ECOLITE

To offer eco-friendly HVAC&R products for a greener tomorrow.

ECRA-E Series

Modular Air Cooled Scroll Chiller

STANDARD REFRIGERATION & ENGINEERING CO., LTD.
立 德 工 程 有 限 公 司
香港液體氣(集團)有限公司 附屬機構

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Ecolite Cooling Technologies Co., Ltd. was originally incorporated in Hong Kong

as a consulting company providing energy savings solutions for efficient energy

management. Now Ecolite has made a business breakthrough from green solutions

to green products supplier. With world leading technology and guaranteed energy-

saving policy, Ecolite Cooling provides incomparable energy-efficient and zero-

emission HVAC&R products to the world market since its creation in 2016.

ECOLITE created the first modular chiller in Melbourne, Australia in 1985. This is a great invention with state-of-the-

art design of the 20th century, featuring energy saving, reliability and flexibility. Users all over the world benefit greatly from ECOLITE's modular air conditioning technology. For decades, ECOLITE continues to provide reliable products and professional services. We are undoubtedly the inventor and leader of modular oil-free technology.

STABLE AND RELIABLE

◎ **Modular Design**

Original modular technology allows for maximum 8 (MSRA130C) or 16 (MSRA065C) Slave Output modules for a chiller bank.

◎ **Compressor Balance Operation**

A compressor is scheduled to operate based on its accumulated running hours to improve its life span.

◎ **Compressor Anti-slug**

Compressors come with oil heaters to be better lubricated when the chiller is idle in winter, making sure that liquid refrigerant can be separated from refrigeration oil to avoid damage caused by liquid slugging at chiller start-up.

INTELLIGENT CONTROL

◎ **Auto Alarm**

The Controller automatically detects Chiller malfunction and displays error codes to help fast troubleshooting.

◎ **Auto Reset**

Faults that are not damaging to the Chiller can be automatically reset and cleared when system data recover.

◎ **ModBus Supported**

Chiller comes with RS485 serial port for connection to Building Management System through ModBus.

◎ **Power Failure Recovery (PFR)**

In the event of power failure, the chiller will automatically resume the last session when power is restored.

◎ **Timer Function**

Timers for days of a week, cycle timer and single timer are available to satisfy users' needs.

High Efficiency Scroll Compressor
features compact structure, low noise & vibration, and high reliability.

"V" Structured Air Side Heat Exchanger
uses rifled tubes to increase heat transfer surface and enhance airflow disturbance, and improve heat transfer efficiency; flat "V"design improves condensed water drainage, reduces risk of frost & ice blockage and increases heat transfer.

High Efficiency Water Side Heat Exchanger
uses shell & tube design and optimized baffle plates,which improve heat exchange between refrigerant and water, with good liquid separation, reliable oil return, high efficiency of heat transfer, stable quality and easy maintenance.

Low-noise Fans
to be axial type with 3 or 5 blades to reduce noise. One-piece air baffle ring is employed to regulate axial direction of airflows and ensure low-noise operation.

Capacity Control
The use of hermetic scroll compressors enables each module to have multiple independent refrigerant systems. Capacity stages (0-25%-50%-75%-100%) are realized by adjusting the number of compressors running.

The C3 computer monitors the chiller's operation and schedules the on and off of each compressor and capacity control stages with respect to the change in load demand. The computer continuously and comprehensively monitors the total operation of all modules in the chiller bank. It will also shut down individual module or the entire bank in the event that a fault occurs. A maximum of 32 refrigeration circuits (16 modules) can be monitored at one time. Each controller can drive two EXVs with built-in EXV control outputs. Thanks to the advanced PID adjustment, the controller's built-in EXVs actuator ensures optimum thermal performance of the refrigeration system.

SYSTEM DATA AND VARIABLES DISPLAY
The controller's LCD display can not only display the chiller's operation data but also provides direct access to all of the chillers setting and variables for total system control.

Chiller operation status	Module operation status	Chiller variables settings
Current working mode	Current module	Password
Chilled water temperature	Current active compressors	Required chilled water temperature
Number of online modules	Exv temperature	Module address
Current fault modules	Compressor suction temperature	Modules number
Number of active compressors	Fin temperature	Compressor number per module
Number of require compressors	Chilled water leaving temperature	Working mode
Current active compressors	Faults status	Temperature integrating time
Current set point	Compressor working hours	Temperature proportional band
etc.	EXV monitoring	Load / unload time delay
	etc.	Time and date
		etc.

COMPRESSOR SEQUENCE
The C3 controller accumulates the running hours of each compressor and hence establishes working sequence. A standby compressor with the least working hours will be activated during loading. The same goes for a compressor with the most working hours will be stopped during unloading. This ensures each compressor in the system has an even usage, which will save you time and money in the long run for maintenance.

CONDENSER FAN MANAGEMENT
The C3 controller has two digital outs and one analog out for each refrigeration circuit. You can choose step control or inverter control for the condenser fans.

FAULT PROTECTION
The C3 controller continuously and comprehensively monitors the total operation of all modules in the chiller bank. It will also shut down individual module or the entire chiller system in the event that a fault occurs. System faults include: low chilled water flow, low chilled water leaving temperature, low suction pressure, high discharge pressure, high discharge temperature, external interlock fault/protection, etc.

FAULT REVIEW
The controller will record and display the last 60 faults that occurred, giving detailed information such as time, date, location, cause, and current status.

PASSWORD PROTECTION
A two level password protection is included (for both service and manufacture personnel) to give you piece of mind. For example the manufacture password will give you full access to settings and variables in manufacture menu and service menu, but the service password will only enable the user to change settings and variables in service menu.
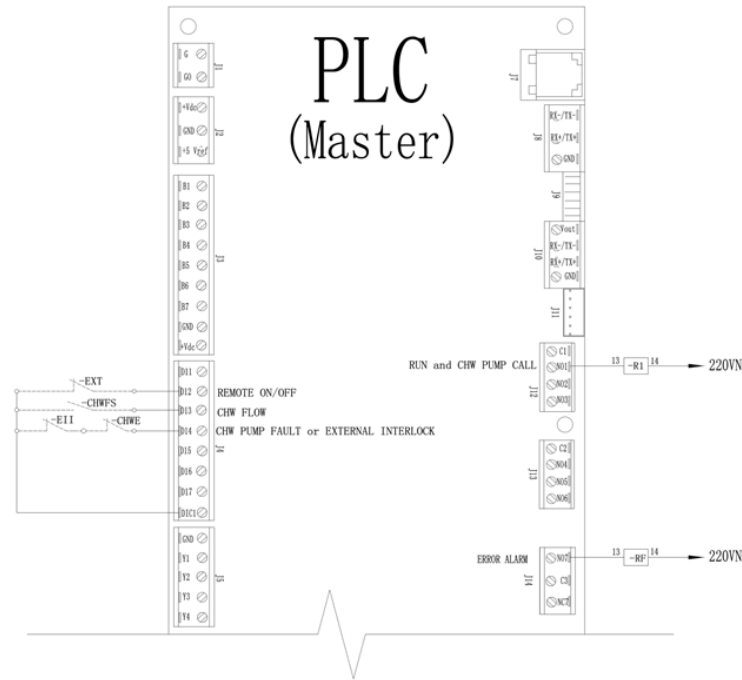
C3 CONTROL

OFF LINE CONTROL
When the slave module is off line, it will be controlled by its own chilled water leaving temperature and operates independently.

REMOTE CONTROL & MONITORING (OPTIONAL)
Connection to BAS is done via Modbus RTU or BACnet IP communication protocol. An optional serial or Ethernet card will be fitted on the system board.

Diagram of external interlock contacts connecting to Master PLC

External Interlock Devices:
CHWFS Chilled water flow switch, verifying water flow;
CHWE Chilled water pump fault signal;
EII External interlock signal;
EXT External remote start/stop input;

Volt-free Output Contacts:
System control board provides 3 volt-free output contacts.
RF Chiller fault status output;
R1 Chiller running status output;
R1 Chilled water pump running signal output;

Field Wiring:
—— Control wiring to be at least 1mm^2 ;
—— Over bridge the input signal terminals DI2 and DI3 to common terminal DIC1 as per wiring diagram if EXT and EII are not used;
—— Volt-free contacts have a maximum current rating of 5A;
—— Flow switch and external interlock devices are supplied by users or bought from ECOLITE;
—— Solid lines indicate factory wiring and dotted lines for field wiring

MODEL NUMBER DESIGNATION

ECRA	065	C	G	S	A	--	6
1	2	3	4	5	6		7

1 — Ecolite Modular Scroll Air Cooled   ECRAS :Remote Condenser

2 — Model Number

3 — Chiller Type C: Cooling Only

4 — Refrigerant Type G: R410A

5 — Heat Exchanger Type: Shell and Tube

6 — Electrical Specification A: AC380/415V-3Ph-50Hz   B: AC380/415V-3Ph-60Hz
                                                    C: AC440/460V-3Ph-60Hz

7 — Number of modules per chiller (Max. 16)

Working Conditions & Limits

Leaving Water Temp. Range: Cooling 5~15℃,

Working Conditions: Cooling 13~43℃

Chiller Model			ECRA065C	ECRA090C	ECRAS130C	ECRA390C
			R410A	R410A	R410A	R410A
General	Nominal Cooling Capacity	KW	63.0	96.3	110.0	390.0
	Nominal Power Input	KW	21.0	32.6	40.4	121.5
	COP at Full Load	KW/KW	3.00	2.95	2.72	3.21
Compressor	Type		Hermetic Scroll			
	No. Of Comressors		2	3	2	6
	Power Supply		AC380V/50Hz/3Ph, AC400V/50Hz/3Ph			
	Startup Current per Comp.	A	124	124	124	210
	Full Load Ampere per Comp.	A	20.8	20.8	20.8	43.1
Control Stages			0,50%,100%	0, 33%, 66%,100%	0, 25%,50%, 75%,100%	0, 17%,33%,50%, 67%,83%,100%
No. of Refeigerating Circuit			2	3	2	6
Refrigerant Charge		Kg/Circuit	7.0	7.5	18.0	15
Evaporator	Type		Shell and tube			
	Rated Water Flow	L/S	3.0	4.6	4.8	18.3
	Pressure Drop	kPa	54	60	28	68
	Fouling Factor	m²·K/kW	0.018			
	Max Working Pressure Water Side	MPa	1	1	1	1
Condenser	Condenser Type		Fin Tube Heat Exchanger			
	Type of Fan		Axial Flow			
	No. of Fan		2	2	2	6
	Power Input per Fan	kW	0.75	2.2	2.2	2.2
	Air Flow	m³/h	13500x2	25000x2	25000x2	25000x6
Physical Data	Connection Size		DN50	DN65	DN65	Dn125
	Operating Weight	Kg	700	1110	1250	3670
	Shipping Weight	kg	660	1150	1210	3550
	Length	mm	1800	2240	2240	3900
	Width	mm	900	1200	1200	2240
	Height	mm	1960	2250	2250	2365
No. of Modules per Chiller		N	16	16	16	5

*Based on standard conditions:
12-7°C Evaporator entering and leaving temperature
35°C Ambient Temperature (For Air cooled Chiller Only)
**Apply for sizing main cables.

Since Multistack has a policy of continuous product improvement, it reserves the right to change design and specification without notice

ECRA065C R410A

Ambient Air Temp. °C	Leaving Chiller Water Temperature (°C)									
	6		7		8		10		12	
	CAP	PI	CAP	PI	CAP	PI	CAP	PI	CAP	PI
25	70.6	17.5	71.8	17.5	73.6	17.6	77.2	17.6	80.7	17.7
30	66.5	19.2	67.6	19.2	69.3	19.2	72.9	19.2	76.3	19.3
35	61.8	21.0	63.0	21.0	64.5	21.0	68.1	21.0	71.4	21.0
40	56.7	23.1	57.8	23.1	59.4	23.1	62.7	23.0	65.9	23.1
45	51.0	25.2	52.0	25.2	53.5	25.2	56.5	25.2	59.7	25.2

ECRA090C R410A

Ambient Air Temp. °C	Leaving Chiller Water Temperature (°C)									
	6		7		8		10		12	
	CAP	PI	CAP	PI	CAP	PI	CAP	PI	CAP	PI
25	107.9	27.6	109.7	27.6	112.5	27.7	118.0	27.7	123.3	27.8
30	101.6	29.9	103.3	29.9	105.9	30.0	111.5	30.0	116.7	30.1
35	94.5	32.6	96.3	32.6	98.6	32.6	104.0	32.6	109.1	32.6
40	86.7	35.6	88.4	35.6	90.8	35.6	95.8	35.5	100.7	35.6
45	78.0	38.7	79.6	38.7	81.8	38.7	86.3	38.7	91.2	38.7

ECRA130C R410A

Ambient Air Temp. °C	Leaving Chiller Water Temperature (°C)									
	6		7		8		10		12	
	CAP	PI	CAP	PI	CAP	PI	CAP	PI	CAP	PI
25	143.8	35.3	146.3	35.3	150.0	35.4	157.3	35.4	164.4	35.6
30	135.5	38.4	137.7	38.4	141.2	38.5	148.6	38.5	155.6	38.6
35	126.0	42.0	128.4	42.0	131.5	42.0	138.7	42.0	145.5	42.0
40	115.6	46.0	117.8	46.0	121.1	46.0	127.7	45.8	134.3	46.0
45	104.0	50.1	106.1	50.1	109.0	50.1	115.1	50.1	121.6	50.1

ECRA390C R410A

Ambient Air Temp. °C	Leaving Chiller Water Temperature (°C)									
	6		7		8		10		12	
	CAP	PI	CAP	PI	CAP	PI	CAP	PI	CAP	PI
25	431.4	105.9	438.9	105.9	450.0	106.2	471.9	106.2	493.2	106.8
30	406.5	115.2	413.1	115.2	423.6	115.5	445.8	115.5	466.8	115.8
35	378.0	126.0	385.2	126.0	394.5	126.0	416.1	126.0	436.5	126.0
40	346.8	138.0	353.4	138.0	363.3	138.0	383.1	137.4	402.9	138.0
45	312.0	150.3	318.3	150.3	327.0	150.3	345.3	150.3	364.8	150.3

CORRECTION FACTOR TABLE

Water Pressure Drop Correction Curve for heat exchanger at various water flow
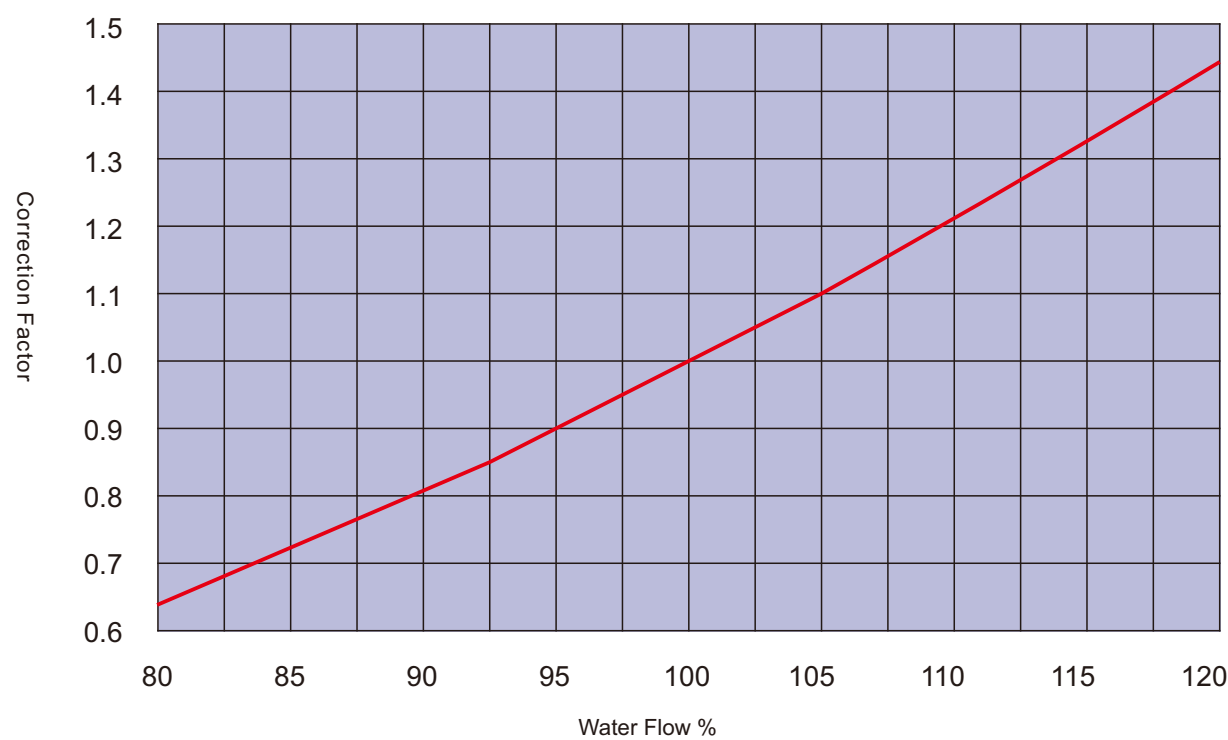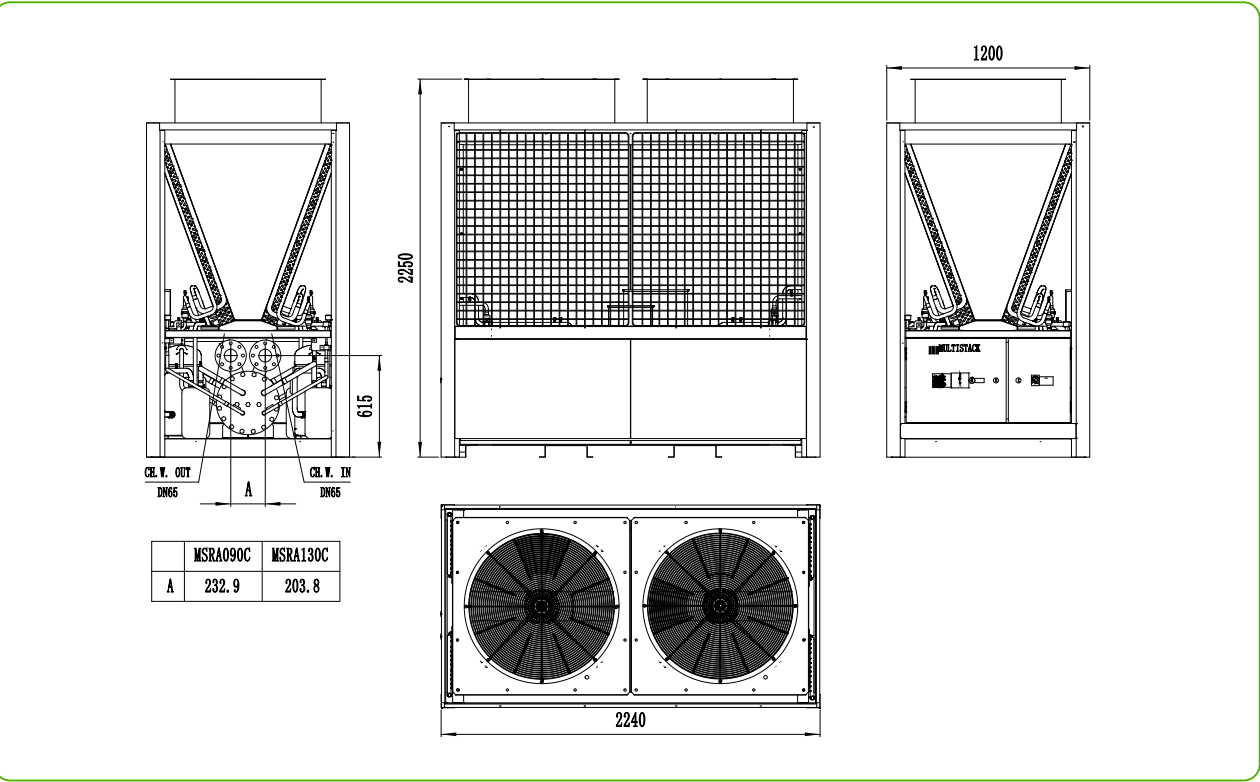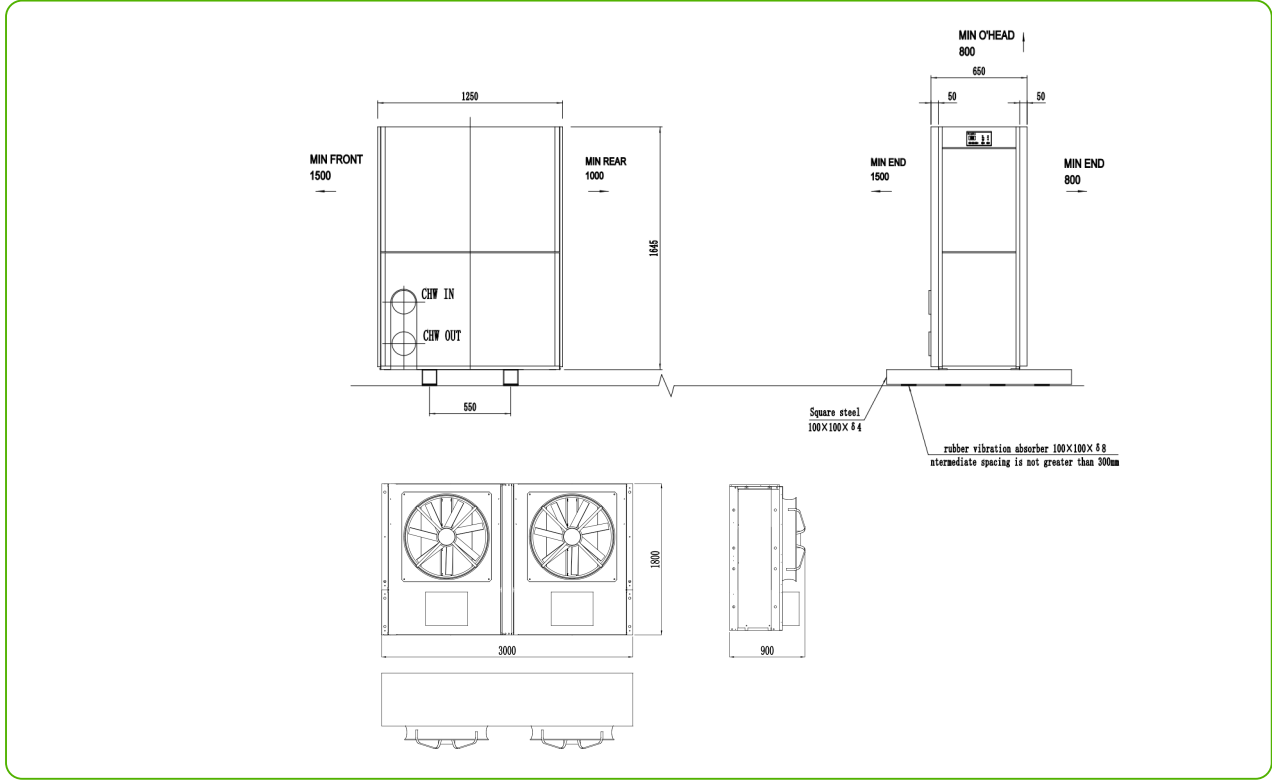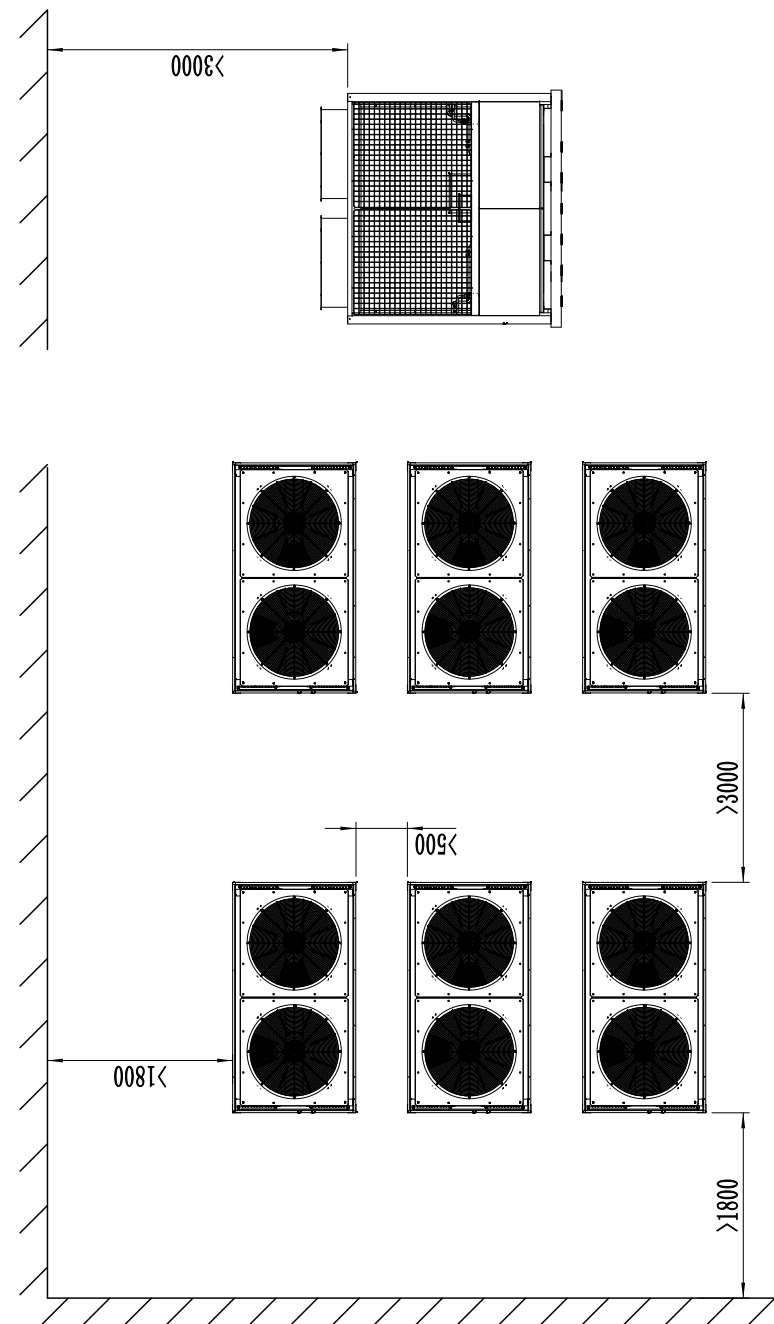

ECRA065C
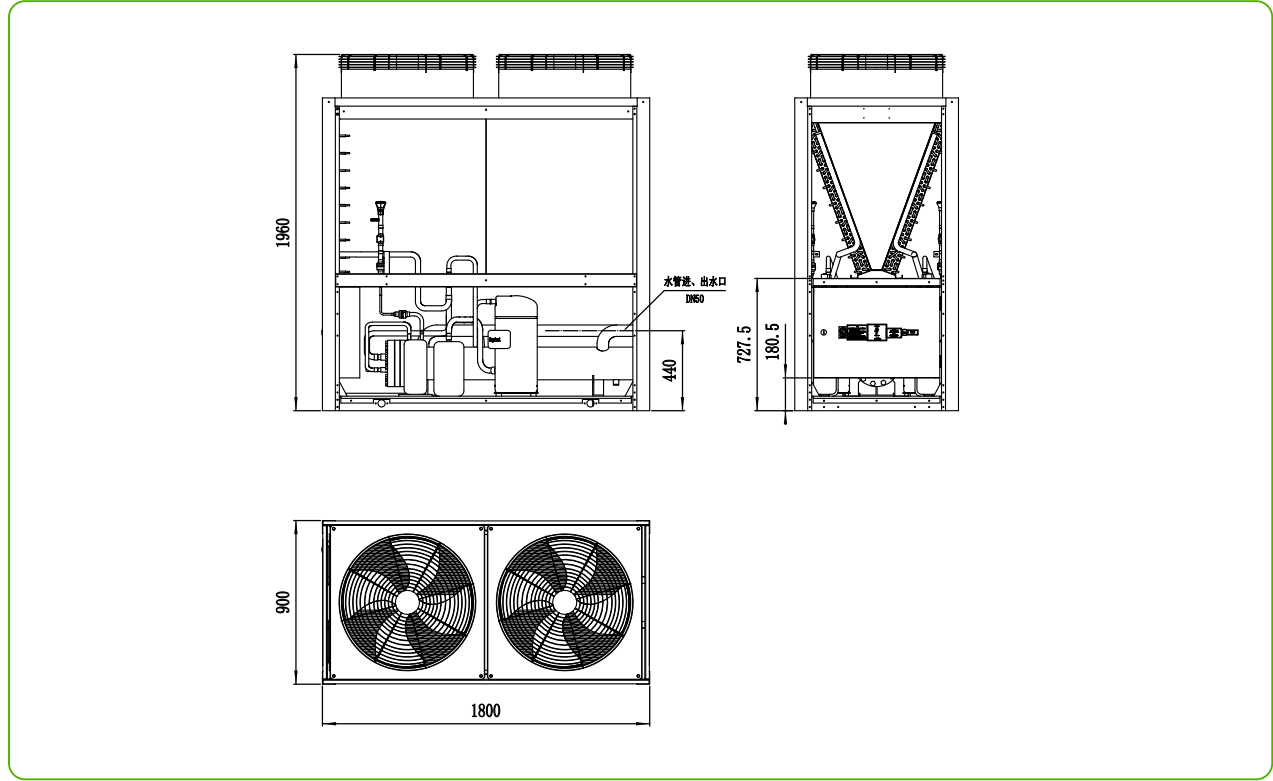
PHYSICAL DIMENSIONS

ECRA090C/130C

|	MSRA090C	MSRA130C
A	232.9	203.8

ECRAS130C

CHILLER LAYOUT

1. The chiller should be installed in clean and well-lit places with good ventilation, drainage and piping, such as the rooftop, balcony or courtyard, where there is no oil fume, steam or other heat sources and will not be adversely affected by the noise and cooling/heating air from the chiller.
2. Plant room should size as below to ensure ample space for maintenance and ventilation. No obstructions are allowed in the service clearances. Surrounding walls must not be higher than the bottom of the fan coils. Overhead of chiller should be minimum 3 meters to avoid short air circuit.
3. Air inlet of the chiller should, as possible, avoid paralleling with monsoon (mainly winter monsoon).
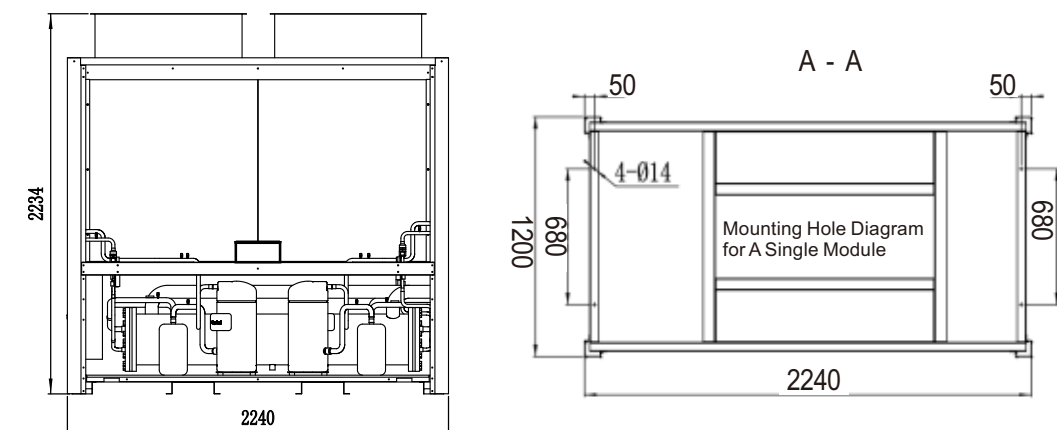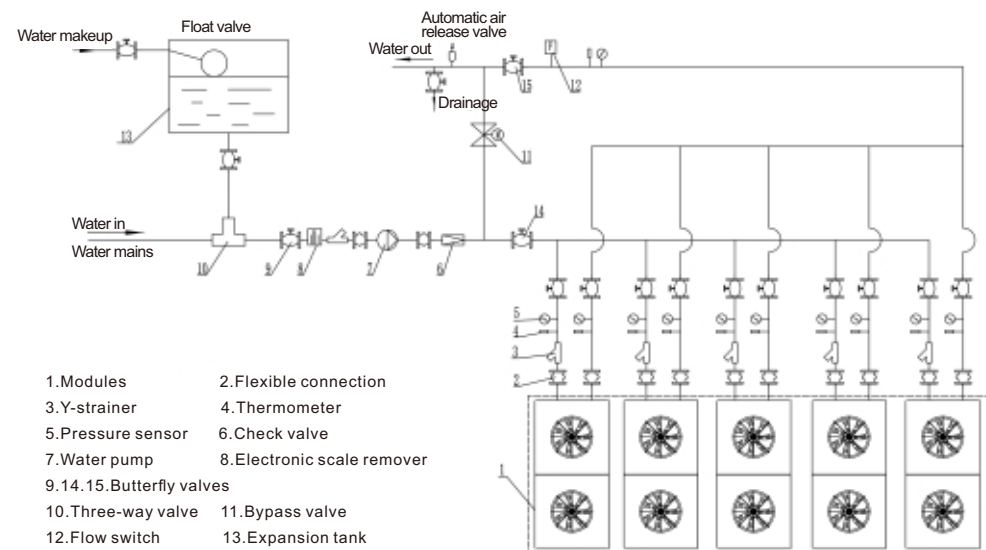
ECRA065C
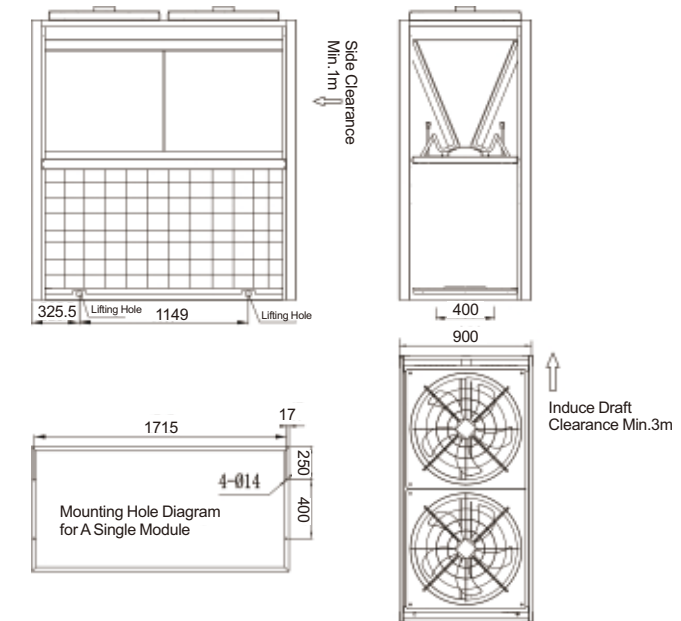
ECRA090C/130C

Technical Requirements:
1. Construction shall be done as required;
2. Concrete base should be casted on cement floor on the rooftop or ground;
3. Chiller should be bolted to the square steel (M12, ≥4.8). Tightening torque should be 10 N·M.

Rigging

1. Hand pallet truck or fork lift can be used to lift up the chiller.
2. Be careful to handle the chiller when using a crane. Wide lift slings or wire ropes can be used to bind the chiller through the lift points at the corners of the base of the chiller and corner protectors should be applied between the wire ropes and the chiller for protection. The wire ropes should wind around the hook to secure the chiller in case of turnover.
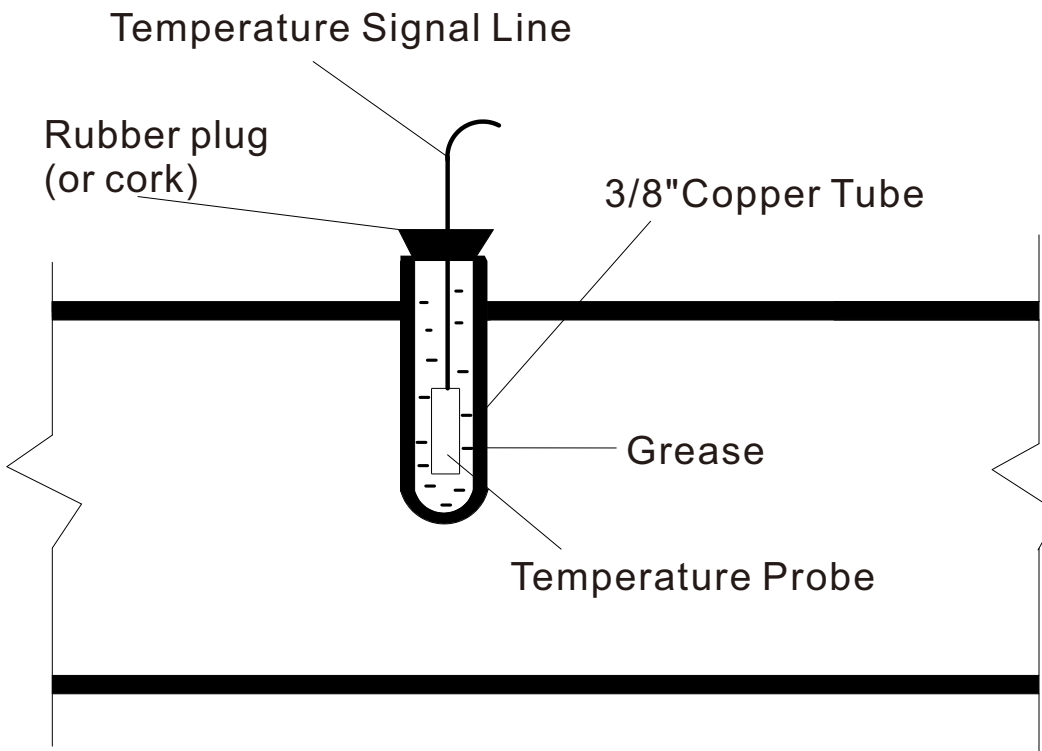
1. Water inlet/outlet headers and valves should be properly insulated. Outdoor part should be protected with enclosure to avoid damage to the structure of the building caused by cooling/heating energy loss and condensation and prevent chilled water from freezing in winter.
2. A flow switch should be installed in water outlet to ensure sufficient water flow in the heat exchangers and piping system. The flow switch should also interlock with the water pump and compressor to prevent the evaporator from freezing due to water shortage.
3. Expansion tank for water return should be installed for the closed-loop water system to absorb impacts on the piping system caused by water expansion/contraction. Water level of the expansion tank must be at least one meter higher than the highest point of the pipelines. Do not install check valve in the outlet of the expansion tank in case of pipe leakage or burst.
4. If the water pump discharge pressure exceeds the pressure limit of the chiller, water pump should be installed on the outlet side of the chiller; if the chiller and the auxiliary heater are in serial connection, water pump should be installed on the inlet side of the auxiliary electric heater.
5. Automatic air vents should be installed on the local high points of the piping system to eliminate entrapped air in water lines. Horizontal piping should have a slope of 1:250 upwards. 20~50 meshes strainer should be installed in water inlet. The water lines should be cleaned of impurities such as rust and welding slag prior to installation. And the chiller should also maintain clean before operation.
6. The weight of water pipes should not bear on the chiller. Flexible or rubber connections should be employed when the water pumps are connected to the water inlet/outlet of the chiller in case of vibration and noise transmission and interferences.
7. Temperature and pressure sensors should be installed in water inlet/outlet for regular operation check.
8. Underground water, hard water or other waste water should not be used in the circulating water system of the chiller. PH-level of circulating water should be within 6.8~8.0 and GH number should not exceed 70. Regular water quality tests are required to ensure water quality.
9. Piping for two or more modules must be arranged in equal distance.
10. Diagram below is for reference only. Construction must be carried out by qualified personnel as per relevant standards and design requirements.

Water makeup | Float valve | Automatic air release valve | Water out | Drainage
Water in
Water mains

1.Modules   2.Flexible connection
3.Y-strainer   4.Thermometer
5.Pressure sensor 6.Check valve
7.Water pump   8.Electronic scale remover
9.14.15.Butterfly valves
10.Three-way valve 11.Bypass valve
12.Flow switch   13.Expansion tank

Reference diagram for standard unit (modules to be supplied by Ecolite)

Notes:

1. Temperature sensor wells are required on the water inlet/outlet headers.

2. The sensor well must be made by the installing company using a 3/8'' copper tube. Punch a hole on the water header and insert the tube to the hole (recommended insert depth: 2/3 diameter of the water header) and weld it to the water header. The tube end inside the water header must be sealed and watertight. Location of the sensor well should be as close to the master module as possible.

3. Grease should be applied into the sensor well to protect the temperature probe. See diagram on the right.
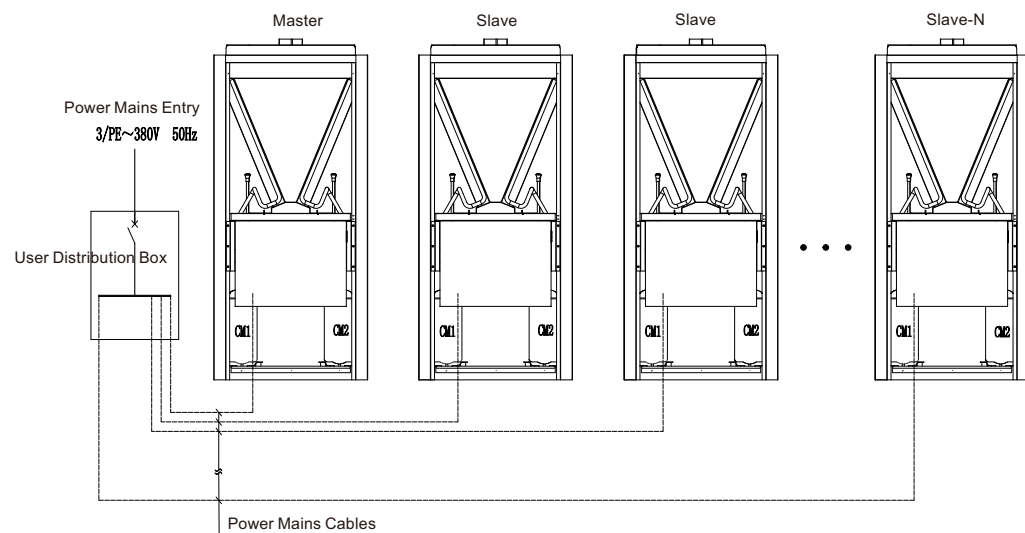
Temperature Signal Line

Rubber plug (or cork)

3/8"Copper Tube

Grease

Temperature Probe

1.Electric Connection Table

Model	Full Load Amperage	Mains Wire (mm^2)	Wires for Each Module
	A	BCR (PVF flexible conduit)	
ECRA065C	54	16	Phase Conductors: 3 wires (16mm^2) for MSRA065C 3 wires (25mm^2) for MSRA090C 3 wires (35mm^2) for MSRA130C 3 wires (150mm^2) for MSRA390C 1 ground wire (10mm^2)
ECRA090C	85	25	
ECRA130C	109.8	35	
ECRA390C	329.4	150	

2.Power Cable Connection for Each Module

Technical Requirements

1. Please connect power mains in strict accordance with correct phase sequence since incorrect connection will lead to compressor damage;
2. Full Load Amperage per module is 109.8A. See "TECHNICAL PERFORMANCE DATA" above for power input of the chiller;
3. Dotted lines stand for power mains cables, which are supplied by user for field installation;
4. Maximum 16 modules in parallel per chiller bank;
5. Power mains cable is distributed via the distribution box, running through cable ducts or conduits, entering electric box from the bottom via conduit gland, and finally to the terminal block of each module;
6. The distribution box is supplied by user.

Technical Requirements:
Communication shielded cable should be single-end earthed.

Communication Cables among Modules
Shielded Communication Cable PVVP2*0.5MM^2