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ENVIRONMENTAL SITE SUPPLIES

# Installation, Use and Maintenance Manual

## GA Line ACF Series

Gas fired absorption chiller

Natural gas/LPG fired

Revision: N
Code: D-LBR357

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# I INTRODUCTION

**Manual**

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

**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.

**Control device**

In order to be able to work, the GA-ACF unit needs a control device (DDC or external request), which must be connected by the installer.

# II SYMBOLS AND DEFINITIONS

## II.1 KEY TO SYMBOLS

DANGER

WARNING

NOTE

PROCEDURE

REFERENCE (to other document)

## II.2 TERMS AND DEFINITIONS

**GA Appliance/Unit** = equivalent terms, both used to designate the GA Gas Absorption chiller.
**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 GA unit.
**DDC Control** (Direct Digital Controller) = optional Robur device to control one or more Robur appliances (GAHP heat pumps, GA chillers and AY boilers) in ON/OFF mode.
**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, circulating pumps, probes).
**GUE** (Gas Utilization Efficiency) = efficiency index of gas chiller, equal to the ratio between the chilling energy produced and the energy of the fuel used (relative to NCV, net calorific value).
**First start-up** = appliance commissioning operation which may only and exclusively be carried out by a TAC.
**S61 Board** = electronic board on the GA unit, to control all functions and to provide interface 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 Skilled 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.

**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 skilled personnel.
- ► In case of danger, switch off the electrical power and gas supplies only if this can be done in total safety.
- ► Do not entrust children, persons with physical, sensory or mental disabilities or persons with poor knowledge and experience with use of the appliance.

**Gas component tightness**

- ► Before performing any operation on gas ducting components, close the gas cock.
- ► 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 cock off.
- ► Disconnect electrical power supply by means of the external isolation switch in the power supply electrical panel.
- ► Use a telephone away from the appliance to ask for intervention from skilled personnel.

**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.

**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 GA unit uses the ammonia-water absorption cycle. The water-ammonia solution is contained in the sealed circuit. The solution is harmful for health if it is ingested, inhaled or comes in 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).
- ► Request assistance from the TAC.

**Electrocution hazard**

- ► Disconnect the electrical power supply before any work/procedure 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 store flammable materials (paper, solvents, paint, etc.) in the vicinity of 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. 21).

- ► Check system tightness.
- ► Avoid frequent top-ups.

**Chloride concentration**

The concentration of chlorides or free chlorine in the system water must not exceed the values in Table 3.2 p. 22.

**Aggressive substances in air**

Halogenated hydrocarbons containing chlorine and fluorine compounds cause corrosion. The supply/ventilation air of the appliance 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 control device provided (DDC or external enable).

**In the event of failure**

Operations on internal components and repairs may exclusively be carried out by a TAC, only using original 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. 32) 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.
- ► Only use 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 CONFORMITY

**EU Directives and standards**

GA series absorption chillers are certified in compliance to EC standards and conform with the essential requirements of the following Directives:

- 2009/142/EC "Gas Appliances Directive" as amended and added.
- 2004/108/EC "Electromagnetic Compatibility Directive" as amended and added.
- 2006/95/EC "Low Voltage Directive" as amended and added.
- 2006/42/EC "Machine Directive" as amended and added.
- 97/23/EEC "Pressure Equipment Directive" as amended and added.

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

- EN 378 Refrigerating systems and heat pumps.

**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, and chillers.
- 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 by the plant or installation to the appliance (mechanical stresses, pressure, vibrations, thermal dilations, power surges...).
- Accidental damages or due to force majeure.

# 1 FEATURES AND TECHNICAL DATA

## 1.1 FEATURES

**Operation**

Based on the thermodynamic water-ammonia absorption cycle ($H_20$–$NH_3$), the appliance produces chilled water using natural gas (or LPG) as primary energy source and dissipating heat directly to the external air.
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.

**Mechanical and thermo-hydraulic components**

- steel sealed cooling circuit, externally treated with epoxy paint;
- Multigas premix burner equipped with ignition and flame detection device, controlled by an electronic controller;
- titanium stainless steel shell-and-tube water exchanger (evaporator), externally insulated;
- air exchanger (condenser) with finned coil, with steel pipe and aluminium fins;
- helical fan motor with variable flow controlled by micro processor.

**Control and safety devices**

- S61 electronic board with microprocessor, LCD display and knob;
- circuit water flow switch;
- generator limit thermostat, with manual reset;
- automatically resettable flue gas thermostat;
- differential air pressure switch on the combustion circuit;
- sealed circuit safety relief valve;
- by-pass valve, between high and low pressure circuits;
- ionisation flame controller;
- gas solenoid valve with double shutter;
- heat recovery exchanger circulating pump relay (HR version only)

**ACF-HR/TK/HT/LB Versions**

The GA unit is available in the following versions:

- ACF standard, for residential/retail/industrial cooling systems with chilled water up to +3 °C.
- HR with heat recovery exchanger, for residential/retail/industrial cooling systems with chilled water up to +3 °C, plus recovery exchanger hot water up to +80 °C (e.g. DHW production);
- TK for heavy duty use, for process systems and applications with chilled water up to +3 °C, in continuous operation year round;
- HT for very hot climates, for residential/retail/industrial cooling systems with chilled water up to +5 °C, with outside air up to +50 °C;
- LB for negative temperatures, for cooling systems with chilled water up to -10 °C (glycol indispensable).

Models ACF, TK, LB and HT have 2 chilled water inlet/outlet fittings, model HR has 4 chilled water and heat recovery exchanger hot water inlet/outlet fittings.
Each version may be supplied with standard (STD) or silenced (S) fan.

## 1.2 DIMENSIONS

**Figure 1.1** – GA-ACF standard version dimensions

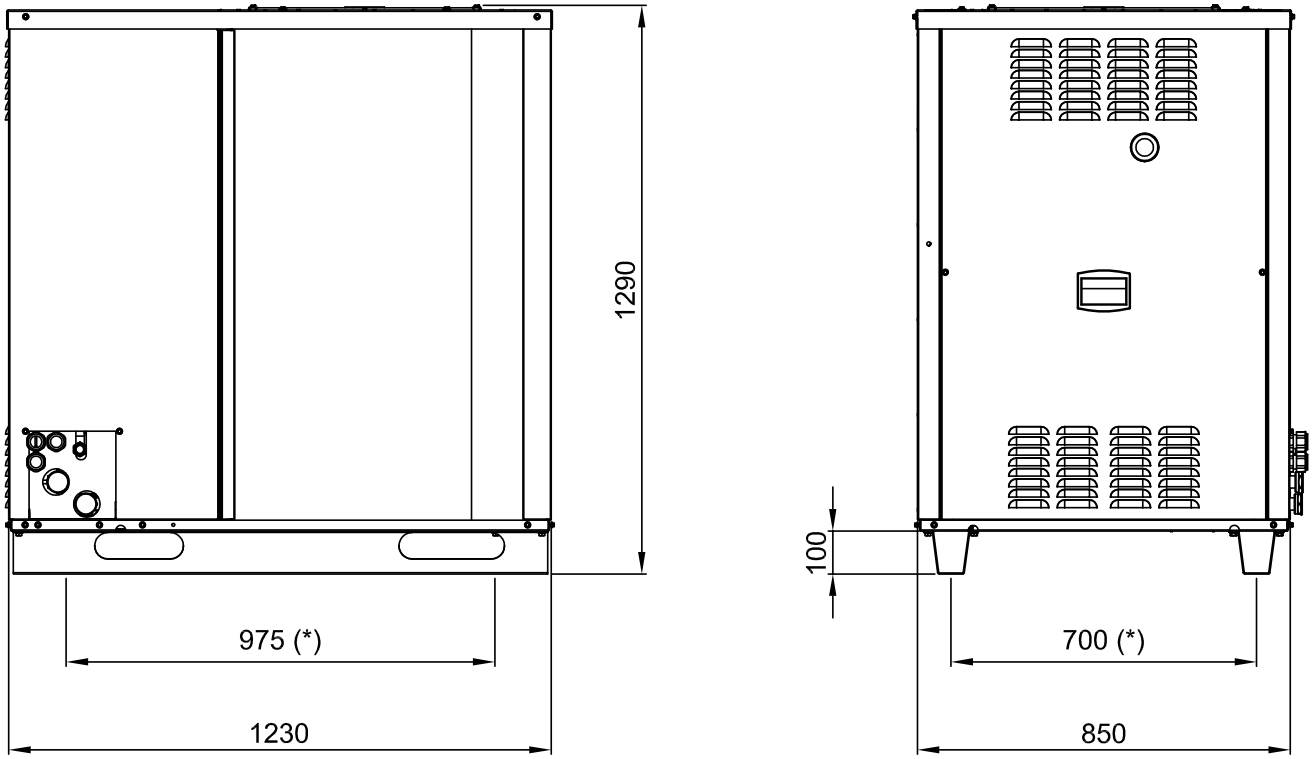


**Figure 1.2** – GA-ACF silenced version dimensions

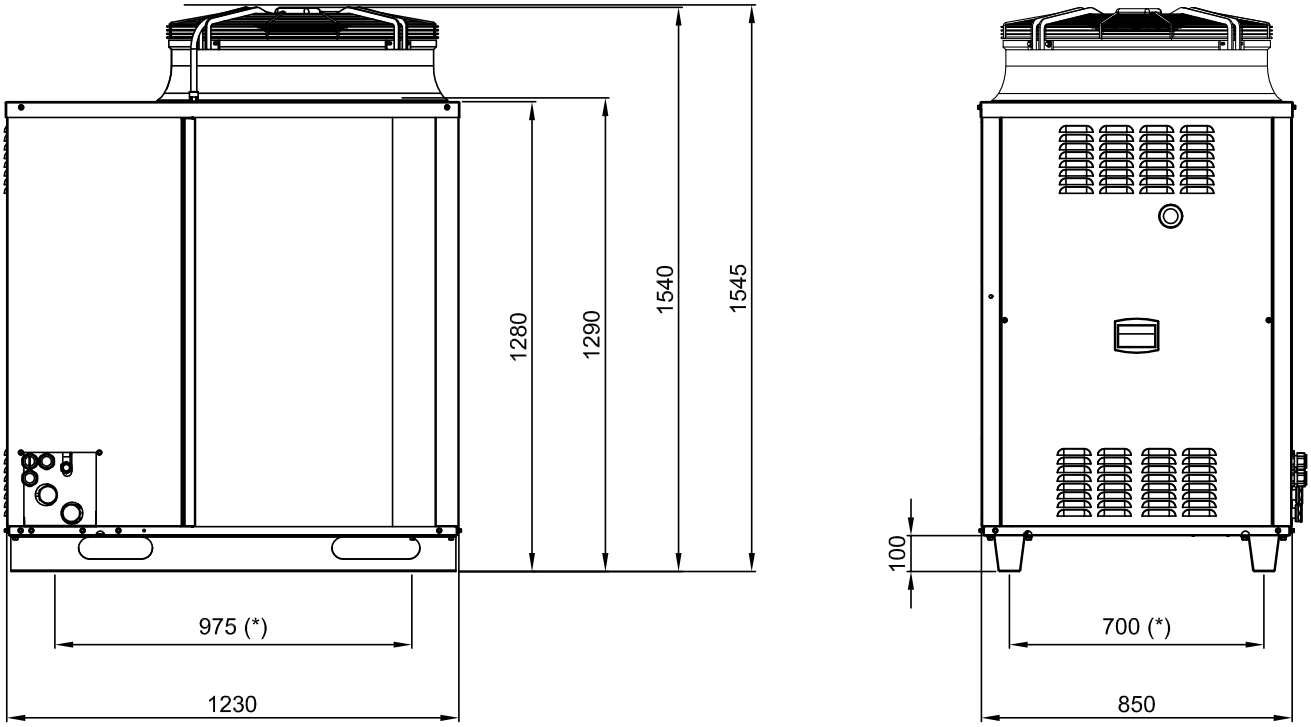



**Figure 1.3** – ACF Service plate with plumbing and gas connections

LEGEND

| | |
|---|---|
| A | WATER FLOW TO INSTALLATION 1"1/4 F |
| B | WATER INLET TO UNIT 1"1/4 F |
| G | GAS SUPPLY 3/4" F |

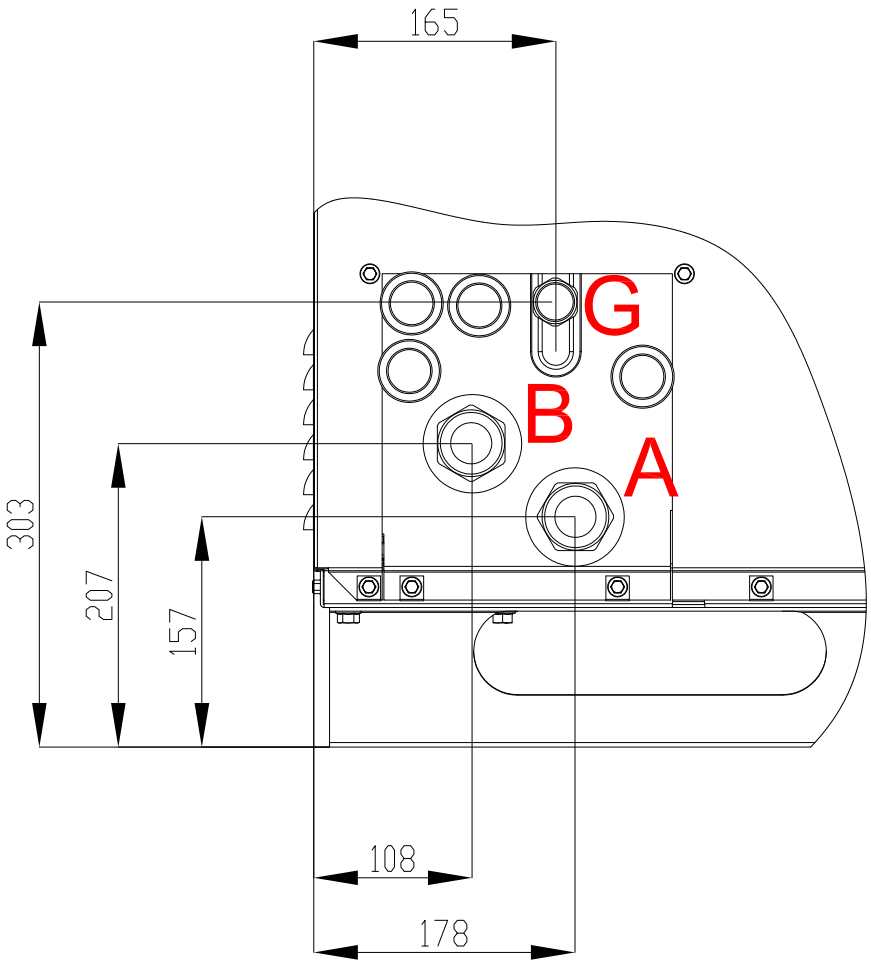
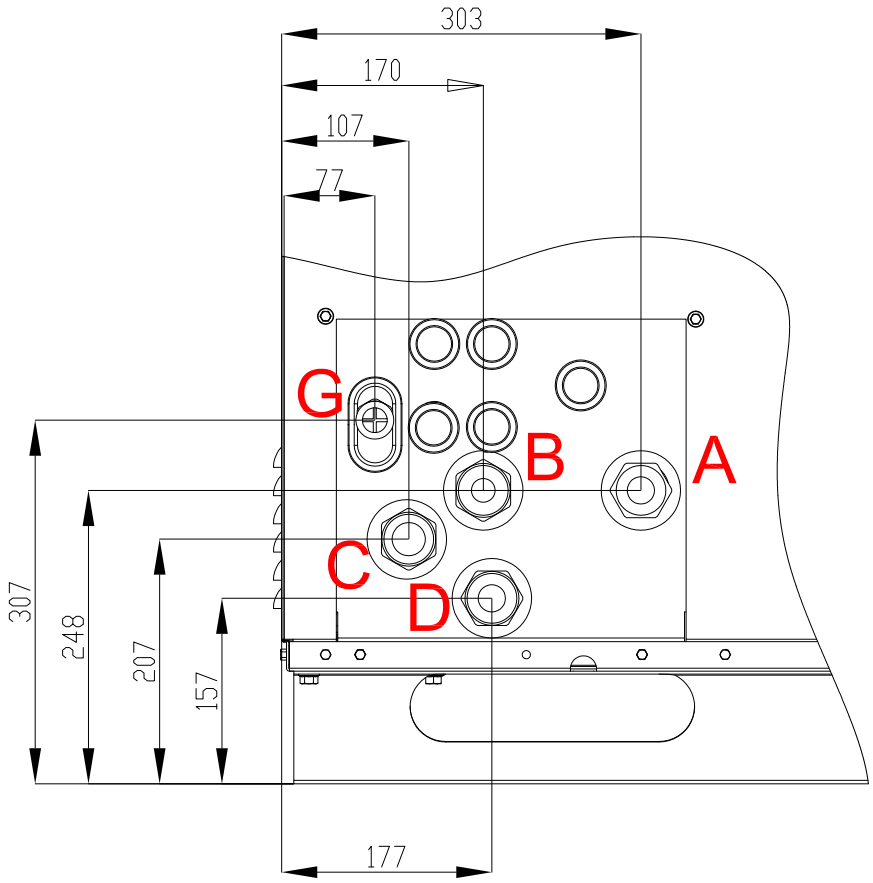


**Figure 1.4** – ACF-HR Service plate with plumbing and gas connections

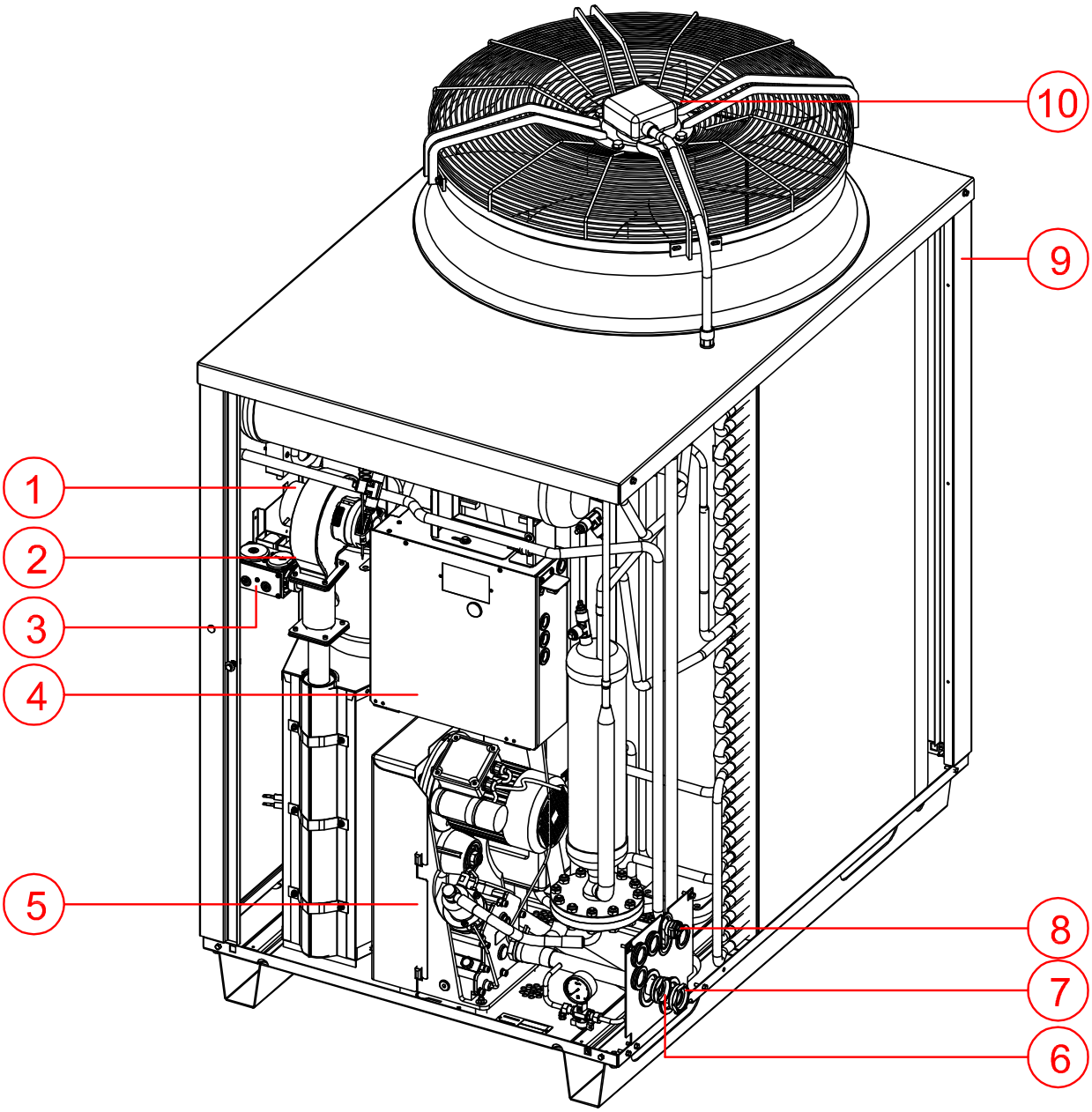



LEGEND

| | |
|---|---|
| G | GAS SUPPLY 3/4" F |
| Chiller - CHILLED WATER | |
| D | WATER FLOW TO INSTALLATION 1"1/4 F |
| C | WATER INLET TO UNIT 1"1/4 F |
| Recovery exchanger - HOT WATER | |
| A | WATER FLOW TO INSTALLATION 1"1/4 F |
| B | WATER INLET TO UNIT 1"1/4 F |

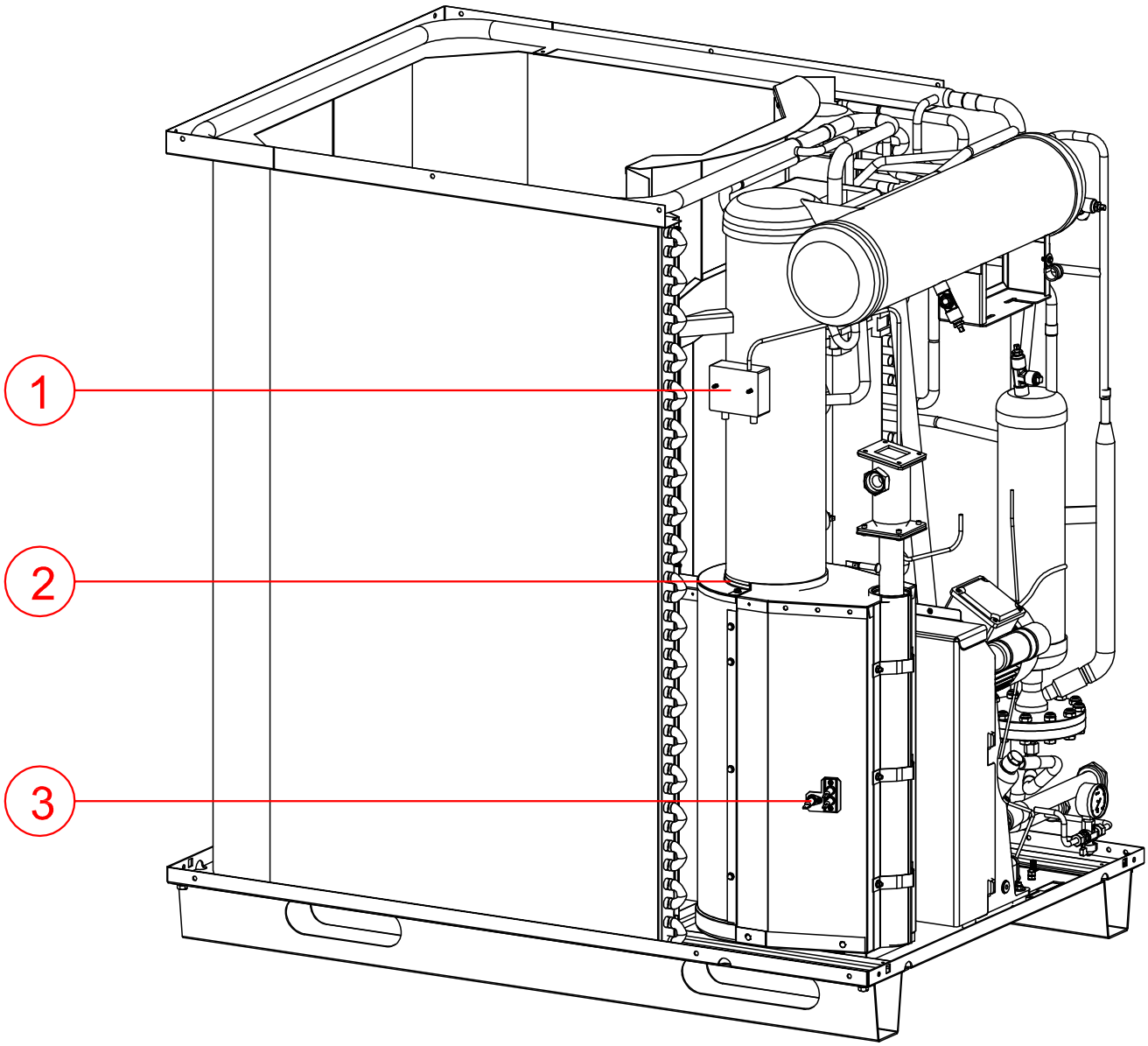
## 1.3 COMPONENTS

**Figure 1.5** – Internal components - front view



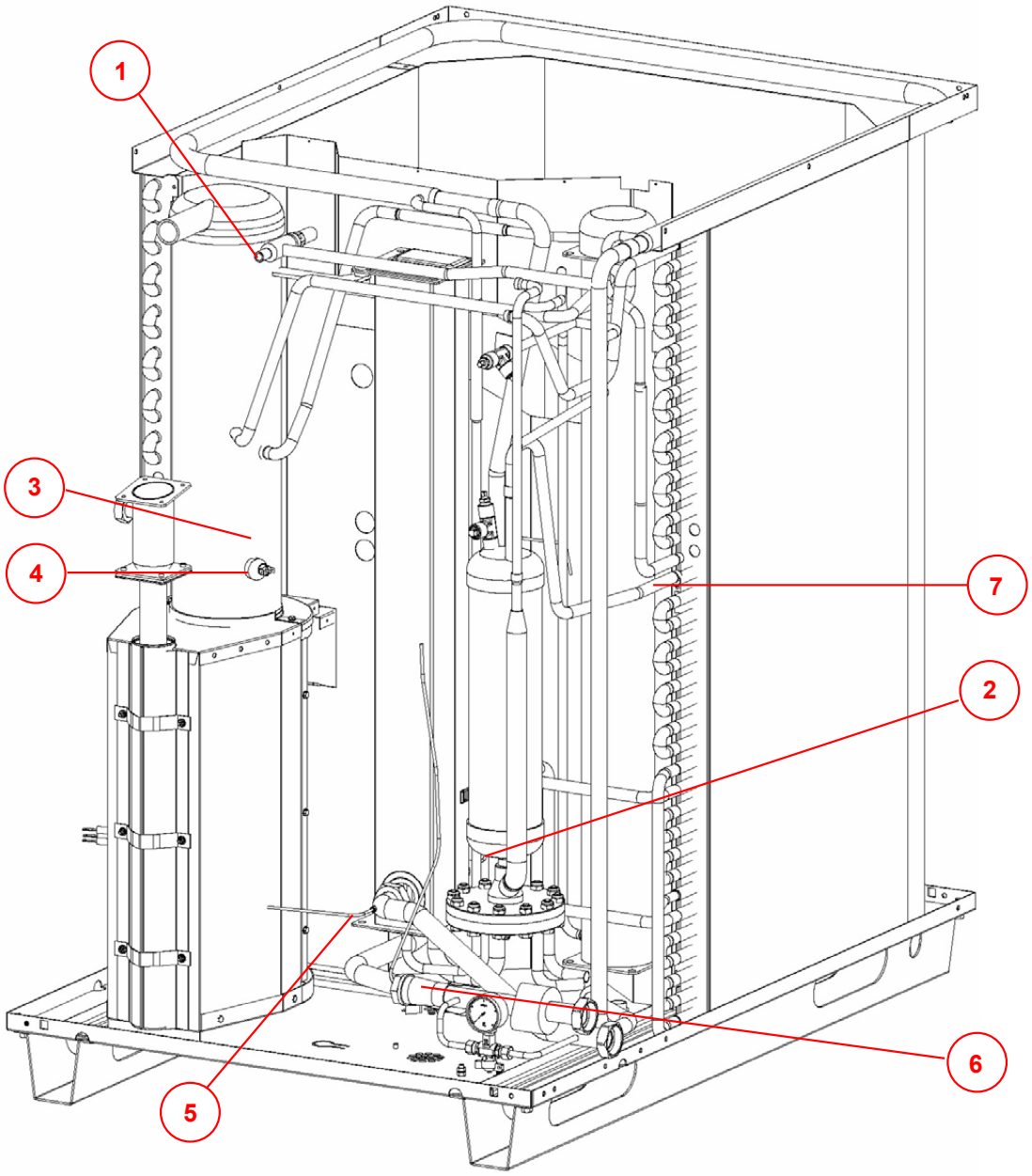

LEGEND
1.Combustion air intake
2.Blower
3. Gas valve
4.Electrical Panel
5.Oil pump
6.Water inlet connection Ø 1"1/4 F
7.Water flow connection Ø 1"1/4 F
8.Gas connection
9.Ambient temperature probe
10.Fan

**Figure 1.6** – Left side internal components




LEGEND
1.Ignition transformer
2.Flue gas thermostat
3.Ignitor and flame detectors

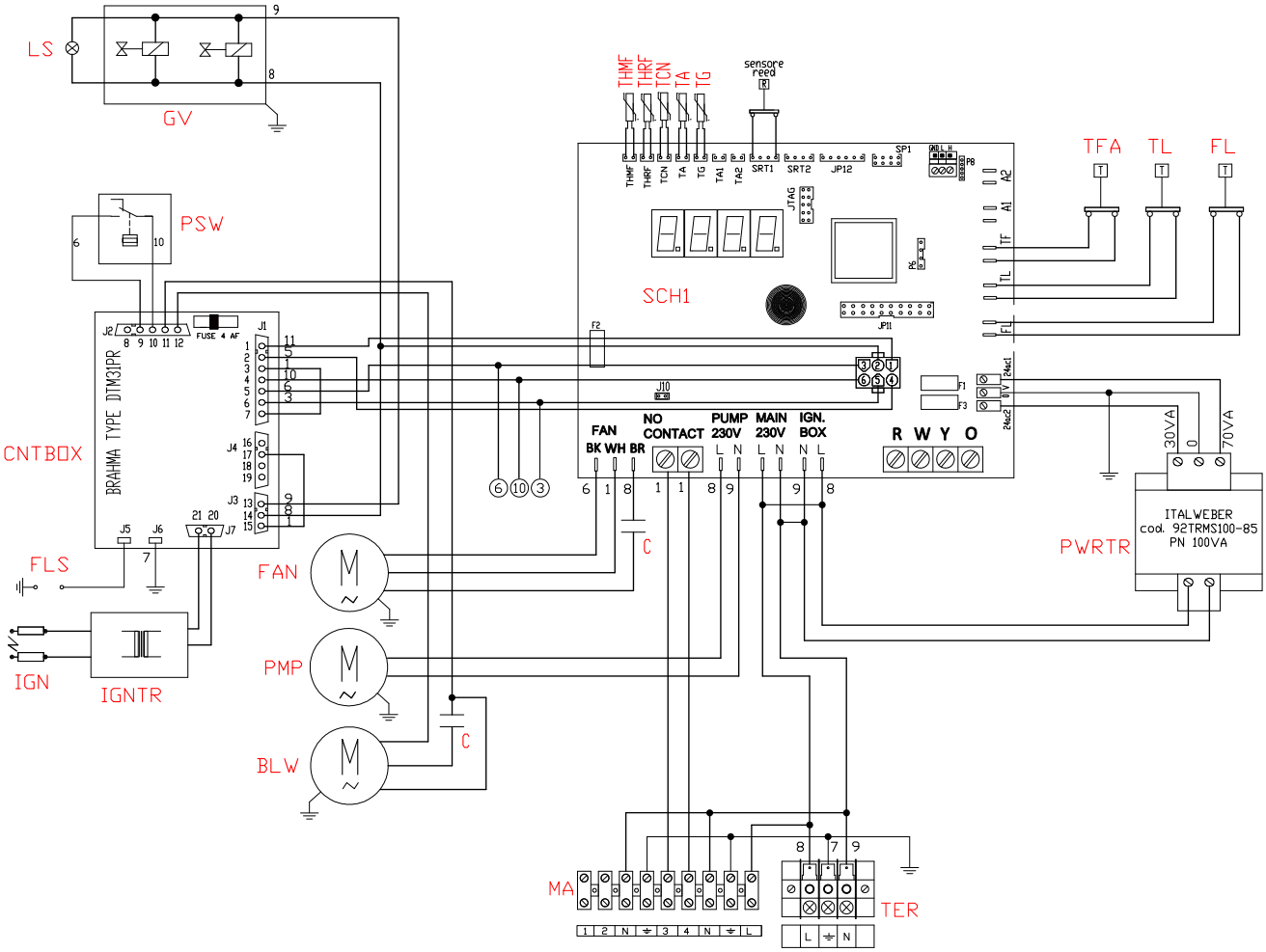
**Figure 1.7** – Right side internal components




LEGEND
1. Safety valve
2. Return temperature probe
3. TG Probe
4. Limit thermostat
5. Flow temperature probe
6. .Water flow switch
7. Teva Probe

## 1.4 ELECTRICAL WIRING DIAGRAM

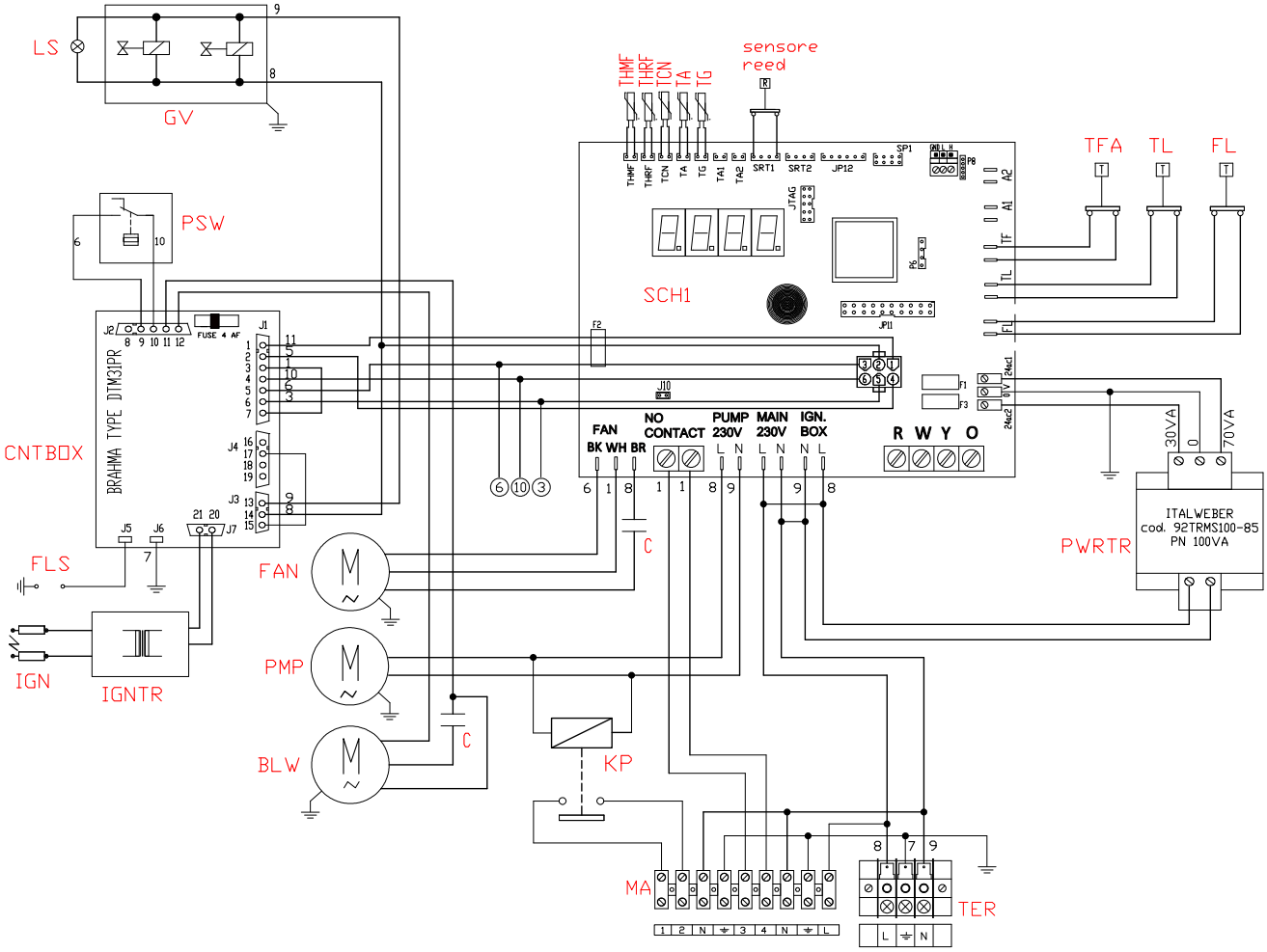
**Figure 1.8** – GA-ACF, ACF-TK, ACF-LB, ACF-HT Unit wiring diagram




LEGEND

| | | | | | |
|---|---|---|---|---|---|
| TER | 230Vac power supply terminal block | TG | condenser inlet temperature probe | C2 | fan condenser |
| SCH | electronic board (S61) | SRT1 | oil pump rotation sensor | PMP | oil hydraulic pump motor |
| GV | gas solenoid valve | TF | exhausted gas thermostat | PWRTR | transformer 230/24 Vac |
| LS | gas flow warning lamp | TL | generator limit thermostat (manual reset) | CNTBOX | flame control unit |
| PSW | air pressure switch | | | IGN | ignition electrodes |
| THMF | outlet water temperature probe | FL | water flow switch | IGNTR | ignition transformer |
| THRF | inlet water temperature probe | BLW | blower motor | FLS | detection electrode |
| TCN | condenser outlet temperature probe | C | blower condenser | | |
| TA | ambient air temperature probe | FAN | fan motor | | |

**Figure 1.9** – GA-ACF-HR Unit wiring diagram



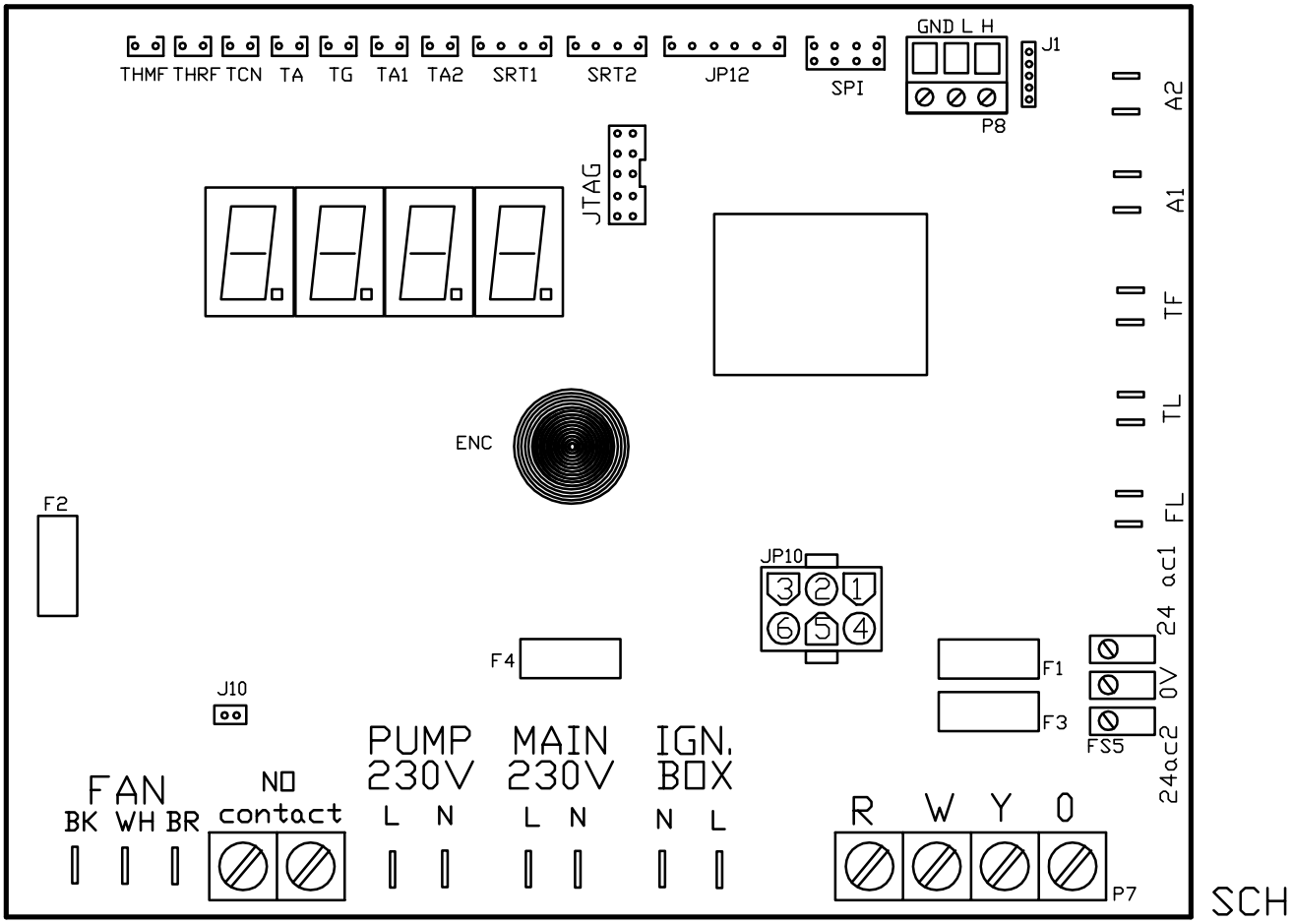

LEGEND

| | | | | | |
|---|---|---|---|---|---|
| TER | 230Vac power supply terminal board | TG | condenser input temperature probe | C2 | fan capacitor |
| SCH | electronic board (S61) | SRT1 | oil pump rotation sensor | PMP | oil pump motor |
| GV | gas solenoid valve | TF | flue gas thermostat | PWRTR | transformer 230/24 Vac |
| LS | gas flow control lamp | TL | generator limit thermostat (manual reset) | CNTBOX | flame controller |
| PSW | air pressure switch | | | IGN | ignitors |
| THM | outlet water temperature probe | FL | water flow switch | IGNTR | ignition transformer |
| THR | inlet water temperature probe | BLW | blower motor | FLS | flame detector |
| TCN | condenser output temperature probe | C | blower capacitor | KP | installation water circulating pump relay (recovery circuit) |
| TA | ambient air temperature probe | FAN | fan motor | | |

## 1.5 ELECTRONIC BOARDS

The appliance's electrical panel contains:
**Electronic Board S61** (Figure 1.10 p. 15), 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 knob.

**Figure 1.10** – Electronic board S61




LEGEND

| | | | | | |
|---|---|---|---|---|---|
| SCH | S61" electronic board | SPI | not used | PUMP | 230V (L, N) oil hydraulic pump supply output |
| THMF | water delivery temperature probe input | P8 | (GND, L, H) CAN BUS connector | N.O. | Contact circuit water circulating pump controller terminals |
| THRF | water return temperature probe input | J1 | CAN BUS jumper | J10 | circuit water circulating pump controller jumper |
| TCN | condenser outlet temperature probe input | A1, A2 | auxiliary inputs (not used) | FAN | (BK, WH, BR) fan output |
| TA | ambient air temperature probe input | TF | flue gas thermostat input | JTAG | board programming connector (SCH) |
| TG | generator temperature probe input (condenser input) | TL | generator limit thermostat input | ENC | knob |
| TA1 | not used | FL | water flow switch input | JP10 | 6-pole flame controller connector |
| TA2 | not used | FS5 | (24V AC) board supply input (SCH) 24 Vac | F1 | fuse T 2A |
| SRT1 | oil pump rotation sensor input | P7 | (R, W, Y, O) operation request inputs | F2 | fuse F 10A |
| SRT2 | not used | IGN.BOX | (L, N) flame controller supply input 230 Vac | F3 | fuse T 2A |
| JP12 | not used | MAIN | (L, N) board supply input (SCH) 230 Vac | F4 | fuse T 3,15A |

## 1.6 CONTROLS

**Control device**

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

- (1) **DDC control**
- (2) **external request**

### 1.6.1 Adjustment system (1) with DDC (GAHP unit ON/OFF)

The DDC controller is able to control appliances, a single GA unit, or even several Robur GAHP/GA/AY units in cascade, only in ON/OFF mode (non modulating). For more details refer to the DDC, RB100, RB200 Manuals and the Design Manual.

**DDC Controller**

The main functions are:

- setup and control of one (or more) Robur units of the absorption line (GAHP, GA, AY);
- parameter figures display and setting;
- hourly programming;
- climate curve control;
- diagnostics;
- reset errors;
- possibility to interface with a BMS;

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

### 1.6.2 Control system (2) with external request

The appliance may also be controlled via generic request devices (e.g. thermostats, clocks, buttons, contactors...) fitted with voltage-free NO contact. This system only provides elementary control (on/off, with fixed set-point temperature), thus without the important system functions (1). It is advisable to limit its possible use only to simple applications and with a single appliance.

For connection of the selected device to the appliance's electronic board please refer to Paragraph 4.4 p. 25.

## 1.7 TECHNICAL CHARACTERISTICS

(see Table 1.1 p. 16).

**Table 1.1** – New table

| | | | ACF60-00 | ACF60-00 HR | ACF60-00 TK | ACF60-00 HT | ACF60-00 LB |
|---|---|---|---|---|---|---|---|
| **THERMAL EFFICIENCIES** | | | | | | | |
| **OPERATING IN COOLING MODE** | | | | | | | |
| Operation point A35 W7 | Cooling output | kW | 17,72 (1) | | | | |
| | GUE | % | 71 | | | | |
| Operation point A50 W7 | Cooling output | kW | | | | 17,12 (1) | |
| | GUE | % | | | | 68 | |
| Operation point A35 W-5 | Cooling output | kW | | | | | 13,3 |
| | GUE | % | | | | | 53 |
| Heating capacity | nominal (1013 mbar - 15°C) | kW | 25,3 | | | | |
| | actual (1005 mbar - 19°C) | kW | 25.0 | | | | |
| Cold water temperature (flow) | minimum | °C | 3 (3) | | | 5 | -10 |
| | nominal | °C | 7 | | | | -5 |
| Cold water temperature (inlet) | maximum | °C | 45 | | | | |
| | minimum | °C | 7,5 | | | | -7 |
| Nominal thermal differential | | °C | 5 | | | | |
| Water flow rate | maximum | l/h | 3200 | | | | 2900 |
| | nominal | l/h | 2770 | | | 2675 | 2600 |
| | minimum | l/h | 2500 | | | | 2300 |
| Internal pressure drop | at nominal water flow | bar | 0,29 (2) | | | | 0,42 (2) |
| External air temperature | nominal | °C | 35 | | | | |
| | maximum | °C | 45 | | | 50 | 45 |
| | minimum | °C | 0 | | -12 | 0 | |
| **OPERATING RECOVERY CIRCUIT** | | | | | | | |
| Thermal power | nominal (1013 mbar - 15°C) | kW | | 25,3 | | | |
| Cooling capacity (with simultaneous recovery exchanger) | | | | 17,93 | | | |
| HOT WATER TEMPERATURE (INLET) | nominal | °C | | 40 | | | |
| HOT WATER TEMPERATURE (OUTLET) | nominal | °C | | 58 | | | |
| Water flow rate | maximum | l/h | | 2500 | | | |
| | minimum | l/h | | 0 | | | |
| | nominal | l/h | | 1000 | | | |
| G.U.E. gas usage efficiency (total) | | % | | 155 | | | |
| **ELECTRICAL SPECIFICATIONS** | | | | | | | |
| Power supply | Voltage | V | 230 | | | | |
| | TYPE | | SINGLE PHASE | | | | |
| | Frequency | 50 Hz supply | 50 | | | | |
| Electrical power absorption | nominal | kW | 0,82 (6) | | 0,90 (6) | | |
| | nominal silenced | kW | 0,87 | | 0.93 | | |
| Degree of protection | IP | | X5D | | | | |
| **INSTALLATION DATA** | | | | | | | |
| gas consumption | methane G20 (nominal) | m3/h | 2,68 (3) | | | | |
| | GPL G30/G31 (nominal) | kg/h | 1,97 (4) | | | | 1,94 (4) |
| Sound power Lw (max) | | dB(A) | 82,1 (7) | | | | |
| Sound power Lw (max) silenced | | dB(A) | 76,1 (7) | | | | |
| Sound pressure Lp at 5 metres (max) | | dB(A) | 60,1 (8) | | | | |
| Sound pressure Lp at 5 metres (max) silenced | | dB(A) | 54,1 (8) | | | | |
| Maximum filling pressure | | bar | 3 | | | | |
| Maximum water pressure in operation | | bar | 4 | | | | |
| Water content inside the apparatus | HOT SIDE | l | | 3 | | | |
| | COLD SIDE | l | 3 | | | | |
| Water fitting | TYPE | | F | | | | |
| | thread | " G | 1 1/4 | | | | |

| | | | ACF60-00 | ACF60-00 HR | ACF60-00 TK | ACF60-00 HT | ACF60-00 LB |
|---|---|---|---|---|---|---|---|
| Gas connection | TYPE | | F | | | | |
| | thread | " G | 3/4 | | | | |
| Dimensions | width | mm | 850 | | | | |
| | depth | mm | 1230 | | | | |
| | height | mm | 1290 | | | | |
| | silenced height | mm | 1540 | | | | |
| Weight | In operation | kg | 360 | 390 | 380 | | |

Note:

(1) As per standard EN12309-2
(2) For flows other than nominal refer to Planning Manual
(3) PCI (G20) 34.02 MJ/m3 (1013 mbar 15 °C)
(4) PCI (G30/G31) 46.34 MJ/kg (1013 mbar 15 °C).
(6) ± 10% according to the power supply voltage and tolerance on electrical motors consumption
(7) Sound power values detected in compliance with the intensity measurement methodology set forth by standard EN ISO 9614.
(8) Maximum sound pressure levels in free field, with directionality factor 2, obtained from the sound power level in compliance with standard EN ISO 9614.

**Table 1.2** – PED data

| | | | ACF60-00 | ACF60-00 HR | ACF60-00 TK | ACF60-00 HT | ACF60-00 LB |
|---|---|---|---|---|---|---|---|
| **PED data** | | | | | | | |
| COMPONENTS UNDER PRESSURE | Generator | l | 18,6 | | | | |
| | Leveling chamber | l | 11,5 | | | | |
| | Evaporator | l | 3,7 | | | | |
| | Cooling volume transformer | l | | | 4,5 | | |
| | Cooling absorber solution | l | 6,3 | | | | |
| | Solution pump | l | 3,3 | | | | |
| TEST PRESSURE (IN AIR) | | bar g | 55 | | | | |
| MAXIMUM PRESSURE OF THE REFRIGERANT CIRCUIT | | bar g | 32 | | | | |
| FILLING RATIO | | kg of NH3/l | 0.173 | 0,159 | 0,177 | 0,157 | 0,173 |
| FLUID GROUP | | | I° | | | | |

# 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**

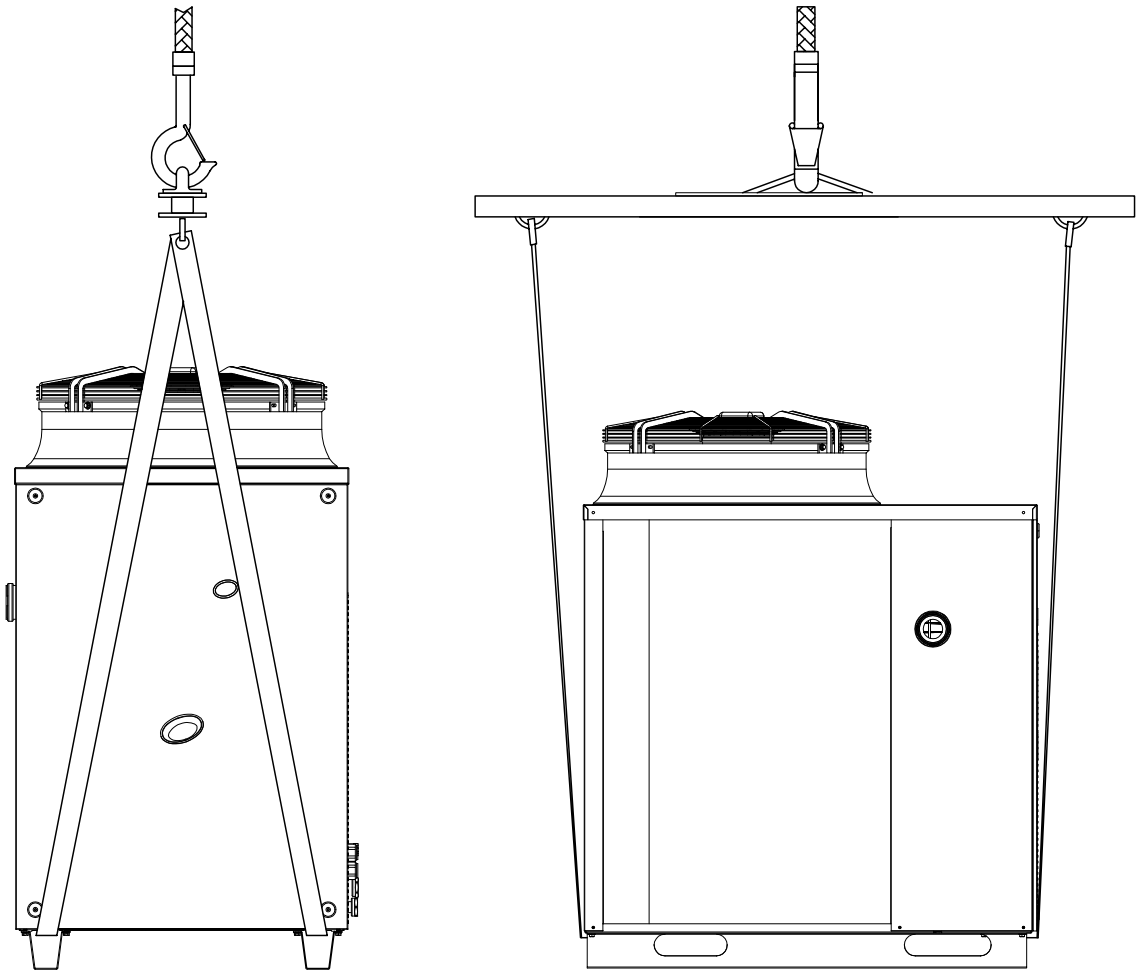
- ► The crane and lifting equipment must be suitable for the load.
- ► Do not stand under suspended loads.

## 2.2 HANDLING

**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. 18).
- ► Use lifting beams to avoid damaging the outer panels and finned coil (Figure 2.1 p. 18).
- ► 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.

**GA Unit ventilation**

The aerothermal 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.

**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.
- ► Do not install near the exhaust of flues, chimneys or hot polluted air. In order to work correctly, the appliance needs clean air.

**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

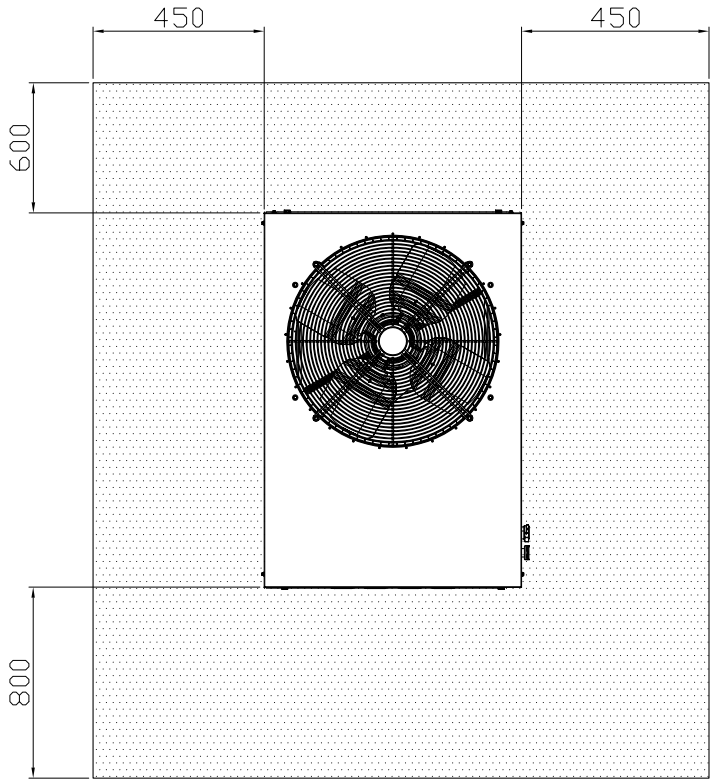
**Distances from combustible or flammable materials**

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

**Clearances around the appliance**

The **minimum clearance distances** shown in Figure 2.2 p. 19 (bar any stricter regulations) are required for safety, operation and maintenance.

**Figure 2.2** – Clearances




## 2.5 MOUNTING BASE

**Mounting base constructive features**

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

**(1) - installation at ground level**

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

**(2) - 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.

**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 connections between the appliance and water and gas pipes.

# 3 HEATING ENGINEER

## 3.1 WARNINGS

**General 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:

► heating/cooling systems and appliances;

► gas systems and appliances;

Installation must also comply with the manufacturer's provisions.

## 3.2 INSTALLATION

**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 volume/thermal inertia.

**Constant water flow rate**

The GA unit works with constant, water flow and ON/OFF operative mode.
System and components must be designed and installed consistently.

**Minimum water content**

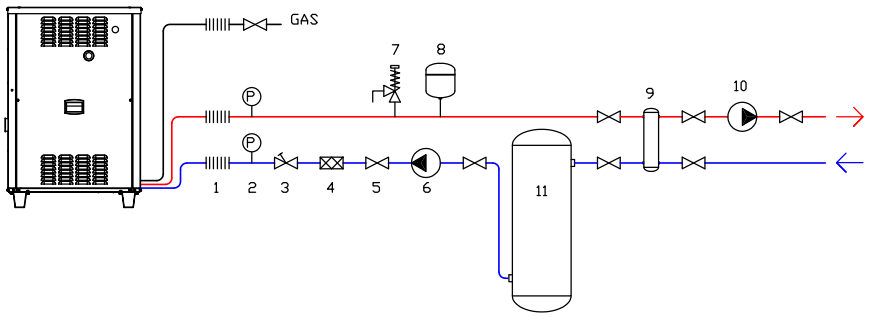
High thermal inertia is conducive to efficient appliance operation. Very short ON/OFF cycles are to be avoided.

- For each GA unit provide a minimum water content in the installation of at least 70 litres.
- If necessary, provide for an inertial volume, to be suitably sized (see design manual).

**Buffer tank**

In the event of using a buffer tank, this may have 2 or 4 pipes, as shown in the following two diagrams (Figures 3.1 p. 20 3.2 p. 20).

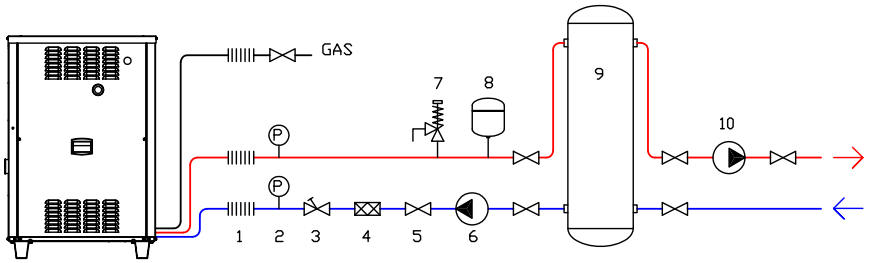
**Figure 3.1** – 2-pipe tank diagram




LEGEND

| | |
|---|---|
| 1 | Anti-vibration connection |
| 2 | Pressure gauge |
| 3 | Flow regulation valve |
| 4 | Water filter |
| 5 | Shut off valves |
| 6 | Water pump (primary circuit) |
| 7 | Safety valve (3 bar) |
| 8 | Expansion tank |
| 9 | Hydraulic separator |
| 10 | Water pump (secondary circuit) |
| 11 | 2-pipe buffer tank |

**Figure 3.2** – 4-pipe tank diagram




LEGEND

| | |
|---|---|
| 1 | Anti-vibration connection |
| 2 | Pressure gauge |
| 3 | Flow regulation valve |
| 4 | Water filter |
| 5 | Shut off valves |
| 6 | Water pump (primary circuit) |
| 7 | Safety valve (3 bar) |
| 8 | Expansion tank |
| 9 | 4-pipe buffer tank |
| 10 | Water pump (secondary circuit) |

## 3.3 HYDRAULIC CONNECTIONS

**Plumbing fittings**

on the right, at the bottom, **connection plate**
Versions ACF/TK/LB/HT (Figure 1.3 p. 8).

- **A** (= out) **1"1/4 F**- chilled WATER OUTPUT (m = flow to the installation);
- **B** (= in) **1"1/4 F**- chilled WATER INPUT (r = inlet from the installation).

HR Version with heat recovery exchanger (Figure 1.4 p. 9).

- **A** (= out) **1"1/4 F** - chilled WATER OUTPUT (m = flow to the installation);
- **B** (= in) **1"1/4 F**- chilled WATER INPUT (r = inlet from the installation).
- **D** (= out) **1"1/4 F** - WATER OUTPUT (chilled) (m = flow to the installation);
- C (= in) **1"1/4 F** - WATER INPUT (r = inlet from the installation).

**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.

**Minimum components of primary plumbing circuit**

- Always provide, near the appliance:

on water piping, both output and input (m/r)

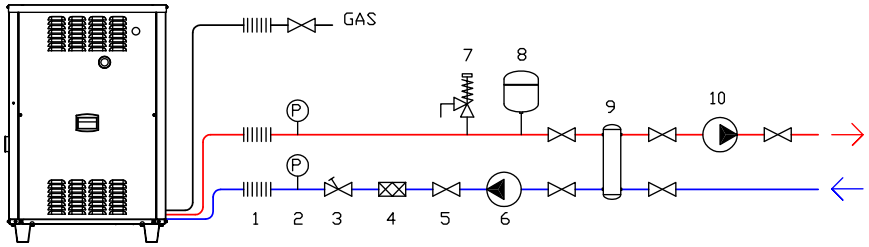
- 2 ANTIVIBRATION JOINTS on water fittings;
- 2 PRESSURE GAUGES;
- 2 ISOLATION BALL VALVES;

on the input water piping (r)

- 1 DIRT SEPARATOR FILTER
- 1 FLOW REGULATION VALVE;
- 1 WATER CIRCULATION PUMP, towards the appliance;

on the output water piping (m)
► 1 SAFETY VALVE (3 bar);
► 1 EXPANSION TANK of the individual unit.

**Figure 3.3** – Hydraulic plan




LEGEND

| | |
|---|---|
| 1 | Anti vibration joint |
| 2 | Pressure gauge |
| 3 | Flow rate adjustment valve |
| 4 | Water filter |
| 5 | Shut off valves |
| 6 | Water pump (primary circuit) |
| 7 | Safety valve (3 bar) |
| 8 | Expansion tank |
| 9 | Hydraulic separator / inertial tank with 4 fittings |
| 10 | Water pump (secondary circuit) |

## 3.4 WATER CIRCULATION PUMP

The circulation pump (flow and head) must be selected and installed based on pressure losses of plumbing/primary circuit (piping + components + exchange terminals + appliance).
For the appliance's pressure losses refer to Table 1.1 p. 16 and Design Manual.

### Circulation pump

The primary circulating pump must be obligatorily controlled by the appliance's electronic board (S61) (see Paragraph 1.5 p. 14).

## 3.5 ANTI-ICING FUNCTION

### Anti-icing self-protection

The anti-icing function, if activated, automatically starts the primary circulation pump when the outside temperature approaches zero.

**Electrical and gas continuity**

The anti-icing self-protection is only effective if the power and gas supplies are assured. Otherwise, anti-freeze liquid might be required.

## 3.6 ANTI-ICING LIQUID

**Precautions with glycol**

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

- ► Always check product suitability and its expiry date with the glycol supplier. Periodically check the product's preservation state.
- ► Do not use car-grade anti-icing liquid (without inhibitors), nor zinc-coated piping and fittings (incompatible with glycol).
- ► Glycol modifies the physical properties of water (density, viscosity, specific heat...).
- ► Dimensionare le tubazioni, la pompa di circolazione e i generatori termici di conseguenza.
- ► With automatic system water filling, a periodic check of the glycol content is required.

**Operation with outside temperatures < 10 °C**

If the outside air temperature is expected to be lower than +10 °C add glycol to prevent a greater icing risk.

### Type of anti-icing glycol

**Inhibited type glycol** is recommended to prevent oxidation phenomena.

### Glycol effects

The Table 3.1 p. 21 shows, indicatively, the effects of using a glycol depending on its percentage.

**Table 3.1** – Technical data for filling the hydraulic circuit

| GLYCOL % | 10 | 15 | 20 | 25 | 30 | 35 | 40 |
|---|---|---|---|---|---|---|---|
| WATER-GLYCOL MIXTURE FREEZING TEMPERATURE | -3°C | -5°C | -8°C | -12°C | -15°C | -20°C | -25°C |
| PERCENTAGE OF INCREASE IN PRESSURE DROPS | -- | 6% | 8% | 10% | 12% | 14% | 16% |
| LOSS OF EFFICIENCY OF UNIT | -- | 0,5% | 1% | 2% | 2,5% | 3% | 4% |

## 3.7 SYSTEM WATER QUALITY

**Responsibility of the user/operator/installer**

The installer, operator and user must assure system water quality (Table 3.2 p. 22). Failure to comply with the manufacturer's guidelines may affect operation, integrity and life of the appliance, voiding the warranty.

### System water features

Free chlorine or water hardness may damage the appliance.
Adhere to the chemical-physical parameters in Table 3.2 p. 22 and the regulations on water treatment for residential and industrial heating systems.

**Table 3.2** – Chemical and physical parameters of water

| CHEMICAL AND PHYSICAL PARAMETERS OF WATER IN HEATING/COOLING SYSTEMS | | |
|---|---|---|
| **PARAMETER** | **UNIT OF MEASUREMENT** | **ALLOWABLE RANGE** |
| 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

### 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 forms 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 INSTALLATION 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 appliance off).
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

### Gas connection

- ► **3/4" F**

on the right, at the bottom, **connection plate** (Figures 1.3 p. 8 1.4 p. 9).

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

### Mandatory shut-off valve

- ► Provide a gas shut-off valve (manual) on the gas supply line, to isolate the appliance when required.
- ► Perform connection in compliance with applicable regulations.

### Gas pipes sizing

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

### Supply gas pressure

The appliance's gas supply pressure, both static and dynamic, must comply with Table 3.3 p. 22, with tolerance ± 15%.

**Table 3.3** – Network gas pressure

| | | Gas supply pressure | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Product categories** | **Countries of destination** | **G20 [mbar]** | **G25 [mbar]** | **G30 [mbar]** | **G31 [mbar]** | **G25.1 [mbar]** | **G27 [mbar]** | **G2,350 [mbar]** |
| $II_{2H3B/P}$ | AL, BG, CY, CZ, DK, EE, FI, GR, HR, IT, LT, MK, NO, RO, SE, SI, SK, TR | 20 | | 30 | 30 | | | |
| | AT, CH | 20 | | 50 | 50 | | | |
| $II_{2H3P}$ | AL, BG, CZ, ES, GB, HR, IE, IT, LT, MK, PT, SI, SK, TR | 20 | | | 37 | | | |
| | RO | 20 | | | 30 | | | |
| $II_{2ELL3B/P}$ | DE | 20 | 20 | 50 | 50 | | | |
| $II_{2Esi3P}$ | FR | 20 | 25 | | 37 | | | |
| $II_{2HS3B/P}$ | HU | 25 | | 30 | 30 | 25 | | |
| $II_{2E3P}$ | LU | 20 | | | 50 | | | |
| $II_{2L3B/P}$ | NL | | 25 | 50 | 50 | | | |
| $II_{2E3B/P}$ | PL | 20 | | 37 | 37 | | | |
| $II_{2ELwLs3B/P}$ | | 20 | | 37 | 37 | | 20 | 13 |
| $II_{2ELwLs3P}$ | | 20 | | | 37 | | 20 | 13 |
| $I_{2E(S);I3P}$ | BE | 20 | 25 | | 37 | | | |
| $I_{3P}$ | IS | | | | 30 | | | |
| $I_{2H}$ | LV | 20 | | | | | | |
| $I_{3B/P}$ | MT | | | 30 | 30 | | | |
| $I_{3B}$ | | | | 30 | | | | |

Non compliant gas pressure (Table 3.3 p. 22) may damage the appliance and be hazardous.

**Vertical pipes and condensate**

► Vertical gas pipes must be fitted with siphon and discharge of the condensate that may form inside the pipe.

► If necessary, insulate the piping.

**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.

# 4 ELECTRICAL INSTALLER

## 4.1 WARNINGS

**General 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**

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

► 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 black outs are tolerated).

► To turn the appliance on and off, exclusively use the suitably provided control device (DDC or external request).

**Control of water circulation pump**

The water circulation pump of the water/primary circuit must mandatorily be controlled by the unit's electronic board (S61). It is not admissible to start/stop the circulating pump with no request from the appliance.

## 4.2 ELECTRICAL SYSTEMS

Electrical connections must provide:

► (a) power supply (Paragraph 4.3 p. 24);

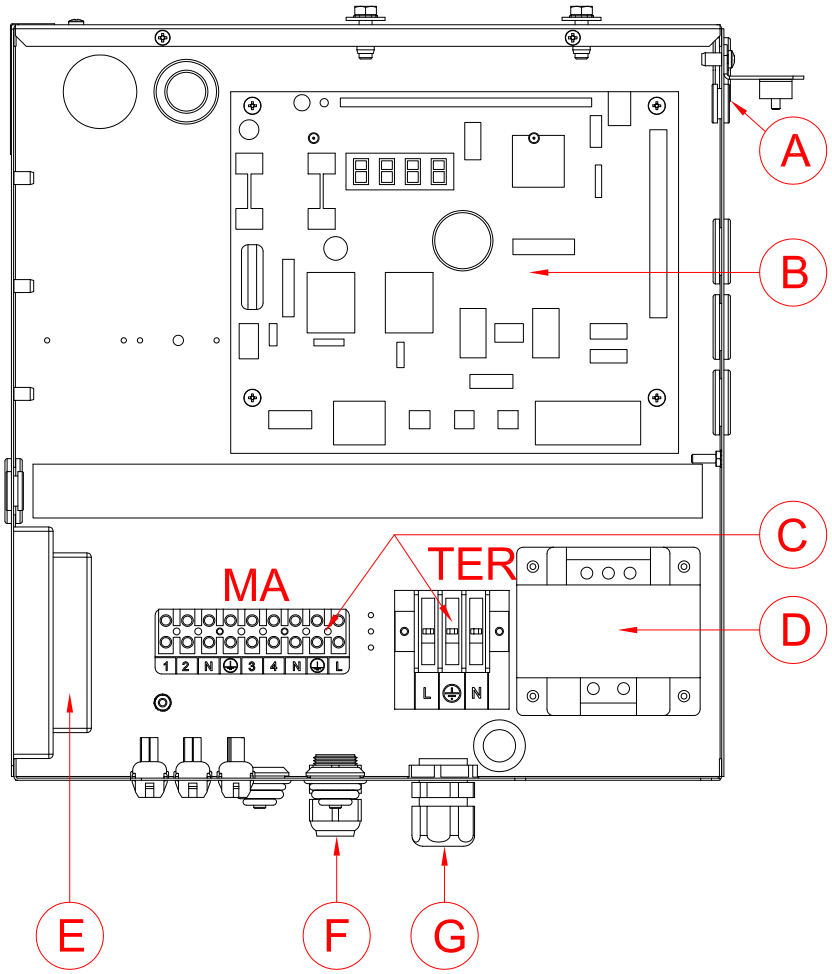
► (b) control system (Paragraph 1.5 p. 14).

**How to perform connections**

All electrical connections must be made in the appliance's Electrical Board:

1. Ensure the appliance's Electrical Panel is not live.
2. Remove the front panel of the appliance and the cover of the Electrical Board.
3. Run the cables through the suitable holes in the Connection Plate.
4. Run the cables through the suitable cable glands in the Electrical Board (Figure 4.1 p. 24)
5. Identify the appropriate connection terminals.
6. Perform the connections.
7. Close the Electrical Panel.and fit the front panel back on.

**Figure 4.1** – GA-ACF Electrical Panel




LEGEND

| | |
|---|---|
| A | CAN-BUS cable gland |
| B | S61 electronic boards |
| C | ME and TER terminal boards |
| D | transformer 230/23 V AC |
| E | flame controller |
| F | circulation pump power supply and control cable gland |
| G | GA power supply cable gland |

Terminals:

TER terminal box

| | |
|---|---|
| L-(PE)-N | phase/earth/neutral GA power supply |

MA terminal box

| | |
|---|---|
| N-(PE)-L | neutral/earth/phase circulation pump power supply |
| 3-4 | circulation pump enable |

## 4.3 ELECTRICAL POWER SUPPLY

### Power supply line

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

- **1 three-core cable** type **FG7(O)R 3Gx1,5**;
- **1 two-pole switch** with two 5A type T fuses, (GS) or one 10A magnetothermic breaker.

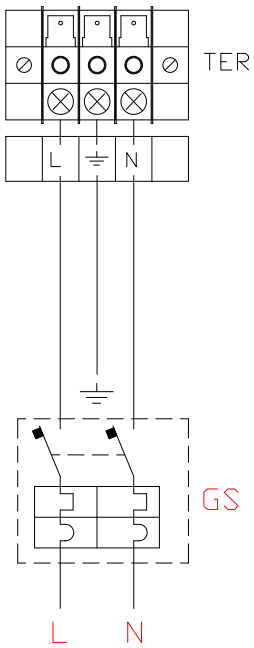
The switches must also provide disconnector capability, with min contact opening 4 mm.

### How to connect the power supply

To connect the three-pole power supply cable (Figure 4.2 p. 24):

1. Access the Electrical Board of the appliance according to the Procedure 4.2 p. 23.
2. Connect the three lead-in wires to the terminal (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** – Electrical wiring diagram




LEGEND

| | |
|---|---|
| TER | terminal board |
| L | phase |
| N | neutral |
| Components NOT SUPPLIED | |
| GS | general switch |

Example of connection of appliance to 230 V 1 N - 50 Hz electricity supply

## 4.4 SET-UP AND CONTROL

### Control systems, options (1) (2)

Two separate control systems are provided, each with specific features, components and diagrams (Figures 4.4 p. 26, 4.5 p. 26):

- System (1), with **DDC control** (with CAN-BUS connection).
- System (2), with an **external request**.

### 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 devices.

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

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

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

### CAN-BUS signal cable

The DDC controller is connected to the appliance through the CAN-BUS cable, shielded, compliant to Table 4.1 p. 25 (admissible types and maximum distances).

**Table 4.1** – CAN BUS cables type

| CABLE NAME | SIGNAL / COLOR | | | MAX LENGTH | Note |
|---|---|---|---|---|---|
| **Robur** | | | | | Ordering 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 | |

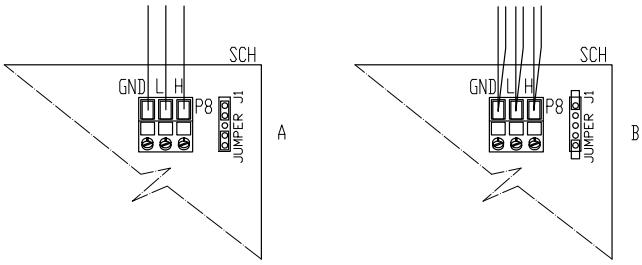
For lengths ≤200 m and max 4 nodes (e.g. 1 DDC + 3 GAHP), a simple 3x0.75 mm shielded cable may even be used.

**How to connect the CAN BUS cable to the appliance**

To connect the CAN-BUS cable to the S61 electronic board (Paragraph 1.5 p. 14),located in the Electrical Panel inside the unit, Figure 4.3 p. 25 and 4.4 p. 26 Details A and B:

1. Access the Electrical Board of the appliance according to the Procedure 4.2 p. 23);
2. Connect the CAN-BUS cable to terminals GND + L and H (shielding/earthing + two signal wires);
3. Place the CLOSED J10 Jumpers if the node is terminal (one connect ed CAN-BUS cable section only), or OPEN if the node is intermediate (two connected CAN-BUS cable sections);
4. Connect the DDC or the CCP/CCI to the CAN-BUS cable according to the instructions in the following Paragraphs and the DDC or CCP/CCI Manuals.

**Figure 4.3** – Electrical wiring diagram




LEGEND

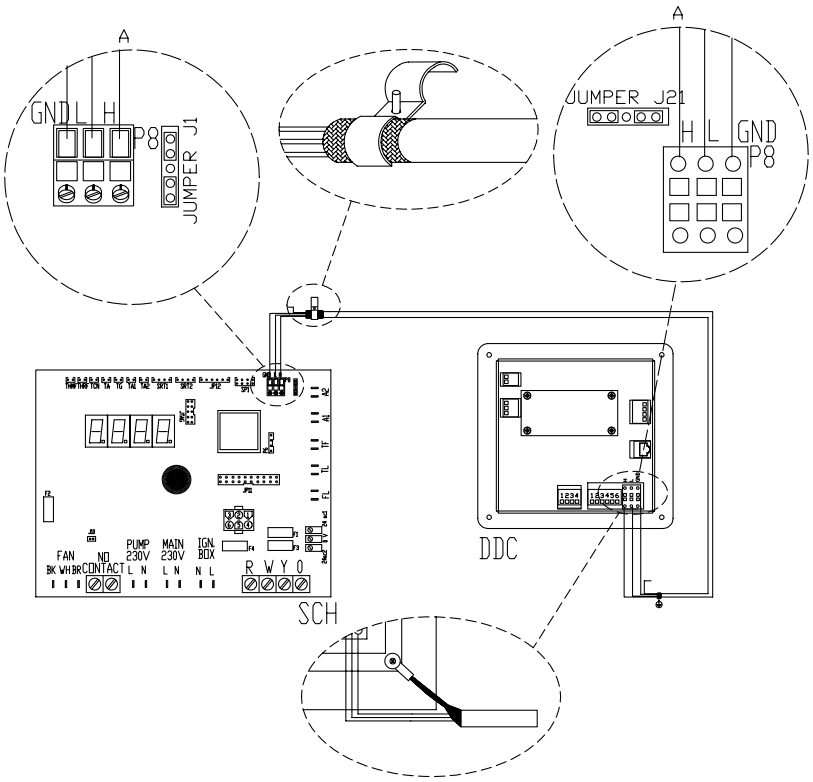
| | |
|---|---|
| SCH | electronic board |
| GND | Common data |
| L | Data signal LOW |
| H | Data signal HIGH |
| J1 | Jumper CAN-BUS in board |
| A | Detail case "terminal node" (3 wires; J1=jumper "closed") |
| B | Detail case "intermediate node" (6 wires; J1=jumper "open") |
| P8 | Port can/connector |

Connection cable CAN BUS to electronic board: detail A case "terminal node", detail B case "intermediate node"

### GAHP Configuration (S61) + DDC

(System (1) see also Paragraph 1.6 p. 15)

**Figure 4.4** – Connexion câble CAN BUS for plants with one unit




LEGEND

| | |
|---|---|
| DDC | direct digital control |
| SCH | electronic board S61 |
| J1 | Jumper CAN-BUS in board S61 |
| J21 | Jumper CAN-BUS in board DDC |
| A | terminal nodes connection - (3 wires; J1 e J21 = "closed") |
| H,L,GND | data signal wires (rif. cables table) |

### External request

(System (2) see also Paragraph 1.6 p. 15)
It is required to arrange:

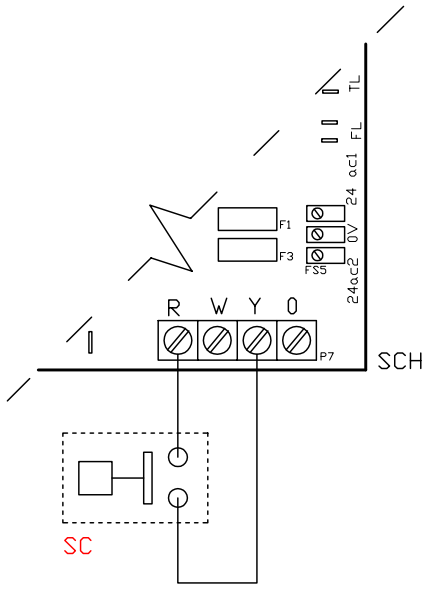
► request device (e.g. thermostat, clock, button, ...) fitted with a voltage-free NO contact.

**How to connect the external request**

Connection of external request is effected on the S61 board located in the Electrical Panel inside the unit:

1. Access the Electrical Board of the appliance according to the Procedure 4.2 p. 23.
2. Connect the voltage free contact of the external device, through two wires, to **terminals R** and **Y**(respectively: common 24 V AC and cooling request) of electronic board S61 (Figure 4.5 p. 26-Detail CS).

**Figure 4.5** – External request connection




LEGEND

| | |
|---|---|
| SCH | Electronic board |
| R | Common |
| Y | Cooling request terminal |
| Components NOT SUPPLIED | |
| SC | external request |

## 4.5 WATER CIRCULATION PUMP

**Constant flow circulating pump**

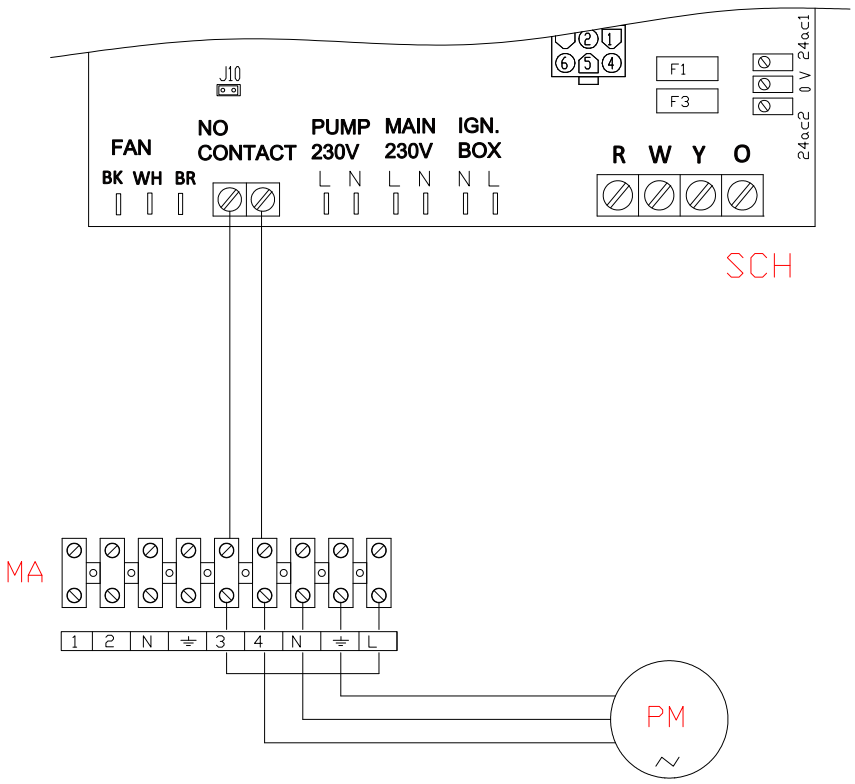
It must be mandatorily controlled from the S61 electronic board. The diagram in Figure 4.6 p. 27 is for pumps < 700 W. For pumps > 700 W it is required to add a control relay and arrange Jumper J10 OPEN.

**How to connect the CONSTANT FLOW circulating pump**

Access the Electrical Board of the appliance according to the Procedure 4.2 p. 23:

1. connect board S61, to terminals 3-4 of terminal board (MA);
2. Jumper J10 CLOSED.

**Figure 4.6** – Electrical wiring diagram




LEGEND

| | |
|---|---|
| SCH | circuit board |
| J10 | closed jumper |
| N.O. CONTACT | N.O voltage free contacts |
| MA | unit terminal block |
| L | phase |
| N | neutral |

Components NOT SUPPLIED

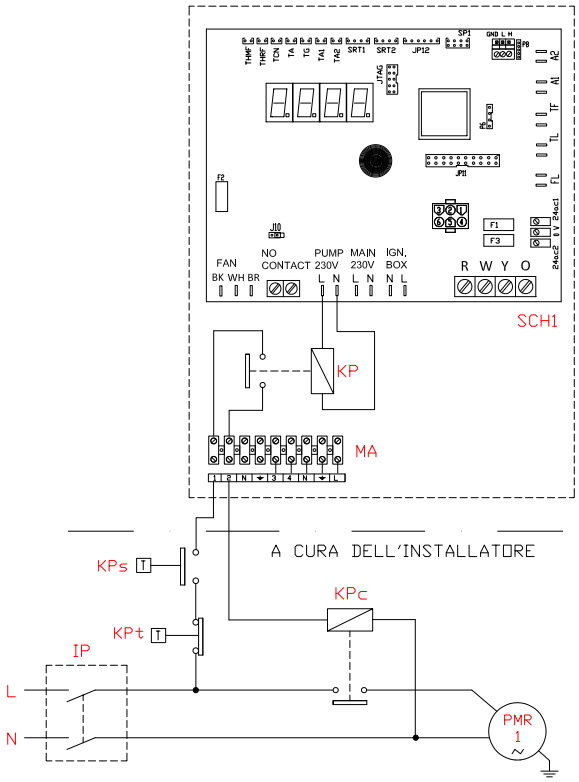
| | |
|---|---|
| PM | water pump <700W |

Example of pump/appliance electrical connection with 230 Vac pump (with absorbed power of < 700 W), controlled directly by the appliance.

**Heat recovery exchanger circulating pump**

It must be controlled through a relay in the appliance's electrical board, connected in parallel to the solution pump.

**Figure 4.7** – Recovery exchanger pump connection wiring diagram




LEGEND

| | |
|---|---|
| KP | Relay on the unit for recovery exchanger pump request |
| KPt | Thermostat with set-point calibration of DHW tank (not supplied) |
| KPs | Thermostat calibrated at 35 °C with capillary tube in the lower part of the DHW tank (not supplied) [to be provided in the event the water flow rate on the recovery circuit exceeds the nominal value of 1000 l/h] |
| KPc | Two-pole relay for recovery exchanger pump request (not supplied) |

# 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

### Preliminary checks for First start-up

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

- water-heating, 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 (methane or LPG);
- supply gas pressure complying with the values of Table 3.3 p. 22, with max tolerance ±15%;
- Power supply mains complying with the appliance's rating plate data;
- appliance correctly installed, according to the manufacturer's instructions;
- system installed in a workmanlike manner, according to national and local regulations.

### 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 control device provided (DDC, or external enable);
- appliance defects or faults caused during transport or installation;
- gas smell;
- non-compliant mains gas pressure;
- all situations that may involve operation abnormalities or are potentially hazardous.

### 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.

# 6 NORMAL OPERATION

This section is for the end user.

## 6.1 WARNINGS

**General warnings**

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

**First start-up by TAC**

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

**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 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.

Inspections before switching on

Before switching on the appliance, ensue that:

- gas cock open;
- appliance electrical power supply (main switch (GS) ON);
- DDC power supply (if any);
- correctly arranged water circuit.

**How to switch on/off**

- If the appliance is controlled by a DDC (System (1), see Paragraph 1.6 p. 15), refer to the relevant manuals.
- If the appliance is controlled by external request (e.g. thermostat, timer, button, ... with voltage-free NO contact), (System (2) see Paragraph 1.6 p. 15), , the appliance is switched on/off by the ON/OFF positions of the external control device.

After switching on with the control, in normal operating conditions, the appliance starts/stops automatically according to the user's thermal needs, supplying 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 MESSAGES ON THE DISPLAY

**4 digit display**

The S61 board of the appliance (Paragraph 1.5 p. 14, Figure 6.1 p. ) 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 S61 board name is displayed.
- After another 15 sec, the appliance is ready to operate.

**Signals in normal operation**

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

**Signals in the event of fault**

In the event of fault the display blinks indicating an operational code (first letter on the display: "E" = error, or "U" = warning)

- If it is only a temporary warning, the appliance may continue working.
- If it is a permanent error or warning the appliance stops.

(Table 8.1 p. 33).

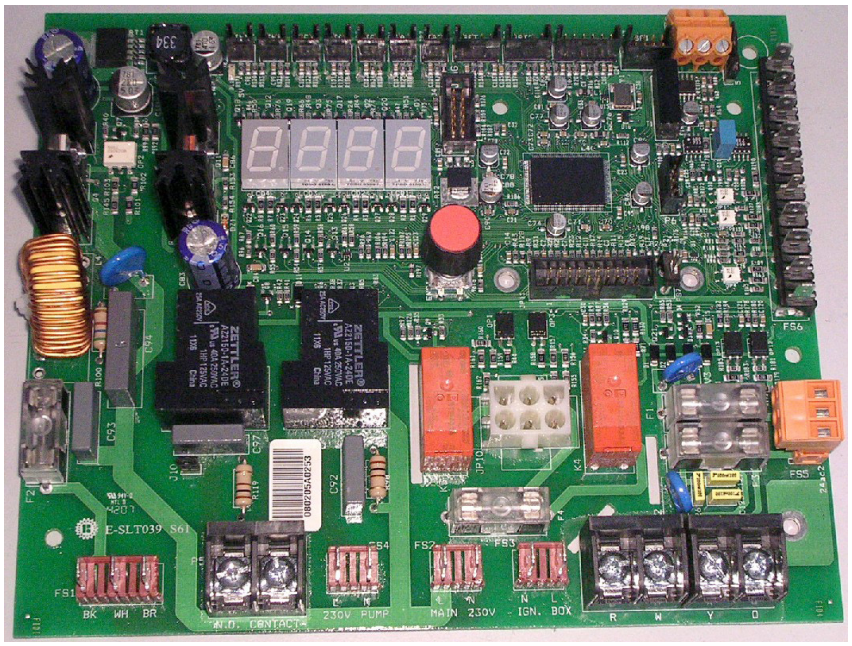
## 6.4 ELECTRONIC ADJUSTMENT ON THE MACHINE – MENUS AND PARAMETERS OF THE S61 BOARD

**Firmware**

The instructions on the use of the S61 electronic board concern the **firmware version 3.028**.

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

**Figure 6.1**




LEGEND
Controller S61
(in every unit)

Electronic board S61

#### Display

The 4-digit display of the S61 board (Detail A Figure 6.1 p. 30) 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").

#### Knob

One of the following actions may be done with the S61 board knob (Detail B in Figure 6.1 p. 30):

- 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.

#### 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 6.6 p. 31);
- menu "3.", display and setting, to set the value of some system parameters (e.g. water set point temperature); the values are initialised by the TAC at First Switch-On.

It is accessed without password.

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

- Menu "4.", "5." and "6." are password-protected. These are specific sections, exclusively intended for skilled personnel (installer or TAC). For information see the technical Assistant 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 failure).

To access the menus and parameters of the S61 board, proceed as follows (see also Figure 6.1 p. 30):

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 075 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 "7" for parameter 075 in menu 3 = water temperature set-point at 7 °C); if instead of a figure/setting it is a command, a blinking code is displayed (e.g. "reS1" for the flame lockout 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.

## 6.5 MODIFYING SETTINGS

**Modify settings via the DDC**

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

**How to raise/lower the water temperature set-point**

The water temperature set-point establishes the delivery temperature to the system (water output from the appliance), or return from the system (water input in the appliance). The temperature is pre-set by the TAC upon First Switch-On.

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

1. Access menu 3 under parameter 75 (= water temperature set-point) by rotating and pressing the knob; "3._75" must be displayed (procedure Paragraph 6.4 p. 29);
2. Display the parameter value by pressing the knob; the previously set value is displayed (from 3 to 25 °C); to reconfirm the pre-existing value press the knob again, otherwise go to point 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.

## 6.6 RESTARTING A LOCKED-DOWN UNIT – RESET

**Fault signals on the display**

In the event of locked-down 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. 33).
- ► 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.

**Locked-down 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 anomaly.
- ► For a fault or breakdown, alert the maintenance technician or TAC.

**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 S61 board:

1. Access Menu 2 under Parameter "__0", to reset flame lockout (Error E12), or Parameter "__1" for any other generic reset, turning and pressing the knob; "2.__0"/"2.__1" must be displayed (procedure Paragraph 6.4 p. 29);
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 blinking, then "2._XX" is displayed again (e.g. "2.__0").

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.

## 6.7 EFFICIENCY

For increased appliance efficiency:

- ► Keep the finned coil clean;
- ► Set minimum 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 (DDC or external enable) and wait for the end of the switching off cycle, then disconnect power and gas supply, by acting on the electrical disconnecter and gas cock.

The efficiency checks and every other "check and maintenance operation" (see Tables 7.1 p. 32 and 7.2 p. 32) 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.

**Heavy-duty use**

If the unit is subject to heavy duty use (for example in process plants or in other conditions of continuous operation), maintenance operations must be more frequent.

## 7.2 PRE-EMPTIVE MAINTENANCE

- ► For pre-emptive maintenance, comply with the recommendations in Table 7.1 p. 32.

**Table 7.1**

| GUIDELINES FOR THE PREVENTIVE MAINTENANCE OPERATIONS | | | | | |
|---|---|---|---|---|---|
| **Check of the unit** | **GAHP-A** | **GAHP-GS/WS** | **AY** | **ACF** | **GAHP-AR** |
| Visually check of the general condition of the unit and of its air heat exchanger (1) | √ | | | √ | √ |
| Check the correct operation of the device used for monitoring the water flow | √ | √ | √ | √ | √ |
| Check the % value of CO2 | √ | √ | √ | | |
| check gas pressure to the burners | | | | √ | √ |
| Check that the condensate discharge is clean [If necessary, frequency of the maintenace operation must be increased] | √ | √ | √ | | |
| Replace the belts after 6 years or 12,000 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 | | | √ | | |
| **Check for every DDC or CCI** | **DDC or CCI** | | | | |
| Check that the plant is able to achive the setpoint temperature | √ | | | | |
| Download the hystorical events | √ | | | | |

1 - It is suggested the cleaning of the air heat exchanger once every 4 years [the optimal frequency of this operation is in any case a consequence of the installation site].

## 7.3 SCHEDULED ROUTINE MAINTENANCE

- ► For scheduled routine maintenance, perform the operations in Table 7.2 p. 32, at least once every 2 years.

**Table 7.2**

| SCHEDULED MAINTENANCE OPERATIONS | TO BE PERFORMED AT LEAST ONE EVERY TWO YEARS | | | | |
|---|---|---|---|---|---|
| **Check of the unit** | **GAHP-A** | **GAHP-GS/WS** | **AY** | **ACF** | **GAHP-AR** |
| Clean the combustion chamber | √* | √* | √ | √ | √* |
| Clean the burner | √* | √* | √ | √ | √* |
| Clean the electrodes of ignition and flame sensing | √ | √ | √ | √ | √ |

| SCHEDULED MAINTENANCE OPERATIONS | TO BE PERFORMED AT LEAST ONE EVERY TWO YEARS | | | | |
|---|---|---|---|---|---|
| Check that the condensate discharge is clean | √ | √ | √ | | |
| Replace the silicone gasket between the front plate and the exchanger | | | √ | | |

*Only in case the analysis of combustion products is non-compliant

## 7.4 PERIODS OF INACTIVITY

**Avoid emptying the water system**

Emptying the system may cause damage due to corrosion of the water pipes. Assure at least one of the two following conditions:

1. sufficient anti-icing glycol (Paragraph 3.6 p. 21)
2. empty the system but ensure it is filled again in compliance with the requirements of Paragraph 3.8 p. 22.

**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 (6.2 p. 29).
2. Only when the appliance is completely off, power it off with the main switch/disconnector switch (Detail GS in Figure 4.2 p. 24).
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 anti-icing protection is missing, Paragraph 3.5 p. 21).

**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. 32 and 7.3 p. 32).

► Check content and quality of the water in the system, and if necessary top it up (Paragraphs 3.8 p. 22, 3.7 p. 21and 3.6 p. 21).

► 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 cock and ensure there are no leaks; should gas smell be noticed, close the gas cock again, do not switch any electrical devices on and request intervention by Skilled Personnel.
2. Power on with the main power supply switch (GS, Figure 4.2 p. 24).
3. Switch on the appliance by means of the provided control device (DDC, CCP/CCI or external request, Paragraph 4.4 p. 25).

# 8 DIAGNOSTICS

## 8.1 OPERATIVE CODES

**Table 8.1** – Operative Codes ACF

| CODES | DESCRIPTION | Warning (u) | Error (E) |
|---|---|---|---|
| 0 | FAULT ON RESET CIRCUIT OF FLAME CONTROL UNIT | NA | • Power cycle the appliance.<br>If the code persists, shows up again or in case of doubt, contact the TAC. |
| 1 | GENERATOR LIMIT THERMOSTAT TRIP | Contact authorised Technical Assistance | |
| 2 | FLUE GAS THERMOSTAT TRIP | Contact authorised Technical Assistance | |
| 3 | COLD WATER ANTI-FREEZE THERMOSTAT TRIPPED | Reset is automatic when the triggering condition ceases. | NA |
| 4 | INSUFFICIENT VENTILATION | 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. |
| 5 | AMBIENT TEMPERATURE EXCEEDING OPERATIVE LIMITS | NA | Reset is automatic when the triggering condition ceases. |
| 6 | AMBIENT TEMPERATURE LOWER THAN OPERATIVE LIMITS | NA | Reset is automatic when the triggering condition ceases. |
| 7 | GENERATOR TEMPERATURE HIGH | 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. |
| 8 | FLAME CONTROL UNIT ERROR | NA | Contact authorised Technical Assistance |

| CODES | DESCRIPTION | Warning (u) | Error (E) |
|---|---|---|---|
| 10 | INSUFFICIENT 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. |
| 11 | 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. |
| 12 | FLAME CONTROLLER UNIT ARREST | Reset is automatic up to 4 attempts (in about 5 minutes). | • Gas supply check.<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. |
| 16 | FAULTY OUTLET WATER TEMPERATURE PROBE | 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. |
| 17 | FAULTY INLET WATER TEMPERATURE PROBE | 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. |
| 18 | FAULTY CONDENSER OUTLET TEMPERATURE PROBE | 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. |
| 20 | FAULTY GENERATOR TEMPERATURE PROBE | 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. |
| 28 | GAS SOLENOID VALVE EXCITED DURING FLAME CONTROLLER ARREST | NA | • Power off the appliance.<br>Contact authorised Technical Assistance. |
| 29 | 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. |
| 51 | DEFROST FUNCTION ACTIVATED | Non-blocking Warning (informative code).<br>The code clears automatically when anti-icing function execution ends. | NA |
| 77 | WATER CIRCULATION IN THE PASSIVE COLD MODULE | Reset is automatic when the triggering condition ceases. | NA |
| 80 | INCOMPLETE OR INVALID PARAMETERS | Contact authorised Technical Assistance. | |
| 81 | INVALID P0 PARAMETERS | Reset is automatic when the triggering condition ceases. | Contact authorised Technical Assistance. |
| 82 | INVALID P1 PARAMETERS | Reset is automatic when the triggering condition ceases. | Contact authorised Technical Assistance. |
| 84 | FAULTY TRANSFORMER CONNECTION OR 24 V AC FUSES | NA | Contact authorised Technical Assistance. |
| 85 | INCORRECT MODULE TYPES | NA | Contact authorised Technical Assistance. |
| 86 | FAULTY BOARD, ROM | NA | Contact authorised Technical Assistance. |
| 87 | FAULTY BOARD, pRAM | NA | Contact authorised Technical Assistance. |
| 88 | FAULTY BOARD, xRAM | NA | Contact authorised Technical Assistance. |
| 89 | FAULTY BOARD, REG. | NA | Contact authorised Technical Assistance. |
| 90 | AMBIENT TEMPERATURE SENSOR DEFECTIVE | 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. |
| 91 | CONTROLLER DEFECTIVE | NA | Contact authorised Technical Assistance. |

NA: Not Applicable

# APPENDICES

## 1 DECLARATION OF CONFORMITY

**Figure 1**

ROBUR

EC – DECLARATION OF CONFORMITY

CE

Manufacturer : Robur S.p.A.
Address : Via Parigi 4/6
City, Country : Verdellino/Zingonia 24040 (Bg), Italy

This is to declare that the ROBUR Gas Absortion Heat Pump (GAHP) are in conformity with the following EC-Directives:

**2006/42/EC Machinery Directive** with subsequent amendments and integrations.

**2004/108/EC Electromagnetic Compatibility** with subsequent amendments and integrations.
Tested and examined according to the following norms: EN55014-1, EN55014-2, EN61000-3-2, EN61000-3-3, EN62233.

**2006/95/EC Low Voltage Directive** with subsequent amendments and integrations.
Tested and examined according to the following norms: EN50165, EN60335-2-102, EN60335-1.

**2009/142/EC Gas Appliance Directive** with subsequent amendments and integrations.
Tested and examined according to the following norms: EN 12309-1. EN 12309-2, EN 483.
As proved whit EC certification number 0964, issued by KIWA Italia S.p.A Via G. Carducci,5 Milan-Italy

**97/23/EC Pressure Equipment Directive** with subsequent amendments and integrations.
As proved with EC Certification number 1370 of all the components under pressure of the III° category, issued by BUREAU VERITAS Italia S.p.A. Via Miramare, 15 Milan-Italy

Jvan Benzoni
R&D Director
Robur S.p.A.

coscienza ecologica caring for the environment

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via Parigi 4/6 24040 Verdellino/Zingonia (BG) Italy T +39 035 888111 F +39 035 884165 capitale sociale € 2.028.000,00 i.v. iscritta al Registro Imprese di Bergamo n. 154968 codice fiscale/partita iva 00373210160 V.A.T. code IT 00373210160 società soggetta all'attività di direzione e coordinamento di Fin Robur S.a.p.A. di Benito Guerra & C.

## Robur mission

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

Revision: N
Code: D-LBR357
15MCMSDC009
24/04/2015

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