



Installation, Operation and Maintenance Manual
D – EIMWC01101-12EN

Original instructions

Frictionless Centrifugal Chiller

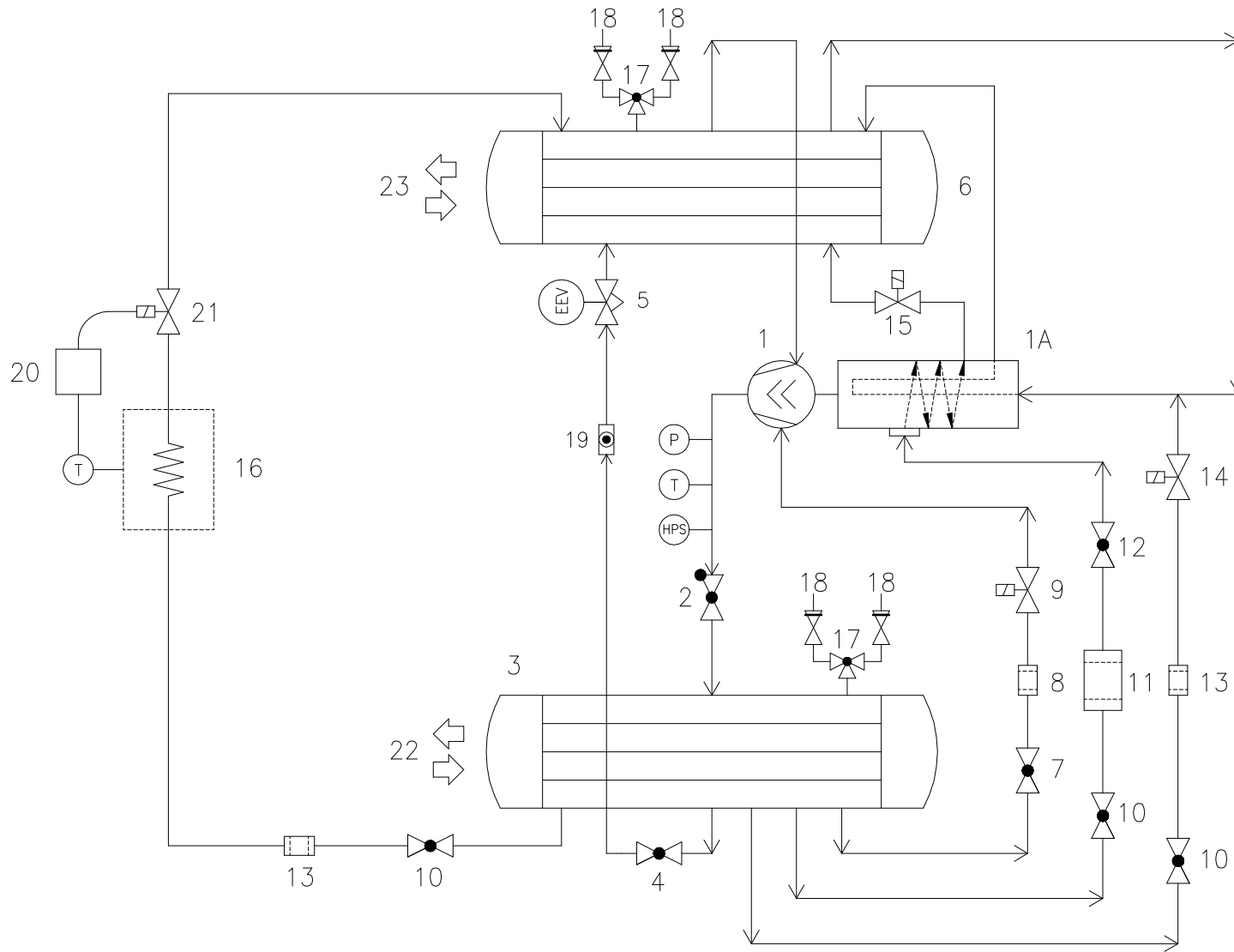
DWME

Refrigerant: R-134a



HFC 134a
ecological refrigerant

Typical refrigerant circuit – Condenser and evaporator water inlet and outlet are indicative. Please refer to the machine dimensional diagrams for exact water connections.



Legend	
1	Compressor
1A	Motor Compressor
2	Check Valve
3	Condenser
4	Shut-off valve
5	Electronic Expansion Valve
6	Evaporator
7	Shut-off valve
8	Strainer
9	Solenoid valve
10	Shut-off valve
11	Filter dryer
12	Shut off valve
13	Strainer
14	Stepper motor valve
15	Solenoid valve
16	VFD Cooler
17	Changeover device
18	Pressure relief valve
19	Sight glass
20	VFD Controller
21	Solenoid valve
22	Condenser water connections
23	Evaporator water connections
P	Pressure sensor
T	Temperature sensor
HPS	High pressure switch

This manual is an important supporting document for qualified personnel but it is not intended to replace such personnel.

Thank you for purchasing this chiller



READ THIS MANUAL CAREFULLY BEFORE INSTALLING AND STARTING UP THE UNIT.

IMPROPER INSTALLATION COULD RESULT IN ELECTRIC SHOCK, SHORT-CIRCUIT, LEAKS, FIRE OR OTHER DAMAGE TO THE EQUIPMENT OR INJURE TO PEOPLE.

THE UNIT MUST BE INSTALLED BY A PROFESSIONAL OPERATOR/TECHNICIAN UNIT STARTUP HAS TO BE PERFORMED BY AUTHORIZED AND TRAINED PROFESSIONAL ALL ACTIVITIES HAVE TO BE PERFORMED ACCORDING TO LOCAL LAWS AND REGULATION.

UNIT INSTALLATION AND START UP IS ABSOLUTELY FORBIDDEN IF ALL INSTRUCTION CONTAINED IN THIS MANUAL ARE NOT CLEAR.

IF CASE OF DOUBT CONTACT THE MANUFACTURER REPRESENTATIVE FOR ADVICE AND INFORMATION.

Description

The unit you bought is a "water cooled chiller", a machine designed to cool water (or water-glycol mixture) within the limits herebelow reported. The unit operation is based on steam compression, condensation and evaporation according to reverse Carnot cycle. The main components are:

- Centrifugal compressor to rise the refrigerant steam pressure from evaporation pressure to condensation pressure
- Evaporator, where the low pressure refrigerant liquid evaporates cooling the water.
- Condenser, where high pressure steam condensates rejecting heat removed from the chilled water in the water tanks to a water cooled heat exchanger.
- Expansion valve to reduce the pressure of condensed liquid from condensation pressure to evaporation pressure.

General Information



All units are delivered with **wiring diagrams, certified drawings, nameplate**; and **DOC (Declaration Of Conformity)**; these documents show all technical data for the unit you have bought and they **MUST BE CONSIDERED ESSENTIAL DOCUMENTS OF THIS MANUAL.**

In case of any discrepancy between this manual and the equipment's documents please refer to on board documents. In case of any doubt contact the manufacturer representative. For other data information of this family of unit, see the Product Manual.

The purpose of this manual is to allow the installer and the qualified operator to ensure proper installation, commissioning and maintenance of the unit, without any risk to people, animals and/or objects.

Receiving the unit

The unit must be inspected for any possible damage immediately upon reaching final place of installation. All components described in the delivery note must be inspected and checked.

Should the unit be damaged, do not remove the damaged material and immediately report the damage to the transportation company and request they inspect the unit. Immediately report the damage to the manufacturer representative, a set of photographs is helpful in recognizing responsibility.

Damage must not be repaired before the inspection of the transportation company representative.

Before installing the unit, check that the model and power supply voltage shown on the nameplate are correct. Responsibility for any damage after acceptance of the unit cannot be attributed to the manufacturer.

Operating limits

Storing

If the chillers have to be stored prior the installation, the following warnings have to be observed.

Store the chillers inside, at ambient temperatures lower than 45°C.

Do not remove the protective plastic.

Do not leave the unit exposed to the elements.

Do not expose the chillers to direct sun light.

Keep the chillers far from heat sources.

Storing below the minimum temperature may cause damage to components. Storing above the maximum temperature causes opening of safety valves. Storing in condensing atmosphere may damage electronic components.

Operating Limits

The units are designed for indoor, non-freezing locations. Outdoor locations will require special design considerations.

Table 1 - Operating Parameters

Leaving chilled water (ice duty not available)	38°F to 60°F (3.3°C to 15°C)
Max. operating evaporator inlet fluid temperature	66°F (19°C)
Max. startup evaporator inlet fluid temperature	90°F (32°C)
Max. standby inlet fluid temperature	105°F (46°C)
Min. condenser water entering temperature	See note below
Max. leaving condenser water temperature	105°F (46°C)

Note:

$$\text{Min. ECWT}(^{\circ}\text{C}) = 2,92 + (\text{ELWT}) - 0,75 * \text{DT}_{\text{FL}} * (\text{PLD}/100) + 7,78 * (\text{PLD}/100)^2$$

Where:

ECWT = Entering condenser water temperature

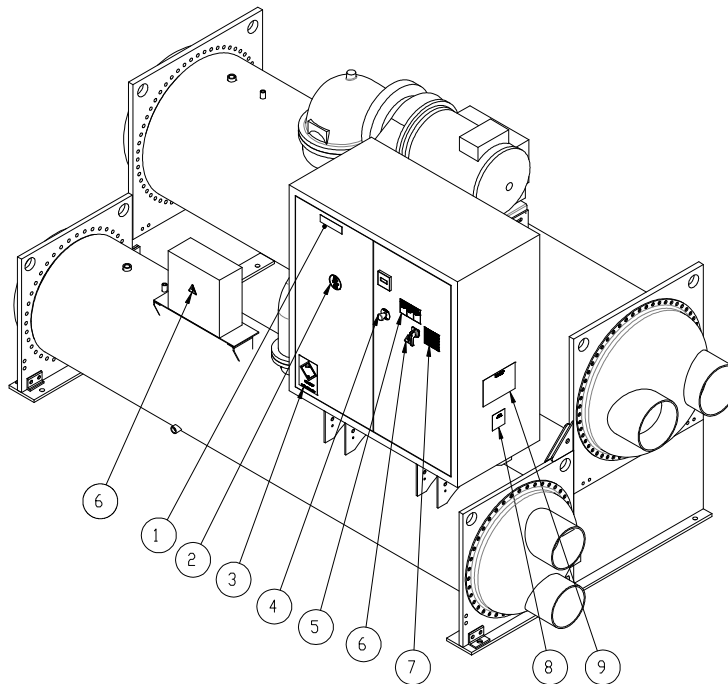
ELWT = Leaving chilled water temperature

DT_{FL} = Chilled Water Delta-T at full load

PLD = The percent chiller load point to be checked

For example, at 7°C ELWT, 5°C Δt @ full load, the entering condenser water temperature could be as low as 10°C.

Figure 1 - Description of the labels applied to the electrical panel



Label Identification

1 – Manufacturer's logo	6 – Electrical hazard symbol
2 – Refrigerant type	7 – Cable tightening warning
3 – Non flammable gas symbol	8 – Unit nameplate data
4 – Emergency stop	9 – Lifting instructions
5 – Hazardous Voltage warning	

Safety

The machine must be firmly secured to the ground.

It is essential to observe the following instructions:

- The machine must be raised only by the lifting points. Only these points can support the whole weight of the unit.
- Do not allow unauthorised and/or unqualified personnel to access the machine.
- It is forbidden to access the electrical components without having opened the machine's general disconnecting switch and switched off the power supply.
- It is forbidden to access the electrical components without using an insulating platform. Do not access the electrical components if water and/or moisture are present.
- All operations on the refrigerant circuit and on components under pressure must be carried out by qualified personnel only.
- Replacement of a compressor must be carried out by qualified personnel only.
- Sharp edges can cause wounds. Avoid direct contact.
- Avoid introducing solid bodies into the water pipes while the machine is connected to the system.
- A mechanical filter must be installed on the water pipe connected to the heat exchanger inlet.
- The unit is supplied with a single pole high pressure safety switch that opens when the pressure exceeds the limit. When the switch opens the control relay is switched off by turning off the compressor. The pressure switch is mounted on the compressor discharge port. In case of cut out, reset the switch by pressing the blue button and then reset the alarm on the microprocessor.
- The unit is supplied with safety valves also, that are installed on both the high and the low pressure sides of the refrigerant circuit.
- Install in the line connecting the discharge of safety valves leak refrigerant sensor.

! Electric shock hazard. Can cause personal injury or equipment damage. This equipment must be properly grounded. Connections to and service of the MicroTech control panel must be performed only by personnel that are knowledgeable in the operation of the equipment being controlled.

! Static sensitive components. A static discharge while handling electronic circuit boards can damage components. Discharge any static electrical charge by touching the bare metal inside the control panel before performing any service work. Never unplug any cables, circuit board terminal blocks, or power plugs while power is applied to the panel.

! Do not install any software not authorized by Daikin or alter operating systems in any unit microprocessor, including the interface panel. Doing so can cause malfunction of the control system and possible equipment damage.

It is absolutely forbidden to remove all protections of moving parts.

In case of sudden stop of the unit, follow the instructions on the **Control Panel Operating Manual** which is part of the on-board documentation delivered to the end user.

It is strongly recommended to perform installation and maintenance with other people. In case of accidental injury or unease, it is necessary to:

- keep calm
- press the alarm button if present in the installation site
- move the injured person in a warm place far from the unit and in rest position
- contact immediately emergency rescue personnel of the building or the Health Emergency Service
- wait without leaving the injured person alone until the rescue operators come.

Moving and lifting

Avoid bumping and/or jolting during loading/unloading unit from the truck and moving it. Do not push or pull the unit from any part other than the basis. Secure the unit inside the truck to prevent it from moving and causing damages. Do not allow any part of the unit to fall during transportation or loading/unloading.

Use extreme caution when handling the unit to prevent damage to the control or the refrigerant piping. The unit must be lifted by inserting a hook in each corner, where there are holes for lifting (see fig. 2). Spacer bars must be used along the line connecting the lifting holes to prevent damage to the electric panel and motor terminal box. During the lifting phase to verify that the ropes and / or the lifting chains do not touch the electrical panel and / or piping. If moving the machine, you had the sleds or skates, push only on the basis of the machine without touching the pipes of copper, steel, compressors and / or the electrical panel.

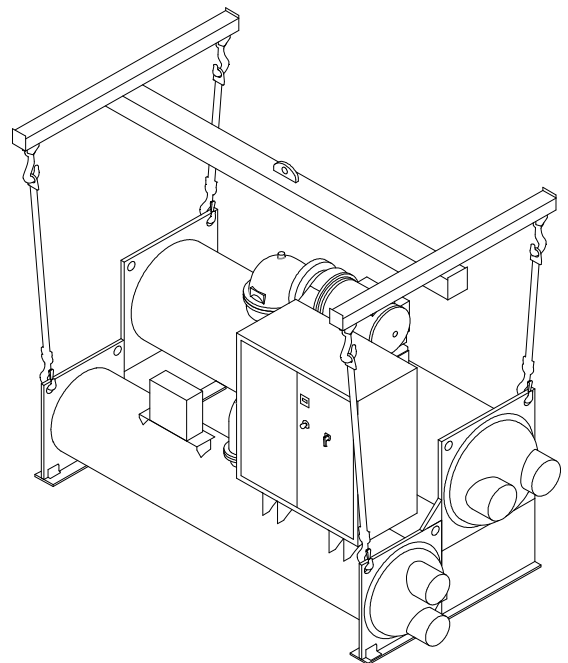
! Both the lifting ropes and the spacing bars must be strong enough to support the unit safely. Please check the unit's weight on the unit nameplate.

The unit must be lifted with the utmost attention and care following lifting label instructions; lift unit very slowly, keeping it perfectly level.

Positioning and assembly

The unit must be mounted on a level base of concrete or steel and must be positioned so as to provide space maintenance unit at one end, to allow removal of the tubes of the evaporator and condenser. The space required is equal to 4,3 m. The tubes of the condenser and evaporator are expanded inside the tube plate to allow the replacement, if necessary. The space of the other sides including the vertical axis is 1,5 m. The unit must be installed on a robust and perfectly level foundation; it might be necessary to use weight distribution beams.

Figure 2 - Lifting unit



If the unit is installed in places that are easily accessible to people and animals, it is advisable to install protection grids around the unit.

To ensure best performance on the installation site, the following precautions and instructions must be followed:

- Make sure to provide a strong and solid foundation to reduce noise and vibrations.
- The water in the system must be particularly clean and all traces of oil and rust must be removed. A mechanical water filter must be installed on the unit's inlet piping.

Sound protection

When sound levels require special control, great care must be exercised to isolate the unit from its base by appropriately applying anti-vibration elements (supplied as an option). Flexible joints must be installed on the water connections, as well.

Water piping

Piping must be designed with the lowest number of elbows and the lowest number of vertical changes of direction. In this way, installation costs are reduced considerably and system performance is improved.

The water system must have:

1. Anti-vibration mountings in order to reduce transmission of vibrations to the structures.
2. Isolating valves to isolate the unit from the water system during maintenance.
3. Flow switch.
4. Manual or automatic air venting device at the system's highest point. drain device at the system's lowest point.
5. A suitable device that can maintain the water system under pressure (expansion tank, etc.).
6. Water temperature and pressure indicators to assist the operator during service and maintenance.
7. In case of unit replacement, the entire water system must be emptied and cleaned before the new unit is installed. Regular test and proper chemical treatment of water are recommended before starting up the new unit.
8. In the event that glycol is added to the water system as anti-freeze protection, pay attention to the fact that suction pressure will be lower, the unit's performance will be lower and water pressure drops will be greater. All unit-protection systems, such as anti-freeze and low-pressure protection will need to be readjusted.
9. Before insulating water piping, check that there are no leaks.
10. Check that the water pressure does not exceed the design pressure of heat exchangers water side. It's recommended to install a safety valve on the water piping.

Water treatment

Before putting the unit into operation, clean the water circuit. Dirt, scales, corrosion debris and other material can accumulate inside the heat exchanger and reduce its transfer. Pressure drop can increase as well, thus reducing water flow. Proper water treatment therefore reduces the risk of corrosion, erosion, scaling, etc. The most appropriate water treatment must be determined locally, according to the type of system and water characteristics.

The manufacturer is not responsible for damage to or malfunctioning of equipment caused by failure to treat water or by improperly treated water.

Evaporator anti-freeze protection

1. If the unit is not operating during the winter it is recommended to drain and wash the evaporator and the water pipes with glycole. Evaporator is supplied with draining and air flow connections.
2. It is recommended to add an appropriate amount of glycole inside the water circuit. Freezing temperature for water-glycole solution should be at least 6°C lower than the expected minimum ambient temperature.
3. Insulate the pipes in particular those related to the chilled water to avoid the moisture phenomena.

Damage caused by freezing is not covered by the warranty.

Installing the flow switch

To ensure sufficient water flow through the evaporator, it is essential that a flow switch be installed on the water circuit. The flow switch can be installed either on the inlet or outlet water piping. The purpose of the flow switch is to stop the unit in the event of interrupted water flow, thus protecting the evaporator from freezing.

The manufacturer offers, as optional, a flow switch that has been selected for this purpose.

This paddle-type flow switch is suitable for heavy-duty outdoor applications (IP67) and pipe diameters in the range of 1" to 8". The flow switch is provided with a clean contact which must be electrically connected to terminals shown in the wiring diagram.

Flow switch has to be tuned to stop the unit when the evaporator water flow is lower than 50% of nominal flow rate.

Electrical Installation

General specifications



All electrical connections to the unit must be carried out in compliance with laws and regulations in force.

All installation, management and maintenance activities must be carried out by qualified personnel.

Refer to the specific wiring diagram for the unit you have bought. Should the wiring diagram not be on the unit or should it have been lost, please contact your manufacturer representative, who will send you a copy.

In case of discrepancy between wiring diagram and electrical panel/cables please contact the manufacturer representative.

Only use copper conductors. Failure to use copper conductors could result in overheating or corrosion at connection points and could damage the unit.

To avoid interference, all control wires must be connected separately from the power cables. Use different electrical passage ducts for this purpose.

Before servicing the unit in any way, open the general disconnecting switch on the unit's main power supply.

When the unit is off but the disconnecting switch is in the closed position, unused circuits are live, as well.

Never open the terminal board box of the compressors before having opened the unit's general disconnecting switch.

Contemporaneity of single-phase and three-phase loads and unbalance between phases could cause leakages towards ground, during the normal operation of the units of the series.

If the unit includes devices that cause superior harmonics (like VFD and phase cut), the leakage towards ground could increase to very higher values (about 2 Amp).

The protections for the power supply system have to be designed according to the above mentioned values.

Operation

Operator's responsibilities

It is essential that the operator is appropriately trained and becomes familiar with the system before operating the unit. In addition to reading this manual, the operator must study the microprocessor operating manual and the wiring diagram in order to understand start-up sequence, operation, shutdown sequence and operation of all the safety devices.

During the unit's initial start-up phase, a technician authorized by the manufacturer is available to answer any questions and to give instructions as to the correct operating procedures.

The operator must keep a record of operating data for every installed unit. Another record should also be kept of all the periodical maintenance and servicing activities.

If the operator notes abnormal or unusual operating conditions, he is advised to consult the technical service authorized by the manufacturer.

Open the isolation valves and / or interception

Before compressor start up, be sure that all isolating valves are fully open and back seated and the valve spindle tightly capped.

ATTENTION

Before filling the water circuit, please close the water valves, on the heads of the heat exchangers.

Routine maintenance

Minimum maintenance activities are listed in Table 2.

Service and limited warranty

WARRANTY IS VOID IN CASE OF MISSING OF THE MAINTENANCE ROUTINE.

These units have been developed and constructed according to high quality standards ensuring years of failure-free operation. It is important, however, to ensure proper and periodical maintenance in accordance with all the procedures listed in this manual and with good practice of machines maintenance.

We strongly advise stipulating a maintenance contract with a service authorized by the manufacturer in order to ensure efficient and problem-free service, thanks to the expertise and experience of our personnel.

It must also be taken into consideration that the unit requires maintenance also during the warranty period as per below Table 2.

It must be borne in mind that operating the unit in an inappropriate manner, beyond its operating limits or not performing proper maintenance according to this manual can void the warranty.

Important information regarding the refrigerant used

This product contains fluorinated greenhouse gases covered by the Kyoto Protocol. Do not vent gases into the atmosphere.

Refrigerant type:	R134a
GWP(1) value:	1300
(1)GWP =	global warming potential

The refrigerant quantity necessary for standard operation is indicated on the unit name plate.

Real refrigerant quantity charged in the unit is listed on a silver sticker inside the electrical panel.

Periodical inspections for refrigerant leaks may be required depending on European or local legislation.

Please contact your local dealer for more information.

This manual is a technical aid and does not represent a binding offer. The content cannot be held as explicitly or implicitly guaranteed as complete, precise or reliable. All data and specifications contained herein may be modified without notice. The data communicated at the moment of the order shall hold firm.

The manufacturer shall assume no liability whatsoever for any direct or indirect damage, in the widest sense of the term, ensuing from or connected with the use and/or interpretation of this manual.

We reserve the right to make changes in design and construction at any time without notice, thus the cover picture is not binding.

Observe the following points in particular, in order to conform to warranty limits:

1. The unit cannot function beyond the specified limits
2. The electrical power supply must be within the voltage limits and without voltage harmonics or sudden changes.
3. The three-phase power supply must not have an unbalance between phases exceeding 3%. The unit must stay turned off until the electrical problem has been solved.
4. No safety device, either mechanical, electrical or electronic must be disabled or overridden.
5. The water used for filling the water circuit must be clean and suitably treated. A mechanical filter must be installed at the point closest to the evaporator and condenser inlet.
6. Unless there is a specific agreement at the time of ordering, the evaporator water flow rate must never be above 120% and below 80% of the nominal flow rate.

Periodic obligatory checks and starting up of appliances under pressure

The units are included in category IV of the classification established by the European Directive PED 97/23/EC.

For chillers belonging to this category, some local regulations require a periodic inspection by an authorized agency. Please check with your local requirements.

Disposal

The unit is made of metal, plastic and electronic parts. All these parts must be disposed of in accordance with the local regulations in terms of disposal.

Lead batteries must be collected and sent to specific refuse collection centres.

Oil must be collected and sent to specific refuse collection centres.

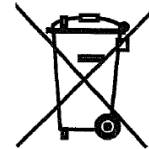


Table 2 - Routine maintenance programme

Maintenance Check List Item	Daily	Weekly	Monthly	Quarterly	Annually	5-Yr	As Req'd
I. Unit							
· Operational Log	O						
· Analyze Operational Log		O					
· Refrigerant Leak Test Chiller		O					
· Test Relief Valves or Replace						X	
II. Compressor							
· Vibration Test Compressor					X		
A. Motor							
· Meg. Windings					X		
· Ampere Balance (within 10% at RLA)				O			
· Terminal Check (Infrared temperature measurement)					X		
· Motor Cooling Filter Drier Pressure Drop					X		
- Motor Winding resistance (milli-ohm)					X		
- Bearing Coil Winding resistance (milli-ohm)					X		
III. Controls							
A. Operating Controls							
· Calibrate Temperature Sensors/Transducers					X		
· Calibrate Pressure Transducers					X		
· Check Vane Control Setting and Operation					X		
· Verify Motor Load Limit Control					X		
· Verify Load Balance Operation					X		
B. Protective Controls							
· Test Operation of:							
Alarm Relay				X			
Pump Interlocks				X			
High and Low Pressure Cutouts				X			
IV. Condenser							
A. Evaluation of Temp Approach (Note 1)			O				
B. Test Water Quality				V			
C. Clean Condenser Tubes (Note 3)					X		X
D. Eddy current Test - Tube Wall Thickness						V	
E. Seasonal Protection							X
V. Evaporator							
A. Evaluation of Temp Approach (Note 1)			O				
B. Test Water Quality					V		
C. Clean Evaporator Tubes (Note 3)							X
D. Eddy current Test - Tube Wall thickness						V	X
E. Seasonal Protection							X
VI. Expansion Valves							
A.Operational Evaluation (Superheat Control)				X			
VII. Starter(s)							
A. Examine Contactors (hardware and operation)				X			
B. Verify Overload Setting and Trip				X			
C. Test Electrical Connections (Infrared temp measurement)				X			

KEY:

O = Performed by in-house personnel.

X = Performed by Daikin authorized service personnel. (Note 4)

V = Normally performed by third parties.

NOTES:

- 1) Approach temperature (the difference between the leaving water temperature and the saturated refrigerant temperature) of either the condenser or evaporator is a good indication of tube fouling, particularly in the condenser, where constant flow usually prevails. Daikin 's high efficiency heat exchangers have very low design approach temperatures, in the order of one to one and one half degrees F.
- 2) The chiller unit controller can display the water and the saturated refrigerant temperatures. Simple subtraction will give the approach. It is recommended that benchmark readings (including condenser pressure drop to confirm future flow rates) be taken during startup and then periodically afterward. An approach increase of two-degrees or more would indicate that excessive tube fouling could be present. Higher than normal discharge pressure and motor current are also good indicators
- 3) Evaporators in closed fluid circuits with treated water or anti-freeze are not normally subject to fouling, hover it is prudent to check the approach periodically.
- 4) Performed when contracted for, not part of standard initial warranty service.

We reserve the right to make changes in design and construction at any time without notice, thus the cover picture is not binding.

Frictionless Centrifugal Chiller

DWME



Daikin units comply with the European regulations that guarantee the safety of the product.