



# Installation, operating and maintenance **ECOLEAN - EAC/EAR**



- Providing indoor climate comfort



Revision 3

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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.lennox europe.com](http://www.lennox europe.com).

All the technical and technological information contained in this manual, including any drawing and technical descriptions provided by us, remain the property of Lennox and must not be utilised (except in the operation of this product), reproduced, issued to or made available to third parties without the prior written agreement of Lennox.

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:

<b>Text</b>	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.**

## DATA PAGE FOR UNIT COMMISSIONING

Unit:		Serial no. :	
Control panel identification code			
Installation address:			
Installer:		Installer tel. :	
Installer address:			
Date of commissioning:			
<b>Checks:</b>			
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		

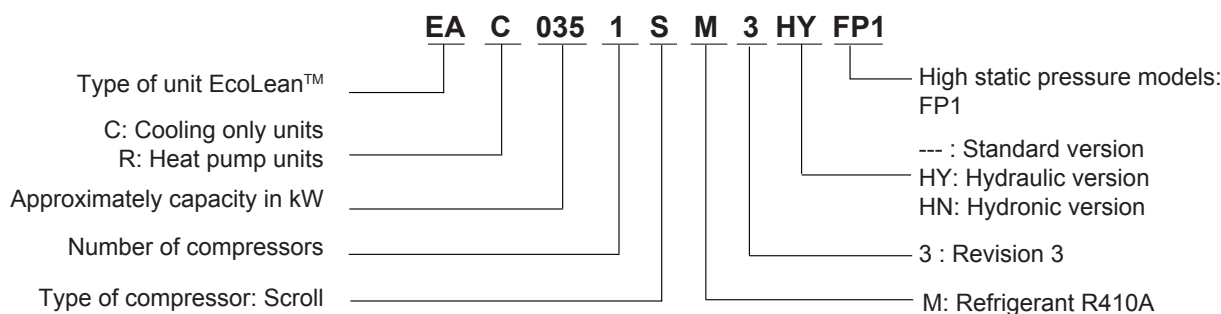
DATA INPUT		COOLING CYCLE	HEATING CYCLE
Air Input Temperature, Coil	°C		
Water Output Temperature	°C		
Water Input Temperature	°C		
High Pressure			
Low Pressure			

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		0251 SM	0291 SM	0351 SM	0431 SM	0472 SM	0552 SM	0672 SM	0812 SM	1003 SM	1103 SM	1203 SM	1303 SM	1403 SM	1604 SM	1804 SM	2104 SM	
Cooling capacity (*)	kW	22,1	25,9	32,0	37,6	44,1	50,7	63,4	75,4	88,2	102	112	126	139	149	174	199	
Compressor	Nr/type	1 / scroll				2 / scroll				3 / scroll				4 / scroll				
Hydraulic connections		1 1/2"G				2"G				2 1/2"G				DN80				
Min. water rate	m³/h	3,16	3,72	4,4	5,3	6,05	7,07	8,6	10,39	12,38	13,9	15,76	17,48	18,86	21,06	24,77	28,3	
Net weight	Standard	kg	237,5	245,8	262,7	292	469,6	481,9	518,4	561,9	640	809	938	990	1019	1328	1683	1703
	FP1	kg	252,5	260,8	277,7	297,4	499,6	511,9	548,4	591,9	680	849	978	1030	1059	1368	1763	1783
Refrigerant	kg	5,5	6,1	7,6	9	11	12,2	15,5	19,5	23,5	26	27	30	33,7	36,2	45	52	

### HEAT PUMP

EAR MODELS		0251 SM	0291 SM	0351 SM	0431 SM	0472 SM	0552 SM	0672 SM	0812 SM	1003 SM	1103 SM	1203 SM	1303 SM	1403 SM	1604 SM	1804 SM	2104 SM	
Cooling capacity (*)	kW	22,1	25,9	32,0	37,6	44,1	50,7	63,4	75,4	88,2	102	112	126	139	149	174	199	
Heating capacity (**)	Nr/type	23,6	27,6	33,6	37,8	47,8	54,7	68,0	75,7	95,0	108	118	130	143	159	180	205	
Compressor	Nr/type	1 / scroll				2 / scroll				3 / scroll				4 / scroll				
Hydraulic connections		1 1/2"G				2"G				2 1/2"G				DN80				
Min. water rate	m³/h	3,16	3,72	4,4	5,3	6,05	7,07	8,6	10,39	12,38	13,9	15,76	17,48	18,86	21,06	24,77	28,3	
Net weight	Standard	kg	243	251	271	300	480	492	534	578	663	831	964	1016	1045	1347	1703	1723
	FP1	kg	257,5	265,8	285,7	305,4	509,6	521,9	564,4	607,9	703	871	1004	1056	1085	1387	1783	1803
Refrigerant	kg	5,8	6,5	8	9,5	12,5	13,5	16	19,3	23,3	28	29,5	32,2	35,5	40	52	54	

(\*) Cooling capacity: Outside temperature: 35°C / Inlet/outlet water temperature: 12/7°C

(\*\*) Heating capacity: Outside temperature: 7°C DB / 6°C WB / Inlet/water outlet temperature: 40/45°C

### HYDRAULIC VERSION / HYDRONIC VERSION

MODELS	0251 SM	0291 SM	0351 SM	0431 SM	0472 SM	0552 SM	0672 SM	0812 SM	1003 SM	1103 SM	1203 SM	1303 SM	1403 SM	1604 SM	1804 SM	2104 SM
Pump type	Horizontal multistage centrifugal pump															
Expansion vessel																
Capacity (l)	12				18				35				50			
Set pressure																
Security valves (bar)									3							
Expansion vessel (bar)									4							
Buffer tank (***)																
Capacity (l)	75				100				240				350			

(\*\*\*) Only in units with Hydronic module

# 1.- GENERAL CHARACTERISTICS

## 1.1.- TECHNICAL DATA

### STANDARD FAN UNITS



MODELS	0251SM	0291SM	0351SM	0431SM	0472SM	0552SM	0672SM	0812SM	
Fan type	Axial - Direct coupling				900 rpm		1~230V		
Fan number	Nr	1			2				
Air flow rate	m³/h	9750	11500	11300	11000	9750+9750	11500+11500	11300+11300	11000+11000
Power input	kW	0,69	0,84	0,84	0,84	0,69+0,69	0,84+0,84	0,84+0,84	0,84+0,84

MODELS	1003SM	1103SM	1203SM	1303SM	1403SM	1604SM	1804SM	2104SM		
Fan type	Axial - Direct coupling				3~400V					
Fan number	Nr	2				4				
Air flow rate	m³/h	High	18100+18100	22700+18100	22700+18100	22700+22700	22500+22700	23500+23500	28600+28600	36000+36000
		Low	15000+15000	18000+15000	18000+15000	18000+18000	17500+18000	18500+18500	22600+22600	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	700+700	900+700	900+700	900+900	900+900	900+900	700+700+700+700	900+900+900+900
		Low	550+550	700+550	700+550	700+700	700+700	700+700	550+550+550+550	700+700+700+700

### HIGH STATIC FAN PRESSURE UNITS FP1 VERSION



MODELS	0251SM	0291SM	0351SM	0431SM	0472SM	0552SM	0672SM	0812SM	1003SM to 1403SM	1604SM	1804SM	2104SM			
Fan type	Axial - Direct coupling 1450 rpm 1~230V								Axial - Direct coupling 900 rpm (Low speed) 3~400V						
Fan number	Nr	1			2				4						
Available static pressure Pa	50	Air flow rate	m³/h	11500	11500	11000	10500	23000	23000	22000	21000	19000+19000	21000+21000	28000+28000	28000+28000
		Power input	kW	1,7	1,7	1,65	1,65	3,4	3,4	3,3	3,3	5	5	10	10
	75	Air flow rate	m³/h	9600	9600	9200	8800	19200	19200	18400	17600	18000+18000	19000+19000	24000+24000	24000+24000
		Power input	kW	1,65	1,65	1,6	1,6	3,3	3,3	3,2	3,2	5,1	5,1	10,2	10,2
100	Air flow rate	m³/h	8500	8500	8100	7700	17000	17000	16200	15400	17000+17000	17000+17000	22000+22000	N/A	
	Power input	kW	1,6	1,6	1,55	1,55	3,2	3,2	3,1	3,1	5,2	5,2	10,4	N/A	
125	Air flow rate	m³/h	7200	7200	6900	6600	14400	14400	13800	13200	15000+15000	16000+16000	20000+20000	N/A	
	Power input	kW	1,55	1,55	1,5	1,5	3,1	3,1	3	3	5,3	5,3	10,6	N/A	
									Axial "short case"- Direct coupling 1450 rpm (High speed) 3~400V						
Available static pressure Pa	150									2		4			
		Air flow rate	m³/h								22000+22000	24000+24000	34000+34000	34000+34000	
	Power input	kW								9,2	9,2	18,4	18,4		
	200	Air flow rate	m³/h								20000+20000	22000+22000	28000+28000	28000+28000	
		Power input	kW								9,3	9,3	18,6	18,6	
	250	Air flow rate	m³/h								18000+18000	19000+19000	24000+24000	24000+24000	
Power input		kW								9,4	9,4	18,8	18,8		

# 1.- GENERAL CHARACTERISTICS

## 1.2.- ELECTRICAL DATA

### STANDARD FAN UNITS



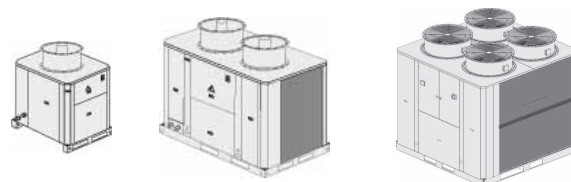
MODELS	0251SM	0291SM	0351SM	0431SM	0472SM	0552SzM	0672SM	0812SM
Maximum power (kW)	10,79	12,64	16,39	17,74	21,58	25,28	32,78	35,48
Maximum Current (A)	3N~400V 24,00	25,40	29,00	34,40	48,00	50,80	58,00	68,80
LRC (A)	3N~400V 114	121,4	161,4	177,4	138	146,8	190,4	211,8
Starting current (A) (*)	3N~400V 97,4	103,7	137,7	151,3	121,4	129,1	166,7	185,7

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
	Low	42,0	50,0	55,6	60,8	63,5	70,1	81,9
Maximum Current (A)	3N~400V High	79,8	88,6	97,6	107,7	118,5	132,0	151,6
	Low	78,0	86,0	95,0	104,3	115,1	128,6	148,0
LRC (A)	3N~400V High	222,8	231,6	282,6	331,2	342,0	275,0	336,6
	Low	221,0	229,0	280,0	327,8	338,6	271,6	333,0
Starting current (A) (*)	3N~400V High	196,7	205,5	248,8	290,4	301,2	248,9	302,9
	Low	194,9	202,9	246,3	287,0	297,8	245,5	299,3

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 - FP1 VERSION



MODELS	0251SM	0291SM	0351SM	0431SM	0472SM	0552SM	0672SM	0812SM
Maximum power (kW)	3N~400V 11,8	13,5	17,2	18,6	23,6	27,0	34,4	37,1
Maximum Current (A)	3N~400V 29,0	30,0	33,6	39,0	58,0	60,0	67,2	78,0
LRC (A)	3N~400V 119,0	126,0	166,0	182,0	148,0	156,0	199,6	221,0
Starting current (A) (*)	3N~400V 102,4	108,3	142,3	155,9	131,3	138,3	175,9	194,9

#### LOW SPEED

MODELS	1003SM	1103SM	1203SM	1303SM	1403SM	1604SM	1804SM	2104SM
Maximum power (kW)	3N~400V 45,5	53,0	58,6	63,3	66	72,6	88,8	98,2
Maximum Current (A)	3N~400V 84,6	91,8	100,8	109,3	120,1	133,6	161,2	178,2
LRC (A)	3N~400V 251,6	258,8	285,8	332,8	343,6	300,6	346,2	401,7
Starting current (A) (*)	3N~400V 221,9	229,1	252,1	292,0	302,8	270,9	312,4	360,9

#### HIGH SPEED

MODELS	1003SM	1103SM	1203SM	1303SM	1403SM	1604SM	1804SM	2104SM
Maximum power (kW)	3N~400V 49,8	57,3	62,9	67,6	70,3	76,9	97,4	106,8
Maximum Current (A)	3N~400V 91,2	98,4	107,4	115,9	126,7	140,2	174,4	191,4
LRC (A)	3N~400V 258,2	265,4	292,4	339,4	350,2	307,2	359,4	414,9
Starting current (A) (*)	3N~400V 228,5	235,7	258,6	298,6	309,4	277,5	325,7	374,1

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 / FP1 UNITS)

MODELS EAC / EAR HY - HN	0251SM	0291SM	0351SM	0431SM	0472SM	0552 SM	0672SM	0812SM
Absorbed power (kW)	0,72	0,72	1,10	1,10	1,17	1,17	1,55	1,55
Maximum current (A)	3~400V 1,40	1,40	1,70	1,70	1,70	1,70	2,80	2,80

MODELS EAC / EAR HY - HN	1003SM	1103SM	1203SM	1303SM	1403SM	1604SM	1804SM	2104SM
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

8.- Air purge valve

9.- Plate exchanger

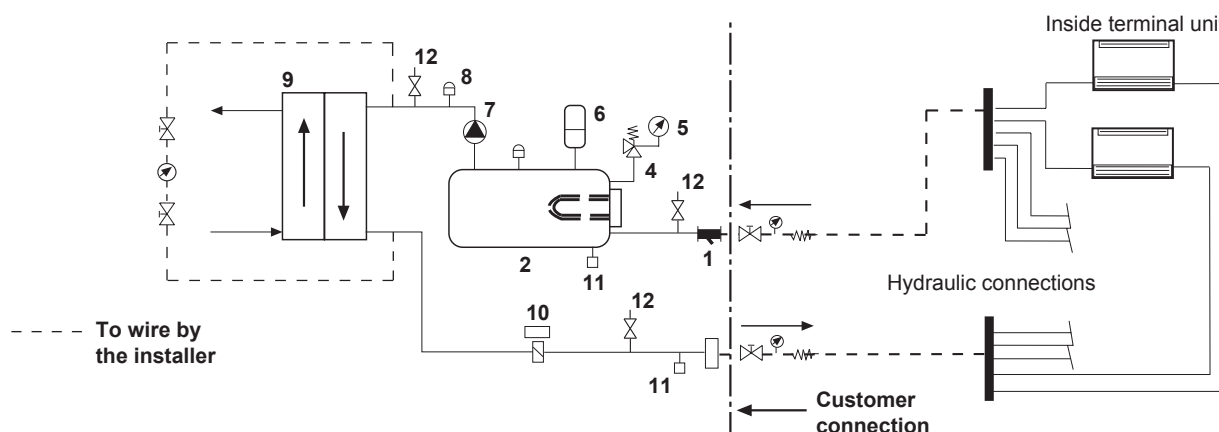
10.- Flow switch

11.- Drain valve

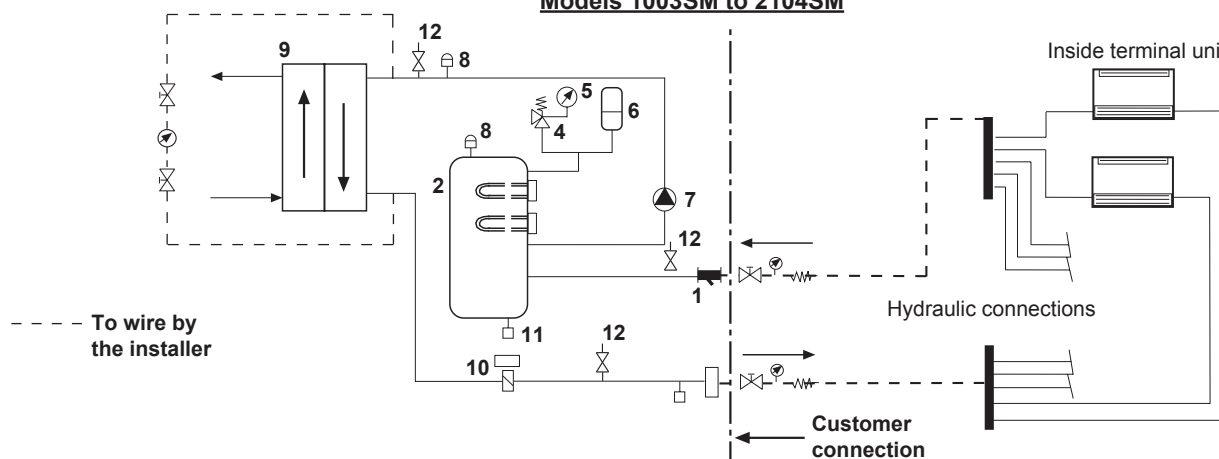
12.- Pressure gauge

### HYDRONIC VERSION (HN)

#### Models 0251SM to 0812SM

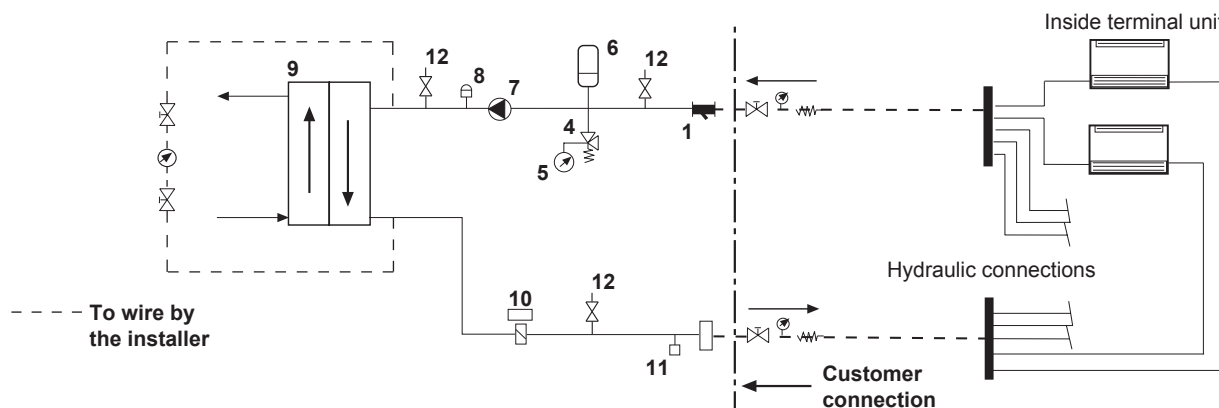


#### Models 1003SM to 2104SM



### HYDRAULIC AND STANDARD VERSIONS (HY & STD)

#### Models 0251SM to 2104SM





# 1.- GENERAL CHARACTERISTICS

## 1.4.- OPERATION LIMITS

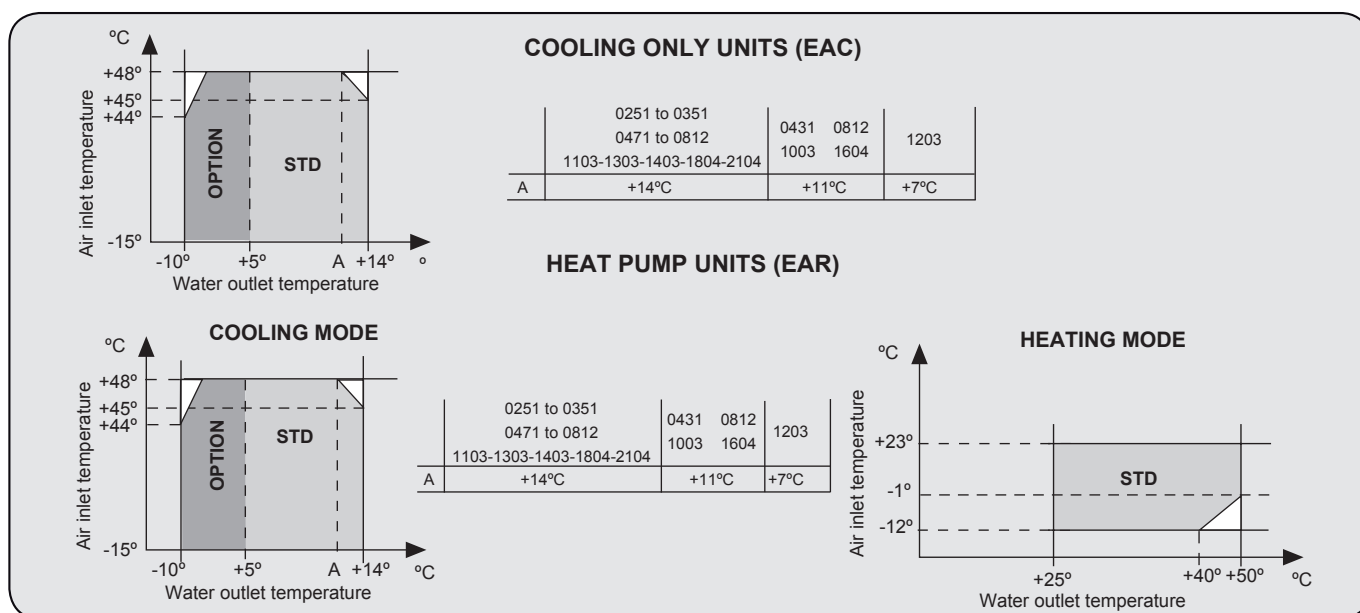
### STANDARD FAN UNITS WITHOUT AIR DUCTS

COOLING MODE	MODELS EAC / EAR	0251SM to 0431SM		0472SM to 0812SM		1003SM to 2104SM	
		MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM
	Outlet chilled water temperature	+5°C	+14°C	+5°C	+14°C	+5°C	+14°C
	Inlet chilled water temperature	+10°C	+22°C	+9°C	+22°C	+8°C	+22°C
	Air inlet temperature	-15°C	+48°C	-15°C	+48°C	-15°C	+48°C

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

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

OUTSIDE THESE VALUES, PLEASE CONSULT US



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

# 1.- GENERAL CHARACTERISTICS

## 1.4.- OPERATION LIMITS

### FAN UNITS WITH AIR DUCTS

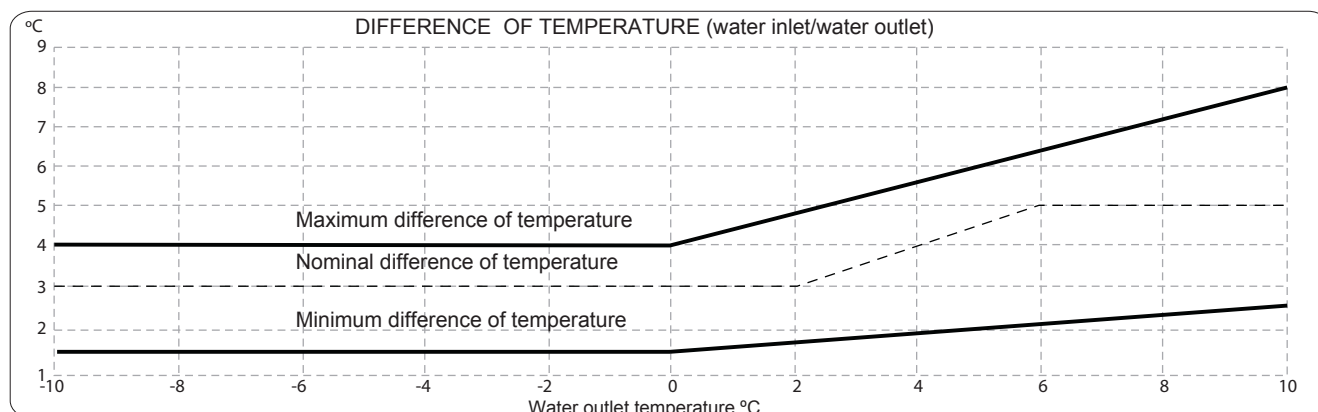
#### COOLING MODE

AIR AVAILABLE STATIC PRESSURE UP TO	VERSION	MODELS	Available static pressure Pa	Maximum ambient temperature °C	Minimum ambient temperature °C	
	<b>50Pa</b>	<b>STANDARD</b>	0251SM to 1804SM	<b>30</b>	44	---
			<b>50</b>	40	---	
<b>125Pa</b>		<b>FP1 (LOW SPEED)</b>	0251SM to 1003SM	<b>50</b>	48	-15°C
				<b>75</b>	45	
			<b>100</b>	41		
			<b>125</b>	37		
		1103SM to 1804SM	<b>50</b>	46	-15°C	
			<b>75</b>	43		
			<b>100</b>	39		
		2104SM	<b>125</b>	37		
			<b>50</b>	39		
			<b>75</b>	36		
	<b>FP1 (HIGH SPEED)</b>	1003SM to 1804SM	<b>150</b>	49		-15°C
			<b>200</b>	46		
			<b>250</b>	43		
			<b>150</b>	45		
		2104SM	<b>200</b>	42		
				<b>250</b>	39	

#### HEATING MODE

AIR AVAILABLE STATIC PRESSURE UP TO	VERSION	MODELS	Available static pressure Pa	Minimum ambient temperature °C	
	<b>50Pa</b>	<b>STANDARD</b>	0251SM to 1804SM	<b>30</b>	-10
			<b>50</b>	-8	
<b>125Pa</b>		<b>FP1 (LOW SPEED)</b>	0251SM to 1003SM	<b>50</b>	-12
				<b>75</b>	-10
			<b>100</b>	-8	
			<b>125</b>	-6	
		2104SM	<b>50</b>	-8	
			<b>75</b>	-6	
		<b>100</b>	(-)		
		<b>125</b>	(-)		
<b>250Pa</b>	<b>FP1 (HIGH SPEED)</b>	1003SM to 1804SM	<b>150</b>	-12	
			<b>200</b>	-10	
	2104SM		<b>250</b>	-8	
			<b>150</b>	-10	
		<b>200</b>	-8		
		<b>250</b>	-6		

### UNITS WITH LOW WATER TEMPERATURE KIT (OPTION)



# 1.- GENERAL CHARACTERISTICS

## 1.5.- PRESSURE DROP IN THE WATER SYSTEM

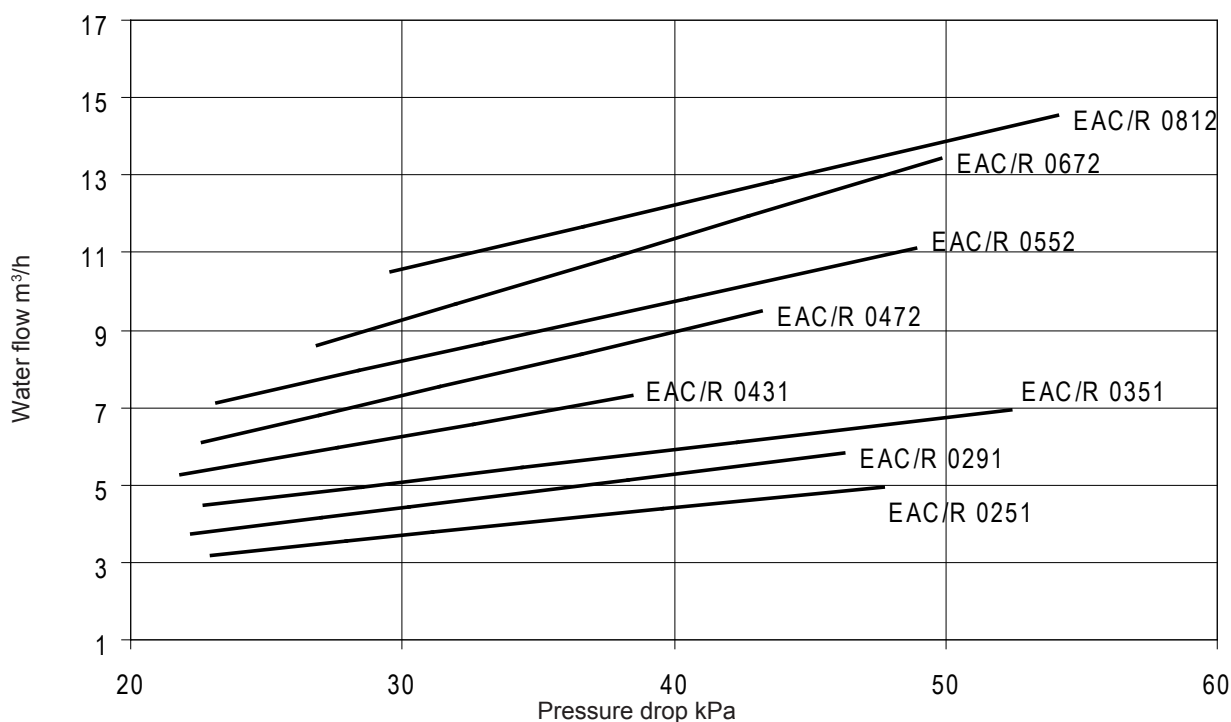


### INSTALLATION ADVISE

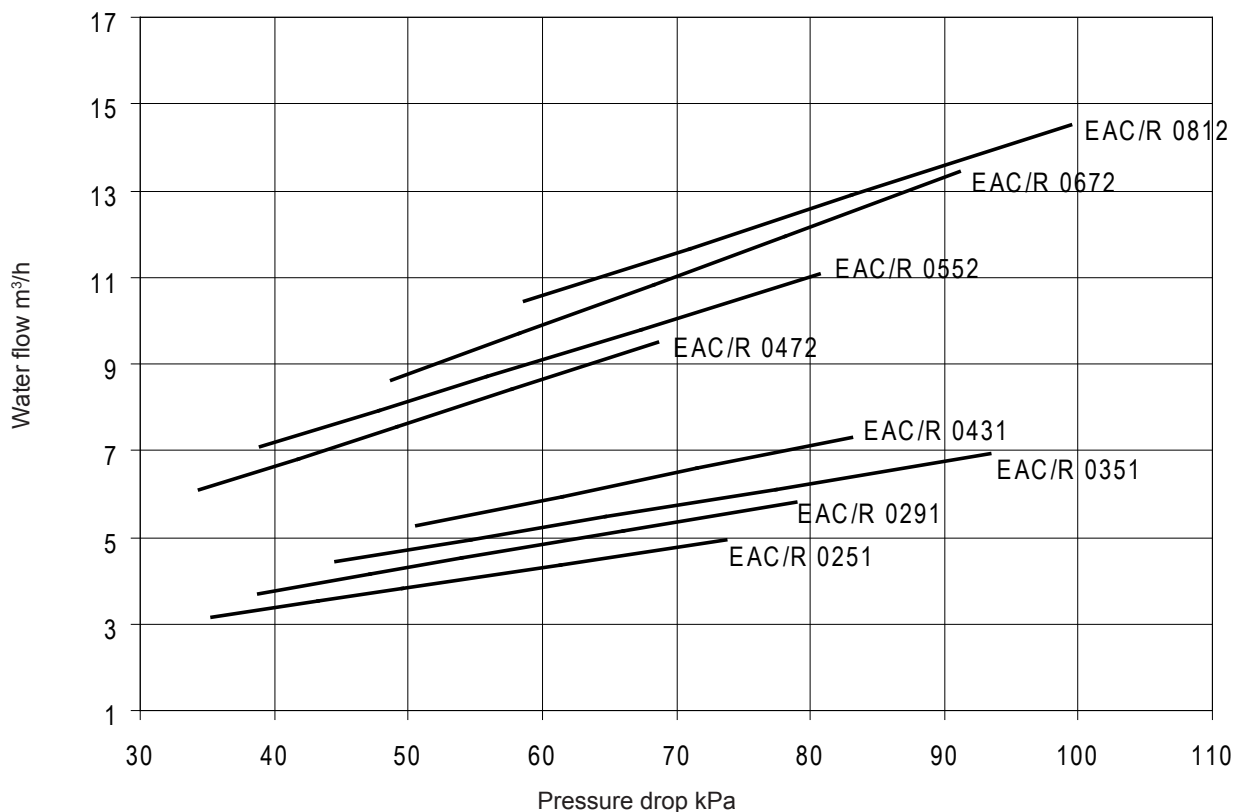
The units include a water filter at the inlet to the unit (trapping any particle with a diameter greater than 1mm. With the option twin pump it can be supplied loose

### MODELS EAC / EAR 0251SM TO 0812SM

**PRESSURE DROP WITHOUT FILTER**



**PRESSURE DROP + WATER FILTER**

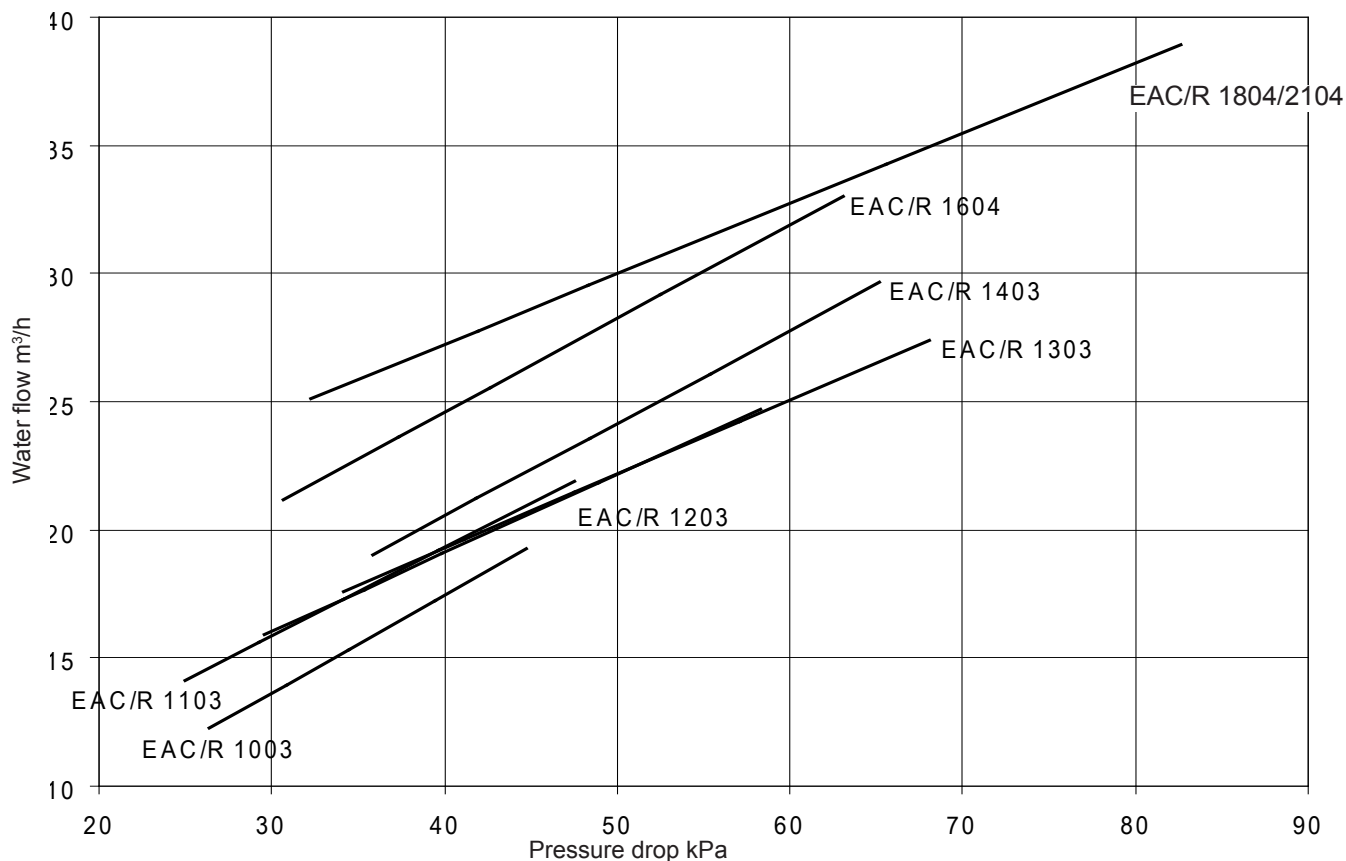


# 1.- GENERAL CHARACTERISTICS

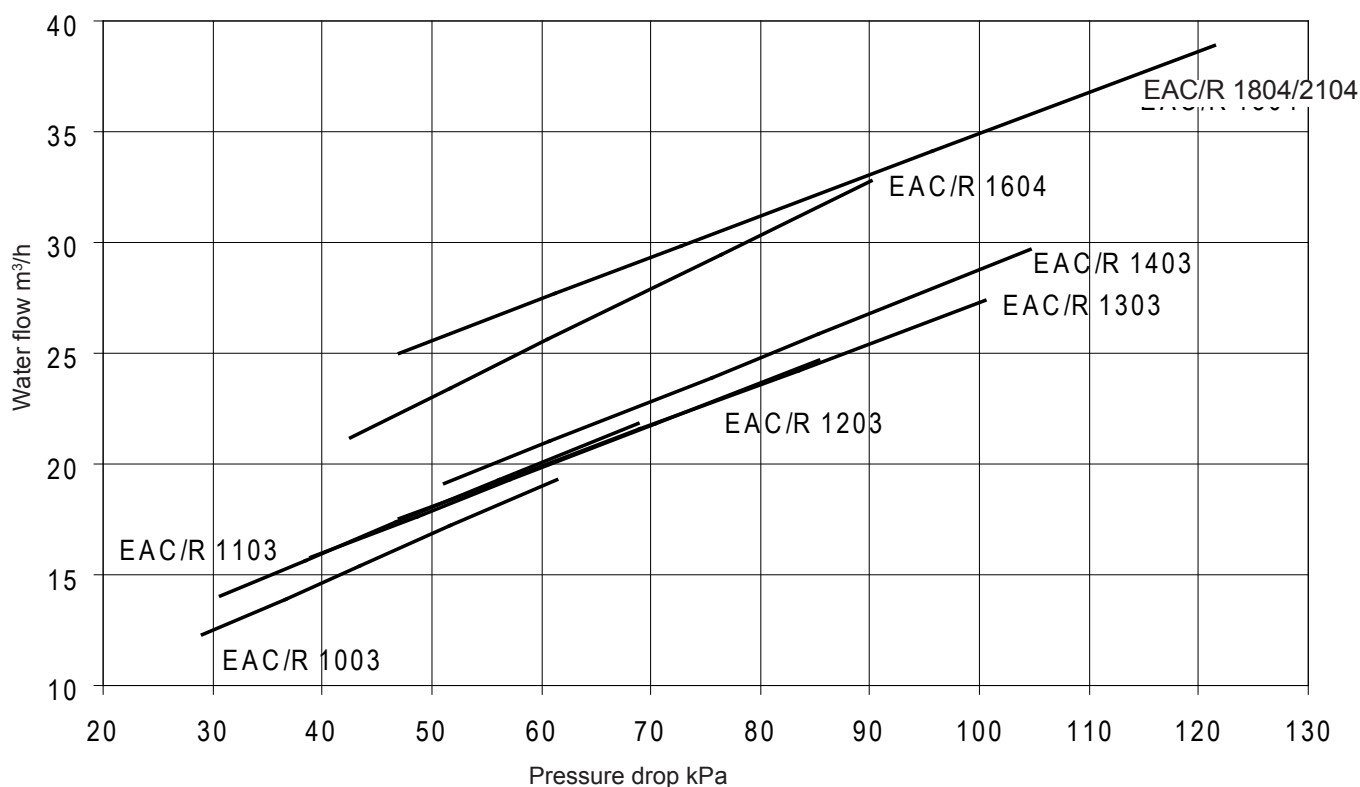
## 1.5.- PRESSURE DROP IN THE WATER SYSTEM

### MODELS EAC / EAR 1003SM TO 1804SM

**PRESSURE DROP WITHOUT FILTER**



**PRESSURE DROP + WATER FILTER**



# 1.- GENERAL CHARACTERISTICS

## 1.5.- HYDRAULIC SYSTEM DATA

WATER FLOW AND AVAILABLE STATIC PRESSURE ( Factory supplied; standard water pump and filter).

MODELS	EAC / EAR 0251SM					EAC / EAR 0291 SM					EAC / EAR 0351SM					EAC / EAR 0431SM				
Water flow	l/s	0,88	0,99	1,06	1,22	1,37	1,03	1,16	1,24	1,43	1,61	1,22	1,38	1,53	1,70	1,91	1,47	1,66	1,80	2,04
	m <sup>3</sup> /h	3,16	3,56	3,80	4,40	4,95	3,72	4,18	4,45	5,16	5,81	4,40	4,95	5,50	6,12	6,88	5,30	5,96	6,47	7,36
Available static pressure	kPa	186	166	151	131	114	167	147	131	111	91	208	176	146	112	72	160	131	97	51

MODELS	EAC / EAR 472 SM					EAC / EAR 0552 SM					EAC / EAR 0672 SM					EAC / EAR 0812 SM				
Water flow	l/s	1,68	1,89	2,11	2,34	2,63	1,96	2,21	2,42	2,73	3,07	2,39	2,69	3,03	3,32	3,73	2,89	3,25	3,61	4,01
	m <sup>3</sup> /h	6,05	6,81	7,59	8,41	9,46	7,07	7,96	8,72	9,82	11,05	8,60	9,68	10,90	11,94	13,44	10,39	11,69	12,98	14,43
Available static pressure	kPa	157	143	129	115	100	142	129	115	97	74	228	197	168	137	100	186	152	110	54

MODELS	EAC / EAR 1003 SM					EAC / EAR 1103 SM					EAC / EAR 1203 SM					EAC / EAR 1303 SM					
Water flow	l/s	3,44	3,87	4,21	4,78	5,38	3,86	4,34	4,89	5,36	6,03	4,38	4,92	5,34	6,08	6,84	4,85	5,46	6,01	6,74	7,58
	m <sup>3</sup> /h	12,38	13,93	15,17	17,20	19,35	13,90	15,63	17,61	19,30	21,72	15,76	17,72	19,23	21,88	24,62	17,48	19,66	21,62	24,27	27,31
Available static pressure	kPa	210	198	186	171	152	204	191	176	158	133	190	172	155	130	99	175	154	132	103	65

MODELS	EAC / EAR 1403 SM					EAC / EAR 1604 SM					EAC / EAR 1804 SM					EAC / EAR 2104 SM					
Water flow	l/s	5,24	5,90	6,63	7,27	8,19	5,85	6,58	7,13	8,12	9,14	6,88	7,74	8,31	9,55	10,75	7,86	8,85	9,51	10,9	12,2
	m <sup>3</sup> /h	18,86	21,22	23,87	26,17	29,48	21,06	23,69	25,66	29,22	32,90	24,77	27,86	29,93	34,37	38,70	28,3	31,86	34,23	39,3	44,25
Available static pressure	kPa	165	142	115	90	51	158	138	115	85	53	197	176	137	106	60	239	204	176	117	51

Nominal conditions

NOTE: The flow data indicated in table are between a minimum and a maximum water flow.

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

Unit conversion: Pressure 1KPa = 1/9,8 m.c.a. = 0,01 bar

1 bar = 10 m.c.a. = 100 kPa

### MINIMUM WATER FLOW

The installation must never operate with less than the minimum water flow (see table above), this will cause:

- i. - Freezing the water heat exchanger.
- ii. - Contamination of the heat exchanger.

### MAXIMUM WATER FLOW

See maximum water flow, (see table above). Always assure the minimum  $\Delta T$  to the exchanger of 3°C.

### 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	0251SM ▶ 0431SM	0472SM ▶ 0812SM	1003SM ▶ 1403SM	1604SM 2104SM
SOLUTION	Water volume in liters			
WATER	550	850	1600	2250
WATER + 10% GYT	400	650	1225	1725
WATER + 20% GYT	350	475	1075	1500
WATER + 30% GYT	300	450	925	1300
WATER + 35% GYT	225	325	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.- SAFETY DEVICES

### 0251SM TO 0812SM UNITS

#### COOLING ONLY

COOLING EAC	1 F			2 F		
	UNIT STD/FP1			KIT LOW WATER T <sup>a</sup> -10°C (STD/FP1)		
	cycle	set	reset	cycle	set	reset
LP1	cooling	4,5	6	cooling	2,5	3,5
HP1	cooling	43	34	cooling	43	34
PT1	N/A			N/A		
HPR	N/A			N/A		
B2	(*)			(*)		
B3	(*)			(*)		

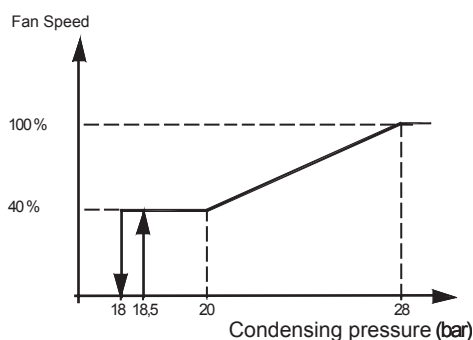
LP / HP / PT / HPR values in Bar. B values in °C.

#### HEAT PUMP

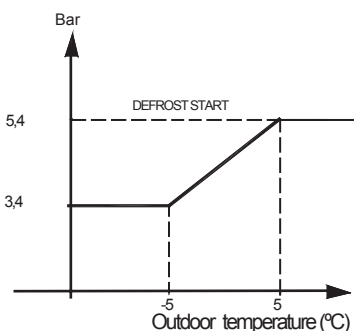
HEATING EAR	1 B			2 B		
	UNIT STD/FP1			KIT LOW WATER T <sup>a</sup> -10°C (STD/FP1)		
	cycle	set	reset	cycle	set	reset
LP1	cooling	4,5	6	cooling	2,5	3,5
PT1	heating	1,7	2,7	heating	1,7	2,7
HP1	c/h	43	34	c/h	43	34
PT1	(*)			(*)		
DT	N/A			N/A		
B2	(*)			(*)		

### (\*) CLIMATIC 40 REGULATION

#### 1.-FAN SPEED REGULATION (B36 PT1)



#### 2.-DEFROST CYCLE (PT1)



#### 3.-ALARMS

##### ANTIFREEZE ALARM (B2)

	CUT	RESET
STD Unit	+3°C	+8°C
Low water T <sup>a</sup> option -10°C	-13°C	-11°C

### 1003SM TO 2104SM UNITS

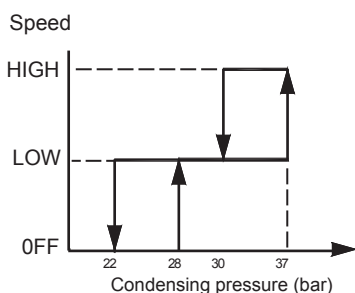
#### COOLING ONLY

COOLING EAC	1 F			2 F		
	UNIT STD/FP1			KIT LOW WATER T <sup>a</sup> -10°C (STD/FP1)		
	cycle	set	reset	cycle	set	reset
LP1	cooling	4,5	6	cooling	2,5	3,5
LP2	cooling	4,5	6	cooling	2,5	3,5
HP1	cooling	43	34	cooling	43	34
HP2	cooling	43	34	cooling	43	34
HPR11	cooling	22	28	cooling	22	28
HPR12	cooling	37	30	cooling	37	30
HPR21	cooling	22	28	cooling	22	28
HPR22	cooling	37	30	cooling	37	30
PT1/PT2	N/A			N/A		
B2	(*)			(*)		

LP / HP / PT / HPR values in Bar. B values in °C.

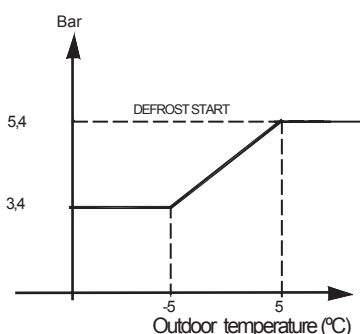
### (\*) CLIMATIC 40 REGULATION (EAC STD/FP1)

#### 1.-FAN SPEED REGULATION



-Start 5,7 Bar  
-End 35 Bar

#### 2.-DEFROST CYCLE (PT1)



#### 3.-ALARMS

##### ANTIFREEZE ALARM (B2)

	CUT	RESET
STD Unit	+3°C	+8°C
Low water T <sup>a</sup> option -10°C	-13°C	-11°C

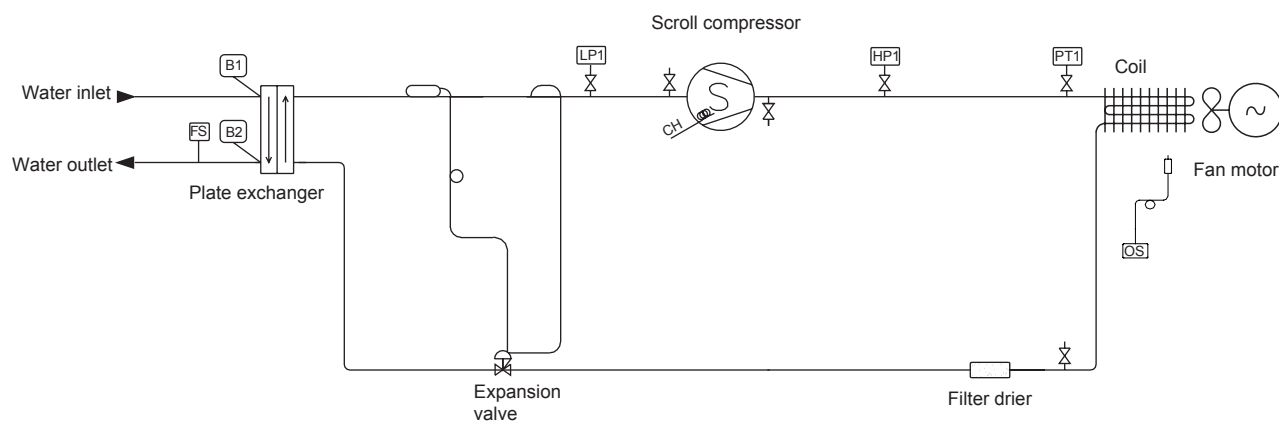
#### HEAT PUMP

HEATING EAR	1 B			2 B		
	UNIT STD/FP1			KIT LOW WATER T <sup>a</sup> -10°C (STD/FP1)		
	cycle	set	reset	cycle	set	reset
LP1	cooling	4,5	6	cooling	2,5	3,5
PT1	heating	1,7	2,7	heating	1,7	2,7
LP2	cooling	4,5	6	cooling	2,5	3,5
PT2	heating	1,7	2,7	heating	1,7	2,7
HP1	c/h	43	34	c/h	43	34
HP2	c/h	43	34	c/h	43	34
HPR12	cooling	37	30	cooling	37	30
PT1/PT2	(*)			(*)		
HPR22	cooling	37	30	cooling	37	30
OT1	heating	6°C differential 2,3		heating	6°C differential 2,3	
DT	N/A			N/A		
B2	(*)			(*)		

# 1.- GENERAL CHARACTERISTICS

## 1.8.- PIPING DRAWINGS

### COOLING ONLY UNITS EAC 0251SM TO 0431SM



Pressure gauge

Flow switch

Water inlet probe (water inlet regulation)

Water outlet probe (anti-freeze protection)

Low pressure switch

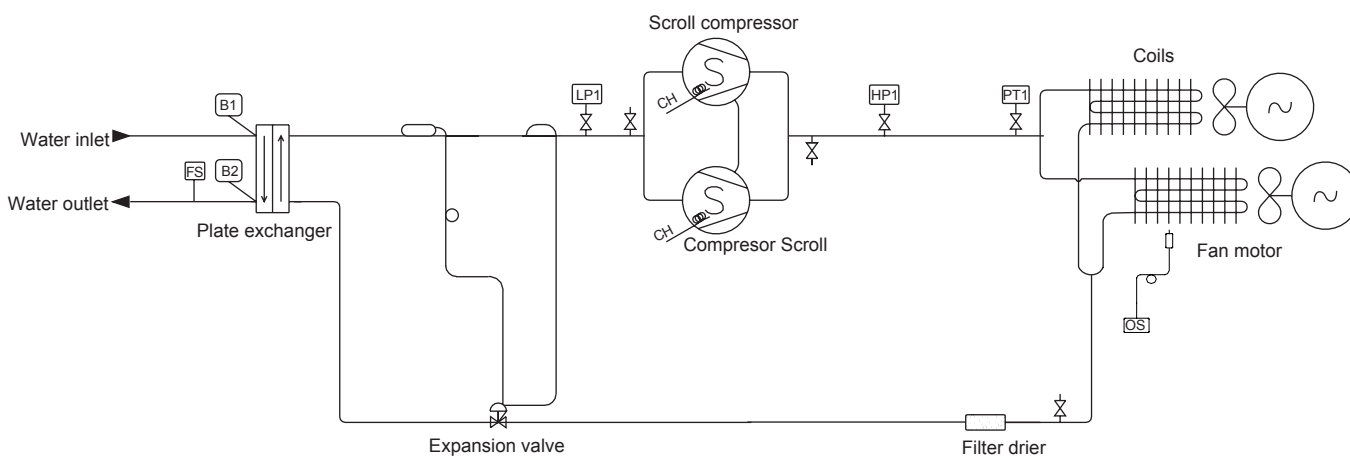
High pressure switch

Crank case heater

Pressure transducer

Outdoor temperature sensor

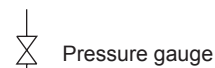
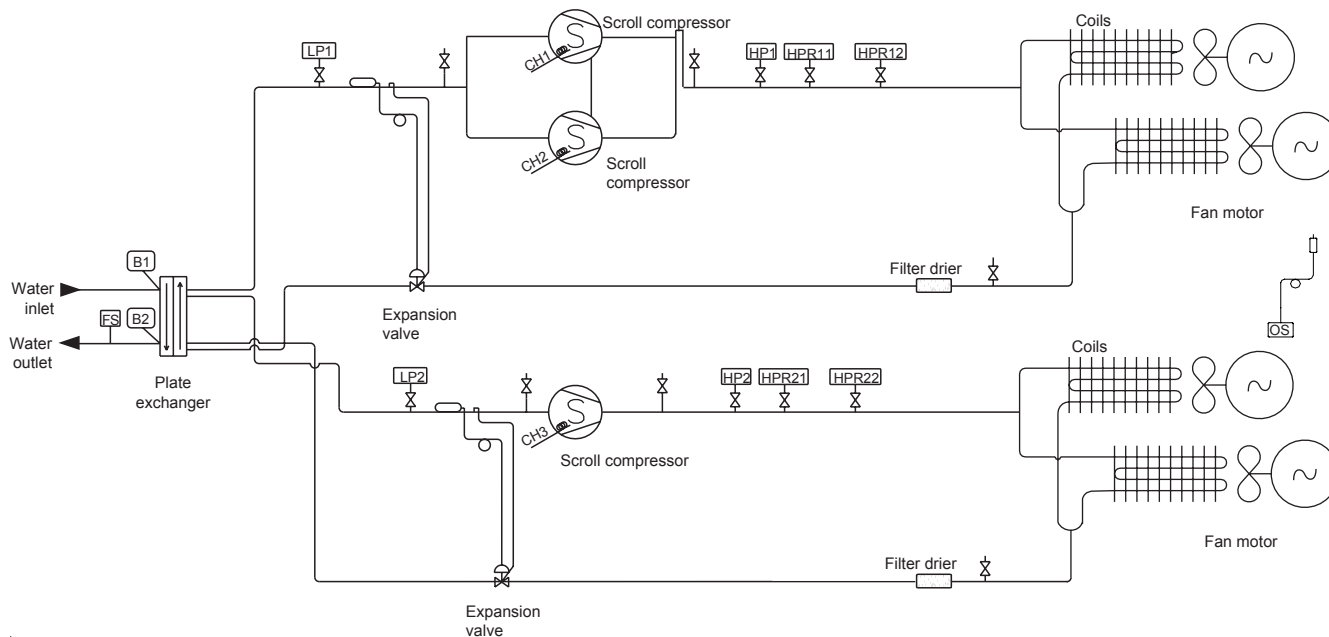
### COOLING ONLY UNITS EAC 0472SM TO 0812SM



# 1.- GENERAL CHARACTERISTICS

## 1.8.- PIPING DRAWINGS

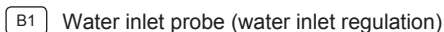
### COOLING ONLY UNITS EAC 1003SM TO 1403SM



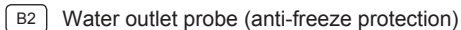
Pressure gauge



Flow switch



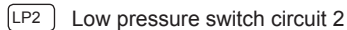
Water inlet probe (water inlet regulation)



Water outlet probe (anti-freeze protection)



Low pressure switch circuit 1



Low pressure switch circuit 2



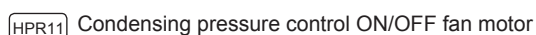
High pressure switch circuit 1



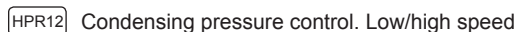
High pressure switch circuit 2



Outdoor temperature sensor



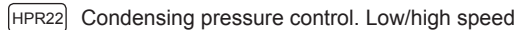
Condensing pressure control ON/OFF fan motor



Condensing pressure control. Low/high speed



Condensing pressure control ON/OFF fan motor



Condensing pressure control. Low/high speed



Crank case heater



Crank case heater

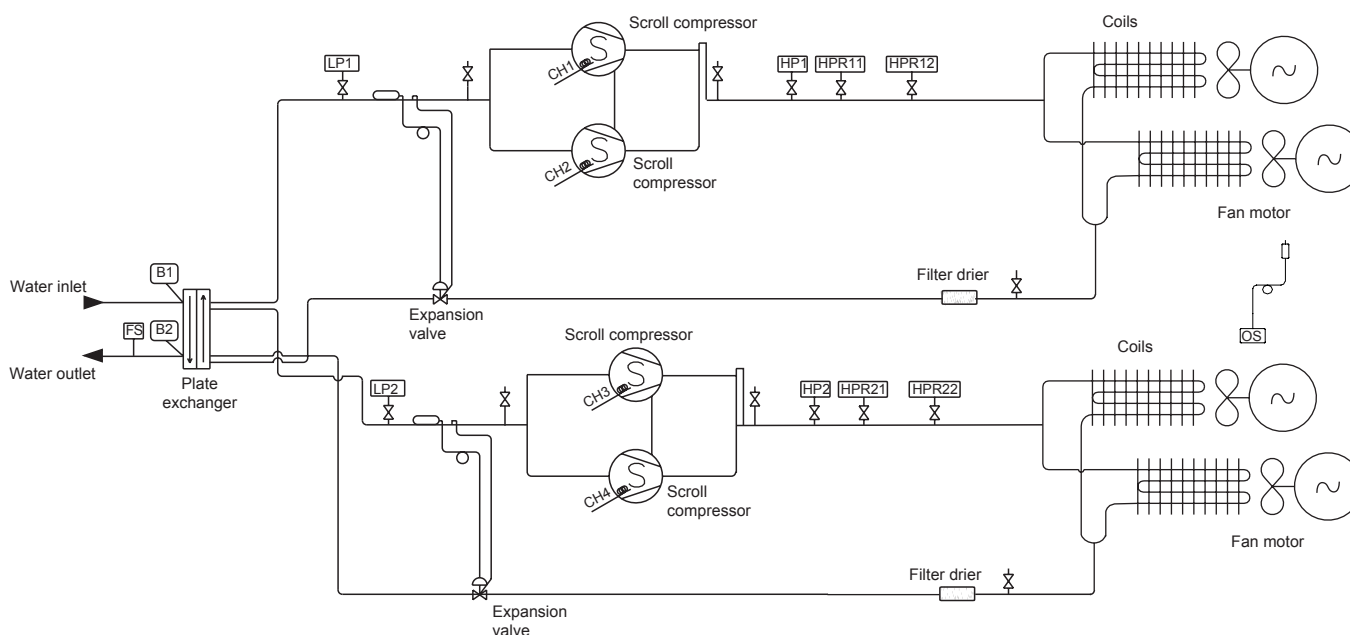


Crank case heater



Crank case heater

### COOLING ONLY UNITS EAC 1604SM - 2104SM

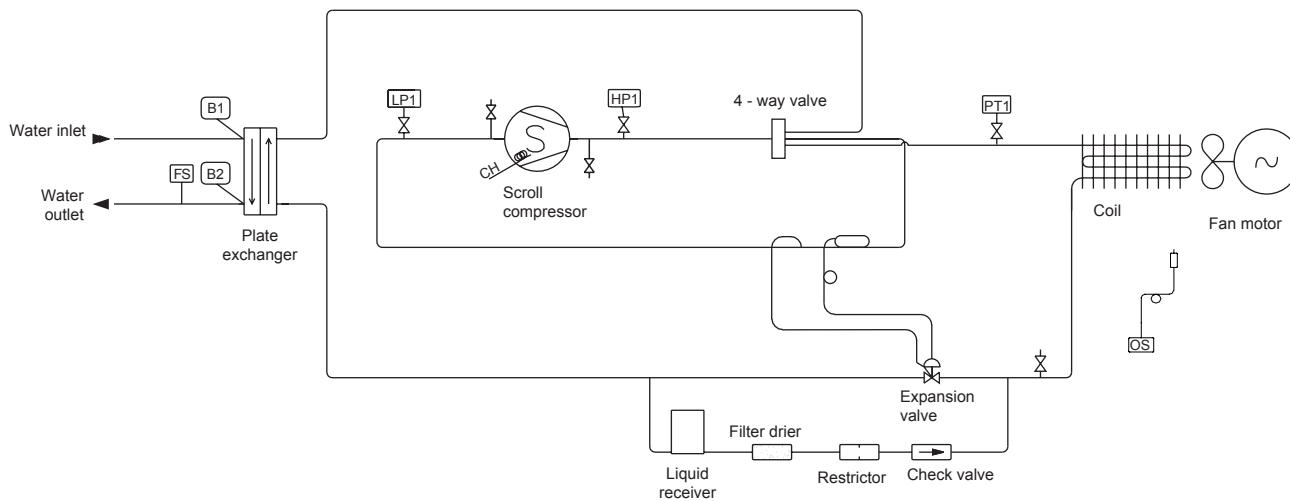




# 1.- GENERAL CHARACTERISTICS

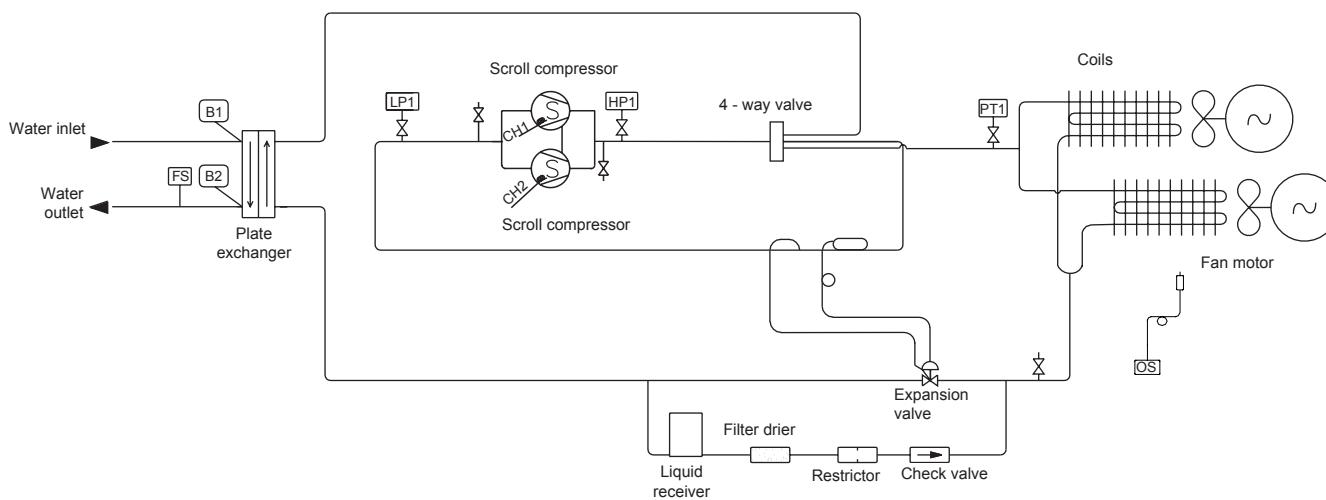
## 1.8.- PIPING DRAWINGS

### HEAT PUMP UNITS EAR 0251SM TO 0431SM



- Pressure gauge
- Flow switch
- Water inlet probe (water inlet regulation)
- Water outlet probe (anti-freeze protection)
- Low pressure switch cooling cycle
- Outdoor temperature sensor
- High pressure switch
- Crank case heater
- Pressure transducer:
  - Cooling: Condensing pressure control
  - Heat pump: Defrost start
  - Defrost end
  - Low pressure switch heating cycle

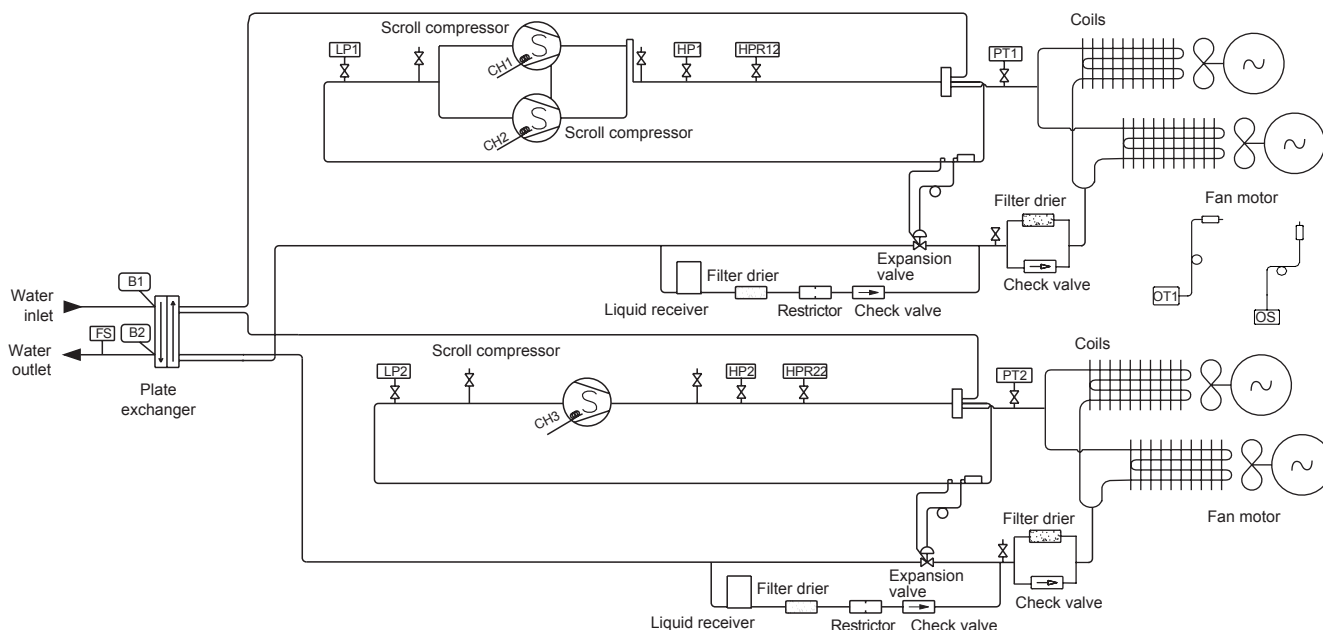
### HEAT PUMP UNITS EAR 0472SM TO 0812SM



# 1.- GENERAL CHARACTERISTICS

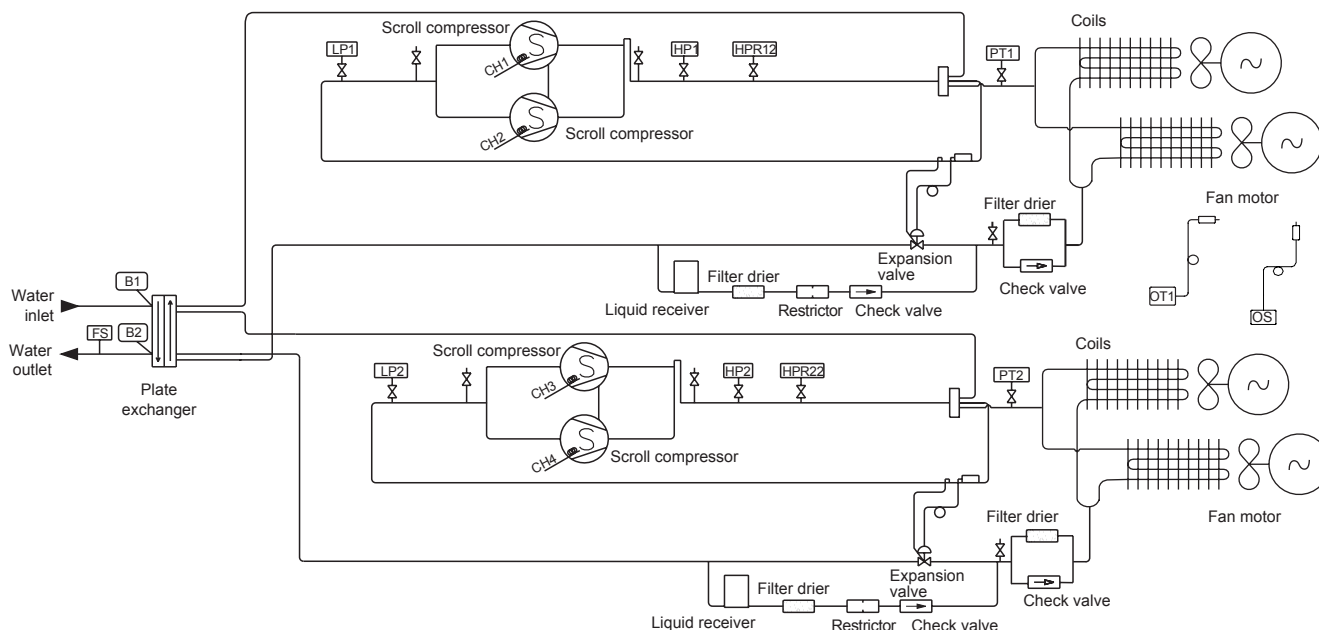
## 1.8.- PIPING DRAWINGS

### HEAT PUMP UNITS EAR 1003SM TO 1403SM



- Pressure gauge
- [FS] Flow switch
- [B1] Water inlet probe (water inlet regulation)
- [B2] Water outlet probe (anti-freeze protection)
- [CH1] Crank case heater
- [CH2] Crank case heater
- [CH3] Crank case heater
- [CH4] Crank case heater
- [HP1] High pressure switch circuit 1
- [HP2] High pressure switch circuit 2
- [HPR12] Condensing pressure control. Low/high speed Circuit 1
- [HPR22] Condensing pressure control. Low/high speed Circuit 2
- [LP1] Low pressure switch cooling cycle circuit 1
- [LP2] Low pressure switch cooling cycle circuit 2
- [PT1] Pressure transducer circuit 1:  
-Cooling: Condensing pressure control  
-Heat pump: Defrost start  
Defrost end/Low pressure switch heating cycle circuit 1
- [PT2] Pressure transducer circuit 2:  
-Cooling: Condensing pressure control  
-Heat pump: Defrost start  
Defrost end/Low pressure switch heating cycle circuit 2
- [OT1] Fan speed thermostat (Heating)
- [OS] Outdoor temperature sensor

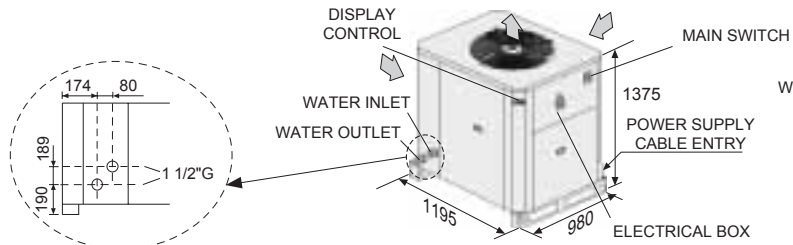
### HEAT PUMP UNITS EAR 1604SM TO 2104SM



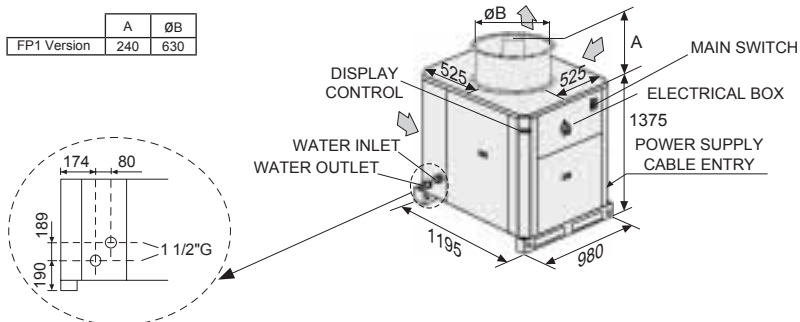
# 1.- GENERAL CHARACTERISTICS

## 1.9.- DIMENSIONS

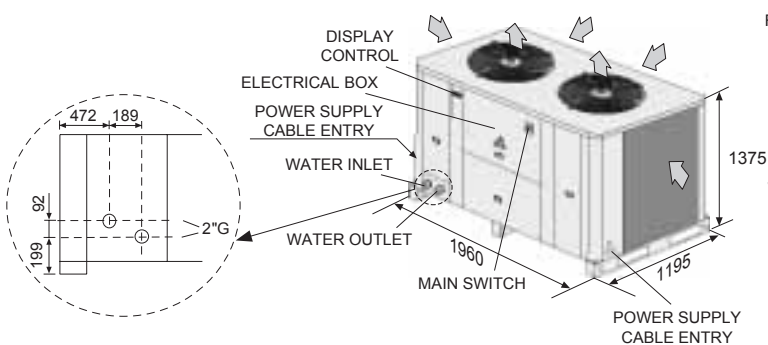
### EAC/EAR 0251SM-0291SM-0351SM-0431SM



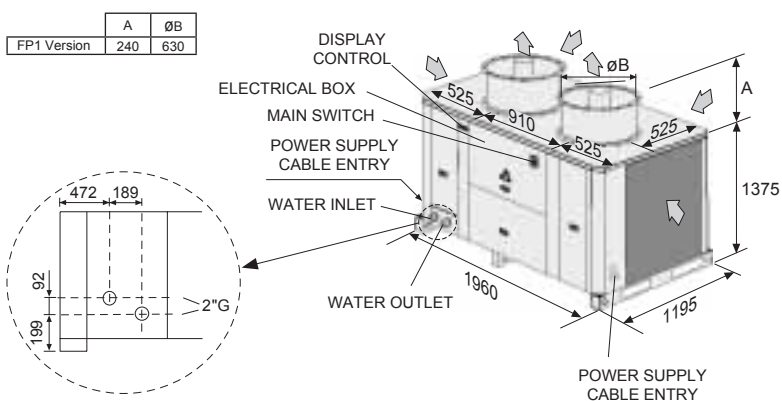
### EAC/EAR 0251SM-0291SM-0351SM-0431SM FP1



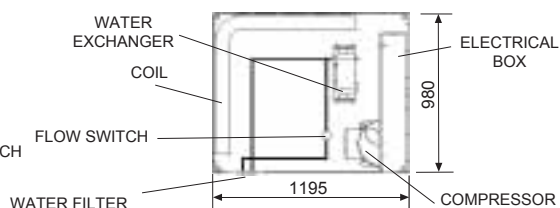
### EAC/EAR 0472SM-0552SM-0672SM-0812SM



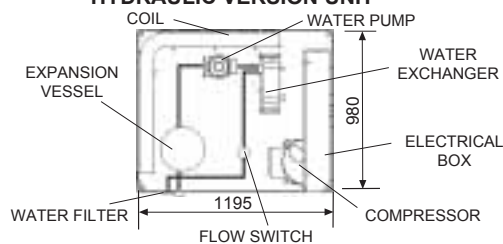
### EAC/EAR 0472SM-0552SM-0672SM-0812SM FP1



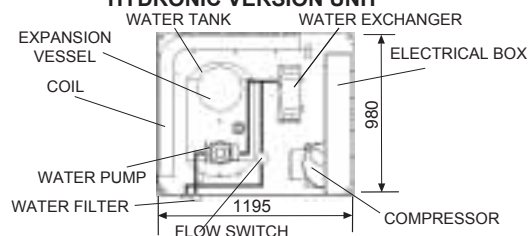
### COMPONENT POSITION STANDARD VERSION UNIT



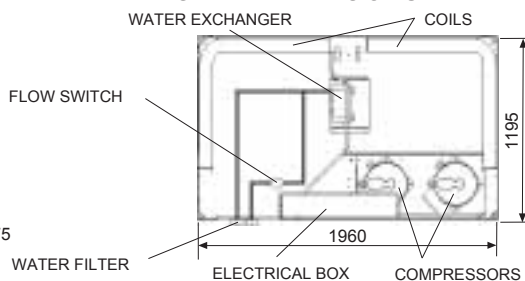
### COMPONENT POSITION HYDRAULIC VERSION UNIT



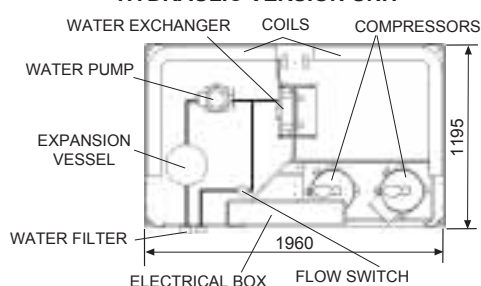
### COMPONENT POSITION HYDRONIC VERSION UNIT



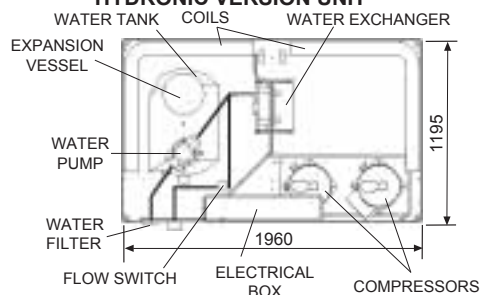
### COMPONENT POSITION STANDARD VERSION UNIT



### COMPONENT POSITION HYDRAULIC VERSION UNIT



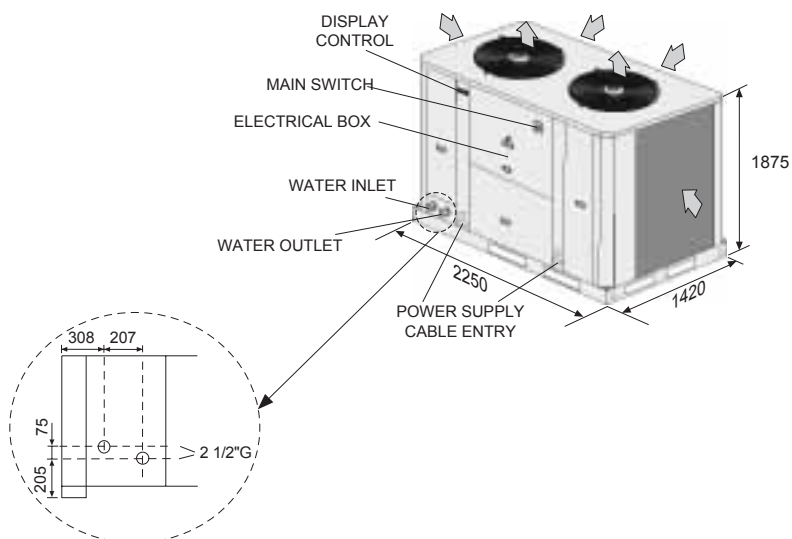
### COMPONENT POSITION HYDRONIC VERSION UNIT



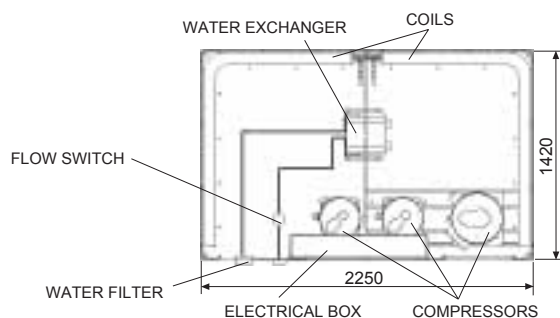
# 1.- GENERAL CHARACTERISTICS

## 1.9.- DIMENSIONS

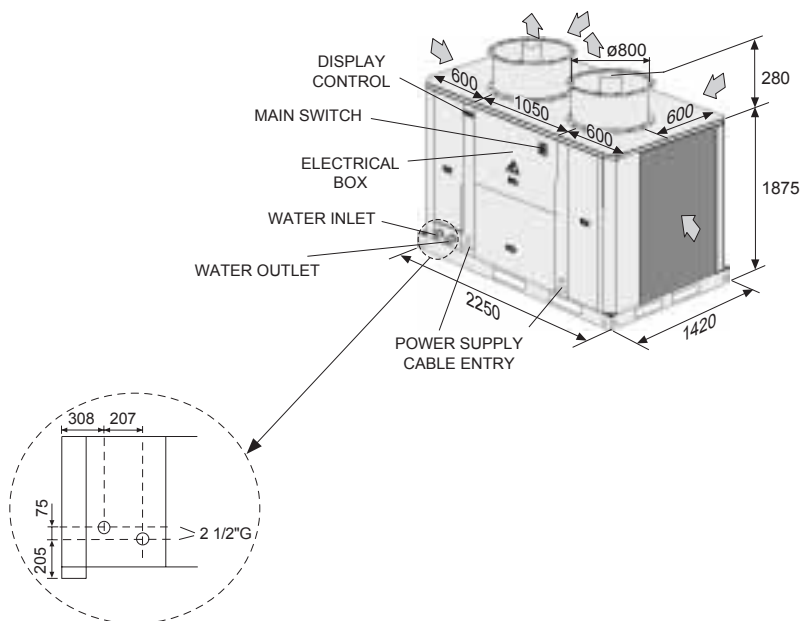
### EAC/EAR 1003SM-1103SM-1203SM-1303SM-1403SM



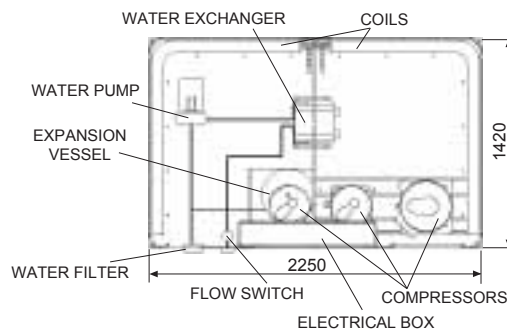
### COMPONENT POSITION STANDARD VERSION UNIT



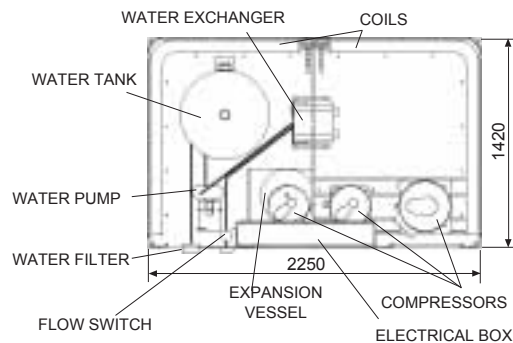
### EAC/EAR 1003SM-1103SM-1203SM-1303SM-1403SM FP1



### COMPONENT POSITION HYDRAULIC VERSION UNIT



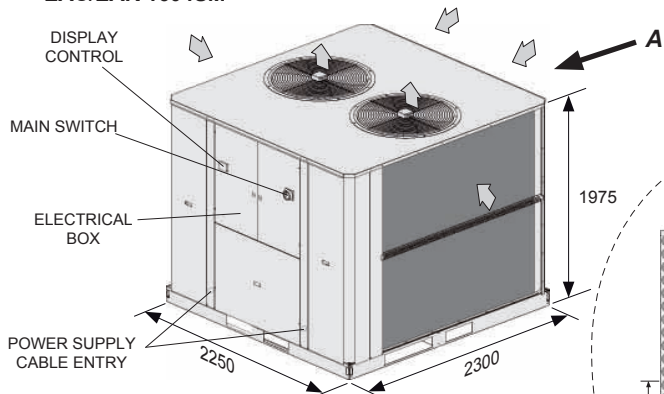
### COMPONENT POSITION HYDRONIC VERSION UNIT



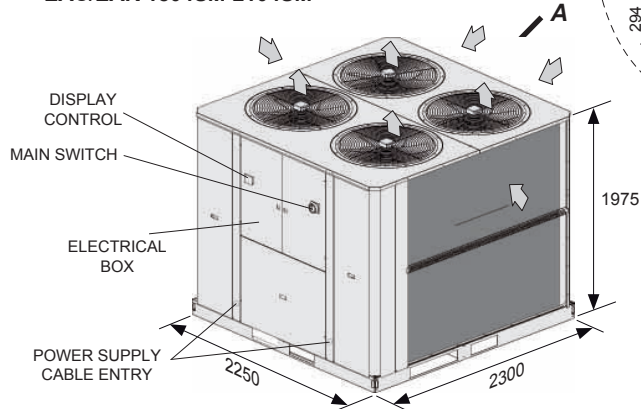
# 1.- GENERAL CHARACTERISTICS

## 1.9.- DIMENSIONS

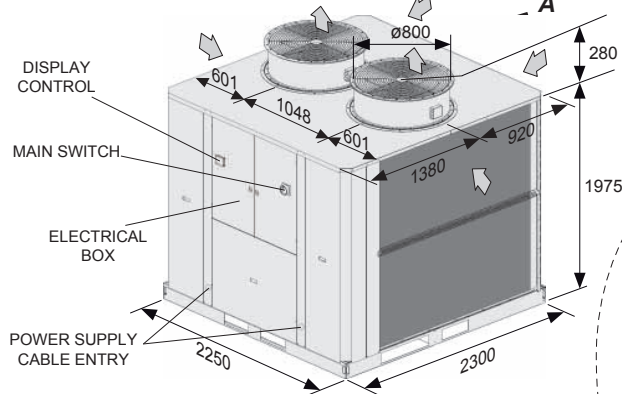
### EAC/EAR 1604SM



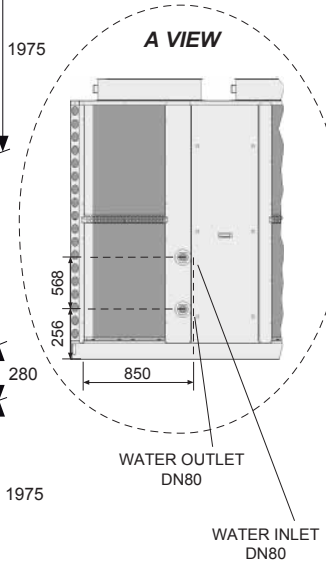
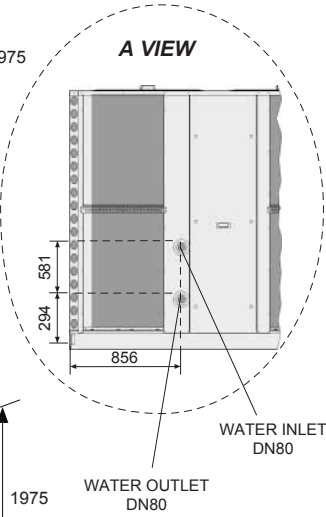
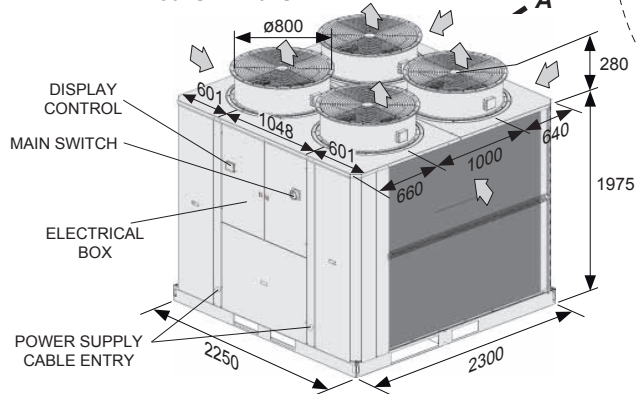
### EAC/EAR 1804SM-2104SM



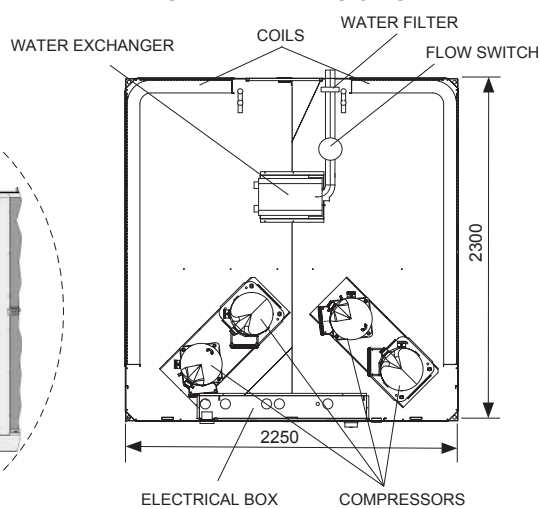
### EAC/EAR 1604SM FP1



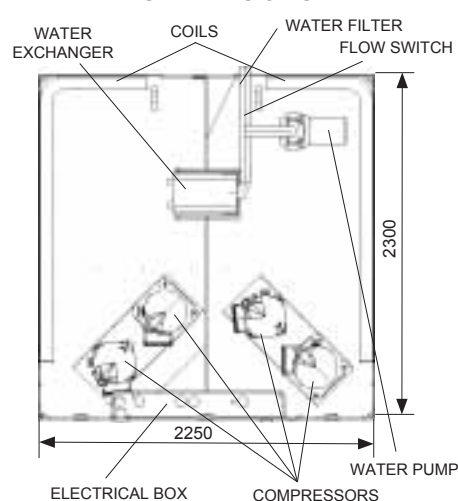
### EAC/EAR 1804SM-2104SM FP1



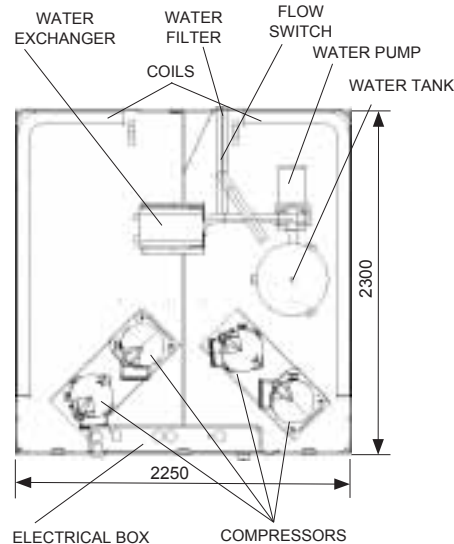
### COMPONENT POSITION STANDARD VERSION UNIT



### COMPONENT POSITION HYDRAULIC VERSION UNIT



### COMPONENT POSITION HYDRONIC VERSION UNIT



## 1.- GENERAL CHARACTERISTICS

### 1.10.- AVAILABLE OPTIONS

	Standard version unit	Hydraulic version unit	Hydronic (1) version unit
<b>COIL TREATMENT</b>			
Epoxy coated al fins coils treated	X	X	X
<b>ELECTRICAL</b>			
Soft starter	X	X	X
Three phase protection	X	X	X
Evaporator antifreeze protection	X	X	X
Tank antifreeze heater (400V/III)	Not available	Not available	X
Water tank electrical heater (400V/III) (2)	Not available	Not available	X
<b>REFRIGERANT CIRCUIT</b>			
HP & LP refrigerant gauges	X	X	X
Kit low water temperature	X	X	X
<b>HYDRAULIC</b>			
Twin pump (3)	Not available	X	X
<b>CONTROL</b>			
ModBus	X	X	X
Remote display (supplied loose)	X	X	X
<b>OTHER OPTIONS</b>			
Coils protection guards	X	X	X
Compressor noise insulation jacket	X	X	X
Anti-vibration (supplied loose)	X	X	X

X Option element.

(1)Water tank included.

(2)Only for heat pumps units.

(3)For models 0251 to 1804. With twin pumps, water filter has to be mounted outside the unit. (1003 to 1403 models).



**NOTE:** All the options will be supplied and mounted in the unit, except rubber antivibration mounts and remote controller, supplied to mount in the moment of installation.

#### 1.10.1.- COIL TREATMENT

##### EPOXY COATED ALUMINIUM FIN COILS TREATED

Special protection of the aluminium condenser coil fins, to give improved protection from aggressive external environmental conditions.

#### 1.10.2.- ELECTRICAL OPTIONS

##### SOFT STARTER

It is an electronic element, which reduces the peak compressor starting current up to 40%.

##### THREE PHASE PROTECTION

Located at electrical box of the unit. It assures that unit will not begin operation on detection of overvoltage, undervoltage, phase reversal fault or phase failure.

##### EVAPORATOR ANTI FREEZE PROTECTION

The evaporator anti freeze heater prevents the water exchange from low temperatures.

##### TANK ANTI-FREEZE HEATER AND WATER TANK ELECTRICAL HEATER (available only for Hydronic version)

An immersion heater can be supplied complete with safety thermostat and pressure switch fitted in the buffer tank, or an anti-freeze and supplementary heater (heat pump units only).

**Tank Anti-freeze heater:** It starts when water temperature in the buffer tank is lower than + 4,5°C .

**Water tank electrical heater:** Heat pump units only. The heater works as anti-freeze heater as explained before and as supplementary heater, when inlet warm water reaches a temperature below a value selected (example: 30 °C) through an independent thermostat included.

THE POWER INPUT IS:

(\*) Heat pump units only

MODELS	0251SM to 0431SM	0472SM to 0812SM	1003SM to 1403SM	1604SM / 2104SM
<b>Voltage</b>	V	3~400V		
<b>Tank anti-freeze heater</b>	KW	2,25	2,25	6,0
<b>Water tank electrical heater*</b>	KW	9	12	24,0

## 1.- GENERAL CHARACTERISTICS

### 1.10.- AVAILABLE OPTIONS

#### 1.10.3.- REFRIGERANT CIRCUIT OPTION

##### HP & LP REFRIGERANT GAUGES

Visualize the high and low pressures of the refrigerant circuit.

##### LOW WATER TEMPERATURE

Necessary for water outlet temperatures below +5°C.

<i>Denomination</i>	<i>Application duty on the water outlet temperature</i>
KIT LOW WATER TEMPERATURE -10°C	For water temperatures below -5°C to -10°C

#### 1.10.4.- HYDRAULIC OPTIONS

##### TWIN PUMPS KIT (only available on Hydraulic and Hydronic versions)

It is formed by two-water pump mounted on parallel and with same characteristics as the single one. Only one pump is working the other remains on stand by.

When the water pump, which is operating cuts out, and the pump turns off, automatically starting the water pump on stand by.

It is possible to select which one of the pumps we want to be working through an external switch supplied with the kit.

With the twin pumps, the available static pressure will decrease 5% from the available static pressure with one water pump only.

#### 1.10.5.- CONTROL OPTIONS

##### MODBUS

It is possible to connect several units with a communication system (MOD BUS Protocol).

##### REMOTE DISPLAY

It controls and shows the unit's operating, it may be installed until 100 m from the unit.

#### 1.10.6.- OTHER OPTIONS

##### COIL PROTECTION GUARDS

The condenser coil protection grill prevents light damage to the coil when shipping and when installed. It cannot protect against very heavy impacts.

##### COMPRESSOR NOISE INSULATION JACKET

Each compressor is fitted with a compressor acoustic jacket this provides attenuation of the compressor noise that radiates from the unit when in operation.

##### ANTI-VIBRATION

To install under the unit, to avoid transmission of vibrations, to the floor where unit is installed, while unit is operating.

## 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.

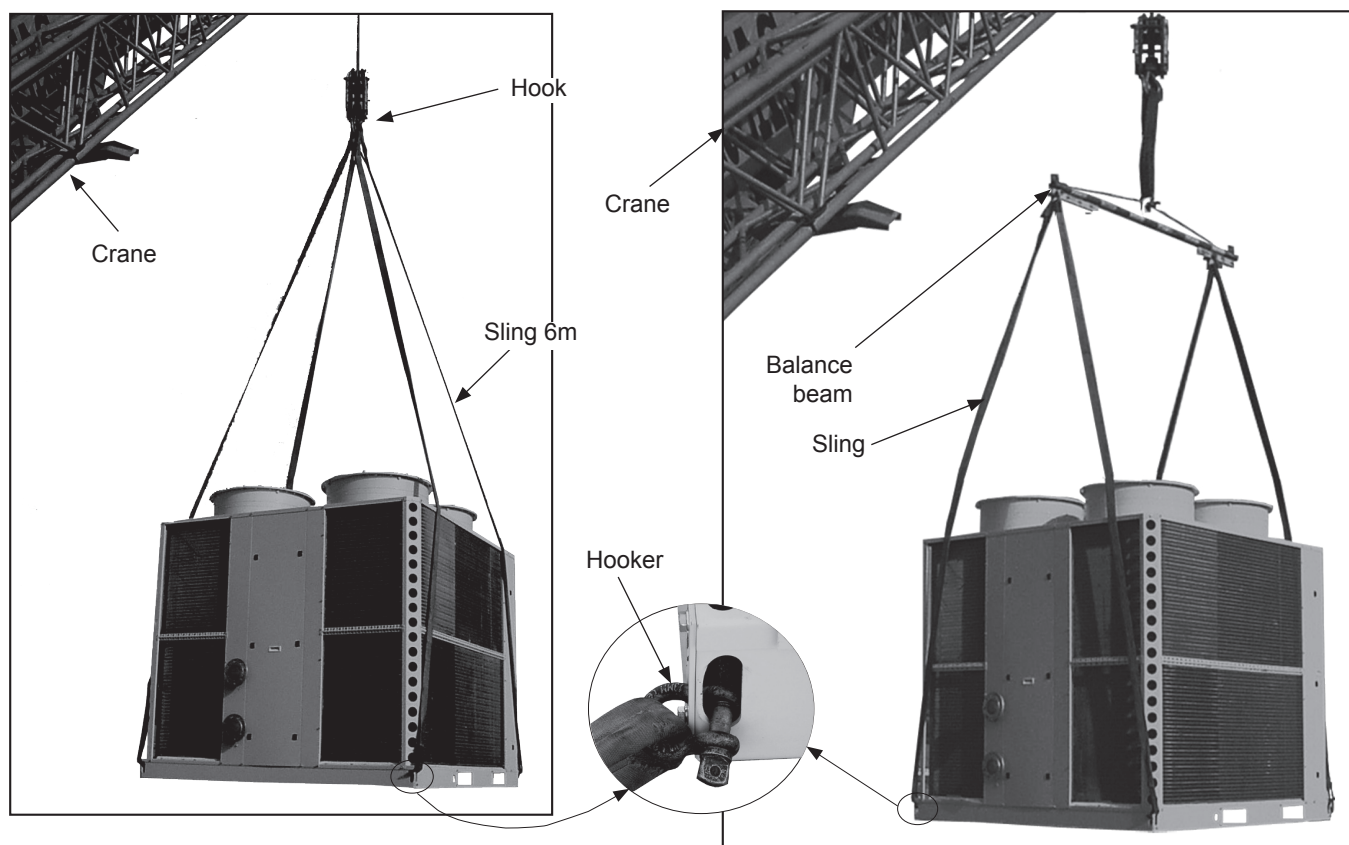
### 2.2.- UNIT LIFTING

#### 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

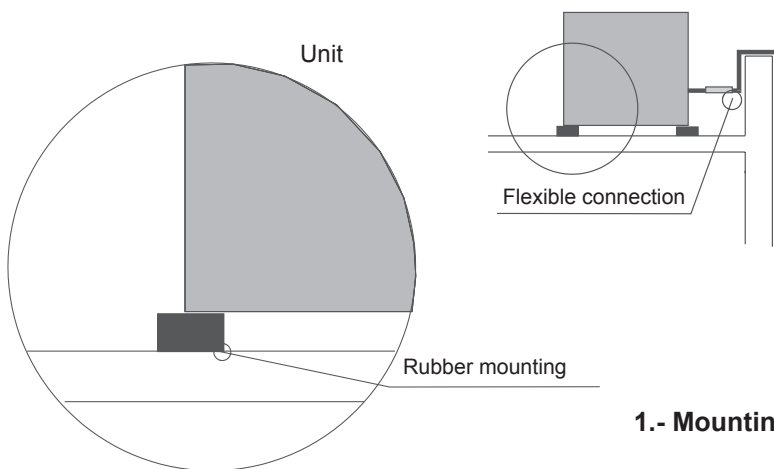


**NOTE:** Use slingers of 6 m with the hook in order to prevent pressure on the top of the unit because it can be damaged. Whenever it is possible, use balance beam.

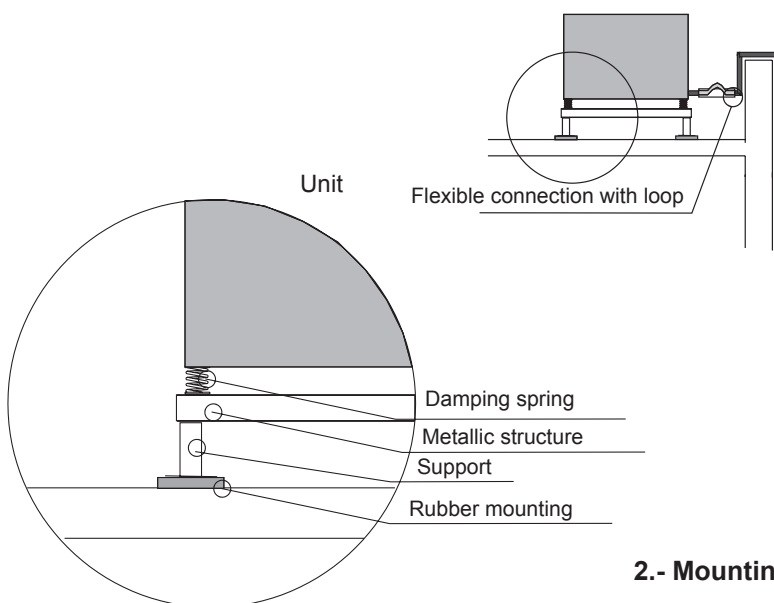


**2.- INSTALLATION**

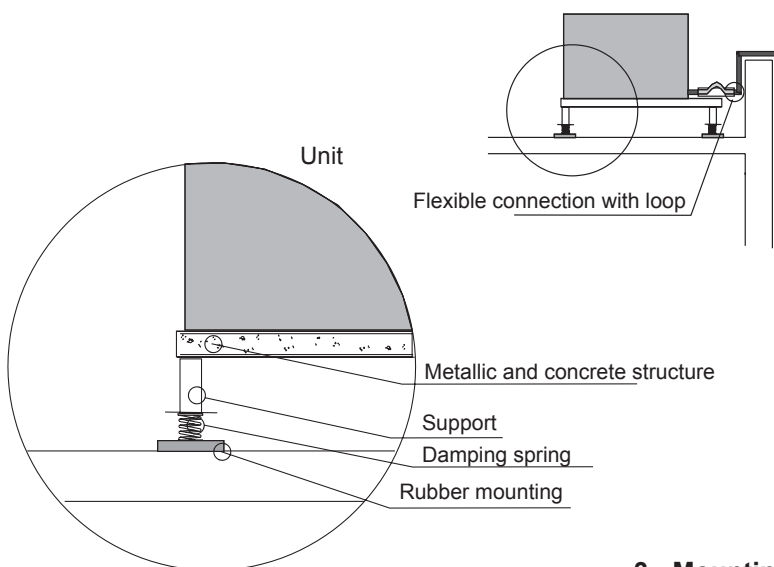
**2.3.- ANTIVIBRATION MOUNTING**



**1.- Mounting on a low sensibility zone**



**2.- Mounting on a medium sensibility zone**



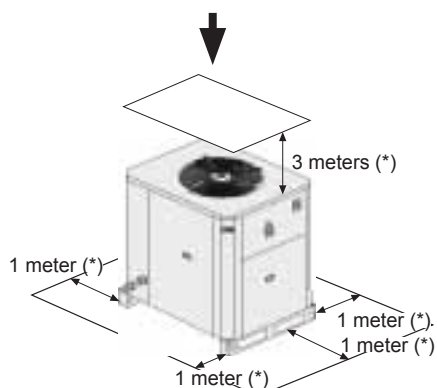
**3.- Mounting on a high sensibility zone  
(Check floor load)**

## 2.- INSTALLATION

### 2.4.- INSTALLATION CLEARANCES

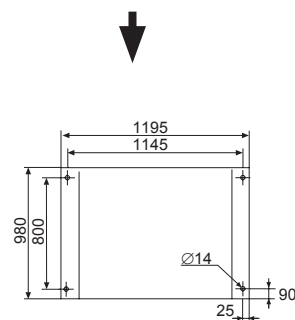
(\*) Clearance around the unit, for all unit versions.  
Failure to install the units as shown will impact performance and reliability.

#### INSTALLATION CLEARANCES

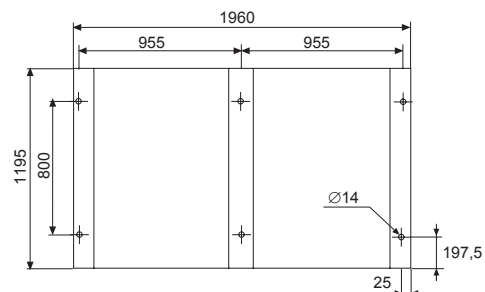
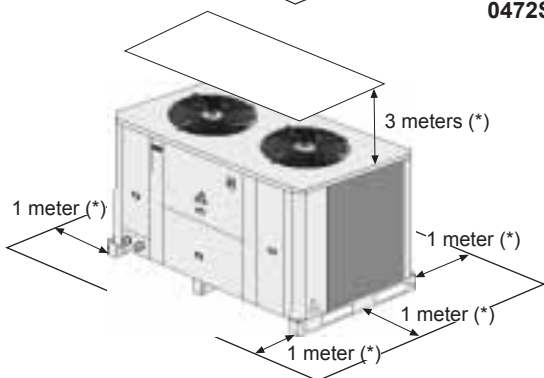


**EAC/EAR**  
**0251SM-0291SM-0351SM-0431SM**

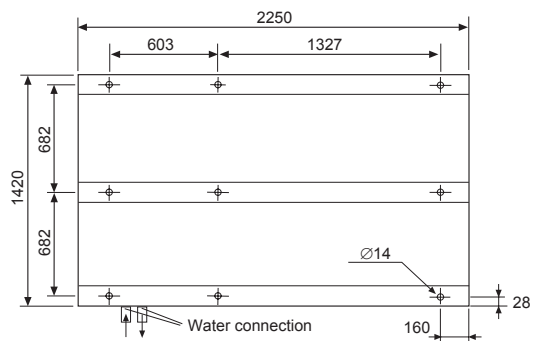
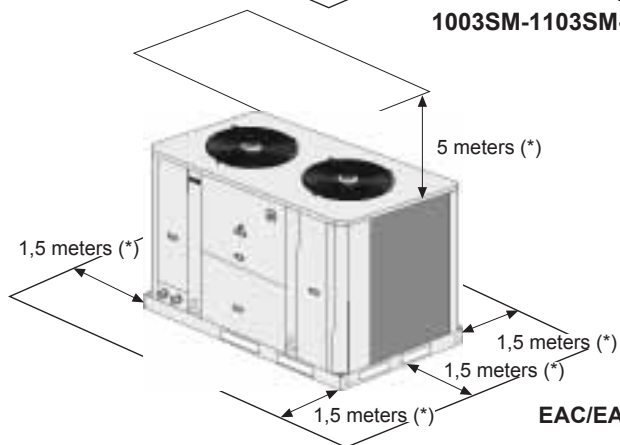
#### DETAILING AVM POSITIONS



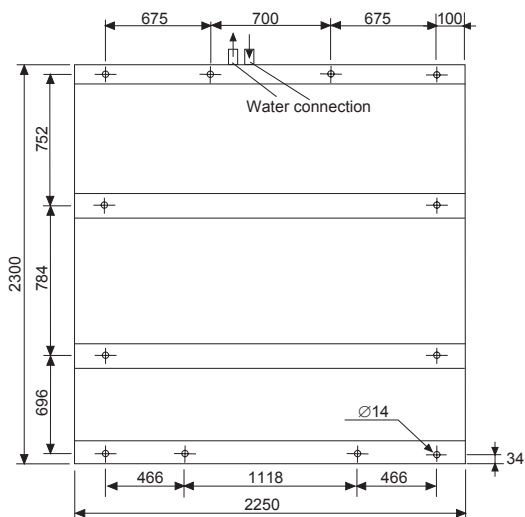
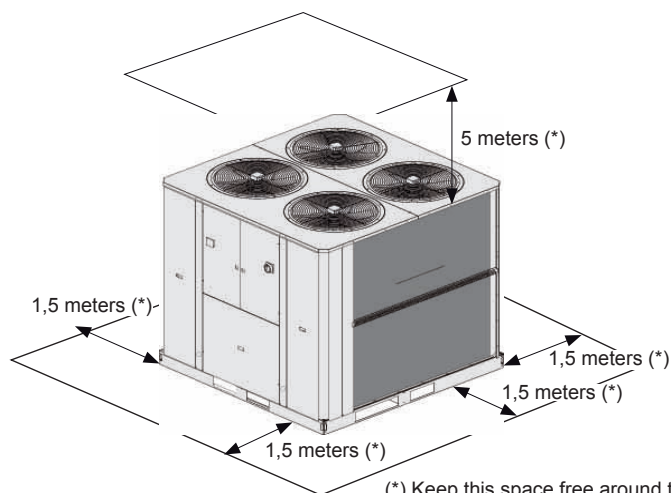
**EAC/EAR**  
**0472SM-0552SM-0672SM-0812SM**



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



**EAC/EAR 1604SM-1804SM-2104SM**



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



## 2.- INSTALLATION

### 2.7.- UNIT INSTALLATION

- 1.- The EcoLean™ 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

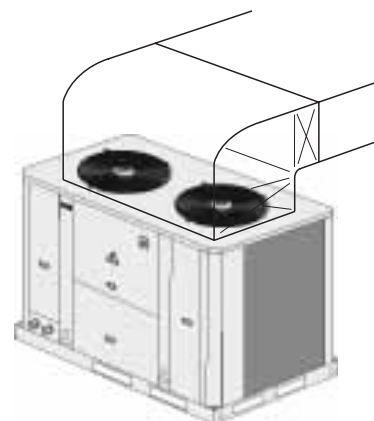
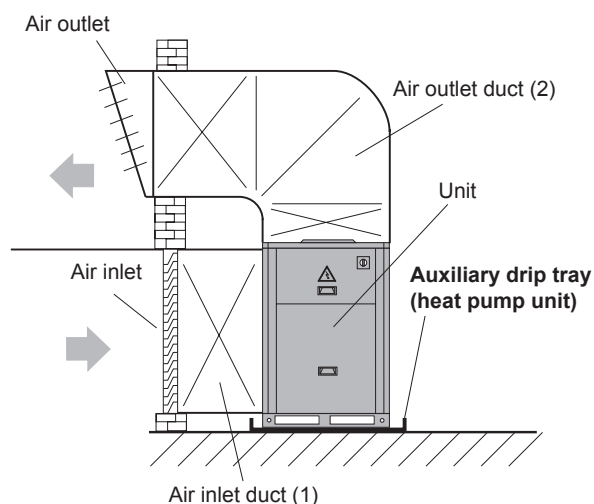
If the unit is exposed for long periods to installation conditions below 0°C the water from defrost can freeze in the base of the unit. This prevents drainage. Ice build up can occur preventing correct operation. For these conditions contact customer service team.

- 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 necessary 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 EcoLean™ 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 °C (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 5°C, 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 +5°C TO 0°C	10%	1,05	1,02	0,997	0,995	0,994
FROM 0°C TO -5°C	20%	1,10	1,05	0,996	0,985	0,993
FROM -5°C TO -5°C	30%	1,15	1,08	0,995	0,975	0,99
FROM -10°C TO -15°C (1)	35%	1,18	1,10	0,994	0,965	0,987

Example: 10 % glycol in EAC 0251SMHN  
 Minimum flow: 3,16 m<sup>3</sup>/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 -10°C 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

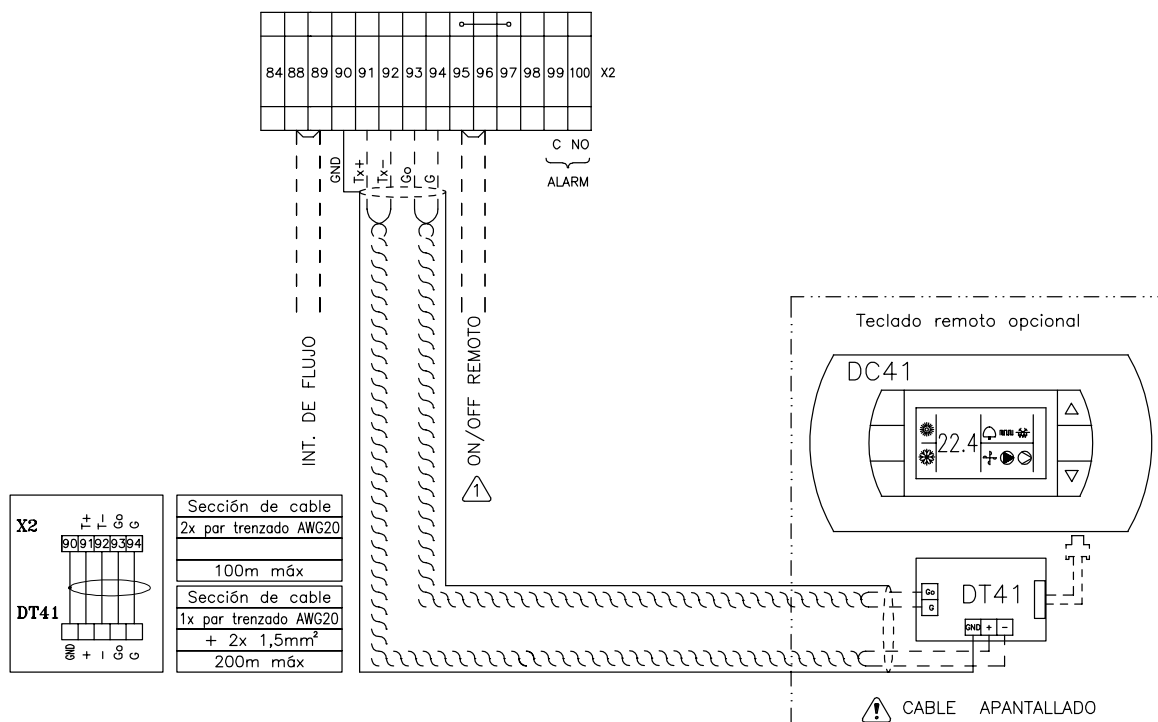


- BEFORE MAKING ANY ELECTRICAL CONNECTIONS, BE SURE THAT ALL CIRCUIT BREAKERS ARE OPEN AND SUPPLY IS OFF.
- IN ORDER TO CARRY OUT THE ELECTRICAL CONNECTIONS, FOLLOW THE ELECTRICAL DIAGRAM SUPPLIED WITH THE UNIT.

POWER SUPPLY	UNIT MODEL	NUMBER OF WIRES X SECTION	
		WITHOUT AEH	WITH AEH
<b>THREE-PHASE UNITS 400V</b>  3N ~ 400V-50Hz + PE	<b>0251SM</b>	5 x 6 mm <sup>2</sup>	5 x 10 mm <sup>2</sup>
	<b>0291SM</b>	5 x 6 mm <sup>2</sup>	5 x 10 mm <sup>2</sup>
	<b>0351SM</b>	5 x 10 mm <sup>2</sup>	5 x 10 mm <sup>2</sup>
	<b>0431SM</b>	5 x 10 mm <sup>2</sup>	5 x 16 mm <sup>2</sup>
	<b>0472SM</b>	5 x 16 mm <sup>2</sup>	3 x 25+2x16 mm <sup>2</sup>
	<b>0552SM</b>	5 x 16 mm <sup>2</sup>	3 x 25+2x16 mm <sup>2</sup>
	<b>0672SM</b>	3 x 25+2x16 mm <sup>2</sup>	3 x 25+2x16 mm <sup>2</sup>
	<b>0812SM</b>	3 x 25+2x16 mm <sup>2</sup>	3 x 35+2x16 mm <sup>2</sup>
	<b>1003SM</b>	3 x 25+2x16 mm <sup>2</sup>	3 x 50+2x25 mm <sup>2</sup>
	<b>1103SM</b>	3 x 35+2x16 mm <sup>2</sup>	3 x 50+2x25 mm <sup>2</sup>
	<b>1203SM</b>	3 x 35+2x16 mm <sup>2</sup>	3 x 70+2x35 mm <sup>2</sup>
	<b>1303SM</b>	3 x 50+2x25 mm <sup>2</sup>	3 x 70+2x35 mm <sup>2</sup>
	<b>1403SM</b>	3 x 50+2x25 mm <sup>2</sup>	3 x 70+2x35 mm <sup>2</sup>
	<b>1604SM</b>	3 x 70+2x35 mm <sup>2</sup>	3 x 95+2x50 mm <sup>2</sup>
<b>1804SM</b>	3 x 70+2x35 mm <sup>2</sup>	3 x 95+2x50 mm <sup>2</sup>	
<b>2104SM</b>	3 x 95+2x50 mm <sup>2</sup>	3 x 120+2x70 mm <sup>2</sup>	

- 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 0251SM TO 2104SM



#### VOLTAGE OPERATION LIMITS

MODELS	VOLTAGE	LIMITS
0251SM A 1804SM	3N~400V-50Hz	3N~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.- Check that the main switch is ON .
- 4.- 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
- 5.- Check that the fan can rotate freely.
- 6.- Check the water pump's direction of rotation.
- 7.- Check for air in the water system. Purge if necessary.
- 8.- The compressor must not be started until the crankcase heater has been running for at least 8 hours.

- The compressor has a single phase 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 so that this heater will be activated.
- Check that the compressor starts after 3 minutes.
- Select cool or heat as the operating mode at the control unit.



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. Single phase models are always started up in the proper direction; however, the three phase models, turn in either direction depending on the order of the power supply phases. 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).
- Connect high and low pressure gauges and check that operating pressure values are normal.
- Measure electrical consumption of the unit and check that it is near what is indicated on the specification plate.
- 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 on the Control Panel checking that the 4-way valve makes the change correctly. Check the pressure values in the new cycle.
- Remember that high and low pressure switch are automatic reset, if it has 3 operations in one hour, it will be a manual reset, through the control of the unit.

### 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 5°C (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 5°C as can be seen in the following table, based on nominal flow rate.

Water output °C	ΔT (Water inlet temperature - Water outlet temperature)						
	Outside temperature °C						
	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.

Water output °C	ΔT ( Water inlet temperature - Water outlet temperature)				
	Outside Temperature °C BH				
	-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.- CORROSION RESISTANCE OF COPPER AND STAINLESS STEEL OF PLATES EXCHANGER (WATER EXCHANGER)

GUIDE TO MEASURE A ANALYSIS OF THE WATER IN THE CIRCUIT.

The resistance guide below is an attempt of give a picture of the corrosion resistance of the stainless steel of the type AISI 316 and pure copper in the water, to a number of important chemical factors. The actual corrosion is however a very complex process influenced by many factors in combination. This table is therefore a considerable simplification and should not be overvalued.

Explanations:

- + Good resistance under normal conditions
- 0 Corrosion problems can occur especially when the factors are valued as 0
- Use is not recommended

WATER CONTAINING	CONCENTRATION mg/l ó ppm	AISI 316	COPPER
Alcalinity (HCNO <sub>3</sub> )	<70	+	0
	70-300	+	+
	>300	+	0
Sulfate (SO <sub>4</sub> <sup>2-</sup> )	<70	+	+
	70-300	+	-
	>300	0	-
HCO <sub>3</sub> / SO <sub>4</sub> <sup>2-</sup>	>1.0	+	+
	<1.0	+	-
Electrical conductivity	<10µS/cm	+	0
	10-500µS/cm	+	+
	>500µS/cm	+	0
pH	<6.0	0	0
	6.0-7.5	0/+	0
	7.5-9.0	+	+
	>9.0	+	0
Amonium (NH <sub>3</sub> )	<2	+	+
	2-20	+	0
	>20	+	-
Chloroides (Cl <sup>-</sup> )	<50	+	+
	>50	0	0
Free chlorine (Cl <sub>2</sub> )	<1	+	+
	1-5	+	0
	>5	0/+	-
Hydrogen sulfide (H <sub>2</sub> S)	<0.05	+	+
	>0.05	+	-
Free( aggressive) Carbon Dioxide (CO <sub>2</sub> )	<5	+	+
	5-20	+	0
	>20	+	-
Total hardness (°dH)	4.0-8.5	+	+
Nitrate (NO <sub>3</sub> )	<100	+	+
	>100	+	0
Iron (Fe)	<0.2	+	+
	>0.2	+	0
Aluminium (Al)	<0.2	+	+
	>0.2	+	0
Manganese (Mn)	<0.1	+	+
	>0.1	+	0

## 4.- MAINTENANCE

### 4.1.- PREVENTIVE MAINTENANCE



#### PREVENTIVE 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  $-5^{\circ}\text{C}$ , 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.

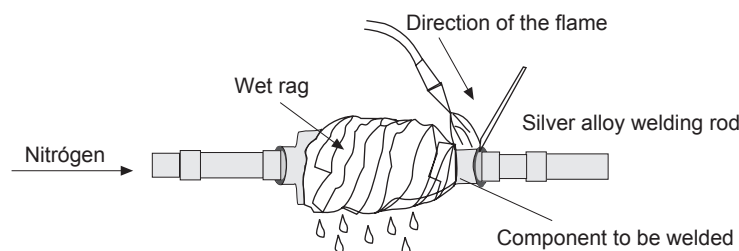
### 4.2.- CORRECTIVE MAINTENANCE



**IMPORTANT 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.	<ul style="list-style-type: none"> <li>* Disconnected supply.</li> <li>* Main switch set to STOP.</li> <li>* No water flow.</li> <li>* Fuses are broken.</li> <li>* Low electrical supply.</li> <li>* One of the safety devices has been activated.</li> <li>* Compressor fault.</li> <li>* Low water temperature.</li> </ul>	<ul style="list-style-type: none"> <li>* Check electrical supply.</li> <li>* Connect main switch.</li> <li>* Start water pump (and check air in system).</li> <li>* Check voltage.</li> <li>* Check antifreeze thermostat.</li> <li>* Check high/low pressure switch.</li> <li>* Change compressor.</li> <li>* Create demand for cooling.</li> </ul>
The fan does not work (although the compressor is operating).	<ul style="list-style-type: none"> <li>* Internal safety device open.</li> <li>* Bad connection.</li> <li>* Poor condensation control.</li> </ul>	<ul style="list-style-type: none"> <li>* Let the motor cool.</li> <li>* Connect properly.</li> <li>* Check operation.</li> </ul>
The compressor stops when the high pressure switch is cut off.	<ul style="list-style-type: none"> <li>* Condenser coil blocked.</li> <li>* Unit operating outside of limiting.</li> <li>* Abnormal operation of the fans.</li> </ul>	<ul style="list-style-type: none"> <li>* Maintain condenser coil.</li> <li>* Check the ventilators.</li> </ul>
The compressor stops when the low pressure switch is cut off.	<ul style="list-style-type: none"> <li>* Insufficient charge.</li> <li>* The water exchanger is blocked (water side).</li> <li>* No water flow.</li> <li>* Expansion valve blocked</li> </ul>	<ul style="list-style-type: none"> <li>* Check the charge.</li> <li>* Maintain the exchanger.</li> <li>* Check that there is sufficient water flow.</li> <li>* Change expansion valve.</li> </ul>
The oil level in the compressor is very low.	<ul style="list-style-type: none"> <li>* The crank case heater is not working.</li> </ul>	<ul style="list-style-type: none"> <li>* Replace the crank case heater and check oil level.</li> </ul>
High noise level of compressor and high and low pressures are abnormal.	<ul style="list-style-type: none"> <li>* Phase connection for compressor power supply incorrectly.</li> </ul>	<ul style="list-style-type: none"> <li>* Switch the wires between two of the phases of compressor power supply.</li> </ul>
Compressor may stop pumping with water running	<ul style="list-style-type: none"> <li>* ASTP protection is working</li> </ul>	<ul style="list-style-type: none"> <li>* Check the causes of high discharge temperature.</li> </ul>



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