ROBUR
caring for the environment

Installation, use and maintenance manual

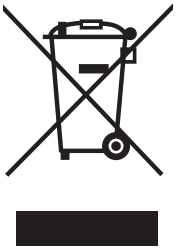
GAHP A Plus

Air-Water gas absorption heat pump

powered by gas and renewable energies

H2NG
HYDROGEN
READY 20%

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.

Revision: A
Code: D-LBR913EN

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I INTRODUCTION

Installation, use and maintenance manual

This Manual is an integral part of the GAHP A Plus 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 GAHP A Plus appliance requires a control device to be connected by the installer.

I.3 AVAILABLE LANGUAGES

This document is originally written in Italian and English. Any other languages are translations of this document.
For versions of this document in other languages, see Robur website.

II SYMBOLS AND DEFINITIONS

II.1 KEY TO SYMBOLS

DANGER

WARNING

NOTE

PROCEDURE

REFERENCE (to other document)

II.2 TERMS AND DEFINITIONS

GAHP appliance = GAHP gas-fired absorption heat pump.
TAC = Robur authorized Technical Assistance Centre.
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 GAHP appliance.
CCI control panel (Comfort Controller Interface) = optional Robur control device which lets you manage up to three modulating GAHP appliances (GAHP A, GAHP GS/WS) of the same type, for heating only.
DDC control panel (Direct Digital Controller) = optional Robur control device to manage one or more Robur appliances in in modulating mode (GAHP heat pumps, AY boilers) or ON/OFF mode (GA chillers).
RB100/RB200 devices (Robur Box) = optional interface devices complementary to the DDC control panel, which may be used to broaden its functions (heating/cooling/DHW production service requests and control of system components such as third party generators, diverter valves, water pumps, probes).
GUE (Gas Utilization Efficiency) = efficiency index of gas heat pumps, equal to the ratio between the thermal energy produced and the energy of the fuel used (relative to LCV, lower calorific value).
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 qualified personnel, with specific knowledge on heating, cooling, 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.

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 understand 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 leak check 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.

Pressure vessels

The appliance has a sealed circuit classified as pressure vessel, the tightness of which is tested by the manufacturer.
- Do not carry out any intervention on the sealed circuit or on the appliance's valves.

Water-ammonia solution

The GAHP appliance uses the ammonia-water absorption cycle. The water-ammonia solution is contained in the sealed circuit. The solution is harmful to health if ingested, inhaled or brought into contact with the skin.
- In the event of a refrigerant leak keep away and disconnect the power and gas supply (only if it is possible to do so with no danger).
- Ask for TAC intervention.

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 (Paragraph 3.7 *p. 14*).
- 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 3.1 *p. 15*.

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 man-

ufacturer's instructions (see Chapter 7 *p. 27*) 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 absorption heat pumps of the GAHP series are certified as conforming to standard EN 12309 and comply with the essential requirements of the following Directives:
- ► 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.
- ► 2014/68/EU "Pressure Equipment 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, as far as they are applicable to the manufacturer:
- ► EN 378 Refrigerating systems and heat pumps.

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 and cooling systems, and heat pumps.
- ► Environmental protection and flue gas 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 plant 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

Based on the thermodynamic water-ammonia absorption cycle (H_20-NH_3), the appliance produces hot water using outdoor air as a renewable energy source (cold source) and natural gas, LPG or mixtures of natural gas and hydrogen up to 20% as the primary energy source.
The thermodynamic cycle takes place within a hermetically sealed circuit, in welded construction, perfectly tight, factory-tested, which does not require any maintenance or refrigerant top-ups.

1.1.2 Mechanical and thermo-hydraulic components

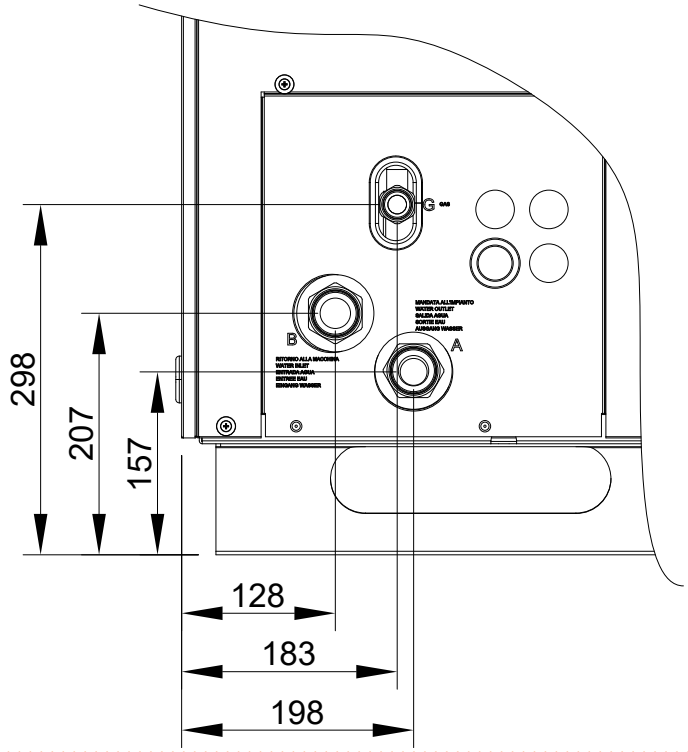
- Steel sealed circuit, externally treated with epoxy paint.
- Sealed combustion chamber (type C) suitable for outdoor installations.
- Metal mesh radiant burner, equipped with ignition electrodes and flame detection, managed by an electronic flame control box.
- Titanium stainless steel shell-and-tube water heat exchanger, externally insulated.
- Stainless steel, shell-and-tube recovery exchanger of flue gas latent heat.
- Air exchanger with finned coil, with steel pipe and aluminium fins.
- Automatic microprocessor-controlled finned coil defrosting valve.
- Low power consumption refrigerant fluid oil pump.
- Modulating premix burner group from 100% to 28% of the nominal heat input.
- Standard or S1 low-noise brushless modulating fan (low power consumption and low noise emission).

1.1.3 Control and safety devices

- Electronic board featuring a microprocessor, LCD, and knob.
- System water flowmeter.
- Generator limit thermostat, with manual reset.
- Flue gas thermostat, with manual reset.
- Generator fins temperature probe.
- Sealed circuit safety relief valve.
- Bypass valve, between high and low-pressure circuits.
- Ionization flame control box.
- Double shutter electric gas valve.
- Condensate drain obstruction sensor.

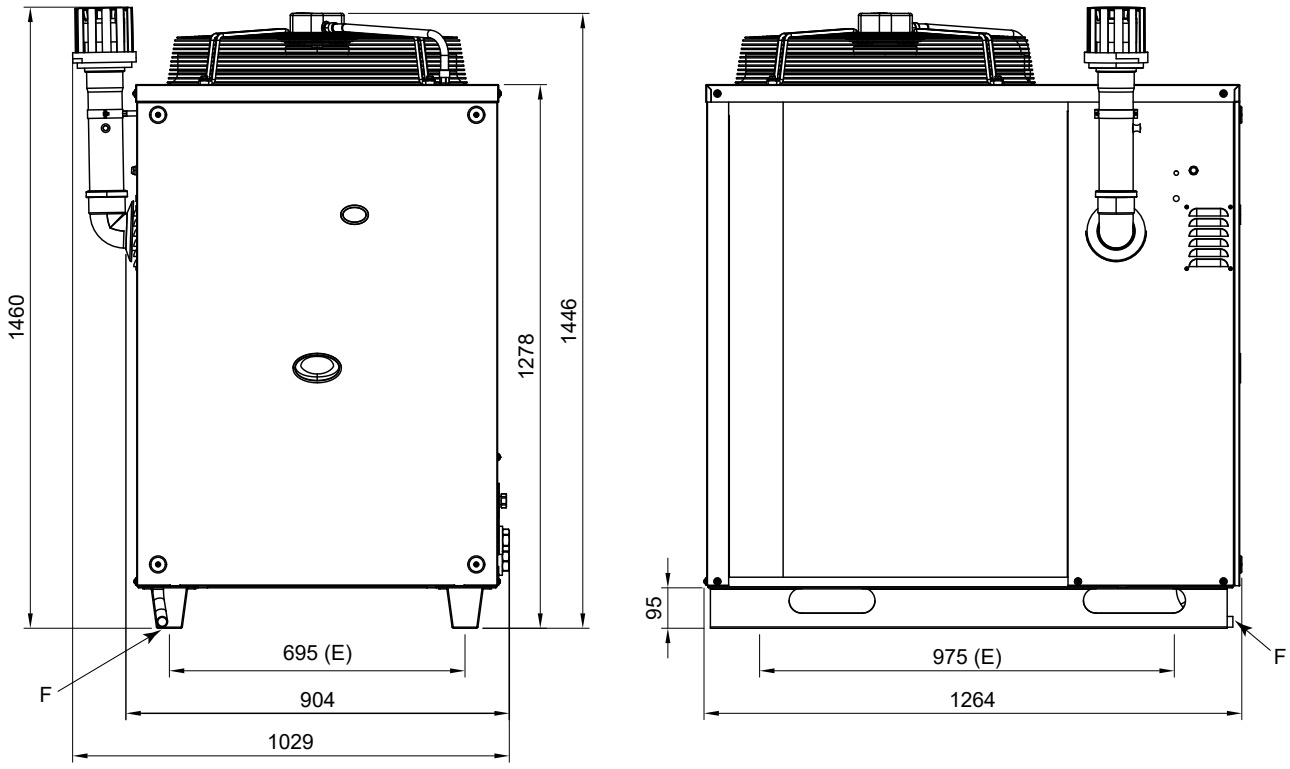
1.2 DIMENSIONS

Figure 1.1 *Service plate - Hydraulic/gas connections detail*



G Gas connection Ø 3/4" F
B Water inlet connection Ø 1 1/4" F
A Water outlet connection Ø 1 1/4" F

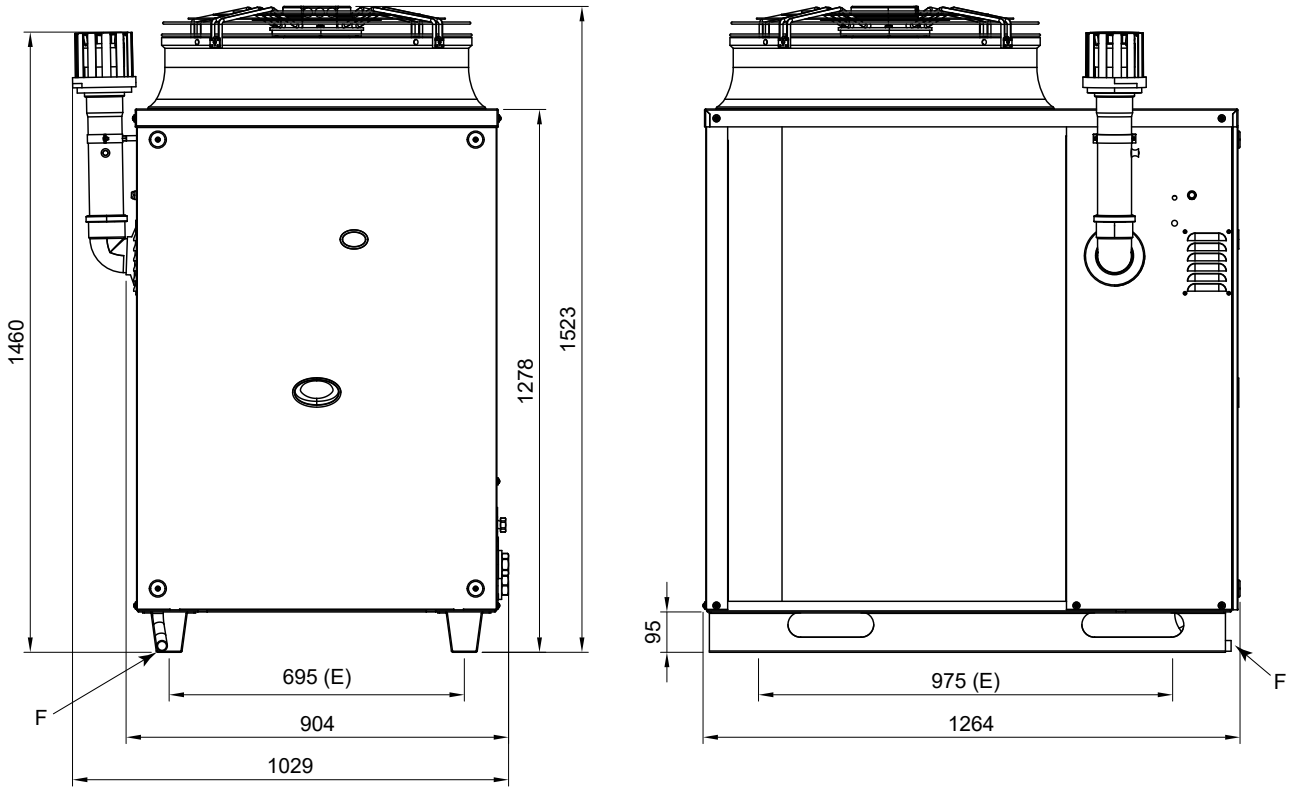
Figure 1.2 *Dimensions (standard fan)*



E Centre distance of holes for vibration damper supports

F Condensate drain connection

Figure 1.3 *Dimensions (low-noise fan)*



E Centre distance of holes for vibration damper supports

F Condensate drain connection

1.3 ELECTRONIC BOARDS

The unit's electrical board contains:

- **Electronic board S61**, with microprocessor, it controls the appliance and displays data, messages and operative codes. The appliance is monitored and programmed by interacting with the display and the knob.
- **Auxiliary electronic board Mod10**, overlaying the S61, manages the power modulation of the burner, fan and water pump.
- **W10 satellite electronic board**, interconnected with the S61 board and located next to it, is used to manage defrosting operations of the GAHP appliance.

1.4 OPERATION MODE

The GAHP A Plus appliance can operate in two modes:

1. ON/OFF, i.e. on (at full power) or off, with water pump at constant or variable flow.
2. MODULATING, from 100% to 28% of the nominal heat input, with constant or variable flow water pump.

For each mode, specific control systems and devices are provided (Paragraph 1.5 *p. 9*).

1.5 CONTROLS

1.5.1 Control device

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

- DDC panel
- CCI panel
- External request

1.5.2 DDC control panel

The DDC control panel allows one or more Robur appliances to be controlled in modulating mode (GAHP heat pumps in heating mode, AY boilers) or ON/OFF (GA chillers).

Modulation management with the DDC control panel is only possible with the latest versions of the DDC control panel FW: from FW version 4.019 for AY boilers and from FW version 4.021 for GAHP heat pumps.

The main functions are:

- Adjustment and control of one (or more) Robur appliances of the absorption line (GAHP, GA, AY).
- Data display and parameters setting.
- Time programming.
- Heating curve control.
- Diagnostics.
- Errors reset.
- Possibility to interface with a BMS.
- Possibility of coupling with remote monitoring and management systems.

DDC control panel 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 water pumps,...).

For further details, please refer to the manuals of the DDC control panel, the RB100 and RB200 devices, and the Abso Pro design manual.

1.5.3 CCI control panel

The CCI control panel can manage up to 3 GAHP appliances in modulating mode (i.e. only GAHP A Plus/GAHP GS/WS Plus for heating only).

The main functions of the CCI control panel are:

- Adjustment and control of up to three Robur heat pumps (GAHP A Plus or GAHP GS/WS Plus) of the same type, with modulation control of the appliances.
- Data display and parameters setting.
- Manifold water temperature probe interface.
- Diagnostics.
- Errors reset.
- Possibility to interface with a BMS.

For further details, please refer to the CCI control panel and the Abso Pro design manual.

1.5.4 External request

The appliance may also be controlled via a generic request device (e.g. thermostat, timer, switch, contactor...) fitted with a voltage-free NO contact. This system only allows basic control (on/off with modulation management based on the parameters set on the appliance board, with a fixed setpoint); therefore, it lacks the important functions of the DDC/CCI control panel. We recommend limiting its use to simple applications and with a single appliance.

For connection of the selected device to the appliance's electronic board please refer to Paragraph 4.4 *p. 19*.

1.6 TECHNICAL DATA

Table 1.1 *GAHP A Plus technical data*

				GAHP A Plus	GAHP A Plus S1
Heating mode					
Seasonal space heating energy efficiency class (ErP)	medium-temperature application (55 °C)		-	A+	A++
	low-temperature application (35 °C)		-	A+	
Nominal heat output	Outdoor temperature/Water outlet temperature	A7W35	kW	44,6	
GUE efficiency	Outdoor temperature/Water outlet temperature	A7W35	%	172	

(1) In transient operation, lower temperatures are allowed.
(2) For flows other than nominal, please refer to the design manual, Pressure losses Paragraph.
(3) As an option, a version for operation down to -30 °C is available.
(4) ±10% depending on power voltage and absorption tolerance of electric motors.
(5) Sound power values detected in accordance with the intensity measurement methodology set forth by standard EN ISO 9614. Data referred to 35 °C outlet temperature.
(6) Maximum sound pressure levels in free field, with directivity factor 2, obtained from the sound power level in accordance with standard EN ISO 9614. Data referred to 35 °C outlet temperature.
(7) Overall dimensions excluding flue gas exhaust.
(8) Tolerance ±5%.

				GAHP A Plus	GAHP A Plus S1
Heat input	nominal (1013 mbar - 15 °C)		kW	26,4	
	real		kW	26,0	
Hot water outlet temperature	maximum for heating		°C	65	
	maximum for DHW		°C	70	
Hot water inlet temperature	maximum for heating		°C	55	
	maximum for DHW		°C	60	
	minimum temperature in continuous operation		°C	30 (1)	
Heating water flow	nominal		l/h	2500	
	maximum		l/h	4000	
	minimum		l/h	2000	
Water pressure drop in heating mode	at nominal water flow		bar	0,31 (2)	
Outdoor temperature (dry bulb)	maximum		°C	45	
	minimum		°C	-15 (3)	
Electrical specifications					
Power supply	voltage		V	230	
	type		-	single-phase	
	frequency		Hz	50	
Electrical power absorption	nominal		kW	0,84 (4)	0,77 (4)
	minimum		kW	-	0,45 (4)
Degree of protection	IP		-	25	
Installation data					
Gas consumption	G20 natural gas (nominal)		m^3/h	2,79	
	G25 (nominal)		m^3/h	3,25	
	G25.1 (nominal)		m^3/h	3,25	
	G25.3 (nominal)		m^3/h	3,13	
	G27 (nominal)		m^3/h	3,41	
	G2.350 (nominal)		m^3/h	3,92	
	G30 (nominal)		kg/h	2,09	
	G31 (nominal)		kg/h	2,05	
NO_x emission class			-	6	
Sound power L_w (max)			dB(A)	79,6 (5)	76,1 (5)
Sound power L_w (min)			dB(A)	-	63,5 (5)
sound pressure L_p at 5 metres (max)			dB(A)	57,6 (6)	54,1 (6)
sound pressure L_p at 5 metres (min)			dB(A)	-	41,5 (6)
minimum storage temperature			°C	-30	
maximum water pressure in operation			bar	4,0	
maximum condensate flow			l/h	4,2	
water content inside the appliance			l	4	
Water fitting	type		-	F	
	thread		"	1 1/4	
Gas connection	type		-	F	
	thread		"	3/4	
Flue gas exhaust	diameter (Ø)		mm	80	
	residual head		Pa	90	
type of installation			-	B23P, B33, B53P	
Dimensions	width		mm	904 (7)	
	depth		mm	1264	
	height		mm	1446 (7)	1523
	Packing	width	mm	930	
		height	mm	1489	1523
		depth	mm	1300	
Weight	in operation		kg	352	363
	gross (including packaging)		kg	349	360
Maximum air flow of the fan			m^3/h	11000	
fan residual head			Pa	-	40
General information					
Refrigerating fluid (8)	ammonia R717		kg	7,5	
	water H_2O		kg	10,0	
maximum pressure of the refrigerating circuit			bar	32	

(1) In transient operation, lower temperatures are allowed.
(2) For flows other than nominal, please refer to the design manual, Pressure losses Paragraph.
(3) As an option, a version for operation down to -30 °C is available.
(4) ±10% depending on power voltage and absorption tolerance of electric motors.
(5) Sound power values detected in accordance with the intensity measurement methodology set forth by standard EN ISO 9614. Data referred to 35 °C outlet temperature.
(6) Maximum sound pressure levels in free field, with directivity factor 2, obtained from the sound power level in accordance with standard EN ISO 9614. Data referred to 35 °C outlet temperature.
(7) Overall dimensions excluding flue gas exhaust.
(8) Tolerance ±5%.

Table 1.2 *GAHP A Plus PED data*

		GAHP A Plus	GAHP A Plus S1
PED data			
test pressure (in air)	bar_g	48,5	48,5
maximum pressure of the refrigerating circuit	bar_g	32	32
filling ratio	kg of NH_3/l	0,157	0,157
fluid group	-	GROUP 1°	GROUP 1°

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, metal panels or finned coil.
- 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 (plastic, polystyrene, nails, etc.) within the reach of children, as they are potentially dangerous.

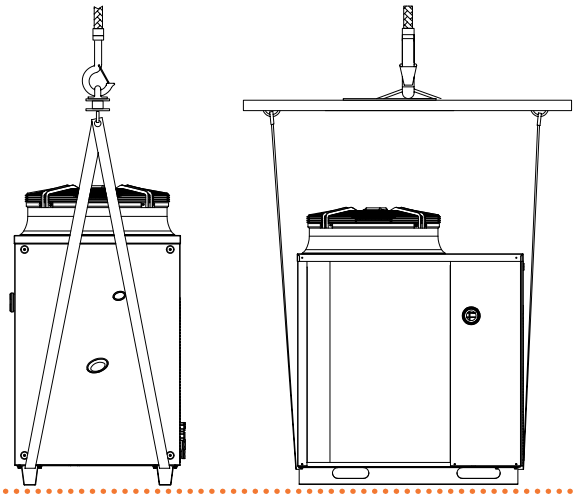
Weight

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

2.2 HANDLING AND LIFTING

► Always handle the appliance in its packing, as delivered by the factory.
► To lift the appliance use straps or slings inserted in the holes of the base (Figure 2.1 *p. 11*).
► Use lifting beams to avoid damaging the outer panels and finned coil (Figure 2.1 *p. 11*).
► Comply with safety regulations at the installation site.

Figure 2.1 *Instruction for lifting*



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

2.3 APPLIANCE POSITIONING

Do not install inside a room

The appliance is type-approved for external installation.
- Do not install inside a room, not even if it has openings.
- In no event start the appliance inside a room.

GAHP A Plus appliance ventilation

- The aerothermic appliance requires a large space, ventilated and free from obstacles, to enable smooth flow of air to the finned coil and free air outlet above the mouth of the fan, with no air recirculation.
- Incorrect ventilation may affect efficiency and cause damage to the appliance.
- The manufacturer shall not be liable for any incorrect choices of the place and setting of installation.

2.3.1 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.
► It must be installed outside buildings, in an area of natural air circulation, outside the dripping path of drainpipes or similar. It does not require protection from weathering.
► No obstruction or overhanging structure (e.g. protruding roofs, canopies, balconies, ledges, trees) shall interfere either

with the air flowing from the top of the appliance or with the exhaust flue gas.
- ► 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.
- ► Do not install near the exhaust of flues, chimneys or hot polluted air. In order to work correctly, the appliance needs clean air.

2.3.2 Defrosting water drainage

In winter, it is normal for frost to form on the finned coil and for the appliance to perform defrosting cycles.

To prevent overflowing and damage provide for a drainage system.

2.3.3 Acoustic issues

Pre-emptively assess the appliance's sound effect in connection to the site, taking into account that building corners, enclosed courtyards, restricted spaces may amplify the acoustic impact due to the reverberation phenomenon.

2.4 MINIMUM CLEARANCE DISTANCES

2.4.1 Distances from combustible or flammable materials

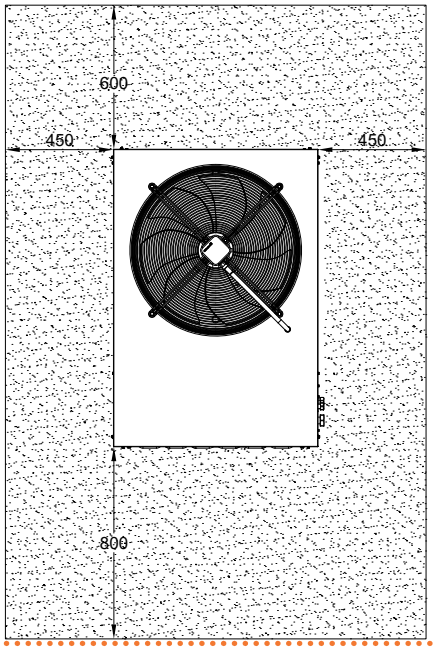
Keep the appliance away from combustible or flammable materials or components, in compliance with applicable regulations.

2.4.2 Clearances around the appliance

The minimum clearance distances shown in Figure 2.2 *p. 12* (bar any stricter regulations) are required for safety, operation and maintenance.
The clearances indicated are for a single appliance, with at most one wall near the appliance that is higher than the appliance itself.

If there are two or more walls higher than the appliance and/or other appliances, please refer to the Abso Pro design manual.

Figure 2.2 *Clearances*



2.5 MOUNTING BASE

2.5.1 Mounting base constructive features

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

2.5.2 Installation at ground level

Failing a horizontal support base, make a flat, level concrete base, at least 150 mm larger than the appliance on each side.

2.5.3 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.

2.5.4 Anti vibration mountings

Although the appliance's vibrations are minimal, resonance phenomena might occur in roof or terrace installations.
- ► Use anti-vibration mountings.
- ► Also provide anti-vibration joints between the appliance and water and gas 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
- cooling systems
- gas systems
- flue gas exhaust
- flue gas condensate drain

Installation must also comply with the manufacturer's provisions.

3.2 HYDRAULIC SYSTEM

The system must be designed and realised consistently with the

characteristics and functionality of the appliance.
Pay particular attention to the variable or constant flow operation of the appliance (Paragraph 3.2.2 *p. 13*).

3.2.1 Primary and secondary circuit

In many cases it is advisable to divide the hydraulic system into two parts, primary and secondary circuit, uncoupled by a hydraulic separator, or possibly by a tank that also acts as inertial tank/buffer.

3.2.2 Constant ot variable water flow

The GAHP A Plus appliance may work with costant or variable water flow, regardless of the ON/OFF or modulating operative mode.

3.2.3 Minimum water content

A minimum volume of water in the primary circuit of at least 70 litres for each GAHP module must be ensured to absorb the thermal energy supplied by the module during the switching off phase.
High thermal inertia is conducive to efficient appliance operation. Very short ON/OFF cycles are to be avoided.

► If necessary, provide for an inertial volume to be suitably sized (refer to the Abso Pro design manual).

3.3 HYDRAULIC CONNECTIONS

3.3.1 Hydraulic connections

on the right, at the bottom, connection plate (Figure 1.1 *p. 7*).

A. Water outlet connection Ø 1 1/4" F

B. Water inlet connection Ø 1 1/4" F

3.3.2 Hydraulic pipes, materials and features

Use pipes for heating/cooling systems, protected from weathering and freezing, insulated for thermal dispersion.

Pipe cleaning

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

3.3.3 Minimum components of primary plumbing circuit

Always provide, near the appliance:

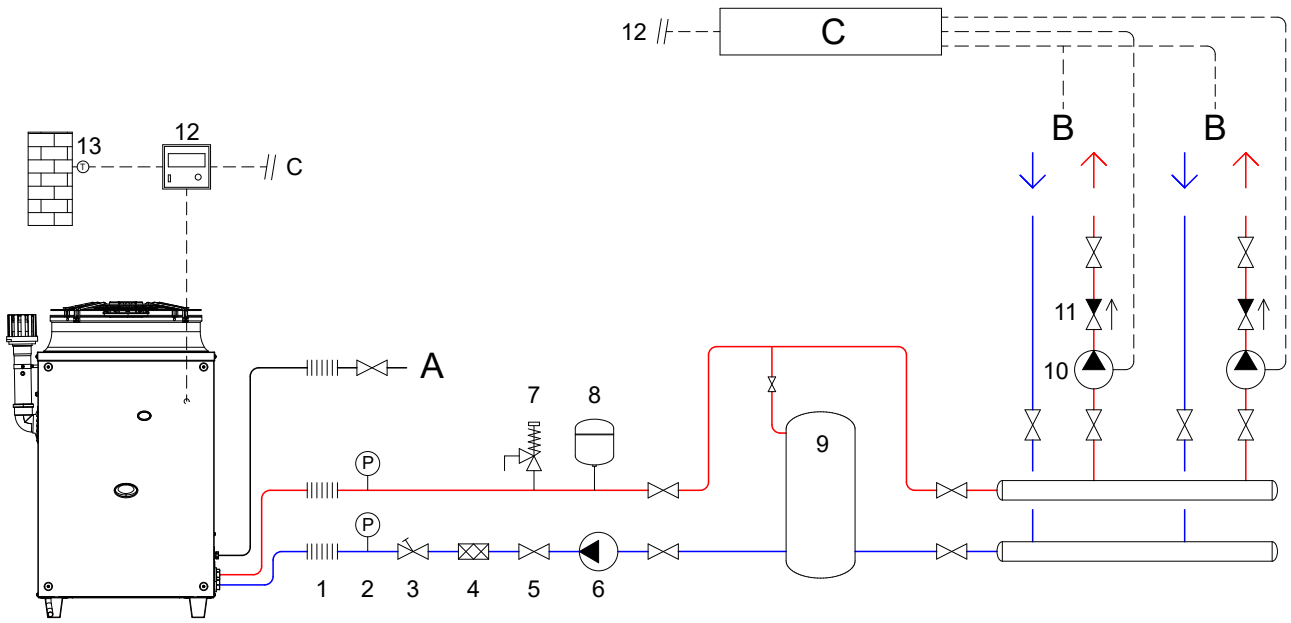
► on water piping, both outlet and inlet
- **2.** antivibration joints on water fittings
- **2.** pressure gauges
- **2.** isolation ball valves

► on the inlet water piping
- **1.** separator filter
- **1.** flow regulation valve, if the pump is with constant flow
- **1.** water circulation pump, towards the appliance

► on the outlet water piping
- **1.** safety valve (3,5 bar)
- **1.** expansion tank

The safety valve and expansion tank must be installed before any isolation valves, so that they cannot be excluded from the system connected to the appliance.

Figure 3.1 *Plumbing diagram*



The flow regulation valve must only be used if the pump in the primary circuit is the fixed flow type

A Gas connection
B Heating circuit
C Secondary circuit management system
1 Anti-vibration connection
2 Pressure gauge
3 Flow regulation valve
4 Sludge filter
5 Shut-off valve
6 Primary circuit water pump
7 Safety valve
8 Expansion tank
9 Buffer tank (and hydraulic separator)
10 Heating circuit water pump
11 Check valve
12 DDC panel
13 Outdoor temperature probe

3.4 WATER PUMP

The appliance is supplied without a water pump (available as an option).
The water pump (flow and head) must be selected and installed based on the pressure drops of the plumbing/primary circuit (piping + components + exchange terminals + appliance), to ensure the nominal water flow required for the appliance to function correctly.

For pressure drops of the appliance and nominal water flow, refer to Table 1.1 *p. 9* and the Abso Pro design manual.

3.4.1 Constant flow pump

The primary water pump must be controlled by the appliance's electronic board.

3.4.2 Variable flow pump

For variable flow operation, it is mandatory to use the OPMP010 pump, supplied as an optional, to be connected to the Mod10 electronic board (see Paragraph 4.5.2 *p. 22*). Any other type of pump will provide a constant flow.

Please refer to the Abso Pro design manual for the characteristics of the OPMP010 pump.

3.5 ANTIFREEZE FUNCTION

The appliance is equipped with an active antifreeze self-protection system to prevent freezing. The antifreeze function (activated by default) automatically starts the primary water pump and, if necessary, the burner when the outdoor temperature approaches zero, or the temperature measured by the appliance's water temperature probes is below a preset value.

Electrical and gas continuity

The active antifreeze self-protection is only effective if the power and gas supplies are assured. Otherwise, antifreeze fluid might be required.

Secondary circuit

Arrange for appropriate measures to prevent water freezing in any secondary side circuits not used in winter (e.g. controlling, by timer or thermostat, the operation of the circulating pumps in that branch of the system).

3.6 ANTIFREEZE FLUID

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 fluid (without inhibitors), nor zinc-coated piping and fittings (incompatible with glycol).
- Glycol modifies water's physical properties (density, viscosity, specific heat, etc.). Size the piping, water pump and thermal generators accordingly.
- With automatic system water filling, a periodic check of the glycol content is required.

With high glycol percentage (> 20…30%)

If the glycol percentage is ≥30% (for ethylene glycol) or ≥20% (for propylene glycol) the TAC must be alerted before first start-up.

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

Please refer to the applicable local regulations for the choice of antifreeze fluid.

The use of toxic antifreeze fluids is forbidden.

3.6.1 Type of antifreeze glycol

Inhibited type glycol is recommended to prevent oxidation phenomena.

3.6.2 Glycol effects

Please refer to the specifications of the chosen glycol for the glycol percentage to be used and for the effects of glycol on appliance efficiency and pressure drops.

When using the antifreeze glycol available as a Robur optional, the characteristics can be found in the Instruction sheet enclosed with the optional.

3.7 SYSTEM WATER QUALITY

Responsibility of the user/operator/installer

The installer, operator and user must assure system water quality (Table 3.1 *p. 15*). Failure to comply with the manufacturer's guidelines may affect operation, integrity and life of the appliance, voiding the warranty.

3.7.1 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 bring some calcium into the system. This calcium attaches to the hot parts, including the heat exchanger, thus creating pressure drops and thermal insulation on the active parts, which 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 type of treatment chosen must be based on the characteristics of the water to be treated, the type of plant and the required purity limits.
Free chlorine or water hardness may damage the appliance.
Adhere to the chemical-physical parameters in Table 3.1 *p. 15* and the regulations on water treatment for residential and industrial heating systems.

Table 3.1 *Chemical and physical parameters of water*

Chemical and physical parameters of water in heating/cooling systems		
Parameter	**Measurement unit**	**Required value**
pH	/	> 7 (1)
Chlorides	mg/l	< 125 (2)
Total hardness ($CaCO_3$)	°f	< 15
	°d	< 8,4
Iron	mg/kg	< 0,5 (3)
Copper	mg/kg	< 0,1 (3)
Aluminium	mg/l	< 1
Langelier's index	/	0-0,4
Harmful substances		
Free chlorine	mg/l	< 0,2 (3)
Fluorides	mg/l	< 1
Sulphides		ABSENT

1 With aluminium or light alloys radiators, pH must also be lower than 8 (in compliance with applicable rules)
2 Value referred to the maximum water temperature of 80 °C
3 In compliance with applicable rules

3.7.2 Choice of treatment

The characteristics of the system water must comply with those detailed in Paragraph 3.7.1 *p. 14*.
The choice of a possible chemical conditioning system or the addition of plant water additives is subject to the designer, depending on the quality of water detected by qualified personnel. It must always be verified (through the technical office of the company producing the additive) that adding it to the plant water does not cause any such alterations to come out of the required parameters.

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.

3.7.3 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 up.

3.8 SYSTEM FILLING

How to fill up the system

After completing all water, electrical and gas connections:

1. Pressurise (at least 1,5 bar) and vent the hydraulic circuit.
2. Let water flow (with burner off) by activating the service request and deactivating it before the burner is ignited.
3. Check and clean the filter on the inlet pipe.
4. Repeat items 1, 2 and 3 until the pressure has stabilised (at least 1,5 bar).

3.9 FUEL GAS SUPPLY

3.9.1 Gas connection

3/4" F on the right-hand side, at the bottom, connection plate (Figure 1.1 *p. 7*).

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

3.9.2 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.

3.9.3 Gas pipes sizing

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

3.9.4 Supply gas pressure

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

Non compliant gas pressure may damage the appliance and be hazardous.

H2NG HYDROGEN READY 20%

The appliance is suitable for the use of fuel gases of group H and/or group E and mixtures of natural gas and hydrogen up to 20% by volume.

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.

The gas supply pressure of the appliance, both static and dynamic, must comply with Table 3.2 *p. 16*, with a tolerance of ±15%.

Table 3.2 *Network gas pressure*

Product category	Country of destination	Gas supply pressure [mbar]							
		G20	G25	G25.1	G25.3	G2.350	G27	G30	G31
$II_{2H3B/P}$	AL, BG, CH, CZ, DK, EE, FI, GR, HR, IT, LT, LV, MK, NO, RO, SE, SI, SK, TR	20						30	
	AT, CH	20						50	
II_{2H3P}	BG, CH, CZ, ES, GB, GR, HR, IE, IT, LT, LV, MK, PT, SI, SK, TR	20							37
	RO	20							30
	AT	20							50
$II_{2ELL3B/P}$	DE	20	20					50	
II_{2Esi3P}	FR	20	25						37
II_{2Er3P}		20	25						37
$II_{2HS3B/P}$	HU	25		25				30	
II_{2E3P}	LU	20							50
I_{2EK}	NL	20			25				
$II_{2EK3B/P}$		20			25			30	
II_{2EK3P}		20			25				30
$II_{2E3B/P}$	PL	20						37	
$II_{2ELwLs3B/P}$		20				13	20	37	
$II_{2ELwLs3P}$		20				13	20		37
$I_{2E(S)}$	BE	20	25						
I_{3P}									37
	IS								30
I_{2H}	LV	20							
$I_{3B/P}$	MT, CY							30	
I_{3B}								30	

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

3.9.5 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.

3.9.6 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.

3.10 FLUE GAS EXHAUST

Compliance with standards

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

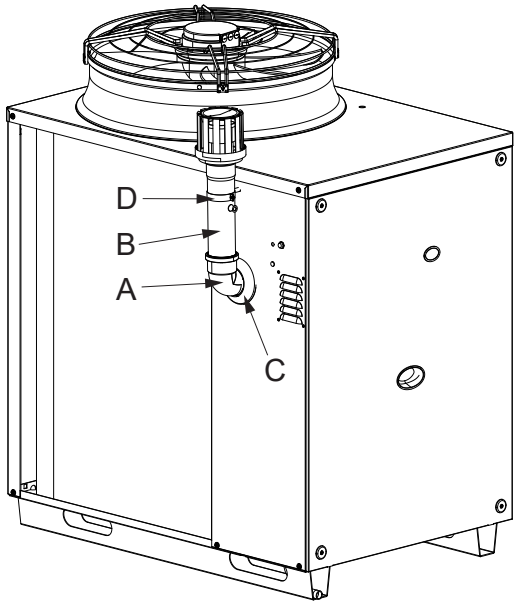
3.10.1 Flue gas exhaust connection

Ø 80 mm (with gasket), on the left, at the top (Figure 3.2 *p. 16*).

3.10.2 Flue gas exhaust kit

The appliance is supplied with flue gas exhaust kit, to be fitted by the installer, including (Figure 3.2 *p. 16*):
1. pipe Ø 80 mm, length 300 mm, with terminal and socket for flue gas analysis
1. support collar
1. 90° elbow Ø 80 mm
1. rain cover

Figure 3.2 *Flue gas exhaust*



A 90° elbow Ø 80 mm
B Pipe Ø 80 mm, length 300 mm, with terminal
C Rain cover
D Collar

How to install the flue gas kit

Figure 3.2 *p. 16*:
1. Remove the front panel.
2. Fasten the collar (D) with its spacer to the left side panel of the appliance.
3. Fit the terminal/pipe assembly (B) to the elbow (A).
4. Fit the rain cover (C) onto the elbow (A).
5. Remove the protective cap of the flue gas exhaust.

6. Insert the elbow/terminal/pipe assembly into the flue gas exhaust.
7. Fit the assembly closing the collar (D) and place the rain cover.
8. Fit the front panel back on.

The cap prevents water and foreign bodies from entering the appliance before the fumes kit is installed. The cap should thus be removed only when the kit itself has been fully assembled and installed.

3.10.3 Possible flue

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

- For flue sizing, please refer to Table 1.1 *p. 9* and the Abso Pro design manual.
- If several appliances are connected to a single flue, a check valve on the outlet of each flue gas exhaust is mandatory. The check valve influences the operation of the appliance and must therefore be selected appropriately to ensure safe operation.
- 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.

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.

3.11 FLUE GAS CONDENSATE DRAIN

The GAHP A Plus appliance produces condensate from combustion flue gas.
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.

Condensate acidity and exhaust regulations

The condensate contains aggressive acid substances. Refer to applicable regulations in force for condensate exhaust and disposal.
If required, install an acidity neutraliser of adequate capacity.

Do not use gutters to discharge the condensate

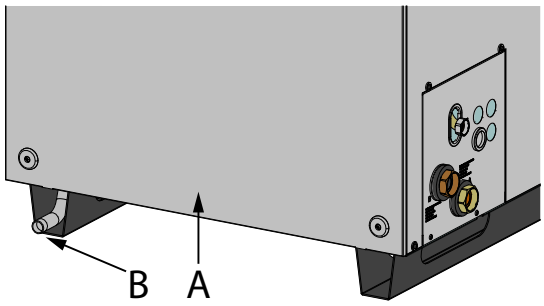
Do not discharge the condensate in gutters, due to the risk of materials corrosion and ice formation.

3.11.1 Flue gas condensate connection

The fitting for flue gas condensate drain is located on the left side of the appliance (Figure 3.3 *p. 17*).

- The condensate drain hose must be connected to a suitable discharge manifold.
- The junction between the pipe and the manifold must remain visible.
- 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 3.3 *GAHP A Plus condensate drain*



A GAHP A Plus front panel B GAHP A Plus condensate drain

3.11.2 Flue gas condensate drain manifold

To make the condensate drain manifold:

- Size the ducts for the maximum condensate flow (Table 1.1 *p. 9*) and in any case with a diameter not less than 15 mm.
- Use plastic materials resistant to acidity pH 3-5.
- Provide a minimum slope of 1%, i.e. 1 cm for each metre of 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.

3.12 DEFROSTING WATER DRAINAGE

Defrosting

In winter, frost may form on the finned coil and the appliance performs defrosting cycles.

3.12.1 Collection basin and drainage system

Provide for a collection basin or containment rim and a discharge system of the defrosting water, to avoid overflowing, freezing and damage.

4 ELECTRICAL INSTALLER

4.1 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 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 appropriate control device provided.

Control of water pump

The water pump of the water/primary circuit must mandatorily be controlled by the appliance's electronic boards. It is not admissible to start/stop the pump with no request from the appliance.

4.2 ELECTRICAL SYSTEMS

Electrical connections must provide:

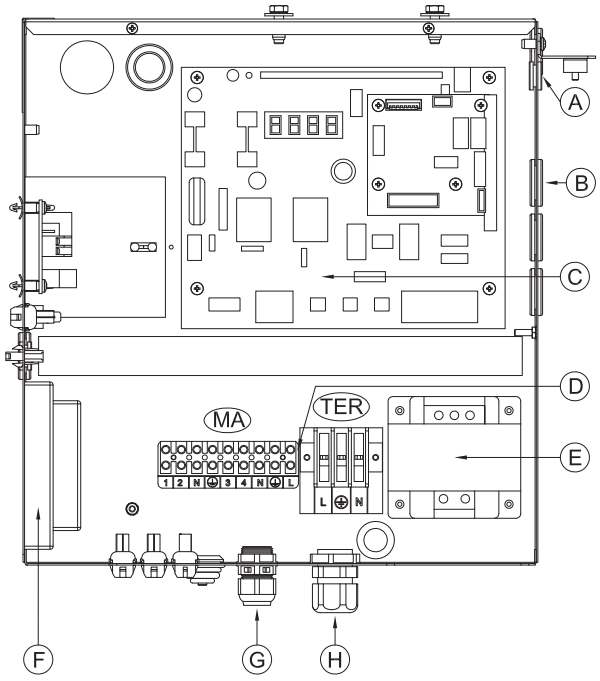
► power supply (Paragraph 4.3 *p. 18*)
► control system (Paragraph 4.4 *p. 19*)
► water pump (Paragraph 4.5 *p. 22*)

How to make connections

All electrical connections must be made in the appliance's electrical panel (Figure 4.1 *p. 18*):

1. Ensure the appliance's electrical panel is not live.
2. Remove the front panel of the appliance and the cover of the electrical panel.
3. Run the cables through the suitable holes in the connection plate.
4. Route the cables through the suitable cable glands in the electrical panel.
5. Identify the appropriate connection terminals.
6. Make the connections.
7. Close the electrical panel and fit the front panel back on.

Figure 4.1 *GAHP/GA electrical panel*



A CAN bus cable gland
B Cable gland for 0-10 V signal of water pump
C Electronic boards
D Terminal blocks
E Transformer 230/24 Vac
F Flame control box
G Pump power supply and control cable gland
H GAHP/GA power supply cable gland

Terminals:
TER terminal block
L-(PE)-N Phase/earth/neutral of GAHP/GA power supply
MA terminal block
N-(PE)-L Neutral/earth/phase of water pump power supply
3-4 Water pump request

4.3 ELECTRICAL POWER SUPPLY

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

► three-wire cable type FG16(O)R16 3Gx1,5
► two-pole switch with two 5 A type T fuses (GS), or one 10 A magnetothermic breaker

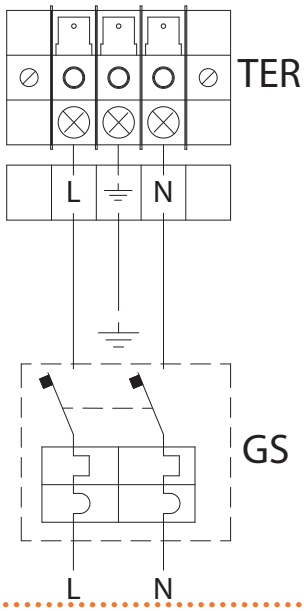
The switches must also provide disconnect capability, with a minimum contact opening of 4 mm.

How to connect the power supply

To connect the three-pole power supply cable (Figure 4.2 *p. 19*):

1. Access the electrical panel of the appliance according to the Procedure 4.2 *p. 18*.
2. Connect the three lead-in wires to the terminal block (TER) in the electrical panel on the machine.
3. Provide the earth lead-in wire longer than live ones (last to be torn in the event of accidental pulling).

Figure 4.2 *Power supply connection*



TER Terminal block
L Phase
N Neutral

Components NOT SUPPLIED
GS Main switch

4.4 ADJUSTMENT AND CONTROL

4.4.1 Control systems

Separate control systems are provided, each with specific features, components and diagrams:

1. DDC control panel (with CAN bus connection).
2. CCI control panel (with CAN bus connection).
3. External request.

4.4.2 CAN bus communication network

The CAN bus communication network, built using the signal cable of the same name, allows one or more Robur appliances to connect and be controlled remotely using the DDC or CCI control panels.
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 or CCI control panels are connected to the appliance using a shielded CAN bus cable in accordance with Table 4.1 *p. 19* (types and maximum permitted distances).
For lengths ≤200 m and up to 4 nodes (e.g. 1 DDC + 3 GAHP), a simple 3x0,75 mm² shielded cable may also be used.

Table 4.1 *CAN bus cable types*

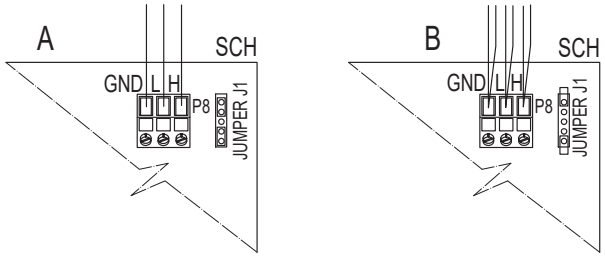
Cable name	Signals / Color			Maximum length	Note
Robur					Optional code OCVO008
ROBUR NETBUS	H = BLACK	L = WHITE	GND = BROWN	450 m	
Honeywell SDS 1620					In all cases the fourth conductor should not be used
BELDEN 3086A	H = BLACK	L = WHITE	GND = BROWN	450 m	
TURCK type 530					
DeviceNet Mid Cable					
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 S61 electronic board, located in the electrical panel inside the appliance (Figures 4.3 *p. 19* and 4.4 *p. 20*):

1. Access the electrical panel of the appliance according to the Procedure 4.2 *p. 18*.
2. Connect the CAN bus cable to the GND (shielding/earthing) + L and H terminals (two signal wires).
3. Place the CLOSED J1 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).
4. Connect the DDC or CCI control panel to the CAN bus cable according to the instructions in the following paragraphs and in the DDC or CCI control panel manuals.

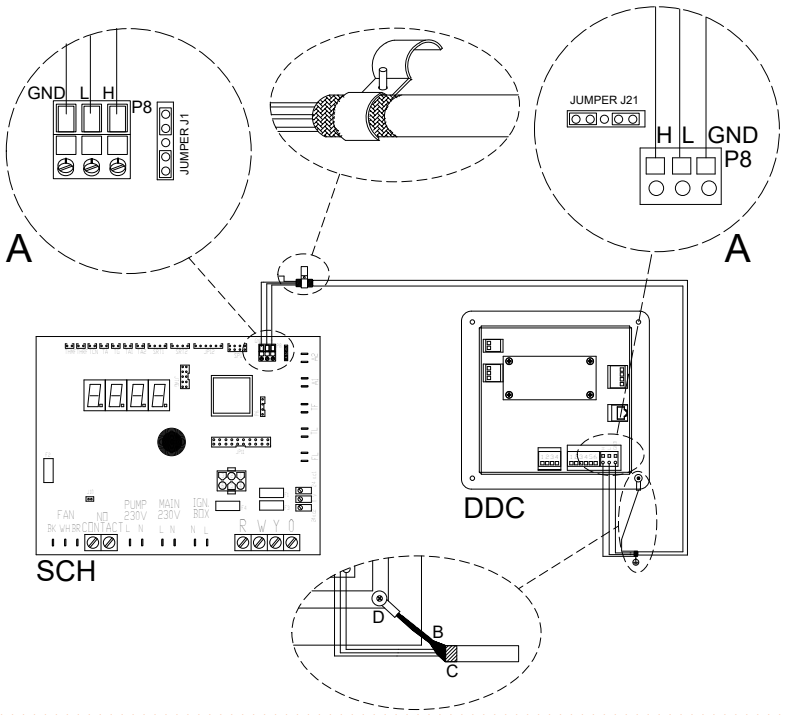
Figure 4.3 *Connection of the CAN bus cable to the electronic board (GAHP/GA/IF ACF)*



SCH GAHP/GA/IF ACF electronic board
GND Common data
L Data signal LOW
H Data signal HIGH
J1 Onboard CAN bus jumper
A Detail of "terminal node" case (3 wires; J1 = jumper "closed")
B Detail of "intermediate node" case (6 wires; J1 = jumper "open")
P8 CAN port/connector

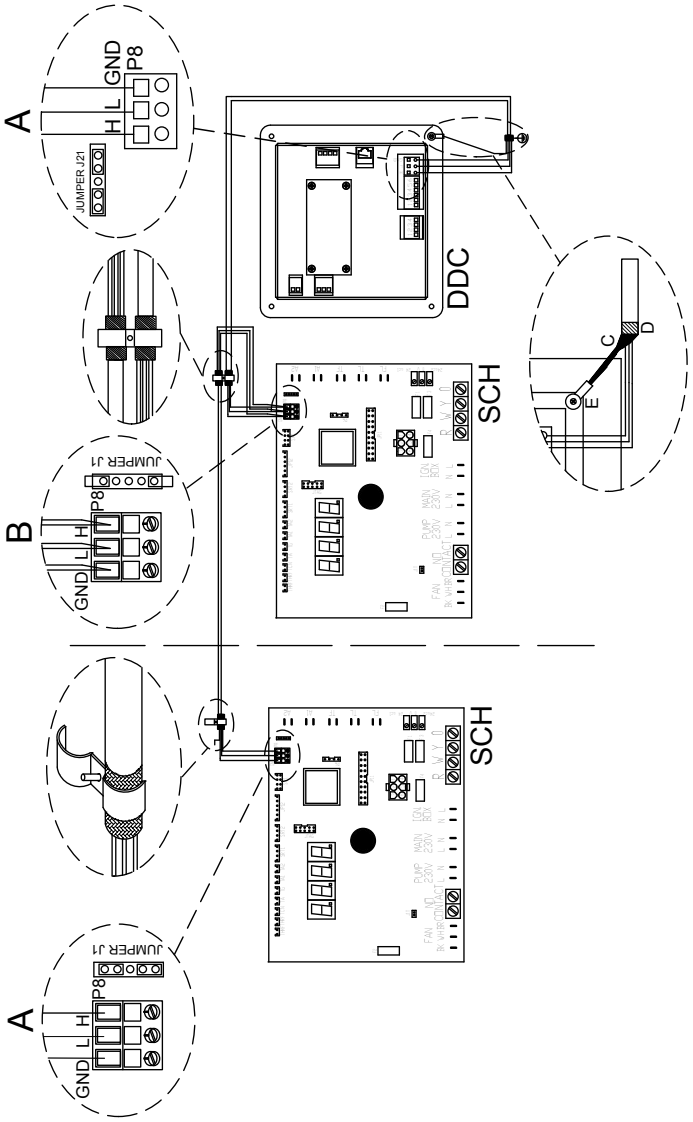
4.4.4 GAHP + DDC or CCI configuration

Figure 4.4 *CAN bus connection for systems with one appliance*



DDC DDC control panel
SCH S61 electronic board
J1 CAN bus jumper onboard S61
J21 CAN bus jumper on DDC board
H,L,GND Data signal wires (ref. cables table)
A Terminal node connection - (3 wires; J1 and J21 = "closed")
B CAN bus cable shield
C Electrical tape to protect the shield of the CAN bus cable
D Eyelet terminal and fixing screw

Figure 4.5 *CAN bus connection for systems with multiple single appliances*

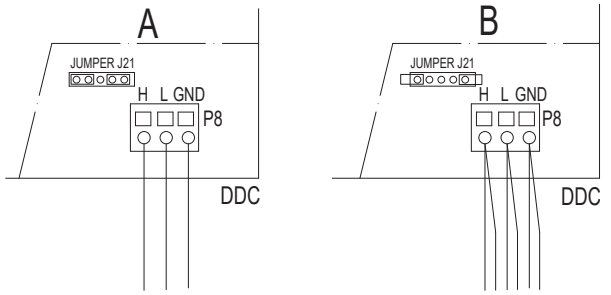


DDC DDC control panel
SCH S61 electronic board
J1 CAN bus jumper onboard S61
J21 CAN bus jumper on DDC board
H,L,GND Data signal wires (ref. cables table)

A Terminal node connection - (3 wires; J1 and J21 = "closed")
B Intermediate node connection - (6 wires; J1 and J21 jumpers = "open")
C CAN bus cable shield
D Electrical tape to protect the shield of the CAN bus cable
E Eyelet terminal and fixing screw

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 4.6 *Connection of the CAN bus cable to the control panel*



DDC DDC control panel
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

4.4.5 External request

It is required to arrange:

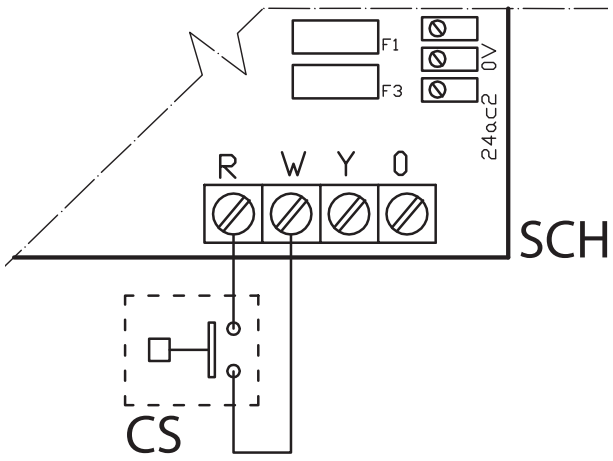
► Request device (e.g. thermostat, timer, switch,...) fitted with a voltage-free NO contact.

How to connect the external request

Connection of external request is effected on the S61 board located in the electrical panel inside the unit (Figure 4.7 *p. 22*):

1. Access the electrical panel of the appliance according to the Procedure 4.2 *p. 18*.
2. Connect the voltage-free contact of the external device (detail CS), through two wires, to **R and W terminals** (respectively: common 24 V AC and heating request) of the S61 electronic board.

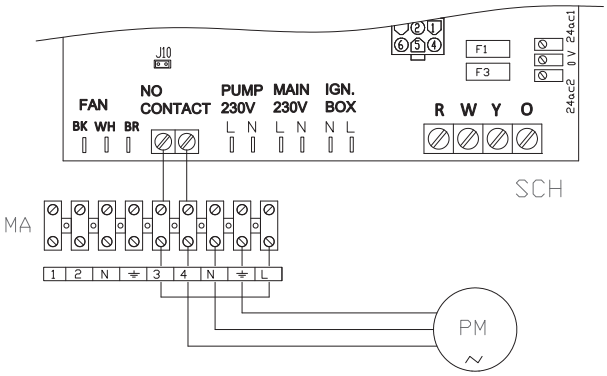
Figure 4.7 *External heating request connection*



SCH Electronic board
R Common 24 VAC
W Heating request terminal

Components NOT SUPPLIED
CS External request

Figure 4.8 *Water pump connection (power absorption less than 700W) controlled directly by the appliance's board*



SCH Electronic board
J10 Jumper (1)
N.O. CONTACT NO voltage-free contacts
MA Terminal block of the appliance
L Phase
N Neutral

Components NOT SUPPLIED
PM Water pump

Note
1 Jumper J10 must be closed if the installed pump is not an electronic pump.
Jumper J10 must be open if the pump installed is an electronic pump or if there is a control relay.

4.5 WATER PUMP

4.5.1 Constant flow pump

The diagram in Figure 4.8 *p. 22* is for pumps < 700 W. For pumps ≥ 700 W, it is required to add a control relay and arrange jumper J10 OPEN.
If a control relay is used, even with pumps < 700 W, jumper J10 must be opened.

How to connect the constant flow circulating pump

1. Access the electrical panel of the appliance according to the Procedure 4.2 *p. 18*.
2. Connect board S61, to terminals 3-4 of terminal block (MA).
3. Jumper J10 is open if the pump is an electronic pump or if there is a control relay; otherwise, it is closed.

4.5.2 Variable flow pump

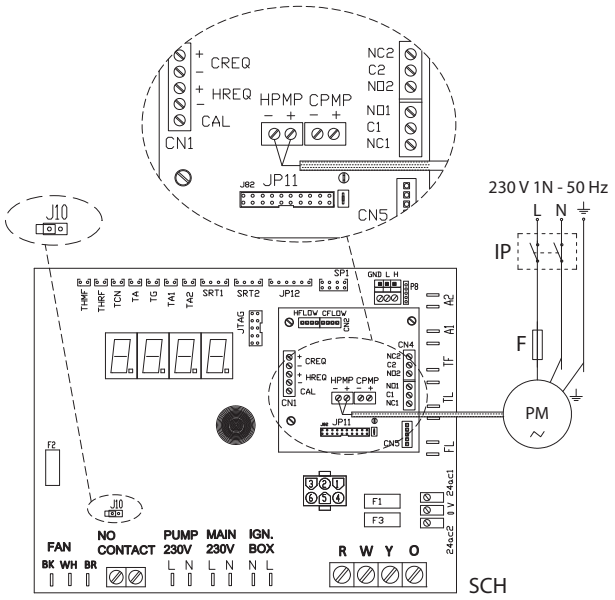
For variable flow operation, it is mandatory to use the OPMP010 pump, supplied as an option, and connect it to the Mod10 electronic board.

How to connect the variable flow circulation pump

The variable flow pump, available as OPMP010 option, is factory-supplied with a power supply cable and a signal cable, both 1,8 m long.
For longer lengths, use FG16 3Gx1,5 mm² cable for the power supply and 2x0,75 mm² shielded cable suitable for 0-10 V signals for the signal cable (maximum length of the signal cable 30 m).

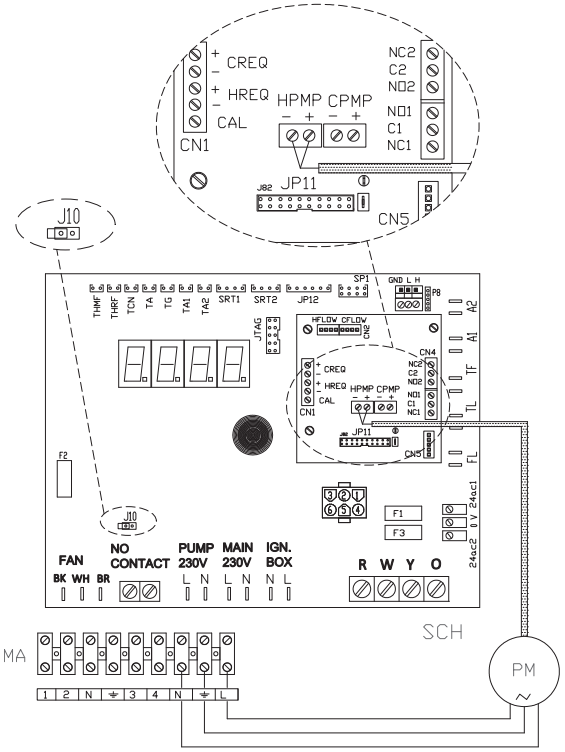
1. Connect the black wire of the pump to the HPMP "-" terminal of the Mod10 board and the red wire of the pump to the HPMP "+" terminal of the Mod10 board.
2. Protect the pump power supply line with a two-pole switch with a 2 A delayed fuse (detail IP, Figure 4.9 *p. 23*), or connect it directly to the terminals inside the appliance's electrical panel (detail MA, Figure 4.10 *p. 23*).

Figure 4.9 *Connection of the variable flow pump for GAHP A Plus*



IP Two-position pump power switch
F Fuse
PM Hot water pump (primary circuit)
Pump 0-10 V signal wire colours
black connect to terminal -
red connect to terminal +

Figure 4.10 *Connection of the variable flow pump powered by the GAHP A Plus appliance*



PM Hot water pump (primary circuit)
MA Terminal block of the appliance
Pump 0-10 V signal wire colours
black connect to terminal -
red connect to terminal +

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 3.2 *p. 16*, with max tolerance ±15%.
- 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:

- Appliance installed inside a room.
- 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 ELECTRONIC ADJUSTMENT ON THE MACHINE – MENUS AND PARAMETERS OF THE S61 BOARD

Firmware

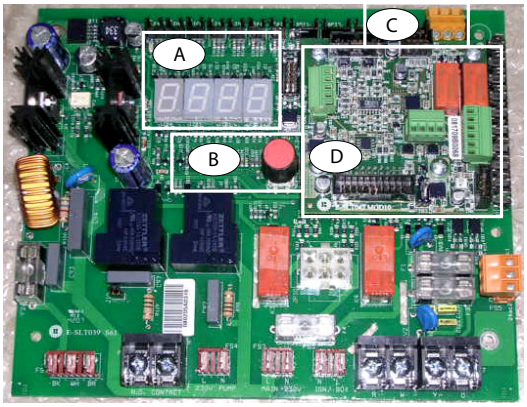
The instructions on the use of the S61 electronic board concern the **firmware version 3.039**.

Checking the firmware version of the S61 electronic board

1. Access parameter 2 in menu 1, according to the procedure described in Paragraph 5.2.3 *p. 24*. This value represents the major firmware version (3 in this case).
2. Still in menu 1, access parameter 3. This parameter represents the minor version of the firmware (039 in this case).
3. Exit menu 1 by selecting and pressing the letter "E".

5.2.1 The appliance's electronic board (S61)

Figure 5.1 *GAHP unit electronic board (S61+Mod10)*



A	4 digit display	C	CAN port
B	Knob	D	Mod10 controller

5.2.2 Knob

One of the following actions can be performed with the S61 board knob (detail B in Figure 5.1 *p. 24*):

- ► Enter the menu list (by pressing the first time).
- ► Scroll the menu list, or a series of parameters in a menu (by turning).
- ► Select a menu or a parameter (by pressing).
- ► Modify and confirm the setting of a parameter (turning and pressing).
- ► Execute a command (by pressing).
- ► Exit a menu and go back to the higher level by selecting the letter "E" which is displayed at the end of the menu list or of a series of parameters in a menu.

The letter "E" is displayed at the end of the menu list or of a series of parameters in a menu, and indicates the exit to go back to the higher level by pressing the knob.

5.2.3 Menus and Parameters

The menus may be display only (functional data or parameters), display and setting (parameters) or control (reset).
Menu items are identified on the electronic board display (detail A Figure 5.1 *p. 24*) according to this logic:

- ► The first digit (left, green) indicates the menu number (e.g. "0"', "1.", "2.",... "8.").
- ► The other three digits (right, red) indicate a code or parameter value from the selected menu (e.g. "__6" "_20", "161").

For example: 0.0 indicates item 0, menu 0; 0.2 indicates item 2, menu 0.

Menu for the user (but for the installer and TAC as well)

- ► The menu "0.", display only, for functional data detected in real time.
- ► The menu "1.", display only, for current values of appliance parameters.
- ► Menu "2.", control, to execute flame control unit reset operations, reset errors (Paragraph 7.5 *p. 28*).
- ► Menu "3.", display and setting, to set the value of some system parameters (e.g. water setpoint temperature); the values are initialised by the TAC at first start-up.

It is accessed without password.

Menu for the installer or TAC (not accessible to the user)

- ► Menu "4.", "5.", "6." and "9." are password-protected. These are specific sections, exclusively intended for qualified personnel (installer or TAC). For information see the Service manual.
- ► Menu "7." is display only and intended for the manufacturer.
- ► Menu "8." is empty, it may be selected but not used.

Special key for the knob

- ■ To access the menus and parameters of the S61 board, use the special standard supplied key, fastened on the gas pipe above the electrical panel. The key allows the knob to be operated through the suitable hole in the electrical panel cover, operating safely away from live components.
- ■ Always keep the key for future uses.

How to access the menus and parameters

Before Starting:

1. Power supply switch on.
2. The S61 board's display shows the detected water temperature data in sequence (if the appliance is in normal operation) or the flashing malfunction and failure codes (if the appliance is in fault).

To access the menus and parameters of the S61 board, proceed as follows (see also Figure 5.1 *p. 24*):

1. Remove the front panel by removing the fixing screws.
2. Remove the cover of the electrical board to access the S61 board knob.
3. Act on the knob by means of the special key through the suitable hole.
4. Press the knob once to display the menus: the first menu is displayed, "0." (= menu 0).
5. Turn the knob clockwise to scroll down and display the other/subsequent menus; the menu numbers will be displayed in order, "1.", "2.", ... , "6." ... or "E" (= exit).
6. Select the menu of interest (e.g. display "2.___" = menu 2) by pressing the knob; the first parameter code will be displayed, in menu order (e.g. display "2._20" = parameter 20 in menu 2).
7. Turn the knob clockwise to scroll down the other parameters in the menu; the codes will be displayed in order (e.g. display "2._20", "2._21", ... "2._25" = parameters 20, 21, ... 25 in menu 2), or letter "E" (= exit) at the end of the list.
8. Select the parameter of interest (e.g. with code 161 in menu 3) by pressing the knob; the display will show the value previously assigned to the parameter, which is

read-only or can be set (e.g. the value "45" for parameter 161 in menu 3 = water temperature setpoint set to 45 °C). If it is a command rather than a value/setting, a flashing code will appear (e.g. "reS1" for the flame lock-out reset command).

9. Press the knob to reconfirm the value, or turn the knob to change the value, then press at the end to confirm or set the new value. If, on the other hand, it is a command for an appliance action, press the knob to perform it.
10. To exit a parameter menu or the menu list and go back to the higher level, turn the knob to display the letter "E" for exit, then press the knob again.
11. Place the cover back on the electrical panel opening and fit the appliance's front panel back on.

5.3 MODIFYING SETTINGS

Table 5.1 *p. 25* lists the parameters that the installer can change via menu 4, as described in Paragraph 5.2.3 *p. 24*.
To access menu 4, you must enter the installer password (1111).

Modification of these settings is reserved for the installer. Any changes made without the necessary expertise put the operation of the appliance and the system connected to it at risk.

Table 5.1 *Menu 4 parameters (for the installer)*

Parameter	Description	Setting	Default
40	Board CAN ID	from 0 to 478	-
44	Temperature measurement unit	0. °C 1. °F	0
150	Heat plant ID	from 0 to 15	-
160	Thermostating mode	0. inlet 1. outlet	1
161	Fixed setpoint in heating operation	from 10 °C to 65 °C	40
162	Differential	from -20 °C to -1 °C	-2
163	Heating antifreeze function activated	0. inactive 1. active	1
172	Belonging to separable group	0. base group 1. separable group	0
174	Water pump modulation in heating mode	0. inactive 1. active	1
175	Water pump drive voltage for water pump switching off in heating mode (if P174=0)	from 0 V to 10 V	0,7
176	Water pump drive voltage for water pump switching on in heating mode (if P174=0)	from 0 V to 10 V	10
177	Water pump drive voltage for water pump switching on in DHW mode	from 0 V to 10 V	10
178	Water Δt setpoint in heating mode	from 1 °C to 20 °C	10
181	Power modulation	0. inactive 1. active	1
183	Water pump modulation in DHW mode	0. inactive 1. active	1
184	Water Δt setpoint in DHW mode	from 1 °C to 20 °C	10
191	Water temperature set for activation of heating antifreeze function	from 4 °C to 15 °C	4
197	Periodic activation duration of heating circulation pump for antifreeze function	from 1 to 10 minutes 0. disabled	2
198 (1)	Reduction of brushless fan noise	0. inactive 1. active	0
200	Minimum water flow of the modulating water pump in heating service	from 8 to 36 hundred litres/hour	8
201	Minimum power modulation percentage	from 28% to 60%	28
203 (1)	Head of the brushless fan	0. standard head 1. maximum head	0
205	Maximum power modulation percentage	from 60% to 100%	100
218	Presence and type of glycol	0. none 1. ethylene 2. propylene	0
219	Glycol concentration	from 20% to 50% by volume	30

1. Only for appliances with a brushless fan.

Table 6.1 *p. 26* lists the parameters that the user can change via menu 3, as described in Paragraph 5.2.3 *p. 24*. These parameters are only used in the absence of the DDC control panel. Paragraph 6.4.1 *p. 26* provides an example of how to change the water temperature setpoint.

If any information (menu, menu entries, parameters and/or values, etc.) is visualized on the display in flashing mode, it means that this information couldn't be entered.

When information is not available, the display visualizes - - - -.

Change the settings using the DDC or CCI control panel

If the device is connected to the DDC or CCI control panel, please refer to the relevant manual to change the settings.

6 NORMAL OPERATION

This section is for the end user.

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

6.1 WARNINGS

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

First startup by TAC

First start-up may exclusively be carried out by a Robur

TAC (Chapter 5 *p. 23*).

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.

If Robur control devices are used to switch on and control the appliance, please refer to the manuals supplied with them for setting operations.
It is important to specify the operating and control requirements of the system as clearly as possible during the first start-up phase, as this allows the Robur TAC to set the adjustment and control systems correctly (if they are in turn provided by Robur), and consequently normal operation will only require minimal changes to the settings already made, drastically reducing the possibility of incorrect settings compromising the efficient operation of the appliance.

6.2 SWITCH ON AND OFF

Routine switching on/off

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

Do not switch on/off with the power supply switch

Do not switch the appliance on/off with the power supply switch. This may be harmful and dangerous for the appliance and for the system.

Checks before switching on

Before switching on the appliance, ensue that:
- gas valve open
- appliance electrical power supply (main switch ON)
- power supply to the DDC or CCI control panel (if any)
- water circuit filled and at the correct pressure

6.2.1 How to switch on/off

► If the appliance is controlled by the DDC or CCI control panel, please refer to the relevant manuals.
► If the appliance is controlled by an external request (e.g. thermostat, timer, switch, ... with voltage-free NO contact), the appliance is switched on/off by the ON/OFF positions of the external control device.

After switching on with the control, in normal operating conditions, the appliance starts/stops automatically according to the user's thermal needs, supplying hot water at the programmed temperature.

Although the external request is in the "ON" position, this does not mean the appliance will start immediately, but it will only start when there are actual service demands.

If you want to switch off the appliance for a long period, please refer to Paragraph 7.6.1 *p. 28*.

6.3 DISPLAY INFORMATION

During normal operation, water temperature values alternate on the display: output, input and the difference between the two.
Further information can be displayed by accessing menu 0.
In particular, it can be helpful to know the value of the water flow (expressed in litres per hour), which is visible in parameter 54 of menu 0.
To access the parameter, follow the procedure described in Paragraph 5.2.3 *p. 24*.
If there is an alarm or warning, please refer to Paragraph 7.4.3 *p. 28*.

6.4 MODIFYING SETTINGS

Change the settings using the DDC or CCI control panel

If the device is connected to the DDC or CCI control panel, please refer to the relevant manual to change the settings.

Table 6.1 *p. 26* lists the parameters that the user can change via menu 3, as described in Paragraph 5.2.3 *p. 24*. These parameters are only used in the absence of the DDC control panel.
Paragraph 6.4.1 *p. 26* provides an example of how to change the water temperature setpoint.

Table 6.1 *Menu 3 parameters (for the user)*

Parameter	Description	Setting	Default
160	Thermostating mode	0. inlet 1. outlet	1
161	Fixed setpoint in heating operation	from 10 °C to 65 °C	40
162	Differential	from -20 °C to -1 °C	-2

If any information (menu, menu entries, parameters and/or values, etc.) is visualized on the display in flashing mode, it means that this information couldn't be entered.

When information is not available, the display visualizes -.-.-.-.

Do not modify complex settings

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

6.4.1 How to raise/lower the water temperature setpoint

If the device is connected to the DDC or CCI control panel, please refer to the relevant manual to change the settings.

The water temperature set-point establishes the outlet temperature to the system (water output from the appliance), or inlet from the system (water input in the appliance). The temperature is pre-set by the TAC upon first start-up.

Before changing the setpoint, it should be checked whether this refers to the outlet or to the inlet. To do this check, proceed as follows:

1. Access parameter 160 (= thermostating mode) in menu 1 by turning and pressing the knob. The display will show "1.160" (procedure Paragraph 5.2.3 *p. 24*).
2. Check whether thermostating is set on the inlet (P160=0) or on the outlet (P160=1, default value).
3. Exit menu 1 by selecting and pressing the letter "E".

To raise/lower the water temperature setpoint via the S61 board, proceed as follows:

1. Access parameter 161 (= fixed setpoint in heating mode) in menu 3 by turning and pressing the knob; "3.161" must be displayed (procedure Paragraph 5.2.3 *p. 24*);
2. Display the parameter value by pressing the knob- The display shows the previously set value. To reconfirm the pre-existing value, press the knob again; otherwise, go to step 3.
3. Turn the knob to modify the value, increasing or decreasing it, and press it to set the new value.
4. Exit menu 3, and from the menu list, by selecting and pressing letter "E" twice, and go back to the normal display of detected temperature data.

6.5 EFFICIENCY

For greater appliance efficiency:
- ► Keep the finned coil clean.
- ► 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

7.1 WARNINGS

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

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.

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

The efficiency checks and every other "check and maintenance operation" (see Tables 7.1 *p. 27* and 7.2 *p. 28*) 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.

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

Environmental or operational heavy conditions

Increase the frequency of appliance maintenance and cleaning operations in especially heavy-duty environmental or use conditions (e.g., intensive use of the equipment, brackish environment, etc.).

7.2 PRE-EMPTIVE MAINTENANCE

For pre-emptive maintenance, comply with the recommendations in Table 7.1 *p. 27*.

Table 7.1 *Guidelines for the GAHP/GA preventive maintenance operations*

		GAHP A Plus	GAHP AR Plus	GAHP GS/WS Plus	GA ACF
Guidelines for the preventive maintenance operations					
Appliance check	visual check of the general condition of the appliance and its finned coil	√ (1)	√ (1)	-	√ (1)
	check the correct operation of the device used for monitoring the water flow	√	√	√	√
	check the % value of CO_2	√	√	√	-
	check gas pressure to the burners	-	-	-	√
	check that the condensate drain is clean (If necessary, frequency of the maintenace operation must be increased)	√	-	√	-
	replace the belts after 6 years or 12000 hours of operation	√	√	√	√
	replace the oil pump motor condenser every 3 years or every 10000 operating hours or whenever the condenser capacity is less than 95% of the nominal value	√	√	√	√
Check for every DDC or CCI	check that the plant is able to achieve the setpoint temperature	√	√	√	√
	download the event history	√	√	√	√

(1) We recommend cleaning the finned coil every 4 years (in any case, the frequency of cleaning is strongly affected by the installation site). Avoid cleaning the finned coil too aggressively, taking care not to bend the fins during cleaning.

7.3 SCHEDULED ROUTINE MAINTENANCE

For scheduled routine maintenance, perform the operations in Table 7.2 *p. 28*, at least once every 2 years.

Table 7.2 *GAHP/GA scheduled routine maintenance*

		GAHP A Plus	GAHP AR Plus	GAHP GS/WS Plus	GA ACF
Ordinary scheduled maintenance					
Appliance check	clean the combustion chamber	√ (1)	√ (1)	√ (1)	√
	clean the burner	√ (1)	√ (1)	√ (1)	√
	clean the ignition and flame sensor electrodes	√	√	√	√
	check that the condensate drain is clean	√	-	√	-

(1) Only in case the analysis of combustion products is non-compliant.

7.4 MESSAGES ON THE DISPLAY

7.4.1 4 digit display

The S61 board of the appliance (Paragraph 1.3 *p. 9*, Figure 5.1 *p. 24*) is fitted with a 4-digit display, visible through the sight glass of the front panel.

► When the appliance is powered on, all the LEDs switch on for 3 sec, then the board name is displayed.
► After another 15 seconds, the appliance is ready for use.

7.4.2 Signals in normal operation

During normal operation, water temperature values alternate on the display: output, input and the difference between the two.

7.4.3 Signals in the event of fault

In the event of fault the display blinks indicating an operational code (first letter on the display: "E" = error, or "U" = warning).
The display rotates after the values of the outlet water temperature, the inlet and the difference between them.
If multiple events are active, they are shown in sequence, ordered by increasing code number.
If warning or error events are active, the left green symbol, shown together with water temperature data, flashes.
If it is a permanent error or warning the appliance stops.
The warning is not an error, but rather a warning, and the appliance attempts to resolve the issue itself.

Table 8.1 *p. 29*.

7.5 RESTARTING A LOCKED-OUT APPLIANCE

7.5.1 Locked-out appliance

An external intervention (reset or repair) is required due to an appliance fault or problem with the system.

► A reset may be enough for a temporary and provisional fault.
► For a fault or breakdown, alert the maintenance technician or TAC.

7.5.2 Reset

Reset

- To restart the appliance you must know and perform the procedure concerning the issue signalled and identified by the code (Paragraph 8.1 *p. 29*).
- Only act if you are familiar with the issue and with the procedure (technical expertise and professional qualifications might be required).
- If you do not have sufficient expertise, and in any case of doubt, contact the TAC.

There are two options for resetting a fault:

1. If the appliance is connected to the DDC panel, you may act through the control device, as described in the relevant manual.
2. You may act directly from the S61 board as described below (if the appliance is controlled with external request, this is the only option).

How to perform reset from the S61 board

To perform the reset directly from the board:

1. Access parameter "_20" in menu 2 to reset flame lock-out (error E412), or parameter "_21", for any other generic reset, by turning and pressing the knob. The display will show "2._20"/"2._21" (procedure Paragraph 5.2.3 *p. 24*).
2. Press the knob to display the flashing reset request (e.g. "reS1" to reset flame block).
3. Press the knob again (the second time) to perform the reset; the reset request stops flashing, then "2._XX" is displayed again (e.g. "2._20"). The reset operation has been performed.
4. Exit menu 2 and the menu list, by selecting and pressing letter "E" twice, and go back to the normal display of detected temperature data.

7.6 PERIODS OF INACTIVITY

Avoid emptying the installation

Emptying the system may cause damage due to corrosion of the water pipes.

Deactivate the system in winter

Should you intend to stop the appliance in the winter season, ensure at least one of the following conditions:

1. antifreeze function active (Paragraph 3.5 *p. 14*)
2. sufficient antifreeze glycol (Paragraph 3.6 *p. 14*)

7.6.1 Prolonged periods of inactivity

Should you foresee to leave the appliance inactive for a long period of time, disconnect it from the electrical and gas mains. These operations must be performed by qualified personnel.

How to deactivate the appliance for long periods of time

1. Switch the appliance off (Paragraph 6.2 *p. 26*).
2. Only when the appliance is completely off, power it off with the main switch/disconnector switch (detail GS, Figure 4.2 *p. 19*).
3. Close the gas valve.
4. If necessary, add water with glycol (if the appliance is disconnected from the power and gas mains, the active antifreeze protection is missing, Paragraph 3.5 *p. 14*).

How to reactivate the appliance after long periods of inactivity

Before reactivating the appliance, the operator/maintenance technician of the system must first of all:

- Check whether any maintenance operations are required (contact the TAC; see Paragraphs 7.2 *p. 27* and 7.3 *p. 27*).
- Check content and quality of the water in the system, and if necessary top it up (Paragraphs 3.8 *p. 15*, 3.7 *p. 14* and 3.6 *p. 14*).
- Ensure the flue gas exhaust duct is not obstructed, and that the condensate drain is clean.

After completing the above checks:

1. Open the gas valve and ensure there are no leaks; should gas smell be noticed, close the gas valve again, do not switch any electrical devices on and request intervention by qualified personnel.
2. Power on with the main power supply switch (GS, Figure 4.2 *p. 19*).
3. Switch on the appliance by means of the provided control device (Paragraph 4.4 *p. 19*).

8 DIAGNOSTICS

8.1 OPERATIVE CODES

Table 8.1 *Operative codes GAHP A*

Code	Description	Warning (u)	Error (E)
400	Flame controller reset circuit fault	NA	Power cycle the appliance. If the code persists, shows up again or in case of doubt, contact the TAC.
401	Limit thermostat trip	Contact the TAC.	
402	Flue gas thermostat trip	Contact the TAC.	
405	Outdoor temperature exceeding operational limits	NA	Reset is automatic when the triggering condition ceases.
406	Outdoor temperature below operational limits	Non-blocking Warning (informative code). Reset is automatic when the triggering condition ceases.	NA
407	High generator temperature	Reset is automatic when the triggering condition ceases.	Reset can be performed from DDC/CCI control panel or from S61 board (menu 2, parameter 21). If the code persists, shows up again or in case of doubt, contact the TAC.
408	Flame controller error	NA	Contact authorised Technical Assistance
410	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. Reset can be performed from DDC/CCI control panel or from S61 board (menu 2, parameter 21). If the code persists, shows up again or in case of doubt, contact the TAC.
411	Insufficient rotation of oil pump	Reset occurs automatically 20 minutes after the code is generated.	Reset can be performed from DDC/CCI control panel or from S61 board (menu 2, parameter 21). If the code persists, shows up again or in case of doubt, contact the TAC.
412	Flame controller lockout	Reset is automatic up to 4 attempts (in about 5 minutes).	Check gas supply. Reset can be performed from DDC/CCI control panel or from S61 board (menu 2, parameter 20). If the code persists or in case of doubt, contact the TAC.
416	Hot water delivery temperature probe fault	NA	Reset can be performed from DDC/CCI control panel or from S61 board (menu 2, parameter 21). If the code persists, shows up again or in case of doubt, contact the TAC.
417	Hot water inlet temperature probe fault	NA	Reset can be performed from DDC/CCI control panel or from S61 board (menu 2, parameter 21). If the code persists, shows up again or in case of doubt, contact the TAC.
420	Generator temperature probe fault	NA	Reset can be performed from DDC/CCI control panel or from S61 board (menu 2, parameter 21). If the code persists, shows up again or in case of doubt, contact the TAC.
422	Water flowmeter fault	NA	Reset can be performed from DDC/CCI control panel or from S61 board (menu 2, parameter 21). If the code persists, shows up again or in case of doubt, contact the TAC.
423	Air-gas mix temperature probe fault	NA	Reset can be performed from DDC/CCI control panel or from S61 board (menu 2, parameter 21). If the code persists, shows up again or in case of doubt, contact the TAC.

Code	Description	Warning (u)	Error (E)
424	Flue gas temperature probe fault	Reset is automatic when the triggering condition ceases.	Reset can be performed from DDC/CCI control panel or from S61 board (menu 2, parameter 21). If the code persists, shows up again or in case of doubt, contact the TAC.
425	Clogged condensate drain	NA	Check and clean condensate drain. Reset can be performed from DDC/CCI control panel or from S61 board (menu 2, parameter 21). If the code persists, shows up again or in case of doubt, contact the TAC.
426	Generator fins temperature probe fault	Reset is automatic when the triggering condition ceases.	Reset can be performed from DDC/CCI control panel or from S61 board (menu 2, parameter 21). If the code persists, shows up again or in case of doubt, contact the TAC.
428	Flame controller error	NA	Power off the appliance. Contact the TAC.
429	Gas solenoid valve without electrical power	Reset occurs automatically if the gas solenoid valve switches on again within 10 minutes (with central flame control unit on).	Reset can be performed from DDC/CCI control panel or from S61 board (menu 2, parameter 21). If the code persists, shows up again or in case of doubt, contact the TAC.
430	High flue gas or generator fins temperature	Reset is automatic when the triggering condition ceases.	Reset can be performed from DDC/CCI control panel or from S61 board (menu 2, parameter 21). If the code persists, shows up again or in case of doubt, contact the TAC.
431	Hot water temperature exceeding operational limits	Check configuration of other heat generators on the system. Check water flow. Check system thermal load. Reset is automatic when the triggering condition ceases.	NA
434	-	Contact the TAC.	NA
436	Blower fault	Reset occurs automatically 20 minutes after the code is generated.	Reset can be performed from DDC/CCI control panel or from S61 board (menu 2, parameter 21). If the code persists, shows up again or in case of doubt, contact the TAC.
437	Low air-gas mix temperature	Non-blocking Warning (informative code). The code is reset automatically when the triggering condition ceases.	NA
444	Evaporator temperature probe fault	NA	Reset can be performed from DDC/CCI control panel or from S61 board (menu 2, parameter 21). If the code persists, shows up again or in case of doubt, contact the TAC.
446	High hot water inlet temperature	Check configuration of other heat generators on the system. Reset is automatic and occurs if the generating condition ceases with circulating pump on or 20 minutes after the code is generated with circulating pump off.	NA
447	Hot water inlet temperature below operational limits	Reset occurs automatically when the generating cause resolves or 430 seconds after the code is generated.	Reset occurs automatically when the condition that generated the code ceases. If the code shows up again or in case of doubt contact the TAC.
448	High hot water differential temperature	Check water flow. Reset occurs automatically 20 minutes after the code is generated.	Reset occurs automatically when the condition that generated the code ceases. If the code shows up again or in case of doubt contact the TAC.
449	Missing auxiliary board	NA	Contact the TAC.
452	Defrosting cycle activated	Non-blocking Warning (informative code). The code clears automatically when execution of defrosting ends.	NA
453	Water flow while system in cooling mode	Reset is automatic when the triggering condition ceases.	NA
460	Defrosting valve has failed to open	Non-blocking Warning (informative code). Reset is automatic, however, it is advisable to contact the TAC.	Reset can be performed from DDC/CCI control panel or from S61 board (menu 2, parameter 21). If the code persists, shows up again or in case of doubt, contact the TAC.
461	Oil pump priming cycle activated	The priming cycle lasts 30' if activated manually or 10 minutes if activated automatically. Reset is automatic when the triggering condition ceases.	NA
478	High hot water delivery temperature	Reset is automatic when the triggering condition ceases.	NA
479	Heating antifreeze function activated	Non-blocking Warning (informative code). The code clears automatically when antifreeze function execution ends.	NA

Code	Description	Warning (u)	Error (E)
80/480	Incomplete functional parameters	Contact the TAC.	
481	Invalid bank 1 parameters	Reset is automatic when the triggering condition ceases.	Contact the TAC.
482	Invalid bank 2 parameters	Reset is automatic when the triggering condition ceases.	Contact the TAC.
484	Transformer or 24 Vac fuse fault	NA	Contact the TAC.
485	Invalid module type configuration parameters	NA	Contact the TAC.
486	ROM board fault	NA	Contact the TAC.
487	pRAM board fault	NA	Contact the TAC.
488	xRAM board fault	NA	Contact the TAC.
489	Registers board fault	NA	Contact the TAC.
490	Outdoor temperature probe fault	NA	Reset can be performed from DDC/CCI control panel or from S61 board (menu 2, parameter 21). If the code persists, shows up again or in case of doubt, contact the TAC.
491	Electronic board fault	NA	Contact the TAC.

NA = not applicable

9 APPENDICES

9.1 PRODUCT FICHE

Table 8

COMMISSION DELEGATED REGULATION (EU) No 811/2013

Technical parameters for heat pump space heaters and heat pump combination heaters

Model(s):	GAHP A Plus
Air-to-water heat pump:	yes
Water-to-water heat pump:	no
Brine-to-water heat pump:	no
Low-temperature heat pump:	no
Equipped with a supplementary heater:	no
Heat pump combination heater:	no
Parameters shall be declared for medium-temperature application.	
Parameters shall be declared for average, colder and warmer climate conditions.	

Item	Symbol	Value	Unit	Item	Symbol	Value	Unit
AVERAGE CLIMATE CONDITIONS							
Rated heat output (*)	*Prated*	31,1	kW	**Seasonal space heating energy efficiency**	η_s	124	%
Declared capacity for heating for part load at indoor temperature 20 °C and outdoor temperature Tj				Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = -7 °C	*Pdh*	27,4	kW	Tj = -7 °C	*PERd*	103	%
Tj = +2 °C	*Pdh*	16,8	kW	Tj = +2 °C	*PERd*	136	%
Tj = +7 °C	*Pdh*	10,9	kW	Tj = +7 °C	*PERd*	130	%
Tj = +12 °C	*Pdh*	4,7	kW	Tj = +12 °C	*PERd*	118	%
T_j = bivalent temperature	*Pdh*	-	kW	Tj = bivalent temperature	*PERd*	-	%
Bivalent temperature	T_{biv}	-	°C				
Annual energy consumption	Q_{HE}	187	GJ				
COLDER CLIMATE CONDITIONS							
Rated heat output (*)	*Prated*	28,3	kW	**Seasonal space heating energy efficiency**	η_s	109	%
Declared capacity for heating for part load at indoor temperature 20 °C and outdoor temperature Tj				Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = -7 °C	*Pdh*	17,3	kW	Tj = -7 °C	*PERd*	110	%
Tj = +2 °C	*Pdh*	10,5	kW	Tj = +2 °C	*PERd*	119	%
Tj = +7 °C	*Pdh*	6,8	kW	Tj = +7 °C	*PERd*	115	%
Tj = +12 °C	*Pdh*	3,1	kW	Tj = +12 °C	*PERd*	113	%
Tj = bivalent temperature	*Pdh*	-	kW	Tj = bivalent temperature	*PERd*	-	%
T_j = operation limit temperature	*Pdh*	28,3	kW	Tj = operation limit temperature	*PERd*	89	%
For air-to-water heat pumps: Tj = -15 °C (if TOL < -20 °C)	*Pdh*	23,2	kW	For air-to-water heat pumps: Tj = -15 °C (if TOL < -20 °C)	*PERd*	91	%
Bivalent temperature	T_{biv}	-	°C				
Annual energy consumption	Q_{HE}	230	GJ				
WARMER CLIMATE CONDITIONS							
Rated heat output (*)	*Prated*	37,7	kW	**Seasonal space heating energy efficiency**	η_s	126	%
Declared capacity for heating for part load at indoor temperature 20 °C and outdoor temperature Tj				Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = +2 °C	*Pdh*	37,7	kW	Tj = +2 °C	*PERd*	122	%
Tj = +7 °C	*Pdh*	24,1	kW	Tj = +7 °C	*PERd*	135	%
Tj = +12 °C	*Pdh*	10,9	kW	Tj = +12 °C	*PERd*	125	%
Tj = bivalent temperature	*Pdh*	-	kW	Tj = bivalent temperature	*PERd*	-	%
Annual energy consumption	Q_{HE}	144	GJ				
Bivalent temperature	T_{biv}	-	°C	For air-to-water heat pumps: Operation limit temperature	*TOL*	-22	°C
				Heating water operating limit temperature	*WTOL*	65	°C
Power consumption in modes other than active mode				Supplementary heater			
Off mode	P_{OFF}	0,000	kW	Rated heat output	*Psup*	-	kW
Thermostat-off mode	P_{TO}	0,021	kW	Type of energy input		monovalent	
Standby mode	P_{SB}	0,005	kW				
Crankcase heater mode	P_{CK}	-	kW				
Other items							
Capacity control		variable		For air-to-water heat pumps: Rated air flow rate, outdoors	—	10000	m³/h
Sound power level, indoors/outdoors	L_{WA}	- / 80	dB	For water- or brine-to-water heat pumps: Rated brine or water flow rate, outdoor heat exchanger	—	-	m³/h
Contact details	Robur SPA, Via Parigi 4/6, I-24040 Zingonia (BG)						

(*) For heat pump space heaters and heat pump combination heaters, the rated heat output *Prated* is equal to the design load for heating *Pdesignh*, and the rated heat output of a supplementary heater *Psup* is equal to the supplementary capacity for heating *sup(Tj)*.

Additional information required by COMMISSION REGULATION (EU) No 813/2013, Table 2:

Emissions of nitrogen oxides:	NO_x	35	mg/kWh

Table 8

COMMISSION DELEGATED REGULATION (EU) No 811/2013

Technical parameters for heat pump space heaters and heat pump combination heaters

Model(s):	GAHP A Plus S1
Air-to-water heat pump:	yes
Water-to-water heat pump:	no
Brine-to-water heat pump:	no
Low-temperature heat pump:	no
Equipped with a supplementary heater:	no
Heat pump combination heater:	no
Parameters shall be declared for medium-temperature application.	
Parameters shall be declared for average, colder and warmer climate conditions.	

Item	Symbol	Value	Unit	Item	Symbol	Value	Unit
AVERAGE CLIMATE CONDITIONS							
Rated heat output (*)	*Prated*	31,1	kW	**Seasonal space heating energy efficiency**	η_s	125	%
Declared capacity for heating for part load at indoor temperature 20 °C and outdoor temperature Tj				Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = -7 °C	*Pdh*	27,4	kW	Tj = -7 °C	*PERd*	108	%
Tj = +2 °C	*Pdh*	16,8	kW	Tj = +2 °C	*PERd*	137	%
Tj = +7 °C	*Pdh*	10,9	kW	Tj = +7 °C	*PERd*	130	%
Tj = +12 °C	*Pdh*	4,7	kW	Tj = +12 °C	*PERd*	116	%
T_j = bivalent temperature	*Pdh*	-	kW	Tj = bivalent temperature	*PERd*	-	%
Bivalent temperature	T_{biv}	-	°C				
Annual energy consumption	Q_{HE}	185	GJ				
COLDER CLIMATE CONDITIONS							
Rated heat output (*)	*Prated*	28,3	kW	**Seasonal space heating energy efficiency**	η_s	111	%
Declared capacity for heating for part load at indoor temperature 20 °C and outdoor temperature Tj				Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = -7 °C	*Pdh*	17,3	kW	Tj = -7 °C	*PERd*	110	%
Tj = +2 °C	*Pdh*	10,5	kW	Tj = +2 °C	*PERd*	124	%
Tj = +7 °C	*Pdh*	6,8	kW	Tj = +7 °C	*PERd*	117	%
Tj = +12 °C	*Pdh*	3,1	kW	Tj = +12 °C	*PERd*	113	%
Tj = bivalent temperature	*Pdh*	-	kW	Tj = bivalent temperature	*PERd*	-	%
T_j = operation limit temperature	*Pdh*	28,3	kW	Tj = operation limit temperature	*PERd*	85	%
For air-to-water heat pumps: Tj = -15 °C (if TOL < -20 °C)	*Pdh*	23,2	kW	For air-to-water heat pumps: Tj = -15 °C (if TOL < -20 °C)	*PERd*	89	%
Bivalent temperature	T_{biv}	-	°C				
Annual energy consumption	Q_{HE}	226	GJ				
WARMER CLIMATE CONDITIONS							
Rated heat output (*)	*Prated*	37,7	kW	**Seasonal space heating energy efficiency**	η_s	128	%
Declared capacity for heating for part load at indoor temperature 20 °C and outdoor temperature Tj				Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = +2 °C	*Pdh*	37,7	kW	Tj = +2 °C	*PERd*	125	%
Tj = +7 °C	*Pdh*	24,1	kW	Tj = +7 °C	*PERd*	136	%
Tj = +12 °C	*Pdh*	10,9	kW	Tj = +12 °C	*PERd*	127	%
Tj = bivalent temperature	*Pdh*	-	kW	Tj = bivalent temperature	*PERd*	-	%
Annual energy consumption	Q_{HE}	141	GJ				
Bivalent temperature	T_{biv}	-	°C	For air-to-water heat pumps: Operation limit temperature	*TOL*	-22	°C
				Heating water operating limit temperature	*WTOL*	65	°C
Power consumption in modes other than active mode				Supplementary heater			
Off mode	P_{OFF}	0,000	kW	Rated heat output	*Psup*	-	kW
Thermostat-off mode	P_{TO}	0,021	kW	Type of energy input		monovalent	
Standby mode	P_{SB}	0,005	kW				
Crankcase heater mode	P_{CK}	-	kW				
Other items							
Capacity control		variable		For air-to-water heat pumps: Rated air flow rate, outdoors	—	10000	m³/h
Sound power level, indoors/outdoors	L_{WA}	- / 76	dB	For water- or brine-to-water heat pumps: Rated brine or water flow rate, outdoor heat exchanger	—	-	m³/h
Contact details	Robur SPA, Via Parigi 4/6, I-24040 Zingonia (BG)						

(*) For heat pump space heaters and heat pump combination heaters, the rated heat output *Prated* is equal to the design load for heating *Pdesignh* , and the rated heat output of a supplementary heater *Psup* is equal to the supplementary capacity for heating *sup(Tj)* .

Additional information required by COMMISSION REGULATION (EU) No 813/2013, Table 2:

Emissions of nitrogen oxides:	NO_x	35	mg/kWh

EU DECLARATION OF CONFORMITY (DOC)

We

Company name	**Robur S.p.A.**
Address	via Parigi 4/6
Postcode and City	24040 Verdellino/Zingonia (BG) Italy
Telephone number and fax	+39 035 888111 - F +39 035 884165
E-Mail	export@robur.it

declare that the DoC is issued under our sole responsibility and belongs to the following product:

Appliance / Product	Gas Absorption Heat Pump
Trade Mark / Commercial Brand	Robur
Type	**GAHP Plus**
Models	GAHP A Plus, GAHP A Plus S1, GAHP AR Plus, GAHP AR Plus S1, GAHP GS Plus, GAHP GS Plus Outdoor, GAHP WS Plus, GAHP WS Plus Outdoor

The object of the declaration described above is in conformity with the relevant Union harmonization legislation:

Regulation on appliances burning gaseous fuels (GAR)	**(EU) 2016/426**
Others applicable Union legislation:	
Low Voltage Directive (LVD)	2014/35/EU
Electromagnetic Compatibility Directive (EMC)	2014/30/EU
Pressure Equipment Directive (PED)	2014/68/EC
Energy related Products (ErP)	811/2013/EU - 813/2013/EU
The following harmonized standards and technical specifications have been applied:	
Gas-fired sorption appliances for heating and/or cooling with a net heat input not exceeding 70 kW - Part 1: Terms and definitions	EN 12309-1:2023
Gas-fired sorption appliances for heating and/or cooling with a net heat input not exceeding 70 kW - Part 2: Safety	EN 12309-2:2015+AC:2015
Notified Body	Identification number as Notified Body
IMQ S.p.A.	0051
EU Type Examination Certificate (Pin-CE)	**51DQ5207**

Signed for and on behalf of:

Robur S.p.A. via Parigi 4/6 - Verdellino/Zingonia (BG)	28/08/2025	Jvan Benzoni - R&D Director
place of issue	date of issue	name, function, signature

coscienza ecologica caring for the environment

D-DOC035EN A 28/08/2025 25MCLSVI017

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.

17/09/2025
25MCLSVI017
Code: D-LBR913EN
Revision: A

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caring for the environment

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afaq QSE Quality Health and Safety Environment AFNOR CERTIFICATION