

YOSHI® W-KIT

GEHP Engine Heat Recovery Kit



ENGINEERING DATA BOOK

TECNOCASA
CLIMATIZZAZIONE
Sole European Distributor **AISIN**
Gas Heat Pump (GHP) / Microcogenerator (MCHP)





YOSHI®
Experience & Technology

PARTS PROVIDED*

W-KIT 8-10-13 HP E1	W-KIT 16-20 HP F1	W-KIT 25-30 HP F1
Exchanger bracket	Exchanger bracket / GEHP post	Exchanger bracket / GEHP post
Outdoor unit panels kit	Outdoor unit panels kit	Outdoor unit panels kit
10 HP insulated heat exchanger + fixing bolts	20 HP insulated heat exchanger + fixing bolts	20 HP insulated heat exchanger + fixing bolts
Exchanger outlet coolant pipe (upper)	Exchanger outlet coolant pipe (upper)	Exchanger outlet coolant pipe (upper)
Exchanger inlet coolant pipe (lower)	Exchanger inlet coolant pipe (lower)	Exchanger inlet coolant pipe (lower)
AISIN 3-way valve	AISIN rubber hose	Copper T fitting 4 ports
AISIN rubber curved hose	AISIN T plastic fitting	AISIN rubber hose (thermostatic valve)
Hose clamp 16 – 25	AISIN plastic 3-way valve	AISIN rubber hose (copper T fitting)
Temperature switch 60°	Small clamp	AISIN rubber curved hose
Temperature switch harness E1	Big clamp	AISIN plastic 3-way valve
Copper curved shank 3/4" x 22 mm	Temperature switch 60°	Small clamp
Gasket 3/4"	Temperature switch harness F1	Big clamp
Plastic box 80x80x40 mm	Copper straight shank 1 1/4" x 28 mm	Temperature switch 60°
Labels Kit F1 16 ~ 30 HP	Gasket 1 1/4"	Temperature switch harness F1
Probe greas, AISIN rubber fitting and hardware bag.	Plastic box 80x80x40 mm	Copper straight shank 1 1/4" x 28 mm
	Labels Kit F1 16 ~ 30 HP	Gasket 1 1/4"
	Probe greas, AISIN rubber fitting and hardware bag.	Plastic box 80x80x40 mm
		Labels Kit F1 16 ~ 30 HP
		Spacer D.38mm M8x70
		Probe greas, AISIN rubber fitting and hardware bag.

SAFETY PRECAUTIONS

The following symbols are used to indicate precautions that must be observed to prevent possible fatal injuries or damage to the equipment. They are also used indicate proper instructions, which have to be followed carefully.

 WARNING	If the items with this symbol shown in this manual are not adhered to, serious injury or death could occur.
 CAUTION	If the items with this symbol shown in this manual are not adhered to, injury or damage to the unit could occur.
	This indicates prohibited action.
	This indicates an action or requirement that must be completed.

* Parts are generally pre-assembled within AISIN GEHP outdoor units.

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Tecnocasa Srl decline any responsibility for any damage whatever caused by improper use of the unit and/or non-compliance with the information contained in the present manual. Specifications, drawings, and technical information within this manual are subject to change without notice.

1. PREFACE

The information presented in this technical manual has been compiled to provide design engineers with a thorough understanding of the capabilities and operation of HVAC systems powered by AISIN GEHP outdoor units with W-KIT, which is the engine heat recovery kit EHRE. AISIN GEHP line-up allows the user to choose whether the engine heat recovery kit EHRE should be factory installed or not. It is anyway possible to purchase the W-KIT as after-market accessory for those units which were delivered without, provided the AISIN Authorised Service Centre clears the technical feasibility of the retrofit.

The W-KIT allows to recover otherwise wasted residual energy from exhaust gas and engine, which can be used for multiple scopes. Refrigerant circuit performances are not affected by the presence of the engine heat recovery kit EHRE; AISIN GEHP output capacity and gas consumption at different loads and outdoor temperatures don't change. Hence, the recovered energy quota improves the overall efficiency of the system.

Even though the heat recovery logic slightly differs from one model of the line-up to another, in general it is automatically managed by the AISIN GEHP electronics as follows:

- In cooling mode operation, the whole recovered energy is used by the engine heat recovery kit EHRE. Should the connected circuit be satisfied, the exceeding quota is dissipated through the engine radiator.
- In heating mode operation, the recovered energy is primarily used by the refrigerant circuit for the evaporation of R41a. The remaining energy is used by the heat recovery kit EHRE. Should the connected circuit be satisfied, the exceeding quota is dissipated through the engine radiator.

Hydraulic ports are located on the short side of AISIN GEHP outdoor units. Identification of the engine heat recovery kit circuit and integration with existing piping are easy. Access to the engine room body panels for periodic maintenance is not blocked.

Visual inspection of the engine heat recovery kit EHRE parts is the only foreseen maintenance. Due to high efficiency heat exchangers and quality components the inspection can be carried out at the same time of the combustion engine service.

For some type of installations, in combination with YOSHI AWS units and AWSMOD2 expansion module, the management of the connected circuit circulation pump is automatically managed by the built-in logic. W-KIT will be prioritised when energy is available for recovery and when there is demand on the connected circuit.

The water circuit connected to the engine heat recovery kit EHRE must not be a drinking water circuit. A process water buffer tank with integrated heat exchanger is needed every time W-KIT is used for the scope of producing domestic hot water.



WARNING



- **NEVER connect a drinking water tap to the engine heat recovery kit plate heat exchanger.** Failure to observe this prescription could result in poisoning or injury.



CAUTION



- **Always use water and glycol mixture to top up the engine heat recovery kit connected circuit. Percentage should be selected according to minimum outdoor temperature working conditions.** Failure to observe this prescription could result in malfunction and/or damage of the AISIN GEHP outdoor unit.

1.1. Technical specifications

The tables below show nominal values measured at Standard Rating Condition. They show data that is needed to properly size the connected circuit and the buffer tank. The Standard Rating Condition operation figures are the following:

- GEHP AISIN outdoor unit in cooling mode;
- Operation condition 100% load;
- Outdoor temperature 35°C

AISIN GEHP outdoor units Energy efficiency manuals can be used to evaluate the engine heat recovery with changing operating conditions.

GEHP AISIN E model outdoor units DX – EVKIT – AWS – AHU EASY connectivity				
Model		W-KIT 8HP	W-KIT 10HP	W-KIT 13HP
Max. engine heat recovery	kW	8,0	10,0	13,5
Max water temperature out	°C	60		
Max water temperature in	°C	55		
Rated flow rate	m ³ /h	1,7	2,0	2,3
Total pressure drop	mca	1,8	2,4	3,2
Heat exchanger water ports	mm	DN20		
Copper shank diameter	mm	22		

GEHP AISIN F model outdoor units DX – EVKIT connectivity					
Model		W-KIT 16HP	W-KIT 20HP	W-KIT 25HP	W-KIT 30HP
Max. engine heat recovery	kW	15,7	19,5	27,2	35,6
Max water temperature out	°C	65			
Max water temperature in	°C	60			
Rated flow rate	m ³ /h	2,7	3,3	4,7	6,1
Total pressure drop	mca	0,6	0,85	1,6	2,6
Heat exchanger water ports	mm	DN32			
Copper shank diameter	mm	28			

GEHP AISIN F model outdoor units AWS – AHU EASY connectivity					
Model		W-KIT 16HP	W-KIT 20HP	W-KIT 25HP	W-KIT 30HP
Max. engine heat recovery	kW	19,5	23,5	30,5	44,5
Max water temperature out	°C	65			
Max water temperature in	°C	60			
Rated flow rate	m ³ /h	3,3	4,0	5,2	7,6
Total pressure drop	mca	0,9	1,2	2,0	3,9
Heat exchanger water ports	mm	DN32			
Copper shank diameter	mm	28			

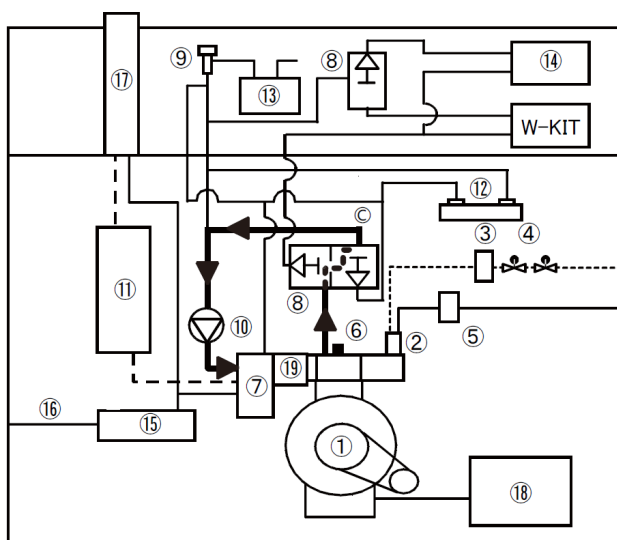
1.2. Operating principle diagram

This chapter explains which operating conditions of the AISIN GEHP outdoor units allow to recover the engine heat through the W-KIT.

GEHP AISIN E1 model outdoor units (8-10-13HP)

- *Engine temperature (coolant) lower than 60°C*

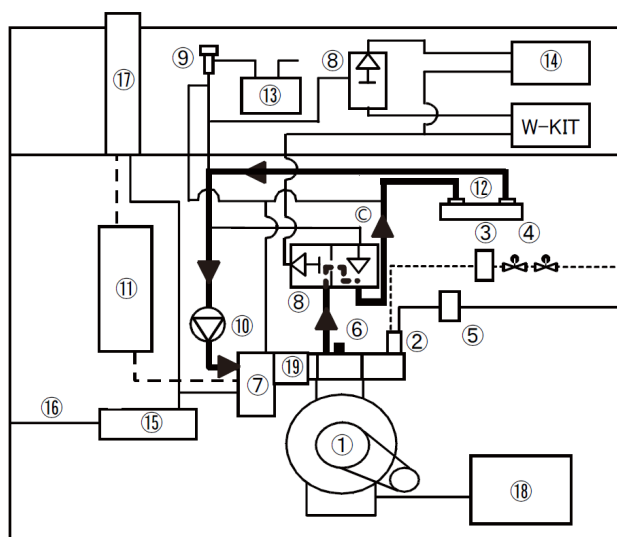
Engine coolant is processed by the pump (10) through the exhaust gas heat exchanger (7) and the engine (1); while warming up, the coolant flows through the thermostats in the engine room (C) and (8), both closed, then enters the bypass to get back to the pump.



► coolant

- *Engine temperature (coolant) higher than 60°C and lower than 70°C*

Engine coolant is processed by the pump (10) through the exhaust gas heat exchanger (7) and the engine (1); while warming up, the coolant flows through the thermostats in the engine room (C) open and (8) closed, then enters the R410a sub heat exchanger (12). In the heat exchanger the coolant enhances evaporation efficiency, then flows back to the pump.



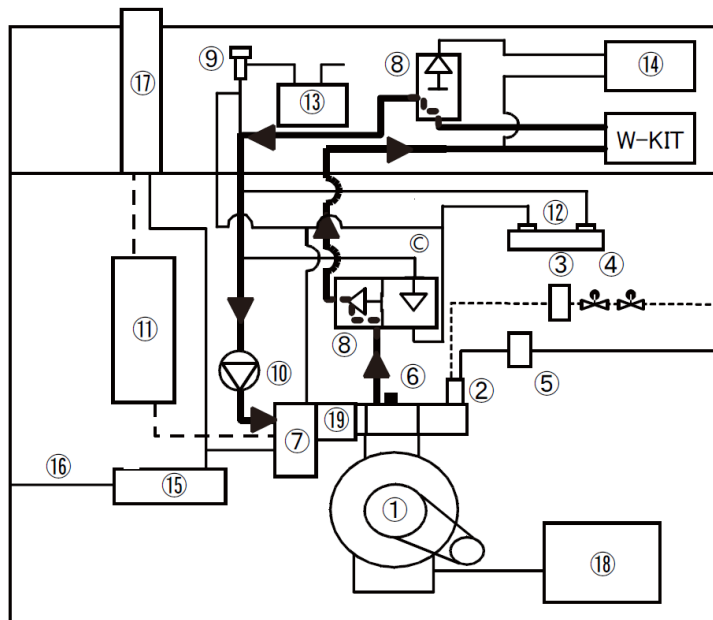
► coolant

1: Engine	6: Engine temp sensor	10: Coolant pump	15: Exhaust drain filter
2: Gas mixer	7: Exhaust heat exchanger	11: Exhaust muffer	16: Exhaust drain hose
3: Gas regulator	c: Thermostatic valve 60°C	12: R410a sub heat exch.	17: Exhaust drain trapper
4: Gas valves	8: Thermostatic valve 70°C	13: Coolant reserve tank	18: Engine oil tank
5: Air filter	9: Radiator cap	14: Radiator	19: Catalyser (where installed)

PREFACE

- *Engine temperature (coolant) higher than 70°C and heat demand on W-KIT*

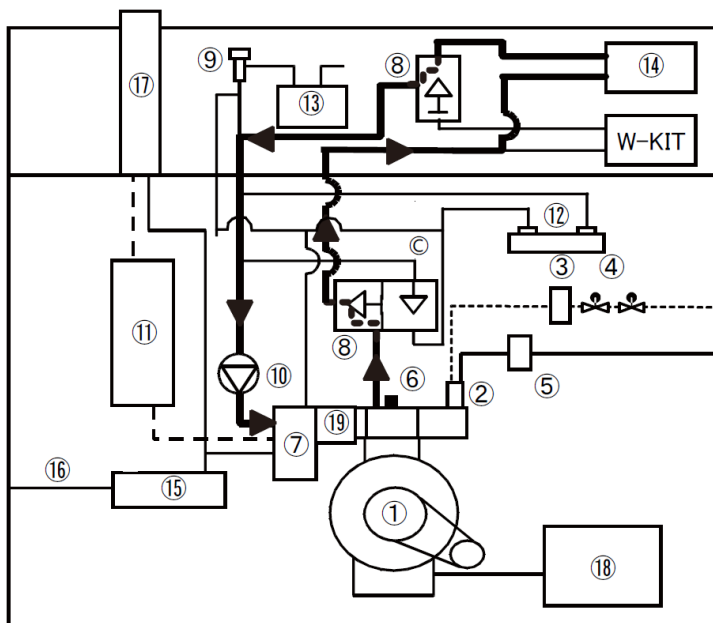
Engine coolant is processed by the pump (10) through the exhaust gas heat exchanger (7) and the engine (1); while warming up, the coolant flows through the thermostats in the engine room (C) and (8), both open, then gets to the engine heat recovery kit EHRE heat exchanger (W-KIT). In the heat exchanger, the coolant releases energy to the connected circuit then flows back to the pump through the closed thermostat (8) in the fan compartment.



► coolant

- *Engine temperature (coolant) higher than 70°C and no heat demand on W-KIT*

Engine coolant is processed by the pump (10) through the exhaust gas heat exchanger (7) and the engine (1); while warming up, the coolant flows through the thermostats in the engine room (C) and (8), both open, then gets to the engine radiator (14), where the energy is dissipated to ambient air. The coolant flows back to the pump through the open thermostat (8) in the fan compartment.



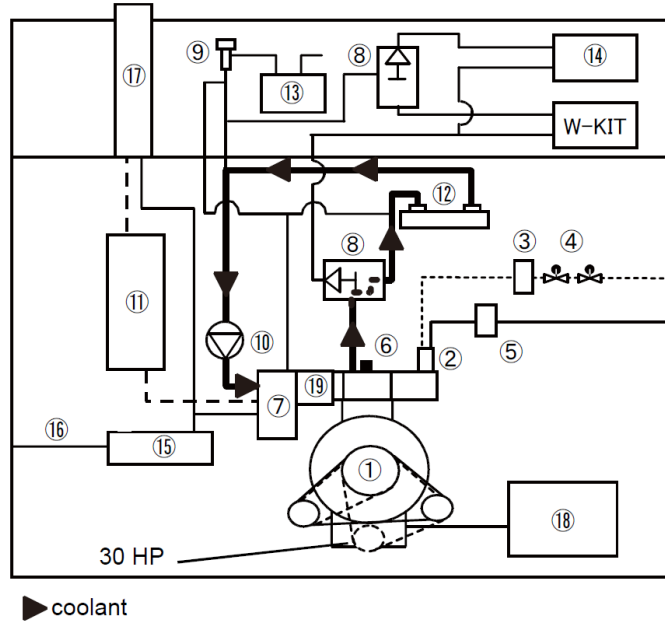
► coolant

1: Engine	6: Engine temp sensor	10: Coolant pump	15: Exhaust drain filter
2: Gas mixer	7: Exhaust heat exchanger	11: Exhaust muffler	16: Exhaust drain hose
3: Gas regulator	c: Thermostatic valve 60°C	12: R410a sub heat exch.	17: Exhaust drain trapper
4: Gas valves	8: Thermostatic valve 70°C	13: Coolant reserve tank	18: Engine oil tank
5: Air filter	9: Radiator cap	14: Radiator	19: Catalyser (where installed)

GEHP AISIN F1 model outdoor units (16-20-25-30HP)

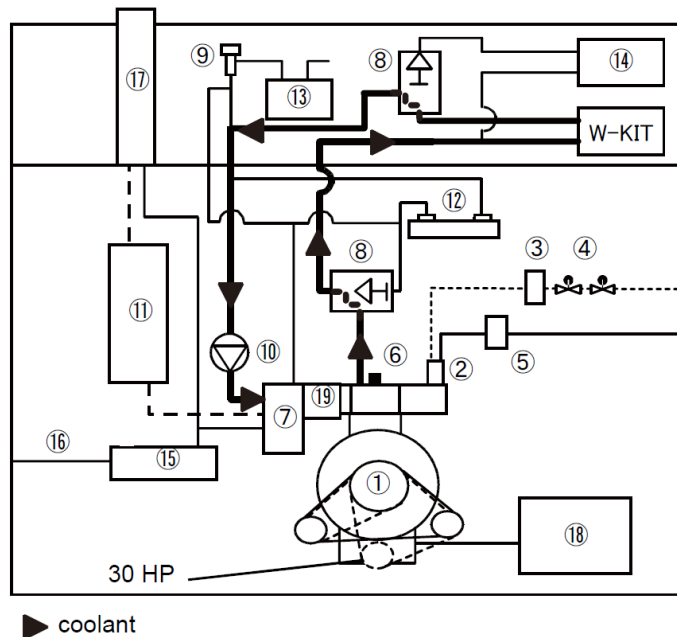
- Engine temperature (coolant) lower than 70°C

Engine coolant is processed by the pump (10) through the exhaust gas heat exchanger (7) and the engine (1); while warming up, the coolant flows through the closed thermostat in the engine room (8), then enters the R410a sub heat exchanger (12). In the heat exchanger the coolant enhances evaporation efficiency, then flows back to the pump.



- Engine temperature (coolant) higher than 70°C and heat demand on W-KIT

Engine coolant is processed by the pump (10) through the exhaust gas heat exchanger (7) and the engine (1); while warming up, the coolant flows through the open thermostat in the engine room (8), then gets to the engine heat recovery kit EHRE heat exchanger (W-KIT). In the heat exchanger, the coolant releases energy to the connected circuit then flows back to the pump through the closed thermostat (8) in the fan compartment.

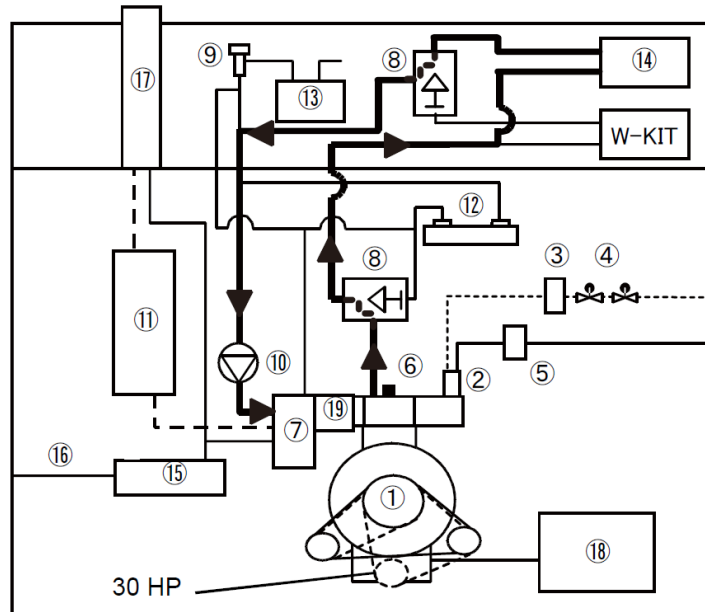


1: Engine	6: Engine temp sensor	11: Exhaust muffer	16: Exhaust drain hose
2: Gas mixer	7: Exhaust heat exchanger	12: R410a sub heat exch.	17: Exhaust drain trapper
3: Gas regulator	8: Thermostatic valve 70°C	13: Coolant reserve tank	18: Engine oil tank
4: Gas valves	9: Radiator cap	14: Radiator	19: Catalyser (where installed)
5: Air filter	10: Coolant pump	15: Exhaust drain filter	

PREFACE

- Engine temperature (coolant) higher than 70°C and no heat demand on W-KIT

Engine coolant is processed by the pump (10) through the exhaust gas heat exchanger (7) and the engine (1); while warming up, the coolant flows through the open thermostatic valve in the engine room (8), then gets to the engine radiator (14), where the energy is dissipated to ambient air. The coolant flows back to the pump through the open thermostatic valve (8) in the fan compartment.





► coolant

1: Engine	6: Engine temp sensor	11: Exhaust muffler	16: Exhaust drain hose
2: Gas mixer	7: Exhaust heat exchanger	12: R410a sub heat exch.	17: Exhaust drain trapper
3: Gas regulator	8: Thermostatic valve 70°C	13: Coolant reserve tank	18: Engine oil tank
4: Gas valves	9: Radiator cap	14: Radiator	19: Catalyser (where installed)
5: Air filter	10: Coolant pump	15: Exhaust drain filter	

2. INSTALLATION

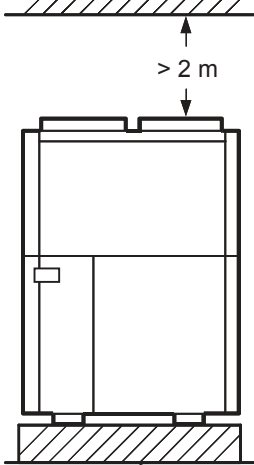
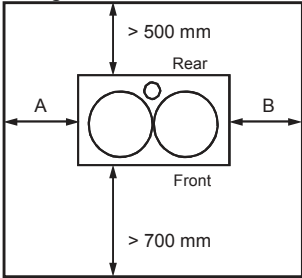
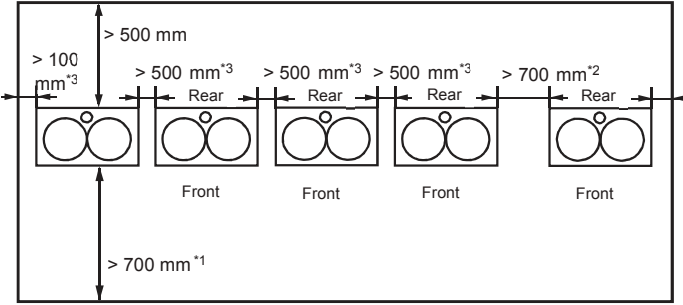
2.1. Installation space

Should AISIN GEHP outdoor units be equipped with the engine heat recovery kit EHRE, additional clearance on the short side of the unit will be needed. The extra space allows routing of water pipes for the connected circuit.

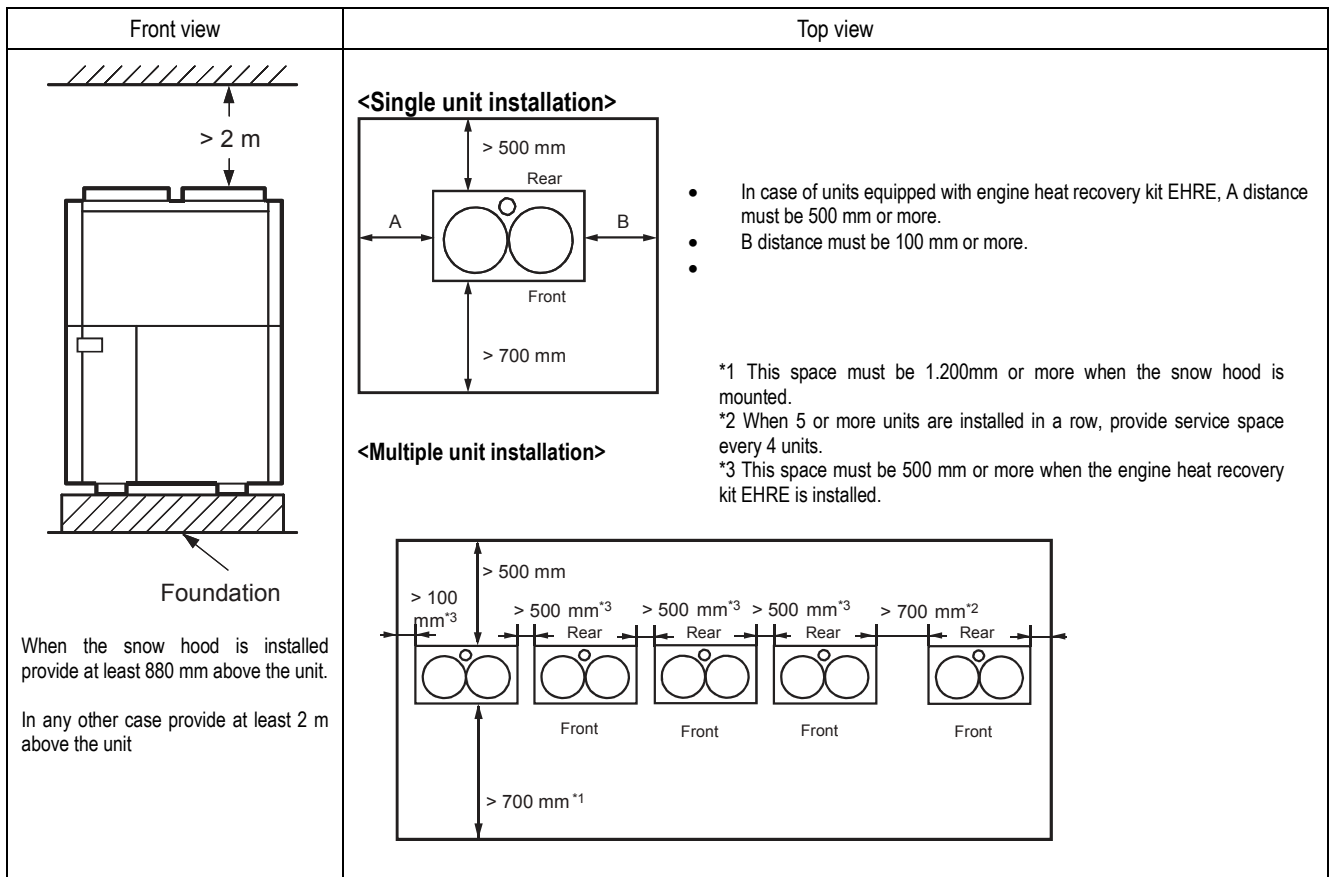
 AVVERTENZA	
	<ul style="list-style-type: none"> • Minimum allowed clearance ensures air circulation, room for inspection and maintenance of the AISIN GEHP outdoor units. Failure to observe this prescription could result in injury to the maintenance personnel and damage to the unit.
	<ul style="list-style-type: none"> • When outdoor units are equipped with the engine heat recovery kit EHRE, make sure to leave enough space for routing pipes where the water ports are located. Failure to observe minimum allowed clearance could result in difficult connection of water pipes.
	<ul style="list-style-type: none"> • When four or more outdoor units are installed in the same location, make sure nearby walls or other objects obstruct air circulation. Short circuit air flow could result in lower performances of the outdoor unit.

Minimum allowed clearance for proper operation and maintenance are described in the table below. All measures are in metric mm. Different installation layouts are possible, provided minimum allowed clearance is granted.

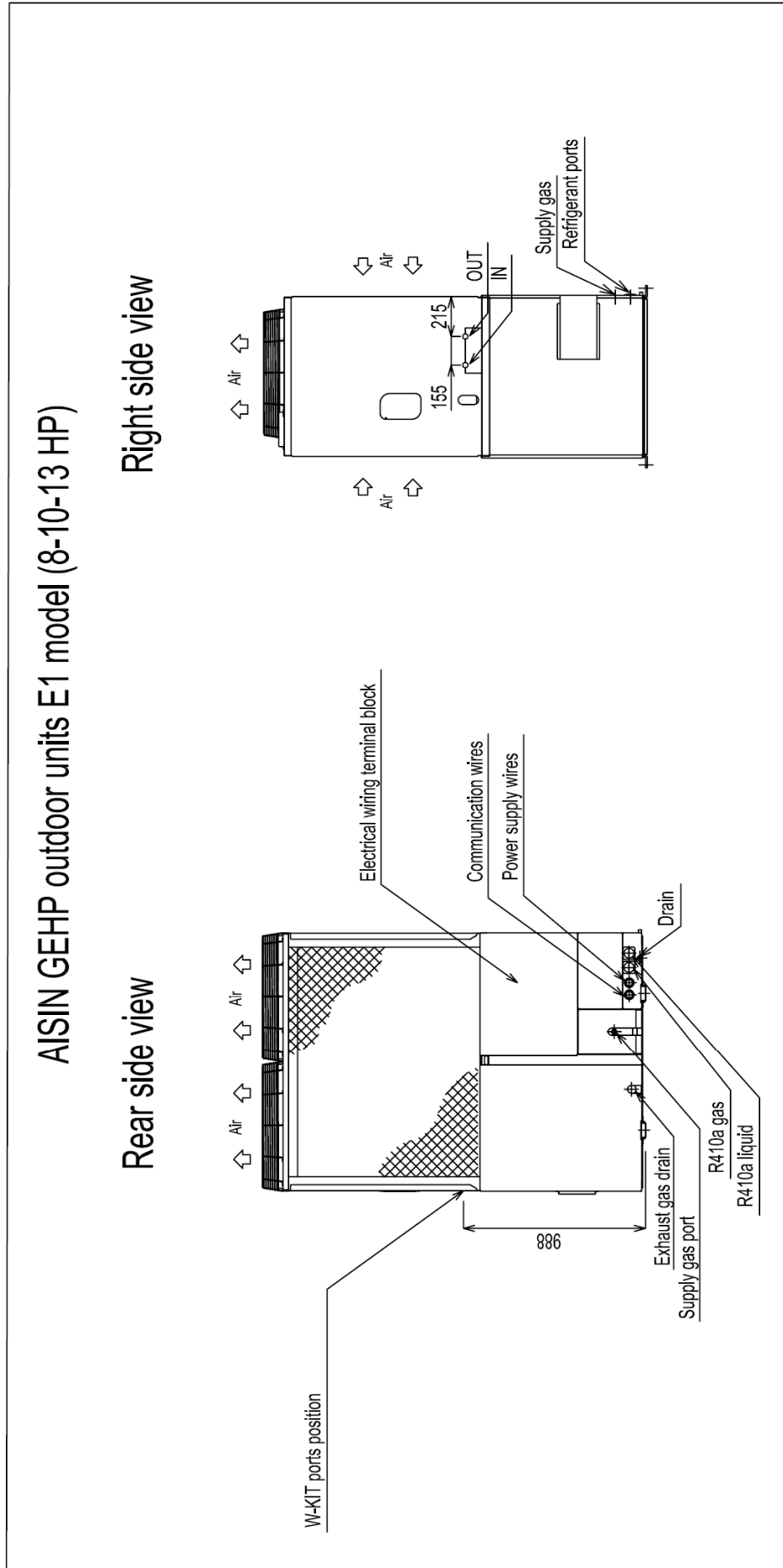
GEHP AISIN E1 model outdoor units (8-10-13HP)

Front view	Top view
 <p style="text-align: center;">> 2 m</p> <p style="text-align: center;">Foundation</p> <p>When the snow hood is installed provide at least 880 mm above the unit.</p> <p>In any other case provide at least 2 m above the unit</p>	<p><Single unit installation></p>  <ul style="list-style-type: none"> • A distance must be 100 mm or more. • In case of units equipped with engine heat recovery kit EHRE, B distance must be 500 mm or more. <p><Multiple unit installation></p>  <p>*1 This space must be 1.200mm or more when the snow hood is mounted. *2 When 5 or more units are installed in a row, provide service space every 4 units. *3 This space must be 500 mm or more when the engine heat recovery kit EHRE is installed.</p>

GEHP AISIN F1 model outdoor units (16-20-25-30HP)

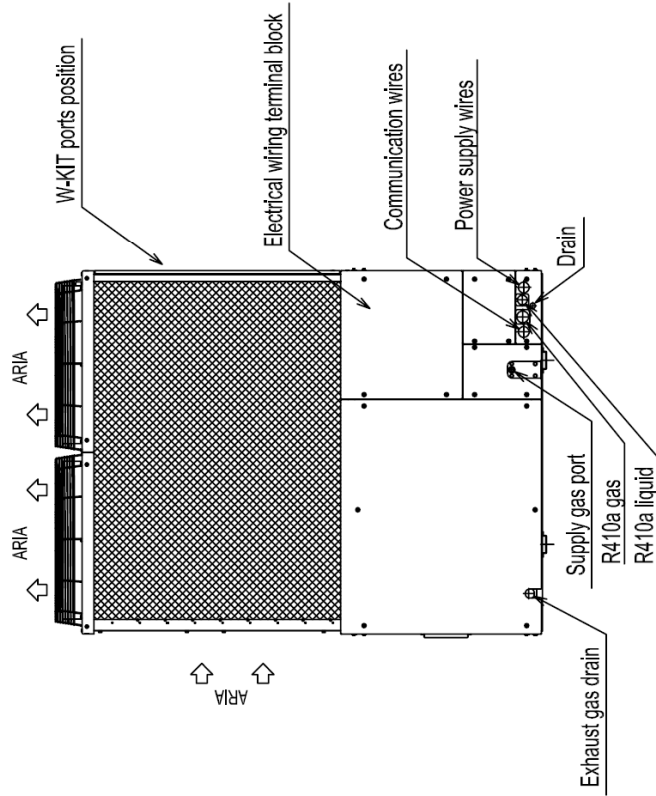


2.2. Water port position

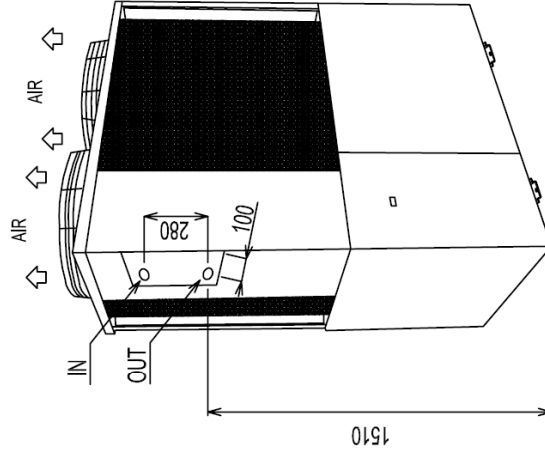


GEHP AISIN outdoor units F1 model (16-20-25-30 HP)






Rear side view



Left side view








2.3. Water piping specifications

 WARNING	
	<ul style="list-style-type: none"> • NEVER use pipes that have a diameter smaller than prescribed. Failure to observe this prescription makes the warranty no longer valid and could result in malfunctioning of the unit.
	<ul style="list-style-type: none"> • The assembly of water piping must be performed by technical qualified personnel in compliance with national and local codes. Failure to observe this prescription could result in malfunctioning of the unit. • The selection of circulation pumps for the W-KIT connected circuit and expansion vessel must be carried out by qualified personnel in compliance with national and local codes. Failure to observe this prescription could result in malfunctioning of the unit.
 CAUTION	
	<ul style="list-style-type: none"> • All minimum diameters indicated in this manual are referred to copper pipes for connection to the shanks supplied. In case of direct connection on threaded heat exchanger ports with different materials, check the diameter equivalence and confirm flow rates and pressure drops with the manufacturer. • For all above mentioned cases, install anti vibration joints on the connected water circuit. Failure to observe this prescription could result in malfunctioning of the unit.

The W-KIT connected circuit should be sized according to the prescriptions in the table below..

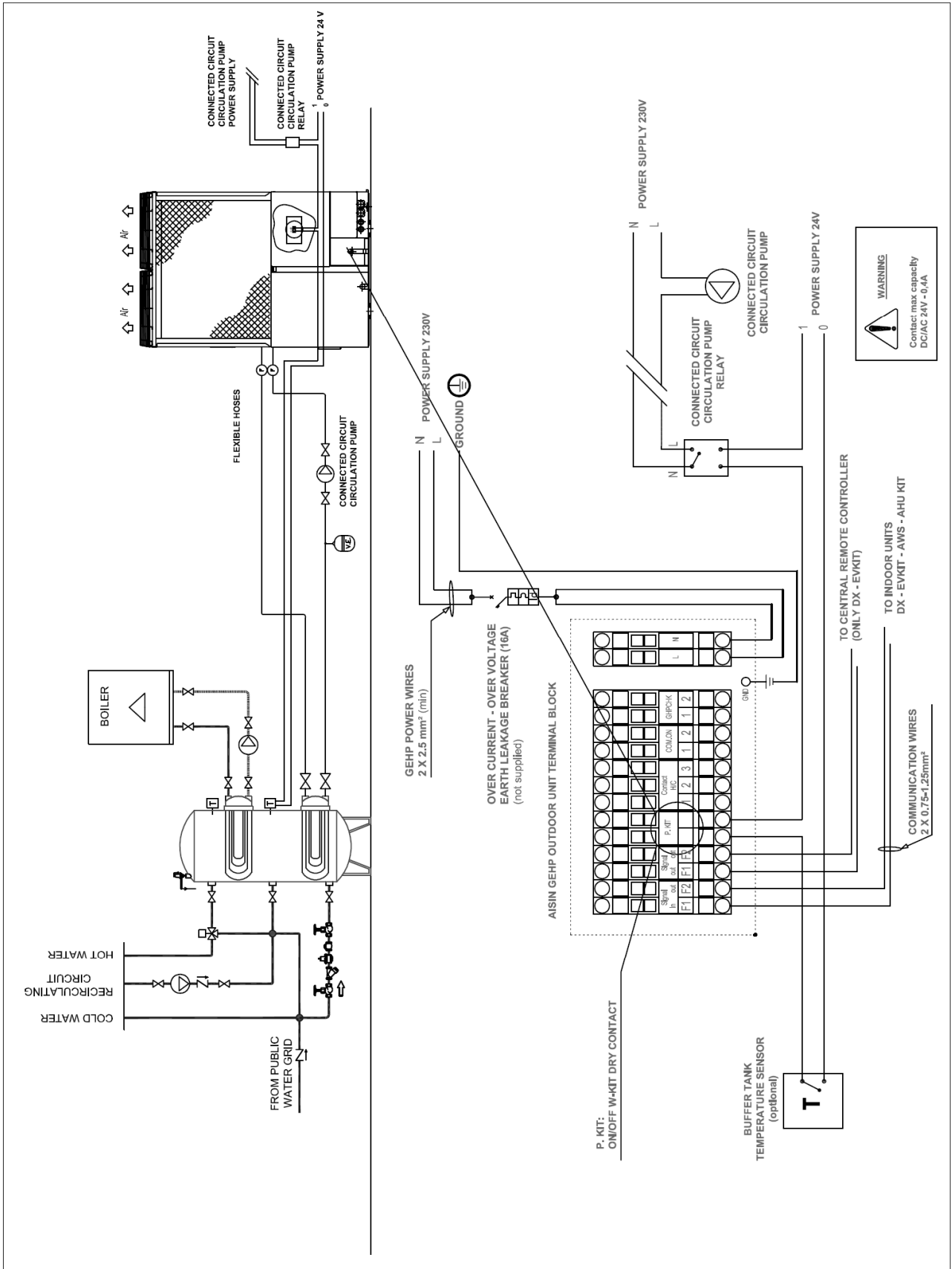
Model		W-KIT E1 (8-10-13 HP)	W-KIT F1 (16-20-25-30 HP)
Heat exchanger water ports	mm	DN20	DN32
Copper shank diameter	mm	22	28
Position of water ports		Right short side	Left short side

2.4. Electrical wiring

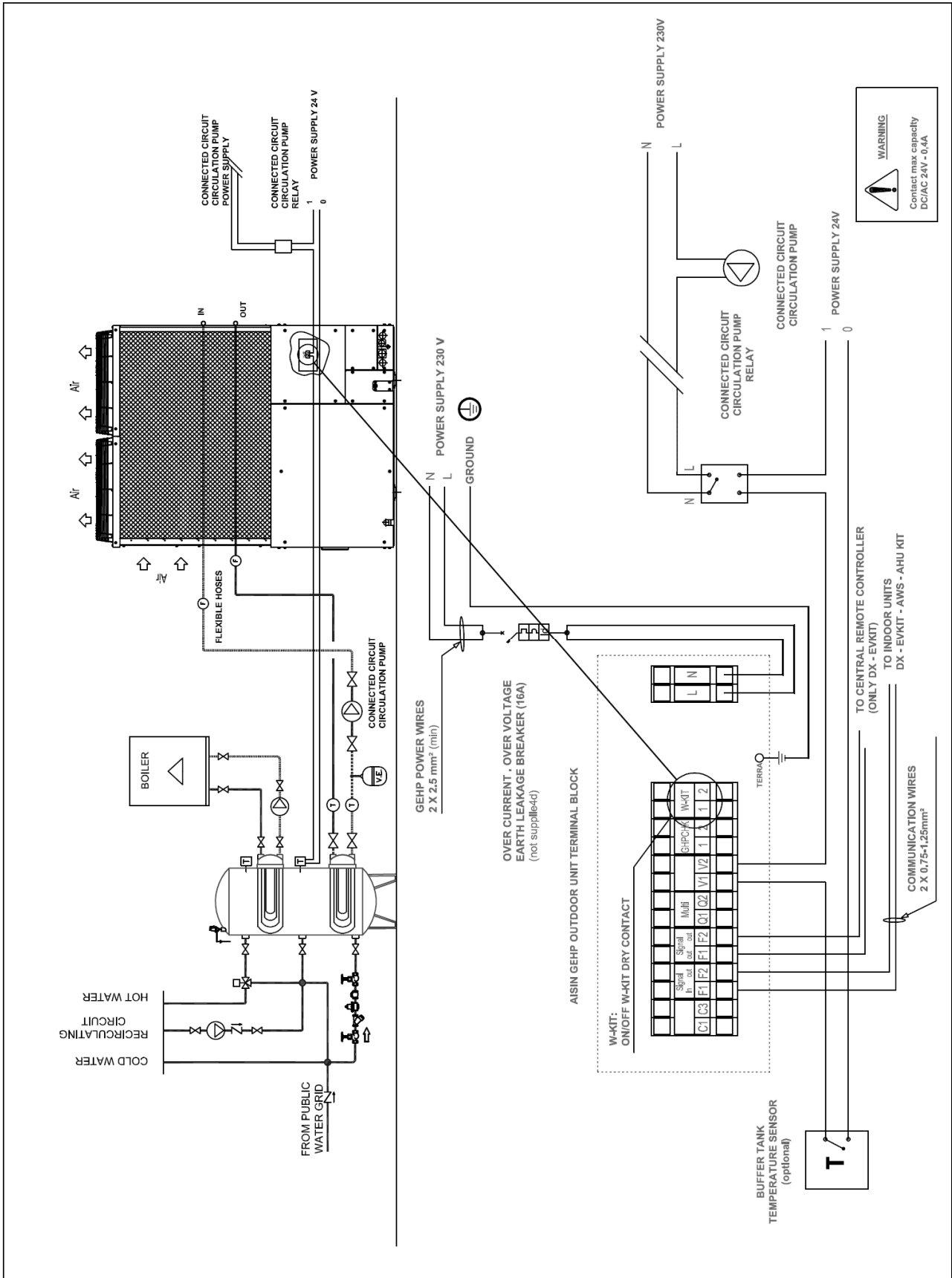
 WARNING	
	<ul style="list-style-type: none"> • NEVER switch the power supply on before the final commissioning is performed by the AISIN Authorised Service Centre. Failure to observe this prescription makes the warranty no longer valid and could result in malfunction and/or damage of the unit. • NEVER use the W-KIT contact on the terminal block to cut the mains of the circulation pump of the water circuit connected to the engine heat recovery kit EHRE. Failure to observe this prescription makes the warranty no longer valid and could result in malfunction and/or damage of the unit.
	<ul style="list-style-type: none"> • All electrical installation work must be performed by specialised technical personnel in accordance with national and local installation standards. A declaration of conformity must be provided by the installer. Failure to observe this prescription could result in electrical shock, fire or other hazards. • Always use the designated cable for wiring, including the ground wiring, according to national and local standards. • Always check the power supply specifications on the unit label. Failure to observe this prescription could result in malfunction and/or damage of the unit.
 CAUTION	
	<ul style="list-style-type: none"> • The maximum capacity of the dry contact that drives the pump operation relay of the engine heat recovery kit connected circuit is AC/DC 24V – 0,4A. Failure to observe this prescription could result in malfunction and/or damage of the unit.

INSTALLATION

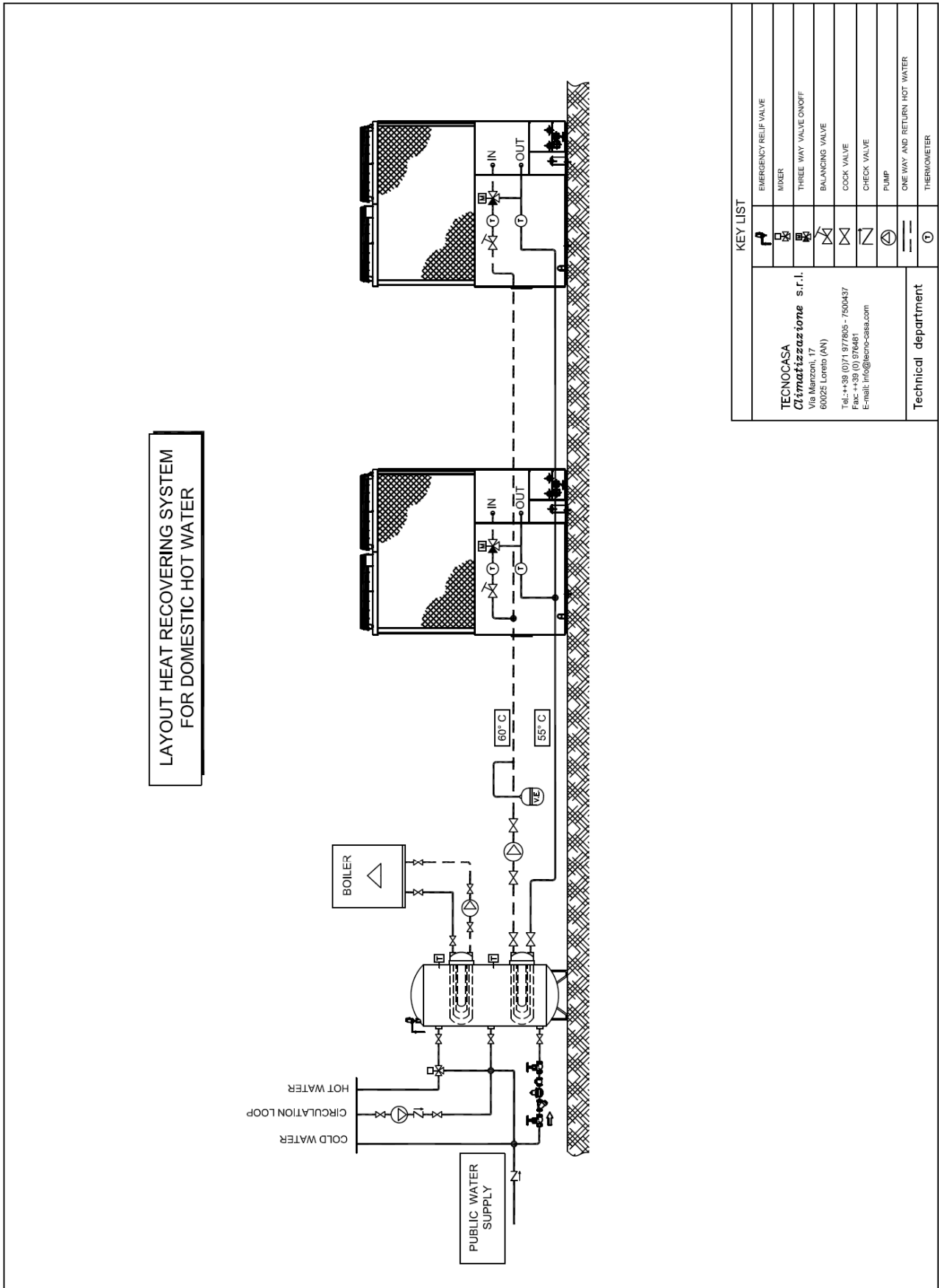
GEHP AISIN E1 model outdoor units (8-10-13HP)

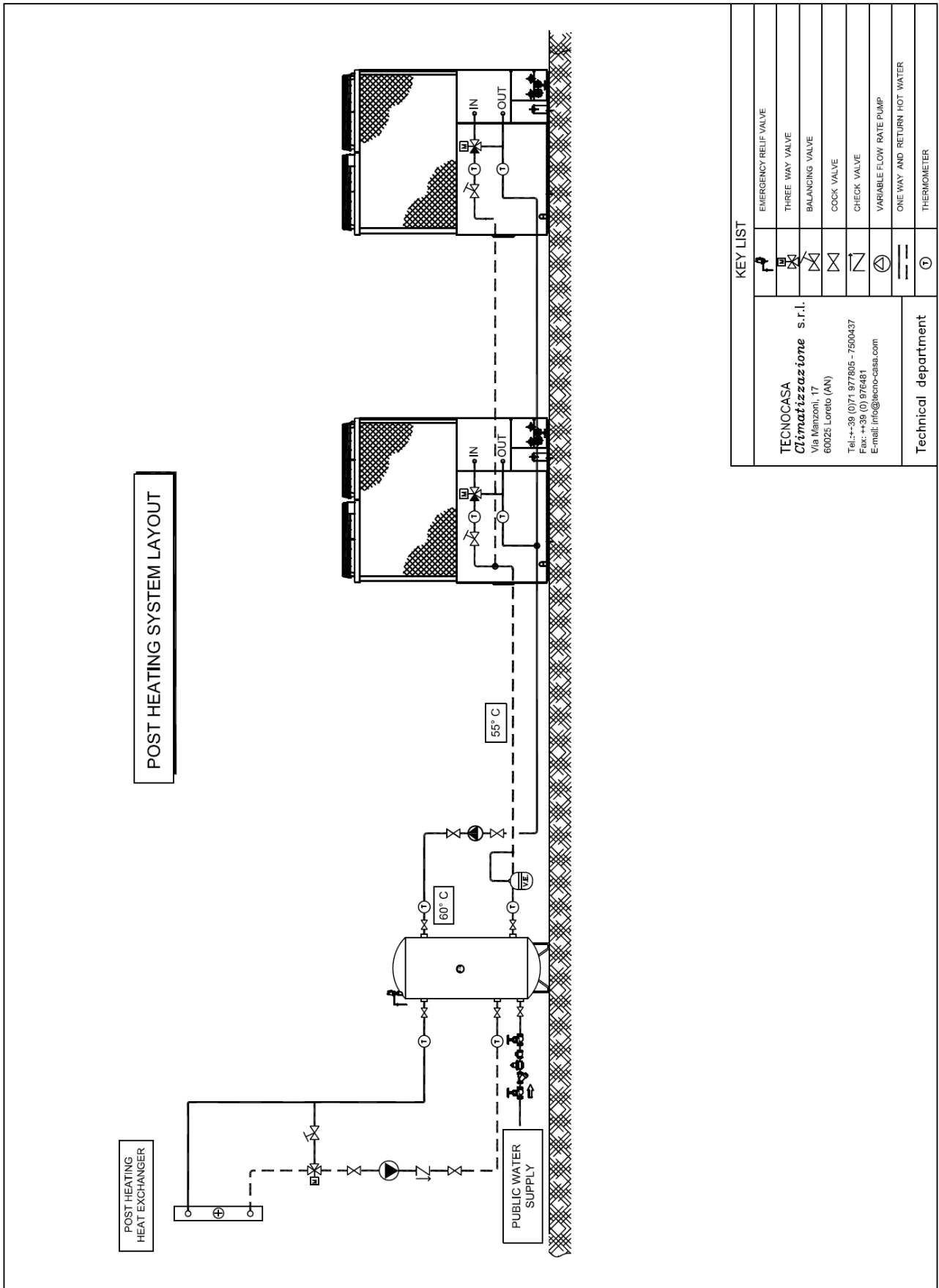


GEHP AISIN F1 model outdoor units (16-20-25-30HP)



3. INSTALLATION LAYOUTS





KEY LIST	
	EMERGENCY RELIEF VALVE
	THREE WAY VALVE
	BALANCING VALVE
	COCK VALVE
	CHECK VALVE
	VARIABLE FLOW RATE PUMP
	ONE WAY AND RETURN HOT WATER
	THERMOMETER
TECNOCASA <i>Climatizzazione</i> s.r.l. Via Manzoni, 17 60025 Loreto (AN) Tel. ++39 (0)71 977805 - 7500437 Fax: ++39 (0) 576481 E-mail: info@tecnocasa.com	
Technical department	

NOTE:

YOSHI[®]
Experience & Technology

TECNOCASA
CLIMATIZZAZIONE
Sole European Distributor **AISIN**
Gas Heat Pump (GHP) / Microcogenerator (MCHP)

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