



Installation, use and maintenance manual

AY

Outdoor condensing boiler
for heating

Powered by natural gas/LPG



DISPOSAL

The appliance and all its accessories must be disposed of separately in accordance with the regulations in force.



Use of the WEEE symbol (Waste Electrical and Electronic Equipment) indicates that this product cannot be disposed of as household waste. Proper disposal of this product helps to prevent potential negative consequences for the environment and human health.

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I INTRODUCTION



Installation, use and maintenance manual

This Manual is an integral part of the AY appliance and must be handed to the end user together with the appliance.

I.1 RECIPIENTS

This Manual is intended for:

- ▶ End user, for appropriate and safe use of the appliance.
- ▶ Qualified installer, for correct appliance installation.
- ▶ Planner, for specific information on the appliance.

I.2 CONTROL DEVICE

In order to work, the AY appliance requires a control device to be connected by the installer.

II SYMBOLS AND DEFINITIONS

II.1 KEY TO SYMBOLS



DANGER



WARNING



NOTE



PROCEDURE



REFERENCE (to other document)

II.2 TERMS AND DEFINITIONS

DHW = domestic hot water.

Appliance/Unit AY = equivalent terms, both used to designate the AY series condensing boiler.

TAC = Technical Assistance Centre authorised by Robur.

External request = generic control device (e.g. thermostat, timer or any other system) equipped with a voltage-free NO contact and used as control to start/stop the AY unit.

DDC Control (Direct Digital Controller) = optional Robur control device to manage one or more Robur appliances in ON/OFF mode (GAHP heat pumps, GA chillers) or in modulating mode (AY boilers).

RB100/RB200 Devices (Robur Box) = optional interface devices complementary to DDC, which may be used to broaden its functions (heating/cooling/DHW production service demands and control of system components such as third party generators, adjustment valves, circulators, probes).

First start-up = appliance commissioning operation which may only and exclusively be carried out by a TAC.

III WARNINGS

III.1 GENERAL AND SAFETY WARNINGS



Installer's qualifications

Installation must exclusively be performed by a qualified firm and by skilled personnel, with specific knowledge on heating, electrical systems and gas appliances, in compliance with the laws in force in the Country of installation.



Declaration of conformity

Upon completing installation, the installing firm shall issue to the owner/client the appliance's workmanlike conformity declaration, according to national/local regulations in force and the manufacturer's instructions/provisions.



Packing

Packing items (plastic bags, polystyrene foam, nails, etc.) must be kept out of the reach of children, as they are potentially dangerous.



Misuse

The appliance must only be used for the purposes for which it has been designed. Any other use is deemed hazardous. Incorrect use may affect operation, duration and safety of the appliance. Adhere to the manufacturer's instructions.



Use of the appliance by children

The appliance can be used by children over 8 years old, and by people with reduced physical, sensory or mental capabilities, or lack of experience or

knowledge, only if they are under surveillance or after they have received instructions regarding safe use of the appliance and understanding the dangers inherent in it. Children should not play with the appliance.



Hazardous situations

- Do not start the appliance in hazardous conditions, such as: gas smell, problems with the plumbing/electrical/gas system, parts of the appliance under water or damaged, malfunctioning, disabling or bypassing control and safety devices.
- In case of danger, request intervention by qualified personnel.
- In case of danger, switch off the electrical power and gas supplies only if this can be done in total safety.



Gas component tightness

- Before performing any operation on gas ducting components, close the gas valve.
- Upon completing any procedure, perform the tightness test according to regulations in force.



Gas smell

If you smell gas:

- Do not use electrical devices such as telephones, multimeters or other equipment that may cause sparks next to the appliance.
- Shut off the gas supply by turning the valve off.
- Switch off the power supply via the external disconnect switch in the power supply electrical panel.
- Use a telephone away from the appliance to ask for intervention from qualified personnel.



Poisoning

- Ensure the flue gas ducts are tight and compliant with the regulations in force.
- Upon completing any procedure, ensure the tightness of the components.



Moving parts

The appliance contains moving parts.

- Do not remove guards during operation, and in any case prior to disconnecting the power supply.



Burn hazard

The appliance contains very hot parts.

- Do not open the appliance and do not touch internal components before the appliance has cooled down.
- Do not touch the flue gas exhaust before it has cooled down.



Electrocution hazard

- Disconnect the electrical power supply before any operation on appliance components.
- For electrical connections exclusively use compliant components and according to the specifications provided by the manufacturer.
- Ensure the appliance cannot be accidentally switched back on.



Earthing

Electrical safety depends on effective earthing system, correctly connected to the appliance and installed according to the regulations in force.



Distance from combustible or flammable materials

Do not deposit flammable materials (paper, diluents, paints, etc.) near the appliance.



Limescale and corrosion

Depending on the chemical/physical properties of the system water, limescale or corrosion may damage the appliance.

- Check system sealing.
- Avoid frequent top-ups.



Chloride concentration

The concentration of chlorides or free chlorine in the system water must not exceed the values in Table 3.2 p. 17.



Aggressive substances in the air

Halogenated hydrocarbons containing chlorine and fluorine compounds cause corrosion. The air of the installation site must be free from aggressive substances.



Acid flue gas condensate

Discharge the acid condensate of combustion flue gas in compliance with current exhaust regulations.



Switching the appliance off

Disconnecting the power supply while the appliance is running may cause permanent damage to internal components.

- Except in the event of danger, do not disconnect the power supply to switch off the appliance, but always and exclusively act through the provided control device.



In the event of failure

Operations on internal components and repairs may exclusively be carried out by a TAC, using only original spare parts.

- In the event of failure of the appliance and/or

breakage of any component, do not attempt to repair and/or restore and immediately contact the TAC.

Routine maintenance

Proper maintenance assures the efficiency and good operation of the appliance over time.

- Maintenance must be performed according to the manufacturer's instructions (see Chapter 7 p. 40) and in compliance with current regulations.
- Appliance maintenance and repairs may only be entrusted to firms legally authorised to work on gas appliances and systems.
- Enter into a maintenance contract with an authorised specialised firm for routine maintenance and for servicing in case of need.
- Use only original parts.

Decommissioning and disposal

If the appliance is to be disposed of, contact the manufacturer for its disposal.

Keep the Manual

This Installation, use and maintenance manual must always accompany the appliance and must be handed to the new owner or installer in the event of sale or removal.

III.2 COMPLIANCE

III.2.1 EU directives and standards

The appliance is certified in accordance with European regulation GAR 426/2016/EU and meet the essential requirements of the following Directives:

- ▶ Efficiency Directive 92/42/EEC and subsequent modifications and additions.
- ▶ 2016/426/EU "Gas Appliances Regulation" as amended and added.
- ▶ 2014/30/EC "Electromagnetic Compatibility Directive" as amended and added.
- ▶ 2014/35/EC "Low Voltage Directive" as amended and added.
- ▶ 2006/42/EC "Machine Directive" as amended and added.
- ▶ 811/2013/EU "Energy-Related Products regulation" as amended and added.
- ▶ 813/2013/EU "Ecodesign requirements regulation" as amended and added.

Furthermore, they comply with the requirements of the following standards:

- ▶ EN 15502 Gas-fired central heating boilers.

III.2.2 Other applicable provisions and standards

The design, installation, operation and maintenance of the systems shall be carried out in compliance with current applicable regulations, depending on the Country and location, and in accordance with the manufacturer's instructions. In particular, regulations regarding the following shall be complied with:

- ▶ Gas systems and equipment.
- ▶ Electrical systems and equipment.
- ▶ Heating systems employing condensing boilers.
- ▶ Environmental protection and combustion products exhaust.
- ▶ Fire safety and prevention.
- ▶ Any other applicable law, standard and regulation.

III.3 EXCLUSIONS OF LIABILITY AND WARRANTY

 Any contractual or extra-contractual liability of the manufacturer for any damage caused by incorrect installation and/or improper use and/or failure to comply with regulations and with the manufacturer's directions/instructions shall be disclaimed.

 In particular, the warranty on the appliance may be rendered void by the following conditions:

- Incorrect installation.
- Misuse.
- Failure to comply with the manufacturer's indications on installation, use and maintenance.
- Alteration or modification of the product or any part thereof.
- Extreme operational conditions or however outside of the operational ranges set forth by the manufacturer.
- Damages caused by external agents such as salts, chlorine, sulphur or other chemical substances contained in the installation water or present in the air of the installation site.
- Abnormal actions transmitted to the appliance by the system or installation (mechanical stresses, pressure, vibrations, thermal expansion, electrical surges...).
- Accidental damages or due to force majeure.

1 FEATURES AND TECHNICAL DATA

1.1 FEATURES

1.1.1 Operation

The AY appliances are outdoor condensing boilers capable of producing hot water up to 88 °C.

The range includes three models: AY 35, AY 50, AY 100.

The boiler casing is approved to resist weathering with particular regard to the action of UV rays.

The operation of the appliance is managed by one of the following controls (Paragraph 1.4 p. 9):

- ▶ DDC control
- ▶ external request (chronothermostat, room thermostat or other operating request)

When the heat supply is requested, the electronic board starts the system water pump, the blower and then the burner.

When the burner starts up, the flame detector checks that the burner has ignited; in the event of a lack of flame, the electronic control unit retries ignition several times and if this fails, it stops the appliance and displays the lock-out. The reset is manual.

In the event of abnormal overheating of the delivery, the boiler is switched off. The limit thermostat has manual reset.

1.1.2 Mechanical and thermo-hydraulic components

- ▶ Integrated spiral single tube stainless steel heat exchanger.
- ▶ Premix modulating burner with 1:9 ratio (AY 35), 1:10 (AY 50), 1:20 (AY 100).
- ▶ Automatic air vent valve.
- ▶ Check valve.
- ▶ High efficiency water pump.
- ▶ System drain tap.
- ▶ Water temperature probes.
- ▶ Condensate drain siphon.
- ▶ Check valve on flue gas exhaust (only for AY 100).
- ▶ Flue gas exhaust duct with relevant terminal, for type B53P configuration.

In the AY 100 the above components are double.

1.1.3 Control and safety devices

- ▶ Flue safety thermal fuse.
- ▶ Gas solenoid valve.
- ▶ Safety thermostat.

In the AY 100 the above components are double.

- ▶ Safety valve. Water differential pressure switch.
- ▶ Expansion tank.
- ▶ Outdoor temperature probe.

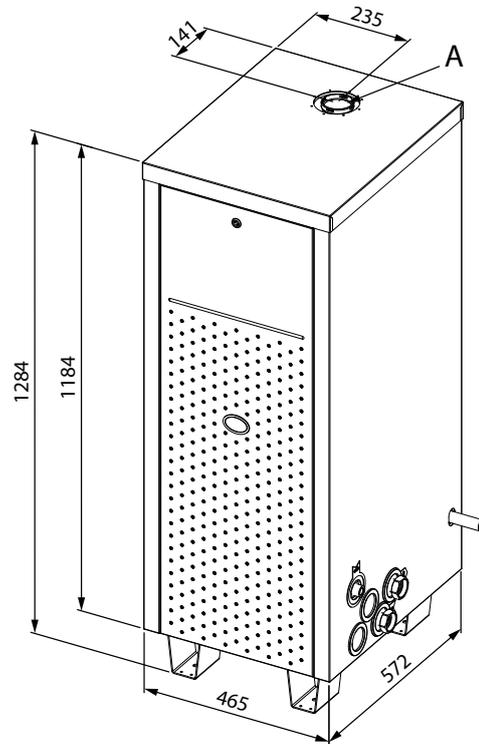
1.1.4 INAIL safety appliances

The kit is only available on appliances intended for the Italian market.

1.2 DIMENSIONS

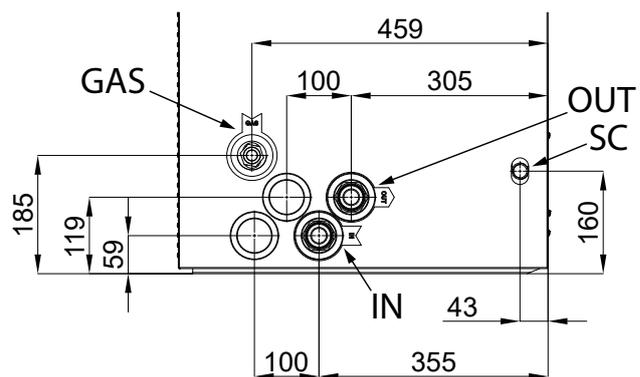
1.2.1 AY 35 and AY 50

Figure 1.2 Unit dimensions



A Flue gas outlet \varnothing 80 mm

Figure 1.3 Service plate - Hydraulic/gas connections detail



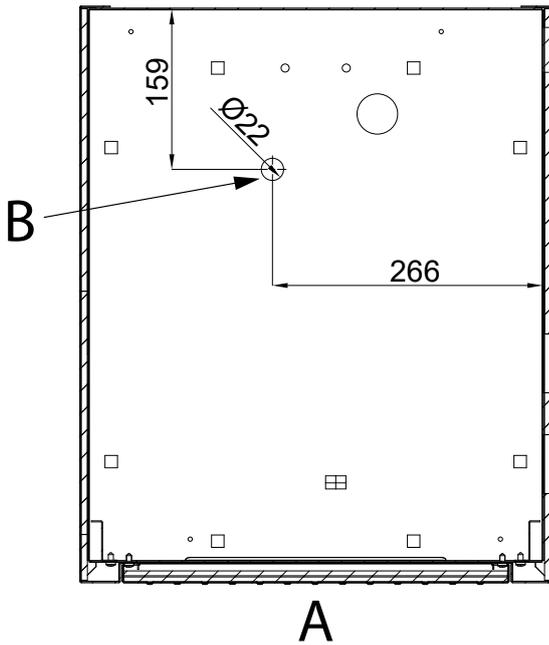
OUT Water outlet connection \varnothing 1 1/4" F

IN Water inlet connection \varnothing 1 1/4" F

SC Condensate drain connection (outside diameter 25 mm, inside 21 mm)

GAS Gas connection \varnothing 3/4" M

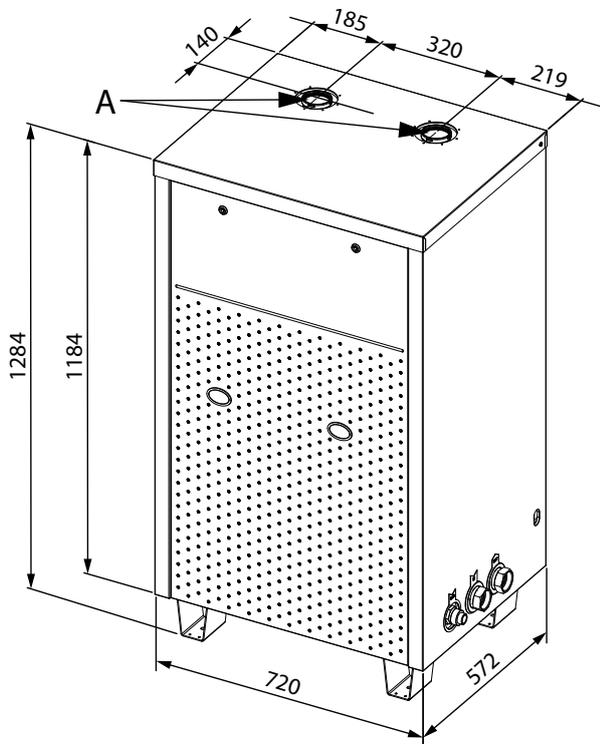
Figure 1.4 Service plate - Detail of bottom plate



- A AY front panel
- B Boiler safety valve drain external Ø 20 mm, internal Ø 14 mm

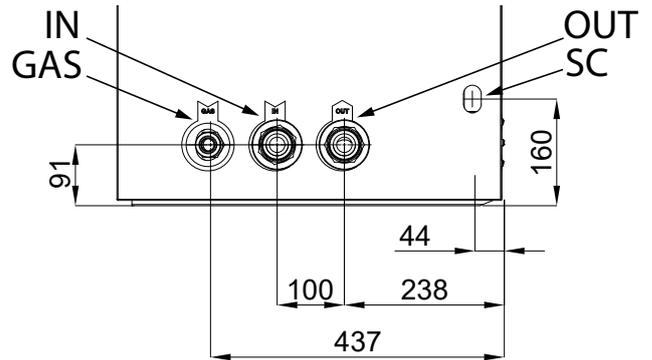
1.2.2 AY 100

Figure 1.5 Unit dimensions



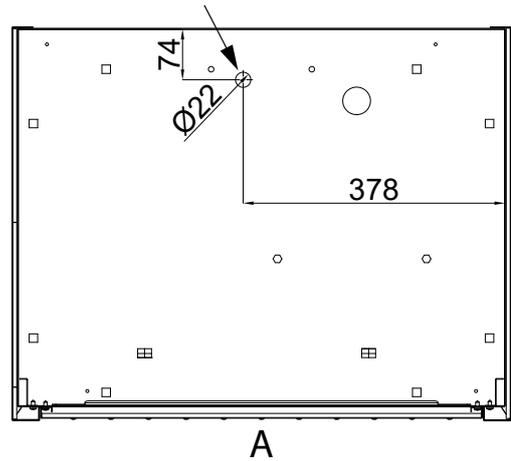
- A Flue gas outlet Ø 80 mm

Figure 1.6 Service plate - Hydraulic/gas connections detail



- OUT Water outlet connection Ø 1 1/2" F
- IN Water inlet connection Ø 1 1/2" F
- SC Condensate drain connection (outside diameter 25 mm, inside 21 mm)
- GAS Gas connection Ø 1" M

Figure 1.7 Service plate - Detail of bottom plate



- A AY front panel
- B Boiler safety valve drain external Ø 20 mm, internal Ø 14 mm

1.3 ELECTRONIC BOARDS

The unit's electrical board contains:

- ▶ **Electronic board MIAH413**, with microprocessor, it controls the appliance and displays data, messages and operative codes. The appliance is monitored and programmed by interacting with the control panel on the boiler.
- ▶ **CAN-NDG electronic board**, controls CAN bus communication with the DDC panel.

1.4 CONTROLS

1.4.1 Control device

The appliance may only work if it is connected to a control device, selected from:

- ▶ DDC control
- ▶ external request

1.4.2 DDC Controller

The DDC control is able to manage one or more Robur appliances in ON/OFF mode (GAHP heat pumps, GA chillers) or modulating mode (AY boilers).

The main functions are:

- ▶ Adjustment and control of one (or more) Robur units of the absorption line (GAHP, GA, AY).
- ▶ Data display and parameters setting.
- ▶ Time programming.
- ▶ Climatic curve control.

- ▶ Diagnostics.
- ▶ Errors reset.
- ▶ Possibility to interface with a BMS.

DDC functionality may be extended with auxiliary Robur devices RB100 and RB200 (e.g. service requests, DHW production, third party generator control, probe control, system valves or circulating pumps, ...).



For further details refer to the DDC, RB100, RB200 manuals and the design manual.

1.4.3 External request

The appliance may also be controlled via generic request devices (e.g. thermostat, timer, switch, contactor...) fitted with **voltage-free NO contact**. This system only provides elementary control, hence without the important functions of the DDC control. It is advisable to possibly limit its use to simple applications only and with a single appliance.



In the case of the AY 100 appliance, two separate requests must be provided for the two thermal modules that make up the appliance.



For connection of the selected device to the appliance's electronic board please refer to Paragraph 4.4.5 p. 27.

1.5 TECHNICAL DATA

Table 1.1 Technical data

			AY 35	AY 50	AY 100	
Heating mode						
Heat input	nominal (1013 mbar - 15 °C)	kW	34,0	50,0	99,8	
	minimum	kW	4,1	5,0		
Operating point 80/60	Nominal heat input	effective power	kW	33,4	49,2	98,4
		efficiency	%	98,2	98,4	98,5
Operating point 50/30	Nominal heat input	efficiency	%	106,4	106,8	
Operating point Tr = 30 °C	Heat input 30%	efficiency	%	108,6	108,8	
Operating point Tr = 47 °C	Heat input 30%	efficiency	%	102,1	102,8	
Heat losses	to casing in operation	%	0,25	0,10	0,47	
	to flue in operation	%	2,40	2,10		
	with burner off	%	0,03	0,05	0,03	
Heating water flow	nominal	l/h	2600	2350	4700	
	minimum	l/h	1200	1500		
Pressure drop heating mode	at nominal water flow	bar	0,57 (1)			
Hot water outlet temperature	maximum	°C	88			
Outdoor temperature (dry bulb)	maximum	°C	45			
	minimum	°C	-25			
Electrical specifications						
Power supply	voltage	V	230			
	type	-	single-phase			
	frequency	Hz	50			
Electrical power absorption	nominal	kW	0,22	0,25	0,49	

(1) For flows other than nominal see design manual, Paragraph "Pressure losses".

(2) Gas not available for AY 35.

(3) 2 independent flue gas exhausts.

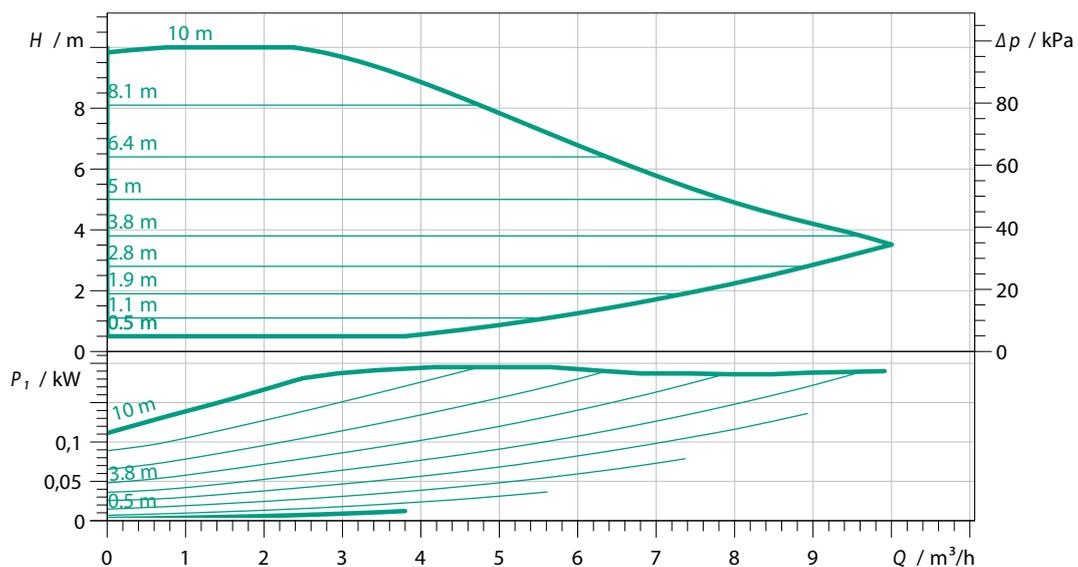
(4) For each of the independent flue gas exhausts.

			AY 35	AY 50	AY 100	
Degree of protection	IP		-	X5D		
Installation data						
Gas consumption	G20 natural gas (nominal)		m ³ /h	3,60	5,29	10,58
	G25 (nominal)		m ³ /h	4,18	6,15	12,30
	G25.1 (nominal)		m ³ /h	- (2)	6,14	12,26
	G25.3 (nominal)		m ³ /h	4,09	6,01	12,03
	G27 (nominal)		m ³ /h	- (2)	6,45	12,88
	G2.350 (nominal)		m ³ /h	- (2)	7,35	14,67
	G30 (nominal)		kg/h	2,68	3,94	7,88
	G31 (nominal)		kg/h	2,64	3,88	7,77
Water fitting	type		-	F		
	thread		"	1 1/4	1 1/2	
Gas connection	type		-	M		
	thread		"	3/4	1	
Flue gas exhaust	diameter (Ø)		mm	80	80 (3)	
	residual head		Pa	91	100	100 (4)
NO_x emission class			-	6		
Circulating pump data	Residual pressure head at nominal flow rate		boiler only bar	0,44		
	nominal flow at the maximum available head		l/h	2600	2350	4700
type of installation			-	B23, B23P, B33, B53		
maximum equivalent length of exhaust duct			m	15	14	14 (4)
maximum water pressure in operation			bar	3,0		
maximum flow rate of flue gas condensate			l/h	3,4	5,0	10,0
water content inside the appliance			l	8	11	22
expansion tank volume			l	10		
minimum storage temperature			°C	-30		
Dimensions	width		mm	465	720	
	depth		mm	575		
	height		mm	1284		
Weight	in operation		kg	77	87	131

- (1) For flows other than nominal see design manual, Paragraph "Pressure losses".
- (2) Gas not available for AY 35.
- (3) 2 independent flue gas exhausts.
- (4) For each of the independent flue gas exhausts.

1.5.1 Circulating pump characteristic curves

Figure 1.15 Oversized pressure head circulating pump characteristic curves



There are two water pumps in the AY 100 appliance.

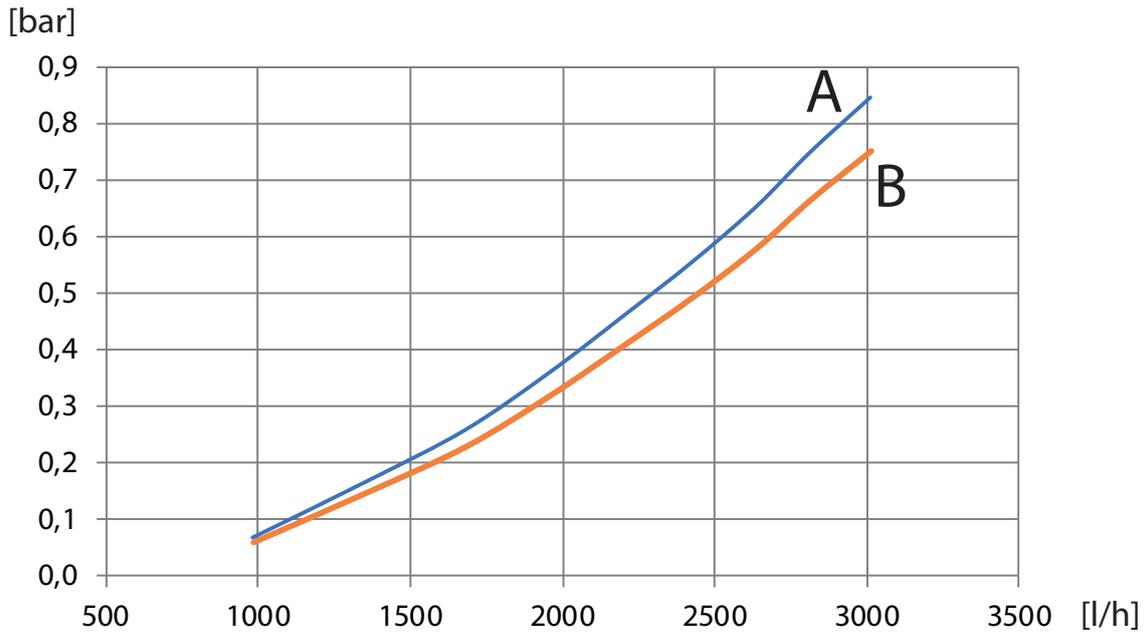
1.5.2 Pressure drops and residual head

Table 1.2 Nominal flow rate and residual head

				AY 35	AY 50	AY 100
Installation data						
Circulating pump data	nominal flow at the maximum available head		l/h	2600	2350	4700
	Residual pressure head at nominal flow rate	boiler only	bar	0,44		

1.5.2.1 AY 35

Figure 1.16 Available head and pressure drop of the boiler

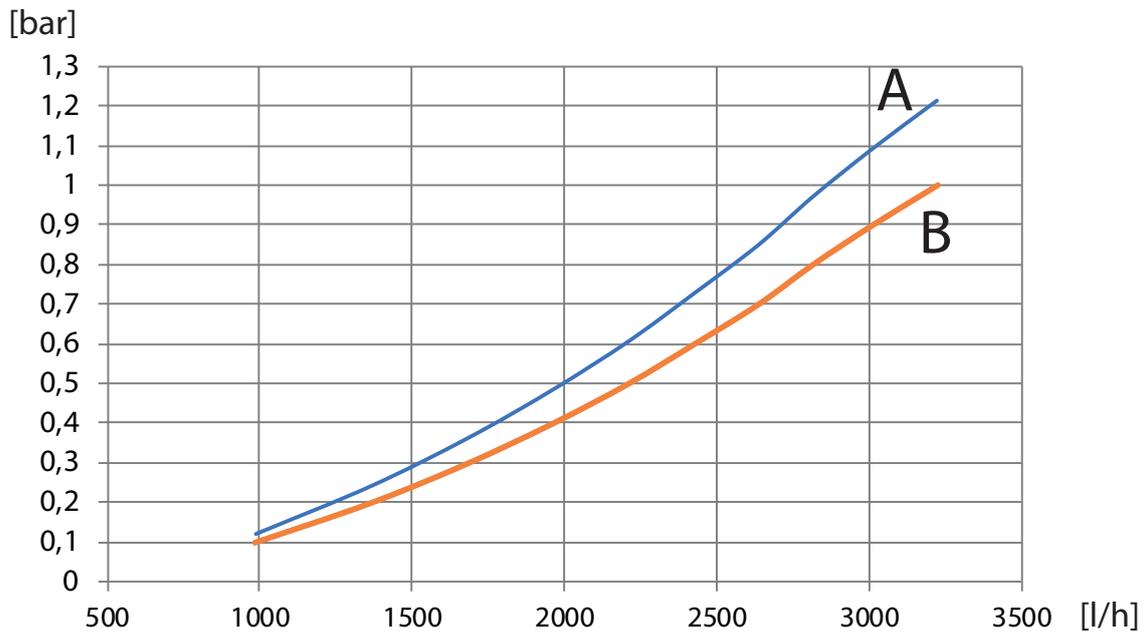


A Boiler pressure drop with 20% glycol water

B Boiler pressure drop with no glycol in water

1.5.2.2 AY 50 and AY 100

Figure 1.17 Pressure drop AY 50 and AY 100



A Boiler pressure drop with 35% glycol water

B Boiler pressure drop with no glycol in water

For AY 100 the curve is the same, as the boiler consists of two thermal modules in parallel, each with its own water pump.

2 TRANSPORT AND POSITIONING

2.1 WARNINGS

Damage from transport or installation

The manufacturer shall not be liable for any damage during appliance transport and installation.

On-site inspection

- Upon arrival at the site, ensure there is no transport damage on packing or boiler panels.
- After removing the packing materials, ensure the appliance is intact and complete.

Packing

- Only remove the packing after placing the appliance on site.
- Do not leave parts of the packing within the reach of children (plastic, polystyrene, nails...) since they are potentially dangerous.

Weight

- The lifting equipment must be suitable for the load.
- Do not stand under suspended loads.

2.2 INSTALLATION KIT

2.2.1 AY 35

The installation kit supplied with the boiler includes:

- 1. AY 35 condensing boiler.
- 1. flanged socket Ø 60/80 mm.
- 1. gasket of the flanged socket.
- 8. fixing screws of the flanged socket.
- 1. rain cover.
- 1. flue gas exhaust kit.

2.2.2 AY 50

The installation kit supplied with the boiler includes:

- 1. AY 50 condensing boiler.
- 1. triangle key for opening the front panel.
- 1. flanged socket Ø 60/80 mm.
- 1. gasket of the flanged socket.
- 8. fixing screws of the flanged socket.
- 1. rain cover.
- 1. flue gas exhaust kit.

2.2.3 AY 100

The installation kit supplied with the boiler includes:

- 1. AY 100 condensing boiler.
- 1. triangle key for opening the front panel.
- 2. flanged socket Ø 60/80 mm.
- 2. gasket of the flanged socket.

16. fixing screws of the flanged socket.
2. rain cover.
2. flue gas exhaust kit.

2.3 HANDLING AND LIFTING

- ▶ Always handle the appliance in its packing, as delivered by the factory.
- ▶ Do not remove the protective cap on the top panel as this can allow dirt and water to enter the interior of the appliance.
- ▶ Comply with safety regulations at the installation site.



In the event of handling with forklift or pallet truck, comply with the handling instructions shown on the packing.

2.4 WHERE TO INSTALL THE APPLIANCE

- ▶ The appliance may be installed at ground level, on a terrace or on a roof, compatibly with its dimensions and weight.
- ▶ The appliance's flue gas exhaust must not be immediately close to openings or air intakes of buildings, and must comply with safety and environmental regulations.
- ▶ No obstruction or overhanging structure (e.g. protruding roofs, eaves, balconies, ledges, trees) may obstruct the exhaust fumes outlet at the top of the appliance.
- ▶ Do not install near the exhaust of flues, chimneys or hot polluted air. In order to work correctly, the appliance needs clean air.
- ▶ In the case of indoor installation, meet all requirements set forth by laws, standards and regulations of the Country and place of installation concerning gas appliances.

2.5 MINIMUM CLEARANCE DISTANCES

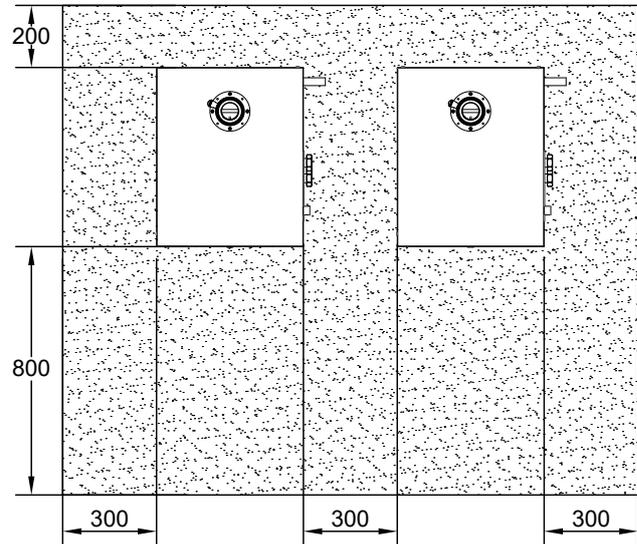
2.5.1 Distances from combustible or flammable materials

Keep the appliance away from combustible or flammable materials or components, in compliance with applicable regulations.

2.5.2 Clearances around the appliance

The minimum clearance distances shown in Figure 2.1 p. 13 (bar any stricter regulations) are required for safety, operation and maintenance.

Figure 2.1 Clearances



2.6 MOUNTING BASE

2.6.1 Mounting base constructive features

Place the appliance on a level flat surface made of fire-proof material and able to withstand its weight.

2.6.2 Installation at ground level

Failing a horizontal supporting base, make a flat and level concrete base, at least 100-150 mm larger than the appliance size per side.

2.6.3 Installation on terrace or roof

- ▶ The structure of the building must support the total weight of the appliance and the supporting base.
- ▶ If necessary, provide a maintenance walkway around the appliance.

2.6.4 Anti-vibration connections

It is advisable to use flexible connections (anti-vibration joints) between the appliance and the hydraulic and gas supply pipes.

3 HEATING ENGINEER

3.1 WARNINGS



Read the warnings in Chapter III.1 p. 4, providing important information on regulations and on safety.



Compliance with installation standards

Installation must comply with applicable regulations in force, based on the installation Country and site, in matters of safety, design, implementation and maintenance of:

- heating systems
- gas systems
- flue gas exhaust
- flue gas condensate discharge

 Installation must also comply with the manufacturer's provisions.

3.2 HYDRAULIC CONNECTIONS

The hydraulic installer must make the hydraulic connection circuit to the heating system.

The installer must provide for the construction of a suitably sized hydraulic connection circuit, taking into account:

- A.** of the following indications:
- Use pipes for heating/cooling systems, protected from weathering and freezing, insulated for thermal dispersion.
 - Sizing of the pipes, according to the standard circulator, must grant the nominal water flow required for the correct operation of the heating system.
 - When using glycol water, take this into account when selecting the pipe material and calculating the additional pressure drop generated by the presence of glycol (Table 3.1 p. 16).
- B.** of the residual head and pressure drop data reported in Paragraph 1.5.2 p. 11.

 Connect the outlet of the boiler safety valve (Paragraph 1.2 p. 7) to a suitable drain. The manufacturer is not liable for any damage caused by the opening of the safety valve in the event of system overpressure.

3.2.1 Hydraulic connections

on the right, at the bottom, connection plate (Paragraph 1.2 p. 7).

3.2.1.1 AY 35 and AY 50

OUT Water outlet connection Ø 1 1/4" F
 IN Water inlet connection Ø 1 1/4" F

3.2.1.2 AY 100

OUT Water outlet connection Ø 1 1/2" F
 IN Water inlet connection Ø 1 1/2" F

3.2.2 Pipe cleaning

Pipe cleaning

Before connecting the appliance, accurately wash the water and gas piping and any other system component, removing any residue.

3.2.3 Minimum components of water circuit

Always provide, near the appliance:

- ▶ on water piping, both outlet and inlet
 - 2 antivibration joints on water fittings
 - 2 pressure gauges
 - 2 isolation ball valves
- ▶ on the inlet water piping
 - 1 separator filter

 The appliance is equipped with its own 10 l internal expansion tank and with a safety valve. Depending

on the water content of the system, assess the need for additional expansion tanks.

3.2.4 System filling

 For the calculation of the total water content to be loaded in the system it is necessary to add the water content of the boiler (Table 1.1 p. 9) and of the distribution terminals to the water content in the pipes and in other elements that make up the system (tanks, hydraulic separators, etc.). Proceed with the filling of the system as follows.



A filling tap on the system must be provided for filling the system.



At the first power supply and each time the power supply is restored, an automatic system venting cycle is activated. The display will show the code F33 for the entire duration of the cycle (5 minutes for the first power supply, 2 minutes for the following ones).



To access the display, remove the front panel of the boiler, as shown in Figure 5.1 p. 29.

3.2.4.1 AY 35

1. Slightly loosen the cap of the jolly valve placed on the top of the condensing block (Figure 3.1 p. 15) to release the air from the top of the boiler.
2. Open the system filling valve (to be provided on the system) and let out all the air.
3. Check with pressure gauge that system pressure reaches 1,5 bar.
4. Open the automatic air vent valves on the system, if any, and check the air venting process.
5. Make sure that the unit is energized.
6. Send an operating request to the unit for a few seconds. The circulating pump will be immediately activated.
7. Remove the request before the burner is activated. The circulating pump will continue to circulate the water for the post-circulation time.
8. If, after the above operations, a decrease in system water pressure is observed, open again the system filling tap until the system pressure reaches 1,5 bar.
9. Repeat items 6, 7, 8 until the pressure has stabilised (at least 1,5 bar).
10. After the operation, make sure that the system filling tap is tightly closed.



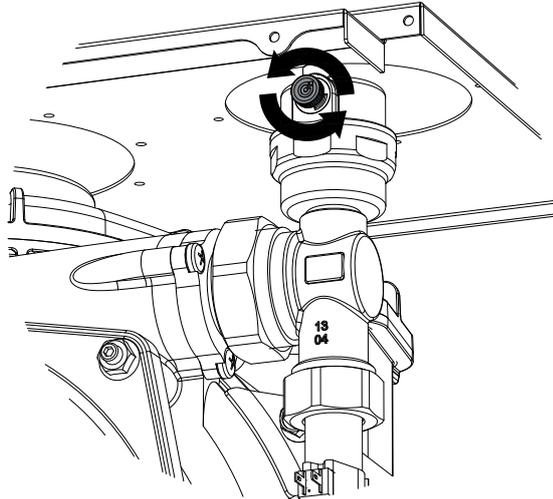
Once the filling operation has been completed, close the cap of the jolly valve on the condensing block, to avoid water leaks.



To start the circulation pump only, with the boiler powered, press the  key (Figure 6.1 p. 37): the symbol  will appear on the display; after

a few seconds turn off the boiler by pressing the  key again (the symbol  will appear on the display). The circulation pump will remain in operation for a few minutes. Repeat the operation several times until the pressure of the circuit remains unchanged.

Figure 3.1 Cap of the jolly valve on condensing block



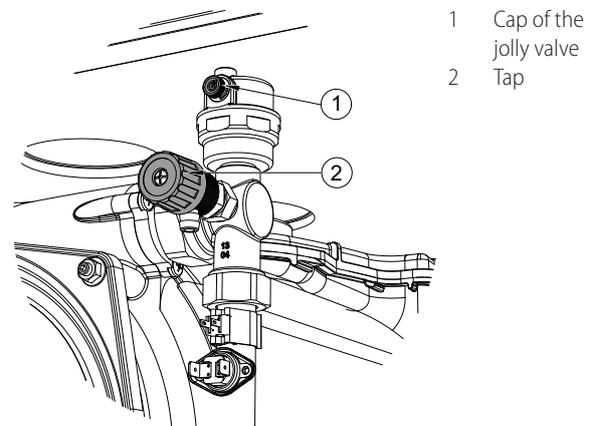
3.2.4.2 AY 50 and AY 100

1. Slightly loosen the cap of the jolly valve located at the top of the condensing block (detail 1, Figure 3.2 p. 15) to let the air out from the highest point of the boiler.
2. Check that the air vent valves in the system are not blocked.
3. Connect a rubber hose to the drain tap (detail 2, Figure 3.2 p. 15).
4. Open the drain tap (detail 2, Figure 3.2 p. 15) counterclockwise.
5. Open the system filling tap (to be provided on the system) and let all the air out. Close it when the air is all out, replaced by a constant water flow.
6. Operations 1 to 5 are to be carried out on both condensation blocks of the AY 100 model.
7. Pressurize the hydraulic system, making sure that the water pressure indicated by the pressure gauge is not less than 1,5 bar.
8. Make sure that the unit is energized.
9. Send an operating request to the unit for a few seconds. The circulating pump will be immediately activated.
10. Remove the request before the burner is activated. The circulating pump will continue to circulate the water for the post-circulation time.
11. If, after the above operations, a decrease in system water pressure is observed, open again the system filling valve until the system pressure reaches 1,5 bar.
12. Repeat items 9, 10, 11 until the pressure has stabilised (at least 1,5 bar).
13. After the operation, close the filling tap.

 Once the filling operation has been completed, close the cap of the jolly valve on the condensing block, to avoid water leaks.

 To start the circulation pump only, with the boiler powered, press the  key (Figure 6.1 p. 37): the symbol  will appear on the display; after a few seconds turn off the boiler by pressing the  key again (the symbol  will appear on the display). The circulation pump will remain in operation for a few minutes. Repeat the operation several times until the pressure of the circuit remains unchanged.

Figure 3.2 Air-vent valve



- 1 Cap of the jolly valve
- 2 Tap

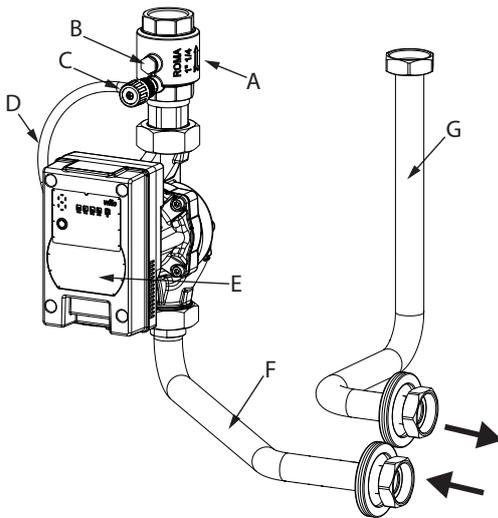
3.2.4.3 Water pump air vent

How to vent the water pumps of AY appliances

1. Turn off the system by means of provided control devices and wait for the water pumps to stop.
2. Disassemble the front panel of the unit.
3. Close the shut-off valve on the outlet and open the upper vent valve (Figure 3.3 p. 16, detail B).
4. When the air is all out, replaced by a constant flow of water, close the upper vent valve and open the shut-off valve on the outlet.
5. Close the shut-off valve on the inlet and open the lower vent valve (Figure 3.3 p. 16, detail C).
6. When the air is all out, replaced by a constant flow of water, close the lower vent valve and open the shut-off valve on the inlet.
7. Reactivate the system and let water flow (with burner off).
8. If the air vent has been properly completed, reassemble the front panel of the unit. If not, repeat the procedure from step 3.

 The correct filling and air venting of the hydraulic system are fundamental to ensure reliability over time of the mechanical components, in particular the circulation pumps.

Figure 3.3 Pump/Roma valve assembly on AY appliances



- A Roma valve
- B Air vent (internal circuit)
- C Air vent (system)
- D Flexible hose
- E Circulator
- F Return pipe
- G Delivery pipe

3.2.5 Pump antifreeze and anti-lock function



Heating antifreeze function

If the outlet water temperature detected by the water temperature probe inside the boiler falls below the antifreeze activation value (default 12 °C, settable via parameter P81), the control board starts the water pump and the ignition of the burner at minimum power. When the outlet water temperature reaches 30 °C or the inlet water temperature reaches 20 °C (antifreeze temperature OFF) the control board will turn off the burner.



Electrical and gas continuity

The antifreeze function is only effective if the power and gas supplies are assured. Otherwise, antifreeze fluid in the system water might be required.



Pump anti-lock function

Table 3.1 Glycol effects (AY)

Glycol %	Water-glycol mixture freezing temperature	Percentage of increase in pressure drops	Loss of efficiency of unit
10	-3 °C	7%	-
15	-5 °C	10%	0,5%
20	-8 °C	13%	1,0%
25	-12 °C	15%	2,0%
30	-15 °C	18%	2,5%
35	-20 °C	21%	3,0%
40	-25 °C	24%	4,0%

In order to prevent the circulation pump from locking, the boiler is equipped with an anti-lock function which, every 24 hours of inactivity, operates the circulation pump for 30 seconds.



Electrical continuity

The pump anti-lock function is only effective if the power supply is guaranteed.

3.2.6 Antifreeze liquid



Precautions with glycol

The manufacturer disclaims any liability for any damage caused by improper glycol use.

- Always check product suitability and its expiry date with the glycol supplier. Periodically check the product's preservation state.
- Do not use car-grade antifreeze liquid (without inhibitors), nor zinc-coated piping and fittings (incompatible with glycol).
- Glycol modifies the physical properties of water (density, viscosity, specific heat...). Size the piping, circulation pump and thermal generators accordingly.
- With automatic system water filling, a periodic check of the glycol content is required.



In the presence of glycol

In the presence of glycol it is necessary to warn the TAC before the first start-up and to set parameter P52 correctly.



When producing DHW by DHW buffer tank, use propylene glycol only.



The use of toxic antifreeze fluids is forbidden.

3.2.6.1 Type of antifreeze glycol

Inhibited type glycol is recommended to prevent oxidation phenomena.

3.2.6.2 Glycol effects

The Table 3.1 p. 16 shows, indicatively, the effects of using a glycol depending on its %.

3.2.7 System water quality

Responsibility of the user/operator/installer

The installer, operator and user must assure system water quality (Table 3.2 p. 17). Failure to comply with the manufacturer's guidelines may affect operation, integrity and life of the appliance, voiding the warranty.

3.2.7.1 System water characteristics



In order to avoid any scale or deposits on the primary exchanger, the water in the system must be treated in accordance with the applicable standards. This treatment is absolutely essential in cases where there are frequent episodes of water supply or partial or total emptying of the system.

The filling and top-up water brings a certain amount of calcium into the system. This is attached to the hot parts including the heat exchanger, thus creating pressure drops and thermal insulation on the active parts. This can lead to damage.

If the filling and top-up water of the system is outside the values indicated below, it must be softened and/or chemically treated. Additives may also be added to keep the calcium in solution. Hardness should be checked regularly and recorded on the system logbook. The choice of the type of treatment must be made according to the characteristics of the water to be treated, the type of plant and the limits of purity required.

Adhere to the chemical-physical parameters in Table 3.2 p. 17 and the regulations on water treatment for residential and industrial heating systems.

Table 3.2 Chemical and physical parameters of water

Acidity	7 < pH < 8,5	
Conductivity	< 400	µS/cm (at 25°C)
Chlorides	< 125	mg/l
Iron	< 0,5	mg/l
Copper	< 0,1	mg/l

3.2.7.2 Water topping up

The chemical-physical properties of the system's water may alter over time, resulting in poor operation or excessive topping up.

- ▶ Ensure there are no leaks in the installation.
- ▶ Periodically check the chemical-physical parameters of the water, particularly in case of automatic topping

Table 3.3 Network gas pressure

Product category	Country of destination	Gas supply pressure [mbar]							
		G20	G25	G25.1 (1)	G25.3	G2.350 (1)	G27 (1)	G30	G31
II ₂ H3B/P	AL, BG, CY, CZ, DK, EE, FI, GR, HR, IT, LT, MK, NO, RO, SE, SI, SK, TR	20						30	
	AT, CH	20						50	
	HU	25						30	

The appliance gas supply pressure, both static and dynamic, must comply with the values in the Table, with a tolerance of $\pm 15\%$.

¹ Gas not available for Caldaia 35 Tech, Caldaia 35 Tech ACS, Caldaria 35, AY 35.

up.

Chemical conditioning and washing

Water treatment/conditioning or system washing carried out carelessly may result in risks for the appliance, the system, the environment and health.

- Contact specialised firms or professionals for water treatment or system washing.
- Check compatibility of treatment or washing products with operating conditions.
- Do not use aggressive substances for stainless steel or copper.
- Do not leave washing residues.

3.3 FUEL GAS SUPPLY

3.3.1 Gas connection

- ▶ AY 35: 3/4" M
- ▶ AY 50: 3/4" M
- ▶ AY 100: 1" M

on the right, at the bottom, connection plate (Paragraph 1.2 p. 7).

- ▶ Install an anti-vibration connection between the appliance and the gas piping.

3.3.2 Mandatory shut-off valve

- ▶ Provide a gas shut-off valve (manual) on the gas supply line, next to the appliance, in a visible and easy accessible position, to exclude it when required.
- ▶ Perform connection in compliance with applicable regulations.

3.3.3 Gas pipes sizing

The gas pipes must not cause excessive pressure drops and, consequently, insufficient gas pressure for the appliance.

3.3.4 Supply gas pressure



This appliance is equipped for a maximum gas supply pressure of 50 mbar.

The appliance's gas supply pressure, both static and dynamic, must comply with Table 3.3 p. 17, with tolerance $\pm 15\%$.



Non compliant gas pressure (Table 3.3 p. 17) may damage the appliance and be hazardous.

Product category	Country of destination	Gas supply pressure [mbar]							
		G20	G25	G25.1 (1)	G25.3	G2.350 (1)	G27 (1)	G30	G31
II ₂ H3B/P	HU	25						30	
II ₂ H53B/P				25					
II ₂ H3P	AL, BE, BG, CH, CZ, ES, FR, GB, GR, HR, IE, IT, LT, NL, MK, PL, PT, SI, SK, TR	20							37
	AT, BE, CH, CZ, DE, ES, FR, GB, HU, NL, SK	20							50
	AT, CZ, DE, NL, RO	20							30
II ₂ ELL3B/P	DE	20	20					50	
II ₂ ESi3P	FR	20	25						37
II ₂ E(R)3P	BE	20							37
II ₂ E(S)3P		20							37
II ₂ E3P	LU	20							50
II ₂ E3B/P	DE, PL, RO	20						30	
II ₂ ELwLs3B/P	PL					13	20		
II ₂ ELwLs3P						13	20		
II ₂ L3B/P	RO		20					30	
II ₂ L3P	FR		25						37
	RO		20						37
II ₂ EK3P	NL	20			25				30
II ₂ EK3B/P		20			25				30
I ₂ EK		20			25				
I ₂ ELL	DE	20	20						
I ₂ E(S)	BE	20							
I ₂ E(R)		20							
I ₂ ESi		FR	20	25					
I ₂ H	AL, AT, BG, CH, CY, CZ, DK, EE, ES, FI, GB, GR, HR, IE, IT, LT, LV, MK, NO, PT, RO, SE, SI, SK, TR	20							
	FR	20							
	HU	25							
I ₂ L	FR		25						
	RO		20						
I ₂ E	DE, PL, RO	20							
I ₃ B/P	AL, AT, BG, BE, CY, CZ, DE, DK, EE, FI, FR, GB, GR, HR, HU, IT, LT, MT, NL, NO, RO, SE, SI, TR							30	
	PL							37	
	AT, CH, DE, SK, CY, CZ							50	
	FR							50	
I ₃ P	AT, BE, CH, CZ, DE, ES, FR, GB, HU, IS, NL, SK								50
	AL, BE, BG, CH, CZ, ES, FR, GB, GR, HR, IE, IT, LT, NL, LV, MK, PL, PT, SI, SK, TR								37
	AT, CZ, DE, NL, RO								30

The appliance gas supply pressure, both static and dynamic, must comply with the values in the Table, with a tolerance of ± 15%.

1 Gas not available for Caldaia 35 Tech, Caldaia 35 Tech ACS, Caldaria 35, AY 35.

Before proceeding with the construction of the system, the installer must:

- ▶ Check that the gas used corresponds to that for which the appliance has been designed (see nameplate).
- ▶ Check that the flow rate of the gas meter is such as to ensure the simultaneous use of all the devices connected to it.



Although it is normal for the inlet pressure to decrease during the operation of the appliance, it is important to check that there are no excessive fluctuations in the inlet pressure. In order to limit the extent of these variations, it is necessary to appropriately define the diameter of the gas inlet pipe to be adopted based on the length and pressure drop of the pipe itself, from the gas meter to the appliance.



If fluctuations in the gas distribution pressure happen, it is advisable to insert a special pressure stabiliser upstream of the gas inlet to the appliance. In case of LPG supply, all necessary precautions must be taken to avoid freezing of the combustible gas in case of very low external temperatures.



If it is necessary to change the type of gas supply to the appliance, contact the TAC that will make the necessary changes.



Under no circumstances shall the installer be authorised to carry out such operations.

3.3.5 Vertical pipes and condensate

- ▶ If needed, vertical gas pipes must be fitted with siphon and discharge of the condensate that may form inside the pipe.
- ▶ If needed, insulate the piping.

3.3.6 LPG pressure reducers

With LPG the following must be installed:

- ▶ A first stage pressure reducer, close to the liquid gas tank.
- ▶ A second stage pressure reducer, close to the appliance.

3.4 COMBUSTION PRODUCTS EXHAUST



The appliance is approved for connection to a combustion products exhaust duct for the types shown in Table 1.1 p. 9.

3.4.1 Flue gas exhaust connection

- ▶ AY 35: Ø 80 mm
- ▶ AY 50: Ø 80 mm
- ▶ AY 100: Ø 80 mm (2 independent flue gas exhausts) on the upper side of the boiler (Paragraph 1.2 p. 7).

The rain cover, supplied, must be mounted on the flue gas exhaust pipe to protect the internal components of the boiler (detail E, Figure 3.4 p. 19).

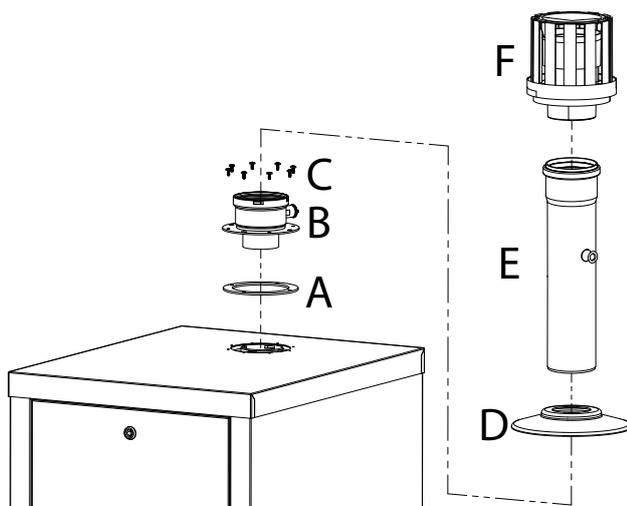
The combustion air is drawn from the outside of the casing by means of special louvres.

3.4.2 Flue gas exhaust kit

The appliance, supplied in B53P configuration, is standard supplied with a DN80 flue gas kit, to be set up by the installer.

For the AY 100 appliance, the flue gas exhaust kit is double and the kit must be installed on both thermal modules.

Figure 3.4 Flue gas exhaust kit



- | | | | |
|---|-------------------------------------|---|-----------------------|
| A | Gasket of the flanged socket | D | Rain cover |
| B | Flanged socket Ø 60/80 mm | E | Flue gas exhaust pipe |
| C | Fixing screws of the flanged socket | F | Roof terminal |

3.4.2.1 How to install the flue gas kit



The protective cap has the purpose of preventing ingress of water and/or foreign matter into the appliance before installation of the flue gas kit. It is therefore important to remove the cap only upon completing installation of the kit.



Figure 3.4 p. 19:

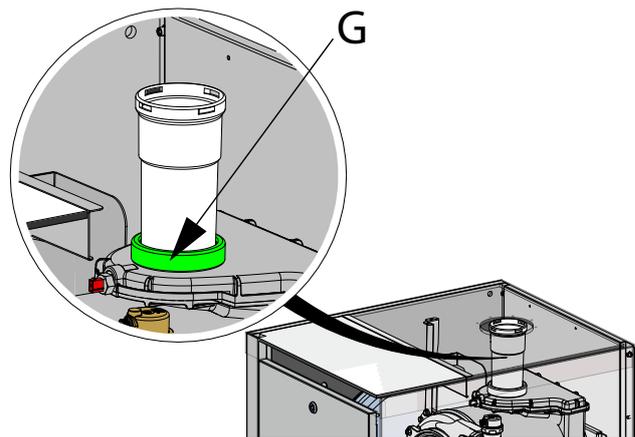
1. Remove the protective cap on the top panel of the appliance.
2. Check that the gasket G is correctly positioned on the combustion chamber (Figure 3.5 p. 19).
3. Position the gasket A of the flanged socket B at the appropriate holes for the fixing screws C.
4. Position the flanged socket B over the gasket A and secure the assembly with the appropriate fixing screws C.
5. Position the rain cover D on the flanged socket B.
6. Insert the flue gas exhaust pipe E into the flanged socket B.
7. Fit the terminal F on the extension pipe E inside the dedicated socket.



It is important to check the correct positioning of the gasket G positioned on the combustion chamber (Figure 3.5 p. 19).

Incorrect positioning of the gasket G can compromise the correct discharge of the flue gas outside and consequently damage the appliance.

Figure 3.5 Correct gasket positioning



G Gasket

3.4.3 Possible flue

If required, the appliance may be connected to a flue appropriate for condensing appliances.

- ▶ To size the flue refer to Table 3.4 p. 20 and design manual.
- ▶ Use ducts and terminals suitable for forced draft condensing appliances.
- ▶ If several appliances are connected to a single flue, it

is obligatory to install a check valve on the flue gas exhaust of each.

- ▶ The flue must be designed, sized, tested and constructed by a skilled firm, with materials and components complying with the regulations in force in the country of installation.
- ▶ Always provide a socket for flue gas analysis, in an accessible position.
- ▶ The horizontal sections for flue gas exhaust must always be mounted on a slope towards the appliance (3° slope = 5 mm per metre of pipe).
- ▶ For vertical ducts longer than 1,5 m, a curve and a Tee (Figure 3.6 p. 20) for condensate collection and drainage must be provided. The condensate must then be evacuated in accordance with the regulations in force, at the same time as that coming from inside the boiler.

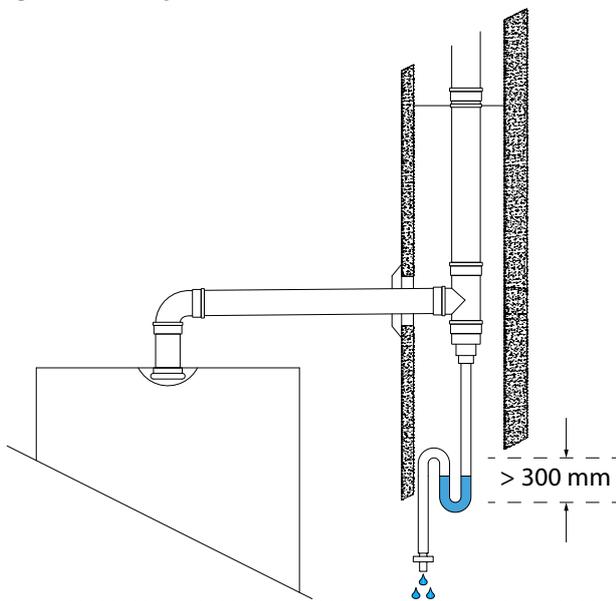


In case the check valves are installed outside, an appropriate UV ray protection must be assured (if the valve is in plastic) as well as protection from potential winter freezing of condensate backflow into the siphon.



The connection of the discharge to the sewerage system must be made at atmospheric pressure, i.e. by dripping into a siphoned container connected to the sewerage system.

Figure 3.6 Flue gas condensate drain



3.4.3.1 Maximum exhaust pipe length

Table 3.4 Characteristics of flue gas exhaust

	AY 35	AY 50	AY 100
Installation data			

- (1) For each of the independent flue gas exhausts.
- (2) 2 independent flue gas exhausts.

		AY 35	AY 50	AY 100
Flue gas exhaust	residual head	Pa	91	100
	diameter (Ø)	mm	80	80 (2)
maximum equivalent length of exhaust duct		m	15	14 (1)

- (1) For each of the independent flue gas exhausts.
- (2) 2 independent flue gas exhausts.

The maximum exhaust length (or equivalent linear length) is obtained by adding the length of the linear duct to the equivalent length of each additional curve. The equivalent lengths of linear ducts and curves are given in Table 3.5 p. 20.

Table 3.5 Pressure drop of flue pipes

	Equivalent length (m)	Pressure drop (Pa)
AY 35		
extension pipe Ø 80 mm, length 1000 mm	1	5,8
elbow 90° Ø 80 mm	1,5	8,7
elbow 45° Ø 80 mm	1,2	7,0
T connector Ø 80 mm	3	17,4
AY 50/AY 100		
extension pipe Ø 80 mm, length 1000 mm	1	7,0
elbow 90° Ø 80 mm	2,5	17,5
elbow 45° Ø 80 mm	1,4	7,8
T connector Ø 80 mm	3	21,0

3.5 FLUE GAS CONDENSATE DRAIN

The provided condensate drain hose must be connected to a suitable collection and disposal system in accordance with the applicable regulations in force.

It will be the responsibility of the designer and/or the installer and/or the person in charge of the system, depending on the power of the system and intended use of the building, to assess the adoption of systems for the neutralization of acid condensate.

The system must be designed in such a way as to prevent condensation from freezing. Before commissioning the appliance, check that the condensate is drained correctly. To do this, disconnect the hose from the siphon outlet and pour water into it, making sure that it is correctly and completely drained from the downstream drainage system.



Do not use gutters to discharge the condensate

Do not discharge the flue condensate in gutters, due to the risk of materials corrosion and ice formation.

3.5.1 Flue gas condensate connection

The fitting for flue gas condensate drain is located on the right side of the appliance (Paragraph 1.2 p. 7) at the connection plate.

The connection of the discharge to the sewerage system should be made at atmospheric pressure, i.e. by dripping into a siphoned container connected to the sewerage system.

3.5.2 Flue gas condensate drain manifold

To make the condensate drain manifold:

- ▶ Size the ducts for maximum condensation flow rate (Table 1.1 *p.* 9). Use plastic materials resistant to acidity pH 3-5.
- ▶ Provide for min. 1% slope, i.e. 1 cm for each m of the length (otherwise a booster pump is required).
- ▶ Prevent freezing.
- ▶ Dilute, if possible, with domestic waste water (e.g. bathrooms, washing machines, dish washers...), basic

and neutralising.

3.5.3 Condensate drain siphon filling

When switching on for the first time, the condensate siphon must be filled to prevent the combustion gases from backflowing through the siphon.

It is advisable, after the first few months of operation of the appliance, to clean the siphon, which collects also any deposits resulting from the first passage of the condensate inside the components of the appliance. These deposits could cause the siphon itself to malfunction.

4 ELECTRICAL INSTALLER



Do not power and/or start the boiler before filling the hydraulic system, as this may damage the internal hydraulic components.

4.1 WARNINGS



General warnings

Read the warnings in Chapter III.1 *p.* 4, providing important information on regulations and on safety.



Compliance with installation standards

Installation must comply with applicable regulations in force, based on the installation Country and site, in matters of safety, design, implementation and maintenance of electrical systems.



Installation must also comply with the manufacturer's provisions.



Live components

After placing the appliance in the final position, and prior to making electrical connections, ensure not to work on live components.



Earthing

- The appliance must be connected to an effective earthing system, installed in compliance with regulations in force.
- It is forbidden to use gas pipes as earthing.



Cable segregation

Keep power cables physically separate from signal ones.



Do not use the power supply switch to turn the appliance on/off

- Never use the external isolation switch to turn the

appliance on and off, since it may be damaged in the long run (occasional blackouts are tolerated).

- To turn the appliance on and off, exclusively use the suitably provided control device.

4.2 ELECTRICAL SYSTEMS

Electrical connections must provide:

- ▶ power supply (Paragraph 4.3 *p.* 22)
- ▶ control system (Paragraph 4.4 *p.* 22)



How to make connections

All electrical connections must be made in the appliance's electrical panel (Figure 4.1 *p.* 21):

1. Ensure the appliance is not live.
2. Remove the appliance front panel (Figure 5.1 *p.* 29).
3. Unscrew the two screws and remove the electrical panel terminal block cover plate.
4. Run the cables through the appropriate holes at the rear of the appliance (Figure 4.2 *p.* 22).
5. Identify the appropriate connection terminals.
6. Make the connections.
7. Replace the terminal block cover plate, securing it with its screws, and refit the front panel.

Figure 4.1 Access to AY terminal block

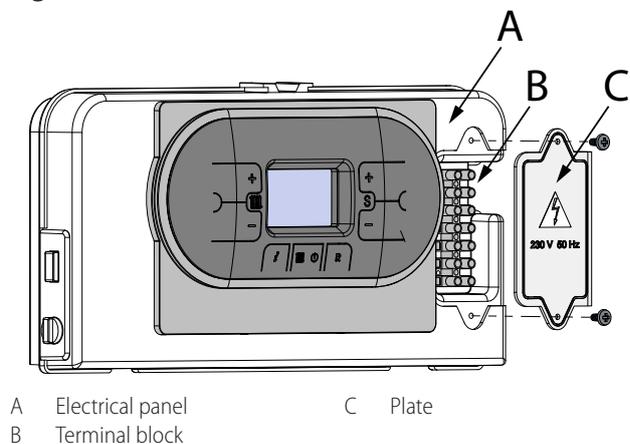
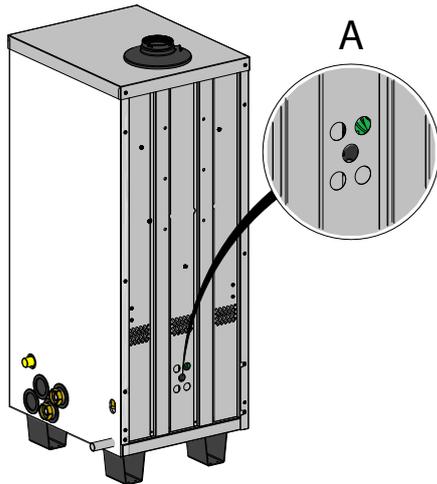


Figure 4.2 Cable glands position



A Detail of cable glands position

4.3 ELECTRICAL POWER SUPPLY

Provide (by the installer) a protected single phase line (230 V 1-N 50 Hz) with:

- ▶ 1 three-pole cable type FG7(O)R 3Gx1,5
- ▶ 1 two-pole switch with 2 2 A type T fuses, (GS) or 1 4 A magnetothermic breaker.



The switches must also provide disconnect capability, with min contact opening 3 mm.

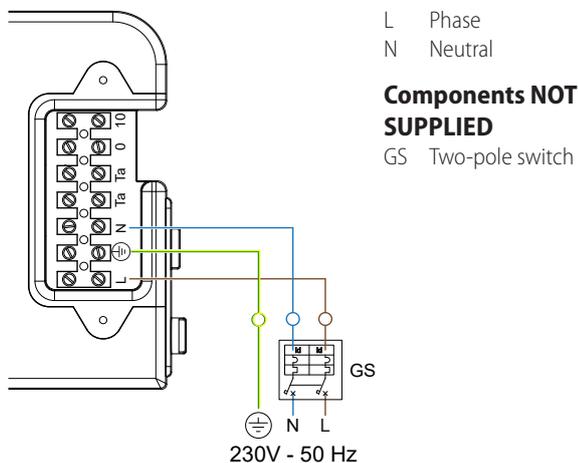


How to connect the power supply

To connect the three-pole power supply cable (Figure 4.3 p. 22):

1. Access the electrical board of the appliance according to the Procedure 4.2 p. 21.
2. Connect the three wires to the terminal block in the electrical panel on the appliance.
3. Provide the earth lead-in wire longer than live ones (last to be torn in the event of accidental pulling).

Figure 4.3 Power supply connection



4.4 ADJUSTMENT AND CONTROL

4.4.1 Control systems

Two separate control systems are provided, each with specific features, components and diagrams (Figures 4.6 p. 24, 4.11 p. 27):

- ▶ DDC control (with CAN bus connection).
- ▶ External request.

4.4.2 CAN bus communication network

The CAN bus communication network, implemented with the cable of the same name, makes it possible to connect and remotely control one or more Robur appliances with the DDC or CCI control devices.

It entails a certain number of serial nodes, distinguished in:

- ▶ intermediate nodes, in variable number
- ▶ terminal nodes, always and only two (beginning and end)

Each component of the Robur system, appliance (GAHP, GA, AY, ...) or control device (DDC, RB100, RB200, ...), corresponds to a node, connected to two more elements (if it is an intermediate node) or to just one other element (if it is a terminal node) through two/one CAN bus cable section/s, forming an open linear communication network (never star- or loop-shaped).

4.4.3 CAN bus signal cable

The DDC controller is connected to the appliance through the CAN bus signal cable, shielded, compliant to Table 4.1 p. 23 (admissible types and maximum distances).

For lengths ≤ 200 m and up to 4 nodes (e.g. 1 DDC + 3 AY), a simple 3x0,75 mm² shielded cable may be used.

Table 4.1 CAN bus cables type

Cable name	Signals / Color			Maximum length	Note	
Robur						
ROBUR NETBUS	H = BLACK	L = WHITE	GND = BROWN	450 m	Optional code OCVO008	
Honeywell SDS 1620						
BELDEN 3086A	H = BLACK	L = WHITE	GND = BROWN	450 m	In all cases the fourth conductor should not be used	
TURCK type 530						
DeviceNet Mid Cable						
TURCK type 5711	H = BLUE	L = WHITE	GND = BLACK	450 m		
Honeywell SDS 2022						
TURCK type 531	H = BLACK	L = WHITE	GND = BROWN	200 m		



How to connect the CAN bus cable to the appliance

To connect the CAN bus cable to the CAN-NDG electronic board, located at the rear of the electrical panel inside the appliance:

1. Access the electrical board of the appliance according to the Procedure 4.2 p. 21.
2. Turn the control panel 90° outwards, using the side latches, to access the CAN-NDG board (Figure 4.4 p. 23).
3. Connect the CAN bus cable to terminals 0, L and H.
4. Place the CLOSED J11 jumpers (Detail A) if the node is terminal (one connected CAN bus cable section only), or OPEN (Detail B) if the node is intermediate (two connected CAN bus cable sections).
5. Connect the DDC to the CAN bus cable according to the instructions in the following Paragraphs and in the DDC manual.

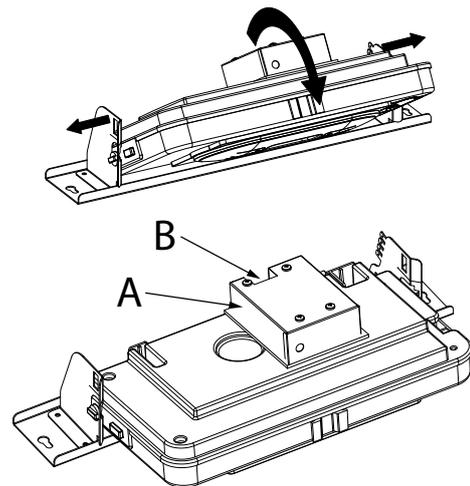


The AY boilers leave the factory with the jumpers already positioned for connecting the individual appliance as a terminal node.



For the AY 100 appliance, the CAN bus connection between the two modules is already factory-made. Consequently, if an individual AY 100 appliance is connected as a terminal node, the connection should only be made on module 1 (right), Figure 4.7 p. 24, without changing the position of the J11 jumpers. If one or more AY 100 appliances are to be connected as Intermediate nodes, the CAN-NDG board of module 1 (right) is to be connected to the previous CAN bus node, without changing the position of the J11 jumpers, while the CAN-NDG board of module 2 (left) is to be connected to the next CAN bus node and the J11 jumpers are to be opened accordingly.

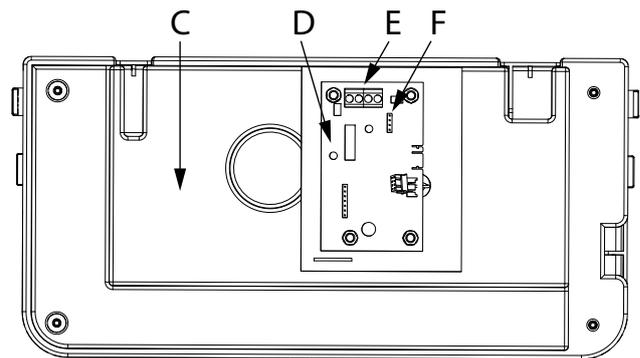
Figure 4.4 Access to CAN-NDG board



A CAN-NDG board

B CAN bus port

Figure 4.5 Connection of the CAN bus cable to the electronic board



C Back of the electrical panel

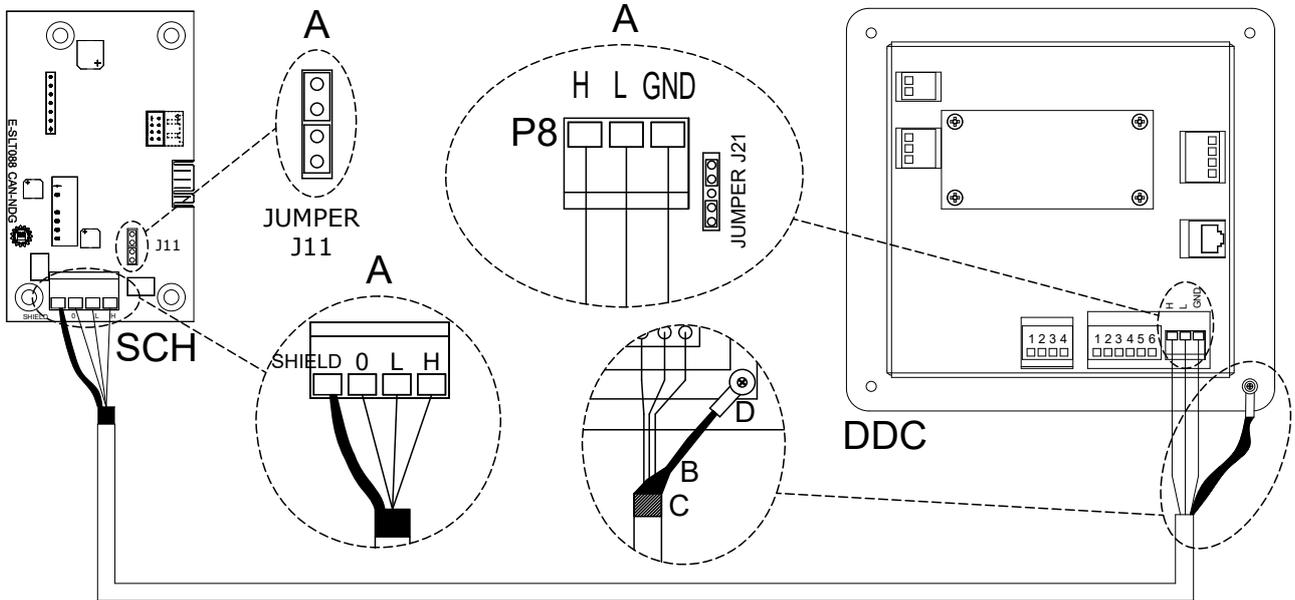
E CAN bus port

D CAN-NDG board

F Jumper J11

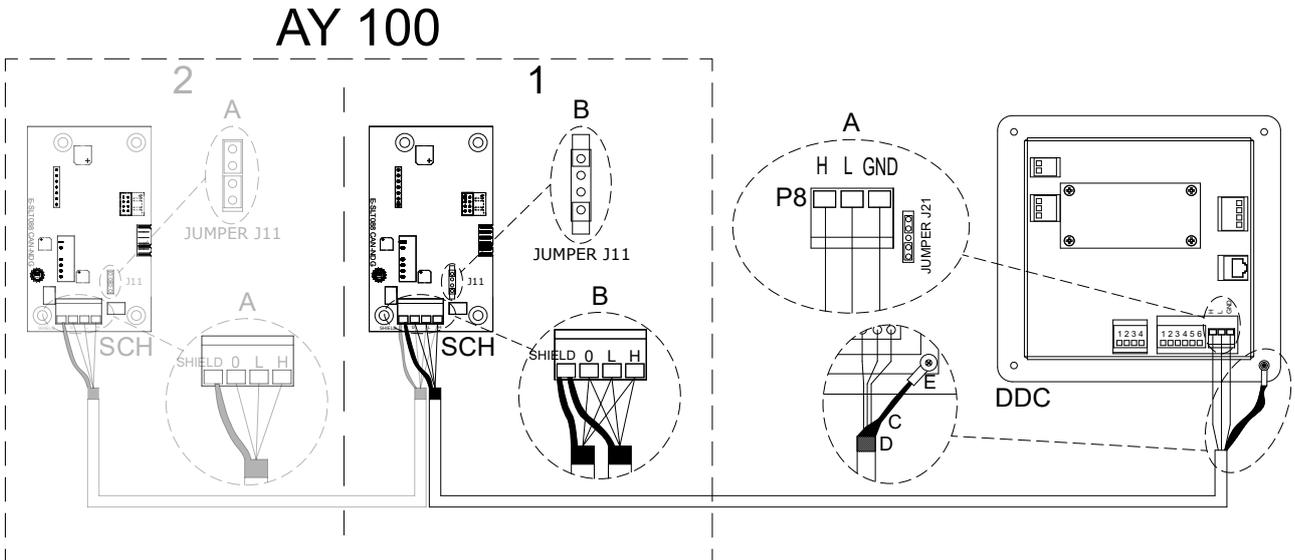
4.4.4 AY + DDC configuration

Figure 4.6 CAN bus connection for systems with a single AY 35/AY 50 unit



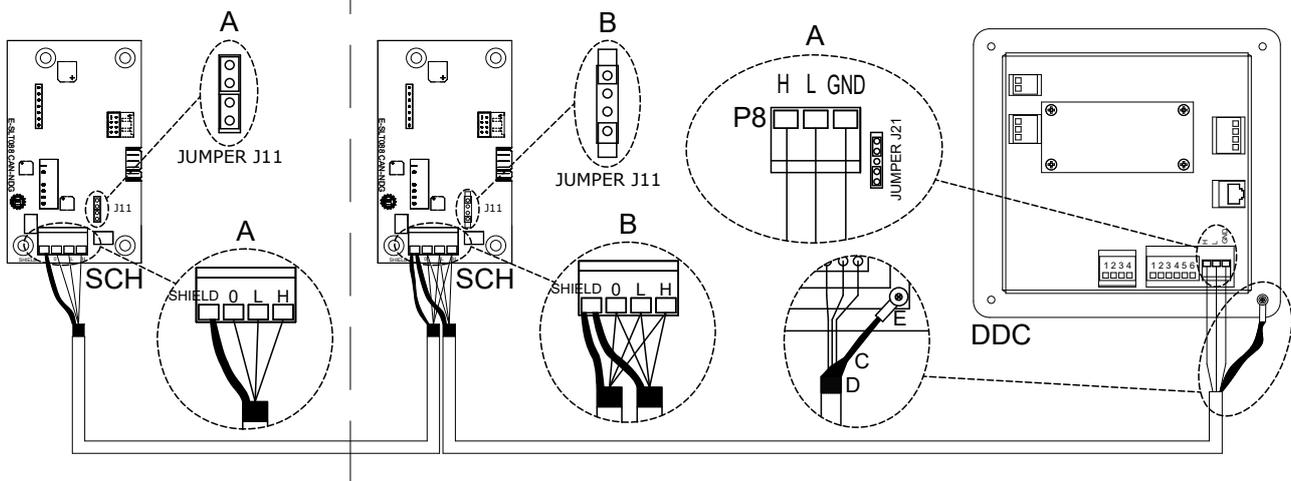
- | | | |
|-------------------------------------|--|--|
| DDC Direct Digital Controller | 0 Common data | B CAN bus cable shield |
| SCH CAN-NDG board | H Data signal HIGH | C Insulating tape to protect the shield of the CAN bus cable |
| J11 CAN bus jumper on CAN-NDG board | L Data signal LOW | D Eyelet terminal and fixing screw |
| J21 CAN bus jumper on DDC panel | A Terminal node connection - (3 wires; J11 and J21 = "closed") | P8 CAN port/connector |
| GND Common data | | |

Figure 4.7 CAN bus connection for systems with a single AY 100 unit



- | | | |
|-------------------------------------|--|--|
| 1 Module 1 (right) | 0 Common data | C CAN bus cable shield |
| 2 Module 2 (left) | H Data signal HIGH | D Insulating tape to protect the shield of the CAN bus cable |
| DDC Direct Digital Controller | L Data signal LOW | E Eyelet terminal and fixing screw |
| SCH CAN-NDG board | A Terminal node connection - (3 wires; J11 and J21 = "closed") | P8 CAN port/connector |
| J11 CAN bus jumper on CAN-NDG board | B Intermediate node connection - (6 wires; J11 and J21 jumpers = "open") | |
| J21 CAN bus jumper on DDC panel | | |
| GND Common data | | |

Figure 4.8 CAN bus connection for systems with several individual AY 35/AY 50 units



DDC Direct Digital Controller

SCH CAN-NDG board

J11 CAN bus jumper on CAN-NDG board

J21 CAN bus jumper on DDC panel

GND Common data

0 Common data

H Data signal HIGH

L Data signal LOW

A Terminal node connection - (3 wires; J11 and J21 = "closed")

B Intermediate node connection - (6 wires; J11 and J21 jumpers = "open")

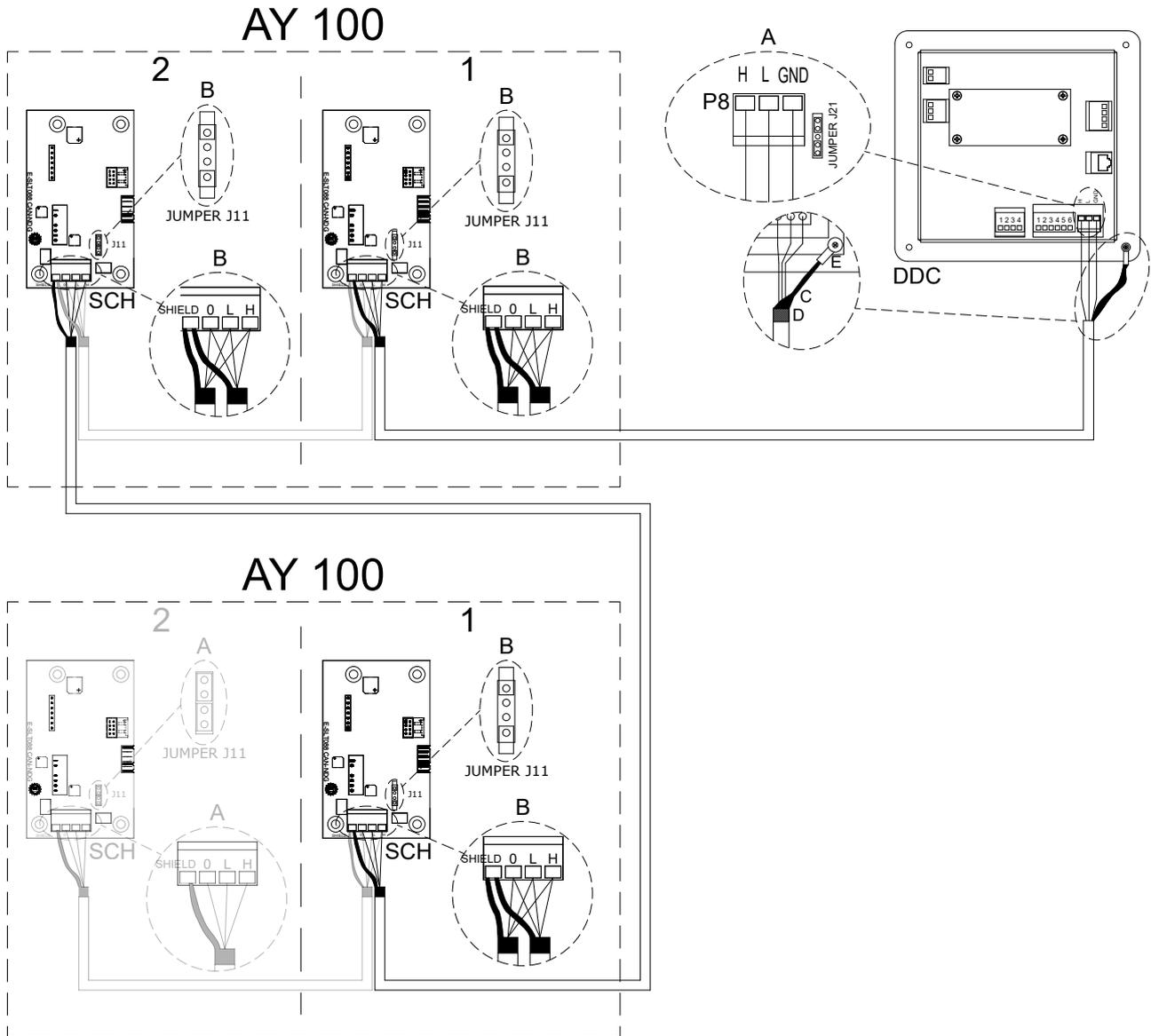
C CAN bus cable shield

D Insulating tape to protect the shield of the CAN bus cable

E Eyelet terminal and fixing screw

P8 CAN port/connector

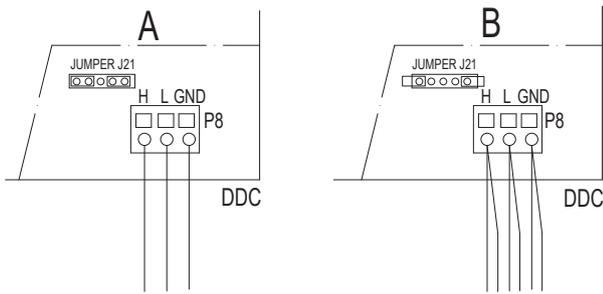
Figure 4.9 CAN bus connection for systems with several individual AY 100 units



- | | | | | | |
|-----|---------------------------------|---|--|----|--|
| 1 | Module 1 (right) | 0 | Common data | C | CAN bus cable shield |
| 2 | Module 2 (left) | H | Data signal HIGH | D | Insulating tape to protect the shield of the CAN bus cable |
| DDC | Direct Digital Controller | L | Data signal LOW | E | Eyelet terminal and fixing screw |
| SCH | CAN-NDG board | A | Terminal node connection - (3 wires; J11 and J21 = "closed") | P8 | CAN port/connector |
| J11 | CAN bus jumper on CAN-NDG board | B | Intermediate node connection - (6 wires; J11 and J21 jumpers = "open") | | |
| J21 | CAN bus jumper on DDC panel | | | | |
| GND | Common data | | | | |

Place the CLOSED J21 Jumpers (Detail A) if the node is terminal (one connected CAN bus cable section only), or OPEN (Detail B) if the node is intermediate (two connected CAN bus cable sections).

Figure 4.10 Connection of the CAN bus cable to the control panel



DDC Direct Digital Controller

GND Common data

L Data signal LOW

H Data signal HIGH

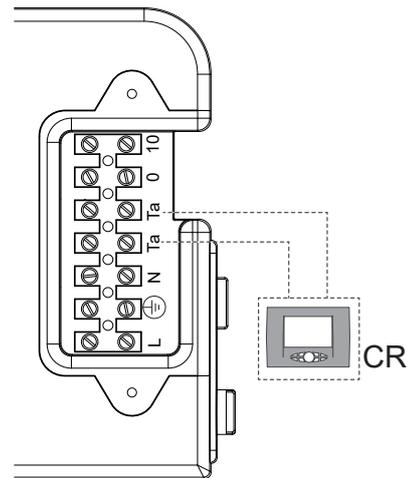
J21 CAN bus jumper on DDC board

A Detail of "terminal node" case (3 wires; J21 = jumper "closed")

B Detail of "intermediate node" case (6 wires; J21 = jumper "open")

P8 CAN port/connector

Figure 4.11 External request connection



CR External request/room thermostat

4.4.5 External request

The following Table 4.2 p. 27 summarizes the features associated with the different control devices.

Table 4.2 Available features depending on controls

Control devices	Description
External request	Heating at fixed temperature, based on the parameters set on the control panel onboard the boiler. Activation/deactivation based on an external request, connected to the Ta-Ta terminals.
Room thermostat	Heating at fixed temperature, based on the parameters set on the control panel onboard the boiler. Activation/deactivation based on the temperature detected by the room thermostat and its settings.

It is required to arrange:

- **Enable device** (e.g. thermostat, timer, switch, ...) fitted with a voltage-free NO contact.



How to connect the external request

The connection of the external request is made on the terminal block located in the electrical panel inside the appliance (Figure 4.11 p. 27).

1. Access the electrical board of the appliance according to the Procedure 4.2 p. 21.
2. Connect the two non-polarised conductors to the Ta-Ta contacts.



Use a cable with a cross-section between 0,5 and 1,5 mm², with a maximum length of 50 metres.



For the AY 100 appliance, two separate requests must be provided, one for each of the Ta1-Ta2 contacts in the electrical panel, which correspond to the two separate thermal modules of the appliance.

4.4.5.1 Thermostat/chronothermostat location

Install the thermostat/chronothermostat according to the following guidelines:

- Place it inside the heated room, in an area that is representative of the room temperature, at about 1,5 m from the floor, protected from draughts, direct exposure to sunlight, influence by direct heating sources (lamps, hot air flows, etc.).
- Avoid installation on walls bordering the outside, to avoid distortion on the detected temperature and therefore affect system operation. Otherwise, shield the control system by placing a sheet of insulating material (cork, polystyrene or other) between it and the wall.



By following the above guidelines, unwanted starting and stopping of the system can be avoided and optimal comfort in the heated space can be guaranteed.

4.4.5.2 0-10 V input



Control via 0-10 V signal is alternative to control via DDC panel or external request.

The 0-10 V signal connection is only available on AY 35 and AY 50 models.

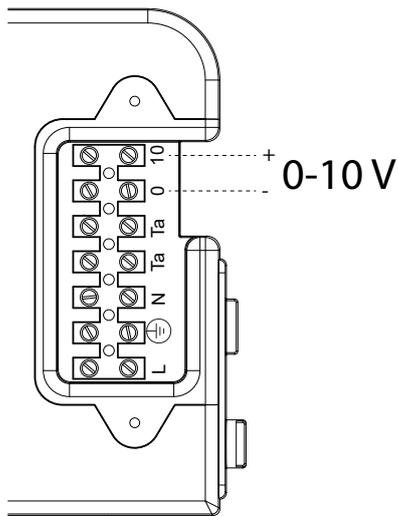
Either the water temperature setpoint or the power value can be communicated alternatively via a 0-10 V analogue signal.

The meaning to be given to the 0-10 V input is chosen by appropriately configuring the boiler board parameters (Paragraph 5.3 p. 29).

The 0-10 V signal should be connected to the 0-10 terminals as shown in Figure 4.12 p. 28.

The cable may not be longer than 30 metres.

Figure 4.12 0-10 V input connection



5 FIRST START-UP



First start-up entails checking/setting up the combustion parameters and may exclusively be carried out by a Robur TAC. NEITHER the user NOR the installation technician is authorised to perform such operations, under penalty of voiding the warranty.

5.1 PRELIMINARY CHECKS

5.1.1 Preliminary checks for first start-up

Upon completing installation, before contacting the TAC the installer must check:

- ▶ Water, electrical and gas systems suitable for the required capacities and equipped with all safety and control devices required by the regulations in force.
- ▶ Absence of leaks in the water and gas systems.
- ▶ Type of gas for which the appliance is designed (natural gas or LPG).
- ▶ Supply gas pressure complying with the values of Table 3.3 p. 17.
- ▶ Correct operation of the flue exhaust duct.
- ▶ Power supply mains complying with the appliance's rating plate data.
- ▶ Appliance correctly installed, according to the manufacturer's provisions.
- ▶ System installed in a workmanlike manner, according to national and local regulations.

5.1.2 Abnormal or hazardous installation situations

Should any abnormal or hazardous installation situations be found, the TAC shall not perform first start-up and the appliance shall not be commissioned.

These situations may be:

- ▶ Failed compliance with minimum clearances.
- ▶ Insufficient distance from combustible or flammable materials.

- ▶ Conditions that do not warrant access and maintenance in safety.
- ▶ Appliance switched on/off with the main switch, instead of the provided control device.
- ▶ Appliance defects or faults caused during transport or installation.
- ▶ Gas smell.
- ▶ Non-compliant mains gas pressure.
- ▶ Non-compliant flue gas exhaust.
- ▶ All situations that may involve operation abnormalities or are potentially hazardous.

5.1.3 Non-compliant system and corrective actions

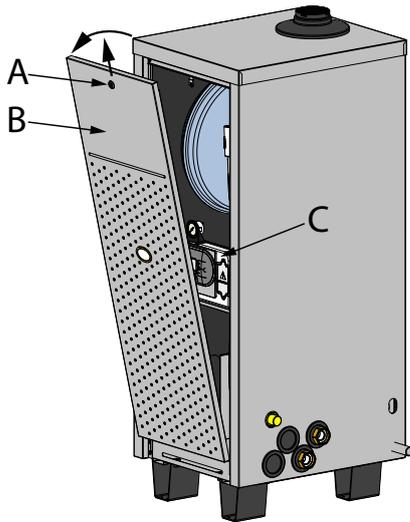
Should the TAC find any non conformities, the user/installer is bound to perform any corrective procedures required by the TAC.

After performing the remedial actions (the installer's responsibility), if the TAC deems that safety and conformity conditions are in place, first start-up may be effected.

5.2 HOW TO ACCESS THE BOILER

For all control and maintenance operations, it is necessary to remove the front panel of the boiler as described below. The other panels cannot be removed as they are structural. Remove the front panel of the boiler as follows:

1. Open lock A with the triangle key supplied with the appliance.
2. Remove front panel B by tilting it outwards and pulling it upwards.

Figure 5.1 Accessing the boiler

A Front panel lock
B Front panel
C AY boiler electrical panel

If the device is connected to the DDC control, refer to the relevant manual to modify settings.

To access the parameters menu and adjust the value of the desired parameter, follow the procedure described below (refer to Figure 5.2 p. 29):

1. Press key to select the OFF mode, displayed with the symbol.
2. Hold at the same time the and keys and wait until on the display appears the symbol with the message 'P10', and release the and keys.
3. Use the and keys of the heating circuit to select the parameter to be edited.
4. Use the keys and of the DHW circuit to change the value of the parameter.
5. Press the key to confirm and wait for the display to stop flashing, to make the adjustment effective.
6. To exit the parameter menu, hold down the and keys simultaneously and wait for the symbol to appear on the display.

The operating parameters are shown in the following Tables and are visible on the internal display of the boiler.

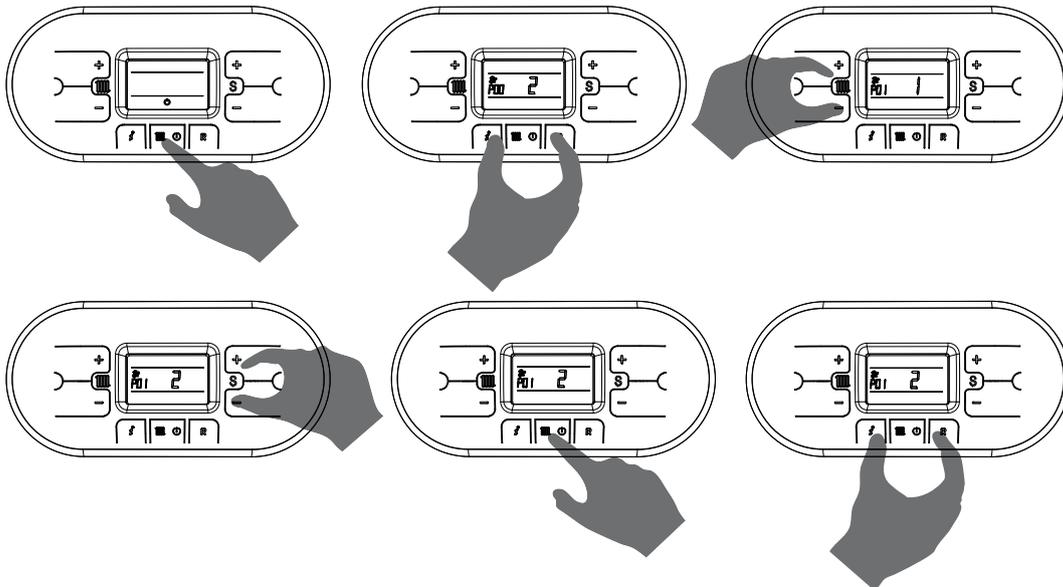
5.3 ELECTRONIC BOARD PARAMETERS SETTING

Before commissioning the operation of the device to the user, the operating parameters must be set or simply checked.

Only for AY 100

All parameters must be set/edited independently on each of the two control panels.

Modify settings via the DDC

Figure 5.2 Access and setting of boiler parameters

5.3.1 AY 35



The parameters and their values refer to the firmware 1.001 for the CAN-NDG board and to the firmware A.10 for the MIAH413 board.

Table 5.1 AY 35 electronic board parameters

Parameter	Description	Range	Default	Setting
P10	Boiler model selection	17 ÷ 18	17	17.AY 35
P20	Mod0 type Not used	--	--	Do not change
P22	Serial number Mod0 - 3 most significant digits Not used	000 ÷ 999	--	Do not change
P23	Serial number Mod0 - 3 intermediate digits Not used	000 ÷ 999	--	Do not change
P24	Serial number Mod0 - 3 least significant digits Not used	000 ÷ 999	--	Do not change
P30	Mod1 type	31 ÷ 32	31	31.AY 35
P32	Serial number Mod1 - 3 least significant digits	000 ÷ 999	--	Do not change
P33	Serial number Mod1 - 3 intermediate digits	000 ÷ 999	--	Do not change
P34	Serial number Mod1 - 3 least significant digits	000 ÷ 999	--	Do not change
P40	Board CAN address It is possible to set the CAN bus address of the CAN-NDG board for connecting the boiler to the DDC panel.	0 ÷ 478	0	The address must be unique for each appliance on the same CAN bus network.
P45	Gas type selection WARNING: before changing the parameter value, read the instructions in Paragraph 5.5 p. 36.	0 ÷ 1	0	0. G20, G25, G25.1 (1), G25.3, G2.350 (1), G27 (1) 1. LPG, G30, G31
P46	Special function	0 ÷ 5	0	Do not change
P50	Mod1: hydraulic system ID It is possible to set the system ID to which the DDC panel considers the boiler to be connected.	0 ÷ 15	0	The code must be the same for all the appliances on the same hydraulic system
P51	Mod1: group of belonging (DHW) It is possible to set the group of belonging to which the DDC panel considers the boiler to be connected.	0 ÷ 1	0	0. base group 1. separable group
P52	Glycol percentage It is possible to set the percentage of glycol in the system water.	0 ÷ 60	0	Value in percentage
P54	Heating run-up It is possible to set the time, during the start-up phase, that the boiler takes to reach the maximum set power (for the space heating service).	0 ÷ 4	1	0. disabled 1. 50 s 2. 100 s 3. 200 s 4. 300 s
P58	Post-circulation heating timing It is possible to set the operating time of the pump, in heating mode, after the main burner has been switched off due to the intervention of the room thermostat.	0 ÷ 90	36	Value in multiples of 5 s (default 36 x 5 = 180 s)
P62	Minimum blower speed adjustment for heating It is possible to set the minimum speed of the blower for the heating service, which corresponds to the minimum power of the burner during a heating request (see Figure 5.4 p. 34). The value is preset according to the boiler model (P10) and the Mod1 type (P30).	33 ÷ min between 133 and P63	53	Value in hertz (1 Hz = 30 RPM)
P63	Maximum blower speed adjustment for heating It is possible to set the maximum speed of the blower for the heating service, which corresponds to the maximum power of the burner during a heating request (see Figure 5.4 p. 34). The value is preset according to the boiler model (P10) and the Mod1 type (P30).	maximum between 40 and P62 ÷ 290	203	Value in hertz (1 Hz = 30 RPM)
P64	Starting step adjustment It is possible to set the blower speed during the start-up phases. The value is preset according to the boiler model (P10) and the Mod1 type (P30).	33 ÷ 255	110	Value in hertz (1 Hz = 30 RPM)
P66 (2) (3)	Setting the climatic curve The appliance is equipped with an outdoor temperature probe (located onboard the appliance) that acts by automatically changing the outlet temperature according to the measured outdoor temperature. The extent of the correction depends on the set heating control value Kd (Figure 5.3 p. 33). The choice of the curve is determined by the maximum outlet temperature Tm and the minimum outdoor temperature Te, taking into account the degree of insulation of the building. The values of the outlet temperatures Tm refer to standard systems 30÷80 °C.	0 1 ÷ 30	0	0. disabled The numbering of the value corresponds to the 'Kd' curves of the graph (Figure 5.3 p. 33)
P68 (2) (4)	0-10 V industrial bus drive enable The 0-10V industrial bus input can be enabled or disabled to set burner power or delivery temperature via the external bus.	0 ÷ 2	0	0. disabled 1. temperature control mode 2. power control mode

P69	Min heating setpoint It is possible to set the minimum user-adjustable heating temperature.	20 ÷ 40	30	Value in °C
P70	Max heating setpoint It is possible to set the maximum user-adjustable heating temperature.	40 ÷ 88	80	Value in °C
P72	Δt delivery-return setpoint It is possible to set the temperature difference between delivery and return.	0 5 ÷ 40	20	0. disabled Value in °C
P73	Modulating pump minimum speed	50 ÷ 70	60	Do not change
P74	Modulating pump maximum speed	70 ÷ 100	100	Do not change
P78	Control mode It is possible to set the control mode of the boiler.	0 ÷ 2	0	0. CAN bus 1. do not use 2. external request
P81	Heating antifreeze temperature setting It is possible to set the temperature of the water in the heating system at which the antifreeze protection is activated.	5 ÷ 12	12	Value in °C
P82	Flowmeter type	0 ÷ 2	2	Do not change
P83	Minimum water flow setting	20 ÷ 68	30	Do not change

1. Gas not available for AY 35.
2. The climatic curve and the use of the 0-10 V input are alternative functions. If both functions are configured as active, the climatic curve is used. These functions are only used in the case of control via external request (P78 = 2).
3. With the climatic curve active, the outlet water setpoint temperature is set to a value between that of parameters P69 and P70 based on the outdoor temperature measured by the probe inside the appliance and on the Kd value set in parameter P66 (Figure 5.3 p. 33).
4. With 0-10 V input active in temperature control mode, the outlet water setpoint is set to a value between that of parameters P69 and P70 based on the line passing through the points (3 V, P69) and (10 V, P70). A voltage lower than 3 V corresponds to no service request.

With 0-10 V input active in power control mode, the thermal output is set to a value between the minimum and maximum power according to the line passing through the points (3 V, minimum power) and (10 V, maximum power). A voltage lower than 3 V corresponds to no service request.

5.3.2 AY 50 and AY 100



The parameters and their values refer to the firmware 1.001 for the CAN-NDG board and to the firmware A.10 for the MIAH413 board.



For AY 100 all parameters must be set/edited independently on each of the two control panels.

Table 5.2 AY 50 and AY 100 electronic board parameters

Parameter	Description	Range	Default	Setting
P10	Boiler model selection	17 ÷ 18	18	18.AY 50 (and each of the two modules of AY 100)
P20	Mod0 type Not used	--	--	Do not change
P22	Serial number Mod0 - 3 most significant digits Not used	000 ÷ 999	--	Do not change
P23	Serial number Mod0 - 3 intermediate digits Not used	000 ÷ 999	--	Do not change
P24	Serial number Mod0 - 3 least significant digits Not used	000 ÷ 999	--	Do not change
P30	Mod1 type	31 ÷ 32	32	32.AY 50 (and each of the two modules of AY 100)
P32	Serial number Mod1 - 3 least significant digits	000 ÷ 999	--	Do not change
P33	Serial number Mod1 - 3 intermediate digits	000 ÷ 999	--	Do not change
P34	Serial number Mod1 - 3 least significant digits	000 ÷ 999	--	Do not change
P40	Board CAN address It is possible to set the CAN bus address of the CAN-NDG board for connecting the boiler to the DDC panel.	0 ÷ 478	0	The address must be unique for each appliance on the same CAN bus network.
P45	Gas type selection WARNING: before changing the parameter value, read the instructions in Paragraph 5.5 p. 36.	0 ÷ 1	0	0. G20, G25, G25.1, G25.3, G2.350, G27 1. LPG, G30, G31
P46	Special function	0 ÷ 5	0	Do not change
P50	Mod1: hydraulic system ID It is possible to set the system ID to which the DDC panel considers the boiler to be connected.	0 ÷ 15	0	The code must be the same for all the appliances on the same hydraulic system

P51	Mod1: group of belonging (DHW) It is possible to set the group of belonging to which the DDC panel considers the boiler to be connected.	0 ÷ 1	0	0. base group 1. separable group
P52	Glycol percentage It is possible to set the percentage of glycol in the system water.	0 ÷ 60	0	Value in percentage
P54	Heating run-up It is possible to set the time, during the start-up phase, that the boiler takes to reach the maximum set power (for the space heating service).	0 ÷ 4	1	0. disabled 1. 50 s 2. 100 s 3. 200 s 4. 300 s
P58	Post-circulation heating timing It is possible to set the operating time of the pump, in heating mode, after the main burner has been switched off due to the intervention of the room thermostat.	0 ÷ 90	36	Value in multiples of 5 s (default 36 x 5 = 180 s)
P62	Minimum blower speed adjustment for heating It is possible to set the minimum speed of the blower for the heating service, which corresponds to the minimum power of the burner during a heating request (see Figure 5.5 p. 34). The value is preset according to the boiler model (P10) and the Mod1 type (P30).	33 ÷ min between 133 and P63	53	Value in hertz (1 Hz = 30 RPM)
P63	Maximum blower speed adjustment for heating It is possible to set the maximum speed of the blower for the heating service, which corresponds to the maximum power of the burner during a heating request (see Figure 5.5 p. 34). The value is preset according to the boiler model (P10) and the Mod1 type (P30).	maximum between 40 and P62 ÷ 290	247	Value in hertz (1 Hz = 30 RPM)
P64	Starting step adjustment It is possible to set the blower speed during the start-up phases. The value is preset according to the boiler model (P10) and the Mod1 type (P30).	33 ÷ 255	130	Value in hertz (1 Hz = 30 RPM)
P66 (1) (2)	Setting the climatic curve The appliance is equipped with an outdoor temperature probe (located onboard the appliance) that acts by automatically changing the outlet temperature according to the measured outdoor temperature. The extent of the correction depends on the set heating control value Kd (Figure 5.3 p. 33). The choice of the curve is determined by the maximum outlet temperature Tm and the minimum outdoor temperature Te, taking into account the degree of insulation of the building. The values of the outlet temperatures Tm refer to standard systems 30÷80 °C.	0 1 ÷ 30	0	0. disabled The numbering of the value corresponds to the 'Kd' curves of the graph (Figure 5.3 p. 33)
P68 (1) (3)	0-10 V industrial bus drive enable The 0-10 V industrial bus input can be enabled or disabled to set burner power or delivery temperature via the external bus.	0 ÷ 2	0	0. disabled 1. temperature control mode 2. power control mode
P69	Min heating setpoint It is possible to set the minimum user-adjustable heating temperature.	20 ÷ 40	30	Value in °C
P70	Max heating setpoint It is possible to set the maximum user-adjustable heating temperature.	40 ÷ 88	80	Value in °C
P72	Δt delivery-return setpoint It is possible to set the temperature difference between delivery and return.	0 5 ÷ 40	20	0. disabled Value in °C
P73	Modulating pump minimum speed	50 ÷ 70	60	Do not change
P74	Modulating pump maximum speed	70 ÷ 100	100	Do not change
P78	Control mode It is possible to set the control mode of the boiler.	0 ÷ 2	0	0. CAN bus 1. do not use 2. external request
P81	Heating antifreeze temperature setting It is possible to set the temperature of the water in the heating system at which the antifreeze protection is activated.	5 ÷ 12	12	Value in °C
P82	Flowmeter type	0 ÷ 2	2	Do not change
P83	Minimum water flow setting	20 ÷ 68	30	Do not change

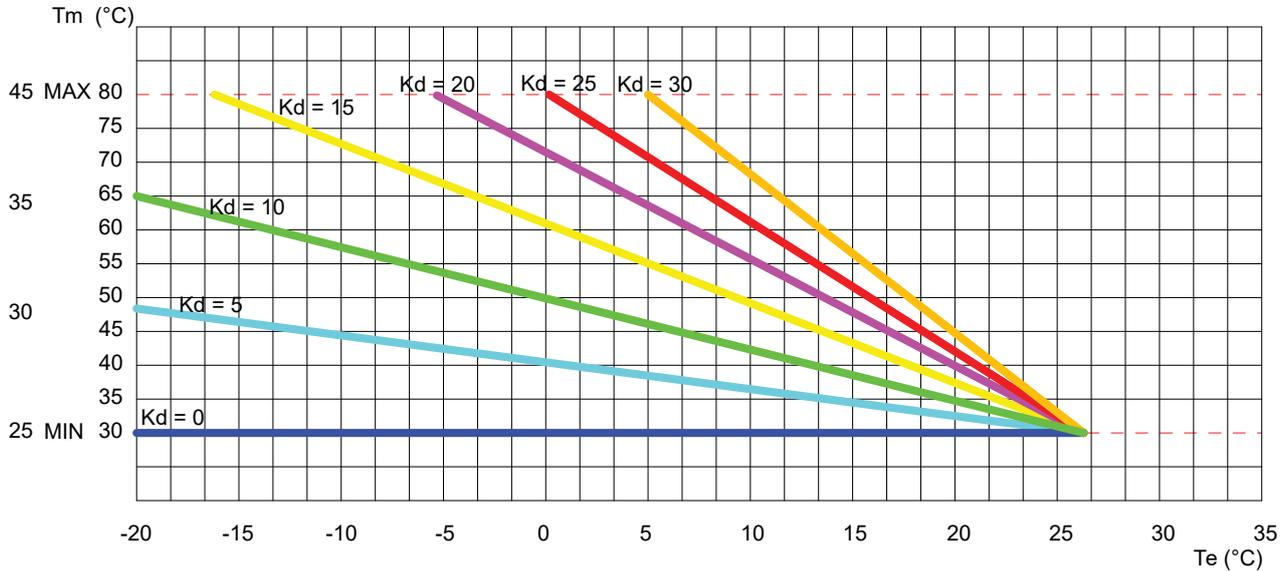
- The climatic curve and the use of the 0-10 V input are alternative functions. If both functions are configured as active, the climatic curve is used. These functions are only used in the case of control via external request (P78 = 2).
- With the climatic curve active, the outlet water setpoint temperature is set to a value between that of parameters P69 and P70 based on the outdoor temperature measured by the probe inside the appliance and on the Kd value set in parameter P66 (Figure 5.3 p. 33).
- With 0-10 V input active in temperature control mode, the outlet water setpoint is set to a value between that of parameters P69 and P70 based on the line passing through the points (3 V, P69) and (10 V, P70). A voltage lower than 3 V corresponds to no service request. With 0-10 V input active in power control mode, the thermal output is set to a value between the minimum and maximum power according to the line passing

through the points (3 V, minimum power) and (10 V, maximum power). A voltage lower than 3 V corre-

sponds to no service request. Control via 0-10 V input is not available for AY 100.

5.3.3 Climatic curves

Figure 5.3 Climatic curves



T_m Delivery temperature
 T_e Outdoor temperature

K_d Heating control value

5.3.4 Blower frequencies

Table 5.3 Minimum and maximum blower frequencies

Boiler	Gas type	Measurement unit	Frequency (heating/DHW) (1)	
			minimum	maximum
Caldaria 35 AY 35	G20	Hz	53	203
	G25	Hz	53	203
	G25.3	Hz	53	203
	G30	Hz	55	195
	G31	Hz	55	203
Caldaria 55.1 Caldaria 100.2 AY 50 AY 100	G20	Hz	53	247
	G25	Hz	53	247
	G25.1	Hz	53	247
	G25.3	Hz	53	247
	G2.350	Hz	53	247
	G27	Hz	53	247
	G30	Hz	55	230
G31	Hz	53	240	

¹ Caldaria 35, Caldaria 55.1, Caldaria 100.2: check parameters P10 and P11 for DHW, P12 and P13 for heating. AY 35, AY 50, AY 100: check parameters P62 and P63 for heating.

lowed only when the operation is completed.

To check and calibrate the CO₂ value at maximum and minimum power, proceed as follows, referring to Figure 5.6 p. 35.

The CO₂ values and other parameters useful to verify combustion are summarized in Table 5.4 p. 35.

- ▶ Power the boiler.
- ▶ Open the gas valve on the boiler and check that the valves connecting to the system are open.
- ▶ Activate the heating request to the boiler, through the control devices provided, and provide an adequate thermal load for carrying out the verification operations.
- ▶ Insert the flue gas analyser into the flue gas analyser socket and turn it on.

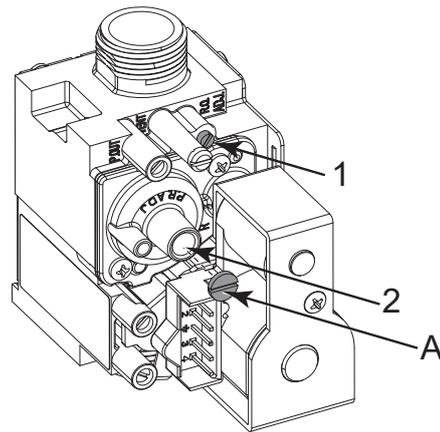


The flue gas analysis socket is positioned on the flue gas exhaust pipe (detail PF, Figure 5.7 p. 35).



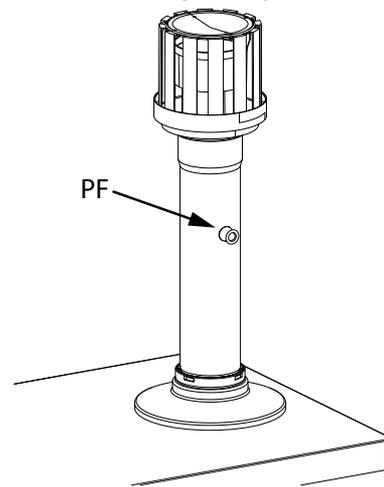
For the AY 100 model, each thermal module has its own flue gas outlet and consequently its own flue gas analysis socket. The checks of each module must be carried out separately.

Figure 5.6 Gas valve



- A Protection screw
1 Gas flow adjustment screw
2 Offset adjustment screw

Figure 5.7 Socket for AY flue gas analysis



- PF Flue gas analysis socket

Table 5.4 AY combustion parameters

				AY 35	AY 50	AY 100	
Installation data							
CO₂ percentage in fumes	Nominal heat input	G20	%	9,45 ÷ 9,25	9,3 ÷ 9,1		
		G25	%	9,35 ÷ 9,15	9,3 ÷ 9,1		
		G25.1	%	- (1)	10,5 ÷ 10,3		
		G25.3	%	9,3 ÷ 9,1			
		G2.350	%	- (1)	9,3 ÷ 9,1		
		G27	%	- (1)	9,3 ÷ 9,1		
		G30	%	11,4 ÷ 11,2	11,3 ÷ 11,1		
	Minimal heat input	G31	%	10,55 ÷ 10,35	10,3 ÷ 10,1		
		G20	%	9,05 ÷ 8,85	9,0 ÷ 8,8		
		G25	%	9,0 ÷ 8,8			
		G25.1	%	- (1)	9,9 ÷ 9,7		
		G25.3	%	9,0 ÷ 8,8			
		G2.350	%	- (1)	9,0 ÷ 8,8		
		G27	%	- (1)	9,0 ÷ 8,8		
G30	%	10,75 ÷ 10,55	10,9 ÷ 10,7				
G31	%	9,9 ÷ 9,7					

- (1) Gas not available for the appliance.
(2) Data refers to each thermal module.

				AY 35	AY 50	AY 100
Flue temperature	Nominal heat input	G20	°C	69,4	66,4	
	Minimal heat input	G20	°C	61,3	56,8	
Fumes flow rate	Nominal heat input	G20	kg/h	54	80	80 (2)
	Minimal heat input	G20	kg/h	7	8	8 (2)
CO emission			ppm	75,0	68,0	

- (1) Gas not available for the appliance.
(2) Data refers to each thermal module.

5.4.1 Minimum heating power

1. Activate the chimney sweep function (F32) by pressing for 7 seconds the  key (Figure 6.1 p. 37). The maximum time before being forced out of the function is 15 minutes.
2. Check that the CO₂ value conforms to that reported in Table 5.4 p. 35.
3. If this is not the case, unscrew the protection screw A and adjust with a 4 hex key the screw 2 of the offset adjuster (Figure 5.6 p. 35). To increase the value of CO₂ turn the screw clockwise and vice-versa if you want to decrease it.
4. Once completed the adjustment, tighten the protection screw A on the offset adjuster.

5.4.2 Maximum heating power

1. Press the  key of the heating side  for the calibration of the maximum heating power.
2. Check that the CO₂ value complies to the value shown in Table 5.4 p. 35.
3. If this is not the case, adjust the gas flow adjuster using the screw 1 (Figure 5.6 p. 35). To increase the CO₂ value turn the screw counterclockwise and vice versa if you want to decrease it.
4. After each adjustment on screw 1 of the gas flow adjuster, you have to wait about 30 seconds for the boiler to stabilize itself to the set value.
5. Press the  key of the heating side  and check that CO₂ value at minimum power has not changed. If so, repeat the calibration described in previous Paragraph 5.4.1 p. 36.
6. Deactivate the chimney sweep function by switching the boiler to OFF mode using the  button ( symbol appears on the display).
7. Disconnect the flue gas analyzer and screw the cap of the flue gas analysis socket back on.
8. Replace the boiler front panel.

5.5 GAS CHANGEOVER



Contact a TAC for the gas change operation.

5.6 COMMISSIONING

1. Remove the boiler front panel (Paragraph 5.2 p. 28).
2. Power the boiler.



The ignition system will automatically activate the system venting cycle function shown in the display with the code F33, which lasts 2 minutes

(except the first time the appliance is switched on, where the duration is 5 minutes).



When function F33 is active, the pump is activated at intervals and the burner ignition request is disabled. The regular operation of the boiler is allowed only when the operation is completed.

3. Make sure that the circulator is not locked.
4. If it is locked, wait for the circulator to perform the automatic unlocking function (duration 3 minutes).
5. If the circulator is still locked, reactivate the automatic unlocking function of the circulator (a further 3 minutes) by power cycling the boiler.
6. At the end of the above operations, open the gas tap.
7. To switch the boiler to the heating operating mode, press the  key; the fixed  symbol will appear on the display, indicating that the function has been activated.
8. When there is a request for service from the provided control device, the burner ignition will start.
9. In case of lack of flame, the board repeats the ignition operations again after the post-ventilation (20 seconds).
10. It may be necessary to repeat the ignition operation several times to remove any air in the gas pipe. Before repeating the operation, wait about 5 seconds from the last ignition attempt and unlock the boiler from error code E12 by pressing the reset key .
11. Check the system pressure. If a decrease is observed, open the filling tap again until the pressure reaches 1,5 bar. After the operation, close the filling tap again.

5.7 SWITCHING OFF

To switch off the unit, select the OFF mode using the  key (Figure 6.1 p. 37). In this way, the appliance is in standby mode ( symbol appears on the display), ONLY the antifreeze function (system water) and the boiler pump anti-lock function remain active. For AY 100, remember to act on both modules.



As it is harmful to the appliance, it is essential to avoid switching off the appliance by removing the power supply to the external module.



For the antifreeze and pump anti-lock functions to be active, the boiler must be left powered.

5.8 PROLONGED PERIODS OF INACTIVITY

To switch off the unit, select the OFF mode using the  key (Figure 6.1 p. 37). In this way, the appliance is in standby mode ( symbol appears on the display). For AY 100, remember to act on both modules. Switch off the power using the main switch, outside the

boiler, and close the gas tap upstream of the appliance.



By removing the power supply, the automatic antifreeze and pump anti-lock functions will be disabled. If it is expected that during the period of inactivity the external temperature may fall below zero, it is therefore advisable NOT to cut off the electrical and gas supply to the appliance.

6 NORMAL OPERATION



This section is for the end user.



The use of the device by the end user is only permitted after the Robur authorised TAC has completed the first start-up.

Figure 6.1 Boiler control panel

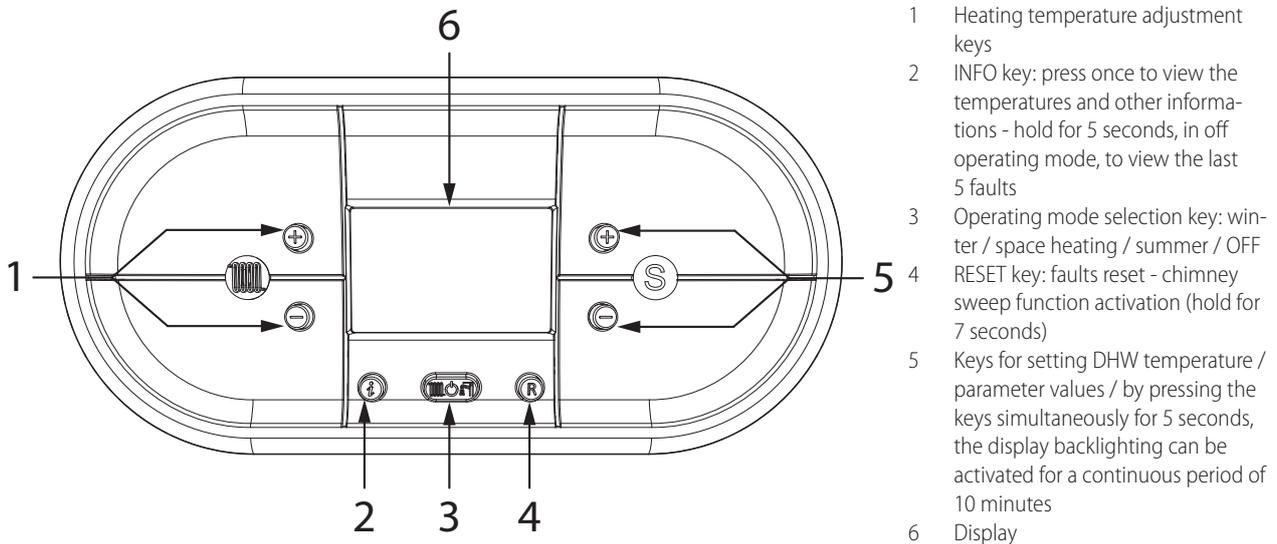
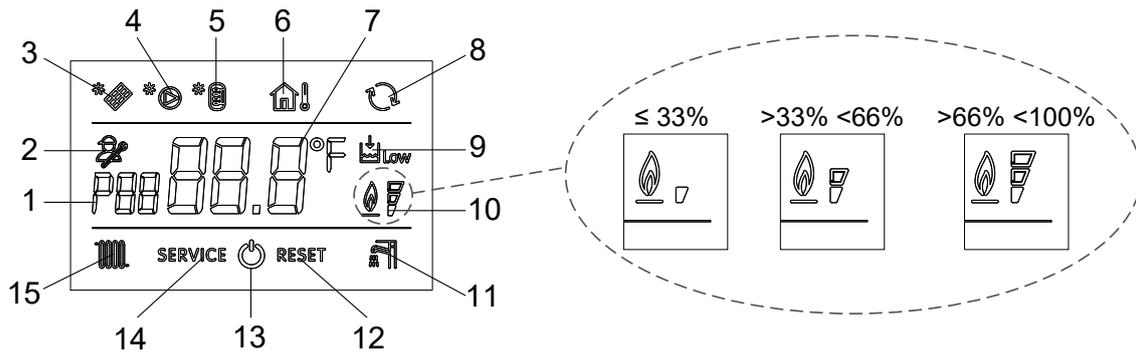


Figure 6.2 Boiler display icons



- 1 Parameter number indication or displayed info code
- 2 Parameter programming function active
- 3 Not used
- 4 Not used
- 5 Not used
- 6 Installed outdoor probe / Outdoor temperature display
- 7 Temperature display / setpoint / parameter value
- 8 OpenTherm communication present (remote control)
- 9 Insufficient system water pressure signal
- 10 Flame presence signal / it also indicates, on 3 percentage levels, the modulating power level of the boiler
- 11 Operation in DHW mode enabled (only for boilers having this function)
- 12 Resettable error signal
- 13 Off operating mode
- 14 Non resettable error signal
- 15 Operation in heating mode enabled

6.1 WARNINGS

i General warnings

Prior to using the appliance carefully read the warnings in Chapter III.1 p. 4, providing important information on regulations and on safety.

i First startup by TAC

First start-up may exclusively be carried out by a Robur TAC (Chapter 5 p. 28).

i Never power the appliance off while it is running

NEVER power the appliance off while it is running (except in the event of danger, Chapter III.1 p. 4), since the appliance or system might be damaged.

i Routine switching on/off

The appliance may exclusively be switched on/off by means of the suitably provided control device.

6.2 PRELIMINARY CHECKS

i Checks before switching on

Before switching on the appliance, ensure that:

- Gas valve open.
- Appliance electrical power supply (main switch ON).
- The fumes exhaust duct is free and correctly connected to the fumes exhaust system.

- The hydraulic circuit has been filled. If this is not the case, fill the system according to the instructions in Paragraph 3.2.4 p. 14 and 3.5.3 p. 21.
- Check on the pressure gauge that the system pressure is 1,5 bar.

i If there is no water in the system or if the system pressure is lower than the minimum required pressure, and error E73 appear on the display of the control panel (Figure 6.2 p. 38), while error E173 appears on the DDC panel (if any). When the correct pressure is restored, the error code disappears.

6.3 OPERATION WITH EXTERNAL REQUEST

6.3.1 Turning the boiler on and off

6.3.1.1 Switching on

1. Open the gas tap and provide electrical power.
2. Supply the boiler with electric power by closing the omnipolar switch (to be provided by the installer).
3. Press the key on the control panel of the boiler (Figure 6.1 p. 37) and select the desired operating mode.
4. The fixed symbol that appears on the display, corresponding to the operating mode, indicates that the function has been activated.

i The burner is only ignited when there is a heating service request from the provided control device (e.g. thermostat, timer, switch, contactor ...).

 After a long period of unit inactivity or at the first start-up, it may be necessary to repeat the ignition operation a few times due to the presence of air in the gas piping.

6.3.1.2 Switching off

The burner switches off automatically when the heating service request from the provided control device (e.g. thermostat, timer, switch, contactor ...) is switched off or when the setpoint is achieved.

To switch off the boiler, press the  button on the boiler (Figure 6.1 p. 37) until the  symbol appears on the display.

6.3.2 Heating mode

In this operating mode the boiler provides heating only: To switch the boiler to the space heating operating mode:

1. Press the  key (Figure 6.1 p. 37), the fixed  symbol will appear on the display, indicating that the function has been activated.
2. Adjust the heating water temperature as described in Paragraph 6.3.3 p. 39.
3. Whenever there is a request for space heating, the automatic ignition system will ignite the burner; the operation is represented by the ignition of the  symbol with an intermittent signal on the display.

6.3.3 Setting the heating temperature

The temperature is adjusted using the  and  keys of the heating circuit  (Figure 6.1 p. 37):

1. Pressing the  key decreases the temperature.
2. Pressing the  key increases the temperature.
3. The heating temperature control range is from a minimum of 30 °C to a maximum of 80 °C.



In order to change the heating temperature control range, parameters P69 (minimum heating setpoint) and P70 (maximum heating setpoint) must be changed, Paragraph 5.3 p. 29.

6.3.4 OFF mode

In this operating mode the boiler no longer provides heating and DHW, but the antifreeze and pump anti-lock systems remain active.

To switch the boiler to the OFF operating mode, press the  key; the fixed  symbol will appear on the display, indicating that the function has been activated.

If the boiler was previously in operation, it is switched off and the post-ventilation and post-circulation functions are activated.

If you decide to shut down the boiler for a long period of time, secure it by operating in one of the following two ways:

1. Call the TAC that will empty the water system, where there is no provision for the use of antifreeze, and disconnect the power supply, water and gas.

2. Leave the boiler in the OFF operating mode, keeping the power and gas supply active, so that the antifreeze function and the pump anti-lock function can be activated.

6.3.5 Pump antifreeze and anti-lock function

Refer to Paragraph 3.2.5 p. 16.

6.4 OPERATION WITH DDC CONTROL



Modify settings via the DDC

If the device is connected to the DDC control, refer to the relevant manual to modify settings.



Do not modify complex settings

Specific technical and system knowledge is required for complex settings. Contact a TAC.

6.5 INFO MENU DISPLAY

To view the boiler data from Info menu you have to:

1. Press the  key (Figure 6.1 p. 37). The info code will be displayed on the left side of the screen and its value will be displayed on the centre of the screen.
2. To scroll through the list of displayable data, use the  and  keys of the heating side .
3. Press the  key to exit the Info menu. Table 6.1 p. 39 shows the list of Info menu displayable data.

Table 6.1 List of displayable data from menu Info

Info code	Description	Measurement unit
d0	AUX temperature (if not present "--")	°C
d1	Manifold temperature (only if the appliance is connected to DDC control)	°C
d2	Outdoor probe temperature	°C
d3	Inlet temperature	°C
d4	Combustion blower speed	RPM x 10
d5	Water flow rate	l/h x 10
d6	Delivery temperature	°C
d7	Water setpoint	°C

6.6 EFFICIENCY

For increased appliance efficiency:

- ▶ Set water temperature to the actual system requirement.
- ▶ Reduce repeated switch-ons to the minimum (low loads).
- ▶ Program appliance activation for actual periods of use.
- ▶ Keep water and air filters on plumbing and ventilation systems clean.

7 MAINTENANCE

i Correct maintenance prevents problems, assures efficiency and keeps running costs low.

i Maintenance operations described herein may exclusively be performed by the TAC or skilled maintenance technician.

! Any operation on internal components may exclusively be performed by the TAC.

i Before performing any operation, switch off the appliance by means of the control device and wait for the end of the shutdown cycle, then disconnect power and gas supply, by acting on the electrical disconnecter and gas valve.

i The efficiency checks and every other "check and maintenance operation" must be performed with a frequency according to current regulations or, if more restrictive, according to the provisions set forth by the manufacturer, installer or TAC.

i Responsibility for efficiency checks, to be carried out for the aims of restricting energy consumption, lies with the system manager.

It is recommended that the following operations and checks be carried out each year:

- ▶ Combustion circuit functionality and heat exchange control:
 - Burner and flue exhaust duct inspection
 - Cleaning of burner and water/flue exchanger (if applicable)
 - Flame ignition/detection system control
- ▶ Hydraulic circuit and internal components functionality check:

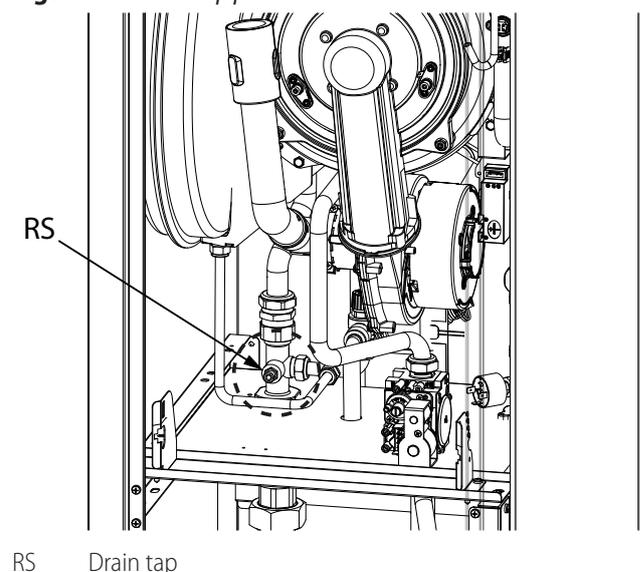
- Hydraulic circuit control (pipes, gaskets)
- Expansion tank
- Control and safety devices
- Water temperature probes
- ▶ Periodic analysis of combustion, in accordance with regulations in force

7.1 HYDRAULIC BOILER EMPTYING

Whenever there is a need to empty the boiler, proceed as follows:

- ▶ Switch off the boiler by pressing the  button.
- ▶ Only after the water pump has completed its post-circulation cycle, cut off the power supply via the main switch.
- ▶ Wait until the boiler has cooled down.
- ▶ Connect a hose emptying point and connect the other end of the hose to a suitable drain.
- ▶ Open the drain tap (Figure 7.1 p. 40).
- ▶ When all the water has drained off, close the drain tap.

Figure 7.1 Drain tap position



RS Drain tap

8 DIAGNOSTICS

In the event of a malfunction of the appliance, before contacting the TAC, make sure that:

- ▶ There is a full electricity supply.
- ▶ The gas is supplied.
- ▶ The gas pressure is within the indicated limits.
- ▶ The DDC control (if any) is set so that the appliance is switched on and the appliance does not display a fault.

8.1 SYSTEM PRESSURE RESTORE

In case of malfunction of the appliance, with pressure inside the hydraulic circuit lower than 0,3 bar, which can be seen through the pressure gauge located on the instru-

ment panel inside the boiler, it is necessary, after having identified and solved any leaks on the circuit, to proceed with the restoring the correct amount of water (with glycol, if needed), as indicated in Paragraph 3.2 p. 14.

8.2 ERROR CODES

Most faults are generated directly by the MIAH413 boiler electronic board and are consequently shown on the boiler display (and sent to the DDC control, if any), while faults generated by the CAN-NDG board are sent to the DDC only (if any).

The faults generated by the boiler board are exclusively

errors (and consequently on the DDC panel, if any, they will always be displayed as E), either temporary (i.e. with automatic reset) or permanent (i.e. with manual reset).

For faults requiring manual reset, this can be done by pressing the reset button  on the boiler or, alternatively, through the appropriate functions of the DDC control, if any.

Specifically, codes 01, 02, 12 and 41 are reset by the DDC control via the reset button of the flame controller.

Errors can be blocking (i.e. implying burner shutdown) or non-blocking. Even with a non-blocking error, it is not guaranteed that the burner can be switched on in the event of a service request.

To display the last 5 fault codes, from the most recent

in chronological order, activate the OFF mode using the  key (Figure 6.1 p. 37) until the fixed  symbol appears on the display, then press and hold the  key for 5 seconds.

► To scroll through the list of stored faults, use the  and  keys of the heating side .

► To reset the fault history, press the reset key .

► To exit the display press the  key.

The fault codes listed below are also shown on the DDC control, if any, by adding the hundreds digit "1" to the code. The code 01 will then be displayed as 101 on the DDC control.

Table 8.1 Error codes

Error codes generated by the MIAH413 boiler electronic board (displayed

both on the boiler display and on the DDC control, if any)

Code	Description	Temporary error	Permanent error
01	Limit thermostat trip	Contact authorised Technical Assistance	
02	Flue gas thermostat trip	Contact authorised Technical Assistance	
09	Ignition failure	Reset is automatic up to 3 attempts.	NA
12	Flame controller lockout	NA	Check gas supply. The reset can be carried out from DDC or from the boiler panel by pressing the  key. If the code persists or in case of doubt, contact the TAC.
31	No CAN bus communication	Contact authorised Technical Assistance	NA
36	Blower fault	Reset occurs automatically 20 minutes after the code is generated.	The reset can be carried out from DDC or from the boiler panel by pressing the  key. If the code persists, shows up again or in case of doubt, contact the TAC.
41	Flame controller error	NA	The reset can be carried out from DDC or from the boiler panel by pressing the  key. If the code persists, shows up again or in case of doubt, contact the TAC.
73	Insufficient water pressure	Reset is automatic when the triggering condition ceases.	NA
74	AUX temperature probe fault	Reset is automatic when the triggering condition ceases.	NA
75	Low hot water flow	Reset is automatic when the triggering condition ceases.	Check and clean water filters on the system. Check for air in the system. Check water flow pump. Power cycle the appliance. The reset can be carried out from DDC or from the boiler panel by pressing the  key. If the code persists, shows up again or in case of doubt, contact the TAC.
76	Hot water delivery temperature probe fault	Reset is automatic when the triggering condition ceases.	NA
77	Hot water inlet temperature probe fault	Reset is automatic when the triggering condition ceases.	NA
83	Invalid functional parameters	NA	Power off the appliance. Contact the TAC.
84	Incorrect supply voltage	Reset is automatic when the triggering condition ceases.	NA
86	Internal boiler board error	NA	Power off the appliance. Contact the TAC.
87	No communication with CAN-NDG board	Reset is automatic if communication is restored within 60 seconds. Otherwise, a reset of the CAN-NDG board is forced and W182 is raised.	Contact the TAC.

NA: Not Applicable

90	Outdoor temperature probe fault	Reset is automatic when the triggering condition ceases.	NA
----	---------------------------------	--	----

NA: Not Applicable

Error codes generated by the CAN-NDG board (displayed only on the DDC control, if any)

Code	Description	Warning (u)	Error (E)
180	Incomplete functional parameters	Contact the TAC.	
181	Error in storing configuration parameters on CAN-NDG board	Reset is automatic when the triggering condition ceases.	Contact the TAC.
182	CAN-NDG board reset	Reset is automatic when the triggering condition ceases.	NA
185	Invalid module type configuration parameters	NA	Contact the TAC.
188	Boiler parameters reading error	Reset is automatic the next time the parameters are read correctly.	NA
189	Boiler parameters writing error	NA	Run parameter writing again.
192	Incompatibility of boiler board FW version	NA	Contact the TAC.

NA: Not Applicable

The special functions listed below are also shown on the DDC control, if any, as warnings, always adding the hundreds digit "1" to the code.

Table 8.2 Function codes

Code	Function	Description
F32	Chimney sweep function active	It is activated by pressing the reset  key for 7 seconds and it is deactivated by turning off the boiler. Brings the boiler to the minimum and maximum power for 15 minutes by deactivating the modulation function. Generally used for combustion and calibration tests.
F33	System air purge cycle in progress	It automatically starts when the boiler is powered up, running for 5 minutes a series of cycles in which the pump is turned on for a period of 40 seconds and then turned off for a period of 20 seconds. Regular operation is only permitted at the end of the function. It can also be activated during normal operation of the boiler, in the event that the enable of the water pressure switch is lacking, when the contact is closed, a 2-minute venting cycle is performed.
F79	Heating antifreeze function	It is automatically activated when the heating probe detects an outlet temperature lower than the value of P81. The boiler operates at minimum power and is deactivated when a water temperature of 30 °C is detected on the outlet or 20 °C on the inlet.

9 APPENDICES

9.1 PRODUCT FICHE

9.1.1 AY 35

Figure 9.1

Table 7

COMMISSION DELEGATED REGULATION (EU) No 811/2013

Technical parameters for boiler space heaters, boiler combination heaters and cogeneration space heaters

Model(s):	AY 35						
Condensing boiler:	yes						
Low-temperature (**) boiler:	yes						
B11 boiler:	no						
Cogeneration space heater:	no	If yes, equipped with a supplementary heater:	no				
Combination heater:	no						
Item	Symbol	Value	Unit	Item	Symbol	Value	Unit
Rated heat output	P_{rated}	33,4	kW	Seasonal space heating energy efficiency	η_s	92,7	%
For boiler space heaters and boiler combination heaters: Useful heat output				For boiler space heaters and boiler combination heaters: Useful efficiency			
At rated heat output and high-temperature regime (*)	P_4	33,4	kW	At rated heat output and high-temperature regime (*)	η_4	88,3	%
At 30 % of rated heat output and low-temperature regime (**)	P_1	10,0	kW	At 30 % of rated heat output and low-temperature regime (**)	η_1	97,8	%
Auxiliary electricity consumption				Other items			
At full load	e_{max}	0,088	kW	Standby heat loss	P_{stby}	0,059	kW
At part load	e_{min}	0,017	kW	Ignition burner power consumption	P_{ign}	0	kW
In standby mode	P_{SB}	0,004	kW	Annual energy consumption	Q_{HE}	266,8	GJ
				Sound power level, indoors/outdoors	L_{WA}	- / 52,4	dB

(*) High-temperature regime means 60 °C return temperature at heater inlet and 80 °C feed temperature at heater outlet.

(**) Low temperature means for condensing boilers 30 °C, for low-temperature boilers 37 °C and for other heaters 50 °C return temperature (at heater inlet).

Contact details | Robur SPA, Via Parigi 4/6, I-24040 Zingonia (BG)

Additional information required by COMMISSION REGULATION (EU) No 813/2013, Table 1:

Emissions of nitrogen oxides: NO_x 49 mg/kWh

9.1.2 AY 50

Figure 9.2

Table 7
COMMISSION DELEGATED REGULATION (EU) No 811/2013

Technical parameters for boiler space heaters, boiler combination heaters and cogeneration space heaters

Model(s):	AY 50		
Condensing boiler:	yes		
Low-temperature (**) boiler:	yes		
B11 boiler:	no		
Cogeneration space heater:	no	If yes, equipped with a supplementary heater: no	
Combination heater:	no		
Item	Symbol	Value	Unit
Rated heat output	P_{rated}	49,2	kW
For boiler space heaters and boiler combination heaters: Useful heat output			
At rated heat output and high-temperature regime (*)	P_4	49,2	kW
At 30 % of rated heat output and low-temperature regime (**)	P_1	14,8	kW
Auxiliary electricity consumption			
At full load	el_{max}	0,113	kW
At part load	el_{min}	0,017	kW
In standby mode	P_{SB}	0,004	kW
Item	Symbol	Value	Unit
Seasonal space heating energy efficiency	η_s	93	%
For boiler space heaters and boiler combination heaters: Useful efficiency			
At rated heat output and high-temperature regime (*)	η_4	88,1	%
At 30 % of rated heat output and low-temperature regime (**)	η_1	98,0	%
Other items			
Standby heat loss	P_{stby}	0,059	kW
Ignition burner power consumption	P_{ign}	0	kW
Annual energy consumption	Q_{HE}	393,1	GJ
Sound power level, indoors/outdoors	L_{WA}	- / 52,4	dB

(*) High-temperature regime means 60 °C return temperature at heater inlet and 80 °C feed temperature at heater outlet.

(**) Low temperature means for condensing boilers 30 °C, for low-temperature boilers 37 °C and for other heaters 50 °C return temperature (at heater inlet).

Contact details | Robur SPA, Via Parigi 4/6, I-24040 Zingonia (BG)

Additional information required by COMMISSION REGULATION (EU) No 813/2013, Table 1:

Emissions of nitrogen oxides: NO_x 46 mg/kWh

9.1.3 AY 100

Figure 9.3

Table 7
COMMISSION DELEGATED REGULATION (EU) No 811/2013
Technical parameters for boiler space heaters, boiler combination heaters and cogeneration space heaters

Model(s):				AY 100			
Condensing boiler:				yes			
Low-temperature (**) boiler:				yes			
B11 boiler:				no			
Cogeneration space heater:				no	If yes, equipped with a supplementary heater:		no
Combination heater:				no			
Item	Symbol	Value	Unit	Item	Symbol	Value	Unit
Rated heat output	P_{rated}	98,4	kW	Seasonal space heating energy efficiency	η_s	93,1	%
For boiler space heaters and boiler combination heaters: Useful heat output				For boiler space heaters and boiler combination heaters: Useful efficiency			
At rated heat output and high-temperature regime (*)	P_4	98,4	kW	At rated heat output and high-temperature regime (*)	η_4	88,1	%
At 30 % of rated heat output and low-temperature regime (**)	P_1	30,0	kW	At 30 % of rated heat output and low-temperature regime (**)	η_1	98,0	%
Auxiliary electricity consumption				Other items			
At full load	el_{max}	0,225	kW	Standby heat loss	P_{sby}	0,100	kW
At part load	el_{min}	0,023	kW	Ignition burner power consumption	P_{ign}	0	kW
In standby mode	P_{SB}	0,004	kW	Annual energy consumption	Q_{HE}	785,3	GJ
				Sound power level, indoors/outdoors	L_{WA}	- / 52,0	dB

(*) High-temperature regime means 60 °C return temperature at heater inlet and 80 °C feed temperature at heater outlet.
(**) Low temperature means for condensing boilers 30 °C, for low-temperature boilers 37 °C and for other heaters 50 °C return temperature (at heater inlet).

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Additional information required by COMMISSION REGULATION (EU) No 813/2013, Table 1:

Emissions of nitrogen oxides: NO_x 50 mg/kWh

Robur mission

Robur is dedicated to dynamic progression in research, development and promotion of safe, environmentally-friendly, energy-efficiency products, through the commitment and caring of its employees and partners.



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