FRIGOESPACIOS®

SERVICE MANUAL

Outdoor Condensing Unit

Applicable Model

■ R22

OCU-R200SF	OCU-S700HF
OCU-R300SF	OCU-S400SF
OCU-S350HF	OCU-S500SF
OCU-S400HF	OCU-S600SF
OCU-S400HF-D	OCU-S350QSF-D
OCU-S500HF	OCU-S400QSF
OCU-S500HF-D	OCU-S500QSF
OCU-S600HF	OCU-S600QSF

■ R404A

OCU-NR200SF	OCU-NS600HF
OCU-NR200SF-D	OCU-NS700HF
OCU-NR300SF	OCU-NS400SF
OCU-NR300SF-D	OCU-NS500SF
OCU-NS350HF	OCU-NS600SF
OCU-NS400HF	OCU-NS350QSF-D
OCU-NS400HF-D	OCU-NS400QSF
OCU-NS500HF	OCU-NS500QSF
OCU-NS500HF-D	OCU-NS600QSF

For proper installation and maintenance, please read and follow this manual carefully before beginning. Please keep this manual for future reference.

Contents

Applicable Model

Outdoor Condensing Unit

■ R22 Model

OCU-R200SF	OCU-S700HF
OCU-R300SF	OCU-S400SF
OCU-S350HF	OCU-S500SF
OCU-S400HF	OCU-S600SF
OCU-S400HF-D	OCU-S350QSF-D
OCU-S500HF	OCU-S400QSF
OCU-S500HF-D	OCU-S500QSF
OCU-S600HF	OCU-S600QSF

■ R404A Model

OCU-NR200SF	OCU-NS600HF
OCU-NR200SF-D	OCU-NS700HF
OCU-NR300SF	OCU-NS400SF
OCU-NR300SF-D	OCU-NS500SF
OCU-NS350HF	OCU-NS600SF
OCU-NS400HF	OCU-NS350QSF-D
OCU-NS400HF-D	OCU-NS400QSF
OCU-NS500HF	OCU-NS500QSF
OCU-NS500HF-D	OCU-NS600QSF

Outline

OCU-S500HF

Safety Precautions

Make it sure to follow

In order to avoid any personal injury or property damage, please read following "SAFETY PRECAUTIONS" carefully before perform any servicing.

■ The following symbols used in this manual are divided into 2 sections according to the level of safety hazard and damage.

⚠	WARNING	This symbol indicates a hazard or unsafe practice which can result in severe personal injury or death.
⚠	CAUTION	This symbol indicates a hazard or unsafe practice which can result in personal injury or product or property damage.

■ The items to be followed are classified by the symbols:

	This symbol indicates the【Prohibited】item.
	This symbol indicates the item that 【Must Be Taken】

⚠ WARNING

Installation Work

Installation must be done by qualified technicians, or electrical shock or fire will be resulted in.

A defective installation will result in electrical shock or fire. Install properly according to this manual strictly.

Do not use (charge, add or replace) air or gas other than the designated refrigerant.(R22/R404A)

Otherwise, an excessively high pressure may result in unit burst and cause injury.

Install the unit at a strong and firm location

If the installation is not properly done, the unit may collapse and cause injury.
Standard foundation is basically the concrete foundation with the weight about 3 times the weight of the unit. The unit should be fastened at the foundation with anchor bolts.

Conduct a airtight test.

The leakage of refrigerant will cause oxygen deficiency and result in death, it may also cause electrical shock or fire. Make it sure to conduct a airtight test and confirm there is no leakage.

Use the attached accessories and specified parts for installation.

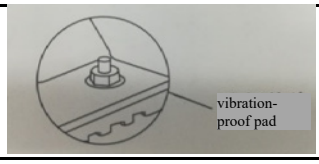
Otherwise, it will cause the unit to fall, get fire or electrical shock.

Install the refrigerant piping properly before the airtight test.

The leakage of refrigerant will cause suffocation.

Please fix the unit with anchor bolts.

Improper installation can cause the unit to tip over and cause injury.
To prevent vibration, install a vibration-proof pad (8-15mm thick) on the foot of the unit and fix it with anchor bolts.



Safety Precautions

Make it sure to follow

Electrical Wiring Work

Make it sure to use the designated circuit.

Be sure to follow the local national wiring standards,regulations and installation instruction. Use the designated circuit and install an earth leakage breaker. Improper installation will cause electrical shock or fire.

This unit must be properly earthed.

The earthing work should be implemented by electrical specialists.
Earth line must not be connected to gas line, water pipe, earth of lighting rod and telephone. Otherwise, it may cause electrical shock.The earth wire should be special one (with the color of yellow and green)

Connect the cables tightly.

Use the designated cables and connect the cables properly to make sure no external force will act on the terminal. If connecting or fixing is not perfect, it will cause heat up or fire.

Be sure to fix the components of unit perfectly.

Fix the cover for electric box and control board perfectly. Otherwise, it will cause fire or electrical shock.

Operating Precautions

Do not change the settings of safety devices.

The safety devices are equipped in this unit. The change of setting may disable the safety shutdown and cause the unit burst or fire.

Do not insert fingers, sticks, or other objects into the fan cover.

The high speed fans may cause injury.Do not insert fingers, sticks, or other objects into the air vent of unit panels.

Consult professionals in the case of the tripping of earth leakage breaker.

Forcible power recovery may cause electrical shock or fire.

When water entering into the electric box, shutdown the power and the earth leakage breaker.

Operation in this condition will cause short circuit and electrical shock or fire.
Prevent the the electrical components from cleaning with

Repair Work

Request professionals for disassembling and repair.

It is strictly forbidden the personnel other than professionals to disassemble, repair or modify the unit. Improper disassembling or repair may result in abnormal operation, thus cause injury, electrical shock or fire.

Shut down the unit in case of abnormal operation.

(1) In case of abnormal operation, shut down the unit and turn off the earth leakage breaker. The continuous operation of unit under abnormal conditions will cause electrical shock or fire.
(2) Consult with your construction side immediately when the warning light turning on.

During pump down operation, stop the compressor before taking off the piping.

Removal of the piping while compressor is running will mix the air in the system, cause abnormal high pressure of the refrigeration cycle and result in explosion and injury.

Relocation/Move

Consult professionals when relocating the unit.

Improper relocation may cause abnormal vibration and cause refrigerant leak, electrical shock or fire.

Safety Precautions

Make it sure to follow

⚠ CAUTION

Installation Work

Do not install the unit in a place where the flammable gases may leak.

The leaked flammable gas accumulating surrounding of the unit may cause fire.

Only the operator can touch the unit

Set up the notice label and guard rail to prevent personnel other than specified operators to operate the unit. Wrong operation to the unit may cause injury.

Form a refrigeration cycle within the application standards of specification.

Formation a refrigeration cycle beyond the boundaries of specification may cause explosion, smoke, ignition,or short circuit.

Conduct drain work.

Water will be released from the unit after rain or defrosting process. If the drain work is not done properly, the wet surface may be slippery with mold and moss, which may cause injury.

Condensation of moisture or frosting may occur on the suction piping.

Do heat insulation work. Otherwise the water will make surroundings wet.

Install the unit in a well-ventilated location.

Refrigerant leakage may cause oxygen deficiency and personnel injury.

Handle the unit with care. Do not turn over the unit when transportation.

The unit is a heavy load, keep vertical position when moving the unit with forklift truck. Improper loading may lead falling and cause injury.

Precautions should be noted when the unit is operated at the first time.

When the unit is operated for the first time, please fix the unit on the foundation and let it stand for at least 2 hours before turning it on.

Electrical Work

Ensure to install an earth leakage breaker with the designated capacity.

Use of an earth leakage breaker with wrong capacity may disable the safety shutdown and cause electrical shock or fire.

Do not wrap the electrical cables into the heat insulation materials which covering the piping.

Putting electrical cables and the refrigerant piping together may lead to overheat of the cables, which may cause fire.

Safety Precautions

Make it sure to follow

Operating Precautions

Take care of the liquid refrigerant when open the refrigerant cycle.

The refrigerant will spray out when opening the service valve. The refrigerant may generate toxic gases when it contacts flames.

Turn off the power supply when conducting maintenance and inspection.

Applying current when doing the cleaning or carrying out maintenance and inspection may cause electrical shock, injury, or burn.

Do not touch electrical components with wet hand.

Do not handle switches with wet hand. Otherwise, it may cause the electrical shock.

Do not touch the high temperature parts of unit with hand.

Because of the high temperature, Touch with compressor or discharge piping will hurt your hand.

Check the operation of earth leakage breaker periodically.

Use of a defective earth leakage breaker will disable the safety shutdown, which may cause electrical shock or fire.

Check the installation platform periodically.

The use of a deteriorated platform may lead to the collapse or fall of the unit, thus causing injury.

Do not climb or put other objects on the unit.

Climbing or placing objects on the unit may result in the collapse or fall of the unit, thus causing injury.

Do not operate the unit when the service valve is closed.

Operating while closing the high pressure service valve leads the abnormal high pressure. It may cause the explosion.

Do not use a flammable aerosol spray near the unit or do not put combustible materials near the unit.

A spark from switches may lead to ignition, thus catching fire.

When removing the fin guard of the condenser,do not touch the fin.

Touching the fin and sliding along the fin may cause skin cut by the fin edge.

Disposal

Consult professionals when disposing of the unit.

If the unit is disposed of while it is still filled with refrigerant and oil, the unit may cause fire and explosion.

Recover all the refrigerant before disposal.

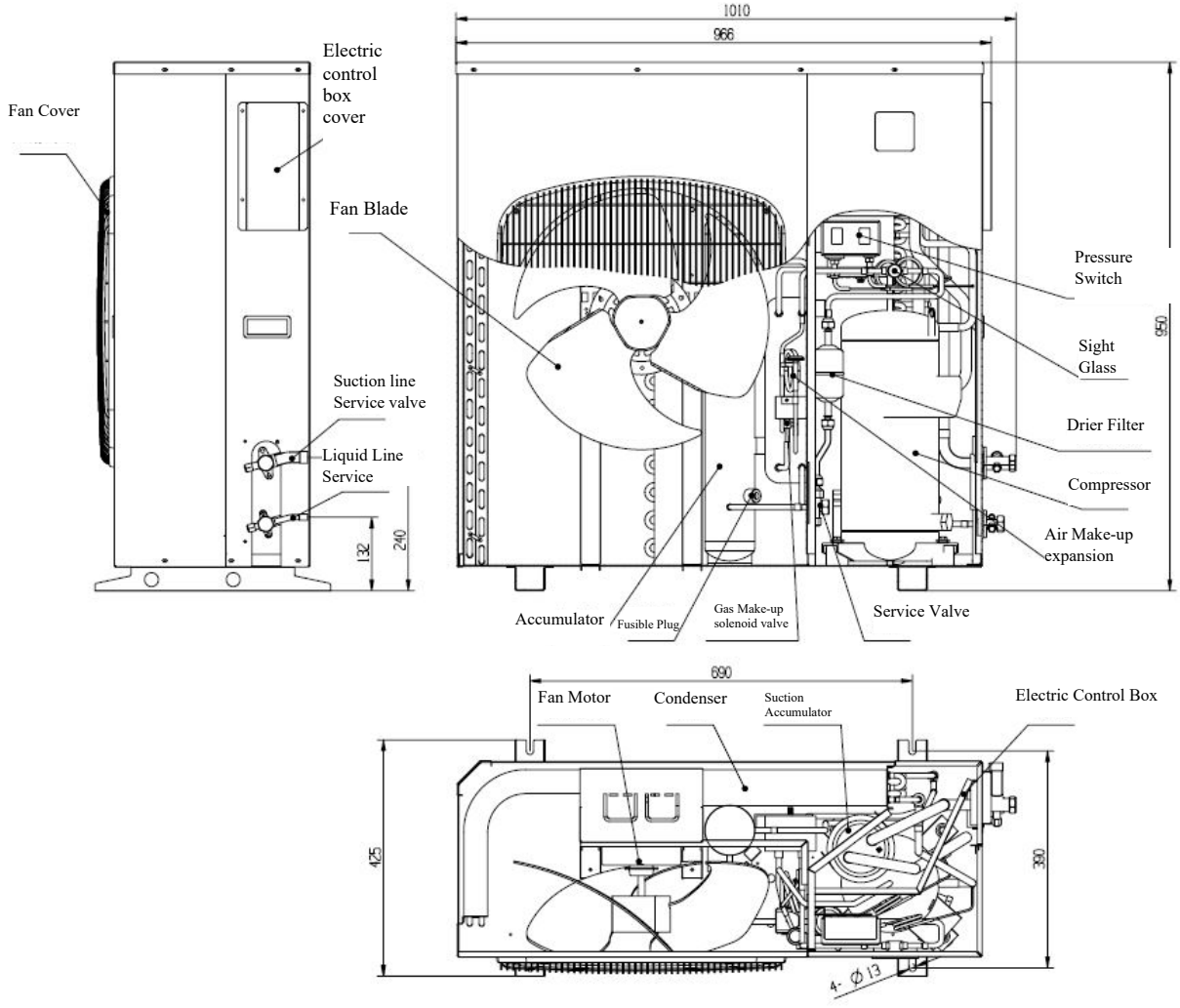
The refrigerant in the unit must be recovered. The release of refrigerant into the air will pollute the environment. Consult with professionals for recycle or disposal.

Names of Components

Names of the Components

Models :

OCU-R200SF	OCU-NR200SF
OCU-R300SF	OCU-NR200SF-D
OCU-S350HF	OCU-NR300SF
OCU-S400HF	OCU-NR300SF-D
OCU-S400HF-D	OCU-NS350HF
OCU-S400SF	OCU-NS400HF
OCU-S400QSF	OCU-NS400HF-D
OCU-S350QSF-D	OCU-NS350QSF-D



Attachment

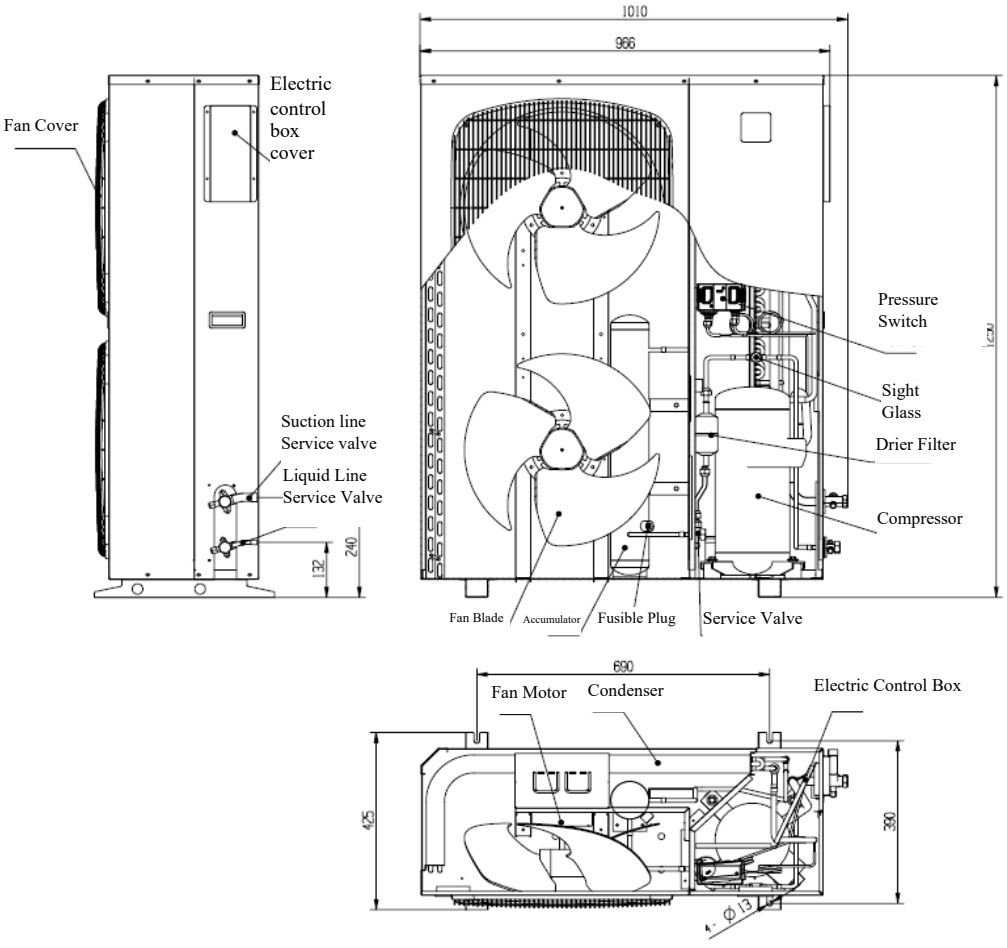
Operation Manual	1 copy

Names of Components

Names of Components

Models:

OCU-S500HF	OCU-NS500HF
OCU-S500HF-D	OCU-NS500HF-D
OCU-S600HF	OCU-NS600HF
OCU-S700HF	OCU-NS700HF
OCU-S500SF	OCU-NS500SF
OCU-S600SF	OCU-NS600SF
OCU-S500QSF	OCU-NS500QSF
OCU-S600QSF	OCU-NS600QSF



Attachment

Fuse Tube 5A 250V	2 pcs, for operation circuit
Operation Manual	1 copy

Application Standards

The unit shall be operated within below range

Items		MT and LT Rotor Unit	MT Scroll Unit	MT and LT Rotor Unit	MT and LT Scroll Unit	MT and LT Scroll Unit	MT Scroll Unit
Applicable Model	Unit	OCU-R200SF OCU-R300SF	OCU-S350HF OCU-S400HF OCU-S400HF-D OCU-S500HF OCU-S500HF-D OCU-S600HF OCU-S700HF	OCU-S400SF OCU-S500SF OCU-S600SF OCU-S350QSF-D OCU-S400QSF OCU-S500QSF OCU-S600QSF	OCU-NR200SF-D OCU-NR300SF-D OCU-NR200SF OCU-NR300SF	OCU-NS400SF OCU-NS500SF OCU-NS600SF OCU-NS350QSF-D OCU-NS400QSF OCU-NS500QSF OCU-NS600QSF	OCU-NS350HF OCU-NS400HF OCU-NS400HF-D OCU-NS500HF OCU-NS500HF-D OCU-NS600HF OCU-NS700HF
Refrigerant		R22			R404A		
Evaporating Temp.	℃	-40～-5	-15～10	-40～-5	-40～-5	-40～-5	-15～10
Suction Pressure	MPa[a)]	0.005～0.320	0.25～0.62	0.005～0.25	0.008～0.42	0.008～0.42	0.27～0.73
Suction Temp.	℃	18 and below（according to the evaporation tempeture, the best suction superheat range is from					
Suction Superheat	K	8~15K（on the side of unit）					
Condensing Temp.	℃	30～55			30～55		
Discharge Pressure	MPa	1.09～2.50			1.33～2.78		
Discharge Temp.	℃	115 and below					
Oil Temp.	℃	95 Max（Ambient temperature+10K and over）					
Ambient Temp.	℃	-7～48（according to the data on the catalogue）					
Power Source	V	Three phase 380±10%（singe phase 220±10%}					
Operation Circuit	V	Single phase 220±10%					
Unbalanced Voltage Rates	%	2 and below					
Installation Tilt	°	3 and below					
ON-OFF Cycle	min	10(minimum duration for start or stop is 3）					
Installation Location		Outdoor installation					
Remark：a). Unless otherwise specified， all pressures refer to Gauge Pressure.							

Technical Specifications

Refer to the unit nameplate for the nominal cooling capacity, input power, performance factor, operating coefficient, and operating current of the unit.
Nominal working conditions: evaporation temperature -7 ° C, suction temperature 18 ° C, condenser inlet air temperature (dry bulb temperature) 32 ° C.

Precautions for Model Selection

Application for medium and low temperature scroll units: :

The cooling capacity generated by the low-temperatur gas make-up unit in the middle temperature state (-5°C~-15°C) is equivalent to the cooling capacity of medium-temperature units with the same HP (in the medium-temperature state, the compressor will be overloaded, and make-up gas is controlled by discharge temp) . As the evaporation temperature decreases, the discharge gas temperature increases, and the amount of gas supplementation gradually increases. When the evaporation temperature is below -25 °C, the supercooling effect is manifested.

Under the system that operates at evaporating temperature about -5℃ for long time, low temperature make-up gas unit,which runs in the high load condition of compressor easily resulting in the compressor overload and burn-out.The compressor motor of the low-temperature make-up gas unit is configured according to the low-temperature load and the motor capacity is smaller than that of the medium-temperature compressor with the same number of HP, so it is easier to burn out when overload occurs.

Please select the unit model reasonably according to the operating temperature.

Tips on the Effective Use of the Unit

For Economical Use

Following tips are the recommendations for the economical use of the condensing unit, for your reference.

Cooling capacity greatly varies depending on application conditions.

Cooling capacity decreases by 3 to 6% as evaporating temperature (temperature-conversion value of the pressure measured at the entrance to unit) drops by 1°C. As condensing temperature rises by 5°C, of the pressure measured at the entrance to unit) drops by 1°C. As condensing temperature rises by 5°C, cooling capacity decreases by about 9 to 18%, with the increase of power consumption.

To optimize the performance of condensing unit, it is important to increase suction pressure and decrease discharge pressure as much as possible.

1.Minimize the pressure drop in piping while ensure the oil return rate.

Reference: Rates of capacity change per pressure loss by 1°C (in suction pipe)

Evaporating temp (°C)	Rates of capacity change per 1°C
-5～-20	3～4%
-20 and below	4～6%

Reference: Rates of capacity change per pressure loss by 1°C (in discharge pipe)

Evaporating temperatures (°C)	Rates of capacity change per 1°C
-5～-20	2～3%
-20 and below	3～4%

2.Increase evaporating temperatures by selecting a evaporator with sufficient capacity.

3.Do not block with food, etc. the cool air outlet and inlet of the refrigerator (freezer) or showcase.

4.Open and close the door of the refrigerator (freezer) as quick as possible (do not keep the door open unnecessarily to prevent cool air from running away)

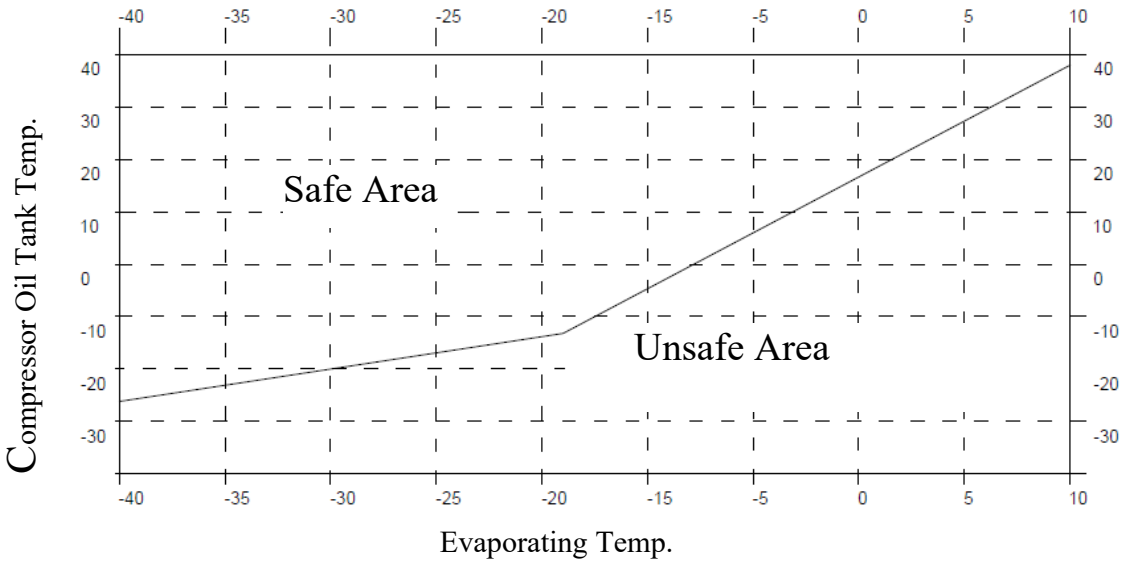
5.Keep the condenser clean by doing the cleaning periodically to prevent clogging.

Reference: Rates of capacity change per change in air inlet temperature of condenser by 1°C

Evaporating temp (°C)	Rates of capacity change per 1°C
-5～-20	2～3%
-20 and below	3～4%

Compressor sump temperature analysis

After the compressor runs smoothly, please make sure that the operation condition of compressor is not in the liquid return area according to the following table. If the liquid returned is too much, please adjust the expansion valve.



Tips on the Effective Use of the Unit

Use with Specified Refrigerant

The filter dryer in this unit will react with water and air, so please carefully observe following instructions.

Never install this unit into a refrigeration system which is using different type refrigerant or oil. (Only use this unit in a new system in case of the cleanliness, impurities and oil) .

System Components

1.Use the specific expansion valve for designated refrigerant.
2. Dry the components thoroughly after cleaning process.
3.Use clean deoxidized copper pipes for piping and phosphor copper filler as a brazing material. "In case of the use of silver solder, do not use flux containing chlorine."
4.Use hub oil seal for pipe joints (pipe for a refrigerant).
5. Suction filter is recommended to prevent metal pieces entering into compressor.

Installation：

1.Do the construction work of refrigerator connections at the end of piping work.
2.The refrigerant connection should be assembled within 30 minutes and then the airtight test should be done.
3. Conduct the air-tight test. Use the specified leakage detector for designated refrigerant.
(Halogen Leak Detector has less sensitivity for R404A).

Use in Cold Weather Regions

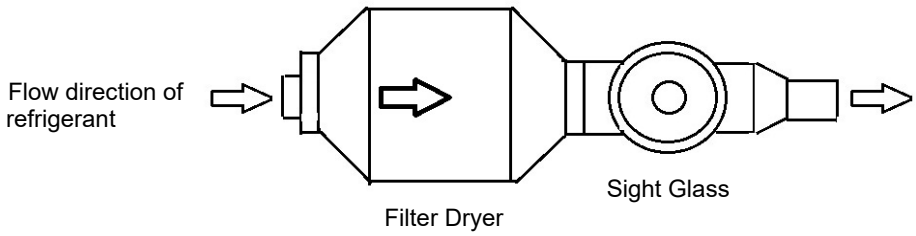
In cold weather regions (where daytime temperatures plunge to some degrees below zero), if the ambient temperature of the Refrigerator (temperature inside) becomes higher than the ambient temperature of the unit, the use of pump down cycle during the defrosting process is advisable to prevent refrigerant

If the ambient temperature of the unit becomes less than -5°C, take measures to prevent the fast fall of high pressure, for example by enclosing the unit with some materials.

The crankcase heater is recommended be used to prevent refrigerant migration and oil dilution in compressor.

Installation of Unit

1. Install the unit in a place where no corrosion gas (nitrogen oxide: NOx etc.) or salt air.
2. Use the concrete foundation with the weight about 3 times the weight of the unit. The tilt of unit should be less than 3°.
3. The antivibration pads should be installed between the unit and foundation if the vibration may transfer to the building.
4. For cold room application, or the ambient temperature of unit lower than room temperature:
   A. The refrigerant flood back may happen due to the continued operation of evaporator fan motor after defrosting. A timer should be installed to set the operation time of fan motor within 1\~2 minutes.
   B. Apply the pump down cycle to avoid refrigerant migration in long period stopping.
5. Please install the filter dryer and sight glass horizontally behind liquid line service valve when connect the pipes to ensure the operation safety and stability of the unit.



Selection of Installation Location

General precautions

For the installation of the equipment, select a location where it is easy to do construction work and to perform daily operation and maintenance.

! As for distance between the equipment, select a place where the length of piping and wiring become as short as possible, and where it is easy to do construction work.

" Install the equipment in a place where it is easy to do daily inspection and maintenance work. (Daily inspection and maintenance includes checks of operation pressure, the moisture indicator, the filter dryer, the magnetic contactor, etc.)

In a place where not disturb neighbors

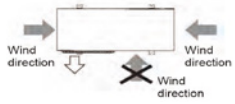
Ensure that discharge wind from condenser and noise from the compressor would not annoy the neighborhood.

In a place where easy for maintenance

Ensure that a space for maintenance and service work is preserved.

Measure Against Strong Wind

Set the air outlet side of unit is at right angle to wind flow direction.



In a place where it is well-ventilated and where it is environmentally safe

Install the unit in a well-ventilated place where air temperatures to condenser less than 43°C for better heat release. Do not install the unit in a place where the unit would be influenced by corrosive gas (salt water, toilets, incinerators, wastewater treatment facilities, chemical plants, exhaust from cars or heaters, etc.)

In a place where is well drained

Water will released from the unit after rain or, in some cases, after defrosting process. Do drainage work, if necessary.

In a place where there is no influence of snow

In the cold weather regions, ensure that the unit is not exposed to snow in winter, and that freezing and frost formation are minimized, for example by covering the unit with a roof.

a place where the floor is robust and level

Install the unit on the robust foundation so that noise would not be amplified. Attention should be taken for the boundary with neighbors and niose level regulation.

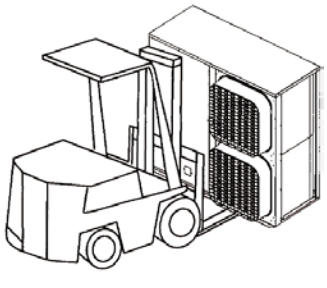
In a place where is heat-proof

Install the unit so that the unit would not be influenced by sunlight reflection from the floor.

Delivery·Installation

Unloading

Unload the unit with care so that the unit is kept upright as much as possible. Never allow the unit to lie on its side. When unloading the unit by forklift truck, etc, place the unit on a pallet so that it can be kept upright.

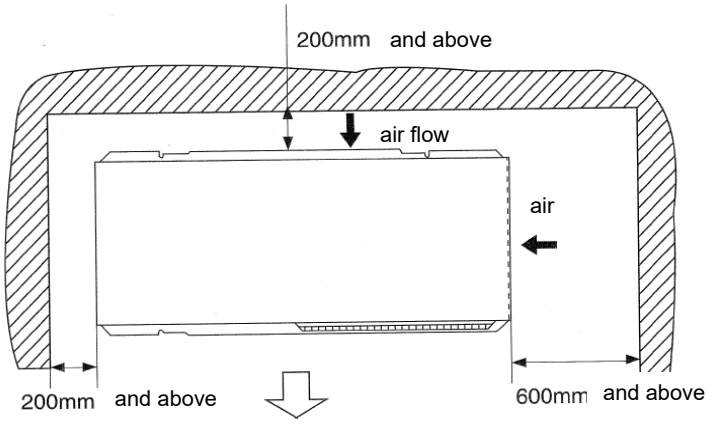


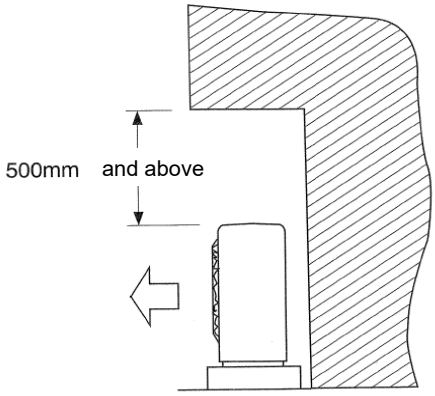
Transportation

Be sure to prevent the vibration of unit(especially compressor) during transportation.

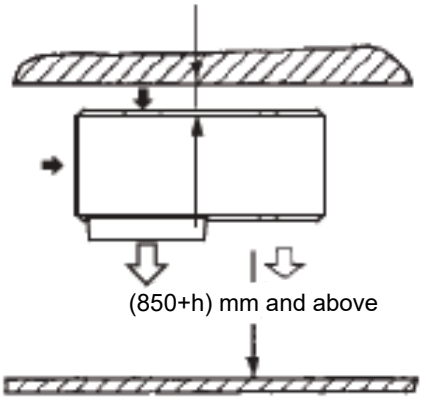
Examples of Installation

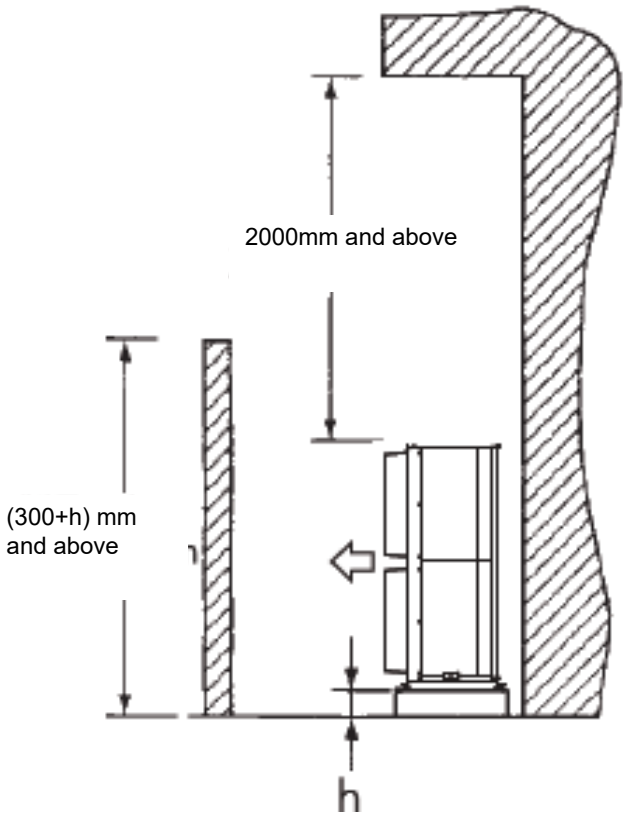
When there are no obstructions near the air outlet side





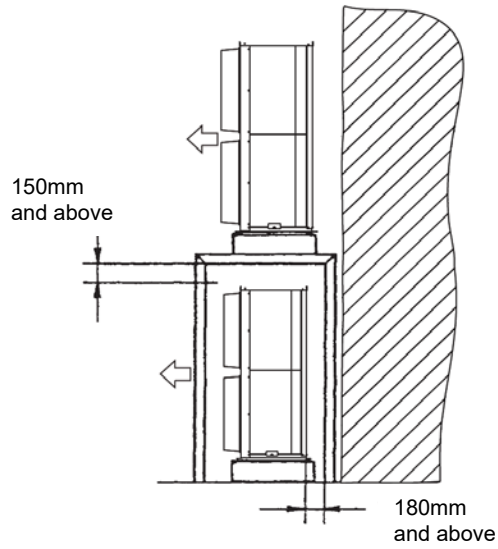
When there are obstructions near the air outlet side



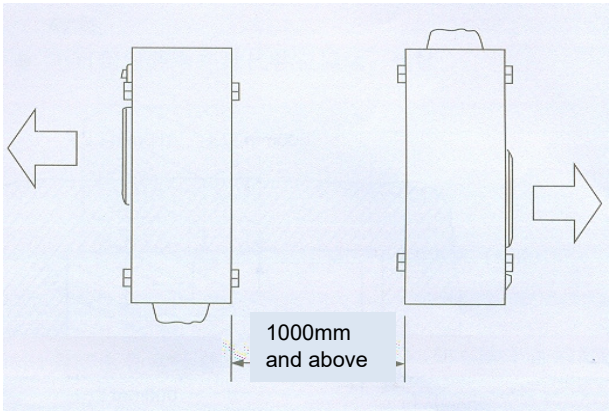


Examples of Installation

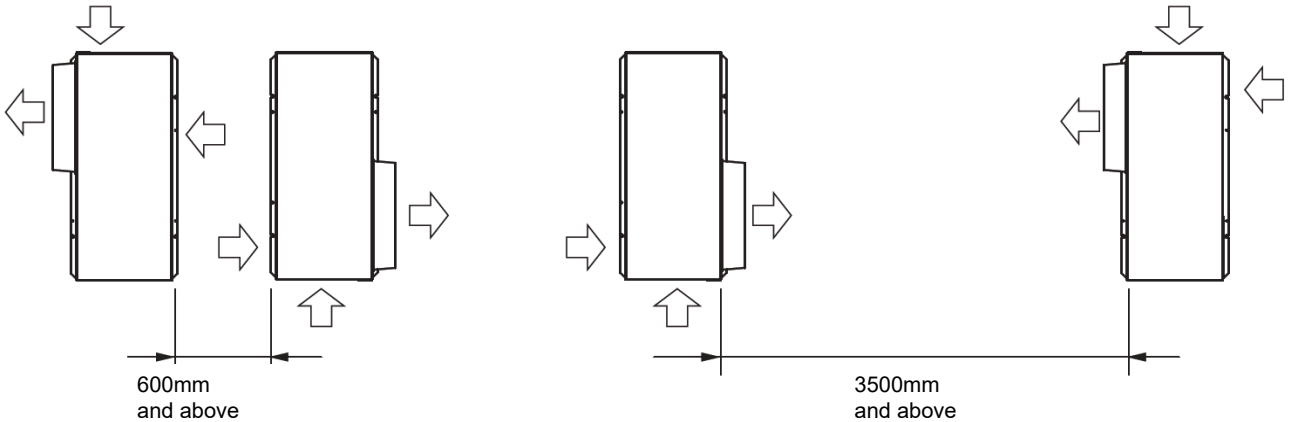
Double Stack Installation



Back to Back Installation



Face to face(Face to back) Installation



Refrigerant Piping Work

The quality of the design and construction work of refrigerant piping has great impact on the performance and reliability of Condensing unit. Observe precautions given below in the case of design and construction work.
The compressor is cooled by liquid injection, if the refrigerant charge volume is not enough, the cooling effect will be decreased due to gas bubble in liquid line, it will result in high temperature of compressor. Do not operate the unit under lack of refrigerant conditions.

Size of refrigerant piping

The sizes of piping by unit models are given as below. However, note that an optimal size shall be decided by calculating the loss of pressure in piping and the flow rates of a refrigerant so that cooling capacity and oil return would not be affected.

Model	OCU-R Series, OCU-NR Series	Other Model
Liquid Line	3/8"（φ9.53）	3/8"（φ9.53）
Suction Line	5/8"（φ15.88）	3/4"（φ19.05）

Do not contaminate the unit with dust, metallic powder, oxidized scale, etc.

Since the unit is composed of highly-precise components, any contaminants mingled into will damage the unit, with gas leakage, capacity reduction, even abrasion and burn.
1.Spray with nitrogen gas during brazing (Strictly abide by).
2.Use the deoxidized phosphorus copper pipes that are clean both inside and outside.
3.When cutting or deburring a copper pipe, do not allow chips to contaminate the pipe. The customer should install the suction filter on the suction line by themselves.

Air-tight Test（After piping construction work, before heat insulation work）

After the piping construction work, conduct the air-tight test as below:

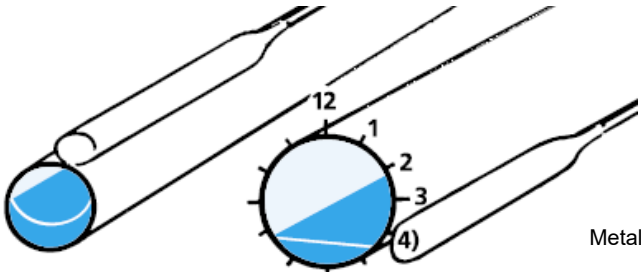
Refrigerant	High Pressure Side	Low Pressure Side
R22	2.8MPa	1.4MPa
R404A	2.84MPa	1.75MPa

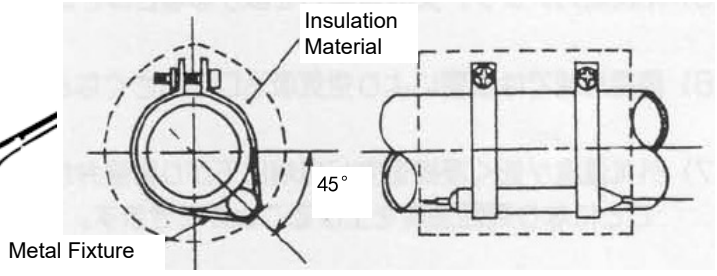
Expansion valve

1.Install and insulate the bulb according to the instruction. Make it sure minimum 5K superheat in all conditions.

Install angle of Bulb
Pipe diameter less than φ25.4(1 inch)：upper position
Pipe diameter more than φ25.4(1inch)：Lower postion 45°（4 o'clock position）

The bulb package installation method is as shown in the figure. The bulb needs to be installed horizontally.



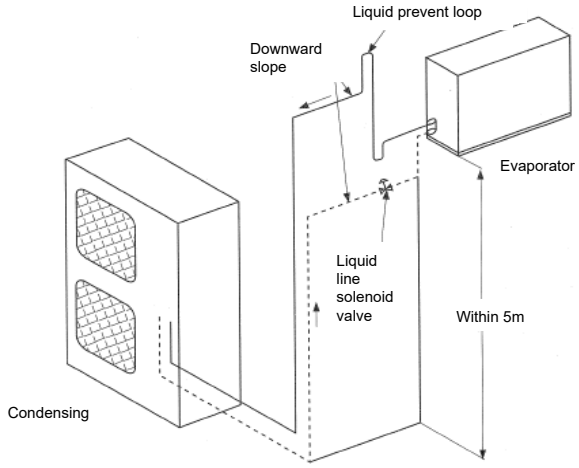


2.The superheat degree will become less in winter season, adjust the expansion valve to make sure minimum 5K superheat degree.

Refrigerant Piping Work

When the evaporator is installed above the unit

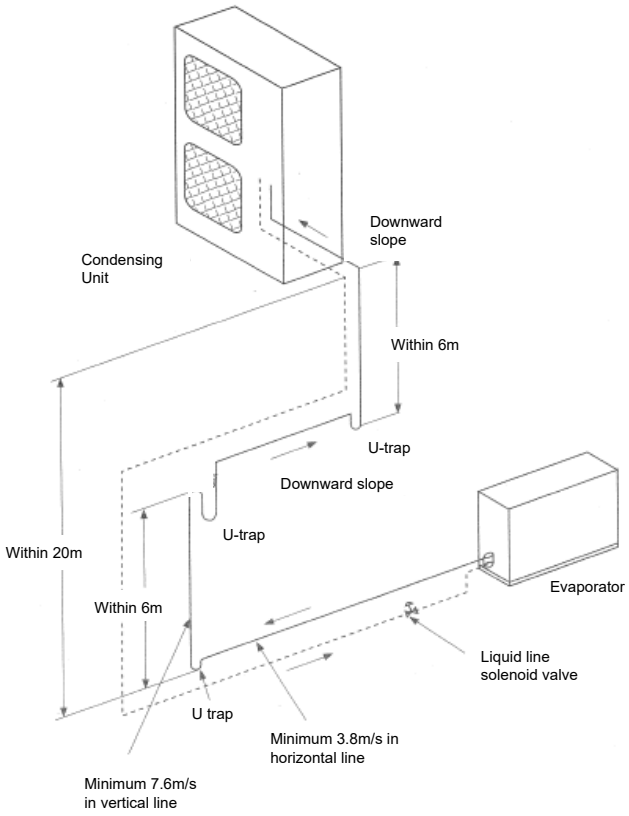
● Difference in height shall be within 5 meters.
Otherwise, flash gas may be caused by increased pressure loss of a liquid refrigerant due to difference in height.



Other notes:
* Heat Insulation material: Insulate the piping from evaporator to compressor.Thickness of 25mm and above for refrigerator / 50mm and above for freezer.
*Liquid line solenoid valve: close to expansion valve.
*Downward slope: 1/200~1/250
*Oil trap(U-trap): dimension as small as possible
*refrigerant floodback prevent loop:should be installed higher than the location of evaporator.

When the evaporator is installed below the unit

● For better oil return, set the oil trap in every 6 meters height.
Difference in height shall be within 20 meters.



Other notes:
* Heat Insulation material: Insulate the piping from evaporator to compressor.Thickness of 25mm and above for refrigerator / 50mm and above for freezer.
*Liquid line solenoid valve: close to expansion valve.
*Downward slope: 1/200~1/250
*Oil trap(U-trap): dimension as small as possible
*refrigerant floodback prevent loop:should be installed higher than the location of evaporator.

Refrigerant Oil

Technical Specification

Ref.	Model	Ref. Oil Amount	Ref. Oil	Model	Ref. Oil Amount	Ref. Oil
R-22	OCU-R200SF	0.9	3GSD-T	OCU-S350HF	1.7	SAY-56T
	OCU-R300SF	0.9		OCU-S400HF	1.7	
	OCU-S350QSF-D	1.7	3GSD	OCU-S400HF-D	1.7	
	OCU-S400QSF	1.7		OCU-S500HF	1.7	
	OCU-S400SF	1.7		OCU-S500HF-D	1.7	
	OCU-S500QSF	1.7		OCU-S600HF	1.7	
	OCU-S500SF	1.7		OCU-S700HF	1.7	
	OCU-S600QSF	1.7				
	OCU-S600SF	1.7				
R-404A	OCU-NS350QSF-D	1.7	FV32S	OCU-NR200SF	0.9	FV68S
	OCU-NS400QSF	1.7		OCU-NR200SF-D	0.9	
	OCU-NS400SF	1.7		OCU-NR300SF	0.9	
	OCU-NS500QSF	1.7		OCU-NR300SF-D	0.9	
	OCU-NS500SF	1.7		OCU-NS350HF	1.7	
	OCU-NS600QSF	1.7		OCU-NS400HF	1.7	
	OCU-NS600SF	1.7		OCU-NS400HF-D	1.7	
	OCU-NS500HF	1.7	FV68S	OCU-NS600HF	1.7	
	OCU-NS500HF-D	1.7		OCU-NS700HF	1.7	

Refrigerant Oil Replenishment for Unit

When the length of the main suction pipe （single course and including the pipe length in vertical position） exceeds 10 meters, charge the refrigerant oil according to the following rules:

When the length exceeds 10 meters, charge the refrigerant oil according to the following rules:

1/2	10
5/8	20
3/4	30
7/8	40
1	50

For scroll unit, it is possible to directly add refrigerant oil more than 35% of the original amount (see the catalogue), and for the rotor unit, it is recommended to charge the refrigerant more than 25% of the original amout. Before connecting refrigeration system, ensure all components clean and dry. Pipes connected to unit should be flexibly structured. The horizontal section of suction pipe should be inclined to the direction of compressor. The flow rate of the gas to ensure oil return should be not less than 4 m/s. The flow rate of the refrigerant vapor in the vertical ascent section of the suction pipe should be not less than 8 m/s , but the flow rate of refrigerant in air tube shouldn't exceed 15 m/s. When the evaporation temperature is below 10 °C, the suction

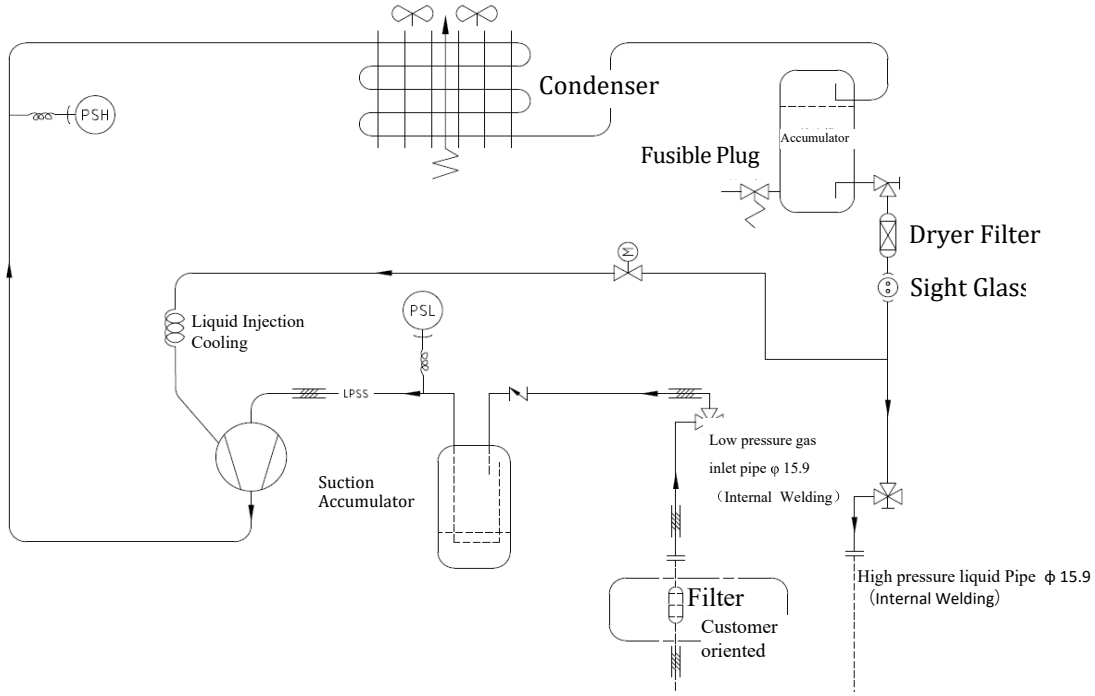
For the R404A refrigerant system, pay special attention to the leakage check of the welded joint. For systems using R404A refrigerant, speacial dry filter, expansion valve, pressure switch and sight glass and other accessories should be used. Dry filter can not adopt silica gel. Refrigerant charging equipment and vacuuming equipment should be used exclusively and should not be mixed with R22's.

The piping of the refrigeration system should be connected by welding as much as possible. In the welding, the method of charging the pipe with nitrogen should be adopted to prevent the occurrence of scale, and also to protect the valve gasket and packing from heat damage.

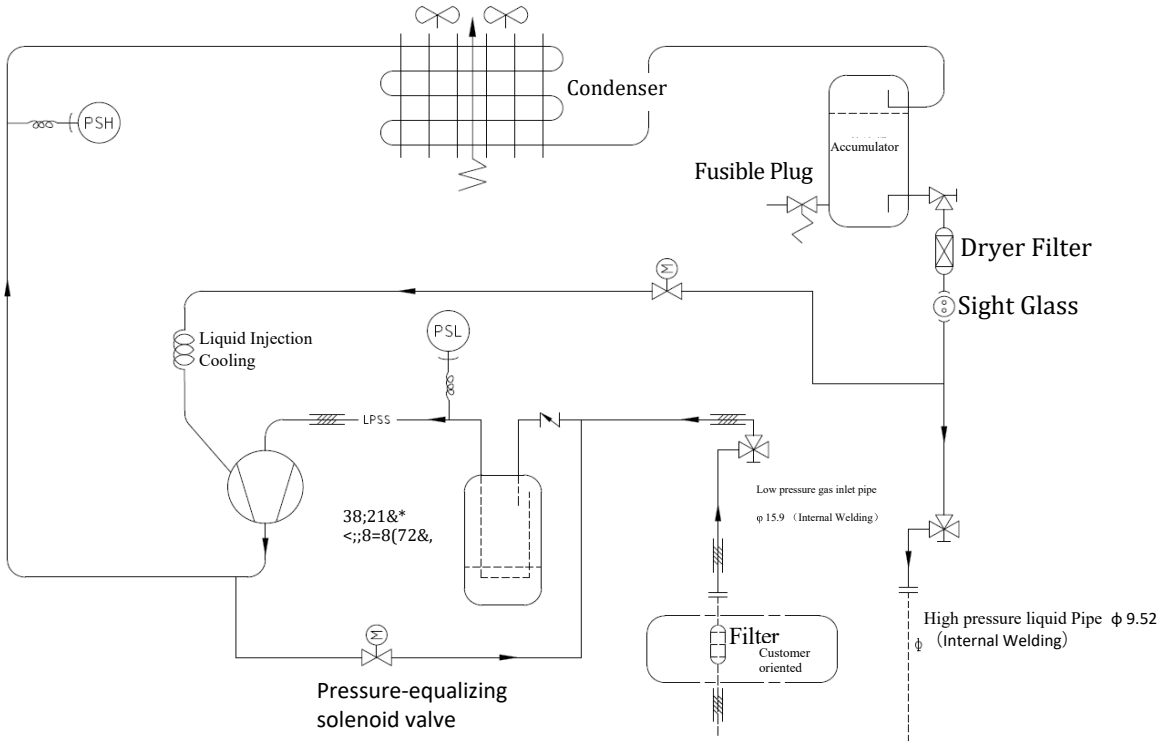
The refrigerant used in the condensing unit should be of the type indicated on the compressor's nameplate, and other refrigerants should not be misused. The compressor of the R404A refrigerant condensing unit is charged with special synthetic refrigerating oil. This special refrigerating oil is not allowed to be mixed with other mineral oils or synthetic oils, and this special synthetic refrigerating oil is highly susceptible to moisture, so it should be connected to the system after the refrigeration system is fully dry. The compressor of the condensing unit using R22 refrigerant is charged with (our company coded) mineral oil.

Refrigerant Circuit Diagram

Models: OCU-R200SF OCU-NR200SF
OCU-R300SF OCU-NR300SF

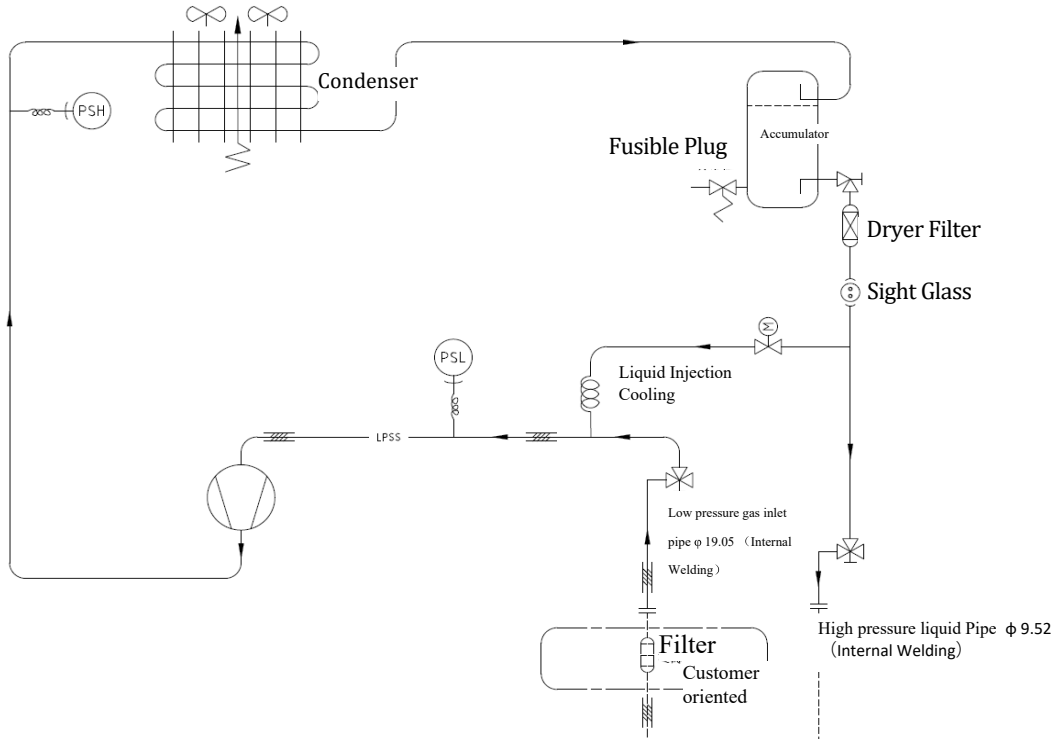


Models: OCU-NR200SF-D
OCU-NR300SF-D

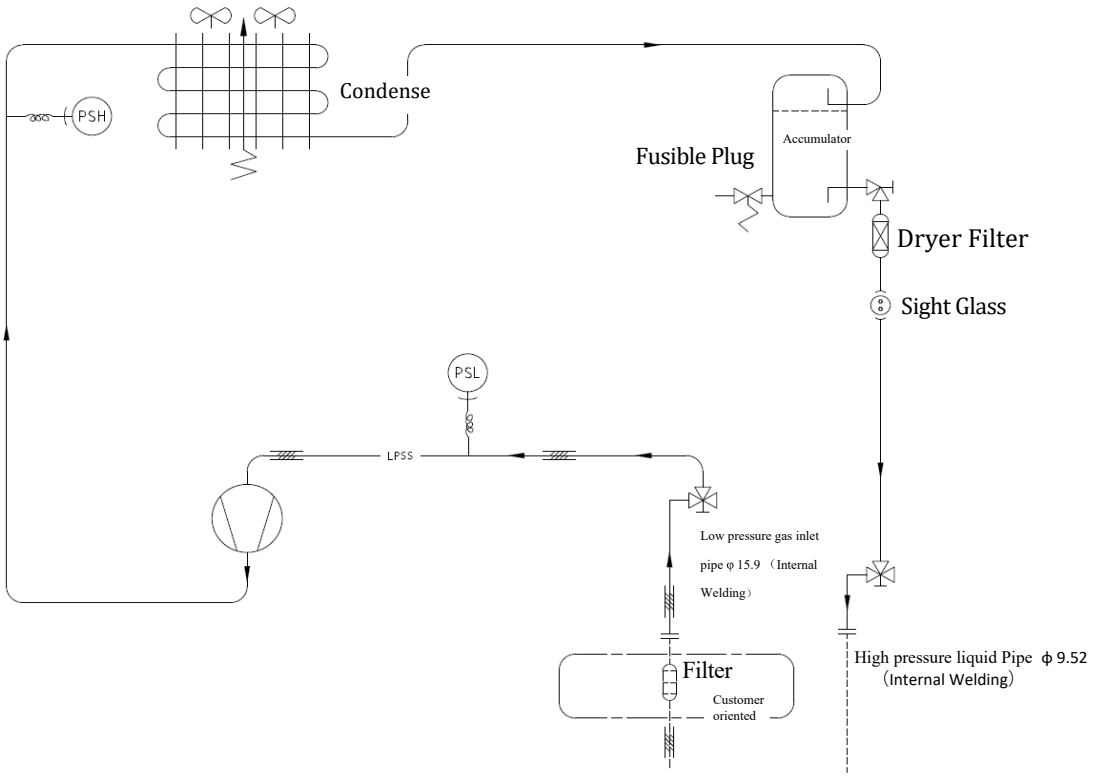


Refrigerant Circuit Diagram

Models: OCU-S350HF OCU-S400HF OCU-S500HF OCU-S600HF OCU-S700HF

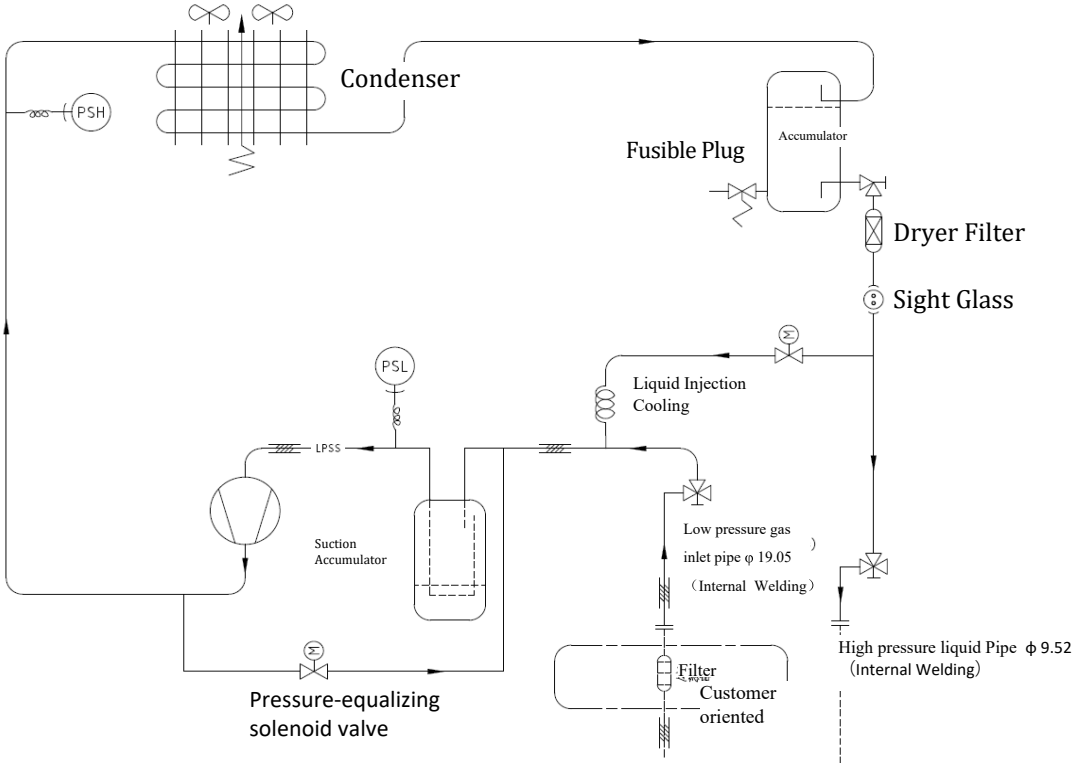


Models: OCU-NS350HF OCU-NS400HF OCU-NS500HF OCU-NS600HF OCU-NS700HF

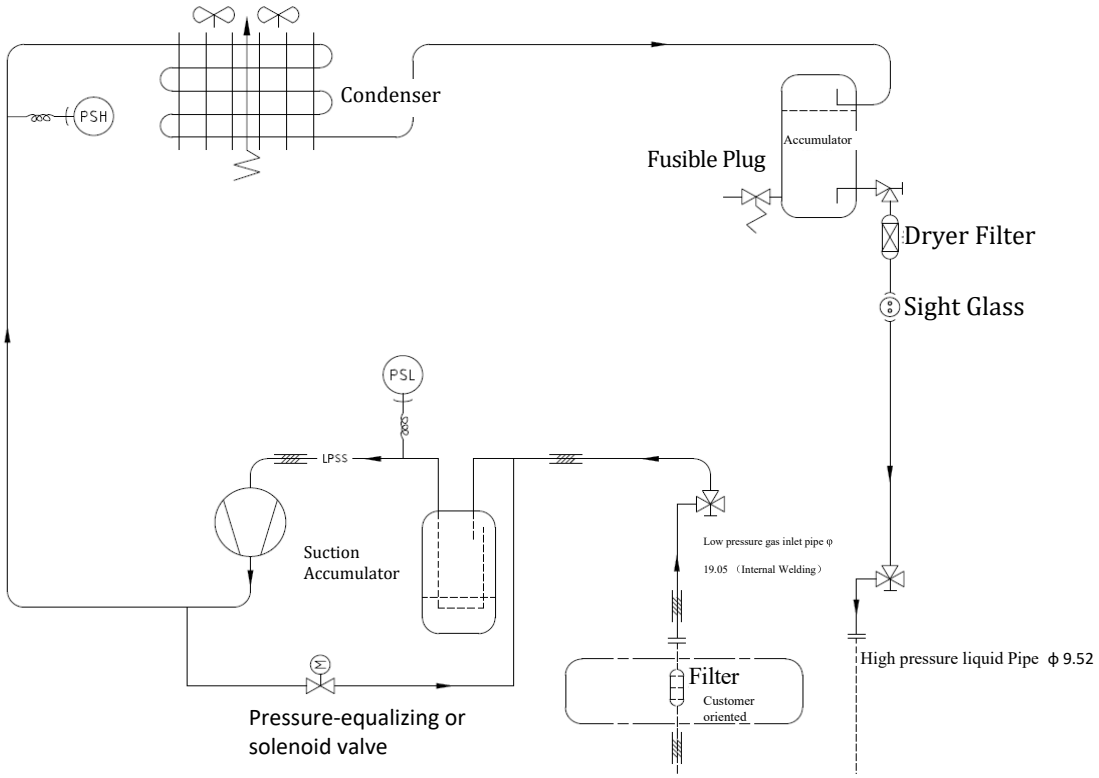


Refrigerant Circuit Diagram

Models: OCU-S400HF-D OCU-S500HF-D

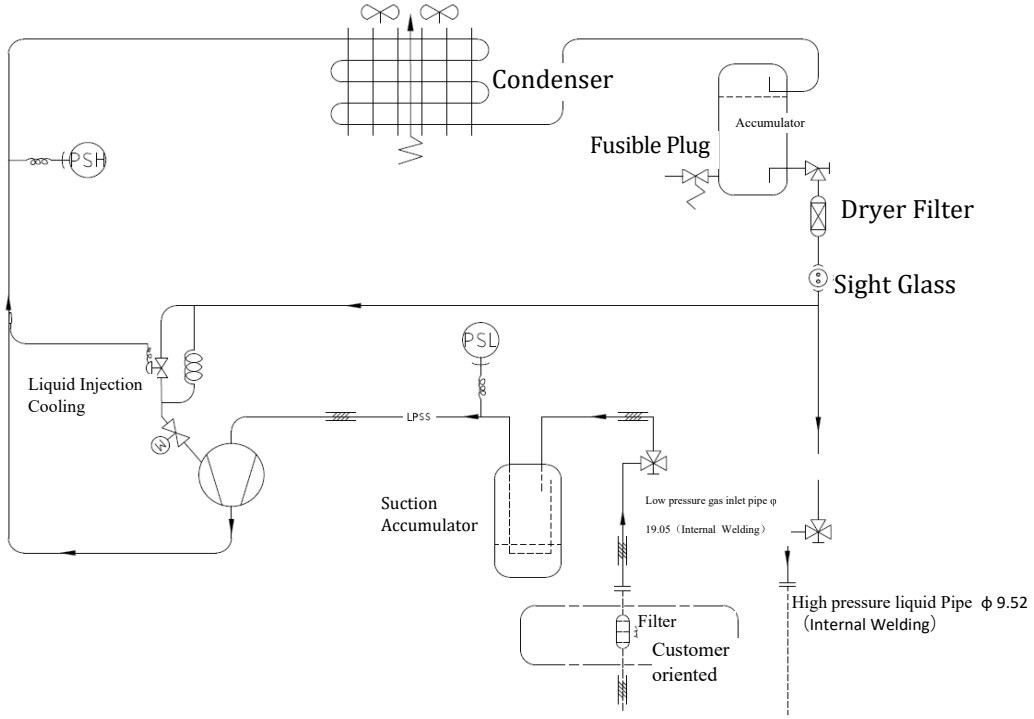


Models: OCU-NS400HF-D OCU-NS500HF-D

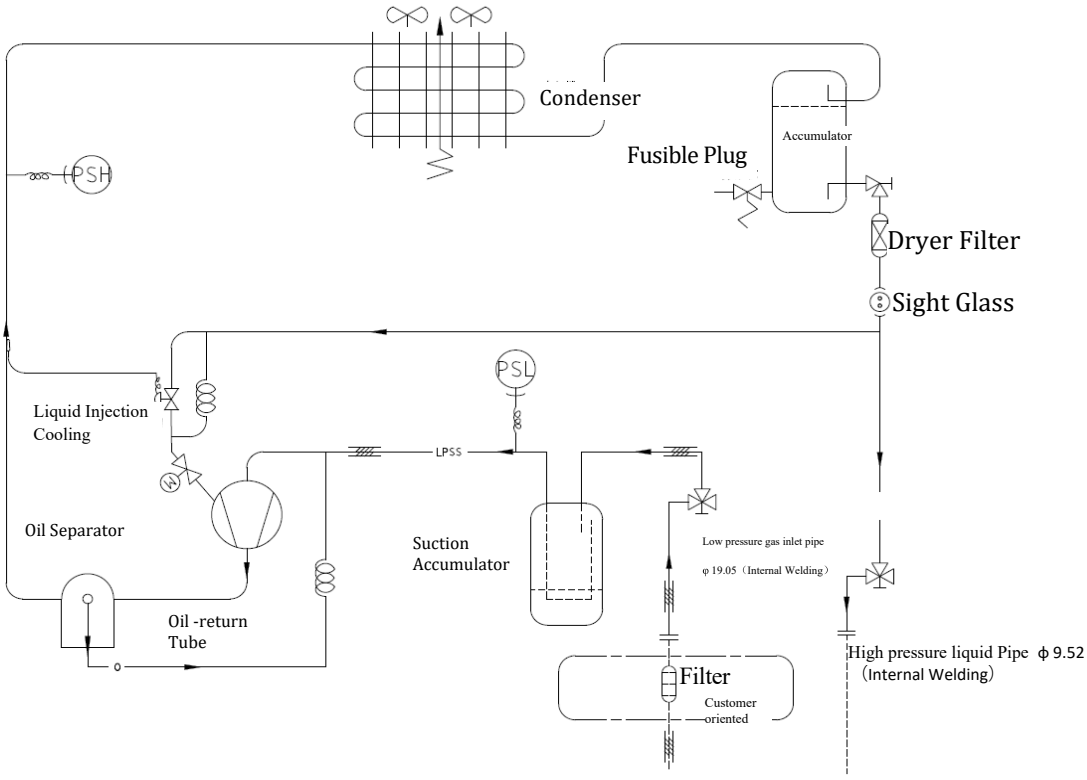


Refrigerant Circuit Diagram

Models： OCU-S400SF OCU-NS400SF

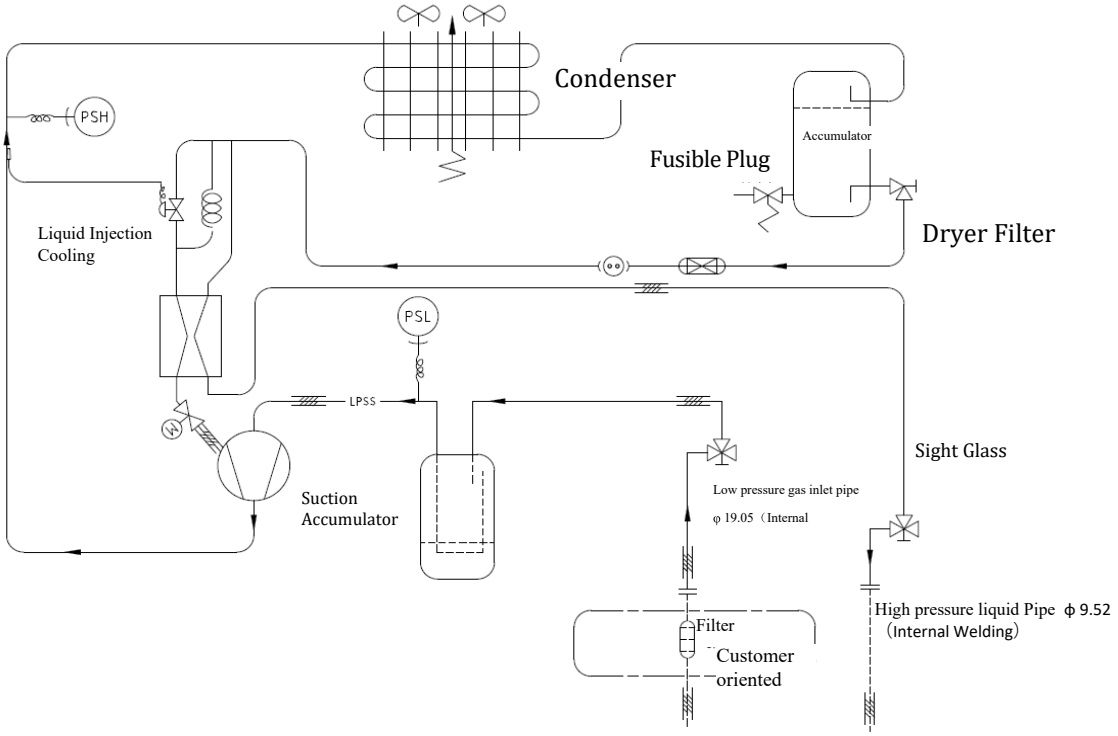


Models： OCU-S500SF OCU-NS500SF
OCU-S600SF OCU-NS600SF

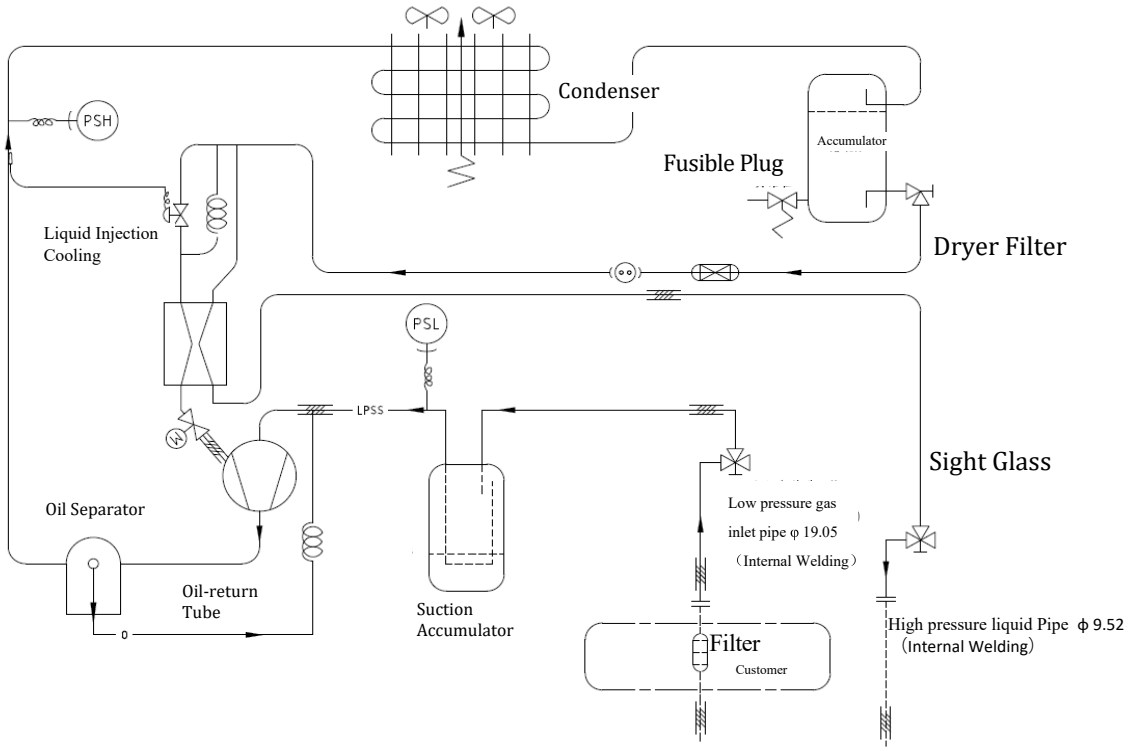


Refrigerant Circuit Diagram

Models: OCU-S400QSF OCU-NS400QSF

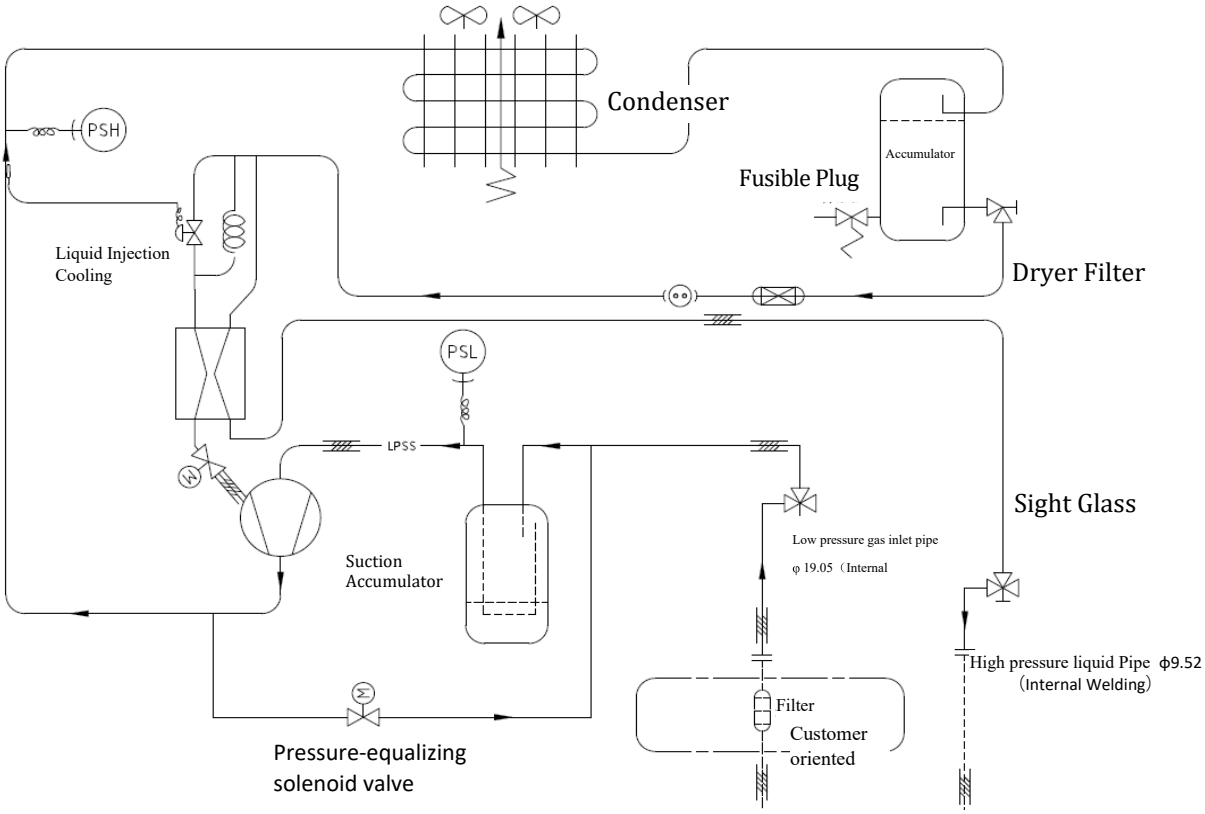


Models: OCU-S500QSF OCU-NS500QSF
OCU-S600QSF OCU-NS600QSF



Refrigerant Circuit Diagram

Models: OCU-S350QSF-D OCU-NS350QSF-D



Refrigerant Charge

Evacuation

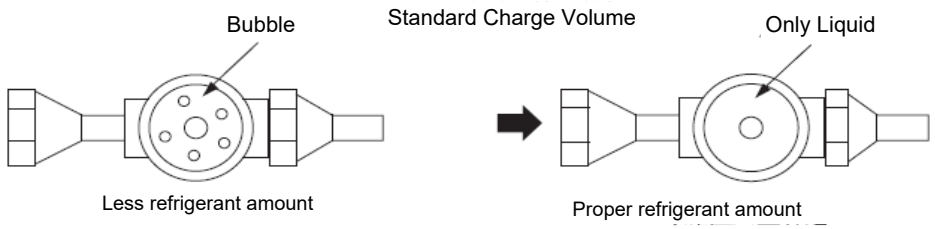
(1) Before charging refrigerant, be sure to conduct vacuum drying of the whole refrigerant circuit with a vacuum pump to prevent the air and moisture from entering the circuit. Ensure that an air-tight test is implemented before evacuation. After conducting an air-tight test, do not release all the air and keep pressure of about 0.02 MPa when implementing evacuation.
(2) It is essential to connect the vacuum pump to both the high-pressure side and low-pressure side simultaneously to ensure that the system is completely evacuated. (use service valves)
(3) During evacuation process: the service valves connecting with vacuum pump shall be at half-open position, while other valves in the system shall be at full-open position.
(4) Use the manifold gauge to check the vacuum degree:

- Target: Reduce pressure to vacuum degree of 133 Pa and continue evacuation for about 1 to 3 hours.
- Service valves: Open (turn anticlockwise), Close (turn clockwise)
  - Suction and Liquid line service valve: Open (anticlockwise), Close (clockwise)

(5)Do not implement evacuation with compressor on.

Refrigerant charge(after wiring work）

(1) Use the refrigerant specified manifold gauge and charge hoses. Do not use it mixed with other refrigerants.
(2) Charge the liquid refrigerant from service port of high pressure side liquid line immediately after evacuation.
(3) If additional charge needed, it should be charged with gas from suction side service valve when compressor is running. Operate compressor at least 1 minute within 15 minutes after refrigerant charge.
(4) R404A is a "near azeotrope"and therefore should de charge in the liquid phase.lf additional refrigerant charging is done in the liquid state from the suction line,it should be done using a safety charger,a liquid charging adapter or etc.(Refrigerant flashes off into a saturated vapor.)
(5) Never charge liquid refrigerant from low pressure side.
(6) Refrigerant charge amount varies depending on system components size and operation conditions, the proper amount observed is until the flash gas from moisture indicator disappearing.
(6) Refrigerant charge amount varies depending on system components size and operation conditions, another 5%-10% refrigerant needed to be charged after the flash gas from moisture indicator disappearing.
(7) During the charging process, multiple pressure protections may occur shutdown and startup delays may occur. During this period, the bypass low-voltage controller and the low-voltage protector are prohibited, and carry out charging foribly.
(8) An additional liquid tank may be installed if the refrigerant charge is too much for recovery.



Volume of liquid receiver

Model	OCU-R200SF OCU-R300SF OCU-S350HF OCU-S400HF OCU-S400HF-D OCU-S500HF OCU-S500HF-D	OCU-S400SF OCU-S500SF OCU-S600SF OCU-S350QSF-D OCU-S400QSF OCU-S500QSF	OCU-NR200SF OCU-NR200SF-D OCU-NR300SF OCU-NR300SF-D OCU-NS350HF OCU-NS400HF OCU-NS400HF-D	OCU-NS400SF OCU-NS500SF OCU-NS350QSF-D OCU-NS400QSF OCU-NS500QSF OCU-NS500HF OCU-NS500HF-D	OCU-S600HF OCU-S700HF OCU-S600QSF OCU-S600SF OCU-NS600HF OCU-NS700HF OCU-NS600SF
Liquid Receiver Volume（L）	3L				6L

Electrical Wiring Work

Electrical work shall be done by qualified technicians with enough electrical knowledge.

Ensure to install an earth leakage breaker with the designated capacity

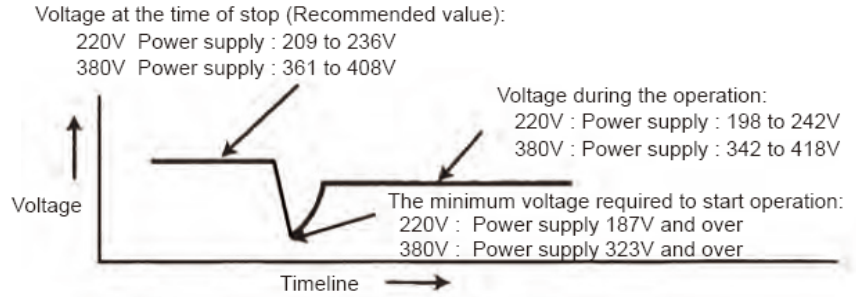
Use of an earth leakage breaker other than the one with designated capacity may disable the safety shutdown and cause electrical shock or fire.
Protection cannot be made by a current leak relay.

Prevention of electrical shock and fire

- Make it sure to conduct the earthing of the unit!
- Use the circuit exclusively for the unit (do not share the circuit with other products).
- Do not allow wiring to come closer to high temperature areas (compressor, condenser, discharge pipe) and the edge of metals.

Allowable power-supply voltage

The figure below shows the allowable voltage for the unit. Ensure that voltage falls within this range.



Testing point is on the power source terminal of the unit

- In case of electricity recovery after power interruptions, if all the devices including the condensing unit start up simultaneously, which, in turn, may cause the failure of electrical components.

  If the capacity of power supply or wiring is not enough, the start failure may occur due to low starting voltage (when starting voltage less than 187 V (220 V power source) or 323 V (380 V power source)).

  In this case do not allow device to start up simultaneously. (Use the time relay to set the start sequence)

Electrical Wiring Project

Wiring capacity of the unit is as followed:

Items	Leakage protector or circuit breaker ※1		Power Line （mm^2） ※2	Earthing Wiring
Model Names	Rated Current （A）	Rated leakage current （mA）	Within 30m	Wire Diameter mm^2
OCU-NR300SF	10	30	2.5	2.5
OCU-R300SF	10	30	2.5	2.5
OCU-NS400HF	16	30	4	4
OCU-S400HF	16	30	4	4
OCU-NS350HF	16	30	4	4
OCU-S350HF	16	30	4	4
OCU-NS400HF-D	50	30	6	6
OCU-S400HF-D	50	30	6	6
OCU-NS500HF	16	30	4	4
OCU-S500HF	16	30	4	4
OCU-NS500HF-D	63	30	10	10
OCU-S500HF-D	63	30	10	10
OCU-NS600HF	20	30	4	4
OCU-S600HF	20	30	4	4
OCU-NS700HF	20	30	4	4
OCU-S700HF	20	30	4	4
OCU-NR200SF-D	25	30	6	6
OCU-NR300SF-D	32	30	6	6
OCU-NR200SF	10	30	2.5	2.5
OCU-NS400QSF	16	30	4	4
OCU-S400QSF	16	30	4	4
OCU-NS350QSF-D	40	30	6	6
OCU-NS400SF	16	30	4	4
OCU-S400SF	16	30	4	4
OCU-NS500QSF	16	30	4	4
OCU-S500QSF	16	30	4	4
OCU-NS500SF	16	30	4	4
OCU-S500SF	16	30	4	4
OCU-NS600QSF	20	30	4	4
OCU-S600QSF	20	30	4	4
OCU-NS600SF	20	30	4	4
OCU-S600SF	20	30	4	4

Note 1: the leakage protector or circuit breaker shall be configured by the customer, and the type D specification shall be selected

Note 2: Wire specification value is the value under the condition that the environment temperature is below 40 °C with the 600 V wire, colloid insulated wire (VV), and metal pipe connection under three-root value.

Wire specification values is calculated under the ambient temperature 32 °C and evaporation temperature –20 °C / –5 °C.

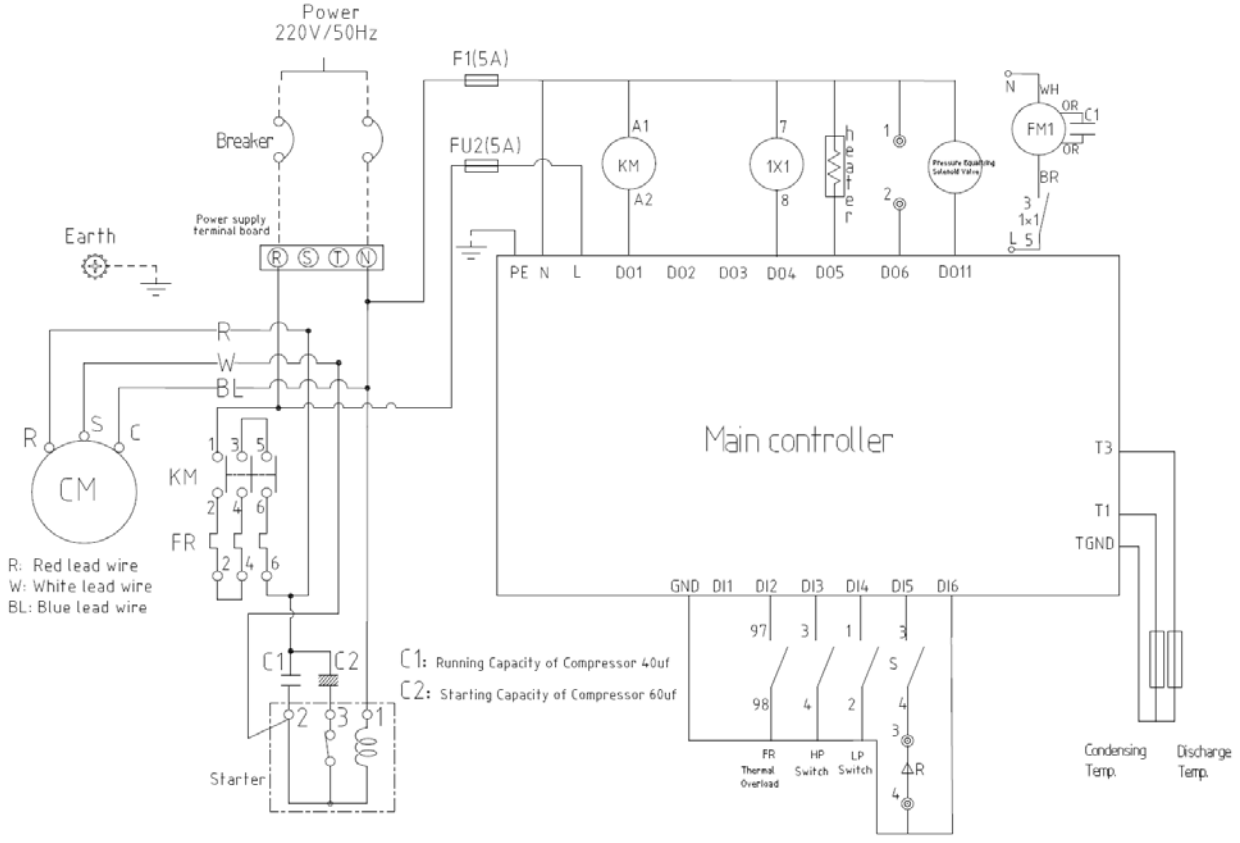
Electrical Wiring Work

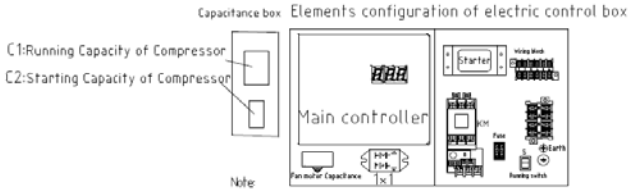
Setting up of Alarm System

This unit is equipped with various protection devices to secure safety. If the earth leakage breaker or a protection device is activated without proper alarming system and temperature management system, the operation of the unit will be stopped for very long time. This will cause damages to the stored items. Therefore, please take into consideration the setting up of alarm device and establishment of temperature management system at the planning period of project.

Electrical Diagram

Model: OCU-R200SF-D OCU-R300SF-D
OCU-NR200SF-D OCU-NR300SF-D





Note:

1. Grounding wire is attached to the grounding screw.
2. ◎ is the terminal on the wiring block in the electrical control box.
3. The point 1 and point 2 are the fault output signals of the unit. They are active output. The contact capacity is 220V/5A.
4. When the remote start-stop is enabled, please connect the passive signal to point 3 and point 4 of the wiring block and dismantle the red short wiring.
5. Breaker should be prepared by the customers. The capacity of the circuit breaker is marked on the label of wire size of the unit.

FR THermal Overload setting:
2HP:13A 3HP:24A

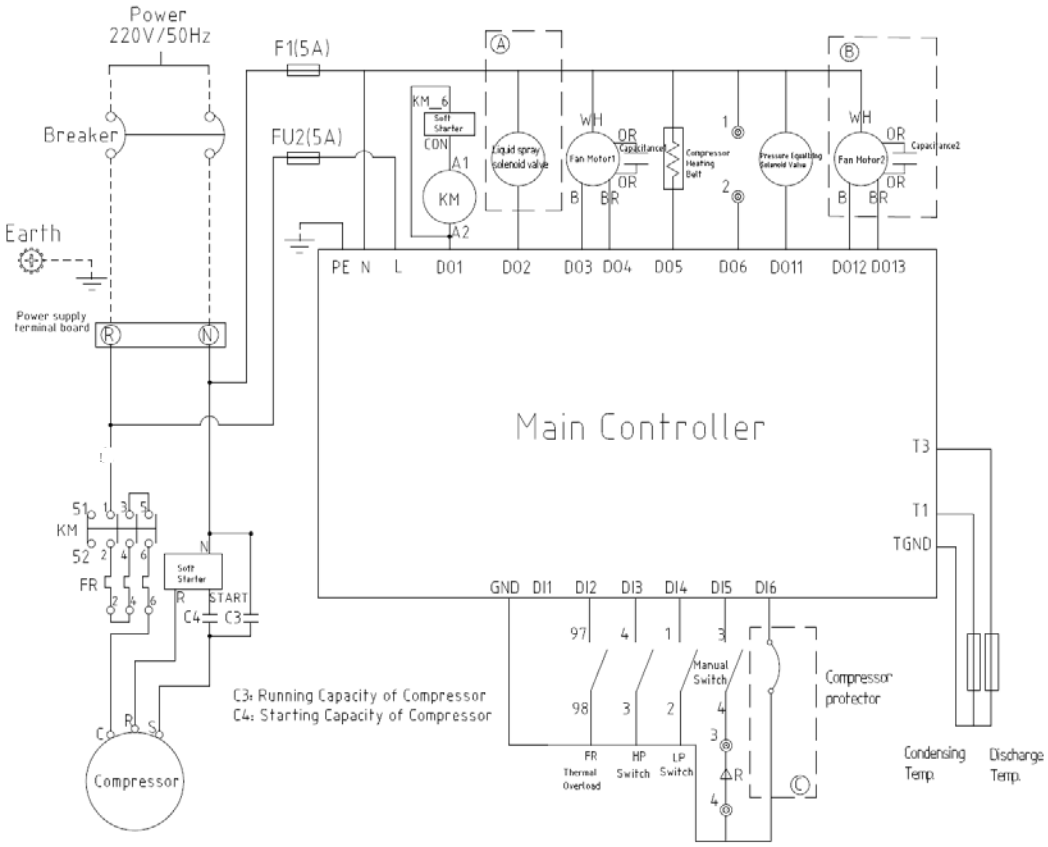
Fault code:

- E00: Reverse phase protection of input power supply
- E01: Protection of high discharge temp.
- E02: Over current protection
- E03: Protection of high discharge pressure
- E04: Protection of discharge sensor fault
- E05: Protection of condensing sensor fault
- E06: Main control panel fault
- E07: Protection of high compressor temp.

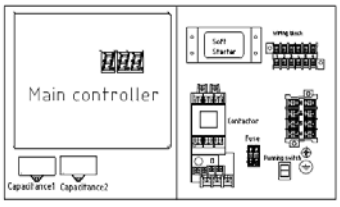
Electrical Wiring Project

Electrical Diagram

Models: OCU-S350QSF-D OCU-S400HF-D OCU-S500HF-D
OCU-NS350QSF-D OCU-NS400HF-D OCU-NS500HF-D



Elements configuration of electric control box



Note:

1. Grounding wire is attached to the grounding screw.
2. ⓞ is the terminal on the wiring block in the electrical control box.
3. The point 1 and point 2 are the fault output signals of the unit. They are active output. The contact capacity is 220V/5A.
4. When the remote start-stop is enabled, please connect the passive signal to point 3 and point 4 of the wiring block and dismantle the red short wiring.
5. Only the unit 5/6/7horsepower mark the fan motor at Ⓑ. Only low temperature unit mark the compressor protector at Ⓒ.
6. The high temperature unit with the new refrigerant does not mark the liquid spray solenoid valve at Ⓐ.
7. Breaker should be prepared by the customers. The capacity of the circuit breaker is marked on the label of wire size of the unit.

Fault code:

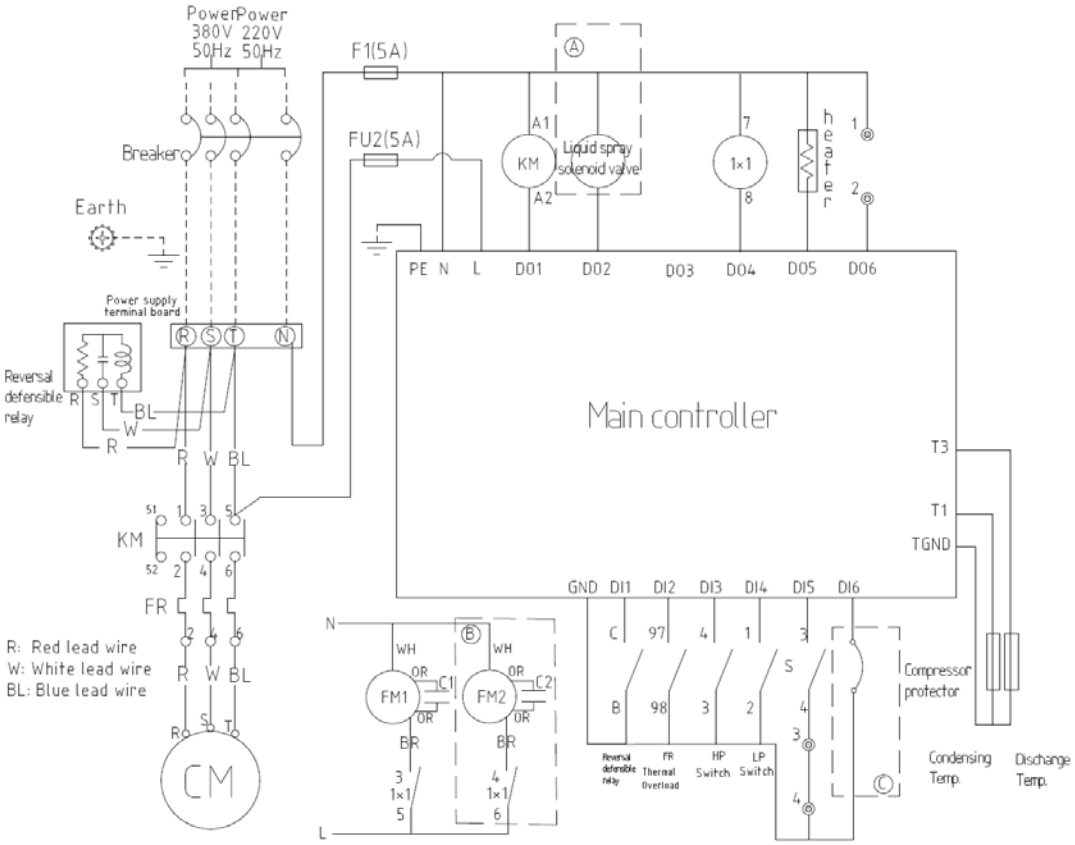
E00: Reverse phase protection of input power supply
E01: Protection of high discharge temp.
E02: Over current protection
E03: Protection of high discharge pressure
E04: Protection of discharge sensor fault
E05: Protection of condensing sensor fault
E06: Main control panel fault
E07: Protection of high compressor temp.

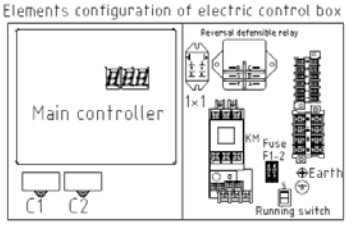
Electrical Wiring Project（续）

Electrical Diagram

Models:

OCU-R200SF	OCU-S400SF	OCU-NR200SF	OCU-NS400SF
OCU-R300SF	OCU-S500SF	OCU-NR300SF	OCU-NS500SF
OCU-S350HF	OCU-S600SF	OCU-NS350HF	OCU-NS600SF
OCU-S400HF	OCU-S400QSF	OCU-NS400HF	OCU-NS400QSF
OCU-S500HF	OCU-S500QSF	OCU-NS500HF	OCU-NS500QSF
OCU-S600HF	OCU-S600QSF	OCU-NS600HF	OCU-NS600QSF
OCU-S700HF		OCU-NS700HF	





Fault Codes

E00: Reverse phase protection of input power supply
E01: Protection of high discharge temp.
E02: Over current protection
E03: Protection of high discharge pressure
E04: Protection of discharge sensor fault
E05: Protection of condensing sensor fault
E06: Main control panel fault
E07: Protection of high compressor temp.

Note

1. Grounding wire is attached to the grounding screw.
2. ⓞ is the terminal on the wiring block in the electrical control box.
3. The point 1 and point 2 are the fault output signals of the unit. They are active output. The contact capacity is 220V/5A.
4. When the remote start-stop is enabled, please connect the passive signal to point 3 and point 4 of the wiring block and dismantle the red short wiring.
5. The high temperature unit with the new refrigerant does not mark the liquid spray solenoid valve at Ⓑ. Only the unit 5/6/7 horsepower mark the fan motor at Ⓐ. Only low temperature unit mark the compressor protector at Ⓒ.
6. Breaker should be prepared by the customers. The capacity of the circuit breaker is marked on the label of wire size of the unit.

PCB Function

With the running state of the compressor displayed on the LED of PCB,when the compressor is abnormal, the fault code indicating the abnormal reason can be seen.

Display

During normal operation

The running state, discharge temperature and condensation temperature are displayed alternately every 2 seconds

e.g. On→89→45

During abnormal operation

e.g. E00

Low Pressure Control

When the low pressure of the unit is lower than the OFF value of the pressure switch, the compressor will be shut down due to low pressure. When the low pressure is higher than the ON value of the pressure switch, the compressor will be started up in a delay time of 1 minute set by the factory.

Delay time	1min		3min		
Models	OCU-R200SF	OCU-NR200SF	OCU-S400HF-D	OCU-S400SF	OCU-NS400SF
	OCU-R300SF	OCU-NR300SF	OCU-S500HF-D	OCU-S500SF	OCU-NS500SF
	OCU-S350HF	OCU-NS350HF	OCU-S350QSF-D	OCU-S600SF	OCU-NS600SF
	OCU-S400HF	OCU-NS400HF	OCU-NR200SF-D	OCU-S400QSF	OCU-NS400QSF
	OCU-S500HF	OCU-NS500HF	OCU-NR300SF-D	OCU-S500QSF	OCU-NS500QSF
	OCU-S600HF	OCU-NS600HF	OCU-NS400HF-D	OCU-S600QSF	OCU-NS600QSF
	OCU-S700HF	OCU-NS700HF	OCU-NS500HF-D		
			OCU-NS350QSF-D		

Condenser Fan Control

When the compressor is running, the speed of the condensing fan is controlled by the condensing temperature sensor. When the condensing temperature is higher than the set value, the fan runs at high speed. When the condensing temperature is lower than the set value, the condensing fan runs at medium speed.

Protection Control

（1）High discharge pressure protection

（2）Over-current protection

（3）Discharge temp protection

（4）Anti-phase protection

（5）Breaking protection for temp. sensor

（6）Compressor motor protection

Alarm code Fault Analysis

Alarm Code Fault Analysis table

Fault Code Table

Fault Code	Cause	Method
E00	**Anti-phase Protection**	Adjust the phase sequence
E01	**Discharge Temp Abnormal**	
	Condenser Dirty	Clean the condenser
	Low charge quantity or refrigerant leakage	Confirm valve opening status one by one according to system diagram
	High ambient temperature, no much air flow	mprove ventilation conditions to ensure adequate ventilation space around the unit
	High suction superheat	Verify that the refrigerant is sufficient and adjust the opening of the expansion valve until the suction superheat is controlled within a reasonable range.
	There is air in the system and intermittent bubbles in the liquid scope	Implement vacuum and recharge with refrigerant
	Failure of spray cooling system	Check liquid injection solenoid valve, liquid injection expansion valve, and liquid injection capillary
	Compressor internal fault	Check the compressor to make sure the high and low pressure are in the air
	Lack of refrigerant	Replenish refrigerant
	Suction pressure too low,amd below operating range	Adjust the pressure controller to control the operating range of the compressor
E02	**Over current alarm**	
	The compressorrunning beyond the range	Reconfirm the matching parameters of the compressor, or change the type of the unit
	Poor lubrication, lack of lubricating oil, increased running resistance	Make-up lubricant oil
	severe wear compressor	Replace the compressor and confirm whether the system has the problem of oil return
E03	**High pressure switch action**	
	The condenser is dirty	Clean the condenser
	Globe valve or other valve forgot to open	Confirm valve opening status one by one according to system diagram
	High ambient temperature, no much air flow	mprove ventilation conditions to ensure adequate ventilation space around the unit
	High suction superheat	Slowly release and recover part of the refrigerant from the liquid pipe stop valve to prevent excessive oil loss.
	There is air in the system and intermittent bubbles in the liquid scope	It needs to be vacuumed and refilled with refrigerant
E04	Discharge sensor fault	Check wiring or replace sensor
E05	Condensation sensor fault	Check wiring or replace sensor
E07	Compressor motor fault	

Temperature sensor resistance corresponding table

	T(℃)	5	6	7	8	9	10	11	12	13	14	15	16	17
排气温度传感器阻值	Rnom.[kΩ]	126.2	120.2	114.5	109.1	104	99.14	94.55	90.2	86.06	82.14	78.42	74.88	71.53
冷凝温度传感器阻值	Rnom.[kΩ]	11.15	10.68	10.24	9.809	9.404	9.018	8.65	8.298	7.964	7.644	7.339	7.048	6.771
	T(℃)	18	19	20	21	22	23	24	25	26	27	28	29	30
排气温度传感器阻值	Rnom.[kΩ]	68.34	65.31	62.42	59.69	57.08	54.6	52.24	50	47.86	45.83	43.89	42.05	40.29
冷凝温度传感器阻值	Rnom.[kΩ]	6.505	6.252	6.01	5.778	5.557	5.346	5.144	4.95	4.761	4.581	4.408	4.243	4.084

Check Points and Settings for Operation

Points to be confirmed before starting

⑴ Reconfirm that there are no alarms or loosen connection in wiring.
⑵ Open all the service valves to full extent with a ratchet wrench.
⑶ Confirm that power-supply voltage falls within ±10% of rated voltage.
⑷ For three phase power supply, confirm the correct phase sequence. Never start the unit by manual clicking the contactor.
⑸ Check whether the insulation resistance is over 1MΩ.

Power for crankcase heater（option accessory）

When starting the unit after turning off the earth leakage breaker, activate the crankcase heater for more than six hours before starting the compressor. This is to prevent oil foaming during start process.（Turn off the operation switch located on the body of the unit. Wait six hours while turning on an earth leakage breaker. After this, turn on the operation switch)

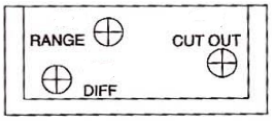
Note: after the connection of the leakage protector, crankcase heater is heated by electricity, so please do not directly touch!

Setting of pressure switches

⑴ High Pressure Switch
Follow below setting strictly.

Refrigerant	R22	R404A
Setting	2.65MPa	2.78MPa

Top of Pressure Switch



⑵ Low Pressure Switch

Low pressure CUT OFF value can be set according to the purpose by adjusting RANGE screw and DIFF screw.Please avoid negative pressure operation.
The on-off relationship of the low-pressure side is as follows:

CUT OFF ＝ RANGE － DIFF	

⑶Setting of Low Pressure Switch by Applications

Ref.	Showcase Temperature	Applications	Evaporating Temperature	Setting of LPS (MPa)		
				(RANGE)	(DIFF)	(CUT OFF)
R22	+20～+10℃	Fruits	10～0℃	0.50	0.30	0.20
	+3～+10℃	Rfrigerator	-5℃	0.40	0.20	0.20
	-2～+10℃	Vegetables, Fruits	-8℃	0.30	0.10	0.20
	-5～0℃	Meat, Fish	-10℃	0.26	0.21	0.05
	-8～-5℃	Fast-frozen food	-30～-25℃	0.20	0.17	0.03
	-22～-8℃	Frozen meals, ice cream	-40～-35℃	0.10	0.10	0.00

Ref.	Showcase Temperature	Applications	Evaporating Temperature	Setting of LPS (MPa)		
				(RANGE)	(DIFF)	(CUT OFF)
R404A	+20～+10℃	Fruits	10～0℃	0.55	0.30	0.25
	+3～+10℃	Rfrigerator	-5℃	0.45	0.20	0.25
	-2～+10℃	Vegetables, Fruits	-8℃	0.35	0.10	0.25
	-5～0℃	Meat, Fish	-10℃	0.19	0.10	0.09
	-8～-5℃	Fast-frozen food	-30～25℃	0.14	0.08	0.06
	-30～-22℃	Freezer, Ice Cream	-45～-40℃	0.08	0.08	0.00

The above settings are only used as a reference for pressure setting at a specific temperature. Appropriate adjustments should be made according to different systems and operating temperatures to ensure normal on-off of compressor and performance. The low-voltage switch must be setted to ensure that the compressor is not operating under negative pressure.

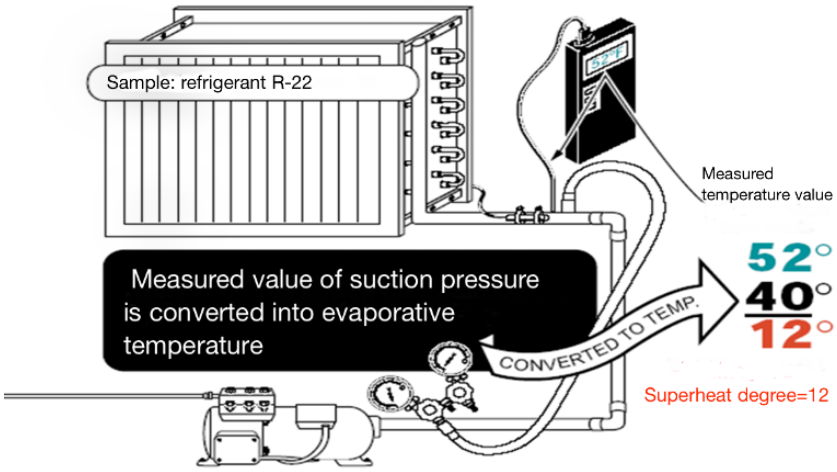
Check Points and Settings for Operation

Suction Superheat of Compressor

Superheat = suction temperature of compressor - evaporation temperature of refrigerant in evaporator.
With superheat, non refrigerant that enters into the compressor is in liquid state, which prevents the wet stroke.

In order to avoid wet stroke, a certain degree of suction superheat is required to ensure that only dry steam enters the compressor (the presence of superheat indicates the complete evaporation of the liquid refrigerant due to the nature of the refrigerant). However, a higher superheat will increase the discharge temperature（discharge superheat）of compressor, worsen compressor operating conditions and reduce the life. Therefore, the suction superheat should be controlled within a certain range. Expansion valve senses temperature difference (suction superheat) between the back temperature and the actual evaporation pressure(corresponding to the saturation temperature) through the temperature sensor placed at the compressor return-air duct or the evaporator outlet. The opening of expansion valve is adjusted based on the set superheat, which is equivalent to adjusting the liquid supply of the evaporator, and finally controlling the superheat of the suction superheat.

The recommended superheat of the unit should be controlled within 8~15K



Prevention of short cycle operation

Short cycle operation (frequent start/stop operation)causes excessive oil overfilling during starting and caused insufficient lubrication.
Adjust operation cycle to avoid short cycke operation. (ON-OFF cycle to be at least 10mins)
The main reason of short cycle operation is inappropriate setting of low pressure,suction filter clogging, and unbalance between cooling capacity and load.
When a unit is used, incorrect fixed position of temperature sensor (cold air-blow should directly hit the sensor)would become a potential risk.

Check the operation condition of condensing unit

(1) Checck if there is any vibration in the condensing unit or pipes.
(2) Check if there is a shortage or overcharge of refrigerant (check the sight glass and high pressure)
(3) Check the remaining water level (through sight glass, the green color is up to standard)
(4) Check the oil amount in the compressor (through the sight glass of compressor or oil tank)
Note: sometimes it takes a few hours or days to stablize the oil level. So please monitor it and if the oil is excessive or insuffient, adjust it accordingly.
(5) Check if the rotation direction of condenser fan is the same with the direction of the arrow.

Maintenance

The maintenance should be conducted by specialized technicians

Some parts of the condensing unit are not for permanent use but for limited time. In order to prevent accidents, the regular maintenance and replacement of parts are required. We would like to ask you and customers to have a maintenance agreement and carry out regular maintenance of the equipment including the cooling system.

Maintenance checks and replacement parts

The major maintenance/replacement parts and timing of maintenance/replacement are as follows.
If the abnormality is observed during the maintenance, please replace the parts as soon as possible.
For the technical details of the maintenance/replacement, please contact us.

The timing of the maintenance/replacement cannot be specified, as it varies for the operation rate, operation condition, surrounding environment and each part. However, during the (1) test operation, (2) regular maintenance, and (3) system repair, please undertake a comprehensive maintenance.

Items		Check Points/Replacement Criteria
	Entire system (temperature of each part)	⑴The pressure should match with the evaporation temperature. ⑵Operating condition check of the pressure switch ⑶All parts' temperature is normal. ⑷There is no abnormality with the installation.
Compressor	Oil	Change of the oil color (dark brown)- replace the oil it is reach grade 4-5 of color patch.
	Abnormal sound/Abnormal vibration	There is no abnormal sound/abnormal vibration.
Condenser	Clogged fin	If there is clogging in the condenser fin: Regular cleaning
	Rotation of fan	If there is abnormal rotation of fan: Check the fan motor.
	Filter dryer	⑴Color of the moisture indicator: Replace if it is yellow (WET). ⑵Replace the filter dryer if it is clogged, or if the difference in the temperature or pressure between inlet and outlet of the filter dryer is large
Pipe parts	Suction filter（compressor suction）	Clogging of Suction filter or its form change: Replace the strainer if the difference in the temperature between entry/exit is large.
	Other pipe parts	There is no refrigerant leakage, oil leakage, form change, abnormalvibration, or deterioration of insulation.
Electrical Parts	Magnet switch	Replace the connection point if it is exhausted, welded, chattering, or
	Fan motor	Replace it if there is abnormal sound, heavy bearing or oil leakage
	Operation of protective device/control parts	Replace it if it is poor operation or poor control due to chattering, etc.
	Terminal, wiring, etc	Check if there is no color change nor insulation deterioration
	Crankcase heater	Check if the crankcase heater is attached to compressor tightly
	PCB	If the Unit does not start, or generate false alarm or control logic errors, replace it.

Troubleshooting Guide

When the unit fails to work or has a problem, please ask the specialized agency to repair.

What to do in case of failure

For some reasons, if the condensing unit or refrigerant circuit part fails to work, turn off the power before repairing.
In order to avoid repeated failures, please pay attention to the following points
(1)In order not to repeat the same failure, ensure to carry out the failure diagnosis and identify the broken part and its cause before repairing
(2) When repairing the pipes, make sure to recover the refrigerant and braze the repair part while running the nitrogen gas through the pipe.
(3) When replacing the major parts of compressor or condenser, or when replacing refrigerant or oil, please make sure to replace the filter dryer. If the inside of the refrigerant pipe is very dirty due to, for example, compressor motor burning, please blow nitrogen gas through the pipe in order to remove the remaining oil in the refrigerant circuit. (Please remove expansion valve at this time.)
(4) When repairing/replacing/disposing the condensing unit, please make sure to recover all the refrigerant.
(5) For parts' failure, please just replace the broken parts, instead of the replacement of the entire unit.
(6) The broken part should be replaced with the same model that is written on the part. When the parts number is unknown, please consult with us. When replacing a fuse, please make sure to use the designated fuse with silica sand. (The other fuse may explode at the time of fusing.)
(7) In order to prevent the earth leakage accidents, please make sure to put all parts that are removed during the check service (e.g. cover, electrical part, etc.) back to their original places.
(8) Prevention of idle heating of crankcase heater:
When replacing compressor, please make sure to turn off power so that the electricity will not run through the crankcase heater while the crankcase heater is detached from the compressor (prevention of fire).
(9) After repair, make sure to test the operating condition, just like test operation. Particularly, check if the failure will not occur again.
* For the failures which the causes are not clear, please record the failure appearance, model number, and manufacturing number, then contact with after sales engineers.

Abnormal alarm instructions

The following table shows the abnomal status of unit

Items	Alarm Code	External Alarm	serial communication	Compressor Status	Reset Way
Discharge Temp. Abnormal	E01	Yes	Yes	Stop	Auto Reset below 75˚C
Over-current Alarm	E02	Yes	Yes	Stop	Reset the Power OFF or Manual
Anti-phase Protection	E00	Yes	Yes	Stop	Correct phase sequence
High Discharge Pressure Alarm	E03	Yes	Yes	Stop	Reset the Power OFF or Manual Switch OFF
Discharge Sensor Alarm	E04	Yes	Yes	Stop	Auto Reset
Condensing Sensor Alarm	E05	Yes	Yes	Stop	Auto Reset
Compressor Motor Fault	E07	Yes	Yes	Stop	Auto Reset

In case of failure alarm, please check the cause of the alarm and consult relevant professionals for troubleshooting if necessary.

Fault Analysis

Fault Analysis

Fault	Cause	Method
Compressor can not start	Power source fault	Measure power supply voltage, phase sequence, etc
	Blown fuse	Replace the fuse Retest the controlled release loop current to confirm whether it is a control loop problem
	Air switch tripping	Check the air switch, confirm whether it is the electric type, check whether there is leakage or short circuit in the power circuit, and repair it in time.
	Contactor problem	Check the contactor, whether the contact is adhered, and whether the voltag
	Thermal relay action	Check whether the thermal relay is in the operating state, check the power loop and confirm the cause of excessive current
	Whether the controller is in a protected state	Check whether there is alarm action
	Compressor built-in protector action	The built-in protector is the no output signal alarm, used for the motor overheating alarm, and it should be measured after the power off and wait for the compressor body down to room temperature.
	Compressor burn down	Measure whether the resistance between the terminals of the compressor is normal. If the ground resistance of the short-circuit machine is zero, it is confirmed as the compressor fault and the compressor needs to be replaced.
	Compressor terminal broken	It may caused by the action of built-in protector of the compressor. It needs to be measured again when the body temperature of the compressor drops to room temperature
	High sound level of compressor	It is caused by the lack of lubricating oil, and lubricating oil needs to be added in time.
Low suction pressure of compressor	System valve not open	Confirm if the system valves and solenoid valves are open, one by one according to the system flow chart.
	Lack of refrigerant	Through the sigh glass, there are a lot of bubbles or not all liquid flow, and on this condition the refrigerant needed to be supplemented.
	Filter plug	If the system is too dirty or contains too much water, replace the filter until it is in normal condition
	Abnormal evaporator	Confirm whether the evaporator is too small, or whether the evaporator is frosted, whether the evaporator fan is normal, whether the expansion valve selection is too small, or the expansion valve opening adjustment is too small.
	Expansion valve fouled	Disassemble the expansion valve strainer and clean the strainer.
Compressor body frosting with low heat return degree	Expansion valve opened too large, compressor frost	Reduce the opening of the expansion valve until the frost is removed from the compressor
	Large opening of expansion valve	Reconfirm the size of the expansion valve and replace it
	Ice-blocked for evaporator	Confirm whether the evaporator defrosting is normal, whether the evaporator heater is intact, whether the defrosting time and cycle and the temperature setting at the end of defrosting are appropriate, and whether the evaporator drainage is abnormal
Frequently-started compressor	System matching problem	If the evaporation terminal is too small, the matching design of the system shall be re-calculated.
	Pressure controller setup problem	Change pressure controller Settings (adjust on-off Settings) to reduce frequent start-on.
	Oil blockage in the pipeline with pressure fluctuation	Check the system pipeline, make the pipeline slope to the compressor, add the oil storage bend and oil stop bend, improve the pipeline process design, and re-set up the pipeline.
	Controller parameters setting in error	Reset starting delay parameter of compressor
	Temperature difference at the end of the evaporator is small	Reset the temperature difference setting of the evaporator terminal controller, and cooperate with the pressure difference controller, so that the compressor start can be controlled during start delay.
	The solenoid valve at the end of the evaporator is not closed tightly	Check the solenoid valve and replace it after confirming the defect.
Poor cooling of terminal	Liquid return system	Since system return liquid can implement bad impact on the terminal cooling, system expansion valve should be adjusted to avoid return liquid.
	The load does not match with the capacity provided	Recalculate the loading system and do the match again.
	Loss of terminal cooling capacity is serious	Whether the cold storage door is opened too frequently, whether the cold storage has the problem of heat loss, whether the air curtain of the cold storage is damaged, whether the cold storage door is opened frequently, whether the cold storage is added with commodities beyond the design load.
	Compressor fault	The invalid disc seal of compressor makes high and low pressure gas in the air, and the compressor needs to be replaced.
	Oil seal in pipeline	Check the system pipeline, make the pipeline slope to the compressor, add the oil storage bend and oil stop bend, improve the pipeline process design, re-set up the pipeline

Fault Analysis

Fault Analysis

Fault	Cause	Method
High sound level of running compressor	Insufficient levelness of the unit	The unit needs to be placed horizontally.
	Loose anchor bolt of compressor	The footing is fixed and strengthened again
	Poor lubrication	Supplement lubricating oil properly
	Contact with components in the case	Adjust fasteners to avoid contact and collision
	Compressor body parts are loose	Check the terminal box and the fixed parts for the suction accumulator in
High sound level and vibration level of running unit	The unit is not installed horizontally	The unit needs to be placed horizontally.Adjust the foot height of the unit
	Unit fixed foundation is not firm	Refix the unit with reliable fixation to confirm no suspension
	The unit is fixed without adding shock	Add shock absorption and refix
	Unit fixed foundation is not firm	The foundation needs to be strengthened to make it firm
	Missing of fixing screw on case	Tighten the box again
	Compressor failure	Service compressor
	Resonance exists in the system	Check the resonant parts and fix them. The resonant parts can be confirmed by pressing, mainly including supports, pipes and fixed parts. After confirming the parts, reinforce the corresponding parts to reduce resonance.
	Compressor liquid return	Since the system return liquid result in poor terminal cooling, system expansion valve should be adjusted to avoid return liquid
	Compressor failure	Since the broken compressor destroy the formation of high and low pressure, the compressor should be replaced.
	Compressor overload operation	Since the load is beyond the operating range of the unit, check the value of low pressure and do adjustment.
	Unit in contact with surrounding parts	Make sure the contacted parts separated
	Foreign material enters into the fan or the fan breaks apart	Remove foreign material and confirm fan integrity
	Poor dynamic balance of fan	Replace the fan
	Poor lubrication of fan motor	Replace fan motor
	Compressor reversal	Check the compressor power source and phase sequence protection. If the connection is wrong, change the connection. If the phase sequence
	Too much refrigerant	Since excessive refrigerant leads to high discharge pressure and high

Daily inspection items of the unit

Routine inspection items	Cycle Period		
	each month	each season	Each year
Suction and discharge temperature	●		
Suction and discharge pressure	●		
refrigerant quantity (refrigerant leakage inspection) and water content in the sight glass of liquid supply should be confirmed	●		
Compressor running sound level	●		
Wiring firm confirmation		●	
Confirmation of compressor oil (color, quantity)	Comfirmation according to oil color		
Compressor Fixation		●	
Earthing wiring		●	
Protection parts（fusible plug）			●
Condenser cleaning	Wash at least once every three months according to the environment and		

Warranty Conditions

Warranty period and scope

In the condition that customer strictly follows all instructions in this service manual, the warranty period is 18 (eighteen) months from the date of factory delivery.If the unit is found to be defective in material or workmanship, we will supply the free components or repair work to customers.

Following failures are outside the scope of warranty

(1) If the failure occurs due to the range of application beyond what is designated in this operating instruction.

(2) Improper selection the type of unit or poor design of the cooling system.
This warranty will be void in the following cases; 1) in the case some work is done without respect for the prohibited items, precautions, and instructions that are described in the operating instructions or manuals provided by us; and 2) in the case we judge that the failure is caused by a selection of a wrong type of unit (too much/small capacity for the cooling load), wrong selection of expansion valve, installation failure, wrong selection of a solenoid valve controller, poor design of refrigeration cycle etc.

(3) In the case there is a failure in the installation work:
●In the case the unit is damaged or broken due to improper handling during the installation work;
●In the case the failure occurs due to the inclusion of foreign substances (e.g. dust, metal powder) in the cycle during the installation work;
●In the case the failure occurs due to failure of electrical wiring during the installation work;
●In the case there is no improvement despite the advice on the installation failure(s) by our staff;
●In case of an accident caused by the work that violates various laws and regulations;
●In the case the operation is carried out even when appearing that the vibration is abnormally large or the operation sound is loud;
●In the case the failure occurs due to weak foundation or weak framework;
●In the case the stop valve or solenoid valve does not function well due to failure at the time of applying the pipe connection brazing;
●A fault caused by chip intruding into an electrical part while open the hole for additional accessory installation.
●In the case the failure caused by improper installation location, temperature range or supply voltage range.
●When an accident occurs due to on-site modification of the company's products or relocation.

(4) In the case of accident caused by remodeling, relocation of the unit by the user, or an accident occurs because the protection devices attached are not applied;

(5) Failure due to incomplete operating environment and maintenance inspection.
●In the case of an accident or a breakdown caused by the installation of the unit in an environment that has a lot of oil (including machining oil), water, salt (e.g. coastal area), or corrosive gas (e.g. hot spring area);
●In the case of an accident or a breakdown caused by the unsuitable installed location (e.g. shortage of wind volume, special environmental condition such as water pressure or chemicals);
●In the case of an accident or a breakdown caused by miss-adjustment of controller;
●In the case of an accident or a breakdown caused by short-cycle operation (repeat the operation and stop for less than 5 minutes each);
●In the case of an accident or a breakdown due to lack of maintenance (e.g. refrigerant gas leakage);
●In the case of an accident or a breakdown caused by mistakes of maintenance and a failure of changing components (e.g. wrong parts, shortage of parts, installation failure);
●In the case of an accident or a breakdown caused by overcharging or lack of refrigerant, or lack of refrigerant oil (e.g. start failure, lack of lubrication, overheating of motor);
●In the case of an accident or a breakdown caused by defrost failure;
●In the case of an accident or a breakdown caused by abnormal supply voltage;
●If we judge that the cycle absorbed air or water.
●Implement the vacuum with the compressor on.
●Failure of compressor unit caused by operation beyond the calibration range.
●Lubrication failure due to the charge of non-specified lubricant.
●Improper filling of refrigerant or lubricating oil, or system failure caused by the use of inferior refrigerant or lubricating oil. In the case of system fault caused by charging of refrigerant or lubricating oil with wrong model or inferior quality.

Warranty Terms

Following failures are outside the scope of warranty

(6) In the case of an accident or a breakdown caused by a power source failure;

- In the case of an accident caused by a motor or electrical component failure due to loss of phase or (open phase) with fuse short circuit or loose terminals of wires;
- In the case of an accident caused by a motor or electrical component failure due to sudden power supply drop at the time of starting emergency power supply during power outage;
- In the case of an accident caused by a motor or electrical component failure due to application of abnormally high voltage to the power supply due to lightening or application of excessive noise such as ark sparks;
- In the case of an accident or breakdown caused by beyond voltage range or failed inverter.
- In the case of an accident or breakdown caused by installation of an undesignated earth breaker.

(7) In the case of an accident or breakdown caused by the work or usage that is not complying with the standard installation location, operation conditions, coordination, maintenance instructions of the unit.

(8) In the case of an accident or breakdown caused by natural disaster such as earthquake, flood damage, lightening, fire, and others;

(9) In the case the unit is used in a vehicle, ship, or transportation vehicle.

(10) Be used in the foreign countries.

(11) The other failures caused by ignoring of common knowledges during installation, operation, adjustment and maintenance are not covered by warranty.

The company shall not be liable for any indirect, incidental or consequential damages of cooled substances and sales that are affected by the condensing unit failure.

To avoid consequential damages, please install the alarming system or have insurance in consultation with our company's agency or distributor.

The company shall not be liable for any loss caused by non-compliance with the instructions and use of non-designated parts.In addition,no warranty is given to the product failure occurred by the aboved situations.

Customer Refrigeration_____

Please fill in below table for convenient maintenance.

Model	
Purchase Date	
Dealer Contact	
	Tel（ ）

Production License Number：XK06-015-01985

Appliances Refrigeration System (Dalian) Co., Ltd.

Add.：No.8 Songlan Street,Economic & Technical Development Zone, Dalian City,P.R.China
Tel：+86-400-886-1099
Fax：+86-411-39254255
P.C.：116600

D00-2-L004-005-00-3
Printed in China
Ver：2018, Aug.

Items		MT and LT Rotor Unit	MT Scroll Unit	MT and LT Rotor Unit	MT and LT Scroll Unit
Applicable Model	Unit	OCU-R200SF OCU-R300SF	OCU-S350HF OCU-S400HF OCU-S400HF-D OCU-S500HF OCU-S500HF-D OCU-S600HF OCU-S700HF	OCU-S400SF OCU-S500SF OCU-S600SF OCU-S350QSF-D OCU-S400QSF OCU-S500QSF OCU-S600QSF	OCU-NR200SF-D OCU-NR300SF-D OCU-NR200SF OCU-NR300SF
Refrigerant		R22			
Evaporating Temp.	℃	-40～-5	-15～10	-40～-5	-40～-5
Suction Pressure	MPa[a)]	0.005～0.320	0.25～0.62	0.005～0.25	0.008～0.42
Suction Temp.	℃	18 and below（according to the evaporation tempeture, the best			
Suction Superheat	K	8~15K（on the side of unit）			
Condensing Temp.	℃	30～55			
Discharge Pressure	MPa	1.09～2.50			
Discharge Temp.	℃	115 and below			
Oil Temp.	℃	95 Max（Ambient temperature+10K an			
Ambient Temp.	℃	-7～48（according to the data on the ca			
Power Source	V	Three phase 380±10%（singe phase 22			
Operation Circuit	V	Single phase 220±10%			
Unbalanced Voltage Rates	%	2 and below			
Installation Tilt	°	3 and below			
ON-OFF Cycle	min	10(minimum duration for start or stop			
Installation Location		Outdoor installation			
Remark：a). Unless otherwise specified， all pressures refer to Gaug					

OCU-NR200SF

OCU-NR200SF-D

OCU-NR300SF

OCU-NR300SF-D

OCU-NS350HF

OCU-NS400HF

OCU-NS400HF-D

OCU-NS500HF

OCU-NS500HF-D

MT and LT Scroll Unit	MT Scroll Unit
OCU-NS400SF OCU-NS500SF OCU-NS600SF OCU-NS350QSF-D OCU-NS400QSF OCU-NS500QSF OCU-NS600QSF	OCU-NS350HF OCU-NS400HF OCU-NS400HF-D OCU-NS500HF OCU-NS500HF-D OCU-NS600HF OCU-NS700HF
R404A	
-40～-5	-15～10
0.008～0.42	0.27～0.73
t suction superheat range is from	
30～55	
1.33～2.78	
d over）	
talogue）	
0±10%}	
is 3）	
e Pressure.	

OCU-NS600HF

OCU-NS700HF

OCU-NS400SF
OCU-NS500SF
OCU-NS600SF
OCU-NS350QSF-D
OCU-NS400QSF
OCU-NS500QSF
OCU-NS600QSF

MT Scroll Unit

Alarm code	Meaning
E00	Reverse phase or Loss of phase
E01	High pressure anomaly
E02	Over current (Constant speed operation)
E03	Discharge gas temperature anomaly (3rd trip)
E04	Discharge gas temperature sensor anomaly
E05	Low pressure sensor anomaly
E06	High pressure sensor anomaly
E07	Suction gas temperature sensor anomaly
E10	Discharge gas temperature anomaly (1st to 2nd trip)
E18	Inverter communication anomaly
E19	Controller communication anomaly
E30	Condenser maintenance alarm
E32	Refrigerant flood back alarm
E33	Suction gas overheat alarm

Cause
▪ Detected reverse phase or loss of phase. ▪ Condenser fan motor protection breaker (EB4) has been turned OFF.
High pressure increased to 2.83MPa or higher and generated an abnormal stop.
Thermal relay starts operating due to over current of the compressor.
Abnormal stop caused by increased discharge temperature to 130°C or higher occurred 3 times in 2 hours.
Discharge gas temperature sensor became abnormal (open circuit condition).
Low pressure sensor became abnormal (open circuit condition).
High pressure sensor became abnormal (open circuit condition).
Suction gas temperature sensor became abnormal (open circuit condition).
▪ Discharge gas temperature increased to 130°C or higher and generated an abnormal stop. ▪ Discharge gas temperature sensor shorted.
No serial communication signal between the control PCB and the inverter for 10 minutes.
No controller signal exists in communication.
High pressure condition, that is higher than ordinary value, continued for 80seconds.
Suction gas superheat became 1 K or below continuously for 2 min. (Except for when compressor stops.)
Suction gas temperature increased to 24°C or higher for 30 minutes. (Except for when compressor stops.)

Correction method
(1) Check for the presence of any anomalies in the power supply. (2) Check the connection of the control PCB “3P3 connector (LINE PHASE)". (3) Check for the condenser fan motor protection breaker (EB4).
(1) Investigate the cause of high pressure anomaly. (2) Check whether the high pressure sensor has failed.
(1) Check the cause of the thermal relay operation. (2) Check the connection of the control PCB “2P10 connector (THERM)". (3) Check whether the thermal relay has failed.
Follow the procedure shown in "Failure Diagnosis at the time of Discharge Gas Temperature Anomaly“. (1) Search for the cause of increasing discharge gas temperature. (2) Check the connection of the control PCB “2P2 discharge connector (DIS)“. (3) Check the resistance value of the discharge gas temperature sensor. Refer to "Method of Checking Sensor Characteristics“.
(1) Check the connection of the control PCB “2P2 discharge connector (DIS)“. (2) Check the resistance value of the discharge gas temperature sensor. Refer to "Method of Checking Sensor Characteristics".
(1) Check the connection of the control PCB “3P1 low pressure connector (LP)“. (2) Check the output voltage of the low pressure sensor. Refer to "Method of Checking Sensor Characteristics".
(1) Check the connection of the control PCB “3P2 high pressure connector (HP)“. (2) Check the output voltage of the high pressure sensor. Refer to "Method of Checking Sensor Characteristics".
(1) Check the connection of the control PCB “2P3 U inlet connector (SUC)“. (2) Check the resistance value of the suction gas temperature sensor. Refer to "Method of Checking Sensor Characteristics".
Follow the procedure shown in "Failure Diagnosis at the time of Discharge Gas Temperature Anomaly“. (1) Search for the cause of increasing discharge gas temperature. (2) Check the connection of the control PCB “2P2 discharge connector (DIS)“. (3) Check the resistance value of the discharge gas temperature sensor. Refer to "Method of Checking Sensor Characteristics“.
Check the communication line between the control PCB “5P3 connector (INV COM)" and the inverter.
(1) Check the communication line (the control PCB “5P1, 5P2 connector (MK-COM)"). (2) Set the communicating condensing unit No. to a value other than “**0**”.
Check whether there is clogging in the condenser fin, and clean the fin.
Check the cause of refrigerant flood back operation.
Check the cause of suction gas overheat operation.