
K18 - Design Manual v1

Modulating, condensing gas absorption heat pump, using aerothermal renewable energy and natural gas for delivery of hot water up to 65° (heating), 70°C (DHW).

Nominal thermal capacity 18,9 kW



FEATURES AND TECHNICAL DATA

FEATURES

Operation

Based on the thermodynamic water-ammonia absorption cycle ($\text{H}_2\text{O}-\text{NH}_3$), the appliance produces hot water using outdoor air as a renewable energy source (cold source) and natural gas as primary energy.

The thermodynamic cycle takes place within a hermetically sealed circuit, in welded construction, perfectly tightness, factory-tested, which does not require any maintenance or refrigerant top-ups.

Mechanical and thermo-hydraulic components

- ▶ steel sealed circuit, externally treated with epoxy paint;
- ▶ sealed combustion chamber suitable for outdoor installations;
- ▶ burner equipped with ignition and flame detection device, controlled by an electronic controller;
- ▶ titanium stainless steel shell-and-tube water exchanger;
- ▶ 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;
- ▶ standard supplied circulation pump in version C1.

Control and safety devices

- ▶ GHP10 electronic board with microprocessor, display and selection keys;
- ▶ installation water flowmeter;
- ▶ generator limit thermostat, with manual reset;
- ▶ flue gas temperature thermostat, with manual reset;
- ▶ sealed circuit safety relief valve;
- ▶ by-pass valve, between high and low pressure circuits;
- ▶ flame control board
- ▶ gas solenoid valve with double shutter;
- ▶ anti-icing function for water circuit;
- ▶ condensate discharge obstruction sensor.

APPLIANCE POSITIONING

Where to install the appliance

- ▶ The appliance may be installed outdoors, at ground level, on a terrace or on a roof, compatibly with its dimensions and weight.
- ▶ It must be installed outside buildings, in an area of natural air circulation. It does not require protection from weathering.
- ▶ Do not install near the exhaust of flues, chimneys or hot polluted air. In order to work correctly, the appliance needs clean air.
- ▶ No obstruction or structure must hinder the air flow from the fan, nor flue gas exhaust.
- ▶ The appliance's flue gas exhaust must not be immediately close to openings or air intakes of buildings, and must comply with safety and environmental regulations.

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Install the appliance so the external pipes are as short as possible, complying with minimum required distances (Paragraph 2.4 p. 16).

Defrosting water drainage

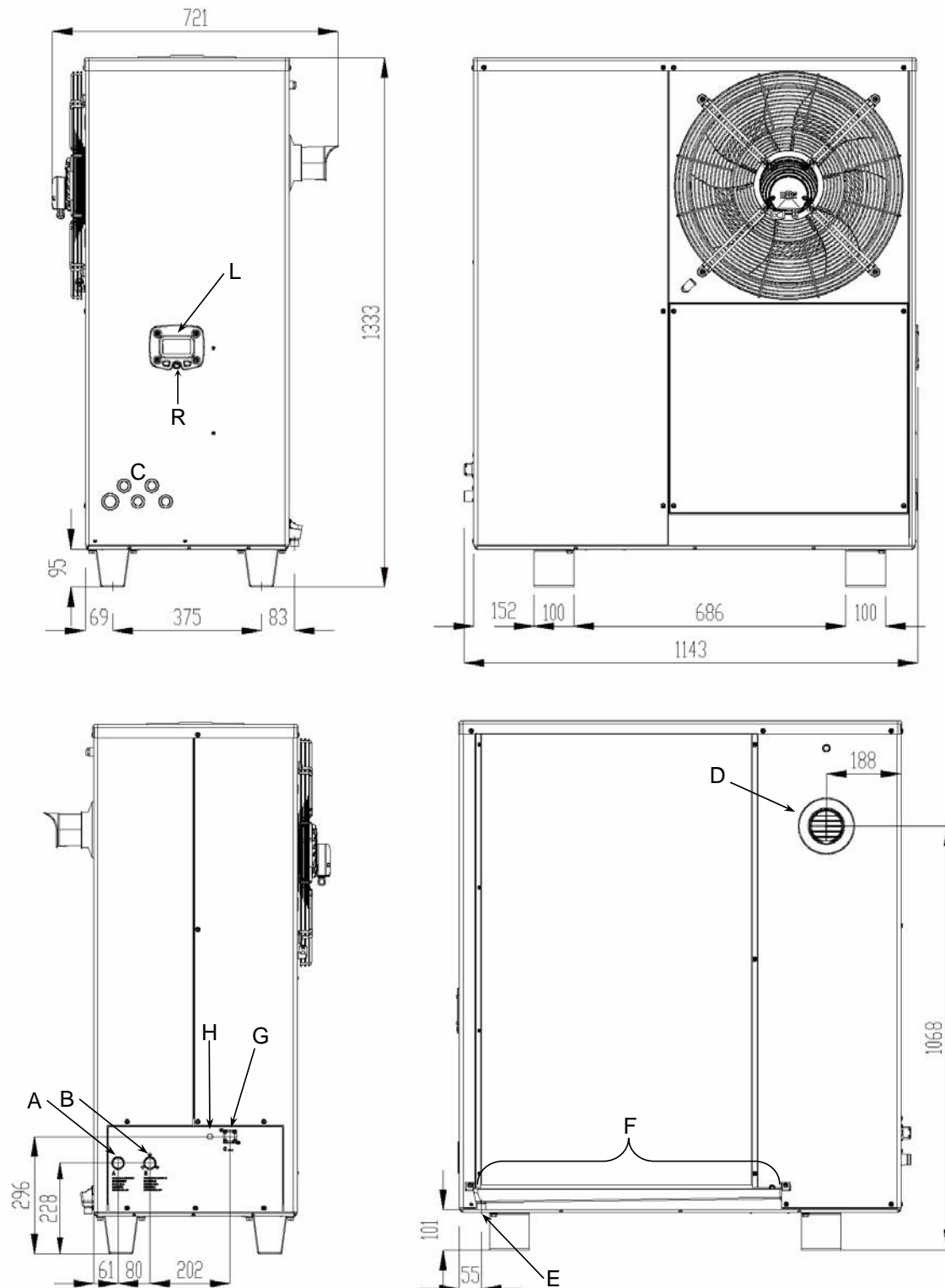
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In winter, it is normal for frost to form on the finned coil and for the appliance to perform defrosting cycles.

- ▶ To prevent overflowing and damages provide for a drainage system connected to water discharge (reference E Figure 1.1 p. 8).

1.2 DIMENSIONS

Figure 1.1 – Dimensions and service plate

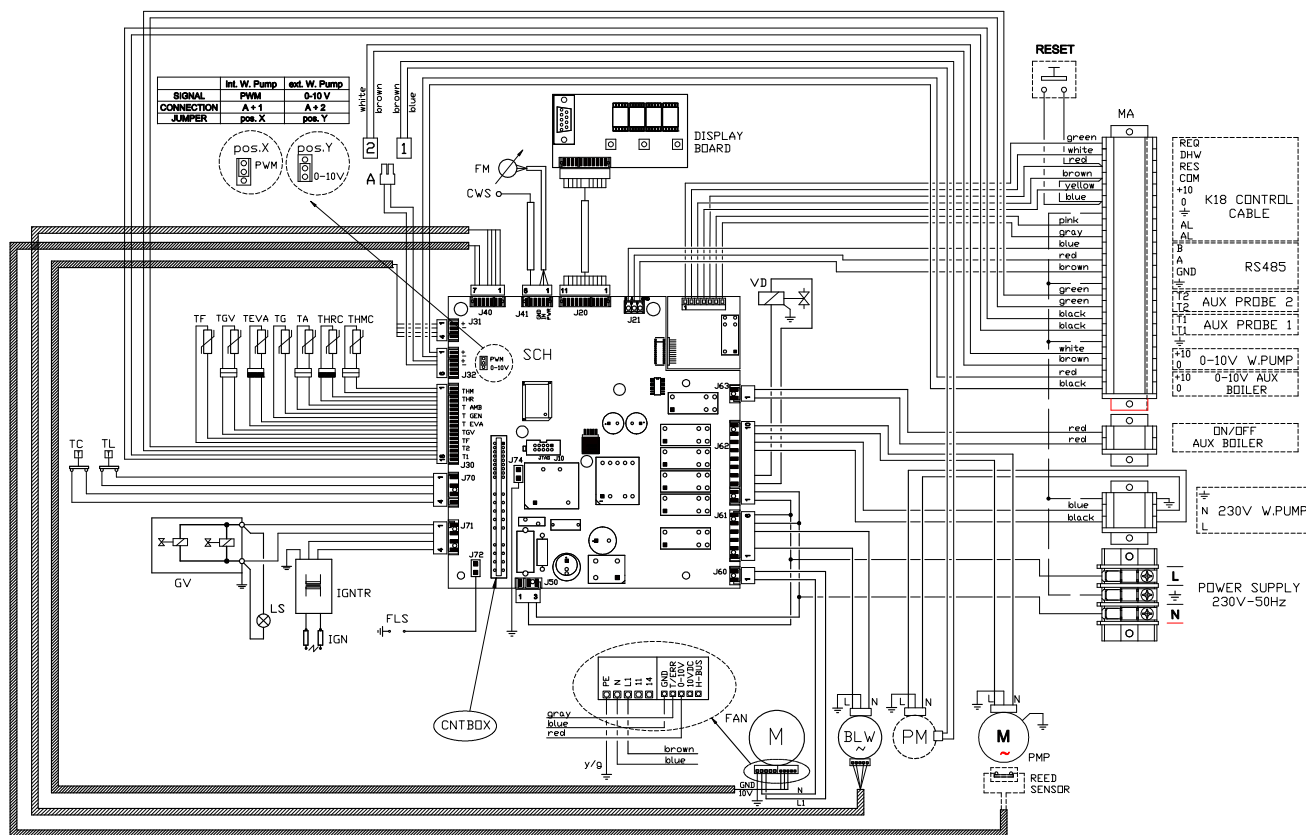


LEGEND

A	Water outlet connection Ø ¾" M	G	Gas connection Ø 1/2" F
B	Water inlet connection Ø ¾" M	H	Gas Valve On green indicator lamp
C	Electrical connection input	L	Transparent cover, which can be detached to access the User Interface keys
D	Flue gas outlet Ø 80	R	Reset/unlock button
E	Flue gas condensate and defrosting water drain		
F	Flue gas condensate and defrosting water discharge conveyor		

ELECTRICAL WIRING DIAGRAM

Figure 1.5 – Appliance wiring diagram



LEGEND

SCH	GHP10 electronic board	GV	Gas solenoid valve	TA	Ambient air temperature sensor
CNTBOX	Flame controller	TC	Manual flue gas thermostat	TG	Generator temperature sensor
BLW	Blower	TL	Generator limit thermostat	TEVA	Evaporator outlet temperature sensor
PM	Water pump	FM	Flowmeter	TGV	Gas valve probe
PMP	Oil pump	CWS	Condensate water sensor	TF	PT1000 flue gas temperature probe
IGNTR	Ignition transformer	VD	Defrosting valve	MA	Terminal block
IGN	Ignition electrodes	FAN	Fan	REED	Oil pump rotation sensor
FLS	Flame sensor	THMC	Hot water flow temperature probe		
LS	Gas valve ON indicator lamp	THRC	Hot water return temperature probe		

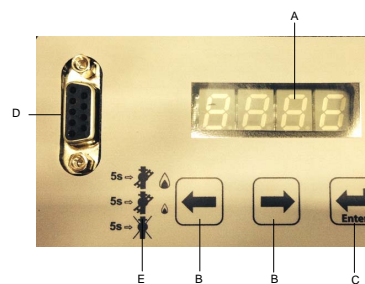
OPERATION MODE

The functioning mode of the appliance is set on MODULATING by default, that is the thermal power output is adapted to the thermal load.

ELECTRONIC BOARD

The appliance's electrical panel contains:

- **Electronic Board GHP10** with microprocessor, it controls the appliance and displays data, messages and operative codes. The appliance is monitored and programmed by interacting with the display and selection keys (Figure 1.6 p. 13).



LEGEND

A	Display
B	Selection keys
C	Enter / Access menu key
D	RS232 connector
E	"Chimney sweep" function (Currently not implemented)

CONTROLS

Control device

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

- ▶ (1) **OQLT017 System controller (optional)**
- ▶ (2) **OCDS007 Ambient chronothermostat (optional)**
- ▶ (3) **external request**

1.7.1 Control system (1) with OQLT017

The OQLT017 controller is able to control one unit K18 plus a possible additional boiler. It is also able to control room comfort and DHW production.

OQLT017 System controller

The main functions are:

- ▶ control of one unit K18 with variable water set point according to heating curves and type of DHW function;
- ▶ control of a possible additional boiler;
- ▶ room comfort control by controlling up to two heating circuits, of which one optionally of mixed type, or zone valves control; control based on weather compensation (one heating curve per heating circuit) and optionally influence by the room unit/s installed;
- ▶ buffer tank DHW production control (in dedicated preparation tank);
- ▶ parameter figures display and setting;
- ▶ hourly programming on a weekly basis on two temperature levels (comfort, reduced);
- ▶ Anti-icing protection function
- ▶ absence periods programming;
- ▶ diagnostics;
- ▶ reset errors.

For additional details and diagrams see Manual OQLT017

1.7.2 Control system (2) with OCDS007

The OCDS007 chronothermostat is able to control a single K18 unit. In this case the water setpoint is either fixed or based on weather compensation, with a single heating curve which is directly controlled by the K18 unit; as such, it can not be modified from the OCDS007 device.

OCDS007 Ambient chronothermostat

The main functions are:

- ▶ room timer thermostat for hourly programming on a weekly basis on various levels of room temperature;
- ▶ interfacing with the unit K18 through voltage-free request contact.

For further information refer to Manual OCDS007.

1.7.3 Control system (3) with external request

The appliance may also be controlled via generic enable devices (e.g. thermostats, timer, buttons, contactors...) fitted with voltage-free NO contact. This system only provides elementary control (on/off, with fixed set-point temperature). It is advisable to possibly limit its use to simple applications only.



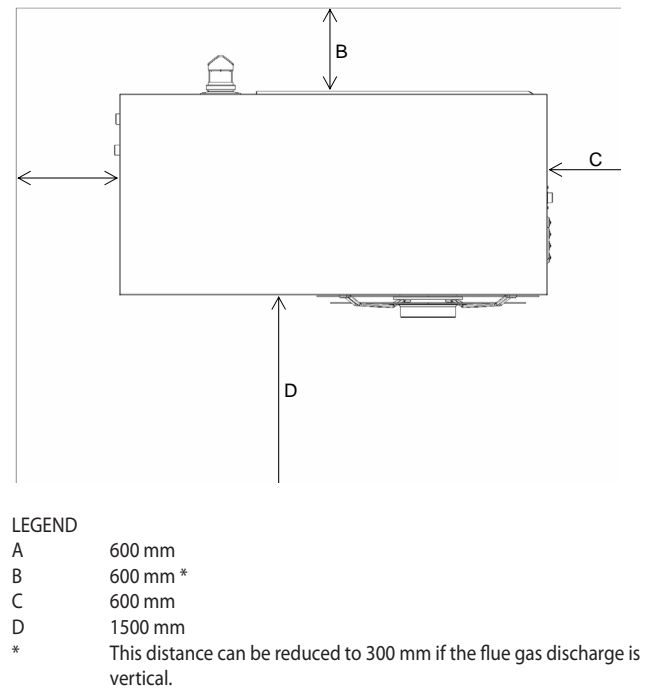
For connection of the selected device to the appliance please refer to Paragraph 4.4 p. 24.

MINIMUM CLEARANCE DISTANCES

Clearances around the appliance

The minimum clearance distances shown in Figure 2.3 p. 16 (barring any stricter regulations) are required for safety, operation and maintenance.

Figure 2.3 – Minimum clearance distances



MOUNTING BASE

Mounting base constructive features

- ▶ Place the appliance on a levelled flat surface made of fire-proof material and able to withstand its weight.

In case of adverse weather conditions (snow, heavy rain ...) it is suggested to install the unit at a height of about 300 mm from the ground.

(1) - installation at ground level

- ▶ Failing a horizontal supporting base, make a flat and levelled concrete base, at least 100-150 mm larger than the appliance dimensions per side.

(2) - installation on terrace or roof

- ▶ The structure of the building must support the total weight of the appliance and the supporting base.
- ▶ If necessary, provide a maintenance walkway around the appliance.

Anti vibration mountings

Although the appliance's vibrations are minimal, resonance phenomena might occur in roof or terrace installations.

- ▶ Use vibration damper supports (available as optional features).
- ▶ Also provide anti-vibration joints between the appliance and water and gas pipes.

TECHNICAL CHARACTERISTICS

Table 1.1 – K18 Technical data

			K18
HEATING MODE			
Seasonal space heating energy efficiency class (ErP)	medium-temperature application (55 °C)		A++
	low-temperature application (35 °C)		A+
OPERATING POINT A7W50	G.U.E. gas usage efficiency	%	157 (1)
	Thermal power	kW	17,6 (1)
OPERATING POINT A7W35	G.U.E. gas usage efficiency	%	169 (1)
	Thermal power	kW	18,9 (1)
Heating capacity	Nominal (1013 mbar - 15°C)	kW	11,4
	true peak	kW	11,2
Hot water delivery temperature	maximum for heating	°C	65
	maximum for DHW	°C	70
Hot water inlet temperature	maximum heating	°C	55
	maximum for DHW	°C	60
	minimum temperature in continuous operation	°C	20 (5)
Hot water flow rate	nominal	l/h	1000
	maximum	l/h	2000
	minimum	l/h	400
Hot water pressure loss	at nominal water flow (A7W35)	bar	0.20
ELECTRICAL SPECIFICATIONS			
Power supply	Voltage	V	230
	TYPE		SINGLE PHASE
	Frequency	50 Hz supply	50
Electrical power absorption	nominal	w	280 (4)
Degree of protection	IP		25
INSTALLATION DATA			
gas consumption	methane G20 (nominal)	m3/h	1,2 (2)
	GPL G30/G31 (nominal)	kg/h	0,87 (6)
NOx emission class			5
Sound pressure Lp at 5 metres (max)		dB(A)	43 (8) (9)
Sound pressure Lp at 5 metres (min)		dB(A)	40 (8) (9)
Maximum water pressure in operation		bar	4
Maximum flow flue condensate		l/h	1,5
Defrosting water flow	maximum	l/min	0,2
Water content inside the apparatus		l	1
Water fitting	TYPE		M
	thread	" G	3/4
Gas connection	TYPE		F
	thread	" G	1/2 (7)
Fume outlet	Dimensions	mm	80
	Residual head	Pa	70
Dimensions	width	mm	1143
	depth	mm	721 (3)
	height	mm	1333
Weight	In operation	kg	210
Water pump data (only for C1 version)	Maximum head	m a.c.	7,5
	Residual pressure head at nominal flow rate	m a.c.	4,0
	Nominal flow at the max.available head	l/h	1500
	Maximum electrical consumption	w	75
GENERAL INFORMATION			
INSTALLATION MODE			B23P - B53P
REFRIGERANT FLUID	AMMONIA R717	kg	4
	WATER H2O	kg	4
MAXIMUM PRESSURE OF THE REFRIGERANT CIRCUIT		bar	32

Notes:

- (1) Refer to norm EN12309
- (2) LHV (G20) 34,02 MJ/m³ (1013mbar 15 °C)
- (3) Dimensions including flue gas discharge
- (4) The data excluded electrical consumption of circulating pump installed on unit (75 W)
- (5) During transitory lower temperatures are allowed
- (6) LHV (G30/G31) 46,34 MJ/kg (1013mbar 15 °C)
- (7) It is possible to reduce gas pipe diameter to 3/8", ensuring enough gas pressure to the appliance, considering pressure losses of entire gas supply pipe.
- (8) Sound pressure values in free field, with directionality factor 2, obtained from the sound power value in compliance with standard EN ISO 9614.
- (9) Sound power Lw 65 dB(A) at maximum ventilation, 62 dB(A) at minimum ventilation; Sound power values detected in compliance with the intensity measurement methodology set forth by standard EN ISO 9614.

Table 1.2 – PED data

			K18
PED data			
COMPONENTS UNDER PRESSURE	Generator	l	14,5
	Cooling volume transformer	l	3,0
	Absorber/condenser	l	2,2
	Cooling absorber solution	l	4,2
	Solution pump	l	2,8
TEST PRESSURE (IN AIR)		bar g	55
MAXIMUM PRESSURE OF THE REFRIGERANT CIRCUIT		bar g	32
FILLING RATIO		kg of NH ₃ /l	0,15
FLUID GROUP			GROUP 1°

3 HEATING ENGINEER

Primary and secondary circuit

The K18 appliance can operate in plants with primary circuit only, or in plants with primary and secondary circuits with hydraulic separation: in the first case the water pump managed by the unit K18 ensures water circulation also for the users; in the second case water circulation in heating circuits is ensured by dedicated water pumps.

In the first case adopt hydraulic scheme as in Figure 3.1 p. 18, in which overpressure valve ensures water circulation even when users circuits are totally closed.

In the second case adopt hydraulic scheme as in Figure 3.2 p. 19, in which primary and secondary circuits are separated through high diameter by-pass, installed after the optional buffer tank.

Auxiliary boiler

It is possible to manage one auxiliary thermal source (typically a boiler) that can be controlled directly by the K18 appliance, with a choice of two different functions (see Figure 3.3 p. 20):

- ▶ **Emergency source:** it is activated, if necessary, only in case of a K18 appliance fault.
- ▶ **Integration source (peak):** it is activated to supplement the thermal power provided by the K18 appliance, typically during the limited time periods when outdoor temperature is particularly low and consequently the building thermal load is high ("bivalent" installation cases).

Constant or variable water flow

The unit K18 may operate with constant or variable water flow. System and components must be designed and installed consistently.

Minimum water content

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

A buffer tank is not strictly required, but suggested in plants with low water content in the primary circuit, in order to ensure a minimum K18 appliance running time at low thermal load. It is always recommended in plants with two way valves controlled zones. A capacity of 80/100 liters is usually adequate. Connect the tank feeding pipe in the upper part of it, and the tank discharge pipe in the lower part.

Plumbing fittings

On the left, at the bottom, connection plate.

- ▶ A (= out) 3/4" M - WATER OUTLET (m = outlet to the system).
- ▶ B (= in) 3/4" M - WATER INLET (r = return from the system) .

Hydraulic pipes, materials and features

- ▶ Use pipes for heating/cooling systems, protected from weathering, insulated for thermal dispersion.



Pipe cleaning

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

Minimum components of primary plumbing circuit

Always provide, near the appliance:

- on water piping, both output and input (m/r)
 - ▶ 2 ANTIVIBRATION JOINTS on water fittings;
 - ▶ 2 ISOLATION BALL VALVES;

on the input water piping (r)

- ▶ 1 SEPARATOR FILTER;
- ▶ 1 PRESSURE GAUGE;
- ▶ 1 FLOW REGULATION VALVE;
- ▶ 1 WATER CIRCULATION PUMP, with flow side towards the group (ONLY to be provided in versions without in-built pumps);

on the output water piping (m)

- ▶ 1 SAFETY VALVE (3 bar);
- ▶ 1 EXPANSION TANK of the individual unit

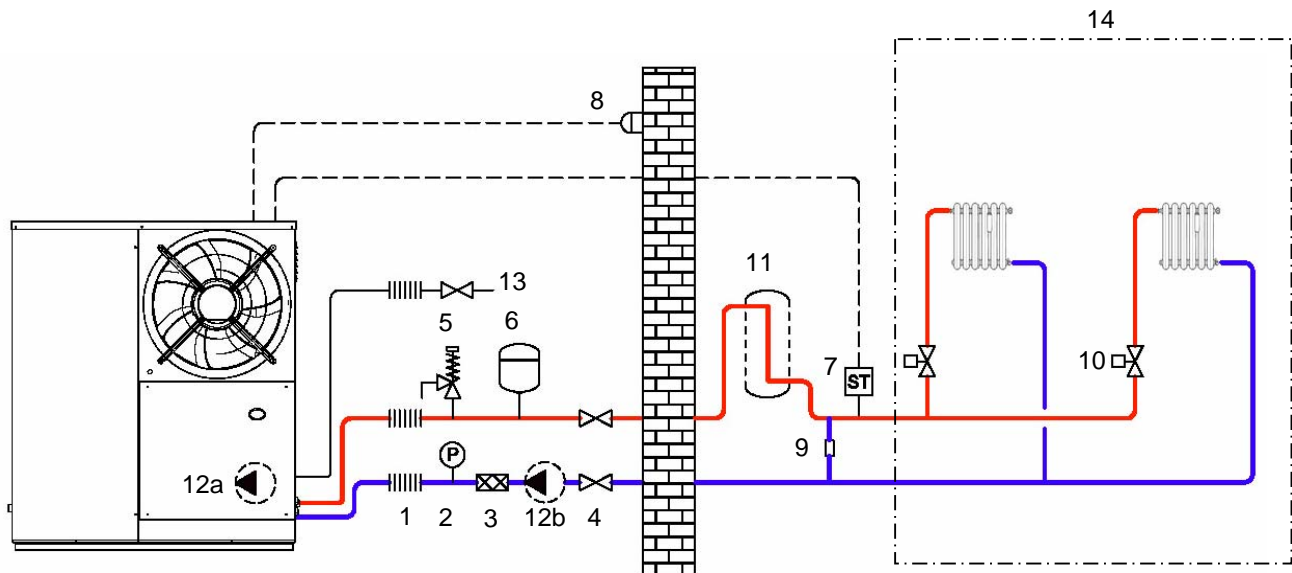


The appliance K18 is equipped with remote temperature probe (GHP), to be installed by the installer on the delivery pipe to the plant, after optional hydraulic separator or by-pass pipe (reference 8 Figure 3.1 p. 18 and 3.2 p. 19).



Insert remote water temperature probe (GHP) in a well in the water flow, using thermal paste to ensure proper heating transfer.

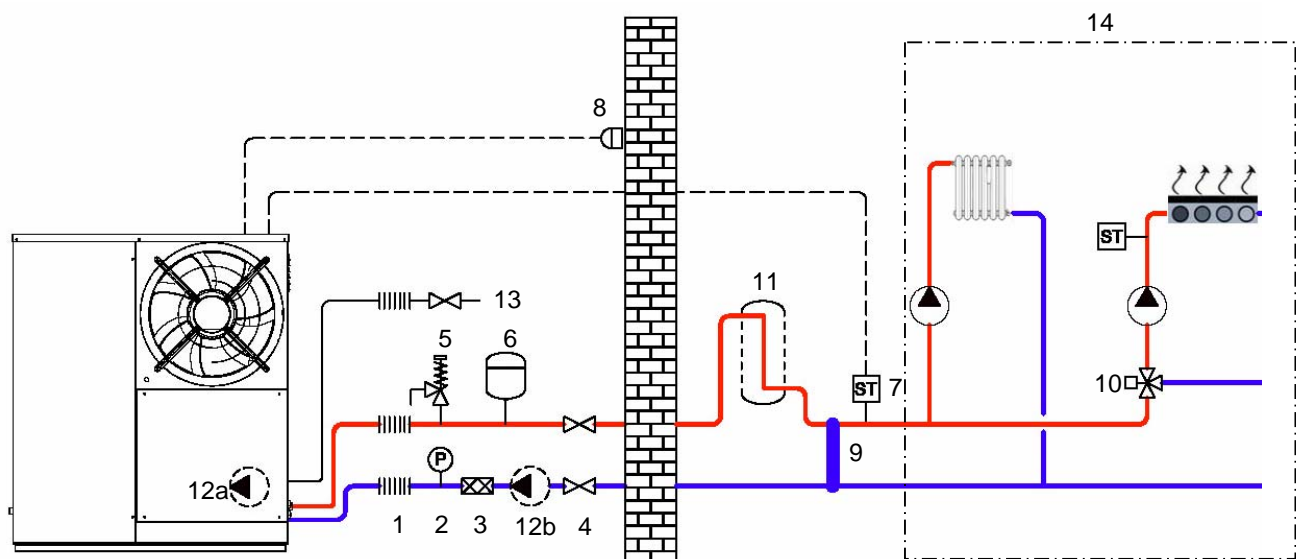
Figure 3.1 – Hydraulic scheme with primary circuit only (example of heating plant with two heating zones)



LEGEND

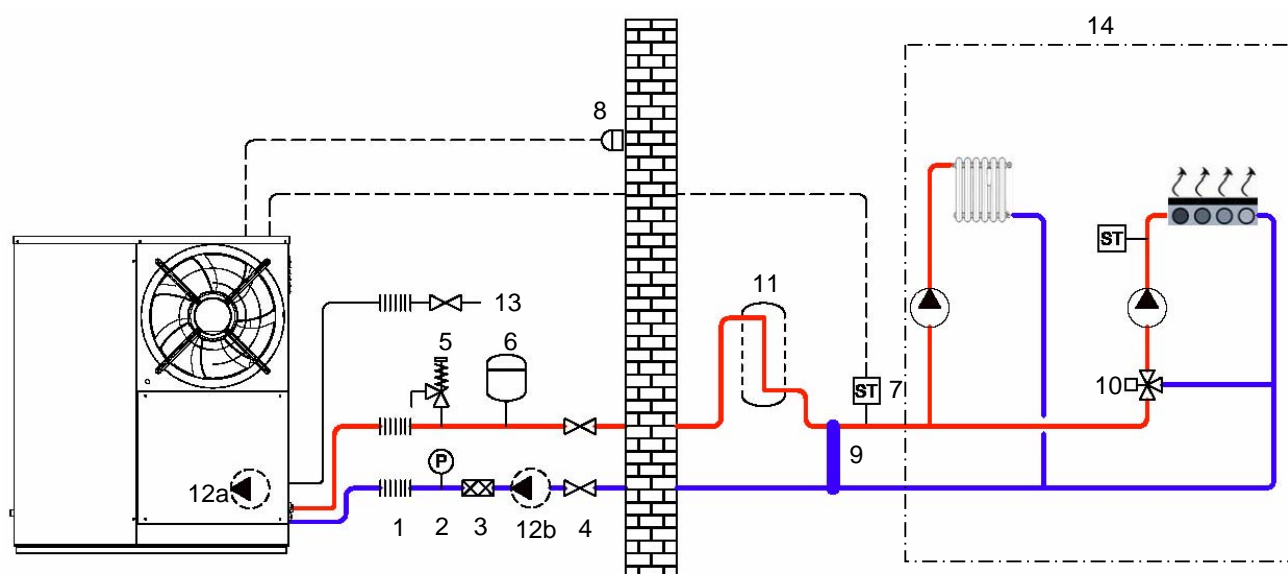
1	Anti-vibration connection	10	Two way valve
2	Pressure gauge	11	Buffer tank
3	Water filter	12	Alternative solutions
4	Valve	12a	C1 version: factory installed, enclosed water pump
5	Safety valve (3 bar)	12b	C0 version: water pump to be installed on the water return, as indicated in figure
6	Expansion tank	13	Gas supply
7	Temperature probe (GHP)	14	Detail of water distribution to users
8	Temperature probe (EXT.T)		
9	Overpressure valve (installed on the by-pass)		

Figure 3.2 – Hydraulic scheme with primary and secondary circuits (example of heating plant with two circuits, one direct and one mixed)



The external air temperature probe (EXT.T) (reference 9 Figure 3.1 p. 18 and 3.2 p. 19) manages weather compensation control when the System Control (OQLT017) is not employed. The probe is available as optional(OSND007).

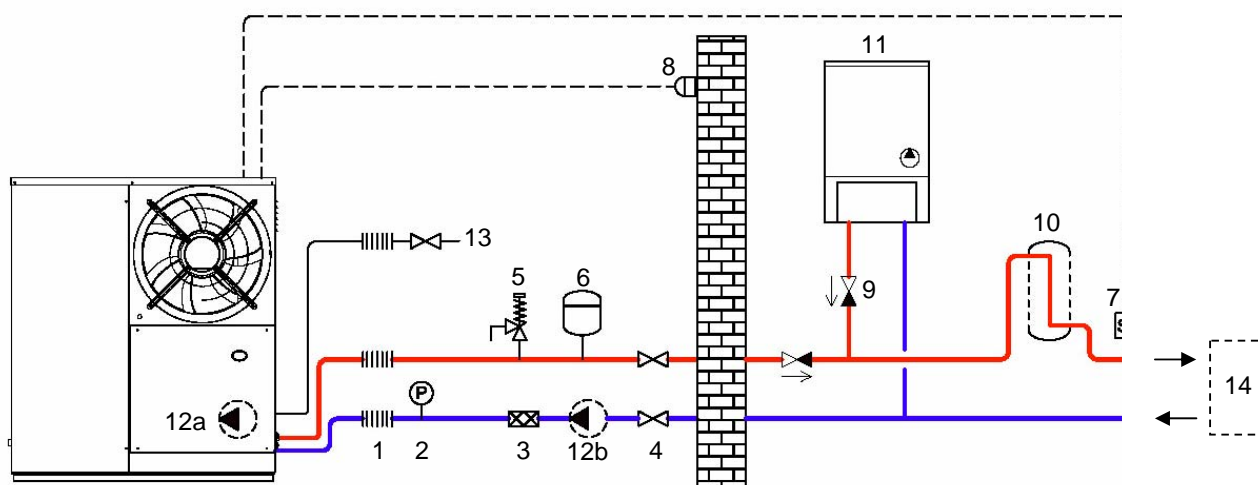
Figure 3.2 – Hydraulic scheme with primary and secondary circuits (example of heating plant with two circuits, one direct and one mixed)



LEGEND

1	Anti-vibration connection	10	Three way valve
2	Pressure gauge	11	Buffer tank
3	Water filter	12	Alternative solutions
4	Valve	12a	C1 version: factory installed, enclosed water pump
5	Safety valve (3 bar)	12b	C0 version: water pump to be installed on the water return, as indicated in figure
6	Expansion tank	13	Gas supply
7	Temperature probe (GHP)	14	Detail of water distribution to users
8	Temperature probe (EXT.T)		
9	Hydraulic decoupler (high diameter pipe, T connection) between		

Figure 3.3 – Hydraulic scheme with auxiliary boiler connected in parallel to K18 unit



WATER CIRCULATION PUMP

C1 appliance version is equipped with a variable flow circulation pump. For the data of the pump, refer to Table 1.1 p. 14.

For units without enclosed circulation pump, the pump (flow and head) must be selected and installed based on pressure losses of water/primary circuit (piping + components + exchange terminals + appliance).

For the appliance's pressure losses refer to Table 1.1 p. 14.

(1) CONSTANT FLOW circulating pump

Circulating pump must be managed by the unit; it must be connected to the unit electronic board K18 (see Paragraph 4.5.1 p. 25).

(2) VARIABLE FLOW circulating pump

For variable flow operation, use of a Wilo Stratos Para pump is obligatory, supplied as accessory on demand, to be connected to the unit electronic board (see Paragraph 4.5.2 p. 25).

ANTI-ICING FUNCTION

Active anti-icing self-protection

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



Electrical and gas continuity

Active antifreeze self-protection is ineffective if gas or power supply is off.

ANTI-ICING LIQUID



Precautions with glycol

The manufacturer disclaims any liability for any damage caused by improper glycol use.

- ▶ Always check product suitability and its expiry date with the glycol supplier. Periodically check the product's preservation state.
- ▶ Do not use car-grade anti-icing liquid (without inhibitors), nor zinc-coated piping and fittings (incompatible with glycol).
- ▶ Glycol modifies the physical properties of water (density, viscosity, specific heat...). Size the piping, circulation pump and thermal generators accordingly.
- ▶ With automatic system water filling, a periodic check of the glycol content is required.



With high glycol percentage (> 20...30%)

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

Type of anti-icing glycol

Inhibited type glycol is recommended to prevent oxidation phenomena.

Glycol effects

The Table 3.1 p. 21 shows, indicatively, the effects of using a glycol depending on its %.

Table 3.1 – Technical data for filling the hydraulic circuit

GLYCOL %	10	15	20	25	30	35	40
WATER-GLYCOL MIXTURE FREEZING 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%

3.9 FUEL GAS SUPPLY

Gas connection

- ▶ 1/2" F

on the left side, at the top, side panel (Detail G Figures 1.1).



It is possible to reduce gas pipe diameter to 3/8", ensuring enough gas pressure to the appliance, considering pressure losses of entire gas supply pipe.

- ▶ Install an anti-vibration connection between the appliance and the gas piping.

Mandatory shut-off valve

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

Gas pipes sizing

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

Supply gas pressure

The appliance's gas supply pressure, both static and dynamic, must comply with Table 3.3 p. 21, with tolerance $\pm 15\%$.

PRODUCT FICHE

Table 8
COMMISSION DELEGATED REGULATION (EU) No 811/2013

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

Model(s):				K18					
Air-to-water heat pump:				yes					
Water-to-water heat pump:				no					
Brine-to-water heat pump:				no					
Low-temperature heat pump:				no					
Equipped with a supplementary heater:				no					
Heat pump combination heater:				no					
Parameters shall be declared for medium-temperature application.									
Parameters shall be declared for average, colder and warmer climate conditions.									
Item	Symbol	Value	Unit	Item	Symbol	Value	Unit		
AVERAGE CLIMATE CONDITIONS									
Rated heat output (*)		Prated	14,3	kW	Seasonal space heating energy efficiency		ηs	126	%
Declared capacity for heating for part load at indoor temperature 20 °C and outdoor temperature Tj				Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20 °C and outdoor temperature Tj					
Tj = -7 °C		Pdh	12,6	kW	Tj = -7 °C		PERd	112	%
Tj = +2 °C		Pdh	7,7	kW	Tj = +2 °C		PERd	128	%
Tj = +7 °C		Pdh	5,0	kW	Tj = +7 °C		PERd	138	%
Tj = +12 °C		Pdh	2,2	kW	Tj = +12 °C		PERd	141	%
Tj = bivalent temperature		Pdh	-	kW	Tj = bivalent temperature		PERd	-	%
Annual energy consumption		QHE	84	GJ					
COLDER CLIMATE CONDITIONS									
Rated heat output (*)		Prated	13,7	kW	Seasonal space heating energy efficiency		ηs	119	%
Declared capacity for heating for part load at indoor temperature 20 °C and outdoor temperature Tj				Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20 °C and outdoor temperature Tj					
Tj = -7 °C		Pdh	8,4	kW	Tj = -7 °C		PERd	118	%
Tj = +2 °C		Pdh	5,1	kW	Tj = +2 °C		PERd	129	%
Tj = +7 °C		Pdh	3,3	kW	Tj = +7 °C		PERd	134	%
Tj = +12 °C		Pdh	1,5	kW	Tj = +12 °C		PERd	134	%
Tj = bivalent temperature		Pdh	-	kW	Tj = bivalent temperature		PERd	-	%
Tj = operation limit temperature		Pdh	13,7	kW	Tj = operation limit temperature		PERd	92	%
For air-to-water heat pumps: Tj = -15 °C (if TOL < -20 °C)		Pdh	11,2	kW	For air-to-water heat pumps: Tj = -15 °C (if TOL < -20 °C)		PERd	98	%
Annual energy consumption		QHE	102	GJ					
WARMER CLIMATE CONDITIONS									
Rated heat output (*)		Prated	17,4	kW	Seasonal space heating energy efficiency		ηs	131	%
Declared capacity for heating for part load at indoor temperature 20 °C and outdoor temperature Tj				Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20 °C and outdoor temperature Tj					
Tj = +2 °C		Pdh	17,4	kW	Tj = +2 °C		PERd	128	%
Tj = +7 °C		Pdh	11,1	kW	Tj = +7 °C		PERd	130	%
Tj = +12 °C		Pdh	5,1	kW	Tj = +12 °C		PERd	137	%
Tj = bivalent temperature		Pdh	-	kW	Tj = bivalent temperature		PERd	-	%
Annual energy consumption		QHE	64	GJ					
Bivalent temperature		Tbiv	TOL < Tdesignh	°C	For air-to-water heat pumps: Operation limit temperature		TOL	-22	°C
				Heating water operating limit		WTOL	65	°C	
Power consumption in modes other than active mode				Supplementary heater					
Off mode		POFF	0,000	kW	Rated heat output		Psup	-	kW
Thermostat-off mode		PTO	0,015	kW	Type of energy input		monovalent		
Standby mode		PSB	0,005	kW					
Crankcase heater mode		PCCK	-	kW					
Other items									
Capacity control		variable		For air-to-water heat pumps: Rated air flow rate, outdoors		—	3900	m³/h	
Sound power level, indoors/ outdoors		LWA	- / 65	dB	For water- or brine-to-water heat pumps: Rated brine or water flow rate, outdoor heat exchanger		—	-	m³/h

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

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

Emissions of nitrogen oxides: NO_x 38 mg/kWh



caring for the environment

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