1. Basic Parameters

1.1 OA-F(S) compression condensing unit

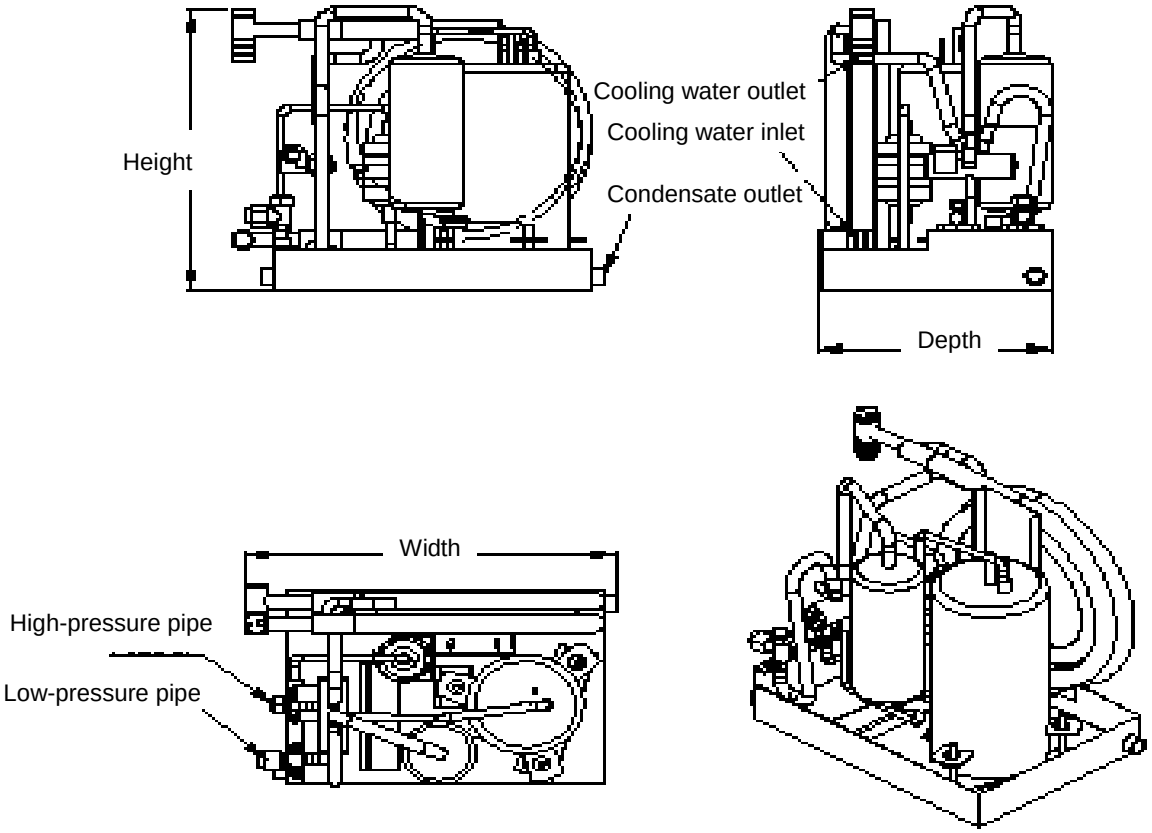


Table 1-2 Basic parameters of OA-F(S) compression condensing unit

Model		Unit	OA-9F	OA-12F	OA-18F	OA-24F	OC-36F	OC-36FS	OC-48FS
Voltage/Frequency		V/Hz	220/50	220/50	220/50	220/50	220/50	380/50	380/50
Water inlet and outlet pipe OD		mm	Φ19	Φ19	Φ25	Φ32	Φ32	Φ32	Φ32
Condensate pipe diameter		mm	DN20	DN20	DN20	DN20	DN20	DN20	DN20
High-pressure pipe		inch	3/8”	3/8”	3/8”	3/8”	3/8”	3/8”	1/2”
Low-pressure pipe		inch	1/2”	1/2”	1/2”	5/8”	5/8”	5/8”	3/4”
Weight		kg	33	35	40	48	64	64	70
Overall dimension	Width	mm	340 255	340 255	405 285	445 285	460 350	460 350	510 360

ns	**Depth Height**		330	330	365	400	485	485	570

1.2 OC-F(S) compression condensing unit

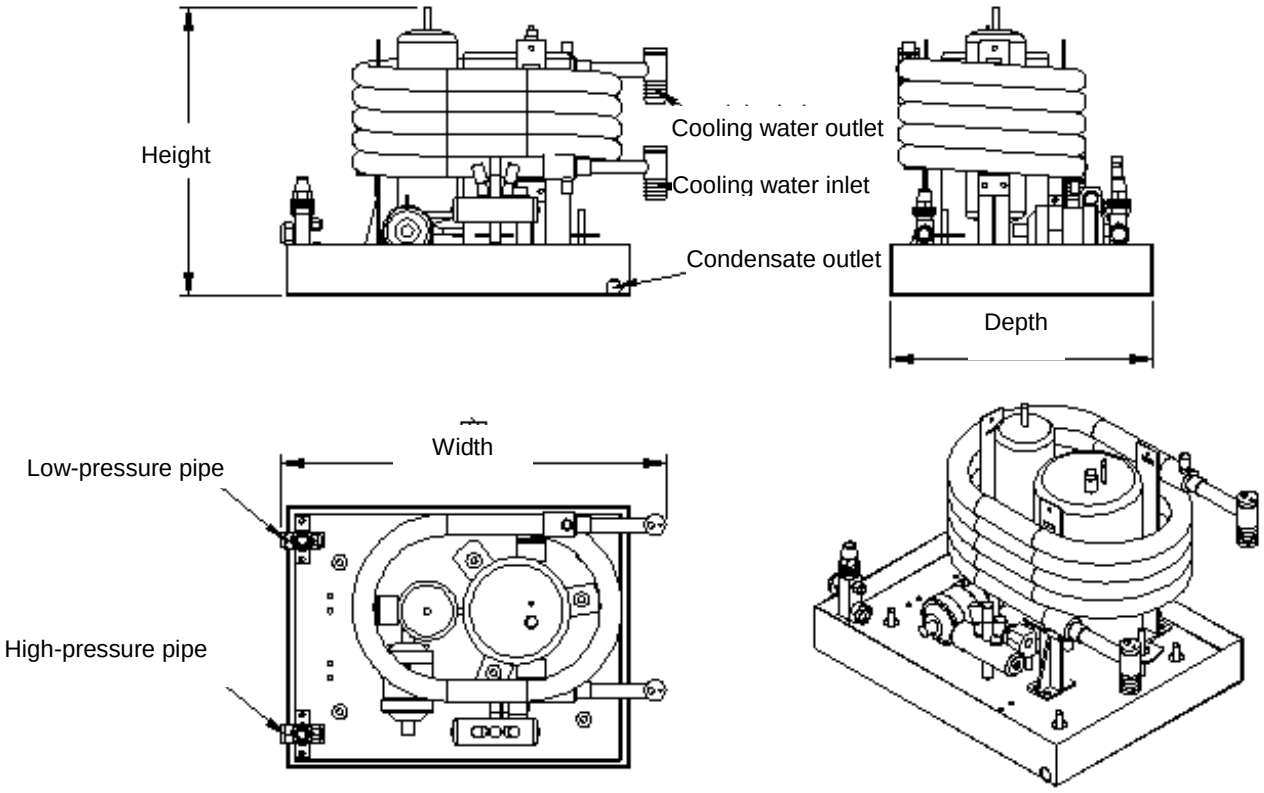


Table 1-1 Basic parameters of OC-F(S) compression condensing unit

Model		**Unit**	**OC-9F**	**OC-12F**	**OC-18F**	**OC-24F**	**OC-24FS**	**OC-36F**	**OC-36FS**	**OC-48FS**
Voltage/Frequency		V/Hz	220 /50	220/ 50	220 /50	220 /50	380 /50	220 /50	380 /50	380 /50
Water inlet/outlet pipe OD		mm	Φ19	Φ19	Φ25	Φ32	Φ32	Φ32	Φ32	Φ32
Condensate pipe diameter		mm	DN20	DN20	DN20	DN20	DN20	DN20	DN20	DN20
High-pressure pipe		inch	3/8”	3/8”	3/8”	3/8”	3/8”	3/8”	3/8”	1/2”
Low-pressure pipe		inch	1/2”	1/2”	1/2”	5/8”	5/8”	5/8”	5/8”	3/4”
Weight		kg	33	35	40	48	48	64	64	70
Overall dimensions	**Width**	mm	350	350	350	350	370	440	440	440
	Depth		465	465	465	512	539	590	590	710
	Height		423	423	438	449	449	524	524	532

1.3 OA-P floor-type fan coil

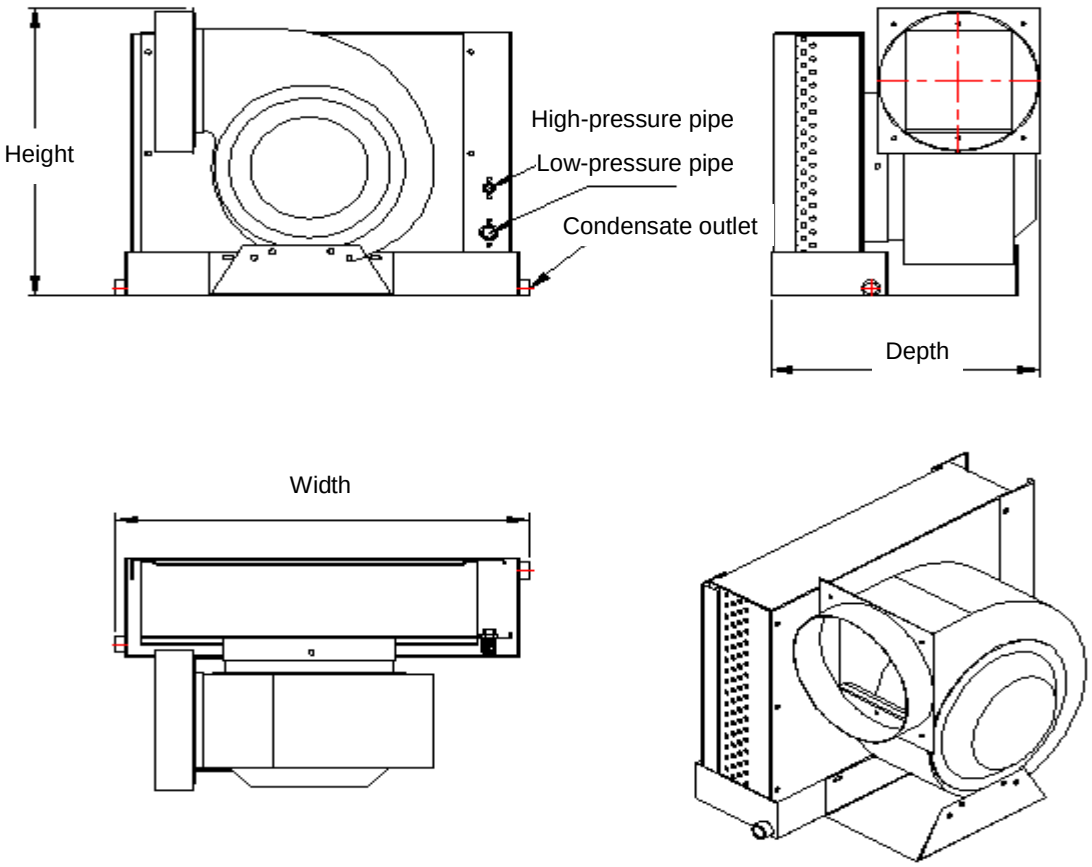


Table 1-4 Basic parameters of OC-P floor-type fan coil

Model	Unit	OA-6P	OA-9P	OA-12P	OA-18P	OA-24P	OA-36P
Voltage/Frequency	V/Hz	220/50	220/50	220/50	220/50	220/50	220/50
Overall dimensions	Width mm	410	490	530	590	610	650
	Depth mm	285	330	335	355	400	455
	Height mm	280	340	340	440	460	545
Air supply outlet OD	mm	Φ125	Φ150	Φ175	Φ200	Φ225	Φ250
Air return inlet width	mm	250	320	320	360	420	450
Air return inlet height	mm	250	300	300	360	380	510
Condensate pipe diameter	mm	DN20	DN20	DN20	DN20	DN20	DN20

Weight (Copper cooling fin)	kg	15	23	25	28	30	45
Weight (Aluminum cooling fin)	kg	13	20	22	24	25	36

Note: facing toward return air inlet, air outlet of floor-type fan coil has four directions optional such as left, upper left, right, upper right. Upper and lateral air outlet can be rotated 45°, 90°.

1.4 OC-P floor-type fan coil

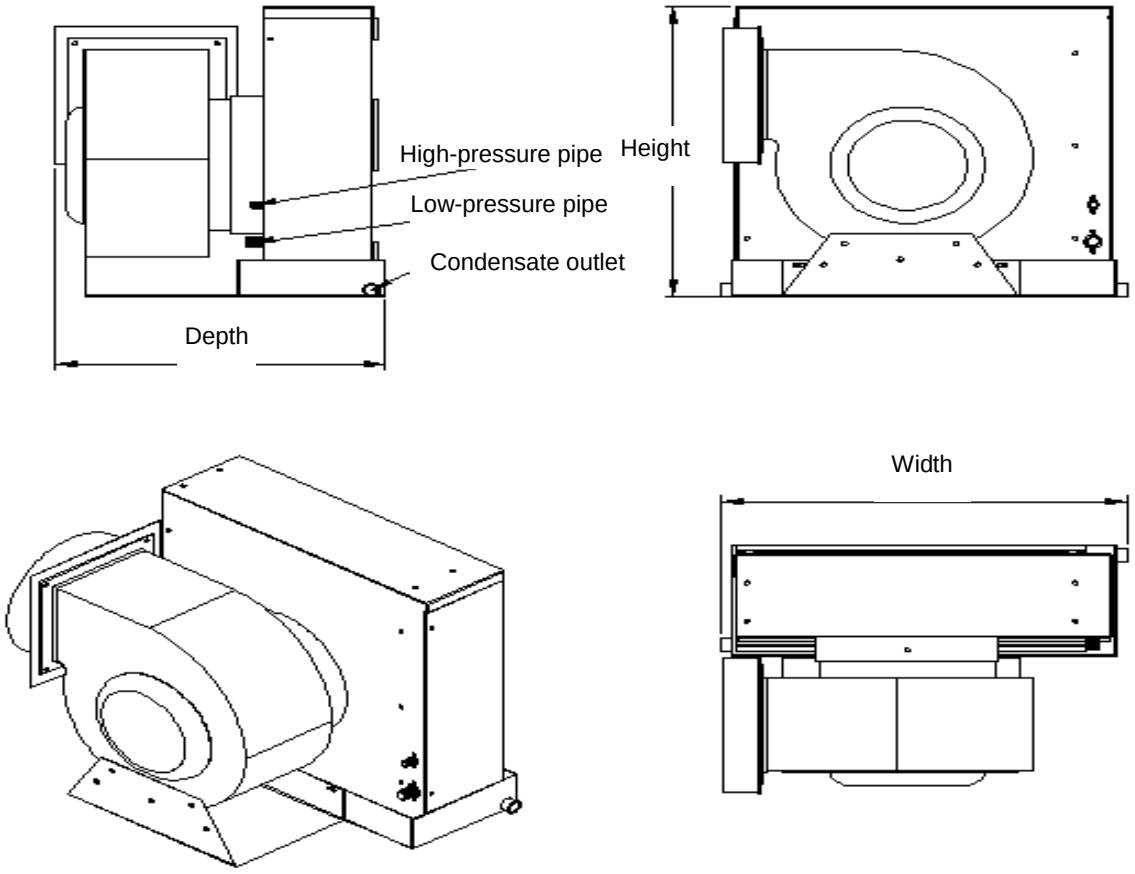


Table 1-3 Basic parameters of OC-P floor-type fan coil

Model	Unit	OC-6P	OC-9P	OC-12P	OC-18P	OC-24P	OC-36P
Voltage/Frequency	V/Hz	220/50	220/50	220/50	220/50	220/50	220/50
Overall dimensions	Width mm	410	490	530	590	610	650
	Depth mm	285	330	335	355	400	455
	Height mm	280	340	340	440	460	545
Air supply outlet OD	mm	Φ125	Φ150	Φ175	Φ200	Φ225	Φ250
Air return inlet width	mm	250	320	360	420	440	480
Air return inlet height	mm	250	310	310	360	410	510
Condensate pipe diameter	mm	DN20	DN20	DN20	DN20	DN20	DN20

Weight (Copper cooling fin)	kg	15	23	25	28	30	45
Weight (Aluminum cooling fin)	kg	13	20	22	24	25	36

Note: facing toward return air inlet, air outlet of floor-type fan coil has four directions optional such as left, upper left, right, upper right. Upper and lateral air outlet can be rotated 45°, 90°.

1.5 OA-P WA roof-top fan coil

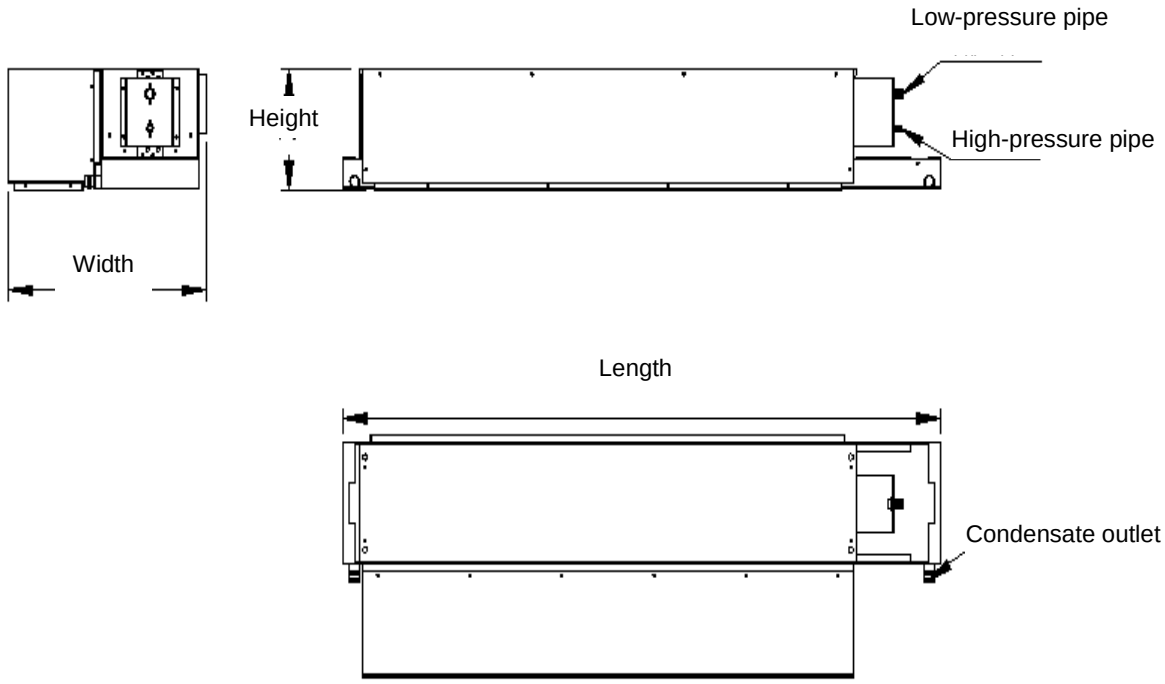


Table 1-6 Basic parameters of OA-P WA roof-top fan coil

Model	Voltage V/Hz	Overall dimensions			Condensate Pipe diameter	Weight kg
		Length	Width	Height		
OA-6P-WA	220/50	810	490	245	DN20	21
OA-9P-WA	220/50	910	490	245	DN20	22
OA-12P-WA	220/50	1000	490	245	DN20	25
OA-18P-WA	220/50	1210	490	245	DN20	28
OA-24P-WA	220/50	1500	490	245	DN20	34
OA-36P-WA	220/50	1690	490	305	DN20	43

1.6 OC-P-WA roof-top fan coil

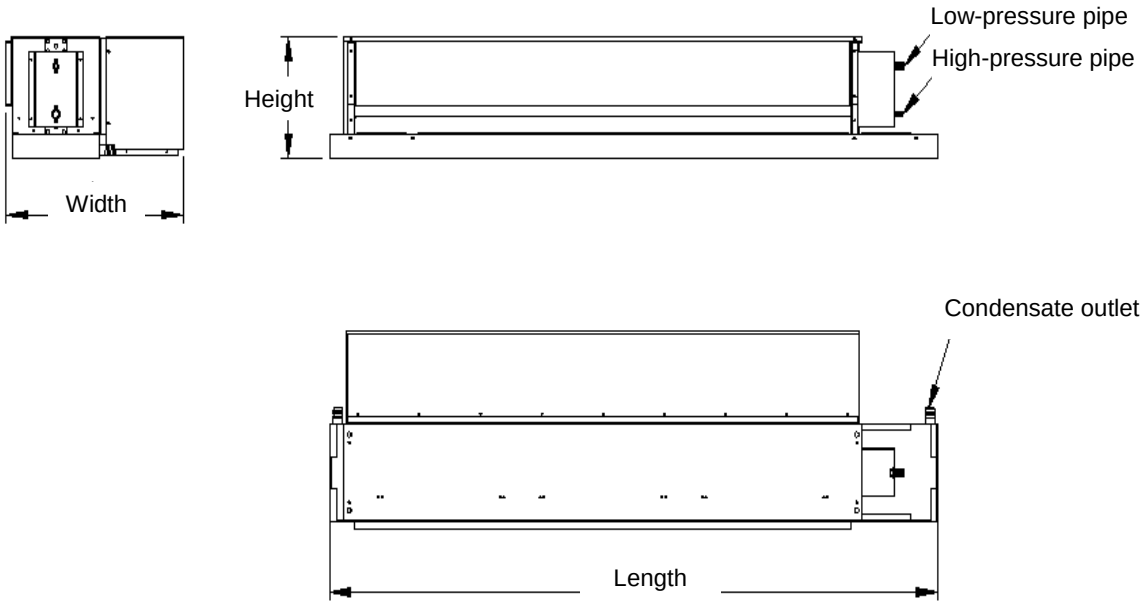


Table 1-5 Basic parameters of OC-P-WA roof-top fan coil

Model	Voltage V/Hz	Overall dimensions			Condensate pipe diameter	Weight kg
		Length	Width	Height		
OC-6P-WA	220/50	810	490	265	DN20	22
OC-9P-WA	220/50	910	490	265	DN20	23
OC-12P-WA	220/50	1000	490	265	DN20	26
OC-18P-WA	220/50	1210	490	265	DN20	30
OC-24P-WA	220/50	1500	490	265	DN20	36
OC-36P-WA	220/50	1690	490	305	DN20	45

2. Installation

2.1 Unit installation

2.1.1 Installation of compression condensing unit

Compression condensing unit can be mounted at any convenient location. It is usually placed in the cabin or equipment room, as well as accommodation space. The mounting position of compressor should not be higher than fan coil in consideration of oil return (refrigeration oil) between fan coil and compressor.

The unit should leave space for maintenance and installation which is convenient for installation and inspection of refrigerant copper tube. There should be no less than 15cm left in electrical junction box side, and no less than 10cm for other sides.

Condensate outlet on unit chassis should be connected to pipe which discharges water outboard. If installation position of unit is lower than water line, water pan will be required to be mounted on bilge by shipyard.

2.1.2 Unit installation steps

- Adjust the direction of connector between refrigerant pipe and seawater to specified direction before installation of unit.
- Put the unit on horizontal plane, and fix it firmly.
- Arrange condensate pipe reasonably to make condensate water flow smoothly. It is best to connect both of the two water outlets on the water pan to help water draining.
- Cooling system installation

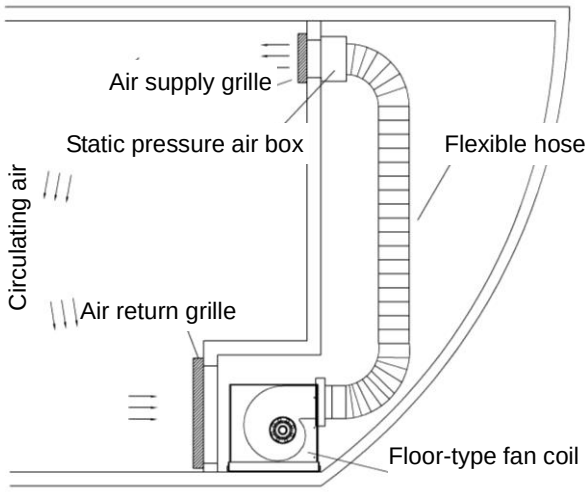
Note: seawater cooling system has to ensure that cooling water flow is more than specified value. Small cooling water flow will reduce the efficiency of unit significantly, and lead to alarm and automatic shut-off of unit.

2.1.3 Installation location inspection：

- Seawater pipeline should be unblocked, without bending and air block.
- Seawater pump should be mounted under water line.
- There has to be enough installation space for repairing and maintenance.
- Leave sufficient space for connection between inlet-outlet of seawater and condensate outlet.
- Mounting surface of air conditioning unit should be horizontal and flat with sufficient strength.

2.2 Installation of fan coil and air system

Installation of floor-type fan coil is similar to that of integral air conditioner. Fan coil and compression condensing unit are connected by refrigerant copper pipe. Refer to installation of integral air conditioning unit and air system.



Note:
The spacing between air return grille and air supply grille should be more than 1.2m.

Figure 2-1 Typical installation diagram of floor-type fan coil of split air conditioner

Table 2-1 Recommended installation of OC/A-P floor-type fan coil air system

Unit model	OC/A-6P	OC/A-9P	OC/A-12P	OC/A-18P	OC/A-24P	OC/A-36P
Minimum net area of return air grille(cm^2)	486	694	846	1208	1556	2137
Minimum net area of supply air grille(cm^2)	253	363	531	744	908	1265
Air supply hose ID (mm)	Φ125	Φ150	Φ1750	Φ200	Φ225	Φ250
Condensate hose ID(mm)	ID15	ID15	ID15	ID15	ID15	ID15
Recommended air duct section area(mm)	100*100	100*100	125*125	175*175	200*200	225*225
Recommended air duct length （mm）	300	380	460	600	780	1100
Recommended quantity of elbows (n)	2	2	2	2	3	3

Note:

Installation of roof-top fan coil can be based on ship body with three forms in general shown as Figure 2.2.Sideward form is usually used when floor height of ship is no more than 2 meters and there is no room for floor-type installation. It is applicable to the cabin of small space. Air-out form from ceiling is applicable to the cabin with floor height of more than 2.3 meters. The cabin which has large area, requires many fan coils and has no space for installation of floor-type fan coil on the floor, should also use this installation form.

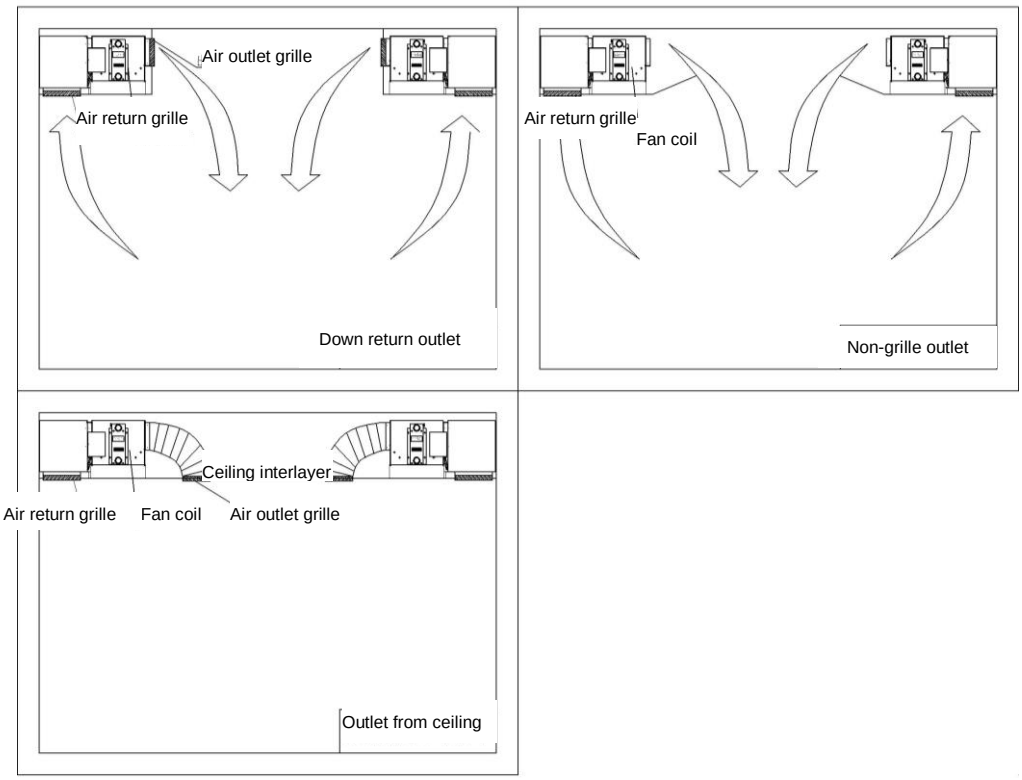


Figure 2-2 Installation diagram of roof-top fan coil of split air conditioner

2.3 Installation of seawater cooling system

Refer to installation requirement of seawater cooling system of integral air conditioner.

2.4 Installation of refrigerant copper pipes

2.4.1 Copper selection

Copper pipe has to be refrigerant grade copper (purple copper pipe). Y-type three-way connection is required when compression condensing unit is connected with two fan coils. Copper pipe size is shown in the following table, with wall thickness being 0.7~0.9mm:

Table 2-2 Model and specification of copper pipes

Model	**OC/A-9F**	**OC/A-12F**	**OC/A-18F**	**OC/A-24F OC-24FS**	**OC/A-36F OC/A-36FS**	**OC/A-48FS**
Air return pipe	1/2”	1/2”	1/2”	5/8”	5/8”	3/4”
Exhaust pipe	3/8”	3/8”	3/8”	3/8”	3/8”	1/2”
Model	OC/A-6P	OC/A-9P	OC/A-12P	OC/A-18P	OC/A-24P	OC/A-36P
Air return pipe	3/8”	1/2”	1/2”	1/2”	5/8”	5/8”
Exhaust pipe	1/4”	3/8”	3/8”	3/8”	3/8”	3/8”

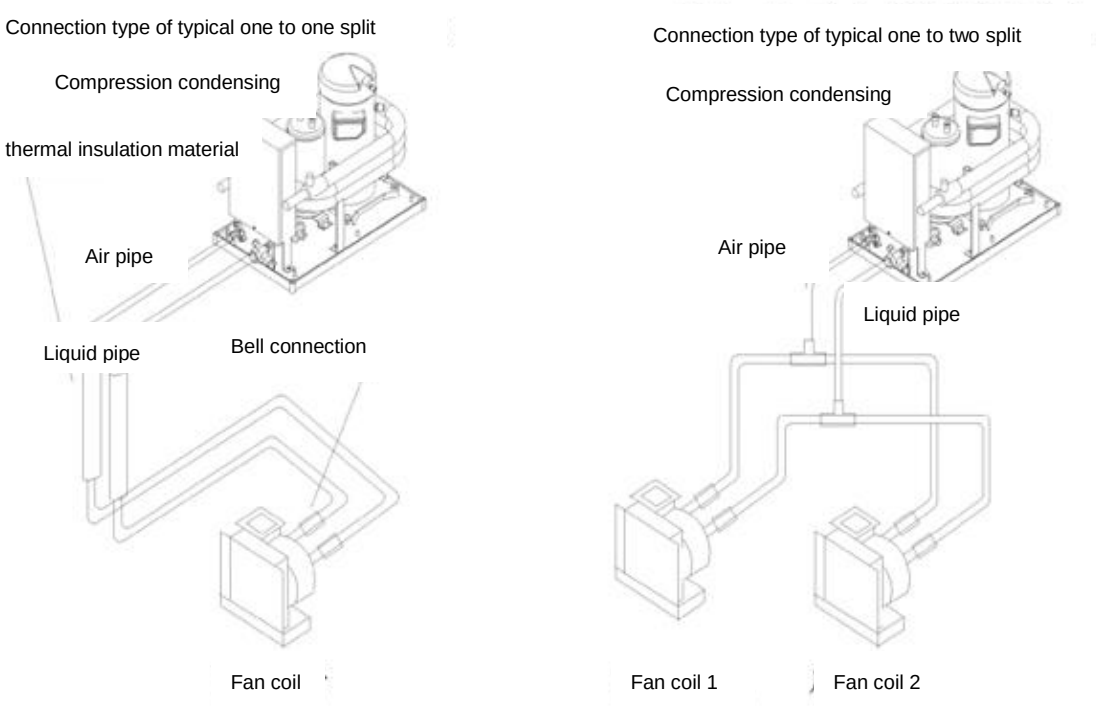


Figure 2-3 Installation diagram of split air conditioning unit

Refrigerant copper pipe can be upward, downward or inclined as required. Elbow can be equipped if necessary, but sharp bend should be avoided.

Refrigerant copper pipes should be wrapped up with thermal insulating layer. Thermal insulating layer should be no less than 15mm.The two ends should be sealed to prevent impurities and steam from going into pipes before connection of copper pipes. After connecting copper pipes and leak detection, bell-mouthed nut and T-joint should be wrapped up with thermal insulating layer.

Bell-mouthed flaring steps of copper pipe

Use high-quality cutting device to cut copper pipes. Before flaring of copper pipes, put bell-mouthed nut on the copper pipes. (see the following steps for flaring steps)

a. 3/8"copper pipe flaring

Protrude copper pipe 1/4" out of mold, tighten the collar clamp. Move the yoke in place and lock it. Rotate teeth handle until the cone touches copper pipe. Rotating about six circles can finish flaring, (rotate a semicircle and retreat 1/4 circle at every turn).

b. 1/2"copper pipe flaring

Protrude copper pipe 3/16" out of mold, tighten the collar clamp. Move the yoke in place and lock it. Rotate teeth handle until the cone touches copper pipe. Rotating about six circles can finish flaring, (rotate a semicircle and retreat 1/4 circle at every turn).

c. 5/8"copper pipe flaring

Protrude copper pipe 1/4" out of mold, tighten the collar clamp. Move the yoke in place and lock it. Rotate teeth handle until the cone touches copper pipe. Rotating about six

circles can finish flaring, (rotate a semicircle and retreat 1/4 circle at every turn).

d. **3/4"** copper pipe flaring

Protrude copper pipe 5/16" out of mold, tighten the collar clamp. Move the yoke in place and lock it. Rotate teeth handle until the cone touches copper pipe. Rotating about seven circles can finish flaring, (rotate a semicircle and retreat 1/4 circle at every turn).

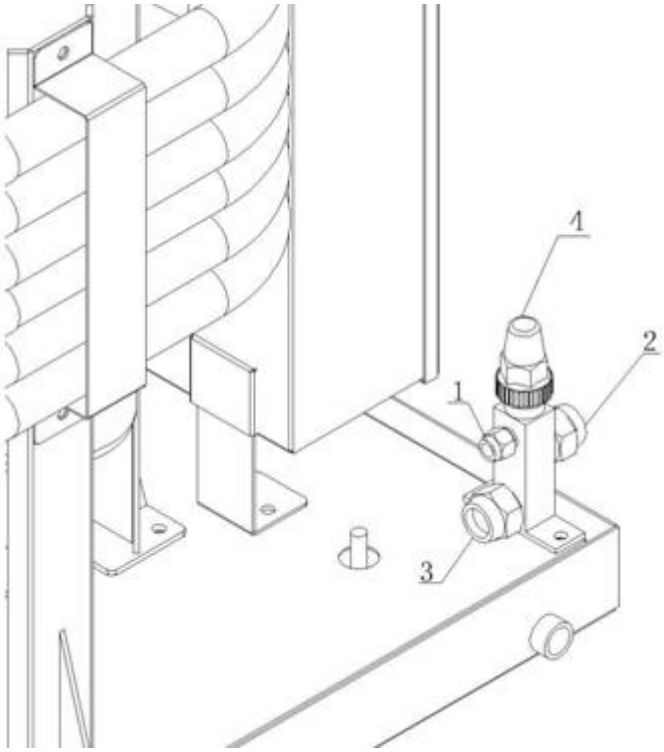
Put bell-mouthed nut on bell mouth of copper pipe after flaring, and the nut should be able to go through bell mouth with touching thread. If thread touches bell mouth, it means the flaring is too large and needs to be redone. If bell mouth cannot fill the nut base, it means the flaring is too small and needs to be redone.

Bell mouth connection: Screw up the bell-mouthed nut as far as possible with fingers, then use spanner to rotate nut a semicircle.(note: the connector has to be aligned when screwing nut up)

2.5 Vacuum pumping and refrigerant charging

Coil and copper pipes should be vacuumized after the connection of refrigerant copper pipe of split air conditioner. If show pressure of vacuum pump is less than 15Pa, continue vacuumizing for 20～30 minutes. If the pressure cannot reach 15Pa (should be less than 15Pa), it means the pipes are not connected well, and the bell mouth should be remade. If the connection between compression condensing unit and fan coil is more than five meters, the coil should be added with extra refrigerant. Only after completion of vacuum pumping and confirming no leakage of pipe connection can refrigerant be charged. Refrigerant charge is subject to data provided by manufacturer.

Note: refrigerant charging should be operated by specialized persons.



1. is for maintenance
2. is for connector of evaporation coil
3. is for connector of compression condensing unit
4. is for three-way globe valve switch

Figure 2-4 Three-way valve of split air conditioner

2.5.1 As shown in Figure 2-4: when “valve 4” rotates to the end clockwise, “maintenance port 1” to ”2” is open, “2” to “3” is closed; when “valve 4” rotates to the end anticlockwise,

“2” to “3” is open, “maintenance port 1" is closed; when “valve 4” rotates to the end anticlockwise and then rotates a semicircle clockwise, “1”, “2” and “3” are all open (at this time, pressure gauge connecting to maintenance port 1 can measure the system pressure.

Note: valve should be rotated to the end anticlockwise before normal startup of machine.

2.5.2 Points for attention on refrigerant charging:

- Refrigerant should be charged at low-pressure maintenance port (located at wider air return pipe).
- Refrigerant charging should be subject to arrow direction on refrigerant tank. Charging in the form of gas is preferred when available, liquid form is preferred when gas form is not available. Valve opening cannot be too large when charging in liquid form to prevent vast amounts of liquid from entering compressor (at this time, it is best to rotate 1.5 circles for valve).
- Refrigerant should be charged when the unit is operating and in refrigeration.

3. Operating instructions

3.1 Main functions and features of OC-DK03A-X controller

3.1.1 LCD display.

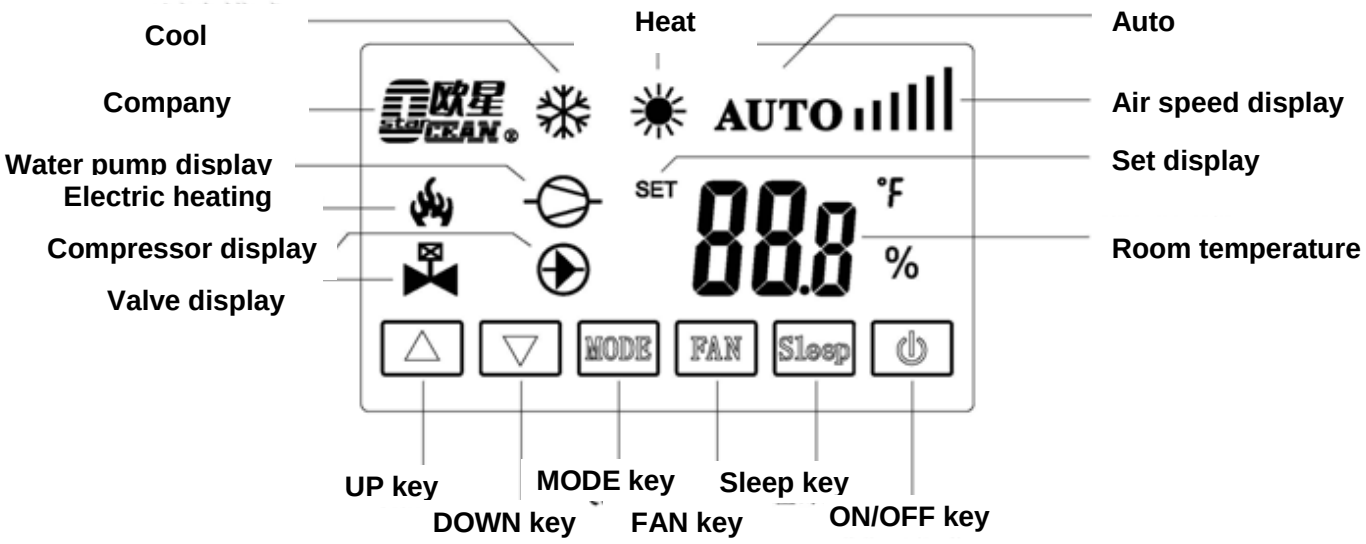
3.1.2 Three kinds of air speed settings, low speed, medium sped and high speed.

3.1.3 Temperature measurement resolution: 0.1℃.

3.1.4 Equipped with LED backlight.

3.1.5 Equipped with communication port, which can be used for remote control.

3.2 User interface description of OC-DK03A-X controller



3.2.1 Only 'OFF' is displayed when power off.

3.2.2 Display content of startup main interface:

Operation mode (refrigerating, heating, automatic, electric heating); running status of fan (low speed, medium speed, high speed); valve status (displaying mark of valve means valve is open, no displaying mark of valve means valve is off); current room temperature and its mark is '℃'.

3.2.3 Display contents of temperature setting interface:

Current temperature setting and setting mark are 'SET','℃'; Temperature setting range is from 12℃ to 32℃, which can be set by pressing UP key '' and DOWN key ''.

3.3 Touch screen key description of OC-DK03A-X controller

3.3.1 User key description of OC-DK03A-X controller

ON/OFF key	Pressing ON/OFF key for one second when electrified can power on or off machine.
MODE key	Able to set four operating modes of heating, refrigerating, automatic, electric heating. Pressing 'ON/OFF' key can achieve sound elimination and fault resetting when fault alarm occurs.
△▽ **UP/DOWN key**	Pressing UP/DOWN key in any mode can change temperature setpoint, the temperature setting range is 12℃－32℃
FAN key	Press this key to get access to air speed setting, air speed indicator will start to flicker. Press UP key '' and DOWN key '' to change air speed, then press FAN key to save air speed setting; The setting

	will be saved automatically in five seconds if no conduction in
SLEEP key	Press it to get access to sleep mode

3.3.2 Advanced setting mode key description

Press MODE key for five seconds to get access to advanced setting mode. At this time, temperature indicator on screen will start to display number. The default display is '00', representing item number '0'. Press UP key '' and DOWN key '' to select item number, and press MODE key to enter the item to be modified or be checked. At this time, the screen will display this parameter flickeringly. Pressing UP key '' and DOWN key '' can modify this parameter. After setting, press MODE key to save it and go back to number indicator. Pressing MODE key for five seconds after setting can quit advanced setting mode.

Setting items description:

Function number	Contents	Default setting	Setting range
0	Program selection	**1**	1~4
1	Interval time between starting of compressor or three-way valve	180	120~300 seconds
2	Low-speed output of SCR	160	150~180
3	Medium-speed output of SCR	190	180~210
4	Time of ignoring low-pressure alarm	180	0~180 seconds
5	Frequency of ignoring low-pressure alarm	**3**	1~5 times
6	Starting time in advance of seawater pump	**30**	0~60 seconds
7	Calibration of temperature sensors	Showing actual indicating temperature flickeringly	±3℃
8	Calibration of water temperature sensors	Showing actual indicating temperature flickeringly	±1℃
9	Adjust Celsius/Fahrenheit temperature display	0 (Celsius degree)	0 (Celsius degree) or 1 (Fahrenheit degree)
10	Backlight time	60(each figure represents one second)	3~180 seconds
11	Backlight mode	0 (limited time)	0 (limited time) or 1 (long light)
12	Default value	0(no default setting value)	0(no setting) or 1(setting)
13	Fault alarm types display	Not available	No setting range

Notes: users should not carry out this operation at discretion, or the normal operation of products will be affected!!!

Interval time between starting of compressor	means that the interval time between initial starting and restarting of compressor or three-way valve should be no less than this setting value
Low-speed output	means the minimum output voltage of ACVV fan at low-level air

of SCR	volume
Medium-speed output of SCR	means the maximum output voltage of ACVV fan at medium-level air volume
Time of ignoring low-pressure alarm	means the time of ignoring low-pressure alarm when there is low-pressure switch signal input under refrigerating or heating status of air conditioner
Frequency of ignoring low-pressure alarm	means the maximum times of ignoring low-pressure alarm when there is low-pressure switch signal input under refrigerating or heating status of air conditioner
Starting time in advance of seawater pump	means the time of starting seawater pump in advance before starting signal of compressor sends out under refrigerating or heating status of air conditioner
Room temperature sensor calibration	adjusts display temperature with ±3℃
Coil temperature sensor calibration	adjusts display temperature with ±1℃
Celsius/Fahrenheit temperature display conversion	C(Celsius degree)/F(Fahrenheit degree)
Backlight time	sets the turn-off time of backlight after operation stops
Backlight mode	long light or limited time
Default value	resets the default value of above settings
Fault alarm types display	0 no any alarm signal output under normal condition 1 High pressure delay alarm 2 Low pressure delay alarm 3 When seawater outlet temperature is higher than 40℃ in refrigerating, the unit will alarm 4 When seawater outlet temperature is lower than 1℃ in heating, the unit will alarm 5 Low pressure frequency alarm
Fault display interface is unavailable to be set, but able to display the fault alarm types. Relevant adjustment and maintenance can be conducted according to alarm types. Alarm types are shown as followings: (when the 1st~4th kind of fault alarms occurs, restart the machine after troubleshooting, and fault type will become fault-free status '0' automatically; when the 5th fault occurs, only powering off the control board and restarting it can return to alarm-free status)	

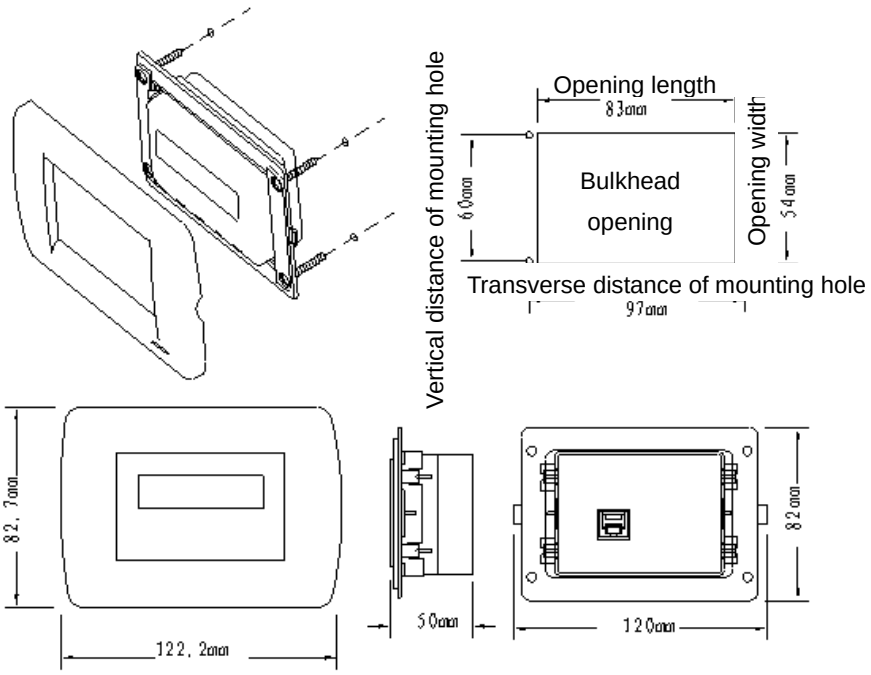


Figure3-2 Installation diagram of control panel

4. Debugging

4.1 Initial start-up

4.1.1. Confirm the electrical connection is correct, the phase sequence of three-phase power should be correct (allowed voltage range of single-phase system is 200-240V/50Hz, and the allowed voltage range of three-phase system is 360V-410V/50Hz).

4.1.2. Open seawater inlet valve.

4.1.3. Switch on the air circuit breaker for power supply of unit. If the relay of water pump is a part of the system, the air circuit breaker of water pump should also be switched on simultaneously.

4.1.4. Switch on power supply of air conditioning system, start up the machine.

4.1.5. Check cooling water of all the air conditioners, and make sure that there is seawater discharged outboard. Seawater pump should be in running in advance before compressor starts up, if control panel alarms after air conditioner starts up, the machine should be shut down immediately. Analyze the causes according to alarm, and conduct troubleshooting finally.

4.1.6. Run the unit for 15 minutes, measure the outlet temperature of air supply grille, then measure return temperature of air return grille. The temperature difference between them should be 8-11℃.Check whether the air volume is normal or not after starting up air conditioner. If the air volume is too small or there is no supply air, air duct and filter screen should be checked immediately. Only after troubleshooting can the corresponding operating mode be on, or the equipment may be damaged.

4.1.7. Measure seawater flow: the seawater flow required by air conditioning unit of each 12000Btu/h is about 1m^3/h. If the flow is insufficient, the cause should be checked. The temperature difference between seawater inlet and outlet should be less than 3℃ in theory. If the temperature difference between seawater inlet and outlet is more than 4℃, seawater flow will be insufficient.

4.2 Regular maintenance

⚠ Note: installation and maintenance should be operated by the qualified personnel familiar with local norms and rules of installation and maintenance, and experience in this model.

⚠ Warning: running machine and power supply is dangerous, which

could cause personnel injury and death. The power supply has to be switched off before repairing.

4.2.1 Check whether all the connectors of seawater pipes is firm or not regularly, and clean up the seawater filter regularly according to water quality.

4.2.2. Check and clean up the air filter screen of air conditioner once a month.

4.2.3. Check the water pan and condensate drainage pipes once every three months. Pour one liter of water into water pan rapidly, if the water cannot be drained out within 30 seconds, check whether water drainage pipe is blocked or not and clean up the pipes.

4.2.4. Seawater inlet should be closed when air conditioning system is not used for a long time. Besides, the seawater in seawater pipes should also be discharged, and the pipes of seawater inlet should be removed from the unit to discharge the water from the unit as well the water pump. Clean up seawater filter and discharge the water, then connect the seawater pipe again.

4.2.5 Comprehensive maintenance operated by specialized persons once a year is recommended when winter and summer alternates to ensure normal operation of air conditioner.

5. Electrical wiring diagram

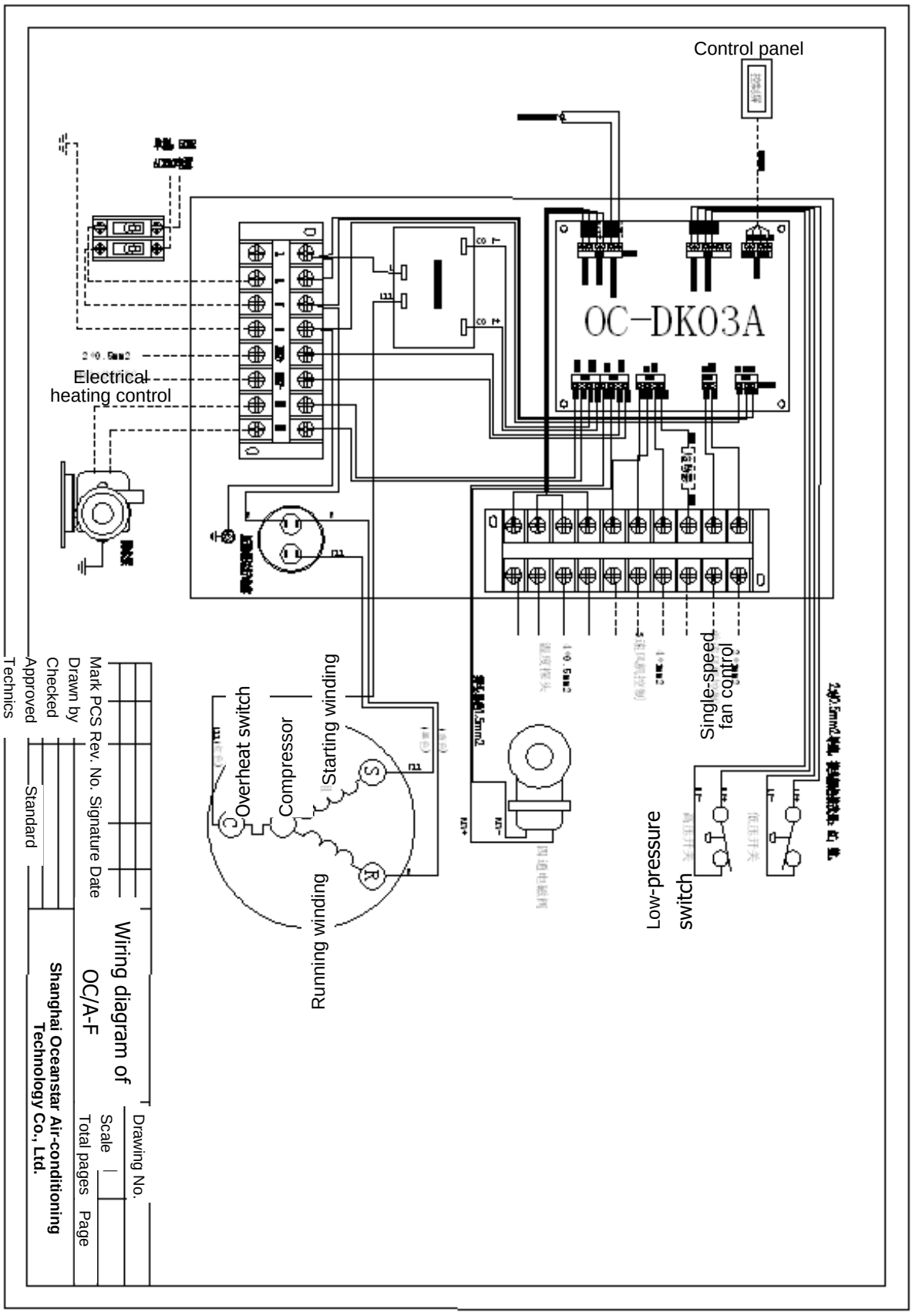


Figure 5-1 Electrical wiring diagram of OC-F compression condensing unit
(Fan output is optional with three-speed and single-speed, arrangement of wires is determined by model of fan coil)

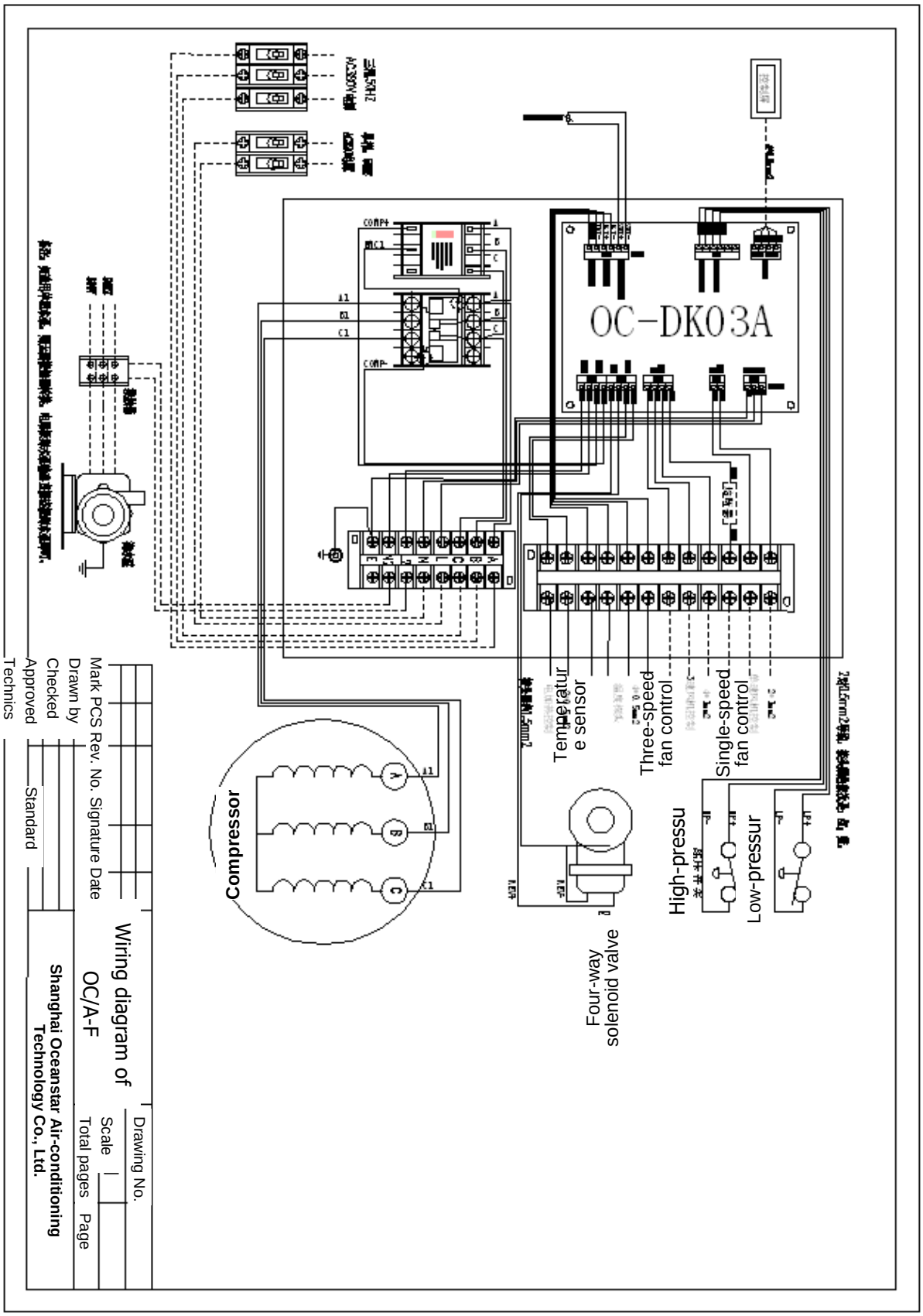


Figure 5-2 Electrical wiring diagram of OC-FS compression condensing unit
(Fan output is optional with three-speed and single-speed, arrangement of wires is determined by model of fan coil)

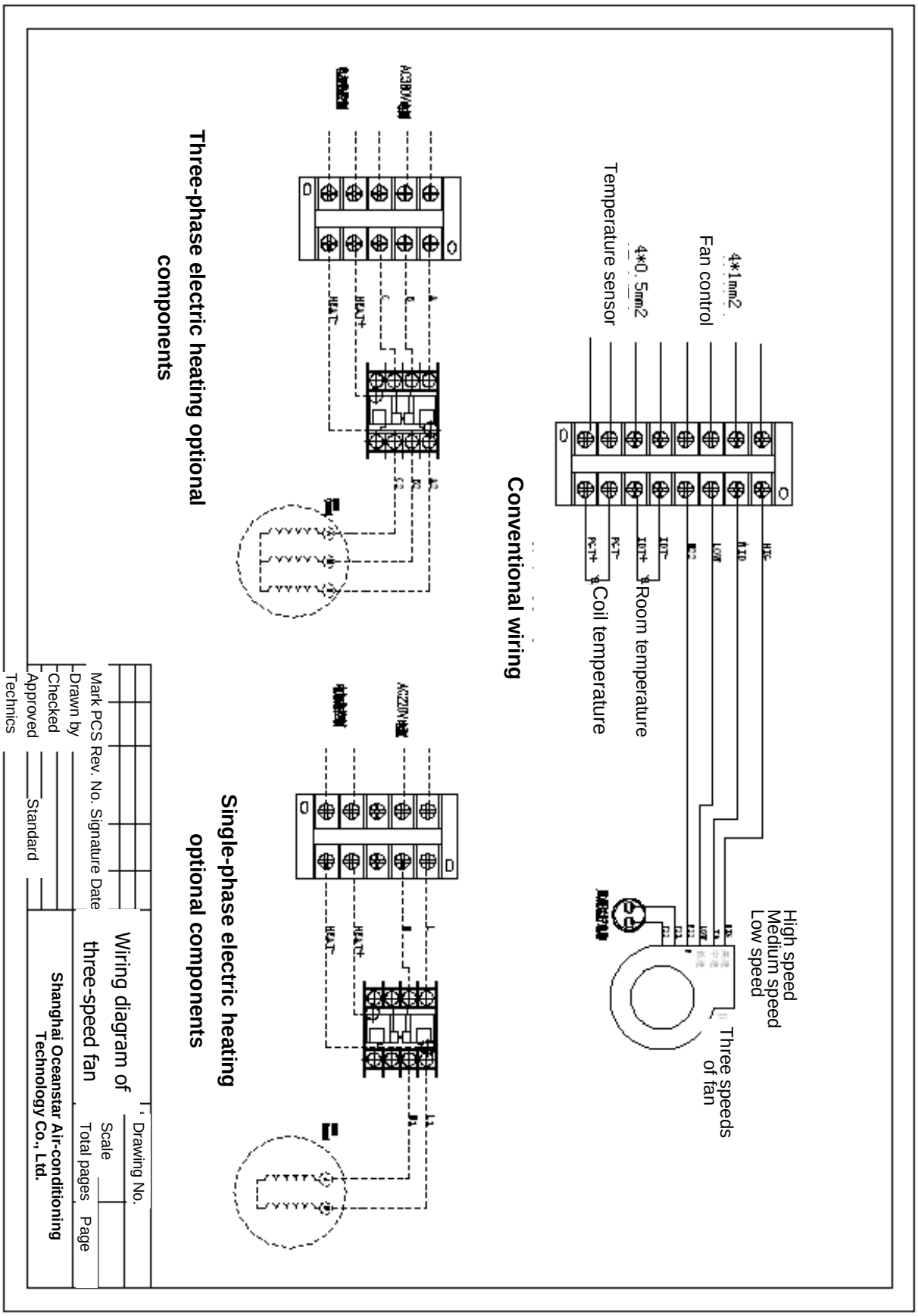


Figure 5-3 Electrical wiring diagram of fan coil with three-speed fan

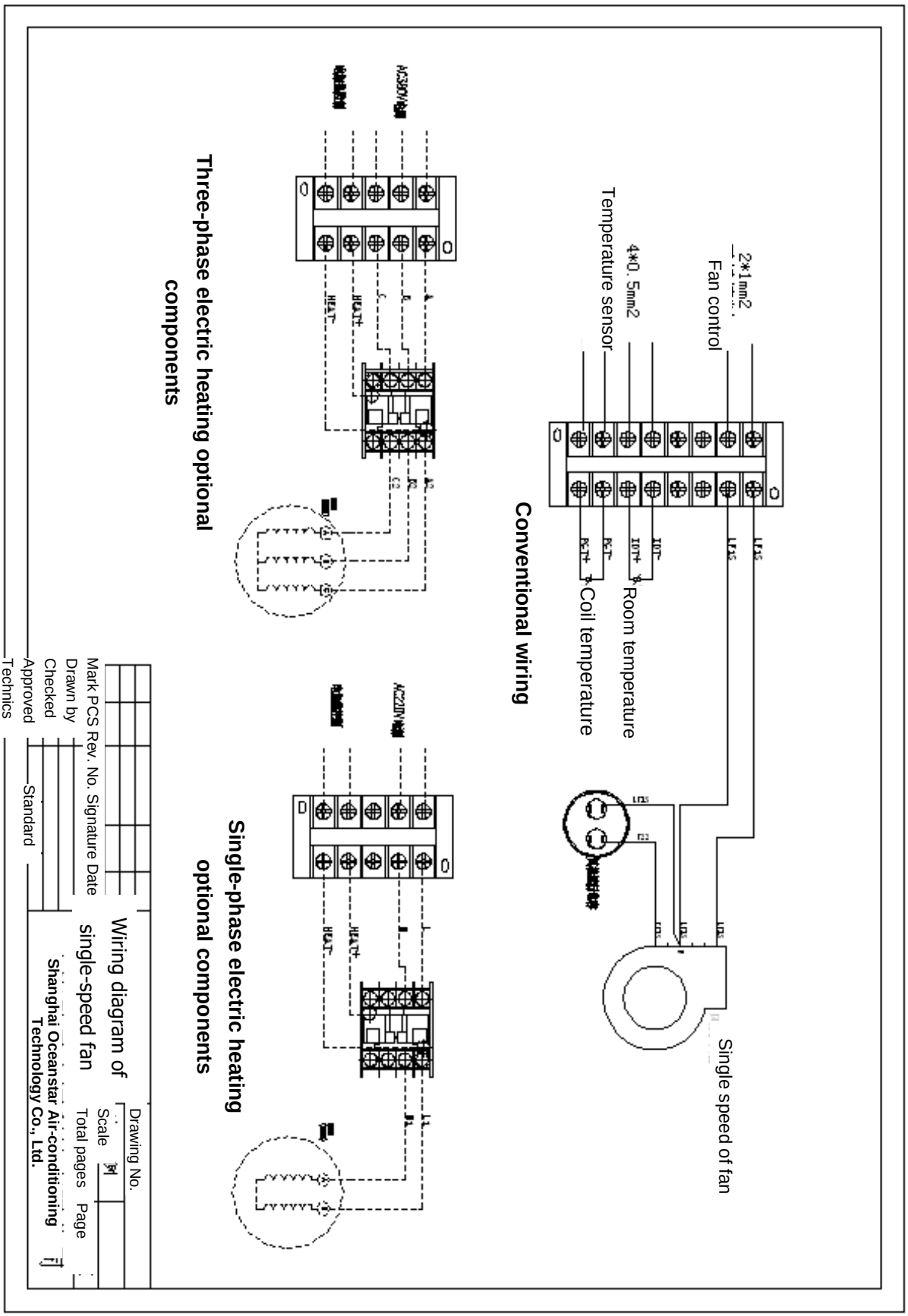


Figure 5-4 Electrical wiring diagram of fan coil with single-speed fan