Carrier

United Technologies

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

Ductable air-cooled scroll chillers and heat pumps

30PA/PH/PAC/PHC

Nominal cooling capacity 17,7 - 36,0 kW
Nominal heating capacity 21,8 - 42,6 kW
50 Hz

Original document

Ductable air-cooled scroll chillers and heat pumps

Contents

Ductable air-cooled scroll chillers and heat pumps

1. Introduction

The **30PA/PH** cooling only and reversible heat pumps are compact outdoor air/water units.

Available in two versions:

- **STD (Standard)**
- **HEE (High Energy Efficiency)**

These units have been made for operation indoors in the production of hot and/or cold water, applicable to heating, cooling, and industry.

They are equipped with centrifugal fan (STD version) or electronic plug-fan (HEE version), plate exchanger, hermetic scroll compressor, and electronic control with microprocessor, components optimised for the R-410A refrigerant.

This range is also offered with an integrated circulation pump: **30PAC/PHC**.

The entire range also has the option to include a desuperheater circuit that allows for the production of hot water at a temperature greater than in the condensation circuits.

- **30PA/PAC**

  Air-cooled water chillers.

- **30PH/PHC**

  Reversible heat pump units for operation in negative outdoor temperatures (greater than -15ºC WB) for water heating and cooling. Defrosting by reversing the cycle.

After manufacturing, all units are charged with refrigerant and are tested at the factory, verifying the correct operation of all their components within the operating range for which they are intended.

The units comply with European Directives: Machinery 2006/42/EC - EMC 2014/30/EU - LVD 2014/35/EU - PED 2014/68/EC (Category 2) - RoHS 2011/65/EU - Eco-design 2009/125/CE - Eco-labelling 2010/30/EU; and with Harmonised Standard: EN 378-2:2012.

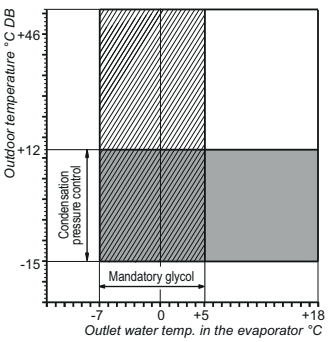
Those in charge of the installation, commissioning, operation and maintenance of the unit must know the instructions contained in this brochure and the specific technical characteristics of the installation place.

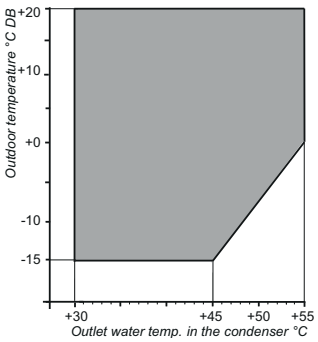
2. Operation limits

Series	Cooling mode				Heating mode			
	Air		Water (outlet T.)		Air		Water (outlet T.)	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
30PA/PAC	46ºC	12ºC ①	18ºC	5ºC ②	--	--	--	--
30PH/PHC	46ºC	12ºC ①	18ºC	5ºC ②	20ºC DB	-15ºC DB	55ºC	30ºC

① With control of the condensation pressure operating up to -15ºC.

② Minimum outlet temperature. With the option of glycol water for lower temperature operation from 5ºC to -7ºC.





3. Safety advice

To avoid any risk of accident during installation, commissioning or maintenance, it is obligatory to take into consideration the following specifications for the units: refrigerated circuits under pressure, refrigerant presence, electrical voltage presence and implantation place.

Because of all of this, only qualified and experienced personnel can perform maintenance tasks or unit repairs.

It is required to follow the recommendations and instructions in the maintenance brochures, the labels, and the specific instructions.

It is necessary to comply with the norms and regulations in effect. It is recommended to consult the competent authorities regarding the applicable regulations for users of units or components under pressure. The characteristics of these units or components are included on the plates of characteristics or in the regulatory documentation provided with the product.

The compressor and line surfaces can reach temperatures above 100ºC causing burns to the body. In the same fashion, under certain conditions these surfaces can reach very cold temperatures that can cause freezing risks.

Use safety goggles and gloves on the job. Be careful with sharp parts or elements in the unit.

Caution: Before intervening in the unit, verify that the main power to the unit is cut off. An electric shock can cause personal damage.

Note: In order to recycle these units follow the stipulations of Directive 2012/19/EU on *Waste electrical and electronic equipment* (WEEE).

Refrigerant leaks:

A periodical check must be performed for refrigerant gas leaks as per Regulation (CE) Nº517/2014 over **certain greenhouse effect fluoride gases.** Please, consult the frequency of checks in chapter of “Maintenance”.

These units work with refrigerant gas **R-410A**.

Components of the R-410A	R-32	R-125
Chemical formula	CH2F2	CHF2CF3
Weight ratio	50%	50%
Unitary global warming potential (GWP)	675	3.500
Global warming potential (GWP)	2.088	

In case of a leak:

- Toxicity: According to ASHRAE 34, R-410A belongs to the A1/A1 group, i.e. with high safety both in the mix and also in the case of a leak.
- Although it is not toxic, in case of a leak to atmospheric pressure the liquid phase evaporates. The resulting vapours are heavier than air and can displace the technician local air. In case of an accidental discharge in a closed enclosure, fans must be used to eliminate said vapours.
- Although the R-410A is not flammable, when in contact with a flame o hot spot it can decompose in fluorhydric acid HF and fluophosgene COF_2 highly toxic and corrosive.
- To detect leaks, an electronic leak detector, an ultraviolet lamp or soapy water must be used. Flame detectors do not help.

Important: Immediately repair any refrigerant leak, using a recovery unit specific for R-410A that avoids a possible mixture of refrigerants and/or oils.

4. Available configurations

According to the air supply:

- **Assembly M00**
  HORIZONTAL air supply.
- **Assembly M01**
  VERTICAL air supply.

According to the type of supply fan:

- **STD version (Standard):**
  Centrifugal fan coupling by pulleys and belts.
- **HEE version (High Energy Efficiency):**
  Variable speed electronic plug-fan.

M00

M01

STD

HEE

5. TECHNICAL CHARACTERISTICS

STD version

30PA/PH			90STD	100STD	120STD	160STD	180STD
Cooling capacities	Net cooling capacity ① (kW)		17,	21,10	25,20	32,70	36,00
	Net power input ③ (kW)		7,75	9,15	10,00	12,60	14,40
	Net efficiency	EER	2,29	2,31	2,51	2,60	2,49
	Seasonal efficiency	ESEER ④	2,61	2,59	2,81	2,94	2,85
Heating capacities	Net heating capacity ② (kW)		21,80	26,10	29,70	38,30	42,60
	Net power input ③ (kW)		7,31	8,90	9,90	12,90	14,20
	Net efficiency	COP	2,97	2,94	3,00	2,97	3,01
	Seasonal efficiency ⑤ Average climate	SCOP	3,11	3,12	3,07	2,95	2,95
		ηs Heat	121%	122%	120%	115%	115%
		Prated (kW)	16,77	19,19	21,82	26,33	31,31
	Seasonal efficiency ⑤ Warmer climate	SCOP	3,59	3,63	3,57	3,42	3,35
		ηs Heat	140%	142%	140%	134%	131%
		Prated (kW)	12,73	14,70	16,72	24,30	27,32
Outdoor circuit centrifugal fan	Nominal air flow (m^3/h)		6500	7000	10000	12200	12200
	Available static pressure (mm.w.c.)		20				
	Number / turbines		1				
	Motor output (kW)		2,2	2,2	3,0	4,0	4,0
	Power input (kW) ⑥		1,46	1,77	2,33	2,83	2,83
	Speed (r.p.m.)		973	1027	837	734	734
Indoor circuit	Nominal water flow (m^3/h)		3,1	3,7	4,3	5,7	6,2
	Pressure drop (m.w.c.)		2,3	3,2	2,9	4,7	2,9
	Minimum water flow (m^3/h)		2,2	2,7	3,1	4,1	4,3
	Maximum water flow (m^3/h)		6,2	7,4	8,8	11,3	12,7
	Type of hydraulic connections		Gas threaded				
	Diameter of connections		1 1/4" M		1 1/2" M		
Compressor	Type		Scroll				
	Number of compressors / stages / circuits		1 / 1 / 1				
	Oil type		Copeland 3MAF 32 cST, Danfoss POE 160 SZ, ICI Emkarate RL 32 CF, Mobil EAL Artic 22 CC				
	Volume of oil (l)		3,0	3,3	3,3	3,3	6,2
Refrigerant	Type		R-410A				
	Global warming potential (GWP) ⑦		2.088				
	Charge (kg)		5,9	6,1	6,6	6,9	7,6
	Environment impact (tCO_2e)		12,3	12,7	13,8	14,4	15,9
Electrical characteristics	Electrical power supply		400 V / III ph / 50 Hz (±10%)				
	Power supply		3 Wires + Ground + Neutral				
Maximum absorbed current	Compressor (A)		15,2	17,3	20,5	25,4	30,5
	Fan (A)		5,0	5,0	6,9	8,9	8,9
	Control (A)		0,9	0,9	0,9	0,9	0,9
	Total (A)		21,1	23,2	28,3	35,2	40,3
Dimensions	Length (mm)		1117		1398		
	Width (mm)		860		860		
	Height (mm)		1447		1727		
Weight	Empty (kg)		302	310	372	390	388
	In operation (kg)		306	315	379	397	396

① Cooling capacity calculated in accordance with the EN-14511-2013 standard given for outlet water temperature conditions of 7ºC and 35ºC outdoor temperature.
② Heating capacity calculated in accordance with the EN-14511-2013 standard given for outlet water temperature conditions of 45ºC and 6ºC WB outdoor temperature.
③ Total power input by compressor, motorised fan and electronic control under nominal conditions, calculated in accordance with the EN-14511-2013 standard. Options are not included.
④ European Seasonal Energy Efficiency Ratio (ESEER) obtained in accordance with the calculation conditions established by the certification body EUROVENT.
⑤ Values calculated in accordance with the EN-14825-2013 standard given for bivalente temperature of -5ºC in average climate and 2ºC in warmer climate.
⑥ Energy-efficient motors IE2.
⑦ Climatic warming potential of a kilogram of fluorinated greenhouse gas in relation to a kilogram of carbon dioxide over a period of 100 years.

5. TECHNICAL CHARACTERISTICS

HEE version

30PA/PH			90HEE	100HEE	120HEE	160HEE	180HEE
Cooling capacities	Net cooling capacity ① (kW)		18,40	21,00	25,50	31,40	35,70
	Net power input ③ (kW)		7,20	7,95	9,10	11,50	13,60
	Net efficiency	EER	2,55	2,64	2,81	2,74	2,62
	Seasonal efficiency	ESEER ④	2,89	2,99	3,20	3,14	3,03
Heating capacities	Net heating capacity ② (kW)		21,40	23,90	29,30	36,40	42,50
	Net power input ③ (kW)		7,10	7,90	9,50	11,90	13,90
	Net efficiency	COP	3,03	3,03	3,08	3,05	3,05
	Seasonal efficiency ⑤ Average climate	SCOP	2,98	2,95	3,29	3,18	3,09
		ηs Heat	116%	115%	129%	124%	121%
		Prated (kW)	15,92	17,74	21,94	26,77	30,87
	Seasonal efficiency ⑤ Warmer climate	SCOP	3,41	3,58	3,82	3,67	3,65
		ηs Heat	134%	140%	150%	144%	143%
		Prated (kW)	13,09	14,68	18,01	22,41	25,89
Outdoor circuit plug-fan	Nominal air flow (m^3/h)		6500	7000	10000	12200	14000
	Nominal available static pressure (mm.w.c.)		20				
	Maximum available static pressure (mm.w.c.)		63,7	70,3	45,6	65,1	62,7
	Number / diameter		1 / 500		1 / 560	2 / 560	
	Motor output (kW)		2,7	2,8	3,0	2 x 3,0	
	Power input (kW) ⑥		1,33	1,21	1,87	2,20	2,52
	Speed (r.p.m.)		1700	1780	1500	1500	
Indoor circuit	Nominal water flow (m^3/h)		3,2	3,7	4,5	5,4	6,2
	Pressure drop (m.w.c.)		1,6	2,1	1,6	2,4	3,1
	Minimum water flow (m^3/h)		2,5	2,9	3,4	4,1	4,6
	Maximum water flow (m^3/h)		6,6	7,4	9,1	11,3	12,8
	Type of hydraulic connections		Rosca gas				
	Diameter of connections		1 1/4" M		1 1/2" M		
Compressor	Type		Scroll				
	Number of compressors / stages / circuits		1				
	Oil type		Copeland 3MAF 32 cST, Danfoss POE 160 SZ, ICI Emkarate RL 32 CF, Mobil EAL Artic 22 CC				
	Volume of oil (l)		3,0	3,3	3,3	3,3	6,2
Refrigerant	Type		R-410A				
	Global warming potential (GWP) ⑦		2.088				
	Charge (kg)		6,0	6,3	6,8	8,9	9,2
	Environment impact (tCO_2e)		12,5	13,2	14,2	18,6	19,2
Electrical characteristics	Electrical power supply		400 V / III ph / 50 Hz (±10%)				
	Power supply		3 Hilos + Tierra + Neutro				
Maximum absorbed current	Compressor (A)		15,2	17,3	20,5	25,4	30,5
	Fan (A)		4,2	4,3	4,6	9,2	9,2
	Control (A)		0,9	0,9	0,9	0,9	0,9
	Total (A)		20,3	22,5	26,0	35,5	40,6
Dimensions	Length (mm)		1117	1398		2113	
	Width (mm)		860	860		860	
	Height (mm)		1447	1727		1447	
Weight	Empty (kg)		294	351	368	450	455
	In operation (kg)		298	358	376	465	468

① Cooling capacity calculated in accordance with the EN-14511-2013 standard given for outlet water temperature conditions of 7ºC and 35ºC outdoor temperature.
② Heating capacity calculated in accordance with the EN-14511-2013 standard given for outlet water temperature conditions of 45ºC and 6ºC WB outdoor temperature.
③ Total power input by compressor, motorised fan and electronic control under nominal conditions, calculated in accordance with the EN-14511-2013 standard. Options are not included.
④ European Seasonal Energy Efficiency Ratio (ESEER) obtained in accordance with the calculation conditions established by the certification body EUROVENT.
⑤ Values calculated in accordance with the EN-14825-2013 standard given for bivalente temperature of -5ºC in average climate and 2ºC in warmer climate.
⑥ Motors that are more energy efficient than what is established by the ErP 2015 standard.
⑦ Climatic warming potential of a kilogram of fluorinated greenhouse gas in relation to a kilogram of carbon dioxide over a period of 100 years.

5. TECHNICAL CHARACTERISTICS

Pump included

30PAC/PHC			90STD	100STD	120STD	160STD	180STD
Cooling	Seasonal efficiency ①	ESEER	2,67	2,61	2,89	2,97	2,84
Heating	Seasonal efficiency ② Average climate	SCOP	3,24	3,13	3,10	2,95	3,06
		ηs Heat	126%	122%	121%	115%	119%
		Prated (kW)	16,83	19,20	21,83	26,21	30,53
	Seasonal efficiency ② Warmer climate	SCOP	3,82	3,60	3,60	3,44	3,57
		ηs Heat	150%	141%	141%	135%	140%
		Prated (kW)	12,77	14,71	16,72	24,22	27,28
Indoor circuit	Nominal water flow (m^3/h)		3,1	3,7	4,3	5,7	6,2
	Pressure drop (m.w.c.)		3,1	4,2	3,8	6,2	4,5
Expansion vessel	Volume (l)		12				
	Filled pressure (kg/cm^2)		1,5				

30PAC/PHC			90HEE	100HEE	120HEE	160HEE	180HEE
Cooling	Seasonal efficiency ①	ESEER	2,95	3,00	3,22	3,17	3,02
Heating	Seasonal efficiency ② Average climate	SCOP	3,12	2,95	3,33	3,20	3,08
		ηs Heat	122%	115%	130%	125%	120%
		Prated (kW)	15,75	17,51	21,70	26,39	30,36
	Seasonal efficiency ② Warmer climate	SCOP	3,64	3,56	3,77	3,67	3,60
		ηs Heat	143%	139%	148%	144%	141%
		Prated (kW)	13,12	14,69	18,05	22,40	25,83
Indoor circuit	Nominal water flow (m^3/h)		3,2	3,7	4,5	5,4	6,2
	Pressure drop (m.w.c.)		2,3	3,1	2,5	3,5	4,6
Expansion vessel	Volume (l)		12				
	Filled pressure (kg/cm^2)		1,5				

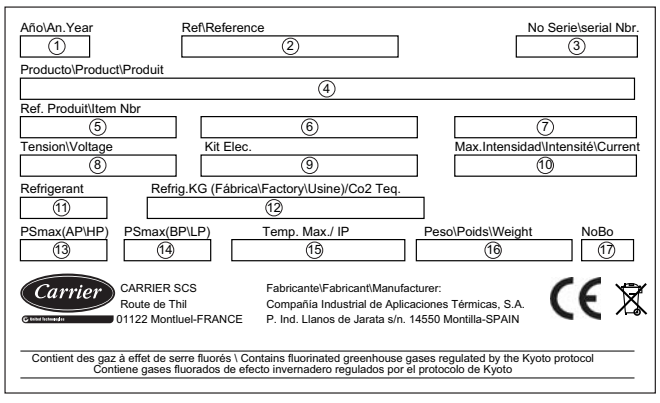
① European Seasonal Energy Efficiency Ratio (ESEER) obtained in accordance with the calculation conditions established by the certification body EUROVENT.
② Values calculated in accordance with the EN-14825-2013 standard given for bivalente temperature of -5ºC in average climate and 2ºC in warmer climate.

6. UNIT IDENTIFICATION

Check the condition of the equipment upon delivery.

Check that the details on the label, the packing and the data plate match the order. If equipment has been damaged, or there is a shortfall in delivery, notify accordingly.

All units bear, legibly and indelibly, a data plate located in a prime space, as appears in the attached image: Check that this plate matches the correct model.



Legend

① Year of manufacture
② Commercial product name
③ Serial number
④ Description of the product
⑤ Purchase order number
⑥ Sales order number
⑦ Work order number
⑧ Power supply
⑨ Power output of the auxiliary electrical heaters kit (optional) (kW)
⑩ Maximum absorbed current under full load (A) (including the electrical kit)
⑪ Type of refrigerant
⑫ Refrigerant content (kg) and Environment impact (CO_2 Teq.)
⑬ Maximum service pressure in the high pressure side (R-410A = 42 bar)
⑭ Maximum service pressure in the low pressure side (R-410A = 24 bar)
⑮ Maximum operating temperature (refer to “Opration limits”)
Maximum shipment and storage temperature: +50ºC
Electrical protection rating: IP54
⑯ Operation weight (kg) (empty weight + fluid + refrigerant)
⑰ Notified Body number for surveillance of the Pressure Equipment Directive

Note: The serial number must be used in all correspondence regarding the unit.

7. Transport and handling

Transport

The unit must be handled with care to avoid transport damage. Thus we recommend:

- Do not dispose of the transport supports or the packaging materials until the unit is in its final location.
- For transport in a container, one must be selected that has an easy load and unload to the installation location.

Discharging of the unit

The unit can be discharged using:

- Forklift truck.
- Crane with a rocker arm and cloth slings.

Any handling of the unit by other means or by gripping points different from those described here may be dangerous for both the unit and the personnel who are carrying out the discharging or transport work.

Always check the weight of the set and verify that the discharging method used is approved for handling that weight.

Note: please see the weight and the gravity centre coordinates of each model stated in the following section.

- **Discharge via forklift truck:**

  The unit is designed to be transported safely by using a forklift truck. The forks of the forklift truck must come in on the side of the unit, ensuring that the centre of gravity of the unit remains within the forks, because a misbalance in the transport may cause the unit to turn over and fall from the forklift truck.

  The recommended length for the forks will be bigger than the unit width, so that the entire weight-bearing structure can be supported on the forklift truck. This also prevents the possible introduction of the truck's fork into functional parts of the unit that may cause damage to the unit.

  The standards and recommendations of the forklift truck must also be respected with regards to the maximum load, inclination of the panel, elevation of the load for transport, and, in particular, the maximum speed.

- **Discharge via crane:**

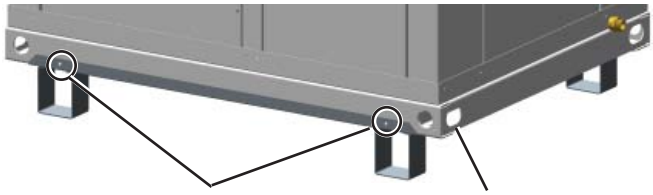
  A rocker arm, as well as approved cloth slings, both suitable for the dimensions and weight of the unit, must be used in order to carry out the work safely and without causing damage to the units or to workers.

  These slings will be hooked to the two mounting holes located on each crossbar. Make sure that the unit is protected from contact with the hooks to prevent damage to the housing.

The unit must be lifted and fixed with care, with maximum inclination of 15º, since it could harm its operation. Do not raise by points outside of those specified here.

Placement on site

Once the unit is discharged, it must be freed from the transport supports so that the inserts available for the silent-blocks can be accessed. Each support is fixed to the crossbar using 2 M4 screws.



M4 screws for fixing the support *Mounting hole*

Centre of gravity coordinates

30PA/PH	Centre of gravity (mm)			Weight (empty) (kg)
	X	Y	Z	
90STD	453	384	528	302
100STD	488	398	576	310
120STD	625	399	676	372
160STD	619	400	666	390
180STD	625	397	674	388

30PA/PH	Centre of gravity (mm)			Weight (empty) (kg)
	X	Y	Z	
90HEE	502	422	614	294
100HEE	569	417	673	351
120HEE	628	426	742	368
160HEE	940	435	573	450
180HEE	936	434	579	455

30PAC/ PHC	Centre of gravity (mm)			Weight (empty) (kg)
	X	Y	Z	
90STD	517	396	577	306
100STD	515	402	574	315
120STD	645	402	673	379
160STD	639	402	663	397
180STD	646	400	669	396

30PAC/ PHC	Centre of gravity (mm)			Weight (empty) (kg)
	X	Y	Z	
90HEE	538	427	599	310
100HEE	638	418	623	370
120HEE	696	427	674	386
160HEE	975	436	570	469
180HEE	972	436	575	476

8. Location and assembling

Location designation

Before moving the unit, it must be checked that all panels are fastened in place. Lift and lower with care.

When choosing the location, whatever may be the selected fashion, the following precautions have to be taken into consideration:

- It is mandatory to comply with norm EN 378-3 on Safety and Environmental Requirements. Part 3: "In situ" installation and protection to people.
- The area where the unit will be located must be perfectly accessible for cleaning and maintenance operations (check minimum free space for maintenance). Leave enough space for air circulation around the unit.
- Check that the unit is perfectly levelled.
- It is necessary to check that the surface of the floor or the structure supports the weight of the unit (please, consult the weight of the unit in the section “Anchorage for silent-blocks”).
- Foresee appropriate damping devices in all the installation so that noise and vibration transmission is avoided (refer to the “Anchorage for silent-blocks”).

  In the event of assembling directly on silent-blocks to the ground, it is recommended that a template of the unit’s footprint with the anchoring points of the silent-blocks be made.

With the help of the crane or the forklift truck, the unit will be raised to a sufficient height that the silent-blocks can be screwed into its base. The 4 silent-blocks must remain oblique and the interiors perpendicular to the unit.

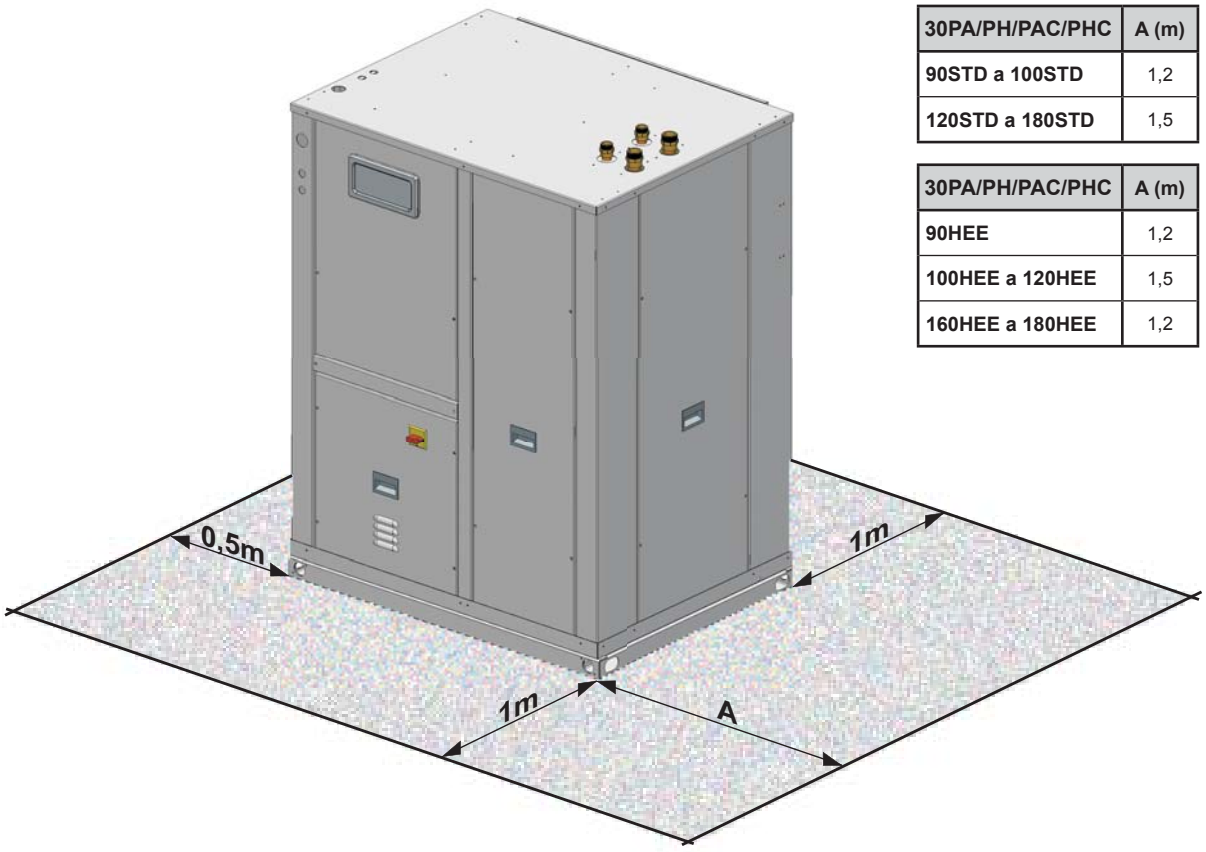
M10 metric threads have been provided for their placement in the supports indicated in the following section “Anchorage for silent-blocks”. A hex key 17 or Allen wrench 8 will be used for this operation based on the type of screw used.

This image shows how the silent-block option that can be supplied for this unit is fixed to the unit.

Since it is an unit designed to work indoors, some specific installation norms must be followed:

- Ensure that the location of the supply and return grilles does not generate air recirculation.
- Check that there are no obstructions in the air supply and return grille slats due to being tightly closed.

Minimum free space for commissioning and maintenance operations



30PA/PH/PAC/PHC	A (m)
90STD a 100STD	1,2
120STD a 180STD	1,5

30PA/PH/PAC/PHC	A (m)
90HEE	1,2
100HEE a 120HEE	1,5
160HEE a 180HEE	1,2

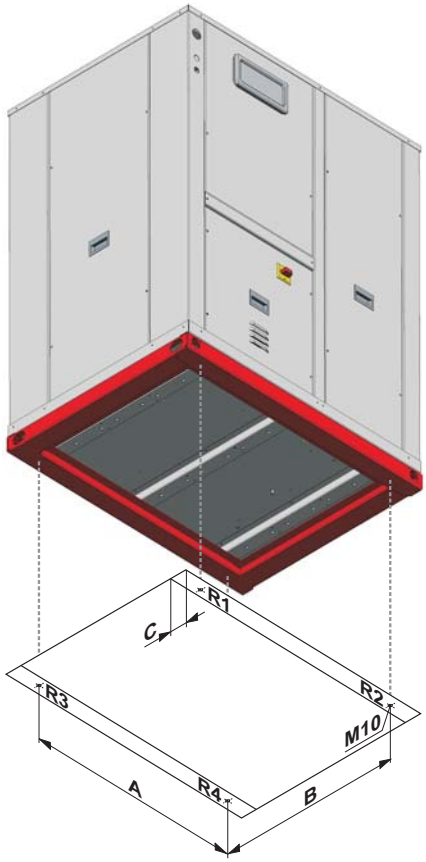
Ductable air-cooled scroll chillers and heat pumps

Anchorage for silent-blocks

30PA/ PH	Distances (mm)			Reactions in the supports (kg)				
	A	B	C	Weight in service	R1	R2	R3	R4
90STD	896	760	65	306	66	101	87	52
100STD	896	760	65	315	69	93	84	60
120STD	1166	760	65	379	89	112	101	77
160STD	1166	760	65	397	92	119	107	79
180STD	1166	760	65	396	93	119	105	79
90HEE	896	760	65	298	64	100	85	50
100HEE	1166	760	65	358	63	127	116	52
120HEE	1166	760	65	376	88	112	100	77
160HEE	1892	760	65	465	69	177	163	56
180HEE	1892	760	65	468	71	178	163	56

30PAC/ PHC	Distances (mm)			Reactions in the supports (kg)				
	A	B	C	Weight in service	R1	R2	R3	R4
90STD	896	760	65	335	81	97	86	71
100STD	896	760	65	345	82	99	90	73
120STD	1166	760	65	410	99	117	107	87
160STD	1166	760	65	428	102	124	113	90
180STD	1166	760	65	429	104	123	111	91
90HEE	896	760	65	327	77	84	87	79
100HEE	1166	760	65	390	88	109	107	86
120HEE	1166	760	65	408	100	101	104	103
160HEE	1892	760	65	497	109	130	140	118
180HEE	1892	760	65	503	110	132	142	119

Note: all the anchorings are bolt and nut type.



Sound level

These units have been designed to operate with a low sound level. In any case, in the design of the installation, it must be taken into consideration: the outdoor environment for the acoustic radiation, the type of building for the noise transmitted in the air and the solid elements for the vibration transmission.

To reduce the transmissions through solid matter to the maximum, we recommend installing damping devices between the floor or structure and the frame of the unit and flexible connections in the hydraulic tubes.

If necessary, an acoustic technician must commission a study.

Unit sound power level

Measurement conditions: ducted discharge and return. For nominal operating conditions EN 14511 – COOLING and HEATING modes.

Acoustic power reference: 10E-12 W, tolerance of ±2 dB (partial charge of ±4 dB).

30PA/PH/ PAC/PHC	STD version				
	90STD	100STD	120STD	160STD	180STD
63 Hz dB(lin)	73,8	74,2	74,4	74,4	74,4
125 Hz dB(lin)	73,2	73,6	73,8	73,8	73,8
250 Hz dB(lin)	70,2	70,6	70,8	70,8	70,8
500 Hz dB(lin)	65,3	65,7	65,9	65,9	65,9
1000 Hz dB(lin)	63,0	63,4	63,6	63,6	63,6
2000 Hz dB(lin)	62,2	62,6	62,8	62,8	62,8
4000 Hz dB(lin)	58,2	58,6	58,8	58,8	58,8
8000 Hz dB(lin)	49,3	49,7	49,9	49,9	49,9
Total dB(A)	69,4	69,8	70,0	70,0	70,0

30PA/PH/ PAC/PHC	HEE version				
	90HEE	100HEE	120HEE	160HEE	180HEE
63 Hz dB(lin)	71,1	73	73,1	73,1	73,1
125 Hz dB(lin)	70,9	72,8	72,9	72,9	72,9
250 Hz dB(lin)	67,5	69,4	69,5	69,5	69,5
500 Hz dB(lin)	65,4	67,3	67,4	67,4	67,4
1000 Hz dB(lin)	62,4	64,3	64,4	64,4	64,4
2000 Hz dB(lin)	59,5	61,3	61,5	61,5	61,4
4000 Hz dB(lin)	56,5	58,4	58,5	58,5	58,5
8000 Hz dB(lin)	49,4	51,3	51,4	51,4	51,4
Total dB(A)	68,0	69,9	70,0	70,0	70,0

Note: The unit has acoustic insulating cover for compressor (Low Noise version).

Sound pressure level

Measurement conditions: in a clear field, measured at a distance of 10 metres, directivity 2 and at 1,5 metres from the ground.

30PA/PH/ PAC/PHC	STD version				
	90STD	100STD	120STD	160STD	180STD
Total dB(A)	38,0	38,4	38,4	38,4	38,4

30PA/PH/ PAC/PHC	HEE version				
	90HEE	100HEE	120HEE	160HEE	180HEE
Total dB(A)	36,6	38,3	38,4	38,4	38,4

Note: The sound pressure level depends on the installation conditions and, as such, is only indicated as a guide. Values obtained according to standard ISO 3744.

9. Checking before commissioning

NOTE: Under no circumstance should the unit be started without having read the brochure completely.

Electrical connections

■ Installation norms

In order to establish the unit's electric power supply (cable inlet, calculation of the lead section, protections etc.), refer to:

- The information supplied in this document (table of technical characteristics).
- Data plate.
- The wiring diagram and the legend supplied with the unit.
- The electronic control brochure which is supplied with the unit.
- The regulations and norms in force which regulate the installation of air-conditioning units and electric receivers.

The electric power supply of the unit must be sized in accordance with the maximum power input by the unit taking into account all the options it features (if necessary, refer to the technical brochure).

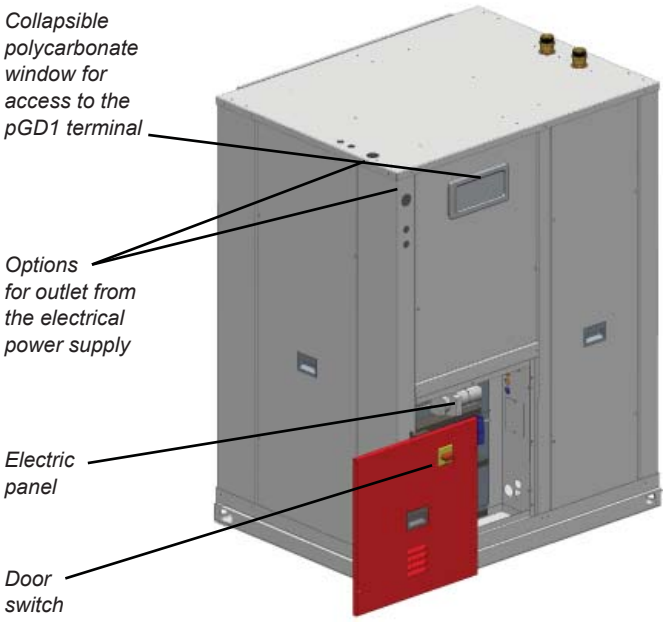
Verify that electrical power corresponds to the one on the data plate and that the voltage remains constant.

Check that the electrical connections are correct and tight (an electrical diagram is included with each unit, along with its legend).

Note: All connections in the site are the responsibility of the installer. These connections are always made as per the current regulation.

To prevent electrical shocks, make all electrical connections before energizing the unit. Check that the automatic switch is closed. Omitting this can cause personal damage. Make the ground connection before any other electrical connection.

The installer must fix line protection elements according to the effective legislation.



■ 30PA/PH electronic control

The **30PA/PH control** l is basically comprised of a µPC SMALL control board, a pGD1 graphic terminal, a TCO user terminal (optional for remote control) and sensors.

Main functions:

- Control in COOLING / HEATING modes.
- Selecction of inlet water temperature setpoints for COOLING / HEATING modes.
- Permanent control and optimization of the operating parameters
- Safety management.
- Timing of the compressor.
- Defrosting management (heat pumps).
- Control of condensation and evaporation pressures.
- Control of outdoor electronic plug-fan (HEE version).
- Control of the circulation pump.
- Regulation of the water outlet temperature.
- Compensation of the setpoint based on the outdoor temperature.
- Timer and weekly programming.
- Failure diagnosis and main alarm.

pGD1 terminal

This graphic terminal, installed on the electric panel of the machine, allows:

- The initial programming of the unit
- Modification of operating parameters.
- Unit ON / OFF.
- Selection of the operating mode.
- Setting of setpoints.
- On-screen display of controlled variables and sensor values measured.
- On-screen display of active alarms and historical record of alarms.

TCO user terminal (optional for remote control):

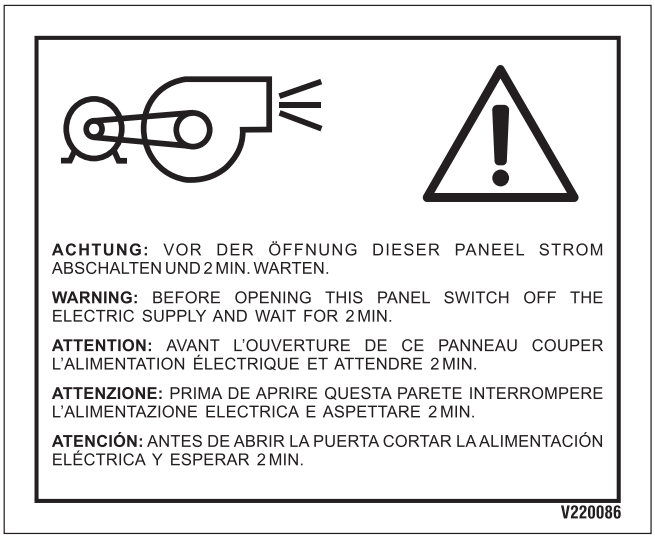
The TCO user terminal, for remote control, allows:

- Modification of some operating parameters.
- Unit ON / OFF.
- Selection of the operating mode and setting of setpoints.
- On-screen display some controlled variables and probe values.
- On-screen display of alarms codes.

Checks in the centrifugal fan:

STD version

- Before commissioning, check the blade rotation direction and that the axis turns without strokes nor vibrations
- Once running, check the operation conditions: pressures, flows and consumptions.
- The coupling of characteristic curves of the fan and the room is very important, so that the flows and pressures provided to the duct network are as required.

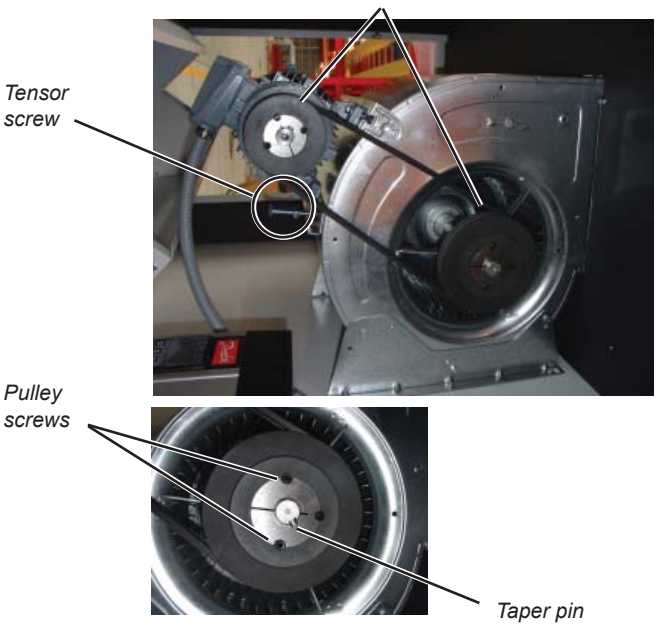


Pulley and belt calibration

Centrifugal motorfans are coupled with pulleys and belts. In this type of fans, the following must be taken into consideration:

- The pulleys must be on the same plane, so it is important to check them with the help of a ruler or a laser aligner.

Pulleys must stay on the same plane



- In case they are not aligned, remove the pulley screws, remove the pulley and, after removing the taper pin, it can be slid over the axle (this action can be performed both in the motor as well as in the fan).
- After fixing the pulleys on the same plane, the belt tension is made by tightening the tensor screw.
- The belt tension must be checked after 24 hours of motor operation.

Attention: Before performing these operations, it is necessary to verify that the unit is disconnected from mains.

Checks on the plug-fan:

HEE version

- Before commissioning, check the blade rotation direction and that the axis turns without strokes nor vibrations
- Once running, check the operation conditions: pressures, flows and consumptions.
- The coupling of characteristic curves of the fan and the room is very important, so that the flows and pressures provided to the duct network are as required.

Ductable air-cooled scroll chillers and heat pumps

Air ducts connections

For units designed for installation indoors with ducted supply and return in the outdoor circuit, it is advisable to have the following recommendations:

- Curves in the fan discharge supply must be avoided. It is recommendable to have a straight section of duct measuring approximately 1 metre. If it is not possible, they must be as smooth as possible, using indoor deflectors when the duct is of large dimensions.
- When making the ducts, direction sharp changes must be avoided since they can generate occasional pressure drops, which affect the available pressure and the flow. The location of discharge and aspiration grilles must be studied carefully to avoid the air recirculation and the transmission and generation of noises to the interior.
- No matter the type of ducts type to use, these must be insulated and must not be composed of materials that propagate fire nor expel toxic gases in the event of a fire. The internal surfaces must be smooth and should not pollute the air that circulates within them. In any case, the effective legislation about this issue must be respected.
- Flexible connections must be made between the ducts and the unit that avoid the noise and vibration transmission.

■ Flexible connections

Optionally, these units can be sent with flexible connections for supply and return air.

Supply ducts

STD version	Without damper ①					
	M00 dimensions (mm)			M01 dimensions (mm)		
	A	B	C	A	B	C
90STD / 100STD	859	407	132	552	430	152
120STD to 180STD	1139	481	132	652	552	152

STD version	With damper ①					
	M00 dimensions (mm)			M01 dimensions (mm)		
	A	B	C	A	B	C
90STD / 100STD	859	407	132	513	391	132
120STD to 180STD	1139	481	132	613	513	132

HEE version	M00 dimensions (mm)			M01 dimensions (mm)		
	A	B	C	A	B	C
90HEE	859	407	132	633	589	132
100HEE / 120HEE	1139	481	132	817	639	132
160HEE / 180HEE	1854	407	132	1619	590	132

① Damper for condensation pressure control (optional): add the height of the damper to the flexible duct.

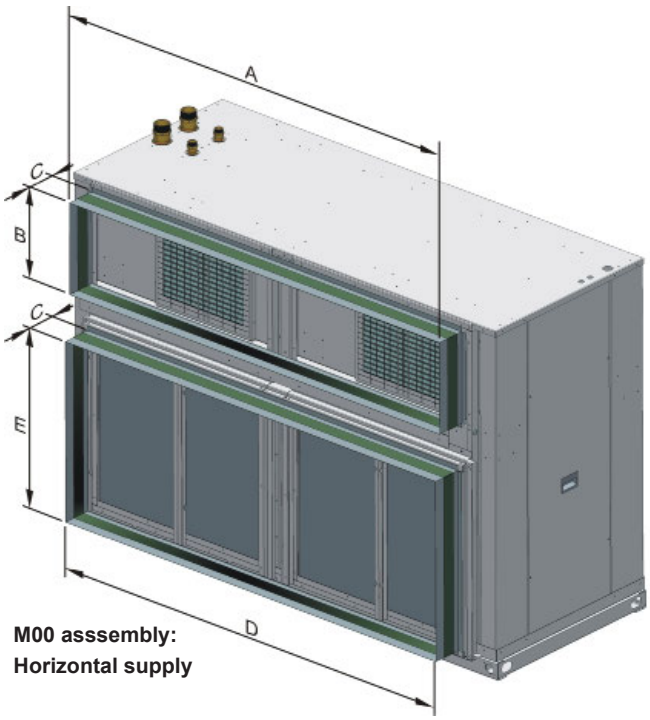
In case of asking together for flexible connections and damper for condensation pressure control (optional for version STD), discharge flexible ducts are attached to the above mentioned damper.

If it is removed the damper for installation on duct, it is necessary to maintain the frame for reconnecting the flexible connections.

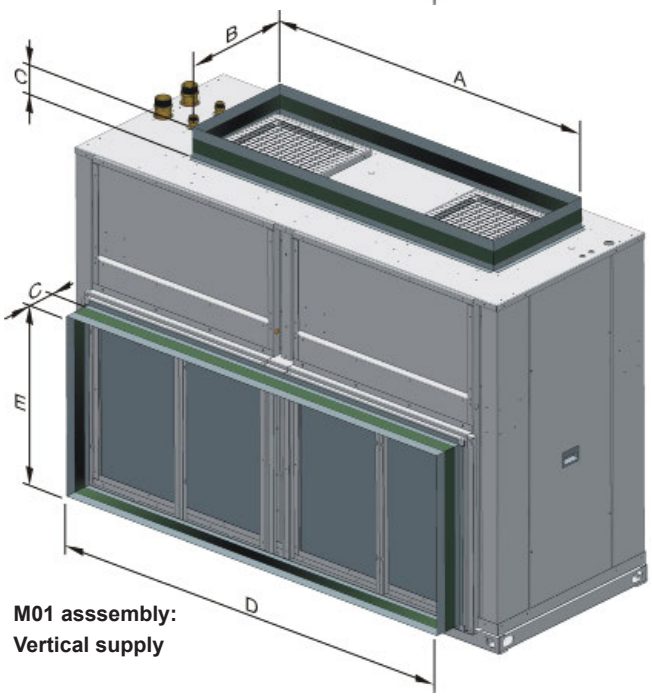
Return ducts

STD version	Without filters (mm)			With filters (mm)		
	C	D	E	C	D	E
90STD / 100STD	132	903	800	109	903	800
120STD to 180STD	132	1183	950	109	1183	950

HEE version	Without filters (mm)			With filters (mm)		
	C	D	E	C	D	E
90HEE	132	903	800	109	903	800
100HEE / 120HEE	132	1183	950	109	1183	950
160HEE / 180HEE	132	1897	800	109	1897	800



M00 asssembly:
Horizontal supply



M01 asssembly:
Vertical supply

Hydraulic connections

■ Installation water volume

Minimum installation volume

The electronic control for these units incorporates an auto-adaptive control for the compressor operating time based on the time set for anti-short-cycle.

This control reduces the number of times the compressor is started up and permanently adjusts the system's thermal inertia, favouring the reduction of the minimum volume of water in the installation. The size of the buffer tank can also be decreased since the unit will be stopped for less time.

30PA/PH/ PAC/PHC	Minimum volume (l)	Minimum flow (m^3/h)	Maximum flow (m^3/h)
90STD	101	2,2	6,2
100STD	120	2,7	7,4
120STD	143	3,1	8,8
160STD	187	4,1	11,3
180STD	204	4,3	12,7
90HEE	107	2,1	6,7
100HEE	132	2,9	8,1
120HEE	152	3,3	9,5
160HEE	189	3,7	11,7
180HEE	210	4,0	12,8

The calculation of the minimum water volume has been done for nominal EUROVENT conditions, only in cooling mode. This value is applicable for the majority of refrigeration applications (group with fan-coil units).

Note: The buffer tank is indispensable in installations that operate with a reduced volume of water (group with an air handling unit) or for industrial processes. For applications with a heat pump, it is recommended that the buffer tank be used in order to maintain a stable temperature during the defrosting cycles.

Maximum installation volume

The water capacity for the installation obtained from this equation corresponds to the maximum that the installation allows based on the expansion vessel assembled.

$$V_{INST} = \frac{V_{vessel} \cdot (P_f - P_i)}{(V_2 - V_1) \cdot P_f}$$

Where:

V_{inst} Installation volume (l)

V_{inst} Expansion vessel volume (l)

V_1 Initial volume of 1kg of water (at water temperature with the machine stopped)

V_2 Final volume of 1kg of water (at water temp. with the machine at normal speed)

P_f Final network pressure (safety valve pressure in bars + 1)

P_i Initial network pressure (absolute filling pressure of the installation in bars)

Note: If the hydraulic circuit has a buffer tank, its volume must be taken into account for this calculation.

- **Volume occupied by 1kg of water at different temperatures:**

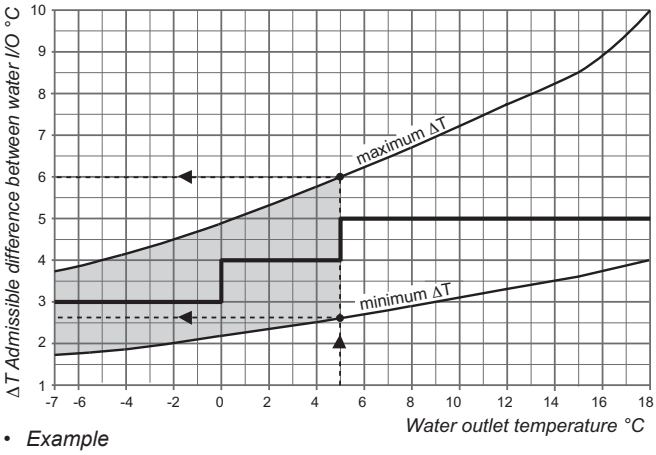
Temperature (ºC)	Volume (l)	Temperature (ºC)	Volume (l)
0	1,00013	50	1,0121
4	1,00000	60	1,0171
10	1,00027	70	1,0227
20	1,00177	80	1,0290
30	1,00435	90	1,0359
40	1,00782	100	1,0434

■ Evaporator operating limits

The curves represent the minimum and maximum admissible temperature increases based on the outlet (discharge) temperature, for both pure water and glycol water.

For temperature changes that are not listed between the curves, please consult.

The minimum outlet temperature for the unit will be +5ºC with pure water and -7ºC with glycol water.



- *Example*

  For an outlet water temperature of +5ºC:

  Minimum Δtemp.: 2,6ºC → T. condition 7,6ºC / 5ºC

  Maximum Δtemp.: 6,0ºC → T. condition 11ºC / 5ºC

■ Anti-freeze protection with glycol water

If a pure product is used for dilution in order to protect the hydraulic circuit, the following instructions must be followed:

- Do not introduce any of the pure anti-freezing product separately and then the water in the installation.
- Always prepare the water mixture + anti-freeze + corrosion inhibitor at the correct dosage prior to introducing it into the installation.

Procedure:

- At minimum, a complete rinsing of the hydraulic installation must be performed.
- After the final rinsing, the installation must be completely drained.
- Introduce the water/anti-freeze/inhibitor mixture and increase the pressure with a hydraulic pump.

  We recommend using a filling device with a non-return valve for compliance with the domestic anti-contamination standards. The device must never in any case be connected to the city network if the additives used in the hydraulic circuit are not approved by the Ministry of Sanitation in the country of installation.
- Completely purge the installation.
- Circulate the mixture throughout the entire installation for a minimum of 2 hours prior to starting up the unit.
- Check the final dosage obtained with a densimeter or refractometer.

- Check the pH obtained with pH paper strips or a pH metre.
- Place a label in a visible place that indicates:
  * the presence of anti-freeze in the installation,
  * the name of the product and the supplier,
  * the dosage and the pH as of the time the unit is started up.

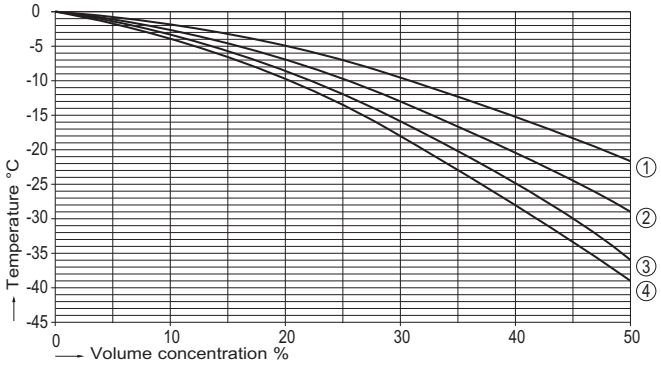
If more amount is needed, it must be exactly the same mixture as the product initially used.

The following table and curves feature the minimum glycol percentages required for the installation in accordance with the freezing point.

The pumps that incorporate the 30PAC/PHC units can work with any concentration of mono-ethylene glycol, albeit with a reduction in the available pressure due to the variation of water flow. The pump must be changed for mono-propylene glycol (upon request).

Warning: the glycol concentration must keep the fluid at least 6°C below the outlet water temperature foreseen in the evaporator in order to allow a correct adjustment of the evaporator's minimum pressure regulation. If the concentration is below the necessary amount, there is a risk of freezing. On the other hand, any excess of concentration entails a decrease in performance.

Minimum freezing and usage temperature graphs



Minimum usage temperature:

① - Mono-propylene glycol

② - Mono-ethylene glycol

Freezing temperature:

③ - Mono-propylene glycol

④ - Mono-ethylene glycol

Required glycol concentration

Concentration %	0	10	20	30	40	50
Mono-ethylene glycol (MEG) ºC	0	-3	-7	-13	-20	-29
Mono-propylene glycol (MPEG) ºC	0	-2	-5	-10	-15	-21

Note: The values are offered as a guide according to the standard characteristics of the MEG. These may vary based on the MEG manufacturer, which is why it is necessary to consult the manufacturer data in order to guarantee protection up to the desired temperature.

■ Corrosion behaviour

The units' hydraulic circuits are made of copper pipes. The exchanger plates are made of AISI-316 stainless steel, and the material used for soldering the plates is copper.

The following table indicates corrosion behaviour for copper and the AISI-316 stainless steel with regard to water with different compositions. Values outside these ranges can cause corrosion problems in the hydraulic circuit and in particular in the plate exchangers.

It is recommended that the water filling the hydraulic circuits be filtered and treated, if necessary.

Note: For open-circuit installations, if it is not possible to maintain the water conditions within the values indicated in the previous table, it will be necessary to install an exchanger that separates the unit's circuit from the water circuit to be treated by using materials compatible with these characteristics, whether stainless steel or titanium.

Water content	Concentration (mg/l)	AISI 316	Copper
Organic substances		+	0
Electrical conductivity	< 500 µS/cm	+	+
	> 500 µS/cm	+	-
NH_3	< 2	+	+
	2 - 20	+	0
	> 20	+	-
Chlorides *	< 300	+	+
	> 300	0	+
Sulphites, chloride-free	< 5	0	+
	> 5	0/-	0
Iron in solution	< 10	+	+
	> 10	+	0
Free carbonic acid	< 20	+	0
	20 - 50	+	-
	50	+	-
Manganese in solution	< 1	+	+
	> 1	+	0
pH value	< 6	0	+
	6 - 9	0/+	+
	> 9	+	0
Oxygen	< 2	+	+
	> 2	+	+
Sulphates	< 70	+	+
	70 - 300	+	0
	> 300	-	-

* *Max. 60ºC*

\+ *Good resistance under normal conditions.*

0 There may be corrosion problems, especially if other factors intervene.

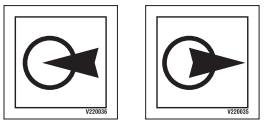
- Not advisable.

Ductable air-cooled scroll chillers and heat pumps

■ Installation hydraulic diagram

The design of the hydraulic circuit must observe the operating conditions (flows - pressure drops).

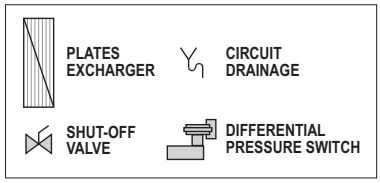
- The direction of water circulation must be observed as indicated on the stickers on the unit.

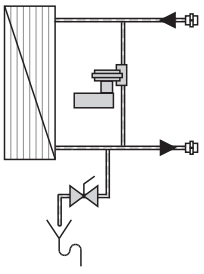


- The diameters of the unit hydraulic connections can be referred in the tables of “Technical characteristic” .
- It is advisable to use flexible hoses for connecting the piping to the unit in order to reduce the transmission of vibrations to the building to the greatest degree. It is mandatory to assemble hoses if the unit is installed over shock absorbers. Optionally, a flexible hydraulic connections kit can be supplied.
- The pipe layouts must be set out with the lowest possible number of bends to minimise pressure drops. The pipes must be correctly supported to prevent exerting excessive force on the unit connections.
- Before insulating the tubes and charging the system perform a preliminary check to verify that there are no drops in the installation.
- The pipes must be carefully insulated to prevent leaks and condensation. Ensure that the material used is steam barrier type. Otherwise, cover the insulation using appropriate protection.
- The water must be analysed and the circuit must be set out according to the results. If necessary, an expert in water treatment must be consulted (see section on corrosion behaviour).
- **In installations to open circuits, if it is not possible to maintain the water conditions within the values indicated in the corrosion behaviour table featured, it will be necessary to install an exchanger that separates the unit circuit from the circuit of the water circuit to be dealt with by using materials compatible with these characteristics, whether stainless steel or titanium.**
- Plan the anti-freeze protection for the installation when the outdoor temperature is low: water with anti-freeze, thermal insulation of the hydraulic circuit, electrical heaters in the hydraulic circuit, draining from the installation when the unit does not work, etc.

• 30PA/PH version

Schematic diagram of the hydraulic circuit





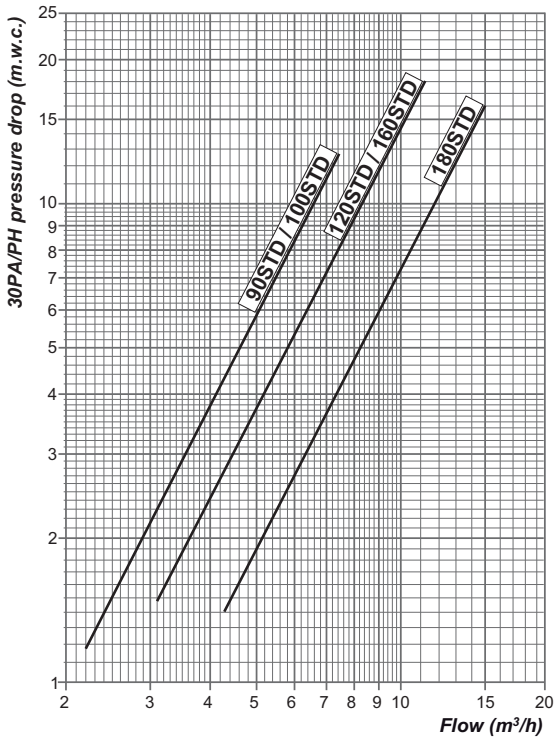
In this case the installer must set up the complete hydraulic circuit with all the components: thermal buffer tank, motorised pump group, expansion vessel, safety, regulation, cut-off and draining valves, air bleeder valve, etc.

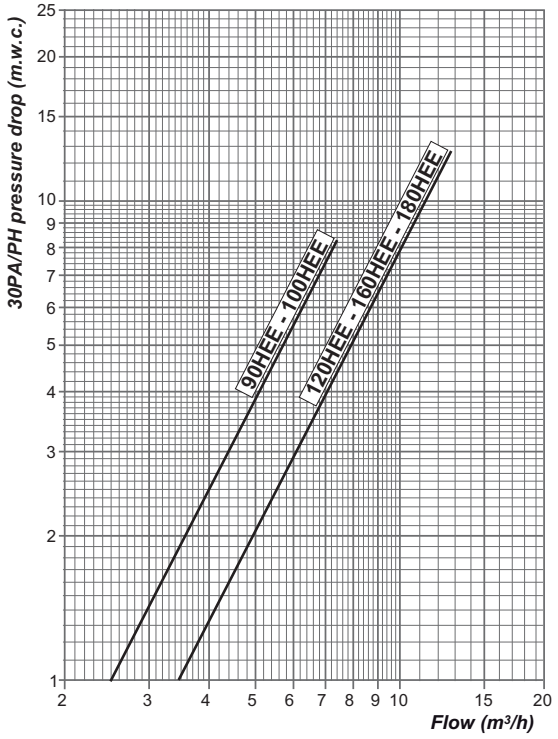
It is also necessary to install a filter in the hydraulic power supply to the unit in order to prevent clogging of the plate exchanger. Non-compliance with this recommendation can cause reduced flow which can lead to freezing and breaking of the exchanger.

Both at the inlet and the outlet of the unit, install thermal pressure gauges which enable supervising the operation of the installation, or at least plan the installation of these.

Note: optionally, a kit can be supplied with :

- A stainless steel mesh filter (500 microns).
- Cut-off and water regulation valves.
- Flexible hydraulic connections of 500 mm.

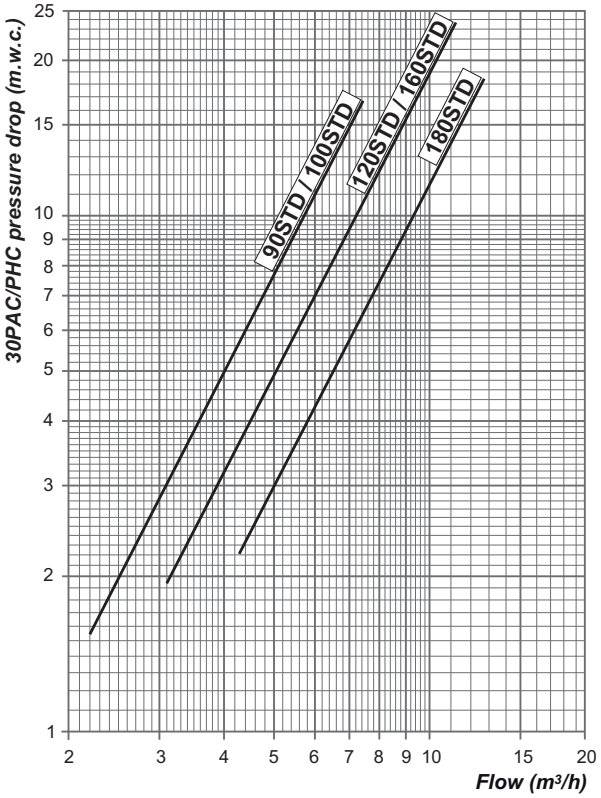


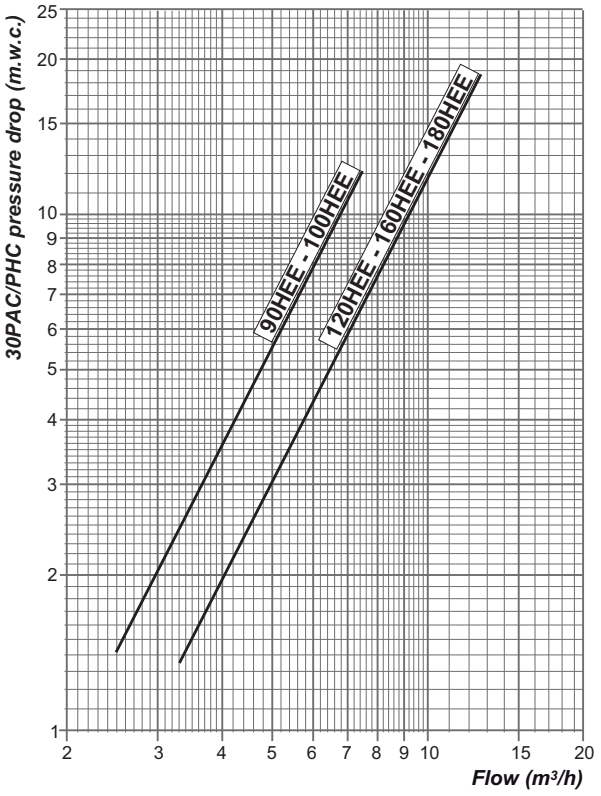


Ductable air-cooled scroll chillers and heat pumps

- **30PAC/PHC version (circulation pump included)**

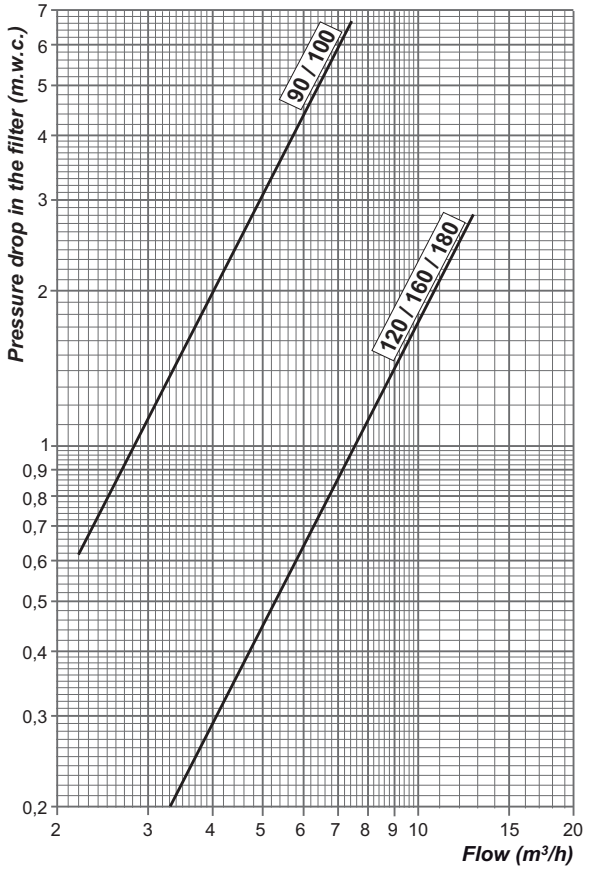
These units include a motorised pump group made up of: centrifugal circulation pump, closed expansion vessel, safety valve with a tare value of 4 bar, draining valve, and automatic air bleeder valve (model 160HEE and 180HEE).



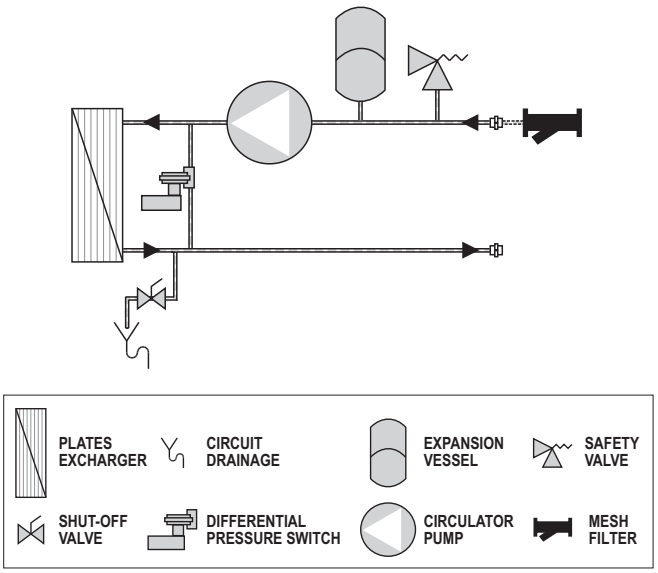


A kit with a stainless steel mesh filter (500 microns) is also supplied for installation by the installer. **It is also necessary to install this filter in the hydraulic power supply to the unit in order to prevent clogging of the plate exchanger.**

The following graph represents the pressure drop for that filter:



Schematic diagram of the hydraulic circuit



Ductable air-cooled scroll chillers and heat pumps

The installer must prepare the other accessories for completion of the hydraulic circuit: thermal buffer tank, air bleeder valve (except models 160HEE and 180HEE), regulation, cut-off and draining valves, etc.

Both at the inlet and the outlet of the unit, install thermal pressure gauges which enable supervising the operation of the installation, or at least plan the installation of these.

Note: optionally, a kit can be supplied with :

- Cut-off and water regulation valves.
- Flexible hydraulic connections of 500 mm.

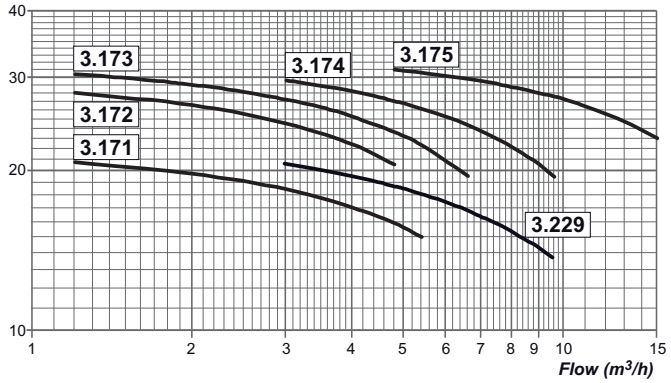
Circulation pumps available for 30PAC/PHC

30PAC/PHC		Versión STD				
		90STD	100STD	120STD	160STD	180STD
Number of pump	Standard	3.171	3.172	3.172	3.173	3.174
	High-pressure (opt.)	3.173	3.173	3.174	3.174	3.175
	Low-pressure (opt.)	--	3.171	3.171	3.171	3.229

30PAC/PHC		Versión HEE				
		90HEE	100HEE	120HEE	160HEE	180HEE
Number of pump	Standard	3.171	3.172	3.172	3.173	3.174
	High-pressure (opt.)	3.173	3.173	3.174	3.174	3.175
	Low-pressure (opt.)	--	3.171	3.171	--	3.229

Note: These pumps can operate with glycol water (mono-ethylene glycol), although with a reduction of the available pressure (due to the flow variation with glycol water). The correction coefficients for operation with glycol water can be referred to in the technical brochure for these units (No. 10056).

Available pressure (m.w.c.)



Number of pump	3.171	3.172	3.173	3.174	3.175	3.229
Motor output (kW)	0,37	0,55	0,75	0,9	1,5	0,55
Maximum abs. current (A)	1,4	2,0	2,3	2,7	4,0	2,0
Minimum water flow (m^3/h)	1,2	1,2	1,2	3,0	4,8	3,0
Maximum pressure (m.w.c.)	20,7	28,0	30,3	29,5	31,6	20,6
Maximum water flow (m^3/h)	5,4	4,8	6,6	9,6	15,0	9,6
Minimum pressure (m.w.c.)	15,0	20,5	19,5	19,5	23,0	13,7

Condensate drain connection

In 30PA/PH/PAC/PHC units, the condensate drain pan includes a 3/4" M bronze, bleeding trunk for draining condensates.

Attention: With low outdoor temperatures, the electrical heater-based anti-freeze protection option for the pan is recommended. Mandatory when outdoor temperatures are below 3°C.

Siphon installation norms

All water drain tubes must be provided with a siphon to avoid bad smell and water spills.

- ***Pan in overpressure:***

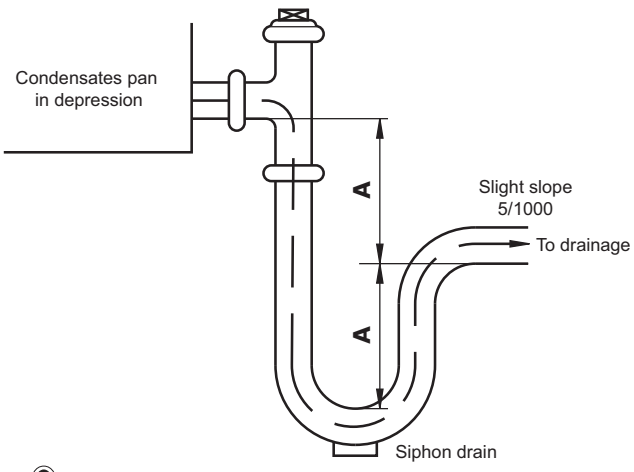
  It is installed to avoid the access through the drain piping of bad smells.

- ***Pan in underpressure:***

  Water must be suctioned from the pan because of the depression with respect to the motorfan assembly.

  Perform the siphon assembly as per the scheme of the attached starting diagram:

  - For the correct siphon design, the "A" height must be at least twice that of the underpressure (mm.w.c) where the condensate pan is placed.
  - Check that the condensate outlet is not clogged.
  - The drain piping must be slightly sloped to ease circulation towards the drain.
  - The original diameter of the piping must be respected. No reduction can be made.
  - With outdoor temperatures which are lower than 0°C, the necessary precautions must be taken to prevent the water in the drain ducts from freezing.



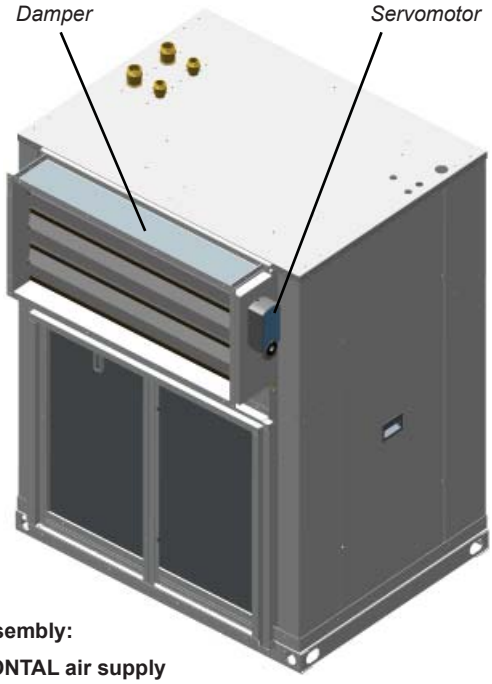
Check the watertightness of the connection.

10. Options

Condensation pressure control

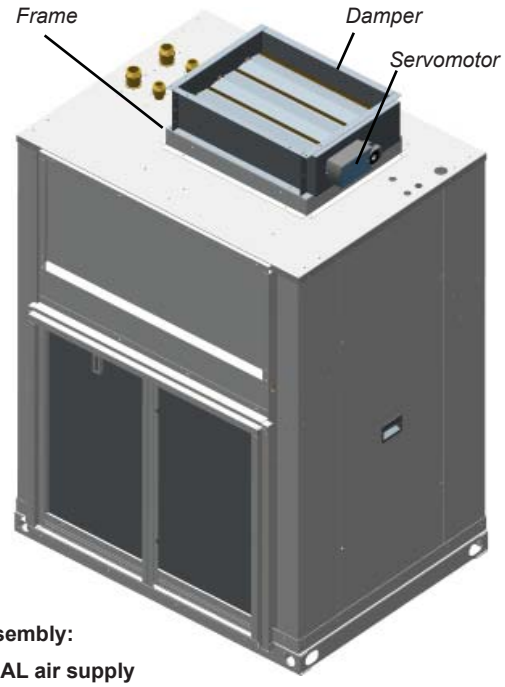
In units with the **STD version** that work in cooling with an outdoor temperature lower than 12ºC, the condensation pressure control allowing an "all seasons" operation (up to -15ºC) is mandatory.

In units with centrifugal fan a check is performed per motorized damper in the fan supply. A servomotor opens or closes the damper depending on the proportional signal 0-10V received from the electronic control system (during the operation of the fan).



M00 assembly:

HORIZONTAL air supply



M01 assembly:

VERTICAL air supply

30PA/PH/PAC/PHC	Assembly	No. of dampers	Servos per damper	Damper width
90STD to 180STD	M00	1	1	150
	M01	1	1	150 (*)

(*) The damper incorporates a frame (60 mm width) to fit the damper to the fan supply.

The motorized damper is mounted on the air supply panel of the machine. This in order to allow the operation test in the factory, with all the necesary presetting during the test of the unit at the end of the production line.

However, in accordance with the code of practice as regards aeraulic installation, we recommend a remote installation of the damper, at a distance approximately equal to 3xDe (equivalent diamenter) of the supply air duct diameter.

This stipulation is the only one allowing a best operation of the motorized damper with a homogeneous flow of the air.

In order to remove the damper it is necessary to unscrew from the unit and disconnect the electrical suply of the servomotor.

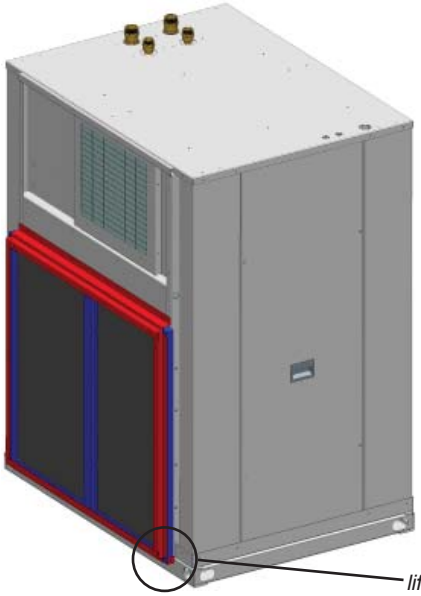
In case of asking together for flexible connections and damper for condensation pressure control (optional for version STD), supply flexible duct is attached to the above mentioned damper. If it is removed the damper for installation on duct, it is necessary to maintain the frame for reconnecting the flexible connections. Without flexible connections this frame may be removed.

Air filter

These units can include a frame with gravimetric filters in the air return to the unit. The frame is assembled on a profile made of moveable steel metal which can be removed.

The filters frame is removable, and upon request, it is possible to supply the frame independently with the 30PA/PH/PAC/PHC unit, to be joined on site.

The frame dimensions can be referred to in the technical brochure for these units (No. 10056).



Frame width = 53 mm

Filters are moved by lifting the tab and dragging

Cooling recovery circuit (optional)

The system consists in a hot water supplying by an heat recovery system on the compressor(s) discharge gas, on an auxiliary desuperheater exchanger.

On an heat pump model, the optional desuperheater can be used whatever the running mode, COOLING or HEATING.

This optional equipment is only available on request, and factory mounted.

■ Operating mode

The heat recovery is possible only if the unit is running, on COOLING mode or on HEAT PUMP mode.

For the same cooling or heating capacity, the desuperheater system allows a free heating of hot water with a reduction of the total input power of the unit.

■ Principle and precaution of hydraulic connection

In order to allow the unit to start up and to run under good conditions, the circuit must be as short as possible, and the water flow of the desuperheater must start slowly to normal operating condition, with a water flow equal to 10% of its standard value, and must be calculated for a hot water inlet temperature of +50°C.

Thus, it is recommended to have a hydraulic diagram making it possible to obtain very quickly a hot water at the inlet of the desuperheater (3 ways valve + controller + temperature sensor on the exchanger water inlet).

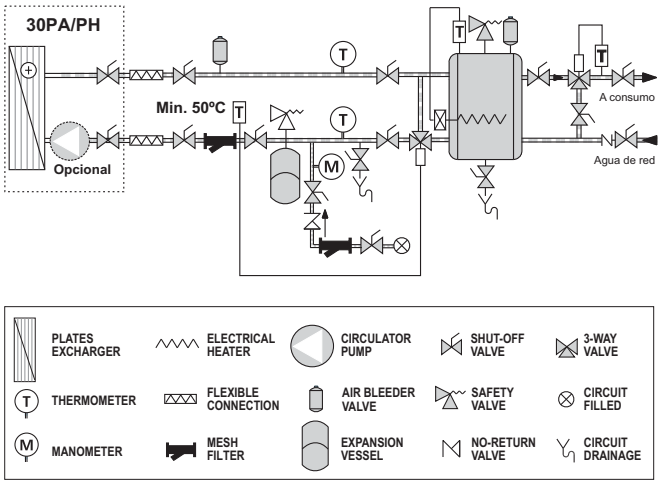
The controller set point must be adjusted to +50°C minimum.

The recovery circuit must be done in accordance with the standards in force and plan all of the necessary elements in a closed circuit: circulation pump (optionally supplied), expansion vessel, safety valve, mesh filter, filler, drainer, bleeders, thermometers, pressure gauges and cut-off and insulation valves.

The circulation pump can only work in a closed circuit. The command is performed from a thermostat located on the unit.

Attention: a detailed attention must carried with the selection of the expansion tank, because the recovery water circuit can reach the temperature of 120°C in the event of stopping of the circulator or non hot water consumption.

- Install heating elements on all pipes that could be exposed to freezing temperatures.



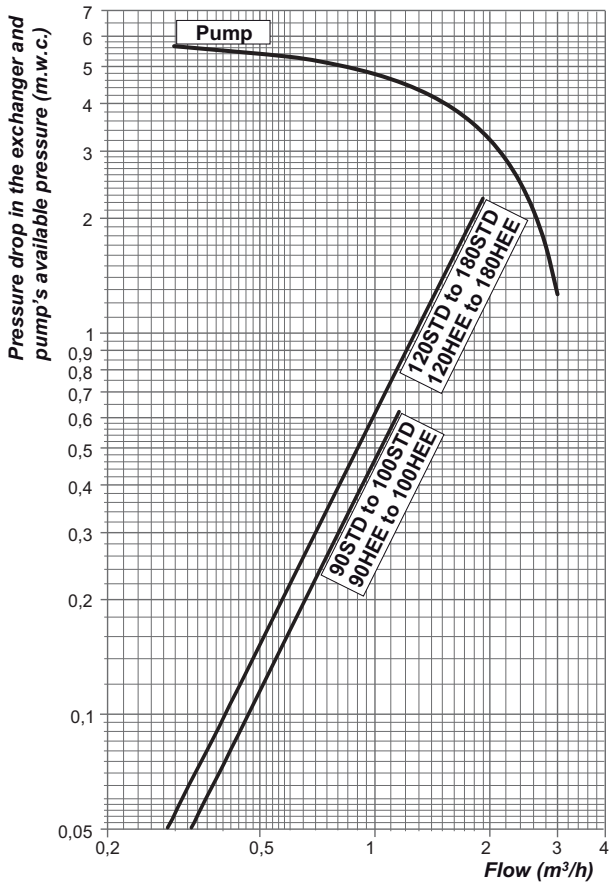
■ Technical characteristics of the recovery circuit

30PA/PH/PAC/PHC		STD version					HEE version				
		90STD	100STD	120STD	160STD	180STD	90HEE	100HEE	120HEE	160HEE	180HEE
Recovery capacity ① (kW)		4,4	5,2	6,2	8,1	8,9	4,5	5,2	6,3	7,7	8,8
Nominal water flow (m^3/h)		0,38	0,45	0,53	0,70	0,76	0,39	0,44	0,54	0,67	0,76
Pressure drop (m.w.c.)		0,06	0,09	0,17	0,30	0,36	0,07	0,09	0,18	0,27	0,35
Cooling capacity (kW)		17,8	21,3	25,3	33,0	36,2	18,5	21,1	25,6	31,6	35,8
Power input (kW)		6,8	7,9	8,6	10,8	12,7	6,2	7,1	7,8	10,0	11,9
Hydraulic connections	Type	Threaded					Threaded				
	Diameter	1" M					1" M				
Pump (optional)	Type	Humid rotor					Humid rotor				
	Number	1					1				
	Motor output (kW)	0,05					0,05				
	Max. absorbed current (A)	0,4					0,4				
	Avail. pressure (m.w.c.) (max. pump speed) ②	5,54	5,45	5,35	5,15	5,07	5,52	5,46	5,34	5,19	5,07
Additional weight	Recovery circuit (kg)	5,3	5,3	6,8	6,8	6,8	5,3	5,3	6,8	6,8	6,8
	Pump (optional) (kg)	3,2					3,2				

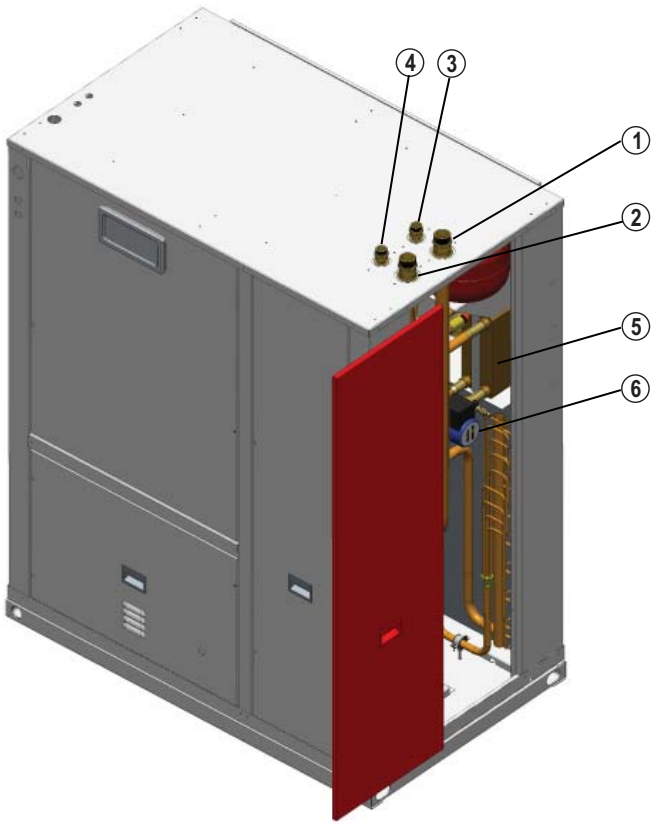
① Capacity recovered by the desuperheater circuit for nominal conditions and recovery water at 50/60ºC.

② The change of speed of the pump is made by a button that changes color according to the selected speed (blue: low; green: medium; yellow: high).

■ Pressure drop of the recovery circuit and pump's available pressure



■ Hydraulic connections of the recovery circuit



LEGEND	
①	Water inlet to the indoor circuit
②	Water outlet from the indoor circuit
③	Water outlet from the recovery circuit
④	Water inlet to the recovery circuit
⑤	Plate exchanger
⑥	Circulation pump (optional)

11. Safety elements

Low pressure pressostat

Connected to the compressor suction, it will stop its operation when the pressure at that point goes down below the tare value (caused by obstructions in the circuit, excessive dirt in the filters, fan stop or ice formation in the evaporator). It disconnects at 2 bar and it is automatically reactivated.

High pressure pressostat

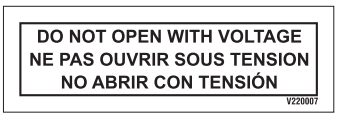
Connected to the compressor discharge, it will stop its operation when the pressure at that point reaches the setpoint. Disconnects at 42 bar and is reactivated automatically.

Magnetothermal protection switches line

They are located at the beginning of the power lines for the compressor and motor fan to protect them.

Main door switch

By using a mechanical device, it impedes access to the electric panel when the unit is with voltage.



Automatic switch in the control circuit

Magnetothermal switch that protects the operation circuit against continuous surges as well as against high currents of short duration (short circuits).

Water circulation pump control

For units that include a circulation pump, the electronic control times its disconnection after the unit is disconnected.

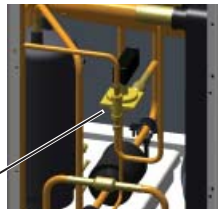
The electronic control also activates a safety device in the event of pump failure which detains the operation of the unit.

Water safety valve

30PAC/PHC units include a safety valve with a tare value of 4 bar (see hydraulic diagrams) in the hydraulic circuit.

Water circulation control

A differential pressure switch detains the operation of the unit when it does not detect water circulation.



Differential pressure switch

Water anti-freeze protection

This safety device is built into the electronic control. This is activated in COOLING mode when the water outlet temperature is lower than the set value. This causes the stop of the outdoor fan and the compressor.

Note: For operation with glycol water: consult.

Refrigerant anti-freeze protection

This safety device is built into the units' electronic control. It is activated when, working in COOLING mode, the indoor refrigerant temperature is lower than the setpoint value. This causes the stop of the outdoor fan and the compressor.

Anti-freeze protection with heaters (optional)

Anti-freeze protection with flexible electrical heaters around the pipe lines of the hydraulic circuit to avoid their freezing. This optional is recommended with negative temperatures.

Defrost control

This control's mission is to eliminate the ice that might possible form on the outdoor coil when the unit is working in HEAT CYCLE.

The control runs a defrost cycle when, after the fixed time has elapsed for the compressor working, the temperature measured at the defrost probe is below the one set for its beginning.

In the defrost operation, the outdoor fan is stopped and the cycle inversion valve triggers the operation in cooling MODE. Next the outdoor fan may be connected.

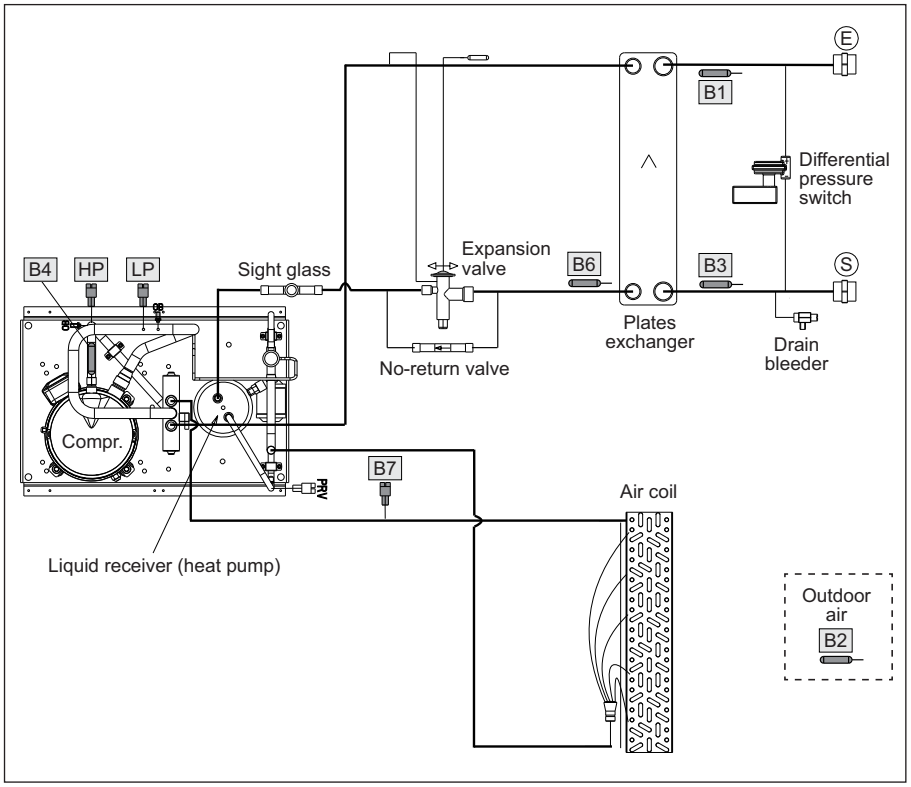
Safeties at the compressor

The scroll type compressor that these units as standard have the following safeties:

- Non-return valve built into the compressor.
- Thermal protection in the compressor, which stops the operation of the motor when there is excessive heating.
- Protection of the compressor discharge temperature through a klixon.

Location of the control and safety elements

30PA/PH control		
Device	**Adjustment**	**Symbol**
Inlet water exchanger probe	30PA/PH controller	B1
Outdoor air probe		B2
Oulet water exchanger probe		B3
Compressor discharge probe		B4
Refrigerant anti-freeze probe on the exchanger		B6
Outdoor coil pressure transducer		B7
Low-pressure pressostat	2 bar	LP
High-pressure pressostat	42 bar	HP



12. Commissioning

Checks prior to commissioning

- It is advisable to make a complete sketch of the installation including the location of the unit and all the components used in the hydraulic circuit (cut-off and safety valves, water filter, circulation pump, buffer tank, etc.). It will be very useful for maintenance and repairs in the installation *(please consult Annex I)*.
- Verify the absence of any leaks of the refrigerant.
- The following must be verified:
  - That the electrical power supply remains constant and that it corresponds to that featured on the unit data plate.
  - That the electric installation has been carried out according to the electric wiring diagram provided with the unit (consult the chapter on “Checking before commissioning”).
  - The correct connection of the sensors supplied with the unit.
  - That they are no cables close to heat sources.
- Once the above verifications have been carried out, the control circuit is supplied with voltage by the automatic control switch. It is necessary to leave the compressor crankcase heater with voltage for 24 hours before starting the compressor.
- All models are equipped with scroll type compressors and have a phase control relay. Verify that they turn in the correct direction and, if not, reverse the power wires.

**SCROLL COMPRESSOR.
CHECK SENSE OF ROTATION**

**COMPRESSEUR SCROLL.
VÉRIFIER LE SENS DE ROTATION**

**COMPRESOR SCROLL.
COMPROBAR SENTIDO DE GIRO**

V220040

WICHTIG: WIEDERBEHEIZUNG DER OLWANNE

BEIDER ERSTEN INBETRIEBSETRUNZ ORDER NACH EINER LANGEN STROMUNTER-BRECHUNG BRINGEN SIE DIE MASCHINE UNTER SPANNUNG 24 STRUNDERLANG BEVOR SIE DEN(DIE) KOMPRESSOR(EN) EINSCHALTEN KOENNEN.

IMPORTANT: CRANKCASE HEATING

FOR THE FIRSTSTART OR AFTER ALONG TIME OUT OF VOLTAGE PUT THE MACHINE ON LIVE 24 HOURS BEFORE TO ALLOW THE COMPRESSOR(S) STARTING

IMPORTANT: SURCHAUFFE CARTER D’HUILE

AU PREMIER DÉMARRAGE OU APRÈS UNE ABSCENCE DE COURANT PROLONGÉE, METTRE LA MACHINE SOUS TENSION 24 HEURES AVANT D’AUTORISER LE DÉMARRAGE DU(DES) COMPRESSEUR(S).

IMPORTANTE: RISCALDARE IL CARTER DELL’OLIO

AL PRIMO AVVIAMENTO U DOPO UNA INTERRUZIONE PROLUNGATA DELLA ALIMENTAZIONE ELETTRICA, LASCIARE LA MACCINA SOTTO TENSIONE PER 24 ORE PRIMA DI AUTORIZZARE L’AVVIAMENTO DEL(DEI) COMPRESSORE(I).

IMPORTANTE: RECALENTAMIENTO DE ACEITE DEL CÁRTER

ANTES DEL PRIMER ARRANQUE O DESPUÉS DE UNA AUSENCIA DE CORRIENTE POR UN LARGO PERIODO DE TIEMPO, CONVIENE QUE LA UNIDAD ESTÉ CONECTADA UN MÍNIMO DE 24 HORAS.

V220084

■ Adjustment of the water flow

- The filling of the hydraulic circuit is then carried out:
  - Open the water circuit valves and ensure that the water circulates around the exchanger with the pump in service.
  - Bleed the air in the hydraulic circuit.
  - Verify the operation of the water circulation controller and the cold/hot water control.
- Factory set configuration:
  - Thermal jump: 5ºC
  - COOLING mode operation: 12ºC / 7ºC
  - HEATING mode operation: 40ºC / 45ºC

  Operation is recommended with the emitters closed.

  Note: other control values are allowed once the verified flow and temperatures remain within the operational limits of the unit.
- The total pressure drop in the installation is not known precisely at start-up, such that it is necessary to adjust the water flow with the regulation valve in order to obtain the desired nominal flow.
- Thanks to the pressure drop generated in the hydraulic network, this regulation valve allows the network's pressure/flow curve to be overlapped with the pump's pressure/flow curve, thereby obtaining the nominal flow corresponding to the desired operating point.
- The reading of the pressure drop in the plate exchanger (which is obtained by connecting two pressure gauges on the unit's inlet and outlet) will be used as a means of control and adjustment of the nominal flow of water in the installation.
- Next the following procedure must be performed:
  - Totally open up the regulation valve.
  - Leave the pump running for 2 hours in order to eliminate any possible solid particles present in the circuit.
  - Read the pressure drop of the plate exchanger when starting up the pump and 2 hours later.
  - If the pressure drop has decreased, this means that the mesh filter is obstructed; it must be disassembled and cleaned.
  - Repeat until the obstruction is eliminated from the filter.
  - Once the circuit is free of contaminating elements, read the pressure drop of the plate exchanger and compare it with the theoretical pressure drop of the selection.

    If the value is greater than the theoretical value, the flow is too high. The pump offers too high of a flow from the point of view of the installation's pressure drop. In that case, close the regulation valve one revolution and read the new pressure drop. Perform a successive approximation by closing the regulation valve until the nominal flow is obtained at the desired operating point.

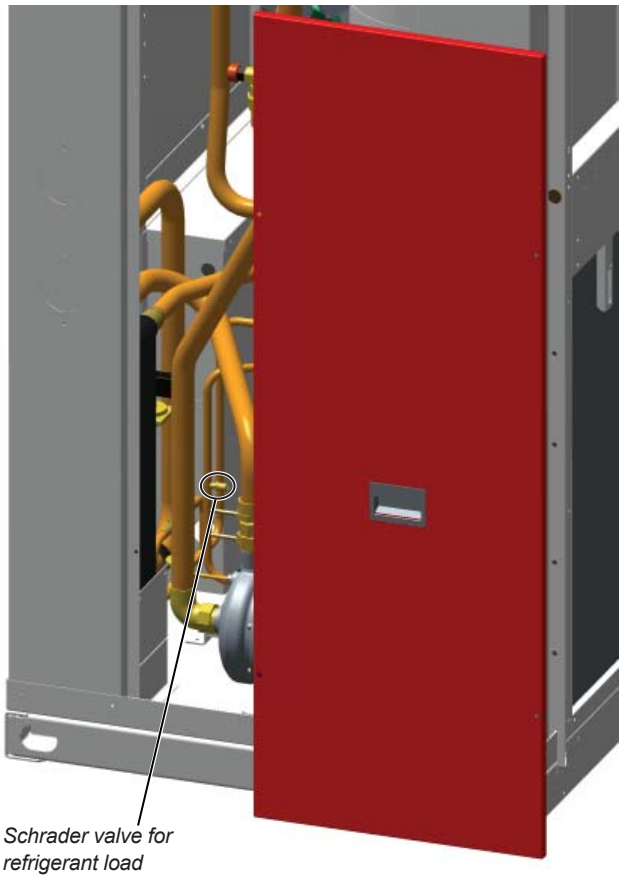
    On the contrary, if the network's pressure drop is too high with regards to the available static pressure offered by the pump, the resulting water flow will be reduced and the temperature difference between the inlet and outlet of the exchanger will be more significant, which is why it will be necessary to minimize the pressure drops.

■ Control of the refrigerant load

- When starting the compressor, check the subcooling and overheating and thus verify is the refrigerant load is appropriate to the operation conditions.
- If the refrigerant load is lower than required, the suction pressure will be rather lower than normal, and overheating when suctioning from the compressors will be high. This can cause an interruption in operation due to activation of the refrigerant load safety device.

  To adjust the refrigerant load, a schrader valve is built into the unit on the liquid line.

- Verify the absence of any leaks of the refrigerant. In the event of a leak:
  - Completely empty the unit using a specific recovery unit for R-410A and repair the leak.
  - Next, reload the gas into the unit according to load data provided in the technical characteristics table and in the unit's data plate.
  - Add the refrigerant via the schrader valve of the liquid line, whilst the compressor is in operation, monitoring the pressures should there be any anomaly.



Schrader valve for refrigerant load

Possible problems at commissioning

All indications given in this brochure must be respected and complied with to guarantee a correct operation of the units.

Next, several possible operation problems are stated which could happen if the conditions of the commissioning are not appropriate.

- Insufficient water flow. Very high temperature differences between water inlet into and outlet from the unit caused by:
  - Insufficient air bleeding.
  - Small water circulation pump or anti-clockwise rotation.
  - Other situations which may prevent correct water circulation.
- Insufficient thermal charge in the installation. The limiting operating values are quickly reached by:
  - Incorrect operation of the emissions system (fan coils, air conditioning exchangers, etc.).
- Air recirculation in the unit, originated by some obstacle in the air aspiration or supply.

Operational checks

Check the unit operation by verifying the electronic control and the safety devices.

It is also recommendable to create a report, taking note of the date, which includes the following information:

- the nominal voltage,
- current absorbed by the compressors, fans and other electrical components,
- significant temperatures in the cooling circuit (see attached table),
- other aspects considered interesting such as alarms detected by the electronic control of the unit.

The recording of these parameters whilst the unit is running allows controlling the installation performance and it is the best possible way to avoid breakdowns since the analysis of these data makes early detection of anomalies possible or the provision of the necessary means available to ensure that they do not take place.

Cooling MODE			
Compressor	Suction pressure	bar	
	Suction temperature (1)	ºC	
	Condensation pressure	bar	
	Condensation temperature (2)	ºC	
Air condenser	Gas inlet temperature	ºC	
	Liquid outlet temperature (3)	ºC	
	Air inlet temperature	ºC	
	Outdoor temperature	ºC	
	Air outlet temperature	ºC	
Water evaporator	Water inlet temperature	ºC	
	Water outlet temperature	ºC	
	Liquid inlet temperature	ºC	
	Evaporator outlet temperature (4)	ºC	
Subcooling (2) - (3)		ºC	
Overheating (4) - (1)		ºC	

Heating MODE			
Compressor	Suction pressure	bar	
	Suction temperature (1)	ºC	
	Condensation pressure	bar	
	Condensation temperature (2)	ºC	
Air evaporator	Liquid inlet temperature	ºC	
	Gas outlet temperature (4)	ºC	
	Air inlet temperature	ºC	
	Outdoor temperature	ºC	
	Air outlet temperature	ºC	
Water condenser	Water inlet temperature	ºC	
	Water outlet temperature	ºC	
	Gas inlet temperature	ºC	
	Liquid outlet temperature (3)	ºC	
Subcooling (2) - (3)		ºC	
Overheating (4) - (1)		ºC	

13. MAINTENANCE

The minimal maintenance operations and their periodicity will be made according to the national regulations.

Any intervention on the electric cooling components must be made by a qualified and authorized technician.

Technicians who intervene with the unit must use the necessary safety equipment (gloves, goggles, insulating clothing, safety shoes, etc.).

Furthermore, if working around sources of significant noise, we recommend the use of noise-dampening headgear.

Caution: Before intervening in the unit, cut off main power.

■ Recommendations

- Do not lean on the unit. A platform must be used to work on a level.
- Do not lean on the copper refrigerant tubes.
- Keep the unit clean.
- Keep the space surrounding the unit clean and cleared in order to avoid accidents and ensure the proper ventilation of the coil.
- Perform a visual (remains of water or oil below or around the unit) and auditory inspection of the entire installation.
- In general, a corrosion control must be performed on the metallic parts of the unit (frame, bodywork, exchangers, electric panel, etc.).
- Check that the insulation foam is not unstuck or torn.
- All the electric connection states must be checked as well, as well as the air tightness of the different circuits.

Next, some recommendations are stated for performing the maintenance and cleaning of the unit's components:

Plate exchanger

- The exchangers are fitted with thermal insulation. Check that the foam is not unstuck or broken.
- The water quality and the pressure drop must be verified at the exchanger level. After verifying the mesh filter condition, if necessary, the exchanger must be cleaned. To this end, a weak solution of phosphoric acid 5% must be circulated using the high pressure pump. During optimum cleaning, the cleaning solution flow must, as a minimum, be 1,5 times the working flow, preferably in the inverse circulation mode. This must be followed by thorough rinsing with water to remove any acidic residues. It is advisable to circulate a solution 1%-2% of sodium hydroxide prior to the last rinsing in order to ensure that the acid has been neutralised.
- Any repair or modification to the plate exchanger is prohibited. It can only be replaced by an original part.

Air coil

- Check that the coil is free from dust and grease.
- Cleaning the accumulated dust on the coil can be performed with a vacuum cleaner perpendicular to the fins or with a low-pressure water cleaner. Grease can be removed with water with degreaser. Do not put stress on the fins as they could deform.

Mesh filter

- **It is also necessary to install a filter in the hydraulic power supply to the unit in order to prevent clogging of the plate exchanger.**
- For 30PAC/PHC units, a kit with a stainless steel mesh filter (500 microns) is also supplied for installation by the installer. Optionally, this filter can be supplied for 30PA/PH units.
- The filtering mesh must be removed and cleaned in order to clean the filter.

Dehydrating filter

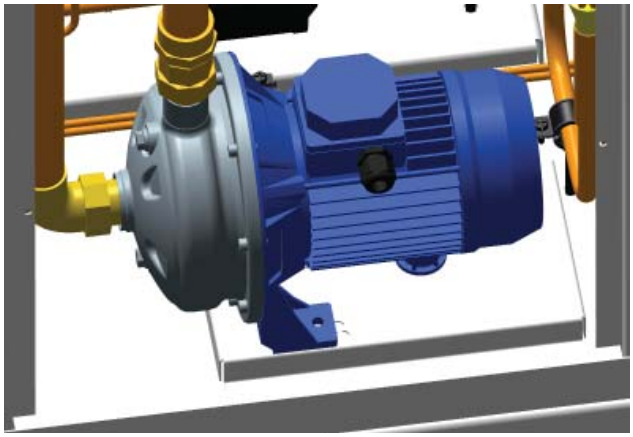
- The filter function is to keep the cooling circuit clean and without humidity, neutralising the acids that can be found in the cooling circuit.
- Verify dirt measuring the difference in temperature at the piping level, at the inlet and at the outlet of the dehydrant.
- If necessary, replace.

Ductable air-cooled scroll chillers and heat pumps

Pump

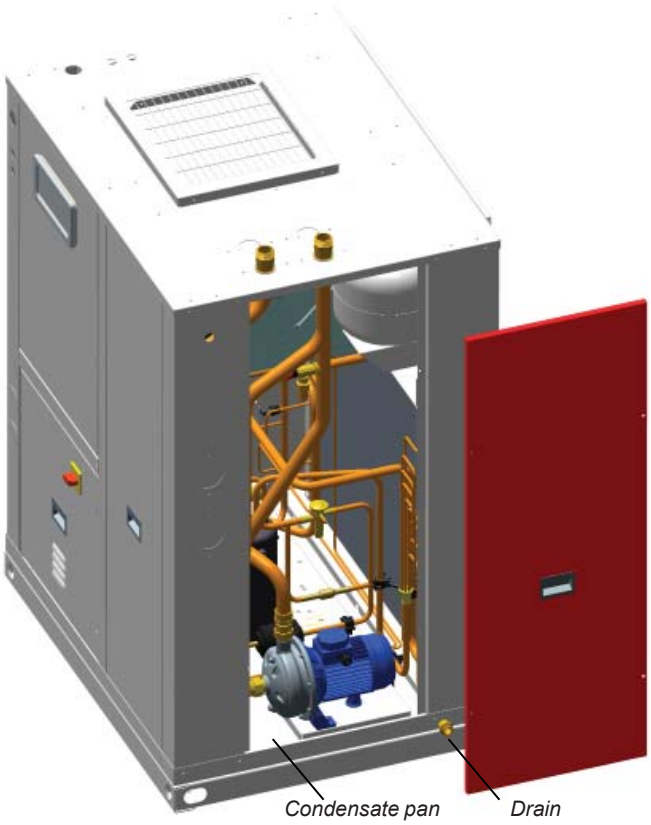
In the case of pump replacement:

- Disconnect the unit from power supply.
- Disconnect electrically the pump.
- Empty completely of water from the hydraulic circuit.
- Loosen the fittings of the 2 pipes.
- Remove the two screws fixing the pump and replace it.



Condensate drain pan

- Check that the condensate pan is clean.
- Check that the drain is not clogged.
- Cleaning of the pan can be done with water and non-abrasive detergent.

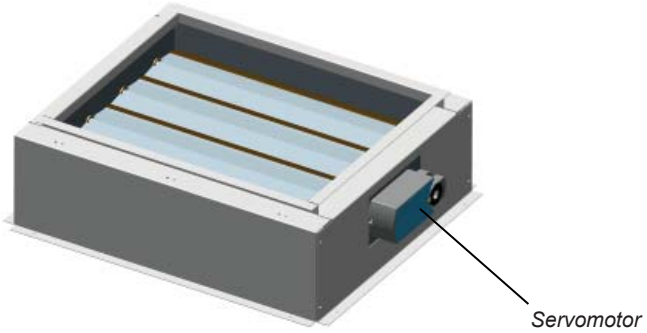


Centrifugal fan (STD version)

- Verify that the turbine and the motor remain clean.
- Foresee having a spare belt set for the fans.
- The motors and the fans have bearings that have been lubricated and sealed and, thus, do not need further lubrication.

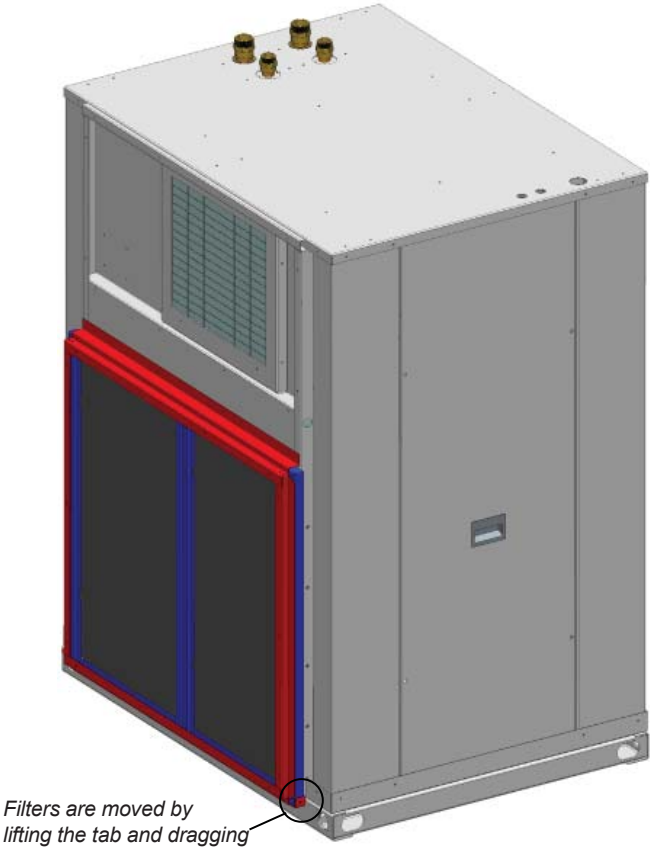
Servomotor (optional)

In units with a condensation pressure regulation damper (in the STD version), it is advisable to check the state of the servomotor.



Filter in the return air (optional)

- Clean usually. Depending on the installation conditions, the filter aspect must be examined to define the cleaning periodicity.
- Gravimetric filters: Cleaning the filtering mesh can be done with a household vacuum cleaner, or by submerging it in water.



Compressor

In the case of compressor replacement:

- Disconnect the unit from power supply.
- Completely empty the load of refrigerant using a specific recovery unit for R-410A
- Disconnect electrically the compresor.
- Carefully unscrew the suction and discharge piping.
- The compressor is fixed onto the platform with 4 screws Ø 8 mm. Unscrew the fixings.
- Place the new compressor and check that it has a sufficient oil charge.

  Warning: when tightening the compressor screws, the maximum torque to be applied is 13 Nm ± 1 for these models.

  If a torque wrench is not available, tighten them until noticing resistance, then tighten the screws by turning them 3/4 of a revolution.
- Screw the suction and discharge piping.
- Connect the compressor in accordance with the circuit diagram.
- Make vacuum and next, reload the gas into the unit according to load data provided in the technical characteristics table and in the unit's data plate.

Oil

Oils used for cooling machines do not post any threat to one's health if used while following the usage guidelines:

- Avoid any unnecessary manipulation of the elements covered in oil. Use protection creams.
- Oils are flammable and must be stored and handled with precaution. "Disposable" rags or towels used for cleaning must be kept away from open flames and must be discarded by using the appropriate procedure.
- Jugs must be kept closed. Avoid using oil from an already-open jug kept in poor conditions.

Both the oil type as well as the volume needed for each model are stated in the characteristics table in chapter 4.

- Check the oil level and aspect. In case of a colour change, check the oil quality using a contamination test.
- In the case of the presence of acid, water or metallic particles, replace the affected circuit oil, as well as the dehydrant filter.
- In the event of an oil charge change, only new oil will be used, which will be identical to the original oil and taken from a jug tightly closed until the moment of the charge.

Refrigerant

Only qualified personnel must perform a periodic tightness control, in accordance with the regulation (CE) **Nº 517/2014.**

- The frequency of checks is no longer related to the load of refrigerant but to its global warming potential:

  Load kg x GWP = t CO2e

  Carbon dioxide equivalency (t CO2e) is a quantity that describes, for a given mixture and amount of greenhouse gas, the amount in tonnes of CO2 that would have the same global warming potential (GWP).

  Please, consult data of carbon dioxide equivalency (t CO2e) provided in the technical characteristics table (chapter 4).
- Operators shall ensure that the unit is checked for leaks ad minima according to the following frequency:
  - t CO2e < 5 ..... not subjected
  - t CO2e 5 to 50 ..... every year
  - t CO2e 50 to 500 ... every 6 months
  - t CO2e > 500 ..... every 3 months
- Where a leakage detection system has been installed the frequency of checks is halved.

Note: Never forget that the cooling systems contain liquids and vapours under pressure. The service pressure of R-410A is approximately 1.5 higher than that of R-407C.

- All necessary precautions must be taken during the partial opening of the cooling circuit. This opening entails the discharge of a certain amount of refrigerant to the atmosphere. It is essential to limit this quantity of lost refrigerant to a minimum by pumping and isolating the charge in some other part of the circuit.
- The refrigerant fluid at low temperature can cause inflammatory injuries similar to burns when contacting the skin or eyes. Always use safety goggles, gloves, etc. when opening ducts that may contain liquids.
- The refrigerant in excess must be stored in appropriate containers and the amount of refrigerant stored at the technical rooms must be limited.
- Refrigerant barrels and deposits must be handled with precaution and visible warning signs must be placed to attract attention over the risks of intoxication, fire and explosion linked to the refrigerant.
- At the end of its useful life, the refrigerant must be retrieved and recycled as per the current regulations.

14. Control and analysis of breakdowns

Symptom	Cause	Solution
Evaporation pressure very high in relation with the air or water inlet	a) Charge excess b) High water temperature c) Compressor suction not air tight d) Cycle reversing valve in middle position	a) Collect refrigerant b) Verify overheating c) Verify compressor state and replace d) Check that the valve is not clogged. Replace if necessary
Very low condensation pressure	a) Gas lack b) Low water temperature c) Compressor suction not air tight d) Cycle inversion valve in middle position e) Liquid circuit plugging	a) Search for leaks, complete charge b) Wait for regular speed c) Verify compressor state and replace d) Check that the valve is not clogged. Replace if necessary e) Verify the dehydrating filter and expansion valve
Condensation pressure very high in relation to the air or water outlet, high pressure pressostat cut-off	a) Air or water flow insufficient b) Air or water inlet temperature very high c) Dirty condenser (does not exchange) d) Much refrigerant load (flooded condenser) e) The condenser fan is broken down f) Air in the cooling circuit	a) Verify the air or water circuits (flow, filter cleanliness etc.) b) Verify the control thermostat readjustment c) Clean it d) Collect refrigerant e) Repair f) Make vacuum and load
Evaporation pressure too low (low pressostat cut-off)	a) Low flow in evaporator. Air recirculation b) Frozen evaporator c) Liquid line as different temperatures at filter inlet and outlet d) Gas lack e) Very low condensation pressure f) Evaporator fan broken down	a) Verify the air or water circuits (flow, filter cleanliness etc.) b) Verify defrost c) Replace filter d) Search for leaks, complete charge e) Temperature of air or water in condenser very low (air or water flow very high), adjust flow f) Repair
Compressor does not start, does not make noise (humming)	a) No power b) The contacts of a control element are open c) Timing of anti cycle short does not allow the starting d) Open contact e) Contactor coil burnt f) Indoor Klixon open	a) Check differential, fuses b) Verify the safety chain of the electronic control c) Verify electronic control d) Replace e) Replace f) Wait for reactivation, verify intensity absorbed
Compressor does not start, motor sounds intermittently	a) Electrical power supply very low b) Power cable disconnected	a) Control line voltage and locate voltage drop b) Verify connections
Repeated compressor starts and stops	a) Because of high pressure b) Control differential too short (short cycle) c) Insufficient gas, cut-off because of low pressure d) Dirty or frosted evaporator e) The evaporator fan does not work, cuts off the low pressostat f) Expansion valve damaged or clogged by impurities (cuts off low pressostat) g) Dehydrating filter clogged (cuts off low safety)	a) Verify charge b) Increase differential c) Search for leak, reload unit d) Clean, verify evaporator air circuit e) Replace or repair f) Replace, as well as filter g) Replace
The compressor makes a noise	a) Loose attachment b) Oil lack c) Compressor noise	a) Fix b) Add oil to recommended level c) Replace
Noisy operation	a) Unit installed without antivibration protection	a) Place base over shock absorbers
Cycle reversing is not carried out: - No defrosting - Does not change winter - summer cycles	a) Electrical fault b) Inversion valve coil defective c) Defrost method not working d) Cycle inversion valve in middle position e) Control fault	a) Locate and repair b) Replace c) Verify parameters d) Tap with running compressor Replace if necessary e) Locate and repair

ANNEX I: QUICK OVERVIEW OF THE INSTALLATION

Air-cooled chillers / air-water heat pumps

Installer _____ Telephone _____

Responsible for installation and/or commissioning _____

Installation / work reference _____

Address _____

Unit	Unit model	Serial number	Date for commissioning

Installation sketch and units location

Ductable air-cooled scroll chillers and heat pumps

Electrical connections

POWER ..... YES ☐ NO ☐

- Provisional voltage _____ V Available power_____kW
- Final Voltage _____ V + T + N
- Line protection type

Fuse ☐ ☐ **A** Curve_____

Automatic ☐ ☐ **A** Curve_____

☐ ☐

CONTROL YES NO

- On / off external control ..... ☐ ☐
- Cooling / heating external selector (only if necessary) ..... ☐ ☐
- Unit operation circuit interlock / circulation pumps ..... ☐ ☐

Unit with voltage from _____ day _____ hour_____

Connections and components of the hydraulic circuit

YES NO

- Unit connections ..... ☐ ☐
- Cut-off valves ..... ☐ ☐
- Circuit: Open ☐ Closed ☐
- Operating nominal pressure _____ kg/cm^2
- Buffer tank_____litres and/or circuit water total capacity _____ litres
- Expansion vessel and safety valve ..... ☐ ☐
- Air drain done ..... ☐ ☐
- Flow controller checking ..... ☐ ☐
- Hydraulic circuit cleaning ..... ☐ ☐
- **Water filter at the unit inlet (Mesh for particles ∅ > 0.5 mm)** ..... ☐ ☐
- Thermometers at the inlet and outlet of the unit ..... ☐ ☐
- Constant water flow in unit _____m3/h
- Circulation pump. Primary (unit) ..... ☐ ☐
- Circulation pump. Secundary (emission system) ..... ☐ ☐
- Emission control system: Two ways ..... ☐ ☐
  Three ways ..... ☐ ☐
- Manometers reading (m.w.c.)

Pump: Suction _____Discharge _____ Diff _____

Unit: Inlet_____Outlet_____ Diff _____

YES NO

- Complete operation emission system (air-conditioner, fan-coil, etc) ☐ ☐

Observations

- Date _____ Signed:

Notes:

ISO-9001

Order No.: 10057, 06.2016. Supersedes order No.: 08.2015
The manufacturer reserves the right to change the specification without prior notice.

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