ACV

EXCELLENCE IN HOT WATER

N2

Condens

21.8 kW

Installation, Operation & Maintenance

Instructions for the User and the Installer

664Y5000 • D

EN

These instructions contain important information necessary for the installation, commissioning and maintenance of the boiler.

These instructions must be given to the user who should keep them in a safe place after carefully reading them.

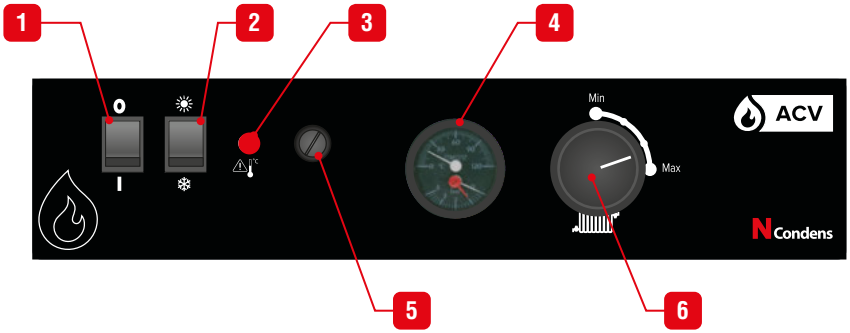
We accept no liability in the event of damage caused by failure to comply with the instructions appearing in this technical manual.

Important safety recommendations

- It is strictly prohibited to modify the inside of the appliance in any way, without the manufacturer's prior written agreement.
- The appliance must be installed by a qualified engineer, in accordance with the local regulations in force.
- The installation must comply with the instructions contained in this manual as well as the local regulations governing installations.
- Failure to comply with the instructions of this manual may lead to personal injury or a risk of environmental pollution.
- The manufacturer does not accept any liability for any damage caused as a result of incorrect installation or in the event of using appliances or accessories that are not specified by the manufacturer.

Important recommendations for the correct operation of the appliance

- In order to ensure the appliance operates correctly, it is important to have it serviced each year by an approved contractor/installer.
- If there is a problem please contact your installer for advice.
- Faulty parts must only be replaced with genuine parts.



1. **Boiler on/off switch**

2. **Summer/winter switch (**is used to turn the heating circulator on and off).

3. **Safety warning indicator (**lights up when the temperature of the flue gas or water of the primary system is too high).

4. **Thermo-pressure gauge (**displays the boiler temperature and the pressure within the primary system).

5. **Manual reset safety thermostat** (enables the boiler to be reset after overheating of the primary water system).

6. **Thermostat control** (allows the boiler temperature to be set between 60°C for the minimum position and 90°C for the maximum position).

Important recommendations for the correct operation of the appliance

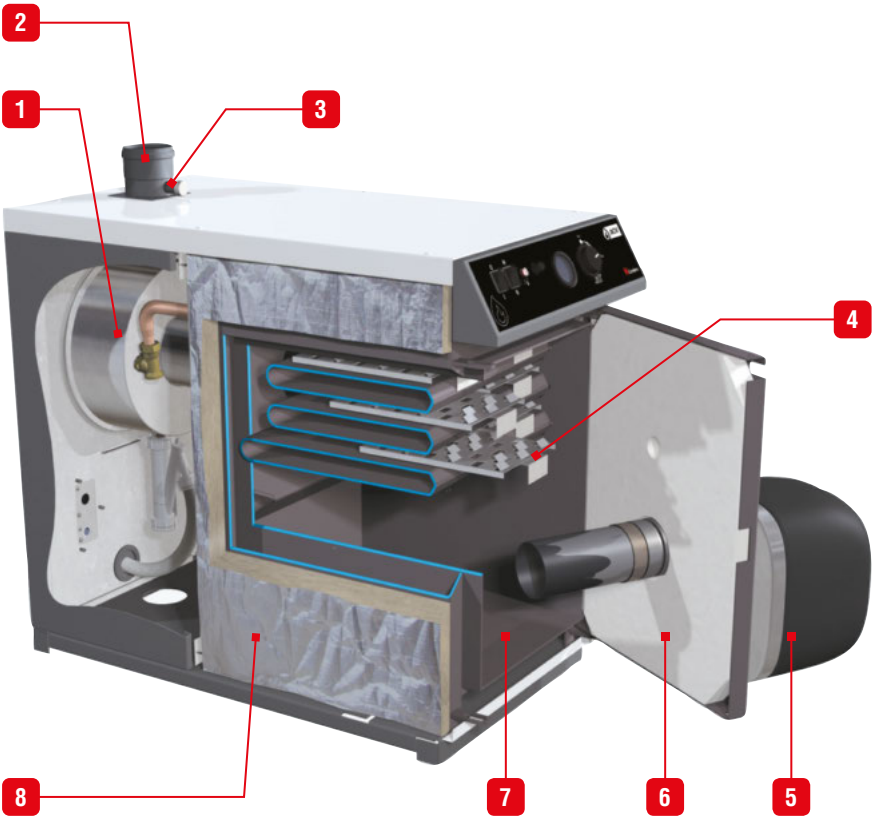
If the boiler switches frequently to safety, contact your installer.

If your boiler is connected to a Domestic Hot Water (DHW) heating tank, make sure that the temperature of the heating thermostat is higher than that of the DHW thermostat in order to guarantee optimal operating conditions.

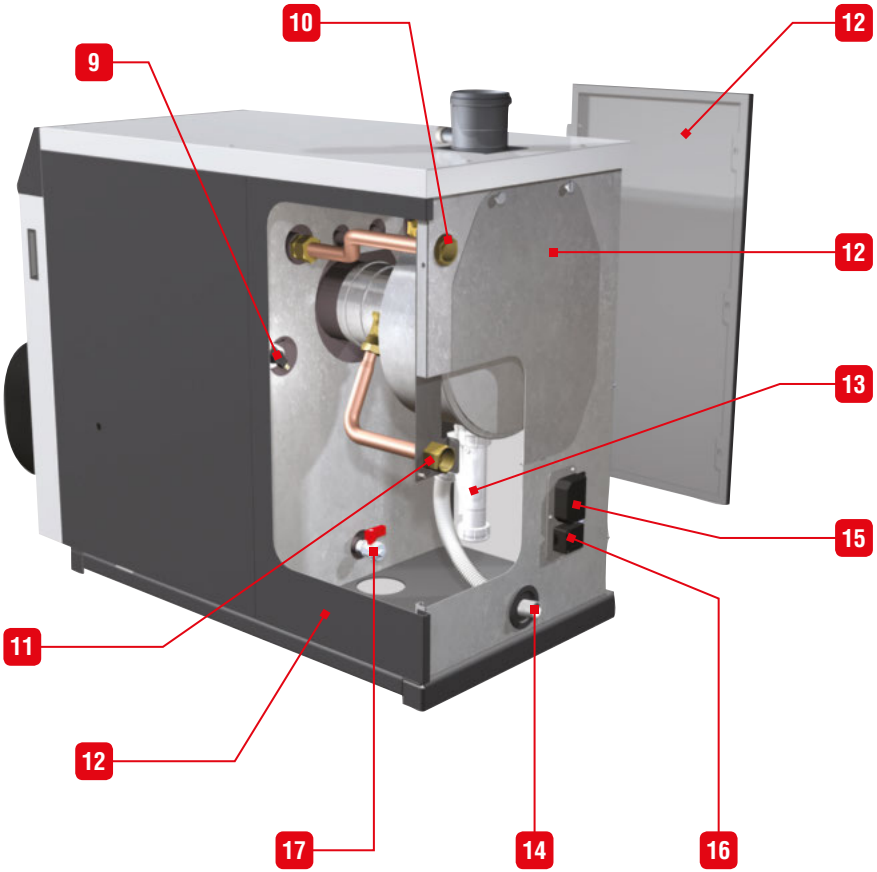
The **N2 Condens** condensing fuel oil boiler is a heat generator that enables the water for the central heating and DHW heater to be reheated (if the latter is connected to the boiler).

Key

1. Condenser
2. Flue outlet
3. Vent for measuring flue gas temperatures
4. Turbulators (6 parts)
5. Blue flame oil burner
6. Burner chamber plate with insulation brick
7. Boiler body
8. Thermal insulation



9. Minimum thermostat
10. Heating flow
11. Heating return
12. Removable panels
13. Condensate trap
14. Condensate exhaust hose
15. Electrical connection socket of the boiler
16. Connection socket of flue gas safety thermostat (optional)
17. Drain valve



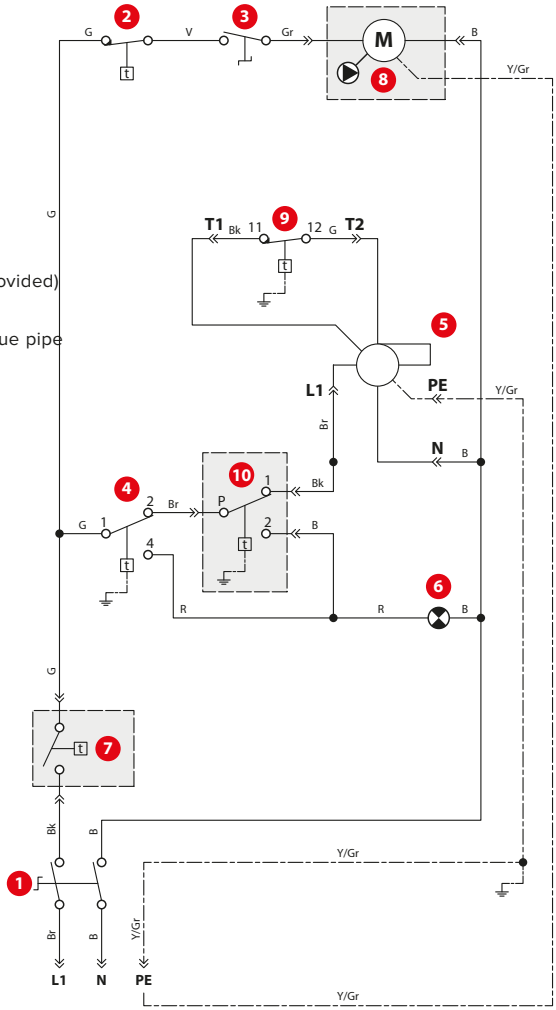
ELECTRICAL CHARACTERISTICS

Main electrical characteristics		N2 Condens
Nominal voltage	V~	230
Nominal frequency	Hz	50
Nominal intensity	A	6

Wiring diagram

Key

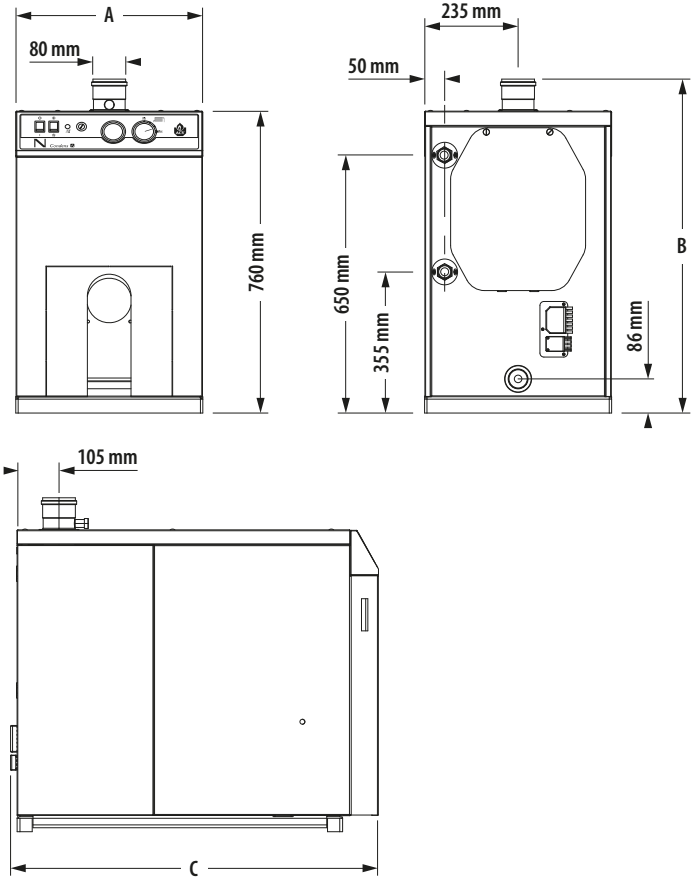
1. On/Off switch
2. Minimum thermostat 45 °C
3. Summer/winter switch
4. Safety thermostat
5. Burner
6. Safety warning indicator
7. Room thermostat (optional)
8. Installation heating pump (not provided)
9. Control thermostat of the boiler
10. Flue gas safety thermostat for flue pipe (optional)



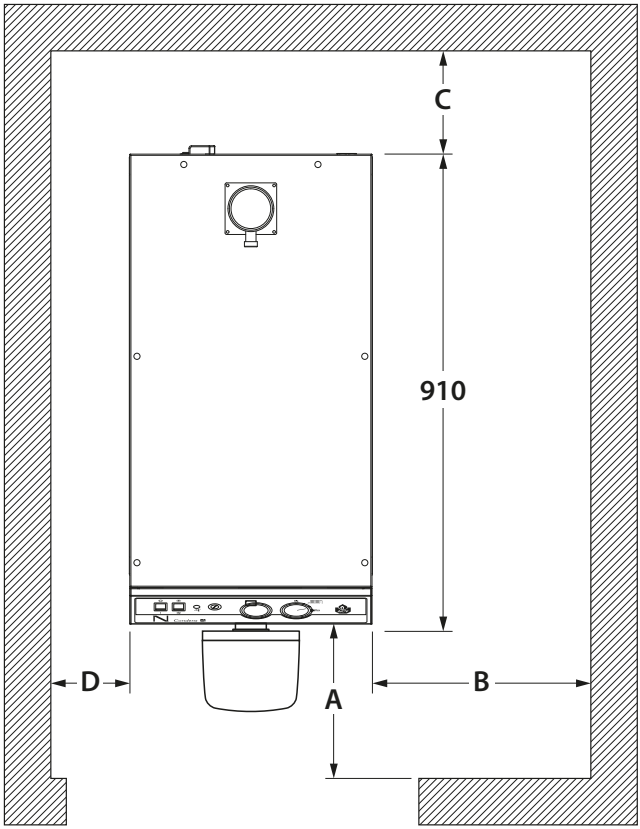
B : Blue
Bk : Black
Br : Brown
G : Grey
Gr : Green
R : Red
V : Violet
Y : Yellow
Y/Gr : Yellow/Green

DIMENSIONAL CHARACTERISTICS

Boiler dimensions			N2 Condens
A = Width		mm	470
B = Height		mm	840
C = Depth		mm	925
Volume of the combustion chamber		dm^3	42.3
Combustion chamber	Height	mm	295
	Width	mm	330
	Depth	mm	435
Empty weight		kg	155



Overall dimensions of boiler	N2 Condens	
	Recommended	Minimum
A (mm)	800	650
B (mm)	1000	900
C (mm)	600	400
D (mm)	150	100

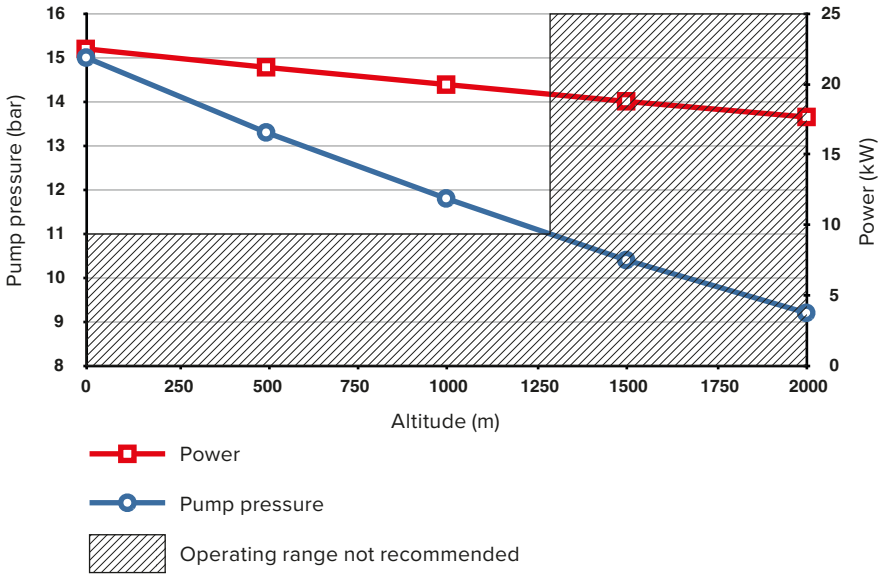


The two lateral rear panels allow access to the components inside the boiler from the left or right hand side.

COMBUSTION CHARACTERISTICS

Main characteristics		N2 Condens
Fuel type		EL fuel oil
Heat flow (input - NCV)	kW	22.4
Output rate (80/60°C)	kW	21.8
Output rate (50/30°C)	kW	23.3
Efficiency at 30% load *(EN 677)*	%	104
Efficiency at 100% load (80/60°C)	%	97.5
Efficiency at 100% load (50/30°C)	%	103.5
Combustion efficiency at 100% load (80/60°C)	%	98.2
Combustion efficiency at 100% load (50/30°C)	%	99
Flue gas temperature (return 30°C)	°C	48.5
Flue gas temperature (return 60°C)	°C	66.7
NOx	mg/kWh	87
CO	mg/kWh	4
Drop when off	W	87

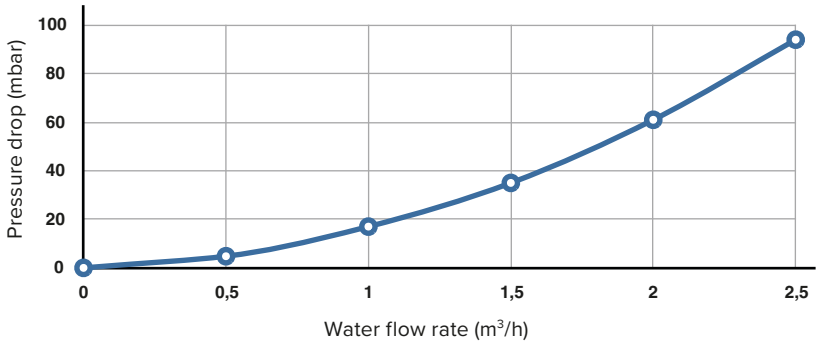
Burner operating limit at altitude



HYDRAULIC CHARACTERISTICS

Main hydraulic characteristics		N2 Condens
Boiler water capacity	L	37
Heating flow connection (female)	Ø	1"
Heating return connection (female)	Ø	1"
Max operating pressure of the heating circuit	Bar	3
Heating exchanger pressure drop (Δt = 20°C)	mbar	18

Curve for drop in hydraulic pressure

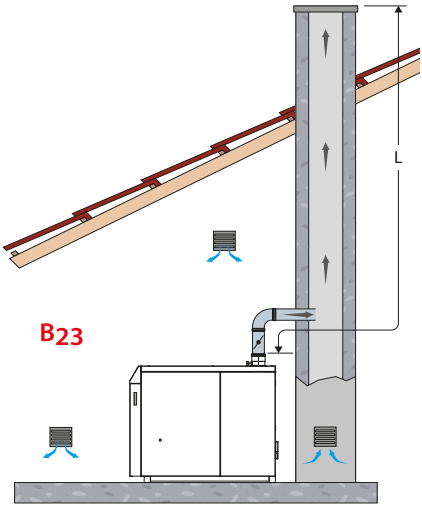


CHARACTERISTICS OF FLUE CONNECTION

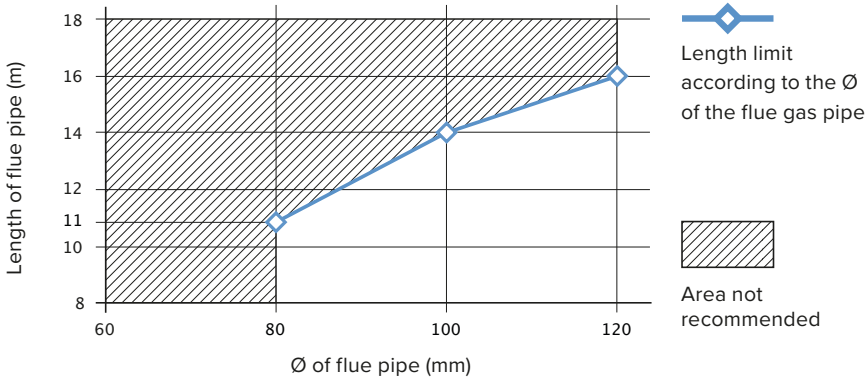
Flue characteristics		N2 Condens
Connection type		B23
Ø of boiler connection to flue	mm	80
Ø of minimum flue pipe	mm	80
L = Maximum length of Ø 80 mm flue pipe	m	10
Maximum flue gas T°	°C	120
Flue gas temperature - Max. ouput power 80/60°C	°C	67
Flue pressure drop	Pa	20
Mass flow of flue gas	g/s	9.5

Flue connection diagram

1 45° pipe bend ≈ 1 m straight pipe
1 90° pipe bend ≈ 1.5 m straight pipe



Curve of flue pipe lengths



OPERATING LIMITS

Maximum service pressure
- Primary circuit : ..... 3 bar

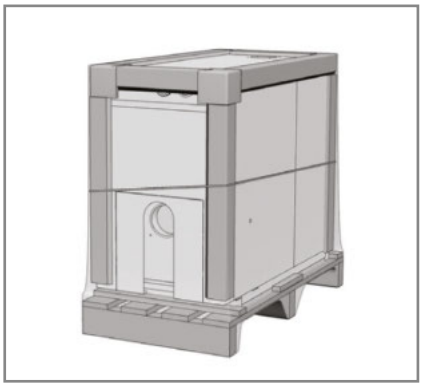
Operating temperature
- Maximum temperature of the primary circuit : ..... 90°C

Water quality
See Recommendations for the prevention of corrosion and scaling

Fuel oil quality
• Low sulphur fuel oil (50 ppm)
• Standard fuel oil (2000 ppm)
• Biofuel oil 0 to 7% of fatty acid methyl esters

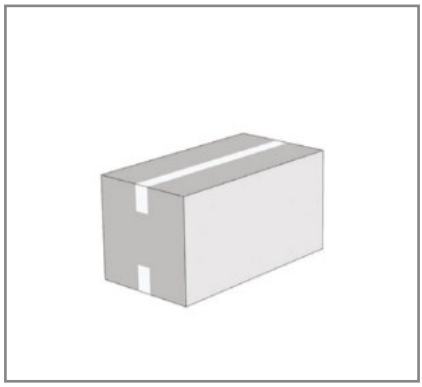
CONTENTS INCLUDED IN DELIVERY

The appliances are delivered tested and separately packaged.



Contents of package No. 1

- N2 Condens boiler.
- Multilingual installation, operating and maintenance instructions.
- A stainless steel flue outlet with measuring vent.



Contents of package No. 2

- A blue flame fuel oil burner BMR 33.
- Multilingual installation, operating and maintenance instructions.

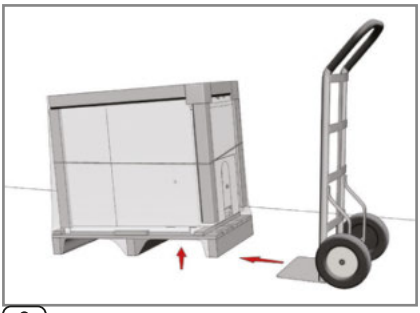
General comments

The manufacturer reserves the right to change the technical characteristics and features of its products without prior notice.

The availability of certain models as well as their accessories may vary according to markets.

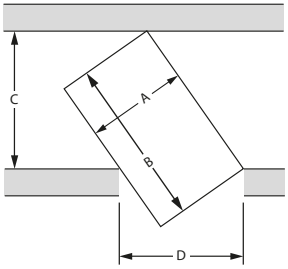
HOW TO MOVE THE BOILER

Move using a hand truck



Use a hand truck suitable for the weight of the boiler.

Minimum door and hall width required to pass the boiler through



A = maximum boiler width
B = maximum boiler length
C = door width
D = hall width

Width of corridor: $C = \frac{A}{D} \times B$

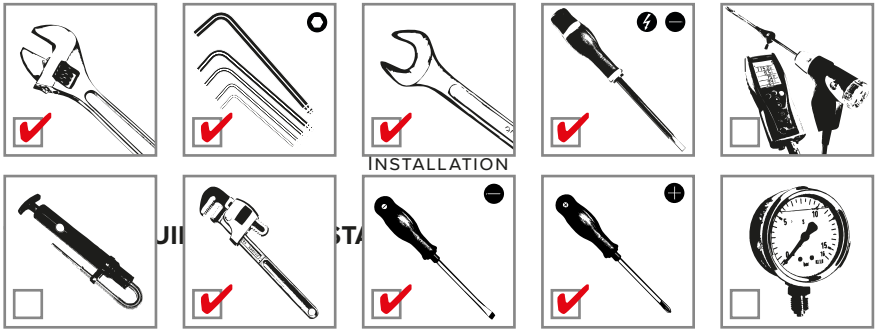
Example of calculation in order to determine the minimum hall width with a door width of D = 800 mm

$C = \frac{540}{800} \times 1000$ = Hall width ≥ 675 mm

Width of door: $D = \frac{A}{C} \times B$

Example of calculation in order to determine the minimum door width with a hall width of C = 900 mm

$D = \frac{540}{900} \times 1000$ = Hall width ≥ 600 mm



INSTALLATION INSTRUCTIONS

General comments

The connections (electrical, flue and hydraulic) must be made in accordance with current standards and regulations.

Important recommendations for the correct operation of the appliance

- The boiler must be installed in a dry and weather-protected room.
- Make sure to position the appliance so that it is always easily accessible.
- In case of work in the boiler room, make sure to switch off the boiler in order to prevent the accumulation of dust in the burner.
- Provide a safety valve set to 3 bar, as well as a primary expansion vessel sized according to the volume of water contained in the heating system.

Important safety recommendations

- Place the boiler on a base made of incombustible material.
- Make sure that the air vents remain unobstructed at all times.
- Provide a drain outlet close to the boiler in order to discharge the flue condensates.

Make a slight gradient of 3% to the horizontal flue gas pipes so that the acid condensation water runs towards a condensate collector and does not damage the heating unit.

Do not store any flammable or corrosive materials, or paint, solvents, salts, chlorine products or any other detergent products in the vicinity of this appliance.

The diameter of the flue must not be smaller than that of the boiler's flue gas outlet.

Important recommendations for electrical safety

- Only an approved installer is authorized to carry out electrical connections.
- Provide a 2-way switch and a fuse or the recommended rated circuit breaker on the outside of the boiler in order to allow the electrical supply to be switched off during servicing and before any maintenance on the boiler.
- Disconnect the electrical supply outside of the appliance before any maintenance on the electrical circuit.
- This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge, only if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved.
- Children shall not play with the appliance.
- Cleaning and user maintenance shall not be made by children unless they are aged from 8 years and above and supervised.
- This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, unless used under the supervision of a person responsible for their safety.
- Children should be supervised to ensure that they do not play with the appliance.

RECOMMENDATIONS FOR THE PREVENTION OF CORROSION AND SCALING

How oxygen and carbonates can affect the heating system

Oxygen and dissolved gasses in the water of the primary circuit contribute to the oxidation and the corrosion of the system components that are made of ordinary steel (radiators, ...). The resulting sludge is then deposited in the boiler exchanger.

The combination of carbonates and carbon dioxide in the water results in the formation of scale on the hot surfaces of the installation, including those of the boiler exchanger.

These deposits in the heat exchanger reduce the water flow rate and thermally insulate the exchange surfaces, which is likely to damage them.

Sources of oxygen and carbonates in the heating circuit

The primary circuit is a closed circuit; the water it contains is therefore isolated from the mains water. When maintaining the system or filling up the circuit, water renewal results in the addition of oxygen and carbonates in the primary circuit. The larger the water volume in the system, the larger the addition.

Hydraulic components without an oxygen barrier (PE pipes and connections) admit oxygen into the system.

Prevention Principles

1. **Clean the existing system before installing a new boiler**
   - Before the system is filled, it must be cleaned in accordance with standard EN14868. Chemical cleaning agents can be used.
   - If the circuit is in bad condition, or the cleaning operation was not efficient, or the volume of water in the installation is substantial (e.g. cascade system), it is recommended to separate the boiler from the heating circuit using a plate-to-plate exchanger or equivalent.

2. **Limit the fill frequency**
   - Limit fill operations. In order to check the quantity of water that has been added into the system, a water meter can be installed on the filling line of the primary circuit.
   - Automatic filling systems are forbidden.
   - If your installation requires frequent water refilling, make sure your system is free of water leaks.

3. **Limit the presence of oxygen and sludge in the water**
   - A deaerator (on the boiler flow line) combined with a dirt separator (upstream of the boiler) must be installed according to the manufacturer's instructions.
   - ACV recommends using additives that keep the oxygen in solution in the water, such as Fernox (www.fernox.com) and Sentinel (www.sentinel-solutions.net) products.
   - The additives must be used in accordance with the instructions issued by the manufacturer of the water treatment product.

4. Limit the carbonate concentration in the water

- The fill water must be softened if its hardness is higher than 20° fH (11,2° dH).
- Check regularly the water hardness and enter the values in the service log.
- Water hardness table :

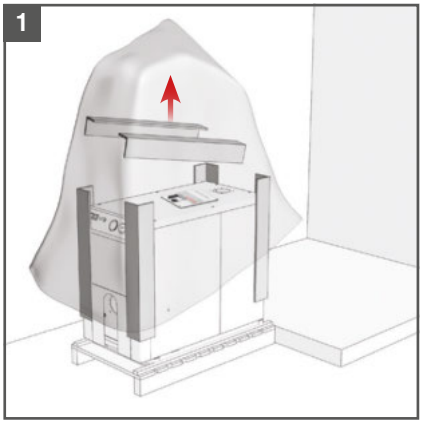
Water hardness	°fH	°dH	mmolCa(HCO3)2 / l
Very soft	0 - 7	0 - 3.9	0 - 0.7
Soft	7 - 15	3.9 - 8.4	0.7 - 1.5
Fairly hard	15 - 25	8.4 - 14	1.5 - 2.5
Hard	25 - 42	14 - 23.5	2.5 - 4.2
Very hard	> 42	> 23.5	> 4.2

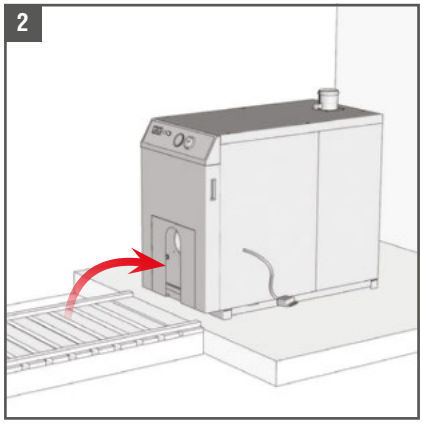
5. Control the water parameters

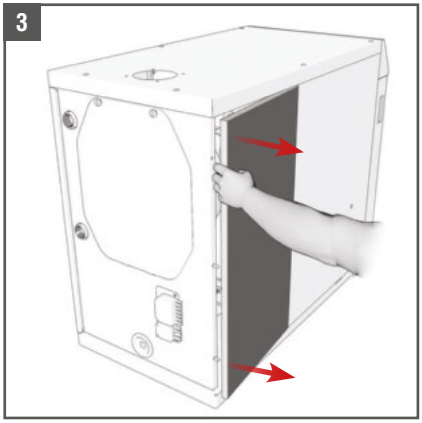
- In addition to the oxygen and the water hardness, other parameters of the water must be checked.
- Treat the water if the measured values are outside the range.

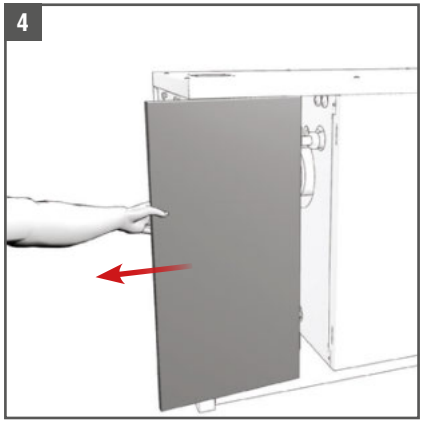
Acidity	6,6 < pH < 8,5
Conductivity	< 400 µS/cm (à 25°C)
Chlorides	< 125 mg/l
Iron	< 0,5 mg/l
Copper	< 0,1 mg/l

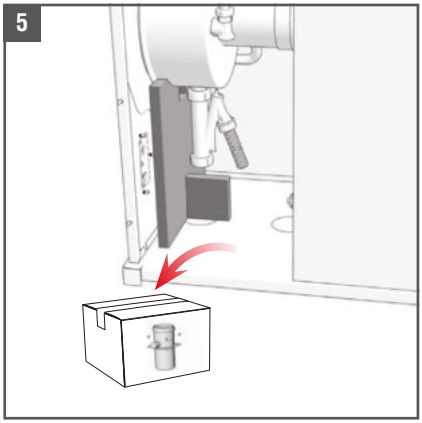
BOILER PREPARATION

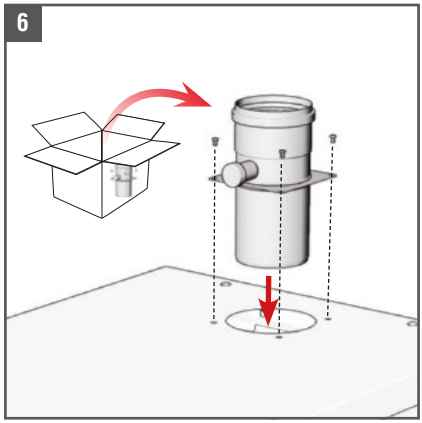












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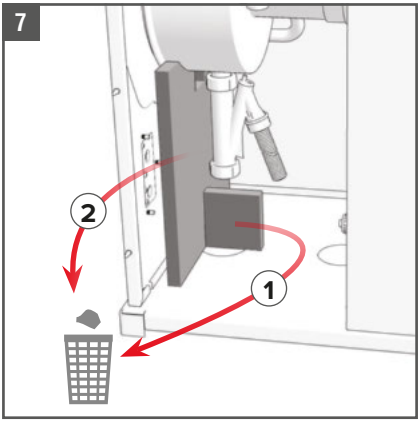

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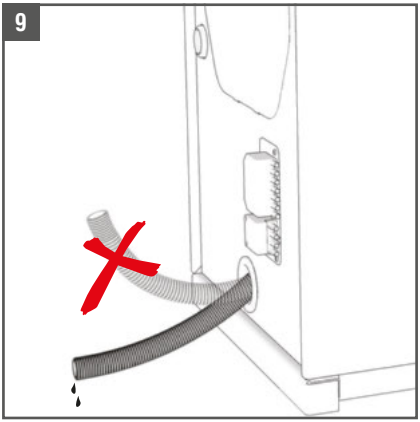

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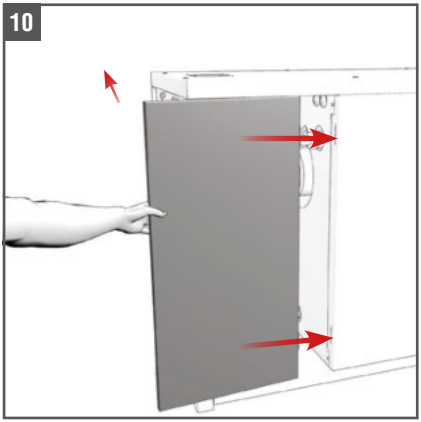

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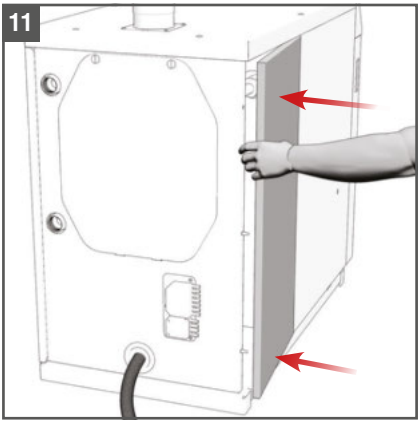
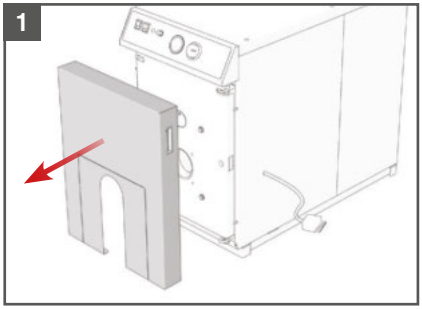
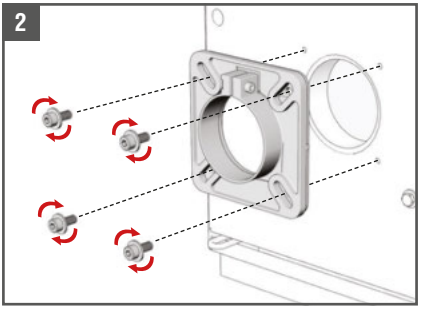
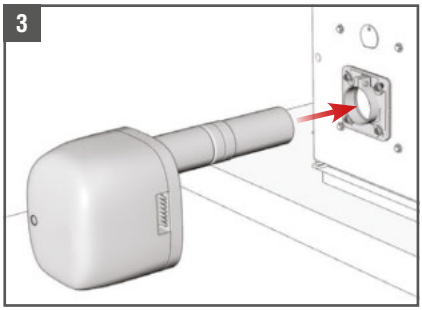
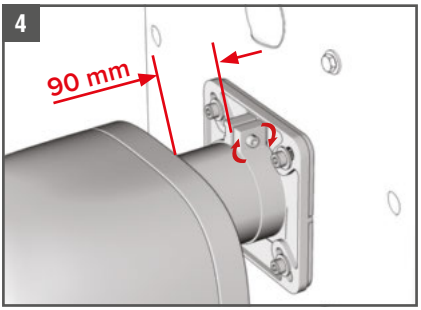


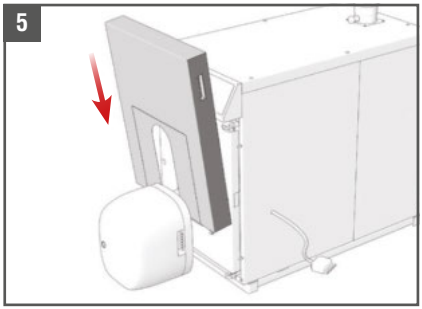
FITTING THE BURNER

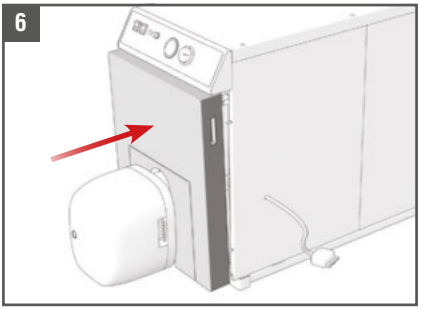


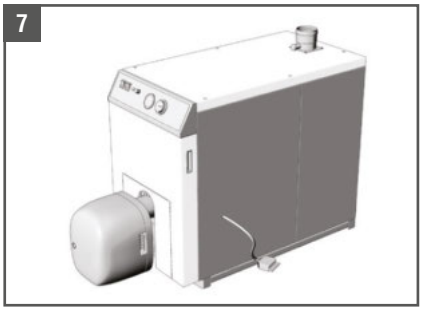


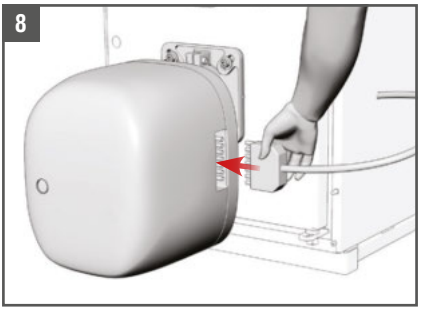








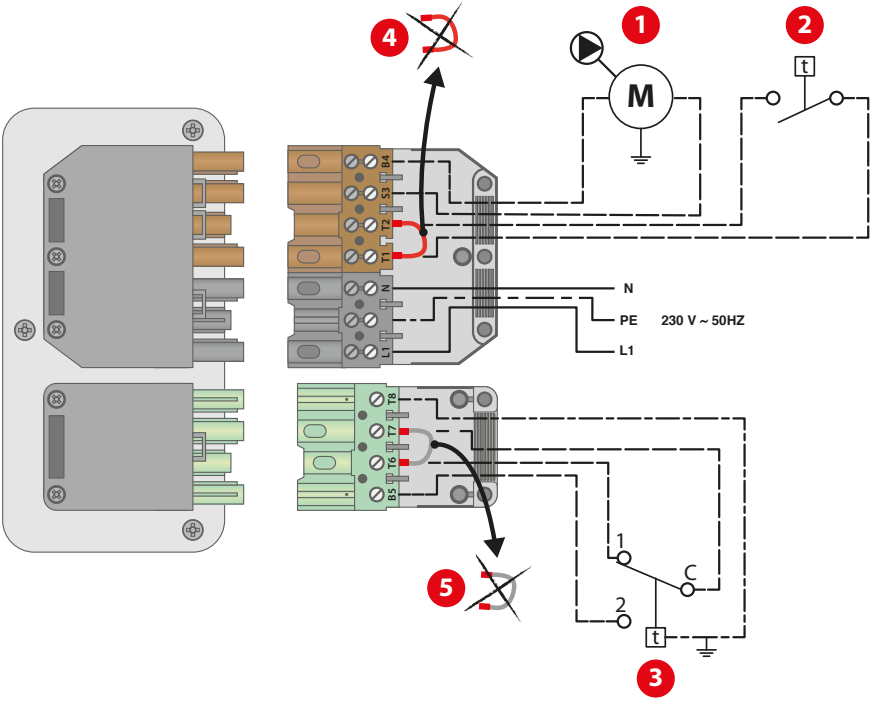




ELECTRICAL CONNECTION

Key

1. Installation heating pump
2. Room thermostat
3. Flue gas safety thermostat for synthetic flue pipe
4. Link (to be removed before connecting the room thermostat ❷)
5. Link (to be removed before connecting the flue gas safety thermostat ❸)



Make sure that the appliance is connected to the earth

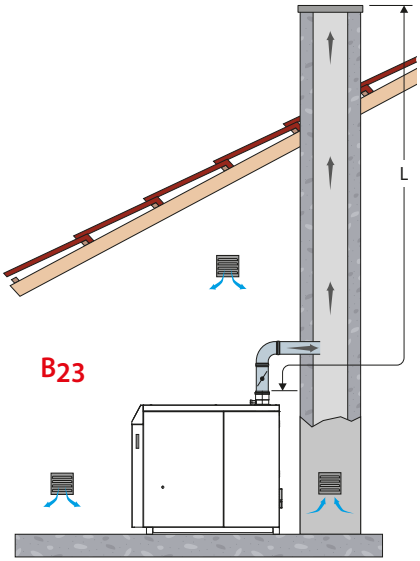
FLUE CONNECTION

Operation dependent on ambient air

(B23 installation)
To ventilate the installation room, it is necessary to provide – in accordance with the regulation on combustion – a vent to the open air from the room with a minimum cross-section of 150 cm^2 or to make a connection with other rooms in order to release the combustion air.

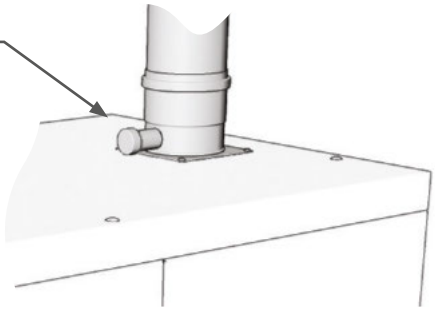
To ensure maximum acoustic comfort is obtained, it is recommended:

- To install the boiler on a solid base (e.g. concrete slab), rather than a hollow base (e.g. block) that could create a resonance volume.
- To disconnect the boiler from the installation hydraulic system by inserting a hose connector on the flow and return circuit, and by ensuring that these hose connectors are not taut or twisted.
- Not to hesitate to increase the diameter of the flue gas exhaust pipes (minimum diameter 80 mm).
- To disconnect the flue gas exhaust system from the flue pipe walls, by adding soft insulation between pipe and wall, in order to prevent the transmission of unavoidable vibrations in the building's walls caused by the flame when the boiler is operational.



Measuring vent
The flue gas measurements are only carried out at the measuring vent.

Under normal operation of the boiler, this vent must always be closed.

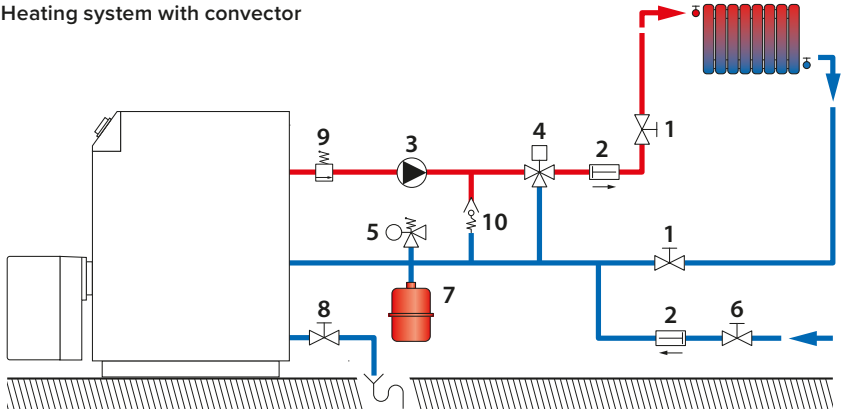


HYDRAULIC CONNECTIONS

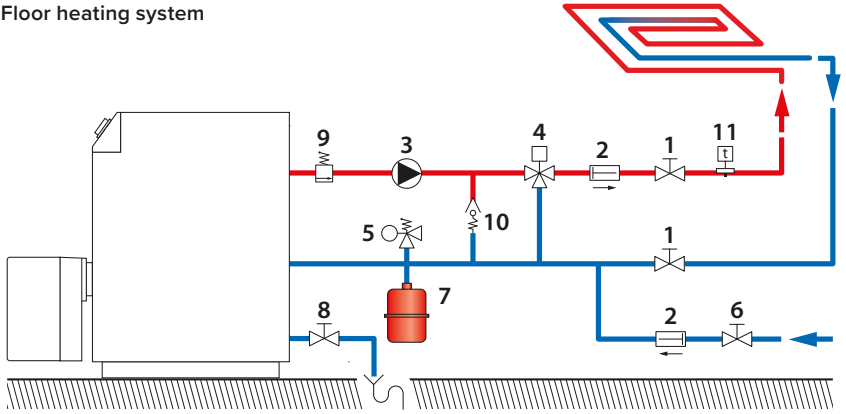
1. Heating isolating valve
2. Check valve
3. Installation heating pump
4. Mixing valve
5. Safety group
6. Primary circuit filling valve
7. Heating expansion vessel
8. Drain valve
9. Automatic air vent
10. By-pass
11. Safety thermostat for floor heating

Do not fit a thermostatic valve on radiators located in rooms equipped with room thermostats.

Heating system with convector



Floor heating system



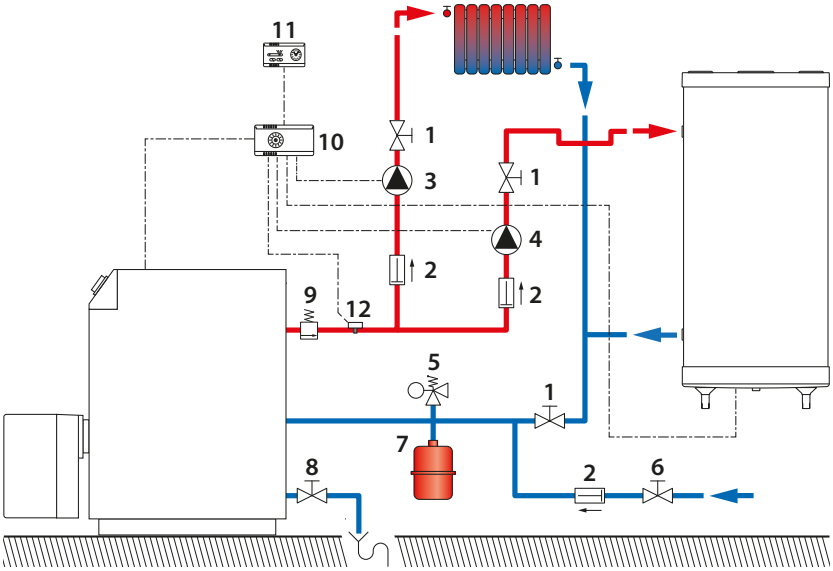
CONNECTION TO A HOT WATER TANK.

General comments

All the accessories for the types of installations described below are available from ACV. Please contact your dealer for further information.

System with 2 circulators and a regulator ensuring the DHW yield

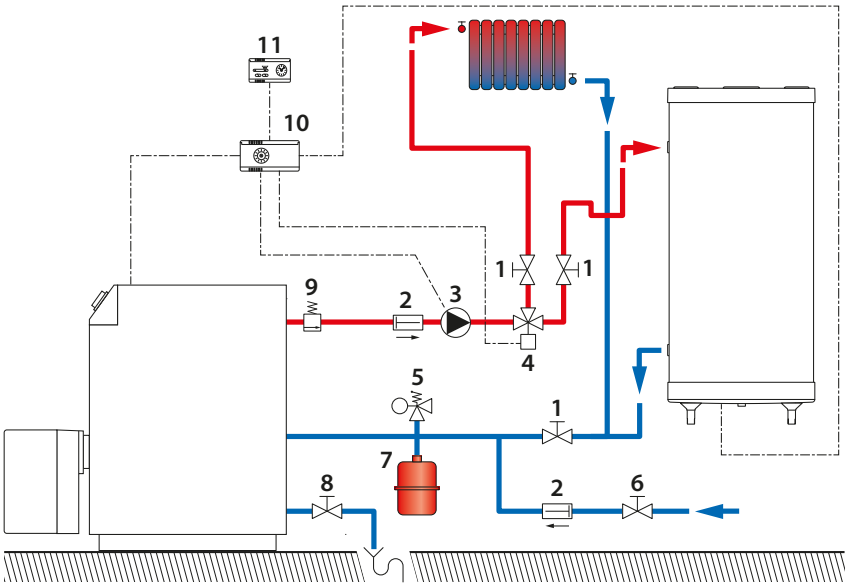
1. Heating isolating valve
2. Check valve
3. Installation heating pump
4. Hot water tank charging pump
5. Safety group
6. Primary circuit filling valve
7. Heating expansion vessel
8. Drain valve
9. Automatic air vent
10. DHW yield regulator
11. Room thermostat
12. Contact sensor



When you use an ACV control or a control of a different make, please assure that you have adjusted the starting temperature of the heating pump (3) above 43°C.

System with circulator, mixing valve and regulator ensuring the DHW yield

1. Heating isolating valve
2. Check valve
3. Installation heating pump
4. Motorised mixing valve
5. 3 bar safety group
6. Primary circuit filling valve
7. Heating expansion vessel
8. Drain valve
9. Auto-air vent
10. DHW yield regulator
11. Room thermostat



☞ **When you use an ACV control or a control of a different make, please assure that you have adjusted the starting temperature of the heating pump (3) above 43°C.**

FUEL OIL CONNECTION

General comments

The fuel oil connection must be made in accordance with the local applicable standards.

Important safety recommendations

Refer to the technical characteristics and safety instructions provided in the technical manual of the burner. Failure to comply with these instructions may damage the installation or cause serious or fatal injuries.

COMMISSIONING SAFETY INSTRUCTIONS

General comments

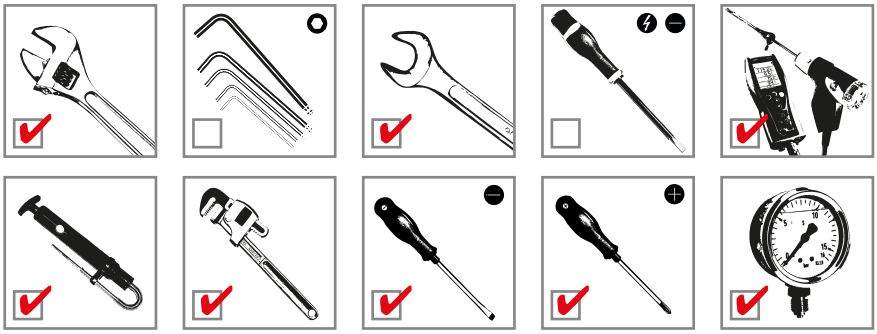
In normal operation, the burner starts automatically when the boiler temperature is lower than that of the set point.

Important safety recommendations

Only an approved installer is authorized to access the components inside the control panel.

Adjust the water temperature in accordance with usage and plumbing regulations.

TOOLS REQUIRED FOR COMMISSIONING



CHECKS BEFORE COMMISSIONNING

Important safety recommendations

Check the tightness of the flue gas pipe connectors

Important recommendations for the correct operation of the appliance

Check the tightness of the hydraulic system connectors

PRELIMINARY FILLING OF THE HEATING SYSTEM

- Fill the primary system with water from the mains supply until a pressure of approx. 1.5 bar is obtained in the system.
- Bleed the whole system.

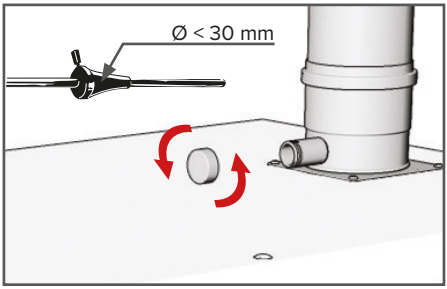
STARTING THE BOILER

Starting the burner

- Switch the boiler's on/off switch to " **I** "
- Turn the boiler's control thermostat to the right to create a heat demand.
- Increase the set point of the room thermostat if there is any.

Adjust the combustion

- Refer to the commissioning instructions detailed in the burner technical manual.
- Adjust the CO_2 in a 13 to 14% setting range y adjusting the fuel oil pressure as well as the air flap as detailed in the paragraph commissioning the burner (refer to burner technical manual).
- Check the temperatures and the CO at the measuring vent (see below)
- Put the cap back on the measuring vent after checking.



Measuring vent for flue gas.

FULL BLEED OF HEATING SYSTEM

- Bleed the heating system again and restore a pressure of 1.5 bar.
- Repeat the process until all the air in the heating system has been evacuated.

SAFETY INSTRUCTIONS FOR MAINTENANCE

Important recommendations for electrical safety

Before starting any work, stop the boiler and disconnect the appliance's electrical supply.

Important safety recommendations

The water flowing from the drain valve is very hot and can cause very serious burns.

Check the tightness of the flue gas pipe connections.

Important recommendations for the correct operation of the appliance

The boiler and the burner must be inspected at least once a year or every 1500 hours of operation. If the boiler is used intensively it may require more regular servicing. Seek advice from the installer as required.

Maintenance of the boiler and the burner must be carried out by a qualified engineer and faulty parts must only be replaced by genuine parts.

Check the tightness of the hydraulic system connections.

REGULAR CHECK

Water supply check

1. Check that the installation water pressure is at least 1 bar when cold.
2. Make sure that the installation system has been correctly bled and is free of air. If it is necessary to regularly fill the installation to maintain the recommended minimum water pressure, check for leaks on the installation.
3. When necessary, only add cold water in small amounts. Adding a large quantity of cold water to a hot boiler can permanently damage the boiler.

Fuel oil supply check

1. Check the presence of fuel oil in the supply system.
2. Check that the hoses are not pinched and that there is no air intake.
3. Make sure that the flame is visible (through the flame sight glass).

Condensate exhaust check

1. Check the tightness of the condensate recovery trap.
2. Check the condensates are flowing correctly to prevent them from entering the combustion chamber and the formation of corrosion.

ANNUAL MAINTENANCE

Cleaning the combustion assembly

☞ **It is recommended to clean the boiler on a warm day as it will be switched off for a few hours.**

Cleaning the burner

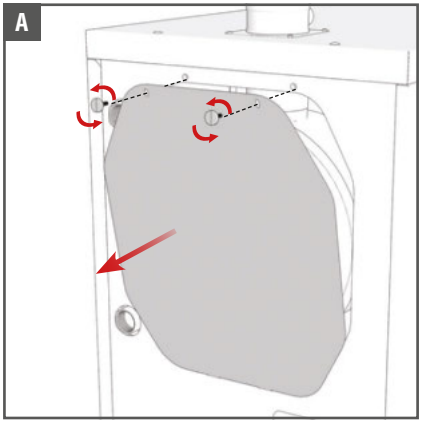
1. Open the front panel.
2. Loosen the burner flange and put the burner in the maintenance position (see burner instructions).
3. Carry out the cleaning (see burner instructions).

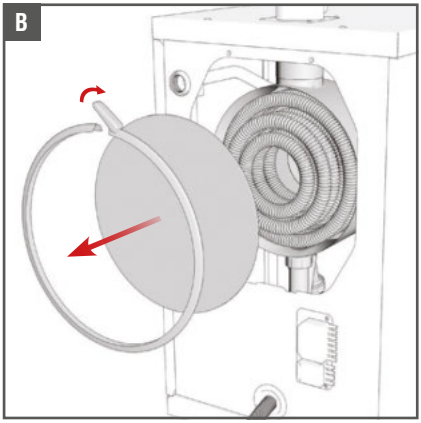
Cleaning the heating unit

1. Open the front panel.
2. Disconnect the burner.
3. Loosen the burner flange and remove the burner.
4. Open the heating unit door.
5. Using a brush, remove any accumulated soot from the heating unit and turbulators.
6. Check the braid is correctly positioned.
7. Close the door and tighten it with sufficient torque to ensure the flue gas tightness.
8. Close the front panel.

Cleaning the condenser

1. Disconnect the flue pipe at the flue outlet fitting.
2. Inspect the inside and clean if required:
   • If the condenser is slightly clogged, pour in a mixture of water and liquid soap (of the washing-up liquid type).
   • If the condenser is considerably clogged, open the rear lateral panel, or the rear panel (**A**), in order to get to the condenser. Open the condenser (**B**) and clean it using a synthetic brush. Do not use the same brush as that used to clean the heating unit, so as to prevent the risk of corrosion.
3. Close the condenser, the rear panels and reconnect the flue pipe.





Cleaning the trap

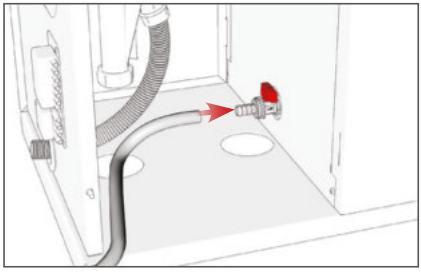
1. Loosen the trap ring.
2. Check that the condensate exhaust pipe is not blocked.
3. Clean the trap with soap and water.
4. Make sure to leave enough water in the trap before reassembly, or pour 20 cl of water in the condenser before reassembly.
5. Insert the trap in the condenser outlet. Replace the O-ring if necessary.
6. Hold the trap in position by re-tightening the ring. Pull the trap downwards to check it is secured.
7. Make sure to reinstall the condensate exhaust pipe so that there is a sufficient gradient for the condensate drainage.

INSPECTION OF SAFETY DEVICES

Check that all thermostats and safety devices are working properly: boiler thermostat, safety thermostat, safety valves, etc.

DRAINING OF THE BOILER

1. Switch the boiler off.
2. Connect a flexible pipe between the boiler drain valve and the drain outlet.
3. Open the automatic air vent and the drain valve.
4. Allow the water to flow to the drain.



COMMISSIONING AFTER MAINTENANCE

See chapter “Commissioning”

CE

DECLARATION OF CONFORMITY - CE

Name and address of manufacturer: **ACV International** SA / NV
Kerkplein, 39
B-1601 Ruisbroek

Description of product type: **Oil condensing boiler**

Models: **N 2 Condens**

CE # : **0461BU0936**

We declare hereby that the appliance specified above is conform to the type model described in the **CE** certificate of conformity to the following directives:

Directives	Description	date
92/42/CEE	Efficiency Requirements Directive	20.03.2008
2006/95/CE	Voltage Limits Directive	12.12.2006
2004/108/CE	Electromagnetic Compatibility Directive	15.12.2004

We declare under our sole responsibility that the product **Delta Pro** complies with the following standards and directives:

EN 303-1	EN 15034	EN 55014-2
EN 303-2	EN 60335-2-102	EN 61000-3-2
EN 267	EN 55014-1	EN 61000-3-3

Ruisbroek, 01 Septembre 2012

Date

Director R & D
Marco Croon