Liebert® HPC-W WH-series

Water- Cooled Chiller with Screw Compressors

Product Documentation

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LIEBERT® HPC-W WH-series

Liebert® HPC-W WH-series is the new product line of water cooled chillers, from 600 to 2100 kW, designed to combine the best performance in terms of efficiency and reliability with the lowest impact on the environment.

The use of shell & tube heat exchangers and semi- hermetic screw compressors specifically designed for applications with R134a, enable the new series to be featured by its high energy efficiency, thus leading its category as for this parameter.

Quality of the used components and the continuous adaptation of the chiller to the conditions of its system thanks to the micro-processor adjustment logic ensure a high flexibility to meet the requirements of the HPAC technological sector, as well as of commercial and industrial applications.

LIEBERT® HPC-W WH-SERIES

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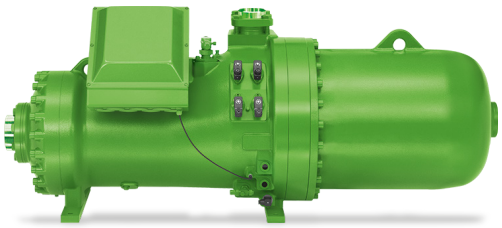
1. FEATURES AND BENEFITS

Reliability and Low Environmental Impact

Reliability

The Liebert® HPC-W WH-series is equipped with two semi- hermetic screw compressors which represent state- of - the- art technology in this sector. They have been designed and optimized for R134a refrigerant applications.



The high volumetric efficiency ensures excellent performance of the Liebert® HPC-W WH-series, 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.

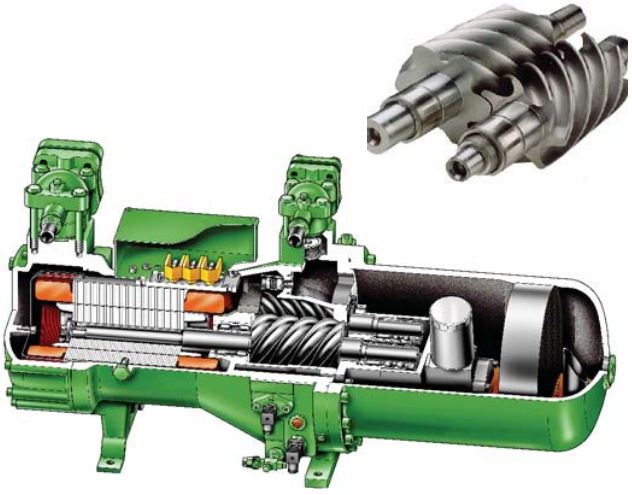
The wide operating range, bearing lubrication, component oversizing, absence of vibrations and few moving parts, together with the resistance to liquid slugging and compressor electronic control integrated with the machine microprocessor enhance the well- known characteristics of operating reliability and long life typical of this compressors type.

Liebert® HPC-W WH-series is available from 600 to 2100 kW; it is equipped with two independent refrigerating circuits ensuring the highest inner redundancy and thus the highest system reliability.

Liebert® HPC-W WH-series units are run tested at the factory before shipment.

Fewer moving parts

Unlike semi- hermetic reciprocating compressors, screw compressors do not have pistons, connecting rods, suction and discharge valves nor a mechanical oil pump. Fewer moving parts lead to greater reliability and a longer lifetime.



The positive effects of the refrigerant R134a when compared to traditional refrigerants (lower temperatures and pressures at the compressor discharge) lead to a lower thermal and mechanical stress on the compressor bearings, thus guaranteeing greater reliability and steady performance in time.

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 granted 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.

Resistance to liquid slugging

The robust design of the screw compressors can tolerate/withstand amounts of liquid refrigerant that would severely damage reciprocating compressor valves, piston rods and cylinders.

Start- up management

The specific features of Liebert® HPC-W WH-series 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&tube evaporators and condensers designed and optimized for applications with R134a, with wide heat exchange surfaces and low load losses on the water side, ensure matchless efficiency levels.

Efficient control and adjustment

The different strategies of the microprocessor control by Vertiv 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.

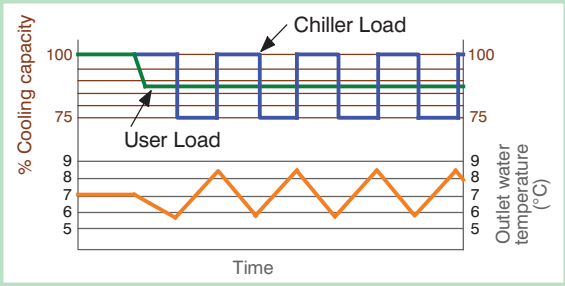
Each unit is equipped with a variable power control without limits from 100% to 25%.

This modulation enables the compressor to perfectly meet the building- cooling load without any change in the outlet temperature from the evaporator.

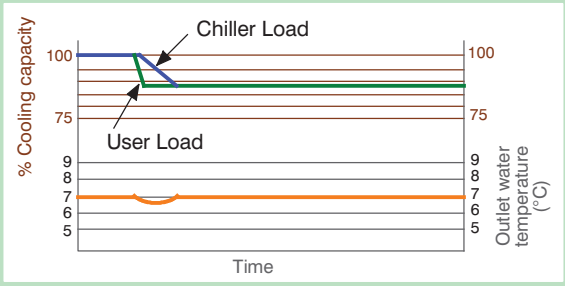
This change in the cooled water temperature is avoided only thanks to a stepless control, such as the one offered by Vertiv. Indeed, with a step capacity control with partial loads, each power step would be too high or too low when compared to the building- cooling load, so loosing water temperature control.

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

The EEV electronic thermal expansion valve enables to fill the evaporator with the correct flow rate of refrigerant and keeps the correct gas over- heating, above all when the operating conditions would be critical for the traditional TXV valve (namely at a partial load of 25% and with a low flow rate pressure).



Fluctuation with steps capacity control



Stability with stepless capacity control

Chiller Seasonal Performance Rating According to Commission Regulation (EU) 2016/2281 Implementing Directive 2009/125/EC (Ecodesign)

Ecodesign regulations for liquid chillers are setting very high energy efficiency requirements.

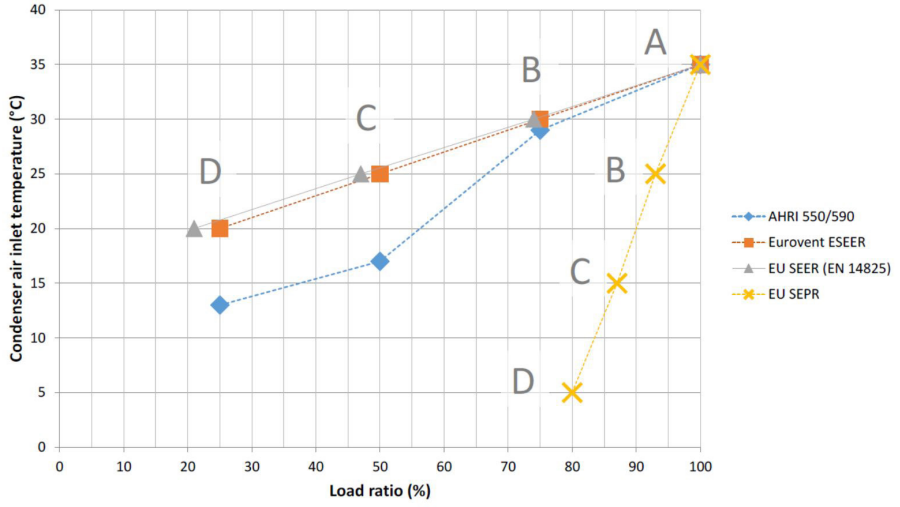
Starting from January 1st, 2018 Minimum Energy Performance Standards (MEPS) will become mandatory for those products (Comfort A/C and HT Process Chillers) installed on the EU Market.

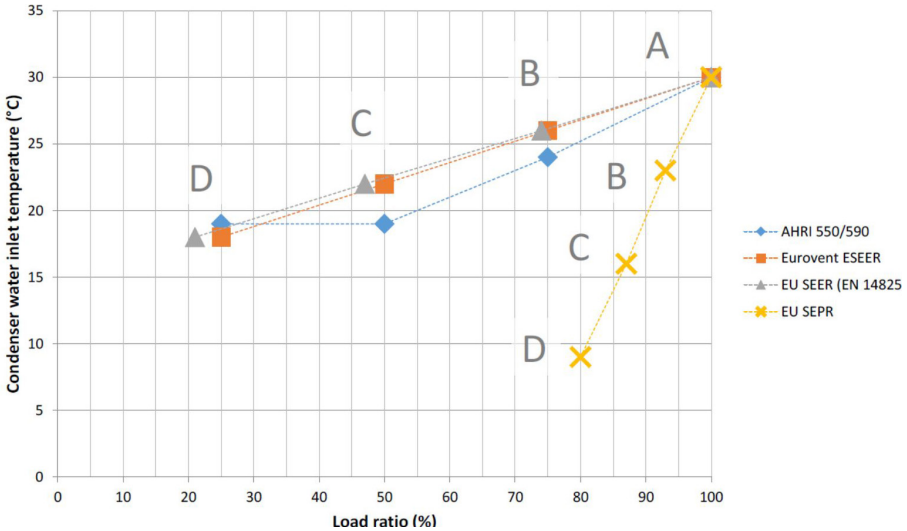
There are some differences in the approach for chillers used in process cooling and those in non-standard comfort cooling, where for the latter more time is spent at higher loading levels and in lower ambient temperatures: in the EU, a separate and quite different set of loading and rating points is specified under the metric called Seasonal Energy Performance Ratio (SEPR). All Vertiv water-cooled liquid chillers are declared as high temperature process chillers.

This means that a product capable of cooling down and continuously maintaining the temperature of a liquid (not lower than + 2 °C nor higher than + 12 °C), in order to provide cooling to a refrigerated appliance or system, the purpose of which is not to provide cooling for human beings, may or may not integrate other ancillary equipment.

In all standards that cover seasonal performance, the standard seasonal rating is based on part load ratings at different cooling loads and outdoor temperatures (or of condensing water temperatures for water-cooled chillers). These different rating points are usually referred to as rating points A, B, C and D

The graphs below provide a visual representation of part load rating conditions (varying condenser inlet and load ratio) of air-cooled chillers and water-cooled chillers in international standards.





High temperature process chiller calculation / measurement methodology is indicated by (EU) 2016/2281 and harmonized standard EN14825 “Testing and rating at part load conditions and calculation of seasonal performance” where all details procedure are provided.

EU Nr. 2016/2281 Process Chillers (HT) - Requirements

Heat transfer medium at the condensing side	Rated refigeration capacity	Mnimum SEPR value - 2018	Mnimum SEPR value - 2021
Air	P_A < 400 kW	4,5	5,0
	P_A ≥ 400 kW	5,0	5,5
Water	P_A < 400 kW	6,5	7,0
	400 kW ≤ P_A < 1 500 kW	7,5	8,0
	P_A ≥ 1 500 kW	8,0	8,5

Efficiency on Vertiv water-cooled liquid chillers

Model	Cooling Capacity [kW]	EER	SEPR
WH2063	638	5,53	8,10
WH2072	735	5,61	8,19
WH2088	895	5,56	7,61
WH2100	1025	5,64	7,72
WH2115	1177	5,76	7,92
WH2131	1338	5,81	7,99
WH2142	1447	5,54	8,05

Low sound emission

Liebert® HPC-W WH-series features extremely reduced sound emissions, above all in the models for silent versions, thanks to the special lay- out of its components.

The operation with extremely reduced noise level and the absence of vibrations enable the installation in rooms with very strict sound limits.

2. DIGIT NOMENCLATURE

The unit is fully defined by twenty five digits.

DIGIT	FEATURE	VALUE	DESCRIPTION
1	Specification	W	Water cooled chiller
2	Version	H	Standard Version - Screw Compressors
3	Number of circuit(s) / compressor(s)	2	2 circuits / Compressor
4 5 6	Cooling capacity (x 10 kW)	100	100 x 10 = 1000 kW
7	Display and switch	A	Small Graphic Display
		B	Small Graphic Display + Network Switch
		C	Seven Inches Touch Screen + Network Switch
8	Free option	0	None
9	Monitoring	0	None
		1	Modbus 485 + HTTP/WEB
		2	Modbus Over IP + HTTP/WEB
		3	BACnet MSTP + HTTP/WEB
		4	BACnet Over IP + HTTP/WEB
		5	SNMP + HTTP/WEB
10	Power factor correction	0	None
		1	Power Factor Connection
11	Free	0	None
12	Free	0	None
13	Special instrumentation	0	None
		1	Energy Meter
		2	Chilled Water Meter
		3	Energy Meter + Chilled Water Meter
14	Fast start ramp and control supply	0	None
		1	Fast Start Ramp - Easy: no need of UPS Line, on-board ultracap for control supply backup
		2	Fast Start Ramp - Classic: control under UPS Line
15	Low temperature device	0	Standard Electrical Panel
		1	Electrical Panel With Heaters
16	Low noise version	0	Standard
		1	With Panel and insulation
17	Free	0	None
18	Special requirements	0	Standard
		X	As specified

3. OPERATING RANGE

Working Limits

The models of the series Liebert® HPC-W are water-cooled chillers for civil, commercial and technological uses, to be installed exclusively indoors and protected from weather agents.

The water temperature limits are different for the two unit versions:

- WH Versions:
    - Max outlet evaporator temperature: 12°C;
    - Min outlet evaporator temperature: 4°C;
    - Max inlet evaporator temperature: 20°C;
    - Max inlet condenser temperature: 42°C;
    - Min outlet condenser temperature: 28°C;
- WHT Versions:
    - Max outlet evaporator temperature: 25°C;
    - Min outlet evaporator temperature: 13°C;
    - Max inlet evaporator temperature: 32°C;
    - Max inlet condenser temperature: 50°C;
    - Min outlet condenser temperature: 30°C;

Only during start-up, higher water temperatures are allowed. Instead, the water flow rate limits for both versions are the same. If the water flow rate is too low, then safety devices lock the unit, because the heat exchange is too low; if the water flow rate is too high it may cause corrosion and vibrations of shell and tubes. Make sure that the water flow rate is compatible with the values given in the tables of page 7.

Versions with special heat exchangers are available when it is necessary to operate with reduced or increased flow rate (example condenser with 4 passages for well water or evaporators with closer plates).

In order to prevent damages and to maintain the warranty, the installation on the hydraulic circuit is mandatory:

- Flow switch on the water supply to the evaporator. If it isn't installed, the unit doesn't work and the relevant contact must not be bridged on the electrical board;
- The Liebert® HPC-W unit locks-out due to self-protection if the water to the condenser is below that of the operating limits of temperature. To prevent that, the customer may install a protection device on the condenser water system, as a three-way or two-way valve allowing the water recirculation on the condenser.

Thermal limits on electric board due to room conditions:

- Room temperature max. = 40°C
- Room temperature min. without electric board heater = 0°C
- Room temperature min. with electric board heater = -10°C
- Nominal power supply tolerance: 400 V ± 10%
- Max phase difference: 2%
- For different design condition ask to your agent;

Unit storage condition:

- Temperature -10°C - +45°C

- Humidity: 5 - 80% non-condensing
- Indoors and protected against weather agents

NOTE: The ambient temperature must not reach 50°C, because in this condition the safety valve on the low pressure side will open.

WH VERSIONS		WH2063	WH2072	WH2088	WH2100	WH2115	WH2131	WH2142
Working range								
Max. condenser inlet water temp. (1)	°C	42	42	42	42	42	42	42
Min. condenser outlet water temp. (1)	°C	20	20	20	20	20	20	20
Min evaporator outlet water temp.	°C	4	4	4	4	4	4	4
Max. evaporator flow	m^3/h	157,7	170,2	221,3	276,0	278,1	347,3	347,5
Min. evaporator flow	m^3/h	37,9	43,0	52,4	65,6	65,1	81,6	81,6
Max. condenser flow	m^3/h	2x109	2x133,5	2x164	2x186	2x215,5	2x244	2x264
Min. condenser flow	m^3/h	2x38	2x46	2x57	2x64	2x74	2x83	2x88
Safety devices settings								
High pressure switch (HP)	bar	20	20	20	20	20	20	20
High pressure safety valve	bar	22	22	22	22	22	22	22
HP safety valves (each circuit)	Nr.	2	2	2	2	2	3	3
High pressure safety valve connection	in	1 1/4" G-M	1 1/4" G-M	1 1/4" G-M	1 1/4" G-M	1 1/4" G-M	1 1/4" G-M	1 1/4" G-M
Low pressure safety valve	bar	14	14	14	14	14	14	14
Low pressure safety valves (each circuit)	Nr.	1	1	1	1	1	1	1
Low pressure safety valve connection	in	1" G-M	1" G-M	1" G-M	1" G-M	1 1/4" G-M	1 1/4" G-M	1 1/4" G-M

WHT VERSIONS		WHT2043	WHT2053	WHT2063	WHT2072	WHT2088	WHT2100	WHT2115	WHT2131	WHT2142
Working range										
Max. condenser inlet water temp. (2)	°C	50	50	50	50	50	50	50	50	50
Min. condenser outlet water temp. (2)	°C	28	28	28	28	28	28	28	28	28
Min evaporator outlet water temp.	°C	13	13	13	13	13	13	13	13	13
Max. evaporator flow	m^3/h	131,7	131,9	157,7	170,2	221,3	276,0	278,1	347,3	347,5
Min. evaporator flow	m^3/h	31,5	31,5	37,9	43	52,4	65,6	65,1	81,6	81,6
Max. condenser flow	m^3/h	2x92,3	2x102,5	2x109	2x133,5	2x164	2x186	2x215,5	2x244	2x264
Min. condenser flow	m^3/h	2x30,7	2x34,1	2x38	2x46	2x57	2x64	2x74	2x83	2x88
Safety devices settings										
High pressure switch (HP)	bar	20	20	20	20	20	20	20	20	20
High pressure safety valve	bar	22	22	22	22	22	22	22	22	22
HP safety valves (each circuit)	Nr.	1	1	2	2	2	2	2	3	3
High pressure safety valve connection	in	1 1/4" G-M	1 1/4" G-M	1 1/4" G-M	1 1/4" G-M	1 1/4" G-M	1 1/4" G-M	1 1/4" G-M	1 1/4" G-M	1 1/4" G-M
Low pressure safety valve	bar	14	14	14	14	14	14	14	14	14
Low pressure safety valves (each circuit)	Nr.	1	1	1	1	1	1	1	1	1
Low pressure safety valve connection	in	1" G-M	1" G-M	1" G-M	1" G-M	1" G-M	1" G-M	1 1/4" G-M	1 1/4" G-M	1 1/4" G-M

NOTE

(1) with nominal condenser and evaporator water flow; evaporator outlet temperature 7°C; full load and automatic unload disable.

(2) with nominal condenser and evaporator water flow; evaporator outlet temperature 20°C; full load and automatic unload disable.

4. TECHNICAL DATA

Tab. 4.1 Liebert® HPC-W WH-series

MODELS		WH2063	WH2072	WH2088	WH2100	WH2115	WH2131	WH2142
Performance [1]								
Cooling Capacity Net	kW	638	735	895	1025	1177	1338	1447
Unit Power Input Net	kW	115	131	161	182	204	230	261
Unit EER Net	-	5,53	5,61	5,56	5,64	5,76	5,81	5,54
SEPR[3] (EU 2016/2281)	-	8,10	8,19	7,61	7,72	7,92	7,99	8,05
Cooling Capacity Gross	kW	641	738	899	1029	1182	1343	1453
Unit Power Input Gross	kW	113	128	157	178	200	226	255
Unit EER Gross	-	5,69	5,75	5,73	5,79	5,92	5,95	5,69
Heat Rejection	kW	754	867	1056	1206	1382	1569	1708
Evaporator water flow	$m^3 h^{-1}$	110,0	126,7	154,3	176,6	202,9	230,5	249,4
Evaporator water pressure drop	kPa	57	53	63	59	57	50	62
Condenser water flow	$m^3 h^{-1}$	130,4	150,0	182,7	208,8	239,1	271,4	295,5
Condenser water pressure drop	kPa	26	26	24	23	24	23	24
Noise								
SPL (Sound Pressure Level) [4]	dB(A)	76,5	77,4	76,7	76,9	79,3	78,7	81,0
PWL (Sound Power Level) [5]	dB(A)	96,0	96,9	96,2	96,4	98,8	98,2	100,5
Low Noise version: SPL (Sound Pressure Level) [4]	dB(A)	68,5	69,4	68,7	68,9	71,3	70,7	73,0
Low Noise version: PWL (Sound Power Level) [5]	dB(A)	88,0	88,9	88,2	88,4	90,8	90,2	92,5
Refrigeration circuits								
Number of refrigeration circuits	-	2	2	2	2	2	2	2
Refrigerant charge	kg	46	85	82	78	144	138	138
Compressors								
Number of compressors	n°	2	2	2	2	2	2	2
Type	-	Semi-hermetic screw compressors						
Nominal power (each compressor)	HP	110	125	140	160	180	210	240
Evaporator								
Number of evaporators	n°	1	1	1	1	1	1	1
Type	-	Shell & Tubes						
Internal volume (refrigerant side)	l	102	127	159	181	217	244	258
Water volume	l	292	553	574	549	1011	979	963
Condenser								
Number of condensers	n°	2	2	2	2	2	2	2
Type	-	Shell & Tubes						
Internal volume each cond. (Shell Side)	l	54	194	175	158	326	306	293
Water volume each cond. (Tubes Side)	l	47	89	106	121	142	159	171

Hydraulic Connection								
Condenser connection Victaulic Coupling	-	DN100 4" 114,30 mm	DN125 5" 141,30 mm	DN125 5" 141,30 mm	DN125 5" 141,30 mm	DN150 6" 168,27 mm	DN150 6" 168,27 mm	DN150 6" 168,27 mm
Evaporator connection Victaulic Coupling	-	DN150 5" 141,30 mm	DN200 8" 219,07 mm	DN200 8" 219,07 mm	DN200 8" 219,07 mm	DN250 10" 273,05 mm	DN250 10" 273,05 mm	DN250 10" 273,05 mm
Dimensions								
Lenght	mm	4241	4588	4588	4588	4976	4976	4976
Depth	mm	1555	1555	1555	1555	1791	1791	1791
Height	mm	2154	2265	2265	2265	2578	2578	2578
Weights								
Net weight	kg	4051	4667	5707	5812	7064	7211	7411
Operating weight	kg	4456	5435	6532	6642	8424	8573	8781

NOTE

(1) At the foolowing standard conditions:

a) Power supply 400 V / 3 ph / 50 Hz;

b) Refrigerant R134a;

c) Evaporator: inlet/outlet water temperature 12-7°C;

d) Condenser: inlet/outlet water temperature 30-35°C.

(2) At the foolowing standard conditions:

a) Power supply 400 V / 3 ph / 50 Hz;

b) Refrigerant R134a;

c) Evaporator: inlet/outlet water temperature 26-20°C;

d) Condenser: inlet/outlet water temperature 35-40°C.

(3) SEPR (Seasonal Energy Performance Ratio) is the efficiency ratio of a high temperature process chiller at standard rating conditions, rapresentative of the variations in load and ambient temperature throughout the year, and calculated as the ratio between the annual refrigeration demand and the annual electricity cosumption as Commision Regulation EU 2016/2281.

(4) The value of **SPL** (Sound Pressure Level) for every octave band frequency is measured in free field conditions and at 1 meter from the unit according to ISO 3744 average method at the standard condition. Sound Pressure Level tolerance for each octave band: -0 / +2 dB.

(5) The value of **PWL** (Sound Power Level) is calculated according to ISO 3744 procedure method at the standard condition. Sound Power Level tolerance for each octave band: -0 / +2 dB.

Tab. 4.2 Liebert® HPC-W version WHT for high water temperatures

MODELS		WHT2043	WHT2053	WHT2063	WHT2072	WHT2088	WHT2100	WHT2115	WHT2131	WHT2142
Performance [2]										
Cooling Capacity Net	kW	740	847	933	1098	1288	1480	1713	1953	2116
Unit Power Input Net	kW	121	140	156	177	202	232	254	287	352
Unit EER Net	-	6,11	6,07	5,96	6,19	6,38	6,38	6,73	6,80	6,01
Cooling Capacity Gross	-	743	851	937	1102	1293	1486	1719	1960	2125
Unit Power Input Gross	kW	118	136	152	173	196	226	248	280	344
Unit EER Gross	kW	6,27	6,27	6,15	6,37	6,59	6,57	6,93	6,99	6,19
Heat Rejection	-	861	987	1089	1275	1490	1712	1967	2240	2468
Evaporator water flow	kW	106,8	122,5	134,8	158,6	186,1	213,8	247,3	281,9	305,7
Evaporator water pressure drop	$m^3 h^{-1}$	60	79	74	70	77	73	71	63	78
Condenser water flow	kPa	149,3	171,1	188,9	221,1	258,3	296,8	340,9	388,4	427,9
Condenser water pressure drop	$m^3 h^{-1}$	43	47	52	46	43	45	44	44	48
Noise										
SPL (Sound Pressure Level) [4]	dB(A)	77,9	78,4	79,7	80,6	79,9	80,1	82,5	81,9	84,2
PWL (Sound Power Level) [5]	dB(A)	97,4	97,9	99,2	100,1	99,4	99,6	102,0	101,4	103,7
Low Noise version: SPL (Sound Pressure Level) [4]	dB(A)	69,9	70,4	71,7	72,6	71,9	72,1	74,5	73,9	76,2
Low Noise version: PWL (Sound Power Level) [5]	dB(A)	89,4	89,9	91,2	92,1	91,4	91,6	94,0	93,4	95,7
Refrigeration circuits										
Number of refrigeration circuits	n°	2	2	2	2	2	2	2	2	2
Refrigeration charge (each circuit)	kg	42	45	46	85	82	78	144	138	138
Compressors										
Number of compressors	n°	2	2	2	2	2	2	2	2	2
Type	-	Semi-hermetic screw compressors								
Nominal Power (each compressor)	HP	125	140	160	180	210	240	280	300	320
Evaporator										
Number of evaporator	n°	1	1	1	1	1	1	1	1	1
Type	-	Shell & Tubes								
Internal volume (Tubes side)	l	87	94	102	127	159	181	217	244	258
Water volume (Shell Side)	l	310	301	292	553	574	549	1011	979	963
Condenser										
Number of condensers	n°	2	2	2	2	2	2	2	2	2
Type	-	Shell & Tubes								
Internal volume each cond. (Shell Side)	l	62	57	54	194	175	158	326	306	293
Water volume each cond. (Tubes Side)	l	41	45	47	89	103	121	142	159	171

Hydraulic Connection										
"Condenser connection Victaulic Coupling"	-	DN100 4" 114,30 mm	DN100 4" 114,30 mm	DN100 4" 114,30 mm	DN125 5" 141,30 mm	DN125 5" 141,30 mm	DN125 5" 141,30 mm	DN150 6" 168,27 mm	DN150 6" 168,27 mm	DN150 6" 168,27 mm
"Evaporator connection Victaulic Coupling"	-	DN150 5" 141,30 mm	DN150 5" 141,30 mm	DN150 5" 141,30 mm	DN200 8" 219,07 mm	DN200 8" 219,07 mm	DN200 8" 219,07 mm	DN250 10" 273,05 mm	DN250 10" 273,05 mm	DN250 10" 273,05 mm
Dimensions										
Lenght	mm	4241	4241	4241	4588	4588	4588	4976	4976	4976
Depth	mm	1555	1555	1555	1555	1555	1555	1791	1791	1791
Height	mm	2154	2154	2154	2265	2265	2265	2578	2578	2578
Weights										
Net weight	kg	4002	4046	4072	4709	5770	5875	7127	7274	7558
Operating weight	kg	4413	4456	4477	5477	6595	6705	8487	8636	8928

NOTE

(1) At the foolowing standard conditions:

a) Power supply 400 V / 3 ph / 50 Hz;

b) Refrigerant R134a;

c) Evaporator: inlet/outlet water temperature 12-7°C;

d) Condenser: inlet/outlet water temperature 30-35°C.

(2) At the foolowing standard conditions:

a) Power supply 400 V / 3 ph / 50 Hz;

b) Refrigerant R134a;

c) Evaporator: inlet/outlet water temperature 26-20°C;

d) Condenser: inlet/outlet water temperature 35-40°C.

(3) SEPR (Seasonal Energy Performance Ratio) is the efficiency ratio of a high temperature process chiller at standard rating conditions, rapresentative of the variations in load and ambient temperature throughout the year, and calculated as the ratio between the annual refrigeration demand and the annual electricity cosumption as Commision Regulation EU 2016/2281.

(4) The value of **SPL** (Sound Pressure Level) for every octave band frequency is measured in free field conditions and at 1 meter from the unit according to ISO 3744 average method at the standard condition. Sound Pressure Level tolerance for each octave band: -0 / +2 dB.

(5) The value of **PWL** (Sound Power Level) is calculated according to ISO 3744 procedure method at the standard condition. Sound Power Level tolerance for each octave band: -0 / +2 dB.

5. MECHANICAL SPECIFICATION

Construction and Panels

The Liebert® HPC-W series is designed for indoor installations, having maximum corrosion protection, with all panels being made of heavy gauge, galvanized steel construction, polyester-powder painted in RAL7032. The steel frame support structure and heat exchangers are in pickled steel double coated (epoxy powder plus polyurethane powder) painted in RAL7032, that has a higher corrosion protection than galvanized steel powder coated. The entire frame is interconnected using special rivets with elevated mechanical characteristics or welded. The chassis is mounted on anti-vibration support to avoid every vibration transmission between the unit and the ground. The bolts are in stainless steel, the screw and the eye-bolts in galvanized steel.

The compressor is located above the evaporator and mounted on anti-vibration rubber to avoid vibration transmission with the chassis evaporator-condensers.

In the low noise version to limit the noise transmission:

- The panels are installed to close the compressor compartment, and they are coated with sound insulation material;
- The compressors are placed on special anti-vibration support and closed with a sound insulation jacket (composed of: 6 mm of open cells polyurethane, 2 mm EPDM, 6 mm of open cells polyurethane and external PU);
- The suction line is coated with a sound insulating material to avoid noise transmission between the compressor and the evaporator;

Refrigeration Circuit

All models are equipped with two compressors configured in independent refrigeration circuits. Each circuit includes a double safety pressure switch for high pressure, an electronic expansion valve, a filter dryer with disposable anti-acid solid cartridge, a humidity indicator, liquid sight glass, high and low pressure gauges, “HP” and “LP” safety valves with ball shut-off valves for safety valves, charge connections and rotalock shut off valve on liquid line.

The units are supplied charged with refrigerant R134a and oil as determined in the factory for the operating conditions within the indicated limits.

Compressor

The Liebert® HPC-W series is equipped with two semi-hermetic, screw compressors specifically designed for applications in water-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 (as special option);

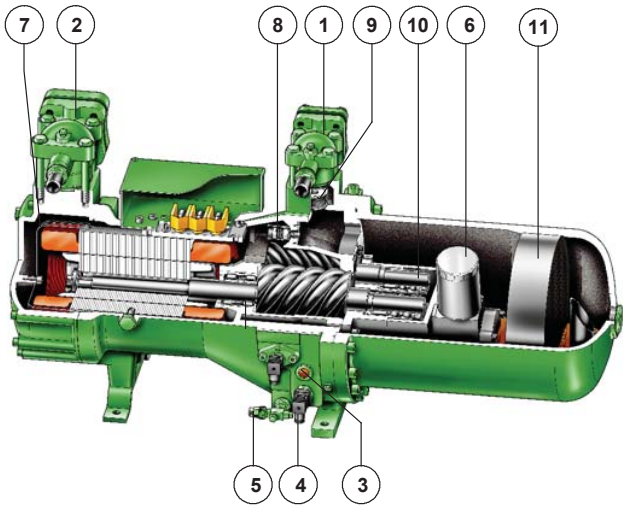
3 - Oil sight glass;

4 - Oil heater;

5 - Oil fill-drain valve;

6 - Long-life fine oil filter 10 µm mesh size;

7 - Suction gas filter with large surface area and fine mesh;



8 - 28 bar differential pressure relief valve (according to EN 12693 standards);

9 - A check valve 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);

10 - Robust axial bearings in tandem configuration, 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;

11 - A three- stage oil separator is integrated in the execution;

The compressor has the arrangement for liquid injection and automatic start unloading. 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. When turn on the motor start to work at reduced load and at either part-winding or star-delta type according to the models.

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).

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.

Electronic Expansion Valve

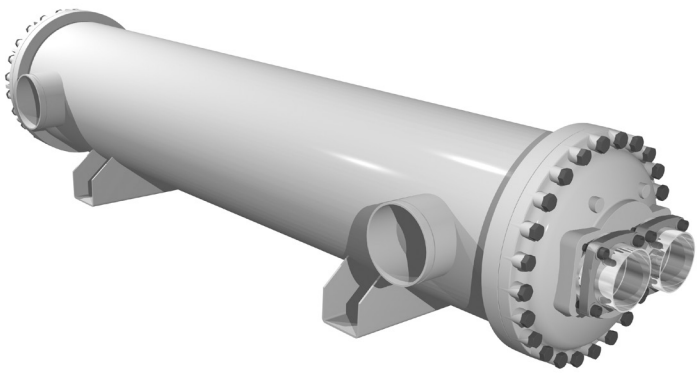
The electronic expansion valve used in the Liebert® HPC-W range enables control of the overheating of the gas sucked by the compressor under all load conditions, together with the operation at low condensation and compressor unloading. Under such application conditions a mechanical expansion valve can 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 final result of the application of the electronic expansion valve on Liebert® HPC-W 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.

Evaporators

The Liebert® HPC-W units are equipped with direct expansion shell and tube evaporators, specifically designed for R134a refrigerant, constructed, tested (pressure test on both refrigerant and water sides) and documented to comply with PED Directive 2014/68/EU standards.

The exchangers incorporate two refrigerant circuits and one water circuit. They are made up of the following components:

- Shell is fabricated from seamless carbon steel with internally finned copper tubes and tube sheets of heavy gauge carbon steel;
- Baffles in plastic material;
- Heads in special cast iron;
- Gaskets in an asbestos free compound;
- Bolts in carbon steel;



- Externally insulated with closed cell.

The evaporators are equipped with drainage and vent connections and they are protected against freezing by a paddle-type flow switch and an antifreeze sensor directly managed by the microprocessor.

As a special option, a thermostatically controlled electric heater is fitted to prevent freezing with ambiant temperatures below 0°C.

Temperature and pressure working limits and pressure test values are indicated below:

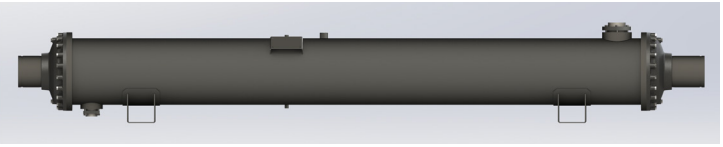
DESIGN TEMPERATURE	DESIGN PRESSURE		TEST PRESSURE	
Min. / Max.	Refrigerant (R134a)	Water	Refrigerant (R134a)	Water
-10 / +80 °C	16,0 bar	10,5 bar	17,6 bar	15, 0 bar

Condensers

The Liebert® HPC-W units are equipped with direct expansion shell and tube condensers, specifically designed for R134a refrigerant, constructed, tested (pressure test on both refrigerant and water sides) and documented to comply with PED Directive 2014/68/EU standards.

The exchangers are made up of the following components:

- Shell is fabricated from seamless carbon steel with internally finned copper tubes and tube sheets of heavy gauge carbon steel (SA 106 Gr.B or SA 53 Gr.B Type E);
- Baffles in DD11 EN10111 or P1;
- Heads in special cast iron;
- Gaskets in an asbestos free compound;
- Bolts in carbon steel;



Heads can be removed for cleaning and maintenance operations on the exchanger. It is available:

- Special versions for well water (for condenser water inlet temperature below 15°C).
- Special versions for sea water, manufactured with the following materials:
  - AISI 316 stainless steel tube plate;
  - Cupronickel pipes, completely finned both inside and outside;
  - AISI 316 stainless steel heads;
  - Carbon steel plates;
  - Removable protection sacrificial anodes in mild steel.

Temperature and pressure working limits and pressure test values are indicated below:

DESIGN TEMPERATURE	DESIGN PRESSURE		TEST PRESSURE	
Min. / Max.	Refrigerant (R134a)	Water	Refrigerant (R134a)	Water
-10/+109 °C	35,0 bar	16,0 bar	38,5 bar	17,6 bar

Electrical Panel

The electrical panel is designed, constructed and tested in compliance with IEC standards (EN60204-1). It is divided into two sections (power and control) with an accessible door to the control display section (without door interlock) in order to allow maintenance: checking, adjustment operation without switching off the unit.

The electrical panel has a degree of protection equivalent to IP54 with closed doors and IP2x with open doors. The cooling of the electrical panel is achieved through forced ventilation. For low ambient temperatures (suggested for T< - 5 ° C) it is possible to have an electric heater fitted inside (optional).

NOTE: Three-phase electric power

Requirements:

The Liebert® HPC-W units are equipped with electrical devices (EC motors, power supplies module, inverter pumps, control devices, etc.) that are designed to operate properly with Star-connected power (Wye) with earthed neutral (TN or TT system). For different design as: three-phase distribution Delta-connected (Δ) or Star-connected power (Wye) without ground or floating ground (IT), please contact Vertiv.

Main features:

- Power supply: 400V ±10% / 3Ph+PE / 50Hz ±1%;
- Auxiliary power supply: 230V ±10% / 1Ph+N+PE / 50Hz ±1%;
- Main switch;
- Main switch for auxiliary circuit and fast start feature (optional);
- Fuses and thermal relays for protecting the compressor;
- Contactors for the compressors with timers for part-winding or start-delta starting;
- Relay for checking phase sequence, minimum voltage, loss one or more phase;

  Manual operation through Vertiv™ ICOM™;
- PFC (Power Factor Correction) for compressors (option);
- EEV with safety dedicated capacitor buffer module (ULTRACAP);
- Energy Meter fitted on electrical panel board (option);
- Dry contacts for remote indication of:
  - Compressors in operation;
  - Pump(s) in operation;
  - General alarm;
  - Warning alarm.
- 24Vac relays supplied from customer for:
  - Remote ON/OFF;
  - Configurable digital input.

Double Power Supply, Ultracap and Fast Start Ramp

The Vertiv ICOM for Liebert® HPC-W is supplied with direct current for immunization from network disturbances. There are 4 possible power supply choices, to guarantee reliability and fast start:

- **Option 0**

  The unit is powered by a single three-phase line. The control is powered by an AC/DC converter, three-phases, that insulate the control from the external electric noises.

- **Option 1 (Fast Start Ramp – easy)**

  The unit is powered by a single three-phase line. A capacitors module (ULTRACAP) is installed for the direct microprocessor power supplying in case of main supply POWER OFF, the control is powered for 90 seconds, minimum buffer time (the amount of time depends on the unit configuration). At the main supply power restore within the buffer time, the control re-starts quickly the controlled components (pumps, fans, valves, compressors, etc.). At the main supply power restore out of the buffer time, the ULTRACAP requires 15 minutes to recharge completely. More repetitions of POWER OFF in a short time and/or long POWER OFF time reduce the minimum buffer time. ULTRACAP has a potentially unlimited lifetime, working temperature limits from -40 to +60° C and does not require any maintenance.

- **Option 2 (Fast Start Ramp – classic)**

  The unit is powered by two power lines: a three phase line for the motors and other high power components and a single phase for the control, typically provided by a UPS installed by the customer/user. The control is powered by an AC/DC single-phase converter, connected to the single-phase power line, which insulates the control from the external electric noises.
  In case of POWER OFF of the three-phase line, the control remains power supplied by its dedicated power supply line, ready to start quickly at the three-phase POWER ON.

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 free-cooling 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 2006/42/EC; 2014/30/EU; 2014/35/EU; 2014/68/EU. The machine is supplied with a final test certificate and a declaration of conformity with the norms. All Liebert® HPC-W units are “CE” marked.

Accessories

Anti-vibration mounts

Rubber anti- vibration supports: “bell-type” supports with a truncated-conic shape. The support is made up of a vulcanized rubber elastic element, on a metal body in galvanized steel with a base arranged for ground fixing. They are suitable for dampening high frequency vibrations and for limiting cross thrusts.

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 (optional).

Other Accessories

The following accessories can be installed as option:

- Seven inch touch screen, fitted on board.
- Paddle switch: compulsory protection device for the evaporator to be installed (by the customer) in the hydraulic circuit. If the algorithms and contacts of the Vertiv™ ICOM™ processor are used to control the evaporator pumps (installed by the customer outside the machine), the flow switch gives the signal to control their start and possible rotation.
- Protect the components against frost with heaters on evaporator, condensers and piping, as special option.
- Compressor power factor capacitors: they are able to get “Cos φ” value equal to about 0.95 on the compressors, in rated operating conditions, as special option.
- Monitoring device according to different communications standards.
- “Y”-shaped mechanical filter protecting the hydraulic circuit (both evaporator and condenser side), as special option.

6. CONTROLS

Microprocessor Controls

Vertiv™ ICOM™ Control for Liebert® HPC-W

The Vertiv™ iCOM™ Control (see Fig. 1) is the standard on- board control and its advanced features secure system optimization and energy savings. Full management of the Liebert® HPC-W units is granted by the on board controller, which allows the programming of temperature and pressure thresholds as well as the teamwork functionality through Ethernet network. User set- up can be done with a simple Operating Display that, through symbols and codes, ensures a reliable and flexible man- machine interface.

Figure 1

Vertiv ICOM Control

- The standard software of the Liebert® HPC-W 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.
- The record of the working hours of compressors is easily available via the local / touch screen display.
- When used with Controls electronic expansion valves board, the Liebert® HPC-W provides the control of the superheat in the evaporator. In order to perform this control task, it requires the suction pressure and the suction gas temperature value. These signals can be received through two analogue inputs.
- 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-W 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.
- The display shows power consumption (measured by energy meter) and instantaneous efficiency index calculation (EER, Virtual pPUE).

Table 1: Technical Data Vertiv ICOM

TECHNICAL DATA	Vertiv™ ICOM™
Flash Memory	128 Mbit
Micro-Controller	ARM9 200 MHz
Analogue Input	10x0- 1V, 0- 5V, 0- 10V, 0- 20mA, 4-20mA, NTC, PTC, DI (configurable)
Digital Input	20 x opto-coupled
Analogue Output	4x0- 10V, 2x0- 10V, 4- 20mA, PWM, Relay (configurable)
Digital Output	12 Relay output 5A and 3 relay output 8A
USB Port	1
Ethernet Network Connector	1 RJ45 socket
CANbus	1 Disconnectable screw connector
Remote LCD Display	1 Dedicated connector
RS 485	1 Master+ 1 Slave

7" Touch Display

The Touch display featuring a 24h / 7 days graphic record of controlled parameters as well as the last 200 events occurred.

- Display (800 x 480 pixels).
- System Window: system operation status at a glance.
- Self-explanatory icons: they are used for the menu-layout of the display.
- Status Report of the latest 200 event/messages of the unit/system.
- Four different Graphic Data Records.
- Timer and Date mode (electronic timer included in the software).
- Semi or full manual mode software management including all safety devices.
- 4- Level passwords system to protect all the settings.
- Ergonomic design for use also as portable device (start-up and "flying connections" by service personnel).

Table 2: Touch Display Technical Data

MICROCONTROLLER	400 MHz ARM9
Ethernet network connectors	1 RJ45 sockets
Serial port RS232 / 422 / 485	2
USB port	1 USB Host 2.0
Power supply	24 VDC supply
Application memory	80 Mb
Memory RAM	64 Mb
Memory slots	1 x SD card

Liebert® HPC-W Connectivity

The Control and Touch Display allow connectivity with superior levels of control and supervision system. Available connectivity protocols:

- WEB;
- MODBUS on RS485 and Over-IP;
- BACnet MS/TP and IP;
- SNMP.

Liebert® HPC-W can support as optional devices:

- Energy meter which provides the instant electrical power consumption reading (including primary pump consumption if this is integrated in the unit).
- Chilled water flow meter which provides the chilled water flow speed (m/s).

If both chilled water flow meter and energy meter are present, the unit control is also able to elaborate the following calculated data output:

- EER
- pPUE

Where:

- Capacity depends on instant values on fluid flow, temperature and glycol percentage (necessary to set on unit control)
- EER: is a ration instant Total Capacity and instant Total Electrical Power Consumption readings (in the same time period)
- pPUE = [(1) + (1/EER)]

All data outputs are calculated using instant values and also the site operating conditions cannot ensure stable measurements, whereby they can provide only an indicative value. These values must not be considered valid as official performance measurements due to conditions of measurement and precision of the instruments which are different from laboratory measurement conditions and instruments.

7. PERFORMANCE ADJUSTMENT FACTORS

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.

Table 7.1 : 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	0,995	0,990	0,990	0,985	0,975

We indicate as R0, V0, P0 respectively the unit capacity, volumetric flow rate and compressor power input with 0% ethylene glycol; 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

8. NOISE LEVEL

The tables show the noise data for the units in standard and low noise versions, operating continuously at full load at the following conditions:

	Water at Evaporator		Water at Condenser	
	Inlet	Outlet	Inlet	Outlet
WH models	12°C	7°C	30°C	35°C
WHT models	26°C	20°C	35°C	40°C

Note 1	The value of **PWL** (Sound Power Level) is calculated according to ISO 3744 procedure method. Sound Power Level tolerance for each octave band: -0 / +2 dB
Note 2	The value of **SPL** (Sound Pressure Level) for every octave band frequency is measured in free field conditions and at 1 meter from the unit according to ISO 3744 average method. Sound Pressure Level tolerance for each octave band: -0 / +2 dB
Note 3	Avoid positioning in rooms with high reverberation of the sound waves, which can adversely effect the noise levels.

8.1 Standard Version

WH models

Table 8.1 : Sound Power Level [dB]

MODEL	Octave Band Frequency								Total PWL [dB(A)]
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
WH2063	92,8	93,2	90,3	95,9	92,4	80,4	70,1	63,9	96,0
WH2072	93,7	94,1	91,2	96,8	93,3	81,3	71,0	64,8	96,9
WH2088	93,0	93,4	90,5	96,1	92,6	80,6	70,3	64,1	96,2
WH2100	93,2	93,6	90,7	96,3	92,8	80,8	70,5	64,3	96,4
WH2115	95,6	96,0	93,1	98,7	95,2	83,2	72,9	66,7	98,8
WH2131	95,0	95,4	92,5	98,1	94,6	82,6	72,3	66,1	98,2
WH2142	97,3	97,7	94,8	100,4	96,9	84,9	74,6	68,4	100,5

Table 8.2 : Sound Pressure Level at 1 m in free field [dB]

MODEL	Octave Band Frequency								Total SPL [dB(A)]
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
WH2063	73,4	73,8	70,9	76,4	73,0	60,9	50,7	44,4	76,5
WH2072	74,3	74,7	71,8	77,3	73,9	61,8	51,6	45,3	77,4
WH2088	73,6	74,0	71,1	76,6	73,2	61,1	50,9	44,6	76,7
WH2100	73,8	74,2	71,3	76,8	73,4	61,3	51,1	44,8	76,9
WH2115	76,2	76,6	73,7	79,2	75,8	63,7	53,5	47,2	79,3
WH2131	75,6	76,0	73,1	78,6	75,2	63,1	52,9	46,6	78,7
WH2142	77,9	78,3	75,4	80,9	77,5	65,4	55,2	48,9	81,0

WHT models

Table 8.3 : Sound Power Level [dB]

MODEL	Octave Band Frequency								Total PWL [dB(A)]
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
WHT2043	86,5	93,0	86,8	98,1	93,1	81,0	69,7	61,8	97,4
WHT2053	87,0	93,5	87,3	98,6	93,6	81,5	70,2	62,3	97,9
WHT2063	88,3	94,8	88,6	99,9	94,9	82,8	71,5	63,6	99,2
WHT2072	89,2	95,7	89,5	100,8	95,8	83,7	72,4	64,5	100,1
WHT2088	88,5	95,0	88,8	100,1	95,1	83,0	71,7	63,8	99,4
WHT2100	88,7	95,2	89,0	100,3	95,3	83,2	71,9	64,0	99,6
WHT2115	91,1	97,6	91,4	102,7	97,7	85,6	74,3	66,4	102,0
WHT2131	90,5	97,0	90,8	102,1	97,1	85,0	73,7	65,8	101,4
WHT2142	92,8	99,3	93,1	104,4	99,4	87,3	76,0	68,1	103,7

Table 8.4 : Sound Pressure Level at 1 m in free field [dB]

MODEL	Octave Band Frequency								Total SPL [dB(A)]
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
WHT2043	67,1	73,6	67,3	78,7	73,6	61,6	50,2	42,4	77,9
WHT2053	67,6	74,1	67,8	79,2	74,1	62,1	50,7	42,9	78,4
WHT2063	68,9	75,4	69,1	80,5	75,4	63,4	52,0	44,2	79,7
WHT2072	69,8	76,3	70,0	81,4	76,3	64,3	52,9	45,1	80,6
WHT2088	69,1	75,6	69,3	80,7	75,6	63,6	52,2	44,4	79,9
WHT2100	69,3	75,8	69,5	80,9	75,8	63,8	52,4	44,6	80,1
WHT2115	71,7	78,2	71,9	83,3	78,2	66,2	54,8	47,0	82,5
WHT2131	71,1	77,6	71,3	82,7	77,6	65,6	54,2	46,4	81,9
WHT2142	73,4	79,9	73,6	85,0	79,9	67,9	56,5	48,7	84,2

8.2 Low Noise Version

WH models

Table 8.5 : Sound Power Level [dB]

MODEL	Octave Band Frequency								Total PWL [dB(A)]
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
WH2063	90,2	86,2	82,3	83,0	86,7	73,0	63,5	54,0	88,0
WH2072	91,1	87,1	83,2	83,9	87,6	73,9	64,4	54,9	88,9
WH2088	90,4	86,4	82,5	83,2	86,9	73,2	63,7	54,2	88,2
WH2100	90,6	86,6	82,7	83,4	87,1	73,4	63,9	54,4	88,4
WH2115	93,0	89,0	85,1	85,8	89,5	75,8	66,3	56,8	90,8
WH2131	92,4	88,4	84,5	85,2	88,9	75,2	65,7	56,2	90,2
WH2142	94,7	90,7	86,8	87,5	91,2	77,5	68,0	58,5	92,5

Table 8.6 : Sound Pressure Level at 1 m in free field [dB]

MODEL	Octave Band Frequency								Total SPL [dB(A)]
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
WH2063	70,7	66,8	62,8	63,5	67,3	53,5	44,1	34,5	68,5
WH2072	71,6	67,7	63,7	64,4	68,2	54,4	45,0	35,4	69,4
WH2088	70,9	67,0	63,0	63,7	67,5	53,7	44,3	34,7	68,7
WH2100	71,1	67,2	63,2	63,9	67,7	53,9	44,5	34,9	68,9
WH2115	73,5	69,6	65,6	66,3	70,1	56,3	46,9	37,3	71,3
WH2131	72,9	69,0	65,0	65,7	69,5	55,7	46,3	36,7	70,7
WH2142	75,2	71,3	67,3	68,0	71,8	58,0	48,6	39,0	73,0

WHT models

Table 8.7 : Sound Power Level [dB]

MODEL	Octave Band Frequency								Total PWL [dB(A)]
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
WHT2043	88,3	84,8	78,3	84,4	88,4	71,3	61,1	53,4	89,4
WHT2053	88,8	85,3	78,8	84,9	88,9	71,8	61,6	53,9	89,9
WHT2063	90,1	86,6	80,1	86,2	90,2	73,1	62,9	55,2	91,2
WHT2072	91,0	87,5	81,0	87,1	91,1	74,0	63,8	56,1	92,1
WHT2088	90,3	86,8	80,3	86,4	90,4	73,3	63,1	55,4	91,4
WHT2100	90,5	87,0	80,5	86,6	90,6	73,5	63,3	55,6	91,6
WHT2115	92,9	89,4	82,9	89,0	93,0	75,9	65,7	58,0	94,0
WHT2131	92,3	88,8	82,3	88,4	92,4	75,3	65,1	57,4	93,4
WHT2142	94,6	91,1	84,6	90,7	94,7	77,6	67,4	59,7	95,7

Table 8.8 : Sound Pressure Level at 1 m in free field [dB]

MODEL	Octave Band Frequency								Total SPL [dB(A)]
	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
WHT2043	68,8	65,4	58,9	65,0	69,0	51,9	41,6	33,9	69,9
WHT2053	69,3	65,9	59,4	65,5	69,5	52,4	42,1	34,4	70,4
WHT2063	70,6	67,2	60,7	66,8	70,8	53,7	43,4	35,7	71,7
WHT2072	71,5	68,1	61,6	67,7	71,7	54,6	44,3	36,6	72,6
WHT2088	70,8	67,4	60,9	67,0	71,0	53,9	43,6	35,9	71,9
WHT2100	71,0	67,6	61,1	67,2	71,2	54,1	43,8	36,1	72,1
WHT2115	73,4	70,0	63,5	69,6	73,6	56,5	46,2	38,5	74,5
WHT2131	72,8	69,4	62,9	69,0	73,0	55,9	45,6	37,9	73,9
WHT2142	75,1	71,7	65,2	71,3	75,3	58,2	47,9	40,2	76,2

9. ELECTRICAL DATA

Tab. 9 Electrical data - Liebert® HPC-W WH-series

MODELS		WH2063	WH2072	WH2088	WH2100	WH2115	WH2131	WH2142
Power Supply		**400 V / 3 ph / 50 Hz**						
Total Power Input	[kW]	112,0	128,0	156,0	177,0	198,0	224,0	254,0
OA(1) (without PFC)	[A]	197,4	226,8	262,8	297,0	326,6	385,0	436,0
FLA	[A]	354	406	466	532	612	690	756
LRA	[A]	697	815	551	702	771	931	1028
cos φ (without PFC)	[-]	0,82	0,81	0,86	0,86	0,88	0,84	0,84
Compressor	[n°]	2	2	2	2	2	2	2
Max Compressors power(2)	[kW]	96	109	132	147	167	186	220
Crankcase heater power(2)	[kW]	300	300	300	300	300	300	300
Compressor Start-up	[-]	Part Winding		Start Delta				
Compressor OA(2)	[A]	98,7	113,4	131,4	148,5	163,3	192,5	218
Compressor FLA(2)	[A]	177	203	233	266	306	345	378
Compressor LRA(2)	[A]	520	612	318	436	465	586	650
Control power supply (only for option fast start)	[-]	230 V /1 ph + N + PE / 50 Hz						
Max power consumption	[kW]	0,59						
Max current consumption	[A]	2,3						
FLA	[A]	7						

MODELS		WHT2043	WHT2053	WHT2063	WHT2072	WHT2088	WHT2100	WHT2115	WHT2131	WHT2142
Power Supply		**400 V / 3 ph / 50 Hz**								
Total Power Input	[kW]	119,0	137,0	154,0	175,0	198,0	228,0	250,0	284,0	347,0
OA(3) (without PFC)	[A]	212,4	239,2	263,4	323,2	346,2	391,8	434,0	482,0	590,0
FLA	[A]	432	492	520	620	740	840	900	900	1132
LRA	[A]	828	911	989	1067	956	1070	1255	1255	1483
cos φ (without PFC)	[-]	0,81	0,83	0,84	0,78	0,83	0,84	0,83	0,85	0,85
Compressor	[n°]	2	2	2	2	2	2	2	2	2
Max Compressors power(2)	[kW]	132	150	160	186	246	255	280	280	332
Crankcase heater power(2)	[kW]	300	300	300	300	300	300	300	300	300
Compressor Start-up	[-]	Part Winding		Start Delta						
Compressor OA(2)	[A]	106,2	119,6	131,7	161,6	173,1	195,9	217	241	295
Compressor FLA(2)	[A]	216	246	260	310	370	420	450	450	566
Compressor LRA(2)	[A]	612	665	729	757	586	650	805	805	917
Control power supply (only for option fast start)	[-]	230 V /1 ph + N + PE / 50 Hz								
Max power consumption	[kW]	0,59								
Max current consumption	[A]	2,3								
FLA	[A]	7								

NOTE

(1) At the foolowing standard conditions:

a) Power supply 400 V / 3 ph / 50 Hz;

b) Refrigerant R134a;

c) Evaporator: inlet/outlet water temperature 12-7°C;

d) Condenser: inlet/outlet water temperature 30-35°C.

(2) For each compressor

(3) At the foolowing standard conditions:

a) Power supply 400 V / 3 ph / 50 Hz;

b) Refrigerant R134a;

c) Evaporator: inlet/outlet water temperature 26-20°C;

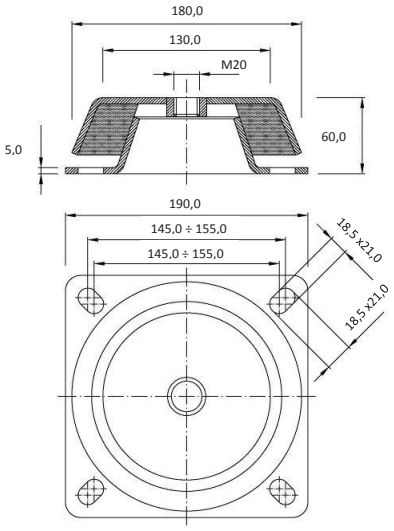
d) Condenser: inlet/outlet water temperature 35-40°C.

10. ACCESSORIES

The customer is responsible for the installation of the accessories, which are provided separately.

Anti-vibration support

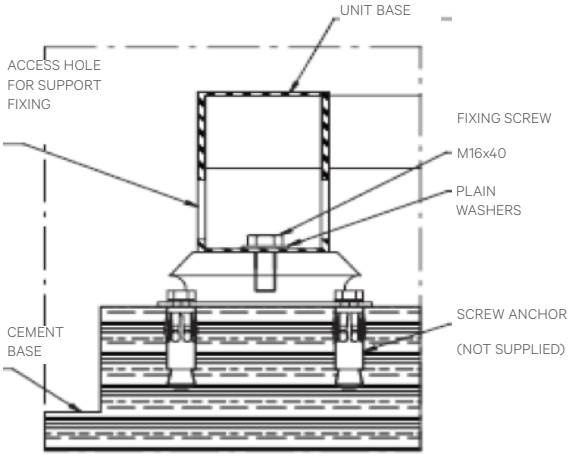
Rubber support dimensions



HPC-W MODEL	SUPPORT KIT CODE	SINGLES SUPPORT CODE	NUMBER OF PIECES
WH2063	455471	269193	4
WH2072	454479	270736	4
WH2088	454479	270736	4
WH2100	454479	270736	4
WH2115	454479	270736	4
WH2131	454479	270736	4
WH2142	454479	270736	4

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

Rubber support installation



Other accessories

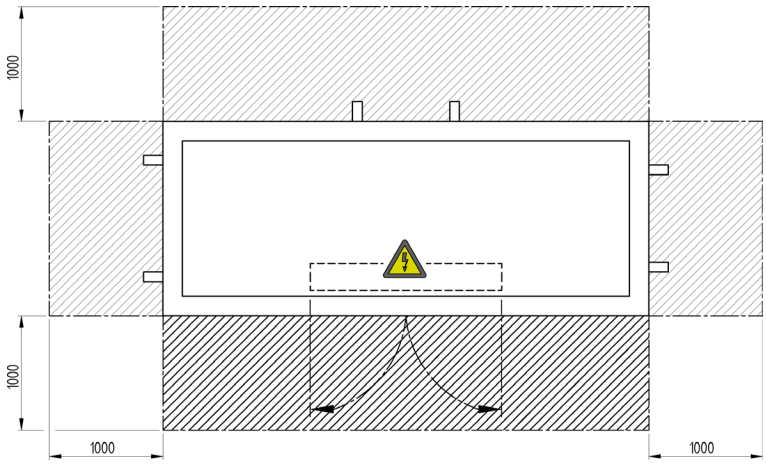
COMPONENT	CODE FOR ALL THE HPC-W MODELS
Paddle flow switch	354404
Y - filters available upon request for evaporator and condenser	

Installation Site

Location

- The HPC-W units must be installed indoors, in rooms protected from weather agents.
- Prepare a level surface suitable to support the weight of the Liebert® HPC-W unit.
- The unit produces heat. The installation site must have a good air flow, so to guarantee heat dispersion even in the most demanding operating conditions.
- Install the unit in an area with clean air, away from loose dirt and foreign matter.

Space Requirements



- See Annex I – Dimensions and Weights for the unit dimensions
- Keep a free space between the unit and any obstacle as shown in the figure.

NOTICE

The maintenance of the unit become extremely difficult if placed too close to walls or other obstacles

ANNEX I – DIMENSIONS AND WEIGHTS

Weights

WH models.

MODEL	WH2063	WH2072	WH2088	WH2100	WH2115	WH2131	WH2142
Net Weight [kg]	4051	4667	5707	5812	7064	7211	7411
Weight included water [kg]	4456	5435	6532	6642	8424	8573	8781

WHT models

MODEL	WHT2043	WHT2053	WHT2063	WHT2072	WHT2088	WHT2100	WHT2115	WHT2131	WHT2142
Net Weight [kg]	4002	4046	4072	4709	5770	5875	7127	7274	7558
Weight included water [kg]	4413	4456	4477	5477	6595	6705	8487	8636	8928

Dimensions

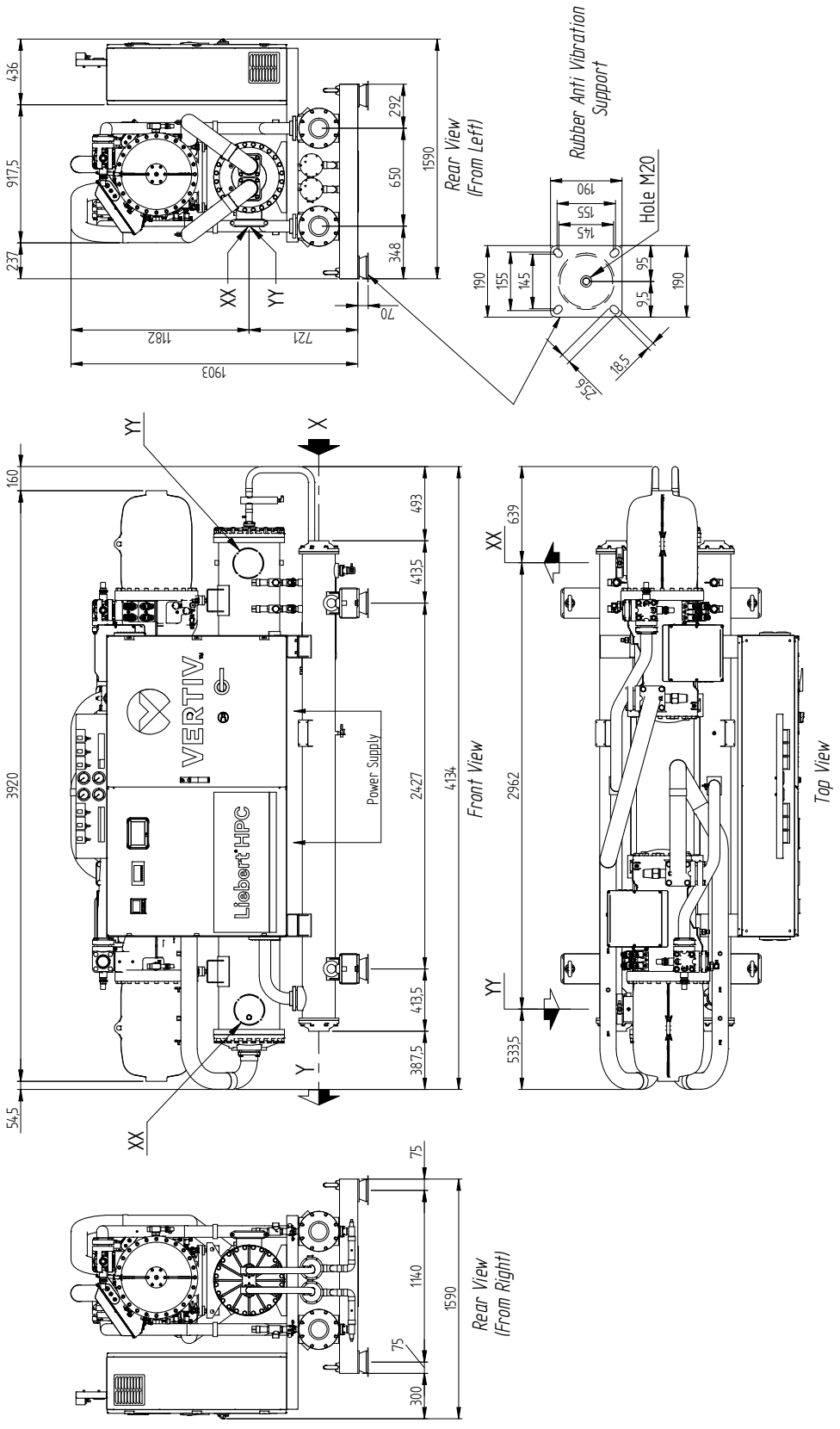
NOTE: Depending on their size, the units of the HPC-W series are built on three different frames.

The following table shows the relation between each frame and the models built on that frame.

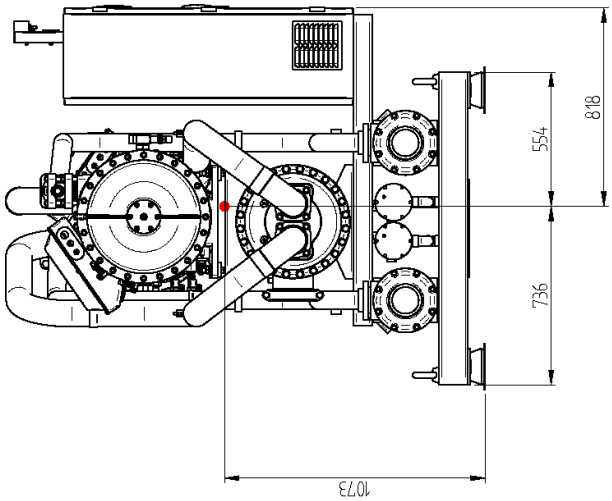
FRAME	WH MODELS	WHT MODELS
01	WH2063	WHT2043 WHT2053 WHT2063
02	WH2072 WH2088 WH2100	WHT2072 WHT2088 WHT2100
03	WH2115 WH2131 WH2142	WHT2115 WHT2131 WHT2142

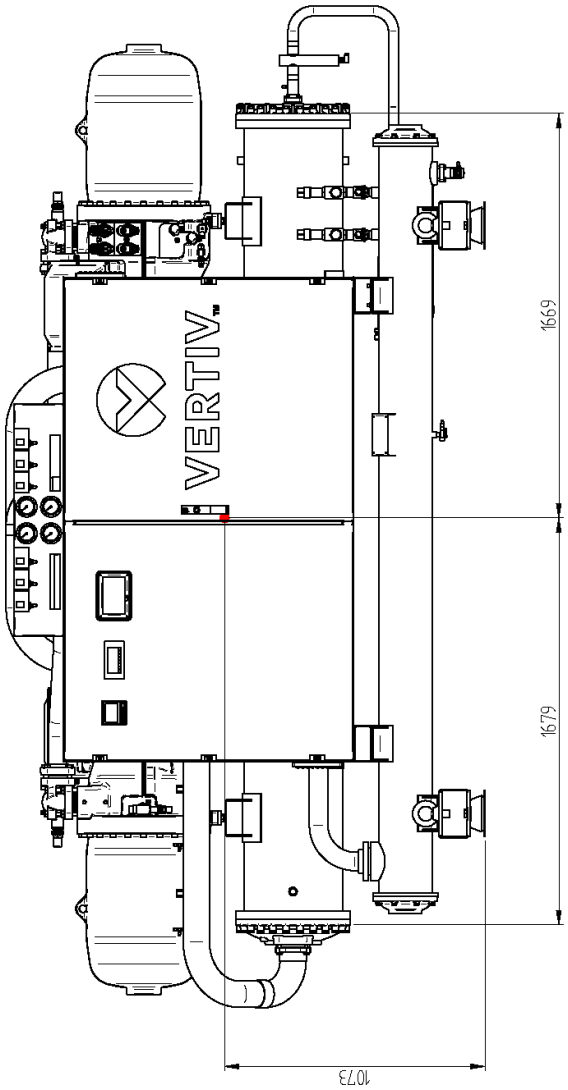
The following pages show the dimensions and gravity center position for each frame.

Frame 1 - Standard - Dimensions

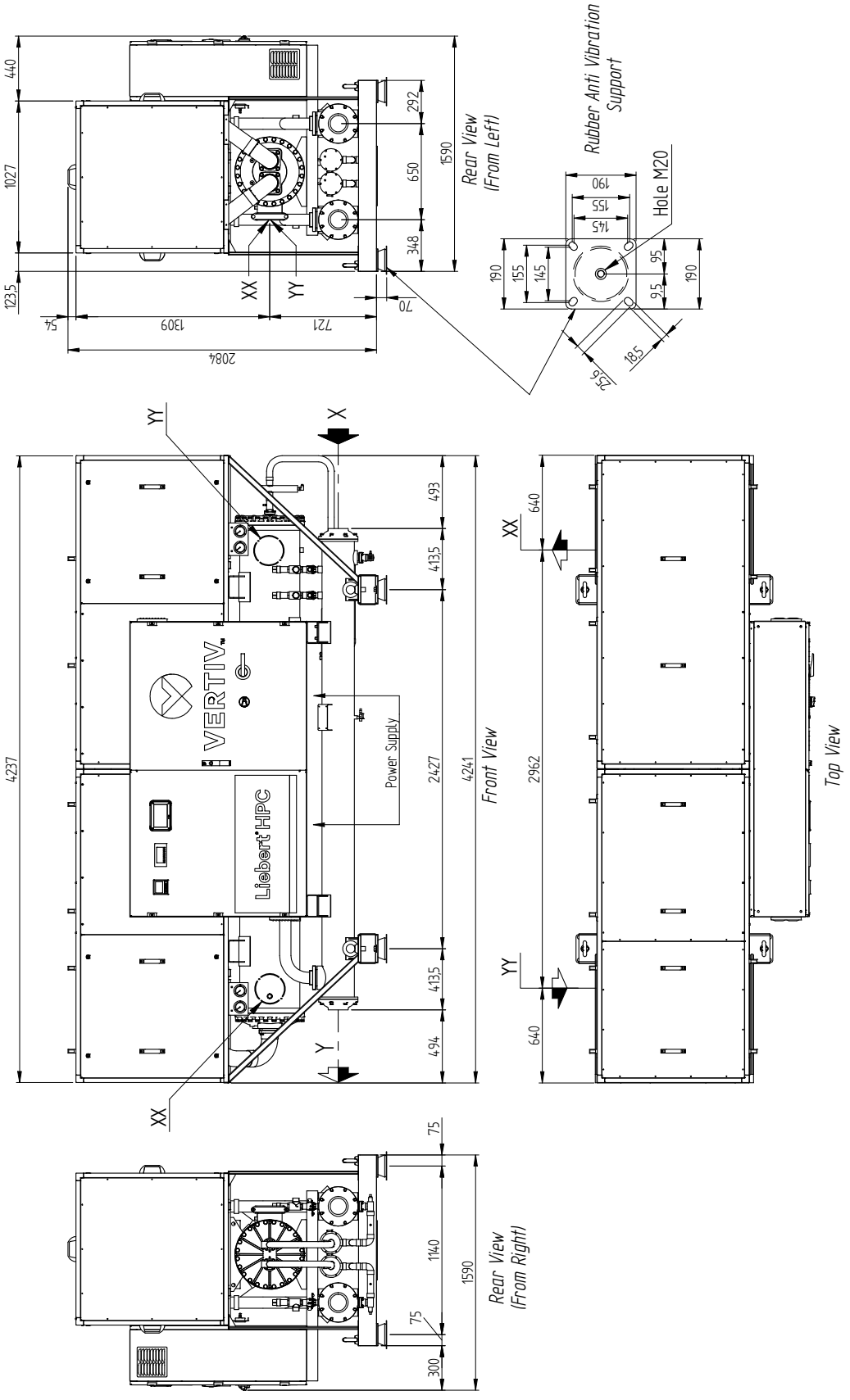


Frame 1 - Standard - Gravity center

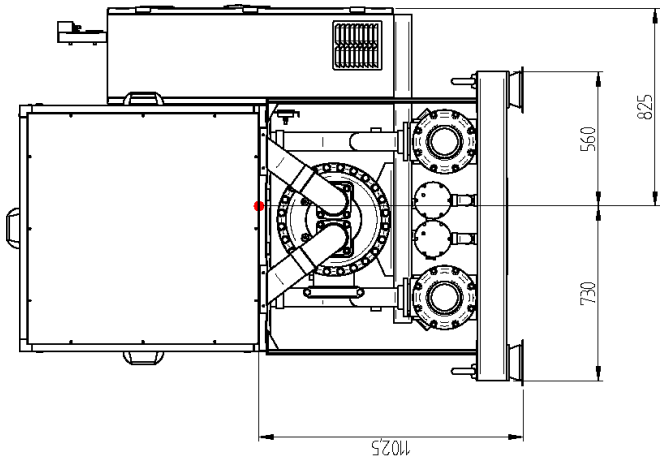


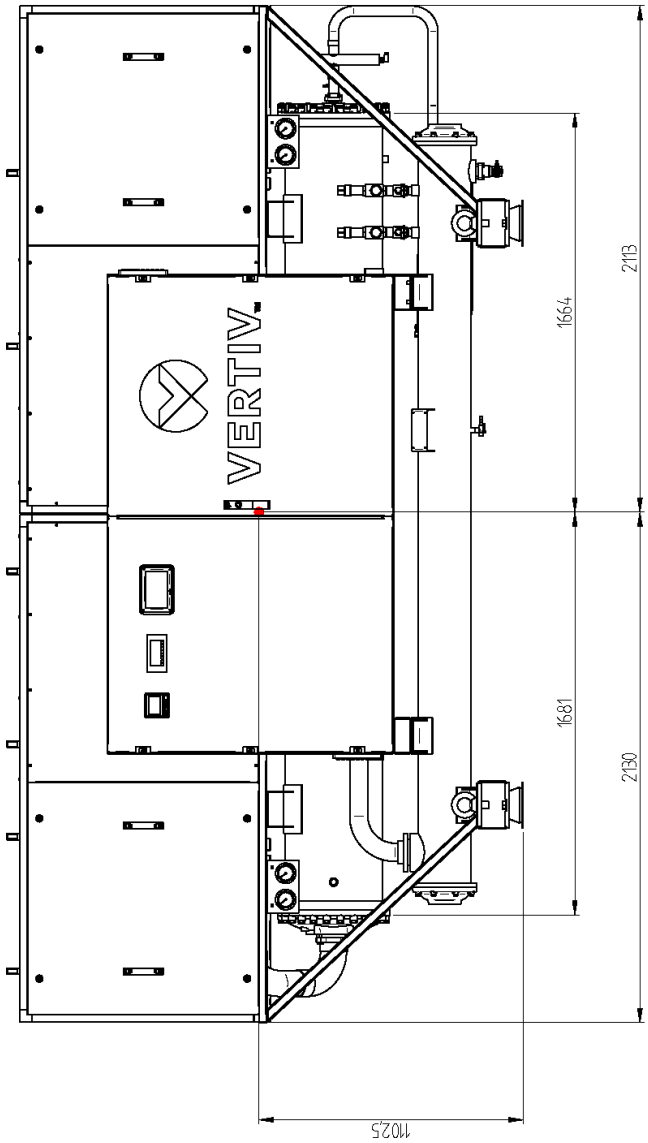


Frame 1 - Low noise - Dimensions

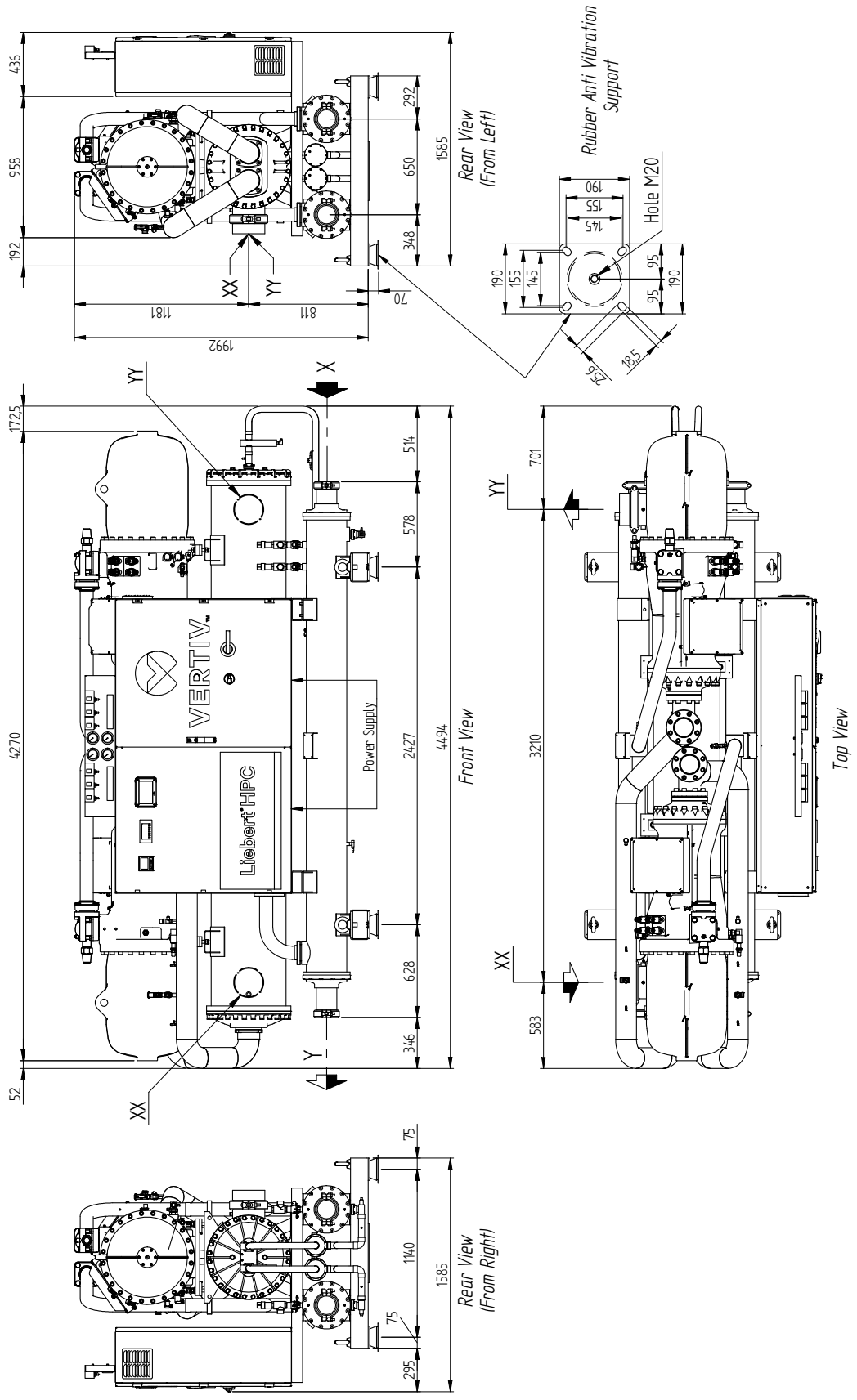


Frame 1 - Low noise - Gravity center

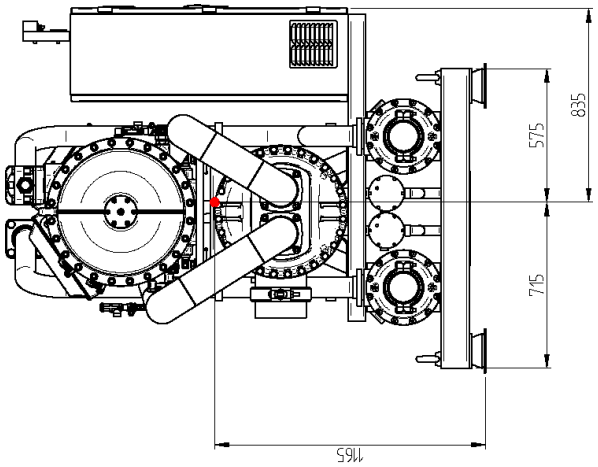


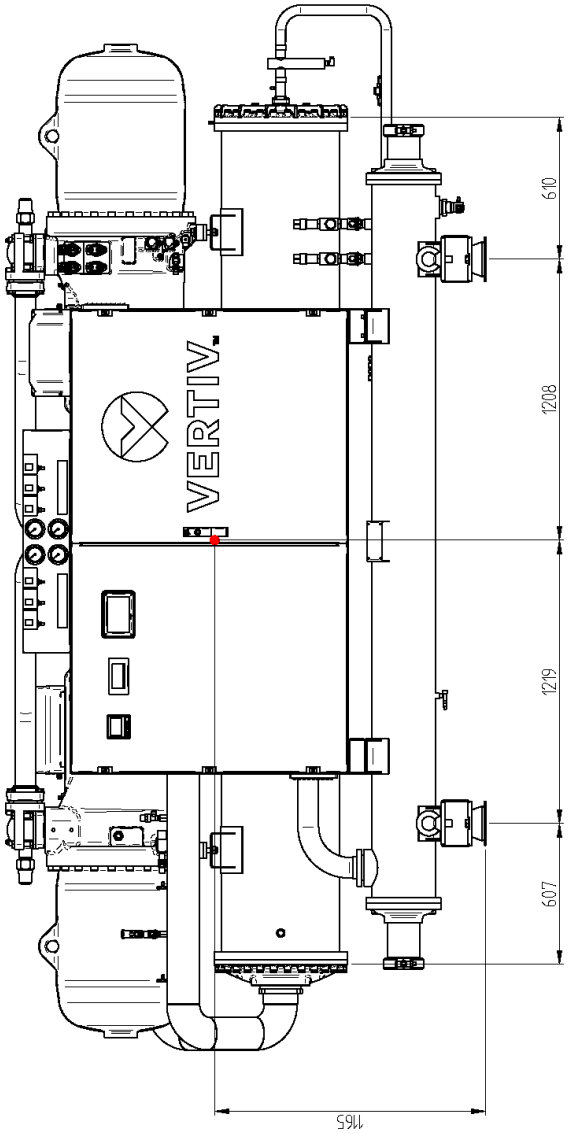


Frame 2 - Standard - Dimensions

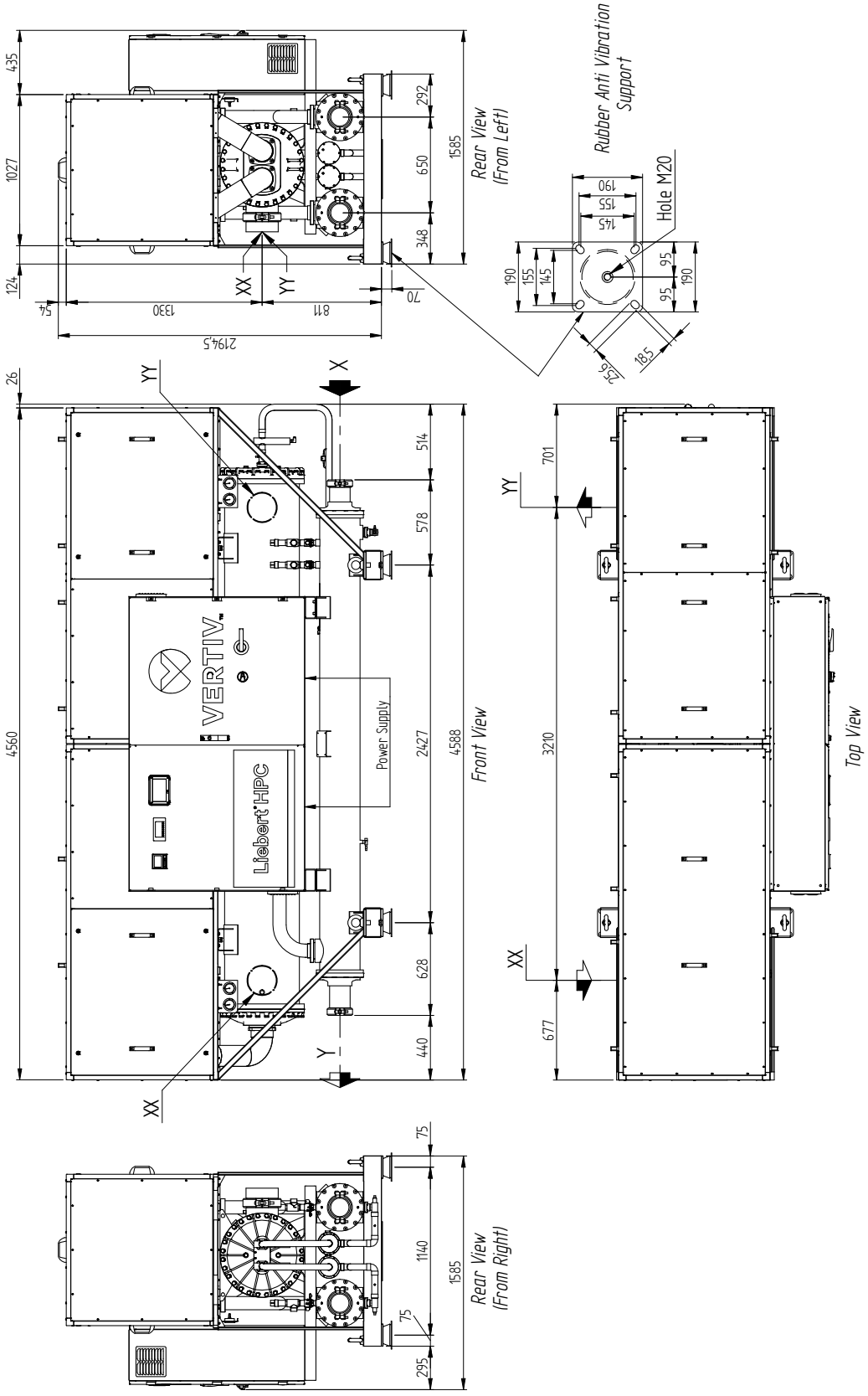


Frame 2 - Standard - Gravity center

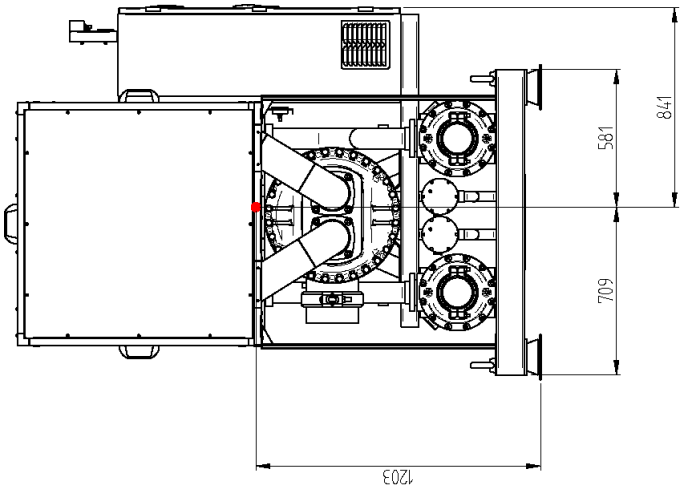


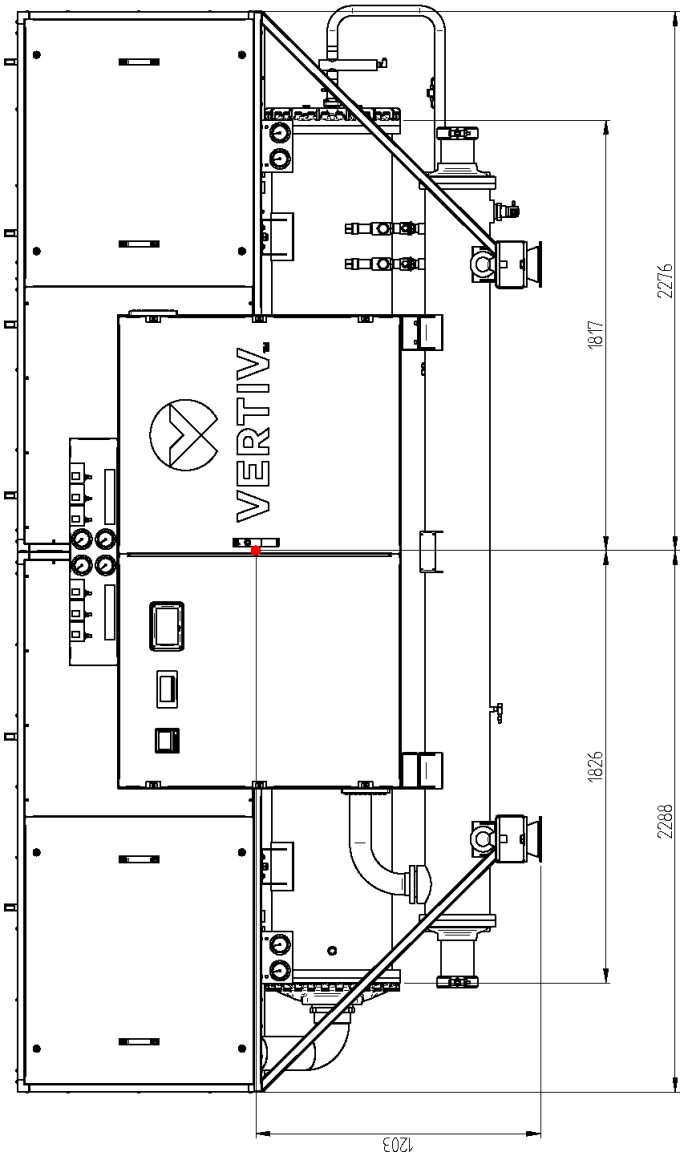


Frame 2 - Low noise - Dimensions

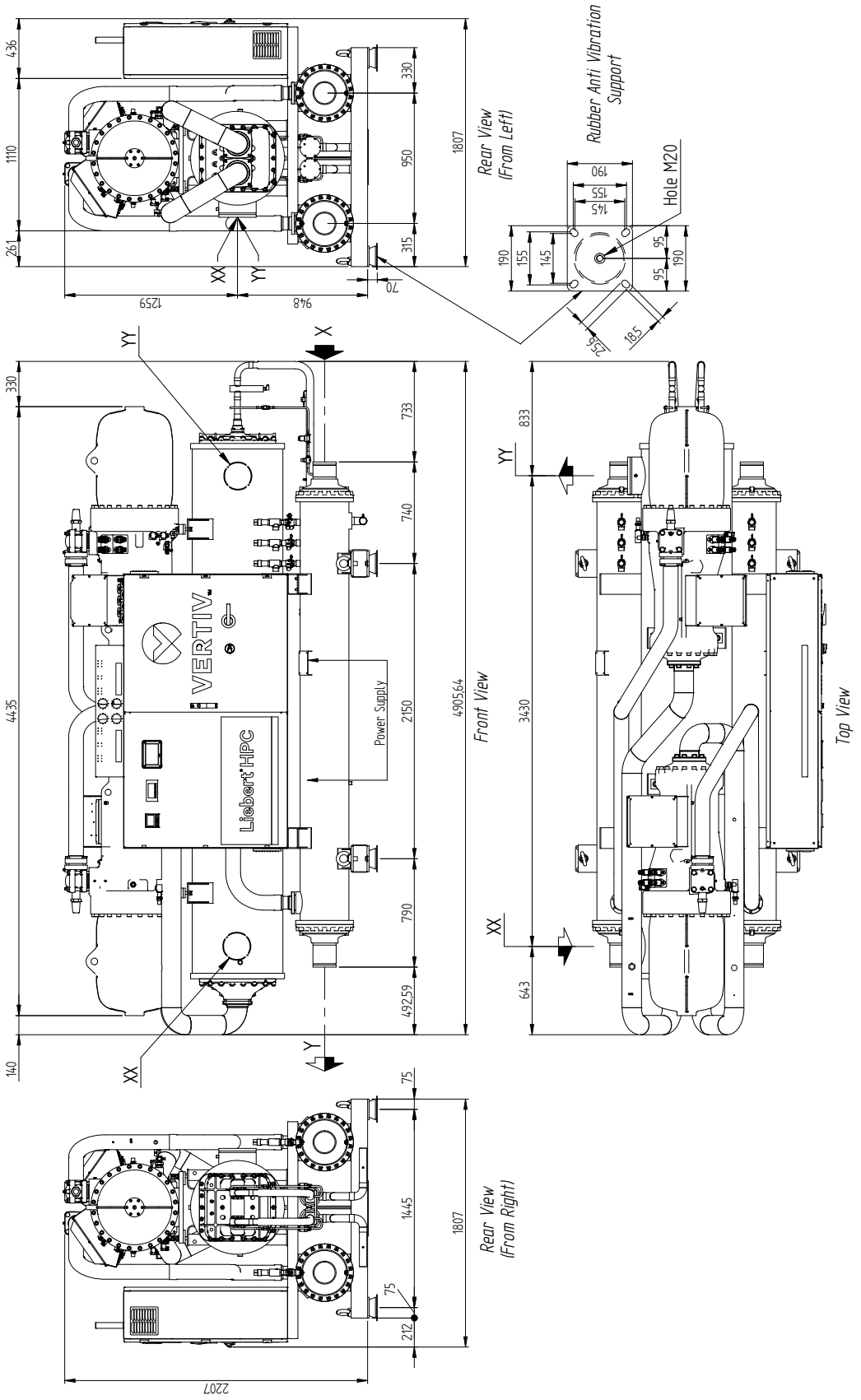


Frame 2 - Low noise- Gravity center

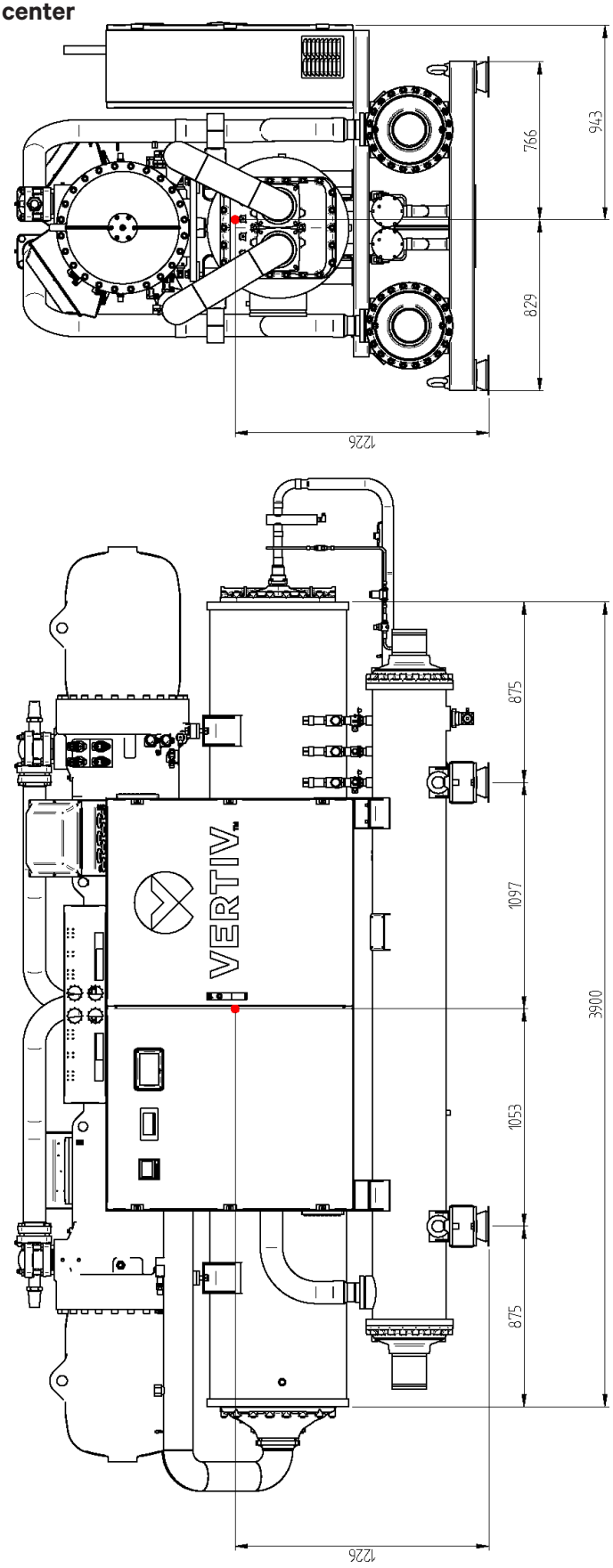




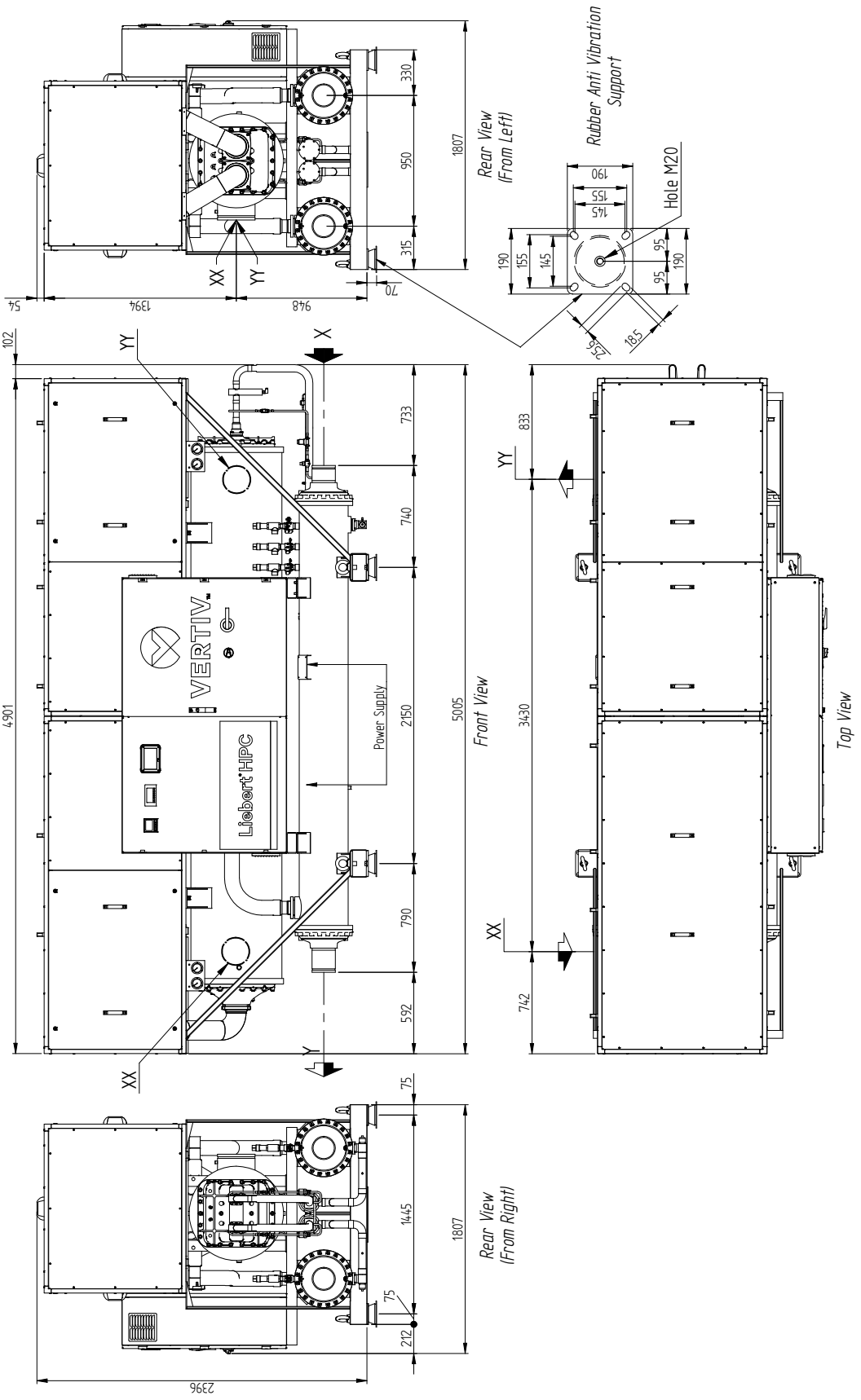
Frame 3 - Standard - Dimensions



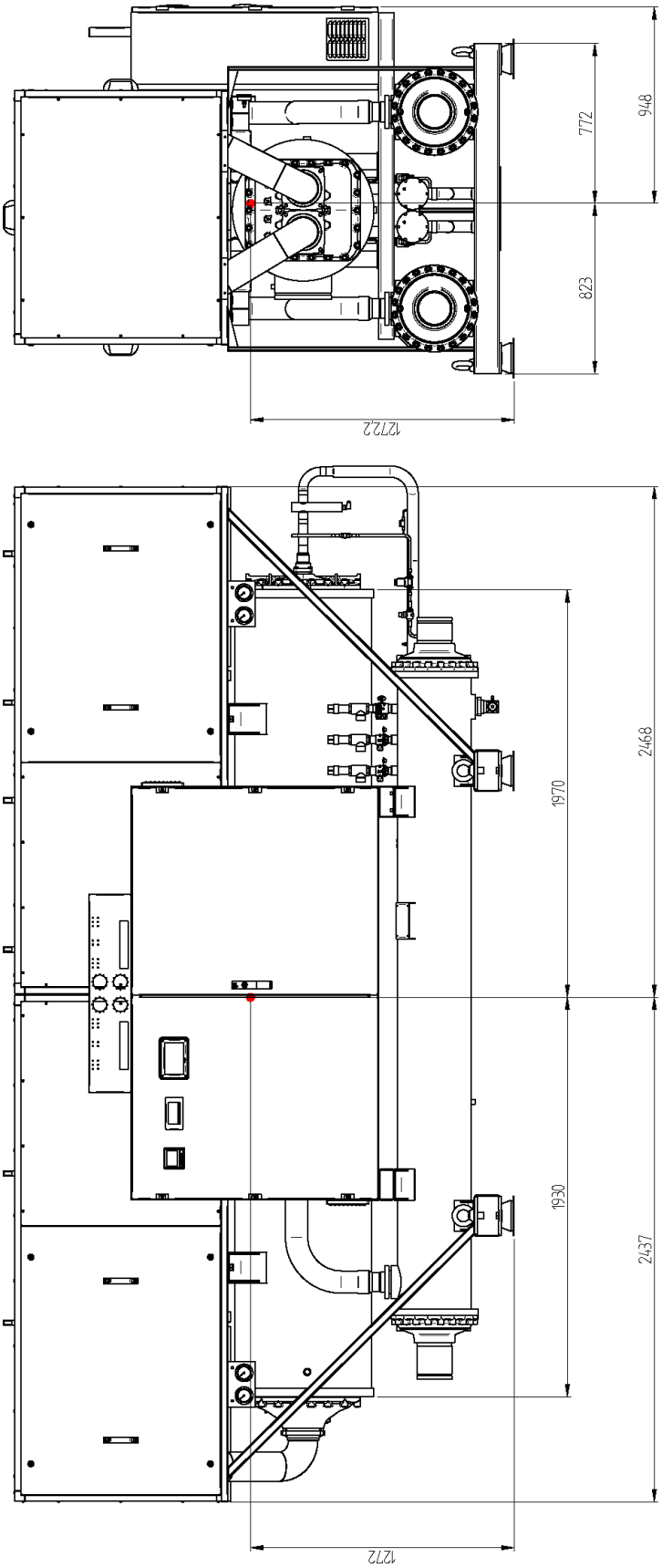
Frame 3 - Standard - Gravity center



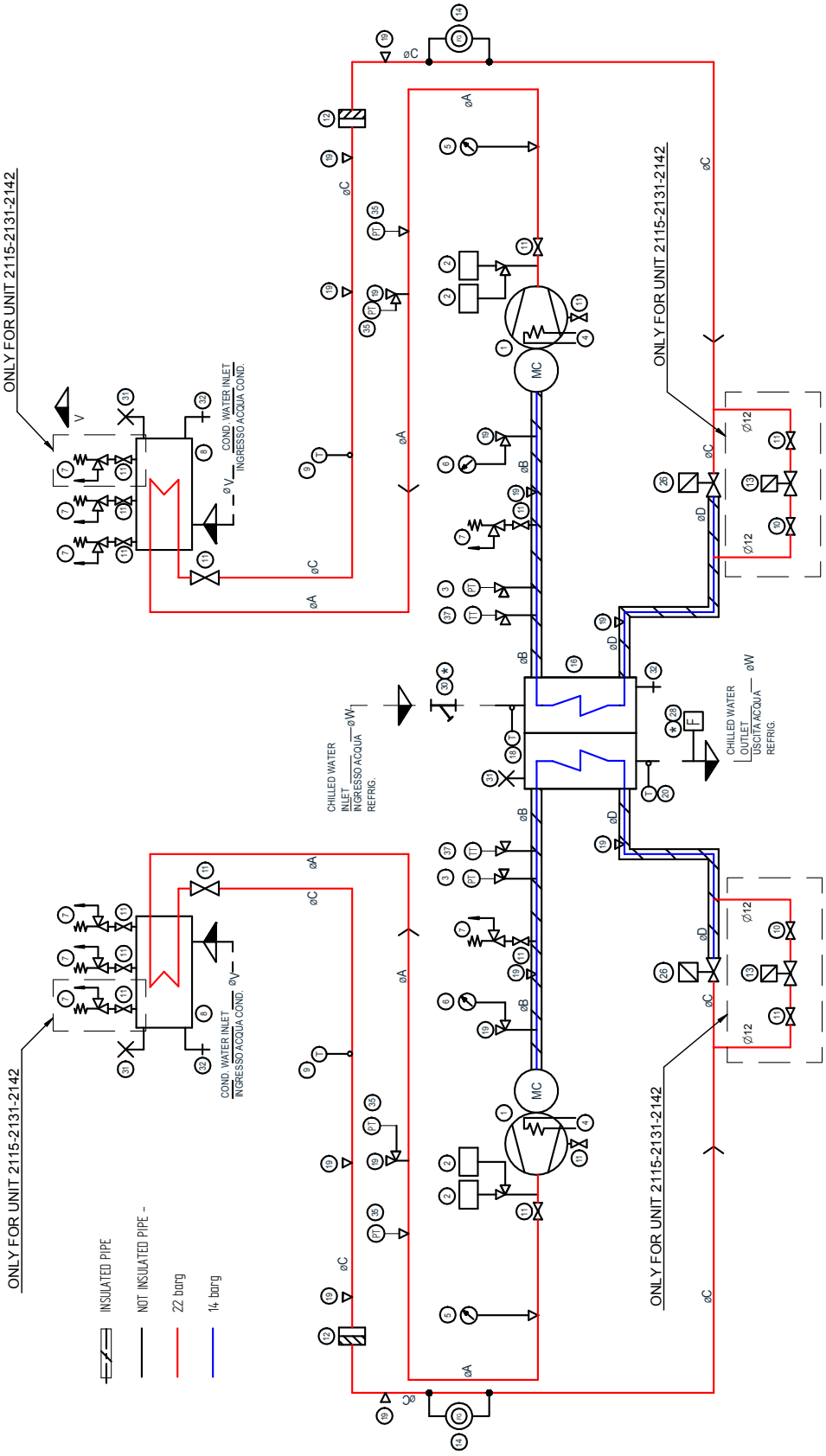
Frame 3 - Low noise - Dimensions



Frame 3 - Low noise - Gravity center



ANNEX II – REFRIGERATING CIRCUIT



1	COMPRESSOR	14
2	HIGH PRESSURE SWITCH Set 20 barg Cat. IV	16
3	PRESSURE TRANSDUCER / L.P. CONTROL / EEV	18
4	CRANKCASE HEATER	19
5	HIGH PRESSURE MANOMETER (OPTIONAL)	20
6	LOW PRESSURE MANOMETER (OPTIONAL)	26
7	SAFETY VALVE - Set 22 barg Cat. IV	28
8	CONDENSER PS 35 barg - Cat. II/III/IV	30
9	TEMPERATURE SENSOR	31
10	NOT RETURN VALVE	32
11	SHUT-OFF VALVE	35
12	FILTER DRYER	36
13	SOLENOID VALVE BY-PASS (MODEL 2115-2131-2142)	37

	SIGHT GLASS
16	EVAPORATOR PS 16 barg - Cat. II/III
18	SERVICE THERMOSTAT SENSOR
19	CHARGE CONNECTION
20	ANTIFREEZE / CAPACITY SENSOR CONTROL
26	ELECTRONIC EXP. VALVE (EEV)
28	FLOW SWITCH
30	WATER FILTER (OPTIONAL)
31	MANUAL AIR VALVE
32	DISCHARGE VALVE
35	PRESSURE TRASDUCER H.P.
36	ACCESS VALVE
37	EEV TEMPERATURE SENSOR

	WH2063	WH2072	WH2088	WH2100	WH2115	WH2131	WH2142
ØA(mm) cooper	76,0	76,0	88,9	88,9	108,0	108,0	108,0
ØB(mm) stainless steel	108,0	108,0	141,3	141,3	141,3	141,3	141,3
ØC(mm) cooper	42	42	42	42	54	54	54
ØD(mm) cooper	42	42	42	42	54	54	54
ØV(*) VICTAULIC COUPLING CONNESS.VICTAULIC	DN 100- 4"- 114,3 mm	DN 100- 4"- 114,3 mm	DN 125- 5"- 114,3 mm	DN 125- 5"- 114,3 mm	DN 150- 6"- 168,27 mm	DN 150- 6"- 168,27 mm	DN 150- 6"- 168,27 mm
ØW(*) VICTAULIC COUPLING CONNESS.VICTAULIC	DN 150- 6"- 168,3 mm	DN 150- 6"- 168,3 mm	DN 200- 8"- 219,1 mm	DN 200- 8"- 219,1 mm	DN 200- 10"- 273,05 mm	DN 200- 10"- 273,05 mm	DN 200- 10"- 273,05 mm

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2006/42/EC; 2014/30/EU; 2014/35/EU; 2014/68/EU

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