DAIKIN

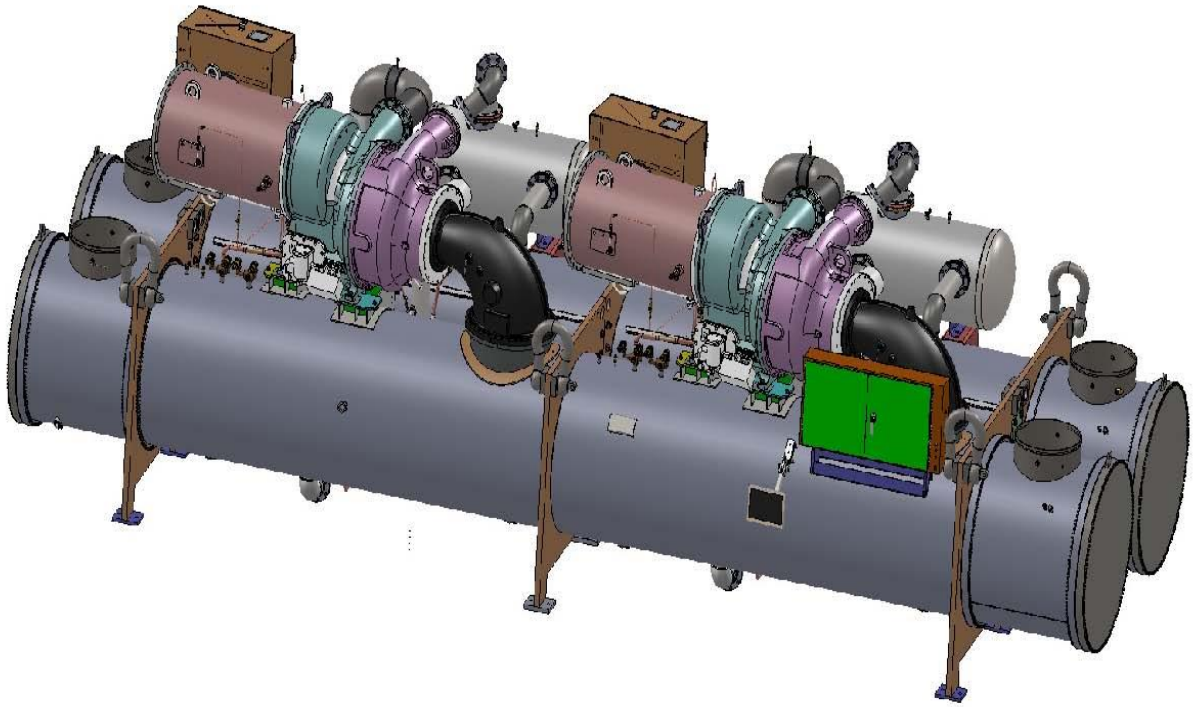
Installation, Operation and Maintenance Manual

D-EIMWC01308-16EN

WCT

Counter-Flow Centrifugal Chillers with Two-Stage Compressors
2200 to 3250 TONS (7750 to 11400 kW)
Series Counter-Flow with Two-Stage Compressors
4500 to 6400 TONS (15830 to 22500 kW)

HFC - 134a



Original Instructions

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⚠ WARNING

Before starting the installation of the unit, please read this manual carefully. Starting up the unit is absolutely forbidden if all instructions contained in this manual are not clear.

⚠ WARNING

All installation and maintenance activities must be carried out in compliance with local laws and regulations.

⚠ CAUTION

All units are delivered from the factory complete with wiring diagrams and dimensional drawings including size and weight for each model.

WIRING DIAGRAMS AND DIMENSIONAL DRAWINGS MUST BE CONSIDERED ESSENTIAL DOCUMENTS OF THIS MANUAL.

In case of any discrepancy between this manual and the equipment's document please refer to the wiring diagram and dimensional drawings.

⚠ NOTE

This Manual is a technical aid and does not represent a binding offer for Daikin.

Daikin has drawn up this Manual to the best of its knowledge. 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.

Daikin 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.

Manufactured in an ISO Certified Facility

Safety Instructions

The following recommendations should be carefully observed as part of installation, operation, maintenance or service.

- This equipment must be installed by trained and qualified personnel experienced in the installation of similar centrifugal chillers.
- This manual contains important information on operation, safety, maintenance, installation, service and warranty.
- Prior to performing any task on this equipment, the information in this manual and any other referenced material must be carefully read and understood.

Cautions and Warnings

At several points in the manual, items of special interest or significant impact are highlighted by one of the following notices.

⚠ DANGER

Dangers indicate a hazardous situation which will result in death or serious injury if not avoided.

⚠ WARNING

Warnings indicate potentially hazardous situations, which can result in property damage, severe personal injury, or death if not avoided.

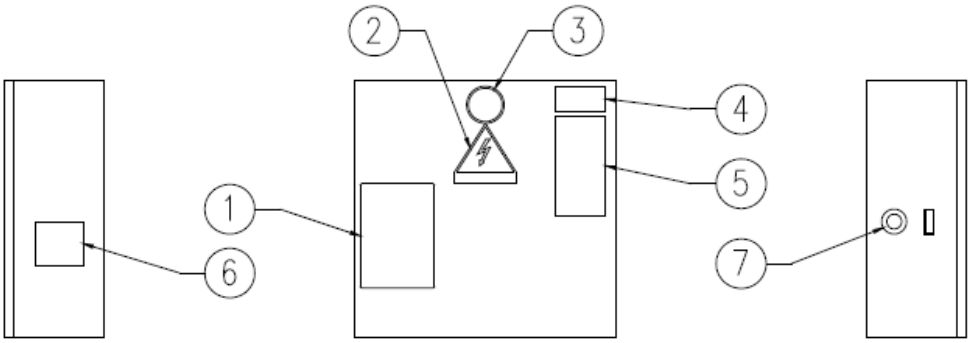
⚠ CAUTION

Cautions indicate potentially hazardous situations, which can result in personal injury or equipment damage if not avoided.

⚠ NOTE

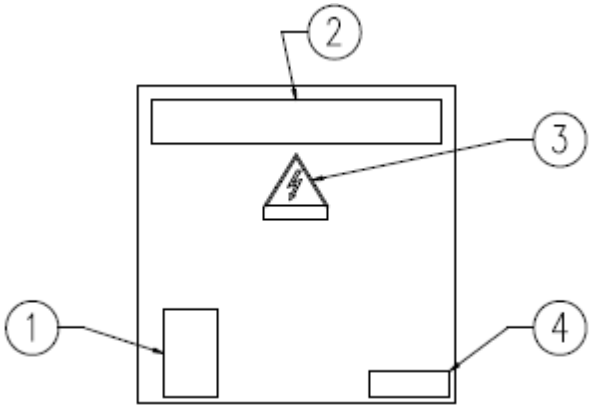
Important information used to obtain best results

Description of the labels applied to the electrical panel



Unit Control Panel

1 – Non flammable gas symbol	**6** – Unit characteristics technical
2 – Electrical hazard symbol	**5** – Unit nameplate data
3 – Gas type	**7** – Emergency stop
4 – Control panel code	



Motor Terminal Box

1 – Terminal box fixing	**3** – Electrical hazard symbol
2 – Manufacturer's logo	**4** – Terminal connection

Introduction

Note: See Operating and Maintenance Manual *OMM 1194* for information on operating and maintaining the chiller. A copy can be obtained from www.Daikineurope.com.

General Description

The Daikin Two-Stage Dual Centrifugal Compressor Water Chillers (WCT) are complete, self-contained, automatically controlled fluid chilling units. Each unit is completely assembled and factory tested before shipment. These chillers have a separate refrigerant circuit for each compressor. They are available in single pass arrangement only. They provide the high full load efficiency advantage of two separate chillers arranged for counter flow operation in a single, compact unit.

The Daikin Model WCT Chillers use 2-stage compressors and provide cooling capacity from 2200 tons (7750 kW) to 3250 tons (11400 kW) depending on operating conditions in each chiller, which comes up 5000-6000TR system capacity when chiller installs in series counter-flow configuration. In the WCT series, each unit has two compressors and two economizers connected to a single condenser, and an evaporator. Each condenser and evaporator has two separate refrigerant circuits.

WCT chiller is suitably designed for series counter-flow, which two WCT unit is connecting in series and work as one chiller.

The driveline of the WCT is made up of two two-stage compressors, each with a gear set and a 2-pole, induction semi-hermetic motor.

The controls are pre-wired, adjusted and tested. Only normal field connections such as water and relief valve piping, electrical and interlocks, etc. are required, thereby simplifying installation and increasing reliability. Most of the necessary equipment protection and operating controls are factory installed in the control panel.

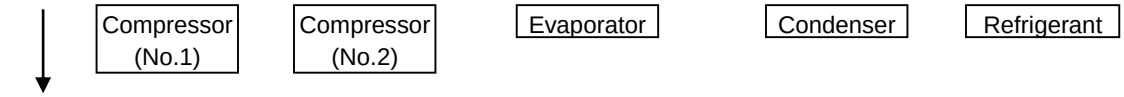
Application

Daikin WCT centrifugal chillers are factory tested prior to shipment and must be initially started at the job site by a factory-trained Daikin authorized technician. Failure to follow this startup procedure can affect the equipment warranty.

Cooling towers used with Daikin centrifugal chillers are normally selected for maximum condenser inlet water temperatures between 75°F and 95°F (24°C and 35°C). Lower entering water temperatures are desirable from the standpoint of energy reduction, but a minimum does exist. See page10 for recommendations on optimum entering water temperature and cooling tower fan control.

Nomenclature

WCTKDCCCP2Z / KDCCCP2Z / E5426-BG-1LL / C5426-BR-1LL /134



WCT : Water Cooled Two-Stage Centrifugal

COMPRESSOR
K : Frame Type of Compressor
D : Shroud Pattern of 1st Stage Impeller
C : Impeller Head of 1st Stage Impeller
C : Shroud Pattern of 2nd Stage Impeller
C : Impeller Head of 2nd Stage Impeller
P2 : Motor Rating (kW)
Z : Voltage (V) and Frequency (Hz)

EVAPORATOR
E5426 : Evaporator Diameter (in) and Length (ft)
B : Tube Count
G : Tube Type
1 : Number of Passes
L : Water Inlet Nozzle Location (R = Right Inlet ; L= Left Inlet)
L : Nozzle Configuration

CONDENSER
C5426 : Condenser Diameter (in) and Length (ft)
B : Tube Count
R : Tube Type
1 : Number of Passes
L : Water Inlet Nozzle Location (R = Right Inlet ; L= Left Inlet)
L : Nozzle Configuration

REFRIGERANT
134 : Refrigerant Type (134 = HFC-134a); WCT is for R134a only.

Receiving and Handling

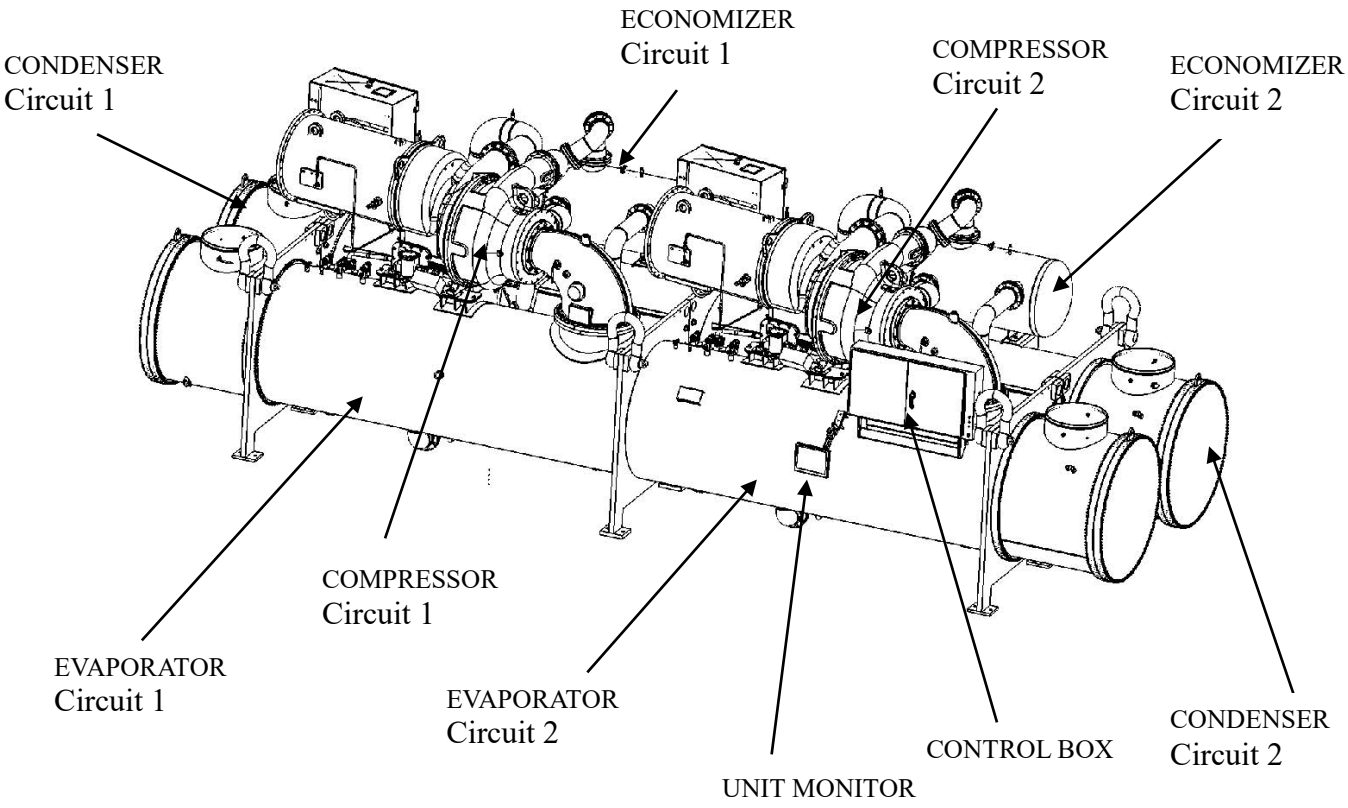
The unit should be inspected immediately after receipt for possible damage.

All Daikin centrifugal water chillers are shipped ex-factory and all claims for handling and shipping damage are the responsibility of the consignee.

Insulation corners from the evaporator's rigging hole locations are shipped loose and should be glued in place after the unit is finally placed. Neoprene vibration pads are also shipped loose. Check that these items have been delivered with the unit.

If so equipped, leave the shipping skid in place until the unit is in its final position. This will aid in handling the equipment.

***Figure 1*, WCT Major Component Locations**



Note: Evaporator nozzles may be side-by-side or over-and-under depending on model.

⚠ NOTE

Chilled water and condenser connection location can vary. Check markings on unit and consult unit certified drawings for connection locations on specific units.

Rigging

Extreme care must be used when rigging the equipment to prevent damage to the control panels or refrigerant piping. See the certified dimension drawings included in the job submittal for the center of gravity of the unit. Consult the local Daikin sales office for assistance if the drawings are not available.

The unit can be lifted by fastening the rigging shackles to the six corners of the unit where the rigging eyes are located. It is highly recommended the unit be picked up using all 6 lifting locations (see Figure 3) and the lifting be done with the load at all six locations being vertically up and not at an angle to prevent possible damage to the control panel, piping, motor terminal box and tubesheets. Lift only using locations shown in Figure 2. Recommended type of shackle is 50 Ton B.S. 3032 by Van Beest or equal.

If optional shipping skids are used, remove them before lowering the unit to its mounting position. Rig the unit to its final location on the floor or mounting pad by lifting the unit (or shell assembly) with an overhead lift and lower the unit to its mounting position.

Figure 2, **Rigging Locations**

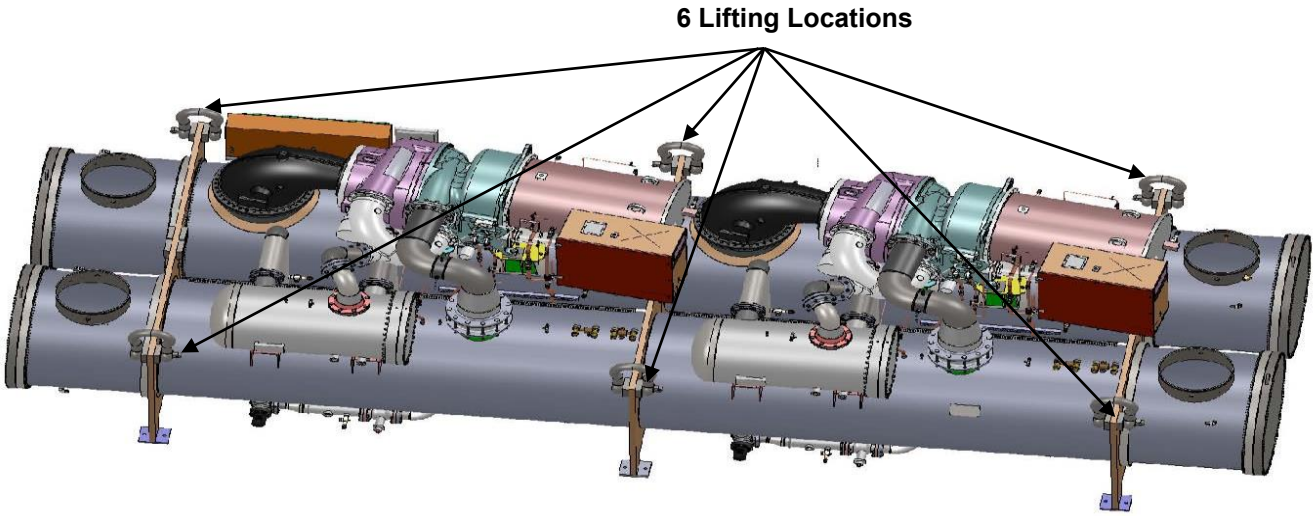
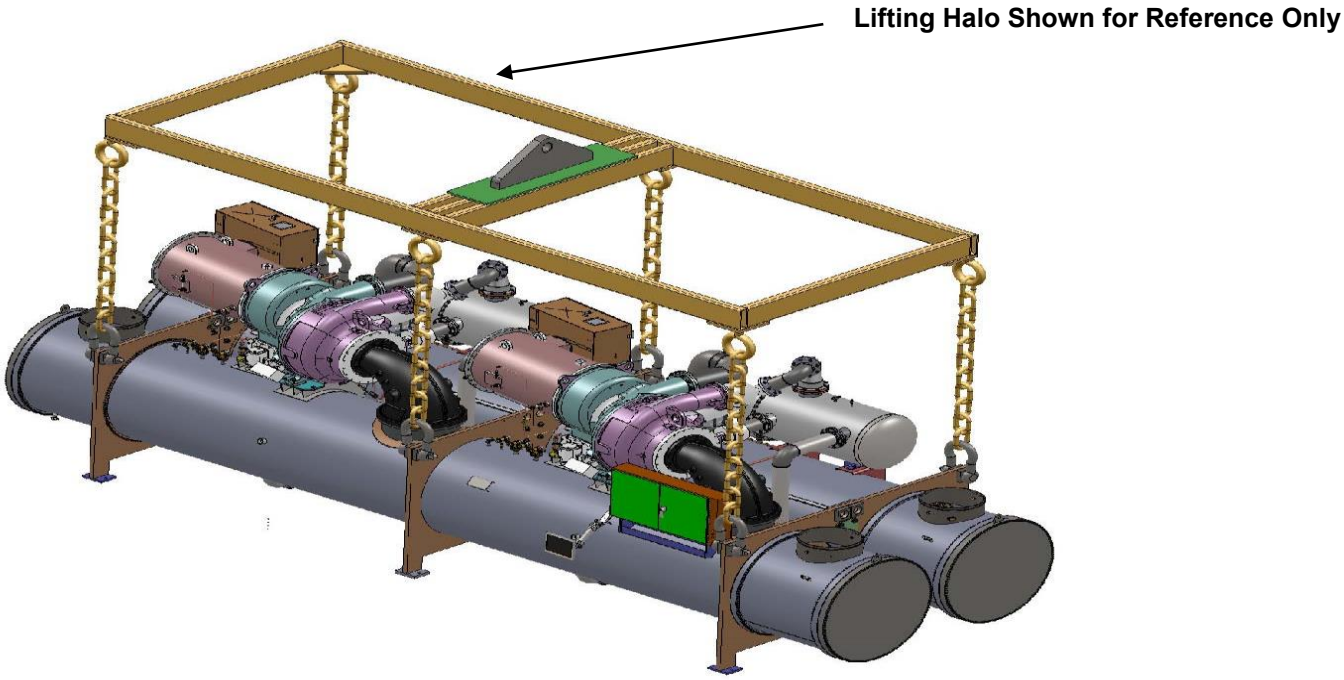


Figure 3**, Unit Rigging**



Location and Mounting

The unit must be mounted on a concrete or steel base which is level end-to-end to within ¼" (6.4 mm) and must be located to provide service clearance at one end of the unit for possible removal and replacement of evaporator and/or condenser tubes, and if necessary, to permit brush cleaning of evaporator and condenser tubes as required. Doors, removable wall sections and piping should be arranged for ease of disassembly at the chiller for tube clearance and cleaning. Minimum clearance at all other points, including the top, is 3 feet (1 meter). Local regulation can require more clearance in and around electrical components and must be checked. These chillers are intended only for installation in an indoor or weather protected area consistent with the NEMA 1 rating on the chiller, controls, and electrical panels. Equipment room temperature for operating and standby conditions is 40°F to 104°F (4.4°C to 40°C) for storage at higher temperatures refrigerant may need to be removed.

Vibration Pads

The unit is shipped with neoprene vibration pads having a nominal 0.375 inch (9.5 mm) operating height. They are to be placed under the steel foot supports for contact with the foundation, and to be flush with the sides and outside edge of the foot supports affixed to the chiller tube sheets.

Mounting

Make sure that the floor or structural support is adequate to support the full operating weight of the complete unit.

The pads should be located in accordance with the unit dimensional drawing. After the pads have been placed into position on the floor, lower the unit onto the pads which are to be centered under the foot supports. When the unit is in place, remove the rigging equipment and check that the chiller is level, both longitudinally and transversely.

First, check the longitudinal alignment of the unit by placing a "level gage" at top center of the evaporator shell which has more compressor/motor load. Second, check the transverse alignment by placing a level gage on top of the tube sheets at both ends of the unit. Their alignment should be within ¼" (6.4 mm) and if not, lift the unit and place shims between the neoprene pads and the foot supports.

It is not necessary to bolt the unit to the mounting slab but should this be desirable, 1-1/8" (28.5 mm) mounting holes are provided in the unit feet. See dimension drawing for location.

Each pad deflection is around 0.06 inch (2 mm) and if necessary, shims should be placed between the unit foot supports and pads to equally deflect all pads.

⚠ NOTE

Units will be shipped with holding refrigerant charge and oil. All valves must remain open until start-up by the authorized commissioning technician.

Nameplates

There are several identification nameplates on the chiller:

- The unit nameplate is located on the side of the Unit Control Panel. It has a Style No. XXXX, Model No. XXXX and Serial No. XXXX. These numbers are unique to the unit and should be used to identify the unit for service, parts, or warranty questions. This plate also lists the unit operating refrigerant charge.
- Vessel nameplates are located on the evaporator, economizer and condenser. Along with other information, they have a National Board Number (NB) and a vessel serial number, either of which identify the vessel (but not the entire unit).
- A compressor nameplate is located on the compressor itself and contains identification numbers.

System Water Volume

All chilled water systems need adequate time to recognize a load change, respond to that load change and stabilize, without undesirable short cycling of the compressors or loss of temperature control. In air conditioning systems, the potential for short cycling usually exists when the building load falls below the minimum chiller plant capacity or on close-coupled systems with very small water volumes or due to improperly operating system controls.

Some of the things the designer should consider when looking at water volume are the minimum cooling load, the minimum chiller plant capacity during the low load period and the desired cycle time for the compressors.

Assuming that there are no sudden load changes and that the chiller plant has reasonable turndown, a rule of thumb of "gallons of water volume equal to two to three times the chilled water gpm flow rate" is often used.

A properly designed storage tank should be added if the system components do not provide sufficient water volume.

Low Condenser Water Temperature Operation (Needs to be updated)

When the ambient wet bulb temperature is lower than design, the condenser water temperature can be allowed to fall. The resultant lower condensing temperature will improve chiller performance.

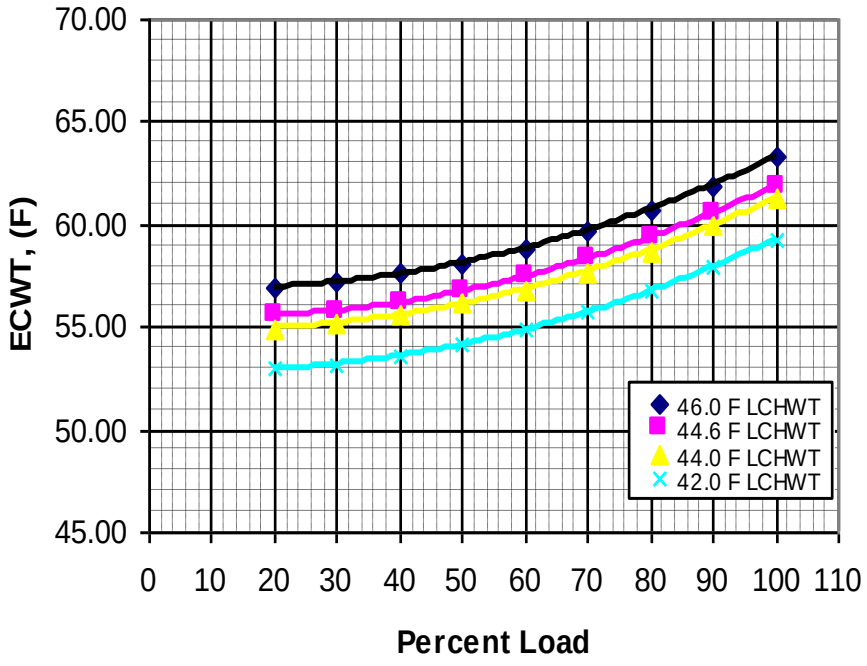
WCT chillers are equipped with electronic expansion valves (EEV) and will operate with entering condenser water temperatures as low as calculated by the following equation and shown in the chart following.

Note: Provisions or modifications need to be made in the event of inverted starts (condenser water colder than chilled water). For example, 3 way bypass valve controlled by the chiller, or tower controls.

$$\text{Min. ECWT} = 10.973 + \text{LCHWT} - 0.17 * \text{CHWDT}_{FL}(\text{PLD}/100) + 8 * (\text{PLD}/100)2$$

- ECWT = Entering condenser water temperature
- L**C**HWT = Leaving chilled water temperature
- **C**HWDT$_{FL}$ = Chilled Water Delta-T at full load
- PLD = The percent chiller load point to be checked

Figure 4, **Minimum Operating Entering Condenser Water Temperature (10°F Range)**



Note : Some limitation in control may apply when operating chiller in the condition that ECWT is same or above but still around minimum ECWT.

For example; at 44°F LCHWT, 10-degree F chilled water Delta-T, and 50% full load operation, the entering condenser water temperature could be as low as 56 °F.

The operating strategy for cooling tower fans requires some analysis. Regardless of power consumption considerations, the minimum allowable entering condenser water temperature must be maintained.

Depending on local climatic conditions, using the lowest possible entering condenser water temperature may be more costly in total system power consumed than the expected savings in chiller power would suggest, due to the excessive fan power required.

Even with tower fan control, some form of water flow control, such as tower bypass, is recommended and is required if fan control alone will not maintain minimum water temperatures.

For cold weather operation, the bypass valve and piping is required and should be inside the building.

Water Piping

Water Pumps

Avoid the use of two-pole pump motors. It is not uncommon to find that these pumps operate with objectionable noise and vibration.

It is also possible to build up a frequency beat due to the slight difference in the operating rpm of the pump motor and the Daikin centrifugal motor. Daikin encourages the use of four-pole pump motors.

Both the condenser and chilled water pumps' discharge connections should be located to supply water through the chiller at positive pressure.

In cases where the water pump noise can be objectionable, vibration isolation sections are recommended at both the inlet and outlet of the pump. In most cases, it will not be necessary to provide vibration

eliminator sections in the condenser inlet and outlet water piping. But they can be required where noise and vibration are critical or if spring isolators are used.

Vessel Drains at Start-up

Unit vessels are equipped with ball-type drain valves in the bottom of each head chamber and shipped with the valves open**.** Be sure to close the valves prior to filling the vessels with fluid.

Draining Vessels

If the chiller can be subject to freezing temperatures (possibly when stored prior to installation), the condenser and evaporator must be drained of all water. Dry air blown through them will aid in forcing all water out. Removal of condenser heads is also recommended. The condenser and evaporator are not self-draining and tubes must be blown out. Water permitted to remain in the piping and vessels can rupture these parts if subjected to freezing temperature and cause corrosion.

Evaporator and Condenser Water Piping

Be sure that water inlet and outlet connections match certified drawings and stenciled nozzle markings. The tower water supply connection is always the bottom connection of the condenser to maximize refrigerant sub cooling.

All evaporators and condensers come with optional flange connections or standard Victaulic groove water nozzles (also suitable for welding). Since the companion flanges, bolts, nuts and gaskets are not included, the installing contractor must provide matching mechanical connections or transitions of the size and type required.

If welding is to be performed on the mechanical or flange connections, remove the solid-state temperature sensor and thermostat bulbs from the wells to prevent damage to those components. Also properly ground the unit or severe damage to the MicroTech unit controller can occur.

Water pressure gauge connection taps and gauges must be provided in the field piping at the inlet and outlet connections of both vessels for measuring the water pressure drops. The pressure drops and flow rates for the various evaporators and condensers are job specific and the original job documentation can be consulted for this information. Refer to the unit nameplate on the control panel for identification. The piping should also include thermometers at the inlet and outlet connections and air vents at the high points.

The piping must be installed and supported to eliminate weight and strain on the fittings and connections. Cold piping must also be adequately insulated. All water piping should be thoroughly cleaned of dirt and debris before being connected to the chiller**.** A cleanable 20-mesh water strainer must be installed in both water inlet lines as close as possible to the vessels. The strainer will attempt to retain any possible dirt/debris coming from the cooling tower, deterioration of piping, or from water source entering the chiller tubes. This can result in a reduction of flow and subsequent reduction of chiller performance or tube freezing.

Water Flow Sensors

Temperature-based (thermal dispersion) flow sensors are factory mounted in the evaporator and condenser inlet water nozzles and are factory wired to the control panel. The sensor tip houses thermistors and a heating element that when power is applied, heats the tip of the probe. How fast the heat is carried away from the sensor tip by the water flow is detected by the thermistors and they provide an output when the flow rate falls below the setpoint. This indicates whether there is an adequate water flow to the vessels before the unit can start. They also serve to shut down the unit in the event that water flow is interrupted to guard against evaporator freeze-up or excessive discharge pressure.

Cooling Towers

Check the condenser water flow rate to be sure that it conforms to the system design. Some form of temperature control is also required if an uncontrolled tower can supply water below about 65°F (18°C). A tower bypass valve is recommended. Unless the system and the chiller unit are specifically designed for condenser bypass or variable condenser flow, it is not recommended, since low condenser flow rates can cause unstable operation and excessive tube fouling.

The condenser water pumps must cycle on and off with the unit. Controlling the pumps with the unit MicroTech controller is an easy way to accomplish this and is highly recommended. See Figure 8, Field Wiring Diagram on page 21 for wiring details.

The quality of the water to both the condenser and evaporator should be analyzed by a water treatment specialist. If not available in-house, competent water treatment specialists can be contracted. Water treatment is essential for continued efficient and reliable chiller operation. Chiller performance can be degraded by poor water quality due to rust, sludge, corrosion, mineral deposits, sedimentation, organic growth etc. Proper chiller performance can be maintained by corrective water treatment when and if necessary, and periodic cleaning of tubes. If fouling or contaminants may become an issue then it may be necessary to allow a larger fouling factor for the chiller provided, and/or specific construction materials for the job site.

Thermal Insulation

Insulation of cold surfaces is required to prevent condensation. These surfaces include the evaporator, economizer, evaporator water heads and nozzles, suction piping, motor housing, oil cooler refrigerant supply and return, economizer gas line, expansion valve, piping between economizer and evaporator and the motor drain line.

Optional factory installed insulation is available in ¾- inch (19 mm) and 1 ½-inch (38 mm) thickness. It is UL recognized (File # E55475) ABS/PVC flexible foam with a skin. The K factor is 0.28 BTU/hr x °F x sq ft (W/m2 x °C) at 75°F (23.9°C). Sheet insulation is fitted and cemented in place forming a vapor barrier and then painted with a resilient finish that resists cracking. Double insulation is available as an option.

The insulation complies to, or has been tested in accordance, with the following:

ASTM-C-177	ASTM-C-534 Type 2	UL 94-5V
ASTM-D-1056-91-2C1	ASTM E 84	MEA 186-86-M Vol. N
CAN/ULC S102-M88		

In the event insulation is to be field-installed, none of the cold surfaces identified above will be factory insulated. Required field insulation is shown beginning on page 14. Approximate total square footage of insulation surface required for individual packaged chillers is tabulated by evaporator code and can be found below.

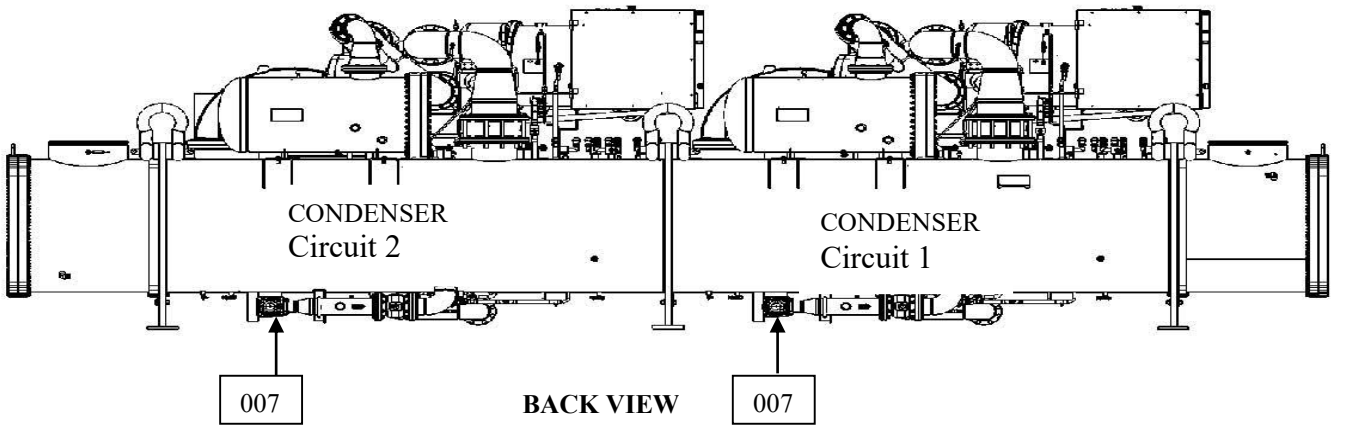
Table 1, Evaporator insulation Surface (approx.)

Evaporator Code	Insulation Area Sq. Ft. (m^2)
E4824	840 (78)
E4826	915 (85)
E5424	935 (87)
E5426	1025 (95)

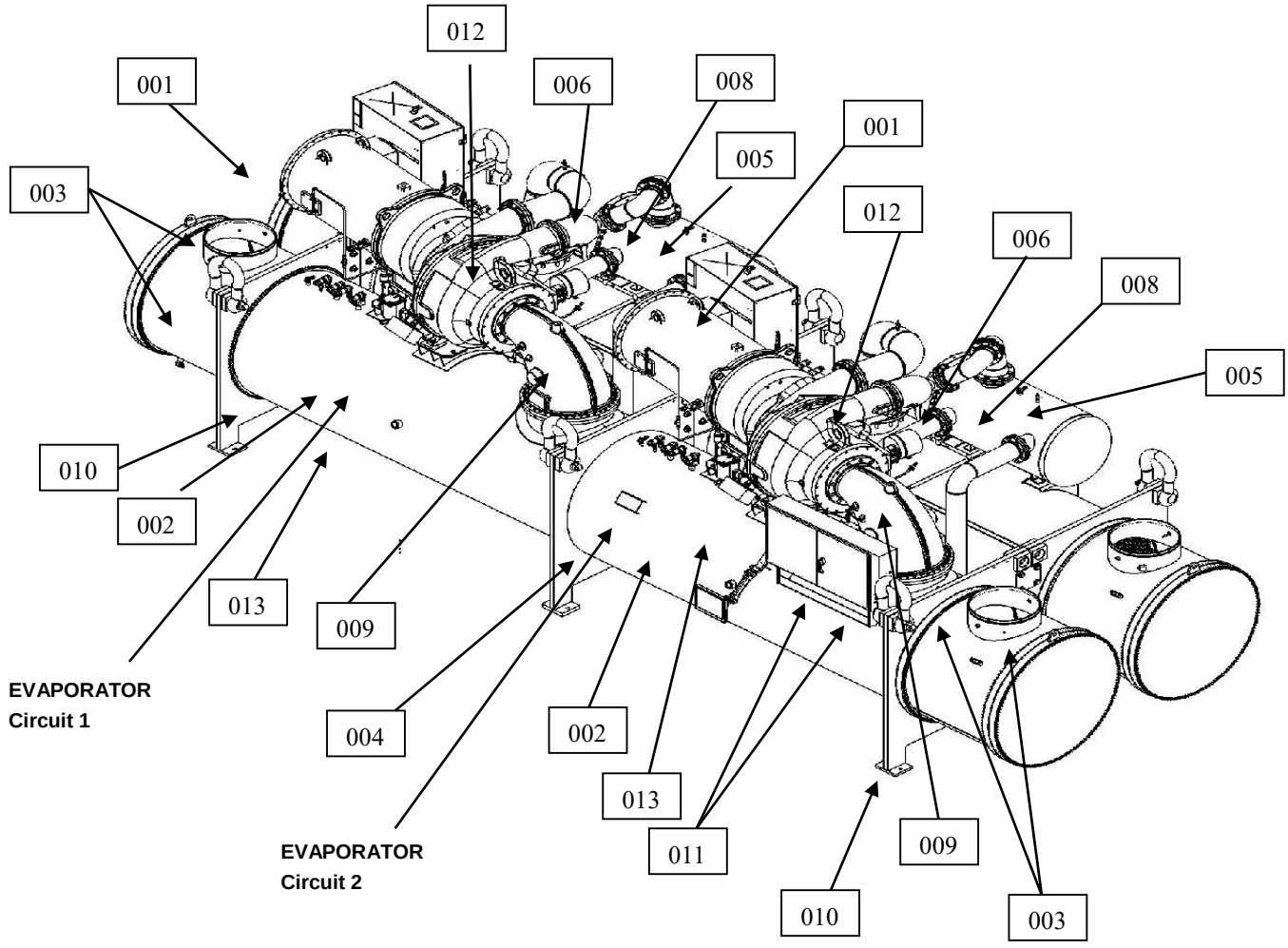
Note : Includes Shell, Tube Sheets and Tube Heads

Field Insulation Guide

Figure 5, Insulation Requirements (Bubble components require insulation)



BACK VIEW



ISOMETRIC VIEW

Table 2, Insulated Parts Description

INSULATED PARTS			
BUB. NO.	**DESCRIPTION**	**THICKNESS (Depend on Customer)**	**Probable Surface Temperature in Rating Operation**
	USE SHEET INSULATION		
001	MOTOR BARREL- BACK PLATE TO GEAR HOUSING	0.75”	36 – 45 ºF (2 – 7 ºC)
002	EVAPORATOR SHELL- TUBESHEET TO TUBESHEET	0.75”	36 – 45 ºF (2 – 7 ºC)
003	NOZZLE HEAD & NOZZLE TO BACK OF FLANGE	0.75”	36 – 45 ºF (2 – 7 ºC)
004	EVAPORATOR MIDDLE TUBE SHEET	0.75”	36 – 45 ºF (2 – 7 ºC)
005	ECONOMIZER- HEAD TO HEAD AND NOZZLES	0.75”	59 – 77 ºF (15 – 25 ºC)
006	ECONOMIZER GAS LINE	0.75”	59 – 77 ºF (15 – 25 ºC)
007	EXPANSION VALVE TO ECONOMIZER	0.75”	59 – 77 ºF (15 – 25 ºC)
008	ALL PIPING LEAVING ECONOMIZER TO EVAPORATOR	0.75”	36 – 45 ºF (2 – 7 ºC)
009	SUCTION LINE- COMPRESSOR TO EVAPORATOR	0.75”	36 – 45 ºF (2 – 7 ºC)
010	EVAPORATOR END TUBESHEETS	0.75”	36 – 45 ºF (2 – 7 ºC)
011	BOTH SIDES OF BRACKETS TO BOTTOM OF WIREWAY	0.75”	36 – 45 ºF (2 – 7 ºC)
012	FRONT END OF COMPRESSOR	0.75”	36 – 45 ºF (2 – 7 ºC)
013	CAP SIGHT GLASSES ON EVAP	0.75”	36 – 45 ºF (2 – 7 ºC)
	USE TUBE INSULATION		
	OIL COOLER SUPPLY LINE (1.125 ID)		
	OIL COOLER RETURN LINE (1.125 ID)		
	MOTOR DRAIN (.375 ID)		
	EDUCTOR LINE-FROM EVAP. TO OIL SUMP (0.375 id)		

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Figure 6, Unit Overall Dimensions

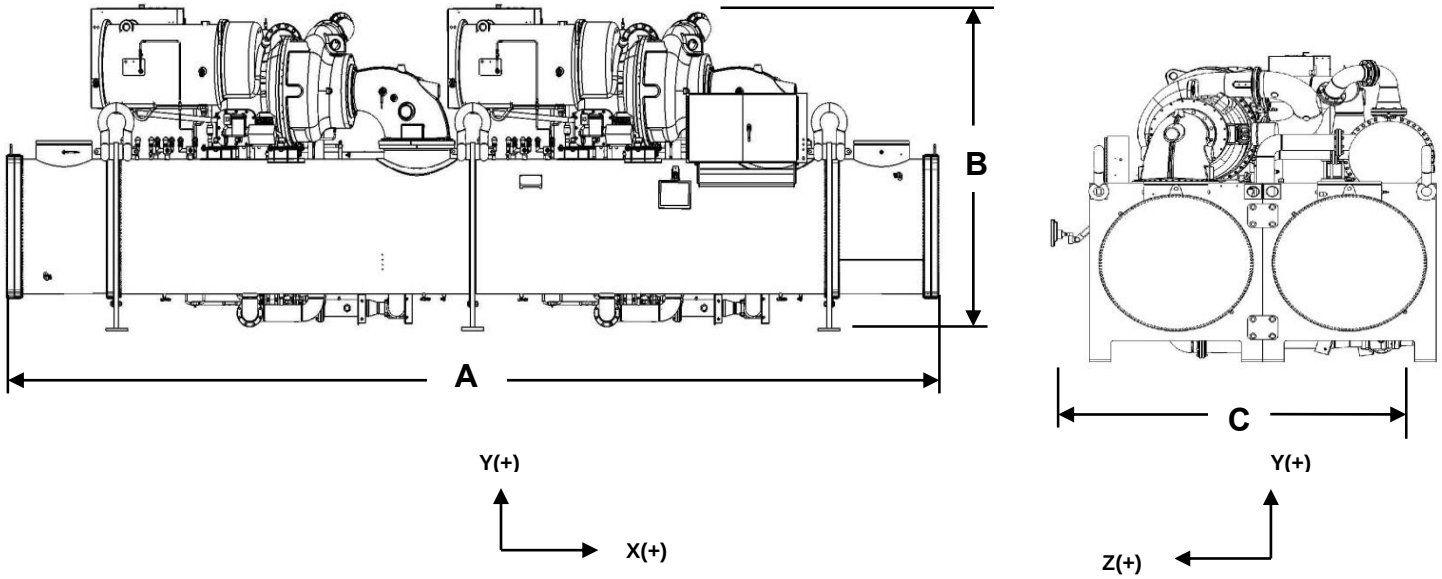


Figure 7, Unit Mounting Feet, Top Sectional View
(Position of Center of Gravity relative to (0,0,0) changes depending on Unit Size)

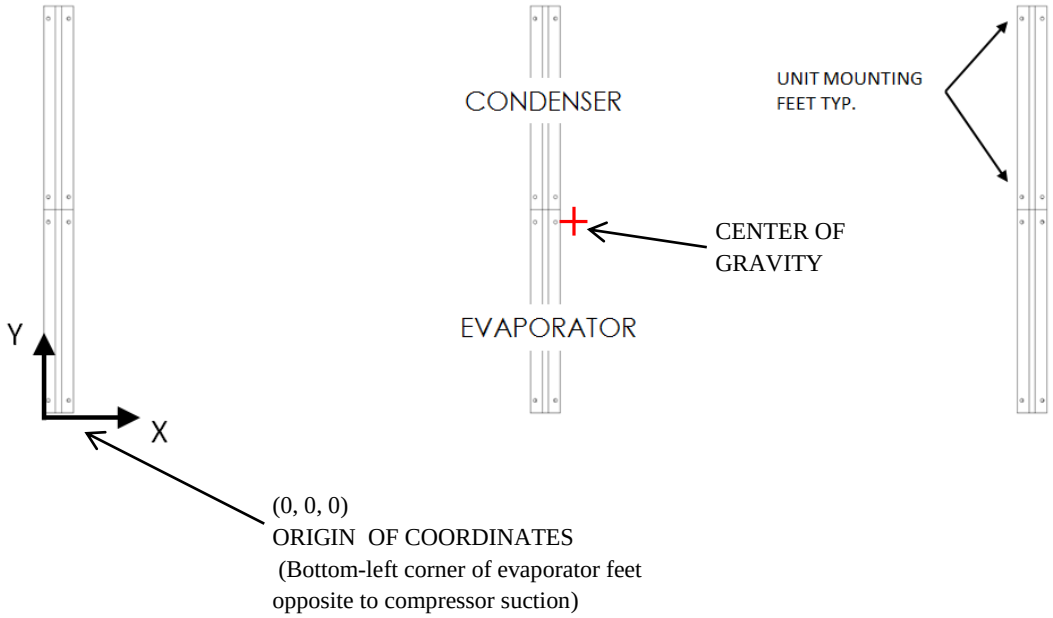


Table 3, Weights and Dimensions

Shells	*Approximated Weights per Chiller*			*Approximated Water Volumes per Chiller*				*Overall Dimensions*					
				Condenser		*Evaporator*		*Unit*			*COG (OPERATING)*		
	Shipping Weight	**Operating Weight**	**Refrigerant Charge**	**Water volume of water boxes (including nozzles)**	**Total water volume**	**Water volume of water boxes (including nozzles)**	**Total water volume**	**A' Overall length**	**B' Overall Height**	**C' Overall width**	**X**	**Y**	**Z**
	lb	**lb**	**lb**	**gal**	**gal**	**gal**	**gal**	**in**	**in**	**In**	**in**	**in**	**in**
	kg	**kg**	**kg**	**l**	**l**	**l**	**l**	**mm**	**mm**	**mm**	**mm**	**mm**	**mm**
C4224-B/E4824-B	81'600	108'100	6'250	470	1'190	580	1'060	371	125	124	142	62	52
	(36'900)	(48'900)	(2'900)	(1'790)	(4'570)	(2'220)	(4'060)	(9'436)	(3'167)	(3'148)	(3'611)	(1'575)	(1'323)
C4224-B/E4824-C	81'300	107'600	6'550	470	1'190	580	1'010	371	125	124	142	62	52
	(36'800)	(48'600)	(3'000)	(1'790)	(4'570)	(2'220)	(3'880)	(9'436)	(3'167)	(3'148)	(3'610)	(1'580)	(1'326)
C4224-B/E4824-D	81'100	106'800	6'850	470	1'190	580	960	371	125	124	142	62	52
	(36'700)	(48'300)	(3'100)	(1'790)	(4'570)	(2'220)	(3'700)	(9'436)	(3'167)	(3'148)	(3'610)	(1'585)	(1'329)
C4224-C/E4824-B	81'500	107'900	6'250	470	1'120	580	1'060	371	125	124	142	62	52
	(36'900)	(48'800)	(2'900)	(1'790)	(4'290)	(2'220)	(4'060)	(9'436)	(3'167)	(3'148)	(3'604)	(1'570)	(1'323)
C4224-C/E4824-C	81'300	107'700	6'550	470	1'120	580	1'010	371	125	124	142	62	52
	(36'800)	(48'700)	(3'000)	(1'790)	(4'290)	(2'220)	(3'880)	(9'436)	(3'167)	(3'148)	(3'607)	(1'575)	(1'327)
C4224-C/E4824-D	81'000	106'700	6'850	470	1'120	580	960	371	125	124	142	62	52
	(36'600)	(48'300)	(3'100)	(1'790)	(4'290)	(2'220)	(3'700)	(9'436)	(3'167)	(3'148)	(3'601)	(1'580)	(1'330)
C4224-D/E4824-B	81'400	107'700	6'250	470	1'050	580	1'060	371	125	124	142	62	52
	(36'800)	(48'700)	(2'900)	(1'790)	(4'040)	(2'220)	(4'060)	(9'436)	(3'167)	(3'148)	(3'602)	(1'565)	(1'324)

C4224-D/E4824-C	81'100	107'200	6'550	470	1'050	580	1'010	371	125	124	142	62	52
	(36'700)	(48'500)	(3'000)	(1'790)	(4'040)	(2'220)	(3'880)	(9'436)	(3'167)	(3'148)	(3'601)	(1'570)	(1'327)
C4224-D/E4824-D	80'800	106'600	6'850	470	1'050	580	960	135	125	124	142	62	52
	(36'600)	(48'200)	(3'100)	(1'790)	(4'040)	(2'220)	(3'700)	(3'436)	(3'167)	(3'148)	(3'601)	(1'575)	(1'331)
C4226-B/E4826-B	85'600	110'200	6'650	470	1'250	580	1'100	396	125	124	158	60	52
	(38'700)	(49'800)	(3'100)	(1'790)	(4'800)	(2'220)	(4'220)	(10'058)	(3'167)	(3'148)	(4'018)	(1'528)	(1'321)
C4226-B/E4826-C	85'000	109'600	6'950	470	1'250	580	1'050	396	125	124	158	60	52
	(38'400)	(49'600)	(3'200)	(1'790)	(4'800)	(2'220)	(4'020)	(10'058)	(3'167)	(3'148)	(4'018)	(1'534)	(1'325)
C4226-B/E4826-D	84'400	109'100	7'300	470	1'250	580	1'000	396	125	124	158	61	52
	(38'200)	(49'300)	(3'300)	(1'790)	(4'800)	(2'220)	(3'820)	(10'058)	(3'167)	(3'148)	(4'018)	(1'540)	(1'326)
C4226-C/E4826-B	93'300	108'900	6'650	470	1'170	580	1'100	396	125	124	158	60	52
	(42'200)	(49'200)	(3'100)	(1'790)	(4'500)	(2'220)	(4'220)	(10'058)	(3'167)	(3'148)	(4'018)	(1'516)	(1'324)
C4226-C/E4826-C	92'500	108'300	6'950	470	1'170	580	1'050	396	125	124	158	60	52
	(41'800)	(49'000)	(3'200)	(1'790)	(4'500)	(2'220)	(4'020)	(10'058)	(3'167)	(3'148)	(4'018)	(1'522)	(1'325)
C4226-C/E4826-D	91'100	107'800	7'300	470	1'170	580	1'000	396	125	124	158	60	52
	(41'200)	(48'700)	(3'300)	(1'790)	(4'500)	(2'220)	(3'820)	(10'058)	(3'167)	(3'148)	(4'018)	(1'528)	(1'327)
C4226-D/E4826-B	92'700	107'700	6'650	470	1'100	580	1'100	396	125	124	158	59	52
	(41'900)	(48'700)	(3'100)	(1'790)	(4'230)	(2'220)	(4'220)	(10'058)	(3'167)	(3'148)	(4'018)	(1'505)	(1'324)
C4226-D/E4826-C	91'900	106'300	6'950	470	1'100	580	1'050	396	125	124	158	59	52
	(41'600)	(48'100)	(3'200)	(1'790)	(4'230)	(2'220)	(4'020)	(10'058)	(3'167)	(3'148)	(4'018)	(1'511)	(1'328)
C4226-D/E4826-D	91'100	106'600	7'300	470	1'100	580	1'000	396	125	124	158	60	52
	(41'200)	(48'200)	(3'300)	(1'790)	(4'230)	(2'220)	(3'820)	(10'058)	(3'167)	(3'148)	(4'018)	(1'517)	(1'325)

C4824-B/E4824-B	91'400	110'000	6'500	570	1'490	580	1'060	371	125	130	142	68	52
	(41'300)	(49'800)	(3'000)	(2'200)	(5'730)	(2'220)	(4'060)	(9'436)	(3'167)	(3'300)	(3'611)	(1'730)	(1'321)
C4824-B/E4824-C	91'000	109'500	6'750	570	1'490	580	1'010	371	125	130	142	68	52
	(41'200)	(49'500)	(3'100)	(2'200)	(5'730)	(2'220)	(3'880)	(9'436)	(3'167)	(3'300)	(3'610)	(1'726)	(1'331)
C4824-B/E4824-D	90'700	109'000	7'050	570	1'490	580	960	371	125	130	142	68	53
	(41'000)	(49'300)	(3'200)	(2'200)	(5'730)	(2'220)	(3'700)	(9'436)	(3'167)	(3'300)	(3'610)	(1'722)	(1'341)
C4824-C/E4824-B	90'600	108'500	6'500	570	1'400	580	1'060	371	125	130	142	68	52
	(41'000)	(49'100)	(3'000)	(2'200)	(5'380)	(2'220)	(4'060)	(9'436)	(3'167)	(3'300)	(3'604)	(1'730)	(1'321)
C4824-C/E4824-C	90'300	108'000	6'750	570	1'400	580	1'010	371	125	130	142	68	52
	(40'800)	(48'800)	(3'100)	(2'200)	(5'380)	(2'220)	(3'880)	(9'436)	(3'167)	(3'300)	(3'607)	(1'726)	(1'331)
C4824-C/E4824-D	89'900	107'400	7'050	570	1'400	580	960	371	125	130	142	68	53
	(40'700)	(48'600)	(3'200)	(2'200)	(5'380)	(2'220)	(3'700)	(9'436)	(3'167)	(3'300)	(3'601)	(1'722)	(1'341)
C4824-D/E4824-B	89'900	106'900	6'500	570	1'310	580	1'060	371	125	130	142	68	52
	(40'600)	(48'400)	(3'000)	(2'200)	(5'020)	(2'220)	(4'060)	(9'436)	(3'167)	(3'300)	(3'602)	(1'730)	(1'321)
C4824-D/E4824-C	89'500	106'400	6'750	570	1'310	580	1'010	371	125	130	142	68	52
	(40'500)	(48'100)	(3'100)	(2'200)	(5'020)	(2'220)	(3'880)	(9'436)	(3'167)	(3'300)	(3'601)	(1'726)	(1'331)
C4824-D/E4824-D	89'100	105'900	7'050	570	1'310	580	960	371	125	130	142	68	53
	(40'300)	(47'900)	(3'200)	(2'200)	(5'020)	(2'220)	(3'700)	(9'436)	(3'167)	(3'300)	(3'601)	(1'722)	(1'341)
C4826-B/E4826-B	93'700	113'700	6'900	570	1'570	580	1'100	396	125	130	158	65	52
	(42'400)	(51'400)	(3'200)	(2'200)	(6'030)	(2'220)	(4'220)	(10'058)	(3'167)	(3'300)	(4'018)	(1'641)	(1'322)
C4826-B/E4826-C	93'300	113'200	7'200	570	1'570	580	1'050	396	125	130	158	65	52
	(42'200)	(51'200)	(3'300)	(2'200)	(6'030)	(2'220)	(4'020)	(10'058)	(3'167)	(3'300)	(4'018)	(1'648)	(1'328)
C4826-B/E4826-D	92'900	112'600	7'550	570	1'570	580	1'000	396	125	130	158	65	52

	(42'000)	(50'900)	(3'400)	(2'200)	(6'030)	(2'220)	(3'820)	(10'058)	(3'167)	(3'300)	(4'018)	(1'655)	(1'329)
C4826-C/E4826-B	92'900	112'000	6'900	570	1'470	580	1'100	396	125	130	158	64	52
	(42'000)	(50'700)	(3'200)	(2'200)	(5'640)	(2'220)	(4'220)	(10'058)	(3'167)	(3'300)	(4'018)	(1'628)	(1'321)
C4826-C/E4826-C	92'500	111'500	7'200	570	1'470	580	1'050	396	125	130	158	64	52
	(41'800)	(50'400)	(3'300)	(2'200)	(5'640)	(2'220)	(4'020)	(10'058)	(3'167)	(3'300)	(4'018)	(1'635)	(1'331)
C4826-C/E4826-D	92'100	110'900	7'550	570	1'470	580	1'000	396	125	130	158	65	52
	(41'700)	(50'200)	(3'400)	(2'200)	(5'640)	(2'220)	(3'820)	(10'058)	(3'167)	(3'300)	(4'018)	(1'642)	(1'327)
C4826-D/E4826-B	92'100	110'800	7'350	570	1'370	580	1'100	396	125	130	158	64	52
	(41'700)	(50'100)	(3'400)	(2'200)	(5'260)	(2'220)	(4'220)	(10'058)	(3'167)	(3'300)	(4'018)	(1'615)	(1'321)
C4826-D/E4826-C	91'700	109'800	7'200	570	1'370	580	1'050	396	125	130	158	64	52
	(41'500)	(49'700)	(3'300)	(2'200)	(5'260)	(2'220)	(4'020)	(10'058)	(3'167)	(3'300)	(4'018)	(1'621)	(1'331)
C4826-D/E4826-D	91'300	109'300	7'550	570	1'370	580	1'000	396	125	130	158	64	53
	(41'300)	(49'400)	(3'400)	(2'200)	(5'260)	(2'220)	(3'820)	(10'058)	(3'167)	(3'300)	(4'018)	(1'628)	(1'340)
C4824-B/E5424-B	95'400	125'000	7'200	570	1'400	730	1'380	371	132	130	142	66	53
	(43'100)	(56'500)	(3'300)	(2'200)	(5'380)	(2'780)	(5'310)	(9'436)	(3'362)	(3'300)	(3'611)	(1'668)	(1'357)
C4824-B/E5424-C	94'900	124'300	7'600	570	1'400	730	1'320	371	132	130	142	66	54
	(42'900)	(56'200)	(3'500)	(2'200)	(5'380)	(2'780)	(5'060)	(9'436)	(3'362)	(3'300)	(3'610)	(1'677)	(1'361)
C4824-B/E5424-D	94'400	123'600	8'000	570	1'400	730	1'250	371	132	130	142	66	54
	(42'700)	(55'900)	(3'600)	(2'200)	(5'380)	(2'780)	(4'800)	(9'436)	(3'362)	(3'300)	(3'610)	(1'685)	(1'366)
C4824-C/E5424-B	94'600	123'500	7'200	570	1'490	730	1'380	371	132	130	142	65	54
	(42'800)	(55'800)	(3'300)	(2'200)	(5'730)	(2'780)	(5'310)	(9'436)	(3'362)	(3'300)	(3'604)	(1'657)	(1'362)
C4824-C/E5424-C	94'100	122'800	7'600	570	1'490	730	1'320	371	132	130	142	66	54
	(42'600)	(55'500)	(3'500)	(2'200)	(5'730)	(2'780)	(5'060)	(9'436)	(3'362)	(3'300)	(3'607)	(1'665)	(1'367)

C4824-C/E5424-D	93'600	122'000	8'000	570	1'490	730	1'250	371	132	130	142	66	54
	(42'300)	(55'200)	(3'600)	(2'200)	(5'730)	(2'780)	(4'800)	(9'436)	(3'362)	(3'300)	(3'601)	(1'674)	(1'372)
C4824-D/E5424-B	93'900	121'900	7'200	570	1'310	730	1'380	371	132	130	142	65	54
	(42'500)	(55'100)	(3'300)	(2'200)	(5'020)	(2'780)	(5'310)	(9'436)	(3'362)	(3'300)	(3'602)	(1'645)	(1'368)
C4824-D/E5424-C	93'400	121'200	7'600	570	1'310	730	1'320	371	132	130	142	65	54
	(42'200)	(54'800)	(3'500)	(2'200)	(5'020)	(2'780)	(5'060)	(9'436)	(3'362)	(3'300)	(3'601)	(1'654)	(1'373)
C4824-D/E5424-D	92'900	120'500	8'000	570	1'310	730	1'250	371	132	130	142	65	54
	(42'000)	(54'500)	(3'600)	(2'200)	(5'020)	(2'780)	(4'800)	(9'436)	(3'362)	(3'300)	(3'601)	(1'662)	(1'378)
C4826-B/E5426-B	97'900	129'000	7'700	570	1'570	730	1'440	396	132	130	158	62	53
	(44'300)	(58'400)	(3'500)	(2'200)	(6'030)	(2'780)	(5'520)	(10'058)	(3'362)	(3'300)	(4'018)	(1'585)	(1'345)
C4826-B/E5426-C	97'300	128'300	8'100	570	1'570	730	1'370	396	132	130	158	63	53
	(44'000)	(58'000)	(3'700)	(2'200)	(6'030)	(2'780)	(5'250)	(10'058)	(3'362)	(3'300)	(4'018)	(1'593)	(1'350)
C4826-B/E5426-D	96'800	127'500	8'550	570	1'570	730	1'300	396	132	130	158	63	53
	(43'800)	(57'700)	(3'900)	(2'200)	(6'030)	(2'780)	(4'970)	(10'058)	(3'362)	(3'300)	(4'018)	(1'601)	(1'354)
C4826-C/E5426-B	97'000	127'400	7'700	570	1'470	730	1'440	396	132	130	158	62	53
	(43'900)	(57'600)	(3'500)	(2'200)	(5'640)	(2'780)	(5'520)	(10'058)	(3'362)	(3'300)	(4'018)	(1'572)	(1'350)
C4826-C/E5426-C	96'500	126'600	8'100	570	1'470	730	1'370	396	132	130	158	62	53
	(43'600)	(57'300)	(3'700)	(2'200)	(5'640)	(2'780)	(5'250)	(10'058)	(3'362)	(3'300)	(4'018)	(1'580)	(1'355)
C4826-C/E5426-D	96'000	125'800	8'550	570	1'470	730	1'300	396	132	130	158	63	54
	(43'400)	(56'900)	(3'900)	(2'200)	(5'640)	(2'780)	(4'970)	(10'058)	(3'362)	(3'300)	(4'018)	(1'588)	(1'360)
C4826-D/E5426-B	96'200	125'700	7'700	570	1'370	730	1'440	396	132	130	158	61	53
	(43'500)	(56'800)	(3'500)	(2'200)	(5'260)	(2'780)	(5'520)	(10'058)	(3'362)	(3'300)	(4'018)	(1'558)	(1'356)
C4826-D/E5426-C	95'700	124'900	8'100	570	1'370	730	1'370	396	132	130	158	62	54

	(43'300)	(56'500)	(3'700)	(2'200)	(5'260)	(2'780)	(5'250)	(10'058)	(3'362)	(3'300)	(4'018)	(1'566)	(1'361)
C4826-D/E5426-D	95'100	124'200	8'550	570	1'370	730	1'300	396	132	130	158	62	54
	(43'000)	(56'200)	(3'900)	(2'200)	(5'260)	(2'780)	(4'970)	(10'058)	(3'362)	(3'300)	(4'018)	(1'575)	(1'366)
C5424-B/E5424-B	100'800	133'100	7'500	720	1'640	730	1'380	371	132	130	142	68	55
	(45'600)	(60'200)	(3'400)	(2'750)	(6'280)	(2'780)	(5'310)	(9'436)	(3'362)	(3'300)	(3'611)	(1'721)	(1'387)
C5424-B/E5424-C	100'300	132'400	7'900	720	1'640	730	1'320	371	132	130	142	68	55
	(45'300)	(59'900)	(3'600)	(2'750)	(6'280)	(2'780)	(5'060)	(9'436)	(3'362)	(3'300)	(3'610)	(1'730)	(1'391)
C5424-B/E5424-D	99'800	131'700	8'300	720	1'640	730	1'250	371	132	130	142	68	55
	(45'100)	(59'600)	(3'800)	(2'750)	(6'280)	(2'780)	(4'800)	(9'436)	(3'362)	(3'300)	(3'610)	(1'738)	(1'395)
C5424-C/E5424-B	99'800	131'100	7'500	720	1'550	730	1'380	371	132	130	142	67	55
	(45'100)	(59'300)	(3'400)	(2'750)	(5'930)	(2'780)	(5'310)	(9'436)	(3'362)	(3'300)	(3'604)	(1'708)	(1'394)
C5424-C/E5424-C	99'300	130'400	7'900	720	1'550	730	1'320	371	132	130	142	68	55
	(44'900)	(59'000)	(3'600)	(2'750)	(5'930)	(2'780)	(5'060)	(9'436)	(3'362)	(3'300)	(3'607)	(1'716)	(1'398)
C5424-C/E5424-D	98'800	129'700	8'300	720	1'550	730	1'250	371	132	130	142	68	55
	(44'700)	(58'600)	(3'800)	(2'750)	(5'930)	(2'780)	(4'800)	(9'436)	(3'362)	(3'300)	(3'601)	(1'725)	(1'402)
C5424-D/E5424-B	98'800	129'100	7'500	720	1'450	730	1'380	371	132	130	142	67	55
	(44'700)	(58'400)	(3'400)	(2'750)	(5'570)	(2'780)	(5'310)	(9'436)	(3'362)	(3'300)	(3'602)	(1'695)	(1'400)
C5424-D/E5424-C	98'300	128'400	7'900	720	1'450	730	1'320	371	132	130	142	67	55
	(44'400)	(58'100)	(3'600)	(2'750)	(5'570)	(2'780)	(5'060)	(9'436)	(3'362)	(3'300)	(3'601)	(1'703)	(1'404)
C5424-D/E5424-D	97'800	127'700	8'300	720	1'450	730	1'250	371	132	130	142	67	55
	(44'200)	(57'700)	(3'800)	(2'750)	(5'570)	(2'780)	(4'800)	(9'436)	(3'362)	(3'300)	(3'601)	(1'712)	(1'409)
C5426-B/E5426-B	110'900	140'300	8'050	720	2'030	730	1'440	396	132	130	158	63	57
	(50'200)	(63'500)	(3'700)	(2'750)	(7'790)	(2'780)	(5'520)	(10'058)	(3'362)	(3'300)	(4'020)	(1'604)	(1'460)

C5426-B/E5426-C	104'100	139'300	8'450	720	2'030	730	1'370	396	132	130	158	63	58
	(47'100)	(63'000)	(3'900)	(2'750)	(7'790)	(2'780)	(5'250)	(10'058)	(3'362)	(3'300)	(4'019)	(1'610)	(1'467)
C5426-B/E5426-D	103'700	138'100	8'900	720	2'030	730	1'300	396	132	130	158	64	58
	(46'900)	(62'500)	(4'100)	(2'750)	(7'790)	(2'780)	(4'970)	(10'058)	(3'362)	(3'300)	(4'019)	(1'616)	(1'471)
C5426-C/E5426-B	103'700	138'300	8'050	720	1'900	730	1'440	396	132	130	158	63	58
	(46'900)	(62'600)	(3'700)	(2'750)	(7'290)	(2'780)	(5'520)	(10'058)	(3'362)	(3'300)	(4'019)	(1'591)	(1'464)
C5426-C/E5426-C	103'200	137'300	8'450	720	1'900	730	1'370	396	132	130	158	63	58
	(46'700)	(62'100)	(3'900)	(2'750)	(7'290)	(2'780)	(5'250)	(10'058)	(3'362)	(3'300)	(4'019)	(1'597)	(1'471)
C5426-C/E5426-D	102'800	136'200	8'900	720	1'900	730	1'300	396	132	130	158	63	58
	(46'500)	(61'600)	(4'100)	(2'750)	(7'290)	(2'780)	(4'970)	(10'058)	(3'362)	(3'300)	(4'019)	(1'604)	(1'474)
C5426-D/E5426-B	102'900	135'500	8'050	720	1'770	730	1'440	396	132	130	158	62	58
	(46'500)	(61'300)	(3'700)	(2'750)	(6'780)	(2'780)	(5'520)	(10'058)	(3'362)	(3'300)	(4'019)	(1'573)	(1'471)
C5426-D/E5426-C	102'500	134'400	8'450	720	1'770	730	1'370	396	132	130	158	62	58
	(46'300)	(60'800)	(3'900)	(2'750)	(6'780)	(2'780)	(5'250)	(10'058)	(3'362)	(3'300)	(4'018)	(1'579)	(1'478)
C5426-D/E5426-D	102'000	133'700	8'900	720	1'770	730	1'300	396	132	130	158	62	58
	(46'100)	(60'500)	(4'100)	(2'750)	(6'780)	(2'780)	(4'970)	(10'058)	(3'362)	(3'300)	(4'018)	(1'585)	(1'482)

Notes:

1. Drawings and data included in this section are for rough layout purposes only. Detailed certified drawings, as **.**pdf or **.**dwg files, are available from the local Daikin sales office. Do not use catalog drawings for final construction
2. These data are for reference only and do not include options (like different tube type) Certified drawing will show data for the specific unit.
3. Obtain specific unit certified drawings for detailed dimensions of water, and relief valve connections.

Lubrication System

Emkarate RL68H Polyolester Oil must be used in the centrifugal two-stage compressor. The nominal oil charge for K compressor is 22 gallons.

An internal oil sump is part of the compressor and contains a 750 W submersible fixed-speed oil pump and a 1.0 kW immersion-type oil heater that is thermostatically controlled. A pre/adjusted oil pressure regulator valve located in the pump discharge line controls the proper oil pressure to all bearings, gears, and rotating parts. The oil pump operates prior to start-up and continuously operates during the chiller operation and coast down.

⚠ CAUTION

When the oil pump operates without any oil or with an insufficient amount of oil, it might cause vibration and become extremely noisy and pump damage can occur.

Oil is filtered by an externally mounted 10 micron replaceable cartridge oil filter and is cooled via refrigerant-cooled oil cooler. Sub-cooled refrigerant liquid is provided by a pressure differential between the condenser and evaporator to the oil cooler. The supply flow of refrigerant to the oil cooler is regulated with a thermal expansion valve, by monitoring the temperature of oil coming out of the oil cooler. Refrigerant leaving the oil cooler is then returned back to the evaporator.

The refrigerant and oil side of the oil cooler are provided with service valves for isolation during service.

⚠ WARNING

Comply with local regulations when removing or disposing of refrigerant system oil.

An eductor-based oil recovery system is part of the chiller circuit. It returns oil-rich refrigerant from the evaporator to the oil sump for separation and reduces or eliminates oil contamination in the evaporator. A filter drier is installed at the inlet of the eductor.

Both the oil lubrication piping and oil cooler refrigerant piping are completely factory-installed, thus eliminating the need for any field piping.

Relief Valves

As a safety precaution and to meet applicable pressure vessel code requirements, each chiller is equipped with spring-loaded pressure relief valves for the purpose of relieving excessive refrigerant pressure (caused by equipment malfunction, fire, etc.) as noted on the pressure vessel name plate. The relief valve should be replaced with a new one whenever such a release occurs.

Table 4, Relief Valve Data per Evaporator Circuit

(sized for combined economizer and evaporator)

Evaporator Code	Pressure Setting	Min. Required Discharge Capacity (lb-air/min)
E4824	200 psi	98
E4826	200 psi	105
E5424	200 psi	108
E5426	200 psi	115

Note : Calculations based on using an economizer nominal 30 in OD and 64 in Long

Table 5, Relief Valve Data per Condenser Circuit

Condenser Code	Pressure Setting	Min. Required Discharge Capacity (lb-air/min)
C4224	200 psi	67
C4226	200 psi	72
C4824	200 psi	77
C4826	200 psi	83
C5424	200 psi	86
C5426	200 psi	94

Refrigerant Vent Piping

Codes require that relief valves be vented to the outside of a building, and this is a desirable practice for all installations. Relief piping connections to the relief valves must have flexible connectors to minimize strain, as well as vertical drop legs to retain condensation.

Remove plastic shipping plugs (if installed) from the inside of the valves prior to making pipe connections. Whenever vent piping is installed, the lines must be run in accordance with local code requirements. Where local codes do not apply, follow the latest issue of ANSI/ASHRAE Standard 15 code recommendations.

Single Vent Line per Relief Valve

WCT units have relief valve settings of 200 psig and resultant valve discharge capacities of 75.5 lbm air/min. Using the formulas in ASHRAE Standard 15 defines the maximum length of discharge vent piping downstream of the pressure relief valve in Table 6.

The ASHRAE 15 User's Manual provides that, when the length of vent pipe exceeds approximately 220 diameters (Equivalent Length / Inside Diameter > 220), use $0.7848*(L)^{0.2}$ (this equation is only true for relief valve setting of 200 psig, relief valve discharge capacity of 75.5 lbm air/min and average friction factor of 0.02) in order to compute the approximate internal diameter of the relief valve discharge line if this diameter is constant for the entire length of pipe. Then compare the calculated internal diameter size to the values in Table 6, and select a pipe having an inside diameter equivalent or bigger than the required internal diameter using standard schedule 40 pipe.

***Table 6*, Maximum Lengths of vent piping per relief valve vented to atmosphere**.

Relief Valve Pressure Setting = 200 psig							
Rated Relief Valve Capacity = 75.5 lbm air/ min							
Nominal Pipe Size (in)	**1-1/4**	**1-1/2**	**2**	**2.5**	**3**	**4**	**5**
(I.D.) Internal Diameter of Pipe for Sch. 40(Note 2) (in)	1.380	1.610	2.067	2.469	3.068	4.026	5.047
(L) Equivalent Length of Discharge Piping (ft)	4	21	113	313	1,021	4,308	14,113

Notes:

1) This table is to be used only as a guideline for estimating and is subject to changes made in Standard ASHRAE 15 or overriding local code.

2) Sch 40 Pipe size used for an example only.

Common Header Vent Line

When valves are piped together, the common piping must follow the rules according to ASHRAE Standard 15. The minimum line size of a common header application is based on the ***sum of the relief valve discharge areas and the sum of the rated discharge capacities.*** The discharge from more than one relief valve can be run into a common header, the area of which cannot be less than the sum of the areas of the connected pipes. First, sum the discharge areas of the relief valves using actual I.D. values from Table 6 for Sch. 40 pipe :

Min. Common Header Diam (in) = $(ID_1^2 + ID_2^2 + ID_3^2 + ID_4^2 + \ldots\ldots + ID_n^2)^{1/2}$

Compare the calculated min. common header diameter to the internal diameter values in Table 6 and choose the minimum size which meets or exceeds the sum of the relief valve discharge areas.

For example, if for E5426/C5426 the min. common header diameter is 2.90 inches. From Table we see that 3" pipe (3.068" I.D.) is the minimum size which meets or exceeds the sum of the relief valve discharge areas.

Next, sum of the rated discharge capacities (Cr) to determine required flow capacity.

Total Flow Capacity (lbm air / min) = $Cr_1 + Cr_2 + Cr_3 + \ldots\ldots\ldots Cr_n$

For example, if E5426/C5426 has the total flow capacity 604 lbm air/min then for this capacity use $1.803*(L)^{0.2}$ (this equation is only true for relief valve setting of 200 psig, relief valve discharge capacity of 75.5 lbm air/min and average friction factor of 0.02) in order to compute the approximate required diameter of the common header diameter if this diameter is constant for the entire length of pipe for a required length (L) of the Sch 40 piping.

"L" Represents the distance in feet from the relief valves where they are vented to atmosphere.

Finally, select a pipe I.D. from Table 6 equivalent or bigger than the required diameter. If the result is bigger than 3" pipe which was the result for the common header diameter above then use the bigger diameter pipe.

The above information is a guide only. Consult local codes and/or latest version of ASHRAE Standard 15 for sizing data.

Pumpdown

To facilitate compressor service, all Daikin centrifugal chillers are designed to permit pumpdown and isolation of the entire refrigerant charge in the unit's condenser. In no case would a combination of evaporator and condenser sizes require more refrigerant than the pumpdown capacity of the condenser. There is a factory-installed check valve in the compressor discharge line leading to the condenser and a liquid line valve in the condenser refrigerant outlet liquid line, to allow isolation and storage of the refrigerant charge in the condenser for servicing for the compressor, economizer, and evaporator. This feature eliminates extra labor, time and the usage of remote storage vessels. Any tubing lines connected to the condenser should also be isolated by closing off the factory provided service angle valves only after the compressor shuts off as a result of pumping down.

Electrical

Wiring and Conduit

Wire sizes must comply with local and state electrical codes. Where total amperes require larger conductors than a single conduit would permit, limited by dimensions of motor terminal box, two or more conduits can be used. Where multiple conduits are used, all three phases must be balanced in each conduit. Failure to balance each conduit will result in excessive heating of the conductors and unbalanced voltage.

An interposing relay can be required on remote mounted starter applications when the length of the conductors run between the chiller and starter is excessive.

Use rated conductors for equipment rated over 2000 volts, 90°C or 105°C.

Power Wiring

⚠ WARNING

Only qualified and licensed electricians should perform wiring. Shock hazard exists.

⚠ CAUTION

Voltage unbalance is not to exceed 2% with a resultant current unbalance of 6 to 10 times the voltage unbalance per NEMA MG-1, 1998 Standard. Failure to comply can cause extensive equipment damage.

Wiring, fuse and wire size (must be in accordance with the National Electric Code (NEC). Standard NEMA motor starters require modification to meet Daikin specifications. Refer to Daikin Specification R35999901.

Power wiring to compressors must be in proper phase sequence. Motor rotation is set up for clockwise rotation facing the motor end with phase sequence of U-V-W or 1-2-3. Care must be taken that the proper phase sequence is carried through the starter to compressor.

The start-up technician will verify the phase sequence.

⚠ NOTE

Connections to terminals must be made with copper lugs and copper wire.

Care must be taken when attaching leads to compressor terminals.

Use only copper supply wires with ampacity based on 75°C conductor rating. (Exception: for equipment rated over 2000 volts. use 90°C or 105°C rated conductors).

Note:! Do not make final connections to motor terminals until wiring has been checked and approved by the authorized startup technician.

⚠ CAUTION

Under no circumstances should a compressor be brought up to speed unless proper sequence and rotation have been established. Serious damage can result if the compressor starts in the wrong direction. Such damage is not covered by product warranty.

Motor Terminal Insulation above 600 Volts

It is the installing contractor's responsibility to insulate the compressor motor terminals when the unit voltage is 600 volts or greater. This is to be done after the Daikin start-up technician has checked for proper phase sequence and motor rotation.

Following this verification by the Daikin technician, the contractor should obtain and apply the following items on medium voltage (above 600 volts) applications.

Materials Required:

1. Loctite® brand safety solvent (12 oz. package available as Daikin part number 350A263H72)
2. 3M™ Co. Scotchfil brand electrical insulation putty (available in a 60-inch roll as Daikin part number 350A263H81)
3. 3M Co. Scotchkote™ brand electrical coating (available in a 15 oz. can with brush as Daikin Part Number 350A263H16)
4. Vinyl plastic electrical tape

The above items are available at most electrical supply outlets.

Application Procedure:

1. Disconnect and lock out the power source to the compressor motor.
2. Using the safety solvent, clean the motor terminals, motor barrel adjacent to the terminals, lead lugs, and electrical cables within the terminal box to remove all dirt, grime, moisture and oil.
3. Wrap the terminal with Scotchfil putty, filling in all irregularities. The final result should be smooth and cylindrical.
4. Doing one terminal at a time, brush the Scotchkote coating on the motor barrel to a distance of up to 2" around the terminal and on the wrapped terminal, the rubber insulation next to the terminal, and the lug and cable for approximately 10". Wrap additional Scotchfil insulation over the Scotchkote coating.
5. Tape the entire wrapped length with electrical tape to form a protective jacket.
6. Finally, brush on one more coat of Scotchkote coating to provide an extra moisture barrier.

Control Power Wiring

The control circuit on the Daikin centrifugal packaged chiller requires 220VAC 3-phase (200-240VAC). Control power can be supplied from three different sources:

1. A freestanding starter furnished by Daikin, or the customer to Daikin specifications, will have a control transformer in it requiring field wiring to terminals in the control box.
2. Power can be supplied from separate circuits and fused at 20 amps inductive load. The control circuit disconnect switch must be tagged to prevent current interruption. Other than for service work, the switch is to remain on at all times in order to keep oil heaters operative and prevent refrigerant from diluting in oil**.**

⚠ DANGER

If a separate control power source is used, the following must be done to avoid severe personal injury or death from electrical shock:
Place a notice on the unit that multiple power sources are connected to the unit.
Place a notice on the main and control power disconnects that additional sources of power to the unit exist

In the event a transformer supplies control voltage, it must be rated at 3 KVA, with an inrush rating of 12 KVA minimum at 80% power factor and 95% secondary voltage. For control wire sizing, refer to NEC Articles 215 and 310. In the absence of complete information to permit calculations, the voltage drop should be physically measured.

***Table 7*, Control Power Line Sizing**

MAXIMUM LENGTH, ft (m)	WIRE SIZE (AWG)	MAXIMUM LENGTH, ft (m)	WIRE SIZE (AWG)
0 (0) to 50 (15.2)	12	120 (36.6) to 200 (61.0)	6
50 (15.2) to 75 (22.9)	10	200 (61.0) to 275 (83.8)	4
75 (22.9) to 120 (36.6)	8	275 (83.8) to 350 (106.7)	3

Notes:

1. Maximum length is the distance a conductor will traverse between the control power source and the unit control panel.
2. Panel terminal connectors will accommodate up to number 10 AWG wire. Larger conductors will require an intermediate junction box.

The Unit On/Off switch located in the Unit Control Panel should be turned to the "Off" position any time compressor operation is not desired.

Flow Switches

The unit has optional factory-mounted water pressure differential switches. Water flow interlock terminals are provided on the unit control panel terminal strip for additional devices such as pump interlocks if so desired. See the Field Wiring Diagram on page 22 or on the cover of the control panel for proper connections.

System Pumps

Operation of the chilled water pump can be:

1. Cycle the pump with the compressor,
2. Operate continuously
3. Start automatically by a remote source.

The cooling tower pump must cycle with the machine. The easiest way to accomplish this is to let the chiller MicroTech III controller control the pump. The controller is programmed to start and stop the pump at the correct times. The holding coil of the cooling tower pump motor starter must be rated at 220 volts, 50/60 Hz, with a maximum volt-amperage rating of 100. A control relay is required if the voltage-amperage rating is exceeded. See the Field Wiring Diagram on page 28 or in the cover of control panel for proper connections.

All interlock contacts must be rated for no less than 10 inductive amps. The alarm circuit provided in the control center utilizes 220-volts AC. The alarm used must not draw more than 10 volt amperes.

Control Panel Switches

Three On/Off switches are located in the Control Panel, which is adjacent to the operator interface panel, and have the following function:

- UNIT shuts down the chiller through the normal shutdown cycle of unloading the compressor(s) and provides a post-lube period.
- COMPRESSOR one switch for the compressor on a unit, executes an immediate shutdown without the normal shutdown cycle.
- CIRCUIT BREAKER disconnects optional external power to system pumps and tower fans.

A fourth switch located on the front of the Control box and labeled EMERGENCY STOP SWITCH stops the compressor immediately. It is wired in series with the COMPRESSOR On/Off switch.

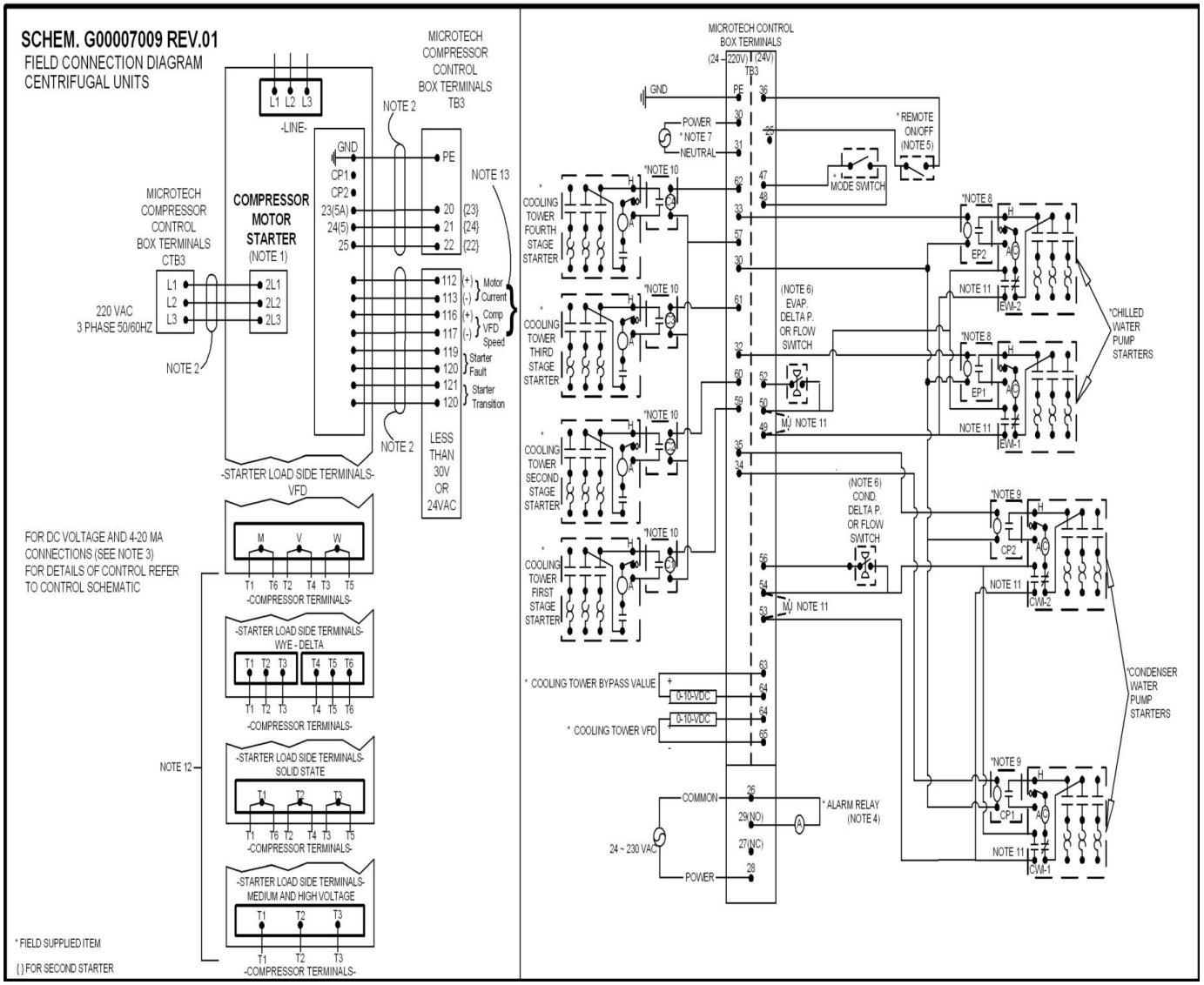
Surge Capacitors

All low voltage units (except those with solid state starters or VFDs) are supplied with standard surge capacitors to protect compressor motors from electrical damage resulting from high voltage spikes.

For free-standing starters, factory or customer supplied, the capacitors are mounted in the motor terminal box and must be connected to the motor terminals with leads less than 18 inches (460 mm) long when the motor is being wired.

Field Wiring Diagram

***Figure 8*, Field Wiring Diagram**



Wiring Diagram Notes

1. Compressor motor starters are either factory mounted and wired or shipped separate for field mounting and wiring. If provided by others starters must comply with Daikin specification 359A999. All line and load side power conductors must be copper, with ampacity based on 75°C conductor rating. (Exception: for equipment rated over 2000 volts, 90°C or 105°C rated conductors shall be used.
2. Field control wiring between the starter and the control panel is required with free-standing starters. Minimum wire size for 115 VAC to 220 VAC is 12 GA. for a maximum length of 50 feet. If greater than 50 feet refer to Daikin for recommended wire size minimum. Wire size for 24 VAC is 18 GA. All wiring to be installed as NEC class 1 wiring system. All 20 VAC wiring must be run in separate conduit from 115 VAC and 220 VAC wiring. Main power wiring between starter and motor terminal is factory installed when units are supplied with unit mounted starters. Wiring of free standing starter must be wired in accordance with NEC and connection to compressor motor terminals must be made with copper wire and copper lugs only.
3. For optional sensor wiring see unit control diagram. It is recommended that DC wires be run separately from 115 VAC to 220 VAC wiring.
4. A customer furnished 24 to 230 VAC power for alarm relay coil may be connected between TB3 terminals 28 power and 26 neutral of the control panel. For normally open contacts wire between 26 and 29, for normally closed wire between 26 and 27. The alarm is operator programmable. Maximum rating of the alarm relay coil is 25 VA.
5. Remote on/off control of unit can be accomplished by installing a set of dry contacts between terminals 36 and 25.
6. Evaporator and condenser flow switches are required. Factory mounted flow switches are standard on WCT units. Field installed flow switches must be wired as shown. If field supplied pressure differential switches are used then these must be installed across the vessel and not the pump. Paddle flow switches may also be field installed if desired.
7. Customer supplied 24 to 230 VAC 20 amp power for optional evaporator and condenser water pump control power and tower fans is supplied to unit control terminals (TB3) 30 power / 31 neutral, PE equipment ground.
8. Optional customer supplied 24-220 VAC 25 VA maximum coil rated chilled water pump relay (EP 1 and 2) may be wired as shown. This optional will cycle the chilled water pump in response to chiller demand.
9. The condenser water pump must cycle with the unit. A customer supplied 24-220 VAC 25 VA maximum coil rated condenser water pump relay (CP 1 and 2) is to be wired as shown. Units with free cooling must have condenser water above 60^{o} before starting.
10. Optional customer supplied 24-220 VAC 25 VA maximum coil rated cooling tower fan relays (C1 – C2 standard, C3 – C4 optional) may be wired as shown. This option will cycle the cooling tower fans in order to maintain unit head pressure.
11. Auxiliary 24 VAC rated contacts in both the chilled water and condenser water pump starters should be wired as shown and remove MJ.
12. For VFD, Wye-Delta, and solid state starters connected to six (6) terminal motors. The conductors between the starter and motor carry phase current and selection shall be based on 58 percent of the motor rated load amperes (RLA). Wiring of free standing starter must be in accordance with the NEC and connection to the compressor motor terminals shall be made with copper wire and copper lugs only. Main power wiring between the starter and motor terminals is factory installed when chillers are supplied with unit-mounted starters.
13. Motor current has three selectable options as follows : 0-5V/0-10V/0-20mA by build in HMI. Compressor VFD speed has two selectable options as follows : 0-10V/4-20m.

Prestart System Checklist

	Yes	No	N/A
Unit			
Visible damages to unit……	☐	☐	☐
Unit structural support adequate and level per IM……..……	☐	☐	☐
Vibration pads installed per IM……..….	☐	☐	☐
Adequate clearances for service and code requirements……..…	☐	☐	☐
Chilled Water			
Piping complete, vent drain, & gauge connections installed……	☐	☐	☐
Piping properly supported and stress free……..	☐	☐	☐
Water system flushed, filled, vented, glycol and water treatment applied necessary	☐	☐	☐
Pumps installed, (rotation checked), strainers cleaned	☐	☐	☐
Controls (3-way, face and bypass dampers, bypass valves, etc.) operable	☐	☐	☐
Water system operated and flow balanced to meet unit design requirements	☐	☐	☐
Condenser Water			
Piping complete, vent drain, & gauge connections installed, Piping properly supported and stress free.....	☐	☐	☐
Cooling tower flushed, filled and vented, water treatment complete	☐	☐	☐
Condenser water piping flushed, filled and vented	☐	☐	☐
Pumps installed, (rotation checked), strainers cleaned	☐	☐	☐
Controls (3-way, bypass valves, etc.) operable	☐	☐	☐
Water system operated and flow balanced to meet unit requirements	☐	☐	☐
Electrical			
All copper conductors connected to unit ……..	☐	☐	☐
220-volt service completed, but not connected to control panel	☐	☐	☐
Power leads connected to starter; load leads run to compressor ready for connection when service engineer is on hand for start-up ..... (Do not connect starter or compressor terminals)	☐	☐	☐
All interlock wiring complete between control panel and complies with specifications ..	☐	☐	☐
Starter complies with specifications	☐	☐	☐
Pump starters and interlock wired	☐	☐	☐
Cooling tower fans and controls wired	☐	☐	☐
Wiring complies with National Electrical Code and local codes	☐	☐	☐
Condenser pump starting relay (CWR) installed and wired	☐	☐	☐
Miscellaneous			
Relief valve piping complete	☐	☐	☐
Thermometer wells, thermometers, gauges, control wells, controls, etc., installed	☐	☐	☐
BAS control sequences, functions and settings confirmed…….....	☐	☐	☐.
Minimum system load of 80% of machine capacity available for testing and adjusting controls	☐	☐	☐

Note: The checklist must be completed and sent to the local Daikin service location two weeks prior to start.

Important information regarding the refrigerant used

This product contains fluorinated greenhouse gase. Do not vent gases into the atmosphere.

Refrigerant type: R134a
GWP[(1)] value: 1430

[(1)]GWP = global warming potential

The refrigerant quantity is indicated on the unit name plate.
Periodical inspections for refrigerant leaks may be required depending on European or local legislation. Please contact your local dealer for
more information.

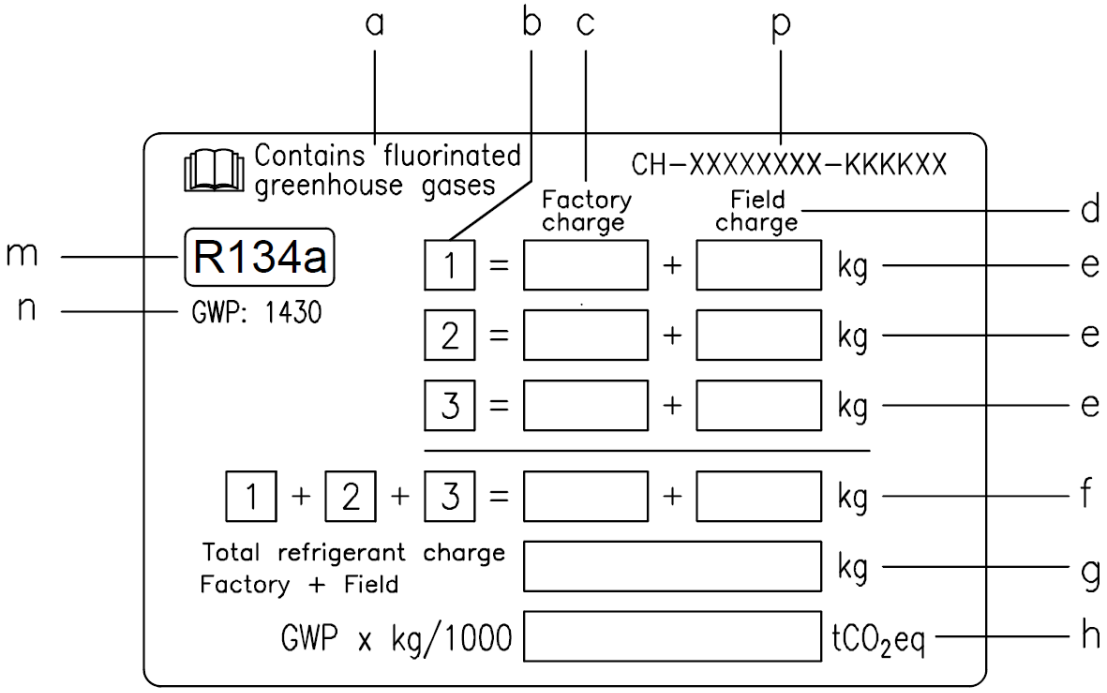
Factory and Field charged units instructions

(Important information regarding the refrigerant used)

The refrigerant system will be charged with fluorinated greenhouse gases.
Do not vent gases into the atmosphere.

1 Fill in with indelible ink the refrigerant charge label supplied with the product as following instructions:

- the refrigerant charge for each circuit (1; 2; 3)
- the total refrigerant charge (1 + 2 + 3)
- **calculate the greenhouse gas emission with the following formula**:
  GWP value of the refrigerant x Total refrigerant charge (in kg) / 1000



a Contains fluorinated greenhouse gases
b Circuit number
c Factory charge
d Field charge
e Refrigerant charge for each circuit (according to the number of circuits)
f Total refrigerant charge
g Total refrigerant charge (Factory + Field)
h **Greenhouse gas emission** of the total refrigerant charge expressed as tonnes of CO2 equivalent
m Refrigerant type
n GWP = Global Warming Potential
p Unit serial number

2 The filled out label must be adhered 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.

NOTICE

In Europe, the **greenhouse gas emission** of the total refrigerant charge in the system (expressed as tonnes CO_2 equivalent) is used to determine the maintenance intervals.
Follow the applicable legislation.

Formula to calculate the greenhouse gas emission:
GWP value of the refrigerant x Total refrigerant charge (in kg) / 1000
Use the GWP value mentioned on the greenhouse gases label. This GWP value isbased on the 4th IPCC Assessment Report. The GWP value mentioned in the manual might be outdated (i.e. based on the 3rd IPCC Assessment Report)

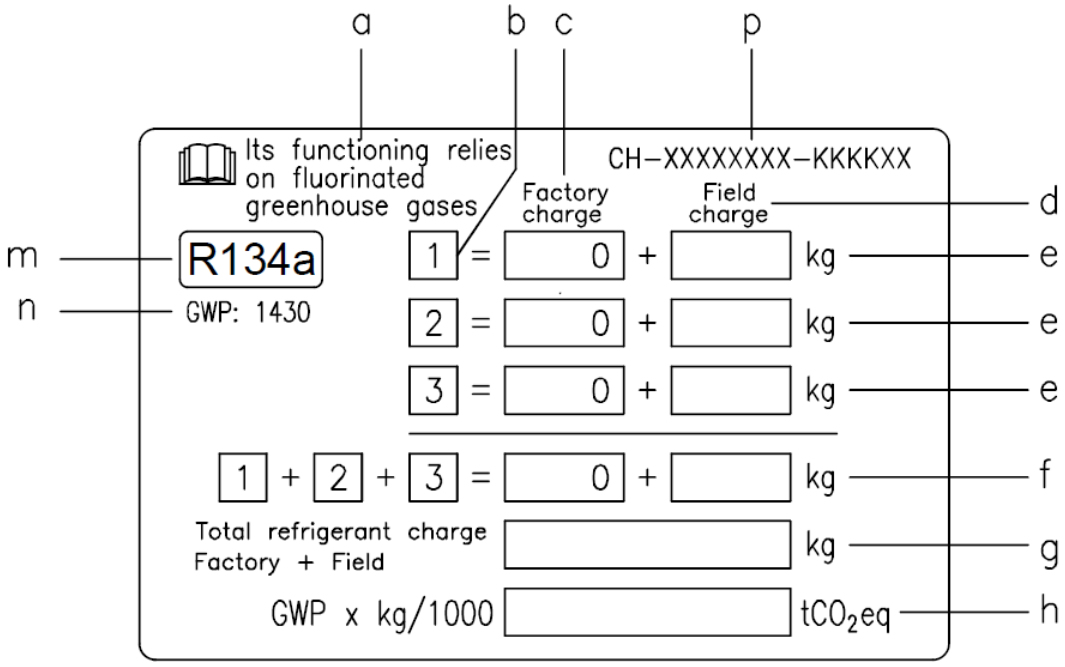
Field charged units instructions

(Important information regarding the refrigerant used)

The refrigerant system will be charged with fluorinated greenhouse gases.
Do not vent gases into the atmosphere.

1 Fill in with indelible ink the refrigerant charge label supplied with the product as following instructions:

- the refrigerant charge for each circuit (1; 2; 3)
- the total refrigerant charge (1 + 2 + 3)
- **calculate the greenhouse gas emission with the following formula**:
  GWP value of the refrigerant x Total refrigerant charge (in kg) / 1000



a Its functioning relies on fluorinated greenhouse gas
b Circuit number
c Factory charge
d Field charge
e Refrigerant charge for each circuit (according to the number of circuits)
f Total refrigerant charge
g Total refrigerant charge (Factory + Field)
h **Greenhouse gas emission** of the total refrigerant charge expressed as tonnes of CO_2 equivalent
m Refrigerant type
n GWP = Global Warming Potential
p Unit serial number

2 The filled out label must be adhered 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.

NOTICE

In Europe, the **greenhouse gas emission** of the total refrigerant charge in the system (expressed as tonnes CO_2 equivalent) is used to determine the maintenance intervals. Follow the applicable legislation.

Formula to calculate the greenhouse gas emission:
GWP value of the refrigerant x Total refrigerant charge (in kg) / 1000

Use the GWP value mentioned on the greenhouse gases label. This GWP value is based on the 4th IPCC Assessment Report. The GWP value mentioned in the manual might be outdated (i.e. based on the 3rd IPCC Assessment Report)

Disposal

The unit is made of metal and plastic parts. All these parts must be disposed of in accordance with the local regulations in terms of disposal.
Lead batteries must be collected and taken to specific refuse collection centres.

DAIKIN APPLIED EUROPE S.p.A.
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