caring for the environment

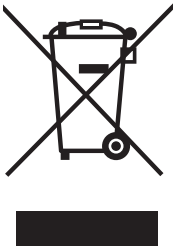
Installation, use and maintenance manual

GAHP GS/WS

water/water gas absorption heat pump

powered by gas and renewable energies

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



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

Revision: W
Code: D-LBR509

INDEX OF CONTENTS

I INTRODUCTION

Installation, use and maintenance manual

This Manual is an integral part of the GAHP GS/WS units 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 GAHP GS/WS unit needs a control device (DDC, CCP/CCI or external requests), 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

GAHP appliance/unit = equivalent terms, both used to designate the GAHP gas powered absorption heat pump (Gas Absorption Heat Pump).
TAC = Technical Assistance Centre authorised by Robur.
External request = generic control device (e.g. thermostat, timer or any other system) equipped with a voltage-free NO contact and used as control to start/stop the GAHP unit.
CCI Controller (Comfort Controller Interface) = optional Robur control device which lets you manage up to three consistent modulating GAHP units (GAHP A, GAHP GS/WS) only for heating.
CCP Controller (Comfort Control Panel) = Robur control device which lets you manage in modulation mode up to 3 consistent GAHP units (GAHP A, GAHP GS/WS) and all system components (probes, diverter/mixing valves, circulating pumps), including any integration boiler.
DDC Control (Direct Digital Controller) = optional Robur control device to manage one or more Robur appliances in ON/OFF mode (AY00-120 heat pumps, GA chillers) or in modulating mode (AY boilers).
RB100/RB200 Devices (Robur Box) = optional interface devices complementary to DDC, which may be used to broaden its functions (heating/cooling/DHW production service demands and control of system components such as third party generators, adjustment valves, circulators, probes).
Heat generator = equipment (e.g. boiler, heat pump, etc..) producing heating and/or DHW.
GUE (Gas Utilization Efficiency) = efficiency index of gas heat pumps, equal to the ratio between the thermal energy produced and the energy of the fuel used (relative to LCV, lower calorific value).
First start-up = appliance commissioning operation which may only and exclusively be carried out by a TAC.
S61/Mod10/W10 Boards = electronic boards on the GAHP 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.

Packing

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

Misuse

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

Use of the appliance by children

The appliance can be used by children over 8 years old, and by people with reduced physical, sensory or mental capabilities, or lack of experience or knowledge, only if they are under surveillance or after they have received instructions regarding safe use of the appliance and understanding the dangers inherent in it. Children should not play with the appliance.

Hazardous situations

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

Gas component tightness

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

Gas smell

If you smell gas:

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

Poisoning

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

Moving parts

The appliance contains moving parts.

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

Burn hazard

The appliance contains very hot parts.

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

Pressure vessels

The appliance has a sealed circuit classified as pressure vessel, the tightness of which is tested by the manufacturer.

- Do not carry out any intervention on the sealed circuit or on the appliance's valves.

Water-ammonia solution

The GAHP 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.

- 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. 22*.

Aggressive substances in the air

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

Acid flue gas condensate

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

Switching the appliance off

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

- Except in the 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, CCP/CCI or external request).

In the event of failure

Operations on internal components and repairs may exclusively be carried out by a TAC, using only original spare parts.
- In the event of failure of the appliance and/or breakage of any component, do not attempt to repair and/or restore and immediately contact the TAC.

Routine maintenance

Proper maintenance assures the efficiency and good operation of the appliance over time.
- Maintenance must be performed according to the manufacturer's instructions (see Chapter 7 *p. 36*) and in compliance with current regulations.
- Appliance maintenance and repairs may only be entrusted to firms legally authorised to work on gas appliances and systems.
- Enter into a maintenance contract with an authorised specialised firm for routine maintenance and for servicing in case of need.
- Use only original parts.

Decommissioning and disposal

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

Keep the Manual

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

III.2 COMPLIANCE

EU directives and standards

The absorption heat pumps of the GAHP series are certified as conforming to standard EN 12309 and comply with the essential requirements of the following Directives:
- ► 2016/426/EU "Gas Appliances Regulation" as amended and added.
- ► 2014/30/EC "Electromagnetic Compatibility Directive" as amended and added.
- ► 2014/35/EC "Low Voltage Directive" as amended and added.
- ► 2006/42/EC "Machine Directive" as amended and added.
- ► 2014/68/EU "Pressure Equipment Directive" as amended and added.
- ► 811/2013/EU "Energy-Related Products regulation" as amended and added.
- ► 813/2013/EU "Ecodesign requirements regulation" as amended and added.

Furthermore, they comply with the requirements of the following standards:
- ► 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 cooling systems, and heat pumps.
- ► Environmental protection and combustion products exhaust.
- ► Fire safety and prevention.
- ► Any other applicable law, standard and regulation.

III.3 EXCLUSIONS OF LIABILITY AND WARRANTY

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

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

1 FEATURES AND TECHNICAL DATA

1.1 FEATURES

1.1.1 Operation

Based on the thermodynamic water-ammonia absorption cycle (H_20–NH_3), the appliance simultaneously produces hot water and chilled water, using the ground or well/ground/surface water as a renewable energy source (cold source) and natural gas (or LPG) as primary energy.
The thermodynamic cycle takes place within a hermetically sealed circuit, in welded construction, perfectly tight, factory-tested, which does not require any maintenance or coolant top-ups.

1.1.2 Mechanical and thermo-hydraulic components

- Steel sealed circuit, externally treated with epoxy paint.
- Sealed combustion chamber (type C).
- Metal mesh radiant burner, equipped with ignition electrodes and flame detection, managed by an electronic flame control box.
- Titanium stainless steel shell-and-tube water exchanger (condenser), externally insulated.
- Titanium stainless steel shell-and-tube water exchanger (evaporator), externally insulated.
- Low power consumption refrigerant fluid oil pump.
- Stainless steel, shell-and-tube recovery exchanger of flue gas latent heat.

1.1.3 Control and safety devices

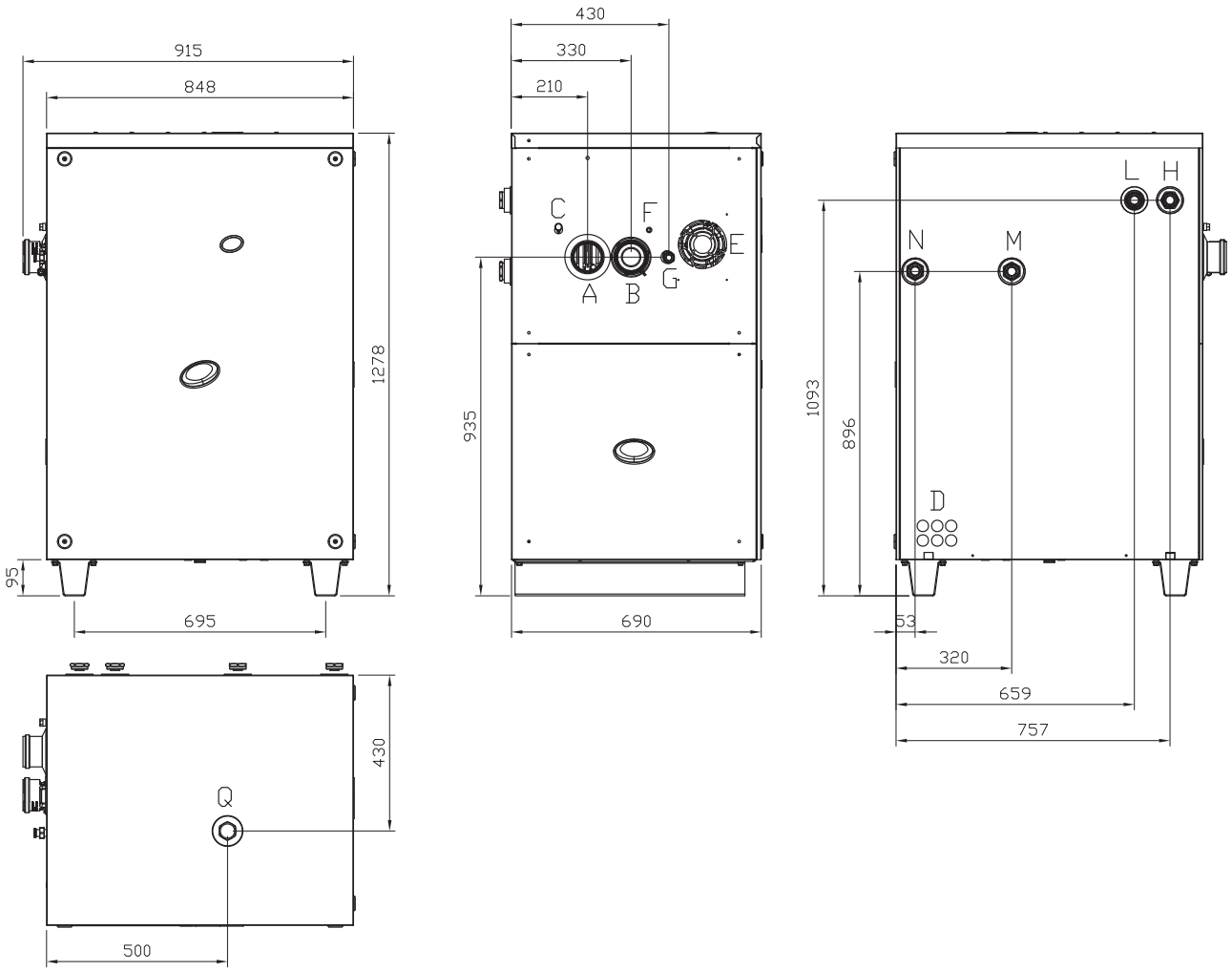
- S61 electronic board with microprocessor, LCD display and knob.
- Mod10 additional electronic board (integrated in S61).
- Auxiliary W10 electronic board.
- Installation water flow meter (hot side).
- Installation water flow switch (cold side).
- Generator limit thermostat, with manual reset.
- Flue gas thermostat, with manual reset.
- Generator fins temperature probe.
- Sealed circuit safety relief valve.
- Bypass valve, between high and low-pressure circuits.
- Ionization flame control box.
- Double shutter electric gas valve.
- Antifreeze function for hydraulic system.
- Condensate drain obstruction sensor.

1.1.4 Outdoor and indoor versions

The GAHP GS/WS units are available in two versions, indoor or outdoor, according to the installation site.

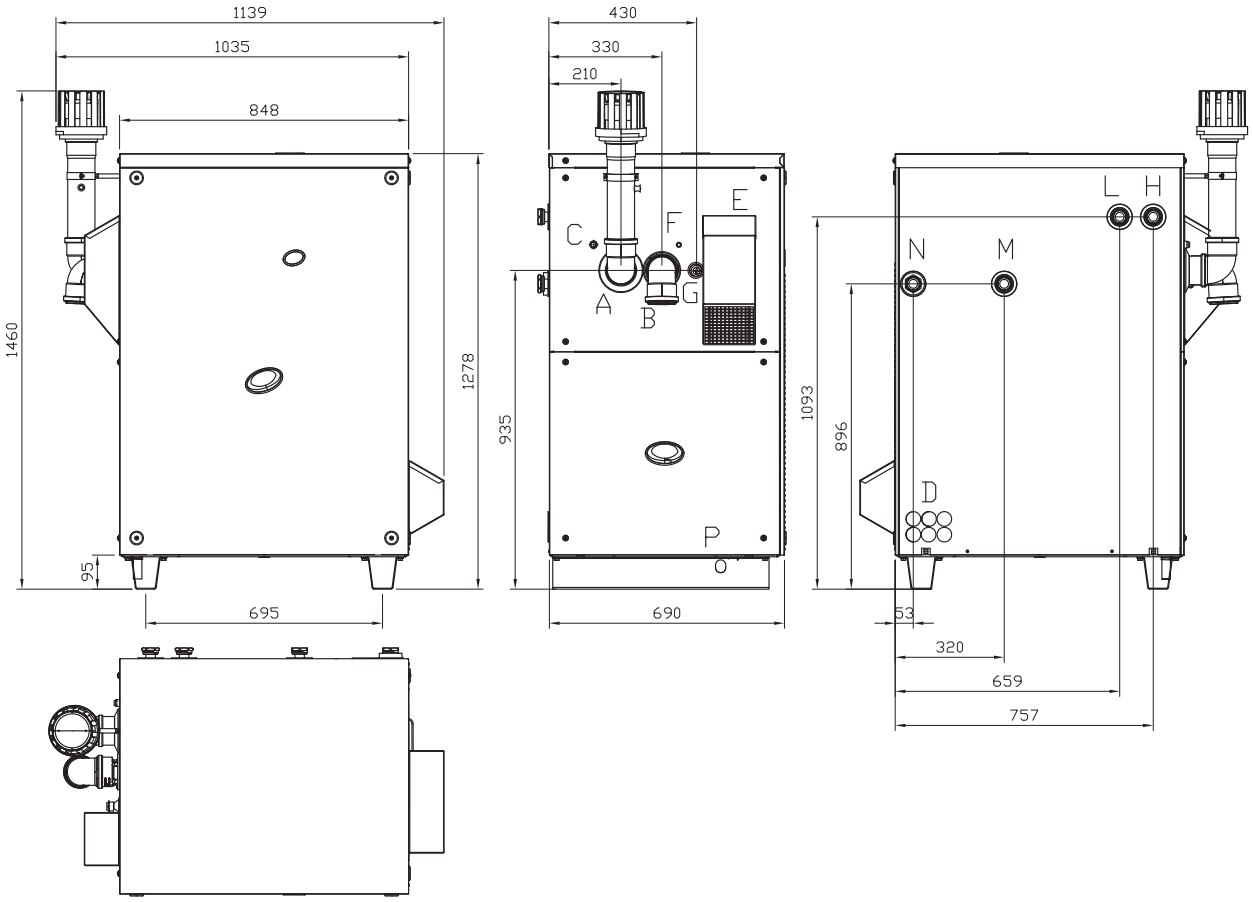
1.2 DIMENSIONS

Figure 1.1 *Indoor GAHP GS/WS dimensions*



A	Flue gas outlet Ø 80 mm	E	Ventilation fan	L	Renewable source water return Ø 1 1/4" F
B	Combustion air intake Ø 80 mm	F	Burner on warning light	M	Renewable source water delivery Ø 1 1/4" F
C	Fumes thermostat manual reset	G	Gas connection Ø 3/4" F	N	Hot water outlet Ø 1 1/4" F
D	Power supply cables input	H	Hot water inlet Ø 1 1/4" F	Q	Safety valve drain ducting Ø 1 1/4"

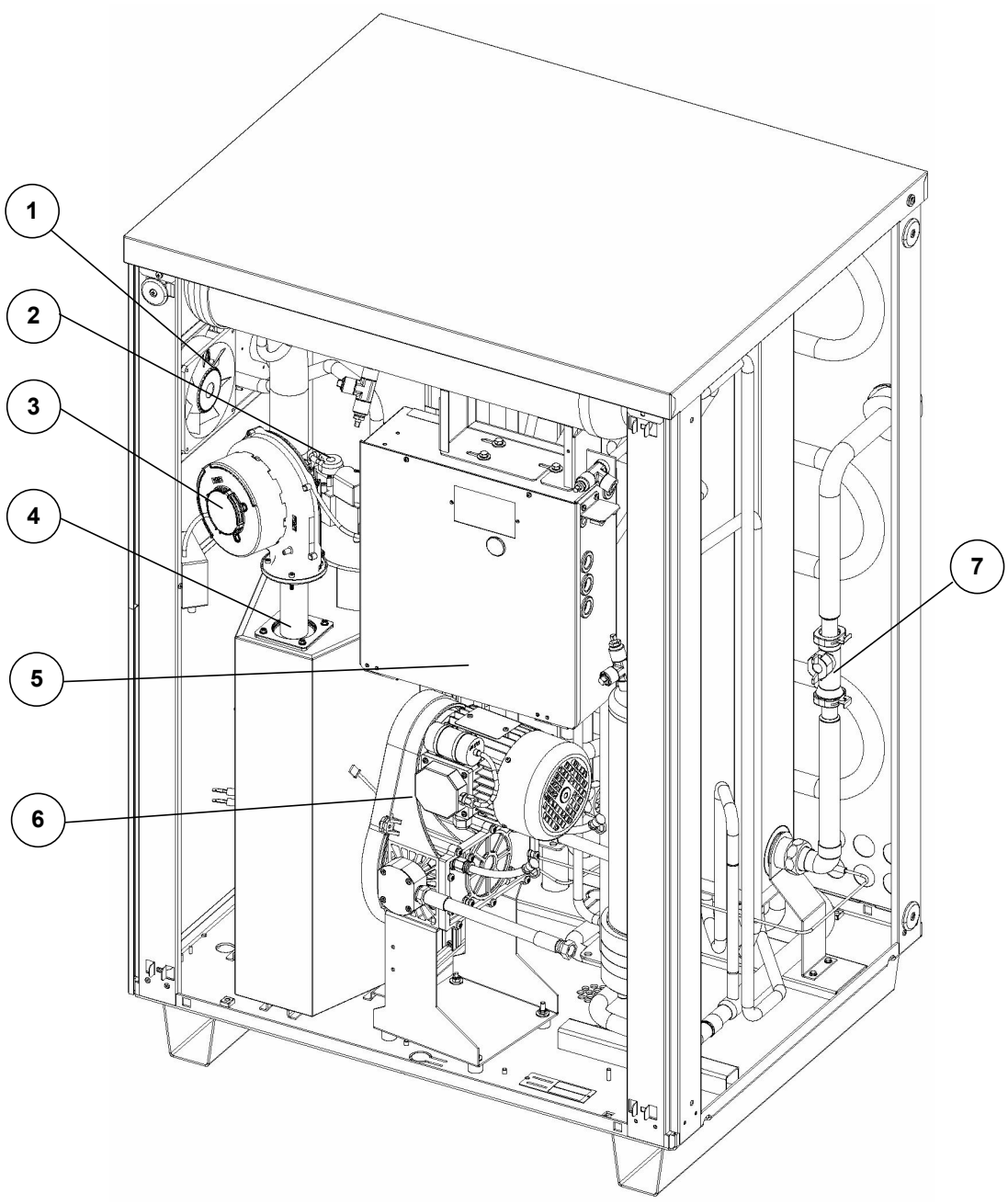
Figure 1.2 *Outdoor GAHP GS/WS dimensions*



A	Flue gas outlet Ø 80 mm	E	Ventilation fan	L	Renewable source water return Ø 1 1/4" F
B	Combustion air intake Ø 80 mm	F	Appliance operation warning light	M	Renewable source water delivery Ø 1 1/4" F
C	Fumes thermostat manual reset	G	Gas connection Ø 3/4" F	N	Hot water outlet Ø 1 1/4" F
D	Power supply cables input	H	Hot water inlet Ø 1 1/4" F	P	Condensate drain

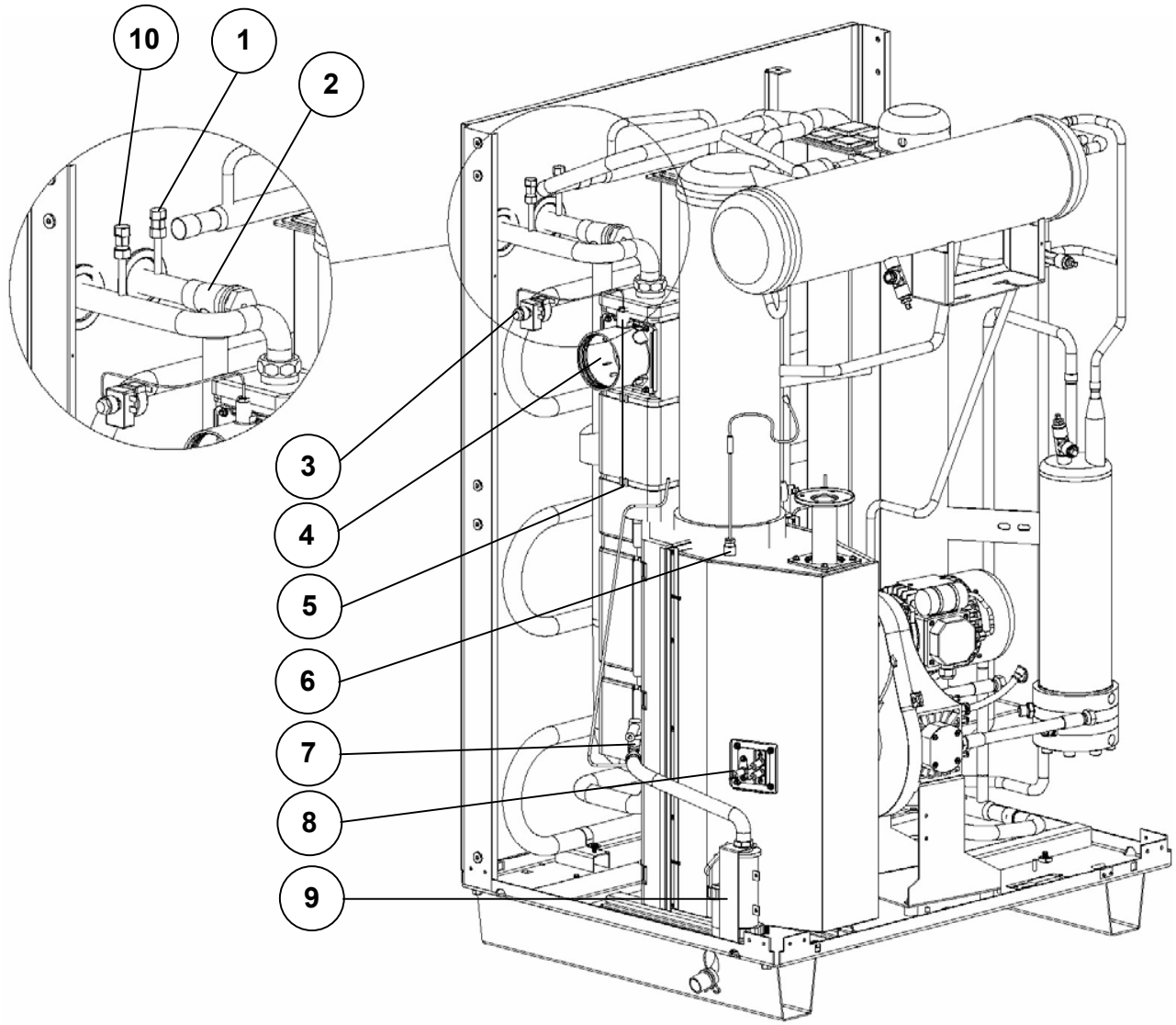
1.3 COMPONENTS

Figure 1.3 *Internal components - front view*



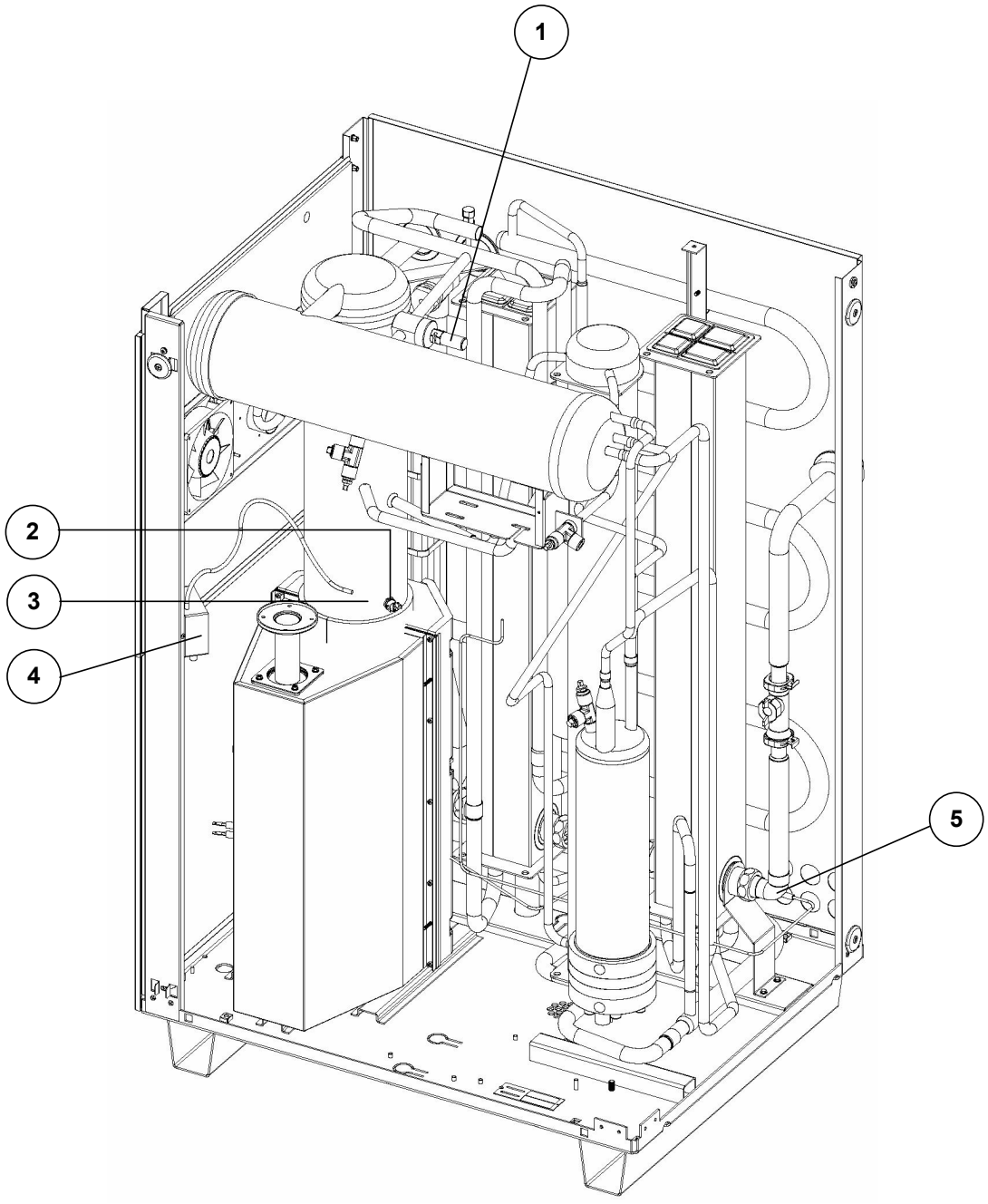
1	Ventilation fan	4	Tmix air-gas mixture temperature probe	7	Flow meter (hot side)
2	Gas valve	5	Electrical panel		
3	Combustion blower	6	Oil pump		

Figure 1.4 *Internal components - left side view*



1	Manual air vent (cold side)	5	Sensing element of the flue exhaust thermostat	9	Condensate drain siphon
2	Flow switch (cold side)	6	Generator fins temperature probe	10	Manual air vent valve (hot side)
3	Manual reset of the flue exhaust thermostat	7	Condensate drain sensor		
4	Ø 80 flue gas exhaust	8	Flame sensor / ignition electrodes		

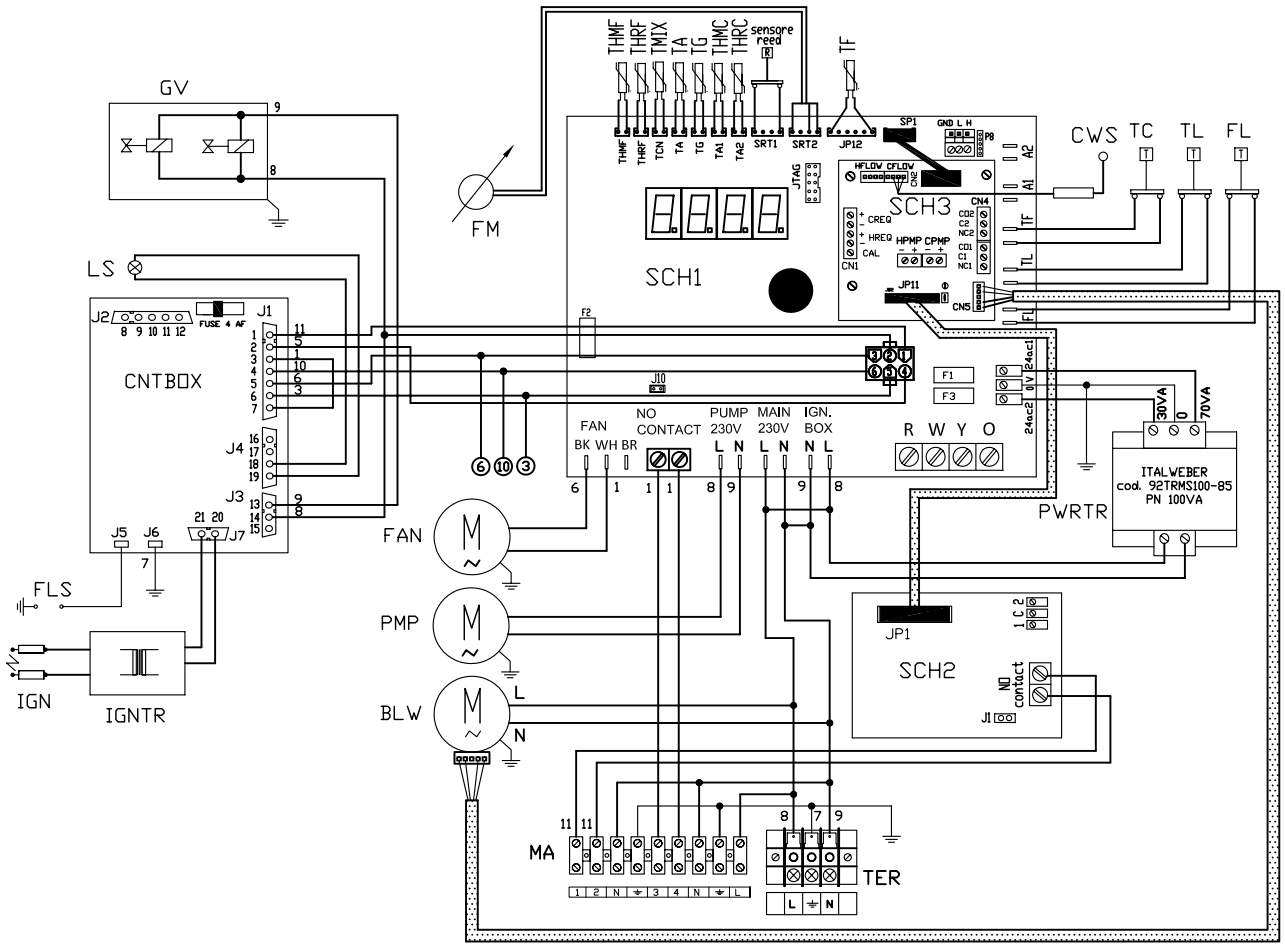
Figure 1.5 *Internal components - right side view*



1 Safety valve
2 TG generator temperature probe
3 Limit thermostat
4 Ignition transformer
5 Flow temperature probe (hot side)

1.4 ELECTRICAL WIRING DIAGRAM

Figure 1.6 *Appliance wiring diagram*



SCH1	Controller S61	FLS	Flame sensor	REED	Oil pump rotation sensor
SCH2	W10 circuit board	LS	Gas valve ON indicator lamp	TF	Fumes temperature sensor or generator fin sensor
SCH3	Mod10 circuit board	GV	Gas solenoid valve		
TER	Power supply terminal block	THMF	Cold water delivery temperature sensor	TC	Manual flue gas thermostat
CNTBOX	Flame controller	THRF	Cold water return temperature sensor	TL	Generator limit thermostat
PWRTR	Board transformer	TMIX	Combustion air temperature sensor	FM	Hot side flowmeter
BLW	Blower	TA	Ambient air temperature sensor	FL	Renewable source water flow switch
PMP	Oil pump	TG	Generator temperature sensor	CWS	Condensate water sensor
IGNTR	Ignition transformer	THMC	Hot water flow temperature probe	MA	Terminal block
IGN	Ignition electrodes	THRC	Hot water return temperature probe		

1.5 ELECTRONIC BOARDS

1.5.1 Electronic boards (S61+Mod10)

The unit's electrical board contains:

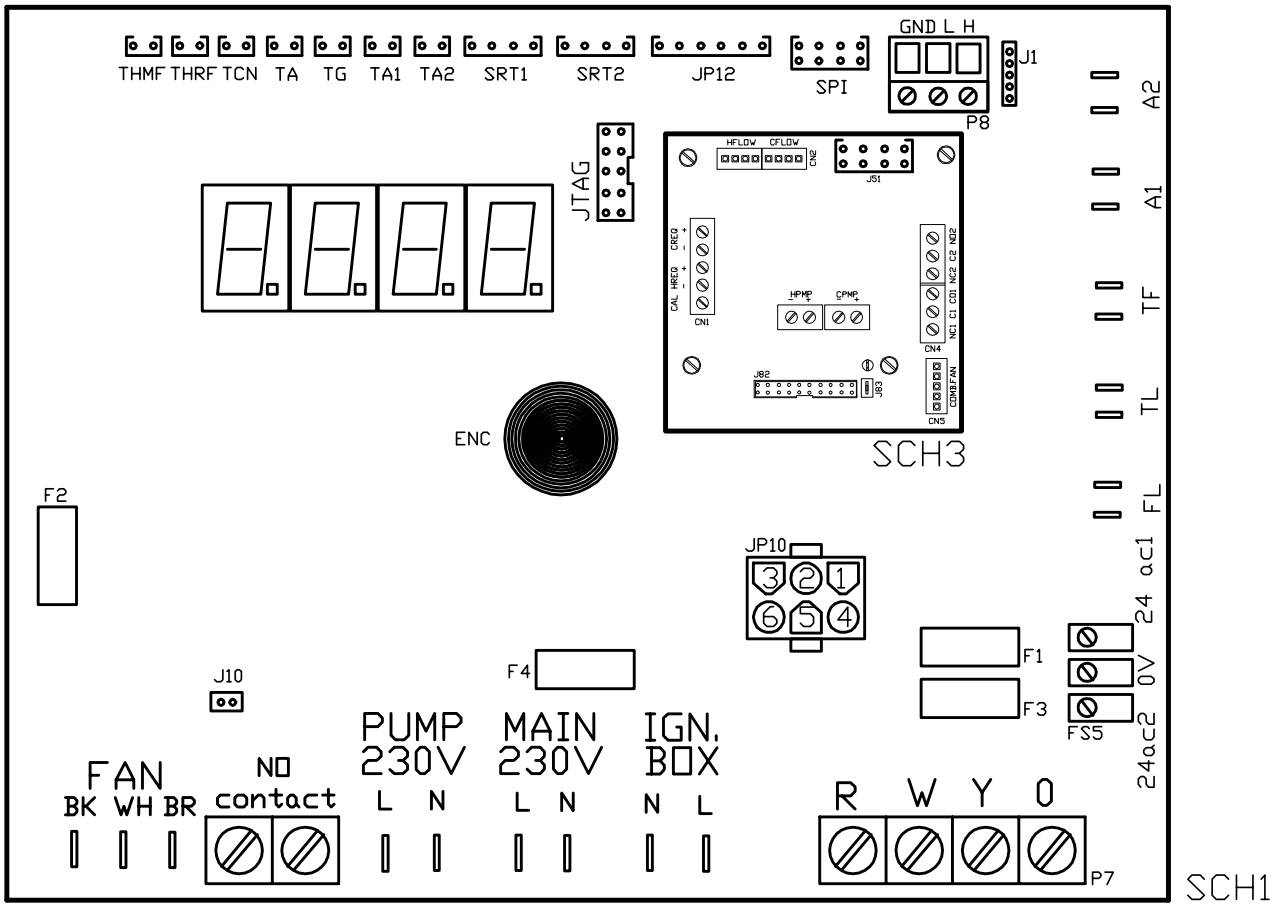
► **Electronic board S61** (Figure 1.7 *p. 14*), with microprocessor, it controls the appliance and displays data, messages and operative codes. The appliance is monitored and programmed by interacting with the display and the knob.

► **Auxiliary Mod10 Electronic Board** (Figure 1.8 *p. 15*), overlapping S61, controls power modulation of the burner

and water circulation pump rate variation.

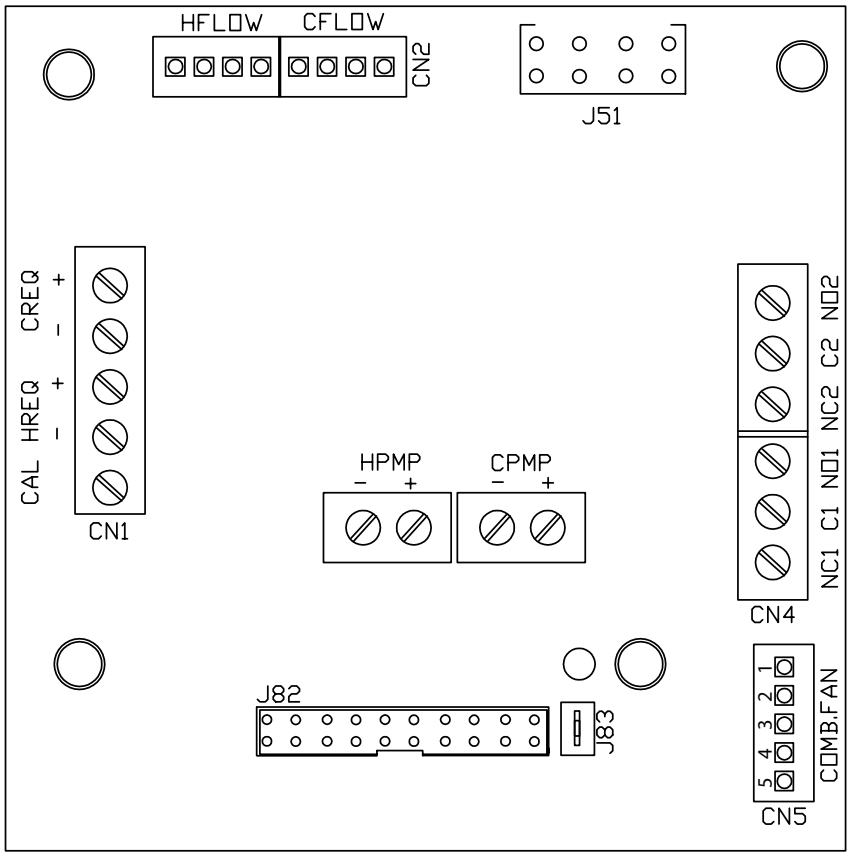
► **Satellite W10 electronic board** (Figure 1.9 *p. 15*), interconnected to the S61 board and located next to it, used mainly to control hot side circulating pump.

Figure 1.7 *Electronic board S61*



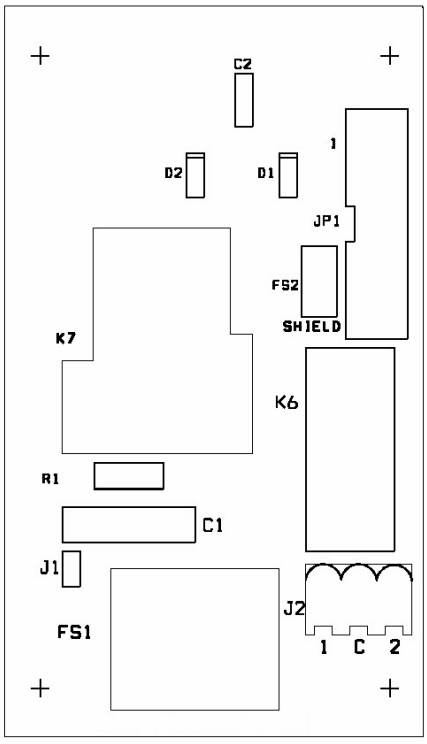
SCH1	Controller S61		230 Vac		controller
SCH3	Mod10 electronic board (see specific figure for further details)	J1	CAN bus Jumper	SRT1	Oil pump rotation sensor input
		J10	Jumper N.O. contact	SRT2	Hot water flowmeter input
A1, A2	Auxiliary inputs	J82	W10 board connector (on Mod10)	TA	Ambient air temperature probe input
ENC	Knob	JP10	6-pole flame controller connector	TA1	Hot water flow temperature probe input
F1	T 2A fuse	JP12	Flue gas probe or generator fin probe input	TA2	Hot water inlet temperature probe input
F2	T 10A fuse	JTAG	S61 board programming connector	TCN	Combustion air temperature probe input
F3	T 2A fuse	MAIN	230V (L, N) S61 board supply input 230 Vac	TF	Flue gas thermostat input
F4	T 3,15A fuse	N.O. CONTACT	Normally open pump contact	TG	Generator temperature probe input
FAN	(BK, WH, BR) Cooling fan output	P7	(R, W, Y, O) Enable input	THMF	Cold water inlet temperature probe input
FL	Flow switch input	P8	(GND, L, H) CAN bus connector	THRF	Cold water inlet temperature probe input
FS5	(24V AC) board supply 24-0-24 Vac	PUMP	230V (L, N) Oil pump supply output	TL	Generator limit thermostat input
IGN.BOX (L, N)	Flame controller power supply	SPI	Communication port with Mod10		

Figure 1.8 *Mod10 controller*



HFLOW	Not used
CFLOW	Condensation water sensor control
J51	S61 connector
HPMP	Primary circuit hot water pump control output (0-10 V) [A/GS/WS]
CPMP	Cold side water pump control output [GS/WS]
NC1-C1	Status indication of locking warnig/error
CN5	Blower control
J82	W10 auxiliary controller connector
J83	W10 cable shielding connection
CN1	Inputs 0-10V (not used)

Figure 1.9 *W10 electronic board*



JP1 Communication with S61/Mod10

1.6 OPERATION MODE

1.6.1 ON/OFF or modulating operation

The GAHP GS/WS unit may operate in two modes:

1. ON/OFF, i.e. on (at full power) or off, with water pump at constant flow.
2. MODULATING, i.e. at variable load from 50% to 100% of heating capacity, with water pump at variable flow (hot side) and at constant flow (cold side).

For each mode, specific control systems and devices are provided (Paragraph 1.7 *p. 15*).

1.7 CONTROLS

1.7.1 Control device

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

1. DDC control
2. CCP/CCI controller
3. external request

1.7.2 Control system (1) with DDC (GAHP unit ON/OFF)

The DDC controller is able to control appliances, a single GAHP 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.

1.7.3 DDC Controller

The main functions are:

► Adjustment and control of one (or more) Robur units of the

absorption line (GAHP, GA, AY).
- ► Data display and parameters setting.
- ► Time programming.
- ► Climatic curve control.
- ► Diagnostics.
- ► Errors reset.
- ► Possibility to interface with a BMS.

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

1.7.4 Control system (2) with CCP/CCI (modulating GAHP unit)

The CCP/CCI control is able to control up to 3 GAHP units in modulating mode (therefore GAHP A/GAHP GS/WS), plus any integration ON/OFF boiler. For further details and diagrams refer to the CCP/CCI Manual and the design manual.

1.7.5 CCP/CCI Control

See CCP/CCI device Manual.

1.7.6 Control system (3) with external request (GAHP unit ON/OFF)

The appliance may also be controlled via generic request devices (e.g. thermostat, timer, switch, contactor...) fitted with voltage-free NO contact. This system only provides elementary control (on/off, with fixed setpoint temperature), hence without the important functions of systems (1) and (2). It is advisable to possibly limit its use to simple applications only and with a single appliance.There are two control options: heating request or cooling request.

For connection of the selected device to the appliance's electronic board please refer to Paragraph 4.4 *p. 28*.

1.8 TECHNICAL DATA

Table 1.1 *GAHP GS/WS technical data*

				GAHP GS HT	GAHP WS
Heating mode					
Seasonal space heating energy efficiency class (ErP)	medium-temperature application (55 °C)		-	A++	
	low-temperature application (35 °C)		-	A+	
Heat output for each unit	Evaporator inlet temperature/Delivery temperature	B0W35	kW	41,6	-
		B0W50	kW	37,6	-
		B0W65	kW	31,4	-
		W10W35	kW	-	43,9
		W10W50	kW	-	41,6
		W10W65	kW	-	35,8
GUE efficiency	Evaporator inlet temperature/Delivery temperature	B0W35	%	165	-
		B0W50	%	149	-
		B0W65	%	125	-
		W10W35	%	-	174
		W10W50	%	-	165
		W10W65	%	-	142
Heat input	nominal (1013 mbar - 15 °C) (1)		kW	25,7	
	real		kW	25,2	
Hot water outlet temperature	maximum for heating		°C	65	
	maximum for DHW		°C	70	
Hot water inlet temperature	maximum for heating		°C	55	
	maximum for DHW		°C	60	
	minimum temperature in continuous operation		°C	30 (2)	
Thermal leap	nominal		°C	10	
Heating water flow	nominal		l/h	3170	3570
	maximum		l/h	4000	
	minimum		l/h	1400	
Pressure drop heating mode	at nominal water flow (B0W50)		bar	0,49 (3)	-
	at nominal water flow (W10W50)		bar	-	0,57 (3)
Outdoor temperature (dry bulb)	maximum		°C	45	
	minimum		°C	0 (4)	
Renewable source operating conditions					

(1) Relative to NCV (net calorific value).
(2) In transient operation, lower temperatures are allowed.
(3) For flows other than nominal see Design Manual, Pressure losses Paragraph.
(4) Data referred to the indoor version. For the outdoor version, the minimum ambient air temperature is -15 °C. A special outdoor version is available as an option for operation down to -30 °C.
(5) ±10% depending on power voltage and absorption tolerance of electric motors.
(6) PCI (G20) 34,02 MJ/m^3 (15 °C - 1013 mbar).
(7) PCI (G30/G31) 46,34 MJ/kg (15 °C - 1013 mbar).
(8) Sound power values detected in compliance with the intensity measurement methodology set forth by standard EN ISO 9614; C type installation.
(9) Maximum sound pressure levels in free field, with directionality factor 2, obtained from the sound power level in compliance with standard EN ISO 9614; C type installation.
(10) Indoor version only.
(11) Overall dimensions excluding flue gas exhaust.

				GAHP GS HT	GAHP WS
Power recovered from renewable source	Evaporator inlet temperature/Delivery temperature	B0W35	kW	16,4	-
		B0W50	kW	12,1	-
		B0W65	kW	7,0	-
		W10W35	kW	-	18,7
		W10W50	kW	-	16,6
		W10W65	kW	-	10,6
Renewable source water return temperature	maximum		°C	45	
Renewable source delivery water temperature	minimum		°C	-5	3
Renewable source water flow rate (with 25% glycol)	nominal (B0W50)		l/h	3020	-
	maximum		l/h	4000	-
	minimum		l/h	2000	-
Renewable source water flow rate	nominal (W10W50)		l/h	-	2850
	maximum		l/h	-	4700
	minimum		l/h	-	2300
Renewable source pressure drop	at nominal water flow		bar	0,51 (3)	0,38 (3)
Electrical specifications					
Power supply	voltage		V	230	
	type		-	single-phase	
	frequency		Hz	50	
Electrical power absorption	nominal		kW	0,41 (5)	
Degree of protection	IP		-	X5D	
Installation data					
Gas consumption	G20 natural gas (nominal)		m^3/h	2,72 (6)	
	G20 natural gas (min)		m^3/h	1,34	
	G25 (nominal)		m^3/h	3,16	
	G25 (min)		m^3/h	1,57	
	G30 (nominal)		kg/h	2,03 (7)	
	G30 (min)		kg/h	0,99	
	G31 (nominal)		kg/h	2,00 (7)	
	G31 (min)		kg/h	0,98	
NO_x emission class			-	5	
NO_x emission			ppm	25,0	
CO emission			ppm	36,0	
sound power L_w (max)			dB(A)	66,1 (8)	
sound pressure L_p at 5 metres (max)			dB(A)	44,1 (9)	
minimum storage temperature			°C	-30	
maximum water pressure in operation			bar	4,0	
maximum flow rate of flue gas condensate			l/h	4,0	
Water content inside the appliance	hot side		l	4	
	cold side		l	3	
Water fitting	type		-	F	
	thread		"	1 1/4	
Gas connection	type		-	F	
	thread		"	3/4	
safety valve outlet duct fitting			"	1 1/4 (10)	
Flue gas exhaust	diameter (Ø)		mm	80	
	residual head		Pa	80	
	product configuration		-	C63	
type of installation			-	C13, C33, C43, C53, C63, C83, B23P, B33	
Dimensions	width		mm	848 (11)	
	depth		mm	690	
	height		mm	1278	
Weight	in operation		kg	300	
General information					
Refrigerating fluid	ammonia R717		kg	7,0	7,2
	water H_2O		kg	10,0	9,6
maximum pressure of the refrigerating circuit			bar	32	

(1) Relative to NCV (net calorific value).
(2) In transient operation, lower temperatures are allowed.
(3) For flows other than nominal see Design Manual, Pressure losses Paragraph.
(4) Data referred to the indoor version. For the outdoor version, the minimum ambient air temperature is -15 °C. A special outdoor version is available as an option for operation down to -30 °C.
(5) ±10% depending on power voltage and absorption tolerance of electric motors.
(6) PCI (G20) 34,02 MJ/m^3 (15 °C - 1013 mbar).
(7) PCI (G30/G31) 46,34 MJ/kg (15 °C - 1013 mbar).
(8) Sound power values detected in compliance with the intensity measurement methodology set forth by standard EN ISO 9614; C type installation.
(9) Maximum sound pressure levels in free field, with directionality factor 2, obtained from the sound power level in compliance with standard EN ISO 9614; C type installation.
(10) Indoor version only.
(11) Overall dimensions excluding flue gas exhaust.

Table 1.2 *PED data*

			GAHP GS HT	GAHP WS
PED data				
Components under pressure	generator	l	18,6	
	leveling chamber	l	11,5	
	evaporator	l	3,7	
	refrigerant volume changer	l	4,5	
	absorber/condenser	l	3,7	
	solution refrigerant absorber	l	6,3	
	solution pump	l	3,3	
test pressure (in air)		bar g	55	
maximum pressure of the refrigerating circuit		bar g	32	
filling ratio		kg of NH_3/l	0,146	0,150
fluid group		-	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 or metal panels.
- After removing the packing materials, ensure the appliance is intact and complete.

Packing

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

Weight

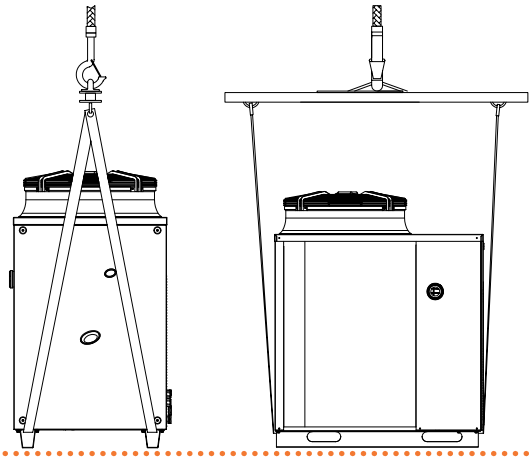
- The crane and lifting equipment must be suitable for the load.
- Do not stand under suspended loads.

2.2 HANDLING

2.2.1 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 POSITION (OUTDOOR VERSION)

Do not install the outdoor version inside a room, not even if it has openings. In no event the outdoor version may be started inside a room.

2.3.1 Where to install the appliance

In the outdoor version the appliance:

- ► May be only installed outside buildings, out of the dripping line of rain gutters or the like. It does not require protection from weathering.
- ► The appliance may be installed at ground level, on a terrace or on a roof, compatibly with its dimensions and weight.
- ► The appliance's flue gas exhaust must not be immediately close to openings or air intakes of buildings, and must comply with safety and environmental regulations.
- ► Do not install near the exhaust of flues, chimneys or hot polluted air. In order to work correctly, the appliance needs clean air.

2.3.2 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 INSTALLATION PREMISES (INDOOR VARIANT)

The installation premises must meet all requirements set forth by laws, standards and regulations of the Country and place of installation concerning gas appliances and cooling appliances

Do not install inside a room that has no aeration openings.

2.4.1 Features of the installation premises

► The premises must be provided with permanent and sufficiently wide ventilation openings to permit even air flow for aeration and possibly for combustion (if type B installation).
► Combustion air intake may be ducted from the outside (type C installation).
► The flue gas exhaust must be ducted to the outside. The flue opening must not be immediately close to openings or air intakes of buildings, and must comply with environmental regulations.

2.5 MINIMUM CLEARANCE DISTANCES

For both the indoor and outdoor version:

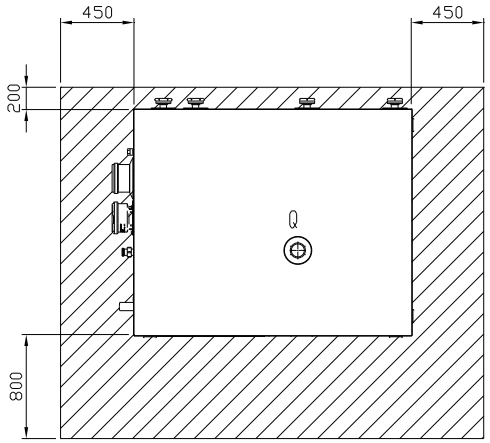
2.5.1 Distances from combustible or flammable materials

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

2.5.2 Clearances around the appliance

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

Figure 2.2 *Clearances*



2.6 MOUNTING BASE

Base or floor construction features

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

For the outdoor version:

2.6.1 (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.

2.6.2 (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.

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

Compliance with installation standards

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

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

Installation must also comply with the manufacturer's provisions.

3.2 HYDRAULIC SYSTEM

3.2.1 Primary and secondary circuit

► In many cases it is advisable to divide the water installation (hot side) 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.

3.2.2 Constant ot variable water flow

The GAHP unit is able to operate with constant water flow rate (always on the cold side) or variable (on hot side only), according to ON/OFF or modulating operative mode.
System and components must be designed and installed consistently.

3.2.3 Minimum water content

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

► If necessary, provide for an inertial volume (on hot side), to be suitably sized (see planning manual).

3.2.4 Heating and/or cooling

It may be required to alternatively or simultaneously produce hot water and/or chilled water. The selection of the type of operation may be performed by the control device, by suitably selecting the priority (cooling or heating).

3.3 HYDRAULIC CONNECTIONS

3.3.1 Hydraulic connections

on the rear panel (Figures 1.1 *p. 8* and 1.2 *p. 9*).

► **N** (= out) **1"1/4 F** -WATER OUTPUT (hot) (m = flow to the installation);
► **H** (= in) **1"1/4 F**- WATER INPUT (hot) (r = inlet from the installation).
► **M** (= out) **1"1/4 F** - WATER OUTPUT (cold) (m = flow to the installation);
► **L** (= in) **1"1/4 F** - WATER INPUT (cold) (r = inlet from the installation).

3.3.2 Hydraulic pipes, materials and features

► Use pipes for heating/cooling installations, protected from weathering, insulated for thermal losses, with vapour barrier to prevent condensation.

Pipe cleaning

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

3.3.3 Minimum components of primary water circuits

Always provide, near the appliance, both on the hot side and cold side:

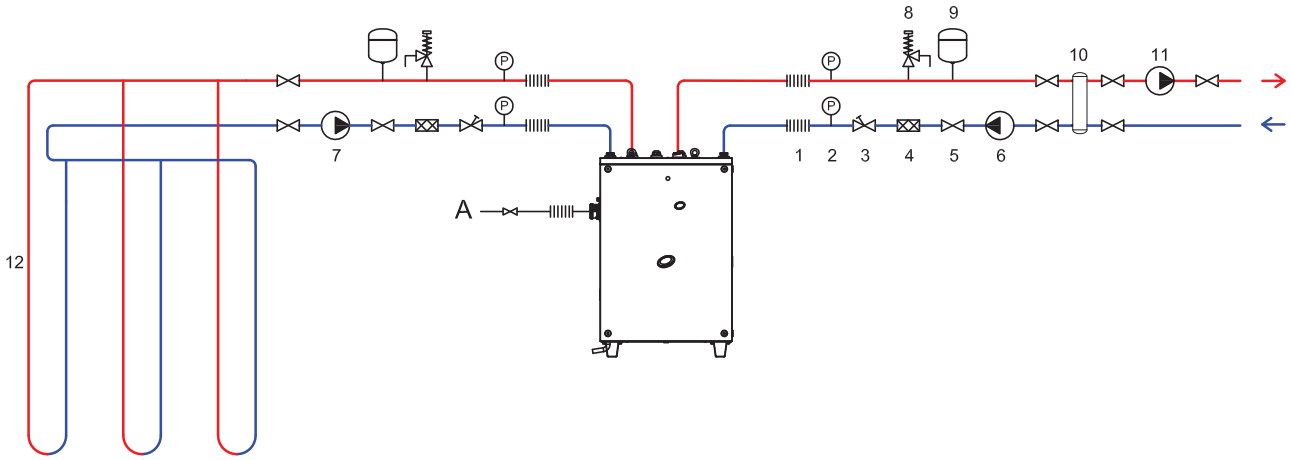
► on water piping, both output and input
- 2 antivibration joints on water fittings
- 2 pressure gauges
- 2 isolation ball valves

► 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 (m) (hot side only)
- 1 safety valve (3 bar)
- 1 expansion tank of the individual unit

For GAHP GS/WS with open circuit the EXCHANGER is obligatory.

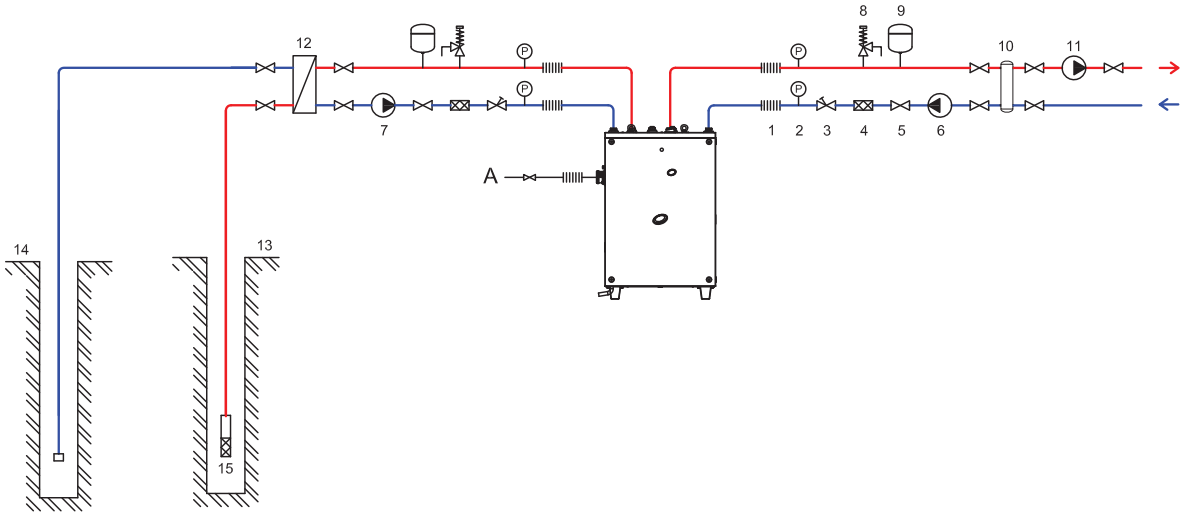
Figure 3.1 *GAHP GS Water diagram*



The flow regulator valve must only be used when the primary circuit circulation pump is constant flow type

A	Gas connection	3	Flow regulator valve	9	Expansion tank
1	Anti-vibration connection	4	Water filter	10	Hydraulic separator/4-pipe buffer tank
2	Pressure gauge	5	Shut-off valves	11	Hot side circulation pump (secondary circuit)
		6	Hot side circulation pump (primary circuit)	12	Geothermal field probes
		7	Cold side circulation pump (primary circuit)		
		8	Safety valve (3 bar)		

Figure 3.2 *GAHP WS Water diagram*



The flow regulator valve must only be used when the primary circuit circulation pump is constant flow type

A	Gas connection	4	Water filter	11	Hot side circulation pump (secondary circuit)
1	Anti-vibration connection	5	Shut-off valves	12	Heat exchanger
2	Pressure gauge	6	Hot side circulation pump (primary circuit)	13	Pumping sump
3	Flow regulator valve	7	Cold side circulation pump (primary circuit)	14	Drain sump
		8	Safety valve (3 bar)	15	Submersible pump
		9	Expansion tank		
		10	Hydraulic separator/4-pipe buffer tank		

3.4 WATER CIRCULATION PUMPS

The appliance needs two water circulation pumps, one for the hot side and one for the cold side.
The circulation pumps (flow and head) must be selected and installed based on pressure drops of water/primary circuit (piping + components + exchange terminals + appliance).
For the appliance pressure drops refer to Table 1.1 *p. 16* and Design Manual.

3.4.1 (1) Constant flow circulation pumps

The circulating pumps, primary on hot side and cold side, must obligatorily be controlled by the appliance's electronic board (S61) (see Paragraph 1.5 *p. 13*).

3.4.2 (2) Variable flow circulation pumps

For variable flow,operation, hot side only (the cold side always runs on constant flow), it is obligatory to use Wilo Stratos Para pumps,supplied as accessory on demand, which must be connected to the electronic board Mod10 (see Paragraph 1.5 *p. 13*). Any other type of pump will give constant flow.
Refer to the Design Manual for the features of the Wilo Stratos Para pump.

3.5 ANTIFREEZE FUNCTION

3.5.1 Active antifreeze self-protection (hot side only)

The appliance is equipped with an active antifreeze self-protection system to prevent freezing. The antifreeze function (activated by default) automatically starts primary circulation pumps and, if required, the burner too, when the outside temperature approaches zero.

Electrical and gas continuity

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

With high glycol percentage (> 20…30%)

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

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

3.6.1 Hot side and cold side glycol

Assess the need to add glycol on the hot side. On the cold side, glycol is recommended (in general) or indispensable (with chilled water operating temperatures lower than zero).

3.6.2 Type of antifreeze glycol

Inhibited type glycol is recommended to prevent oxidation phenomena.

3.6.3 Glycol effects

The Table 3.1 *p. 22* shows, indicatively, the effects of using a glycol depending on its %.

Table 3.1 *Glycol effects (GAHP/GA)*

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

3.7.1 System water characteristics

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

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

3.7.2 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).

To vent the system do not use the appliance's vent, exclusively intended for the internal exchanger.

3.9 FUEL GAS SUPPLY

3.9.1 Gas connection

► 3/4" F
on the left side, at the top, side panel (Detail G Figures 1.1 *p. 8* 1.2 *p. 9*).
► Install an anti-vibration connection between the appliance and the gas piping.

3.9.2 Mandatory shut-off valve

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

3.9.3 Gas pipes sizing

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

3.9.4 Supply gas pressure

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

The appliance's gas supply pressure, both static and dynamic, must comply with Table 3.3 *p. 23*, with tolerance ± 15%.

Non compliant gas pressure (Table 3.3 *p. 23*) may damage the appliance and be hazardous.

Table 3.3 *Network gas pressure*

Product category	Country of destination	Gas supply pressure [mbar]							
		G20	G25	G25.1 (1) (2)	G25.3 (1) (2)	G2.350 (2)	G27 (2)	G30	G31
$II_{2H3B/P}$	AL, AT, BG, CH, CY, CZ, DK, EE, FI, GR, HR, IT, LT, LV, MK, NO, RO, SE, SI, SK, TR	20						30	30
	AT, CH	20						50	50
II_{2H3P}	BG, CH, CZ, ES, GB, GR, HR, IE, IT, LT, LV, MK, PT, SI, SK, TR	20							37
	RO	20							30
	AT	20							50
$II_{2ELL3B/P}$	DE	20	20					50	50
II_{2Esi3P}	FR	20	25						37
II_{2Er3P}		20	25						37
$II_{2HS3B/P}$	HU	25		25				30	30
II_{2E3P}	LU	20							50
$II_{2L3B/P}$	NL		25					30	30
$II_{2EK3B/P}$		20			25			30	30
$II_{2E3B/P}$	PL	20						37	37
$II_{2ELwLs3B/P}$		20				13	20	37	37
$II_{2ELwLs3P}$		20				13	20		37
I_{2EK}	NL	20			25				
$I_{2E(R)}$	BE	20	25						
$I_{2E(S)}$		20	25						
I_{3P}	BE								37
	IS								30
I_{2H}	LV	20							
$I_{3B/P}$	MT, CY							30	30
I_{3B}								30	

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

3.9.5 Vertical pipes and condensate

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

3.9.6 LPG pressure reducers

With LPG the following must be installed:

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

3.10 COMBUSTION PRODUCTS EXHAUST

Compliance with standards

The appliance is approved for connection to a combustion products exhaust duct for the types shown in Table 1.1 *p. 16*.

3.10.1 Flue gas exhaust connection

- ► Ø 80 mm (with gasket), on the left side, at the top, side panel (outlet A Figures 1.1 *p. 8* and 1.2 *p. 9*).

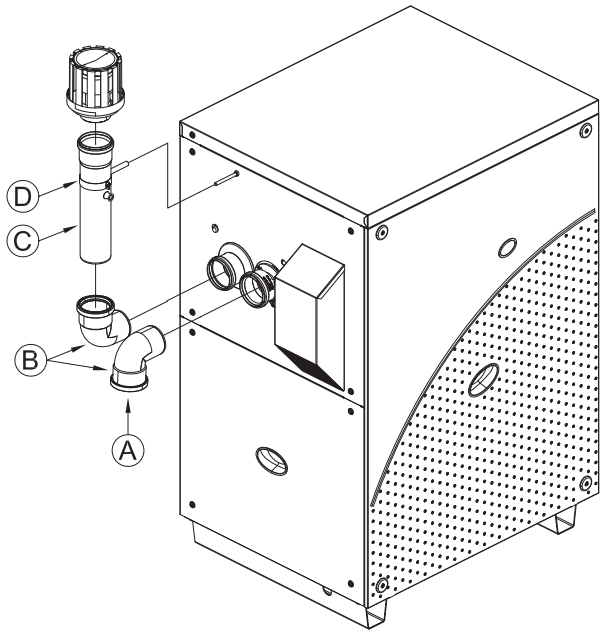
3.10.2 Indoor version

The appliance is supplied in configuration type B63.

3.10.3 Outdoor version

The appliance is supplied complete with air intake and flue gas exhaust kit to be fitted by the installer, shown in Figure 3.3 *p. 23*.

Figure 3.3 *Flue gas exhaust outdoor version*

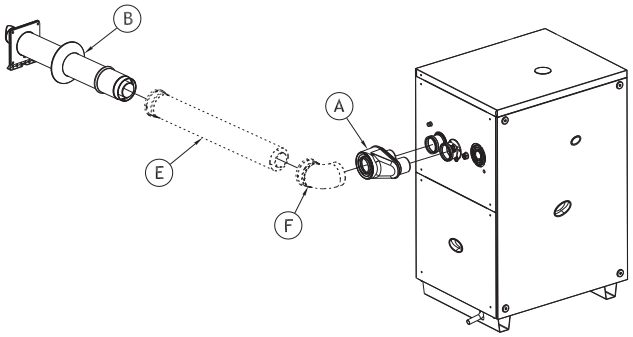


A Air intake
B 90° elbow Ø 80
C Pipe Ø 80 300 mm with terminal
D Collar

3.10.4 Indoor configurations

The possible configurations are shown in the Figures 3.4 *p. 24*, 3.5 *p. 24*, 3.6 *p. 25*, 3.7 *p. 25*, 3.8 *p. 25*.

Figure 3.4 *Type C13 coaxial flue gas exhaust*



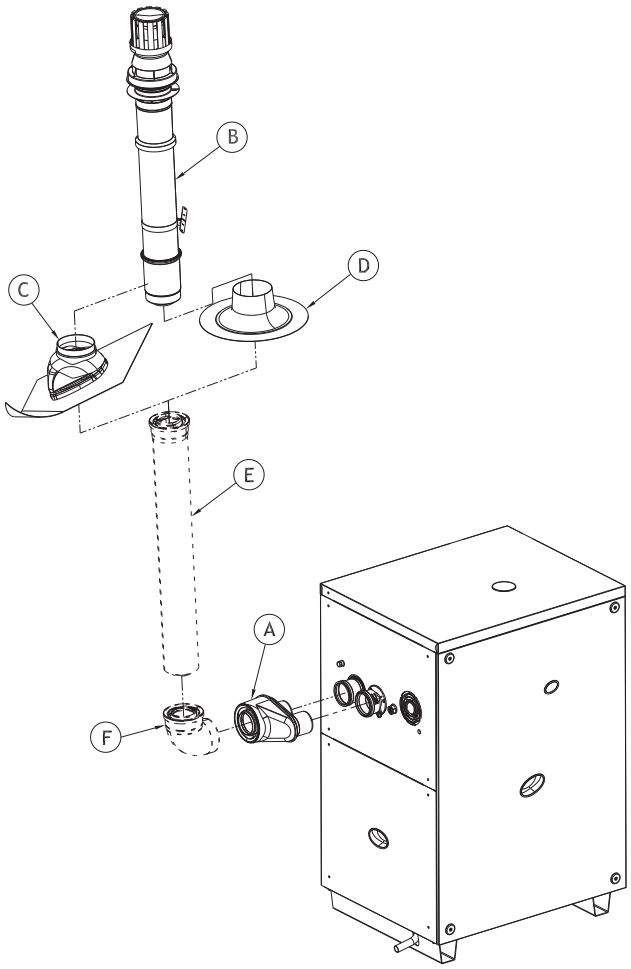
80/125

A DN80/125 2xDN80 splitter
B Wall coaxial terminal 80/125
E Coaxial pipe 80/125 L=1 m (or 2 m)
F Coaxial elbow 90° (or 45°) 80/125

60/100

A DN60/100 2xDN80 splitter
B Wall coaxial terminal 60/100
E Coaxial pipe 60/100 L=1 m (or 2 m)
F Coaxial elbow 90° (or 45°) 60/100

Figure 3.5 *Type C33 coaxial flue gas exhaust*



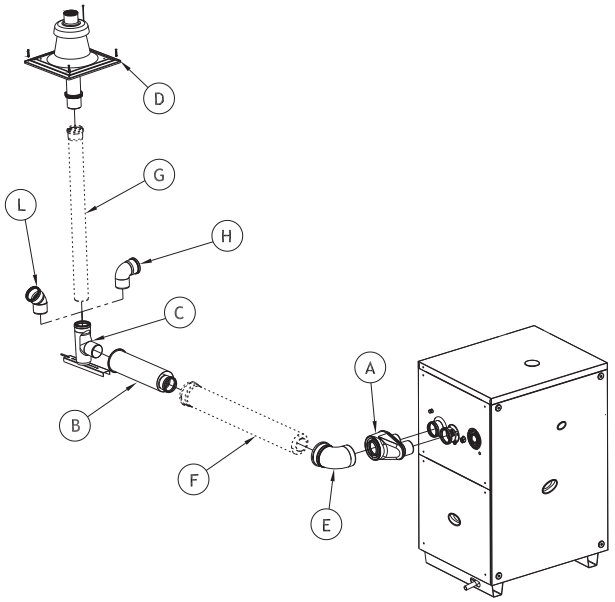
80/125

A DN80/125 2xDN80 splitter
B Coaxial roof terminal 80/125
C Tile adaptor for sloped roof
D Tile adaptor for flat roof
E Roof coaxial pipe 80/125 L=1 m (or 2 m)
F Coaxial elbow 90° (or 45°) 80/125

60/100

A DN60/100 2xDN80 splitter
B Coaxial roof terminal 60/100
C Tile adaptor for sloped roof
D Tile adaptor for flat roof
E Roof coaxial pipe 60/100 L=1 m (or 2 m)
F Coaxial elbow 90° (or 45°) 60/100

Figure 3.6 *Type C43 coaxial flue gas exhaust*



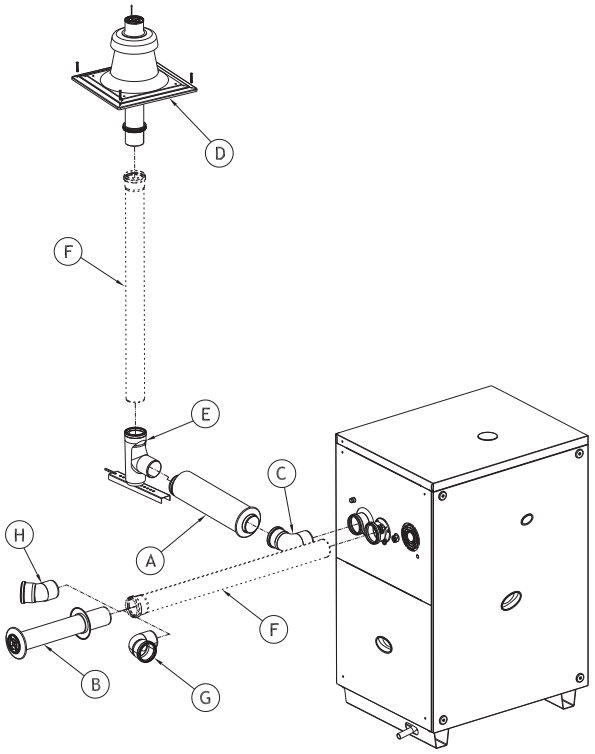
80/125

A DN80/125 2xDN80 splitter
B Wall passage DN 80/125
C Chimney support kit DN80
D Chimney cowl DN80 with terminal
E Coaxial elbow 90° (or 45°) 80/125
G Pipe DN80 L=1 m (or 2 m)
H 90° elbow DN80
L 45° elbow DN80

60/100

A DN60/100 2xDN80 splitter
B Wall passage DN 60/100
C Chimney support kit DN60
D Chimney cowl DN60 with terminal
E Coaxial elbow 90° (or 45°) DN60/100
F Coaxial pipe 60/100 L=1 m (or 2 m)
G Pipe DN60 L=1 m (or 2 m)
H 90° elbow DN60
L 45° elbow DN60

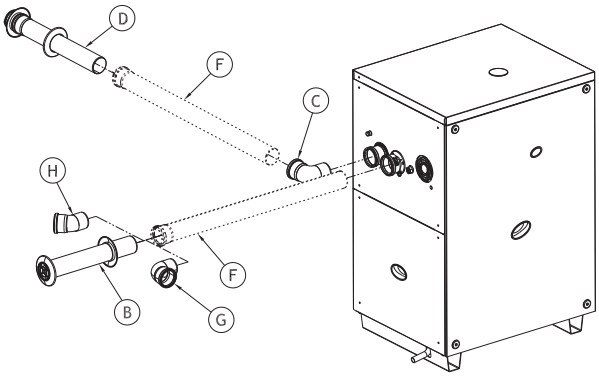
Figure 3.7 *Type C53 split roof flue gas exhaust*



80

A B C Split exhaust intake kit DN80
D Chimney cowl DN80 with terminal
E Chimney support kit DN80
F Pipe DN80 L=1 m (or 2 m)
G 90° elbow DN80
H 45° elbow DN80

Figure 3.8 *Type C53 split wall flue gas exhaust*



80

B C D Wall terminal kit DN80
F Pipe DN80 L=1 m (or 2 m)
G 90° elbow DN80
H 45° elbow DN80

3.10.5 Possible flue

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

- ► To size the flue refer to Table 1.1 *p. 16* and design manual.
- ► If several appliances are connected to a single flue, it is obligatory to install a check valve on the flue gas exhaust of each.
- ► The flue must be designed, sized, tested and constructed by a skilled firm, with materials and components complying with the regulations in force in the country of installation.

► Always provide a socket for flue gas analysis, in an accessible position.

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

3.11 FLUE GAS CONDENSATE DRAIN

The GAHP GS/WS unit is a condensing appliance and therefore produces condensation water from combustion flue gases.

Condensate acidity and exhaust regulations

The flue gas condensate contains aggressive acid substances. Refer to applicable regulations in force for condensate exhaust and disposal.

■ If required, install an acidity neutraliser of adequate capacity.

Do not use gutters to discharge the condensate

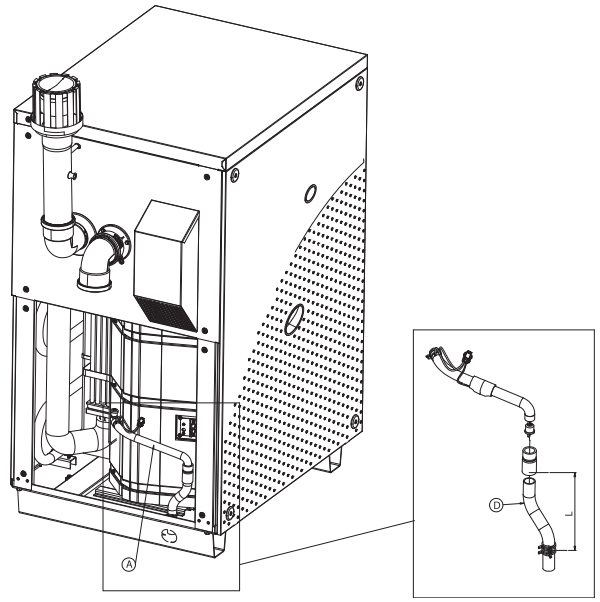
Do not discharge the flue condensate in gutters, due to the risk of materials corrosion and ice formation.

3.11.1 Flue gas condensate connection

The fitting for flue gas condensate drain is located on the left side of the appliance (Figure 3.9 *p. 26*).

► The corrugated condensate drain pipe must be connected to a suitable drain manifold.
► The junction between the pipe and the manifold must remain visible.
► The connection of the discharge to the sewerage system must be made at atmospheric pressure, i.e. by dripping into a siphoned container connected to the sewerage system.

Figure 3.9 *Flue gas condensate drain manifold*



A Condensate drain hose D Corrugated hose

3.11.2 Flue gas condensate drain manifold

To make the condensate drain manifold:

► Size the ducts for maximum condensation flow rate (Table 1.1 *p. 16*).
► Use plastic materials resistant to acidity pH 3-5.
► Provide for min. 1% slope, i.e. 1 cm for each m of the length (otherwise a booster pump is required).
► Prevent freezing.
► Dilute, if possible, with domestic waste water (e.g. bathrooms, washing machines, dish washers...), basic and neutralising.

3.11.3 Condensate drain siphon filling

Robur uses condensate collection siphons with float, which blocks the passage of fumes and odours deriving therefrom in case the equipment remains turned off for a long time and the liquid contained in the siphon evaporates or in case of commissioning.
Thanks to this system, it is not necessary to fill the siphon at commissioning.

3.12 SAFETY VALVE EXHAUST (INDOOR VERSION)

The safety valve drain must be mandatorily ducted outside. Failure to comply with this provision jeopardizes first start-up.

Do not install any shut off device on the drain duct between the safety valve and the outside vent.

3.12.1 Safety valve drain ducting

The drain ducting shall be made in steel pipes (do not use copper or its alloys). Table 3.4 *p. 26* provides sufficient criteria of pipe sizing; alternatively, less compelling sizing is accepted, provided it is compliant with specific applicable norms (the manufacturer cannot be held liable).

Table 3.4 *Safety valve drain ducting*

Diameter	DN	Maximum length (m)
1"1/4	32	30
2"	50	60

How to make the safety valve drain ducting

1. Remove the plastic cap on the appliance's top panel (Detail Q Figure 1.1 *p. 8*).
2. Connect the drain duct, which must have an initial straight section of at least 30 cm, to the outlet.
3. Fasten the pipe to the nut on the safety valve outlet, taking care to place the Teflon seal supplied with the appliance in between.
4. Place the drain terminal outside the room, away from doors, windows and aeration vents, and at such a height that any refrigerant leaks cannot be inhaled by any people.

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

- 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, CCP/CCI or external request).

Control of water pumps

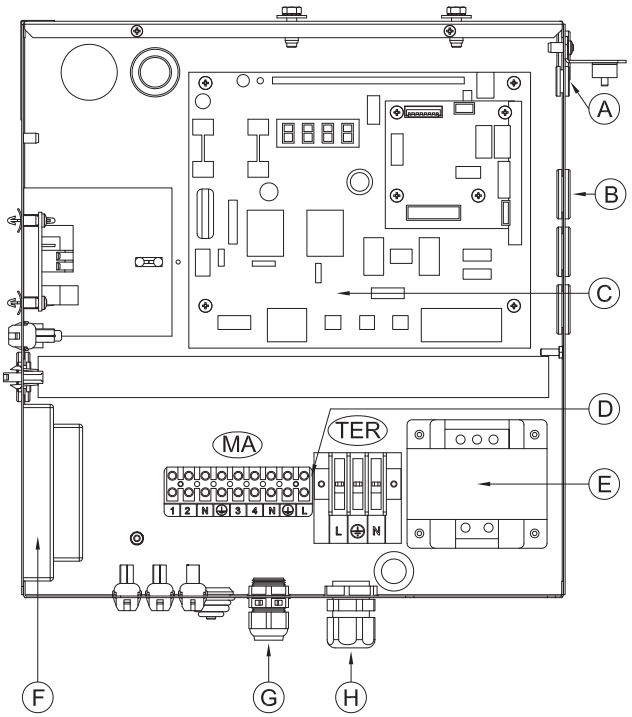
The two water circulation pumps of the hydraulic/primary circuit, hot side and cold side, must mandatorily be controlled by the appliance's electronic boards (S61 + Mod10). It is not admissible to start/stop the circulating pump with no request from the appliance.

4.2 ELECTRICAL SYSTEMS

Electrical connections must provide:

► power supply (Paragraph 4.3 *p. 27*)
► control system (Paragraph 1.5 *p. 13*)

Figure 4.1 *Electrical panel*



A CAN bus cable gland
B Signal cable gland 0-10 V pump Wilo Stratos Para
C Electronic boards S61+Mod10+W10
D Terminal blocks
E Transformer 230/24 V AC
F Flame control box
G Pump power supply and control cable gland
H GAHP power supply cable gland
Terminals:
TER terminal block
L-(PE)-N Phase/earth/neutral GAHP power supply
MA terminal block
N-(PE)-L Neutral/earth/phase pump power supply
3-4 Pump enable

How to make connections

All electrical connections must be made in the appliance's electrical panel (Figure 4.1 *p. 27*):

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. Insert the cables through the suitable holes in the rear panel, at the bottom left (Detail D Figure 1.1 *p. 8*, 1.2 *p. 9*).
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.

4.3 ELECTRICAL POWER SUPPLY

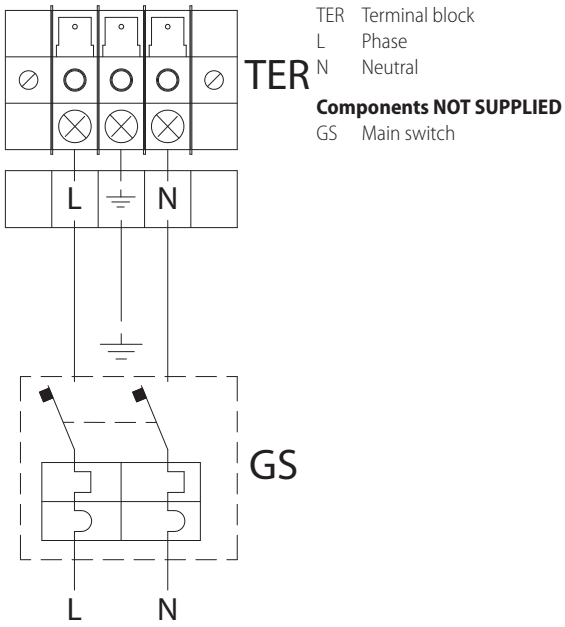
4.3.1 Power supply line

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

Figure 4.2 *Power supply connection*



TER Terminal block
L Phase
N Neutral

Components NOT SUPPLIED
GS Main switch

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. 28*):

1. Access the electrical board of the appliance according to the Procedure 4.2 *p. 27*.
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).

4.4 ADJUSTMENT AND CONTROL

4.4.1 Control systems

Three separate control systems are provided, each with specific features, components and diagrams (Figures 4.4 *p. 29*, 4.7 *p. 31*):

► DDC control (with CAN bus connection).
► CCP/CCI control (with CAN bus connection).
► External request.

4.4.2 CAN bus communication network

The CAN bus communication network, implemented with the cable of the same name, makes it possible to connect and remotely control one or more Robur appliances with the DDC or CCI control devices.
It entails a certain number of serial nodes, distinguished in:

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

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

CAN bus signal cable

The DDC or CCP/CCI controllers are connected to the appliance through the CAN bus signal cable, shielded, compliant to Table 4.1 *p. 28* (admissible types and maximum distances).
For lengths ≤200 m and up to 4 nodes (e.g. 1 DDC + 3 GAHP), a simple 3x0,75 mm² shielded cable may be used.

Table 4.1 *CAN bus cables type*

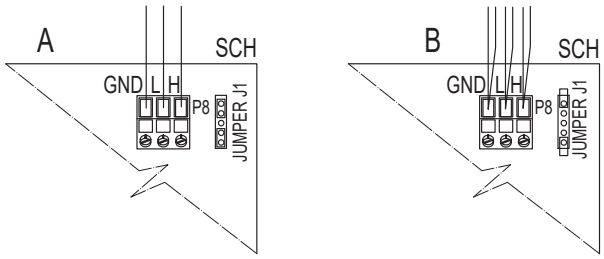
Cable name	Signals / Color			Maximum length	Note
Robur					Optional code OCVO008
ROBUR NETBUS	H = BLACK	L = WHITE	GND = BROWN	450 m	
Honeywell SDS 1620					In all cases the fourth conductor should not be used
BELDEN 3086A	H = BLACK	L = WHITE	GND = BROWN	450 m	
TURCK type 530					
DeviceNet Mid Cable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

How to connect the CAN bus cable to the appliance

To connect the CAN bus cable to the S61 electronic board (Paragraph 1.5 *p. 13*), located in the electrical panel inside the unit, (Figure 4.3 *p. 29* and 4.4 *p. 29*):

1. Access the electrical board of the appliance according to the Procedure 4.2 *p. 27*.
2. Connect the CAN bus cable to the GND (shielding/earthing) + L and H terminals (two signal wires).
3. Place the CLOSED J1 Jumpers (Detail A) if the node is terminal (one connected CAN bus cable section only), or OPEN (Detail B) if the node is intermediate (two connected CAN bus cable sections).
4. Connect the DDC or 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 *Connection of the CAN bus cable to the electronic board of GAHP/GA units*

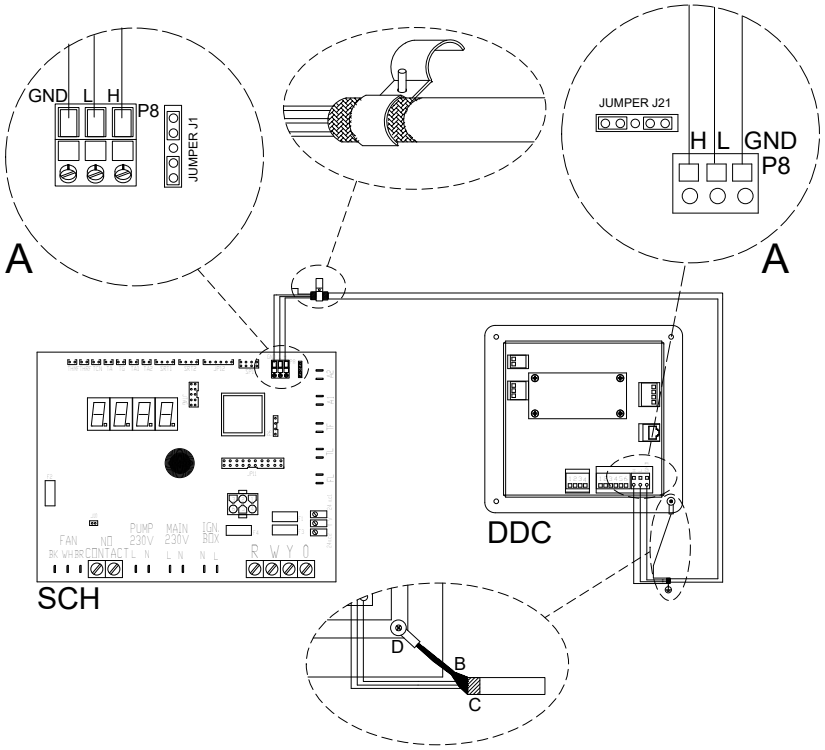


SCH Electronic board of GAHP/GA units
GND Common data
L Data signal LOW
H Data signal HIGH
J1 Onboard CAN bus jumper
A Detail of "terminal node" case (3 wires; J1 = jumper "closed")
B Detail of "intermediate node" case (6 wires; J1 = jumper "open")
P8 CAN port/connector

GAHP (S61) + DDC or CCP/CCI configuration

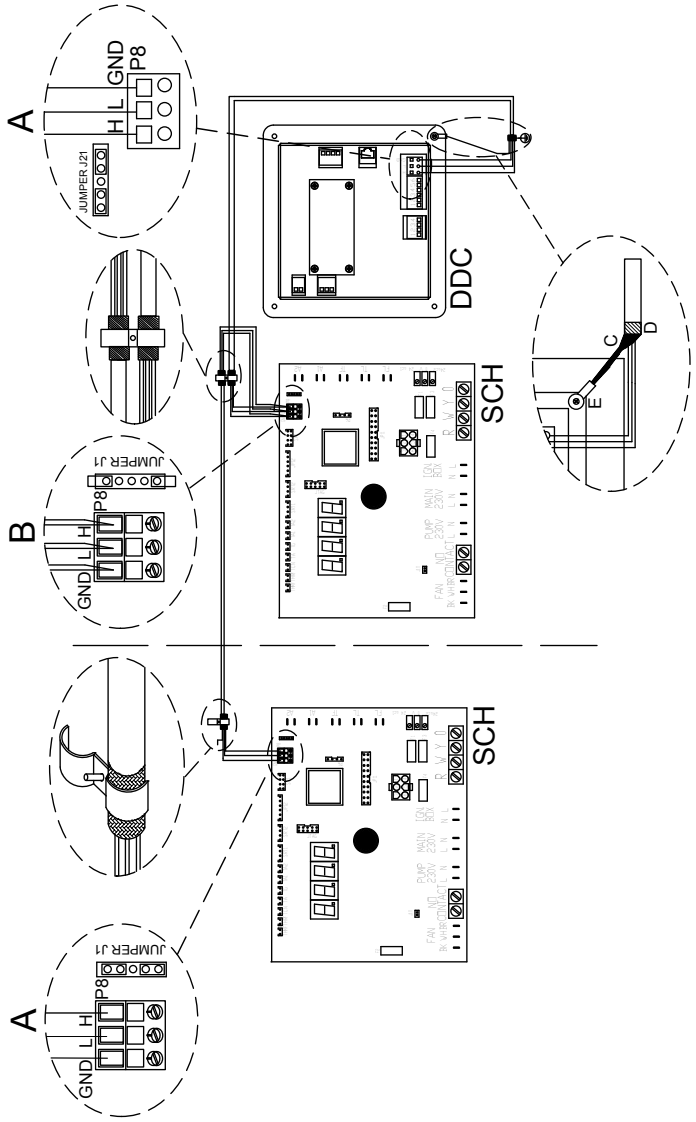
Systems (1) and (2), see also Paragraph 1.7 *p. 15*.

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



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

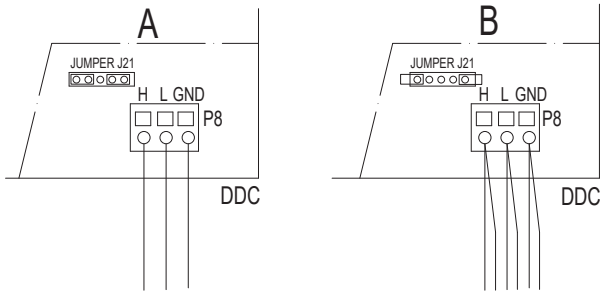
Figure 4.5 *CAN bus connection for systems with multiple single units*



DDC Direct Digital Controller
SCH S61 electronic board
J1 CAN bus jumper onboard S61
J21 CAN bus jumper on DDC board
H,L,GND Data signal wires (ref. cables table)
A Terminal node connection - (3 wires; J1 and J21 = "closed")
B Intermediate node connection - (6 wires; J1 and J21 jumpers = "open")
C CAN bus cable shield
D Insulating tape to protect the shield of the CAN bus cable
E Eyelet terminal and fixing screw

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

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



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

External request

System (3), see also Paragraph 1.7 *p. 15*.
It is required to arrange:

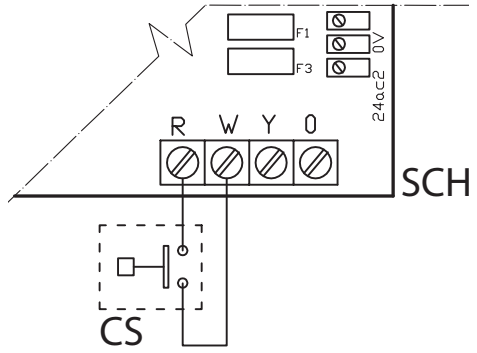
► Enable device (e.g. thermostat, timer, switch, ...) fitted with a voltage-free NO contact.

How to connect the external request

Connection of external request is effected on the S61 board located in the electrical panel inside the appliance (Figure 4.7 *p. 31*, 4.8 *p. 31*):

1. Access the electrical board of the appliance according to the Procedure 4.2 *p. 27*.
2. Connect the voltage-free contact of the external device (Detail CS) through two wires to **terminals R and W** of electronic board S61, respectively common 24 V AC and heating request, if the unit works with heating priority, or to **terminals R and Y**, respectively common 24 V AC and cooling request, if the unit works with cooling priority.

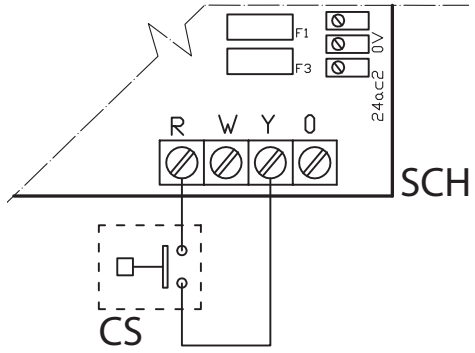
Figure 4.7 *External heating request connection*



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

Components NOT SUPPLIED
CS External request

Figure 4.8 *External cooling request connection*



SCH Electronic board
R Common
Y Cooling request terminal

Components NOT SUPPLIED
CS External request

4.5 WATER CIRCULATION PUMPS

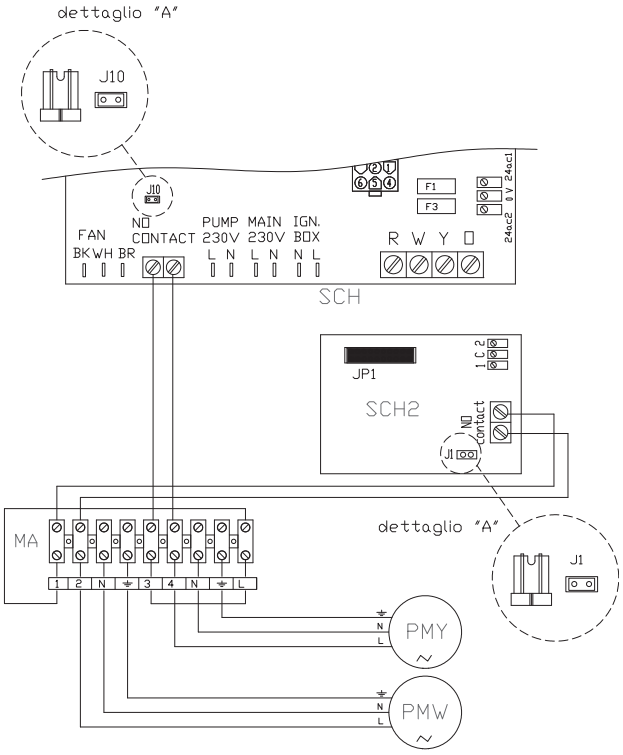
4.5.1 Option (1) constant flow circulating pumps

The two pumps of the primary circuit, hot side and cold side, must obligatorily be controlled by electronic board S61.
The diagram in Figure 4.9 *p. 32* is for pumps < 700 W. For pumps > 700 W it is necessary to add a control relay and arrange Jumper J1 (hot side pump) and J10 (cold side pump) OPEN.

How to connect the constant flow circulating pumps

1. Access the electrical board of the appliance according to the Procedure 4.2 *p. 27*.
2. Connect to board S61, to terminals 1, 2, N, Ground, 3, 4, N, Ground, L of the terminal block (MA) (Figure 4.9 *p. 32*).
3. Jumper J1 (hot side pump) and J10 (cold side pump) open if the pump is > 700 W or is a Wilo electronic pump, otherwise closed.

Figure 4.9 *Connection of constant flow pumps*



SCH Electronic board
SCH2 Electronic board
J10 Cold side pump jumper (1)
J1 Hot side pump jumper (1)
N.O. CONTACT N.O. voltage-free contacts
MA Appliance terminal block
L Phase
N Neutral

Components NOT SUPPLIED
PMW Hot side water pump < 700 W
PMY Cold side water pump < 700 W

Note
1 Jumpers J10 and J1 must be closed if the installed pump is not a Wilo electronic pump.
Jumpers J10 and J1 must be opened if the installed pump is a Wilo electronic pump.

4.5.2 Option (2) variable flow circulating pumps

The two pumps of the primary circuit must mandatorily be controlled by electronic board Mod10 (built into S61).

Only the hot side pump will actually be controlled with variable flow. The cold side pump will in any case be controlled with constant flow.

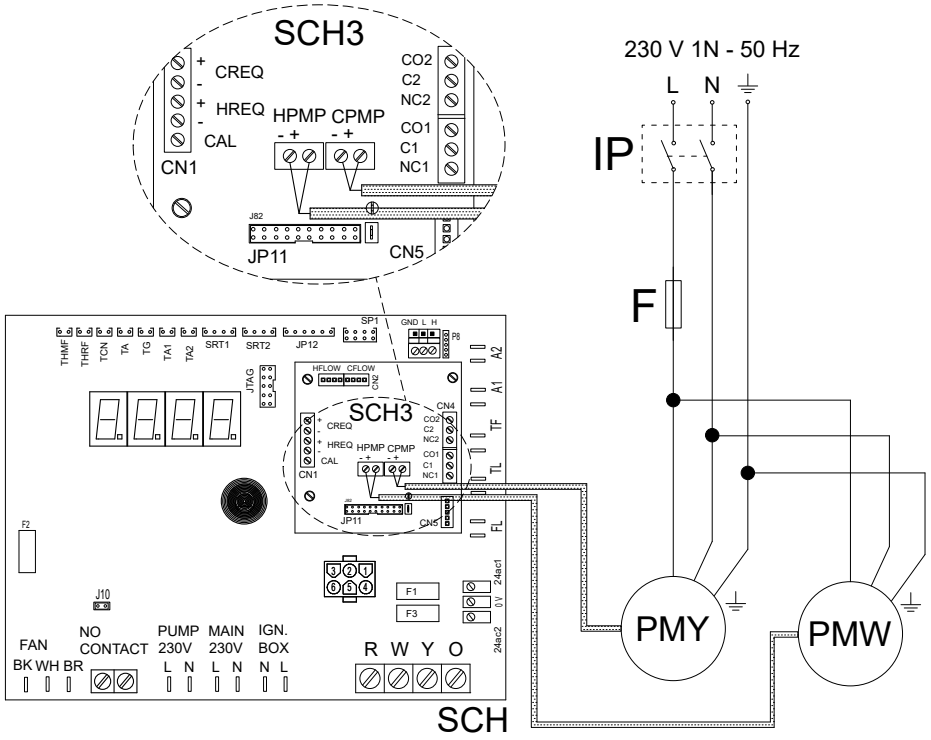
How to connect the variable flow circulating pumps

The Wilo Stratos Para pump is already standard supplied with the power supply cable and signal cable, both 1,5 m long.
For longer distances, use respectively cable FG7 3Gx1,5 mm^2 m and shielded cable 2x0,75 mm^2 suitable for 0-10 V signal.

To connect the Wilo Stratos Para pumps (Figure 4.10 *p. 33* or 4.11 *p. 33*).

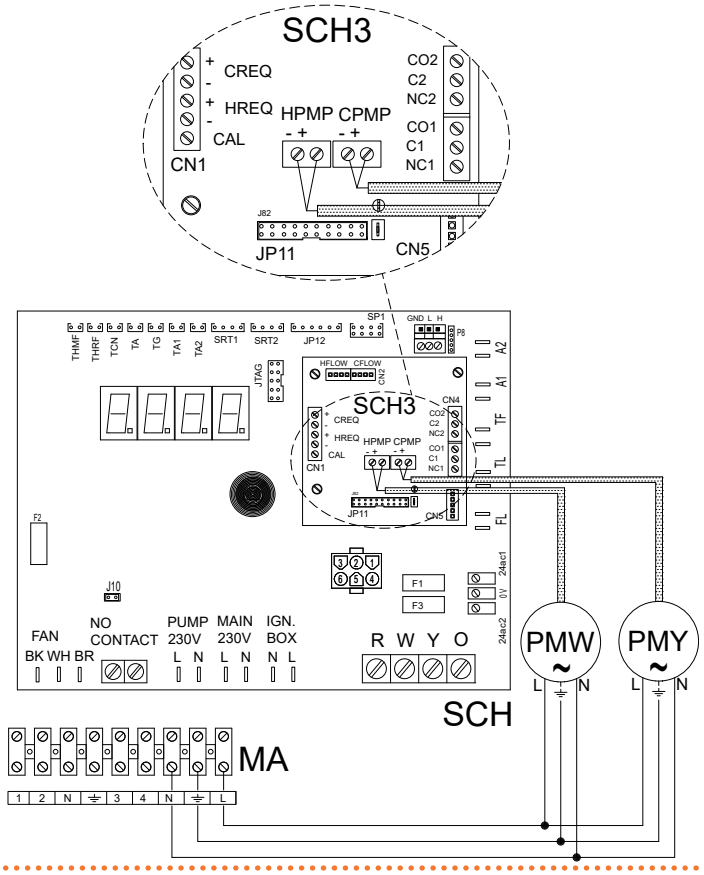
1. Connect the brown wire of the hot side pump to terminal "-" HPMP and the white wire to terminal "+" HPMP of the Mod10 board.
2. Connect the brown wire of the cold side pump to terminal "-" CPMP and the white wire to terminal "+" CPMP of the Mod10 board.
3. Isolate the black wire and the blue one.
4. Protect the two pumps' supply line with a two-pole switch with 2 A delayed fuse (Detail IP, Figure 4.10 *p. 33*), or connect it directly to the terminals inside the appliance's electrical board (Detail MA, Figure 4.11 *p. 33*).

Figure 4.10 *Connection of Wilo Stratos Para variable flow pumps*



IP Two-position pump power switch
F Fuse
PMW Hot side water circulation pump (primary circuit)
PMY Cold side water circulation pump
Pump signal 0-10 V wire colours
brown connect to - terminal
white connect to + terminal
black isolate
blue isolate

Figure 4.11 *Connection of the Wilo Stratos Para variable flow pumps powered by the appliance*



PMW Hot side water circulation pump (primary circuit)
PMY Cold side water circulation pump
MA Appliance terminal block
Pump signal 0-10 V wire colours
brown connect to - terminal
white connect to + terminal
black isolate
blue isolate

5 FIRST START-UP

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

5.1 PRELIMINARY CHECKS

5.1.1 Preliminary checks for first start-up

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

- Water, electrical and gas systems suitable for the required capacities and equipped with all safety and control devices required by the regulations in force.
- Absence of leaks in the water and gas systems.
- Type of gas for which the appliance is designed (natural gas or LPG).
- Supply gas pressure complying with the values of Table 3.3 *p. 23*, with max tolerance ±15%.
- Correct operation of the flue exhaust duct.
- Power supply mains complying with the appliance's rating plate data.
- Appliance correctly installed, according to the manufacturer's provisions.
- System installed in a workmanlike manner, according to national and local regulations.

5.1.2 Abnormal or hazardous installation situations

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

- Appliance installed within premises without safety valve drain ducting.
- Failed compliance with minimum clearances.
- Insufficient distance from combustible or flammable materials.
- Conditions that do not warrant access and maintenance in safety.
- Appliance switched on/off with the main switch, instead of the provided control device.
- Appliance defects or faults caused during transport or installation.
- Gas smell.
- Non-compliant mains gas pressure.
- Non-compliant flue gas exhaust.
- All situations that may involve operation abnormalities or are potentially hazardous.

5.1.3 Non-compliant system and corrective actions

Should the TAC find any non conformities, the user/installer is bound to perform any corrective procedures required by the TAC.
After performing the remedial actions (the installer's responsibility), if the TAC deems that safety and conformity conditions are in place, first start-up may be effected.

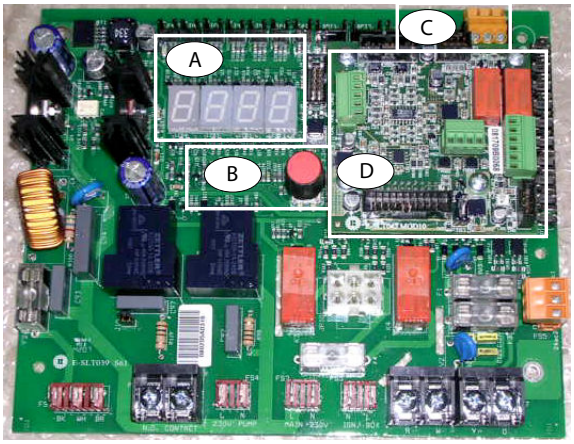
5.2 ELECTRONIC ADJUSTMENT ON THE MACHINE – MENUS AND PARAMETERS OF THE S61 BOARD

Firmware

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

5.2.1 The appliance's electronic board (S61)

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



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

5.2.2 Display

The 4-digit display of the S61 board (Detail A Figure 5.1 *p. 34*) is as follows:

- The **first digit** (on the left, green) indicates the menu number (e.g. "0.", "1.", "2.", ... "8.").
- The **last three digits** (on the right, red) indicate a **code** or a **value** for a parameter, among those included in the selected menu (e.g. "__6" "_20", "161").

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

5.2.3 Knob

One of the following actions may be done with the S61 board knob (Detail B in Figure 5.1 *p. 34*):

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

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

5.2.4 Menus and Parameters

The menus may be display only (functional data or parameters), display and setting (parameters) or control (reset).
Menu for the user (but for the installer and TAC as well)

- The menu "0.", display only, for functional data detected in real time.
- The menu "1.", display only, for current values of appliance parameters.
- Menu "2.", control, to execute flame control unit reset operations, reset errors (Paragraph 7.5 *p. 37*).
- Menu "3.", display and setting, to set the value of some

system parameters (e.g. water setpoint temperature); the values are initialised by the TAC at first start-up.

It is accessed without password.

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

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

Special key for the knob

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

How to access the menus and parameters

Before Starting:
(1) Power supply switch on.
(2) 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. 34*):

1. Remove the front panel by removing the fixing screws.
2. Remove the cover of the electrical board to access the S61 board knob.
3. Act on the knob by means of the special key through the suitable hole.
4. Press the knob once to display the menus: the first menu is displayed, "0." (= menu 0).
5. Turn the knob clockwise to scroll down and display the other/subsequent menus; the menu numbers will be displayed in order, "1.", "2.", ... , "6." ... or "E" (= exit).
6. Select the menu of interest (e.g. display "2.___" = menu 2) by pressing the knob; the first parameter code will be displayed, in menu order (e.g. display "2._20" = parameter 20 in menu 2).
7. Turn the knob clockwise to scroll down the other parameters in the menu; the codes will be displayed in order (e.g. display "2._20", "2._21", ... "2._25" = parameters 20, 21, ... 25 in menu 2), or letter "E" (= exit) at the end of the list.
8. Select the parameter of interest (e.g. with code 161 in menu 3) by pressing the knob; the figure previously assigned to the parameter will be displayed, read-only or to be set (e.g. the figure "45" for parameter 161 in menu 3 = water temperature setpoint at 45 °C); if instead of a figure/setting it is a command, a flashing code is displayed (e.g. "reS1" for the flame lock-out reset command).
9. Press the knob to reconfirm the figure; or rotate the knob to modify the figure, and press at the end to confirm or set the new figure; if however, it is a matter of controlling an appliance operation, press the knob to execute it.
10. To exit a parameter menu or the menu list and go back to the higher level, turn the knob to display the letter "E" for exit, then press the knob again.
11. Place the cover back on the electrical panel opening and fit the appliance's front panel back on.

5.3 MODIFYING SETTINGS

Modify the settings through the DDC or CCP/CCI

If the appliance is connected to the DDC or to the CCP/CCI control, refer to the relevant manual to modify settings.

5.3.1 How to raise/lower the water temperature setpoint

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

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

1. Access menu 3 under parameter 161 (= water temperature set-point) by rotating and pressing the knob; "3.161" must be displayed (procedure Paragraph 5.2 *p. 34*).
2. Display the parameter value by pressing the knob; the previously set value is displayed (from 10 to 65 °C for hot water); to reconfirm the pre-existing value press the knob again, otherwise go to step 3.
3. Turn the knob to modify the value, increasing or decreasing it, and press it to set the new value.
4. Exit menu 3, and from the menu list, by selecting and pressing letter "E" twice, and go back to the normal display of detected temperature data.

Do not modify complex settings

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

6 NORMAL OPERATION

This section is for the end user.

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

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 startup by TAC

First start-up must exclusively be carried out by a Robur TAC (Chapter 5 *p. 34*).

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, CCP/CCI or external requests).

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 or CCP/CCI power supply (if present)
- water circuit ready

6.2.1 How to switch on/off

► If the appliance is controlled by a DDC or by a CCP/CCI (systems (1) and (2) see Paragraph 1.7 *p. 15*), refer to the respective manuals.
► If the appliance is controlled by external request (e.g. thermostat, timer, switch, ... with voltage-free NO contact), (system (3) see Paragraph 1.7 *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 hot or cold 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 the settings through the DDC or CCP/CCI

If the appliance is connected to the DDC or to the CCP/CCI 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:
► Set the maximum hot water temperature or the minimum cold water temperature at the actual installation requirement.
► Reduce repeated switch-ons to the minimum (low loads).
► Program appliance activation for actual periods of use.
► Keep water and air filters on plumbing and ventilation systems clean.

7 MAINTENANCE

7.1 WARNINGS

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

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

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

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

The efficiency checks and every other "check and maintenance operation" (see Tables 7.1 *p. 37* and 7.2 *p. 37*) 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. 37*.

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. 37*, 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

7.4.1 4 digit display

The S61 board of the appliance (Paragraph 1.5 *p. 13*, Figure 5.1 *p. 34*) is fitted with a 4-digit display, visible through the sight glass of the front panel.

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

7.4.2 Signals in normal operation

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

7.4.3 Signals in the event of fault

In the event of fault the display blinks indicating an 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. 38*).

7.5 RESTARTING A LOCKED-OUT UNIT

7.5.1 Fault signals on the display

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

► To restart the appliance you must know and perform the procedure concerning the issue signalled and identified by the code (Table 8.1 *p. 38*).
► Only act if you are familiar with the issue and with the procedure (technical expertise and professional qualifications might be required).
► If you do not know the code, the problem, or the procedure, or you do not have sufficient skills, and in any case of doubt, contact the TAC.

7.5.2 Locked-out appliance

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

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

7.5.3 Reset

There are two options for resetting a fault:

1. If the appliance is connected to a DDC you may act through the control device, as described in the relevant manual.
2. You may act directly from the S61 board as described below

(if the appliance is controlled with external request, this is the only option).

How to perform reset from the S61 board

To perform the reset directly from the board:

1. Access Menu 2 under Parameter "__0", to reset flame lock-out (Error E212), 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. 34*).
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.__X" is displayed again (e.g. "2.__0"). The reset operation has been performed.
4. Exit menu 2 and the menu list, by selecting and pressing letter "E" twice, and go back to the normal display of detected temperature data.

7.6 PERIODS OF INACTIVITY

Avoid emptying the installation

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

Deactivate the system in winter

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

1. antifreeze function active (Paragraph 3.5 *p. 21*)
2. sufficient antifreeze glycol (Paragraph 3.6 *p. 21*)

7.6.1 Prolonged periods of inactivity

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

How to deactivate the appliance for long periods of time

1. Switch the appliance off (Paragraph 6.2 *p. 36*).
2. Only when the appliance is completely off, power it off with the main switch/disconnector switch (Detail GS in Figure 4.2 *p. 28*).
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. 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. 36* and 7.3 *p. 37*).
► Check content and quality of the water in the system, and if necessary top it up (Paragraphs 3.8 *p. 22*, 3.7 *p. 22* and 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 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. 28*).
3. Switch on the appliance by means of the provided control device (Paragraph 4.4 *p. 28*).

8 DIAGNOSTICS

8.1 OPERATIVE CODES

Table 8.1 *Operative Codes*

Code	Description	Warning (u)	Error (E)
200	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.
201	Limit thermostat trip	Contact the TAC.	
202	Flue gas thermostat trip	Contact the TAC.	
203	Chilled water antifreeze thermostat trip	Reset is automatic when the triggering condition ceases.	NA
205	Outdoor temperature exceeding operational limits	NA	Reset is automatic when the triggering condition ceases.
206	Outdoor temperature below operational limits	Non-blocking Warning (informative code). Reset is automatic when the triggering condition ceases.	NA
207	High generator temperature	Reset is automatic when the triggering condition ceases.	Reset may be performed from the DDC/CCI or from the S61 board (menu 2, parameter 21). If the code persists, shows up again or in case of doubt, contact the TAC.
208	Flame controller error	NA	Contact authorised Technical Assistance

Code	Description	Warning (u)	Error (E)
210	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/CCI or from the S61 board (menu 2, parameter 21). If the code persists, shows up again or in case of doubt, contact the TAC.
211	Insufficient rotation of oil pump	Reset occurs automatically 20 minutes after the code is generated.	Reset may be performed from the DDC/CCI or from the S61 board (menu 2, parameter 21). If the code persists, shows up again or in case of doubt, contact the TAC.
212	Flame controller lockout	Reset is automatic up to 4 attempts (in about 5 minutes).	Check gas supply. Reset may be performed from the DDC/CCI or from the S61 board (menu 2, parameter 20). If the code persists or in case of doubt, contact the TAC.
216	Chilled water delivery temperature probe fault	NA	Reset may be performed from the DDC/CCI or from the S61 board (menu 2, parameter 21). If the code persists, shows up again or in case of doubt, contact the TAC.
217	Chilled water inlet temperature probe fault	NA	Reset may be performed from the DDC/CCI or from the S61 board (menu 2, parameter 21). If the code persists, shows up again or in case of doubt, contact the TAC.
220	Generator temperature probe fault	NA	Reset may be performed from the DDC/CCI or from the S61 board (menu 2, parameter 21). If the code persists, shows up again or in case of doubt, contact the TAC.
222	Water flowmeter fault	NA	Reset may be performed from the DDC/CCI or from the S61 board (menu 2, parameter 21). If the code persists, shows up again or in case of doubt, contact the TAC.
223	Air-gas mix temperature probe fault	NA	Reset may be performed from the DDC/CCI or from the S61 board (menu 2, parameter 21). If the code persists, shows up again or in case of doubt, contact the TAC.
224	Flue gas temperature probe fault	Reset is automatic when the triggering condition ceases.	Reset may be performed from the DDC/CCI or from the S61 board (menu 2, parameter 21). If the code persists, shows up again or in case of doubt, contact the TAC.
225	Clogged condensate drain	NA	Check and clean condensate drain. Reset may be performed from the DDC/CCI or from the S61 board (menu 2, parameter 21). If the code persists, shows up again or in case of doubt, contact the TAC.
226	Generator fins temperature probe fault	Reset is automatic when the triggering condition ceases.	Reset may be performed from the DDC/CCI or from the S61 board (menu 2, parameter 21). If the code persists, shows up again or in case of doubt, contact the TAC.
228	Flame controller error	NA	Power off the appliance. Contact the TAC.
229	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/CCI or from the S61 board (menu 2, parameter 21). If the code persists, shows up again or in case of doubt, contact the TAC.
230	High flue gas or generator fins temperature	Reset is automatic when the triggering condition ceases.	Reset may be performed from the DDC/CCI or from the S61 board (menu 2, parameter 21). If the code persists, shows up again or in case of doubt, contact the TAC.
231	Hot water temperature exceeding operational limits	Check configuration of other heat generators on the system. Check water flow. Check system thermal load. Reset is automatic when the triggering condition ceases.	NA
232	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

Code	Description	Warning (u)	Error (E)
233	Source water exceeding operational limit	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
234	-	Contact the TAC.	NA
236	Blower fault	Reset occurs automatically 20 minutes after the code is generated.	Reset may be performed from the DDC/CCI or from the S61 board (menu 2, parameter 21). If the code persists, shows up again or in case of doubt, contact the TAC.
246	High hot water inlet temperature	Check configuration of other heat generators on the system. Reset is automatic and occurs if the generating condition ceases with circulating pump on or 20 minutes after the code is generated with circulating pump off.	NA
247	Hot water inlet temperature below operational limits	Reset occurs automatically when the generating cause resolves or 430 seconds after the code is generated.	Reset occurs automatically when the condition that generated the code ceases. If the code shows up again or in case of doubt contact the TAC.
248	High hot water differential temperature	Check water flow. Reset occurs automatically 20 minutes after the code is generated.	Reset occurs automatically when the condition that generated the code ceases. If the code shows up again or in case of doubt contact the TAC.
249	Missing auxiliary board	NA	Contact the TAC.
251	Cooling antifreeze function activated	Non-blocking Warning (informative code). The code clears automatically when antifreeze function execution ends.	NA
261	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
275	Low hot water flow	Reset is automatic when the triggering condition ceases.	Check and clean water filters on the system. Check for air in the system. Check water flow pump. Power cycle the appliance. Reset may be performed from the DDC/CCI or from the S61 board (menu 2, parameter 1). If the code persists, shows up again or in case of doubt, contact the TAC.
276	Hot water delivery temperature probe fault	NA	Reset may be performed from the DDC/CCI or from the S61 board (menu 2, parameter 1). If the code persists, shows up again or in case of doubt, contact the TAC.
277	Hot water inlet temperature probe fault	NA	Reset may be performed from the DDC/CCI or from the S61 board (menu 2, parameter 1). If the code persists, shows up again or in case of doubt, contact the TAC.
278	High hot water delivery temperature	Reset is automatic when the triggering condition ceases.	NA
279	Heating antifreeze function activated	Non-blocking Warning (informative code). The code clears automatically when antifreeze function execution ends.	NA
80/280	Incomplete functional parameters	Contact the TAC.	
281	Invalid bank 1 parameters	Reset is automatic when the triggering condition ceases.	Contact the TAC.
282	Invalid bank 2 parameters	Reset is automatic when the triggering condition ceases.	Contact the TAC.
284	Transformer or 24 Vac fuse fault	NA	Contact the TAC.
285	Invalid module type configuration parameters	NA	Contact the TAC.
286	ROM board fault	NA	Contact the TAC.
287	pRAM board fault	NA	Contact the TAC.
288	xRAM board fault	NA	Contact the TAC.
289	Registers board fault	NA	Contact the TAC.
290	Outdoor temperature probe fault	NA	Reset may be performed from the DDC/CCI or from the S61 board (menu 2, parameter 21). If the code persists, shows up again or in case of doubt, contact the TAC.
291	Electronic board fault	NA	Contact the TAC.

NA: Not Applicable

9 APPENDICES

9.1 PRODUCT FICHE

Figure 9.1

Table 8

COMMISSION DELEGATED REGULATION (EU) No 811/2013

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

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

Item	Symbol	Value	Unit	Item	Symbol	Value	Unit
AVERAGE CLIMATE CONDITIONS							
Rated heat output (*)	*Prated*	37,4	kW	**Seasonal space heating energy efficiency**	η_s	125	%
Declared capacity for heating for part load at indoor temperature 20 °C and outdoor temperature Tj				Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = –7 °C	*Pdh*	32,9	kW	Tj = –7 °C	*PERd*	128	%
Tj = +2 °C	*Pdh*	20,2	kW	Tj = +2 °C	*PERd*	130	%
Tj = +7 °C	*Pdh*	13,1	kW	Tj = +7 °C	*PERd*	128	%
Tj = +12 °C	*Pdh*	5,6	kW	Tj = +12 °C	*PERd*	123	%
T_j = bivalent temperature	*Pdh*	-	kW	Tj = bivalent temperature	*PERd*	-	%
Annual energy consumption	Q_{HE}	223	GJ				
COLDER CLIMATE CONDITIONS							
Rated heat output (*)	*Prated*	37,4	kW	**Seasonal space heating energy efficiency**	η_s	124	%
Declared capacity for heating for part load at indoor temperature 20 °C and outdoor temperature Tj				Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = –7 °C	*Pdh*	22,8	kW	Tj = –7 °C	*PERd*	129	%
Tj = +2 °C	*Pdh*	13,8	kW	Tj = +2 °C	*PERd*	128	%
Tj = +7 °C	*Pdh*	9,0	kW	Tj = +7 °C	*PERd*	126	%
Tj = +12 °C	*Pdh*	4,1	kW	Tj = +12 °C	*PERd*	122	%
Tj = bivalent temperature	*Pdh*	-	kW	Tj = bivalent temperature	*PERd*	-	%
T_j = operation limit temperature	*Pdh*	37,4	kW	Tj = operation limit temperature	*PERd*	128	%
For air-to-water heat pumps: T_j = –15 °C (if TOL < –20 °C)	*Pdh*	30,7	kW	For air-to-water heat pumps: Tj = –15 °C (if TOL < –20 °C)	*PERd*	128	%
Annual energy consumption	Q_{HE}	268	GJ				
WARMER CLIMATE CONDITIONS							
Rated heat output (*)	*Prated*	37,4	kW	**Seasonal space heating energy efficiency**	η_s	124	%
Declared capacity for heating for part load at indoor temperature 20 °C and outdoor temperature Tj				Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = +2 °C	*Pdh*	37,4	kW	Tj = +2 °C	*PERd*	128	%
Tj = +7 °C	*Pdh*	23,9	kW	Tj = +7 °C	*PERd*	129	%
Tj = +12 °C	*Pdh*	10,9	kW	Tj = +12 °C	*PERd*	127	%
Tj = bivalent temperature	*Pdh*	-	kW	Tj = bivalent temperature	*PERd*	-	%
Annual energy consumption	Q_{HE}	145	GJ				
Bivalent temperature	T_{biv}	TOL < $T_{designh}$	°C	For air-to-water heat pumps: Operation limit temperature	*TOL*	-	°C
				Heating water operating limit temperature	*WTOL*	65	°C
Power consumption in modes other than active mode				Supplementary heater			
Off mode	P_{OFF}	0,000	kW	Rated heat output	*Psup*	-	kW
Thermostat-off mode	P_{TO}	0,019	kW	Type of energy input		monovalent	
Standby mode	P_{SB}	0,005	kW				
Crankcase heater mode	P_{CK}	-	kW				
Other items							
Capacity control		variable		For air-to-water heat pumps: Rated air flow rate, outdoors	—	-	m³/h
Sound power level, indoors/outdoors	L_{WA}	- / 66	dB	For water- or brine-to-water heat pumps: Rated brine or water flow rate, outdoor heat exchanger	—	3,0	m³/h
Contact details	Robur SPA, Via Parigi 4/6, I-24040 Zingonia (BG)						

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

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

Emissions of nitrogen oxides:	NO_x	40	mg/kWh

Figure 9.2

Table 8

COMMISSION DELEGATED REGULATION (EU) No 811/2013

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

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

Item	Symbol	Value	Unit	Item	Symbol	Value	Unit
AVERAGE CLIMATE CONDITIONS							
Rated heat output (*)	*Prated*	41,5	kW	**Seasonal space heating energy efficiency**	η_s	127	%
Declared capacity for heating for part load at indoor temperature 20 °C and outdoor temperature Tj				Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = –7 °C	*Pdh*	36,5	kW	Tj = –7 °C	*PERd*	139	%
Tj = +2 °C	*Pdh*	22,4	kW	Tj = +2 °C	*PERd*	135	%
Tj = +7 °C	*Pdh*	14,5	kW	Tj = +7 °C	*PERd*	127	%
Tj = +12 °C	*Pdh*	6,2	kW	Tj = +12 °C	*PERd*	121	%
T_j = bivalent temperature	*Pdh*	-	kW	Tj = bivalent temperature	*PERd*	-	%
Annual energy consumption	Q_{HE}	243	GJ				
COLDER CLIMATE CONDITIONS							
Rated heat output (*)	*Prated*	41,5	kW	**Seasonal space heating energy efficiency**	η_s	125	%
Declared capacity for heating for part load at indoor temperature 20 °C and outdoor temperature Tj				Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = –7 °C	*Pdh*	25,3	kW	Tj = –7 °C	*PERd*	135	%
Tj = +2 °C	*Pdh*	15,4	kW	Tj = +2 °C	*PERd*	128	%
Tj = +7 °C	*Pdh*	10,0	kW	Tj = +7 °C	*PERd*	124	%
Tj = +12 °C	*Pdh*	4,6	kW	Tj = +12 °C	*PERd*	119	%
Tj = bivalent temperature	*Pdh*	-	kW	Tj = bivalent temperature	*PERd*	-	%
T_j = operation limit temperature	*Pdh*	41,5	kW	Tj = operation limit temperature	*PERd*	142	%
For air-to-water heat pumps: T_j = –15 °C (if TOL < –20 °C)	*Pdh*	34,0	kW	For air-to-water heat pumps: Tj = –15 °C (if TOL < –20 °C)	*PERd*	138	%
Annual energy consumption	Q_{HE}	294	GJ				
WARMER CLIMATE CONDITIONS							
Rated heat output (*)	*Prated*	41,5	kW	**Seasonal space heating energy efficiency**	η_s	126	%
Declared capacity for heating for part load at indoor temperature 20 °C and outdoor temperature Tj				Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = +2 °C	*Pdh*	41,5	kW	Tj = +2 °C	*PERd*	142	%
Tj = +7 °C	*Pdh*	26,6	kW	Tj = +7 °C	*PERd*	136	%
Tj = +12 °C	*Pdh*	12,0	kW	Tj = +12 °C	*PERd*	125	%
Tj = bivalent temperature	*Pdh*	-	kW	Tj = bivalent temperature	*PERd*	-	%
Annual energy consumption	Q_{HE}	158	GJ				
Bivalent temperature	T_{biv}	TOL < $T_{designh}$	°C	For air-to-water heat pumps: Operation limit temperature	*TOL*	-	°C
				Heating water operating limit temperature	*WTOL*	65	°C
Power consumption in modes other than active mode				Supplementary heater			
Off mode	P_{OFF}	0,000	kW	Rated heat output	*Psup*	-	kW
Thermostat-off mode	P_{TO}	0,019	kW	Type of energy input		monovalent	
Standby mode	P_{SB}	0,005	kW				
Crankcase heater mode	P_{CK}	-	kW				
Other items							
Capacity control		variable		For air-to-water heat pumps: Rated air flow rate, outdoors	—	-	m³/h
Sound power level, indoors/outdoors	L_{WA}	- / 66	dB	For water- or brine-to-water heat pumps: Rated brine or water flow rate, outdoor heat exchanger	—	2,9	m³/h
Contact details		Robur SPA, Via Parigi 4/6, I-24040 Zingonia (BG)					

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

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

Emissions of nitrogen oxides:	NO_x	40	mg/kWh

Robur mission

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

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caring for the environment

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