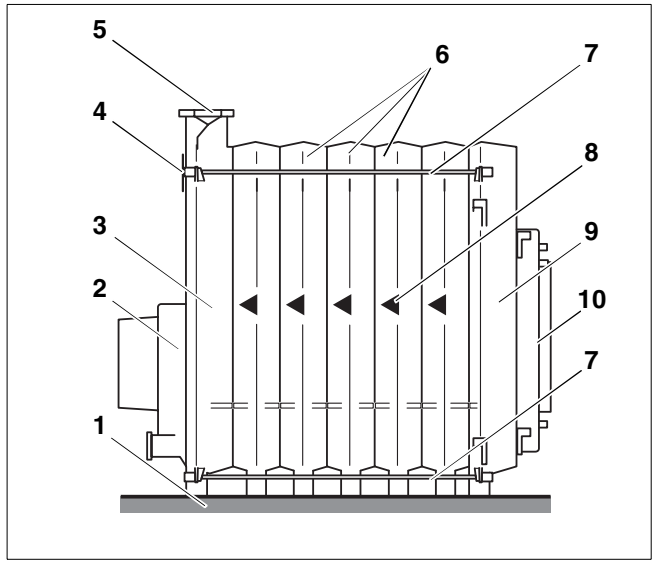


Fig. 5 Boiler block

Legend (Fig. 5):
Ref. 1: Foundations, or boiler base for damping solid-borne sound
Ref. 2: Flue socket
Ref. 3: Rear section
Ref. 4: Return connection
Ref. 5: Flow connection
Ref. 6: Middle sections
Ref. 7: Tie bar
Ref. 8: Arrows indicating direction of insertion
Ref. 9: Front section
Ref. 10: Burner door carrying burner plate

2.4.1 Arrangement of sections in boiler block (when supplied loose)

A boiler block is always assembled from the back forwards, starting with the rear section (Fig. 5, **ref. 3**). The front section (Fig. 5, **ref. 9**) is always the last section to be fitted.

When assembling a boiler, always follow the arrows indicating direction of insertion (Fig. 5, **ref. 8**) and always work from the illustrations and instructions given below!

WARNING!
There is a risk of injury from improperly secured boiler sections!
For erecting boiler sections safety, **Buderus** can supply on request an assembly frame (an item of additional equipment) which is bolted solidly to the rear section of the boiler and stops the sections from falling over (Fig. 6).

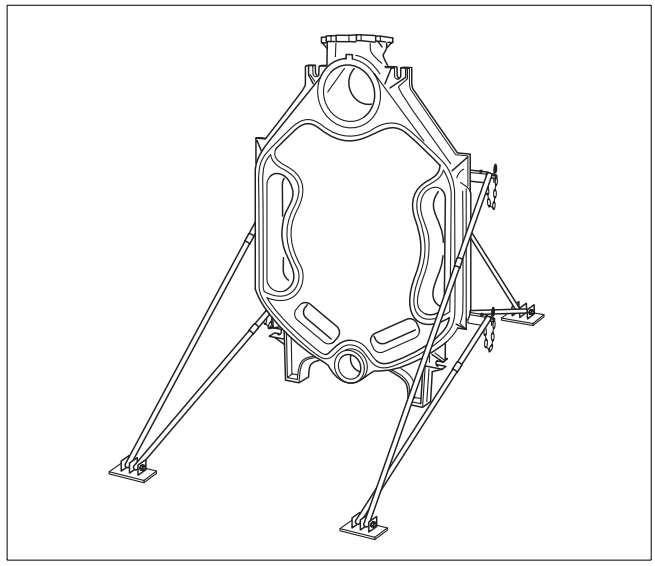


Fig. 6 Rear section with assembly frame fitted

2.4.2 Fitting the boiler block together by its nipples (sections supplied loose)

Before the front and rear sections are fitted, remove the nuts and washers from the studs on the nipple ports of these sections.

Note:
If the **assembly frame** is being used, the cleaning covers need to be removed before the frame is fitted to the rear section.

- Unscrew the cleaning covers from the rear section (Fig. 7, **ref. 1 and 2**).

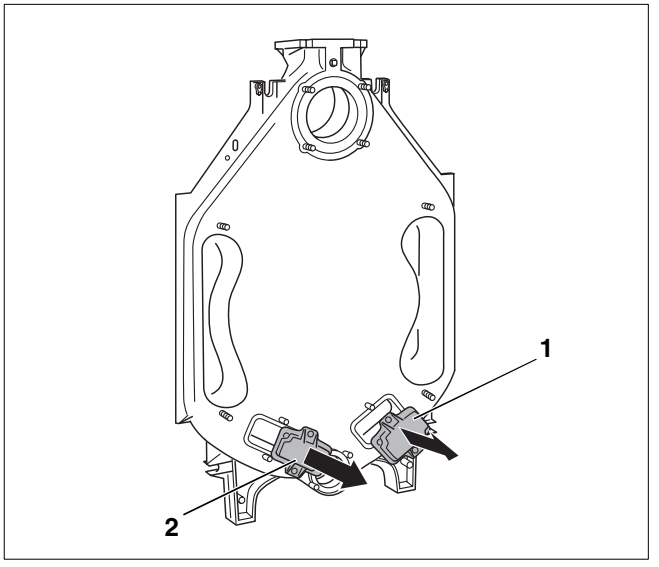


Fig. 7 Removing cleaning covers

- Erect the rear section and fit the assembly frame to prevent it from falling over (see Fig. 8, Fig. 6 and separate fitting instructions for the assembly frame).

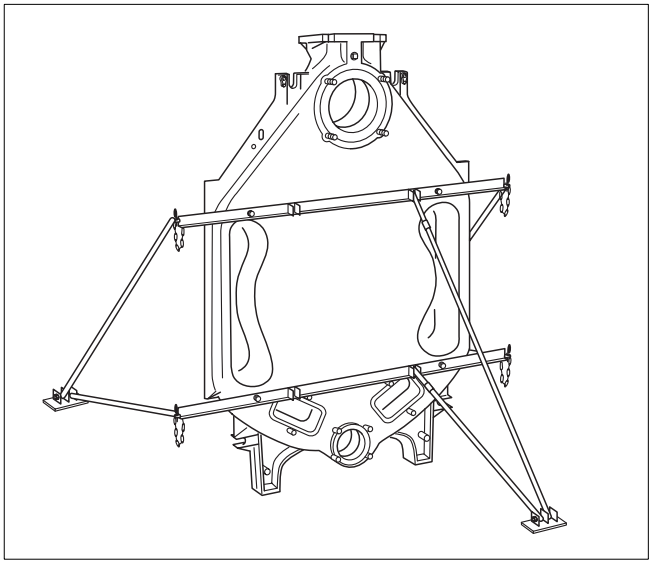


Fig. 8 Fitting assembly frame

- File down any burrs which there may be in the nipple ports (Fig. 9).

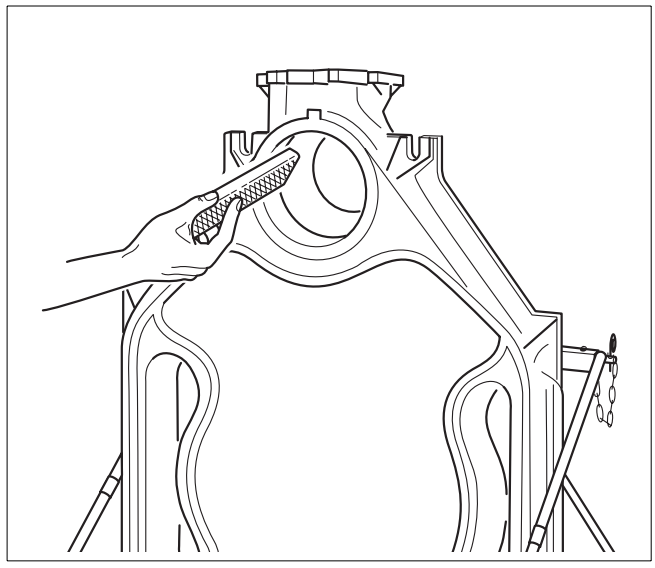


Fig. 9 Filing down burrs

- If the grooves for the sealing rope need cleaning, do so with a wire brush and a rag (Fig. 10, **ref. 3**).
- Clean the sealing faces of the nipple ports (Fig. 10, **ref. 1 and 2**) with a rag soaked in white spirit.
- Apply an even coat of red oxide paint to the sealing faces of the nipple ports.

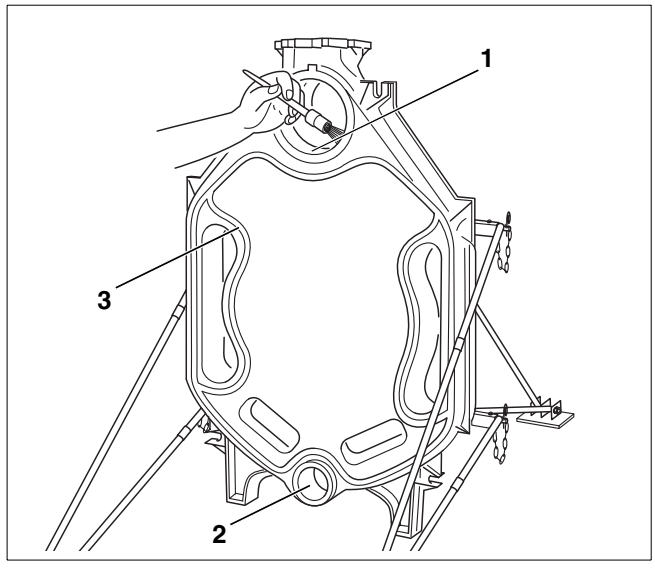


Fig. 10 Preparing grooves for sealing rope and nipple ports

The next stage of the assembly operation is to prepare the nipples to make sealed connections between the sections of the boilers.

- Clean the nipples with a rag soaked in white spirit and then apply an even coat of red oxide paint to them.
- Fit the nipples squarely into the upper (size 4, 181/70) and lower (size 1, 82/50) nipple ports in the rear section and, working diagonally, hammer them in with powerful blows until they seat.
  After they have been hammered home, the upper nipple (Fig. 11, **ref. 1**) should project from its nipple port by about 45 mm and the lower one by about 35 mm.
- Any burrs which have been created should be removed with a file.

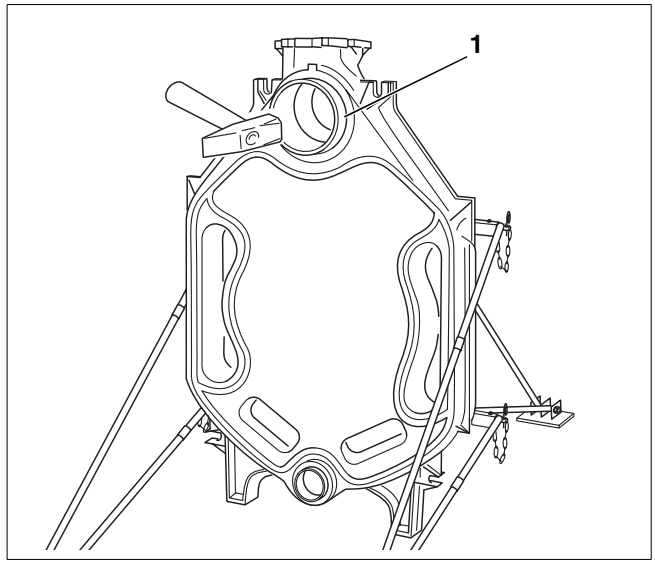


Fig. 11 Hammering in nipples

The grooves for the sealing rope (Fig. 12, **ref. 1**) must be clean and dry to allow the rope (KM rope) to be bonded into them.

- Coat the grooves with the bonding agent (wash primer).

IMPORTANT!
For health reasons you must ensure that the room in which the bonding agent (wash primer) is applied is well ventilated!
Follow the instructions for mixing and using the bonding agent!

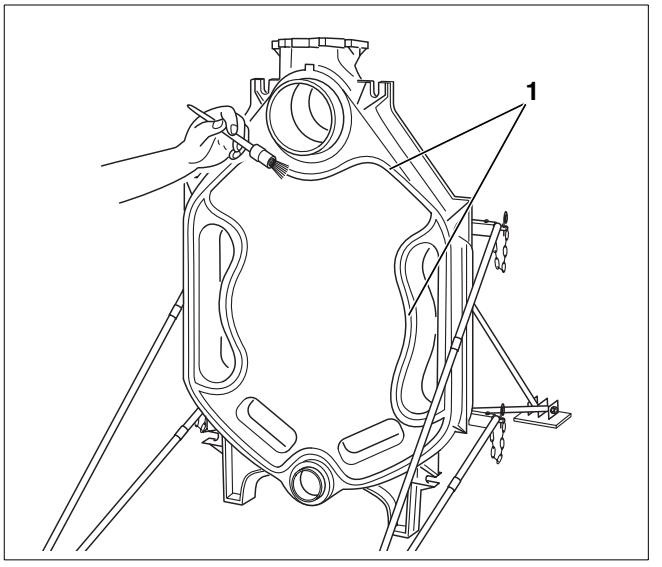


Fig. 12 Coating grooves for sealing rope with bonding agent

- Starting at the top at the point where the nipple port is situated, fit the elastic sealing rope (KM rope: Fig. 13, **ref. 2**) into the grooves provided (Fig. 13, **ref. 1**) in the front face of the rear section and press it gently home. At the joins, allow a 2 cm overlap between the ends of the rope and press the ends hard against each other.

To fit the rope, unroll the length needed from the roll supplied. As you insert it in the groove, peel it away from the paper backing (without stretching it).

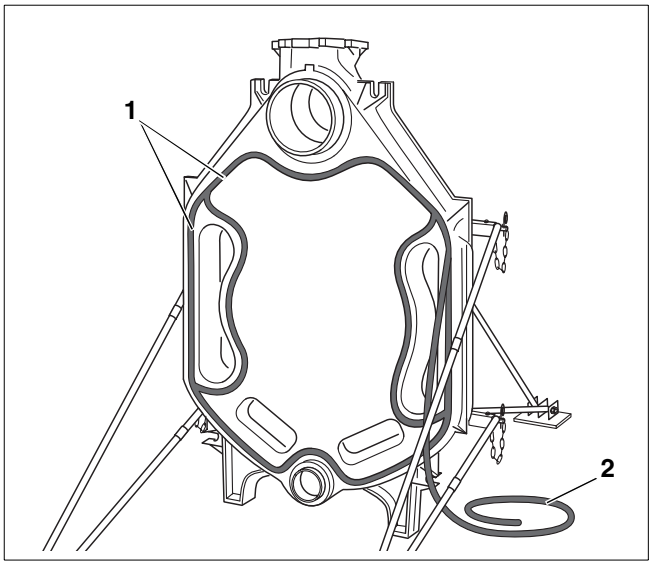


Fig. 13 Fitting sealing rope (KM rope)

Preparing the first of the middle sections:

- File down any burrs there may be in the nipple ports (as shown in Fig. 9).
- The sealing tongues must be clean and dry and may therefore need to be cleaned.
- Clean the sealing faces of the nipple ports with a rag soaked in white spirit.
- Apply red oxide paint to the sealing faces of the nipple ports (Fig. 14, **ref. 1**).
- Apply bonding agent (wash primer) to the sealing tongues (Fig. 14, **ref. 2**).

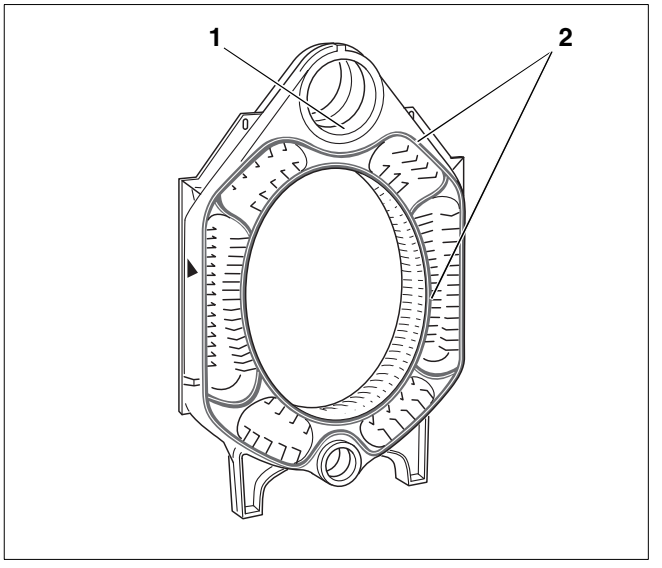


Fig. 14 Preparing middle section

- Insert the top and bottom nipple ports of the middle section (Fig. 15, **ref. 2 and 4**) onto the nipples on the rear section, making sure that the arrow indicating direction of insertion (Fig. 15, **ref. 3**) is pointing backwards.

Note:
For easier assembly, the boiler section being fitted should be inserted onto the nipple in the top nipple port first. Having done that, you can then align the section at the bottom nipple port.

- Hammer the middle section onto the rear section with a mallet or rubber hammer (Fig. 15, **ref. 1**).

However, before you fit the nipples for the next section, you must first fully compress the block so far assembled with the boiler compression tool.

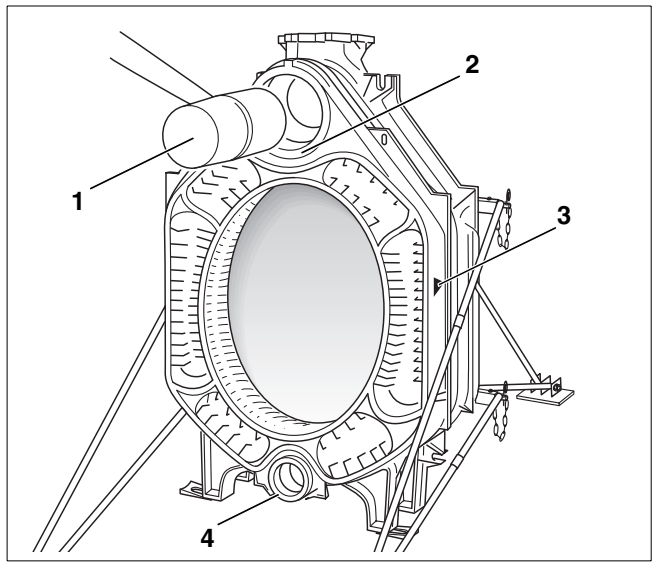


Fig. 15 Hammering on middle section

Using a size 2.2 or 2.3 boiler compression tool (shown in Fig. 1 and Fig. 2 respectively and in Fig. 16, ref. 1 and 2).

- Slide the compression flanges (Fig. 16, **ref. 3**) onto the tie bars (Fig. 1 or Fig. 2, **ref. 4**).
- Insert one tie bar through the upper nipple port and one through the lower.
- Slide the back flanges onto the tie bars and secure each of them with a wedge (or a dowel pin in the case of a size 2.2 tool).
- Hold the tie bars in the centre of the nipple ports and tighten the compression tools gently by turning the nuts on the compression flanges.

You should never compress more than one joint (two boiler sections) in any one compression operation because the boiler block will not be pressed together evenly and this will cause leaks at the joints.

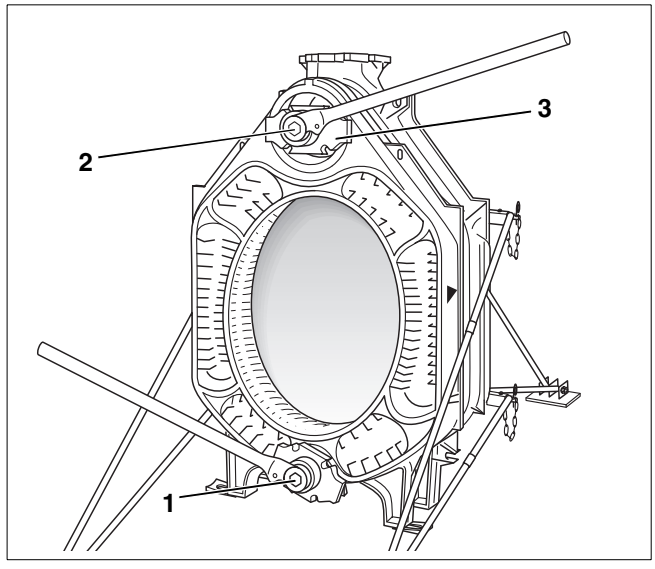


Fig. 16 Using boiler compression tool

- Fit ratchet spanners to the nuts and press the boiler sections together by tightening the nuts evenly.

IMPORTANT!
When the nipple ports butt together, do not apply any further force to press the boiler sections together. Doing so could damage the sections.

- Release and remove the boiler compression tool.
- Check that the nipples are properly seated.

Note:
When the size 2.3 compression tool is released, it is possible that the screwed joints in the tie bars (Fig. 17, **ref. 1**) may partly unscrew, so these joints should be checked and if necessary re-tightened whenever the compression tool is going to be used again (Fig. 17, **ref. 2**).
If the compression operation is performed with the joints partly unscrewed, this may damage or destroy the compression tool.

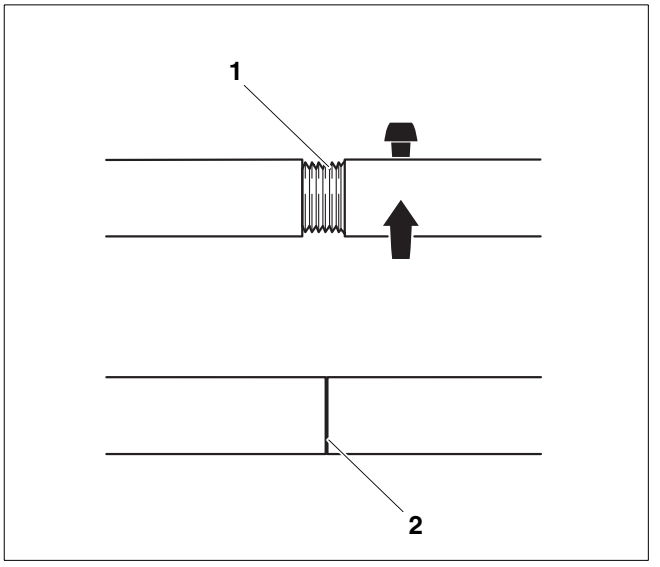


Fig. 17 Size 2.3 boiler compression tool

Fig. 18 shows the rear section with the first middle section fitted to it. The preparations for fitting the next section have already been made.
To simplify assembly, the boiler section has been lined up with wedges for the boiler section feet (Fig. 18, **ref. 1**). These wedges will also be used later on when the fully assembled boiler block has finally to be lined up.

Fit the rest of the sections in the manner described, fitting the front section last.

WARNING!
Do not remove the **assembly frame** until a part-block consisting of **at least three boiler sections** has been assembled!

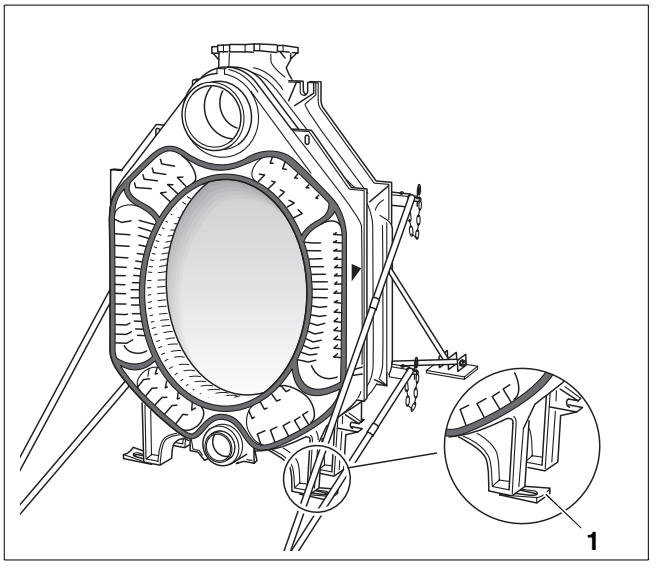


Fig. 18 Using wedges for feet of boiler section

Having fitted the front section, release the compression tool but do not remove it yet. First fit the boiler tie bars.

- Fit the tie bars into the cast lugs to the right and left of the boiler's top and bottom nipple ports (Fig. 19, **ref. 1 – 4**) and insert the packs of springs on them.
- Screw a nut onto the thread of each tie bar by hand.

IMPORTANT!
The packs of springs must always be used in their entirety and not unwound!

- Tighten the nuts on the tie bars a turn to a turn and a half each at a time.
- Line up the boiler horizontally and vertically on the plinth or sound-damping base (see section 2.3 "Installation", p. 7).
- Remove the boiler compression tool.

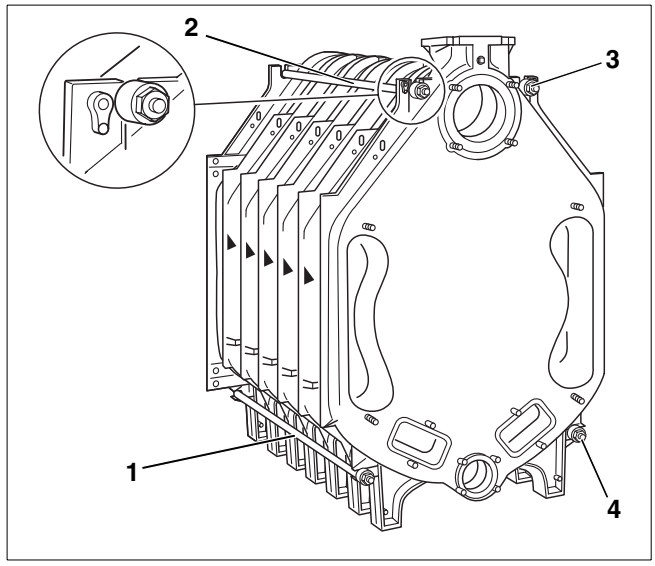


Fig. 19 Assembly – Fitting tie bars

The next step in the assembly process is to fit the sparge pipe (see section 2.4.4 "Fitting the sparge pipe (supplied in the cardboard box of other parts)", p. 17).

2.4.3 Lining up a boiler supplied as a block (already assembled)

- Cut the securing straps (Fig. 20, **ref. 1**).
- Before installing the boiler, take it off the pallet (Fig. 20, **ref. 2**).

WARNING!
Items that fall to the ground may cause fatal injuries! There is a risk of this happening if unsuitable load suspension devices are used! Follow all prevailing accident prevention regulations “Load suspension devices for lifting equipment”.
(Details of the weights of the different sizes of boiler can be found in the section “Dimensions and technical data”, p. 45.)

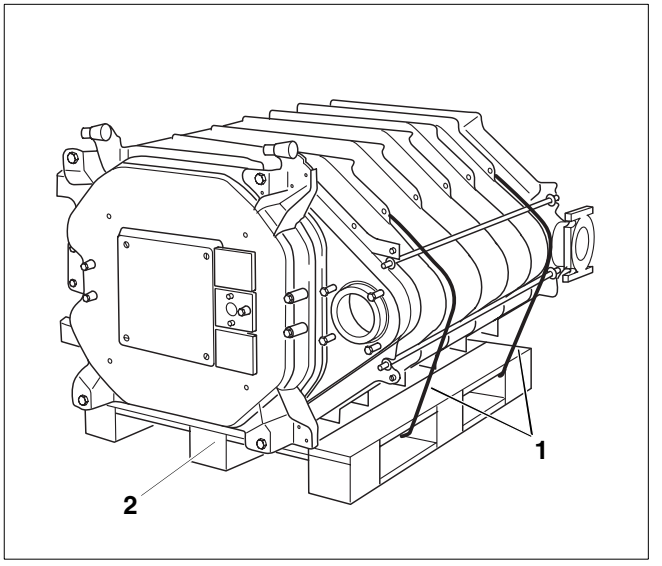


Fig. 20 Boiler block on pallet

- Line up the boiler horizontally and vertically on the plinth or sound-damping base (see section 2.3 “Installation”, p. 7). To do this, use the wedges supplied, as feet for the boiler sections.

Described below is the fitting of the sparge pipe and sensor pocket and this operation has to be performed on boilers supplied both as blocks and in sections.

2.4.4 Fitting the sparge pipe (supplied in the cardboard box of other parts)

The sparge pipe (Fig. 21, **ref. 4**) for boilers with 10 – 12 sections is in two parts.

- Fit the gasket (Fig. 21, **ref. 1**) onto the sparge pipe.
- Insert the sparge pipe into the top nipple port from the front.
- Seal it with the blind flange (Fig. 21, **ref. 2**).

Note:
The lug (Fig. 21, **ref. 3**) on the plate at the end of the sparge pipe must fit into the recess in the top nipple port (Fig. 21, **ref. 5**). This locates the sparge pipe so that the outlet openings in it are at the correct angle and this in turn ensures that water is properly distributed in the vicinity of the top nipple ports.

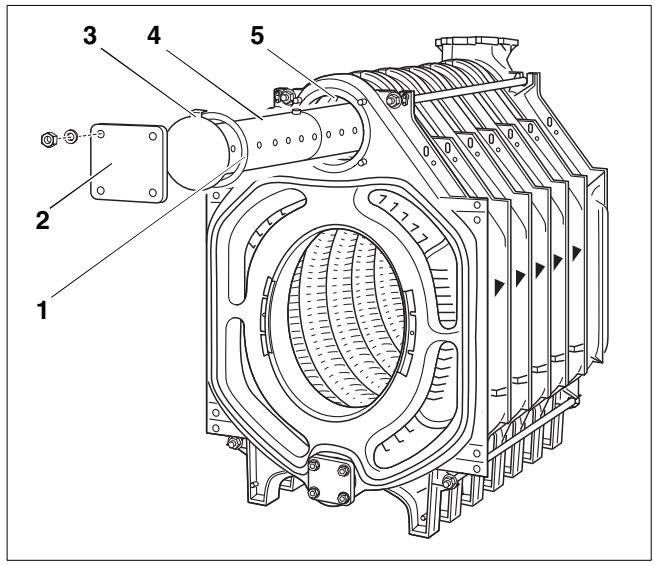


Fig. 21 Assembly – Fitting sparge pipe

2.4.5 Screwing in the sensor pocket

¾" sensor pocket

- Screw the ¾" sensor pocket (length 110 mm) into the ¾" tapped hole in the flow connection (Fig. 22, **ref. 1**).

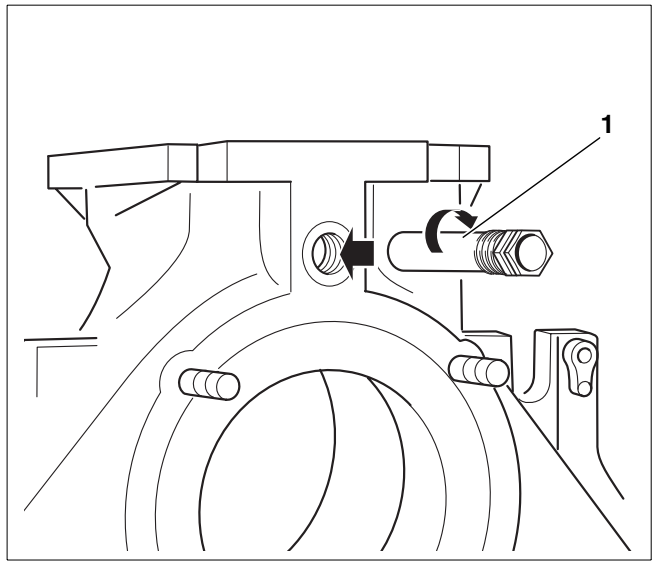


Fig. 22 Assembly – Fitting sensor pocket

2.5 Leak testing

A **leak test** needs to be performed on the boiler **only when it is supplied in sections**. Boilers supplied as blocks have already been tested for leaks in the factory.

The procedure described below therefore applies only to boilers supplied in sections.

For the **next step in the assembly procedure for boilers supplied as blocks** see section 2.6.6 “Fitting burner”, p. 23.

2.5.1 Preparing for a leak test

- Seal off the bottom nipple ports (Fig. 23, **ref. 3**) at front and rear. To do this fit a suitable gasket (Fig. 23, **ref. 1**) to the front nipple port and screw on a blind flange measuring 110 mm along the edges.
  Fit the flange with the ¾" tapped hole for the filling and drain cock (Fig. 23, **ref. 2**) to the rear of the boiler in the same way.
- Fit the filling and drain cock (customer-supplied).
- Seal off the flow and drain connections (fit a flange with an air-venting device to the flow connection).

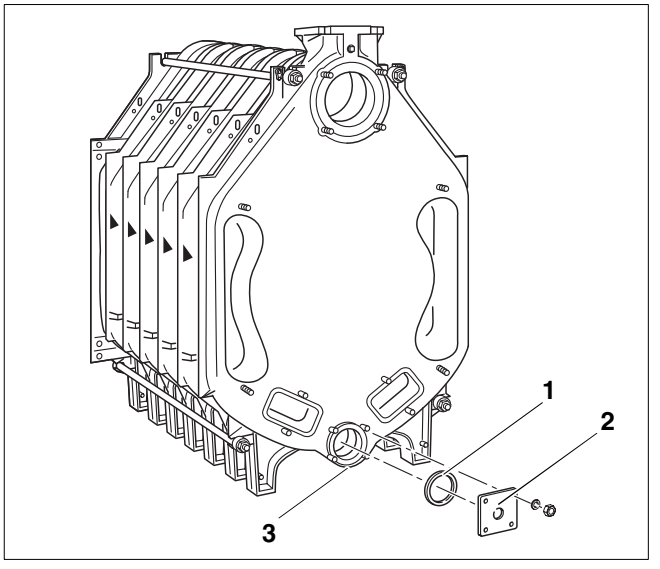


Fig. 23 Assembly – Fitting flange

IMPORTANT!
None of the pressurised, control or safety devices normally connected to the water space of the boiler and which cannot be isolated from it should be fitted at the time of the leak test. There is a risk of their being damaged by the high pressure.

- Slowly fill the boiler with water via the filling and drain cock. At the same time release the air contained in the boiler at the air-venting device fitted to the flow connection.
- If there is a leak at any of the joints between the nipple ports, drain the water out via the filling and drain cock.
- Remove the sparge pipe.
- Unscrew the nuts from the four tie bars and remove the bars.
- Split the boiler at the point where the leak is situated, by driving (hammering) shallow wedges or cold chisels in at the points provided for this purpose (Fig. 24, **ref. 1 and 2**, at top and bottom between the sections).

When re-assembling the boiler, it is essential to use new nipples and sealing rope. Re-assemble the boiler and repeat the leak test.

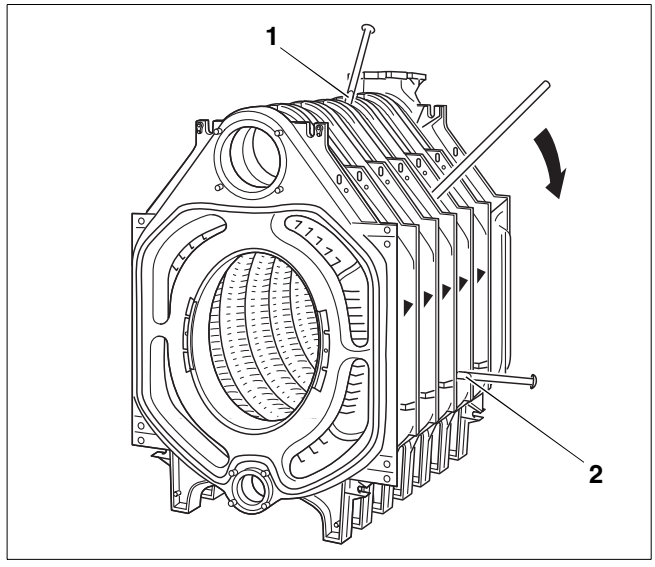


Fig. 24 Splitting boiler block

2.5.2 Test pressure

The test pressure applied during the leak test will depend on the pressure at which the heating system operates and should be 1.5 times this pressure but should not be less than 4 bars.

A class 1.0 pressure gauge should be used for measuring the pressure.

- Fit the weld neck flange (with a section of pipe welded into it) to the top nipple port (Fig. 25, **ref. 3** – return connection) to allow the return connection to be made later on.
  The weld neck flange and its gasket are seen in the illustration (Fig. 25, **ref. 4 and 5**).
- Fit the flow connection flange (Fig. 25, **ref. 1**) and gasket (Fig. 25, **ref. 2**) to allow the flow connection to be made later on.

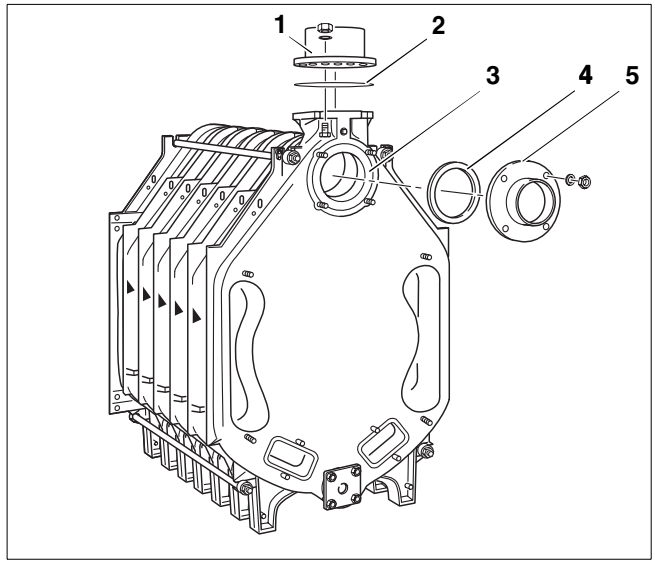


Fig. 25 Assembly – Fitting connecting flanges

2.6 Fitting burner door and fittings to boilers supplied in sections

When boilers are supplied as blocks, the burner door and flue socket have already been fitted in the factory and so you do not have to fit them.

2.6.1 Fitting flue socket

The GP sealing rope (a silicone-sheathed rope made of glass fibre) used for sealing is fitted to the flue socket in the factory.

- Fit the flue socket onto the four studs in the rear section (Fig. 26, **ref. 1 – 4**) and screw it on with the nuts and washers.

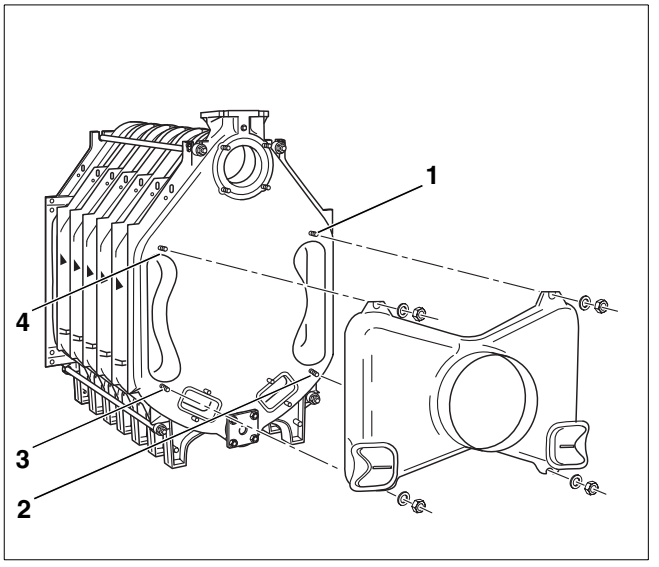


Fig. 26 Assembly – Fitting flue socket

2.6.2 Screwing cleaning covers to rear section

- If the cleaning covers were removed to allow the assembly frame to be fastened to the rear section, they should now be screwed back onto it with nuts and washers (Fig. 27, **ref. 1 and 2**).

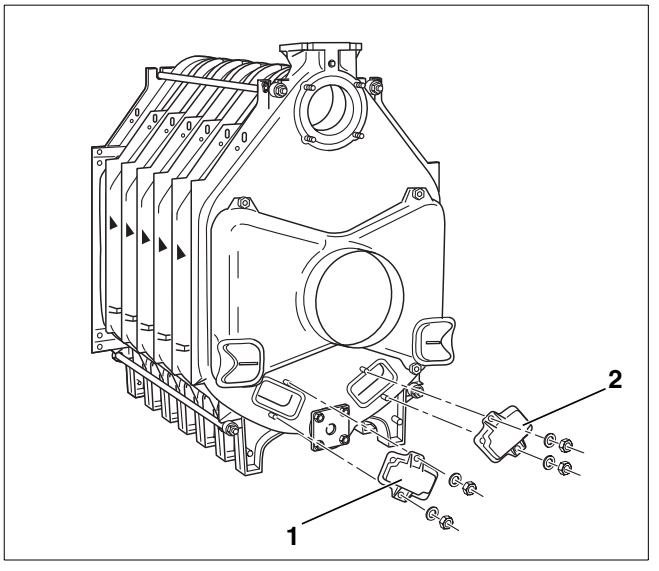


Fig. 27 Assembly – Fitting cleaning covers

2.6.3 Fitting burner door

- At intervals of 15 to 20 cm, place a few drops of Silastik adhesive in the groove for the sealing rope in the front section around the openings into the combustion chamber and hot-gas passes (Fig. 28).
- Fit the GP sealing rope into the groove in the front section. When this is done the joint in the sealing rope should be positioned at the side (Fig. 28, **ref. 2**).

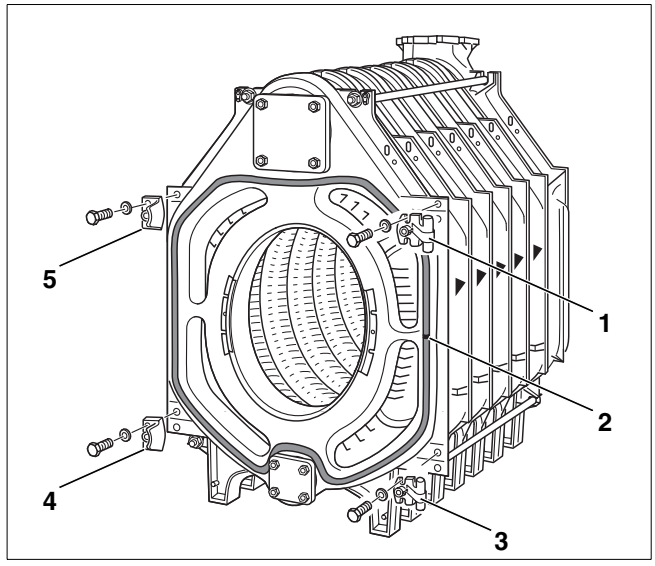


Fig. 28 Assembly – Fitting hinge knuckles and strikers

In the factory the two hinge knuckles are mounted on the right of the burner door (Fig. 29, **ref. 1 and 2**). For a left-hung door, take the knuckles off and fit them on the left of the burner door in the same way

- For a right-hung door, screw each of the hinge pintles to the front section with two M12 x 55 mm machine bolts as shown in the illustration (Fig. 28, **ref. 1 and 3**). For a left-hung door, screw them on in the same way on the left-hand side.
- For a right-hung burner door, screw each of the bevelled strikers for the door to the front section with two M12 x 55 mm machine bolts as shown in the illustration (Fig. 28, **ref. 4 and 5**). For a left-hung door, screw them on in the same way on the right-hand side.

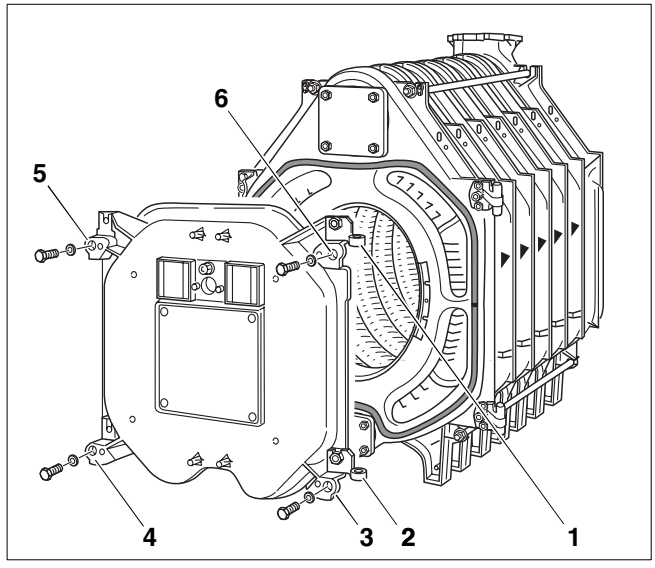


Fig. 29 Hanging burner door

Note:
The bevels should always face towards the centre of the boiler.

- Hang the hinge knuckles on the burner door onto the hinge pintles.

2.6.4 Hot-gas blanking plates on front section

Hot-gas blanking plates (Fig. 30, **ref. 1 and 2**) are screwed to the front section with one socket screw each.

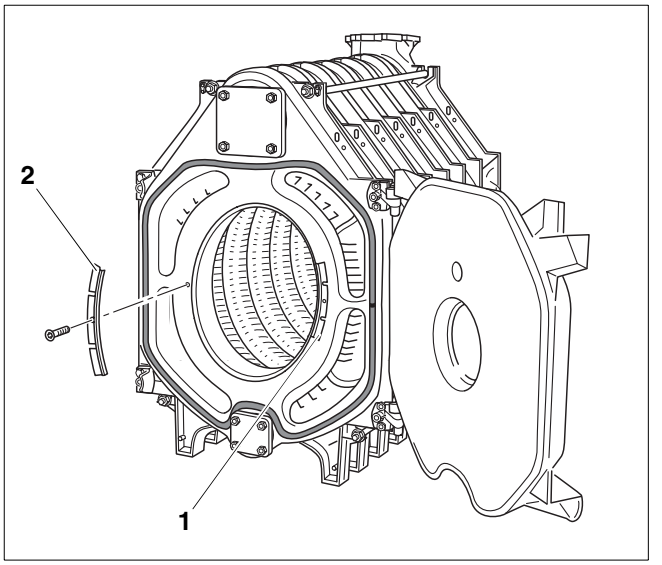


Fig. 30 Positions of hot-gas blanking plates

2.6.5 Inserting hot-gas baffles

Note:
When boilers are supplied as blocks the hot-gas baffles are fitted in the factory and all that needs to be done is to remove the corrugated cardboard used to protect them in transit.

- Take the hot-gas baffles out of the box of fittings and insert them in the hot-gas passes as indicated by the **directions cast into them** (see Fig. 31 and the table below).

  Note:
  Size 200 boilers with **7 sections** and size 510 boilers with **12 sections** have **no hot-gas baffles** fitted to them.

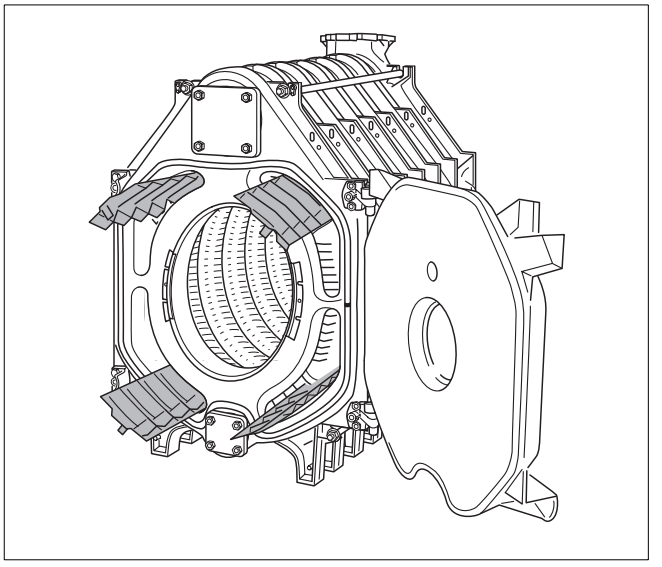


Fig. 31 Hot-gas baffles (boilers with 8 – 11 sections only)

Number of sections	Number	Length [mm]	Insertion directions on baffles
8 – 10	1	680	At top right
	1	680	At top left
	1	680	At bottom right
	1	680	At bottom left
11	1	425	At top right
	1	425	At top left
	1	425	At bottom right
	1	425	At bottom left

2.6.6 Fitting burner

- Close burner door and seal it with four M16 x 140 mm machine bolts (Fig. 29, **ref. 3 – 6**). Tighten the machine bolts evenly, working diagonally.
- Bore, drill or flame-cut a hole in the steel burner plate (Fig. 32, **ref. 1**) to suit the diameter of the burner flame tube (max. Ø 270 mm) on site. Drill holes for fastening the burner in place to match the hole pattern in the burner connecting flange.

Note:
Pre-drilled burner plates are available from **Buderus** on request (as additional equipment). For UK Installations the pre-drilled burner plate is supplied together with the burner.

- Bolt the burner plate to the burner door (using 10 mm Ø GP sealing rope to make a seal).
- Bolt the burner to the burner plate.
- Cut the inside diameter of the rings of insulating material to the diameter of the burner flame tube (Fig. 32, **ref. 2**).
- Fill the gap between the burner flame tube and the insulation on the burner door (Fig. 32, **ref. 4**) with the fitted rings of insulating material (Fig. 32, **ref. 3**).
- Connect the air-blast connection for the inspection hole to the burner so that the inspection glass will be kept free of deposits.

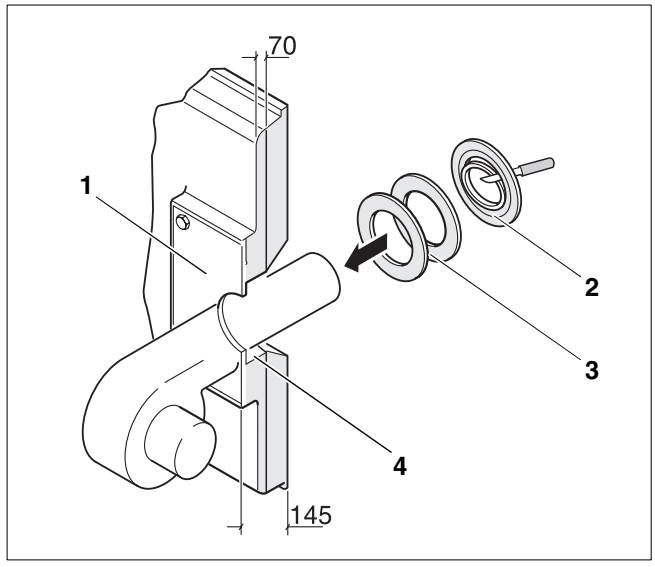


Fig. 32 Assembly – Fitting burner

2.6.7 Fitting sealed connecting sleeve for flue pipe (additional equipment)

Note:
The use of a sealed sleeve (Fig. 33, ref. 1) to make the connection to the flue pipe is recommended.

- Slide the flue pipe onto the flue socket connection as far as it will go.
- Fit the sealed connecting sleeve around the flue pipe and the flue socket connection so that it overlaps at the top.
- Fit the worm-drive clips (Fig. 33, **ref. 4**) around the connecting sleeve. One of the clips should tighten onto the flue-gas socket and one onto the flue pipe.
- Tighten the worm-drive clips.

After the worm-drive clips have been tightened, the connecting sleeve should make tight, flat contact.

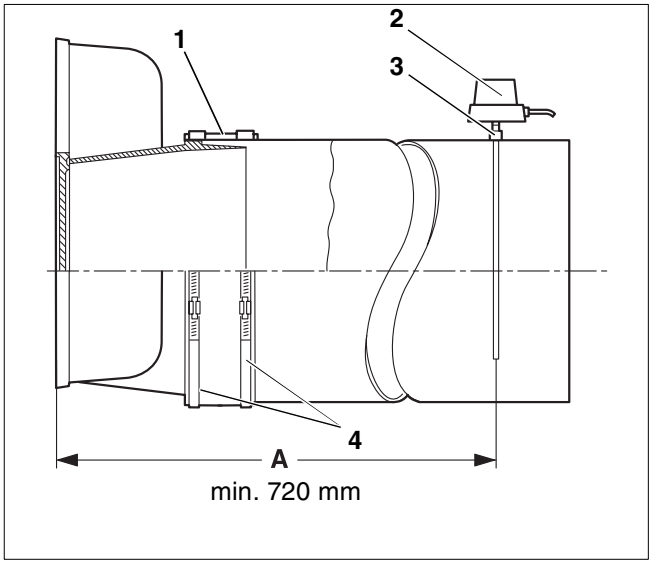


Fig. 33 Assembly – Fitting flue pipe

Note:
The worm-drive clips should be tightened again after the boiler has run for a short period.

2.6.8 Fitting flue-gas temperature sensor (additional equipment)

- Weld the pocket (Fig. 33, **ref. 3**) for the sensor into the flue pipe at a distance from the flue-gas socket of 2 x diameter of the flue pipe (A) – not less than 720 mm.
- Fit the flue-gas temperature sensor (Fig. 33, **ref. 2**) as detailed in the separate installation instructions.

2.7 Boiler casing

This section describes how to fit the thermal insulation and the sections of casing.

Note:
To allow the brackets to be lined up correctly, the cross-members and longitudinal rails should be fitted before the thermal insulation.
The next step is then to remove the longitudinal rails again so that the thermal insulation can be fitted.

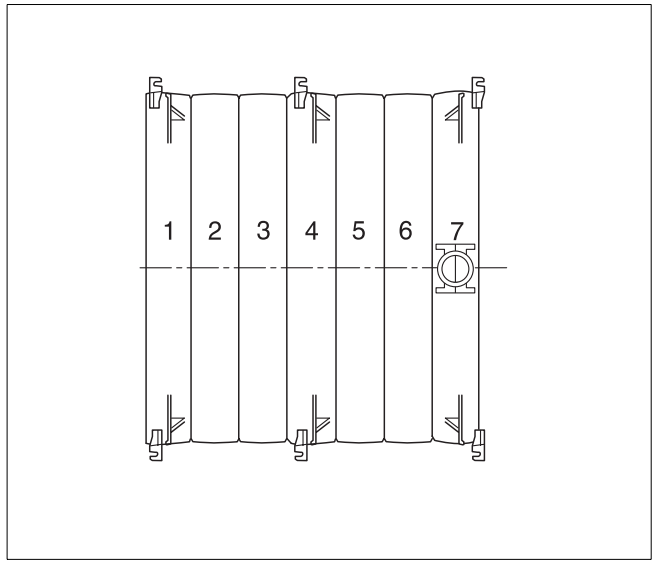


Fig. 34 Plan view of boiler block (7 sections) showing brackets

2.7.1 Brackets

- Screw the brackets for the boiler casing loosely to the top ribs on the left and right of the boiler sections as indicated in the table below and as shown in Fig. 34 and Fig. 35.

Note:
The brackets on the front section and middle sections (Fig. 35, **ref. 1**) must always be screwed to the front of the ribs and those on the rear section (Fig. 35, **ref. 2**) should be screwed to the rear of the ribs.

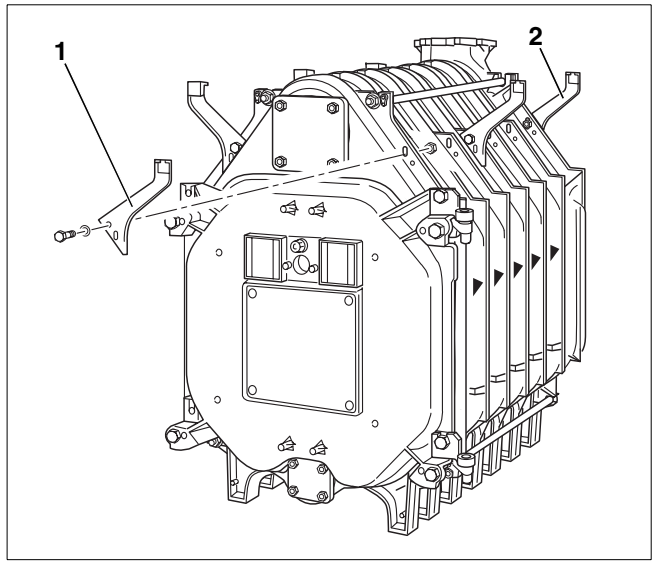


Fig. 35 Assembly – Fitting brackets

Total number of boiler sections	Left and right brackets fitted to		
	Front section, no.	Middle section, no.	Rear section, no.
7	1	4	7
8	1	4	8
9	1	5	9
10	1	5	10
11	1	4 and 7	11
12	1	4 and 8	12

2.7.2 Cross-members

- Locate the upper front cross-member (Fig. 36, **ref. 2**) on the cast lugs (Fig. 36, **ref. 1 and 4**) and screw it on finger tight with hex-head bolts (M8 x 16 mm). The horizontal limb of the cross-member should point forwards.
- Locate the upper rear cross-member (Fig. 36, **ref. 3**) on the cast lugs and screw it on finger tight with hex-head bolts (M8 x 16 mm). The horizontal limb of the cross-member should point to the rear.

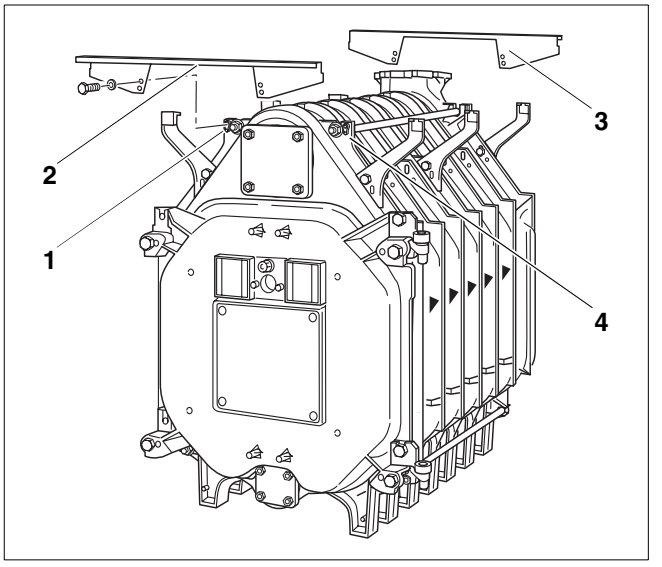


Fig. 36 Assembly – Fitting cross-members

Note:
To allow the side panels and top covers to be fitted later on, the longitudinal rails and brackets need to be lined up correctly.
The brackets can be lined up only before the thermal insulation is fitted.

- Place the longitudinal rails (Fig. 37, **ref. 1 and 2**) on the pairs of brackets on the front and rear boiler sections.
- The longitudinal rails already have bolts fitted in them (Fig. 37, **ref. 3**). Fit these bolts into the slots in the brackets (Fig. 37, **ref. 4**) and use them to bolt the rails to the brackets.

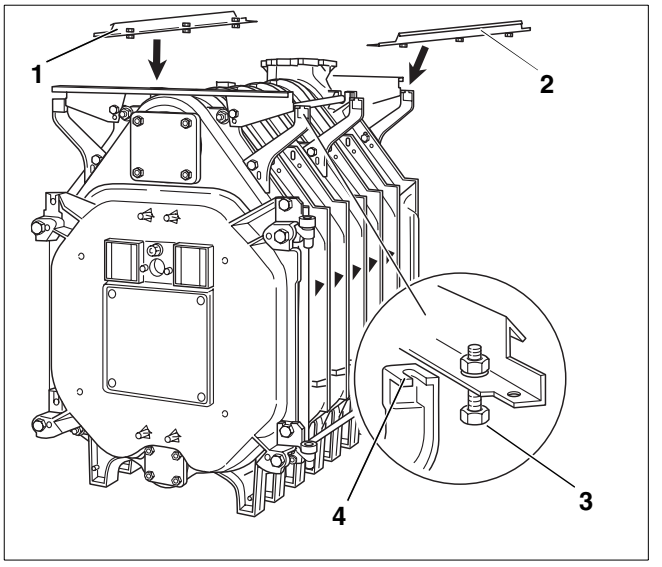


Fig. 37 Assembly – Fitting longitudinal rails

- Hook the cut-out at the front of the longitudinal rail (Fig. 38, **ref. 1**) onto the cut-out in the cross-member (Fig. 38, **ref. 2**).
- At the rear of the boiler the longitudinal rail has to be pressed up against the cross-member from below.

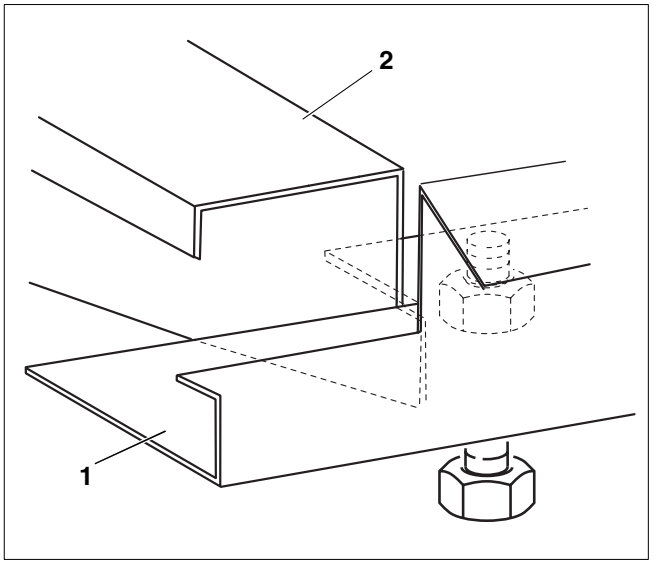


Fig. 38 Hooking longitudinal rail onto cross-member

- Line up the longitudinal rails and bolt the brackets tightly to the front and rear sections (Fig. 39, **ref. 1 and 3**).
- Slide the centre brackets (Fig. 39, **ref. 2**) up against the longitudinal rails from below and then bolt them tightly to the boiler block.

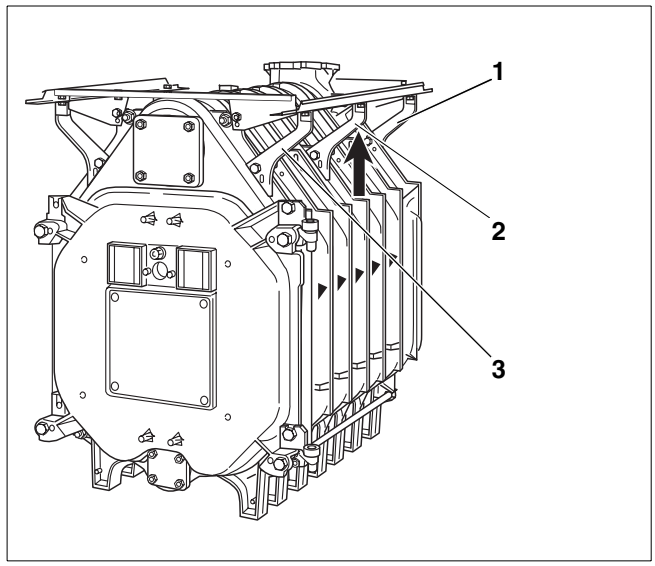


Fig. 39 Lining up longitudinal rails

2.7.3 Thermal insulation

Note:
The longitudinal rails have to be removed again to allow the thermal insulation to be fitted.

- The thermal insulation (Fig. 40, **ref. 1**) supplied corresponds to the size of the boiler. It should be fitted to the boiler block as shown in the diagram in Fig. 41 (the thermal insulating blankets are shown spread out and the numbers above them are the numbers of sections in the boiler).
- Slide the brackets through the slits in the thermal insulation.
- At the bottom, the thermal insulation must be tucked under the boiler block. The feet on the boiler sections fit into the cut-outs in the thermal insulation.

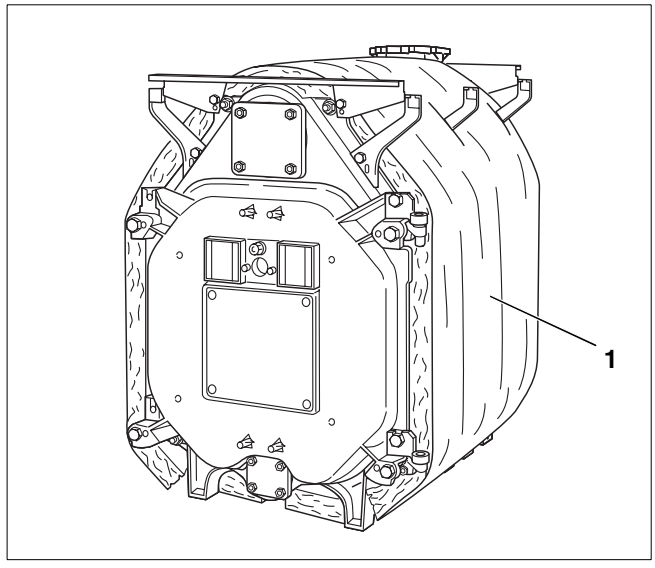
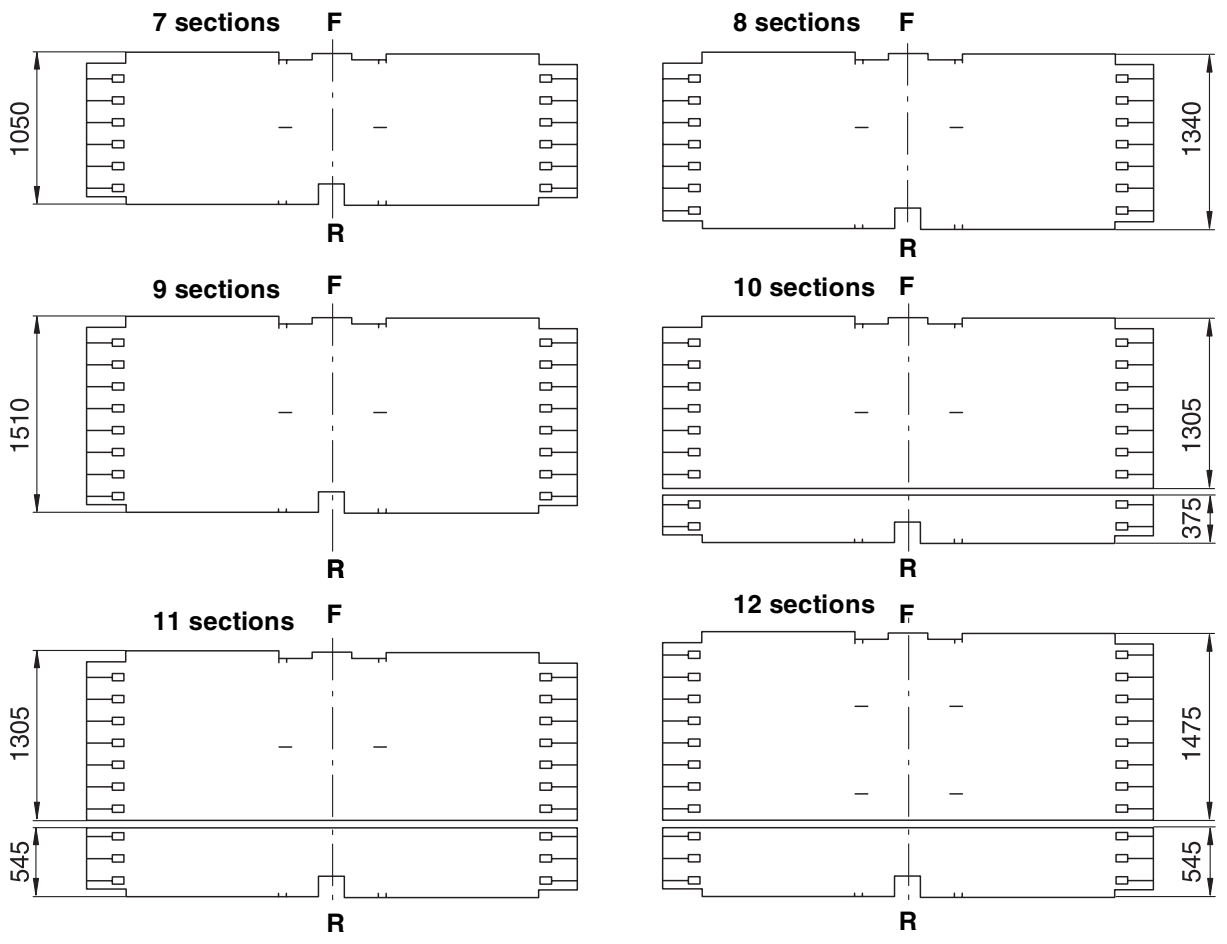


Fig. 40 Boiler block with thermal insulation fitted



Thermal insulation for different sizes of boiler.
Number on left above thermal insulation ≙ number of boiler sections
F ≙ front of boiler
R ≙ rear of boiler

Fig. 41

- Bolt the lower front cross-member (Fig. 42, **ref. 1**) and lower rear cross-member to the respective pairs of feet on the boiler sections with two hex-head bolts for each foot. The horizontal limbs of these cross-members point away from the boiler.

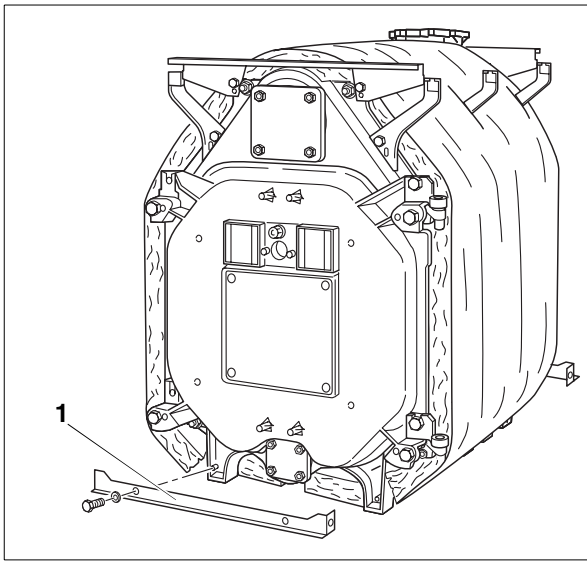


Fig. 42 Assembly – Fitting bottom cross-members

- Fit the rectangular pad of insulation (Fig. 43, **ref. 1**) to the front of the boiler above the door, with the slits at the top.
- Fasten it to the insulation on the main block with 3 spring clips (Fig. 43, **ref. 2**).

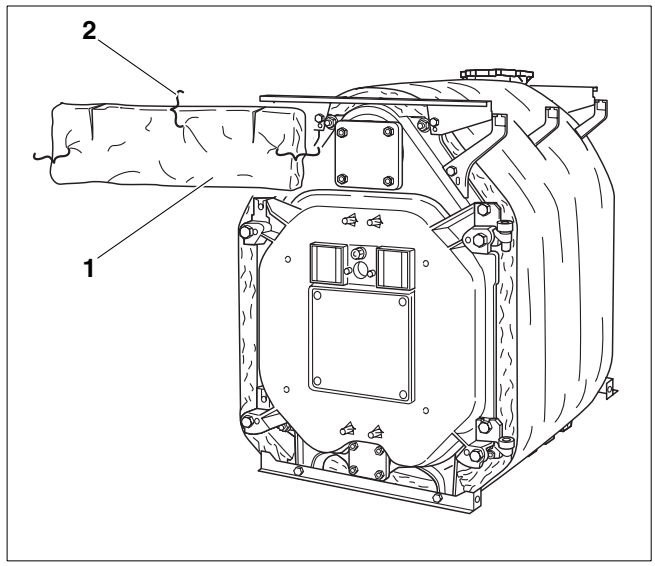


Fig. 43 Assembly – Fitting front insulation

- As already described, slide the prefitted bolts in the longitudinal rails (Fig. 44, **ref. 1 and 2**) into the slots in the brackets and use them to bolt the rails tightly to the brackets.

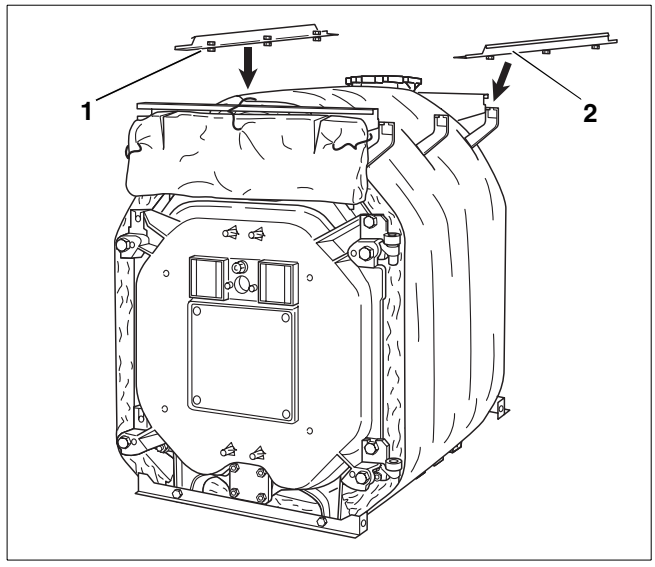


Fig. 44 Final fitting of longitudinal rails

- Insert the thermal insulation for the rear section of the boiler (Fig. 45, **ref. 1**) onto the flue connection. The cut-out for the boiler return (Fig. 45, **ref. 2**) should be at the top.
- Fasten the insulation for the rear section to the insulation on the main block with four spring clips.
- Pull the gap below the flue connection closed with two spring clips (Fig. 45, **ref. 3**).

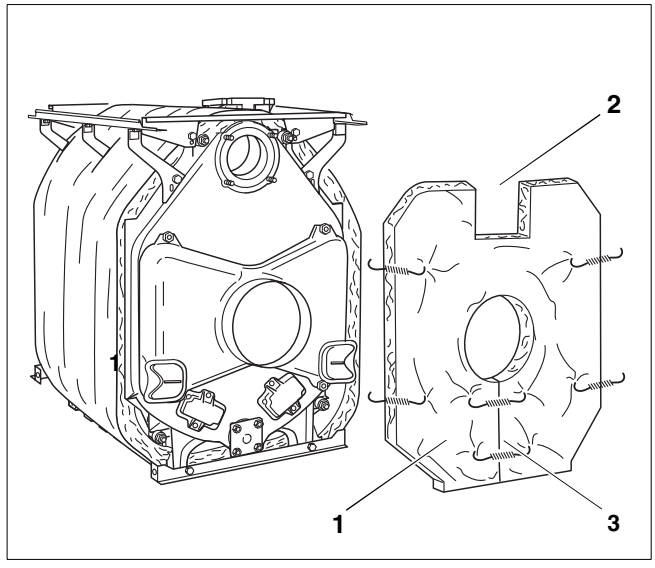


Fig. 45 Assembly – Fitting insulation to rear section

- Slot the bottom rails (Fig. 46, **ref. 1 and 3**) onto the bottom cross-members so that the longer projection (Fig. 46, **ref. 2**) is at the front in both cases.
- At this stage, screw the bottom rails loosely to the cross-members with self-tapping screws.

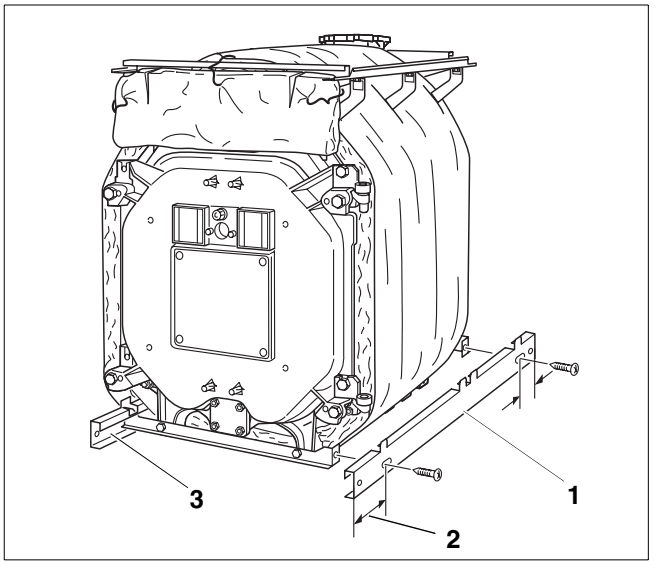
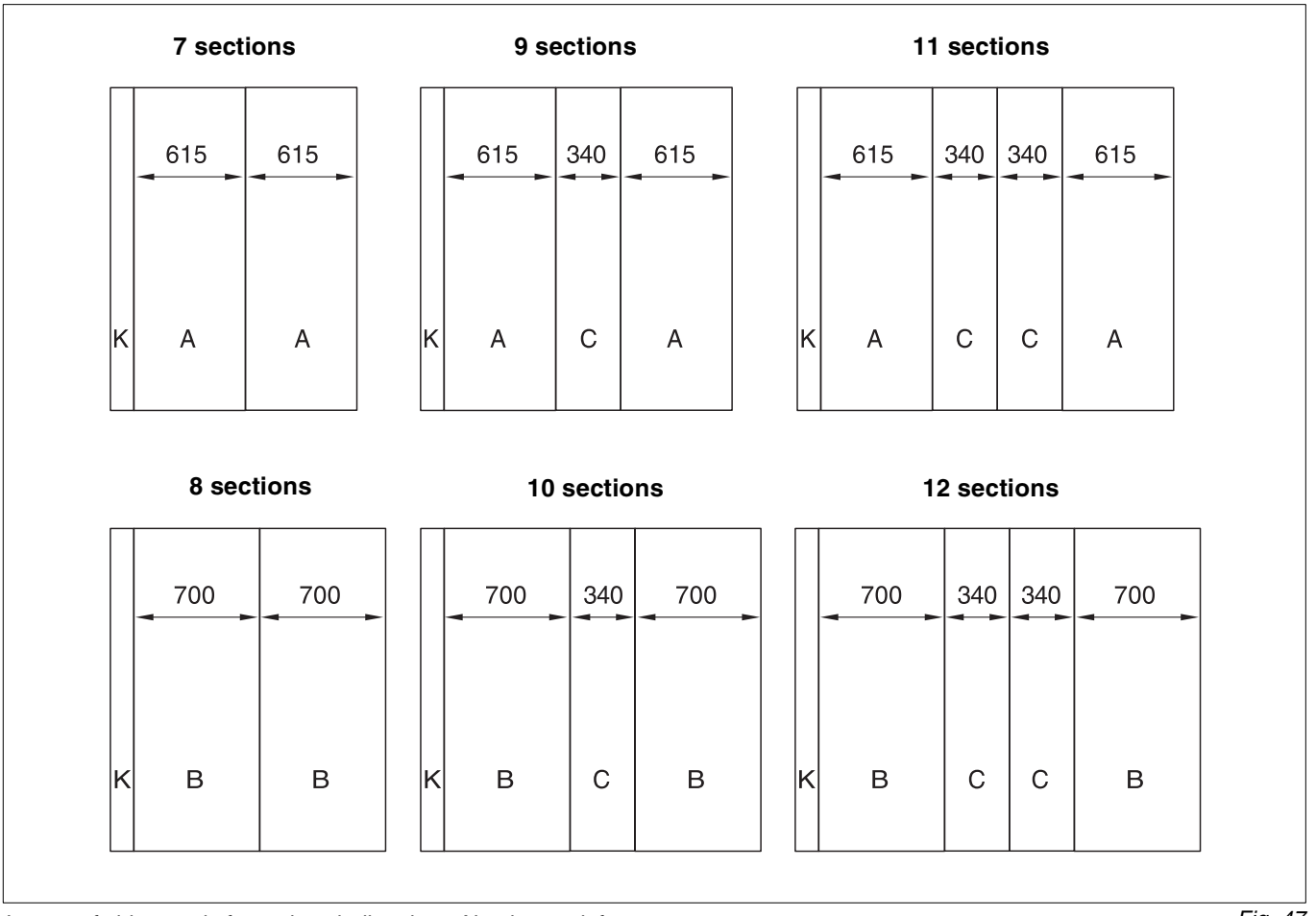


Fig. 46 Assembly – Fitting lateral bottom rails

2.7.4 Side panels and top covers

Fit all the side panels as shown in the layout drawing (Fig. 47).



Layout of side panels for various boiler sizes. Number on left above layout drawing ≙ number of boiler sections. Dimensions in mm – K ≙ opening panel = 110 mm

Fig. 47

To fit the side panels, first fix the opening side panels to the front side panels.

- Insert the hooks on the hinges of the opening side panels (Fig. 48, **ref. 1**) into the cut-outs in the front side panel and screw the hinges to the panel with self-tapping screws.
- Hook the traction spring (Fig. 48, **ref. 2**) to the side panel and opening side panel.

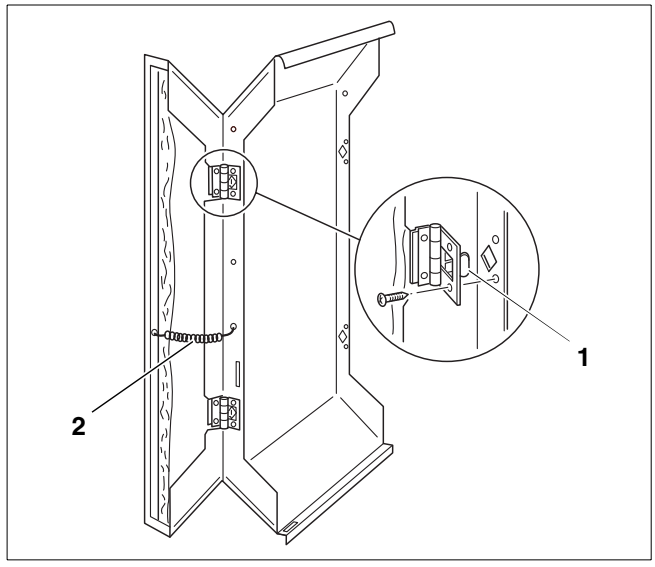


Fig. 48 Assembly – Fitting opening side panels

- Slot the bottoms of the left- and right-hand front side panels onto the upright tabs on the bottom rails (Fig. 49, **ref. 1**) and slide their tops over the folded lips on the longitudinal rails.

The sequence in which the side panels should be fitted can be seen from Fig. 47.

- Once the side panels are lined up vertically, the self-tapping screws holding the bottom rails can be driven home.

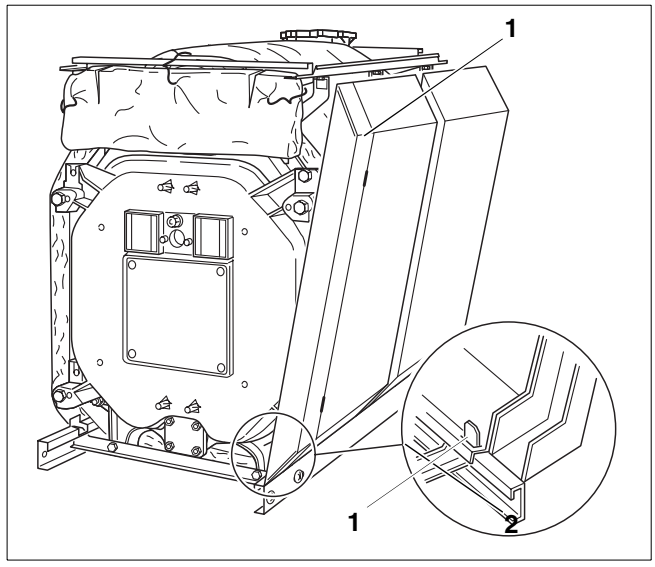


Fig. 49 Slotting on the side panels

- Slide the transverse bottom rails into the longitudinal bottom rails from the front and rear. The horizontal limbs of the transverse bottom rails must be at the bottom and pointing towards the boiler (Fig. 50).

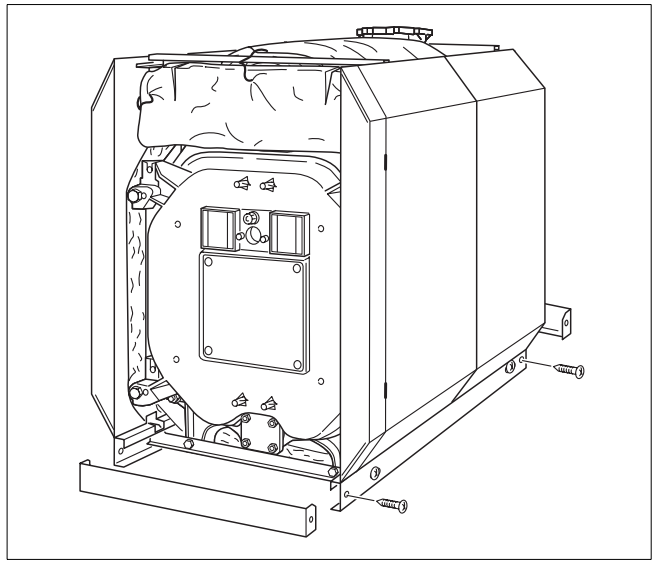


Fig. 50 Assembly – Fitting bottom rails

- On the front cover (Fig. 51, **ref. 1**) are two hooks (Fig. 51, **ref. 3**) and these should be hooked into the front side panels.
- Use two self-tapping screws (Fig. 51, **ref. 2**) to screw the front cover to the longitudinal rails from below.

Before the other sections of cover are fitted you should fit the control panel, lay the capillary tubes to the sensor pocket and fit the sensors into the pocket (see section “2.8 Control panel” on p. 34).

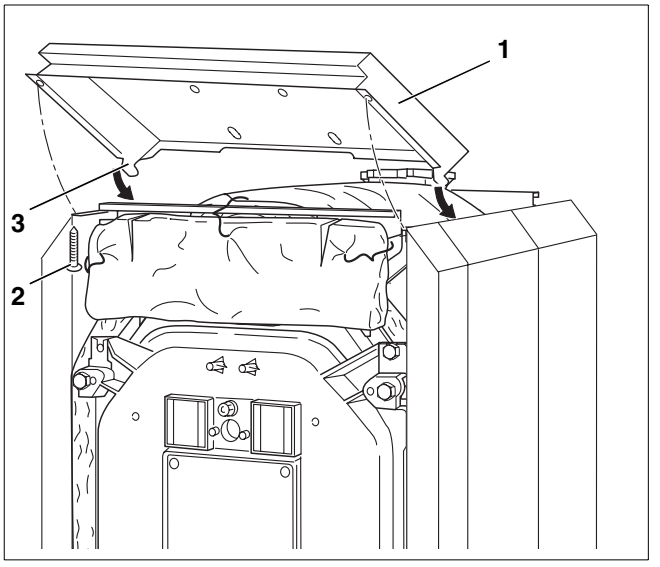


Fig. 51 Assembly – Fitting front cover

- Slide the folded lips (Fig. 52, **ref. 1**) of the centre cover under the front cover and lower it into the grooves on the side panels.

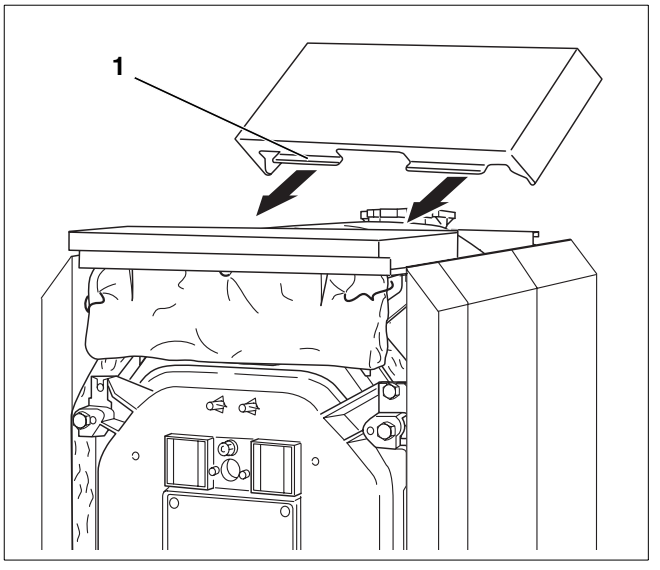


Fig. 52 Assembly – Fitting centre cover

- Place the rear cover on the side panels, with the folded lips and the cut-out for the heating circuit flow (Fig. 53, **ref. 1**) at the front.

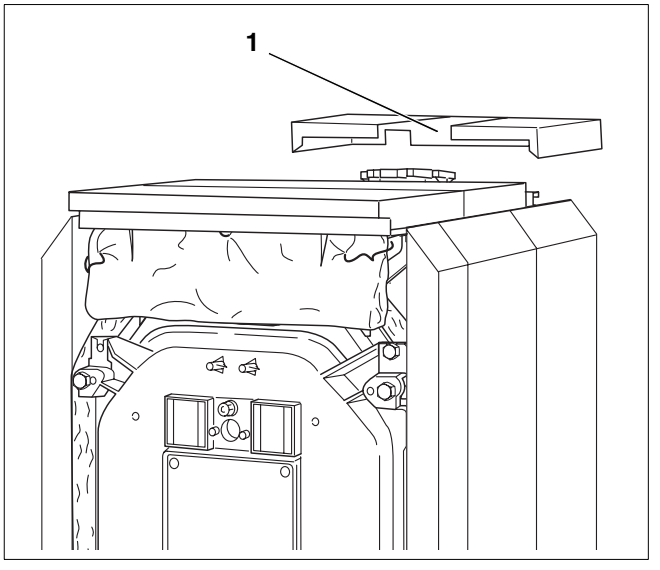


Fig. 53 Assembly – Fitting rear cover

- Slide the upper rear panel of the boiler casing under the rear cover (Fig. 54, **ref. 1**) and screw it to the side panels from the rear with four self-tapping screws (Fig. 54, **ref. 2**).

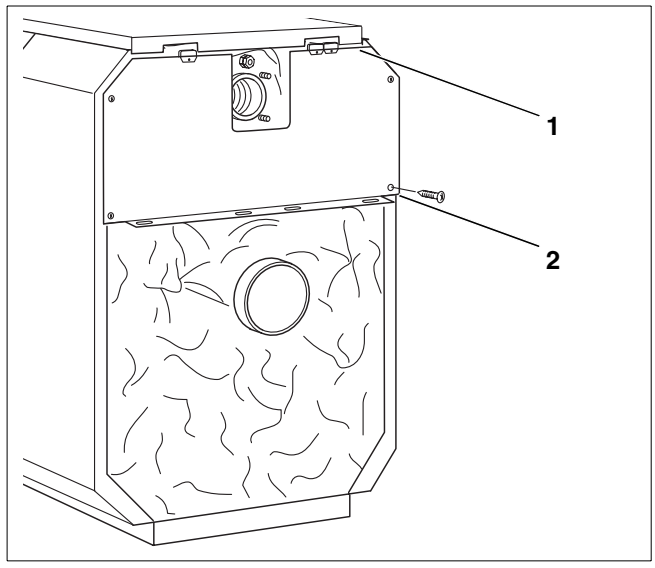


Fig. 54 Assembly – Fitting upper rear panel

- Clip captive nuts into the left- and right-hand side panels and the lower rear panels (Fig. 55, **ref. 1, 3, 4 and 8**).
- Hook the left- and right-hand lower rear panels into slots in the folded edges of the upper rear panel and side panels (Fig. 55, **ref. 5**).
- Secure the lower rear panels to the side panels with self-tapping screws.
- Screw the connecting plate (Fig. 55, **ref. 2**) to the lower rear panels with self-tapping screws at a point below the flue connection.
- Fasten plastic cable lead-throughs to either the right or the left of the upper rear panel (Fig. 55, **ref. 5 and 6**).

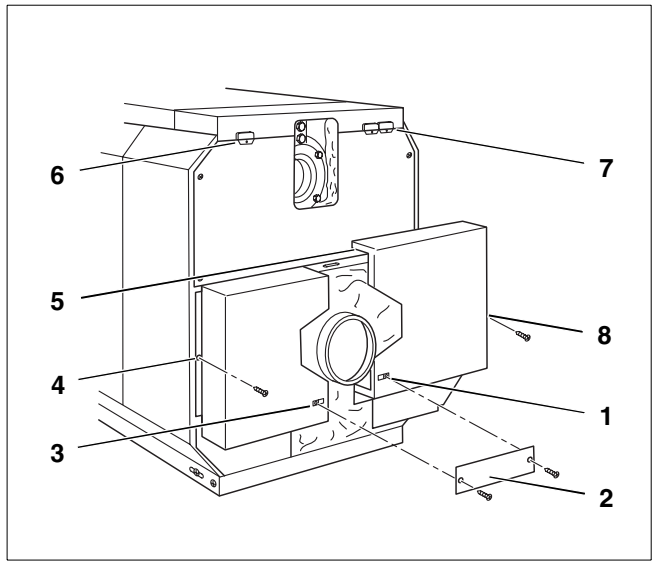


Fig. 55 Assembly – Fitting lower rear panels

- Clip the strain relief on the burner cable into the cable lead-through (Fig. 56, **ref. 1**).
- Fit the strain relief on the burner cable into the burner door cladding.
- Run the burner cable upwards in the folded edge of the burner door cladding and position it with the fixing clip so that it will not be in contact with any of the hot parts of the boiler.
- Fit the burner door cladding to the burner door from the front and bolt it to the door with four machine bolts (Fig. 56, **ref. 2 – 5**).
- Run the burner cable to the cable entry of the control panel.

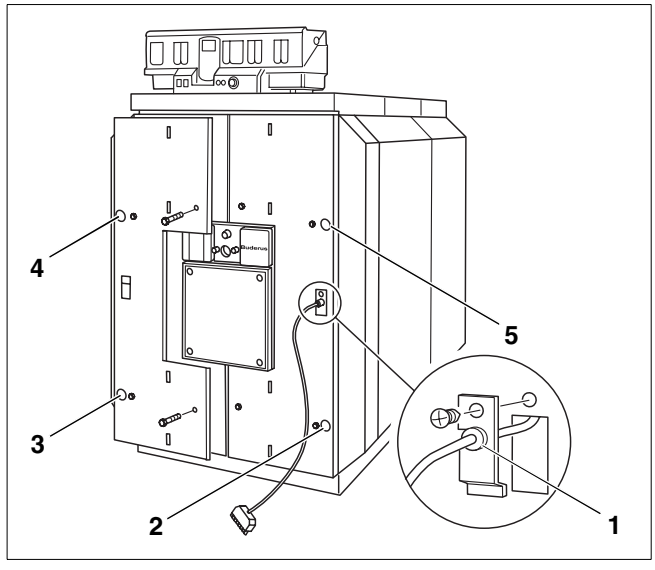


Fig. 56 Assembly – Fitting burner door cladding

- Hook the burner door blanking plates into the burner door cladding (Fig. 57, **ref. 1 and 2**).
- Depending on the site conditions, fasten the rating plate on either the right- or left-hand side panel in a place where it is clearly visible.

Note:
In boilers supplied as blocks you will find the rating plate in the combustion chamber together with the installation and maintenance instructions; in boilers supplied in sections you will find it in a transparent envelope on the burner door.

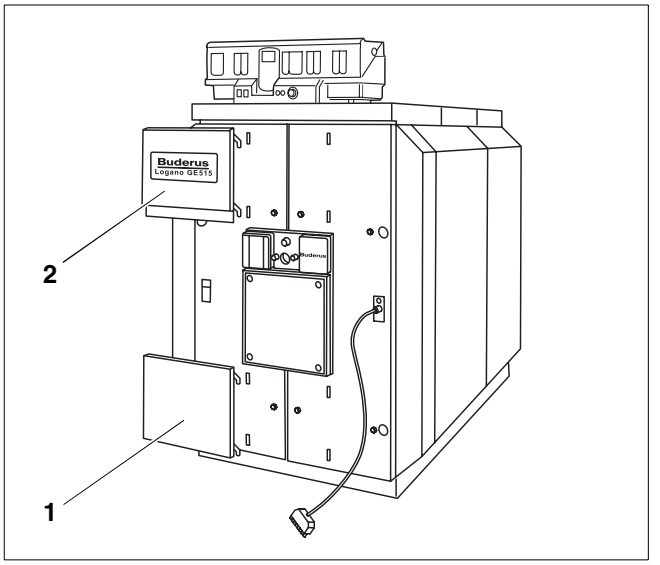


Fig. 57 Fitting burner door blanking plates

2.8 Control panel

2.8.1 Fitting control panel

Fig. 58 shows the control panel and front cover “A” from the rear.

- Unfasten the two screws holding the case (Fig. 58, **ref. 1**) covering the terminals and lift the case to remove it.
- Fit the control panel. Insert the lugs at the front of the control panel (Fig. 58, **ref. 4**) into the oval holes (Fig. 58, **ref. 5**) in the front cover of the boiler. Pull the control panel forward and then tilt it down and back. The hooks at the rear (Fig. 58, **ref. 2**) should clip into the rectangular openings in the front cover (Fig. 58, **ref. 3**).
- On the left and right of the cable opening (Fig. 58, **ref. 6**) fasten the base of the control panel to the front cover with two self-tapping screws (Fig. 58, **ref. 7**).

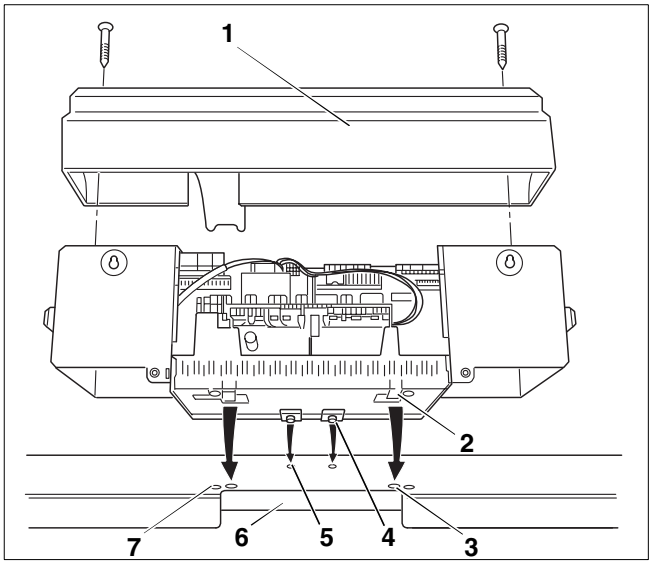


Fig. 58 Assembly – Fitting control panel

2.8.2 Fitting temperature sensors

- Break open the closure (Fig. 59, **ref. 1**) in the rear wall of the cable opening if necessary (Logamatic 33..) or take off rear panel (Logamatic 43..) (Fig. 59, **ref. 2**).
- Run the capillary pipes through the cable opening and unroll the pipes to the requisite length.

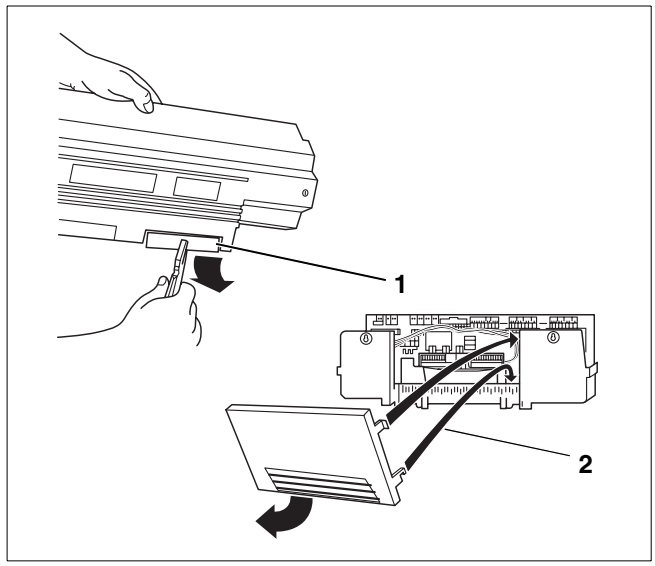


Fig. 59 Preparation – Cable opening

The sensor pocket has already been screwed into the flow connection (see section 2.4.5).

The cluster of sensors (three sensors and one dummy – Fig. 60, **ref. 1**) connected to the control panel is fitted into the R¾" sensor pocket.

- Run the sensor capillary tubes to the measuring point on the boiler, insert the sensors in the sensor pocket there (Fig. 60, **ref. 2**) and secure them in the pocket with the sensor retainer (Fig. 60, **ref. 3**).

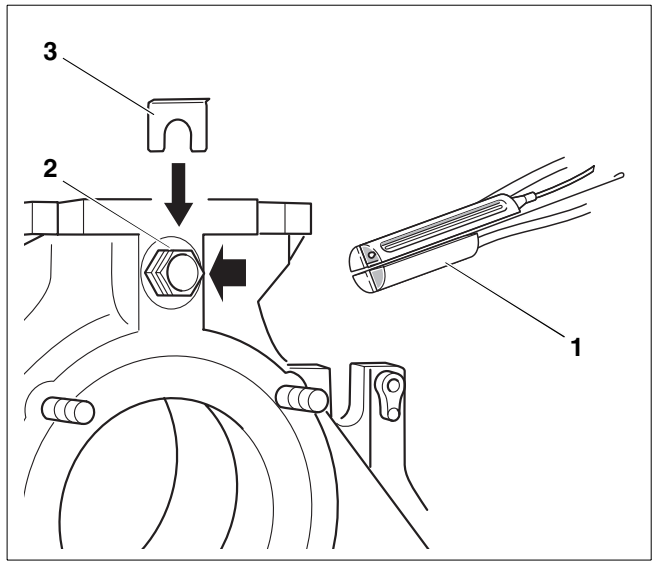


Fig. 60 Assembly – Fitting sensor cluster

- Screw a cable lead-through (Fig. 61, **ref. 1 and 2**) to the left or right of the upper rear panel.
- Make electrical connections as shown in the circuit diagram. Ensure that cables and capillary tubes are laid carefully.

The connections made should be permanent ones to EN 50165 or the appropriate domestic wiring standard.

Note:
Be sure to comply with all domestic rules and regulations. Secure all cables in place with cable clips.

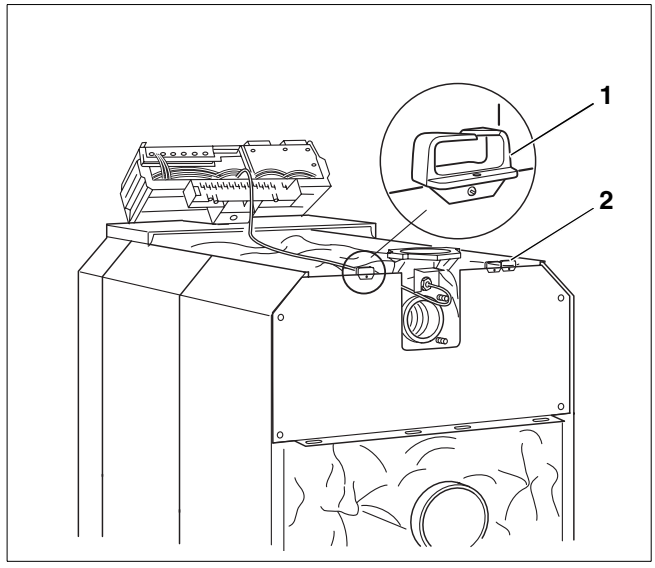


Fig. 61 Electrical connections

- Insert cable clips, with cables attached, into the clip frame and secure them in position by turning the lever to the upright position (Fig. 62, **ref. 1**).

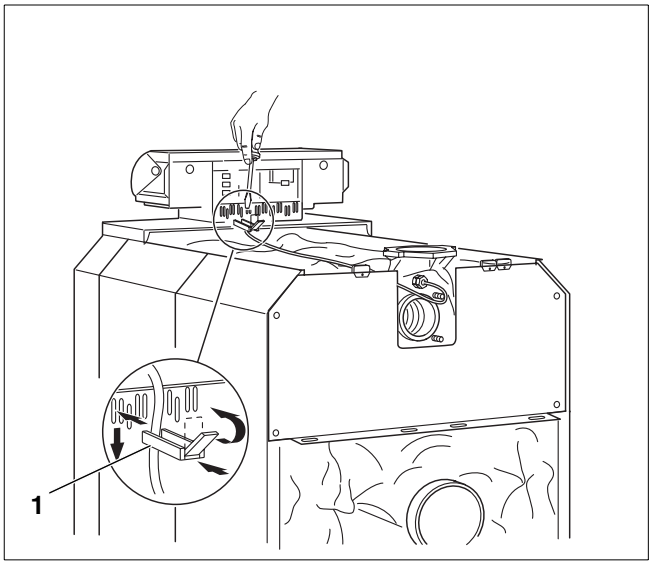


Fig. 62 Fastening electrical connecting cables in place

- Fasten the hook at the bottom of the rear panel to the clip frame and then press in the top of the panel until the hooks at the side (Fig. 59, **ref. 2**) engage.
- Fasten the case covering the terminals (Fig. 58, **ref. 1**) to the base of the control panel with two self-tapping screws (Fig. 63).

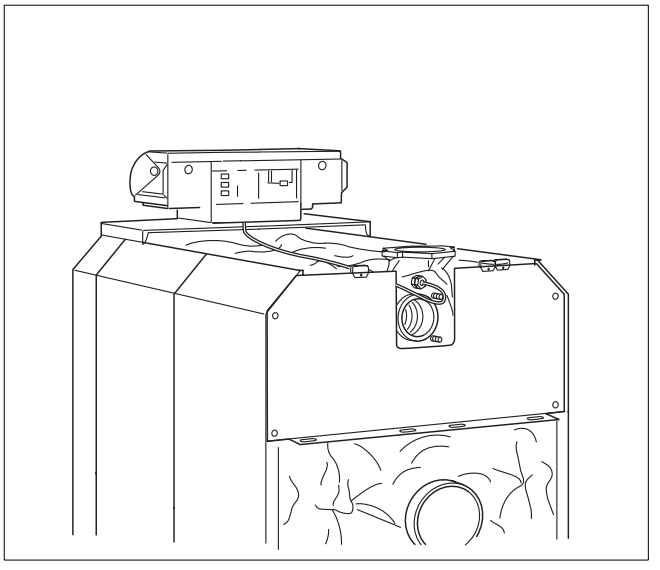


Fig. 63 Boiler with control panel fitted

3 Maintenance

3.1 General notes

Important! Save energy!

- **Make regular checks to see that the burner is properly adjusted. Make sure that it is operating efficiently and is not producing soot.**
- **Clean the boiler at least once a year. Suitable cleaning brushes are available from branches of Buderus Heiztechnik GmbH.**
- **We recommend taking out a maintenance contract with your heating engineers or burner supplier.**

3.2 Cleaning with brushes

- Switch off the power to the system.

Note:
This can be done for example by switching off the heating system emergency off-switch situated upstream of the boiler room and securing it against being switched back on unintentionally.

- Move the on/off switch (Fig. 64, **ref. 1**) on the control panel to the “0” position.
- Shut off the fuel supply.

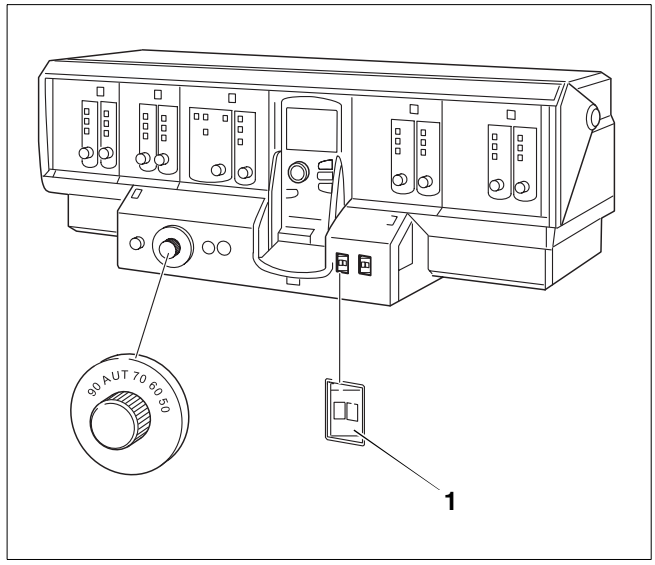


Fig. 64 Logamatic 4311 shown as an example

Note:
Work on the gas pipe must be done only by an *approved specialist engineer*.

- Unscrew the four machine bolts used to fasten the burner door to the front boiler section (Fig. 65, **ref. 1 – 4**).
- Open the burner door.

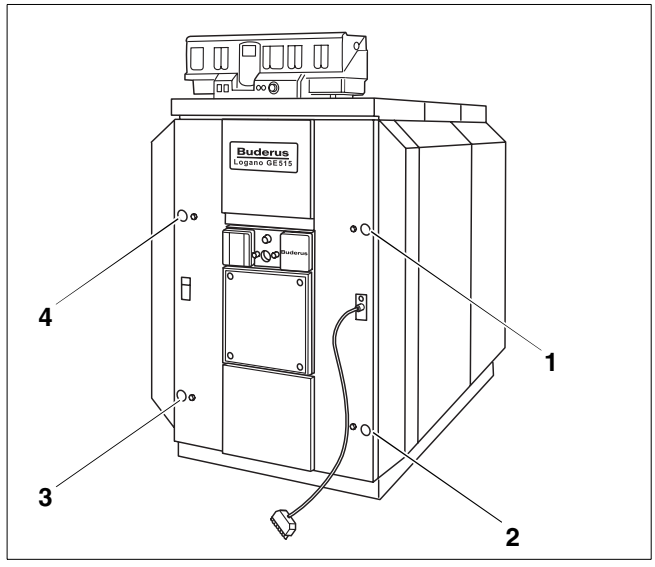


Fig. 65 Bolts for fastening burner door

- Slide the hot-gas baffles forwards and out of the hot-gas passes (Fig. 66, **ref. 1 – 4**).

Note:
Size 200 boilers with 7 sections and size 510 boilers with 12 sections do not have any hot-gas baffles (see section “2.6.5 Inserting hot-gas baffles”, p. 22).

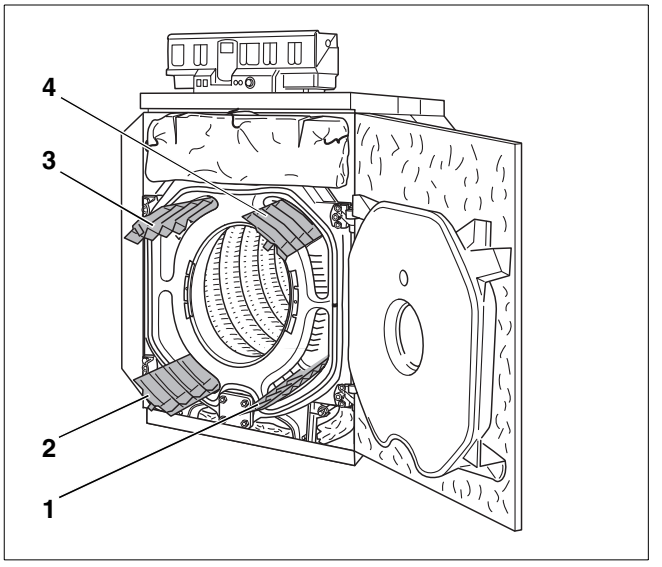


Fig. 66 Removing hot-gas baffles

- Unscrew the two self-tapping screws holding the connecting plate in place and remove the plate.
- Remove the left- and right-hand self-tapping screws holding the lower rear panels.
- Lift the lower rear panels slightly and take them off backwards.
- Detach the spring clips below the flue connection, and fold up the two flaps of the thermal insulation and fasten them with the spring clips (Fig. 67, **ref. 1**).
- Remove the cleaning covers from the rear section of the boiler (Fig. 67, **ref. 2**) and the flue socket (Fig. 67, **ref. 3**).

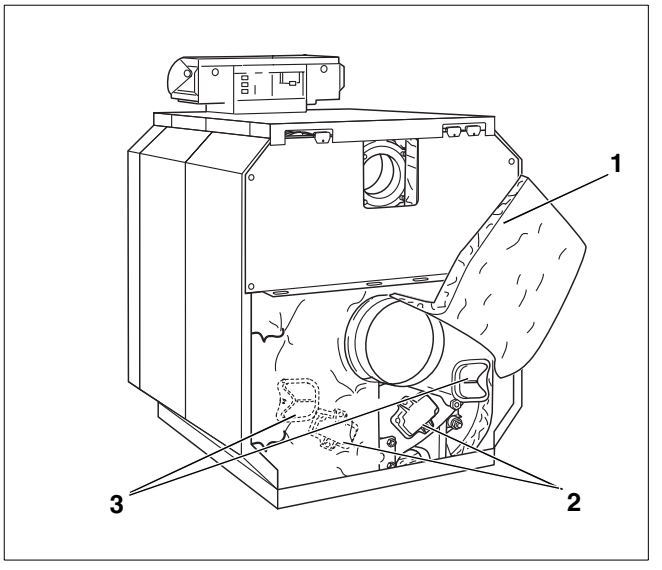


Fig. 67 Removing cleaning covers

The different types of cleaning brush available from **Buderus** (as additional equipment) are shown in Fig. 68.

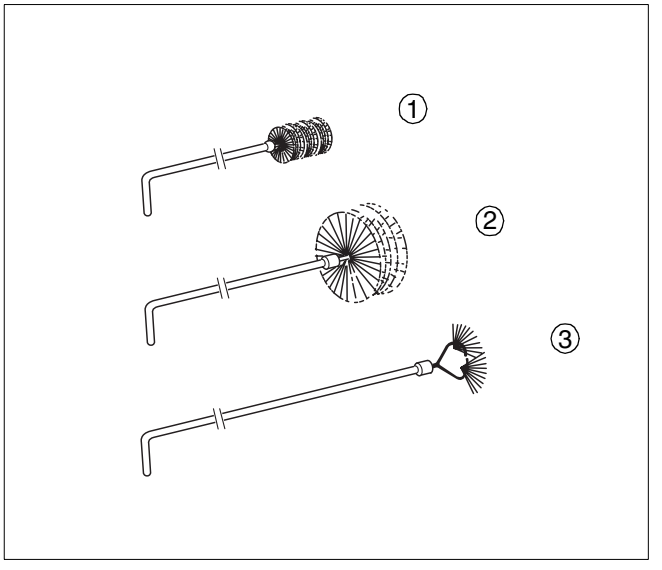


Fig. 68 Cleaning brushes

- Clean the hot-gas passes with brushes 1 and 2, working from front to rear (Fig. 69, **ref. 1 and 3**).
- Clean the rear wall of the combustion chamber with brush 3.
- The rest of the combustion chamber (Fig. 69, **ref. 2**) should be cleaned with brush 2.
- Clean the bottom hot-gas passes from the front with brush 2 (Fig. 69, **ref. 1**).
- Remove the combustion residues detached by the cleaning process from the combustion chamber, hot-gas passes and flue socket.
- Check the sealing ropes at the cleaning openings and burner door. Ropes which have been damaged or have become hard and brittle should be replaced.

Note:
Suitable sealing ropes can be obtained from your nearest Buderus branch.

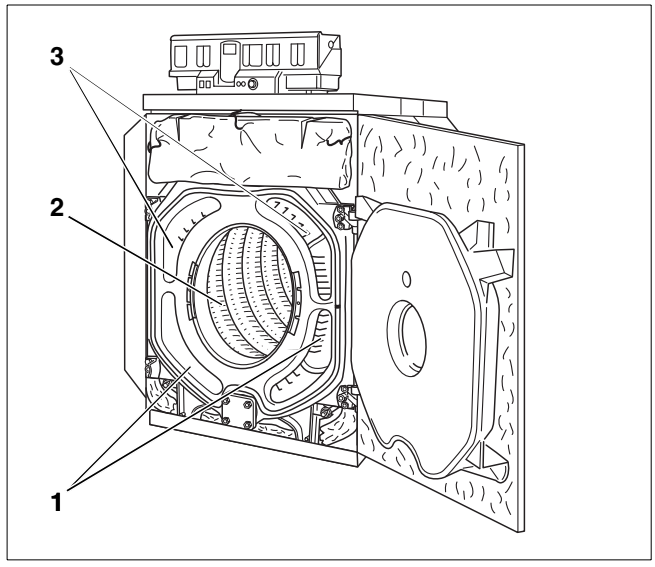


Fig. 69 Cleaning the hot-gas passes

- Clean the hot-gas baffles with the cleaning brushes.
- Re-insert the hot-gas baffles in the hot-gas passes (see section “2.6.5 Inserting hot-gas baffles”, p. 22).
- Fasten the cleaning covers in place and close the burner door. Tighten the bolts evenly.
- Fold down the flaps of the rear-section thermal insulation and fasten them together under the flue connection with the spring clips (Fig. 70, **ref. 1**).
- Hook the left- and right-hand lower rear panels of the boiler casing into the slots in the folded lip of the upper rear panel and screw the connecting plate onto the lower rear panels below the flue connection.

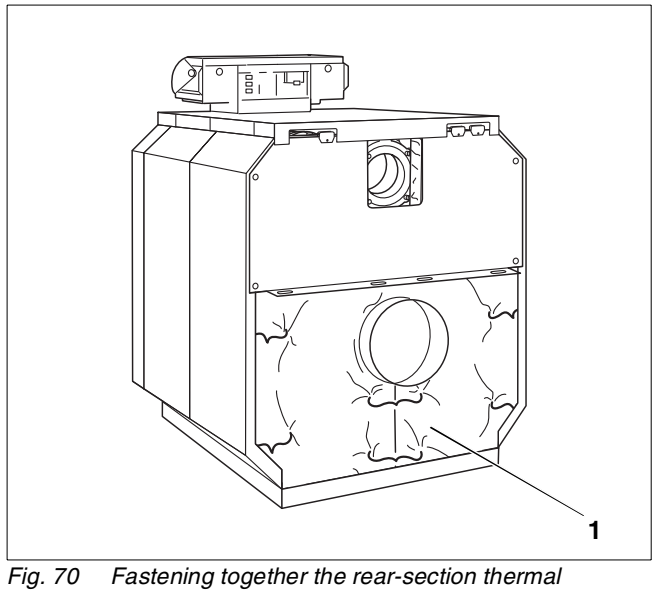


Fig. 70 Fastening together the rear-section thermal insulation

3.3 Wet cleaning

When cleaning the boiler wet, proceed in the same sequence as described above for cleaning with brushes.

It is vital that you follow the operating instructions for the cleaning equipment and cleanser you are using!

3.4 Checking water level

- With open systems, set the red marker on the pressure gauge to the requisite pressure for the system. With closed systems, the pointer on the pressure gauge should be in the green area.
- Check the water level in the system; top up the water if required and bleed the entire system of air. If water is lost during a period of operation, top up the water (but do so only slowly) and bleed the entire system of air. If there are frequent losses of water, find out why this is happening and remedy the fault at once.

3.5 Local water supply

Particularly close attention needs to be paid to the quality of the local water and if necessary it should be treated.

Note:
You will find information on this subject in instruction sheet K8 “Water treatment for heating systems” (in the general catalogue) or in the attached supplementary instruction sheet “Water treatment”.

3.6 Raising flue-gas temperature

- Shut down the boiler as detailed in the operating instructions.

You can take the steps described below to raise the temperature of the flue gases.

3.6.1 Removing hot-gas baffles

In size 8 – 11 boilers (295 kW – 455 kW) the flue-gas temperature can be raised by removing the top or bottom pair of hot-gas baffles.

3.6.2 Removing hot-gas blanking plates

The temperature of the flue gases can be raised considerably by removing the hot-gas blanking plates.

- Unscrew the socket screw in each of the left- and right-hand blanking plates and remove the plates (Fig. 71, **ref. 1 and 2**).

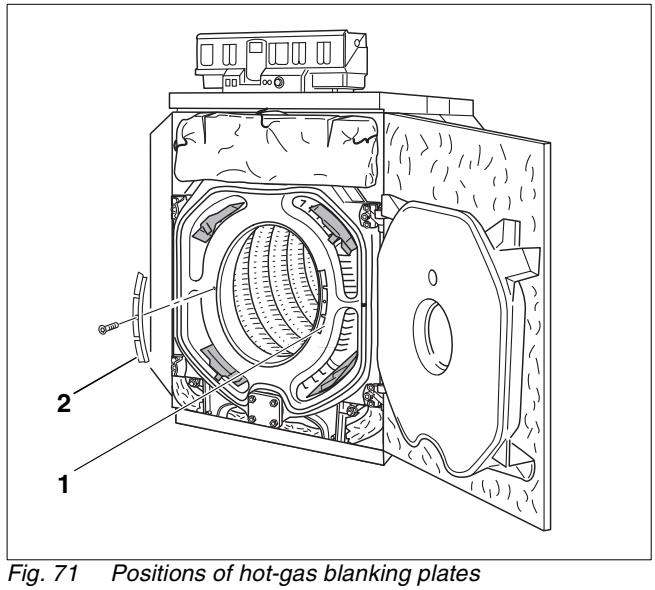


Fig. 71 Positions of hot-gas blanking plates

3.6.3 Raising flue-gas temperature slightly

- Unscrew the socket screws (Fig. 72, **ref. 3**) in each of the left- and right-hand hot-gas blanking plates and remove the plates (Fig. 71, **ref. 1 and 2**).
- Put the plates down on a supporting surface so that the notches (Fig. 72, **ref. 1 and 2**) project over the edge and are unsupported. Then knock one arcuate segment off the plates with a hammer.
- Screw the plates back onto the front section of the boiler with the socket screws.

If this fails to raise the temperature of the hot gases sufficiently, you can knock a second arcuate segment off the blanking plates in the same way or you can remove the plates entirely as described above.

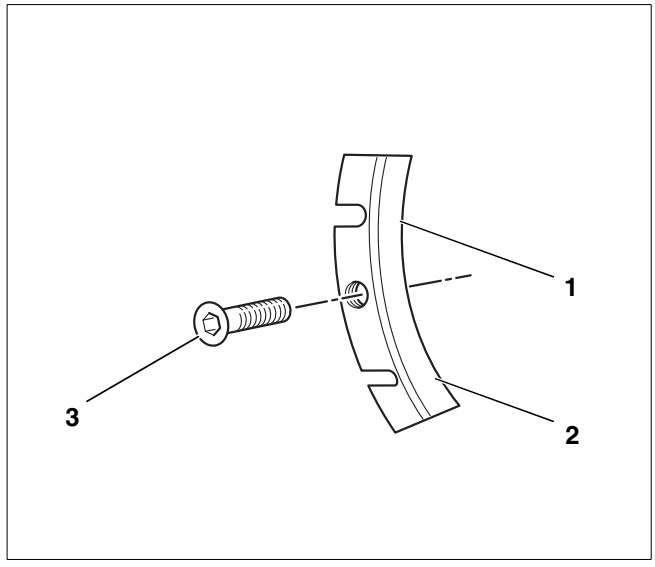


Fig. 72 Hot-gas blanking plate

Notes

Appendix

System details and handover certificate

Type _____ User _____

Manufacturer's serial no. _____ Location _____

System installers _____

The system identified above was installed and commissioned in accordance with standard rules of good practice, building regulations and other statutory requirements.

The technical documentation was handed over to the user and he was acquainted with the safety instructions for the system and with details of how to operate and service it.

Date and signature of system installer

Date and signature of user

Cut along this line 

For the system installer

Type _____ User _____

Manufacturer's serial no. _____ Location _____

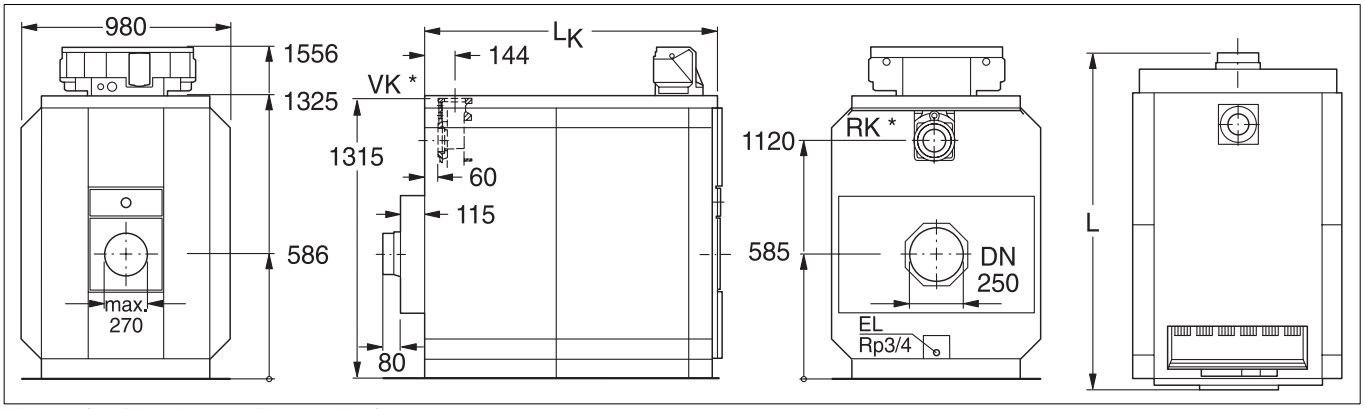
The technical documentation was handed over to the user and he was acquainted with the safety instructions for the system and with details of how to operate and service it.

Date and signature of user

Notes

Dimensions and technical data

Logano GE515 oil-/gas-fired hot water boilers



VK = boiler flow, RK = boiler return, EL = drain, AA = flue connection

Fig. 73

Boiler size			240	295	350	400	455	510
Boiler sections	Number		7	8	9	10	11	12
Total length of boiler	L	[mm]	1580	1750	1920	2090	2260	2430
Length of boiler block	L_K	[mm]	1360	1530	1700	1870	2040	2210
Moving to installation site	Boiler section Boiler block	[mm] [mm]	Width 835 / Height 1315 / Depth 170 Width 835 / Height 1315 / Length L_K					
Combustion chamber	Length	[mm]	1165	1335	1505	1675	1845	2015
Combustion chamber	Ø	[mm]	515					
Burner door	Depth	[mm]	142					
Nominal heat output		[kW]	201 – 240	241 – 295	296 – 350	351 – 400	401 – 455	456 – 510
Heat input		[kW]	215.6 – 259.7	257.8 – 319.0	316.6 – 377.1	374.6 – 429.6	428.4 – 489.2	488.2 – 547.8
Weight [1]	Net	[kg]	1270	1430	1590	1753	1900	2060
Water capacity of boiler (approx.)		[l]	258	294	330	366	402	438
Gas capacity		[l]	421	487	551	616	681	745
Flue gas temperature [2]	Part load (60%) Full load	[°C] [°C]	138 164 – 183	138 161 – 183	140 161 – 177	129 157 – 171	130 159 – 172	140 164 – 174
Flue gas mass flow:								
– Oil	Part load (60%) Full load [3]	[kg/s] [kg/s]	0.0647 0.092 – 0.11	0.08 0.109 – 0.135	0.094 0.134 – 0.16	0.108 0.159 – 0.182	0.123 0.182 – 0.208	0.137 0.207 – 0.233
– Gas	Part load (60%) Full load [3]	[kg/s] [kg/s]	0.065 0.092 – 0.111	0.08 0.11 – 0.136	0.095 0.135 – 0.161	0.108 0.16 – 0.183	0.123 0.183 – 0.208	0.138 0.208 – 0.233
CO_2 content	Oil Gas	[%] [%]	13 10					
Draught required		[Pa]	0					
Flow resistance on hot-gas side		[mbar]	0.5 – 0.6	1 – 1.4	1.1 – 1.6	2.1 – 2.9	2.5 – 3.3	2.4 – 3.1
Max. flow temperature		[°C]	105					
Max. operating pressure (gauge)		[bar]	6					

1) Weight with packing approx. 6 – 8% more.
2) Under DIN EN 303. The minimum flue gas temperature for chimney design under DIN 4705 is about 12 K less.
3) The figures for full load relate to the upper and lower ranges of nominal heat output.

Notes

Buderus
HEIZTECHNIK

Konformitätserklärung

Declaration of conformity

Déclaration de conformité

Wir
We
Nous

Buderus Heiztechnik GmbH, D-35576 Wetzlar

erklären in alleiniger Verantwortung , dass das Produkt
declare under our responsibility that the product
déclarons sous notre seule responsabilité que le produit

Logano GE515

konform ist mit den Anforderungen der Richtlinien
is in conformity with the requirements of the directives
est conforme aux exigences des directives

Richtlinie Directive Directive		Norm Standard Norme	Identnummer Identification number Numéro d'identification
90/396/EEC	gas appliance directive	EN 303-1 EN 303-3	0461AR6154
92/42/EEC	boiler efficiency directive	-	0461AR6154
73/23/EEC	low voltage directive	EN 60335	-
89/336/EEC	EMC directive	EN 55014 EN 60730-1 EN 50081-1	-
97/23/EC*	pressure equipment directive	TRD 702 EN 303-1	-

* nur gültig für den Betrieb als Heißwassererzeuger (mit TS>110°C)
effective only if operating as hot water boiler (with TS>110°C)
uniquement valable pour chaudière chauffage seul (avec TS>110°C)

Ergänzung für Deutschland :
Supplement for Germany :
Supplément pour l'Allemagne :

- HeizAnlV vom 04.05.1998 : Niedertemperaturkessel gemäß § 2, Abs. 7 (Kessel mit Nennwärmeleistung bis 400 kW)
- 1.BImSchV vom 07.08.1996 : Normnutzungsgrad > 91 % gemäß § 7, Abs. 3 (Kessel mit Nennwärmeleistung über 400 kW)

Wetzlar, 13.06.2000

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Becker Dr. Schulte

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Buderus Heiztechnik GmbH 35573 Wetzlar
http://www.heiztechnik.buderus.de
e-mail: info@heiztechnik.buderus.de