Precision Cooling for
Business-Critical Continuity

Liebert HPC-L

Air Cooled Chillers with Double Screw Compressors

PRODUCT DOCUMENTATION

Liebert HPC-L - PD - 273510 - 14.02.2008

Liebert

EMERSON
Network Power

Liebert HPC–L

The water chiller market has met in the latest years stricter and stricter challenges due to the industrial society evolution and to technological developments, even if it is experiencing a full maturity phase.
To meet the most different requirements, depending on the several application places, the modern water chiller must thus be **highly flexible**, so as to suit to the surrounding environment.

Here comes **Liebert HPC–L**, the innovative range of air–cooled water chillers by **Emerson Network Power**, covering a power range from 700 to 1600 kW.

Over 60 models, 4 sound emission versions, one chiller and one freecooling configurations, two types of environment–friendly refrigerants, a wide range of options and accessories – such as economizer and electronic expansion valve, just to name two – **Liebert HPC–L** can be a leader in the chiller world, both in its natural position for brand belonging – the technological market – and in other sectors such as high power commercial and industrial sectors.
Besides its high flexibility **Liebert HPC–L** – loyal to the tradition by **Emerson Network Power** – is featured by **efficiencies** among the highest on the market, which are more and more needed to face the challenges of energy saving and environment protection of today, as well as by the lowest **sound emissions** in its category, above all in the **Quiet** version.
Structure **sturdiness** and high **reliability** complete the features of the whole range.

Liebert HPC–L

Solutions Committed to your Business

Contents

The Quality Management System of Emerson Network Power S.r.l. High Performance Air Conditioning has been approved by Lloyd's Register Quality Assurance to the quality management system standard ISO 9001:2000

The product conforms to European Union directives 98/37/CE (89/392/CEE; 91/368/CEE; 93/68/CEE), 89/336/CEE; 73/23/CEE; 97/23/CE.

Units are supplied complete with a test certificate and conformity declaration and control component list.

Liebert HPC-L units are CE marked as they comply with the European directives concerning mechanical, electrical, electromagnetic and pressure equipment safety.

1 Features and Benefits

Integration with Indoor Air Conditioners

Supersaver System

A special working mode can be set up in combination with **Emerson Network Power HPAC** indoor units to obtain the "Supersaver' system, that enhances the energy saving capabilities and thus optimises the SEER (Seasonal Energy Efficiency Ratio) of the system.

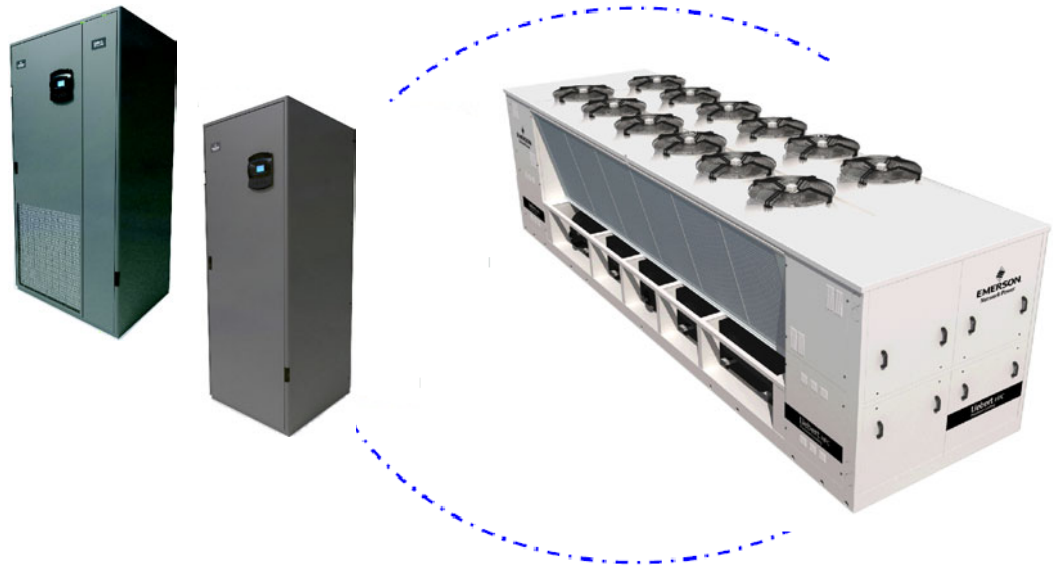
The information on the cooling needs of the air conditioners is available to the **Liebert HPC–L** units, that will manage their resources (compressors and free cooling) in the most efficient way in order to save additional energy.
This solution does not require any modification, mechanical or electrical thus avoiding additional components and regulation algorithms in the units which could undermine the reliability of the system.

@ Connectivity

When the room units are equipped with the same type of control system **Emerson Network Power** (Microface and Hiromatic Evolution), it is possible to maximise the energy savings and improve the total operation management.
The solution is @connectivity, which is a highly sophisticated way to let the system components (the Air--Conditioners as well as the **Liebert HPC–L** units, Chiller and Freecooling executions) talk to each other.
The @connectivity plug–in allows the setting of different working modes for different situations, such as:

- higher water temperature in low load operation (energy saving);
- lower water temperature for dehumidification (better performance);
- special "night" Setpoint (energy saving & noise reduction);
- lower water temperature if one or more Air Conditioners fail (keep capacity in emergency situations);
- . . . and much more!

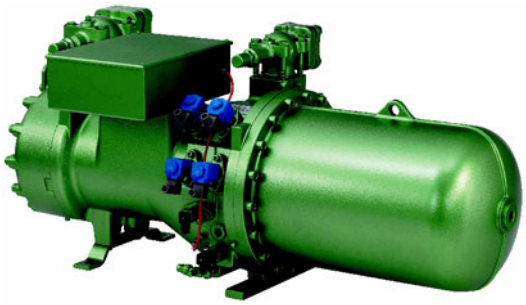
To add @connectivity function to your system, it is simply necessary:
To build up an Hironet connection between the room units and the **Liebert HPC–L** units. The network can be only 1 (if the distance and the number of units allow this) or it can be split in several networks. Each Hironet needs to be connected to one Hirolink.
Hirolink can be connected directly to the computer where @connectivity is installed. As alternative it can be connected, with a special interface, via your company network (Local Area Network).
On @connectivity it is possible to define the rules that you want your system to respect.
It will be then up to the web capabilities to allow the view and control of your system from any PC of your Local area network (provided that @connectivity PC is connected on the LAN) or even.
If you have a connection to Internet and your system is open to external access, you will have the possibility to browse and control your system via Internet.



Features and Benefits

Reliability and Low Environmental Impact

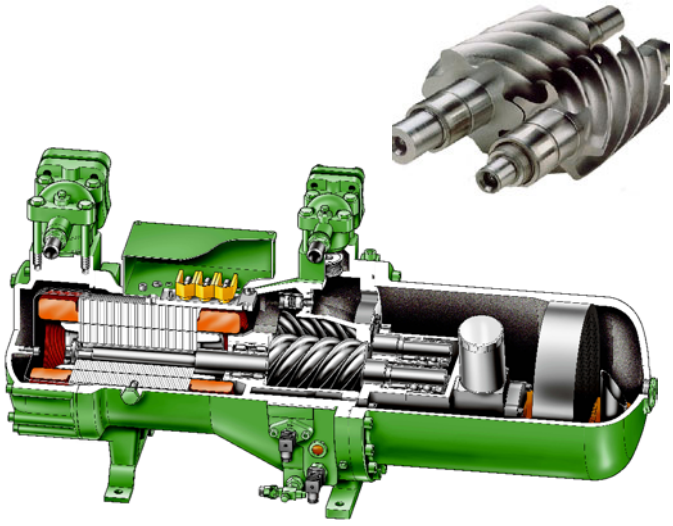
Reliability



The **Liebert HPC–L** series is equipped with two semi–hermetic screw compressors which represent state–of–the–art technology in this sector. They have been designed and optimised for air–cooled water chillers within air conditioning applications.

The high volumetric efficiency ensures excellent performance of the **Liebert HPC–L** units, not only at full load operation but with partial loads too, thanks to the continuous capacity control and to the sliding valves, modifying the delivery gas outlet clearance. Extremely low noise operation and the absence of vibrations aid the installation of the unit in city sites requiring strict noise limits. The wide operating range, bearing lubrication, component oversizing, absence of vibrations and few moving parts, together with the resistance to liquid slugging and compressor electronic control integrated with the machine microprocessor enhance the well–known characteristics of operating reliability and long life typical of this compressors type.
Liebert HPC–L with two independent refrigerating circuits, two electric boards with independent supplies (each one interlocked with its own refrigerating circuit), two microprocessor boards – each one installed on its electric control board and even operating independently of each other – features the highest inner redundancy and thus the highest system reliability.
All **Liebert HPC–L** units are run tested at the factory before shipment.

Fewer moving parts



Unlike reciprocating compressors, screw compressors do not have pistons, connecting rods, suction and discharge valves or a mechanical oil pump. Fewer moving parts lead to greater reliability and a longer life.

High outdoor temperature

The oversizing of heat axchangers and the wide operating range of the screw compressors permit the use of **Liebert HPC–L** units in high temperature environments as well, up to 46°C at 100% full load.
In the version with R407C, only, the device HTD (High Temperature Device), keeping the oil temperature within a safe range, allows each compressor to operate up to its limits without affecting either its reliability or its internal components (bearings).
In all versions, both with R407C and R134a, if the limits are exceeded, the microprocessor reduces the load of the compressor to 50%, thus allowing continuous operation.

Continuous capacity control

Precise and stable control of the supply water temperature over the complete range of operating conditions is granting by the continuous capacity control. As the demand for load increases or decreases the compressor sliding valves modulate the capacity to match the required cooling load. This leads to a drastic reduction of cycling rates in comparison with a step capacity control and therefore, higher reliability.

Features and Benefits

Resistance to liquid slugging

The robust design of the screw compressors can bear/withstand liquid coolant quantities in suction that would severely damage the valves, the connecting rods and the cylinders of the reciprocating compressors.

Start–up management

The specific features of **Liebert HPC–L** screw compressors and the integrated microprocessor control functions permit unloaded start–up management, with pressure equalisation, thus reducing stress and enhancing the overall reliability.

Unequalled efficiency and energy saving

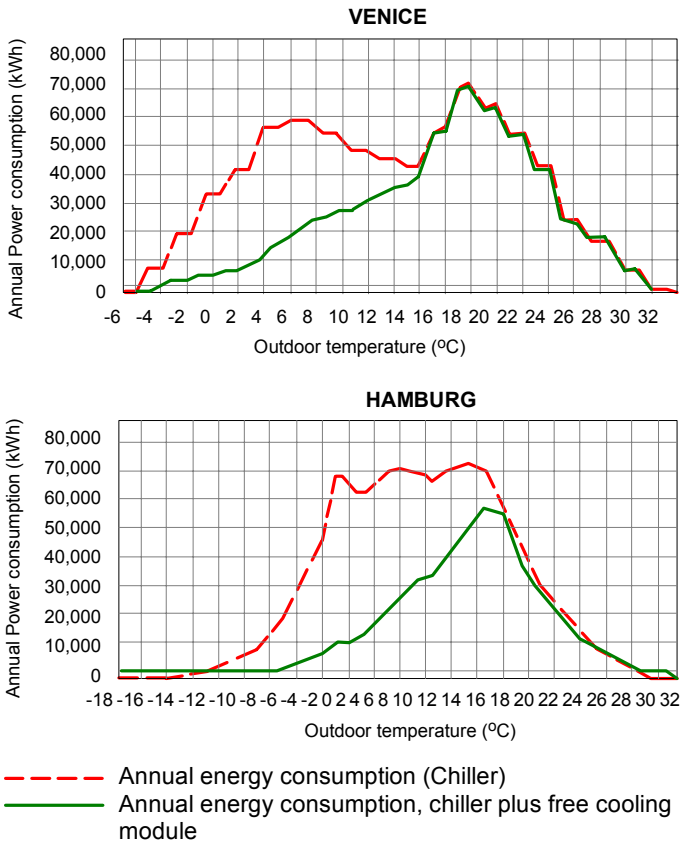
The use of semi–hermetic screw compressors of the latest generation; shell and tube evaporators selected for R134a and R407C application; aerodynamic profiled blade fans with high efficiency nozzles and continuous speed regulation; large surface W–shaped condenser coils ensure the achievement of unequalled efficiency figures.

Freecooling module

The execution with built–in free cooling module, allows **Liebert HPC–L** to take advantage of low outdoor air temperatures in the water cooling process in order to save energy, by avoiding compressors running, besides increasing significantly the compressor life.

A three–way valve arrangement permits the coolant to be diverted via the additional heat exchangers before being fed into the cooling evaporator.
This means that even if the outside ambient temperature is not low enough to provide the complete cooling load, a significant contribution to the running costs of the system can be made whenever the ambient temperatures falls below the coolant inlet temperature.

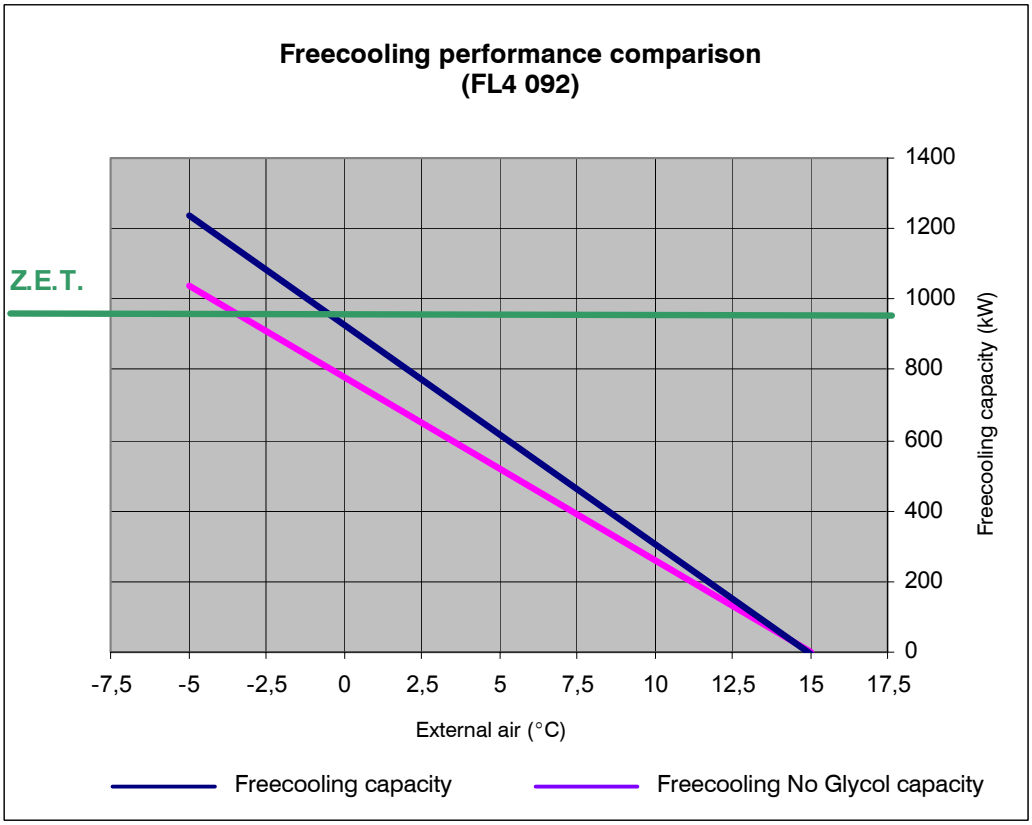
Reduced space requirements in comparison with a conventional chiller plus a dry–cooler, are obtained through the freecooling execution's compact design and the reduction of the compressors working hours offers exceptional saving both in the long and short term.



The different strategies adopted by the proprietary microprocessor control in managing the various components, fans – compressors – regulation valves, and operating modes, mechanical and/or free cooling, together with the compressors' continuous partialisation ensure typical energy savings greater than 30%.

For specific applications and requirements, where the glycol mixture can't be used and circulated inside the building, **Emerson Network Power** has developed a dedicated Freecooling version, defined as "No Glycol, Freecooling", that border the glycol fluid inside the external unit only.
In the No Glycol Freecooling version, a plate heat exchanger is positioned between the glycol fluid of the freecooling coils and the water of the evaporator preventing from the circulation of the glycol in the user hydraulic circuit. The parts and components of the chiller exposed to the external environment involved by the water flow are protected from potential frost by insulation, the heat load of the user circuit and by

the electrical heating driven by the microprocessor control.
The plate exchanger oversizing, the optimized flow between such exchangers thanks to the use of high efficiency pumps, the operating logics managed by the microprocessor control with the same strategies of increased efficiency and reliability research of the standard freecooling versions enable a min. decrease in the freecooling performance while advantageously recovering energy in this No Glycol version freecooling version, too.
The graph below compares the cooling performance of the two freecooling solutions for the machine model FL4092; Z.E.T. means “Zero Equivalent Temperature”, namely the temperature of external air at which the nominal mechanical cooling capacity (i.e. developed in standard summer operating conditions) is obtained from the freecooling system (winter cooling capacity with compressors off).

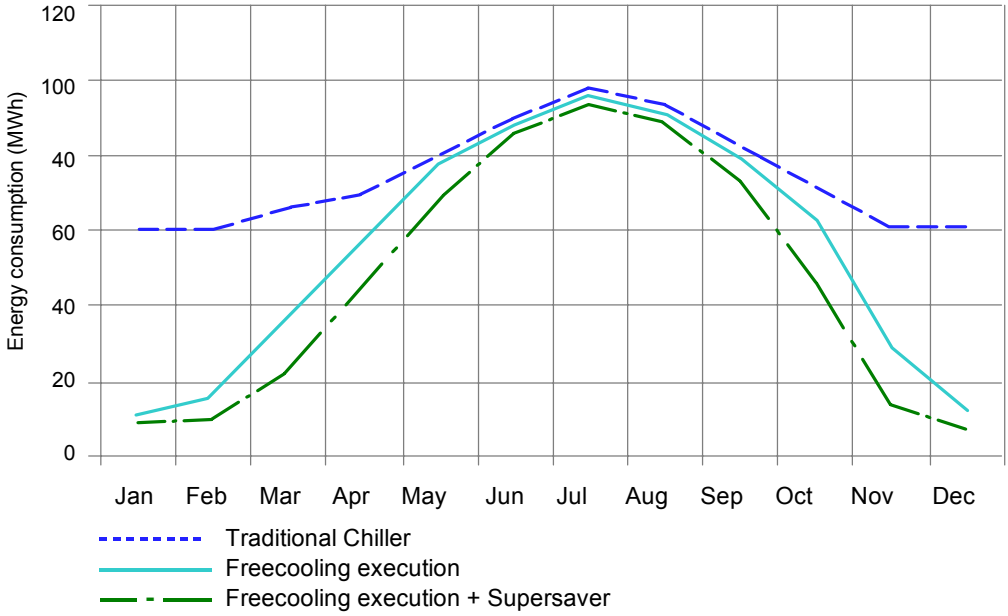


Features and Benefits

Seasonal efficiency

The freecooling execution finds its best application in combination with the Supersaver system which regulates the coolant temperatures according to the variation of the thermal load, increasing the numbers of hours during which free cooling is possible.
The percentage of energy saving can thus be greater than 35%.

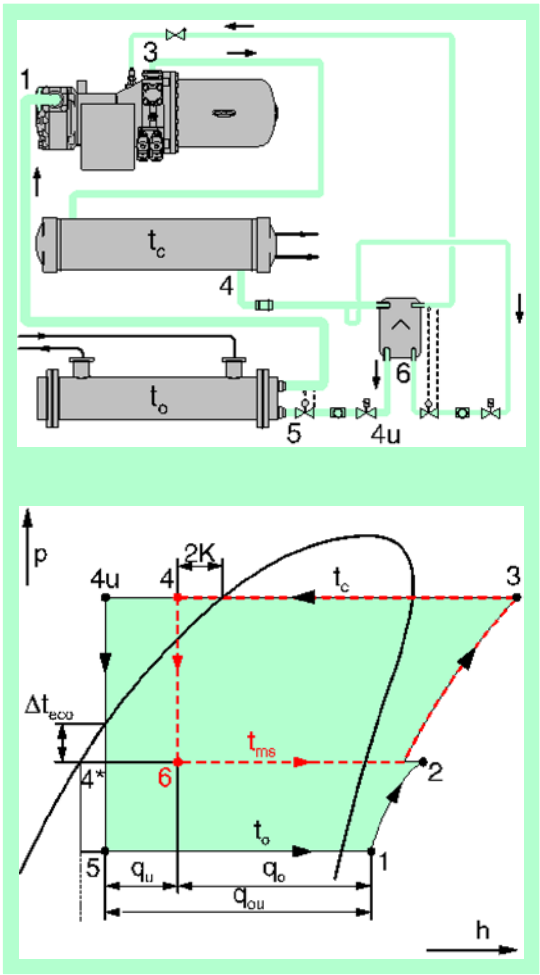
Annual power consumption. Comparison among the systems:



Economiser circuit

The operation with economizer is a convenient and efficient method to increase the cooling capacity and the COP. This device is particularly advisable for the conditioning applications where the condensing temperatures are high or medium.

By this operation system, the liquid refrigerant is cooled by a heat exchanger (sub–cooler). When a sub–cooler is used, some of the refrigerant mass (ECO flow rate) is separated from the condenser mass after the condenser (4). This ECO mass is thus expanded at an intermediate pressure (t ms). The ECO mass evaporates inside the sub–cooler and enters the compressor through the economizer opening. The evaporator mass flow rate is sub–cooled by the exchanger at a lower liquid temperature (4u). The intermediate pressure at the economizer changes depending on the type of compressor, on the operating conditions (evaporations and condensation temperatures) and on the ECO flow rate. The additional sub–cooling of the liquid involves a significant increase of the cooling capacity. From certain operating conditions, the electric absorption by the compressor increases less proportionally than the cooling capacity (improving the machine efficiency), as the compression process occurs at a better efficiency level due to the positive contribution of the fresh gas portion sucked throu-

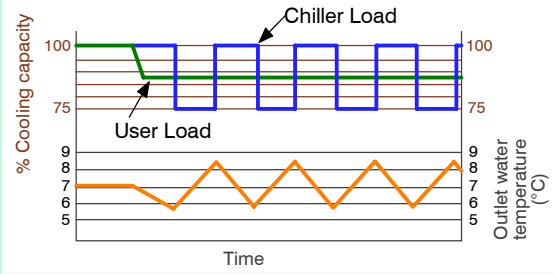


gh the ECO opening.
A further feature of the economizer circuit in the **Liebert HPC–L** units is the slide valve for choking the compressor, equipped with an integrated economizer channel; this ensure the above described benefits, due to the additional sub–cooling, independently of the machine load conditions and thus of the position of the slide valve for the compressor choking.

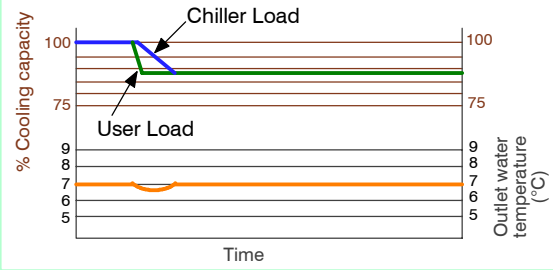
Efficient control and adjustment

The different strategies of the microprocessor control by **Emerson Network Power** for the compressors – capacity adjustment valves with continuous modulation and different operating modes (economizer, expansion with electronic valve) – ensure energy saving typically over 20%.

The cooling capacity can be changed and modulated continuously thanks to the microprocessor control of the choking slide valve for the compressor capacity. Each unit is equipped with a variable power control without limits from 100% up to 25%. This modulation enables the compressor to perfectly meet the building–cooling load without any change in the outlet temperature from the evaporator. This change in the cooled water temperature is avoided only thanks to a stepless control, such as the one offered by **Emerson Network Power**. Indeed, with a step capacity control with partial loads, each power step would be too high or too low when compared to the building–-cooling load, so loosing water temperature control.



Fluctuation with steps capacity control



Stability with stepless capacity control

Thus, the energy costs for the chiller are decreased, above all under conditions of partial load featuring the chiller operation most of the time.

Seasonal efficiency: IPLV–ESEER efficiency ratios

Liebert HPC–L features excellent performance under partial loads. The loads of the air conditioning systems in the standard operating conditions are remarkably lower than the max. rated load conditions for the chiller selection.

Thus, chillers seldom work under full load. The **Liebert HPC–L** chillers can offer significant operation savings.

The operation of the chillers under partial load is usually associated with reduced air temperatures in the condenser and reduced room temperatures.
With the operation under partial load, the heat to be disposed is less than the one under full load. Further, the operation under partial load is typically associated with reduced outdoor temperatures that enable the best performance of the unit.

The operation under partial load associated with reduced room temperatures ensures better performance and efficiency by the chiller. IPLV (Integrated Part Load Value) is a method for measuring the total chiller performance in a defined range of operating conditions under partial load. This method has been studied by ARI and is included in the standard ARI 550/590–98. As most of the conditioning systems operate for most of the time at a load lower than the max. rated one, IPLV is an excellent method to compare the chiller efficiency under similar conditions.

The formula to calculate IPLV is:

IPLV = 0.01A + 0.42B + 0.45C + 0.12D

Where:

A = EER at 100%, load point at 35.0 °C condenser air inlet

B = EER at 75%, load point at 26.7 °C

C = EER at 50%, load point at 18.3 °C

D = EER at 25%, load point at 12.8 °C

An alternative seasonal efficiency ratio has been defined for Europe, which is more suitable for the load conditions, the outdoor air temperatures and the building principles typical of European countries. It is defined by the acronym ESEER (European Seasonal Energy Efficiency Ratio), as specified here below:

ESEER = 0.03A + 0.33B + 0.41C + 0.23D

Where:

A = EER at 100%, load point at 35 °C condenser air inlet

B = EER at 75%, load point at 30.0 °C

C = EER at 50%, load point at 25.0 °C

D = EER at 25%, load point at 20.0 °C

Such ratios are really useful to calculate the energy consumption, when the load distribution required by the chiller in one year of operation follows the same percentage subdivisions considered in the above mentioned formulas.

Absorbed energy = Required energy / Efficiency ratio

Tab. 1a – Efficiency ratios

HPC–L									
Model	**Size**	**EER**	**IPLV**	**ESEER**	**Model**	**Size**	**EER**	**IPLV**	**ESEER**
CA7	081	2.67	4.20	3.70	**CA4**	069	3.31	4.33	3.99
	087	2.59	4.10	3.60		075	3.22	4.45	4.06
	093	2.57	3.97	3.51		081	3.16	4.58	4.15
	100	2.49	4.01	3.53		087	3.08	4.39	3.96
	107	2.62	4.20	3.71		093	3.04	4.09	3.75
	115	2.54	4.06	3.57		100	3.00	4.26	3.85
	122	2.67	4.03	3.59		107	3.15	4.46	4.04
	131	2.85	4.18	3.75		–	–	–	–
	140	2.78	4.24	3.78		–	–	–	–
CB7	081	2.59	4.27	3.72	**CB4**	069	3.28	4.49	4.09
	087	2.49	4.12	3.59		075	3.18	4.59	4.15
	093	2.48	4.01	3.51		081	3.09	4.73	4.23
	100	2.38	4.07	3.54		087	3.00	4.46	4.02
	107	2.52	4.24	3.73		093	2.97	4.19	3.80
	115	2.44	4.09	3.57		100	3.93	4.35	3.92
	122	2.58	4.07	3.60		107	3.10	4.61	4.14
	131	2.79	4.28	3.82		–	–	–	–
	140	2.71	4.33	3.84		–	–	–	–
CL7	080	2.77	4.40	3.88	**CL4**	068	3.29	4.56	4.16
	086	2.68	4.27	3.77		074	3.17	4.67	4.20
	092	2.79	4.29	3.82		080	3.28	4.82	4.36
	099	2.70	4.35	3.85		086	3.19	4.58	4.15
	106	2.62	4.43	3.88		092	3.29	4.40	4.05
	114	2.54	4.24	3.72		099	3.26	4.58	4.18
	121	2.81	4.34	3.85		106	3.24	4.81	4.33
	130	2.72	4.37	3.86		–	–	–	–
	139	2.63	4.40	3.88		–	–	–	–
CQ7	080	2.46	4.31	3.71	**CQ4**	068	3.05	4.59	4.13
	086	2.36	4.14	3.57		074	2.89	4.63	4.15
	092	2.49	4.21	3.66		080	3.03	4.88	4.35
	099	2.38	4.25	3.67		086	2.93	4.57	4.13
	106	2.26	4.31	3.70		092	3.07	4.46	4.05
	114	2.17	4.09	3.49		099	3.00	4.60	4.16
	121	2.50	4.22	3.67		106	2.95	4.79	4.29

EER *(Energy Efficiency Ratio)*
IPLV *(Integrated Part Load Value)*
ESEER *(European Seasonal Energy Efficiency Ratio)*

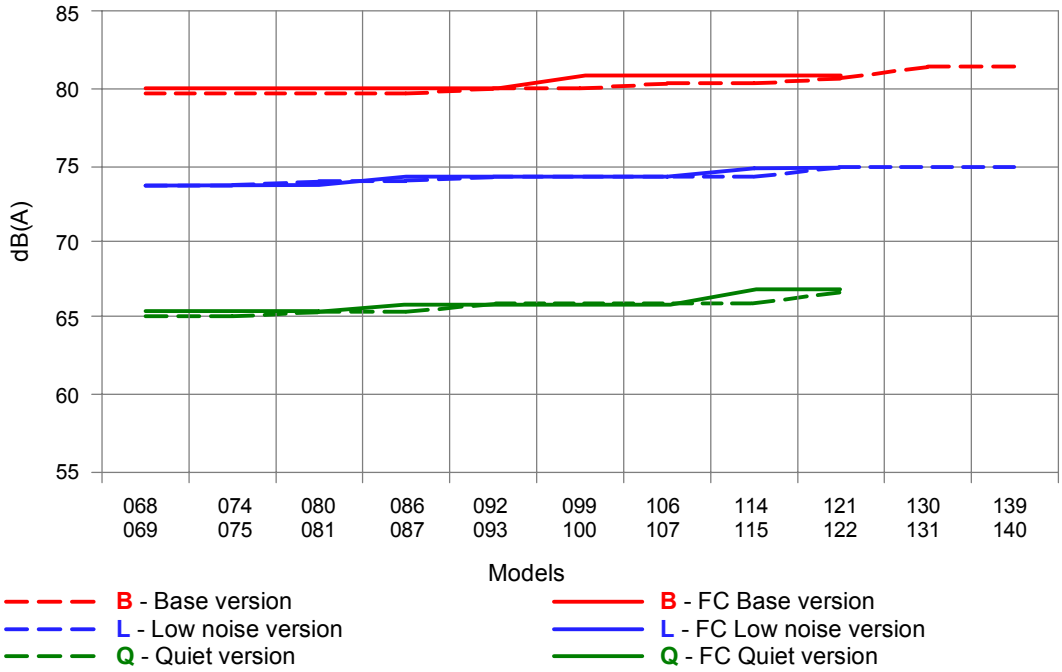
Low sound emission

The **Liebert HPC–L** series is characterised by unrivalled low sound emissions, in particular the models of the version Quiet.
A sound–proofed compressors enclosure, "Muffler"–type pulsation dampers integrated in the compressor oil separator, compressor fastening on insulating/anti–vibration supports, inlet and outlet hoses, fans and speed adjusters specifically designed to reduce sound emission lead to these superior results.

All units are equipped with a modulating fans speed control; controlled by a special algorithm which, while optimising the compressors management, enables to keep the fan speed always to the minimum.

Even lower sound emission levels can be obtained with the EC fans (with integrated electronic switching motor), above all in low speed operation.

Liebert HPC-L series sound emissions at 1 m distance



Tab. 1b – Sound levels

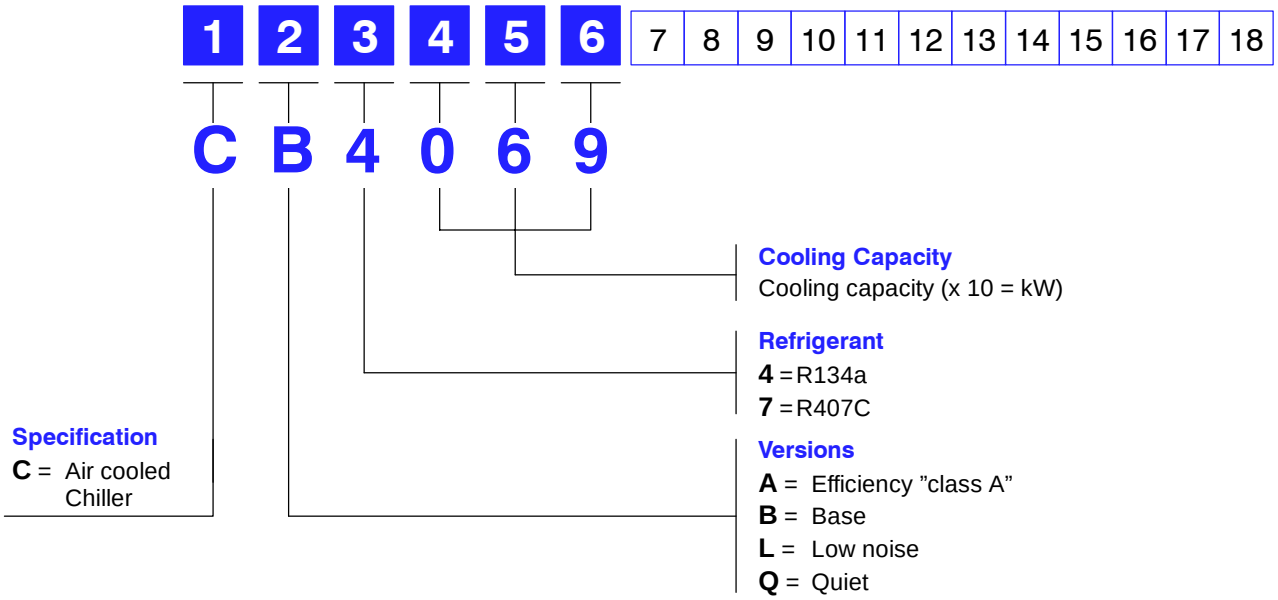
Models	HPC–L (Chiller)			HPC–L (Freecooling)		
	"B" version	"L" version	"Q" version	"B" version	"L" version	"Q" version
068 – 069	79.5	73.0	65.0	80.0	73.0	65.5
074 – 075	79.5	73.0	65.0	80.0	73.0	65.5
080 – 081	79.5	73.5	65.5	80.0	73.0	65.5
086 – 087	79.5	73.5	65.5	80.0	74.0	66.0
092 – 093	80.0	74.0	66.0	80.0	74.0	66.0
099 – 100	80.0	74.0	66.0	81.0	74.0	66.0
106 – 107	80.5	74.0	66.0	81.0	74.0	66.0
114 – 115	80.5	74.0	66.0	81.0	75.0	67.0
121 – 122	81.0	75.0	67.0	81.0	75.0	67.0
130 – 131	82.0	75.0	–	–	–	–
139 – 140	82.0	75.0	–	–	–	–

The unit sound level in the version "B" and in the version "L" is lowered by 3 dB(A) in standard operating conditions with water 12/7°C at the evaporator and outdoor air less than 30°C by special suitable measures, such as:

- better sound insulation of the compressor compartment;
- automatic fan speed reduction with standard adjustment with phase cutoff (TRIAC) for the "B" versions;
- automatic fan speed reduction with inverter adjustment for the "L" versions.

2 Model Number Description

Model Nomenclature / Digit Numbers



Liebert HPC–L

Digits 1, 2, 3, 4, 5, 6 – Base unit

Base unit main features

- Structure and bearing base in galvanized steel sheet sections, with powder–painting and suitable thickness
- Two indipendent refrigeration circuits
- Semihermetic screw compressors with continuous capacity control
- Shell & Tube evaporators with direct expansion and independent circuit on the refrigerant side for each compressor
- Axial fans with modulating speed control
- Condensing coils with copper pipes and aluminum fins
- International approval 97/23 EC – PED
- Microface board / Display control interlocked to each electric board
- Double electric panel CE compliant and complete with safety equipments, fan motors protection, fuses and protection thermal relays for compressors, power supply 400 V / 3 Ph / 50 Hz (RST + PE)
- Main switch on each electric board
- Antiscratch plastic film packaging
- Colour Ral 7032 "Grey"

Digit 7 – Electronic expansion valve (EEV)

0 = Standard mechanic valve
1 = Electronic valve

Digit 8 – Compressor suction shut–off valve

0 = None
1 = With shut–off valve

Digit 9 – Refrigerant gauges

0 = None
1 = With HP/LP gauges

Digit 10 – Economiser (ECO) / Liquid injection

0 = No ECO / no liquid injection
1 = With ECO
2 = With liquid injection

Digit 11 – Fan speed control

1 = TRIAC control
2 = Inverter control
3 = EC–Fan

Digit 12 – Pumps group / Hydraulic Kit

0 = No pumps / no hydraulic Kit
1 = No pumps / with hydraulic Kit
2 = 2 standard head pumps / with hydraulic Kit
3 = 2 high head pumps / with hydraulic Kit
4 = 2 pumps (1 with inverter), standard head / with hyd. Kit
5 = 2 pumps (1 with inverter), high head / with hyd. Kit

Digit 13 – 20 % heat recovery

0 = None
1 = 20 % heat recovery

Digit 14 – Electric panel options

0 = None
1 = With electric heaters
2 = With energy meter
3 = With electric heaters and energy meter

Digit 15 – Evaporator electric heaters

0 = None
1 = With electric heaters only evaporator
2 = With evaporator electric heaters, pumps and pipes

Digit 16 – Compressor power factor capacitors

0 = None
1 = With compressor power factor capacitors

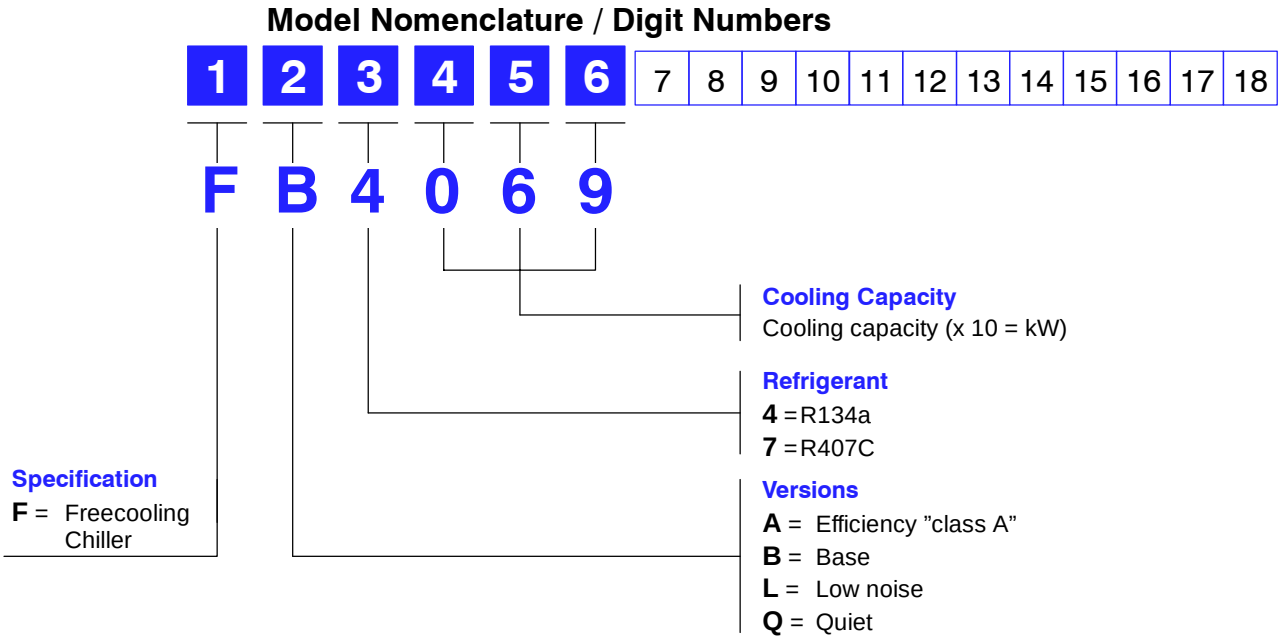
Digit 17 – Condensing coil filter / Protection grid

0 = None
1 = With condensing coil filter
2 = With protection grids
3 = With condensing coil filters and protection grids

Digit 18 – Special requests

0 = None
X = As Specified

Model Number Description



Liebert HPC–L

Digits 1, 2, 3, 4, 5, 6 – Base unit

Base unit main features

- Structure and bearing base in galvanized steel sheet sections, with powder–painting and suitable thickness
- Two indipendent refrigeration circuits
- Semihermetic screw compressors with continuous capacity control
- Shell & Tube evaporators with direct expansion and independent circuit on the refrigerant side for each compressor
- Axial fans with modulating speed control
- Freecooling coils with copper pipes and aluminum fins
- Condensing coils with copper pipes and aluminum fins
- International approval 97/23 EC – PED
- Microface board / Display control interlocked to each electric board
- Double electric panel CE compliant and complete with safety equipments, fan motors protection, fuses and protection thermal relays for compressors, power supply 400 V / 3 Ph / 50 Hz (RST + PE)
- Main switch on each electric board
- Antiscratch plastic film packaging
- Colour Ral 7032 "Grey"

Digit 7 – Electronic expansion valve (EEV)

0 = Standard mechanic valve
1 = Electronic valve

Digit 8 – Compressor suction shut–off valve

0 = None
1 = With shut–off valve

Digit 9 – Refrigerant gauges

0 = None
1 = With HP/LP gauges

Digit 10 – Economiser (ECO) / Liquid injection

0 = No ECO / no liquid injection
1 = With ECO
2 = With liquid injection

Digit 11 – Fan speed control

1 = TRIAC control
2 = Inverter control
3 = EC–Fan

Digit 12 – Pumps group / Hydraulic Kit

Complete freecooling version

0 = No pumps / no hydraulic Kit
1 = No pumps / with hydraulic Kit
2 = 2 standard head pumps / with hydraulic Kit
3 = 2 high head pumps / with hydraulic Kit
4 = 2 pumps (1 with inverter), standard head / with hyd. Kit
5 = 2 pumps (1 with inverter), high head / with hyd. Kit

No–glycol freecooling version

A = No pumps / no hydraulic Kit
B = No pumps / with hydraulic Kit
C = 2 standard head pumps / with hydraulic Kit
D= 2 high head pumps / with hydraulic Kit
E= 2 pumps (1 with inverter), standard headF/ with hyd. Kit
F = 2 pumps (1 with inverter), high head / with hyd. Kit

Digit 13 – 20 % heat recovery

0 = None
1 = 20 % heat recovery

Digit 14 – Electric panel options

0 = None
1 = With electric heaters
2 = With energy meter
3 = With electric heaters and energy meter

Digit 15 – Evaporator electric heaters

0 = None
1 = With electric heaters only evaporator
2 = With evaporator electric heaters, pumps and pipes

Digit 16 – Compressor power factor capacitors

0 = None
1 = With compressor power factor capacitors

Digit 17 – Condensing coil filter / Protection grid

0 = None
1 = With condensing coil filter
2 = With protection grids
3 = With condensing coil filters and protection grids

Digit 18 – Special requests

0 = None
X = As Specified

3 Operating Range

Working Limits

Minimum temperature of outdoor air entering condenser coils (with standard operating unit):

–25 °C for freecooling models;

–10 °C for Chiller models.

Maximum outdoor air temperature is in relation to each model, as indicated in the following tables. In any case outdoor temperatures over 46°C are not admitted; such limits are determined by electrical and electronic components fitted on units. Maximum flow rates are indicated in the following tables.
Higher flow values may cause corrosions and vibrations inside the shell and tube heat exchanger.
The Minimum water flow allowed corresponds to a maximum temperature difference of 8°C. More extreme operating conditions would active safety devices and the unit would be stopped.
Outlet water temperature from 4 to 15 °C.
The maximum allowed water return temperature when the unit is in full operation is 20 °C; return temperatures in excess of 20 °C are allowed only during start–up.
The maximum glycol percentage permitted is 50% (35% with standard pump sets fitted)

The minimum glycol percentage necessary is in relation to the minimum ambient air temperature conditions referred to the place of installation.
The maximum hydraulic working pressure is 6 Barg (Safety valve setting is 5 Barg with the optional hydraulic kit).
Nominal power supply tolerance: 400V $^{+}/_{-}$ 10%; max. voltage drop: 3%.
See operation range Table in which each model's limits are indicated; for different values ask your agent.

Unit storage conditions:

- Between –20 °C and + 45 °C for all models.

Technical Data

Tab. 4g – Technical Data – CL4 068–106 **R 134a**

Model CL4		068	074	080	086	092	099	106
Performance (1)								
Cooling capacity	kW	728	772	851	886	947	995	1054
Compressors power input	kW	201	223	236	254	261	278	298
Total power input	kW	221	243	260	278	288	305	325
Compressors COP	-	3.62	3.46	3.61	3.49	3.63	3.58	3.54
Unit EER	-	3.29	3.17	3.28	3.19	3.29	3.26	3.24
Water flow	m^3/h	125.2	132.8	146.4	152.4	162.9	171.1	181.3
Water pressure drop	kPa	43	48	36	39	45	49	43
Performance (2)								
Cooling capacity	kW	819	863	939	983	1051	1096	1147
Compressors power input	kW	234	257	264	288	297	314	333
Total power input	kW	254	277	288	312	324	341	360
Compressors COP	-	3.50	3.36	3.56	3.41	3.54	3.49	3.44
Unit EER	-	3.22	3.11	3.26	3.15	3.24	3.21	3.18
Water flow	m^3/h	140.9	148.4	161.5	169.1	180.8	188.5	197.3
Water pressure drop	kPa	50	55	41	45	51	55	47
Sound level								
SPL [Sound Pressure Level] (3)	dB(A)	73		73.5		74		
PWL [Sound Power Level] (4)	dB(A)	94		94.5		95.5		
Refrigeration circuits								
Number of refrigeration circuits	No	2						
Refrigerant charge [each circuit]	kg	117		135	135/140	160		168
Compressors								
Number of compressors	No	2						
Type	-	double screw with integrated oil separator and muffler						
Nominal power [each compressor]	HP	160	160+180	180	180+210	210	210+240	240
Capacity control	-	25 ⇒ 100 % stepless						
Fans								
Number of fans	No	12		14		16		
Type	-	axial						
Wheel nominal diameter	mm	800						
Rpm	1/min	900						
Nominal power input [each fan]	kW	1.7						
Fans power input	kW	20.4		23.8		27.2		
Air flow rate	m^3/h	218400		254800		291200		
Evaporator								
Number of evaporators	No	1						
Type	-	shell & tube						
Internal volume [each circuit, refrigerant side]	l	93		112				132
Condensing coil								
Material tubes / fins	-	copper / aluminium						
Rows / Fins space	no/mm	3 / 1.8						
Face area	m^2	33.0		38.5		44.0		
Internal volume [each circuit]	l	186		216		248		
Water connections								
Diameters inlet	DN-inch	2 x DN 125-5”				2 x DN 150-6”		
Diameter outlet	DN-inch	1 x DN 150-6”				1 x DN 200-8”		
Unit volume	l	414		372				446
Dimensions								
Length	mm	8590		9586		11578		
Depth	mm	2308						
Height	mm	2571						
Weights								
Net weight	kg	8672	9684	9302	9374	10260	10288	10474
Operating weight	kg	9086	9098	9674	9746	10632	10660	10920

Notes:

(1) - At the following standard conditions: power supply 400V/3Ph/50Hz; outdoor temperature 35 °C; water inlet/outlet temperature 12/7 °C; ethylene glycol 0%.
(2) - At the following standard conditions: power supply 400V/3Ph/50Hz; outdoor temperature 35 °C; economizer option; water inlet/outlet temperature 12/7 °C; ethylene glycol 0%.
(3) - Measured with outdoor temperature 35 °C; 1m from the unit; free field conditions; according to ISO 3744.
(4) - With outdoor temperature 35 °C; calculated according to ISO 3744.

5 Mechanical Specifications

Construction and Panels

The **Liebert HPC – L** series is designed for outdoor installations, having maximum corrosion protection, with all panels being of heavy gauge, galvanised steel construction.
The base is of 3+4mm gauge galvanised steel channels, polyester powder painted in RAL7032, interconnected using special rivets with elevated mechanical characteristics and the frame hidden inner parts are in galvanized steel.

Holes (ø 56 mm) are drilled on the base, where the unit lifting bars can be fit.
Panels are made of heavy gauge galvanised steel, polyester powder painted in RAL7032 and provided with waterproof gaskets.
Lateral panels are fixed with screws, panels on the front and electrical board are closed by a suitable lock that can be opened by triangle wrench (dedicated/specific tool).

All screws are galvanised or Dacromet – type.
The compressor is located at the bottom of the unit and isolated from the airflow to avoid noise transmission and heat dissipation to the air stream.The compartment cooling is anyway ensured by a grid in the side closing panels. The compressor compartment incorporates the electric board as well as the electric and electronic power devices; the latter is complete with closed base.

In the Low Noise and Quiet versions (L & Q), panels are lined with sound – proof material; compressors are mounted on anti – vibration mounts to prevent vibration transmission to the unit casing and the compressor compartment is lined with 35mm thick, double layer, polyurethane sound – proof material embedded with one or more high density sound – proof diaphragms.

Refrigeration Circuit

All models are equipped with two compressors configured in independent refrigeration circuits. Each circuit includes double safety pressure switch for high pressure, a safety pressure switch for low pressure, a thermal expansion valve with equalizer, a filter dryer with disposable anti – acid solid cartridge, a humidity indicator lamp, high and low pressure safety valves, charge connections, a three – way solenoid valve enabling the thermal expansion valve to shut off the liquid in the piping and a manual on – off valve; circuit with economizer exchanger (optional), circuit with liquid injection in the compressor (optional), high and low pressure switches (optional) and inlet and outlet flexible hoses (only in the ”Q” versions).

The units are supplied charged with refrigerants R134a or R407C (depending on the versions) and oil as determined in the factory for the operating conditions within the indicated limits.

Mechanical Specifications

Refrigerant

The units are arranged for using the refrigerant R134a or R407C depending on the chosen models.

Technical notes R407C

Attention: The differences between units operating with refrigerant fluid R407C and those operating with fluid R22 are described below.

ATTENTION

The differences between the units operating with the fluid R407C and those operating with the fluid R22 are described below.

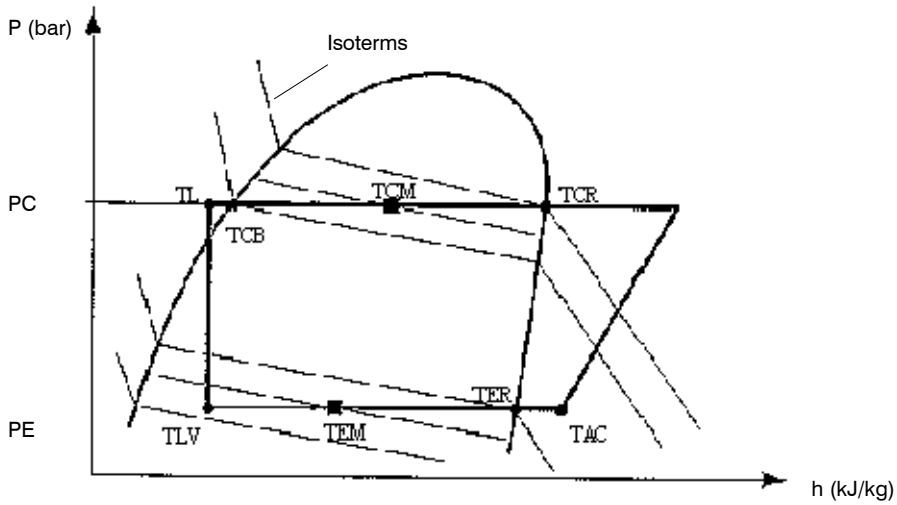
It has been proven that the chlorine inside some refrigerants (HCFC and above all CFC) is harmful for the atmosphere ozone layer.
The Montreal protocol, with the following amendments and the new European regulation no. 2037/2000, in force since 1st October 2000, limit in time, with several expiry dates, the production and use of the HCFC refrigerants, among which R22. The refrigerant R407C (HFC) does not contain chlorine and is thus absolutely suitable for the use in air conditioning systems, without damaging the ozone layer.

Its main features are:

- Non–azeotropic mixture made of R32/R125/R134a in which the percentage weight composition is, in ratio, 23/25/52.
- Thermophysical features similar to R22.
- ODP (Ozone Depletion Potential) equal to 0.
- Not flammable in the air.
- Low toxicity.

The new HFC fluids are essentially incompatible with the mineral oils which are usually used with R12 and R22.
Therefore, new synthetic lubricants based on polyester molecules have been developed for their use.

Note:
Considering the unique thermophysical properties of RC407C the refrigeration cycle is illustrated in the diagram below.



High pressure side

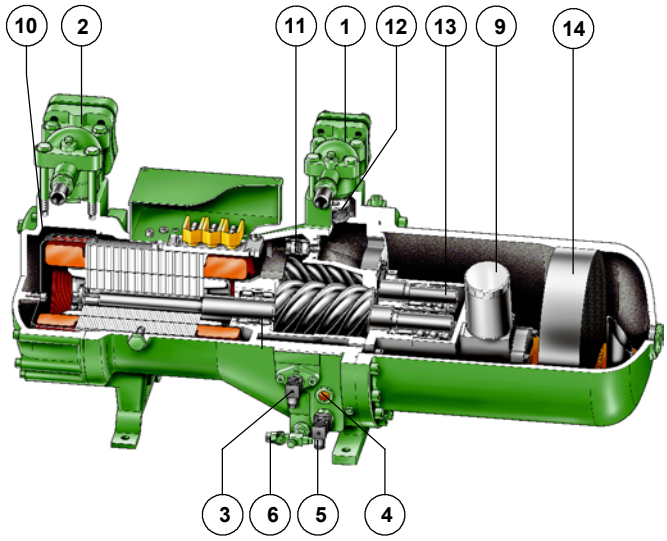
TCB: Condensation temperature bubble point (Liquid)
TCR: Condensation temperature dew point (Vapor)
TCM: Average condensation temperature (TCB+TCM)/2
TL: Temperature of the refrigerant at the expansion valve inlet Overheating = TAC - TER

Low pressure side

TLV: Liquid-steam temperature
TER: Evaporation temperature dew point (Vapor)
TEM: Average evaporation temperature (TLV+TER)/2
TAC: Temperature of the overheated vapour at the compressor inlet Sub-cooling = TCB -TL

Mechanical Specifications

Compressor



The **Liebert HPC–L** series is equipped with two semi–hermetic, screw compressors specifically designed for application in air–cooled refrigeration systems. Each compressor corresponds to an independent refrigerant circuit to allow maximum redundancy and system reliability, and is fitted with:

1 – discharge shut–off valve;
2 – suction shut–off valve (option);
3 – oil level safety switch;
4 – oil sight glass;
5 – oil heater;
6 – oil fill/drain valve;
7 – direct liquid injection (option, standard on Q version);
8 – automatic start unloading;
9 – long–life fine oil filter 10 ìm mesh size;
10 – suction gas filter with large surface area and fine mesh;
11 – 28 bar differential pressure relief valve (according to PrEN 12693 standards).

Each compressor is equipped with a three–phase asynchronous two–pole motor located on the shaft of the male screw rotor and cooled by the suction gas. It is removable for inspection and maintenance. The motor start with reduced load is star/delta type.

The motor is equipped with protection devices having the following functions:

- winding temperature, PTC sensor in the motor windings;
- oil temperature–PTC sensor;
- phase sequence/direction of rotation;
- phase lack monitoring.

The main screw (male, with 5 lobes) is driven directly by the motor and drives the secondary one (female, with 6 cavities). A check valve (12) is incorporated in the discharge chamber to prevent reverse rotation of the screws and to allow/facilitate pressure equalization inside the compressor [unloaded start–up]. Robust axial bearings in tandem configuration (13), a bearing chamber pressure isolated by seal rings, and pressure unloading of axial bearings ensure minimum refrigerant dilution in the oil, oil higher viscosity and thus increased compressor reliability and longer working life.
A three–stage oil separator (14) is integrated in the execution.

The chillers are equipped with infinite slide control with Vi compensation managed by a flanged solenoid valve. This is to ensure precise and stable control of the supply water temperature over the complete range of operating conditions.

Evaporators

Liebert HPC–L units are equipped with direct expansion, shell and tube type evaporators, designed, constructed, tested (pressure test on both refrigerant and water sides) and documented to comply with PED 97/23/CE standards.
The ”U”–designed tube nest can thermally expand in the shell without mechanical stress and can be removed for maintenance operations.
They incorporate two refrigeration circuits and one water circuit. The shell is fabricated from seamless carbon steel with internally finned copper tubes and tube sheets of heavy gauge carbon steel.
Baffles are of carbon steel; heads are constructed of carbon steel, gaskets of an asbestos free compound and bolts of steel alloys. They are externally insulated with closed cell elastomer with high resistance to UV rays HT–type for outdoor installations.
The evaporators are equipped with drainage and vent connections.

The evaporators are protected against freezing by a paddle–type flow switch and an antifreeze sensor directly managed by the microprocessor.
As an option, a thermostatically controlled electric heater cable is wrapped around the shell to prevent

freezing with outdoor temperatures below 0°C.
Temperature and pressure working limits and pressure test values are indicated below:

Tab. 5a – Evaporator working limits

Design temperature	Design pressure		Test pressure	
Min. / Max.	Refrigerant (R407C)	Water	Refrigerant (R407C)	Water
-10 / +90 °C	30.0 bar	10.0 bar	33.0 bar	11.0 bar

Design temperature	Design pressure		Test pressure	
Min. / Max.	Refrigerant (R134a)	Water	Refrigerant (R134a)	Water
-10 / +90 °C	16.5 bar	10.0 bar	18.2 bar	11.0 bar

Condensers

The condensing coils are made of copper tubes and aluminium fins and are mounted in double V (W) configuration to provide a larger heat exchange surface.
Copper tubes in staggered rows are mechanical expanded in order to have the best contact with fins; the tubes are grooved type (KME Crossfin) to increase the thermal exchange. The Aluminium fins are manufactured with a special high efficiency rusticate surface that increases the thermal exchange.
The condenser coils are tested at a pressure of 30bar.

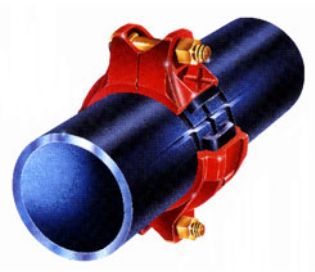
"HTD" High outdoor temperature device: liquid injection (versions R407C only)

The over–sizing of the heat exchangers and the wide operating range of the new generation screw compressors enable use in very hot climates, too. The compressor liquid injection device is available as an option (HTD) as an alternative to the economizer; this options keeps the oil temperature within largely tolerated temperature values, and enables the compressor to run up its operating limits without jeopardising its reliability or the life of its components (bearings).

The machine's continuity of service is even ensured when exceeding the maximum operating limits, as the microprocessor limits the compressor load (before locking it out), reducing its capacity to 50%.
Such device is not recommended in the units with R134a; only if the unit it operating under very hard conditions (e.g brine operation) such option can be actually used; for this reason, in case of doubt get in touch with your dealer.

Hydraulic Circuit

The hydraulic circuit utilises carbon steel pipes connected with grooved–end (Victaulic) fittings and couplings; gaskets are made of EPDM. This arrangement permits compensation for thermal expansion, reduces noise and vibrations propagating through hydraulic pipelines and facilitates ease of maintenance. Insulation of the hydraulic circuit is by closed cell synthetic elastomer with high resistance to UV rays HT type for outdoor installations.



Hydraulic Kit (Option)

Il comprises an expansion vessel (charged at 1.5 bar, max. operating pressure 10 bar) and a safety valve set at 5 bar. Their installation positions are indicated in the hydraulic circuit schematic.
The components are installed on the machine but the hydraulic connection as indicated in the hydraulic circuit scheme must be carried out by the installer.

Such kit is always supplied together with the pump option.

Expansion vessel volumes: 2 x 12 lt

It is recommended that the total expansion vessel capacity required is always checked, depending on the unit volume, the circuit volume, the glycol percentage in the mixture and the expected maximum temperature variation of the mixture.

Mechanical Specifications

Superchiller execution

Liebert HPC–L models in the "Freecooling execution" are designed with an integrated freecooling system consisting of:

- cooling coils with copper tubes and aluminium fins, mounted in double V (W) configuration to provide a larger heat exchange surface
- vent and drainage valves on the freecooling coils
- low pressure drop three–way valve with modulating servo–control

All the freecooling functions are managed by the microprocessor controls, according to ambient conditions and thermal load:

- direct Expansion with compressor operation only; 100 % coolant flow through the evaporator
- direct Expansion and Freecooling; 100% coolant flow first through the free cooling coils and then the evaporators, with partial compressor operation
- freecooling; 100% coolant flow through the free cooling coils and then the evaporators, without compressor operation

Fan speed control, compressor starting and compressor partialisation, are managed by the controls with different strategies in order to increase the energy saving to the maximum possible.

Superchiller No Glycol execution

The models **Liebert HPC–L** in the "No Glycol Freecooling version" are designed with a freecooling system composed of two sections: the first inside the chiller, the second in a separated module.
The following equipment is installed inside the chiller:

- Cooling coils with copper pipes and aluminum fins, installed in W configuration to ensure a large heat exchange surface.
- Vent and unloading valves on the freecooling coils.
- Entirely insulated evaporator water circuit, coated with heaters.
- Arrangement for the hydraulic and electric connection with the separate module.
- Transducers and microprocessor control to manage the freecooling mode and the components installed in the separate module.

The following equipment is installed inside the separate module (N.G. module):

- Plate exchanger, recovering the freecooling capacity and separating the user water circuit from the freecooling glycol fluid circuit.
- Glycol fluid circulation pump complete with shut–off valves.
- Three–way valve for switching between freecooling and no freecooling operation.
- Hydraulic circuit complete with expansion tank, safety valve, vent valve, loading and unloading valves, tray for accidental glycol spilling collection.
- Heaters to protect the piping and the heat exchanger.
- Electric board complete with switch for the pump, three–way valve, heater control thermostats, terminal board for the connection of the transducers and for the connection with the machine control electric board.

Three hydraulic modules have been selected to be combined with each unit according to the dimensions of the freecooling coils: the 900 kW module is combined with the 12–fan units, the 1200 kW module with the 16–fan units and the 1400 kW module with the 20–fan units.
The performances and technical features are described in the table below.

Tab. 5b – Technical features and performance

EMERSON Code	Exchanger model	Capacity (kW)	H_2O flow (m^3/h)	DP H_2O (kPa)	Glycol flow (m^3/h)	DP Glycol (kPa)	Pump (Model)	FLI (kW)	FLA (A)
186795	K460/100	900	155	60	170	90	NB 80–160/147	11	21.4
186799	K460/148	1200	206	60	228	88	NB 80–160/161	18.5	34.5
186797	K750/109	1400	241	77	265	107	TPD 100–360/2	18.5x2	34.5x2

Reference conditions: input/output water: 15/10°C; input/output water–glycol mixture 70–30%: 6/11°C

Note: expansion tank volume: 25 l; safety valve calibration: 5 bar; max. working pressure: 5 bar

Mechanical Specifications

Recirculating pumps (Option)

All the models can be equipped with twin water circulating pumps mounted on–board and factory piped. It is possible to select the pump type (low or high head) on each unit, both in the standard version and in the one with inverter and integrated electronic adjustment. All pumps are dynamically balanced according to ISO 1940 class 6.3. The electronic pump adjustment algorithm enables to modulate the pump speed to keep the delivery steady through the evaporator even if the hydraulic load changes; in this way, a significant energy saving is achieved and varies depending on the applications. In particular, in the Freecooling units this benefit is obtained above all in summer, when the Freecooling coil is short–circuited. The programming of the adjustment set of the electronic pump can be made in factory or in the installation site thanks to a simple remote control; in case of doubt, contact your dealer. They are suitable for operation with water–ethylene glycol mixture up to 35/65% by weight and coolant fluid temperatures down to 4°C. The Pumps are of the close–coupled centrifugal type, direct driven, with two–pole electric motor having IP54 protection, Class F insulation and efficiency class 1 (according to CEMEP). The motors with this efficiency class (the highest) ensure a higher energy saving than the pump with lower efficiency class; further, they enable a more silent operation of the motor and can reach very high use limits of the room temperature (up to 60°C). Pump casings are in cast iron, impellers in cast iron, shafts in stainless steel and the mechanical seals in silicon carbide/EPDM with dimensions according to EN12756, suitable for the use of coolant containing ethylene glycol.
The Pump hydraulic circuit includes a discharge check valve for each pump. The pump body, the stator body and the fastening bolts and nuts are electrophoretically painted; such pumps can thus be used in outdoor places subject to weather agents without corrosion problems. Each pump also has an automatic circuit breaker. Microprocessor controls manage the pump rotation and stand–by and automatically start the stand–by pump in case of failure of the primary one. In the versions with inverter and integrated electronic adjustment only the first pump is equipped with these devices: the second one is a standard pump operating only if the first one is in alarm. The microprocessor will start the second pump for a short period every week so as to avoid locks and/or deposits on the propeller due to a long inactivity.

Fan Section

Fans are axial type, with die–cast aluminium blades statically and dynamically balanced, directly coupled to an electric motor with external rotor. They are balanced Q 6,3 according to DIN ISO 1940 part 1, have an IP54 degree of protection, Class F winding insulation and internal thermal protection.
The characteristics of the motor depend on the unit version:

"A" high efficiency: . . . . . 6–pole motor, propeller diameter 910 mm, 900 rpm

"B" base: . . . . . 6–pole motor, propeller diameter 910 mm, 900 rpm

"L" low noise: . . . . . 6–pole motor, propeller diameter 800 mm, 900 rpm

"Q" silent: . . . . . 8–pole motor, propeller diameter 800 mm, 700 rpm

The fans are complete with safety protection grilles and high efficiency nozzles.

Except the "A" versions, die–cast aluminum blades with sickle–shaped profile have been used to improve the sound deadening. The fan speed control, except in the "Q" versions, is carried out by an adjuster with speed continuous modulation, phase cutoff type (TRIAC). In the "Q" versions, the fan speed is controlled by an adjuster with speed continuous modulation, inverter type, to get the max. sound reduction even while modulating (such adjustment is available as option on the "L" versions, too).

EC fans (Option)

Only in the "L" and "Q" versions, as alternative to the standard modulating adjustment, it is possible to choose fans with electronic switching motor, with the same aeraulic performance as those installed in the selected unit, as well as the possibility of a fan modulating adjustment entirely managed by the microprocessor control. The EC technology includes a permanent magnet rotor combined with an electronic switching control of the stator magnetic field directly integrated in the motor (brushless motor). Such electronic switching device manages the fan rotation speed modulation. Compared to the traditional induction three–phase motors, the inner losses in the iron reduce by 60% and in the copper by 40%, with an electric absorption lower by 20–30% than those of a traditional fan with induction three–-phase motor, getting the same aeraulic performance. Further, while modulating the speed, the absorbed power can be equal to 50 % than one of a traditional fan with phase cutoff adjustment (TRIAC).
A general noise reduction is further obtained, as the EC technology used for the adjustment does not cause magnetic vibrations, not even on special frequencies corresponding to certain rotation speeds. Finally, the decrease of pickup currents thanks to the EC technology and the absence of sliding contacts for the rotor supply significantly reduce the stresses that negatively influence the component life, increasing the machine overall reliability.

Electrical Panel and Control

The electrical panel is designed, constructed and tested in compliance with IEC standards (EN60204–1). Each unit includes two symmetric electric boards, each one interlocked to half machine; they both must be electrically power supplied.
The unit is adjusted by two independent microprocessor boards (Master and Subunit) installed on each electric board and reciprocally connected by Hirobus network. During the standard operation, the Master board exchanges information with the Subunit board; the display connected with the Master board enables to read and set parameters, while the one of the Subunit board enables only to display them. All analog/digital inputs and outputs for ensuring the independent and autonomous operation of half machine in case of alarm, if there is a problem on the outer power supply mains, on a machine component, on an electronic board or on the communication Hirobus network are connected on each microprocessor board.
The main electric board – where the Master board is fited – is on the left side of the hydraulic connection front in machines without pumps, while on the right side of the hydraulic connection front in machines with pumps.

In the units with asymmetric compressors and/or with electronic pump (if this option is installed) the main electric board – where the Master board is fit – is located in the same machine side as such components.

The position of the Master and Subunit boards can be simply inverted by shifting a dedicated jumper.

The board is installed in a closed technical compartment (compressor compartment), thus it features a protection degree by IP54.

The temperature inside the electric board is adjusted with the forced ventilation controlled by the microprocessor board by a sensor reading the temperature there. For low ambient temperatures (below –5°C) it is possible to have an electric heater fitted inside (optional) and controlled as well by the microprocessor board.

Main features:

- power supply, 400 V ±10% / 3 Ph + PE / 50Hz;
- auxiliary power supply circuit, 230 V / 1 Ph / 50 Hz and 24 V / 1 Ph / 50 Hz;
- Main switch;
- fuses and thermal relays for protecting the compressors;

- contactors for the compressors with timers for star–delta starting;
- fuses, contactors and thermal relays for protecting the pumps (optional);
- MCBs for fans with modulating speed control;
- manual operation through Microface controller;
- volt–free contacts for remote indication of:
  - compressors in operation;
  - pump(s) in operation;
  - general alarm.

Packing

Units are shipped with plastic film protection.

Warranty Clauses

The warranty does not apply for any damage or malfunction that may occur during or as a result of operation outside of the application range. The warranty does not apply for freecooling units damaged by frost if the hydraulic circuit has not been charged with a water–glycol mixture with suitable percentage for the min. temperatures in the installation site. The company is not responsible for damage due to incorrect or improper use of the product and it reserves the right to change technical specifications without any prior notice.

Final Tests and Reference Standards

The units are designed, manufactured and tested in compliance with the European directives 98/37/CE (89/392/CEE; 91/368/CEE; 93/68/CEE), 89/336/CEE; 73/23/CEE; 97/23/CE. The Quality management system of the HPAC division is approved by LRQA in conformity with the norms ISO 9001:2000 and the product is the result of the activities performed according to the provisions in the processes, procedures and plans for the quality.

The machine is supplied with a final test certificate and a declaration of conformity with the norms.

All **Liebert HPC–L** units are "CE" marked.

Mechanical Specifications

Accessories

Pumps group

Available head pressure values are declared at the unit's hydraulic connections and are referred to the nominal working conditions of each unit. Please contact us for different fluid flow rates or head pressures. All pumps can work with up to 35% ethylene glycol percentage by weight

In all chiller versions and most freecooling models one pump is operating and one is in stand–by, as indicated by (1+1); in some freecooling models both pumps can be operating simultaneously, as indicated by (2). In the version "Inverter pump", (inverter pump available up to the max. power of 22 kW) one inverter pump is operating and a traditional pump is in stand–by (1+1). The indicated hydraulic performance refers to the inverter pump in their max. capacities (if available); obviously, they will adapt from such values to the hydraulic load required by the user circuit and by the chiller inner circuit; in case of freecooling unit, they will adapt their performance so as to keep the flow rate crossing the evaporator steady with relevant energy saving.

Tab. 5c - Standard head pressure (Chiller) **R407C**

Model			081/080	087/086	093/092	100/099	107/106	115/114	122/121	131/130	140/139
CA7	Water flow	m^3/h	152.2	159.6	171.3	179.7	199	208.3	227.4	251.5	263
	Available pressure head	kPa	112	101	84	70	59	44	106	74	107
CB7	Water flow	m^3/h	148.3	155	166.2	173.9	193.5	202.1	221.2	246.1	257.1
	Available pressure head	kPa	119	107	92	80	66	54	115	81	114
CL7	Water flow	m^3/h	153.4	160.8	176.3	185.1	195.9	204.7	229.8	240.6	251.3
	Available pressure head	kPa	111	99	76	61	63	50	103	88	123
CQ7	Water flow	m3/h	142.9	149	164.3	171.8	180.8	188	214.3	–	–
	Available pressure head	kPa	126	117	95	83	85	76	125	–	–
Pump rotor model		–	80–160/147 (1+1)						80–160/151 (1+1)		80–160/161 (1+1)
Nominal motor power		kW	11						15		18.5
Noise level (*)		dB(A)	65								66
Each pump weight		kg	175						183		206

(*) – According to ISO 3744

Tab. 5d - High head pressure (Chiller) **R407C**

Model			081/080	087/086	093/092	100/099	107/106	115/114	122/121	131/130	140/139
CA7	Water flow	m^3/h	152.2	159.6	171.3	179.7	199	208.3	227.4	251.5	263
	Available pressure head	kPa	179	167	148	133	118	102	159	123	131
CB7	Water flow	m^3/h	148.3	155	166.2	173.9	193.5	202.1	221.2	246.1	257.1
	Available pressure head	kPa	186	173	157	143	127	113	168	131	142
CL7	Water flow	m^3/h	153.4	160.8	176.3	185.1	195.9	204.7	229.8	240.6	251.3
	Available pressure head	kPa	177	165	139	123	123	108	155	139	153
CQ7	Water flow	m3/h	142.9	149	164.3	171.8	180.8	188	214.3	–	–
	Available pressure head	kPa	194	184	160	148	147	138	177	–	–
Pump rotor model		–	80–160/151 (1+1)						80–160/161 (1+1)		80–160/167 (1+1)
Nominal motor power		kW	15						18.5		22
Noise level (*)		dB(A)	65						66		68
Each pump weight		kg	183						206		243

(*) – According to ISO 3744

Mechanical Specifications

Tab. 5e - Standard head pressure (Chiller) **R134a**

Model			069/068	075/074	081/080	087/086	093/092	100/099	107/106
CA4	Water flow	m^3/h	128.1	135.9	145.5	151.5	159.3	167.2	182.8
	Available pressure head	kPa	133	120	125	116	105	92	80
CB4	Water flow	m^3/h	125.9	133.5	142.6	148.3	155.7	163.4	179.1
	Available pressure head	kPa	137	125	128	122	110	98	85
CL4	Water flow	m^3/h	125.2	132.8	146.4	152.4	162.9	171.1	181.3
	Available pressure head	kPa	137	125	124	115	99	87	82
CQ4	Water flow	m3/h	119.2	125.9	139.7	144.8	155.3	163.1	172.2
	Available pressure head	kPa	147	136	132	125	110	98	95
Pump rotor model		–	80–160/147 (1+1)						
Nominal motor power		kW	11						
Noise level (*)		dB(A)	65						
Each pump weight		kg	175						

(*) – According to ISO 3744

Tab. 5f - High head pressure (Chiller) **R134a**

Model			069/068	075/074	081/080	087/086	093/092	100/099	107/106
CA4	Water flow	m^3/h	128.1	135.9	145.5	151.5	159.3	167.2	182.8
	Available pressure head	kPa	202	188	193	183	171	157	142
CB4	Water flow	m^3/h	125.9	133.5	142.6	148.3	155.7	163.4	179.1
	Available pressure head	kPa	206	193	196	189	176	163	148
CL4	Water flow	m^3/h	125.2	132.8	146.4	152.4	162.9	171.1	181.3
	Available pressure head	kPa	206	194	192	182	164	151	145
CQ4	Water flow	m3/h	119.2	125.9	139.7	144.8	155.3	163.1	172.2
	Available pressure head	kPa	216	206	201	193	176	164	159
Pump rotor model		–	80–160/151 (1+1)						
Nominal motor power		kW	15						
Noise level (*)		dB(A)	65						
Each pump weight		kg	183						

(*) – According to ISO 3744

Mechanical Specifications

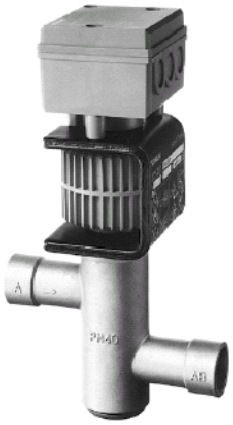
Anti–Vibration mounts

Rubber vibration–damping supports: These are "bell"–type supports with a truncated–conic shape. The support is made up of a vulcanised rubber elastic element, on a metal body in galvanised steel with a base arranged for ground fixing. They are suitable to dampen the high frequencies and to limit the cross thrusts.

Spring vibration–damping support: with 6/7 steel springs, UNI 3823 wire, built according to the UNI 7900 norms. The spring surfaces are protected by an anti–corrosion cataphoresis treatment. The two spring containment plates are equipped with holes for ground fixing.

Each plate is composed of a steel sheet, 4–5 mm thick, coated with elastomer by vulcanisation; this system prevents the high frequency vibrations from being transmitted through the spring turns. The contact surfaces feature anti–slip deformable cylinders so that the support can stand still due to the friction alone. 2 nylon tie rods, with galvanised steel bushes, enable locking of the springs between the bodies. They are suitable to dampen high and medium frequencies > 6 Hz, guaranteeing excellent efficiency.

Electronic expansion valve



The electronic expansion valve used in the **Liebert HPC–L** range enables accurate and min. possible control of the overheating of the gas sucked by the compressor under all load conditions, together with the operation at low condensation and high compressor choking. Under such application conditions a mechanical expansion valve can never reach the performance ensured by an electronic expansion valve (with energy benefits) nor the functional stability, above all during the transients of the load variations (with benefits as for reliability).

The magnetic motor of the expansion valve guarantees superior advantages on the adjustment quality that cannot be obtained with other technologies used for this types of valves /stepped motors), such as:

- continuous adjustment with unlimited adjustment positions;
- extremely high positioning speed (< 1.0 sec for an adjustment 0–100%);
- very accurate control on overheating;
- microprocessor – algorithms highly adjustable and adaptable for the most different load variations (transients).

The final result of the application of the electro–magnetic expansion valve on **Liebert HPC–L** is therefore an improved energy operating costs and a higher reliability, thanks to its special adjustment features above all on partial loads, conditions under which every chiller operates for most of the time.

Heat Recovery

In all system types where chilled water and hot water are needed at the same time, it is energetically recommended to recover the condensation heat, which usually is dissipated in air through the finned coil.

Please note that recovering condensation heat does not mean having a heat pump, namely a machine with refrigerating cycle suitably reversed according to the thermal load demand: the production of hot water, typically at temperatures of 40–55°C, depends on the production of chilled water and, thus, if no refrigerating load is available and the compressor/s is/are off, if required, a different heat generator must be installed (standard boiler, boiler with electric heaters), anyway requiring a waste of energy.
Depending on the quantity of obtained heat, the following qualifiers can be used for the achieved RECOVERY of **partial heat recovery**, when only the heat from the de–overheating of the compressed gas is recovered (about 20–25% of the cooling capacity);
All chillers equipped with heat recovery option – either total or partial – are standard equipped with the modulating condensing fan speed control (TRIAC type with phase cut, with EC type fans or inverter) driven by the Microface microprocessor.

Partial Heat Recovery (20%)

It enables to recover up to 20% of the heat discharged by the unit to the condenser.
The system does not have any adjustment and is made up by plate heat exchangers installed on each circuit before the condenser. The exchangers are protected by a suitable anti–freeze heater activated

when the system is not working. It is recommended to install a safety valve in the hydraulic circuit to avoid hazards due to over–pressures in case of water flow lack in the recuperator. The temperature of the water entering the recuperator (in steady operating conditions) must always be within the range 25–45°C, the thermal difference in the range 3.5–8°C.

Energy meter

The electronic device is a full system enabling the following functions:

- measuring and monitoring electrical values;
- counting the used electric power;
- protecting the system against electric supply quality problems.

Energy meter

Water inlet manifolds

Some kits are available as option to aid the connection with the two evaporator inlet connections, thus making a single hydraulic connection point available.

Namely:

Cod. 486064 . . . . . manifold kit for chiller and freecooling in no–glycol version without pumps from 2 x DN 125 to 1 x DN 150 (c/c distance 5500 mm)

Cod. 486065 . . . . . manifold kit for chiller and freecooling in no–glycol without pumps from 2 x DN 150 to 1 x DN 200 (c/c distance 5500 mm)

Cod. 486066 . . . . . manifold kit for chiller and freecooling in no–glycol without pumps from 2 x DN 150 to 1 x DN 200 (c/c distance 6500 mm)

Cod. 486067 . . . . . manifold kit for chiller anf freecooling with pumps complete with shut–off valves on each pump: from 2 x DN 125 to 1 x DN 150

Cod. 486068 . . . . . manifold kit for chiller and freecooling with pumps complete with shut–off valves on each pump: from 2 x DN 150 to 1 x DN 200

Please note that if the hydraulic connection is carried out without such kits, it is necessary to arrange a symmetrical structure on the water inlet lines, so as to ensure the same water delivery on each connection of the evaporator. Further, if pumps are installed on the machine, without such kits also shut–off valves for each pump must be installed, so as to aid the ”Service” operations.

Other accessories

The following accessories can be installed as options:

- Coil–protecting mechanical filters (recommended to aid the coil maintenance–cleaning).
- Pump/evaporator heaters and lines needed to avoid the frost risk on such components.
- High and low pressure gauges located in the compressor compartment (recommended to aid the unit control and maintenance).
- Compressor power factor capacitors: they enable to get a Cosfi value equal to about 0.94 on the compressors, in rated operating conditions.
- Certified lifting bars.

6 Controls

Microprocessor Controls

Microface Evolution

MICROFACE & HIROMATIC

Microface is the standard on–board control and its advanced features secure system optimisation and energy savings. Full management of the **Liebert HPC–L** units is granted by the on board control Microface Evolution, which allows the programming of temperature and pressure thresholds as well as the teamwork functionality through the proprietary Hirobus system. All the set–up can be done with a simple Operating Display that, through symbols and codes, ensures a reliable and flexible man–machine interface.

- The standard software of the **Liebert HPC–L** Units includes special control algorithms that ensure real energy savings and enhance the reliability of the full system.
- Immediate set–up can be available through the "Unit Code" system. In case of re–configuration needs, the full configuration of the unit and recalculation of all the thresholds levels (which depend on the refrigerant type) are available by simply enabling the configuration Unit Code.
- Sequential auto–restart timer allows phased units restart after power failure.
- Pumps' durability is granted by a special auto–rotation start–up function.
- The record of the working hours of compressors, pumps and freecooling is easily available via the local Microface display.
- Auto–selection of the best control strategy at different ambient temperatures is implemented in order to assure an optimised usage of the compressors and condensers fans.
- The "Ambient compensation" function can be enabled to make the unit set–point rise automatically during warm periods, permitting energy savings.
- For low noise versions with fanspeed control there is a special algorithm which, together with the compressor management, enables to keep the fan speed always to the minimum.
- Compressors' Run/Stop time management is implemented in order to obtain the optimisation of compressors' operations either within the unit, or, in case of networking via Hirobus, within the whole of the **Liebert HPC–L** Units system.
- A special working mode can be established in combination with **Emerson Network Power HPAC** Units to obtain the so called "Supersaver" system, that enhances the energy saving capabilities. Through a simple 2–wires connection the information on the cooling needs of the air conditioners is available to the **Liebert HPC–L** units, that will manage its resources (compressors and freecooling) in the most efficient way in order to save additional energy.
- All settings are protected through a 3–Level Password system.
- Input for Remote on–off and Volt–free contacts for simple remote monitoring of alarms and warnings are available.
- Up to 16 **Liebert HPC–L** units can be easily linked together on a network to provide teamwork mode, stand–by operation and duty cycling without additional hardware. Reliability is not affected if there are problems on the data communication buses, because the units return automatically to the stand–alone mode.

Technical data Microface Evolution

- E2prom: . . . . . 64 Kbit;
- Eprom/Flash memory: . . . . . 1, 2 or 4 Mbit;
- RAM memory space: . . . . . 256 Kbit;
- Analog Input: . . . . . 3 x Analog 0–10V;
- Digital Input: . . . . . 8 x Flexible Analog multi input;
- Analog Output: . . . . . 2 x Analog 0–10V;
- Digital output: . . . . . 7 triacs output and 2+1 relay output;
- Time and date function buffered by an LI–battery;
- Hirobus LAN connectors: . . . . . 3 RJ45 sockets (to Microface and Hiromatic LAN and Slave–Board and Microface Display);
- Hironet connectors: . . . . . 1 RJ9 socket for RS485 (direct connection to **Emerson Network Power** supervision systems).

Hiromatic Evolution for Liebert HPC–L Line

All **Emerson Network Power Liebert HPC–L** units are equipped with the latest electronic technology; one of the highlights is the new Hiromatic Evolution, with 32 Kbyte of buffered RAM to store data and with an integrated RS–422/485 for the Hirolink communication manager connection.
The new ergonomic design allows its use also as portable device, to be used for start–up and "flying connections "by service personnel. Hiromatic Evolution can locally manage up to 16 air units (or up to 8 when linked to supervision systems) connected via the high speed communication Hirobus cable. A multi–language menu with on–the–fly language selection is available.
Hiromatic Evolution offers the possibility to access all the connected units of the Microface LAN system from one point.

- Hiromatic System Window: it allows to have the system operation status at a glance.
- Self–explanatory Icons: they are used for the Menu–Layout of the Hiromatic Evolution.
- Online Help: every single parameter has its own multi–page explanation.
- Status Report: of the latest 200 event–messages are stored for the system (which represent the summary of the reports of all the connected units) and 200 event–messages are available for each single unit. The unit status report is stored into the Microface memory and even if Hiromatic it is not connected, connecting one Hiromatic equipped with **Liebert HPC–L** units SW it is possible to upload into the Hiromatic all the information present into each single Microface.
- Four different Graphic Data Records: they are provided for each single unit: the temperature and humidity trends referring to the last 24 hours and 8 days.(Each unit's record remains stored in Microface E and is uploaded by Hiromatic E).Hiromatic Evolution creates and saves its own Graphic Data Record with the average of all the units connected.
- Timer Mode (electronic timer included in the Software) to select the time–related functionality of the system.
- Semi or Full Manual Mode software management including all safety devices.
- A 4–Level Passwords system: it safely protects all the settings.

Technical data Hiromatic Evolution

- Eprom/Flash memory: . . . . . 2 or 4 Mbit;
- RAM memory space: . . . . . 256 Kbit;
- Time and date function buffered by an LI–battery;
- Hirobus Lan connectors: . . . . . 2 RJ45 sockets (to Microface);
- Hironet connectors: . . . . . 2 RJ9 socket for RS422/485
  (Hirolink connection versus Supervision Systems).

Liebert HPC–L Connectivity

Microface and Hiromatic Graphic allow Connectivity with superior levels of control and supervision systems:

Hirolink SMM:

can send SMS messages of Microface and system alarms, indicating also the number of units connected in network. On message request the unit will answer in one sms–message with the most important values, such as: actual temperatures, setpoints, number of compressors in operation, condensing pressure, alarm status . . .

Hirovisor IP software:

allows distance monitoring and telemaintenance, and also the storing in the personal computer of the graphics of water temperature trends and status reports for archiving purposes. Delivery of SMS and e–mail is supported.

CONNECTIVITY

BMSs connections:

represent the communication manager which allow the integration of the **Liebert HPC–L** units into the most diffused Building Management Systems. The most diffused are: MODBUS, LONWORK, SNMP.

Cooling Capacity Performance

Tab. 7aw – CL4 068

Ta [°C]	Pf [kW]	Pa [kW]	dPev [kPa]	Two [°C]
25	764	165	47	5
	816	170	53	7
	870	176	60	9
	924	181	67	11
	981	187	75	13
30	724	180	42	5
	773	185	48	7
	825	191	54	9
	878	197	61	11
	931	203	68	13
35	681	195	38	5
	728	201	43	7
	777	207	48	9
	827	213	54	11
	879	220	61	13
40	635	213	33	5
	680	219	38	7
	726	226	42	9
	774	232	48	11
	823	239	54	13

Tab. 7ax – CL4 074

Ta [°C]	Pf [kW]	Pa [kW]	dPev [kPa]	Two [°C]
25	810	181	52	5
	864	186	59	7
	918	192	66	9
	975	198	74	11
	1035	204	–	13
30	768	198	47	5
	819	203	53	7
	872	209	60	9
	926	216	67	11
	983	222	76	13
35	723	217	42	5
	772	223	48	7
	822	229	54	9
	875	236	61	11
	927	243	68	13
40	675	238	37	5
	721	245	42	7
	769	251	47	9
	819	259	54	11
	870	266	60	13

Tab. 7ay – CL4 080

Ta [°C]	Pf [kW]	Pa [kW]	dPev [kPa]	Two [°C]
25	889	189	40	5
	948	194	45	7
	1009	200	50	9
	1073	205	57	11
	1137	211	64	13
30	844	208	36	5
	901	214	41	7
	960	219	46	9
	1021	225	52	11
	1084	232	58	13
35	796	230	32	5
	851	236	36	7
	907	242	41	9
	965	248	46	11
	1026	255	52	13
40	747	254	28	5
	798	260	32	7
	852	266	37	9
	907	273	41	11
	965	281	46	13

Tab. 7az – CL4 086

Ta [°C]	Pf [kW]	Pa [kW]	dPev [kPa]	Two [°C]
25	930	207	43	5
	991	213	49	7
	1055	220	55	9
	1120	227	62	11
	1188	235	69	13
30	881	225	39	5
	940	232	44	7
	1002	239	50	9
	1065	247	56	11
	1129	255	63	13
35	830	246	35	5
	886	253	39	7
	945	261	45	9
	1006	269	50	11
	1069	278	57	13
40	775	270	30	5
	829	278	35	7
	885	286	39	9
	943	294	45	11
	1003	304	50	13

Tab. 7ba – CL4 092

Ta [°C]	Pf [kW]	Pa [kW]	dPev [kPa]	Two [°C]
25	991	216	49	5
	1058	223	55	7
	1125	231	62	9
	1197	240	70	11
	1272	249	79	13
30	940	233	44	5
	1004	241	50	7
	1071	249	57	9
	1138	257	64	11
	1210	266	72	13
35	885	253	39	5
	947	261	45	7
	1011	269	51	9
	1077	278	57	11
	1144	288	65	13
40	827	276	35	5
	886	284	39	7
	947	293	45	9
	1010	302	51	11
	1076	312	58	13

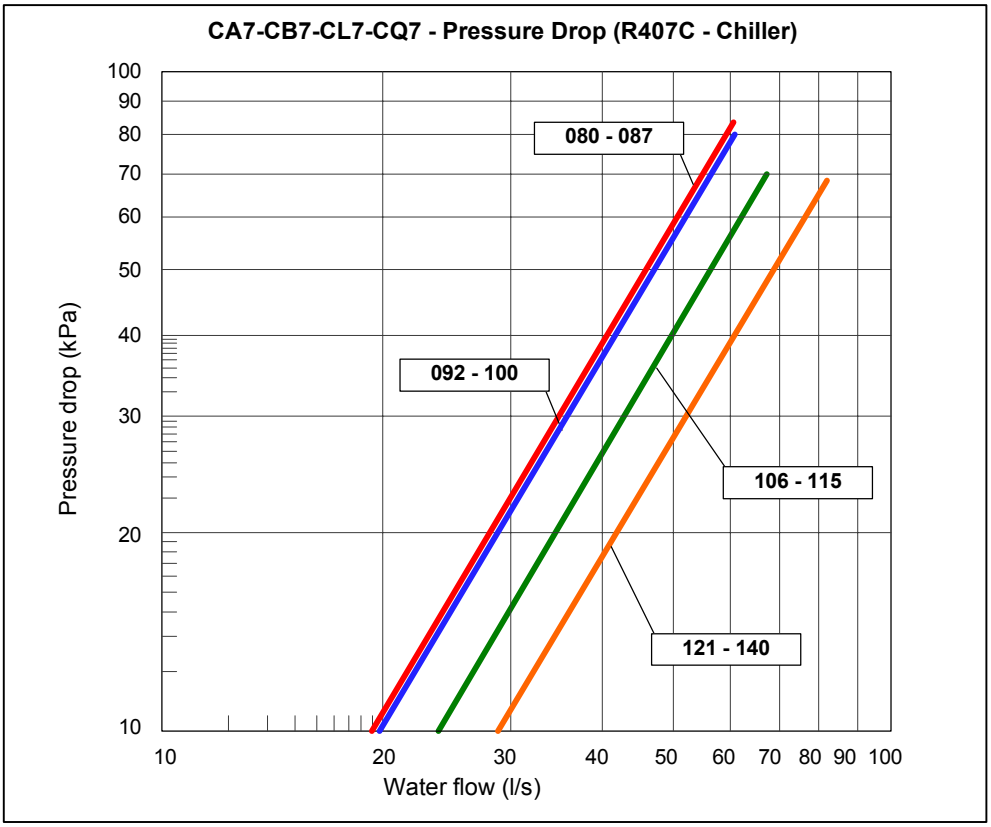
Notes:

1) *Ta: Outdoor temperature*
2) *Pf: Cooling capacity*
3) *Pa: Compressors power absorbed*
4) *dPev: Evaporator pressure drop*
5) *Two: Leaving water temperature*
6) *Refrigerant: R 134a*
7) *Fluid: Water*
8) *ΔT on evaporator: 5 °C*
9) *Power supply: 400V / 3Ph / 50Hz*
10) *Evaporator fouling factor: 0,43 x 10^{-4} m^2 °C / W*
11) *Sea level: 0 m*
12) *Rated in accordance with EN 12055*
13) *Interpolat. between points is permissible; extrapolat. is not permitted*

8 Hydraulic Features and Performance Adjustment Factors

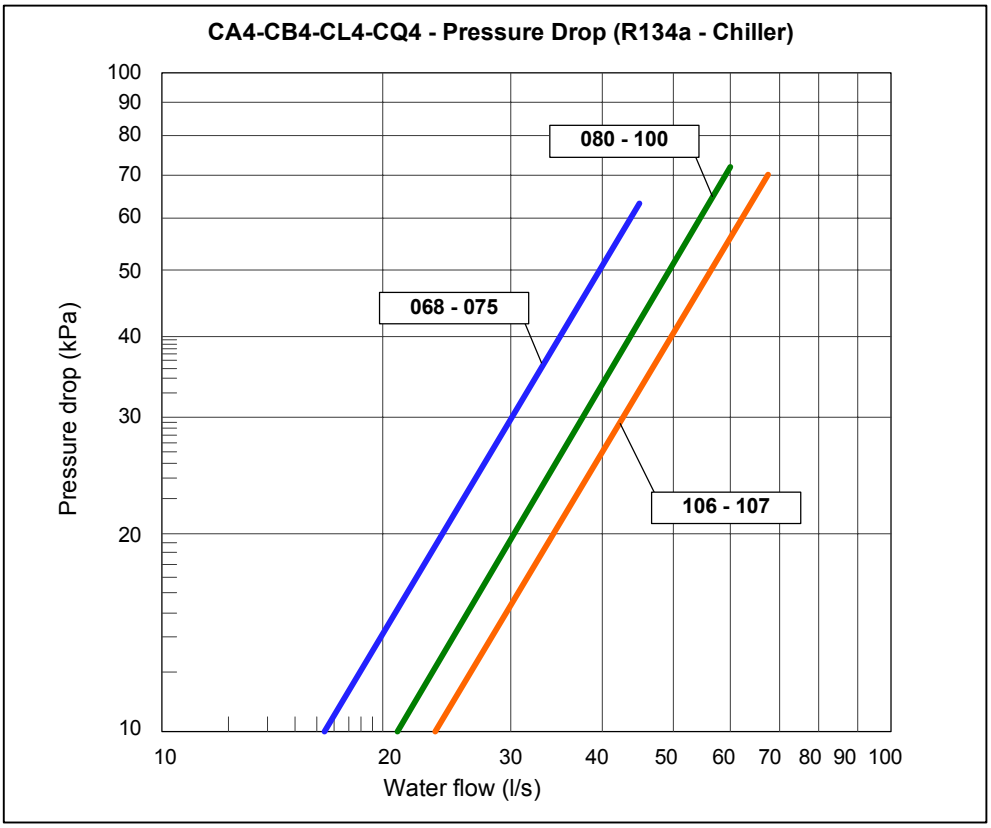
Hydraulic Features

Hydraulic Pressure Drop



Models

- 080 - 087
- 092 - 100
- 106 - 115
- 121 - 140

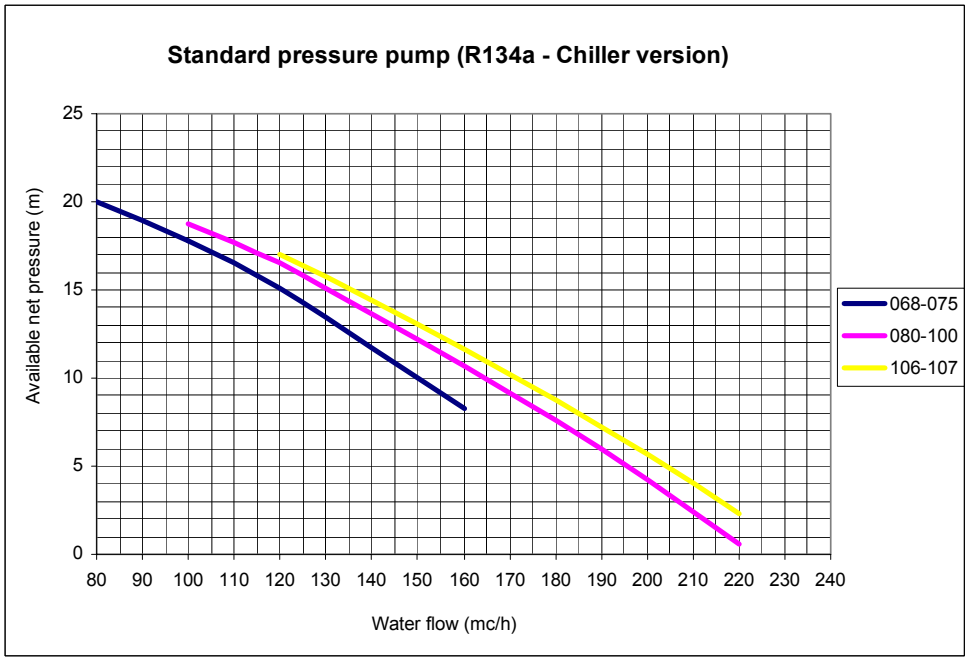


Models

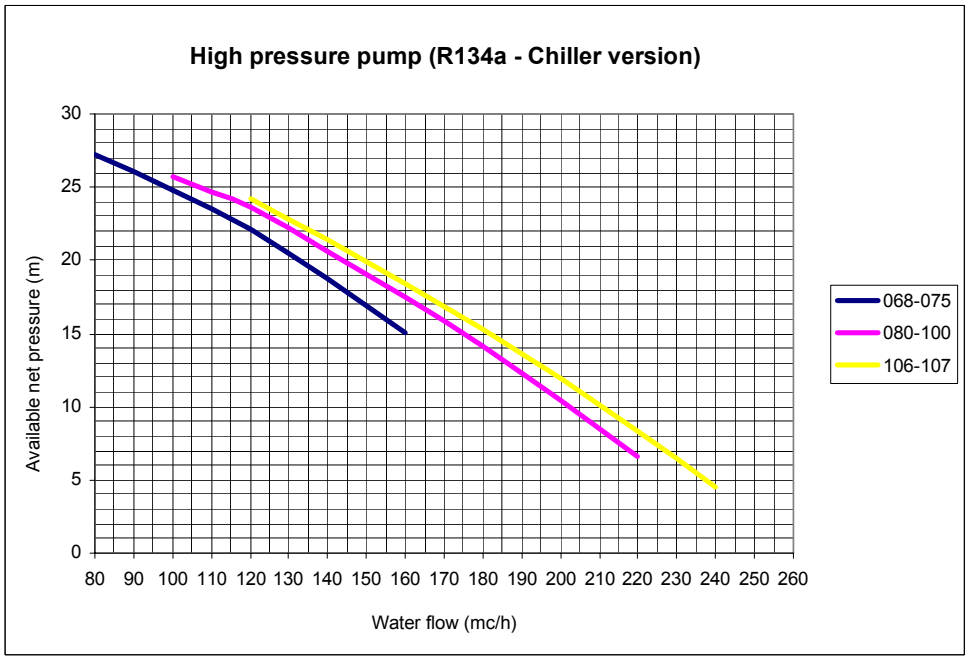
- 068 - 075
- 080 - 100
- 106 - 107

Hydraulic Features and Performance Adjustment Factors

Mod. R134a - CA4 - CB4 - CL4 - CQ4



Mod. R134a - CA4 - CB4 - CL4 - CQ4



Correction Factors

Glycol mixture correction factors

The water glycol mixtures are used as a thermal carrier fluid, in very cold climates with temperatures below 0 °C. The use of low freezing point mixtures causes a modification in the main thermodynamic properties of the units.
The main parameters affected by the use of glycol mixtures are the following:

- Cooling capacity
- Mixture volumetric flow
- Pressure drop
- Compressor power input

In the table below are reported correction factors referred to the most common ethylene glycol mixtures.

Tab. 8a – Chiller table

Ethylene glycol [% in weight]		0	10	20	30	40	50
Freezing temperature	°C	0	–4,4	–9,9	–16,6	–25,2	–37,2
Refrigeration capacity correcting factor	F3	1	0,987	0,977	0,969	0,958	0,950
Mixture volume flow rate correcting factor	F4	1	1,046	1,080	1,098	1,150	1,210
Mixture side pressure drop correcting factor	F5	1	1,053	1,109	1,168	1,234	1,311
Compressor power input correcting factor	F6	1	0,955	0,990	0,990	0,985	0,975

Tab. 8b – Superchiller table

Ethylene glycol [% in weight]		0	10	20	30	40	50
Freezing temperature	°C	0	–4,4	–9,9	–16,6	–25,2	–37,2
Refrigeration capacity correcting factor	F3	1,032	1,023	1,013	1	0,989	0,981
Mixture volume flow rate correcting factor	F4	0,911	0,926	0,956	1	1,048	1,102
Mixture side pressure drop correcting factor	F5	0,856	0,902	0,950	1	1,056	1,122
Compressor power input correcting factor	F6	1,010	1,010	1,005	1	0,995	0,985

We indicate as R0, V0, P0 respectively the unit capacity, volumetric flow rate and compressor power input with 0% ethylene glycol on Chiller models or 30% ethylene glycol on Superchiller models; when we use glycol mixtures with different % with the same inlet and outlet temperatures at the evaporator, the performance will vary as follows:

- Refrigeration capacity = R0 x F3
- Volumetric flow rate = V0 x F3 x F4
- Mixture pressure drop = DP1 x F5, where DP1 is the unit water pressure drop for the new volumetric mixture flow rate
- Compressor power input = P0 x F6

Fouling: Correction factors

Tab. 8c – Fouling correction factors

Fouling factors [10^{-4} m² °C/W]	Correction factors	
	F1a refrigeration capacity correction factor	F2a compressor power input correction factor
0	1,015	1,005
0,43	1	1
0,88	0,985	0,995
0,176	0,960	0,985
0,352	0,915	0,965

Unit performance reported in the tables are given for the condition exchanger with fouling factor corresponding at 0,43 10^{-4} m² °C / W. For different fouling factor values, performances should be corrected with the correction factors shown above.

Sea level: Correction factors

Tab. 8d – Sea level correction factors

Elevation above sea level [meters]	Correction factors	
	F1b refrigeration capacity correction factor	F2b compressor power input correction factor
0	1	1
600	0,997	1,004
1200	0,993	1,007
1800	0,988	1,015

Unit performance reported in the tables are given for sea level conditions.
For different altitude, performances should be corrected with the correction factors shown above.

Sound Levels

Tab. 9e – SPL – CL7 – CL4

Models	Octave band frequency [Hz]								Total [dB(A)]
	63	125	250	500	1000	2000	4000	8000	
	"SPL" Sound pressure levels [dB]								
CL4 068	70.0	76.0	76.0	70.0	68.0	62.0	54.0	47.0	73.0
CL4 074	70.0	76.0	76.0	70.0	68.0	62.0	54.0	47.0	73.0
CL7 080 – CL4 080	70.0	77.0	76.0	70.0	69.0	63.0	55.0	47.0	73.5
CL7 086 – CL4 086	70.0	77.0	76.0	70.0	69.0	63.0	55.0	47.0	73.5
CL7 092 – CL4 092	70.0	79.0	76.0	71.0	69.0	64.0	56.0	48.0	74.0
CL7 099 – CL4 099	70.0	79.0	76.0	71.0	69.0	64.0	56.0	48.0	74.0
CL7 106 – CL4 106	70.0	79.0	76.0	71.0	69.0	64.0	56.0	48.0	74.0
CL7 114	70.0	79.0	76.0	71.0	69.0	64.0	56.0	48.0	74.0
CL7 121	71.0	79.0	77.0	72.0	70.0	65.0	58.0	49.0	75.0
CL7 130	71.0	79.0	77.0	72.0	70.0	65.0	58.0	49.0	75.0
CL7 139	71.0	79.0	77.0	72.0	70.0	65.0	58.0	49.0	75.0

Note:
Sound pressure levels tolerance for each octave band: –0/+2 dB

Tab. 9f – PWL – CL7 – CL4

Models	Octave band frequency [Hz]								Total [dB(A)]
	63	125	250	500	1000	2000	4000	8000	
	"PWL" Sound power levels [dB]								
CL4 068	91.0	97.0	97.0	91.0	89.0	83.0	75.0	68.0	94.0
CL4 074	91.0	97.0	97.0	91.0	89.0	83.0	75.0	68.0	94.0
CL7 080 – CL4 080	91.0	98.0	97.0	91.0	90.0	84.0	76.0	68.0	94.5
CL7 086 – CL4 086	91.0	98.0	97.0	91.0	90.0	84.0	76.0	68.0	94.5
CL7 092 – CL4 092	91.5	100.5	97.5	92.5	90.5	85.5	77.5	69.5	95.5
CL7 099 – CL4 099	91.5	100.5	97.5	92.5	90.5	85.5	77.5	69.5	95.5
CL7 106 – CL4 106	91.5	100.5	97.5	92.5	90.5	85.5	77.5	69.5	95.5
CL7 114	91.5	100.5	97.5	92.5	90.5	85.5	77.5	69.5	95.5
CL7 121	93.0	101.0	99.0	94.0	92.0	87.0	80.0	71.0	97.0
CL7 130	93.0	101.0	99.0	94.0	92.0	87.0	80.0	71.0	97.0
CL7 139	93.0	101.0	99.0	94.0	92.0	87.0	80.0	71.0	97.0

Note:
Sound power levels tolerance for each octave band: –0/+2 dB

Electrical Data

Tab. 10g – Electrical data – CL4 068–106

Models CL4		068	074	080	086	092	099	106
Power supply	V/Ph/Hz	400 V / 3 Ph / 50 Hz						
OA (1)	A	375	406	432	466	494	521	552
FLA	A	603	633	670	680	698	738	778
LRA	A	759	788	825	946	964	1028	1068
Compressors – Power input (1)	kW	201	223	236	254	261	278	298
Compressors – Nominal current (1)	A	332	363	382	416	436	463	494
Compressors – Max. current	A	280	280/310	310	310/320	320	320/360	360
Fans number	n.	12		14		16		
Fans – Power input	kW	1.7						
Fans – Nominal current	A	3.6						
Fans – Max. current	A	4.1						
EC Fans – Power input (Opt.)	kW	1.3						
EC Fans – Nominal current (Opt.)	A	2.3						
Std. head pressure pump model (Opt.)	–	80–160/147–127						
Std. head pressure pump – Motor power	kW	11						
Std. head pressure pump – Max. current	A	21.4						
High head pressure pump model (Opt.)	–	80–160/153						
High head pressure pump – Motor power	kW	15						
High head pressure pump – Max. current	A	28						

(1) – Outdoor temperature 35°C; water inlet/outlet temperature 12/7°C; R134a refrigerant

Note: The electrical data shown for the EC fans are referred to operating conditions (rpm/air delivery) perfectly equivalent to standard fans; such operating conditions are determined by the factory–set microprocessor control signal.

Tab. 10h – Electrical data – CQ4 068–106

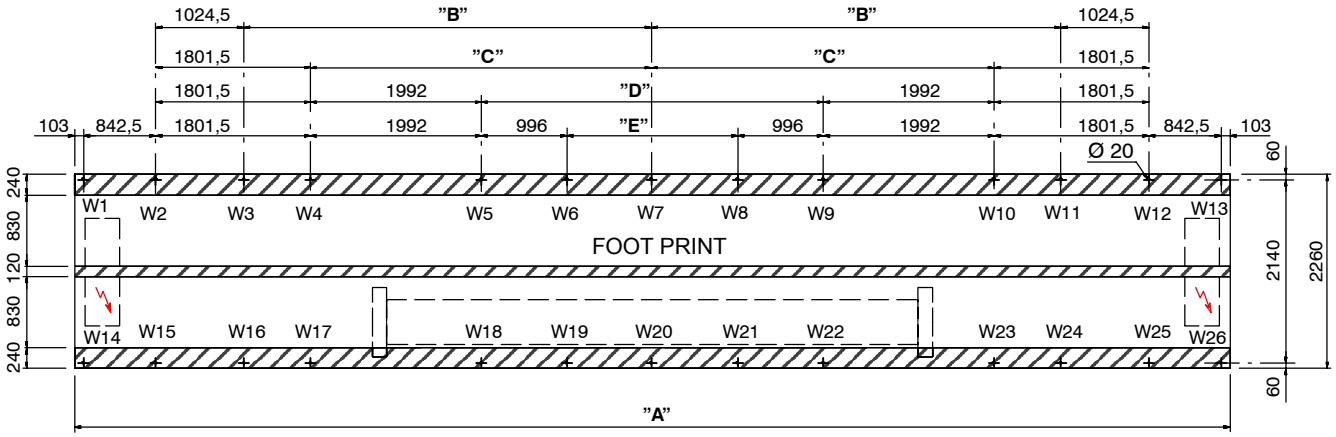
Models CQ4		068	074	080	086	092	099	106
Power supply	V/Ph/Hz	400 V / 3 Ph / 50 Hz						
OA (1)	A	377	414	437	473	496	527	564
FLA	A	585	615	649	659	674	714	754
LRA	A	741	770	804	925	940	1004	1044
Compressors–Power input (1)	kW	214	240	253	272	277	298	322
Compressors–Nominal current (1)	A	352	389	408	444	462	493	530
Compressors–Max. current	A	280	280/310	310	310/320	320	320/360	360
Fans number	n.	12		14		16		
Fans–Power input	kW	1.1						
Fans–Nominal current	A	2.1						
Fans–Max. current	A	2.3						
EC Fans–Power input (Opt.)	kW	0.8						
EC Fans–Nominal current (Opt.)	A	1.5						
Std. head pressure pump model (Opt.)	–	80–160/147–127						
Std. head pressure pump–Motor power	kW	11						
Std. head pressure pump–Max. current	A	21.4						
High head pressure pump model (Opt.)	–	80–160/153						
High head pressure pump–Motor power	kW	15						
High head pressure pump–Max. current	A	28						

(1) – Outdoor temperature 35°C; water inlet/outlet temperature 12/7°C; R134a refrigerant

Note: The electrical data shown for the EC fans are referred to operating conditions (rpm/air delivery) perfectly equivalent to standard fans; such operating conditions are determined by the factory–set microprocessor control signal.

11 Application Consideration

Fig. 11a – Support positions and loads



Tab. 11a – Dimensions

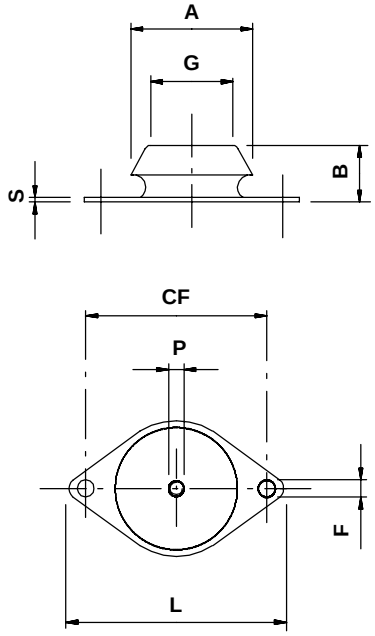
Models	Size	Fans nr.	Dimensions (mm)				
			"A"	"B"	"C"	"D"	"E"
CA7 / CB7 CA4 / CB4 CL4 / CQ4	081–087–093–100 069–075–081–087–093–100 068–074	10 – 12	8482	2271	–	–	–
CA7 / CB7 CL7 / CQ7 CA4 / CB4 CL4 / CQ4	107–115 080–086 107 080–086	14	9478	–	1992	–	–
CA7 / CB7 CL7 / CQ7 CL4 / CQ4	122 092–099–106–114 092–099–106	16	11470	–	–	1992	–
CA7 / CB7 CL7 / CQ7	131–140 121–130–139	20	13462	–	–	–	1992
FA7 / FB7 FL7 / FQ7 FA4 / FB4 FL4 / FQ4	081–087–093 080 069–075–081–087–093 068–074–080	12	9478	–	1992	–	–
FA7 / FB7 FL7 / FQ7 FA4 / FB4 FL4 / FQ4	100–107–115–122 086–092–099–106 100–107 086–092–099–106	16	11470	–	–	1992	–
FL7 / FQ7	114–121	20	13462	–	–	–	1992

Tab. 11d – Weight distribution – unit with pumps (Chiller)

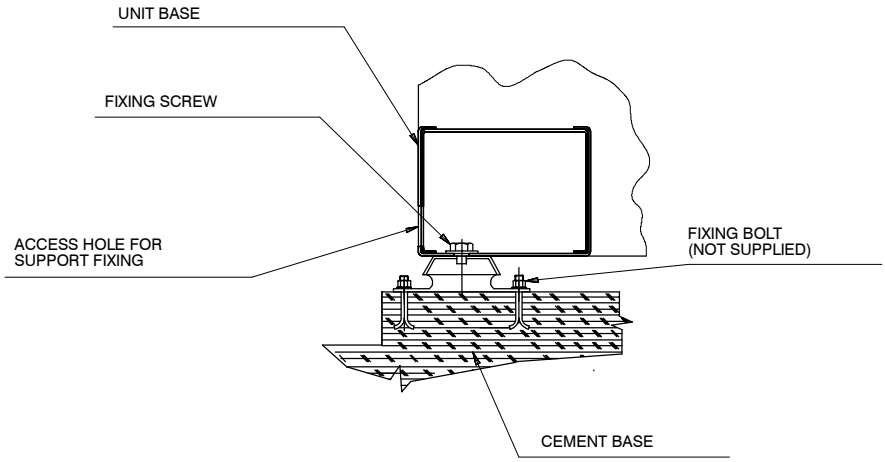
Models	Weight distribution (kg)																									Tot.
	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16	W17	W18	W19	W20	W21	W22	W23	W24	W25	W26	
CA/CB7 081	635	635	635	–	–	–	635	–	–	–	639	639	639	767	767	767	–	–	–	767	–	–	–	771	771	771	9838
CA/CB7 087	638	638	638	–	–	–	638	–	–	–	638	638	638	770	770	770	–	–	–	770	–	–	–	770	770	770	9856
CA/CB7 093	654	654	654	–	–	–	654	–	–	–	657	657	657	784	784	784	–	–	–	784	–	–	–	789	789	789	10090
CA/CB7 100	656	656	656	–	–	–	656	–	–	–	658	658	658	786	786	786	–	–	–	786	–	–	–	788	788	788	10106
CA/CB7 107	704	704	–	704	–	–	704	–	–	708	–	708	708	852	852	–	852	–	–	852	–	–	856	–	856	856	10916
CA/CB7 115	711	711	–	711	–	–	704	–	–	704	–	704	704	867	867	–	867	–	–	857	–	–	857	–	857	857	10978
CA/CB7 122	675	675	–	675	675	–	–	–	678	678	–	678	678	818	818	–	818	818	–	–	–	821	821	–	821	821	11968
CA/CB7 131	595	595	–	595	595	595	–	594	594	594	–	594	594	709	709	–	709	709	709	–	708	708	708	–	708	708	13030
CA/CB7 140	598	598	–	598	598	598	–	600	600	600	–	600	600	711	711	–	711	711	711	–	713	713	713	–	713	713	13110
CL/CQ7 080	670	670	–	670	–	–	670	–	–	673	–	673	673	801	801	–	801	–	–	801	–	–	805	–	805	805	10318
CL/CQ7 086	673	673	–	673	–	–	672	–	–	672	–	672	672	805	805	–	805	–	–	804	–	–	804	–	804	804	10338
CL/CQ7 092	646	646	–	646	646	–	–	–	648	648	–	648	648	760	760	–	760	760	–	–	–	763	763	–	763	763	11268
CL/CQ7 099	648	648	–	648	648	–	–	–	649	649	–	649	649	762	762	–	762	762	–	–	–	763	763	–	763	763	11288
CL/CQ7 106	656	656	–	656	656	–	–	–	659	659	–	659	659	785	785	–	785	785	–	–	–	788	788	–	788	788	11552
CL/CQ7 114	662	662	–	662	662	–	–	–	655	655	–	655	655	798	798	–	798	798	–	–	–	789	789	–	789	789	11616
CL/CQ7 121	576	576	–	576	576	576	–	578	578	578	–	578	578	690	690	–	690	690	690	–	693	693	693	–	693	693	12685
CL/CQ7 130	579	579	–	579	579	579	–	578	578	578	–	578	578	693	693	–	693	693	693	–	692	692	692	–	692	692	12710
CL/CQ7 139	582	582	–	582	582	582	–	584	584	584	–	584	584	695	695	–	695	695	695	–	697	697	697	–	697	697	12790
CA/CB4 069	632	632	632	–	–	–	632	–	–	–	635	635	635	765	765	765	–	–	–	765	–	–	–	769	769	769	9800
CA/CB4 075	633	633	633	–	–	–	633	–	–	–	635	635	635	767	767	767	–	–	–	767	–	–	–	769	769	769	9812
CA/CB4 081	636	636	636	–	–	–	636	–	–	–	639	639	639	773	773	773	–	–	–	773	–	–	–	778	778	778	9887
CA/CB4 087	644	644	644	–	–	–	637	–	–	–	637	637	637	786	786	788	–	–	–	780	–	–	–	780	780	780	9964
CA/CB4 093	655	655	655	–	–	–	655	–	–	–	659	659	659	801	801	801	–	–	–	801	–	–	–	806	806	806	10219
CA/CB4 100	660	660	660	–	–	–	659	–	–	–	659	659	659	807	807	807	–	–	–	805	–	–	–	805	805	805	10257
CA/CB4 107	706	706	–	706	–	–	706	–	–	709	–	709	709	871	871	–	871	–	–	871	–	–	875	–	875	875	11060
CL/CQ4 068	631	631	631	–	–	–	631	–	–	–	634	634	634	764	764	764	–	–	–	764	–	–	–	769	769	769	9789
CL/CQ4 074	632	632	632	–	–	–	632	–	–	–	634	634	634	766	766	766	–	–	–	766	–	–	–	768	768	768	9798
CL/CQ4 080	670	670	–	670	–	–	670	–	–	674	–	674	674	808	808	–	808	–	–	808	–	–	812	–	812	812	10370
CL/CQ4 086	679	679	–	679	–	–	671	–	–	671	–	671	671	823	823	–	823	–	–	814	–	–	814	–	814	814	10446
CL/CQ4 092	648	648	–	648	648	–	–	–	650	650	–	650	650	776	776	–	776	776	–	–	–	779	779	–	779	779	11412
CL/CQ4 099	652	652	–	652	652	–	–	–	650	650	–	650	650	780	780	–	780	780	–	–	–	777	777	–	777	777	11436
CL/CQ4 106	658	658	–	658	658	–	–	–	660	660	–	660	660	802	802	–	802	802	–	–	–	805	805	–	805	805	11700

Fig. 11b – Rubber anti–vibration support

Rubber support dimensions



Rubber support installation



Tab. 11f – Single support code

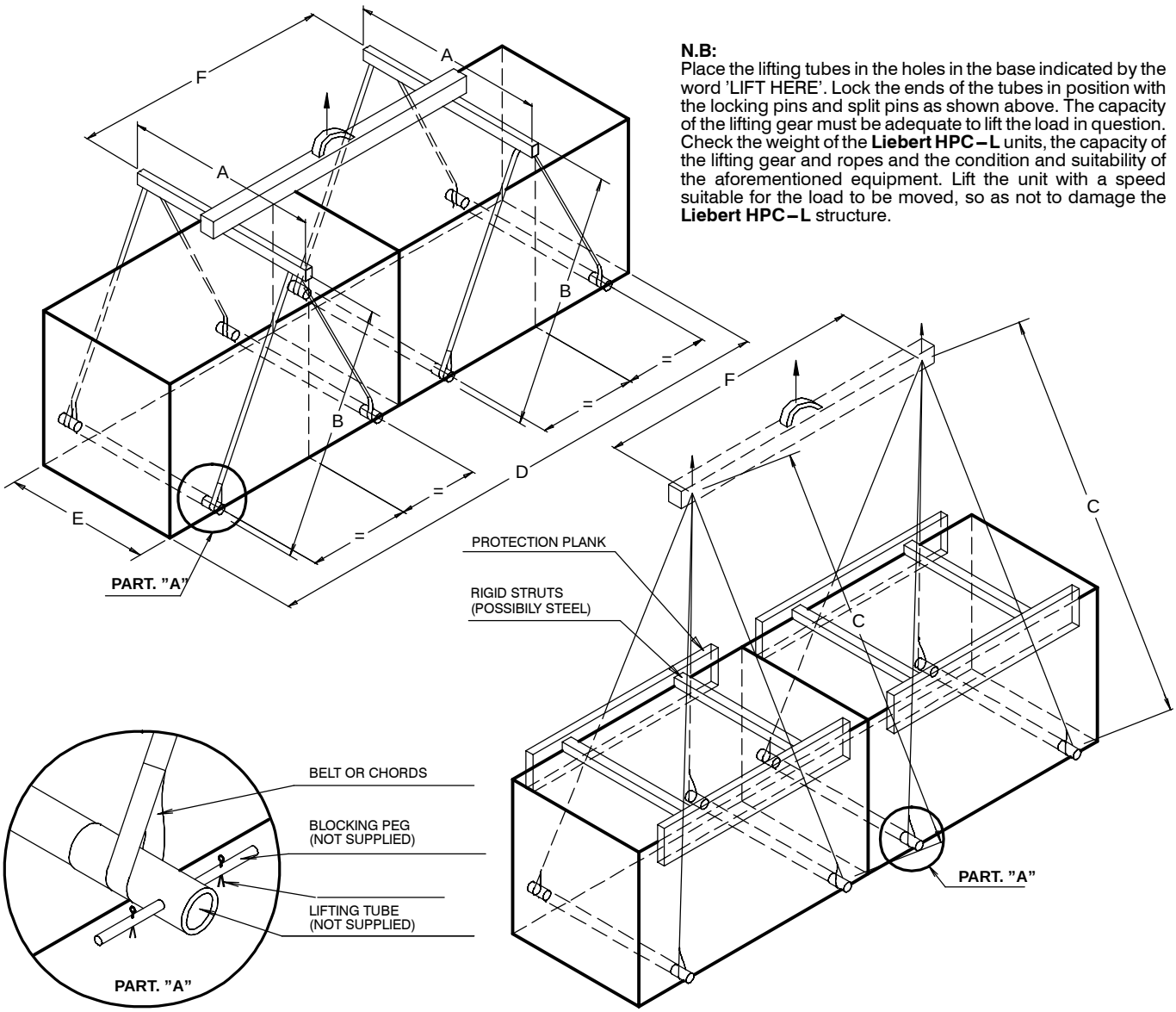
Code	A (mm)	B (mm)	P (mm)	F (mm)	CF (mm)	G (mm)	L (mm)	S (mm)
270326	108	50	M16	16.5	160	83	190	5

Tab. 11g – Rubber support (Chiller)

Unit	Configuration	Fans N.	Support kit code	Single support code	Kit support pieces
CA7 / CB7 081 CA7 / CB7 087	With or without pumps	10	489030	270326	14
CA7 / CB7 093 CA7 / CB7 100		12			
CA7 / CB7 107 CA7 / CB7 115		14			
CA7 / CB7 122		16	489031		16
CA7 / CB7 131 CA7 / CB7 140		20	485772		20
CL7 / CQ7 080 CL7 / CQ7 086		14	489030		14
CL7 / CQ7 092 CL7 / CQ7 099 CL7 / CQ7 106 CL7 / CQ7 114		16	489031		16
CL7 / CQ7 121 CL7 / CQ7 130 CL7 / CQ7 139		20	485772		20
CA4 / CB4 069 CA4 / CB4 075 CA4 / CB4 081 CA4 / CB4 087		10	489030		14
CA4 / CB4 093 CA4 / CB4 100		12			
CA4 / CB4 107		14			
CL4 / CQ4 068 CL4 / CQ4 074		12			
CL4 / CQ4 080 CL4 / CQ4 086		14			
CL4 / CQ4 092 CL4 / CQ4 099 CL4 / CQ4 106		16	489031		16

Each kit is complete with stainless steel fixing screws and plain washers for unit assembly.

Fig. 11c – Lifting instructions



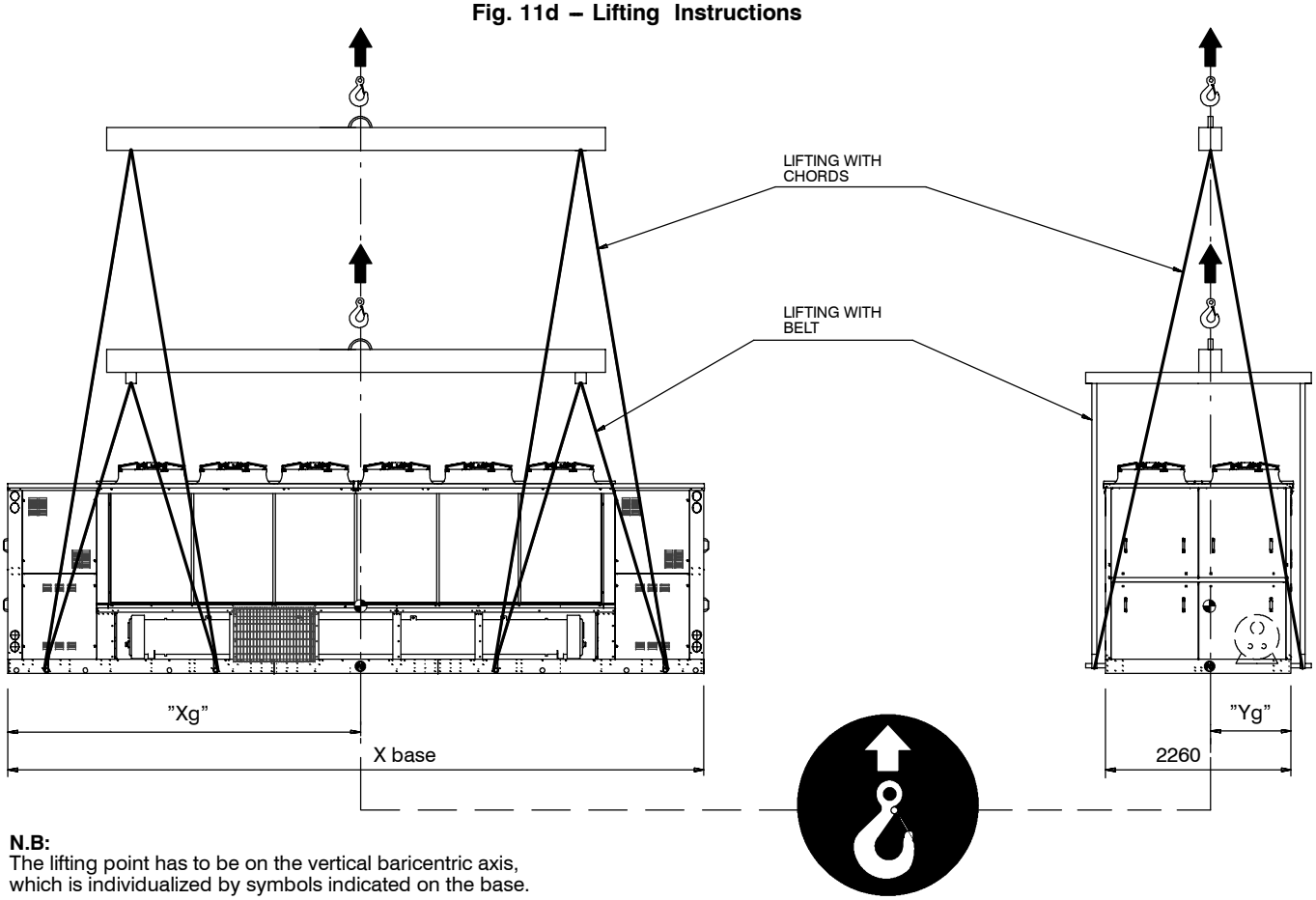
N.B:
Place the lifting tubes in the holes in the base indicated by the word 'LIFT HERE'. Lock the ends of the tubes in position with the locking pins and split pins as shown above. The capacity of the lifting gear must be adequate to lift the load in question. Check the weight of the **Liebert HPC–L** units, the capacity of the lifting gear and ropes and the condition and suitability of the aforementioned equipment. Lift the unit with a speed suitable for the load to be moved, so as not to damage the **Liebert HPC–L** structure.

Tab. 11j – Lifting

Models	Fans nr.	"A" (mm)	"B" (mm)	"C" (mm)	"D" (mm) (Base)	"E" (mm) (Base / Roof)	"F" (mm)
CA7 / CB7 081–087–093–100 CA4 / CB4 069–075–081–087–093–100 CL4 / CQ4 068–074	10 / 12	2750	≃ 4500	≃ 10000	8482	2260 / 2308	5476
CA7 / CB7 107–115 CA4 / CB4 107 CL7 / CQ7 080–086 CL4 / CQ4 080–086	14	2750	≃ 4500	≃ 10000	9478	2260 / 2308	5974
FA7 / FB7 081–087–093 FA4 / FB4 069–075–081–087–093 FL7 / FQ7 080 FL4 / FQ4 068–074–080	12	2750	≃ 4500	≃ 10000	9478	2260 / 2308	5974
CA7 / CB7 122 CL7 / CQ7 092–099–106–114 CL4 / CQ4 092–099–106 FA7 / FB7 100–107–115–122 FA4 / FB4 100–107 FL7 / FQ7 086–092–099–106 FL4 / FQ4 086–092–099–106	16	2750	≃ 4500	≃ 10000	11470	2260 / 2308	7100
CA7 / CB7 131–140 CL7 / CQ7 121–130–139 FL7 / FQ7 114–121	20	2750	≃ 4500	≃ 10000	13462	2260 / 2308	8056

Application Consideration

Fig. 11d – Lifting Instructions



N.B:
The lifting point has to be on the vertical baricentric axis, which is individualized by symbols indicated on the base.

Tab. 11k – Shipping weight and unit baricentre position (with and without pumps) – Chiller version

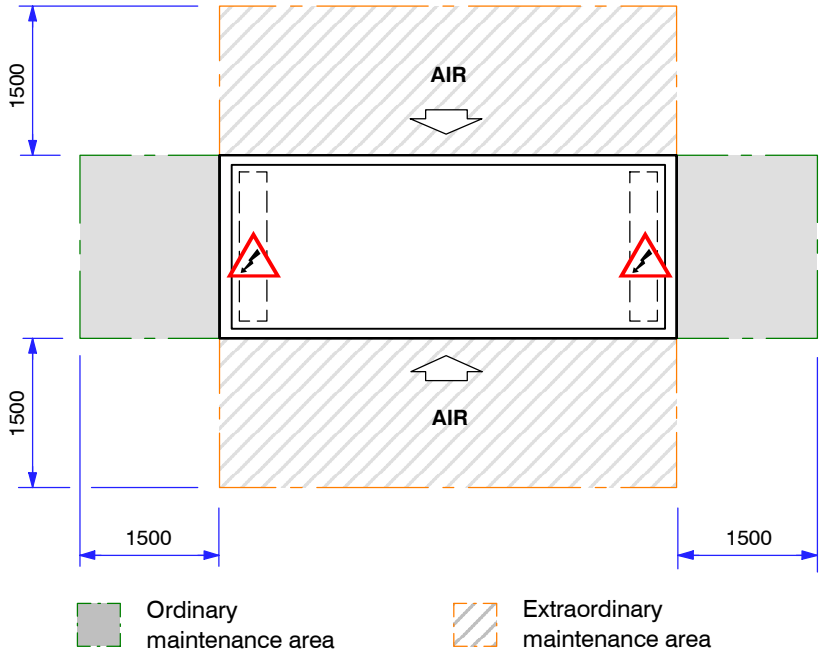
Models	X base (mm)	Unit without pumps			Unit with pumps		
		"Xg" (mm)	"Yg" (mm)	Shipping weight (kg)	"Xg" (mm)	"Yg" (mm)	Shipping weight (kg)
CA7 / CB7 081	8482	4250	1024	8690	4249	1049	9291
CA7 / CB7 087	8482	4241	1024	8712	4241	1050	9311
CA7 / CB7 093	8482	4250	1023	8902	4249	1049	9546
CA7 / CB7 100	8482	4246	1024	8922	4245	1050	9563
CA7 / CB7 107	9478	4747	1023	9637	4747	1048	10283
CA7 / CB7 115	9478	4721	1019	9698	4722	1044	10343
CA7 / CB7 122	11470	5743	1020	10730	5742	1043	11394
CA7 / CB7 131	13462	6727	1030	11784	6728	1050	12452
CA7 / CB7 140	13462	6738	1030	11809	6738	1052	12530
CL7 / CQ7 080	9478	4747	1029	9174	4747	1053	9775
CL7 / CQ7 086	9478	4738	1030	9194	4738	1053	9795
CL7 / CQ7 092	11470	5743	1035	10078	5742	1058	10724
CL7 / CQ7 099	11470	5738	1037	10094	5737	1059	10742
CL7 / CQ7 106	11470	5743	1030	10270	5742	1053	10918
CL7 / CQ7 114	11470	5712	1026	10334	5714	1049	10978
CL7 / CQ7 121	13462	6738	1027	11449	6738	1048	12112
CL7 / CQ7 130	13462	6727	1027	11464	6728	1048	12132
CL7 / CQ7 139	13462	6738	1028	11489	6738	1050	12210
CA4 / CB4 069	8482	4250	1020	8686	4249	1046	9287
CA4 / CB4 075	8482	4246	1020	8694	4245	1046	9297
CA4 / CB4 081	8482	4250	1015	8815	4249	1041	9416
CA4 / CB4 087	8482	4224	1011	8892	4226	1037	9492
CA4 / CB4 093	8482	4250	1009	9074	4249	1036	9721
CA4 / CB4 100	8482	4238	1010	9105	4238	1036	9751
CA4 / CB4 107	9478	4747	1009	9836	4747	1034	10483
CL4 / CQ4 068	8482	4250	1020	8672	4249	1046	9276
CL4 / CQ4 074	8482	4246	1020	8684	4245	1046	9286
CL4 / CQ4 080	9478	4747	1021	9302	4747	1045	9900
CL4 / CQ4 086	9478	4720	1018	9374	4721	1042	9977
CL4 / CQ4 092	11470	5743	1023	10260	5742	1046	10905
CL4 / CQ4 099	11470	5728	1024	10288	5728	1047	10935
CL4 / CQ4 106	11470	5743	1016	10474	5742	1040	11120

Application Consideration

Tab. 11l – Shipping weight and unit baricentre position (with and without pumps) – Freecooling version

Models	X base (mm)	Unit without pumps			Unit with pumps		
		"Xg" (mm)	"Yg" (mm)	Shipping weight (kg)	"Xg" (mm)	"Yg" (mm)	Shipping weight (kg)
FA7 / FB7 081	9478	4746	1048	10618	4746	1067	11123
FA7 / FB7 087	9478	4738	1048	10638	4738	1067	11143
FA7 / FB7 093	9478	4746	1049	10785	4746	1067	11250
FA7 / FB7 100	11470	5737	1059	12192	5737	1076	12867
FA7 / FB7 107	11470	5741	1054	12371	5741	1070	13046
FA7 / FB7 115	11470	5716	1050	12439	5717	1067	13114
FA7 / FB7 122	11470	5742	1043	12623	5741	1060	13298
FL7 / FQ7 080	9478	4746	1047	10498	4746	1066	11003
FL7 / FQ7 086	11470	5733	1056	11812	5733	1073	12317
FL7 / FQ7 092	11470	5742	1057	11957	5741	1073	12422
FL7 / FQ7 099	11470	5737	1058	11972	5737	1075	12647
FL7 / FQ7 106	11470	5742	1052	12151	5741	1069	12826
FL7 / FQ7 114	13462	6709	1056	13441	6710	1072	14116
FL7 / FQ7 121	13462	6737	1049	13623	6737	1065	14298
FA4 / FB4 069	9478	4746	1045	10630	4746	1064	11135
FA4 / FB4 075	9478	4742	1045	10640	4742	1064	11145
FA4 / FB4 081	9478	4746	1041	10763	4746	1060	11268
FA4 / FB4 087	9478	4723	1037	10836	4723	1057	11341
FA4 / FB4 093	9478	4746	1037	10974	4746	1055	11439
FA4 / FB4 100	11470	5729	1048	12404	5729	1065	13079
FA4 / FB4 107	11470	5742	1042	12591	5741	1059	13266
FL4 / FQ4 068	9478	4746	1044	10510	4746	1064	11015
FL4 / FQ4 074	9478	4742	1044	10520	4742	1064	11025
FL4 / FQ4 080	9478	4746	1040	10643	4746	1059	11148
FL4 / FQ4 086	11470	5715	1047	12018	5716	1064	12523
FL4 / FQ4 092	11470	5742	1046	12154	5741	1062	12619
FL4 / FQ4 099	11470	5729	1047	12184	5729	1064	12859
FL4 / FQ4 106	11470	5742	1040	12371	5741	1058	13046

Fig. 11e – Service areas (top view)



Notes:
Minimum distance between 2 units from condensing coil side = 3 m
Do not obstruct the air exiting the fans for a minimum distance of 2.5 m

Dimensional Data

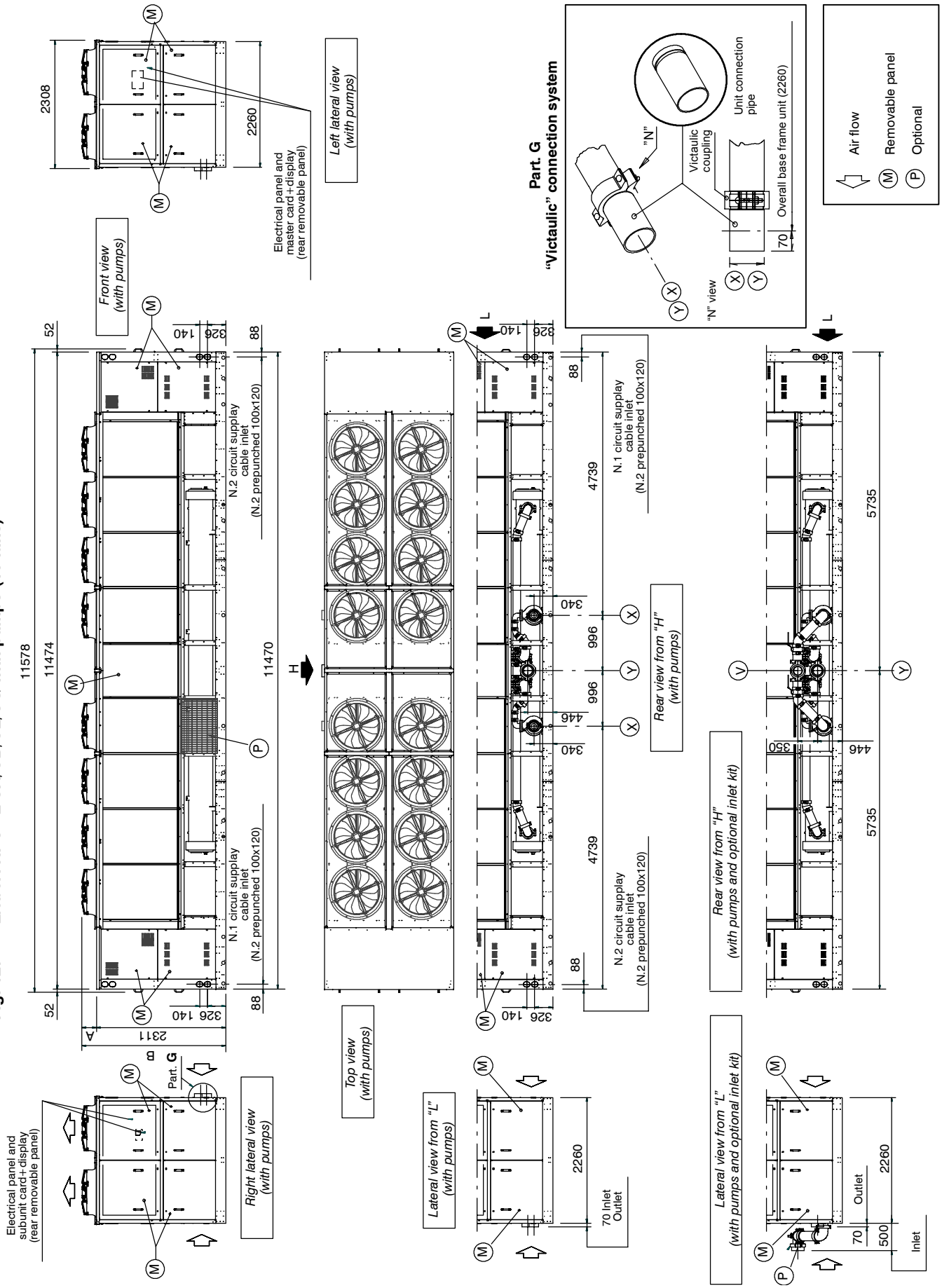


Fig. 12f – Liebert HPC–L CA/CB/CL/CQ with pumps (16 fans)

Tab. 12f – HPC–L CA/CB/CL/CQ with pumps (16 fans)

			Chiller water connection		
Model	**"A"** (mm)	**"B"** (mm)	**"X"** (Standard)	**"V"** (Optional)	**"Y"**
CA7 122	252	2563	2 x Inlet DN150–6"–168.3mm	1 x Inlet DN200–8"–219.1mm	1 x Outlet DN200–8"–219.1mm
CB7 122	260	2571			
CL7 / CQ7 092–099 CL4 / CQ4 092–099	260 (*)	2571 (*)			
CL7 / CQ7 106–114 CL4 / CQ4 106					

(*) In EC fans version added 30 mm

Dimensional Data

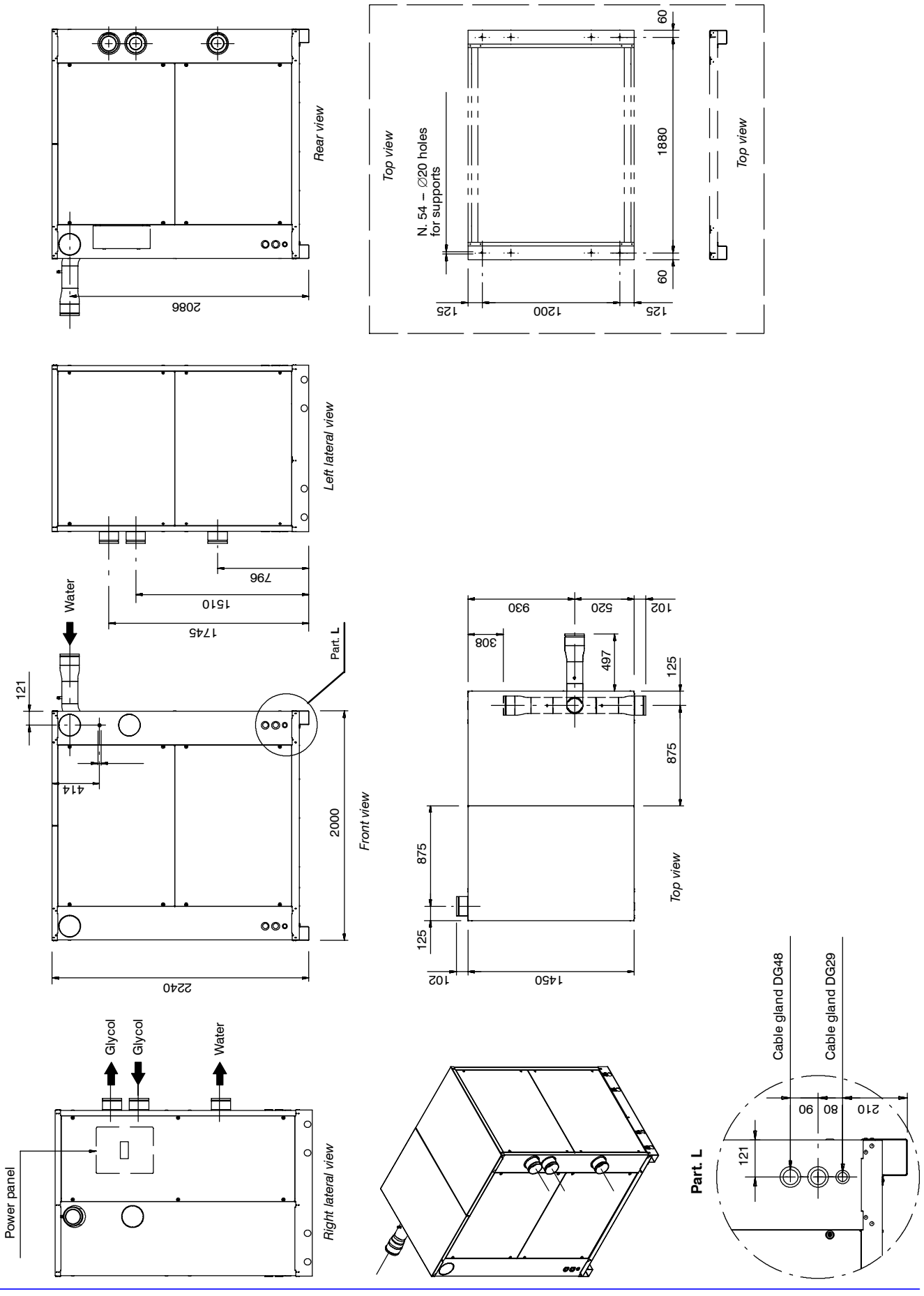
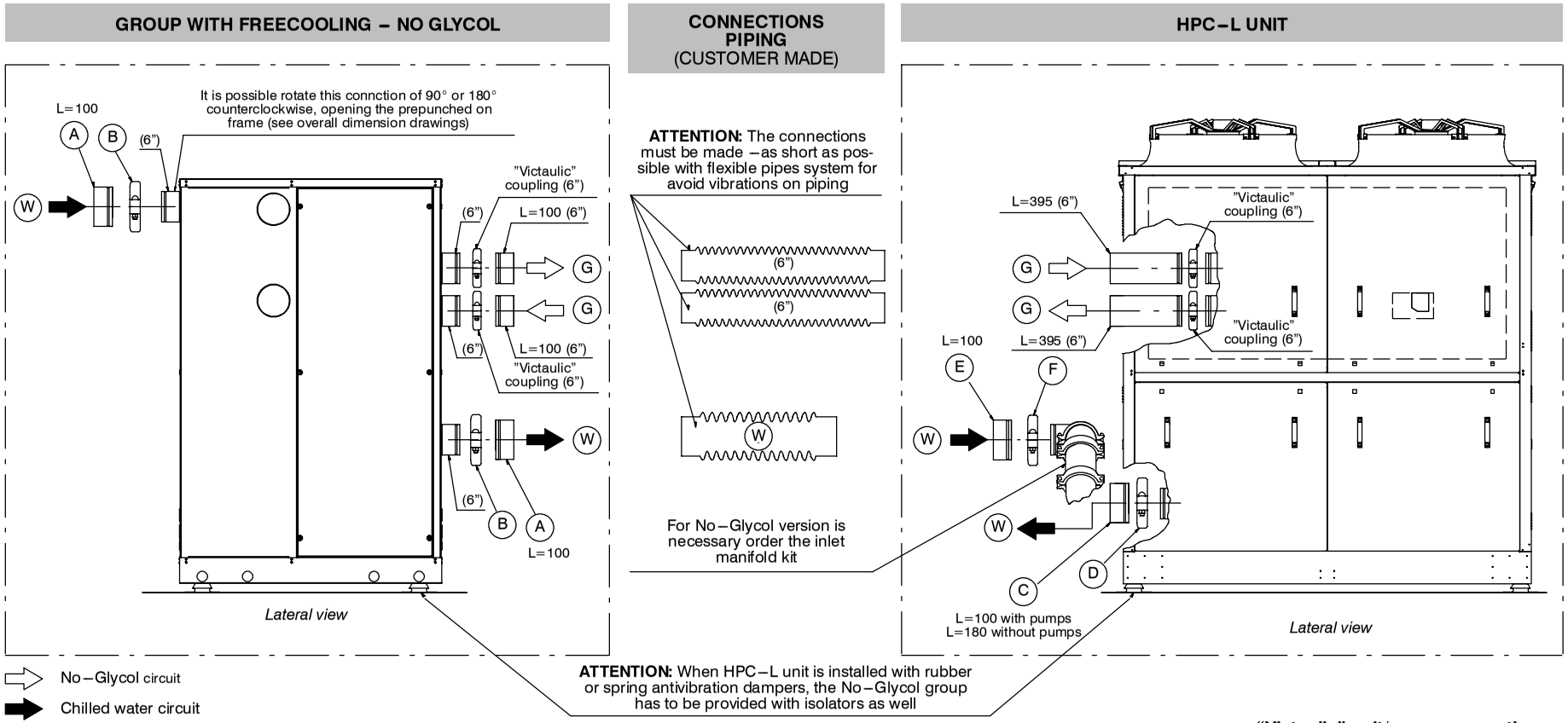


Fig. 12q – No Glycol group dimensions



Tab. 12q – HPC–L unit connections with freecooling / No Glycol group

HPC–L	N. Fan	(A)	(B)	(C)	(D) With pumps	(D) Without pumps	(E)	(F)	Chilled water connction (W)	No Glycol connection (G)
FA7 / FB7 081–087 FA4 / FB4 069–075–081–087	12	6"	Victaulic coupling 6"	6"	Victaulic riduc. coupling 5"–6"	Victaulic riduc. coupling 6"–8"	6"	Victaulic riduc. coupling 5"–6"	DN150–6"–168.3mm	DN150–6"–168.3mm
FA7 / FB7 093 FA4 / FB4 093		8"	Victaulic riduc. coupling 6"–8"	8"	Victaulic riduc. coupling 6"–8"	Victaulic coupling 8"	8"	Victaulic riduc. coupling 6"–8"	DN200–8"–219.1mm	
FA7 / FB7 100–107–115–122 FA4 / FB4 100–107	16									
FL7 / FQ7 080 FL4 / FQ4 068–074–080	12	6"	Victaulic coupling 6"	6"	Victaulic riduc. coupling 5"–6"	Victaulic riduc. coupling 6"–8"	6"	Victaulic riduc. coupling 5"–6"	DN150–6"–168.3mm	
FL7 / FQ7 086 FL4 / FQ4 086	16									
FL7 / FQ7 092–099–106 FL4 / FQ4 092–099–106		8"	Victaulic riduc. coupling 6"–8"	8"	Victaulic riduc. coupling 6"–8"	Victaulic coupling 8"	8"	Victaulic riduc. coupling 6"–8"	DN200–8"–219.1mm	
FL7 FQ7 114–121	20									

"Victaulic" unit/group connection system

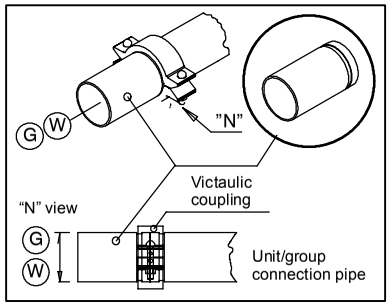


Fig. 12r – Instructions for HPC–L unit / No Glycol group piping