Installation, operating and maintenance

ECOLEAN

Air cooled liquid chiller

25 - 200 kW

MIL113E-0311 02-2012
Original manual translation

TABLE OF CONTENTS

Our company's products comply with European standards.

The manufacturing of EcoLean™ answers to ISO9001 control quality system.

Units are certificated by EUROVENT

Lennox have been providing environmental solutions since 1895, our range of EcoLean™ reversible chillers continues to meet the standards that have made LENNOX a household name. Flexible design solutions to meet YOUR needs and uncompromising attention to detail. Engineered to last, simple to maintain and Quality that comes as standard.
Information on local contacts at www.lennoxeurope.com.

The specifications and technical characteristics in this booklet are given for information purposes. The manufacturer reserves the right to modify them without prior notice or obligation to modify in a similar manner, the equipments previously supplied.

PREFACE

Please read this operating manual prior to commissioning the EcoLean™ chiller. Familiarize yourself with the operation and control of the EcoLean™ chiller and closely follow the instructions.

We would like to stress the importance of training with respect to the correct handling of the chiller. Please consult Lennox on the options available in this field.

It is important that this manual be stored in a permanent location in the vicinity of the EcoLean™ chiller.

For the sake of clarity, important items in this manual are shown as follows:

Text	Important general instructions
	Danger of damage to the chiller

This manual contains important instructions regarding the commissioning of the EcoLean™ chiller. It also includes important instructions to prevent personal injury and damage to the machine during operation. Furthermore, in order to promote fault-free operation of the chiller, maintenance information has been included.

Please do not hesitate to contact one of our employees should you require further information on specific chiller subjects.
Order related documentation will be forwarded under separate cover. This documentation consists of:

- **CE declaration**
- **Operating manual for control system**
- **Installation Operating manual**
- **Wiring diagram**
- **Unit detail are given on unit nameplate**

FOR NETHERLAND: the STEK logbook, including the required certificates will be handed over by the installation technician or left with the machine following commissioning by Lennox. The data published in this manual is based on the most recent information available. It is supplied conditional to later modifications. We reserve the right to modify the construction and/or design of our EcoLean™ chillers, at any time, without prior notification or obligation to adapt previous supplies accordingly.

Any work on the Chiller should be carried out by trained and licensed competent technician.
The following risks are present on the unit:

- **risk of electrical shock.**
- **risk of injury from rotating parts.**
- **risk of injury from sharp edges and heavy weight.**
- **risk of injury from high pressure gas.**
- **risk of injury from high and low temperatures components.**

The unit must be installed in accordance with local safety codes andregulations and can only be used in a well ventilated area. Please readcarefully the manufacturer's instructions before starting this unit

All work on the unit must be carried out by a qualified and authorised employee.

Non-compliance with the following instructions may result in injury or serious accidents.

Work on the unit:

The unit shall be isolated from the electrical supply by disconnection and locking using the main isolating switch. Workers shall wear the appropriate personal protective equipment (helmet, gloves, glasses,etc.).

Electrical system:

Electrical connections can become loose during transport. Please check them before starting-up the unit Compressors with specific rotation direction. Check the correct rotation direction of the fan before closing the compressor circuit breakers. If the direction is incorrect, the phases must be reversed at the head of the main switch. Work on electric components shall be performed with the power off (see below) by employees having valid electrical qualification and authorisation.

Refrigerating circuit(s):

After more than 12 hours of power cut, the cranckcase heater (compressor) should be powered for 5 hours before any return to service. Non-compliance with this instruction can cause deterioration of the compressors.

Monitoring of the pressures, draining and filling of the system under pressure shall be carried out using connections provided for this purpose and suitable equipment.

To prevent the risk of explosion due to spraying of coolant and oil, **the relevant circuit shall be drained and at zero pressure** before any disassembly or unbrazing of the refrigerating parts takes place.

There is a residual risk of pressure build-up by degassing the oil or by heating the exchangers after the circuit has been drained. **Zero pressure shall be maintained** by venting the drain connection to the atmosphere on the low pressure side.

The brazing shall be carried out by a qualified brazier. The brazing shall comply according to code ASME section IX following the procedures specific.

Before starting up:

-Test the circuit to the maximum working pressure(see the nameplate)

-Verifify the operation of the high pressure swich.

-Check the piping and the components of the refrigerant circuit.

Replacing components:

In order to maintain CE marking compliance, replacement of components shall be carried out
using spare parts, or using parts approved by Lennox.

Only the coolant shown on the manufacturer's nameplate shall be used, to the exclusion of all other
products (mix of coolants, hydrocarbons, etc.).

CAUTION:
In the event of fire, refrigerating
circuits can cause an explosion
and spray coolant gas and oil.

DATA PAGE FOR UNIT COMMISSIONING

Unit:		Serial no. :	
Control panel identification code			
Installation address:			
Installer:		Installer tel. :	
Installer address:			
Date of commissioning:			
Checks:			
Supply voltage:		Rated voltage of the unit :	

	YES	NO
Unit on rubber antivibration mounts		
General power supply connection		
Control panel connection (option)		
Compressor oil level indicator		
Hydraulic connection		
Purged of the installation		

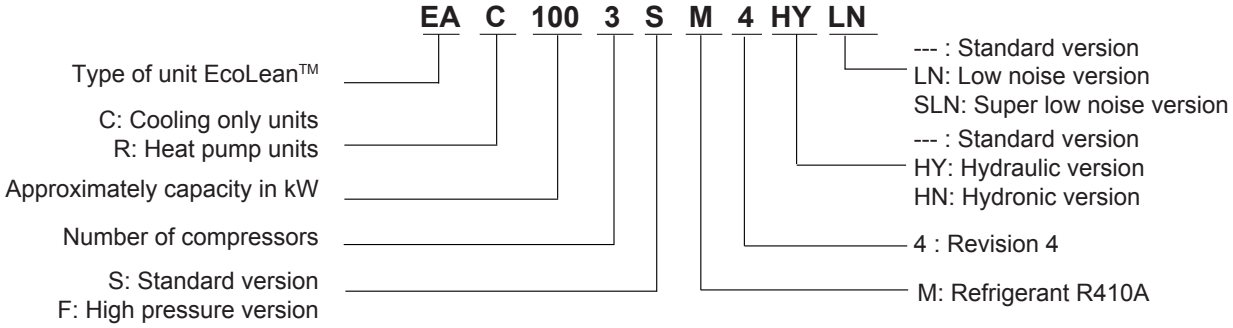
DATA INPUT		COOLING CYCLE	HEATING CYCLE
Air Input Temperature, Coil	°C		
Water Output Temperature	°C		
Water Input Temperature	°C		
High Pressure			
Low Pressure			

ELECTRIC POWER CONSUMPTION		COOLING CYCLE			HEATING CYCLE		
Compressor 1	A						
Fan 1	A						
Compressor 2	A						
Fan	A						
Compressor 3	A						
Fan 3	A						
Compressor 4	A						
Fan 4	A						

Options Installed:	
Comments:	

1.- GENERAL CHARACTERISTICS

1.1.- TECHNICAL DATA



COOLING ONLY

EAC MODELS			0251SM	0291SM	0351SM	0431SM	0472SM	0552SM	0672SM	0812SM
Cooling capacity (*)		kW	22,1	25,9	32,0	37,6	44,1	50,7	63,4	75,4
Compressor		Nr/type	1 / scroll				2 / scroll			
Hydraulic connections			1 1/2"G				2"G			
Min. water rate		m^3/h	3,16	3,72	4,4	5,3	6,05	7,07	8,6	10,39
Net weight	Standard	kg	238	246	263	292	470	482	518	562
	High pressure	kg	253	261	278	298	500	512	548	592
Refrigerant		kg	5,5	6,1	7,6	9	11	12,2	15,5	19,5
EAC MODELS			**1003SM**	**1103SM**	**1203SM**	**1303SM**	**1403SM**	**1604SM**	**1804SM**	**2104SM**
Cooling capacity (*)		kW	88,2	102	112	126	139	149	174	199
Compressor		Nr/type	3 / scroll					4 / scroll		
Hydraulic connections			2 1/2"G					DN80		
Min. water rate		m^3/h	12,38	13,9	15,76	17,48	18,86	21,06	24,77	28,3
Net weight	Standard	kg	640	809	938	990	1019	1328	1683	1703
	High pressure	kg	680	849	978	1030	1059	1368	1763	1783
Refrigerant		kg	23,5	26	27	30	33,7	36,2	45	47

HEAT PUMP

EAR MODELS			0251SM	0291SM	0351SM	0431SM	0472SM	0552SM	0672SM	0812SM
Cooling capacity (*)		kW	22,1	25,9	32,0	37,6	44,1	50,7	63,4	75,4
Heating capacity (**)		Nr/type	23,6	27,6	33,6	37,8	47,8	54,7	68,0	75,7
Compressor		Nr/type	1 / scroll				2 / scroll			
Hydraulic connections			1 1/2"G				2"G			
Min. water rate		m^3/h	3,16	3,72	4,4	5,3	6,05	7,07	8,6	10,39
Net weight	Standard	kg	243	251	271	300	480	492	534	578
	High pressure	kg	258	266	286	305	510	522	564	608
Refrigerant		kg	5,8	6,5	8	9,5	12,5	13,5	16	19,3
EAR MODELS			**1003SM**	**1103SM**	**1203SM**	**1303SM**	**1403SM**	**1604SM**	**1804SM**	**2104SM**
Cooling capacity (*)		kW	88,2	102	112	126	139	149	174	199
Heating capacity (**)		Nr/type	95,0	108	118	130	143	159	180	205
Compressor		Nr/type	3 / scroll					4 / scroll		
Hydraulic connections			2 1/2"G					DN80		
Min. water rate		m^3/h	12,38	13,9	15,76	17,48	18,86	21,06	24,77	28,3
Net weight	Standard	kg	663	831	964	1016	1045	1347	1703	1723
	High pressure	kg	703	871	1004	1056	1085	1387	1783	1803
Refrigerant		kg	23,3	28	29,5	32,2	35,5	40	52	54

(*) Cooling capacity: Outside temperature: 35ºC / Inlet/outlet water temperature: 12/7ºC
(**) Heating capacity: Outside temperature: 7ºC DB / 6ºC WB / Inlet/water outlet temperature: 40/45ºC

1.- GENERAL CHARACTERISTICS

1.1.- TECHNICAL DATA

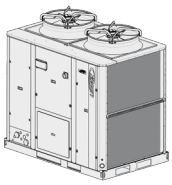
HYDRAULIC VERSION / HYDRONIC VERSION

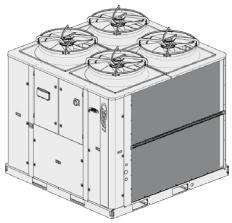
MODELS	0251SM	0291SM	0351SM	0431SM	0472SM	0552SM	0672SM	0812SM
Pump type	Horizontal multistage centrifugal pump							
Expansion vessel Capacity (l)	12				18			
Set pressure Security valves (bar)	3				3			
Expansion vessel (bar)	4				4			
Buffer tank (***) Capacity (l)	75				100			

MODELS	1003SM	1103SM	1203SM	1303SM	1403SM	1604SM	1804SM	2104SM
Pump type	Horizontal multistage centrifugal pump							
Expansion vessel Capacity (l)	35					50		
Set pressure Security valves (bar)	3					3		
Expansion vessel (bar)	4					4		
Buffer tank (***) Capacity (l)	240					350		

(***) Only in units with Hydronic module

STANDARD FAN UNITS





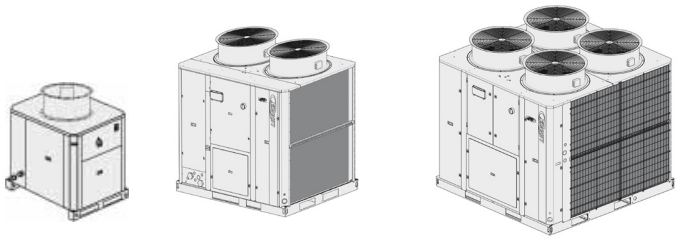
MODELS			0251SM	0291SM	0351SM	0431SM	0472SM	0552SM	0672SM	0812SM
Fan type			*Axial - Direct coupling*					*3~400V*		
Fan number		Nr	**1**					**2**		
Air flow rate	m^3/h	High	9950	12900	12500	12250	9950+9950	12900+12900	12500+12500	12250+12250
		Low	8250	10500	10250	10000	8250+8250	10500+10500	10250+10250	10000+10000
Power input	kW	High	0,49	0.69	0,69	0,7	0,49+0,49	0,69+0,69	0,69+0,69	0,7+0,7
		Low	0,37	0,51	0,52	0,53	0,37+0,37	0,51+0,51	0,52+0,52	0,53+0,53
Fan speed	rpm	High	930	927	925	920	930/930	927/927	925/925	920/920
		Low	786	773	768	762	786/786	773/773	768/768	762/762

MODELS			1003SM	1103SM	1203SM	1303SM	1403SM	1604SM	1804SM	2104SM
Fan type			*Axial - Direct coupling*					*3~400V*		
Fan number		Nr	**2**						**4**	
Air flow rate	m^3/h	High	17000+17000	22500+17000	22500+17000	22500+22500	22500+22000	23000+23000	26000+26000	36000+36000
		Low	13500+13500	17500+13500	17500+13500	17500+17500	17500+17200	18500+18500	19000+19000	27200+27200
Power input	kW	High	1,05+1,05	2+1,05	2+1,05	2+2	2+2	2+2	2,1+2,1	4+4
		Low	0,77+0,77	1,25+0,77	1,25+0,77	1,25+1,25	1,25+1,25	1,25+1,25	1,54+1,54	2,5+2,5
Fan speed	rpm	High	683/683	910/683	910/683	910/910	9910/908	920/920	675/675/675/675	925/925/925/925
		Low	545/545	730/545	730/545	730/730	730/750	740/740	518/518/518/518	700+700+700+700

1.- GENERAL CHARACTERISTICS

1.1.- TECHNICAL DATA

HIGH STATIC FAN PRESSURE UNITS



LOW SPEED

MODELS				0251FM	0291FM	0351FM	0431FM	0472FM	0552FM	0672FM	0812FM
Fan type				*Axial - Direct coupling (Low speed) 3~400V*							
Fan number			Nr	1				2			
Available static pressure . Pa	76	Air flow rate	m^3/h	10736	10736	10662	10181	10736+10736	10736+10736	10662+10662	10181+10181
		Power input	kW	1,57	1,57	1,57	1,58	1,57+1,57	1,57+1,57	1,57+1,57	1,58+1,58
	100	Air flow rate	m^3/h	9455	9455	9479	9045	9455+9455	9455+9455	9479+9479	9045+9045
		Power input	kW	1,59	1,59	1,59	1,59	1,59+1,59	1,59+1,59	1,59+1,59	1,59+1,59
	120	Air flow rate	m^3/h	8304	8304	8316	8001	8304+8304	8304+8304	8316+8316	8001+8001
		Power input	kW	1,6	1,6	1,6	1,6	1,6+1,6	1,6+1,6	1,6+1,6	1,6+1,6

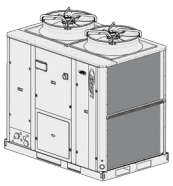
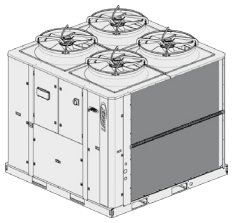
MODELS				1003FM	1103FM	1203FM	1303FM	1403FM	1604FM	1804FM	2104FM
Fan type				*Axial - Direct coupling (Low speed) 3~400V*							
Fan number			Nr	2						4	
Available static pressure . Pa	76	Air flow rate	m^3/h	36125	36125	36125	36125	36125	38215	61205	61205
		Power input	kW	6,2	6,2	6,2	6,2	6,2	6,2	12,6	12,6
	100	Air flow rate	m^3/h	33700	33700	33700	33700	33700	35700	58500	58500
		Power input	kW	6,3	6,3	6,3	6,3	6,3	6,3	12,6	12,6
	125	Air flow rate	m^3/h	30100	30100	30100	30100	30100	32100	54700	54700
		Power input	kW	6,3	6,3	6,3	6,3	6,3	6,3	12,7	12,7

HIGH SPEED

MODELS				0251FM	0291FM	0351FM	0431FM	0472FM	0552FM	0672FM	0812FM
Fan type				*Axial - Direct coupling (High speed) 3~400V*							
Fan number			Nr	1				2			
Available static pressure . Pa	76	Air flow rate	m^3/h	15608	15608	15299	14994	15608+15608	15608+15608	15299+15299	14994+14994
		Power input	kW	2,47	2,47	2,50	2,52	2,47+2,47	2,47+2,47	2,50+2,50	2,52+2,52
	100	Air flow rate	m^3/h	14933	14933	14609	14293	14933+14933	14933+14933	14609+14609	14293+14293
		Power input	kW	2,49	2,49	2,52	2,53	2,49+2,49	2,49+2,49	2,52+2,52	2,53+2,53
	126	Air flow rate	m^3/h	14102	14102	13813	13510	14102+14102	14102+14102	13813+13813	13510+13510
		Power input	kW	2,51	2,51	2,54	2,55	2,51+2,51	2,51+2,51	2,54+2,54	2,55+2,55
	150	Air flow rate	m^3/h	13242	13242	13034	12716	13242+13242	13242+13242	13034+13034	12716+12716
		Power input	kW	2,54	2,54	2,56	2,56	2,54+2,54	2,54+2,54	2,56+2,56	2,56+2,56
	200	Air flow rate	m^3/h	11166	11166	11276	10842	11166+11166	11166+11166	11276+11276	10842+10842
		Power input	kW	2,58	2,58	2,59	2,59	2,58+2,58	2,58+2,58	2,59+2,59	2,59+2,59
	250	Air flow rate	m^3/h	9983	9983	10329	9793	9983+9983	9983+9983	10329+10329	9793+9793
		Power input	kW	2,60	2,60	2,61	2,61	2,60+2,60	2,60+2,60	2,61+2,61	2,61+2,61

MODELS				1003FM	1103FM	1203FM	1303FM	1403FM	1604FM	1804FM	2104FM
Fan type				*Axial - Direct coupling (High speed) 3~400V*							
Fan number			Nr	2						4	
Available static pressure . Pa	76	Air flow rate	m^3/h	49920	49920	49920	49920	49920	50250	72500	72500
		Power input	kW	10,1	10,1	10,1	10,1	10,1	10,1	20,4	20,4
	100	Air flow rate	m^3/h	48000	48000	48000	48000	48000	50000	72000	72000
		Power input	kW	10,1	10,1	10,1	10,1	10,1	10,1	20,5	20,5
	126	Air flow rate	m^3/h	45920	45920	45920	45920	45920	49210	70420	70420
		Power input	kW	10,2	10,2	10,2	10,2	10,2	10,2	20,7	20,7
	150	Air flow rate	m^3/h	44000	44000	44000	44000	44000	48000	68000	68000
		Power input	kW	10,2	10,2	10,2	10,2	10,2	10.2	20,8	20,8
	200	Air flow rate	m^3/h	40000	40000	40000	40000	40000	44000	60000	60000
		Power input	kW	10,3	10,3	10,3	10,3	10,3	10,3	21,1	21,1
	250	Air flow rate	m^3/h	36000	36000	36000	36000	36000	38000	48000	48000
		Power input	kW	10,4	10,4	10,4	10,4	10,4	10,4	21,4	21,4

1.- GENERAL CHARACTERISTICS

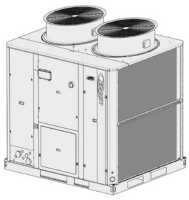
1.2.- ELECTRICAL DATA

STANDARD FAN UNITS

MODELS			0251SM	0291SM	0351SM	0431SM	0472SM	0552SM	0672SM	0812SM
Maximum power (kW)		High	10,6	12,5	16,3	17,6	21,2	25,0	32,5	35,2
		Low	10,5	12,3	16,1	17,4	21,0	24,6	32,1	34,9
Maximum Current (A)	3~400V	High	22,3	23,8	27,4	32,8	44,5	47,5	54,7	65,5
		Low	21,7	23,1	26,7	32,1	43,5	46,2	53,4	64,2
LRC (A)	3~400V	High	112,3	119,8	159,8	175,8	134,5	143,5	187,1	208,5
		Low	111,7	119,1	159,1	175,1	133,5	142,2	185,8	207,2
Starting current (A) (*)	3~400V	High	95,6	102,1	136,1	149,7	117,9	125,8	163,4	182,4
		Low	95,1	101,4	135,4	149,0	116,8	124,5	162,1	181,1
MODELS			1003SM	1103SM	1203SM	1303SM	1403SM	1604SM	1804SM	2104SM
Maximum power (kW)		High	42,6	51,1	56,7	62,3	65	71,6	83,0	96,2
		Low	42,0	50,0	55,6	60,8	63,5	70,1	81,9	93,6
Maximum Current (A)	3~400V	High	79,8	88,6	97,6	107,7	118,5	132,0	151,6	175
		Low	78,0	86,0	95,0	104,3	115,1	128,6	148,0	168,2
LRC (A)	3~400V	High	222,8	231,6	282,6	331,2	342,0	275,0	336,6	398,5
		Low	221,0	229,0	280,0	327,8	338,6	271,6	333,0	391,7
Starting current (A) (*)	3~400V	High	196,7	205,5	248,8	290,4	301,2	248,9	302,9	357,7
		Low	194,9	202,9	246,3	287,0	297,8	245,5	299,3	350,9

Maximum power calculated for compressor operation at +12,5/65°C.
(*) Starting current 2 cycles later from compressor starts (4 mseg).

HIGH STATIC FAN PRESSURE UNITS


LOW SPEED

MODELS		0251FM	0291FM	0351FM	0431FM	0472FM	0552FM	0672FM	0812FM
Maximum power (kW)	3~400V	11,6	13,3	17,2	18,5	23,3	26,7	34,3	37,0
Maximum Current (A)	3~400V	23,7	24,7	28,3	33,7	47,4	49,4	56,6	67,4
LRC (A)	3~400V	113,7	120,7	160,7	176,7	137,4	145,4	189,0	210,4
Starting current (A) (*)	3~400V	97,1	103,0	137,0	150,6	120,8	127,7	165,3	184,3
MODELS		1003FM	1103FM	1203FM	1303FM	1403FM	1604FM	1804FM	2104FM
Maximum power (kW)	3~400V	46,8	54,3	59,9	64,6	67,3	73,9	91,5	100,9
Maximum Current (A)	3~400V	85,0	92,2	101,2	107,7	120,5	134,0	162,0	179,0
LRC (A)	3~400V	228,0	235,2	286,2	333,2	344,0	277,0	347,0	402,5
Starting current (A) (*)	3~400V	201,9	209,1	252,5	292,4	303,2	250,9	313,3	361,7

HIGH SPEED

MODELS		0251FM	0291FM	0351FM	0431FM	0472FM	0552FM	0672FM	0812FM
Maximum power (kW)	3~400V	12,7	14,4	18,2	19,5	24,8	28,2	35,7	38,3
Maximum Current (A)	3~400V	25,8	26,8	30,4	35,8	51,6	53,6	60,8	71,6
LRC (A)	3~400V	115,8	122,8	162,8	178,8	141,6	149,6	193,2	214,6
Starting current (A) (*)	3~400V	99,2	105,1	139,1	152,7	125,0	131,9	169,5	188,5
MODELS		1003FM	1103FM	1203FM	1303FM	1403FM	1604FM	1804FM	2104FM
Maximum power (kW)	3~400V	50,9	58,4	64,0	68,7	71,4	78,0	100,2	109,6
Maximum Current (A)	3~400V	92,2	99,4	108,4	116,9	127,7	141,2	177,0	194,0
LRC (A)	3~400V	235,2	242,4	293,4	340,4	351,2	284,2	362,0	417,5
Starting current (A) (*)	3~400V	209,1	216,3	259,7	299,6	310,4	258,1	328,3	376,7

Maximum power calculated for compressor operation at +12,5/65°C.
(*) Starting current 2 cycles later from compressor starts (4 mseg).

HYDRAULIC / HYDRONIC VERSION (STANDAR / HIGH PRESSURE)

MODELS EAC / EAR HY - HN		0251	0291	0351	0431	0472	1552	0672	0812
Absorbed power (kW)		0,65	0,65	1,20	1,20	1,20	1,20	1,20	1,20
Maximum current (A)	3-400V	1,76	1,76	3,10	3,10	3,10	3,10	3,10	3,10
MODELS EAC / EAR HY - HN		1003	1103	1203	1303	1403	1604	1804	2104
Absorbed power (kW)		2,45	2,45	2,45	2,45	2,93	2,93	3,70	4,00
Maximum current (A)	3-400V	4,95	4,95	4,95	4,95	4,80	4,80	6,80	9,20

1.- GENERAL CHARACTERISTICS

1.3.- COMPONENTS

The EcoLean™ system comprises a water cooler or air/water pump combined with a series of hydraulic accessories obtaining the Hydraulic or Hydronic version.

COMPONENTS:

HYDRONIC VERSION (HN):
1,2,3,4,5,6,7,8,9,10,11.

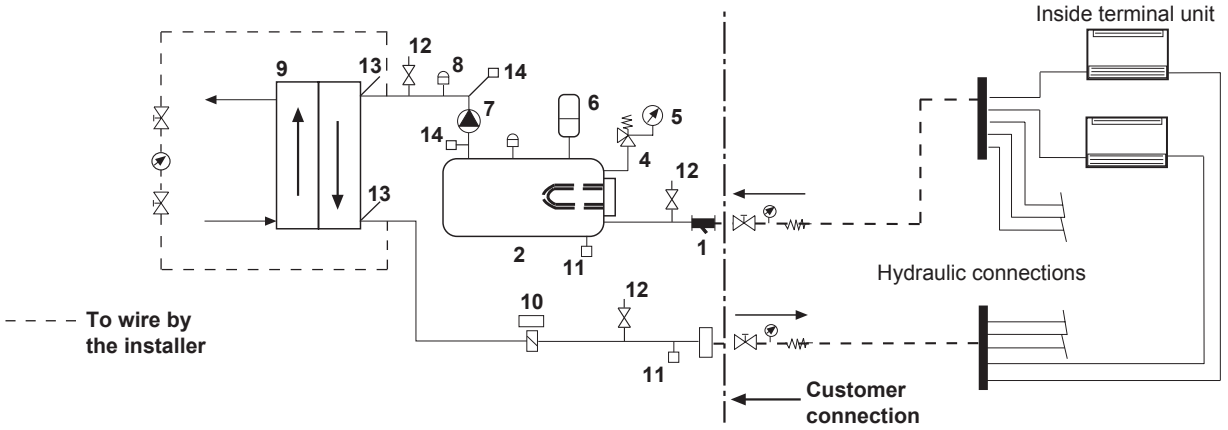
HYDRAULIC VERSION (HY):
1,4,5,6,7,8,9,10,11.

STANDARD VERSION (STD):
1,8,9,10.

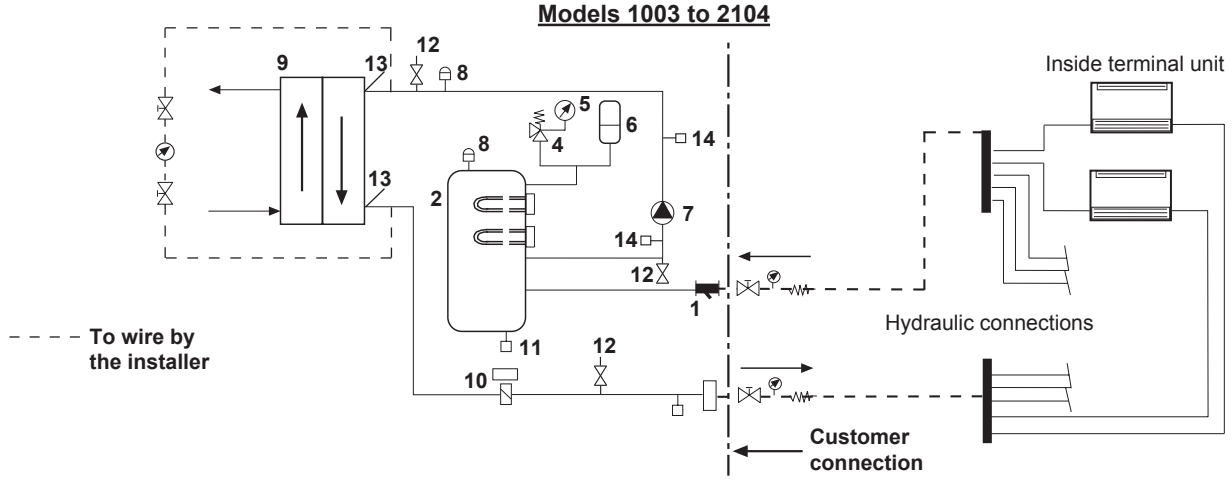
1.- Detachable water filter
2.- Water tank
3.- Water tank heater (in option)
4.- Safety valve
5.- Manometer
6.- Expansion vessel
7.- Water pump (HY version)
8.- Air purge valve
9.- Plate exchanger
10.- Flow switch
11.- Drain valve
12.- Pressure gauge
13.- Inlet/Oulet water sensor
14.- Water pressure transducer "Variable water flow" option

HYDRONIC VERSION (HN)

Models 0251SM to 0812SM

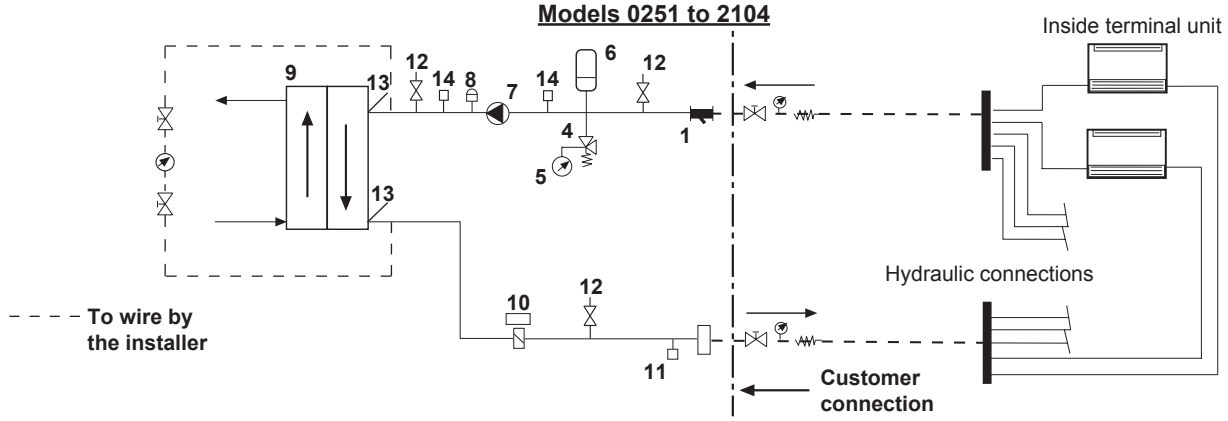


Models 1003 to 2104



HYDRAULIC AND STANDARD VERSIONS (HY & STD)

Models 0251 to 2104



1.- GENERAL CHARACTERISTICS

1.4.- OPERATION LIMITS

STANDARD FAN UNITS WITHOUT AIR DUCTS

COOLING MODE

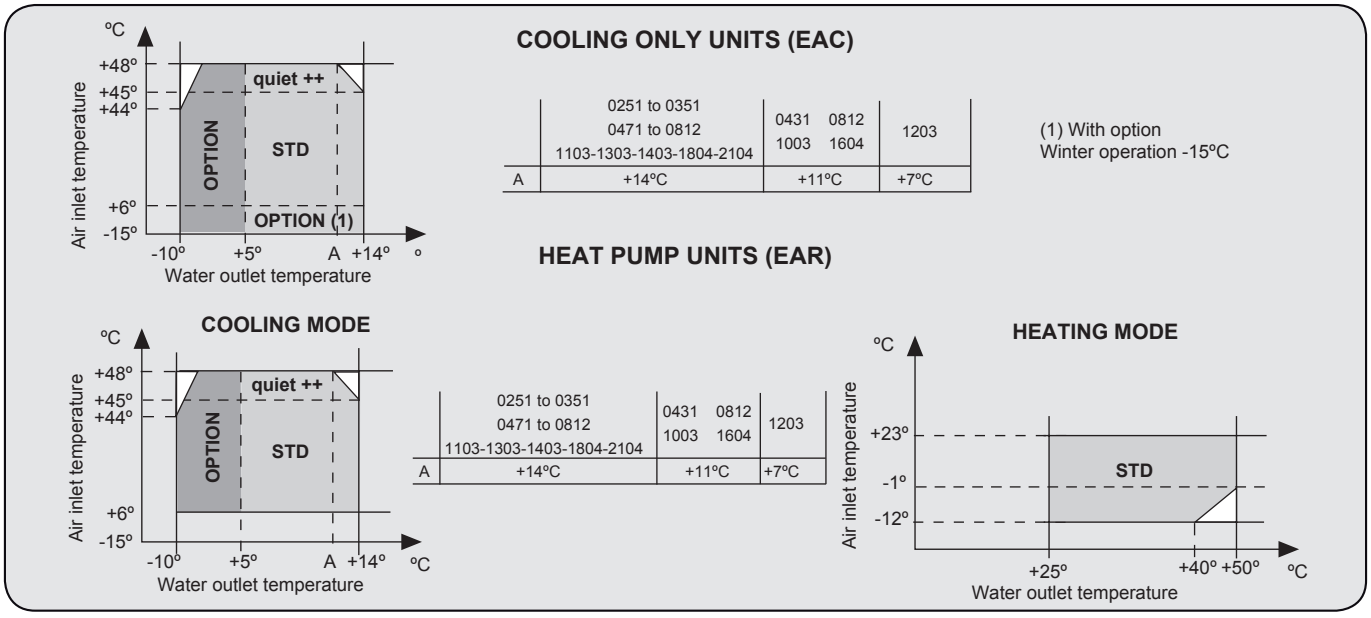
MODELS EAC / EAR	0251SM to 0431SM		0472SM to 0812SM		1003SM to 2104SM	
	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM
Outlet chilled water temperature	+5ºC	+14ºC	+5ºC	+14ºC	+5ºC	+14ºC
Inlet chilled water temperature	+10ºC	+22ºC	+9ºC	+22ºC	+8ºC	+22ºC
Air inlet temperature	+6ºC	+48ºC	+6ºC	+48ºC	+6ºC	+48ºC

NOTE: With outdoor temperatures below +5°C, add glycol

HEATING MODE

MODELS EAR	0251SM to 2104SM	
	MINIMUM	MAXIMUM
Hot water outlet temperature (operation)	+25ºC	+50ºC
Hot water inlet temperature (start)	+10ºC	- - -
Difference hot water inlet / outlet	+3ºC	+8ºC
Air inlet temperature	-12ºC	+23ºC

OUTSIDE THESE VALUES, PLEASE CONSULT US



NOTE: With outdoor temperatures below +5°C, add glycol.

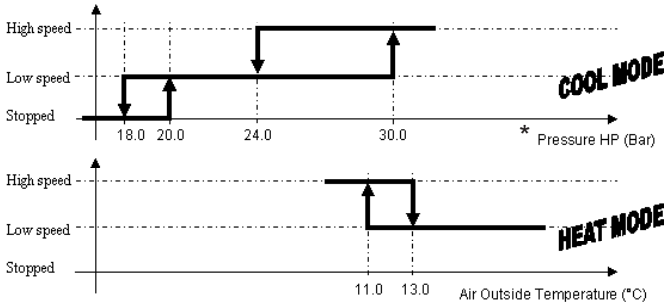
1.- GENERAL CHARACTERISTICS

1.4.- OPERATION LIMITS

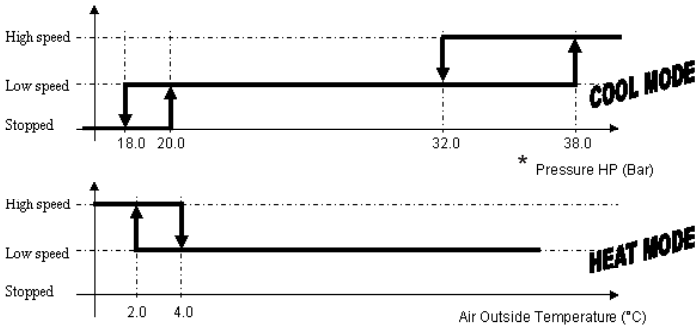
The maximum sound level and the fan strategies can be adjusted with limaticTM60 control according to the schedule mode.

The different modes can be selected. See below operation mode for all of them:

"HIGH PERFORMANCE"



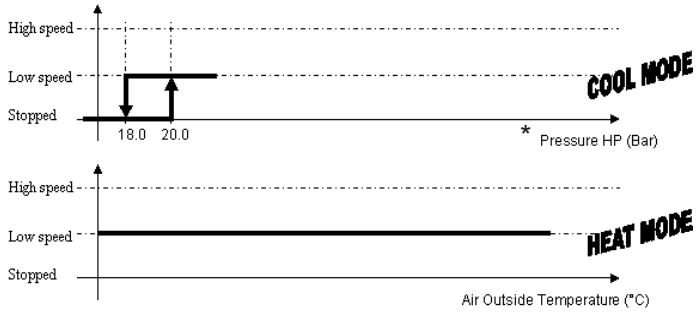
"QUIET"



In this mode, the fan capacity is limit according to the sound level desired. For fan using low / high speed the high speed is locked.

In case of condensing temperature too high, the Climatic^{TM}60 unlocks the limit or the high speed to prevent from unloading compressor.

"QUIET ++"

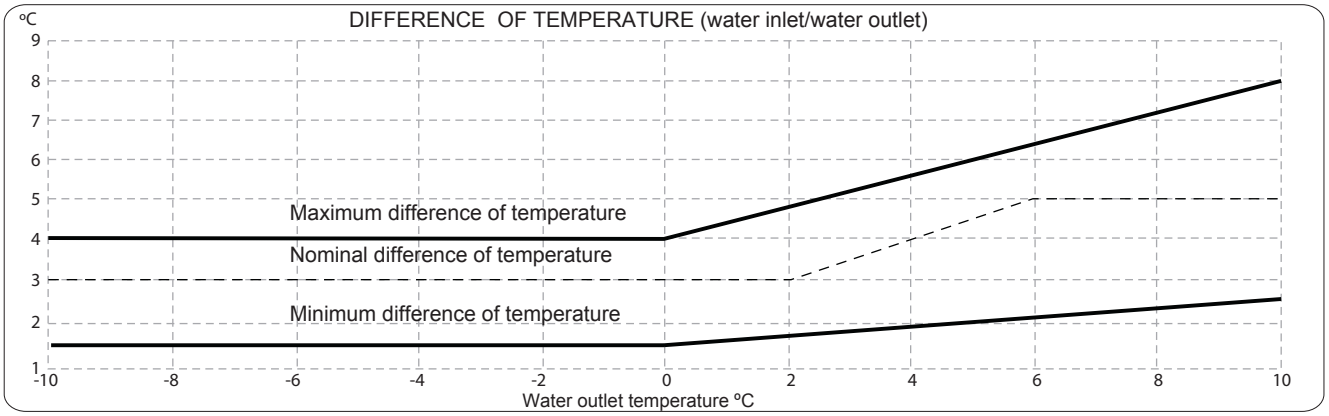


This mode is similar to the "Quiet" mode except that the fan speed limit or the high speed is never unlocked.

In case of condensing temperature too high, the Climatic^{TM}60 will unload compressor to prevent from HP security.

* Approximated values.

UNITS WITH LOW WATER TEMPERATURE KIT (OPTION)

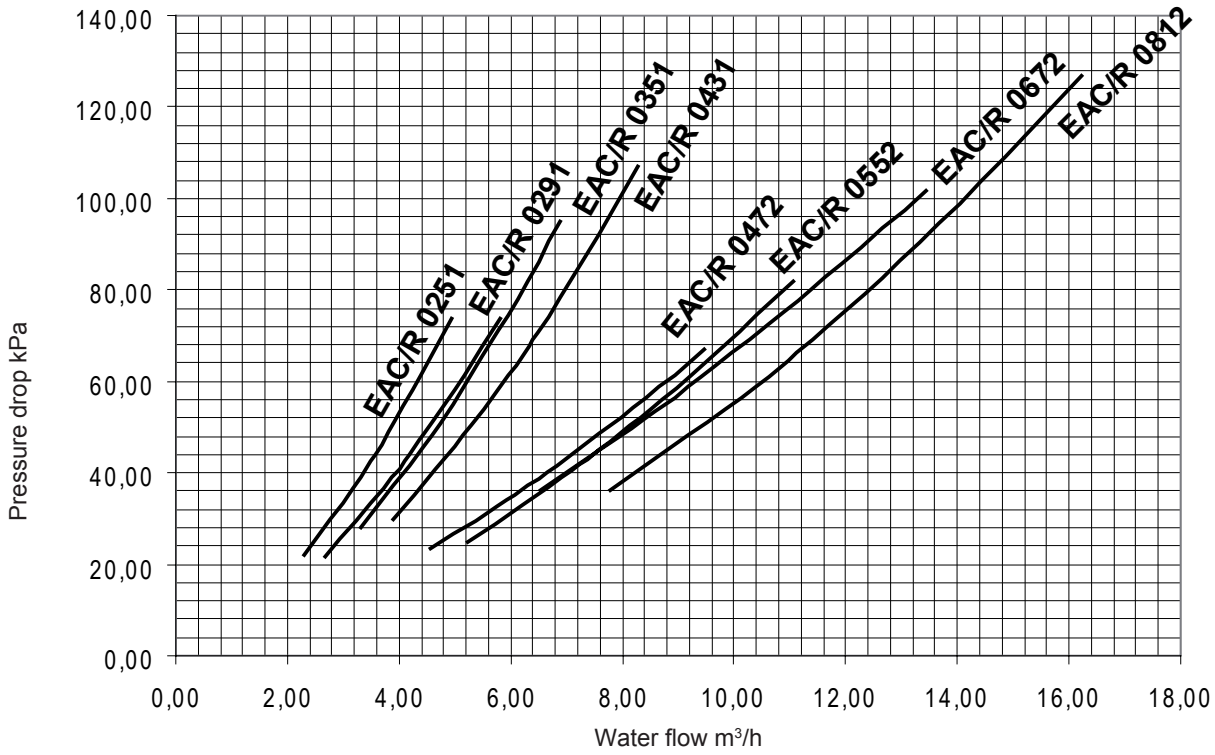


1.- GENERAL CHARACTERISTICS

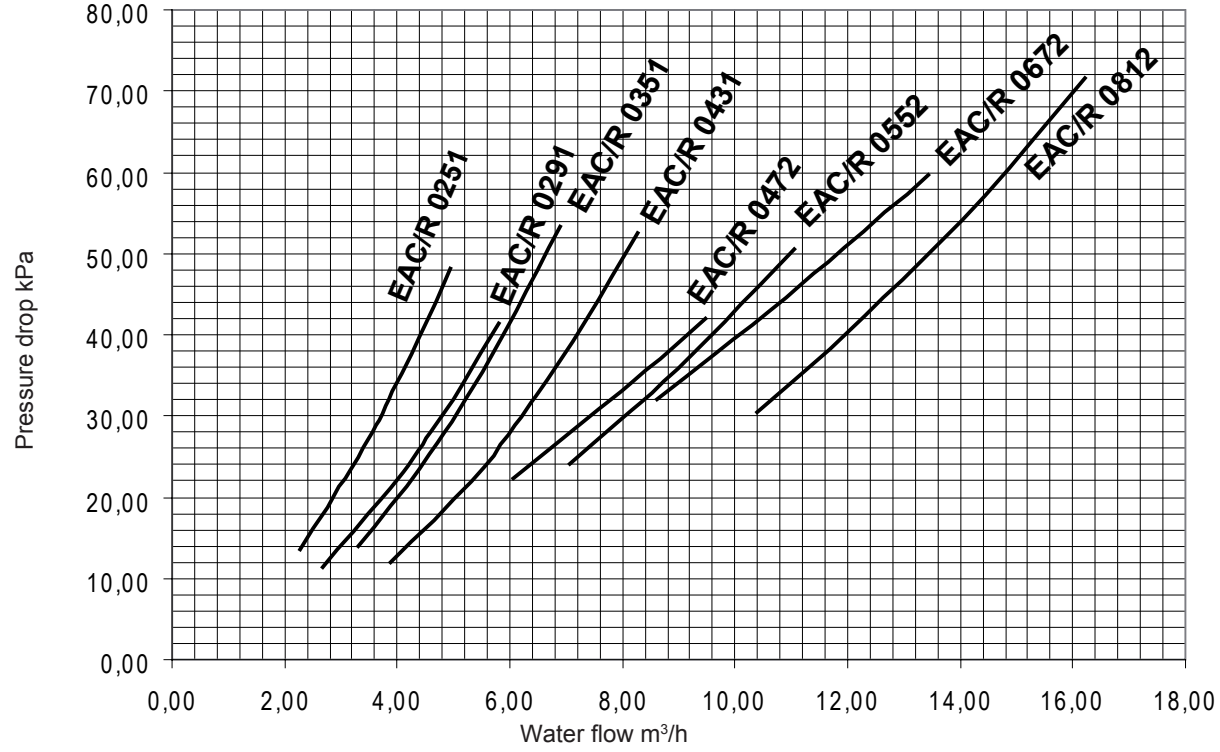
1.5.- PRESSURE DROP IN THE WATER SYSTEM

INSTALLATION ADVISE
The units include a water filter at the inlet to the unit (trapping any particle with a diameter greater than 1mm.
With the option twin pump it can be supplied loose

PRESSURE DROP + WATER FILTER



PRESSURE DROP WITHOUT FILTER

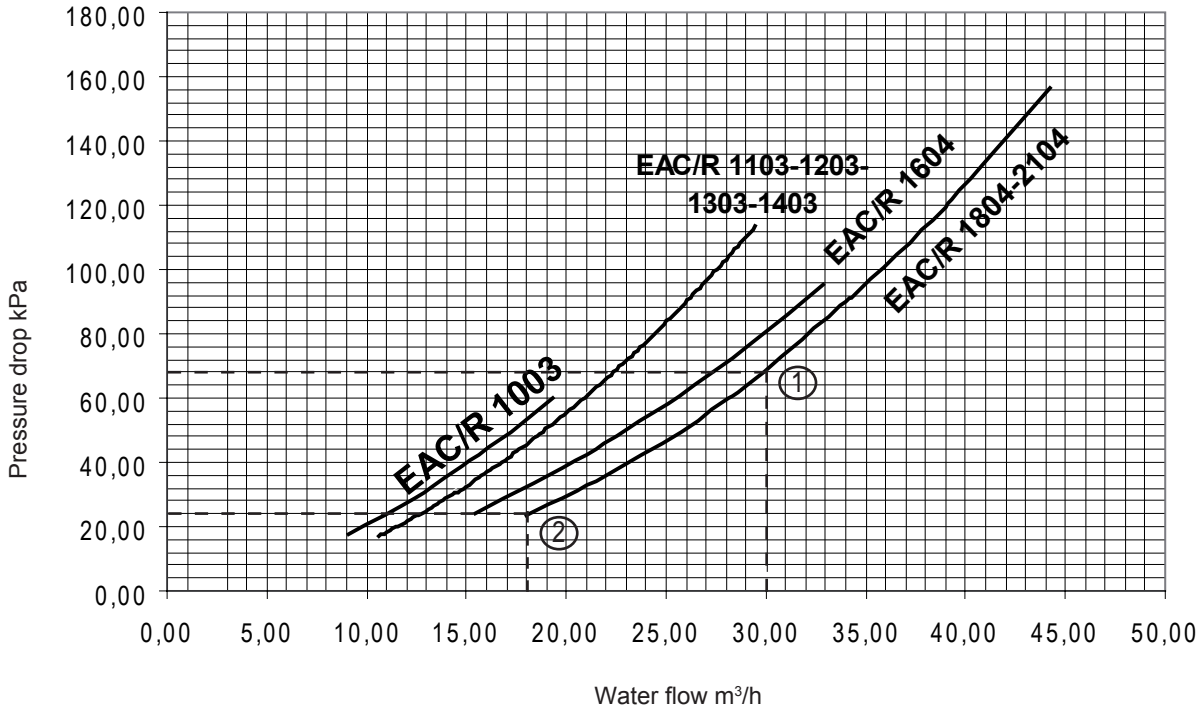


1.- GENERAL CHARACTERISTICS

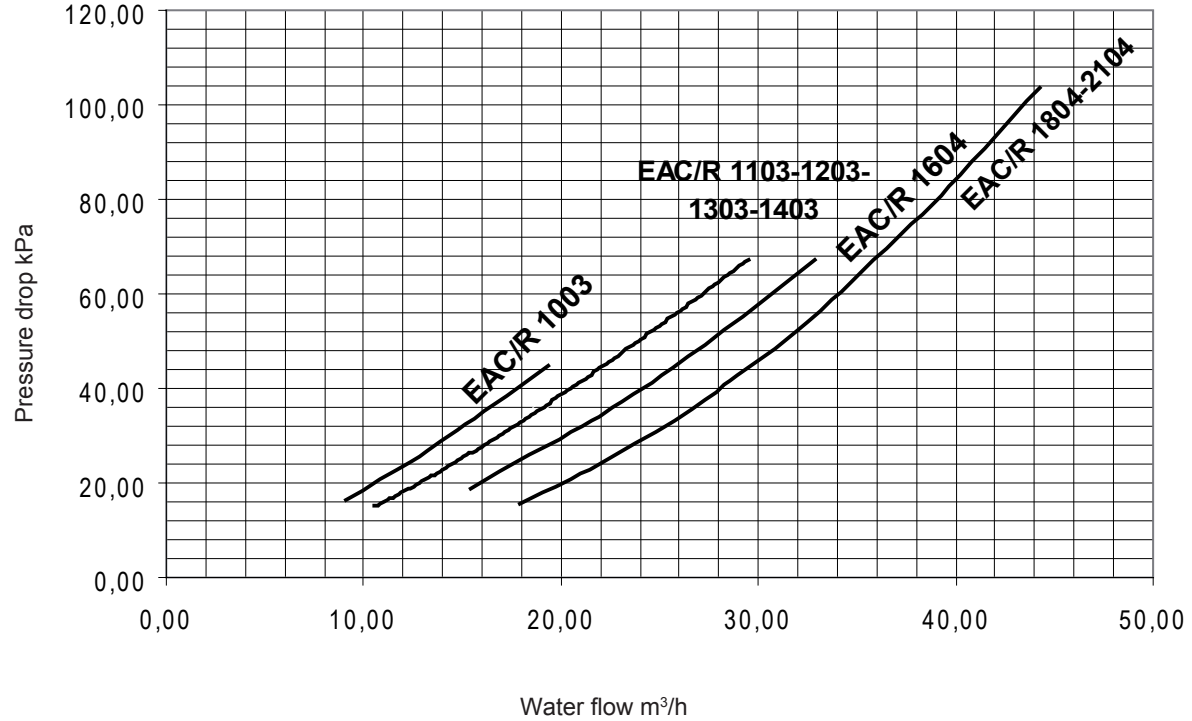
1.5.- PRESSURE DROP IN THE WATER SYSTEM

INSTALLATION ADVISE
The units include a water filter at the inlet to the unit (trapping any particle with a diameter greater than 1mm. With the option twin pump it can be supplied loose

PRESSURE DROP + WATER FILTER



PRESSURE DROP WITHOUT FILTER

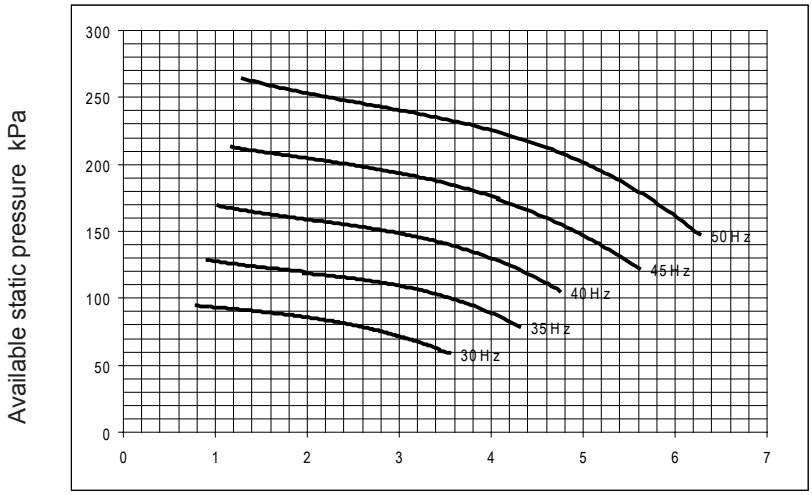


1.- GENERAL CHARACTERISTICS

1.6.- HYDRAULIC SYSTEM DATA

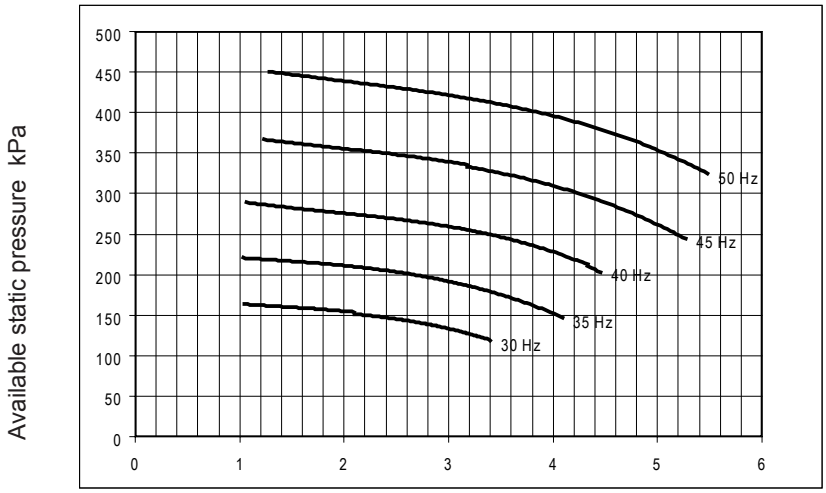
WATER FLOW AND AVAILABLE STATIC PRESSURE OF WATER PUMP

0251 - 0291



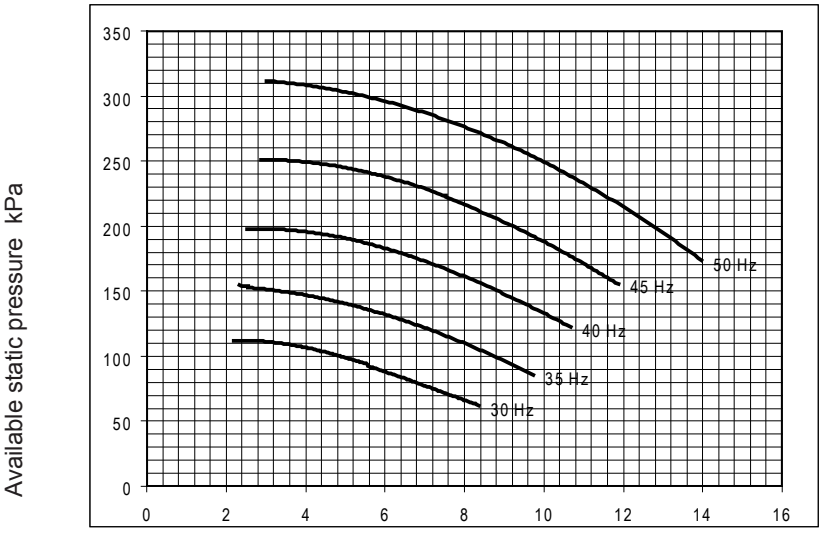
Water flow m^3/h

0351 - 0431



Water flow m^3/h

0472 - 0812

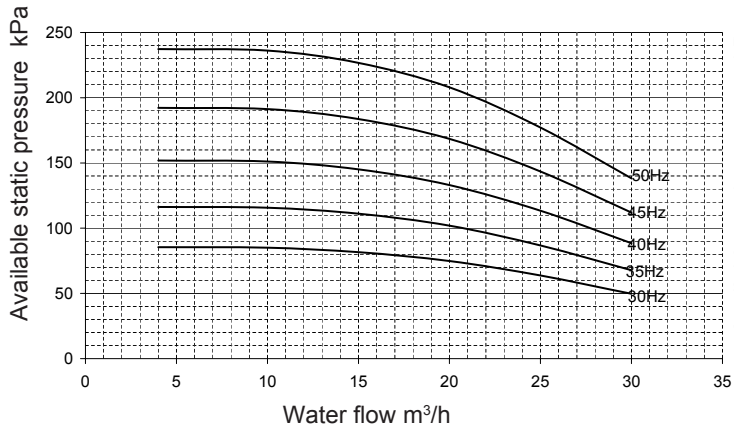


Water flow m^3/h

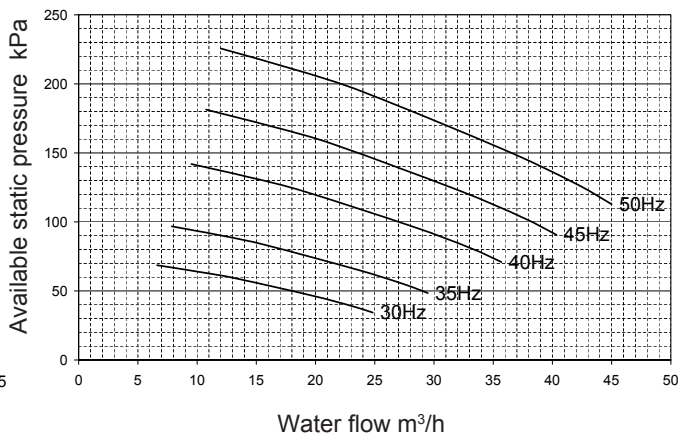
1.- GENERAL CHARACTERISTICS

1.6.- HYDRAULIC SYSTEM DATA

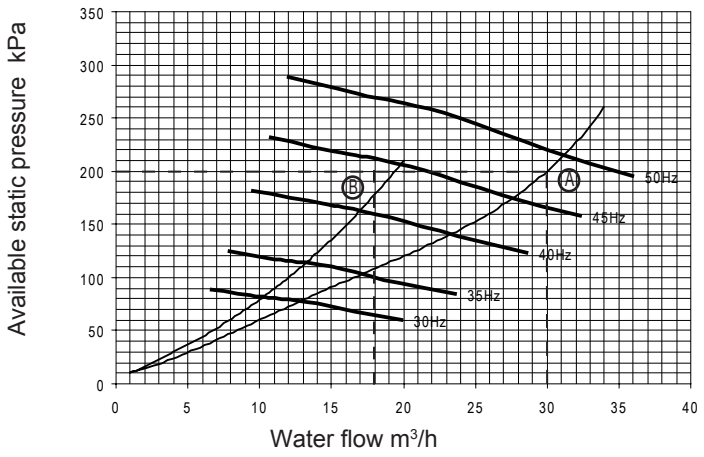
1003-1103-1303-1303



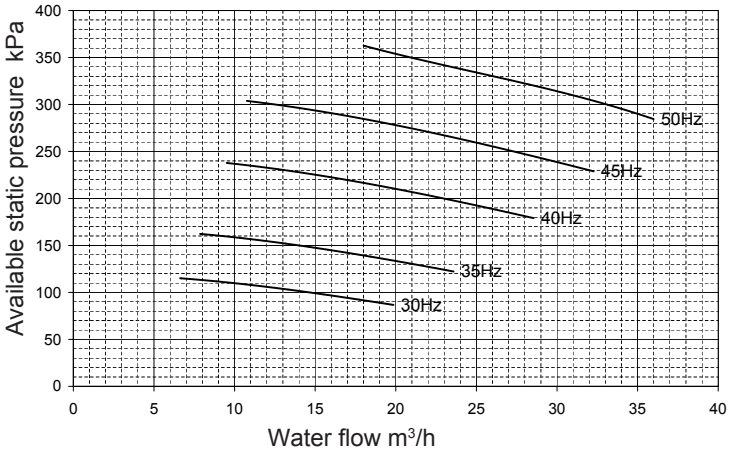
1403-1604



1804



2104



NOTE: With the twin pumps kit, the available static pressure will decrease 5% from the data shown above.

UNITS WITHOUT VARIABLE WATER FLOW OPTION:
To get available static pressure of the unit, use the graphics for the water pump available static pressure (50Hz) and take into account pressure drop of the unit +filter.

UNITS WITH VARIABLE WATER FLOW OPTION:
It is possible to vary the speed of the water pump:
1. - Constant value for the difference between input/output water temperature of heat plates exchanger (Fix delta T).
2. - Constant value for the difference between input/output water pressure of the pump (Fix delta P).
For these control settings please consult the user manual of Climatic 60: “Pump evaporator flow control”
3. - The calculation for the “Fix delta T” must be around 5K. For the calculation of “Fix delta P” with 2 pipes please use the following process.
For a 2 pipes installation with unit EAC1804SM4:
a) With all valves and terminal units opened. (Reference A)
Nominal airflow: 30 m3/h
Pressure drop unit+filter: 68 kPa (Reference 1)
Pressure drop of the installation (to determine for each installation): 132 kPa
Available static pressure: 68+132= 200 kPa.
Control setting for the unit **2 bar** (200 kPa) and **94%** (48 Hz)

b)The same installation with 30% of the valves and terminal units opened.
The installation is **self-adjusted** to the reference B of the graph keeping constant initial setting value of 2 bar (200kPa) according to the following explanation:
Nominal airflow: 19,5 m3/h
Pressure drop unit+filter:24 kPa (Reference 2)
Pressure drop of the installation (to determine for each installation): 176 kPa
Available static pressure: 24+176= 200 kPa.
Water pump speed is decreased (44 Hz) and therefore power consumption is also reduced.

1.- GENERAL CHARACTERISTICS

1.6.- HYDRAULIC SYSTEM DATA

MINIMUM WATER FLOW

In case of installation without variable water flow, the flow rate must be higer than the minimum flow given in the table below.
In case of installation with variable water flow, the pump speed the pump speed is controlled through the CLIMATIC control. The hydraulic system must be properly designed and balanced to ensure a right water flow.

		Water flow (m3/h)			
Models	Capacity (kW)	Minimum (With variable water flow option)	Minimum (Without variable water flow option)	Nominal	Maximum
0251	22,1	2,3	3,2	3,80	4,95
0291	25,9	2,7	3,7	4,45	5,81
0351	32,0	3,3	4,4	5,50	6,88
0431	37,6	3,9	5,3	6,47	7,36
0472	44,1	4,6	6,1	7,59	9,46
0552	50,7	5,2	7,1	8,72	11,05
0672	63,4	6,5	8,6	10,90	13,44
0812	75,4	7,8	10,4	12,97	14,43
1003	88,2	9,1	12,38	15,17	19,35
1103	102	10,5	13,9	17,54	21,72
1203	112	11,6	15,76	19,26	24,62
1303	126	13,0	17,48	21,67	27,31
1403	139	14,3	18,86	23,91	29,48
1604	149	15,4	21,06	25,63	32,90
1804	174	18,0	24,77	29,93	38,70
2104	199	20,5	28,3	34,23	44,25

WARNING
Because of cooling motor issues, it is not possible water pump working below 30Hz.

MAXIMUM WATER FLOW
See maximum water flow, (see table above). Always assure the minimum ΔT to the exchanger of 3ºC.

MAXIMUM WATER VOLUME IN THE INSTALLATION
The units with Hydronic or Hydraulic module include a expansion vessel.
The table below details the maximum water volume in the system.

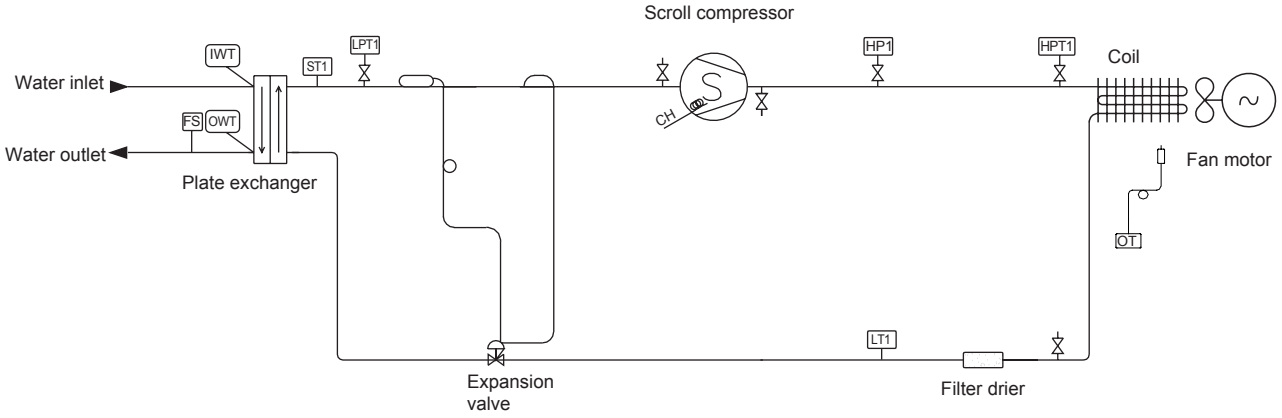
MODELS	**1003 ► 1403**	**1604 2104**
SOLUTION	Water volume in liters	
WATER	1600	2250
WATER + 10% GYT	1225	1725
WATER + 20% GYT	1075	1500
WATER + 30% GYT	925	1300
WATER + 35% GYT	700	1000

If the water volume in the system is greater than that detailed in the table it will be necessary to add additional expansion vessel(s).
The system design must allow for water expansion and contraction.

1.- GENERAL CHARACTERISTICS

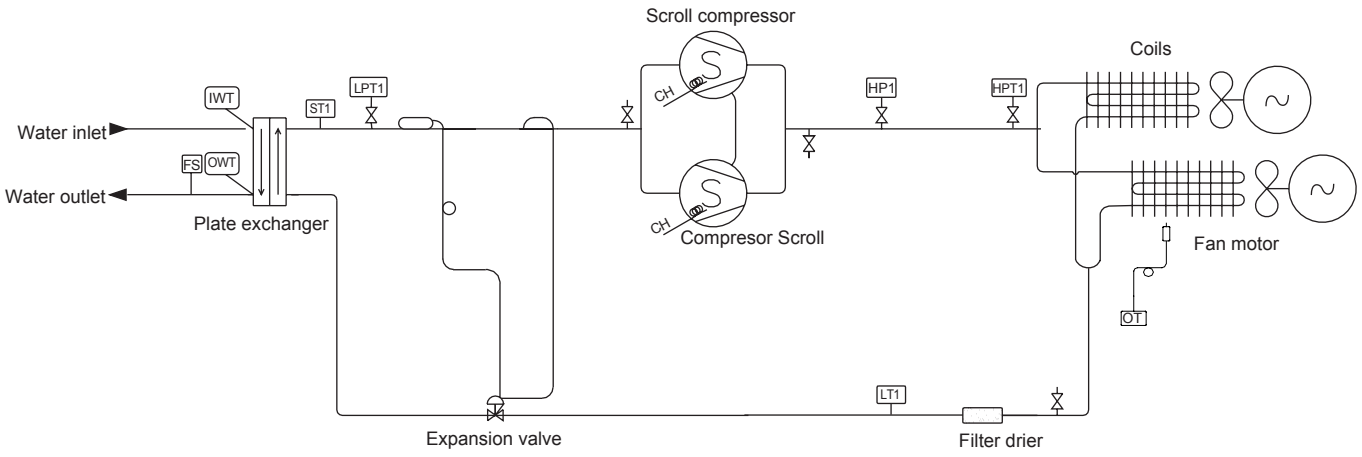
1.7.- PIPING DRAWINGS

COOLING ONLY UNITS EAC 0251SM TO 0431SM



- Pressure gauge
- FS — Flow switch
- IWT — Water inlet probe (water inlet regulation)
- OWT — Water outlet probe (anti-freeze protection)
- HP1 — High pressure switch
- CH — Crank case heater
- OT — Outdoor temperature sensor
- LPT1 — Low pressure transducer. Circuit 1
- HPT1 — High pressure transducer. Circuit 1
- ST1 — Suction temperature probe. Circuit 1
- LT1 — Liquid temperature probe. Circuit 1

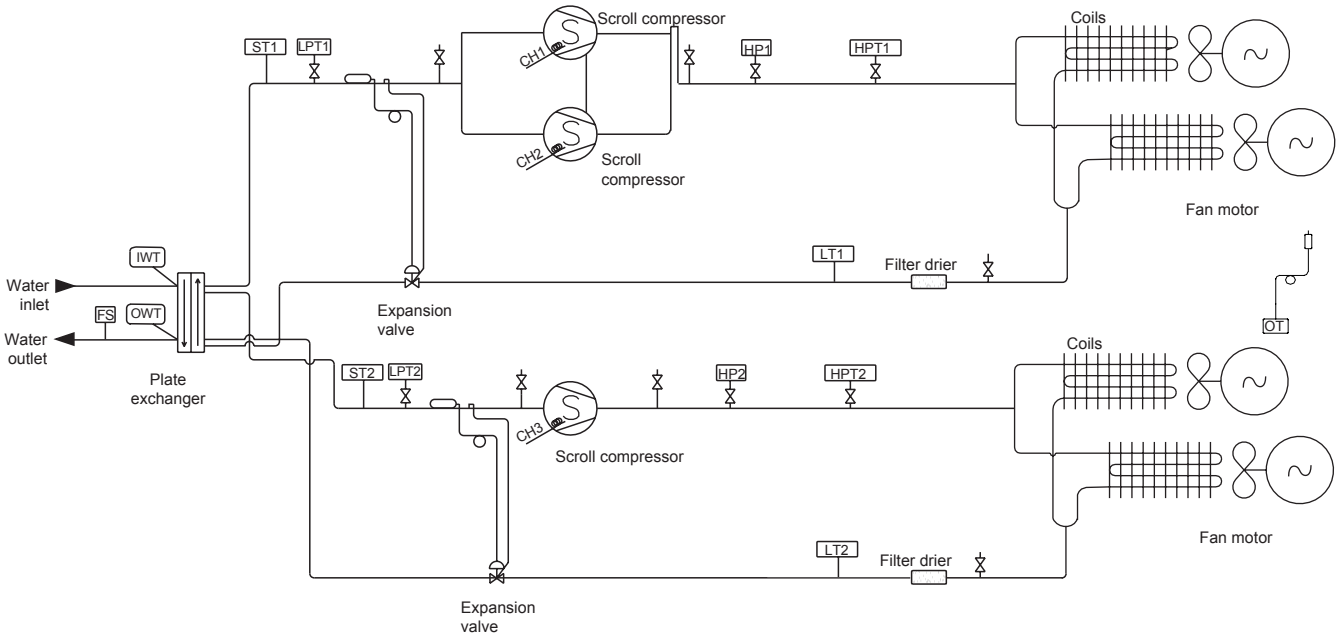
COOLING ONLY UNITS EAC 0472SM TO 0812SM



1.- GENERAL CHARACTERISTICS

1.7.- PIPING DRAWINGS

COOLING ONLY UNITS EAC 1003 TO 1403



Pressure gauge

FS Flow switch

IWT Water inlet probe

OWT Water outlet probe

LP1 LP2 Low pressure transducer circuit 1/ circuit 2

HP1 HP1 Low pressure switch circuit 1 / circuit 1

OT Outdoor temperature sensor

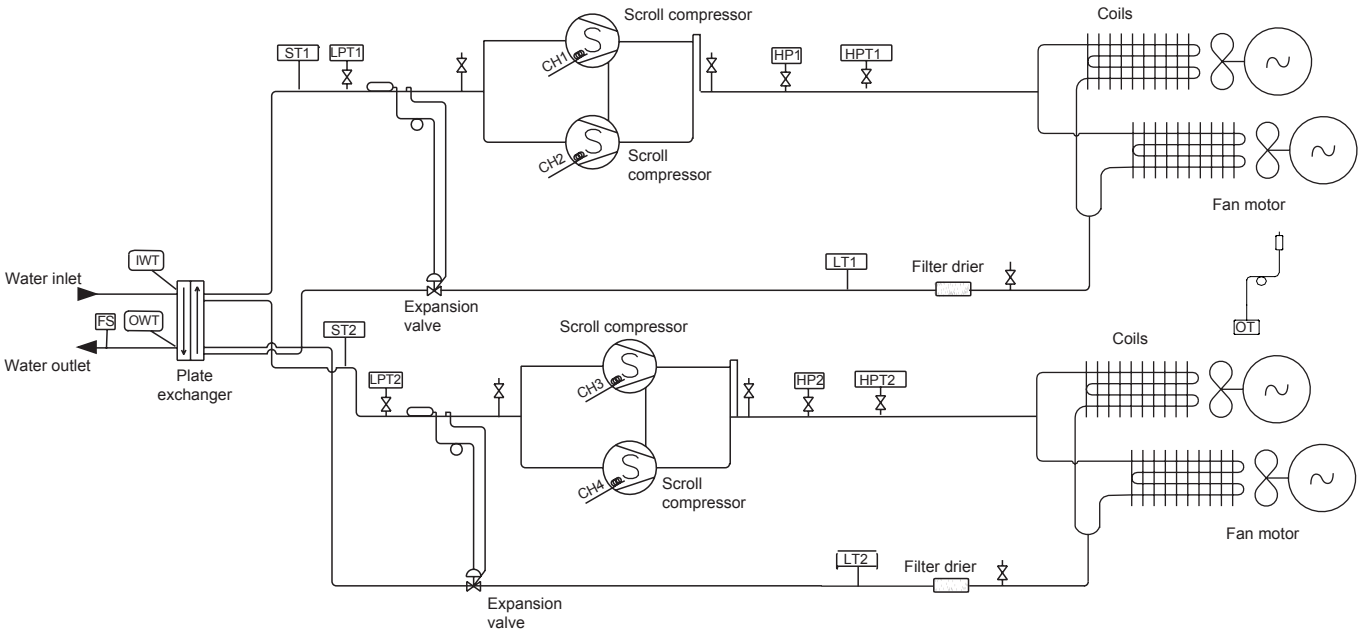
HPT1 HPT2 High pressure transducer. Circuit 1 / Circuit 2

LT1 LT2 Liquid temperature probe. Circuit 1 /Circuit 2

ST1 ST2 Suction temperature probe. Circuit 1 / Circuit 2

CH1 CH2 CH3 CH4 Crank case heater 1 / 2 / 3 / 4

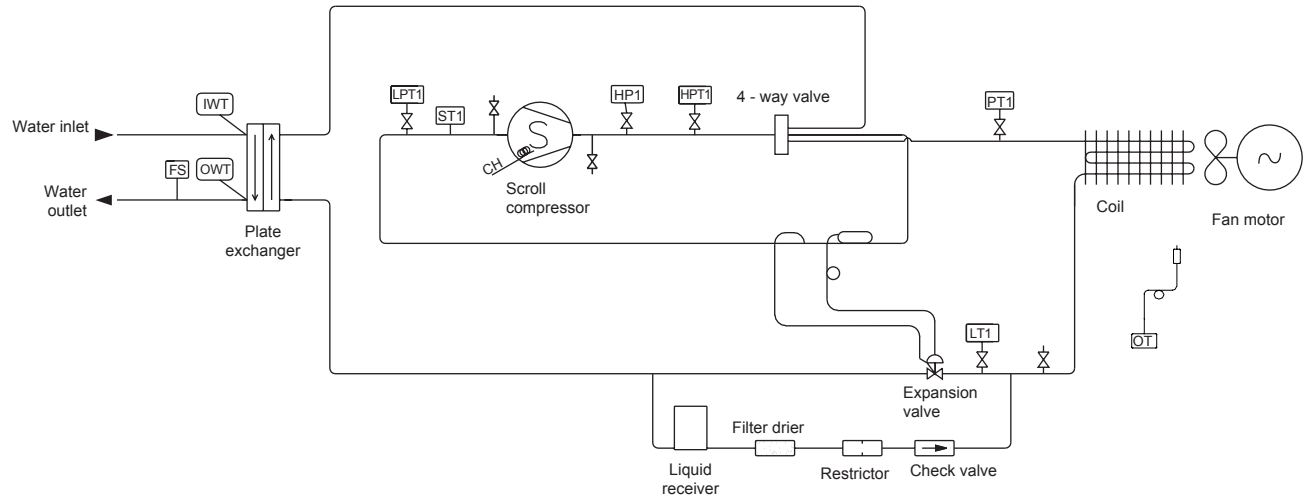
COOLING ONLY UNITS EAC 1604 TO 2104



1.- GENERAL CHARACTERISTICS

1.7.- PIPING DRAWINGS

HEAT PUMP UNITS EAR 0251SM TO 0431SM



Pressure gauge

FS Flow switch

IWT Water inlet probe (water inlet regulation)

OWT Water outlet probe (anti-freeze protection)

LPT1 Low pressure transducer. Circuit 1

HPT1 High pressure transducer. Circuit 1

HP1 High pressure switch

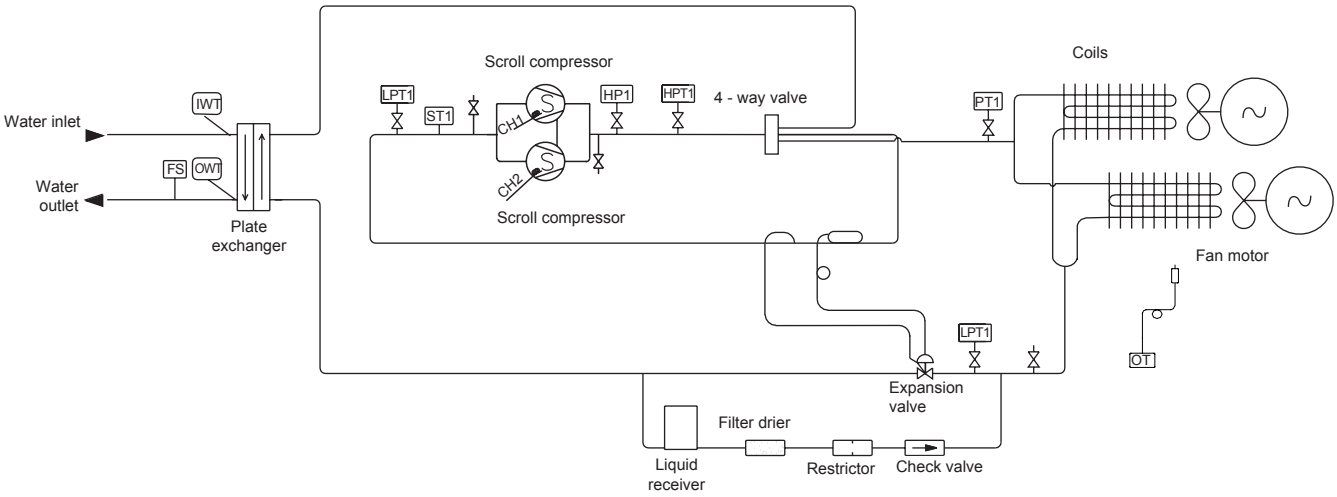
CH Crank case heater

LT1 Liquid temperature probe. Circuit 1

ST1 Suction temperature probe. Circuit 1

OT Outdoor temperature sensor

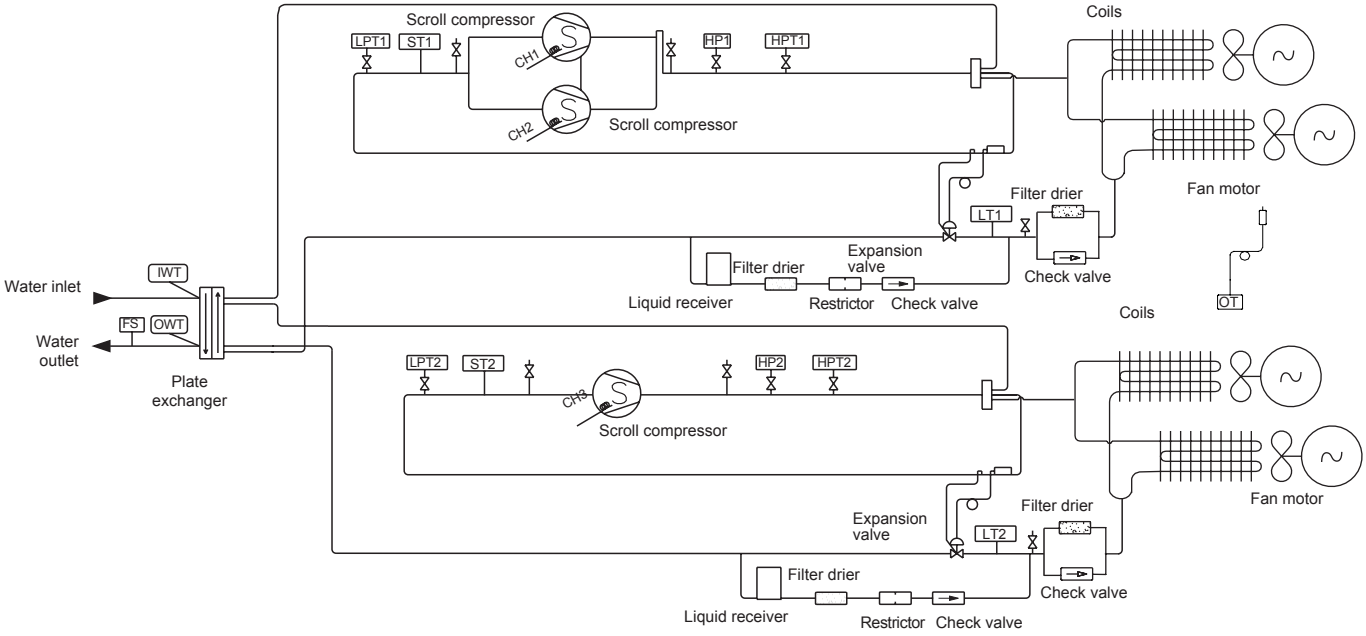
HEAT PUMP UNITS EAR 0472SM TO 0812SM



1.- GENERAL CHARACTERISTICS

1.7.- PIPING DRAWINGS

HEAT PUMP UNITS EAR 1003 TO 1403



Pressure gauge

FS Flow switch

IWT Water inlet probe

OWT Water outlet probe

CH1 CH2 CH3 CH4 Crank case heater 1 / 2 / 3 / 4

HP1 HP2 High pressure switch circuit 1 / circuit 2

LPT1 LPT2 Low pressure transducer. Circuit 1 / Circuit 2

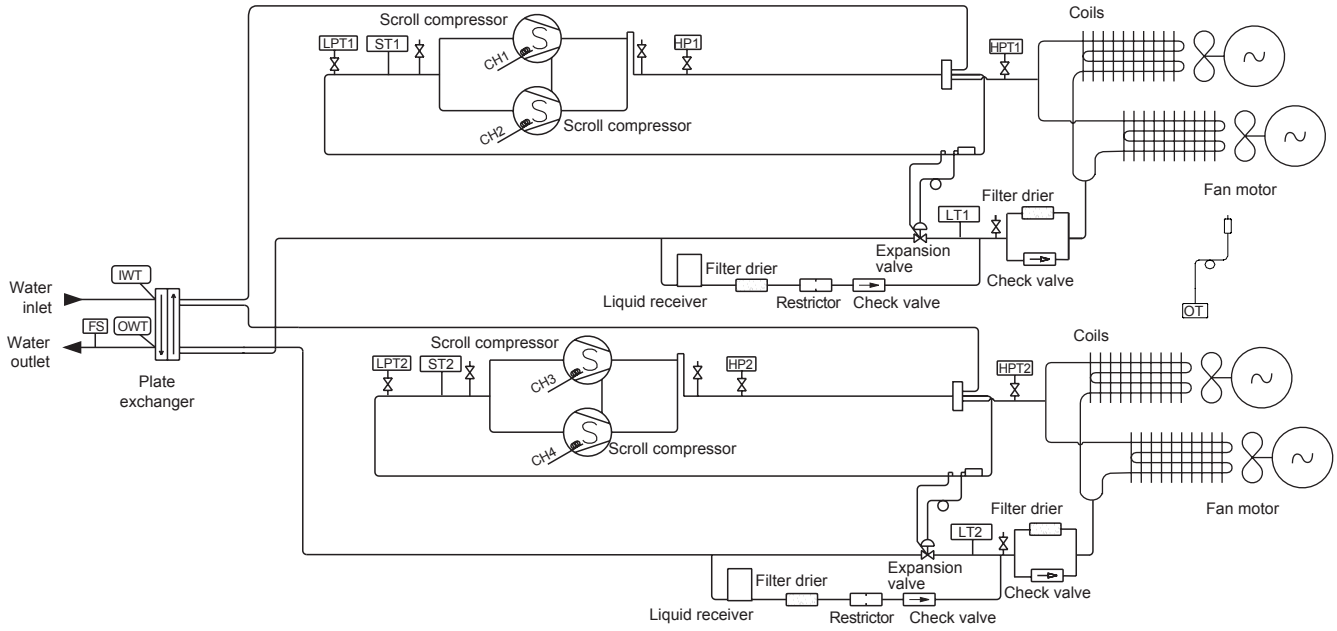
HPT1 HPT2 High pressure transducer. Circuit 1 / Circuit 2

LT1 LT2 Liquid temperature probe. Circuit 1 /Circuit 2

ST1 ST2 Suction temperature probe. Circuit 1 / Circuit 2

OT Outdoor temperature sensor

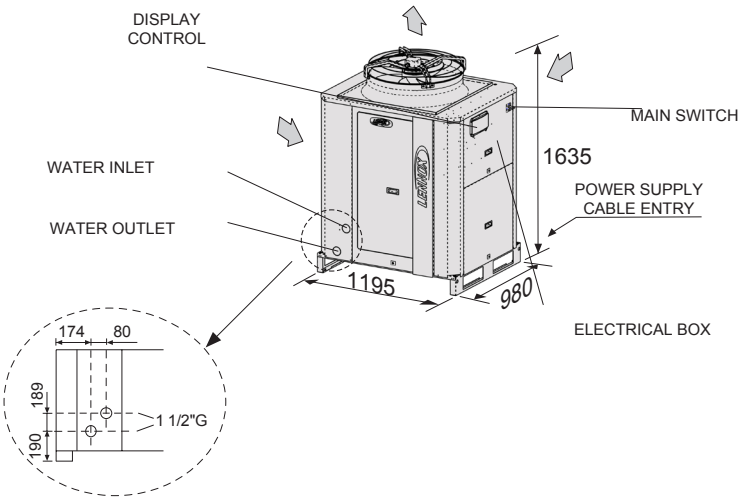
HEAT PUMP UNITS EAR 1604 TO 2104



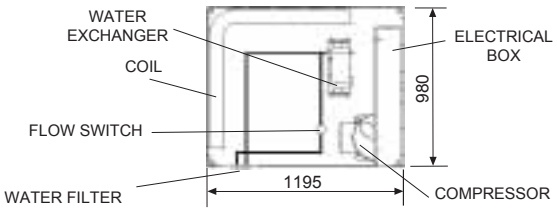
1.- GENERAL CHARACTERISTICS

1.8.- DIMENSIONS

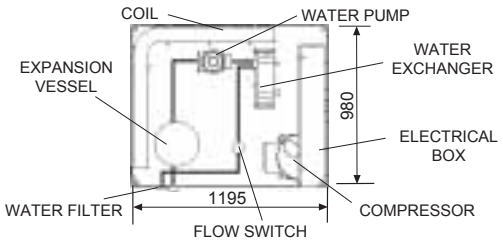
EAC/EAR 0251-0291-0351-0431



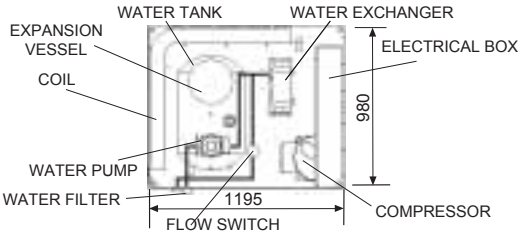
COMPONENT POSITION STANDARD VERSION UNIT



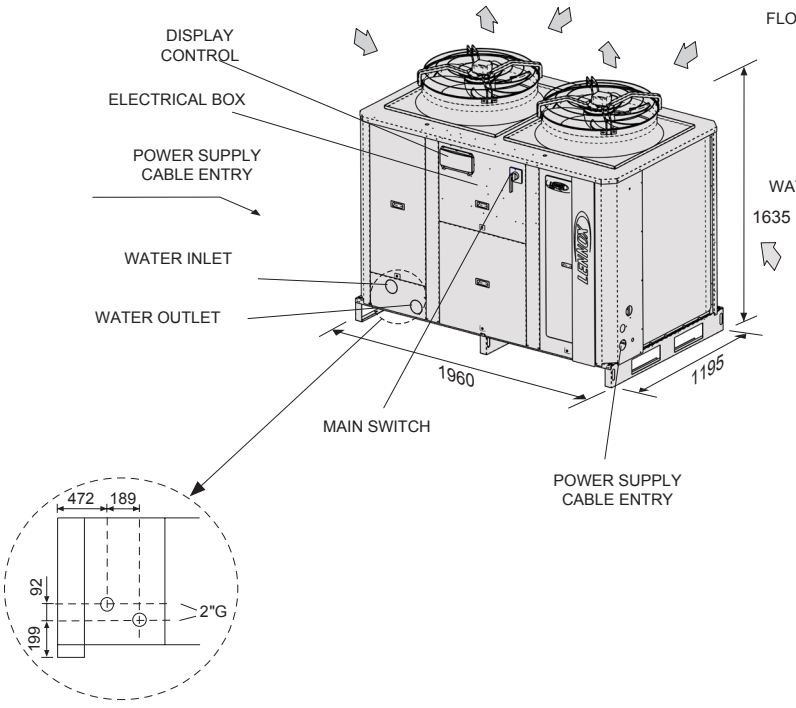
COMPONENT POSITION HYDRAULIC VERSION UNIT



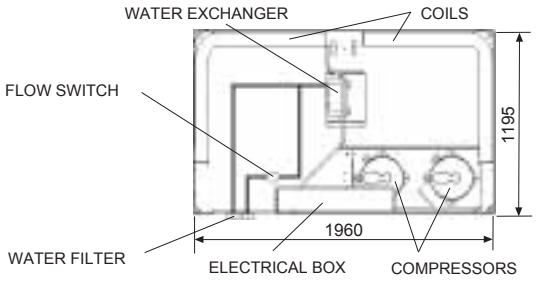
COMPONENT POSITION HYDRONIC VERSION UNIT



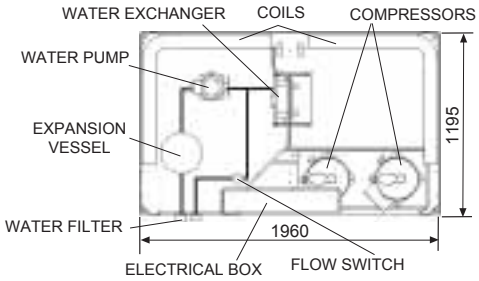
EAC/EAR 0472-0552-0672-0812



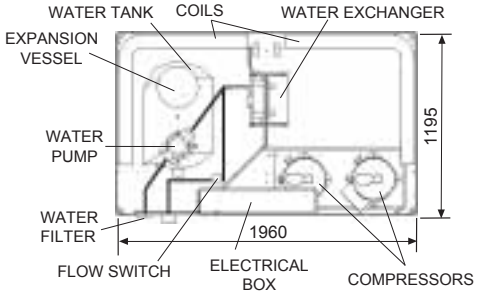
COMPONENT POSITION STANDARD VERSION UNIT



COMPONENT POSITION HYDRAULIC VERSION UNIT



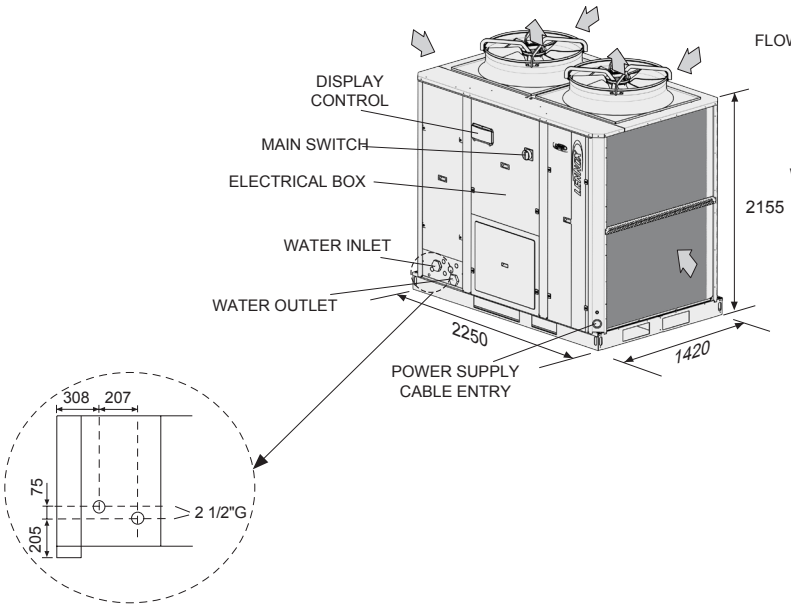
COMPONENT POSITION HYDRONIC VERSION UNIT



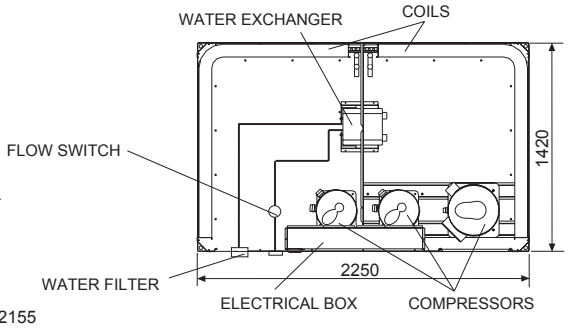
1.- GENERAL CHARACTERISTICS

1.8.- DIMENSIONS

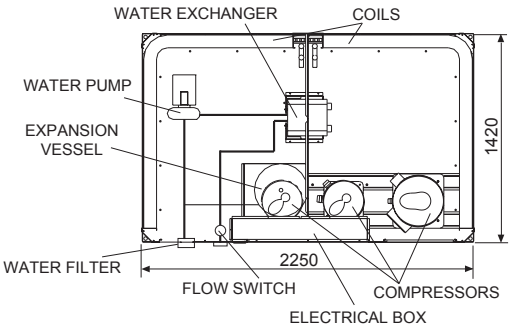
EAC/EAR 1003SM-1103SM-1203SM-1303SM-1403SM



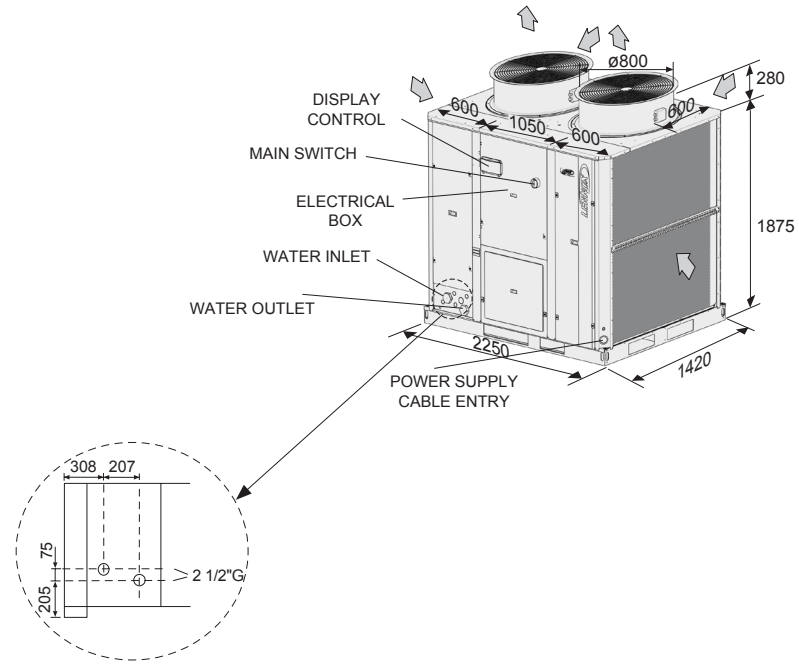
COMPONENT POSITION STANDARD VERSION UNIT



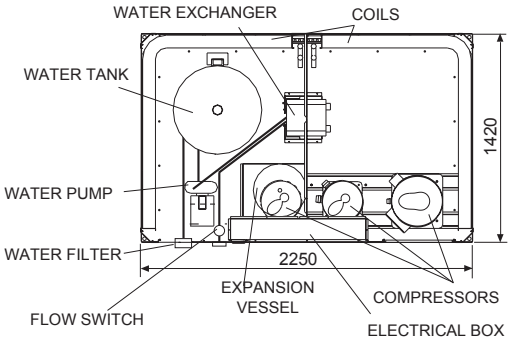
COMPONENT POSITION HYDRAULIC VERSION UNIT



EAC/EAR 1003FM-1103FM-1203FM-1303FM-1403FM



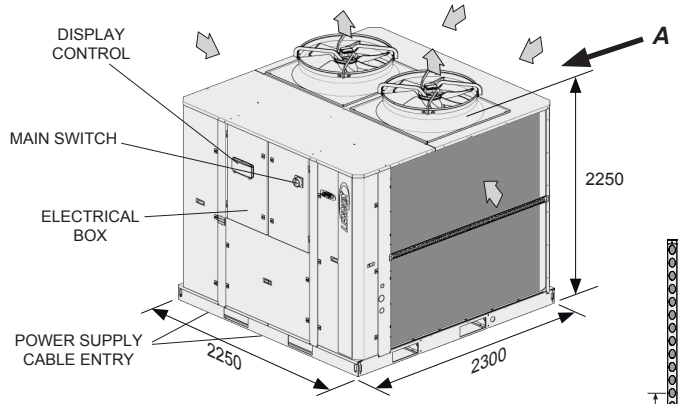
COMPONENT POSITION HYDRONIC VERSION UNIT



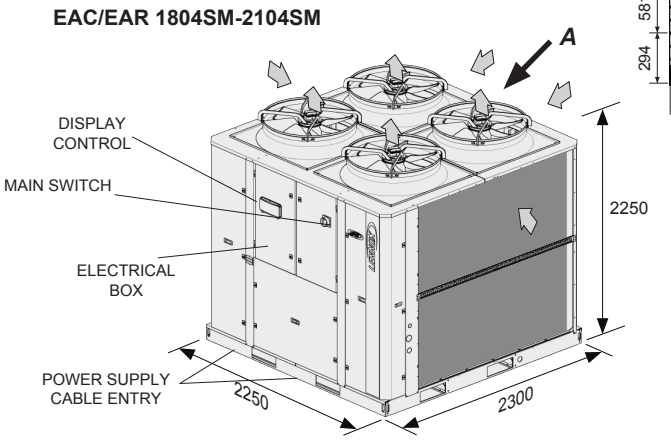
1.- GENERAL CHARACTERISTICS

1.8.- DIMENSIONS

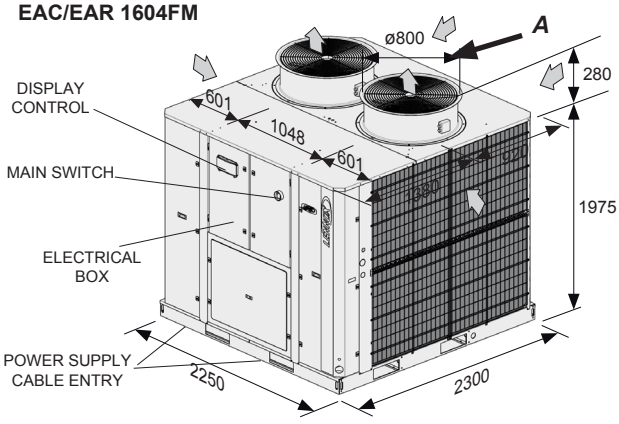
EAC/EAR 1604SM



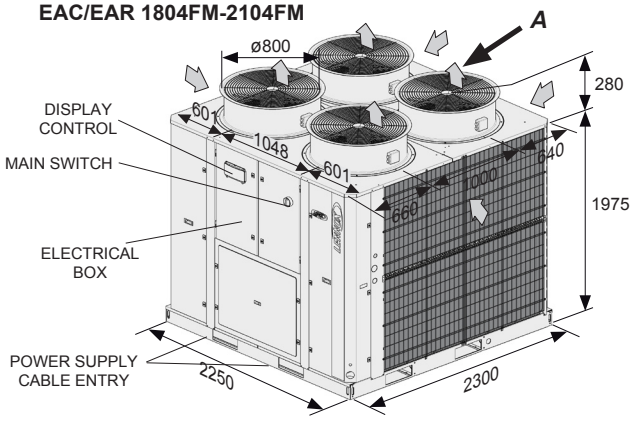
EAC/EAR 1804SM-2104SM



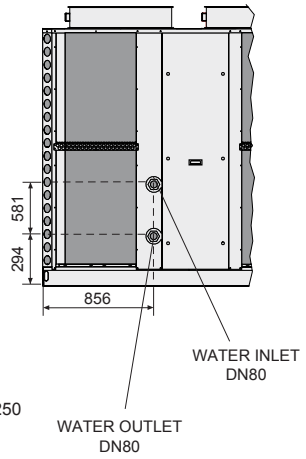
EAC/EAR 1604FM



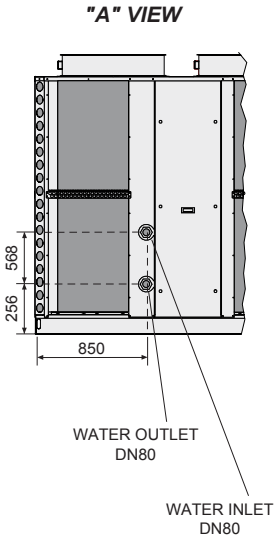
EAC/EAR 1804FM-2104FM



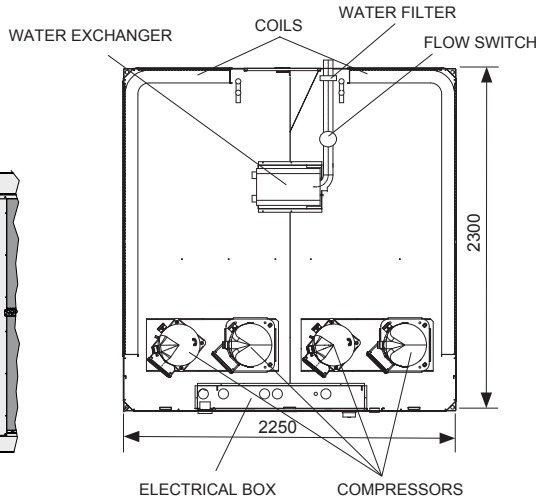
"A" VIEW



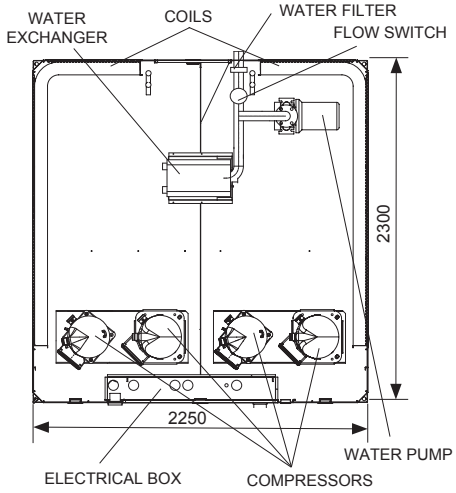
"A" VIEW



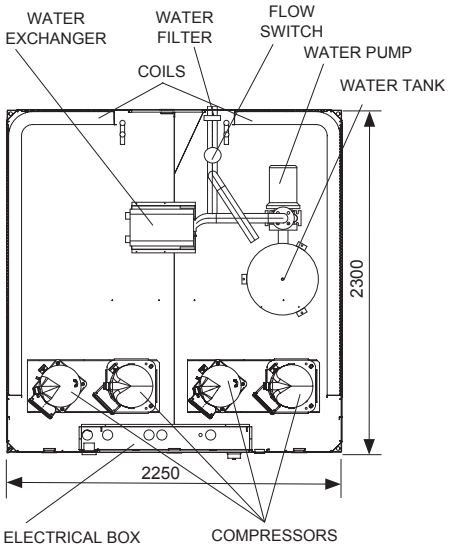
COMPONENT POSITION STANDARD VERSION UNIT



COMPONENT POSITION HYDRAULIC VERSION UNIT



COMPONENT POSITION HYDRONIC VERSION UNIT



2.- INSTALLATION

2.1.- SITE AND SHIPPING GUIDANCE

All INSTALATION, SERVICE, and MAINTENANCE operations must be carried out by QUALIFIED PERSONNEL

The unit must be transported in a HORIZONTAL POSITION on its metal bedplate profiles . Any other position may cause serious damage to the machine.
When the unit is received, it should be checked to assure that there are no bumps or other damage, following the instructions on the packaging. If there is damage, the unit may be rejected by notifying the LENNOX Distribution Department and reporting why the machine is unacceptable on the transport agent's delivery notice. Any later complaint or claim made to the LENNOX Distribution Department, for this type of anomaly, cannot be considered under the Guarantee.

Sufficient space must be allowed to facilitate placement of the unit. The unit may be mounted outdoors. There should be adequate drainage around the unit.

In heat pump units during defrost cycle, the units produce a great amount of water melting the ice off coils.
If you wish to drain the water, adequate drainage should be installed behind the unit to collect and carry out the water where desired.

When positioning the unit, be sure that the Rating Plate will always be visible since this data will be necessary to assure proper maintenance.

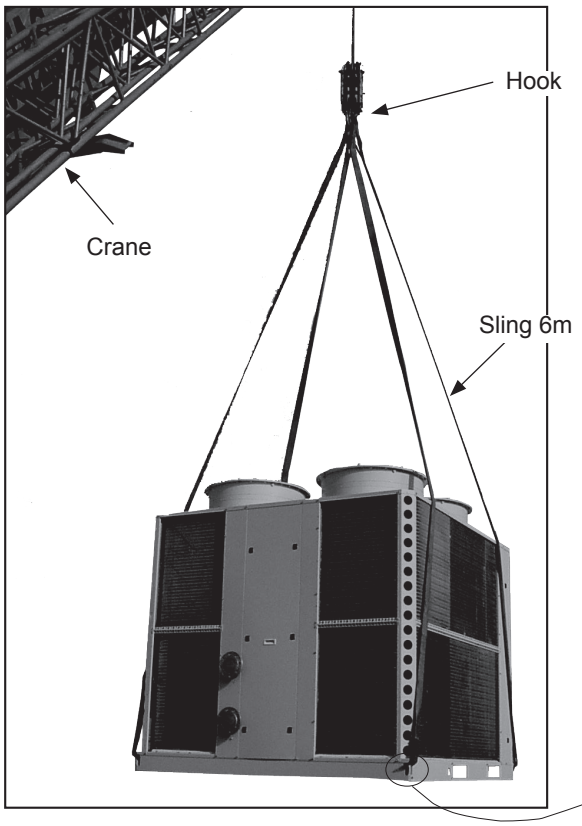
It is advisable to unpack the unit at the place where the unit is going to be installed, to avoid damages during manage.

2.2.- UNIT LIFTING

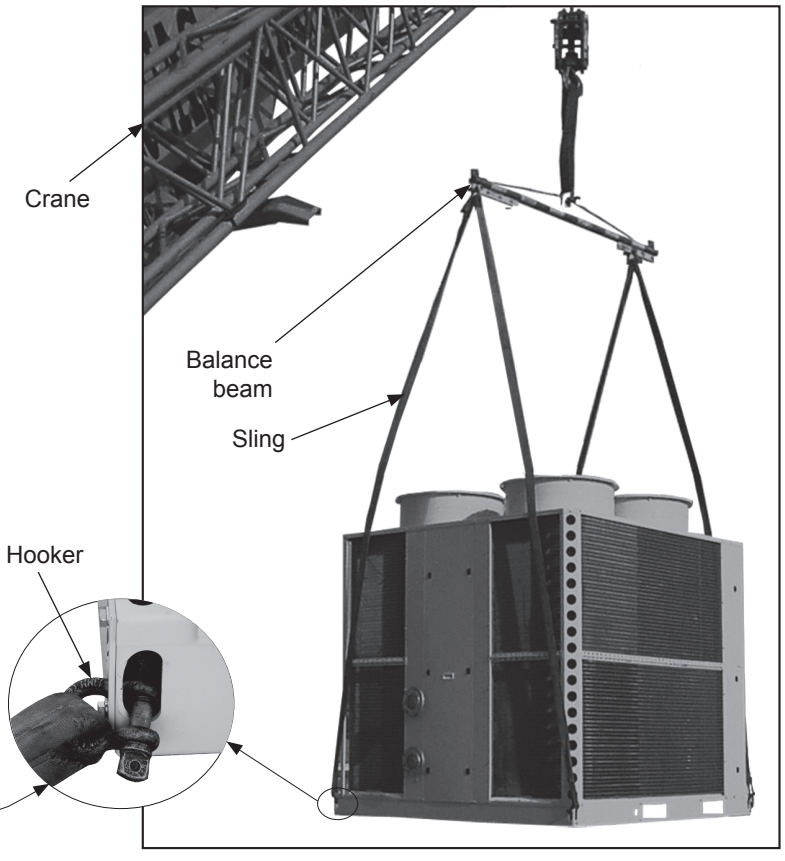
How to hoist the unit

If unloading and placement requires the use of a crane, then secure the suspension cables as shown in the figure.
The unit can only be lifted and moved by its base.

WITH HOOK



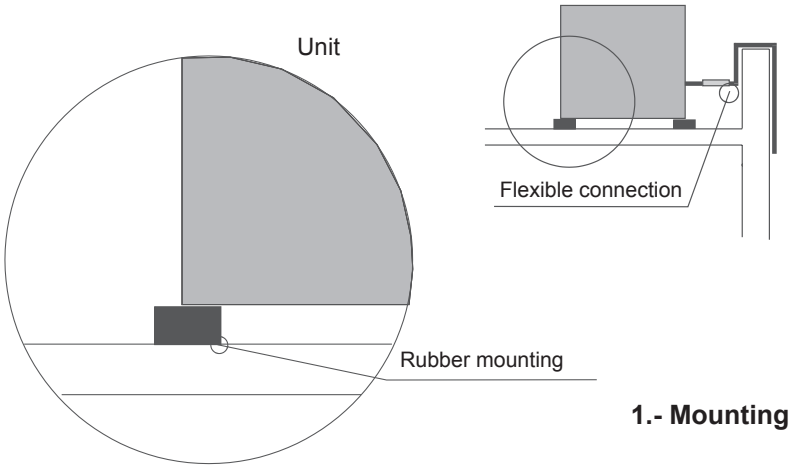
WITH BALANCE BEAM



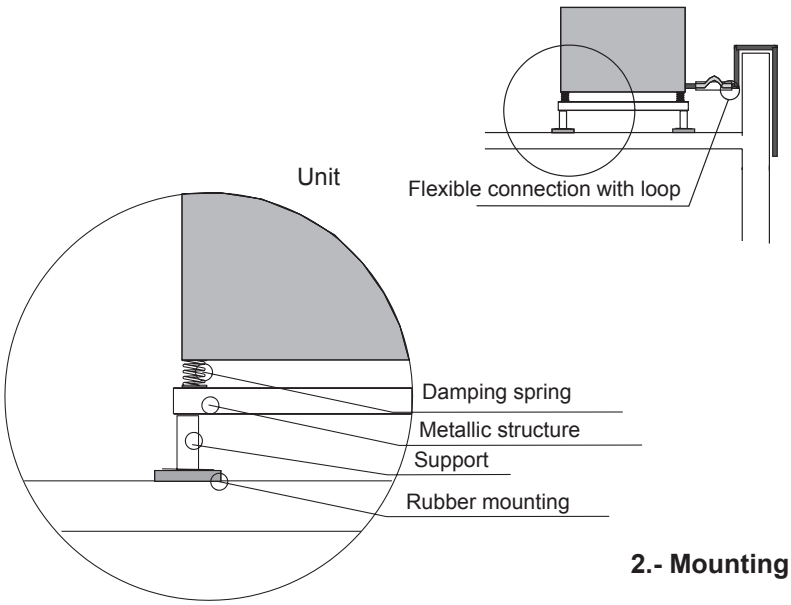
NOTE: Use slingers of 6 m with the hook in order to prevent pressure on the top of the unit because it can be damaged. Whenever it is possible, use balance beam.

2.- INSTALLATION

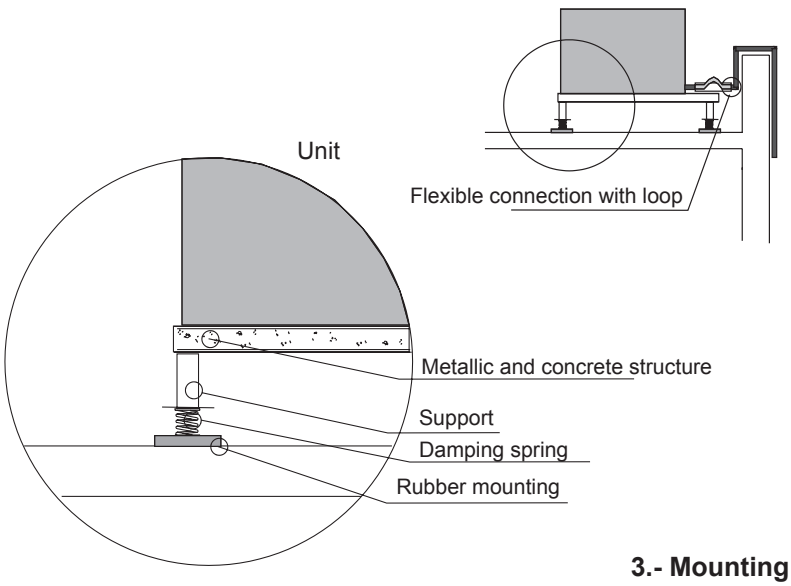
2.3.- ANTIVIBRATION MOUNTING



1.- Mounting on a low sensibility zone



2.- Mounting on a medium sensibility zone



3.- Mounting on a high sensibility zone (Check floor load)

2.- INSTALLATION

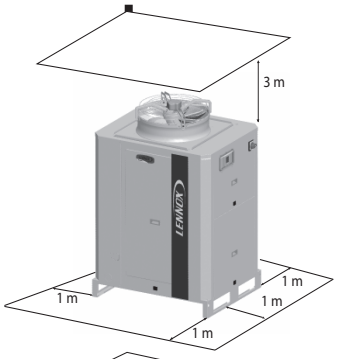
2.4.- INSTALLATION CLEARANCES

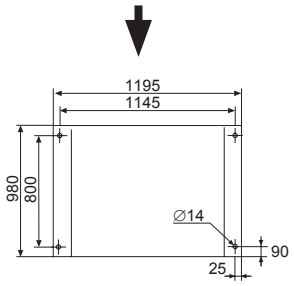
(*) Clearance around the unit, for all unit versions.
Failure to install the units as shown will impact performance and reliability.

INSTALLATION CLEARANCES

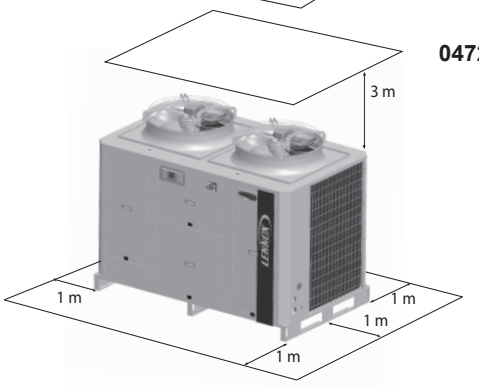
DETAILING AVM POSITIONS

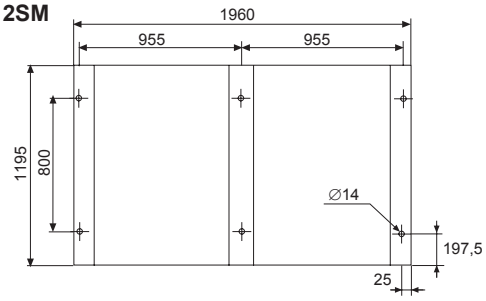
EAC/EAR
0251SM-0291SM-0351SM-0431SM



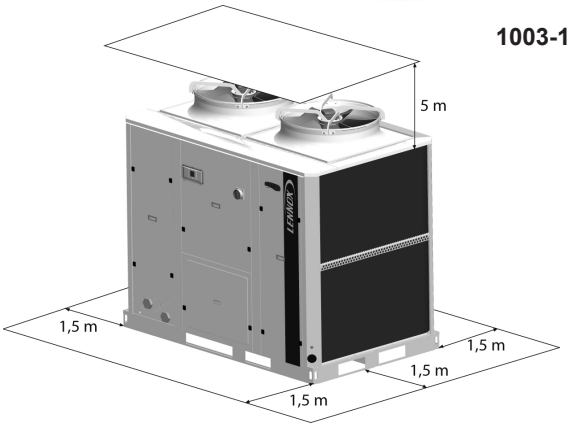


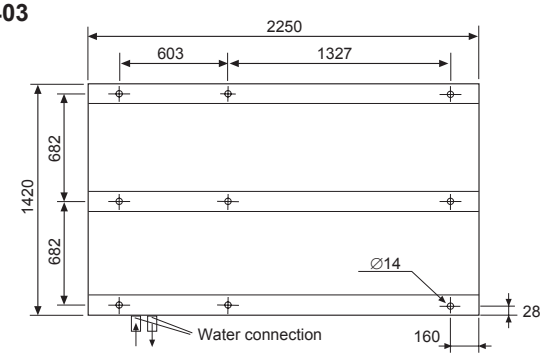
EAC/EAR
0472SM-0552SM-0672SM-0812SM



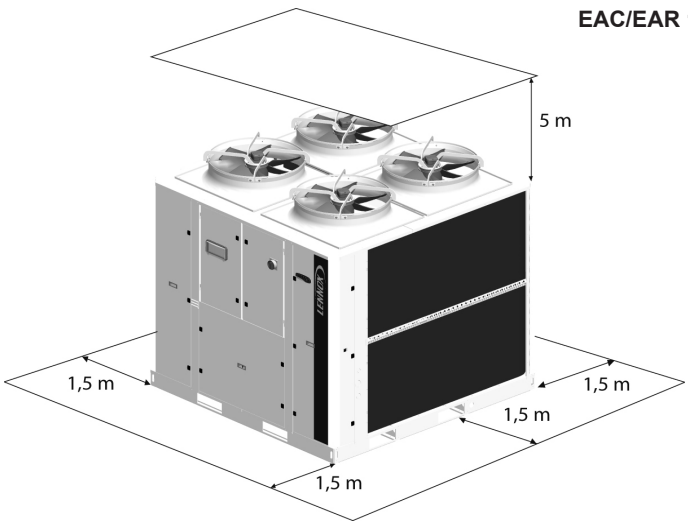


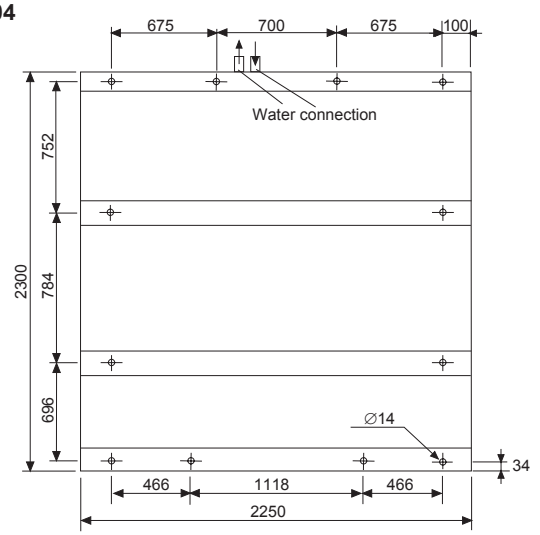
EAC/EAR
1003-1103-1203-1303-1403





EAC/EAR 1604-1804-2104





(*) Keep this space free around the unit for installation, for all unit versions.

2.- INSTALLATION

2.7.- UNIT INSTALLATION

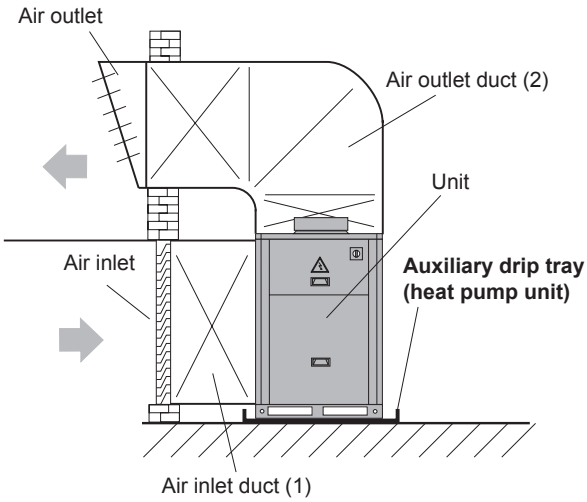
1.- The EcoLeanTM units could be installed outside or inside.
2.- See the minimum clearance diagrams for access - air supply to the batteries in the heating section of the unit (see page 25).
3.- Assemble the unit on a resistant base, preferably concrete. To prevent vibrations, the concrete base should not come into contact with the building's foundations.
4.- It is advisable to assemble the unit on shock absorbers (antivibration mountings).
5.- During heating mode (heating pump coolers) ice forms in the coils. The defrost process is activated during heating mode in heat pump units, when the outside temperature is low and the outdoor coil could become frozen.
To melt the ice, the defrost function will switch the unit to cooling operation for a short period. When the evaporation temperature starts to drop, a defrost period sets in to provide sufficient heat transfer. During defrosting, the ice melts from the batteries. As a result, the ice contains water which must be removed.

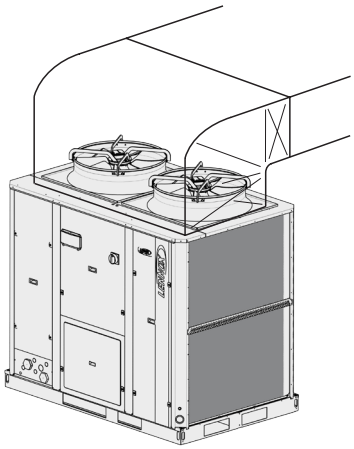
WARNING
If the unit is exposed for long periods to installation conditions below 0ºC the water from defrost can freeze in the base of the unit. This prevents drainage. Ice build up can occur preventing correct operation. For these conditions contact customer service team.

6.- The heat exchanger water flow during cooling must be the same as during heating.
7.- The unit must incorporate a water filter in the unit inlet.

It is necesary that unit incorporate a mesh filter. The step of the mesh should not be superior to 1 mm.

8.- Use water treating if necessary.
9.- The water inlet to the circuit has to be filled from lowest point, with purges opened, to prevent air being trapped.
10.- Location inside:





In units 1804SM, if only one duct is going to be installed, a regulated pressure damper should be installed for each fan, to avoid air by-pass through the fan if it has stopped.

For location inside, keep in mind following advice:
- In heat pump units during defrost cycle, the units produce a great amount of water melting the ice off coils.
If you wish to drain the water, adequate drainage should be installed below the unit to collect and carry out the water where desired.
- Air duct installation:
If air duct has been installed, the operating limits get reduced (see operation limits section in this manual).

2.- INSTALLATION

2.7.- UNIT INSTALLATION

11.- For cooling or heat pump units the hydraulic system must contain the following components pump, buffer tank, expansion device, safety valve, water filter, flow switch.
12.- To obtain the total water system pressure drop add the unit pressure drop + water pipework + fittings and terminal unit pressure drops the water pump can be selected to provide the correct water flow across the heat exchanger.
13.- A water balancing valve is advised to ensure correct water flow.

IMPORTANT

If the outside temperature in the area where the EcoLeanTM unit is to be installed is likely to drop below 5°C, it is very important to take the following precautions to avoid that water in the circuit freezing, that may produce damage to the components.

- If unit has to work under low outside temperatures:

* Do not disconnect power supply in order that water pump starts when detects water temperatures below +5 ºC (only Hydraulic and Hydronic models).

* If the outside temperature where the system is to be installed or the water outlet temperature is likely to drop below 5ºC, it is very important to use glycol anti-freeze.
The amount of anti-freeze required will vary depending on the minimum ambient temperature or the water outlet temperature.
When the percentage of glycol increases the standard pump flow decreases, the pressure drop increases and the cooling and thermal capacities drop. As a result the minimum flow must be multiplied by the coefficient shown in the table:

MINIMUM AMBIENT TEMPERATURE OR WATER OUTLET TEMPERATURE	ETHYLENE GLYCOL %	PRESSURE DROP	WATER FLOW	POWER INPUT	CAPACITIES	
					COOL	HEAT
FROM +5ºC TO 0ºC	10%	1,05	1,02	0,997	0,995	0,994
FROM 0ºC TO -5ºC	20%	1,10	1,05	0,996	0,985	0,993
FROM -5ºC TO -10ºC	30%	1,15	1,08	0,995	0,975	0,99
FROM -10ºC TO -15ºC **(1)**	35%	1,18	1,10	0,994	0,965	0,987

Example: 10 % glycol in EAC 0251SMHN
Minimum flow: 3,16 m^3/h x 1,02
Pressure drop: 175 x 1,05
System capacity x 0,995
Power input x 0,997

(1) With low water temperature -10ºC option, use these quantities of glycol.

Also is advisable to use the option “evaporator anti freeze protection”

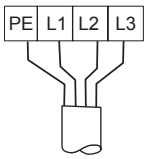
Failure to follow this advice, may result in damage to the installation.

Optionally, an immersion heater can be supplied complete with safety thermostat and pressure switch fitted in the buffer tank of the cooling only chiller. A similar option is available for heat pump versions with the added advantage of a supplementary heating source (Hydronic version units).

2.- INSTALLATION

2.8.-ELECTRICAL CONNECTIONS

- BEFORE MAKING ANY ELECTRICAL CONNECTIONS, BE SURE THAT ALL CIRCUIT BREAKERS ARE OPEN AND SUPPLY IS OFF.
- IN ORDER TO CARRY OUT THE ELECTRICAL CONNECTIONS, FOLLOW THE ELECTRICAL DIAGRAM SUPPLIED WITH THE UNIT.

POWER SUPPLY	UNIT MODEL	NUMBER OF WIRES X SECTION	
		WITHOUT AEH	WITH AEH
THREE-PHASE UNITS 400V  3 ~ 400V-50Hz + PE	**0251**	4 x 6 mm²	4 x 10 mm²
	0291	4 x 6 mm²	4 x 10 mm²
	0351	4 x 10 mm²	4 x 10 mm²
	0431	4 x 10 mm²	4 x 16 mm²
	0472	4 x 16 mm²	3 x 25+1x16 mm²
	0552	4 x 16 mm²	3 x 25+1x16 mm²
	0672	3 x 25+1x16 mm²	3 x 25+1x16 mm²
	0812	3 x 25+1x16 mm²	3 x 25+1x16 mm²
	1003	3 x 25+1x16 mm²	3 x 50+1x25 mm²
	1103	3 x 35+1x16 mm²	3 x 50+1x25 mm²
	1203	3 x 35+1x16 mm²	3 x 70+1x35 mm²
	1303	3 x 50+1x25 mm²	3 x 70+1x35 mm²
	1403	3 x 50+1x25 mm²	3 x 70+1x35 mm²
	1604	3 x 70+1x35 mm²	3 x 95+1x50 mm²
	1804	3 x 70+1x35 mm²	3 x 95+1x50 mm²
	2104	3 x 95+1x50 mm²	3 x 120+1x70 mm²

- AEH: Auxiliary Electric Heater
- The cable sections have been calculated based on a distance of 50m and variation of -10V.
  Do not start the unit if the drop is greater than this.
- The wiring and circuit breakers to be mounted in the installation must comply with the Regulations in force.
- Ground wires must be properly connected and have a greater length than the phase wires.

EAC/EAR 0251 - 2104

VOLTAGE OPERATION LIMITS

MODELS	VOLTAGE	LIMITS
0251 - 1804	3~400V-50Hz	3~342-462V-50Hz

3.- COMMISSIONING AND OPERATION

3.1.- STEPS TO FOLLOW FOR COMMISSIONING THE UNITS

Before commissioning the unit check the following:
1.- Check that the voltage is the same as the rated voltage on the specification plate.
2.- Check that the supply to the control system is connected in accordance with the electrical diagram (if incorporates)
3.- Make sure that the water connections are correct and have not been altered, as this can result in incorrect operation the flow divider will not operate if the connections are mixe.
4.- Check that the main switch is ON .
5.- The compressor must not be started until the crankcase heater has been running for at least 8 hours.
6.- Check the water pump's direction of rotation.
7.- Check for air in the water system. Purge if necessary.
8.- Check that the fan can rotate freely.

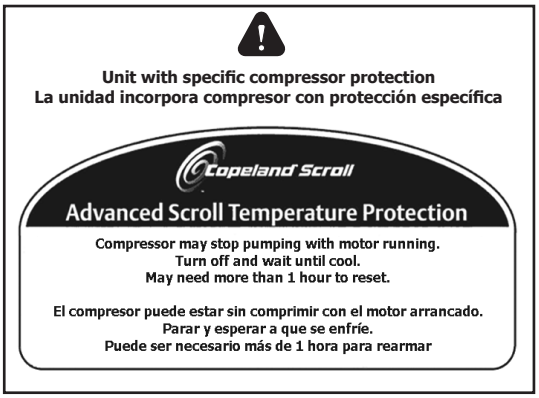
- The compressor has an electric heating element to assure a separation between the Refrigerant and the oil in the housing. This heater is activated when the compressor is off and stops working when the compressor is on. About eight hours before start up or after a long shutdown period, voltage should be supplied to the unit and main switch activated in order to this heater will be activated.
- Check that the compressor starts after several minutes since water pump is working.
- Adjust the control to select the operating mode.

REMEMBER THAT THE COMPRESSOR IS A SCROLL TYPE COMPRESSOR:

Before starting the unit, the compressor should be checked that rotates in the correct direction, through a three phase protection. Scroll type compressors only compress in one direction of the rotation. Therefore, it is essential that the phase connection for scroll-type three-phase compressors be carried out correctly (the correct direction of rotation can be checked when the pressure on the suction side decreases and the pressure on the discharge side increases when the compressor is activated). If the connection is wrong, the rotation will be reversed causing a high noise level and a reduction in the amount of current consumed. If this occurs, the compressor's internal protection system will operate in shutting down the unit. The solution is to disconnect, switch the wires between two of the phases and connect the three again).

ASTP Protection is included with the unit compressors

ASTP Protection:
This device protects the compressor against high discharge temperatures.
When the temperature reaches critical values, ASTP protection causes "Scrolls" are separated. Compressor may stop pumping with motor running.



- Occasionally, when compressor stops and starts, there is a metallic noise because of spirals of the compressor. This is normal.
- Check compressor oil level, sight glass included (on the sides of the compressor, the level should be between 1/4 and 3/4 in the sight glass, while during operation the level should be between 3/4 and full).
- Check that operating pressure values are normal.
- Measure electrical consumption for the unit.
- Check the electrical consumption of the compressor and the fans with what is specified in the physical data sheets.
- In the case of a Heat Pump unit, make a cycle change checking that the 4-way valve makes the change correctly. Check the pressure values in the new cycle.

3.- COMMISSIONING AND OPERATION

3.2.- CHECKING THE WATER FLOW RATE

It is very important that the unit operates at the correct water flow rate. It is dangerous to leave the unit operating at a low flow rate as this could result in serious damage to components as well as the water exchanger. If the unit operates at too high a flow rate, this will also hinder optimum performance. The best way of determining the operating flow rate is to measure the temperature difference between the inlet and water outlet.

Checking the water flow rate (it is vital to measure the thermal peak) (Standard unit)
For nominal and minimum water flow the difference between the inlet and water outlet temperature should be 5ºC (cooling and heating pump units in cooling cycle only) for an inlet temperature of 12°C, an outlet temperature of 7°C and an outside temperature of 35°C. If these conditions change, the unit capacity will also change and as a result for nominal flow the difference between the inlet and water outlet temperature will vary slightly from 5ºC as can be seen in the following table, based on nominal flow rate.

	ΔT (Water inlet temperature - Water outlet temperature)						
	Outside temperature ºC						
Water output ºC	15	20	25	30	35	40	45
7	6,1	5,8	5,5	5,3	5,0	4,7	4,4
9	6,5	6,2	5,9	5,6	5,3	5,0	4,7
11	7,0	6,7	6,4	6,0	5,7	5,4	5,0

If the unit must be started in the heating cycle and if you wish to operate at nominal cooling rate, the following shows the approximate differences between the inlet and water outlet temperatures for the various conditions.

	ΔT (Water inlet temperature - Water outlet temperature)				
	Outside Temperature ºC BH				
Water output ºC	-6	0	6	12	18
35	4,5	5,5	6,5	7,5	8,5
50	4	5	6	7	8

Note:
The unit control system displays the inlet and water outlet temperature to be displayed. See the Control Description section.

Check that the correct water pump has been selected, taking into account the loss of pressure in the hydraulic system. It is dangerous to let the unit run at a low rate and any faults which may result will not be covered under warranty.

Do not start up the air conditioning units or the fan coils until the water temperature reaches the set temperature or use an automatic control device which cancels the air conditioning unit operation if the installation is not properly set.

When everything is operating normally, take a reading of all the data and **fill out the Commissioning Sheet.**

3.- COMMISSIONING AND OPERATION

3.3.- WATER ANALYSIS

The water must be analysed; the water circuit installed must include all items necessary for treatment of the water: filters, additives, intermediate exchangers, bleed valves, vents, isolating valves etc... depending on the results of the water analysis.

We do not advise operation of the units with open loops which can cause problems with oxygenation, or operation with untreated ground water.

Use of untreated or improperly treated water can cause deposits of scale, algae and sludge or cause corrosion and erosion. It is advisable to call in a qualified water treatment specialist to determine what kind of treatment will be necessary. The manufacturer cannot accept liability for damage caused by the use of untreated or improperly treated water, salt water or brine.
Here are our non exhaustive recommendations given as an indication:

- No NH4+ ammonium ions in the water, they are very detrimental for copper. <10mg/l
- Cl- Chloride ions are detrimental for copper with a risk of perforations by corrosion by puncture. < 10 mg/l.
- SO42- sulphate ions can cause perforating corrosion.< 30 mg/l.
- No fluoride ions (<0.1 mg/l).
- No Fe2+ and Fe3+ ions with dissolved oxygen. Dissolved iron < 5 mg/l with dissolved oxygen < 5 mg/l. Over those values, it means a corrosion of steel which may generate a corrosion of copper parts under deposite of Fe – this is mainly the case with shell and tube heat exchangers.
- Dissolved silicon: silicon is an acid element of water and can also lead to corrosion risks. Content < 1mg/l.
- Water hardness: TH >2.8 K. Values between 10 and 25 can be recommended. This will facilitate scale deposit that can limit corrosion of copper. TH values that are too high can cause piping blockage over time.
- TAC< 100.
- Dissolved oxygen: Any sudden change in water oxygenation conditions must be avoided. It is as detrimental to deoxygenate the water by mixing it with inert gas as it is to over-oxygenate it by mixing it with pure oxygen. The disturbance of the oxygenation conditions encourages destabilisation of copper hydroxides and enlargement of particles.
- Specific resistance – electric conductivity: the higher the specific resistance, the slower the corrosion tendency. Values above 3000 Ohm/cm are desirable. A neutral environment favours maximum specific resistance values. For electric conductivity values in the order of 200-6000 S/cm can be recommended.
- pH: pH neutral at 20°C (7 < pH < 8)

4.- MAINTENANCE

4.1.- PREVENTIVE MAINTENANCE

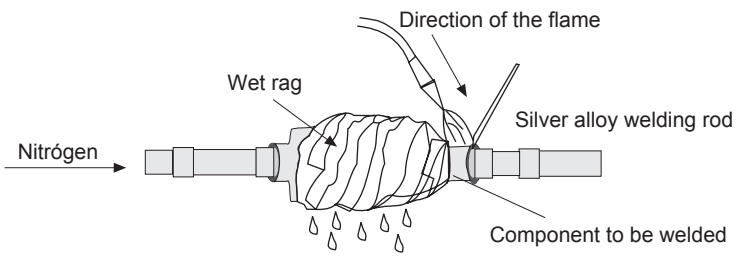
EPREVENTIVE MAINTENANCE PREVENTS COSTLY REPAIRS.
We recommend regular and thorough servicing of the LENNOX unit. It is therefore advisable to ask your dealer about maintenance contracts. Check maintenance of the following points (depending on the operating conditions maintenance every 6 months may be necessary).
Local legislation always takes precedence.

-- GENERAL STATE OF THE CASING:
Casing, paint, deterioration due to bumps, rust spots, leveling and supporting, state of the antivibration mounts, if installed, screwed panels, etc.
- ELECTRICAL CONNECTIONS:
State of cables, tightness of screws, grounding, current draw of the compressor and fans and checking that the unit is receiving the correct voltage.
- COOLING CIRCUIT:
Check that pressure values are correct and that there are no leaks. Check that there is no damage to the pipe insulation, that the state of the batteries is correct and that there are no chips or clogs retained by the air flow, etc.
- COMPRESSOR:
Inspect the oil level.
Inspect the state of the compressor mountings.
- FANS:
Check that fans turn freely and in the correct direction without excessive noises.
- CONTROL:
Check Set Points and normal operation.
- WATER:
If the installation contains anti-freeze, regularly check the state of the anti-freeze as well as the cleanliness of the water.
- WATER FILTER:
Clean the water inlet filter if necessary.
- WATER PUMP:
When the installation is going to work with percentages of glycol up to 20% and water temperatures below -5ºC, even do we use a specific closing for the water pump, it is advisable to clean the water pump's closing every year and a half, in order to avoid leaks by crystallization.
- PLATE EXCHANGER:
Prove the general isolation state and tightness of the water connections.
- CHECK FOR REFRIGERANT LEAKAGE AND WATER LEAKAGE.

4.2.- CORRECTIVE MAINTENANCE

IIMPORTANT MAKE SURE THAT THE UNIT IS COMPLETELY DISCONNECTED FROM THE POWER SUPPLY WHEN CARRYING OUT ANY TYPE OF WORK ON THE MACHINE

If some component in the cooling circuit must be replaced, follow these recommendations:
- Always use original replacement parts.
- Regulation prohibits the release on the refrigerant into the atmosphere.
- If cuts must be made in the pipe work, use pipe cutters. Do not use saws or any other tools that produce filings.
- All brazing must be carried out in a nitrogen atmosphere to prevent corrosion from forming.
- Use silver alloy brazing rod.
- Take special care that the flame from the torch is aimed in the opposite direction from the component to be welded and is covered with a wet rag in order to avoid overheating.



4.- MAINTENANCE

4.2.- CORRECTIVE MAINTENANCE

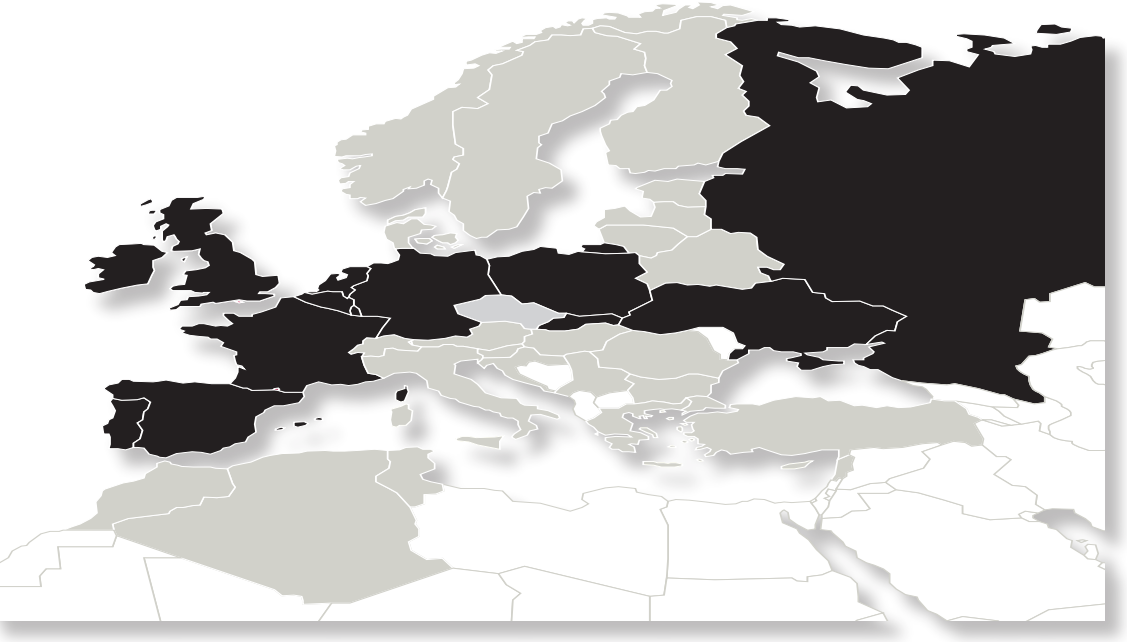
- Take very special care if 4-way check valves are to be replaced since these have internal components that are very heat-sensitive such as plastic, teflon, etc.
- If a compressor must be replaced, disconnect it electrically and un-braze the suction and discharge lines. Remove the securing screws and replace the old compressor with the new one. Check that the new compressor has the correct oil charge, screw it to the base and connect the lines and electrical connections.
- Carry out the vacuum above and below through the Schrader valves of the outdoor unit until -750 mm Hg is reached. Once this level of vacuum has been reached, keep the pump in operation for at least one hour. DO NOT USE THE COMPRESSOR AS A VACUUM PUMP. If the compressor runs in vacuum it will fail.
- Charge the unit with refrigerant according to the data on the Rating Plate for the unit and check that there are no leaks.

PRECAUTIONS TO BE TAKEN IN THE USE OF R-410A REFRIGERANT

The following precautions characteristic of this gas should be taken:
- The Vacuum Pump must have a Check Valve or Solenoid Valve.
- Pressure Gauges and Hoses for the exclusive use with R-410A Refrigerant should be used.
- The charge should be carried out in the Liquid Phase.
- Always use scales to weight-in charge
- Use the Leak Detector exclusive for R-410AC Refrigerant.
- Do not use mineral oil, only synthetic oil to ream, expand or make connections.
- Keep pipes capped before using them and be very thorough about any possible moisture and dirt (dust, filings, burrs, etc.).
- Brazing should always be carried out in a nitrogen atmosphere.
- Reamers should always be well sharpened.
- The refrigerant bottle must contain at least 2 % of the total amount .

4.3.- FAILURE DIAGNOSIS

PROBLEM	CAUSE	ACTION
The unit does not start after the last start.	* Disconnected supply. * Main switch set to STOP. * No water flow. * Fuses are broken. * Low electrical supply. * One of the safety devices has been activated. * Compressor fault. * Low water temperature.	* Check electrical supply. * Connect main switch. * Start water pump (and check air in system). * Check voltage. * Check antifreeze thermostat. * Check high/low pressure switch. * Change compressor. * Create demand for cooling.
The fan does not work (although the compressor is operating).	* Internal safety device open. * Bad connection. * Poor condensation control.	* Let the motor cool. * Connect properly. * Check operation.
The compressor stops when the high pressure switch is cut off.	* Condenser coil blocked. * Unit operating outside of limiting. * Abnormal operation of the fans.	* Maintain condenser coil. * Check the ventilators.
The compressor stops when the low pressure switch is cut off.	* Insufficient charge. * The water exchanger is blocked (water side). * No water flow. * Expansion valve blocked	* Check the charge. * Maintain the exchanger. * Check that there is sufficient water flow. * Change expansion valve.
The oil level in the compressor is very low.	* The crank case heater is not working.	* Replace the crank case heater and check oil level.
High noise level of compressor and high and low pressures are abnormal.	* Phase connection for compressor power supply incorrectly.	* Switch the wires between two of the phases of compressor power supply.
Compressor may stop pumping with water running	* ASTP protection is working	* Check the causes of high discharge temperature.



● **Direct Sales Offices:**

BELGIUM AND LUXEMBOURG
☎ + 32.3.633.3045
✉ info.be@lennoxeurope.com

FRANCE
☎ +33 1 64 76 23 23
✉ info.fr@lennoxeurope.com

GERMANY
☎ + 49 (0) 69 42 09 790
✉ info.de@lennoxeurope.com

NETHERLANDS
☎ + 31.332.471.800
✉ info.nl@lennoxeurope.com

POLAND
☎ +48 22 58 48 610
✉ info.pl@lennoxeurope.com

PORTUGAL
☎ +351 229 066 050
✉ info.pt@lennoxeurope.com

RUSSIA
☎ +7 495 626 56 53
✉ info.ru@lennoxeurope.com

SLOVAKIA
☎ +421 2 58 31 83 12
✉ info.sk@lennoxeurope.com

SPAIN
☎ +34 902 533 920
✉ info.sp@lennoxeurope.com

UKRAINE
☎ +380 44 461 87 79
✉ info.ua@lennoxeurope.com

UNITED KINGDOM AND IRELAND
☎ +44 1604 669 100
✉ info.uk@lennoxeurope.com

● **Distributors and Agents**
Algeria, Austria, Belarus, Botswana, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, Georgia, Greece, Hungary, Israel, Italy, Kazakhstan, Latvia, Lebanon, Lithuania, Morocco, Near East, Norway, Romania, Serbia, Slovenia, Sweden, Switzerland, Tunisia, Turkey

LENNOX DISTRIBUTION
☎ +33.4.72.23.20.00
✉ info.dist@lennoxeurope.com

CE

MIL113E-0311 02-2012
Original manual translation