1 SPECIFICATION OF SUPPLY

4 star sealed chamber condensing boiler, fed with natural gas or LPG, to produce hot water up to a delivery temperature of 80°C, for indoor or outdoor installation.
The appliance is provided with an internal heat exchanger to separate internal hydraulic circuit from system hydraulic circuit.
The boiler consists of:

- ► premixed multi-gas burner with low NOx and CO emissions;
- ► stainless steel plate heat exchanger, combining a hydraulic separator;
- ► automatic and manual air bleeds on the internal circuit;
- ► flue gas discharge duct with relevant terminal, for type B53P configuration;
- ► condensate discharge siphon (with antifreeze function).

Control and safety devices:

- ► electronic board with microprocessor;
- ► automatically resettable water temperature limiting thermostat;
- ► flue gas limit thermostat, for single use (thermal switch);
- ► 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;
- ► ionisation flame controller;
- ► gas solenoid valve with double shutter;
- ► antifreeze function for water circuit;
- ► anti-freezing thermostat used for the activation of the heating element on the condensate drain.

2 FEATURES AND TECHNICAL DATA

2.1 DIMENSIONS

Figure 2.1 *Dimensions (front and right side views)*

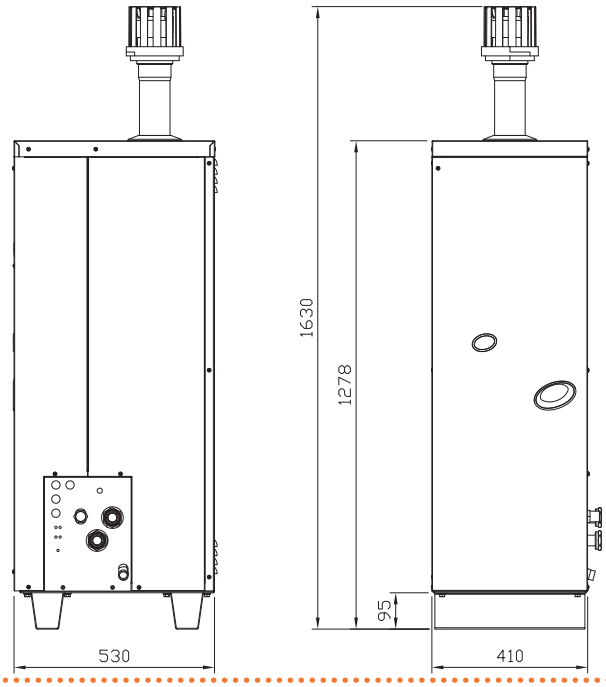
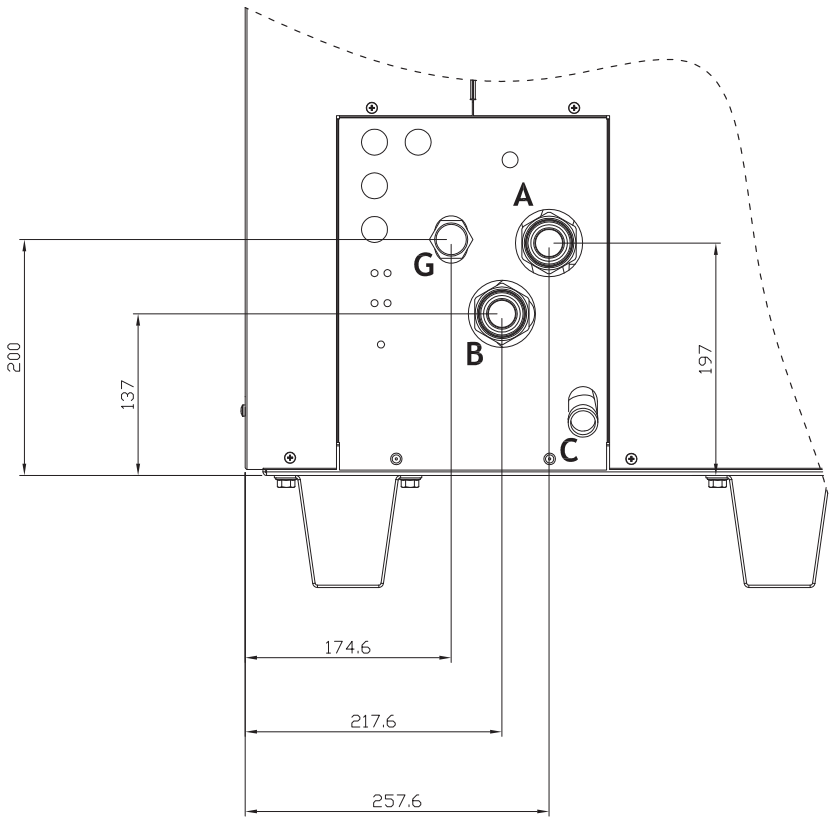


Figure 2.2 *Service plate - Hydraulic/gas unions detail*



G Gas connection Ø 3/4" M
A Water outlet connection Ø 1 1/4" F
B Water inlet connection Ø 1 1/4" F
C Condensate discharge connection (ext. D. 25 mm)

2.2 OPERATION MODE

The AY00-120 unit may only work in the ON/OFF mode, i.e. ON (at full power) or OFF, with circulating pump at constant flow.

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 Adjustment system (1) with DDC control (ON/OFF unit)

The DDC controller is able to control the appliances, a single AY00-120 unit, or even several GAHP/GA/AY Robur 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), thus without the important system functions (1). It is advisable to possibly limit its use to simple applications only and with a single appliance.

2.4 TECHNICAL CHARACTERISTICS

Table 2.1 *Technical specifications AY00-120*

				AY00-120
Heating mode				
Seasonal space heating energy efficiency class (ErP)				A
Operating point 80/60	Nominal thermal capacity	effective power	kW	34,4
		efficiency	%	98,6
	Mean thermal capacity	efficiency	%	98,3
	Minimal thermal capacity	efficiency	%	97,3
Operating point 70/50	Nominal thermal capacity	efficiency	%	100,6
Operating point 50/30	Nominal thermal capacity	efficiency	%	104,6
Operating point Tr = 30 °C	Thermal capacity 30%	efficiency	%	107,5
Operating point Tr = 47 °C	Thermal capacity 30%	efficiency	%	100,3
Heating capacity	nominal (1013 mbar - 15 °C)		kW	34,9
	average		kW	21,5
	minimum		kW	8,0
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
Heating water flow	nominal		l/h	2950
	maximum		l/h	3200
	minimum		l/h	1500
Pressure drop heating mode	at nominal water flow		bar	0,40 (1)
Efficiency class				****
Heat loss	to jacket in operation		kW	0,15
	to jacket in operation		%	0,44
	to flue in operation		kW	0,86
	to flue in operation		%	2,54
	in off mode		kW	0,058
	in off mode		%	0,17
Ambient air temperature (dry bulb)	maximum		°C	45
	minimum		°C	-20 (2)
Electrical specifications				
Power supply	voltage		V	230
	type		-	single-phase
	frequency		50 Hz supply	50
Electrical power absorption	nominal		kW	0,18
Degree of protection	IP		-	XSD
Installation data				

(1) For flows other than nominal see Design Manual, Pressure losses Paragraph.
(2) As an option, a version for operation down to -40 °C is available.

			AY00-120
Gas consumption	methane G20 (nominal)	m^3/h	3,69
	methane G20 (min)	m^3/h	0,85
	G25 (nominal)	m^3/h	4,35
	G25 (min)	m^3/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
NO_x emission class		-	5
NO_x emission		ppm	19,5
CO emission		ppm	8,4
Minimum storage temperature		°C	-30
Maximum water pressure in operation		bar	4
Maximum flow flue condensate		l/h	5,5
Water content inside the apparatus	hot side	l	1
Water fitting	type	-	F
	thread	" G	1 1/4
Gas connection	type	-	M
	thread	" G	3/4
Fume outlet	diameter (Ø)	mm	80
	residual head	Pa	100
	product configuration		B53P
Type of installation		-	B32P, B33, B35P, C13, C33, C34, C53, C63, C83
Dimensions	width	mm	410
	depth	mm	530
	height	mm	1278
Weight	in operation	kg	71

(1) For flows other than nominal see Design Manual, Pressure losses Paragraph.
(2) As an option, a version for operation down to -40 °C is available.

2.4.1 Pressure drops

Table 2.2 *Pressure drop AY*

Water flow rate	Outlet water temperature
	20 °C
	Bar
2007 l/h	0,20
2400 l/h	0,27
3000 l/h	0,41

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;
- 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

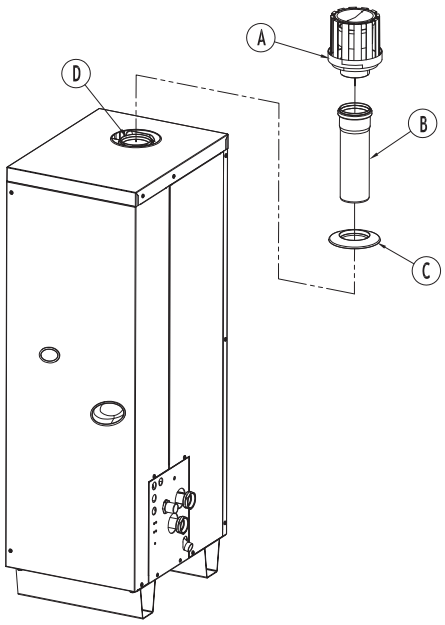
Compliance with standards

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 kit

The appliance, supplied in B53P configuration, is standard supplied with a DN80 flue gas kit, to be set up by the installer.
The fitting (DN80) for connecting the flue gas kit is located in the upper part of the appliance with vertical outlet.

Figure 3.1 *Flue gas exhaust kit*



A roof terminal (DN80)
B extension pipe (DN80)
C rain cover (DN80)
D flanged fitting (DN80) on upper panel
A+B+C flue gas exhaust duct kit

3.3.2 Flue gas ducting for type B installation

The flue must be sized with reference to the following Table 3.1 *p. 5*.

Table 3.1 *Fumes evacuation pipe ducting (type B)*

Useful residual head	100 Pa
Maximum length of straight DN80 pipe sections	31.0 m
Equivalent DN80 curve length at 90°	2.0 m

Example: to install a horizontal fumes pipe using n. 1 DN80 90° curve, the maximum extension possible with DN80 straight pipe sections is 29 m.

3.3.3 Air/flue gas ducting for type C installation

The appliance is approved to be configured also for type C installations.
The possible configurations are set out in Table 2.1 *p. 3*.
Refer to Table 3.2 *p. 6* below for sizing the combustion flue gas exhaust and combustion air intake ducts.

Table 3.2 *Ducting for fumes evacuation and air intake pipes (type C)*

				AY00-120
Installation data				
Fume outlet	residual head		Pa	100
Percentage CO_2 in fumes	Nominal thermal capacity	G25	%	9,40
		G20	%	9,40
		G25.1	%	10,70
		G27	%	9,35
		G2.350	%	9,15
		G30	%	12,40
		G31	%	10,60
	Minimal thermal capacity	G25	%	8,90
		G20	%	8,90
		G25.1	%	10,20
		G27	%	8,90
		G2.350	%	8,80
		G30	%	11,50
		G31	%	10,20
Flue temperature	Nominal thermal capacity	G25	°C	72,0
		G20	°C	72,5
		G25.1	°C	72,0
		G27	°C	72,0
		G2.350	°C	72,0
		G30	°C	71,5
		G31	°C	72,5
	Minimal thermal capacity	G25	°C	72,0
		G20	°C	71,6
		G25.1	°C	71,0
		G27	°C	71,5
		G2.350	°C	72,0
		G30	°C	71,5
		G31	°C	71,5
FUMES FLOW RATE	Nominal thermal capacity	G25	kg/h	62
		G20	kg/h	55
		G25.1	kg/h	49
		G27	kg/h	55
		G2.350	kg/h	56
		G30	kg/h	49
		G31	kg/h	56
	Minimal thermal capacity	G25	kg/h	15
		G20	kg/h	13
		G25.1	kg/h	12
		G27	kg/h	13
		G2.350	kg/h	13
		G30	kg/h	12
		G31	kg/h	13

Examples of the two principal type C configurations:
- ► C13 - using a 90° concentric elbow DN60/100, the maximum possible extension with straight concentric DN60/100 ducts is 5.75 m, while the minimum extension to be assured is 0.75 m.
- ► C33 - the maximum permitted extension with concentric DN60/100 straight pipe sections is 6.25 m.

The exhaust ducts exposed to weathering must be made of black polypropylene or equivalent material that withstands weather.

3.3.4 Possible flue

If required, the appliance may be connected to a flue appropriate for condensing appliances.
- ► For flue sizing please refer to the specification sheet in Section C1.10.
- ► If several appliances are connected to a single flue, it is obligatory to install a check valve on the exhaust of each.
- ► 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.

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

3.4 FLUE GAS CONDENSATE DISCHARGE

The AY00-120 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 right side of the appliance (Figure 2.2 *p. 2*) at the connection plate.

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.

3.5 ELECTRICAL AND CONTROL CONNECTIONS

3.5.1 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).

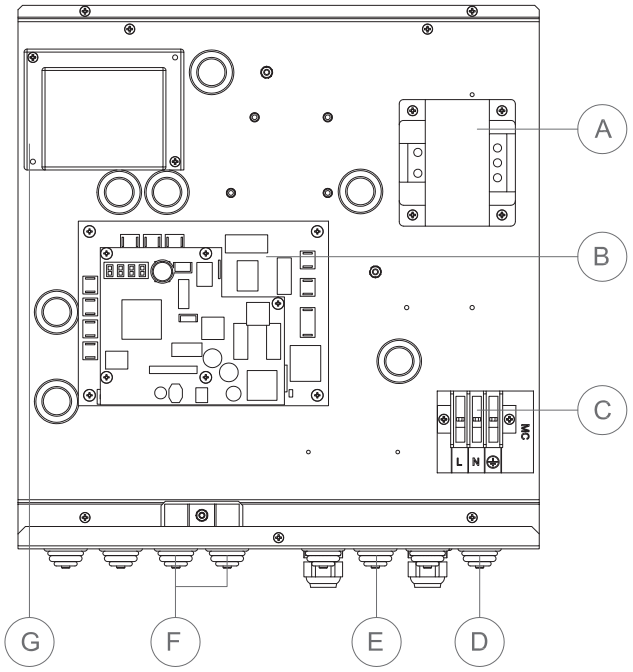
Control of water circulation pumps

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.

3.5.2 Electrical systems

Electrical connections must provide:
- ► (a) power supply;
- ► (b) control system.

Figure 3.2 *Electrical Panel*



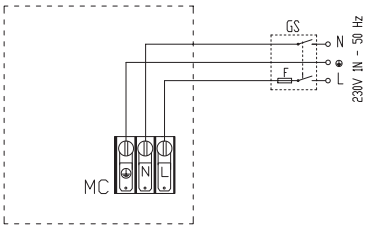
A Transformer 230/23 V AC
B AY10+S70 electronic boards
C MC terminal block
D Power supply cable gland
E Circulating pump cable gland
F CAN-BUS cable gland
G Flame control box

3.5.3 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 2 2A type T fuses, (GS) or 1 4A magnetothermic breaker.

Figure 3.3 *Electrical wiring diagram - Example of connection of appliance to 230 V 1 N - 50 Hz electricity supply*



MC power terminal block
GS General switch
F Fuse(s)
N Neutral terminal
Ground Earth terminal
L Single phase line terminal

The switches must also provide disconnect capability, with min contact opening 3 mm.

3.5.4 Set-up and control

Control systems, options (1) or (2)

Two separate control systems are provided, each with specific features, components and diagrams (Figures 3.5 *p. 8*, 3.6 *p. 9*):
- ► System (1), with **DDC control** (with CAN-BUS connection).
- ► System (2), with an **external request**.

CAN-BUS communication network

The CAN-BUS communication network, implemented with the cable of the same name, makes it possible to connect and remotely control one or more Robur appliances with the DDC 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 controller is connected to the appliance through the CAN-BUS signal cable, shielded, compliant to Table 3.3 *p. 8* (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*

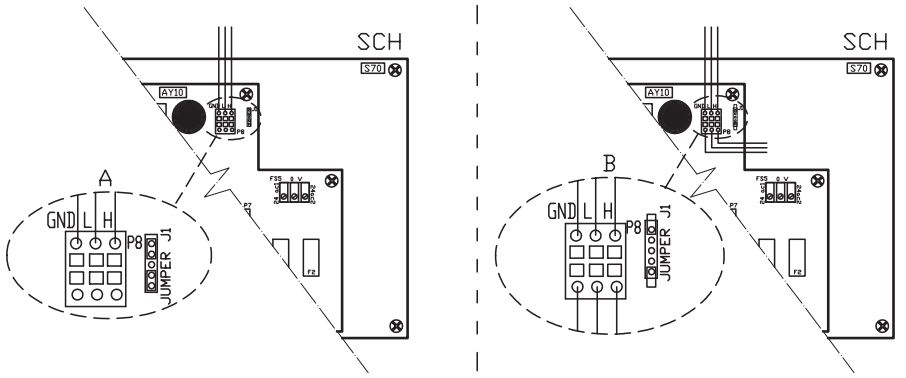
CABLE NAME	SIGNALS / COLOR			MAX LENGTH	Note
Robur					Ordering Code OCVO008
ROBUR NETBUS	H= BLACK	L= WHITE	GND= BROWN	450 m	
Honeywell SDS 1620					In all cases the fourth conductor should not be used
BELDEN 3086A	H= BLACK	L= WHITE	GND= BROWN	450 m	
TURCK type 530					
DeviceNet Mid Cable					
TURCK 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 AY10 electronic board, located in the Electrical Panel inside the appliance (Picture 3.4 *p. 8*):

1. Access the Electrical Board of the appliance according to the Procedure 3.5.2 *p. 7*);
2. Connect the CAN-BUS cable to terminals GND, L and H (shielding/earthing + two signal conductors) of the P8 connector;
3. Place the CLOSED J1 Jumpers (Detail A) if the node is terminal (one connected CAN-BUS cable section only), or OPEN (Detail B) if the node is intermediate (two connected CAN-BUS cable sections);
4. Connect the DDC to the CAN-BUS cable according to the instructions of the following Paragraphs and DDC Manual.

Figure 3.4 *Electrical wiring diagram - Connection cable CAN BUS to electronic board*

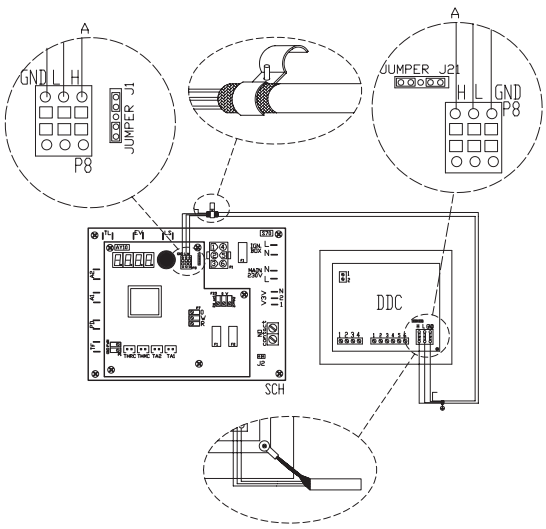


SCH Electronic board
J1 Jumper CAN-BUS in board
A detail of "terminal node" case (3 wires; J1=jumper "closed")
B Detail of "intermediate node" case (6 wires; J1=jumper "open")
GND Common data
L Data signal LOW
H Data signal HIGH
P8 CAN port/connector

AY configuration (AY10) + DDC

(System (1) Picture 3.5 *p. 8*, see also Paragraph 2.3 *p. 3*)

Figure 3.5 *CAN-BUS connection for systems with one unit*



DDC Direct Digital Control
SCH electronic board (AY10+S70)
J1 CAN-BUS Jumper on AY10 board
J21 Jumper CAN-BUS in board DDC
A terminal node connection (3 wires; J1 and J21 = "closed")
H,L,GND data signal wires

External request

(System (2), Picture 3.6 *p. 9*, see also Paragraph 2.3 *p. 3*)

It is required to arrange:

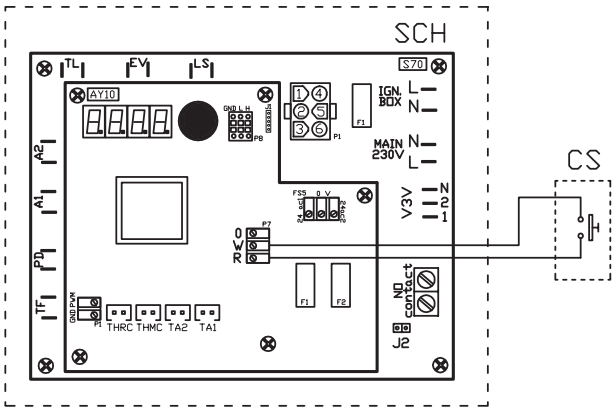
► request device (e.g. thermostat, clock, button, ...) fitted with a voltage-free NO contact.

How to connect the external request

Connection of external request is effected on the AY10 terminal block located in the Electrical Panel inside the appliance (Picture 3.6 *p. 9*).

1. Access the Electrical Board of the appliance according to the Procedure 3.5.2 *p. 7*.
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 AY10 electronic board.

Figure 3.6 *Wiring diagram, external heating enable connection*



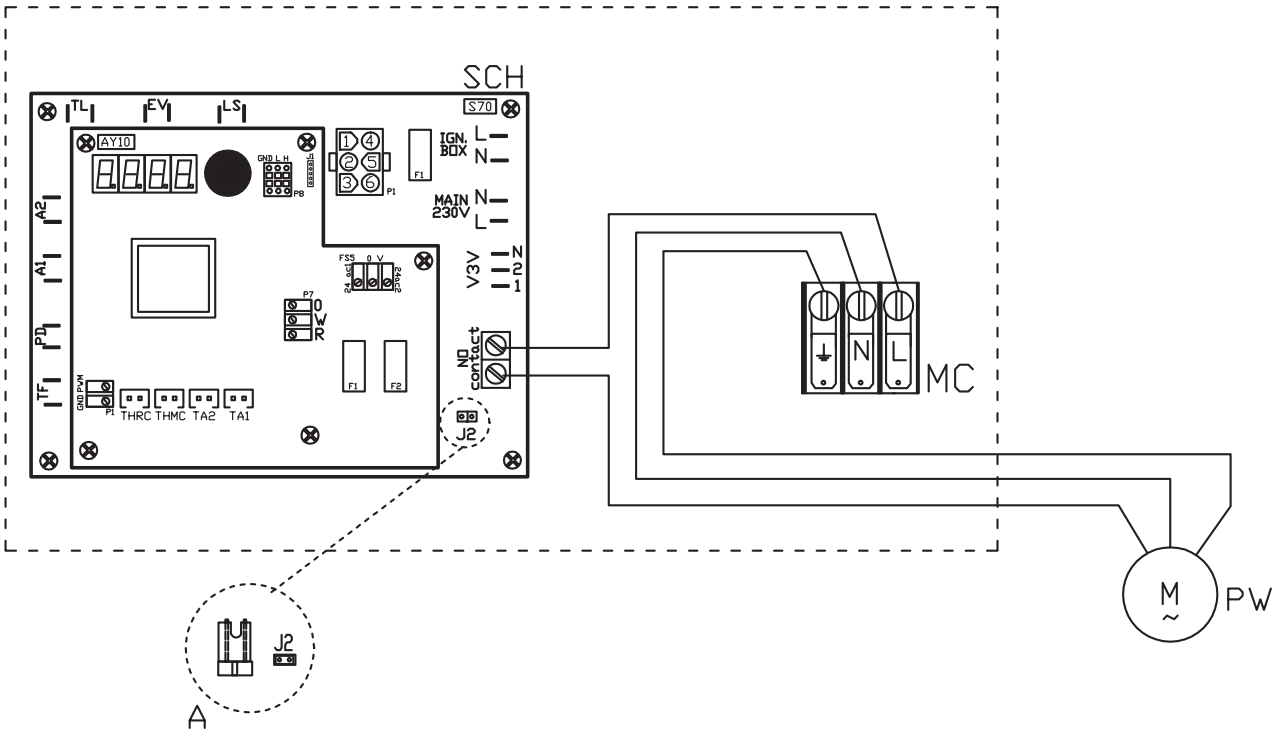
SCH Electronic board
R Common
W Terminal consensus warming

Components NOT SUPPLIED
CS external request

3.5.5 Water circulation pump

It must be mandatorily controlled from the S70 electronic board. The diagram in Picture 3.7 *p. 9* is for pumps < 700 W. For pumps > 700 W it is required to add a control relay and set up Jumper J2 OPEN.

Figure 3.7 *Water circulation pump connection - Connection of plant water circulation pumps (power absorption less than 700W), controlled directly by the appliance.*



SCH electronic board
NO contact system water circulating pump control terminals (voltage-free normally open contact, maximum absorbed power 700 W)
J2 system water circulating pump control jumper
A "closed" jumper detail
MC 230 VAC power supply terminal block
Components NOT SUPPLIED
PW water pump < 700 W