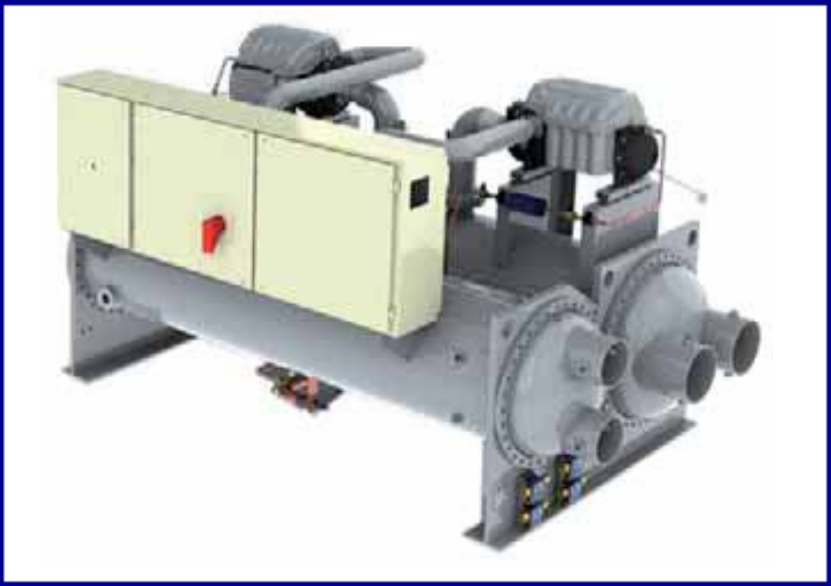
DAIKIN

technical data



Applied Systems

R-134a

Oil Free Centrifugal Chiller with Magnetic Bearings

EWWD~FZ

Index

Features and advantages

Next Generation Centrifugal

The industry's next generation of centrifugal chillers is here today with EWWD~FZ chillers. The new technology begins with centrifugal compressors utilizing frictionless magnetic bearings for oil-free operation, integral variable-frequency drives, and high-speed direct drive technology. The high efficiency compressor is matched with highly efficient heat exchangers to make an impressive chiller. The control system is based on MicroTech II® family to provide the optimum chiller control system.

Benefit Summary

- **Breakthrough energy efficiency**, especially at part load conditions, resulting in great energy savings.
- **Increased reliability** This frictionless magnetic bearing design needs no oil management system, resulting in increased reliability and reduced maintenance. With no oil to coat the heat transfer surfaces, a gain in heat exchanger efficiency can also be realized.
- **Compact design and light weight** The compressor weight of 120 kg is less than 20% of the weight of competitive compressors and approximately 50% smaller, this allows a compact unit design thus making this series the perfect choice for retrofit projects
- **Low noise level** The EWWD~FZ chiller is one of the quietest in its size range: this eliminates the need for expensive sound attenuation accessories and makes the unit ideal for every sound sensitive environments such as schools, performance halls, museums, etc.
- **Extremely low vibration levels** As a result of the high-speed design, the compressor vibration levels are extremely low, minimizing vibration that could be transmitted to the structure.
- **Smart refrigerant choice** The compressor is optimized for HFC 134a, the positive pressure refrigerant with no phase-out schedule and no ozone depletion.
- **Smart controls** Onboard digital electronics provide smart controls. The compressor is totally self-correction and incorporates a system of sophisticated self-diagnostics, monitoring and controls.

  In the event of a power failure, the compressor motor acts as a generator, providing power for the bearing control system during coast down. It also has a system to gently de-levitate the shaft.
- **Easy integration with BMS** The unit controller can be connected to BMS (Building Management System) based on the most common protocols as LONWORKS®, BACnet®, or Modbus®
- **Extensive option list** A wide portfolio of options is available to meet different requirements

Code requirements – Safety and observant of laws/directives

All EWWD~FZ units are designed and manufactured in accordance with applicable selections of the following:

Construction of pressure vessel	97/23/EC (PED)
Machinery Directive	2006/42/EC
Low Voltage	2006/95/EC
Electromagnetic Compatibility	2004/108/EC
Electrical & Safety codes	EN 60204–1 / EN 60335-2-40
Manufacturing Quality Stds	UNI – EN ISO 9001:2004

Certifications

All units manufactured are CE marked, complying with European directives in force, concerning manufacturing and safety. On request units can be produced complying with laws in force in non European countries (ASME, GOST, etc.), and with other applications, such as naval (RINA, etc.).

Versions

EWWD~FZ is available in high efficiency version:

X: High Efficiency

6 sizes to cover a range from 317 up to 1048 kW (Cooling Capacity), with EER up to 6.00 and ESEER up to 9.60.

The EER (Energy Efficiency Ratio) is the ratio of the Cooling Capacity to the Power Input of the unit. The Power Input includes: the power input for operation of the compressor, the power input of all control and safety devices.

The ESEER (European Seasonal Energy Efficiency Ratio) is a weighed formula enabling to take into account the variation of EER with the load rate and the variation of water inlet condenser temperature.

$ESEER = A \times EER_{100\%} + B \times EER_{75\%} + C \times EER_{50\%} + D \times EER_{25\%}$

	A	B	C	D
Coefficient	0.03 (3%)	0.33 (33%)	0.41 (41%)	0.23 (23%)
Condenser water inlet temperature (°C)	30	26	22	18

Noise Configuration

EWWD~FZ is available in standard noise level configuration:

S: Standard Noise

General characteristics

Cabinet and structure

The cabinet is made of galvanized steel sheet and painted to provide a high resistance to corrosion. Colour Ivory White (Munsell code 5Y7.5/1) (±RAL7044).

Frictionless Centrifugal compressor with magnetic bearings

The frictionless Centrifugal compressor with magnetic bearings and integrated VFD is an innovative compressor that allows great unit efficiency and reliability.

The compressor's one moving part (rotor shaft and impellers) is directly put in rotation by the permanent magnet direct drive motor and kept levitated by a digitally controlled magnetic bearing system; the speed of rotation reduces as the condensing temperature and/or cooling load reduces. Movable inlet guide vanes, activated by step motor, redirect gas flow into the first stage impeller during low loads, after the compressor has reached minimum speed.

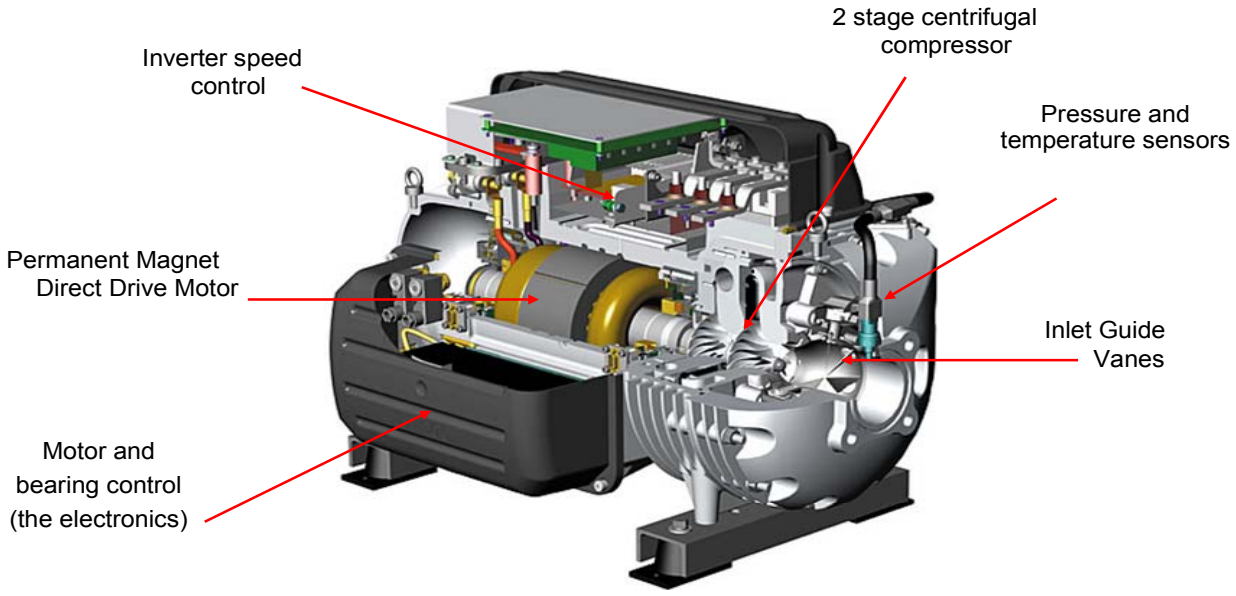


Fig.1

Motor

Variable Speed Permanent Magnet Direct Drive Motor (Fig.2), also known as 'brushless', is a synchronous motor, refrigerant cooled and fully protected with thermistors.

Permanent magnets (Fig.3), placed onto the rotor, generate the magnetic flux that is necessary to provide torque.

VFD (Variable Frequency Drive) is required to adjust, depending on the load, the speed of rotation that normally is between 18,000 and 48,000rpm.

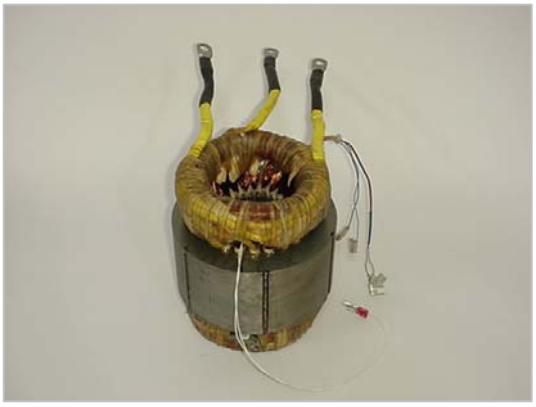


Fig.2

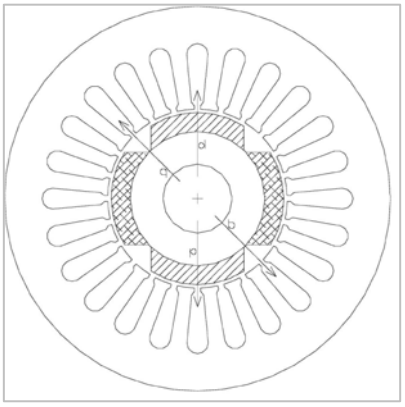


Fig.3

Magnetic bearing system

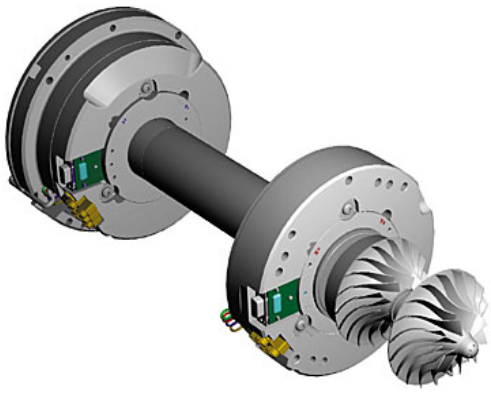


Fig.4

Fig.5

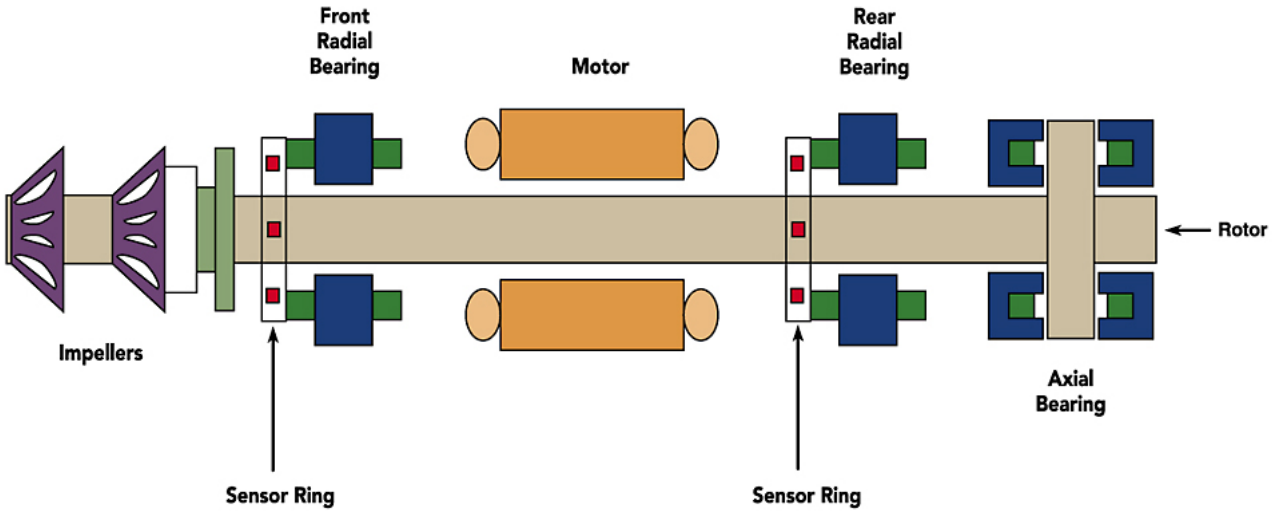


Fig.6

1. The rotor shaft's position is held by front and rear electro-magnetic cushions;
2. The shafts position is monitored with 10 sensors that send a signal to a digital controller which then sends a command to the 5 separate pulse width modulators (PWM), for a proper shaft repositioning;
3. In case of power failure, within 0.5 micro-seconds, the motor acts as a generator for the magnetic bearings and the compressor comes gradually to a complete stop; the rotor de-levitates normally unto backup bearings. Onboard capacitors have enough power to fully support the bearing system during the coast down.

The friction losses and the oil management hardware and controls associated with conventional oil-lubricated bearings are now totally eliminated.

There is no need for oil pumps, oil reservoirs, controls, starter, piping, heaters, oil coolers, oil filters, water regulating valves or oil relief valves that are needed to maintain oil quality. These devices can be a source of problems in traditional chillers, and removing them significantly increases unit reliability and reduces the maintenance.

Modern magnetic bearing technology along with the integrated VFD (variable-speed drive) enables outstanding energy efficiency, especially at partial loads, where significant gains can be realized.

The improvements in terms of efficiency and annual energy cost is maximised when there are long periods of part load operation.

Also the inrush current is strongly reduced thanks to the use of VFD, resulting in an advantageous down-sizing of electrical protection devices.

Electronics

Inbuilt sophisticated electronics (Fig.7 and 8) guarantee self-diagnostics on Motor, bearings, compressor, expansion valve, performance, events, faults,…and allow the exchange and visibility of data with the chiller controller.

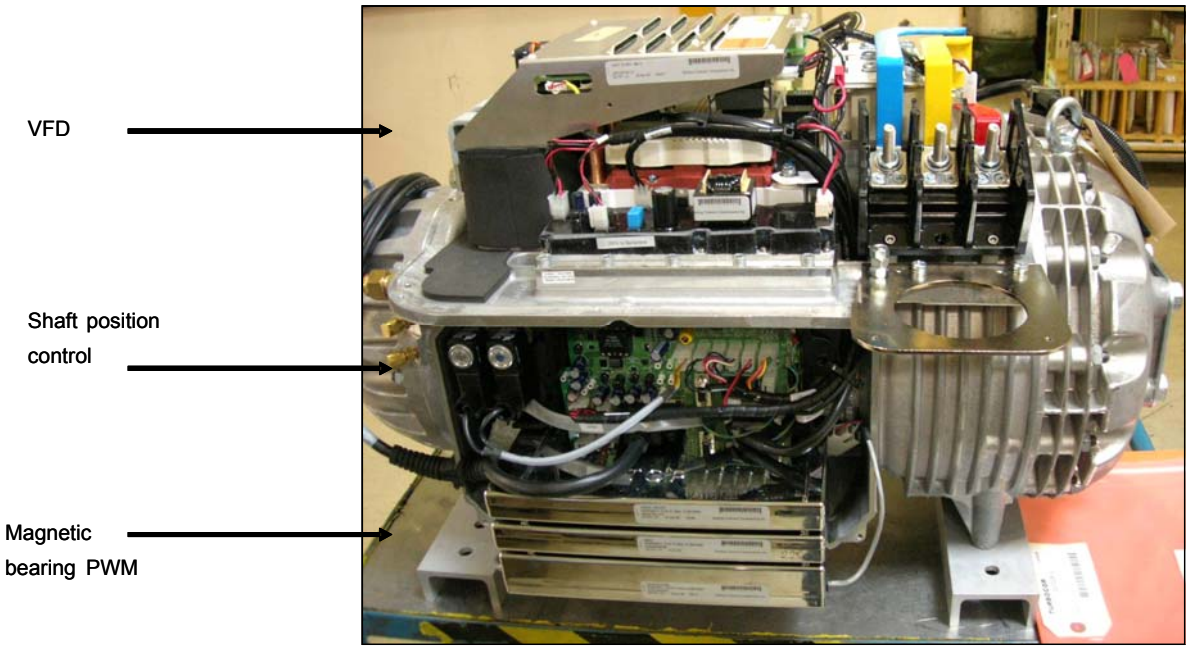


Fig. 7

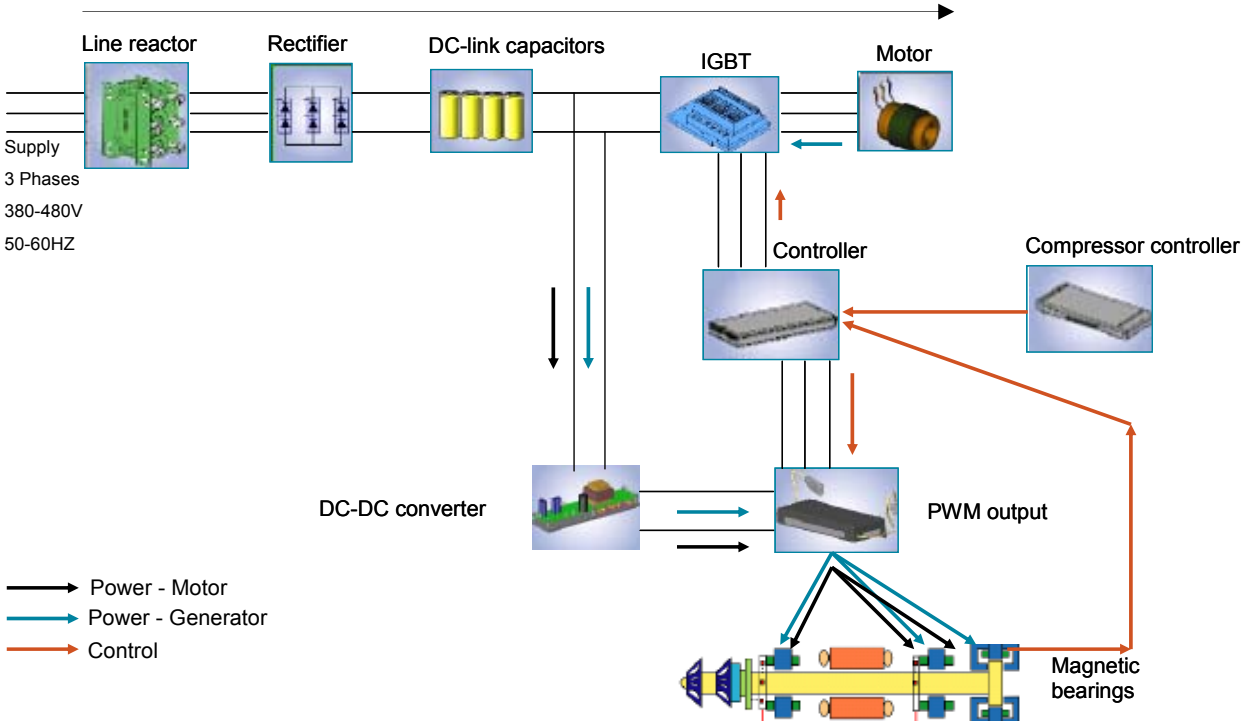


Fig. 8

Ecological HFC 134a refrigerant

The compressors have been designed to operate with R-134a, ecological refrigerant with zero ODP (Ozone Depletion Potential) and very low GWP (Global Warming Potential) that means low TEWI (Total Equivalent Warming Impact).

Evaporator

Flooded shell-and-tube evaporator operating with refrigerant in shell and water in tubes. Replaceable water tubes are fabricated from integral finned copper and mechanically bonded to steel tube sheets. The evaporator is PED designed, constructed, inspected and stamped. Water side working pressure is designed for 10,5 bar. Vessels include 1" NPT spring loaded pressure relief valves. Shell and non-connection water heads are insulated with 3/4" thick closed cell insulation. Standard configuration on water connection side is 2 passes. The evaporator water outlet connections are provided with Victaulic Kit (as standard).

Condenser

Flooded Shell-and-tube type operating with refrigerant in shell and water in tubes. Replaceable water tubes are fabricated from integral finned copper and mechanically bonded to steel tube sheets. Condenser is designed to conform PED. Water side working pressure is designed for 10.5 bar. Standard configuration on water connections side is 2 passes. The condenser water outlet connections are provided with Victaulic Kit (as standard).

Electronic expansion valve

The unit is equipped with the most advanced electronic expansion valves to achieve precise control of refrigerant mass flow. As today's system requires improved energy efficiency, tighter temperature control, wider range of operating conditions, the application of electronic expansion valves becomes mandatory. Electronic expansion valves possess unique features: short opening and closing time, high resolution, positive shut-off function to eliminate use of additional solenoid valve, continuous modulation of mass flow without stress in the refrigerant circuit and corrosion resistance stainless steel body.

Electronic Expansion Valves are typically working with lower ΔP between high and low pressure side, than a thermostatic expansion valve. The electronic expansion valve allows the system to work with within a wide operating range without any refrigerant flow problems and with perfect chilled water leaving temperature control.

Refrigerant Circuit

Each unit has 1 refrigerant circuit including:

- 1 or 2 Compressors
- Electronic expansion valve
- Evaporator
- 1 or 2 (1/compressor) safety valve on suction side
- Manometers on evaporator and condenser
- Condenser
- Safety valves on evaporator and condenser
- Water pressure differential switch on evaporator and condenser

Electrical control panel

Power and control are located in two sections of the main panel that is manufactured to ensure protection against all weather conditions. The electrical panel is IP54 and (when opening the doors) internally protected with Plexiglas panel against possible accidental contact with electrical components (IP20). The main panel is fitted with a main switch interlocked door.

Power Section

The power section includes circuit breaker, compressors inverters, control circuit transformer.

MicroTech II controller

The control system of the chiller consists of two major components: the operator interface panel and the unit control panel.

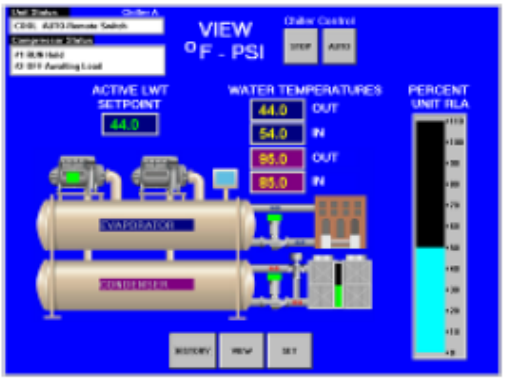


Fig.8

The touch screen panel is on an adjustable arm so that it can be positioned comfortably for the operator.
The operator interface panel has a Super VGA touch-screen, utilizing graphics to provide clear and concise information on the chiller status, alarms, trends, and setpoint adjustment. Should the touch-screen become inoperable, the unit and compressor controllers will continue uninterrupted operation of the chiller.

The control panel contains a USB port for downloading the unit's fault history, major parameter trends, and the unit operating manual that is stored in the microprocessor. These design features built into this control system optimize ease of operation, reliability, and efficient operation.

The unit's control panel is featured with the controller, which is responsible for functions involving the single compressors and the entire unit (controlling the electronic expansion valve, for instance) and is the interface point for devices and signals external to the unit.

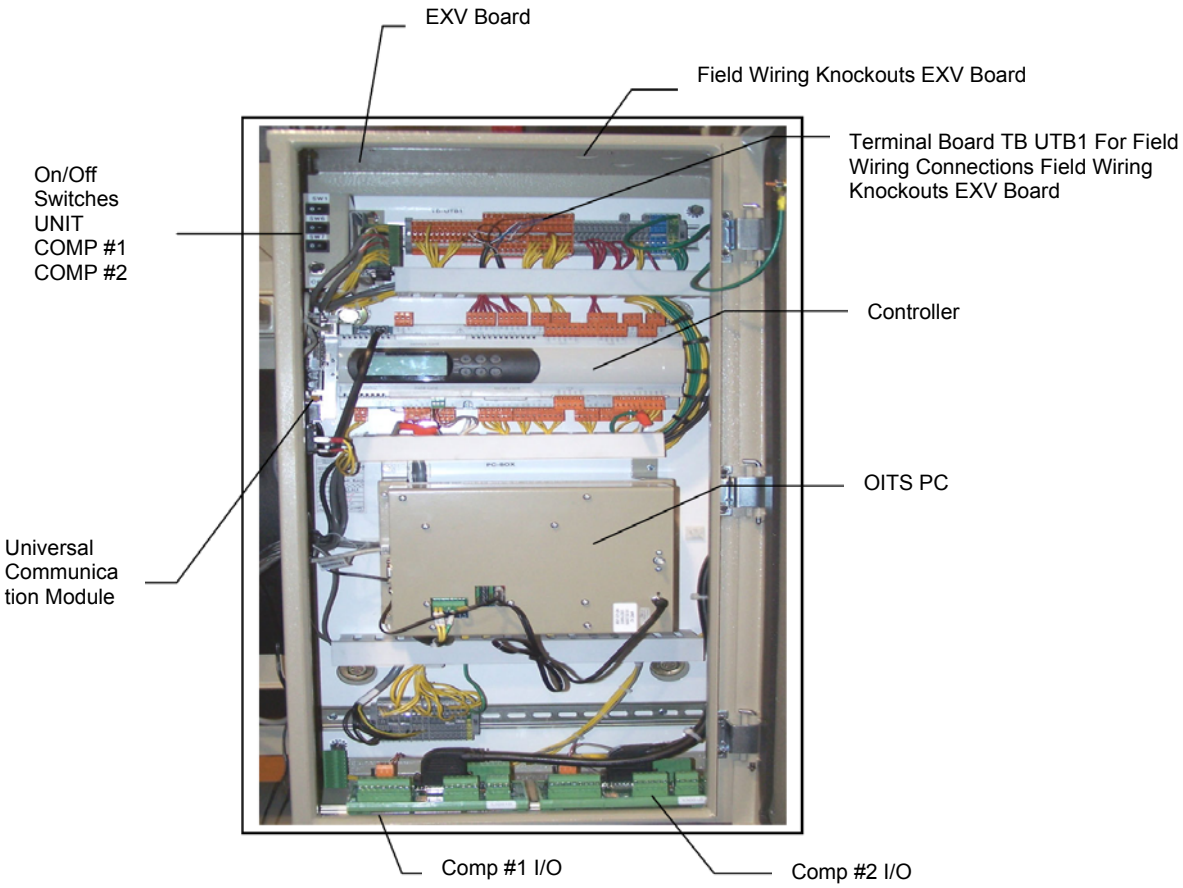


Fig. 9

Controller features and benefits

FEATURE	BENEFIT
Easy integration into Building Management System	Designer can select any BAS supplier using standard open protocols and know the MicroTech II control will interface with it.
Easy to read, adjustable, Super VGA colour touch screen operator interface	Operators can observe chiller operation at a glance and easily select various data screens and change setpoints
Historic trend data-downloadable	Water temperatures, refrigerant pressures, and motor load plots can provide valuable information for energy conservation
Precise ± 0.2 °F chilled water control	Provides stability in chilled water system
Proactive pre-shutdown correction of “unusual conditions” allows chiller to stay li	Activates alarm and modifies chiller operation to provide maximum possible cooling
Automatic control of chilled water and condenser water pumps	Integrated lead/lag and automatic engagement of backup pump
Controls up to four stages of tower fans and modulation of tower fan and/or bypass valve	Optimum integrated, efficient, control of cooling tower water based on system conditions
Twenty-five previous alarm descriptions are stored in memory	Invaluable asset in trouble shooting
Operating and maintenance manuals plus unit parts lists stored in memory	Information instantly available (downloadable) for the life of the unit.
Multiple language capability	Great asset for world-wide applications

Reliable, economic use of any chiller depends largely on an easy operator interface. That’s why operation simplicity was one of the main considerations in the development of the MicroTech II controller. The operator’s interface with the chiller is through a compact Super VGA color monitor with touch-screen capability. The operator can clearly see the entire chiller graphically displayed with the key operating parameters viewable on the screen. Pressing a single on-screen button will access the set screens where setpoints can be reviewed and changed, if necessary. Other screens, such as alarm history, are easily accessed through touch screen buttons.
By constantly monitoring chiller status, the MicroTech II controller will automatically take proactive measures to relieve abnormal conditions or shut the unit down if a fault occurs. For example, if a problem occurs in the cooling tower and discharge pressure starts to rise, the controller will automatically hold the load point and activate an alarm signal. A further rise in pressure will initiate compressor unloading in an effort to maintain the setpoint pressure and stay online. If the pressure continues to rise, the unit will shut off at the cutout pressure setting.
The MicroTech II controller's memory retains a record of faults and the time/date stamp. The controller's memory (no batteries required) can retain and display the cause of the current fault and the last twenty-five fault conditions. This method for retaining the fault is extremely useful for trouble shooting and maintaining an accurate record of unit performance and history. The controller features a two-level password security system to provide protection against unauthorized use.

The Home Screen shown in Figure 8 is usually used as the primary viewing screen. It provides real time data on unit status, water temperatures, chilled water set point and motor amp draw

Many standard features have been incorporated into MicroTech II control in order to maintain the operating economy of EWWD~FZ chillers. In addition to replacing normal relay logic circuits, the controller's energy saving capabilities are enhanced with the following features:

- Direct control of water pumps. Optically isolated, digital output relays provide automatic lead-lag of the evaporator and condenser pumps, permitting pump operation only when required.

- User-programmable compressor soft loading. Prevents excessive power draw during pull down from high unoccupied chilled water temperature conditions.

- Chilled-water reset. Accomplished directly on the unit by resetting the leaving water temperature based on the return water temperature. A remote 4-20 ma or 1-5 VDC BAS signal can also be used to reset the leaving water. Raising the chilled water setpoint during periods of light loads dramatically reduces electrical consumption.
- Demand limit control. Maximum motor current draw can be set on the panel, or can be adjusted from a remote 4-20 ma or 1-5 VDC BAS signal. This feature controls maximum demand charges during high usage periods.
- Condenser water temperature control. Capable of four stages of tower fan control plus an optional analog control of either a three-way tower-bypass valve or variable speed tower-fan motor. Stages are controlled from condenserwater temperature. The three-way valve can be controlled to a different water temperature or track the current tower stage. This allows optimum chilled water plant performance based upon specific job requirements.
- Plotting Historic Trends. Past operation of the chiller can be plotted as trend lines and even downloaded to spread sheets for evaluation - a valuable tool for optimizing efficiency.

Connection to BMS

The controller can be connected to BMS (Building Management System) based on the most common protocols as LONWORKS®, BACnet®, or Modbus®; this is possible through serial cards (not included).

Standard accessories (supplied on basic unit)

Evaporator - 2 passes configuration

Evaporator Victaulic kit – Hydraulic joint with gasket for an easy and quick water connection.

Evaporator water side design pressure 10 bar

20mm evaporator insulation

Condenser – 2 passes configuration

Condenser Victaulic kit – Hydraulic joint with gasket for an easy and quick water connection.

Condenser water side design pressure 10 bar

Electronic expansion valve

High pressure side manometers on evaporator and condneser

Water pressure differential switch on evaporator and condenser - Factory mounted, differential switch is available to detect evaporator and condenser loss of flow.

Inverter compressor starter – For low inrush current and reduced starting torque.

Double pressure relief valve with diverter

Current limit – To limit maximum absorbed current of the unit whenever is required

Hour run meter

General fault contactor

Set-point reset – The leaving water temperature set-point can be overwritten with the following options: 4-20mA from external source (by user); outside ambient temperature; evaporator water temperature Δt.

Demand limit – User can limit the load of the unit by 4-20mA signal or by network system

Alarm from external device – Microprocessor is able to receive an alarm signal from an external device (pump etc…). User can decide if this alarm signal will stop or not the unit.

Options (on request)

Evaporator 1/3 passes – availability of these configurations must be checked on the selection software

Evaporator flange kit - Evaporator flanged connections (150 psig) are available instead of the standard victaulic connections

Evaporator double flange kit

Evaporator marine water box - Evaporator can be furnished with marine water boxes with victaulic or flanged connections (on request). To save time and work marine water boxes cover can be easily removed to clean internal tubes without the disconnection of water pipes.

Evaporator water side design pressure 21 bar

Condenser 1/3 passes - availability of these configurations must be checked on the selection software

Condenser flange kit - Condenser flanged connections (150 psi) are available instead of the standard victaulic connections

Condenser double flange kit

Condenser marine water box - Evaporator can be furnished with marine water boxes with victaulic or flanged connections (on request). To save time and work marine water boxes cover can be easily removed to clean internal tubes without the disconnection of water pipes.

Condenser water side design pressure 21 bar

20mm condenser insulation

Cu-Ni 90-10 condenser tubes - To work with sea water the heat exchangers are fitted with Cu-Ni tubes and special protection inside the end covers.

Evaporator/Condenser Flow switch – Supplied separately to be wired and installed on the evaporator water piping (by the customer).

Suction line shut off valve – Installed on the suction port of the compressor to facilitate maintenance operation.

Energy Meter – This device allows to measure the energy absorbed by the chiller during its life. It is installed inside the control box mounted on a DIN rail and show on a digital display: Line-to-Line Voltage, Phase and Average Current, Active and Reactive Power, Active Energy, Frequency.

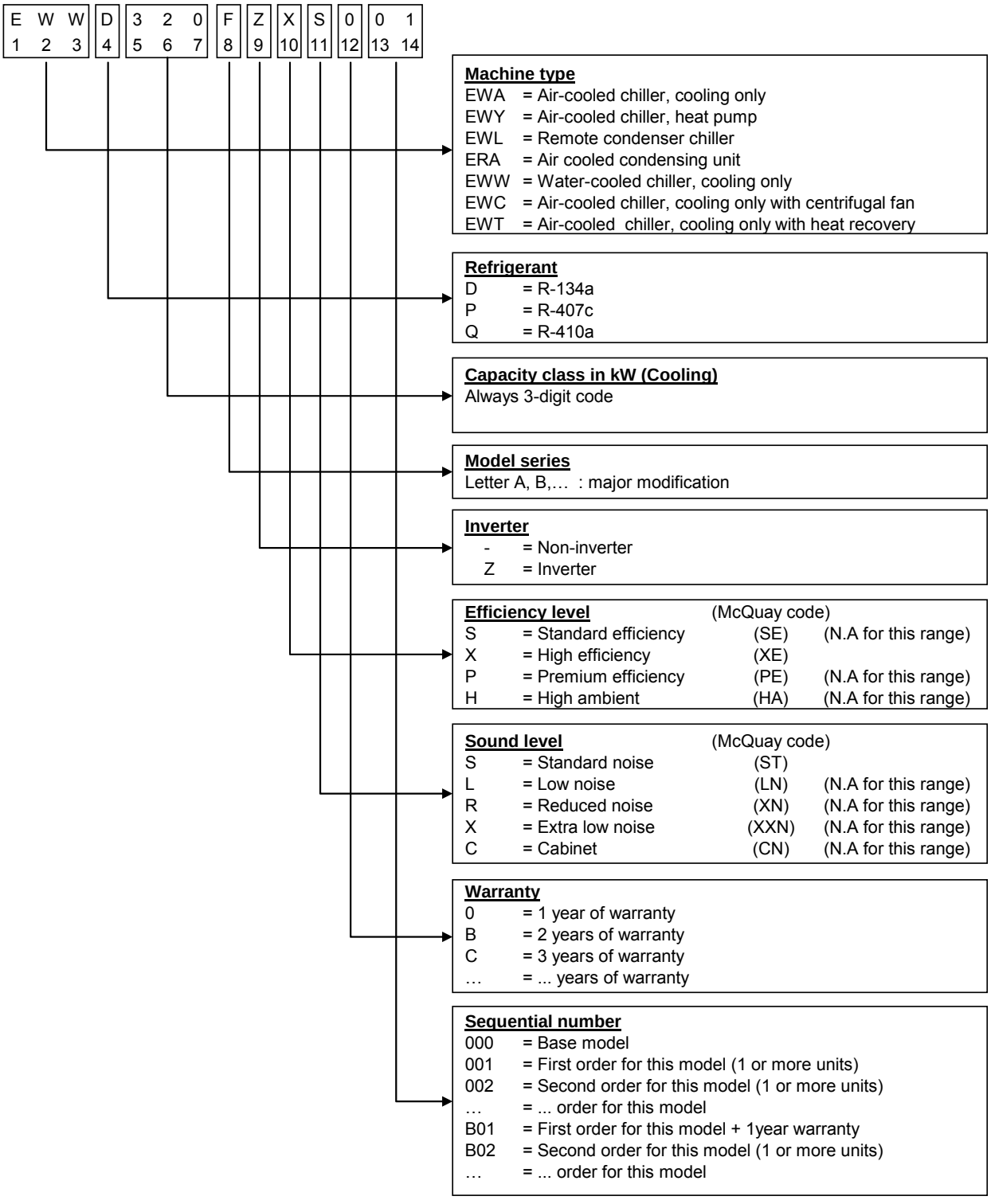
Rubber type antivibration mounts – Supplied separately, these are positioned under the base of the unit during installation. Ideal to reduce the vibrations when the unit is floor mounted.

Sound proof system - - Made of sheet metal and internally insulated, the cabinet is "integral kind" (around the whole chiller, not only around the compressors) to reach the best performance in noise reduction.

Witness test – Every unit is always tested at the test bench prior to the shipment. On request, a second test can be carried out, at customer's presence, in accordance with the procedures indicated on the test form. (Not available for units with glycol mixtures).

Acoustic test

Nomenclature



Specifications EWWD~FZ

TECHNICAL SPECIFICATIONS			EWWD~FZXS	320	430	520	640	860	C10
Cooling Capacity (1) (2)	Cooling - MIN		kW	114-317	128-429	172-521	114-635	128-856	172-1048
Capacity control	Type		---	Variable speed centrifugal compressor					
Unit power input (1) (2)	at MIN capacity		kW	21.6	27.7	33.1	21.6	27.7	33.1
	at MAX capacity		kW	65.9	85.7	104	132	171	206
EER up to (1)			---	5.40	5.40	6.00	5.40	5.50	5.90
ESEERup to (1)			---	8.60	9.40	9.40	8.80	8.60	9.60
Casing	Colour		---	Ivory White					
	Material		---	Galvanized and painted steel sheet					
Dimensions	Unit	Height	mm	1823	1823	1823	1755	1748	1794
		Width	mm	1276	1276	1276	1790	1853	1904
		Length	mm	3254	3419	3419	3441	3289	3401
Weight	Unit		kg	2360	2546	2546	3709	4095	4765
	Operating Weight		kg	2520	2812	2812	4074	4548	5330
Evaporator	Type		---	Flooded Shell&Tube (2 passes)					
	Nominal water flow rate (3)	Cooling	l/s	15.1	24.9	24.9	30.3	40.9	50.1
	Nominal Water pressure drop (3)	Cooling	kPa	30	23	23	18	21	11
	Insulation material			Closed cell					
Condenser	Type		---	Flooded Shell&Tube (2 passes)					
	Nominal water flow rate (3)	Cooling	l/s	18.3	29.9	29.9	36.7	49.1	59.9
	Nominal Water pressure drop (3)	Cooling	kPa	24	28	28	24	25	29
	Insulation material			Closed cell					
Compressor	Type		---	Oil free Centrifugal compressor with magnetic bearings					
	Quantity		No.	1	1	1	2	2	2
Sound level	Sound Power	Cooling	dB(A)	89.0	90.1	91.2	92.4	93.6	94.6
	Sound Pressure (4)	Cooling	dB(A)	70.9	72.0	73.0	73.8	75.1	75.9
Refrigerant circuit	Refrigerant type		---	R-134a	R-134a	R-134a	R-134a	R-134a	R-134a
	Refrigerant charge		kg.	210	180	180	220	300	300
	N. of circuits		No.	1	1	1	1	1	1
Piping connections	Evaporator water inlet/outlet		mm	168.3	219.1	219.1	219.1	219.1	273.0
	Condenser water inlet/outlet		mm	168.3	168.3	168.3	219.1	219.1	219.1
Safety devices	Low suction and high discharge pressure								
	Surge high motor temperature								
	Low motor current								
	Starter fault								
	Sensor fault								
	Evaporator - Condenser water flow loss								
Notes (1)	Oil free Centrifugal chiller provide different Cooling capacity, Power input, EER, etc (at fixed evaporator and condenser water conditions) depending on the compressor speed of rotation;figures in the table are based on following standard conditions:evaporator 12/7°C; condenser 30/35°C. EER and ESEER reported in the table are the maximum at these conditions and at a specific speed. A dedicated selection tool (**EWWD~FZ Selection Software**) is available to select the units and calculate the performance at specific working conditions								
Notes (2)	For dual compressor units the minimum capacity is related to the condition with only one compressor running								
Notes (3)	Nominal water flow rate and Pressure drop values are related to maximum cooling capacity at standard conditions; values at specific working conditions can be calculated by the EWWD~FZ selection software								
Notes (4)	Sound pressure related to maximum cooling capacity at standard conditions, according to ISO3744 at 1m and free field semi spherical conditions								

ELECTRICAL SPECIFICATIONS			EWWD~FZXS	320	430	520	640	860	C10
Power Supply	Phase		---	3	3	3	3	3	3
	Frequency		Hz	50	50	50	50	50	50
	Voltage		V	400	400	400	400	400	400
	Voltage Tolerance	Minimum	%	-10%	-10%	-10%	-10%	-10%	-10%
		Maximum	%	+10%	+10%	+10%	+10%	+10%	+10%
Unit	Maximum starting current		A	135	176	176	270	420	352
	Nominal running current		A	104	168	168	207	285	335
	Maximum running current		A	135	176	176	270	420	352
	Maximum current for wires sizing		A	149	194	194	297	462	385
Compressor	Phase		No.	3	3	3	3	3	3
	Voltage		V	400	400	400	400	400	400
	Voltage Tolerance	Minimum	%	-10%	-10%	-10%	-10%	-10%	-10%
		Maximum	%	+10%	+10%	+10%	+10%	+10%	+10%
	Maximum running current		A	135	176	176	135+135	210+210	176+176
	Starting method		---	VFD					

Notes	
	Allowed voltage tolerance ± 10%. Voltage unbalance between phases must be within ± 3%.
	Maximum starting current: starting current of biggest compressor + current of the compressor at 75% maximum load
	Nominal current in cooling mode is referred to the following conditions: evaporator 12/7°C; condenser 30/35°C
	Maximum running current is based on max compressor absorbed current in its envelope
	Maximum unit current for wires sizing is based on minimum allowed voltage
	Maximum current for wires sizing: compressors full load ampere x 1,1.

Sound Levels

EWWD~FZ

Unit size	Sound pressure level at 1 m from the unit in semispheric free field (rif. 2 x 10^{-5} Pa)									Power
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)	dB(A)
320	38.7	50.1	55.6	58.8	64.5	62.7	63.6	66.6	**70.9**	**89.0**
430	39.2	50.6	57.0	59.8	66.0	63.5	64.7	67.9	**72.0**	**90.1**
520	39.7	51.7	57.7	61.1	66.8	64.6	66.1	68.5	**73.0**	**91.2**
640	41.7	53.0	58.6	61.8	67.4	65.8	66.4	69.6	**73.8**	**92.4**
860	42.2	53.6	60.0	62.9	69.1	66.4	67.9	71.0	**75.1**	**93.6**
C10	42.7	54.9	60.7	63.9	69.8	67.5	69.1	71.3	**75.9**	**94.6**

Figures in the table are related to standard working conditions (evaporator water 12/7°C and condenser water 30/35°C) and maximum cooling capacity

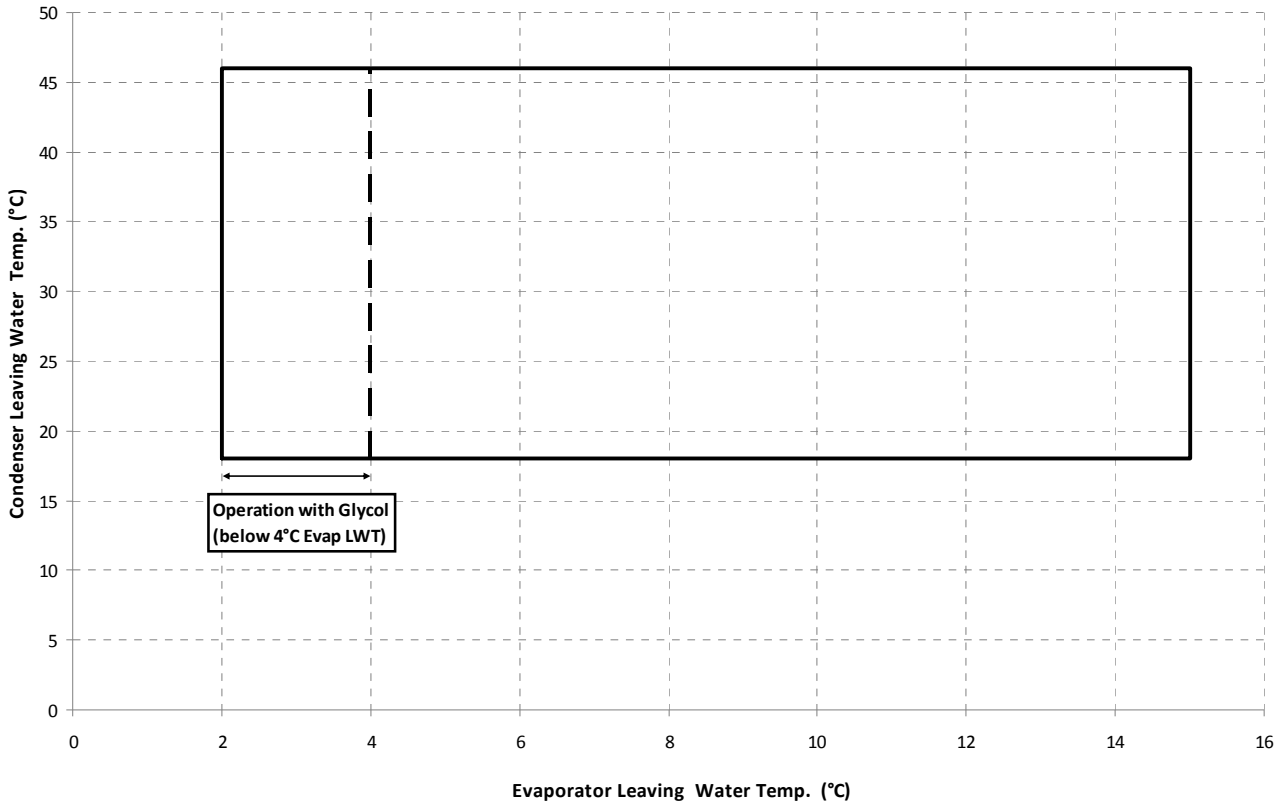
Sound pressure level correction for different distances

Unit size	Distance						
	1m	5m	10m	15m	20m	25m	50m
320	0.0	-8.7	-13.7	-16.9	-19.2	-21.1	-26.9
430	0.0	-8.7	-13.8	-17.0	-19.3	-21.1	-26.9
520	0.0	-8.7	-13.7	-16.9	-19.2	-21.0	-26.8
640	0.0	-8.4	-13.4	-16.6	-18.9	-20.7	-26.5
860	0.0	-8.5	-13.5	-16.6	-18.9	-20.7	-26.5
C10	0.0	-8.4	-13.4	-16.5	-18.8	-20.6	-26.4

Reduction to be applied to standard sound levels

Operating limits

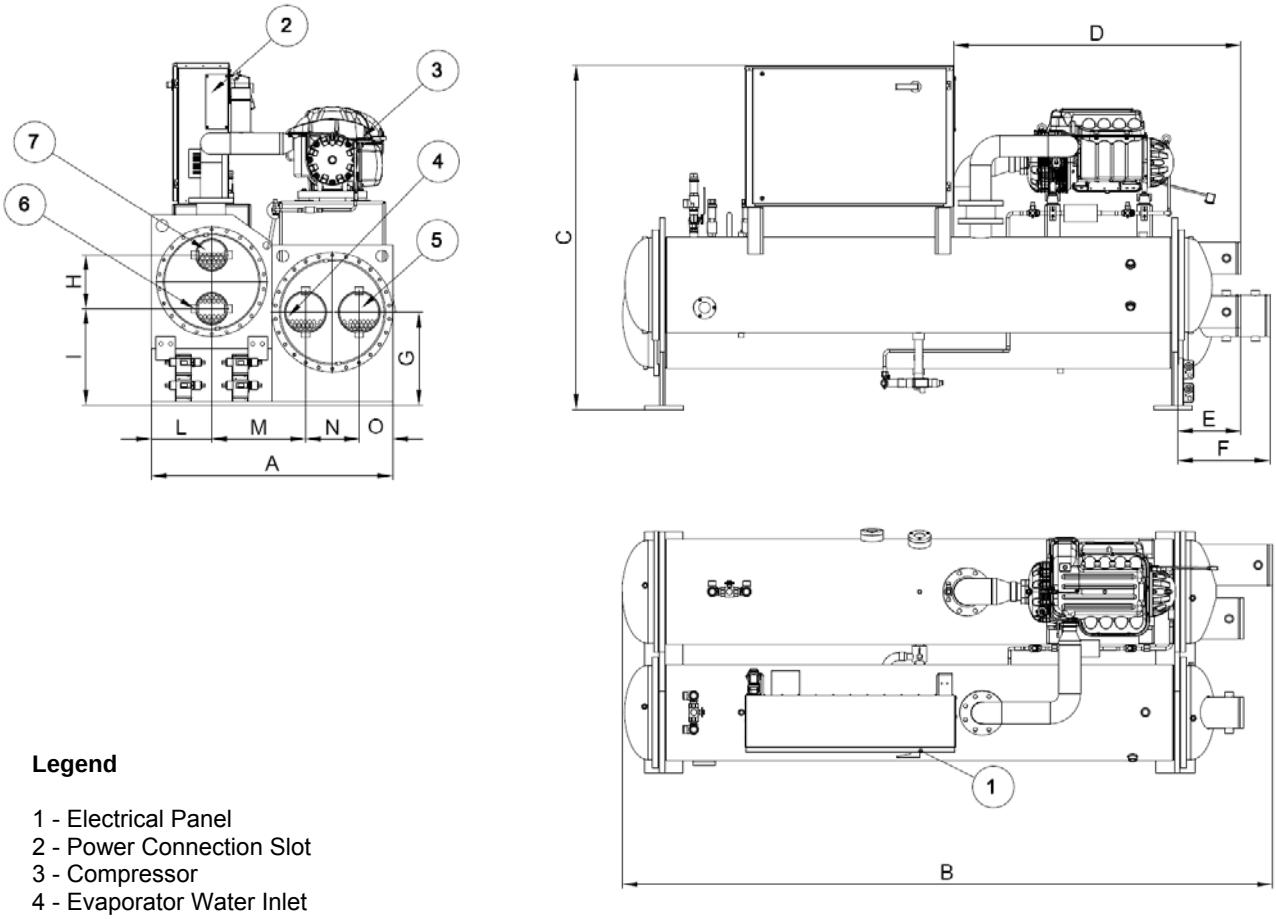
EWWD~FZ



Above diagram is indicative: for the operating limits of the specific models please refer to the unit selection software.

Notes:
The operation with Glycol influences the unit performance: the unit selection software is able to adjust the calculations keeping this into account

Dimensions EWWD~FZ

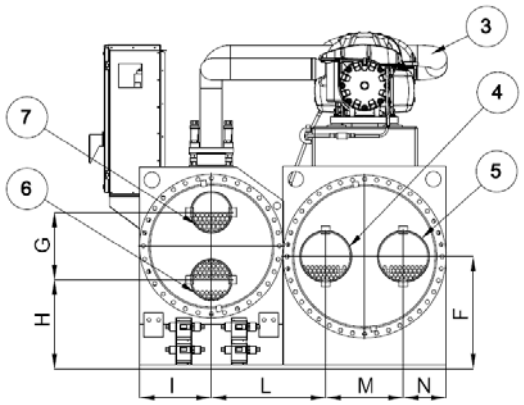


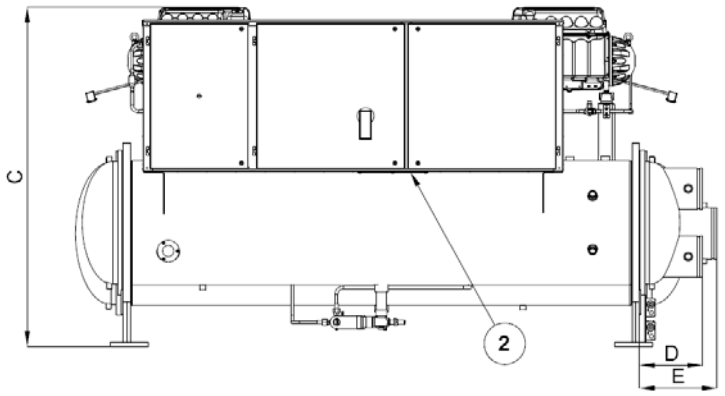
Legend

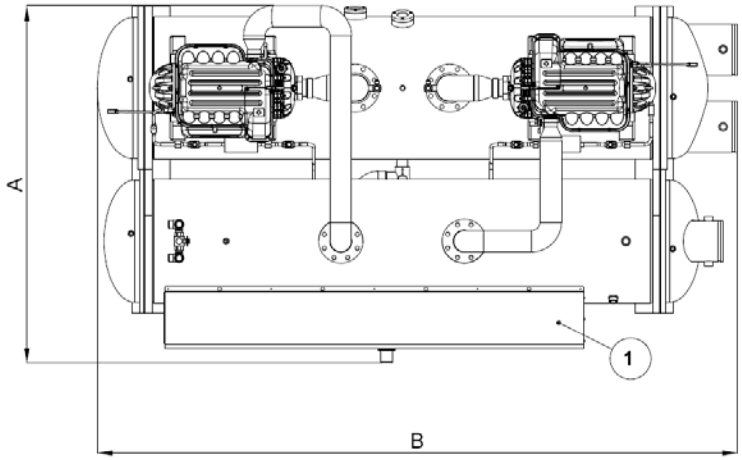
1 - Electrical Panel
2 - Power Connection Slot
3 - Compressor
4 - Evaporator Water Inlet
5 - Evaporator Water Outlet
6 - Condenser Water Inlet
7 - Condenser Water Outlet

EWWD~FZ	Dimensions												
	A	B	C	D	E (1)	F (2)	G	H	I	L	M	N	O
320	1276	3254	1822	1518	334	334	496	286	515	319	495	286	176
430	1276	3254	1822	1518	334	334	496	286	515	319	495	286	176
520	1276	3419	1822	1518	334	487	496	286	515	319	496	284	177

(1) Condenser hydraulic connections
(2) Evaporator hydraulic connections
Note: the above drawing refers to size 520







Legend

1 - Electrical Panel
2 - Power Connection Slot
3 - Compressor
4 - Evaporator Water Inlet
5 - Evaporator Water Outlet
6 - Condenser Water Inlet
7 - Condenser Water Outlet

EWWD~ FZ	Dimensions											
	A	B	C	D (1)	E (2)	F	G	H	I	L	M	N
640	1790	3441	1755	487	334	546	284	542	319	522	360	203
860	1853	3289	1748	334	334	546	360	496	383	585	360	203
C10	1904	3401	1794	334	411	598	360	474	383	609	413	227

(1) Condenser hydraulic connections
(2) Evaporator hydraulic connections
Note: the above drawing refers to size C10

Installation notes

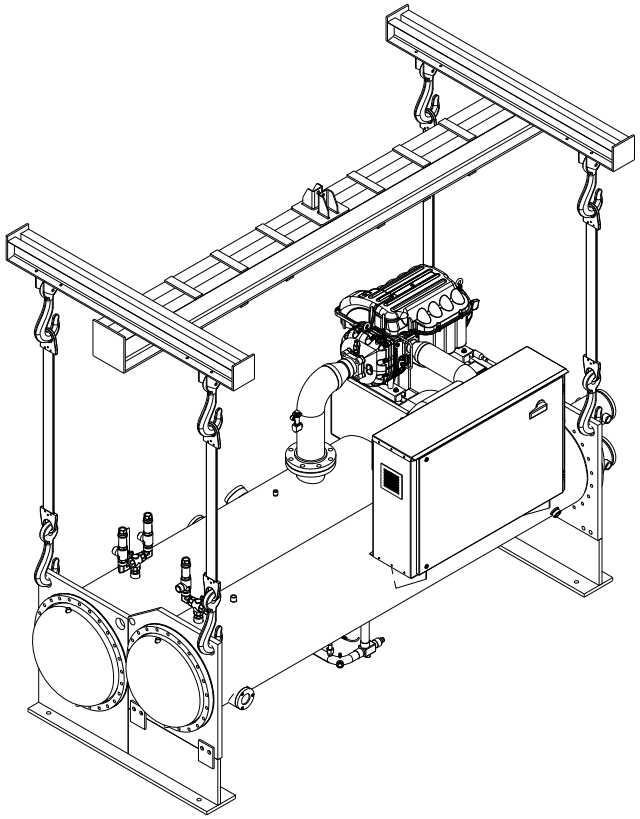
Warning

Installation and maintenance of the unit must to be performed only by qualified personnel who have knowledge with local codes and regulations, and experience with this type of equipment. Must be avoided the unit installation in places that could be considered dangerous for all the maintenance operations.

Handling

Care should be taken to avoid bumping and/or jolting during unloading from the lorry and moving the unit. Do not push or pull the machine from any part other than the base frame. Secure the machine inside the lorry to prevent it from moving and causing damage to the panels and to the base frame. Do not allow any part of the unit to fall during transportation or unloading, as this could cause serious damage.

All units of the series are supplied with lifting points marked in yellow. Only these points may be used for lifting the unit, as shown in the following figure (the picture is indicative, so lifting tools are not supplied)



Location

All units are designed for indoor installations. The machine must be installed on a robust and perfectly level foundation; should the machine be installed on balconies or roofs, it might be necessary to use weight distribution beams.

For installation on the ground, a strong cement base that is at least 250 mm wider and longer than the machine must be prepared. Also, this base must be strong enough to support the weight of the machine as stated in the technical specifications.

If the machine is installed in places that are easily accessible to people and animals, it is advisable to install protection gratings for the compressor section.

To ensure the best possible 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 vibration as much as possible.

• The water in the system must be particularly clean and all traces of oil or rust must be removed. A mechanical water filter must be installed on the machine's inlet piping.

Space requirements

Every side of the machine must be accessible for all post-installation maintenance activities.

In particular, service clearance has to be provided at one end of the unit for possible removal of evaporator and/or condenser tubes. Evaporator and condenser tubes are rolled into the tube sheets to permit replacement if necessary; the length of the vessel must be allowed at one end (doors or removable wall sections can be utilized). Keep a free space to allow the opening of electrical panel doors. Minimum clearance at all sides, including the top, is (1 meter); local regulation may require larger clearance.

The above recommended information are representative of general installation. A specific evaluation should be done by contractor depending on the case.

Technical Specification for Oil Free Centrifugal Water Cooled Chiller

GENERAL

The Oil free Centrifugal water cooled chiller will be designed and manufactured in accordance with following European directives:

Construction of pressure vessel	97/23/EC (PED)
Machinery Directive	2006/42/EC
Low Voltage	2006/95/EC
Electromagnetic Compatibility	2004/108/EC
Electrical & Safety codes	EN 60204–1 / EN 60335-2-40
Manufacturing Quality Stds	UNI – EN ISO 9001:2004

The unit will be tested at full load in the factory at the nominal working conditions and water temperatures. Before shipment a full test will be held to avoid any losses.

Chiller will be delivered to the job site completely assembled and charged with right refrigerant.

Comply with the manufacturer instructions for rigging and handling equipment.

The unit will be able to start up and operate as standard at full load and condenser entering fluid temperature from …. °C to …. °C with an evaporator leaving fluid temperature between …. °C and ….. °C

REFRIGERANT

Only HFC 134a will be accepted.

PERFORMANCE

- ✓ Number of Oil free Centrifugal water cooled chiller: .....
- ✓ Cooling capacity for single Oil free Centrifugal water cooled chiller: ..... kW
- ✓ Power input for single Oil free Centrifugal water cooled chiller in cooling mode: ..... kW
- ✓ Flooded Shell & tube evaporator entering water temperature in cooling mode: ..... °C
- ✓ Flooded Shell & tube evaporator leaving water temperature in cooling mode: ..... °C
- ✓ Flooded Shell & tube evaporator water flow: ..... l/s
- ✓ Flooded Shell & tube condenser entering water temperature in cooling mode: ..... °C
- ✓ Flooded Shell & tube condenser leaving water temperature in cooling mode: ..... °C
- ✓ Flooded Shell & tube evaporator water flow: ..... l/s
- ✓ Operating voltage range should be 400V ±10%, 3ph, 50Hz, voltage unbalance maximum 3%, without neutral conductor and shall only have one power connection point.

UNIT DESCRIPTION

Chiller shall include as standard not less than: one refrigerant circuit, Oil free Centrifugal water cooled compressors (with integrated VFD), electronic expansion device (EEXV), flooded shell & tube heat exchangers, R134a refrigerant, control system and all components necessary for safe and stable unit operation.

Chiller will be factory assembled, protected by an epoxy paint.

NOISE LEVEL AND VIBRATIONS

Sound pressure level at 1 meter distance in free field, semispheric conditions, shall not exceed ……dB(A). The sound pressure levels must be rated in accordance to ISO 3744.

DIMENSIONS

Unit dimensions shall not exceed following indications:

- ✓ unit length ..... mm
- ✓ unit width ..... mm
- ✓ unit height ..... mm

CHILLER COMPONENTS

Compressors

1. The unit shall utilize magnetic bearing, oil-free, semi-hermetic centrifugal compressors. The compressor drive train shall be capable of coming to a controlled, safe stop in the event of a power failure.
2. The motor shall be of the semi-hermetic type, of sufficient size to efficiently fulfill compressor horsepower requirements. It shall be liquid refrigerant cooled with internal thermal sensing devices in the stator windings. The motor shall be compatible with variable frequency drive operation.
3. The chiller shall be equipped with an integrated Variable Frequency Drive (VFD) to automatically regulate compressor speed in response to cooling load and the compressor pressure lift requirement. Movable inlet guide vanes and variable compressor speed, shall provide unloading. The chiller controls shall coordinate compressor speed and guide vane position to optimize chiller efficiency.
4. Each compressor circuit shall be equipped with a line reactor to help protect against incoming power surges and help reduce harmonic distortion.

Evaporator

Water side working pressure is designed for 10,5 bar. Vessels include 1" NPT spring loaded pressure relief valves. Shell and non-connection water heads are insulated with 3/4" thick closed cell insulation. Standard configuration on water connection side is 2 passes.

- ✓ The units will be equipped with a flooded shell-and-tube evaporator operating with refrigerant in shell and water in tubes. Replaceable water tubes are fabricated from integral finned copper and mechanically bonded to steel tube sheets.
- ✓ The evaporator will have 1 circuit and standard configuration on water connection side is 2 passes.
- ✓ The water connections shall be VICTAULIC type connections as standard to ensure quick mechanical disconnection between the unit and the hydronic network.
- ✓ Evaporator is manufactured in accordance to PED approval.

Condenser

- ✓ Condenser will be flooded shell-and-tube operating with refrigerant in shell and water in tubes. Replaceable water tubes are fabricated from integral finned copper and mechanically bonded to steel tube sheets.
- ✓ The units will have one condenser on the refrigerant circuit
- ✓ Standard configuration on water connection side is 2 passes.
- ✓ The water connections shall be VICTAULIC type connections as standard
- ✓ Condenser is manufactured in accordance to PED approval.

Refrigerant circuit

- ✓ The unit must have one refrigerant circuit.
- ✓ Each circuit shall include as standard: electronic expansion device piloted by unit's microprocessor control, sight glass with moisture indicator and insulated suction line.

Control panel

1. The unit shall have a microprocessor-based control system consisting of a 15-inch VGA touch-screen operator interface and a unit controller.
2. The touch-screen shall display the unit operating parameters, accept setpoint changes (multi-level password protected) and be capable of resetting faults and alarms. The following parameters shall be displayed on the home screen and also as trend curves on the trend screen:
   - Entering and leaving chilled water temperatures
   - Entering and leaving condenser water temperatures
   - Evaporator saturated refrigerant pressure
   - Condenser saturated refrigerant pressure
   - Percent of 100% speed (per compressor)
   - % of rated load amps for entire unit
3. In addition to the trended items above, all other important real-time operating parameters shall also be shown on the touch-screen. These items shall be displayed on a chiller graphic showing each component. At a minimum, the following critical areas must be monitored:
   - Compressor actual speed, maximum speed, percent speed
   - Evaporator water in and out temperatures, refrigerant pressure and temperature
   - Condenser water in and out temperatures, refrigerant pressure and temperature

- Liquid line temperature
- Chilled water setpoint
- Compressor and unit state and input and output digital and analog values

4. A fault history shall be displayed using an easy to decipher, color coded set of messages that are date and time stamped. The alarm history shall be downloadable from the unit's USB port. An operating and maintenance manual specific for the unit shall be viewable on the screen.
5. All setpoints shall be viewable and changeable (multi-level password protected) on the touch screen and include setpoint description and range of set values.
6. Automatic corrective action to reduce unnecessary cycling shall be accomplished through preemptive control of low evaporator or high discharge pressure conditions to keep the unit operating through abnormal transient conditions.
7. Optionally, the factory mounted controller(s) shall support operation on a BACnet®, Modbus® or LONWORKS® network via one of the data link / physical layers listed below as specified by the successful Building Automation System (BAS) supplier.
   - Modbus
   - BACnet MS/TP master (Clause 9)
   - BACnet IP
   - BACnet ISO 8802-3, (Ethernet)
   - LonTalk® FTT-10A. The unit controller shall be LONMARK ® certified.
8. The information communicated between the BAS and the factory mounted unit controllers shall include the reading and writing of data to allow unit monitoring, control and alarm notification as specified in the unit sequence of operation and the unit points list.
9. For chillers communicating over a LONMARK network, the corresponding LONMARK eXternal Interface File (XIF) shall be provided with the chiller submittal data.
10. All communication from the chiller unit controller as specified in the points list shall be via standard BACnet objects. Proprietary BACnet objects shall not be allowed. BACnet communications shall conform to the BACnet protocol. A BACnet Protocol Implementation Conformance Statement (PICS) shall be provided along with the unit submittal.

- ✓ Field power connection, control interlock terminals, and unit control system should be centrally located in an electric panel (IP 54). Power and starting controls should be separate from safety and operating controls in different compartments of the same panel.
- ✓ Operating and safety controls should include energy saving control; emergency stop switch; high and low pressure cut-out switch (for each refrigerant circuit); anti-freeze thermostat; cut-out switch for each compressor.
- ✓ All of the information regarding the unit will be reported on a display and with the internal built-in calendar and clock that will switch the unit ON/OFF during day time all year long.
- ✓ The following features and functions shall be included:
  - leaving water temperature reset by controlling the water temperature Δt, by a remote 4-20mA DC signal or by controlling the external ambient temperature;
  - soft load function to prevent the system from operating at full load during the chilled fluid pulldown period;
  - password protection of critical parameters of control;
  - start-to-start and stop-to-start timers to provide minimum compressor off-time with maximum motor protection;
  - communication capability with a PC or remote monitoring;
  - discharge pressure control through intelligent cycling of condenser fans;
  - lead-lag selection by manual or automatically by circuit run hours;
  - double set point for unit version;
  - scheduling via internal time clock to allow programming of a yearly start-stop schedule accommodating weekends and holidays.

Optional High Level Communications Interface

Chiller must be able to communicate to BMS (Building Management System) based on the most common protocols as:

- ModbusRTU
- LonWorks, now also based on the international 8040 Standard Chiller Profile and LonMark Technology
- BacNet BTP certifief over IP and MS/TP (class 4) (Native)
- Ethernet TCP/IP.

In Daikin, a green heart

Daikin's unique position as a manufacturer of air conditioning equipment, components and refrigerants has led it to take its commitment to environmental issues further. Several years ago Daikin launched the initiative to become a pioneer in the provision of products that have limited impact on the environment. This challenge demands the eco design and development of a wide range of products and an energy intelligent system, resulting in energy conservation and a reduction of waste.

ISO 14001 assures an effective environmental management system in order to help protect the earth from the adverse effects from potential impact of our activities, products and services and to assist in maintaining and improving the quality of the environment.

Daikin Europe N.V. is approved by LRQA for its Quality Management System which complies with the ISO9001 standard. ISO9001 pertains to quality assurance in design / development, production, installation as well as to several aspects in the process.

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

Daikin Europe N.V. participates in the Eurovent Certification Programme for Air Conditioners (AC). Latest certificate can be checked on www.eurovent-certification.com or www.certa.fr

DAIKIN EUROPE N.V.

Naamloze Vennootschap

Zandvoordestraat 300

B-8400 Oostend, België

www.daikin.eu

BTW : BE 0412 120 336

RPR Oostende