caring for the environment

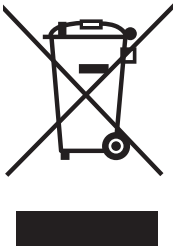
Installation, use and maintenance manual

GA ACF

absorption chiller

gas powered

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: B
Code: D-LBR305GB

INDEX OF CONTENTS

I INTRODUCTION

Installation, use and maintenance manual

This Manual is an integral part of the GA ACF 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 adjustment device to control one or more Robur appliances (GAHP heat pumps, GA chillers and AY00-120 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, circulators, 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 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.

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.
- 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 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.

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).
- 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. 21*).
- Check system sealing.
- Avoid frequent top-ups.

Chloride concentration

The concentration of chlorides or free chlorine in the system water must not exceed the values in Table 3.2 *p. 21*.

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 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. 30*) 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 CONFORMITY

EU directives and standards

GA series absorption chillers 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.
- ► 2006/42/EC "Machine Directive" as amended and added.
- ► 2014/68/EU "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, heat pumps 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 to the appliance by the plant or installation (mechanical stresses, pressure, vibrations, thermal expansion, electrical surges...).
- Accidental damages or due to force majeure.

1 FEATURES AND TECHNICAL DATA

1.1 FEATURES

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 and dissipating heat directly to the outside 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 circuit, externally treated with epoxy paint.
- Multigas premix burner equipped with ignition and flame detection managed by an electronic control unit.
- Titanium stainless steel shell-and-tube water exchanger (evaporator), externally insulated.
- Air exchanger (condenser) with finned coil, with steel pipe and aluminium fins.
- Variable-flow microprocessor-controlled helicoidal motor-fan.

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.
- Bypass valve, between high and low-pressure circuits.
- Ionization flame control box.
- Double shutter electric gas valve.
- Antifreeze functions for hydraulic circuit.
- Heat recovery exchanger circulation pump relay (HR version only).

Versions

The GA ACF unit is available in the following versions:

- ACF standard, for residential/retail/industrial cooling systems with chilled water down to +3 °C.
- HR with heat recovery exchanger, for residential/retail/industrial cooling systems with chilled water down 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 down to +3 °C, in continuous operation year round.
- HT for very hot climates, for residential/retail/industrial cooling systems with chilled water down to +5 °C, with outside air up to 50 °C.
- LB for negative temperatures, for cooling systems with chilled water down 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.

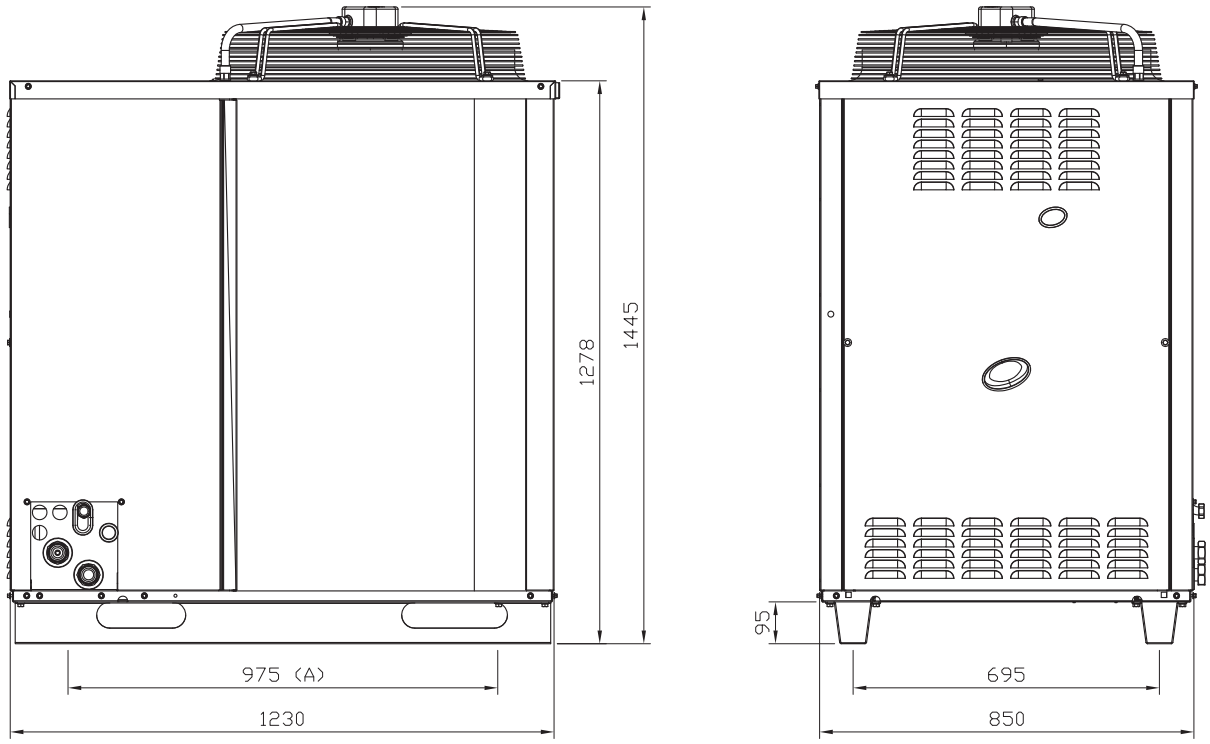
1.1.1 Standard or silenced fan

According to the type of fan, all the GA ACF units are available in two versions:

- Standard fan, for applications that do not require a special degree of noiselessness.
- Silenced fan, for applications that require a high degree of noiselessness.

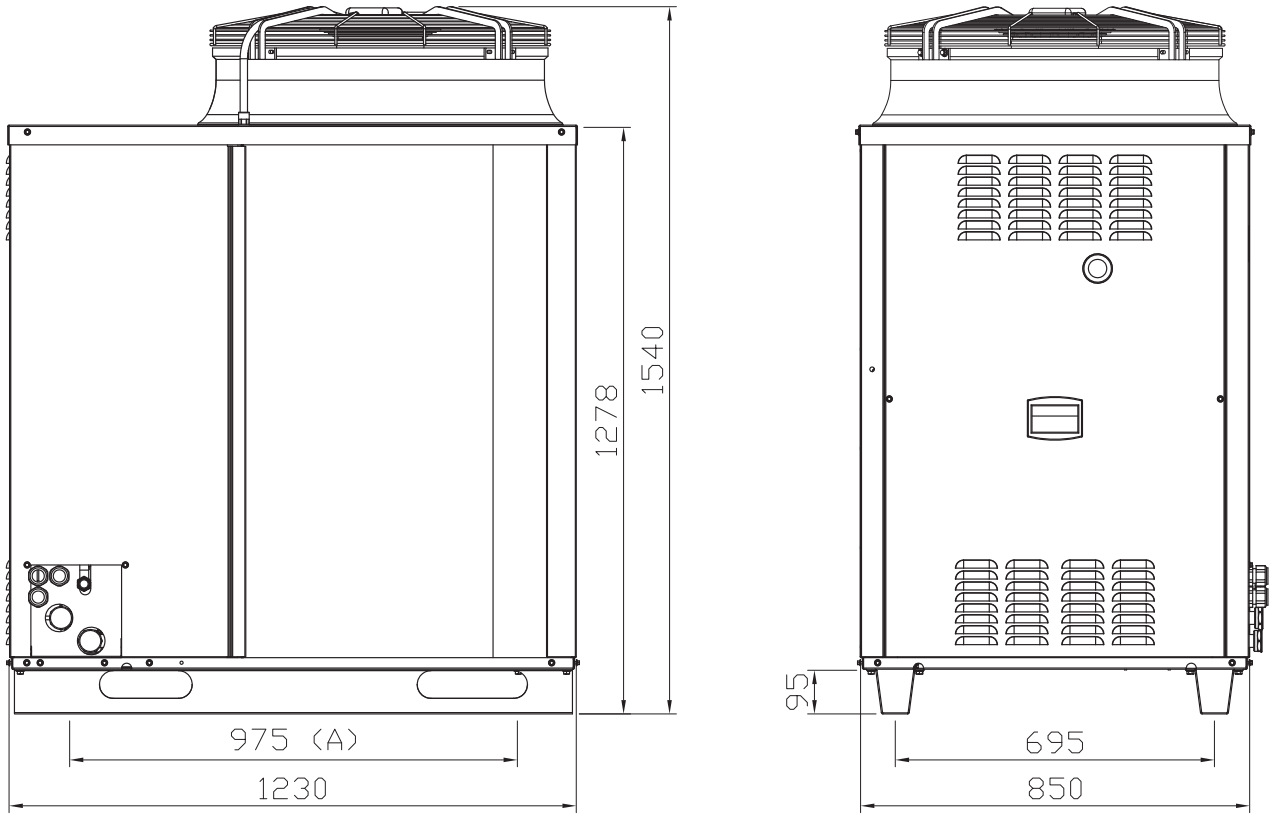
1.2 DIMENSIONS

Figure 1.1 *ACF standard version dimensions*



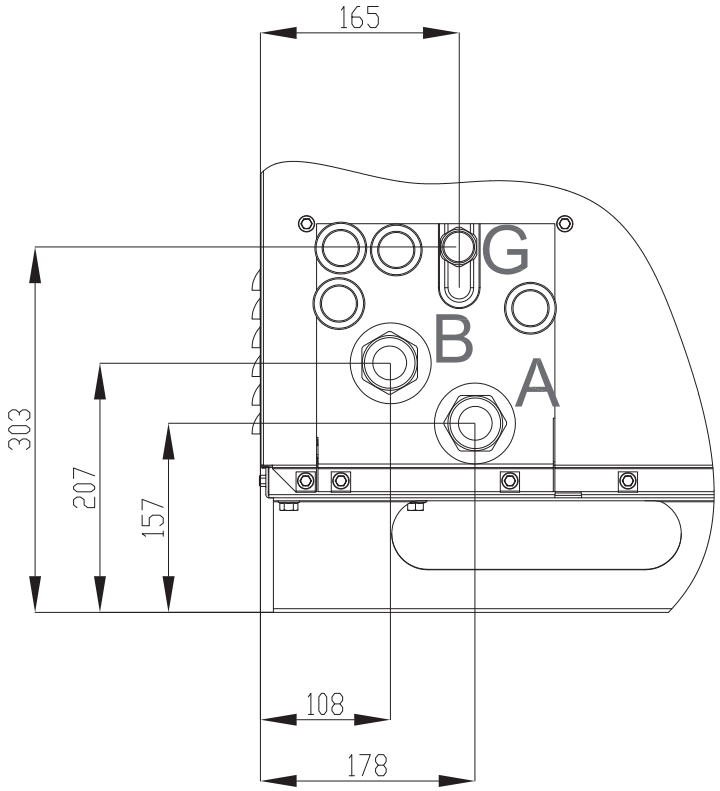
A Position of holes for fixing of anti-vibration joints

Figure 1.2 *ACF silenced version dimensions*



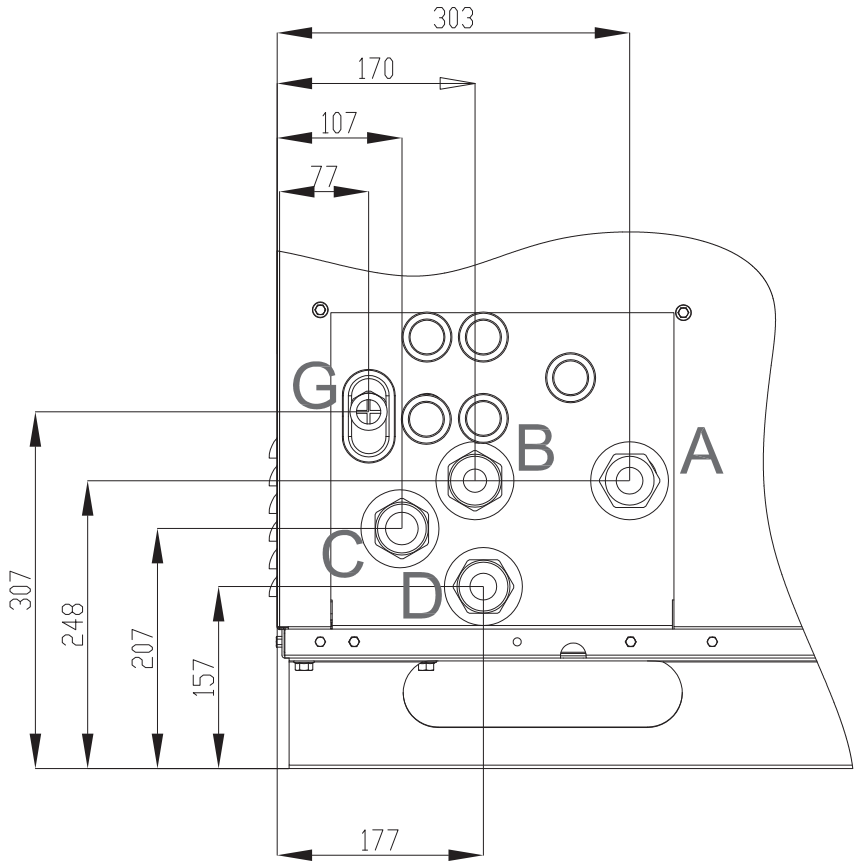
A Position of holes for fixing of anti-vibration joints

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



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

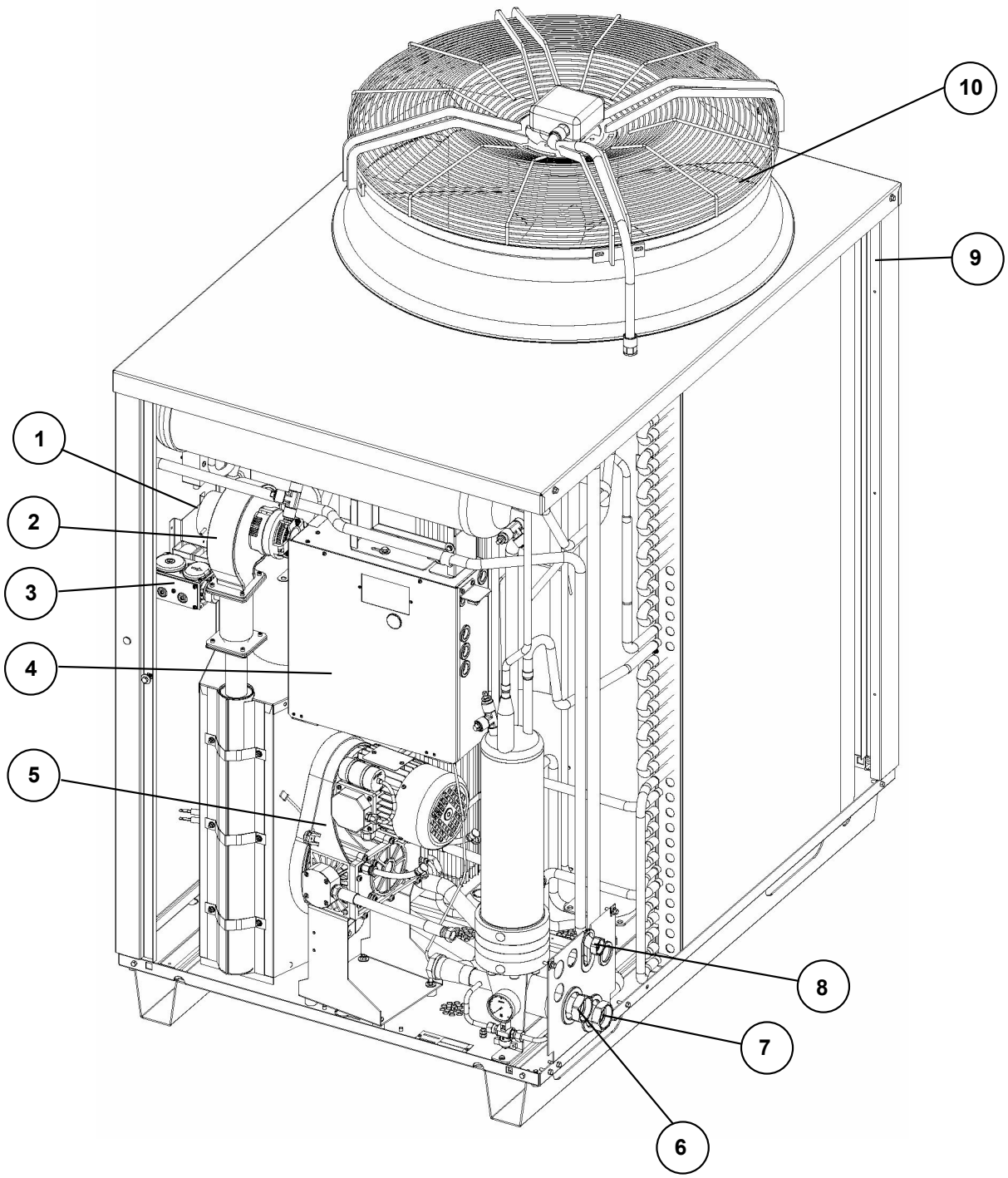
Figure 1.4 *ACF-HR Service plate with plumbing and gas connections*



G Gas connection Ø 3/4" F
Chiller - CHILLED WATER
D Outlet water fitting Ø 1 1/4" F
C Water inlet connection Ø 1 1/4" F
Recovery exchanger - HOT WATER
A Water outlet connection Ø 1 1/4" F
B Water inlet connection Ø 1 1/4" F

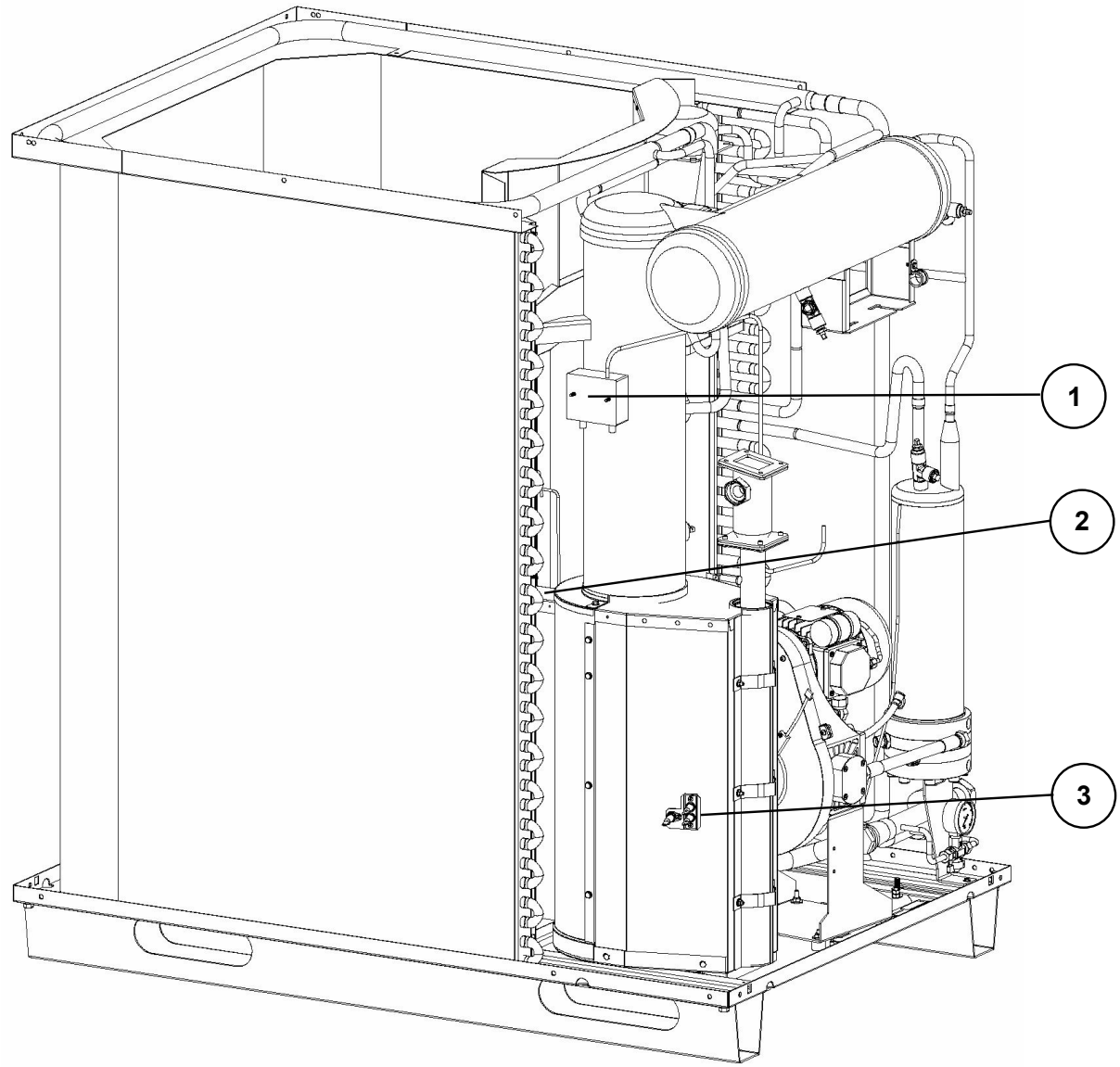
1.3 COMPONENTS

Figure 1.5 *Internal components - front view*



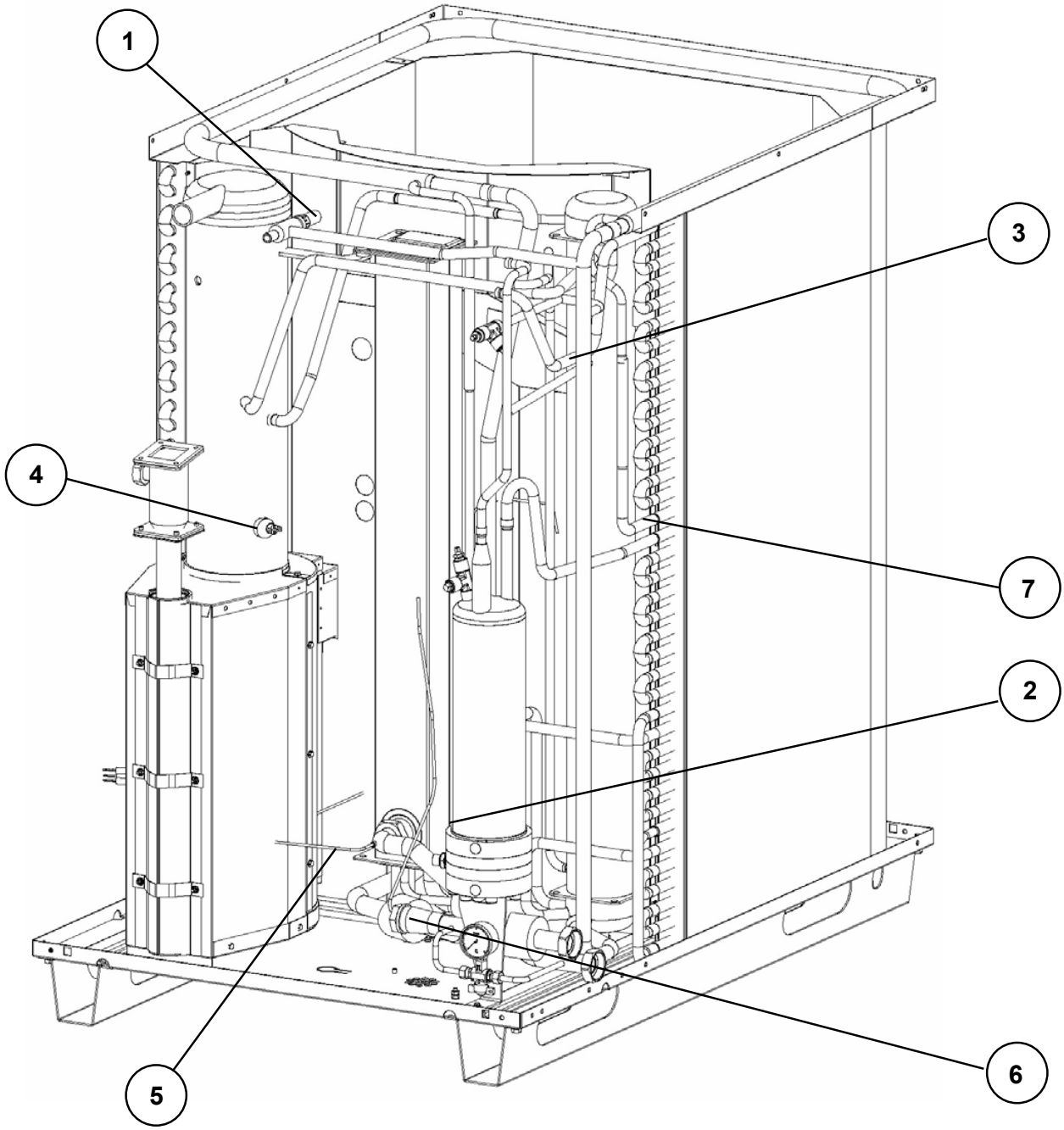
1	Combustion air intake	5	Oil pump	9	Room temperature probe
2	Combustion blower	6	Water inlet connection Ø 1 1/4" F	10	Fan
3	Gas valve	7	Water outlet connection Ø 1 1/4" F		
4	Electrical panel	8	Gas connection Ø 3/4" F		

Figure 1.6 *Internal components - left side view*



1 Ignition transformer
2 Flue thermostat
3 Ignitor and flame detectors

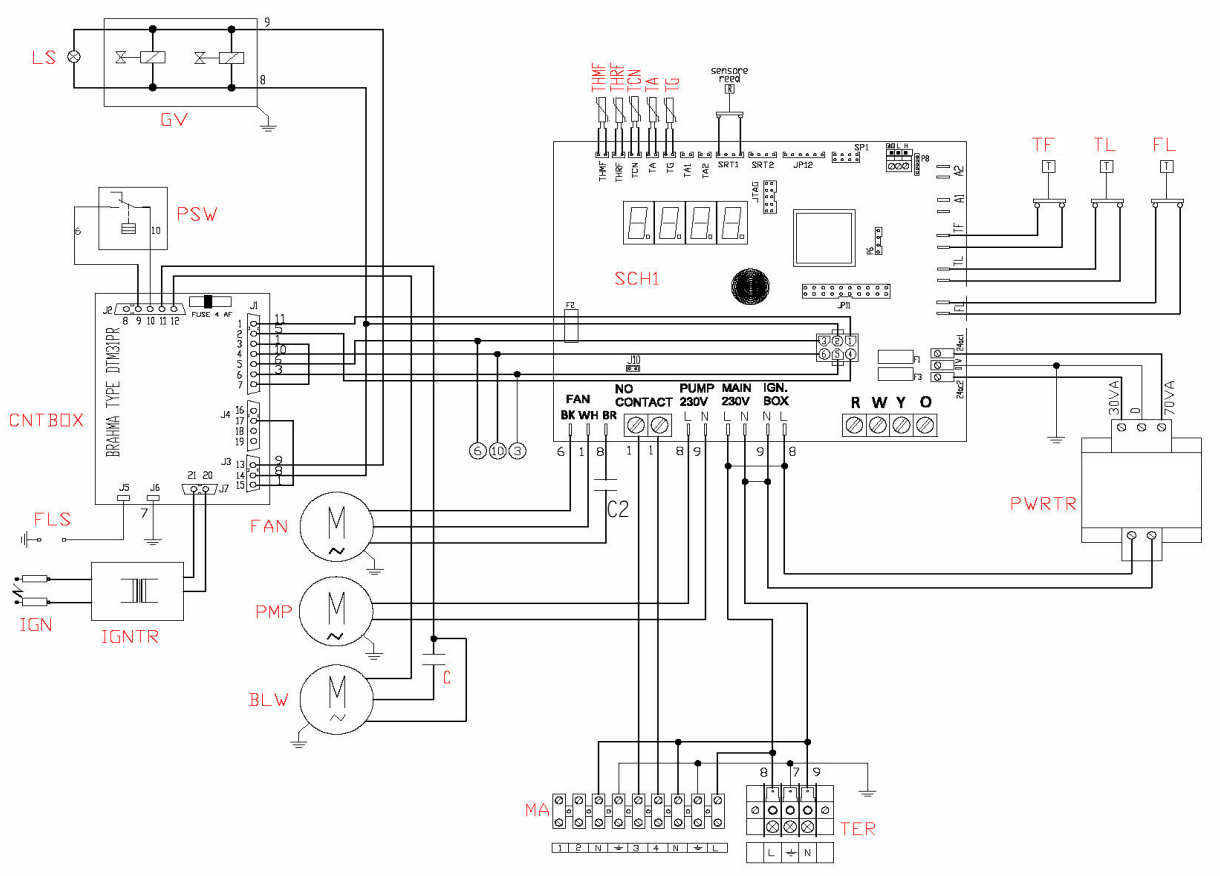
Figure 1.7 *Internal components - right side view*



1	Safety valve	4	Limit thermostat	7	TCN probe
2	Return temperature probe	5	Flow temperature probe		
3	TG generator temperature probe	6	Flow switch		

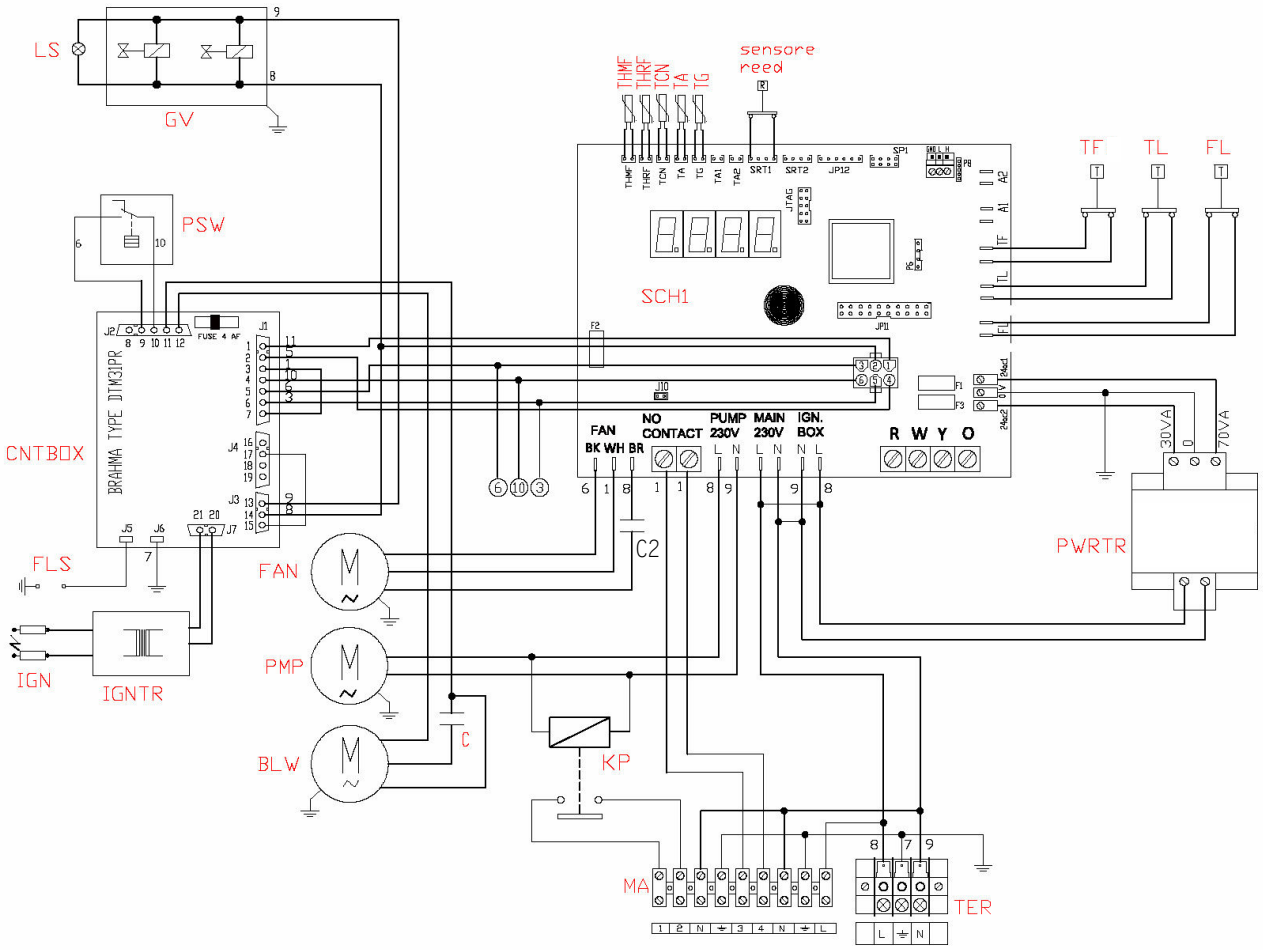
1.4 ELECTRICAL WIRING DIAGRAM

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



TER	Power supply terminal block 230 Vac	TA	Ambient air temperature probe	FAN	Fan motor
SCH1	Electronic board (S61)	TG	Generator temperature sensor	C2	Fan condenser
GV	Gas solenoid valve	SRT1	Oil pump rotation sensor	PMP	Oil hydraulic pump motor
LS	Gas flow warning lamp	TF	Flue gas thermostat	PWRTR	Tansformer 230/24 Vac
PSW	Air pressure switch	TL	Generator limit thermostat (manual reset)	CNTBOX	Flame controller
THMF	Outlet water temperature probe	FL	Water flow switch	IGN	Ignition electrodes
THRF	Inlet water temperature probe	BLW	Blower motor	IGNTR	Ignition transformer
TCN	Condenser outlet temperature probe	C	Blower condenser	FLS	Detection electrode

Figure 1.9 *ACF-HR Unit wiring diagram*

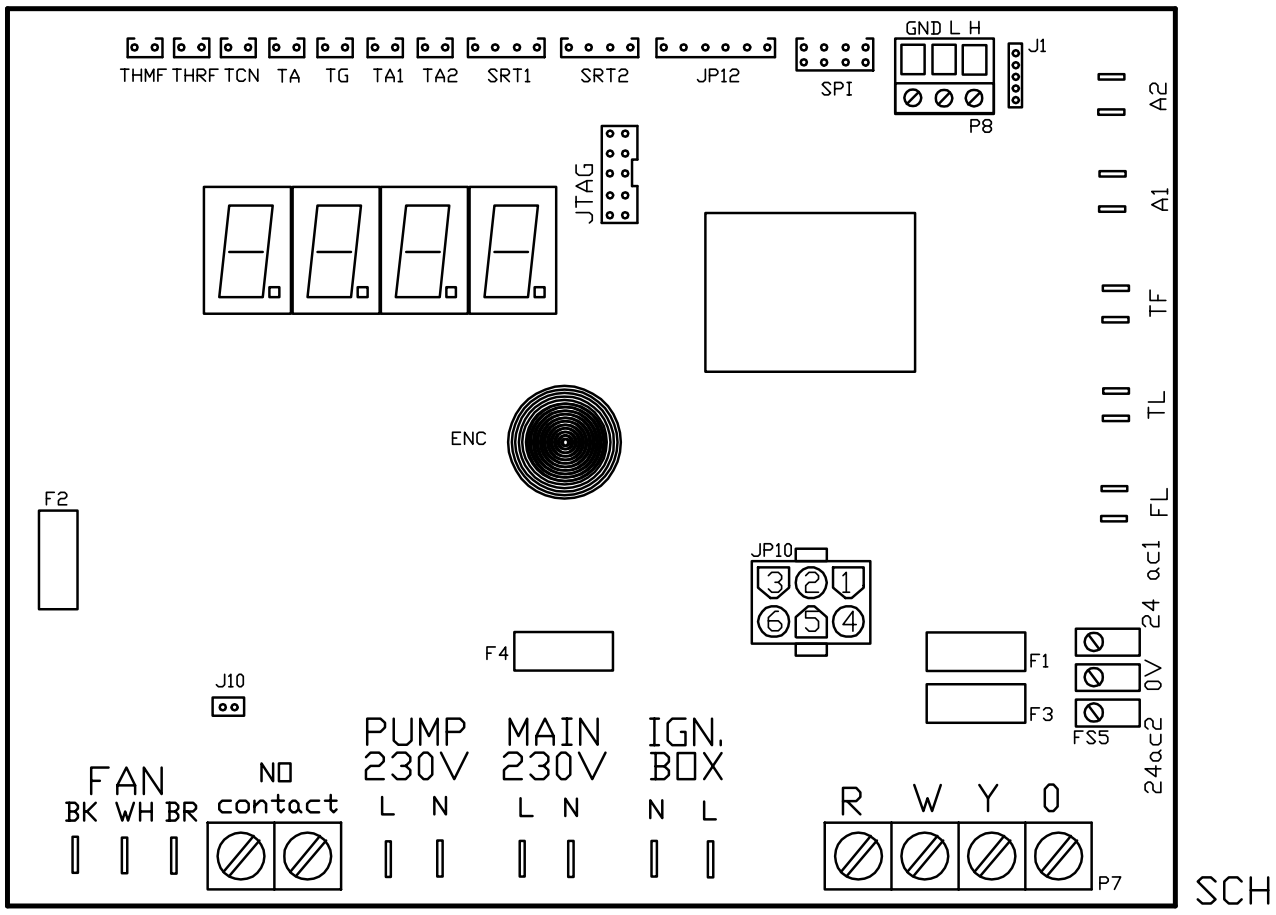


TER	Power supply terminal block 230 Vac	TG	Generator temperature sensor	PMP	Oil hydraulic pump motor
SCH1	Electronic board (S61)	SRT1	Oil pump rotation sensor	PWRTR	Tansformer 230/24 Vac
GV	Gas solenoid valve	TF	Flue gas thermostat	CNTBOX	Flame controller
LS	Gas flow warning lamp	TL	Generator limit thermostat (manual reset)	IGN	Ignition electrodes
PSW	Air pressure switch	FL	Water flow switch	IGNTR	Ignition transformer
THMF	Outlet water temperature probe	BLW	Blower motor	FLS	Detection electrode
THRF	Inlet water temperature probe	C	Blower condenser	KP	Installation water circulating pump relay (recovery circuit)
TCN	Condenser outlet temperature probe	FAN	Fan motor		
TA	Ambient air temperature probe	C2	Fan condenser		

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 the knob.

Figure 1.10 *Electronic board S61*



SCH	Electronic board S61	P8	(GND, L, H) CAN BUS connector	N.O. Contact	Circuit water circulation pump controller terminals
THMF	Water delivery temperature probe input	J1	CAN bus Jumper	J10	Circuit water circulation pump controller jumper
THRF	Water return temperature probe input	A1, A2	Auxiliary inputs (not used)	FAN	(BK, WH, BR) Fan output
TCN	Condenser outlet temperature probe input	TF	Flue gas thermostat input	JTAG	S61 board programming connector
TA	Ambient air temperature probe input	TL	Generator limit thermostat input	ENC	Knob
TG	Generator temperature probe input	FL	Water flow switch input	JP10	6-pole flame controller connector
TA1	Not used	FS5	Board supply input 24 Vac	F1	T 2A fuse
TA2	Not used	P7	(R, W, Y, O) operation request inputs	F2	T 10A fuse
SRT1	Oil pump rotation sensor input	IGN.BOX	(L, N) flame controller supply input 230 Vac	F3	T 2A fuse
SRT2	Not used	MAIN	board supply input 230 Vac	F4	T 3,15A fuse
JP12	Not used	PUMP	230V (L, N) oil hydraulic pump supply output		
SPI	Not used				

1.6 CONTROLS

Control device

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

- ► DDC controller
- ► external request

1.6.1 Control 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).
- ► Data display and parameters setting.
- ► Hourly programming.
- ► Climatic curve control.
- ► Diagnostics.
- ► Errors reset.
- ► Possibility to interface with a BMS.

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

1.6.2 Control system (2) with external request for heating or cooling (GAHP unit ON/OFF)

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 system (1). 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. 23*.

1.7 TECHNICAL DATA

Table 1.1 *GA ACF technical data*

				ACF 60-00	ACF 60-00 HR	ACF 60-00 TK	ACF 60-00 HT	ACF 60-00 LB
Operation in cooling mode								
Unitary cooling power	Outdoor temperature/Delivery temperature	A35W7	kW	17,7			17,1	-
		A35W-5	kW	-				13,3
Heat input	nominal (1013 mbar - 15 °C)		kW	25,3				
	real		kW	25,0				
Cold water temperature (outlet)	minimum		°C	3 (1)			5	-10
	nominal		°C	7				-5
Cold water temperature (inlet)	maximum		°C	45				
	minimum		°C	8				-7
Water flow rate	maximum		l/h	3500				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								
Recovery unit heat output	Outdoor temperature/Inlet temperature/1000 l/h water flow	A35W40	kW	-	21,0	-		
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	-		
Total GUE (40°C inlet temperature)	Outdoor temperature/Inlet temperature/1000 l/h water flow	A35W7	%	-	155	-		
Electrical specifications								
Power supply	voltage		V	230				
	type		-	single-phase				
	frequency		Hz	50				
Electrical power absorption	nominal		kW	0,82 (3)				
	nominal silenced		kW	0,87 (3)				
Degree of protection	IP		-	X5D				
Installation data								
Gas consumption	G20 natural gas (nominal)		m^3/h	2,68 (4)				
	LPG G30/G31 (nominal)		kg/h	1,97 (5)				1,94 (5)
sound power L_w (max)			dB(A)	79,6 (6)				
sound power L_w (max) silenced			dB(A)	75,0 (6)				
sound pressure L_p at 5 metres (max)			dB(A)	57,6 (7)				
sound pressure L_p at 5 m (maximum) silenced			dB(A)	53,0 (7)				
maximum water pressure in operation			bar	4,0				
Water content inside the apparatus	hot side		l	-	3	-		
	cold side		l	3				
Water fitting	type		-	F				
	thread		"	1 1/4				
Gas connection	type		-	F				
	thread		"	3/4				
Dimensions	width		mm	850				
	depth		mm	1230				
	height		mm	1445				
	silenced height		mm	1540				
Weight	in operation		kg	360	390	380		

(1) To be set (on demand) during the first startup. Default Minimum Temperature = 4,5 °C.
(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) PCI (G20) 34,02 MJ/m^3 (15 °C - 1013 mbar).
(5) PCI (G30/G31) 46,34 MJ/kg (15 °C - 1013 mbar).
(6) Sound power values detected in compliance with the intensity measurement methodology set forth by standard EN ISO 9614.
(7) Maximum sound pressure levels in free field, with directionality factor 2, obtained from the sound power level in compliance with standard EN ISO 9614.

			ACF 60-00	ACF 60-00 HR	ACF 60-00 TK	ACF 60-00 HT	ACF 60-00 LB
General information							
Cooling fluid	ammonia R717	kg	6,8	7,2	7,9	7,1	7,2
	water H_2O	kg	10,0	10,3	10,0	10,5	

(1) To be set (on demand) during the first startup. Default Minimum Temperature = 4,5 °C.
(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.
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(7) 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*

			ACF 60-00	ACF 60-00 HR	ACF 60-00 TK	ACF 60-00 HT	ACF 60-00 LB
PED data							
Components under pression	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 cooling circuit		bar g	32				
filling ratio		kg of NH_3/l	0,157	0,166	0,165	0,148	0,150
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

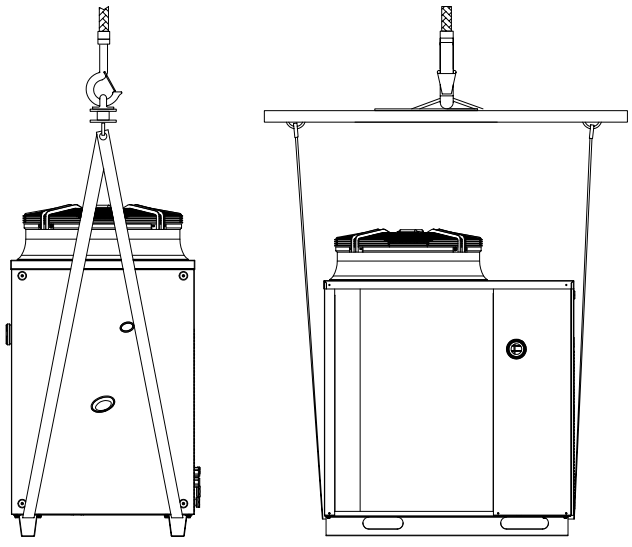
- The crane and lifting equipment must be suitable for the load.
- Do not stand under suspended loads.

2.2 HANDLING

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. 17*).
► Use lifting beams to avoid damaging the outer panels and finned coil (Figure 2.1 *p. 17*).
► 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 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.

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

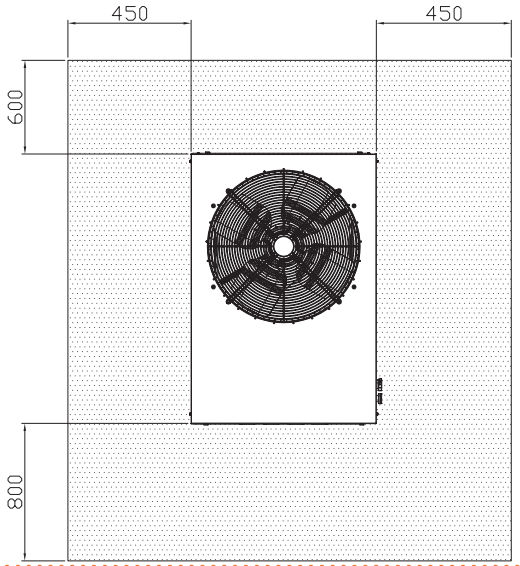
Distances from combustible or flammable materials

► 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. 18* (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 level 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 level 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 joints between the appliance and water and gas pipes.

3 HEATING ENGINEER

3.1 WARNINGS

General warnings

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

Compliance with installation standards

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

Installation must also comply with the manufacturer's provisions.

3.2 HYDRAULIC SYSTEM

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.

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.

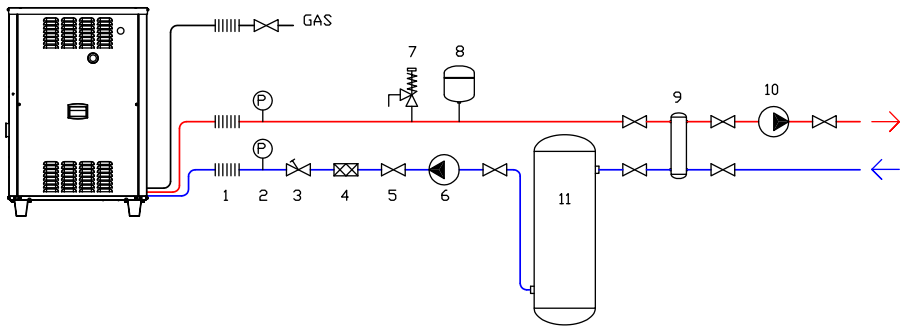
► For each GA unit provide a minimum water content in the installation of at least 70 litres.

► If necessary, provide for an inertial volume, to be suitably sized (see design manual).

Buffer tank

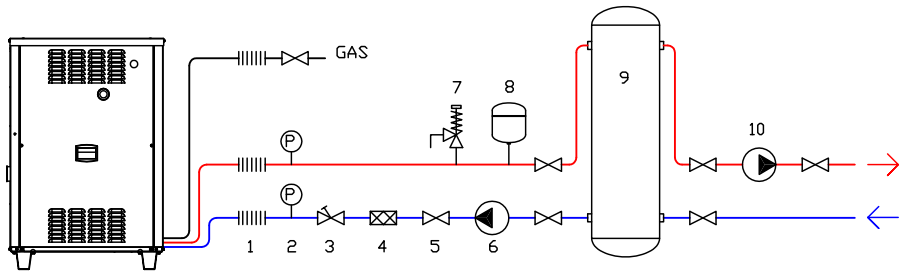
If using a buffer tank, it can be with 2 or 4 hydraulic connections, as shown in the following two diagrams (Figure 3.1 *p. 19*, 3.2 *p. 19*).

Figure 3.1 *2-pipe tank diagram*



1 Anti-vibration connection
2 Pressure gauge
3 Flow regulator 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-connection inertial buffer tank

Figure 3.2 *4-pipe tank diagram*



1 Anti-vibration connection
2 Pressure gauge
3 Flow regulator valve
4 Water filter
5 Shut-off valves
6 Water pump (primary circuit)
7 Safety valve (3 bar)
8 Expansion tank
9 4-connection inertial 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. 9*).

► A (= out) 1 1/4" F - chilled WATER OUTLET (m = outlet to the system)

► B (= in) 1 1/4" F - chilled WATER INPUT (r = inlet from the system)

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

► A (= out) 1 1/4" F - hot WATER OUTLET (m = outlet to the system)

► B (= in) 1 1/4" F - hot WATER INPUT (r = inlet from the system)

► D (= out) 1 1/41" F - chilled WATER OUTLET (m = outlet to the system)

► C (= in) 1 1/4" F - chilled WATER INPUT (r = inlet from the system)

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:

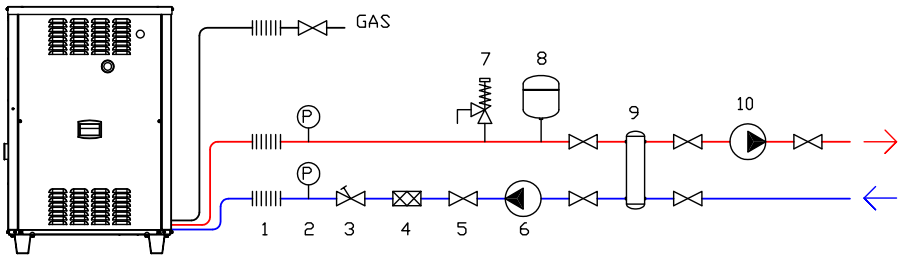
► on water piping, both output and input
  ■ 2 antivibration joints on water fittings
  ■ 2 pressure gauges
  ■ 2 isolation ball valves

► 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 output water piping
- 1 safety valve (3 bar)
- 1 expansion tank of the individual unit

Figure 3.3 *Hydraulic plan*



1 Anti-vibration connection
2 Pressure gauge
3 Flow regulator 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 pressure losses refer to Table 1.1 *p. 16* and Design Manual.

Constant flow circulation pump

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

3.5 ANTIFREEZE FUNCTION

Antifreeze self-protection

The appliance is equipped with an active antifreeze self-protection system to prevent freezing. The antifreeze function (deactivated by default) automatically starts the primary circulation pump when the outside temperature approaches zero.

Electrical continuity

The active antifreeze self-protection is only effective if the power supply is assured. Otherwise, antifreeze liquid might be required.

3.6 ANTIFREEZE LIQUID

Precautions with glycol

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

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

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 antifreeze glycol

Inhibited type glycol is recommended to prevent oxidation phenomena.

Glycol effects

The Table 3.1 *p. 20* shows, indicatively, the effects of using a glycol depending on its %.

Table 3.1 *Technical data for filling the hydraulic circuit*

Glycol %	Water-glycol mixture freezing temperature	Percentage of increase in pressure drops	Loss of efficiency of unit
10	-3 °C	-	-
15	-5 °C	6,0%	0,5%
20	-8 °C	8,0%	1,0%
25	-12 °C	10,0%	2,0%
30	-15 °C	12,0%	2,5%
35	-20 °C	14,0%	3,0%
40	-25 °C	16,0%	4,0%

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. 21*). Failure to comply with the manufacturer's guidelines may affect operation, integrity and life of the appliance, voiding the warranty.

System water characteristics

Free chlorine or water hardness may damage the appliance.
Adhere to the chemical-physical parameters in Table 3.2 *p. 21* 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	**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

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 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. 9* and 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, next to the appliance, to isolate it when required.
► Perform connection in compliance with applicable regulations.

Gas pipes sizing

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

Supply gas pressure

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

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

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

Table 3.3 *Network gas pressure*

		Gas supply pressure							
Product category	**Countries of destination**	**G20** [mbar]	**G25** [mbar]	**G30** [mbar]	**G31** [mbar]	**G25.1** [mbar]	**G25.3** [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}	BG, CH, CZ, ES, GB, HR, IE, IT, LT, MK, PT, SI, SK, TR	20			37				
	RO	20			30				
	AT	20			50				
$II_{2ELL3B/P}$	DE	20	20	50	50				
II_{2Esi3P}; II_{2Er3P}	FR	20	25		37				
$II_{2HS3B/P}$	HU	25		30	30	25 (1) (2)			
II_{2E3P}	LU	20			50				
$II_{2L3B/P}$	NL		25	30	30				
$II_{2EK3B/P}$	NL	20		30	30		25 (1) (2)		
$II_{2E3B/P}$	PL	20		37	37				
$II_{2ELwLs3B/P}$		20		37	37			20 (2)	13 (2)
$II_{2ELwLs3P}$		20			37			20 (2)	13 (2)
$I_{2E(S)}$; I_{3P}	BE	20	25		37				
I_{3P}	IS				30				
I_{2H}	LV	20							
$I_{3B/P}$	MT			30	30				
I_{3B}				30					

(1) GAHP-AR not approved for G25.1, G25.3 gases.
(2) GA ACF not approved for G25.1, G27, G2.350, G25.3 gases.

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.1 *p. 4*, providing important information on regulations and on safety.

Compliance with installation standards

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

Installation must also comply with the manufacturer's provisions.

Live components

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

Earthing

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

Cable segregation

Keep power cables physically separate from signal ones.

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

■ Never use the external isolation switch (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 circulation pump

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

4.2 ELECTRICAL SYSTEMS

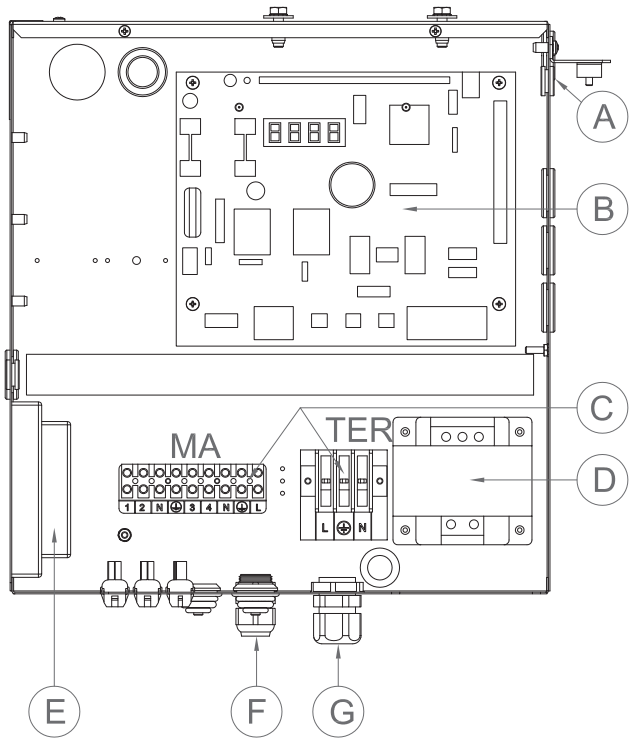
Electrical connections must provide:
► power supply (Paragraph 4.3 *p. 23*)
► control system (Paragraph 4.4 *p. 23*)

How to make connections

All electrical connections must be made in the appliance's electrical panel (Figure 4.1 *p. 23*):

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 *ACF Electrical Panel*



A CAN bus cable gland
B Electronic board S61
C MA and TER terminal boards
D Transformer 230/24 V AC
E Flame control box
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-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.

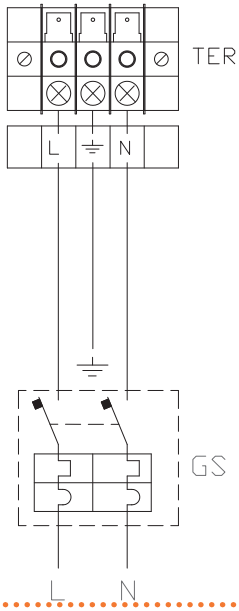
The switches must also provide disconnector capability, with min contact opening 4 mm.

How to connect the power supply

To connect the three-pole power supply cable (Figure 4.2 *p. 23*):

1. Access the electrical board of the appliance according to the Procedure 4.2 *p. 22*.
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

Control systems, options (1) or (2)

Two separate control systems are provided, each with specific features, components and diagrams (Figures 4.4 *p. 24*, 4.7 *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 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).

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. 24* (admissible types and maximum distances).

For lengths ≤200 m and max 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*

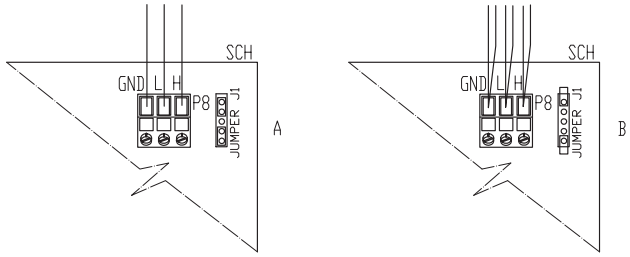
CABLE NAME	SIGNALS / COLOR			MAX LENGTH	Note
Robur					Ordering Code OCVO008
ROBUR NETBUS	H= BLACK	L= WHITE	GND= BROWN	450 m	
Honeywell SDS 1620					In all cases the fourth conductor should not be used
BELDEN 3086A	H= BLACK	L= WHITE	GND= BROWN	450 m	
TURCK type 530					
DeviceNet Mid Cable					
TURCK type 5711	H= BLUE	L= WHITE	GND= BLACK	450 m	
Honeywell SDS 2022					
TURCK type 531	H= BLACK	L= WHITE	GND= BROWN	200 m	

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. 24* and 4.4 *p. 24*):

1. Access the electrical board of the appliance according to the Procedure 4.2 *p. 22*.
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 of the following Paragraphs and DDC Manual.

Figure 4.3 *Connection of the CAN bus cable to the electronic board*

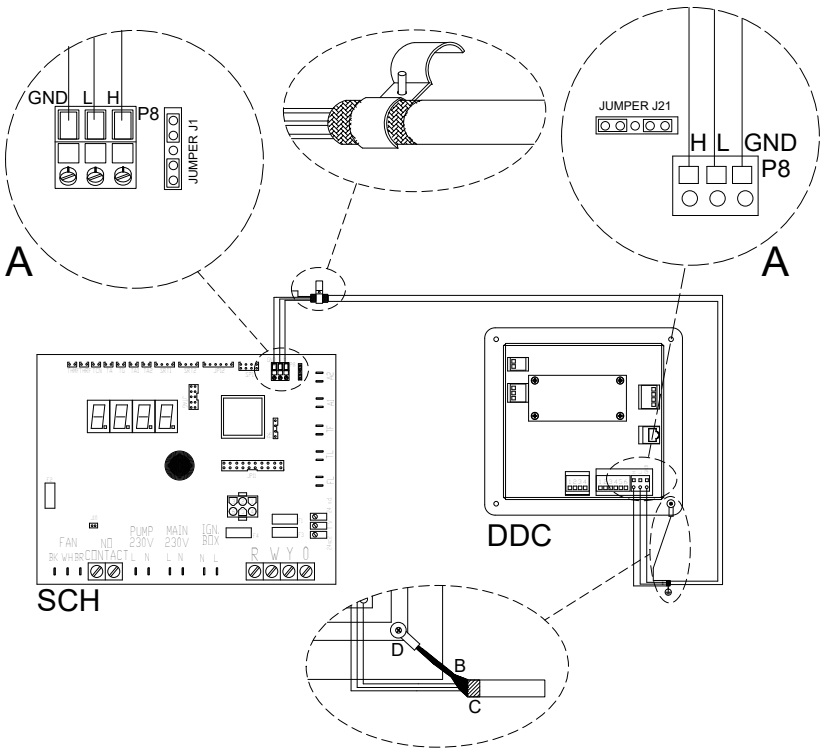


SCH	Electronic board
GND	Common data
L	Data signal LOW
H	Data signal HIGH
J1	Jumper CAN bus in board
A	detail of "terminal node" case (3 wires; J1 = jumper "closed")
B	Detail of "intermediate node" case (6 wires; J1 = jumper "open")
P8	CAN port/connector

GAHP Configuration (S61) + DDC

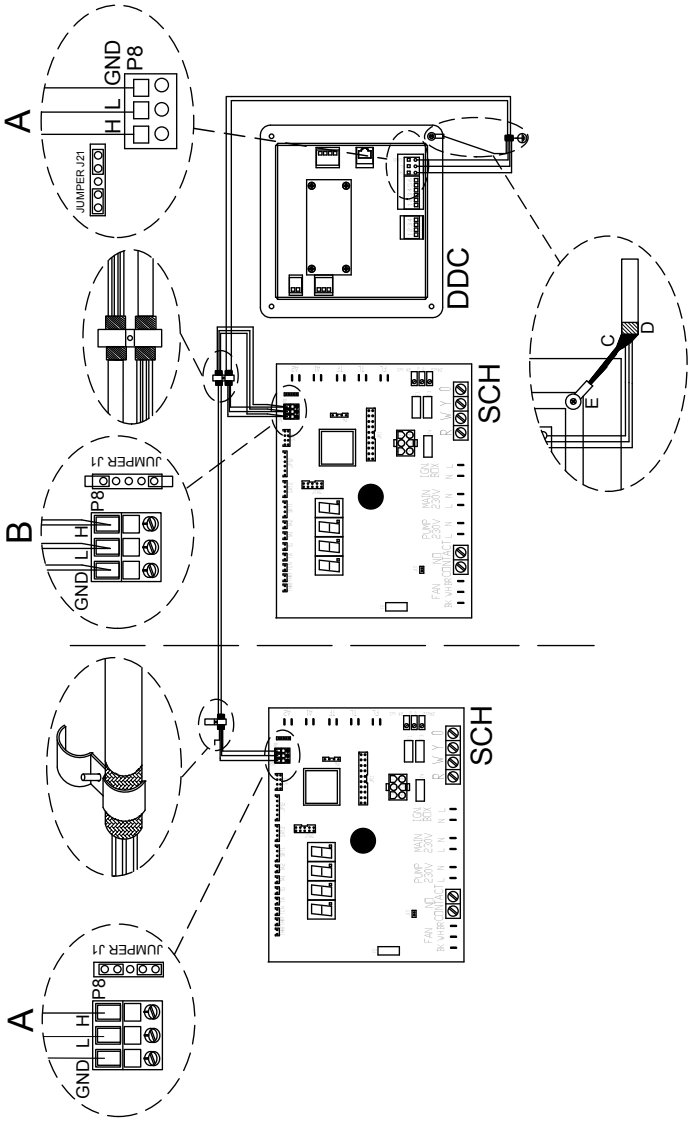
System (1) see also Paragraph 1.6 *p. 15*.

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



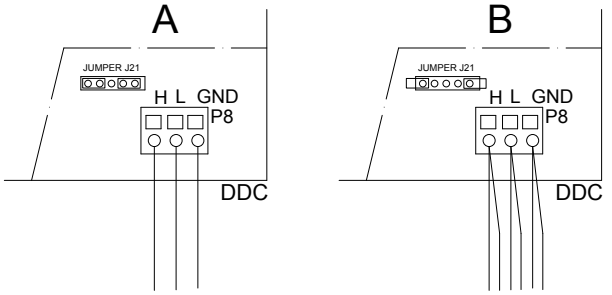
DDC	Direct Digital Control
SCH	S61 controller
J1	Jumper CAN bus in board
J21	Jumpers CAN bus on DDC board
H,L,GND	Data signal wires (ref. cables table)
A	Terminal node connection (3 wires; J1 and J21 = "closed")
B	CAN bus cable shield
C	Insulating tape to protect the shield of the CAN bus cable
D	Eyelet terminal and fixing screw

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



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

External request

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

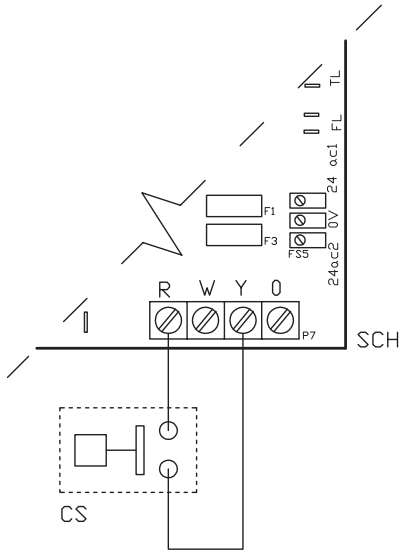
► Enable device (e.g. thermostat, timer, switch, ...) fitted with a voltage-free NO contact.

How to connect the external request

Connection of external request is effected on the S61 board located in the electrical panel inside the unit (Figure 4.7 *p. 26*):

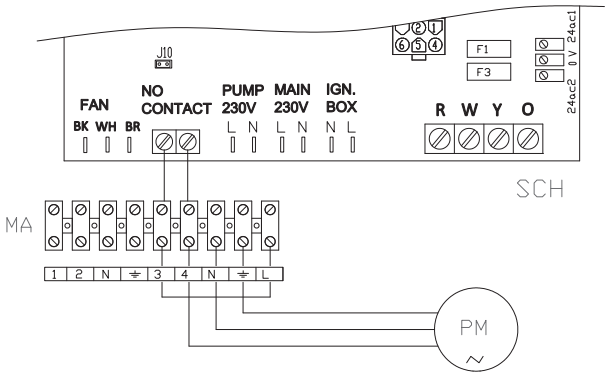
1. Access the electrical board of the appliance according to the Procedure 4.2 *p. 22*.
2. Connect the voltage-free contact of the external device (Detail CS), through two wires, to **terminals R and Y** (respectively: common 24 V AC and cooling request) of electronic board S61.

Figure 4.7 *External cooling request connection*



SCH Electronic board
R Common
Y Cooling request terminal
Components NOT SUPPLIED
CS External request

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



SCH Electronic board
J10 Jumper (1)
N.O. CONTACT N.O voltage-free contacts
MA unit 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.

4.5 WATER CIRCULATION PUMP

4.5.1 Constant flow circulation pump

It must be mandatorily controlled from the S61 electronic board. The diagram in Figure 4.8 *p. 26* is for pumps < 700 W. For pumps > 700 W it is required to add a control relay and arrange Jumper J10 OPEN.

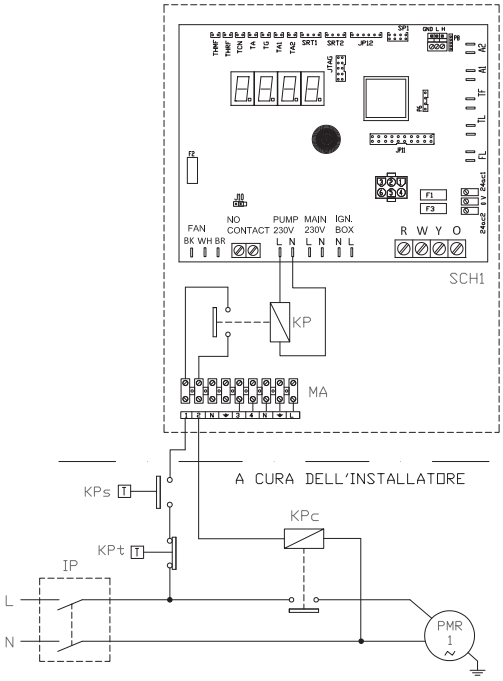
How to connect the constant flow circulating pump

1. Access the electrical board of the appliance according to the Procedure 4.2 *p. 22*.
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.

4.5.2 Heat recovery exchanger pump

To be controlled through contacts 1 - 2 on terminal block MA (Figure 4.9 *p. 27*).

Figure 4.9 *Recovery exchanger pump connection*



KP	Relay on the unit for recovery exchanger pump request
KPt	Thermostat with setpoint 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)
IP	Two-pole isolation switch for recovery exchanger pump power supply (not supplied)
PMR	Recovery exchanger pump (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, electrical and gas systems suitable for the required capacities and equipped with all safety and control devices required by the regulations in force.
- Absence of leaks in the water and gas systems.
- Type of gas for which the appliance is designed (natural gas or LPG).
- Supply gas pressure complying with the values of Table 3.3 *p. 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 request).
- 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.

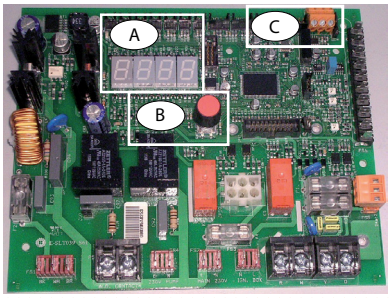
5.2 ELECTRONIC ADJUSTMENT ON THE MACHINE – MENUS AND PARAMETERS OF THE S61 BOARD

Firmware

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

The appliance's electronic board (S61)

Figure 5.1 *Electronic board S61*



Display

The 4-digit display of the S61 board (Detail A Figure 5.1 *p. 28*) 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 5.1 *p. 28*):

- 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 7.5 *p. 31*).
- 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 failure).
To access the menus and parameters of the S61 board, proceed as follows (see also Figure 5.1 *p. 28*):

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 setpoint 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.

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.

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 75 (= water temperature setpoint) by rotating and pressing the knob; "3._75" must be displayed (procedure Paragraph 5.2 *p. 28*).
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 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.

6.1 WARNINGS

General warnings

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

First startup by TAC

First start-up may exclusively be carried out by a Robur TAC (Chapter 5 *p. 27*).

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

How to switch on/off

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

After switching on with the control, in normal operating conditions, the appliance starts/stops automatically according to the user's cooling 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 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 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 request) 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. 30* and 7.2 *p. 30*) 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. 30*.

Table 7.1

		GAHP A	GAHP GS/WS	AY00-120	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 discharge 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. 30*, at least once every 2 years.

Table 7.2

		GAHP A	GAHP GS/WS	AY00-120	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 discharge is clean	√	√	√	-	-
	replace the silicone gasket between the front plate and the exchanger	-	-	√	-	-

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

7.4 MESSAGES ON THE DISPLAY

4 digit display

The S61 board of the appliance (Paragraph 1.5 *p. 14*, Figure 5.1 *p. 28*) 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.

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).
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, blinks.
If it is a permanent error or warning the appliance stops.
(Table 8.1 *p. 32*).

7.5 RESTARTING A LOCKED-OUT UNIT

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. 32*).
► 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-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.

Reset

There are two options for resetting a fault:
If the appliance is connected to a DDC you may act through the control device, as described in the relevant manual.
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 5.2 *p. 28*).
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"). 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. Assure at least one of the two following conditions:

1. sufficient antifreeze glycol (Paragraph 3.6 *p. 20*)
2. empty the system, however taking care to fill it again following the instructions in Paragraph 3.8 *p. 21*

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. 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. 23*).
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. 20*).

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. 30* and 7.3 *p. 30*).
■ Check content and quality of the water in the system, and if necessary top it up (Paragraphs 3.8 *p. 21*, 3.7 *p. 21* and 3.6 *p. 20*).
■ 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. 23*).
3. Switch on the appliance by means of the provided control device (DDC or external request, Paragraph 4.4 *p. 23*).

8 DIAGNOSTICS

8.1 OPERATIVE CODES

Table 8.1 *Operative codes*

Code	Description	Warning (u)	Error (E)
0	Flame controller reset circuit fault	NA	Power cycle the appliance. If the code persists, shows up again or in case of doubt, contact the TAC.
1	Limit thermostat trip	Contact the TAC.	
2	Flue gas thermostat trip	Contact the TAC.	
3	Chilled water antifreeze thermostat trip	Reset is automatic when the triggering condition ceases.	NA
4	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). If the code persists, shows up again or in case of doubt, contact the TAC.
5	Outdoor temperature exceeding operational limits	Reset is automatic when the triggering condition ceases.	NA
6	Outdoor temperature below operational limits	Reset is automatic when the triggering condition ceases.	NA
7	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). If the code persists, shows up again or in case of doubt, contact the TAC.
8	Flame controller error	NA	Contact authorised Technical Assistance
10	Low chilled water flow	Reset is automatic when the triggering condition ceases.	Check and clean water filters on the system. Check for air in the system. Check water flow pump. Power cycle the appliance. Reset may be performed from the DDC or from the S61 board (menu 2, parameter 1). 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). If the code persists, shows up again or in case of doubt, contact the TAC.
12	Flame controller lockout	Reset is automatic up to 4 attempts (in about 5 minutes).	Check gas supply. Reset may be performed from the DDC or from the S61 board (menu 2, parameter 0). If the code persists or in case of doubt, contact the TAC.
16	Chilled water delivery temperature probe fault	NA	Reset may be performed from the DDC or from the S61 board (menu 2, parameter 1). If the code persists, shows up again or in case of doubt, contact the TAC.
17	Chilled water inlet temperature probe fault	NA	Reset may be performed from the DDC or from the S61 board (menu 2, parameter 1). If the code persists, shows up again or in case of doubt, contact the TAC.
18	Condenser temperature probe fault	NA	Reset may be performed from the DDC or from the S61 board (menu 2, parameter 1). If the code persists, shows up again or in case of doubt, contact the TAC.
20	Generator temperature probe fault	NA	Reset may be performed from the DDC or from the S61 board (menu 2, parameter 1). If the code persists, shows up again or in case of doubt, contact the TAC.
28	Flame controller error	NA	Power off the appliance. Contact the TAC.
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). If the code persists, shows up again or in case of doubt, contact the TAC.
32	Chilled water temperature exceeding operational limits	Check configuration of other chillers on the system. Check water flow. Check system's chilling load. Reset is automatic when the triggering condition ceases.	NA

51	Cooling antifreeze function activated	Non-blocking Warning (informative code). The code clears automatically when antifreeze function execution ends.	NA
61	Oil pump priming cycle activated	The priming cycle lasts 30' if activated manually or 10 minutes if activated automatically. Reset is automatic when the triggering condition ceases.	NA
77	Water flow while system in heating mode	Reset is automatic when the triggering condition ceases.	NA
80	Incomplete functional parameters	Contact the TAC.	
81	Invalid bank 1 parameters	Reset is automatic when the triggering condition ceases.	Contact the TAC.
82	Invalid bank 2 parameters	Reset is automatic when the triggering condition ceases.	Contact the TAC.
84	Transformer or 24 Vac fuse fault	NA	Contact the TAC.
85	Invalid module type configuration parameters	NA	Contact the TAC.
86	ROM board fault	NA	Contact the TAC.
87	pRAM board fault	NA	Contact the TAC.
88	xRAM board fault	NA	Contact the TAC.
89	Registers board fault	NA	Contact the TAC.
90	Outdoor temperature probe fault	NA	Reset may be performed from the DDC or from the S61 board (menu 2, parameter 1). If the code persists, shows up again or in case of doubt, contact the TAC.
91	Electronic board fault	NA	Contact the TAC.

NA: Not Applicable

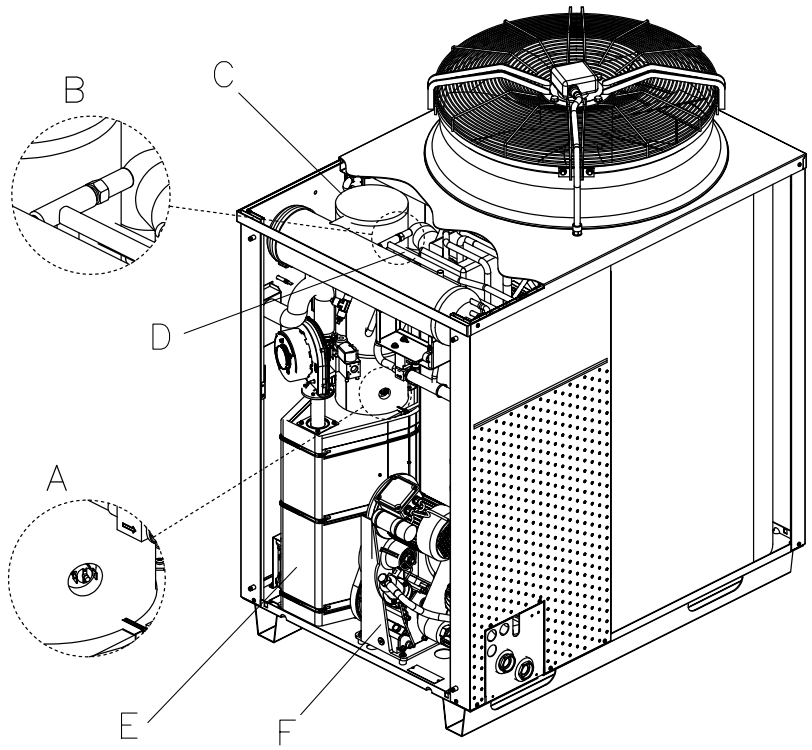
9 APPENDICES

9.1 SAFETY DEVICES

9.1.1 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 9.1 *p. 34*).

Figure 9.1 *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 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				

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 *p. 38*);
4. re-mount the front and upper panel of the unit.

9.1.2 Additional safety devices

The following additional safety devices are installed on the appliance:

- ► Generator limit thermostat (see pos. A in the Figure 9.1 *p. 34*).
- ► Bypass valve (see pos. B in the Figure 9.1 *p. 34*).

The main features of the two devices are given in Table 9.2 *p. 35*.

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. 35*). The manufacturer is exempt from any contractual or extra-contractual responsibility for damage caused by the use of non-original spare parts.

9.1.3 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.)

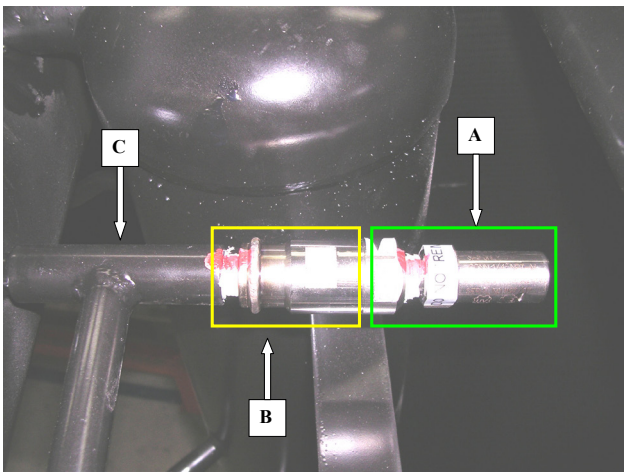
Material necessary for the intervention (see Figure 9.2 *p. 35*):
- ► n. 2 CH22 face spanners
- ► n. 1 CH8 box spanner
- ► spare parts kit made up from (see key in Figure 9.2 *p. 35*).

Figure 9.2 *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 9.3 *p. 36*.

Figure 9.3 *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 9.4 *p. 36*).

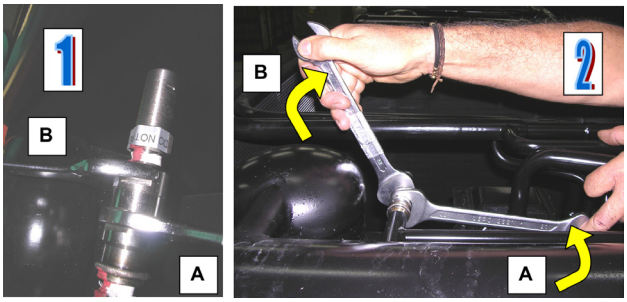
WARNING! DO NOT REMOVE THE COMPONENTS DISTINGUISHED BY THE WAX SEAL.

1. Loosen the inspection valve in the direction indicated in detail "2" of Figure 9.4 *p. 36* until complete assembly as indicated in Figure 9.5 *p. 37* paying attention not to loosen part "B" of the inspection valve (see Figure 9.3 *p. 36*);

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 9.6 *p. 37*.
3. Tighten part "B" of the inspection valve to part "A" (see Figure 9.7 *p. 37*)
4. Tighten the valve, applying a torque of 62 Nm.

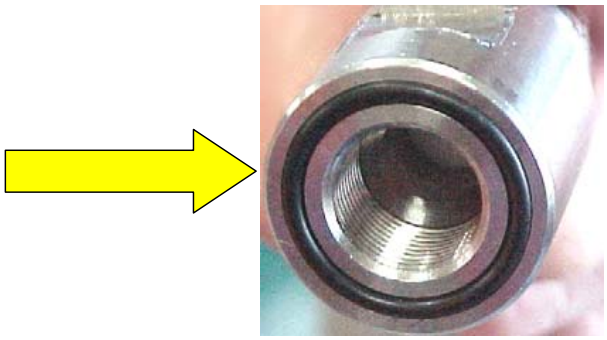
Figure 9.4 *Safety valve disassembly - Details 1 and 2 of safety valve disassembly*



A hold in place
B turn counterclockwise

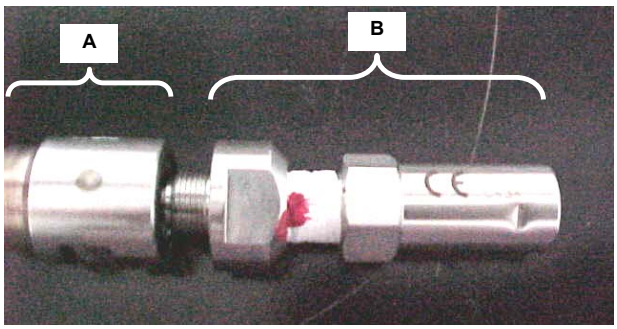
Figure 9.5 *Removal of safety valve mobile part - Removal of safety valve*

Figure 9.6 *o-ring - Down view*



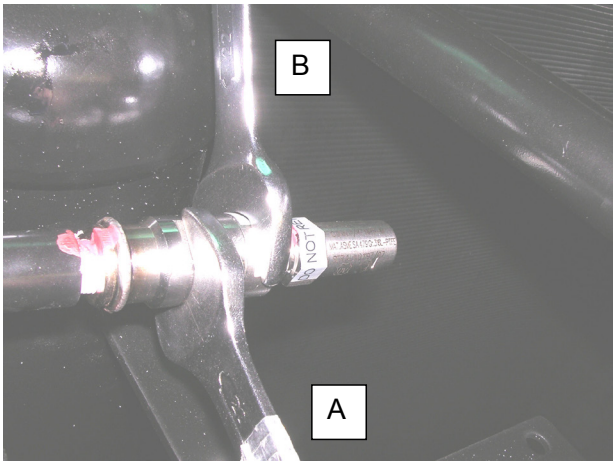
Detail O-ring

Figure 9.7 *Inspection valve - Detail A of fixed part, detail B of removable part*



A Fixed part
B Removable part

Figure 9.8 *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.

9.1.4 Non-condensable or non-absorbable gases

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 interruption 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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