ROBUR

caring for the environment

Design Manual v4

39.4% renewable energy

165% heating efficiency

GAHP-A S1

Gas powered air source heat pump boiler for external installation.

GAHP-A indoor

For plant room installation

Index

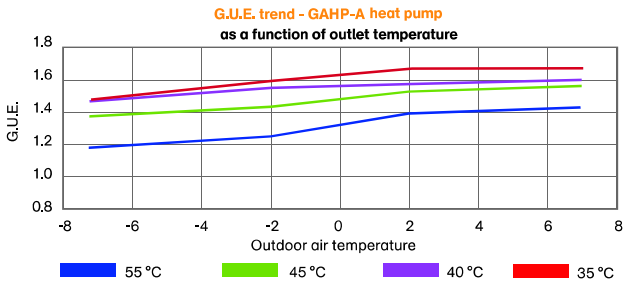
Single GAHP-A Heat Pump

Multiple "Links"/ AY Boiler

General Description

A GAHP-A offers high efficiency heating and high water temperature delivery at low ambient temperatures using a non-HFC Ammoniac solution powered by Natural Gas or LPG.

The GAHP-A model provides high efficiency Air Source Heat only. Alternative models are available as either Ground, Water or Air Source and offer cooling & heating, cooling only and cooling with recovery for "free" hot water.



Gas absorption GAHP heat pumps can be used effectively with all types of hydronic heating plant, offering water temperatures up to 65°C (heating) 70°C (DHW).

Model Codes

Single Units

GAHP	(Gas Absorption Heat Pump)		**-A**	(Air Source)
S1	(Low Noise)			
MET/NAT	(Natural Gas)	or	**LPG**	(Butane or Propane)

Example GAHP-A S1 MET/NAT, an Air Source Heat Pump, Low Noise for Mains Gas.

Factory Assembled Multiple Units

Heat pumps may be combined, on factory assembled "skids" with or without condensing boilers.

AY (Robur Condensing Boiler, 34.4kW)

RTA... multiple assembly with just Heat Pumps.
RTAY...multiple assembly with heat pumps & boilers refer to ESS for full codes.

Specification - single heat pump, S1 outdoor version

GAHP-A S1 (Low Noise) Specification			GAHP-A S1
Performance (*1)			
Operating Point - Air 7°C Water 35°C	Gas Usage Efficiency (GUE)	%	164.0
	Output	kW	41.3
Operating Point - Air 7°C Water 50°C	Gas Usage Efficiency (GUE)	%	152.0
	Output	kW	38.3
Operating Point - Air 7°C Water 65°C	Gas Usage Efficiency (GUE)	%	124.0
	Output	kW	31.1
Operating Point - Air -4°C Water 50°C	Gas Usage Efficiency (GUE)	%	133.1
	Output	kW	33.1
Thermal input	True Peak	kW	25.2
	Max (1013 mbar - 15°C)	kW	25.7
Hot water delivery temperature	maximum for heating	°C	65
	maximum for DHW	°C	70
Hot water return temperature	maximum heating	°C	55
	maximum for DHW	°C	60
	minimum temp for continuous operation	°C	30
Hot water flow rate	nominal	l/h	3000
	maximum	l/h	4000
	minimum	l/h	1400
Hot water pressure drop	nominal water pressure (A7W50)	bar	0.43
Ambient air temperature (dry bulb)	maximum	°C	40
	minimum	°C	-15 or -30(*3)
Thermal differential (Delta T)	nominal	°C	10
Gas Consumption	Natural Gas (Methane G20) nom	m3/h	2.72
	Natural Gas (Methane G20) min	m3/h	1.34
	LPG (Butane G30) nom	kg/h	2.03
	LPG (Butane G30) min	kg/h	0.99
	LPG (Propane G31) nom	kg/h	2.00
	LPG (Propane G31) min	kg/h	0.98
Emissions			
NOx emission class		class	5
NOx emission		mg/kWHr	44.1
CO emission		mg/kWHr	63.5
Electrical Specification			
Power supply	Voltage	V	230
	Type		Single Phase
	Frequency	Hz	50
Electrical power absorption	nominal	kW	0.83
	minimum	kW	0.56
Installation Data			
Sound Pressure at 5 metres	minimum	dB(A)	53.3
Sound Pressure at 5 metres	maximum	dB(A)	50.3
Sound Power (max)		dB(A)	72.3
Sound Power (min)		dB(A)	75.3
Minimum storage temperature		°C	-30
Minimum operating pressure		bar	4
Maximum condensation water rate		l/h	4
Water content inside apparatus		l	4
Recommended water content, primary circui	minimum	l	250
Water fitting	Type, Thread		Female 1 1/4"
Gas fitting	Type, Thread		Female 3/4"
Fume outlet	Diameter (ø)	mm	80
	Residual head	Pa	80
Dimenions (*2)	width	mm	848
	height	mm	1537
	depth	mm	1258
Weight	In operation	kg	400
Required Airflow		m3/h	11000
Residual Flue Pressure		Pa	80
General Information (Sealed Pressurised Cooling Circuit)			
Cooling Fluid	Ammonia R717	kg	7
	Water H2O	kg	10
Maximum Operating Pressure		bar	35

Notes: All data is subject to variation. Literature supplied with equipment takes precedence.

(*1) Performances as per ENV12309-2

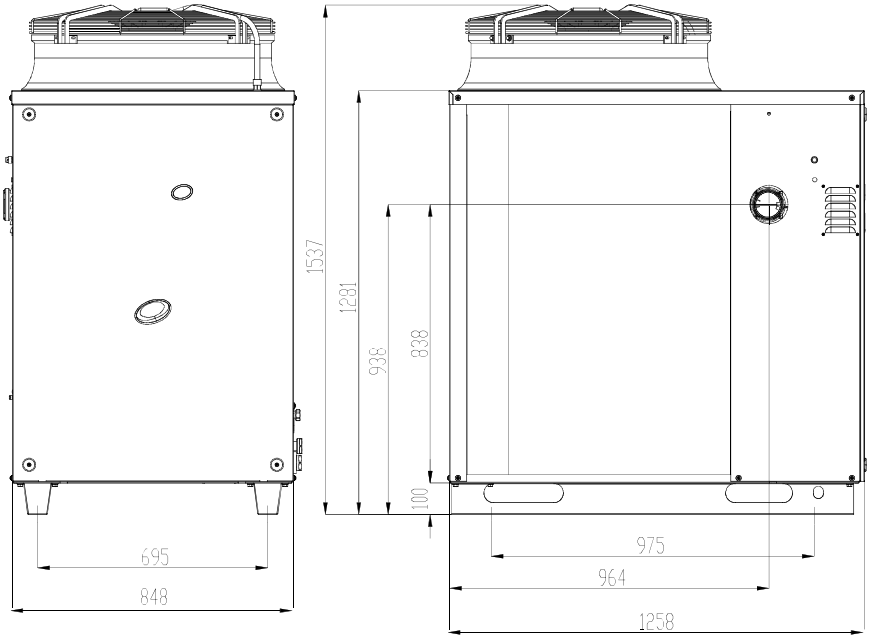
(*2) Dimensions exclude flue pipe

(*3) Factory setting is -15°C, adjustable to -30°C

(*4) Noise criteria to EN ISO 9614

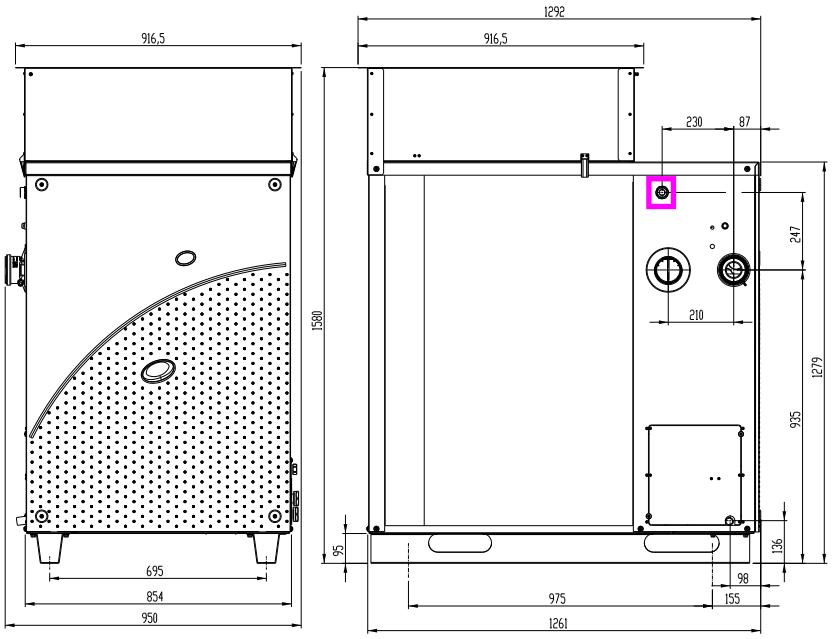
Dimensions

Single GAHP-A Heat Pump Outdoor S1 quiet version



Front and side views (dimensions in mm).

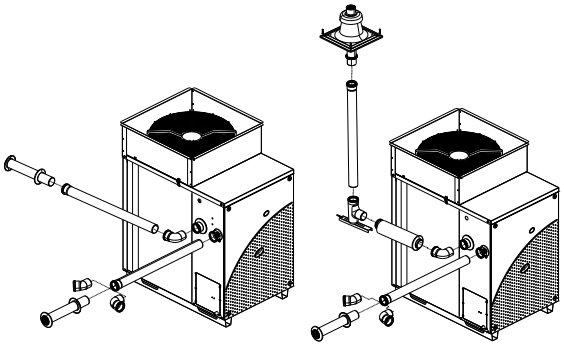
Single GAHP-A Heat Pump Indoor (plant room) version



For all indoor installations-

- Provision to be made to convey discharged ammonia from the emergency pressure relief valve.

Ensure that the combustion air intake and flue exhaust are provided, for example-



Installation Criteria

The GAHP-A is to be installed externally, where both the supply and exhaust air can circulate naturally. Under no circumstances should the plant be installed internally of where obstructions and constructions prevent the free air flow. Care must be taken to ensure the exhaust fumes outlet is away from the air inlets of occupied buidlings.

Mounting Base

Always position the appliance on a flat, level surface made of fireproof material and able to sustain the weight of the appliance itself.
During operation, condensation is generated which, in the case of winter operation may give rise to ice formation and a slip hazard. Care must be taken to collect, channel or disperse condensation in such a way to avoid this effect.

Hydraulic Plant Components

The following components are required to be fitted in accordance with the schematics in this document and the installation instructions and guidelines.

Anti-Vibration Joints - at the water and gas connections to the Heat Pump. Manometers - in the inlet and outlet water pipes.
Flow Regulation Valve - at the water inlet pipe.
Water Filter - at the water inlet pipe, mesh 0.7mm-1.00mm.
Ball Check Valve - on the water and gas pipes.
3 Bar Safety Valve - on the appliance water outlet pipe.
Plant Water Circulation Pump - on the water inlet pipe.
Condensate Collection e.g. tray and Disposal System.
System for Air Bleeding.
Drain Cock - for water pipes.
Plant Filling System.
Expansion Vessel - on the water oulet side
Buffer Vessel

If more than 1 heat pump is installed, the following items will be required...
Water Circulation Pump for each unit - on the water inlet side
Hydraulic Separator - complete with air bleeder and drain tap. Plant
Water Circulation Pump - on the plant delivery pipe.

Buffer Vessel/Water Content

For a single GAHP-A, the recommended total water content within the primary circuit is 300-400 litres.

Defrosting

The GAHP-A provides continuous heating throughout its de-frost cycle as the system does not undergo cycle inversion.
De-frost is achieved by diverting a small amount of the ammoniac from the generator at a temperature close to 80°C to the heat exchanger. Ammoniac is diverted to the tube coil heat exchanger in which the exchange of heat with the plant water occurs. Typically, the number of de-frost cycles will be fewer than 1 per day (on average about 50 per heating season), and each cycle lasts an average of 3 minutes. This is due to the high condensing temperature of the ammoniac. In short, the defrosting cycles do not compromise the overall efficiency of the heat pump, and do not need to be considered for design.

Gas & Supply Pressure

The appliance is suitable for Natural Gas or LPG (Butane or Propane).
Pressure must be in the range 17-25 mBar for Natural Gas, 25-30 mBar for LPG.

Freeze Prevention

The appliance is equipped with an anti-freeze function whereby the GAHP operates the pump, and, if necessary the burner. This is dependant on a continuous electrical supply to the appliance.

Where this cannot be guaranteed, use glycol antifreeze as per table below (inhibited monoethylene).

Percentage of monoethylene glycol

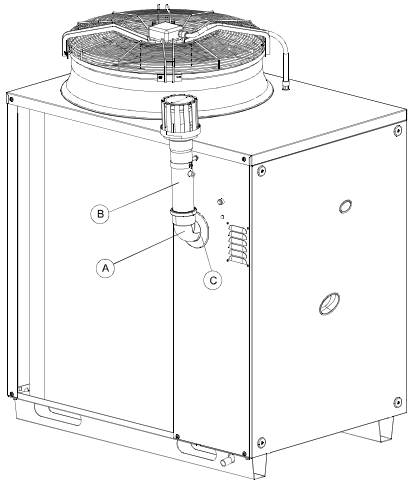
% of MONOETHYLENE GLYCOL	10	15	20	25	30	35	40
WATER FREEZING POINT TEMPERATURE	-3°C	-5°C	-8°C	-12°C	-15°C	-20°C	-25°C
PERCENTAGE OF INCREASE IN PRESSURE DROPS	--	6%	8%	10%	12%	14%	16%
LOSS OF EFFICIENCY OF UNIT	--	0,5%	1%	2%	2,5%	3%	4%

Emissions Data

Fumes flow rate and temperature.

COMBUSTION PRODUCTS TABLE FOR A SINGLE GAHP-A UNIT				
-	UNIT OF MEASUREMENT	NATURAL GAS G20	LPG. G30	LPG. G31
EXHAUST GAS FLOW	kg/h	42	43	48
EXHAUST GAS TEMPERATURE	°C	65	65	65
CARBON DIOXIDE CO_2	%	9,1	10.4	9,1

Fume Outlet



LEGEND

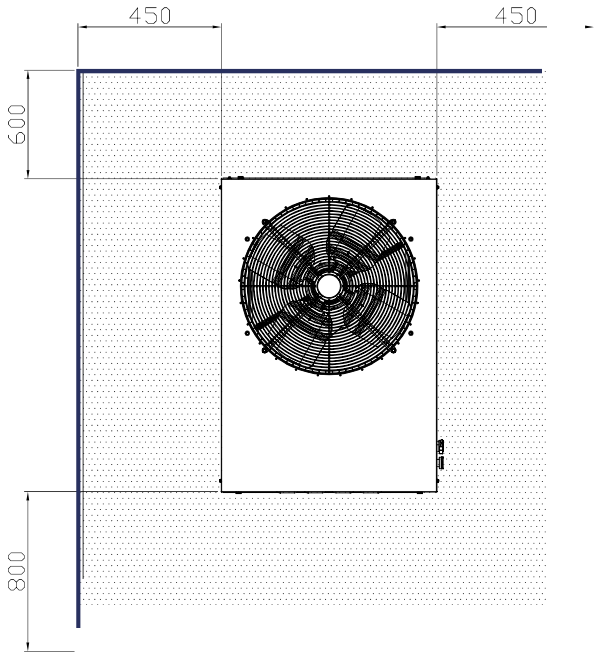
A	Curve 90° Ø 80
B	Pipe Ø 80 Lg.300 mm w/terminal
C	Rain cover

The flue and flumes exhaust are made in polypropylene.

Use the high available head (80 Pa) to extend the discharge in order to avoid occupied buildings.

The flue exhaust kit is supplied with each GAHP-A for site fitting in compliance with building regulations.

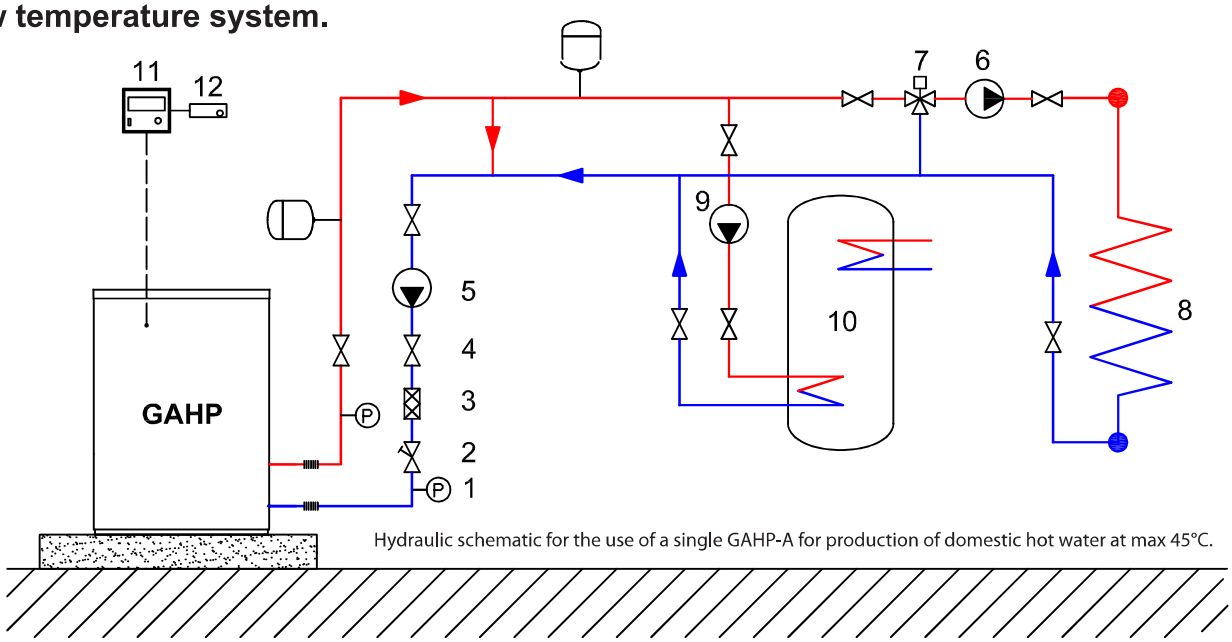
Recommended Clearances



Production of Domestic Hot Water (DHW)

Domestic hot water can be provided by GAHP-A, up to 70°C, but bearing in mind the maximum return temperature to the condenser is 55°C for the HT version, 45° for the LT version, one should thus implement an accumulation system with temperature close to the service temperature (e.g. 45°C) or a system with direct heat exchange at the same working temperature.
For the control of DHW, both an RB100 and a DDC controller are required (see relevant sections)

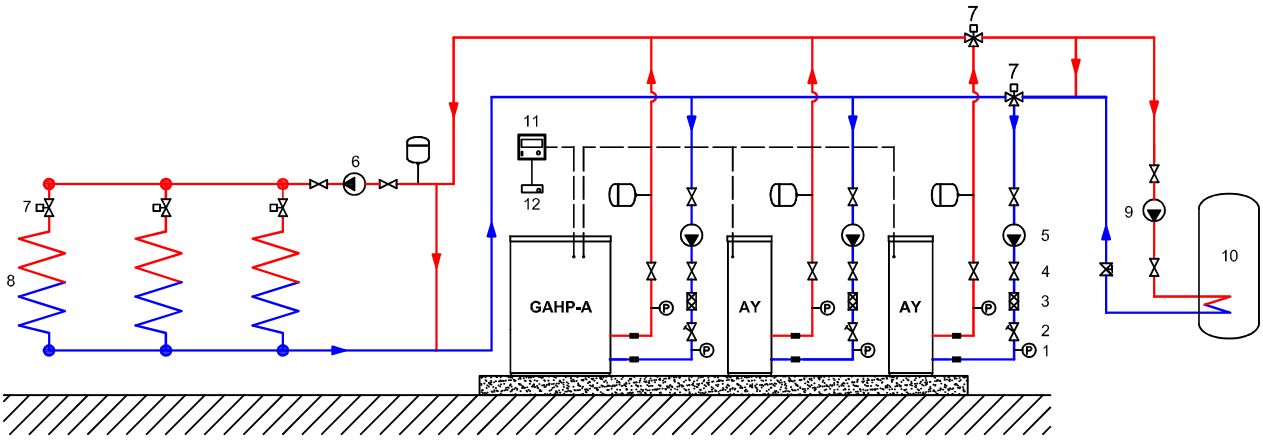
Low temperature system.



Hydraulic schematic for the use of a single GAHP-A for production of domestic hot water at max 45°C.

"1" pressure gauge; "2" flow regulator valve; "3" water filter; "4" shut-off valve;
"5" internal circuit constant rate pump; "6" external service circuit constant rate pump;
"7" three-way regulator/mixer valve; "8" heating system services;
"9" DHW production external circuit constant rate pump; "10" boiler for DHW production;
"11" Direct Digital Controller. "12" RB100 system interface.

Hydraulic schematic, GAHP-A heat pumps with AY condensing boilers for a mixed heating and DHW production system.



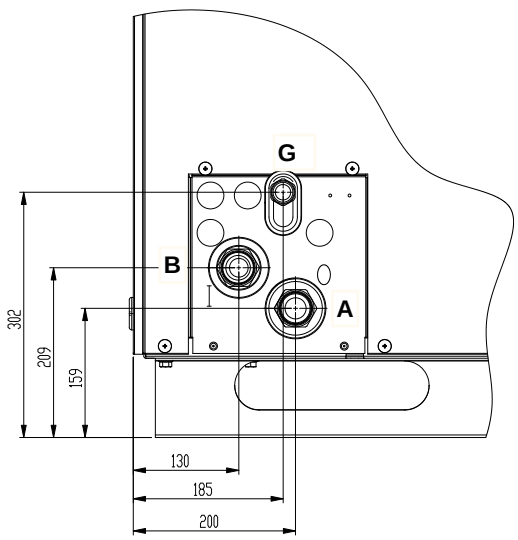
Water & Gas Pipework

The sizing of the plumbing pipes and pump/s must guarantee the nominal water flow of the appliance (see below). The hydraulic circuit must be completed in stainless steel, black steel, copper or crosslinked polyethylene, insulated to ensure heat transfer and prevent condensation.

When rigid pipes are used, anti-vibration fittings must be installed on water inlets and outlets.

PRESSURE DROP OF A SINGLE GAHP-A (versions LT and HT)								
Hot water flow rate	VECTOR FLUID TEMPERATURE AT OUTLET (T_{hm}) OF GAHP-A							
	30°C	35°C	40°C	45°C	50°C	55°C	60°C	65°C
[l/h]	[bar]	[bar]	[bar]	[bar]	[bar]	[bar]	[bar]	[bar]
1000	0,07	0,07	0,07	0,07	0,07	0,06	0,06	0,06
1100	0,09	0,08	0,08	0,08	0,08	0,07	0,07	0,07
1200	0,10	0,10	0,09	0,09	0,09	0,09	0,08	0,08
1300	0,11	0,11	0,11	0,10	0,10	0,10	0,09	0,09
1400	0,13	0,12	0,12	0,12	0,11	0,11	0,11	0,10
1500	0,14	0,14	0,13	0,13	0,13	0,12	0,12	0,11
1600	0,16	0,15	0,15	0,15	0,14	0,14	0,13	0,13
1700	0.18	0,17	0,17	0,16	0,16	0,15	0,15	0,14
1800	0.20	0,19	0.18	0.18	0,17	0,17	0,16	0,16
1900	0,21	0,21	0.20	0.20	0,19	0.18	0.18	0,17
2000	0,23	0,23	0,22	0,21	0,21	0.20	0,19	0,19
2100	0,25	0,25	0,24	0,23	0,23	0,22	0,21	0.20
2200	0,28	0,27	0,26	0,25	0,25	0,24	0,23	0,22
2300	0,30	0,29	0,28	0,27	0,27	0,26	0,25	0,24
2400	0,32	0,31	0,30	0,29	0,29	0,28	0,27	0,26
2500	0,35	0,33	0,32	0,32	0,31	0,30	0,29	0,27
2600	0.37	0,36	0,35	0,34	0,33	0,32	0,31	0,29
2700	0,40	0,38	0.37	0,36	0,35	0,34	0,33	0,31
2800	0,42	0,41	0,40	0,39	0,38	0,36	0,35	0,34
2900	0,45	0.44	0,42	0,41	0,40	0,39	0.37	0,36
3000	0,48	0,46	0,45	0.44	0,43	0,41	0,40	0,38
3100	0,51	0,49	0,48	0,46	0,45	0.44	0,42	0,40
3200	0,54	0,52	0,50	0,49	0,48	0,46	0,45	0,43
3300	0,57	0,55	0,53	0,52	0,51	0,49	0,47	0,45
3400	0,60	0,58	0.56	0,55	0,54	0,52	0,50	0,48
3500	0.63	0,61	0,59	0,58	0,57	0,54	0,52	0,50
3600	0,67	0,65	0.62	0,61	0,60	0,57	0,55	0,53
3700	0,70	0,68	0,66	0,64	0.63	0,60	0,58	0.56
3800	0.74	0.71	0,69	0,67	0,66	0.63	0,61	0,58
3900	0,77	0,75	0,72	0.71	0,69	0,66	0,64	0,61
4000	0,81	0,78	0,76	0.74	0,72	0,70	0,67	0,64

Service Connections

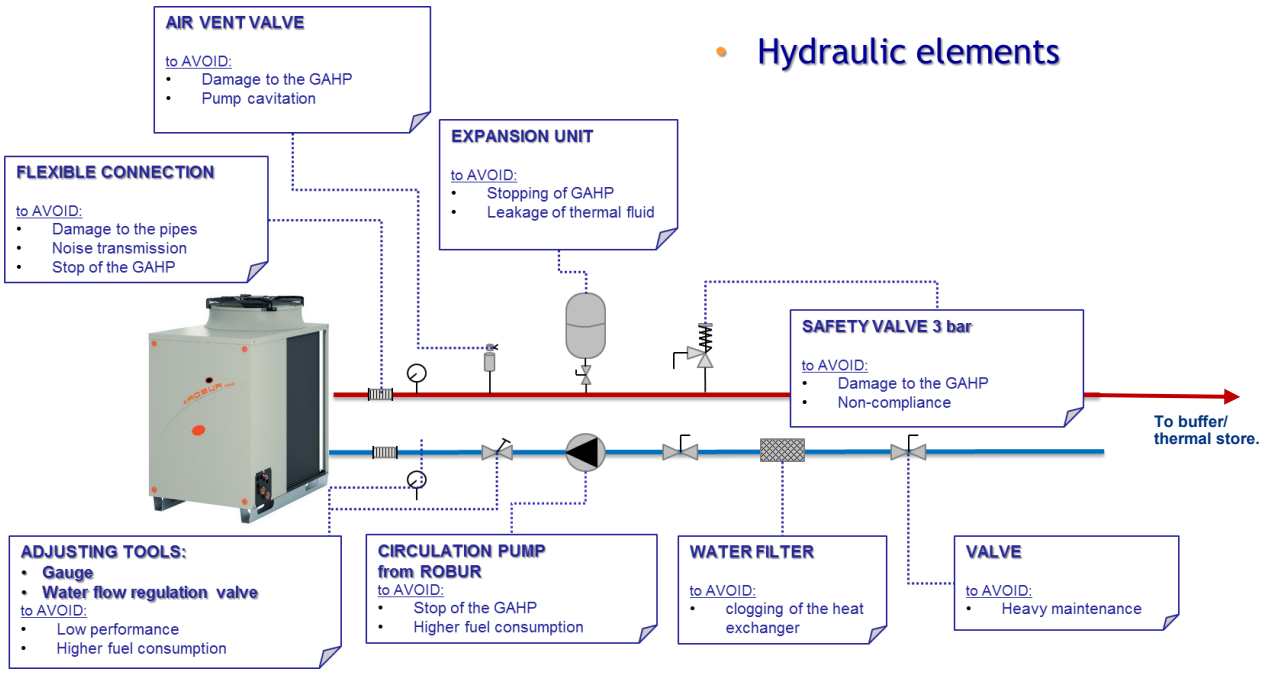


LEGEND

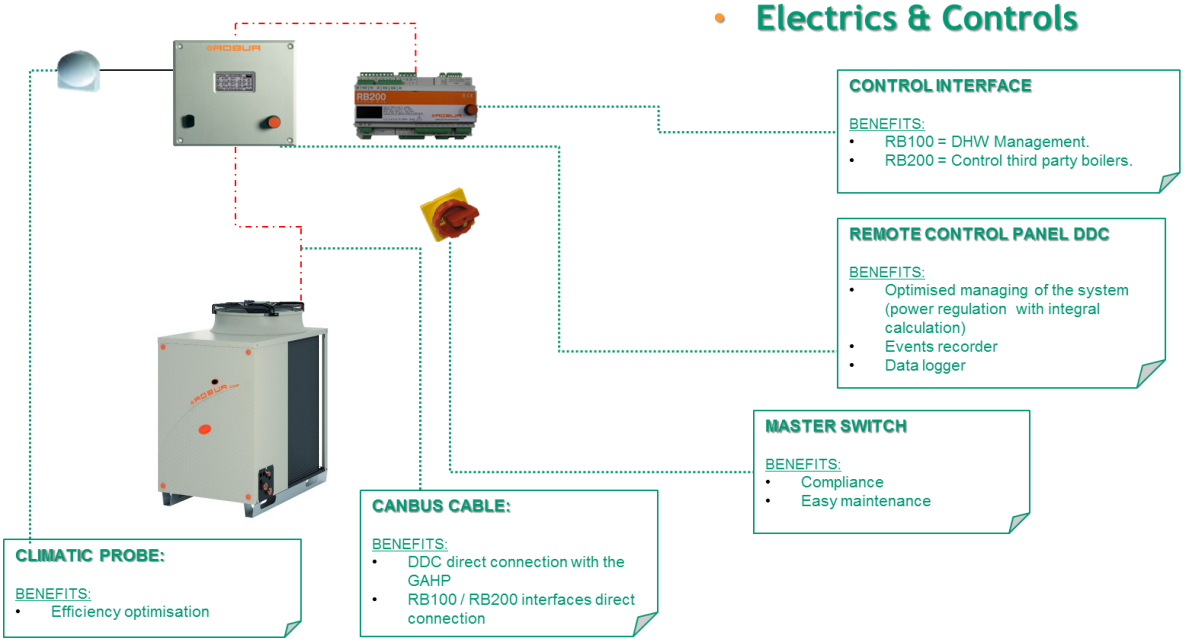
G	Gas fitting Ø ¾" F
B	Inlet water fitting Ø 1¼" F
A	Outlet water fitting Ø 1¼" F

GAHP Best Practice

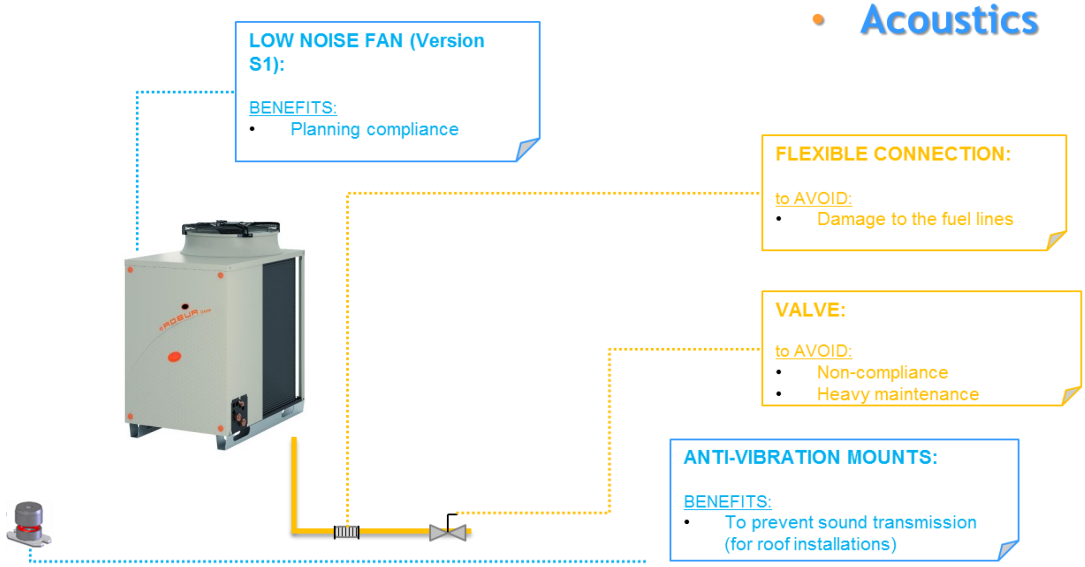
• Hydraulic elements



• Electrics & Controls



• Gas connection
• Acoustics



DDC - Control & Regulation of the GAHP System/s

The Direct Digital Controller which both controls and displays, the status, operating and error conditions of each individual unit to which it is linked. The DDC supports communicaion with BMS (Modbus protocol) via front and rear RS232 9-pole connections. External connections are indicated on the figure below.
In the case of multiple assembled heat pumps, a DDC is supplied. In the case of a single heat pump it is an optional accessory, yet strongly recommended.

The DDC is designed for indoors installation (ambient air temperature in the range 0°C to 50°C), mounted to an electrical cabinet in a hole measuring 155 x 151 mm, and requires an independant 24V AC power supply, and should be linked to the heat pumps only by comms (CANBUS) cable.

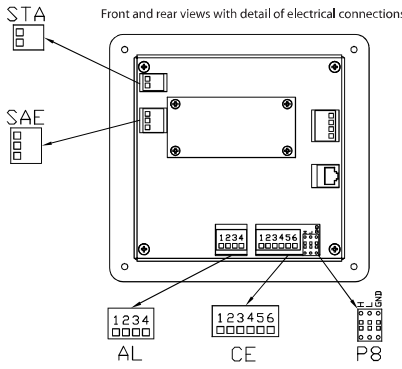
For the control and regulation of the system, install one or more DDC, which serve to obtain full system diagnostics and control and regulate the operation of the system itself.
In particular, they are used to set the winter-time vector fluid differential and setpoints, with the option to control either the delivery or return temperature.
The above settings can be made for four daily time bands, with the option of using four different setpoints.

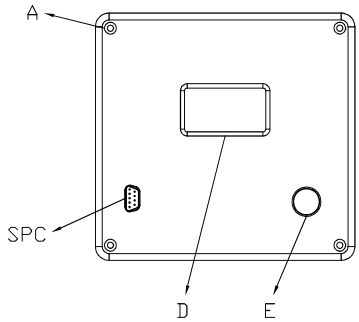
A Single DDC can control up to 16 GAHPs, delivering the heating power strictly required to handle the real time load, thus preventing frequent operational variations and consequent wasted fuel consumption.

Where multiple units are installed, the DDC offers cascade control and automatic load sharing between units.

Direct Digital Control (DDC)

Front and rear views with detail of electrical connections.

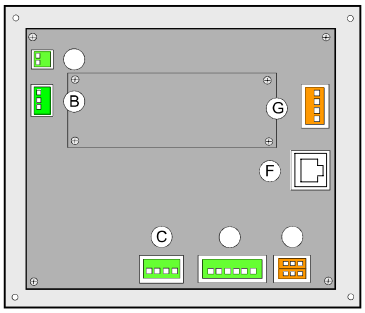




LEGEND

STA	ambient temperature probe - 2-pole connector
SAE	external alarm systems - 3-pole connector
AL	power supply 24 V ac - 4-pole connector
CE	external consents - 6-pole connector
P8	CAN BUS network connector (orange)
SPC	232 serial connection to PC - 9-pole connector
A	mounting holes DDC
E	Encoder
D	Display

Detail of electrical connections.



KEY

(A) TERMINALS FOR CONNECTION OF INTERNAL OR EXTERNAL AIR SENSOR (NTC 10K), IF SPECIFIED (see Paragraph 4.5.3.1.4)

(B) TERMINALS FOR CONNECTION TO EXTERNAL ALARM SYSTEMS
- terminal 1 COM
- terminal 2 NO
- terminal 3 NC

(C) TERMINALS FOR 24 Vac FOR DIRECT DIGITAL CONTROLLER POWER SUPPLY
Respect connection polarity
- terminal 1 24 Vac
- terminal 2 0 Vac
- terminal 3 earth
- terminal 4 not used

(D) 6-POLE CONNECTOR FOR EXTERNAL CONTACTS
(see Paragraphs 4.5.3.1.2 or 4.5.3.1.3)
- terminal 1 R (24 Vac)
- terminal 2 W (heating)
- terminal 3 Y (cooling)
- terminal 4 0 (0 Vac)
- terminal 5 NA (not connected)
- terminal 6 R (24 Vac)

(E) CAN-BUS CABLE CONNECTION

(F) RS232 PORT REAR CONNECTION (RJ45)
Alternative connection to front connection, for the same RS232 port

(G) RS485 PORT CONNECTION
(see Paragraph 4.4.1.13)
- terminal 1 A (TXD/RXD+)
- terminal 2 B (TXD/RXD-)
- terminal 3 Common (connected to the system mass and earth)
- terminal 4 Cable sheath (connected to the system mass and earth)

RB100 - Control Of Domestic Hot Water Production

In order to use absorption heat pumps to produce DHW, the controller must be equipped with a DDC and an "RB100" system interface.

If Robur AY condensing boilers are also to be used, the RB100 module connected with a CAN-BUS cable to the DDC can be used to deviate the vector fluid flow (with appropriate diverter valves, not supplied) to a heat exchanger for direct or accumulation production of DHW.
Once the heating circuit has been deviated to DHW production, the RB100 module modifies the setpoint only of the Robur AY condensing boilers involved in this service. The adjustment of the DHW setpoint of the Robur AY condensing boilers can be donewith an ON-OFF analogue signal originated by a thermostat, or by a 0 - 10 V digital signal from an electronic controller. The advantage of the RB100 unit is that there is no need to include other boilers for DHW production, so that all the Robur AY condensing units can be used, which would otherwise be kept switched off most of the time during the winter.
DHW production service has operational priority, so that if the system is operating under maximum design conditions, the boilers dedicated to the dual service will nonetheless be switched from heating mode to DHW production for the duration of the period for which the service is required.

RB100 board dimensions: width 158 mm, depth 74.6 mm height 106.5 mm. The weight of the component is 0.320 kg and it must be mounted to the cabinet on a 35 mm DIN rail.

Requires 24V AC supply.

Web Based Control “WISE”

The WISE unit provides remote control of the major functions of the DDC, Robur and plant controlled by the latter, over a common cellphone line equipped with WAP browser or using a point-to-point connection with a PC with a PSTN or GSM modem. The system is controlled by means of a web browser, and provides alarms to the user by SMS.

The WISE device is composed of:

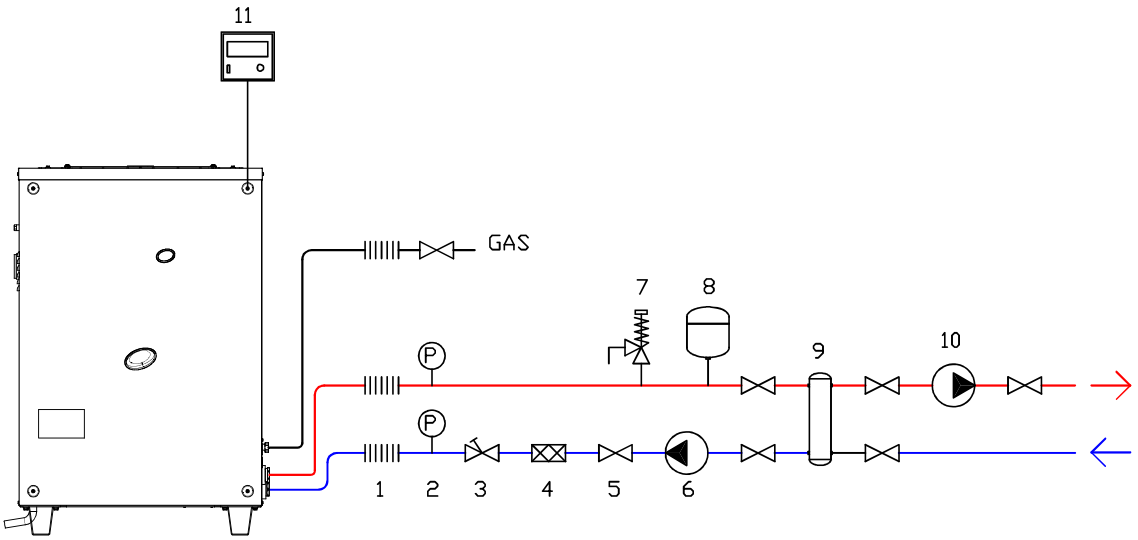
- -WISE device
- -Antenna
- -RS232 null-modem serial cable for device configuration
- -WISE - DDC communications cable with phone plug connection to the rear of the DDC
- -CD Rom Program disk

Modbus

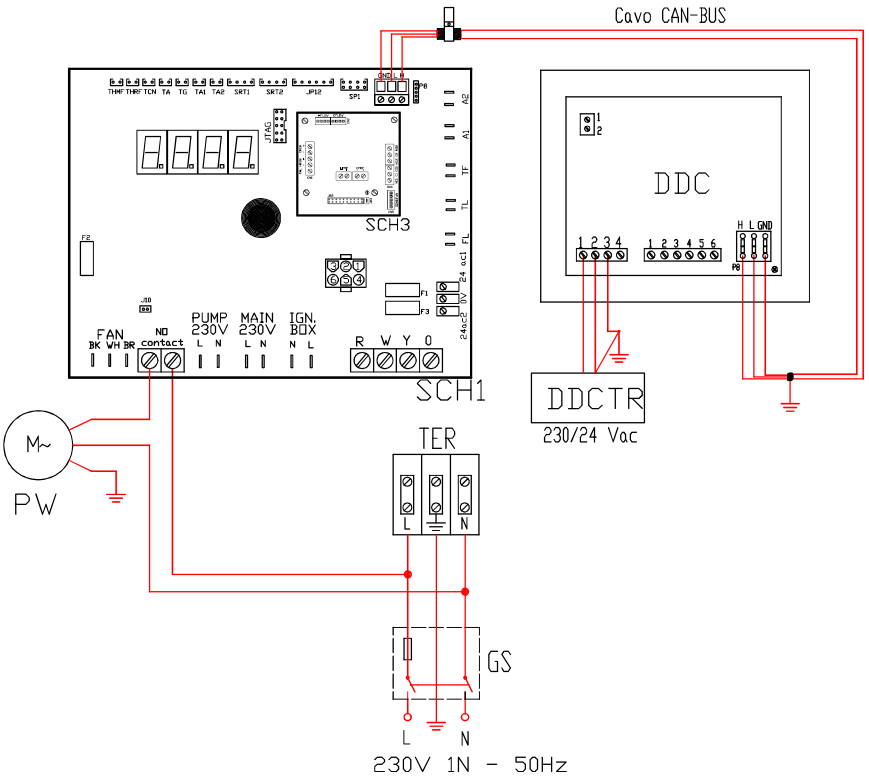
The DDC supports interfacing with external equipment (BMS, PLC, SCADA, etc.) via the Modbus RTU protocol. The Modbus protocol makes it possible to acquire data regarding the operation of the units and the plant controlled by the DDC (temperatures, statuses, counters, etc.).
It can also acquire information regarding alarms, both current and registered in the alarms log. It can also act on the plant to set a variety of operational parameters such as unit On/Off, mode selection inversion, setpoints, differentials, power steps, and operating time bands.

Schematic Examples

GAHP-A HEAT PUMP FOR HEATING ONLY



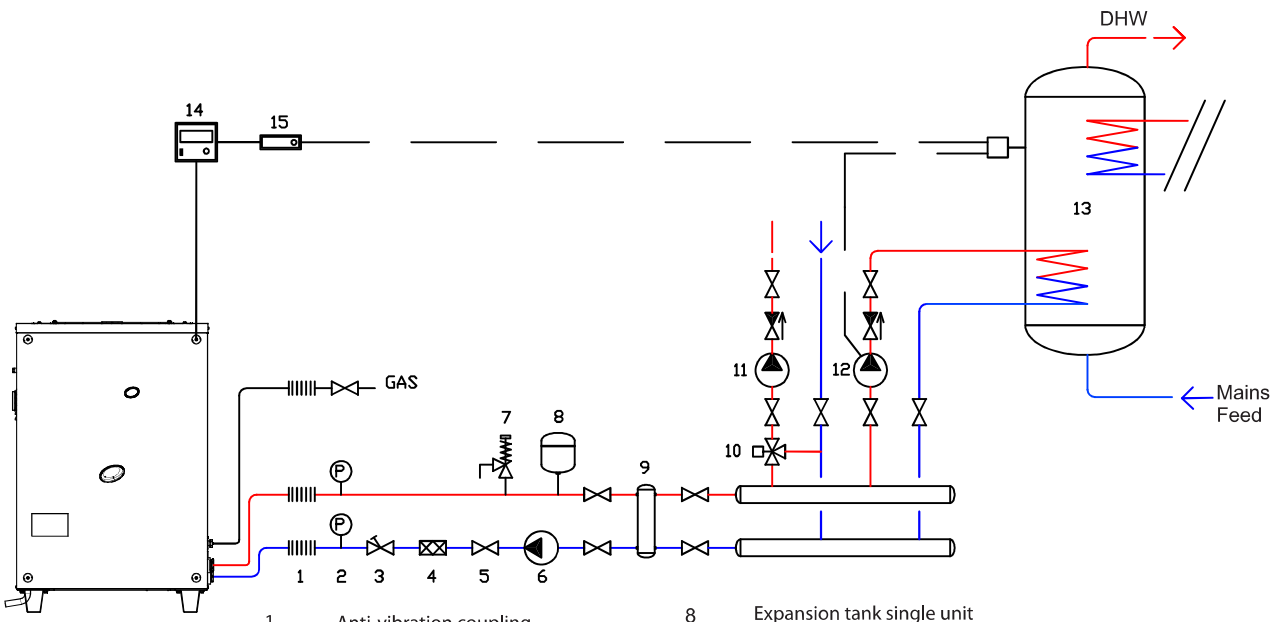
1	Anti-vibration joints	7	Safety valve 3 bar
2	Manometer	8	Expansion tank of the unit
3	Flow regulator valve	9	Hydraulic separator / inertial tank with 4 attack
4	Water filter	10	Water pump (secondary circuit)
5	Cut-off valve	11	Direct Digital Controller
6	Water pump (primary circuit)		



LEGEND

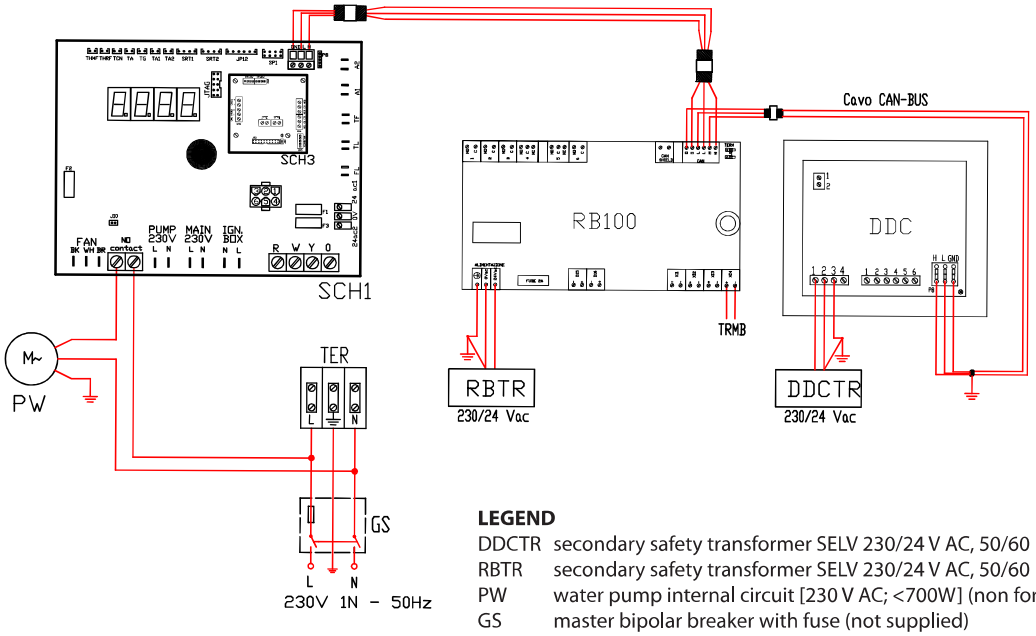
DDCTR	secondary safety transformer SELV 230/24 V AC, 50/60 Hz (not supplied)
PW	plant water pump [230 V AC; less than 700W] (not supplied)
GS	master bipolar breaker with fuse (not supplied)
TER	9-pole on-board terminal block, of unit
DDC	direct digital controller (not supplied)
S60	unit on-board logic
L	line terminal (single phase)
N	Neutral terminal

GAHP-A HEAT PUMP FOR HEATING & DHW



LEGEND
1

1	Anti-vibration coupling
2	Pressure gauge
3	Flow regulator valve
4	Water filter
5	Shut-off valve
6	Water circulation pump internal circuit
7	Safety valve 3 bar
8	Expansion tank single unit
9	Hydraulic separator
10	3-way mixer valve
11	Water circulation pump heating circuit
12	Water circulation pump DHW circuit
13	DHW accumulation tank, with thermostat (T.max = 45°C)
14	Direct Digital Controller
15	RB100 controller



LEGEND

DDCTR	secondary safety transformer SELV 230/24 V AC, 50/60 Hz (not supplied)
RBTR	secondary safety transformer SELV 230/24 V AC, 50/60 Hz (not supplied)
PW	water pump internal circuit [230 V AC; <700W] (non fornita)
GS	master bipolar breaker with fuse (not supplied)
TER	9-pole on-board terminal block, of unit
DDC	Direct Digital Controller (not supplied)
SCH1	unit on-board logic
RB100	Robur Box logic
TRMB	Boiler thermostat
L	line terminal (single phase)
N	Neutral terminal

Performance Tables - Single Heat Pump

GAHP- A S1

			Heating							DHW
Water Delivery Temp (°C)			35°C	40 °C	45 °C	50 °C	55 °C	60 °C	65 °C	70 °C
		Gas Input (Kw)	25.2	25.2	25.2	25.2	25.2	25.2	25.2	12.6
Outdoor temperature	-20 °C	Output (kW)	33.9	31.5	29.6	27.7	25.7	23.7	22.7	9.3
		Effic. (GUE)	1.345	1.250	1.175	1.100	1.020	0.940	0.900	0.740
	-15 °C	"	35.2	32.8	30.9	29.0	27.0	24.9	23.9	10.0
		"	1.397	1.300	1.225	1.150	1.070	0.990	0.950	0.790
	-12 °C	"	35.9	33.5	31.6	29.7	27.7	25.7	24.7	10.3
		"	1.425	1.330	1.255	1.180	1.100	1.020	0.980	0.820
	-10 °C	"	36.4	34.0	32.1	30.2	28.2	26.2	25.2	10.6
		"	1.444	1.350	1.275	1.200	1.120	1.040	1.000	0.840
	-8 °C	"	37.9	36.0	33.7	31.4	29.2	27.0	25.5	10.8
		"	1.504	1.430	1.338	1.247	1.160	1.073	1.013	0.860
	-7 °C	"	38.7	37.0	34.5	32.0	29.7	27.5	25.7	11.0
		"	1.536	1.470	1.370	1.270	1.180	1.090	1.020	0.870
	-6 °C	"	39.5	37.4	34.9	32.4	30.2	28.0	26.1	11.0
		"	1.567	1.484	1.384	1.284	1.197	1.110	1.034	0.874
	-5 °C	"	40.3	37.7	35.2	32.7	30.6	28.5	26.4	11.1
		"	1.599	1.498	1.398	1.298	1.214	1.130	1.048	0.878
	-4 °C	"	40.4	38.1	35.6	33.1	31.0	29.0	26.8	11.1
		"	1.603	1.512	1.412	1.312	1.231	1.150	1.062	0.882
	-3 °C	"	40.5	38.5	35.9	33.4	31.4	29.5	27.1	11.2
		"	1.607	1.526	1.426	1.326	1.248	1.170	1.076	0.886
	-2 °C	"	40.6	38.8	36.3	33.8	31.9	30.0	27.5	11.2
		"	1.611	1.540	1.440	1.340	1.265	1.190	1.090	0.890
	-1 °C	"	40.8	39.0	36.7	34.4	32.3	30.1	27.8	11.3
		"	1.619	1.547	1.457	1.366	1.281	1.195	1.105	0.895
	0 °C	Output (kW)	40.8	39.2	37.1	35.1	32.7	30.3	28.2	11.3
		Effic. (GUE)	1.619	1.555	1.474	1.393	1.297	1.201	1.120	0.900
	1 °C	"	40.9	39.4	37.6	35.8	33.1	30.4	28.6	11.4
		"	1.623	1.562	1.491	1.420	1.314	1.206	1.135	0.905
	2 °C	"	40.9	39.6	38.0	36.5	33.5	30.5	29.0	11.5
		"	1.623	1.570	1.509	1.448	1.330	1.212	1.150	0.910
	3 °C	"	41.1	39.7	38.3	36.8	33.9	31.0	29.4	11.6
		"	1.631	1.575	1.519	1.462	1.347	1.231	1.166	0.918
	4 °C	"	41.2	39.8	38.5	37.2	34.4	31.5	29.8	11.7
		"	1.635	1.581	1.528	1.476	1.363	1.251	1.183	0.926
	5 °C	"	41.3	40.0	38.8	37.5	34.8	32.0	30.2	11.8
		"	1.639	1.586	1.538	1.490	1.380	1.270	1.200	0.934
	6 °C	"	41.3	40.1	39.0	37.9	35.2	32.5	30.7	11.9
		"	1.639	1.591	1.548	1.504	1.397	1.291	1.218	0.942
	7 °C	"	41.3	40.2	39.3	38.3	35.7	33.0	31.1	12.0
		"	1.639	1.597	1.558	1.519	1.415	1.311	1.236	0.950
	8 °C	"	41.3	40.4	39.4	38.5	36.0	33.5	31.6	12.1
		"	1.639	1.602	1.565	1.527	1.428	1.329	1.254	0.961
	10 °C	"	41.3	40.6	39.8	38.9	36.6	34.4	32.5	12.4
		"	1.639	1.613	1.578	1.542	1.454	1.367	1.290	0.984
	12 °C	"	41.4	40.9	40.1	39.2	37.3	35.4	33.4	12.7
		"	1.643	1.624	1.590	1.557	1.480	1.404	1.326	1.006
	15 °C	"	41.6	41.3	40.6	39.8	38.3	36.8	34.8	13.1
		"	1.640	1.640	1.610	1.580	1.520	1.460	1.380	1.040

ROBUR
caring for the environment

RTA

Multiple Assemblies, Heat Pumps

&

RTAY

Multiple Assemblies,
Heat Pumps with
Robur Condensing Boilers

powered by gas and renewable energy

AY

4 star condensation boiler
for heating

powered by gas

GAHP-A Gas Absorption Air Source Heat Pumps, factory assembled links, skid mounted for heating and DHW only. Combinations with or without condensing boilers.

For further products utilising Ground, Water or Air Source and offer cooling & heating, cooling only and cooling with recovery for "free" hot water.

Model Codes

RTA... multiple assembly with just Heat Pumps.
RTAY...multiple assembly with heat pumps & boilers refer to ESS for full codes.

MET/NAT	(Natural Gas)	or	**LPG**	(Butane or Propane)
AY	(Robur Condensing Boiler, 34.4kW)		**S1**	(Low Noise)

DDC - Control and Regulation of Multiple Links

Where linked multiple units are installed, the DDC offers cascade control, load sharing between units and control and prioritising of Heating & DHW.
A DDC is supplied with every multiple linked system, designed for internal mounting.

Production of domestic hot water

DHW can be provided either by a 2-pipe system as with the single GAHP-A, or utilising a 4-pipe configuration for dedicated supply. See schematics. An RB100 controller is recommended.

SPECIFICATION - Popular Link Multi-Systems
GAHP Heat Pumps & GAHP Heat Pumps with a single AY Boiler

Link Options - Heat Pumps Only					
Performance & Dimensions	**Unit**				
Number of GAHP Heat Pumps		2	3	4	5
Model number (abbreviated)*		RTA266	RTA399	RTA532	RTA665
Heat Output	kW	82.6	123.9	165.2	206.5
Thermal Input	kW	50.4	75.6	100.8	126
Dimensions					
Length (Height=1537mm, Depth=1245mm)	mm	2314	3610	4936	6490
Weight	kg	950	1410	1890	2370

Link Options - Heat Pumps with Single AY Boiler					
Performance & Dimensions	**Unit**				
Number of GAHP Heat Pumps	n.	1	2	3	4
Number of AY Boilers	n.	1	1	1	1
Model number (abbreviated)*		RTAY253	RTAY386	RTAY519	RTAY652
Heat Output	kW	75.7	117	158.3	199.6
Thermal Input	kW	60.1	85.3	110.5	135.7
Length (Height=1537mm, Depth=1245mm)	mm	2314	3382	4936	6490
Weight	kg	640	1100	1580	2220

Buffer Storage	Unit					
No. of GAHPs or AYs serving primary heating	n.	1	2	3	4	5
Recommended Volume	litres	2-300	3-500	800-1000		

* For full model number insert 00, add S1 for low noise, NAT for mains gas or LPG. Example ***RTAY 00 253 S1 MET***

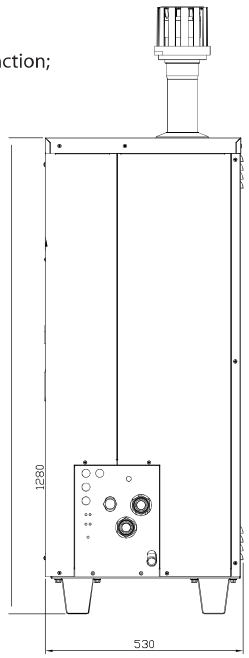
LINK TECHNICAL CHARACTERISTICS		LINK COMPOSITION				
Connections and Noise	**Unit**					
Number of GAHP Heat Pumps	n.	1	2	3	4	5
Number of AY Boilers	n.	1 to 5	0 to 5	0 to 5	0 to 4	0
NUM. OF TOTAL LINK UNITS	n.	2 to 6	2 to 7	3 to 8	4 to 8	5
Power supply (voltage, type - frequency)		400 V 3N - 50 Hz				
Gas fitting dia	Inches	1 ½" F				
Water fitting (out/in) dia. (2)	Inches	2" M				
Condensation discharge fitting dia. (2)	Inches	1" F				
Sound pressure level at 10 metres Maximum	dB(A)	54	55	57	58	59
Minimum	dB(A)	49	50	52	53	54

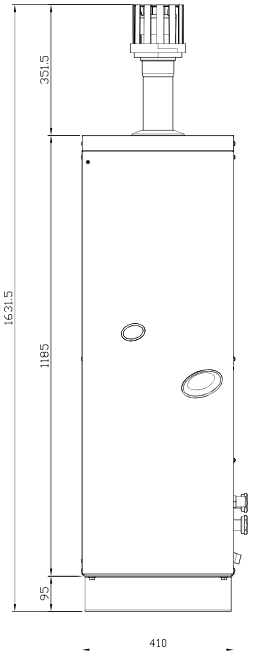
Condensing Boiler Model AY00-120 or "AY"

A high efficiency gas condensing boiler with modulating control (regulated by control of the nominal gas fow (nominal thermal input).
The appliance, which can produce hot water up to 80°C, is suited to installation in all hot water production systems for heating, sanitary use (ACS), process needs, air handlers, etc.

Supplied with the following-

- premixed multigas burner with low NO_x and CO emissions;
- stainless steel plate exchanger, acting as a hydraulic separator;
- AY10 microprocessor controller with LCD display and control knob
- S70 controller
- ionisation-based flame controller;
- gas solenoid valve with double shutter;
- system water antifreeze function;
- internal circuit antifreeze function;
- automatically resettable water temperature limiting thermostat;
- single-use fumes limiting thermostat (thermal cutout);
- system circuit water differential pressure switch (PD1);
- internal circuit water differential pressure switch (PD2) with anti-sticking function;
- overpressure valve on internal circuit, set to trip at 3 bar;
- internal circuit expansion tank;
- automatic and manual air bleeds on the internal circuit;
- fumes pipe with terminal, for type B53P configuration.
- condensate discharge siphon (with antifreeze function);
- anti-freezing thermostat used for the activation of the heating element on the condensate drain.





TECHNICAL DATA - Single AY

DIMENSIONS AND WEIGHT			
			AY00-120
Size	width	mm	410
	height	mm	1280
	depth	mm	530
Weight		kg	71

PRESSURE DROP OF A SINGLE AY00-120 CONDENSING UNIT	
Water flow rate	WATER TEMPERATURE
	20°C
[l/h]	[bar]
1008	0,066
1198	0,085
1398	0,106
1608	0,136
1801	0,165
2007	0,204
2199	0,234
2400	0,269
2601	0,312
2797	0,353
2958	0,395
3000	0,406
3201	0,469

Technical Data (Contd)

			AY00-120
OPERATION WHEN HEATING			
Thermal capacity	Nominal (1013 mbar - 15°C)	kW	34,9
	MEAN	kW	21.5
	MIN	kW	8.0
OPERATING POINT: Tm80/Tr60 and nominal thermal capacity	Available power	kW	34.4
	Efficiency	%	98.6
OPERATING POINT: Tm80/Tr60 and minimal thermal capacity	Efficiency	%	97.3
OPERATING POINT: Tm70/Tr50 and nominal thermal capacity	Efficiency	%	100,6
Efficiency classes			****
NOx emission class			5
Hot water delivery temperature	maximum	°C	80
	minimum	°C	25
	nominal	°C	60
Hot water return temperature	maximum	°C	70
	minimum	°C	20
	nominal	°C	50
Hot water flow rate	nominal	l/h	2950
	maximum	l/h	3200
	minimum	l/h	1500
Hot water pressure drop	at nominal water flow	bar	0,395
Ambient air temperature (dry bulb)	maximum	°C	45
	minimum	°C	-20
gas consumption	methane G20 (nominal)	m3/h	3.69
	methane G20 (MIN)	m3/h	0.85
	G25 (nominal)	m3/h	4,35
	G25 (MIN)	m3/h	1,00
	G30 (nominal)	kg/h	2.75
	G30 (MIN)	kg/h	0.63
	G31 (nominal)	kg/h	2.71
	G31 (MIN)	kg/h	0.62
THERMAL EFFICIENCIES			
Efficiency at MEAN thermal capacity Tm80/Tr60		%	98.3
Efficiency at MIN thermal capacity Tm80/Tr60		%	97.3
Efficiency at nominal thermal capacity Tm50/Tr30		%	104.6
Efficiency at 30% of nominal thermal capacity Tr=30°C		%	107.5
Efficiency at 30% of nominal thermal capacity Tr=47°C		%	100.3
Operational heat loss to jacket		kW	0,15
Operational heat loss to jacket		%	0.44
Operational heat loss to flue		kW	0,86
Operational heat loss to flue		%	2.54
Heat loss in off mode		kW	0,058
Heat loss in off mode		%	0,2
ELECTRICAL SPECIFICATIONS			
Power supply	Voltage	V	230
	TYPE		single-phase
	Frequency	50 Hz supply	50
Electrical power absorption	nominal	kW	0.185
Degree of protection	IP		X5D
INSTALLATION DATA			
Minimum storage temperature		°C	-30
Maximum operating pressure		bar	3
Water content inside the apparatus	HOT SIDE	l	1,0
Water fitting	TYPE		F
	thread	" G	1 1/4
Gas fitting	TYPE		M
	thread	" G	3/4
Fume outlet	Type of installation		B23P-B33-B53P-C13-C33-C43-C53-C63-C83
	Diameter (⊠)	mm	80
	Residual head	Pa	100
	Product configuration		B53P

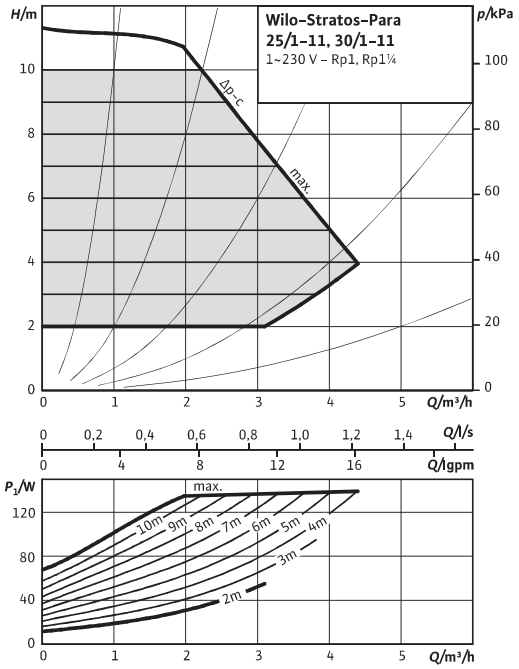
Circulating Pumps (accessories)

Linked systems may be supplied with no pumps (SC), or complete with standard (CV) or high head (CW) configurations. To maintain efficiency in partial load conditions, it is recommended that a pump is installed for EACH heat pump in the link.

Standard (CV). Electrical consumption at 3000 l/h, 6M head; 170W

Wilo-Stratos PARA 25/1-11

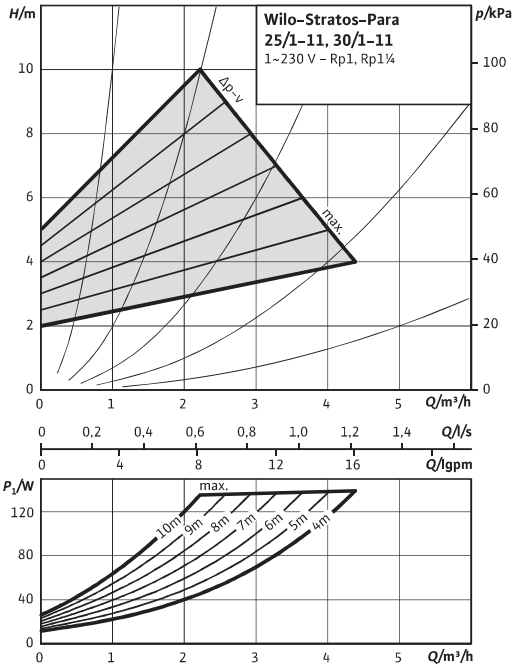
Δp-c (constant)



Tolerances of each curve according to EN 1151-1:2006

Wilo-Stratos PARA 25/1-11

Δp-v (variable)

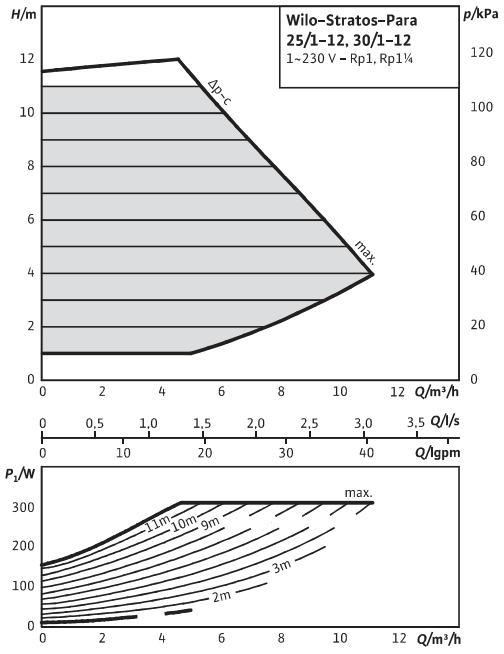


Tolerances of each curve according to EN 1151-1:2006

High Head (CW). Electrical consumption at 3500 l/h, 10M head; 300W

Wilo-Stratos PARA 30/1-12

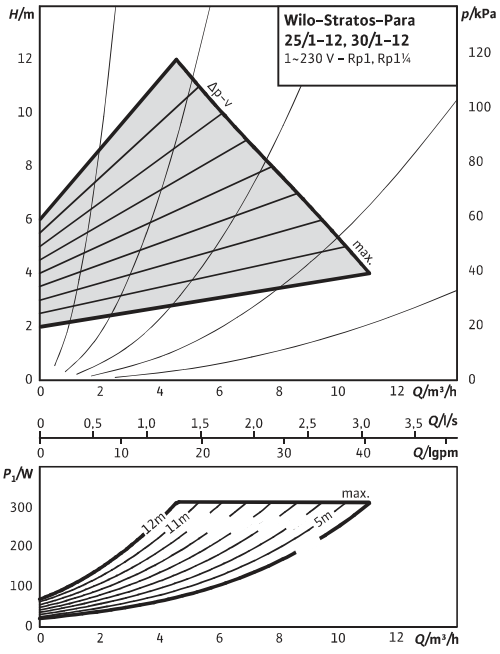
Δp-c (constant)



Tolerances of each curve according to EN 1151-1:2006

Wilo-Stratos PARA 30/1-12

Δp-v (variable)

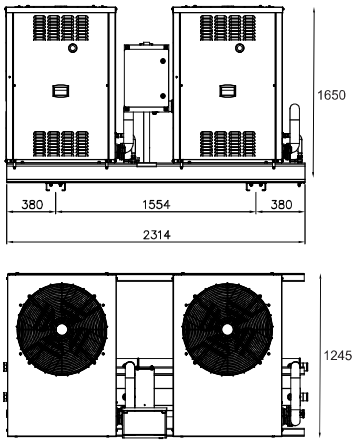


Tolerances of each curve according to EN 1151-1:2006

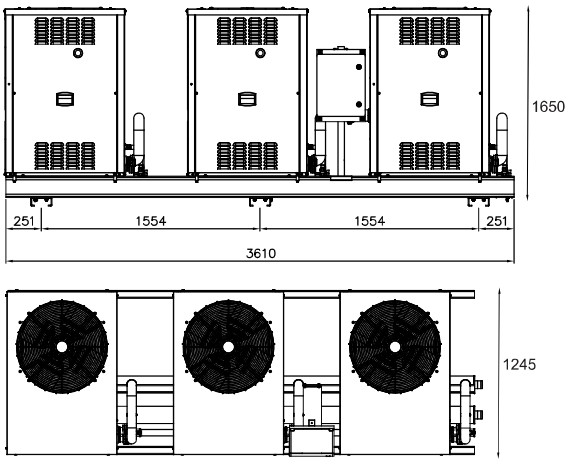
More information at www.wilo.co.uk, product is "Stratos-Para Z range"

Overall Dimensions

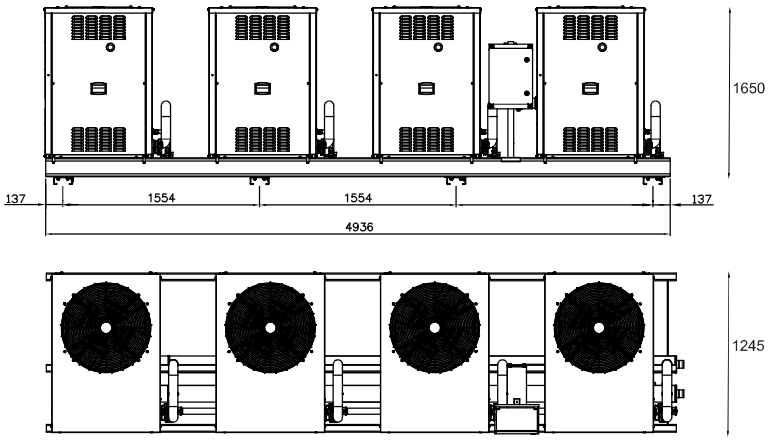
Preassembled GAHP (with 2 units)



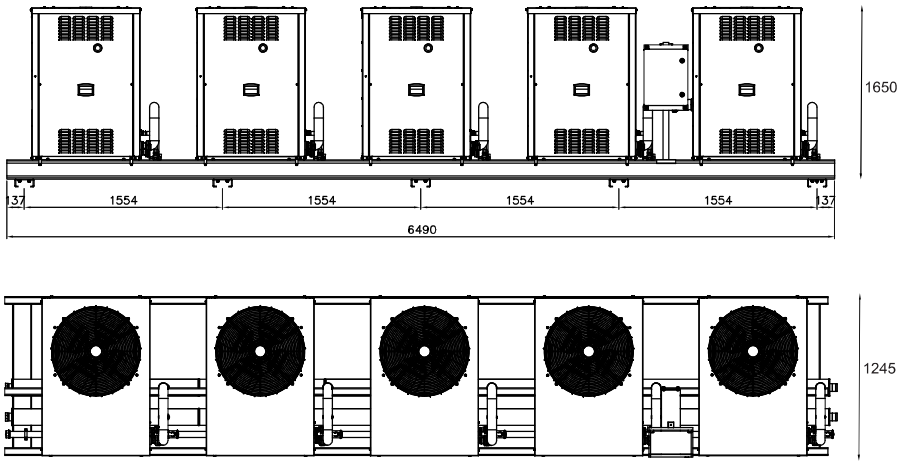
Preassembled GAHP (with 3 units)



Preassembled (with 4 units)



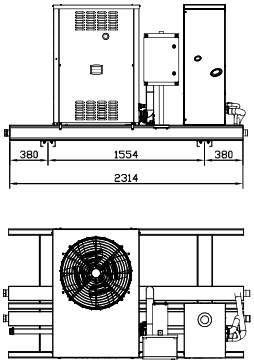
Preassembled (with 5 units)



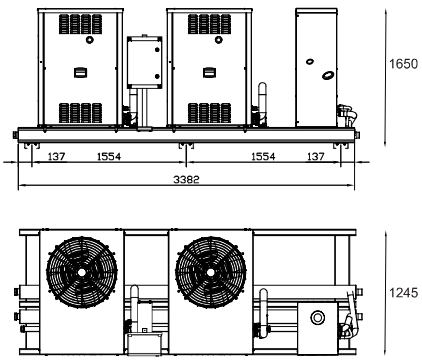
Overall Dimensions

Preassembled GAHP with Single AY Boiler

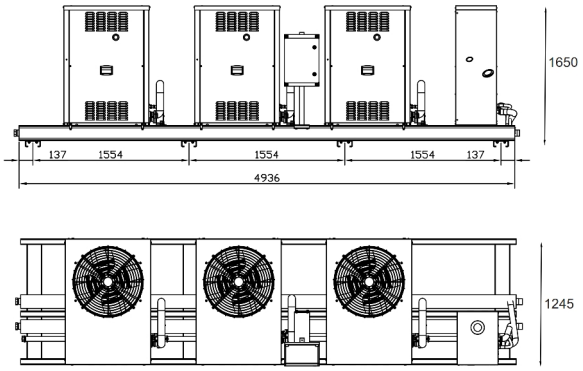
1 GAHP + 1AY



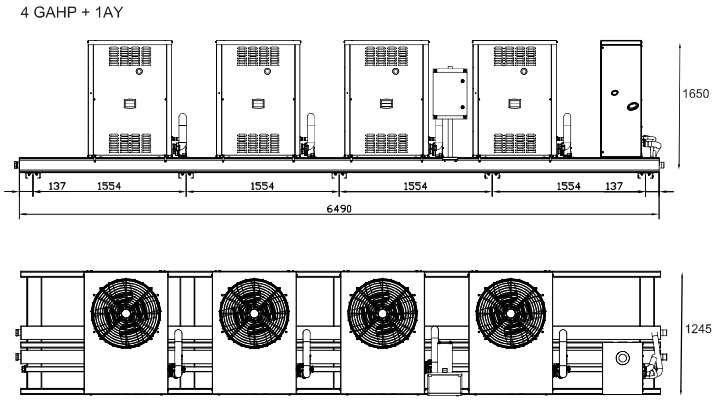
2 GAHP + 1AY



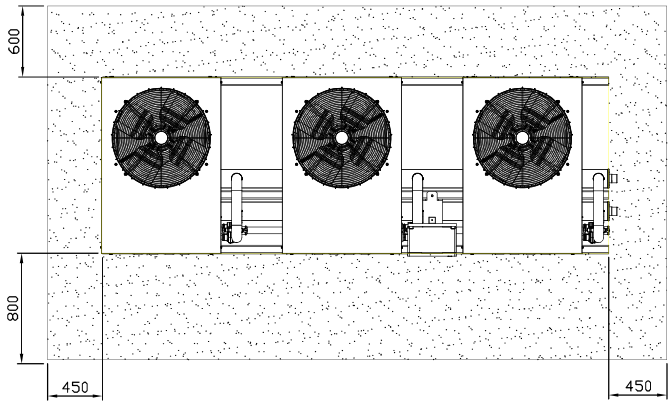
3 GAHP + 1AY



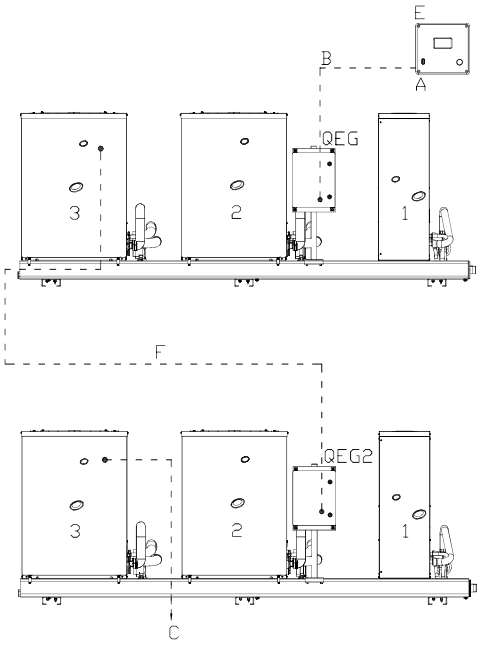
4 GAHP + 1AY



Recommended Clearances (all assemblies)



"CAN BUS" Cable



LEGEND

A	terminal node connection to CCI/DDC
B	CAN-BUS cable (not supplied - see table)
C	terminal node on last unit (prewired)
QEG1	appliance 1 general electrical panel
QEG2	appliance 2 general electrical panel
E	CCI/DDC
F	CAN-BUS cable (not supplied - see table)
3	last unit of appliances (with "ID00")

Example of CAN network with 7 nodes (1 CCI/DDC + 2 appliances connected on a single hydraulic circuit).

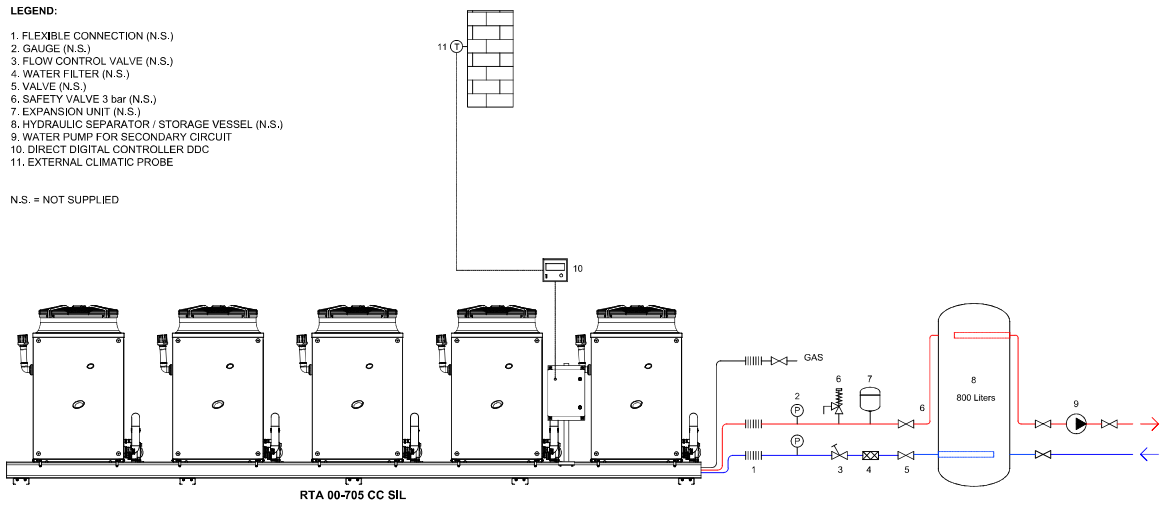
The communication cable (hashed line above) connects DDC controller to GAHP system/s.
Specification and maximum lengths in the table below.

CABLE NAME	SIGNAL / COLOR			MAX LENGTH	Note
Robur					Ordering Code O-CVO008
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	

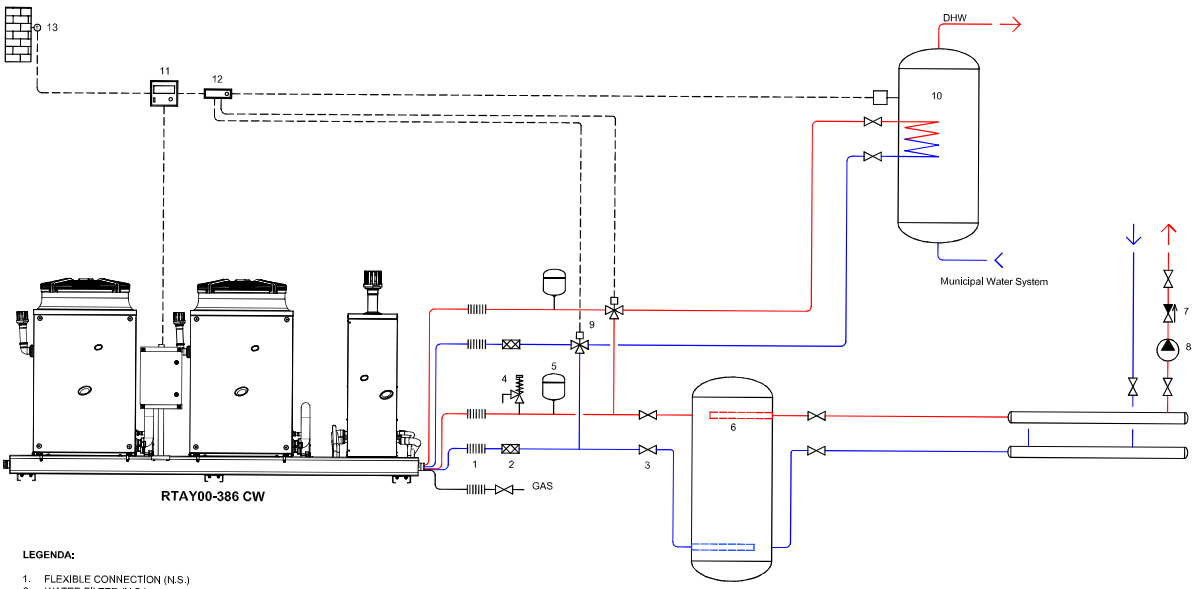
Allow 6 Metres for the internal wiring of each GAHP heat pump.
If the total run is under 200M, then a simple 3 x 0.75mm2 shielded cable may be used

Hydraulic Sketches (examples)

GAHPs Serving Buffer Tank for Heating



GAHPs with AY Boiler for Heating & DHW



LEGENDA:

1. FLEXIBLE CONNECTION (N.S.)
2. WATER FILTER (N.S.)
3. VALVE (N.S.)
4. SAFETY VALVE 3 bar (N.S.)
5. EXPANSION UNIT (N.S.)
6. HYDRAULIC SEPARATOR / STORAGE VESSEL (N.S.)
7. NON-RETURN VALVE
8. WATER PUMP for Heating secondary circuit (N.S.)
9. THREE-WAY DEVIATING VALVE (N.S.)
10. DHW STORAGE VESSEL (N.S.)
11. DIRECT DIGITAL CONTROLLER DDC
12. RB100 Interface System for DHW and Legionella managing
13. CLIMATIC PROBE

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