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Innovens ADVANCE

Cascade description

High-efficiency wall-hung gas boilers

MCA 160

SOLAR
SOLID FUEL
HEAT PUMPS
CONDENSING OIL/GAS

De Dietrich
Sustainable Comfort®

Contents

1 Safety

1.1 Liabilities

1.1.1 Manufacturer's liability

Our products are manufactured in compliance with the requirements of the various Directives applicable. They are therefore delivered with the CE marking and any documents necessary. In the interests of the quality of our products, we strive constantly to improve them. We therefore reserve the right to modify the specifications given in this document.

Our liability as manufacturer may not be invoked in the following cases:

- Failure to abide by the instructions on installing the appliance.
- Failure to abide by the instructions on using the appliance.
- Faulty or insufficient maintenance of the appliance.

1.1.2 Installer's liability

The installer is responsible for the installation and initial commissioning of the appliance. The installer must observe the following instructions:

- Read and follow the instructions given in the manuals provided with the appliance.
- Install the appliance in compliance with prevailing legislation and standards.
- Carry out initial commissioning and any checks necessary.
- Explain the installation to the user.
- If maintenance is necessary, warn the user of the obligation to check the appliance and keep it in good working order.
- Give all the instruction manuals to the user.

1.1.3 User's liability

To guarantee optimum operation of the system, you must abide by the following instructions:

- Read and follow the instructions given in the manuals provided with the appliance.
- Call on a qualified professional to carry out installation and initial commissioning.
- Get your installer to explain your installation to you.
- Have the required inspections and maintenance carried out by a qualified installer.
- Keep the instruction manuals in good condition close to the appliance.

2 About this manual

2.1 General

This technical information contains useful and important details for proper dimensioning of a cascade system with wall-mounted boilers. The description includes the correct use of the complete De Dietrich cascade system with MCA 160 modulating wall-mounted boilers, potentially combined with one or more MCA 45-115 boilers. Separate cascade systems are available for a combination consisting exclusively of MCA 45-115 boilers. Refer to separate cascade description.

Important
Please contact us if you have any questions or for further information about cascade configurations.

2.2 Symbols used

2.2.1 Symbols used in the manual

This manual uses various danger levels to draw attention to special instructions. We do this to improve user safety, to prevent problems and to guarantee correct operation of the appliance.

Danger
Risk of dangerous situations that may result in serious personal injury.

Danger of electric shock
Risk of electric shock.

Warning
Risk of dangerous situations that may result in minor personal injury.

Caution
Risk of material damage.

Important
Please note: important information.

See
Reference to other manuals or pages in this manual.

3 Description of the product

3.1 Cascade configuration

In many situations it is advantageous to spread the total required heat output over several boilers. This can be made possible by means of a "cascade configuration". In a cascade configuration, heating boilers are connected hydraulically. If the heat demand increases or decreases, boilers are switched on or off respectively. It is then important to determine the ideal number of boilers for the cascade. The following factors need to be taken into account when deciding on the number of boilers:

- **Investment:**
  When boilers are split up, the investment costs (boiler cost including installation, fittings, pipe work, pumps and control equipment) can work out lower or higher. However, this depends to a large extent on the situation.
- **Reliability:**
  Reliability increases with the number of boilers. Research has shown that reliability is already optimum for systems with four boilers in a cascade.
- **Efficiency:**
  There is no appreciable difference in terms of efficiency between several small or one or two larger boilers.
- **Maintenance and faults:**
  There is a greater overall risk of faults in a system with several boilers. A larger group of engineers can service and maintain smaller boilers.
- **Arrangement:**
  The compact units and therefore compact configuration means that you have more flexibility for potential boiler locations.
- **Adjustment:**
  When using several boilers and modulating control, the heat output offered is virtually equal to the heat output requested.

Important

- A number of the points mentioned are dependent on the situation and so consideration as to which solution is the best will need to be given on a project-by-project basis.

3.2 Hydraulic isolation: low-loss header

Practical experience has shown that it is beneficial to create hydraulic isolation between the boiler circuit and the system circuit using a low-loss header. This means that a widely varying volume flow on the system side hardly influences the volume flow on the boiler side at all. This also applies in reverse: a widely varying volume flow on the boiler side hardly influences the volume flow on the system side at all. Controlling several different groups hydraulically is therefore significantly easier as they do not, or barely, influence each other. This creates better overall operating conditions for the system.

3.3 De Dietrich cascade systems

In order to make it as simple as possible to create a cascade configuration, De Dietrich has included complete cascade systems in the range for some years. The compact design of the boilers, combined with the smart gas and water connection technology (no brazing) of the cascade system, makes it possible to install a high heat output system in a small area.

For example, eight MCA 160 boilers can be installed in an area of 4.4 m² (including low-loss header) to provide close to 1200 kW.

Important
Please contact us for different configurations (specials). We also provide in-depth advice on the choice of flue gas outlet material and control engineering, including for non-standard configurations.

If you want to decide on the position of the boilers and the configuration yourself, choose an independently installed cascade system. Be sure to use De Dietrich cascade components.

For more information:

See
Appendix, page 48

3.4 Main components

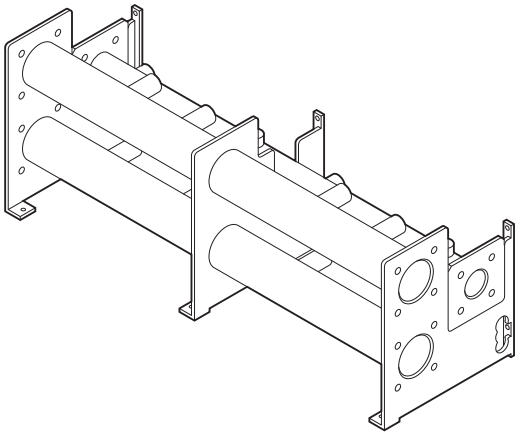
3.4.1 General

The cascade systems consist of the following components:

- Main pipes
- Low-loss header
- Boiler pump
- Boiler connection kits
- Free-standing frames
- Accessories

3.4.2 Main pipes

Fig.1 Main pipe



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The main pipes consist of: main supply, return and gas pipes.

By connecting main pipes, it is possible to extend the system to a maximum of 8 boilers in a linear configuration or 2 x 4 boilers in a back-to-back configuration.

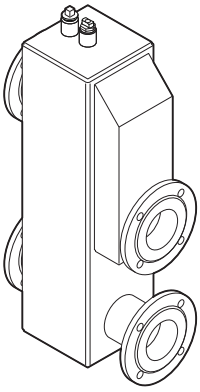
In a linear configuration, the rear connections must be capped off using the caps supplied. In a back-to-back configuration with an odd number of boilers, the unused connections must also be capped off.

Diameter of supply and return pipes 100 mm:

- Main pipes for 2 (4) boilers with gas pipe DN 65
- Main pipes for 3 (6) boilers with gas pipe DN 65

3.4.3 Low-loss header

Fig.2 Low-loss header DN65



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The low-loss headers have the following connecting flanges:

- Low-loss header for main pipes with diameter = 65 mm up to a heat output of 350 kW
  Connection DN 65/DIN 2631 (4 holes)
- Low-loss header for main pipes with diameter = 65 mm up to a heat output of 350 - 460 kW
  Connection DN 65/DIN 2631 (4 holes)

Fig.3 Low-loss header DN100

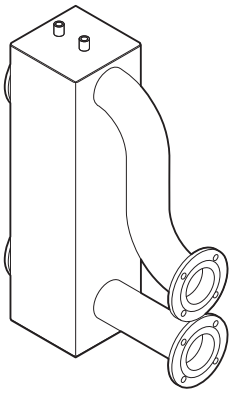

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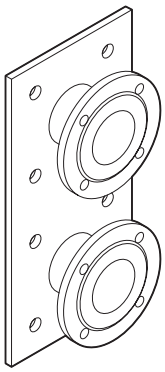
Fig.4 Adapter DN 65 —> DN 100



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Important
In the case of DN 65 low-loss headers, an adapter is supplied in order to be able to close the DN 100 flanges of the collector pipe kit in the MCA 160 cascade.

3.4.4 Boiler pump

An energy-saving, modulating pump is supplied with cascade systems for each MCA 160 boiler and any MCA 45-115 45, 65, 90 or 115 boiler.

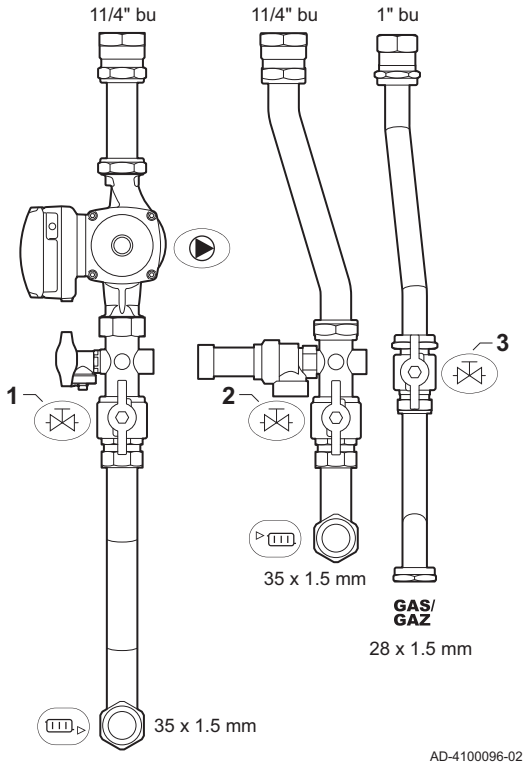
Important
The boiler connection kits include the required glands.

3.4.5 Boiler connection kits

The boiler connection kit consists of service shut-off valves in the flow, return and gas pipes and also include the pipes between boiler and main pipes. In a back-to-back configuration, the length of the pipes that go to the rearmost row of boilers has been adjusted to the correct length. It is assumed that, when an odd number of boilers are supplied, the larger number of boilers is mounted on the front. The service shut-off valve in the return includes a non-return valve, filling and drain cock and expansion vessel connection, for example. The safety valve is included. Supply and return T-pieces are supplied for systems with calorifier connection, so the installer can work from there towards the calorifier. The calorifier should be boosted by a pump (not supplied, nor the required non-return valve).

■ Connection kit with pump

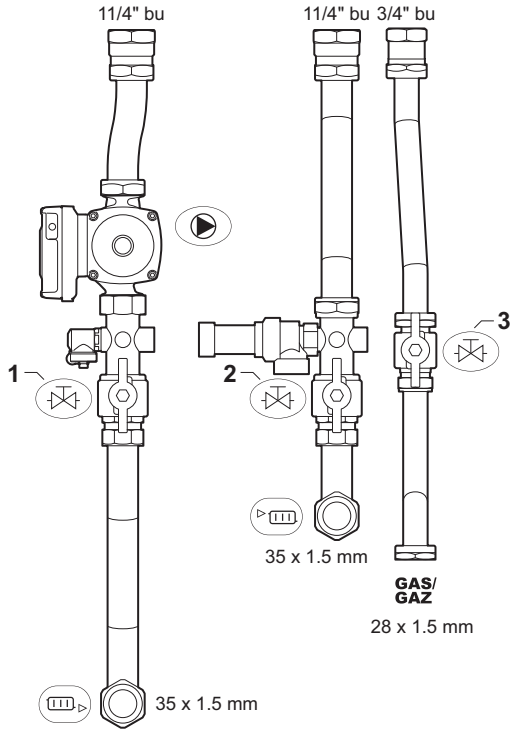
Fig.5 Connection kit with MCA 160 pump



Connection kit with pump for the MCA 160

- Flow connection: (1¼" female thread to boiler and 35 x 1.5 mm to main pipe)
- Return connection: (1¼" female thread to boiler and 35 x 1.5 mm to main pipe)
- GAS/GAZ Gas connection: (1" female thread to boiler and 28 x 1.5 mm to main pipe)
- Boiler pump
- **1** Ball valve, non-return valve, expansion vessel connection (½" male thread) and filling/drain cock in return pipe
- **2** Ball valve in supply pipe as well as safety valve
- **3** Gas valve

Fig.6 Connection kit with MCA 45-115 pump

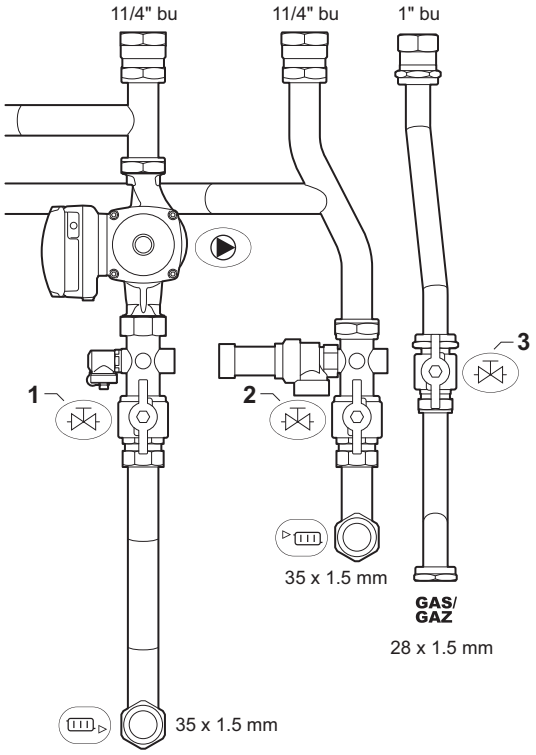


Connection kit with pump for the MCA 45-115

- Flow connection: (1¼" female thread to boiler and 35 x 1.5 mm to main pipe)
- Return connection: (1¼" female thread to boiler and 35 x 1.5 mm to main pipe)
- GAS/GAZ Gas connection: (¾" female thread to boiler and 28 x 1.5 mm to main pipe)
- Boiler pump
- **1** Ball valve, non-return valve, expansion vessel connection (½" male thread) and filling/drain cock in return pipe
- **2** Ball valve in supply pipe as well as safety valve
- **3** Gas valve

■ Connection kit for calorifier

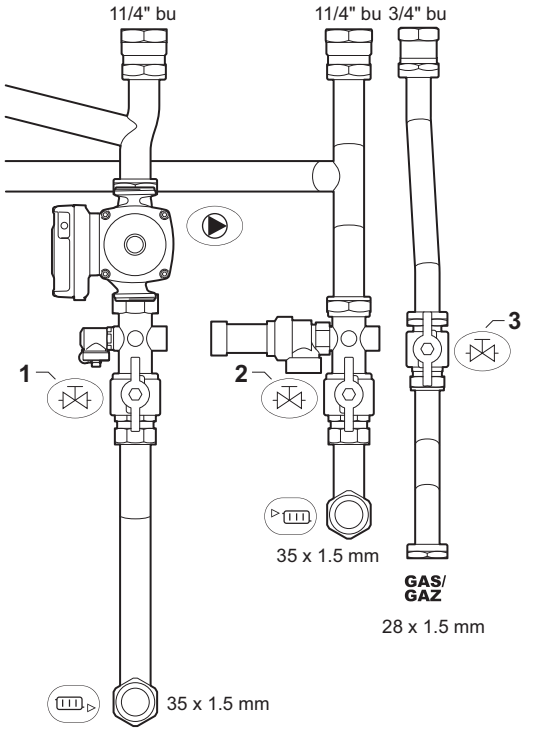
Fig.7 Connection kit for MCA 160 calorifier



Connection kit for calorifier with MCA 160

- Flow connection: (1¼" female thread to boiler and 35 x 1.5 mm to main pipe)
- Return connection: (1¼" female thread to boiler and 35 x 1.5 mm to main pipe)
- GAS/GAZ Gas connection: (1" female thread to boiler and 28 x 1.5 mm to main pipe)
- Boiler pump
- **1** Ball valve, non-return valve, expansion vessel connection (½" male thread) and filling/drain cock in return pipe
- **2** Ball valve in supply pipe as well as safety valve
- **3** Gas valve

Fig.8 Connection kit for MCA 45-115 calorifier

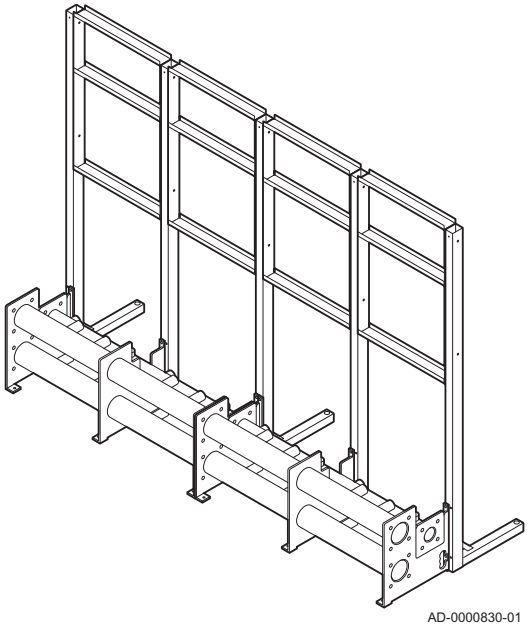


Connection kit for calorifier with MCA 45-115

- Flow connection: (1¼" female thread to boiler and 35 x 1.5 mm to main pipe)
- Return connection: (1¼" female thread to boiler and 35 x 1.5 mm to main pipe)
- GAS/GAZ Gas connection: (¾" female thread to boiler and 28 x 1.5 mm to main pipe)
- Boiler pump
- **1** Ball valve, non-return valve, expansion vessel connection (½" male thread) and filling/drain cock in return pipe
- **2** Ball valve in supply pipe as well as safety valve
- **3** Gas valve

3.4.6 Free-standing frames

Fig.9 Frames

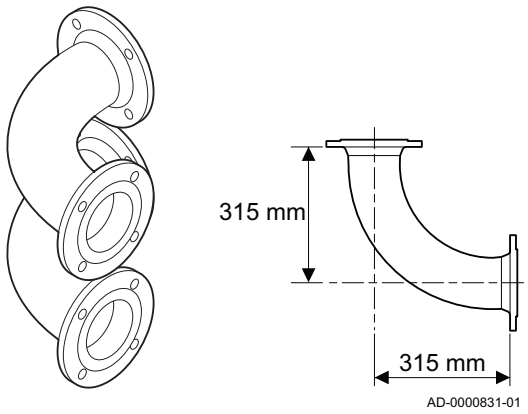


The free-standing frames consist of a combination of I and/or L poles with an intermediate frame. 1 intermediate frame is required per boiler. The L poles have bolt holes for fixing to the floor. The frame has two fitting brackets. The top bracket should be used with a MCA 160 boiler and the bottom bracket for a MCA 45-115 boiler L poles are only required if boilers are mounted at the rear of the frame (for a back-to-back configuration). Only I poles are used with linear configurations. The top of the frame can be used as a cableway. The nuts and bolts required are included with the delivery, along with installation instructions. Fastenings for fixing to the floor are not included.

3.5 Accessories and options

3.5.1 Accessories

Fig.10 Elbow kit



- Elbow kit for angled connection of the low-loss header in 65 and 100 mm diameters
- Connecting flanges DN 65 and DN 100 for system side of the low-loss header

Important
Depending on the system resistance, it may be necessary to switch to a larger pipe diameter after the connecting flanges of the low-loss header.

- Insulation for low-loss header, low-loss header elbow, connection kits and main pipes.
- DN 65 gas filter
- Gas filter expansion piece (for mounting gas filter next to low-loss header) DN 65 (to be used if gas filter mounted on the same side as the low-loss header with elbows or low-loss header with insulation).
- Temperature sensor including thermostat pocket for low-loss header.
- Adjustable feet
- Calorifier connection

4 Before installation

4.1 Installation requirements

4.1.1 Points to consider for boiler replacement

If the boiler output is reduced, the water flow rate will need to be adjusted accordingly. Imagine that 4 MCA 160 boilers are connected in a cascade. The total water flow rate is then 4 x 6.38 = 25.5 m^3/h (at ΔT= 20° C). If the water is now pumped around the system at 32.7 m^3/h, it flows in the low-loss header from the return to the supply line at 7.42 m^3/h. The ΔT in the system is then 25.5/32.7 times as great as on the boiler side. If the boilers heat to 90/70° C, the system then heats with a supply temperature of +/- 85° C. Most heat-output elements (such as radiators) have an exponential curve. This means that a lower supply temperature results in much less heat output. This can lead to complaints about the cold. The solution is to match the flow rate in the system to the flow rate in the boilers. A lower supply temperature is then worse than a lower water flow rate, especially for the heat-output elements, where a high water temperature is required.

4.1.2 Cascade system structures

The return, flow, and gas connections of the individual boilers are connected using the fittings supplied by means of horizontal connections to main pipes for return, flow and gas. These pipes are welded onto a frame that rests on the floor and is fixed to the wall or to a free-standing frame. The low-loss header supplied has flange connections, which can be fitted to the left or right of the cascade main pipe as required. The blind flanges supplied are then fitted on the other side. The gas main pipe has a flange to which the optional gas filter can also be connected on the left or right as required. When a gas filter is used, a pressure drop of 3 mbar over the gas filter must be taken into account. The minimum gas pressure after the gas filter is 20 mbar for L gas and 17 mbar for H gas. A common PVC condensed water discharge pipe (not supplied) can be installed in the frame. For this purpose, holes have been made in the frame into which this pipe can be fitted (to the left or right as required) sloping downwards.

Important
Any mix of MCA 160 and MCA 45-115 boilers is possible. This manual focuses on the combination of MCA 160 boilers. Separate cascade systems are available for combination consisting exclusively of MCA 45-115 boilers.
See table for outputs of the different boilers.

Tab.1 Boiler outputs

Boiler type	Nominal output [kW]	
	50/30° C	80/60° C
MCA 45-115 45	43	40
MCA 45-115 65	65	61
MCA 45-115 90	89.5	84.2
MCA 45-115 115	114	107
MCA 160	157	148

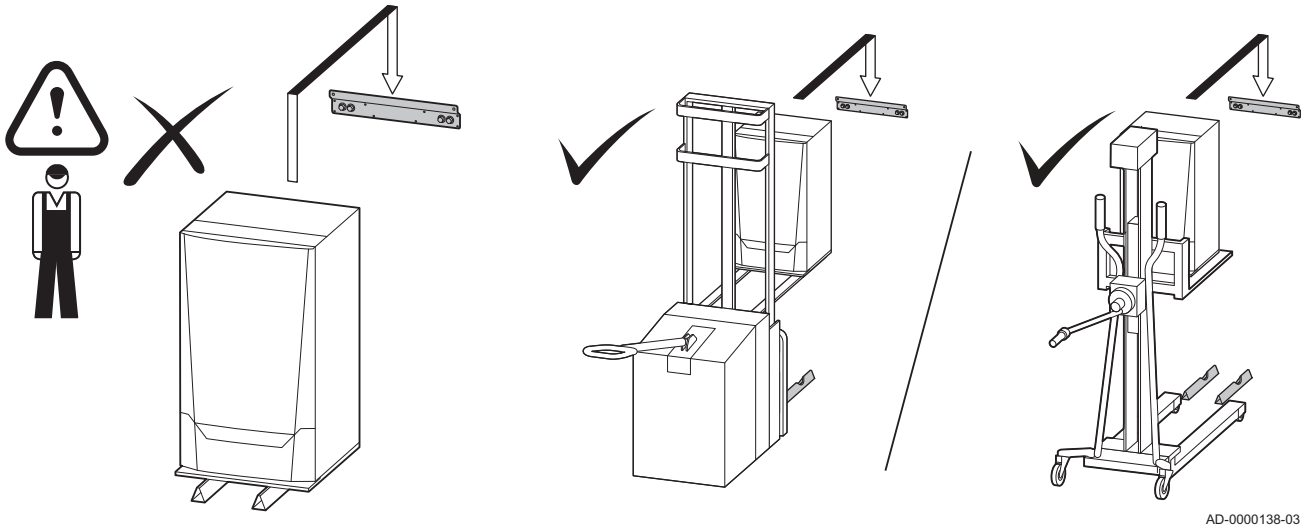
4.2 Choice of the location

4.2.1 Boiler room

One or more boilers with a combined load less than 130 kW maximum can, if required, be located in a boiler or operations room. A cascade system with a total maximum load of more than 130 kW must comply with the regulations that apply to boiler rooms.

4.2.2 Installation area and dimensions

Fig.11 Lifting aids



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Select the desired combination of boilers on the basis of the required heat output. We advise leaving 1 m of free space at the front of the units. The distance between individual boilers is 3 cm. A wall bracket is supplied for wall-mounted linear configurations. This must be mounted at a height as specified in the installation manual supplied with the cascade system. We recommend a clearance of at least 50 cm above the units. This distance also depends on any installation of flue gas outlet and air supply collector pipes. Consult the flue gas tables.

The weight of the MCA 160 boiler exceeds the maximum lift weight for one person. We recommend the use of a lifting aid.

4.3 Connecting diagrams

4.3.1 General

The cascade systems can be divided into 3 main groups:

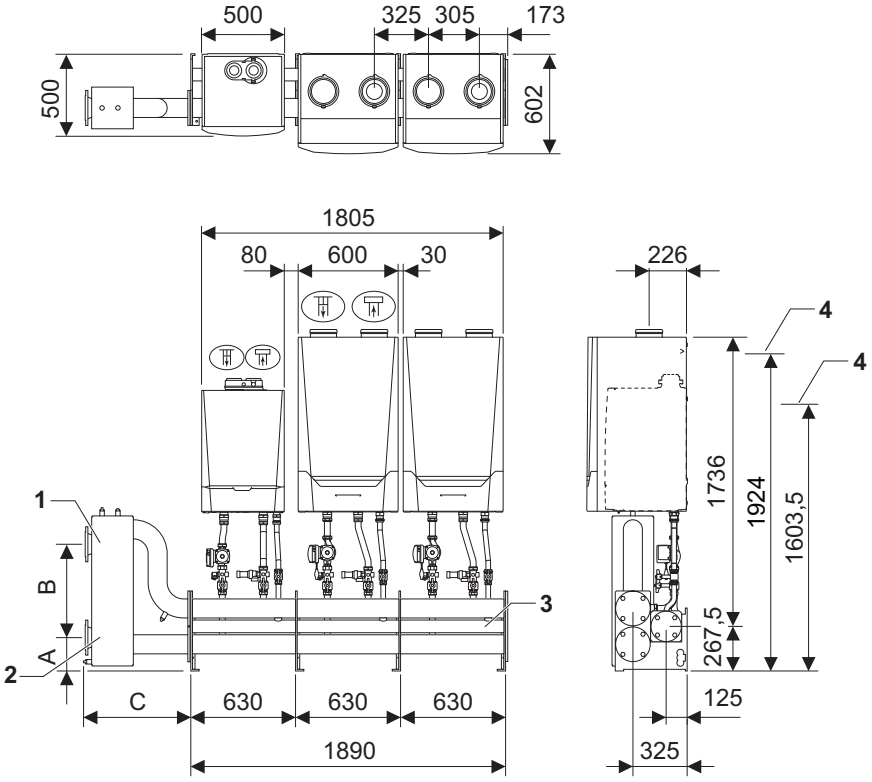
- 2 to 8 boilers in a linear configuration, wall mounted (LW)
- 2 to 8 boilers in a linear configuration, mounted on a free-standing frame (LV)
- 3 to 8 boilers in a back-to-back configuration, mounted on a free-standing frame (RG)

For each main group, the first listing is a sample configuration for two MCA 160 boilers and one MCA 45-115 boiler. Of course, many more configurations are possible but they would be too numerous to include in this technical information.

4.3.2 Linear, wall-mounted - LW

■ **Sample configuration drawing with 3 LW boilers; 2 x MCA 160 and 1 x MCA 45-115.**

Fig.12 3 LW boilers



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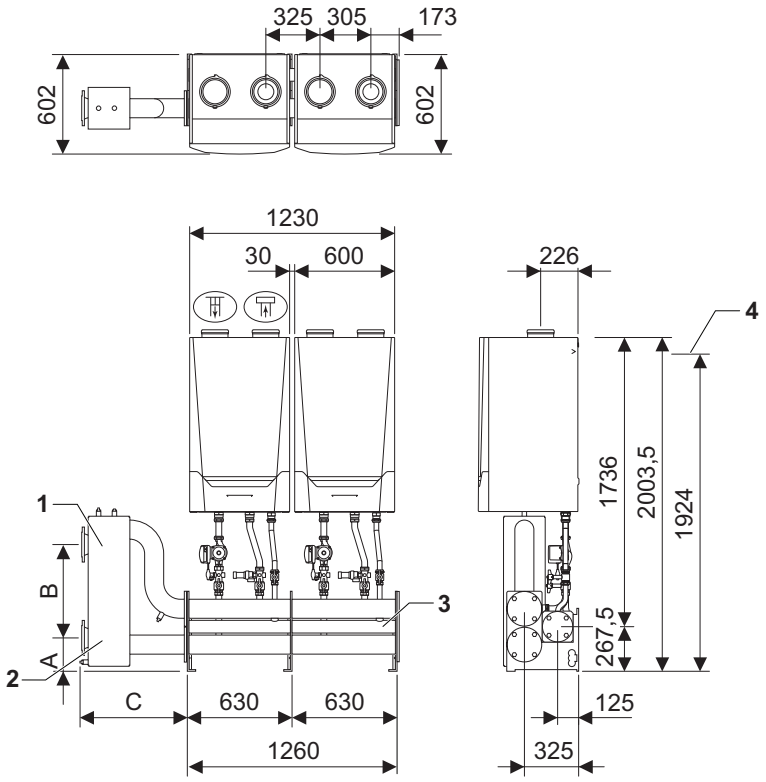
1 System water supply; connection DN 65/DIN 2631 (4 holes)
2 System return; connection DN 65/DIN 2631 (4 holes)
3 Gas supply connection DN 65/DIN 2633 (4 holes)
4 Suspension points
Air supply 150 mm
Flue gas outlet 150 mm

A System flow centre line = 330 mm up to 350 kW and 560 mm above 350 kW
B System return centre line = 210 mm to 350 kW and 200 mm above 350 kW
C Low-loss header; DN 65 connection with adapter to DIN 100 = 361 mm to 350 kW and 701 mm above 350 kW

■ Configuration drawing for 2 boilers - LW

Fig.13 2 LW boilers



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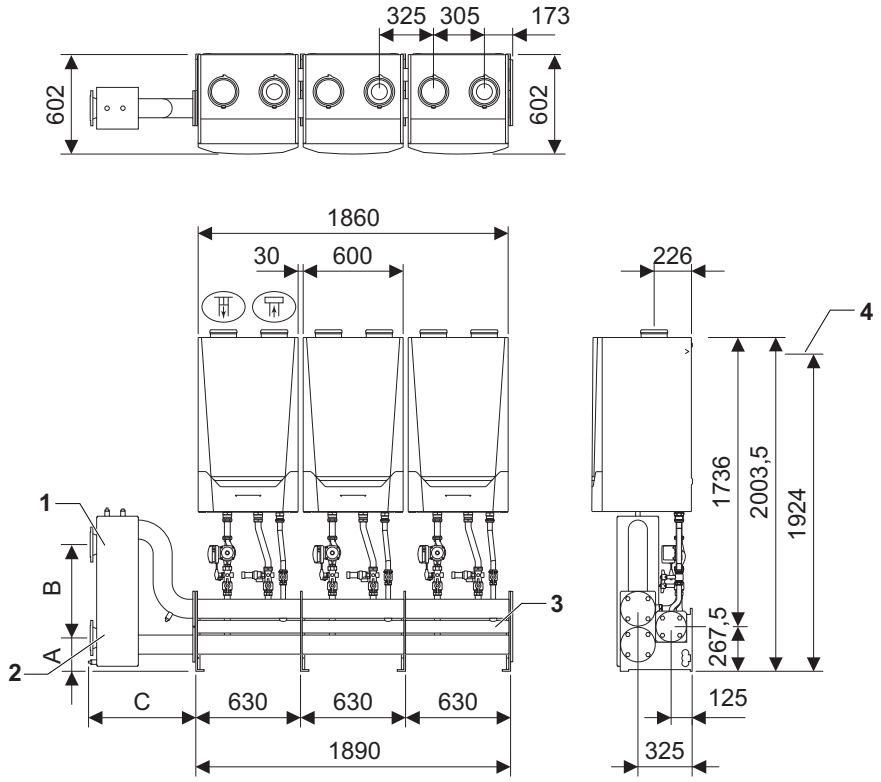
1 System water supply; connection DN 65/DIN 2631 (4 holes)
2 System return; connection DN 65/DIN 2631 (4 holes)
3 Gas supply connection DN 65/DIN 2633 (4 holes)
4 Suspension points
Air supply 150 mm
Flue gas outlet 150 mm
A System flow centre line = 330 mm
B System return centre line = 210 mm
C Low-loss header; DN 65 connection with adapter from DIN 65 to DIN 100 = 361 mm

■ Configuration drawing for 3 boilers - LW

Fig.14 3 LW boilers



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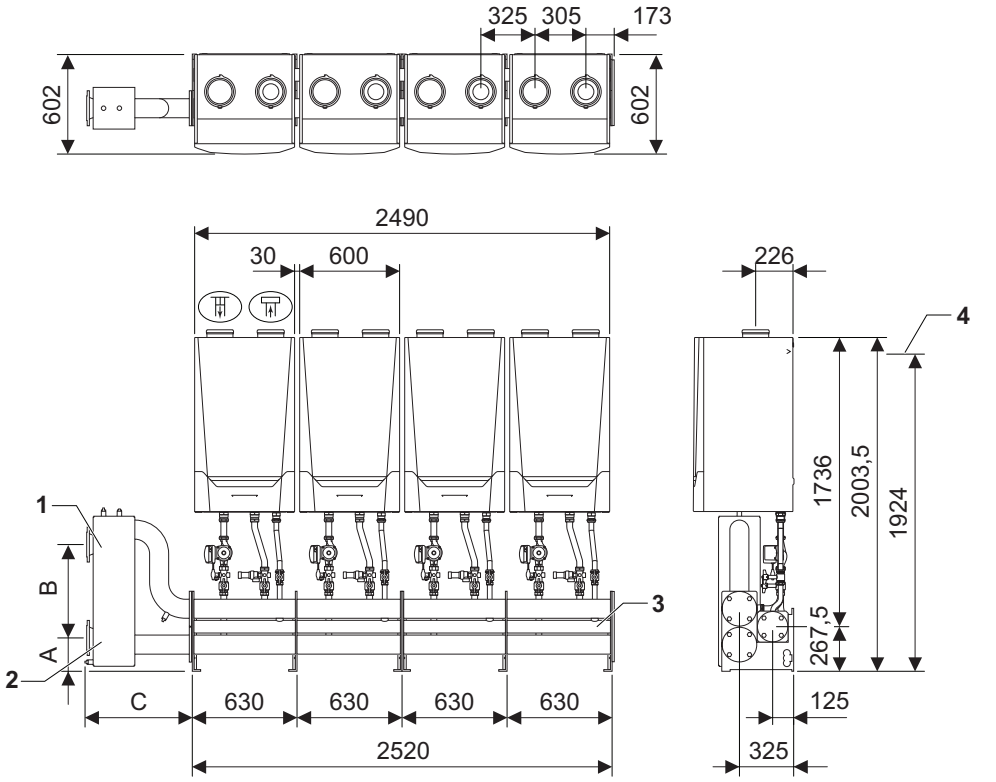
1 System water supply; connection DN 65/DIN 2631 (4 holes)
2 System return; connection DN 65/DIN 2631 (4 holes)
3 Gas supply connection DN 65/DIN 2633 (4 holes)
4 Suspension points
Air supply 150 mm
Flue gas outlet 150 mm

A System flow centre line = 330 mm up to 350 kW and 560 mm above 350 kW
B System return centre line = 210 mm to 350 kW and 200 mm above 350 kW
C Low-loss header; DN 65 connection with adapter to DIN 100 = 361 mm to 350 kW and 701 mm above 350 kW

■ Configuration drawing for 4 boilers - LW

Fig.15 4 LW boilers

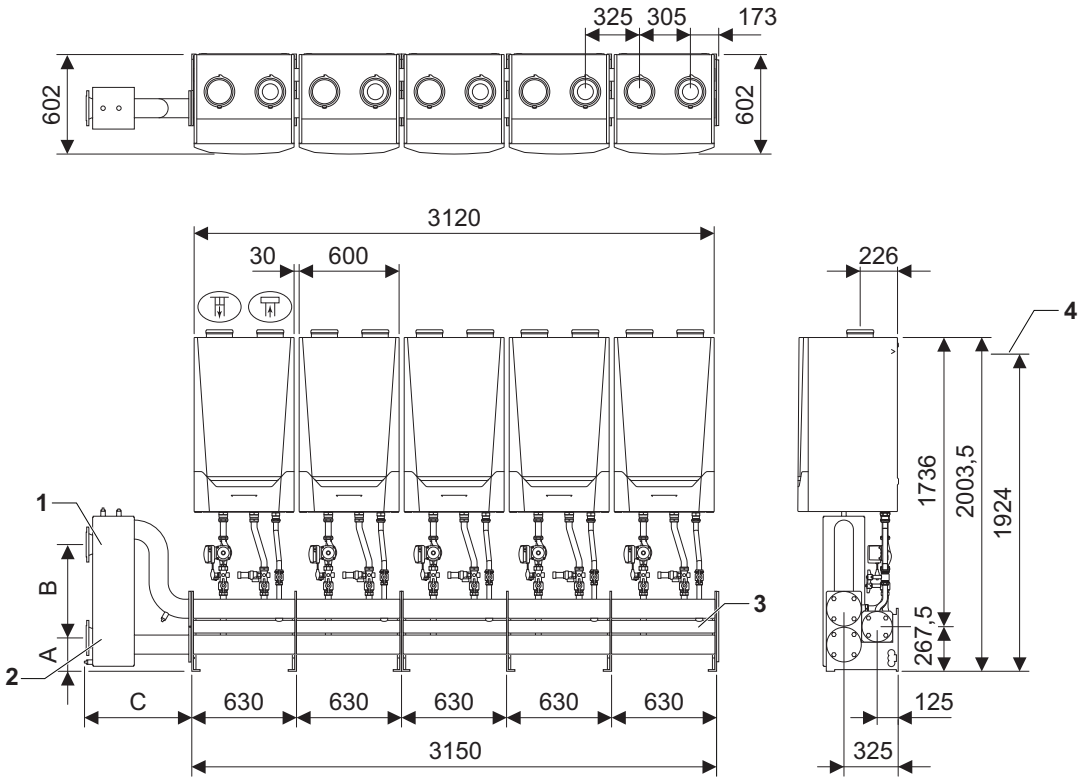


1 System water supply; DN 100/DIN 2631 connection (4 holes)
2 System water supply; DN 100/DIN 2631 connection (4 holes)
3 Gas supply connection DN 65/DIN 2633 (4 holes)
4 Suspension points

Air supply 150 mm
Flue gas outlet 150 mm
A System flow centre line = 560 mm
B System return centre line = 200 mm
C Low-loss header; DN 100 = 633 mm connection

■ Configuration drawing for 5 boilers - LW

Fig.16 5 LW boilers

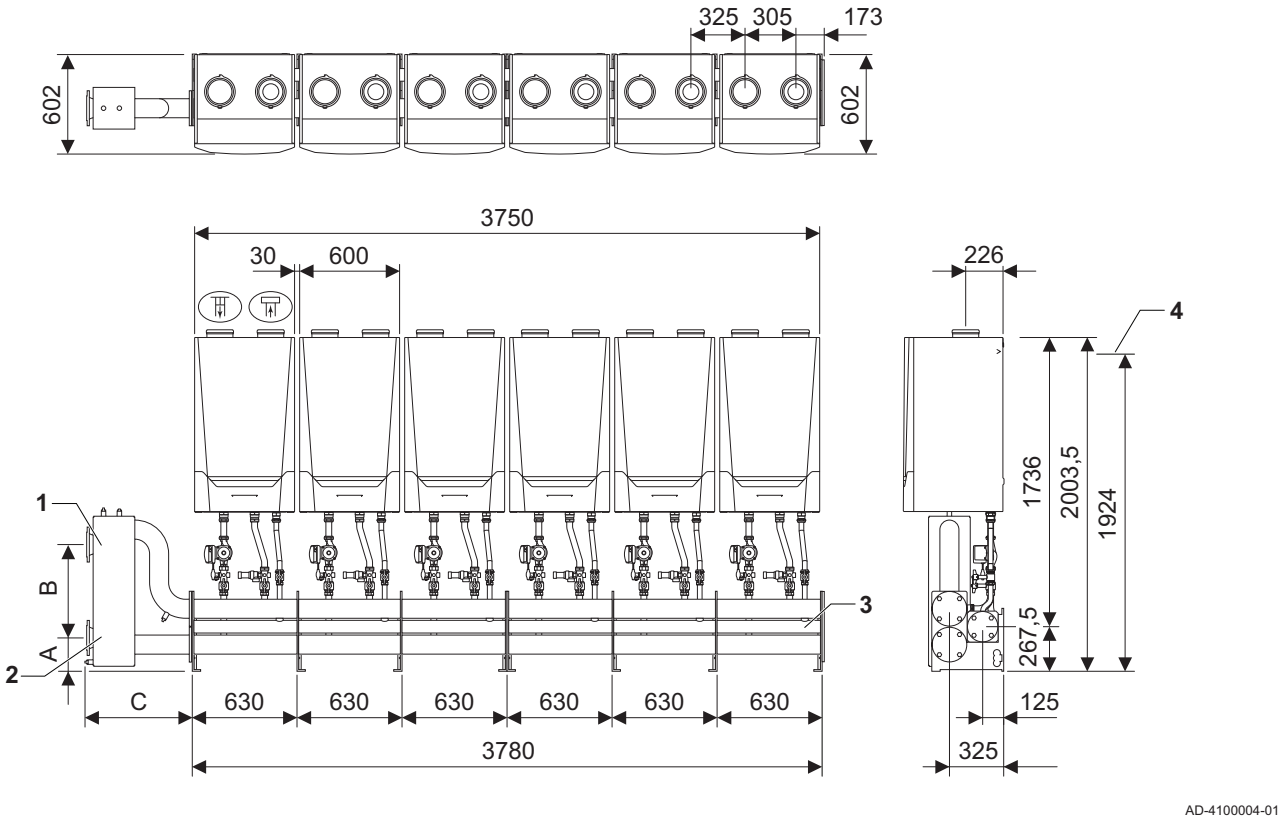


1 System water supply; DN 100/DIN 2631 connection (4 holes)
2 System water supply; DN 100/DIN 2631 connection (4 holes)
3 Gas supply connection DN 65/DIN 2633 (4 holes)
4 Suspension points

Air supply 150 mm
Flue gas outlet 150 mm
A System flow centre line = 560 mm
B System return centre line = 200 mm
C Low-loss header; DN 100 = 633 mm connection

■ Configuration drawing for 6 boilers - LW

Fig.17 6 LW boilers

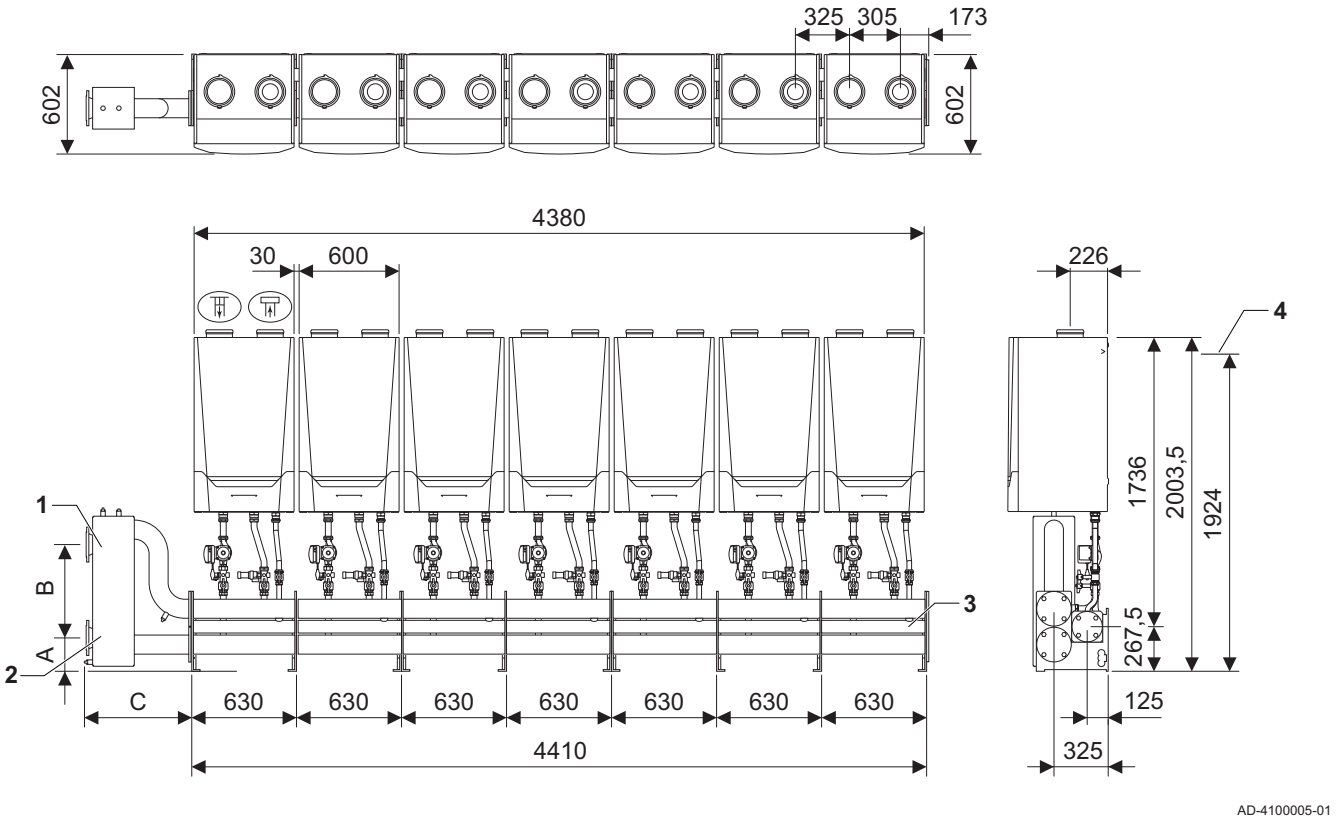


1 System water supply; DN 100/DIN 2631 connection (4 holes)
2 System water supply; DN 100/DIN 2631 connection (4 holes)
3 Gas supply connection DN 65/DIN 2633 (4 holes)
4 Suspension points

Air supply 150 mm
Flue gas outlet 150 mm
A System flow centre line = 560 mm
B System return centre line = 200 mm
C Low-loss header; DN 100 = 633 mm connection

■ Configuration drawing with 7 boilers - LW

Fig.18 7 LW boilers

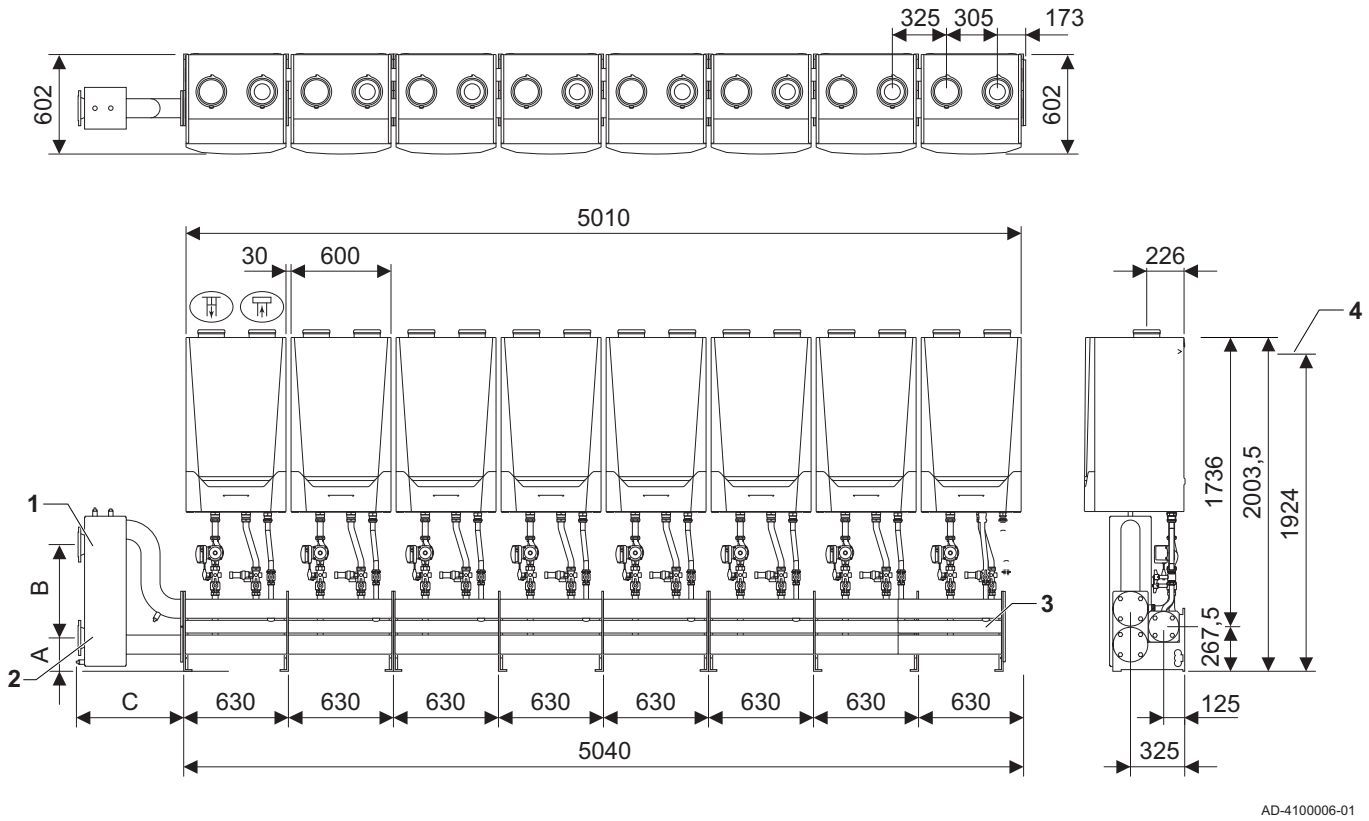


1 System water supply; DN 100/DIN 2631 connection (4 holes)
2 System water supply; DN 100/DIN 2631 connection (4 holes)
3 Gas supply connection DN 65/DIN 2633 (4 holes)
4 Suspension points

Air supply 150 mm
Flue gas outlet 150 mm
A System flow centre line = 560 mm
B System return centre line = 200 mm
C Low-loss header; DN 100 = 633 mm connection

■ Configuration drawing for 8 boilers - LW

Fig.19 8 LW boilers



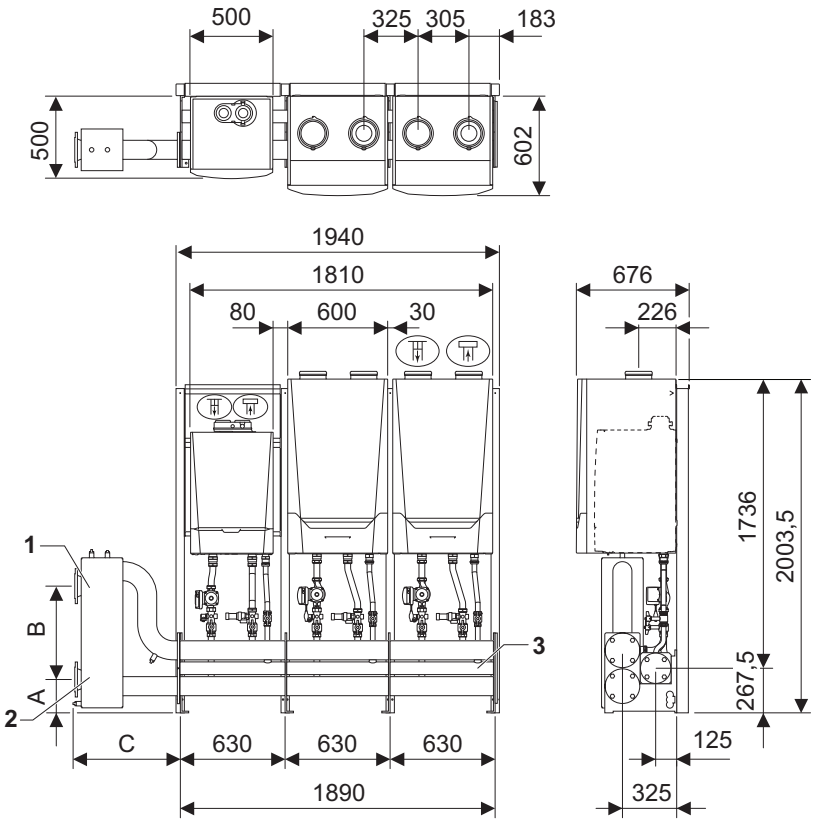
1 System water supply; DN 100/DIN 2631 connection (4 holes)
2 System water supply; DN 100/DIN 2631 connection (4 holes)
3 Gas supply connection DN 65/DIN 2633 (4 holes)
4 Suspension points

Air supply 150 mm
Flue gas outlet 150 mm
A System flow centre line = 560 mm
B System return centre line = 200 mm
C Low-loss header; DN 100 = 633 mm connection

4.3.3 Linear, free-standing - LV

■ **Sample configuration drawing with 3 LV (linear, free-standing) boilers; 2 x MCA 160 and 1 x MCA 45-115.**

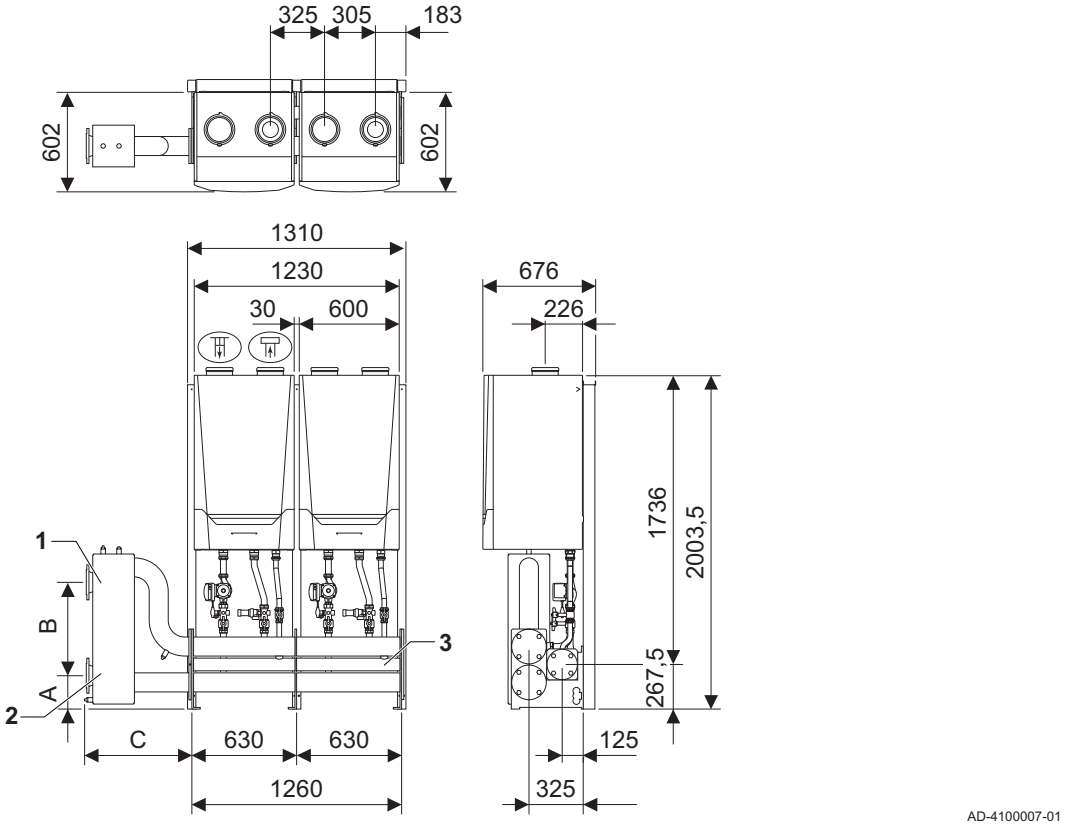
Fig.20 3 LV boilers



1 System water supply; connection DN 65/DIN 2631 (4 holes)
2 System return; connection DN 65/DIN 2631 (4 holes)
3 Gas supply connection DN 65/DIN 2633 (4 holes)
Air supply 150 mm
Flue gas outlet 150 mm
A System flow centre line = 330 mm up to 350 kW and 560 mm above 350 kW
B System return centre line = 210 mm to 350 kW and 200 mm above 350 kW
C Low-loss header; DN 65 connection with adapter to DIN 100 = 361 mm to 350 kW and 701 mm above 350 kW

■ Configuration drawing with 2 boilers - LV

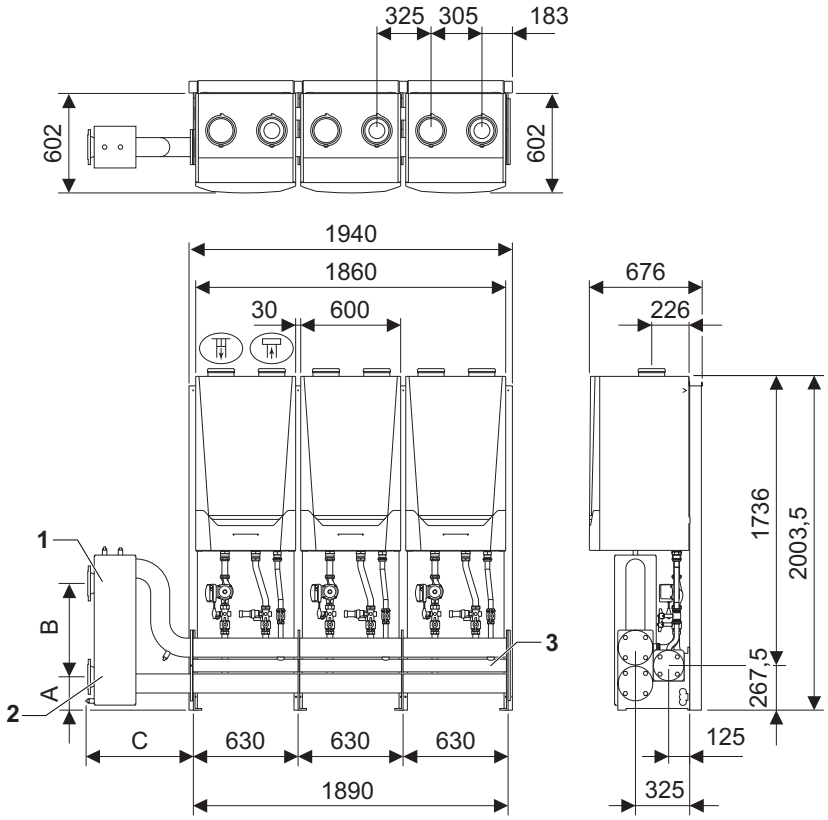
Fig.21 2 LV boilers



1 System water supply; connection DN 65/DIN 2631 (4 holes)
2 System return; connection DN 65/DIN 2631 (4 holes)
3 Gas supply connection DN 65/DIN 2633 (4 holes)
Air supply 150 mm
Flue gas outlet 150 mm
A System flow centre line = 330 mm
B System return centre line = 210 mm
C Low-loss header; DN 65 connection with adapter from DIN 65 to DIN 100 = 361 mm

■ Configuration drawing for 3 boilers - LV

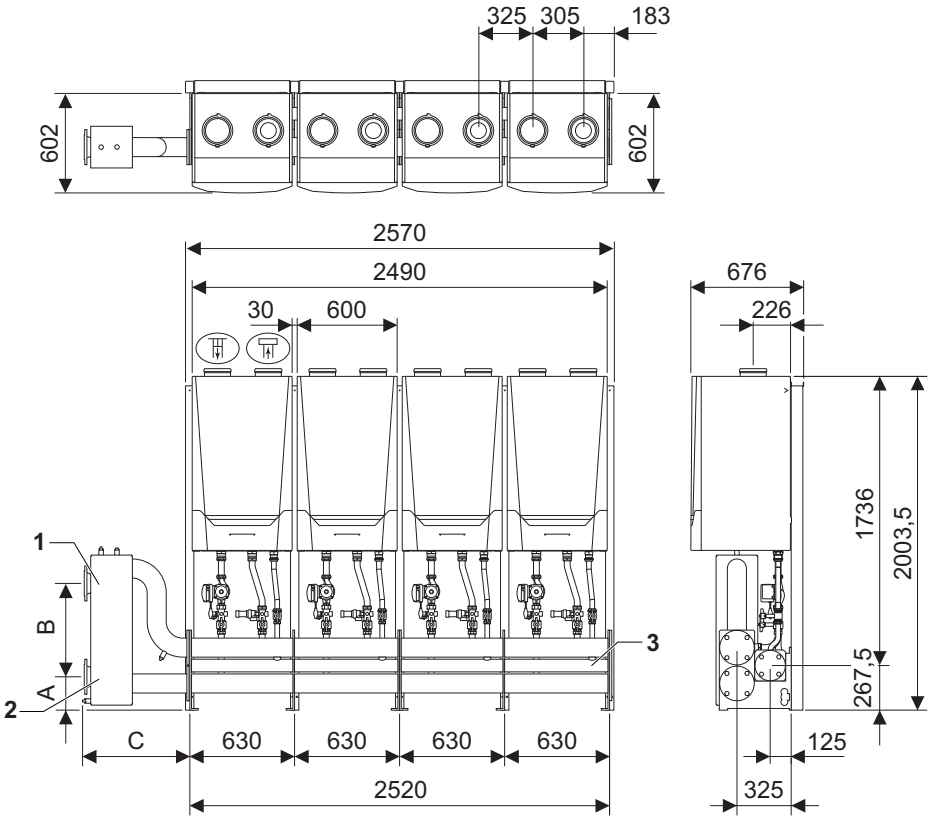
Fig.22 3 LV boilers



1 System water supply; connection DN 65/DIN 2631 (4 holes)
2 System return; connection DN 65/DIN 2631 (4 holes)
3 Gas supply connection DN 65/DIN 2633 (4 holes)
Air supply 150 mm
Flue gas outlet 150 mm
A System flow centre line = 330 mm up to 350 kW and 560 mm above 350 kW
B System return centre line = 210 mm to 350 kW and 200 mm above 350 kW
C Low-loss header; DN 65 connection with adapter to DIN 100 = 361 mm to 350 kW and 701 mm above 350 kW

■ Configuration drawing with 4 boilers - LV

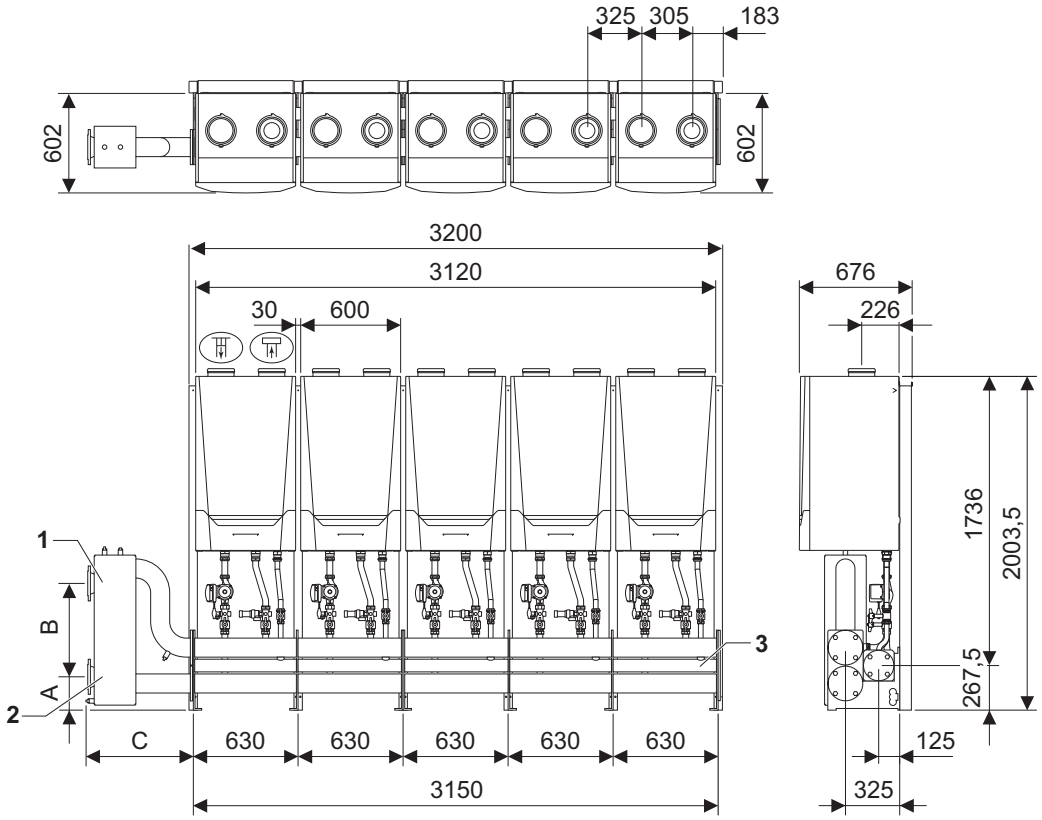
Fig.23 4 LV boilers



1 System water supply; DN 100/DIN 2631 connection (4 holes)
2 System water supply; DN 100/DIN 2631 connection (4 holes)
3 Gas supply connection DN 65/DIN 2633 (4 holes)
Air supply 150 mm
Flue gas outlet 150 mm
A System flow centre line = 560 mm
B System return centre line = 200 mm
C Low-loss header; DN 100 = 633 mm connection

■ Configuration drawing with 5 boilers - LV

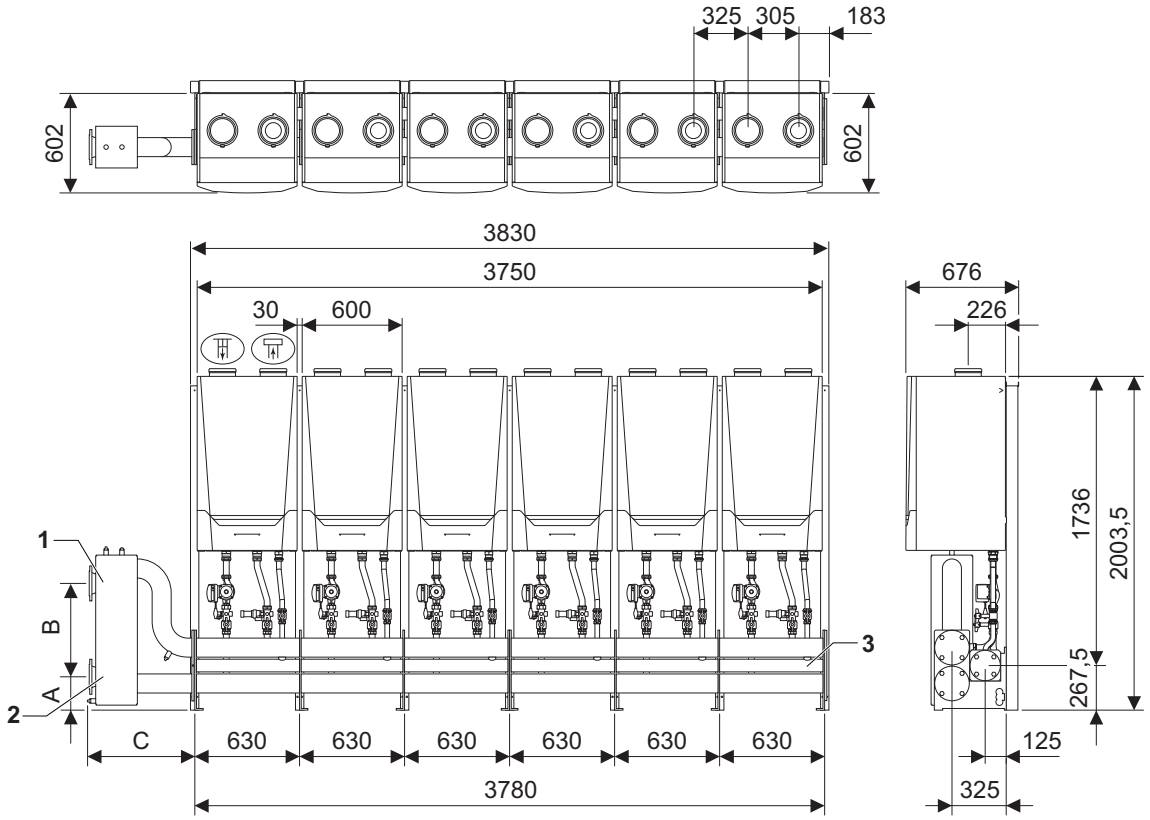
Fig.24 5 LV boilers



1 System water supply; DN 100/DIN 2631 connection (4 holes)
2 System water supply; DN 100/DIN 2631 connection (4 holes)
3 Gas supply connection DN 65/DIN 2633 (4 holes)
Air supply 150 mm
Flue gas outlet 150 mm
A System flow centre line = 560 mm
B System return centre line = 200 mm
C Low-loss header; DN 100 = 633 mm connection

■ Configuration drawing with 6 boilers - LV

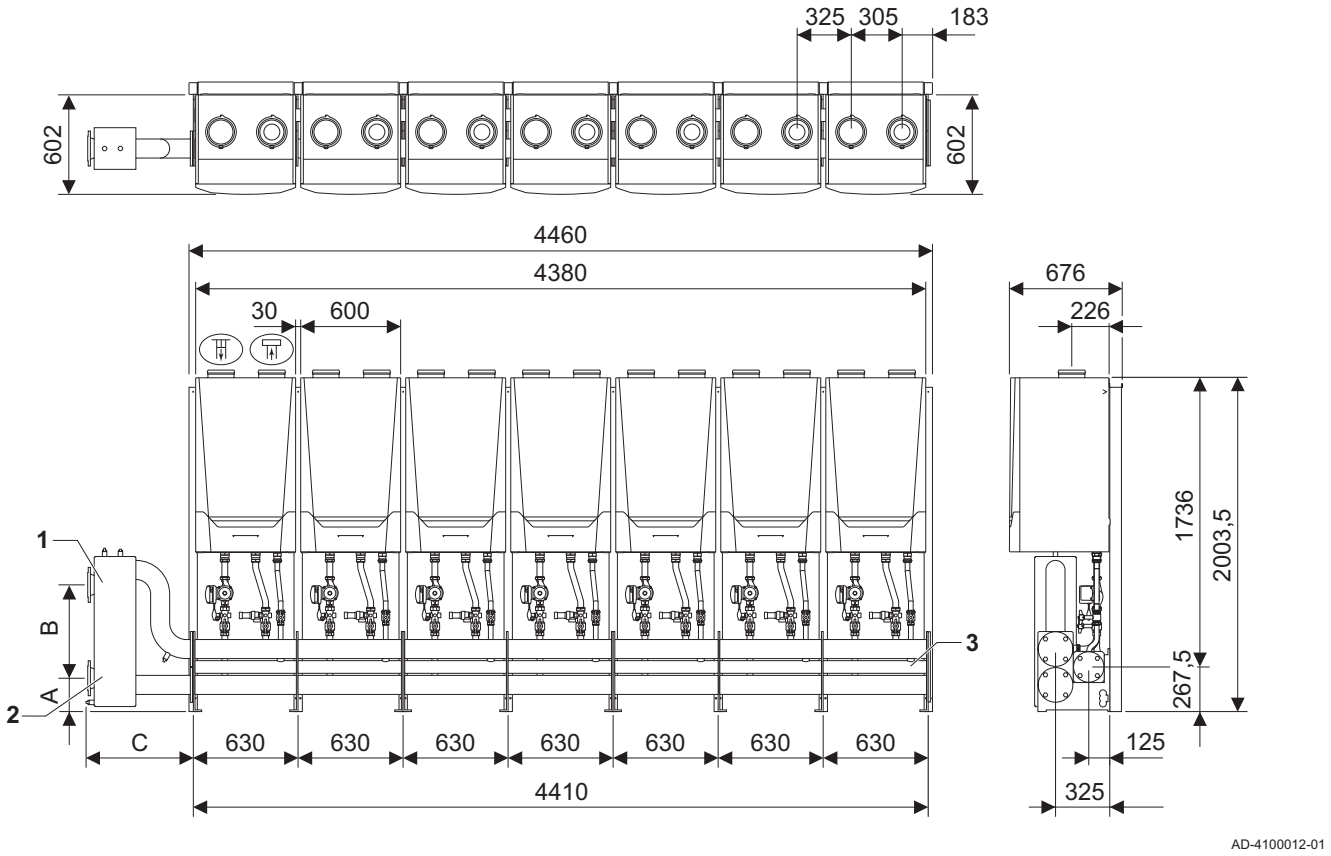
Fig.25 6 LV boilers



1 System water supply; DN 100/DIN 2631 connection (4 holes)
2 System water supply; DN 100/DIN 2631 connection (4 holes)
3 Gas supply connection DN 65/DIN 2633 (4 holes)
Air supply 150 mm
Flue gas outlet 150 mm
A System flow centre line = 560 mm
B System return centre line = 200 mm
C Low-loss header; DN 100 = 633 mm connection

■ Configuration drawing with 7 boilers - LV

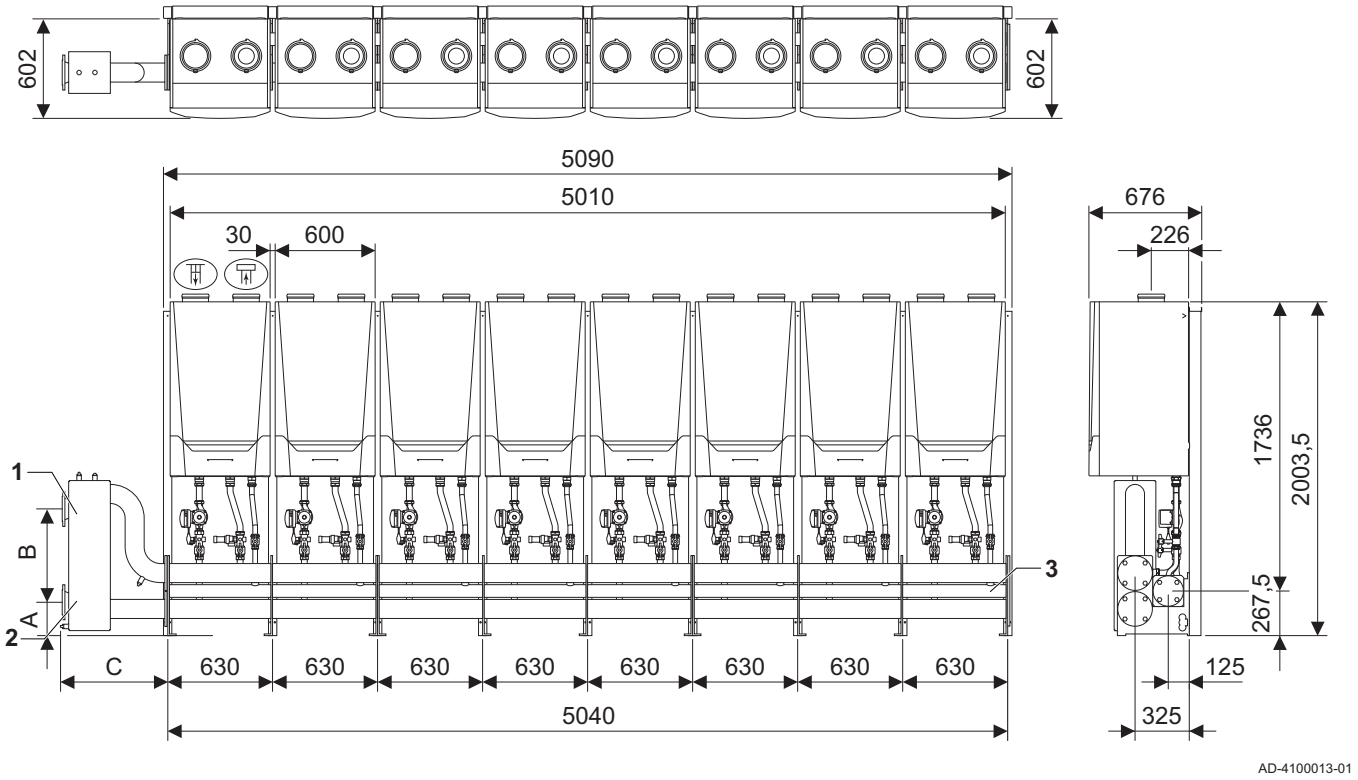
Fig.26 7 LV boilers



1 System water supply; DN 100/DIN 2631 connection (4 holes)
2 System water supply; DN 100/DIN 2631 connection (4 holes)
3 Gas supply connection DN 65/DIN 2633 (4 holes)
Air supply 150 mm
Flue gas outlet 150 mm
A System flow centre line = 560 mm
B System return centre line = 200 mm
C Low-loss header; DN 100 = 633 mm connection

■ Configuration drawing with 8 boilers - LV

Fig.27 8 LV boilers

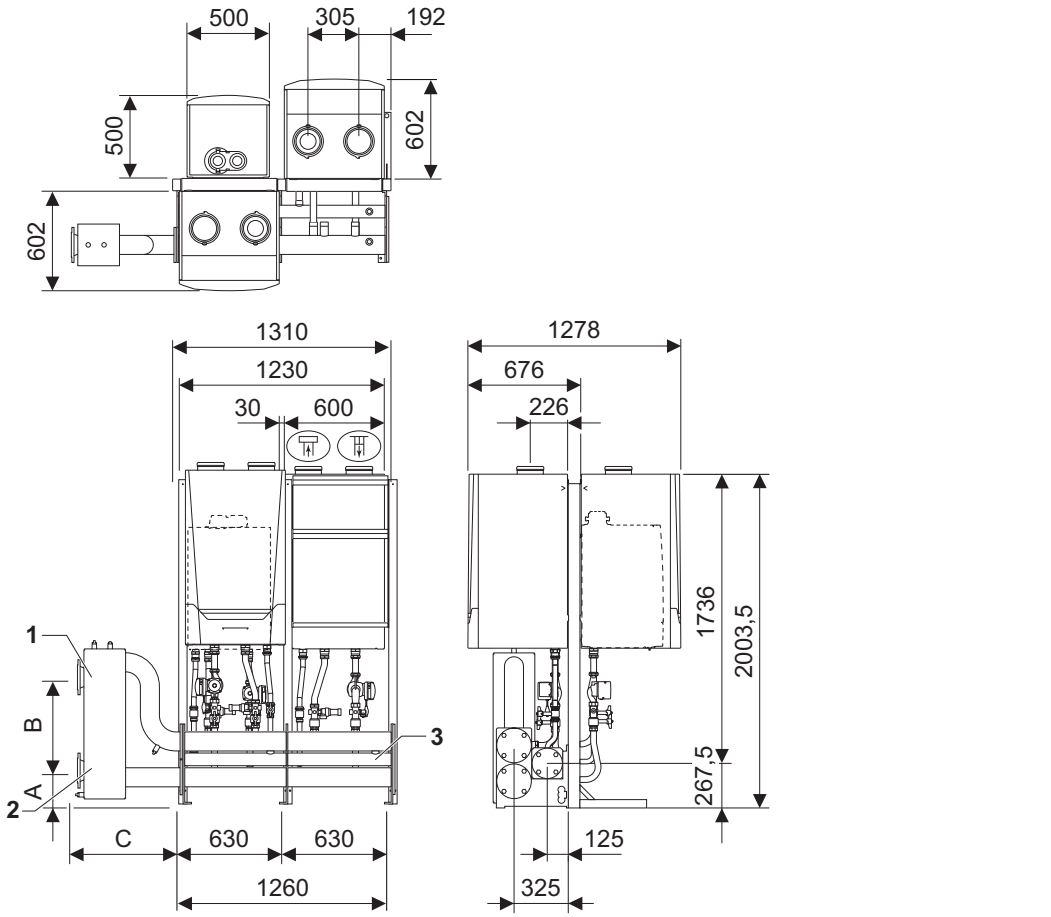


1 System water supply; DN 100/DIN 2631 connection (4 holes)
2 System water supply; DN 100/DIN 2631 connection (4 holes)
3 Gas supply connection DN 65/DIN 2633 (4 holes)
Air supply 150 mm
Flue gas outlet 150 mm
A System flow centre line = 560 mm
B System return centre line = 200 mm
C Low-loss header; DN 100 = 633 mm connection

4.3.4 Back-to-back configuration - RG

■ **Sample configuration drawing with 3 RG boilers; 2 x MCA 160 and 1 x MCA 45-115.**

Fig.28 3 RG boilers



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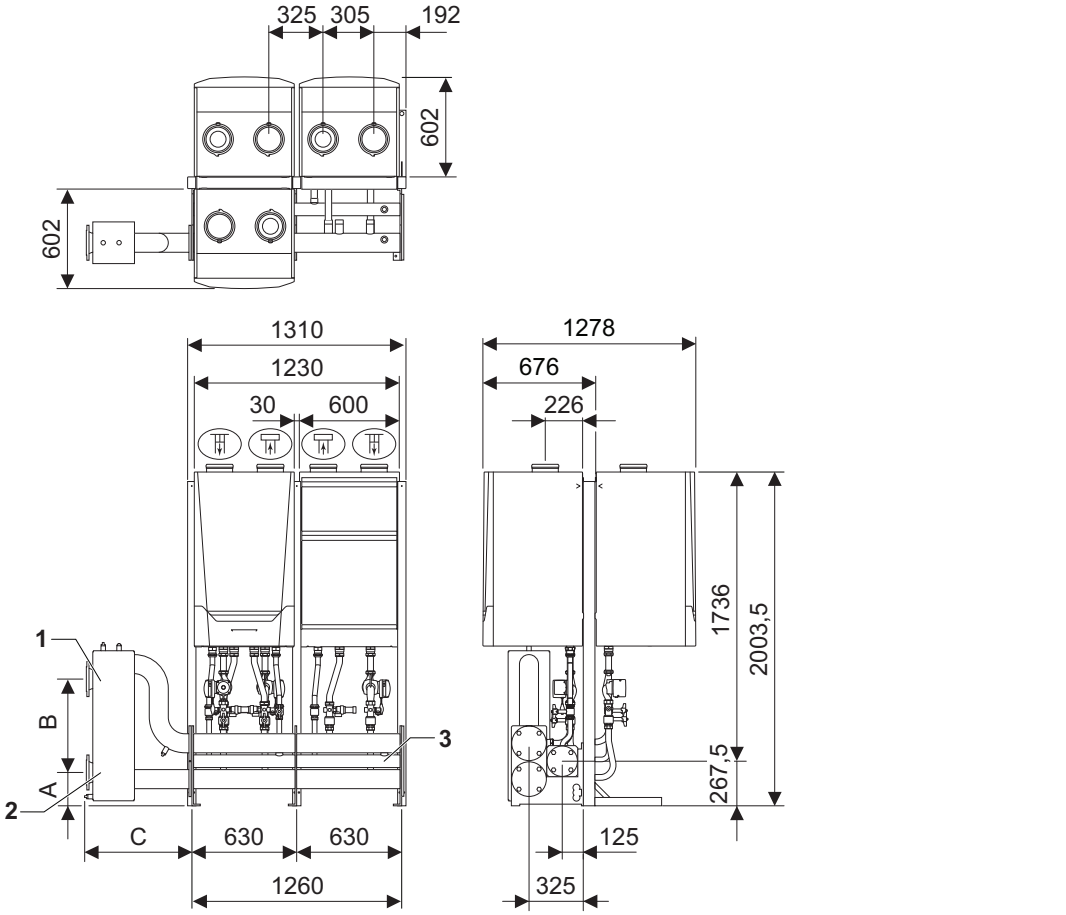
1 System water supply; connection DN 65/DIN 2631 (4 holes)
2 System return; connection DN 65/DIN 2631 (4 holes)
3 Gas supply connection DN 65/DIN 2633 (4 holes)
Air supply 150 mm
Flue gas outlet 150 mm
A System flow centre line = 330 mm up to 350 kW and 560 mm above 350 kW
B System return centre line = 210 mm to 350 kW and 200 mm above 350 kW
C Low-loss header; DN 65 connection with adapter to DIN 100 = 361 mm to 350 kW and 701 mm above 350 kW

■ Configuration drawing for 3 boilers - RG

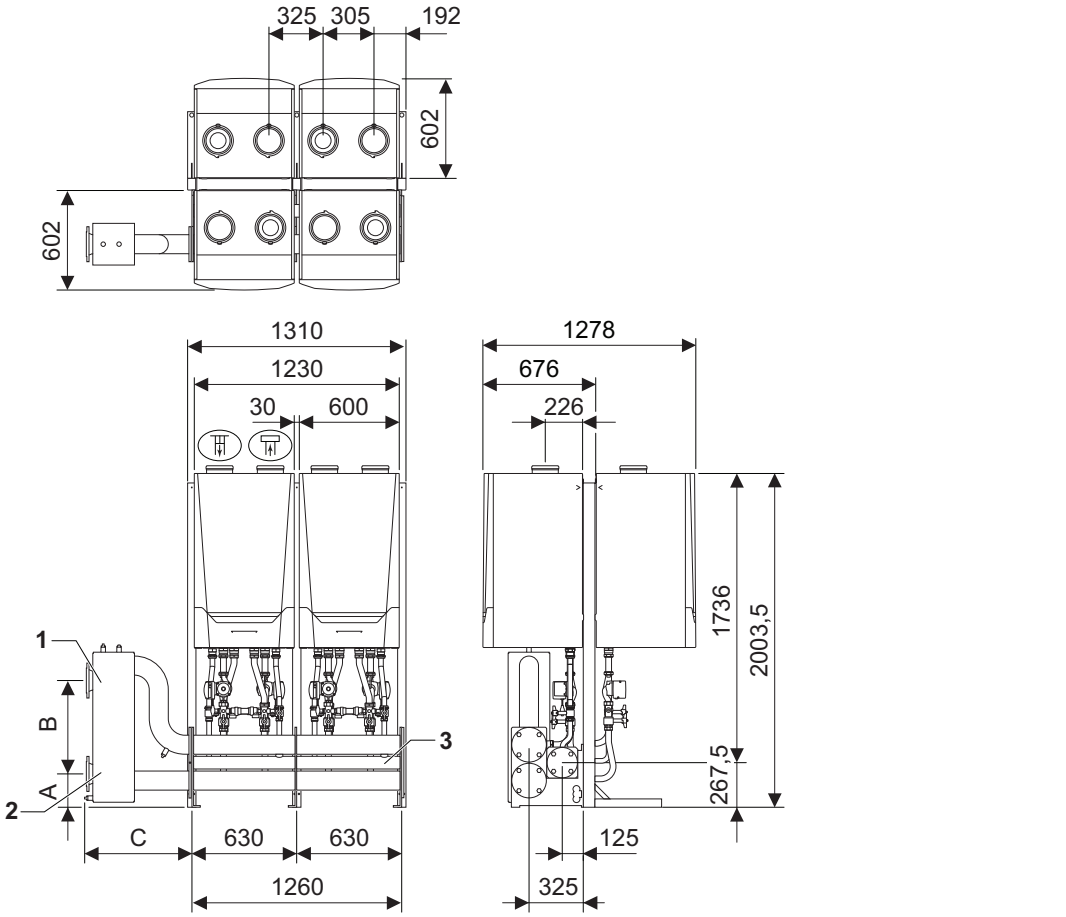
Fig.29 3 RG boilers



1 System water supply; connection DN 65/DIN 2631 (4 holes)
2 System return; connection DN 65/DIN 2631 (4 holes)
3 Gas supply connection DN 65/DIN 2633 (4 holes)
Air supply 150 mm
Flue gas outlet 150 mm
A System flow centre line = 330 mm up to 350 kW and 560 mm above 350 kW
B System return centre line = 210 mm to 350 kW and 200 mm above 350 kW
C Low-loss header; DN 65 connection with adapter to DIN 100 = 361 mm to 350 kW and 701 mm above 350 kW

■ Configuration drawing for 4 boilers - RG

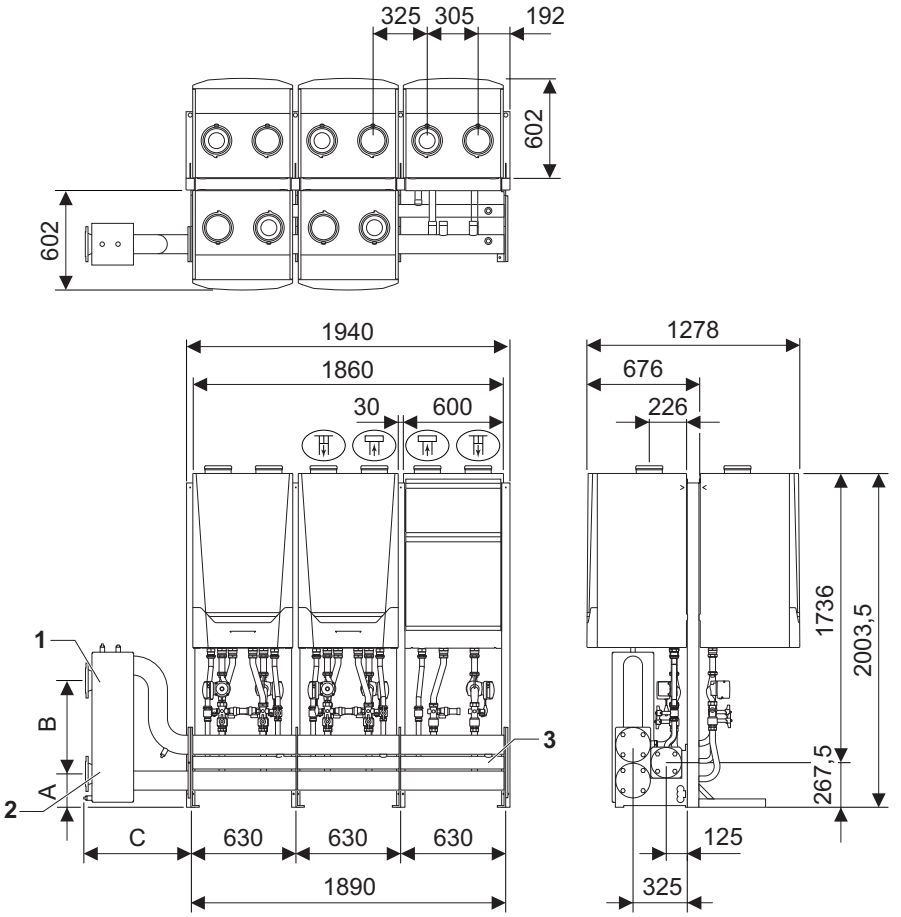
Fig.30 4 RG boilers



1 System water supply; DN 100/DIN 2631 connection (4 holes)
2 System water supply; DN 100/DIN 2631 connection (4 holes)
3 Gas supply connection DN 65/DIN 2633 (4 holes)
Air supply 150 mm
Flue gas outlet 150 mm
A System flow centre line = 560 mm
B System return centre line = 200 mm
C Low-loss header; DN 100 = 633 mm connection

■ Configuration drawing for 5 boilers - RG

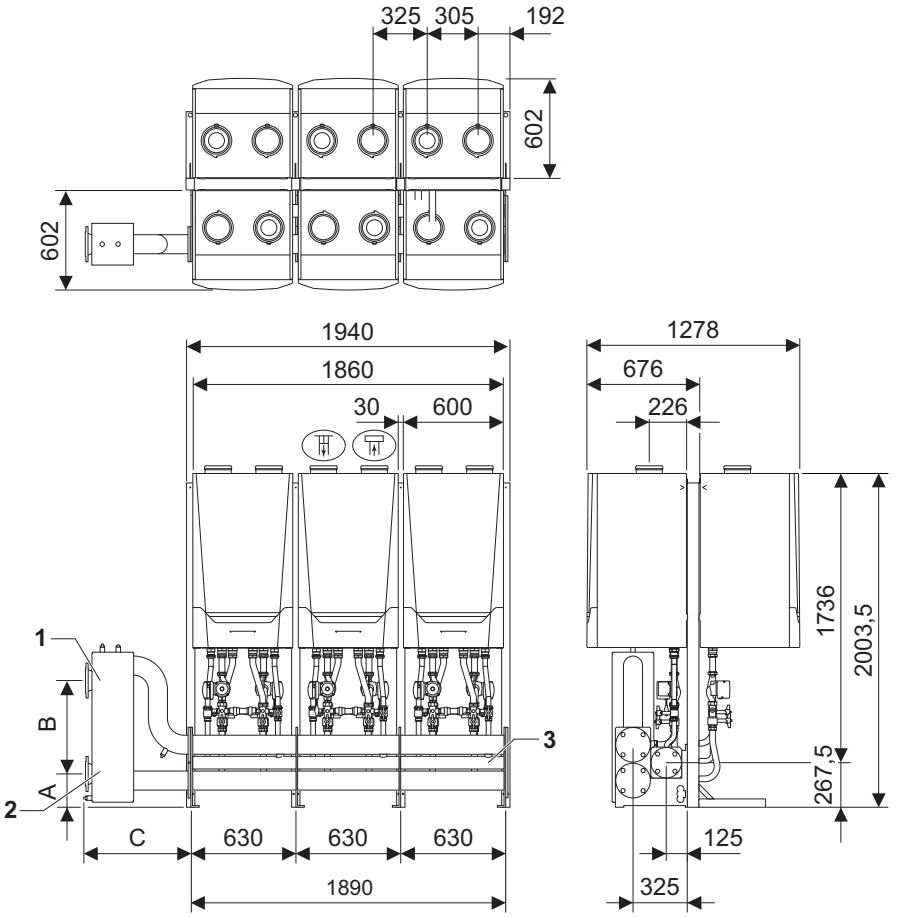
Fig.31 5 RG boilers



1 System water supply; DN 100/DIN 2631 connection (4 holes)
2 System water supply; DN 100/DIN 2631 connection (4 holes)
3 Gas supply connection DN 65/DIN 2633 (4 holes)
Air supply 150 mm
Flue gas outlet 150 mm
A System flow centre line = 560 mm
B System return centre line = 200 mm
C Low-loss header; DN 100 = 633 mm connection

■ Configuration drawing for 6 boilers - RG

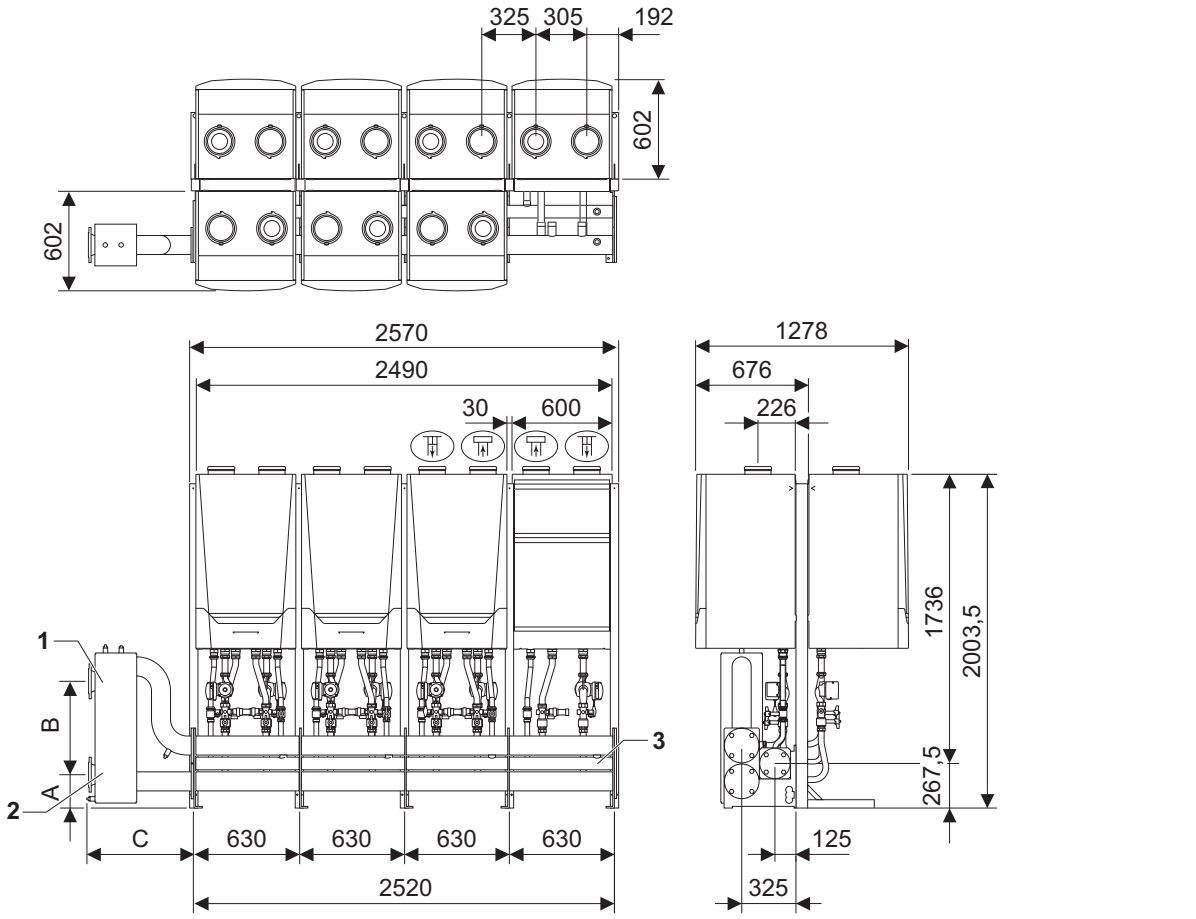
Fig.32 6 RG boilers



1 System water supply; DN 100/DIN 2631 connection (4 holes)
2 System water supply; DN 100/DIN 2631 connection (4 holes)
3 Gas supply connection DN 65/DIN 2633 (4 holes)
Air supply 150 mm
Flue gas outlet 150 mm
A System flow centre line = 560 mm
B System return centre line = 200 mm
C Low-loss header; DN 100 = 633 mm connection

■ Configuration drawing for 7 boilers - RG

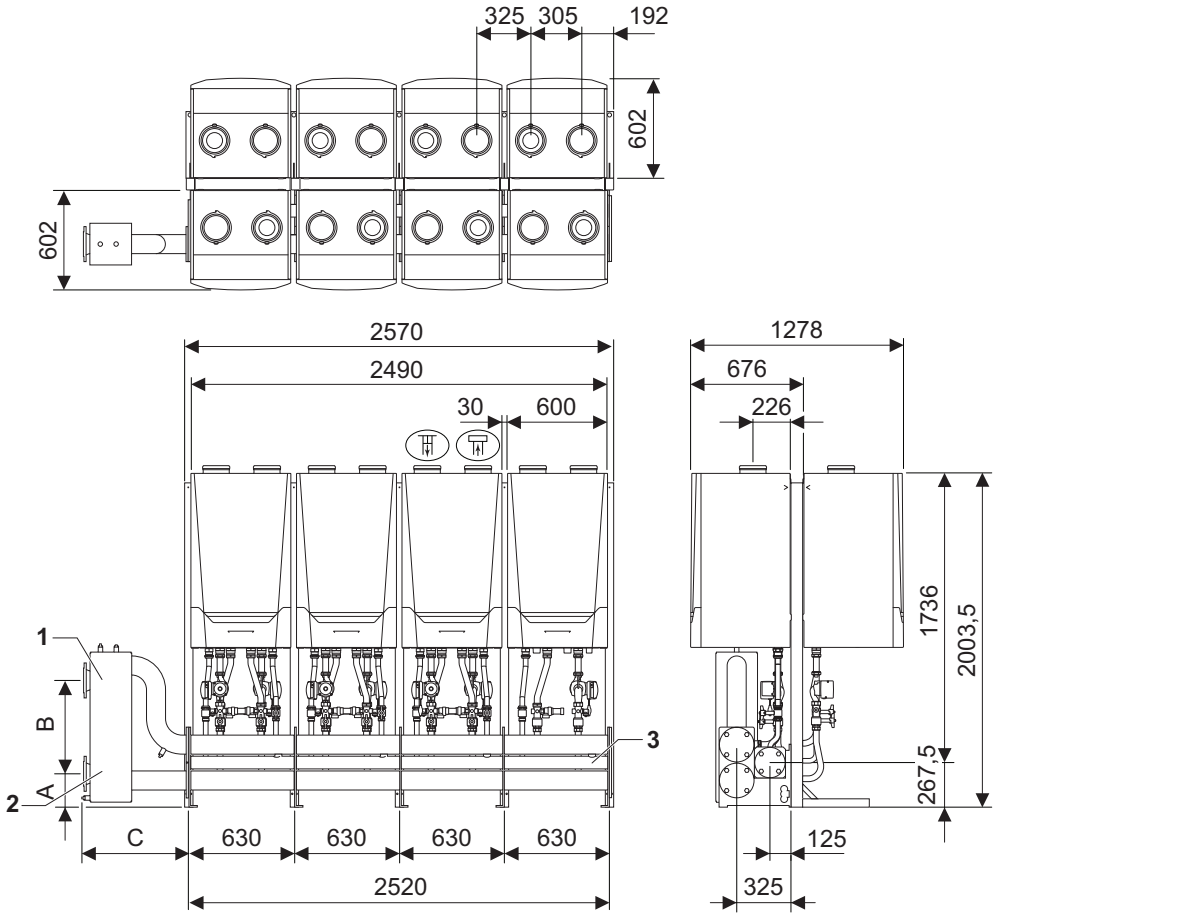
Fig.33 7 RG boilers



1 System water supply; DN 100/DIN 2631 connection (4 holes)
2 System water supply; DN 100/DIN 2631 connection (4 holes)
3 Gas supply connection DN 65/DIN 2633 (4 holes)
Air supply 150 mm
Flue gas outlet 150 mm
A System flow centre line = 560 mm
B System return centre line = 200 mm
C Low-loss header; DN 100 = 633 mm connection

■ Configuration drawing for 8 boilers - RG

Fig.34 8 RG boilers



1 System water supply; DN 100/DIN 2631 connection (4 holes)
2 System water supply; DN 100/DIN 2631 connection (4 holes)
3 Gas supply connection DN 65/DIN 2633 (4 holes)
Air supply 150 mm
Flue gas outlet 150 mm
A System flow centre line = 560 mm
B System return centre line = 200 mm
C Low-loss header; DN 100 = 633 mm connection

5 Installation

5.1 Hydraulic connections

5.1.1 Connecting the hot tap water circuit

General

Both an independently installed cascade system and a complete cascade system will allow hot tap water to be prepared. You can in principle connect an indirectly fired calorifier (use one of the outer boilers) to each boiler. When selecting an output for the calorifier, select a value that is at least one half of the boiler output, up to a maximum value that is equal to the boiler output.

Important
If only the MCA 160 is used, an external regulator is not required. The integrated Diematic Evolution regulator can be used.

Connecting a calorifier pump

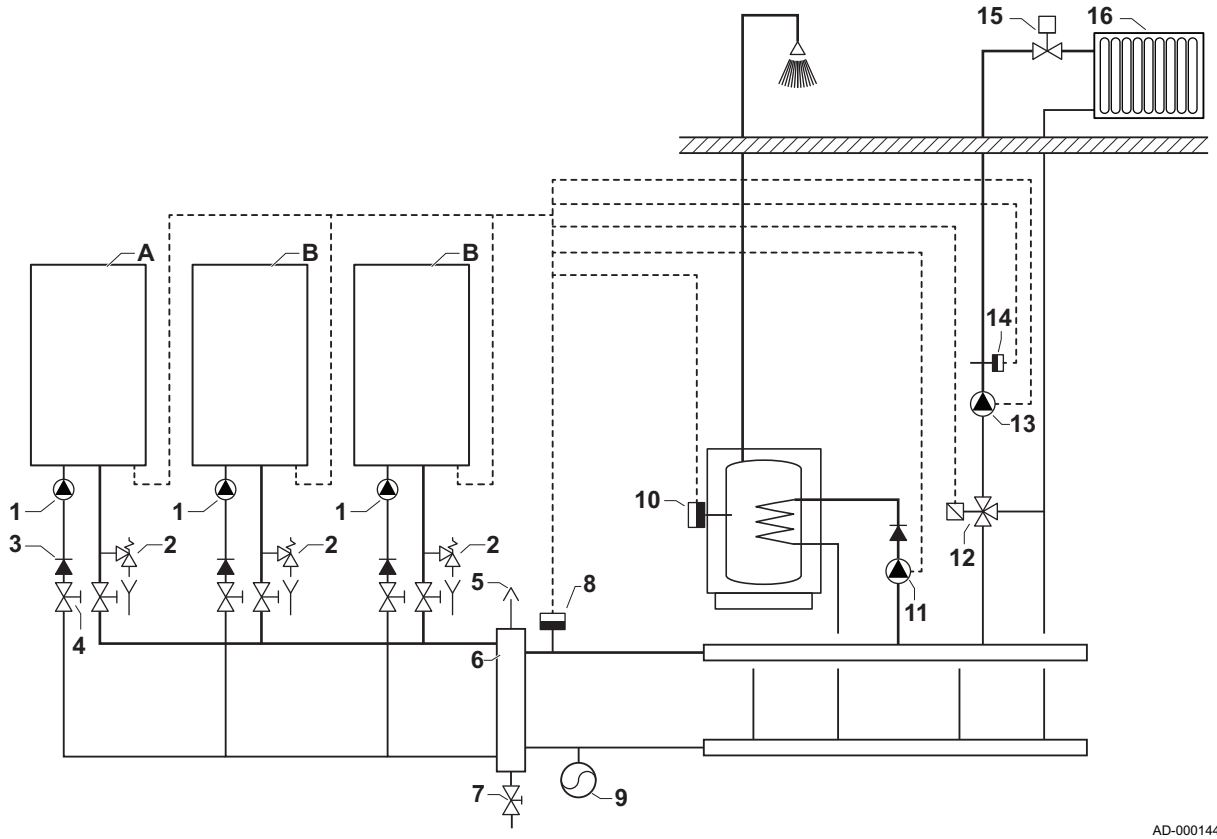
If you use an MCA 160 to boost the calorifier in an independently installed cascade system, we advise using a calorifier pump.

- The water resistance of the MCA 160 is approx. 170 mbar at a flow rate of 6.5 m^3/h (ΔT = 20 °C).

Select a calorifier pump that can withstand this resistance, plus the resistance of the chosen calorifier and appendages. Only use an auxiliary relay if the output of the calorifier pump is more than 300 VA.

Calorifier connection as heating group

Fig.35 Calorifier as heating group



A Cascade master
B Cascade slave
1 Boiler pump
2 Safety valve
3 Non-return valve
4 Manual seal
5 Air vent
6 Low-loss header

7 Drain valve
8 Flow sensor (clamp or immersion sensor)
9 Expansion vessel
10 Calorifier sensor
11 Outside temperature sensor
12 Mixing valve
13 System pump
14 Flow sensor
15 Thermostatic valve
16 Central heating system

5.2 Gas connection

The boilers are suitable for use with all types of natural gas and propane. In the case of MCA 160 boilers, the gas connections are at the bottom of the boiler and have a 1" male thread. There must be a main gas cock close to the boilers.

Important
Consult the documentation supplied with the boiler in order to find the correct gas category.

When cascade systems are used, manual seals for the gas pipes are included for each boiler. A gas filter for the gas supply pipe is available as an accessory.

Important
We recommend installing a gas filter to prevent clogging of the gas valve units.

5.2.1 Gas pressure

The required inlet working pressure per boiler is 17 to 25 mbar. For propane operation, see the installation and service manual for the boiler concerned. The usual inlet pressure for commercial propane (37 - 50 mbar) can be used.

The correct burner pressure setting for natural H gas (G20) is set at the factory and, in principle, does not need readjusting.

5.3 Air supply/flue gas outlet connections

The boilers can be used in room-ventilated or room-sealed operation. The room-ventilated version extracts the necessary combustion air from its environment. In this case via an air supply opening at the top of the boilers.

By installing an air supply pipe on the air supply opening, you obtain a room-sealed system. This increases the number of possible locations within the building. Moreover, combustion air extracted directly from outside is generally cleaner than air from inside.

5.3.1 Outlets

The outlet for a flue gas connection must be through the roof. The outlet must be in area I or II for the open version. Other outlet areas are possible for the closed version. The outlet for the flue gas outlet and the air supply must be in the same pressure range. Use the same diameters for the air supply channels and the flue gas outlet channels.

Important
Contact us for more information.

5.3.2 Individual flue gas outlet

If there is insufficient height for a joint flue gas outlet and/or air supply, individual roof feed-throughs can be fitted. When installing a small number of boilers, it is also more economical to give them an individual flue gas outlet. For sealed systems, the individual roof feed-throughs must be installed at the same height on flat or sloping roofs This avoids flue gases from one boiler being taken in by another boiler. From an aesthetic point of view, the individual roof feed-throughs can be placed within a single feed-

through construction. Recirculation problems may arise where discharge takes place into recesses and in the vicinity of rising walls.

Important
Contact us for more information.

5.3.3 Joint flue gas outlet

If there is sufficient height, a collector system can be used (not supplied by us). In the design of the collector system, a distinction is made between a series or parallel configuration. This document only covers the series configuration.

In series configurations, individual boilers are connected directly to a horizontal collector, which then continues on to the vertical section. An advantage of this configuration is that only one (room-ventilated operation) or two (room-sealed operation) collector pipes run immediately above the boilers. This document describes a flue gas connection for several boilers under high pressure. This means smaller diameters for the flue gas discharge pipe. Standard MCA 160 boilers have an integrated flue gas non-return valve for this. This creates a considerable saving on the cost of a combined flue gas outlet system with several boilers switched in a cascade.

Important
Contact us for more information.

5.3.4 Dimensions for back-to-back configurations

In the case of back-to-back configurations, it is easy to connect the boilers open and to lead the individual flue gas pipes together through one or two openings, for example. Closed configurations or configurations with a common supply must be custom-made.

Important
Contact us for more information.

5.3.5 Dimensions for linear configurations

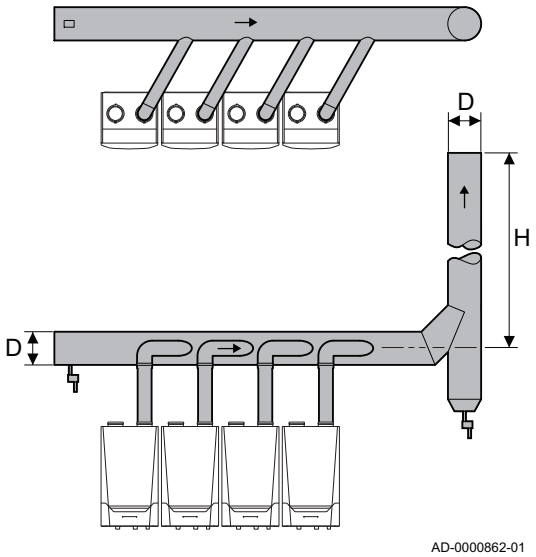
This main section contains tables for the size of flue gas outlets and air supply for cascade systems. The tables cover up to 8 boilers. When compiling the tables, we assumed the boilers will be switched on and off one by one and that there are no elbows in the horizontal and vertical collector pipes.

Important

- The smallest boiler should preferably be located as far as possible from the vertical section.
- Connect the boilers to the collector as follows: direction of flow or internal flow.
- Contact us for more information about greater heights or configurations that differ from the drawings.

■ Room-ventilated, high pressure

Fig.36 Room-ventilated version



Sizes of the flue gas outlet/air supply connections: room-ventilated, high pressure

- Connection sizes for MCA 160: ∅ 150/150 mm

Instructions for using the table:

- look for the desired output P (in kW at 80/60° C) in the left column.
- Then take the available height (H) from the right columns.
- If necessary, round up the diameter found to the available size sold.

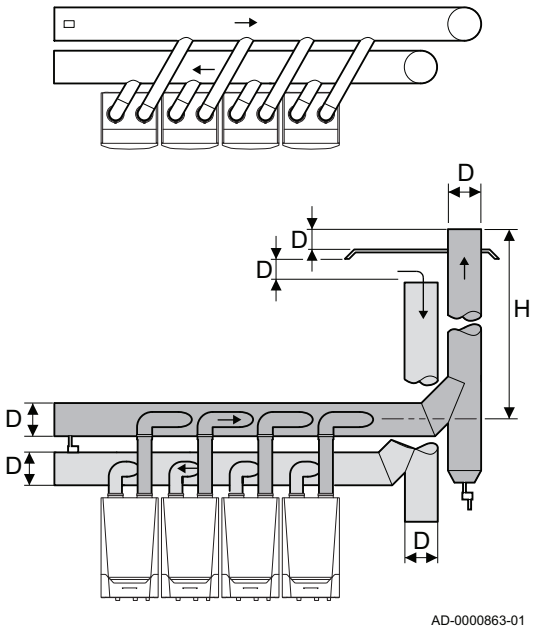
Important
The boiler's parameter settings will need to be changed. Contact us for more information.

Tab.2 Flue gas outlet dimensions

Output (P)kW (80/60 °C)	Number of boilers	dia. D (mm)				
		H = 0 - 2 m	H = 2 - 5 m	H = 5 - 9 m	H = 9 - 13 m	H = 13 - 17 m
294	2	150	150	160	165	170
441	3	185	190	195	200	205
588	4	225	225	235	235	240
735	5	250	255	260	265	270
882	6	280	285	290	295	295
1029	7	305	305	310	315	320
1176	8	325	330	335	335	340

■ Room-sealed version, high pressure

Fig.37 Room-ventilated version



Sizes of the flue gas outlet/air supply connections: room-sealed version, high pressure

- Connection sizes for MCA 160: dia. 150/150 mm

Instructions for using the table:

- look for the desired output P (in kW at 80/60° C) in the left column.
- Then take the available height (H) from the right columns.
- If necessary, round up the diameter found to the available size sold.

Important
The boiler's parameter settings will need to be changed. Contact us for more information.

Tab.3 Flue gas outlet dimensions

Output (P)kW (80/60° C)	Number of boilers	dia. D (mm)				
		H = 0 - 2 m	H = 2 - 5 m	H = 5 - 9 m	H = 9 - 13 m	H = 13 - 17 m
294	2	180	185	190	195	200
441	3	215	220	225	235	235
588	4	260	265	270	275	275
735	5	300	300	305	310	315
882	6	330	335	340	340	345
1029	7	360	365	370	370	370
1176	8	390	390	395	400	400

5.3.6 Material

Warning

- The coupling and connection methods may vary depending on the manufacturer. It is not permitted to combine pipes, coupling and connection methods from different manufacturers.
- The materials used must comply with the prevailing regulations and standards.

Tab.4 Flue gas outlet pipework materials

Design(1)	Material(2)
Single-wall, rigid	• Thick-walled, aluminium • Plastic T120 • Stainless steel
Flexible	• Plastic T120 • Stainless steel
(1) The sealing must conform to pressure class 1 (2) With CE marking	

Tab.5 Air supply pipework materials

Version	Material
Single-wall, rigid	• Aluminium • Plastic • Stainless steel
Flexible	• Aluminium • Plastic • Stainless steel

5.3.7 Additional guidelines

- For installing the flue gas outlet and air supply materials, refer to the instructions of the manufacturer of the relevant material. If the flue gas outlet and air supply materials are not installed in accordance with the instructions (e.g. not leakproof, not correctly bracketed), this can result in dangerous situations and/or physical injury. After installation, check at least all flue gas outlet and air supply parts for tightness.
- Direct connection of the flue gas outlet to structural ducts is not permitted because of condensation.
- Always clean shafts thoroughly when using lining pipes and/or an air supply connection.

- It must be possible to inspect the lining duct.
- If condensate from a plastic or stainless steel pipe section can flow back to an aluminium part in the flue gas outlet, this condensate must be discharged via a collector before it reaches the aluminium.
- With longer lengths of aluminium flue gas outlet pipes, relatively large quantities of corrosion products flowing back out of the outlet pipes together with the condensate must be taken into account the first time. Clean the siphon of the appliance regularly or install an extra condensate collector above the unit.
- Make sure that the flue gas outlet pipe towards the boiler has a sufficient gradient (at least 50 mm per metre) and that there is a sufficient condensate collector and discharge (at least 1 m before the outlet of the boiler). The bends used must be larger than 90° to guarantee the gradient and a good seal on the lip rings.

Important
Contact us for more information.

5.3.8 Condensate drain

Because the flue gases condense in the discharge system, condensed water develops and must be discharged. As a rule of thumb, we anticipate a maximum of 1 litre of condensed water per m^3 of natural gas consumed. In practice, this amounts to:

- approx. 17.5 litres of condensate per hour for the MCA 160

6 Spare parts

6.1 Parts

Fig.38 Frame and main pipes

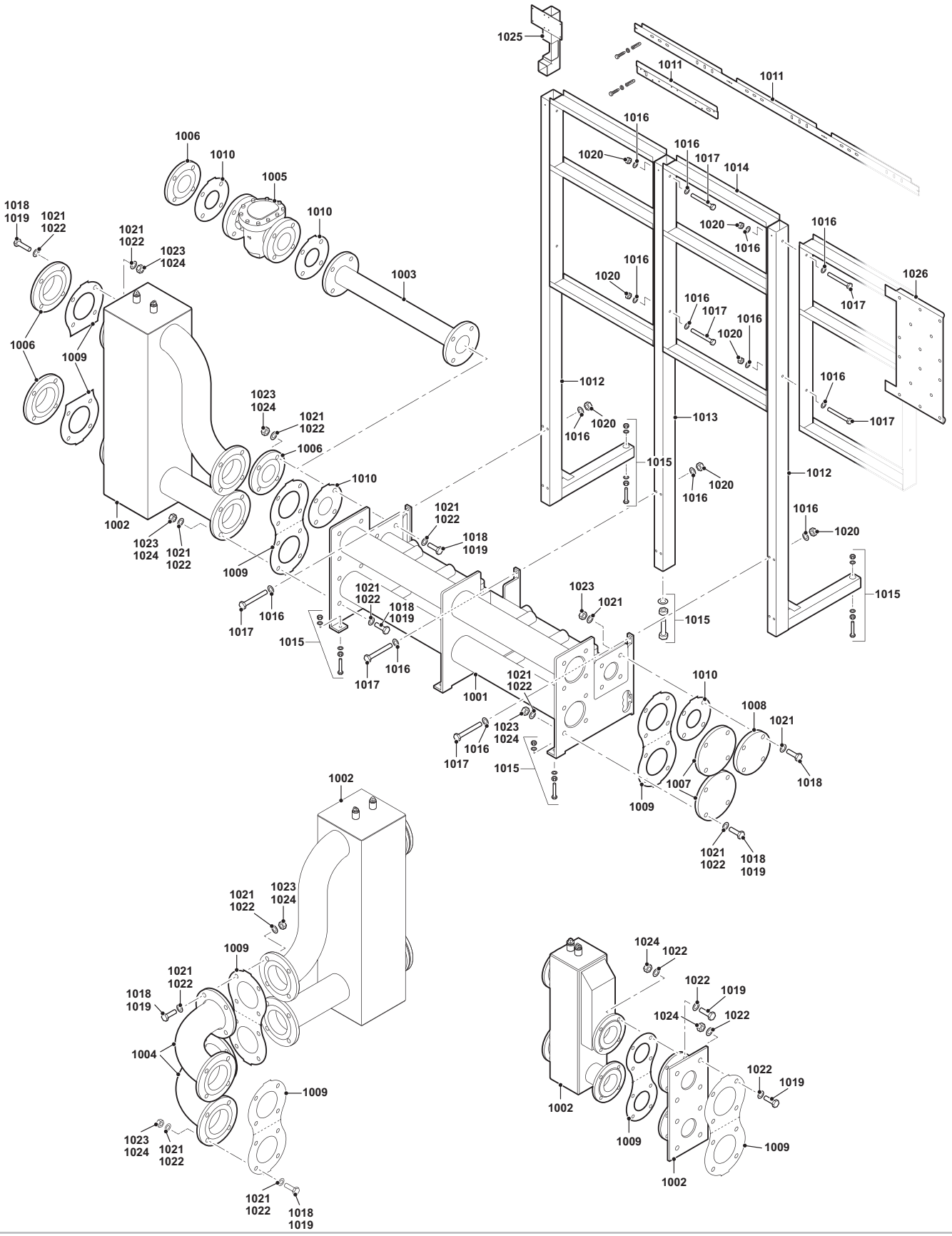


Fig.39 Connecting pipes

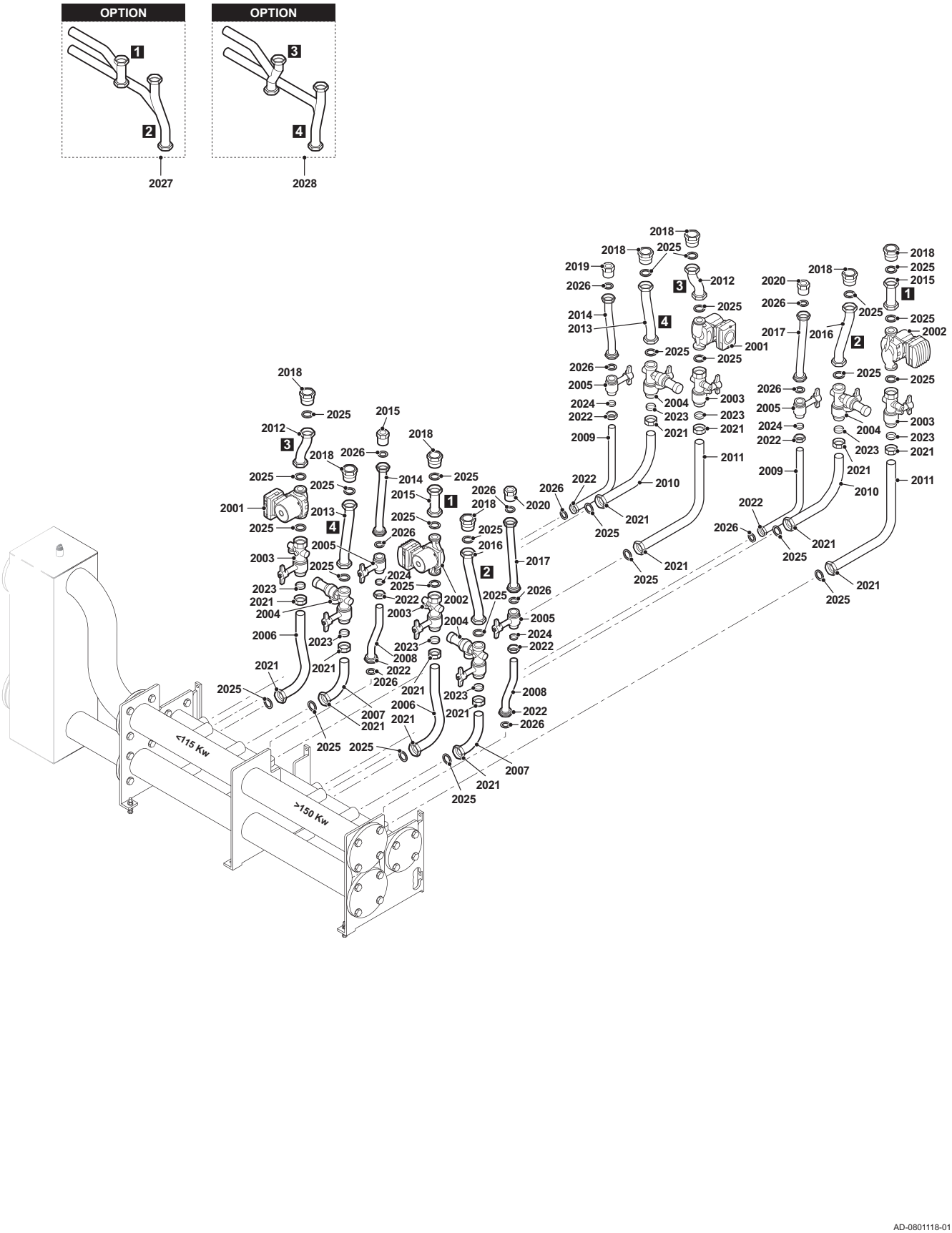
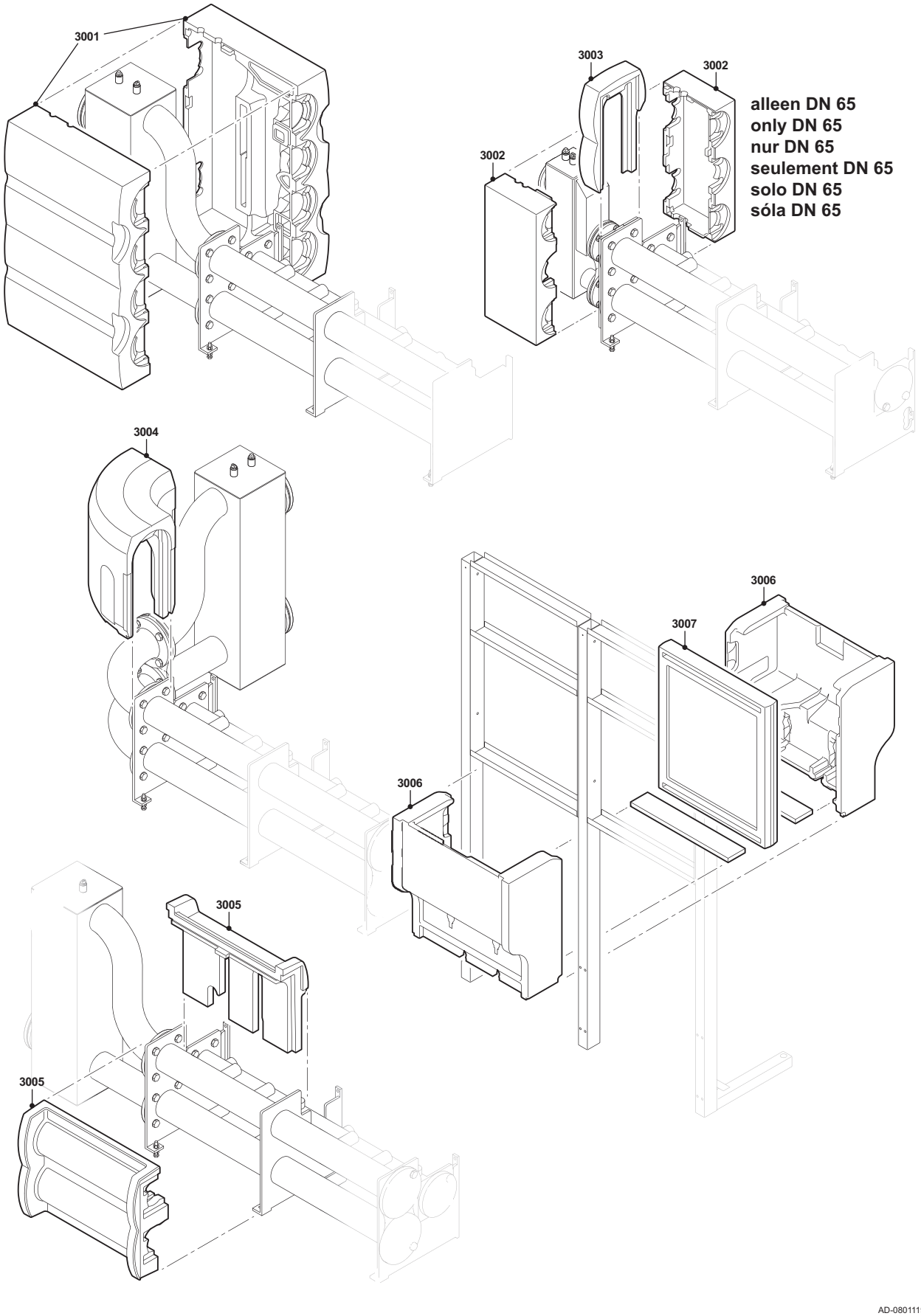


Fig.40 Insulation parts



6.2 Parts list

Tab.6 Frame and main pipes

Position number	Designation	Number
1001	Set of main pipes 100-2	1
1001	Set of main pipes 100-3	1
1002	Low-loss header DN 65	1
1002	Low-loss header DN 100	1
1002	Low-loss header DN 65 (<350 kW)	1
1002	Adapter DN 65 (<350 kW)	1
1003	Gas inlet pipe	1
1004	Curve DN 65	1
1004	Curve DN 100	1
1005	Gas filter DN 65	1
1006	Connecting flanges DN 65	1
1006	Connecting flanges DN 100	1
1007	Blind flange DIN 2527 / DN 100	1
1009	Packing ring ∅ 65	5
1009	Packing ring ∅ 100	5
1010	Packing ∅ 65	10
1011	Wall bracket LW2	1
1011	Wall bracket LW3	1
1012	Stand at right angles	1
1013	Stand	1
1014	Intermediate frame	1
1015	Height adjustment	1
1016	Washer ∅ 8.4 mm	25
1017	Screw DIN 931 M8 x 70	1
1017	Screw DIN 931 M8 x 90	1
1018	Bolt M16 x 50	20
1019	Bolt M12 x 45	20
1020	Nut M8	20
1021	Washer ∅ 17 mm	20
1022	Washer ∅ 13 mm	20
1023	Nut M16	20
1024	Nut M12	20
1025	Mounting plate for power supply	1
1026	Mounting plate for regulator	1

Tab.7 Connecting pipes

Position number	Designation	Number
2001	UPML 25-105 pump for MCA 45-115 90	1
2002	Pump XL (Grundfos)	1
2003	Return cock	1
2004	Flow cock	1
2005	Gas valve	1
2006	Return line kit LV/LW	1
2007	Supply line kit LV/LW	1
2008	RG gas line kit (back-to-back, free-standing) (not for use in France)	1
2009	Gas line kit RG	1
2010	Gas line kit RG	1
2011	Return line kit RG	1
2012	MCA 45-115 TOP return line kit	1
2013	MCA 45-115 TOP supply line kit	1
2014	MCA 45-115 TOP gas line kit	1
2015	MCA 45-115 TOP return line kit	1
2016	MCA 45-115 TOP supply line kit	1
2017	MCA 45-115 TOP gas line kit	1
2018	Screw fitting 1¼” - 1½”	1
2019	Screw fitting 1” -1¼”	1
2020	Fitting 1” -1¼”	1
2021	Union nut 1½”	10
2022	Union nut 1¼”	10
2023	Clamping ring 28 mm	10
2024	Clamping ring 35 mm	10
2025	Packing ring ∅ 44	10
2026	Packing ring ∅ 38	10
2027	MCA 160 calorifier connecting pipes set	1
2028	MCA 160 calorifier connecting pipes set	1

Tab.8 Insulation parts

Position number	Designation	Number
3001	Insulation parts for low-loss header	1
3003	Intermediate insulation piece	1
3004	Curve insulation part	1
3005	Main pipe insulation parts	1
3006	Connecting pipes insulation part	1
3007	Intermediate insulation piece	1

7 Appendix

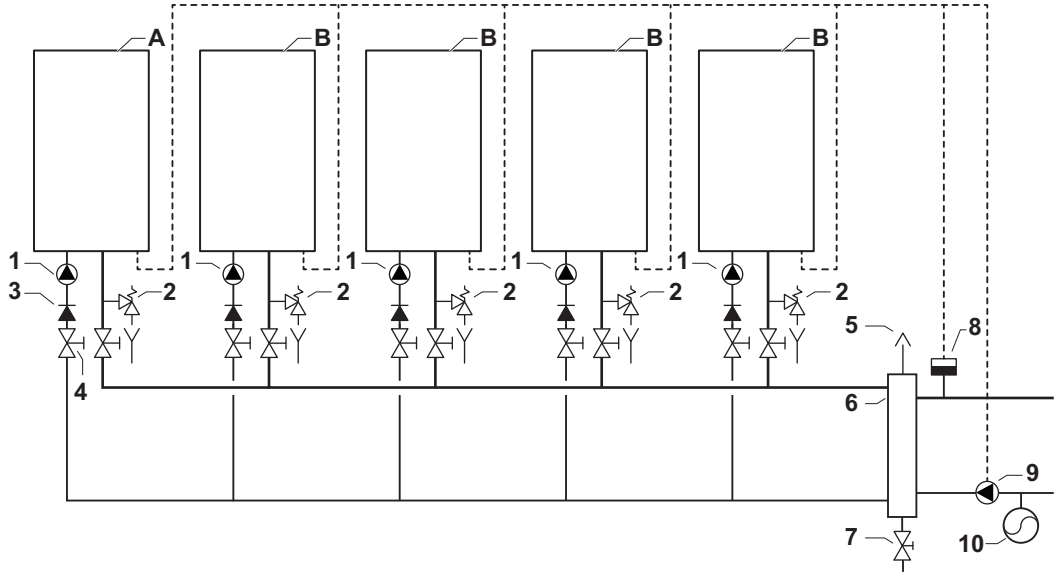
7.1 Independently installed cascade systems

7.1.1 General

It is also possible to have an independently installed cascade system consisting of several units. You then determine the position of the boilers and the piping for your specific situation. To make this easier to do, this chapter provides a summary and description of the components to be used. The components of the cascade systems are also available individually for independent assembly. Boiler connection kits can be advantageous because of their reasonable price and fitting dimensions.

7.1.2 Standard cascade system

Fig.41 Standard cascade system

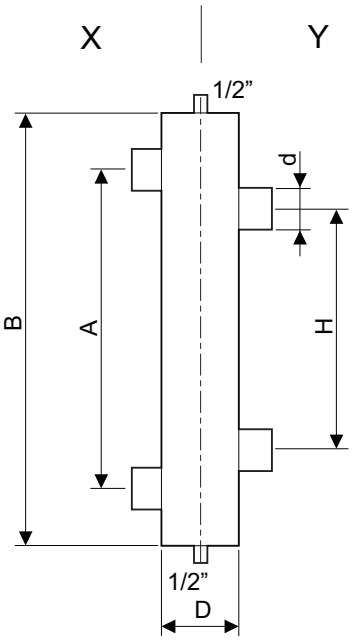


A Cascade master
B Cascade slave
1 Boiler pump
2 Safety valve
3 Non-return valve
4 Manual seal
5 Air vent
6 Low-loss header
7 Drain valve
8 Flow sensor (clamp sensor or immersion sensor)
9 System pump
10 Expansion vessel

The schematic diagram of a standard cascade system is shown in the illustration On the first circuit (boiler side), the central heating units are connected in parallel. The second circuit (system side) is formed by one or more system groups.

7.1.3 Dimensioning a standard low loss header

Fig.42 Low-loss header



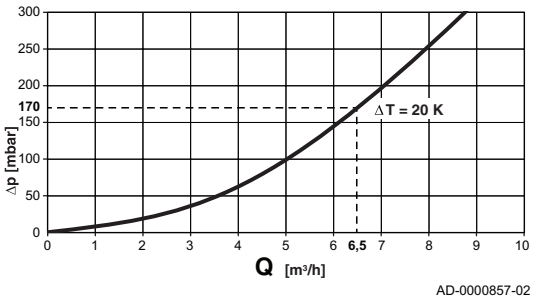
X Boiler-side connection
Y System-side connection

The low-oss header serves to isolate the boiler circuit from the system circuit. The resistance of the low-oss header must be very low. The rate of flow in the low-oss header must not exceed 0.25 m/s. Please refer to the table for the correct dimensions of a standard low-loss header.

Nominal output	Capacity Q	d	D ∅ or D □		H	A	B
kW	m^3/h at ΔT = 20° C	"	"	mm	mm	mm	mm
300	12.9	2	6 (DN 150)	140 x 140	453	604	752
450	19.4	2.5	8 (DN 200	170 x 170	555	740	898
600	25.8	2.5	10 (DN 250)	190 x 190	641	854	1022
750	32.3	3	10 (DN 250)	220 x 220	716	955	1131
900	38.7	4	12 (DN 300)	240 x 240	785	1046	1229
1050	45.2	4	12 (DN 300)	260 x 260	848	1130	1320
1200	51.6	4	12 (DN 300)	270 x 270	906	1208	1404

7.1.4 Boiler and system pumps

Fig.43 Boiler resistance



ΔP Boiler resistance (mbar)
Q Flow rate (m^3/h)

The total output of the system pump(s) must not be more than the combined capacity Q of the boiler pumps Otherwise, with full take-up, the system pump will pump part of the system return water straight to the system flow. This means that the flow temperature to the system will be lower than the flow temperature from the boilers. In addition, the selected system pump must be able to overcome the hydraulic resistance from the system.

Important
A pump is available as an accessory for the MCA 160.

7.1.5 Non-return valve

Install (spring-loaded) non-return valves in the boilers' return pipes to avoid water flowing back to the boilers that are not in operation. This prevents unwanted water loss.

7.1.6 Overflow valve and manual seals

Install a safety valve in the supply line between the manual seal and the unit to protect against an unacceptably high pressure Close the overflow valve with an open connection to the condensate drain.

7.1.7 Expansion vessel

Fit an overflow valve for each boiler in the cascade system. You do not have to equip each boiler with an expansion vessel, a central expansion vessel may be used. This must be installed in the return pipe of the system side. In this case, it must only be possible to shut off the expansion vessel using special tools (see regulations). When using an indirectly heated calorifier on one or more boilers, this/these boiler(s) must have an additional expansion vessel. This also applies if part of the system is isolated by means of a heat exchanger.

7.1.8 Configuration and mounting

Select the desired combination of boilers on the basis of the required heat output. The boilers can be installed next to each other or back to back. Mount the boilers level on a sufficiently strong wall or mounting frame. We advise leaving 1 m of free space at the front of the units. The clearance to the left and right is minimal because all parts can be reached from the front. A clearance of at least 3 cm between units is recommended to ensure that the front panel opens easily. We recommend a clearance of at least 50 cm above the units. To determine the clearance below the boilers, the dimensions of fittings, connection pipes and low-loss header must be taken into account.

Warning

- The weight of the boiler exceeds the maximum lift weight for one person. Observe the applicable regulations. We recommend the use of a lifting aid. Please ensure all necessary care is taken when lifting the boiler on to the wall mounting bracket.

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