

SHEEN NA

WiSAN-YSE1 NA 30.2

Air cooled reversible full inverter heat pump

Outdoor installation



SIZE - EXCELLENCE	30.2
Cooling capacity [tons]	19.9
Heating capacity [MBH]	256



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Features and benefits

SHEEN EVO is the new air-cooled heat pump, equipped with Full DC Inverter technology and R-32 refrigerant with low environmental impact, designed for outdoor installation.

WISAN-YSE1 NA

Air-cooled reversible heat pump with Full DC Inverter technology and R-32 refrigerant

- Nominal cooling capacity 19.9 tons
- Nominal heating capacity 256 MBH
- Seasonal efficiency IPLV 5.91
- Operating with 131°F (55°C) of outdoor air temperature in cooling
- Funzionamento fino a -22°F (-30°C) of outdoor air temperature in heating
- Hot water production up to 149°F (65°C)
- Copper/aluminium hydrophilic condensing coils
- Plate exchanger
- 2 refrigeration circuits



Features and benefits

The WiSAN-YSE1 NA unit is available in a single energy version with very high efficiency levels when cooling and heating, is able to provide a high outlet water temperature, is suitable for colder climates due to its wide operating range and also operates very quietly.

Capacity modulation from 15%

Wide operating range

EXCELLENCE

Outdoor temperature	Max	Min
Heating	118°F (48°C)	-22°F (-30°C)
Cooling	131°F (55°C)	5°F (-15°C)

Produced water temperature	Max	Min
Heating	149°F (65°C)	77°F (25°C)
Cooling	77°F (25°C)	14°F (-10°C)

When the unit is used to produce domestic hot water, the maximum set-point that can be selected is 140°F (60°C)

Functionality

- Hot water management and production at up to 149°F (65°C) in variable flow operation
- Climate compensation based on external temperature
- Double set-point management
- Management of auxiliary system
- Management of external hydronic unit driven by inverter
- Management of external hydronic unit on/off
- Management of external three-way valve for domestic hot water production
- Management of DHW-side auxiliary generator
- Energy Saving mode

Application Versatility

System components that may be fitted on board the unit:

- Hydronic assembly with 1 inverter pump
- Condensate drip pans with integrated frost heaters

Cascade management

SHEEN EVO NA is designed to connect up to eight units in a local area network, reaching a maximum unit capacity of 160 tonnes.

Standard unit technical specifications

Compressor

Inverter controlled scroll-type hermetic compressor equipped with a motor protection device for overheating, overcurrents and excessive temperatures of the supply gas. It is installed on rubber anti-vibration mounts and comes with a full oil charge. The compressor is wrapped in a sound-absorbing hood, that reduces its sound emissions. A guard heater with automatic insertion prevents the refrigerant from diluting the oil when the compressor stops.

Structure

Supporting structure and base made entirely of sturdy sheet steel, with hot-dip galvanised surface treatment and parts in full view painted with polyester powder RAL9001, which guarantees excellent mechanical characteristics and high corrosion resistance over time.

Panelling

External panelling made of sheet steel, with hot-dip galvanised surface treatment and painted with polyester powder RAL9001 that guarantees greater corrosion resistance in outdoor installations and eliminates the need for periodic painting. The panels can be easily removed to fully access internal components.

Internal exchanger

AISI 304/316 stainless steel direct expansion brazed plate heat exchanger, packaged without seals using copper as brazing material, with low refrigerant content and high exchange surface area, complete with:

- 13 mm thick external anti-condensation thermal insulation;
- antifreeze heater to protect the water side exchanger to prevent ice from forming if the water temperature drops below the pre-set value

External exchanger

Direct expansion finned coil exchanger made with copper pipes placed on staggered rows mechanically expanded to better adhere to the fin collar. The fins are made of hydrophilic aluminium and properly spaced for maximum heat exchange efficiency.

Fan

Helical fans with four profiled blades made of reinforced plastic material, directly coupled to an electronically controlled brushless DC motor in IP44 execution. The brushless technology and the special power supply increase both the life cycle and the efficiency. Consumption is thus reduced by as much as 50%. The fans are housed in aerodynamically shaped nozzles to increase efficiency and minimise noise levels and are fitted with accident prevention grilles. Both fans and grilles are designed with CFD technology. Supplied with variable speed control.

Refrigeration circuit

Cooling circuit complete with:

- electronic expansion valve;
- 4-way cycle inversion valve;
- high-pressure safety pressure switch;
- liquid receiver;
- suction separator;
- high and low pressure transducers;
- safety thermostat against compressor drain overheating;
- temperature sensors;
- fuse cap;
- economiser exchanger;

Electrical panel

The power section includes:

- general protection fuses;
- AC filter on the power supply;
- power supply phase sequence protection;
- protection for compressor overload;

The control section includes:

- serial port with Modbus port (RS485) for remote communication;
- compressor overload protection and timer;
- relay for remote cumulative fault signal;
- defrosting cycle optimisation;
- condenser control;
- dry contact for remote on/off control;
- dry contact for SUMMER/WINTER remote control;
- dry contact for auxiliary generator management;

The control keypad includes:

- remote interface terminal with graphic display for indoor installation;
- multifunction keys for ON/OFF control;
- hot, cold or auto operation modes;
- alarms display and reset;
- daily or weekly schedule;
- separate power adapter for remote use;
- the keypad supplied with the unit must be remote-controlled in an enclosed space and protected from the elements. The standard cable supplied is 32.8 ft long, and a dedicated power supply is supplied as standard for installations at greater distances (in these cases the cable will have to be sized accordingly).

Water circuit

- Pressure relief valve 87 psi;
- low switch;
- antifreeze heaters to protect the water side exchanger to prevent ice from forming if the water temperature drops below the pre-set value;
- temperature sensors;
- de-aerator

Test

Unit subjected to factory-tested in specific steps and test pressure of the piping of the refrigerant circuit (with nitrogen and hydrogen), before shipping them.

Standard unit technical specifications

Unit equipment with outdoor air low temperatures

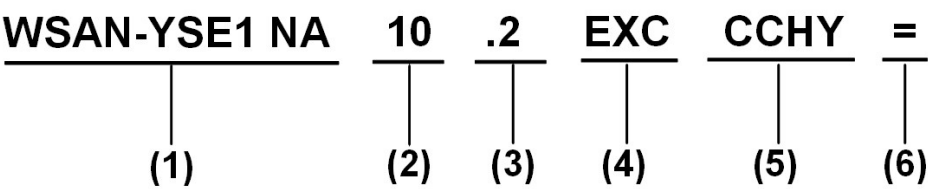
MINIMUM OUTDOOR AIR TEMPERATURE	OPERATING UNIT		UNIT IN STAND-BY (FED UNIT)	UNIT IN STORAGE (UNIT NOT FED)
	COOL*	HOT**		
From 51,8°F to 14°F	✓ STANDARD UNIT	✓ STANDARD UNIT	✓ STANDARD UNIT	✓ WATER EMPTY UNIT OR WITH AN APPROPRIATE PERCENTAGE ⁽¹⁾
From 14°F to 4°F			✓ STANDARD UNIT	
From 4°F to -4°F	✗ NOT POSSIBLE		✓ WATER EMPTY UNIT OR WITH AN APPROPRIATE GLYCOL PERCENTAGE	
From -4°F to -22°F				

(1) Water empty unit or with an appropriate glycol percentage

At the unit start-up the water temperature or water with glycol must be inside the operating range indicated in the "Operating range" graph. To know the water freezing temperature on varying the glycol percentage refer to the specific 'Correction factors for glycol use' table.

- ⚠ Strong winds can induce air to flow through the exchanger and air-levels which can provoke a reduction in the operating limit. In the presence of predominant winds it is necessary to use suitable windbreak barriers.
- ⚠ The unit, with an outdoor air temperature on average lower than 14 °F can remain stored for a maximum of 1 month.

Unit configuration



(1) Range

WiSAN-YSE1 NA = Air cooled reversible full inverter heat pump

(2) Size

10 = Nominal compressor capacity (HP)

(3) Compressors

.2 = Number of compressors

(4) Energy version

EXC = EXCELLENCE Version

(5) Condensing coils

CCHY = Copper/aluminium condensing coil with hydrophilic treatment (Standard)
BCACF = Copper/aluminium condensing coil with anti-corrosive coating

(6) Pumping unit

(-) Not required (standard)
HYGU1VI - User side hydronic group with 1 inverter pumps

Built-in options

BCACF Copper/aluminium condensing coil with anti-corrosive coating

Batteries with copper tubes and aluminium fins with paint resistant for 1,500 hours according to NSS test. They can be used in environments containing airborne concentrations of salt and other moderately aggressive agents.

TCDC Drain pan with electric heater

Condensate collection basins made of AISI 316 stainless steel allow condensate to be collected and drained.

The various basins, located underneath the batteries, are equipped with antifreeze heating elements applied to the bottom. The basins are fitted with stainless steel pipes for channelling the outlets to a common outlet, which the installer is responsible for arranging.

The electric heaters are thermostatically controlled and are activated depending on the outside air temperature.

Accessories separately supplied

AVIBX Anti-vibration mount support

The anti-vibration mounts are fixed in special housings on the support stringers and have the function of dampening the vibrations produced by the unit by reducing the noise transmitted to the supporting structures.
Thus reducing the noise transmitted to the support structure.

⚠ Nota: Suitable for installations down to -4°F of ambient temperature, not suitable for lower ambient temperatures

CMSC13X Serial communication module ModBus TCP/IP, BACnet/IP, BACnet MS/TP

This enables the serial connection of the supervision system, using ModBus TCP/IP, BACnet/IP, BACnet MS/TP as the communication protocol. It enables access to the complete list of operational variables, commands and alarms. Using this accessory every unit can dialogue with the main supervision systems.

⚠ The configuration and management activities for the BACnet networks are the responsibility of the client.

⚠ The total length of each individual serial line must not exceed 3280 ft and the line must be connected in bus type (input/output).

General technical data

Performance - Excellence

Size		30.2
Cooling		
Cooling capacity	TR	19.9
Power supply	kW	23.3
EER	1 Btu/W*h	10.2
IPLV	Btu/W*h	20.1
Water flow rate	gpm	47.4
Heating		
Heating capacity	MBH	256
Power supply	2 kW	19.0
COP	kW/kW	3.95
Heating		
Heating capacity	MBH	212
Power supply	3 kW	23.9
COP	kW/kW	2.60
Heating		
Heating capacity	MBH	256
Power supply	4 kW	22.1
COP	kW/kW	3.40
Heating		
Heating capacity	MBH	205
Power supply	5 kW	26.7
COP	kW/kW	2.25
Heating		
Heating capacity	MBH	191.2
Power supply	6 kW	22.90
COP	kW/kW	2.45

1. AHRI 550-590 cooling capacity conditions: Ambient air at 95°F. EWT at 54°F and LWT at 44°F.
2. Low water / high air = 47°F room temperature / 105°F outlet water temperature (full load heating performance tested according to AHRI 550/590 standard).
3. Low water / low air = 17°F room temperature / 105°F outlet water temperature (full load heating performance tested according to AHRI 550/590 standard).
4. Medium water / high air = 47°F ambient / 120°F outlet water temperature (full load heating performance tested according to AHRI standard 550/590).
5. Medium water / low air = 17°F room temperature / 120°F outlet water temperature (full load heating performance tested according to AHRI standard 550/590).
6. High water / high air = 47°F ambient / 140°F outlet water temperature (full load heating performance tested according to AHRI standard 550/590).

Sound levels - Excellence

Acoustic configuration with compressor soundproofing (SC)

Size	Sound power level (dB) - Octave band (Hz)								Sound pressure level	Sound power level
Standard acoustic configuration	63	125	250	500	1000	2000	4000	8000	dB(A)	dB(A)
30.2	53	67	72	76	80	77	69	57	66	83

Size	Sound power level (dB) - Octave band (Hz)								Sound pressure level	Sound power level
Silence acoustic configuration	63	125	250	500	1000	2000	4000	8000	dB(A)	dB(A)
30.2	52	64	70	72	76	72	64	54	61	78

Size	Sound power level (dB) - Octave band (Hz)								Sound pressure level	Sound power level
Super silence acoustic configuration	63	125	250	500	1000	2000	4000	8000	dB(A)	dB(A)
30.2	48	61	67	69	72	68	61	51	58	75

Sound Pressure Tested at 3.3 Feet

For the silent and super silent versions, the correction factors for cooling capacity and EER at rated operating conditions are as follows:

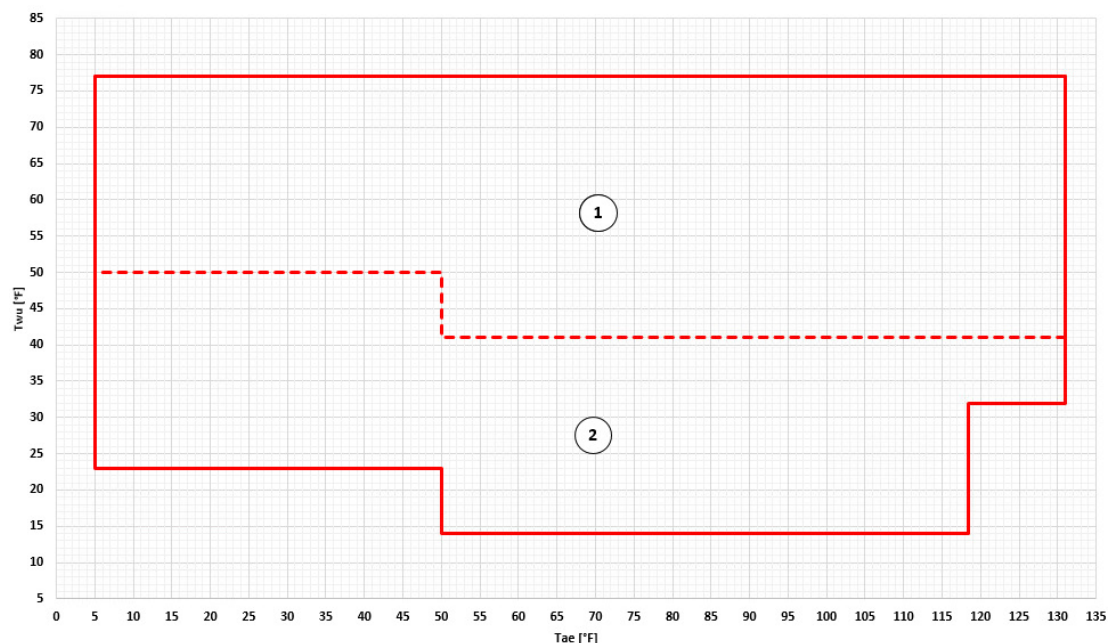
COOLING CAPACITY
SILENT Version = 0.92
SUPER-SILENT Version = 0.83

EER
SILENT Version = 0.95
SUPER-SILENT Version = 0.95

General technical data

Operating range - Excellence

Cooling

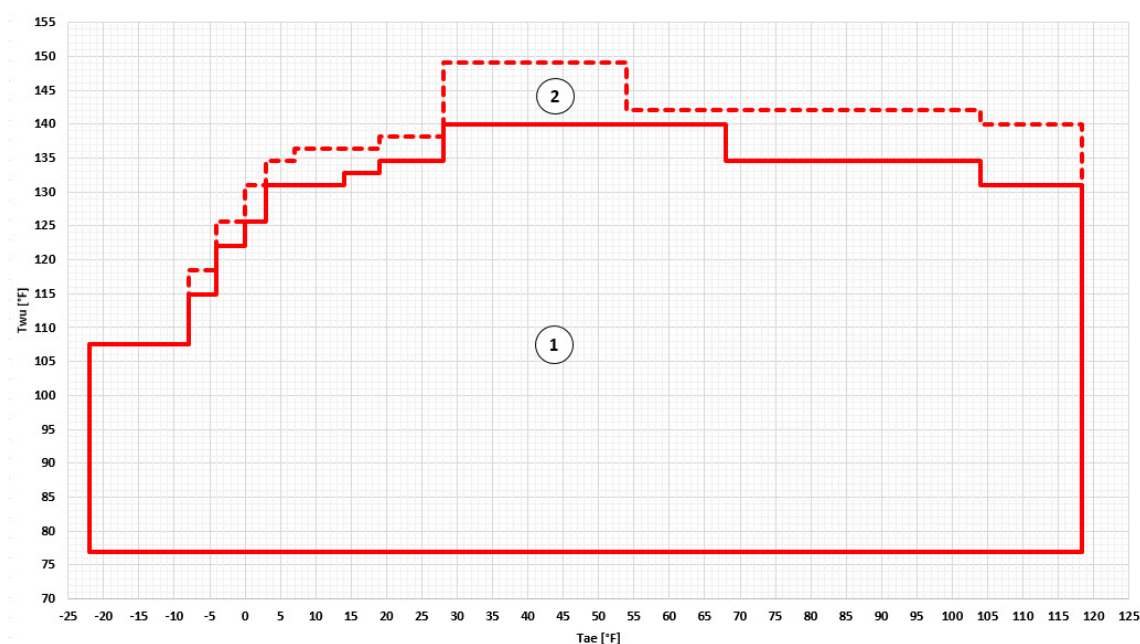


T_{wu} [°F] = Temperature of the outlet water from the exchanger.

T_{ae} [°F] = External exchanger inlet air temperature

1. Standard unit operating range
2. Operating range where the use of ethylene or propylene glycol is mandatory in relation to the temperature of the outlet water from the user side exchanger, the set-point needs to be coherent with type and quantity of glycol in the system.

Heating



T_{wu} [°F] = Temperature of the outlet water from the exchanger

T_{ae} [°F] = External exchanger inlet air temperature

1. Normal operating range.
2. Operating range only achievable if the system is equipped with an inverter pump and correctly dimensioned (unit configuration and setting for Multiple Pump system). The pump in this case must be driven by the unit controller to ensure extended envelope operation. This function must be activated and configured via dip-switch. Downstream of the configuration, voltage must be switched off and on again.

Construction - Excellence

SIZE		30.2
Compressor		
Type of compressor		Scroll Inverter
No. of compressors	Nr	2
Refrigerant type		R32
Refrigerant charge per circuit	lbs	12.57
Number of refrigerant circuits	Nr	2
Oil charge	gal	5.8
Hot user side exchanger		
Type of exchanger		Plate
No. Of exchangers	Nr	1
Water content	gal	17.2
Hot source side exchanger		
Type of exchanger		Copper pipes / Aluminium fins
No. Of exchangers	Nr	2
Fan		
Type of fans		AX
Number of fans	Nr	2
Type of motor		Brushless DC
Airflow	cfm	16865
Motor rated inlet	a kW	1.24
MOC	a A	4.0
Water circuit		
Diameter of inlet/outlet connections	inch	2
Maximum operating pressure	psi	87
Minimum water content in heating	gal	199
Minimum water content in cooling	gal	47
Total internal water volume	gal	2.38
Power supply		
Standard power supply		208-230/3~/60
Electrical data		
Power Current		
MCA	A	103
MOP	A	125
SCCR	kA	5
Compressor		
RIC	a A	42.0

MCA: Min. Circuit Amps. (For wire diameter selection)
MOP: Maximum overcurrent protector MSC: Max. Starting Amps.
SCCR: Short Circuit Current rating.
RIC = rated input current of the variable speed inverter
MOC = Maximum output current of the variable speed pump

a - data is related to the single component

General technical data

Correction factors when using ethylene glycol - Heating

Ethylene glycol concentration (%)	Modification coefficient				Freezing point	
	Freezing point	Power supply	Water resistance	Water flow	°C	°F
0	1.000	1.000	1.000	1.000	0	32
10	0.993	0.997	1.013	1.034	-3	26.6
20	0.984	0.994	1.149	1.051	-8	17.6
30	0.975	0.989	1.343	1.075	-14.1	6.62
40	0.969	0.984	1.623	1.110	-23.3	-9.94
50	0.961	0.978	2.026	1.150	-33.8	-28.84

Propylene glycol concentration (%)	Modification coefficient				Freezing point	
	Freezing point	Power supply	Water resistance	Water flow	°C	°F
0	1.000	1.000	1.000	1.000	0	32
10	0.987	0.992	1.071	1.007	-3	26.6
20	0.975	0.985	1.215	1.010	-7	19.4
30	0.962	0.978	1.420	1.021	-13	8.6
40	0.946	0.971	1.716	1.036	-21	-5.8
50	0.929	0.965	2.228	1.061	-33	-27.4

The correction factors reported refer to water and ethylene glycol mixes used to prevent ice from forming in the exchanger connected to the hydraulic circuit during inactivity in winter.

Fouling Correction Factors

		cooling mode		heating mode	
		F1	FK1	F2	FK2
0.10 x 10 (-3)	0.18 x 10 (-4)	1.000	1.000	1.000	1.000
0.25 x 10 (-3)	0.44 x 10 (-4)	1.000	1.000	1.000	1.000
0.50 x 10 (-3)	0.88 x 10 (-4)	0.970	0.990	0.970	1.080
0.75 x 10 (-3)	1.32 x 10 (-4)	0.955	0.985	0.945	1.065
1.00 x 10 (-3)	1.76 x 10 (-4)	0.940	0.980	0.920	1.050

F1 = Cooling capacity correction factors

FK1 = Compressor power input correction factor (cooling mode)

F2 = heating capacity correction factors

FK2 = Compressor power input correction factor (heating mode)

Overload and control device calibrations

		OPEN	CLOSED
Refrigerant side			
High pressure safety pressure switch	bar	623.66	464.12
Safety thermostat against compressor drain overheating	°C	167	239
Water side			
Antifreeze protection	°C	44.6	39.2
High pressure safety valve	bar	87.02	-

Performance tables are based on sea level. Altitudes other than sea level affect the performance of the unit. Decreasing air density reduces condenser capacity and unit performance. The maximum altitude allowed is 1,800 metres.

$$D_Q = A_Q \cdot p^2 + B_Q \cdot p + C_Q$$

$$D_\eta = A_\eta \cdot p^2 + B_\eta \cdot p + C_\eta$$

$$(CF_Q)_{P=P_{test}} = 1 + \left(\frac{Q_{\%Load}}{Q_{100\%}}\right) \cdot (D_Q - 1) \cdot exp\{-0.35 \cdot [(D_\eta \cdot \eta_{test,100\%}) - 9.6]\}$$

$$(CF_\eta)_{P=P_{test}} = 1 + \left(\frac{Q_{\%Load}}{Q_{100\%}}\right) \cdot (D_\eta - 1) \cdot exp\{-0.35 \cdot [(D_\eta \cdot \eta_{test,100\%}) - 9.6]\}$$

$$Q_{corrected,application} = \frac{Q_{corrected,standard}}{(CF_Q)_{P=P_{rating}}}$$

$$\eta_{corrected,application} = \frac{\eta_{corrected,standard}}{(CF_\eta)_{P=P_{rating}}}$$

Measurement unit for P	Capacity DQ			Efficiency Dn			Atmospheric Pressure Corresponding to Altitude
	AQ	BQ	CQ	An	Bn	Cn	P
Value	0.001127	-0.04127	1.36304	0.002431	-0.09008	1.79872	According to the actual values; you can refer to the comparison table.

Q _{standard}	Capacity at sea level 0, unit: ton
n _{standard}	Efficiency at sea level 0, unit: Btu/W*h
Q _{correct}	Capacity at sea level P, unit: ton
n _{correct}	Efficiency at a height different than sea level, unit: Btu/W*h

Altitude and Atmospheric Pressure Comparison Table

Altitude (meters)	Altitude (feet)	Atmospheric Pressure (mmHg)	Atmospheric Pressure (psi)
0	0	760	15
500	1640	716	14
1000	3281	674	13
1500	4921	633	12
2000	6562	593	11

$$p_{atm} = p_0 \cdot \left[\frac{T_0}{T_0 + \beta_1 \cdot (Z_H - Z_{H0})} \right]^{\left(\frac{g_0}{\beta_2} \frac{M_0}{R^*} \right)}$$

Where:

$$\beta_1 = -0.00198 \text{ K/ft}$$

$$\beta_2 = -0.0065 \text{ K/m}$$

$$Z_{H0} = 0 \text{ ft}$$

$$Z_H = \text{installation height of the site in feet}$$

$$g_0 = 9.80665 \text{ m/s}^2$$

$$M_0 = 28.96442 \text{ kg/kmol}$$

$$R^* = 8314.32 \text{ J/(K} \cdot \text{kmol)}$$

$$p_0 = 14.696 \text{ psia}$$

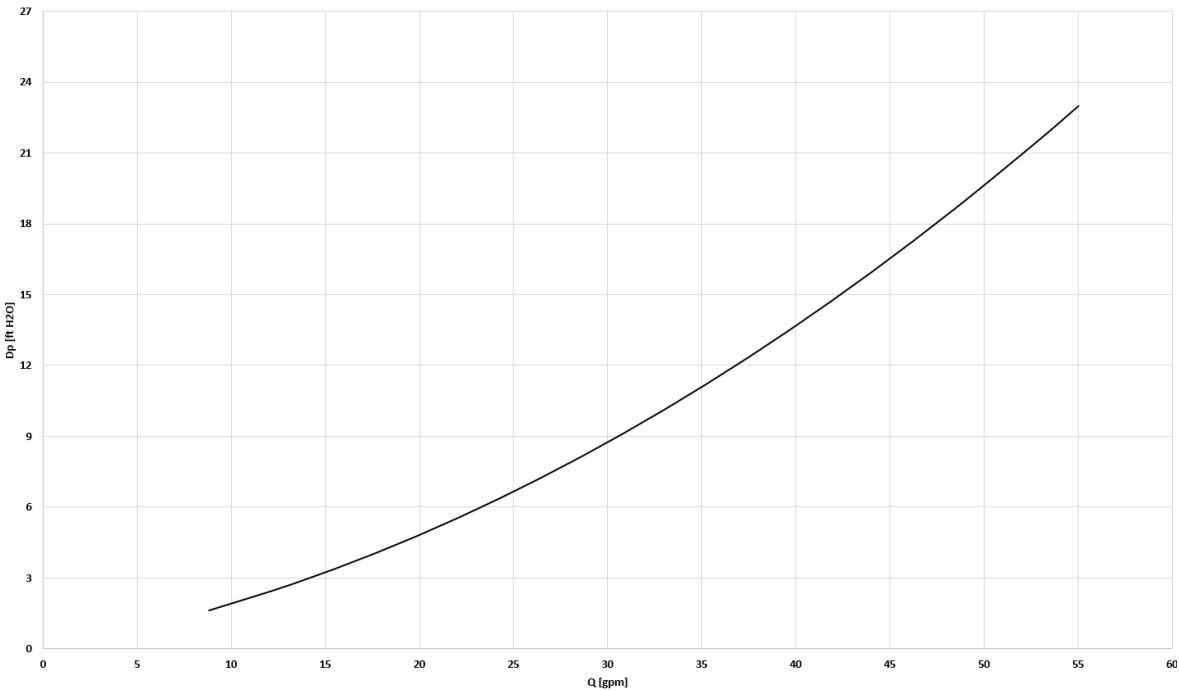
$$T_0 = 288.15 \text{ K}$$

Plate exchanger pressure drops

Size 30.2 has 2" water connections. The recommended hydraulic connection is Victaulic or equivalent.

⚠ Hydraulic connections are not supplied with the unit.

Internal exchanger pressure drop curves



The water side pressure drops are calculated considering an average water temperature of 7°C.
 Q = Water flow-rate[gpm]
 DP = Pressure drops [ft H2O]

⚠ The pressure losses of the internal heat exchanger must also be added to the pressure losses of all the various components in series with the unit, including the steel mesh filter that must be positioned on the water inlet line. This device is mandatory for the correct operation of the unit and is not supplied as standard.

Size	Operating Modes	UNIT WATER FLOW RATE LIMITS (gpm)	
		Min.	Max.
30.2	STANDARD	38.12	57.08
	HIGH TEMPERATURE	17.62	57.08

Accessories - Hydronic assembly

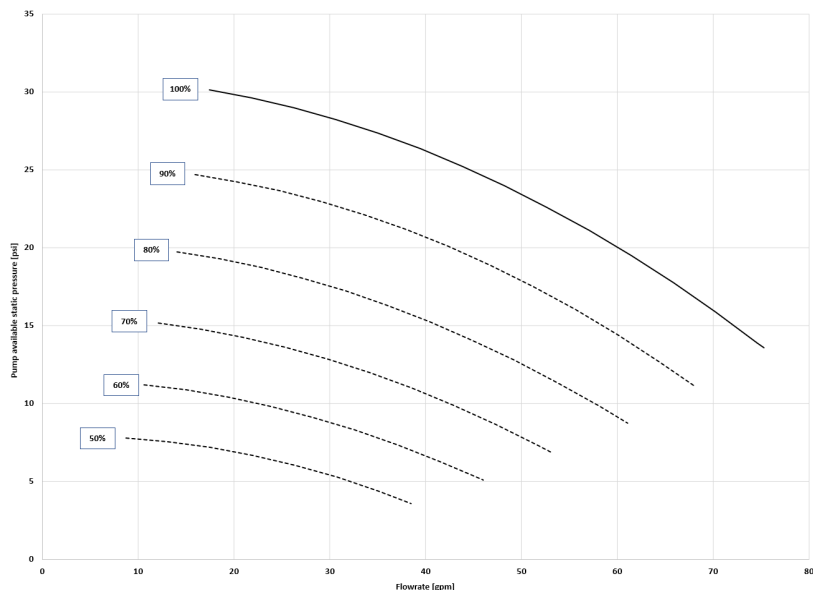
HYGU1VI - Unit with one inverter pump

Configuration with one centrifugal electric pump, adjusted by way of inverter with AISI 304 steel body and impeller. The electric pump is equipped with three-phase electric motor with IP55 protection and complete with heat formed insulating casing.

During installation, it is possible to choose the most suitable head curve for the system by setting the inverter frequency.

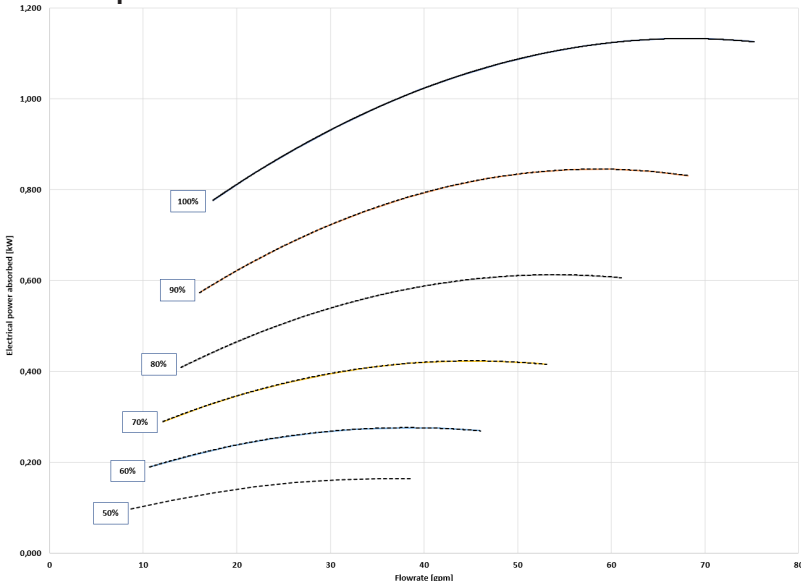
If the maximum frequency is de-rated, the pump will always work at a fixed flow rate. Otherwise by default it will modulate the flow rate according to the thermal jump in accordance with its operating logic.

Head



- ⚠ Caution: to obtain the available pressure values, the heads on these diagrams must be decreased by:
- User side exchanger pressure drops
 - IFWX accessory - Steel mesh filter on the water side (where present)

Power input

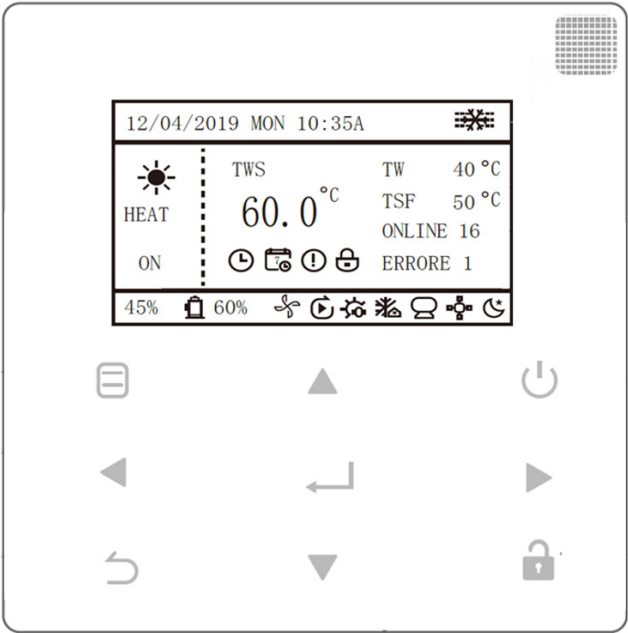


Electrical data

SIZE		30.2
F.L.A.	A	4.8
F.L.I.	kW	1.1

Features and options

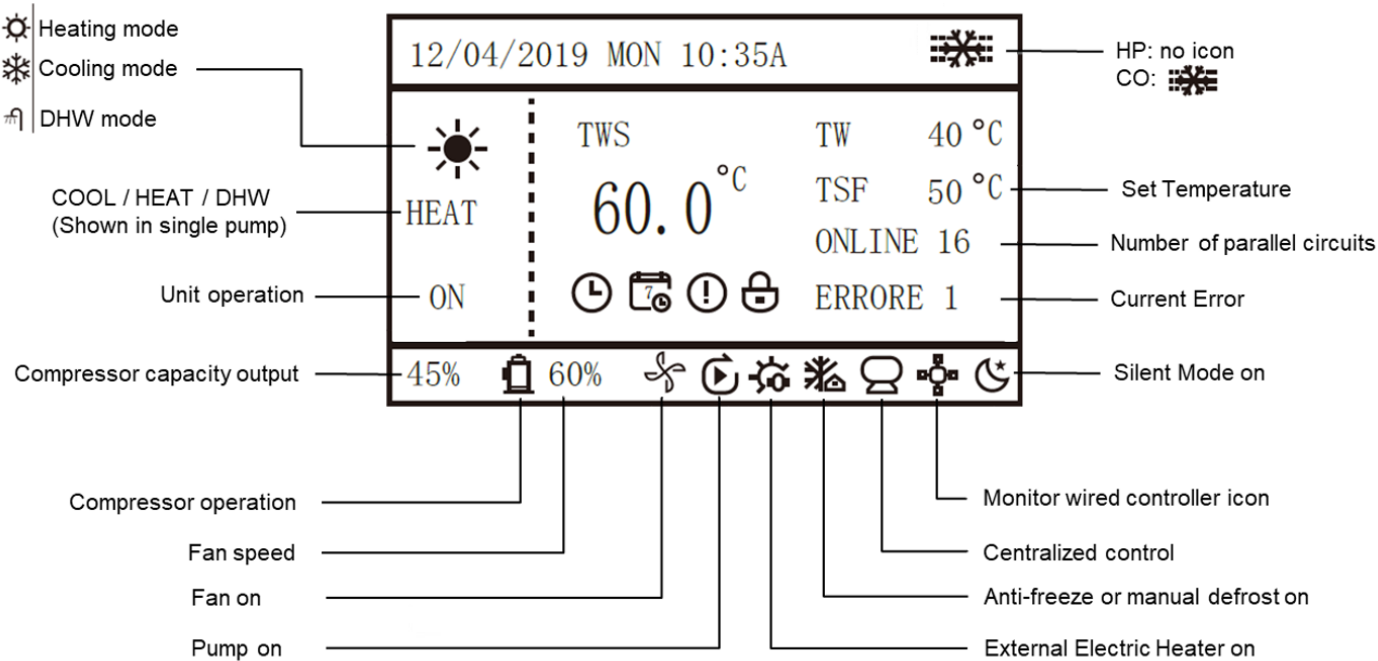
User interface (HMI)



Resolution		1 °F
Temperature sensor		NTC 5k 1%
Power input		< 1 W
Storage temperature		-4÷131°F
Communication		RS485
Wiring	Type	Cavo schermato
	STD length	32.8 ft

A user interface (HMI) is supplied with the unit but must be remote-controlled in an enclosed space protected from the elements. If within 32.8 ft the supplied cable can be used, otherwise the power supply must be via a dedicated power supply unit (supplied) and the communication cable is the responsibility of the installer. Indoor installation HMI IP grade not suitable for outdoor installation.

The user interface comes as standard with 11 selectable languages.



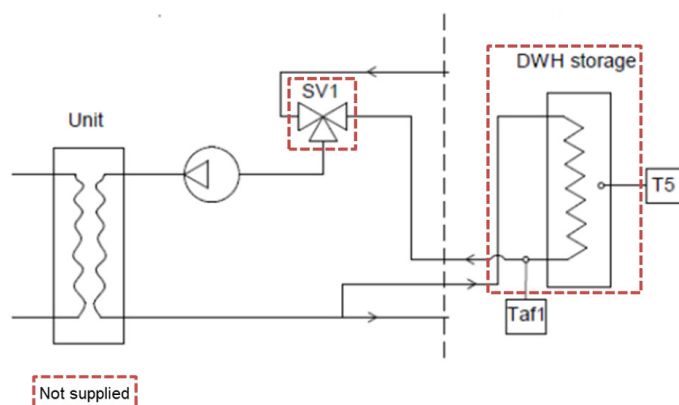
Features and options

DHW management

The unit does not have a three-way valve on board for hot water production.

The valve must be part of the installation and connected consistently with the expected operation.

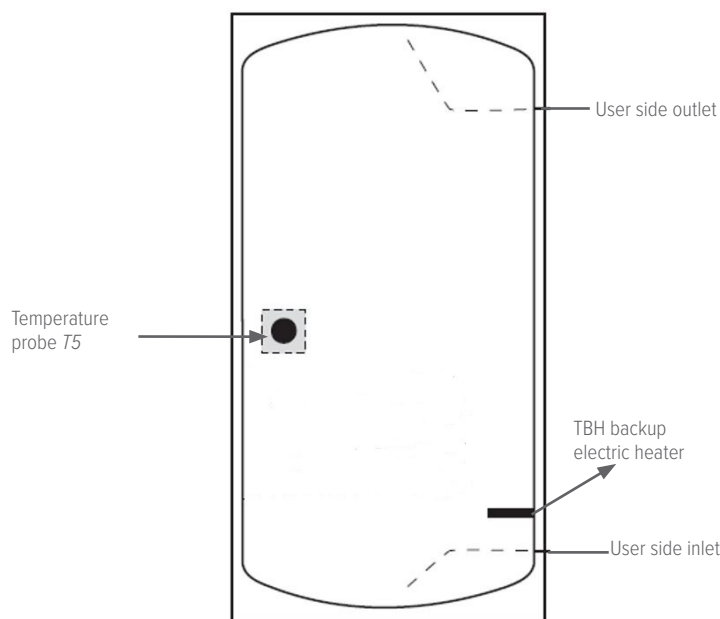
- SV1: three-way valve (not supplied)
- Taf1: temperature probe, for frost protection Domestic hot water (supplied as standard)
- T5: temperature probe, for temperature control and switching between system and DHW



Connection of a DHW boiler

As an option, the unit can be connected to a DHW tank of suitable volume, by fitting the system with a 3-way switching valve controlled by the unit. It is advisable to connect the DHW tank at a distance of no more than 32.8 ft from the unit, and preferably as close as possible to it. The sizing of the connection piping and its thermal insulation must always be considered with care, especially in the case of long distances between the unit and the storage tank.

The standard boiler must have these characteristics:



It is advisable to provide the boiler with a sacrificial anode and integrated backup electric heater, which will be controlled by the unit. Make sure that the coil or intermediate exchanger is properly sized to ensure correct heat exchange.

Double Set-Point function

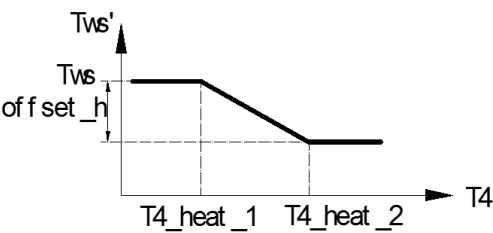
Enables the Double set-point function via the HMI. Once it is enabled, the first target water temperature (SetPoint1) and the second target water temperature (SetPoint2) must be configured. The unit now detects the closed status of the TEMP-SWITCH contact (normally open). If the contact is open, the unit will operate at the first target temperature; if it is closed, it will operate at the second target temperature.

Set-Point compensation function based on the outside air temperature

Allows to enable the temperature compensation function via HMI. Once the function has been enabled, it is necessary to set:

- The two offset points for the outside air temperature (T4_heat/cool_1; T4_heat/cool_1), which will define the outside air temperature range within which the set-point change will take place;
- The offset point for the water production temperature (offset_h / offset_c) which represents the maximum permissible set-point variation. As a result, the unit will update the set-point periodically according to the calculation cycle of the offset function.

Example of temperature compensation in heating mode

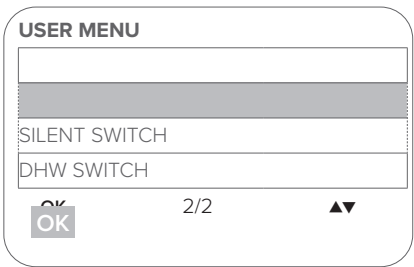


- When the ambient temperature (T_4) is lower than the offset temperature ($T_4 < T_{4_Heat1}$), the set-point stays the same.
- When the ambient temperature (T_4) is between the two offset temperatures ($T_{4_Heat1} \leq T_4 < T_{4_Heat2}$), the set-point is reduced in direct proportion to the ambient temperature rise.
- When the ambient temperature (T_4) is higher than the highest offset temperature ($T_4 \geq T_{4_Heat2}$), the greater the reduction will be in the set-point temperature.

SILENT function

This mode enables the selection of various acoustic modes, for maximum sound configurability of the units. Four muted functions are available with fixed scheduling, or a further two continuously muted functions. Silent mode can be activated via HMI and via BMS.

To select the mode of interest, simply set it from the HMI through the User menu as shown in the following screen.



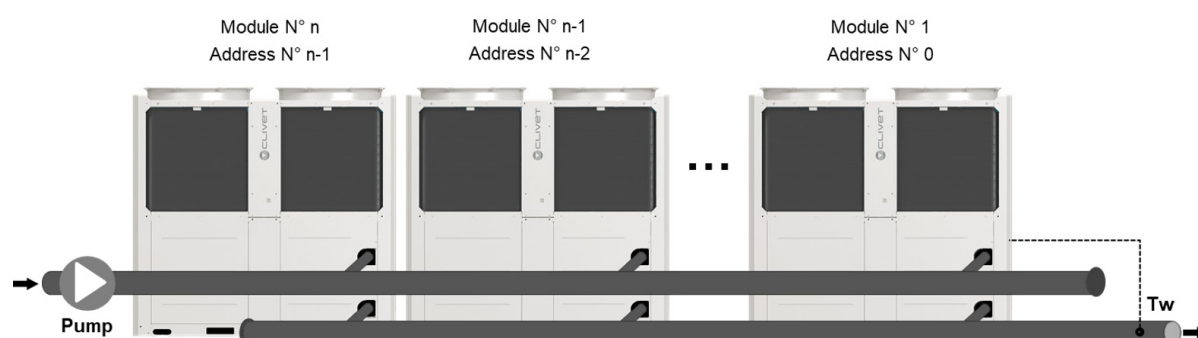
Modularity and management of cascade units

Modularity

Many applications require drives to be installed as back-up to the main system or have loads that can change significantly during annual operation.

In this mode, up to eight units can be operated in a cascade format without any additional accessories.

Please refer to the operation and maintenance manual for connection of modular units. Each connected module is identified by an address, from 0 to 15: the Master unit is identified as 0. The complete control of the system (including auxiliary elements such as external pumping system and auxiliary generator) is managed by the Master unit.

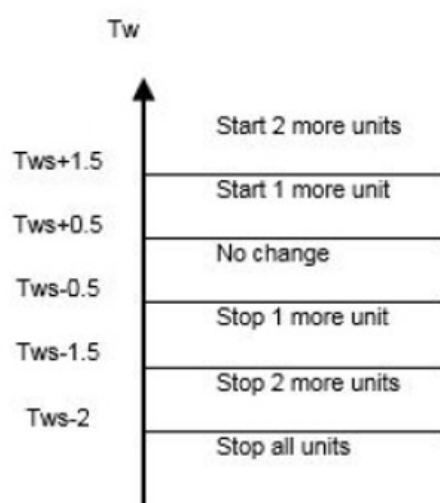


Operation

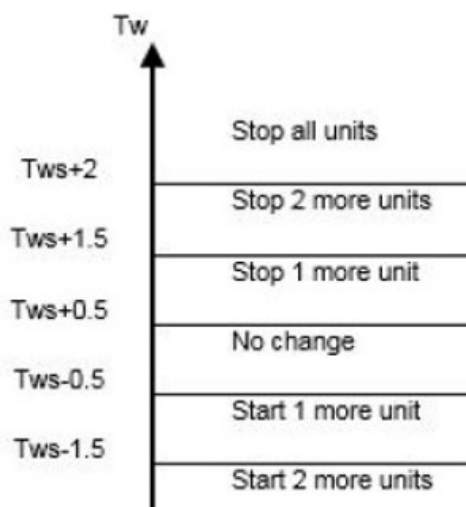
The Master unit calculates the required heating/cooling capacity of the system based on the water delivery temperature and the temperature set-point. Instead, each individual unit calculates its required heating/cooling capacity based on the delivery and return temperatures. The activation of the units takes place according to the last in first out logic (the last unit to be activated will also be the first to be deactivated) and is indicated in the following two figures.

- T_w = Water supply temperature
- T_{ws} = Water supply temperature set-point

Cooling mode



Heating mode



In cooling mode, if $T_w \geq T_{ws}-10^\circ\text{C}$, 50% of the units in the system are activated, otherwise one unit at a time starts. In heating mode, if $T_w \leq T_{ws}-10^\circ\text{C}$, 50% of the units in the system are activated, otherwise one unit at a time starts. After having satisfied the system load and having deactivated the units, at the next start-up the first unit to have been deactivated will be the first to be started, in order to guarantee the correct balancing of the operating hours. The Master unit does not participate in the rotation but is always the first to be started.

DHW (Domestic Hot Water) settings and management

The unit is designed to be coupled to DHW storage boilers (HMI-enabled), connected with the T5 probe. To switch from system operation to DHW production, the system will first be stopped and then it will switch to DHW.

There are two conditions checked prior to DHW production start-up:

CONDITION 1 that the T5 temperature measured by the DHW water tank is higher than the minimum value for DHW production start-up and lower than the minimum value between the DHW water tank set-point temperature and the maximum temperature that the unit can ensure at a given outdoor temperature, net of the temperature delta for DHW production start-up by default at 46.4 °F.

CONDITION 2 that the outlet temperature from the unit is lower than the minimum value between the DHW water tank set-point temperature and the maximum supply temperature that the unit can ensure at a given outdoor temperature, all reduced by default by 35.6 °F.

DHW production is stopped if:

- The domestic hot water mode is stopped from the HMI
- The T5 temperature measured is higher that the minimum value between the DHW water tank set-point temperature and the maximum temperature that the unit can ensure at a given outdoor temperature
- The T5 temperature measured is lower than the minimum DHW production start-up value
- The Two outlet temperature from the unit is higher than the minimum value between the maximum supply temperature that the unit can ensure at a given outdoor temperature and the target set point of the unit increased by 35.6 °F

DHW SWITCH

SELECT ADDRESS	◀ 11 ▶ #
DHW SWITCH	◀ YES ▶
DHW FIRST	◀ YES ▶

0001020304050607

0809101112131415

OK

▲▼◀▶

Modularity and management of cascade units

Installation with multiple pumps on the system

In a system with multiple pumps, both master and slave units must be configured separately for DHW operation, and therefore DHW production must be set as priority. The DHW priority is configurable on the following menu screen:

- **DHW production priority**
Once the DHW priority is set, if the unit is in stand-by, CONDITION 1 is considered and if this is verified, domestic hot water production is started, otherwise the unit is started to fulfil the load of the system.
If CONDITION 1 is verified when the unit has exceeded the minimum system side operating period, then DHW production is started, otherwise activation of the TBH backup heater is considered and DHW production only switches to the heat pump after the minimum system side operating period and CONDITION 1 are fulfilled.
- **No DHW production priority**
If no DHW priority has been set, the unit is started directly to fulfil the load of the system, and only after the minimum system side operating time has elapsed is CONDITION 1 considered.
If this is fulfilled, DHW production is started, otherwise activation of the TBH backup heater is considered and DHW production only switches to the heat pump after CONDITION 1 is fulfilled.

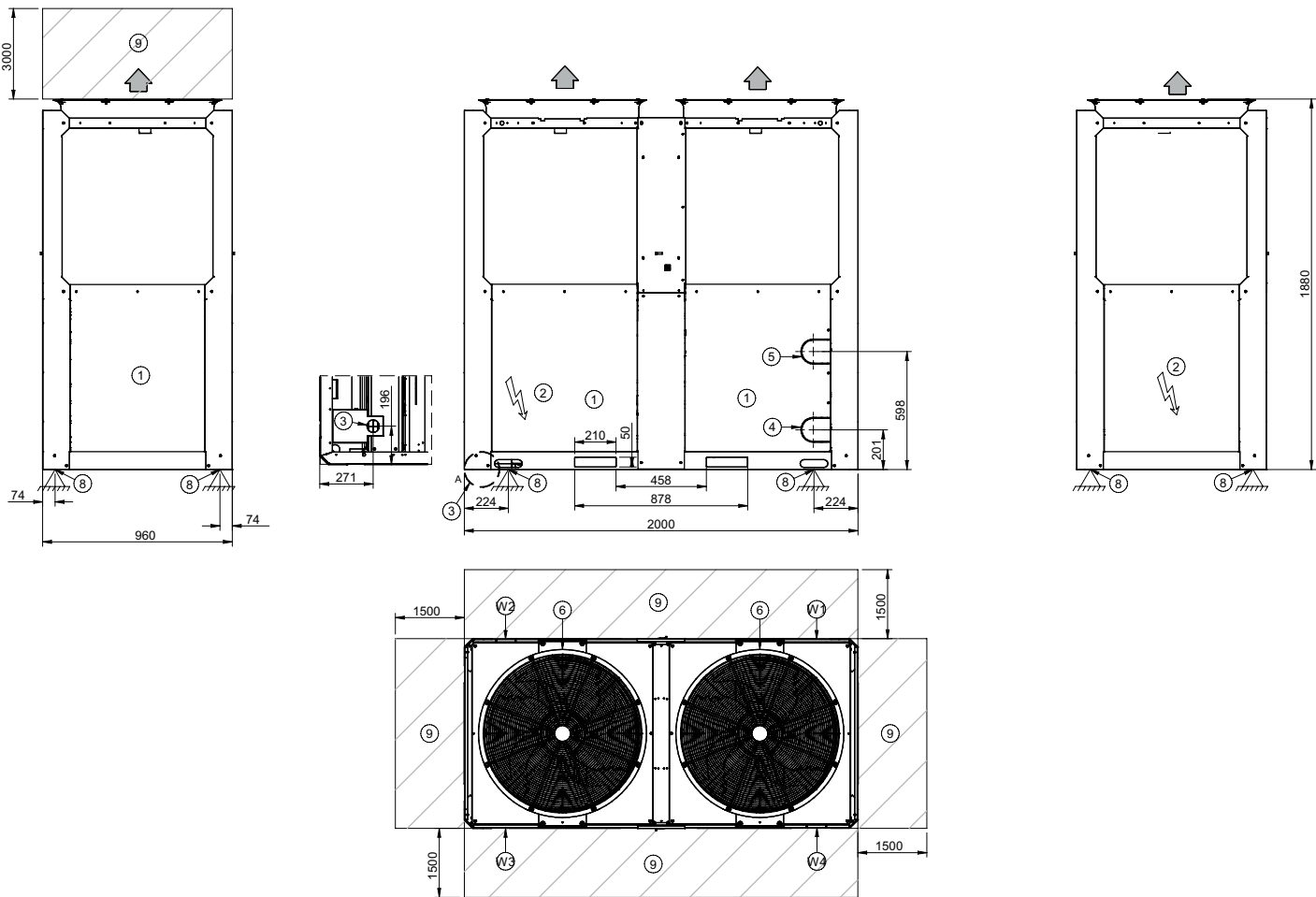
Caution: In DHW production mode, the compressors only start if the DHW tank temperature is above a minimum threshold (see table). To prevent the temperature from dropping below the minimum threshold, it is advisable to install an electric backup generator on the DHW storage tank.

T outdoor	T5	compr.	backup heater
75.2°F < t.o ≤ 86°F	< 59°F	OFF	ON
75.2°F < t.o ≤ 86°F	≥ 59°F	ON	OFF
t.o > 86°F	< 68°F	OFF	ON
t.o > 86°F	≥ 68°F	ON	OFF

The maximum supply temperature threshold of the system varies depending on the outdoor air temperature. The maximum value that can be set for T5S (DHW set-point) is 41° F lower than the maximum set-point that can be achieved by the unit to consider heat exchange.

Dimensional drawings

SIZE 30.2



1. Technical compartment

2. Electrical panel

3. Power input

4. Inlet water connection 2" (Vactaulic not supplied)

5. Outlet water connection 2" (Vactaulic not supplied)
6. Fan

7. Souce exchanger

8. Unit fixing holes

9. Functional clearances

SIZE		30.1
Length	mm/inch	2000 / 78.74
Depth	mm/inch	960 / 37.80
Height	mm/inch	1880 / 74.02
W1 Supporting point	kg / lbs	135 / 298
W2 Supporting point	kg / lbs	135 / 298
W3 Supporting point	kg / lbs	135 / 298
W4 Supporting point	kg / lbs	135 / 298
Operating weight	kg / lbs	541 / 1193
Shipping weight	kg / lbs	565 / 1246

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