



refrigerating systems
ENS 200 / 300

**INSTALLATION, USER
AND MAINTENANCE MANUAL**

READ CAREFULLY
AND KEEP WITH THE MACHINE

Number of document : **QSM000545E**

Revision status: **A**

Daye of 1st issue: **15.Jun.09**

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USE AND MAINTENANCE MANUAL

010 – GENERAL INFORMATION / TABLE OF CONTENTS

This manual has been compiled in a simple and easy-to-read manner so that the refrigeration system can be installed, set up and serviced correctly.

Please read its contents carefully and keep it near the machine at all times.

The following points are of capital importance:

- The refrigerating equipment must be installed and set up by legally qualified personnel.
- Local safety regulations applicable at the time of installation must be observed.
- The refrigerating equipment must only ever be used for the purpose for which it was designed. Uses other than those specified shall in no way be binding for the Manufacturer, and so are any faults or hazards as may result therefrom.
- Any packaging components included (plastic bags, polystyrene, wood, etc.) represent a potential hazard and must be kept out of the reach of children. Sort them out and dispose of them according to local applicable regulations.
- Power supply specifications must comply with the details shown on the machine serial plate.
- Connection to the power mains must be achieved by legally qualified personnel and in compliance with the standards and laws in force.
- In the event of a fault or of faulty operation, always switch off the machine.
- Modifications to the power system or unauthorized alterations in general, which are not envisaged in this manual, shall invalidate the warranty.
- Machine disposal at the end of its service life must be carried out according to the laws in force and the resulting material must be sorted and recycled accordingly. The refrigerant contained in the machine must be disposed of by authorized personnel.

To service or repair the machine, always contact an authorized Epta after-sales service center and ask for original spare parts. Failure to do so could jeopardize machine and operator safety.

THE MANUFACTURER DISCLAIMS ALL LIABILITY FOR DIRECT OR INDIRECT DAMAGE TO PROPERTY OR INJURY TO PERSONS RESULTING FROM FAILURE TO COMPLY WITH THE INSTRUCTIONS CONTAINED IN THIS MANUAL.

KEY:

“ - “ First issue
A, B, C, ... Chapter revision index
AA, AB, AC , General document revision index
...

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This manual consists of the following sections representing an integral part thereof and which must not therefore be separated.

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020 – DESCRIPTION / TECHNICAL DETAILS

General information

The soundproof refrigerating systems called Energy series “200” and “300” are offered with two or three Copeland hermetic scroll compressors of the ZB series, connected in parallel, respectively for positive and negative-temperature applications using refrigerant R404A.

These machines were designed and built to the laws and European Directives in force.

They consists of a bearing and housing structure made of galvanized steel elements with galvanized sheet outer elements (panels) lined with embossed sound-proofing material (expanded polyurethane). They were designed for indoor use, in plant rooms, or for outdoor installation, provided that they are adequately protected from the elements. The front and upper panels as well as the sides of the equipment are removable. The machines on/off lamps and the programmable microprocessor controller are mounted on the fixed front panel, at the top front of the machine.

In positioning the components inside the equipment, much consideration has been given to comfortable maintenance, with easy access to parts requiring periodical inspection (compressors, viewers, etc.) or replacement (filters), as well as to regulation and adjustment parts.

The electrical board controlling compressors and fans, built to CEI EN 60204-1 standards, integral with the machine and pre-wired, undergoes factory functional testing. Mains cut-off handle on the outside.

The design solutions adopted as well as the components in the refrigerating circuit meet the high manufacturing and quality standards for which Epta is renowned and comply with the technical regulations in force.

The refrigerating circuit undergoes leak testing and is subsequently charged with dry air. The equipment is painted beige RAL 7032 with blue RAL 5019 elements (front and base).

Main features

- management of output following the real cooling demand by means of a microprocessor controller;
- electromechanical control of condensation pressure through high pressure switches;
- liquid receiver vessel of capacity 22 l. complying with Directive 97/23/CE.
- safety valve as per Directive 97/23/CE protecting the liquid receiver vessel.
- DTC Copeland liquid injector for compressor heads on low-temperature systems (ZF model scroll compressors).
- High-capacity anti-acid drier filter with replaceable cartridge on the liquid line, including liquid and moisture indicator.
- mechanical filter on the suction line, upstream of the suction manifold;
- insulation of suction manifold and suction circuit stretches;
- flexible-type polyamide service pipes.
- motor-driven compressors secured to the base with interposed stiff rubber vibration-dampers.
- two safety high pressure switches for the system (manual-reset type);
- one high pressure switch per compressor;
- one compressor/system low pressure switch;
- one low pressure switch for electromechanical security

Accessories:

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- Oil separator
- Compressor power-factor correction.
- Kit for changing night reference point

Machine model	ENS200 TN R404A		ENS200 TN R404A		ENS200 TN R404A		ENS200 TN R404A		ENS200 TN R404A		
Epta Code	UEA21D0A3		UEA21D5A3		UEA21E0A3		UEA21F0A3		UEA21G0A3		
Rated output (HP)	3		3,5		4		5		6		
Power voltage	400/3/50										
Heat extraction rate (W) ¹	11020		12720		15000		18620		21900		
Power input (W) ¹	4460		5240		5960		7520		8600		
Maximum power (W) ²	7140		8320		9220		11520		12980		
Length (mm)	1390		1390		1390		1390		1390		
Width (mm)	706		706		706		706		706		
Height (mm)	1091		1091		1091		1091		1091		
Cond. discharge diameter DL (mm)	22		22		22		22		28		
Diameter of condenser return RL (mm)	22		22		22		28		28		
Diameter of liquid line LL (mm)	22		22		22		22		22		
Diameter of suction line SL (mm)	35		35		35		42		42		
Diameter of safety valve exhaust (mm)	16		16		16		16		16		
Sound pressure dBA (1m)	58		58		59		61		62		
Weight (kg)	490		505		505		510		525		
Compressor	ZB 21 KCE		ZB 26 KCE		ZB 30 KCE		ZB 38 KCE		ZB 45 KCE		
Type	hermetic screw-type (scroll)										
Oil	ICI Emkarate RL 32 CF (MOBIL EAL Arctic 22 CC)										
Electrical equipment	TFD		TFD		TFD		TFD		TFD		
Power input under operation (A) ¹	4,63		5,43		6,92		8,68		8,84		
Max. power input (A) ³	7,2		8,85		10,3		12,8		13,1		
Electrical board (400/3/50)	147818	147838 ^d	147919	147839 ^d	147820	147840 ^d	147821	147841 ^d	147821	147841 ^d	
Range of overcurrent switch	5,5-8A		7-10A		9-12,5A		11-16A		11-16°		
Refrigerant	R404A										
Capacity of liquid receiver vessel (l.)	22										
Accessories											
Compressor power-factor correction.	3N1911		3N1912		3N1911		3N1911		3N1911		
Oil separator	3N1909		3N1909		3N1909		3N1909		3N1910		
Night set-point change	147587 – (in the configuration of the electrical board)										

¹ details from Copeland catalogue at following conditions: Te= -10°C / Tc= 40°C suction gas temp. 20°C – subcooling 0°K

² System only (condenser fans excluded).

³ Per compressor.

⁴ good for versions with single-phase condenser fans

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ENS “200” – Low-temperature applications using R404A with DTC Copeland compressors

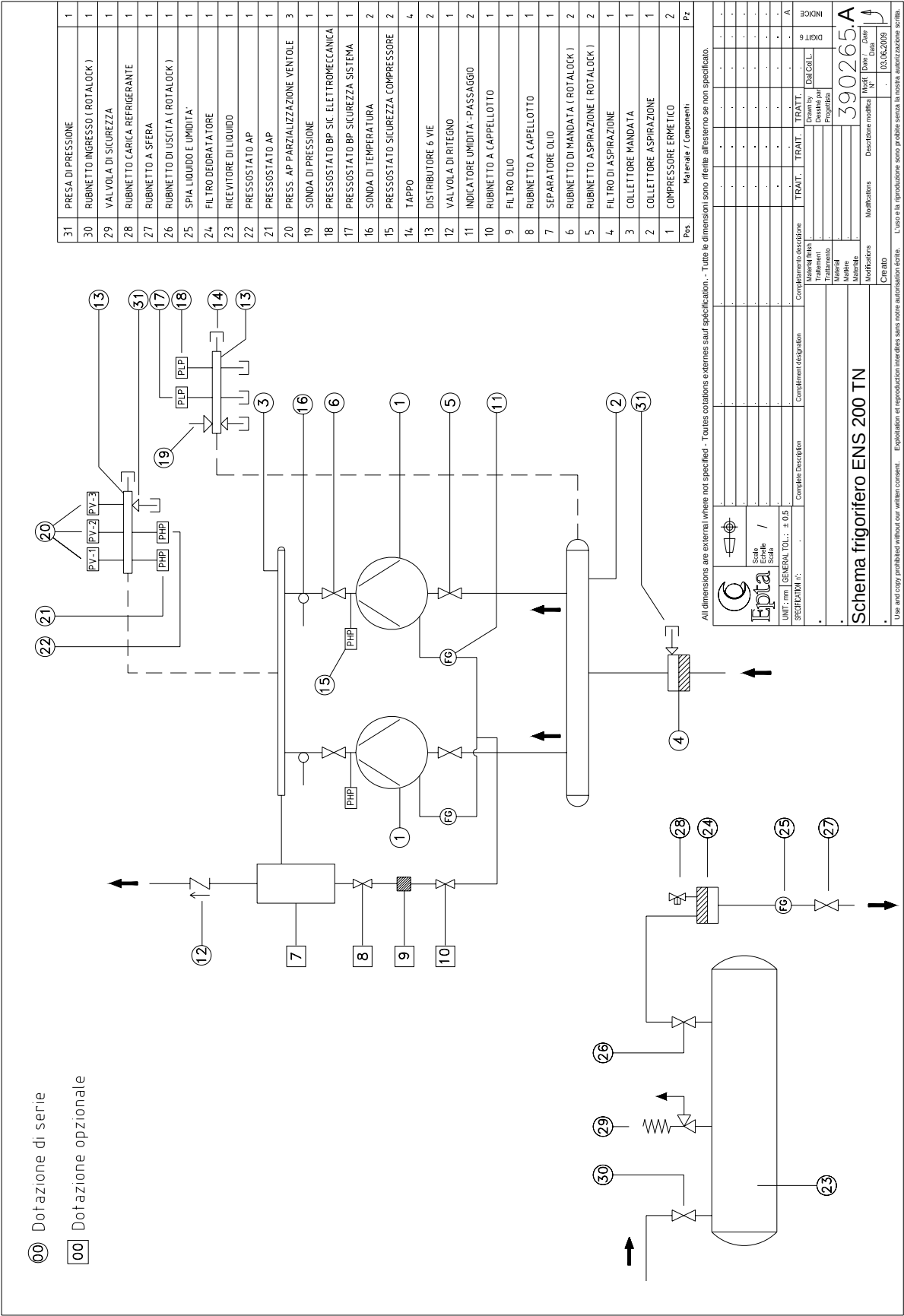
Machine model	ENS200 BT R404A		ENS200 BT R404A		ENS200 BT R404A		ENS200 BT R404A		ENS200 BT R404A	
Epta Code	UEA21D0B3		UEA21D5B3		UEA21E0B3		UEA21F0B3		UEA21G0B3	
Rated output (HP)	3		3,5		4		5		6	
Power voltage					400/3/50					
Heat extraction rate (W) ¹	3880		4920		5600		6840		8360	
Power input (W) ¹	3560		4320		4660		5660		6860	
Maximum power (W) ⁵	6480		7960		8980		11760		12780	
Length (mm)	1390		1390		1390		1390		1390	
Width (mm)	706		706		706		706		706	
Height (mm)	1091		1091		1091		1091		1091	
Cond. discharge diameter DL (mm)	16		16		16		16		22	
Diameter of condenser return RL (mm)	22		22		22		22		22	
Diameter of liquid line LL (mm)	22		22		22		22		22	
Diameter of suction line SL (mm)	35		35		35		42		42	
Diameter of safety valve exhaust (mm)	16		16		16		16		16	
Sound pressure dBA (1m)	62		63		65		65		67	
Weight (kg)	490		505		505		510		525	
Compressor	ZF 09 K4E		ZF 11 K4E		ZF 13 K4E		ZF 15 K4E		ZF 18 K4E	
Type	hermetic screw-type (scroll)									
Oil	ICI Emkarate RL 32 CF (MOBIL EAL Arctic 22 CC)									
Injection	Injection of liquid (DTC Copeland system)									
Electrical equipment	TFD		TFD		TFD		TFD		TFD	
Power input under operation (A) ¹	4,61		5,28		5,05		6,45		6,59	
Max. power input (A) ⁶	6		7		8		10		12	
Electrical board (400/3/50)	147818	147838 ⁴	147918	147838 ⁴	147819	147839 ⁴	147820	147840 ⁴	147821	147841 ⁴
Range of overcurrent switch	5,5-8A		5,5-8A		7-10A		9-12,5A		11-16A	
Refrigerant	R404A									
Capacity of liquid receiver vessel (l.)	22									
Accessories										
Compressor power-factor correction.	3N1911		3N1912		3N1911		3N1911		3N1912	
Oil separator	3N1908		3N1908		3N1908		3N1908		3N1909	
Night set-point change	147587 – (in the configuration of the electrical board)									

⁵ System only (condenser fans excluded).

⁶ Per compressor.

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Refrigerating system diagram for ENERGY SYSTEM 200 TN



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ENS “300” – Positive-temperature applications using R404A with Copeland compressors

Machine model	ENS300 TN R404A		ENS300 TN R404A		ENS300 TN R404A		ENS300 TN R404A		ENS300 TN R404A		
Epta Code	UEA31D0A3		UEA31D5A3		UEA31E0A3		UEA31F0A3		UEA31G0A3		
Rated output (HP)	3		3,5		4		5		6		
Power voltage	400/3/50										
Heat extraction rate (W) ¹	16530		19080		22500		27930		32850		
Power input (W) ¹	6690		7860		8940		11280		12900		
Maximum power (W) ²	10710		12480		13830		17280		19470		
Length (mm)	1390		1390		1390		1390		1390		
Width (mm)	706		706		706		706		706		
Height (mm)	1091		1091		1091		1091		1091		
Cond. discharge diameter DL (mm)	22		22		28		28		28		
Diameter of condenser return RL (mm)	22		28		28		28		28		
Diameter of liquid line LL (mm)	22		22		22		22		22		
Diameter of suction line SL (mm)	35		35		42		42		42		
Diameter of safety valve exhaust (mm)	16		16		16		16		16		
Sound pressure dBA (1m)	60		60		61		63		64		
Weight (kg)	520		525		535		545		560		
Compressor	ZB 21 KCE		ZB 26 KCE		ZB 30 KCE		ZB 38 KCE		ZB 45 KCE		
Type	hermetic screw-type (scroll)										
Oil	ICI Emkarate RL 32 CF (MOBIL EAL Arctic 22 CC)										
Electrical equipment	TFD		TFD		TFD		TFD		TFD		
Power input under operation (A) ¹	4,63		5,43		6,92		8,68		8,84		
Max. power input (A) ³	7,2		8,85		10,3		12,8		13,1		
Electrical board (400/3/50)	148038	148058 ⁴	148039	148059 ⁴	148040	148060 ⁴	148041	148061 ⁴	148041	148061 ⁴	
Range of overcurrent switch	5,5-8A		7-10A		9-12,5A		11-16A		11-16°		
Refrigerant	R404A										
Capacity of liquid receiver vessel (l.)	22										
Accessories											
Compressor power-factor correction.	UA3334010		UA3334015		UA3334010		UA3334010		UA3334010		
Oil separator	3N1909		3N1909		3N1910		3N1910		3N1910		
Night set-point change	147587 – (in the configuration of the electrical board)										

¹ details from Copeland catalogue at following conditions: Te= -10°C / Tc= 40°C suction gas temp. 20°C – subcooling 0°K

² System only (condenser fans excluded).

³ Per compressor.

⁴ good for versions with single-phased condenser fans

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ENS “300” – Low-temperature applications using R404A with DTC Copeland compressors

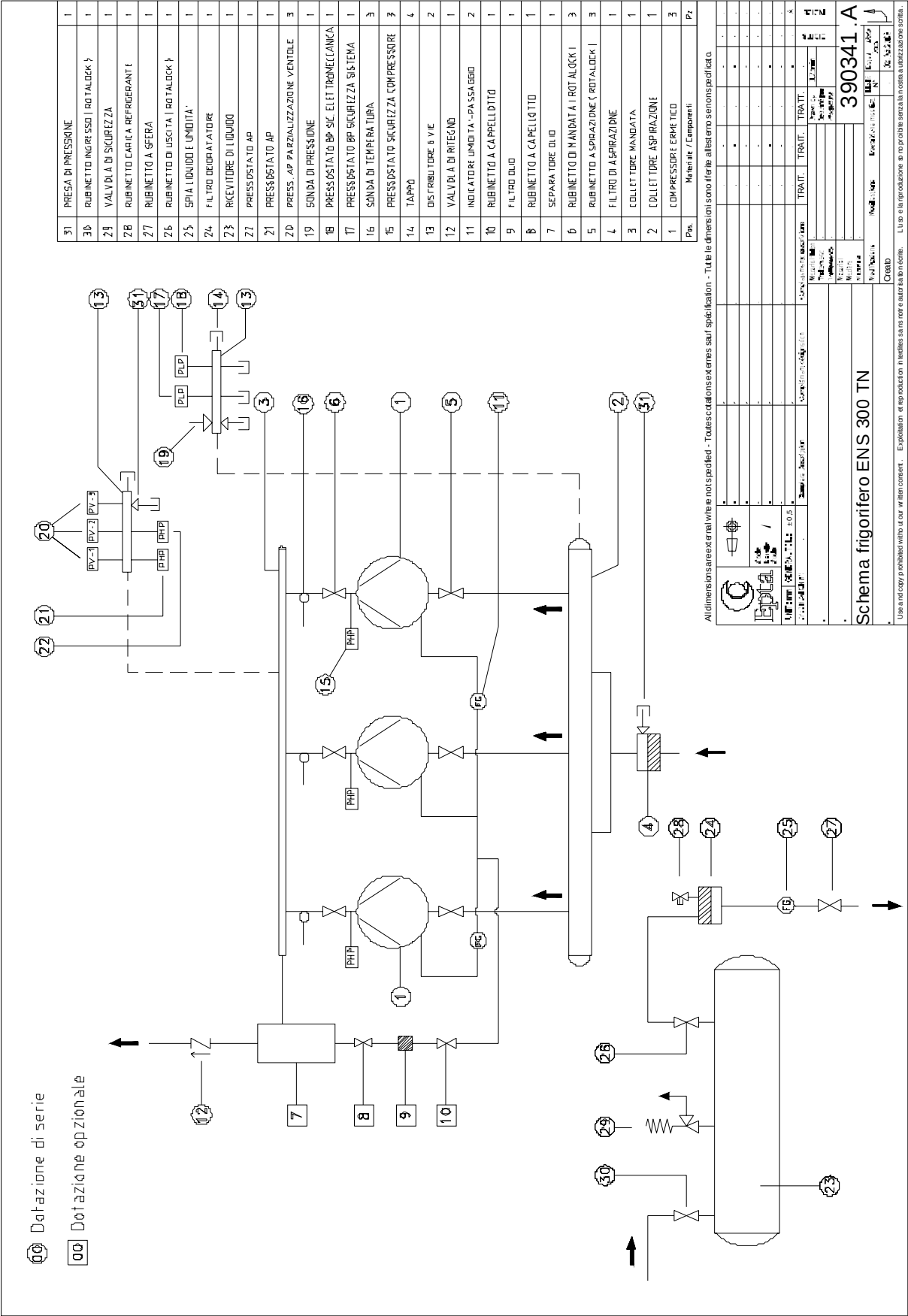
Machine model	ENS300 BT R404A		ENS300 BT R404A		ENS300 BT R404A		ENS300 BT R404A		ENS300 BT R404A	
Epta Code	UEA31D0B3		UEA31D5B3		UEA31E0B3		UEA31F0B3		UEA31G0B3	
Rated output (HP)	3		3,5		4		5		6	
Power voltage					400/3/50					
Heat extraction rate (W) ¹	5820		7380		8400		10260		12540	
Power input (W) ¹	5340		6480		6990		8490		10290	
Maximum power (W) ⁵	9720		11940		13470		17640		19170	
Length (mm)	1390		1390		1390		1390		1390	
Width (mm)	706		706		706		706		706	
Height (mm)	1091		1091		1091		1091		1091	
Cond. discharge diameter DL (mm)	16		16		22		22		22	
Diameter of condenser return RL (mm)	22		22		22		22		22	
Diameter of liquid line LL (mm)	22		22		22		22		22	
Diameter of suction line SL (mm)	35		35		42		42		42	
Diameter of safety valve exhaust (mm)	16		16		16		16		16	
Sound pressure dBA (1m)	64		65		67		67		69	
Weight (kg)	520		525		535		545		560	
Compressor	ZF 09 K4E		ZF 11 K4E		ZF 13 K4E		ZF 15 K4E		ZF 18 K4E	
Type	hermetic screw-type (scroll)									
Oil	ICI Emkarate RL 32 CF (MOBIL EAL Arctic 22 CC)									
Injection	Injection of liquid (DTC Copeland system)									
Electrical equipment	TFD		TFD		TFD		TFD		TFD	
Power input under operation (A) ¹	4,61		5,28		5,05		6,45		6,59	
Max. power input (A) ⁶	6		7		8		10		12	
Electrical board (400/3/50)	148038	148058 ⁴	148038	148058 ⁴	148039	148059 ⁴	148040	148060 ⁴	148041	148061 ⁴
Range of overcurrent switch	5,5-8A		5,5-8A		7-10A		9-12,5A		11-16A	
Refrigerant	R404A									
Capacity of liquid receiver vessel (l.)	22									
Accessories										
Compressor power-factor correction.	UA3334010		UA3334015		UA3334010		UA3334010		UA3334015	
Oil separator	3N1908		3N1908		3N1909		3N1909		3N1909	
Night set-point change	147587 – (in the configuration of the electrical board)									

⁵ System only (condenser fans excluded).

⁶ Per compressor*

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Refrigerating system diagram for ENERGY SYSTEM 300 TN



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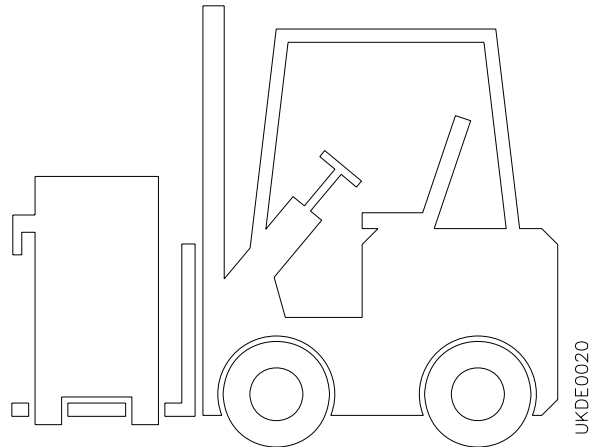
030 - HANDLING AND POSITIONING

For correct machine handling and positioning, the following precautions will have to be taken, bearing in mind that all the operations indicated below must be carried out by authorized personnel only and in conformity with the applicable safety regulations in terms of both handling equipment and operating procedures.

Hoisting by lift truck

Steps to be taken:

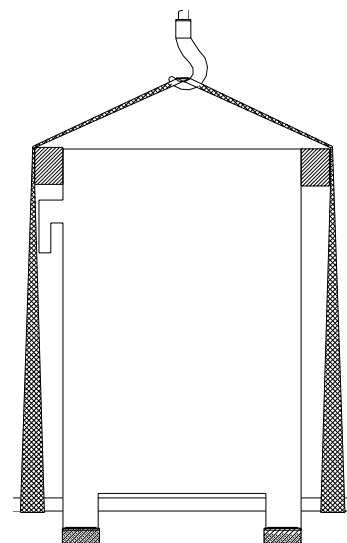
- ensure that the carrying capacity of the fork-lift truck is suitable for the weight of the unit in question (check the weight as stated on the serial plate and in the table below);
- position the forks of the fork-lift truck as shown in the figure, ensuring that the unit is balanced and stable before starting to lift;
- the equipment is standard-supplied on a wood platform to which it is secured; hoist the equipment as much as needed to remove the platform;
- complete equipment hoisting;
- if the equipment is not installed immediately in its installation site and is going to be temporarily stored outdoors; ensure that it stays dry, and safe from the elements, and do not lay any objects on top of it.



Hoisting by crane

Steps to be taken:

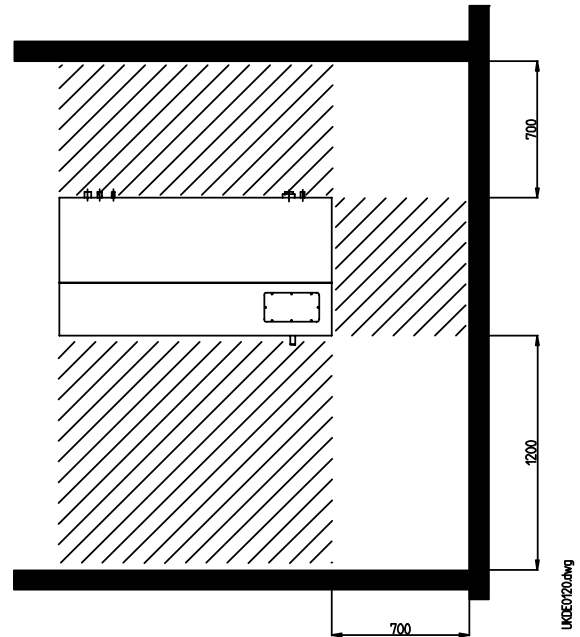
- ensure that the carrying capacity of the crane is suitable for the weight of the pack in question, as stated on the pack's serial plate and in the table below);
- Place hoisting bars in the points marked on the undercarriage as shown in picture 2. Use spacers to safeguard the equipment from structural damage;
- tie the equipment using the appropriate slings;
- ensure that the unit is balanced and stable before starting to lift;
- the equipment is standard-supplied secured onto a wood platform; hoist the equipment as much as needed to remove the platform;
- complete equipment hoisting.



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Functional clearance

Correct unit operation can be ensured by proper placement. This is why it is essential to comply with some basic rules concerning its location. Above all, do not position the unit wherever air flow is limited (e.g. too near walls), or near flows of hot air. It is equally important that ample room be left for maintenance, especially to safeguard authorized operators and other persons. Make sure that the ventilation grids and slots are not obstructed. Do not lean objects on the plant



Mass of ENERGY SYSTEM packs					
ENS 200 TN					
Model	ENS 200 TN ZB 21 KCE	ENS 200 TN ZB 26 KCE	ENS 200 TN ZB 30 KCE	ENS 200 TN ZB 38 KCE	ENS 200 TN ZB 45 KCE
Epta Code	UEA21D0A3	UEA21D5A3	UEA21E0A3	UEA21F0A3	UEA21G0A3
Weight of unit (kg)	490	505	505	510	525
ENS 200 BT					
Model	ENS 200 BT ZF 09 K4E	ENS 200 BT ZF 11 K4E	ENS 200 BT ZF 13 K4E	ENS 200 BT ZF 15 K4E	ENS 200 BT ZF 18 K4E
Epta Code	UEA21D0B3	UEA21D5B3	UEA21E0B3	UEA21F0B3	UEA21G0B3
Weight of unit (kg)	490	505	505	510	525
Mass of ENERGY SYSTEM 300 packs					
ENS 300 TN					
Model	ENS 300 TN ZB 21 KCE	ENS 300 TN ZB 26 KCE	ENS 300 TN ZB 30 KCE	ENS 300 TN ZB 38 KCE	ENS 300 TN ZB 45 KCE
Epta Code	UEA31D0A3	UEA31D5A3	UEA31E0A3	UEA31F0A3	UEA31G0A3
Weight of unit (kg)	520	525	535	545	560
ENS 300 BT					
Model	ENS 300 BT ZF 09 K4E	ENS 300 BT ZF 11 K4E	ENS 300 BT ZF 13 K4E	ENS 300 BT ZF 15 K4E	ENS 300 BT ZF 18 K4E
Epta Code	UEA31D0B3	UEA31D5B3	UEA31E0B3	UEA31F0B3	UEA31G0B3
Weight of unit (kg)	520	525	535	545	560

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040 - INSTALLATION

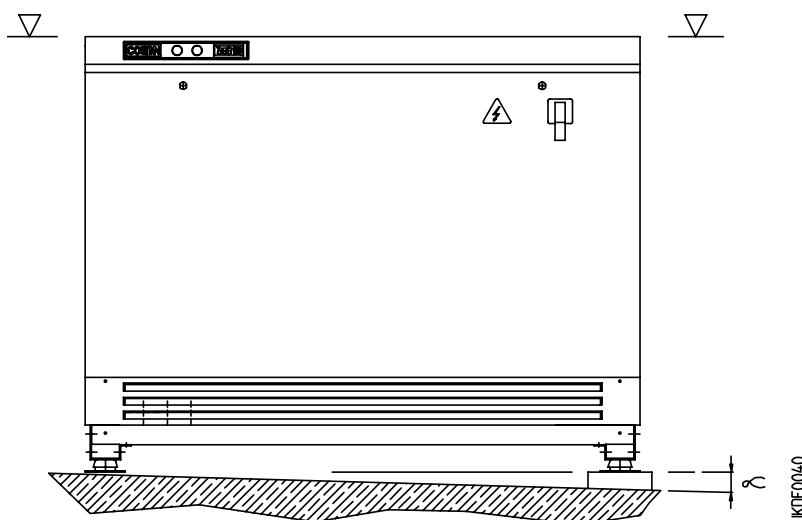
Take the protective packaging (if provided) and wood pallet off the equipment and position this in the plant area where it is to be installed. Being potentially hazardous, packaging components (plastic bags, polystyrene, cardboard, nails, etc.) must never be left within the reach of children, but must be disposed of in accordance with applicable regulations.

	Access to the plant room in which the refrigerating equipment is installed must be forbidden to personnel that is unqualified and not in charge of equipment maintenance.
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For correct operation it is important to **lay the machine horizontally**.

Use shims to correct any unevenness existing on the laying surface. Take the rear and top panel off the equipment and then check that this is level by resting a spirit level on the support of the suction manifold . Afterwards secure the system to the base stiffly using screw anchors and the fastening holes on the machine's vibration dampening pads (with Ø11 mm holes).

Put the panels withdrawn back in place.



Plant room

If the equipment is installed in a plant housing room, it is necessary to provide for adequate ventilation in the premises in order to avoid hazardous gas concentrating in the event of an accidental gas leak. Ventilation will have to be ensured by slots made on the encircling walls or by appropriate air devices, so that the relevant technical standards concerning air flow are respected.

Non-standard plant rooms must satisfy the requirements established by standards EN 378-3. The provisions concerning dimensions, construction, accessibility and ventilation must be especially complied with.

If the plant room enjoys natural ventilation, the total area of natural ventilation outlets must be at least (EN378-3:2002 5.5):

$$A = 0,14 \times m^{1/2}$$

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where:

A = is the free opening in square meters;

m = is the mass in kilos of the refrigerant fluid with the greatest charge, having one part whatsoever in the special plant room;

0,14= is the ratio between the area and the mass – in square meters – divided by the square root of the kilos

The free flow of air from windows, grids and outlets or pipes must not be hampered by walls or barriers, enclosing walls, buildings or other means of obstruction. Mind the density of the refrigerating fluid.

Mechanical ventilation, if any, must be ensured by fans able to exchange the air in the plant room, and at least:

$$V = 14 \times m^{2/3}$$

where:

V = is the air flow rate in liters per second;

m = is the mass in kilos of the refrigerant fluid with the greatest charge, having one part whatsoever in the special plant room;

14 = is the conversion factor

The ventilation system must renew the air in the room 15 times per hour.

It must be possible to operate the fans from both inside and outside the plant room, and when the special plant room is installed in a basement, the outside plant room control switch must be on ground floor.

The compressor/electrical board compartment can be accessed by removing the front panel. To this purpose, turn the circuit breaker handle to position “0” and then rotate the retention fastener on the upper side of the panel by 1/4 turn. Once the front panel has been removed it is possible to check and service the main components of the refrigerating equipment (compressor oil viewers, mechanical filter, filter dryer, pressure switch board) and access the control board electric parts. The upper panel can be removed by simply lifting it.

Detectors and alarm

When plant rooms are near areas in which people are present on a regular basis, restricted areas of difficult evacuation, detectors and alarms must be installed as established by standards EN378-3 in order to speedily give warning of any hazardous concentration of cooling fluid vapor in the air. Such devices must operate an attended alarm and/or a noticeable alarm that may enable the consequent actions by the personnel.

Power connections

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The electrical board was designed to operate on 380V-400V/3Ph/50-60 Hz or 220V-230V/3Ph/50-60 Hz.

To select operating voltage it is necessary to relocate the jumpers on the auxiliary transformer as appropriate.

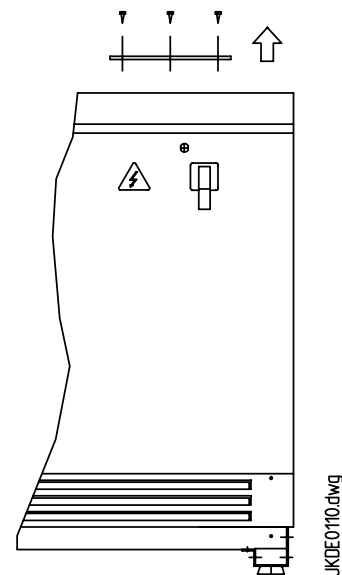
The electrical board must be supplied power using a cable with a cross-section suitable for the equipment's power rating and for the laying conditions existing in the place of installation.

The serial number plate on the machine shows, among other details, maximum electrical power. This value is also indicated in the performance table of the **DESCRIPTION / TECHNICAL DETAILS** section of this manual. It is the electrician's duty to size the wiring and earthing systems in accordance with applicable regulations 64-8 (Italian Law 46 - 5 March 1990).

EPTA disclaims all liability for incorrectly set-up wiring systems or which are not in conformity with applicable CEI standards.

Power supply cables must enter the machine through a hole to be drilled in the upper right portion of the front plate, at the master switch, after having removed the plate from the casing. **Drill the plate on a work bench and avoid doing it on the casing:** metal chips could deposit among the electrical board components causing malfunction and short circuits.

For connection purposes use only elbows and fittings which may ensure the appropriate insulation standard and drill and place such fittings following the manufacturer's instructions. Put the metal plate back in place with the appropriate adhesive gasket behind it.



All machine parts are connected to the earth system lead (yellow-green).



The fitter will have to connect the machine to the earthing system of the building.

For a detailed description of the electrical components, reference is made to the **"ELECTRICAL BOARD TECHNICAL SPECIFICATIONS"** section.

Make sure that the power cables are correctly secured to the terminal board (during transport and handling, vibrations could cause these to loosen). Check electrical board wiring and make sure the cable sheaths neither touch the refrigerant pipes nor press against the compressor.

Refrigerating connection

The equipment is supplied including:

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- one set of filtering elements (cartridges) for filter dryer or mechanical filter
- 3,78 l can of lubricant oil Mobil EAL Arctic 22

The pipes for connection to the system are located at the rear of the equipment. The discharge pipe leading to the condenser is blocked; all other valves leading to the open are closed. Remove the front panel, take off the copper disk, open the taps and scavenge pressurized air before connecting the unit up to the system. Use a stiff annealed copper pipe suitable for refrigeration systems.

Certain basic rules have to be followed when making R404A systems. Brazing must be done in nitrogen gas atmosphere to prevent the formation of system-damaging residue. It is most important that the fitter keep to the following instructions:

- Use nitrogen gas suitable for refrigeration purposes, marked "R".
- Connect one end of the pipe to be brazed to the nitrogen tank using a pressure-reducing valve. To adjust the pressure correctly, remember that the flow of nitrogen must be only just perceived by the palm of the hand. Braze as usual.

Place BOA vibration dampeners between the system and fixed pipes; install shutoff taps on the lines leading to and from the condenser, on the liquid line and on the suction line, referring to the connection diagrams contained in the system's technical book (for plants serviced by Epta). Fit one connection (Schrader valve) on the suction stretch and one on the liquid line to perform scavenging operations and the leak test. Complete the connection of the safety valve providing for an outdoor outlet in a position that is not liable to cause injury to persons or damage to property.

The equipment termed "refrigerating unit" cannot work on its own and must be included in the set termed "system". When inoperative and not connected up to a system, some pack versions contain pressure vessels, that, due to a possible refrigerant accumulation, may entail a potential hazard in case of fire. Such vessels, named liquid receivers, are duly protected by safety valves ensuring refrigerant discharge.

If the pack is delivered without an on-board liquid receiver, it is the installer's responsibility to fit the receiver with suitable safety valves providing for refrigerant discharge at the time when the pack is connected up to the other system components, i.e. to pressure vessels that may be subject to a pressure rise in case of fire.

Neither the unit nor the system include vessels containing an independent source of heat.

The position of outdoor-leading exhaust pipes branching off from the safety valves must ensure that no obstruction hazard exists and must avoid any personal or property damage during the exit of refrigerant

Complete suction line insulation.



The hermetic scroll compressors used on the Energy System 200 series use polyester oil as lubricant (POE). A drawback of this oil, which is compatible with chlorine-free refrigerants (HFC), is that it is very sensitive to environmental humidity (strong hygroscopicity), which means that certain rules have to be observed as regards use, in order not to jeopardize functional characteristics. All oil containers must stay sealed until the oil has to be introduced into the compressor. Avoid leaving the inside of the compressors and parts of the refrigeration circuit in contact with the outside environment even during routine system maintenance. Never pour left-over lubricant into damp-permeable containers (e.g. plastic containers) but keep it in its original metal can.

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Pressure-tightness test

The dimensions of the safety valve were chosen in order to avoid excessive pressure rise in the vessels not protected by safety pressure switch due to a fire event, as per the instructions in European standards EN 13136.

This must be performed after visual inspection.

Before and during the test, every measure to prevent hazards to persons and property in case of explosion must be taken.

The pressure-tightness test is performed with equal pressure values on both sides of the system:

- High pressure side: test pressure = 16 bar ($PSa=28\text{ bar}$)
- low pressure side: test pressure = 16 bar ($PSb=17\text{ bar}$)

In order to achieve test pressure it is necessary to:

- shut off all those components that may be damaged (low pressure-switches, low-pressure transducers, low-pressure meters);
- open all taps and automatic valves and keep them open;

The minimum overpressure time for the system undergoing the pressure-resistance test is 6 hours (system leakage check).

The pressure-tightness test may be performed, if this is considered useful, also for system sections shut off by taps (partial tests). The pressure test is finished when both sides of the system have been put to overpressure and no works are needed on permanent joints.

The outcome of the test must be recorded by the person in charge of the jobs.

Preparation of filters, oil charging and vacuum test

 **Do not fill the suction manifold with lubricant oil: only do this after startup if necessary, and carefully dose the amount that is let in.**

When the machine is delivered, filter internal parts are not mounted. These are supplied in air-tight containers, in numbers appropriate for initial startup and first replacement. At first place the supplied dryer cartridges Castel 4490/A on both filters (liquid and suction).

 **Dryer cartridges 4490/A must be placed in the filter using the appropriate holding set (mesh tube, cap and spring); cartridges 4495/C (on the suction side) only use a top cap, a bottom cap and a spring. When in doubt, follow the instructions on the filter packaging.**

If an oil separator is provided, it will be necessary to perform an oil charge: the amounts of oil to be let in are as follows:

- Turboil F-2505: 0,3L.
- Turboil F-3007: 0,3L.
- Turboil F-3009: 0,3L.

When the machine is delivered, filter internal parts are not mounted. These are supplied in air-tight containers, in numbers appropriate for initial startup and first replacement. At first place the supplied dryer cartridges Castel 4490/A on both filters (liquid and suction). **Dryer cartridges 4490/A must be placed in the filter using the appropriate holding device (mesh inner tube, cap and spring);**

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cartridges 4495/C (on the suction line) only use a top cap, a bottom cap and a spring according to the instructions on the filter's packaging.

Close the circuit, connect up the vacuum pump and scavenge the system and/or affected stretches. In case of systems containing charges above 20 kg of halides or hydrocarbons, the system must be dried and scavenged to a vacuum below 270 Pa absolute (same value for both sides, high and low pressure). Vacuum must be kept for at least 30 minutes and then dry nitrogen must be introduced. Then scavenge again to vacuum below 270 Pa absolute. Keep the system in this condition for at least 6h. Then ensure that the pressure was actually kept and introduce the system refrigerating fluid. The vacuum test may be performed, if this is considered necessary or useful, also for system sections shut off by taps (partial tests).

The charge will only be filled up when the appliances fed have reached their operating temperature.

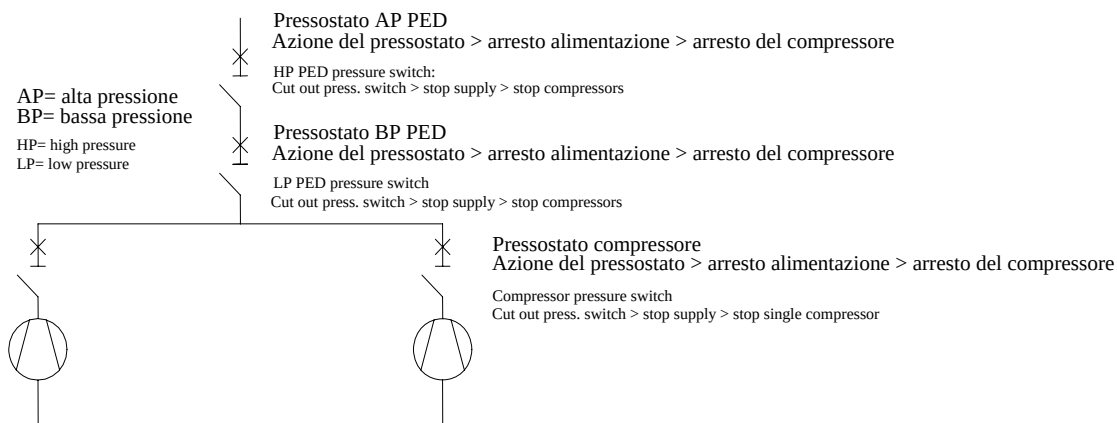
Checking pressure switches, filling and starting up the system

The pressure switch panel is inside the machinery compartment. The system's safety pressure switches PHP-2 (KP7S) and PHP-1 (KP7B) have each a sticker on the outside, that indicates tripping pressure and serial number. Pressure switch PHP-2 is marked red and factory-set for a pressure of 28bar whereas pressure switch PHP-1 is marked blue and factory-calibrated for a pressure of 27bar. After being calibrated, the adjustment screw is sealed with lead to prevent tampering. Both pressure switches are manual-*reset* type. to *reset* pressure switch PHP-1 just remove the upper lid and push the green lever inwards; to reset pressure switch PHP-2 it is necessary to open the pressure switch (the reset button is up in the right corner).

 **Check that the lead seals are intact; do not tamper with the adjustment screw of safety pressure switches.**

 **Prior to resetting safety switches manually (KP7S or KP7B), identify and remove the causes that have led to system failure.**

The high pressure switches protecting the compressors are cartridge-type and installed directly on the discharge valve of the compressor (connection to the valve coupling that cannot be **bypassed**); pressure switch trip value is 26,5bar. Set the system/compressor safety low pressure switch. The figure below shows the running diagram for the safety pressure switches featured in each single compressor.



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- The action of pressure switches, with reference to the refrigerating diagrams in Chapter 020, may be summarized as follows: HP safety pressure switches: (PED pressure switch): when pressure rises above the calibration value downstream of the compressors, then these pressure switches trip, shutting down the power supply and consequently stopping all the compressors.
- BP safety pressure switch (PED pressure switch): when pressure drops below the set value following a decrease in suction temperature, then this pressure switch trips, which shuts down the power supply and consequently stops all the compressors;
- Pressure switch for compressor protection on HP side: when pressure rises in an individual compressor then this pressure switch trips, which shuts down the power supply to that compressor and stops it immediately.
- Pressure switches HP for fan unloaders: three pressure switches are fitted on the high pressure side; they enable partial operation of condenser fans when the pressure on the high pressure side rises above the calibration value.

Set the high pressure switches for fan unloaders and the electromechanical security (duty cycle) low pressure switch.

Set the tripping threshold of overcurrent cutouts and delay devices as shown in the reference table (cfr. end of this section).

The microprocessor unit controlling the compressors is factory calibrated using standard operation values. If the equipment is provided with water-cooled condensers, open up the manostatic valve (if this is provided).

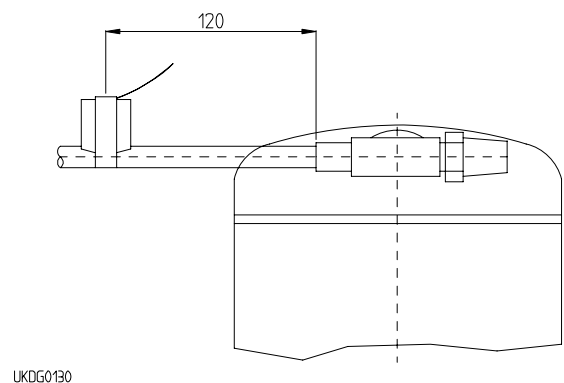
Ensure that the exhaust thermostat is positioned correctly (120 from the valve brazing – cfr. fig.).

After the connection to the power mains has been made, with the cutoff switch « OFF » and using a multimeter, check the value of the mains voltage upstream of the switch. **power voltage must be 400V±10%.**

Check phase imbalance. This must be below 3%.

Perform an initial charge of refrigerant in liquid condition on the line downstream from the receiver (liquid line) using tanks with liquid-gas tap or overturning the container if this is equipped with a standard valve. These steps are necessary to prevent any change in the relative concentration of refrigerant components.

Before starting up the machine it is necessary to power the carter outer heaters (belt oil heater) for at least 12 hours.



UKDG0130

To do this without switching the compressor on, remove fuses F2 and F8 from their housing. Ensure that the heater itself is in its correct position (10 to 40mm from the bottom of the compressor).

Turn the switch/circuit breaker ON and then measure the voltage between terminals 8-9 to ensure that the heater is powered. Then close the machinery compartment.

After the indicated time has elapsed, remove the door, turn the circuit-breaker “OFF” position (“0”) and put fuses F2 and F8 back in place. Make sure that the discharge and suction valves are open and then restart the machine.

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	When restarting the system, ensure that the motor is turning in the correct direction. Scroll compressors, unlike reciprocating compressors, achieve compression in one direction only. Before startup, connect a pressure gauge to HP and another to LP. By running the compressor for 1-2 seconds, the pressure should increase on the HP side and drop on the LP side. If this does not occur, two of the compressor power leads will have to be inverted. Once this change has been made, repeat the test again. The above operation must be performed for both compressors.
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	Jobs requiring the electrical board to be live and open may be carried out only by qualified and expert personnel. When the electrical board is open and energized, this is visually signaled by an alarm/danger red intermittent light. The person in charge of these jobs must absolutely not leave the machine when the safety devices provided by the manufacturer are disabled.
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Check rotation of the remote condenser fans (the fans must expel air from the condenser battery). Then, if necessary, correct high pressure switch settings.

Top up with refrigerant through the suction line following the instructions above and modulating the amount of refrigerant.

Turn the mains switch off and put the front panel back in place. Then supply power again and, if necessary, correct the low-pressure controller preset values (see instructions in “ELECTRICAL BOARD TECHNICAL SPECIFICATIONS”).

Check oil level in each compressor (the check must be carried out while the compressors are OFF) and if necessary, top up with oil (Mobil EAL Arctic 22), strictly complying with the directions above.

After a certain operation period (about 12 hours), or when a remarkable increase in leaks through the suction filters is detected, shut down the system. Shut both filters off and replace the filtering cartridges: place a mechanical filtering cartridge (Castel 4495/C) in the suction filter and a dryer cartridge (Castel 4490/C) in the liquid line filter using the supplies. Empty the affected pipe stretches and then restart the system.

Check the oil level in the compressors again.

Also check oil level in the compressors every now and then.

Overcurrent circuit breakers

I.D.	SETTING
QM1	Compressor rated current In (In = nominal current) –5%
QM2	Compressor rated current In (In = nominal current) –5%
QM3	Compressor rated current In (In = nominal current) –5%

Pressure switch for compressor mechanical backup operation

Low pressure side		TN	BT
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I.D.	FUNCTION	R404A bar ¹ (°C) ²	R404A bar (°C)
PSB ³	COMPRESSOR SHUTDOWN	2,6 (-15)	0,5 (-37)
	DIFFERENTIAL	1,0	0,7

¹ Bar relative.

² The saturation temperature corresponding to calibration pressure is shown in brackets.

³ Low pressure switch, automatic-reset, adjustable-calibration type, for mechanical back-up operation in the event of controller failure (compressor cycling).

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Fan control pressure switches

High pressure side		TN	BT
I.D.	FUNCTION	R404A bar (°C)	R404A bar (°C)
PV1 (VC1) ¹	START OF FAN #1	13,9 (+32,0)	13,9 (+32,0)
	DIFFERENTIAL	3,0	3,0
PV2 (VC2) (if this is provided)	START OF FAN #2	15,0 (+35,0)	15,0 (+35,0)
	DIFFERENTIAL	3,0	3,0
PV3 (VC3) (if this is provided)	START OF FAN #3	17,0 (+40,0)	17,0 (+40,0)
	DIFFERENTIAL	3,0	3,0

SAFETY PRESSURE SWITCHES

Low pressure side		TN	BT
I.D.	FUNCTION	R404A bar (°C)	R404A Bar (°C)
PLP ²	SYSTEM PROTECTION	1,5 (-25)	0 (-46)
	DIFFERENTIAL	1,0	0,7

High pressure side		TN	BT
I.D.	FUNCTION	R404A bar (°C)	R404A Bar (°C)
PHP-1 ⁷	SYSTEM PROTECTION	27	27

¹ High pressure switch KP5, automatic-reset, adjustable-calibration type, for mechanical back-up operation (condenser fan cycling).

² System-protection low-pressure switch KP1, automatic-reset, adjustable-calibration type.

⁸ System-protection high pressure switch KP7B, manual-reset type (factory-calibrated at Epta's).

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		(+59)	(+59)
	DIFFERENTIAL	fixed 4,0	fixed 4,0
PHP-2 ⁸	SYSTEM PROTECTION	28	28
		(+60,6)	(+60,6)
	DIFFERENTIAL	fixed 4,0	fixed 4,0
PHP-C ⁹	COMPRESSOR PROTECTION	26,5	26,5
		(+58,1)	(+58,1)
	DIFFERENTIAL	6,0	6,0

DELAY DEVICES

DESCRIPTION	I.D.	TIME (MIN)
ACTUATION OF EMERGENCY BACK-UP REGULATION	R0	40
BACK-UP CUT-IN FOR COMPRESSOR #1	R2	2



ON-SITE TESTING AND INSPECTION ADVICE1. All the settings in these tables must be verified.2. All pressure switches and delay devices must be tested and test-operated.3. Pressure switches are factory-calibrated by Quality Control Dept. following procedure OP00144Q. They must be attached an I.D. label including calibration values and date, as well as the ID of the person who performed the calibration. Their lead seal must be intact. When commissioned as per operational instruction QOP019110A, correct tripping of safety pressure-switches was simulated and verified

⁸ high pressure switch KP7S, manual-reset type to protect the system (factory-calibrated at Epta's).

⁹ high pressure switch KP5, manual-reset type, for system protection (factory-calibrated at Epta's).

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Copeland DTC valve (ZF09K4E.....ZF18K4E)

The DTC system is made up of a thermal-expansion valve controlled by a bulb that is located in the compressor hood, inside a suitable chamber. This bulb is connected to the valve through a capillary tube. Refrigerant is injected only as long as it is necessary and discharge gas is kept below a maximum temperature of 115°C. The DTC system replaces the copper capillary tube, the solenoid valve and the Kriwan amperometric relay. The DTC valve (one model fits all the compressors concerned, using either R22 or R404A), still needs an exhaust thermostat on the discharge line.

There is a removable 100mm mesh filter in the valve.

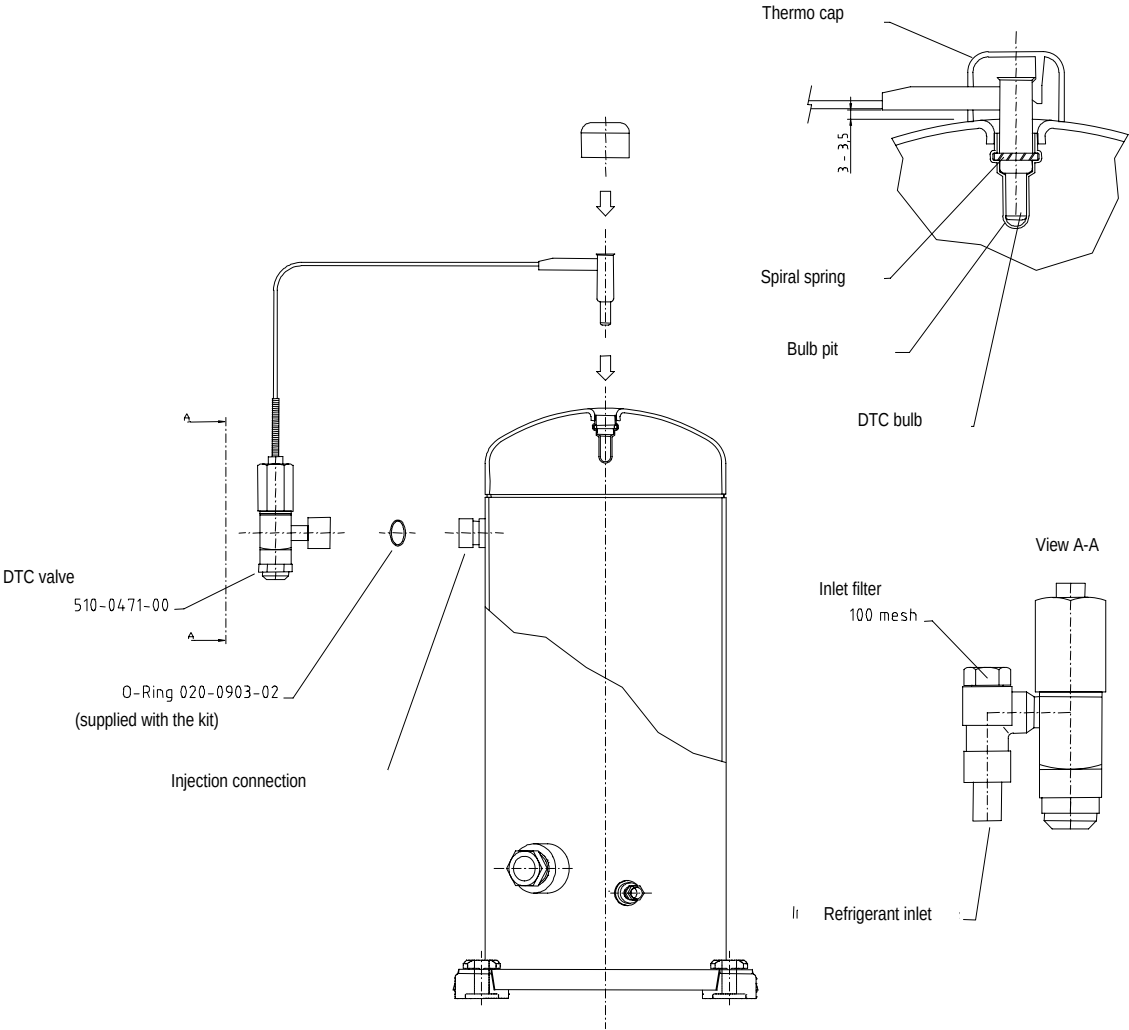
Find below a list of instructions concerning assembly and a diagram of the parts composing the system. When maintaining and or repairing, always refer to the instructions on the packaging.

Instructions for installation:

- Remove the plastic plug and ensure that the coiled spring is in the chamber on the compressor head (the spring is attached to the compressor).
- Screw the DTC valve onto the injection connection so that the attached “O-ring” gasket is positioned correctly (cfr. figure). The closing torque must be between 24 and 27 Nm.
- Push the DTC bulb well into the compressor hood chamber.
- Secure the bulb on the hood using the snap plug. The distance between the bulb copper capillary tube and the compressor hood must be approximately 3-3,5mm (cfr. fig.).

Always wrap a soaked rag around the valve when brazing it onto the circuit.

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050 - ELECTRICAL BOARD TECHNICAL SPECIFICATIONS ENS 200/300

1.Overview.

- 1.1 On-board electrical panel for the control of up to 3 compressors and # 2-3 condenser fans.

2.Reference standards

- 2.1 **EN 60204-1** in force (Electrical equipment of machines)
2.2 **EN 60439-1** in force (Low-voltage electrical board)

3.Power supply and operating voltage

- 3.1 Standard: 400V/3Ph/50Hz
3.2 As for 230V auxiliary voltage adjustment, cfr. chap.6.
3.3 Observe the wiring inlet position

The cables leading power to the equipment must enter the board from the front, right hand side of the electrical board, through a hole that needs to be drilled on the appropriate plate, which is located above the master switch.

For the purposes of maintaining the electrical board's protection rating it is necessary to use the appropriate grommet.

Short-circuit hazard: when drilling the hole through which cables are going to run it is necessary to exercise maximum caution and prevent metal chips from entering the electrical panel.

- 3.5 Power wires must be directly connected to terminals L1-L2-L3 of the master switch, observing the cyclic direction of phases.

**The earthing wire must be connected to the earthing terminal marked PE.
Connect this before connecting the phases.**

4. Master circuit breaker and power distribution.

- 4.1 Master circuit breaker, magnetic type: ABB series OS from 32A up to 160A including terminal-covering caps.
4.2 Yellow-red handle that can be padlocked (emergency) assembled onto the door.

When servicing the equipment the circuit breaker must be OFF

5.Distribution.

- 5.1 Bus bar feeder system SIEMENS SIRIUS 3R, distance between bar centers 60mm.
5.2 Overcurrent switches on compressors and fans are connected to the contactors by way of accessories that afford safe current transmission.
5.3. The overcurrent switch/contactator set is fastened to a suitable plate that can be fitted onto the bars by spring terminals, thus ensuring secure electrical transmission.

6.Auxiliary circuit

- 6.1.1 **Power supply and operating voltage 230V/50-60Hz. /**
6.1.2 **230V** auxiliary voltage from transformer LEGRAND 230V-400V/230V. mod. **044266** (400VA):

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The electrical panel is mounted on the machine following the power voltage requested at the time of ordering. Before powering up the machine, verify that the auxiliary transformer's primary voltage setting suits the equipment's voltage and ensure that the transformer's secondary output is constantly **230V**. Transformer output voltage can be adjusted by +/- 15V: for effective 230V output, adjusting the transformer's primary is capital. Adjustment depends on the voltage supplied by the electricity company. In the standard version the transformer is always provided already adjusted for operation on 400V/50-60Hz. Non-standard versions are prepared for the voltage requested at the time of ordering.

6.3 Red color wires.

6.4 Cable numbering as per diagram.

6.5 Line start fuses for auxiliary circuits with fuses 5x20 (250Vac).

6.6 Timers: FINDER 80.11.

6.7 Auxiliary relays: FINDER 55.34.

6.8 Warning lights: SIEMENS series SB32 52-6AA_0 diameter 22 with a led lamp.

6.9 Distribution in auxiliary circuit 230V through shielded LEGRAND bars art. 004880 / 004881.

6.10 **PED Directive-compliant general low-pressure and high pressure switches for safety.**

6.10.1 System shutdown in case of low pressure emergency by pressure-switch KLP (Danfoss KP1).

6.10.2 System shutdown in case of high pressure emergency by pressure-switch KHP1 (Danfoss KP7B) and KHP2 (Danfoss KP7S). These pressure-switches are pre-set at the factory and need to be re-engaged manually after they have tripped and after the cause of the fault has been removed.

6.11 **Emergency back-up regulation:**

Mechanical back-up operation in case of failure of the high and low pressure electronic control.

6.11.1 Low pressure mechanical back-up.

Performed by pressure switch PSB (Danfoss KP1) and delay devices R0-2. Functioning: when the electronic controller fails, all compressors stay off. If the off-time exceeds the value assigned to timer R0 (40-50 min.) back-up operation takes over; if this signal persists, then the low pressure switch PSB trips, which starts the first compressor. Timer R2 simultaneously starts, which will turn on the next compressor. Compressors under backup operation are controlled through pressure switch PSB and delay devices. PSB must absolutely be set for the pack's average operating value and must never interfere with the KLP (Danfoss KP1) safety low-pressure switch.

Low-pressure back-up regulation, is an emergency condition that does enable compressor and pressure management optimization. Therefore regulation by the electronic control must be restored as soon as possible.

6.12 **Alarms**

One single red alarm warning lamp is provided: it warns that there is damage or malfunction but it gives no information about the part of the electrical board involved; the person in charge of maintenance will have to establish that.

Only voltage below 50V can be led to the alarm terminal and respective clean contacts.

7. **Circuito compressors**

7.1 Compact system SIEMENS SIRIUS S0/2

7.1.1 Overcurrent cutout (Overload cutout) and circuit breaker that can be padlocked when jobs are carried out on the compressor (Siemens series S0/2/3)

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7.1.2 Contactors: Siemens series S0/2, coordinated with their respective overcurrent device following the tables supplied by SIEMENS

7.1.3 Compressors are protected by an overload cutout switch performing the following functions:

- protection against short-circuit
- protection against overcurrent
- protection against phase loss
- protection against phase imbalance: this trips when current input differs by 30%-50% between phases.

7.1.6 Overload protection system detected by means of thermistor probes

7.1.7 Maneuvers and life of contactors

Motor contactors have been designed for a million maneuvers on average (1 maneuver = 1on+1off) with the maximum rated current in category AC3. Considering that the limit of an average compressor is 10-12 starts per hour, the useful life of a contactor will be **10** years if their starts occur under the severest conditions (continuous breakaway - maximum compressor load - rated current). Considering that in systems including several compressors, these are made turn over by the electronic controller, that under normal operation conditions electric motors are used by 50-40% of their rated nominal current and considering also that systems have neutral zone periods (in which systems are stable and compressors are not required to go on or off), contactor life must necessarily be longer than the length they were designed for.

(Data for contactor maneuvers were taken from catalogue SIEMENS SIRIUS 3R).

It is worth underlining and bearing in mind that in our case, the life of a contactor is not determined by the number of maneuvers it performs (which, considering the rated current in category AC3 may total 250 maneuvers/hour) but by the compressor: for small/medium compressors max. 10-15 manoeuvres/hour; for large compressors max. N. 6-7 manoeuvres/hour. Exceeding the compressor maneuvers/hour physical limit may damage the equipment itself and even cause short circuit in the electric motor.

Short circuit is prevented by the overcurrent device protecting the compressor.

After a short-circuit, both the overcurrent protection cutout and the contactor will have to be replaced.

(cfr. chapter 23 “important notice”).

8. Condenser fan circuit

8.1 Compact system SIEMENS SIRIUS S0/S2.

8.1.1.Cutoff switch with fuse.

8.1.2 Contactor SIEMENS S00/0/2.

8.2 Wire the fan power circuit strictly following the phase sequence L1-L2-L3.

9. Control electronics

9.1. The controllers available and installed on request can be chosen among the following two:

9.1.1 Carel ir 32 W3

9.1.2 Danfoss EKC 331T

As for the controller features, cfr. the relevant manual issued by the manufacturer.

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10. Terminal strips.

10.0 Phoenix spring terminals organized in terminal strips as below:

10.1 In general terms their layout follows the ergonomic criteria as per Epta's layout, i.e. the following principles, from left to right of the electrical board front: Electronic controller terminals (pressure-switch PED, Back-up, liquid level, Auxiliary services) – compressors 1-6 – alarms – condenser fans 1-6.

11. Wiring.

13.1 Wiring as per reference EN-IEC standards.

13.2 All wires are flame-proof type.

13.3 The electrical board was designed for an estimated internal temperature of 50°C.

12. Earthing connections.

14.1 The bottom plate, door and all other metal parts are connected to the earthing system.

14.2 For the earthing connection of devices, a copper bar of suitable cross-section and dimensions to standards is provided.

14.3 When connecting devices to the earthing system on-site (condenser fans, machine-room expeller etc..) use the earthing bar.

13. Warning lamps

15.1 Warning lamps are diameter d=22, ingress protection rating IP65.

15.2 The lamp is led-type 230V.

15.3 Warning lamp color: alarm = red
operation = white

15.4 Detail of warning lamps

Type	color	I.D.	Application	Function
Operation	white	HF	Voltage	The auxiliary circuit is hot. This warning lamp must be on at all times.
Alarm	red	HA	Low pressure	Low-pressure alarm on the general circuit. The entire system is shut down.
			High pressure	High-pressure alarm on the general circuit Pressure switches PHP-1 and PHP-2 have tripped.
			Back-up regulation	Mechanical back-up regulation has come on due to failure of the electronic control.
			Compressor	General compressor alarm: tripping of overcurrent device due to alarm condition
			Controller ¹	Controller alarm: Goes on in the event of any controller alarm.

14. Lay-out of components / drilling.

14.1 The component lay-out is determined by ergonomic principles, with the power section separated from the regulation section.

¹ La funzione viene eseguita solo con controllore Danfoss EKC 331T e non con il controllore Carel IR 32 W3

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15. Electrical board cooling

15.1 The electrical board is cooled by the appropriate slot protected by a grille.

18. Component brands / models

16.1 Common components: as listed in the key to the wiring diagrams.

16.2 Variable components, size as per Epta tables: (ENS200-1.0-2009)

17. Accessories included.

17.1 None

18. Inspection and testing.

18.1 The equipment undergoes electrical testing before delivery, including all the tests prescribed by the reference standards: **EN 60439-1** and **EN 60204-1**.

19.Attached documents and certifications.

21.1. Wiring diagrams including relevant key.

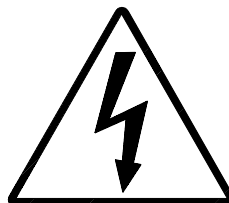
21.2 Conformity declaration for the set of equipment making up the refrigerating system;

21.3 Installation, use and maintenance manual for the refrigerating system;

21.4 All the documents mentioned above are attached to the equipment and delivered in the relevant document compartment. (pocket inside the electrical board on the right-hand door).

20. Danger signs

20.1 Caution voltage triangle sign black thunderbolt on yellow background near the master switch handle.



20.2 Manufacturer sticker identifying the electrical board, at the right lower corner inside the panel. It contains the name of the manufacturer, the electrical board code, the serial number and manufacturing date. When failure is reported all these details must be provided to Epta Quality Department.

21 Important notice

Board breaking capacity

The circuit-breaking capacity (Icu) of the electrical board is 50kA.

This information must be carefully considered when installing the equipment.

(Icu=rated ultimate circuit-breaking capacity).

Coordinating power equipment

The devices protecting compressors (overcurrent cutout-contactor) and condenser fans (magnetic circuit-breaker and contactor) must be coordinated according to standards DIN VDE 0660, part

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102/IEC947-4-1.

Coordination can be of two types: type one and type two. Epta electrical boards are designed for coordination type 1 (one): **this means that the overcurrent cutout and relevant contactor must be replaced after short circuit has occurred downstream from the contactor** (e.g. winding of compressor electric motor).

22. Electrical options available on request:

22.1 The standard electrical board does not have a neutral wire.

22.2 An electrical board with neutral wire is only provided for applications including single-phase condenser fans.

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060 - WIRING DIAGRAMS

The wiring diagrams for refrigerating systems Energy System 200/300 are delivered inside the electrical board or attached to the “Installation, Use and Maintenance Manual for the refrigerating system” according to the relevant configuration.

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070 – REGULATION

Regulation electrical boards

Manufacturer Model

Carel IR 32 W3

IR 32 Z3

Danfoss EKC

331T

The position of controller Carel IR32 W3/Z3 is on the left, on the fixed top profile.

Controller Danfoss EKC331/T is on the front panel, behind a plexiglass protection door; open this to access the controller.

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080 - OUTSTANDING RISKS AND EMERGENCY SITUATIONS

All jobs carried out around the equipment must be done by authorized and competent personnel.

General risks

Component considered	Outstanding risk	Type	Caution
Exchange battery	Minor injuries	Contact	Avoid accidental contact. Only handle with protective gloves.
Compressors	Burns	Contact	Avoid accidental contact. Only handle with protective gloves.
Discharge pipes	Burns	Contact	Avoid accidental contact. Only handle with protective gloves.

Area considered	Outstanding risk	Type	Caution
Area around equipment	Injuries Intoxication Serious burns Death	Explosions due to increase in ambient temperature following a fire.	Never leave compressor discharge and suction valves closed. Only shut them for maintenance purposes.
Area around equipment	Injuries Intoxication Serious burns Death	Fire due to short-circuit or overheating of power cable upstream of machine cutoff switches.	Connection cables and protection devices must be correctly sized following the instructions in Epta's technical literature
Danger area	Serious burns Electric shocks Death	Insulation fault of power cables located upstream of machine power cutoff switches.	Open the main system electrical board switch in the event of having to perform any jobs on the terminals upstream of the machine cutoff switch.
Danger area	Electric shocks Death	Metal parts energized.	Connect the electrical board of the equipment to the earth sockets so that all the metal parts of the unit are properly earthed.
Danger area	Serious burns Electric shocks Death	Contact with energized parts that have become accessible due to removal of covers.	Open the machine cutoff switch and lock this with the safety padlock provided before removing the covers and accessing internal equipment parts.
Danger area	Electric shocks Death	Maintenance of energized parts by authorized persons.	Never perform any jobs in the rain or when in contact with water and always work in the presence of another person.

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	(R-11 = 1) =0.28 Potential global warming effect of halocarbons;; ODP; (R-11 = 1) = 0
Disposal	Waste refuse/unused products: usable through reconditioning. contaminated containers: depressurized containers should be returned to the supplier.
Details of regulations	EEC Directive Safety sheet: D91/155/EEC amended by D 93/112/EEC "hazardous substances and compounds" Hazardous compounds: D 67/548/EEC amended by D 93/21/EEC "labeling guide" Circulars 46/79 and 61/81 issued by the Ministry of Labor "Risks relating to the use of products containing aromatic amines" L.D. 133/92 "Regulations relating to the disposal of hazardous substances in groundwaters" L.D. 277/91 "Protection of workers from noise, lead and asbestos" M.D. 28/01/92 "Classification and rules governing packaging and labeling of hazardous Compounds" P.D. N. 175/88 "Activities entailing serious accident risks (Seveso Law)" P.D. N. 203/88 "Emissions into the atmosphere" P.D. N. 303/56 "Work hygiene" P.D. N. 547/55 "Regulations governing accident prevention" Law 319/76 "Protection of waters (also known as Merli law)"

These indications conform to those provided by Dupont De Nemours and are to be considered as based on the latest knowledge relating to the substance in question. Products must be used for the specific purposes for which they were intended in accordance with the indications shown above. All other uses must be carefully assessed in terms of the risks involved. The list of rules and regulations is provided as a mere indication and should not be considered complete as the user shall be responsible for making reference to the official regulations of the country of installation, both in terms of use, storage and handling of products.

Safety sheet for lubricant oil Mobil EAL Arctic 22

1. PRODUCT AND SUPPLIER IDENTIFICATION

PRODUCT NAME: MOBIL EAL ARCTIC 32

SUPPLIER: Esso Italiana S.r.l. V.le Castello della Magliana, 25 00148 Roma ITALY Tel. + 39 06 6569 2400

Emergency, 24 hours: Centro Antiveleni Policlinico Universitario (Poison Center University Clinic

"A. Gemelli" Tel. 39 06 3054343

Technical info/Products: 800 011 723

PURPOSE: oil for refrigeration compressor

2. COMPOSITION /INFORMATION ON INGREDIENTS

NAMES AND CHEMICAL SINONYMS: synthetic esther and additives

COMPONENTS TO BE LISTED ON THE SAFETY SHEET:

(according to EU or other International body):

None.

3. HAZARD IDENTIFICATION

Under normal use conditions, this product cannot be considered as hazardous based on EU guidelines (see Section 15).

POTENTIAL EFFECTS ON HEALTH: Under the normal use conditions provided for by the manufacturer, this product does not represent a health hazard. Excessive exposure may cause eye, skin or breathing system irritation.

For further effects on health and/or toxicological details, see Section 11.

Note: this product may not be used for applications other than those foreseen by the manufacturer without previous consultation with an expert.

4. FIRST-AID MEASURES

CONTACT WITH EYES: rinse with water thoroughly. Should irritation appear, call a doctor.

CONTACT WITH SKIN: wash contact areas with water and soap. Daily remove and clean garments soaked in oil and also wash affected areas.

NOTICE IN CASE OF ACCIDENTAL INJECTION: if the product is injected in or under the skin, or in any body part, regardless of the appearance or of wound size, have the patient be seen by a surgical emergency doctor immediately. Even though the initial symptoms from a high-pressure injection may be minimal or nonexistent, speedy surgery may significantly reduce damage.

INHALATION: no problem is expected from this. However, if following exposure to high vapor or mist concentration the person exposed experiences breathing soreness, dizziness, nausea or a fainting fit, call a doctor immediately. If the person stops breathing, give artificial respiration. using a manual device or either expired air ventilation.

INGESTION does not represent a problem. In case of pain, resort to medical care. Do not cause the person to vomit.

5. FIRE-PREVENTION MEASURES

FIRE-FIGHTING EQUIPMENT: foam, CO2, dust or water-mist extinguishers.

SPECIAL FIRE-FIGHTING PROCEDURES: The use of foam or water may cause foaming. Use water to cool containers that have been exposed to heat. Pressurized water may be used to wash off the material spilt in the area affected by the fire. Prevent leaks from the fire-fighting system and pollution of rivers, sewers and drinkable water lines.

SPECIAL PROTECTION EQUIPMENT: use a respirator to fight fires in closed environments.

SPECIAL FIRE AND EXPLOSION HAZARDS: Note: pressurized mist may form an explosive mixture.

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COMBUSTION PRODUCTS. exhalations, smoke, carbon dioxide, sulfur oxide, aldehydes and other products of decomposition in case of incomplete combustion.

flashing point C (F): 230(446) (ASTM D-92).

inflammability limits (% vol. in air, approximately) -LEL: 0,9%, UEL: 7,0%

IDENT. OF NFPA HAZARD: Health: 0 , Inflammability: 1 , Reactivity: 0

6. PROCEDURES IN CASE OF ACCIDENTAL SPILLING

PROCEDURES TO BE NOTIFIED: report spills to the relevant authorities, e.g. Health authority and Fire Squad. If the leak may affect the sewer system or rivers, immediately contact the Health authorities. In case of accident or spills on roads, report to the Police and Fire Squad and, if necessary, to the Health Authority.

PROCEDURE IN CASE OF PRODUCT LEAK OR SPILLING:

a) SPILLS ON GROUND: stop the spilling at the source using normal safety measures. Use any measure needed to minimize effects on groundwater. Recover by pumping out or contain using sand or other appropriate material and collect in suitable containers. As for disposal procedures, see section 13.

b) SPILLING ON WATER: immediately contain using floating barriers. Warn crafts or swimmers. Report to the relevant authorities (port and marine authorities, etc.). Remove the product from the surface by skimming or using suitable absorbing substances. When this is allowed by the relevant authority, consider using a suitable dispersant, if appropriate for localized oil-spilling.

ENVIRONMENTAL PROTECTION MEASURES stop the material from reaching the sewer system, water sources or depressions; if the product has polluted the soil and/or vegetation, notify the relevant authority.

PERSONAL PRECAUTIONS: See Section 8

7. HANDLING AND STORING

SPECIFIC USES: oil for refrigeration compressor

MANIPULATION: this material is not appropriate for use in compressors aimed for breathing air. High-pressure injection of oil under the skin may be determined by a leak of pressurized product due to a hydraulic line failure. Always see a doctor. No special precautions are requested other than good hygienic practice. See Section 8

for further advice on personal means of protection when using this product.

WAREHOUSING: keep containers closed when they are not in use. Do not keep containers open and unlabelled. Keep away from strongly oxidizing agents and from combustible material. Do not store in the vicinity of heat sources, sparks, flames or strong oxidants.

SPECIAL PRECAUTIONS: Avoid leakage and seepage in order to avoid slipping hazard.

NOTICE REGARDING EMPTY CONTAINERS: empty containers may hold residue (liquid and/or vapor) and therefore be hazardous. DO NOT PRESSURIZE, CUT, WELD, DRILL, EMERY-POLISH OR EXPOSE CONTAINERS TO HEAT, FLAMES, SPARKS, STATIC ELECTRICITY OR OTHER SOURCES OF IGNITION; CONTAINERS COULD EXPLODE AND CAUSE INJURY AND DEATH. Do not try and fill them or clean them because residue is hard to remove. Empty drums must be completely drained and then closed tight and sent to reconditioning. Dispose of the containers in an environmentally safe manner and following the standards in force.

8. EXPOSURE CONTROL / INDIVIDUAL PROTECTION

PROFESSIONAL EXPOSURE LIMITS: this product does not contain any component for which exposure limits have been acknowledged.

VENTILATION: In case oil mist forming, keep exposure below the limits provided using appropriate ventilation means, localized suction lines or screening.

BREATHING PROTECTION: in case of oil mist and/or insufficient ventilation, wear a suitable and approved breathing system protecting device.

EYE PROTECTION: If contact with the eyes is likely to occur, wear safety goggles with side protection or chemical protection.

SKIN PROTECTION: In normal conditions this is not required. In case of frequent spraying or contact with liquid wear gloves that may resist oil and/or other protective apparel. Proper personal cleansing is always required.

ENVIRONMENTAL CHECKS SEE SECTION 7

9. CHEMICAL AND PHYSICAL PROPERTIES

For deeper insight, we recommend looking up the data contained in the relevant product sheet.

GENERAL:

PHYSICAL STATE: Liquid

COLOUR: Straw-yellow

SMELL: Weak

LIMIT SMELL: NA

IMPORTANT INFORMATION ON HEALTH, SAFETY AND ENVIRONMENT:

pH: NA

BOILING TEMPERATURE C(F) > 316(600)

FLASHING TEMPERATURE C(F): 230(446) (ASTM D-92).

xxxx (solids): NA

SELF-INFLAMMABILITY C(F): NA

EXPLOSIVE PROPERTIES: NA

OXIDIZING PROPERTIES: NA

VAPOUR TENSION -mm Hg 20 C: < 0,1

RELATIVE DENSITY, 15/4 C: 0,993

WATER SOLUBILITY: negligible

PARTITION COEFFICIENT: NA

VISCOSITY AT 40 C, cSt: 30,0

VISCOSITY AT 100 C, cSt: 5,5

vapour density: NA

EVAPORATED FRACTION: NA

FURTHER INFORMATION:

FUSION TEMPERATURE C(F) NA

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CREEPING POINT C (F): -48(-54)
 FREEZING POINT C (F): NA
 EXTRACTED IN DMSO, IP 346 (%weight): NA
 NA=NOT APPLICABLE ND=UNDETERMINED D=DECOMPOSITION

FURTHER TECHNICAL INFORMATION: it is advisable to contact a sales technical person from the Company.

10. STABILITY AND REACTIVITY

STABILITY (THERMAL, TO LIGHT, ETC.): Stable.
 CONDITIONS TO BE AVOIDED: High temperature and high energy lead to flashing.
 INCOMPATIBILITY (MATERIALS TO BE AVOIDED): Strong oxidants.
 HAZARDOUS PRODUCTS THAT MAY FORM THROUGH DECOMPOSITION: The product does not decompose at ambient temperature.
 DANGER POLIMERIZATION: Does not occur.

11. TOXICOLOGICAL DETAILS

---ACUTE TOXICOLOGY--
 ORAL TOXICOLOGY: Virtually non toxic (LD50: above 2000 mg/Kg). ---Based on tests for similar products and/or components.
 SKIN TOXICOLOGY: Virtually non toxic (LD50: above 2000 mg/Kg). ---Based on tests for similar products and/or components.
 INHALATION TOXICOLOGY: Virtually non toxic (LC50: above 5 mg/l). ---Based on tests for similar products and/or components.
 EYE IRRITATION: virtually non irritant. ---Based on tests for similar products and/or components.
 SKIN IRRITATION: virtually non irritant. ---Based on tests for similar products and/or components.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL IMPACT:
 When no specific environmental information is provided for this product, this issue is evaluated based on information for representative products.
 ECOTOXICITY: LC/EC50 Acute: young rainbow trout: Practically non toxic – Based on tests performed on similar products (EC50: >5000 ppm).
 MOBILITY: not determined.
 PERSISTANCE AND DEGRADABILITY: this product meets OECD criteria for speedy biodegradability. Small product spills not used on land, will speedily be biodegraded by natural organisms existing in soil when exposed to air.
 BIOACCUMULATION POTENTIAL: not determined.

13. DISPOSAL REMARKS

WASTE DISPOSAL: HOWEVER SPEEDILY BIODEGRADABLE, THIS PRODUCT MUST NOT BE INDISCRIMINATELY RELEASED IN THE ENVIRONMENT. This product is appropriate for combustion in a closed controlled burner and to be recycled in an appropriate plant. Also, it can be disposed of in a waste disposal plant. Disposal in farming land or purifying plant may be applicable, but needs approval from the relevant authorities. The conditions of the waste at the time of disposal may affect the availability of the above options.
 EUROPEAN CODE FOR WASTE: 13 01 12 (synthetic oil for hydraulic circuits, easily biodegradable) Code attribution implies that the product has been used for the application it was aimed for. In case of different use and/or in case of pollutants, the user may have to assign a different code. According to Directive 91/689/EEC on hazardous waste, this waste is considered as hazardous and subject to the rules set out by this Directive, unless Article 1(5) of the Directive is applied.

14. HANDLING DETAILS

USA DOT: Not regulated.
 DNR: Not regulated.
 IMO: Not regulated.
 IATA: Not regulated.
 STATIC ACCUMULATOR (50 picosiemens or less): YES

15. DETAILS OF REGULATIONS

CLASSING AND LABELLING (UE): The product is not hazardous according to the EU Directives on Hazardous Substances/Preparations. EU labeling not required.
 THE FOLLOWING COMPONENTS OF THE PRODUCT ARE LISTED BELOW:
 CHEMICAL NAME CAS NUMBER QUOTATION LIST
 *** NO COMPONENT TO REPORT ***
 --- QUOTATION LIST REFERENCE --
 1=IARC 1 6=NO ALLERGIA 11=DE TERAT B 16=DE CANC B 21=CH CANC
 2=IARC 2A 7=SE ALLERGIA 12=DE TERAT C 17=AT TERAT A22=at
 3=IARC 2B 8=SE CANC 13=DE TERAT D 18=AT TERAT B
 4=NTP CANC 9=DK CANC 14=DE CANC A1 19=AT TERAT C
 5=NTP SUS 10=DE TERAT A 15=DE CANC A2 20=AT TERAT D
 CANC= CANCEROGENO; SUS= SOSPETTO CANCEROGENO; TERAT= TERATOGENO
 AT = Austria DE = Germany NO = Norway
 CH = Swizerland DK = Denmark SE = Sweden

16. FURTHER INFORMATION

NOTE: PRODUCTS BY EXXON MOBIL CORPORATION AND AFFILIATES ARE FORMULATED WITHOUT THE USE OF PCB. Medical studies have indicated that many hydrocarbons entail potential health hazards that may vary from person to person. The information provided in this Safety Data Sheet reflect the specific use expected for the product, which may not be used for other applications. At any rate, consider the following advice:
 INDUSTRY LABELS

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Under the normal use conditions provided for by the manufacturer, this product does not represent a health hazard. Excessive exposure may cause eye, skin or breathing system irritation. Always observe the rules for good cleanliness. Emergency measures: Wash the skin with water and soap. Wash eyes with plenty of water. If the person is overwhelmed by smoke or vapour, take the person outdoors. If the product has been ingested, do not cause vomit. If symptoms persist, call a doctor. Read and understand the Safety Sheet before using this product.

The sections in this Data Sheet printed in bold highlight recent important changes made to the advice and information provided.

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090 - MAINTENANCE

Constant supervision of machine conditions and correct maintenance guarantee reliability and efficient operation of the entire system over time. This chapter caters for qualified personnel and addresses scheduled controls and maintenance but also deals with a series of checks that the user himself can do at the indicated intervals. For example, some simple visual controls of the system's main components that require no particular technical skills

Periodic machine maintenance

- Control of machine structural integrity: the metal panels composing the casing must be firmly secured to the structure; removable panels and peep panels must not cause irregular vibration or noise during operation.
- Control oxidized parts: Rust must be removed; ascertain rust causes, remedy and if necessary repair.
- Control of leaks: unusual oil spots on the floor, condensation due to damaged insulation and leaking piping demand immediate assistance from Epta's after-sales service.
- check the integrity of the electric power line: the power cord connecting the machine to the mains must be in perfect condition, with no cracks or damage that may jeopardize insulation. Should repairs be needed, request assistance from the after-sales service.
- Check the tripping capacity of safety pressure-switches as per the laws in force
- Check the tripping capacity of the pressure-switches protecting the compressor¹

Machine maintenance

The actions indicated here below are restricted to the authorized personnel and must be performed following the recommended frequency after start up.

Disconnect the machine from the mains before attempting any maintenance. Avoid contact with the hot internal parts.

CONTROL/ACTION	WEEKLY	MONTHLY	2-YEARLY
Measure discharge pressure	X		
Measure suction-line pressure	X		
Measure electrical power voltage	X		
Measure current intensity	X		
Check whether electrical contacts and connections are tight		X	
Check compressor oil level		X	
Check moisture and liquid viewer		X	
Check suction filters			X
Check whether motor-driven fans are securely fastened			X

¹ I pressostati vengono tarati in fase di collaudo in conformità all'istruzione operativa QOP019110A

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Control of the **liquid sight glass** downstream of the filter dryer may indicate that the filter dryer cartridge needs replacing. The color of the sensitive element may vary from green to yellow according to the amount of humidity in the circuit. Deep yellow or yellowish pink indicates that the cartridge is unable to hold any more moisture and must be replaced (code Epta 761300028).

A strong flow resistance along the suction filters denotes that the mechanical filtering cartridge is clogged with residue and dirt. Cartridges must then be replaced (Code). Epta 761300034).

Safety valve

It is advisable to replace the safety valve after it has tripped; valve discharging may cause manufacturing residues that proceed from components and pipes to build up against the valve seal, which may impair valve tightness after opening.

	Safety valves must be replaced regularly as called for in the instructions from the valve's manufacturer. They must be test-operated as established by Italian law DM 1/12/2004 n° 329, attachment B:
	for systems in category III and V : every 3 years. for systems in category I and II: every 4 years.

Prior to replacing the valve, make sure that the system area in which the jobs are carried out is free from pressure and high temperature. When installing, strictly follow the instructions on the package.

Compatibility of lubricants approved by Copeland Europe for scroll compressors series ZB/ZF

Find below a table showing compatibility between lubricant by different manufacturers, which are suitable for Copeland motor-driven compressors. Before any such jobs, it is advisable to check the original oil type on the compressor rating plate. When in doubt, contact Epta's service center.

Oil supplied with the equipment

Compressore tipo Compressor type	Refrigerante Refrigerant	Tipo di olio Oil type	Viscosità a 40°C Viscosity at 40°C	Carica originale Original charge
ZF09 - ZF18 ZB21 – ZB45	HFC (R404A)	POE	32 cst	ICI Emkarate RL 32 CF

Approved oil for topping up and recharging

Compressore tipo Compressor type	Refrigerante Refrigerant	Tipo di olio Oil type	Viscosità a 40°C Viscosity at 40°C	Oli approvati Approved oils (adjusting & recharging)
ZF09 - ZF18 ZB21 – ZB45	HFC (R404A)	POE	32 cst	MOBIL EAL Arctic 22 CC ICI Emkarate RL 32 CF

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Tollerated oil for limited topping-up

Compressore tipo Compressor type	Refrigerante Refrigerant	Tipo di olio Oil type	Viscosità a 40°C Viscosity at 40°C	Oli tollerati Oil tolerated for limited refilling
ZF09 - ZF18 ZB21 – ZB45	HFC (R404A)	POE	32 cst	MOBIL EAL Arctic 22 ICI Emkarate RL 32 S

	Specific servicing jobs on individual components must be carried out following the schedules and methods stated in the relevant use and maintenance manual attached to this manual.
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Control of operating condition and overall condition as per DM 329/04

Such inspection and testing must be performed by qualified personnel (ISPELS or other notified bodies) and specific requests must be addressed to them.
Inspection intervals depend on the PED category quoted in the conformity declaration for the refrigerating plant as indicated in attachment B to M.D: 329/04.

DM 329/04 Attachment B	
TABLE – Reconditioning intervals for pressure equipment (section 10, subsections 3 and 5)	
PRESSURE EQUIPMENT	INSPECTION LIMITS AND INTERVALS
EQUIPMENT/SETS OF APPLIANCES CONTAINING FLUIDS GROUP 2 (D.Lgs. 93/2000 art.3)	
Vessels/sets of devices containing compressed, liquefied, dissolved or vapour gas other than water vapour under categories III and IV, and vessels containing water vapour or superheated water belonging in categories from I to IV	Inspection intervals: - every 3 years; Test-operation - every 10 years; Control of overall condition
Vessels/sets of devices containing compressed, liquefied, dissolved or vapour gas other than water vapour under categories I and II	Inspection intervals: - every 4 years; Test-operation - every 10 years; verifica d'integrità

Equipment decommissioning and disposal

At the end of its working life, or in case the equipment or parts thereof are decommissioned, the equipment must be disposed of in compliance with the laws in force at the time of decommissioning.

- In particular, the system must be scavenged and the refrigerating fluid must be recovered using the appropriate equipment. The refrigerant can later be re-used or stored and disposed of by an authorized company.
- Compressors contain oil that will have to be duly recovered and disposed of by an authorized company.
- Do not release the refrigerating fluid, the oil and the other materials in the environment.

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- Do not use open flames or disassemble parts of the system before having recovered the refrigerating fluid; such recovery must only be performed by specialized personnel.