1 SPECIFICATION OF SUPPLY

Water-ammonia absorption heat pump, fed with natural gas or LPG, air-water version, modulating and condensing, for hot water production up to a delivery temperature of 65°C (70°C at 50% of maximum power), for installation in technical room, consisting of:

- steel sealed circuit, externally treated with epoxy paint;
- Sealed combustion chamber (type C);
- metal mesh radiant burner equipped with ignition and flame detection device, controlled by an electronic control unit;
- titanium stainless steel shell-and-tube water heat exchanger, externally insulated;
- stainless steel, flue gas latent heat recovery exchanger;
- air exchanger with finned coil, with steel pipe and aluminium fins;
- automatic microprocessor-controlled finned coil automatic defrosting valve;
- low power consumption refrigerant fluid oil pump;
- low-noise fan S1.

Control and safety devices:

- electronic board with microprocessor;
- installation water flowmeter;
- generator limit thermostat, with manual reset;
- flue gas temperature thermostat, with manual reset;
- generator fin temperature sensor;
- sealed circuit safety relief valve;
- by-pass valve, between high and low pressure circuits;
- ionisation flame controller;
- gas solenoid valve with double shutter;
- antifreeze function for water circuit;
- condensate discharge obstruction sensor.

2 FEATURES AND TECHNICAL DATA

2.1 DIMENSIONS

Figure 2.1 *GAHP indoor dimensions*

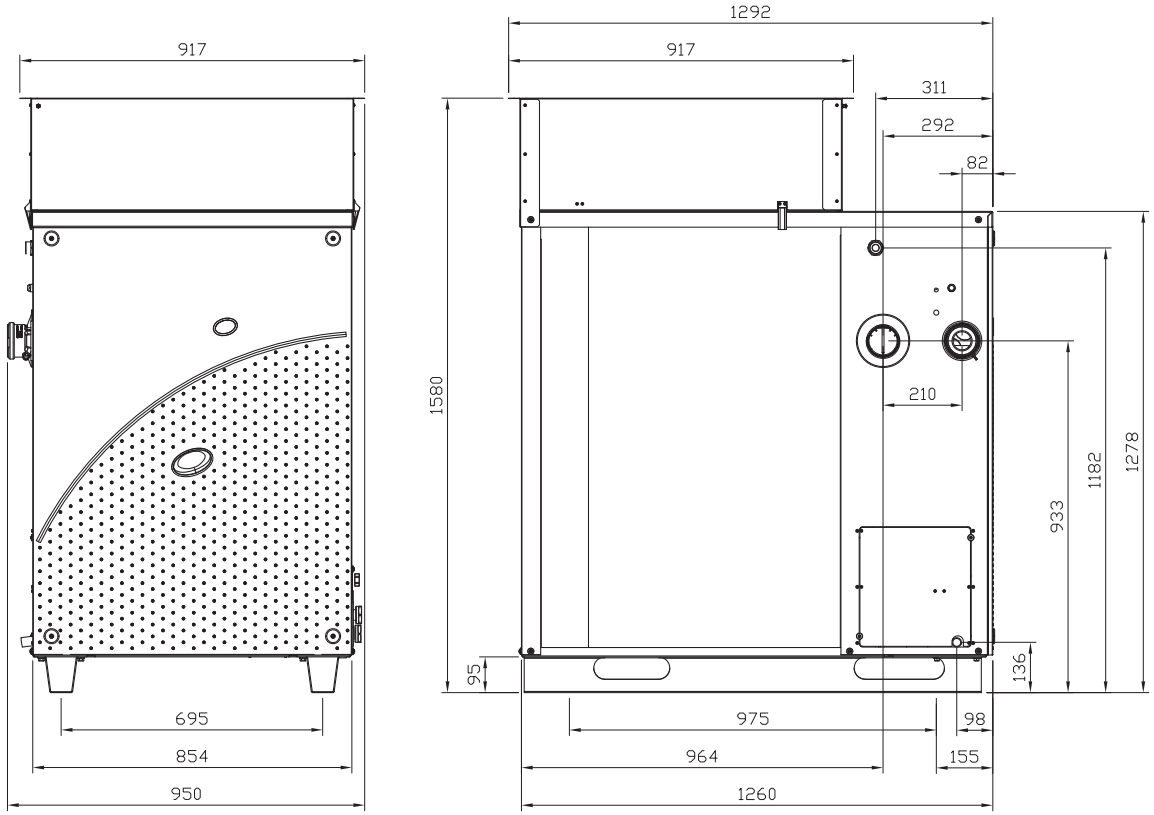
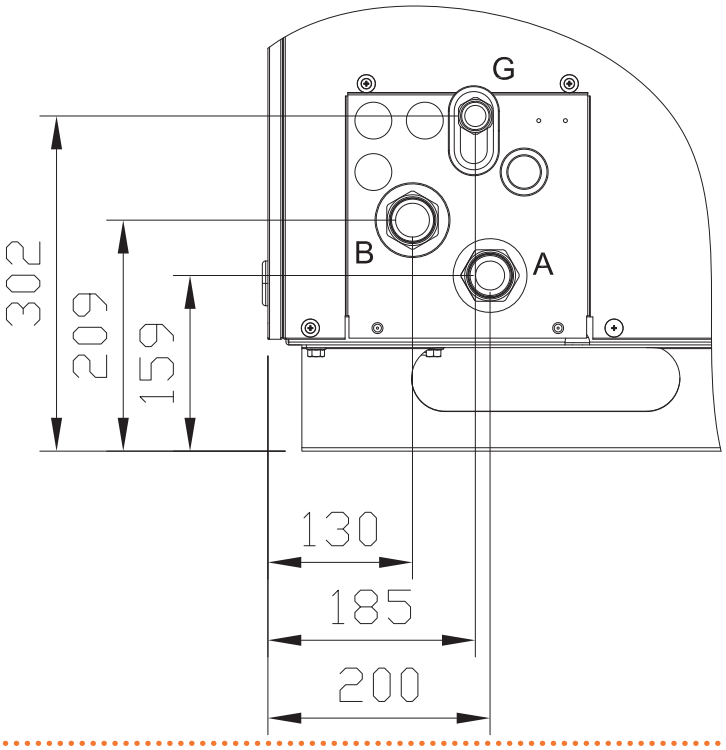


Figure 2.2 *Service plate - Hydraulic/gas unions detail*



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

2.2 OPERATION MODE

ON/OFF or modulating operation

The GAHP A Indoor unit may operate in two modes:

- mode (1) ON/OFF, i.e. On (at full power) or Off, with circulating pump at constant or variable flow;
- mode (2) MODULATING, i.e. at variable load from 50% to 100% of heating capacity, with circulating pump at variable flow.

For each mode, (1) or (2), specific control systems and devices are provided (Paragraph 2.3 *p. 3*).

2.3 CONTROLS

Control device

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

- (1) **DDC control**
- (2) **CCP/CCI control**
- (3) **external request**

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

The DDC controller is able to control the appliances, a single GAHP unit, or even several Robur GAHP/GA/AY units in cascade, only in ON/OFF mode (non modulating). For more information see Section C1.12.

2.3.2 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 A/WS/GS only, excluding AR/ACF/AY), plus any integration ON/OFF boiler. For more information see Section C1.12.

2.3.3 Adjustment system (3) with external request (GAHP unit ON/OFF)

The appliance may also be controlled via generic enable devices (e.g. thermostat, timer, button, 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.

2.4 TECHNICAL CHARACTERISTICS

Table 2.1 *GAHP-A Indoor technical data*

				GAHP A Indoor
Heating mode				
Seasonal space heating energy efficiency class (ErP)	medium-temperature application (55 °C)		-	A+
	low-temperature application (35 °C)		-	A+
Unitary heating power	Outdoor temperature/Delivery temperature	A7W35	kW	41,3
		A7W50	kW	38,3
		A7W65	kW	31,1
		A-7W50	kW	32,0
GUE efficiency	Outdoor temperature/Delivery temperature	A7W35	%	164
		A7W50	%	152
		A7W65	%	124
		A-7W50	%	127
Heating capacity	nominal (1013 mbar - 15 °C)		kW	25,7
	real		kW	25,2
Hot water delivery temperature	maximum for heating		°C	65
	maximum for DHW		°C	70
Hot water return temperature	maximum for heating		°C	55
	maximum for DHW		°C	60
	minimum temperature in continuous operation		°C	30 (1)
Thermal differential	nominal		°C	10
Heating water flow	nominal		l/h	3000
	maximum		l/h	4000
	minimum		l/h	1400
Pressure drop heating mode	nominal water pressure (A7W50)		bar	0,43 (2)
Ambient air temperature (dry bulb)	maximum		°C	45
	minimum		°C	-15 (3)
Electrical specifications				
Power supply	voltage		V	230
	type		-	SINGLE PHASE
	frequency		50 Hz supply	50

(1) In transient operation, lower temperatures are allowed.
(2) For flows other than nominal see Design Manual, Pressure losses Paragraph.
(3) As an option, a version for operation down to -30 °C is available.
(4) Value stated with free drain. ±10% according to the power supply voltage and tolerance on electrical motors consumption.
(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 (G25) 29,25 MJ/m^3 (15 °C - 1013 mbar).
(8) PCI (G27) 27,89 MJ/m^3 (15 °C - 1013 mbar).
(9) PCI (G30/G31) 46,34 MJ/kg (15 °C - 1013 mbar).
(10) Sound power values detected in compliance with the intensity measurement methodology set forth by standard EN ISO 9614.
(11) Maximum sound pressure levels in free field, with directionality factor 2, obtained from the sound power level in compliance with standard EN ISO 9614.
(12) Value stated with free drain.

			GAHP A Indoor
Electrical power absorption	nominal	kW	0,87 (4)
	minimum	kW	0,50 (5)
Degree of protection	IP	-	X5D
Installation data			
Gas consumption	methane G20 (nominal)	m^3/h	2,72 (6)
	methane G20 (min)	m^3/h	1,34
	G25 (nominal)	m^3/h	3,16 (7)
	G25 (min)	m^3/h	1,57
	G27 (nominal)	m^3/h	3,32 (8)
	G27 (min)	m^3/h	1,62
	G30 (nominal)	kg/h	2,03 (9)
	G30 (min)	kg/h	0,99
	G31 (nominal)	kg/h	2,00 (9)
	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)	74,0 (10)
Sound power L_w (min)		dB(A)	71,0 (10)
Sound pressure L_p at 5 metres (max)		dB(A)	52,0 (11)
Sound pressure L_p at 5 metres (min)		dB(A)	49,0 (11)
Minimum storage temperature		°C	-30
Maximum water pressure in operation		bar	4
Maximum defrosting water flow		l/h	40
Maximum flow flue condensate		l/h	4,0
Water content inside the apparatus		l	4
Water fitting	type	-	F
	thread	" G	1 1/4
Gas connection	type	-	F
	thread	" G	3/4
Safety valve outlet channel fitting		" G	1 1/4
Fume outlet	diameter (Ø)	mm	80
	residual head	Pa	80
Type of installation		-	C13, C33, C43, C53, C63, C83
Dimensions	width	mm	917
	depth	mm	1292
	height	mm	1580
Weight	in operation	kg	405
Required air flow		m^3/h	11000
Required air flow at the maximum available head		m^3/h	10000
Fan residual head		Pa	40 (12)
General information			
Cooling fluid	ammonia R717	kg	7,0
	water H_2O	kg	10,0
Maximum pressure of the cooling circuit		bar	32

(1) In transient operation, lower temperatures are allowed.
(2) For flows other than nominal see Design Manual, Pressure losses Paragraph.
(3) As an option, a version for operation down to -30 °C is available.
(4) Value stated with free drain. ±10% according to the power supply voltage and tolerance on electrical motors consumption.
(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 (G25) 29,25 MJ/m^3 (15 °C - 1013 mbar).
(8) PCI (G27) 27,89 MJ/m^3 (15 °C - 1013 mbar).
(9) PCI (G30/G31) 46,34 MJ/kg (15 °C - 1013 mbar).
(10) Sound power values detected in compliance with the intensity measurement methodology set forth by standard EN ISO 9614.
(11) Maximum sound pressure levels in free field, with directionality factor 2, obtained from the sound power level in compliance with standard EN ISO 9614.
(12) Value stated with free drain.

Table 2.2 *PED data*

			GAHP A Indoor
PED data			
Components under pression	generator	l	18,6
	leveling chamber	l	11,5
	evaporator	l	3,7
	cooling volume transformer	l	4,5
	cooling absorber solution	l	6,3
	solution pump	l	3,3
Test pressure (in air)		bar g	55
Maximum pressure of the cooling circuit		bar g	32
Filling ratio		kg of NH_3/l	0,146
Fluid group		-	GROUP 1°

2.4.1 Pressure drops

Table 2.3 *GAHP A and GAHP A Indoor pressure drops*

Water flow rate	Vector fluid temperature at outlet		
	35 °C	50 °C	60 °C
	Bar	Bar	Bar
2000 l/h	0,23	0,21	0,19
3000 l/h	0,46	0,43	0,40
4000 l/h	0,78	0,72	0,67

2.4.2 Performances

Table 2.4 *p. 5* shows the unitary thermal power at full load and in stable operation, depending on hot water delivery temperature to the system and outdoor temperature.
Please consider that, according to the actual heating request, the unit may often need to operate under partial load conditions and in non stationary operation.

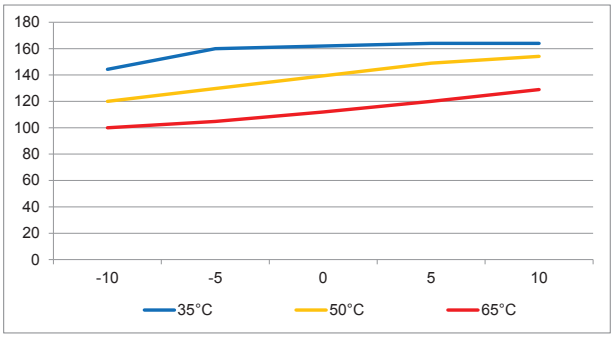
Table 2.4 *GAHP A and GAHP A Indoor heating power for each unit*

External air 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
-20 °C	33,9	31,5	29,6	27,7	25,7	23,7	22,7	9,3
-15 °C	35,2	32,8	30,9	29,0	27,0	24,9	23,9	10,0
-10 °C	36,4	34,0	32,1	30,2	28,2	26,2	25,2	10,6
-5 °C	40,3	37,7	35,2	32,7	30,6	28,5	26,4	11,1
0 °C	40,8	39,2	37,1	35,1	32,7	30,3	28,2	11,3
5 °C	41,3	40,0	38,8	37,5	34,8	32,0	30,2	11,8
7 °C	41,3	40,2	39,3	38,3	35,7	33,0	31,1	12,0
10 °C	41,3	40,6	39,8	38,9	36,6	34,4	32,5	12,4
15 °C	41,6	41,3	40,6	39,8	38,3	36,8	34,8	13,1
20 °C	41,6	41,4	40,8	40,2	39,5	38,5	37,1	13,8
25 °C	41,7	41,5	41,0	40,4	39,9	39,2	38,2	14,2
30 °C	41,8	41,6	41,1	40,5	40,1	39,4	38,4	14,4
35 °C	41,9	41,7	41,2	40,6	40,2	39,5	38,5	14,5

(1) Thermal input reduced to 50%

Picture 2.3 *p. 5* shows the GUE trend at full load and in stable operation for three representative delivery temperatures, according to outdoor temperature.
Please consider that, according to the actual heating request, the unit may often need to operate under partial load conditions and in non stationary operation.

Figure 2.3 *GAHP A and GAHP A Indoor GUE*



In abscissa the outdoor temperature
In ordinate the full load GUE rate

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 discharge.

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

3.1 PLUMBING DESIGN

Please refer to Section C1.04.

3.2 FUEL GAS SUPPLY

Please refer to Section C1.09.

3.3 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. 3*.

3.3.1 Flue gas exhaust connection

► Ø 80 mm (with gasket), on the left, at the top (Figure 2.1 *p. 2*).

3.3.2 Combustion air intake fitting

► Ø 80 mm (with gasket), on the left, at the top (Figure 2.1 *p. 2*).

3.3.3 Fume outlet

Some possible configurations are shown in the Figures 3.1 *p. 6*, 3.2 *p. 7*.

Figure 3.1 *Type C53 split wall flue gas exhaust*

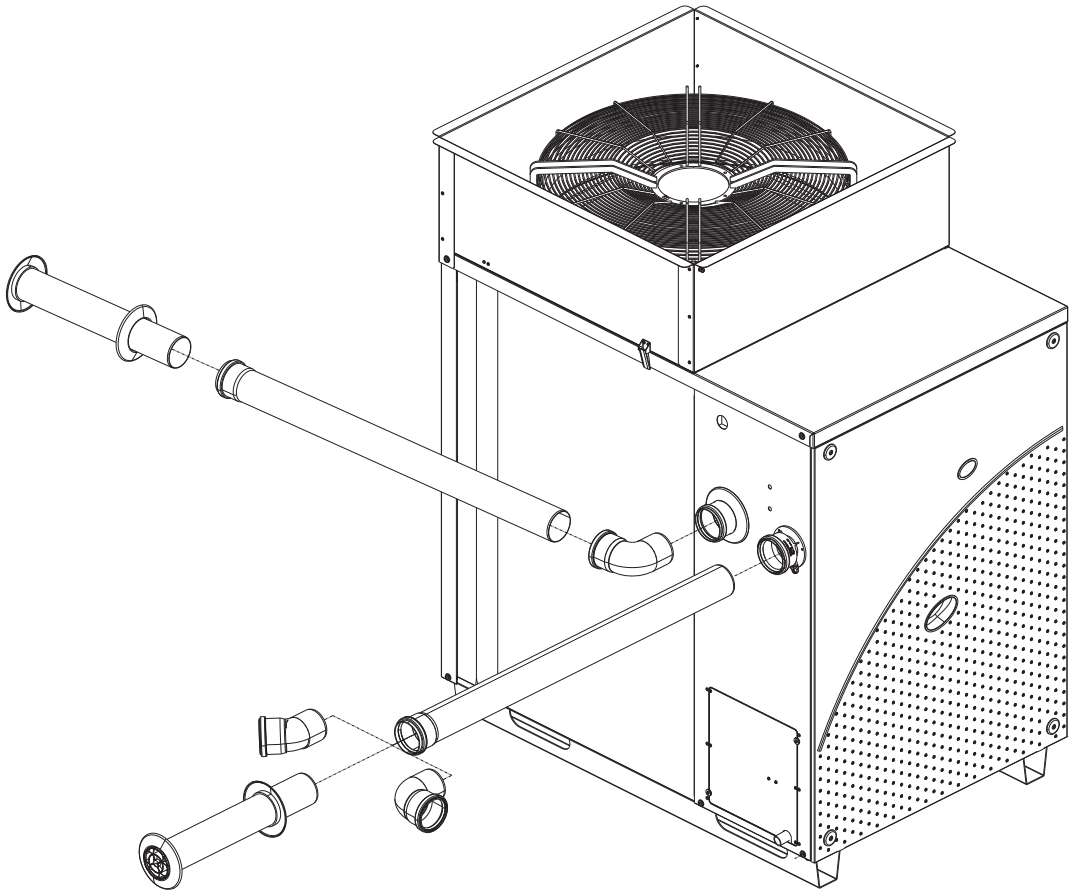
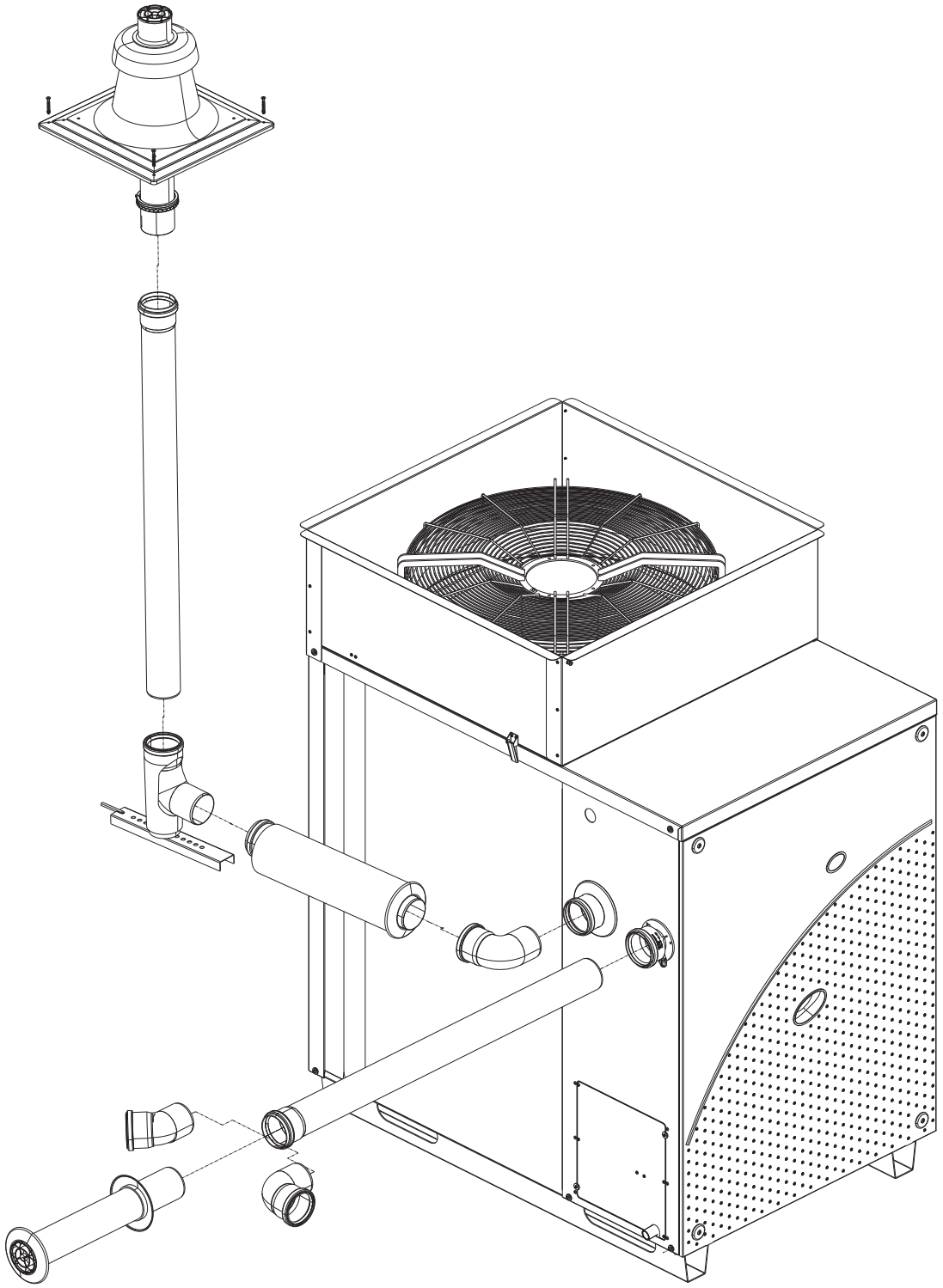


Figure 3.2 *Type C53 roof flue gas exhaust*



Flue

- ► It is not admissible to connect several appliances to a single flue, but each appliance must have its own separate flue.
- ► For flue sizing please refer to the Table 3.1 *p. 8* and the specification sheet in Section C1.10.
- ► The flue must be designed, sized, tested and constructed by a skilled form, 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.

Table 3.1 *Fumes temperature and flow*

Gas type	Heating capacity	CO_2 (%)	TF (C°)	Fumes flow (kg/h)	Residual head (Pa)
G20	Nominal	9,10	65	42	80
	Minimum	8,90	46	21	80
G25	Nominal	9,10	63,6	42	80
	Minimum	8,90	45,7	21	80
G25.1	Nominal	10,10	65	45	80
	Minimum	9,60	46	23	80
G27	Nominal	9,0	64	42	80
	Minimum	8,5	46	21	80
G2.350	Nominal	9,00	62,7	42	80
	Minimum	8,70	46,8	22	80
G30	Nominal	10,40	65	43	80
	Minimum	10,10	46	22	80
G31	Nominal	9,10	65	48	80
	Minimum	8,90	46	24	80

3.4 FLUE GAS CONDENSATE DISCHARGE

The GAHP A Indoor 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 fume condensate in gutters, due to the risk of materials corrosion and ice formation.

3.4.1 Flue gas condensate connection

The fitting for flue gas condensate discharge is located on the left side of the appliance (Figure 3.3 *p. 8*).

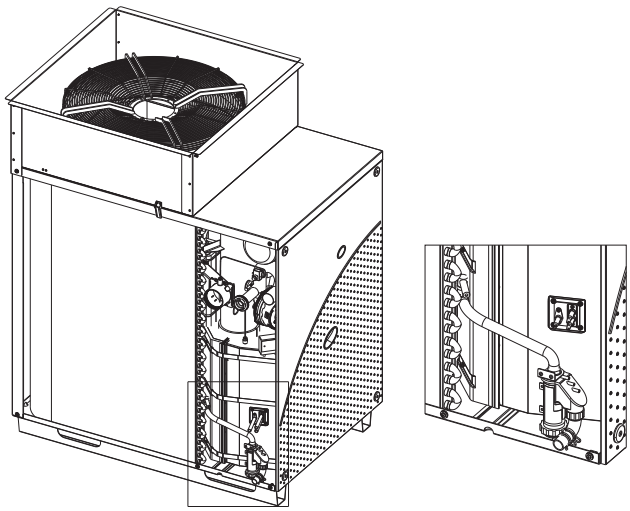
- ► The corrugated condensate discharge pipe must be connected to a suitable discharge manifold.
- ► The junction between the pipe and the manifold must remain visible.

3.4.2 Flue gas condensate discharge manifold

To make the condensate discharge manifold:

- ► Size the ducts for maximum condensation capacity (Table 2.1 *p. 3*).
- ► 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 icing.
- ► Dilute, if possible, with domestic waste water (e.g. bathrooms, washing machines, dish washers...), basic and neutralising.

Figure 3.3 *Condensate drain component*



3.5 SAFETY VALVE DRAIN

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 exhaust duct between the safety valve and the outside exhaust.

3.5.1 Safety valve drain ducting

The exhaust ducting shall be made in steel pipes (do not use copper or its alloys). Table 3.2 *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 3.2 *Safety valve drain ducting*

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

The exhaust 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 coolant leaks cannot be inhaled by any people.

3.6 FAN AIR DUCTING

3.6.1 Air duct

The appliance is fitted with a flange for connecting to a fan outlet air duct.

- ► Arrange removable fitting/bellows between the air duct and the appliance's flange, for fan maintenance operations.
- ► A pressure socket is provided to measure the pressure differential.

3.7 ELECTRICAL AND CONTROL CONNECTIONS

3.7.1 Warnings

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 black outs 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 circulation pump

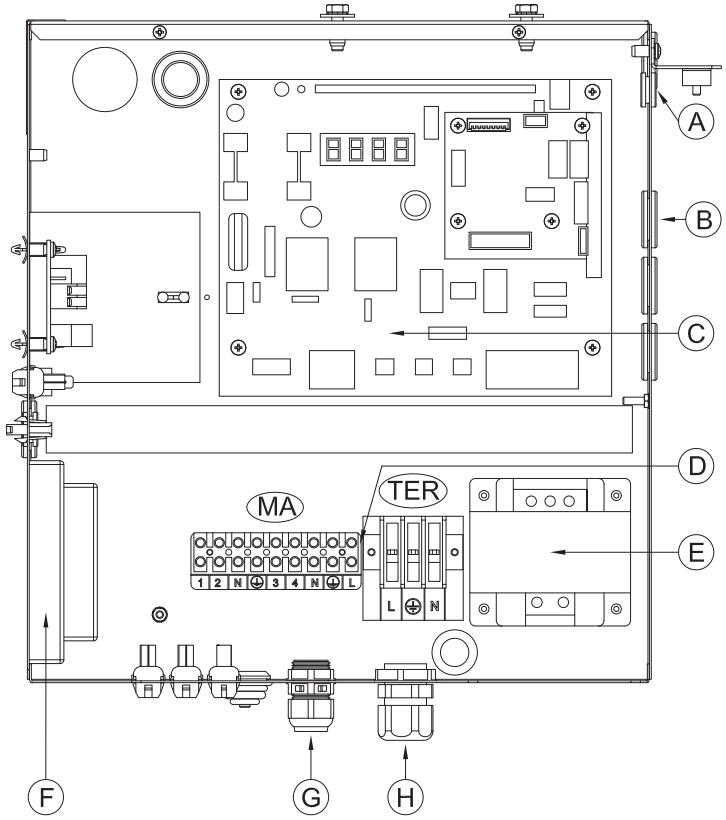
The water circulation pump of the water/primary circuit must mandatorily be controlled by the appliance's electronic boards. It is not admissible to start/stop the circulating pump with no request from the appliance.

3.7.2 Electrical systems

Electrical connections must provide:

- ► (a) power supply;
- ► (b) control system.

Figure 3.4 *GAHP A 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 boxes
E transformer 230/23 V AC
F flame control unit
G circulation pump power supply and control cable gland
H GAHP power supply cable gland

Terminals:
TER terminal box
L-(PE)-N phase/earth/neutral GAHP power supply

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

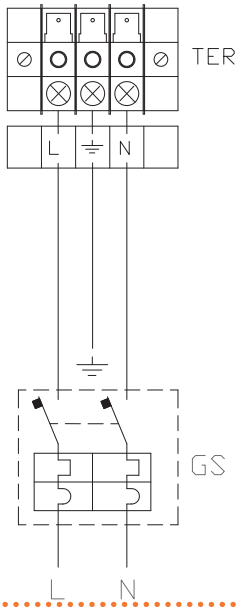
3.7.3 Electrical power supply

Power supply line

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

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

Figure 3.5 *Electrical wiring diagram - Example of connection of appliance to 230 V 1 N - 50 Hz electricity supply*



TER terminal block
L phase
N neutral

Components NOT SUPPLIED
GS general switch

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

3.7.4 Set-up and control

Control systems, options (1) (2) (3)

Three separate adjustment systems are provided, each with specific features, components and diagrams (see 3.7 *p. 11*, 3.8 *p. 11*):

- ► System (1), with **DDC control** (with CAN-BUS connection).
- ► System (2), with **CCP/CCI control** (with CAN-BUS connection).
- ► System (3), with an **external request**.

CAN-BUS communication network

The CAN-BUS communication network, implemented with the cable of the same name, makes it possible to connect and remotely control one or more Robur appliances with the DDC or CCP/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, CCI, ...), 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 3.3 *p. 10* (admissible types and maximum distances).

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

Table 3.3 *CAN BUS cables type*

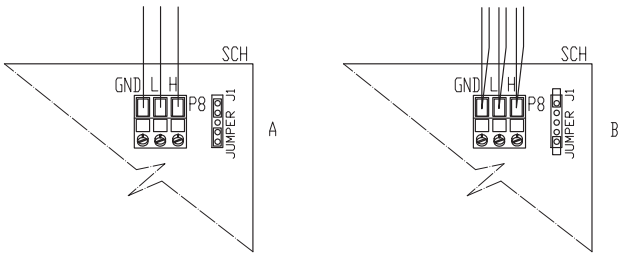
CABLE NAME	SIGNALS / COLOR			MAX LENGTH	Note
Robur					Ordering Code OCVO008
ROBUR NETBUS	H= BLACK	L= WHITE	GND= BROWN	450 m	
Honeywell SDS 1620					In all cases the fourth conductor should not be used
BELDEN 3086A	H= BLACK	L= WHITE	GND= BROWN	450 m	
TURCK type 530					
DeviceNet Mid Cable					
TURCK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

How to connect the CAN BUS cable to the appliance

To connect the CAN-BUS cable to the electronic board, located in the Electrical Panel inside the appliance, (Pictures 3.6 *p. 10* and 3.7 *p. 11*):

1. Access the Electrical Board of the appliance according to the Procedure 3.7.2 *p. 9*);
2. Connect the CAN-BUS cable to terminals GND, L and H (shielding/earthing + two signal conductors);
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 3.6 *Electrical wiring diagram - Connection cable CAN BUS to electronic board*



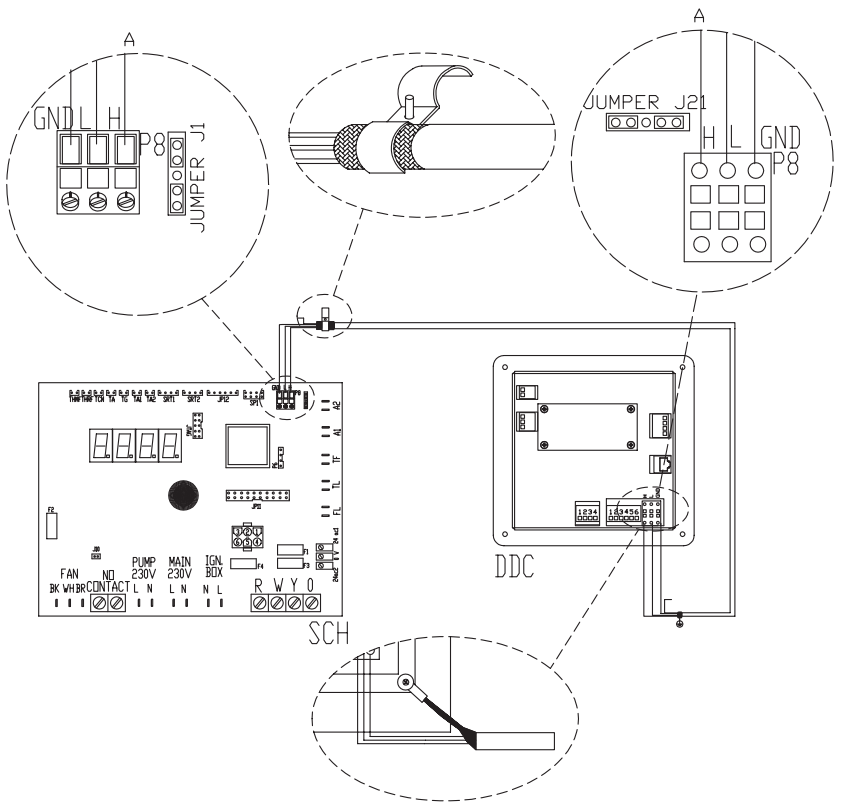
SCH Electronic board
GND Common data
L Data signal LOW
H Data signal HIGH
J1 Jumper CAN-BUS in board
A detail of "terminal node" case (3 wires; J1=jumper "closed")
B Detail of "intermediate node" case (6 wires; J1=jumper "open")
P8 CAN port/connector

GAHP Configuration (S61) + DDC or CCP/CCI

(Systems (1) and (2), Picture 3.7 *p. 11*, see also Paragraph

2.3 *p. 3*)

Figure 3.7 *CAN-BUS connection for systems with one unit*



DDC Direct Digital Control
SCH electronic board S61
J1 Jumper CAN-BUS in board S61
J21 Jumper CAN-BUS in board DDC
A terminal node connection (3 wires; J1 and J21 = "closed")
H,L,GND data signal wires (ref. cables table)

External request

(System (3), Picture 3.8 *p. 11*, see also Paragraph 2.3 *p. 3*).
It is required to arrange:

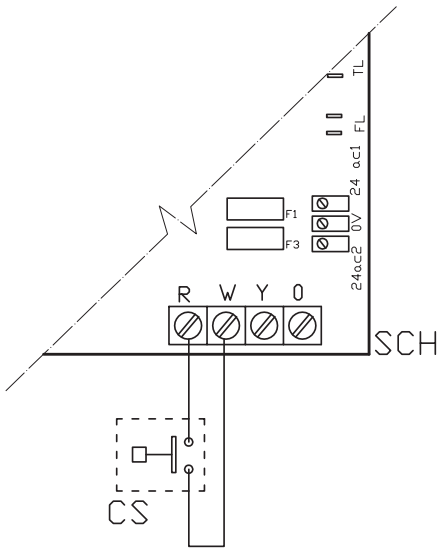
► request device (e.g. thermostat, clock, button, ...) fitted with a voltage-free NO contact.

How to connect the external request

Connection of external request is effected on the S61 board located in the Electrical Panel inside the unit (Figure 3.8 *p. 11*):

1. Access the Electrical Board of the appliance according to the Procedure 3.7.2 *p. 9*.
2. Connect the voltage-free contact of the external device (Detail CS), through two wires, to **terminals R and W** (respectively: common 24 V AC and heating request) of S61 electronic board.

Figure 3.8 *Wiring diagram, external heating enable connection*



SCH Electronic board
R Common
W Terminal consensus warming

Components NOT SUPPLIED
CS external request

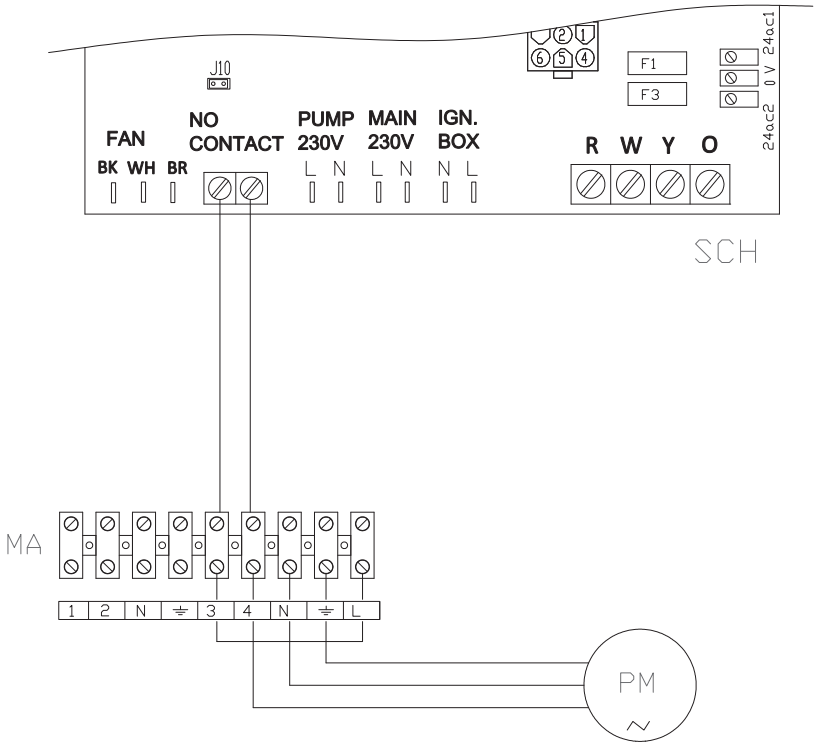
3.7.5 Water circulation pump

Option (1) CONSTANT FLOW circulating pump

It must be mandatorily controlled from the S61 electronic board. The diagram in Figure 3.9 *p. 12* is for pumps < 700 W. For

pumps > 700 W it is required to add a control relay and arrange Jumper J10 OPEN.

Figure 3.9 *Water circulation pump connection - Connection of plant water circulation pumps (power absorption less than 700W), controlled directly by the appliance.*



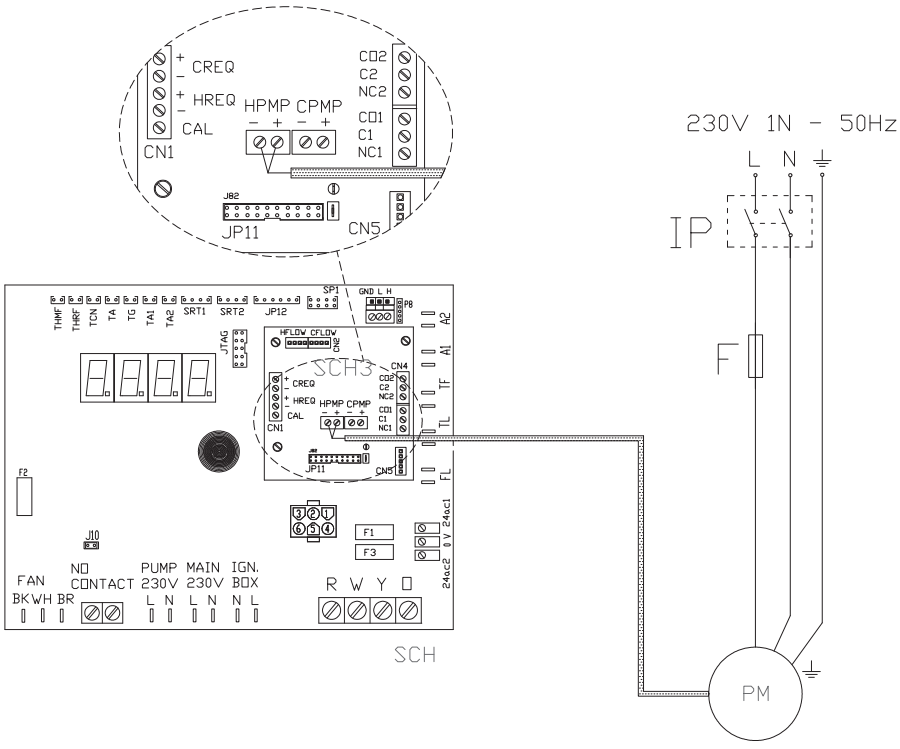
SCH electronic board
J10 closed jumper
N.O. CONTACT N.O voltage free contacts
MA unit terminal block
L phase
N neutral
Components NOT SUPPLIED
PM water pump < 700W

Option (2) VARIABLE FLOW circulating pump

It must be mandatorily controlled from the Mod10 electronic board (built into the S61).

The Wilo Stratos Para pump is already standard supplied with the power supply cable and signal cable, both 1.5m long.
For longer distances, use respectively cable FG7 3Gx1.5mm² m and shielded cable 2x0.75 mm² suitable for 0-10V signal.

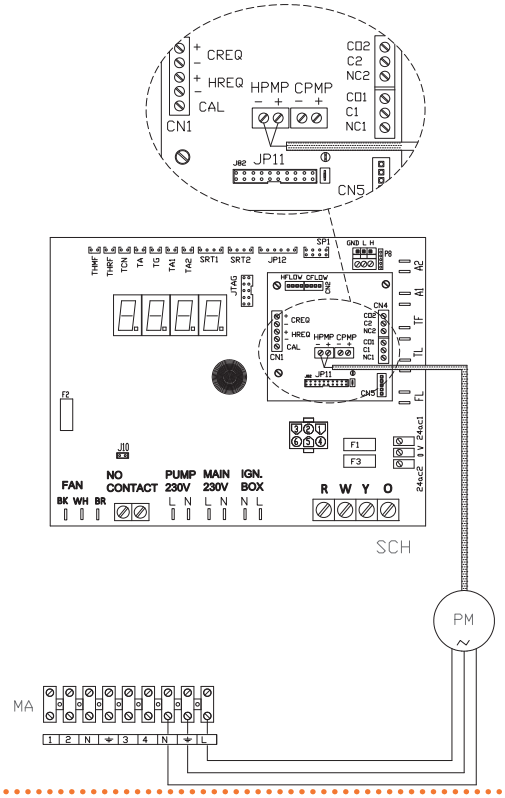
Figure 3.10 *Wiring diagram for connection of Wilo Stratos Para variable rate pump*



IP Two-position pump power switch
F Fuse
PM Hot water circulation pump (primary circuit)

Pump signal 0-10V wire colours
brown connect to -ve
white connect to +ve
black isolate
blue isolate

Figure 3.11 *Wiring diagram for hooking up the Wilo Stratos Para variable rate pump powered by the unit*



PM Hot water circulation pump (primary circuit)
MA unit terminal block

Pump signal 0-10V wire colours
brown connect to -ve
white connect to +ve
black isolate
blue isolate