OMEGA.V 2001

188 ÷ 1143 kW

Manual	**M 19**
Issue	**02.02**
Supersedes	**---**

Operating,
installation
and maintenance manual

Water/Water chillers

Semihermetic screw compressors

BLUE BOX
condizionamento

ISO 9001-Cert. N. 0201/2

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OMEGA V 2001 - Water chiller

Water cooled water chiller with semihermetic compressor, shell and tube heat exchangers. Unit is suitable for indoor insatllation.

TECHNICAL CHARACTERISTICS

UNIT FRAME
Self-supporting frame made from galvanised steel protected with polyester powder paint enamel (stoved at 180°). Stainless steel screws and bolts.

COMPRESSORS
screw-type semi-hermetic compressor, direct male rotor/female rotor drive, with crankcase heater. Lubrification ensured by delivery and intake pressure difference. Continuous cooling capacity control available, enabling to maximise the energetic efficiency of the unit in any working condition. Integral electronic motor protection and temperature sensors inserted directly in windings. Delta-star motor start-up and standard capacity step reduction.

HEAT EXCHANGERS
shell and tube type, dry expansion evaporator. Insulation with closed-cell foam material for reduced heat loss. All evaporators are fitted with temperature probe for anti-freeze protection.

REFRIGERANT CIRCUIT
Includes: compressor delivery valves, liquid line shut-off valve, charging connection, liquid sight glass, drier filter, thermostatic valve, high and low pressure, evaporation and condensation temperature probes for readout by control.

ELECTRICAL PANEL
The electric panel includes:
- main switch
- power and auxiliary cicuits fuses
- compressor contactors
- microprocessor for control of the following functions:
    - water temperature control
    - anti-freeze protection
    - compressor operation timing
    - compressor automatic start-up sequence
    - alarm signals
    - alarm reset
    - potential contact for remote alarm signals
- digital display of:
    - inlet and outlet water temperature
    - temperature and differential settings
    - alarm description
    - hour meters readout of operation and number of unit, compressor start-ups
    - high and low pressures, relative condensation and evaporation temperature controls.

Electri power supply [V/f/Hz]: 400/3~/50 ±5%

CONTROL AND SAFETY DEVICES
- manual-reset high pressure switch
- manual high / low pressure switch controlled by microprocessor
- mechanical flow switch
- compressors over temperature protection on supply gas with liquid injection

TESTS
Units are factory tested and come with oil and refrigerant fluid charges.

OTHER VERSIONS

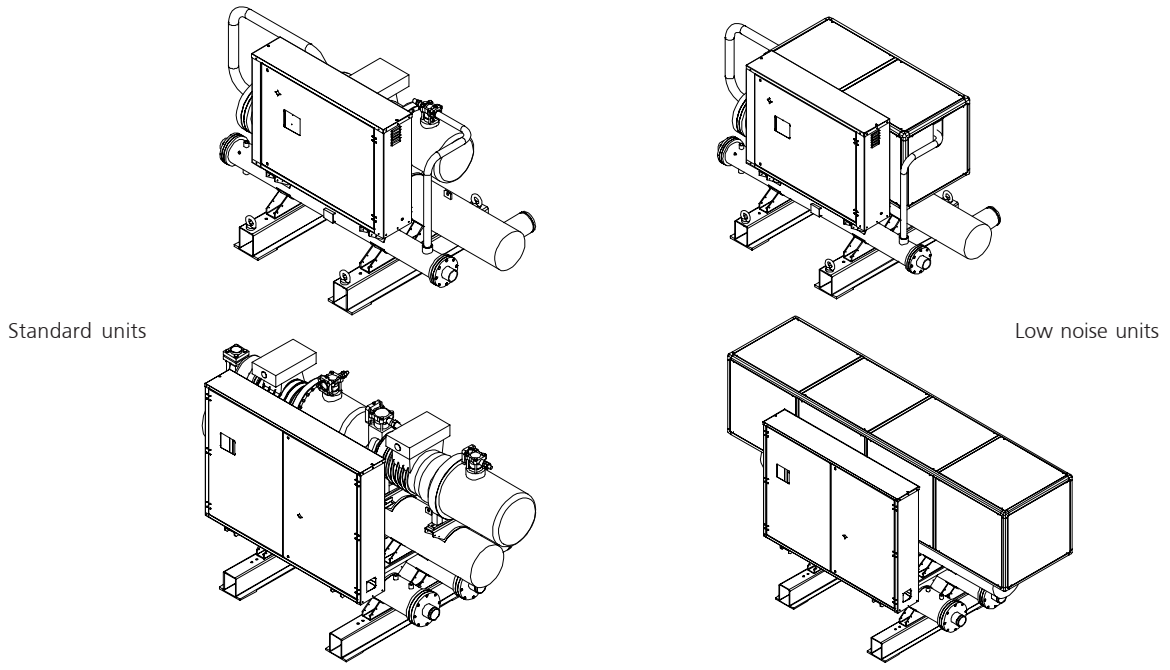
OMEGA V 2001 /DC: unit with heat recovery condenser
Besides the standard components of the OMEGA V 2001 for each compressor the unit includes a 100% heat recovery condenser for hot water production. The recovery water temperature control and the safety heat recovery disabling are automatically handled by the microprocessor.

OMEGA V 2001 /LC: motoevaporating unit
The unit is manufactured without water condenser, to be connected to a remore air coole dondenser.

OMEGA V 2001 /LN: low noise unit
Besides the standard components of the OMEGA V 2001 version, the unit includes:
- compressors fitted in soundproofed compartment made of painted galvanized sheet with internal insulation, sound-absorbing mat with high impedance material inserted.
- compressor on antivibrating mountings.

ACCESSORIES:

- Desuperheaters
- Additional compressor step control
- Rubber or spring vibration dampers
- Pressostatic valve
- Mechanical flow switch
- Continuous compressor step control
- Electronic expansion valve
- Solenoid valve on liquid line
- Liquid receiver
- Compressor suction valve
- Power factor cos $\varphi \geq 0.9$ at nominal working conditions
- Single potential free contacts
- Serial interface
- Double set point
- Remote contro terminal (added to the standard one)
- Variable Set point with remote signal
- Leaving water temperature control



Standard units

Low noise units

Picture 1

THE SERIES

Water cooled water chillers OMEGA.V 2001 are available in various sizes with capacities ranging from 187 to 1153 kW.

The model can be identified by two numbers:

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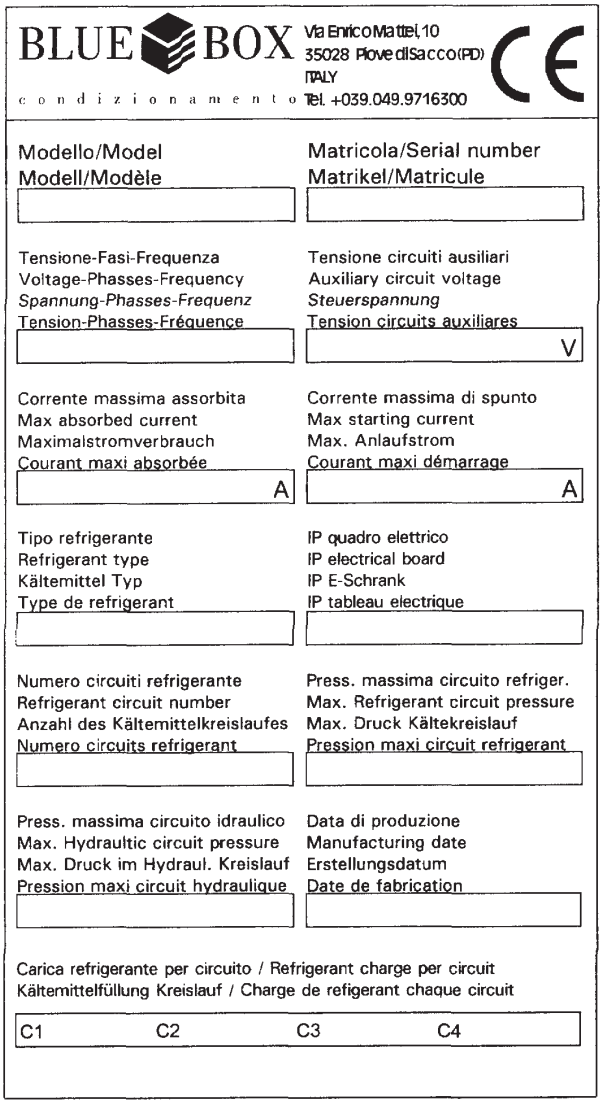
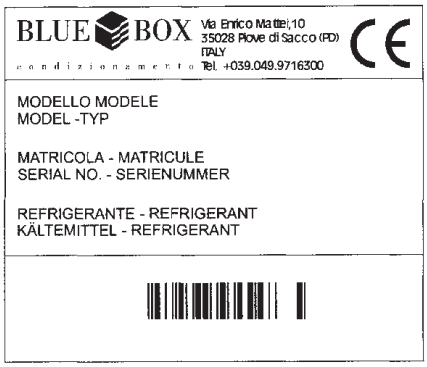
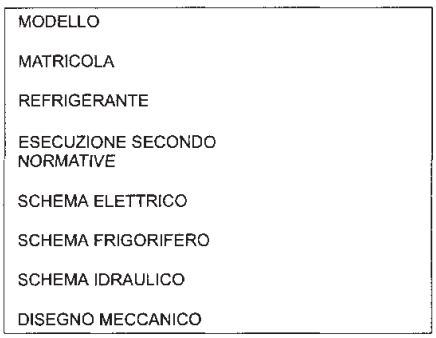
Nominal cooling capacity* in kW x 10 — number of circuits

* Capacity refers to water inlet/outlet 12/7 °C, condenser water temperature 30/35 °C.

Model, factory number, technical data, electric power supply, etc. are reported on the labels of the unit.







TECHNICAL DATA Refrigerant R407C

MODEL OMEGA V 2001		19.1	22.1	27.1	33.1	38.2	39.1
Cooling (*)							
Nominal capacity	kW	188	217,4	270	322,4	376,1	380,2
Evaporator water flow	l/s	8,985	10,387	12,899	15,405	17,969	18,164
	(l/h)	32.344	37.393	46.436	55.458	64.688	65.391
Evaporator pressure drop	kPa	71,2	20,6	26,6	37,4	58,8	59,9
Condenser water flow	l/s	11,322	13,09	16,159	19,336	22,644	22,565
	(l/h)	40.760	47.124	58.173	69.609	81.519	81.233
Condenser pressure drop	kPa	12,8	13,8	16,9	17,3	12,8	17,7
Compressors	type	semihermetic screw					
Quantity	n	1	1	1	1	2	1
Absorbed power cooling (*)	kW	48,9	56,6	68,2	82,3	97,9	92,1
Capacity steps	%	0-50-100	0-50-100	0-50-100	0-50-100	0-25-50-75-100	0-50-100
Refrigerant charge							
Circuit C1	kg	25	26	27	50	25	54
Circuit C2	kg	---	---	---	---	25	---
Oil							
Circuit C1	l	10	10	11	11	10	15
Circuit C2	l	---	---	---	---	10	---
Oil producer		DEA					
Oil type		SE 170					
Evaporator	type	shell and tube					
Evaporator water volume	l	54,8	112	105	96,2	159,6	159,6
Max operating pressure water side	bar	10					
Condenser	type	shell and tube					
Condenser 1 water volume	l	18,3	20,2	22,1	29	18,3	32,8
Condenser 2 water volume	l	---	---	---	---	18,3	---
Max operating pressure water side	bar	10					
Dimension and weight (**)							
Length	mm	2.885	3.410	3.430	3.445	3.450	3.480
Width	mm	1.500	1.500	1.500	1.500	1.500	1.500
Heigth	mm	1.610	1.610	1.610	1.690	2.015	1.690
Shipping weight	kg	1.138	1.297	1.423	1.553	2.197	1.800

(*) evaporator entering/leaving water temperature 12-7 °C
condenser entering/leaving water temperature 30-35 °C
(**) Valid only for standard units

CHARACTERISTICS AND ELECTRICAL DATA

MODEL OMEGA V 2001		19.1	22.1	27.1	33.1	38.2	39.1
Maximum absorbed power (1)	kW	70,3	81,3	98,1	116,9	140,6	130,9
Maximum starting current	A	155	188	240	263	279	323
Full load current (2)	A	124	140	168	196	248	225
Power supply	V/f/Hz	400/3~/50 ±5%					
Control power supply	V/f/Hz	230/~/50					

(1) Electric power supply which must be available from the net

(2) Current of intervention of the internal protections of unit. It is the max absorbed current of unit. This value is never exceeded and must be utilized to dimension the line supply and the protections (see el. diagram of unit).

MODEL OMEGA V 2001		43.1	44.2	47.1	52.1	54.2	58.1
Cooling (*)							
Nominal capacity	kW	424,8	434,8	460,2	517,5	540	571,5
Evaporator water flow	l/s	20,296	20,774	21,987	24,724	25,798	27,306
	l/h	73.065	74.786	79.153	89.006	92.872	98.303
Evaporator pressure drop	kPa	53	55,3	62,7	57,7	42,8	47,4
Condenser water flow	l/s	25,17	26,18	27,276	30,806	32,318	34,15
	(l/h)	90.612	94.248	98.195	110.902	116.346	122.941
Condenser pressure drop	kPa	17,2	13,8	16,2	16	16,9	15,1
Compressors	type	semihermetic screw					
Quantity	n	1	2	1	1	2	1
Absorbed power cooling (*)	kW	102	113,1	110,7	127,3	136,5	143,2
Capacity steps	%	0-50-100	0-25-50-75-100	0-50-100	0-50-100	0-25-50-75-100	0-50-100
Refrigerant charge							
Circuit C1	kg	53	25	55	60	29	79
Circuit C2	kg	---	25	---	---	29	---
Oil							
Circuit C1	l	15	10	18	18	11	18
Circuit C2	l	---	10	---	---	11	---
Oil producer		DEA					
Oil type		SE 170					
Evaporator	type	shell and tube					
Evaporator water volume	l	150	150	136,2	266	247,8	247,8
Max operating pressure water side	bar	10					
Condenser	type	shell and tube					
Condenser 1 water volume	l	36,5	20,2	40,3	31,4	22,1	51,6
Condenser 2 water volume	l	---	20,2	---	---	22,1	---
Max operating pressure water side	bar	10					
Dimension and weight (**)							
Length	mm	3.480	3.450	3.480	3.500	3.535	3.520
Width	mm	1.500	1.500	1.500	1.500	1.500	1.500
Heigth	mm	1.690	2.015	1.690	1.690	2.095	1.740
Shipping weight	kg	1.850	2.267	2.169	2.410	2.742	2.559

(*) evaporator entering/leaving water temperature 12-7 °C
condenser entering/leaving water temperature 30-35 °C
(**) Valid only for standard units

CHARACTERISTICS AND ELECTRICAL DATA

MODEL OMEGA V 2001		43.1	44.2	47.1	52.1	54.2	58.1
Maximum absorbed power (1)	kW	145	162,6	157,3	175,1	196,2	195
Maximum starting current	A	374	328	453	543	408	595
Full load current (2)	A	245	280	270	300	336	334
Power supply	V/f/Hz	400/3~/50 ±5%					
Control power supply	V/f/Hz	230/~/50					

(1) Electric power supply which must be available from the net

(2) Current of intervention of the internal protections of unit. It is the max absorbed current of unit. This value is never exceeded and must be utilized to dimension the line supply and the protections (see el. diagram of unit).

TECHNICAL DATA Refrigerant R407C

MODEL OMEGA V 2001		60.2	65.2	71.2	77.2	82.2	86.2
Cooling (*)							
Nominal capacity	kW	593,2	644,9	702,6	760,4	805	849,6
Evaporator water flow	l/s	28,34	30,81	33,569	36,329	38,46	40,592
	l/h	102.022	110.916	120.850	130.783	138.457	146.131
Evaporator pressure drop	kPa	50,7	55	46,6	53,7	36,1	39,8
Condenser water flow	l/s	35,519	38,672	41,901	45,13	47,735	50,34
	(l/h)	127.870	139.219	150.843	162.467	171.846	181.225
Condenser pressure drop	kPa	20,1	17,3	20	17,7	19,5	17,2
Compressors	type	semihermetic screw					
Quantity	n	2	2	2	2	2	2
Absorbed power cooling (*)	kW	150,3	164,5	174,4	184,2	194,1	204
Capacity steps	%	0-25-50-75-100	0-25-50-75-100	0-25-50-75-100	0-25-50-75-100	0-25-50-75-100	0-25-50-75-100
Refrigerant charge							
Circuit C1	kg	52	52	54	55	58	55
Circuit C2	kg	29	52	54	55	55	55
Oil							
Circuit C1	l	11	11	15	15	15	15
Circuit C2	l	11	11	11	15	15	15
Oil producer		DEA					
Oil type		SE 170					
Evaporator	type	shell and tube					
Evaporator water volume	l	247,8	184,4	225	225	403	403
Max operating pressure water side	bar	10					
Condenser	type	shell and tube					
Condenser 1 water volume	l	22,1	29	29	32,8	32,8	36,5
Condenser 2 water volume	l	22,1	29	29	32,8	32,8	36,5
Max operating pressure water side	bar	10					
Dimension and weight (**)							
Length	mm	3.535	3.365	3.860	3.860	3.895	3.895
Width	mm	1.500	1.500	1.500	1.500	1.500	1.500
Heigth	mm	2.095	2.095	2.095	2.095	2.195	2.165
Shipping weight	kg	2.868	2.945	3.185	3.333	3.622	3.640

(*) evaporator entering/leaving water temperature 12-7 °C
condenser entering/leaving water temperature 30-35 °C
(**) Valid only for standard units

CHARACTERISTICS AND ELECTRICAL DATA

MODEL OMEGA V 2001		60.2	65.2	71.2	77.2	82.2	86.2
Maximum absorbed power (1)	kW	215	233,8	247,8	261,8	275,9	290
Maximum starting current	A	436	459	488	548	568	619
Full load current (2)	A	364	392	421	450	470	490
Power supply	V/f/Hz	400/3~/50 ±5%					
Control power supply	V/f/Hz	230/~/50					

(1) Electric power supply which must be available from the net

(2) Current of intervention of the internal protections of unit. It is the max absorbed current of unit. This value is never exceeded and must be utilized to dimension the line supply and the protections (see el. diagram of unit).

MODEL OMEGA V 2001		90.2	93.2	104.2	116.2
Cooling (*)					
Nominal capacity	kW	891,1	920,4	1035	1143,1
Evaporator water flow	l/s	42,573	43,974	49,448	54,613
	l/h	153.263	158.307	178.013	196.606
Evaporator pressure drop	kPa	43,4	46	57,3	82,7
Condenser water flow	l/s	52,649	54,553	61,612	68,301
	(l/h)	189.537	196.391	221.804	245.882
Condenser pressure drop	kPa	18,6	16,2	16	15,1
Compressors	type	semihermetic screw			
Quantity	n	2	2	2	2
Absorbed power cooling (*)	kW	210,9	221,4	254,6	286,5
Capacity steps	%	0-25-50-75-100	0-25-50-75-100	0-25-50-75-100	0-25-50-75-100
Refrigerant charge					
Circuit C1	kg	55	54	64	82
Circuit C2	kg	54	54	64	82
Oil					
Circuit C1	l	18	18	18	18
Circuit C2	l	15	18	18	18
Oil producer		DEA			
Oil type		SE 170			
Evaporator	type	shell and tube			
Evaporator water volume	l	403	403	378	348
Max operating pressure water side	bar	10			
Condenser	type	shell and tube			
Condenser 1 water volume	l	36,5	40,3	31,4	51,6
Condenser 2 water volume	l	36,5	40,3	31,4	51,6
Max operating pressure water side	bar	10			
Dimension and weight (**)					
Length	mm	4.025	4.040	4.040	4.040
Width	mm	1.500	1.500	1.500	1.500
Heigth	mm	2.220	2.220	2.220	2.270
Shipping weight	kg	3.933	4.222	4.385	4.612

(*) evaporator entering/leaving water temperature 12-7 °C
condenser entering/leaving water temperature 30-35 °C
(**) Valid only for standard units

CHARACTERISTICS AND ELECTRICAL DATA

MODEL OMEGA V 2001		90.2	93.2	104.2	116.2
Maximum absorbed power (1)	kW	302,3	314,6	350,2	390
Maximum starting current	A	644	723	843	929
Full load current (2)	A	515	540	600	668
Power supply	V/f/Hz	400/3~/50 ±5%			
Control power supply	V/f/Hz	230/~/50			

(1) Electric power supply which must be available from the net

(2) Current of intervention of the internal protections of unit. It is the max absorbed current of unit. This value is never exceeded and must be utilized to dimension the line supply and the protections (see el. diagram of unit).

SOUND POWER AND PRESSURE LEVEL

STANDARD UNITS

OMEGA	Octave band [Hz]																Total	
V 2001	63 [dB]		125 [dB]		250 [dB]		500 [dB]		1000 [dB]		2000 [dB]		4000 [dB]		8000 [dB]		[dB(A)]	
	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp
19.1	82,9	64,7	88,7	70,5	79,3	61,1	85,4	67,2	82,6	64,4	82,8	64,6	68,7	50,5	63,8	45,6	88,1	69,9
22.1	82,0	63,7	89,4	71,1	81,0	62,7	84,5	66,2	82,2	63,9	84,9	66,6	67,2	48,9	63,5	45,2	88,8	70,5
27.1	83,6	65,0	89,4	70,8	81,7	63,1	86,0	67,4	84,9	66,3	86,4	67,8	68,9	50,3	66,9	48,3	90,5	71,9
33.1	84,7	66,4	92,2	73,9	83,7	65,4	88,8	70,5	87,4	69,1	85,0	66,7	73,7	55,4	66,3	48,0	91,6	73,3
38.2	84,9	66,6	92,4	74,1	83,9	65,6	89,0	70,7	85,8	67,5	86,7	68,4	74,6	56,3	64,4	46,1	91,7	73,4
39.1	86,6	68,0	94,1	75,5	85,6	67,0	90,7	72,1	88,8	70,2	87,6	69,0	72,2	53,6	66,4	47,8	93,5	74,9
43.1	88,0	69,7	95,5	77,2	87,0	68,7	91,4	73,1	90,9	72,6	88,8	70,5	73,8	55,5	70,4	52,1	94,9	76,6
44.2	83,1	64,8	91,2	72,9	83,1	64,8	87,7	69,4	86,4	68,1	88,4	70,1	72,7	54,4	69,2	50,9	92,4	74,1
47.1	88,5	69,7	96,0	77,2	87,5	68,7	92,0	73,2	89,4	70,6	90,7	71,9	79,0	60,2	68,3	49,5	95,4	76,6
52.1	89,5	70,3	96,9	77,7	88,5	69,3	93,6	74,4	90,4	71,2	91,3	72,1	76,6	57,4	71,0	51,8	96,3	77,1
54.2	87,2	68,8	94,7	76,3	86,2	67,8	92,4	74,0	89,1	70,7	87,6	69,2	75,5	57,1	67,5	49,1	94,1	75,7
58.1	90,5	72,7	98,0	80,2	89,5	71,7	93,0	75,2	91,0	73,2	93,4	75,6	79,6	61,8	74,5	56,7	97,4	79,6
60.2	87,7	68,9	95,2	76,4	86,7	67,9	93,4	74,6	88,6	69,8	88,5	69,7	74,8	56,0	69,6	50,8	94,6	75,8
65.2	87,8	69,1	95,2	76,5	86,8	68,1	90,2	71,5	88,8	70,1	90,7	72,0	72,9	54,2	68,4	49,7	94,6	75,9
71.2	89,3	70,4	96,8	77,9	87,7	68,8	93,5	74,6	91,6	72,7	90,4	71,5	74,8	55,9	73,4	54,5	96,2	77,3
77.2	90,3	71,4	97,8	78,9	89,3	70,4	94,4	75,5	91,2	72,3	92,2	73,3	77,4	58,5	71,9	53,0	97,2	78,3
82.2	91,0	71,9	98,5	79,4	90,0	70,9	95,2	76,1	91,9	72,8	92,9	73,8	78,2	59,1	72,6	53,5	97,9	78,8
86.2	91,7	72,7	99,2	80,2	90,8	71,8	95,9	76,9	92,7	73,7	93,6	74,6	78,9	59,9	73,3	54,3	98,6	79,6
90.2	92,3	73,1	99,8	80,6	91,3	72,1	96,4	77,2	93,2	74,0	94,1	74,9	79,4	60,2	73,8	54,6	99,2	80,0
93.2	92,5	73,3	100,0	80,8	91,5	72,3	96,6	77,4	93,4	74,2	94,3	75,1	79,6	60,4	74,0	54,8	99,4	80,2
104.2	93,2	75,0	100,7	82,5	92,3	74,1	97,4	79,2	94,2	76,0	95,1	76,9	80,4	62,2	74,8	56,6	100,1	81,9
116.2	94,2	75,0	101,6	82,4	93,2	74,0	98,3	79,1	95,1	75,9	96,0	76,8	81,3	62,1	75,7	56,5	101,0	81,8

LOW NOISE UNITS

OMEGA	Octave band [Hz]																Total	
V 2001	63 [dB]		125 [dB]		250 [dB]		500 [dB]		1000 [dB]		2000 [dB]		4000 [dB]		8000 [dB]		[dB(A)]	
LN	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp	Lw	Lp
19.1	77,8	59,6	86,0	67,8	77,6	59,4	82,4	64,2	76,8	58,6	77,7	59,5	59,3	41,1	58,6	40,4	83,6	65,4
22.1	79,6	61,3	87,8	69,5	79,4	61,1	84,2	65,9	78,6	60,3	79,5	61,2	61,1	42,8	60,4	42,1	85,4	67,1
27.1	81,9	63,3	90,1	71,5	81,7	63,1	86,5	67,9	80,9	62,3	81,8	63,2	63,4	44,8	62,7	44,1	87,7	69,1
33.1	83,1	64,8	91,3	73,0	82,9	64,6	87,7	69,4	82,1	63,8	83,0	64,7	64,6	46,3	63,9	45,6	88,9	70,6
38.2	81,8	63,5	90,0	71,7	81,6	63,3	86,4	68,1	80,8	62,5	81,7	63,4	63,3	45,0	62,6	44,3	87,6	69,3
39.1	85,0	66,4	93,2	74,6	84,8	66,2	89,6	71,0	84,0	65,4	84,9	66,3	66,5	47,9	65,8	47,2	90,8	72,2
43.1	86,0	67,7	94,2	75,9	85,8	67,5	90,6	72,3	85,0	66,7	85,9	67,6	67,5	49,2	66,8	48,5	91,8	73,5
44.2	83,2	64,9	91,4	73,1	83,0	64,7	87,8	69,5	82,2	63,9	83,1	64,8	64,7	46,4	64,0	45,7	89,0	70,7
47.1	86,6	67,8	94,8	76,0	86,4	67,6	91,2	72,4	85,6	66,8	86,5	67,7	68,1	49,3	67,4	48,6	92,4	73,6
52.1	87,2	68,0	95,4	76,2	87,0	67,8	91,8	72,6	86,2	67,0	87,1	67,9	68,7	49,5	68,0	48,8	93,0	73,8
54.2	85,2	66,8	93,4	75,0	85,0	66,6	89,8	71,4	84,2	65,8	85,1	66,7	66,7	48,3	66,0	47,6	91,0	72,6
58.1	88,3	70,5	96,5	78,7	88,1	70,3	92,9	75,1	87,3	69,5	88,2	70,4	69,8	52,0	69,1	51,3	94,1	76,3
60.2	85,9	67,1	94,1	75,3	85,7	66,9	90,5	71,7	84,9	66,1	85,8	67,0	67,4	48,6	66,7	47,9	91,7	72,9
65.2	86,1	67,4	94,3	75,6	85,9	67,2	90,7	72,0	85,1	66,4	86,0	67,3	67,6	48,9	66,9	48,2	91,9	73,2
71.2	87,6	68,7	95,8	76,9	87,4	68,5	92,2	73,3	86,6	67,7	87,5	68,6	69,1	50,2	68,4	49,5	93,4	74,5
77.2	88,6	69,7	96,8	77,9	88,4	69,5	93,2	74,3	87,6	68,7	88,5	69,6	70,1	51,2	69,4	50,5	94,4	75,5
82.2	89,2	70,1	97,4	78,3	89,0	69,9	93,8	74,7	88,2	69,1	89,1	70,0	70,7	51,6	70,0	50,9	95,0	75,9
86.2	90,0	71,0	98,2	79,2	89,8	70,8	94,6	75,6	89,0	70,0	89,9	70,9	71,5	52,5	70,8	51,8	95,8	76,8
90.2	90,3	71,1	98,5	79,3	90,1	70,9	94,9	75,7	89,3	70,1	90,2	71,0	71,8	52,6	71,1	51,9	96,1	76,9
93.2	90,7	71,5	98,9	79,7	90,5	71,3	95,3	76,1	89,7	70,5	90,6	71,4	72,2	53,0	71,5	52,3	96,5	77,3
104.2	91,3	73,1	99,5	81,3	91,1	72,9	95,9	77,7	90,3	72,1	91,2	73,0	72,8	54,6	72,1	53,9	97,1	78,9
116.2	92,1	72,9	100,3	81,1	91,9	72,7	96,7	77,5	91,1	71,9	92,0	72,8	73,6	54,4	72,9	53,7	97,9	78,7

Lw: Sound power measured in free field according to ISO 3746 rules,
Lp: Sound pressure level measured in free field conditions at 1 m from the unit, according to ISO 3746 rules.

1. SAFETY REQUIREMENTS

1.1 DANGEROUS AREA

Only trained and qualified personnel should gain access to the unit.

- External dangerous area is considered an area of about 2 m around the unit. If the unit is installed in a not protected area, it is important to install a protection to permit access only to suitably qualified person.

1.2 SAFETY

The units are designed and built to guarantee maximum safety. In order to avoid risks to persons or objects, adhere to the following:

- Make sure that persons using the unit have read and fully understood the manual provided before carrying out any operations. Always keep a copy of the manual near the unit.

- Always use suitable protections (gloves, helmet, protective goggles, safety clothing etc.) before carrying out checks or maintenance on the unit.

- Make sure to use exclusively tools and protective devices which are in good working order

- High temperature parts are present inside the compressor. Ensure that the correct protective measures are taken before touching any of the unit's components when working in the vicinity.

- Ensure that safety valve discharge is conveyed outside the building.

- Do not work in the trajectory of the safety valves.

MECHANICAL SAFETY DATA

Operating	Risk or danger	Suggested solution
Unit operating Maintenance	Stability.	When the unit operates do not exist any risk of overturning. Follow carefully the instructions of this manual.
Transport and handling	Stability.	To avoid overturning, the unit must be lifted using the 4 eyebolts marked by yellow arrows. Follow carefully the instructions of this manual.
Unit operating Maintenance	Breaking of pipes	Pipes are rigidly fixed with brackets to minimize the vibrations.
Unit operating	Sharp edges.	Corners and sharp edges have been reduced as much as possible. Access to unit must be restricted to suitably qualified persons. Should the unit be installed in non-protected area, protections have to be installed.
Maintenance	Sharp edges.	Risks related to sharp edges or corners can not be completely eliminated. Maintenance operations must be restricted to suitably qualified persons who are familiar with the potential hazards and precautions necessary for safe operation and with the necessary protections.
Unit operating Maintenance	Release of high-pressure vapour and liquid. Risk of explosion	All units are fitted with safety valves to avoid risk of explosion. Discharge from safety valves has to be suitably conveyed to avoid damage due to release of high-pressure vapour contained in the unit

THERMAL SAFETY DATA

Operating	Risk or danger	Suggested solution
Unit operating Maintenance	Burns due to high temperatures.	Insulating material protects the most part of the hot pipes, which could produce burns. Access to unit must be restricted to suitably qualified persons. Should the unit be installed in non-protected area, protections to be installed.
Maintenance	Burns due to high temperatures	Insulating material protects the most part of the hot pipes, which could produce burns. Access to unit must be restricted to suitably qualified persons. Use adequate protections to avoid contact with hot pipes which could produce burns.

NOISE SAFETY DATA

Operating	Risk or danger	Suggested solution
Unit operating Maintenance	Operating difficulties – Danger for the hearing.	The emission of noise has been reduced to a minimum.

ELECTRICAL SAFETY DATA

Operating	Risk or danger	Suggested solution
Unit operating Maintenance	Direct contact with live equipments.	Units are built in conformity with the requirements EN 60204-1.
	Live parts in case of failure.	
	Not adequate insulation.	
	Thermal radiation due to short-circuits or overloads.	

REFRIGERANT SAFETY DATA - R407C

1. IDENTIFICATION OF THE SUBSTANCE	1.1	Identification of the preparation:	407C
		Synonyms:	HFC-32lHFC-125lHFG134a
		Formula:	Mixture
		EE-No:	difluoromethane (HFC-32) : 200-839-4 1-1-1-2-tetrafluoroethane UHFC-134a) : 212-377-0 pentafluoroethane (HFC-125) : 206-557-8

2. COMPOSITION / INFORMATION ON INGREDIENTS	Chemical Name	CAS-No - Wt % -	Symbol(s): & phrases "R"
	difluoromethane	75/10/5 - 23 -	F+;R12
	1-2-2-2-tetrafluoroethane	811/97/2 - 52	
	pentafluoroethane	354/33/ 6 - 25	

3. HAZARDS IDENTIFICATION:	3.1	Most important hazards:	Liquefied gas: may cause frostbite. Contact with eyes may cause irritation.

4. FIRST-AID MEASURES:	4.1	Eyes	Rinse immediately with plenty of water for at least 15 minutes. Keep eye wide open while rinsing. If symptoms persist, call a physician.
		Skin	Liquefied gas may cause frostbite. Wash frostbitten areas with plenty of water. Do not remove clothing. Wash off with warm water. if skin irritation persists, call a physician.
		Inhalation	Move to fresh air in case of accidental inhalation of vapours. Oxygen or artificial respiration if needed. Do not apply artificial respiration if patient is breathing; Consult a physician after significant exposure. Do not give adrenaline or similar drugs.
		Ingestion	Do not induce vomiting without medical advice. Call a physician immediately. Do not give drugs from adrenaline-ephedrine group.
		General advice	Consult a physician alter significant exposure.

5. FIRE-FIGHTING MEASURES:	5.1	Suitable extinguishing media:	The product itself does not burn. Extinguish with carbon dioxide, dry chemical, foam or water spray. Use extinguishing measures that are appropriate to the environment.
	5.2	Extinguishing media which must not be used for safety reasons:	None
	5.3	Specific hazards:	Possibility of generating hazardous reactions during a fire due to the presence of F and/or Cl groups. Fire or intense heat may cause violent rupture of packages.
	5.4	Special protective equipment for fire-fighters:	In case of fire, west a self contained breathing apparatus. Protective suit.
	5.5	Specific methods:	Standard procedure for chemical fires. In the event of fire, cool tanks with water spray.

6. ACCIDENTAL RELEASE MEASURES:	6.1	Personal precautions:	*Use* personal protective equipment. Evacuate personnel to safe areas. Do not breath vapours or spray mist. Ensure adequate ventilation.
	6.2	Methods for cleaning up:	Shut off leaks it without risk. Solid evaporates. Ensure adequate ventilation.

REFRIGERANT SAFETY DATA - R407C

7. HANDLING AND STORAGE:	7.1	Handling:	Keep away from heat, sources of ignition. Do not puncture or drop container, Provide sufficient air exchange and / or exhaust in work rooms.
	7.2	Storage:	Keep containers tightly closed in a cool, well-ventilated place. Store in a cool and shaded area. Do not expose to temperatures above 50 °C. Keep tightly closed.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION:	8.1	Engineering measures to reduce exposure:	Ensure adequate ventilation, especially in confined areas.
	8.2	Personal protection equipment:	
		Respiratory protection:	In case of insufficient ventilation wear suitable respiratory equipment, preferably a compressed airline breathing apparatus.
		Hand protection:	Impervious butyl rubber gloves.
		Eye protection:	Wear as appropriate: safety glasses, gaggles, Wear face-shield and protective suit for abnormal processing problems.
		Skin and body protection:	Chemical resistant apron, long sleeved clothing, safety shoes.
	8.3	Exposure limit(s):	1-1-1-2-tetrafluoroethane 1000 ppm (TWA); difluoromethane: 1000 ppm (TWA); pentafluoroethane: 1000 ppm (TWA)(AIHA);

9. STABILITY AND REACTIVITY:	9.1	Stability:	Stable at normal conditions. No decomposition if stored and applied as directed. Decomposition starting from 250°C.
	9.2	Conditions to avoid:	Do not expose to temperatures above 50 °C. Fire or Intense heat may cause violent rupture of packages.
	9.3	Materials to avoid:	alkaline metals (Na, K), alkaline earth metals (Ca, Mg), finely divided aluminium, zinc.
	9.4	Hazardous decomposition products:	halogenated compounds, hydrogen halides (HF, HCI), carbonyl halides ($COCl_2$), carbon monoxide, carbon dioxide ($C0_2$).

10. TOXICOLOGICAL INFORMATION:	10.1	Acute toxicity:	LC50/inh./4 h/rat : > 500000 ppm
	10.2	Irritation :	
		Skin:	slightly irritant, may cause frostbite.
		Eyes:	slightly irritant.
	10.4	Chronic toxicity:	chronic inhalation, no-observed-effect level (NOEL):> 10000pprn rat.

11. DISPOSAL CONSIDERATIONS:	11.1	Waste from residues / unused products:	Offer surplus and non-recyclable solutions to an established disposal company. In accordance with local and national regulations. S59 - Refer to manufacturer/supplier for information on recovery/recycling.
		Contaminated packaging:	Do not reuse empty containers. Empty pressure vessels should be returned to supplier.

12. TRANSPORT INFORMATIQN:	No. O.N.U.	3340
	ADR/RID	UN 3340 Refrigerant gas R407C, 2, 2° A, ADR/RID Label: 2

2. APPLICATION FIELD

These units have been designed for cooling water, generally used in air conditioning or refrigeration application. Their recommended operation range is reported in chaptel 6.

2.1 GENERALITY

- When installing or servicing the unit, it is necessary to strictly follow the rules reported on this manual, to conform to all the specifications of the labels on the unit, and to take any possible precautions of the case.

- Pressure in refrigerant circuit and electrical equipment present in the unit can be hazardous when installing or servicing the unit.

Every action on the unit must be done by trained people only.

Caution: before every operation of servicing on the unit, be sure that the electric supply is disconnected.

Not observing the rules reported on this manual, and every modification to the unit done without explicit previous authorisation, will cause the immediate termination of the warranty.

3. INSPECTION, TRANSPORT, SITE HANDLING

3.1 INSPECTION

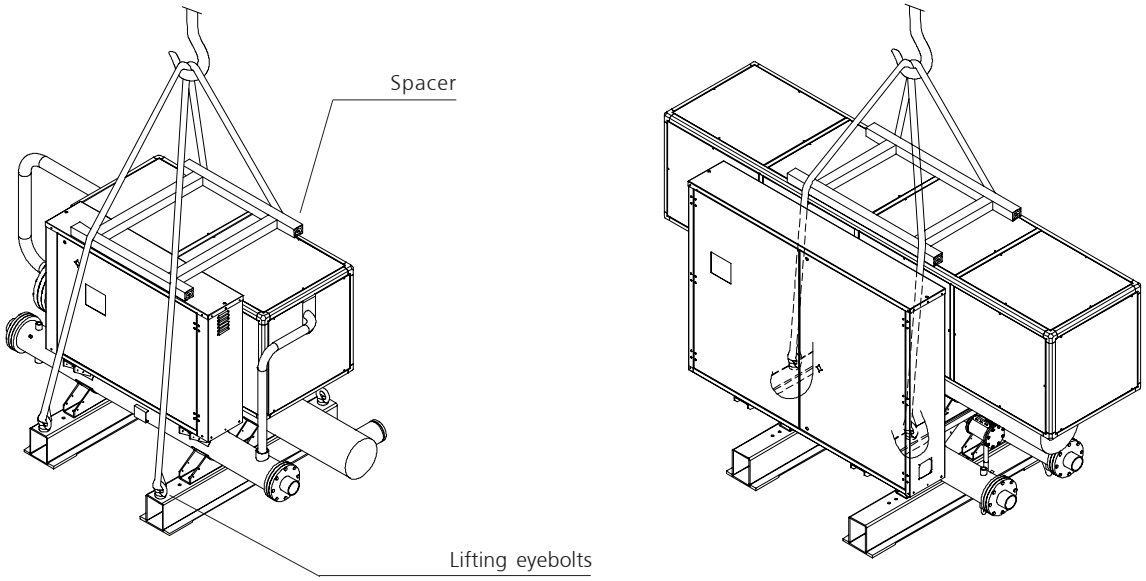
After receiving the unit, immediately check its integrity. The unit left the factory in perfect condition; any eventual damage must be questioned to the carrier and recorded on the Delivery Note before it is signed.
Blue Box or their Agent must be informed as soon as possible of the extent of the damage.
The Customer should prepare a written statement and pictures of any severe damage.

3.2 LIFTING AND TRANSPORT

When unloading the unit, it is highly recommended to avoid any sudden move.
Avoid to use as lifting points any unit component.

The unit can be lifted using the eye-bolts located along the sides of the unit and chords. Check the weight of unit on the tables at the end of this manual before lifting.

Caution: be sure that the method of lifting does not allow the unit to slip from chains and slings and does not allow the unit to turn over or slide from lifting devices.



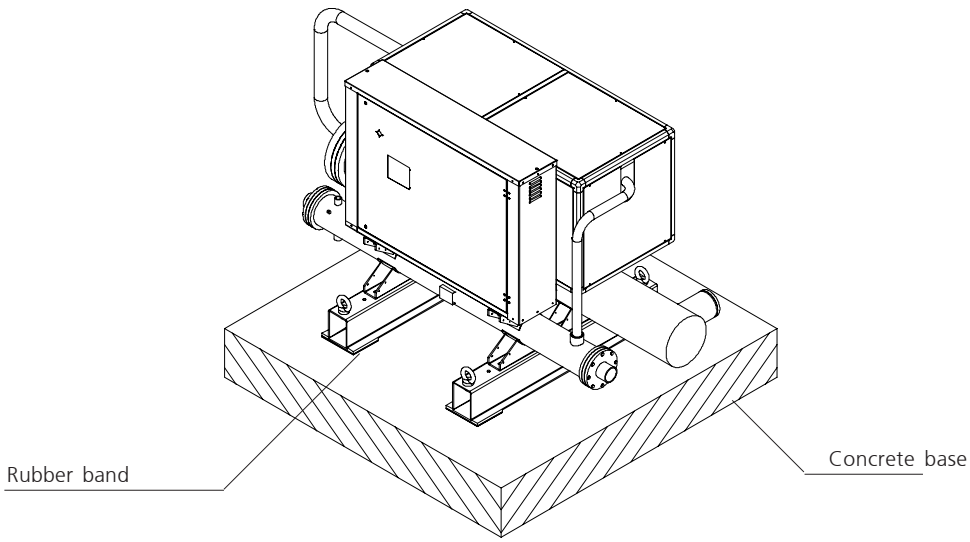
Picture 2

3.3 UNPACKING

When unpacking the unit pay attention not to damage the unit.
The package is made up by different materials: wood, paper, nylon etc.
It's a good rule to keep them separately and deliver to the proper gathering centre in order to reduce their environmental impact.

3.4 LOCATION

The unit is to be located in roofed ambients, where temperature never goes down below 4 °C.
Unit vibration level is very low: it is advisable however, to fit a rigid rubber band between the floor or basement and unit base-frame.
If it is the case, it is possible to install anti-vibration mounts (spring or rubber), to keep vibrations at a very low level (contact our Technical Department).

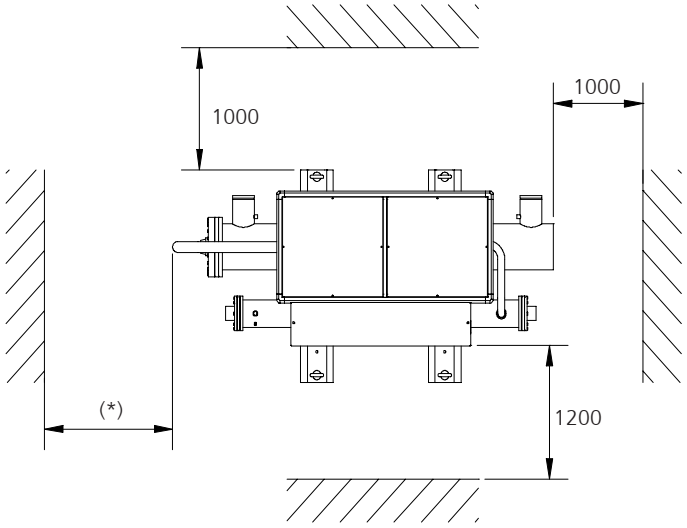


Picture 3

4. INSTALLATION

4.1 CLEARANCES

Minimum clearances for all units should be as following:
- broadside: 1000 mm to allow hydraulic connection to the system and servicing operations;
- front side: 1200 mm to allow access to electric board;
- rear side: 1000 mm to allow maintenance operations;
- heat exchanger connection side: enough space to extract the heat exchange bundle (* see dimensional drawings).



Picture 4

4.2 GENERAL RECOMMENDATIONS FOR WATER PIPING CONNECTIONS

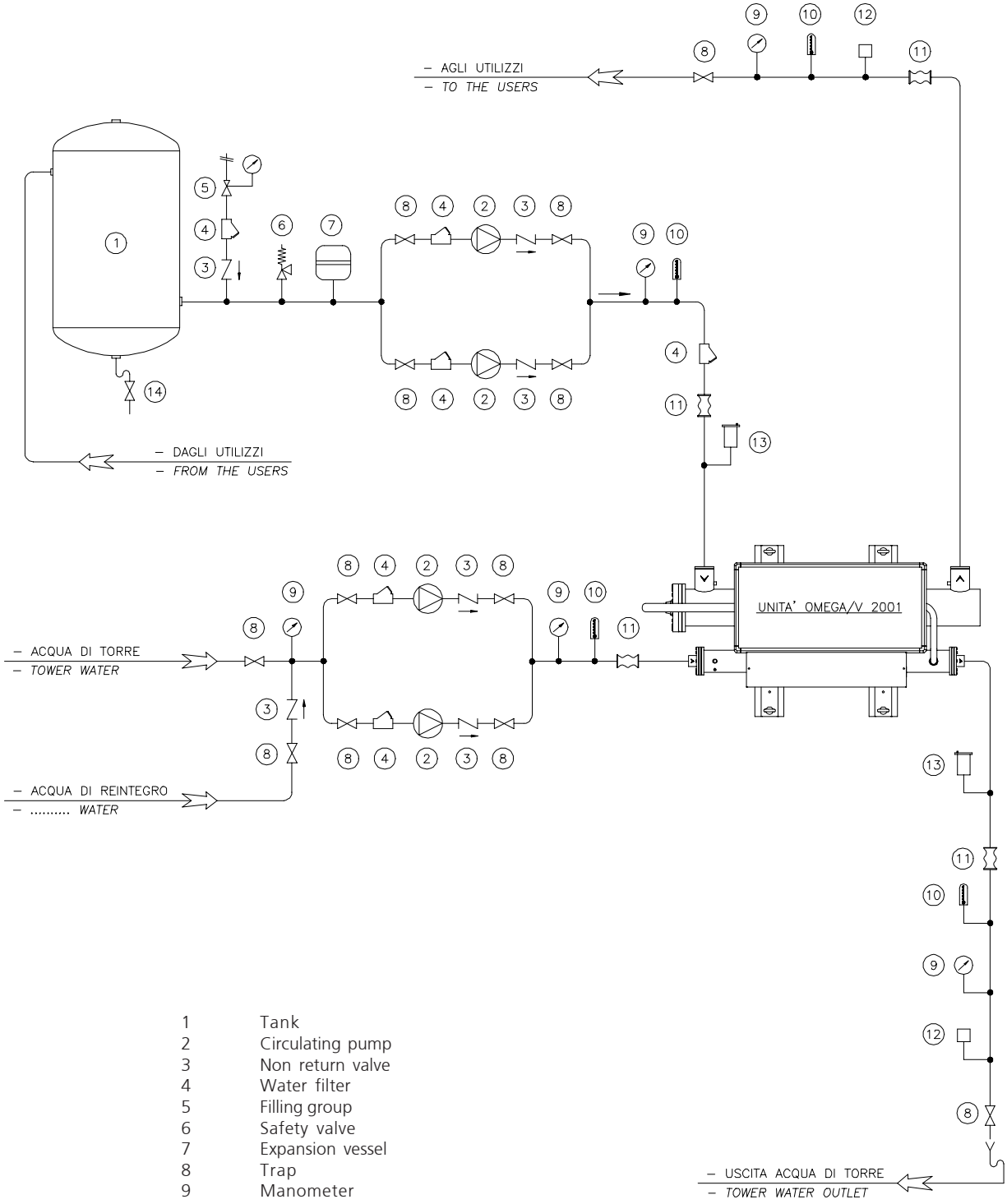
Unit water pipework must be installed in accordance with national and local regulation and code.
Please follow the recommendations reported below, when designing the unit water piping circuit (please refer to the diagrams included in this manual).

Piping should be connected to the unit with flexible joints, in order to avoid vibration transmission and compensate thermal expansion (the same procedure should be adopted for the pumps).

On the pipings should be installed the following devices:
- isolating valves, temperature gauges, pressure gauges for the ordinary maintenance or servicing operations.
- thermometer probe pockets, if temperature gauges should not be present.
- shut-off valves to separate the unit from the hydraulic circuit.
- metallic filters (inlet pipings) with a mesh not larger than 1 mm, to prevent dusting in the heat exchangers.
- vent valves, to be installed in the upper parts of the circuit, for air bleeding.
- expansion tank with accessories (water filling group) for circuit pressurisation and water thermal expansion compensation.
- unload valve and if necessary drainage tank for circuit emptying during maintenance and seasonal stop.

It is highly recommended to install a safety valve on hydraulic circuit. In case of dangerous situation (i.e. fire) the valve will discharge the system avoiding explosions. The valve must be connected to a vent pipe with a cross area equal or greater than the valve and must be directed into a safe zone in which no injuries can be done to people.

HYDRAULIC CIRCUIT DIAGRAM



1	Tank
2	Circulating pump
3	Non return valve
4	Water filter
5	Filling group
6	Safety valve
7	Expansion vessel
8	Trap
9	Manometer
10	Thermometer
11	Flexible joint
12	Flow switch
13	Vent valve
14	Drain

4.3 WATER PIPE CONNECTIONS TO EVAPORATOR

Water inlet must be in correspondence with the connection labelled with

Otherwise the evaporator may freeze, since the antifreeze thermostat would not work properly.
All the units are provided with hydraulic connections in stainless steel male threaded type.

The hydraulic circuit must guarantee a constant water flow to the evaporator in any operating condition. If this should not happen, liquid refrigerant could come back to the compressor causing its breakdown.

Compressors start and stop often, since the users cooling demand is not generally corresponding to the compressors capacity. In the hydraulic circuits with low water volume, where the thermal inertia action is not appreciable, it is advisable to verify if the water volume fulfils the following ratio:

$$M >= \frac{24 \cdot Q_{COMPTOT}}{N}$$

where:

M	=	system water content [kg]
$Q_{COMPTOT}$	=	unit cooling capacity [kW]
N	=	number of capacity steps

If the water volume does not reach the value given by the formula, it is advisable to provide the circuit with a storage vessel in order to get the required water volume (tank + circuit).
The chilled water pipings and the storage vessel must be carefully insulated, in order to prevent condensation on the tubes surface and to avoid circuit performance losses.

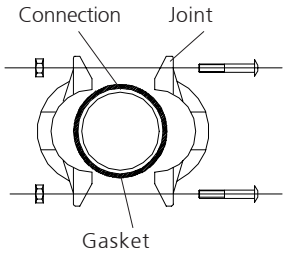
On all the units it is compulsory to install the flow switch that is provided with the unit on the evaporator outlet connection labelled with:

It is compulsory to install on the water inlet piping a mesh metallic filter: should the flow switch or the filter not be present on the unit, the warranty will terminate immediately.

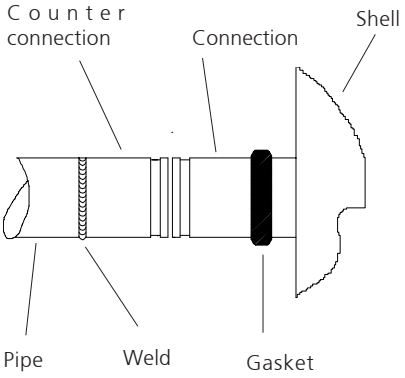
Caution: When executing hydraulic connections never use flames close or inside the unit.

4.4 FLEXIBLE JOINTS

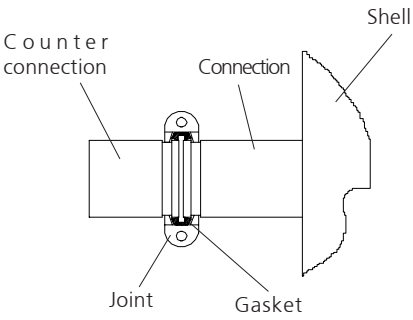
Flexible joints allow axial movements due to thermal expansion, eliminate vibrations and allow an easy assembly and disassembly of the joint parts.
To assembly joint act as follow:



1) Disconnect bolts and open the joint .



2) Move the gasket on the heat exchanger connection towards the shell .
3) Weld the counter-connection to the hydraulic circuit pipe.



4) Line up the connection and the counter-connection, place the gasket in the original position and if possible lubricate it on contact areas with not aggressive oil or grease.
5) Assembly the joint and tighten the nuts.

Picture 5

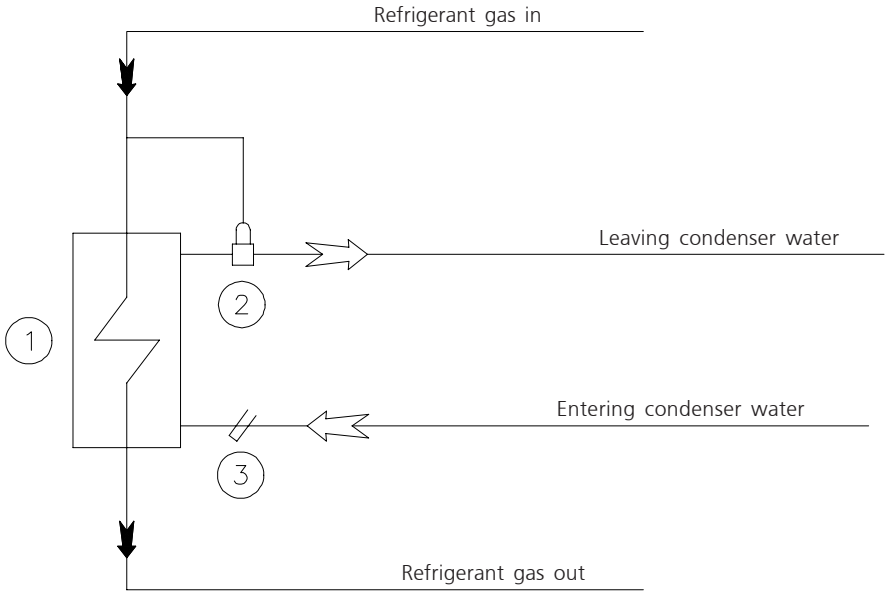
4.5 WATER PIPE CONNECTION TO THE CONDENSER

Water inlet must be in correspondence with the connection labelled with

Hydraulic connections are of threaded steel pipes till 3" diameter and with flexible joints for diameters higher or equal to 114,3 mm.

For the units equipped with more than one compressor, water inlets and outlets must be joined together with a manifold.
Location and dimensions are reported on dimensional sheet reported at the end of this manual.

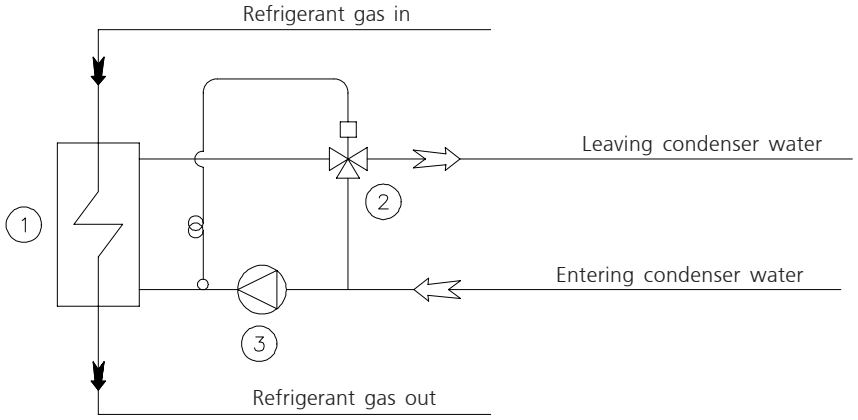
When not using cooling tower but city water, it is highly recommended to install a pressostatic valve to assure the correct working of the unit.
The pressostatic valve is also recommended for closed circuit installations. In fact this valve guarantees a regular operation of the unit when changing condenser water conditions (for example when restarting after a weekend pause).
The pressostatic valve is absolutely necessary if the tower water entering into the condenser can descend below 20 °C (see picture 6). The pressostatic valve must grant a condensing pressure higher than 12.5 bar relative.
Contact our Company for further informations.



1 Condenser
2 Pressostatic valve
3 Trap

Picture 6

A 3 way modulating valve with temperature probe fitted on condenser water inlet can be provided instead of the pressostatic valve, to maintain the inlet condenser water temperature higher than 20 °C. See Picture 7.



1	Condenser
2	3 way valve
3	Circulating pump

Picture 7

4.6 DESUPERHEATER HYDRAULIC CONNECTIONS (optional)

For units provided with desuperheater is recommended to install a pressostatic valve to the condenser or a modulating three way valve with temperature probe fitted on condenser water inlet.

Water inlet must be in correspondence with the connection labelled with:

IN **DESUPERHEATER WATER**

In this way the system will be kept under optimal operating parameters. See paragraph 4.5.

4.7 HEAT RECOVERY EXCHANGE HYDRAULIC CONNECTIONS (Version /DC)

Water inlet to recovery circuit must be in correspondence with the connection labelled with:

IN **RECOVERY WATER**

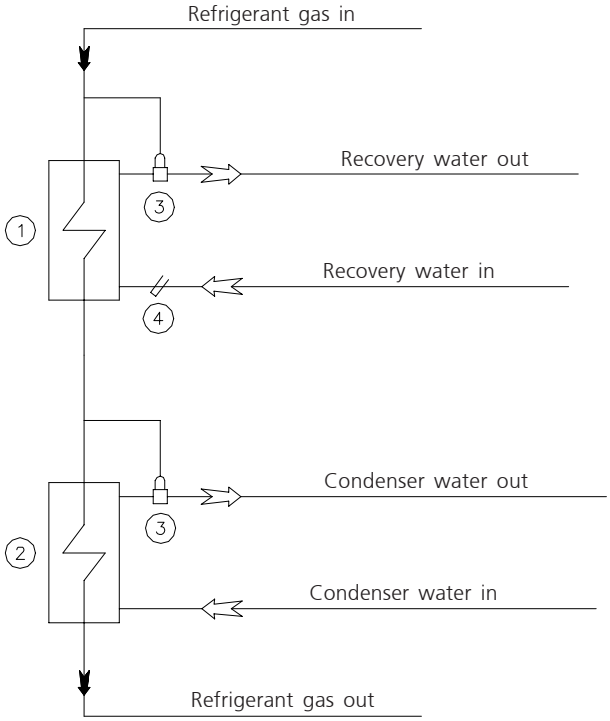
To allow the unit working under optimal operating parameters when working in heat recovery conditions, the condensing temperature must be kept at around 53 °C. The leaving water temperature from recovery condenser must be kept in-between the limits of diagram of page 28 (T min. out = 25 °C, T max out = 50 °C).

Water flow to main condenser and recovery condenser must be controlled in order to maintain the set recovery temperature and the condensing pressure always higher than 12.5 bars.

The hydraulic circuits to main condenser and recovery condenser will have therefore variable water flowsi.

To keep the condensing pressure higher than 12.5 bars, two possible solutions are suggested:
- with pressostatic valve (Picture 8)
- with 3 way valve (Picture 9)

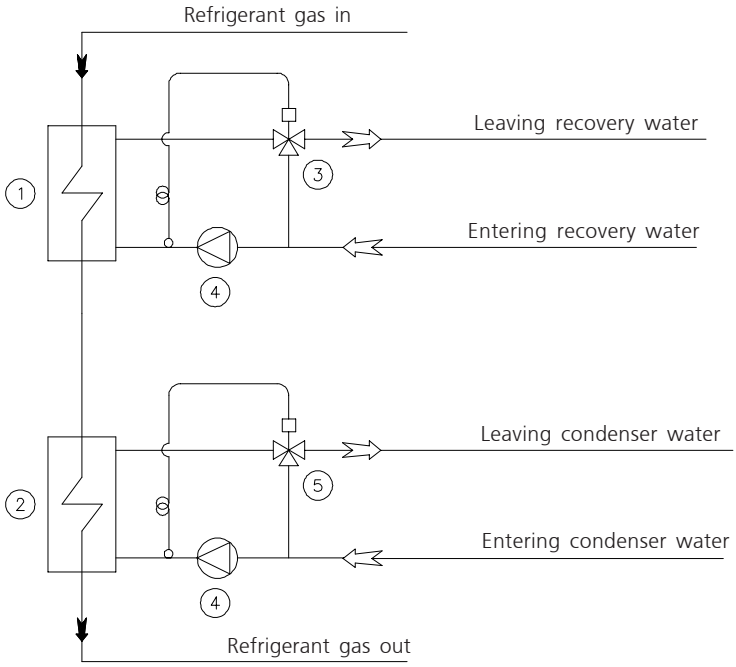
DIAGRAM WITH PRESSOSTATIC VALVE



1 Recovery condenser
2 Main condenser
3 Pressostatic valve
4 Trap

Picture 8

DIAGRAM WITH 3 WAY VALVE



1	Recovery condensr
2	Main consenser
3	3 way valve
4	Circulating pump
5	3 way valve

Picture 9

4.8 REMOTE AIR COOLED CONDENSER CONNECTION (VERSION LC)

4.8.1 Refrigerant connections

LC units (motoevaporating) will be connected to the remote air cooled conder with refrigernat pipes.

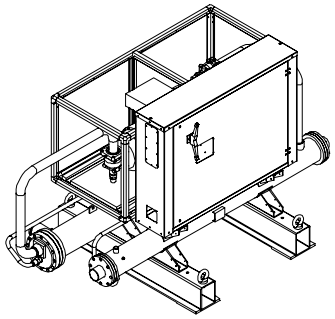
4.8.2 Pipings layout and max distance between the 2 sections

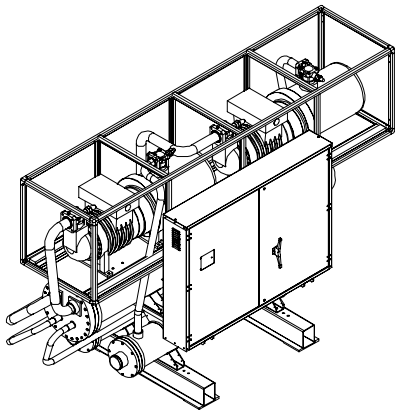
Pipings layout is determined by sections location and building structure.
Piping should be as shorter as possible in order to reduce pressure drops in refrigerant circuit and the refrigerant charge in the system.
Maximum admitted pipe length is 40 meters and the maximum hight diffrence between the 2 units is 6 m (See table with external diameters of refrigerant connection pipes).
Further informations on the matter can be achieved contacting our company.

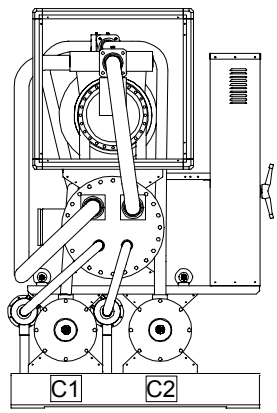
CONNECTION PIPE EXTERNAL DIAMETERS TO REMOTE AIR COOLED CONDENSER

Table 1

MODEL OMEGA V 2001	Circuit	Distance between unit and remote air cooled condenser [m]					
		10		20		30	
		Diameter of connecting pipes between unit and remote air cooled condenser					
		Supply [mm]	Liquid [mm]	Supply [mm]	Liquid [mm]	Supply [mm]	Liquid [mm]
19.1	C1	54	35	54	35	54	35
22.1	C1	54	35	54	35	54	42
27.1	C1	54	35	54	42	54	42
33.1	C1	54	42	54	42	54	42
39.1	C1	67	42	67	42	67	42
38.2	C1	54	35	54	35	54	35
	C2	54	35	54	35	54	35
43.1	C1	67	42	67	42	67	54
44.2	C1	54	35	54	35	54	42
	C2	54	35	54	35	54	42
47.1	C1	67	54	67	54	67	54
52.1	C1	67	54	67	54	67	54
54.2	C1	54	35	54	42	54	42
	C2	54	35	54	42	54	42
58.1	C1	67	54	67	54	67	54
60.2	C1	54	42	54	42	54	42
	C2	54	35	54	42	54	42
65.2	C1	54	42	54	42	54	42
	C2	54	42	54	42	54	42
71.2	C1	67	42	67	42	67	42
	C2	54	42	54	42	54	42
77.2	C1	67	42	67	42	67	42
	C2	67	42	67	42	67	42
82.2	C1	67	42	67	42	67	42
	C2	67	42	67	42	67	54
86.2	C1	67	42	67	42	67	54
	C2	67	42	67	42	67	54
90.2	C1	67	54	67	54	67	54
	C2	67	42	67	42	67	54
93.2	C1	67	54	67	54	67	54
	C2	67	54	67	54	67	54
104.2	C1	67	54	67	54	67	54
	C2	67	54	67	54	67	54
116.2	C1	67	54	67	54	67	54
	C2	67	54	67	54	67	54







In the units with 2 compressors, the C1 circuit has the larger compressor and is located on the right side looking the unit from the electric panel side.
The labels on the compressors identify the circuits.

Picture 10

4.8.3 Recomendations for installation of the refrigerant line

Depending on the relative position of the condenser unit and evaporator sections, certain parameters should be observed when installing the refrigerant line.
Table 1 gives the diameter of pipe connections for LC versions.

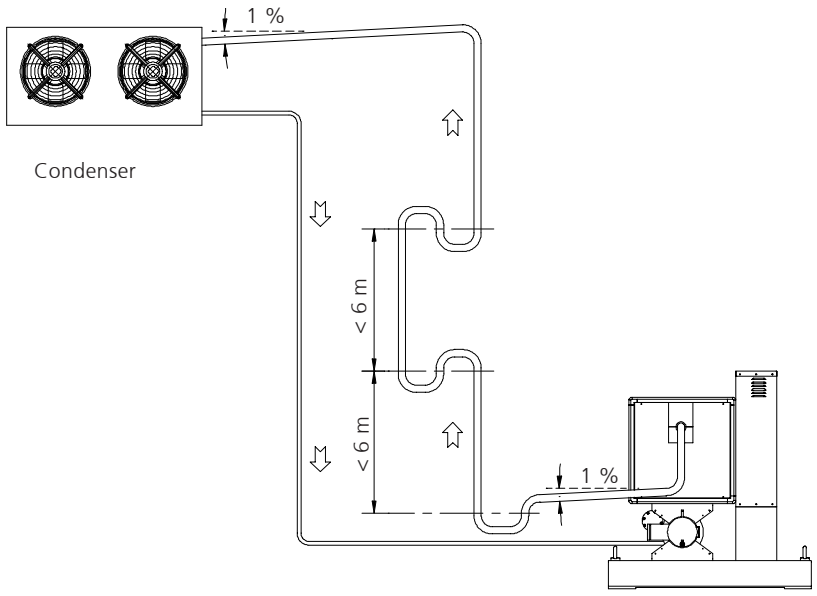
4.8.4 Version LC: remote condenser above the evaporating unit:

a) Make a trap on the supply line, immediately downstream the compressor, to collect the liquid refrigerant which can be developed during the shutdown of unit and could irreparably damage the compressor.

b) Install siphons at least every 6 metres on vertical upward sections of pipelines in order to facilitate the return of oil to the compressor.

c) Make sure there is a gradient of at least 1% on horizontal sections of the suction line in order to facilitate oil drainage in the correct direction of the flow.

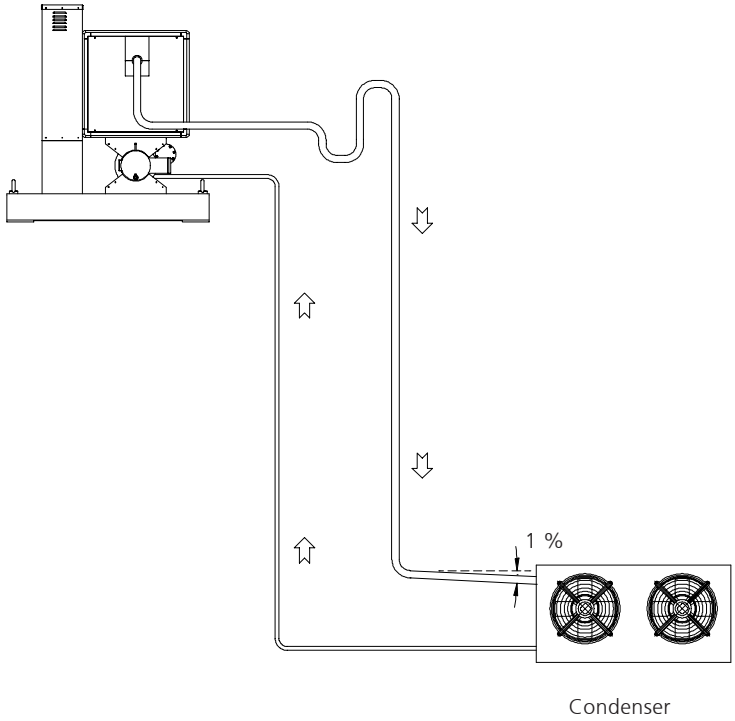
d) Install a non return valve close to compressor inlet, to avoid that liquid refrigerant could fall into the compressor during the shutdown of unit. This must be made when, with the unit off, the ambient temperature of condenser is higher than one of compressor.



Picture 11

4.8.5 Version LC: remote air cooled condenser below the evaporating unit:

No special suggestions for this installation.
It is in any case advisable to install a non return valve close to compressor inlet, to avoid that liquid refrigerant could fall into the compressor during the shutdown of unit. This must be made when, with the unit off, the ambient temperature of condenser is higher than one of compressor.



Picture 12

4.9 SAFETY VALVES RELIEF

Pressure relief valves are fitted on the refrigerant circuit both on the high pressure side and low pressure side: according to main safety norms these valves must be vented outdoors, through a vent pipe.
The vent pipe must have a size not lower than the relief valve and it must not hang on the valve.

Caution: The valve relief must be directed into a safe zone in which no injuries can be caused to people.

4.10 WATER QUALITY

When well or river water is applied for chilled water or condenser water, corrosion or dusting problems may occur due to water quality. In this case it is necessary to analyse the quality of water by checking pH, electrical conductivity, ammonia ion content, sulphur and chloride content, total hardness, etc. and, if it is the case, provide a chemical treatment.

4.11 LOW TEMPERATURE WATER AT CONDENSER

The units are not planned to work with condenser cooling water below 20 °C. Below this limit, the unit could require substantial changes. In case of necessity please contact our Company.

4.12 OPERATION WITH LOW TEMPERATURE CHILLED WATER AT EVAPORATOR

Standard units are not designed to operate with water temperature below 5°C at the evaporator outlet. In order to work below this limit, the unit should need some structural modifications. In this case contact our Company.

When chilled water at the evaporator outlet is below 5 °C, it is necessary to operate with a mixture of water and ethylene glycol. In this case, control and antifreeze set points must be changed:
This value is normally set at factory.

The ethylene glycol percentage must be chosen in relation to the desired chilled water temperature (see Table 2).

TABLE 2 - FREEZING POINT FOR WATER-ANTIFREEZE MIXTURES

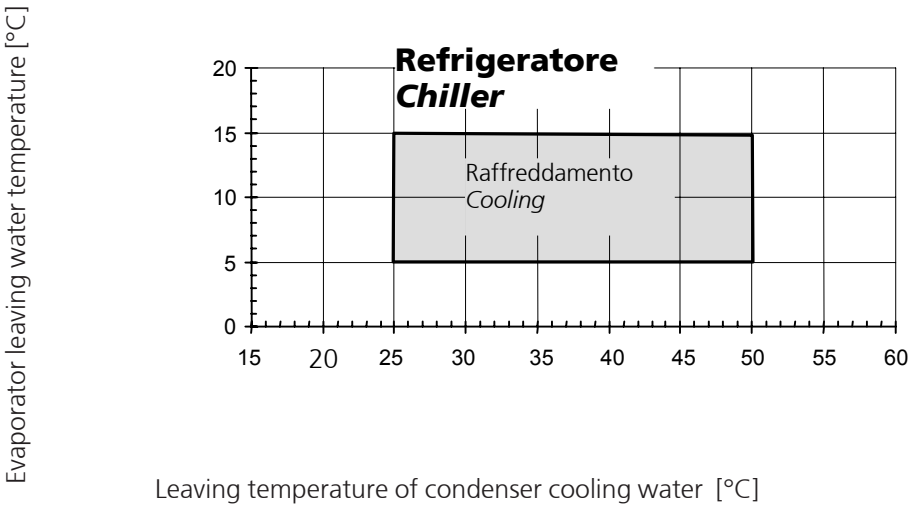
LIQUID OUTLET TEMPERATURE OR MINIMUM AMBIENT TEMPERATURE (°C)	+0°	-5°	-10°	-15°	-20°	-25°	-30°	-35°	-40°
FREEZING POINT (°C)	-5°	-10°	-15°	-20°	-25°	-30°	-35°	-40°	-45°
NON FREEZING LIQUID	% WEIGHT PERCENTAGE								
ETHYLENE GLYCOL	6	22	30	36	41	46	50	53	56
PROPYL GLYCOL	15	25	33	39	44	48	51	54	57
METHANOL	8	14	20	26	30	34	38	41	45
CALCIUM CHLORIDE	9	14	18	21	24	26	27	28	30
TEMPER -20	T -20°C					---			
TEMPER -40	T -40°C								---
TEMPER -60	T -60°C								
TIFOXITE	40			50	60	63	69	73	---
FREEZIUM	10	20	25	30	34	37	40	43	45
PEKASOL 50	50		59	68	75	81	86	90	---

If ambient temperatures lower than the freezing point of water can be expected, antifreeze mixtures in percentage indicated in table 2 must be utilized.

If the glycole percentage is higher than 30%,units with special pum seals must be used.

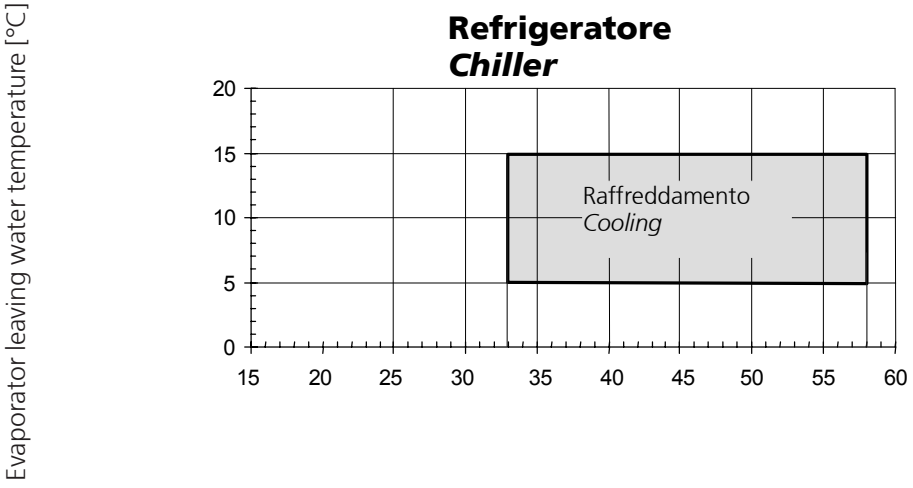
OPERATION LIMITS

OMEGA V 2001



Water thermal difference for all versions: min: 3 °C ; max: 8 °C

OMEGA V 2001 /LC



Water thermal difference for all versions: min: 3 °C ; max: 8 °C

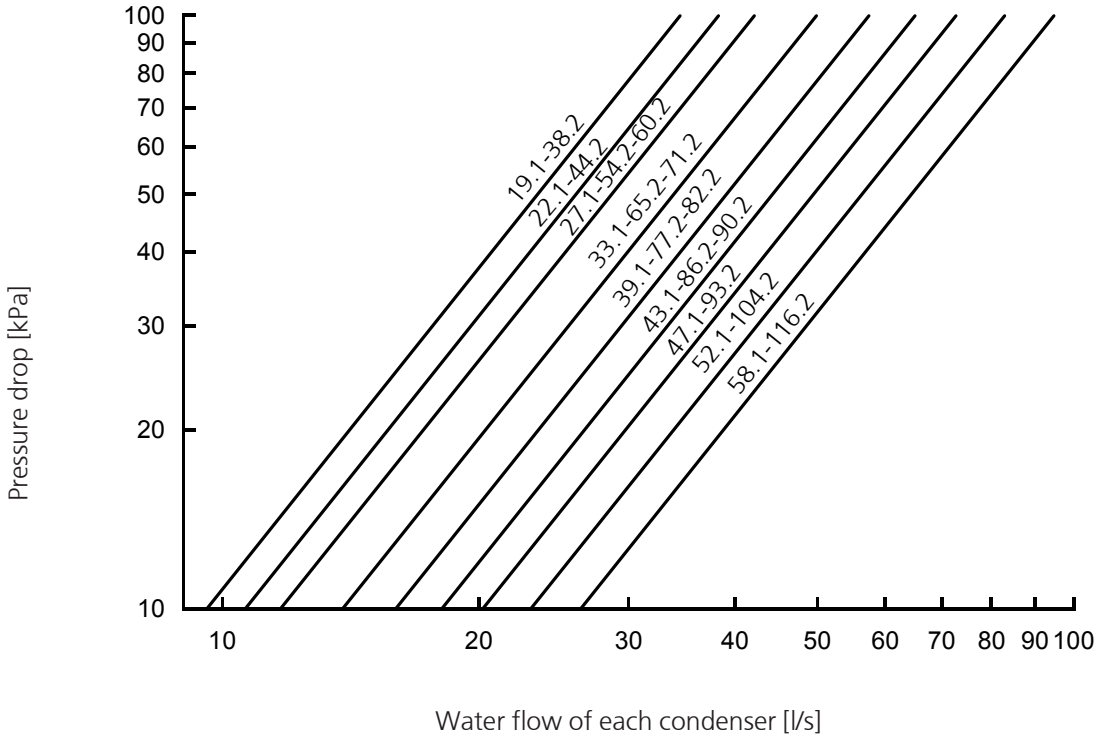
4.13 CONDENSER AND EVAPORATOR WATER FLOW RATE

LThe nominal water flow rate given by Blue Box is referred to a thermal difference between the evaporator inlet and outlet of 5 °C, at the nominal cooling capacity.
Maximum allowed flow rate is the one that presents a thermal difference of 3 °C: higher values could result in a inadmissible pressure drop with possibility of erosion in the exchanger.
The minimum water flow rate allowed is the one presenting a thermal difference of 8 °C: lower values may cause too low evaporating temperatures or too high condensing temperatures with the action of safety devices which would stop of the unit.

4.14 CHILLED WATER TEMPERATURE TO THE EVAPORATOR

The minimum temperature allowed at the evaporator outlet is 5 °C: for lower temperatures please refer to paragraph 4.12. The maximum temperature allowed at the evaporator inlet is 20 °C. For higher temperatures it is necessary to adopt proper solutions: (split circuits, three way valves, by-pass, storage vessels).

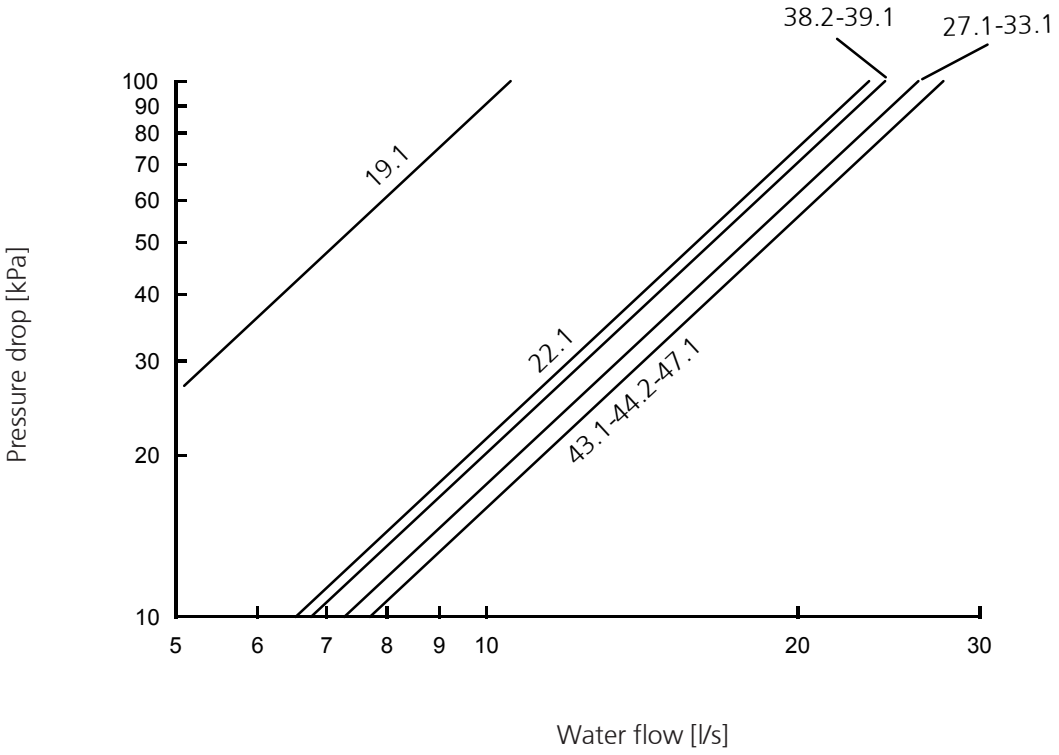
PRESSURE DROP CONDENSERS



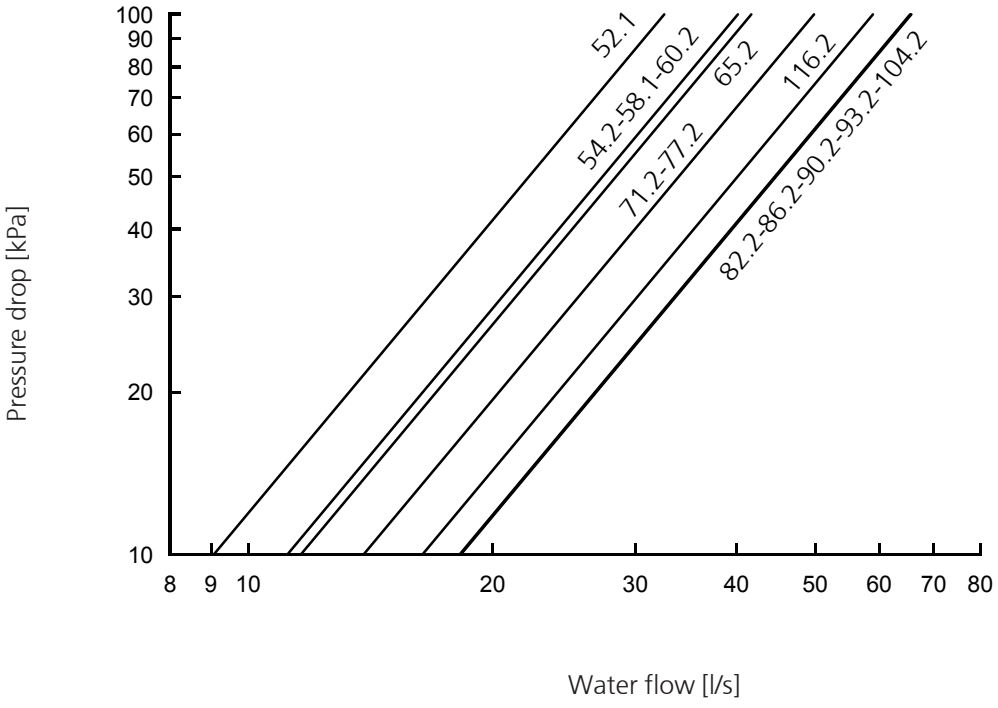
Pressure drop is referred to each condenser [kPa]

Il salto termico per tutte le versioni deve essere compreso fra: 3 °C, max: 8 °C

PRESSURE DROP EVAPORATORS



Water thermal difference for all versions: min: 3 °C ; max: 8 °C



Water thermal difference for all versions: min: 3 °C ; max: 8 °C

4.15 ELECTRICAL CONNECTIONS

4.15.1 Generality

Electrical connections must comply with wiring diagram supplied with the unit and conform to established regulations.

Earth connection is compulsory. Installer must connect ground cable with ground bar in the electric board labelled with PE.

It must be verified that electric supply is corresponding to the unit electric nominal data (tension, phases, frequency) reported on the label in the front panel of the unit.

The line voltage fluctuations must not be more than ±5% of the nominal value, while the voltage unbalance between one phase and another must not exceed 2%. If those tolerances should not be respected, please contact our Technical Department to provide proper devices.

Check power connection for correct phase sequence.

For cable connection drill the cover on the side of electric control box, according to the model.

The control circuit derives from the power supply through a transformer fitted inside the electrical panel.

The control circuit is protected by fuses.

Supply cable fixing: supply cable must be fixed so as to withstand any tensile and torsional stress.

Before every operation on the electric section, be sure that the electric supply is disconnected.

Power cable and line protection must be sized according to the specification reported on the wiring diagram and the form enclosed with the unit.

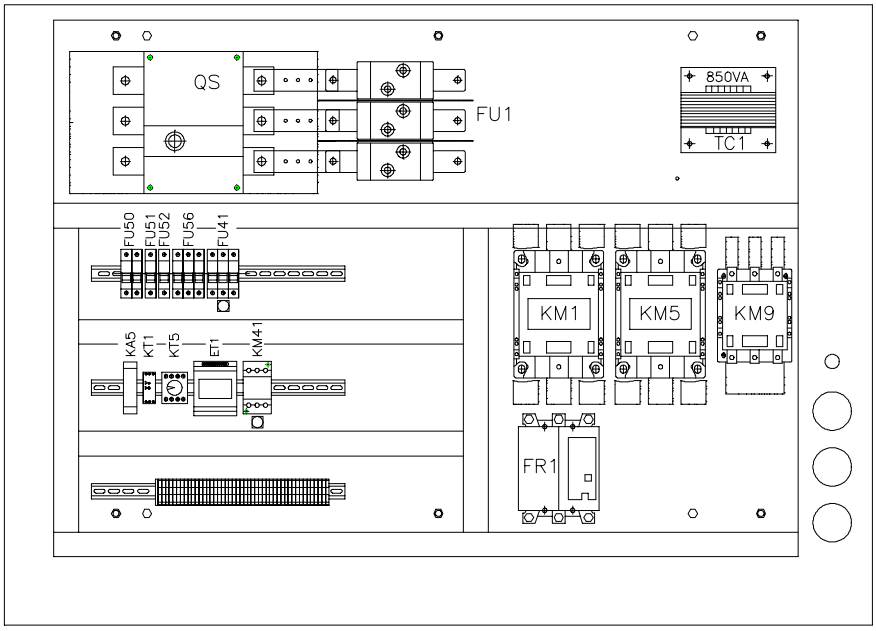
Crankcase heaters must be supplied at least 12 hours before start up by simply closing the main switch (heaters are automatically supplied when main switch is closed).

Electric supply must be in the limits shown: in the opposite case warranty will terminate immediately.

To supply the crankcase heaters procede as follows:
1) Close the main switch turning it from position "0" to position "1"
2) Check that the display shows "OFF"
3) Check that unit is in "OFF" position and external interlock is open
4) If the display shows the alarm "WRONG PHASE SEQUENCE", invert 2 phases of the power supply.
5) The unit must remain for a minimum of 12 hours in this situation to supply the crankcase heaters

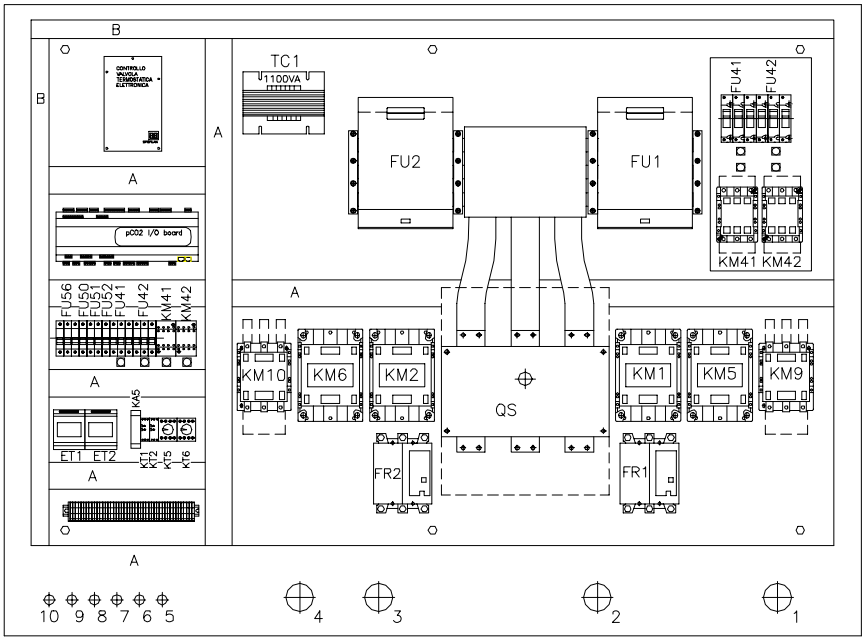
Picture 13

ELECTRICAL BOARD LAYOUT - STANDARD UNITS WITH 1 AND 2 COMPRESSORS



Standard unit with
1 compressor

Picture 14



Standard unit with
2 compressors

Picture 15

POS.	DESCRIPTION	POS.	DESCRIPTION
FR1	THERMAL PROTECTION COMPRESSOR 1	KM10	CONTACTOR Y COMPRESSOR 2
FR2	THERMAL PROTECTION COMPRESSOR 2	KM41	POW. FACTOR CORRECTION CONTACTOR COMPR. 1
FU1	FUSES COMPRESSOR 1	KM42	POW. FACTOR CORRECTION CONTACTOR COMPR. 2
FU2	FUSES COMPRESSOR 2	KM5	CONTACTOR COMPRESSOR 1, D
FU41	POW. FACTOR CORRECT. CONDENSER FUSES COMPR. 1	KM6	CONTACTOR D COMPRESSOR 2
FU42	POW. FACTOR CORRECT. CONDENSER FUSES COMPR. 2	KM9	CONTACTOR Y COMPRESSOR 1
FU50	AUX. TRANSF. CIRCUIT FUSES	KT1	TIMER COMPRESSOR 1
FU51	AUX. CIRCUIT FUSES	KT2	TIMER COMPRESSOR 2
FU52	CONTROL FUSES	KT5	TIMER COMPRESSOR 1 START
FU56	PHASE SEQ. RELAY FUSES	KT6	TIMER COMPRESSOR 2 START
KA5	PHASE SEQUENCE RELAY	QS	MAIN SWITCH
KM1	COMPRESSOR 1 CONTACTOR, Y	TC1	AUX.TRANSFORMER
KM2	COMPRESSOR 2 CONTACTOR, Y		

4.15.2 Potential free contacts

The following potential free contacts are availablei:
- 1 potential free contact for general alarm (terminals 100 - 101 - 102)
- 1 potential free contact for each compressor (option)

4.15.3 Circulating pump electrical connections

Normally open external water pump contactor terminals must be connected in series to terminal 1-2 of electric panel.
Upon request, some potential free contacts fof the compressors (on/off), can be supplied as option to control the condenser pump.

The pumps of evaporator and condenser must be started up before the chiller and shut down after the latter (recommended minimum advance/ delay interval: 60 seconds).

4.15.4 Microprocessor controller on the unit

OMEGA.V 2001 Chillers are controlled by pCO^2 microprocessor.

The pCO^2 electronic microprocessor, controls refrigerating units with 2 compressors and with 2 capacity steps each.

The program controls water cooled chillers with shell and tube heat exchangers, the compressors, the time settings and alarms, as well as "accessory" functions,

The required hardware has been optimised to maximise the utility of available inputs and outputs, while inter-board connections and user-terminal interface are ensured by means of the pLANE, using the serial connector RS485, dedicated for network construction.
Each unit can be connected by a 485 serial line to supervisor and/or tele-maintenance systems.
Detailed informations on the control are reported in the manual enclosed with the unit.

4.15.5 Serial RS485 interface (opzion)

The serial card for remote supervision or remote assistance by computer is available on request for all OMEGA.V 2001 units.

The serial board is fitted in the connection board (see figure of large board).
Connection with the serial line for supervision or tele-maintenance is made by standard RS485 and by means of serial boards.
When the serial board is fitted, communication protocol Carel, Modbus-jbus and BacNet are available. Note that systems using the Lon-Talk protocol require a special board.
Conversion gateways are not required.

4.15.6 User interface – Microprocessor pCO²

The back-lit LCD display comprises 4 lines and 20 columns.

Picture 16

Besides the liquid crystal display, the user interface features the following keys with relative functions:

Menu key: press when in any display to return to the first menu page.

Maintenance key: press to access maintenance functions.

Print key: associated function currently unavailable.

"I/O" key: press to access pages displaying current status of digital inputs and outputs, values of analogue inputs and outputs.

"Clock" key: press to access clock functions.

"Set" key: press to access pages for modifying operating parameters.

"prog" key: press to access service pages.

“? info” key: press the key to access the pages to change the address of the unit connected to the terminal.

"Summer" (blue) and "Winter" (red) keys: OMEGA V 2001 units operate as chiiller only. “Summer” and “Winter” keys are not used.

on/off key: press this key to switch the unit from stand-by to on and vice-versa.

Alarm key: press to silence the alarm buzzer, display (and cancel as necessary) activated alarms.

Arrow keys: press to pass from one page to another or to change settings when in a modifiable field.

Enter key: press to access fields with modifiable parameters, then to confirm modifications.

Electronic components could be damaged by air temperature below -20 °C.

5. START UP

5.1 PRELIMINARY CHECKS

- Verificare che l'allacciamento elettrico sia stato eseguito in maniera corretta e che tutti i morsetti siano serrati strettamente.

- The voltage at the phase R S T clamps must be 400 V ± 5% (or teh nominal for units with special voltage). If the power supply has frequent changes, please contact our Technical Department to select the necessary protections.

- Check that the display shows the refrigerant gas pressure of the refrigerant circuits.

- Check that there is not any refrigerant leak by means of a leak finder.

- Check that the crankcase heaters are correctly supplied.

Large refrigerant gas leakage change the composition of the remaining refrigerant gas mixture and reduce the performance of the unit.

Crankcase heaters must be supplied at least 12 hours before start up by simply closing the main switch (heaters are automatically supplied when main switch is closed).

- Verify that heaters are working correctly: after the warm up period the crankcase must be warm to the touch and must have at least a temperature 10 - 15 °C higher than ambient temperature.

- Check that all hydraulic connections are correctly installed and all indications on unit labels are observed.

- The system must be purged in order to eliminate any air that might have remained in the unit by means of vent valves, previously installed, together with an expansion tank of a proper size (see paragraph 4.2).

5.2 WORKING DESCRIPTION

5.2.1 General

The regulator maintains the water temperature of the evaporator at the set value; this is achieved through the control of compressor operation.
The controller has 2-step capacity control over each compressor.
The controller also actuates all the components of the cooling system, the alarms and the "accessory functions".
Almost all operating parameters (set points, differentials, calibration, delays, etc.) described below can be configured from the program pages visible on display. See also the manual of pCO^2 controller.

5.2.2 Unit in stand-by mode

The regulator maintains water temperature of the evaporator at the set value through the control of compressor operation.
The controller has 2-step capacity control over each compressor.
The microprocessr also controls all the components of the cooling system, the alarms and the "accessory" functions.
Almost all operating parameters (set points, differentials, calibration, delays, etc.) described below can be configured from the program pages.
For specific information see the instruction manuala of pCO^2 controller.

5.2.3 Enabling the unit

The unit can be put into service from stand-by mode after an external permissive has been closed, when the "on/off" key is pressed or by means of a serial signal.
The controller outputs controlling the various sections of the chiller unit are activated in accordance with the operation time settings. If the "on" key is pressed before the closing of the external permissive, the display shows the permissive not closed.
The compressors can start only if the pumps of the condenser and of the evaporator are already working.

5.2.4 Pumps control

The microprocessor does not control the pumps of condenser and evaporator.
When the unit sets from operating status to stand-by by means of the opening of the external permissive, pump shutdown must be delayed for a certain time after the shutdown of the last compressor, in order to take full advantage of thermal accumulation.

5.2.5 Compressors start-up

The controller allows compressors start-up if the flowmeter input is closed by the time of start-up delay. In the event that the flowmeter input is opened after compressor start-up, it will in any case be delayed before chiller shutdown.
An alarm will be displayed in the event of unit shutdown due to the opening of the flowmeter input.
Compressor start-up, shutdown and step control will be carried out by the controller according to system requirements and selected operations.

5.2.6 Chiller operation

The microprocessor does not control the pumps of condenser and evaporator.
The control maintains the water temperature inside the limits of the set values. In the standard units the if the controller acts on evaporator input water, the control of compressor outlets and relative step capacity will depend on the difference between the input water temperature and the set point.

5.2.7 Evaporator antifrost

In the event that the output water temperature from a heat exchanger is lower than the antifrost limit value, the controller will shut down all the compressors and will give the antifrost alarm.
In the event that the output water temperature from a heat exchanger is lower than the antifrost limit value, the controller will cut in to shut down compressor operation in the chiller circuit, and will give the antifrost alarm.
Manual cancelling of alarms and compressor restart will only be possible when the water temperature at the heat exchanger outlet causing the alarm is equal to or greater than the antifrost limit value, increased by the antifrost differential.
The antifrost alarm will automatically shut down the entire unit and therefore all compressors.
The antifrost alarm will only appear when the unit is on (but not when in stand-by mode).

5.2.8 Antifrost heater (opzion)

In the event of an antifrost alarm, the antifrost heater output is automatically enabled.
The output remains enabled as long as the conditions causing the alarm persist.
While the alarm will only be given when the unit is switched on, the output of the antifrost heater will remain enabled even when the unit is in stand-by status.

5.2.9 Working of compressors

When the unit is operating correctly (without any general alarms as described above) and the water temperature requires, the microprocessor activates the compressors.
The compressors and relative step capacity operation are activated with a time delay in order to prevent high breakaway current.
Before activating a compressor the controller checks the delivery pressure on the basis of the value read by the transducer and the status of the high pressure switch. A check is also made of the compressor motor winding

temperature by verification of the status of the overload switch input.
When the compressor has been activated, the opening of the one of the above digital inputs causes its immediate shutdown and the display of the relative alarm.
In any case, each compressor will operate for a minimum time, unless shut down by a serious alarm.
The alarms that can cause the compressor to shut down during the minimum operating time are the high pressure alarm and the compressor overload alarm.
During compressor operation, delivery and suction pressure ratings are checked by the respective probes.
Once shut down, the compressors can only be restarted after the minimum shutdown time has elapsed, and in any case after the minimum interval between two consecutive compressor start-ups has elapsed.
The consecutive start-up of two compressors, or the start-up of a compressor followed by the relative step capacity operation will take place with a minimum delay equal to the time of step start-up.
Start-up and shutdown of two compressors or capacity steps will operate with a minimum set delay time, equal to the time of step start-up.
The consecutive shutdown of two compressors, or the consecutive deactivation of the step capacity operations and of the relative compressor, will be carried out with delays equal to the time for step deactivation.

5.2.10 High and low pressure alarms

Delivery (high) pressure and suction (low) pressure are checked by the controller by means of probes.
When the compressor is operating, the controller checks that:
- Delivery pressure is always below the safety value set for cooling operation. In the event that these values are exceeded, the controller immediately shuts down compressor operation and displays a high pressure alarm. The high pressure alarm can be removed manually on the controller only when the pressure rating read by the delivery pressure probe has dropped below the value that caused the shutdown.
- Suction pressure is always higher than the set safety value during cooling operation. In the event that the values read by the suction pressure probe are lower than the set values, the controller immediately shuts down compressor operation and displays a low pressure alarm. This alarm is not instantaneous, and is disregarded with relative delays at unit start-up and during operation. The alarm can be cancelled manually. Low pressure alarms can be cancelled by the controller only when the pressure reading made by the suction pressure probe is greater than the value that tripped the alarm.

5.2.11 Compressor and step capacity control

Start up and capacity step operation of compressors are enabled by the controller in accordance to variations in reference water temperature in relation to the set point.
The reference water temperature is normally the one read at the inlet on the chiller unit.

The control of compressors and capacity steps at the increase of the thermal load can be carried out in two diffrent ways:

- The arrangement of power steps in "FPM" operation ensures that all compressors are activated and step controlled before full capacity is requested.
- In "CPM" step capacity control, as the operating requirement increases, each compressor is progressively activated to operate at full capacity before the next is activated.

As the load request declines, the number of power steps activated by the controller will be accordingly reduced.
The reduction in the request for power steps by the controller is carried out with the reverse procedure to that of activation: as the load decreases, compressor operation is reduced by steps then shut down ("FMP" operation), or the operation of each compressor is progressively reduced by steps then shut down ("CPM").

The even distribution of operating hours over all compressors in the unit is ensured by selecting rotation of operation requests.
When this function is active, the first compressor to be activated is also the first to be shut down (the compressor that has not be activated for the longest time will in any case be activated).
The capacity control of compressors can be carried out either by steps or continuously.
During capacity step control, each solenoid valve of compressor represents a power step.

In continuous capacity step control (upon request), compressor power is adjusted by the movement of the step control cylinder. Cylinder movement is actuated by two solenoid valves; one to increase power yield, the other to

reduce it.
The cylinder moves in response to pulses by the solenoids; cylinder position and the degree of step control is regulated by the controller, on the basis of the time configured for the entire cylinder stroke.

Shutdown and start-up of compressors are always carried out at reduced capacity step.

5.2.12 Desuperheater (option)

The desuperheater recovers part of the total power to be dispersed through the condenser and produces hot water (design entering water temperature 40 °C; leaving water temperature 45 °C). It is therefore possible to save energy and have an economic benefit. Each refrigerant circuit is equipped with a shell and tube desuperheater connected in series to the main condenser.
For the hydraulic circuit see paragraph 4.6.

5.2.13 Heat recovery (OMEGA V 2001/DC only)

The heat recovery recovers the 100 % of the energy which should be disposed, enabling therefore to save energy and have an economic benefit.

OMEGA V 2001 DC unit has for each refrigerant circuit is a shell and tube 100% heat recovery condenser to produce hot water (design entering water temperature 40 °C; leaving water temperature 45 °C)..
The heat recovery is installed between the compressor and the conder (see refrigerant circuit diagram).
Cooling water circuits of desuperheater and condenser are fully independent, to allow the maximum flexibility to use the water flowing through the heat recovery. When the heat recovery is disabled (no water flow through the heat recovery) the unit works as a standard chiller.
To enable fully operational capacity, the hydraulic circuit must be properly configured; see paragraph 4.7.

5.2.14 Dual set point (option)

The refrigerant circuit has two the solenoid valves which enable two thermostatic valves according to the expansion temperature needed.
The microprocessor control enables the selection of two operating set points and can be made either by keyboard or digital input. The changeover of the thermosattic valves is automatic and is controlled by the water temperature. The thermostatic valves are sized according to the temperature range specified at the order.
The working limits of units are unchanged and are as per catalogue; if the unit operates with enough antifreeze mixture to avoid ice formation, the lower operating limit on leaving water is extended till a minimum temperature of -5 °C.

5.2.15 Operation with outlet water temperature (option)

For control of outlet water temperature, the reference probe must be installed at the evaporator outlet.
The activation of unit power steps depends on activation and deactivation delays in relation to a dead band.
When the leaving water temperature exceeds the set point, the compressors are activated.

5.3 COMMISSIONING

Close the main power switch before commissioning the unit.

Refer to the microprocessor controller instruction manual for the commissioning procedure.

- Close the external interlock
- Push the key "ON" of microprocessor control
- If all the permissive are available, the display will show "UNIT ON"

After the procedure has been completed, the unit will automatically start with a delay of about 5 minutes when the microprocessor control, flow switch and circulator pump permissives are available.

If the unit fails to start:
DO NOT tamper with the internal electrical connections; this invalidates the warranty.

Disconnect the unit power supply only in case of prolonged disuse (e.g. seasonal shutdown). Disconnecting the power supply to the unit also disconnects the casing heater, thus resulting in damage to the compressor when the unit is started up again. For temporary shutdowns, follow the instructions in paragraph 5.6.

5.4 CONTROLS DURING UNIT OPERATION

- At steady condition, check that condenser entering and leaving water temperatures are in-between the working limits, as per technical specification.

5.5 REFRIGERANT CHARGE CHECK

- After few hours the unit is working, check that sight glass moisture indicator has its core of a green colour: if the core should have a yellow colour, moisture would be present in the circuit. In this case it is necessary circuit dehydration to be carried out by qualified people only.

- Check that at the sight glass there is no continuous vapour bubbles presence. In this case additional refrigerant charge could be required. It is however allowed the presence of few vapour bubbles at the sight glass.

- Few minutes after the start up check that condensing temperature read on pressure gauge, is approximately 8 °C higher than condenser outlet water temperature. Check moreover that evaporating temperature read on pressure gauge, is 5 °C lower than the evaporator outlet temperature.

- Check that refrigerant superheat is about 5-7 °C

This operation can be done in this way:

1) read the temperature value shown by a contact thermometer with the probe on the suction pipe of the compressor;
2) read the temperature value shown by a graduated pressure gauge set on the suction side too (this value is the saturated temperature corresponding to the suction pressure); for unit with refrigerant R407c refer to centigrade scale marked with D.P. (Dew Point).
   The difference between this two values represents the refrigerant gas superheat.

- Check that refrigerant subcooling on the condenser is about 5-7 °C: this operation can be done in this way:
1) read the temperature value shown by a contact thermometer on the refrigerant outlet of the condenser;
2) read the temperature value shown by a graduated pressure gauge set on the outlet too (this value is the saturated temperature corresponding to the condenser outlet pressure); for unit with refrigerant R407c refer to centigrade scale marked with B.P. (Bubble Point).
   The difference between this two values represents the refrigerant liquid subcooling.

5.6 SHUTTING DOWN THE UNIT

Temporary stop:
- Push key "OFF" on the front panel.

Seasonal stop:
- Disconnect the power supply
- Discharge the water system (if not charged with antifreeze mixture)
- At the next start, repeat the start procedure

Caution: Do not use the main power switch to shut down the unit; only use the main power switch when the unit has already been shut down ("OFF" mode). Disconnecting the power supply to the unit also disconnects the casing heater, thus resulting in damage to the compressor when the unit is started up again.

5.7 EMERGENCY SHUTDOWN

In case of emergency turn on "0" position the red main switch of electric control panel.

Picture 17

6. CONTROL DEVICES SETTING VALUES

6.1 GENERALITY

All the control devices are set and tested on factory before they are delivered. Anyway it is advisable to check all this devices after a reasonable period unit working time. Setting values are reported in Tables 3 and 4.

All operations on control and safety devices must be done by TRAINED PEOPLE ONLY: wrong setting value or exercise of the mentioned devices could cause serious damage to the unit and injuries to the people.

TABLE 3 - CONTROL DEVICES FACTORY SETTINGS

CAPACITY STEPS		2		3		4		6	
Controller		*Set Point*	Differential	*Set Point*	Differential	*Set Point*	Differential	*Set Point*	Differential
Setting	°C	10	2	9	3	9	3	7	5

TABLE 4 - SAFETY DEVICES FACTORY SETTINGS

CONTROL		SET POINT VALUE	DIFFERENTIAL	RESET
Anti freezing	°C	3	7	manual
Max pressure	bar	26	7	manual
Min pressure	bar	2	1	manual

7. MAINTENANCE AND PERIODIC CHECKS

7.1 IMPORTANT RULES

All this operation described in this chapter MUST BE DONE BY TRAINED PEOPLE ONLY

Before every operation of servicing on the unit, be sure that the electric supply is disconnected.

Compressor discharge pipe is usually at high temperature level. Be very careful when operating in its surroundings.

7.2 GENERALITY

It is a good rule to carry on periodic checks in order to verify the correct working of the unit:

CHECK	PERIOD
Check that safety and control devices work correctly as previously described	monthly
Check all the terminals on electric board and compressor are well locked. Periodic cleaning of the sliding terminals of the contactors should be done: if any damage is found, please replace the contactors	monthly
Verify refrigerant charge checking sight glass	monthly
Check there is no oil leakage from compressor	monthly
Check there is no water leakage in the hydraulic system	monthly
If the unit is to be expected to be stopped for a long period, unit hydraulic circuit should be emptied from all the tubes and heat exchangers. This operation is compulsory if, during seasonal stop, ambient temperature is expected to go down below the freezing point of employed mixture	seasonal operation
Check process water levels	monthly
Check flow switch proper working	monthly
Check compressor crankcase heater proper supply and functioning	monthly
Clean metallic filters on water piping	monthly
Check the colour of the sight glass core (green = no moisture, yellow = moisture present): if it has a yellow colour, change the refrigerant filter	every 4 months
Check the unit is not too noisy	every 4 months

7.3 REFRIGERANT CIRCUIT REPAIR

In the case that refrigerant circuit has been repaired, following operations must be executed:
- refrigerant leakage check;
- vacuum and drying of refrigerant circuit;
- refrigerant charge.

If the system should be discharged, all the refrigerant must be recovered with proper machines.

7.3.1 Refrigerant leakage check

The system must be charged with anhydrous nitrogen, using a gas bottle with a pressure reducing valve, until 15 bar pressure is reached. Any eventual leakage must be searched with a bubble leak finder.
If bubbles or foam should appear, leakage is detected. In this case, discharge the circuit before welding with proper alloys.

Never use oxygen instead of nitrogen: explosions may occur.

7.3.2 Vacuum and drying of refrigerant circuit

In order to get high vacuum in refrigerant circuit, it is necessary to operate with a high vacuum degree pump, able to reach 0,1 mbar absolute pressure with a refrigerant flow of 10 m^3/h. Using this kind of pump it is normally required only one vacuum cycle until 0,1 mbar absolute pressure is reached.
When this kind of pump should not be available, or the circuit has been opened for a long time, it is highly recommended to follow triple evacuation method. This method is also recommended when humidity is detected in refrigerant circuit.
Vacuum pump must be connected to the charging valves.

Follow the procedure described below:

- Evacuate the circuit until 35 mbar absolute pressure is reached: at this point charge the circuit with nitrogen until a relative pressure of 1 bar is reached.

- Repeat the procedure just described.

- Repeat a third time this operation, but trying in this case to reach the highest vacuum degree.

With this procedure it is possible to easily evacuate 99% of pollutant substances.

7.3.3 Refrigerant charge

- Connect refrigerant bottle to 1/4 SAE male charging valve on the liquid line, discharging a few refrigerant gas in order to evacuate the air on the connecting pipe.

- Reverse the refrigerant bottle and charge the circuit; charge only with liquid refrigerant.

The refrigerant R407C have to be charged only in liquid form, using the charging plug on the liquid line.

7.4 ENVIRONMENT PROTECTION

According to norms dealing with the use of depleting stratospheric ozone substances, it is forbidden to release refrigerants fluids in the atmosphere.
They must be redelivered to the seller or to proper gathering points at the end of their operating life.
Refrigerant R407C is mentioned among controlled substances and for this reason it must be subjected to said norms.

A particular care is recommended during service operations in order to reduce as much as possible any refrigerant loss.

8. PUTTING THE UNIT OUT OF SERVICE

Once the unit is arrived at the end of its life and needs to be removed or replaced, the following operations are recommended:

- the unit refrigerant has to be recovered by trained people and sent to proper collecting centre;
- compressor lubricating oil has to be recovered and sent to proper collecting centre ;
- the frame and various components, if not usable any longer, have to be dismantled and subdivided according their nature; particularly copper and aluminium, which are present in conspicuous quantity in the unit.

These operations allow easy material recover and recycling process, reducing environmental impact.

9. TROUBLE SHOOTING

In the following pages are reported the most common troubles that can cause the unit stop or an incorrect operation.

Concerning the solutions, it is necessary to take an extreme care on the actions to adopt: an excessive confidence may cause serious accidents to inexperienced people. It is advisable, once the cause is detected, to contact our servicing people or trained people only.

PROBLEM	LIKELY CAUSE	POSSIBLE REMEDY
A) No compressor working Display off	No supply line voltage	Check voltage
	Main switch open contacts. (position "O")	Rotate main switch on position "I"
	Transformer fuses and/or 24 V fuses burnout	Check and ewtl. change burnout fuses (FU50 e FU51). If the problem persist, call assistence.
	Controller card failure	Call assisstance
B) No compressor working. Display with alarm: "OFF due to external interlock"	External interlocks locks out the unit	Check that external lockout safeties enable units start; if necessary bridge terminals 1 and 2
C) No compressor working Display with alarm: "OFF needs maintenance"	Lock out from maintenance	Activate start of unit from maintenance
D) No compressor working Display with alarm: "OFF"	No start given from user interface key "on/off"	Push key "on/off"

PROBLEM	LIKELY CAUSE	POSSIBLE REMEDY
E1) No compressor working Unit ON with alarm: "Compressor 1 and 2 High Pressure "	Fuses of 220 V (FU51) burnout (LC version displays also the alarm "Fan protections")	Change fuses. If the problem persists, call assistance
	Insufficient condenser water flow	Check hydraulic circuit and condenser water flow
	Too high condenser inlet water temperature	Check hydraulic condenser circuit
	(LC version only) Unit has excessive refrigerant charge	Call assistence
	(LC version only) Remote condenser failure	Check proper working of remote condenser and ewtl. call assistence
E2) No compressor working Unit ON with alarm: "Compressor 1 and 2 Thermal Overload Protection"	Too high condenser inlet water temperature	Check condenser entering water flow and water temperature and the thermal protection setting
	Line voltage too low	Check line voltage stability and ewtl. install adequate protections
	Thermal protection settings	Call assistence
	Circuits with insufficient refrigerant charge	Call assistence per integrare la carica
E3) No compressor working. Unit ON with alarm: "Compressor 1 and 2 Low pressure"	Hydraulic circuit with insufficient glycol percentage	Restore the correct glycol percentage
	Both circuits with insufficient refrigerant charge	Check and repair ewtl circuit leaks and recharge.

PROBLEM	LIKELY CAUSE	POSSIBLE REMEDY
E4) No compressor working. Unit ON with alarm: "User water outlet low Temperature Thresold overcome"	Insufficient evaporator water flow	Increase evaporator water flow and check thermal stage
	Control failure	Call assistence
E5) No compressor working. Unit ON with alarm: "User water inlet high temperature threshold overcome"	Excessive thermal load	Start unit; when the unit has reached the normal temperature, start the evaporator's hydraulic system. If the problem persists, call assistence
	Circuits with insufficient refrigerant charge	Call assistence
E6) (Only LC version) No compressor working. Unit ON with alarm: "Fan protections"	Depends from type of installed fans	Check fans thermal overload
E7) No compressor working. Unit ON with alarm: "Lacking Aux. Supply"	Unstable line voltage	Check line voltage; if not correct contact the electricity supply company
F1) No compressor working. Unit ON with alarm: "Flow Switch Alarm"	No water flow to evaporator	Check hydraulic system
	Flow switch failure	Check flow switch contacts and ewtl. change
F2) No compressor working. Unit OFF with alarm: "Phase Sequence Failure"; sequence phase relay with green led on and orange led off	Wrong phase sequence	Disconnect power supply and invert two phases of power cable

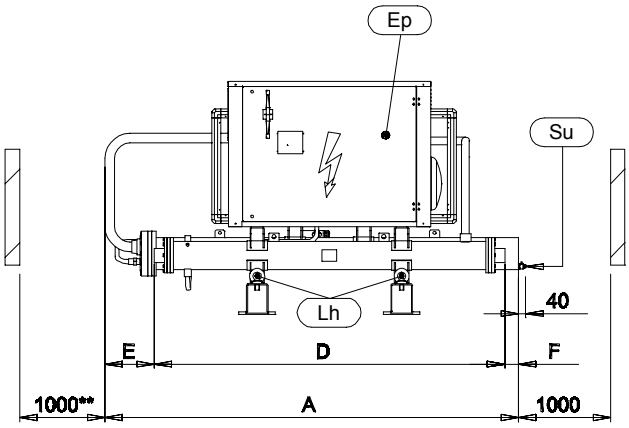
PROBLEM	LIKELY CAUSE	POSSIBLE REMEDY
F3) No compressor working. Unit OFF with alarm: "Phase Sequence Failure"; sequence phase relay with green and orange leds on	Relay failure	Check if relay closes contacts
F4) No compressor working Unit OFF with alarm: "Phase Sequence Failure"; sequence phase relay with green and orange leds off	Fuses FU56 burnout	Check fuses FU56 and ewtl. change
	One of the three phases is not present	Check each phase connection
G) No compressor working. Unit On with no alarm	Digital lock out of compressors	Check reason of digital lock out of compressors and close it
	Unit in temperature	Normal working stage
	Compressors fuses burnout	Check fuses, if burnout call assistance
	Controller failure	Call assistence
H1) Only 1 compressor working. Display with alarm: "Compressor high pressure"	Excessive refrigerant charge.	Check the refrigerant charge of circuit and call the assistance
	Problems at condenser hydraulic circuit	Check flow and temperature of condenser inlet water
	High pressure switch failure or not properly set	Check high pressure switch settings
	Thermostatic expansion valve non properly set	Check the thermostatic expansion valve settings and call the assistance

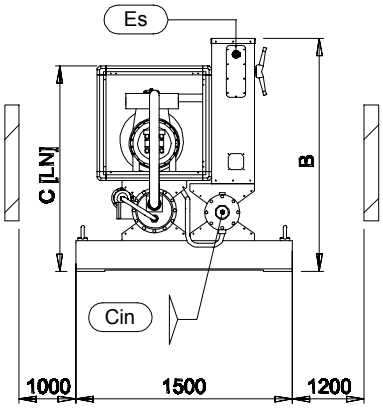
PROBLEM	LIKELY CAUSE	POSSIBLE REMEDY
H2) Only 1 compressor working. Display with alarm: "Compressor low pressure"	Insufficient refrigerant gas charge due to circuit leak	Call assistence
	Thermostatic expansion valve failure	Call assistence
	Liquid solenoid valve failure (if present)	Call assistance
	Dehydrating filter clogged	Call assistance
H3) Only 1 compressor working. Display with alarm: "Compressor thermal overload protection"	Compressor defective	Call assistance
I) Only 1 compressor working. Display with no alarm	Unit works with capacity step	Normal working stage
	Fuses burnout	Call assistence
	Controller failure	Call assistence
	External lock out of compressor	Check external lock out of compressor
L1) All compressors working. Display with alarm: "Compressor needs maintenance"	Compressor needs maintenance	Call assistence for programmed controls on unit
L2) All compressors working. Display with alarm: "Unit needs maintenance"	Unit needs maintenance	Call assistance for programmed controls on unit

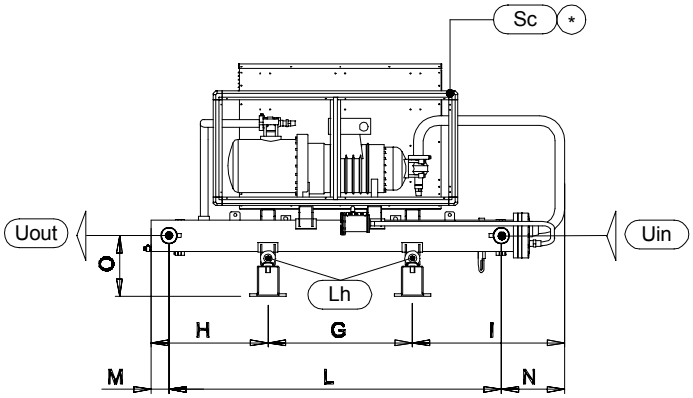
PROBLEM	LIKELY CAUSE	POSSIBLE REMEDY
M) All compressors operate without ever stopping Display with no alarm	Excessive thermal load	Call maintenance
	Circuits with insufficient refrigerant charge	Call maintenance
	Unit operates with reduced capacity due to failure of starting coil timer (only with capacity step control)	Check proper working of timer and ewtl. change it
	Unit operates with reduced capacity because compressor's forced step capacity operation is on	Check on menu display page if the forced capacity step of compressors is on
	Unit operates with reduced capacity due to continous capacity step piston coil failure (only with continous capacity step control)	Call maintenance and change coil
	Controller not working	Call maintenance
N) Unusual operating noise.	Noisy compressor.	Call maintenance to check and ewtl. replace.
	Noisy thermostatic valve.	Call maintenance to check / charge refrigerant
	Pipe vibration.	Call maintenance to fix pipes with brackets.
	Panels vibrate	Check if panels are properly secured; ewtl. call assistance

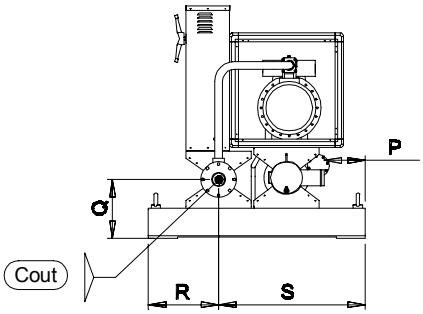
If different alarms are displayed, please contact the assistance.

OMEGA V 2001 - 1 COMPRESSOR
OVERALL DIMENSIONS AND HYDRAULIC CONNECTIONS



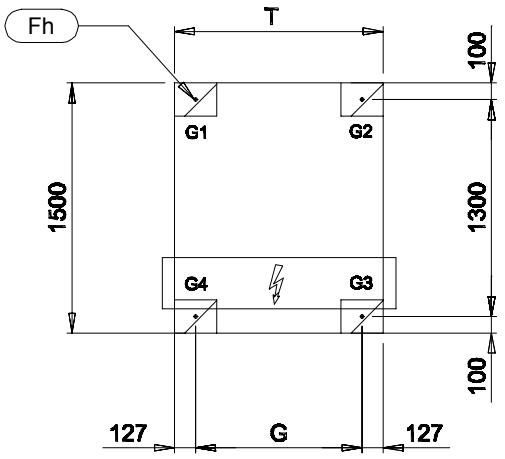






** SI CONSIGLIA DI LASCIARE LO SPAZIO NECESSARIO PER L'ESTRAZIONE DEI TUBI, QUOTA "A"
WE SUGGEST YOU TO PROVIDE THE MINIMUN CLEARANCE TO PULL OUT THE PIPES, "A" DIMENSION

Uin	INGRESSO ACQUA UTILIZZO USER WATER INLET		Ep	QUADRO ELETTRICO ELECTRICAL PANEL	
Uout	USCITA ACQUA UTILIZZO USER WATER OUTLET		Es	INGRESSO ALIMENTAZIONE ELETTRICA ELECTRICAL SUPPLY INLET	
Cin	INGR. ACQUA CONDENSAZIONE CONDENSING WATER INLET		Fh	FORI DI FISSAGGIO FIXING HOLES	ø22
Cout	USCITA ACQUA CONDENSAZIONE CONDENSING WATER OUTLET		Sc	CUFFIA INSONORIZZANTE SOUNDPROOF CASING	
Su	SCARICO ACQUA UTILIZZO USER WATER DISCHARGE		Lh	FORI DI SOLLEVAMENTO LIFTING HOLES	
	SPAZI DI INSTALLAZIONE CLEARANCES		*	OPTIONAL	



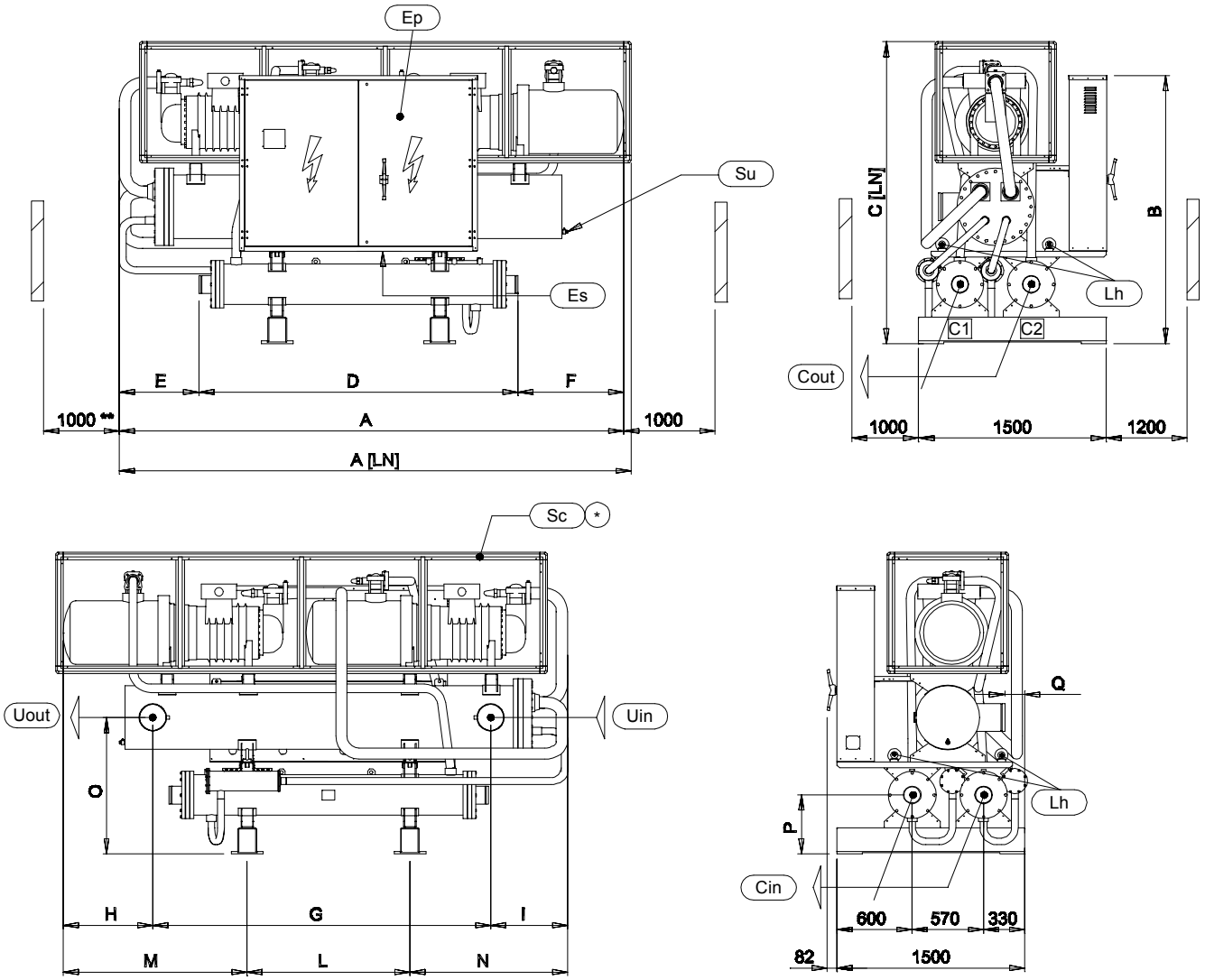
Footprint

MOD. OMEGA V 2001	A	B	C	D	E	F	G	H	I	L	M	N	O	P	Q	R	S	T
	mm																	
19.1	2.885	1.610	1.420	2.428	350	107	1.000	821	1.064	2.300	136	449	420	285	407	485	1.015	1.254
22.1	3.410	1.610	1.475	2.428	612	370	1.000	1.084	1.326	2.780	148	482	447	258	407	485	1.015	1.254
27.1	3.430	1.610	1.475	2.428	632	370	1.000	1.084	1.346	2.780	148	502	447	258	407	485	1.015	1.254
33.1	3.445	1.690	1.475	2.526	598	321	1.300	934	1.212	2.780	148	518	447	258	447	485	1.015	1.554
39.1	3.480	1.690	1.705	2.526	609	345	1.300	958	1.222	2.750	180	549	472	183	447	395	1.105	1.554
43.1	3.480	1.690	1.705	2.526	609	345	1.300	958	1.222	2.750	180	550	472	183	447	395	1.105	1.554
47.1	3.480	1.690	1.705	2.526	609	345	1.300	958	1.222	2.750	180	550	472	183	447	395	1.105	1.554
52.1	3.500	1.690	1.785	2.526	609	365	1.300	978	1.222	2.700	215	585	513	142	447	395	1.105	1.554
58.1	3.520	1.740	1.785	2.552	616	352	1.300	978	1.242	2.700	215	605	513	142	472	395	1.105	1.554

MOD. OMEGA V 2001	User water	Condenser water	Weight		Weight distribution on base frame			
	Ø - Uin/Uout	Ø - Cin/Cout	Transport	Operating	G1	G2	G3	G4
[STANDARD]	mm	mm	Kg		Kg			
19.1	114,3 OD	3" BSP F.	1.138	1.213	436	328	193	256
22.1	141,3 OD	3" BSP F.	1.297	1.431	512	414	226	279
27.1	141,3 OD	3" BSP F.	1.423	1.552	620	397	209	326
33.1	141,3 OD	114,3 OD	1.553	1.679	522	340	322	495
39.1	168,3 OD	114,3 OD	1.800	1.991	657	359	344	631
43.1	168,3 OD	114,3 OD	1.850	2.039	655	378	368	638
47.1	168,3 OD	114,3 OD	2.169	2.347	690	531	490	636
52.1	219,1 OD	114,3 OD	2.410	2.710	845	590	524	751
58.1	219,1 OD	141,3 OD	2.559	2.860	921	573	524	842

MOD. OMEGA V 2001	User water	Condenser water	Weight		Weight distribution on base frame			
LN	Ø - Uin/Uout	Ø - Cin/Cout	Transport	Operating	G1	G2	G3	G4
[LOW NOISE]	mm	mm	Kg		Kg			
19.1	114,3 OD	3" BSP F.	1.269	1.344	484	380	211	269
22.1	141,3 OD	3" BSP F.	1.428	1.563	560	466	244	293
27.1	141,3 OD	3" BSP F.	1.554	1.683	669	448	227	339
33.1	141,3 OD	114,3 OD	1.684	1.812	562	381	351	518
39.1	168,3 OD	114,3 OD	1.989	2.179	703	428	397	651
43.1	168,3 OD	114,3 OD	2.039	2.228	702	447	420	659
47.1	168,3 OD	114,3 OD	2.358	2.535	732	605	542	656
52.1	219,1 OD	114,3 OD	2.599	2.899	887	664	577	771
58.1	219,1 OD	141,3 OD	2.748	3.050	964	646	578	862

OMEGA V 2001 - 2 COMPRESSORS
OVERALL DIMENSIONS AND HYDRAULIC CONNECTIONS



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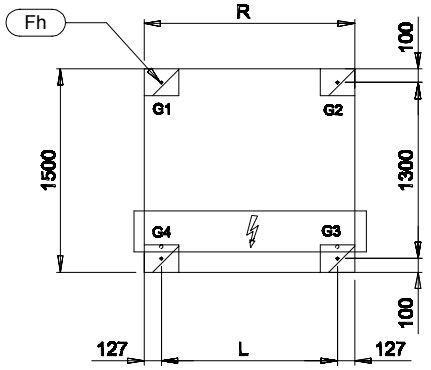
Uout	USCITA ACQUA UTILIZZO USER WATER OUTLET		Es	INGRESSO ALIMENTAZIONE ELETTRICA ELECTRICAL SUPPLY INLET	
Cin	INGR. ACQUA CONDENSAZIONE CONDENSING WATER INLET		Fh	FORI DI FISSAGGIO FIXING HOLES	ø22
Cout	USCITA ACQUA CONDENSAZIONE CONDENSING WATER OUTLET		Sc	CUFFIA INSONORIZZANTE SOUNDPROOF CASING	
Su	SCARICO ACQUA UTILIZZO USER WATER DISCHARGE		Lh	FORI DI SOLLEVAMENTO LIFTING HOLES	
	SPAZI DI INSTALLAZIONE CLEARANCES		*	OPTIONAL	



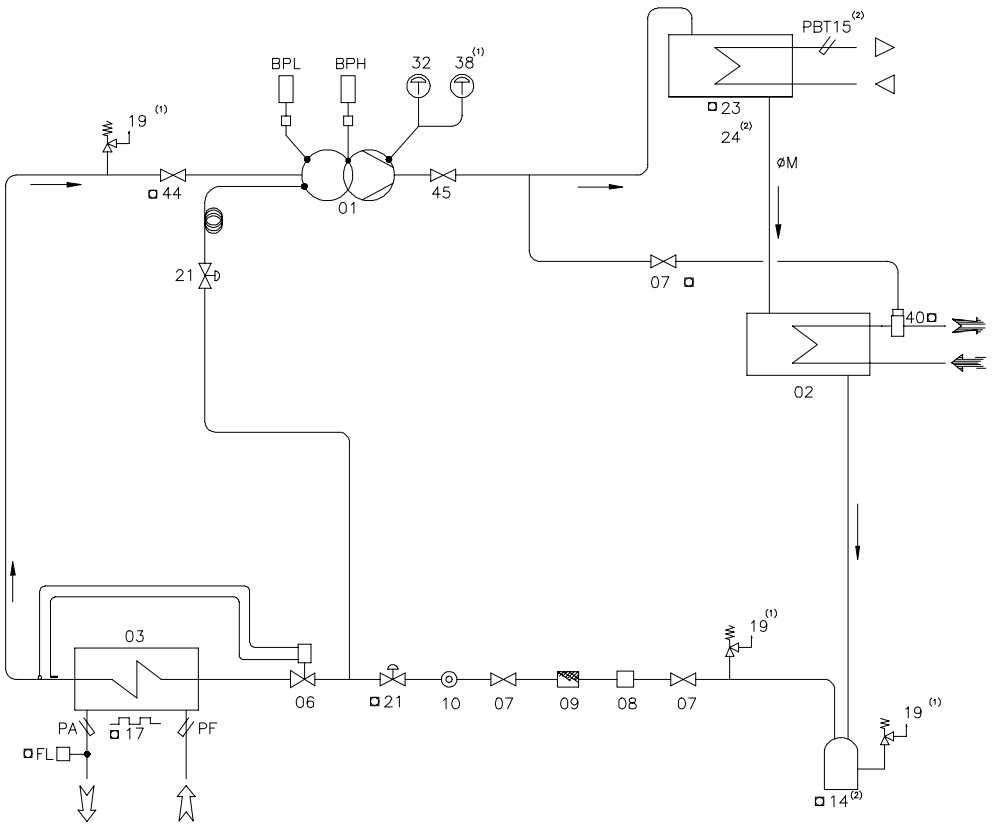
Footprint

MOD. OMEGA V 2001	A	A [LN]	B	C [LN]	D	E	F	G	H	I	L	M	N	O	P	Q	R	Cir-cuit
	mm																	
38.2	3.450	3.510	2.015	1.925	2.428	628	394	2.750	180	520	1.000	1.108	1.342	871	407	253	1.254	C1=C2
44.2	3.450	3.510	2.015	1.925	2.428	628	394	2.750	180	520	1.000	1.108	1.342	871	407	253	1.254	C1=C2
54.2	3.535	3.575	2.095	2.085	2.428	693	414	2.700	216	619	1.300	978	1.257	991	447	212	1.554	C1=C2
60.2	3.535	3.575	2.095	2.085	2.526	644	365	2.700	216	619	1.300	978	1.257	991	447	212	1.554	C1
	3.535	3.575	2.095	2.085	2.428	693	414	2.700	216	619	1.300	978	1.257	991	447	212	1.554	C2
65.2	3.365	3.445	2.095	2.085	2.526	515	324	2.200	424	741	1.300	937	1.128	991	447	212	1.554	C1=C2
71.2	3.860	4.040	2.095	2.265	2.526	816	518	2.700	368	791	1.300	1.131	1.429	991	447	212	1.554	C1=C2
77.2	3.860	4.040	2.095	2.265	2.526	786	548	2.700	399	761	1.300	1.161	1.399	991	447	212	1.554	C1=C2
82.2	3.895	4.075	2.165	2.365	2.526	821	548	2.700	406	789	1.300	1.161	1.434	1.042	447	161	1.554	C1=C2
86.2	3.895	4.075	2.165	2.365	2.526	821	548	2.700	406	789	1.300	1.161	1.434	1.042	447	161	1.554	C1=C2
90.2	4.025	4.085	2.220	2.365	2.526	757	742	2.700	600	725	1.300	1.357	1.368	1.042	447	161	1.554	C1=C2
93.2	4.040	4.100	2.220	2.365	2.526	657	857	2.700	715	625	1.300	1.470	1.270	1.042	447	161	1.554	C1=C2
104.2	4.040	4.100	2.220	2.365	2.526	657	857	2.700	715	625	1.300	1.470	1.270	1.042	447	161	1.554	C1=C2
116.2	4.040	4.100	2.270	2.415	2.552	644	844	2.700	715	625	1.300	1.470	1.270	1.093	472	161	1.554	C1=C2

MOD. OMEGA V 2001	User water	Condenser water	Weight		Weight distribution on base frame			
	Ø - Uin/Uout	Ø - Cin/Cout	Transport	Operating	G1	G2	G3	G4
[STANDARD]	mm	mm	Kg		Kg			
38.2	168,3 OD	3" BSP F.	2.197	2.395	975	609	312	499
44.2	168,3 OD	3" BSP F.	2.267	2.459	981	649	330	499
54.2	219,1 OD	3" BSP F.	2.742	3.035	1090	564	471	910
60.2	219,1 OD	114,3 OD	2.868	3.169	1107	601	514	947
65.2	219,1 OD	114,3 OD	2.945	3.190	970	763	642	815
71.2	219,1 OD	114,3 OD	3.185	3.474	1158	727	613	976
77.2	219,1 OD	114,3 OD	3.333	3.626	1115	851	719	941
82.2	219,1 OD	114,3 OD	3.622	4.097	1527	705	589	1276
86.2	219,1 OD	114,3 OD	3.640	4.119	1535	712	593	1279
90.2	219,1 OD	114,3 OD	3.933	4.414	1757	655	544	1458
93.2	219,1 OD	114,3 OD	4.222	4.708	1568	1046	838	1256
104.2	219,1 OD	114,3 OD	4.385	4.828	1665	1012	813	1338
116.2	219,1 OD	141,3 OD	4.612	5.075	1742	1074	861	1398

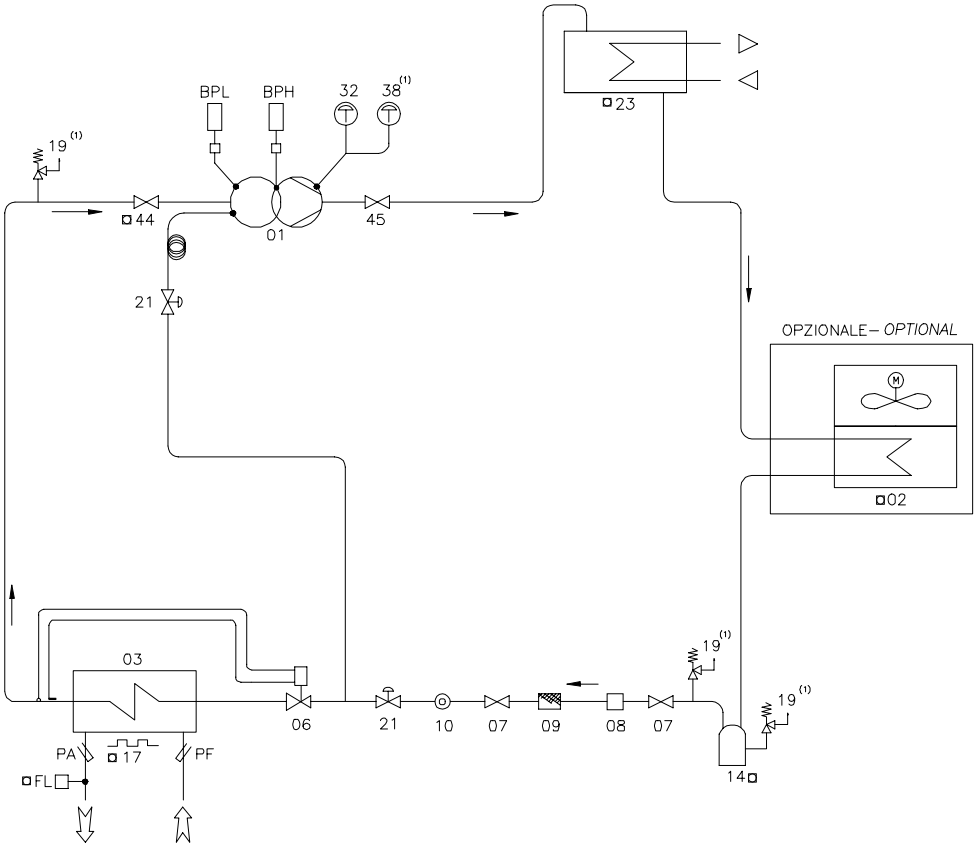
MOD. OMEGA V 2001 LN	User water	Condenser water	Weight		Weight distribution on base frame			
	Ø - Uin/Uout	Ø - Cin/Cout	Transport	Operating	G1	G2	G3	G4
[LOW NOISE]	mm	mm	Kg		Kg			
38.2 LN	168,3 OD	3" BSP F.	2.437	2.635	1061	693	348	533
44.2 LN	168,3 OD	3" BSP F.	2.507	2.699	1067	733	366	533
54.2 LN	219,1 OD	3" BSP F.	2.982	3.276	1159	632	524	961
60.2 LN	219,1 OD	114,3 OD	3.108	3.408	1176	668	567	997
65.2 LN	219,1 OD	114,3 OD	3.185	3.430	1038	831	694	867
71.2 LN	219,1 OD	114,3 OD	3.531	3.820	1258	824	688	1050
77.2 LN	219,1 OD	114,3 OD	3.679	3.972	1199	964	806	1003
82.2 LN	219,1 OD	114,3 OD	3.968	4.443	1612	800	674	1357
86.2 LN	219,1 OD	114,3 OD	3.986	4.465	1631	813	672	1349
90.2 LN	219,1 OD	114,3 OD	4.279	4.761	1843	767	632	1519
93.2 LN	219,1 OD	114,3 OD	4.568	5.054	1635	1176	938	1305
104.2 LN	219,1 OD	114,3 OD	4.731	5.174	1732	1141	914	1387
116.2 LN	219,1 OD	141,3 OD	4.958	5.421	1810	1203	962	1446

REFRIGERANT CIRCUIT DIAGRAM



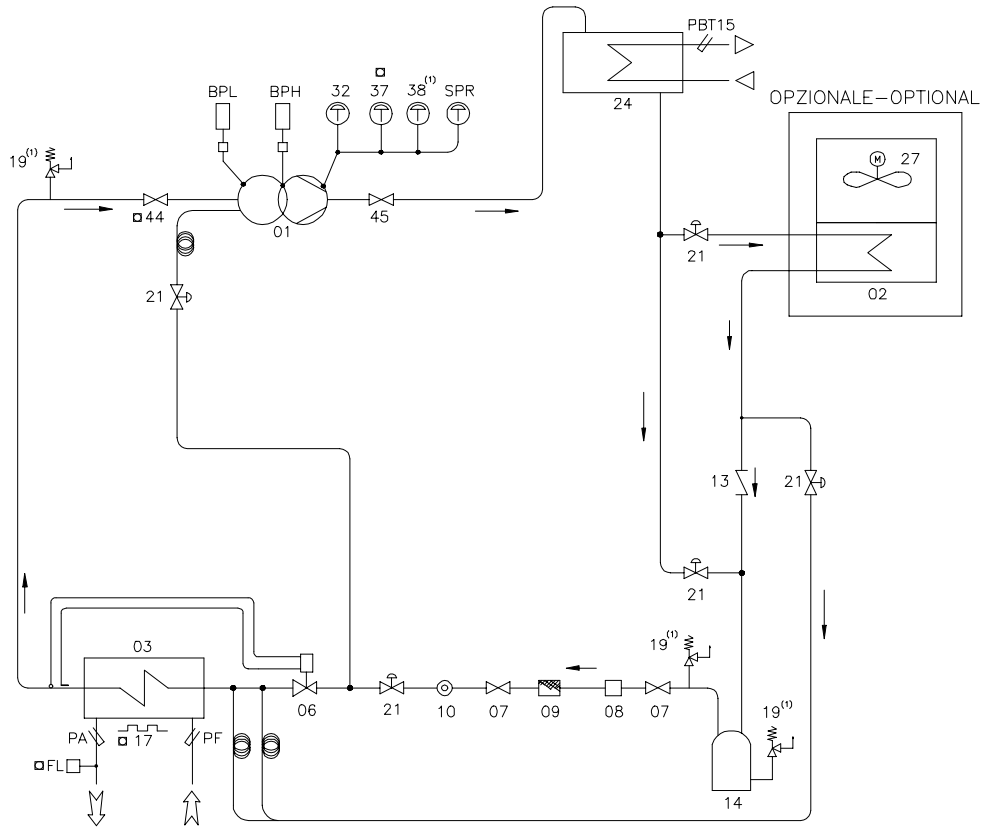
01	COMPRESSORE	COMPRESSOR
02	CONDENSATORE	CONDENSER
03	EVAPORATORE	EVAPORATOR
06	VALVOLA TERMOSTATICA	THERMOSTATIC VALVE
07	RUBINETTO	VALVE
08	PRESA DI CARICA	CHARGING CONNECTION
09	FILTRO	FILTER
10	INDICATORE DI UMIDITÀ'	MOISTURE INDICATOR SIGHT GLASS
14	RICEVITORE DI LIQUIDO	LIQUID RECEIVER
17	RESISTENZA ELETTRICA	ELECTRIC HEATER
19	VALVOLA DI SICUREZZA	SAFETY VALVE
21	VALVOLA SOLENOIDE	SOLENOID VALVE
23	DESURRISCALDATORE	DESUPERHEATER
24	SCAMBIATORE A RECUPERO TOTALE	TOTAL RECOVERY EXCHANGER
32	PRESSOSTATO ALTA PRESSIONE	HIGH PRESSURE SWITCH
38	PRESSOSTATO DI SICUREZZA	SAFETY PRESSURE SWITCH
40	VALVOLA PRESSOSTATICA	PRESSOSTATIC VALVE
44	RUBINETTO COMPRESSORE BASSA PRESSIONE	LOW PRESSURE SHUT–OFF VALVE
45	RUBINETTO COMPRESSORE ALTA PRESSIONE	HIGH PRESSURE SHUT –OFF VALVE
BPL	TRASDUTTORE DI BASSA PRESSIONE	LOW PRESSURE TRANSDUCER
BPH	TRASDUTTORE DI ALTA PRESSIONE	HIGH PRESSURE TRANSDUCER
PA	POZZETTO PER SONDA ANTIGELO	LOW WATER TEMPERATURE PROBE POCKET
PF	POZZETTO PER SONDA INGRESSO ACQUA	INLET PROBE OCKET
PBT15	POZZETTO PER SONDA DI RECUPERO	RECOVERY PROBE POCKET
FL	FLUSSOSTATO	WATER FLOW SWITCH
NOTE	(1) In conformita' alle normative *In conformity with the norms* (2) Di serie nelle versioni DC *Standard for DC version* □ OPZIONALE– *OPTIONAL*	Acqua utenze *Users water* Acqua di torre *Tower water* Acqua di recupero *Recovery water*

REFRIGERANT CIRCUIT DIAGRAM /LC



01	COMPRESSORE	COMPRESSOR
02	CONDENSATORE	CONDENSER
03	EVAPORATORE	EVAPORATOR
06	VALVOLA TERMOSTATICA	THERMOSTATIC VALVE
07	RUBINETTO	VALVE
08	PRESA DI CARICA	CHARGING CONNECTION
09	FILTRO	FILTER
10	INDICATORE DI UMIDITÀ'	MOISTURE INDICATOR SIGHT GLASS
14	RICEVITORE DI LIQUIDO	LIQUID RECEIVER
17	RESISTENZA ELETTRICA	ELECTRIC HEATER
19	VALVOLA DI SICUREZZA	SAFETY VALVE
21	VALVOLA SOLENOIDE	SOLENOID VALVE
23	DESURRISCALDATORE	DESUPERHEATER
32	PRESSOSTATO ALTA PRESSIONE	HIGH PRESSURE SWITCH
38	PRESSOSTATO DI SICUREZZA	SAFETY PRESSURE SWITCH
40	VALVOLA PRESSOSTATICA	PRESSOSTATIC VALVE
44	RUBINETTO COMPRESSORE BASSA PRESSIONE	LOW PRESSURE SHUT–OFF VALVE
45	RUBINETTO COMPRESSORE ALTA PRESSIONE	HIGH PRESSURE SHUT –OFF VALVE
BPL	TRASDUTTORE DI BASSA PRESSIONE	LOW PRESSURE TRANSDUCER
BPH	TRASDUTTORE DI ALTA PRESSIONE	HIGH PRESSURE TRANSDUCER
PA	POZZETTO PER SONDA ANTIGELO	LOW WATER TEMPERATURE PROBE POCKET
PF	POZZETTO PER SONDA INGRESSO ACQUA	INLET PROBE OCKET
PBT15	POZZETTO PER SONDA DI RECUPERO	RECOVERY PROBE POCKET
FL	FLUSSOSTATO	WATER FLOW SWITCH
NOTE	(1) In conformita' alle normative *In conformity with the norms* □ OPZIONALE– *OPTIONAL*	Acqua utenze *Users water* Acqua di recupero *Recovery water*

REFRIGERANT CIRCUIT DIAGRAM / LC DC



01	COMPRESSORE	COMPRESSOR
02	CONDENSATORE	CONDENSER
03	EVAPORATORE	EVAPORATOR
06	VALVOLA TERMOSTATICA	THERMOSTATIC VALVE
07	RUBINETTO	VALVE
08	PRESA DI CARICA	CHARGING CONNECTION
09	FILTRO	FILTER
10	INDICATORE DI UMIDITÀ'	MOISTURE INDICATOR SIGHT GLASS
13	VALVOLA DI RITEGNO	CHECK VALVE
14	RICEVITORE DI LIQUIDO	LIQUID RECEIVER
17	RESISTENZA ELETTRICA	ELECTRIC HEATER
19	VALVOLA DI SICUREZZA	SAFETY VALVE
21	VALVOLA SOLENOIDE	SOLENOID VALVE
24	SCAMBIATORE A RECUPERO TOTALE	TOTAL RECOVERY EXCHANGER
27	ELETTROVENTOLA	ELECTRIC FAN
32	PRESSOSTATO ALTA PRESSIONE	HIGH PRESSURE SWITCH
37	PRESSOSTATO VENTILATORI	FAN PRESSURE SWITCH
38	PRESSOSTATO DI SICUREZZA	SAFETY PRESSURE SWITCH
44	RUBINETTO COMPRESSORE BASSA PRESSIONE	LOW PRESSURE SHUT–OFF VALVE
45	RUBINETTO COMPRESSORE ALTA PRESSIONE	HIGH PRESSURE SHUT –OFF VALVE
BPL	TRASDUTTORE DI BASSA PRESSIONE	LOW PRESSURE TRANSDUCER
BPH	TRASDUTTORE DI ALTA PRESSIONE	HIGH PRESSURE TRANSDUCER
PA	POZZETTO PER SONDA ANTIGELO	LOW WATER TEMPERATURE PROBE POCKET
PF	POZZETTO PER SONDA INGRESSO ACQUA	INLET PROBE OCKET
PBT15	POZZETTO PER SONDA DI RECUPERO	RECOVERY PROBE POCKET
SPR	PRESSOSTATO ALTA RECUPERO	RECOVERY PRESSURE SWITCH
FL	FLUSSOSTATO	WATER FLOW SWITCH
NOTE	(1) In conformita' alle normative *In conformity with the norms* □ OPZIONALE– *OPTIONAL*	⇦ Acqua utenze *Users water* ◁ Acqua di recupero *Recovery water*

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