Technical Information

Gas condensing boilers

EN

Rules of good practice
for the installation of gas condensing boilers

RF/JS N° **ITOE0240-en** 31/08/2021

This technical information gathers the basic points to follow, to ensure the optimal operation of a **gas condensing boiler** installed in a private home.
For all countries: the applicable regulations, standards and rules must be respected in any case.
For France: installations in public Establishments are not concerned, as they have specific regulations in France.

In case of faults, check the following points.

Table of contents

1. Installation

1.1 Ensure room ventilation

All countries: to ensure adequate ventilation, observe the instructions in the manuals delivered with the appliances. Also comply with the relevant standards and the regulations in force.

For France : refer in particular to the recommendations of the CNPG Thematic Guide; extracts 1.1.1 and 1.1.2 below.

1.1.1 Installations with heat output below 70kW (France)

The energy production room has a permanent ventilation system consisting of:

- a device for introducing fresh air in the lower part
- an air evacuation device in the upper part.

The room may have a cooling air exhaust system necessary for certain gas appliances.

Common requirements

The air intake and exhaust systems shall not cause disturbance to the neighborhood. They shall be sized according to the output and nature of the appliances installed in the energy production room.
If the intake and exhaust air devices (ventilation and/or cooling) of an energy production room with a useful output of up to 70 kW, consist of ducts located in the building, they must be made of materials materials classified as M0 or A1-s1, d0 and fireproof to degree 1 hour or EI 60.

Device for introducing ventilation and cooling air

The air intake device allows the entry of outside air for ventilation of the room and the supply of combustion and/or cooling air to the appliances.
With the exception of rooms with gas appliances requiring air cooling, the air intake is made directly through an external wall or through a duct.

- For unsealed appliances, the free cross-sectional area for air flow is 100 cm² if the total heat output is 50 kW or less. It is 150 cm² if the total heat output is greater than 50 kW.
- For airtight units, the free cross-section of air passage is 50 cm ².

If the room contains a gas appliance that requires air cooling, the free cross-sectional area for air flow is calculated taking into account the appliance manufacturer's requirements.
Except in the case of a liquefied petroleum gas supply, the introduction of air by transit from a crawl space also meets the safety requirements of the decree for energy production rooms:

- Located inside a building (except for attics) ;
- Located within a car park.

Exhaust air ventilation device

The exhaust air system allows the ventilation air from the energy production room to be discharged to the outside. It consists:

- Either in one or more ducts starting in the room near its ceiling and leading to the roof of the building which is housing the energy production room;
- or in one or more permanent openings in the walls of the room.

For non- airtight appliances:

- The air is evacuated through:
  - The air intake of the draught diverter located at least 1.8 m above the floor of the room;
  - or by a vertical duct leading to the roof of the building.
- The safety requirements of the decree are also met by exhausting the air through an external wall separate from the air intake wall in the case of energy production rooms located on a terrace, outside a building or in the attic. The wall receiving the exhaust air passage must not be exposed to the dominant wind.

For airtight appliances :

- The air is evacuated directly through an external wall or through a duct.

The free cross-section of the air flow is 50 cm² regardless of the type of air outlet.

Cooling air outlet device

A supplementary flue outlet is provided when a cooling airflow is required for a gas appliance. It complies with the specifications of the appliance manufacturer and consists of:

- Either a vertical duct;
- Or, for outdoor or terraced energy production rooms, of two permanent openings in the walls of the room, each on a different facade of the building.

Special conditions for a liquefied petroleum gas-fuelled energy production room located underground.

- This room has, on its side walls, one or more openings directly to the outside, the total opening area of which is at least 0.40 m ².
- Fresh air is introduced through one (or more) ducts taking air directly from the outside, with the lower part of the opening no higher than 0.30 m from the floor of the room.

1.1.2 Installations with heat output above 70kW (France)

The energy production room has a permanent ventilation system consisting of:

- an air inlet device in the lower part
- an air outlet device in the upper part

The room may have an air evacuation system for the cooling air required for certain gas appliances.

Common requirements

The air inlet and outlet devices shall not cause disturbance to the neighborhood; they shall be sized according to the output and the nature of the appliances installed in the energy production room. The air inlet and outlet devices, sized according to the rules of the NF DTU P 52-221 standard, meet this requirement.
If the air inlet and air outlet devices (for ventilation and/or cooling) of an energy production room with an effective output of more than 70 kW are made up of ducts inside the building, these ducts must be made of materials classified as M0 or A1-s1, d0 and fireproof to degree 2 hours or EI 120.

Air inlet device

The air inlet device allows the entry of outside air for ventilation of the room and, if necessary, the supply of combustion air and/or cooling air to the appliances. It consists of one or more air inlets, opening at the lower part of the energy production room.

Air inlets accessible to the public shall be protected by a screen with a mesh size of at most 10 mm or by any similar device designed to prevent the introduction of any external objects.

Ventilation air outlet device

The ventilation air outlet device allows the ventilation air from the energy production room to be exhausted to the outside. It is made of:

- either one or more vertical ducts starting in the room near its ceiling and leading to the roof of the building housing the room,
- or, for outdoor or terraced energy production rooms, of two permanent openings in the walls of the energy production room, each on a different facade of the building.

Cooling air evacuation device

A supplementary exhaust system is provided where a cooling airflow is required for a gas appliance. It complies with the appliance manufacturer's specifications and is made of :

- either a vertical flue ;
- or, for outdoor or terraced energy production rooms, by two permanent openings in the walls of the energy production room, each on a different facade of the building.

Special requirements for a liquefied petroleum gas-fueled power production room.

Room located in the basement

This room is ventilated by one or more openings directly to the outside, the total minimum opening area of which is greater than or at least equal to 0.40 m².

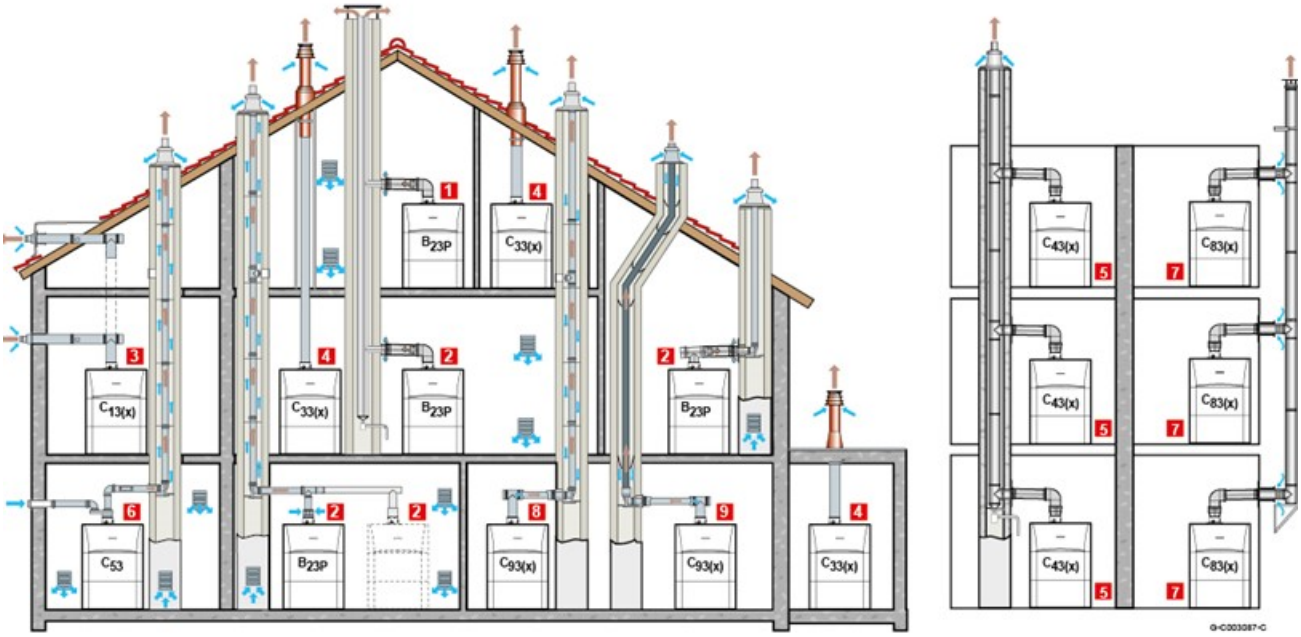
- This room is equipped with:
  - An upper ventilation via a duct;
  - an air intake device via a duct or a passage through an external wall, which must be equipped with a mechanical device and established in accordance with the provisions of this chapter.
- The gas supply to the room is conditioned by the right operation of the mechanical device of ventilation air intake.

Room located elsewhere than in the basement

- Where ventilation air is supplied by a duct not fitted with a mechanical device, the room shall have an opening to the outside, flush with the floor and with a cross-sectional area greater than or equal to 1/1000 of the floor area of the room.

1.2 Ensure compliance of the flue gas connections.

1.2.1 Identify the configuration



Information: The assembly and installation of type B pipes are defined in the NF DTU 24.1 standard (for France).

Type B, non-tight configurations:

1 : Configuration B23P in the housing.
Combustion air is taken from the housing.
France: with double-walled duct to the chimney + suction piece. See ITOE0231 (for France).

2 : Configuration B23P (compulsorily outside the housing / in the boiler room)
Connection to a chimney via a single wall or concentric pipe.
Combustion air is taken from the boiler room.

Type C, airtight configurations:

3 - Configuration C13(x)
Air/flue connection via concentric pipes to a horizontal terminal (so-called forced flue).

4 - Configuration C33(x)
Air/flue connection via concentric pipes to a vertical terminal (roof outlet).

5 - Configuration C43(x)
Air/flue connection to a collective pipe for airtight boilers (3CEP system)

6 - Configuration C53 (compulsorily in the boiler room)
Separate air and flue connection by means of a bi-flow adapter and single pipes.
Combustion air taken from outside.

7 - Configuration C83(x)
Flue gases connection to a collective pipe for airtight boilers.
The air supply is individual and is provided via a terminal coming from outside the building.

8 - Configuration C93(x)
Air/flue gases connection by concentric pipes in the boiler room and simple pipes in the chimney.
Combustion air is taken in counterflow from the chimney.

9 - Configuration C93(x)
Air/flue gas connection by concentric pipes in the boiler room and single flexible pipe in the chimney.
Combustion air is taken in counterflow from the chimney.

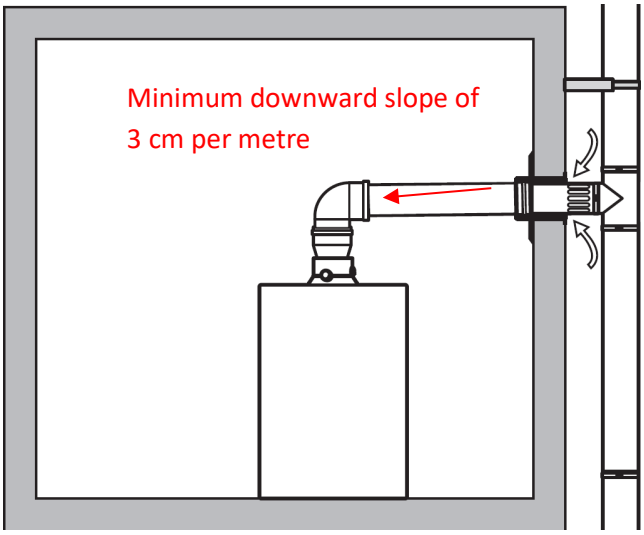
1.2.2 Respect the pipe maximum lengths

- Respect the maximum lengths recommended in the technical manual and in.
  These maximum lengths are given for the accessories certified with the boiler.
- The maximum lengths are given as a guide. For France : Installations above 70 kW, require a calculation note to be produced (France – see Guide thématique -EVAPDC – Evacuation of Combustion Products).

1.2.3 Respect the flue system installation instructions

- **Provide a slope to the boiler siphon**

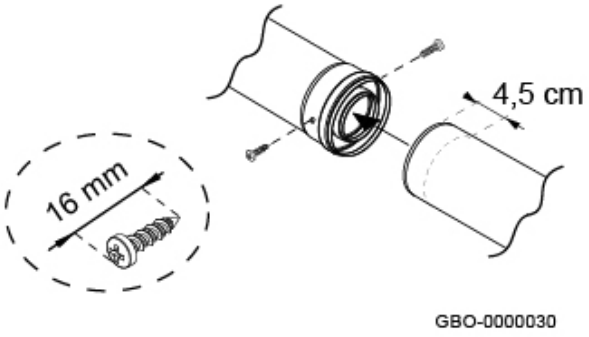
  Ensure a **minimum 3%** downward slope (**3 cm per horizontal meter**) towards the boiler to ensure a good flow of the condensate remaining in the flue gas to the siphon of the boilers.



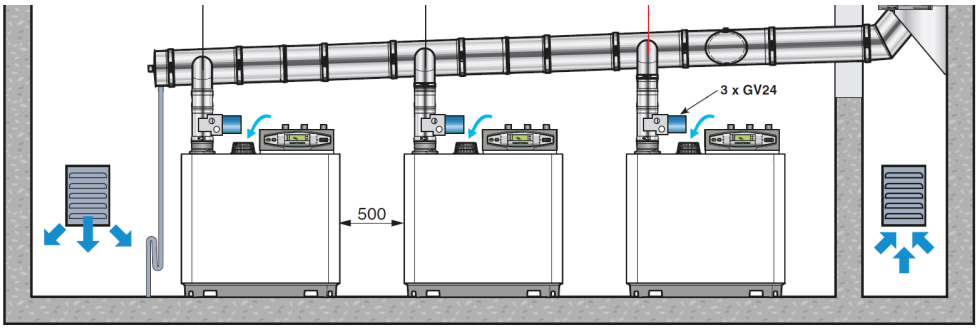
- **Attach the pipes with screws**

  Secure the flue pipes to avoid loosening:

  1. Check that at least **4.5 cm** of flue pipe is inserted into the joint of the other pipe
  2. Assemble the 2 pipes with **2 x 16 mm** galvanized screws



1.2.4 For cascaded Boilers



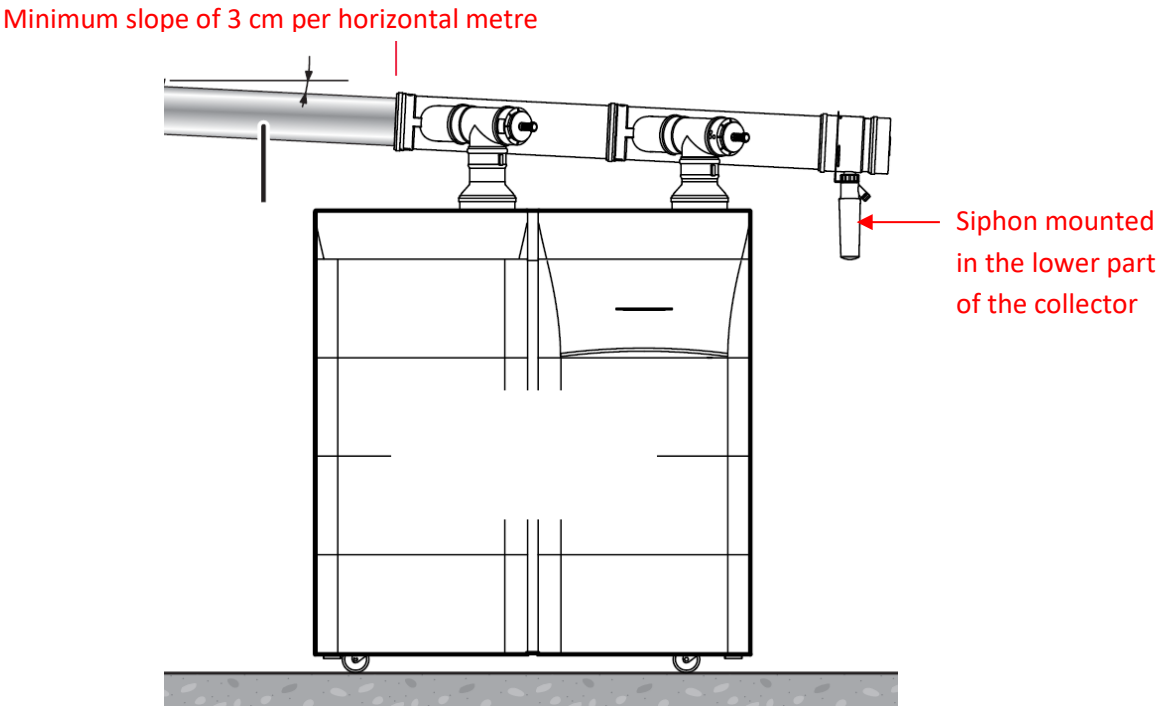
- For boilers without an integrated non-return flap, fit a non-return flap to the flue pipe of each boiler.

  The non-return flap (supplied with some boiler models) prevents the backflow of combustion products into the ambient air of the boiler room when a boiler is shut down.

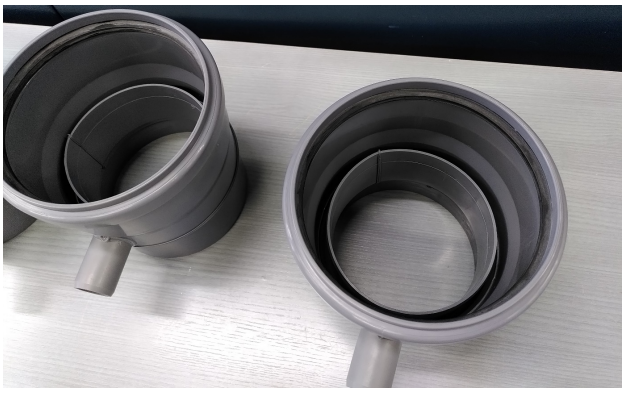
- If the boiler does not have a flue gas non-return flap as standard, select one from the list of accessories in the price list, as it has been tested and approved to work with this boiler.

Example of non return flap for boiler range GSR 230 Condens

- Connect the flue pipe of each boiler to the side of the flue collector and not from below: this prevents any residual condensation in the flue pipe from flowing through the first boiler connected to the collector.
- Connect a siphon to the lower part of the flue pipe.



- Install a condensate collector on the flue pipe of each boiler to avoid condensate accumulation on a single boiler.



Depending on the connection diameter of the boiler, the following condensate recuperators are available as options:

Package no	Reference	Description		Equivalent length
DY916	100018981	Condensate recuperator – Ø 80/125 mm	PPs/Alu	0,8 m
DY917	100018983	Condensate recuperator – Ø 110 mm	PPs	0,1 m
DY918	100018984	Condensate recuperator – Ø 110/150 mm	PPs/Alu	0,6 m
DY919	100018985	Condensate recuperator – Ø 80 mm	PPs	1,3 m

1.3 Connect the gas supply

Remark: to calculate the pipe diameters, OEcotools calculation sheets are at your disposal (link : OEcotools).

Check that the following points are respected before commissioning:

- Install a gas shut-off valve that complies with current regulations (NF for France) on the boiler input.
- On older gas systems, install a filter to prevent progressive clogging of the boiler's gas valve.
- Observe the gas supply pressure indicated on the boiler nameplate according to the gas used.
- Respect the relevant regulations.

1.4 Make hydraulic connections

- Check the following points before commissioning the installation.
- Ensure that the installation complies with the relevant regulations.

1.4.1 Check the flow and return connections

It is essential to respect the flow and return water connections. The boiler's temperature sensors will detect a possible inversion and put the boiler in safety mode.

1.4.2 Install a decoupling cylinder

A decoupling cylinder is mainly used for renovations. Indeed, old boilers had very little pressure drop, and the circulator was therefore dimensioned to overcome the installation's own pressure drop.

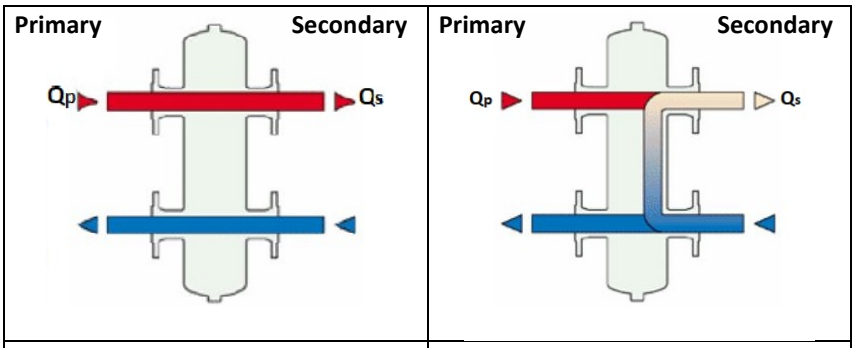
When replacing the boiler with a recent condensing boiler, the cumulative pressure drops of the installation and the boiler may be too great to be overcome by a circulator.

It is therefore advisable in this case to isolate the generator pressure losses from the secondary circuits by installing a decoupling cylinder (see hereafter).

1.4.3 Chose the operating principle

To ensure that the condensing boiler develops the best possible performance, use for example the modulation of the boiler pump.

Operating principle :



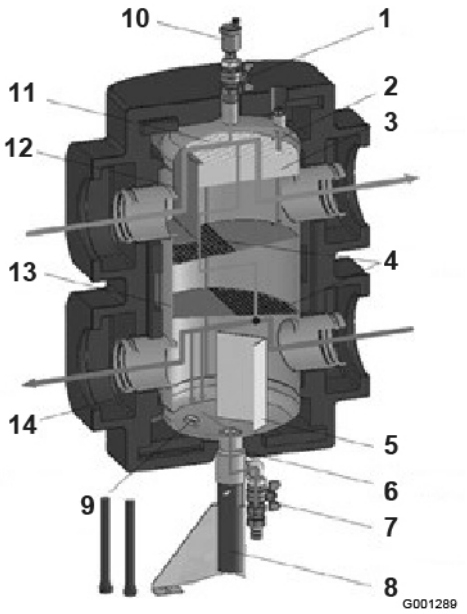
G001295

1.4.4 Install a sludge separator

Make sure that **one of the following two solutions** is present in the installation's hydraulic system.

- **Sludge separator**: refer to the technical leaflet « Boiler room equipment».
- **Decoupling cylinder** with integrated deaerator and magnetic sludge separator.

  Exemple for **IX-245 250** :



1. Flush valve with hose nozzle
2. Temperature sensor pocket
3. Rectifier
4. Perforated bottoms
5. Separation sheets
6. Sludge collector
7. Ball drain valve with nozzle connection
8. Height adjustable foot
9. Magnetic cartridges
10. Automatic air vent
11. Expansion chamber
12. Impact plate
13. Air vent duct
14. Insulation

Important: ensure annual maintenance of the sludge pot or the decoupling cylinder.
During annual maintenance, flush the cylinder by opening the lower valve. This allows emptying the cylinder from the sludge and magnetic particles into the drain (see example below: 3.7 Cleaning the decoupling cylinder).

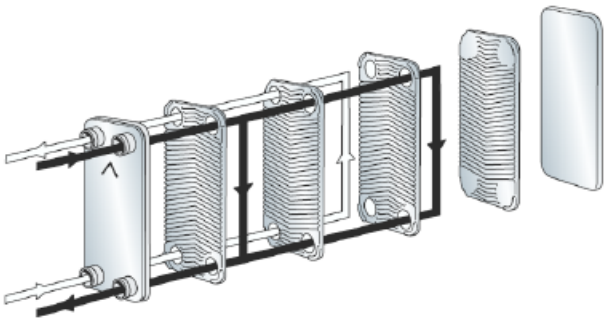
1.4.5 Installing a plate heat exchanger

The main purpose of a plate heat exchanger is to hydraulically isolate the primary and secondary circuits. This function is mainly used in two applications:

- In case of an old installation where you want to protect the new generator from polluted heating water from the secondary circuit
- In the domestic hot water application where all elements in contact with hot water must be certified as food safe. Not all boilers have this compatibility.

- **Check the operating principle**

Ensure that primary and secondary flows are counter-current for best performance.



- **Provide maintenance of the plate heat exchanger**

During the annual maintenance, clean the plate heat exchanger, which becomes dirty over time. This is done either by introducing a cleaning solvent on the side to be cleaned (see hereafter: 3.8 Cleaning the plate heat exchanger) or by disassembling the exchanger plates to clean them.

1.4.6 Check the expansion vessel

- **Principle**

When water heats up in the heating circuit it expands. This thermal expansion causes the volume of water to increase, resulting in excess pressure (between 10 and 90°C, 1m^3 of water expands by approximately 40 litres, i.e. 4%). The role of the expansion vessel is to collect this excess volume of water and to prevent a depression in the installation when the water cools down again.

The expansion vessel is divided into two parts. The first part is filled with the excess volume of water in the circuit, the second with compressed air. When the water arrives in the vessel, it pushes on the air part which compresses and absorbs the excess pressure.

- **Check the dimensioning**

Remark : an OEcotools calculation sheet (click on the link: OEcotools) is available for sizing the expansion vessel.

Table 2 : Expansion vessel volume (litres) depending on the system volume and filling pressure

Initial pressure of the expansion vessel	Volume of the installation (in litres)							
	100	125	150	175	200	250	300	> 300
50 kPa (0,5 bar)	4,8	6,0	7,2	8,4	9,6	12,0	14,4	Volume of the installation x 0,048
100 kPa (1 bar)	8,0	10,0	12,0	14,0	16,0	20,0	24,0	Volume of the installation x 0,080
150 kPa (1,5 bar)	13,3	16,6	20,0	23,3	26,6	33,3	39,9	Volume of the installation x 0,133

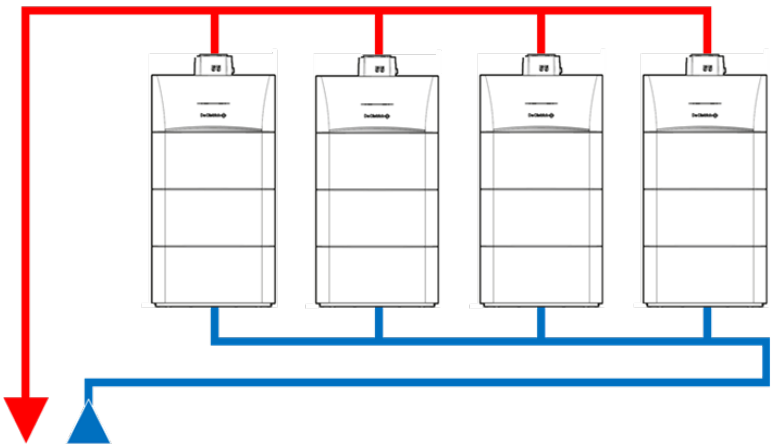
Conditions of validity :

- Safety valve set to 0,6 MPa (6 bar)
- Average water temperature: 70 °C
- Heating ciruit flow temperature : 80 °C
- Heating circuit return temperature : 60 °C
- System filling pressure less than or equal to the filling pressure of the expansion tank.

1.4.7 Connect cascaded boilers

If you do not use the cascade kits available with our boilers, connect the cascaded boilers hydraulically with a Tichelmann loop. This will ensure that the boilers are evenly supplied with water and therefore work at equal load.

Each boiler should be equipped with an isolation valve or boiler pump.



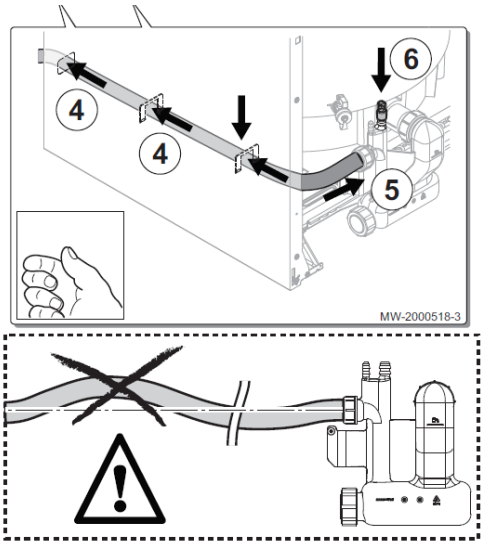
1.4.8 Install a differential bypass

In domestic systems where the primary pump also supplies the secondary circuit, fit the system with a differential bypass. This component protects the pump and the boiler in the event of zero flow in the system, for example when all the radiators are closed.

Note: A variable flow pump controlled by the boiler allows to do without a differential bypass.

1.5 Connect the condensate discharge

- **Check the connection of the condensate discharge. :**
    - Make sure to create a slope of 3 cm per horizontal metre
    - Ensure that the drain pipe is correctly positioned to avoid creating a double siphon.



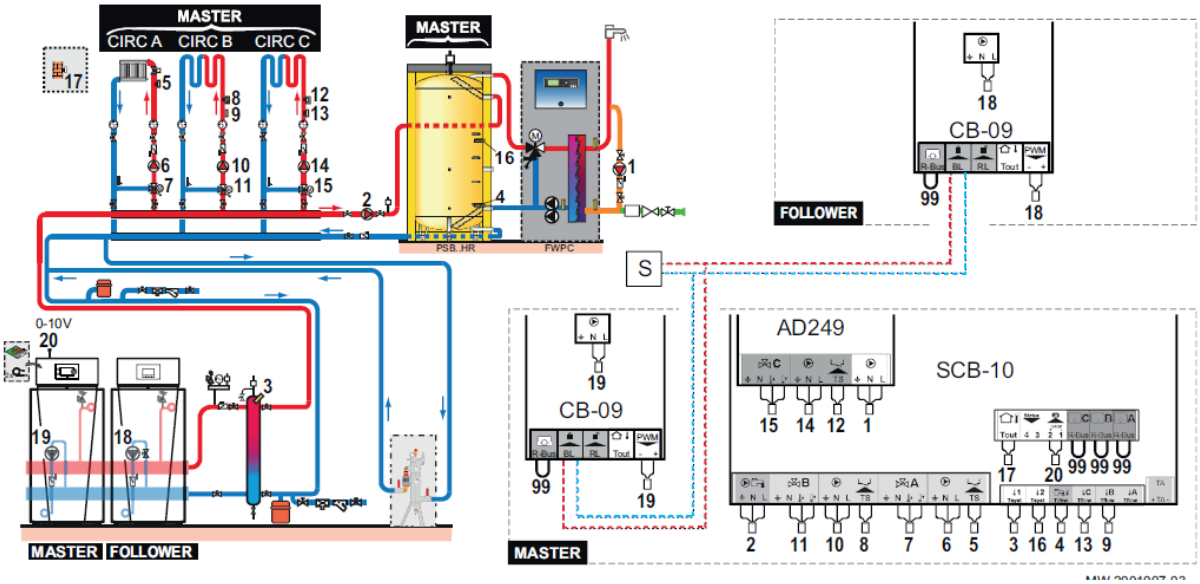
- **In cascade:** connect the condensate collector **safety** device to a blocking inlet of each boiler.

When using a single condensate neutralization container with lift pump on a cascade:

- It is essential to connect the high-level **safety** device of the container to the **BL** blocking inputs (on OEtronic controllers) of **each of the boilers** in the cascade.
- Be sure to **observe the polarity** of the connections on the **BL** plugs.

It can happen that the condensate lifting pump is defective or that the outlet of the condensate neutralization container is clogged. In this case, if the container is only connected to the **BL** inlet of one boiler, only this boiler will go into safety mode if the condensate level sensor opens the safety contact. The other boilers in the cascade will continue to operate and the condensate from the other boilers will overflow the condensate collector until the boiler room is flooded.
Therefore, it is important that the whole cascade goes to safety if the **BL** contact is opened.

- Example of connection to the **BL** contact on an OETROCOM-3 cascade.



S : Dry contact or external ON/OFF connected to the blocking input **BL**.

1.6 Check the electrical connections

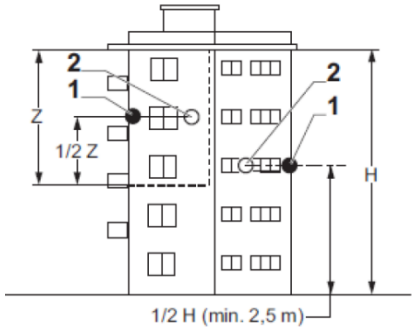
1.6.1 Check the power supply

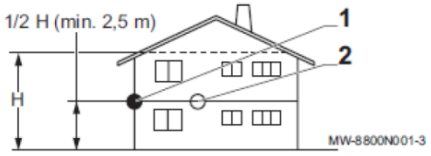
- Install a differential circuit breaker and wiring that complies with the relevant standards (France: NF C 15-100).
- Use flexible cables to facilitate connections.
- Avoid stressing wires in the boiler control panel.
- Observe the polarity. In the case of a neutral phase inversion, it is possible that the ionization current is zero even if there is a flame. Therefore, at start-up a flame may be present, but the boiler will go into safety mode because it will not detect any flame.
- Ensure a **minimum distance of 10 cm** between low voltage (230V) and extra low voltage (24V) cables. This will avoid electromagnetic interferences on the 24V signals.
- Observe the maximum current that can be delivered by the electronic board when connecting the various accessories (circulators, 3-way valves, etc.).
- On high power boilers, install power relays.

1.6.2 Check the location of the outdoor sensor

Be sure to choose a location that allows the sensor to properly and effectively measure the outdoor conditions.

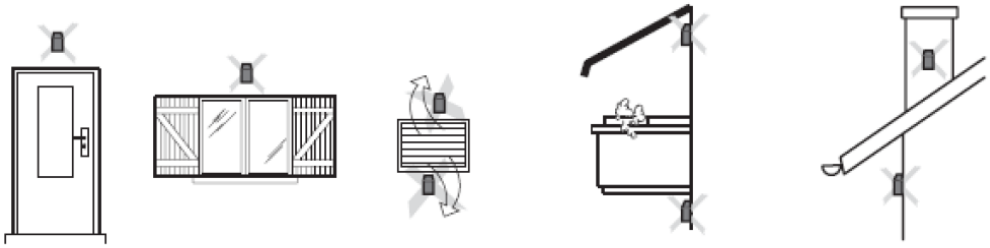
- Place the outdoor sensor in a location with the following characteristics:
  - On the side of the area to be heated: prefer the north side.
  - Halfway up (1/2 H) of the area to be heated (H).
  - Exposed to weather variations (**1**).
  - Protected from direct sunlight.
  - In an easily accessible location.





1: Optimal location
2: Possible location
H: Inhabited height controlled by the sensor
Z: Inhabited area controlled by the sensor

- Avoid the following locations:
  - Hidden by: a balcony, a roof, a building element, ...
  - Close to a heat source: chimney, ventilation grid, ...
  - Exposed to the sun



CAUTION: Check that the sensor is compatible with the boiler control:

- Sensor QAC34 : Siemens Control
- Sensor AF60 : OEtronic Control

2. Commissioning

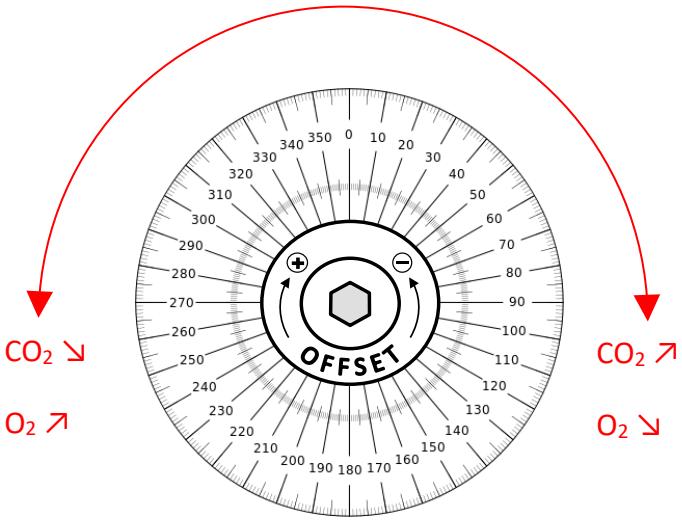
2.1 Check the combustion

The combustion analysis is always carried out with the boiler housing open.
The settings defined in the technical instructions are precisely given so that the CO_2/O_2 aimed at with the housing open corresponds to the nominal heat output with the housing closed.

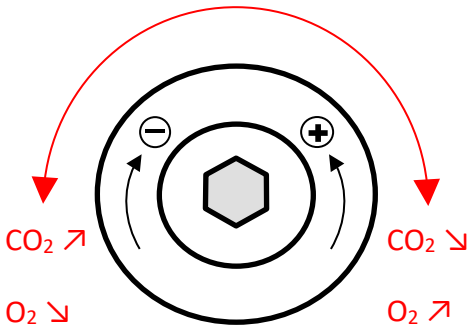
- **Always set the combustion in the following order:**

1. Check the control parameters according to the gas type: refer to the boiler manual.
2. Check the equipment (diaphragm/venturi): see the boiler manual.
3. Run the boiler at the minimum heat output (Qmin): refer to the manual.
4. Adjust the "Offset" screw on the gas valve until the O_2 is in the required range at Qmin,
5. Run the boiler at the nominal heat output (Qn)
6. Adjust the valve adjustment screw until the O_2 is in the required range at Qn
7. Return to Qmin
8. Check that the setting is still within the required range at Qmin,
9. When changing the setting at Qmin, always check the impact of this setting on Qn and vice versa

Useful tip : In most cases, the "Offset" and Qn adjustment screws react as follows:



OFFSET screw



Qn adjustment screw

2.2 Check the gas supply pressure

- Measure the pressure when the boiler is operating at nominal heat output.
- Measure the gas supply pressure at the gas valve or on a measuring nipple as close as possible to the gas valve.
- Check that the measured gas supply pressure:
  - Corresponds to the value indicated on the boiler nameplate for the gas concerned,
  - Is within the minimum and maximum pressure tolerances indicated in the boiler technical instructions.

2.3 Check the back pressure in the flue gas nozzle

- Measure the flue gas nozzle back pressure when the boiler is operating at nominal heat output.
- In a cascade, measure the flue gas nozzle back pressure on each boiler, when all boilers are operating at nominal heat output.
- Check that the measured back pressure is lower than the pressure available at the flue gas nozzle indicated in the technical specifications of the manual.

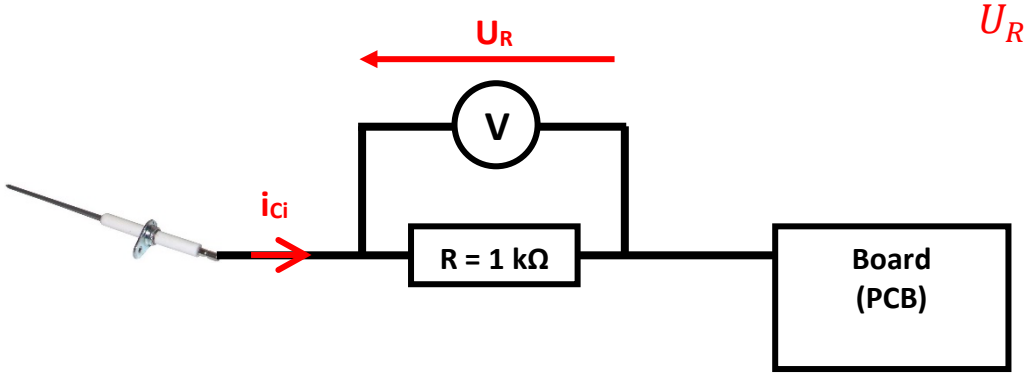
2.4 Check the ionization current

The ionization current can be read in the "**Information**" menu of the boiler.
If the control panel does not allow the ionization current to be read, use the following method.
The ionization current is in the µA range: the micro-ammeter measurement is not very reliable for these low values.
We therefore recommend the following method, except in the case when the ionization sensor is also an ignition sensor.

1. Make the following connection, using a 1 kΩ resistor:

Ohm's Law

$$U_R = R \times i_{Ci}$$



2. Set the multimeter to mV
3. The reading of the **U_R value in mV** corresponds directly to the ionization current i_{Ci} in **µA**.

It may be interesting to compare this measured value with the value indicated by the boiler.

3. Maintenance

3.1 Carry out an annual inspection

- Inspect and service the boiler at least once a year.

3.2 Clean the heating body

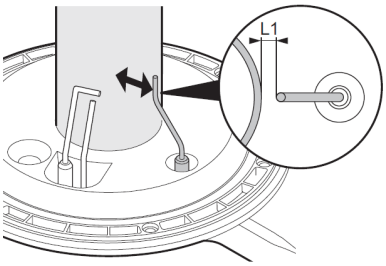
- Avoid metal brushes which cause irreparable damages to the heating body.
- For aluminium bodies, there are cleaning accessories available in the catalogue. The boiler's technical manual explains step by step how to clean the boiler body.
- For stainless steel bodies, only use nylon brushes to clean the heating body.
  Tip: mount the nylon brush on the mandrel of a drilling machine: this will facilitate cleaning.
- Use only the cleaning products recommended in the boiler technical manual.
- **Caution:** some bodies are not cleanable and must be replaced if they become too dirty.

3.3 Clean the siphon

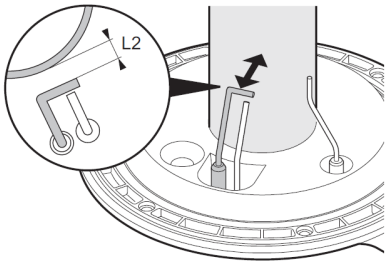
- Clean the siphon settling tank at each maintenance. It collects the impurities which, by accumulating, can block the siphon and cause a rise of condensates in the heating element.
  Emptying and cleaning the siphon regularly will prevent breakdowns.
- ***Important:*** always fill the siphon with water (up to the line) before putting it back to the boiler.

3.4 Check the electrodes

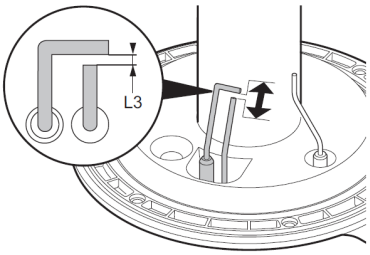
- During maintenance, check the integrity of the ignition and ionization electrodes.
  A damaged surface can lead to ignition faults.
- Check the following 3 distances, referring to the values given in the boiler technical instructions:



L_1
Distance between ionization sensor - Burner



L_2
Distance between Ignition electrode - Burner



L_3
Gap between the ignition electrodes

3.5 Check the burner

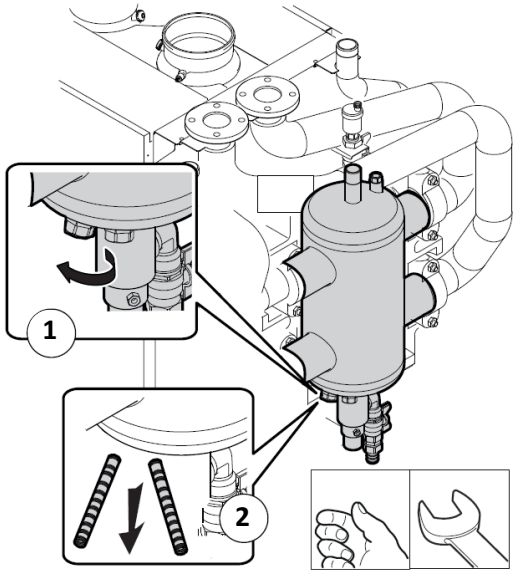
- Check the burner surface integrity,
- If it is damaged, do not hesitate to change it.
- Clean a non-braided burner with a soft brush
- Be careful not to get any dirt inside the burner during cleaning.

3.6 Replace the gaskets

- When removing a fitting that is sealed with a gasket, replace the gasket with a new one before reassembly.
- On gas-carrying pipe fittings, check the tightness of the fitting with a "thousand-bubble" type leak detector spray.

3.7 Cleaning the decoupling cylinder (example)

The decoupling cylinder collects the sludge from the entire heating system. It is therefore important to clean it during regular maintenance of the boiler. **Following procedure is an example: always refer to the boiler manual.**

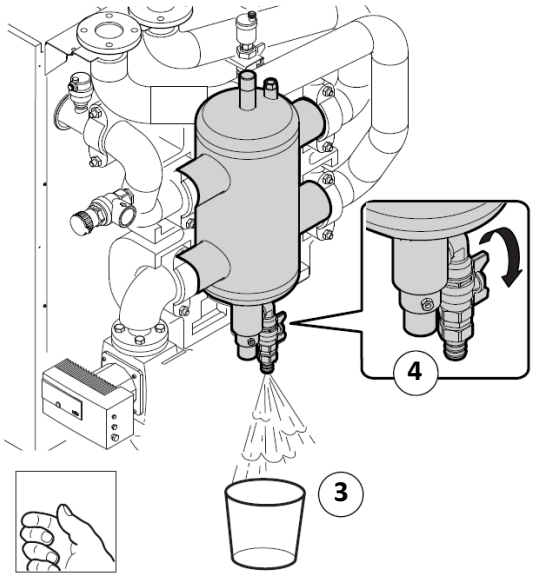


MW--4000310

1 - Unscrew the 2 magnetic plugs.

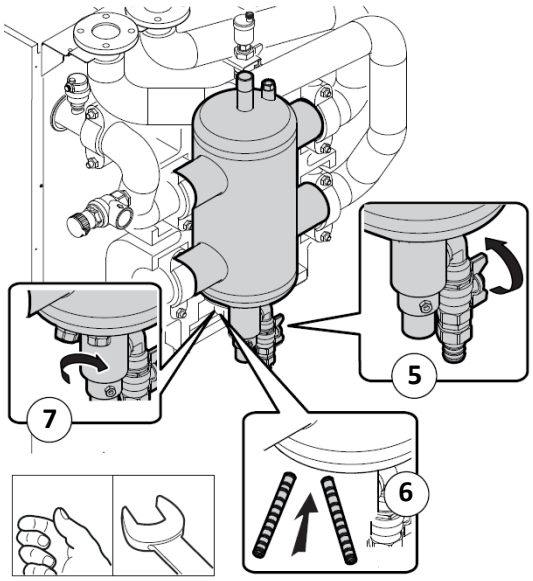
2 - Remove the 2 magnetic bars from their location.

Remark: When **replacing a boiler**, repeat this operation as often as necessary until the system is completely cleaned.



3 - Place a large enough container under the bleed valve of the decoupling cylinder.

4 - Open the drain valve: let it run until all dirt is removed.

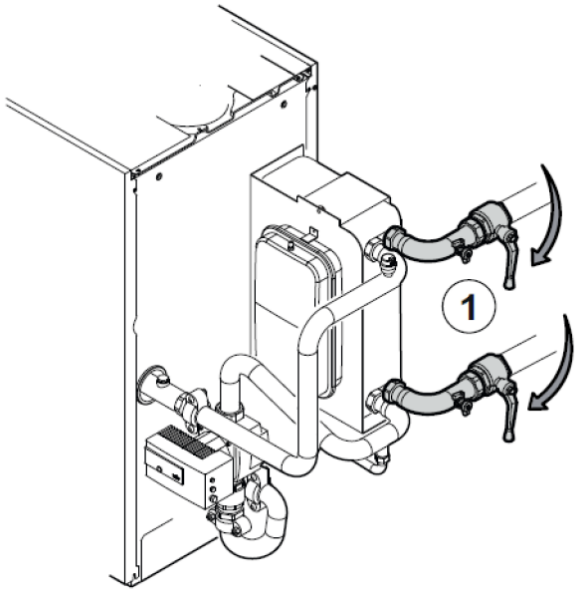


5 - Close the bleed valve.

6 - Put the 2 magnetic bars back in their locations.

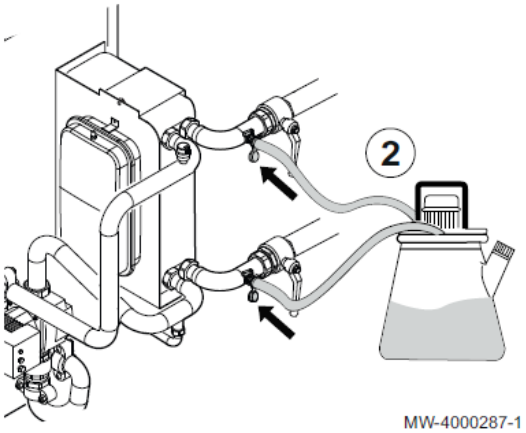
7 - Refit the plug screws.

3.8 Cleaning the plate heat exchanger



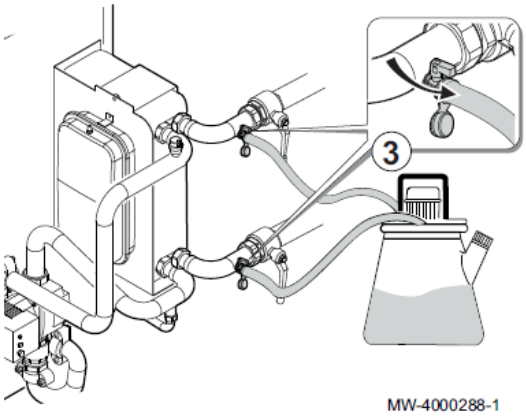
1 – Close the 2 valves on the secondary side

Fig.174



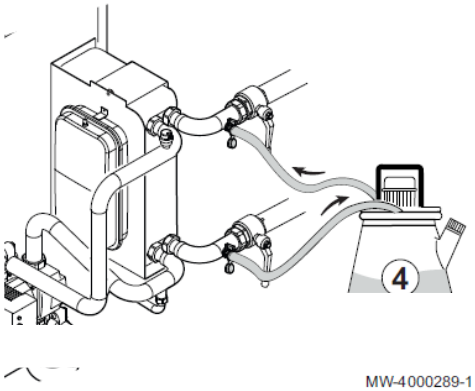
2. Connect the cleaning pump to the taps

Fig.175



3. Open the taps

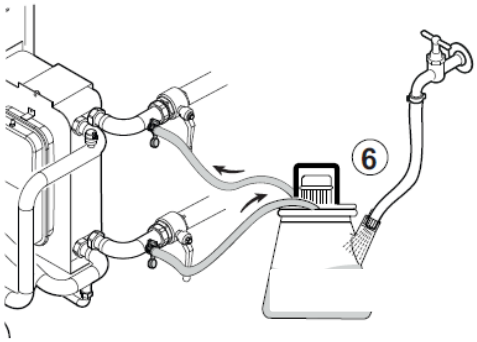
Fig.176



MW-4000289-1

4. Descale with a suitable product.
5. Apply a neutralizing and passivating product.

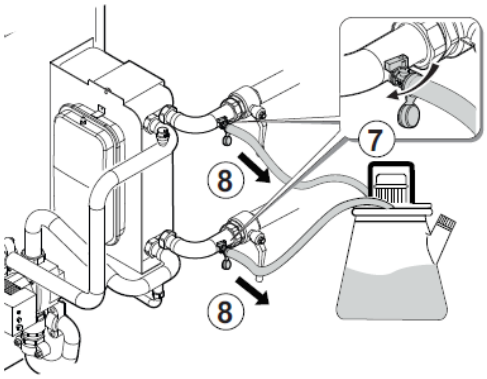
Fig.177



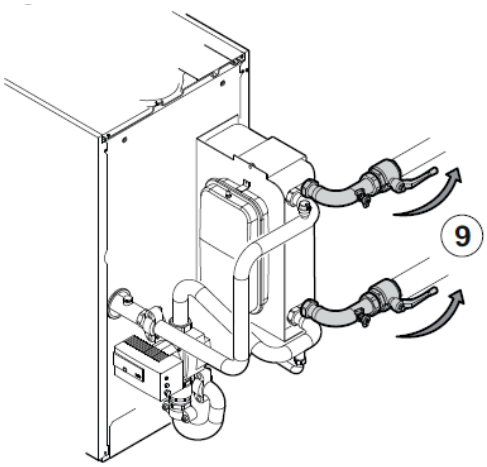
MW-4000290-1

6. Rinse the exchanger with water until a pH between 6 and 9 is reached.

Fig.178



7. Close the taps
8. Disconnect the cleaning pump.



9. Open the 2 valves on the secondary side.

4. Check the heating water

The water used to fill the system must meet the following requirements, depending on the boiler body type.

- Check that the heating water characteristics meet the following requirements.
- If these requirements are not met, a water treatment is necessary.
- Use a corrosion inhibitor adapted to the boiler body (aluminium, stainless steel) and to any type of installation (steel radiators, cast iron, underfloor heating).
  A corrosion inhibitor protects the installation and the boiler against corrosion, scaling and microbiological development (they are the cause of sludge).
- For more information, see the leaflet: Water quality instructions (ref. 7670933).

Remark : a heating water analysis kit is available as an option (package **SA41** - 7651707).

4.1. Aluminium heating body

Characteristics		First commissioning	Concentration (addition)
Degree of acidity (untreated water)	pH	6,5 – 8,5	6,5 – 8,5
Degree of acidity (treated water)	pH	7,0 – 9,0	7,0 – 9,0
Conductivity at 25 ° C	µS/cm	≤ 500	≤ 500
Chlorides	mg/l	≤ 50	≤ 50
Other components	mg/l	< 1	< 1
Total water hardness	° f	5 - 35	≤ 155
	° dH	2,8 – 20,0	≤ 8,5
	mmol/l (1)	0,5 – 3,5	< 1,5

(1) Flow temperature below 90 ° C – Maximal hardness: 1,5 mmol/l

- OERTLI recommends the following manufacturers: Cillite, Climalife, Fernox, Permo, Sentinel.

4.2. Stainless steel heating body

Characteristics		Total output of the installation			
		≤ 70 kW	70 – 200 kW	200 – 550 kW	> 550 kW
Degree of acidity (untreated water)	pH	7,5 - 9,5	7,5 - 9,5	7,5 - 9,5	7,5 - 9,5
Degree of acidity (treated water)	pH	7,5 - 9,5	7,5 - 9,5	7,5 - 9,5	7,5 - 9,5
Conductivity at 25 ° C	µS/cm	≤ 800	≤ 800	≤ 800	≤ 800
Chlorides	mg/litre	≤ 50	≤ 50	≤ 50	≤ 50
Other components	mg/litre	< 1	< 1	< 1	< 1
Total water hardness(1)	° f	1 - 35	1 - 20	1 - 15	1 - 5
	° dH	0,5 - 20,0	0,5 - 11,2	0,5 - 8,4	0,5 - 2,8
	mmol/litre	0,1 - 3,5	0,1 - 2,0	0,1 - 1,5	0,1 - 0,5

(1) For constantly heated systems with a maximum total system output of 200 kW, the maximum permissible total hardness is 8.4 ° dH (1.5 mmol/l, 15 ° f). For systems with a total capacity of more than 200 kW, the maximum appropriate total hardness is 2.8 ° dH (0,5 mmol/l, 5 ° f).

- OERTLI recommends the following manufacturers: Sotin, Fernox, Sentinel.