



“IP” series

INDUSTRIAL WATER CHILLER



Use & Maintenance Manual

IPE - IPC

CONFORMITY

DECLARATION OF CONFORMITY

The Company:

Euroklimat S.p.A.
with registered office in Via Liguria, 8
27010 SIZIANO (PV)

DECLARES
Under ist own responsibility



that the INDUSTRIAL WATER CHILLERS of the range "IP" are in **conformity** with:

- Machinery Directive 98/37/EC.
- Low Voltage Directive 73/23/EC.
- Electromagnetic Compatibilit  Directive 89/336/EC.
- Pressure Equipment Directive 97/23/CE - Module H



Name: **MICHELE**
Surname: **BEDIN**
Position in Company: **MANAGING DIRECTOR**

Date: March 2006

Signature *Michele Bedin*

DESCRIPTION

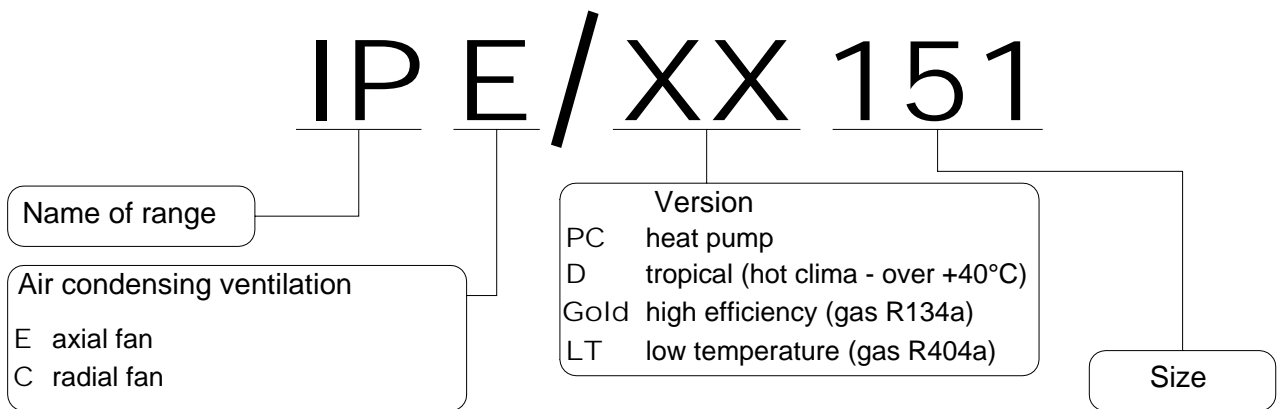
The liquid chillers of "IP" range have been made to meet the needs of industrial processes or plants where the production of chilled water is required.

A variety of models and powers are available to cover a vast range of applications, with inlet water temperatures between -30° and + 25 °C.

Cold water is produced through a chilling cycle, as shown in the diagram given later in this booklet.

MACHINE CODE IDENTIFICATION

The model of the machine, write on the **rating plate (CE)**, it's very easy to recognize it by the name (see example).



CONTENTS

Identification	page 4
Warranty	page 4
General recommendations	page 4
Basic safety use	page 5
Qualified operators	page 6
Specialized maintenance electrician	page 6
Specialized maintenance mechanic	page 6
Refrigeration technician	page 6
Transport operator	page 6
Person assigned to switching ON/OFF	page 6
Safety officer	page 6
Conditions of use	page 6
Storage	page 7
Transportation and handling	page 7
Example of lifting with a lift truck	page 7
Example of lifting with ropes	page 8
Operating spaces	page 8
Installation	page 8
Water connections	page 9
Hydraulic connections dimension	page 10
Safety valves installation	page 10
Electrical connections	page 11
Safety system connections	page 11
Power supply	page 11
Check of protective devices and unit	page 12
Filling the water circuit	page 12
Starting and use	page 14
Controls	page 14
Unit starting	page 14
Check of cooling	page 17
Check of safety devices	page 17
Compressor START/STOP	page 17
Standby	page 17
Switching off	page 17
Control panel	page 18
Display	page 18
Remote control panel (optional)	page 19
Set point modification	page 20
Routine maintenance	page 22
General safety rules	page 22
Checking the belt tension (IPC 81...802)	page 22
Checking the condensing coil	page 22
Checking the electrical equipment	page 22
Extraordinary maintenance	page 23
Adjusting the belt tension (IPC 81...802)	page 23
Replacing the belt (IPC 81...802)	page 23
Adjusting the velocity ratio (IPC 81...802)	page 23
Cleaning the coil	page 24
Reset of oil press. switch (mod. 251...802)	page 24
Seasonal stop	page 24
Seasonal start	page 24
Troubleshooting	page 25
List of alarms µchiller ²	page 25
List of warnings µchiller ²	page 25
Programming parameters	page 31
R407c gas chemical data sheet	page 44
R404a gas chemical data sheet	page 47
R134a gas chemical data sheet	page 50

IDENTIFICATION

The units may be identified through:

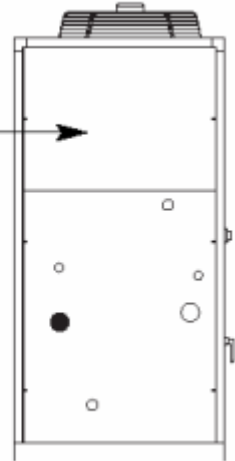
Rating plate (CE)

This gives the technical and performance data of the unit and is located on the fittings side of the unit.

It's advisable to take note of the SERIAL NUMBER of the unit and to conserve it with care.

The serial number is indispensable for spare parts and assistance support.

		Euroklimat S.p.A. Via Liguria, 8 27010 SIZIANO (PV)		
MODELLO _____	MATRICOLA _____			
	CODICE _____			
POTENZA FRIGORIFERA	_____ kW			
POTENZA TERMICA	_____ kW			
TIPO REFRIGERANTE	_____			
CARICA REFRIGERANTE	_____ kg			
PRESSIONE MASSIMA	_____ bar			
ALIMENTAZIONE ELETTRICA DI POTENZA	_____ V - - - Hz			
ALIMENTAZIONE ELETTRICA AUSILIARI	_____ V - - - Hz			
POTENZA ELETTRICA MAX. ASSORBITA	_____ kW			
CORRENTE MAX. ASSORBITA	_____ A			
CORRENTE DI SPUNTO	_____ A			
GRADO DI PROTEZIONE	IP X 4			
SCHEMA ELETTRICO	_____ N°			
PESO IN FUNZIONAMENTO	_____ kg			
ANNO DI FABBRICAZIONE	_____			



If the plate has become detached and is missing, request a copy from the **Euroklimat S.p.A.** Service Department.

WARRANTY

The unit described in this guide is **subject to the following form of warranty**, which is considered as automatically accepted and undersigned by the customer at the time of placing the order with **Euroklimat**.

The supplier guarantees the workmanship and good quality of the material of the supply, undertaking during the warranty period specified below to repair or replace, at its discretion, as quickly as possible those parts that are shown to the company's satisfaction to be defective due to faulty materials, construction or workmanship, which make them unsuitable for the use for which they are designed. The foregoing provided there is no negligence by the buyer, damage caused by natural wear and tear, negligence or misuse by the user, damage caused by third parties, force majeure or in any case damage from other causes not attributable to defects in constructional quality.

The supplier shall not be under any liability to compensate for direct or consequential damage of any nature or due to any reason whatsoever.

The warranty is automatically rendered invalid should the units in respect of which complaint is made have been repaired or altered in any way whatsoever.

The foregoing warranty and conditions are subject to the buyer's obligations as to payment having been performed and to compliance by the buyer with contractual obligations.

No employee, sales representative or After-Sales Service Centre of **Euroklimat**, or any other person is authorised to grant any form of exception to the foregoing warranty and conditions.

For further details refer to the terms of the agreement entered into at the time of purchase, which are the only valid conditions.

GENERAL WARNINGS

Before starting to use the units, the contents of this manual must have been fully read and understood.

This operating and maintenance manual describes the construction, operation and directions for use and maintenance of the units made by **Euroklimat S.p.A.**

Euroklimat S.p.A. is relieved of all and any liability for damage or injury due to failure to comply with the instructions in this manual.

If in doubt of any kind whatsoever or in need of explanations, **Euroklimat S.p.A.** is ready with its








own qualified technical personnel to provide all the necessary indications.

To make it easier to identify and recognise the units it is important that the technical data printed on the label applied to the exterior of the units and in particular the serial number are always quoted.











The unit must not be made to operate other than under design conditions, even for a short time.

Under no circumstances may parts be inserted that do not guarantee safety.

BASIC SAFETY RULES

-  The unit must be fitted with an emergency stop by the installer. The user must check that this has been done before starting the unit.
-  The unit is fitted with fixed guards to protect its components. When installed outdoors, a canopy must be provided to protect the unit from snow, which could create risks during operation if it freezes on the fan blades. **Respect the indication of the Chapter "Installation".**
-  Replace any damaged or missing supply lines of the various energy sources.
-  The refrigerant fluids could be R407c, R134a or R404a depending on the version. They are not harmful if inhaled. They only become dangerous if they saturate the environment. Under certain conditions some fluids are inflammable. See **safety data sheet at the end of the manual** for the specifications of each fluid.
-  The lubricating oil in the compressor is not dangerous. Gloves must be worn, however, when handling it and it should not be swallowed.
-  For all work concerned with installation, commissioning, equipping, use, alterations to the conditions of use and working methods, routine maintenance, inspection and periodic maintenance, comply with the procedures given in the relative sections of this manual. The manual must be kept to hand for ready reference
-  The unit must be used in the conditions envisaged in this operating and maintenance manual.

Some recommendations are given below for the **USER**, who should avoid abnormal conditions of use. Any condition of use other than those expressly described in this manual must be avoided.

-  Do not climb onto the unit;
-  Operate with the unit correctly installed in the recommended position;
-  Operate with the unit correctly installed in the recommended position;
-  Do not start the unit without the fixed guards correctly mounted;
-  Do not remove the guards when the unit is in operation;
-  Do not remove the guards when the unit is powered;
-  Do not clean the unit when it is in operation.
-  Do not install the unit in corrosive or explosive environments;
-  Do not disconnect or remove safety parts or devices;
-  The unit may not be used other than in the conditions described in this manual.

Euroklimat S.p.A. declines every responsibility for eventual damages that can directly or indirectly derive to persons or things in consequence to the lapsed observance of the present instructions.

Any assembly/disassembly carried out by the USER that is not contemplated in this manual or authorised by "Euroklimat", will be considered as tampering, thereby jeopardising the safety functions and invalidating the warranty of the unit.

QUALIFIED OPERATORS

Only the following professionals may operate the unit after having received all the necessary instructions contained in this manual:

Specialised maintenance electrician

The electrician must have general experience with switchboards and specific experience with the control panel and electrical components of chillers or similar appliances in the air-conditioning sector.

The electrician may only carry out the specific operations indicated in this manual, scrupulously following the relative instructions.

Specialised maintenance mechanic

The mechanic must have general experience with mechanics in general and specific experience with chillers or similar appliances in the air-conditioning sector.

The mechanic may only carry out the specific operations indicated in this manual, scrupulously following the relative instructions.

Refrigeration technician

The refrigeration technician must have specific qualifications from a suitable school for similar appliances or work under the supervision of instructed personnel. The refrigeration technician may only carry out the specific operations indicated in this manual, scrupulously following the relative instructions.

Transport operator

The transport operator may only carry out the specific operations indicated in this manual, scrupulously following the relative instructions.

Person assigned to switching on and off (Ordinary and mechanical operator)

After having read the information in this manual the ordinary operator may manually operate the unit with regard to the following functions: switching on, switching off, display of alarms.

In any case this operator may only carry out the specific operations indicated in this manual, scrupulously following the relative instructions.

Safety officer

The safety officer is responsible for protection and the prevention of occupational risks as set forth in **European Directive 89/391/EEC** (Safety in the workplace).

The safety officer shall make certain that all the persons who operate the unit have received all applicable instructions which are contained in this manual, including the initial installation and commissioning operations.

CONDITIONS OF USE

The unit in **standard version (gas R407c)** has been designed for operation according to the following parameters:

- liquid: **water or water + ethylene glycol;**
- inlet water temperature range: **-5 / +20 °C for standard version; (-25 / +15°C for LT version)**

Mixture temperature	% ethylene glycol
Standard version (R407c – R134a)	
+20 °C	-
+15 °C	-
+10 °C	5% (suggested)
+5 °C	10%
0 °C	15%
-5 °C	25%

Mixture temperature	% ethylene glycol
Low temp. version LT (R404a)	
-5 °C	25%
-10 °C	30%
-15 °C	35%
-20 °C	40%
-25 °C	45%
-30 °C	50%

- Range of ammissible temperature: **-5 / +40 °C (+45°C for D version _ tropical)**

For all that concerns:

- model;
- power supply;
- load and type of refrigerant;
- weight;
- serial number;

refer to the **rating plate** positioned on the hydraulic side of the machine.




Under normal conditions the working life of the unit is estimated to be approx. 25.000 hours of operation and in any case no more than ten years. At the end of this time a general overhaul is recommended to refurbish the unit so that it may still be used in all safety.


STORAGE


Store away from:


- Direct sunlight, rain, sand and wind
- Temperature: max.60°C / min. -10°C
- Maximum rel. humidity: 90%


TRANSPORT and HANDLING


 The courier is always liable for any damage during transit to the goods that have been entrusted to the same. Before preparing the unit for installation and commissioning, a thorough visual inspection must therefore be carried out to check that the packaging is intact and that the unit presents no visible damage nor oil or refrigerant leak. Also ensure that the units correspond to the order that was placed.


 Any damage or complaints should be reported to **Euroklimat** and to the carrier by recorded delivery letter within 8 days from receiving the goods.

 Should one or more components be damaged, do not proceed with starting up the unit and inform **Euroklimat** of the problem, agreeing with the latter the actions to be taken.

 Preferably remove the packaging at the actual place of installation. Internal handling must be carried out with the utmost care, without using unit components as handholds. To avoid damage it is essential when moving the units that they always remain in the position envisaged for their operation.

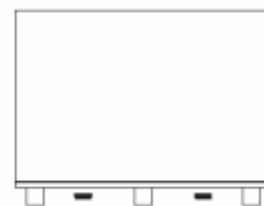
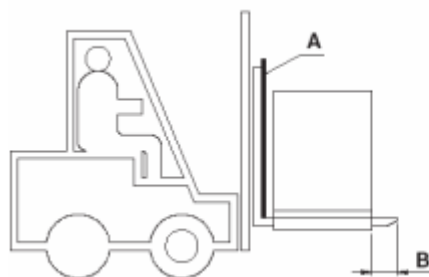
 Do not leave packaged units in places exposed to strong sunlight, since the internal temperature could reach safety device tripping values.

 The water circuit must be fully drained before handling the unit in any way whatsoever.

 Lifting should preferably be carried out with a lift truck. Use a spreader beam if belts or ropes are used for slinging, making sure that there is no pressure on the upper edges of the units or the packaging.

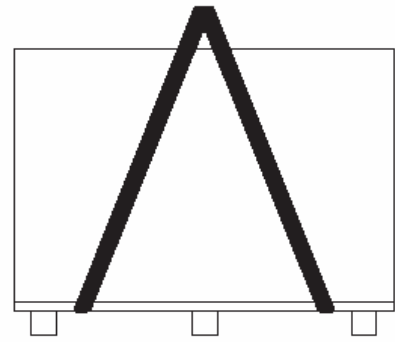
Example of lifting with a lift truck:

- Insert protection for the outer structure of the unit, for example a sheet of cardboard or polystyrene (A).
- Make sure that the forks of the lift truck project at least 100 mm (B) from the other side of the unit.



Example of lifting with ropes:

- Place the lifting pipes like the figure.
- Place rigid structures on the upper edges of the unit so as to ensure it is not damaged (only in the case of one point at which the force acts).
- Tighten the hoisting straps gradually, ensuring that they are correctly positioned.
- Begin hoisting the unit.



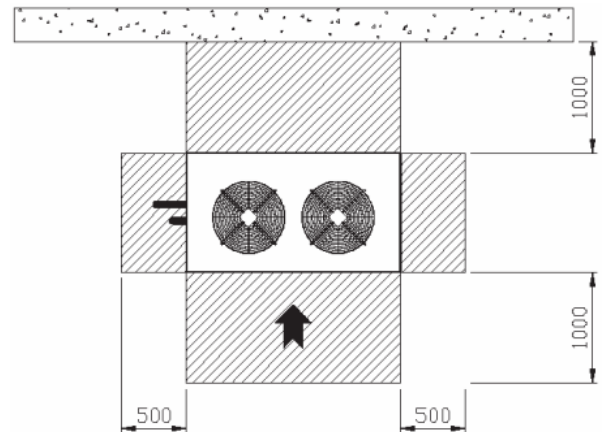
OPERATING SPACES

The customer should check that the strength of the supporting surface is suitable for the weight of the unit.

It is unnecessary to fix the unit to the floor for correct operation. If the floor is rough, to ensure a level surface and prevent even the smallest of vibrations, it is advisable to insert a continuous rubber sheet the same size as the base supports.

It is also advisable to make sure the unit is level. Should this be impossible or difficult to accomplish, the unit must not tilt more than 0.5°.

For a correct operation and for maintenance interventions respect the free space around the unit (see figure).



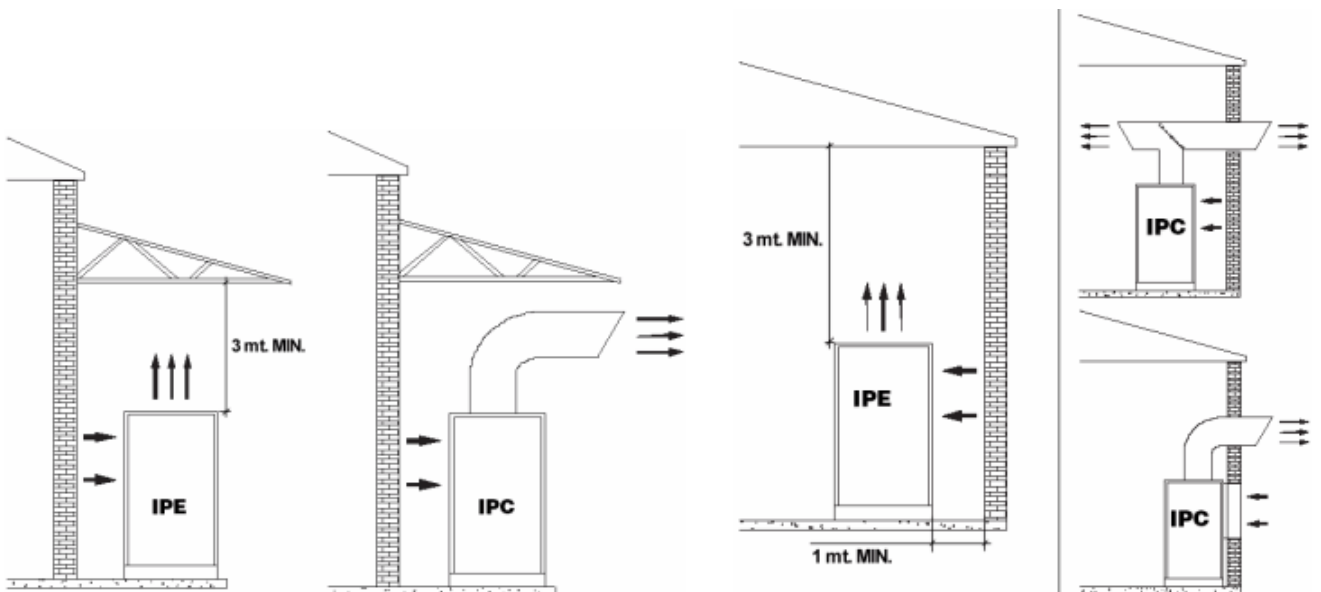
INSTALLATION



The units must be installed without obstructing the air intakes.

When installing under a canopy roof, this roof must be at least 3 meters above the top of the unit.

Examples of correct installation are shown in the figures.



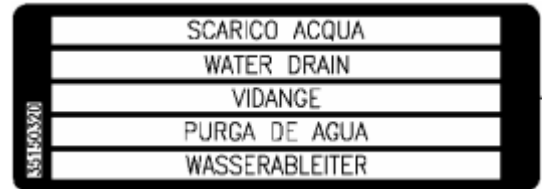
WATER CONNECTIONS

Authorised personnel: **Maintenance mechanic**

Before carrying out the water connections to the user positions on the water circuit, the installed piping must be flushed through to eliminate machining residues and in any case to reveal any leaks.

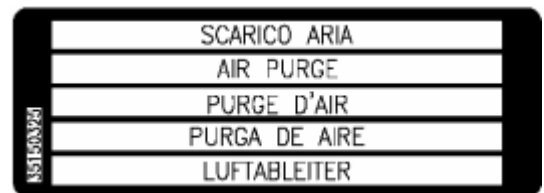
Water drain

This outlet is fitted with a hose connecting tap suitable for attaching, and securing with a hose clamp, a plastic hose with an inside diameter of **13 mm**. It allows the filling of the tank connecting it to the water net. During the unfilling of the inside tank (if present), it allows to drain the water to the extern.



Air purge

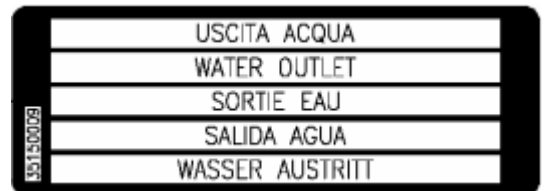
This outlet is fitted with a hose connecting tap suitable for attaching, and securing with a hose clamp, a plastic hose with an inside diameter of **13 mm**. During the unfilling of the inside tank (if present), it allows to drain the water to the extern.



Water outlet

This connection is male and has a diameter that changes by the size of the unit as for following table. Connect the outlet pipe of the chilled water to the plant.

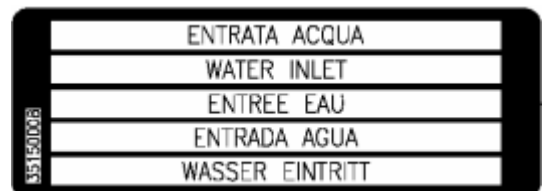
The diameter of the pipe must be equal or major of the diameter of the outlet connection.



Water inlet

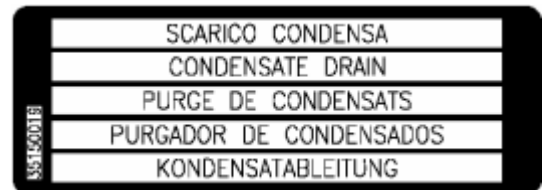
This connection is male and has a diameter that changes by the size of the unit as for following table. Connect the inlet pipe of the heated water from the plant.

The diameter of the pipe must be equal or major of the diameter of the outlet connection.



Condensate drain

"IP" chiller has got a special condensate water recipient positioned under the air condenser; Since the tray collects rainwater it is not compulsory for the outlet to be connected to a drain. In any case the water may be drained off with a plastic hose secured with a hose clamp, the value of the hose diameter being given in the table.



"IP" range	Hydraulic connections dimensions				
Size	Water drain	Air purge	Water outlet	Water inlet	Condensate drain
M2 – M4	13 mm	13 mm	½"	½"	19 mm
M10 –15 – 20			1"	1"	
31 – 51			1"¼	1"¼	28 mm
81 – 101 – 121 – 151			1"½	1"½	
201 – 251			2"	2"	
301 – 351 – 401			3"	3"	
502 – 602			4"	4"	
702 – 802					

Safety valves installation

All the units are fitted with a safety valve on the water side. The purpose of this valve is to drain to the outside through a pipe. It is therefore advisable to connect the valve to a pipe of at least the same diameter in order to convey any discharge from the valve to the outside. This pipe must be located so that the discharge can cause no damage to property or injury to persons. The pipe must also be suitably supported so that it does not weigh on the valve.

The installation must be in conformity with current safety regulations.



If units are not used during the winter, fully drain the water system of all units installed outdoors. If operation is envisaged also in this period or in any case with low ambient temperatures, antifreeze mixtures must be used. With indoor installations, drainage is in any case necessary when the room temperature falls to below 0°C.



For installation diagrams, refer to the examples given in the section "Installation".

Always fit ball shutoff valves on the water inlet and outlet.

If it is possible that the water may be dirty, also install a "Y" filter on the water inlet.

For more information please contact the After Sales Department of Euroklimat S.p.A..

If the USER needs to disassemble some parts for which the procedure is not given in this manual, it is indispensable to request permission and the relevant procedure from "Euroklimat".

Any assembly/disassembly carried out by the USER that is not contemplated in this manual or authorised by "Euroklimat", will be considered as tampering, thereby jeopardising the safety functions and invalidating the warranty of the unit.

During construction of the unit all necessary measures are taken to ensure cleanliness in all the parts. After installation, clean the unit removing the protective substances. Use soft cloths and harmless detergent substances for cleaning, which do not damage the surfaces.

The unit is always tested and inspected in the factory prior to delivery and requires no further controls.

ELECTRICAL CONNECTIONS

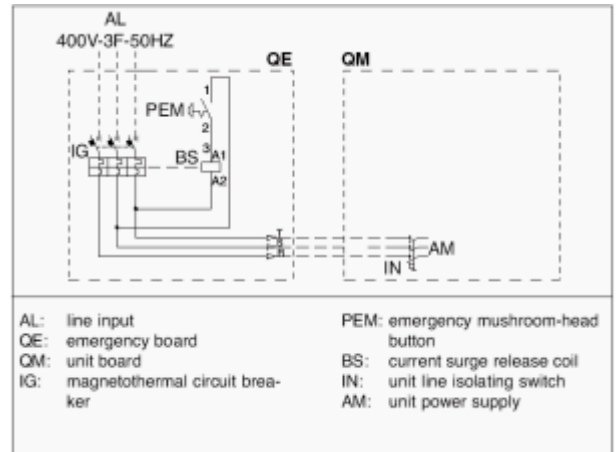
Safety system connections

Authorised personnel: **Maintenance electrician**

The unit must be fitted with an emergency stop, which the installer must put in an easily accessible position. Should just one activation point be considered insufficient, several emergency stops in various points may be installed.

This device is available as an accessory from **Euroklimat**.

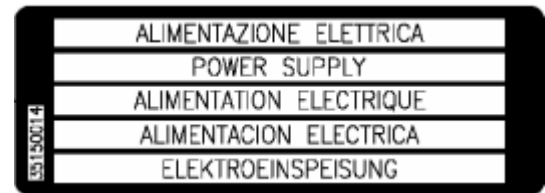
There is just one version for all models.



Power supply

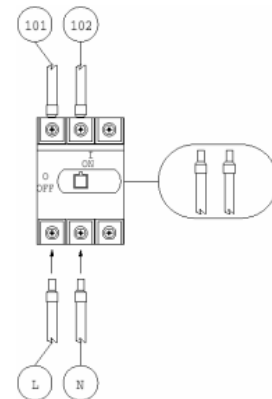
Authorised personnel: **Maintenance electrician**

Carry out all the electrical connections, scrupulously observing the wiring diagrams supplied with the units. The components onboard the unit are protected by the equipment inside the switchboard. It is the end user's responsibility to ensure the correct size and capacity of the power supply cable of the unit in relation to the total input indicated on the wiring diagram and the length of the same. This cable must also be protected by a safety device installed on the user's electrical system.



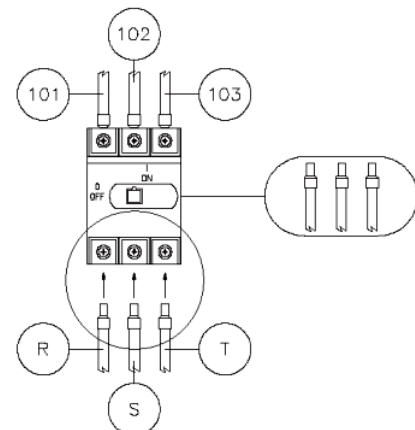
MONOPHASE 230/1/50 power supply connection (mod. M2 / M4 / M10):

Connect the line to terminal **L** on the circuit breaker. Connect the neutral to terminal **N**. The earth wire (yellow-green) is connected to a special terminal inside the electrical panel.



3-PHASE power supply connection (mod. 15-20-31-51-81-101-121-151-201-251-301-351-401-502-602-702-802):

Connect the phase wires to the unit's circuit breaker, respecting the sequence of the phases L1 L2 L3. The **neutral** is not needed. The earth is connected to the special terminal inside the electrical panel. The picture to the side shows an example of connection of the cables. Power supply from below.



Check of protective devices and unit operations before switching on
 Authorised personnel: **Safety officer**

Should any abnormality be found when checking the unit, inform "Euroklimat" and do not operate the unit.

Before switching on for the first time, the unit must be visually inspected, checking that:

No electrical wires are loose, especially at connection points, and that there is no possibility of doubtful contacts.

The fluid circuit connections have been carried out correctly and show no visible leaks or damage.

The air intake and outlet sides have no obstructions of any kind whatsoever that could jeopardise efficient operation.

The fluid circuit connections present no obstructions such as: clogged filters, closed manual or automatic shutoff valves, etc.

Check that all the fixed guards are mounted and properly bolted in position and that the mobile protective elements are closed.

Filling the water circuit

Authorised personnel: **Maintenance mechanic**

Before to start up the unit it's necessary to fill the water circuit

Water / mixture temperature for filling = MAX. 25°C

Filling with water Mod. MICRO2 – MICRO4

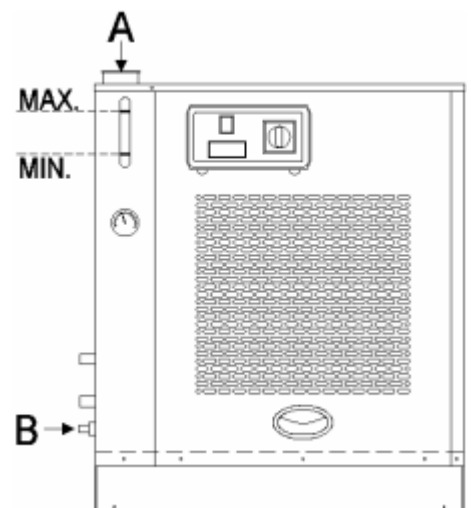
Open the tap (A) positioned on the upper part of the unit.
 Connect the water drain outlet (B) to the water net.
 Opening it the water fills.
 The level of the water in the tank is visible through the indicator on the front of the unit; **when the level reach "MAX" close the water filling from the net.**

Warning:

After having filled the plant and after the pump running, check the water level which it does not decrease under "MIN" level; in this case it's necessary to fill again water using the manual fill by tap A up to reach "MAX" level.



Warning: in this way the unit runs in "open vessel" mode (circuit without pressure).
 The unit is designed also for use with "close vessel" mode (circuit with pressure): **in this case** it's necessary



to close the 2 ball valves positioned inside the unit close tho the tank and **and to install absolutely a closed expansion vessel and the pressure reducing valve.**

Filling with antifreeze mixture Mod. MICRO2 – MICRO4

If it is necessary to use antifreeze mixtures, filling must be carried out with a solution prepared according to the water temperature, as specified in the section "Conditions of Use".

If a ready solution is unavailable, it must be prepared in a container to be connected to the unit water outlet, as described above.

Water filling (Mod. M2-M4 excluded)

Open the air valve (and connect it to a drainage well using a plastic hose) so that any air present in the circuit will be discharged during filling, which will consequently be quicker. Take care that any water that sprays out when the circuit has been filled does not create a hazardous situation. If there are any points in the system circuit higher than the unit air valve, another air valve, if possible automatic, must be inserted at the highest point to ensure complete filling of the circuit.

Connect the unit water outlet tap to the mains water system.

Open the mains water supply to fill the circuit.

When water comes out of the hose connected to the air valve, the circuit has been filled.



Warning:

Once the system has been filled and after having made the pump circulate for some time, check for residual air. If there is still air present, the circuit must be bled and filled up with the missing water. With the system inoperative, it is also necessary to ensure that the pressure in the circuit is only just above zero. This indication is visible through the pressure gauge mounted on the unit.



Warning:

WHEN THE FILLING IS FINISHED YOU HAVE TO CLOSE THE WATER DRAIN TO AVOID THAT THE PRESSURE IN THE CIRCUIT INCREASES.

(Not for versions with closed vessel, which is equipped with pressure reducing valve).

Filling with antifreeze mixture

If it is necessary to use antifreeze mixtures, filling must be carried out with a solution prepared according to the water temperature, as specified in the section "Conditions of Use".

If a ready solution is unavailable, it must be prepared in a container to be connected to the unit water outlet, as described above.

Closed or open tank filling kits, as shown in the following diagrams, are available on request by the customer.

For more information please contact the After Sales Department of Euroklimat S.p.A..

STARTING AND USE

Controls

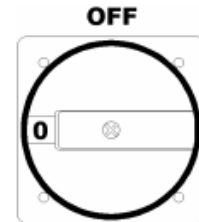
The professionals involved in this section are:

The **Operator**, who must always operate with the fixed guards correctly mounted and check that under no circumstances have they been tampered with.

The **Maintenance men**, who must always operate with the unit at a standstill and after having carried out the required operations, check that all the protective devices are correctly remounted, closed and in proper working order.

The **Safety officer**, who must check that the **Operator** and the **Maintenance men** have received all the necessary information as per this manual. He will check in particular that all the fixed guards have been correctly mounted, are in proper working order and have not been tampered with.

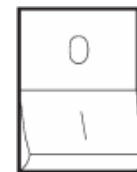
Door interlock.



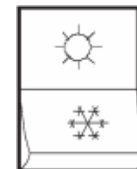
Microprocessor for unit start and control.



Compressor ON/OFF switch.



Compressor SUMMER/WINTER switch. (only "heat pump" switch)



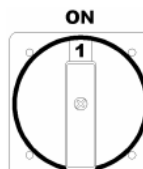
Warning:

Check compliance with instructions up to this point. It is only possible to operate the unit or its parts with the front panel closed and the power on/off switch put to on.

**Check that the compressor ON/OFF switch is put to off
Put the door interlock switch to on**

Unit starting

- Check the compressor ON/OFF switch is off (**position "0"**).
- Turn the door interlock in position **"1" (ON)**.





When switching on for the first time, the oil must be preheated in the models indicated in the table. This requirement is also identified on the unit by the following plate. The procedure is carried out when starting the unit for the first time and whenever the unit has been switched off by means of the power on/off switch for longer than 4 hours. Do not proceed with other operations until this procedure has been completed, otherwise the compressors could be damaged.

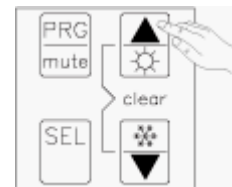


Only for models (IPE-IPC):

201 – 251 – 301 – 351 – 502 – 602 – 702 – 802 (with reciprocating semihermetic compressor)

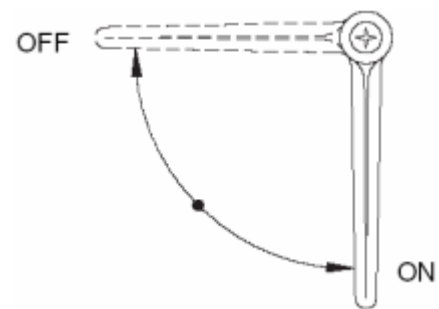
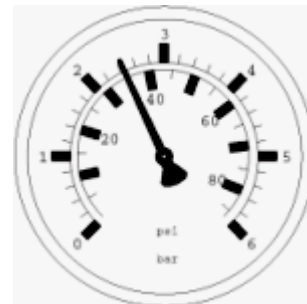
Euroklimat S.p.A. declines every responsibility for eventual damages that can directly or indirectly derive to persons or things in consequence to the lacked observance the present instructions.

Put to ON. Working from the microprocessor, press the button ▲ for **5 seconds** (for the models with heat pump press the SUMMER/WINTER switch).



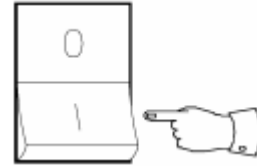
The water pump (if present) **starts**.

When starting for the first time, check the correct direction of rotation of the pump. To do this, close the ball valve fitted at the unit water inlet and outlet, as described in the paragraph “water connections” in the section “Commissioning”. Fully open the by-pass. Using the pressure gauge on the unit check that the circuit is pressurised. If it is not, switch off the unit using the power on/off switch and invert the connection phases at the on/off switch input, paying attention to the possible presence of current. Then check the working pressure with the pressure gauge on the unit. Make sure that there are no automatic valves, which could reduce the flow, and that the circuit shutoff valves are fully open. Use the handle of the by-pass valve to adjust the pressure until the liquid pressure gauge indicator is in the appropriate sector. This sector is specific for each type of pump (standard or uprated) and for each model. The table below indicates the operating range for each combination.



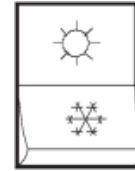
“IP” pump operating range	Standard Pump [bar]		Uprated pump [bar]	
	min	max	min	max
MICRO2 – MICRO 4	2,8	4,3	non disponibile	
M10	2,8	3,8	4,8	5,9
15	2,9	4,4	4,3	5,9
20	3,0	4,8	4,6	6,2
31 – 51	2,3	3,7	4,6	5,3
81 – 101 – 121 – 151	2,3	3,1	4,5	5,0
201	3,1	3,7	5,4	5,9
251 – 301 – 351	3,3	3,6	5,3	5,8
401 – 502 – 602 – 702 - 802	2,5	3,2	4,3	5,2

Enable the compressors by putting the relative switch to position 1 (ON).



Only for “heat pump” version

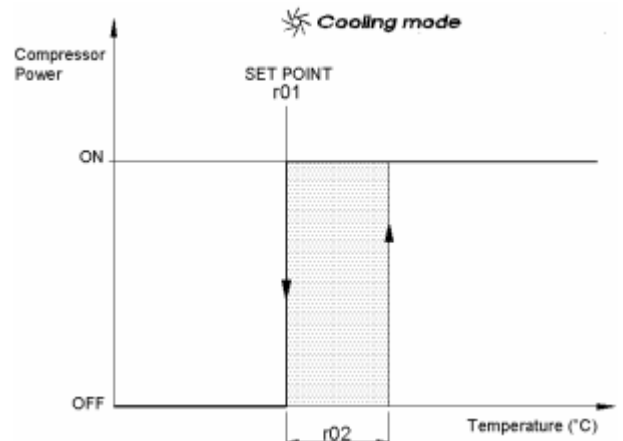
Select operating mode, SUMMER (cooling) / WINTER (heating) using the switch.



COOLING mode – all the versions

If the temperature of the water (see value of the display) is **lower** than r01 (Summer/cooling set point) value (default is 7.0°C), **the compressor is OFF**. The water pump (if present) runs.

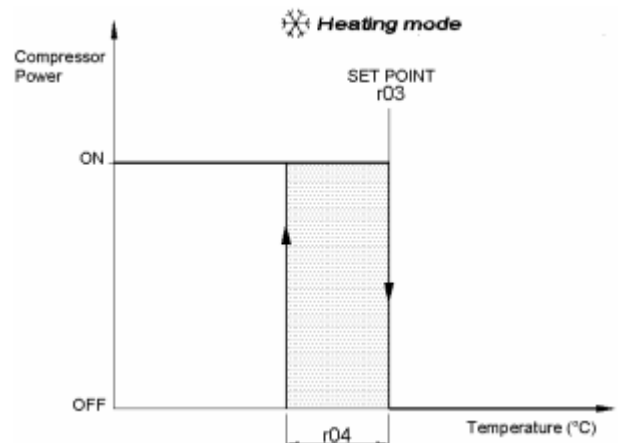
If the temperature of the water (see value of the display) is **higher** than r01 + r02 (differential) value (default is 3.0°C), **the compressor is ON** and the cooling starts and runs until the set point r01.



HEATING mode – only “heat pump” version

If the temperature of the water (see value of the display) is **lower** than r03 (Winter/heating set point) value (default is 40.0°C) **the compressor is ON** and the heating starts and runs up to reach r03 value. The water pump (if present) runs.

If the temperature of the water is **higher** than r03 + r04 (differential) value (default is 3.0°C) **the compressor is OFF**.



FOR SET POINT MODIFICATION (r01 and/or r03) SEE CHAPTER “CONTROL PANEL”



In the units with SCROLL compressor, it is also necessary to check the direction of rotation of the compressor. An accentuated noise level and almost total lack of efficiency are signs of reverse rotation. Two of the compressor power supply phases must therefore be inverted to obtain the correct direction of rotation, which is shown by a clearly lower noise level and correct efficiency. Having inverted the phases, restart.

Do not persist in operating with reverse rotation or the compressor could be irreparably damaged.



Check of cooling

The chiller normally works with a difference of approx. 5° between the evaporator water inlet and outlet (with by-pass valve closed), which may be checked with contact thermometers.

Check for any alarm warnings.

Checking the safety devices

The unit, connected as described in the section "Commissioning" under the paragraph "Connection of Safety Devices", must guarantee safety functions in an emergency. The emergency stop button must therefore be pressed to check that all the motors stop. If operation is correct, reset the emergency button and continue with the switching on procedure as described previously.

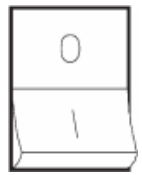
Check correct activation of the protective and safety devices (mushroom-head pushbutton).

Compressor START/STOP

This switch is used to cut out compressor operation and allow the unit to work with the pump only whenever working conditions so require.

Under normal working conditions compressor starting and stopping is automatic and is controlled entirely by the microprocessor.

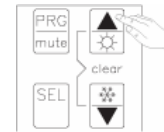
Posizione "0": Compressor off
Posizione "1": Compressor on



The unit is equipped with a safety that doesn't permit more than 1 (one) START/STOP every 3 minutes from the first.

Standby

- Press button ▲ for 5 seconds.
- Press button ▼ for 5 seconds ("heat pump" version).



Since the compressor and the pump are timed and work together, before stopping they finish the cycle in progress. A certain interval may therefore be necessary before the unit comes to a total stop. In this condition the unit is in stand-by and may be restarted by just pressing the button ▲ for 5 seconds.

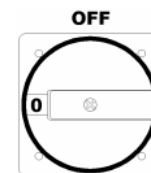


S During stand-by preheating of the oil for models from 201 to 802 is unnecessary.

Switching off

This operation should always be carried out after having put the unit in stand-by and after all the components have come to a stop.

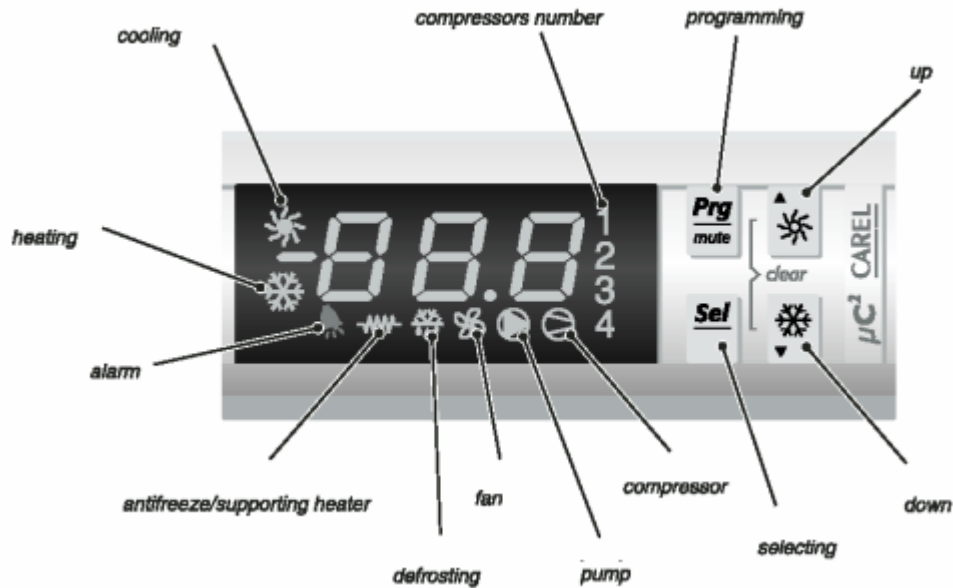
Put the door interlock switch to OFF.



If the unit has been at a standstill for more than 4 hours, before restarting the oil must be preheated where indicated (or size 201 – 251 – 301 – 351 – 401 – 502 – 602 – 702 – 802).

CONTROL PANEL

"IP" water chillers are fitted with a compact electronic control (μ chiller²), having the size of a normal thermostat, for complete control of the unit; The device has:



Symbol	Colour	Meaning		Reference refrigerant circuit
		with LED on	with LED flashing	
1 ; 2	Amber	Compressor 1 and/or 2 ON	Start up request	1
3 ; 4	Amber	Compressor 3 and/or 4 ON	Start up request	2
	Amber	At least one compressor ON	-	1 / 2
	Amber	Pump ON (if present)	Start up request	1 / 2
	Amber	Not used	-	1 / 2
	Amber	Defrost ON (only "heat pump")	Defrost request (only "heat pump")	1 / 2
	Amber	Heater ON (if present)	-	1 / 2
	Red	Alarm active	-	1 / 2
	Amber	Heating mode (only "heat pump")	Heating mode request (only "heat pump")	1 / 2
	Amber	Cooling mode (chiller)	Cooling mode request (chiller)	1 / 2

Main functions

- water temperature control
- complete alarm management
- set-up for serial line for supervision/remote servicing
- a connectable external terminal (optional)
- self-diagnosis

Controlled devices

- compressor
- condensing fans
- water circulating pump
- safety and timing devices, alarms

Display

The 3-digit display automatically shows the decimal point between -19.9 and +19.9 °C. Outside this range the value is automatically displayed without the decimal point (although the unit always operates inside considering the decimal part). In the normal operating mode the displayed value corresponds to the temperature read by the sensor.

In the event of alarm, the sensor value is displayed alternately with the codes of the active alarms. During programming the parameter codes and their value appear on the display.

The visualization and the configuration of the unit is possible also using a **remote control panel** (available on request).

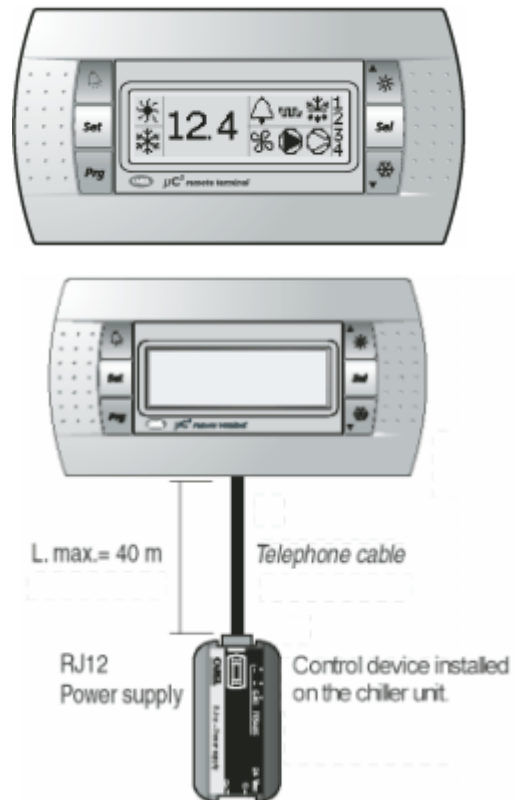
Remote control panel (available on request)

The remote control panel (**available on request**) is an electronic device that allows the remote control of the unit.

The functions allowed are the same as those available on the display and the local keypad of the μ Chiller² installed on the unit.

The connection between the remote control panel and the unit is possible using a pin-to-pin phone cable (**max. length = 40 meters**).

For more longer applications please contact the Euroklimat S.p.A. Customer Service.



There are 2 versions of the remote control panel (available on request):

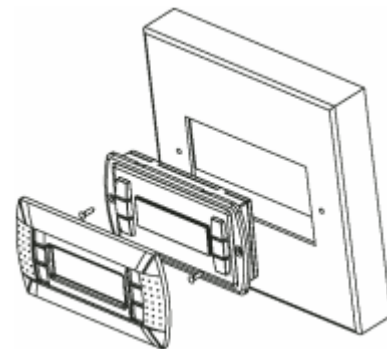
- version for panel installation
- version for wall-mounting installation

Panel installation

This version has been designed for panel installation, with the drilling template measuring 127 x 69 mm with 2 circular holes, diameter 4 mm, as shown in figure.

For installation proceed as follows:

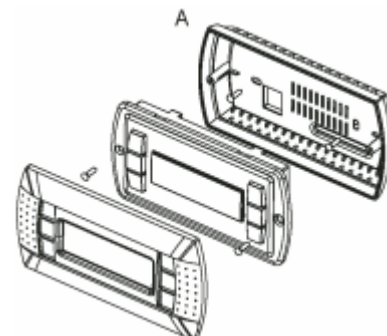
- connect the telephone cable;
- insert the terminal, without the front frame, in the opening, and use the countersunk screws to fasten the device to the panel;
- finally, apply the click-on frame.



Version for wall-mounting installation

The version of the terminal for wall-mounting requires the rear of the case A to be fastened (see figure) using a standard 3-module switch box.

- fasten the rear of the case to the box using the round-head screws;
- connect the telephone cable;
- rest the front panel on the rear of the case and fasten the assembly using the countersunk screws, as shown in figure;
- finally, apply the click-on frame.

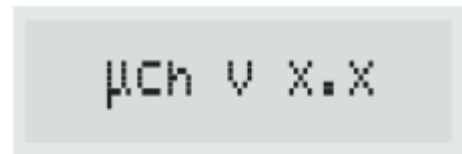


To install the remote terminal, no configuration is required on the μ Chiller².

When first switched on the display will show the firmware version of the μ Chiller².

After around 4 s the main screen will be displayed, with the symbols that represent the status of the μ Chiller².

Now it's possible to obtain all the functions managed by the control installed on board of the chiller unit.



.... 4 sec.



Set point modification (outlet water temperature) in **COOLING mode** (all the versions)

The manufacturer set point setting is **7.0°C**; the range of possible values is **+5 / +25°C** for standard version, **-30, / +20°C** for **LT** version (low temperature).

Normal condition:

When starting or during the operation, the display shows the water temperature (es.: 14,0°C).



Press SEL button for 5 seconds	
The display shows - / -	
Press button ▼ for 2 times	
The display shows -r-	
Press SEL button	
The display shows r01	
Press SEL button	
The display shows the actual value of set point (7.0°C)	
Press ▲ button the increase the value; Press ▼ button to decrease the value.	
The display shows the new value (es.: 12.5°C)	
Press SEL button	
Press PRG button for 3 times to save the new value and to come back to the standard visualization (water outlet temperature)	

Set point modification (outlet water temperature) in HEATING mode (only "heat pump")
The manufacturer set point setting is **40.0°C**; the range of possible values is **+30 / +50°C**

Normal condition:

When starting or during the operation, the display shows the water temperature (es.: 40,0°C).



Press SEL button for 5 seconds	
The display shows - / -	
Press button ▼ for 2 times	
The display shows -r-	
Press SEL button	
The display shows r01	
Press button ▼ for 2 times	
The display shows r03	
Press SEL button	
The display shows the actual value of set point (40.0°C)	
Press ▲ button the increase the value; Press ▼ button to decrease the value.	
The display shows the new value (es.: 42.5°C)	
Press SEL button	
Press PRG button for 3 times to save the new value and to come back to the standard visualization (water outlet temperature)	

ROUTINE MAINTENANCE

General safety rules

Before carrying out inspections, maintenance and controls, scrupulously comply with all that is specified below:

- check that the power on/off switch is put to off (position '0') and padlocked in that position;
- check that there are no moving parts;
- observe the accident-prevention regulations in force;
- put on adequate personal protective equipment (gloves, goggles, etc.) before carrying out any operation.

Except for visual inspections, all the operations are to be carried out solely by specialised and expert personnel, otherwise the warranty is rendered invalid.

Checking the belt tension (IPC mod. 81 ÷ 802)

Authorised personnel: maintenance mechanic

Frequency: once a month

Checks: after a certain number of hours of operation

- check the centrifugal fan belt tension. It could have slackened and therefore start to slip on the pulleys.

Should such a situation persist, it would cause overheating with consequent wear and breaking of the belt.

Belt tension is acceptable when the belt can be pushed down, in the halfway point between the two pulleys, by approx. 20mm.

For the check, proceed as follows:

- switch off the unit by putting the switch to '0' and padlock it in that position;
- check that there are no moving parts;

Checking the condensing coil

Authorised personnel: maintenance mechanic

Frequency: once a month

Checks:

- visually check from outside the unit if there is any dirt, such as paper, dry leaves or simply dust, on the coil. The presence of such deposits causes a reduction in the air flow with a consequent reduction of efficiency and the possibility that the high pressure switch could trip resulting in the unit stopping.

Checking the electrical equipment

Authorised personnel: maintenance electrician

Frequency: once a month

Checks:

- check the wiring to ensure that there are no loose wires at connection points and no possibility of doubtful contacts.

For the check, proceed as follows:

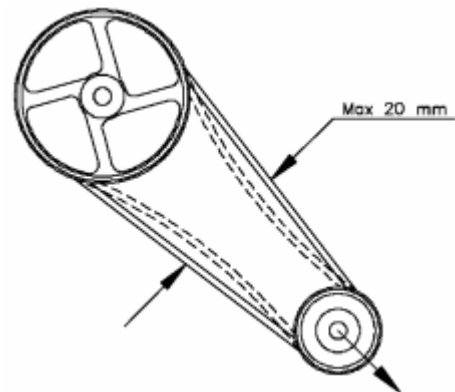
- switch off the unit by putting the switch to '0';
- check that there are no moving parts;
- once the unit has stopped, open the electrical panel;
- gently tug the wires of the contacts to check that the wiring up is secure;
- if necessary tighten the screws using a screwdriver.

For operations not contemplated in this manual, contact **Euroklimat**.

For constant efficiency and a long working life of the unit, it must be periodically controlled and maintained. A thorough visual inspection of the equipment and general cleaning are always of the utmost importance for trouble-free operation.

Relatively simple, inexpensive operations and checks fall within this category of work, which on the one hand ensures good operation over a period of time and on the other allows possible faults to be forestalled that, if neglected, could become considerably problematic

- once the unit has stopped, open the upper front panel;
- press on the drive belt with fingers in the points indicated in the figure.



EXTRAORDINARY MAINTENANCE

Adjusting the belt tension (IPC mod. 81 ÷ 802)

Authorised personnel: maintenance mechanic.

Frequency: after checking the correct tension if necessary.

Work:

- switch off the unit by putting the switch to '0' and padlock it in that position;
- once the unit, including all its parts, has stopped, remove the upper front panel;
- the motor is mounted on a belt-tightening slide with an adjusting screw in the centre, which may be adjusted using a hexagon wrench as shown in the figure. The slide may thus be moved until the belt is taut;
- replace the panel;
- restart the unit, following the starting procedure.

Replacing the belt (IPC mod. 81 ÷ 802)

Authorised personnel: maintenance mechanic.

Frequency: after checking the correct tension if necessary.

Work:

- switch off the unit by putting the switch to '0' and padlock it in that position;
- once the unit, including all its parts, has stopped, remove the upper front panel;
- remove the broken belt and any fragments of the same;
- the motor is mounted on a belt-tightening slide with an adjusting screw in the centre, which may be adjusted using a hexagon wrench as shown in the figure. The slide may thus be moved until the new belt can be inserted;
- once the new belt has been mounted, adjust as described above;
- replace the panel;
- restart the unit, following the starting procedure.

Adjusting the velocity ratio (IPC mod. 81 ÷ 802)

Authorised personnel: maintenance mechanic.

Frequency: if a change in the air flow is required.

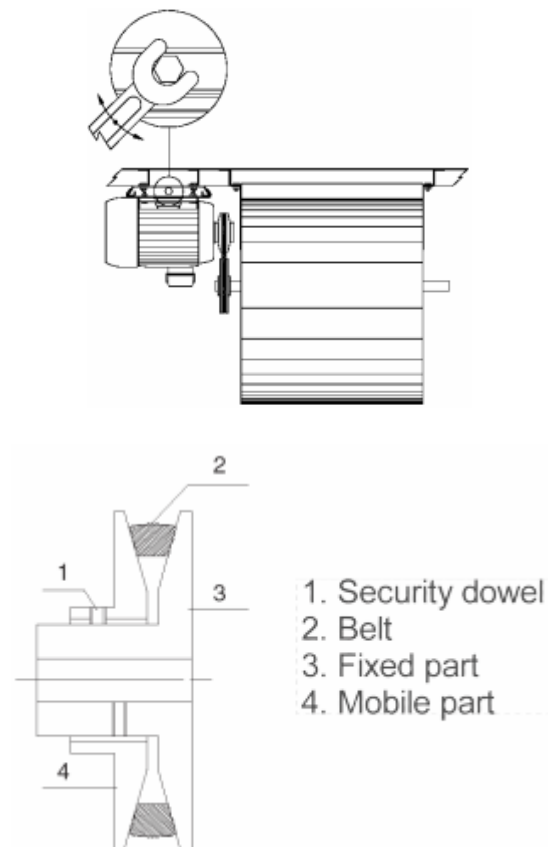
Work:

- this adjustment allows the air flow of the fan to be changed by approx. 10 % more or less using the variable pitch pulley of the motor.

Procedure:

- switch off the unit by putting the switch to '0' and padlock it in that position;
- once the unit, including all its parts, has stopped, remove the upper front panel;
- using a hexagon wrench, loosen the belt adjusting screw in order to free the pulleys;
- loosen the security dowel located on the mobile part of the pulley;
- loosen (decrease of pitch diameter and increase of flow rate) or tighten (increase of pitch diameter and decrease of flow rate) the mobile part of the pulley;
- upon completion of adjustment, tighten the security dowel on the mobile part;
- replace the belt and adjust the belt tension;
- check alignment of the pulleys;
- replace the panel;
- restart the unit, following the starting procedure.

If the fan thermal cut out trips with the unit closed, this is a sign of absorption in excess of the rating plate value. Reset the conditions prior to adjustment or create a resistance on the fan delivery to bring the absorption values to below the rating plate value.



Cleaning the coil

Authorised personnel: maintenance mechanic.

Frequency: after visual inspection if necessary and at least once a year.

Work:

- switch off the unit by putting the on/off switch to '0' and padlock it in that position;
 - once the unit, including all its parts, has stopped, remove the perforated protective panel from the coil;
 - clean the fins using a bristle (not wire) brush, proceeding vertically in the direction of the fins and taking care not to exert too much pressure, which could otherwise damage the fins. In the event of stubborn dirt, use detergent products or compressed air, blowing the latter in the reverse direction to the normal airflow;
 - replace the panel;
- restart the unit, following the starting procedure.

Reset of the oil pressure switch differential (mod. 201 ÷ 802)

Authorised personnel: maintenance mechanic.

Frequency: in case of alarm C1 only (see alarms table).

Work:

- switch off the unit by putting the switch to '0';
- once the unit, including all its parts, has stopped, remove the lower front panel;
- reset the pressure switch by pressing the key to be found on the actual switch, as shown in the figure to the side;
- replace the panel;
- restart the unit, following the starting procedure.

Seasonal stop

Authorised personnel: maintenance mechanic and electrician.

Frequency: once a year.

Procedure:

- close the water circuit water supply valve;
- if the system risks being exposed to freezing temperatures during the period of inactivity, fully drain the water circuit;
- disconnect from the electricity supply by means of the power on/off switch, ensuring that the switch cannot be put to "on" again during the period of inactivity of the system.

Seasonal start

Authorised personnel: maintenance mechanic and electrician.

Frequency: once a year.

Procedure:

- open the water supply tap;
- if the system has been drained, refill the water circuit;
- Carry out all checks and procedures as with the first time of starting.

TROUBLESHOOTING

Authorised personnel: maintenance mechanic, electrician and refrigeration technician.

In the event of unit malfunction, the display starts to blink and the buzzer activates.

The alarm identification code appears on the display for a few seconds, while the buzzer continues.

Press the PRG key to mute the buzzer. The display continues to blink and the alarms are not reset.

Remove the causes that have generated the alarm.

Press the keys ▲ and ▼ simultaneously for a few seconds to reset.

The display stops blinking and the normal screen display returns.



List of ALARMS μ chiller²

ALARM code	Description	"IP" range	Reset	Action		
		Size		Compress.	Fan	Pump
HP1	High pressure alarm (circuit 1)	all	manual	OFF	OFF	-
HP2	High pressure alarm (circuit 2)	502 ÷ 802	manual	OFF	OFF	-
LP1	Low pressure alarm (circuit 1)	M2 ÷ 401	manual M2-M4: auto	OFF	OFF	-
LP2	Low pressure alarm (circuit 2)	502 ÷ 802	manual M2-M4: auto	OFF	OFF	-
tP	General overload alarm	M2 ÷ 401	manual	OFF	OFF	OFF
tC1	Circuit 1 overload alarm	502 ÷ 802	manual	OFF	OFF	OFF
tC2	Circuit 2 overload alarm	502 ÷ 802	manual	OFF	OFF	OFF
FL	Water flow alarm	all	manual	OFF	OFF	OFF
E1 ÷ E8	E1 ÷ E8 probe alarm	all	automat.	OFF	OFF	OFF
EPr	EEPROM error during operation	all	automat.	-	-	-
EPb	EEPROM error at the start-up	all	automat.	OFF	OFF	OFF
ESP	Expansion error	502 ÷ 802	automat.	OFF	OFF	OFF
A1	Antifreeze alarm	all	manual	OFF	OFF	-

List of WARNING μ chiller²

ALARM code	Description	"IP" range	Reset	Action		
		Size		Compress.	Fan	Pump
Ht	High temperature plant warning	tutte	manual	-	-	-
Lt	Low temperature plant warning	tutte	manual	-	-	-
AHt	High temp. plant at the start-up	tutte	manual	-	-	-
ALt	Low temp. plant at the start-up	tutte	manual	-	-	-
ELS	Low supply voltage	tutte	automat.	-	-	-
ELH	High supply voltage	tutte	automat.	-	-	-
D1	Defrost circuit 1	M2 ÷ 401 "heat pump"	-	-	-	-
D2	Defrost circuit 2	502 ÷ 802 "heat pump"	-	-	-	-

High pressure alarm
HP1 (circuit 1)
HP2 (circuit 2)

Description:

The alarm leads to the immediate stopping of the compressor and the fan, activation of the buzzer and the alarm relay, and blinking of the display.

CAUSE	CHECK	AUTHORIZED PERSONNEL
Airflow rate too low.	Check for obstructions near or on the air intake and outlet. Check the condensing coil for fouling.	Maintenance mechanic.
Air inlet temperature too high.	Measure the inlet air temperature and compare it with design values. (ver. ST= standard → max. +40°C) (ver. /D= tropical → max. +45°C) Eliminate any recirculation of expelled air.	Refrigeration technician.
Condensing fans do not start.	Check that the condensation control systems are in proper working order. Check the fan motor and the electrical circuit for breaks or faults. Replace the defective piece. Check if the fan thermal cutout has tripped and if necessary check its absorption. Check the direction of rotation of the fans.	Maintenance mechanic. Maintenance electrician.
Refrigerant circuit too full.	Check and bring it to within the recommended limits.	Refrigeration technician.
Faulty high pressure switch operation.	Check correct operation of its contact; check the connecting capillary for obstruction or crushing and if necessary replace.	Refrigeration technician.
Compressor delivery valve partially closed.	Check its state and if necessary open the valve.	Refrigeration technician.
Compressor thermal cutout trips due to motor overheating.	Check the motor winding and the charge level. Replace if necessary. Check that the winding resistance is correct and there is no short circuit. Replace the compressor if necessary. The compressor is mechanically jammed or has gripped. Replace the compressor. Absorption is too high. Check operating conditions (water and expansion tank temperatures, condensation, overheating, supercooling, etc.). The motor is operating with single-phase instead of three-phase power supply. Check the power supply voltage and correct electrical connection. Check continuity of the single windings.	Maintenance mechanic. Maintenance electrician.

CAUSE	CHECK	AUTHORIZED PERSONNEL
Low pressure alarm LP1 (circuit 1) LP2 (circuit 2)	Description: The alarm is detected with the compressor on or off and leads to the immediate stopping of the compressor or its non-start. The buzzer and the alarm relay activate and the display blinks.	
No water.	Check the water circuit for closed valves, obstructed filters or obstructions of any kind. Check the pump for the direction of rotation and correct operation.	Refrigeration technician.
Faulty thermostatic valve.	Check the sensitive bulb and its capillary for leaks and if it is therefore empty. Check the external equaliser for obstruction or crushing and that overheating is within correct values. Replace if necessary.	Refrigeration technician.
Thermostat valve out of calibration.	Check the overheating values and re-calibrate if necessary.	Refrigeration technician.
Condensation pressure too low.	Check operation of the condensation control systems.	Refrigeration technician.
No gas in refrigerant circuit.	Search for any gas leaks. Repair and restore correct gas load.	Refrigeration technician.
Obstructed filter on liquid line.	Replace the filter.	Refrigeration technician.
Faulty low pressure switch operation.	Check correct operation of its contact; check the connecting capillary for obstruction or crushing and if necessary replace.	Refrigeration technician.

CAUSE	CHECK	AUTHORIZED PERSONNEL
Overload alarm tP (general) tC1 – tC2 (circuit 1-2)	Description: The alarm leads to the immediate stopping of the compressor and the fan, activation of the buzzer and the alarm relay, and blinking of the display.	
Intervention of the magnetothermal protection of the compressor.	Test the winding resistance of the motor and if abnormal replace the compressor. The compressor is mechanically jammed or has gripped. Replace the compressor. The absorption is too high. Check operating conditions (water temperature, evaporating pressure, condensing pressure, superheating, subcooling, etc...). Check the power supply voltage and correct electrical connection. Check the continuity of the single windings.	Maintenance electrician.

Flow switch alarm Pump thermal cut-out FL	Description:	
	The alarm is detected irrespective of the pump and compressor status. The compressor, pump and fan stop, while the buzzer and alarm relay activate and the display blinks.	
CAUSE	CHECK	AUTHORIZED PERSONNEL
No water.	Check the water circuit for any closed valves, obstructed filters or obstructions of any kind. Check the pump for the direction of rotation and correct operation.	Refrigeration technician.
Pump winding short-circuited.	Test the winding resistance and if abnormal replace the pump. The pump is mechanically jammed or has gripped. Replace the pump.	Maintenance electrician.
Pump current absorption too high.	Check operating conditions in terms of flow rate and delivery pressure. If necessary re-calibrate pump operation using the by-pass valve.	Maintenance electrician.
Pump motor operating with single-phase instead of three-phase power supply. (ver. MICRO2 – MICRO4 excluded)	Check the power supply voltage and correct electrical connection. Check the continuity of the single windings.	Maintenance electrician.
Incorrect calibration of flow switch or mechanical failure.	Check instrument calibration and operation and replace if necessary.	Refrigeration technician.

Probe alarm E1 E8	Description:	
	These alarms are also detected with the unit in stand-by. The values read by a sensor are outside normal values. The presence of a sensor alarm leads to deactivation of the compressor, the condensing fans and the pump. The buzzer and alarm relay activate and the display blinks.	
CAUSE	CHECK	AUTHORIZED PERSONNEL
Probe damaged or fault.	Check the wiring between the sensor and the microprocessor for breaks or faults.	Maintenance electrician.

EEPROM error during operation EPr	<p>Description:</p> <p>The microprocessor continues to perform the control of the unit with the data present in the random memory (RAM). After the first power supply failure the configuration will be lost.</p>
---	--

CAUSE	CHECK	AUTHORIZED PERSONNEL
Microprocessor error.	Turn OFF the unit. Wait for some seconds. Turn ON the unit. If after the autocontrol the alarm will be shows again, replace the regulator.	Maintenance electrician.

EEPROM error at the start-up EPb	<p>Description:</p> <p>At the start-up of the μchiller² it blocks and the diciture appears on the display.</p>
--	---

CAUSE	CHECK	AUTHORIZED PERSONNEL
Microprocessor error.	Turn OFF the unit. Wait for some seconds. Turn ON the unit. If the alarm will be shows again, replace the regulator.	Maintenance electrician.

Communication error with expansion card ESP (mod. 502 – 602 – 702 – 802)	<p>Description:</p> <p>If the control μchiller² loses communication with the expansion card, the entire system will be stopped to avoid affecting the unit. The alarm leads to the immediate stopping of the compressor and the fan, activation of the buzzer and the alarm relay, and blinking of the display.</p>
---	--

CAUSE	CHECK	AUTHORIZED PERSONNEL
Communication data error.	Turn OFF the unit. Wait for some seconds. Turn ON the unit. If the alarm will be shows again, contact Euroklimat SpA .	Maintenance electrician.

Antifreeze alarm
A1

Description:

The alarm is detected through the water sensor in the tank when the evaporator outlet water temperature is below the set antifreeze threshold. The compressor and the condensing fans stop immediately, the buzzer and the alarm relay activate and the display blinks.

CAUSE	CHECK	AUTHORIZED PERSONNEL
No water.	Check the water circuit for closed valves, obstructed filters or obstructions of any kind. Check the pump for the direction of rotation and correct operation.	Refrigeration technician.
Water temperature too low.	Check operating set point calibration.	Refrigeration technician.

PROBE setting parameters (/)	display	range		default	Models "IP" range – all the versions					
		MIN	MAX		M2 - M4	M10...201	251...401	501...602	702 - 802	custom
Probe type B1 0= not present 1= present	/01	0	1	1	1	1	1	1	1	
Probe type B2 0= not present 1= present	/02	0	1	0	1	1	1	1	1	
Probe type B3 0= not present 1= NTC cond. probe 2=NTC ext. probe.	/03	0	2	0	0	0	0	0	0	
Probe type B4 0= not present 1= present	/04	0	3	0	0	0	0	0	0	
Probe type B5 0= not present 1= present	/05	0	1	0	0	0	0	0	0	
Probe type B6 0= not present 1= present	/06	0	1	0	0	0	0	0	0	
Probe type B7 0= not present 1= present	/07	0	2	0	0	0	0	0	0	
Probe type B8 (expansion) 0= not present 1= ON/OFF 2= NTC ext. probe 3= ratiometric probe cond. 5Vdc	/08	0	3	0	0	0	0	0	0	
Minimum value voltage input	/09	0	/10	50	50	50	50	50	50	
Maximum value voltage input	/10	/09	500	450	450	450	450	450	450	
Pressure min. value	/11	0	/12	0	0	0	0	0	0	
Pressure max. value	/12	/11	99.9	34.5	34.5	34.5	34.5	34.5	34.5	
Probe B1 calibration	/13	-12.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	
Probe B2 calibration	/14	-12.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	
Probe B3 calibration	/15	-12.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	
Probe B4 calibration	/16	-12.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	
Probe B5 calibration	/17	-12.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	
Probe B6 calibration	/18	-12.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	
Probe B7 calibration	/19	-12.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	
Probe B8 calibration	/20	-12.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	
Digital filter	/21	1	15	4	4	4	4	4	4	
Input limitatio	/22	1	15	8	8	8	8	8	8	
Unit of measure 0=°C 1=°F	/23	0	1	0	0	0	0	0	0	

ANTIFREEZE/AUXILIARY HEATER setting parameters (A)	display	range		default	Models "IP" range – all the versions					
		MIN	MAX		M2 - M4	M10...201	251...401	501...602	702 - 802	custom
Antifreeze	A01	A07	A04	3.0	3.0	3.0 (-32.0) ver. LT	3.0 (-32.0) ver. LT	3.0 (-32.0) ver. LT	3.0 (-32.0) ver. LT	
Differential for antifreeze/low ambient temperature alarm	A02	0.3	122.0	5.0	4.0	4.0	4.0	4.0	4.0	
Bypass time for antifreeze alarm/low ambient temp. when turning on the unit in heating mode	A03	0	150	0	0	0	0	0	0	
Set point for the activation of antifreeze heater	A04	A01	r16	5.0	5.0	5.0 (-30.0) ver. LT	5.0 (-30.0) ver. LT	5.0 (-30.0) ver. LT	5.0 (-30.0) ver. LT	
Differential for antifreeze heater	A05	0.3	50.0	1.0	1.0	1.0	1.0	1.0	1.0	
Auxiliary heater probe 0= control probe 1= antifreeze probe	A06	0	1	0	0	0	0	0	0	
Antifreeze alarm set point limit	A07	-40.0	176.0	-40.0	-40.0	-40.0	-40.0	-40.0	-40.0	
Auxiliary heater set point in heating mode	A08	A01	r15	25.0	25.0	25.0	25.0	25.0	25.0	
Auxiliary heater differential in heating mode	A09	0.3	50.0	3.0	3.0	3.0	3.0	3.0	3.0	
Antifreeze automatic start up 0= disabled function 1= heaters and pump on at the same time on A4/A8 2= heaters and pump on independently on A4/A8 3= heaters ON on A4/A8	A10	0	3	0	0	0	0	0	0	

PROBE reading parameter (b)	display	range		default	Models “IP” range – all the versions					
		MIN	MAX		M2 - M4	M10...201	251...401	501...602	702 - 802	custom
Config. of probe to be shown on the display 0= probe B1 1= probe B2 2= probe B3 4= probe B4 5= probe B5 6= probe B6 7= probe B7 8= probe B8 8= set point without compensation 9= set point (dynamic) with possible compensation 10= remote ON/OFF digital input status	b00	0	10	0	0	0	0	0	0	
Value read by probe B1	b01	-	-	-	-	-	-	-	-	
Value read by probe B2	b02	-	-	-	-	-	-	-	-	
Value read by probe B3	b03	-	-	-	-	-	-	-	-	
Value read by probe B4	b04	-	-	-	-	-	-	-	-	
Value read by probe B5	b05	-	-	-	-	-	-	-	-	
Value read by probe B6	b06	-	-	-	-	-	-	-	-	
Value read by probe B7	b07	-	-	-	-	-	-	-	-	
Value read by probe B8	b08	-	-	-	-	-	-	-	-	
Driver 1 evaporator temperature	b09	-	-	-	-	-	-	-	-	
Driver 1 evaporator pressure	b10	-	-	-	-	-	-	-	-	
Driver 1 superheating	b11	-	-	-	-	-	-	-	-	
Driver1 saturation temperature	b12	-	-	-	-	-	-	-	-	
Driver 1 valve position	b13	0	100.0	-	-	-	-	-	-	
Driver 2 evaporator temperature	b14	-	-	-	-	-	-	-	-	
Driver 2 evaporator pressure	b15	-	-	-	-	-	-	-	-	
Driver 2 superheating	b16	-	-	-	-	-	-	-	-	
Driver 2 saturation temperature	b17	-	-	-	-	-	-	-	-	
Driver 2 valve position	b18	0	100.0	-	-	-	-	-	-	
Temp. probe at the outlet of the external coil C1	b19	-	-	-	-	-	-	-	-	
Temp. probe at the outlet of the external coil C2	b20	-	-	-	-	-	-	-	-	

COMPRESSOR setting parameter (c)	display	range		default	Models “IP” range – all the versions					
		MIN	MAX		M2 - M4	M10...201	251...401	501...602	702 - 802	custom
Min. compressor ON time	c01	0	999	60	120	120	120	120	120	
Min. OFF time compressor	c02	0	999	60	240	240	240	240	240	
Delay between 2 starts of the same compressor	c03	0	999	360	360	360	360	360	360	
Delay between starts of the 2 compressors	c04	0	999	10	-	-	-	30	30	
Delay between 2 shut-downs of the 2 compressors	c05	0	999	0	-	-	-	30	30	
Delay at start-up	c06	0	999	0	0	0	0	0	0	
Delay in switching ON the compressor after switching OFF the pump	c07	0	150	20	20	20	20	20	20	
Delay in switching OFF the compressor after switching OFF the pump	c08	0	150	1	1	1	1	1	1	
Max. compressor operating time in tandem	c09	0	60	0	0	0	0	0	0	
Compressor 1 timer	c10	0	800.0	0	0	0	0	0	0	
Compressor 2 timer	c11	0	800.0	0	-	-	-			
Compressor 3 timer	c12	0	800.0	0	-	-	-	-	-	
Compressor 4 timer	c13	0	800.0	0	-	-	-	-	-	
Operation timer threshold	c14	0	100	0	0	0	0	0	0	
Hour counter evaporator pump	c15	0	800.0	0	0	0	0	0	0	
Hour counter condenser backup pump	c16	0	800.0	0	0	0	0	0	0	
Min. time between 2 pump starts	c17	0	150	30	30	30	30	30	30	
Min. pump ON time	c18	0	15	3	3	3	3	3	3	

DEFROST setting parameters (d)	display	range		default	Models "IP" range – all the versions					
		MIN	MAX		M2 - M4	M10...201	251...401	501...602	702 - 802	custom
Defrosting cycle/Condenser antifreeze 0= no 1= yes, with shared defrosting	d01	0	1	0	0	0	0	0	0	
Defrost type 0= time 1= temperature + pressure 2= start in pressure, end in temperature	d02	0	2	0	-	-	-	-	-	
Start defrosting temperature Condenser antifreeze alarm set point Start defrosting pressure	d03	-40.0 /11	d04 d04	-5.0 3.5	-	-	-	-	-	
End defrosting temperature End defrosting pressure	d04	d03 d03	176.0 /12	20.0 14.0	-	-	-	-	-	
Min. time to start a defrosting cycle	d05	10	150	10	-	-	-	-	-	
Min. duration of a defrosting cycle	d06	0	150	0	-	-	-	-	-	
Max. duration of a defrosting cycle	d07	1	150	5	-	-	-	-	-	
Delay between 2 defrosting cycle requests within the same circuit	d08	10	150	30	-	-	-	-	-	
Defrosting delay between the 2 circuits	d09	0	150	10	-	-	-	-	-	
Defrost by external contact 0= disables function 1= external contact start 2= external contact end 3= external contact start and end	d10	0	3	0	-	-	-	-	-	
Antifreeze heaters activated while defrosting 0= not present 1= present	d11	0	1	0	-	-	-	-	-	
Waiting time before defrosting	d12	0	3	0	-	-	-	-	-	
Waiting time after defrosting	d13	0	3	0	-	-	-	-	-	
End defrosting with 2 refrigerating circuits 0= independent 1= if both at end defrost 2= if at least one at end defrost	d14	0	2	0	-	-	-	-	-	
Start defrosting with 2 refrigerating circuits 0= independent 1= if both at end defrost 2= if at least one at end defrost	d15	0	2	0	-	-	-	-	-	
Forced ventilation time at the end of the defrosting	d16	0	360	0	-	-	-	-	-	
Defrost with compressor OFF	d17	0	80.0	0	-	-	-	-	-	



DEFROST setting parameters (d)	display	range		default	Models “IP” range – only versions “heat pump” IP*/PC					
		MIN	MAX		M2 - M4	M10...201	251...401	501...602	702 - 802	custom
Defrosting cycle/Condenser antifreeze 0= no 1= yes, with shared defrosting	d01	0	1	0	1	1	1	1	1	
Defrost type 0= time 1= temperature + pressure 2= start in pressure, end in temperature	d02	0	2	0	0	0	0	0	0	
Start defrosting temperature Condenser antifreeze alarm set point Start defrosting pressure	d03	-40.0 /11	d04 d04	-5.0 3.5	-5.0 3.5	-5.0 3.5	-5.0 3.5	-5.0 3.5	-5.0 3.5	
End defrosting temperature End defrosting pressure	d04	d03 d03	176.0 /12	20.0 14.0	20.0 14.0	20.0 14.0	20.0 14.0	20.0 14.0	20.0 14.0	
Min. time to start a defrosting cycle	d05	10	150	10	10	10	10	10	10	
Min. duration of a defrosting cycle	d06	0	150	0	0	0	0	0	0	
Max. duration of a defrosting cycle	d07	1	150	5	5	5	5	5	5	
Delay between 2 defrosting cycle requests within the same circuit	d08	10	150	30	30	30	30	30	30	
Defrosting delay between the 2 circuits	d09	0	150	10	10	10	10	10	10	
Defrost by external contact 0= disables function 1= external contact start 2= external contact end 3= external contact start and end	d10	0	3	0	0	0	0	0	0	
Antifreeze heaters activated while defrosting 0= not present 1= present	d11	0	1	0	0	0	0	0	0	
Waiting time before defrosting	d12	0	3	0	0	0	0	0	0	
Waiting time after defrosting	d13	0	3	0	0	0	0	0	0	
End defrosting with 2 refrigerating circuits 0= independent 1= if both at end defrost 2= if at least one at end defrost	d14	0	2	0	0	0	0	0	0	
Start defrosting with 2 refrigerating circuits 0= independent 1= if both at end defrost 2= if at least one at end defrost	d15	0	2	0	0	0	0	0	0	
Forced ventilation time at the end of the defrosting	d16	0	360	0	0	0	0	0	0	
Defrost with compressor OFF	d17	0	80.0	0	0	0	0	0	0	



FANS setting parameters (F)	display	range		default	Models “IP” range – all the versions					
		MIN	MAX		M2 - M4	M10...201	251...401	501...602	702 - 802	custom
Fan output 0= absent 1= present	F01	0	1	0	0	0	0	0	0	
Fan operating mode 0= always ON 1= depending ON the compressor (in parallel oper. mode) 2= depending ON the compressor in ON/OFF control 3= depending ON the compressor in speed control mode	F02	0	3	0	-	-	-	-	-	
Min. voltage threshold for Triac	F03	0	F04	35	-	-	-	-	-	
Max. voltage threshold for Triac	F04	F03	100	75	-	-	-	-	-	
Temp. value for min. speed Cooling Pressure value for min. speed Cooling	F05	-40.0 /11	176.0 /12	35.0 13.0	-	-	-	-	-	
Differential value for max. speed Cooling Pressure value for max. speed Cooling	F06	0 0	50.0 300	10.0 3.0	-	-	-	-	-	
Fan shut-down differential in Cooling mode Fan shut-down pressure in Cooling mode	F07	0 0	50.0 F5	15.0 5.0	-	-	-	-	-	
Temp. value for min. speed Heating Pressure value for min. speed Heating	F08	-40.0 /11	176.0 /12	35.0 13.0	-	-	-	-	-	
Differential value for max. speed Heating Pressure value for max. speed Heating	F09	0 0	50.0 F08	5.0 4.0	-	-	-	-	-	
Fan shut-down differential in Heating mode Fan shut-down pressure in Heating mode	F10	0 0	F08 30.0	5.0 3.0	-	-	-	-	-	
Fan starting time	F11	0	120	0	-	-	-	-	-	
Triac impulse duration (fan start)	F12	0	10	2	-	-	-	-	-	
Fan management in defrost mode 0= disabled fans 1= fan in chiller mode 2= max speed after defrost	F13	0	2	0	-	-	-	-	-	
Fan on time when starting in high condensing temperature	F14	0	999	0	-	-	-	-	-	



FANS setting parameters (F)	display	range		default	Models "IP" range versions with fan speed control / LT versions					
		MIN	MAX		M2 - M4	M10...201	251...401	501...602	702 - 802	custom
Fan output 0= absent 1= present	F01	0	1	0	1	1	1	1	1	
Fan operating mode 0= always ON 1= depending ON the compressor (in parallel oper. mode) 2= depending ON the compressor in ON/OFF control 3= depending ON the compressor in speed control mode	F02	0	3	0	0	0	0	0	0	
Min. voltage threshold for Triac	F03	0	F04	35	35	35	35	35	35	
Max. voltage threshold for Triac	F04	F03	100	75	75	75	75	75	75	
Temp. value for min. speed Cooling Pressure value for min. speed Cooling	F05	-40.0 /11	176.0 /12	35.0 13.0	35.0 13.0	35.0 13.0	35.0 13.0	35.0 13.0	35.0 13.0	
Differential value for max. speed Cooling Pressure value for max. speed Cooling	F06	0 0	50.0 300	10.0 3.0	10.0 3.0	10.0 3.0	10.0 3.0	10.0 3.0	10.0 3.0	
Fan shut-down differential in Cooling mode Fan shut-down pressure in Cooling mode	F07	0 0	50.0 F5	15.0 5.0	15.0 5.0	15.0 5.0	15.0 5.0	15.0 5.0	15.0 5.0	
Temp. value for min. speed Heating Pressure value for min. speed Heating	F08	-40.0 /11	176.0 /12	35.0 13.0	35.0 13.0	35.0 13.0	35.0 13.0	35.0 13.0	35.0 13.0	
Differential value for max. speed Heating Pressure value for max. speed Heating	F09	0 0	50.0 F08	5.0 4.0	5.0 4.0	5.0 4.0	5.0 4.0	5.0 4.0	5.0 4.0	
Fan shut-down differential in Heating mode Fan shut-down pressure in Heating mode	F10	0 0	F08 30.0	5.0 3.0	5.0 3.0	5.0 3.0	5.0 3.0	5.0 3.0	5.0 3.0	
Fan starting time	F11	0	120	0	0	0	0	0	0	
Triac impulse duration (fan start)	F12	0	10	2	2	2	2	2	2	
Fan management in defrost mode 0= disabled fans 1= fan in chiller mode 2= max speed after defrost	F13	0	2	0	0	0	0	0	0	
Fan on time when starting in high condensing temperature	F14	0	999	0	0	0	0	0	0	

UNIT setting parameters (H)	display	range		default	Models "IP" range					
		MIN	MAX		M2 - M4	M10...201	251...401	501...602	702 - 802	custom
Unit model 0= air_air unit 1= air_air heat pump 2= air_water chiller 3= air_water heat pump 4= water_water chiller 5= water_water heat pump with reversal on gas circuit 6= water_water heat pump with reversal on water circuit 7= condensing unit 8= reverse-cycle condensing unit 9= water-cooled condensing unit 10= reverse-cycle water-cooled condensing unit	H01	0	10	2	2 per ver. "solo freddo"	2 per ver. "solo freddo"	2 per ver. "solo freddo"	2 per ver. "solo freddo"	2 per ver. "solo freddo"	2 per ver. "solo freddo"
3 per ver. "pompa di calore"					3 per ver. "pompa di calore"	3 per ver. "pompa di calore"	3 per ver. "pompa di calore"	3 per ver. "pompa di calore"	3 per ver. "pompa di calore"	3 per ver. "pompa di calore"
Number of condensers 0= 1 circuit 1= 2 circuit	H02	0	1	0	0	0	0	0	0	0
Number of evaporators 0= 1 evaporator 1= 2 evaporatos	H03	0	1	0	0	0	0	0	0	0
Number of compressor for circuit 0= 1 comp./1 circuit 1= 2 comp. Tandem/1circuit 2= 1 comp. per circuit/2 circuits 3= 2 tandem/2 circuits 4= 1 comp./1 parz./1 circuit 5= 1 comp./1 parz. for circuit	H04	0	5	0	0	0	4	5	5	
Pumpmode 0= absent 1=always ON 2= ON upon request of the controller 3= ON upon request of the controller and for set time	H05	0	3	1	1	1	1	1	1	1
Cooling/Heating digital input 0= absent 1= present	H06	0	1	0	0	0	0	0	0	0
ON/OFF digital input 0= absent 1= present	H07	0	1	0	0	0	0	0	0	0
μC^2 network configuration 0= only μC^2 1= μC^2 + valve 2= μC^2 + exp. 3= μC^2 +exp.+valve	H08	0	3	0	0	0	0	2	2	
Lock keypad 0= disabled 1= enabled	H09	0	1	1	1	1	1	1	1	1
Serial address	H10	1	200	1	1	1	1	1	1	1

...follow UNIT setting parameter (H)	display	range		default	Models "IP" range					
		MIN	MAX		M2 - M4	M10...201	251...401	501...602	702 - 802	custom
Output modes (see tab. 5.3 manual +030220420 CAREL)	H11	0	5	0	0	0	1	1	1	
Capacity control logic valve and inversion valve 0= both normally closed 1= both normally open 2= inversion valve normally open and capacity-control valve normally closed 3= inversion valve normally closed and capacity-control valve normally open	H12	0	3	1	1	1	2	2	2	
Second pump function 0= disabled 1= backup and weekly rotation 2= backup and daily rotation 3= condensing control on corresponding set point 4= condensing control always on	H21	0	4	0	0	0	0	0	0	
Disable load default values 0= function disabled 1= function enabled	H22	0	1	0	0	0	0	0	0	
Enable Modbus protocol	H23	0	1	0	0	0	0	0	0	



ALARMS setting parameters (P)	display	range		default	Models "IP" range					
		MIN	MAX		M2 - M4	M10...201	251...401	501...602	702 - 802	custom
Flow switch alarm delay when starting the pump	P01	0	150	20	20	20	20	20	20	
Flow switch alarm delay during steady operation	P02	0	120	5	5	5	5	5	5	
Low pressure alarm delay at start-up	P03	0	200	40	40	40	40	40	40	
Enable part load in high pressure	P04	0	1	0	0	0	0	0	0	
Alarm reset	P05	0	6	0	2	0	0	0	0	
Cooling/Heating logi 0= ❄️ : chiller, ❄️ : heat pump 1= ❄️ : heat pump, ❄️ : chiller	P06	0	1	0	0	0	0	0	0	
Low pressure alarm from transducer 0= disabled 1= enabled	P07	0	1	0	0	0	0	0	0	
Digital input 1 selection 0= N 1=FL man 2=FL auto 3=TP man. 4=TP auto 5=TC1 Man. 6=TC1 auto 7=TC2 man. 8=TC2 auto 9=Est./inv. 10=Est./inv. con ritardo 11=LA man. 12=LA auto 13=2°set 14=2°set timer 15=stop defrost c.1 16=stop defrost c.2 17=start defrost c.1 18=start defrost c.2. 19=step 1 20=step 2 21=step 3 22=step 4	P08	0	22	0	0	1	1	1	1	
Digital input 2 selection (see tab. P08)	P09	0	22	0	0	5	5	5	5	
Digital input 6 selection (see tab. P08)	P10	0	22	0	0	0	0	0	0	
Digital input 7 selection (see tab. P08)	P11	0	22	0	0	0	0	7	7	
Digital input 10 selection (see tab. P08)	P12	0	22	0	0	0	0	0	0	
Configuration of B4 as P8 if /4=1 (digital input)	P13	0	22	0	0	0	0	0	0	
Configuration of B8 as P8 if /8=1 (digital input)	P14	0	22	0	0	0	0	0	0	
Low pressure alarm L configuration 0= not active with compressor OFF 1= active with compressor OFF	P15	0	1	0	0	0	0	0	0	
High temperature alarm set	P16	-40.0	176.0	80.0	80.0	80.0	80.0	80.0	80.0	
High temperature alarm delay at start-up	P17	0	250	30	30	30	30	30	30	
High pressure alarm set from transducer	P18	0	99.9	20.0	20.0	20.0	20.0	20.0	20.0	
System low temperature alarm set point	P19	-40.0	176.0	10.0	10.0	10.0	10.0	10.0	10.0	
Enable system start-up protection 0= disabled 1=enabled	P20	0	1	0	0	0	0	0	0	
Alarm relay management 0= normally de-activated 1=norm. activated	P21	0	1	0	0	0	0	0	0	



CONTROL setting parameters (r)	display	range		default	Models "IP" range					
		MIN	MAX		M2 - M4	M10...201	251...401	501...602	702 - 802	custom
Cooling (Summer) set point	r01	r13	r14	12.0	7.0	7.0	7.0	7.0	7.0	
Cooling (summer) differential	r02	0.3	50.0	3.0	3.0	3.0	3.0	3.0	3.0	
Heating (Winter) set point	r03	r15	r16	40.0	40.0	40.0	40.0	40.0	40.0	
Heating (Winter) differential	r04	0.3	50.0	3.0	3.0	3.0	3.0	3.0	3.0	
Compressor rotation 0= disabled 1= FIFO type 2= hourcontrol 3= direct relation between D.I. and compressors D.O.	r05	0	3	0	0	0	0	1	1	
Type of compressor control 0= prop. on inlet 1= prop. on inlet. + dead zone 2= prop. on outlet 3= prop. on outlet + dead zone 4= time on outlet with dead zone	r06	0	4	0	0	0	0	0	0	
Dead zone differential	r07	0.1	50.0	2.0	2.0	2.0	2.0	2.0	2.0	
Activation delay at lower limit of r07	r08	0	999	120	120	120	120	120	120	
Activation delay at upper limit of r07	r09	0	999	100	100	100	100	100	100	
Deactivation delay of lower limit of r12	r10	0	999	120	120	120	120	120	120	
Deactivation delay at upper limit of r12	r11	0	999	100	100	100	100	100	100	
Compressor deactivation differential	r12	0	50.0	2.0	2.0	2.0	2.0	2.0	2.0	
Min. cooling (Summer) set point	r13	-40.0	r14	-40	5.0	5.0	5.0	5.0	5.0	
Max. cooling (Summer) set point	r14	r13	176.0	80.0	25.0	25.0	25.0	25.0	25.0	
Min. heating (Winter) set point	r15	-40.0	r16	-40	30.0	30.0	30.0	30.0	30.0	
Max. heating (Winter) set point	r16	r15	176.0	80.0	50.0	50.0	50.0	50.0	50.0	
Cooling compensation constant	r17	-5.0	+5.0	0.0	0.0	0.0	0.0	0.0	0.0	
Maximum distance from the set point	r18	0.3	20.0	0.3	0.3	0.3	0.3	0.3	0.3	
Start compensation temperature in cooling mode	r19	-40.0	176.0	30.0	30.0	30.0	30.0	30.0	30.0	
Start compensation temperature in heating mode	r20	-40.0	176.0	0	0	0	0	0	0	
Second cooling set point from external contact	r21	r13	r14	12.0	12.0	12.0	12.0	12.0	12.0	
Second heating set point from external contact	r22	r15	r16	40.0	40.0	40.0	40.0	40.0	40.0	
Enable accumulation vessel suppression 0= disabled 1= enabled in cool 2= enabled in heat 3= always enabled	r27	0	3	0	0	0	0	0	0	
Minimum time to determine low load conditions	r28	0	999	60	60	60	60	60	60	
Low load differential in cool pump mode	r29	0.3	50.0	3.0	3.0	3.0	3.0	3.0	3.0	
Low load differential in heat pump mode	r30	0.3	50.0	3.0	3.0	3.0	3.0	3.0	3.0	
Heating compensation constant	r31	-5.0	+5.0	0.0	0.0	0.0	0.0	0.0	0.0	

CONTROL setting parameters (r)	display	range		default	Models "IP" range – LT version (low temperature)					
		MIN	MAX		M2 - M4	M10...201	251...401	501...602	702 - 802	custom
Cooling (Summer) set point	r01	r13	r14	12.0	-	-20.0	-20.0	-20.0	-20.0	
Cooling (summer) differential	r02	0.3	50.0	3.0	-	3.0	3.0	3.0	3.0	
Heating (Winter) set point	r03	r15	r16	40.0	-	40.0	40.0	40.0	40.0	
Heating (Winter) differential	r04	0.3	50.0	3.0	-	3.0	3.0	3.0	3.0	
Compressor rotation 0= disabled 1= FIFO type 2= hourcontrol 3= direct relation between D.I. and compressors D.O.	r05	0	3	0	-	0	0	1	1	
Type of compressor control 0= prop. on inlet 1= prop. on inlet. + dead zone 2= prop. on outlet 3= prop. on outlet + dead zone 4= time on outlet with dead zone	r06	0	4	0	-	0	0	0	0	
Dead zone differential	r07	0.1	50.0	2.0	-	2.0	2.0	2.0	2.0	
Activation delay at lower limit of r07	r08	0	999	120	-	120	120	120	120	
Activation delay at upper limit of r07	r09	0	999	100	-	100	100	100	100	
Deactivation delay of lower limit of r12	r10	0	999	120	-	120	120	120	120	
Deactivation delay at upper limit of r12	r11	0	999	100	-	100	100	100	100	
Compressor deactivation differential	r12	0	50.0	2.0	-	2.0	2.0	2.0	2.0	
Min. cooling (Summer) set point	r13	-40.0	r14	-40	-	-30.0	-30.0	-30.0	-30.0	
Max. cooling (Summer) set point	r14	r13	176.0	80.0	-	20.0	20.0	20.0	20.0	
Min. heating (Winter) set point	r15	-40.0	r16	-40	-	30.0	30.0	30.0	30.0	
Max. heating (Winter) set point	r16	r15	176.0	80.0	-	50.0	50.0	50.0	50.0	
Cooling compensation constant	r17	-5.0	+5.0	0.0	-	0.0	0.0	0.0	0.0	
Maximum distance from the set point	r18	0.3	20.0	0.3	-	0.3	0.3	0.3	0.3	
Start compensation temperature in cooling mode	r19	-40.0	176.0	30.0	-	30.0	30.0	30.0	30.0	
Start compensation temperature in heating mode	r20	-40.0	176.0	0	-	0	0	0	0	
Second cooling set point from external contact	r21	r13	r14	12.0	-	12.0	12.0	12.0	12.0	
Second heating set point from external contact	r22	r15	r16	40.0	-	40.0	40.0	40.0	40.0	
Enable accumulation vessel suppression 0= disabled 1= enabled in cool 2= enabled in heat 3= always enabled	r27	0	3	0	-	0	0	0	0	
Minimum time to determine low load conditions	r28	0	999	60	-	60	60	60	60	
Low load differential in cool pump mode	r29	0.3	50.0	3.0	-	3.0	3.0	3.0	3.0	
Low load differential in heat pump mode	r30	0.3	50.0	3.0	-	3.0	3.0	3.0	3.0	
Heating compensation constant	r31	-5.0	+5.0	0.0	-	0.0	0.0	0.0	0.0	

R407c GAS CHEMICAL SAFETY DATA SHEET**PRODUCT NAME:** REFRIGERANT GAS R407c**COMPOSITION/INFORMATION ON INGREDIENTS**

EEC No.: 200-839-4 HFC32, 206-557-8 HFC125, 212-377-0 HFC134a

HAZARDOUS INGREDIENT(S)	CAS No.	% (w/w)	Symbol	R Phrases
Difluoromethane (HFC 32)	000075-10-5	23	F+	R12
Pentafluoroethane (HFC 125)	000354-33-6	25		
1,1,1,2-tetrafluoroethane (HFC 134a)	000811-97-2	52		

HAZARDS IDENTIFICATION

Low acute toxicity. High exposures may cause an abnormal heart rhythm and prove suddenly fatal. Very high atmospheric concentrations may cause anaesthetic effects and asphyxiation.

Liquid splashes or spray may cause freeze burns to skin and eyes.

FIRST-AID MEASURES

The first aid advice given for skin contact, eye contact, and ingestion is applicable following exposures to the liquid or spray. See also TOXICOLOGICAL INFORMATION.

Inhalation: Remove patient from exposure, keep warm and at rest. Administer oxygen if necessary. Apply artificial respiration if breathing has ceased or shows signs of failing. In the event of cardiac arrest apply external cardiac massage. Obtain immediate medical attention.

Skin Contact: Thaw affected areas with water. Remove contaminated clothing. Caution: clothing may adhere to the skin in the case of freeze burns. After contact with skin, wash immediately with plenty of warm water. If irritation or blistering occur obtain medical attention.

Eye Contact: Immediately irrigate with eyewash solution or clean water, holding the eyelids apart, for at least 10 minutes. Obtain immediate medical attention.

Ingestion: Unlikely route of exposure.
Do not induce vomiting. Provided the patient is conscious, wash out mouth with water and give 200-300 ml (half a pint) of water to drink. Obtain immediate medical attention.

Further Medical Treatment

Symptomatic treatment and supportive therapy as indicated.

Adrenaline and similar sympathomimetic drugs should be avoided following exposure as cardiac arrhythmia may result with possible subsequent cardiac arrest.

FIRE-FIGHTING MEASURES

This refrigerant is not flammable in air under ambient conditions of temperature and pressure. Certain mixtures of this refrigerant and air when under pressure may be flammable. Mixtures of this refrigerant and air under pressure should be avoided.

Certain mixtures of HFCs and chlorine may be flammable or reactive under certain conditions.

Thermal decomposition will evolve very toxic and corrosive vapours. (hydrogen fluoride)

Containers may burst if overheated.

Extinguishing Media: As appropriate for surrounding fire. Water spray should be used to cool containers.

Fire Fighting Protective Equipment: A self contained breathing apparatus and full protective clothing must be worn in fire conditions. See Also EXPOSURE CONTROLS/PERSONAL PROTECTION.

ACCIDENTAL RELEASE MEASURES

Ensure suitable personal protection (including respiratory protection) during removal of spillages. See Also EXPOSURE CONTROLS/PERSONAL PROTECTION.

Provided it is safe to do so, isolate the source of the leak. Allow small spillages to evaporate provided there is adequate ventilation.

Large spillages: Ventilate area. Contain spillages with sand, earth or any suitable adsorbent material. Prevent liquid from entering drains, sewers, basements and workpits since the vapour may create a suffocating atmosphere.

HANDLING AND STORAGE**HANDLING**

Avoid inhalation of high concentrations of vapours. Atmospheric levels should be controlled in compliance with the occupational exposure limit. Atmospheric concentrations well below the occupational exposure limit can be achieved by good occupational hygiene practice.

The vapour is heavier than air, high concentrations may be produced at low levels where general ventilation is poor, in such cases provide adequate ventilation or wear suitable respiratory protective equipment with positive air supply.

Avoid contact with naked flames and hot surfaces as corrosive and very toxic decomposition products can be formed.

Avoid contact between the liquid and skin and eyes.

For correct refrigerant composition, systems should be charged using the liquid phase and not the vapour phase.

Process Hazards

Liquid refrigerant transfers between refrigerant containers and to and from systems can result in static generation. Ensure adequate earthing.

Certain mixtures of HFCs and chlorine may be flammable or reactive under certain conditions.

STORAGE

Keep in a well ventilated place. Keep in a cool place away from fire risk, direct sunlight and all sources of heat such as electric and steam radiators.

Avoid storing near to the intake of air conditioning units, boiler units and open drains.

Cylinders and Drums:

Keep container dry.

Storage temperature (Deg C): < 45

EXPOSURE CONTROLS/PERSONAL PROTECTION

Wear suitable protective clothing, gloves and eye/face protection. Wear thermal insulating gloves when handling liquefied gases.

In cases of insufficient ventilation, where exposure to high concentrations of vapour is possible, suitable respiratory protective equipment with positive air supply should be used.

Occupational Exposure Limits

HAZARDOUS INGREDIENT(S)	TWA ppm	TWA mg/m ³	STEL ppm	STEL mg/m ³	
Difluoromethane (HFC 32)	1000	-	-	-	COM
Pentafluoroethane (HFC 125)	1000	-	-	-	COM
1,1,1,2- Tetrafluoroethane (HFC 134a)	1000	4240	-	-	OES

PHYSICAL AND CHEMICAL PROPERTIES

Form:	liquified gas
Colour:	colourless
Odour:	slight ethereal
Boiling Point (Deg C):	-44.3 to -37.1 (boiling range)
Vapour Pressure (mm Hg):	7810 at 20 Deg C
Density (g/ml):	1.16 at 20 Deg C
Solubility (Water):	insoluble
Solubility (Other): soluble in:	chlorinated solvents, alcohols, esters
Vapour Density (Air= 1):	3.0 at bubble point temperature

STABILITY AND REACTIVITY

Hazardous Reactions: Certain mixtures of HFCs and chlorine may be flammable or reactive under certain conditions.

Incompatible materials: finely divided metals, magnesium and alloys containing more than 2% magnesium.
Can react violently if in contact with alkali metals and alkaline earth metals -sodium, potassium, barium.

Hazardous Decomposition Product(s): hydrogen fluoride by thermal decomposition and hydrolysis.

TOXICOLOGICAL INFORMATION

Inhalation

High exposures may cause an abnormal heart rhythm and prove suddenly fatal. Very high atmospheric concentrations may cause anaesthetic effects and asphyxiation.

Skin Contact

Liquid splashes or spray may cause freeze burns. Unlikely to be hazardous by skin absorption.

Eye Contact

Liquid splashes or spray may cause freeze burns.

Ingestion

Highly unlikely - but should this occur freeze burns will result.

Long Term Exposure

HFC 32: An inhalation study in animals has shown that repeated exposures produce no significant effects (49,500ppm in rats).

HFC 125: An inhalation study in animals has shown that repeated exposures produce no significant effects (50,000ppm in rats).

HFC 134a: A lifetime inhalation study in rats has shown that exposure to 50,000ppm resulted in benign tumours of the testis. The increased tumour incidence was observed only after prolonged exposure to high levels, and is considered not to be of relevance to humans occupationally exposed to HFC 134a at or below the occupational exposure limit.

ECOLOGICAL INFORMATION**Environmental Fate and Distribution**

High tonnage material produced in wholly contained systems. High tonnage material used in open systems. Vapour.

Persistence and Degradation

HFC 32: Decomposed comparatively rapidly in the lower atmosphere (troposphere). Atmospheric lifetime is 5.6 year(s).

Has a Halocarbon Global Warming Potential (HGWP) of 0.15 (relative to a value of 1 for CFC 11) or a Global Warming Potential (GWP) of 650 (relative to a value of 1 for carbon dioxide at 100 years).

HFC 125: Decomposed slowly in the lower atmosphere (troposphere). Atmospheric lifetime is 32.6 year(s).

Has a Halocarbon Global Warming Potential (HGWP) of 0.70 (relative to a value of 1 for CFC 11) or a Global Warming Potential (GWP) of 2800 (relative to a value of 1 for carbon dioxide at 100 years).

HFC 134a: Decomposed comparatively rapidly in the lower atmosphere (troposphere). Atmospheric lifetime is 13.6 year(s).

Has a Halocarbon Global Warming Potential (HGWP) of 0.30 (relative to a value of 1 for CFC 11) or a Global Warming Potential (GWP) of 1300 (relative to a value of 1 for carbon dioxide at 100 years).

HFC 32, HFC 125, HFC 134a: Do not influence photochemical smog (i.e. they are not VOCs under the terms of the UNECE agreement). Do not deplete ozone.

Effect on Effluent Treatment

Discharges of the product will enter the atmosphere and will not result in long term aqueous contamination.

DISPOSAL CONSIDERATIONS

Best to recover and recycle. If this is not possible, destruction is to be in an approved facility which is equipped to absorb and neutralise acid gases and other toxic processing products.

TRANSPORT INFORMATION

UN No.: 3340

AIR

ICAO/IATA

-primary: 2.2

SEA

IMDG

-primary: 2.2

Marine Pollutant: Not classified as a Marine Pollutant

Proper Shipping Name: REFRIGERANT GAS R 407C

ROAD/RAIL

ADR/RID Class: 2

ADR/RID Item No: 2A

ADR Sin: 3340

REGULATORY INFORMATION

Not Classified as Hazardous to Users.

GLOSSARY

OES:	Occupational Exposure Standard (UK HSE EH40)
MEL:	Maximum Exposure Limit (UK HSE EH40)
COM:	The company aims to control exposure in its workplace to this limit
TLV:	The company aims to control exposure in its workplace to the ACGIH limit
TLV-C:	The company aims to control exposure in its workplace to the ACGIH Ceiling limit
MAK:	The company aims to control exposure in its workplace to the German limit
Sk:	Can be absorbed through skin
Sen:	Capable of causing respiratory sensitisation
Bmgv:	Biological monitoring guidance value (UK HSE EH40)
ILV:	Indicative Limit Value (UK HSE EH40)

R404a GAS CHEMICAL SAFETY DATA SHEET

PRODUCT NAME: REFRIGERANT GAS R404a

COMPOSITION/INFORMATION ON INGREDIENTS

No. CEE: 206-996-5 HFC 143a, 206-557-8 HFC 125, 212-377-0 HFC 134a

HAZARDOUS INGREDIENT(S)	CAS No.	% (w/w)	Symbol	R Phrases
1,1,1-Trifluoroethane (HFC 143a)	000420-46-2	52	F+	R12
Pentafluoroethane (HFC 125)	000354-33-6	44		
1,1,1,2-tetrafluoroethane (HFC 134a)	000811-97-2	4		

HAZARDS IDENTIFICATION

Low acute toxicity. High exposures may cause an abnormal heart rhythm and prove suddenly fatal. Very high atmospheric concentrations may cause anaesthetic effects and asphyxiation.
Liquid splashes or spray may cause freeze burns to skin and eyes.

FIRST-AID MEASURES

The first aid advice given for skin contact, eye contact, and ingestion is applicable following exposures to the liquid or spray. See also TOXICOLOGICAL INFORMATION.

- Inhalation:** Remove patient from exposure, keep warm and at rest. Administer oxygen if necessary. Apply artificial respiration if breathing has ceased or shows signs of failing. In the event of cardiac arrest apply external cardiac massage. Obtain immediate medical attention.
- Skin Contact:** Thaw affected areas with water. Remove contaminated clothing. Caution: clothing may adhere to the skin in the case of freeze burns. After contact with skin, wash immediately with plenty of warm water. If irritation or blistering occur obtain medical attention.
- Eye Contact:** Immediately irrigate with eyewash solution or clean water, holding the eyelids apart, for at least 10 minutes. Obtain immediate medical attention.
- Ingestion:** Unlikely route of exposure.
Do not induce vomiting. Provided the patient is conscious, wash out mouth with water and give 200-300 ml (half a pint) of water to drink. Obtain immediate medical attention.

Further Medical Treatment

Symptomatic treatment and supportive therapy as indicated.
Adrenaline and similar sympathomimetic drugs should be avoided following exposure as cardiac arrhythmia may result with possible subsequent cardiac arrest.

FIRE-FIGHTING MEASURES

This refrigerant is not flammable in air under ambient conditions of temperature and pressure. Certain mixtures of this refrigerant and air when under pressure may be flammable. Mixtures of this refrigerant and air under pressure should be avoided.
Certain mixtures of HFCs and chlorine may be flammable or reactive under certain conditions.
Thermal decomposition will evolve very toxic and corrosive vapours. (hydrogen fluoride)
Containers may burst if overheated.

- Extinguishing Media:** As appropriate for surrounding fire. Water spray should be used to cool containers.
- Fire Fighting Protective Equipment:** A self contained breathing apparatus and full protective clothing must be worn in fire conditions. See Also EXPOSURE CONTROLS/PERSONAL PROTECTION.

ACCIDENTAL RELEASE MEASURES

Ensure suitable personal protection (including respiratory protection) during removal of spillages. See Also EXPOSURE CONTROLS/PERSONAL PROTECTION.
Provided it is safe to do so, isolate the source of the leak. Allow small spillages to evaporate provided there is adequate ventilation.
Large spillages: Ventilate area. Contain spillages with sand, earth or any suitable adsorbent material. Prevent liquid from entering drains, sewers, basements and workpits since the vapour may create a suffocating atmosphere.

HANDLING AND STORAGE
HANDLING

Avoid inhalation of high concentrations of vapours. Atmospheric levels should be controlled in compliance with the occupational exposure limit. Atmospheric concentrations well below the occupational exposure limit can be achieved by good occupational hygiene practice.
The vapour is heavier than air, high concentrations may be produced at low levels where general ventilation is poor, in such cases provide adequate ventilation or wear suitable respiratory protective equipment with positive air supply.
Avoid contact with naked flames and hot surfaces as corrosive and very toxic decomposition products can be formed.
Avoid contact between the liquid and skin and eyes.
For correct refrigerant composition, systems should be charged using the liquid phase and not the vapour phase.

Process Hazards

Liquid refrigerant transfers between refrigerant containers and to and from systems can result in static generation. Ensure adequate earthing.
Certain mixtures of HFCs and chlorine may be flammable or reactive under certain conditions.

STORAGE

Keep in a well ventilated place. Keep in a cool place away from fire risk, direct sunlight and all sources of heat such as electric and steam radiators.

Avoid storing near to the intake of air conditioning units, boiler units and open drains.

Cylinders and Drums:

Keep container dry.

Storage temperature (Deg C): < 45

EXPOSURE CONTROLS/PERSONAL PROTECTION

Wear suitable protective clothing, gloves and eye/face protection. Wear thermal insulating gloves when handling liquefied gases.

In cases of insufficient ventilation, where exposure to high concentrations of vapour is possible, suitable respiratory protective equipment with positive air supply should be used.

Occupational Exposure Limits

HAZARDOUS INGREDIENT(S)	TWA ppm	TWA mg/m ³	STEL ppm	STEL mg/m ³	
1,1,1,2-Trifluoroethane (HFC 143a)	1000	-	-	-	COM
Pentafluoroethane (HFC 125)	1000	-	-	-	COM
1,1,1,2- Tetrafluoroethane (HFC 134a)	1000	4240	-	-	OES

PHYSICAL AND CHEMICAL PROPERTIES

Form:	liquified gas
Colour:	colourless
Odour:	slight ethereal
Boiling Point (Deg C):	-47.2 to -46.4 (boiling range)
Vapour Pressure (mm Hg):	8270 at 20 Deg C
Density (g/ml):	1.06 at 20 Deg C
Solubility (Water):	insoluble
Solubility (Other): soluble in:	chlorinated solvents, alcohols, esters
Vapour Density (Air= 1):	3.42 approx. at bubble point temperature

STABILITY AND REACTIVITY

Hazardous Reactions: Certain mixtures of HFCs and chlorine may be flammable or reactive under certain conditions.

Incompatible materials: finely divided metals, magnesium and alloys containing more than 2% magnesium.

Can react violently if in contact with alkali metals and alkaline earth metals -sodium, potassium, barium.

Hazardous Decomposition Product(s): hydrogen fluoride by thermal decomposition and hydrolysis.

TOXICOLOGICAL INFORMATION

Inhalation

High exposures may cause an abnormal heart rhythm and prove suddenly fatal. Very high atmospheric concentrations may cause anaesthetic effects and asphyxiation.

Skin Contact

Liquid splashes or spray may cause freeze burns. Unlikely to be hazardous by skin absorption.

Eye Contact

Liquid splashes or spray may cause freeze burns.

Ingestion

Highly unlikely - but should this occur freeze burns will result.

Long Term Exposure

HFC 143a: An inhalation study in animals has shown that repeated exposures produce no significant effects (40,000ppm in rats).

HFC 125: An inhalation study in animals has shown that repeated exposures produce no significant effects (50,000ppm in rats).

HFC 134a: A lifetime inhalation study in rats has shown that exposure to 50,000ppm resulted in benign tumours of the testis. The increased tumour incidence was observed only after prolonged exposure to high levels, and is considered not to be of relevance to humans occupationally exposed to HFC 134a at or below the occupational exposure limit.

ECOLOGICAL INFORMATION

Environmental Fate and Distribution

High tonnage material produced in wholly contained systems. High tonnage material used in open systems. Vapour.

Persistence and Degradation

HFC 143a: Decomposed comparatively rapidly in the lower atmosphere (troposphere). Atmospheric lifetime is 53.5 year(s).

Has a Halocarbon Global Warming Potential (HGWP) of 0.15 (relative to a value of 1 for CFC 11) or a Global Warming Potential (GWP) of 3800 (relative to a value of 1 for carbon dioxide at 100 years).

HFC 125: Decomposed slowly in the lower atmosphere (troposphere). Atmospheric lifetime is 32.6 year(s).

Has a Halocarbon Global Warming Potential (HGWP) of 0.70 (relative to a value of 1 for CFC 11) or a Global Warming Potential (GWP) of 2800 (relative to a value of 1 for carbon dioxide at 100 years).

HFC 134a: Decomposed comparatively rapidly in the lower atmosphere (troposphere). Atmospheric lifetime is 13.6 year(s).

Has a Halocarbon Global Warming Potential (HGWP) of 0.30 (relative to a value of 1 for CFC 11) or a Global Warming Potential (GWP) of 1300 (relative to a value of 1 for carbon dioxide at 100 years).

HFC 143a, HFC 125, HFC 134a: Do not influence photochemical smog (i.e. they are not VOCs under the terms of the UNECE agreement). Do not deplete ozone.

Effect on Effluent Treatment

Discharges of the product will enter the atmosphere and will not result in long term aqueous contamination.

DISPOSAL CONSIDERATIONS

Best to recover and recycle. If this is not possible, destruction is to be in an approved facility which is equipped to absorb and neutralise acid gases and other toxic processing products.

TRANSPORT INFORMATION

UN No.: 3337

AIR

ICAO/IATA

-primary: 2.2

SEA

IMDG

-primary: 2.2

Marine Pollutant: Not classified as a Marine Pollutant

Proper Shipping Name: REFRIGERANT GAS R 407C

ROAD/RAIL

ADR/RID Class: 2

ADR/RID Item No: 2A

ADR Sin: 3337

REGULATORY INFORMATION

Not Classified as Hazardous to Users.

GLOSSARY

OES:	Occupational Exposure Standard (UK HSE EH40)
MEL:	Maximum Exposure Limit (UK HSE EH40)
COM:	The company aims to control exposure in its workplace to this limit
TLV:	The company aims to control exposure in its workplace to the ACGIH limit
TLV-C:	The company aims to control exposure in its workplace to the ACGIH Ceiling limit
MAK:	The company aims to control exposure in its workplace to the German limit
Sk:	Can be absorbed through skin
Sen:	Capable of causing respiratory sensitisation
Bmgv:	Biological monitoring guidance value (UK HSE EH40)
ILV:	Indicative Limit Value (UK HSE EH40)

R134a GAS CHEMICAL SAFETY DATA SHEET**PRODUCT NAME:** REFRIGERANT GAS R134a**COMPOSITION/INFORMATION ON INGREDIENTS**CAS No.: 000811-97-2
EEC No.: 212-377-0

HAZARDOUS INGREDIENT(S)	CAS No.	Symbol	R Phrases
1,1,1,2-tetrafluoroethane (HFC 134a)	000811-97-2		

HAZARDS IDENTIFICATION

Low acute toxicity. High exposures may cause an abnormal heart rhythm and prove suddenly fatal. Very high atmospheric concentrations may cause anaesthetic effects and asphyxiation.
Liquid splashes or spray may cause freeze burns to skin and eyes.

FIRST-AID MEASURES

The first aid advice given for skin contact, eye contact, and ingestion is applicable following exposures to the liquid or spray. See also TOXICOLOGICAL INFORMATION.

Inhalation: Remove patient from exposure, keep warm and at rest. Administer oxygen if necessary. Apply artificial respiration if breathing has ceased or shows signs of failing. In the event of cardiac arrest apply external cardiac massage. Obtain immediate medical attention.

Skin Contact: Thaw affected areas with water. Remove contaminated clothing. Caution: clothing may adhere to the skin in the case of freeze burns. After contact with skin, wash immediately with plenty of warm water. If irritation or blistering occur obtain medical attention.

Eye Contact: Immediately irrigate with eyewash solution or clean water, holding the eyelids apart, for at least 10 minutes. Obtain immediate medical attention.

Ingestion: Unlikely route of exposure.
Do not induce vomiting. Provided the patient is conscious, wash out mouth with water and give 200-300 ml (half a pint) of water to drink. Obtain immediate medical attention.

Further Medical Treatment

Symptomatic treatment and supportive therapy as indicated.
Adrenaline and similar sympathomimetic drugs should be avoided following exposure as cardiac arrhythmia may result with possible subsequent cardiac arrest.

FIRE-FIGHTING MEASURES

This refrigerant is not flammable in air under ambient conditions of temperature and pressure. Certain mixtures of this refrigerant and air when under pressure may be flammable. Mixtures of this refrigerant and air under pressure should be avoided.
Certain mixtures of HFCs and chlorine may be flammable or reactive under certain conditions.
Thermal decomposition will evolve very toxic and corrosive vapours. (hydrogen fluoride)
Containers may burst if overheated.

Extinguishing Media: As appropriate for surrounding fire. Water spray should be used to cool containers.

Fire Fighting Protective Equipment: A self contained breathing apparatus and full protective clothing must be worn in fire conditions. See Also EXPOSURE CONTROLS/PERSONAL PROTECTION.

ACCIDENTAL RELEASE MEASURES

Ensure suitable personal protection (including respiratory protection) during removal of spillages. See Also EXPOSURE CONTROLS/PERSONAL PROTECTION.
Provided it is safe to do so, isolate the source of the leak. Allow small spillages to evaporate provided there is adequate ventilation.
Large spillages: Ventilate area. Contain spillages with sand, earth or any suitable adsorbent material. Prevent liquid from entering drains, sewers, basements and workpits since the vapour may create a suffocating atmosphere.

HANDLING AND STORAGE**HANDLING**

Avoid inhalation of high concentrations of vapours. Atmospheric levels should be controlled in compliance with the occupational exposure limit. Atmospheric concentrations well below the occupational exposure limit can be achieved by good occupational hygiene practice.
The vapour is heavier than air, high concentrations may be produced at low levels where general ventilation is poor, in such cases provide adequate ventilation or wear suitable respiratory protective equipment with positive air supply.
Avoid contact with naked flames and hot surfaces as corrosive and very toxic decomposition products can be formed.
Avoid contact between the liquid and skin and eyes.
For correct refrigerant composition, systems should be charged using the liquid phase and not the vapour phase.

STORAGE

Keep in a well ventilated place. Keep in a cool place away from fire risk, direct sunlight and all sources of heat such as electric and steam radiators.

Avoid storing near to the intake of air conditioning units, boiler units and open drains.

Cylinders and Drums:

Keep container dry.

Storage temperature (Deg C): < 45

EXPOSURE CONTROLS/PERSONAL PROTECTION

Wear suitable protective clothing, gloves and eye/face protection. Wear thermal insulating gloves when handling liquefied gases.

In cases of insufficient ventilation, where exposure to high concentrations of vapour is possible, suitable respiratory protective equipment with positive air supply should be used.

Occupational Exposure Limits

HAZARDOUS INGREDIENT(S)	TWA ppm	TWA mg/m ³	STEL ppm	STEL mg/m ³	
1,1,1,2- Tetrafluoroethane (HFC 134a)	1000	4240	-	-	OES

PHYSICAL AND CHEMICAL PROPERTIES

Form: liquified gas

Colour: colourless

Odour: slight ethereal

Boiling Point (Deg C): -26.2

Vapour Pressure (mm Hg): 4270 at 20 Deg C

Density (g/ml): 1.22 at 20 Deg C

Solubility (Water): insoluble

Solubility (Other): soluble in: chlorinated solvents, alcohols, esters

Vapour Density (Air= 1): 3.66 at bubble point temperature

STABILITY AND REACTIVITY

Hazardous Reactions: Certain mixtures of HFCs and chlorine may be flammable or reactive under certain conditions.

Incompatible materials: finely divided metals, magnesium and alloys containing more than 2% magnesium.

Can react violently if in contact with alkali metals and alkaline earth metals -sodium, potassium, barium.

Hazardous Decomposition Product(s): hydrogen fluoride by thermal decomposition and hydrolysis.

TOXICOLOGICAL INFORMATION

Inhalation

High exposures may cause an abnormal heart rhythm and prove suddenly fatal. Very high atmospheric concentrations may cause anaesthetic effects and asphyxiation.

Skin Contact

Liquid splashes or spray may cause freeze burns. Unlikely to be hazardous by skin absorption.

Eye Contact

Liquid splashes or spray may cause freeze burns.

Ingestion

Highly unlikely - but should this occur freeze burns will result.

Long Term Exposure

A lifetime inhalation study in rats has shown that exposure to 50,000ppm resulted in benign tumours of the testis.

The increased tumour incidence was observed only after prolonged exposure to high levels, and is considered not to be of relevance to humans occupationally exposed to HFC 134a at or below the occupational exposure limit.

ECOLOGICAL INFORMATION

Environmental Fate and Distribution

High tonnage material produced in wholly contained systems. High tonnage material used in open systems. Vapour.

Persistence and Degradation

Decomposed comparatively rapidly in the lower atmosphere (troposphere). Atmospheric lifetime is 13.6 year(s).

Has a Halocarbon Global Warming Potential (HGWP) of 0.30 (relative to a value of 1 for CFC 11) or a Global Warming Potential (GWP) of 1300 (relative to a value of 1 for carbon dioxide at 100 years).

Effect on Effluent Treatment

Discharges of the product will enter the atmosphere and will not result in long term aqueous contamination.

DISPOSAL CONSIDERATIONS

Best to recover and recycle. If this is not possible, destruction is to be in an approved facility which is equipped to absorb and neutralise acid gases and other toxic processing products.

**TRANSPORT INFORMATION**

UN No.: 3159

AIR

ICAO/IATA

-primary: 2.2

SEA

IMDG

-primary: 2.2

Marine Pollutant: Not classified as a Marine Pollutant

Proper Shipping Name: 1,1,1,2-TETRAFLUOROETHANE

ROAD/RAIL

ADR/RID Class: 2

ADR/RID Item No: 2A

ADR Sin: 3159

REGULATORY INFORMATION

Not Classified as Hazardous to Users.

GLOSSARY

OES:	Occupational Exposure Standard (UK HSE EH40)
MEL:	Maximum Exposure Limit (UK HSE EH40)
COM:	The company aims to control exposure in its workplace to this limit
TLV:	The company aims to control exposure in its workplace to the ACGIH limit
TLV-C:	The company aims to control exposure in its workplace to the ACGIH Ceiling limit
MAK:	The company aims to control exposure in its workplace to the German limit
Sk:	Can be absorbed through skin
Sen:	Capable of causing respiratory sensitisation
Bmgv:	Biological monitoring guidance value (UK HSE EH40)
ILV:	Indicative Limit Value (UK HSE EH40)



Euroklimat S.p.A.
Via Liguria, 8 – 27010 SIZIANO (PV) ITALY
Tel. (+39) 0382.610282 – Fax (+39) 0382.617782
www.euroklimat.it - Email: info@euroklimat.it

All technical specifications presented in this manual are not binding and subject to change without notice.