LG
Life's Good

ENGLISH

INSTALLATION MANUAL

# CHILLER

# AIR-COOLED SCREW

- Please read this installation manual completely before installing the product.
- Installation work must be performed in accordance with the national wiring standards by authorized personnel only.
- Please retain this installation manual for future reference after reading it thoroughly.

MODEL: MCAW(A) Series

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. WARNING AND CAUTION

## *READ ALL INSTRUCTIONS BEFORE USING THE APPLIANCE.*

Always comply with the following precautions to avoid dangerous situations and ensure peak performance of your product

### ⚠ WARNING

This symbol indicates the possibility of death or serious injury.

### ⚠ CAUTION

This symbol indicates the possibility of injury or damage to properties only.

Meanings of symbols used in this manual are as shown below.

Be sure to follow the instruction.

Be sure not to do.

## WARNING

- All wiring must comply with local requirements and the instructions given in this manual.
  - If the power source capacity is inadequate or electric work is performed improperly, electric shock or fire may result.
- Ask the dealer or an authorized technician to install the chiller.
  - Improper installation by the user may result in water leakage, electric shock, or fire.
- Always ground the product.
  - There is risk of fire or electric shock.
- Always install dedicated circuit and breaker.
  - Improper wiring or installation may cause fire or electric shock.
- For re-installation of the installed product, always contact a dealer or an Authorized Service Center.
  - There is risk of fire, electric shock, explosion, or injury.
- Do not install, remove, or re-install the unit by yourself(customer).
  - There is risk of fire, electric shock, explosion, or injury.
- Do not store or use flammable gas or combustibles near the chiller.
  - There is risk of fire or failure of product.
- Use the correctly rated breaker or fuse.
  - There is risk of fire or electric shock.
- Do not install the product on a defective installation stand.
  - It may cause injury, accident, or damage to the product.
- When installing and moving the chiller to another site, do not charge it with a different refrigerant from the refrigerant specified on the unit.
  - If a different refrigerant or air is mixed with the original refrigerant, the refrigerant cycle may malfunction and the unit may be damaged.
- Do not reconstruct to change the settings of the protection devices.
  - If the pressure switch, thermal switch, or other protection device is shorted and operated forcibly, or parts other than those specified by LGE are used, fire or explosion may result.
- Ventilate before operating chiller when gas leaked out.
  - It may cause explosion, fire, and burn.

- Securely install the cover of control box and the panel.
  - If the cover and panel are not installed securely, dust or water may enter the air-cooled unit and fire or electric shock may result.
- If the chiller is installed in a small room, measures must be taken to prevent the refrigerant concentration from exceeding the safety limit when the refrigerant leaks.
  - Consult the dealer regarding the appropriate measures to prevent the safety limit from being exceeded. Should the refrigerant leak and cause the safety limit to be exceeded, hazards due to lack of oxygen in the room could result.
- Use a dedicated outlet for this appliance.
  - There is risk of fire or electrical shock.
- Be cautious that water could not enter the product.
  - There is risk of fire, electric shock, explosion, or injury.
- Do not touch the power switch with wet hands.
  - There is risk of fire, electric shock, explosion, or injury.
- When the product is soaked (flooded or submerged), contact an Authorized Service Center.
  - There is risk of fire or electric shock.
- Take care to ensure that nobody could step on or fall into the air-cooled unit.
  - This could result in personal injury and product damage.
- Follow the permitted pressure level
  - Follow the regulated pressure for chilled water, cooling water, refrigerant etc.
  - It can cause electricity leakage or burn/frostbite eruption or leakage.
- Be cautious of fire, earthquake and lightning
  - If there is natural disaster such as fire or earth-quake, or risk of lightning, immediately stop operating the unit
  - If you continue to operate the unit, it can cause a fire or electric shock.
- Be careful of the rotating part
  - Be careful not to put your finger or a stick in the rotating part of the fan or pump.
  - Do not operating the fan with the protective net removed. It can cause body injury.
- Use of undesignated refrigerant and oil is prohibited.
  - Do not use undesignated refrigerant, freezer oil and brine.
  - It can have a critical effect on the compressor and component defects.
  - If you would like to use a substitute for the refrigerant, please contact the manufacturer.
- Redesigning the control box is prohibited
  - Lock the control box with possible locking device and if you need to open the control box inevitably, turn off the main power first.
  - Do not touch the wiring or parts within the control box.
  - It can cause electric shock, fire or defects.
- Be careful of leakage
  - If you find a leakage in the connected part such as pump, piping etc., immediately stop the operation.
  - It can cause electric shock, leakage or defects.
- Changing the set value is prohibited
  - Do not change the set value of the safety device.
  - If you operate the product with incorrectly set values, it can cause defect, fire or explosion.
  - When you change the control setting value, please consult with the specialized expert.
- Electric shock prevention
  - When installing the freezer, always ground the wire.
  - It can cause electric shock.
- Follow all safety codes
  - When working on this equipment, observe precautions in the literature, and on tags, stickers, and labels attached to the equipment, and any other safety precautions that apply.
- Wear safety equipment
  - Wear safety glasses and work gloves.
  - Use care in handing, rigging, and setting this equipment, and in handling all electrical components.
- Shut off all power to this equipment during installation and service.
  - Electrical shock can cause personal injury and death.

- There may be more than one disconnect switch. Tag all disconnect locations to alert others not to restore power until work is completed.

• Always run fluid through heat exchangers when adding or removing refrigerant charge.
- It prevents potential damage to heat exchanger tubes.
- Use appropriate brine solutions in cooler fluid loops to prevent the freezing of heat exchangers when the equipment is exposed to temperatures below 32°F (0°C).

• Do not vent refrigerant relief valves within a building.
- Outlet from relief valves must be vented outdoors in accordance with the latest edition of ANSI/ASHRAE (American National Standards Institute/American Society of Heating, Refrigeration and Air Conditioning Engineers) 15 (Safety Code for Mechanical Refrigeration).
- The accumulation of refrigerant in an enclosed space can displace oxygen and cause asphyxiation.
- Provide adequate ventilation in enclosed or low overhead areas. Inhalation of high concentrations of vapor is harmful and may cause heart irregularities, unconsciousness or death. Misuse can be fatal. Vapor is heavier than air and reduces the amount of oxygen available for breathing. Product causes eye and skin irritation.

• Do not attempt to umbrage factory joints when servicing this equipment. Cut lines with a tubing cutter as required when performing service.
- Compressor oil is flammable and there is no way to detect how much oil may be in any of the refrigerant lines.
- Use a pan to catch any oil that may come out of the lines and as a gage for how much oil to add to system.

• Do not re-use compressor oil.
- It may cause damage to the product.

• Do not leave refrigerant system open to air any longer than necessary.
- Seal circuits being serviced and charge with dry nitrogen to prevent oil contamination when timely repairs cannot be completed.

# CAUTION

## Installation

• Always check for gas (refrigerant) leakage after installation or repair of product.
- Low refrigerant levels may cause failure of product.

• Do not install the product where the noise or hot air from the air-cooled unit could damage the neighborhoods.
- It may cause a problem for your neighbors.

• Keep level even when installing the product.
- To avoid vibration or water leakage.

• Do not install the unit where combustible gas may leak.
- If the gas leaks and accumulates around the unit, an explosion may result.

• Use power cables of sufficient current carrying capacity and rating.
- Cables that are too small may leak, generate heat, and cause a fire.

• Do not use the product for special purposes, such as preserving foods, works of art, etc. It is a consumer chiller, not a precision refrigeration system.
- There is risk of damage or loss of property.

• Keep the unit away from children.
- It can cause the injury, such as cutting the finger. Also the damaged fin may result in degradation of capacity.

• When installing the unit in a hospital, communication station, or similar place, provide sufficient protection against noise.
- The inverter equipment, private power generator, high-frequency medical equipment, or radio communication equipment may cause the chiller to operate erroneously, or fail to operate. On the other hand, the chiller may affect such equipment by creating noise that disturbs medical treatment or image broadcasting.

• Do not install the product where it is exposed to sea wind (salt spray) directly.
- It may cause corrosion on the product. Corrosion could cause product malfunction or inefficient operation.

• Do not use the chiller in special environments.
- Oil, steam, sulfuric smoke, etc. can significantly reduce the performance of the chiller or damage its parts.

• Make the connections securely so that the outside force of the cable may not be applied to the terminals.
- Inadequate connection and fastening may generate heat and cause a fire.

• Be sure the installation area does not deteriorate with age.
- If the base collapses, the chiller could fall with it, causing property damage, product failure, or personal injury.

- Be very careful about product transportation.
  - When transporting the chiller, always consult with the specialized expert. When transporting the chiller, make sure to comply with the method regulated in the manual. If not, it can cause overturn, fall etc.
- Safely dispose of the packing materials.
  - Packing materials, such as nails and other metal or wooden parts, may cause stabs or other injuries.
  - Tear apart and throw away plastic packaging bags so that children may not play with them. If children play with a plastic bag which was not torn apart, they face the risk of suffocation.
- Turn on the power at least 12hours before starting operation.
  - Starting operation immediately after turning on the main power switch can result in severe damage to internal parts. Keep the power switch turned on during the operational season.
- Do not touch any of the refrigerant piping during and after operation.
  - It can cause a burn or frostbite.
- Do not operate the chiller with the panels or guards removed.
  - Rotating, hot, or high-voltage parts can cause injuries.
- Do not directly turn off the main power switch after stopping operation.
  - Otherwise it may result in oil supply shortage or other problems.
- Use a firm stool or ladder when cleaning or maintaining the chiller.
  - Be careful and avoid personal injury.
- Be careful of disposal
  - When disposing the device, request to the specialized expert.
- Be careful of high voltage
  - Install separate wiring for the power and always install and use dedicated power supply and circuit breaker.
  - It can cause electric shock or fire.
- Be careful of high temperature
  - Because the machine part can be hot, do not touch it with any part of your body.
  - It can cause burns.
- Be careful of restarting
  - When the safety device of the product operates, resolve the cause before re-operating.
  - If you repeat this arbitrarily, it can cause fire and defect.
- Be careful of device installation
  - Be careful of the clearance of the device during the installation and make sure there are no surrounding obstacles for the air cooling type and that it is well ventilated.
- Be careful of sound or odor
  - If you hear a weird sound or smell weird odor, immediately stop operating the unit and contact the service center.
  - It can cause fire, explosion and injury.
- Check
  - Execute the periodic check. If an issue is found, stop operating the unit and contact the service center.
  - Insufficient check can cause fire, explosion and defect.
- It can cause an injury.
  - Use appropriate tools used for the repair and make sure to calibrate the measuring devices precisely before use.
  - If you use inappropriate tools etc, it can cause an accident.
- Be careful of air cooling type heat
  - Because the condenser of the air cooling type device is sharp, do not touch the condenser.
  - Protective net must always be kept installed.
  - It can cause an injury.
- It can cause an injury.
  - Check the safety label of the safety device.
  - Follow upper precautions and labels. If not, it can cause injury or damage such as a fire etc.
  - To prevent the generation of condensed water, the connecting pipe to the evaporator, as well as the evaporator itself, must be insulated.
- Do not use jumpers or other tools to short out components, or to bypass or otherwise depart from recommended procedures

- Any short-to-ground of the control board or accompanying wiring may destroy the electronic modules or electrical components.

• Do not attempt to bypass or alter any of the factory wiring.

- Any compressor operation in the reverse direction will result in a compressor failure that will require compressor replacement.

• Consult a water treatment specialist for proper treatment procedures.

- Hard scale may require chemical treatment for its prevention or removal

• Water must be within design flow limits, clean and treated.

- This makes it possible to ensure proper machine performance and reduce the potential of tubing damage due to corrosion, scaling, erosion, and algae.
- LG assumes no responsibility for chiller or condenser damage resulting from untreated or improperly treated water.

• Harsh chemical, household bleach or acid cleaners should not be used to clean outdoor or indoors coils of any kind

- These cleaners can be very difficult to rinse out of the coil and can accelerate corrosion at the fin/tube interface where dissimilar materials are in contact. If there is dirt below the surface of the coil, use the Environmentally Sound Coil Cleaner.

• Do not use high-pressure water or air to clean coils

- It may cause fin damage
- High Velocity Water or Compressed Air should never be used to clean a coil. The force of the water or air jet will bend the fin edges and increase airside pressure drop. Reduced unit performance or nuisance unit shutdown may occur.

• Do not overcharge system

- Overcharging results in higher discharge pressure with higher cooling fluid consumption, possible compressor damage and higher power consumption.

• Do not add oil at any other location

- It may cause improper unit operation

• Compressor oil is pressurized.

- Use proper safety precautions when relieving pressure.

• Turn controller power off before servicing controls.

- This ensures safety and prevents damage to controller.

• Welding is not recommended in the cooler heads or nozzles.

- In the event that welding must be performed, remove the chilled water flow switch and entering a leaving fluid thermistors before welding.
- Reinstall flow switch and thermistors after welding is complete. Failure to remove these devices may cause component damage.

ENGLISH

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# 2. NOMENCLATURE

Identification Rule

M C A W 010 A A 1 1

**Development Sequence**

**NO. of Compressor :**
1=1, 2=2, 3=3

**Hydraulic Pressure :**
A= Chilled Water 10kgf/cm$^2$, Cooling Water 10kgf/cm$^2$
B= Chilled Water 16kgf/cm$^2$, Cooling Water 16kgf/cm$^2$
C= Chilled Water 20kgf/cm$^2$,
Cooling Water 20kgf/cm$^2$ D= Chilled Water 8kgf/cm$^2$,
Cooling Water 8kgf/cm$^2$
E: ETC

**Product Type:**
A=Flooded System, B= Dry System,
C=Falling Film System,
M=Ice Storage, High Efficiency, N=Nuclear PJT, High Efficiency, R=Heat Recovery,
W=W Type Condenser, S=Special,
V=V Type Condenser

**Nominal Capacity in Tons (USRT) :**
Ex) 010=100RT, -06=65RT,
200=2000RT, 005=50RT

**Compressor Type :**
W = Screw Compressor

**Chiller Type :**
A = Air cooled C/O
H = Air cooled H/P
W = Water cooled C/O
K = Water cooled H/P

**Product Type :** C =Chiller

**Refrigerant type & code :**
T= China R22, A= Korea R410a,
L= Korea R22, M=China R134a,
R= Korea R134a, U= China R410a,
1= Korea R123, S= Outsourcing R22,
F= Outsourcing R134a

# 3. SELECT INSTALLATION LOCATION

## Precaution when selecting the installation location

- Precaution when selecting the installation location.
- Select space for installation air-cooled unit, which will meet the following conditions.
- With strength which bears weight of unit
- With space for air passage and service work, don't install the unit at the space where generation, inflow, stagnation, and leak of combustible gas is expected.
- Avoid unit installation in a place where acidic solution and spray (sulfur) are often used.
- Location with no leakage of combustible gas
- Location with installation or service work space (Refer to required space)
- Do not use the air-cooled unit under any special environment where oil, steam and sulfuric gas exist.
- Establish an anti-freeze plan for the water supply when the product is stopped during the winter.
- The floor of the machine room must be water proof.
- In order to prevent the condensed water from being produced, both the evaporator and the pipe connected to it should be insulated.
- Install a floor slope to make the drainage smooth.
- Avoid installing the air-cooled unit in the location with following conditions.
- Location where corrosive gas such as acidic gas is generated.
  (It may cause the refrigerant leakage by corrosion of the pipe.)
- Location where electromagnetic waves happen.
  (It may cause the abnormal operation by control parts disorder.)
- Location to be able to leak the combustible gas
- Location with carbon fiber or combustible dust.
- Location with the combustible material like thinner or gasoline.
  (It may cause a fire by leaking the gas near the product.)

# 4. TRANSPORTATION METHOD

When carrying the unit suspended, pass the ropes under the unit and use the all suspension points each at the front and rear.

Always lift the unit with ropes attached at all points so that impact is not applied to the unit

If central lifting point is used, it must be a minimum of 15 ft.(4572mm) Spreader bars made from steel must be placed just above the tip of the unit (and stacks) to reduce the risk of damage to the top of the unit and coils.

❊ Reference

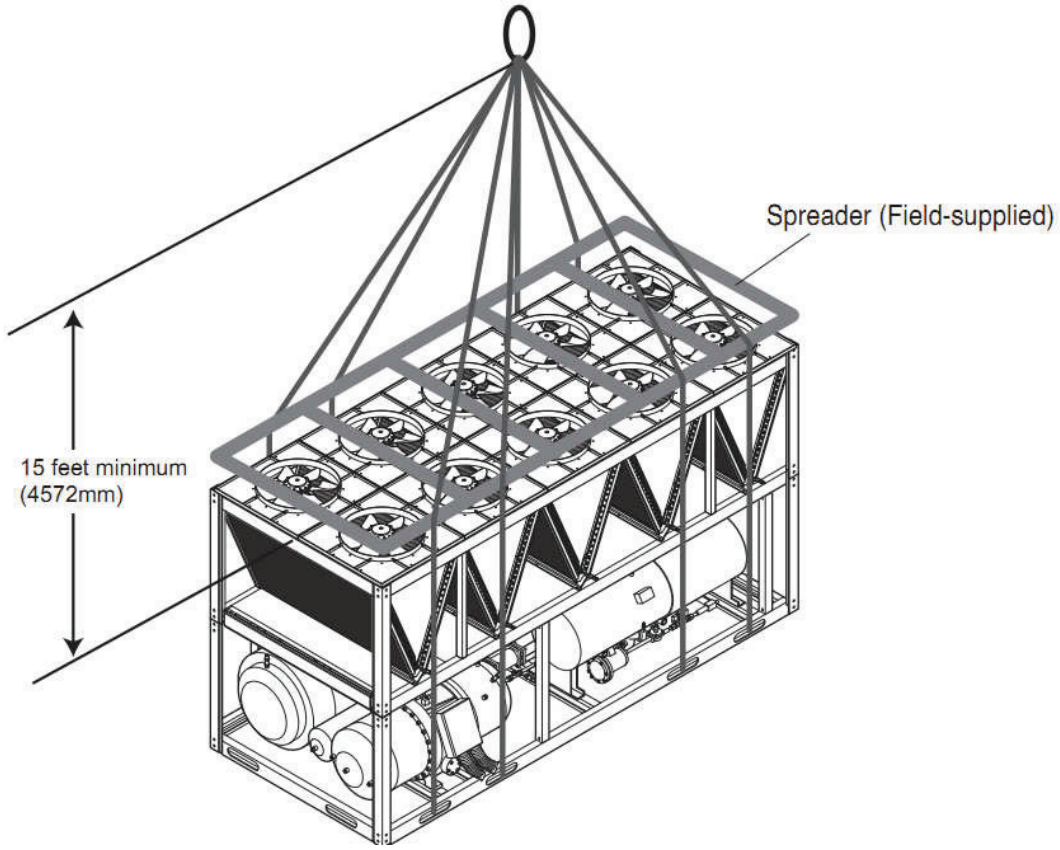



Fig 5

## ⚠ CAUTION

- When carrying in air-cooled unit, be sure to support it at all points. Carrying in and lifting with insufficient support may make air-cooled unit unstable, resulting in a fall of it.
- When carrying with the forklift, be careful not to drop the product.

# 5. INSTALLATION

## Storage

If the unit is to be stored for a period of time before installation or start-up, be sure to protect the machine from construction dirt and moisture. Keep protective shipping covers in place until machine is ready for installation.

## Install and mount unit

Inspect the unit upon arrival for damage. If damage is found, file a claim right away with the shipping company.

### 1. PLACING UNIT.

- When considering location for the unit, be sure to consult National Electrical Code (NEC, U.S.A.) and local code requirements or Electrical Code and local code requirements for each nation. Allow sufficient space for airflow, wiring, piping, and service. Be sure surface beneath the unit is level, and is capable of supporting the operating weight of the unit. See specification, dimensional drawings and foundation for unit lifting points, mounting and operating weights.
- Locate the unit so that the condenser airflow is unrestricted both above and on the sides of the unit. Airflow and service clearances around the unit are dependent on models. Provide ample room for servicing and removing cooler. Local codes for clearances take precedence over the manufacturer's recommendations when local codes call for greater clearances.
- Modular units, MCAW020~032AA must be installed with a minimum separation end to end of 4 feet (1.3 m) for airflow and service clearance along with NEC regulations.
- If multiple units are installed at the same site, a separation of 11.2 feet (3.4 m) between the sides of the machines is required to maintain proper airflow and minimize the chances of condenser air recirculation.

### 2. MOUNTING UNIT

- The unit may be mounted on a level pad directly on the base rails, on rails along the long axis of the machine, or on vibration isolation springs. For all units, ensure placement area is strong enough to support unit operating weight. Mounting holes are provided for securing the unit to the pad or vibration isolation springs or pads. The base rail can be point loaded at the mounting points.
- Bolt the unit securely to pad or rails. If vibration isolators or pads (field supplied) are required for a particular installation, refer to unit weight of specification table to aid in the proper selection of isolators or pads. The MCAW units can be mounted directly on spring isolators. For each unit or module, the final unit location must be level so that oil will equalize properly.
- If the unit was shipped with coil protection, it must be removed before start-up. The shipping bag for export units must be removed before start-up.

**⚠ WARNING**

- Be sure to install unit in a place strong enough to withstand its weight. Any lack of strength may cause unit to fall down, resulting in a personal injury.
- When carrying with the forklift, be careful not to drop the product.
- Have installation work in order to protect against a strong wind and earthquake. Any installation deficiency may cause unit to fall down, resulting in a personal injury.
- Especially take care for support strength of the floor surface, water drain processing (processing of water flown out from the air-cooled unit during operation) and paths of the pipe and wiring when making a base support.

## Mounting Method

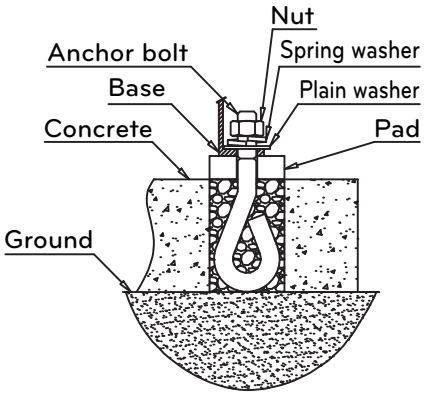



Fig 6

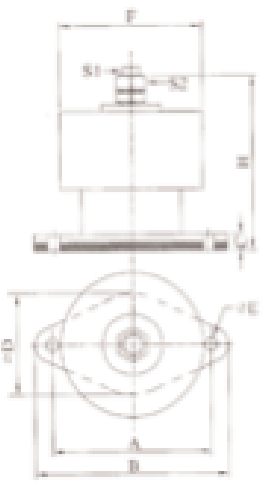
| NO. | Name |
|---|---|
| 1 | Ground |
| 2 | Concrete |
| 3 | Unit |
| 4 | Bolt |
| 5 | Nut |
| 6 | Washer |
| 7 | Pad |

Table 1

These parts are not included in the product

## Isolator

| MODEL | LOAD (kg) | LOAD (N) | DEFLECTION (±1mm) | VERTICAL-RIGIDITYk (kg/mm) | OUTER SIZE(mm) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | A | B | C | øE | F | H | S1 | S2 | øD |
| MHD-1200 | 1200 | 11760 | 25 | 48 | 165 | 200 | 13 | 12.5 | 147 | 165 | M12x25 | M20x60 | 104 |
| MHD-920 | 920 | 9016 | 25 | 36.8 | 165 | 200 | 13 | 12.5 | 147 | 165 | M12x25 | M20x60 | 104 |
| MHD-730 | 730 | 7154 | 25 | 29.2 | 165 | 200 | 13 | 12.5 | 147 | 165 | M12x25 | M20x60 | 104 |



## Unit Mounting Weights

| MCAW(A) | Mounting Weights(kg) | | | | |
|---|---|---|---|---|---|
| UNIT SIZE | A | B | C | D | Total |
| 008 | 1033 | 603 | 612 | 1079 | 3326 |

| MCAW(A) | Mounting Weights(kg) | | | | | | |
|---|---|---|---|---|---|---|---|
| UNIT SIZE | A | B | C | D | E | F | Total |
| 010 | 577 | 841 | 452 | 467 | 945 | 608 | 3890 |

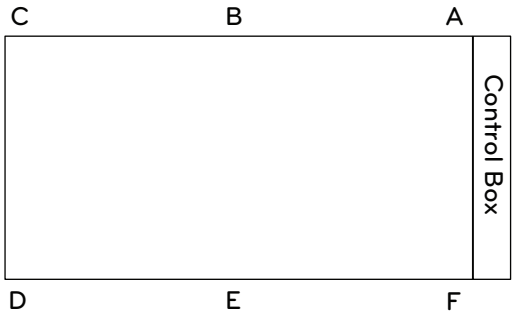
| MCAW(A) | Mounting Weights(kg) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| UNIT SIZE | A | B | C | D | E | F | G | H | Total |
| 012 | 502 | 726 | 540 | 293 | 297 | 568 | 800 | 524 | 4251 |
| 014 | 572 | 915 | 527 | 312 | 317 | 556 | 1100 | 610 | 4909 |
| 016 | 527 | 989 | 643 | 382 | 389 | 677 | 1132 | 546 | 5285 |

| MCAW(A) | Mounting Weights(kg) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| UNIT SIZE | A | B | C | D | E | F | G | H | I | J | K | L | Total |
| 020 | 602 | 858 | 459 | 524 | 825 | 461 | 479 | 948 | 551 | 473 | 963 | 635 | 7779 |

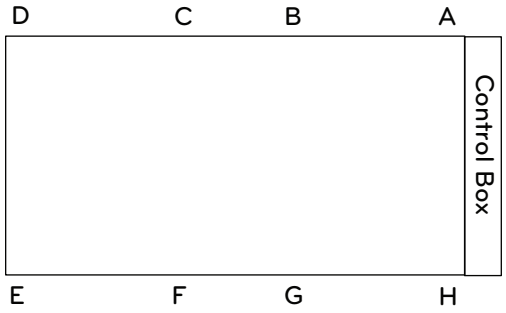
| MCAW(A) | Mounting Weights(kg) | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| UNIT SIZE | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Total |
| 024 | 513 | 743 | 553 | 300 | 445 | 709 | 553 | 295 | 300 | 591 | 795 | 464 | 305 | 582 | 819 | 536 | 8502 |
| 028 | 385 | 747 | 902 | 445 | 406 | 795 | 903 | 470 | 457 | 803 | 738 | 398 | 437 | 782 | 712 | 380 | 9760 |
| 032 | 537 | 1008 | 655 | 389 | 490 | 906 | 696 | 404 | 413 | 746 | 1024 | 506 | 396 | 690 | 1153 | 556 | 10570 |

MCAW008AA

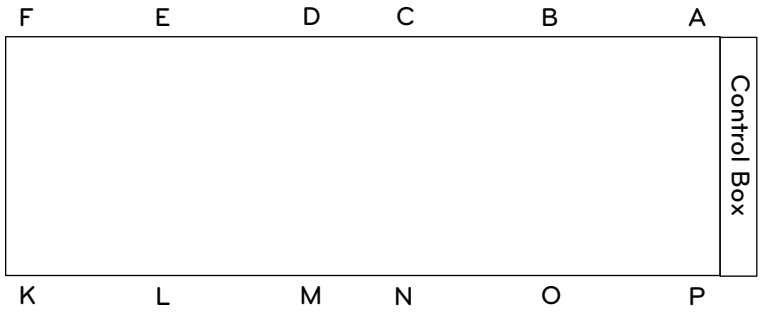

MCAW010AA



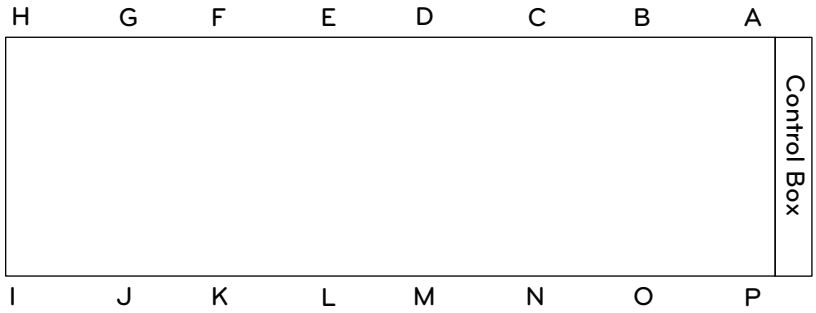
MCAW012-016AA




MCAW020AA




MCAW024-032AA



# Specification (50 Hz)

| Air Cooled Screw Chiller | | Model | MCAW008AA11 | MCAW010AA11 | MCAW012AA11 |
|---|---|---|---|---|---|
| General Unit Data | Unit Capacity | usRT | 74 | 92 | 111 |
| | at ARI Conditions | kW | 261 | 324 | 392 |
| | Input Power | kW | 86.2 | 105.7 | 127.1 |
| | COP | | 3 | 3.1 | 3.1 |
| | Number of Independent Refrigerant Circuits | | 1 | 1 | 1 |
| | Refrigerant Charge, R-134a | kg | 110 | 140 | 160 |
| | Oil Charge | ℓ | 18 | 20 | 28 |
| Weight | Shipping Weight | kg | 3,420 | 3,830 | 4,400 |
| | Operating Weight | kg | 3,496 | 3,920 | 4,501 |
| Compressors | Compressor type | | Semihermetic Twin Screw | | |
| | Quantity | EA | 1 | 1 | 1 |
| Condenser | Total Chiller Coil Face Area | $m^2$ | 14.8 | 18.5 | 22.2 |
| | Number of Coils | EA | 8 | 10 | 12 |
| | Number of rows | - | 3 | 3 | 3 |
| | Fins per inch | FPI | 15 | 15 | 15 |
| Fans | Number | EA | 8 | 10 | 12 |
| | Fan Motor | kW | 8 | 10 | 12 |
| | Fan Speed | RPM | 950 | 950 | 950 |
| | Fan Diameter | mm | 680 | 680 | 680 |
| | Fan Tip Speed | m/s | 32.4 | 32.4 | 32.4 |
| | Total Chiller Airflow | ℓ/s | 23,120 | 28,900 | 34,680 |
| Evaporator | Evaporator type | | Flooded | | |
| | Water Volume | ℓ | 76 | 90 | 101 |
| | Maximum Water Side Pressure | MPa | 1 | 1 | 1 |
| | Maximum Refrigerant Side Pressure | Mpa | 2 | 2 | 2 |
| | Minimum Chiller Water Flow Rate | ℓ/s | 5.6 | 7 | 8.4 |
| | Maximum Chiller Water Flow Rate | ℓ/s | 22.5 | 27.9 | 33.7 |
| Water Connections | Water Connections | DN | 100 | 100 | 100 |
| | Drain(NPT) | mm | 32 | 32 | 32 |
| Dimension | Length | mm | 3454 | 4217 | 4980 |
| | Width | mm | 2154 | 2154 | 2154 |
| | Height | mm | 2270 | 2270 | 2270 |

NOTES:

1. 1usRT = 3,024kcal/hr = 3.517kW, 1mH2O = 9.8kPa
2. Fouling factor of water in evaporator is 0.018m2·°C/kW (0.0001h·ft2·°F/Btu)
3. Cooling conditions : Ambient temperature is 35°C (95°F),
   Chilled water temperature outlet is 6.7°C (44°F). Temperature difference is 5.5°C (10°F).
4. Due to our policy of innovation some sppecifications may be changed without prior notification.
5. All data in this table is rated in accordance with ARI Standard 550/590.

(50Hz)

| Air Cooled Screw Chiller | | Model | MCAW014AA11 | MCAW016AA11 | MCAW020AA21 |
|---|---|---|---|---|---|
| General Unit Data | Unit Capacity | usRT | 134 | 156 | 185 |
| | at ARI Conditions | kW | 472 | 547 | 649 |
| | Input Power | kW | 151.3 | 173.2 | 211.4 |
| | COP | | 3.1 | 3.2 | 3.1 |
| | Number of Independent Refrigerant Circuits | | 1 | 1 | 2 |
| | Refrigerant Charge, R-134a | kg | 200 | 230 | 140 / 140 |
| | Oil Charge | ℓ | 28 | 28 | 20 / 20 |
| Weight | Shipping Weight | kg | 4,900 | 5,220 | 7,660 |
| | Operating Weight | kg | 5,019 | 5,345 | 7,839 |
| Compressors | Compressor type | | Semihermetic Twin Screw | | |
| | Quantity | EA | 1 | 1 | 2 |
| Condenser | Total Chiller Coil Face Area | $m^2$ | 25.9 | 29.6 | 18.5 / 18.5 |
| | Number of Coils | EA | 14 | 16 | 10 / 10 |
| | Number of rows | - | 3 | 3 | 3 / 3 |
| | Fins per inch | FPI | 15 | 15 | 15 / 15 |
| Fans | Number | EA | 14 | 16 | 10 / 10 |
| | Fan Motor | kW | 14 | 16 | 10.0 / 10.0 |
| | Fan Speed | RPM | 950 | 950 | 950 |
| | Fan Diameter | mm | 680 | 680 | 680 |
| | Fan Tip Speed | m/s | 32.4 | 32.4 | 32.4 |
| | Total Chiller Airflow | ℓ/s | 40,460 | 46,240 | 28,900 / 28,900 |
| Evaporator | Evaporator type | | Flooded | | |
| | Water Volume | ℓ | 119 | 125 | 90 / 90 |
| | Maximum Water Side Pressure | MPa | 1 | 1 | 1 |
| | Maximum Refrigerant Side Pressure | Mpa | 2 | 2 | 2 |
| | Minimum Chiller Water Flow Rate | ℓ/s | 10.2 | 11.8 | 14 |
| | Maximum Chiller Water Flow Rate | ℓ/s | 40.6 | 47.1 | 55.9 |
| Water Connections | Water Connections | DN | 125 | 125 | 100 / 100 |
| | Drain(NPT) | mm | 32 | 32 | 32 |
| Dimension | Length | mm | 5743 | 6506 | 8092 |
| | Width | mm | 2154 | 2154 | 2154 |
| | Height | mm | 2270 | 2270 | 2270 |

NOTES:

1. 1usRT = 3,024kcal/hr = 3.517kW, 1mH2O = 9.8kPa
2. Fouling factor of water in evaporator is 0.018m2·°C/kW (0.0001h·ft2·°F/Btu)
3. Cooling conditions : Ambient temperature is 35°C (95°F),
   Chilled water temperature outlet is 6.7°C (44°F). Temperature difference is 5.5°C (10°F).
4. Due to our policy of innovation some sppecifications may be changed without prior notification.
5. All data in this table is rated in accordance with ARI Standard 550/590.

(50Hz)

| Air Cooled Screw Chiller | | Model | MCAW024AA21 | MCAW028AA21 | MCAW032AA21 |
|---|---|---|---|---|---|
| General Unit Data | Unit Capacity | usRT | 223 | 268 | 311 |
| | at ARI Conditions | kW | 784 | 944 | 1093 |
| | Input Power | kW | 254.2 | 302.6 | 346.4 |
| | COP | | 3.1 | 3.1 | 3.2 |
| | Number of Independent Refrigerant Circuits | | 2 | 2 | 2 |
| | Refrigerant Charge, R-134a | kg | 160 / 160 | 200 / 200 | 230 / 230 |
| | Oil Charge | ℓ | 28 / 28 | 28 / 28 | 28 / 28 |
| Weight | Shipping Weight | kg | 8,800 | 9,800 | 10,440 |
| | Operating Weight | kg | 9,002 | 10,038 | 10,690 |
| Compressors | Compressor type | | Semihermetic Twin Screw | | |
| | Quantity | EA | 2 | 2 | 2 |
| Condenser | Total Chiller Coil Face Area | $m^2$ | 22.2 / 22.2 | 25.9 / 25.9 | 29.6 / 29.6 |
| | Number of Coils | EA | 12 / 12 | 14 / 14 | 16 / 16 |
| | Number of rows | - | 3 / 3 | 3 / 3 | 3 / 3 |
| | Fins per inch | FPI | 15 / 15 | 15 / 15 | 15 / 15 |
| Fans | Number | EA | 12 / 12 | 14 / 14 | 16 / 16 |
| | Fan Motor | kW | 12.0 / 12.0 | 14.0 / 14.0 | 16.0 / 16.0 |
| | Fan Speed | RPM | 950 | 950 | 950 |
| | Fan Diameter | mm | 680 | 680 | 680 |
| | Fan Tip Speed | m/s | 32.4 | 32.4 | 32.4 |
| | Total Chiller Airflow | ℓ/s | 34,680 / 34,680 | 40,460 / 40,460 | 46,240 / 46,240 |
| Evaporator | Evaporator type | | Flooded | | |
| | Water Volume | ℓ | 101 / 101 | 119 / 119 | 125 / 125 |
| | Maximum Water Side Pressure | MPa | 1 | 1 | 1 |
| | Maximum Refrigerant Side Pressure | Mpa | 2 | 2 | 2 |
| | Minimum Chiller Water Flow Rate | ℓ/s | 16.9 | 20.3 | 23.5 |
| | Maximum Chiller Water Flow Rate | ℓ/s | 67.5 | 81.3 | 94.1 |
| Water Connections | Water Connections | DN | 100 / 100 | 125 / 125 | 125 / 125 |
| | Drain(NPT) | mm | 32 | 32 | 32 |
| Dimension | Length | mm | 9618 | 11144 | 12670 |
| | Width | mm | 2154 | 2154 | 2154 |
| | Height | mm | 2270 | 2270 | 2270 |

NOTES:

1. 1usRT = 3,024kcal/hr = 3.517kW, 1mH2O = 9.8kPa
2. Fouling factor of water in evaporator is 0.018m2·°C/kW (0.0001h·ft2·°F/Btu)
3. Cooling conditions : Ambient temperature is 35°C (95°F),
   Chilled water temperature outlet is 6.7°C (44°F). Temperature difference is 5.5°C (10°F).
4. Due to our policy of innovation some sppecifications may be changed without prior notification.
5. All data in this table is rated in accordance with ARI Standard 550/590.

# Specification (60 Hz)

| Air Cooled Screw Chiller | | Model | MCAW008AA11 | MCAW010AA11 | MCAW012AA11 |
|---|---|---|---|---|---|
| General Unit Data | Unit Capacity | usRT | 71 | 89 | 111 |
| | at ARI Conditions | kW | 250 | 314 | 390 |
| | Input Power | kW | 83 | 104 | 130 |
| | COP | | 3 | 3 | 3 |
| | Number of Independent Refrigerant Circuits | | 1 | 1 | 1 |
| | Refrigerant Charge, R-134a | kg | 110 | 130 | 160 |
| | Oil Charge | ℓ | 16 | 18 | 20 |
| Weight | Shipping Weight | kg | 3,250 | 3,800 | 4,150 |
| | Operating Weight | kg | 3,326 | 3,890 | 4,251 |
| Compressors | Compressor type | | Semihermetic Twin Screw | | |
| | Quantity | EA | 1 | 1 | 1 |
| Condenser | Total Chiller Coil Face Area | $m^2$ | 14.8 | 18.5 | 22.2 |
| | Number of Coils | EA | 8 | 10 | 12 |
| | Number of rows | - | 3 | 3 | 3 |
| | Fins per inch | FPI | 15 | 15 | 15 |
| Fans | Number | EA | 8 | 10 | 12 |
| | Fan Motor | kW | 10.8 | 13.5 | 16.2 |
| | Fan Speed | RPM | 1100 | 1100 | 1100 |
| | Fan Diameter | mm | 680 | 680 | 680 |
| | Fan Tip Speed | m/s | 39.2 | 39.2 | 39.2 |
| | Total Chiller Airflow | ℓ/s | 28,000 | 35,000 | 42,000 |
| Evaporator | Evaporator type | | Flooded | | |
| | Water Volume | ℓ | 76 | 90 | 101 |
| | Maximum Water Side Pressure | MPa | 1 | 1 | 1 |
| | Maximum Refrigerant Side Pressure | Mpa | 2 | 2 | 2 |
| | Minimum Chiller Water Flow Rate | ℓ/s | 5.4 | 6.8 | 8.4 |
| | Maximum Chiller Water Flow Rate | ℓ/s | 21.5 | 27 | 33.6 |
| Water Connections | Water Connections | DN | 100 | 100 | 100 |
| | Drain(NPT) | mm | 32 | 32 | 32 |
| Dimension | Length | mm | 3454 | 4217 | 4980 |
| | Width | mm | 2154 | 2154 | 2154 |
| | Height | mm | 2270 | 2270 | 2270 |

NOTES:

1. 1usRT = 3,024kcal/hr = 3.517kW, 1mH2O = 9.8kPa
2. Fouling factor of water in evaporator is 0.018m2·°C/kW (0.0001h·ft2·°F/Btu)
3. Cooling conditions : Ambient temperature is 35°C (95°F),
   Chilled water temperature outlet is 6.7°C (44°F). Temperature difference is 5.5°C (10°F).
4. Due to our policy of innovation some sppecifications may be changed without prior notification.
5. All data in this table is rated in accordance with ARI Standard 550/590.

(60Hz)

| Air Cooled Screw Chiller | | Model | MCAW014AA11 | MCAW016AA11 | MCAW020AA21 |
|---|---|---|---|---|---|
| General Unit Data | Unit Capacity | usRT | 134 | 149 | 178 |
| | at ARI Conditions | kW | 471 | 523 | 627 |
| | Input Power | kW | 157.3 | 174.4 | 208 |
| | COP | | 3 | 3 | 3 |
| | Number of Independent Refrigerant Circuits | | 1 | 1 | 2 |
| | Refrigerant Charge, R-134a | kg | 200 | 220 | 130 / 130 |
| | Oil Charge | ℓ | 28 | 28 | 18 / 18 |
| Weight | Shipping Weight | kg | 4,790 | 5,160 | 7,600 |
| | Operating Weight | kg | 4,909 | 5,285 | 7,779 |
| Compressors | Compressor type | | Semihermetic Twin Screw | | |
| | Quantity | EA | 1 | 1 | 2 |
| Condenser | Total Chiller Coil Face Area | $m^2$ | 25.9 | 29.6 | 18.5 / 18.5 |
| | Number of Coils | EA | 14 | 16 | 10 / 10 |
| | Number of rows | - | 3 | 3 | 3 |
| | Fins per inch | FPI | 15 | 15 | 15 |
| Fans | Number | EA | 14 | 16 | 10 / 10 |
| | Fan Motor | kW | 18.9 | 21.6 | 13.5 / 13.5 |
| | Fan Speed | RPM | 1100 | 1100 | 1100 |
| | Fan Diameter | mm | 680 | 680 | 680 |
| | Fan Tip Speed | m/s | 39.2 | 39.2 | 39.2 |
| | Total Chiller Airflow | ℓ/s | 49,000 | 56,000 | 35,000 / 35,000 |
| Evaporator | Evaporator type | | Flooded | | |
| | Water Volume | ℓ | 119 | 125 | 90 / 90 |
| | Maximum Water Side Pressure | MPa | 1 | 1 | 1 |
| | Maximum Refrigerant Side Pressure | Mpa | 2 | 2 | 2 |
| | Minimum Chiller Water Flow Rate | ℓ/s | 10.1 | 11.3 | 13.5 |
| | Maximum Chiller Water Flow Rate | ℓ/s | 40.5 | 45 | 54 |
| Water Connections | Water Connections | DN | 125 | 125 | 100 / 100 |
| | Drain(NPT) | mm | 32 | 32 | 32 |
| Dimension | Length | mm | 5743 | 6506 | 8092 |
| | Width | mm | 2154 | 2154 | 2154 |
| | Height | mm | 2270 | 2270 | 2270 |

NOTES:

1. 1usRT = 3,024kcal/hr = 3.517kW, 1mH2O = 9.8kPa
2. Fouling factor of water in evaporator is 0.018m2·°C/kW (0.0001h·ft2·°F/Btu)
3. Cooling conditions : Ambient temperature is 35°C (95°F),
   Chilled water temperature outlet is 6.7°C (44°F). Temperature difference is 5.5°C (10°F).
4. Due to our policy of innovation some sppecifications may be changed without prior notification.
5. All data in this table is rated in accordance with ARI Standard 550/590.

(60Hz)

| Air Cooled Screw Chiller | | Model | MCAW024AA21 | MCAW028AA21 | MCAW032AA21 |
|---|---|---|---|---|---|
| General Unit Data | Unit Capacity | usRT | 222 | 268 | 297 |
| | at ARI Conditions | kW | 780 | 943 | 1046 |
| | Input Power | kW | 260.1 | 314.3 | 348.8 |
| | COP | | 3 | 3 | 3 |
| | Number of Independent Refrigerant Circuits | | 2 | 2 | 2 |
| | Refrigerant Charge, R-134a | kg | 160 / 160 | 200 / 200 | 220 / 220 |
| | Oil Charge | ℓ | 20 / 20 | 28 / 28 | 28 / 28 |
| Weight | Shipping Weight | kg | 8,300 | 9,580 | 10,320 |
| | Operating Weight | kg | 8,502 | 9,818 | 10,570 |
| Compressors | Compressor type | | Semihermetic Twin Screw | | |
| | Quantity | EA | 2 | 2 | 2 |
| Condenser | Total Chiller Coil Face Area | $m^2$ | 22.2 / 22.2 | 25.9 / 25.9 | 29.6 / 29.6 |
| | Number of Coils | EA | 12 / 12 | 14 / 14 | 16 / 16 |
| | Number of rows | - | 3 | 3 | 3 |
| | Fins per inch | FPI | 15 | 15 | 15 |
| Fans | Number | EA | 12 / 12 | 14 / 14 | 16 / 16 |
| | Fan Motor | kW | 16.2 / 16.2 | 18.9 / 18.9 | 21.6 / 21.6 |
| | Fan Speed | RPM | 1100 | 1100 | 1100 |
| | Fan Diameter | mm | 680 | 680 | 680 |
| | Fan Tip Speed | m/s | 39.2 | 39.2 | 39.2 |
| | Total Chiller Airflow | ℓ/s | 42,000 / 42,000 | 49,000 / 49,000 | 56,000 / 56,000 |
| Evaporator | Evaporator type | | Flooded | | |
| | Water Volume | ℓ | 101 / 101 | 119 / 119 | 125 / 125 |
| | Maximum Water Side Pressure | MPa | 1 | 1 | 1 |
| | Maximum Refrigerant Side Pressure | Mpa | 2 | 2 | 2 |
| | Minimum Chiller Water Flow Rate | ℓ/s | 16.8 | 20.3 | 22.5 |
| | Maximum Chiller Water Flow Rate | ℓ/s | 67.1 | 81.2 | 90 |
| Water Connections | Water Connections | DN | 100 / 100 | 125 / 125 | 125 / 125 |
| | Drain(NPT) | mm | 32 | 32 | 32 |
| Dimension | Length | mm | 9618 | 11144 | 12670 |
| | Width | mm | 2154 | 2154 | 2154 |
| | Height | mm | 2270 | 2270 | 2270 |

NOTES:

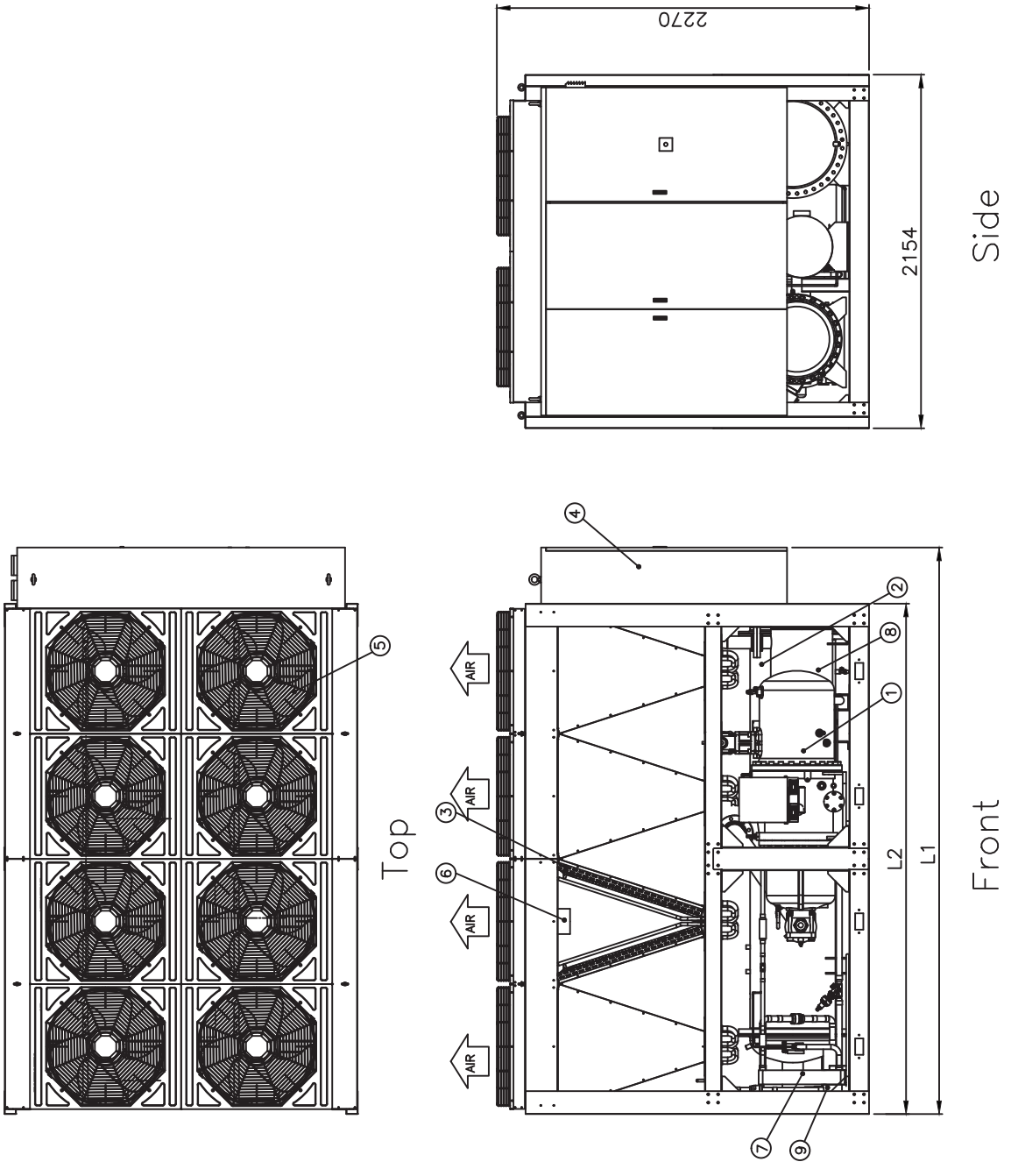
1. 1usRT = 3,024kcal/hr = 3.517kW, 1mH2O = 9.8kPa
2. Fouling factor of water in evaporator is 0.018m2·°C/kW (0.0001h·ft2·°F/Btu)
3. Cooling conditions : Ambient temperature is 35°C (95°F),
   Chilled water temperature outlet is 6.7°C (44°F). Temperature difference is 5.5°C (10°F).
4. Due to our policy of innovation some sppecifications may be changed without prior notification.
5. All data in this table is rated in accordance with ARI Standard 550/590.

# Dimensional Drawings

- MCAW008AA11(50/60Hz), MCAW010AA11(50/60Hz), MCAW012AA11(50/60Hz)
  MCAW014AA11(50/60Hz), MCAW016AA11(50/60Hz)

| Model Name | L1(mm) | L2(mm) |
|---|---|---|
| MCAW008AA11(50/60Hz) | 3454 | 3112 |
| MCAW010AA11(50/60Hz) | 4217 | 3875 |
| MCAW012AA11(50/60Hz) | 4980 | 4683 |
| MCAW014AA11(50/60Hz) | 5743 | 5403 |
| MCAW016AA11(50/60Hz) | 6506 | 6164 |

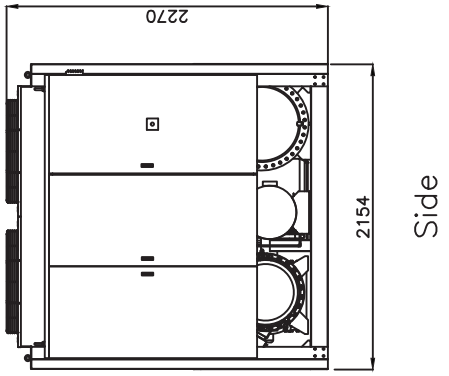
Depending on the number of the model number are different.
Refer to SPEC SHEET.

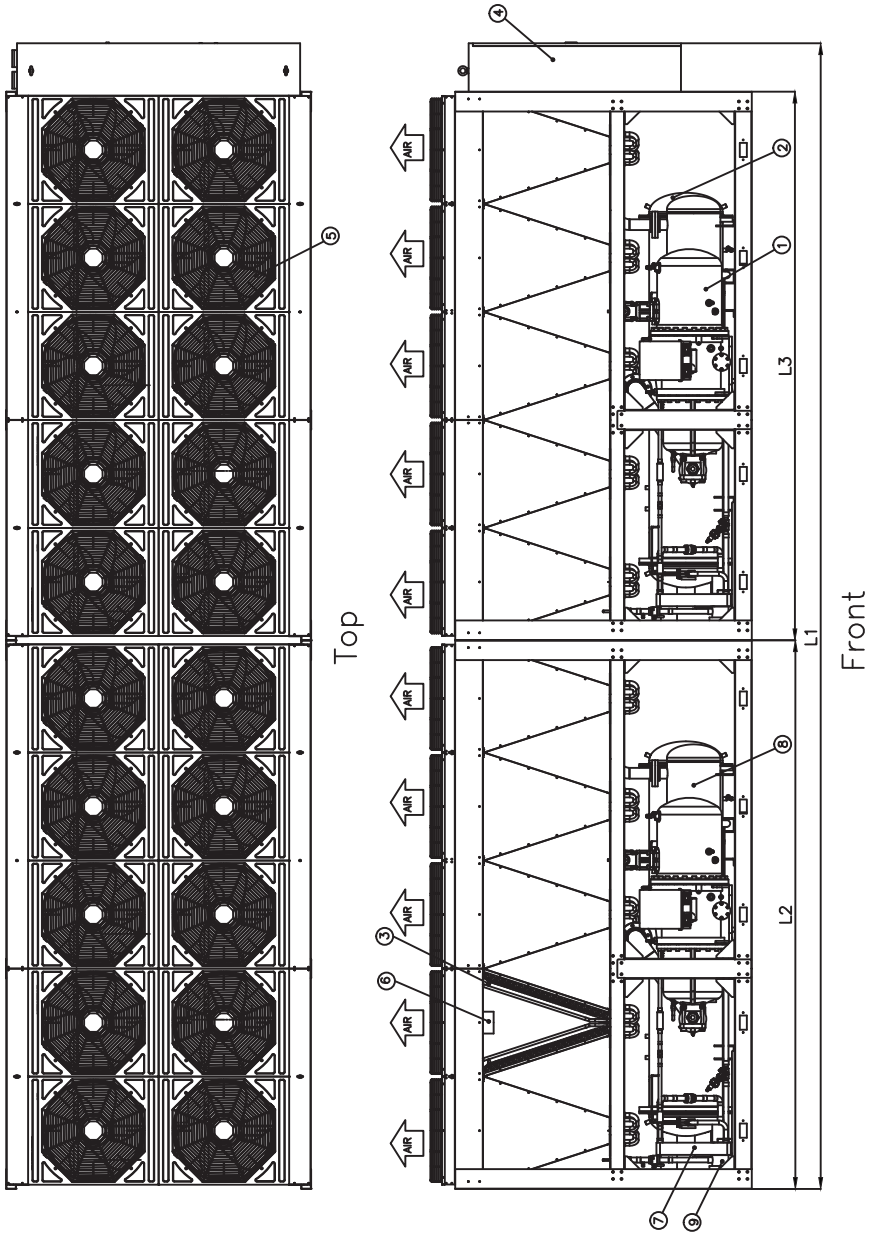


- MCAW020AA21(50/60Hz), MCAW024AA21(50/60Hz)
  MCAW028AA21(50/60Hz), MCAW032AA21(50/60Hz)

| Model Name | L1(mm) | L2(mm) | L3(mm) |
|---|---|---|---|
| MCAW020AA21(50/60Hz) | 8092 | 3875 | 3875 |
| MCAW024AA21(50/60Hz) | 9618 | 4638 | 4638 |
| MCAW028AA21(50/60Hz) | 11144 | 5403 | 5403 |
| MCAW032AA21(50/60Hz) | 12670 | 6164 | 6164 |

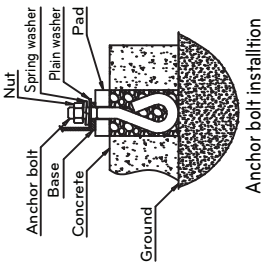
Depending on the number of the model number are different.
Refer to SPEC SHEET.

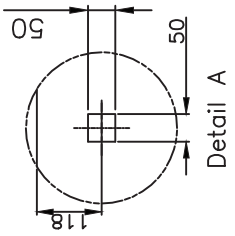


# Foundation

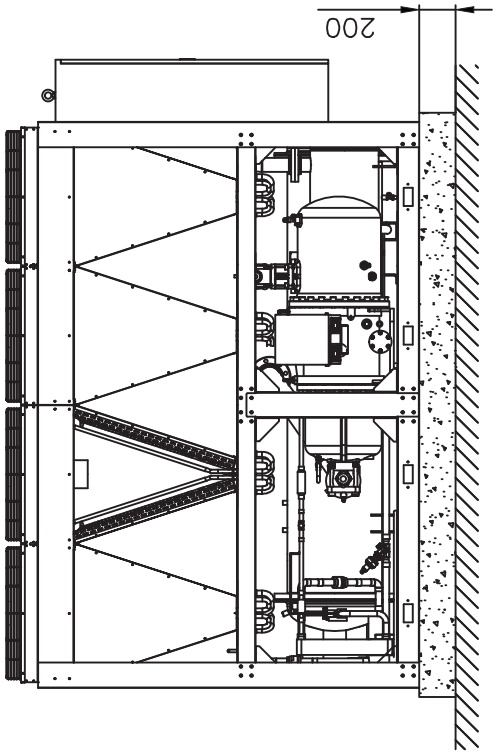
• MCAW008AA11(50/60Hz)

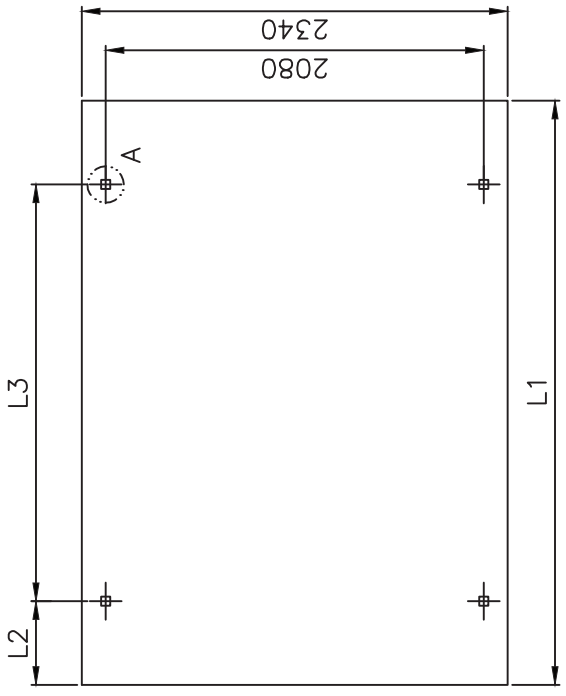



| Model Name | L1(mm) | L2(mm) | L3(mm) |
|---|---|---|---|
| MCAW008AA11(50/60Hz) | 3212 | 461 | 2290 |

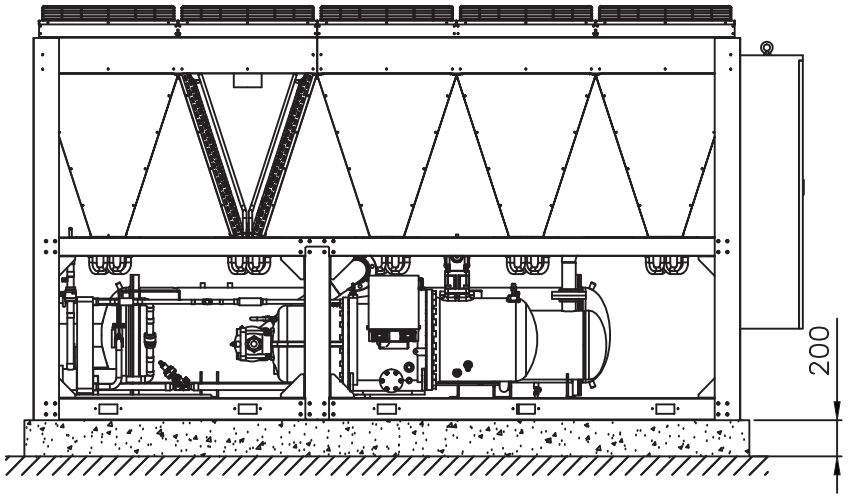
Depending on the number of the model number are different.
Refer to SPEC SHEET.

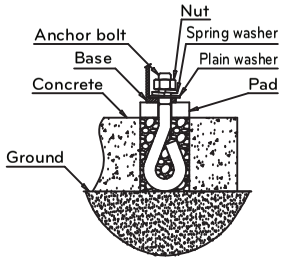


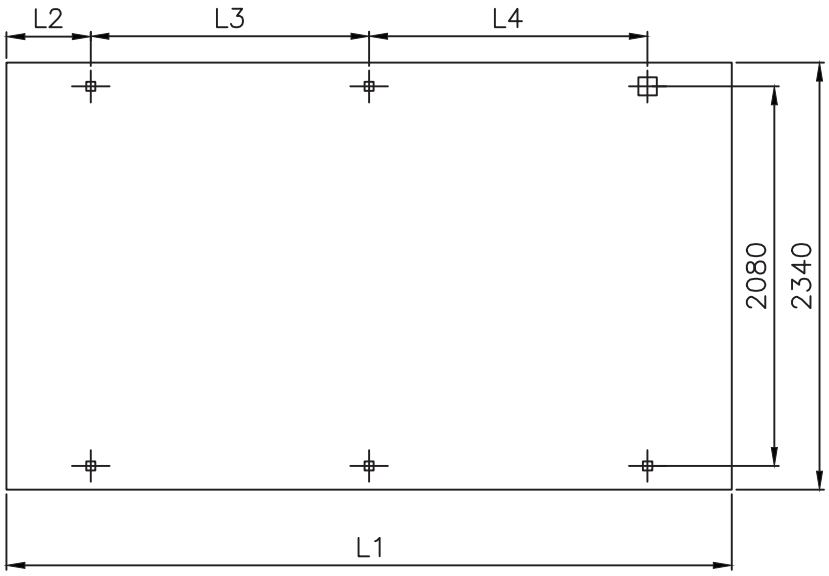
| Model Name | L1(mm) | L2(mm) | L3(mm) | L4(mm) |
|---|---|---|---|---|
| MCAW010AA11(50/60Hz) | 3974 | 461 | 1526 | 1526 |

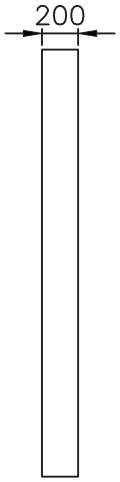
Depending on the number of the model number are different.
Refer to SPEC SHEET.




Anchor bolt installtion

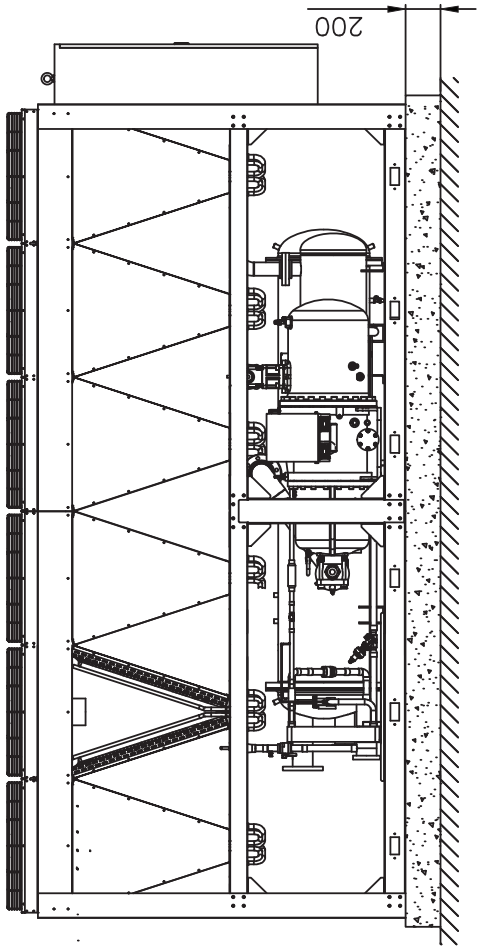


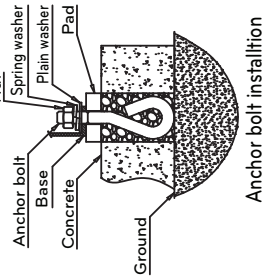



• MCAW012AA11(50/60Hz), MCAW014AA11(50/60Hz), MCAW016AA11(50/60Hz)

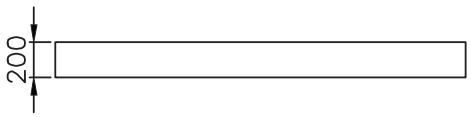
| Model Name | L1(mm) | L2(mm) | L3(mm) | L4(mm) | L5(mm) |
|---|---|---|---|---|---|
| MCAW012AA11(50/60Hz) | 4738 | 462 | 1526 | 763 | 1526 |
| MCAW014AA11(50/60Hz) | 5502 | 461 | 1528 | 1526 | 1526 |
| MCAW016AA11(50/60Hz) | 6263 | 461 | 1526 | 2289 | 1526 |

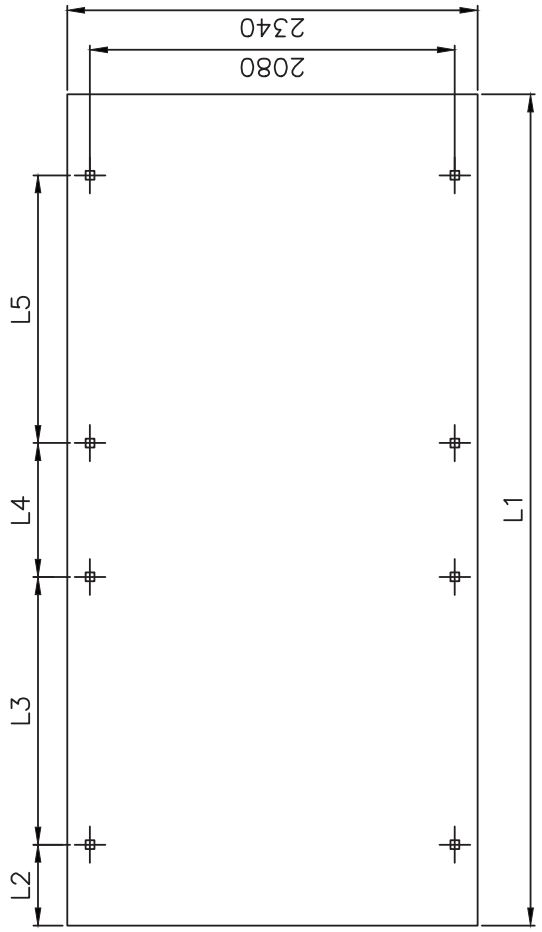
Depending on the number of the model number are different.
Refer to SPEC SHEET.




Anchor bolt installtion

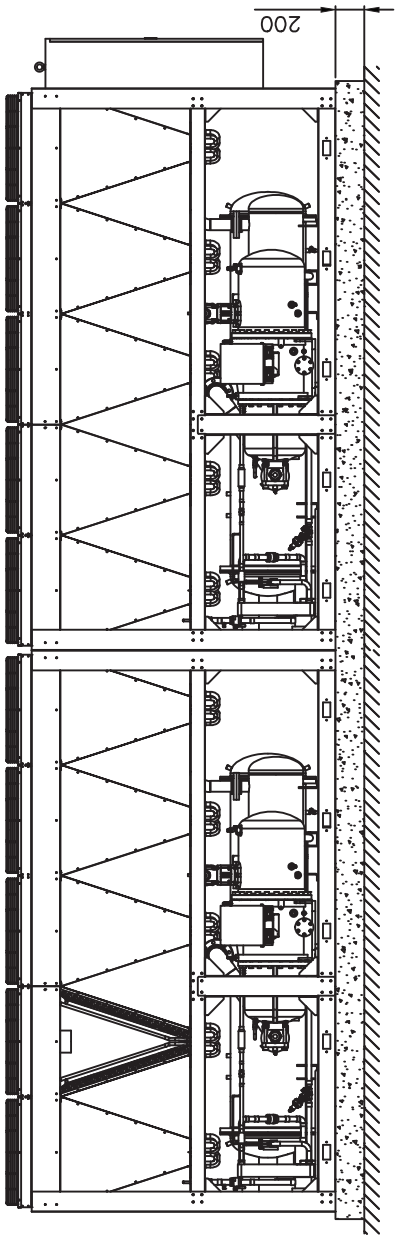


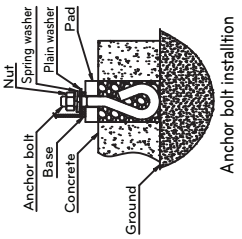



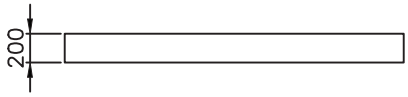
• MCAW020AA21(50/60Hz)

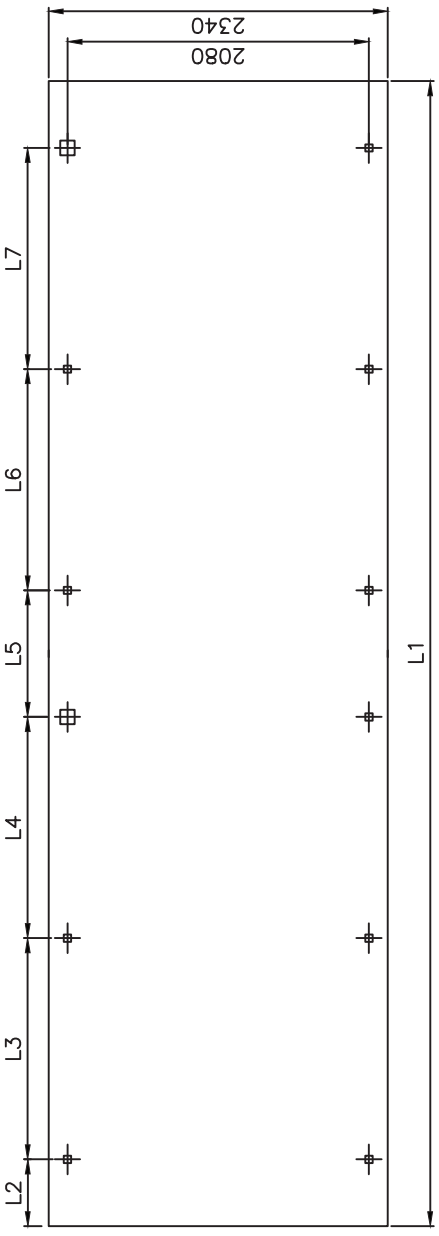
| Model Name | L1(mm) | L2(mm) | L3(mm) | L4(mm) | L5(mm) | L6(mm) | L7(mm) |
|---|---|---|---|---|---|---|---|
| MCAW020AA21(50/60Hz) | 7899 | 461 | 1526 | 1526 | 873 | 1526 | 1526 |

Depending on the number of the model number are different.
Refer to SPEC SHEET.



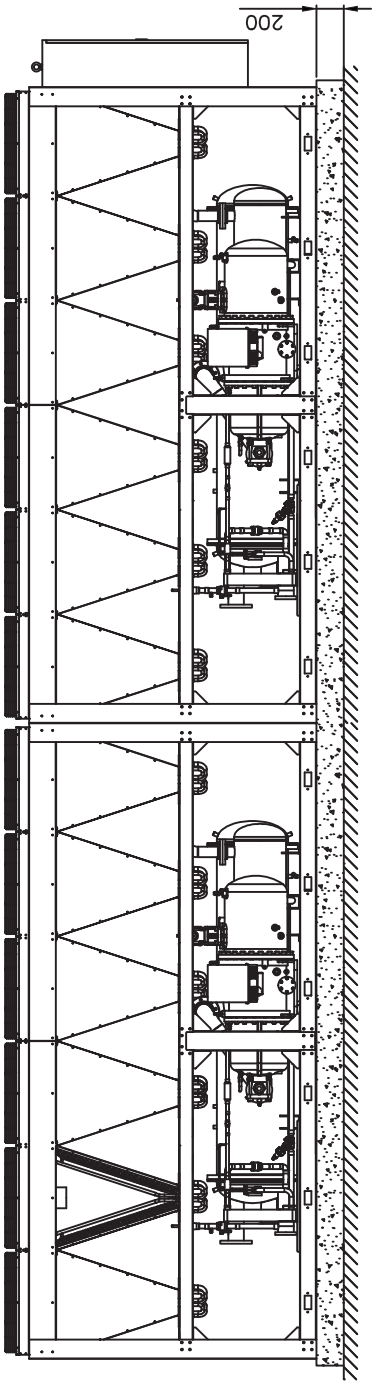



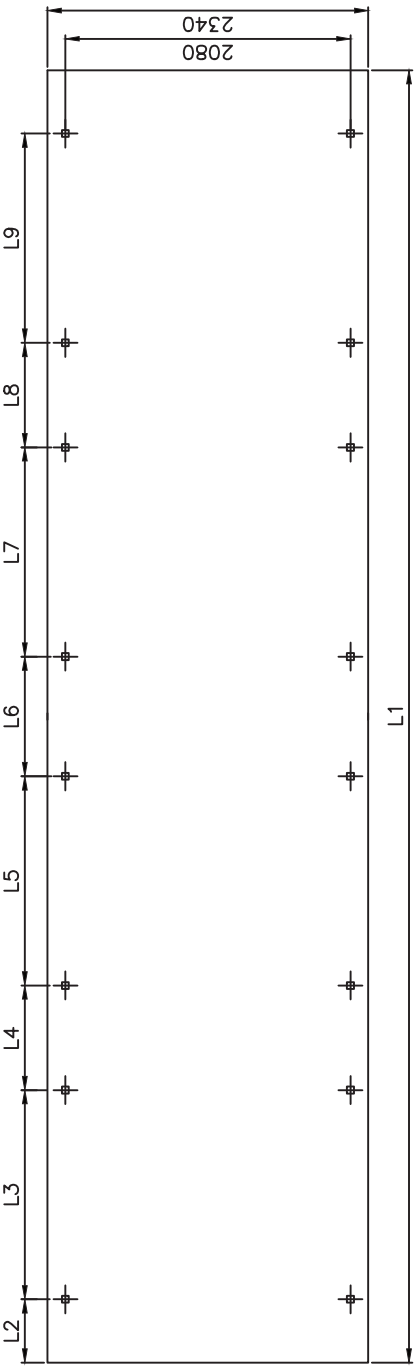



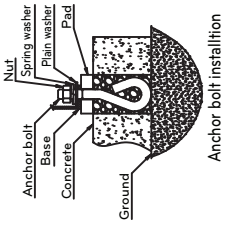
• MCAW024AA21(50/60Hz), MCAW028AA21(50/60Hz), MCAW032AA21(50/60Hz)

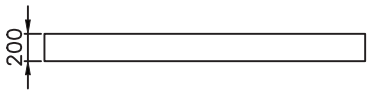
| Model Name | L1(mm) | L2(mm) | L3(mm) | L4(mm) | L5(mm) | L6(mm) | L7(mm) | L8(mm) | L9(mm) |
|---|---|---|---|---|---|---|---|---|---|
| MCAW024AA21(50/60Hz) | 9426 | 462 | 1526 | 763 | 1526 | 873 | 1526 | 763 | 1526 |
| MCAW028AA21(50/60Hz) | 10953 | 461 | 1528 | 1526 | 1526 | 871 | 1528 | 1526 | 1526 |
| MCAW032AA21(50/60Hz) | 12477 | 461 | 1526 | 2289 | 1526 | 873 | 1526 | 2289 | 1526 |

Depending on the number of the model number are different.
Refer to SPEC SHEET.



# 2 Unit Assembly

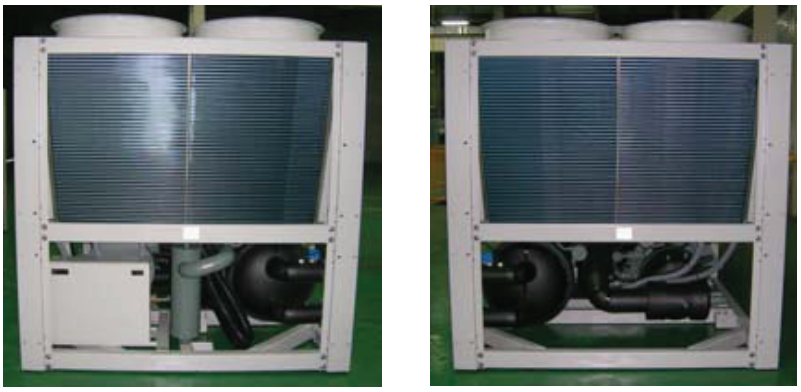
### 1. Unit Assembly

When you assemble 2 Unit, refer to foundation page.

1) Put 2 units on foundation for installation.

2) Arrange chiller and fit holes.

3) Bolt the units through holes tightly.



Back of #1 Unit

Front of #2 Unit

Fig 9

### 2. Water connection

When you assemble 2units, the chillers use a special water connection to distribute same water flow rate.

We recommend that use the flange like below picture. Chilled water inlet, outlet are same.

Back of #1 Unit, there are 2 temperature sensors, #1 is Entering Chilled Water Temperature sensor and #2 is Leaving Chilled Water Temperature sensor. The sensor have to put into the water connection to check water temperature and control capacity.

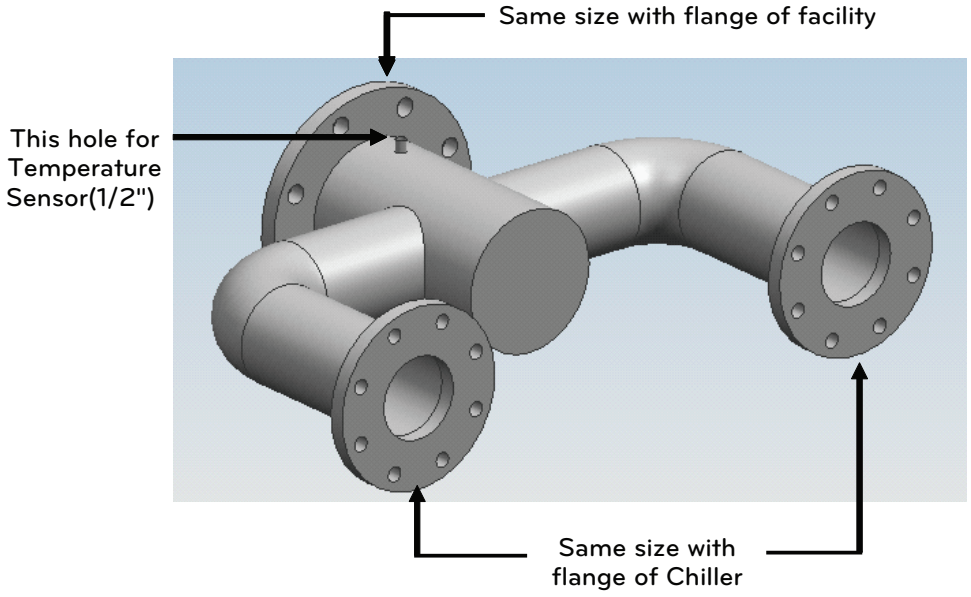
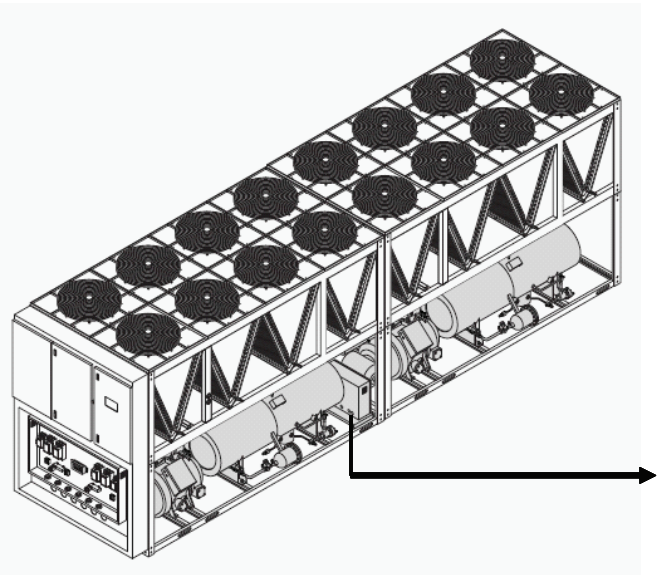
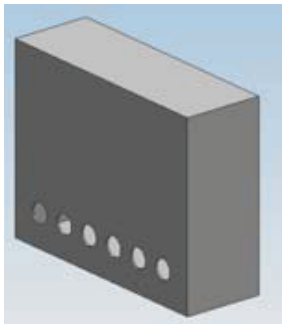



Fig 9

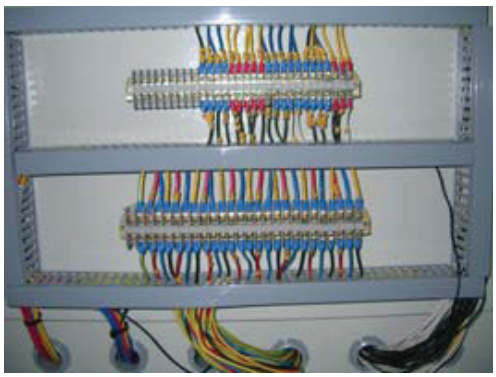
### 3. Junction Box Assembly

2unit chiller has a junction box to control #2 unit at the end of the #1 unit. There are some holes for wire connection at the back of junction box. Wires have a number in junction box, just match the numbers and color and connect wires.





Holes for wires



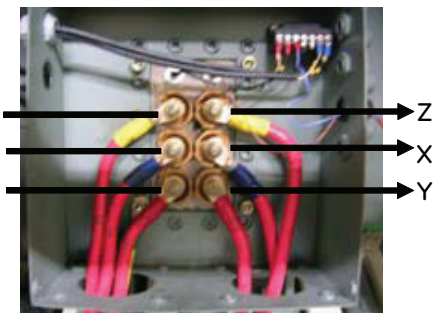
Inside of Junction Box

Fig 10

### 4. Compressor power connection

It is necessary that #2 unit of compressor power wire must connect exactly. It is very important. Refer to Compressor connection information. It is the other side of compressor power box cover.

Compressor Power Box




Inside of Compressor Power Box

Fig 10

# Cooler fluid piping connections

The MACW units are supplied with a factory-installed flow switch in the chiller water leaving water pipe and temperature sensors are installed in the water inlet and outlet pipes.

**CAUTION**

If welding is needed on connecting pipes, remove the chilled water flow switch, entering and leaving water sensor before welding connecting piping. Reinstall flow switch and thermistors after welding is complete. Failure to remove these devices may cause unit damage.

1. Installation of water pipe

- The factory-installed flange type connection is applied in all MCAW units.
- Execute heat insulation on the pipe so that water drops do not form on the outer side of the water pipe.
- Always install a strainer at the entrance of the water pipe.
- Install a pressure, temperature gauge at the inlet and out let of the water pipe.
- Flexible joints (vibration eliminators) must be installed not to cause any leakage form the vibration of pipes.
- For the components of the water system, 145 psi (10 bar) use the components applicable at 145 psi(10 bar) or higher.
- Be sure to install the insulation material in the water pipe inlet/outlet to prevent water drop, freeze and to save energy.

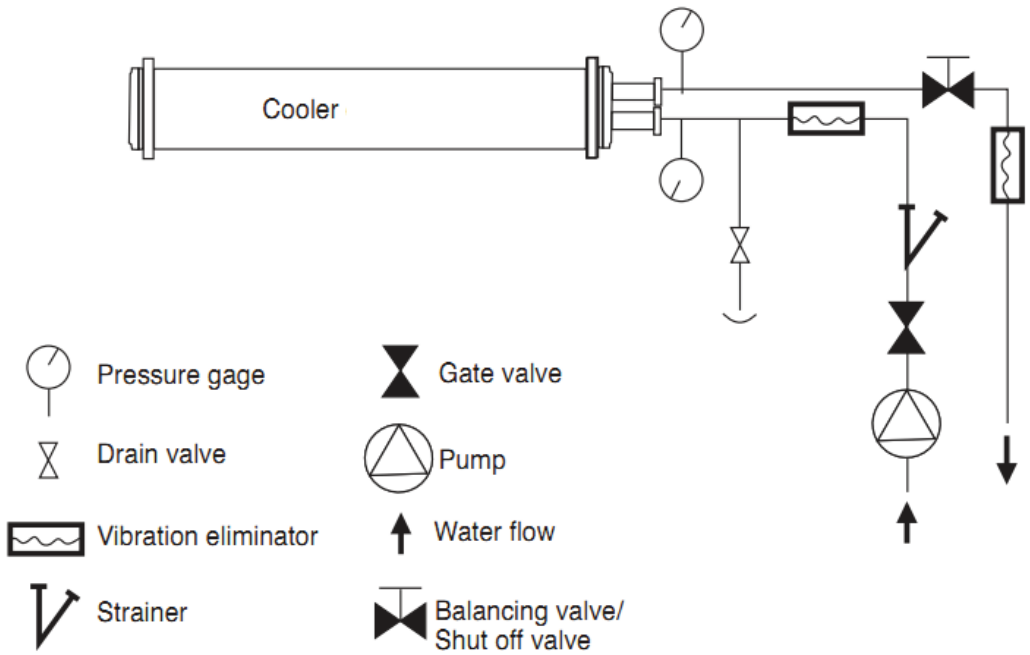



Fig 9

- When facing the cooler side of the unit, the inlet (return) water connection is on the bottom. It is required that a field-supplied strainer with a minimum size of 20 mesh be installed within 10 ft(3.05 m) of the cooler inlet to prevent debris from damaging internal tubes of the cooler. The outer connection is on the top. The cooler has waterside.
- If the multiple chiller algorithm is used, and the machines are installed in parallel, multiple chilled water sensor must be installed for each module. Install the well in the common leaving water header. See parallel multiple chiller operation. The serial multiple chiller application is shown in serial multiple chiller operation.

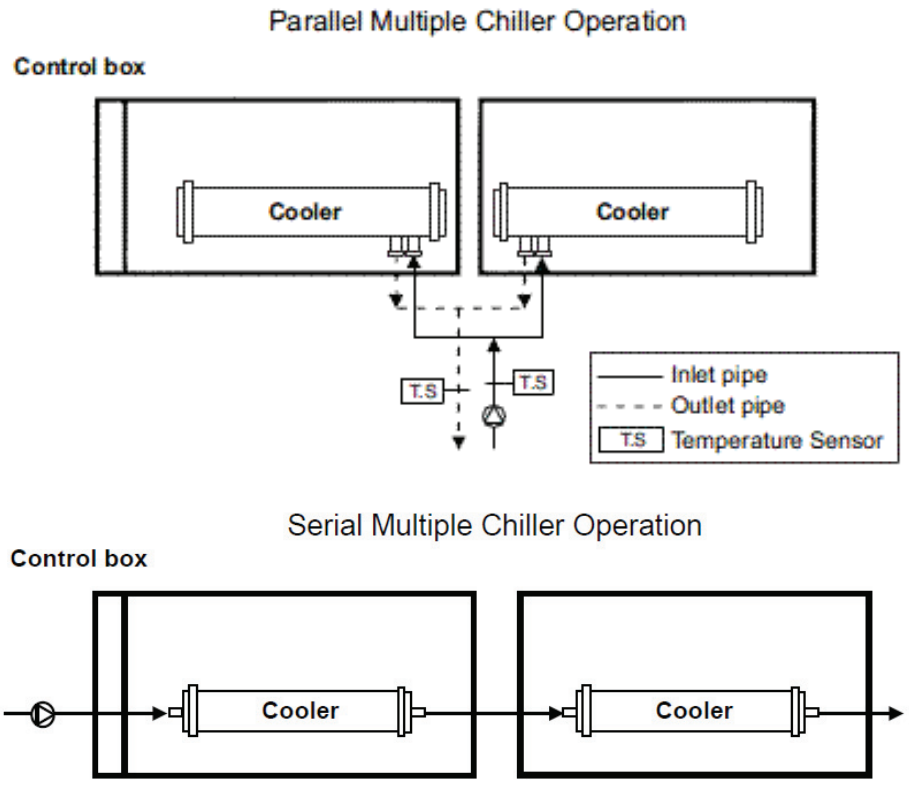



Fig. 10

- The water volume (filled system) will be different by the type of application. In order to keep water temperature stable for comfort cooling applications, minimum of 3.25 l/kW is required. For cooling applications process, applications where high stability is critical, or operation at ambient temperatures below 32°F (0°C) is expected, the loop volume should be increased to 6.5 to 10.8 l/kW of cooling. In order to achieve this volume, it may need to add a water storage tank to the water loop. If a storage tank is added to the system, it should be properly vented so that the tank can be completely filled and all air is eliminated. Failure to do so could cause lack of pump stability and poor system operation. Any storage tank that is placed in the water loop should have internal baffles to allow thorough mixing of the fluid.

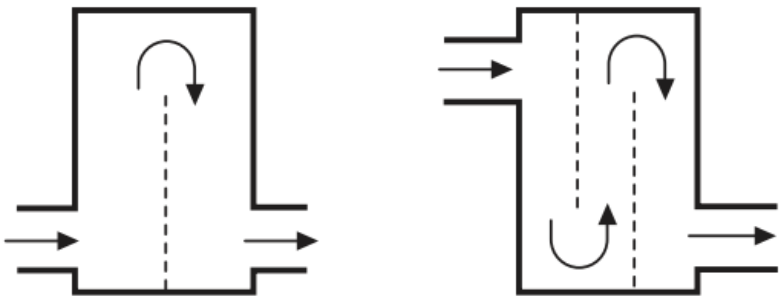


Fig 10

- The system must be constructed with pressure tight components and thoroughly tested for installation leaks.
- Installation of water systems should follow sound engineering practice as well as applicable local and industry standards. Improperly designed or installed systems may cause unsatisfactory operation and/or system failure.
- Consult a water treatment specialist or appropriate literature for information regarding filtration, water treatment, and control devices.
- For proper system operation, it is essential that water loops be installed with proper means to manage air in the system. Free air in the system can cause noise, reduce terminal output, stop flow, or even cause pump failure due to pump cavitation. For closed system, equipment should be provided to eliminate all air form the system.
- Install automatic air vents at all high points in the system. Automatic vents should be located in accessible locations for maintenance purposes and protected form freezing.
- Install an air separator in the water loop, at the place where the water is at higher temperatures and lower pressure – usually in the chilled water return piping.

### 2. Cooler pump control

- It is recommended that cooler pump control be utilized on all chillers unless the chilled water pump runs continuously or the chilled water system contains a suitable antifreeze solution.
- Refer the control and power wiring schematic for proper connection of the cooler pump output. The cooler pump output will remain energized for 10 minutes, after all compressors stop due to an OFF command. The cooler pump output is also energized anytime a compressor is started.

### 3. Water treatment

Untreated or improperly treated water may result in corrosion, scaling, erosion, or algae. The services of a qualified water treatment specialist should be obtained to develop and monitor a treatment program.

**⚠ CAUTION**

Water must be within design flow limits, clean, and treated to ensure proper chiller performance and reduce the potential of tube damage due to corrosion, scaling, erosion, and algae. LG assumes no responsibility for chiller damage resulting from untreated or improperly treated water.

### 4. Preparation for year-round operation

In areas where the piping or unit is exposed to 32°F (0°C) or lower ambient temperatures, freeze-up protection is required. If there is no freeze-up protection, water in system (in chiller and all pipes) must be drained out.

# Filled chilled water loop

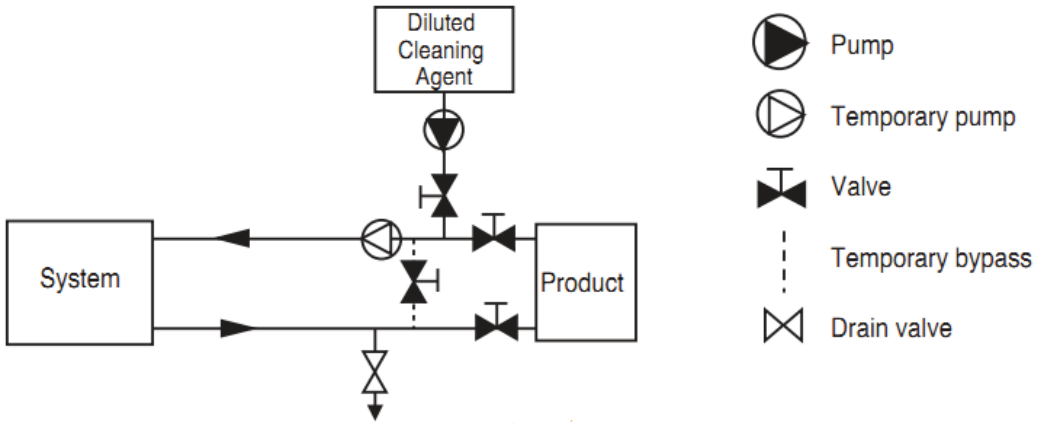
Before starting unit, be sure all of the air has been purged from the system.

The maximum cooler fluid side pressure is 145 psig (10 bar). Check the pressure rating for all of the chilled water devices installed. Do not exceed the lowest pressure rated device.

1. Water system cleaning (Chilled water loop cleaning)

- Proper water system cleaning is very important. Excessive particulates in the water system may cause excessive pump seal wear, reduce or stop flow, and damage to other components.

  1) Install a temporary bypass around the chiller to avoid circulating dirty water and particulates into the pump package and chiller during the flush. Use a temporary circulating pump during the cleaning process. Also, be sure that there is capability to fully drain the system after cleaning.




2) Be sure to use a cleaning agent that is compatible with all system materials. Be especially careful if the system contains any galvanized or aluminum components. Both detergent-dispersant and alkaline-dispersant cleaning agents are available.

3) It is recommended to fill the system through a water meter. This provides a reference point for the future for loop volume readings, and it also establishes the correct quantity of cleaner needed in order to reach the required concentration.

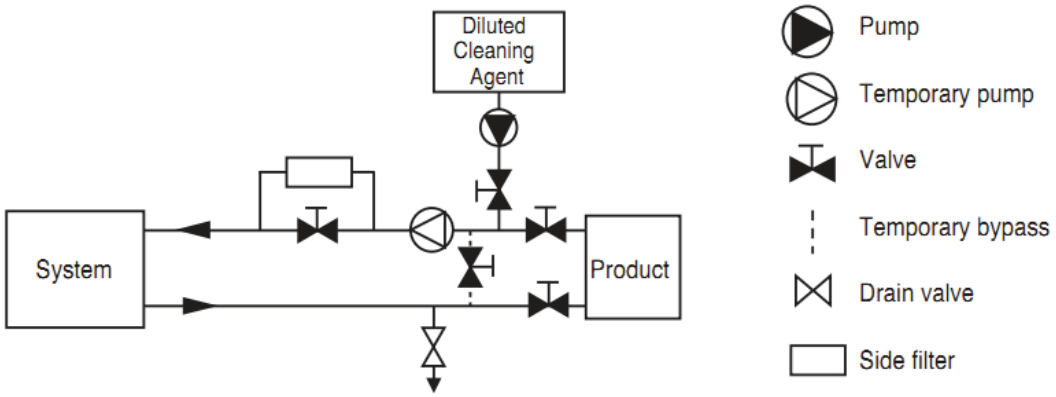
4) Use a feeder/transfer pump to mix the solution and fill the system. Circulate the cleaning system for the length of time recommended by the cleaning agent manufacturer.

   a. After cleaning, drain the cleaning fluid and flush the system with fresh water.

   b. After cleaning, maintain water under pH 10 (appropriately around pH 8-9). If not, it may cause damage to pump seal components.

   c. Use of side stream filter is recommended and change filters as often as necessary during the cleaning process.

   d. Close the valve on temporary bypass when cleaning is completed.



- It is ideal to clean up the loop before connecting the equipment. The strainer must be removed and changed within the first 24 hours of operation.

## 2. Water treatment

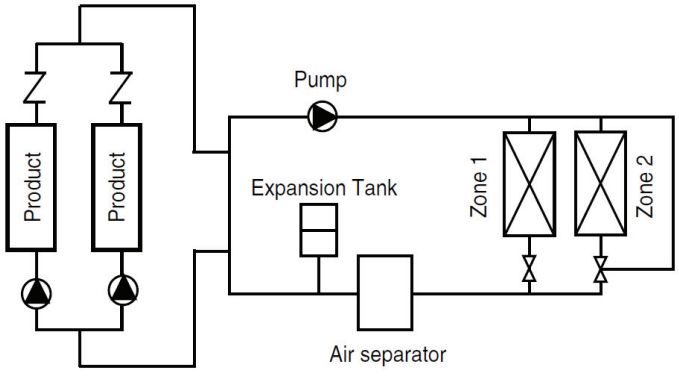
- Fill the fluid loop with water (or brine) and a corrosion-resistant inhibitor suitable for the water of that area.
- Consult the local water treatment specialist for characteristics of system water and a recommended inhibitor for the cooler fluid loop.

## 3. System pressurization

- Proper water pressure must be set before the system is filled with water. The expansion tank functions are on the following:
  1) Set the pressure inside the loop (system).
  2) Accommodate expansion and contraction of water due to temperature changes.
  3) Act as a pressure reference for the pump.
- The expansion tank pressure must be set before the system is filled.
- Once the system is pressurized, the pressure at the connection point of the expansion tank to water piping will not change unless the water loop volume changes (either due to addition/subtraction of water or temperature expansion/contraction).The pressure at this point remains the same regardless of whether or not the pump is running.

## 4. Filling inside the loop (system)

- The initial filling of the chilled water system must accomplish three goals:
  1) The entire piping system must be filled with water.
  2) The pressure at the top of the system must be high enough to vent air from the system (usually 27.6 kPa)
  3) The pressure at all points in the system must be high enough to prevent flashing in the piping or cavitations in the pump.
- The pressure created by an operating pump affects system pressure at all points except at the connection of the expansion tank to the system. Therefore, the best location to install the fill connection is close to the expansion tank in order to keep the exact pressure. An air vent should be installed close by to help eliminate air that enters during the filling procedure. When filling the system, ensure the following:
  1) Remove temporary bypass piping and cleaning equipment.
  2) Check to make sure all drain plugs are installed




- Normally, a closed system needs to be filled only once. The actual filling process is a fairly simple procedure. All air should be purged or vented from the system. Thorough venting at high points and circulation at room temperature for several hours is highly recommended.

**CAUTION**

Protection device must be installed in order to protect contamination of the public water supply. The protection device is very important, especially when the inhibited antifreeze is used.

### 5. Set water flow rate

- Once the system is cleaned, pressurized, and filled, the flow rate through the chiller needs to be established. Select the motor and determine the balancing valve in order to meet the Maximum Water side pressure and the Minimum chiller water flow rate of the specification.
- We recommend a differential pressure gauge when measuring pressure across the pumps or balancing valves. This provides for greater accuracy and reduces error build-up that often occurs when subtracting pressure made by different gauges.

### 6. Pump modification for flow setting

- The loss of pressure inside of the loop must be minimized in order to increase flow rate. If greater flow is necessary, consider opening the valve. Also, verify that the strainer is clean, and that no unnecessary system resistance is present, such as partially closed isolation valves.
- Once the combination valve is set, note the stem position. If later service work requires the valve to be closed, it will be easier to re-balance the system, if the original balance point is known.
- Increasing system resistance by closing the valve will result in less flow. Although it will reduce power consumption slightly, it may not be the desirable method of reducing the flow, especially if a large reduction is needed.

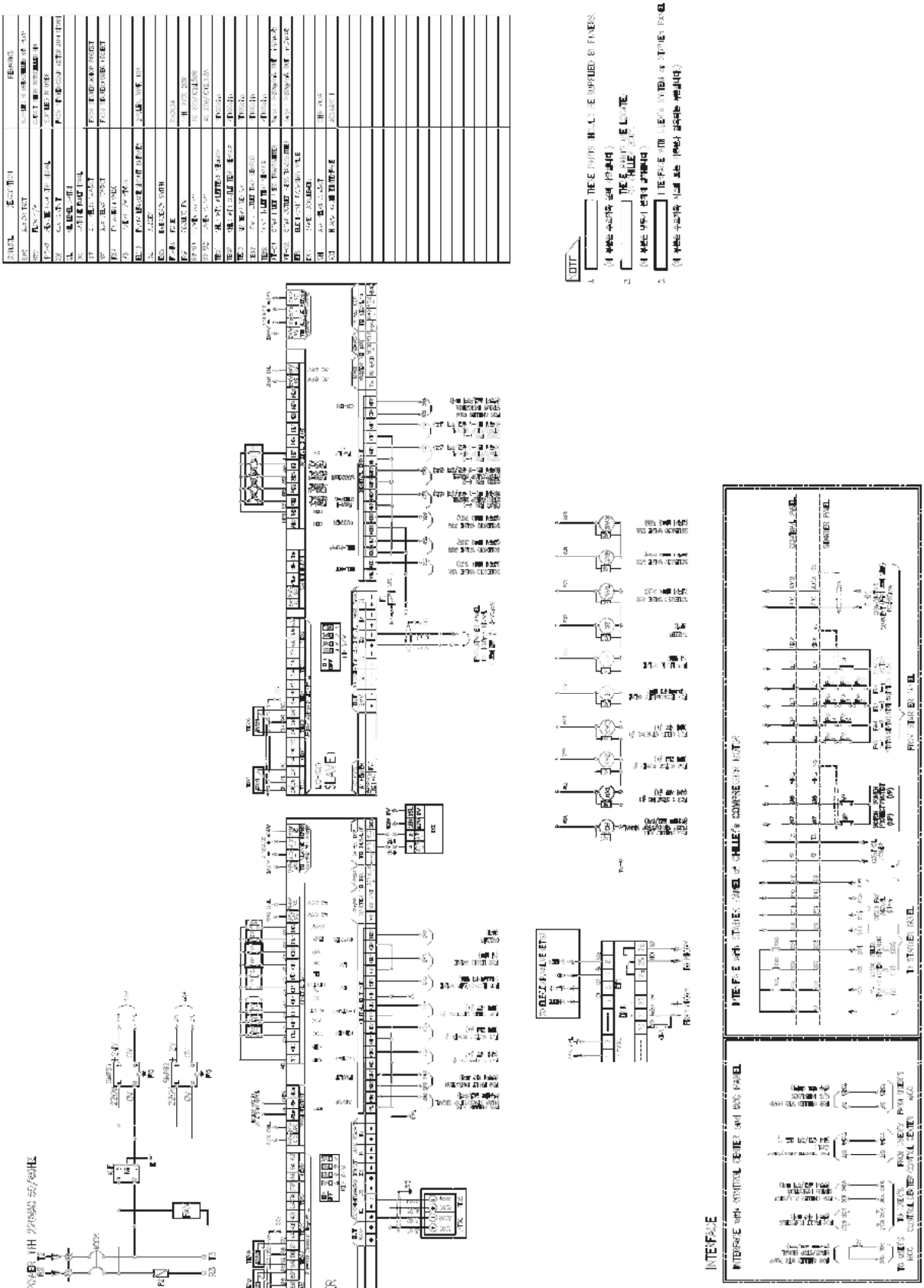
### 7. Freeze protection

- The flow switch will be attached to the product and provided to protect against freezing situations that may occur when there is no water flow. When the water temperature falls below the freezing mark, the chiller can be protected by temperature sensor for freezing protection. However, the chiller can't be protected when there is power failure and water temperature falls below the freezing mark suddenly. So, you may consider using ethylene glycol or other suitable inhibited anti-freeze solution for chiller protection. Especially you should consider using inhibited anti-freeze solution or heater when the ambient temperatures are expected to fall below 32°F(0°C). Consult local water treatment specialist on characteristics of the system water and add a recommended inhibitor to the chilled water. The LG warranty does not cover damage due to freezing. If the above propylene or ethylene glycol or other suitable inhibited antifreeze solution is applied, all components such as pump and valve should be usable at the above solutions.
- Do not use unapproved antifreeze solution. Only use appropriately inhibited antifreeze solution which is concentrated to provide adequate protection for the temperature considered.

### 8. Preparation for winter shutdown

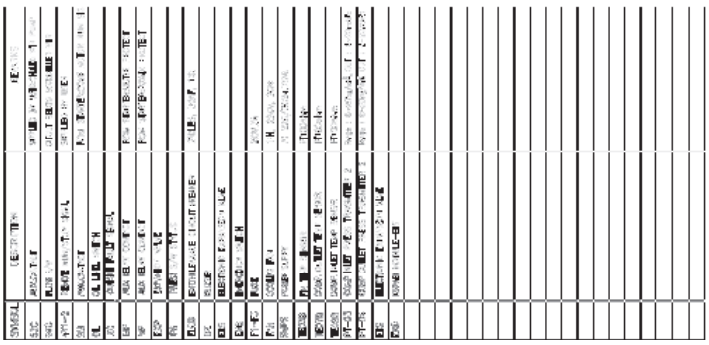
- If the chiller is not operational during the winter, complete the steps at the end of summer season.
  1) We strongly recommend you to drain the water from inside of the loop. You must drain the water from the loop especially when the whole loop or ambient temperature around chiller is below 32°F(0° C).
  2) Isolate the cooler from the loop with shutoff valves.
  3) Change the drain plug and fill the cooler with water, inhibited antifreeze solution and inhibitor such as propylene glycol.
  4) Leave the cooler filled with the antifreeze solution for the winter, or drain if desired.

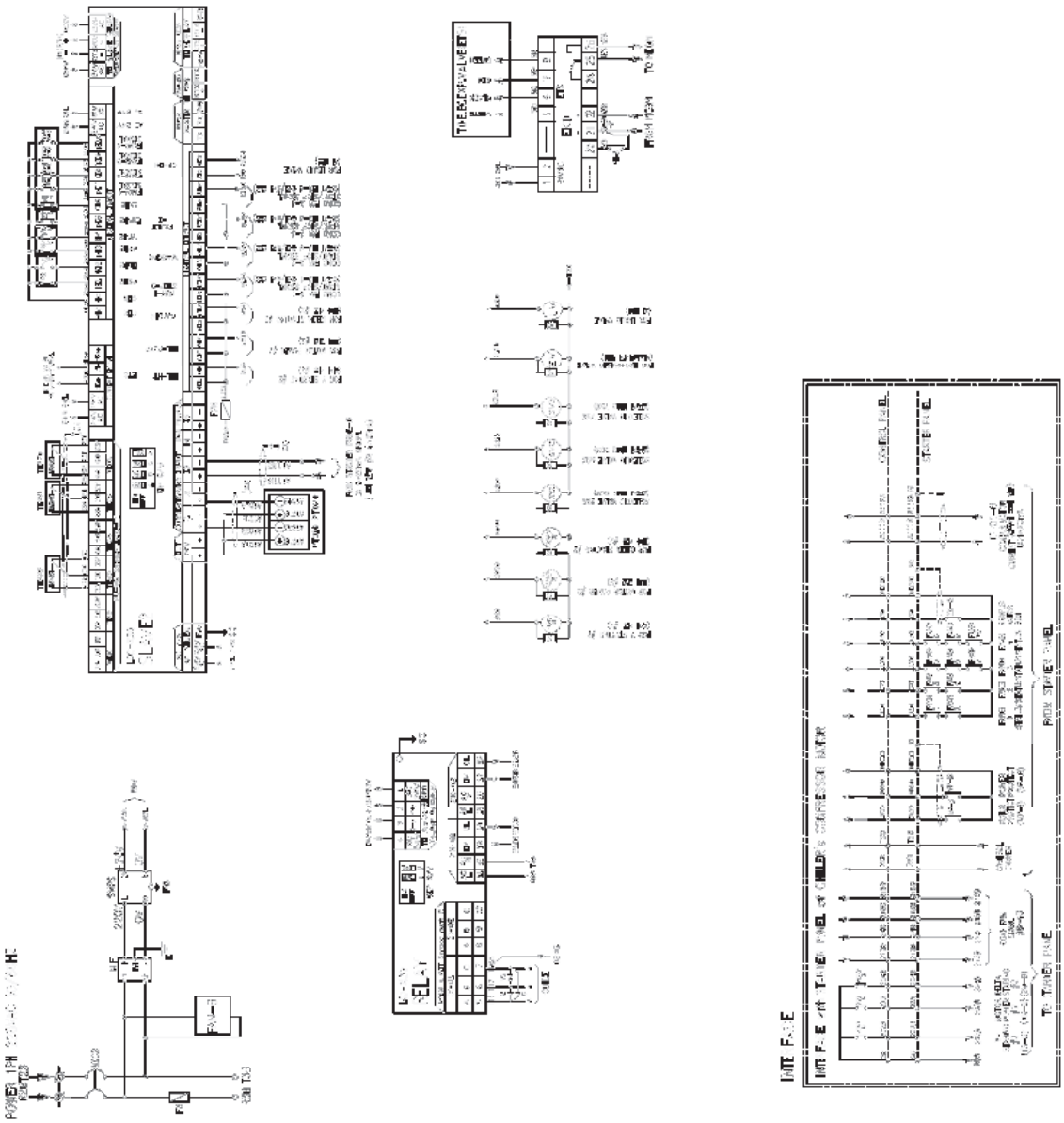
# Wiring Diagram (Control box)



ENGLISH

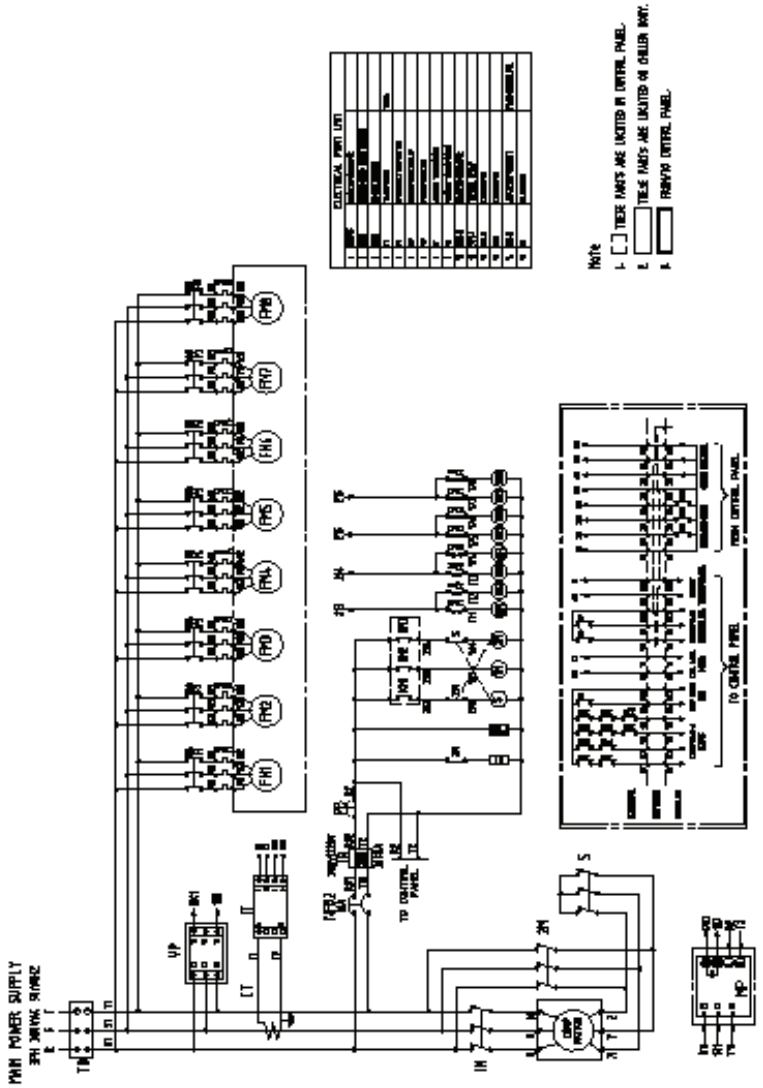
# Wiring Diagram (Control box, 2compressor)



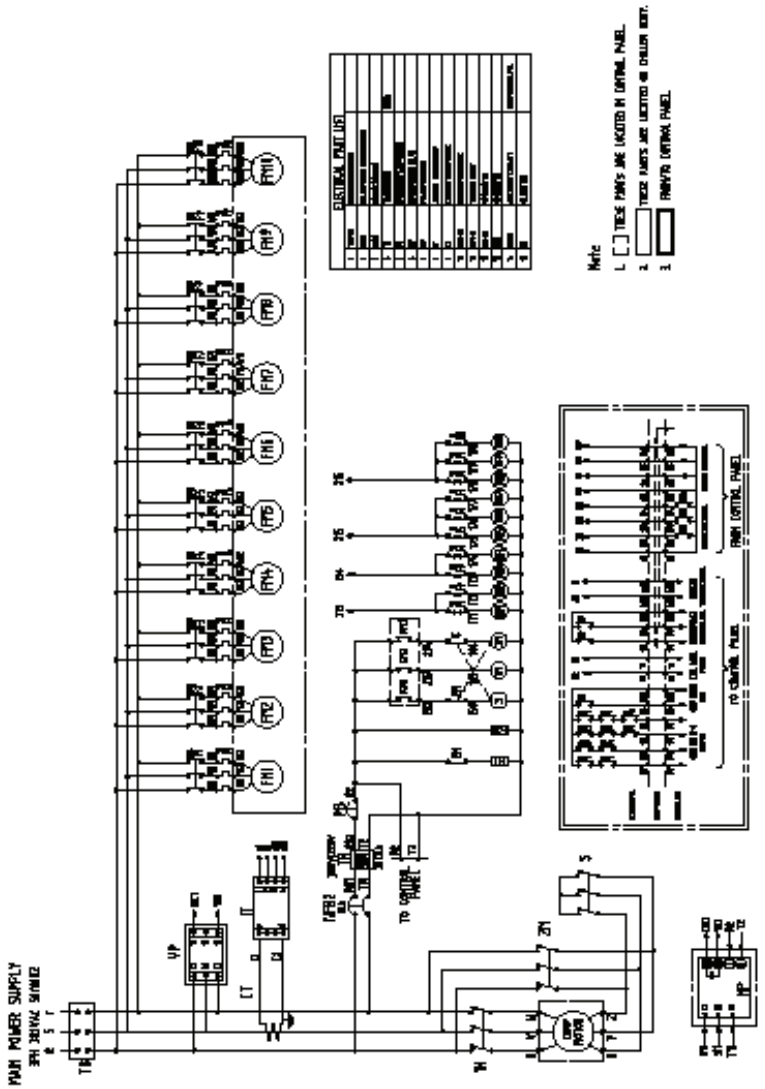


# Wiring Diagram (Power box)

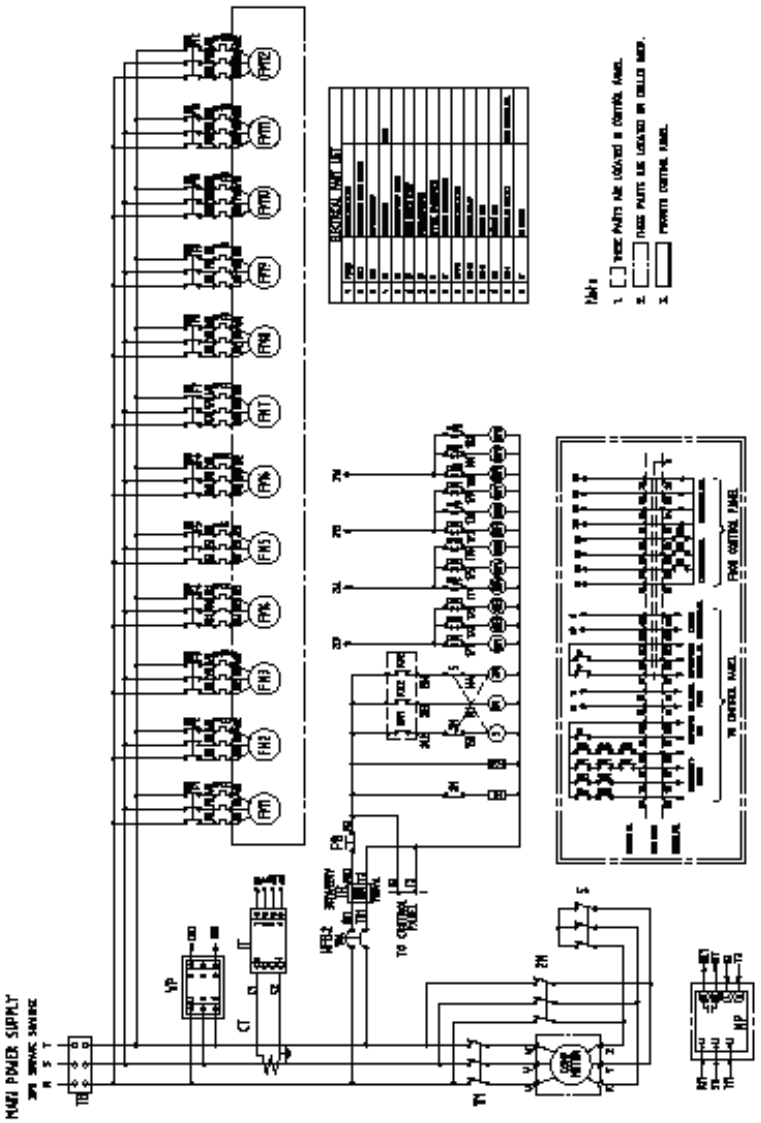
MCAW008AA11



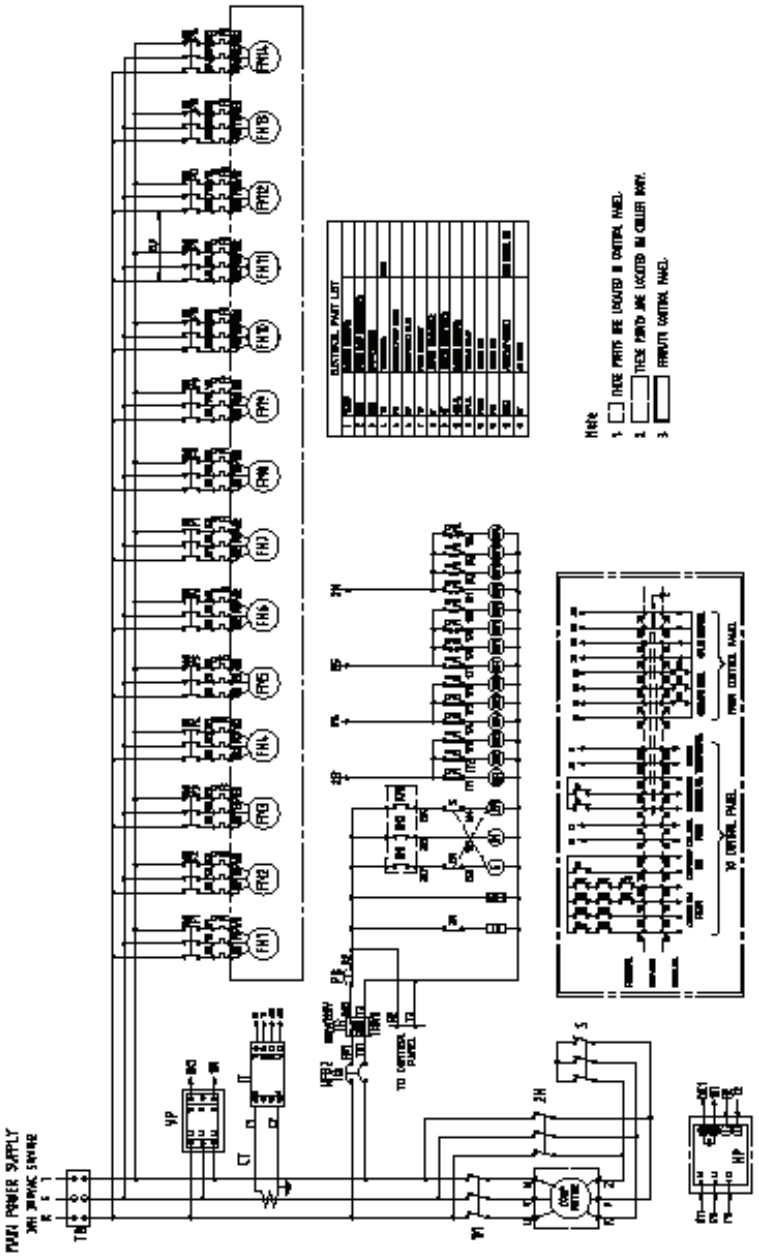
MCAW010AA11/MCAW020AA21



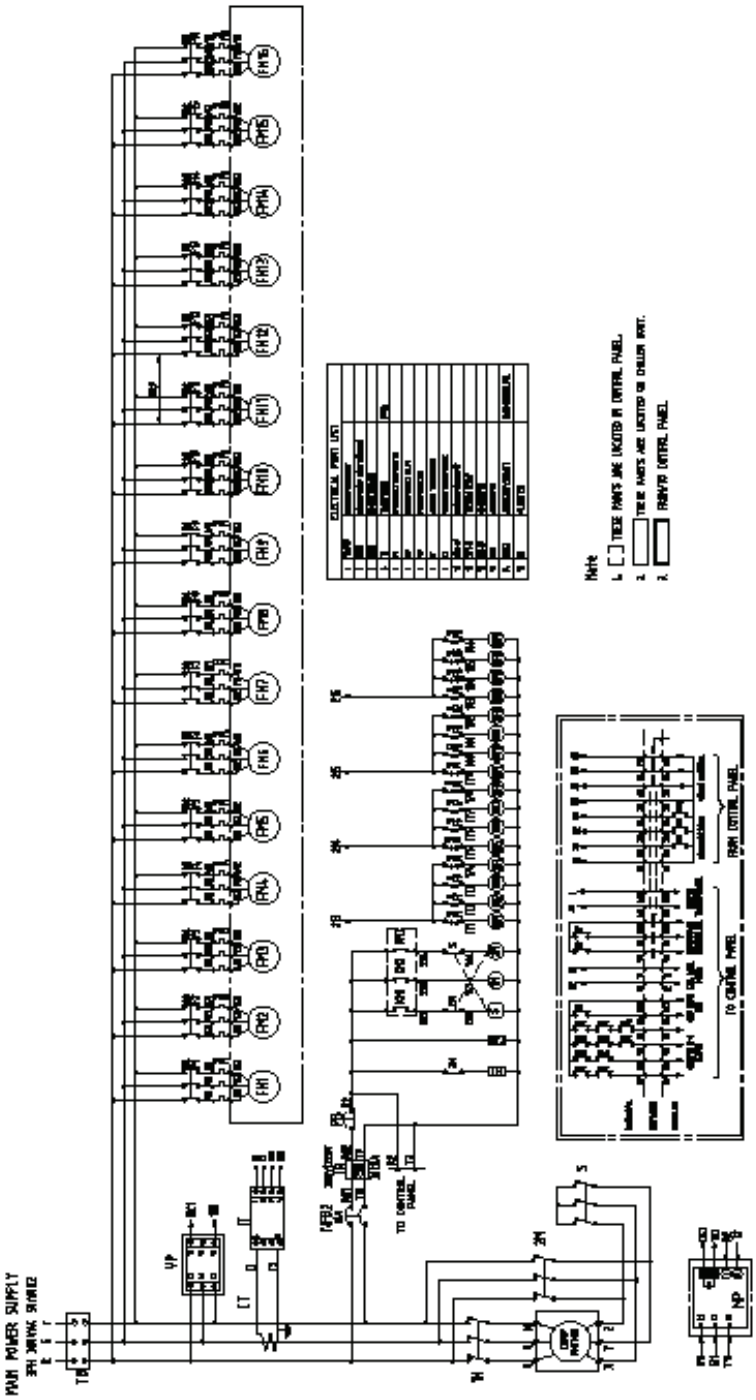
MCAW012AA11/MCAW024AA21



MCAW014AA11/MCAW028AA21



MCAW016AA11/MCAW032AA21



# Electrical Data(50Hz)

Single point power connection

| Model | Unit Voltage | | | Compressor | | | Fan | | | Minimum Circuit Amps. (MCA) | MOCP | REC Fuse Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | V-Hz-Phase | Supplied | | No. | LRA | RLA | No. | RLA | Total RLA | | | |
| | | Min. | Max | EA | Amp. | Amp | EA | Amp | | | | |
| MCAW008AA11 | 380-50-3 | 342 | 418 | 1 | 1220 | 135 | 8 | 2.8 | 157 | 247 | 450 | 300 |
| MCAW010AA11 | 380-50-3 | 342 | 418 | 1 | 1330 | 165 | 10 | 2.8 | 193 | 302 | 600 | 400 |
| MCAW012AA11 | 380-50-3 | 342 | 418 | 1 | 1990 | 200 | 12 | 2.8 | 234 | 361 | 700 | 450 |
| MCAW014AA11 | 380-50-3 | 342 | 418 | 1 | 2355 | 238 | 14 | 2.8 | 277 | 429 | 800 | 600 |
| MCAW016AA11 | 380-50-3 | 342 | 418 | 1 | 2625 | 272 | 16 | 2.8 | 317 | 491 | 900 | 600 |
| MCAW020AA21 | 380-50-3 | 342 | 418 | 2 | 1330 | 165 | 20 | 2.8 | 386 | 302 | 600 | 400 |
| MCAW024AA21 | 380-50-3 | 342 | 418 | 2 | 1990 | 200 | 24 | 2.8 | 467 | 361 | 700 | 450 |
| MCAW028AA21 | 380-50-3 | 342 | 418 | 2 | 2355 | 238 | 28 | 2.8 | 554 | 429 | 800 | 600 |
| MCAW032AA21 | 380-50-3 | 342 | 418 | 2 | 2625 | 272 | 32 | 2.8 | 634 | 491 | 900 | 600 |

Symbols:

LRA : Locked Rotor Amps. RLA : Rated Load Amps.

MCA : Minimum Circuit Amps. (for wire sizing)

MOCP : Maximum Overcurrent Protection

REC Fuse Size : Recommended Fuse Size

NOTES:

1. 380V - 3Ø - 50Hz rating voltage, voltage maximum tolerance ±10%.
2. Electrical source must be 3phase 3wire for security. Neutral line and earth line must be separately connected.
3. Ground wire must be installed.
4. Use cable applicable to current more than MCA.
5. Use ring type terminal cable.
6. Have all electric work done by a licensed electrician according to "Electrical facility engineering standard" and "Interior wire regulations.

# Electrical Data(60Hz)

Single point power connection

| Model | Unit Voltage | | | Compressor | | | Fan | | | Minimum Circuit Amps. (MCA) | MOCP | REC Fuse Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | V-Hz-Phase | Supplied | | No. | LRA | RLA | No. | RLA | Total RLA | | | |
| | | Min. | Max | EA | Amp. | Amp | EA | Amp | | | | |
| MCAW008AA11 | 380-60-3 | 342 | 418 | 1 | 1220 | 128 | 8 | 2.8 | 150 | 236 | 450 | 300 |
| MCAW010AA11 | 380-60-3 | 342 | 418 | 1 | 1445 | 160 | 10 | 2.8 | 188 | 297 | 600 | 400 |
| MCAW012AA11 | 380-60-3 | 342 | 418 | 1 | 1605 | 195 | 12 | 2.8 | 229 | 363 | 700 | 450 |
| MCAW014AA11 | 380-60-3 | 342 | 418 | 1 | 2470 | 234 | 14 | 2.8 | 273 | 431 | 800 | 600 |
| MCAW016AA11 | 380-60-3 | 342 | 418 | 1 | 2875 | 258 | 16 | 2.8 | 303 | 478 | 900 | 600 |
| MCAW020AA21 | 380-60-3 | 342 | 418 | 2 | 1445 | 160 | 20 | 2.8 | 376 | 297 | 600 | 400 |
| MCAW024AA21 | 380-60-3 | 342 | 418 | 2 | 1605 | 195 | 24 | 2.8 | 457 | 363 | 700 | 450 |
| MCAW028AA21 | 380-60-3 | 342 | 418 | 2 | 2470 | 234 | 28 | 2.8 | 546 | 431 | 800 | 600 |
| MCAW032AA21 | 380-60-3 | 342 | 418 | 2 | 2875 | 258 | 32 | 2.8 | 606 | 478 | 900 | 600 |

Symbols:

LRA : Locked Rotor Amps. RLA : Rated Load Amps.

MCA : Minimum Circuit Amps. (for wire sizing)

MOCP : Maximum Overcurrent Protection

REC Fuse Size : Recommended Fuse Size

NOTES:

1. 380V - 3Ø - 60Hz rating voltage, voltage maximum tolerance ±10%.
2. Electrical source must be 3phase 3wire for security. Neutral line and earth line must be separately connected.
3. Ground wire must be installed.
4. Use cable applicable to current more than MCA.
5. Use ring type terminal cable.
6. Have all electric work done by a licensed electrician according to "Electrical facility engineering standard" and "Interior wire regulations.

# Electrical Connections

## ⚠ CAUTION

Electrical shock can cause personal injury and death. Shut off all power to this equipment during installation. There may more than one disconnect switch. Tag all disconnect locations to alert others not to restore power until work is completed.

### 1. Power supply

The electrical characteristics of the available power supply must be same with the equipment nameplate.

Supply voltage must be within the limits indicated.

### 2. Field power connections and Power wiring

All power wiring must comply with applicable local and national codes. See diagram of power wiring.

### 3. General Wiring Notes

1) The control circuit does NOT require a separate power source. A step-down transformer from the main three-phase power supply obtains control circuit power. Be sure that the appropriate connection tap is connected on all transformers for the supply voltage. Up to two terminal blocks are provided for field-wired control devices.
2) Cooler and pump heaters (if factory installed) are wired in the control circuit so they are operable as long as the main power supply to the unit is ON. A factory-installed and set overload device protects them.
3) Power entry depends on the size and power entry option ordered.
4) Terminals for field power supply are suitable for copper conductors. Insulation must be rated 75 C minimum.
   - The field-supplied disconnect should never be off except when unit is being serviced or is to be down for a prolonged period, in which case the cooler should be drained.
   - To ensure power to the heaters, make sure power to the unit is always on (except during service or a prolonged shutdown).

### 4. Control power

- Control power is obtained from the main power supply and does not require a separate source

# Standard and Options

## 1. Standard

1) Wye-Delta Compressor starter
2) Discharge line shut off valve - Installed on the discharge port of the compressor.
3) Suction line shut off valve - Suction shut off valve installed on the suction port of the compressor to facilitate maintenance.
4) Flow Switch-Supplied separately to be wired and installed on the evaporator water piping.

## 2. Options

1) Condenser - High ambient operation : 125 °F(52 °C)
2) Evaporator - Low leaving temperature : Less than 40 °F(4 °C)
3) Electric and Control
   - Circuit breaker
   - Unit-mounted non-fused disconnect switch with circuit breaker
4) Etc. - Compressor sound attenuating blanket (Sound proof)
   - Soft starter (Factory set)
   - Condenser coil protection Grill.

**NOTE**

These options should be attached in factory.

## Leak test unit

- The MCAW units are shipped with a complete operating charge of R134a and should be under sufficient pressure to conduct a leak test.
- These units are designed for use with R134a only. Do not use any other refrigerant in these units.
- Perform a leak test to ensure that leaks have not developed during unit shipment.
- If there is no pressure in the system, introduce enough nitrogen to search for the leak. Repair the leak using good refrigeration practices. After leaks are repaired, system must be evacuated and dehydrated.

## Refrigerant charging

- To charge refrigerant, see the weight of refrigerant in the specification data.
- Start unit and allow it to run several minutes fully loaded. Check for a clear sight glass. Be sure clear condition is liquid and not vapor.

**⚠ CAUTION**

- When adjusting refrigerant charge, circulate fluid through cooler continuously to prevent freezing and possible damage to the cooler.
- Do not overcharge, and never charge liquid into the low-pressure side of system. Overcharging results in higher discharge pressure with higher cooling fluid consumption, possible compressor damage, and higher power consumption.

## Oil charging

- To charge oil, see the weight of oil in the specification data
- To use only SOLEST 220 for oil of MCAW series.

| Oil | | Unit | CPI SOLEST 220 |
|---|---|---|---|
| Specific gravity | | - | 0.95 |
| Viscosity | 104°F (40°C) | mm2/S | 215.9 |
| | 212°F (100°C) | (cSt) | 20.8 |
| Flash point | | °F (°C) | 519.8 (271) |
| Pour point | | °F (°C) | -13 (-25) |

# APPENDIX

1. Torque specification for bolts tightening

### Flare part

| Type | Tightening torque (N·m) | |
|---|---|---|
| | Union-Type | Flare Type |
| 1/4″ | 20 | 20 |
| 3/8″ | 30 | 35 |
| 5/8″ | 100 | 85 |
| 7/8″ | 250 | 150 |

### Electrical wiring part

| Type | Tightening torque (N·m) |
|---|---|
| M3 | 0.6 ~ 0.8 |
| M3.5 | 1 ~ 1.3 |
| M4 | 1.5 ~ 2 |
| M5 | 3 ~ 4 |
| M6 | 5 ~ 6 |
| M8 | 12 ~ 15 |
| M10 | 24 ~ 49 |
| M12 | 41 ~ 100 |
| M16 | 103 ~ 127 |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