ROBUR
caring for the environment

# Installation, use and maintenance manual

## GAHP-AR

Air-Water reversible absorption heat pumps for heating and cooling

powered by gas and renewable energies

**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: X
Code: D-LBR270

# TABLE OF CONTENTS

# I INTRODUCTION

**Installation, use and maintenance manual**

This Manual is an integral part of the GAHP-AR unit 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 be able to work, the GAHP-AR unit needs a control device (DDC or external request), which must 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/unit** = equivalent terms, both used to designate the GAHP gas powered absorption heat pump (Gas Absorption Heat Pump).
**TAC** = Technical Assistance Centre authorised by Robur.
**External request** = generic control device (e.g. thermostat, timer or any other system) equipped with a voltage-free NO contact and used as control to start/stop the GAHP unit.
**DDC Control** (Direct Digital Controller) = optional Robur control device to manage one or more Robur appliances in ON/OFF mode (GAHP heat pumps, GA chillers) or in modulating mode (AY boilers).
**RB100/RB200 Devices** (Robur Box) = optional interface devices complementary to DDC, which may be used to broaden its functions (heating/cooling/DHW production service demands and control of system components such as third party generators, adjustment valves, 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.
**S61/AR11 boards** = electronic boards on the GAHP appliance, to control all functions and to provide interfacing with other devices and with the user.

# 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 understanding the dangers inherent in it. Children should not play with the appliance.

**Hazardous situations**

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

**Gas component tightness**

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

**Gas smell**

If you smell gas:

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

**Poisoning**

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

**Moving parts**

The appliance contains moving parts.

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

**Burn hazard**

The appliance contains very hot parts.

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

**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 coolant 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. 15*).

- 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.

**Switching the appliance off**

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

- Except in the case of danger, do not disconnect the power supply to switch off the appliance, but always and exclusively act through the provided control device (DDC or external request).

**In the event of failure**

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

- In the event of failure of the appliance and/or breakage of any component, do not attempt to repair and/or restore and immediately contact the TAC.

**Routine maintenance**

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

- Maintenance must be performed according to the manufacturer's instructions (see Chapter 7 *p. 26*) 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.
- ► EN 60335 Household and similar electrical appliances - Safety.

### 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 air conditioning systems, heat pumps and chillers.
- ► Environmental protection and combustion products exhaust.
- ► Fire safety and prevention.
- ► Any other applicable law, standard and regulation.

## III.3 EXCLUSIONS OF LIABILITY AND WARRANTY

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

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

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

- Accidental damages or due to force majeure.

# 1 FEATURES AND TECHNICAL DATA

## 1.1 FEATURES

### 1.1.1 Operation

Based on the thermodynamic water-ammonia absorption cycle ($H_20$–$NH_3$), the appliance alternatively produces hot water or chilled water with (seasonal) switching of the hot/cold cycle, using outdoor air as a renewable energy source and natural gas (or LPG) as primary energy.
The thermodynamic cycle takes place within a hermetically sealed circuit, in welded construction, perfectly tight, factory-tested, which does not require any maintenance or coolant top-ups.
The GAHP-AR unit, for heating and/or cooling systems, is able to alternatively (not simultaneously) provide:

- Hot water up to 60 °C.
- Chilled water down to 3 °C.

### 1.1.2 Mechanical and thermo-hydraulic components

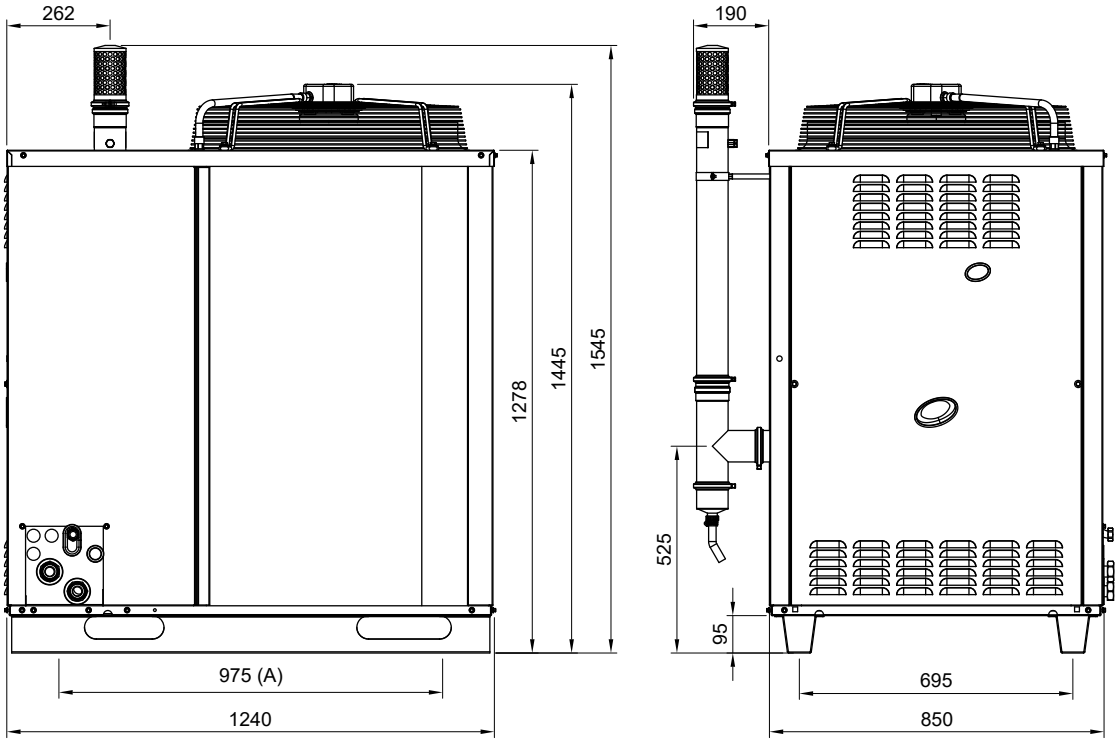
- Steel sealed circuit, externally treated with epoxy paint.
- Sealed combustion chamber (type C) suitable for outdoor installations.
- Metal mesh radiant burner, equipped with ignition electrodes and flame detection, managed by an electronic flame control box.
- Titanium stainless steel shell-and-tube water heat exchanger, externally insulated.
- Air exchanger with finned coil, with steel pipe and aluminium fins.
- Inversion valve on the cooling circuit, for use of the appliance in heating or cooling mode.
- Automatic microprocessor-controlled finned coil defrosting valve.
- Low power consumption refrigerant fluid oil pump.
- Variable-flow (for summer operation) microprocessor-controlled helicoidal motor-fan.
- Standard or low noise S fan.

### 1.1.3 Control and safety devices

- S61 electronic board with microprocessor, LCD display and knob.
- Auxiliary AR11 electronic board.
- Circuit water flow switch.
- Generator limit thermostat, with manual reset.
- Generator fins temperature probe.
- Differential air pressure switch on the combustion circuit.
- Sealed circuit safety relief valve.
- Bypass valve, between high and low-pressure circuits.
- Ionization flame control box.
- Double shutter electric gas valve.

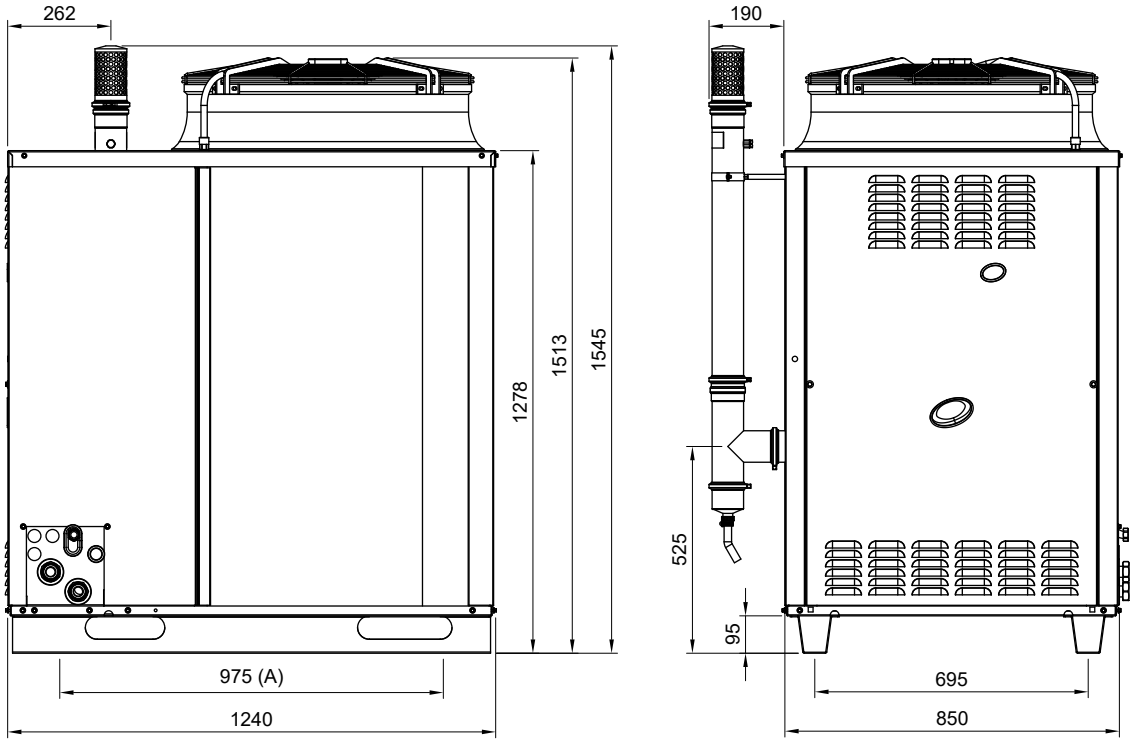
## 1.2 DIMENSIONS

**Figure 1.1** *Dimensions (standard fan)*



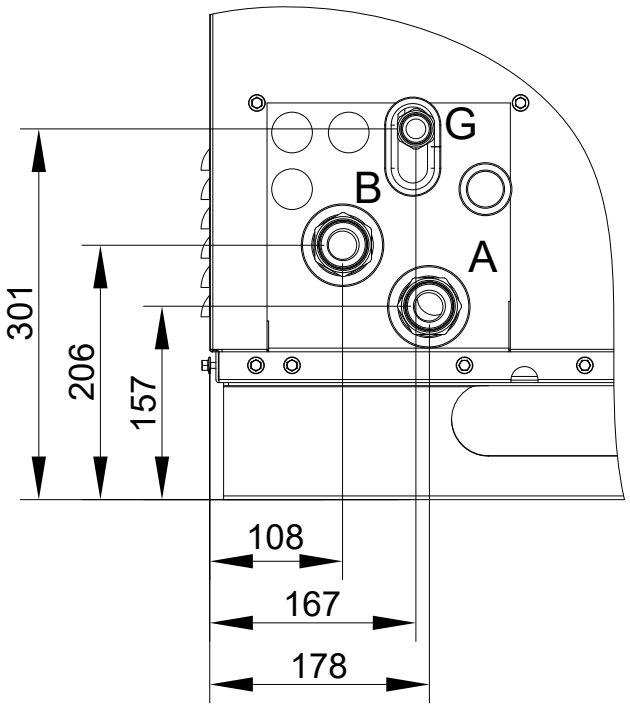

A Centre distance of holes for vibration damper supports

**Figure 1.2** *Dimensions (low-noise fan)*




A Centre distance of holes for vibration damper supports

**Figure 1.3** *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

## 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.
- **Satellite AR11 electronic board**, interconnected to the S61 board and located next to it, is used to control the cycle switching valve and to control defrosting operations of the GAHP-AR unit.

## 1.4 CONTROLS

### 1.4.1 Control device

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

1. DDC control
2. external request

### 1.4.2 DDC Controller

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

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

► Errors reset.
► Possibility to interface with a BMS.

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

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

### 1.4.3 External request

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

For connection of the selected device to the appliance's electronic board please refer to Paragraph 4.4 *p. 20*.

## 1.5 TECHNICAL DATA

**Table 1.1** *GAHP-AR technical data*

| | | | | GAHP-AR | GAHP-AR S |
|---|---|---|---|---|---|
| **Heating operation** | | | | | |
| **Seasonal space heating energy efficiency class (ErP)** | medium-temperature application (55 °C) | | - | A+ | |
| | low-temperature application (35 °C) | | - | A | |
| **Heat output for each unit** | Outdoor temperature/Water outlet temperature | A7W35 | kW | 37,8 | |
| | | A7W50 | kW | 35,3 | |
| **GUE efficiency** | Outdoor temperature/Water outlet temperature | A7W35 | % | 150 | |
| | | A7W50 | % | 140 | |
| **Heat input** | nominal (1013 mbar - 15 °C) | | kW | 25,7 | |
| | real | | kW | 25,2 | |
| **Hot water outlet temperature** | maximum | | °C | 60 | |
| | nominal | | °C | 50 | |
| **Hot water inlet temperature** | maximum | | °C | 50 | |
| | minimum temperature in continuous operation | | °C | 30 (1) | |
| **Thermal leap** | nominal | | °C | 10 | |
| **Heating water flow** | nominal | | l/h | 3040 | |
| | maximum | | l/h | 3500 | |
| | minimum | | l/h | 2500 | |
| **Pressure drop heating mode** | at nominal water flow | | bar | 0,29 (2) | |
| **Outdoor temperature (dry bulb)** | nominal | | °C | 7 | |
| | maximum | | °C | 35 | |
| | minimum | | °C | -20 | |
| **Cooling mode** | | | | | |
| **Cooling output for each unit** | Outdoor temperature/Water outlet temperature | A35W7 | kW | 16,9 | |
| **GUE efficiency** | Outdoor temperature/Water outlet temperature | A35W7 | % | 67 | |
| **Cold water temperature (inlet)** | maximum | | °C | 45 | |
| | minimum | | °C | 8 | |
| **Cold water flow** | nominal | | l/h | 2900 | |
| | maximum | | l/h | 3500 | |
| | minimum | | l/h | 2500 | |
| **Internal pressure drop** | at nominal water flow | | bar | 0,31 (2) | |
| **Outdoor temperature** | nominal | | °C | 35 | |
| | maximum | | °C | 45 | |
| | minimum | | °C | 0 | |
| **Electrical specifications** | | | | | |
| **Power supply** | voltage | | V | 230 | |
| | type | | - | single-phase | |
| | frequency | | Hz | 50 | |

(1) In transient operation, lower temperatures are allowed.
(2) For flows other than nominal see Design Manual, Pressure losses Paragraph.
(3) ±10% according to the power supply voltage and tolerance on electrical motors consumption. Measured at outdoor temperature of 30 °C.
(4) Sound power values detected in compliance with the intensity measurement methodology set forth by standard EN ISO 9614.
(5) Maximum sound pressure levels in free field, with directivity factor 2, obtained from the sound power level in compliance with standard EN ISO 9614.
(6) Overall dimensions excluding flue gas exhaust.
(7) Tolerance ±5%.

| | | | GAHP-AR | GAHP-AR S |
|---|---|---|---|---|
| **Electrical power absorption** | nominal | kW | 0,84 (3) | 0,87 (3) |
| **Degree of protection** | IP | - | X5D | |
| **Installation data** | | | | |
| **Gas consumption** | G20 natural gas (nominal) | $m^3/h$ | 2,72 | |
| | G25 (nominal) | $m^3/h$ | 3,16 | |
| | G27 (nominal) | $m^3/h$ | 3,32 | |
| | G2.350 (nominal) | $m^3/h$ | 3,78 | |
| | G30 (nominal) | kg/h | 2,03 | |
| | G31 (nominal) | kg/h | 2,00 | |
| **$NO_x$ emission class** | | - | 5 | |
| **sound power $L_w$ (max)** | | dB(A) | 79,6 (4) | 75,0 (4) |
| **sound pressure $L_p$ at 5 metres (max)** | | dB(A) | 57,6 (5) | 53,0 (5) |
| **maximum water pressure in operation** | | bar | 4,0 | |
| **water content inside the appliance** | | l | 3 | |
| **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 | 12 | |
| **type of installation** | | - | B23, B53 | |
| **Dimensions** | width | mm | 850 | |
| | depth | mm | 1240 | |
| | height | mm | 1445 (6) | 1513 (6) |
| **Weight** | in operation | kg | 380 | 390 |
| **General information** | | | | |
| **Refrigerating fluid (7)** | ammonia R717 | kg | 7,1 | |
| | 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 see Design Manual, Pressure losses Paragraph.
(3) ±10% according to the power supply voltage and tolerance on electrical motors consumption. Measured at outdoor temperature of 30 °C.
(4) Sound power values detected in compliance with the intensity measurement methodology set forth by standard EN ISO 9614.
(5) Maximum sound pressure levels in free field, with directivity factor 2, obtained from the sound power level in compliance with standard EN ISO 9614.
(6) Overall dimensions excluding flue gas exhaust.
(7) Tolerance ±5%.

**Table 1.2** *PED data*

| | | | GAHP-AR | GAHP-AR S |
|---|---|---|---|---|
| **PED data** | | | | |
| **Components under pressure** | generator | l | 18,6 | |
| | leveling chamber | l | 11,5 | |
| | evaporator | l | 3,7 | |
| | refrigerant volume changer | l | 4,5 | |
| | solution refrigerant absorber | l | 6,3 | |
| | solution pump | l | 3,3 | |
| **test pressure (in air)** | | $bar_g$ | 48,5 | |
| **maximum pressure of the refrigerating circuit** | | $bar_g$ | 32 | |
| **filling ratio** | | kg of $NH_3$/l | 0,148 | |
| **fluid 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 within the reach of children (plastic, polystyrene, nails...) since they are potentially dangerous.

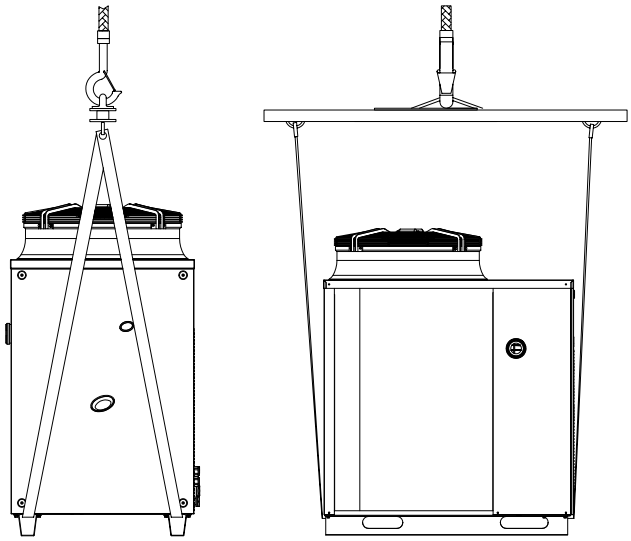
**Weight**

- 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. 12*).
► Use lifting beams to avoid damaging the outer panels and finned coil (Figure 2.1 *p. 12*).
► 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-AR unit 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

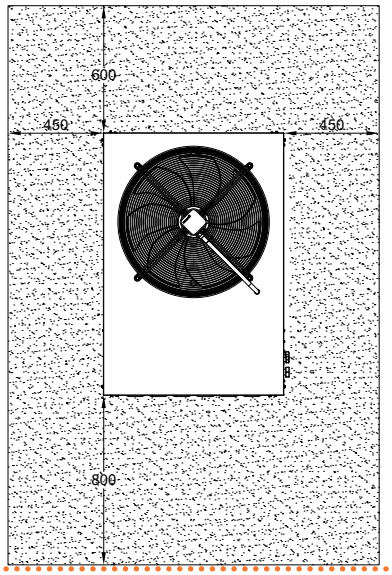
### 2.4.1 Distances from combustible or flammable materials

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. 13* (bar any stricter regulations) are required for safety, operation and maintenance.

**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 fire-proof material and able to withstand its weight.

### 2.5.2 Installation at ground level

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

### 2.5.3 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

### 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 Water flow

The GAHP appliance may work with costant water flow and ON/OFF operative mode.
System and components must be designed and installed consistently.

### 3.2.3 Minimum water content

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 (see design manual).

## 3.3 HYDRAULIC CONNECTIONS

### 3.3.1 Hydraulic connections

on the right, at the bottom, connection plate (Figure 1.3 *p. 9*).

**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 installations, protected from weathering, insulated for thermal losses, with vapour barrier to prevent condensation.

**Pipe cleaning**

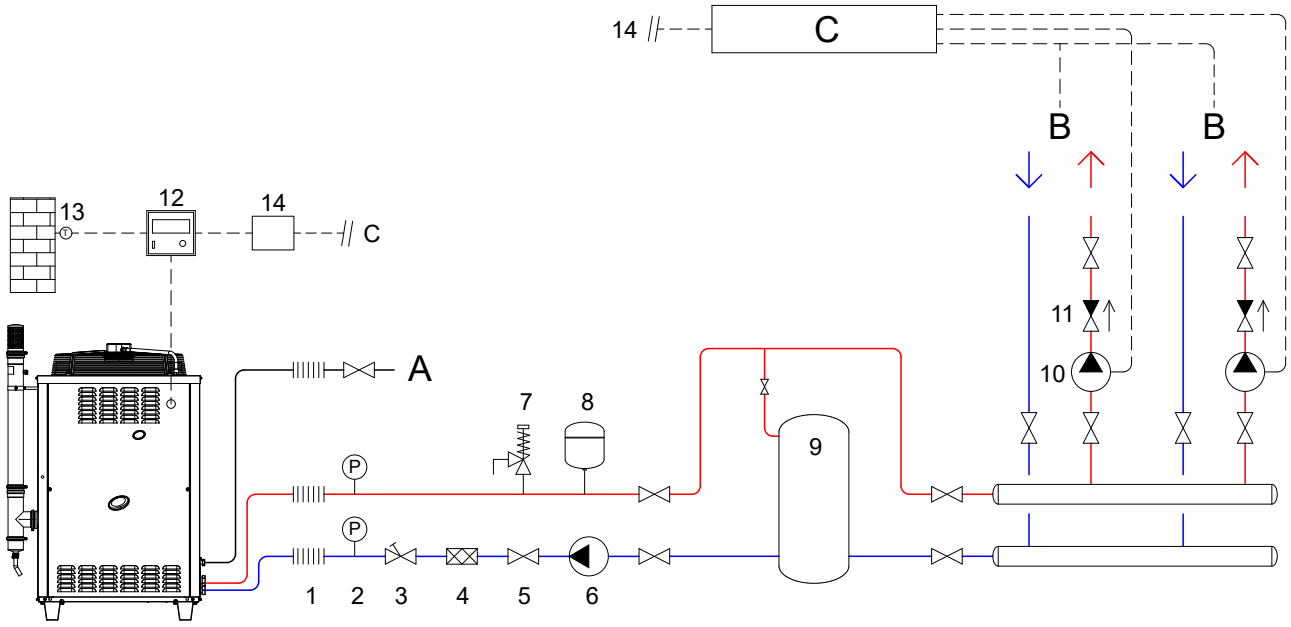
Before connecting the appliance,accurately wash the water and gas piping and any other system component, removing any residue.

### 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 circulation 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

**Figure 3.1** *Plumbing diagram for a single GAHP-AR for heating and cooling*




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/Cooling 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/Cooling circuit water pump
11 Check valve
12 DDC panel
13 Outdoor temperature probe
14 Summer/winter selector switch

## 3.4 WATER PUMP

The circulation pump (flow and head) must be selected and installed based on pressure drops of plumbing/primary circuit (piping + components + exchange terminals + appliance).
For the appliance pressure drops refer to Table 1.1 *p. 10* and Design Manual.

### 3.4.1 Constant flow pump

The primary circulation pump must be obligatorily controlled by the appliance's electronic board (S61) (see Paragraph 1.3 *p. 9*).

## 3.5 ANTIFREEZE FUNCTION

The appliance is equipped with an active antifreeze self-protection system to prevent freezing during wintertime, therefore in heating mode. The antifreeze function (activated by default) automatically starts the primary water pump and, if required, the burner too, when the outdoor temperature approaches zero.

**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.

## 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 (in-

compatible with glycol).
- Glycol modifies the physical properties of water (density, viscosity, specific heat...). Size the piping, water pump and thermal generators accordingly.
- With automatic system water filling, a periodic check of the glycol content is required.

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

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 choice of 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 amount of calcium into the system. This is attached to the hot parts including the heat exchanger, thus creating pressure drops and thermal insulation on the active parts. This can lead to damage.
If the filling and top-up water of the system is outside the values indicated below, it must be softened and/or chemically treated. Additives may also be added to keep the calcium in solution. Hardness should be checked regularly and recorded on the system logbook.
The choice of the type of treatment must be made according to the characteristics of the water to be treated, the type of plant and the limits of purity required.
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. 15*.
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.

### 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.

**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.

## 3.8 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, at the bottom, connection plate (Figure 1.3 *p. 9*).

► 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, to isolate 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.

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 appliance's gas supply pressure, both static and dynamic, must comply with Table 3.2 *p. 16*, with tolerance ± 15%.

**Table 3.2** *Network gas pressure*

| Product category | Country of destination | Gas supply pressure [mbar] | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | G20 | G25 | G25.1 (1) | G2.350 | G27 | G30 | G31 |
| $II_{2H3B/P}$ | AL, BG, CH, CY, CZ, DK, EE, FI, GR, HR, IT, LT, LV, MK, NO, RO, SE, SI, SK, TR | 20 | | | | | 30 | |
| | AT, CH | 20 | | | | | 50 | |
| | HU | 25 | | | | | 30 | |
| $II_{2H3P}$ | AL, 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 |
| $II_{2L3B/P}$ | NL | | 25 | | | | 30 | |
| $II_{2L3P}$ | | | 25 | | | | | 37 |

The appliance gas supply pressure, both static and dynamic, must comply with the values in the Table, with a tolerance of ± 15%.
1 GA not approved for G25.1, G2.350, G27 gases.

| Product category | Country of destination | Gas supply pressure [mbar] | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | G20 | G25 | G25.1 (1) | G2.350 | G27 | G30 | G31 |
| $II_{2E3B/P}$ | PL | 20 | | | | | 37 | |
| $II_{2ELwLs3B/P}$ | | 20 | | | 13 | 20 | 37 | |
| $II_{2ELwLs3P}$ | | 20 | | | 13 | 20 | | 37 |
| $I_{2E}$ | | 20 | | | | | | |
| $I_{2E(S)}$ | BE | 20 | 25 | | | | | |
| $I_{3P}$ | | | | | | | | 37 |
| | IS | | | | | | | 30 |
| $I_{2H}$ | LV | 20 | | | | | | |
| $I_{3B/P}$ | MT | | | | | | 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%.
1 GA not approved for G25.1, G2.350, G27 gases.

### 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 COMBUSTION PRODUCTS 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. 10*.

### 3.10.1 Flue gas exhaust connection

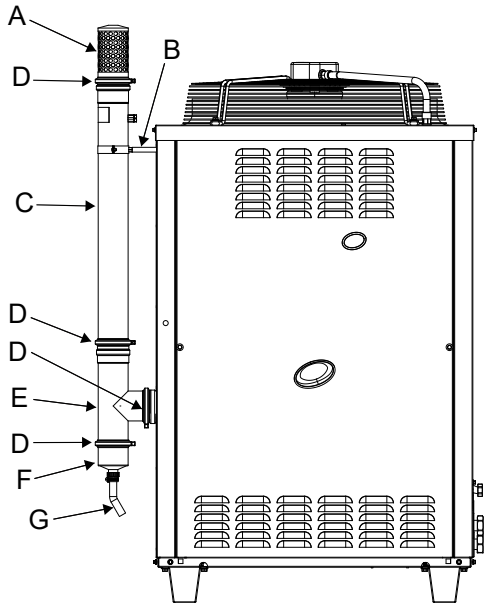
Ø 80 mm (with gasket), on the left, at the bottom (Figure 3.2 *p. 17*).

### 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. 17*):

1. Ø 80 mm flue gas exhaust pipe, length 750 mm (C)
1. "T" connector (E)
1. condensate trap (F)
1. terminal (A)
1. clamp for fixing pipe (B) to left side panel
4. pipe clamps (D)
1. condensate drain hose fitting and silicone hose (G)

**Figure 3.2** *Components of flue gas exhaust kit*




| | | | |
|---|---|---|---|
| A | Terminal | E | T connector |
| B | Pipe clamp | F | Condensate drain |
| C | Exhaust pipe L = 750 mm | G | Hose adaptor + condensate drain pipe |
| D | Pipe clamp | | |

**How to install the flue gas kit**

Figure 3.2 *p. 17*:

1. Remove the front panel.
2. Remove the protective cap of the flue gas exhaust.
3. Place the clamp with spacer (B) in the suitable hole on the left panel of the appliance.
4. Fasten the condensate trap (F) on the T connector (E).
5. Fasten the T connector (E) on the appliance's flue gas exhaust (Ø 80 mm).
6. Fasten the flue gas exhaust pipe (C) (L= 750 mm) onto the T connector (E).
7. Block the flue gas exhaust pipe (C) in the clamp with spacer (B).
8. Fit the terminal (A) on the flue gas exhaust pipe (C).
9. Fix the condensate drain pipe fitting and the relevant silicon tube (G).
10. 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 of appropriate type for non-condensing appliances.

- ► To size the flue refer to Table 1.1 *p. 10* and design manual.
- ► 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.

If several GAHP-AR appliances are connected to a single flue, NO check valves must be installed.

To avoid corrosion, convey the acid condensate drain to the base of the flue gas exhaust duct.

## 3.11 FLUE GAS CONDENSATE DRAIN

The GAHP-AR appliance produces condensate from flue gases only during the cold start-up transient.

**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 base of the flue gas exhaust duct (Figure 3.2 *p. 17*).
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.

### 3.11.2 Flue gas condensate drain manifold

To make the condensate drain manifold:

- ► Size ducts with diameter no less than 15 mm.
- ► Use plastic materials resistant to acidity pH 3-5.
- ► Provide for min. 1% slope, i.e. 1 cm for each m of the length (otherwise a booster pump is required).
- ► Prevent freezing.
- ► Dilute, if possible, with domestic waste water (e.g. bathrooms, washing machines, dish washers...), basic and neutralising.

## 3.12 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 *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 (GS) to turn the appliance on and off, since it may be damaged in the long run (occasional blackouts are tolerated).
- To turn the appliance on and off, exclusively use the suitably provided control device (DDC or external request).

**Control of water pump**

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

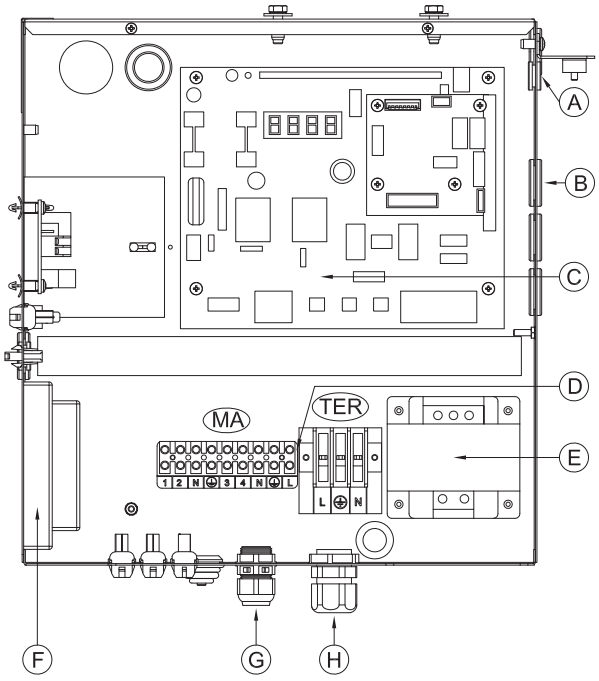
## 4.2 ELECTRICAL SYSTEMS

Electrical connections must provide:
- ► power supply (Paragraph 4.3 *p. 19*)
- ► control system (Paragraph 4.4 *p. 20*)
- ► water pump (Paragraph [Ref] )

**How to make connections**

All electrical connections must be made in the appliance's electrical panel (Figure 4.1 *p. 19*):
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. Run 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 V AC
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:
- ► 1 three-pole cable type FG7(O)R 3Gx1,5
- ► 1 two-pole switch with two 5 A type T fuses, (GS) or one 10 A magnetothermic breaker

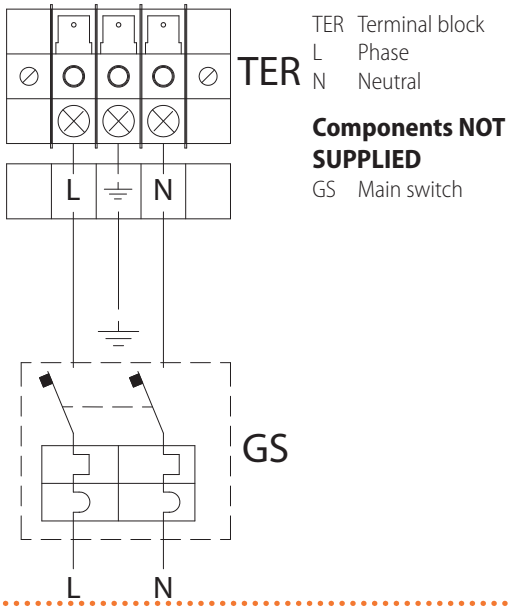
The switches must also provide disconnect capability, with a minimum contact opening of 4 mm.

**How to connect the power supply**

To connect the three-pole power supply cable (Figure 4.2 *p. 20*):
1. Access the electrical panel of the appliance according to the Procedure 4.2 *p. 19*.
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

**Switching for reversible units**

Use that entails frequent switching between heating/conditioning operating modes are to be avoided for reversible units.

### 4.4.1 Control systems

Two separate control systems are provided, each with specific features, components and diagrams (Figures 4.4 *p. 21*, 4.7 *p. 23*):

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

### 4.4.2 CAN bus communication network

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

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

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

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

### 4.4.3 CAN bus signal cable

The DDC controller is connected to the appliance through the CAN bus signal cable, shielded, compliant to Table 4.1 *p. 20* (admissible types and maximum distances).

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

**Table 4.1** *CAN bus cables type*

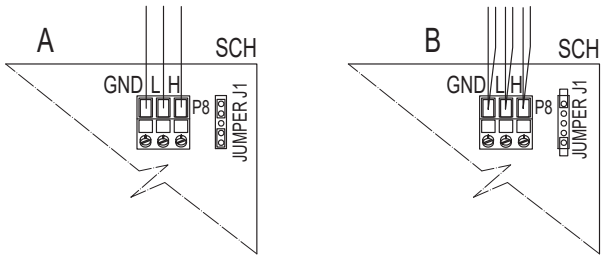
| Cable name | Signals / Color | | | Maximum length | Note |
|---|---|---|---|---|---|
| **Robur** | | | | | Optional code OCVO008 |
| ROBUR NETBUS | H = BLACK | L = WHITE | GND = BROWN | 450 m | |
| **Honeywell SDS 1620** | | | | | In all cases the fourth conductor should not be used |
| BELDEN 3086A | 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 (Paragraph 1.3 *p. 9*), located in the electrical panel inside the appliance (Figures 4.3 *p. 21* and 4.4 *p. 21*):

1. Access the electrical panel of the appliance according to the Procedure 4.2 *p. 19*.
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 to the CAN bus cable according to the instructions in the following Paragraphs and in the DDC manual.

**Figure 4.3** *Connection of the CAN bus cable to the electronic board of GAHP/GA units*

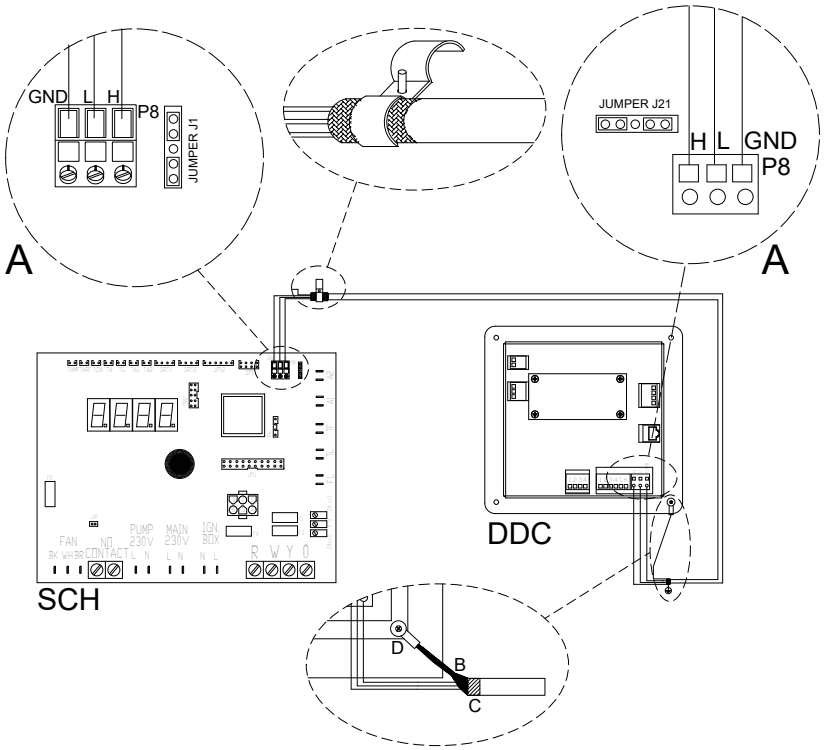



SCH Electronic board of GAHP/GA units
GND Common data
L Data signal LOW
H Data signal HIGH
J1 Onboard CAN bus jumper
A Detail of "terminal node" case (3 wires; J1 = jumper "closed")
B Detail of "intermediate node" case (6 wires; J1 = jumper "open")
P8 CAN port/connector

### 4.4.4 GAHP + DDC configuration

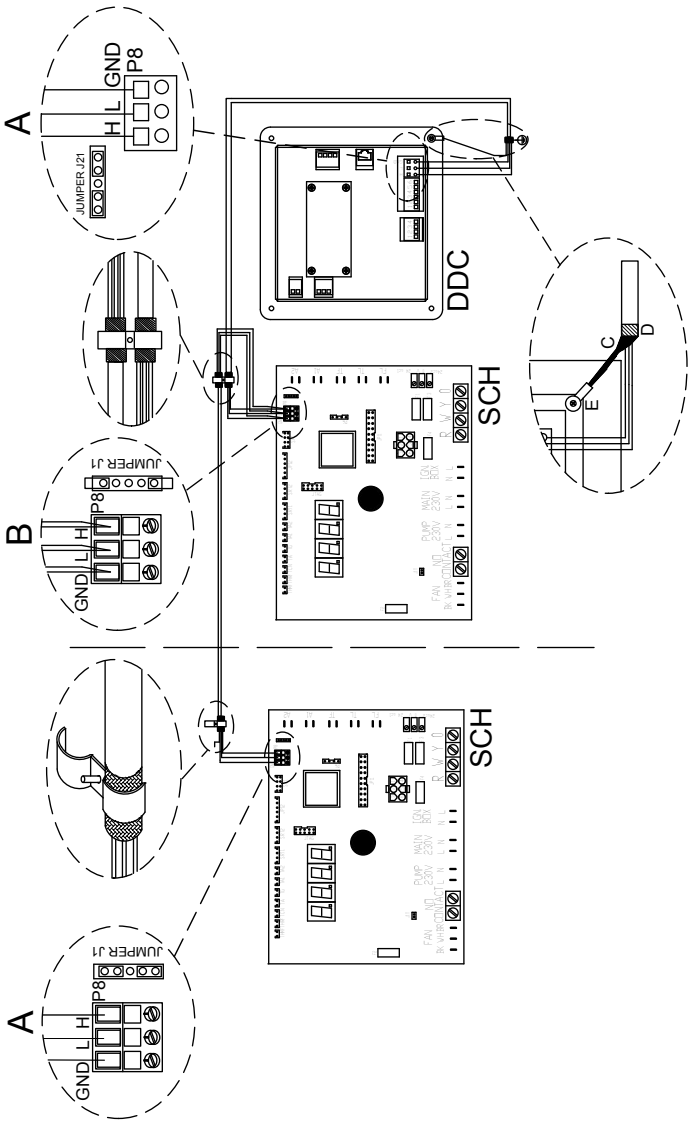
System (1) see also Paragraph 1.4 *p. 9*.

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




DDC Direct Digital Controller
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 Insulating tape to protect the shield of the CAN bus cable
D Eyelet terminal and fixing screw

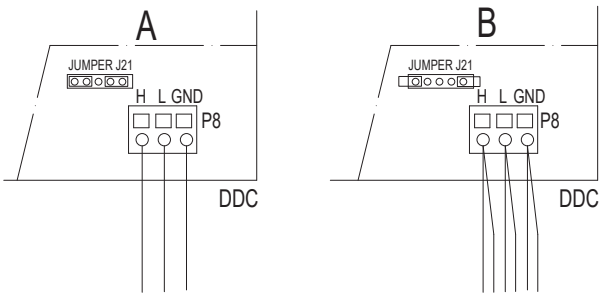
**Figure 4.5** *CAN bus connection for systems with multiple single units*




DDC Direct Digital Controller
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 Insulating 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 Direct Digital Controller
GND Common data
L Data signal LOW
H Data signal HIGH
J21 CAN bus jumper on DDC board
A Detail of "terminal node" case (3 wires; J21 = jumper "closed")
B Detail of "intermediate node" case (6 wires; J21 = jumper "open")
P8 CAN port/connector

### 4.4.5 External request

System (2), see also Paragraph 1.4 *p. 9*.
It is required to arrange:

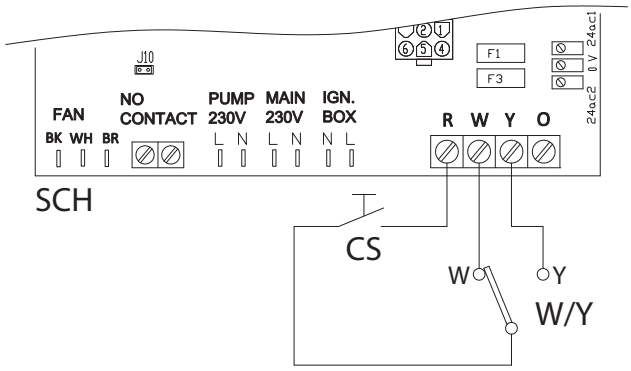
► Enable device (e.g. thermostat, timer, switch, ...) fitted with a voltage-free NO contact.
► Switching devicewinter/summer (heating/cooling, W and Y contacts on the S61 board).

**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. 23*):

1. Access the electrical panel of the appliance according to the Procedure 4.2 *p. 19*.
2. Connect the voltage-free contact of the external device (detail CS), with winter/summer switching, through three wires, to **terminals R, W and Y** (respectively: common 24 V AC, heating request and cooling request) of S61 electronic board.

**Figure 4.7** *External operation requests connection*




SCH Electronic board
R Common 24 V AC
W Heating request terminal
Y Cooling request terminal

**Components NOT SUPPLIED**

CS External request
W/Y Heating/Cooling switch (winter/summer)

## 4.5 WATER PUMP

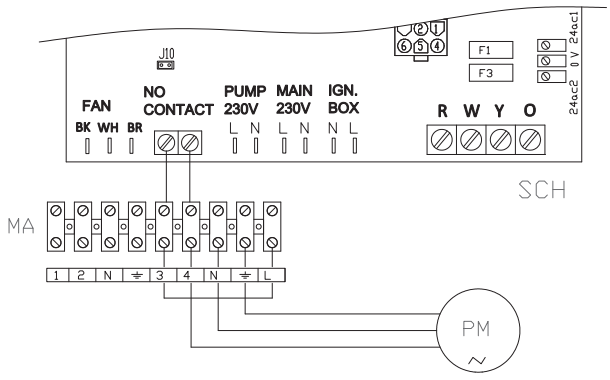
### 4.5.1 Constant flow pump

It must be mandatorily controlled from the S61 electronic board.
The diagram in Figure 4.8 *p. 23* is for pumps < 700 W. For pumps > 700 W it is required to add a control relay and arrange jumper J10 OPEN.

**How to connect the constant flow circulating pump**

1. Access the electrical panel of the appliance according to the Procedure 4.2 *p. 19*.
2. Connect board S61, to terminals 3-4 of terminal block (MA).
3. Jumper J10 open if the pump is > 700 W or is a Wilo electronic pump, otherwise closed.

**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 Appliance terminal block
L Phase
N Neutral

**Components NOT SUPPLIED**

PM Water pump < 700 W

**Note**

1 Jumper J10 must be closed if the installed pump is not a Wilo electronic pump.
Jumper J10 must be opened if the installed pump is a Wilo electronic pump.

# 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.

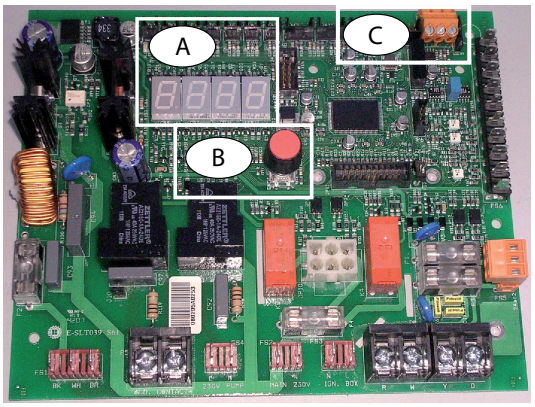
## 5.2 ELECTRONIC ADJUSTMENT ON THE MACHINE – MENUS AND PARAMETERS OF THE S61 BOARD

**Firmware**

The instructions on the use of the S61 electronic board concern the **firmware version 3.036**.

### 5.2.1 The appliance's electronic board (S61)

**Figure 5.1** *Electronic board S61*




A 4 digit display
B Knob
C CAN port

### 5.2.2 Display

The 4-digit display of the S61 board (detail A, Figure 5.1 *p. 24*) is as follows:
- ► The **first digit** (on the left, green) indicates the menu number (e.g. "0.", "1.", "2.", ... "8.").
- ► The **last three digits** (on the right, red) indicate a **code** or a **value** for a parameter, among those included in the selected menu (e.g. "__6" "_20", "161").

(e.g. menu+parameter "1.__6", "2._20", "3.161").

### 5.2.3 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.

### 5.2.4 Menus and Parameters

The menus may be display only (functional data or parameters), display and setting (parameters) or control (reset).
**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. 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. Display of the S61 board showing in sequence the detected water temperature data (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 figure previously assigned to the parameter will be displayed, read-only or to be set (e.g. the figure "45" for parameter 161 in menu 3 = water temperature setpoint at 45 °C); if instead of a figure/setting it is a command, a flashing code is displayed (e.g. "reS1" for the flame lock-out reset command).
9. Press the knob to reconfirm the figure; or rotate the knob to modify the figure, and press at the end to confirm or set the new figure; if however, it is a matter of controlling an appliance operation, press the knob to execute 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

**Modify settings via the DDC**

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

### 5.3.1 How to raise/lower the water temperature setpoint

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.

If the appliance is not connected to a DDC control, to raise/lower the water temperature setpoint with the S61 board, proceed as follows:

1. Access menu 3 under parameter 161 or 075 (= hot or chilled water temperature setpoint) by rotating and pressing the knob; "3.161" must be displayed in heating mode or "3.075" in cooling mode (procedure Paragraph 5.2 *p. 24*).
2. Display the parameter value by pressing the knob; the previously set value is displayed (from 3 to 60 °C); 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.

**Do not modify complex settings**

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

# 6 NORMAL OPERATION

**This section is for the end user.**

**The use of the device by the end user is only permitted after the Robur authorised TAC has com-**

**pleted 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.

## 6.2 SWITCH ON AND OFF

**Routine switching on/off**

The appliance may exclusively be switched on/off by means of the suitably provided control device (DDC or external request).

**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 (GS) ON)
- DDC power supply (if any)
- water circuit ready

### 6.2.1 How to switch on/off

The appliance may be turned on/off, in heating or cooling mode by seasonal heating/cooling switching, to alternatively produce hot water or chilled water, according to climate control needs.

► If the appliance is controlled by a DDC, refer to the relevant manual.

► If the appliance is controlled by an external request (e.g. thermostat, timer, switch, ... with NO voltage-free contact), the appliance is switched on/off by the ON/OFF positions of the external control device, with heating/cooling seasonal change through winter/summer switching (contacts R = common, W = winter, Y = summer, board S61, see Paragraph 4.4 *p. 20*).

After switching on with the control, in normal operating conditions, the appliance starts/stops automatically according to the user's heating/cooling needs, supplying hot or chilled 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.

## 6.3 MODIFYING SETTINGS

**Modify settings via the DDC**

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

**Do not modify complex settings**

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

## 6.4 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 by means of the control device and wait for the end of the shutdown cycle, then disconnect power and gas supply, by acting on the electrical disconnector and gas valve.

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

In environmental or operational conditions particularly heavy (for example: heavy-duty use of the appliance, salty environment, etc.), maintenance and cleaning operations must be more frequent.

## 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 | GAHP GS/WS | GA ACF | GAHP-AR |
|---|---|---|---|---|---|
| **Guidelines for the preventive maintenance operations** | | | | | |
| **Check of the unit** | visually check of the general condition of the unit and of 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 | √ | √ | √ | √ |
| | check/restore the pressure of the primary hydronic circuit | - | - | - | - |
| | check/restore the air pressure inside of the expansion vessel of the primary hydronic circuit | - | - | - | - |
| | 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) It is suggested to clean the finned coil once every 4 years (optimal frequency of the cleaning operation is in any case strongly affected by the installation site). Avoid excessively aggressive cleaning of the finned coil (e.g. high-pressure washer).

## 7.3 SCHEDULED ROUTINE MAINTENANCE

For scheduled routine maintenance, perform the operations in Table 7.2 *p. 27*, at least once every 2 years.

**Table 7.2** *GAHP/GA scheduled routine maintenance*

| | | GAHP A | GAHP GS/WS | GA ACF | GAHP-AR |
|---|---|---|---|---|---|
| **Ordinary scheduled maintenance** | | | | | |
| **Check of the unit** | 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 sec, the appliance is ready to operate.

### 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 oper-

ational 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.

Table 8.1 *p. 29*.

## 7.5 RESTARTING A LOCKED-OUT UNIT

### 7.5.1 Fault signals on the display

In the event of locked-out appliance, an operational code flashes on the display (first green figure on the left, letter "U" = warning or "E" = error).

► 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 know the code, the problem, or the procedure, or you do not have sufficient skills, and in any case of doubt, contact the TAC.

### 7.5.2 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.

### 7.5.3 Reset

There are two options for resetting a fault:

1. If the appliance is connected to a DDC 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 Menu 2 under Parameter "__0", to reset flame lockout (Error E612), or Parameter "__1" for any other generic reset, turning and pressing the knob; "2.__0"/"2.__1" must be displayed (procedure Paragraph 5.2 *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.__0"). 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. 20*).
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. 16*, 3.7 *p. 15* 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. 20*).
3. Switch on the appliance by means of the provided control device (Paragraph 4.4 *p. 20*).

# 8 DIAGNOSTICS

## 8.1 OPERATIVE CODES

**Table 8.1** *Operative codes GAHP-AR*

| Code | Description | Warning (u) | Error (E) |
|---|---|---|---|
| 600 | Flame controller reset circuit fault | NA | Power cycle the appliance.<br>If the code persists, shows up again or in case of doubt, contact the TAC. |
| 601 | Limit thermostat trip | Contact authorised Technical Assistance | |
| 602 | Flue gas thermostat trip | Contact authorised Technical Assistance | |
| 603 | Chilled water antifreeze thermostat trip | Reset is automatic when the triggering condition ceases. | NA |
| 604 | Insufficient ventilation in cooling mode | Reset occurs automatically 20 minutes after the code is generated. | Reset may be performed from the DDC or from the S61 board (menu 2, parameter 1).<br>If the code persists, shows up again or in case of doubt, contact the TAC. |
| 605 | Outdoor temperature exceeding operational limits | NA | Reset is automatic when the triggering condition ceases. |
| 606 | Outdoor temperature below operational limits | Non-blocking Warning (informative code). The code is reset automatically when the triggering condition ceases. | NA |
| 607 | High generator temperature | Reset is automatic when the triggering condition ceases. | Reset may be performed from the DDC or from the S61 board (menu 2, parameter 1).<br>If the code persists, shows up again or in case of doubt, contact the TAC. |
| 608 | Flame controller error | NA | Contact authorised Technical Assistance |
| 610 | Low water flow | Reset is automatic when the triggering condition ceases. | Check and clean water filters on the system.<br>Check for air in the system.<br>Check water flow pump.<br>Power cycle the appliance.<br>Reset may be performed from the DDC or from the S61 board (menu 2, parameter 1).<br>If the code persists, shows up again or in case of doubt, contact the TAC. |
| 611 | Insufficient rotation of oil pump | Reset occurs automatically 20 minutes after the code is generated. | Reset may be performed from the DDC or from the S61 board (menu 2, parameter 1).<br>If the code persists, shows up again or in case of doubt, contact the TAC. |
| 612 | Flame controller lockout | Reset is automatic up to 4 attempts (in about 5 minutes). | Check gas supply.<br>Reset may be performed from the DDC or from the S61 board (menu 2, parameter 0).<br>If the code persists or in case of doubt, contact the TAC. |
| 616 | Chilled water delivery temperature probe fault | NA | Reset may be performed from the DDC or from the S61 board (menu 2, parameter 1).<br>If the code persists, shows up again or in case of doubt, contact the TAC. |
| 617 | Chilled water inlet temperature probe fault | NA | Reset may be performed from the DDC or from the S61 board (menu 2, parameter 1).<br>If the code persists, shows up again or in case of doubt, contact the TAC. |
| 618 | Condenser temperature probe fault | NA | Reset is automatic in case of switching from "cold" to "hot" mode.<br>Reset may be performed from the DDC or from the S61 board (menu 2, parameter 1).<br>If the code persists, shows up again or in case of doubt, contact the TAC. |
| 620 | Generator temperature probe fault | NA | Reset may be performed from the DDC or from the S61 board (menu 2, parameter 1).<br>If the code persists, shows up again or in case of doubt, contact the TAC. |

| | | | |
|---|---|---|---|
| 626 | Generator fins temperature probe fault | Reset is automatic when the triggering condition ceases. | Reset may be performed from the DDC or from the S61 board (menu 2, parameter 1).<br>If the code persists, shows up again or in case of doubt, contact the TAC. |
| 628 | Flame controller error | NA | Power off the appliance.<br>Contact the TAC. |
| 629 | 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 may be performed from the DDC or from the S61 board (menu 2, parameter 1).<br>If the code persists, shows up again or in case of doubt, contact the TAC. |
| 630 | High flue gas or generator fins temperature | Reset is automatic when the triggering condition ceases. | Reset may be performed from the DDC or from the S61 board (menu 2, parameter 1).<br>If the code persists, shows up again or in case of doubt, contact the TAC. |
| 631 | Hot water temperature exceeding operational limits | Check configuration of other heat generators on the system.<br>Check water flow.<br>Check system thermal load.<br>Reset is automatic when the triggering condition ceases. | NA |
| 632 | Chilled water temperature exceeding operational limits | Check configuration of other chillers on the system.<br>Check water flow.<br>Check system's chilling load.<br>Reset is automatic when the triggering condition ceases. | NA |
| 634 | - | Contact the TAC. | NA |
| 644 | Evaporator temperature probe fault | NA | Reset is automatic in case of switching from "hot" to "cold" mode.<br>Reset may be performed from the DDC or from the S61 board (menu 2, parameter 1).<br>If the code persists, shows up again or in case of doubt, contact the TAC. |
| 646 | High hot water inlet temperature | Check configuration of other heat generators on the system.<br>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 |
| 647 | Hot water inlet temperature below operational limits | Reset occurs automatically when the generating cause resolves or 430 seconds after the code is generated. | Reset is automatic in case of switching from "hot" to "cold" mode.<br>Reset may be performed from the DDC or from the S61 board (menu 2, parameter 1).<br>If the code shows up again or in case of doubt contact the TAC. |
| 648 | High hot water differential temperature | Check water flow.<br>Reset occurs automatically 20 minutes after the code is generated. | Reset is automatic in case of switching from "hot" to "cold" mode.<br>Reset may be performed from the DDC or from the S61 board (menu 2, parameter 1).<br>If the code shows up again or in case of doubt contact the TAC. |
| 649 | Missing auxiliary board | NA | Contact the TAC. |
| 651 | Cooling antifreeze function activated | Non-blocking Warning (informative code). The code clears automatically when antifreeze function execution ends. | NA |
| 652 | Defrosting cycle activated | Non-blocking Warning (informative code). The code clears automatically when execution of defrosting ends. | NA |
| 654 | Inversion valve in opposite position | NA | Reset is automatic in case of new switching and discontinuation of the generating cause.<br>If the code shows up again or in case of doubt contact the TAC. |
| 655 | Inversion valve in unknown position | NA | Reset is automatic in case of new switching and discontinuation of the generating cause.<br>If the code shows up again or in case of doubt contact the TAC. |

| | | | |
|---|---|---|---|
| 656 | Inversion valve in uncertain position | NA | Reset is automatic in case of new switching and discontinuation of the generating cause.<br>If the code shows up again or in case of doubt contact the TAC. |
| 660 | Defrosting valve has failed to open | Non-blocking Warning (informative code).<br>Reset is automatic, however, it is advisable to contact the TAC. | Reset may be performed from the DDC or from the S61 board (menu 2, parameter 1).<br>If the code shows up again or in case of doubt contact the TAC. |
| 661 | Oil pump priming cycle activated | The priming cycle lasts 30' if activated manually or 10 minutes if activated automatically.<br>Reset is automatic when the triggering condition ceases. | NA |
| 678 | High hot water delivery temperature | Reset is automatic in case of switching from "hot" to "cold" mode.<br>Reset is automatic when the triggering condition ceases. | NA |
| 679 | Heating antifreeze function activated | Non-blocking Warning (informative code).<br>The code clears automatically when antifreeze function execution ends. | NA |
| 80/680 | Incomplete functional parameters | Contact the TAC. | |
| 681 | Invalid bank 1 parameters | Reset is automatic when the triggering condition ceases. | Contact the TAC. |
| 682 | Invalid bank 2 parameters | Reset is automatic when the triggering condition ceases. | Contact the TAC. |
| 683 | RY and RW contacts simultaneously activated | Reset is automatic when the triggering condition ceases. | NA |
| 684 | Transformer or 24 Vac fuse fault | NA | Contact the TAC. |
| 685 | Invalid module type configuration parameters | NA | Contact the TAC. |
| 686 | ROM board fault | NA | Contact the TAC. |
| 687 | pRAM board fault | NA | Contact the TAC. |
| 688 | xRAM board fault | NA | Contact the TAC. |
| 689 | Registers board fault | NA | Contact the TAC. |
| 690 | Outdoor temperature probe fault | NA | Reset may be performed from the DDC or from the S61 board (menu 2, parameter 1).<br>If the code persists, shows up again or in case of doubt, contact the TAC. |
| 691 | Electronic board fault | NA | Contact the TAC. |

NA = not applicable

# 9 APPENDICES

## 9.1 PRODUCT FICHE

**Figure 9.1**

*Table 8*

*COMMISSION DELEGATED REGULATION (EU) No 811/2013*

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

| | |
|---|---|
| Model(s): | GAHP-AR |
| 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* | 28,4 | kW | **Seasonal space heating energy efficiency** | $\eta_s$ | 110 | % |
| 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* | 25,0 | kW | Tj = –7 °C | *PERd* | 93 | % |
| Tj = +2 °C | *Pdh* | 15,3 | kW | Tj = +2 °C | *PERd* | 118 | % |
| Tj = +7 °C | *Pdh* | 9,9 | kW | Tj = +7 °C | *PERd* | 116 | % |
| Tj = +12 °C | *Pdh* | 4,3 | kW | Tj = +12 °C | *PERd* | 118 | % |
| $T_j$ = bivalent temperature | *Pdh* | - | kW | Tj = bivalent temperature | *PERd* | - | % |
| Annual energy consumption | $Q_{HE}$ | 207 | GJ | | | | |
| COLDER CLIMATE CONDITIONS | | | | | | | |
| **Rated heat output (*)** | *Prated* | 26,7 | kW | **Seasonal space heating energy efficiency** | $\eta_s$ | 105 | % |
| 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* | 16,3 | kW | Tj = –7 °C | *PERd* | 103 | % |
| Tj = +2 °C | *Pdh* | 9,9 | kW | Tj = +2 °C | *PERd* | 116 | % |
| Tj = +7 °C | *Pdh* | 6,4 | kW | Tj = +7 °C | *PERd* | 114 | % |
| Tj = +12 °C | *Pdh* | 2,9 | kW | Tj = +12 °C | *PERd* | 112 | % |
| Tj = bivalent temperature | *Pdh* | - | kW | Tj = bivalent temperature | *PERd* | - | % |
| $T_j$ = operation limit temperature | *Pdh* | 26,7 | kW | Tj = operation limit temperature | *PERd* | 89 | % |
| For air-to-water heat pumps: $T_j$ = –15 °C (if TOL < –20 °C) | *Pdh* | 21,9 | kW | For air-to-water heat pumps: Tj = –15 °C (if TOL < –20 °C) | *PERd* | 92 | % |
| Annual energy consumption | $Q_{HE}$ | 242 | GJ | | | | |
| WARMER CLIMATE CONDITIONS | | | | | | | |
| **Rated heat output (*)** | *Prated* | 32,6 | kW | **Seasonal space heating energy efficiency** | $\eta_s$ | 120 | % |
| 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* | 32,6 | kW | Tj = +2 °C | *PERd* | 121 | % |
| Tj = +7 °C | *Pdh* | 20,9 | kW | Tj = +7 °C | *PERd* | 128 | % |
| Tj = +12 °C | *Pdh* | 9,5 | kW | Tj = +12 °C | *PERd* | 111 | % |
| Tj = bivalent temperature | *Pdh* | - | kW | Tj = bivalent temperature | *PERd* | - | % |
| Annual energy consumption | $Q_{HE}$ | 141 | GJ | | | | |
| Bivalent temperature | $T_{biv}$ | TOL < $T_{designh}$ | °C | For air-to-water heat pumps: Operation limit temperature | *TOL* | -22 | °C |
| | | | | Heating water operating limit temperature | *WTOL* | 60 | °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 | $P_{TO}$ | 0,023 | kW | Type of energy input | | monovalent | |
| Standby mode | $P_{SB}$ | 0,007 | kW | | | | |
| Crankcase heater mode | $P_{CK}$ | - | kW | | | | |
| Other items | | | | | | | |
| Capacity control | | fixed | | For air-to-water heat pumps: Rated air flow rate, outdoors | — | 11000 | 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: | $NO_x$ | 48 | mg/kWh |

## Figure 9.2

*Table 8*

*COMMISSION DELEGATED REGULATION (EU) No 811/2013*

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

| | |
|---|---|
| Model(s): | GAHP-AR S |
| 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* | 28,4 | kW | **Seasonal space heating energy efficiency** | $\eta_s$ | 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* | 25,0 | kW | Tj = –7 °C | *PERd* | 94 | % |
| Tj = +2 °C | *Pdh* | 15,3 | kW | Tj = +2 °C | *PERd* | 119 | % |
| Tj = +7 °C | *Pdh* | 9,9 | kW | Tj = +7 °C | *PERd* | 118 | % |
| Tj = +12 °C | *Pdh* | 4,3 | kW | Tj = +12 °C | *PERd* | 121 | % |
| $T_j$ = bivalent temperature | *Pdh* | - | kW | Tj = bivalent temperature | *PERd* | - | % |
| Annual energy consumption | $Q_{HE}$ | 207 | GJ | | | | |
| COLDER CLIMATE CONDITIONS | | | | | | | |
| **Rated heat output (*)** | *Prated* | 26,7 | kW | **Seasonal space heating energy efficiency** | $\eta_s$ | 105 | % |
| 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* | 16,3 | kW | Tj = –7 °C | *PERd* | 103 | % |
| Tj = +2 °C | *Pdh* | 9,9 | kW | Tj = +2 °C | *PERd* | 116 | % |
| Tj = +7 °C | *Pdh* | 6,4 | kW | Tj = +7 °C | *PERd* | 114 | % |
| Tj = +12 °C | *Pdh* | 2,9 | kW | Tj = +12 °C | *PERd* | 112 | % |
| Tj = bivalent temperature | *Pdh* | - | kW | Tj = bivalent temperature | *PERd* | - | % |
| $T_j$ = operation limit temperature | *Pdh* | 26,7 | kW | Tj = operation limit temperature | *PERd* | 89 | % |
| For air-to-water heat pumps: $T_j$ = –15 °C (if TOL < –20 °C) | *Pdh* | 21,9 | kW | For air-to-water heat pumps: Tj = –15 °C (if TOL < –20 °C) | *PERd* | 92 | % |
| Annual energy consumption | $Q_{HE}$ | 242 | GJ | | | | |
| WARMER CLIMATE CONDITIONS | | | | | | | |
| **Rated heat output (*)** | *Prated* | 32,6 | kW | **Seasonal space heating energy efficiency** | $\eta_s$ | 120 | % |
| 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* | 32,6 | kW | Tj = +2 °C | *PERd* | 121 | % |
| Tj = +7 °C | *Pdh* | 20,9 | kW | Tj = +7 °C | *PERd* | 120 | % |
| Tj = +12 °C | *Pdh* | 9,5 | kW | Tj = +12 °C | *PERd* | 113 | % |
| Tj = bivalent temperature | *Pdh* | - | kW | Tj = bivalent temperature | *PERd* | - | % |
| Annual energy consumption | $Q_{HE}$ | 141 | GJ | | | | |
| Bivalent temperature | $T_{biv}$ | TOL < $T_{designh}$ | °C | For air-to-water heat pumps: Operation limit temperature | *TOL* | -22 | °C |
| | | | | Heating water operating limit temperature | *WTOL* | 60 | °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 | $P_{TO}$ | 0,023 | kW | Type of energy input | | monovalent | |
| Standby mode | $P_{SB}$ | 0,007 | kW | | | | |
| Crankcase heater mode | $P_{CK}$ | - | kW | | | | |
| Other items | | | | | | | |
| Capacity control | | fixed | | For air-to-water heat pumps: Rated air flow rate, outdoors | — | 11000 | m³/h |
| Sound power level, indoors/outdoors | $L_{WA}$ | - / 75 | 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:

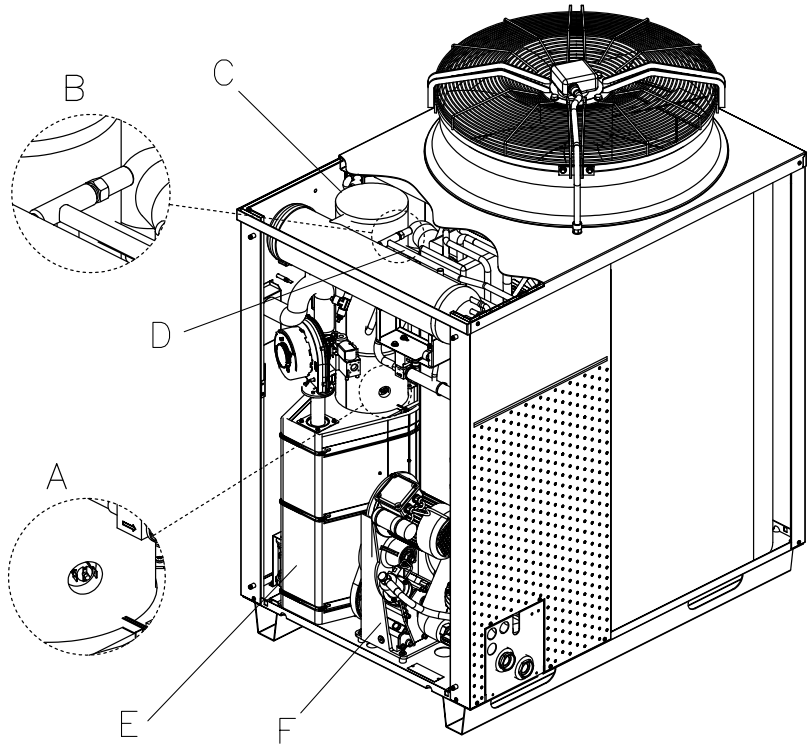
| | | | |
|---|---|---|---|
| Emissions of nitrogen oxides: | $NO_x$ | 48 | mg/kWh |

## 9.2 SAFETY DEVICES

### 9.2.1 Safety devices prescribed by the PED

The PED (Pressure Equipment Device) Directive prescribes that the unit is supplied with a hermetic circuit safety valve (detail B Figure 9.3 *p. 34*).

**Figure 9.3** *Main safety devices of the unit - Internal view of the unit*




A Limit thermostat of the generator
B Pressure relief valve of the sealed circuit
C Gas unit heater
D Bypass valve
E Combustion chamber
F Oil pump

**Table 9.1** *Safety valve*

| | Type | Calibration | Model | Spare part code |
|---|---|---|---|---|
| Sealed circuit safety valve | Valve and actuator | 464.1 PSIG (32 bar) at 110 °C ± 3% | NGI* | J-VLV095B |

* The manufacturer guarantees the functioning and the safety of the unit only if it is equipped with original spare parts

#### 9.2.1.1 Safety valve inspection procedure

The appliance off (external master switch in OFF position) and without electric and gas power supply:

1. remove the front and upper panel of the unit;
2. identify the valve, which lies behind the levelling chamber;
3. inspect the component (if the valve must be replaced, refer to Paragraph 9.2.4.1 *p. 36*);
4. re-mount the front and upper panel of the unit.

### 9.2.2 Additional safety devices

The following additional safety devices are installed on the appliance:

► Generator limit thermostat (see pos. A in the Figure 9.3 *p. 34*).
► Bypass valve (see pos. B in the Figure 9.3 *p. 34*).

The main features of the two devices are given in Table 9.2 *p. 34*.

**Table 9.2** *Characteristics of the two supplementary devices*

| | Type | Calibration | Model | Spare part code |
|---|---|---|---|---|
| Limit thermostat of the generator | Thermostat, with bimetal disk inside, of manual reset type ed quick opening of the contact. NC contact type (normally closed) | 180 °C ± 7 °C | CAMPINI COREL code 60R180H02/04154 or similar* | J-TLT015 |
| Bypass valve | Valve and actuator | 25,5 + 0/-2 bar | Robur S.p.A. code H-VLV108 | — |

* The manufacturer guarantees the functioning and the safety of the unit only if it is equipped with original spare parts

In the case of replacement, the use of original spare parts is recommended (see codes in Table 9.2 *p. 34*). The manufacturer is exempt from any contractual or extra-contractual responsibility for

damage caused by the use of non-original spare parts.

### 9.2.3 Safety valve replacement operations

This operation must be performed by professionally qualified staff. Before proceeding, visually check the integrity of the unit hermetic circuit.

Proceed as indicated below for the replacement operations:

OPERATIONS TO BE CARRIED OUT USING THE ENVISIONED INDIVIDUAL PROTECTION DEVICES (I.P.D.)

Material necessary for the intervention (see Figure 9.4 *p. 35*):

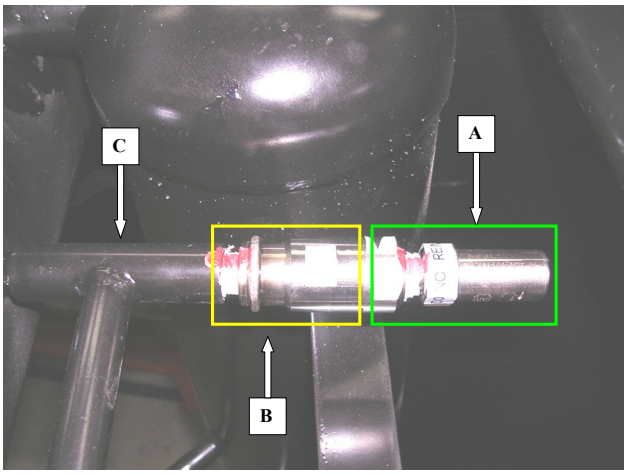
- n. 2 CH22 face spanners
- n. 1 CH8 box spanner
- spare parts kit made up from (see key in Figure 9.4 *p. 35*).

**Figure 9.4** *Safety valve kit - Componenents required for service*

1 safety valve
1 O-ring
1 litmus paper

The components subject of the intervention are represented in Figure 9.5 *p. 35*.

**Figure 9.5** *Detail of safety valve mounted on unit - Description of components involved in the operation*




A Safety valve
B Inspection valve
C Sealed circuit

Stop the unit and wait for the end of the shutdown cycle.

1. Disconnect the unit electric power supply.
2. Remove the upper panel from the unit.
3. Position the n. 2 CH22 spanners in the relevant seat (see Figure 9.6 *p. 36*).

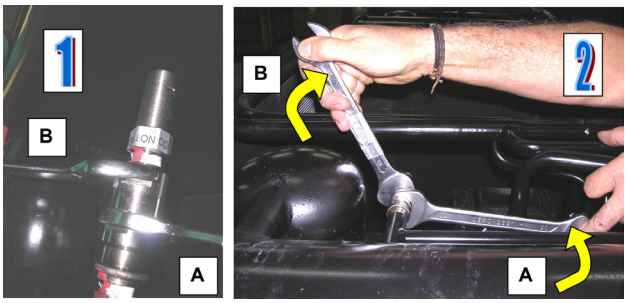
WARNING! DO NOT REMOVE THE COMPONENTS DISTINGUISHED BY THE WAX SEAL.

1. Loosen the inspection valve in the direction indicated in detail "2" of Figure 9.6 *p. 36* until complete assembly as indicated in Figure 9.7 *p. 36* paying attention not to loosen part "B" of the inspection valve (see Figure 9.5 *p. 35*);

ATTENTION! if a consistent ammonia leak is detected during the removal phase, tighten the inspection valve immediately.

2. Replace the o-ring as indicated in Figure 9.8 *p. 36*.
3. Tighten part "B" of the inspection valve to part "A" (see Figure 9.9 *p. 36*)
4. Tighten the valve, applying a torque of 62 Nm.

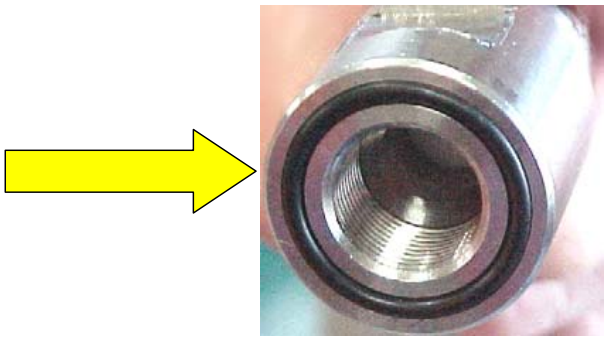
**Figure 9.6** *Safety valve disassembly - Details 1 and 2 of safety valve disassembly*




A hold in place
B turn counterclockwise

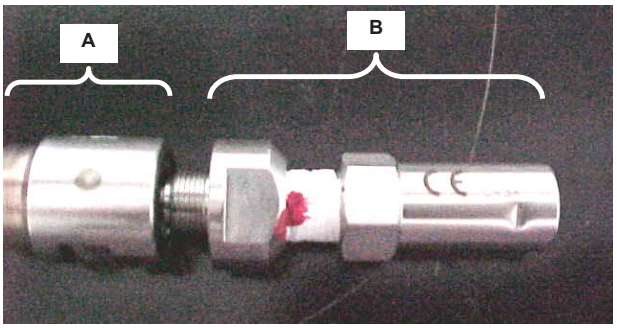
**Figure 9.7** *Removal of safety valve mobile part - Removal of safety valve*

**Figure 9.8** *o-ring - Down view*



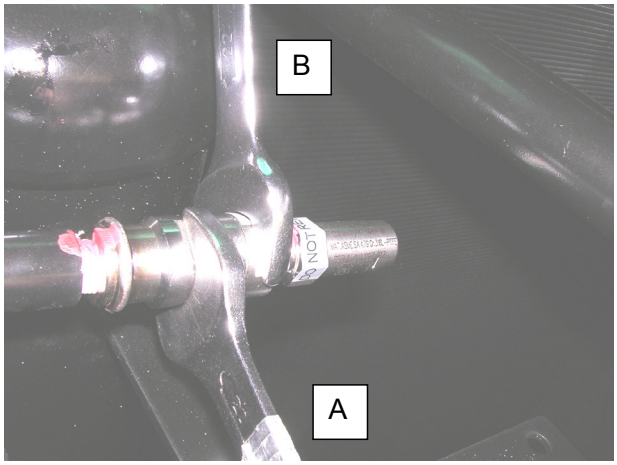
Detail O-ring

**Figure 9.9** *Inspection valve - Detail A of fixed part, detail B of removable part*




A Fixed part
B Removable part

**Figure 9.10** *Inspection valve assembly - Assembly of removable part*




A Hold in place
B Turn clockwise

1. Test for the absence of ammonia using a phenolphthalein test strip.
2. Mount the unit upper panel.

WARNING! DO NOT START THE APPLIANCE WITHOUT THE SAFETY VALVE.

### 9.2.4 Non-condensable or non-absorbable gases

#### 9.2.4.1 Indirect control of the presence of non-condensable or non-absorbable gas in the hermetic circuit or internal corrosion phenomena

The presence of corrosion phenomena inside the hermetic circuit has immediate effect that cause machine anomalies that can be easily recognised:

1. development of a large amount of non-condensable and non-absorbable gas, produced of the corrosion reaction, which causes an accumulation of these gases in the generator and, consequently, immediate overheating of the generator. This is caused by the inter-

ruption of the water-ammonia solution evaporation process.

2. production of rust which, detaching from the internal walls of the hermetic circuit, rapidly blocks the circulation of refrigerant fluid, thus blocking the orifices of the restrictors. This situation leads to a lack of water-ammonia solution to be evaporated in the generator and causes the same over-heating phenomenon.

In both cases, the over-heating of the generator makes the manual-rearm safety thermostat intervene, which is installed on the wall of the generator.

As a consequence, if there are no generator thermostat interventions, all corrosion phenomena can be excluded and no inspection or additional action is necessary.

The possibility that internal corrosion phenomena are in progress must be taken into consideration only when a series of five (5) thermostat interventions are detected. In this case, contact the after-sales service.

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Revision: X

## Robur mission

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afaq QSE Quality Health and Safety Environment AFNOR CERTIFICATION