

LCS

Air cooled water chillers with screw compressors TECHNICAL MANUAL

GB



FREE COOLING and ONLY COOLING Version

CE

COMPANY
WITH QUALITY SYSTEM
CERTIFIED BY DNV
=ISO 9001/2000=

 **Galletti**
AIR CONDITIONING

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DECLARATION OF CONFORMITY

Galletti S.p.A., whose main office is at n°12/a Via Romagnoli, 40010 Bentivoglio (BO) - Italy, hereby declares, under its sole responsibility, that the LCS water chillers, devices for air conditioning systems, conform to the specifications of EEC Directives 73/23, 89/392, 91/368, 93/44, 93/68, 97/23, 89/336.

Bologna, 22/01/2002

Luigi Galletti
President



FIELD OF APPLICATION

These machines are designed to cool-heat water and solutions containing up to 30% glycol (percentage by weight) in civil, industrial and technological air-conditioning systems.

They must be used in observance of the operating limits specified in this manual; failure to comply with said limits will invalidate the warranties provided in the contract of sale.

1 TECHNICAL SPECIFICATIONS

UNIT STRUCTURE

Self-supporting frame made of galvanised steel protected with polyester powder paint enamel (stoved at 180°C) for resistance to atmospheric agents. Stainless steel screws and bolts.

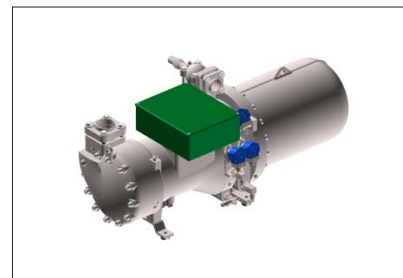


COMPRESSORS

Semi-hermetic screw compressors, direct male rotor / female rotor drive, with crankcase heater. Lubrication ensured by delivery and intake pressure difference.

Integral electronic motor protection and temperature sensors inserted directly in windings.

Part winding motor start-up and standard capacity step reduction.



CONDENSERS

Including high-efficiency coils with copper tubes and aluminium fins.

The condensing coil are provided with draining holes on bottom side to allow the perfect cleaning of the coil itself, even with FREE COOLING

versions : exclusive water solution for the water chiller market.



FANS

Axial type, directly driven by 6-pole three-phase electric motors with integrated klaxon thermal overload protection. IP 54 motor protection grading. Fitted with safety fan guard.



EVAPORATOR

Of the AISI 316 stainless steel brazewelded plates type (shell-in tube type for 482 and 532 sizes) .

They are factory insulated with flexible close cell material.

The technical and dimensional data provided herein may undergo changes in connection with product improvements.

1 TECHNICAL SPECIFICATIONS

REFRIGERANT CIRCUIT

It is including: compressor delivery valves, liquid line shut-off valve, charging connection, liquid sight glass, filter drier, thermostatic valve, pressure transducer for the reading of high/low pressure and temperature readout by control, solenoid valve on liquid line.

ELECTRICAL PANEL



IP 55, includes:

- main switch;
- power circuit (automatic circuit breakers) and fuses; thermal-magnetic for all users (available for FL-FS versions)
- control circuit fuses;
- compressor contactors;
- fan 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.
Control of 3 way valve FREE COOLING based on favourable ambient conditions.

DIGITAL DISPLAY OF:

- inlet and outlet water temperature;
- temperature and differential settings;
- alarm description;
- hour meters readout of operation and number of unit, compressor and pump (if present) start-ups;
- high and low pressures, and relevant condensation and evaporation temperature .



CONTROLS AND SAFETY DEVICES

- manual reset high pressure switch;
- automatic reset low pressure switch;
- mechanical flow switch; mechanical flow switch; standard differential pressure switch; paddle flow switch, panic button and victaulic-type plumbing connections, on request.
- compressor cut-out device.

AVAILABLE OPTIONS

Supply voltage

- 400V / 3ph + N / 50Hz
- 400V / 3ph / 50Hz with built-in transformer for 230V devices

WATER BUFFER TANK

Installed inside all units; does not preclude the installation of other options. For each size, you can choose among all the tanks corresponding to the previous sizes.

HYDRAULIC PUMPS

Single or double pump, standard or uprated. Installation of other brands on request.

ANTIFREEZE KIT

Self-regulating PTC-type heating elements for keeping the water temperature above 0°C (not available for FC versions).

ELECTRONIC EXPANSION VALVE

It enhances the energy efficiency of the units by up to 50% during operation under partial loads.

CONDENSATION CONTROL

Phase-cut type with adjustment of air flow rate, it enables the unit to work in the chiller mode with air temperatures as low as -15°C. For applications in temperatures below -15°C, a condenser coil "flooding" configuration is available on request.

LOW-NOISE VERSION

Standard and low-noise versions are normally featured in the price list. Super low-noise versions may be supplied on request.

PARTIAL HEAT RECOVERY

Recovery of 40% of the heating capacity dissipated from the condenser. Total recovery systems may be provided on request.

REFRIGERANTS

- R 407C
- R 134a for applications in high outdoor air temperatures or at the customer's request

REMOTE COMMUNICATION/SUPERVISION

Serial ports available:

- RS232
- RS485

GSM Modem with prepaid card and antenna on the unit.

PROTOCOLS:

- Carel (incorporated),
- Modbus® (Incorporated with Advanced control)
- Modbus® (With external gateway with Basic control)
- LonWorks® (Dedicated serial card to be requested when ordering the unit)
- BACnet™ (with external gateway)
- TCP-IP (with external gateway)
- TREND® (Dedicated serial card to be requested when ordering the unit)

2 MODELS AND CONFIGURATIONS

The LCS series is made of 10 models, only cooling and FREE COOLING operation, standard and low noise version.

The number of constructive options can be selected using the configuration selector below .

The choice of some options can prevent the choice of others or render obligatory other fields. To contact the Galletti for verification

OPTION AND UNIT CONFIGURATION

16 fields which customise the unit complying with customer's requirements

Field	Name.	Description
1	Versions	
	A	Base(on/off)
	B	Base with modulating airflow with fan speed control
	C	Low noise version without modulating airflow with fan speed control
	M	Low noise version with modulating airflow with fan speed
	D	Partial heat recover including the modulating airflow with fan speed control
	E	Low noise version + partial heat recover including the modulating air flow with fan speed
2	Microprocessor / expansions devices	
	0	advanced (pCO) + standard expansion valve
	1	advanced (pCO) + electronic expansion valve
3	Refrigerant / Power supply	
	0	R407C/400V-3-50Hz+N
	1	R407C/400V-3-50Hz with transformer for 230V
	2	R407C/400V-3-50Hz + N with thermal-magnetic
	3	R407C/400V-3-50Hz with transformer for 230V + thermal-magnetic
	4	R22/400V-3-50Hz+N
	5	R22/400V-3-50Hz with transformer for 230V
	6	R22/400V-3-50Hz + N with thermal-magnetic
	7	R22/400V-3-50Hz with transformer for 230V + thermal-magnetic
4	Pumping units	
	0	Not present (STD.)
	1	One Pump STD. (mod. 201...322)
	2	Double pump STD. (mod. 201...322)
	3	One Pump STD. (mod. 351...532)
	4	Double pump STD. (mod. 351...532)
	5	Up rated pump (mod. 201...322)
	6	Up rated double pump (mod. 201...322)
	7	Up rated pump (mod. 351...532)
	8	Up rated double pump (mod. 351...532)
5	Water storage tank	
	A	Not present (std.)
	B	only pump
	C	Tank type "1" (600 litres - mod. 201...322)
	D	Tank type "2" (1230 litres - mod. 351...532)
6	Interface for supervision system	
	0	Not present
	1	Serial port RS485
	2	Serial port RS232
7	Documentation language	
	0	Italian
	1	English
	2	German
	S	Other
8	Sensors pressure	
	0	Not present
	1	Refrigerant pressure gauges A/B
	2	Low pressure probes
	3	Low/high pressure probes
	4	Pressure gauges A/B + low pressure probes
	5	Pressure gauges A/B + low/high pressure probes
9	Directives	
	E	EUROPE directive (PED)
	W	Others
10	Grille/filter options	
	0	Not present
	1	Grille for coils
	2	Metallic filter for coils
	3	Low gridded panels
	4	Grilles for coils + lower gridded panels
	5	Metallic filter for coils + lower gridded panels

OPTION AND UNIT CONFIGURATION

Field	Name.	Description
11	Antifreeze electric element options	
	A	not present
	B	present on evaporator
	C	present on evaporator + pump
	D	present on evaporator + pump + tank
12	Compressor options	
	0	Not present
	1	Power factors correction capacitors
	2	Suction shut-off-valve
	3	SOFT-STARTER KIT
	4	Suction shut-off-valve + Power factors correction capacitors
	5	SOFT-STARTER KIT + Power factors correction capacitors
	6	SOFT-STARTER KIT + Suction shut-off-valve
	7	SOFT-STARTER KIT + Suction shut-off-valve + Power factors correction capacitors
13	Package	
	A	Standard package (squared timber + plastic foil)
	S	Other
14	Remote control board	
	0	not present
	S	simplified
	P	with pCO microprocessor
15	Dampers	
	0	Not present
	G	Rubber antivibration
	M	Spring antivibration
16	Accessories	
	0	Not present
	1	Pair of VIC-TAULIC couplings for IN-OUT water connection
	2	Paddle flow-switch (standard differential pressure switch)
	3	ANTI-PANIC button
	4	Paddle flow-switch + ANTI-PANIC button
	5	Paddle flow-switch + Pair of VIC-TAULIC couplings
	6	Pair of VIC-TAULIC couplings + ANTI-PANIC button
	7	Paddle flow-switch + Pair of VIC-TAULIC couplings + ANTI-PANIC button

CODE

It consists of 8 characters, which show the range, the model, the operation mode and the power supply

Commercial name of the series	
LCS	Air condensed water chillers
Model	
201	Gives information on the heating capacity of the standard models
261	
272	
301	
322	
351	
372	
422	
482	
532	
Operation	
C	WATER CHILLER
Version	
S	STANDARD
L	LOW NOISE

2 MODELS AND CONFIGURATIONS (FREE COOLING LCS)

The LCS series is made of 10 models, only cooling and FREE COOLING operation, standard and low noise version.

The number of constructive options can be selected using the configuration selector below .

The choice of some options can prevent the choice of others or render obligatory other fields. To contact the Galletti for verification

OPTION AND UNIT CONFIGURATION

16 fields which customise the unit complying with customer's requirements

Field	Name.	Description
1	Versions	
	F	FREE-COOLING and standard modulating condensing control
	G	FREE-COOLING + low noise version and standard modulating condensing control
	H	FREE-COOLING + condensing control + heat recovery at 40%
	I	FREE-COOLING + low noise version + condensing control + heat recovery at 40%
2	Microprocessor / expansions devices	
	0	advanced (pCO) + standard expansion valve
	1	advanced (pCO) + electronic expansion valve
3	Refrigerant/ Power supply	
	0	R407C/400V-3-50Hz+N
	1	R407C/400V-3-50Hz with transformer for 230V
	2	R407C/400V-3-50Hz + N with thermal-magnetic
	3	R407C/400V-3-50Hz with transformer for 230V + thermal-magnetic
	4	R22/400V-3-50Hz+N
	5	R22/400V-3-50Hz with transformer for 230V
	6	R22/400V-3-50Hz + N with thermal-magnetic
	7	R22/400V-3-50Hz with transformer for 230V + thermal-magnetic
4	Pumping units	
	0	Not present (STD.)
	5	Up rated pump (mod. 201...322)
	6	Up rated double pump (mod. 201...322)
	7	Up rated pump (mod. 351...532)
	8	Up rated double pump (mod. 351...532)
5	Water storage tank	
	A	Not present (std.)
	B	only pump
	C	Tank type "1" (600 litres - mod. 201...322)
	D	Tank type "2" (1230 litres - mod. 351...532)
6	Interface for supervisions system	
	0	Not present
	1	Serial port RS485
	2	Serial port RS232
7	Documentation language	
	0	Italian
	1	English
	2	German
	S	Other
8	Sensors pressure	
	0	Not present
	1	Refrigerant pressure gauges A/B
	2	Low pressure probes
	3	Low/high pressure probes
	4	Pressure gauges A/B + low pressure probes
	5	Pressure gauges A/B + low/high pressure probes
9	Directives	
	E	EUROPE directive (PED)
	W	Others
10	Grille/filter options	
	0	Not present
	1	Grille for coils
	2	Metallic filter for coils
	3	Low graded panels
	4	Grilles for coils + lower grided panels
	5	Metallic filter for coils + lower grided panels

OPTION AND UNIT CONFIGURATION

Field	Name.	Description
11	Antifreeze electric element options	
	A	Not present: THE SOLUTION WITH GLYCOL IS OBLIGATORY
12	Compressor options	
	0	Not present
	1	Power factors correction capacitors
	2	Suction shut-off valve
	3	SOFT-STARTER KIT
	4	Suction shut-off valve + Power factors correction capacitors
	5	SOFT-STARTER KIT + Power factors correction capacitors
	6	SOFT-STARTER KIT + Suction shut-off valve
	7	SOFT-STARTER KIT + Suction shut-off valve + Power factors correction capacitors
13	Package	
	A	Standard package (squared timber + plastic foil)
	S	Other
14	Remote control board	
	0	not present
	S	simplified
	P	with pCO microprocessor
15	Dampers	
	0	Not present
	G	Rubber antivibration
	M	Spring antivibration
16	Accessories	
	0	Not present
	1	Pair of VIC-TAULIC couplings for IN-OUT water connection
	2	Paddle flow-switch (standard differential pressure switch)
	3	ANTI-PANIC button
	4	Paddle flow-switch + ANTI-PANIC button
	5	Paddle flow-switch + Pair of VIC-TAULIC couplings
	6	Pair of VIC-TAULIC couplings + ANTI-PANIC button
	7	Paddle flow-switch + Pair of VIC-TAULIC couplings + ANTI-PANIC button

CODE

It consists of 8 characters, which show the range, the model, the operation mode and the power supply

Commercial name of the series	
LCS	Air condensed water chillers
Model	
201	Gives information on the heating capacity of the standard models
261	
272	
301	
322	
351	
372	
422	
482	
532	
Operation	
F	FREE COOLING
Version	
S	STANDARD
L	LOW NOISE

3 LCS C RATED TECHNICAL DATA

LCS - CS		201	261	272	301	322	351	372	422	482	532
Cooling capacity	kW	202	266	271	300	321	346	375	422	477	531
Rated electrical input	kW	79,9	93,6	104,9	109,7	118,7	121,9	138,0	158,4	174,3	185,7
Nominal absorbed current	A	129,6	159,3	179,2	186,0	201,2	207,5	234,4	261,7	12,2	314,2
Power supply	V / ph / Hz	400 / 3N / 50									
Maximum current absorption	A	170	202	238	238	278	276	318	354	378	394
Starting current	A	431	542	399	634	440	695	524	615	718	734
Compressor	type	Screw									
Number of compressors/circuits	n°	1/1	1/1	2/2	1/1	2/2	1/1	2/2	2/2	2/2	2/2
Step controls	%	4	4	8	4	8	4	8	8	8	8
Axial fans	n°	8	6	6	6	6	8	8	8	10	10
Air flow	m³/h	68000	124000	124000	116000	116000	168000	168000	168000	192000	176000
Evaporator type		Plate									shell&tube
Water flow	l/h	34753	45700	46600	51600	55200	59600	64500	72600	82000	91300
Pressure drops, water side	kPa	39,0	29,0	30,5	31,0	35,0	33,0	38,0	33,0	28,0	35,0
Water content, excluding optionals	dm³	99	30	36	63	30	36	63	69	207	207
Type of hydraulic connection	type	victaulic									
Hydraulic connection	inches	4	4	4	4	4	5	5	5	5	5
Power pump (option)	kW	4,0	5,5	5,5	5,5	5,5	7,5	7,5	7,5	9,2	9,2
Available pressure	kPa	199	179	176	172	164	212	204	199	195	182
Water tank (option)	liters	800	600	600	600	600	1230	1230	1230	1230	1230
Expansion vessel (option)	liters	25	25	25	25	25	25	50	50	50	50
Sound power level	dB A	88	90	90	90	90	92	92	92	93	93
Sound pressure level	dB A	60	62	62	62	62	64	64	64	65	65
Height	mm	1637	2487	2487	2487	2487	2487	2487	2487	2487	2487
Lenght	mm	4296	3290	3290	3290	3290	4976	4976	4976	4976	4976
Widht	mm	1654	2245	2245	2245	2245	2245	2245	2245	2245	2245
LCS - CL		201	261	272	301	322	351	372	422	482	532
Cooling capacity	kW	194	266	264	285	304	334	360	409	460	503
Rated electrical input	kW	82,1	93,6	104,5	111,4	121,5	120,6	137,2	158,0	175,6	192,0
Nominal absorbed current	A	132,0	159,3	175,5	185,7	202,0	201,1	228,5	256,8	289,8	319,5
Power supply	V / ph / Hz	400 / 3 / 50 + N									
Maximum current absorption	A	168	202	229	229	269	262	304	340	365	383
Starting current	A	429	542	390	625	431	681	510	601	705	723
Compressor	type	Screw									
Number of compressors/circuits	n°	1/1	1/1	2/2	1/1	2/2	1/1	2/2	2/2	2/2	2/2
Step controls	%	4	4	8	4	8	4	8	8	8	8
Axial fans	n°	8	6	6	6	6	8	8	8	10	10
Air flow	m³/h	56500	124000	88000	88000	88000	128000	128000	120000	132000	132000
Evaporator type		Plate									shell&tube
Water flow	l/h	33444	45752	45434	49100	52264	57512	62000	70321	79188	86491
Pressure drops, water side	kPa	34	55	38	44	35	37	42	46	29	35
Water content, excluding optionals	dm³	99	30	36	63	30	36	63	69	207	207
Type of hydraulic connection	type	victaulic									
Hydraulic connection	inches	4	4	4	4	4	5	5	5	5	5
Power pump (option)	kW	4,0	5,5	5,5	5,5	5,5	7,5	7,5	7,5	9,2	9,2
Available pressure	kPa	199	179	176	172	164	212	204	199	195	182
Water tank (option)	liters	800	600	600	600	600	1230	1230	1230	1230	1230
Expansion vessel (option)	liters	25	25	25	25	25	25	50	50	50	50
Sound power level	dB A	82	84	84	84	84	86	86	86	87	87
Sound pressure level	dB A	54	56	56	56	56	58	58	58	59	59
Height	mm	1637	2487	2487	2487	2487	2487	2487	2487	2487	2487
Lenght	mm	4296	3290	3290	3290	3290	4976	4976	4976	4976	4976
Widht	mm	1654	2245	2245	2245	2245	2245	2245	2245	2245	2245

Performances refer to the following conditions:

FREE COOLING capacity: ambient air temperature -5 °C ; water inlet temperature 12 °C, glycol 30%.

4 LCS FREE COOLING RATED TECHNICAL DATA

LCS - FS		201	261	272	301	322	351	372	422	482	532
Cooling capacity	kW	188,86	259,80	260,63	285,02	301,28	343,86	360,67	408,64	456,80	492,51
Rated electrical input	kW	84,06	93,06	104,20	110,94	120,13	122,67	139,03	158,19	175,70	191,32
Nominal absorbed current	A	136	158	178	188	193	207	234	260	294	323
Power supply	V / ph / Hz	400 / 3 / 50 + N									
Maximum current absorption	A	172	202	238	238	278	275	317	354	380	398
Starting current	A	433	542	369	634	403	694	482	569	675	701
Compressor	type	screw									
Number of compressors/circuits	n°	1/1	1/1	2/2	1/1	2/2	1/1	2/2	2/2	2/2	2/2
Step controls	%	4	4	8	4	8	4	8	8	8	8
Axial fans	n°	8	6	6	6	6	8	8	8	10	10
Air flow	m³/h	56000	109600	109600	109600	109600	156000	156000	144000	158000	158000
Evaporator type		Plate									shell&tube
Water flow	l/h	32484	44689	44828	49023	51826	59140	62035	70182	78579	84712
Pressure drops, water side	kPa	47	75	58	64	72	66	74	73	74	83
Water content, excluding optionals	dm³	162	188	193	473	188	193	473	480	646	646
Type of hydraulic connection	type	victaulic									
Hydraulic connection	inches	4	4	4	4	4	5	5	5	5	5
Power pump (option)	kW	4,0	5,5	5,5	5,5	5,5	7,5	7,5	7,5	9,2	9,2
Available pressure	kPa	199	179	176	172	164	212	204	199	195	182
Water tank (option)	liters	800	600	600	600	600	1230	1230	1230	1230	1230
Expansion vessel (option)	liters	25	25	25	25	25	25	50	50	50	50
Sound power level	dB A	88	90	90	90	90	92	92	92	93	93
Sound pressure level	dB A	60	62	62	62	62	64	64	64	65	65
Height	mm	1637	2487	2487	2487	2487	2487	2487	2487	2487	2487
Lenght	mm	4296	3290	3290	3290	3290	4976	4976	4976	4976	4976
Widht	mm	1654	2245	2245	2245	2245	2245	2245	2245	2245	2245
LCS - FL		201	261	272	301	322	351	372	422	482	532
Cooling capacity	kW	181,98	242,30	243,37	262,90	275,17	329,55	343,73	385,63	431,85	461,49
Rated electrical input	kW	86,58	95,62	108,79	115,40	126,62	124,24	140,95	163,83	180,24	197,30
Nominal absorbed current	A	139	160	182	192	209	209	235	267	298	329
Power supply	V / ph / Hz	400 / 3 / 50 + N									
Maximum current absorption	A	168	195	231	231	271	265	307	343	367	385
Starting current	A	429	535	369	627	403	684	482	569	675	701
Compressor	type	screw									
Number of compressors/circuits	n°	1/1	1/1	2/2	1/1	2/2	1/1	2/2	2/2	2/2	2/2
Step controls	%	4	4	8	4	8	4	8	8	8	8
Axial fans	n°	8	6	6	6	6	8	8	8	10	10
Air flow	m³/h	48000	74000	74000	74000	74000	113600	113600	106400	117600	117600
Evaporator type		Plate									shell&tube
Water flow	l/h	31300	41676	41859	45218	47329	56683	59121	66329	74278	79377
Pressure drops, water side	kPa	47	75	51	64	61	66	74	73	74	83
Water content, excluding optionals	dm³	162	188	193	473	188	193	473	480	646	646
Type of hydraulic connection	type	victaulic									
Hydraulic connection	inches	4	4	4	4	4	5	5	5	5	5
Power pump (option)	kW	4,0	5,5	5,5	5,5	5,5	7,5	7,5	7,5	9,2	9,2
Available pressure	kPa	199	179	176	172	164	212	204	199	195	182
Water tank (option)	liters	800	600	600	600	600	1230	1230	1230	1230	1230
Expansion vessel (option)	liters	25	25	25	25	25	25	50	50	50	50
Sound power level	dB A	82	84	84	84	84	86	86	86	87	87
Sound pressure level	dB A	54	56	56	56	56	58	58	58	59	59
Height	mm	1637	2487	2487	2487	2487	2487	2487	2487	2487	2487
Lenght	mm	4296	3290	3290	3290	3290	4976	4976	4976	4976	4976
Widht	mm	1654	2245	2245	2245	2245	2245	2245	2245	2245	2245

Performances refer to the following conditions:

FREE COOLING capacity: ambient air temperature -5 °C ; water inlet temperature 12 °C, glycol 30%.

5 LCS CS COOLING CAPACITY

T_{w1} Water inlet temperature
 T_{w2} Water outlet temperature
 T_{bs1} Dry bulb air temperature
 PF Cooling capacity
 PA Power input

LCS	T_{bs1}		25°C		30°C		35°C		40°C		45°C	
	T_{w1}	T_{w2}	PF	PA	PF	PA	PF	PA	PF	PA	PF	PA
	°C	°C	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW
LCS 201 CS	10	5	219,2	64,8	204,6	71,0	189,6	77,9	173,7	86,1	157,7	94,4
	12	7	233,2	66,6	218,0	72,9	202,1	79,9	185,4	88,1	168,3	96,5
	14	9	247,4	68,7	231,1	74,8	214,7	81,9	197,0	90,3	179,8	98,2
	16	11	262,1	70,8	244,8	76,9	227,7	83,9	209,5	92,4	191,1	100,1
	18	13	276,9	73,0	259,3	78,9	240,5	86,2	221,5	94,3	203,0	101,6
LCS 261 CS	10	5	298,3	75,3	269,2	84,5	248,8	91,3	227,9	99,3	205,3	108,6
	12	7	321,3	76,4	287,5	86,6	266,0	93,6	244,6	101,5	220,8	110,9
	14	9	327,2	82,8	306,8	88,7	284,9	95,8	261,3	104,0	237,3	113,1
	16	11	348,7	85,1	326,6	91,3	303,4	98,2	279,5	106,4	254,6	115,4
	18	13	370,8	87,6	347,6	93,8	324,2	100,8	297,7	109,1	272,5	117,7
LCS 272 CS	10	5	303,5	81,8	273,9	93,9	254,2	102,7	233,4	112,8	212,5	124,2
	12	7	326,1	83,1	291,9	96,1	271,0	104,9	249,5	115,2	227,9	126,4
	14	9	330,3	91,1	309,6	98,5	288,7	107,2	266,1	117,7	243,7	128,9
	16	11	350,9	93,7	328,9	101,1	306,8	109,9	282,9	120,2	259,6	131,1
	18	13	372,0	96,4	349,2	103,6	325,7	112,3	300,3	122,6	275,6	133,2
LCS 301 CS	10	5	339,9	85,6	304,6	98,5	280,9	107,2	256,4	116,0	231,5	125,4
	12	7	364,9	86,9	324,4	101,1	300,0	109,7	274,4	118,8	248,7	128,4
	14	9	368,7	95,6	344,9	103,7	319,7	112,1	293,1	121,6	266,5	131,3
	16	11	391,8	98,6	366,9	106,1	339,6	114,8	312,8	124,2	284,5	134,1
	18	13	415,6	101,3	389,1	108,7	361,2	117,4	331,7	127,0	303,0	136,7
LCS 322 CS	10	5	348,8	98,9	324,5	106,8	299,4	116,1	272,7	126,3	245,1	138,2
	12	7	371,5	101,7	346,6	109,6	321,0	118,7	291,9	129,5	263,9	140,9
	14	9	396,5	104,6	369,6	112,6	342,6	121,8	312,7	132,8	283,0	144,0
	16	11	420,7	107,7	394,7	115,7	365,2	124,9	333,8	136,2	303,0	146,8
	18	13	446,7	111,0	419,1	119,1	387,7	128,4	355,3	139,8	324,4	150,1
LCS 351 CS	10	5	374,0	99,5	347,3	109,7	324,0	119,5	299,3	130,8	273,3	143,8
	12	7	401,9	101,0	370,8	112,1	346,0	121,9	319,9	133,3	292,6	146,5
	14	9	430,8	102,7	394,2	114,8	368,6	124,7	341,1	136,0	312,6	149,2
	16	11	461,7	104,6	419,2	117,7	391,6	127,5	363,6	138,6	333,7	152,1
	18	13	492,6	106,7	444,2	120,7	415,8	130,3	385,3	141,4	354,2	154,6
LCS 372 CS	10	5	413,3	111,0	378,3	124,3	350,8	135,1	321,3	146,4	290,4	158,5
	12	7	444,4	112,7	403,7	127,3	375,0	138,0	343,6	149,8	311,4	162,3
	14	9	477,3	114,6	430,5	130,4	399,3	141,2	367,6	153,0	334,2	165,7
	16	11	511,5	116,7	457,3	133,8	424,8	144,4	392,3	156,2	357,0	169,2
	18	13	518,0	127,5	485,7	136,9	451,2	147,4	416,8	159,4	380,0	172,4
LCS 422 CS	10	5	472,7	123,0	426,3	141,6	395,9	154,9	363,8	170,3	331,0	187,5
	12	7	507,9	124,9	453,4	145,3	422,0	158,4	388,2	174,0	354,4	191,0
	14	9	513,8	137,3	481,9	148,7	448,6	162,3	413,6	177,8	378,6	194,6
	16	11	545,3	141,3	511,4	152,7	476,6	165,9	440,4	181,5	403,2	198,0
	18	13	576,6	145,8	542,1	156,7	504,8	169,8	465,7	185,7	428,2	201,3
LCS 482 CS	10	5	536,3	136,5	481,8	156,9	449,3	170,6	414,7	187,0	377,6	205,0
	12	7	543,6	147,9	511,2	160,4	477,0	174,3	439,0	190,9	402,1	208,9
	14	9	574,9	151,8	541,0	164,0	505,8	178,1	466,5	195,0	427,1	212,7
	16	11	609,2	155,9	574,0	168,2	535,8	182,4	494,8	199,2	452,9	216,5
	18	13	645,1	160,3	607,8	172,6	567,3	186,9	525,2	203,5	481,2	220,3
LCS 532 CS	10	5	599,6	145,4	538,8	167,0	499,6	181,5	459,1	198,5	416,7	217,4
	12	7	609,6	158,2	571,5	171,1	531,0	185,7	487,2	202,8	443,1	221,5
	14	9	647,2	162,4	608,1	175,6	566,4	190,5	520,9	207,9	473,6	225,8
	16	11	688,7	167,3	645,5	180,2	602,6	195,4	554,2	212,9	505,1	230,7
	18	13	725,6	171,8	682,5	184,9	637,4	200,3	588,6	218,4	539,5	235,8

5 LCS CL COOLING CAPACITY

T_{w1} Water inlet temperature
 T_{w2} Water outlet temperature
 T_{bs1} Dry bulb air temperature
 PF Cooling capacity
 PA Power input

LCS	T_{bs1}		25°C		30°C		35°C		40°C		45°C	
	T_{w1}	T_{w2}	PF	PA	PF	PA	PF	PA	PF	PA	PF	PA
	°C	°C	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW
LCS 201 CL	10	5	213,1	66,1	198,5	72,5	182,7	80,0	166,7	88,5	151,2	96,4
	12	7	226,2	68,1	210,7	74,6	194,4	82,1	178,0	90,6	161,4	98,4
	14	9	239,7	70,4	223,5	76,7	206,1	84,4	189,0	92,9	172,0	100,4
	16	11	253,9	72,5	236,2	79,1	218,4	86,7	200,5	94,8	-	-
	18	13	267,6	74,8	249,3	81,3	230,7	89,1	212,2	96,8	-	-
LCS 261 CL	10	5	282,2	76,7	262,8	82,9	242,9	90,0	220,7	98,4	198,5	107,7
	12	7	300,6	78,9	280,5	85,1	259,8	92,4	236,3	100,9	213,8	109,9
	14	9	320,0	81,1	299,3	87,5	277,2	94,9	253,4	103,5	229,1	112,3
	16	11	340,5	83,6	318,1	90,0	295,0	97,5	270,5	106,3	-	-
	18	13	361,5	86,3	338,7	92,9	314,2	100,1	288,0	109,1	-	-
LCS 272 CL	10	5	286,3	85,0	267,4	93,0	247,3	102,2	227,3	112,6	205,9	123,8
	12	7	304,5	87,4	284,4	95,4	264,2	104,5	242,3	115,3	220,5	126,4
	14	9	323,2	89,8	302,4	97,9	281,1	107,1	257,8	118,0	235,1	129,0
	16	11	342,7	92,6	321,4	100,6	297,9	109,8	274,3	120,9	-	-
	18	13	362,5	95,5	339,7	103,4	315,5	112,5	290,8	123,6	-	-
LCS 301 CL	10	5	313,1	91,6	291,1	99,6	268,4	108,3	243,5	117,3	218,8	126,6
	12	7	333,4	94,1	309,7	102,4	285,5	111,4	259,8	120,6	234,8	129,9
	14	9	353,9	97,0	329,6	105,3	303,4	114,2	276,8	123,9	251,1	133,2
	16	11	375,3	100,1	349,3	108,2	322,6	116,9	295,1	126,9	-	-
	18	13	397,2	102,9	369,4	111,0	342,3	119,9	312,9	129,8	-	-
LCS 322 CL	10	5	334,9	100,0	309,7	108,5	284,2	118,1	256,8	129,5	230,0	140,6
	12	7	356,1	103,1	330,3	111,6	303,9	121,5	274,6	133,0	247,2	143,6
	14	9	379,2	106,2	351,8	114,8	323,4	125,0	293,5	136,5	265,4	146,6
	16	11	401,8	109,7	374,2	118,5	344,1	128,6	313,2	140,0	-	-
	18	13	425,7	113,2	396,3	122,3	364,9	132,7	333,0	143,5	-	-
LCS 351 CL	10	5	374,0	93,5	337,5	107,5	313,7	117,9	289,0	129,9	263,5	143,3
	12	7	401,9	95,0	359,4	110,3	334,4	120,6	308,3	132,8	281,7	146,2
	14	9	407,8	104,3	382,7	113,2	355,9	123,6	328,9	135,7	300,7	148,9
	16	11	433,0	107,5	406,3	116,3	378,3	126,5	349,2	138,6	-	-
	18	13	458,2	110,8	430,0	119,4	400,1	129,5	370,4	141,9	-	-
LCS 372 CL	10	5	413,3	105,0	366,5	122,8	337,8	133,8	308,7	145,6	277,2	157,6
	12	7	418,1	116,0	390,3	126,1	360,5	137,2	329,9	149,3	297,5	161,6
	14	9	444,5	119,4	414,8	129,5	384,2	140,8	351,6	153,1	318,4	165,5
	16	11	471,1	123,1	441,0	133,3	408,5	144,2	374,3	156,5	-	-
	18	13	498,6	126,8	467,4	136,6	432,9	147,6	398,1	160,3	-	-
LCS 422 CL	10	5	444,1	128,0	414,9	140,2	384,3	154,0	352,4	170,3	319,8	187,4
	12	7	472,0	131,8	441,3	143,9	408,8	158,0	375,2	174,6	341,7	191,3
	14	9	501,5	135,9	468,8	148,0	434,1	162,2	399,4	179,1	364,0	195,1
	16	11	531,4	140,2	496,6	152,3	460,4	166,5	423,1	183,4	-	-
	18	13	561,6	144,6	524,3	156,6	486,9	170,5	448,9	187,3	-	-
LCS 482 CL	10	5	501,9	144,0	469,2	156,5	436,2	171,5	399,5	188,6	362,0	206,4
	12	7	529,4	147,6	496,8	160,4	460,4	175,7	424,2	193,0	385,9	210,2
	14	9	559,7	151,5	525,5	164,7	488,3	180,0	449,1	197,8	410,0	214,6
	16	11	592,2	156,0	555,6	169,1	516,0	184,5	474,0	202,4	-	-
	18	13	627,3	161,0	587,0	173,9	546,9	189,6	503,1	207,1	-	-
LCS 532 CL	10	5	550,2	157,8	514,7	171,4	474,2	187,2	432,4	205,6	391,1	223,2
	12	7	584,3	162,2	544,9	176,1	502,9	192,0	459,5	210,7	416,9	227,9
	14	9	620,5	167,0	578,1	181,1	534,6	197,5	488,7	215,9	444,0	232,6
	16	11	657,8	172,4	613,0	186,3	567,1	203,4	519,2	221,2	-	-
	18	13	692,6	177,8	647,5	192,2	600,6	209,3	551,9	227,0	-	-

6 LCS F FREE COOLING CAPACITY

T_{w1} Water inlet temperature
 T_{bs1} Dry bulb air temperature
 PFC Cooling capacity

LCS F	T_{bs1} T_{w1} °C	LCS FS					LCS FL				
		-5°C	0°C	5°C	10°C	12°C	-5°C	0°C	5°C	10°C	12°C
		PFC	PFC	PFC	PFC	PFC	PFC	PFC	PFC	PFC	PFC
		kW	kW	kW	kW	kW	kW	kW	kW	kW	kW
LCS 201 F	10	139,3	92,0	45,7	-	-	128,0	84,6	42,0	-	-
	12	157,6	110,2	63,7	-	-	144,9	101,3	58,6	-	-
	15	185,0	137,5	90,9	45,1	26,9	170,0	126,4	83,5	41,4	24,8
	18	212,2	164,6	117,8	71,9	53,7	195,0	151,3	108,2	66,0	49,3
LCS 261 F	10	249,7	164,8	81,7	-	-	210,6	139,1	68,7	-	-
	12	282,3	197,5	114,1	-	-	238,2	166,5	96,1	-	-
	15	331,1	246,1	162,4	80,5	48,1	279,4	207,6	136,9	67,9	40,6
	18	379,7	294,4	210,5	128,4	96,0	320,4	248,1	177,6	108,3	80,9
LCS 272 F	10	249,7	165,0	81,6	-	-	210,7	139,0	68,8	-	-
	12	282,5	197,5	114,2	-	-	238,3	166,6	96,1	-	-
	15	331,4	246,1	162,6	80,4	48,2	279,6	207,5	137,0	67,9	40,6
	18	379,9	294,4	210,7	128,5	96,1	320,4	248,3	177,7	108,3	80,9
LCS 301 F	10	255,3	168,5	83,5	-	-	214,0	141,2	69,9	-	-
	12	288,7	201,8	116,7	-	-	242,1	169,1	97,7	-	-
	15	338,6	251,4	165,9	82,2	49,1	284,0	210,8	139,1	68,9	41,1
	18	388,0	300,7	215,1	131,2	97,9	325,7	252,3	180,3	110,0	82,2
LCS 322 F	10	258,2	170,6	84,5	-	-	215,9	142,5	70,5	-	-
	12	292,0	204,1	117,8	-	-	244,2	170,6	98,6	-	-
	15	342,4	254,3	168,0	83,2	49,6	286,3	212,6	140,1	69,6	41,5
	18	392,6	304,3	217,7	132,7	99,2	328,4	254,4	181,8	110,7	82,8
LCS 351 F	10	364,3	240,6	119,1	-	-	318,3	210,2	104,1	-	-
	12	412,0	287,9	166,6	-	-	360,1	251,6	145,2	-	-
	15	483,3	362,6	237,0	117,4	70,2	422,3	313,7	140,4	102,6	61,3
	18	554,1	429,4	307,3	187,3	140,1	484,0	375,2	268,3	163,5	122,2
LCS 372 F	10	368,2	243,1	120,4	-	-	320,9	211,9	104,9	-	-
	12	416,4	291,2	168,3	-	-	362,9	253,8	146,6	-	-
	15	488,4	359,1	239,6	118,6	70,9	425,6	316,1	140,4	103,3	61,9
	18	559,9	434,1	310,7	189,1	141,5	488,0	378,3	270,3	164,8	123,0
LCS 422 F	10	366,4	241,7	119,8	-	-	318,6	210,2	104,0	-	-
	12	414,6	289,6	167,1	-	-	360,1	251,6	145,2	-	-
	15	485,9	360,7	238,2	118,0	70,7	422,4	313,4	140,4	102,3	61,3
	18	557,1	431,7	308,7	188,2	140,4	484,4	375,3	268,1	163,2	122,1
LCS 482 F	10	389,0	256,4	127,0	-	-	339,9	224,3	111,1	-	-
	12	439,7	307,3	177,5	-	-	384,5	268,6	155,2	-	-
	15	515,6	382,9	252,7	125,2	74,9	450,9	334,7	220,9	109,3	65,3
	18	590,8	458,0	327,2	199,5	149,0	516,9	400,4	286,0	174,3	130,3
LCS 532 F	10	394,1	260,1	128,9	-	-	343,4	226,7	112,1	-	-
	12	445,4	311,3	179,7	-	-	388,3	271,4	156,8	-	-
	15	522,6	387,7	255,9	126,7	75,7	455,6	338,1	223,2	110,5	66,0
	18	598,7	463,7	331,6	201,8	150,8	522,1	404,4	289,1	175,8	131,4

7 HEAT RECOVERY OPTIONS

T_{w_1}	Inlet water temperature at recuperator
T_{w_2}	Outlet water temperature at recuperator
T_{bs_1}	Outdoor air temperature (dry bulb)
CS	Standard version
CL	Low noise version
PTR	Heating capacity heat recovery

LCS			LCS CS				LCS CL			
	T_{bs_1}		30	35	40	45	30	35	40	45
	T_{w_1}	T_{w_2}	PTR	PTR	PTR	PTR	PTR	PTR	PTR	PTR
	°C	°C	kW	kW	kW	kW	kW	kW	kW	kW
LCS 201	35	40	74,2	82,2	96,9	108,9	71,4	79,1	93,3	104,8
	40	45	73,8	80,0	95,1	104,9	71,0	77,0	91,5	101,0
	45	50	64,0	69,8	83,1	90,2	61,6	67,2	80,0	86,8
LCS 261	35	40	98,8	109,1	128,2	144,3	98,8	109,1	128,2	144,3
	40	45	97,7	106,0	126,2	139,1	97,7	106,0	126,2	139,1
	45	50	84,8	92,0	110,1	120,0	84,8	76,1	110,1	120,0
LCS 272	35	40	100,2	111,2	130,9	146,9	97,4	108,1	127,2	142,8
	40	45	21,7	108,0	128,6	141,4	96,5	105,0	125,0	137,5
	45	50	86,5	93,8	112,1	122,2	84,1	91,2	109,0	118,8
LCS 301	35	40	111,7	123,5	145,3	163,2	106,1	117,3	138,0	155,0
	40	45	25,3	120,0	142,7	157,1	104,9	114,0	135,6	149,2
	45	50	96,0	104,3	124,8	135,7	91,2	99,1	118,6	128,9
LCS 322	35	40	119,2	131,8	154,9	173,9	112,6	124,6	146,5	164,4
	40	45	28,0	128,0	152,4	167,6	111,4	121,0	144,1	158,4
	45	50	102,3	111,2	133,1	144,8	96,7	105,1	125,8	136,9
LCS 351	35	40	128,4	142,0	166,8	187,6	123,7	136,9	160,8	180,8
	40	45	31,7	138,0	164,4	180,8	122,2	133,0	158,4	174,2
	45	50	110,4	120,0	143,6	156,0	106,4	115,7	138,4	150,3
LCS 372	35	40	139,7	154,4	181,3	204,2	134,1	148,2	174,1	196,0
	40	45	37,4	150,0	178,4	196,4	132,3	144,0	171,2	188,6
	45	50	120,1	130,5	155,9	169,5	115,3	125,2	149,7	162,8
LCS 422	35	40	156,3	173,1	203,2	228,5	151,6	168,0	197,2	221,7
	40	45	42,1	168,0	199,9	220,1	149,8	163,0	194,0	213,5
	45	50	134,3	146,0	174,6	190,0	130,3	141,6	169,4	184,4
LCS 482	35	40	176,6	195,9	229,9	258,5	171,0	189,7	222,7	250,3
	40	45	50,8	190,0	226,1	248,9	169,3	184,0	219,0	241,0
	45	50	152,1	165,2	197,6	214,8	147,3	160,0	191,3	208,0
LCS 522	35	40	197,2	218,3	256,5	288,3	186,9	207,0	243,2	273,4
	40	45	195,0	212,0	252,4	277,6	184,8	201,0	239,3	263,2
	45	50	169,7	184,6	220,5	239,4	160,9	175,0	209,1	227,0

8 EVAPORATOR WATER PRESSURE DROP

The diagram shows the pressure drops on the water side (Δp_w) as a function of the water flow rate (Q_w), assuming an average water temperature of 10°C, referred to the standard units (evaporator only) and units with free-cooling options free-cooling heat exchanger, 3-way valve and evaporator).

It is mandatory to install a metal mesh filter in (inlet pipe) to protect the exchanger from scale or impurities present in the pipes. For this reason the filter pressure drop must be considered in the total water pressure drop calculation.

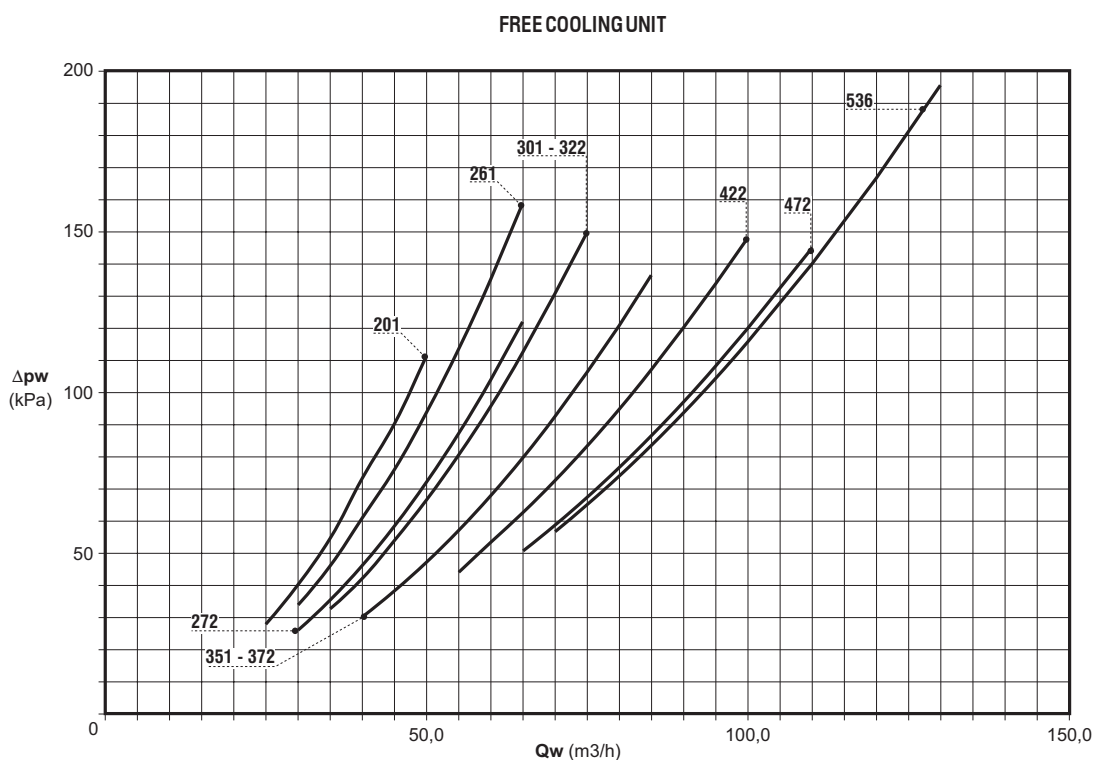
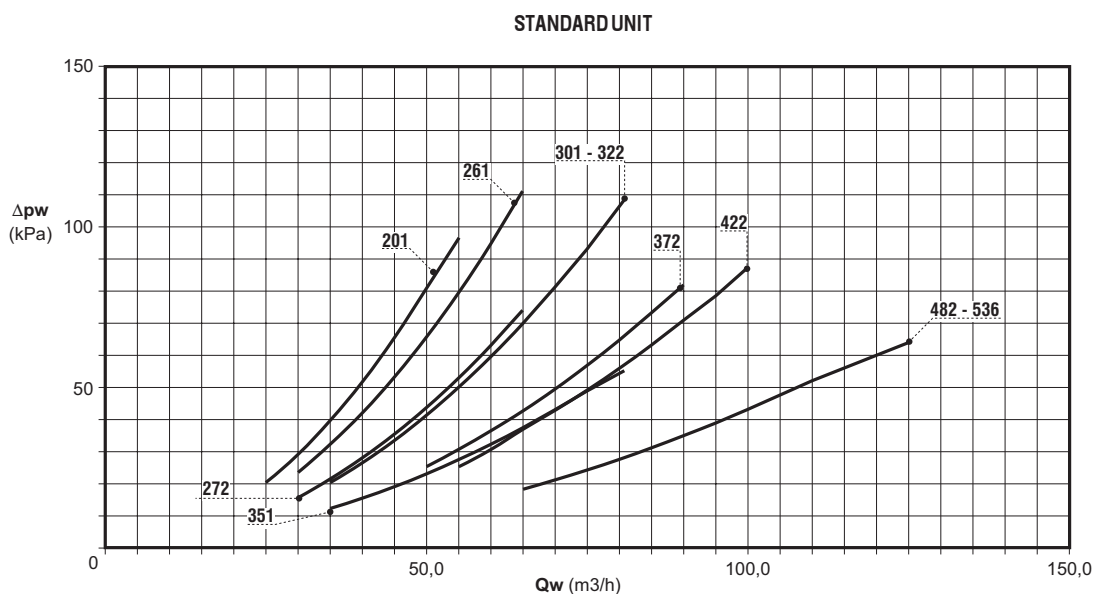
The filter pressure drop can be calculate with the folowing formula:

$$\Delta P_w = (Q_w / 258)^2$$

where

ΔP_w is the pressure drop on water side (kg/cm²)

Q_w is the water flow (m³/h)



9 HYDRAULIC OPTIONS

LCS units may be equipped with 4 types of pumping systems, complete with expansion tank, and inertial storage reservoirs:

- single standard pump
- single uprated pump
- standard pump and back-up pump
- uprated pump and back-up pump.

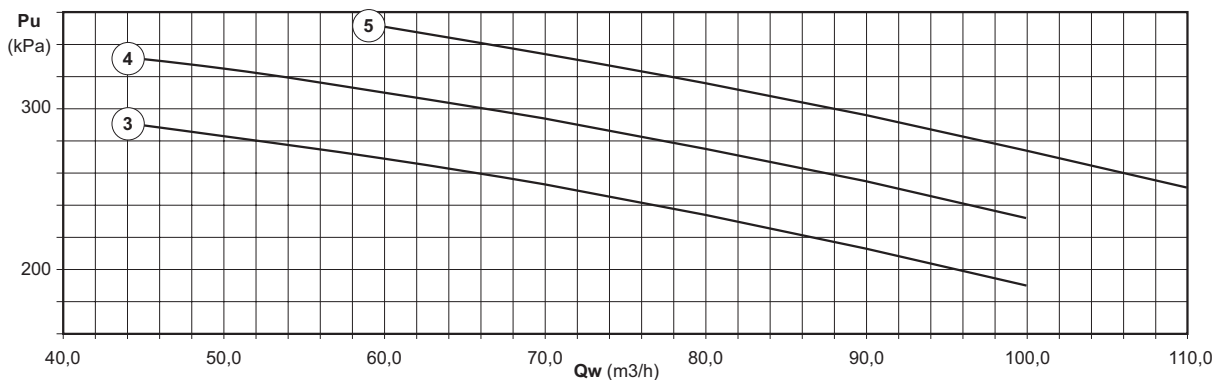
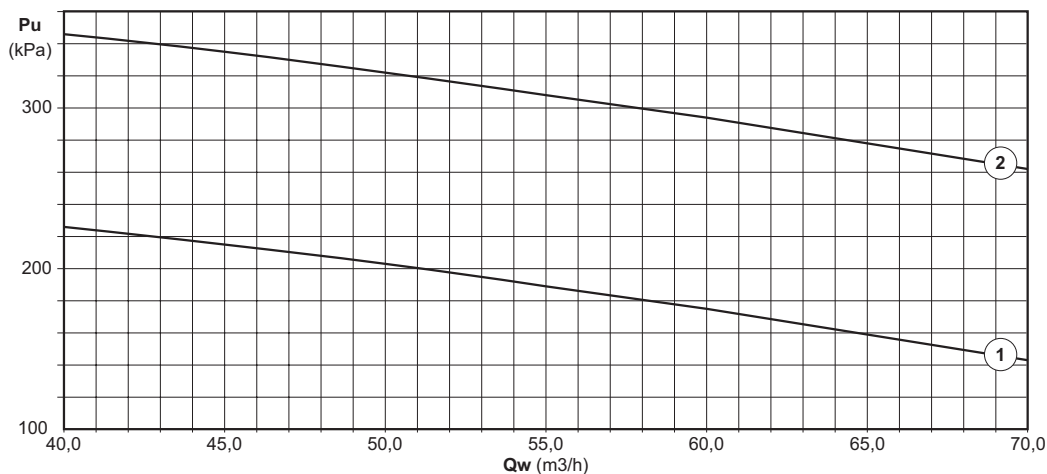
In the case of pump systems including a back-up pump, the microprocessor controls the pumps in such a way as to equally divide the hours of operation, changing over the pumps in the event of a fault.

The water tank is located between the condenser coils and can be mounted together with all the other options available.

LCS		201	261	272	301	322	351	372	422	482	532
Inertial storage reservoir capacity	dm ³	800	600	600	600	600	1230	1230	1230	1230	1230
Expansion tank	dm ³	25	25	25	25	25	25	50	50	50	50
Standard pump diagram		1	1	1	1	1	2	2	2	2	2
LCS Available head (nominal flow rate)	kPa	198	158	173	155	138	243	220	202	201	176
Rated electrical output	kW	4,00	4,00	4,00	4,00	4,00	7,50	7,50	7,50	7,50	7,50
Operating current	A	6,9	6,9	6,9	6,9	6,9	13,0	13,0	13,0	13,0	13,0
Uprated pump diagram		3	3	4	3	3	4	3	4	4	5
LCS Available head (nominal flow rate)	kPa	319	278	293	274	257	284	261	243	242	258
Rated electrical output	kW	7,50	7,50	7,50	7,50	7,20	9,20	9,20	9,20	9,20	11,00
Operating current	A	13,0	13,0	13,0	13,0	12,5	15,9	15,9	15,9	15,9	19,0

The diagram shows the hydraulic pumps head curves (standard and uprated), as a function of the water flow, to be installed on LCS units.

In order to calculate the available head is necessary to deduct the water pressure drop (found in the diagram of "EVAPORATOR ORESSURE DROPS") from pump head.

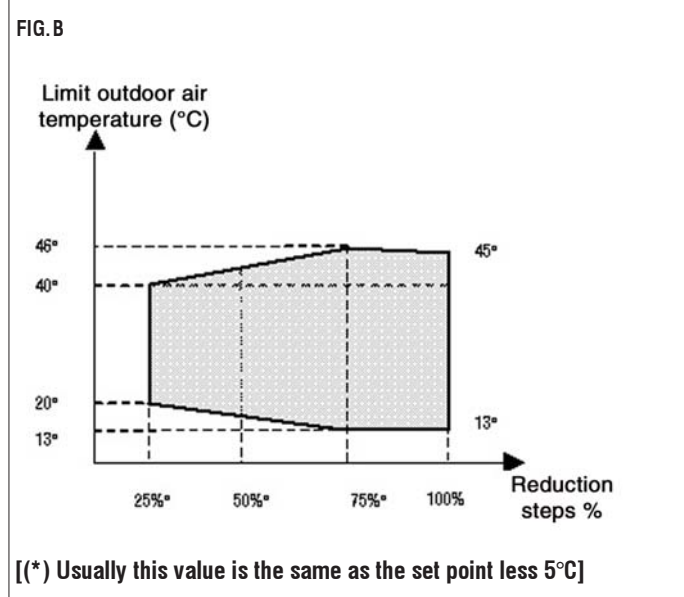
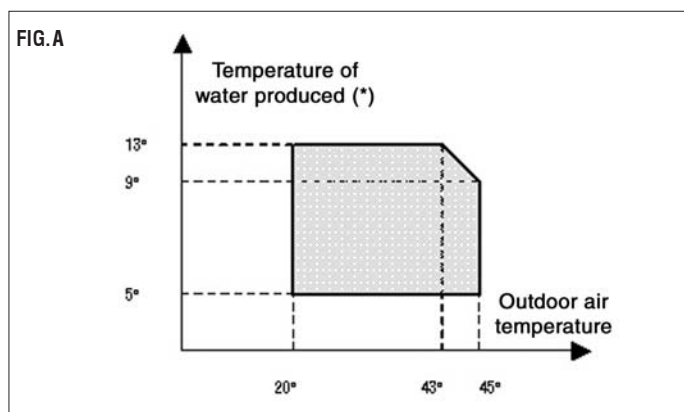


10 OPERATING RANGE

All LCS units are designed for outdoor installation in technological and industrial applications. The materials are chosen so as to be able to withstand different atmospheric conditions. In the case of especially harsh environments, such as in marine atmospheres, special versions are available..

LCS C VERSION FOR COOLING FUNCTION ONLY

Fig. A illustrates the range of normal applications without condensation control. Fig. B shows the possible range of application according to the number of capacity reduction steps active and the minimum and maximum temperatures allowed, beyond which a condensation control device is mandatory.



Order to work with outdoor temperatures below 20°C, it is essential to install a condensation control device.

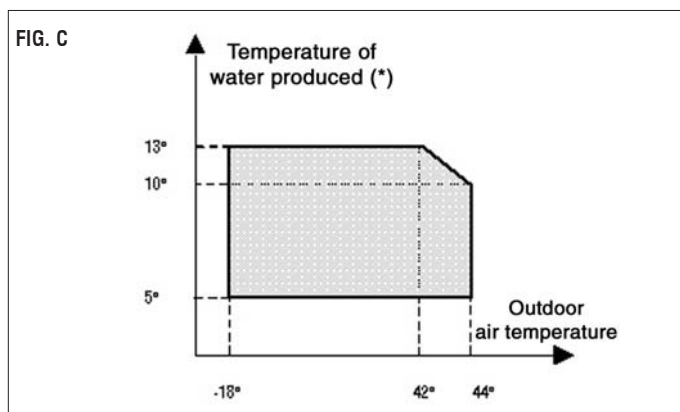
- The condensation control device varies the fan speed through a phase cut device in the following temperature conditions: $-15^{\circ}\text{C} < T_{\text{outdoor air}} < +20^{\circ}\text{C}$
- In addition to the condensation control device, on request a "flooding" device may be provided which contains a high-resilience stainless steel tank for the fluid ($T_{\text{min.}} -40^{\circ}\text{C}$) and a control valve allowing the range of application to be extended to the following temperature conditions: $-35^{\circ}\text{C} < \text{outdoor air } T < -15^{\circ}\text{C}$.

Note: for applications with outdoor temperatures T above 45°C and/or chilled fluids above 13°C the unit may be configured in an R134a version, supplied on request. This configuration enables continuous chiller operation in outdoor temperatures up to $+55^{\circ}\text{C}$.

VERSION WITH LCS F FREE-COOLING

The FREE-COOLING option is available for all models in the version for cooling only. This function cannot be associated with heat pump operation. Given the particular nature of the application, all units are equipped with a condensation control device and ADVANCED-type microprocessor control, incorporated as standard features.

Fig. C below illustrates the type of normal applications for Free-Cooling units.



The lower limit is determined by the freezing threshold of solutions containing 35% glycol by weight, the maximum concentration allowed for the gaskets used on the pumps. Special ceramic gaskets can be supplied on request for the pumps to enable operation with temperatures below those specified (use of solutions containing up to 50% glycol by weight).

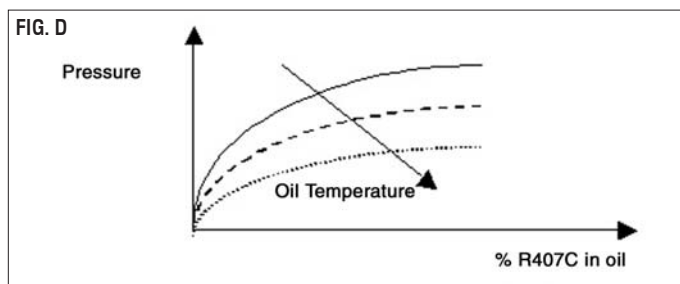
Minimum temperature of water produced °C	5	2	-1	-5	-10
% of ethylene glycol	0	10	15	25	30
Freezing temperature of mixture	0	-4	-8	-14	-18

The Free-Cooling units and the heat pump model are available with a heating element installed in the compressor crankcase. Fig. D illustrates a specific property [Charles' Law] of gases, which are more soluble in liquids as the pressure increases but less soluble as the temperature increases: if the oil in the sump is held at a constant pressure in the heating element causing an increase in temperature will significantly reduce the amount of refrigerant dissolved in it, thus ensuring that the lubricating function desired is maintained.

A problem of inadequate lubrication may occur when the crankcase is not correctly heated, especially after long periods of disuse. Due to the suction effect of the compressor, an abrupt pressure drop occurs inside the crankcase, resulting in abundant evaporation of the refrigerant previously dissolved in the oil.

In the absence of heating elements this phenomenon would cause two problems:

- > dilution of the oil, hence inadequate lubrication;
- > migration of the oil toward the cooling circuit to the entrainment effect of the refrigerant.



10 OPERATING RANGE

The use of heating elements is particularly important especially at first start-up. In this connection it is recommended that they are switched on at least 12 hours before the compressors are started..

If the outdoor air temperature drops drastically, the water temperature of the equipment is controlled through the fan modulating action and under extreme conditions (strong prevalent winds) through the additional modulation action of the 3-way valve. The joint modulating action of the 3-way valve is available only on request for special cases.

WATER FLOW TO EVAPORATOR

The nominal flow rate is based on a thermal differential of 5° C between inlet and outlet water, in relation to the cooling capacity provided at the nominal water (12-7 °C) and air (35°C) temperatures.

The maximum allowed flow rate is associated with a thermal differential of 3 °C: higher flow rates will cause high pressure drops.

The minimum allowed flow rate is associated with a thermal differential of 8 °C or a minimum pressure drop of 10 kPa: lower flow rates cause a reduction in heat exchange coefficients and excessively low evaporation temperatures, which may trigger the safety devices and cause the unit to stop.

CHILLED WATER TEMPERATURES

The minimum temperature of the water leaving the evaporator is 5 °C: lower temperatures are possible, but for such applications the Manufacturer should be consulted at the time the order is placed.

The maximum temperature of the water entering the evaporator is 20 °C. To allow higher temperatures specific equipment solutions must be adopted (split circuits, three-way valves, bypasses, buffer tanks, R134a refrigerant): contact the Manufacturer.

OUTDOOR AIR TEMPERATURE

The units are designed and built to work with outdoor temperatures ranging from -10 (with condensation control) to 45 °C. Contact the Manufacturer in the event of outdoor temperatures beyond this range.

On request, the units may be equipped with an electric heating element serving to heat the evaporator in cases where the unit is exposed to rigid temperatures during wintertime periods of quiescence.

The heating element is activated whenever the temperature of the water leaving the evaporator falls below the temperature set on the antifreeze heating element.

OPERATION WITH WATER AT LOW TEMPERATURE



The standard units making up the series are not designed to work with chilled water temperatures below 5 °C at the evaporator outlet. In order to work below this limit, the unit requires specific technical adjustments: in such cases contact the Manufacturer.

11 CALCULATION FACTORS

WATER TEMPERATURE DROP/RISE DIFFERENT THAN 5						
Water temperature drop/rise	3	4	5	6	7	8
Capacity correction factor	0,975	0,990	1,000	1,015	1,030	1,040
Power input correction factor	1,000	1,000	1,000	1,000	1,000	1,000
Water flow correction factor	1,630	1,240	1,000	0,850	0,740	0,650
Water pressure drop correction factor	2,640	1,530	1,000	0,720	0,540	0,420

OPERATION WITH ETHYLEN GLYCOL AND WATER SOLUTION					
Percentage of glycol	0%	10%	20%	30%	40%
Minimum water outlet temperature	5°C	2°C	-5°C	-10°C	-15°C
Mixture freezing temperature (°C)	0°C	-4°C	-14°C	-18°C	-24°C
Capacity correction factor	1,000	0,998	0,994	0,989	0,983
Water flow correction factor	1,000	1,047	1,094	1,140	1,199
Water pressure drop correction factor	1,000	1,157	1,352	1,585	1,860

OPERATION WITH PROPYLEN GLYCOL AND WATER SOLUTION					
Percentage of glycol	0%	10%	20%	30%	40%
Minimum water outlet temperature	5°C	2°C	-5°C	-10°C	-15°C
Mixture freezing temperature (°C)	0°C	-4°C	-14°C	-18°C	-24°C
Capacity correction factor	1,000	0,996	0,985	0,971	0,960
Water flow correction factor	1,000	1,022	1,043	1,070	1,098
Water pressure drop correction factor	1,000	1,111	1,307	1,532	1,777

FOULING FACTORS			
Fouling factors (m ² °C / W)	4,4 x 10 ⁻⁵	8,8 x 10 ⁻⁵	17,6 x 10 ⁻⁵
Capacity correction factor	1,000	0,970	0,940
Power input correction factor	1,000	0,990	0,980

12 WATER CIRCUIT

GENERAL GUIDELINES FOR PLUMBING CONNECTIONS

When you are getting ready to set up the water circuit for the evaporator you should follow the directions below and in any case make sure to comply with national or local regulations (use the diagrams included in this manual as your reference).

- Connect the pipes to the chiller using flexible couplings to prevent the transmission of vibrations and to compensate thermal expansions.
- It is recommended to install the following components on the pipes:
 - temperature and pressure indicators for routine maintenance and monitoring of the unit. Checking the pressure on the water side will enable you to verify whether the expansion tank is working efficiently and to promptly detect any water leaks within the equipment.
 - N.B.:** check that the water pressure on the intake side of the pump is at least 0.6 bar. otherwise the buffer tank may undergo damages.
 - traps on incoming and outgoing pipes for temperature measurements, which can provide a direct reading of the operating temperatures. Temperature readings can in any case be obtained from the microprocessor installed on the unit.
 - regulating valves (gate valves) for isolating the unit from the water circuit.
 - metal mesh filter (incoming pipes), with a mesh not to exceed 1 mm, to protect the exchanger from scale or impurities present in the pipes.
 - air vent valves, to be placed at the highest points of the water circuit for the purpose of bleeding air. [The internal pipes of the unit are fitted with small air vent valves for bleeding the unit itself: This operation may only be carried out when the unit is disconnected from the power supply. - especially in the Free-Cooling models, make sure the circuit is completely full of water, then bleed air from the water coils to prevent pump cavitation].
 - drainage valve and, where necessary, a drainage tank for emptying out the equipment for maintenance purposes or when the unit is taken out of service at the end of the season. [A 1" drainage valve is provided on the optional water buffer tank: This operation may only be carried out when the unit is disconnected from the power supply.
 - Carefully evaluate the minimum air temperatures the unit may be exposed to and define the % of antifreeze to be added accordingly. In the FS-FL models, the use of glycol solutions (max. 30% in weight) is mandatory in order to prevent hard-to-repair damage to the finned coil caused by freezing. Carefully determine the minimum air T the unit may be exposed to and calculate the % of antifreeze products to be added accordingly.

! Failure to use antifreeze solutions may result in serious damages to free-cooling coils and water/cooling circuit.

WATER CONNECTION TO THE EVAPORATOR

! It is of fundamental importance that the incoming water supply is hooked up to the connection marked "Water Inlet". Otherwise the evaporator would be exposed to the risk of freezing since the antifreeze thermostat would not be able to perform its function; moreover the reverse cycle would not be respected in the cooling mode, resulting in additional risks of malfunctioning or flow switch failure. The dimensions and position of plumbing connections are shown in the dimension tables at the end of the manual.

! The water circuit must be set up in such a way as to guarantee that the nominal flow rate of the water supplied to the evaporator remains constant (+/- 15%) in all operating conditions.

The compressors work intermittently. Since the chilling requirements of the user generally do not coincide with the compressor output. In systems containing a small amount of water, where the water itself has a lower thermal inertia effect, you should check that the water content of the cool section of the system satisfies the following condition:

$$V = \frac{Cc \times \Delta\tau}{\rho \times Sh \times \Delta T \times Ns}$$

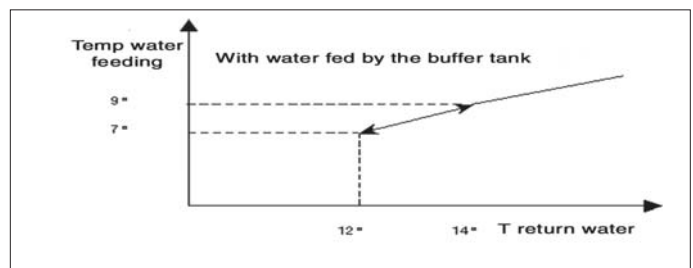
V	= water content in cool section	[m ³]
Sh	= specific heat of the fluid	[J/(kg·°C)]
ρ	= fluid density	[kg/m ³]
Δτ	= minimum time lapse between 2 compressor restarts	[s]
ΔT	= allowed water T differential	[°C]
Cc	= Cooling capacity	[W]
Ns	= N° of reduction steps	

Irrespective of their configuration, all units have a single external plumbing connection (inlet + outlet). This is an important aspect in that it reduces on-site connection times. All units are normally provided with a flow switch that triggers an immediate stop of the unit in the event of faults, thus preventing the plate heat exchanger from freezing or being damaged. On the evaporator outlet side there is also a water temperature sensor, which is connected to the anti-freeze thermostat.

For all units, a number of optional features are available for setting up various configurations with:

- single or dual pumps for operating at temperatures as low as -10°C, with a maximum glycol content of 35% [for operating with glycol content > 35% ceramic seals on the pump shafts are available on request];
- buffer tank on the drainage side of the water circuit. This system facilitates the balancing of the inevitable temperature fluctuation occurring as a result of the modulating action of the compressor.

Fig.E shows the integrated and balanced effect of the buffer tank. Its function is to favour precise control over the temperature, according to the ambient parameters of the units connected.



If no inertial buffer tank whether incorporated into the unit or installed in another point of the water circuit, every compressor start or stop would be associated with temperature fluctuations equal to ΔT/reduction steps.

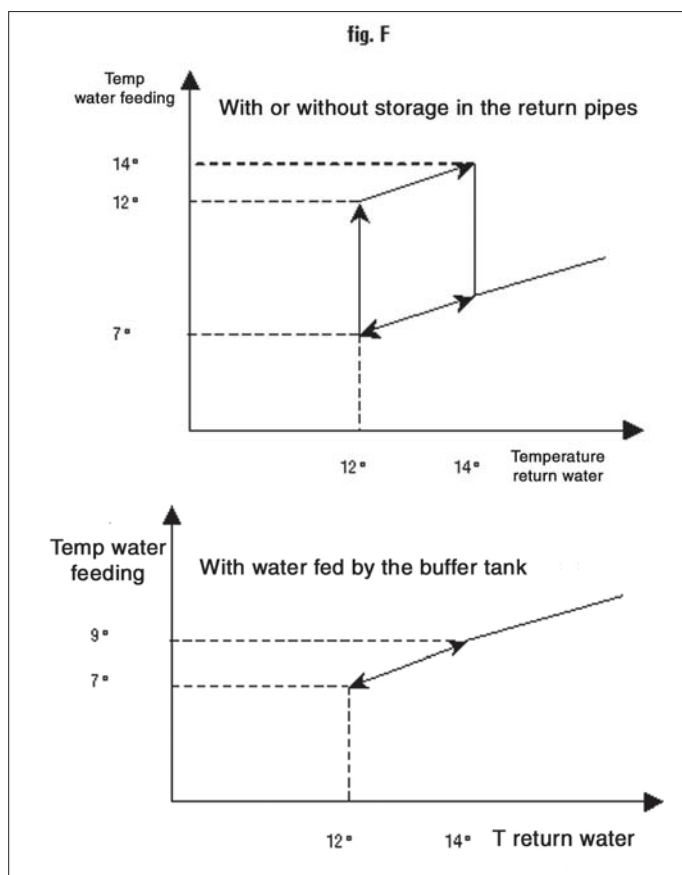
This situation could obviously improve depending on the number of capacity reduction steps.

12 WATER CIRCUIT

Fig. F illustrates a system with and without an inertial buffer tank, applicable for control with one reduction step. The balancing effect obtained thanks to the inertial buffer tank is clearly apparent, given the impossibility of maintaining the ambient parameters, especially relative humidity, when the inlet water temperature fluctuates by 7°C as shown.

It is possible to control the inlet water temperature setpoint by:

- an adjustment of the water flow. This situation is however undesirable because, supposing that the entire room requires a reduced cooling capacity and then a maximum cooling capacity, it would not be possible to control temperature and relative humidity.
- bypassing the hot gases, but this situation is not desirable from an energy standpoint, since it would cause a reduction in cooling capacity equivalent to the electrical power absorbed by the compressor.
- installing an inertial buffer tank thus represents the simplest and most energy-efficient solution, since it optimises the combined operation of the water chiller and indoor units.



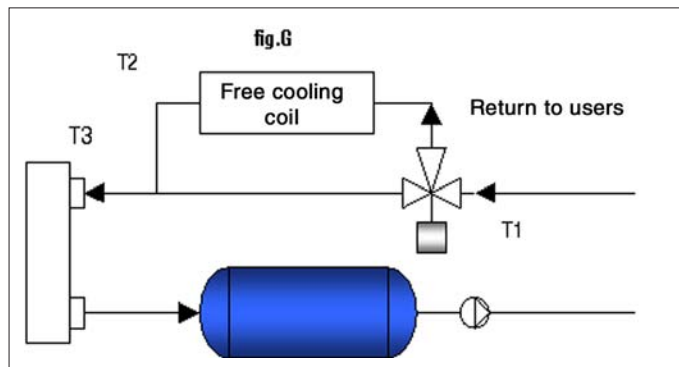
When a water pump kit with a dual pump (optional) is chosen, the built-in microprocessor enables automatic control of the pump stand-by and rotation periods. In this case a warning signal is generated and sent to the terminal board and an external LED (on the front of the unit) will light up to signal the condition. The pump system is incorporated in the structure of the unit and is arranged so as to ensure that the pump motors are always cooled by outside air.

FREE COOLING WATER CIRCUIT SYSTEM

The free cooling versions are provided with a 3-way valve that deviates the water flow to the free cooling coils.

The free cooling coil versions are installed outside the condensation coils.

The valve is actuated by the microprocessor (advanced type, standard feature in the FC version) which calculates the temperature difference between the water temperature setpoint (1) and the outdoor air (t2). [fig. G]

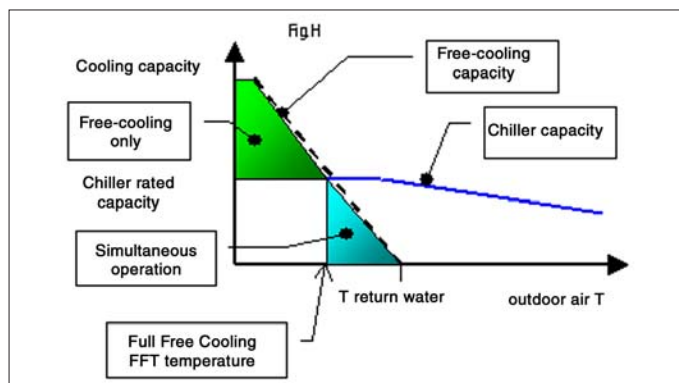


A sensor is installed at the evaporated inlet (t3) to provide for additional compressor start-ups in the event that the free-cooling function is not sufficient on its own to satisfy the total cooling requirements. T1 and T3 are constantly monitored by the microprocessor installed on the unit in order to detect any fault of the free cooling 3-way valve. For example, if the free-cooling function is activated, the valve should be actuated accordingly, but t1 and t3 are equal. This means that the valve is blocked. It will be necessary to decide whether simply to generate an alarm or stop the unit when a malfunctioning occurs in the free-cooling system.

Among the various available options, the pumps may be chosen with different external static pressures. For chiller units in the free-cooling version it is recommended to choose pumps with high external static pressures in order to compensate for the greater pressure drops which occur due to the additional 3-way valve, free-cooling exchanger and use of glycol mixtures.

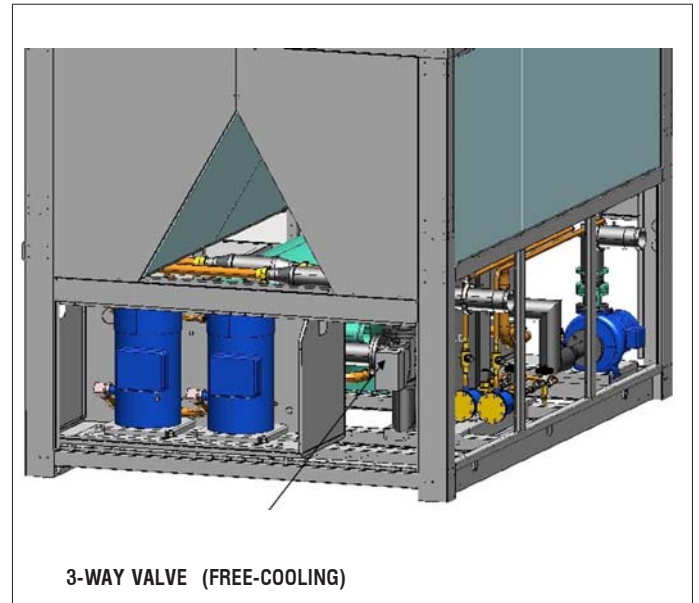
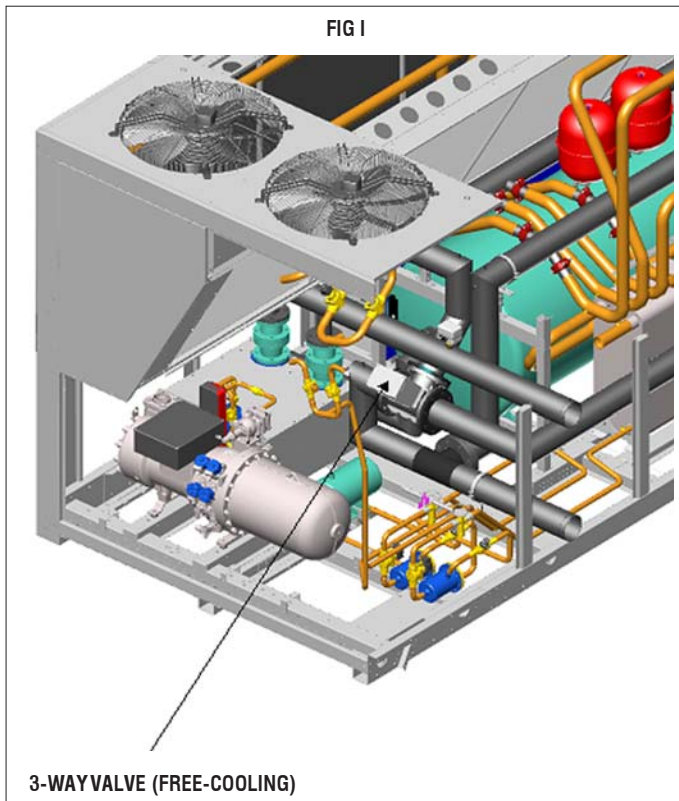
[see the technical sheet for the use of glycol]

The free cooling units permit high energy saving when outdoor temperature is lower than the circulating fluid temperature (process industry, close control applications, information technology, congress halls, etc.). Free cooling circuit performance depends on the difference between outdoor air T and circulating water temperature, as illustrated in Fig. H.



12 WATER CIRCUIT

When the outdoor temperature (T_2) falls below the temperature of the water returning from users (T_1), a heat exchange may occur. This is what happens, in fact, when the free-cooling function is activated and accompanied by one or two mechanical cooling steps, depending on the case. Across the entire range of free-cooling units, the cooling capacity is modulated by regulating the fan speed so as to maintain a constant outlet water T . To prevent blockage of the 3-way valve, the latter is automatically activated up to 30% every 140 hours of operation while the chiller is running. The 3-way valve is configured so as to be accessible in case of malfunctioning of the servomotor, which can be accessed by removing the metal guard as shown in figure I.



SAFETY VALVE DRAIN PIPES

! Safety valves are fitted in each refrigerant circuit: some regulations require that the refrigerant is drained from the valves be conveyed to the outside by means of a suitable pipe with a diameter at least matching that of the valve drainage outlet; the valve must not bear the weight of the pipe. The valves positioned on the compressor outlet only discharge hot saturated gas; those on the liquid receivers, despite being positioned in the top part of the latter, may discharge saturated liquid and pose a greater hazard of burns due to the strong dehydrating effect caused by the sudden evaporation of refrigerant fluid in contact with bodies having a $T > -41^\circ\text{C}$.

! **WARNING:** always direct the drain pipe toward an area where the discharge cannot harm people.

! A standard feature of LCS units is a device for controlling the flow rate (flow switch or differential pressure switch) in the water circuit in the immediate vicinity of the evaporator.

Any tampering with said device will immediately invalidate the warranty. It is advisable to install a metal mesh filter on the inlet water pipe.

! It is strongly recommended to install a safety valve in the water circuit. In the event of serious equipment faults (e.g. fire) it will enable water to be drained from the system, thereby preventing possible bursts. Always connect the drain outlet to a pipe with a diameter at least as large as that of the valve opening and direct it toward an area where the discharge of water cannot harm people. This is a standard feature of units equipped with the optional buffer tank.

! **WARNING:** When making the plumbing connections, make sure there are no open flames in proximity to or inside the unit.

13 ELECTRICAL DATA

LCS		201	261	272	301	322	351	372	422	482	532
Power supply	V-f-Hz	400 - 3 - 50 + N									
Rated current absorption	A	136,4	160,6	179,6	186,1	198,8	213,8	235,8	272,8	297,1	314,1
Maximum input power	kW	103,2	120,8	140,8	142,8	166,8	164,4	190,4	206,4	224,1	238,1
Maximum current absorption	A	176,4	203,6	231,6	236,6	269,6	259,8	316,8	352,8	380,1	400,1
Starting current	A	437,4	504,6	396,6	592,6	435,6	643,8	522,8	613,8	681,1	701,1
Number of axial fans	n°	6 (8)	6	6	6	6	8	8	8	10	10
Rated power of fan motor	kW	6(8)x0,6	6x1,8	6x1,8	6x1,8	6x1,8	8x1,8	8x1,8	8x1,8	10x1,8	10x1,8
Rated current of fan motor	A	6(8)x2,7	6x3,6	6x3,6	6x3,6	6x3,6	6x3,6	1,25	1,25	1,25	1,25
Auxiliary power supply	V-f-Hz	24/1/50									

- The maximum input power is the power supply that must be available in order for the unit to work.
- The maximum current absorption refers to the current that will trigger the internal safety devices of the unit. It is the maximum current allowed in the unit. This value may never be exceeded; it must be used as a reference for determining the size of the power supply line and the related safety devices (refer to the wiring diagram supplied with the units).

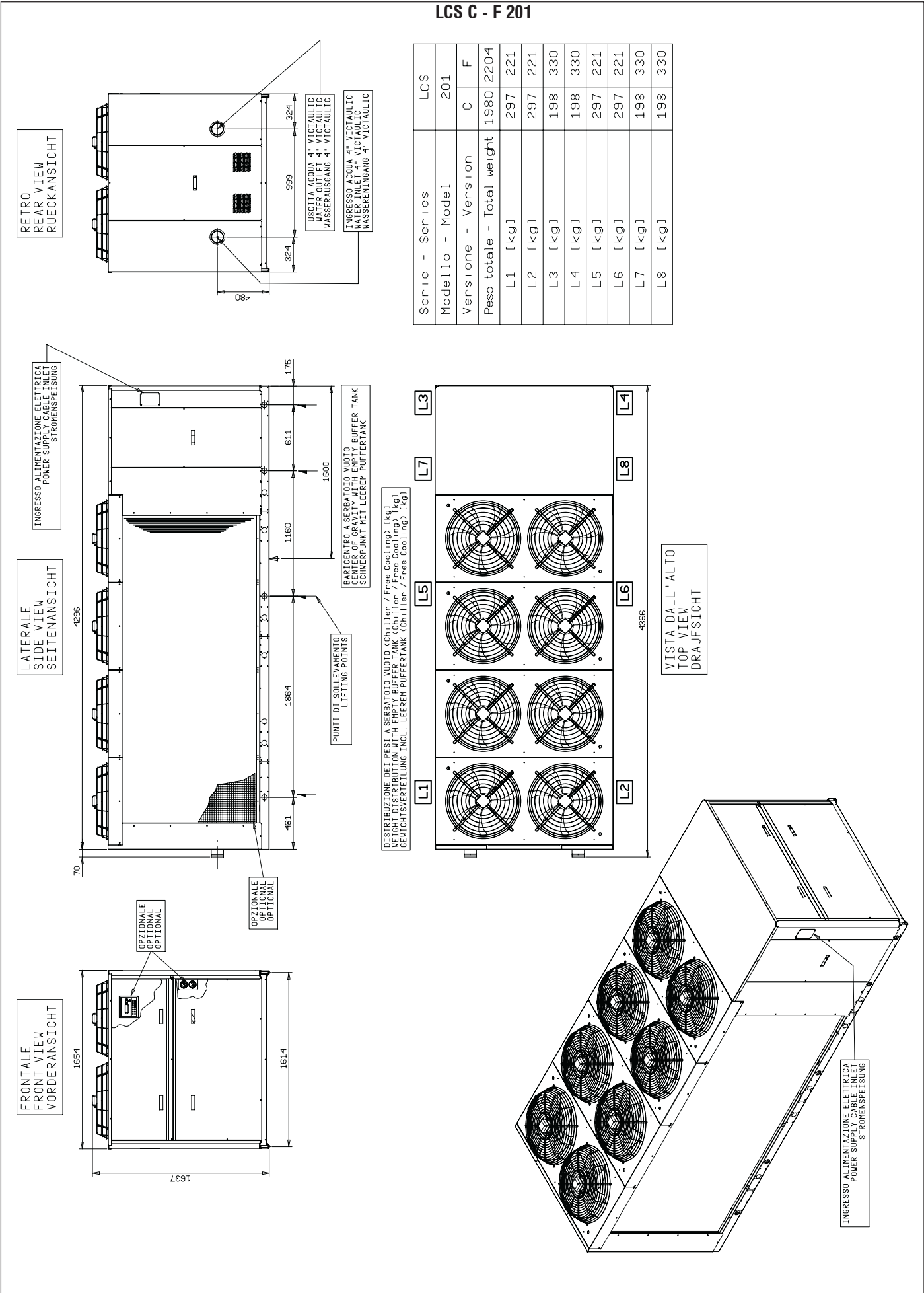
14 SOUND LEVELS

Legend:

- Lp_A** A - weighted sound pressure level (10m distance, 2 directional factor)
Lw Octave band sound power level
Lw_A A - weighted sound power level

LCS	CS / CL FS / FL	Lw								
		125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	Lw A	Lp A
		dB	dB	dB	dB	dB	dB	dB	dB A	dB A
LCS 201	CS	73,5	76,7	77,7	80,6	77,9	73,2	63,1	85,2	57,2
LCS 201	CL	71,3	75,5	74,6	76,2	73,2	63,7	54,8	81,5	53,3
LCS 201	FS	73,5	76,7	77,7	80,6	77,9	73,2	63,1	85,2	57,2
LCS 201	FL	71,3	75,5	74,6	76,2	73,2	63,7	54,8	81,5	53,3
LCS 261	CS	72,1	76,1	80,8	87,8	84,7	76,9	70,4	90,6	62,6
LCS 261	CL	65,0	69,9	76,7	83,0	77,0	69,6	61,5	85,0	57,0
LCS 261	FS	72,1	76,1	80,8	87,8	84,7	76,9	70,4	90,6	62,6
LCS 261	FL	65,0	69,9	76,7	83,0	77,0	69,6	61,5	85,0	57,0
LCS 272	CS	72,1	76,1	80,8	87,8	84,7	76,9	70,4	90,6	62,6
LCS 272	CL	65,0	69,9	76,7	83,0	77,0	69,6	61,5	85,0	57,0
LCS 272	FS	72,1	76,1	80,8	87,8	84,7	76,9	70,4	90,6	62,6
LCS 272	FL	65,0	69,9	76,7	83,0	77,0	69,6	61,5	85,0	57,0
LCS 301	CS	72,1	76,1	80,8	87,8	84,7	76,9	70,4	90,6	62,6
LCS 301	CL	65,0	69,9	76,7	83,0	77,0	69,6	61,5	85,0	57,0
LCS 301	FS	72,1	76,1	80,8	87,8	84,7	76,9	70,4	90,6	62,6
LCS 301	FL	65,0	69,9	76,7	83,0	77,0	69,6	61,5	85,0	57,0
LCS 322	CS	72,1	76,1	80,8	87,8	84,7	76,9	70,4	90,6	62,6
LCS 322	CL	65,0	69,9	76,7	83,0	77,0	69,6	61,5	85,0	57,0
LCS 322	FS	72,1	76,1	80,8	87,8	84,7	76,9	70,4	90,6	62,6
LCS 322	FL	65,0	69,9	76,7	83,0	77,0	69,6	61,5	85,0	57,0
LCS 351	CS	73,4	77,3	82,1	89,1	86,0	78,1	71,6	91,8	63,8
LCS 351	CL	66,2	71,2	77,9	84,2	78,3	70,8	62,7	86,3	58,3
LCS 351	FS	73,4	77,3	82,1	89,1	86,0	78,1	71,6	91,8	63,8
LCS 351	FL	66,2	71,2	77,9	84,2	78,3	70,8	62,7	86,3	58,3
LCS 372	CS	73,4	77,3	82,1	89,1	86,0	78,1	71,6	91,8	63,8
LCS 372	CL	66,2	71,2	77,9	84,2	78,3	70,8	62,7	86,3	58,3
LCS 372	FS	73,4	77,3	82,1	89,1	86,0	78,1	71,6	91,8	63,8
LCS 372	FL	66,2	71,2	77,9	84,2	78,3	70,8	62,7	86,3	58,3
LCS 422	CS	73,4	77,3	82,1	89,1	86,0	78,1	71,6	91,8	63,8
LCS 422	CL	66,2	71,2	77,9	84,2	78,3	70,8	62,7	86,3	58,3
LCS 422	FS	73,4	77,3	82,1	89,1	86,0	78,1	71,6	91,8	63,8
LCS 422	FL	66,2	71,2	77,9	84,2	78,3	70,8	62,7	86,3	58,3
LCS 482	CS	74,4	78,3	83,0	90,1	86,9	79,1	72,6	92,8	64,8
LCS 482	CL	67,2	72,2	78,9	85,2	79,3	71,8	63,7	87,2	59,2
LCS 482	FS	74,4	78,3	83,0	90,1	86,9	79,1	72,6	92,8	64,8
LCS 482	FL	67,2	72,2	78,9	85,2	79,3	71,8	63,7	87,2	59,2
LCS 532	CS	74,4	78,3	83,0	90,1	86,9	79,1	72,6	92,8	64,8
LCS 532	CL	67,2	72,2	78,9	85,2	79,3	71,8	63,7	87,2	59,2
LCS 532	FS	74,4	78,3	83,0	90,1	86,9	79,1	72,6	92,8	64,8
LCS 532	FL	67,2	72,2	78,9	85,2	79,3	71,8	63,7	87,2	59,2

15 DIMENSIONS



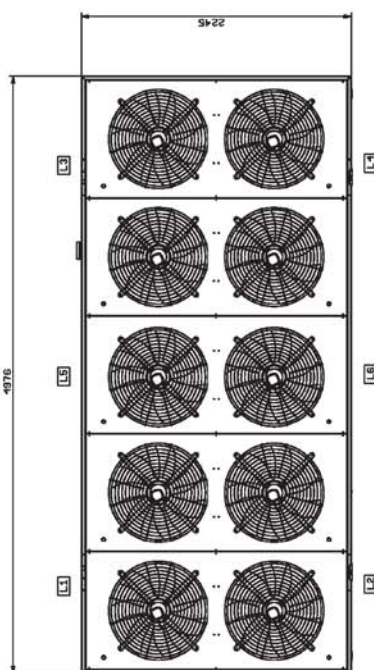
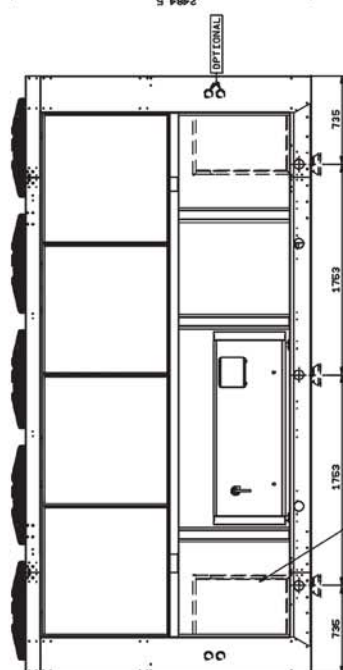
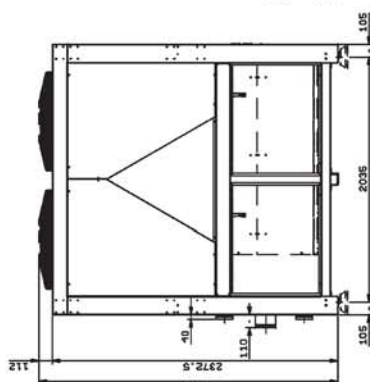
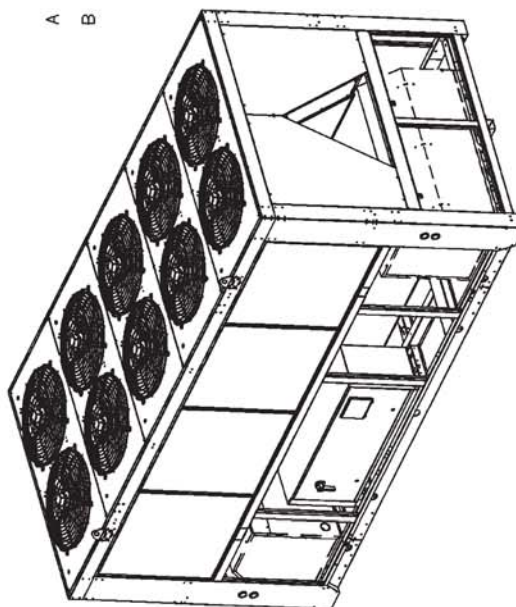
Serie - Series		LCS												
Modello - Model		201		261			301			272			322	
Versione - Version		C	F	C	F	C	F	C	F	C	F	C	F	
Peso totale - Total weight		3040	3640	3420	4020	3520	4120	3320	3920	3750	4350			
L1 [kg]		750	900	890	1040	915	1065	700	850	805	955			
L2 [kg]		665	815	715	865	740	890	700	850	805	955			
L3 [kg]		735	885	785	935	810	960	950	1110	1070	1220			
L4 [kg]		890	1040	1030	1180	1055	1205	950	1110	1070	1220			

LCS C - F 351 - 372 - 422 (Plates evaporator) - (Frame 2)



Serie - Series		LC5																													
Modello - Model		351					372					422																			
Versione - Version		C					F					C					F														
Peso totale - Total weight		3862					4762					4035					4935					4122					5022				
L1 [kg]		271					421					538					688					550					700				
L2 [kg]		463					613					807					957					824					974				
L3 [kg]		734					884					538					688					550					700				
L4 [kg]		1042					1192					807					957					824					974				
L5 [kg]		541					691					538					688					550					700				
L6 [kg]		811					961					807					957					824					974				

LCS C - F 482 - 532 (shell & tube evaporator) - (Frame 2)

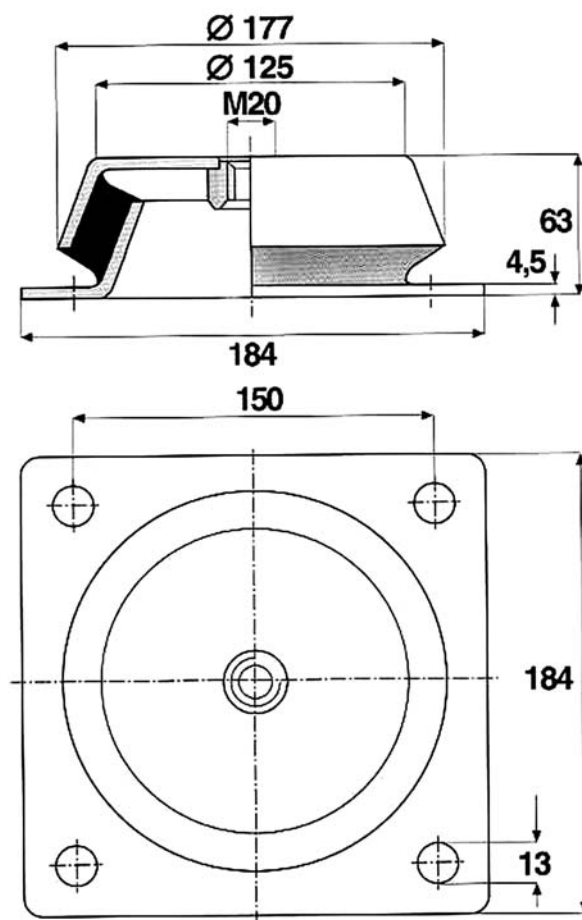


DISTRIBUZIONE DEI PESI A SERBATOIO VUOTO (Chiller / Free Cooling) (kg)
WEIGHT DISTRIBUTION WITH EMPTY BUFFER TANK (Chiller / Free Cooling) (kg)
BEWICHTVERTEILUNG INCL. LEEREN PUFFERTANK (Chiller / Free Cooling) (kg)

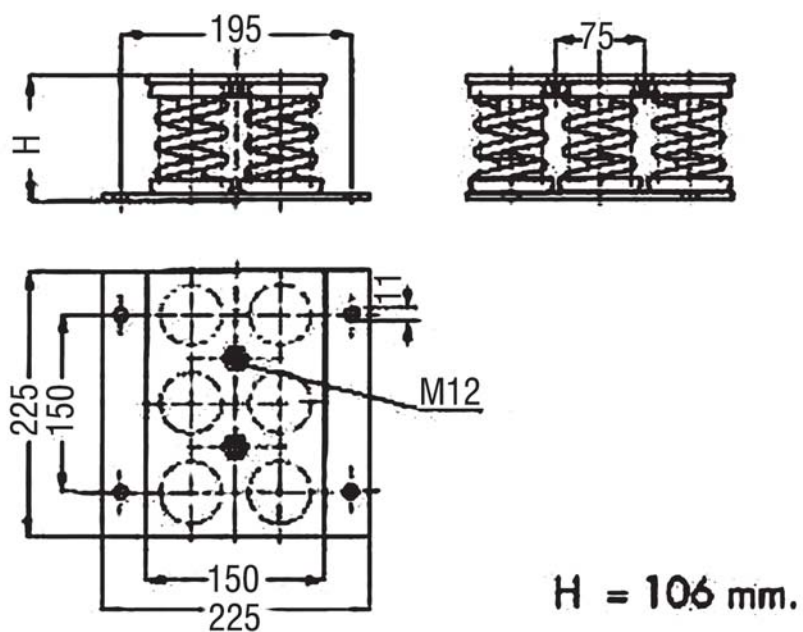
Series - Series	LCS				
Model to - Model					
Versions - Version	C	F	C	F	
Peso totale - Total weight	5012	5912	5438	6338	
L1 [kg]	802	962	870	1020	
L2 [kg]	902	1062	979	1129	
L3 [kg]	802	962	870	1020	
L4 [kg]	902	1062	979	1129	
L5 [kg]	802	962	870	1020	
L6 [kg]	802	962	870	1020	

15 DIMENSIONS

RUBBER DAMPERS



SPRING DAMPERS



16 WEIGHTS

LCS - C	201	Frame 1				Frame 2				
model		261	272	301	322	351	372	422	482	532
weight (kg)	1980	3320	3420	3520	3750	3862	4035	4122	5012	5438

Weights without hydraulic kit										
LCS - C	201	Frame 1				Frame 2				
model		261	272	301	322	351	372	422	482	532
weight (kg)	1652	2910	2995	3070	3300	3377	3540	3612	4487	4938

Weights with hydraulic kit (empty water tank)										
LCS - F	201	Frame 1				Frame 2				
model		261	272	301	322	351	372	422	482	532
weight (kg)	2204	3920	4020	4120	4350	4762	4935	5022	5912	6338

Weights without hydraulic kit										
LCS - F	201	Frame 1				Frame 2				
model		261	272	301	322	351	372	422	482	532
weight (kg)	1876	3498	3583	3658	3888	4259	4422	4494	5369	5820

Weights with full buffer tank

LCS 201 + 835 kg

Frame 1+ 648 kg

Frame 2+ 1290 kg

17 INSTALLATION RECOMMENDATIONS

LOCATION

- Strictly allow clearances as indicated in the catalogue.
- Ensure there are no obstructions on the air suction and discharge side.
- Locate the unit in order to be compatible with environmental requirements (sound level, integration into the site, etc.).

ELECTRICAL CONNECTIONS

- Check the wiring diagram enclosed with the unit, in which are always present all the instructions necessary to the electrical connections.
- Supply the unit at least 12 hours before startup, in order to turn crankcase heaters on. Do not disconnect electrical supply during temporary stop periods (i.e. week ends).
- Before opening the main switch, stop the unit by acting on the suitable running switches or, if lacking, on the remote control.
- Before servicing the inner components, disconnect electrical supply by opening the main switch.
- The electric supply line must be equipped with an automatic circuit breaker (to be provided by the installer).
- Electrical connections to be done:
three-wire power cable + ground cable, or three-wire power cable + neutral cable + ground cable;
external interlock;
remote alarm signalling.

HYDRAULIC CONNECTIONS

- Carefully vent the system, with pump turned off, by acting on the vent valves. This procedure is fundamental: little air bubbles can freeze the evaporator causing the general failure of the system.
- Drain the system during seasonal stops (wintertime) or use proper mixtures with low freezing point. In case of temporary stop periods an electric heater should be installed on the evaporator and hydraulic circuit.
- Install the hydraulic circuit including all the components indicated in the recommended hydraulic circuit diagrams (expansion vessel, flow switch, storage tank, vent valves, shut off valves, flexible connections, etc.).
- When the flow switch is furnished not fitted on the units, connect it carefully following the instructions enclosed with the units.

START UP AND MAINTENANCE OPERATIONS

- Strictly follow what reported in use and maintenance manual.
All these operations must be carried on by trained personnel only.

18 INSPECTION

On receiving the unit, check that it is perfectly intact: the machine left the factory in perfect conditions; immediately report any signs of damage to the carrier and note them on the Delivery Slip before signing it.

Galletti S.p.A. and its Agent must be promptly notified of the entity of the damage.

The Customer must submit a written report describing every significant sign of damage.

19 CONVEYANCE AND LIFTING

While the unit is being unloaded and positioned, utmost care must be taken to avoid abrupt or violent manoeuvres. The unit must be handled carefully and gently; avoid using machine components as anchorages when lifting or moving it.

The unit must be lifted using steel pipes inserted through the eyebolts provided on the base frame.

Prior to being lifted, the unit should be harnessed as shown in the figure below: use ropes or belts of adequate length and spacer bars to avoid damaging the sides and top of the unit.



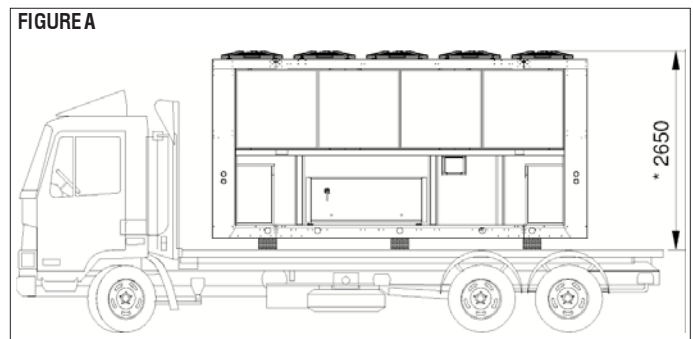
WARNING:

IN ALL LIFTING OPERATIONS MAKE SURE THAT THE UNIT IS SECURELY ANCHORED IN ORDER TO PREVENT ACCIDENTAL FALLS OR OVERTURNING.

TRANSPORT

Side loading with a forklift truck

For loading, a side-loading (not curtain-side) lorry is necessary (see figure A).



* = Minimum height of loading opening

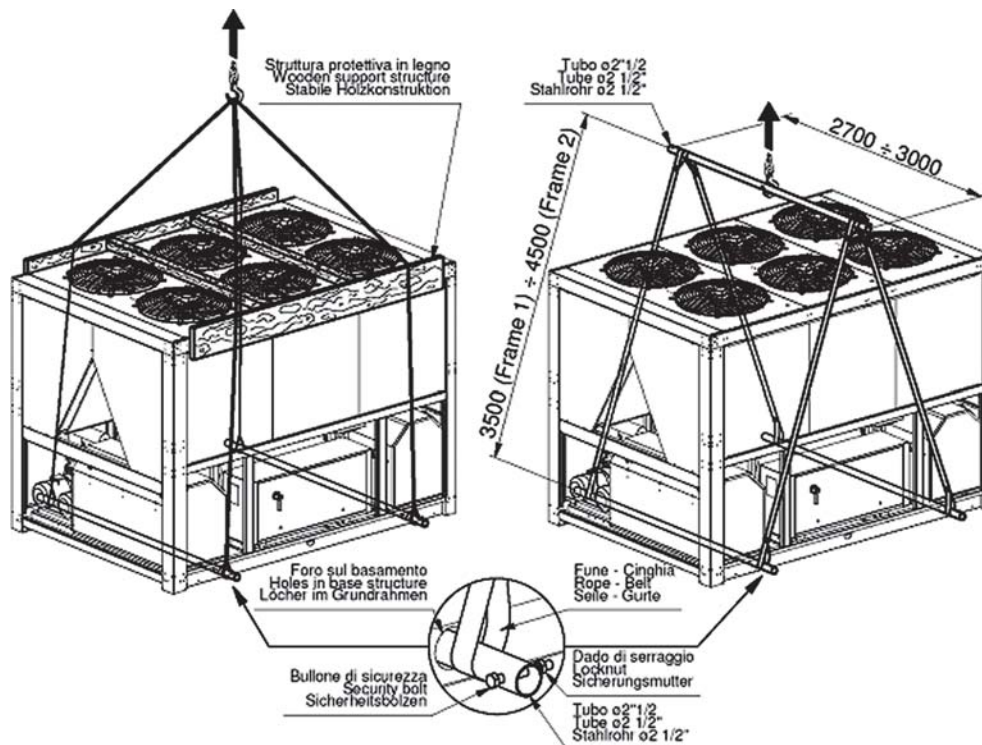
20 CONVEYANCE

The machine has squared timbers placed beneath the base and may be conveyed as follows:

- using a lift truck of adequate capacity (see overall dimensions drawings)
- using steel tubes $\varnothing 2.1/2"$ (supplied with machine - to be inserted into the base through the holes provided), for slinging with ropes, straps or webbing of adequate capacity connected to a lifting hook.

N.B. The top and sides of the unit must be protected by means of a rigid wooden frame or steel tubing such as to prevent contact between the lifting ropes and machine (see figure B).

FIGURE B



21 UNPACKING

The packing must be carefully removed to avoid the risk of damaging the unit. Different packing materials are used: wood, cardboard, nylon, etc.

It is recommended to keep them separate and deliver them to authorised waste disposal or recycling facilities in order to minimise their environmental impact.



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