3. DESIGN CHARACTERISTICS

Pos.	
1	Heat pump.
2	Control panel.
3	External PVC jacket.
4	Enameled storage tank
5	Upper storage tank probe. **"T3"**
6	Lower storage tank probe. "**T2**"
7	Refrigerant recharge needles.
8	Ambient air recirculation fan.
9	Electronically regulated expansion valve.
10	High-efficiency finned evaporator.
11	Air inlet (∅ 160 mm).
12	Air outlet (∅ 160 mm).
13	Hermetically-sealed rotary compressor.
14	Compressor's accumulator
15	(1.5 kW – 230 W) El. heater
16	Condenser outlet line - liquid
17	Condenser inlet line – hot gas
18	Replaceable magnesium anode.
19	Hot water outlet connection (G 1").
20	Recirculation fitting (G ¾").
21	Evaporator's distributor
22	Condensates drain (G 3/4").
23	Solar coil (G 1")
24	Cold water inlet connection (G1").
25	50 mm polyurethane insulation.
26	High pressure switch – automatic reset.
27	Safety thermostat, manual reset.
28	Controller box.
29	Probe for solar coil thermosensor.
30	Low pressure switch – automatic reset.
31	4-way defrosting valve
32	Upper decorative panel
33	Back decorative panel
34	Front decorative panel
35	Lower decorative panel (condense trap)
36	Condenser.
37	Protective fan grid
38	Return gas temperature **"T5"**
39	Coil temperature **"T4"**
40	Bolts M6x60
41	Ambient temperature **"T1"**

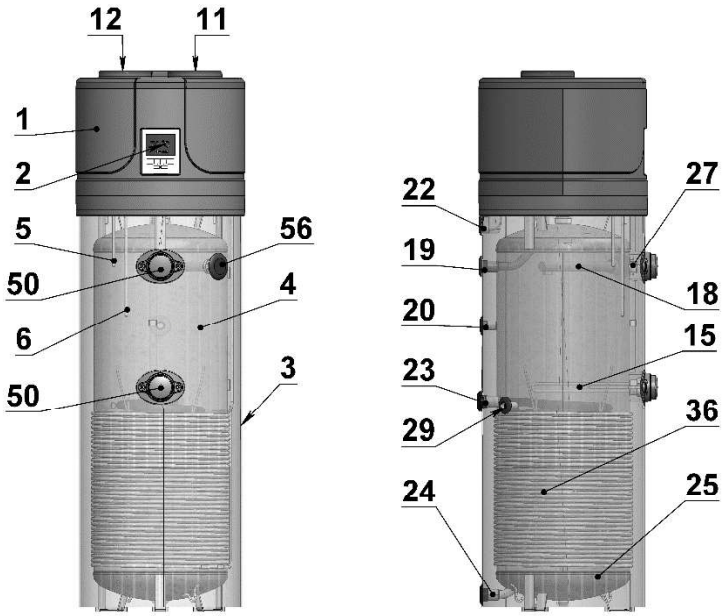


Fig. 3a

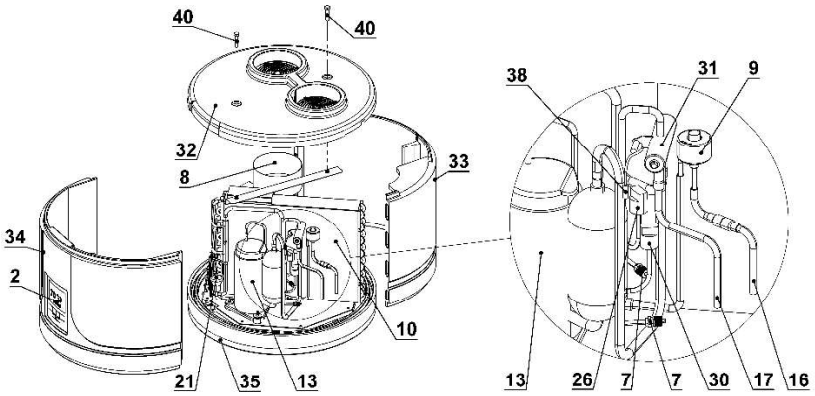


Fig. 3b

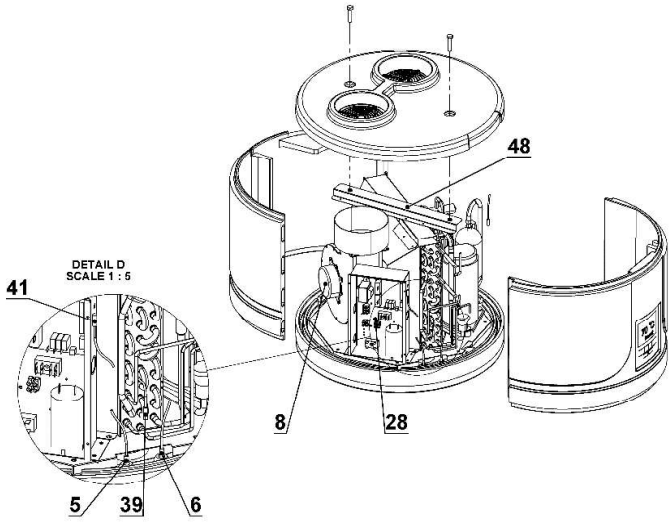


Fig. 3c

Descriptions		HP2.1 260S	HP2.1 260	HP 2.1 200S	HP2.1 200
Performance data acc. EN16147:2017					
Load profile		XL	XL	L	L
Hot water temperature set point	°C	55	55	55	55
Heating up time; t_h • (EN 16147:2017 – A20/W55) • (EN 16147:2017 - A14/W55) • (EN 16147:2017 - A7/W55) • (EN 16147:2017 – A2/W55)	**h:m**	 8:05 9:12 10:15 12:26	 8:05 9:12 10:15 12:26	 7:01 8:07 8:59 10:45	 7:01 8:07 8:59 10:45
Heating up time in BOOST mode (A7/W10-55)	**h:m**	4:21	4:21	3:47	3:47
Average heat pump power consumption at initial heat up $W_{eh\text{-}HP}$ / t_h • (EN 16147:2017 A40/W55) • (EN 16147:2017 – A20/W55) • (EN 16147:2017 - A14/W55) • (EN 16147:2017 - A7/W55) • (EN 16147:2017 – A2/W55)	kW	 0.462 0.452 0.440 0.420 0.428	 0.462 0.452 0.440 0.420 0.428	 0.474 0.463 0.451 0.428 0.436	 0.474 0.463 0.451 0.428 0.436
Power consumption, standby period; P_{es} • (EN 16147:2017 – A20) • (EN 16147:2017 - A14) • (EN 16147:2017 - A7) • (EN 16147:2017 – A2)	kW	 0.051 0.052 0.051 0.058	 0.051 0.052 0.051 0.058	 0.045 0.043 0.042 0.045	 0.045 0.043 0.042 0.045
Daily electrical energy consumption; Q_{elec} • EN 16147:2017 – A20) • (EN 16147:2017 - A14) • (EN 16147:2017 - A7) • (EN 16147:2017 – A2)	kWh	 5.138 5.599 6.449 7.847	 5.138 5.599 6.449 7.847	 3.381 3.765 4.184 5.030	 3.381 3.765 4.184 5.030
COP_{DHW}; • (EN 16147:2017– A20/W55) • (EN 16147:2017 - A14/W55) • (EN 16147:2017 - A7/W55) • (EN 16147:2017 – A2/W55)	-	 3.7 3.4 3.0 2.4	 3.7 3.4 3.0 2.4	 3.4 3.1 2.8 2.3	 3.4 3.1 2.8 2.3
Water heating energy efficiency; η_{WH} / **ErP** class • (EN 16147:2017– A20/W55) • (EN 16147:2017 - A14/W55) • (EN 16147:2017 - A7/W55) • (EN 16147:2017 – A2/W55)	%	 158 / A+ 145 / A+ 124 / A+ 103 / A	 158 / A+ 145 / A+ 124 / A+ 103 / A	 146 / A+ 138 / A+ 118 / A+ 101 / A	 146 / A+ 138 / A+ 118 / A+ 101 / A
Annual electrical energy consumption; **AEC** • (EN 16147:2017– A20/W55) • (EN 16147:2017 - A14/W55) • (EN 16147:2017 - A7/W55) • (EN 16147:2017 – A2/W55)	kWh/a	 1059 1154 1354 1628	 1059 1154 1354 1628	 695 742 867 1012	 695 742 867 1012
Maximum volume of mixed water at 40°C • (EN 16147:2017– A20/W55) • (EN 16147:2017 - A14/W55) • (EN 16147:2017 - A7/W55) • (EN 16147:2017 – A2/W55)	l	 352.6 350.4 350.8 349.9	 340.3 338.2 338.1 337.8	 265 263 262 259	 275 273 272 269
Reference hot water temperature; θ'_{WH}	°C	53.7	53.7	53.6	53.6
Rated heat output; P_{rated} • (EN 16147:2017 – A40/W55) • (EN 16147:2017 – A20/W55)	kW	 2.01 1.59	 2.01 1.59	 1.76 1.39	 1.76 1.39

• (EN 16147:2017 - A14/W55) • (EN 16147:2017 - A7/W55) • (EN 16147:2017 – A2/W55)		1.33 1.20 0.98	1.33 1.20 0.98	1.16 1.05 0.88	1.16 1.05 0.88
Maximal heat output (Summer condition)	kW	2.305	2.305	2.305	2.305
Electrical data					
Power supply	V	1/N/220-240			
Frequency	Hz	50			
Degree of protection		IPX4			
HP maximum power consumption	kW	0.663+1,500 (e-heater) = 2,163			
Electric heating element power	kW	1.5			
Maximum current of appliance	A	3.1+6.5 (e-heater) = 9.6			
Max. starting current of heat pump	A	13.5			
Required overload protections	A	16A T fuse/ 16A automatic switch, characteristic C (to be expected during installation on power supply systems)			
Internal thermal protection		Safety thermostat with manual reset			
Operating conditions					
Min.÷ max temperature heat pump air intake (90% R.H.)	°C	-10 ÷ 43			
Min. ÷ max temperature installation site	°C	4 ÷ 40			
Working temperature					
Reference DHW temperature (EN 16147:2017)	°C	55			
Max. settable water temperature [with E-heater] (EN 16147:2017)	°C	65 [75]			
Compressor		Rotary			
Compressor protection		Thermal circuit breaker with automatic reset			
Automatic safety pressure switch (high)	MPa	2.5			
Automatic safety pressure switch (low)	MPa	0.1			
Fan		Centrifugal			
Available external pressure of heat pump	Pa	77			
Ejection outlet diameter	mm	160			
Nominal air capacity	m^3/h	315 (98 Pa)			
Motor protection		Internal thermal circuit breaker with automatic reset			
Condenser		Aluminium; wrapped externally, not in contact with water			
Refrigerant		R134a			
Refrigerant charge	g	880			
Global warming potential of the refrigerant		1430			
CO_2 equivalent (CO2e)	t	1287			
Defrosting		Active with "4-way valve"			
Sound emission data; EN12102:2013					
Sound power Lw(A) indoor	dB(A)	53			
Automatic anti-Legionella cycle		YES			
Water storage tank					
Descriptions		**HP2.1 260S**	**HP2.1 260**	**HP 2.1 200S**	**HP2.1 200**
Water storage capacity	l	251	260	194	202
Solar heat exchanger surface	m^2	1.2	n.a.	1.0	n.a.
Solar heat exchanger volume	l	7.5	n.a.	5.8	n.a.
Corrosion protection		Mg anode Ø33x400 mm			
Thermal insulation		50 mm rigid PU			
Maximum working pressure – storage tank	Bar	8			
Transport weight	Kg	128	110	121	105
***The output data refers to new appliances with clean heat exchangers!!!**					

4. IMPORTANT INFORMATION

4.1. Conformity with European regulations

The EVHP heat pump is a device intended for domestic use in conformity with the following European directives:

- 2012/19/EU Directive on waste electrical and electronic equipment (WEEE);

- 2011/65/EU Directive on the restrictions of use of certain hazardous substances in electric and electronic equipment (RoHS);
- Directive 2014/30/EU - Electromagnetic compatibility (EMC);
- Directive 2014/35/EU – Low Voltage Directive (LVD);
- Directive 2009/125/EC Eco design Requirements.

4.2. Degrees of protection provided by enclosures

The degree of protection of the equipment is equal to: IPX4.

4.3. Limitations of use.

WARNING!: This device has not been designed, nor is it intended for use within hazardous environments (due to the presence of potentially explosive atmospheres –according to ATEX standards or with a requested IP level exceeding that of the equipment) or in applications that require (fault-tolerant, fail-safe) safety characteristics such as in circuit-breaking systems and/or technologies or in any other context in which the malfunctioning of an application could cause death or injury to people or animals or serious damage could be caused to objects or the environment.

N.B.: In the event of a product breakdown or fault, this could cause damage (to people, animals and goods). It is necessary to arrange for a separate functional monitoring system with alarm functions in order to avoid such damage being caused. Moreover, it is necessary to arrange for a back-up service in case of failure!

4.4. Operating limits

The above-mentioned device is intended to be used exclusively for the heating of domestic hot water within the foreseen limitations of use.

The equipment can only be installed and started up for the intended use within closed heating systems in conformity with the EN 12828:2012 standard.

N.B.: The manufacturer shall not be held responsible under any circumstances in the event that the equipment is used for other purposes than for which it has been designed and as regards any installation errors or equipment misuse.

WARNING! It is forbidden to use the device for purposes other than those intended. Any other use is to be considered improper and therefore not allowed.

N.B.: During the design and construction stage of the systems, current local rules and provisions are complied with.

4.5. Fundamental safety rules

- The device must be used by adults;
- Do not open or disassemble the device when this is connected to the power supply;
- Do not touch the device with wet or humid body parts when barefoot;
- Do not pour or spray the device with water;
- Do not stand, sit and/or rest anything on the device.

4.6. Information on coolant used

This device contains fluorinated greenhouse gas included in the Kyoto protocol. Do not discard such gas into the environment.

Coolant type: HFC-R134a.

5. INSTALLATION AND CONNECTION

WARNING! Installation, commissioning and maintenance of the device must be performed by qualified and authorised personnel. Do not attempt to install the device yourself.

5.1. Preparation of the installation site

The installation of the device must be carried out in a suitable place in order to allow the normal use and adjustment operations, together with ordinary and extraordinary maintenance to be performed. Therefore, it is important to allow the necessary working space by referring to the dimensions, shown in **Fig. 4**.

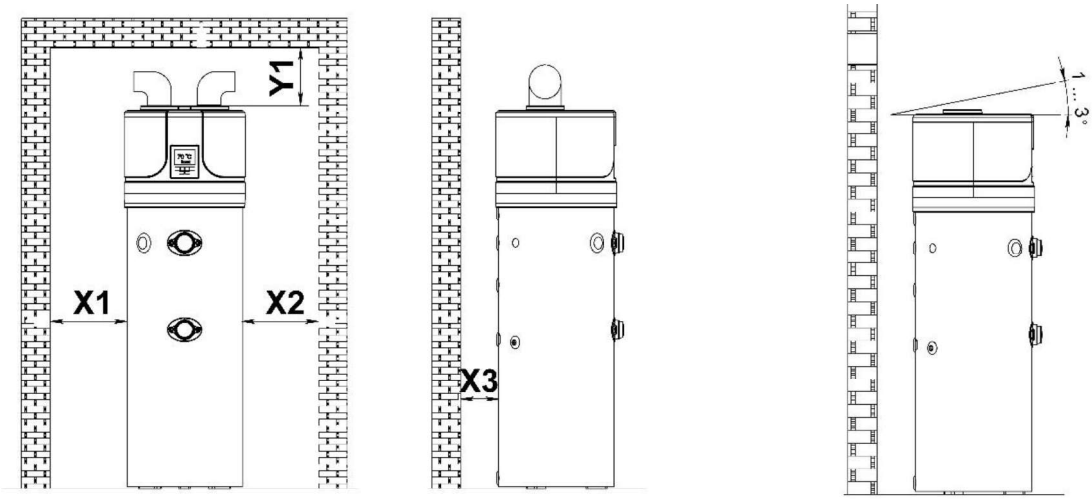


Fig. 4a - Minimum space and Non-ducted installation. **Fig. 4b**

X1	X2	X3	Y1
650 mm	650 mm	200 mm	300 mm

Moreover, the premises must:

- Have adequate water and power supply lines;
- Be available and ready for connection to the condense drain;
- Be available and ready with adequate discharge pipes in case of damage caused to the boiler or actuation of the safety valve or breakage of pipes/connections;
- Have containment systems in case of serious water leaks;
- Be sufficiently lit (where appropriate);
- Not measure less than 20 m^3;
- Be frost-proof and dry.
- Be horizontally installed or with small incline backwards: 1 … 3° see **Fig 4b**

WARNING! In order to avoid the propagation of mechanical vibrations, do not install the equipment on floor slabs with wooden beams (e.g. in lofts).

WARNING! In order to avoid short circulation of air between inlet / outlet, always use two elbows mounted in opposite direction when non-ducted installation is done! Fig.4

5.2. Ventilation connection

Apart from the space indicated in paragraph 5.1, the heat pump requires adequate ventilation.

It is necessary to create a dedicated air duct as indicated in the illustration (**Fig. 5**).

Moreover, it is important to ensure an adequate ventilation of the premises where the equipment is to be installed.

An alternative solution is indicated in the following illustration (**Fig. 5a**): this consists of a second duct that draws air in from outside instead of directly from inside the premises.

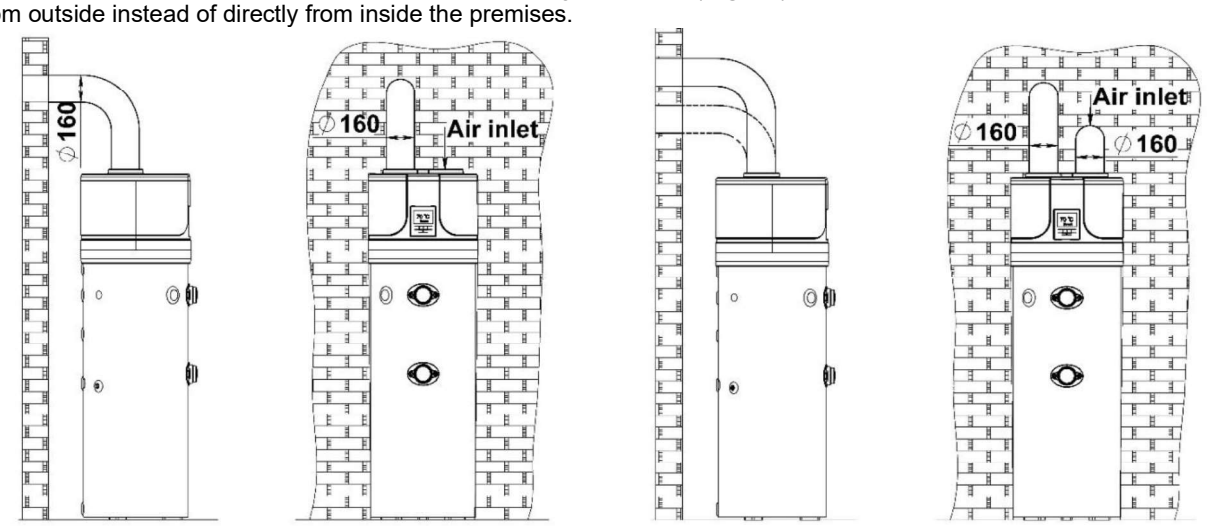


Fig. 5 – Example of an air outlet duct **Fig. 5a - Example of dual duct connection**

Carry out the installation of each air duct taking care that:

- The weight of such does not adversely affect the equipment itself;
- Maintenance operations can be carried out;
- This is adequately protected so as to avoid the accidental intrusion of material inside the equipment itself;
- The maximum total allowable pressure drops for all components, including through holes for mounting on external wall, within the pipe system must not exceed 77 Pa.

	All Technical parameters shown in the table above, are guaranteed at air flow rate 315 m³/h at pressure 98Pa. So Please keep the following rules: **1. Use airduct pipe system with diameter Ø160mm** **2. Maximum length of both inlet and outlet straight pipes must not exceed 12 meters!!!** **3. Each elbow 90º, is equal to 2 m straight pipe.** **4. Elbow 45º, is equal to 1.5 m straight pipe.** *Examples:* *four elbows 90º + 4m straight pipes, or two elbows 90º + 8m straight pipes, four elbows 45º + 6m straight pipes.*

During operation, the heat pump tends to lower the ambient temperature if the external air duct is not carried out.

An appropriate protection grid must be installed in line with the discharge pipe conveying air to the outside with the aim of avoiding foreign bodies from entering the equipment. In order to guarantee maximum device performance, the grid chosen must ensure low pressure loss.

In order to avoid the formation of condensate: insulate the air discharge pipes and the air duct cover connections with steam-tight thermal cladding of an adequate thickness.

If it is considered necessary in order to prevent flow noise, sound mufflers can be mounted.
Fit the pipes, the wall through holes and the connections to the heat pump with vibration damping systems.

WARNING! the simultaneous operation of an open-flue firebox (e.g. an open-flue fireplace) together with the heat pump causes a dangerous environmental pressure drop. This could cause the backflow of exhaust gas into the environment itself.
Do not operate the heat pump together with an open-flue firebox.
Use only sealed-chamber fireboxes (approved) with a separate duct for combustion air.
Keep the doors to the boiler room closed and hermetically sealed if they do not have a combustion air supply in common with inhabited areas.

5.3. Particular installation conditions

One of the peculiarities of the heat pump heating system is represented by the fact that these units cause a considerable reduction of the air temperature that is generally ejected from inside the home. Apart from being colder than the ambient air, the exhaust air is also completely dehumidified; for this reason, it is possible to allow the air to flow back into the home in order to cool specific environments or rooms during the summer.

Installation consists of the splitting of the discharge pipe to which two shutters are applied with the aim of directing the air flow either towards the outside or the inside of the home (**Fig. 6a, 6b**).

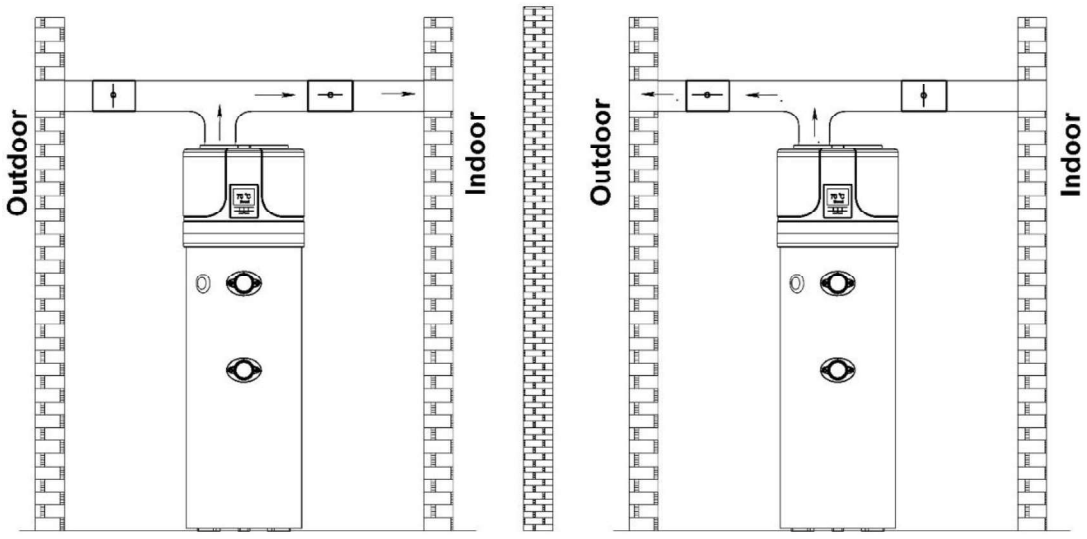


Fig. 6a - Example of installation in summer **Fig. 6b Example of installation in winter**

5.4. Device mounting and connection

The device must be installed on a stable, flat floor surface that is not subject to vibration.

Dimensions [±5mm]	260	200
h [mm]	2010	1720
a [mm]	1285	994
b [mm]	834	724
d [mm]	1285	995
f [mm]	1064	803
i [mm]	781*	681*
k [mm]	60	60
n [mm]	766*	681*
u [mm]	1440	1153
w [mm]	58	58
R [mm]	2055	1785
ØD [mm]	630	630
ØDF [mm]	160	160
M [mm]	260	260

* - for models with heat exchanger only!

The table below shows the characteristics of the connection points.

CW - cold water inlet - G1"
HW - hot water outlet - G1"
IS - solar flow - G1"
OS - solar return - G1"
TS - thermosensor - G 1/2"
R - recirculation - G 3/4"
EE - opening for electrical element - G 11/2
MA - Mg anodes - G11/4
CD – condense drainage – G3/4

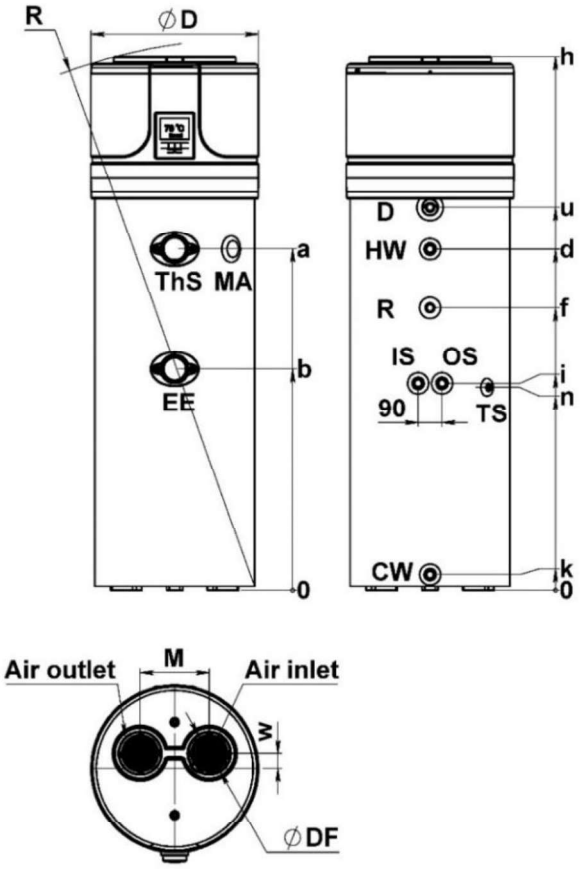


Fig. 7 – Overall dimensions

5.5. Water supply connections

The following illustration (**Fig. 8**) shows an example of a water supply connection.

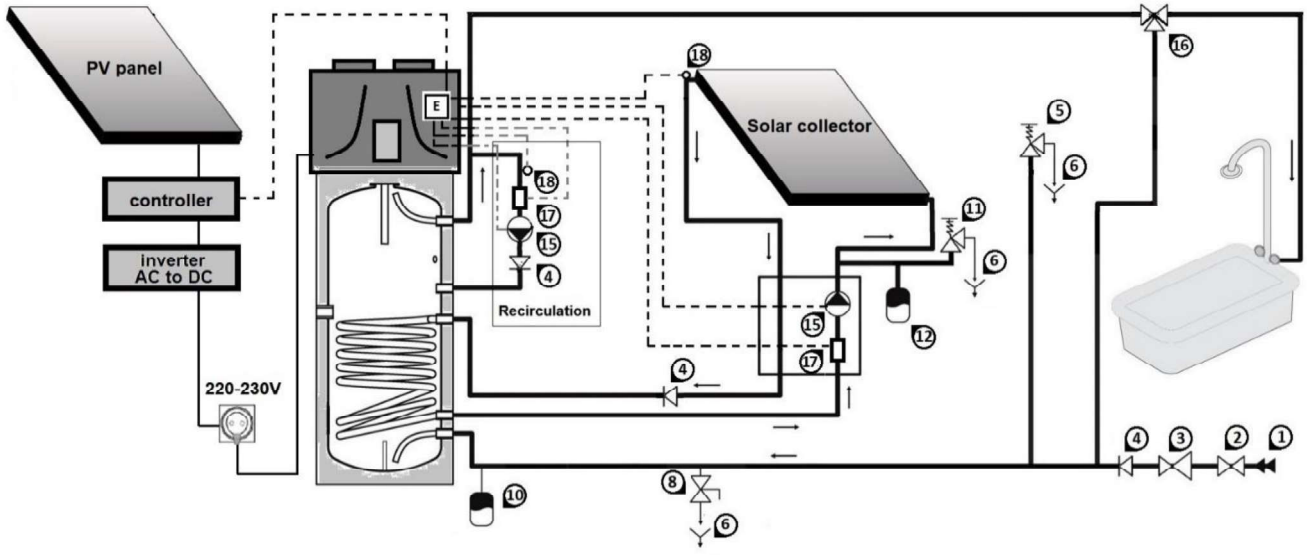


Fig. 8 Connections to the water supply net and solar collector

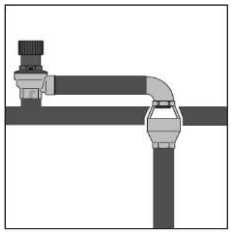


Fig 8a

Obligatory elements to be installed:

1. Water inlet pipe
2. Shut-off valve
3. Inlet water pressure regulator
4. Back flow preventing valve
5. Safety valve – 8 Bar
6. Safety valves drainage
7. Safety valves drainage
8. Tank drainage valve
10. Expansion vessel
11. Solar Safety valve – 6 Bar
12. Solar expansion vessel.
15. Recirculating pump; I max = 5A (solar or recirculation
16. Thermostatic mixing valve
17. Flow switch
18. External thermosensor (solar or recirculation)

E. Heat pump controller

When the water hardness is particularly high (higher than 25°F), it is recommended to use a water softener, properly calibrated and monitored; in this case the residual hardness should not fall below 15°F.

- ***Usage of this device at temperature and pressure level above prescribed leads to warranty violation!***
- ***This device is intended for heating of potable water in liquid state. Using different fluids in different states leads to warranty violation!***
- ***Device's heat exchangers are intended for use with circulating clean water and mixture of it plus Propylene GLYCOL at liquid state. The presence of anticorrosion additives is obligatory. Using different fluids in different states leads to warranty violation!***
- ***Dissimilar Metals cause galvanic corrosion. Therefore pipes, joints and fittings of dissimilar metals should be connected to the appliance by means of dielectric separators.***
- ***Plastic pipes (PP) are permeable to oxygen. It is forbidden to connect the heat exchanger to system made by PP pipes as well as to open circulation system! Abusing this rule will lead to corrosion inside tube.***

- ***It is obligatory for the system installer to fit an 8-bar safety valve No5 on the cold water intake pipe (Fig. 8).***
- ***It is forbidden a presence of any stop valves, taps between the safety valve and storage tank!***

The safety equipment for protection against over pressure must be operated regularly in order to remove limescale deposits and to check that it is not blocked (Fig. 8)

The drain pipe No6, connected to the safety valve must be installed sloping continuously downwards and, in a place, where it is protected against the formation of ice (Fig. 8). Using a tundish is obligatory (Fig.8a)

An expansion vessel No10 (Fig.8) should be installed in order to absorb water expansion due to temperature variation. Pressure regulator No3 and expansion vessel should be calculated together by qualified person.

WARNING! The heat pump for the production of domestic hot water is capable of heating water up to more than 65°C. For this reason, as a protection against burns, it is necessary to install an automatic thermostat mixing equipment No16 to the hot waterpipe (Fig. 8)

5.6. Condense drain connections

Condensate, that forms during the operation of the heat pump, flows through an appropriate discharge pipe (G 3/4") that passes inside cladding and it comes out on the side of the equipment. Use flexible hose Ø16 (**69, fig. 9**) to connect it to the plastic nipple **68**. This plastic part 68, should be handle with care in order to avoid damages. Connected the hose to a siphon so that the condensate can flow freely (**Fig. 9**).

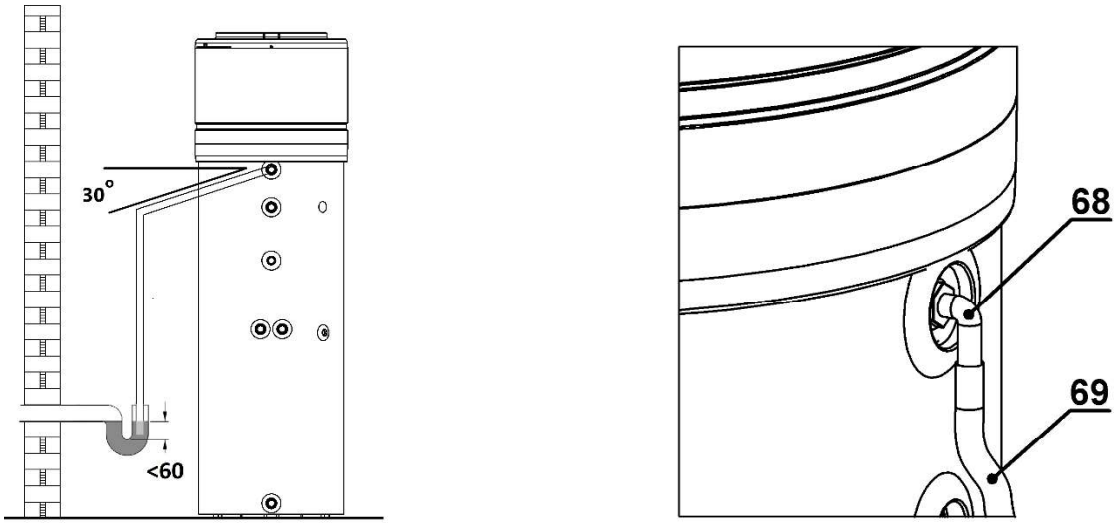


Fig. 9 - Example of condensate drain connection via siphon

The plastic nipple No68 (fig.9) should be manipulated gently, by hand, to avoid damages!

5.7. Electrical connections

The device is supplied already wired for the main power supply. It is powered through a flexible cable and a socket/plug combination (**Fig. 10 and Fig. 10a**). An earthed Schuko socket with separate protection is needed for the connection to the mains power supply.

Fig. 10 –A *Schuko* socket

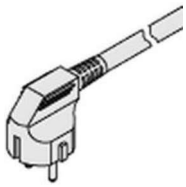


Fig. 10a –Equipment plug

WARNING! The power supply to which the equipment will be connected must be protected by an adequate residual current circuit breaker at least: 16A/230V

The type of residual current circuit breaker must be chosen by evaluating the type of electric equipment to be used on the entire system.

With reference to the connection to the main power supply and the safety equipment (e.g. residual current circuit breaker) comply with standard IEC 60364-4-41.

6. COMMISSIONING.

WARNING! Check that the equipment is connected to the earth cable.

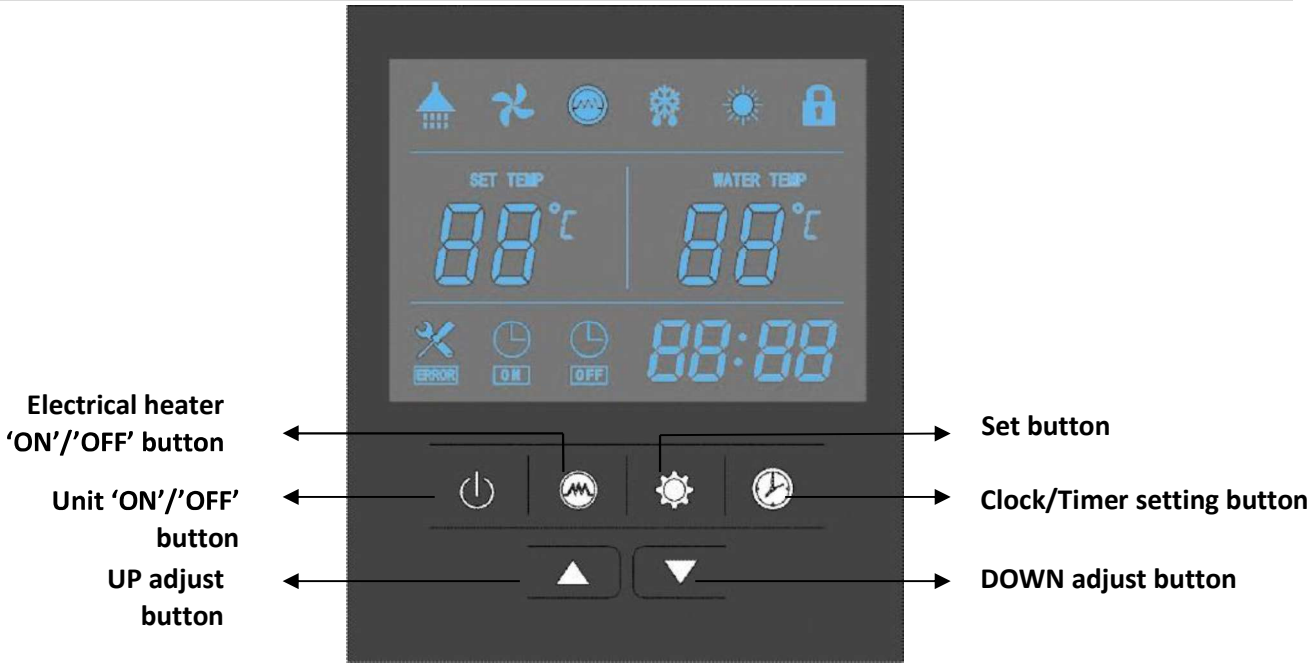
WARNING! Check that the line voltage corresponds to that indicated on the equipment identification plate.
WARNING! Do not exceed the maximum permitted pressure indicated in the "general technical data" section; 8 Bar
WARNING! Check that the water circuit safety valve is working;

The commissioning procedure must be carried out by performing the following procedures:

6.1. Filling the tank with water.

Fill the boiler by opening inlet tap No2 (**Fig. 8**) and the tap hot water of your bathroom. The tank is fully filled with water, when only water without air starts leaking trough the tap in the bathroom. Check that there are no leaks from gaskets and connections. Tighten the bolts or connections where necessary;

7. OPERATING MODES. USER INTERFACE. INITIAL CONTROLLER ADJUSTMENT.



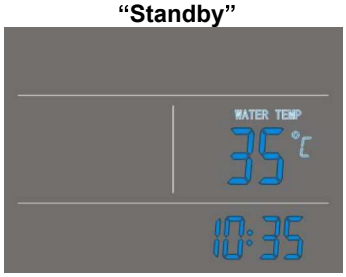
- Display Symbol; **- Button symbol**

7.1. User interface – Buttons and their function explanation.

7.1.1. Power 'ON'

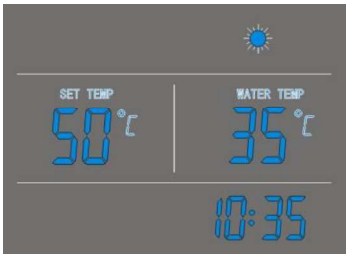
When the unit is connected to the main power supply, all icons are displayed on the controller screen for 3 seconds. After functionality check, the unit enters into the "standby" mode (OFF):

"Standby"



7.1.2. button

Press this button and hold it for 2 seconds when the unit is in standby, the unit will be turned 'ON'.
Press this button and hold it for 2 seconds when the unit is running, the unit will be turned standby.
Short press this button to enter or exit the parameter setting or checking.



7.1.3. buttons ▲ And ▼

- These are the multi-purpose buttons. They are used for the temp setting, parameter setting, parameter checking, clock adjustment and adjustment of the timer.
- During running status, press ▲ or ▼ button to adjust the setting temperature directly.
- Press these buttons when the unit is on clock setting status, the hour(s) and the minute(s) of the clock time can be adjusted.
- Press these buttons when the unit is on timer setting status, the hour(s) and the minute(s) of the timer 'ON'/'OFF' can be adjusted.
- Press ▲ and ▼ buttons at the same time and hold for 5 seconds, the buttons are locked.
- Press ▲ and ▼ buttons at the same time and hold for 5 seconds again, the buttons are unlocked.

7.1.4. button - TIMER AND CLOCK SETTING

Clock setting:

- After power on, short press button to enter the clock setting interface, hour and minute icons "88:88" flash simultaneously;
- Short press button to switch hour/minute setting, press the ▲ and ▼ buttons to set the exact hour(s) and minute(s);
- Press button again to confirm the settings/changes and exit.

Timer setting:

- After power on, long press button for 5 seconds to enter the timer setting interface, the timer on icon and hour icon "88:" flash simultaneously;
- Press the ▲ and ▼ buttons to set the exact hour(s).
- Press button to transfer to minute setting, minute icon ":88" flash, press the ▲ and ▼ buttons to set the exact minute(s).
- Press button again to transfer to timer off setting, the timer off icon and hour icon "88:" flash simultaneously.
- Press the ▲ and ▼ buttons to change the hour(s).
- Press button to transfer to minute setting, minute icon ":88" flash, press the ▲ and ▼ buttons to change the minute(s).
- Press button again to save and exit the timer setting interface.

Press button to cancel the timer, while the "timer setting" mode is active!!!

NOTE:

1) The timer 'ON' and timer 'OFF' functions can be set at the same time.
2) The timer settings are automatically repeating.
3) The timer settings are still valid after a sudden power cut.

7.1.5. button

1) When the heat pump is ON, press this button to turn 'ON' the electrical heater. The heater icon will be shown, and the electrical heater will start to work according to the control program after "delay" time elapsed (parameter 3 – default 30 min).
2) When the heat pump is ON, press this button and hold for 5 seconds to enable or disable the fan ventilation function.
3) When the heat pump is OFF, press this button to entry E-heater heating mode.

7.1.6. button

1) Check the temperatures and EXV open steps
   -Press this button to enter temp and EXV open step checking.

-Press the ▲ and ▼ buttons to check the temp sensor values and EXV open steps (parameters A-F).

2) Check the system parameters (from 1 to 35)
-In any status, press this button and hold for 5 seconds, entry the system parameter checking interface.
-Press the ▲ and ▼ buttons to check the system parameters.

3) Adjust the system parameters. See 8.2. “Parameter list”

If no action is performed using the buttons for 10 seconds, the controller will exit and save the setting automatically.

NOTE: The parameters have been set; the user cannot change the parameters optionally. Please ask a qualified service person to do this when required.

7.2. User interface - LED icons description

	**Hot water available**	The icon indicates that the domestic hot water temperature has reached the set point. The hot water is available for use. Heat pump is standby
	**Fan ventilation**	The icon indicates that the fan ventilation function is enabled.
	**Electrical heating**	The icon indicates that the electrical heating function is enabled. The electrical heater will work according to the control program.
	**Defrosting**	The icon indicates that the defrosting function is enabled. This is an automatic function; the system will enter or exit the defrosting according to the internal control program
	**Heating**	The icon indicates that the unit is operating in Heating mode.
	**Key lock**	The icon indicates the key lock function is enabled. The keys Will be deactivated until this function is disabled
	**Left temperature display**	The display shows the set water temperature. In case any malfunction occurs, this section will display the related error code.
	**Right temperature display**	When checking or adjusting the parameters, this section will display the related parameter value
	**Time display**	The display shows the clock time or timer time.
	**Timer ‘ON’**	The icon indicates that the timer ‘ON’ function is enabled.
	**Timer ‘OFF’**	The icon indicates that the timer ‘OFF’ function is enabled.
	**Error**	The icon indicates there is a malfunction.

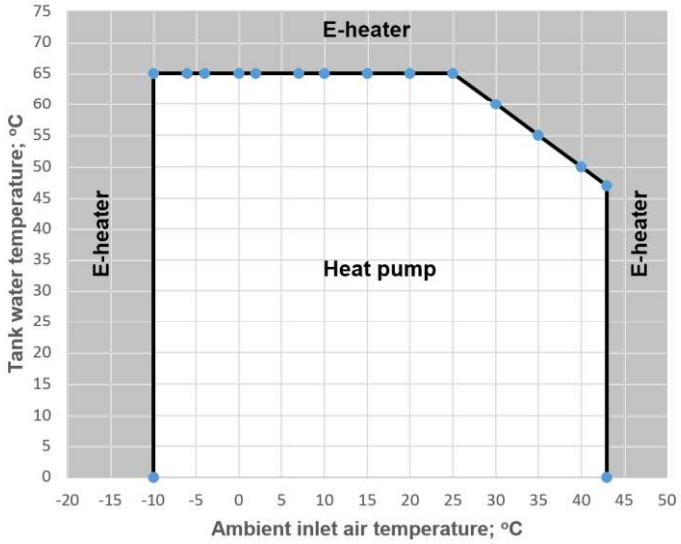
7.3. Operating modes - main function

7.3.1. Heating mode - 

After pressing button  , “Normal heating mode is activated.

Water temperature difference for compressor starting is used to control the compressor on or off. (Parameter 1 “water temp. difference TS6”)

When lower tank temperature T2 is less than set temperature TS1-TS6, the compressor will work to heat the water until reaching the set temperature “TS1 set”. “TS1 set” is an adjustable one by the user via main control display – Max value by default is 65ºC. In this mode if the ambient air temperature T1 ≤ -10°C or > 44°C the compressor will turn OFF and Electric heater will turn ON. If the ambient temperature T1 arises to ≥ -8°C or < 42°C, Electric heater will turn OFF and compressor will be turned ON.



When the ambient air temperature is within certain range (for example above 25°C), for preventing the appliance from malfunctioning, "TS1 calc" is constantly recalculated by the controller's logic. This occurs despite of what value "TS1 set" is adjusted by the user via control display. In this case:

- If the lower tank temperature T2 = "TS1 calc" < "TS1 set" compressor is OFF and E-heater is ON automatically to the moment when T2 reaches "TS1 set".
- If the "TS1 calc" > "TS1 set" = T2, compressor is OFF and E-heater is OFF.

For running the appliance bellow -10°C, see p.7.3.3. At these conditions, the unit can work with E-heater only!

7.3.2. "Boost mode"

When the heat pump is running, press this button to turn 'ON' "Boost mode". The heater icon will be shown, and the electrical heater will work according to the control program (parameter 3) together with the compressor until TS1 is reached.

7.3.3. "E heater only"

If the E-heater button on the control panel has been turned on manually <u>when the unit is at OFF status (standby)</u>, the E-heater will work only, until the upper tank temperature T3 (Fig. 3a) reaches the setting temperature TS2 adjusted by the customer via control display;

7.3.4. "Antifreeze mode".

When the unit is at OFF status and if lower tank water temperature T2 ≤ 5°C (tank water frozen protection) E-heater will works only, until lower tank temperature T2 (Fig. 3a) ≥ 10°C or the unit is turned on.

7.3.5. "Defrosting"

The icon indicates that the defrosting function is enabled. This is an automatic function, the system will entry or exit the defrosting according to the inner control program.

In "Defrosting regime", E-heater will work, only if the parameter 20 is set to 1=on.

7.3.6. Disinfection weekly cycle

The E-heater will start each week at the setting time (parameter 13) automatically, regardless if the machine is on or off (in standby).

When upper tank temperature T3 ≥ TS3 (parameter 4 = 70°C by default), the E-heater stops. When upper tank temperature T3 ≤ TS3-2°C, the E-heater starts. The upper tank temperature T3 is kept in range TS3-2°C to TS3 for the set disinfection time t2 (parameter 5 = 30min by default), then the unit quits the disinfection. It's possible to set the interval between the disinfection cycles (parameter 21 = 7days by default).

7.3.7. Pump anti-block function:

When the pump stops for 12 hours, it will be forced to run for 2 min.

7.3.8. Fan ventilation

The icon indicates that the fan ventilation function is enabled. When the heat pump is ON, press this button and hold it for 5 seconds to enable or disable the fan ventilation function. If this function is enabled the fan will continue working to ventilate the air, even when the water temperature reaches the set point and the unit enters standby mode. If this function is disabled the fan will stop, when the water temperature reaches the set point and the unit enters standby mode.

8. CONTROLLER ADJUSTMENT. PARAMETERS

8.1. Wiring diagram

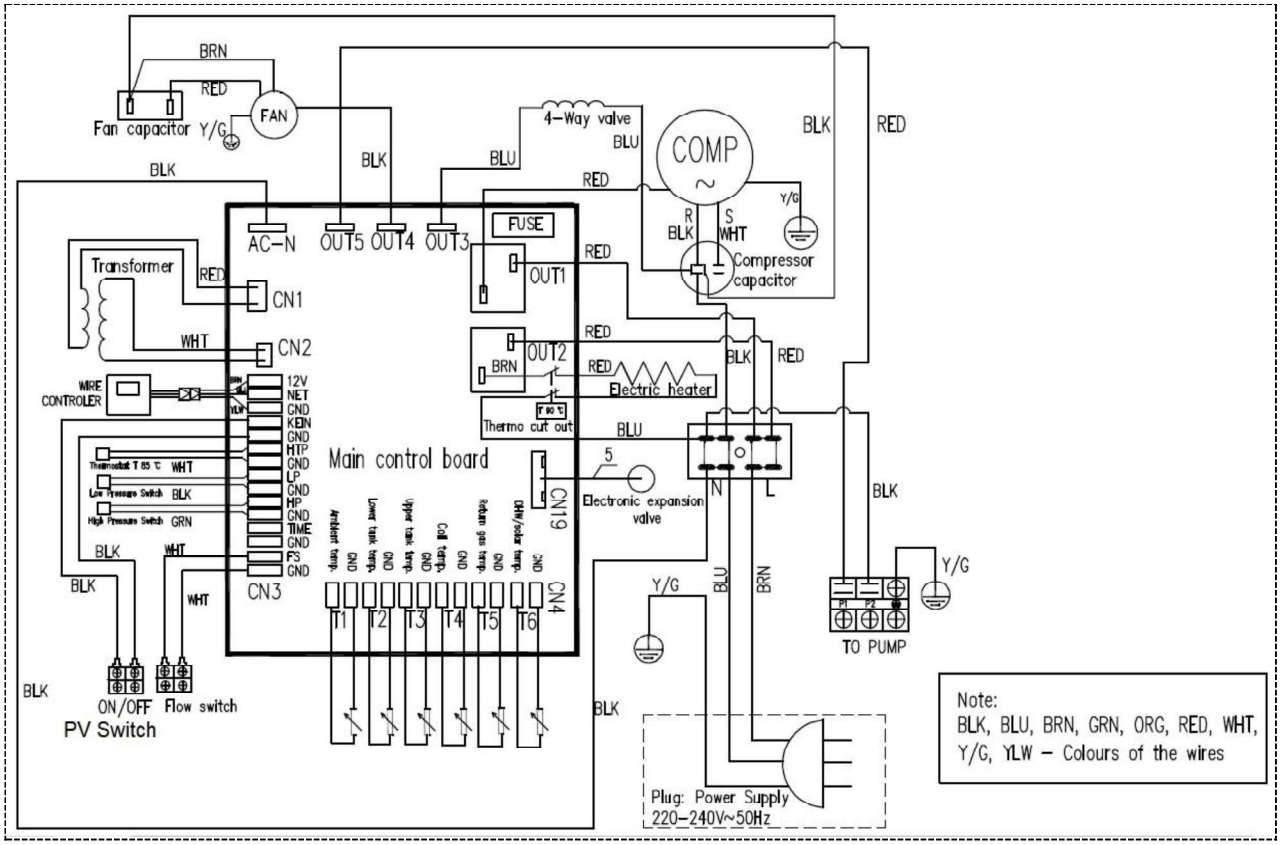


Fig. 11

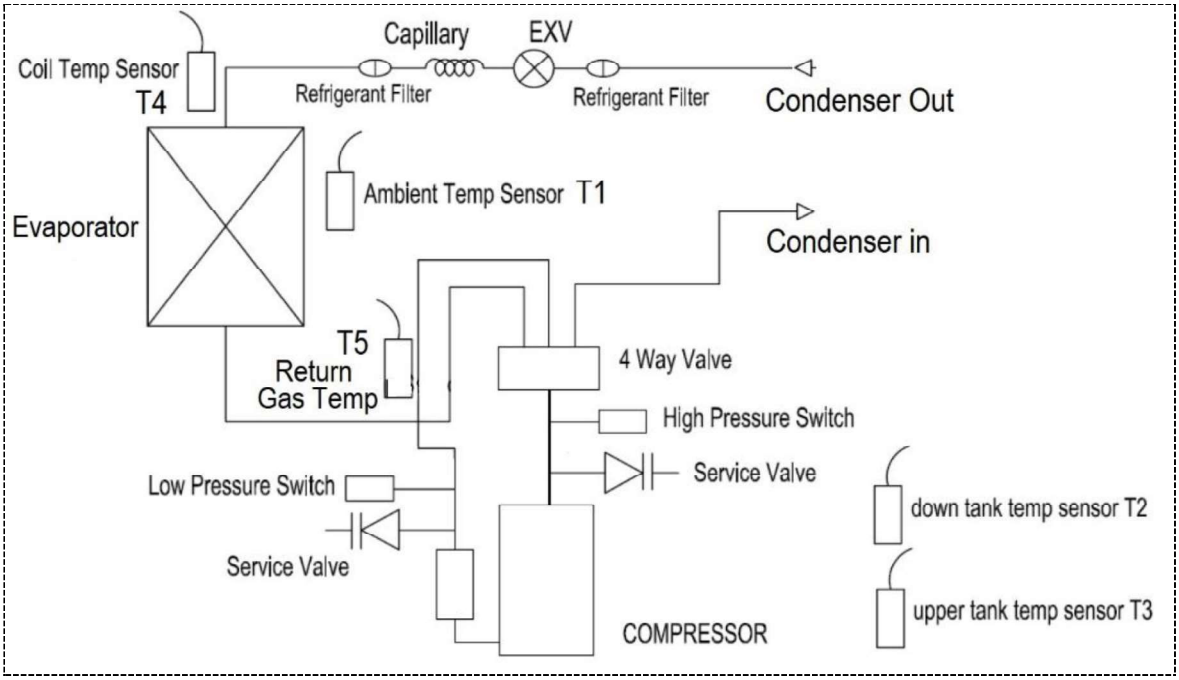


Fig. 12

8.2. Parameter list

Checking parameters: When the unit is on, press button and hold for 5 seconds to entry the system parameter view

Adjusting parameters: When the unit is off (standby), press simultaneously + for 5 seconds to entry the parameter adjusting interface. A password is necessary to change the parameters!

Parameter No.	Visibility: U=user I=installer	Description		Range	Default	Remarks
	Adjustable parameters:					
0	I/U	Tank water setting temp.	TS1	10 ~ 65°C	Adjust	Adjustable
1	I	Water temp difference	TS6	2 ~ 15°C	5°C	Adjustable
2	I	E-heater off tank water temp	TS2	10 ~ 90°C	65°C	Adjustable
3	I	E-heater delay time	t1	0 ~ 90min	6	t * 5 min
4	I	Week disinfection temperature.	TS3	50 ~ 70°C	70°C	Adjustable
5	I	High temp disinfection time	t2	0 ~ 90 min	30 min	Adjustable
13	I	Disinfection start up time adjusting		0 ~ 23	23:00 h	Adjustable(hour)
14	I	Type of water pump		0/1/2	0	0: no water pump 1: (circulation pump) 2: (solar water pump)
15	I	Setting circulation water temperature		15～50℃	35℃	Adjustable
16	I	The temperature difference to start the circulation water pump		1-15℃	2℃	Adjustable
17	I	The temperature difference to start the solar water pump		5-20℃	5℃	Adjustable
18	I	The temperature difference to stop the solar water pump		1-4℃	2℃	Adjustable
19	I	Low outside temp. electrical heater activation		0/1	1	Adjustable 0=off, 1=on
20	I	Electrical heater activation during defrosting		0/1	1	Adjustable 0=off, 1=on
21	I	Disinfection period		1~30 days	7 days	Adjustable
35	I	ON/OFF		0-1	0	0: (remote on/off signal) 1: (PV function)
	Checking parameters:					
	Check the real temperature and expansion valve working process.					
	Short press button to entry temp and EXV open step checking.					
A	U	Lower tank water temp.	T2	-9 ~ 99°C	Actual testing value. Error code P1 will be shown in case of a malfunction	
b	U	Upper tank water temp.	T3	-9 ~ 99°C	Actual testing value. Error code P2 will be shown in case of a malfunction	
C	U	Evaporator coil temp.	T4	-9 ~ 99°C	Actual testing value. Error code P3 will be shown in case of a malfunction	
d	U	Return gas temp.	T5	-9 ~ 99°C	Actual testing value. Error code P4 will be shown in case of a malfunction	
E	U	Ambient temp.	T1	-9 ~ 99°C	Actual testing value. Error code P5 will be shown in case of a malfunction	
F	U	Temp of solar thermal collector		~0 ~ 140℃	Measured value if failure show P6	
G	U	Electronic expansion valve step		10 ~ 47 step	N*10 step	
H	U	Tank water setting temp “T calc”. (real value)	TS1			

9. EXTERNAL CONNECTIVITY

9.1. Solar collector (thermal power) integration

The illustration (**Fig. 8**) shows an example of solar power system integration. It is obligatory to install all hydraulic elements shown on **Fig. 8**

Connection and adjustment of main controller should be done as follow: The Parameter no. 14 must be configured by the installer (2 = solar water circulation). External circulation pump 15, **Fig.8** (I max = 5A) must be connected, as well as the solar thermosensor 18 and flow switch 17 (optional). If the flow switch is not present, short connect contact FS 17 (**Fig. 13**).

The logic of solar thermal power function is as follow:

- The pump will start when the below conditions are satisfied at the same time:
  - The unit is on;
  - T6 (temperature of solar collector - thermosensor 18 **– Fig. 8**) ≥ T2 (lower tank water temperature) + parameter 17;
  - T2 (lower tank water temperature) ≤78°C ;
- The pump will stop when one of the below conditions is satisfied:
  - The unit is off;
  - T6 (temperature of solar collector - thermosensor 18 **– Fig. 8**) ≥ T2 (lower tank water temperature) + parameter 18
  - T2 (lower tank water temperature) ≥83°C ;

While solar thermal function is active, the compressor of heat pump is running too!

Parameters for solar thermal function:

Code		Description	Range	Default	Remark
14	I	Type of water pump	0/1/2	0	0: no water pump 1: (circulation pump) 2: (solar water pump)
17	I	The temperature difference to start the solar water pump	5-20℃	5℃	Adjustable
18	I	The temperature difference to stop the solar water pump	1-4℃	2℃	Adjustable

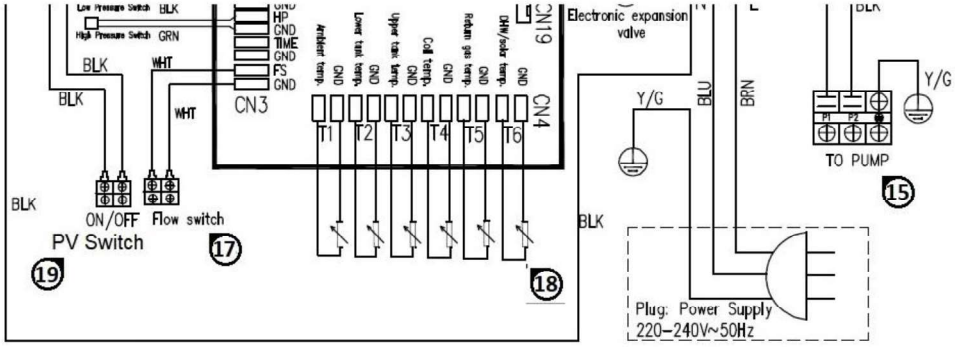


Fig. 13. Wiring external devices

15. Recirculating pump; I max = 5A (solar or recirculation
17. Flow switch
18. External thermosensor (solar or recirculation)
19. PV switch

Device's solar heat exchanger is intended for use with circulating clean water and mixture of it and Propylene Glycol at liquid state. The presence of anticorrosion additives is obligatory. Using different fluids in different states leads to warranty violation!

Only qualified persons should design and install solar loop with all elements according to the Fig. 8!

Flow switch: After the pump is running for 30 sec, if the water flow switch signal is checked to OFF for 5 sec, the pump stops. The pump will restart after 3 min. If this malfunction occurs 3 times in 30 min, the pump cannot start until the unit is re-powered. The relating error code will be shown on the controller. Only the pump will be stopped but not the unit itself.

9.2. Solar photovoltaic integration

One the heat pump detects the voltage of solar PV is higher enough to support heat pump running, the heat pump or e-heater will be driven by solar PV, and the heat pump will also make the water setting temperature higher to have more hot water. PV switch No19 (**Fig.13**) should be connected to the PV system. The logic of PV function is as follow:

- When parameter 35 = 1, PV function is available as follow:
  - If the terminal “PV switch” is closed and TS1 manually adjusted (by display button) < “TS1 calc”, the controller will automatically switch to “TS1 calc”.
  - If the terminal “PV switch” is closed and TS1 manually adjusted (by display button) > “TS1 calc”, the controller will automatically switch to TS1 manually adjusted
  - When the terminal “PV switch” is opened (there is no solar voltaic energy), the appliance will work in normal “heating mode” described in 7.3.1.

Parameters for PV function:

Parameter No.	Description	Range	Default	Remarks
35	ON/OFF	0: (remote on/off signal) 1: (PV function)	0	
0	Setting temp of water tank TS1	10～65℃	50℃	Adjustable
1	Temp difference to start heating TS6	2～15℃	5℃	Adjustable

Only qualified persons should design and install photovoltaic system!

9.3. Installation of an external re-circulation pump and flow switch

In case there is the possibility to re-circulate solar water or hot sanitary water, an external pump and flow switch must be connected and installed hydraulically and electrically according to **Fig. 8**. If the flow switch is not present, short connect contact FS 17 (**Fig. 13**). The max available output for the pump is 5 A resistive. Also, the optional thermosensor 18 must be connected to the controller and correctly positioned on the hydraulic plant (see the **Fig. 8**). The Parameter no. 14 must be configured by the installer (1= hot sanitary water circulation).

The circulation of hot sanitary water is useful to avoid water becomes cold in the sanitary circuit if not used for several time. In this way the hot water will be always ready when requested.

The logic of recirculation pump function is as follow:

- The pump will start when the below conditions are satisfied at the same time:
  - The unit is on;
  - T3 (upper tank water temperature) ≥ parameter 15 + parameter 16
  - T6 (temperature of circulation water - thermosensor 18 **– Fig. 8**) ≤ parameter 15-5℃;
- The pump will stop when one of the below conditions is satisfied:
  - The unit is on;
  - T3 (upper tank water temperature) ≤ parameter 15-2℃;
  - T6 (temperature of circulation water - thermosensor 18 **– Fig. 8**) ≥ parameter 15;

Parameters for recirculation pump function:

Code	Description	Range	Default	Remark
14	Type of water pump	0/1/2	0	0: no water pump 1: (circulation pump) 2: (solar water pump)
15	Setting circulation water temperature	15～50℃	35℃	Adjustable
16	The temperature difference to start the circulation water pump	1-15℃	2℃	Adjustable

9.4. ON/OFF contact.

Parameter 35, must be set to “0”

When ON/OFF contact is closed, and the controller is ON, the unit can work and the running mode is decided by the setting of the controller.

When ON/OFF contact is closed, but the controller is OFF, the unit can’t work.

When ON/OFF contact is opened, but the controller is ON, the unit can’t work (with the exception of external pump).

If the controller is ON, and the ON/OFF status is changed from opened to closed, the unit will work by the previous settings of the controller (auto-restart).

If the unit was previously in stand-by, in case the ON/OFF status is changed from opened to closed, the unit remains in stand-by.

A signal/warning in case of remote OFF signal (opened contact) is displayed. In such a way the customer can understand why the unit is not working.

Only qualified persons should design and install ON/OFF system!

9.5. Electrical heater

9.5.1. E-heater turned ON or OFF condition 1:

when the unit is turned on, and the E-heater button on the control panel hasn't been turned on manually

1) When lower tank temperatureT2 becomes equal to "TS1 calc", compressor is turned OFF and if "TS1 calc" < TS1 manual set value, e-heater will work according to the following logic:
   ON: when upper tank temperature T3 ≤ TS1 manual value -3°C (Parameter 33, default 3℃), e-heater is turned ON;
   OFF: when the upper tank water temperature T3 reaches the setting temperature TS1 manual value + 1°C.
2) ON：when the ambient temperature ≤ -10°C or > 44°C;
   OFF：when the ambient temperature ≥ -8°C or < 42°C.
3) ON：when there is high pressure or low-pressure protection for 3 times in 30 min;
   OFF: when the third time pressure protection occurs, the error code will be displayed, and this protection cannot be recovered unless powering off the supply. So, the E-heater keeps running to reach the setting temperature, then it is switched off.
4) ON: when in defrosting (only if the parameter 20 is set to 1=on) or disinfection;
   OFF: when exit defrosting or disinfection.

9.5.2. E-heater turned ON or OFF condition 2:

when the unit is turned on, and the E-heater button on the control panel has been turned on manually

1) ON: Compressor runtime exceeds the E-heater delay time (parameter 3), and the upper tank water temperature T3 ≤ TS1 manual - 3°C;
   OFF：upper tank water temperature T3 ≥ TS1 manual + 1°C.

9.5.3. E-heater turned ON or OFF condition 3:

when the unit is turned off

1) ON：if the E-heater button on the control panel has been turned on manually when the unit is at OFF status, the E-heater will work until the tank water T3 reaches the setting temperature TS2;
   OFF：The E-heater button on the control panel has been turned off manually or the tank water T3 reaches the setting temperature TS2.
2) ON：lower tank water temperature T2 ≤ 5°C (tank water frozen protection);
   OFF：lower tank water temperature T2 ≥ 10°C or the unit is turned on.

10. MAINTENANCE AND CLEANING.

WARNING! Any equipment repair must be performed by qualified personnel. Improper repairs can put the user in serious danger. If your equipment needs to be repaired, please contact the technical assistance service.

WARNING! Before attempting any maintenance operation, make sure that the equipment is not and cannot be accidentally connected to the power supply. Therefore, disconnect the equipment from the mains power supply before carrying out any maintenance or cleaning activities.

10.1. Resetting of safety thermostat 27 (Fig.14)

The device is equipped with a safety thermostat. When manually reset, the equipment is tripped in case of over-heating. In order to reset the protection, it is necessary to:

- Disconnect the device from the mains power supply;
- Remove the plastic cover 50 by undoing the appropriate locking screws 53 (**Fig. 14**);
- Manually reset the safety thermostat 27 (**Fig. 14**).
- Reassemble the upper cover that was previously removed

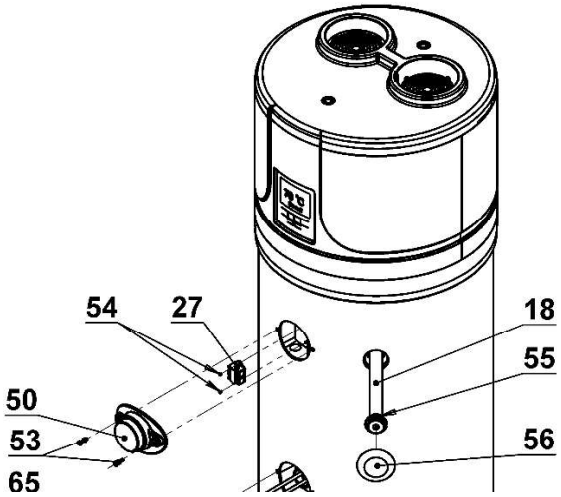


Fig. 14

WARNING! The tripping of the safety thermostat can be caused by a fault linked to the control board or by the absence of water inside the tank.

WARNING! Carrying out repair operations on parts that perform safety functions jeopardises the safe operation of the equipment. Substitute the faulty elements only with original spare parts.

N.B.: The intervention of the thermostat excludes the operation of the electric heating elements but not the heat pump system within the permitted operating limits.

Thermal protections
First step protection: when the tank water goes up to 85°C, the unit will stop and the relating error code will be shown on the controller. This is an auto-reset protection. When tank water temperature goes down, the unit can start again.
Second step protection: when the tank water keeps going up and reaches 90°C, the manual reset cut-off will be active, the electrical heater stops, unless you manual reset the protector.

10.2. Quarterly inspections

- Visual inspection of the general conditions of the equipment systems as well as the absence of leaks;
- Inspection of the ventilation filter, if present

10.3. Annual inspections

- Inspection of the tightness of bolts, nuts, flanges and water supply connections that may have been loosened by vibration;
- Check the state of integrity of the magnesium anodes (see paragraph 10.4).

10.4. Magnesium anodes 18. (Fig.14)

The magnesium anode (Mg), also called "sacrificial" anode, avoids any parasitic currents that are generated inside the boiler that can trigger corrosion processes on the device surface.

In fact, magnesium is a metal with a lower electrochemical potential when compared to the material that lines the inside of the boiler, therefore it first attracts the negative charges that form with the heating of the water and that cause it to corrode. Therefore, the anode “sacrifices” itself by corroding instead of the tank.

The integrity of the magnesium anodes must be checked at least **every two years** (even better if checked on an annual basis). The operation must be carried out by qualified personnel. Before performing the inspection, it is necessary to:

- Empty the water from the boiler (see paragraph 10.5);
- Unscrew the upper anode and check its state of corrosion, if more than 30% of the anode surface is corroded then it is necessary to replace it;

The anodes have appropriate sealing gaskets, in order to avoid causing water leaks, it is recommended to use anaerobic sealant for threads compatible for use on sanitary and heating systems. The gaskets must be substituted both in case of inspection as well as the replacement of anodes with new gaskets

The integrity of the magnesium anodes must be checked at least every two years (even better if checked on an annual basis). The manufacturer does not bear the responsibility for all consequences caused by not obeying the instructions, given hereby.

10.5. Emptying the boiler

It is advisable to drain the water from inside the boiler if the boiler is idle for a certain period of time, especially in low temperatures.

Close tap 2 (**Fig. 8**). Then open the tap hot water in the bathroom or kitchen which one is closer to the tank. Next step is to open draining tap 8(**Fig. 8**).

N.B.: It is important to empty the system in case of low temperatures in order to avoid the water freezing.

11. TROUBLESHOOTING

In case of problems of equipment performance, without the occurrence of any of the alarms or errors described in the relative paragraphs, it is advisable to check to see if the problem can be easily solved by checking the possible solutions specified in the table below prior to seeking technical assistance.

Problem	**Possible causes**
The heat pump does not work	There is no electricity; The plug is not correctly inserted in the socket.
The compressor and/or the fan do not work	The set safety period of time has not finished; The scheduled temperature has been reached.

11.1. Malfunctioning of the unit and error codes

When an error occurs or the protection mode is set automatically, the circuit board and the wired controller will both display the error message.

Protection/ Malfunction	**Error code**	**LED indicator**	**Possible reasons**	**Corrective actions**
Standby		Dark		
Normal running		Bright		
Lower tank water temp. sensor failure	P1	☆● (1flash 1 dark)	1) The sensor open circuit 2) The sensor short circuit 3)PCB board failure	1) Check the sensor connection 2) Replace the sensor 3)change the PCB board
Upper tank water temp. sensor failure	P2	☆☆● (2 flashes 1 dark)	1) The sensor open circuit 2) The sensor short circuit 3) PCB board failure	1) Check the sensor connection 2) Replace the sensor 3) change the PCB board
Evaporator coil temp. sensor failure	P3	☆☆☆● (3 flashes 1 dark)	1) The sensor open circuit 2) The sensor short circuit 3) PCB board failure	1) Check the sensor connection 2) Replace the sensor 3) change the PCB board

Return gas temp sensor failure	P4	☆☆☆☆● (4 flashes 1 dark)	1) The sensor open circuit 2) The sensor short circuit 3) PCB board failure	1) Check the sensor connection 2) Replace the sensor 3) change the PCB board
Ambient temp. sensor failure	P5	☆☆☆☆☆● (5 flashes 1 dark)	1) The sensor open circuit 2) The sensor short circuit 3) PCB board failure	1) Check the sensor connection 2) Replace the sensor 3) change the PCB board
Solar temp. sensor failure	P6	☆☆☆☆☆☆☆☆☆☆●(10 flash1dark)	1) The sensor open circuit 2) The sensor short circuit 3) PCB board failure	1) Check the sensor connection 2) Replace the sensor 3) change the PCB board
T6 too high temp.protection	P8	Dark	1) T6 too high temp. 2) T6 sensor has problem	1) P8 appears at 125°C and disappears at 120°C 2) Check and if it's necessary replace the sensor
Emergency switch off	EC	only show the protection code	1) Connecting wire off 2) PCB board failure	1) According to the physical truth judging whether is normal or not 2) change the PCB board
High pressure protection (HP Switch)	E1	☆☆☆☆☆☆● (6 flashes 1 dark)	1) Too high air inlet temp 2) Less water in the tank 3) The electronic expansion valve assembly blocked 4) Too much refrigerant 5) The switch damaged 6) The uncompressed gas is in refrigerant system 7) PCB board failure	1) Check if the air inlet temp is over the working limited 2) Check if the tank is full of water. If not, charge water 3) Replace the electronic expansion valve assembly 4) Discharge some refrigerant 5) Replace a new switch 6) Discharge and then recharge the refrigerant 7) change the PCB board
Low pressure protection (LP Switch)	E2	☆☆☆☆☆☆☆● (7 flashes 1 dark)	1) Too low air inlet temp 2) The electronic expansion valve assembly blocked 3) Too less refrigerant 4) The switch damaged 5) The fan assembly cannot work 6 PCB board failure	1) Check if the air inlet temp is over the working limited 2) Replace the electronic expansion valve assembly 3) Charge some refrigerant 4) Replace a new switch 5) Check if the fan working when the compressor working. If not, some problems with the fan assembly 6) change the PCB board

Over heat protection (HTP Switch)	E3	☆☆☆☆☆☆☆☆● (8 flashes 1 dark)	1) Too high tank water temp 2) The switch damaged 3) PCB board failure	1) If the tank water temp is over 85C, the switch will open and the unit will stop for protection. After the water comes to normal temp, 2) Replace a new switch 3) Change the PCB board
Solar thermal collector high temp protection	E4	☆☆☆☆☆☆☆☆☆☆☆●(11flash1 dark)	1) solar water circuit water flow very little or without water flow 2) Related connecting wires off 3) Water pump failure 4) PCB board failure	1) Solar water circuit fluid infusion and exhaust 2) Related connecting wires being reconnected 3) Change the water pump 4) change the PCB board
Water flow failure	E5	☆☆☆☆☆☆☆☆☆●(9 flash 1dark)	1) solar water circuit water flow very little or without water flow 2) Related connecting wires off 3)water pump failure 4)water flow switch failure 5) PCB board failure	1) Solar water circuit fluid infusion and exhaust 2) Related connecting wires being reconnected 3) Change the water pump 4) Change the water flow switch 5) Change the PCB board
Defrost	Defrosting indicate	☆☆☆☆☆☆☆☆…… (all long flashes)		
Communication failure	E8	Bright		

When remote signal is on, no P7 will be showed on the controller, when remote signal is off, P7 will be displayed. It is not an error code, but a situation for remote on/off signal.

WARNING! In the event that the operator does not succeed in solving the problem, switch off the equipment and seek technical assistance specifying the device model purchased.

12. DISPOSAL.

At the end of their device lifecycle, the heat pumps will be disposed of in conformity with the applicable regulations.

WARNING! This equipment contains greenhouse fluorinated gas included in the Kyoto protocol. The maintenance and disposal operations must only be carried out by qualified personnel. This device contains R134a refrigerant in the amount as stated in the specification. Do not vent R134a into the atmosphere: R134a, is a fluorinated greenhouse gas with a Global Warming Potential (GWP) = 1975.

INFORMATION TO USERS:

Pursuant to EU Directives **2011/65/EU (RoHS)**, **2012/19/EU (WEEE),** relating to the reduction of the use of hazardous substances in electric and electronic equipment as well as waste disposal.

The symbol of the barred wheelie bin that can be seen either on the equipment or its packaging indicates that the device must be collected separately from other waste at the end of its lifecycle.