LG
Life's Good

ENGLISH

INSTALLATION MANUAL

Water-cooled Oil Free Inverter Centrifugal Chiller

Be sure to read the precautions for safety before installation and use it correctly.
The content is to ensure the safety of users and to prevent property damage.
Keep the instruction manual in a place that is easily accessible to all users.
Only authorized persons can use the product.

Model : RCWFL Series(100 ~ 300 RT)

P/NO : MFL68928605 (Rev 0)

www.lge.com

For your records

Staple your receipt to this page in case you need it to prove the date of purchase or for warranty purposes. Write the model number and the serial number here:

Model number :

Serial number :

You can find them on a label on the side of each unit.

Dealer's name :

Date of purchase :

1. CAUTIONS FOR SAFETY _ WARNING/CAUTION

Installation of the product, movement and delivery of heavy materials and the environment may be dangerous due to pressure of the system, electrical devices and location of equipment location (roof, lifting structure), etc. Please check and comply with warnings/cautions attached on the sticker or label on the equipment when operating the product.

You must comply with the following instructions to prevent an injury or a property damage of the user or others.

- Incorrect operation of the product stemming from ignoring the instructions on the instruction manual may cause an injury or damage.
  The seriousness is classified into the following signs.
- LG Electronics does not take any responsibility for failures caused by careless management, natural disasters and damages of the power cord regardless of the guarantee period.
- The content in the instruction manual may change for the improvement of the product without a notice.

⚠ WARNING

This mark represents a possibility of a death or a serious injury.

⚠ CAUTION

This mark represents a possibility of a loss or damage of a property only.

Marks used in this instruction manual have meanings as shown below

Strictly prohibited

Must follow the instruction

1-1. WARNING

- Certified engineers should do electrical works following “Technology standard or wiring standard of an electrical installation”, “Interior wiring standard” and the instruction manual and should use specific wires.
  - An improper power capacity or defect of electrical works may cause fire or electric shock.
- Only the specialty store with the installation certificate may install the product.
  - An improper installation may cause leak, fire and electric shock.
- Request to the specialty store when moving or reinstalling the product.
  - This may cause fire, electric shock, explosion or injury.
- Make sure to install a leakage current breaker and an exclusive switch.
  - Otherwise, this may cause fire and electric shock.
- Do not disassemble, repair and remodel the product arbitrarily.
  - LG does not take any responsibility for the product abnormality due to arbitrary disassembly, repair and remodeling.
- Make sure to have groundings
  - No grounding may cause electric shock.

- Do not keep or use combustibles or inflammables in the vicinity of the product.
  - This may cause fire and product failure.
- Remodeling of the control panel is prohibited.
  - Disconnection or forced operation of the protection devices such as the pressure switch and temperature sensor or using other parts may cause fire or explosion.
- Install the product in a place that can support the product weight.
  - The product may fall if it is installed in an improper place that cannot support the product weight and thus cause injury.
- In case the product is installed in a small place, make sure to take corrective measures for leakage amount not to exceed the safety limit when the refrigerant leaks.
  - You may request to the specialty store about proper corrective measures to prevent exceeding the safety limit. If leakage amount of the refrigerant exceeds the safety limit, this may cause dangers due to lack of oxygen in a space.
- Make sure to install covers of the panel and control box correctly.
  - Otherwise, water and dust infiltrate into the product and thus cause fire and electric shock.
- Do not handle the product arbitrarily.
  - Handling the product in a wrong manner may cause dangerous situations such as product failure, leak or electric shock, etc. Make sure to request to the specialty store.
- Do not use a damaged leakage current breaker or exclusive switch.
  - This may cause fire, electric shock, explosion or injury.
- Make sure that water does not flow into the product (the control part). Especially do not clean the control part with water.
  - This may cause fire and product failure.
- Make sure to request to the installation-specialty store when the product is immerged.
  - This may cause fire and electric shock.
- Make sure to use an exclusive cable of the product.
  - This may cause fire and electric shock
- Do not fill the product with refrigerants other than the designated refrigerant (R134a) when installing or moving the product to other places.
  - If other refrigerants get mixed with the original refrigerant, it causes abnormality of the refrigerant cycle, and this may damage the product.
- Do not operate the earth leakage breaker or the main power switch with wet hands.
  - This may cause fire and electric shock.
- In case of explosive gas leaks, close the gas valve and ventilate the space by opening the window before operating the product.
  - Do not use the phone or operate the power switch at this moment. This may cause fire or explosion.
- Do not place heavy objects or step on the product.
  - This may cause product failure and injury.
- Be careful about the rotating part.
  - Make sure not to put fingers or sticks into the rotating part. This may cause injury.
- Please use the fuse and earth leakage breaker of the rated capacity.
  - This may cause fire and product failure.
- Remodeling of the control panel is prohibited.
  - Lock the control panel using the available lock device, and in case you must open the control panel, turn off the main power first.
    Do not touch wirings or parts in the control panel.
    This may cause electric shock, fire or product failure.
- Observe the allowed pressure.
  - Observe the prescribed pressure for cold water, coolant, and refrigerant.

- Do not change the settings.
  - Do not change the settings of the control device or safety device.
    Operating the product with improper settings may cause product damage.
    Consult with the experts in the proper field when changing the control settings.
- Be cautious about fire, earthquake, and lightning.
  - Stop operating the product immediately in case natural disasters such as fire, earthquake, or lightning occur or if under the danger of thunderstroke. Operating the product continuously may cause a fire or electric shock.
- Observe the safety rules.
  - Observe the precautions listed on the manuals, tags, stickers, and labels when operating the Chiller.
- Do not use a refrigerant that is not specified.
  - Do not use a refrigerant or brine that is not specified. It may cause serious defects to the compressor and parts.
- Shut off the power during the installation and service process.
  - Electric shock may cause injury and death.
    Check all switches to ensure the electricity is not restored until the work is completed.
- Wear protective equipment.
  - Wear protective glasses and gloves.
    Be cautious when installing and handling the Chiller and handling electrical parts.
- Make sure that water always flows in the heat exchanger when filling or removing the refrigerant.
  - This prevents the potential damage of the tube in the heat exchanger.
    Adequately use cold water or brine in the water circulation loop to prevent the heat exchanger from freezing and bursting when the Chiller is exposed to a temperature below 0°C
- Do not discharge the refrigerant through the refrigerant discharge valve inside of a building.
  - The outlet of the discharge valve should be outside of a building. Leakage of the refrigerant in a closed area may remove the oxygen and cause suffocation. Closed or low-ceiling areas need proper ventilation.
    Inhaling the refrigerant is harmful to human health and may cause an irregular heartbeat, unconsciousness, and death. Misuse can be fatal. As the refrigerant gas is heavier than the air, it reduces oxygen.
    It can cause eye and skin irritation.
- Be cautious about leakage.
  - Stop operation immediately when a leak is detected in the joints such as pumps and piping.
    It may cause electric shock, short circuit or product failure.
- Be cautious about electric shock.
  - Make sure to ground when installing the Chiller. It may cause electric shock.
- Do not leave the refrigerant system in the atmosphere for more than the required time.
  - When a repair cannot be completed, shut the cycle and refill the dry nitrogen to prevent contamination and rust in the machine.

1-2. CAUTION

- Make sure to check leakage of the refrigerant gas after installation and repair of the product.
  - This may cause product failure.
- Do not install in a place with leakage of the combustible
  - Installing in a place with leakage of the combustible may cause property damages.
- Keep the product at level when installing the product.
  - Otherwise, the refrigerant level becomes unstable, and this may cause product failure.
- Do not use the product in spaces for special applications such as preservation of animal/plant, precision system, or art works.
  - This may cause property damages.
- Use the exclusive power cable of the enough allowable current capacity exclusively for the Chiller.
  - This may cause fire and electric shock.

- Provide proper protective facilities for the noise when installing in places such as the hospital or the communication base station.
  - Inverter equipment, personal generators, high frequency medical devices and telecommunication equipment may cause malfunction or failure of the product.
    On the other hand, the product generates the noise that disturbs medical devices or video broadcasting.
- Prevent the product from becoming rusty due to sea breezes (salt) and install shied if needed.
  - This may cause deformation and failure of the product.
- Install the product with no tension applied to the product cable.
  - Tension may cut cables, and this may cause fire due to heat.
    Do not replace the power cable by yourself. Contact the service center for replacement.
- Do not use the product in special environments.
  - Oil, steam and Sulphur gas, etc. may cause degradation of the product or part damages.
- Be cautious when transporting the product.
  - Always consult with the specialist when transporting the Chiller.
    Comply with the prescribed methods in the instruction manual when transporting the Chiller. Otherwise, the product may turn over or fall.
- Do not touch the refrigerant piping when operating or right after starting operation.
  - The piping when operating or right after starting operation may be hot or cold depending on the status of the refrigerant flowing through parts of the refrigerant piping, compressor and refrigerant cycle parts.
    Touching the piping at that moment may cause burn or frostbite.
- Turn on the main power 12 hours before starting operation.
  - Starting operation right after turning on the main power may cause serious damage. Leave the main power on while operating
- Do not turn off the main power right after stopping operation.
  - Make sure to wait for more than 5 minutes before turning off the main power. Otherwise, this may cause leak or other problems.
- Do not operate the product with the panel or the safety devices removed.
  - Rotating, high temperature or high pressure parts may cause safety accidents.
- Be cautious when discarding.
  - Request to the agent when discarding the Chiller.
- Use the strong chair or ladder when cleaning or repairing the Chiller.
  - This may cause injury.
- Be cautious about the high temperature.
  - Make sure that there is no contact between the high temperature part of the Chiller and body.
    This may cause burn.
- Be cautious about the high voltage.
  - Make sure to use the power exclusively for the Chiller by installing a separate wiring and install a disconnecting device for the power. This may cause electric shock or fire.
- Be cautious about installation of the Chiller.
  - Install the product after considering about spare space for the product service. Install the product in places with no obstacles especially for the air-cooling and with good ventilation.
- Do not use strong chemicals, household bleaches or acidic cleaning solvents when cleaning the Chiller.
  - It is very hard to wash these out, and it may accelerate corrosion of the contacted area when a contact is made with other materials. Use environmentally safe cleaning products.
- Be careful when restarting the product.
  - When the product safety device operates, remove the cause and then restart the product.
    Repeating to operate arbitrarily may cause a fire and product failure.
- Use suitable tools.
  - Use adequate tools for repairs, and use measuring apparatuses after adjusting correctly.
    Using inadequate tools may cause an accident.

- Be cautious regarding sounds and smells.
  - Stop operating immediately and call the service center when the product emits strange sounds or smells. It may cause a fire, explosion, and injury.
- Be careful to avoid injury.
  - Check the safety label of the safety devices.
    Observe the precautions shown above and the contents of the label. It may cause a fire and injury.
    To prevent the formation of condensate, insulate not only the evaporator but also the piping connected to the evaporator.
- Check
  - Carry out periodic checks. Stop operation and call the service center when a problem is detected. Insufficient inspection may cause a fire, explosion, and product failure.
- Do not remove or change the wire connection initially connected when the Chiller was delivered.
  - The compressor operating in the opposite direction may cause a failure, and it needs replacement.
- Do not short-circuit the parts by using a jumper or other tools, or bypass unlike the normal procedures.
  - Ground of the control board and short-circuit of the other wirings may cause damage to the electrical module or parts.
- Flow should remain within the designed range, and it should be handled cleanly.
  - It guarantees the performance of the product and reduces a possibility of tube damage due to corrosion, precipitate, moss, etc.
    LG does not take responsibility for damage of the Chiller caused by unhandled or inadequately handled cold water.
- Consult with a specialist about proper cold water treatment.
  - Chemical treatment may be needed to prevent or remove precipitate, corrosion, etc.
- Do not overcharge the system.
  - Overcharge increases the discharge pressure of the compressor and consumption of the refrigerant. Also it can damage the compressor and increase the power consumption.
- Disconnect the controller power before service.
  - It secures the safety and prevents damage to the controller.
- Welding the evaporator head or nozzle parts is not recommended.
  - If needed, remove the flow switch and the thermometers in the inlet and outlet of the cold water before welding. Reinstall the flow switch and thermometers after welding.
    If the flow switch and thermometers are not removed, it may cause damage to the parts.

ENGLISH

Thank you for using our product, Water-cooled Centrifugal Chiller.

You may use the product more conveniently and safely by installing the product as the standard after reading the instruction manual.

- Make sure to read the instruction manual to install the Centrifugal Chiller safely and correctly before use.
- Make sure to conduct a test run and an inspection following the instruction manual after completing an installation construction.

❉ The instruction manual consists of safety precautions, basic product information, and information about bring-in, installation, and wiring when istalling Water-Cooled, Centrifugal Chiller.

TABLE OF CONTENTS

2. OVERVIEW

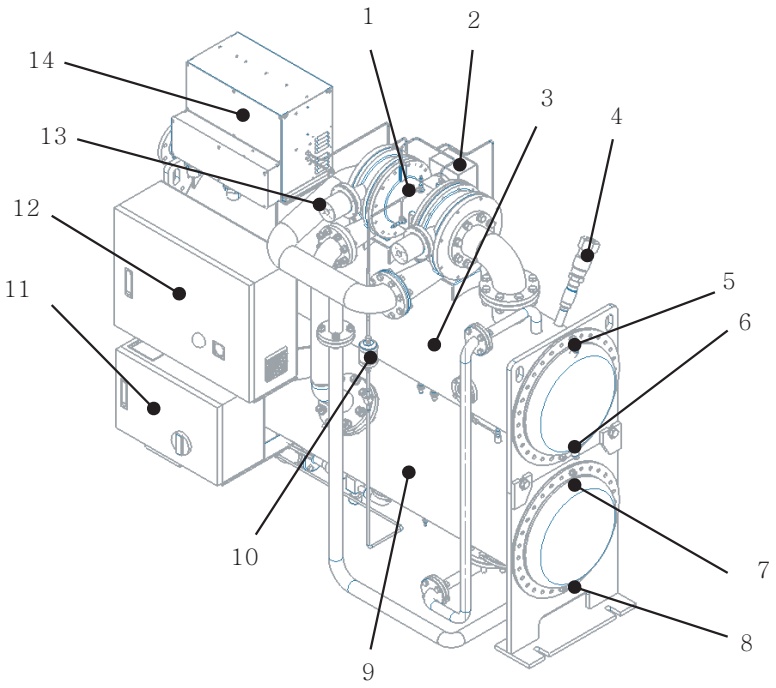
2-1. General Instruction

This manual describes the handling method of the oil-free inverter Centrifugal Chiller that uses R-134a, applying an AC Smart Premium controller.

2-2. Product Structure

Figure 1 represents the general structure and part composition of the oil free Inverter Centrifugal Chiller.

As the location of the control board, shape of the water box, direction of inlet/outlet of the cold water/cooling water and some piping differ based on models and customer specifications, check the approved drawing matching with the site for the details.



1. Compressor
2. Terminal box for compressor motor
3. Evaporator
4. Safety valve
5. Air vent (for cold water)
6. Drain (for cold water)
7. Air vent (for Cooling water)
8. Drain (for Cooling water)
9. Condenser
10. Filter Dryer
11. Power Panel
12. Control panel
13. Variable Diffusion Motor
14. Inverter

Figure 1. Components of the oil-free Inverter Centrifugal Chiller

2-3. Nomenclature

The nomenclature of the Centrifugal Chiller is as shown in the figure 2.

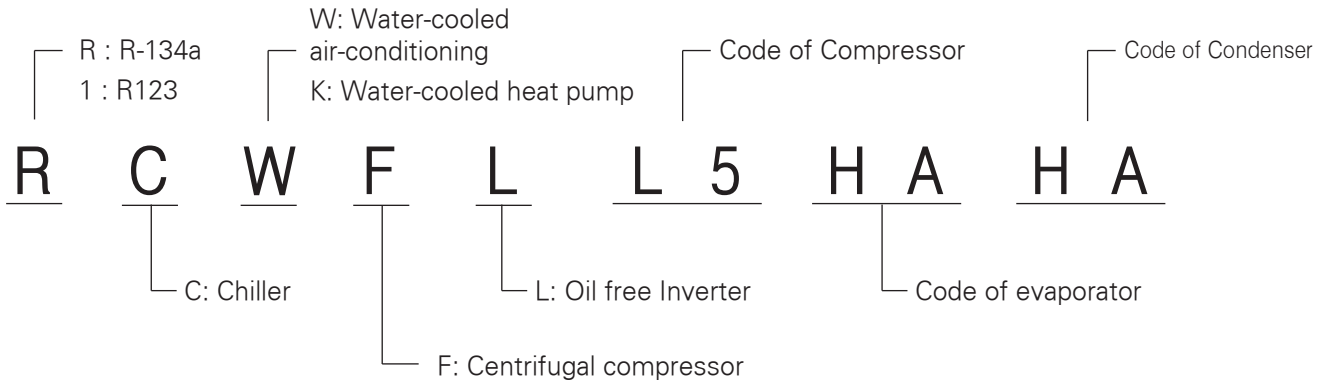


Figure 2: Naming Convention of a Model

Basic Model

Capacity		Compressor	Evaporator	Condenser	Power Consumption (kW)	Product Weight (kg)	Operating Weight (kg)	Refrigerant amoun (kg)
RT	KW							
100	362	L5	HA	HA	59.8	2300	2500	100
200	703	L6	JA	HB	119.6	4300	3920	400
300	1055	L7	JB	AA	179.4	5330	4620	600

2-4. Name plate

Name plate for the unit is attached on the right side of the control panel. General information of the product can be achieved from the plate, and the information can be used for quicker service later.

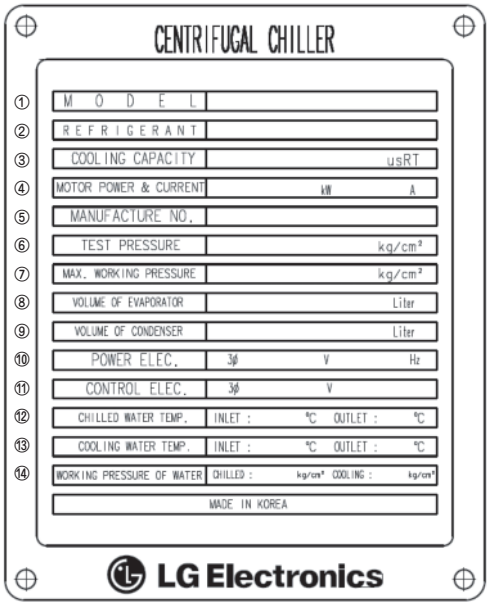


Figure 3. Name plate

① Model name
② Refrigerant
③ Cooling capacity
④ Power and current required for motor
⑤ Manufacture's serial number
⑥ Internal pressure test pressure
⑦ Maximum working pressure (Design pressure)
⑧ Volume of Evaporator
⑨ Volume of Condenser
⑩ Power electricity
⑪ Control electricity
⑫ Temperatures of Chilled water inlet/outlet
⑬ Temperatures of Cooling water inlet/outlet
⑭ Maximum pressure of chilled water and cooling water

3. PREPARATION BEFORE INSTALLATION

3-1. Check Site Information

• Consult the following below with a person in charge of the site for a safe and accurate installation by inspecting the site in advance and reviewing needs before installing the Centrifugal Chiller.

1) Work range and product Data: Check the site installation work range and approved documents.

2) Installation place: Review environment conditions of an installation place based on the Section 3-2.

3) Inspection of Entrance: Plan for a smooth delivery by checking an entrance size(width, length, height)

3-2. Environment Conditions for Installation Place

• Install and store the product by considering environment conditions of a product installation place below including securing a place for installation of the Centrifugal Chiller.

1) Make sure that the piping, insulation materials, and wire of the Centrifugal Chiller are not damaged during storage or operation.
The product should be stored in a way that when the Centrifugal Chiller refrigerant leaks, it can be ventilated.

2) Temperature of a product storage place should be below 40°C, and select a place with good ventilation and low temperature. Give a special care about a temperature increase of a storage place for a long-term storage, and maintain the temperature of the machine room below 40°C.
A loss of the refrigerant and damage of human life may occur if the safety valve operates and the refrigerant gas is discharged when the safety valve discharge pressure increases abnormally in case the refrigerant is filled in the Centrifugal Chiller.
Check the safety valve setting pressure of the product if a temperature of the machine room is above 40°C, and maintain a temperature of the machine room below a pressure at which discharge starts by consulting with our service engineers.

3) Store the Centrifugal Chiller in a dry, vibration-free and safe place.

4) Make sure that the floor on which the Centrifugal Chiller is installed can bear the weight of the product.

5) Avoid installing in the vicinity of the inflammables and combustibles. Be cautious of the radiant heat when installing the product in parallel with heating units such as a boiler, etc.

6) Be cautious about a high humidity as it may cause electric failure and corrosion of the Centrifugal Chiller.

7) Select a place with little dust. Dust may cause electric failure.

8) Secure enough space for a work place to replace the heat pipe and a place for opening the water box and maintenance and inspection.

9) Secure the maximum or safe height matching with a crane to lift the Centrifugal Chiller easily.

10) Make sure that an enough drainage treatment from the machine room is installed.

11) Secure enough illumination and light for repair and inspection.

12) The Centrifugal Chiller is an indoor-type product, thus do not install it outdoor or under direct sun light.

13) Make sure to have enough protection (vinyl cover) for dust or rain.

14) Plan complying with the installation place standard of the High-Pressure Gas Safety Control Act when installing the Centrifugal Chiller in the machine room. (for domestic use)

3-3. Secure installation service space

1) Before installation of the turbo chiller, secure enough space for service as indicated in the foundation drawings. It is a minimum space needed for maintenance.
2) For installation of the Centrifugal Chiller, the installation must be robust to withstand the operation weight of the Centrifugal chiller according to the specifications indicated in the basic drawings.
3) Provide a good drainage path to drain out the water when cleaning the heat transfer tubes as well as for draining cold water and cooling water before shutting down.
4) To ensure the stable operation of the Centrifugal chiller, level off the Centrifugal chiller by adjusting the leveling plates during the installation. (Maintain 0.5 mm for each 1 m)
5) Basic construction is out of scope of LG Electronics. Please work according to the approved foundation drawings. LG Electronics is not responsible for any equipment problems due to inappropriate foundation design and construction.

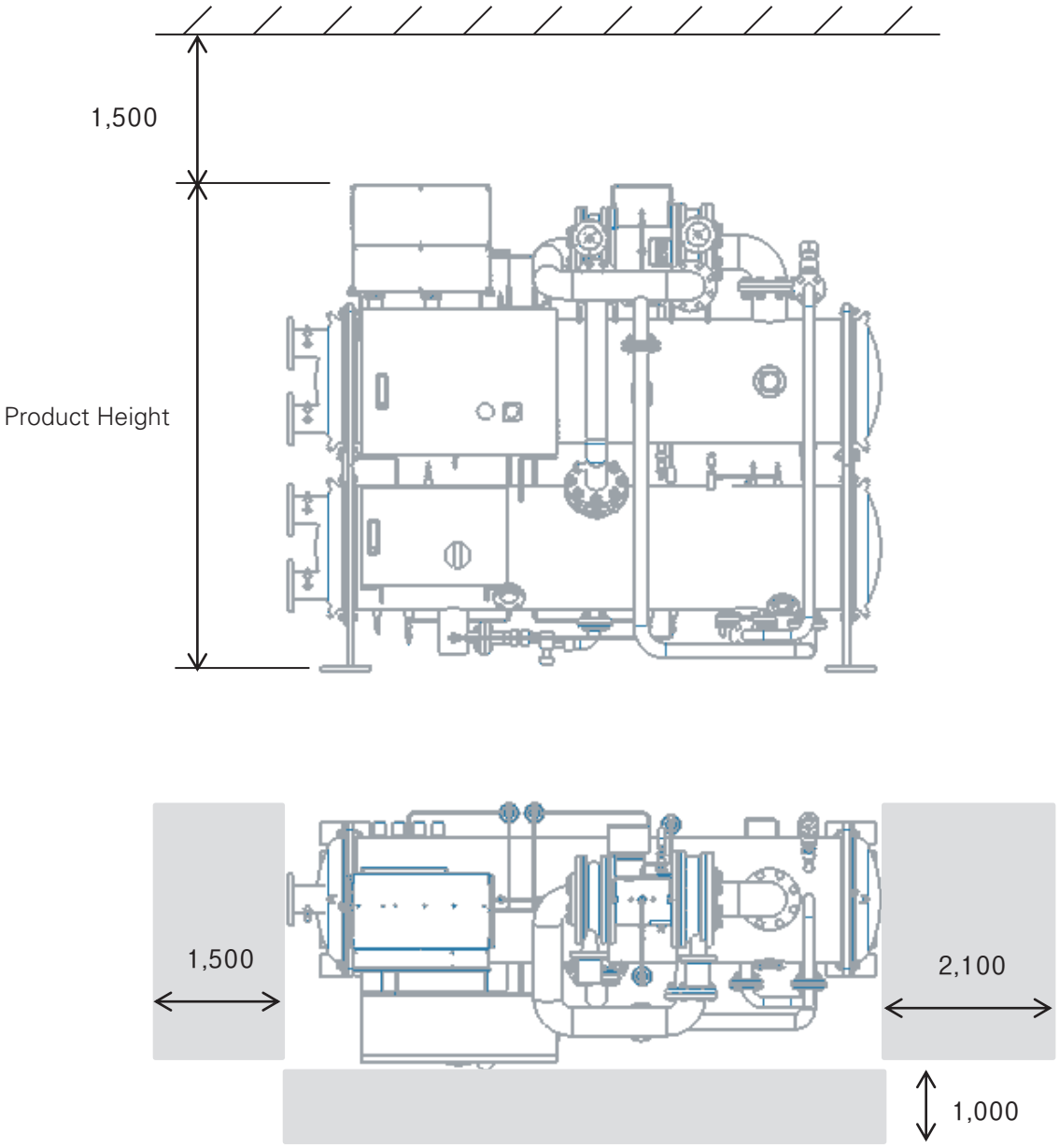


Fig 4. Minimum space required for installation

3-4. Long-term Storage and Place

Store and manage under the conditions below in case of a long-term storage of the Centrifugal Chiller regardless of whether it is before or after installation.

3-4-1. Conditions of Storage Place

Store the product in a place matching with the environment conditions of installation place in the Section 3-2.
If water is supplied when the water pipe is connected, make sure to store the product after completely draining the cold water and coolant and purge with the air additionally so that there is no water inside the product. Water remaining in the heat pipe may cause freezing breakage in an environment condition in which an outdoor temperature goes below 0 °C or there is a rapid change in an outdoor temperature as the remaining water evaporates.
Place a protection cover for electrically running parts such as the control board and vane start, store the product in a dry, vibration-free and safe place and protect from a long-term exposure to the sunlight.

3-4-2. Long-term storage Inspection of the Centrifugal Chiller

Inspection Items	Inspection Timing	Inspection Description
Chiller Status Inspection	When arrived at the site	Inspect if there is a damage and leakage of the refrigerant by inspecting the exterior of the Chiller. Check if there is any leakage in connection parts of the piping especially.
Storage of electric systems	When arrived at the site	Store by covering the control board, security relay and control motor, etc. with vinyl and desiccants (silica gel, etc.) inside. Cover other electric systems with vinyl to protect from dust, etc.
Regular Inspection	Weekly	Visually inspect if there is a damage of pipe or leakage of connection part. Record and manage the pressure change by inspecting the pressure gauge installed on the compressor. Follow steps in the installation manual when the refrigerant leaks. Store the product without the filled refrigerant by filling nitrogen in the vacuum and inspect the pressure every day.

3-4-3. Inspection after a Long-term Storage

1) Inspect the oil status through the sight glass and check if there is any mechanical or electric abnormality before operation in case of operating after a long-term storage.
   If there is any abnormality, inspection by our engineers is required.
   It is recommended to have an inspection by a professional service center after a long-term storage.
   LG Electronics does not take any responsibility for all problems due to inspections by agencies other than LG Electronics or service centers (engineer) that we approved.
2) Inspection by LG Electronics or professional service engineers is required if the Chiller is left without an oxygen pressure or a refrigerant before operating.
   LG Electronics does not take any responsibility for all problems due to inspections by agencies other than LG Electronics or service centers (engineer) that we approved.
3) Inspection of electric systems
   Check that there is no failure of parts and abnormality of wire connection parts, and measure the insulation resistance of the motor.
   Follow the steps in the operation & maintenance manual for the inspection procedure and judgement criterion.
4) Inspection of water systems.
   Contamination due to inflow of dust and foreign substances, etc. during a long-term stop is expected inside the cold water/ coolant system. Clean the water systems and inspect the filters.
   The coolant system generally requires a special care as it is an open pipe system.
5) Conduct the test run following steps in the operation & maintenance manual.

4. PRODUCT TAKEOVER

4-1. Delivery List and Status Inspection

• The Centrifugal Chiller is shipped assembled or partially and filled with the refrigerant or nitrogen depending on the status of the site. For partial delivery, it requires an agreement from the customer in advance.

1) Assembled or partial delivery
   All parts are delivered assembled in case of the assembled product, and parts are delivered through 2 or 3 times of delivery depending on the site conditions in case of the partial delivery.
2) Refrigerant-filled delivery or nitrogen-filled delivery
   In case of the assembled product, the refrigerant or nitrogen is filled for delivery based on requests by the customer.
   In case of filling the refrigerant, the filling refrigerant volume that the Chiller needs is sealed, and in case of the refrigerant, be cautious of the high pressure as a saturated refrigerant pressure is determined depending on the outside temperature. (the oil is delivered separately and filled during the test run.)
   The product is shipped from the factory at the nitrogen pressure of 0.5kg/cm2. If the pressure is “0”, make sure to record and inspect leakage parts as there is a possibility of a leakage.

4-2. Product Check

1) Check if the product shipment list and takeover list matches.
2) Check terms on the product nameplate with the project information.
   Refer to Section 2-4 for terms on the nameplate.
3) Check the exteriorof the product and check if there is any damage and leakage.

Check for the safety of the damaged parts (refrigerant leakage, etc.) when detected and contact the service center to take corrective measures by our engineers after taking pictures of damaged parts for its seriousness.

4-3. Product Protection

• When taking over the product, inspect and record the following to protect the product.

1) The product is shipped with the refrigerant or nitrogen filled to prevent corrosion due to inflow of outside moistures.
   Make sure to avoid arbitrary control or opening of the valves of connection parts attached on the product.
   The refrigerant leakage may cause damage of human life when filling the refrigerant.
   If the water box is sealed by clamping with blank flanges, open it after purging the nitrogen in advance when opening the flanges as it is filled with nitrogen at the pressure of 0.5kg/cm2.
   Caution) Do not open the service valve, etc. in any case when the nitrogen or refrigerant is filled.
   Product damage problem may be caused if the nitrogen is lost by opening the valve.
2) Inspect and record leakages by damage or loose bolts by inspecting the exterior and piping when taking over the product.
3) The product is delivered with no oil filled to prevent oil from turning into steam due to the refrigerant dissolution when delivering or storing in case the product is shipped with the refrigerant filled.
   Contact our engineers if the oil level cannot be seen through the sight glass.
4) Raise contents of the problem to the deliverer if there is product damage or part abnormality during inspection and call a person in charge at LG Electronics. Damaged products should not be installed without an approval of LG Electronics

⚠ CAUTION

Make sure to check if there is any damage occurred in the process of delivery by inspecting the status of the Chiller before unloading the product when the product delivery vehicles arrives at the site.

5. PRODUCT BRING-IN/MOVING

5-1. Precautions for bring-in

Inspect if the size of the entrance is big enough for the product in advance by checking the size and weight of the product when bring in the product, and prepare for a proper transportation equipment and method for the product weight and size after checking environment conditions of the site.

Secure the minimum required entrance for bring-in and be careful not to damage the product when delivering the product.

The measurement in Table 3 is the reference information about the standard model of LG Electronics. Make sure to check the approved drawing for the product measurement to enter. Proceed with installation after consulting with LG Electronics or the agency that LG Electronics approved for the condition of the site.

WARNING

Bringing-in the product in disassembled parts and assembling it should be implemented under the supervision of LG Electronics or the agency that LG Electronics approved.
Otherwise, LG Electronics does not take any responsibility for the problems happened.

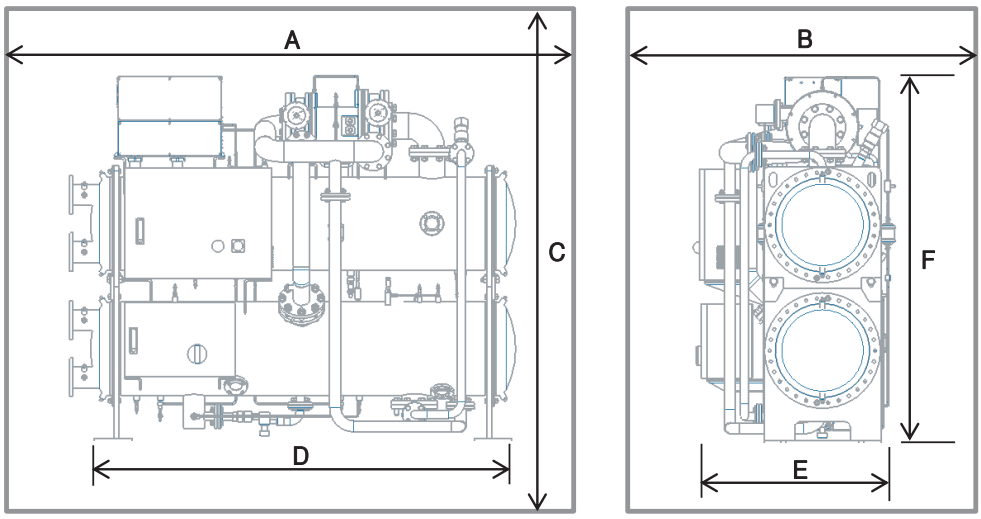


Figure 5. Product Bring-in

(Unit : mm)

Location	A	B	C	D	E	F
100RT	2,750	2,140	2,600	2,430	994	1,984
200RT	3,860	2,600	3,100	3,004	1,428	2,434
300RT	4,450	2,600	3,100	3,650	1,428	2,434

Table 3. Minimum entrance (door) dimensions

General Product Weight

As the product weight shown below is about the standard product of LG Electronics, the product weight may change depending on the conditions of the site.
Check the weight and size in the approved drawings for the site.

Table 4. Weight of the product and the compressor

(Unit : kg)

Capacity	100RT	200RT	300RT
Product Weight	2,300	4,300	5,330
Operating Weight	2,500	3,920	4,620
Motor Weight	105	210	315
Compressor Weight (Including Motor)	305	610	915

5-2. Moving method

5-2-1. Moving by crane

When lifting the Centrifugal Chiller to move, keep the Turbo Chiller level by hooking a loop for connection to a hole in the tube plate of the Centrifugal Chiller and hooking a wire so that its load is caught in the middle.

Also, make sure to avoid damage to the electric wire, body, and parts by wire when lifting up.

To lift the Centrifugal Chiller up, use 4 Rigging Lugs at the lifting hole of the Centrifugal Chiller as shown in the figure below, and make sure to observe the warning/caution below when moving.

WARNING

- Lift the Centrifugal Chiller up by balancing it properly. Secure the minimum chain length.
  Firstly, lift it up for about 0.5 m to test and check whether the product is leveled, and check if the product is appropriately lifted. Each chain should be capable of supporting the weight of the product.
- Lifting or moving the Centrifugal Chiller by tilting may cause damage to the Centrifugal Chiller, and shifted weight may cause the product to drop or death or a serious injury.

CAUTION

- Make sure to avoid any impact to the machine while working if the refrigerant is filled.
  Be cautious about any possible leakage of the connection parts especially due to an impact on the piping.
- If the compressor is tilted in the longitudinal direction for over 15°, make sure to remove the oil in the oil tank before moving. Moving the product tilted for over 15° may cause the oil of the compressor to flow to other parts of the Centrifugal Chiller.
- Please ensure sufficient height for the spreader made of iron material to prevent damage to the compressor, power, the control panel and other parts of the product.

Table 5. Minimum chain length for the products lifting

Capacity	Maximum Weight (kg)	Evaporator Length (mm)	Minimum Chain Length (mm)
100RT	2,300	2,000	2,100
200RT	4,300	3,000	3,100
300RT	5,330	3,650	3,750

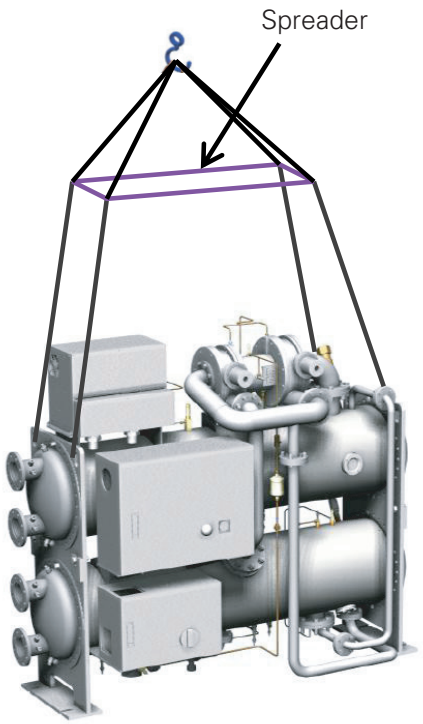


Figure 6. Lifting up by a Crane

5-2-2. Moving using a Roller

Secure at least 300 mm additional allowance on the maximum width and height of the product for entrance.
The figure below represents the know-how needed to bring the product in by using a roller.
Make sure to avoid any impact to the Centrifugal Chiller.
If damaged, repair may not be easy.
When bringing the product in using roller, the installer should prepare the roller and assistant wood by his own cost.
Considering the weight and size of the product, the installer must prepare the parts accordingly.
Be mindful of the safety especially when moving.

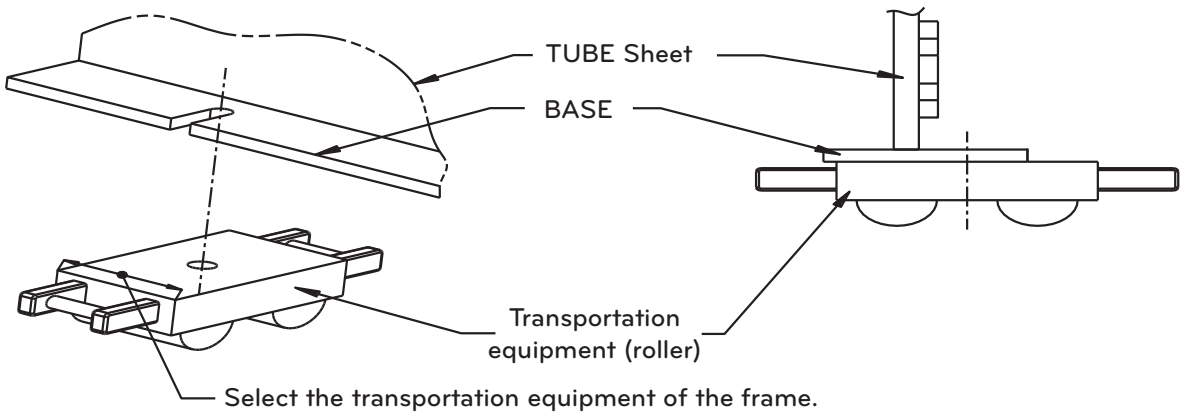


Figure 7. Moving method by using a transportation equipment (roller)

6. PRODUCT INSTALLATION

6-1. Precautions for installation

1) When considering the place for the Centrifugal chiller, secure enough space to allow the installation of the attached device, wiring, piping and maintenance access. Check the level and strength of the base for installation. Refer to the product specification, product dimension, and foundation drawing for the parts to lift the Centrifugal Chiller, product weight, and operating weight.
2) Service clearance for a Centrifugal chiller differs by model. Secure enough space to provide services to the Chiller. Refer to the Section 3.3
3) When installing multiple Centrifugal chillers at the same site, secure the appropriate service space.
4) The following base dimensions are based on the standard model. Prepare foundation fitting the model to install after checking the foundation drawing approved.

Table 5. The basic dimensions (standard)

(Unit : mm)

Capacity	A	B	C	D
100RT	2,510	710	400	150~200
200RT	3,400	1,300	400	150~200
300RT	4,100	1,300	400	150~200

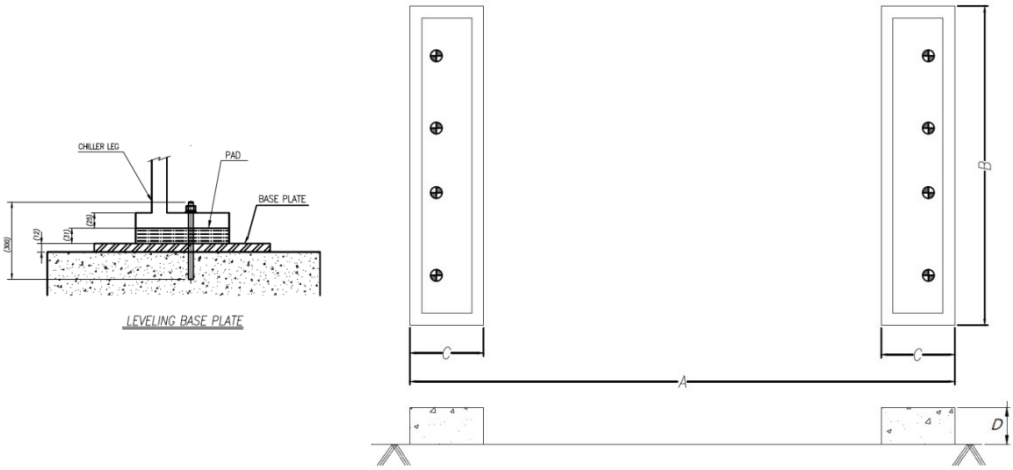


Figure 8. Basic measurement (standard model)

WARNING

- Make sure to install the Centrifugal Chiller in a place with enough strength to support the product weight. Insufficient strength may cause the Centrifugal Chiller to drop and also damage of the product and human life.
- Install the product in a way to protect it from an earthquake.
  A defect in installation may cause the Centrifugal Chiller to drop and cause injury.
  Be cautious about the support strength of a floor surface, drainage treatment (drain trench construction, treatment of water from the Centrifugal Chiller while operating), piping and wiring especially when making the foundation plane.

6-2. Product Horizontalizing

Make sure to secure the horizontality of the product when installing to secure the refrigerant level and reliability of the stable Centrifugal Chiller while operating. (Maintain below 0.5mm for 1 m) Consider all front/back/left/right, length direction and width direction when securing the horizontality.

** How to secure horizontality

1) Using a level
   : Adjust horizontality by using Shell length direction or compressor Base for the length direction.
   Secure horizontality by using the Centrifugal Chiller Base for width direction.
2) Using the difference of water levels(use transparent vinyl hose)
   : Secure horizontality in a way that water levels are in the same position after marking the same position from the base on the tubes on each side of the length direction of the product and fixing the vinyl hose by using a transparent vinyl hose. Secure horizontality for the width direction by same method.

6-3. Anti-vibration Device Installation

Install the anti-vibration pad or anti-vibration spring (option) at the base of the product to minimize noise and vibration propagation through a structure of a building.

6-3-1. Standard anti-vibration (anti-vibration pad) and Anchor Bolt Work

1) Install basic anti-vibration devices following the Figure 9 anti-vibration pad and Set Anchor Bolt Work Order shown below at the base of the product.
   Contact LG Electronics if anchor applications other than Set Anchor Bolt are needed.

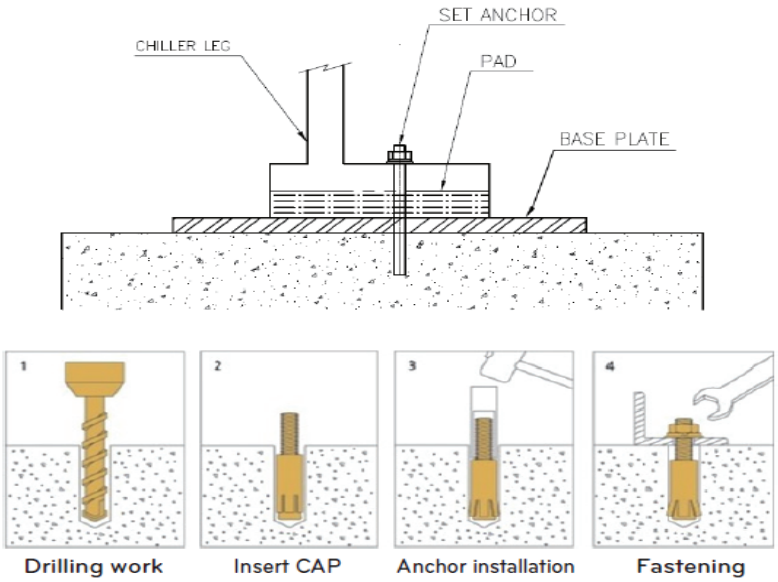


Figure 9. The installation work of isolation pads and Anchor Bolts

2) Option (anti-vibration spring)
   Contact LG Electronics for the anti-vibration specification and installation method when installing the optional anti-vibration spring.

CAUTION

Adjustment of the anti-vibration spring should be implemented after the pipes are filled with the refrigerant or water.

6-4. Precautions of Installation of the Refrigerant Fill Product

Make sure to pay special attention to the following for the machine that is delivered with the refrigerant filled and comply with the following precautions about refrigerant leakage accidents when delivering or installing.

LG Electronics does not take any responsibility for problems due to not complying with the precautions.

6-4-1. Checklists before Delivery and Installation

1) Check if ventilation facilities are prepared in the machine room in which the Centrifugal Chiller will be installed. No ventilation in case of the refrigerant leakage may cause suffocation.

6-4-2. Precautions during Bring-in and Installation

1) Move the Centrifugal Chiller after balancing enough. Make sure to pay a meticulous attention when moving as an impact on the Centrifugal Chiller or tilted Chiller may cause damage to the Centrifugal Chiller due to the leakage of the refrigerant.
2) Make sure that the wire does not interfere with the valve and piping, etc. up when lifting the Centrifugal Chiller up.
3) Make sure that the piping or valve does not collide with the pillar or obstacles when lifting or bring down the Centrifugal Chiller.
4) Refrigerant filled and oil weights are added to the Centrifugal Chiller weight when bring in it. Make sure to consider additional weight when bring in the Centrifugal Chiller.

6-4-3. Precautions after Installation

1) Make sure to avoid damage of the valve and piping, etc. of the Centrifugal Chiller when implementing works such as connecting water piping, safety valve discharge piping and cold insulation.
2) Make sure that high temperature water does not flow into the Chiller after water piping construction.
3) Consult with service staffs for a long-term storage.
4) Always run the ventilation facilities. Leakage of the refrigerant may cause oxygen deficient accidents.

6-4-4. Actions for the Refrigerant Leakage

1) Close the joint and valve and block the leakage when the leakage part is found and can be handled without a danger.
2) Move the Centrifugal Chiller to an open and danger-free place to discharge when the leakage does not stop and the Centrifugal Chiller can be moved.
   Open the installation room for enough ventilation if the Centrifugal Chiller cannot be moved.
3) Evacuate people in the surrounding area and ban access of the people by blocking with a rope around the place of leakage if the leakage volume is large. Make sure to wear oxygen breathing apparatuses.
4) Clean eyes with flowing clean water for more than 15 minutes and see a doctor immediately if the refrigerant contacted the eyes.
5) Immediately take off wet clothes, shoes and socks as there is a danger of frostbite when the refrigerant contacted the skin. See a doctor immediately after first-aids.
6) Go to a place with fresh air immediately and warm the body with a blanket and see a doctor immediately after first-aids when inhaled highly concentrated gas.

7. PIPING INSTALLATION

7-1. Considerations when Installing Water Piping

Install considering the following when constructing water piping with the Chiller.
Water piping is out of the scope of the standard installation work of LG Electronics.
Check whether the considerations are properly applied when installing the Chiller.

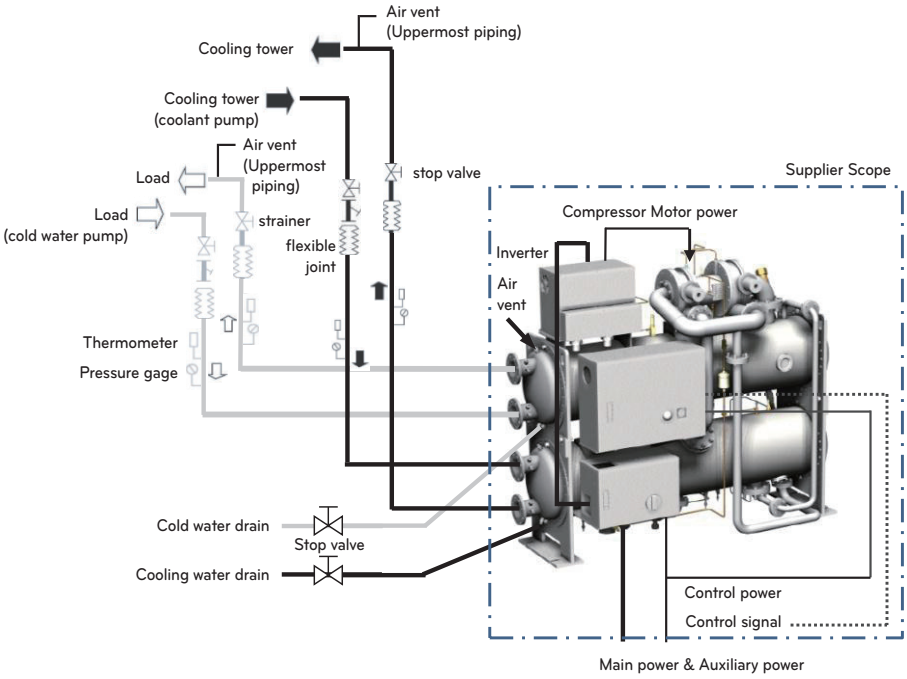


Figure10. Piping system connected to the chiller (User installation scope)

1) Based on the exterior diagram (Installation drawing), install the inlet/outlet piping of the cold water/cooing water. Make sure to check the direction of the inlet/outlet, standard of connection flange and working pressure.
2) Separate support should be installed aside from that of the chiller so that the load and the vibration of the piping of the cold water and cooling water are not transferred to the evaporator and condenser. Also provide enough space for repair.
3) Install a strainer of 10 mesh or higher on the front side of the inlet pipe of the cold water/cooing water, so that the heat transfer tube of the heat exchanger is not blocked by particles. It may cause damage of copper tube (freeze or damage).
4) Provide a device on the outlet of the turbo chiller to control the flow amount of the cold water and cooling water.
5) Provide a device to prevent pressure hunting that may cause a malfunction to the flow switch of the cold water and cooling water.
6) The water box cover should be easy to open to clean the heat transfer tubes of the heat exchanger. Install the piping connections to be separated easily without interfering with other piping when extracting heat transfer tubes.
7) Please avoid using cold water/cooing water pump at 3,600 RPM.
   It may cause resonance as the RPM is the same as that of the motor of the Centrifugal Chiller.
   A vibration isolation device should be installed if unavoidable.
8) Install an accurate thermometer and pressure gauge on the piping so that the status of the cold water/cooing water supplied to the Centrifugal chiller can be checked and managed.
9) Install an air vent valve, drain valve, and piping in the cold water and cooling water box.
   Also, install an automatic air discharge valve on the piping.
10) Use of inappropriate water can cause sediments, corrosion and scaling to damage the product. Therefore, check and manage the water quality standard. LG Electronics does not take any responsibility for the problem caused by using water with quality beyond the warranty range.
11) Install the discharge pipe for the relief valve in accordance with the high pressure gas safety management law.

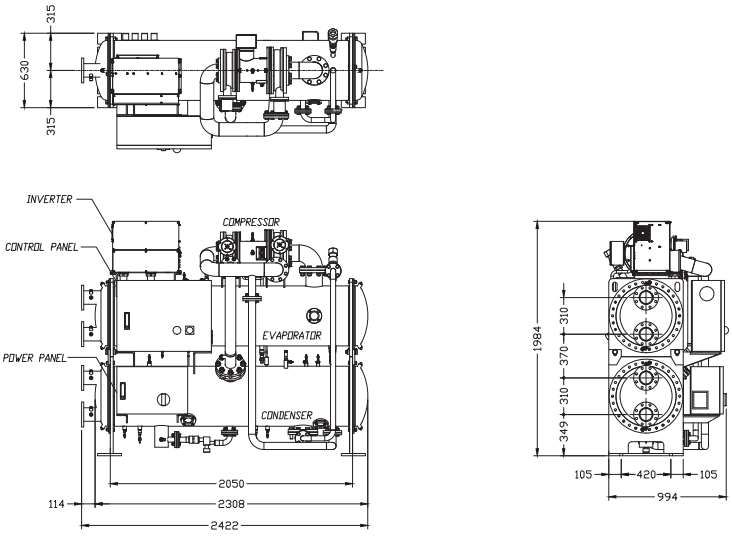
7-2. Location of the Cold Water/Cooling water Piping

Refer to the Figure 11 shown below for piping design and water plan by using information related to the water box.

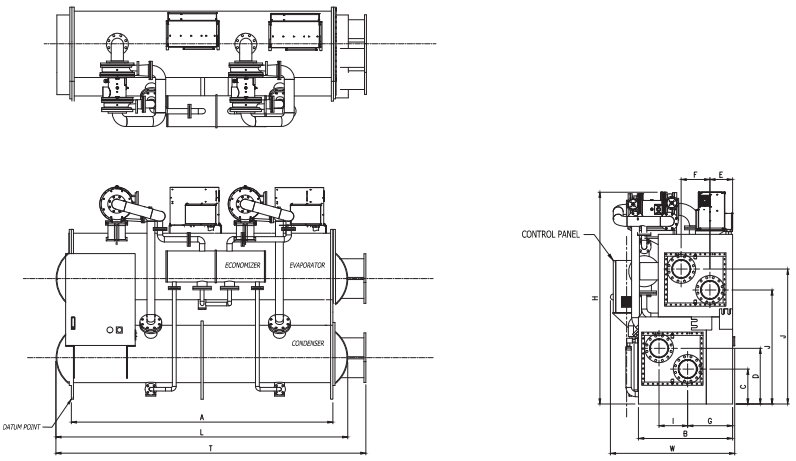
The Figure describes the Nozzle in Head Type standard product. Contact LG Electronics for a non-standard specification such as Marine Type.

❋ The size of piping changes depending on the product combination. Refer to the submitted data sheet.

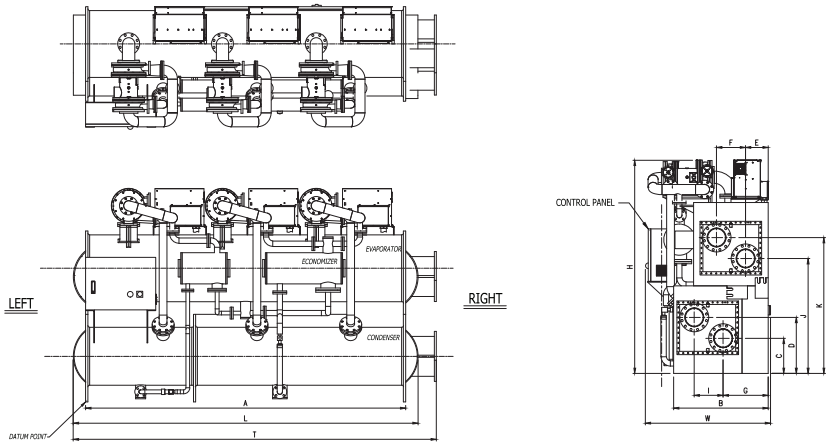
100 RT



200 RT



300 RT



CAPACITY	MODEL	L	T	W	H	A	B	C	D	E	F	I	J
200RT	RCWFLL6	3353	3561	1428	2434	3004	1080	400	640	260	330	1310	1550
300RT	RCWFLL7	3973	4150	1428	2434	3650	1080	332	668	426	690	1426	1704

7-3. Order of Fastening the Water Piping Bolts

Flange bolt using the flat gasket or O-ring should be fastened diagonally and fastened diagonally after moving 90˚ as shown in the picture below.

Improper fastening of the flange connection part may cause leakage and water leakage.

1) Fastening the piping flange bolt.
   : Refer to the Figure 12. Tighten the bolts with an adequate torque following the flange fastening order. Repeat this with the clamping force fit to the bolts.
2) Fastening Water Box Flange Bolt
   : Fasten 12 bolts with an adequate torque following the order by referring to the Figure 12. Fasten the next 12 bolts with a final torque following the consecutive sequence. And fasten the first 12 bolts and unfastened bolts with the final torque. Start fastening the bolt from number "1" and fasten the rest in clockwise direction around the flange in order.

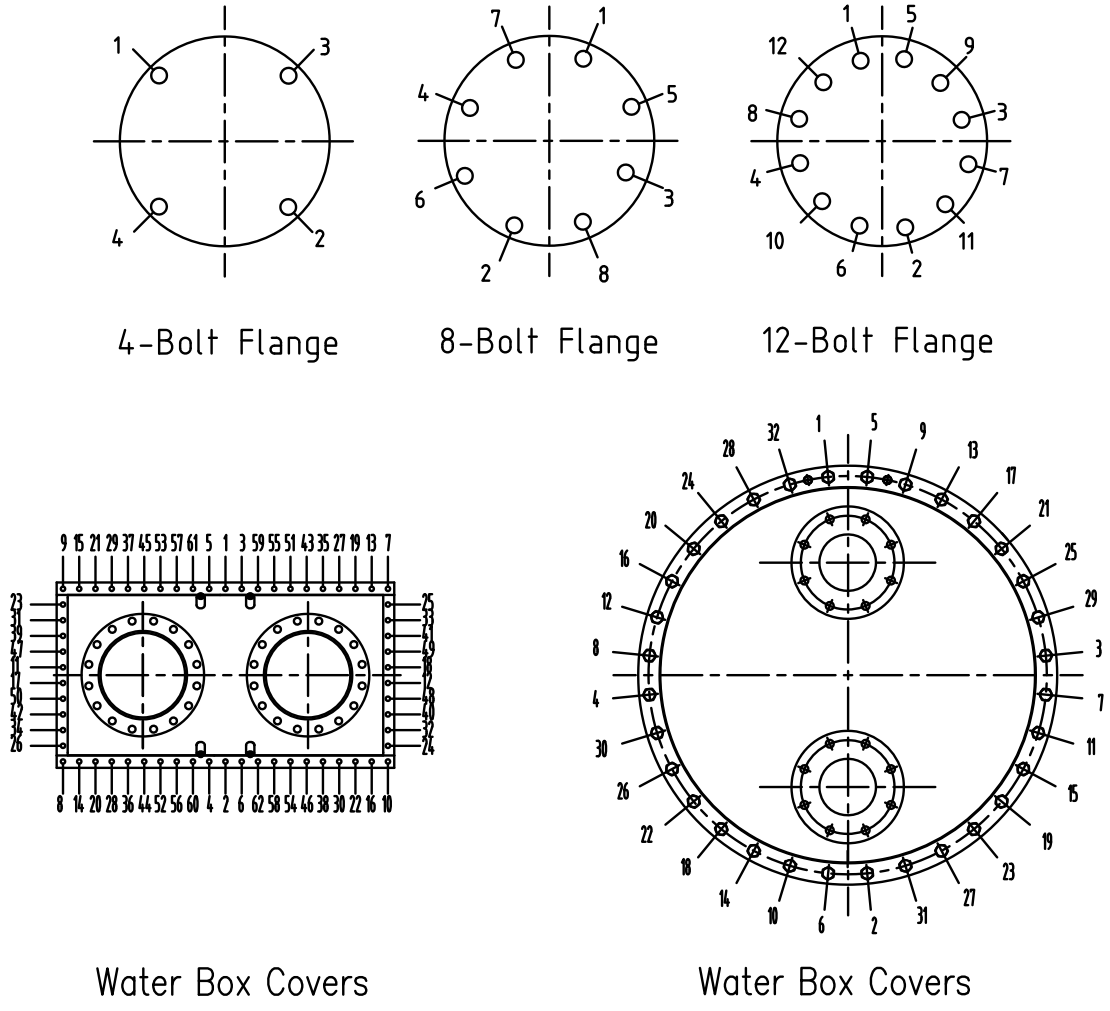


Figure 12. Order for Fastening the Flange Connection Part Bolts

7-4. Installing Refrigerant Gas Discharge Pipe of Safety Valve

The safety valve is a device preventing damage from a pressure increase by discharging refrigerant gas to the outside to protect the turbo chiller in case the internal pressure of Centrifugal chiller increases due to the occurrence of an abnormal temperature in the machine room is caused by fire, etc.
Install the refrigerant gas discharge pipe from the outlet of the safety valve to the outside.

7-4-1. Installation by the High Pressure Gas Safety Law (Follow the regulation of each region/country)

1) When installing the Centrifugal chiller, the safety valve installed on each Centrifugal chiller must lead gas discharge pipe to the outside based on the regulation provided by Article 8 of "Refrigeration Manufacturing Facility Standard and Technical Standard" as shown in Fig 13.
2) As the R-134a refrigerant applied to our products is a kind of Freon gas, the discharge pipe of the safety valve should be installed in a safe location outside the building based on the regulation of "Refrigeration Manufacturing Facility Standard and Technical Standard."

7-4-2. Precautions when Connecting the Discharge Pipe

1) When connecting the discharge pipe to the safety valve, do not apply excessive force so that the force does not transfer to the connecting part of the safety valve.
   Fix the screws of the safety valve with the proper tools and tighten the screws on the opposite side.
   It may cause a failure of the Centrifugal Chiller due to the refrigerant leakage.
2) In order to make it easy to perform the work when connecting the discharge pipe and change safety valve, form piping connections in the "ㄱ" shape using a flange or union, as shown on the Figure 13.

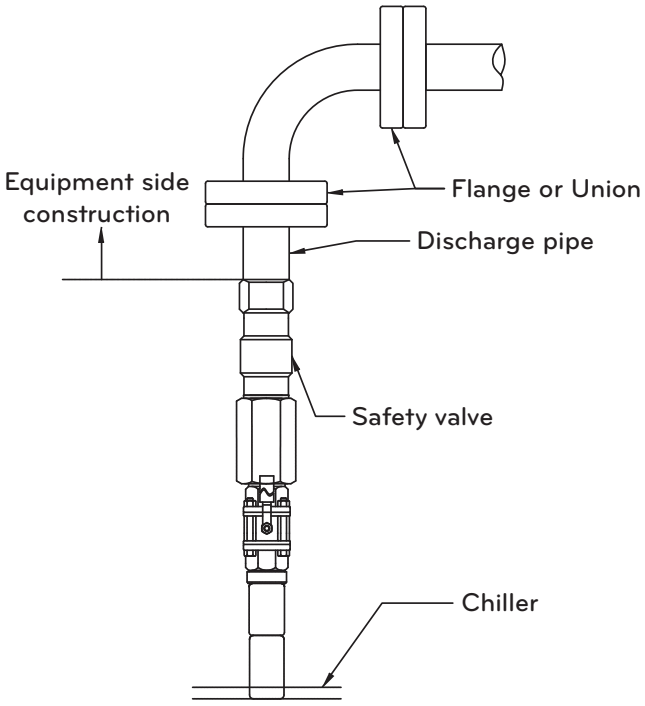


Figure 13. Installation instruction for safety valve outside discharge pipe

7-5. Water Quality Management Standard

Neglecting management of the cold water and coolant may cause not only the deterioration of the heat exchanging function due to adhesion of the scale but also serious accidents such as corrosion, insulation and deterioration inside the machine due to inflow of the water that causes damage of the heat pipe by corrosion and pitting corrosion of the heat pipe. This requires a lot of costs and time.

⚠ CAUTION

LG Electronics does not take any responsibility for corrosion-related problems due to water quality management problems as corrosion accidents are caused by external factors mostly.

Prevent accidents by enough management
Causes of scale adhesion and corrosion are various and counter actions are not uniform. As this Centrifugal Chiller is designed for the water quality that is set by the cold water/coolant water quality management standard of the Korean industrial standard, make sure to maintain enough water quality managements to be qualified to this water quality standard.
Refer to the instruction manual for detailed water quality management methods.

	Items	Coolant system			Cold water system		Tendency	
		Circulation system		Routine system				
		Circulating water	Makeup water	Routine water	Circulating water (Below 20°C)	Makeup water	Corrosion	Generation of scale
Standard item	pH(25°C)	6.5~8.2	6.0~8.0	6.8~8.0	6.8~8.0	6.8~8.0	o	o
	Electric conductivity (Ma/m)(25°C) (μS/cm) (25°C)	below 80 below 800	below 30 below 300	below 40 below 400	below 40 below 400	below 30 below 300	o	o
	Chloride ion ($mgCl^-$/L)	below 200	below 50	below 50	below 50	below 50	o	
	Sulfuric ion ($mgSO_4^{2-}$/L)	below 200	below 50	below 50	below 50	below 50	o	
	Acid consumption (pH4.8) ($mgCaCO_3$/L)	below 100	below 50	below 50	below 50	below 50		o
	Total hardness ($mgCaCO_3$/L)	below 200	below 70	below 70	below 70	below 70		o
	Calcium hardness ($mgCaCO_3$/L)	below 150	below 50	below 50	below 50	below 50		o
	Ion silica ($mgSiO_2$/L)	below 50	below 30	below 30	below 30	below 30		o
Reference item	Iron (mgFe/L)	below 1.0	below 0.3	below 1.0	below 1.0	below 0.3	o	
	Copper (mgCu/L)	below 0.3	below 0.1	below 1.0	below 1.0	below 0.1	o	o
	Sulfide ion ($mgSO^{2-}$/L)	Not detected	Not detected	Not detected	Not detected	Not detected	o	
	Ammonium ion ($mgNH_4$+/L)	below 1.0	below 0.1	below 1.0	below 1.0	below 0.1	o	
	Residual chlorine (mgCl/L)	below 0.3	below 0.3	below 0.3	below 0.3	below 0.3	o	
	Free carbon dioxide ($mgCO_2$/L)	below 4.0	below 4.0	below 4.0	below 4.0	below 4.0	o	
	Stability index	5.0~7.0	—	—	—	—	o	o

Notes)

(1) Names and units of items comply with KS MD 100.

(2) O mark in the table represents that the factor is related to the tendency of the corrosion or generation of scale.

(3) Units and number in ( ) is existing units for your reference

(4) In case a temperature is high(above 40°C), corrosion possibility is generally high and in case of steel material especially, it is desirable to establish measures effective to water such as addition of water proof chemicals and de-aeration when steel materials contact water directly without protection films.

Table 7. Cold Water/Coolant Water Quality Management Standard

8. COLD INSULATION WORK

The standard of LG Electronics is to deliver without the cold insulation construction from the factory.
Implement the cold insulation construction after leak test in the site, before commissioning.
Cold insulation construction must comply with the standard cold insulation construction manual.

Precautions for cold insulation construction

1) Make sure the operating parts (vane starter, valves, handles, etc.) are not covered or touched by cold insulation material.
2) Make sure to implement construction in order for the cold insulation material to be removed well at the fastening part of the fixed bolt of water box in order to open the water box when cleaning the tubes in the Heat Exchanger.
   Also, consider for an easy separation of the water box cover.
   (Consider for an easy separation of the flanges for water piping also)
3) Make sure to implement construction in order for the cold insulation material to be removed well at the fastening part of the compressor and main piping bolt, order to be disassembled easily for overhaul or inspection service.
4) Make sure that cold insulation material does not block the view of the liquid level gauge and its window.
5) When working cold insulation, consider that the temperature sensor and others can be separated for replacement.
6) Use cold insulation materials with an equal or higher thermal conductivity and quality than those specified by LG Electronics.
7) Install the cold insulation material firmly using adhesive and completely close the gap between the insulation material and the insulating part so that air does not get into it.
8) Thickness and specification of the cold insulation material should comply with the construction drawing of cold insulation approved by LG Electronics. The standard design condition is as follows.
   - Dry-bulb temperature: 29.4°C (85°F)
   - Relative Humidity: 75%
9) After cold insulation work, make sure not to expose it to excessive sunlight or damage to the insulation.
   Dew condensation through deformation or damaged parts may occur and reconstruction may be needed.

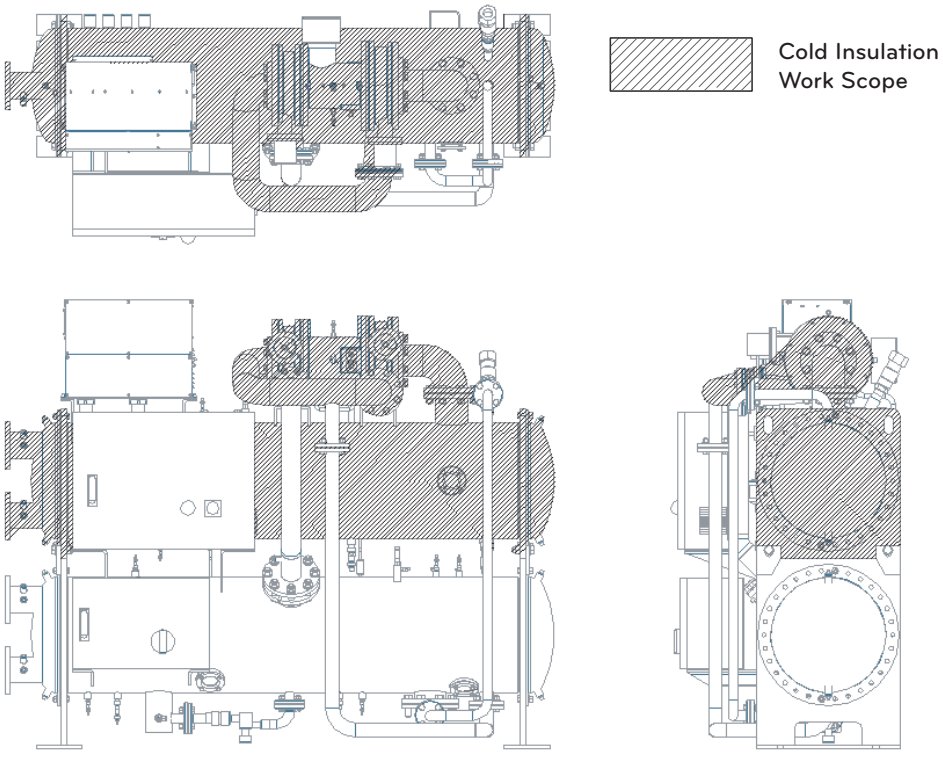


Figure 14. Locations requiring thermal insulation

9. ELECTRIC WIRING

Precautions for electric installation

WARNING

- Ground as prescribed before supplying the power when installing and remove the ground most late when removing.
  It may cause electric shock or fire.
- Use a proper measuring instrument.
  It may cause injury or electric shock.
- Remove foreign substances (work tool, wire, bolt and washer) after completing installation, inspection, and repair.
  It may cause injury, fire, and damage.

CAUTION

- Only those who are fully aware of the operation and maintenance manual are allowed to operate the control panel and inverter.
  It may cause injury, fire, malfunction, or damage.
- Do not weld in the vicinity of the cables connected to the body.
  It may cause a fire and damage.
- Do not place bolts and nuts, etc. inside the control panel and inverter.
  It may cause malfunction or damage.
- Use cables matching with the rating.
  It may cause fire and damage.
- Install the machine, control panel, and inverter in a place with no inflammable substance.
  It may cause a fire.
- Make sure the supplied voltage does not exceed the range specified in the manual or related data.
  It may cause damage or malfunction.
- Connect electric wires for the control device as shown in the circuit diagram.
  It may cause damage or malfunction.
- Do not keep the product in places with high flood risks or humidity.
  It may cause damage or malfunction.
- Do not use the indoor control panel and inverter outside.
  It may cause fire, damage, or malfunction.
- Tighten bolts and screws with the prescribed torque.
  It may cause fire, damage, or malfunction.
- Do not change the machine or control devices arbitrarily.
  It may cause fire, damage, or malfunction.

Transportation (Power panel, Inverter)

- Precautions for handling

  Do not let power panel and inverter tilted.
  Be careful not to cause an impact to the components inside the control panel and the inverter as they are fragile.
  Components inside the power panel and the inverter should not be soaked with water or oil.
  Never fail to keep power panel and inverter indoors (For indoor type)
  Do not load the goods on the top of the power panel and inverter.
  Do not let any moisture generated inside the power panel and inverter.
  Keep it in a dry place.

- Procedures for unloading

  Hang the wire rope tightly.
  Hang the wire rope with the degree less than 60°.
  Adjust the crane hook at the center of the start-up panel to lift the power panel and inverter horizontally.
  Lift the power panel and inverter slowly.
  Tighten the wire rope and use a properly stranded wire rope.
  Use a wire rope that can support the weight of the package enough.
  Make sure to use 2 lifting hooks.
  Moving the power panel and inverter stacked on each other or two or more sets simultaneously during unloading is very dangerous. Never attempt to do so.
  When pushing or pulling power panel and inverter, pay sufficient attention.

- Transportation by vehicles, etc.

  1) How to uploading
     Fix and stabilize the power panel and inverter when loading to prevent them from falling while transporting.
     Do not load the start-up panel or any other goods on top of the power panel and inverter.
     Use rope to fix the power panel and inverter to prevent them from moving or falling due to vibration.
     Fix the starter by applying enough force to prevent the rope from loosening by impacts or vibrations when transporting.

- Transportation by Using a Roller

  Try not to transport by using a roller.
  If inevitable, care shall be exercised for transportation of the system to prevent any impact to the control panel and the operation panel.

- Transportation by forklift

  Square bars with more than 60 mm thickness should be prepared when transporting the power panel and inverter with a forklift.
  Be cautious about the following when transporting by using a forklift.
  Do not transport in stack.
  Keep the valance of the power panel and inverter.
  Transportation speed should be lower than 4 km/h (walking speed).
  Use alternative transportation methods if there is a danger of disrupting driving of the forklift as the power panel and inverter are too big.
  Use forks length longer than the width of the start-up panel.
  Be sure to use the forklift suitable for the weight of the power panel and inverter.

Storage (Start-up panel)

- Storage Place

  The power panel and inverter should be kept indoors, which shall be dry and free from dusts.
  If it is inevitable to keep the system outdoors, do not store the system longer than two weeks, and keep in mind of the following conditions:
  Cover them with tents or by making a roof to prevent the power panel and inverter from being exposed to rain or other water.
  The power panel and inverter should be stored in a dry place with good drainage.

- How to Store

  Before storing, check if there would be any damage during transportation.
  Keep the accessories for the product and other installation in order not to be lost.
  Do not let the bottom of the power panel and inverter come into contact with the floor directly, and store them at least 60~120 mm above ground.
  Do not keep the power panel and inverter stacked on each other.
  Use a separate protection cover to protect the power panel and inverter from changes of the surrounding environment in case of a long-time storage.
  Also, start them after supplying power to the Space Heater.
  Set as restricted area if it is roadway or there are other works going on.
  Ensure ventilation for storing in a small and closed warehouse.
  Ensure ventilation by making holes if there are abnormal phenomena (high temperature, high humidity) of the surrounding area when storing with a protection cover.

Inspection

Check if there is any damage to the parts attached on the product or control devices during delivery or transportation.
Check if there is any problem for spare part or separately packed parts.

Environment Conditions

Check if the installation status or environment is the same as the table shown below.

Item	Specification	Remarks
Power supply	380Vac, 440Vac	It is the user's option. May change depending on the power supply of the customer.
Power Frequency	50/60Hz	It is the user's option.
Number of Power phase	3Phase	It is the user's option.
Control power	220/380/440Vac,3Ph	It is the user's option. May change depending on power supply of the customer
Controller power	20Vac,1PH,50/60Hz	
Storage temperature	-10 °C ~ 60 °C	
Working temperature	5 °C ~ 40 °C	
Working humidity	25°C, 20% ~80%RH, No dew condensation	
Surrounding environment	No corrosive gas, flammable gas, oil residue, dust, etc.	
Elevation vibration	Altitude of 1000 m or below 5.9 m/sec²(=0.6g) or below	
Controller contact Output capacity	Load below 250 Vac, 3 A, Available to connect load below 30 Vdc, 1 A	- No-voltage "A" contact output
Controller contact Input capacity	Zero voltage contact input	- Power (20 Vdc, 10 mA) applied from the controller. - Do not apply power from the outside.
Momentary blackout compensation	Controller : 100 mS or below	

• Installation (start-up panel)

- Installation place

  Check the floor, pillar, and wall of the installation place and layout drawing of the start-up panel

- Status of the floor

  Design the skid by checking the foundation drawing, and clean the installation part after making horizontality by investigating the horizontality of the installation part and polishing bumps.

- Installation of the start-up panel

  When installing the start-up panel, be careful not to damage the chiller projected on the surface of start-up panel and the parts including operating switch, display gauge, meter, etc.

  Also, clean the start-up panel after installation and check if there is any damaged or destroyed part during installation.

- Installation of foundation bolts

  Completely tighten prepared foundation bolts in the foundation bolt holes of the Channel base.

  Make sure to adjust horizontality before installing the foundation bolts.

Table: Nut tightening torque

	Bolt Standard	Torque(Kgf · cm)
1	M3	6~8
2	M3.5	10~13
3	M4	15~20
4	M5	30~40
5	M6	50~60
6	M8	120~150
7	M10	240~500
8	M12	420~1020
9	M16	1050~1300

Connection of control power (Applies to high voltage 3300 V/6600 V)

Connect the control power to the input terminal or terminal block of the control transformer attached to the inside of the panel.

- Other Precautions

  Only specialists that LG Electronics approved can handle the control devices or tools.

  Do not move to the front of the control devices.

  Cut off all the power when connecting the power cord and control signal line.

  The user must be fully aware of the safety devices and functions in the manual and should not violate the requirements for safety.

  The user must be aware of the control method, function, and set value of the system.

  Do not load tools or parts on/inside the top of the power panel and start-up panel while operating.

  Keep the control panel, power panel, and inverter clean.

  Do not open the protection cover when the control panel, power panel, or inverter is operating or the operating power is supplied.

  Do not come into contact with the heated surfaces such as the heater.

  Inspect the signal connection parts, protection devices, and structure regularly.

  Contact specialists if there is any suspicious or abnormal part detected.

  Keep the door of the control panel, power panel, and inverter closed.

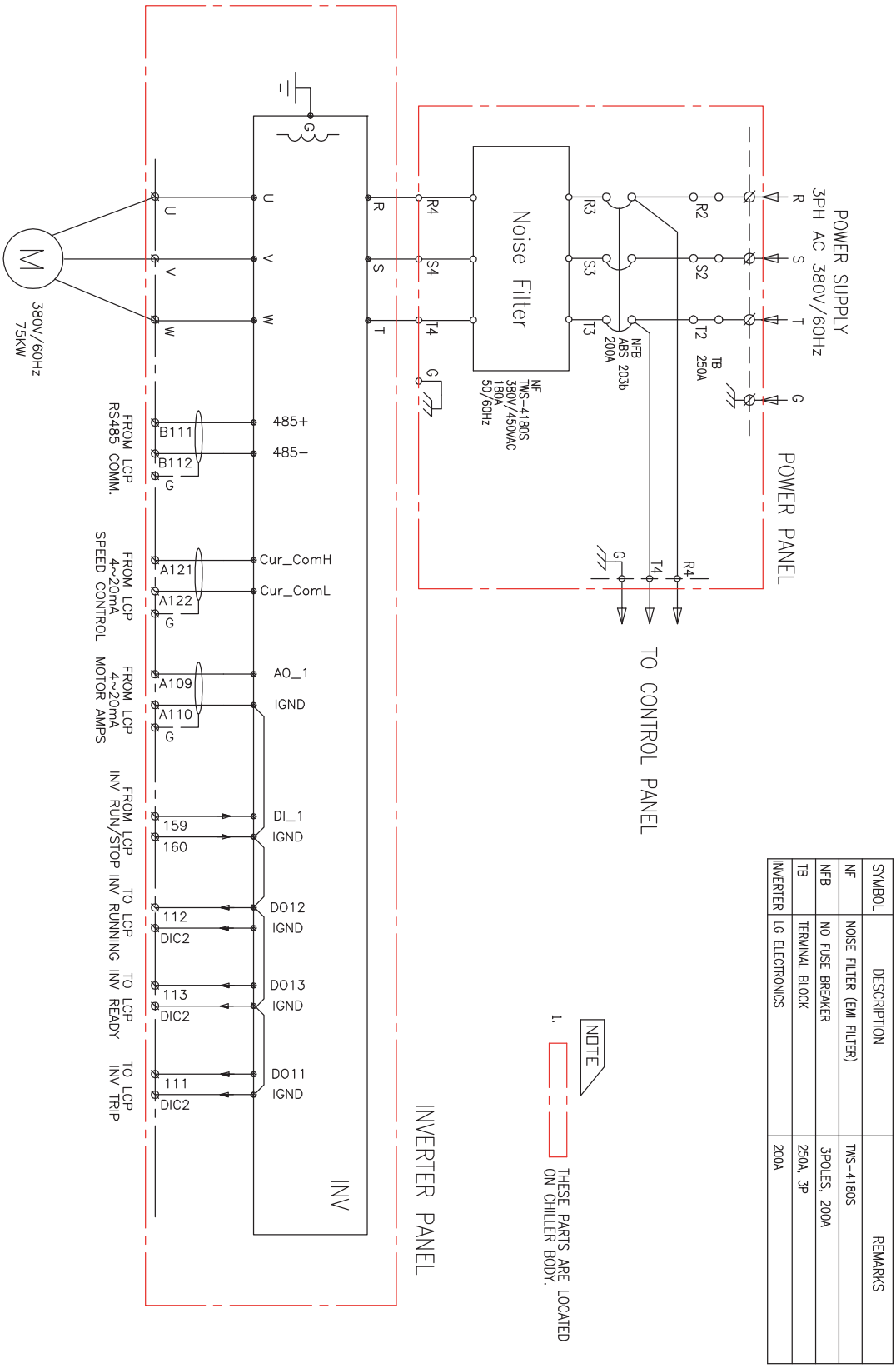
  Close the inlet of the Pit, etc. perfectly by using barriers and close the door of the power panel and inverter unless needed to prevent short circuit accidents by the inflow of foreign substances.

  Inspect the wiring after failure recovery or parts replacement and check the operation of related devices.

9-1. Wiring diagram of the power panel on-site

9-1-1. LG Wiring diagram of the power panel on-site

Inverter start-up



SYMBOL	DESCRIPTION	REMARKS
NF	NOISE FILTER (EMI FILTER)	TWS-4180S
NFB	NO FUSE BREAKER	3POLES, 200A
TB	TERMINAL BLOCK	250A, 3P
INVERTER	LG ELECTRONICS	200A

** The diagram shown above is a reference diagram. As it may change depending on the design improvements and customer requests, please refer to the approved diagram.

9-2. Main Power Cord Connection

3 phase power supply

1) Verify whether the ratings marked on the nameplate of the power panel and inverter is same with the power supplied, and same with the electric data marked on the name plate of the chiller.

2) If the enclosure of the power panel and inverter should be cut to provide electrical access, be careful to prevent debris from falling inside the enclosure.

3) Use copper (Cu) conductors for the 3-phase power supply of the start-up panel installed in the chiller with 'Separated type' or 'Integration type'.

4) The size of the wiring of the power supply is indicated on the interface diagram, and it may be changed based on consultation with the customer and the site condition.

5) Pressure operation power cable must be arranged in an appropriate way.
Each power supply pipe should operate to carry an accurate number of conductors to the start motor.

6) Make sure that the power supply conduit does not interfere with the service, structural members, and refrigeration equipment.

7) Reinforcing rotating power – Follow the method on the document of rotating power from the starter manufacturing and its annual test method.
Also, the conduit should be long enough for services such as the replacement of the start-up panel in the future. (For example, removal of the start-up panel)

Part Damage!

Remove all the debris inside of the power panel and inverter.

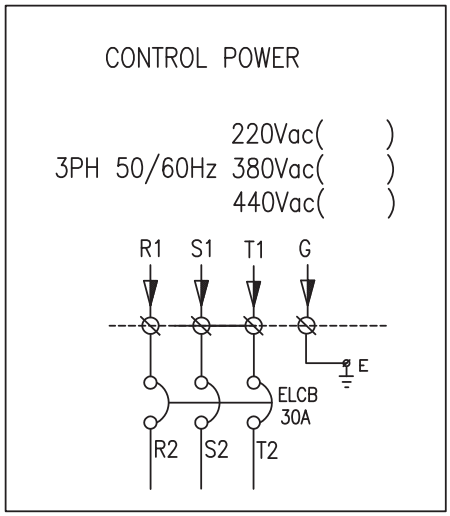
Otherwise, It may cause a short-circuit or serious part damage of the starter.

9-3. Control Board Site Connection Diagram

Control Board Power Supply

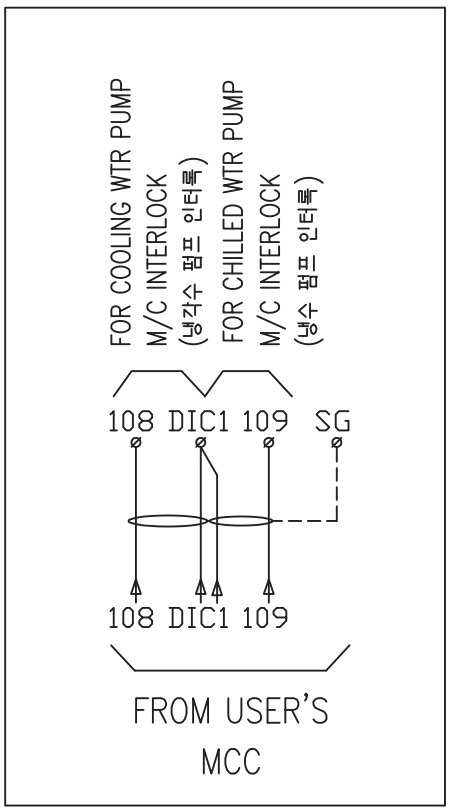
The control board should be supplied with the 3 phase 3wire power. (Including ground wire)

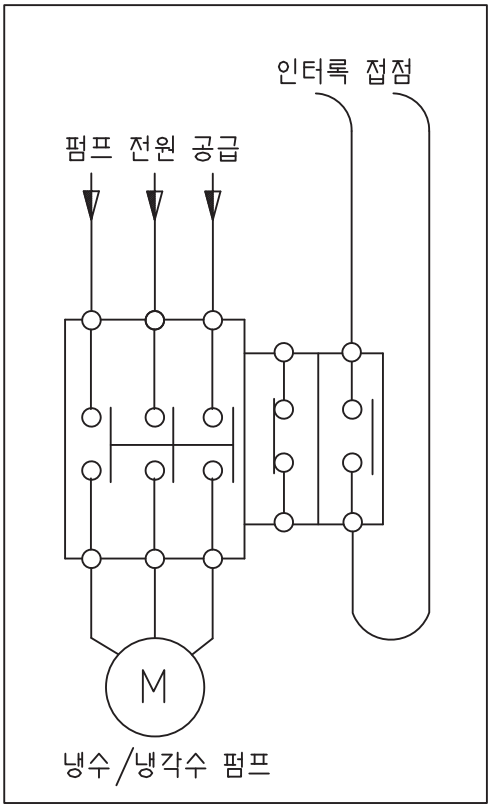
1. The nominal voltage is 220/380/440VAC, 60/50Hz and allowed range is ±10% of them. This may change depending on the power environment of the consumer.
2. Power capacity: Require higher than 4kVA.
3. Be cautious of connection R, S and T.
4. The cable size of 6SQ or higher is recommended.
5. Make sure to provide the ground line.



Consumer Interlock Contact

The Cold water/coolant pump interlock contact must be connected to prevent freeze.
It should be provided as the zero voltage contact. Otherwise, this may cause serious problems of the Centrifugal Chiller. Therefore, make sure to connect for the safety.





9-4. Precaution for motor protection

Customers provided with the Chiller may have concerns about protection and safety of the Chiller compressor medium voltage, but the LG Chiller has a safety function in the inverter for the protection of the medium voltage as shown below.

Motor Protection

There is a protection function for no motor, motor phase deficiency and over current in the inverter, so it checks whether the high-voltage motor is being operated safely. If current over the set value occurs, it has a protection function to prevent overload and stop chiller immediately by sending a signal to the control panel depending on the degree.

Appendix

1. Installation Checklists

• Inspection before Installation

NO	Inspection items	Result	Note
1	Have you acquired information related to equipment installation of the site for Chiller? (heat source flow diagram, machine room layout diagram, foundation drawing, electric drawing)		
2	Have you acquired the general progress schedule related to the Chiller and surrounding construction? (Check equipment delivery and piping connection schedule)		
3	Have you check the size of equipment entrance?		
4	Have you established bring in flow and delivery plan of the equipment?		
5	Is the skid size and height enough? (Check the machine room and drawing)		
6	Is there any obstacle in the installation place? (drain in the machine room)		
7	Have you maintained distance from the inflammables? (Domestic high pressure license)		

• Chiller

NO	Inspection items	Result	Note
1	Are parts of the Chiller received properly?		
2	Have you checked external damage of the equipment or internal connection abnormality during transportation?		
3	Has the refrigerant leaked after sealing? (check the refrigerant pressure)		
4	Is the heat insulation of equipment such as the evaporator and economizer strong?		
5	Are the directions of the cold water and coolant inlet/outlet of the Chiller the same as the design drawing?		
6	Has the horizontality of the Chiller secured?		
7	Has the anti-vibration rubber pad installed?		

• Piping

NO	Inspection items	Result	Note
1	Have all piping installed and connected as the installation guideline?		
2	Have ventilation pipe and inlet/outlet of the cold water and coolant connected properly?		
3	Have you implemented removal of foreign substances in the piping and air purge work?		
4	Have the connection parts of water piping of the Chiller constructed as the drawing? (strainer, flexible, balancing valve, pressure gauge, etc.)		
5	Is the heat insulation of the piping, flange and valve strong?		

** Result: good O, Defective: X, Not Applicatble: N/A

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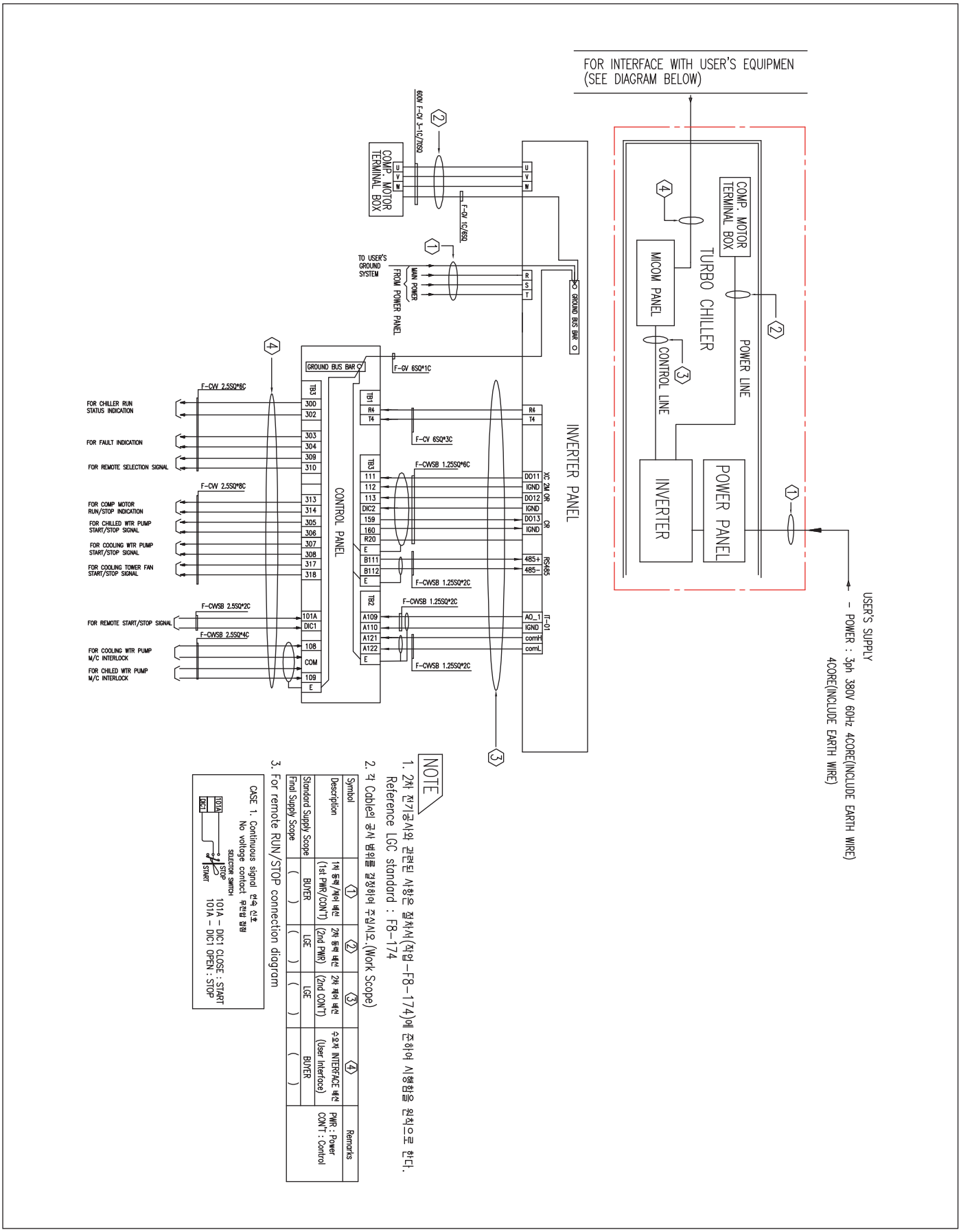
2. Centrifugal Chiller Interface Diagram (1/2)



Symbol	①	②	③	④	Remarks
Description	1차 동력/제어 배선 (1st PWR/CONT)	2차 동력 배선 (2nd PWR)	2차 제어 배선 (2nd CONT)	수요자 INTERFACE 배선 (User Interface)	PWR : Power CONT : Control
Standard Supply Scope	( ) BUYER	( ) LGE	( ) LGE	( ) BUYER	
Final Supply Scope					

✻ Control Power Lead-in Wire: Above F-CV 6SQ
✻ Control Signal Wire: F-CVV 2.5SQ
✻ Motor Analog Signal Wire: F-CVVSB1.5SQ

2. Centrifugal Chiller Interface Diagram (2/2)

SELECTION TABLE

Method / Power / SELECT / MOTOR	Y-DELTA STARTING							
	380 V		440 V		3300 V		EARTH SIZE	
	FLA / √3	WIRE SIZE	FLA / √3	WIRE SIZE	FLA / √3	WIRE SIZE	380V 440V	3300V 6600V
100KW	113.3A	50SQ	97.8A	50SQ	12.8A	16SQ	35SQ	70SQ
120KW	135.9A	50SQ	117.4A	50SQ	15.3A	16SQ	35SQ	70SQ
150KW	171.9A	95SQ	148.4A	95SQ	19.1A	16SQ	35SQ	70SQ
180KW	211.4A	95SQ	177.1A	95SQ	23.0A	16SQ	35SQ	70SQ
210KW	235.2A	120SQ	203.1A	95SQ	27.3A	25SQ	35SQ	70SQ
260KW	287.9A	150SQ	248.7A	150SQ	33.1A	25SQ	35SQ	70SQ
300KW	332.3A	185SQ	287.0A	150SQ	38.3A	25SQ	35SQ	70SQ
340KW	376.6A	240SQ	325.2A	185SQ	42.4A	25SQ	35SQ	70SQ
390KW					47.6A	35SQ	35SQ	70SQ
410KW					50.3A	35SQ	35SQ	70SQ
460KW					60.3A	35SQ	35SQ	70SQ
510KW					67.3A	35SQ	35SQ	70SQ
580KW					75.7A	35SQ	35SQ	70SQ
640KW					79.4A	35SQ	35SQ	70SQ
700KW					86.8A	60SQ	35SQ	70SQ
800KW					98.2A	60SQ	35SQ	70SQ

Method / Power / SELECT / MOTOR	DIRECT, REACTOR, KONDORFER STARTING									
	380V		440V		3300/3600V		6600V		EARTH SIZE	
	FLA	WIRE SIZE	FLA	WIRE SIZE	FLA	WIRE SIZE	FLA	WIRE SIZE	380V 440V	3300V 6600V
100KW	196.2A	95SQ	169.4A	95SQ	22.1A	16SQ	11.0A	16SQ	35SQ	70SQ
120KW	235.4A	120SQ	203.3A	95SQ	26.5A	16SQ	13.3A	16SQ	35SQ	70SQ
150KW	297.7A	120SQ	257.1A	120SQ	33.1A	25SQ	16.6A	16SQ	35SQ	70SQ
180KW	366.2A	185SQ	306.7A	120SQ	39.8A	25SQ	19.9A	16SQ	35SQ	70SQ
210KW	407.4A	240SQ	351.8A	185SQ	47.2A	25SQ	23.6A	16SQ	35SQ	70SQ
260KW	498.7A	300SQ	430.7A	240SQ	57.4A	25SQ	28.1A	16SQ	35SQ	70SQ
300KW	575.5A	150SQ*2	497.0A	300SQ	66.3A	35SQ	33.1A	25SQ	35SQ	70SQ
340KW	652.2A	185SQ*2	563.2A	150SQ*2	73.4A	35SQ	38.9A	25SQ	50SQ	70SQ
390KW					82.4A	50SQ	41.4A	25SQ	60SQ	70SQ
410KW					87.1A	50SQ	43.6A	35SQ	60SQ	70SQ
460KW					104.5A	50SQ	50.8A	35SQ	60SQ	70SQ
510KW					116.6A	50SQ	56.3A	35SQ	60SQ	70SQ
580KW					131.1A	70SQ	64.8A	35SQ	60SQ	70SQ
640KW					137.5A	70SQ	71.5A	35SQ	60SQ	70SQ
700KW					150.4A	70SQ	73.9A	35SQ	60SQ	70SQ
800KW					170.0A	70SQ	85.0A	35SQ	60SQ	70SQ
900KW					194.4A	70SQ	97.2A	35SQ	60SQ	70SQ
1000KW					216.0A	70SQ	108.0A	35SQ	60SQ	70SQ
1200KW					259.2A	95SQ	129.6A	35SQ	60SQ	70SQ

→ Turbo Chiller second power supply construction cable table
The table shown above may change depending on the conditions of the site.

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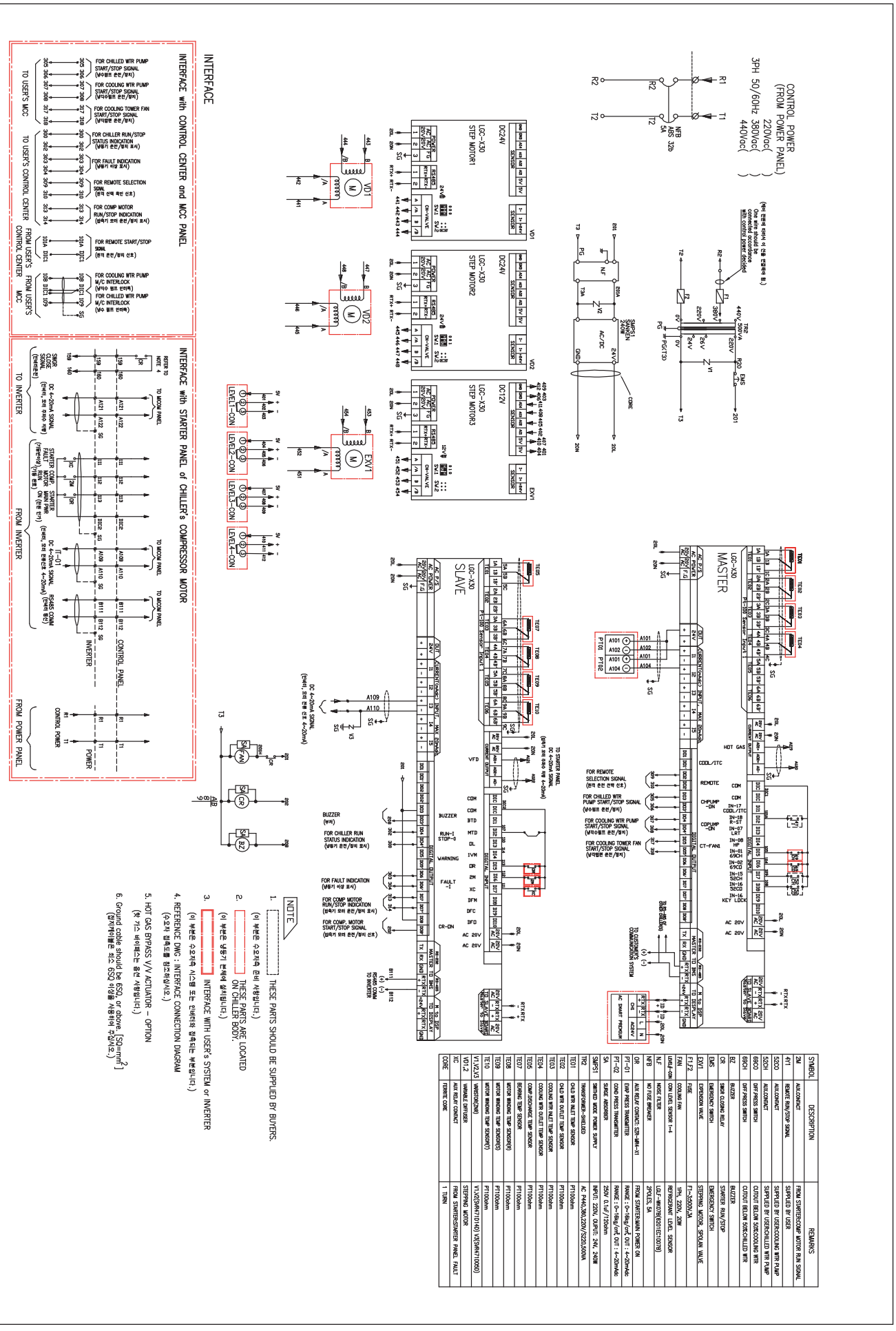
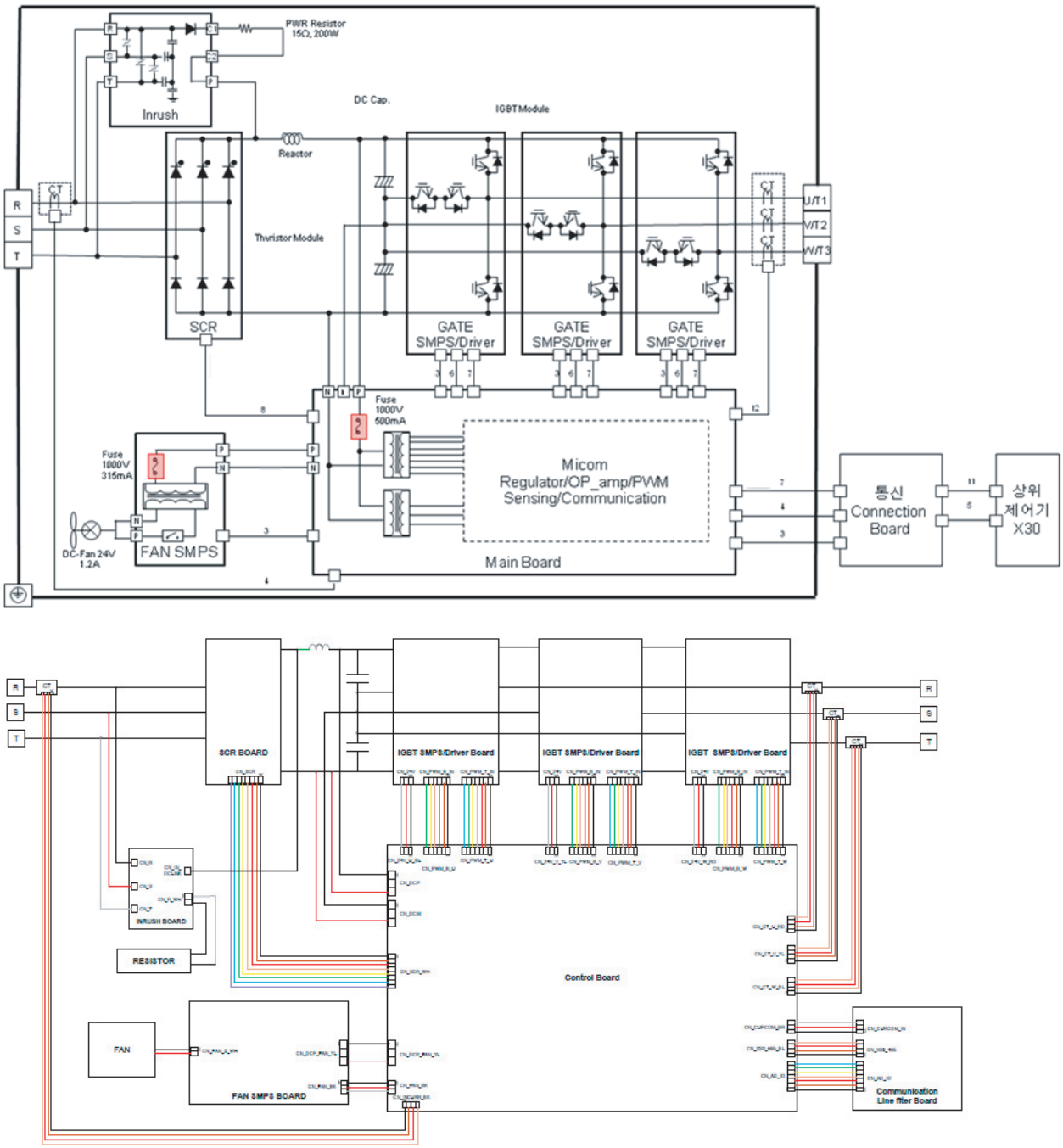
3. Control panel wiring diagram



SYMBOL	DESCRIPTION	REMARKS
2M	AUX.CONTACT	FROM STARTER(COMP. MOTOR RUN SIGNAL)
4Y1	REMOTE RUN/STOP SIGNAL	SUPPLIED BY USER
S2CO	AUX.CONTACT	SUPPLIED BY USER(COOLING WTR PUMP)
S2CH	AUX.CONTACT	SUPPLIED BY USER(CHILLED WTR PUMP)
69CO	DIFF.PRESS SWITCH	CUTOUT BELOW 5KG/COOLING WTR
69CH	DIFF.PRESS SWITCH	CUTOUT BELOW 5KG/CHILLED WTR
BZ	BUZZER	BUZZER
CR	SPARE CLOSING RELAY	STARTER RUN/STOP
EMS	EMERGENCY SWITCH	EMERGENCY SWITCH
EXV1	EXPANSION VALVE	STEPPING MOTOR, SPORLAN VALVE
F1,F2	FUSE	T1=250V,5A
FAN	COOLING FAN	1PH, 220V, 20W
LEVEL-CON	CON LEVEL SENSOR 1~4	REFRIGERANT LEVEL SENSOR
N.F	NOISE FILTER	LGLF-MK07R(EGS1EC107R)
NFB	NO FUSE BREAKER	2POLES, 5A
OR	AUX.RELAY CONTACT: S2R-MR1-U1	FROM STARTER:MAIN POWER ON
PT-01	EVAP.PRESS TRANSMITTER	RANGE : 0~18kg/cm², OUT : 4~20mAdc
PT-02	COND.PRESS TRANSMITTER	RANGE : 0~46kg/cm², OUT : 4~20mAdc
SA	SURGE ABSORBER	250V, 0.1uF/100ohm
SMPS1	SMPS(SEC.POWER SUPPLY	INPUT: 220V, OUPUT: 24V, 240W
TR2	TRANSFORMER-SHIELDED	AC 440/380/220V/5220,500VA
TE01	CHILD WTR INLET TEMP.SENSOR	PT100ohm
TE02	CHILD WTR OUTLET TEMP.SENSOR	PT100ohm
TE03	COOLING WTR INLET TEMP.SENSOR	PT100ohm
TE04	COOLING WTR OUTLET TEMP.SENSOR	PT100ohm
TE05	COMP.DISCHARGE TEMP.SENSOR	PT100ohm
TE07	BEARING TEMP.SENSOR	PT100ohm
TE08	MOTOR WINDING TEMP.SENSOR(R)	PT100ohm
TE09	MOTOR WINDING TEMP.SENSOR(S)	PT100ohm
TE10	MOTOR WINDING TEMP.SENSOR(T)	PT100ohm
V1,V2,V3	VARISTOR(D08)	V1,V2(SVR471D140) V3(SVR471D060)
V01,2	WARNABLE DIFFUSER	
XC	AUX.RELAY CONTACT	STEPPING MOTOR
CORE	FERRITE CORE	FROM STARTER/INVERTER PANEL FAULT
		1 TURN

3. Control panel wiring diagram

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