1 SPECIFICATION OF SUPPLY

1.1 GAHP GS HT OUTDOOR VERSION

Water-ammonia absorption heat pump, fed with natural gas or LPG, brine-water version, modulating and condensing, for alternate or simultaneous production of hot water up to a delivery temperature of 65 °C (70 °C at 50% of maximum thermal input) and cold water even at negative temperatures (minimum delivery temperature -5 °C), for outdoor installation.
Heat output for each unit (B0W35): 41,6 kW
GUE efficiency (B0W35): 165 %
Power recovered from renewable source (B0W35): 16,4 kW
Heat input: 25,2 kW
Electrical power absorption nominal: 0,41 kW
Power supply: 230 V - 50 Hz single-phase
Weight: 300 kg
Dimensions: width 1056 mm, depth 690 mm, height 1278 mm

1.2 GAHP GS HT INDOOR VERSION

Water-ammonia absorption heat pump, fed with natural gas or LPG, brine-water version, modulating and condensing, for alternate or simultaneous production of hot water up to a delivery temperature of 65 °C (70 °C at 50% of maximum thermal input) and cold water even at negative temperatures (minimum delivery temperature -5 °C), for indoor installation.
Heat output for each unit (B0W35): 41,6 kW
GUE efficiency (B0W35): 165 %
Power recovered from renewable source (B0W35): 16,4 kW
Heat input: 25,2 kW
Electrical power absorption nominal: 0,41 kW
Power supply: 230 V - 50 Hz single-phase
Weight: 300 kg
Dimensions: width 1056 mm, depth 690 mm, height 1278 mm

1.3 GAHP WS OUTDOOR VERSION

Water-ammonia absorption heat pump, fed with natural gas or LPG, water-water version, modulating and condensing, for alternate or simultaneous production of hot water up to a delivery temperature of 65 °C (70 °C at 50% of maximum thermal input) and cold water down to a delivery temperature of 3 °C, for outdoor installation.
Heat output for each unit (W10W35): 43,9 kW
GUE efficiency (W10W35): 174 %
Power recovered from renewable source (W10W35): 18,7 kW
Heat input: 25,2 kW
Electrical power absorption nominal: 0,41 kW
Power supply: 230 V - 50 Hz single-phase
Weight: 300 kg
Dimensions: width 1056 mm, depth 690 mm, height 1278 mm

1.4 GAHP WS INDOOR VERSION

Water-ammonia absorption heat pump, fed with natural gas or LPG, water-water version, modulating and condensing, for alternate or simultaneous production of hot water up to a delivery temperature of 65 °C (70 °C at 50% of maximum thermal input) and cold water down to a delivery temperature of 3 °C, for indoor installation.
Heat output for each unit (W10W35): 43,9 kW
GUE efficiency (W10W35): 174 %
Power recovered from renewable source (W10W35): 18,7 kW
Heat input: 25,2 kW
Electrical power absorption nominal: 0,41 kW
Power supply: 230 V - 50 Hz single-phase
Weight: 300 kg
Dimensions: width 1056 mm, depth 690 mm, height 1278 mm

2 FEATURES AND TECHNICAL DATA

2.1 FEATURES

2.1.1 Mechanical and thermo-hydraulic components

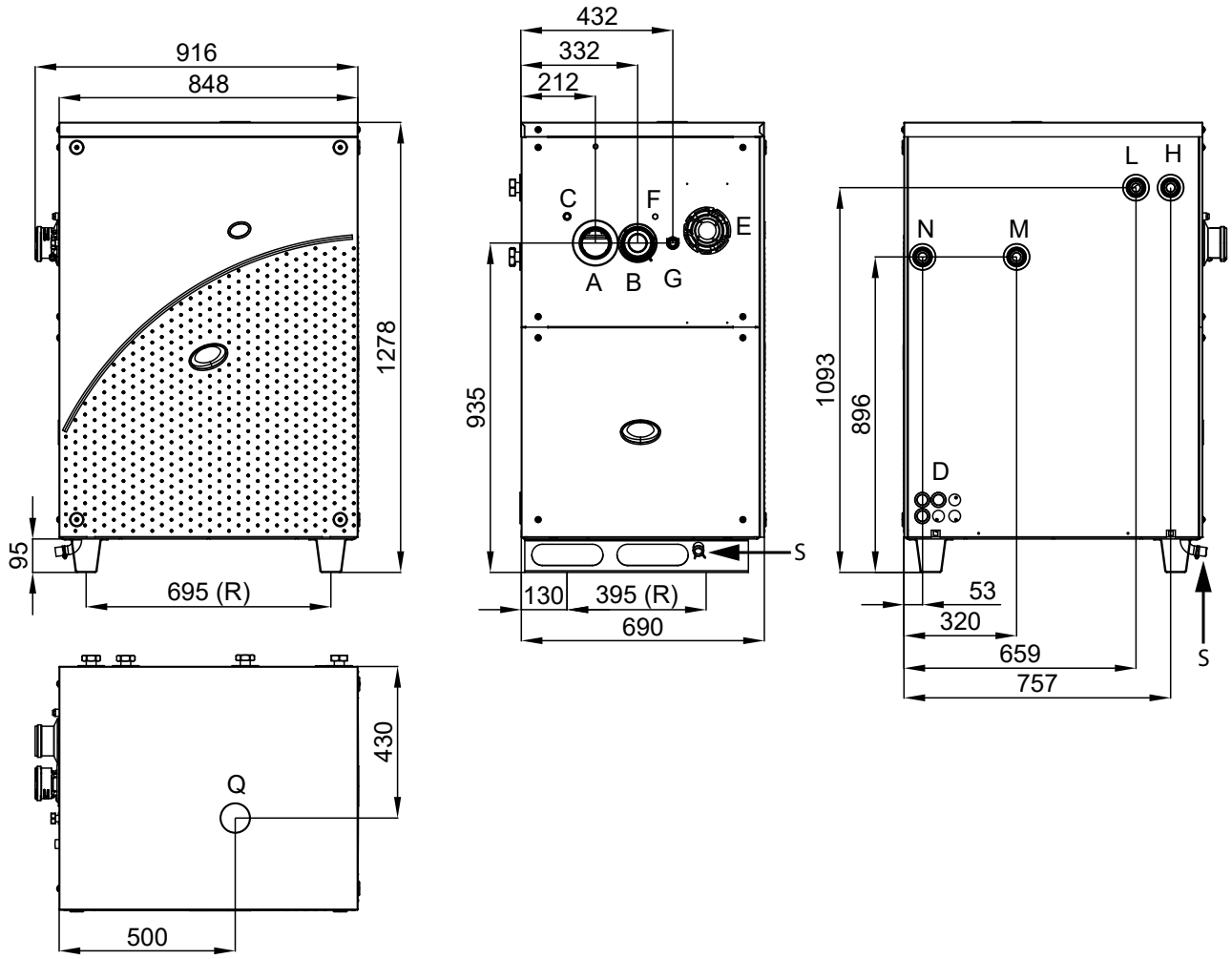
- Steel sealed circuit, externally treated with epoxy paint.
- Sealed combustion chamber (type C) suitable for outdoor installations.
- Metal mesh radiant burner, equipped with ignition electrodes and flame detection, managed by an electronic flame control box.
- Titanium stainless steel shell-and-tube water 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.

2.1.2 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.
- Condensate drain obstruction sensor.

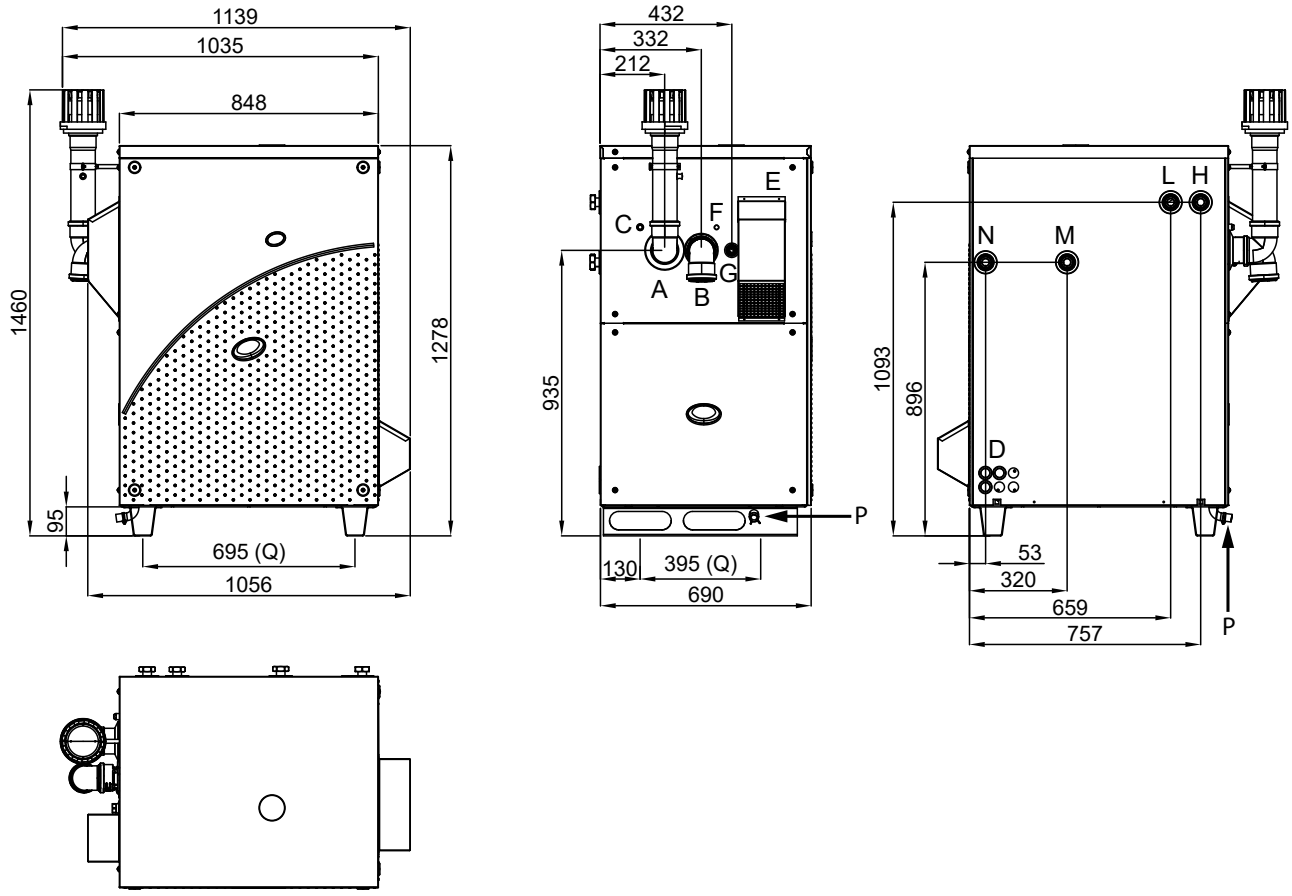
2.2 DIMENSIONS

Figure 2.1 *Indoor GAHP GS/WS dimensions*



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

Figure 2.2 *Outdoor GAHP GS/WS dimensions*



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

2.3 CONTROLS

Control device

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

1. DDC control
2. CCI control
3. external request

2.3.1 DDC Controller

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

For more details see Section C01.11.

2.3.2 CCI control

The CCI control can manage up to 3 GAHP appliances in modulating mode (only GAHP A/GAHP GS/WS).

For more details see Section C01.11.

2.3.3 External request

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

2.4 TECHNICAL DATA

Table 2.1 *GAHP GS/WS technical data*

				GAHP GS HT	GAHP WS
Heating operation					
Seasonal space heating energy efficiency class (ErP)	medium-temperature application (55 °C)		-	A++	
	low-temperature application (35 °C)		-	A+	
Heat output for each unit	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)		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 (1)	
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		bar	0,49 (2)	0,57 (2)
Outdoor temperature (dry bulb)	maximum		°C	45	
	minimum		°C	0 (3)	
Renewable source operating conditions					
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 (2)	0,38 (2)
Electrical specifications					
Power supply	voltage		V	230	
	type		-	single-phase	
	frequency		Hz	50	
Electrical power absorption	nominal		kW	0,41 (4)	
Degree of protection	IP		-	X5D	
Installation data					

(1) In transient operation, lower temperatures are allowed.
(2) For flows other than nominal see Design Manual, Pressure losses Paragraph.
(3) 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.
(4) ±10% depending on power voltage and absorption tolerance of electric motors.
(5) Sound power values detected in compliance with the intensity measurement methodology set forth by standard EN ISO 9614; C type installation.
(6) Maximum sound pressure levels in free field, with directivity factor 2, obtained from the sound power level in compliance with standard EN ISO 9614; C type installation.
(7) Indoor version only.
(8) Width indoor version 916 mm. Overall dimensions excluding flue gas exhaust.
(9) Overall dimensions excluding flue gas exhaust.

			GAHP GS HT	GAHP WS
Gas consumption	G20 natural gas (nominal)	m^3/h	2,72	
	G25 (nominal)	m^3/h	3,16	
	G25.1 (nominal)	m^3/h	3,16	
	G25.3 (nominal)	m^3/h	3,09	
	G27 (nominal)	m^3/h	3,32	
	G2.350 (nominal)	m^3/h	3,78	
	G30 (nominal)	kg/h	2,03	
	G31 (nominal)	kg/h	2,00	
NO_x emission class		-	5	
sound power L_w (max)		dB(A)	66,1 (5)	
sound pressure L_p at 5 metres (max)		dB(A)	44,1 (6)	
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 drain ducting connection		"	1 1/4 (7)	
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	1056 (8)	
	depth	mm	690	
	height	mm	1278 (9)	
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) In transient operation, lower temperatures are allowed.
(2) For flows other than nominal see Design Manual, Pressure losses Paragraph.
(3) 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.
(4) ±10% depending on power voltage and absorption tolerance of electric motors.
(5) Sound power values detected in compliance with the intensity measurement methodology set forth by standard EN ISO 9614; C type installation.
(6) Maximum sound pressure levels in free field, with directivity factor 2, obtained from the sound power level in compliance with standard EN ISO 9614; C type installation.
(7) Indoor version only.
(8) Width indoor version 916 mm. Overall dimensions excluding flue gas exhaust.
(9) Overall dimensions excluding flue gas exhaust.

2.4.1 Pressure drops

2.4.1.1 Condenser

Table 2.2 *p. 5* shows the condenser side pressure drop data referring to GAHP GS HT unit.

Table 2.2 *Pressure drop GAHP GS condenser side*

Hot water flow	Heat transfer fluid temperature at outlet		
	35 °C	50 °C	65 °C
	bar	bar	bar
2000 l/h	0,23	0,21	0,19
3000 l/h	0,46	0,43	0,38
4000 l/h	0,78	0,72	0,64

Table 2.3 *p. 5* shows the condenser side pressure drop data referring to GAHP WS unit.

Table 2.3 *Pressure drop GAHP WS condenser side*

Hot water flow	Heat transfer fluid temperature at outlet		
	35 °C	50 °C	65 °C
	bar	bar	bar
2000 l/h	0,23	0,21	0,19
3000 l/h	0,46	0,43	0,38
4000 l/h	0,78	0,72	0,64

2.4.1.2 Evaporator

Table 2.4 *p. 5* shows the evaporator side pressure drop data referring to GAHP GS HT unit.

Table 2.4 *Pressure drop GAHP GS evaporator side*

Cold water flow	Heat transfer fluid temperature at outlet		
	-5 °C	0 °C	5 °C
	bar	bar	bar
2500 l/h	0,43	0,40	0,38
3000 l/h	0,57	0,54	0,52
3500 l/h	0,74	0,70	0,67

The data refer to operation with 25% glycol water.

Table 2.5 *p. 5* shows the evaporator side pressure drop data referring to GAHP WS unit.

Table 2.5 *Pressure drop GAHP WS evaporator side*

Cold water flow	Heat transfer fluid temperature at outlet	
	3 °C	7 °C
	bar	bar
2500 l/h	0,31	0,30
3000 l/h	0,44	0,43
3500 l/h	0,60	0,58

The data refer to operation with no glycol in water.

2.4.2 Performances

2.4.2.1 Heating

Table 2.6 *p. 6* shows the unitary heat output at full load and stable operation, depending on hot water delivery temperature to the system and cold water return temperature from the renewable source for GAHP GS HT unit.

Table 2.6 *GAHP GS HT heat output for each unit*

Evaporator inlet water temperature	Water delivery temperature							
	35 °C	40 °C	45 °C	50 °C	55 °C	60 °C	65 °C	70 °C (1)
	kW	kW	kW	kW	kW	kW	kW	kW
0 °C	41,6	40,5	39,0	37,6	35,6	33,5	31,4	13,6
5 °C	42,2	41,7	40,0	39,0	37,1	35,2	32,9	13,9
10 °C	42,3	41,8	40,9	40,0	38,4	37,1	35,2	15,5
15 °C	42,6	42,2	41,7	40,9	39,6	39,0	37,1	16,0

(1) Thermal input reduced to 50%

Data refer to the hot water delivery temperature to the system (condenser outlet).
Data refer to the cold water return temperature from the renewable source (evaporator inlet).

Table 2.7 *p. 6* shows the GUE at full load and stable operation in heating mode, depending on the hot water delivery temperature to the system and the cold water return temperature from the renewable source, for the GAHP GS HT unit.
-

Table 2.7 *GUE GAHP GS HT heating mode*

Evaporator inlet water temperature	Water delivery temperature							
	35 °C	40 °C	45 °C	50 °C	55 °C	60 °C	65 °C	70 °C (1)
	%	%	%	%	%	%	%	%
0 °C	165	161	155	149	141	133	125	108
5 °C	168	166	159	155	147	140	131	110
10 °C	168	166	163	159	152	147	140	123
15 °C	169	168	166	163	157	155	147	127

(1) Thermal input reduced to 50%

Table 2.8 *p. 6* shows the unitary heat output at full load and stable operation, depending on hot water delivery temperature to the system and cold water return temperature from the renewable source for GAHP WS unit.

Table 2.8 *GAHP WS heat output for each unit*

Evaporator inlet water temperature	Water delivery temperature							
	35 °C	40 °C	45 °C	50 °C	55 °C	60 °C	65 °C	70 °C (1)
	kW	kW	kW	kW	kW	kW	kW	kW
10 °C	43,9	43,2	42,4	41,6	39,6	37,7	35,8	13,6
15 °C	43,9	43,6	43,1	42,6	40,6	38,8	36,9	14,1
20 °C	43,9	43,6	43,6	43,6	41,7	39,9	38,1	14,6
25 °C	43,9	43,6	43,6	43,6	42,8	41,0	39,2	15,1

(1) Thermal input reduced to 50%

Data refer to the hot water delivery temperature to the system (condenser outlet).
Data refer to the cold water return temperature from the renewable source (evaporator inlet).

Table 2.9 *p. 6* shows the GUE at full load and stable operation in heating mode, depending on the hot water delivery temperature to the system and the cold water return temperature from the renewable source, for the GAHP WS unit.

Table 2.9 *GUE GAHP WS heating mode*

Evaporator inlet water temperature	Water delivery temperature							
	35 °C	40 °C	45 °C	50 °C	55 °C	60 °C	65 °C	70 °C (1)
	%	%	%	%	%	%	%	%
10 °C	174	172	168	165	157	150	142	108
15 °C	174	173	171	169	161	154	147	112
20 °C	174	173	173	173	166	158	151	116
25 °C	174	173	173	173	170	163	156	120

(1) Thermal input reduced to 50%

Please consider that, according to the actual heating request, the appliance may often need to operate under partial load conditions and in non-stationary operation.

2.4.2.2 Power recovered from renewable source

Cooling performance corresponds to the power recovered from the renewable energy source

In cooling mode, the return temperature from the system corresponds to the inlet temperature of the evaporator, while the water delivery temperature corresponds to the outlet temperature to the thermal energy dissipation system (geothermal probes or heat exchanger).

Table 2.10 *p. 7* shows the unitary power recovered from the renewable energy source at full load and stable operation, depending on hot water delivery temperature to the system and cold water return temperature from the renewable source for GAHP GS HT unit.

Table 2.10 *Power recovered from renewable source GAHP GS HT*

Evaporator inlet water temperature	Water delivery temperature					
	35 °C	40 °C	45 °C	50 °C	55 °C	60 °C
	kW	kW	kW	kW	kW	kW
12 °C	17,6	17,4	17,4	17,1	16,8	15,8
15 °C	17,9	17,7	17,6	17,5	17,3	16,6

Data refer to the hot water delivery temperature to the system (condenser outlet).
Data refer to the cold water return temperature from the renewable source (evaporator inlet).

Table 2.11 *p. 7* shows the GUE at full load and stable operation in cooling mode, depending on the cold water return temperature from the system and the hot water delivery temperature to the dissipation system, for the GAHP GS HT unit.

Table 2.11 *GUE GAHP GS HT cooling mode*

Evaporator inlet water temperature	Water delivery temperature					
	35 °C	40 °C	45 °C	50 °C	55 °C	60 °C
	%	%	%	%	%	%
12 °C	70	69	69	68	67	63
15 °C	71	70	70	69	69	66

Table 2.12 *p. 7* shows the unitary power recovered from the renewable energy source at full load and stable operation, depending on hot water delivery temperature to the system and cold water return temperature from the renewable source for GAHP WS unit.

Table 2.12 *Power recovered from renewable source GAHP WS*

Evaporator inlet water temperature	Water delivery temperature					
	35 °C	40 °C	45 °C	50 °C	55 °C	60 °C
	kW	kW	kW	kW	kW	kW
12 °C	18,7	18,2	17,5	16,8	14,8	12,9
15 °C	18,7	18,4	17,9	17,4	15,4	13,6

Data refer to the hot water delivery temperature to the system (condenser outlet).
Data refer to the cold water return temperature from the renewable source (evaporator inlet).

Table 2.13 *p. 7* shows the GUE at full load and stable operation in cooling mode, depending on the cold water return temperature from the system and the hot water delivery temperature to the dissipation system, for the GAHP WS unit.

Table 2.13 *GUE GAHP WS cooling mode*

Evaporator inlet water temperature	Water delivery temperature					
	35 °C	40 °C	45 °C	50 °C	55 °C	60 °C
	%	%	%	%	%	%
12 °C	74	72	69	67	59	51
15 °C	74	73	71	69	61	54

Please consider that, according to the actual heat exchange with the renewable source (or cooling request), the unit may often need to operate under partial load conditions and in non stationary operation.

3 DESIGN

Compliance with installation standards

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

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

Design and installation must also comply with the manufacturer's provisions.

3.1 APPLIANCE POSITIONING

Please refer to Section C01.02.

3.2 PLUMBING DESIGN

Please refer to Section C01.03.

3.3 WATER PUMP

The circulation pump (flow and head) must be selected and installed based on pressure drops of plumbing/primary circuit (piping + components + exchange terminals + appliance).
For appliance pressure drops see Paragraph 2.4.1.1 *p. 5* (for condenser side) and Paragraph 2.4.1.2 *p. 5* (for evaporator side).

Please refer to Section C01.04 for the characteristics of the pumps available as Robur optional.

3.4 SYSTEM WATER QUALITY

Please refer to Section C01.05.

3.5 ANTIFREEZE PROTECTION

Please refer to Section C01.06.

3.6 FUEL GAS SUPPLY

Please refer to Section C01.08.

3.7 COMBUSTION PRODUCTS EXHAUST

Compliance with standards

The appliance is approved for connection to a combustion products exhaust duct for the types shown in Table 2.1 *p. 4*.

3.7.1 Flue gas exhaust connection

Ø 80 mm (with gasket), on the left side, at the top, side panel (detail A Figures 2.1 *p. 2* and 2.2 *p. 3*).

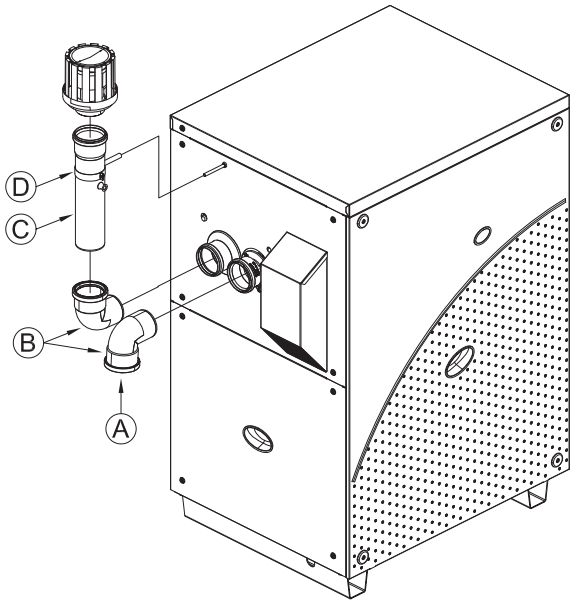
3.7.2 Indoor version

The appliance is supplied in configuration type B63.

3.7.3 Outdoor version

The appliance is supplied complete with air intake and flue gas exhaust kit to be fitted by the installer, shown in Figure 3.1 *p. 8*.

Figure 3.1 *Flue gas exhaust outdoor version*



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

3.7.4 Possible flue

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

For more details see Section C01.09.

3.8 FLUE GAS CONDENSATE DRAIN

Please refer to Section C01.09.

3.9 SAFETY VALVE DRAIN (INDOOR VERSION)

Ø 1 1/4", on the upper panel (detail Q Figure 2.1 *p. 2*).

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.

3.9.1 Safety valve drain ducting

The drain ducting shall be made in steel pipes (do not use copper or its alloys). Table 3.1 *p. 8* 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 3.1 *Safety valve drain ducting*

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

The drain duct must have an initial straight section of at least 30 cm.

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.

3.10 ELECTRICAL AND CONTROL CONNECTIONS

Please refer to Section C01.10.

3.11 EXAMPLE DIAGRAMS

Please refer to Section C01.13.

3.12 ACOUSTIC

Please refer to Section C01.14.