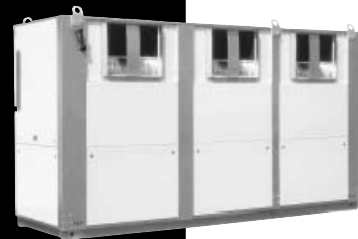


INSTALLATION - OPERATING & MAINTENANCE MANUAL



PROVIDING **INDOOR CLIMATE COMFORT**

**AIR COOLED
CHILLERS**

AIR COOLED CHILLERS AND SPLIT UNITS

INSTALLATION OPERATION MAINTENANCE MANUAL

Ref : CHILLERS_IOM-0105-E

The present manual applies to the following CHILLERS versions :

ECOLOGIC range : WA - WAH - RA

ECOMAX range : LCH - LCB

MCC range

MCB range

Our company is a member of the Eurovent Certification Programme, all LENNOX chillers are tested and rated in accordance with Eurovent certification program,

Our products comply with the European standards,

Product designed and manufactured under a quality management system certified to AFAQ ISO 9001 by AFAQ,



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

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1 - PREFACE

You must read and be familiar with this operating manual prior to commission the chiller. Please closely follow the instructions.

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

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

Text	Important general instruction
------	-------------------------------



Danger of Injury or damage to the chiller

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

Please do not hesitate to contact one of our employees should you require further information on specific chiller subjects.

Order related documentation will be forwarded under separate cover.

This documentation consists of :

- **CE declaration.**
- **Operating manual for control system.**
- **Installation Operating manual**
- **Wiring diagram.**
- **Refrigerant flow diagram (except for WA-RA-WAH-LCH)**
- **Unit detail are given on unit nameplate.**

The data published in this manual is based on the most recent information available. It is supplied conditional to later modifications. We reserve the right to modify the construction and/or design of our chillers, at any time, without prior notification or obligation to adapt previous supplies accordingly.

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



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

It is expected that all works on equipment be carried out in accordance with all local standards and norms. It is expected that all works are carried out with good working practices.

**All Units are compliant with the PED directive 97-23-CE.
The following note must be followed carefully**

IMPORTANT NOTICE

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

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

Work on the unit :

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

Work on the electrical system :

- . Work on electric components shall be performed with the power off (see below) by employees having valid electrical qualification and authorisation.

Work on the refrigerating circuit(s) :

- . Monitoring of the pressures, draining and filling of the system under pressure shall be carried out using connections provided for this purpose and suitable equipment.
- . To prevent the risk of explosion due to spraying of coolant and oil, the relevant circuit shall be drained and at zero pressure before any disassembly or unbrazing of the refrigerating parts takes place.
- . There is a residual risk of pressure build-up by degassing the oil or by heating the exchangers after the circuit has been drained. Zero pressure shall be maintained by venting the drain connection to the atmosphere on the low pressure side.
- . The brazing shall be carried out by a qualified brazer. The brazing shall comply with the standard NF EN1044 (minimum 30% silver).

Replacing components :

- . In order to maintain CE marking compliance, replacement of components shall be carried out using spare parts, or using parts approved by Lennox.
- . Only the coolant shown on the manufacturer's nameplate shall be used, to the exclusion of all other products (mix of coolants, hydrocarbons, etc.).

CAUTION :

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

2 - WARRANTY

The warranty of the chillers is subject to the warranty definitions as agreed upon in the order. It is expected that the design and installation of the unit utilises good working practices.

The warranty will be legally null and void if :

- **Service and maintenance have not been executed in accordance with the regulations, repairs have not been carried out by Lennox personnel or have been implemented without prior written permission by Lennox.**
- **Modifications have been made to the equipment without prior written permission by Lennox.**
- **Settings and protections have been modified without prior written permission by Lennox.**
- **Non-original or other than the prescribed refrigerants or lubricants are used.**
- **The equipment has not been installed and/or connected in accordance with the installation instructions.**
- **The equipment is being used improperly, incorrectly, negligently or not in accordance with its nature and/or purpose.**
- **A flow protection device is not fitted.**

In these circumstances Lennox is indemnified from any product liability claims from third parties.

In the event of a warranty claim the machine serial number and Lennox order number must be quoted.

2.1 - SAFETY

The safety information contained in this manual is provided as a guide for the safe handling of this installation. Lennox does not vouch for the completeness of this information and can therefore not accept liability for any possible omissions.

In the air cooled chillers, heat is being transported by a pressurised refrigerant, with changes in pressure and temperature. Fans have been provided to discharge heat into the environment. The protection of operating and maintenance personnel was central in the design of the air cooled chiller. Safety features have been included to prevent excessive pressure in the system. Sheet metal parts have been fitted to prevent inadvertent contact with (hot) pipes. The fans are equipped with protective grids and the electrical control panel is completely touch-proof. This excludes some parts operating at a safe voltage (< 50 Volt). The service panels can only be opened using tools.

Notwithstanding that the air cooled chillers are equipped with extensive safety and protection features, the utmost care and attention is needed when carrying out operations on the machine. Furthermore, ear protection should be worn when working on or in the vicinity of the air cooled chillers. Operations on the cooling circuit or electrical equipment should be carried out by authorised personnel.

2.1.1 - Safety Definition

The air cooled chillers meet the following safety definitions:

- Pr-EN-378-1.
- EU Directive 89/392/EG ("Machine Directive").
- EN-60204-1.
- "EMC Directive".
- Pressure Equipment Directive 97/23/CE.

And is provided with CE markings.(on the condition that the necessary options are present) (for further information see II-A declaration).

2.1.2 - Warning labels

The chiller is marked with the following warning labels to alert to potential hazards (on or near the potentially hazardous part).



Check regularly that the warning labels are still in the correct positions on the machine and replace them if necessary.

3. INSTALLATION

3.1 - Transport - Handling

3.1.1 - Controls and delivery checks

On receipt of a new equipment please check the following points. It is the customer's responsibility to ensure that the products are in good working order (fill the check list page 48):

- The exterior has not been damaged in any way.
- The lifting and handling equipment are suitable for the equipment and comply with the specifications of the handling instructions enclosed here-in.
- Accessories ordered for on site installation have been delivered and are in good working order.
- If the unit is delivered with its operating charge of refrigerant, that there has been no leakage (use an electronic detector).
- The equipment supplied corresponds to the order and matches the delivery note.

If the product is damaged, exact details must be confirmed in writing by registered post to the shipping company within 48 hours of delivery (working days).

A copy of the letter must be addressed to LENNOX and the supplier or distributor for information purposes.

Failure to comply will invalidate any claim against the shipping company.

Please be reminded that LENNOX is not responsible for off-loading and positioning.

3.1.1.1 : Unit Nameplate

The rating plate provides a complete reference for the model and ensures that the unit corresponds to the model ordered. It states the electrical power consumption of the unit on start-up, its rated power and its supply voltage.

The supply voltage must not deviate beyond +10/-10 %.

The start-up power is the maximum value likely to be achieved for the specified operational voltage. The customer must have a suitable electrical supply. It is therefore important to check whether the supply voltage stated on the unit's rating plate is compatible with that of the mains electrical supply. The rating plate also states the year of manufacture as well as the type of refrigerant used and the required charge for each compressor circuit.

LENNOX		USINE LYON Z.I. LES MEURIERES Tel. 04 72 23 20 20 69780 MIONS - FRANCE	
Type / Unit type	WA 230DKLN		
N° Serie / Serial N.R.	125995/01		
Annee / Year	02/2004		
Refrigerant / Fluide	R407C		
Nombre de circuits / Circuits N.R.	2		
Kg/Circuit	34	34	
	C1	C2	C3 C4
Pression Max. service HP Max. operating pressure HP	27 bar		
Pression Max. service BP Max. operating pressure BP	15 bar		
Puissance frigo nominale Capacity	251 Kw		
Alimentation Elec. principale Elec. supply	400/3/50 Viph/Hz		
Alimentation Elec. auxiliaire Elec. auxiliary	230/1/50 Viph/Hz		
Valeur alim. principale/auxiliaire Elec. value supply/auxiliary	KVA		
Temp. Air ambiant Maxi Air ambiant temp. Maxi	+45 °C		
Poids total Unit weight	2161 Kg		
Type compresseur Compressor type	SZ 300		
Pression d'eprouve HP Test pressure HP	32 bar		
Pression d'eprouve BP Test pressure BP	25 bar		
Pression Max. service HP Max. operating pressure HP	27 bar		
Pression Max. service BP Max. operating pressure BP	15 bar		
CE		0062	

3.1.2 - Storage

When units are delivered on site they are not always required immediately and are sometimes put into storage. In the event of medium to long-term storage, we recommend the following procedures :

- Ensure that there is no water in the hydraulic systems.
- Keep the heat exchanger covers in position.
- Keep protective plastic film in position.
- Ensure the electrical panels are closed.
- Keep all items and options supplied in a dry and clean place for future assembly before using the equipment.

It is strongly recommended to store units in a dry, sheltered place (in particular for units that will be installed indoors).

3.2 - LIFTING THE UNIT

3.2.1 - Safety instructions

Installation, start up and adjustment of this equipment can be dangerous if certain system specific factors are ignored, such as operating pressures, electrical components, locations (roofs, terraces and other structures located well above ground level).

Only highly qualified contractors and technicians with sound knowledge of this type of equipment, are authorised to install, start up and service it.

During any service operations, observe the recommendations given on labels or instructions sent with the equipment, as well as any other applicable safety procedures.

- Follow all safety rules and regulations
- Wear protective glasses and work gloves
- Handle heavy or bulky equipment carefully during lifting and moving operations, and when setting it on the ground.



CAUTION : BEFORE EACH SERVICE OPERATION MAKE SURE THAT THE UNIT POWER SUPPLY IS PROPERLY ISOLATED AND LOCKED OUT.

NOTE : SOME UNITS MAY HAVE A SEPARATE 230V CONTROL SUPPLY THAT REQUIRES SEPARATE ISOLATION. PLEASE CHECK THE WIRING DIAGRAM.

3.2.2 - Handling

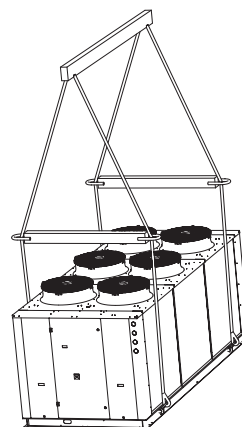
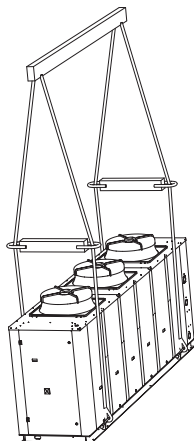
Handling operations must be carried out by qualified personnel. Comply strictly with lifting instruction pasted on the unit. Unit handling operations must be carried out carefully to avoid jolting the frame, the panels, the electrical box, the condenser coil fins, etc....

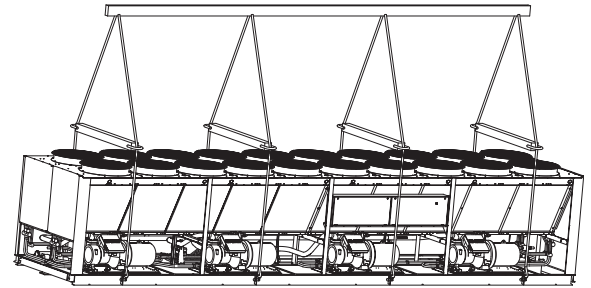
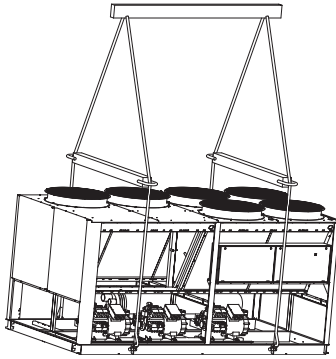
NOTE :

The heat exchangers of the condensers could be protected from damage during transport by plastic plates. The machine is also wrapped in packing foil. It is recommended to leave this protection in place during any transport and lifting operations, and not to remove the plastic plates until commissioning (take care that the protecting foil wrapping is not blown away!).

NOTE :

Rubber anti-vibrations mountings (AVM) & factory accessories are to be found in the control panel for shipping. If the unit is mounted on anti-vibration mountings, these should be fitted to the unit before final positioning.





3.3 - LAY-OUT AND INSTALLATION REQUIREMENTS

The following preparations are important for the installation of the chiller :

- Air-cooled chillers such as Ecologic or Ecomax are designed for outdoor installation. Please consult Lennox prior to implementing other types of installation.
- Locate the chiller where it is least affected by wind (install windbreaks where wind speeds > 2.2 m/s).
- The ground beneath the unit must be flat, level and of sufficient strength to support the weight of the unit with its full liquid charge, and the occasional presence of the usual service equipment.

In locations exposed to frost, the supporting surface, if the unit is installed on the ground, must be built on concrete stakes extending downwards beyond the normal depth of frost. It is always advisable to build a supporting surface detached from the general building structure to avoid transmission of vibrations.

- On normal applications, unit rigidity and point load positions enable installation to minimise vibrations. Vibration isolators may be used by contractors on installations requiring particularly low vibration levels.
- **Use of vibration isolators MUST be accompanied by installation of flexible connections in the unit water piping. Vibration isolators must also be fixed to the unit BEFORE being fixed to the ground.**

Selection of vibration absorbing isolator capacity is not LENNOX's responsibility.

The unit must be bolted to the vibration isolators and the latter solidly fixed into the concrete slab.

Check that vibration isolator contact surfaces fit flush to the floor. If necessary, use spacers or re-surface the flooring, but in all events, make sure that the isolators seat flatly on the supporting surface.

- It is essential that the units be installed with sufficient free space around them to enable proper circulation of air ejected by the condensers and to provide easy access to all unit components for servicing and maintenance. If the air rejected by the condenser encounters any obstacles, it will tend to be recycled by the fans. This will cause an increase in the temperature of the air used to cool the condensers. Obstruction of the air outlet will also impair air distribution across the entire heat exchanging surface of the condenser. Both of these conditions, which reduce the heat exchange capacity of the coils, will cause an increase in condensing pressure. This will lead to a loss of capacity and an increase in compressor power input.
- To prevent air flow to be reversed due to prevailing winds, units cannot be completely shrouded with a higher, uninterrupted wind shield. If such a configuration cannot be avoided, an air ejection duct must be installed at the same height as the surrounding shield.



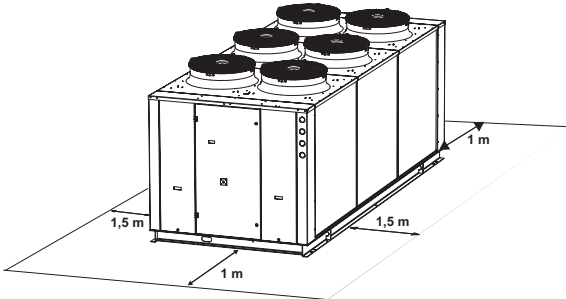
It is important that units must be leveled failure to install unit correctly will void warranty.



CLEARANCES DRAWINGS

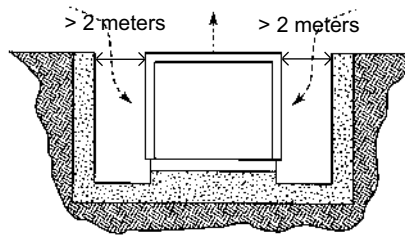
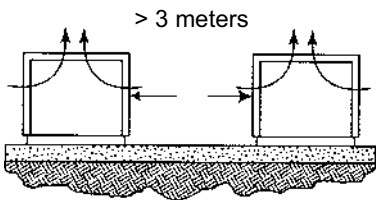
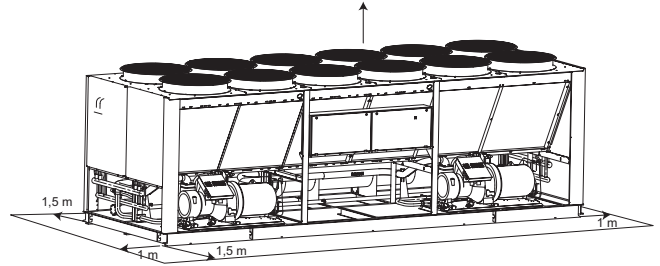
For more details, please consult our Application Guides or the drawings supplied with the unit.

ECOLOGIC range

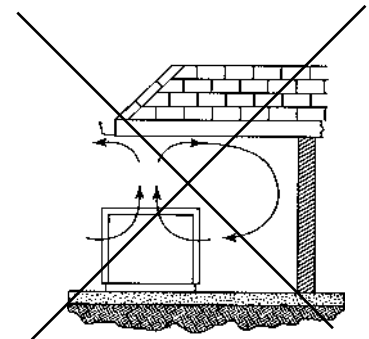


ECOMAX range

OVERHEAD OBSTRUCTIONS ARE NOT PERMITTED



Not recommended



Not allowed



For any air cooled unit, it is necessary to have a minimum distance between air coil and any obstacle of 1,5 meters.
For any chiller a minimum distance of 1 meter is required for the good opening and servicing of the electrical box.

3.4 - WATER CONNECTIONS

3.4.1 - Water connections - Evaporator/Condenser

The water circulating pump will be preferably installed upstream so that the evaporator/condenser will be subjected to positive pressure. Entering and leaving water connections are indicated on the certified drawing sent with the unit or shown in the sales brochure.

For shell and tube heat exchangers, a drainage plug is located at the base of the evaporator. A drainage pipe may be connected to this to enable drainage of evaporator water for service operations or for seasonal shut down.

The use of a water filter in the water circuit upstream of the heat exchanger is mandatory. These filters must remove all particles with a diameter greater than 1 mm, and must be positioned within 1 meter of the inlet of the exchanger. They may be supplied as an option by the manufacturer.

LACK OF FILTER AT THE INLET OF A PLATE HEAT EXCHANGER WILL MAKE WARRANTY VOID.



Hydraulic drawings in Annexes page 50 to 54, or supplied with the unit.

3.4.2 - Water analysis

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



We do not advise operation of the units with open loops which can cause problems with oxygenation, nor operation with untreated ground water.

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

3.4.3 - Antifreeze protection

3.4.3.1 : Use glycol/water solution



ADDITION OF GLYCOL IS THE ONLY EFFICIENT WAY TO PROTECT AGAINST FREEZING

The glycol/water solution must be sufficiently concentrated to ensure proper protection and prevent formation of ice at the lowest outdoor air temperatures expected on an installation. Take precautions when using non passivated MEG antifreeze solutions (Mono Ethylene Glycol or MPG Mono Propylene Glycol). Corrosion can occur with these antifreeze solutions with oxygen.

3.4.3.2 : Drain the installation

It is important to make sure that manual or automatic air bleeders are installed at all the high points of the water circuit. To enable drainage of the circuit, make sure that drain cocks are installed at all the low points of the circuit. To drain the circuit, the drain cocks must be opened and an air inlet ensured.

Note : air bleeders are not designed to admit air.



FREEZING OF AN EVAPORATOR DUE TO COLD WEATHER CONDITIONS IS NOT COVERED BY LENNOX WARRANTY.

3.4.4 - Electrolytic corrosion



We would like to draw your attention to the problems of corrosion due to electrolytic corrosion caused by an imbalance between earthing points.

AN EVAPORATOR THAT IS PUNCTURED BY ELECTROLYTIC CORROSION IS NOT COVERED BY THE UNIT WARRANTY

3.4.5 - Minimum water capacity

The minimum volume of the chilled water circuit must be calculated with the formula here under. If necessary, install a buffer tank. Proper operation of regulating and safety devices can only be ensured if the volume of water is sufficient.

The theoretical volume of the water loop for a proper air conditioning operation can be calculated using the formula hereafter:

Q → Cooling capacity of the chiller in kW

N → Number of capacity stage of the chiller

Dt → Water temperature Delta T.

$$Vt = 72 \times Q / (n \times dt) \text{ litres}$$

Example, for a chiller with 400kW, water conditions 12°C/7°C and 4 capacity stages, the minimum volume is :

$$Vt = 72 \times 400 / (5 \times 4) = 1440 \text{ l.}$$

This formula will give the minimum water capacity of the installation that will ensure a temperature rise of the water loop of (dt/n)°C during anti short cycle of compressors.



This formula is only applicable for air-conditioning installation and must not be used for process cooling where temperature stability is required.

3.4.6 - Flow switch

A flow switch must be installed on the evaporator water inlet or outlet, so as to enable detection of water flow through the heat exchanger before the unit is started up. This will protect the compressors against any eventual liquid slugging during the starting phase and prevent accidental ice formation in the evaporator, if the flow of water is interrupted. Flow switches are available on option.

The normally open contact of the flow switch should be connected to the terminals provided to that effect in the unit electrical box. (See the wiring diagram supplied with the unit).

The normally closed contact can be used as an indication of a lack of flow condition.

Warranty is void if a flow detection device is not fitted and connected to the LENNOX control panel.



3.5 - ELECTRICAL CONNECTIONS

First of all, make sure that power supplies from the building to the place where the unit is installed are properly established and that wire gauges are in keeping with the start up and running currents.

Check tightness of all electrical connections.

You **MUST** make absolutely certain that the power supplies applied to the power and control circuits are those for which the electrical panel was manufactured.

A main isolator switch must be inserted between the end of the power supply cable and the unit to enable total isolation of the latter when necessary. Chillers are supplied as standard without a main isolator switch. This is available as an option.

**WARNING**

Wiring must conform to applicable regulations. The type and location of fused isolators must also conform with regulations. For the sake of safety, install them where they can be seen and in easy reach of the unit. Units must have full earthing continuity.

**IMPORTANT**

Operation of a unit with the wrong power supply or with excessive phase imbalance constitutes abuse and is not covered by the LENNOX warranty. If phase imbalance exceeds 2 % for voltage and 1 % for current, contact your local electricity company immediately before powering up the unit.

3.6 - SOUND LEVELS

Liquid chillers are a significant source of noise in refrigeration and air conditioning systems.

Account is taken of technical constraints, both in design and manufacturing, sound levels cannot be improved much further than specified.

Sound levels must therefore be accepted for what they are, and the area surrounding the chillers should be treated as necessary. The quality of installation can either improve or decrease initial sound characteristics: it may be necessary to provide further treatment such as sound-proofing or installation of screens around units installed externally. The choice of the location for the installation can be of great importance : reflection, absorption, transmission of vibrations.

The type of unit support is also very important : inertia of the room and the structure of the walling, interfere with the installation and its behaviour.

Before taking any other steps, first determine whether the sound level is compatible or not with the environment, what it is perfectly justifiable and that these measures envisaged will not cause unreasonable cost.

Determine what level of sound proofing is necessary on the equipment, the installation (silencer, vibration isolators, screens) and on the building (reinforcement of flooring, false ceilings, wall coverings).

It may be necessary to contact an engineering office that specialises in sound abatement.

3.7 - CONNECTION OF SPLIT UNITS

Connections between the unit and the condenser must be made by a qualified refrigeration engineer and require several important precautions.

In particular, the shape and dimensions of the hot gas lines must be carefully designed to ensure proper oil return in all cases and prevent liquid from returning into the cylinder heads when the compressor is stopped.

On units fitted with capacity reducers, the piping sizes must be calculated so that gas velocity is sufficiently high when the unit is operating on capacity reduction.

Non application of these precautions will cancel the compressor warranty.

We recommend to follow ASHRAE recommendations.

3.7.1 - Liquid line sizing

Determine the size of liquid lines using :

- 1) Operating conditions at full load.
- 2) Maximum pressure drop of 100 kPa
- 3) Liquid velocity under 2 m/s (to avoid liquid slugging).
- 4) For liquid risers, make sure that liquid subcooling is sufficient to counteract the loss of static pressure and prevent gas flashing.

3.7.2 - Discharge lines and suction lines

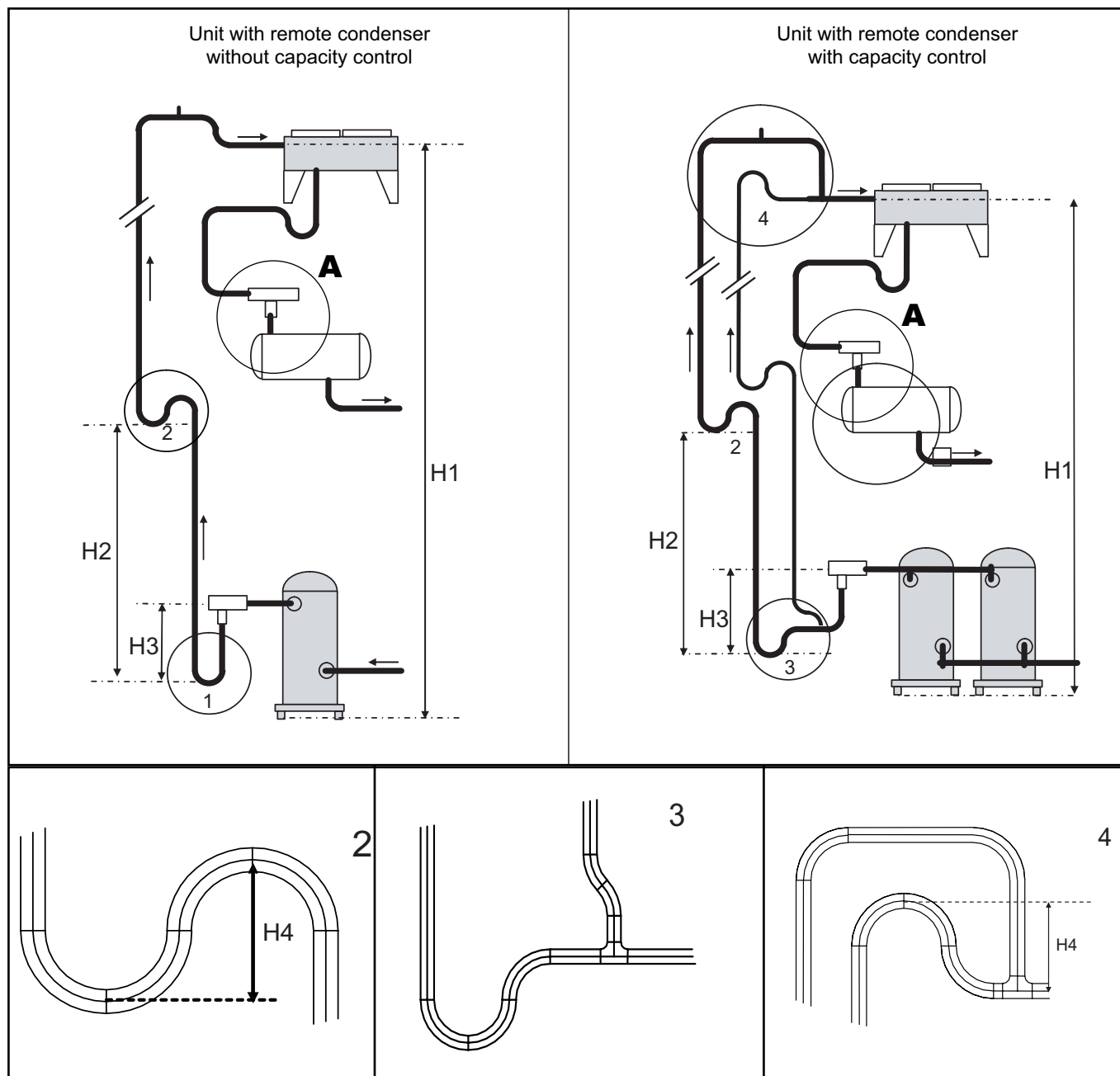
Calculate these to obtain a gas velocity in vertical sections that enables compressor oil migration and steady return to the compressor (tables C and D - page 15).

Determine the dimensions of vertical lines using the following tables.

Horizontal lines may be bigger in order to compensate pressure drop in vertical lines.

The total pressure drop in the piping has to be lower or equal to 1°C at saturation pressure on the suction side.

UNITS WITH REMOTE CONDENSER



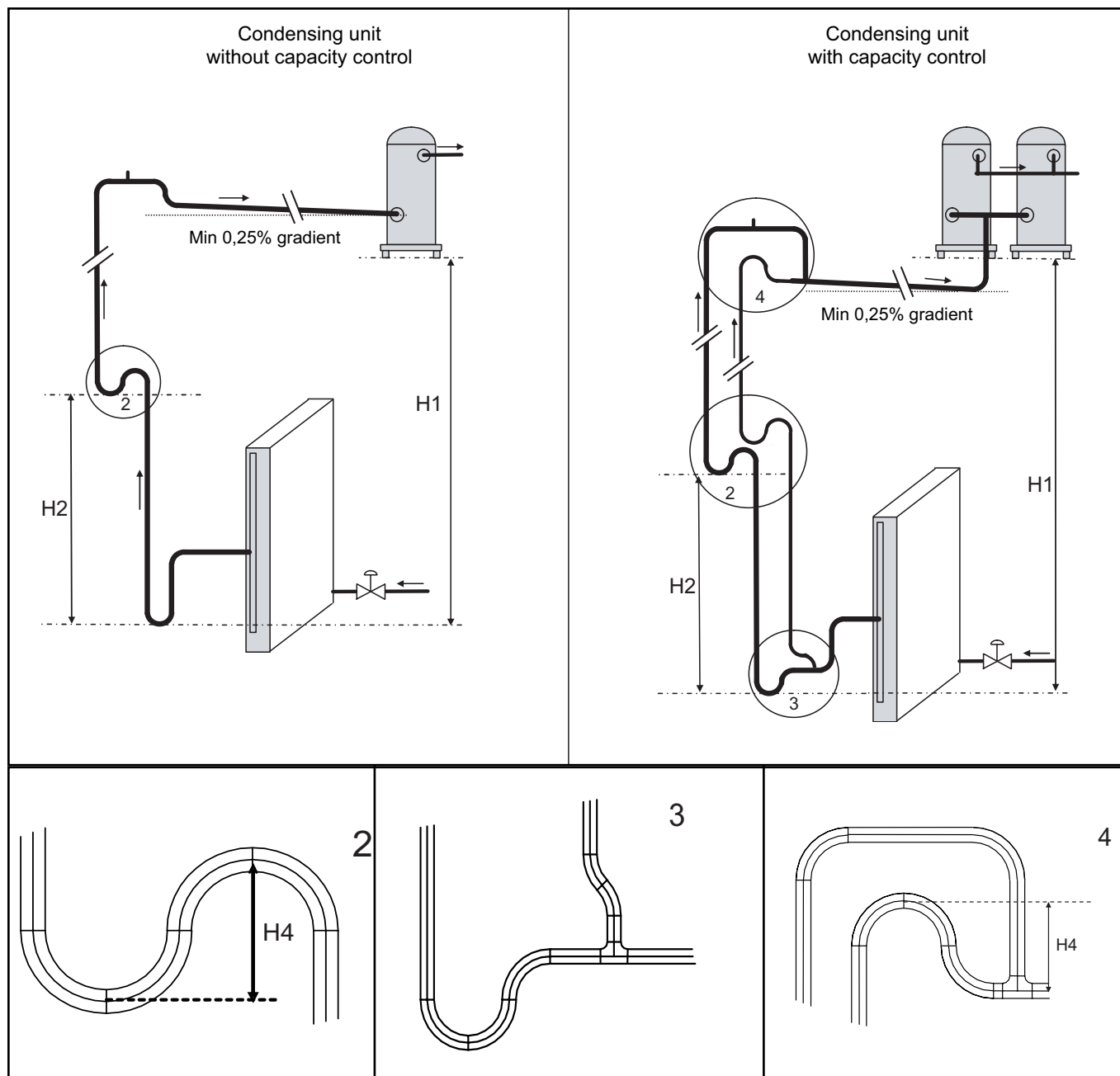
H1 : 15 m. maxi
 H2 : 5 m. maxi
 H3 : 0,3 m. maxi
 H4 : 0,15 m. maxi

1 - Lower trap with single tube
 2 - Clode coupled trap
 3 - Lower trap with double tubes
 4 - Higher trap with double tubes

WARNING : The liquid level between the condenser and the check valve A must compensate the check valve pressure drop

If receiver option : PED declaration class 3
If no receiver option : PED declaration class 1

CONDENSING UNITS



H1 : 15 m. maxi
 H2 : 5 m. maxi
 H4 : 0,15 m. maxi

- 1 - Lower trap with single tube
- 2 - Clode coupled trap
- 3 - Lower trap with double tubes
- 4 - Higher trap with double tubes

If receiver option : PED declaration class 3
If no receiver option : PED declaration class 1

**Minimum refrigeration capacity in kW for oil entrainments up Suction risers
Refrigerant : R407C**

Table C		Tubing nominal OD, mm											
Saturated temperature (°C)	Suction gas temperature (°C)	12	15	18	22	28	35	42	54	67	79	105	130
-5	0	0,39	0,71	1,20	2,04	3,88	6,88	11,11	21,31	36,85	55,86	115,24	199,30
	10	0,37	0,68	1,14	1,94	3,68	6,53	10,54	20,20	34,94	52,95	109,25	189,14
5	10	0,47	0,86	1,45	2,47	4,69	8,33	13,44	25,77	44,58	67,56	139,39	241,30
	20	0,44	0,81	1,36	2,31	4,39	7,79	12,58	24,13	41,73	63,25	130,49	225,90

**Minimum refrigeration capacity in kW for oil entrainments up HOT-Gas risers
Refrigerant : R407C**

Table D		Tubing nominal OD, mm											
Saturated discharge temperature (°C)	Discharge gas temperature (°C)	12	15	18	22	28	35	42	54	67	79	105	130
30	70	0,60	1,09	1,84	3,13	5,95	10,55	17,03	32,65	56,47	85,59	176,59	305,70
	80	0,58	1,06	1,79	3,04	5,78	10,25	16,55	31,74	54,90	83,21	171,67	297,19
	90	0,57	1,04	1,74	2,96	5,64	10,00	16,14	30,95	53,53	81,13	167,39	289,77
40	80	0,62	1,13	1,90	3,24	6,16	10,93	17,65	33,85	58,55	88,73	183,07	316,92
	90	0,60	1,10	1,85	3,16	6,00	10,65	17,19	32,96	57,01	86,40	178,26	308,60
	100	0,58	1,07	1,80	3,07	5,83	10,34	16,70	32,02	55,38	83,94	173,17	299,79
50	90	0,63	1,16	1,94	3,31	6,29	11,16	18,02	34,55	59,77	90,58	186,88	323,52
	100	0,61	1,12	1,88	3,21	6,10	10,82	17,47	33,50	57,95	87,83	181,21	313,70
	110	0,60	1,09	1,83	3,13	5,94	10,54	17,02	32,63	56,44	85,53	176,47	305,49

3.7.3 - Mechanical isolation of refrigerant lines

Isolate refrigerant lines from the building to prevent the vibrations normally generated by the lines to the building structure. Avoid bypassing the isolation system on the unit by fixing refrigerant lines or electrical conduits too tightly. Any vibrations will be transmitted to the building by rigid piping. Lack of vibration isolation on refrigerant pipework will lead to early failure of copper pipe and loss of gas.

3.7.4 - Pressure test

To avoid formation of copper oxide during brazing operations, blow a little dry nitrogen through the pipes. Piping must be made with tubing that is perfectly clean, plugged during storage and between connections operations.

During these operations, observe the following precautions:

- 1) Do not work in a confined atmosphere, refrigerant fluid can cause asphyxiation. Make sure there is sufficient ventilation.
- 2) Do not use oxygen or acetylene instead of refrigerant fluid and nitrogen for leak testing : this could cause a violent explosion.
- 3) Always use a regulator valve, isolating valves and a pressure gauge to control test pressure in the system. Excessive pressure can cause lines to burst damage to the unit and/or cause an explosion with severe personal injury.

Ensure conduct liquid line and gas line pressure tests are in conformity with applicable legislation. Before starting up a unit on a receiver, the piping and the condenser must be dehydrated. Dehydration should be carried out using a double stage vacuum pump, capable of drawing 600Pa absolute pressure vacuum.

Best results are obtained with a vacuum down to 100 Pa. To get down to this level at normal temperatures, i.e. 15 °C, it is often necessary to leave the pump running for 10 to 20 hours. The duration of pump operation is not a factor of efficiency. The pressure level must be checked before the unit is put into service.

3.7.5 - Refrigerant charge

Chillers with R407C must be filled in the liquid phase. Never charge a machine operating on R407C in the vapour phase (vapour): the composition of the mixture could be modified.

In liquid phase, connect either to a liquid isolating valve, or to the quick-connector on the liquid line at the valve outlet.

For unit using R22, the charging may be done in vapour phase in that case, connection will be made to the suction valve.

Note:

Splits units are supplied with a refrigerant or nitrogen holding charge. Before pulling down the vacuum for dehydration, completely purge the unit.

Charge the unit until there is a constant flow of bubble-free liquid in the sight-glass indicating that there is sufficient charge and controlled that sub cooling is correct according to the system design value.

In all cases, do not top up the charge until the unit reaches a stable state of operation.

It is pointless to overcharge a system, this can adversely affect operation.

Overcharging causes :

- Excessive discharge pressure,
- A risk of damage to the compressor,
- Excessive power consumption.

3.7.6 - Oil charge

All units are delivered with a complete oil charge. In the case of split units, it may be necessary, due to the length of piping installed, to add a certain amount of oil compatible with the type of compressor and refrigerant used.

Please refer to the following oil table.

Note : This table is valid for self-contained chillers only (or chillers mounted on receivers) on which the leaving water temperature is not lower than -5°C. For other cases, consult the documentation shipped with the machine.

Oil recommendation for Lennox chillers

Refrigerant	Compressor type	Brand	Oil type
R22	Screw CSH...	Bitzer	B320SH
R22	Scroll SM...	Maneurop	Maneurop 160 P
R22	Scroll ZR...	Copeland	Suniso 3 GS
R22	Reciprocating D8...	Copeland	Suniso 160P
R22	Reciprocating MT...	Maneurop	Maneurop 160 P
R407C	Screw CSH...	Bitzer	BSE170
R407C	Scroll SZ...	Maneurop	Maneurop 160 SZ
R407C	Scroll ZR...	Copeland	Copeland 3MA, Mobil EAL Arctic 22CC, ICI Emkarate RL32CF
R407C	Reciprocating D8...	Copeland	Mobil EAL Arctic 22
R407C	Reciprocating MS...	Maneurop	Maneurop 160 SZ

3.7.7 - Air cooled condensers

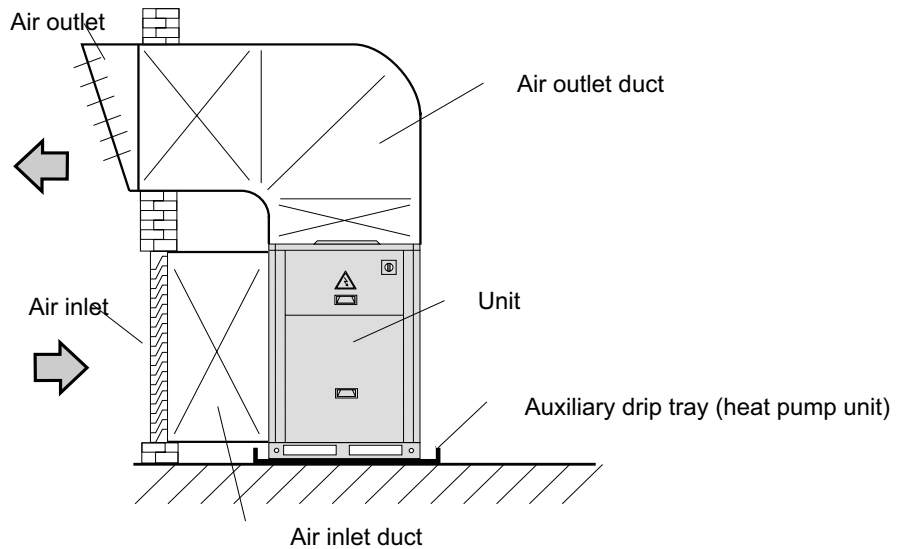
An air cooled condenser connected to a unit must have the same number of circuits as the unit. Selection of the condenser must be made carefully to enable transfer of the heat capacity of the unit even at the highest temperatures expected on an installation.

It is mandatory to control the head pressure in order to enable the unit to operate properly whatever the season: A variety of different systems may be used, but the most simple and efficient of these modulates fan operation using a pressure or temperature control.

For condensers fitted with a small number of fans (1 or 2), it may be necessary to vary the fans speed.

Head pressure control systems that operate by flooding the condenser with liquid refrigerant should be avoided since they entail very large refrigerant charges and can cause serious problems if they are not correctly controlled.

3.8 - DUCTED UNITS INSTALLATION



Notes :

- Be carefull of air cycling between inlet and outlet.
- For air outlet it is recommended to duct each fan separately.

4 - PRELIMINARY CHECKS

Check that all drain and purge plugs are in place and well tightened prior to fill the installation with water.

4.1 - LIMITS

Prior to any operation, please check the operation limits of the unit given in the «ANNEXES» at the end of the IOM, page 55 to 62.

These tables will give you all necessary information concerning the operating envelope of the unit.

Please consult the «Risk analysis and hazardous situations according to 97/123 directive» given in the «ANNEXES» at the end of the IOM, pages 63 & 64, or supplied with the unit.

4.2 - REFRIGERATION CIRCUIT CHECKS AND RECOMMENDATIONS

In case of split units, check the installation has been made according to the recommendation described § Installation.

The unit refrigeration circuit sketch is given in the «ANNEXES» at the end of the IOM, page 65 to 69 or supplied with the unit.

4.3 - HYDRAULIC SYSTEM INSTALLATION CHECKS

The unit hydraulic sketch is given in the «ANNEXES» at the end of the IOM - See page 50 to 54.

4.4 - INSTALLATION OF EXTERNAL HYDRAULIC COMPONENTS (supplied loose by Lennox).

Some hydraulic components may be supplied loose by Lennox:

- Filters
- Expansion vessels
- Valves
- Manometers
- ...



The components are located inside the units and must be installed by a qualified engineer.
Note : In case of plate heat exchangers it is mandatory that a filter is installed at exchanger unit entrance. These filters must remove all particles with a diameter greater than 1 mm.

4.5 - CHECK LIST BEFORE START-UP

Before proceeding with start up, even for a test of short duration, check the following points, after having made sure that all the valves on the refrigeration circuit are fully open (discharge valves and liquid valves). Starting up a compressor with the discharge valve closed will either trip the HP safety switch, or blow the cylinder head gasket or the internal pressure safety disc.

- 1) The liquid pump(s) and other apparatus interlocked with the unit (coils, air handling units, dry coolers, cooling towers, terminals such as fan coil units, etc.) are in working order as required by the installation and according to their own specific requirements.
Place all water valves and refrigerant valves in their operating positions and start the water circulating pumps.
Ensure main power supply is isolated before any work is started. Ensure unit is correctly earthed and that earth continuity is correctly done.
Check that anti-vibration mountings are correctly installed and set.
- 2) **Check the cleanliness and the tightness of all electrical connections**, both the connections made at the factory and the connections made on site. Also make sure that all thermostat bulbs are correctly inserted and tightened in the various wells, if necessary add heat conducting paste to improve contact. Make sure all sensors are correctly fitted and that all capillary tubes are fastened.

The technical data printed at the top of the wiring diagram should correspond with those indicated on the unit nameplate.

- 3) Make sure that the power supplied to the unit corresponds to its operating voltage and that **phase rotation corresponds to the direction of rotation of the compressors** (screw & scroll).
- 4) Make sure that the water circuits mentioned in 1 are completely filled with water or brine as the case may be; with the air bled out of all high points, including the evaporator ensuring they are perfectly clean and leaktight. In the case of machines with water cooled condensers, the condenser water circuit must be ready to operate, filled with water, pressure tested, bled, filter cleaned after 2 hours of operation of the water pump. Cooling tower in operating condition, water supply and overflow checked, fan in operating condition.
- 5) Reset all manually resetting safety devices (where necessary).
Open power circuits to all components: compressors, fans....
- 6) Power up the unit with the main disconnect switch (option). Visually check the oil level in the compressor crankcases (bullseyes). This level may vary from one compressor to another, but should never be higher than the first third of the way up the bullseyes.



CAUTION : Power up the compressor crankcase heaters at least 24 hours before starting the unit. This will enable the refrigerant in the crankcases to evaporate off, and prevents damage to compressors through lack of lubrication during start up.

- 7) Start the pump(s) check the flow of liquid to be cooled through the heat exchangers: note the inlet and outlet water pressures, and, using the pressure drop curves, calculate liquid flow by applying the following formula:

actual flow

$$Q = Q_1 \times (P2/P1)^{1/2}$$

where

P2 = pressure drop measured on site

P1 = pressure drop published by LENNOX for a liquid flow of Q1

Q1 = nominal flow

Q = real flow

- 8) On units with air cooled condensers, check for correct operation of the fans and that the protective grilles are in good condition. Make sure that rotation is in the right direction.
- 9) On units with ducted fan, check the air flow and duct pressure drop.
On delivery, the drive belts are new and correctly tensioned. After the first 50 operating hours check and adjust the tension. 80% of the total elongation of belts is generally produced during the first 15 hours of operation. Before adjusting the tension, make sure that the pulleys are correctly aligned. To tension the belt, set the height of motor support plate by moving the plate adjustment screws.

The recommended deflection is 16 mm per metre from centre to centre.

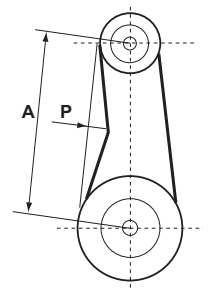
Check that according to the diagram below (figure 14), the following ratio remains the same.

$\frac{A(mm)}{P(mm)}$ 20

The belts should always be replaced when :

- the disk is set to maximum,
- the belt rubber is worn or the wire is visible.

Replacement belts must have the same rated size as the ones they are replacing. If a transmission system has several belts, they must all be from the same manufacturing batch (compare serial numbers).





NOTE :

An under-tensioned belt will slip, heat and wear prematurely. On the other hand, if a belt is over-tensioned, the pressure on the bearings will cause them to over-heat and wear prematurely. Incorrect alignment will also cause the belts to wear prematurely.

9a) PULLEYS ALIGNMENT

After adjusting one or both of the pulleys, check the transmission alignment using a ruler placed on the inner face of the two pulleys.

NOTE: The warranty may be affected if any major modification is made to the transmission without obtaining our agreement beforehand.

The actual resistance of ductwork systems is not always identical to the calculated theoretical values. To rectify this, it may be necessary to modify the pulley and belt setting. To this effect, the motors are fitted with variable pulleys.

9b) AIRFLOW BALANCING

Measure the absorbed amps

If the absorbed amps are greater than the rated values, the ventilation system has a lower pressure drop than anticipated. Reduce the flow by reducing the rpm. If the system resistance is significantly lower than design, there is a risk that the motor will overheat resulting in an emergency cut out.

If the absorbed amps are lower than the rated values, your system has a higher pressure drop than anticipated. Increase the flow by increasing the rpm. At the same time you will increase the absorbed power which may result in having to increase the motor size.

9c) CHECKING AIRFLOW AND ESP

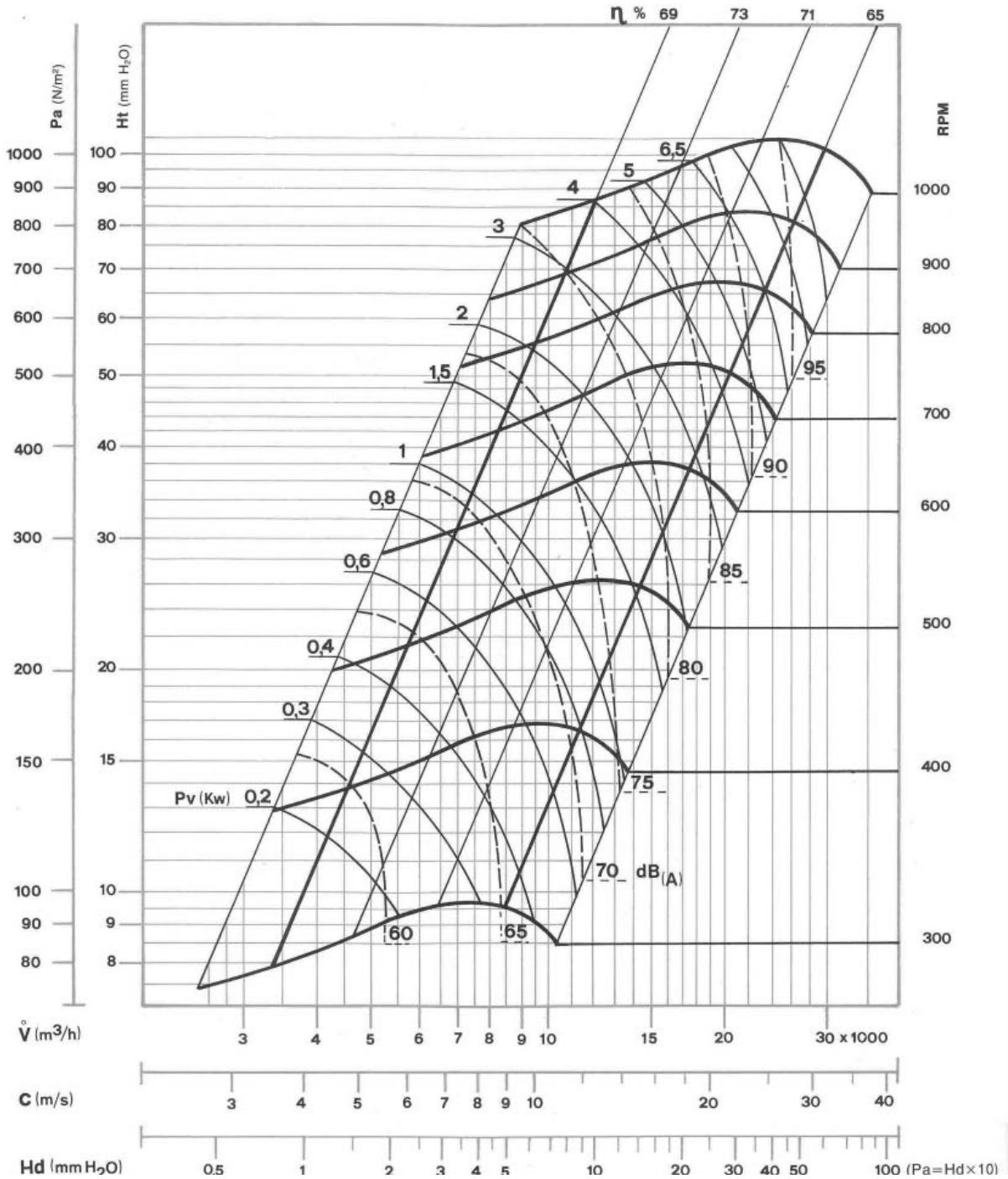
Using the following fan curve, the airflow, the total pressure available (P^{TOT}) and the corresponding dynamic pressure (P_d) can be estimated, for a specific operating point.

10) Before making any electrical connections, check that insulation resistance between power supply connection terminals is in keeping with applicable regulations. Check the insulation of all electrical motors using a DC 500V megohmmeter, following the manufacturer's instructions.

CAUTION: Do not start any motor whose insulation resistance is lower than 2 mégohms.

Never start any motor while the system is under a vacuum.

AT 18-18 FAN CURVE



5 - UNIT START-UP

5.1 - CHECKS TO BE MADE DURING START UP

5.1.1 CHECKS TO BE MADE DURING START UP

Before starting the unit, fill in the check list sheet on page 48 of this manual and follow the instructions below to be sure that the unit is correctly installed and ready to operate.

- 1) Thermometers and pressure switches installed in the chilled water circuit and the condenser water circuit.
Check these safety devices in this order: high pressure switch, differential oil pressure switch, low pressure switch, fan control pressure switches and thermostats, anti short cycle relay. Make sure all indicator lights operate correctly.
- 2) Run evaporator pump prior to start the chiller.
- 3) Flow switch installed and wired into the control box operates properly.
- 4) With the compressor running, check the oil pressure. If there is a fault, do not restart the compressor again until the source of the problem has been located.
- 5) Check that there is sufficient cooling load on the day the start up is conducted (at least 50 % of the nominal load).

PROCEDURE TO FOLLOW WHEN STARTING THE UNIT

- 5-a) Press the power "ON-OFF" switch. The compressor will only start if the evaporating pressure is greater than the cut-in set point of the low pressure switch.
Check immediately the good rotation of the compressor.
Evaporating pressure drops steadily, the evaporator empties itself of the liquid refrigerant accumulated in it during storage. After a few seconds, the solenoid valve opens if any.
- 5-b) Check on the sightglass (upstream of the expansion valve) that the bubbles disappear progressively, indicating a correct refrigerant charge and without non condensable gas. If the humidity indicator changes colour, indicating the presence of humidity, replace the filter-drier cartridge if the latter is of the replaceable type. Even better, check the sub cooling after the condenser.
- 5-c) Check that, when the cooling load has been balanced by the capacity of the unit, the chilled liquid is at design temperature.
- 6) Check the current values per phase on each compressor motor.
- 7) Check the current values per phase on each fan motor.
- 8) Check compressor discharge temperature.
- 9) Check compressor oil pump temperatures (semi-hermetic reciprocating compressors).
- 10) Check suction and discharge pressures and compressor suction and discharge temperatures.
- 11) Check chilled liquid entering and leaving temperatures.
- 12) Check outdoor air temperature.
- 13) Check liquid refrigerant temperature at the condenser outlet.

These verifications should be made as quickly as possible with a stable cooling load, i.e. the cooling load of the installation should be the same as the capacity developed by the unit. Measurements taken without heeding this condition will result in unusable and probably wrong values.

These verifications can only be made once the proper operation of all safety devices and unit controls has been established.

5.2 - OIL CHARGE

Units have a complete operating charge of oil when they are shipped, and there is no need to add any oil before start up or afterwards. Note that unit shutdowns by the differential oil pressure switch are usually caused by other problems than a lack of oil in the refrigeration circuits. Overcharging with oil can cause serious problems on an installation, particularly for the compressors. The only time any oil might need adding is when a compressor is replaced.

5.3 - REFRIGERANT CHARGE

Self-contained units have a complete refrigerant charge at the time they are shipped. This charge may need to be topped up when the unit is installed or at other times during the service life of the unit. Additional charge can be introduced through the Schrader valves on the suction line. Every time fluid is added, check the state of the charge with the sightglass provided to that effect on the liquid line and also by the amount of liquid subcooling at the condenser outlet.



IMPORTANT

- **Start up and commissioning must be conducted by LENNOX authorised engineer.**
- **Never shut of power to the crankcase heaters except for lengthy service operations or seasonal shu-**

6 - OPERATION

6.1 - CLIMATIC CONTROL

cf. See the specific CLIMATIC 50 manual
 cf. See the specific «Basic CLIMATIC controller» manual

6.1.1 - Menu Tree - ECOLOGIC range

See «Annexes», page 70 to 78

6.1.2 - Menu Tree - ECOMAX range

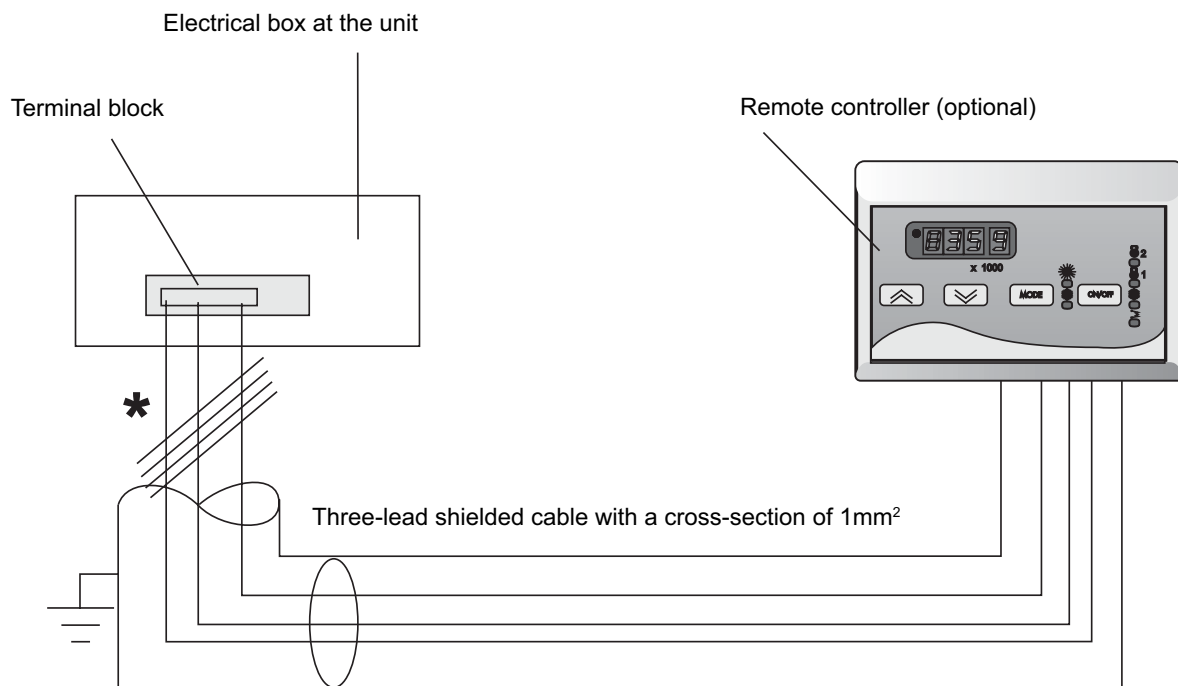
See «Annexes», page 79 to 90.

6.1.3 - Connection diagrams - CLIMATIC™ 30

A remote controller is offered as an option.
 To install this optional remote controller proceeded as follow :

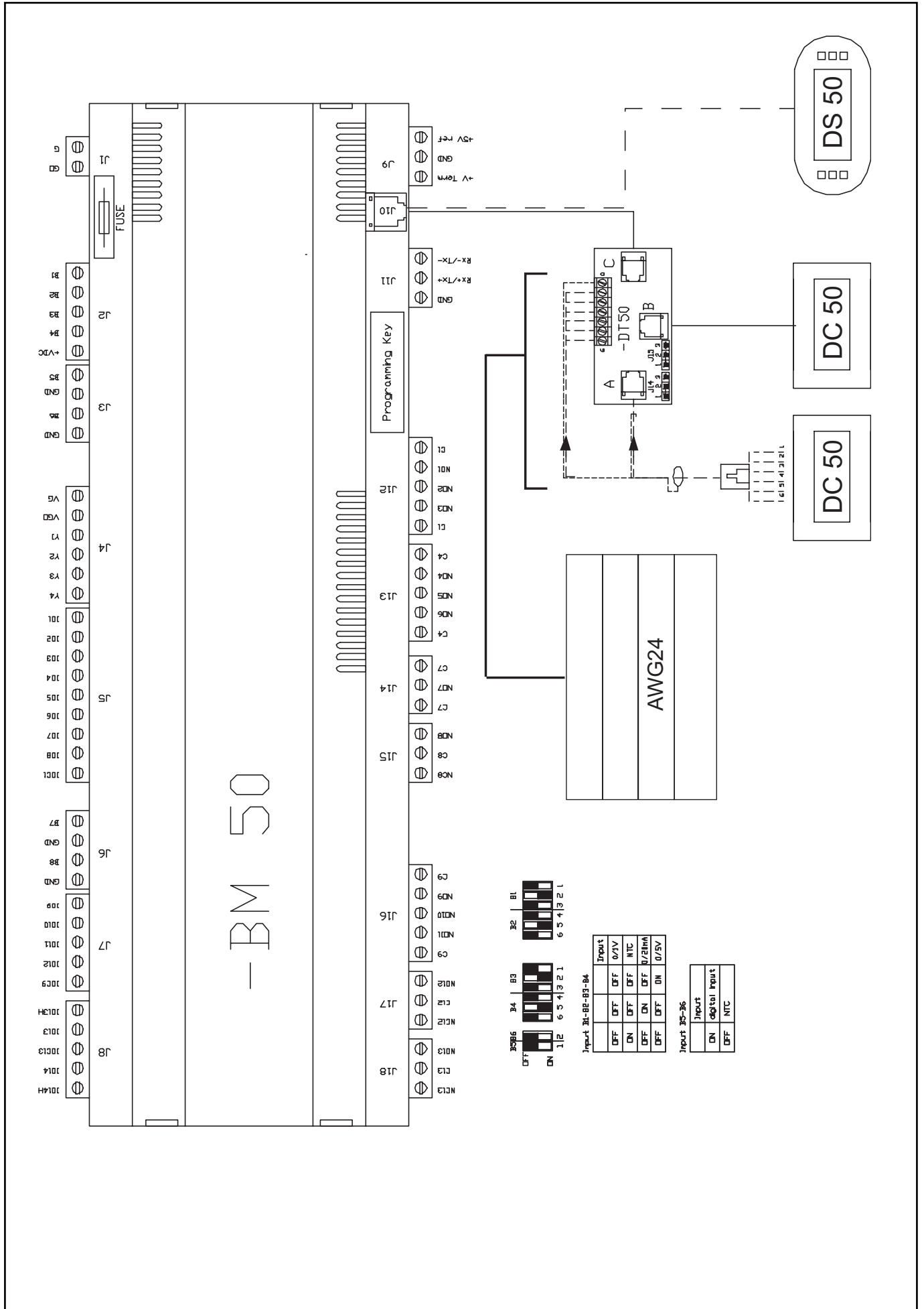
- Connect exactly as indicated in electrical diagram
- The wire should not exceed 50 m.

The three cables for connection from the keypad to the power board must be kept separate from other cables, using an individual cable channel; and use shielded cables, with a cross-section of 1 mm².



* Connection to be made by user MAXIMUM LENGTH 50m

6.1.4 - Connection diagrams - CLIMATIC™ 50



Input 30-31	Input	OFF	ON
Input 32	0/1V	OFF	ON
Input 33	NTC	OFF	ON
Input 34	0/21mV	OFF	ON
Input 35	0/5V	OFF	ON

Input 36-38	Input	OFF	ON
Input 39	0/1V	OFF	ON
Input 40	NTC	OFF	ON
Input 41	0/21mV	OFF	ON
Input 42	0/5V	OFF	ON

Input 43-44	Input	OFF	ON
Input 45	0/1V	OFF	ON
Input 46	NTC	OFF	ON
Input 47	0/21mV	OFF	ON
Input 48	0/5V	OFF	ON

6.2 - UNIT OPERATION

6.2.1 - Functions of refrigeration circuit components

6.2.1.1 - Thermostatic expansion valve:

Very important:

The thermostatic expansion valve fitted on each machine has been selected for a given operating range; it must be replaced with a model with the same reference from the same manufacturer.

6.2.1.2 - Filter-drier:

This is designed to remove all traces of humidity from within the refrigeration circuit, since this can impair operation of the unit, by acidification of the oil, which causes slow disintegration of the varnish protecting the compressor motor windings.

6.2.1.3 - High and low pressure gauges (option): Enables instantaneous readout of suction and discharge pressures.

Sightglass/humidity indicator: (optional on units fitted with scroll type or reciprocating compressors) :

- Enables visual verification of the state of the liquid refrigerant (monophase ou diphasic) in the liquid line, upstream of the thermostatic expansion valve.
- Enables detection of humidity in the circuit.

6.2.1.4 - Crankcase heater:

Every compressor is fitted with a single phase crankcase heater that is activated when the compressor stops to ensure separation of the refrigerant and the compressor oil. It is therefore powered up when the compressor is not running.

NB : Scroll and reciprocating +6°C ambient type compressors are not fitted with a crankcase heater.

6.2.1.5 - High pressure switch:

This pressostat initiates unconditional stoppage of the unit if compressor discharge pressure exceeds the operating limits. Reset is automatic.

- Screw and reciprocating compressor with R407C high pressure switch equal 26.5 bars
- Scroll compressor with R407C high pressure switch equal 29 bars

6.2.1.6 - Low pressure switch:

This pressure switch initiates unconditional stoppage of the unit if if evaporating pressure drops below the value P.

- 1) +6°C ambient temperature machines (standard) P = 2,4 bars relative
- 2) optional -20°C ambient temperature machines P = 0,8 bars relative

6.2.1.7 - Fan control pressure switch and thermostat:

The function of these devices is to ensure a level of head pressure compatible with proper unit operation.

An increase in outdoor air temperature increases head pressure, and this is maintained at its required value by fan operation.

6.2.1.8 - Antifreeze function:

This function only exists on units designed for brine or glycol/water chilling for which the freezing temperature depends on the concentration of the solution.

Whatever type of device is used (see case 1 and 2), cut-out by the antifreeze function causes immediate unit stoppage.

CASE 1 : Antifreeze thermostat:

This device monitor chilled liquid temperature at the evaporator outlet. It triggers when the temperature goes below the minimum value (+ 4°C for water).

CASE 2 : Antifreeze pressure switch:

This monitors evaporating pressure of the refrigerant. It triggers when the temperature goes below the preset minimum value.

Note: On units fitted with CLIMATIC control, see the appropriate user manual for more specific details.

6.2.1.9 - Differential oil pressure safety switch : (only on units with semi-hermetic compressors)

a) Reciprocating compressors:

This pressure switch initiates unconditional unit stoppage if differential oil pressure drops for more than two minutes below a pre-established minimum safety value.

Differential oil pressure is the difference between the oil pump discharge pressure and the gas pressure inside the compressor crankcase (suction pressure). The differential oil pressure safety switch is factory set and is not modifiable on site.

b) Screw compressors:

This pressure switch initiates unconditional unit stoppage if differential oil pressure rises above a preset safety value.

Differential oil pressure in this case is high pressure less the compressor oil injection pressure.

6.2.2 - Functions of electrical components

6.2.2.1 - Electronic or cam type anti-short cycle relay:

This device limits the number of compressor start ups.

Compressor motor thermal protection:

This device stops the motor if winding temperature rises too high and enables it to start up again when temperature drops back to a normal value.

6.2.2.2 - Fan over current protection:

Circuit breaker designed to stop the fan motors in the event of phase over current in relation to the permitted value.

6.2.2.3 - Compressor motor over current protection:

Circuit breaker designed to protect each motor winding against accidental over current.

6.2.2.4 - Indicator lights:

The electrical control box is fitted with indicator lights enabling visualisation of the state of operation or non operation of a function or given circuit.

There is also an indicator to show that the unit is powered up, an emergency stoppage indicator for each compressor, an indicator to show stoppage of the compressor via the regulating system (through the main control thermostat which is sensitive to chilled water temperature), a run light per compressor, and a general fan default stoppage indicator (on air cooled units).

On units with CLIMATIC control, see the appropriate manual.

6.2.2.5 - Time delay relay for starting compressor motors one winding at a time (option) :

This optional relay is supplied on units ordered with the part winding start system. The time delay between starting the first winding and the second winding cannot exceed 0.8 seconds.

6.2.2.6 - Chilled liquid pump interlock:

This interlock is made only if the the pump is supplied with the liquid chiller. As soon as the unit is powered up and the remote on/off for the unit is validated, the pump starts running. Prior operation of the pumps is mandatory for compressor operation.

Note : on units with CLIMATIC control, control of 1 or 2 water pumps is catered for by the control program.

6.2.2.7 - Flow switch for the chilled liquid (option) :

This control device initiates unconditional unit stoppage as soon as the flow of chilled liquid (water, brine, etc...) ensured by the pump becomes insufficient, since this could cause rapid evaporator freeze up. When the contact opens due to a lack of flow the unit must stop immediately.

If the purchaser installs a flow switch himself, electrical connections should be made to the two remote interlock terminals (dry contact).

6.2.3 - Automatic sequences

6.2.3.1 - Starting sequence:

- Press the unit start switch, the power light will come on ; The control circuit cannot be energised if there is no power supply to the main power circuit.
- Depending on the demand for cooling, the control thermostat authorises start up of the compressor(s), which takes place in sequence. The compressor run indicating lights come on.

6.2.3.2 - Regulator stoppage sequence :

When the cooling load starts decreasing from its maximum value, the multi-stage control thermostat shuts down successive stages depending on the progressive reduction in return chilled liquid temperature. Depending on machine equipment, staged reduction consists either in shutting down a compressor or activation of a compressor capacity reducer. This continues until the unit shuts down completely through action of the regulator. The compressor regulation stoppage lights come on.

6.2.3.3 - Safety shutdown sequence :

If a default occurs on a circuit, it is detected by the appropriate safety device, (high pressure overshoot, loss of oil pressure, motor protection, etc...) The relay in question initiates unconditional stoppage of the compressor on that circuit and the safety stoppage indicating light comes on.

Some defaults give rise to immediate stoppage of the entire unit :

- Tripped flow switch,
- Tripped antifreeze thermostat
- ...etc....

In cases other than that of manually reset safety devices, starting up of the circuit or the machine takes place automatically once the default has been cleared.

6.2.3.4 - Loss of power supply :

There are no problems restarting the machine after a loss of power supply of short duration (up to about one hour). If loss of power supply lasts longer than this, when power supply is resumed set the unit to «OFF» with the compressor crankcase heaters activated for as long as it takes to bring sump oil back up to temperature, then restart the unit.

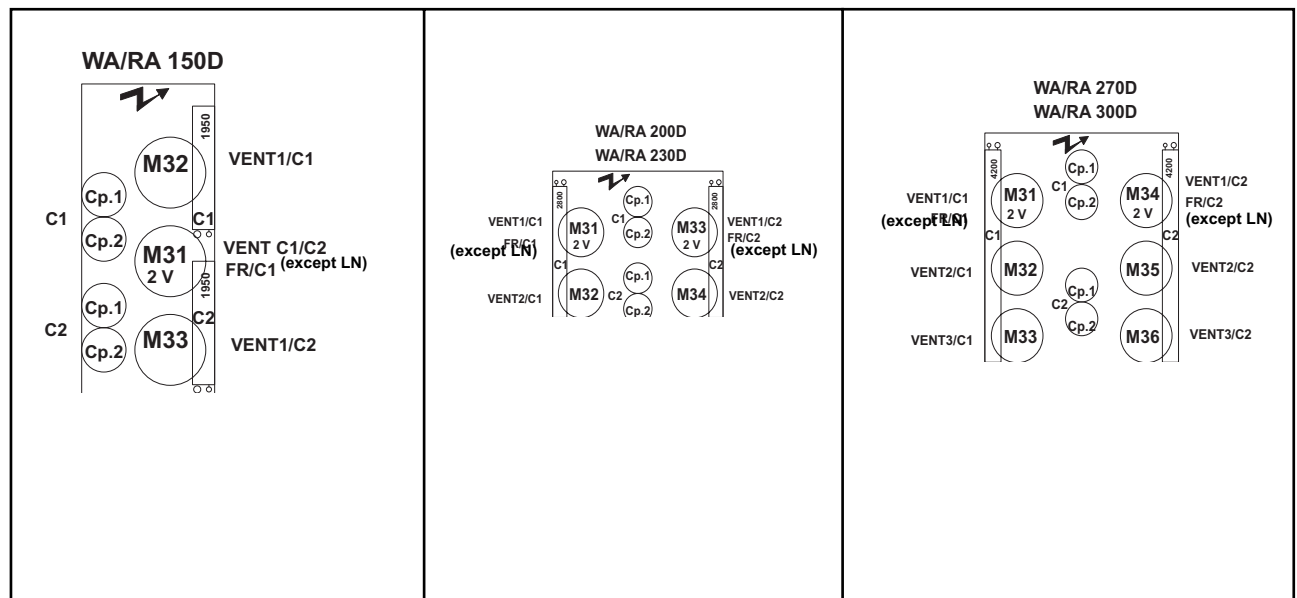
6.2.3.5 - Pressostatic water valve :

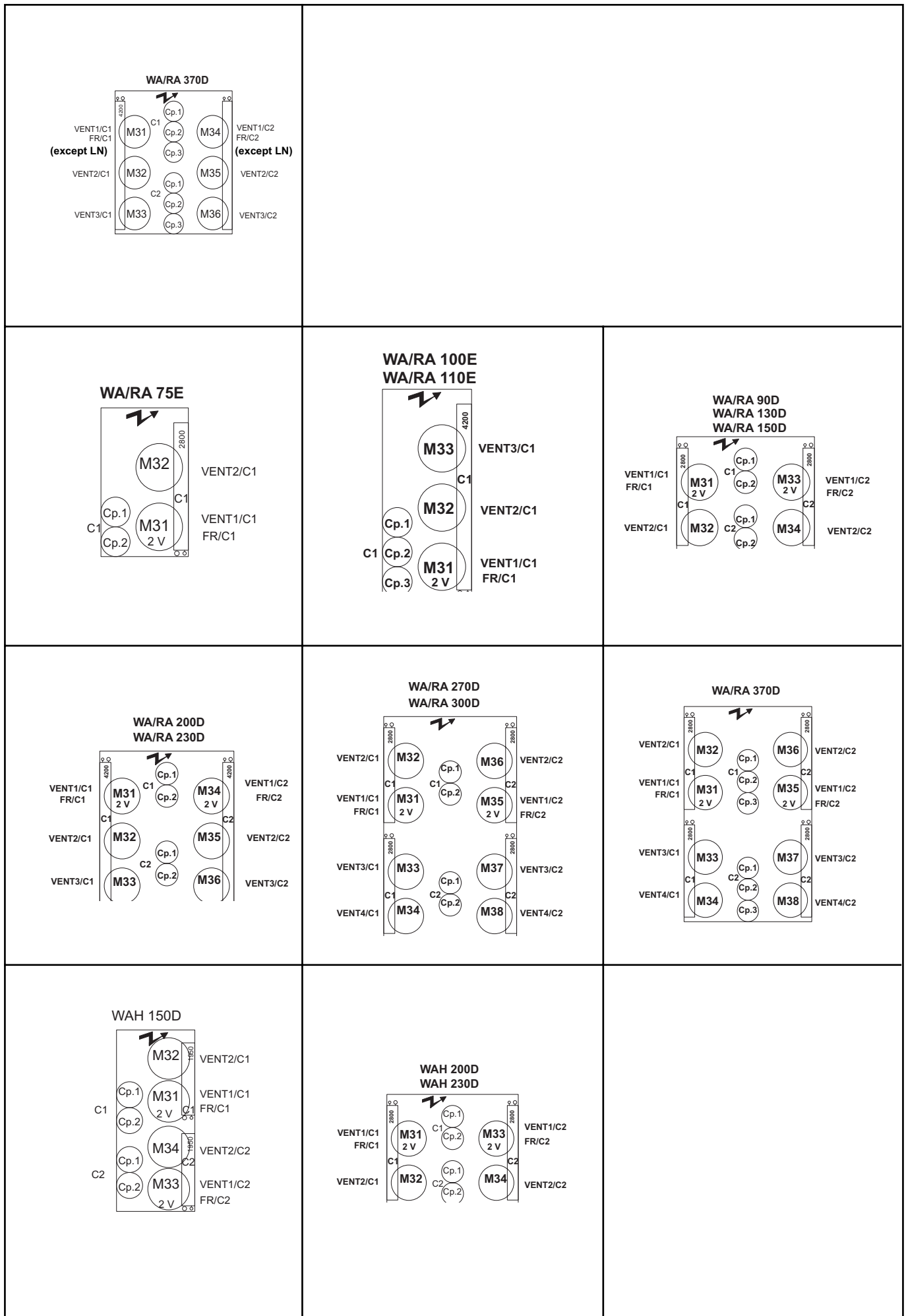
This device is available as an option for low capacity water cooled condensing units (MCW)

The pressostatic water valve should be installed on the condenser outlet. It enables water flow through the heat exchanger to be varied so as to maintain condensing pressure at an appropriate value.

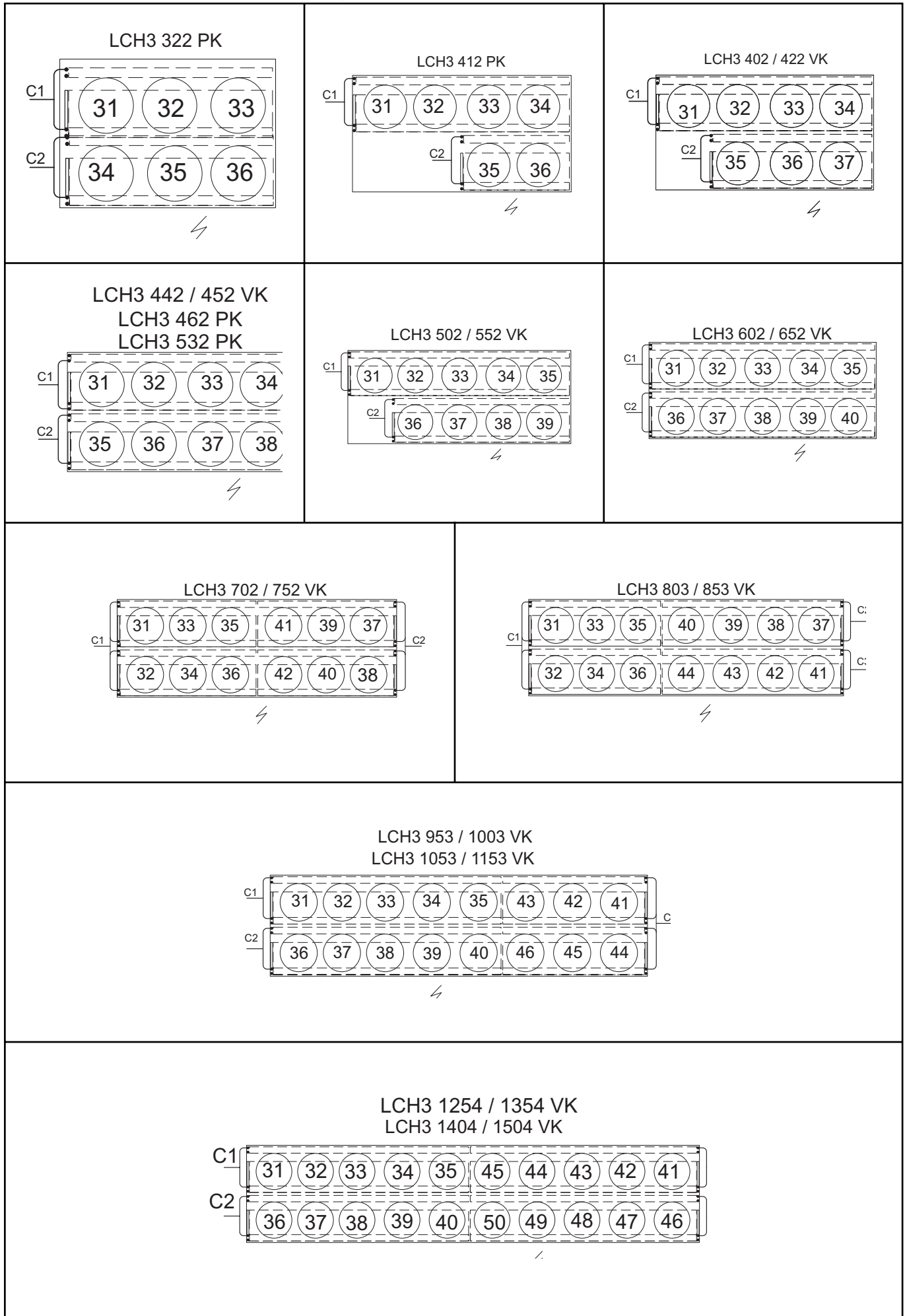
6.2.3.6 - Fan motor control:

ECOLOGIC - Fans electrical box labelling.





ECOMAX - Fans electrical box labelling.



7. MAINTENANCE

The following maintenance instructions form a part of the operations required for this type of equipment. However, It is not possible to give fixed and precise rules for permanent maintenance procedures capable of keeping all units in perfect operating condition since too many factors depending on local conditions specific to the installation, the way the machine is operated, the frequency of operation, climatic conditions, atmospheric pollution, etc. Only trained experienced personnel can establish strict maintenance procedures adapted to the conditions listed above. Nonetheless, we recommend a regular maintenance schedule :

- 4 times a year for chillers operating all year long
- 2 times a year for chiller that only operate during the cooling season

All operations must be performed in conformity with the maintenance plan; this will extend the service life of the unit and reduce the number of serious and costly breakdowns.

It is essential to keep a «service log», for weekly records of operating conditions of the machine. This log will serve as an excellent diagnostic tool for maintenance personnel ; likewise, the machine operator, by noting down changes in machine operating conditions, will often be able to anticipate and avoid problems before they actually occur or worsen.

The manufacturer cannot be held responsible for any malfunctioning of any equipment it provides if it is caused by a lack of maintenance or by operating conditions beyond those recommended in this manual.

Shown below, and as an illustration only, are some of the most common rules applied for maintenance.

7.1 WEEKLY MAINTENANCE

- 1) Check the compressor oil level. This should be half way up the sightglass with the machine running at full load. Let the compressor operate for 3 to 4 heures before adding any oil. Check the oil level every 30 minutes. If the level does not reach the level indicated above, contact a qualified refrigeration mechanic.
- 2) Overcharging with oil can be as dangerous to a compressor as a lack of oil. Before topping up, contact a qualified technician. Only use oils recommended by the manufacturer. See page 15.
- 3) Check the oil pressure.
- 4) The flow of liquid refrigerant through the sightglass should be steady and without bubbles. Bubbles are a sign of a low charge, a possible leak, or of a restriction in the liquid line. Contact a qualified technician.

Each sightglass is fitted with a humidity indicator. The colour of the element changes according to the level of humidity in the refrigerant, but also according to temperature. It should indicate «dry refrigerant. If it shows «wet» or «CAUTION», contact a qualified refrigeration technician.

CAUTION : When starting up the unit, run the compressor for at least 2 hours before taking a humidity reading. The humidity detector is also sensitive to temperature, and as a consequence, the system must be at normal operating temperature to give a meaningful reading.

- 5) Check operating pressures. If they are higher or lower than those recorded when the machine was put into service, see the chapter 8.
- 6) Inspect the entire system so as to detect any eventual abnormality: noisy compressor, loose casing panels, leaky pipes or juddering contacts.
- 7) Record temperatures, pressures, dates et times and any other observations in the service log.
- 8) Leak detection is recommended.

7.2 ANNUAL MAINTENANCE

On units with water cooled condensers, it is important that the unit be serviced regularly by a qualified technician, at least once every year or every 1000 hours of operation.

Failure to observe this rule can lead to cancellation of the warranty and will clear LENNOX of whatever responsibility.

A service visit by a qualified technician is also recommended after the first 500 hours of operation after the unit is first put into service.

- 1) Inspect valves and piping. Clean the filters if necessary, clean the condenser tubes (see «cleaning the condenser» §7.3).
- 2) Clean the chilled water piping filters.
 CAUTION: The chilled water circuit may be pressurised. Observe the usual precautions when depressurising the circuit before opening it. Failure to observe these rules could lead to accidents and cause injury to service personnel.
- 3) Clean any corroded surfaces and repaint them.

- 4) Inspect the chilled water circuit for any signs of leakage.
 Check operation of the water circulating pump and its ancillaries.
 Check the percentage of antifreeze in the chilled water circuit, top up as necessary (if antifreeze is used).
- 5) Carry out all weekly maintenance duties.
 The first and last inspection will include the seasonal shutdown procedure or the restarting procedure depending on the case.
 These inspections should include the following operations:
 - Check the contacts of motor contactors and control devices.
 - Check the adjustment and operation of each control device.
 - Conduct an oil analysis to determine the acidity. Record the results.
 - Change the oil if necessary.

WARNING : Oil analyses should be carried out by a qualified technician. Misinterpretation of the results could cause damage to the equipment.
 Also, analysis operations should be conducted according to the right procedures, so as to avoid accidents and potential injury of service personnel.

 - Follow the recommendations given by LENNOX as concerns compressor oil (see the appropriate table).
 - Conduct a refrigerant leak test.
 - Check motor winding isolation.
 Other operations may be necessary depending on the age and the number of hours of operation of the installation.

7.3 CLEANING THE CONDENSER

7.3.1 Air cooled condensers

Clean the coils either with a vacuum cleaner, cold water, compressed air, or with a soft brush (non metallic). On units installed in a corrosive atmosphere, coil cleaning should be part of the regular maintenance program. On this type of installation, all dust gathered on the coils should be quickly removed by regular cleaning. **Caution:** do not use high pressure cleaners that could cause permanent damage to the aluminium coil fins.

7.3.2 Multitube water cooled condensers

Use a cylindrical brush to remove sludge and other substances in suspension inside the condenser tubes. Use a non corrosive solvent to remove scale deposits.
 The water circuit in the condenser is manufactured in steel and copper. A water treatment specialist, given the right information, will be able to recommend the right solvent for removing scale.
 The equipment to be used for external water circulation, the quantity of solvent and the safety measures to be taken must be approved by the company supplying the cleaning products or by the company conducting these operations.

7.4 COMPRESSORS / OIL DRAINAGE

Oil for refrigeration equipment is clear and transparent. It keeps its colour over a long period of operation. Given that a correctly designed and installed refrigeration system will operate without any problems, there is no need to replace the compressor oil even after a very long period of operation.
 Oil that has become dark in colour has been exposed to impurities in the refrigeration piping system or to excessive temperatures on the discharge side of the compressor, and this inevitably impairs the quality of the oil. Darkening of the colour of the oil or degradation of its qualities can also be caused by the presence of humidity in the system. When the oil has changed colour or has been degraded, it must be changed.
 In this event, before putting the unit back into service, the compressor and the refrigeration circuit will have to be evacuated.

7.5 IMPORTANT

Before proceeding with any service operations, make sure that the power supply to the unit is switched off. When the refrigeration circuit has been opened it will have to be evacuated, recharged, and inspected to ensure that it is perfectly clean (filter-drier) and leaktight. Remember that only trained and qualified personnel are authorised to open a refrigeration circuit.
 Regulations stipulate recovery of refrigerants and forbid willful discharge of refrigerants into the atmosphere.

8.1 LIST OF THE MOST COMMON PROBLEMS

PROBLEMS – SYMPTOMS	PROBABLE CAUSE	RECOMMENDED ACTION
A) THE COMPRESSOR DOES NOT START		
- Motor control circuits established, the compressor does not run	- No power supply	- Check main power supply and switch positions
	- Compressor motor burnt out	- Replace
- Low voltage reading on voltmeter	- Voltage too low	- Contact power company
- The system does not start up	- Breaker tripped or fuses blown	- Determine the cause. If the system is in running order, close the disconnect
		- Check condition of fuses
	- No water flow in the evaporator	- Measure flow, check the water pump and water circuitry and filters
	- Flow switch contacts open	- Find the cause of the trip out
		- Check circulation of liquid in the evaporator, and the condition of the flow switch
	- Anti short cycle relay action	- Wait until the anti short cycle time delay has expired
	- Faulty control thermostat	- Check for proper operation, set points, contacts
	- Oil pressure switch tripped	- Check the oil pressure switch and determine the cause of the trip out
	- Antifreeze thermostat or low pressure safety switch tripped	- Check evaporating pressure, the condition of the antifreeze thermostat and the low pressure safety switch
	- Compressor thermal protection relay tripped	- Check for proper operation of the relay
- High pressure safety switch tripped	- Check the condensing pressure, and the condition of the high pressure safety switch	

8.1 LIST OF THE MOST COMMON PROBLEMS - continued

PROBLEMS – SYMPTOMS	PROBABLE CAUSE	RECOMMENDED ACTION
B) THE COMPRESSOR DOES NOT START		
	- Low pressure safety switch trip out	- Check low pressure safety switch differential
- Normal operation with too frequent starts and stoppages due to action of the low pressure safety switch. Bubbles in sightglass. Or, normal compressor operation, but the low pressure safety switch trips out and resets frequently	- Low refrigerant charge	- Check the charge through the sightglass on the liquid line, carry out a leak test, then top up the refrigerant charge
- Suction pressure too low, Filter drier frozen up	- Filter-drier obstructed	- Check the state of the drier and replace the filter
	- Solenoid valve closed	- Check that the valve is operating properly
	- Expansion valve closed	- Check bulb and capillaries, operation of the valve
	- Compressor suction valve	- Check the filter

C) THE COMPRESSOR SHORT CYCLES ON HIGH PRESSURE SAFETY SWITCH TRIP OUT		
	- High pressure safety switch trip out	- Check high pressure safety switch differential
	- Low air/water flow in condenser or dirty condenser coil (poor heat exchange)	- Check that pumps are operating correctly or the state of cleanliness of the coils / check fan operation
	- Incondensibles in the refrigeration circuit	- Bleed from circuit and top up the refrigerant charge. Note : it is not permitted to discharge refrigerant to atmosphere

8.1 LIST OF THE MOST COMMON PROBLEMS - continued

PROBLEMS – SYMPTOMS	PROBABLE CAUSE	RECOMMENDED ACTION
D) THE COMPRESSOR RUNS IN LONG CYCLES OR RUNS CONTINUOUSLY		
	- Faulty control thermostat	- Check operation
- Temperature too low in the conditioned space	- Chilled water thermostat set too low	- Adjust it
- Bubbles in sightglass	- Low refrigerant charge	- Check the refrigerant charge in the sightglass and top up if necessary
	- Filter-drier partly obstructed	- Check the drier and replace as required, change the filter cartridge
	- Expansion valve partly closed	- Check expansion valve bulb and capillary, measure superheat
	- Liquid line valve not open far enough	- Open the valve completely
- Noisy compressor, or abnormally high suction pressure or low discharge pressure	- Leaky compressor valves	- Check valve gas-tightness, replace the valve plate if necessary. Tighten compressor nuts and bolts

E) THE COMPRESSOR CUTS OUT ON OIL PRESSURE SAFETY SWITCH		
	- Oil pressure switch tripped	- Check operation of the oil pressure safety switch
- Oil level in sightglass is too low	- Oil pressure too low	- Check the oil level in the sightglass on the crankcase, check the cleanliness of the oil filter, check the oil pump
- Visible oil leak / Oil level too low	- Low oil charge	- Check that there is no leakage and add oil
	- Leaky oil sump	- Repair and add oil
- Suction line unusually cold, compressor noisy	- Liquid refrigerant present in the compressor crankcase	- Check appearance of the oil in the sightglass. Measure temperature of the oil pump, measure superheat at the expansion valve, check that the valve bulb is tightly attached
	- Poor heat exchange in the evaporator	- Check water flow. Check fouling by measuring the water pressure drop. Excessive oil migration in the circuit : measure evaporating pressure, superheat and the temperature of the oil pump

8.1 LIST OF THE MOST COMMON PROBLEMS - continued

PROBLEMS – SYMPTOMS	PROBABLE CAUSE	RECOMMENDED ACTION
F) THE COMPRESSOR CUTS OUT ON ANTIFREEZE PRESSURE SWITCH		
	- Antifreeze pressure switch tripped	- Check that the pressure switch is operating properly
	- Low water flow in the evaporator	- Check the water pump
	- Evaporator obstructed	- Determine the degree of fouling by measuring water pressure drop
	- Evaporator frozen up	- Measure pressure drop in water circuit, keep water circulating until evaporator has thawed completely
	- Low refrigerant charge	- Check the refrigerant charge and add refrigerant if necessary

G) THE COMPRESSOR CUTS OUT ON ITS MOTOR PROTECTION THERMAL RELAY		
	- Thermal protection Tripped	- Check operation of thermal protection, change it if necessary
	- Motor windings are not being sufficiently cooled	- Measure superheat in the evaporator, adjust it if necessary

H) COMPRESSOR CUTS OUT THROUGH ACTION OF THE MAIN POWER FUSE		
	- Power supply on two phases only	- Check power supply voltage
	- Faulty motor windings	- Replace the compressor
	- Compressor seized	- Replace the compressor

I) THE COMPRESSOR STARTS WITH DIFFICULTY		
	- Faulty windings	- Replace the compressor
	- Mechanical problem	- Replace the compressor

8.1 LIST OF THE MOST COMMON PROBLEMS - continued

PROBLEMS – SYMPTOMS	PROBABLE CAUSE	RECOMMENDED ACTION
J) THE COMPRESSOR IS NOISY		
	- If starting on a single winding on compressors fitted with part winding start or wye-delta	- Check operation of the starter contacts, the start up time delay and the condition of the windings
- Compressor knocking	- Broken mechanical parts inside compressor	- Replace the compressor
- Suction line is unusually cold	a) Liquid slugging	a) Check superheat and that the expansion valve bulb is correctly installed
	b) Expansion valve blocked in open position	b) Repair or replace
	- Broken suction valves	- Replace broken valves
- High discharge pressure. The water regulating valve or the pressure operated water valve taps or knocks	- Pressure operated water valve fouled, water pressure is too high or irregular	- Clean the valve. Install and expansion tank upstream of the valve
- Compressor shuts down through action of the oil pressure safety switch	- Low oil charge	- Add oil

K) DISCHARGE PRESSURE TOO HIGH		
- Water is far too hot at condenser outlet	- Water flow too low or water temperature too high in the condenser	- Adjust the pressure operated water valve or the thermostat on the cooling tower
- Water is far too cold at the condenser outlet	- Condenser tubes fouled	- Clean the tubes
- Condenser abnormally hot	- Presence of air or incondensibles in the circuit, or excessive refrigerant charge	- Purge incondensibles and/or air, and recover excess refrigerant
- Chilled water leaving temperature too high	- Excessive cooling load	- Reduce load, reduce water flow if necessary

L) DISCHARGE PRESSURE IS TOO LOW		
- Water is very cold at condenser outlet	- Condenser water flow too high or water temperature is too low	- Adjust the pressure operated water valve or the thermostat on the cooling tower
- Bubbles in sightglass	- Low refrigerant charge	- Repair the leak and add refrigerant

8.1 LIST OF THE MOST COMMON PROBLEMS - continued

PROBLEMS – SYMPTOMS	PROBABLE CAUSE	RECOMMENDED ACTION
M) SUCTION PRESSURE IS TOO HIGH		
- The compressor runs continuously	- Too much cooling demand on the evaporator	- Check the system
- Suction line unusually cold. Liquid refrigerant returns to compressor	a) Expansion valve opened to far	a) Adjust superheat and check that the expansion valve bulb is correctly fitted in place
	b) Expansion valve blocked in open position	b) Repair or replace

N) SUCTION PRESSURE IS TOO LOW		
- Bubbles in sightglass	- Low refrigerant charge	- Repair the leak and add refrigerant
- Excessive pressure drop across the filter-drier or the solenoid valve	- Filter-drier obstructed	- Replace the cartridge
- No refrigerant passing through the expansion valve	- Expansion valve bulb has lost its charge.	- Replace the bulb
- Loss of capacity	- Expansion valve obstructed	- Clean or replace
- Conditioned space too cold	- Control thermostat contacts stuck in closed position	- Repair or replace
- Compressor short-cycling	- Capacity modulation setting too low	- Adjust
- Superheat value too high	- Excessive pressure drop in the evaporator	- Check the external equalizing line on the expansion valve
- Low pressure drop in the evaporator	- Low water flow	- Check water flow. Check the condition of the filters, look for obstructions in the chilled water circuit piping

8.2 CONTROL DEVICES

Operation

By reacting to compressor discharge pressure, the high pressure switch monitors efficiency of the condenser. Poor efficiency, the result of an excessive condensing pressure, is usually caused by :

- A dirty condenser
- Low water flow
- Low air flow

The low pressure switch monitors the pressure at which the refrigerant evaporates in the evaporator tubes. Low evaporating pressure is usually caused by :

- Low refrigerant charge
- A faulty expansion valve
- An obstructed liquid line filter-drier
- A damaged compressor cylinder bank unloader.

The control thermostat monitors chilled water temperature at the evaporator inlet. The most common causes of subnormal temperatures in this zone are:

- Low water flow
- Thermostat setting too low

The oil pressure switch monitors oil injection pressure on the compressor. Low oil pressure is usually caused by :

- Low oil charge
- A worn or faulty oil pump
- A defective crankcase heater, causing condensation of refrigerant in the oil sump.

The above information does not represent a complete analysis of the refrigeration system. It is intended to familiarise the operator with unit operation and to provide him with the technical data required to enable him to recognise, correct or report a fault.



Only trained and qualified personnel is authorised to service and maintain this equipment.

8.3 OPERATION AND START-UP CHECK SHEET

Machine identifications :		File number :	
Year of manufacture :			
NORMAL CONDITIONS OF USE			
Leaving chilled water temperature :	 °C	
Outdoor air temperature :		Max :..... °C	Min :..... °C
Power supply voltage :	 V/Ph/Hz	
Refrigerant type :		
Date and time measurements were taken :		
Outdoor air temperature :	 °C	
Company responsible for measurements :		
Name of technician :		
Remarks :		
		
		
		
		
		

		Circuit 1			Circuit 2			Circuit 3	Circuit 4
		Compr. 1	Compr. 2	Compr. 3	Compr. 1	Compr. 2	Compr. 3	Compr. 1	Compr. 1
Number of hours of operation									
Compressors in service per circuit									
Evaporating pressure	Bar								
Suction piping temperature	°C								
Condensing pressure	Bar								
Discharge piping temperature	°C								
Oil pump temperature	°C								
Oil pressure	Bar								
Oil level	A								
Current on phase 1 per compressor	A								
Current on phase 2 per compressor	A								
Current on phase 3 per compressor	°C								
Liquid line temperature	Bar								
Evaporator pressure drop	°C								
Chilled water temperature	°C								
Leaving chilled water temperature	Bar								
Condenser pressure drop	°C								
Condenser entering water temperature	°C								
Condenser leaving water temperature	Bar								
H.P. pressure switch cut-out	Bar								
H.P. pressure switch cut-in	Bar								
Low pressure switch cut-in	Bar								
Oil pressure switch cut-out	Bar								
Antifreeze pressure switch cut-out	Bar								

Fan pressure switch 1 : (cut-out / bar)	Fan 2 :	Fan 3 :	Fan 4 :
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8.4 REGULAR CHECKS TO BE MADE - CHILLER UNIT ENVIRONMENT

CHILLED WATER CIRCUIT VALUE

Inlet / Outlet pressure guages for pressure drop	DkPa
Evaporator inlet temperature	°C
Evaporator outlet temperature	°C
Glycol concentration (1)	%
Flow switch operational at	% débit
Chilled water pump interlock	[]
Filter on water circuit	[]

CONDENSER WATER CIRCUIT

Inlet / Outlet pressure guages for pressure drop	DkPa
Condenser inlet temperature	°C
Condenser outlet temperature	°C
Regulation on condenser water inlet	[]
Condenser pump interlock	[]
Filter on water circuit	[]
Unrestricted air flow on condenser coils (2)	[]

ELECTRICAL POWER SUPPLY

Control circuit voltage	V
Power circuit power supply voltage L1/L2	V
Power circuit power supply voltage L2/L3	V
Power circuit power supply voltage L3/L1	V

(1) Depending on the application

(2) According to the type of unit

8.5 MANUFACTURER’S RECOMMENDED INSPECTIONS

8.5.1 - LIQUID CHILLERS WITH RECIPROCATING COMPRESSOR(S)

8.5.1.1 - Number of recommended preventive maintenance visits :

NUMBER OF RECOMMENDED PREVENTIVE MAINTENANCE VISITS								
Year	Start up	500/1000H visit	Major technical inspection	Inspection visit	15 000 h inspection	30000 h inspection	Tube analysis	
1	1	1		2				
2			1	3				
3			1	3				
4				3	1			
5			1	3			1 ⁽¹⁾	
6			1	3				
7				3		1		
8			1	3				
9			1	3				
10				3		1		1
+10					Every year	3 times a year	Every 15000 hours	Every 30000 hours

This table is published for units operating under normal conditions with an average annual runtime of 4000 hours. In hostile industrial environments, a specific maintenance visit schedule must be envisaged.

(1) Depending on the quality of the water

8.5.1.2 - Description of inspection duties - Liquid chiller with reciprocating compressor(s)**START UP**

- Check unit installation
- Check water flow and water circuit ancillaries
- Check safety devices
- Check leaktightness
- Configuration of the microprocessor based management system (if used)
- Verification of operating parameters and unit performance
- Transmission of the machine service log

500 H / 1000 H VISITS

- Post wear in inspection
- Oil acidity test, leak test
- Replacement of the filter-drier cartridges depending on the results of the test above.
- Monitor unit performance and any eventual variations linked to use of the installation.

INSPECTION VISIT

- Leak test
- Operating test with record of measurements taken and functional analysis.

MAJOR TECHNICAL INSPECTION

- Inspection visit
- Acid test
- Oil change if necessary
- Replacement of filter-drier cartridges if necessary
- Check up on the microprocessor based management system (if used)
- Adjustment of safety devices
- Verification of unit interlocks
- Lubrication of bearings / dampers if necessary

15 000 H VISIT

- Major technical inspection
- Inspection of the compressor and replacement of valves, springs and seals (depending on the type of compressor).

30 000 H VISIT

- Major technical inspection
- Inspection of the compressors with replacement of the valves, springs, seals and gaskets, bearings, oil discharge valve, piston rings.
- Dimensional inspection of the big ends and gudgeon pins, replacement of parts as required (quotation) (depending on the type of compressor).

TUBE ANALYSIS

- Inspection of water cooled evaporator and condenser tube bundles with an eddy current test to enable potentially serious problems to be anticipated.
- Frequency : Every 5 years up to 10 years (depending on the quality of water), then every 3 years.

8.5.2 - LIQUID CHILLERS WITH SCROLL COMPRESSOR(S)

8.5.2.1 - Number of recommended preventive maintenance visits :

NUMBER OF RECOMMENDED PREVENTIVE MAINTENANCE VISITS

Year	Start up	500/1000H visit	Major technical inspection	Inspection visit	Tube analysis
1	1	1		2	
2			1	3	
3			1	3	
4				3	
5			1	3	1 ⁽¹⁾
6			1	3	
7			1	3	
8			1	3	
9			1	3	
10			1	3	1
+10					Every year

This table is published for units operating under normal conditions with an average annual runtime of 4000 hours. In hostile industrial environments, a specific maintenance visit schedule must be envisaged.

(1) Depending on the quality of the water

8.5.2.2 - Description of inspection duties - Liquid chiller with scroll compressor(s)**START UP**

- Check unit installation
- Check water flow and water circuit ancillaries
- Check safety devices
- Check leaktightness
- Configuration of the microprocessor based management system (if used)
- Verification of operating parameters and unit performance
- Transmission of the machine service log

500 H / 1000 H VISITS

- Post wear in inspection
- Oil acidity test, leak test
- Replacement of the filter-drier cartridges depending on the results of the test above.
- Monitor unit performance and any eventual variations linked to use of the installation.

INSPECTION VISIT

- Leak test
- Operating test with record of measurements taken and functional analysis.

MAJOR TECHNICAL INSPECTION

- Inspection visit
- Acid test
- Oil change if necessary
- Replacement of filter-drier cartridges
- Check up on the microprocessor based management system (if used)
- Adjustment of safety devices
- Verification of unit interlocks
- Lubrication of bearings / dampers if necessary

TUBE ANALYSIS

- Inspection of water cooled evaporator and condenser tube bundles with an eddy current test to enable potentially serious problems to be anticipated.
- Frequency : Every 5 years up to 10 years (depending on the quality of water), then every 3 years.

8.5.3 - LIQUID CHILLERS WITH SCREW COMPRESSOR(S)

8.5.3.1 - Number of recommended preventive maintenance visits :

NUMBER OF RECOMMENDED PREVENTIVE MAINTENANCE VISITS

Year	Start up	500/1000H visit	Major technical inspection	Inspection visit	30000 h inspection	Tube analysis
1	1	1		2		
2			1	3		
3			1	3		
4				3		
5			1	3		1 ⁽¹⁾
6			1	3		
7				3	1	1
8			1	3		
9			1	3		
10				3		
+10					Every year	3 times a year

This table is published for units operating under normal conditions with an average annual runtime of 4000 hours. In hostile industrial environments, a specific maintenance visit schedule must be envisaged.

(1) Depending on the quality of the water

8.5.3.2 - Description of inspection duties - Liquid chiller with screw compressor(s)**START UP**

- Check unit installation
- Check water flow and water circuit ancillaries
- Check safety devices
- Check leaktightness
- Configuration of the microprocessor based management system
- Verification of operating parameters and unit performance
- Transmission of the machine service log

500 H / 1000 H VISITS

- Post wear in inspection
- Oil acidity test, leak test
- Replacement of the filter-drier cartridges depending on the results of the test above.
- Monitor unit performance and any eventual variations linked to use of the installation.

INSPECTION VISIT

- Leak test
- Operating test with record of measurements taken and functional analysis.

MAJOR TECHNICAL INSPECTION

- Inspection visit
- Acid test
- Oil change if necessary
- Replacement of filter-drier cartridges
- Check up on the microprocessor based management system
- Adjustment of safety devices
- Verification of unit interlocks
- Lubrication of bearings / dampers if necessary

30000 H VISIT

- Replacement of the compressor and return the old one for revision with replacement of bearing and inspection of compressor geometry
- Major technical inspection
- Start-up of the installation again

TUBE ANALYSIS

- Inspection of water cooled evaporator and condenser tube bundles with an eddy current test to enable potentially serious problems to be anticipated.
- Frequency : Every 5 years up to 10 years (depending on the quality of water), then every 3 years.

This check list should be filled in by the contractor to make sure that unit installation takes place according to appropriate industry practices.

WARNING : Disconnect the power supply before carrying out any inspections on the unit. If the unit must be left powered up, proceed with precaution to avoid risk of electrocution.

Note : some units have a separate control circuit supply that is not isolated when the main power supply is OFF. This must be isolated separately.

RECEPTION

- Check absence of transport damage
- Check for missing items
- Availability of suitable lifting gear, slings and spacers

UNIT PLACEMENT

- Shipping crate removed
- Clearances checked
- Vibration isolators mounted
- Unit set in place
- Unit levelled

CHILLED WATER CIRCUIT

- All piping checked for leakage
- Thermometers installed
- Water pressure regulator installed
- Balancing valves installed
- Flow switch installed
- System rinsed, cleaned and filled before being connected to the unit. Checked presence of filter on unit inlet and state of cleanliness of the filter.
- Checked operation of the pump and evaporator pressure drop

CONDENSER WATER CIRCUIT

- Checked order of power supply phases for scroll and screw compressor units
- All piping checked for leakage
- Thermometers installed
- Water pressure regulator installed
- System balancing valves installed
- System rinsed, cleaned and filled before being connected to the unit. Checked presence of filter on unit inlet and state of cleanliness of the filter.
- Checked operation of the pump and condenser pressure drop

ELECTRICAL EQUIPMENT

- Check the main power supply matches the unit data plate.
- Check that the unit is correctly earthed
- Checked order of power supply phases for scroll and screw compressor units
- Checked correct direction of rotation of fan motors and proper operation of the latter.
- Direction of rotation of pump correct
- Control cabinet wired up.
- Power supply conforms with unit nameplate indications
- Pump starter and flow switch circuits complete and in working order
- Pipe heaters installed on all piping exposed to freezing temperatures
- All unions tightened with a torque wrench

GENERAL

- Cooling load available, minimum 50 %
- Coordination between different professions for final commissioning

CUSTOMER ORDER NUMBER : LENNOX REFERENCE:

DESIGNATION :

COMMENTS :

.....

NAME : SIGNATURE :

AIR COOLED CHILLERS AND SPLIT UNITS

INSTALLATION OPERATION MAINTENANCE MANUAL

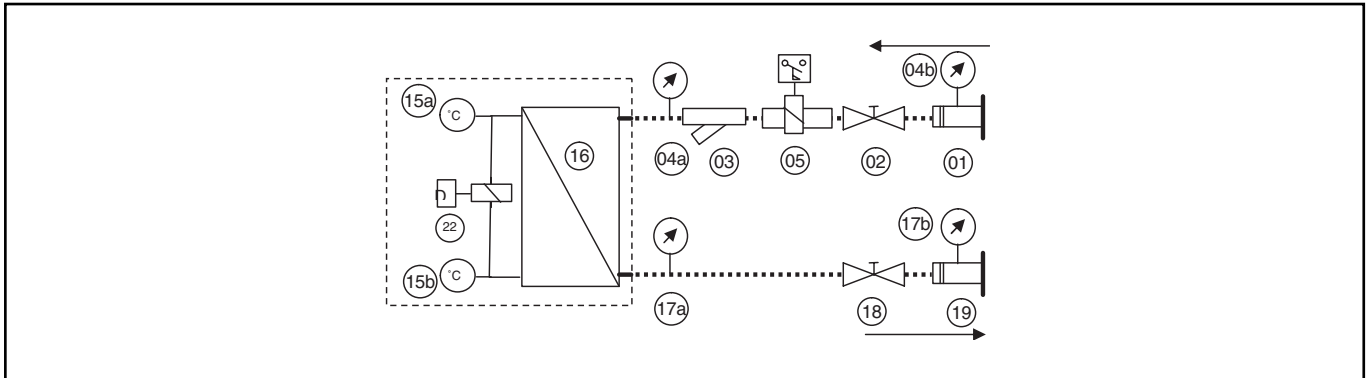
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ANNEXES

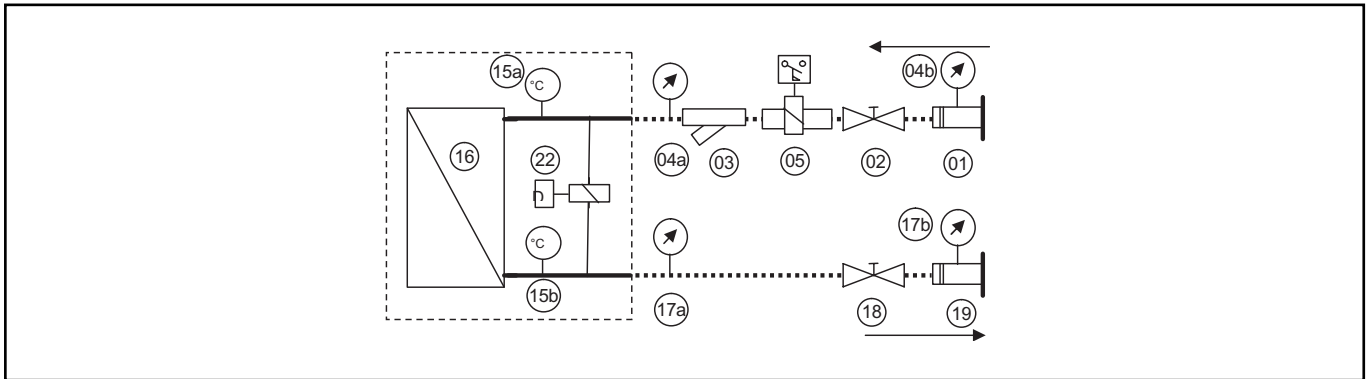
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**UNIT WITHOUT
HYDRAULIC OR HYDRONIC MODULE**

**WA 150 STD/LN
75/100/110 HE/SLN**



**WA 200 -> 370 STD/LN/HE/SLN
90/130/150 HE/SLN**



ITEMS SUPPLIED LOOSE

- 01 19 Groove lock coupling
- 02 18 Unit isolation valve
- 03 Water inlet filter
- 04a 17a In/Out manometers without groove lock coupling option
- 04b 17b in/Out manometers mounted on groove lock coupling option
- 05 Paddle flow switch

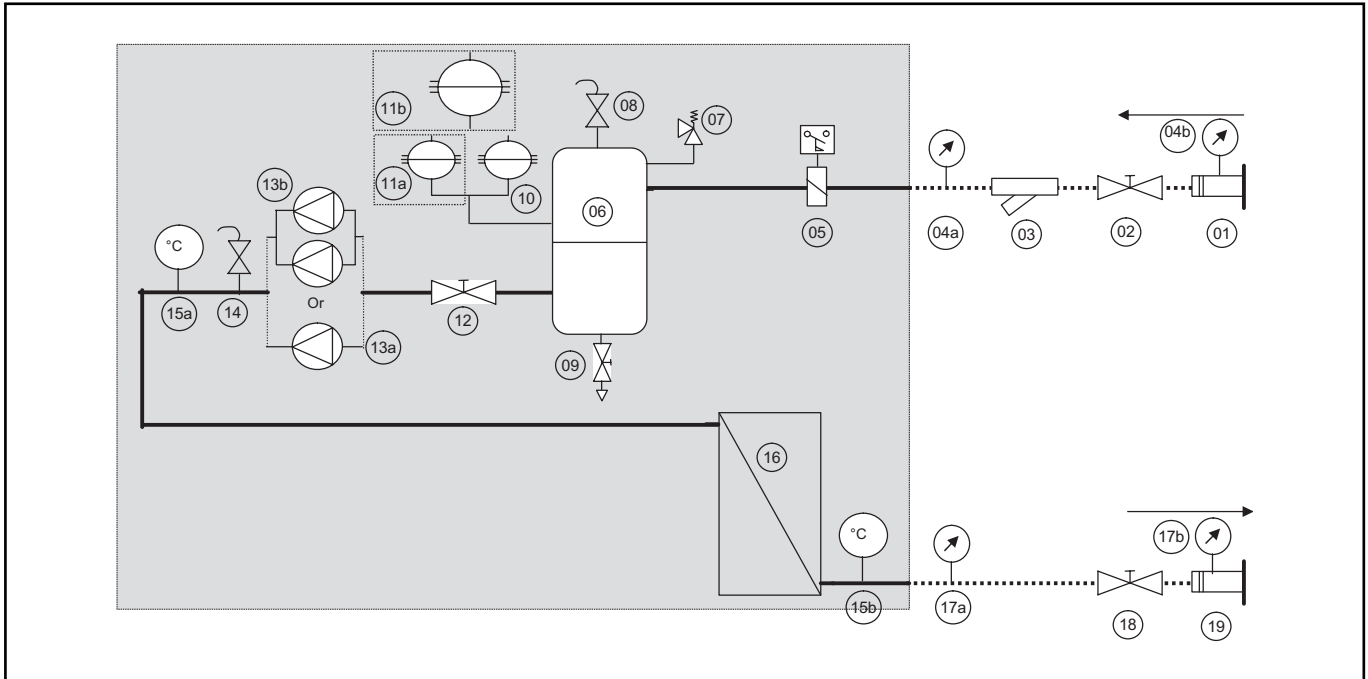
ITEMS MOUNTED INSIDE THE UNIT

- 15a 15b Temperature sensors
- 16 Plate heat exchanger
- 22 Flow switch/Differential

OPTIONS				
BASIC UNIT	Water inlet filter	Flow switch (paddle) Supplied loose	Flow switch (differential) Supplied mounted	Unit isolation valve
	Add 03	Add 05	Add 22	Add 02/18
16 15a/15b	Kit for groove lock coupling	Inlet/Outlet manometer	Inlet/Outlet manometer + kit for groove lock coupling	
	Add 01/19	Add 04a/17a	Add 04b/17b & 01/19	

UNIT WITH HYDRONIC MODULE

WA - EK - DK STD/LN/HE/SLN



ITEMS SUPPLIED LOOSE

- 01 19 Groove lock coupling
- 02 18 Unit isolation valve
- 03 Water inlet filter
- 04a 17a In/Out manometers without groove lock coupling option
- 04b 17b In/Out manometers mounted on groove lock coupling option

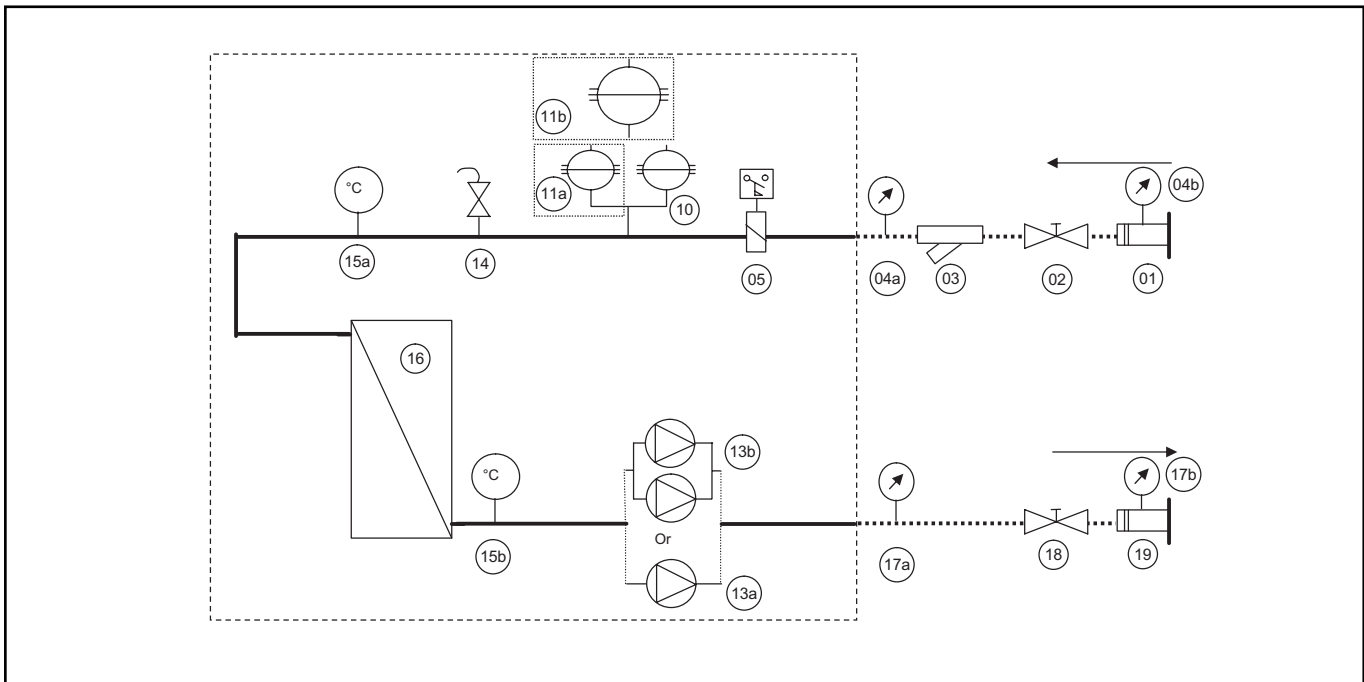
ITEMS MOUNTED INSIDE THE UNIT

- 05 Paddle flow switch
- 06 Water tank 200L or 500L
- 07 Safety valve
- 08 Air purge
- 09 Water drain
- 10 25L expansion vessel
- 11a Second 25L expansion vessel for (WA > 150D)
- 11b Single 50L expansion vessel (WA ≤ 150D)
- 12 Pump suction isolation valve
- 13a Single pump
- 13b Double pump
- 14 Air purge
- 15a Temperature sensor return
- 15b Temperature sensor supply
- 16 Plate heat exchanger

	OPTIONS					
BASIC UNIT + 200/500L tank and single or double pump	Flow switch (paddle) mounted	Water inlet filter	Expansion vessel 25L	Expansion vessel 50L for 075/090/100/110 HE & SLN	Expansion vessel 50L for all other WA units	Pump isolation valve
	Add 05	Add 03	Add 10	Add 11b	Add 10/11a	Add 12/18
06/07/08/09/13a or 13b/14/15a/15b/16	Unit isolation valve	Pump + Unit isolation valve	Kit for groove lock coupling	Inlet/Outlet manometer	Inlet/Outlet manometer + kit for groove lock coupling	
	Add 02/18	Add 02/12/18	Add 01/16	Add 04a/17a	Add 04b/17b & 01/19	

UNIT WITH HYDRAULIC MODULE

WA - EK - DK STD/LN/HE/SLN

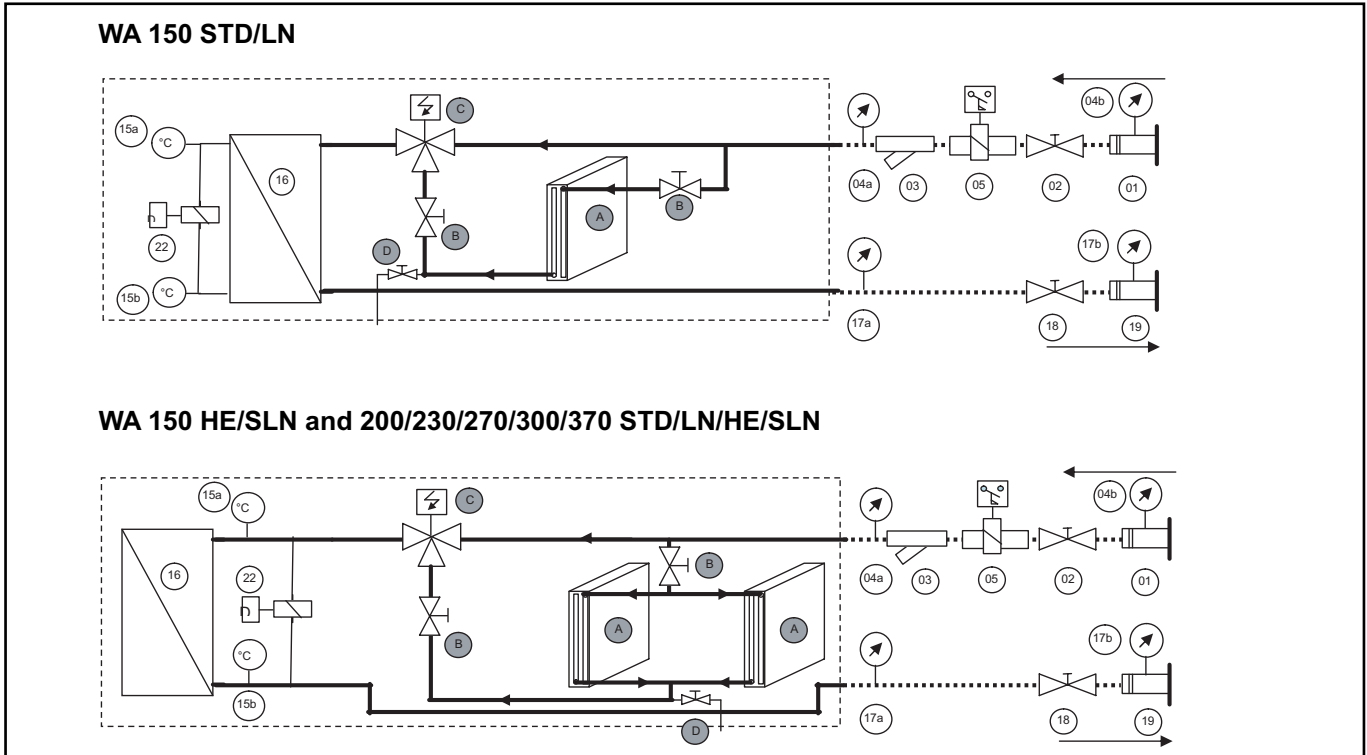


ITEMS SUPPLIED LOOSE	ITEMS MOUNTED INSIDE THE UNIT	
01 19 Groove lock coupling	05 Paddle flow switch	13a Single pump
02 18 Unit isolation valve	10 25L expansion vessel	13b Double pump
03 Water inlet filter	11a Second 25L expansion vessel for (WA > 150D)	14 Air purge
04a 17a In/Out manometers without groove lock coupling option	11b Single 50L expansion vessel (WA ≤ 150D)	15a Temperature sensor return
04b 17b In/Out manometers mounted on groove lock coupling option		15b Temperature sensor supply
		16 Plate heat exchanger

	OPTIONS				
BASIC UNIT + Single or double pump	Flow switch (paddle) mounted	Water inlet filter	Expansion vessel 25L	Expansion vessel 50L for WA 150 STD & 075/090/100/110 HE & SLN	Expansion vessel 50L for all other WA units
	Add 05	Add 03	Add 10	Add 11b	Add 10 & 11a
14/15a/15b/16/13a or 13b	Unit isolation valve	Kit for groove lock coupling	Inlet/Outlet manometer	Inlet/Outlet manometer + kit for groove lock coupling	
	Add 02/18	Add 01/19	Add 04a/17a	Add 04b/17b & 01/19	

UNIT WITH FREE COOLING OPTION

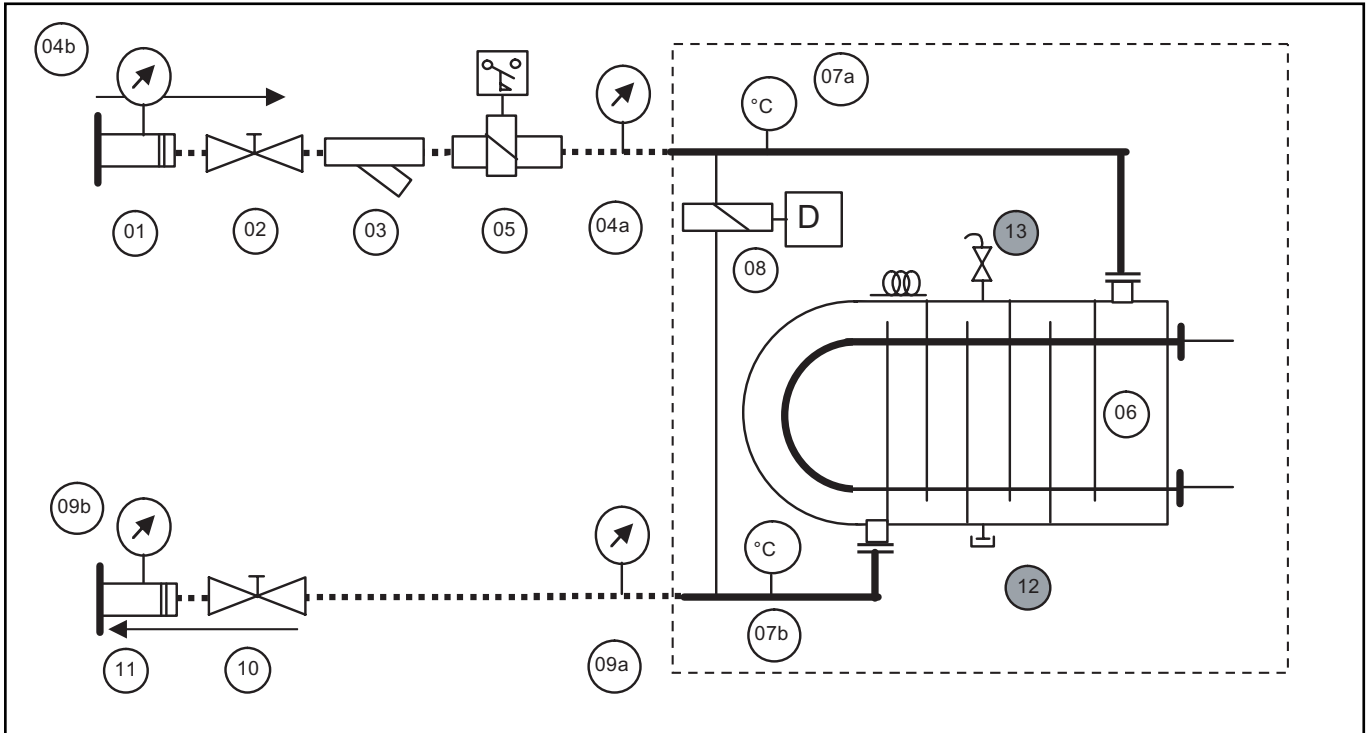
WA - EK - DK STD/LN/HE/SLN



ITEMS SUPPLIED LOOSE	ITEMS MOUNTED INSIDE THE UNIT
<ul style="list-style-type: none"> 01 19 Groove lock coupling 02 18 Unit isolation valve 03 Water inlet filter 04a 17a In/Out manometers without groove lock coupling option 05 Paddle flow switch mounted on tube 	<ul style="list-style-type: none"> 16 Plate heat exchanger 15a 15b Temperature sensors 22 Flow switch/differential A Free cooling coil B Isolating valves C Three way valve D Drain

	OPTIONS			
BASIC UNIT	Water inlet filter	Paddle flow switch Supplied loose	Differential flow switch Supplied mounted	Unit isolation valve
	Add 03	Add 05	Add 22	Add 02/18
16 15a/15b	Kit for groove lock coupling	Inlet/Outlet manometer	Inlet/outlet manometer + kit for groove lock coupling	
	Add 01/19	Add 04a/17a	Add 04b/17b and 01/19	

ALL **STANDARD**
HIGH AMBIENT
LOW NOISE



ITEMS SUPPLIED LOOSE

- 01 19 Groove lock coupling
- 02 10 Unit isolation valve
- 03 Water inlet filter
- 04a 09a In/Out manometers without groove lock coupling option
- 04b 09b In/Out manometers mounted on groove lock coupling option
- 05 Paddle flow switch

ITEMS MOUNTED INSIDE THE UNIT

- 06 Heat exchanger
- 07a 07b Temperature sensors
- 08 Differential Flow switch
- 12 Water drain
- 13 Air purge

OPTIONS

Basic Unit	Water Inlet Filter	Flow Switch (Paddle) (1)	Flow Switch (differential) (2)	Unit Isolation Valve	Kit for Groove Lock Coupling	Inlet/Outlet Manometer	Inlet/Outlet Manometer + kit for Groove LockCoupling
06 / 07a / 07b	Add	Add	Add	Add	Add	Add	Add
13 / 12	03	05	08	02 / 10	01 / 11	04a / 09a	04b / 09b + 01 / 11

(1) Supplied Loose
(2) Supplied Mounted

WA - EK - DK	STANDARD
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ECOLOGIC WA

WA	150	200	230	270	300	370
Minimum outlet water temperature °C	5					
Maximum inlet water temperature °C	20					
Minimum difference water inlet/outlet °C	3					
Maximum difference water inlet/outlet °C	8					
Minimum outside air temperature °C	6					
Minimum outside air temperature with low ambient kit °C	-10					
Maximum outside air temperature :						
• Normal operation with CLIMATIC™ 30 12°C water inlet/7°C water outlet °C	43	44	44	44	43	43
• Normal operation with CLIMATIC™ 50 12°C/7°C water + one compressor unloaded °C	51	59	59	51	51	48
• Start-up with CLIMATIC™ 30 + Thermostatic expansion valve and NO unloading °C	37	39	39	38	36	37
• Start-up with CLIMATIC™ 50 + Thermostatic expansion valve and ONE compressor unloaded °C	49	46	46	48	48	45
• Start-up with CLIMATIC™ 50 + Electronic expansion valve and ONE compressor unloaded °C	49	47	47	49	49	46

WA - EK - DK	LOW NOISE
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ECOLOGIC WA

WA	150	200	230	270	300	370
Minimum outlet water temperature °C	5					
Maximum inlet water temperature °C	20					
Minimum difference water inlet/outlet °C	3					
Maximum difference water inlet/outlet °C	8					
Minimum outside air temperature °C	6					
Minimum outside air temperature with low ambient kit °C	-10					
Maximum outside air temperature :						
• Normal operation with CLIMATIC™ 30 12°C water inlet/7°C water outlet °C	41	43	42	42	41	41
• Normal operation with CLIMATIC™ 50 12°C/7°C water + one compressor unloaded °C	50	48	47	50	50	47
• Start-up with CLIMATIC™ 30 + Thermostatic expansion valve and NO unloading °C	35	37	36	36	33	33
• Start-up with CLIMATIC™ 50 + Thermostatic expansion valve and ONE compressor unloaded °C	47	45	44	47	47	43
• Start-up with CLIMATIC™ 50 + Electronic expansion valve and ONE compressor unloaded °C	48	46	45	48	48	44

WA - EK - DK	HIGH EFFICIENCY
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ECOLOGIC WA

WA		075	090	100	110	130	150	200	230	270	300	370
Minimum outlet water temperature	°C	5										
Maximum inlet water temperature	°C	20										
Minimum difference water inlet/outlet	°C	3										
Maximum difference water inlet/outlet	°C	8										
Minimum outside air temperature	°C	6										
Minimum outside air temperature with low ambient kit	°C	-10										
Maximum outside air temperature :												
• Normal operation with CLIMATIC™ 50 12°C/7°C water + one compressor unloaded	°C	53	51	51	54	53	53	51	51	52	53	49
• Start-up with CLIMATIC™ 50 + Electronic expansion valve and ONE compressor unloaded	°C	52	49	49	53	52	52	49	49	50	52	46

WA - EK - DK	SUPER LOW NOISE
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ECOLOGIC WA

WA		075	090	100	110	130	150	200	230	270	300	370
Minimum outlet water temperature	°C	5										
Maximum inlet water temperature	°C	20										
Minimum difference water inlet/outlet	°C	3										
Maximum difference water inlet/outlet	°C	8										
Minimum outside air temperature	°C	6										
Minimum outside air temperature with low ambient kit	°C	-10										
Maximum outside air temperature :												
• Normal operation with CLIMATIC™ 50 12°C/7°C water + one compressor unloaded	°C	52	49	49	53	52	52	50	49,5	51,5	52,3	47,1
• Start-up with CLIMATIC™ 50 + Thermostatic expansion valve and ONE compressor unloaded	°C	50	46	46	51	50	49	47	46	48	49	43
• Start-up with CLIMATIC™ 50 + Electronic expansion valve and one compressor unloaded	°C	51	47	48	52	51	50	48	47	49	50	44

WAH	STANDARD
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ECOLOGIC WAH - COOLING MODE

WAH		150	200	230
Minimum outlet water temperature	°C		5	
Maximum inlet water temperature	°C		20	
Minimum difference water inlet/outlet	°C		3	
Maximum difference water inlet/outlet	°C		8	
Minimum outside air temperature	°C		6	
Maximum outside air temperature :				
• Normal operation with CLIMATIC™ 50 12°C/7°C water + one compressor unloaded	°C	51	50	49
• Start-up with CLIMATIC™ 50 + Thermostatic expansion valve and ONE compressor unloaded	°C	49	47	46

ECOLOGIC WAH - HEATING MODE

WAH		150	200	230
Minimum inlet water temperature	°C		10	
Maximum outlet water temperature	°C		50	
Minimum difference water inlet/outlet	°C		3	
Maximum difference water inlet/outlet	°C		8	
Minimum outside air temperature with water outlet 35°C	°C		-10	
Maximum outside air temperature	°C		30	

WA - EK - DK **STD/LN/HE/SLN**

WA			075	090	100	110	130	150
Water	Test pressure	bar				10		
Refrigerant	Test pressure	bar				29		
Water	Max. operating pressure	bar				6		
Refrigerant	Max. operating pressure	bar				29		
Water	Minimum flow rate	m ³ /h				8°C ΔT		
Water	Maximum flow rate	m ³ /h				3°C ΔT		
Safety	Low pressure cut out	bar				0,7		
Safety	Interlocking of low pressure	bar				2,2		
Safety	High pressure cut out	bar				29		
Safety	High pressure reset	bar				20		

WA			200	230	270	300	370
<i>Operating limits for evaporator</i>							
Water	Test pressure	bar				10	
Refrigerant	Test pressure	bar				29	
Water	Max. operating pressure	bar				6	
Refrigerant	Max. operating pressure	bar				29	
Water	Minimum flow rate	m ³ /h				8°C ΔT	
Water	Maximum flow rate	m ³ /h				3°C ΔT	
<i>Operating limits for evaporator</i>							
Safety	Low pressure cut out	bar				0,7	
Safety	Interlocking of low pressure	bar				2,2	
Safety	High pressure cut out	bar				29	
Safety	High pressure reset	bar				20	

ALL	LCH - VK
	STANDARD

LCH		402V	422VE	442V	452VE	502V
Operating limits						
Min. outlet water temperature	°C	5	5	5	5	5
Max. inlet water temperature	°C	20	20	20	20	20
Min. difference water inlet/outlet	°C	3	3	3	3	3
Max. difference water inlet/outlet	°C	8	8	8	8	8
Min. outside air temperature	°C	6	6	6	6	6
Min. outside air temperature (1)	°C	-15	-15	-15	-15	-15
Max. outside air temperature (2)	°C	49,5	49,5	49,5	49,5	48,5

LCH		552VE	602V	652VE	702V	752VE
Operating limits						
Min. outlet water temperature	°C	5	5	5	5	5
Max. inlet water temperature	°C	20	20	20	20	20
Min. difference water inlet/outlet	°C	3	3	3	3	3
Max. difference water inlet/outlet	°C	8	8	8	8	8
Min. outside air temperature	°C	6	6	6	6	6
Min. outside air temperature (1)	°C	-15	-15	-15	-15	-15
Max. outside air temperature (2)	°C	48,5	48,5	48,5	49	49

LCH		803V	853VE	953V	1003VE	1053V
Operating limits						
Min. outlet water temperature	°C	5	5	5	5	5
Max. inlet water temperature	°C	20	20	20	20	20
Min. difference water inlet/outlet	°C	3	3	3	3	3
Max. difference water inlet/outlet	°C	8	8	8	8	8
Min. outside air temperature	°C	6	6	6	6	6
Min. outside air temperature (1)	°C	-15	-15	-15	-15	-15
Max. outside air temperature (2)	°C	49	49	48,5	48,5	47,5

LCH		1153VE	1254V	1354VE	1404V	1504VE
Operating limits						
Min. outlet water temperature	°C	5	5	5	5	5
Max. inlet water temperature	°C	20	20	20	20	20
Min. difference water inlet/outlet	°C	3	3	3	3	3
Max. difference water inlet/outlet	°C	8	8	8	8	8
Min. outside air temperature	°C	6	6	6	6	6
Min. outside air temperature (1)	°C	-15	-15	-15	-15	-15
Max. outside air temperature (2)	°C	47,5	48,5	48,5	47,5	47,5

(1) With low temperature kit
 (2) Unloading start up sequence

ALL	LCH - VK - PK HIGH AMBIENT
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LCH		322P	412P	462P	532P	402V	422VE
Operating limits							
Min. outlet water temperature	°C	5	5	5	5	5	5
Max. inlet water temperature	°C	20	20	20	20	20	20
Min. difference water inlet/outlet	°C	3	3	3	3	3	3
Max. difference water inlet/outlet	°C	8	8	8	8	8	8
Min. outside air temperature	°C	6	6	6	6	6	6
Min. outside air temperature (1)	°C	-15	-15	-15	-15	-15	-15
Max. outside air temperature (2)	°C	50	48	52,5	52	53,5	53,5

LCH		442V	452VE	502V	552VE	602V	652VE
Operating limits							
Min. outlet water temperature	°C	5	5	5	5	5	5
Max. inlet water temperature	°C	20	20	20	20	20	20
Min. difference water inlet/outlet	°C	3	3	3	3	3	3
Max. difference water inlet/outlet	°C	8	8	8	8	8	8
Min. outside air temperature	°C	6	6	6	6	6	6
Min. outside air temperature (1)	°C	-15	-15	-15	-15	-15	-15
Max. outside air temperature (2)	°C	53,5	53,5	52	52	52	52

LCH		702V	752VE	803V	853VE	953V	1003VE
Operating limits							
Min. outlet water temperature	°C	5	5	5	5	5	5
Max. inlet water temperature	°C	20	20	20	20	20	20
Min. difference water inlet/outlet	°C	3	3	3	3	3	3
Max. difference water inlet/outlet	°C	8	8	8	8	8	8
Min. outside air temperature	°C	6	6	6	6	6	6
Min. outside air temperature (1)	°C	-15	-15	-15	-15	-15	-15
Max. outside air temperature (2)	°C	52,5	52,5	52,5	52,5	52	52

LCH		1053V	1153VE	1254V	1354VE	1404V	1504VE
Operating limits							
Min. outlet water temperature	°C	5	5	5	5	5	5
Max. inlet water temperature	°C	20	20	20	20	20	20
Min. difference water inlet/outlet	°C	3	3	3	3	3	3
Max. difference water inlet/outlet	°C	8	8	8	8	8	8
Min. outside air temperature	°C	6	6	6	6	6	6
Min. outside air temperature (1)	°C	-15	-15	-15	-15	-15	-15
Max. outside air temperature (2)	°C	51,5	51,5	52	52	51,5	51,5

(1) With low temperature kit
 (2) Unloading start up sequence

ALL	LCH - VK LOW NOISE
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LCH		402V	422VE	442V	452VE	502V
Operating limits						
Min. outlet water temperature	°C	5	5	5	5	5
Max. inlet water temperature	°C	20	20	20	20	20
Min. difference water inlet/outlet	°C	3	3	3	3	3
Max. difference water inlet/outlet	°C	8	8	8	8	8
Min. outside air temperature	°C	6	6	6	6	6
Min. outside air temperature (1)	°C	-15	-15	-15	-15	-15
Max. outside air temperature (2)	°C	51	51	51	51	50.5

LCH		552VE	602V	652VE	702V	752VE
Operating limits						
Min. outlet water temperature	°C	5	5	5	5	5
Max. inlet water temperature	°C	20	20	20	20	20
Min. difference water inlet/outlet	°C	3	3	3	3	3
Max. difference water inlet/outlet	°C	8	8	8	8	8
Min. outside air temperature	°C	6	6	6	6	6
Min. outside air temperature (1)	°C	-15	-15	-15	-15	-15
Max. outside air temperature (2)	°C	50.5	50.5	50.5	50.5	50.5

LCH		803V	853VE	953V	1003VE	1053V
Operating limits						
Min. outlet water temperature	°C	5	5	5	5	5
Max. inlet water temperature	°C	20	20	20	20	20
Min. difference water inlet/outlet	°C	3	3	3	3	3
Max. difference water inlet/outlet	°C	8	8	8	8	8
Min. outside air temperature	°C	6	6	6	6	6
Min. outside air temperature (1)	°C	-15	-15	-15	-15	-15
Max. outside air temperature (2)	°C	50.5	50.5	50.5	50.5	49

LCH		1153VE	1254V	1354VE	1404V	1504VE
Operating limits						
Min. outlet water temperature	°C	5	5	5	5	5
Max. inlet water temperature	°C	20	20	20	20	20
Min. difference water inlet/outlet	°C	3	3	3	3	3
Max. difference water inlet/outlet	°C	8	8	8	8	8
Min. outside air temperature	°C	6	6	6	6	6
Min. outside air temperature (1)	°C	-15	-15	-15	-15	-15
Max. outside air temperature (2)	°C	49	50.5	50.5	49	49

(1) With low temperature kit
 (2) Unloading start up sequence

ALL	LCH - VK - PK
	STD / LN / HA

LCH		322P	412P	462P	532P	402V	422VE
Operating limits for Evaporator							
Water Test pressure	Bar	10	10	10	10	10	10
Refrigerant Test pressure	Bar	26,5	26,5	26,5	26,5	26,5	26,5
Water Max. operating pressure	Bar	6,0	6,0	6,0	6,0	6,0	6,0
Refrigerant Max. operating pressure	Bar	26,5	26,5	26,5	26,5	26,5	26,5
Water Min. flow	m3/h	8°C ΔT	8°C ΔT	8°C ΔT	8°C ΔT	8°C ΔT	8°C ΔT
Water Max. flow	m3/h	89,3	153,5	153,5	153,5	89,3	89,3
Operating limits for Pressure gauge control							
Safety Cut of low pressure	Bar	0,7	0,7	0,7	0,7	0,7	0,7
Safety Interlocking of low pressure	Bar	2,2	2,2	2,2	2,2	2,2	2,2
Safety Cut of high pressure	Bar	26,5	26,5	26,5	26,5	26,5	26,5
Safety Interlocking of high pressure	Bar	20	20	20	20	20	20

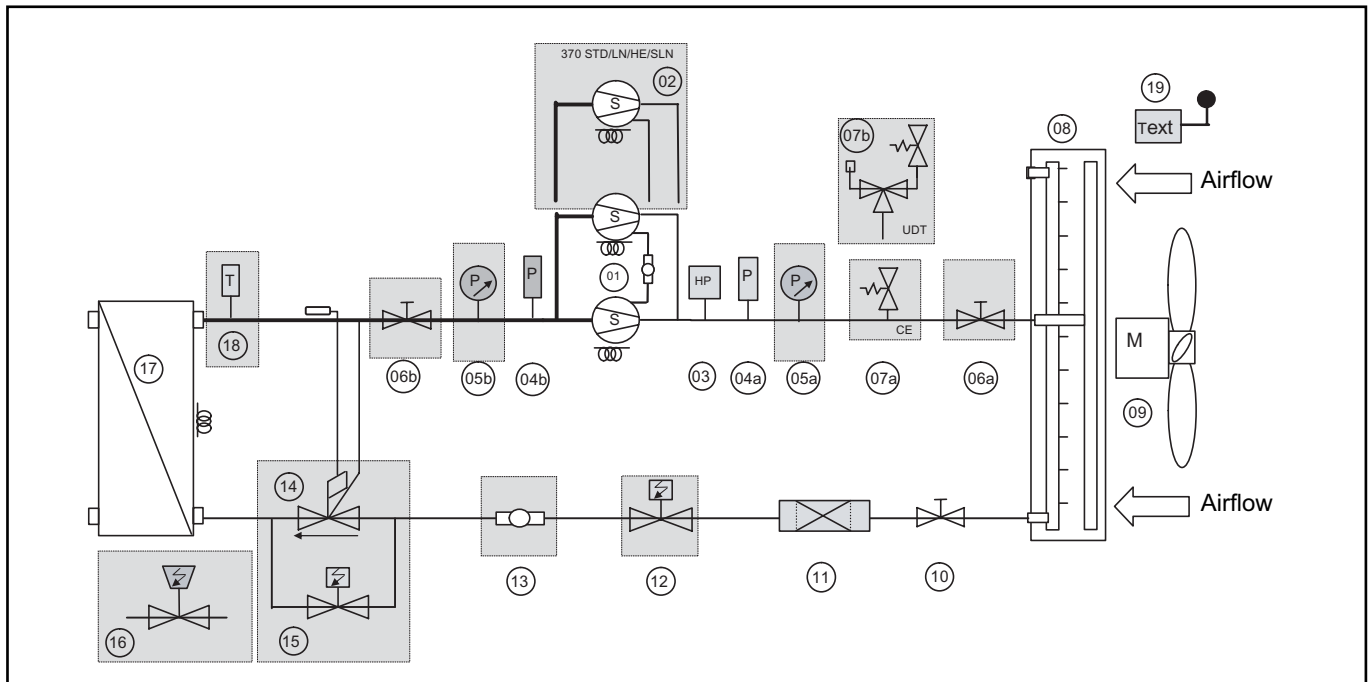
LCH		442V	452VE	502V	552VE	602V	652VE
Operating limits for Evaporator							
Water Test pressure	Bar	10	10	10	10	10	10
Refrigerant Test pressure	Bar	26,5	26,5	26,5	26,5	26,5	26,5
Water Max. operating pressure	Bar	6,0	6,0	6,0	6,0	6,0	6,0
Refrigerant Max. operating pressure	Bar	26,5	26,5	26,5	26,5	26,5	26,5
Water Min. flow	m3/h	8°C ΔT	8°C ΔT	8°C ΔT	8°C ΔT	8°C ΔT	8°C ΔT
Water Max. flow	m3/h	89,3	89,3	153,5	153,5	153,5	153,5
Operating limits for Pressure gauge control							
Safety Cut of low pressure	Bar	0,7	0,7	0,7	0,7	0,7	0,7
Safety Interlocking of low pressure	Bar	2,2	2,2	2,2	2,2	2,2	2,2
Safety Cut of high pressure	Bar	26,5	26,5	26,5	26,5	26,5	26,5
Safety Interlocking of high pressure	Bar	20	20	20	20	20	20

LCH		702V	752VE	803V	853VE	953V	1003VE
Operating limits for Evaporator							
Water Test pressure	Bar	10	10	10	10	10	10
Refrigerant Test pressure	Bar	26,5	26,5	26,5	26,5	26,5	26,5
Water Max. operating pressure	Bar	6,0	6,0	6,0	6,0	6,0	6,0
Refrigerant Max. operating pressure	Bar	26,5	26,5	26,5	26,5	26,5	26,5
Water Min. flow	m3/h	8°C ΔT	8°C ΔT	8°C ΔT	8°C ΔT	8°C ΔT	8°C ΔT
Water Max. flow	m3/h	153,5	153,5	153,5	153,5	180	180
Operating limits for Pressure gauge control							
Safety Cut of low pressure	Bar	0,7	0,7	0,7	0,7	0,7	0,7
Safety Interlocking of low pressure	Bar	2,2	2,2	2,2	2,2	2,2	2,2
Safety Cut of high pressure	Bar	26,5	26,5	26,5	26,5	26,5	26,5
Safety Interlocking of high pressure	Bar	20	20	20	20	20	20

LCH		1053V	1153VE	1254V	1354VE	1404V	1504VE
Operating limits for Evaporator							
Water Test pressure	Bar	10	10	10	10	10	10
Refrigerant Test pressure	Bar	26,5	26,5	26,5	26,5	26,5	26,5
Water Max. operating pressure	Bar	6,0	6,0	6,0	6,0	6,0	6,0
Refrigerant Max. operating pressure	Bar	26,5	26,5	26,5	26,5	26,5	26,5
Water Min. flow	m3/h	8°C ΔT	8°C ΔT	8°C ΔT	8°C ΔT	8°C ΔT	8°C ΔT
Water Max. flow	m3/h	220	220	220	220	250	250
Operating limits for Pressure gauge control							
Safety Cut of low pressure	Bar	0,7	0,7	0,7	0,7	0,7	0,7
Safety Interlocking of low pressure	Bar	2,2	2,2	2,2	2,2	2,2	2,2
Safety Cut of high pressure	Bar	26,5	26,5	26,5	26,5	26,5	26,5
Safety Interlocking of high pressure	Bar	20	20	20	20	20	20

REFRIGERANT DRAWING

WA - EK - DK STD/LN/HE/SLN



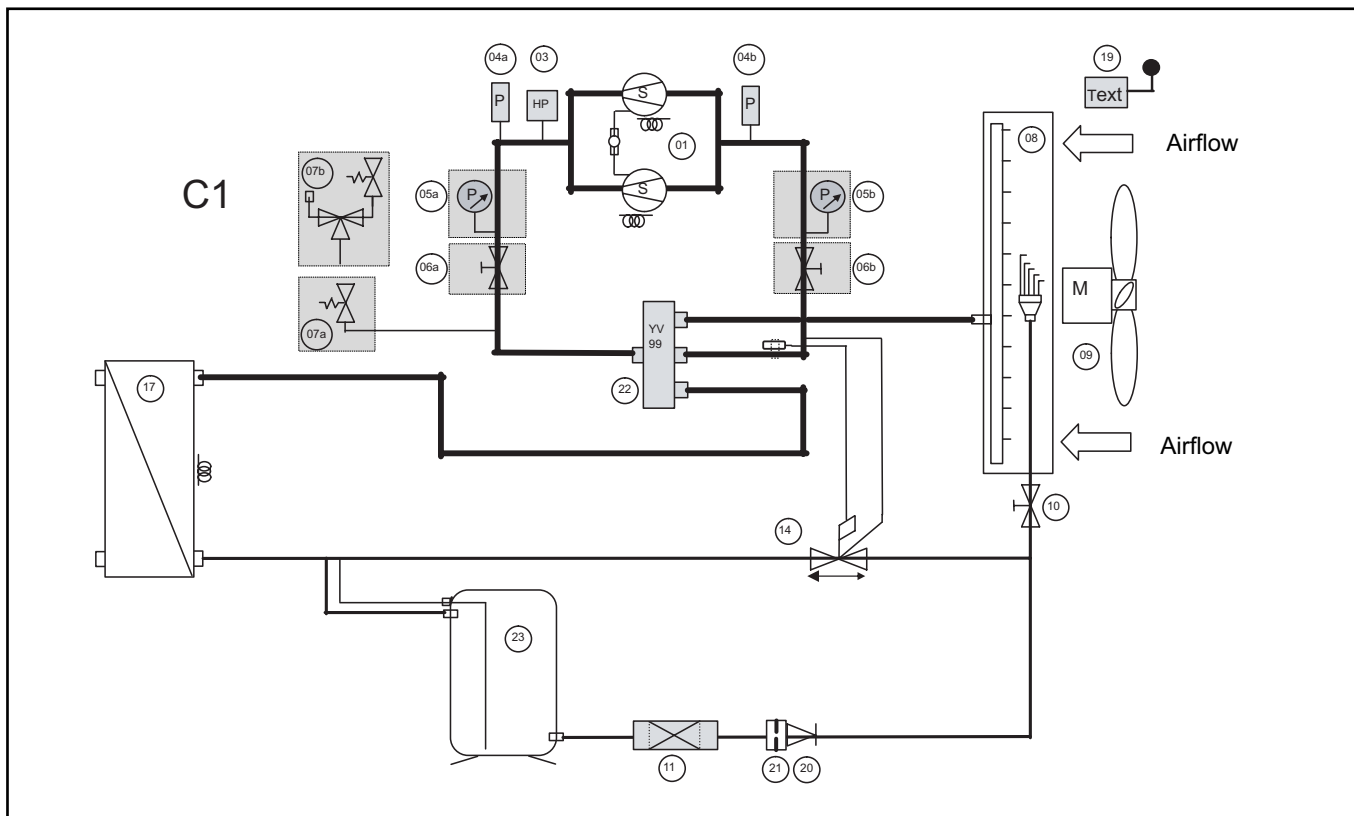
REFRIGERATION CIRCUIT COMPONENTS

01 1st & 2nd scroll compressors	08 Air cooled condenser	15 Expansion valve bypass for low ambient operations
02 3rd scroll compressor on size 370 STD/LN/HE & SLN	09 Fan motor	16 Electronic expansion valve
03 High pressure switch	10 Manual isolating valve	17 Evaporator heat exchanger
04a 04b Pressure transducers HP & BP	11 Filter drier	18 Suction temperature sensor
05a 05b Low and High pressure manometer	12 Solenoid valve	19 External temperature sensor
06a 06b Suction and discharge isolation valves	13 Sight glass	Heating resistance (option)
07a 07b Safety valve CE or UDT	14 Thermostatic expansion valve	

VARIANTS			EXPANSION DEVICE			OPTIONS		
BASIC UNIT	Size 370 STD/LN/HE/SLN	WA unit CE or UDT	Thermostatic expansion valve	Thermostatic expansion valve + low ambient	Electronic expansion valve	HP/LP pressure gauges	Suction and discharge isolating valve	Sight glass
01/03/04a/04b/08/09/10/11/17/19	Add 02	07a or 07b	Add 14 & 12	Add 14, 12 & 15	Add 16 & 18	Add 05a & 05b	Add 06a & 06b	Add 13

REFRIGERANT DRAWING

WAH 150/200D/230D



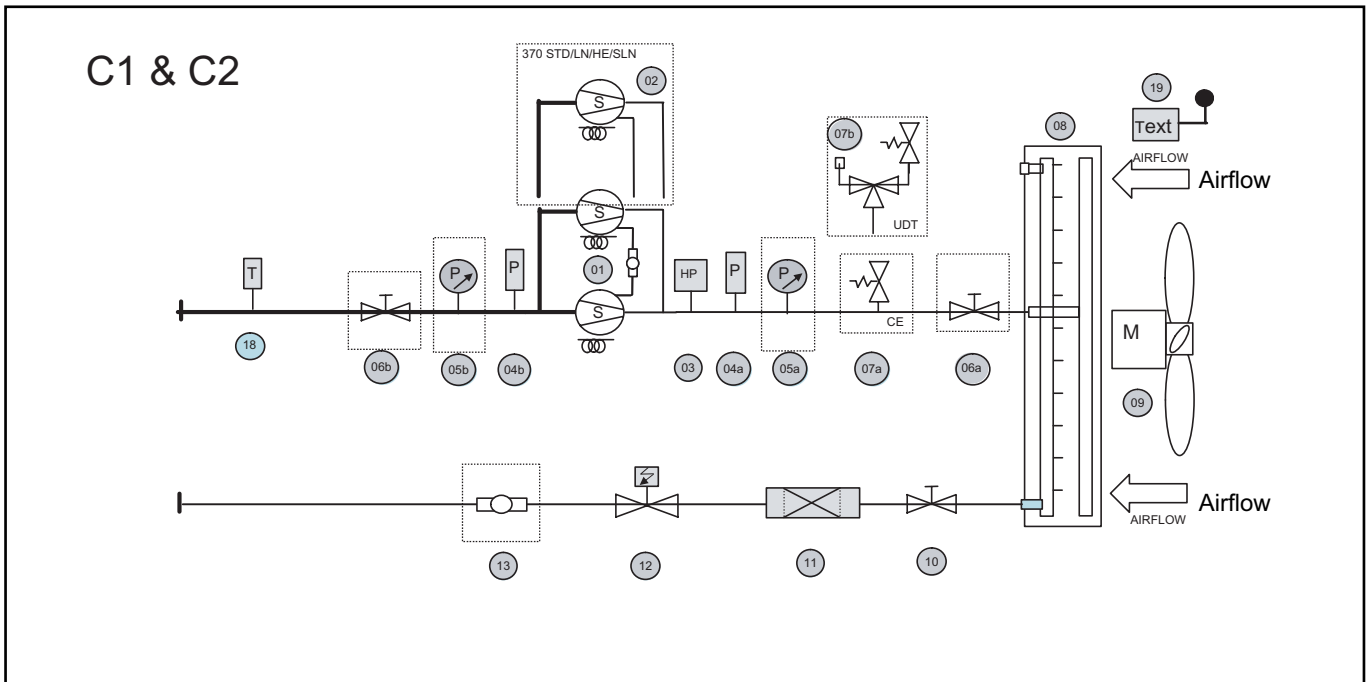
REFRIGERATION CIRCUIT COMPONENTS

- | | | |
|--|--|--|
| <p>01 1st & 2nd scroll compressors</p> <p>03 High pressure switch</p> <p>04a 04b Pressure transducers HP & BP</p> <p>05a 05b Low and High pressure manometer</p> <p>06a 06b Suction and discharge isolation valves</p> <p>07a 07b Safety valve CE or UDT</p> | <p>08 Air cooled condenser/Evaporator</p> <p>09 Fan motor</p> <p>10 Manual isolating valve</p> <p>11 Filter drier</p> <p>14 Thermostatic expansion valve</p> <p>17 Evaporator/Condenser heat exchanger</p> | <p>19 External temperature sensor</p> <p>20 Check valve</p> <p>21 Restrictor</p> <p>22 4-way inverting valve</p> <p>23 Liquid receiver</p> <p> Heating resistance (option)</p> |
|--|--|--|

BASIC UNIT	VARIANT	OPTIONS	
Basic unit	CE or UDT	HP/LP pressure gauges	Suction and discharge isolating valves
01/03/04a/04b/19/22/08 09/10/11/23/20/17/14/21	07a or 07b	Add 06a/06b	Add 05a/05b

REFRIGERANT DRAWING

RA STD/LN/HE/SLN

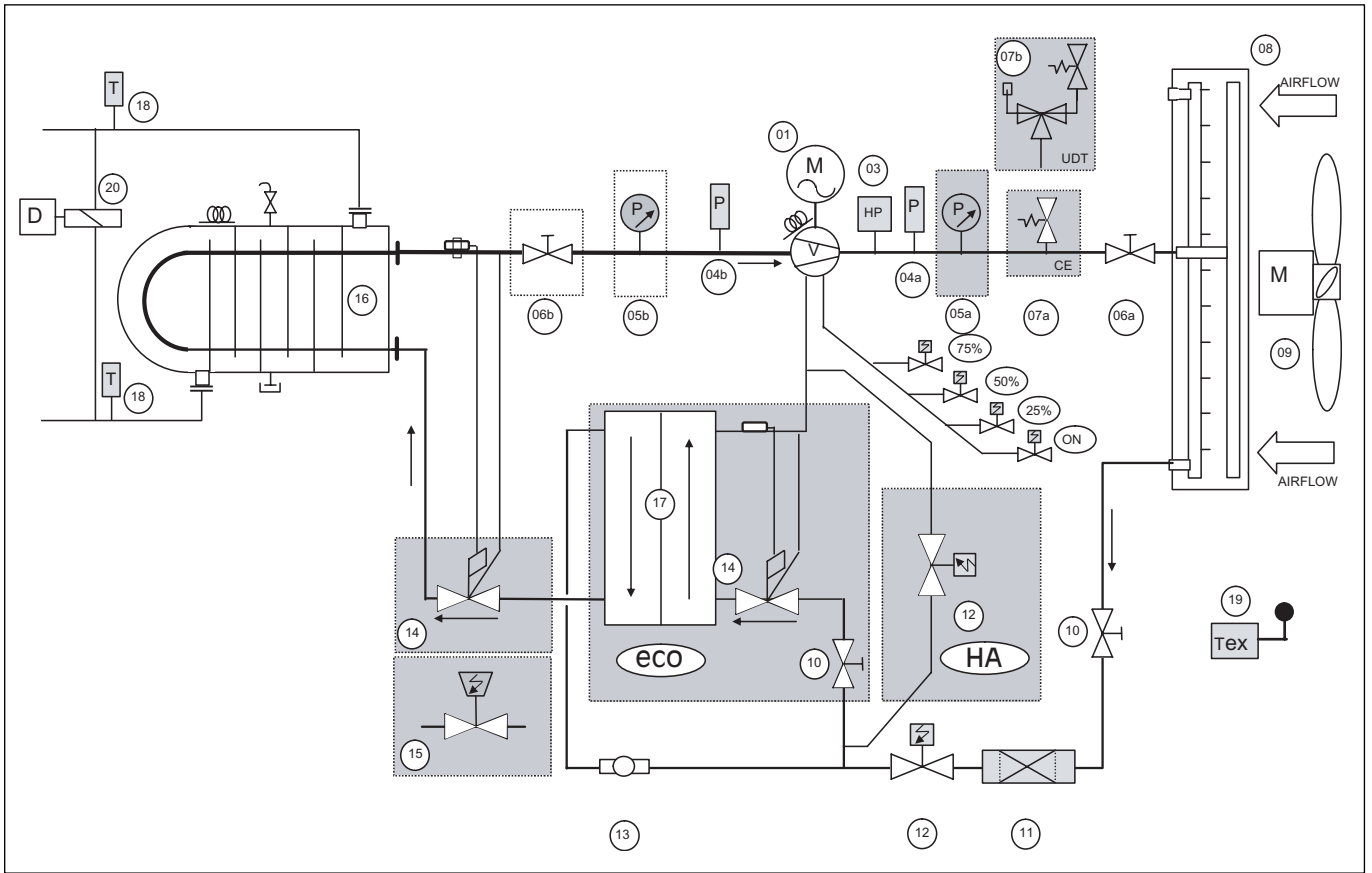


REFRIGERATION CIRCUIT COMPONENTS

- | | | |
|---|--|---|
| <p>01 1st & 2nd scroll compressors</p> <p>02 3rd scroll compressor on size 370 STD/LN/HE & SLN</p> <p>03 High pressure switch</p> <p>04a 04b Pressure transducers HP & BP</p> <p>05a 05b Low and High pressure manometer</p> <p>06a 06b Suction and discharge isolation valves</p> | <p>07a 07b Safety valve CE or UDT</p> <p>08 Air cooled condenser</p> <p>09 Fan motor</p> <p>10 Manual isolating valve</p> <p>11 Filter drier</p> | <p>12 Solenoid valve</p> <p>13 Sight glass</p> <p>18 Suction temperature sensor</p> <p>19 External temperature sensor</p> <p> Heating resistance (option)</p> |
|---|--|---|

VARIANTS			OPTIONS		
BASIC UNIT	Size 370 STD/LN/HE/SLN	WA unit CE or UDT	HP/LP pressure gauges	Suction and discharge isolating valve	Sight glass
01/03/04a/04b/ 08/09/10/11/12/18/19	Add 02	07a or 07b	Add 05a & 05b	Add 06a & 06b	Add 13

ALL	STANDARD
	HIGH AMBIENT
	LOW NOISE

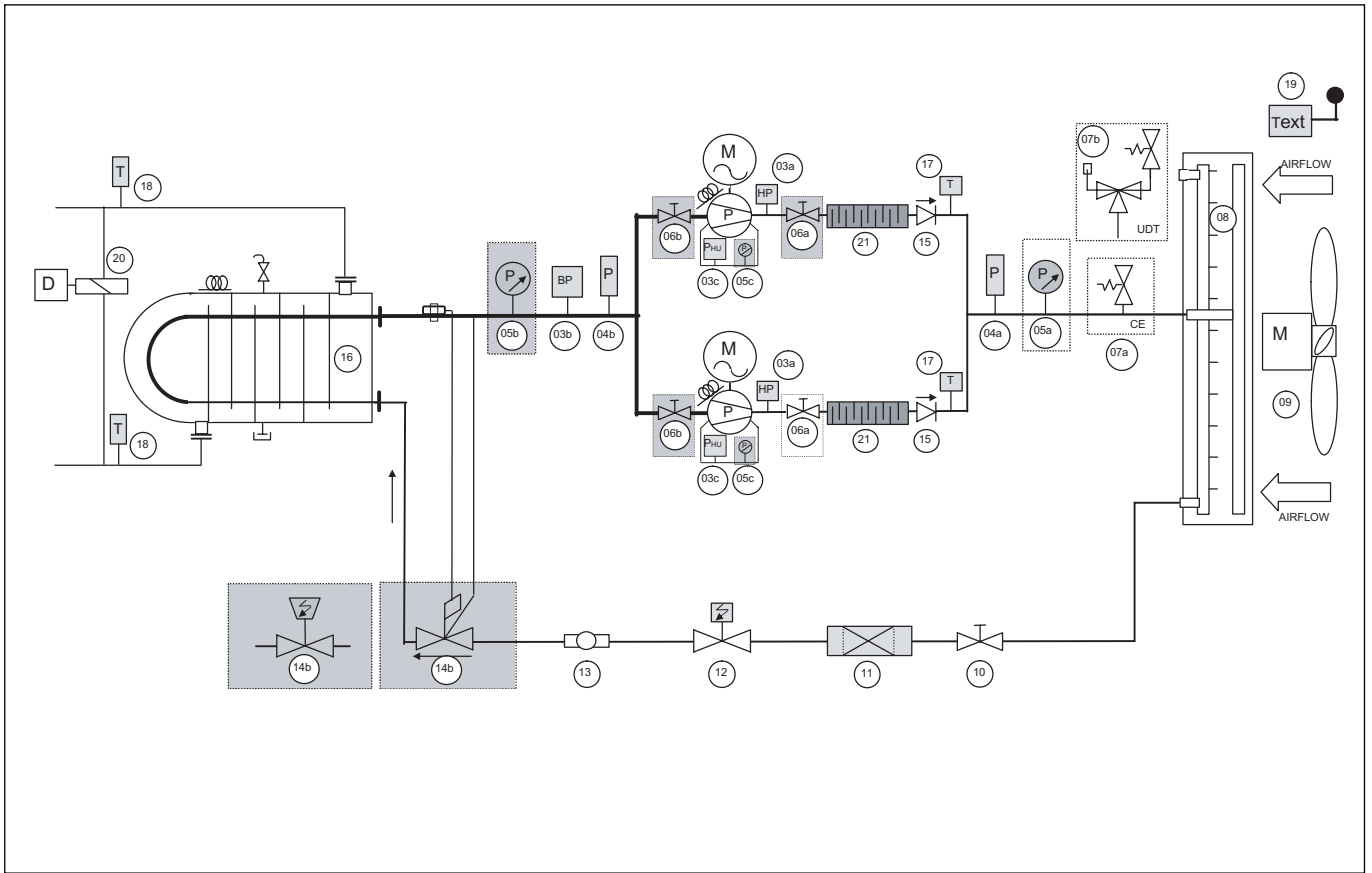


Refrigeration Circuit Component

- | | | |
|--|---------------------------------|---------------------------------------|
| 01 Screw compressor | 08 Air cooled condenser | 15 Electronic expansion valve |
| 03 High pressure switch | 09 Fan motor | 16 Shell and tube evaporator |
| 04a 04b Pressure transducers HP & BP | 10 Manual isolating valve | 17 Economiser heat exchanger |
| 05a 05b Low and High pressure manometer | 11 Filter drier | 18 Temperature sensors |
| 06a 06b Suction and discharge isolation valves | 12 Solenoid valve | 19 External temperature sensor |
| 07a 07b Safety valve CE or UDT | 13 Sight glass | 20 Water differential pressure switch |
| | 14 Thermostatic expansion valve | ☉ Heating resistance (option) |

VARIANTS			EXPANSION DEVICES		OPTIONS	
Basic Unit	LCH with Eco	LCH Unit CE or UDT	Thermostatic Expansion valve	Electronic Expansion valve	HP LP Pressure Gauges	Suction Isolating valve
01 03 04a 04b 08 09 10 11 12 16 06a 13	Add 17 14 10	07a or 07b	Add 14	Add 15	Add 05a or 05b	Add 06b

ALL	STANDARD
	HIGH AMBIENT
	LOW NOISE



Refrigeration Circuit Component

- | | | |
|--|--|---|
| <ul style="list-style-type: none"> 01 Screw compressor 03 03a 03b HP/BP and oil pressure switch 04a 04b Pressure transducers HP & BP 05a 05b 05c Pressure indicator HP, BP, oil 06a 06b Suction and discharge isolation valves 07a 07b Safety valve CE or UDT 08 Air cooled condenser | <ul style="list-style-type: none"> 09 Fan motor 10 Manual isolating valve 11 Filter drier 12 Solenoid valve 13 Sight glass 14a 14b Thermostatic/Electronic expansion valve | <ul style="list-style-type: none"> 15 Check valve 16 Shell and tube evaporator 17 Thermostat 18 Temperature sensors 19 External temperature sensor 20 Water differential pressure switch 21 Discharge muffler Heating resistance (option) |
|--|--|---|

VARIANTS		EXPANSION DEVICES	OPTIONS	
Basic Unit	LCH unit CE or UDT	Thermostatic or Electronic	HP LP Pressure Gauges + Oil	Suction and Discharge Isolating valve
01/03a/03c/04a/08/09/10/11 12/13/14/15/16/17/18/19	Add 07a or 07b	Add 14a or 14b	Add 05a 05b 05c	Add 06a 06b

OPERATION - CLIMATIC™ 50 - MENU TREE - ECOLOGIC RANGE

Main screen	Code	Description	Code	Description	Code	Description	Code	Unit	Min	Factory	Max								
1-Alarm	1000	1-(date).(time)																	
		2-(date).(time)																	
		3-(date).(time)																	
2-Data	2000	1-General	2100	1-Temperature	2110	1-Outside	2111	°C											
						2-Inlet	2112	°C											
						3-Outlet	2113	°C											
		2-Circuit 1	2120	1-SuperHeat	2121	2-T° Condensing	2122	2-T° Condensing	2123	°C									
														3-T° Saturated	2124	°C			
														5-P Condensing	2126	b			
																			6-P Saturated
														1-SuperHeat	2132	°C			
		2-T° Condensing	2133	°C															
							3-T° Saturated	2134	°C										
		4-T° Suction	2135	b															
							5-P Condensing	2136	b										
		6-P Saturated	2141	On/Off															
							1-Sw On/Off	2142	On/Off										
		2-Sw Flow	2143	On/Off															
3-Sw Dis. C1	2144						On/Off												
		4-Sw Dis. C2	2145	On/Off															
5-Sw Reset	2146						On/Off												
		6-Sw Unoc.	2151	On/Off															
1-Relay 1	2152						On/Off												
		2-Relay 2	2153	On/Off															
3-Relay 3	2154						On/Off												
		4-Relay 4	2161	On/Off															
1-Switch 1	2162						On/Off												
		2-Switch 2	2163	On/Off															
3-Switch 3	2164						On/Off												
		4-Switch 4																	
5-Out. Custom.	2150																		
		6-In. Custom.																	

OPERATION - CLIMATIC™ 50 - MENU TREE - ECOLOGIC RANGE (CONTINUED)

Main screen	Code	Description	Code	Description	Code	Description	Code	Unit	Min	Factory	Max	
			2170	7-In. % Custom	2171	1-Temp. 1	°C					
					2172	2-Temp. 2	°C					
					2173	3-Temp. 3	°C					
					2174	4-Temp. 4	°C					
	2-Control	2200	1-Water	2210		2211	1-Sp Cool	°C				
						2212	2-Sp Heat	°C				
						2213	3-Cap.Cool	%				
						2214	4-Cap.Heat	%				
						2215	5-Sw 2°Sp	On/Off				
						2216	6-Offset	°C				
	3-Pump		2-Ventilation	2220		2221	1-SetPoint	b				
						2222	2-Capa. V1	%				
					2223	3-Capa. V2	%					
					2311	1-Config.	Liste					
					2312	2-State	Liste					
					2313	3-Sw Flow	On/Off					
					2314	4-Sw State	On/Off					
4-Compressor	2400	1-Comp.1 - Circ.1	2410		2315	5-Relay 1	On/Off					
					2316	6-Running T. 1	h					
					2317	7-Relay 2	On/Off					
					2318	8-Running T. 2	h					
					2411	1-Config.	Liste					
	2412	2-State	Liste									
	2413	3-Sw State	On/Off									
	2414	4-Sw High P.	On/Off									
	2415	5-Sw Low P.	On/Off									
	2416	6-Relay	On/Off									
	2417	7-H.Pump	On/Off									
	2418	8-Bypass	On/Off									
	2419	9-Run Time	h									

OPERATION - CLIMATIC™ 50 - MENU TREE - ECOLOGIC RANGE (CONTINUED)

Main screen	Code	Description	Code	Description	Code	Description	Code	Unit	Min	Factory	Max
			2420	2-Comp.2 - Circ.1	2421	1-Config.	Liste				
					2422	2-State	Liste				
					2423	3-Sw State	On/Off				
					2424	4-Sw High P.	On/Off				
					2425	5-Sw Low P.	On/Off				
					2426	6-Relay	On/Off				
					2427	7-H.Pump	On/Off				
					2428	8-Bypass	On/Off				
					2429	9-Run Time	h				
			2430	3-Comp.3 - Circ.1	2431	1-Config.	Liste				
					2432	2-State	Liste				
					2433	3-Sw State	On/Off				
					2434	4-Sw High P.	On/Off				
					2435	5-Sw Low P.	On/Off				
					2436	6-Relay	On/Off				
					2437	7-H.Pump	On/Off				
					2438	8-Bypass	On/Off				
					2439	9-Run Time	h				
			2440	4-Comp.1 - Circ.2	2441	1-Config.	Liste				
					2442	2-State	Liste				
					2443	3-Sw State	On/Off				
					2444	4-Sw High P.	On/Off				
					2445	5-Sw Low P.	On/Off				
					2446	6-Relay	On/Off				
					2447	7-H.Pump	On/Off				
					2448	8-Bypass	On/Off				
					2449	9-Run Time	h				
			2450	5-Comp.2 - Circ.2	2451	1-Config.	Liste				
					2452	2-State	Liste				
					2453	3-Sw State	On/Off				
					2454	4-Sw High P.	On/Off				
					2455	5-Sw Low P.	On/Off				
					2456	6-Relay	On/Off				
					2457	7-H.Pump	On/Off				
					2458	8-Bypass	On/Off				
					2459	9-Run Time	h				

OPERATION - CLIMATIC™ 50 - MENU TREE - ECOLOGIC RANGE (CONTINUED)

Main screen	Code	Description	Code	Description	Code	Description	Code	Description	Code	Unit	Min	Factory	Max
				6-Comp.3 - Circ.2	2460		1-Config.	2461	Liste				
							2-State	2462	Liste				
							3-Sw State	2463	On/Off				
							4-Sw High P.	2464	On/Off				
							5-Sw Low P.	2465	On/Off				
							6-Relay	2466	On/Off				
							7-H.Pump	2467	On/Off				
							8-Bypass	2468	On/Off				
							9-Run Time	2469	h				
				1-Circuit 1	2510		1-Config.	2511	Liste				
							2-State	2512	Liste				
							3-Position	2513	~				
				2-Circuit 2	2520		1-Config.	2521	Liste				
							2-State	2522	Liste				
							3-Position	2523	~				
				1-Fan 1 - Circuit 1	2610		1-Config.	2611	Liste				
							2-State	2612	Liste				
							3-Sw State	2613	On/Off				
							4-Relay	2614	On/Off				
							5-Modulat.	2615	%				
				2-Fan 2 - Circuit 1	2620		1-Config.	2621	Liste				
							2-State	2622	Liste				
							3-Sw State	2623	On/Off				
							4-Relay	2624	On/Off				
				3-Fan 3 - Circuit 1	2630		1-Config.	2631	Liste				
							2-State	2632	Liste				
							3-Sw State	2633	On/Off				
							4-Relay	2634	On/Off				

OPERATION - CLIMATIC™ 50 - MENU TREE - ECOLOGIC RANGE (CONTINUED)

Main screen	Code	Description	Code	Description	Code	Description	Code	Unit	Min	Factory	Max
			2640	4-Fan 4 - Circuit 1		1-Config.	2641	Liste			
						2-State	2642	Liste			
						3-Sw State	2643	On/Off			
						4-Relay	2644	On/Off			
			2650	5-Fan 1 - Circuit 2		1-Config.	2651	Liste			
						2-State	2652	Liste			
						3-Sw State	2653	On/Off			
						4-Relay	2654	On/Off			
						5-Modulat.	2655	%			
			2660	6-Fan 2 - Circuit 2		1-Config.	2661	Liste			
						2-State	2662	Liste			
						3-Sw State	2663	On/Off			
						4-Relay	2664	On/Off			
			2670	7-Fan 3 - Circuit 2		1-Config.	2671	Liste			
						2-State	2672	Liste			
						3-Sw State	2673	On/Off			
						4-Relay	2674	On/Off			
			2680	8-Fan 4 - Circuit 2		1-Config.	2681	Liste			
						2-State	2682	Liste			
						3-Sw State	2683	On/Off			
						4-Relay	2684	On/Off			
			2700	1-Recovery		1-Config.	2711	Liste			
						2-State	2712	Liste			
						3-Inlet	2713	°C			
						4-Outlet	2714	°C			
						5-Sw State	2715	On/Off			
		7-Option									

OPERATION - CLIMATIC™ 50 - MENU TREE - ECOLOGIC RANGE (CONTINUED)

Main screen	Code	Description	Code	Description	Code	Unit	Min	Factory	Max	Comments
3-Setting	3000	1-General	3100	1-Order	3110	On/Off	~	Off	~	*[On / Off] Unit
				2-Pompe	3112	Liste	0	0	6	pump operation mode set up (see Pump operation description page 11 – IOM Climatic 50)
				3-Reset A.I.	3114	Yes/No	~	Off	~	*[Reset] Discharges the safety measures of the unit
				4-Resume	3115	Yes/No	~	Off	~	*[Override] Cancel any override action set with the DC50
				5-Test	3116	Liste	0	0	3	Lennox set point
				1-Hour	3121	H	0	~	23	*[Clock] Clock setting "Hour"
2-Schedule	3200	1-Time	3210	2-Minute	3122	m	0	~	59	*[Clock] Clock setting "minute"
				3-Day	3123	~	1	~	31	*[Clock] Clock setting "Day"
				4-Month	3124	~	1	~	12	*[Clock] Clock setting "Month"
				5-Year	3125	~	2	~	99	*[Clock] Clock setting "Year"
				6-Win/Sum	3126	Yes/No	~	Yes	~	*[Clock] automatic switch summer time / winter time
				1-Start Uno	3211	h	0	24	24	*[Zone Setting] Starting time "Hour" for "Unoccupied" zone – set 6.3 to get 6h30mn – modulo 10mn
				3-Start z.A	3212	h	0	0	24	*[Zone Setting] Starting time for "Zone A" – set 6.3 to get 6h30mn – modulo 10mn
				5-Start z.B	3213	h	0	24	24	*[Zone Setting] Starting time for "Zone B" – set 6.3 to get 6h30mn – modulo 10mn
				7-Start z.C	3214	h	0	24	24	*[Zone Setting] Starting time for "Zone C" – set 6.3 to get 6h30mn – modulo 10mn
				1-Foot	3221	°C				
2-Anticipation	3220	2-Gradient	3222			m/°C	-10	10	20	*[Anticipation Function] Slope in "Minutes of anticipation per degrees".
				1-Mode	3311	Liste	0	0	100	*[Change over] Change over mode for heat pump units, 0: chiller only, 1: HP only, 2: automatic with pump, 3: automatic without pump operation.
				2-Winter	3312	°C	0	0	4	
3-Control	3300	1-Change Over	3310	3-Summer	3313	°C	-10	19	50	*[Change over] Change over winter setting
				1-Sp Wat.1	3321	°C	5 / -10	7	17	*[Change over] Change over summer setting
				2-Water Cool	3320	°C	5 / -10	7	17	*[Water SP] Outlet chilled water temperature set point (see page 11 – IOM Climatic 50) – minimum with Glycol according to %
				2-Sp Wat.2	3322	°C	5 / -10	7	17	*[Water SP] Outlet chilled water temperature set point (see page 11 – IOM Climatic 50) – minimum with Glycol according to %



Main screen	Code	Description	Code	Description	Code	Unit	Min	Factory	Max	Comments
				3-Sp Out.1	3323	°C	-10	22	50	*[Water SP] Ambient air temperature set point (see page 13 – IOM Climatic 50)
				4-Sp Out.2	3324	°C	-10	30	50	*[Water SP] Ambient air temperature set point (see page 13 – IOM Climatic 50)
				5-Reactiv.	3325	%°C	1	5	50	*[Capacity Factor] Reactivity factor for cooling mode
		3-Water Heat	3330	1-Sp Wat.1	3331	°C	17	40	50	*[Water SP] Outlet hot water temperature set point (see page 13 – IOM Climatic 50)
				2-Sp Wat.2	3332	°C	17	40	50	*[Water SP] Outlet hot water temperature set point (see page 13 – IOM Climatic 50)
				3-Sp Out.1	3333	°C	-10	19	50	*[Water SP] Ambient air temperature set point (see page 13 – IOM Climatic 50)
				4-Sp Out.2	3334	°C	-10	0	50	*[Water SP] Ambient air temperature set point (see page 13 – IOM Climatic 50)
				5-Reactiv.	3335	%°C	1	5	50	*[Capacity Factor] Reactivity factor for heating mode
		4-Safety	3340	1-Wat. Low	3341	°C	3 / -10	5 / -10	12	*[Safety limit] Chilled water outlet temperature limit – minimum with Glycol according to %
				2-Wat. High	3342	°C	22	53	53	*[Safety limit] Hot water outlet temperature limit
		4-Compressor	3400	1-Rotat.	3411	Liste	0	4	4	*[Comp.priorit] Circuit priority management
				2-Safety	3420	°C	-1 / -20	-1 / -20	5	*[Safety limit] Freezing safety limit – minimum with Glycol according to %
				3-Defrost	3430	Liste	0	0	1	*[Function Defrost] Choice of defrost: 1 = “cycling” or 0 = “dynamic”
					3432	°C	8	10	20	*[Function Defrost] Authorization of defrost - Threshold of outside temperature (in °C)
					3433	°C	-10	2	10	*[Function Defrost] Authorization of defrost - Threshold of coil temperature (in °C)
				4-Time Limit	3434	m				*[Function Defrost] Time limit for icing (in minute) - For the dynamic defrost the unit will run this minimum amount of time. If cycling defrost this is the time delay to start the defrost once the temperature conditions are met.
				5-Time Fc	3435	s	5	60	300	*[Function Defrost] Running time of fans after defrost cycle in order to dry the outside coil.
		5-EEV	3500	1-SuperHeat	3511	°C	2	5	15	*[EEV] Superheat set point
				2-Dead zone	3512	°C	0	0	9.9	*[EEV] Lennox set point
				3-P	3513	°C	0	3.5	99.9	*[EEV] Lennox set point – Proportional factor
				4-I	3514	s	0	30	999	*[EEV] Lennox set point – Integral factor
				5-D	3515	s	0	1	999	*[EEV] Lennox set point – Derivate factor
		6-Ventilation	3600	1-Sp Cond.	3611	b	12	17 / 11	30	*[HP SP] High pressure set point – for R134a unit
				2-Reactiv.	3612	%°C	1	5	50	*[HP Factor] Reactivity set point for fan operation
		7-Option	3700							

OPERATION - CLIMATIC™ 50 - MENU TREE - ECOLOGIC RANGE (CONTINUED)



Main screen	Code	Description	Code	Description	Code	Unit	Min	Factory	Max	Comments
8-Config.	3800	1-Unit	3810	1-Range	3811	Liste	0	~	8	*[Configuration] Unit model
				2-Size	3812	Liste	0	~	61	*[Configuration] Type of unit
				3-Pump	3813	Liste	0	~	2	*[Configuration] Pump configuration
				4- gaz	3814	Liste	0	~	1	*[Configuration] Type of refrigerant R407C – R134a –R22
				5-EEV	3815	Yes/No	~	~		*[Configuration] Electronic expansion valve
				6-Modul. Fan	3816	Yes/No	~	~		*[Configuration] Fan control type
				7-LAK	3817	Yes/No	~	~		*[Configuration] All season control
				8-Glycol	3818	%	0	~	50	*[Configuration] Glycol percentage
				9-Recovery	3819	Yes/No	~	~		*[Configuration] Heat recovery option
				1-BE50.1	3820	Liste	0	0	6	*[Configuration] Free output to be customised (First output of the extension board BE50)
				2-BE50.2	3822	Liste	0	0	6	*[Configuration] Free output to be customised (Second output of the extension board BE50)
				3-BE50.3	3823	Liste	0	0	6	*[Configuration] Free output to be customised (Third output of the extension board BE50)
				4-BE50.4	3824	Liste	0	0	6	*[Configuration] Free output to be customised (Fourth output of the extension board BE50)
				1-BE50.1	3830	Liste	0	0	5	*[Configuration] Free input to be customised (input of the extension board BE50)
				2-BE50.2	3832	Liste	0	0	5	*[Configuration] Free input to be customised (input of the extension board BE50)
				3-BE50.3	3833	Liste	0	0	5	*[Configuration] Free input to be customised (input of the extension board BE50)
				4-BE50.4	3834	Liste	0	0	5	*[Configuration] Free input to be customised (input of the extension board BE50)
				1-BE50.1	3840	Liste	0	0	2	*[Configuration] Free input to be customised (input of the extension board BE50)
				2-BE50.2	3842	Liste	0	0	2	*[Configuration] Free input to be customised (input of the extension board BE50)
3-BE50.3	3843	Liste	0	0	2	*[Configuration] Free input to be customised (input of the extension board BE50)				
4-BE50.4	3844	Liste	0	0	2	*[Configuration] Free input to be customised (input of the extension board BE50)				

OPERATION - CLIMATIC™ 50 - MENU TREE - ECOLOGIC RANGE (CONTINUED)



Main screen	Code	Description	Code	Description	Code	Description	Code	Unit	Min	Factory	Max	Comments
		9-Com.	3900	1-Display	3910	1-Standard Sp	3911	Yes/No	~	Off	~	*Allows a reset of ALL set point to standard factory settings (when available). No possible for configurations, and clock as there is no factory settings for these.
			3920	2-Link	3921	1-ID	3921	~	1	~	4	*[Configuration] Identification address for the unit from 1 to 4 for master slave operation.
					3922	1-Number	3922	~	1	1	4	*[Configuration] Number of units on the BUS. Unit with address N°1 is always the master.
					3923	2-Type	3923	Liste	0	0	2	*Master / Slave relationship: refer to page 7 for details
			3930	3-BMS	3931	1-ID	3931	~	1	1	200	*[Configuration] Identification number on the 485 Bus
					3932	2-Type	3932	Liste	0	0	2	*[Configuration] Type of BMS 0 Mode Lennox Climatic; 1 MODBUS; 2 LONWORKS
					3933	3-Baud	3933	Liste	0	3	4	BMS communication speed between 1200BDS and 19800
					3934	4-Watchdog	3934	~				*[BMS] Activation of the control by a computer or an automat - mode BMS is activated if this value is different from zero, This value is decreased every second
					3935	5-BMS Unoc.	3935	On/Off	~	Off	~	*[BMS] Cancel the override unoccupied mode

OPERATION - CLIMATIC™ 50 - MENU TREE - ECOMAX RANGE

Main screen	Code	Description	Code	Description	Code	Description	Code	Unit	Min	Factory	Max
1-Alarm	1000	1-(date)(time)									
		2-(date)(time)									
		3-(date)(time)									
2-Data	2000	1-General	2100	1-Temperature	2110	1-Outside	2111	°C			
					2112	2-Inlet	2112	°C			
					2113	3-Outlet	2113	°C			
					2-Circuit 1	2120	1-SuperHeat	2121	°C		
						2122	2-T° Condensing	2122	°C		
						2123	3-T° Saturated	2123	°C		
		2124	4-T° Suction	2124		°C					
		2125	5-P. Condensing	2125		b					
		2126	6-P. Saturated	2126		b					
		3-Circuit 2	2130	1-SuperHeat	2131	°C					
			2132	2-T° Condensing	2132	°C					
			2133	3-T° Saturated	2133	°C					
	2134		4-T° Suction	2134	°C						
	2135		5-P. Condensing	2135	b						
	2136		6-P. Saturated	2136	b						
	4-Circuit 3	2140	1-SuperHeat	2141	°C						
		2142	2-T° Condensing	2142	°C						
		2143	3-T° Saturated	2143	°C						
		2144	4-T° Suction	2144	°C						
		2145	5-P. Condensing	2145	b						
		2146	6-P. Saturated	2146	b						
	5-Circuit 4	2150	1-SuperHeat	2151	°C						
		2152	2-T° Condensing	2152	°C						
		2153	3-T° Saturated	2153	°C						
2154		4-T° Suction	2154	°C							
2155		5-P. Condensing	2155	b							
2156		6-P. Saturated	2156	b							

OPERATION - CLIMATIC™ 50 - MENU TREE - ECOMAX RANGE (CONTINUED)

Main screen	Code	Description	Code	Description	Code	Description	Code	Unit	Min	Factory	Max
			2160	6-Other		1-Sw On/Off	2161	On/Off			
						2-Sw Flow	2162	On/Off			
						3-Sw Dis. C1	2163	On/Off			
						4-Sw Dis. C2	2164	On/Off			
						5-Sw Dis. C3	2165	On/Off			
						6-Sw Dis. C4.	2166	On/Off			
						7-Sw Reset	2167	On/Off			
						8-Sw Unoc.	2168	On/Off			
			2170	7-Out. Custom.		1-Relay 1	2171	On/Off			
						2-Relay 2	2172	On/Off			
						3-Relay 3	2173	On/Off			
						4-Relay 4	2174	On/Off			
			2180	8-In. Custom.		1-Switch 1	2181	On/Off			
						2-Switch 2	2182	On/Off			
						3-Switch 3	2183	On/Off			
						4-Switch 4	2184	On/Off			
			2190	9-In. % Custom		1-Temp. 1	2191	°C			
						2-Temp. 2	2192	°C			
						3-Temp. 3	2193	°C			
						4-Temp. 4	2194	°C			

OPERATION - CLIMATIC™ 50 - MENU TREE - ECOMAX RANGE (CONTINUED)

Main screen	Code	Description	Code	Description	Code	Description	Code	Unit	Min	Factory	Max
		2-Control	2200	1-Water	2210	1-Sp Cool	2211	°C			
						2-Cap.Cool	2212	%			
						3-Sw 2°Sp	2213	On/Off			
						4-Offset	2214	°C			
				2-Ventilation	2220	1-SetPoint	2221	b			
						2-Capa. V1	2222	%			
						3-Capa. V2	2223	%			
						4-Capa. V3	2224	%			
						5-Capa. V4	2225	%			
				3-Pump		1-Config.	2311	Liste			
						2-State	2312	Liste			
						3-Sw Flow	2313	On/Off			
						4-Sw State	2314	On/Off			
						5-Relay 1	2315	On/Off			
						6-Running T. 1	2316	h			
						7-Relay 2	2317	On/Off			
						8-Running T. 2	2318	h			
				1-Comp.1 - Circ.1	2410	1-Config.	2411	Liste			
						2-State	2412	Liste			
						3-Sw State	2413	On/Off			
						4-Sw High P.	2414	On/Off			
						5-Sw Low P.	2415	On/Off			
						6-Relay	2416	On/Off			
						7-Valve	2417	On/Off			
						8-Run Time	2418	h			
		4-Compressor	2400								

OPERATION - CLIMATIC™ 50 - MENU TREE - ECOMAX RANGE (CONTINUED)

Main screen	Code	Description	Code	Description	Code	Description	Code	Unit	Min	Factory	Max
			2420	2-Comp.2 - Circ.1	2421	1-Config.	Liste				
					2422	2-State	Liste				
					2423	3-Sw State	On/Off				
					2424	4-Sw High P.	On/Off				
					2425	5-Sw Low P.	On/Off				
					2426	6-Relay	On/Off				
					2427	7-Valve	On/Off				
					2428	8-Run Time	h				
			2430	3-Comp.1 - Circ.2	2431	1-Config.	Liste				
					2432	2-State	Liste				
					2433	3-Sw State	On/Off				
					2434	4-Sw High P.	On/Off				
					2435	5-Sw Low P.	On/Off				
					2436	6-Relay	On/Off				
					2437	7-Valve	On/Off				
					2438	8-Run Time	h				
			2440	4-Comp.2 - Circ.2	2441	1-Config.	Liste				
					2442	2-State	Liste				
					2443	3-Sw State	On/Off				
					2444	4-Sw High P.	On/Off				
					2445	5-Sw Low P.	On/Off				
					2446	6-Relay	On/Off				
					2447	7-Valve	On/Off				
					2448	8-Run Time	h				
			2450	5-Comp.3	2451	1-Config.	Liste				
					2452	2-State	Liste				
					2453	3-Sw State	On/Off				
					2454	4-Sw High P.	On/Off				
					2455	5-Sw Low P.	On/Off				
					2456	6-Relay	On/Off				
					2457	7-Valve	On/Off				
					2458	8-Run Time	h				

OPERATION - CLIMATIC™ 50 - MENU TREE - ECOMAX RANGE (CONTINUED)

Main screen	Code	Description	Code	Description	Code	Description	Code	Unit	Min	Factory	Max
				6-Comp.4	2460	1-Config. 2-State 3-Sw State 4-Sw High P. 5-Sw Low P. 6-Relay 7-Valve 8-Run Time	2461 2462 2463 2464 2465 2466 2467 2468	Liste Liste On/Off On/Off On/Off On/Off On/Off h			
		5-EEV	2500	1-Circuit 1	2510	1-Config. 2-State 3-Position	2511 2512 2513	Liste Liste ~			
				2-Circuit 2	2520	1-Config. 2-State 3-Position	2521 2522 2523	Liste Liste ~			
				3-Circuit 1	2530	1-Config. 2-State 3-Position	2531 2532 2533	Liste Liste ~			
				4-Circuit 2	2540	1-Config. 2-State 3-Position	2541 2542 2543	Liste Liste ~			
		6-Ventilation	2600	1-Fan - Circuit 1	2610	1-Config. 2-State 3-Sw State 4-Relay 1 5-Relay 2. 6-Relay 3 7-Relay 4 8-Relay 5 9-Modulat.	2611 2612 2613 2614 2615 2616 2617 2618 2619	Liste Liste On/Off On/Off On/Off On/Off On/Off On/Off %			
				1-Fan - Circuit 2	2620	1-Config. 2-State 3-Sw State 4-Relay 1 5-Relay 2. 6-Relay 3 7-Relay 4 8-Relay 5 9-Modulat.	2621 2622 2623 2624 2625 2626 2627 2628 2619	Liste Liste On/Off On/Off On/Off On/Off On/Off On/Off On/Off %			

OPERATION - CLIMATIC™ 50 - MENU TREE - ECOMAX RANGE (CONTINUED)

Main screen	Code	Description	Code	Description	Code	Description	Code	Unit	Min	Factory	Max
			2630	2-Fan 2 - Circuit 3		1-Config.	2631	Liste			
						2-State	2632	Liste			
						3-Sw State	2633	On/Off			
						4-Relay 1	2634	On/Off			
						5-Relay 2.	2635	On/Off			
						6-Relay 3	2636	On/Off			
						7-Relay 4	2637	On/Off			
						8-Relay 5	2638	On/Off			
						9-Modulat.	2639	%			
			2640	1-Fan - Circuit 4		1-Config.	2641	Liste			
						2-State	2642	Liste			
						3-Sw State	2643	On/Off			
						4-Relay 1	2644	On/Off			
						5-Relay 2.	2645	On/Off			
						6-Relay 3	2646	On/Off			
						7-Relay 4	2647	On/Off			
						8-Relay 5	2648	On/Off			
						9-Modulat.	2649	%			
						1-Recovery	2710	Liste			
			2700	7-Option		2-State	2712	Liste			
						3-Inlet	2713	°C			
						4-Outlet	2714	°C			
						5-Sw State	2715	On/Off			

OPERATION - CLIMATIC™ 50 - MENU TREE - ECOMAX RANGE (CONTINUED)

Main screen	Code	Description	Code	Description	Code	Unit	Min	Factory	Max	Comments		
4-Compressor	3400	1-Circuit	3410	1-Rotat.	3411	Liste	1	15	15	*[Comp.priorité] Circuit priority management		
		2-Safety	3420	1-Frost	3421	°C	-1/-20	-1/-20	5	*[Safety limit] Freezing safety limit – minimum with Glycol according to %		
5-EEV	3500	1-Cooling	3510	2-Time limit	3422	°C	1	30	360	*[Safety limit] Lennox setting		
				1-SuperHeat	3511	°C	2	5	15	15	*[EEV] Superheat set point	
				2-Dead zone	3512	°C	0	0	9,9	0	9,9	*[EEV] Lennox set point
				3-P	3513	°C	0	3,5	99,9	0	99,9	*[EEV] Lennox set point – Proportional factor
				4-I	3514	s	0	30	999	0	30	999
6-Ventilation	3600			5-D	3515	s	0	1	999	*[EEV] Lennox set point – Derivate factor		
				1-Sp Cond.	3611	b	12	17/11	30	17/11	30	*[HP SP] High pressure set point – for R134a unit
7-Option 8-Config.	3700 3800	1-Unit	3810	2-Reactiv.	3612	%/°C	1	5	50	*[HP Factor] Reactivity set point for fan operation		
				1-Range	3811	Liste	0	~	3	~	3	*[Configuration] Unit model
2-Compressor	3820			2-Size	3812	Liste	0	~	61	*[Configuration] Type of unit		
				3- gaz	3813	Liste	0	~	1	~	1	*[Configuration] Type of refrigerant R407C – R134a – R22
				1-EEV	3821	Yes/No	~	~	~	~	~	*[Configuration] Electronic expansion valve
				2-LAK	3822	Yes/No	~	~	~	*[Configuration] All season control		
				3-Stages +.	3823	Yes/No	~	~	~	~	~	*[Configuration] For units with reciprocating compressor extra capacity reduction

OPERATION - CLIMATIC™ 50 - MENU TREE - ECOMAX RANGE (CONTINUED)

Main screen	Code	Description	Code	Description	Code	Unit	Min	Factory	Max	Comments	
3-Setting	3000	1-General	3100	1-Order	3110	On/Off	~	Off	~	*[On / Off] Unit pump operation mode set up (see Pump operation description page 11 – IOM Climatic 50)	
				2-Pompe	3112	Liste	0	0	6		
				3-Reset Al.	3114	Yes/No	~	Off	~		*[Reset] Discharges the safety measures of the unit
				4-Resume	3115	Yes/No	~	Off	~		*[Override] Cancel any override action set with the DC50
				5-Test	3116	Liste	0	0	3		Lennox set point
				1-Hour	3121	H	0	~	23		*[Clock] Clock setting “Hour”
				2-Minute	3122	m	0	~	59		*[Clock] Clock setting “minute”
				3-Day	3123	~	1	~	31		*[Clock] Clock setting “Day”
				4-Month	3124	~	1	~	12		*[Clock] Clock setting “Month”
				5-Year	3125	~	2	~	99		*[Clock] Clock setting “Year”
2-Schedule	3200	1-Time	3210	6-Win/Sum	3126	Yes/No	~	Yes	~	*[Clock] automatic switch summer time / winter time	
				1-Start Uno	3211	h	0	24	24		*[Zone Setting] Starting time “Hour” for “Unoccupied” zone – set 6.3 to get 6h30mn – modulo 10mn
				3-Start z.A	3212	h	0	0	24		*[Zone Setting] Starting time for “Zone A” – set 6.3 to get 6h30mn – modulo 10mn
				5-Start z.B	3213	h	0	24	24		*[Zone Setting] Starting time for “Zone B” – set 6.3 to get 6h30mn – modulo 10mn
				7-Start z.C	3214	h	0	24	24		*[Zone Setting] Starting time for “Zone C” – set 6.3 to get 6h30mn – modulo 10mn
				1-Foot	3221	°C					*[Anticipation Function] Bottom of the slope in °C. Limit of activation of the function. This allows an anticipated startup in the morning depending on the outdoor temperature. Only for the “Zone-A”
				2-Gradient	3222	m/°C	0	0	100		*[Anticipation Function] Slope in “Minutes of anticipation per degrees”.
3-Control	3300	1-Water Cool	3310	1-Sp Wat.1	3311	°C	5 / -10	7	17	*[Water SP] Outlet chilled water temperature set point (see page 11 – IOM Climatic 50) – <i>minimum with Glycol according to %</i>	
				2-Sp Wat.2	3312	°C	5 / -10	7	17		*[Water SP] Outlet chilled water temperature set point (see page 11 – IOM Climatic 50) – <i>minimum with Glycol according to %</i>
				3-Sp Out.1	3313	°C	-10	22	50		*[Water SP] Ambient air temperature set point (see page 13 – IOM Climatic 50)
				4-Sp Out.2	3314	°C	-10	30	50		*[Water SP] Ambient air temperature set point (see page 13 – IOM Climatic 50)
				5-Reactiv.	3315	%/°C	1	5	50		*[Capacity Factor] Reactivity factor for cooling mode
2-Safety	3320	1-Wat. Low	3321	1-Wat. Low	3321	°C	3 / -10	5 / -10	12	*[Safety limit] Chilled water outlet temperature limit – <i>minimum with Glycol according to %</i>	

OPERATION - CLIMATIC™ 50 - MENU TREE - ECOMAX RANGE (CONTINUED)

Main screen	Code	Description	Code	Description	Code	Description	Code	Unit	Min	Factory	Max	Comments		
4-Compressor	3400	1-Circuit	3410	1-Rotat.	3411	Liste		1	15	15		*[Comp priority] Circuit priority management		
			3420	2-Safety	3421	°C		-1/-20	-1/-20	5			*[Safety limit] Freezing safety limit – <i>minimum with Gbcol according to %</i>	
5-EEV	3500	1-Cooling	3510	2-Time limit	3422	°C		1	30	360		*[Safety limit] Lennox setting		
				1-SuperHeat	3511	°C		2	5	15			*[EEV] Superheat set point	
				2-Dead zone	3512	°C		0	0	0	9,9			*[EEV] Lennox set point
				3-P	3513	°C		0	3,5	99,9				*[EEV] Lennox set point – Proportional factor
				4-I	3514	s		0	30	999				*[EEV] Lennox set point – Integral factor
6-Ventilation	3600	1-Unit	3610	5-D	3515	s		0	1	999		*[EEV] Lennox set point – Derivate factor		
				1-Sp Cond.	3611	b		12	17//11	30				*[HP SP] High pressure set point – <i>for R134a unit</i>
				2-Reactiv.	3612	%/°C		1	5	50				*[HP Factor] Reactivity set point for fan operation
7-Option	3700	1-Unit	3810	1-Range	3811	Liste		0	~	3		*[Configuration] Unit model		
				2-Size	3812	Liste		0	~	61				*[Configuration] Type of unit
8-Config.	3800	2-Compressor	3820	3-gaz	3813	Liste		0	~	1		*[Configuration] Type of refrigerant R407C – R134a – R22		
				1-EEV	3821	Yes/No		~	~	~				*[Configuration] Electronic expansion valve
				2-LAK	3822	Yes/No		~	~	~		*[Configuration] All season control		
				3-Stages +.	3823	Yes/No		~	~	~		*[Configuration] For units with reciprocating compressor extra capacity reduction		
		3-Ventilation	3830	1-Circuit 1	3831	Liste		0	0	2		*[Configuration] Fan configuration No = No fans Stages + = Single speed stage fans Modulation = 1 fan with speed control, others with single speed		
				2-Circuit 2	3832	Liste		0	0	2		Low Speed = 1 fan with 2 speed others with single speed * [Configuration] Fan configuration No = No fans Stages + = Single speed stage fans Modulation = 1 fan with speed control, others with single speed Low Speed = 1 fan with 2 speed others with single speed		



Main screen	Code	Description	Code	Description	Code	Unit	Min	Factory	Max	Comments
			3830	3-Ventilation	3831	Liste	0	0	2	*[Configuration] Fan configuration No = No fans Stages + = Single speed stage fans Modulation = 1 fan with speed control, others with single speed Low Speed = 1 fan with 2 speed others with single speed
					3832	Liste	0	0	2	*[Configuration] Fan configuration No = No fans Stages + = Single speed stage fans Modulation = 1 fan with speed control, others with single speed Low Speed = 1 fan with 2 speed others with single speed
					3833	Liste	0	0	2	*[Configuration] Fan configuration No = No fans Stages + = Single speed stage fans Modulation = 1 fan with speed control, others with single speed Low Speed = 1 fan with 2 speed others with single speed
					3834	Liste	0	0	2	*[Configuration] Fan configuration No = No fans Stages + = Single speed stage fans Modulation = 1 fan with speed control, others with single speed Low Speed = 1 fan with 2 speed others with single speed

OPERATION - CLIMATIC™ 50 - MENU TREE - ECOMAX RANGE (CONTINUED)

Main screen	Code	Description	Code	Description	Code	Description	Code	Unit	Min	Factory	Max	Comments
			3840	4-Option.	3841	1-Pump	Liste	0	~	2	*[Configuration] Pump configuration	
					3842	2-Glycol	%	0	~	50	*[Configuration] Glycol percentage	
					3843	3-Recovery	Yes/No	~	~	~	*[Configuration] Heat recovery option	
			3850	5-Out. Custom.	3851	1-BE50.1	Liste	0	0	6	*[Configuration] Free output to be customised (First output of the extension board BE50)	
					3852	2-BE50.2	Liste	0	0	6	*[Configuration] Free output to be customised (Second output of the extension board BE50)	
					3853	3-BE50.3	Liste	0	0	6	*[Configuration] Free output to be customised (Third output of the extension board BE50)	
					3854	4-BE50.4	Liste	0	0	6	*[Configuration] Free output to be customised (Fourth output of the extension board BE50)	
			3860	6-In. Custom.	3861	1-BE50.1	Liste	0	0	5	*[Configuration] Free input to be customised (input of the extension board BE50)	
					3862	2-BE50.2	Liste	0	0	5	*[Configuration] Free input to be customised (input of the extension board BE50)	
					3863	3-BE50.3	Liste	0	0	5	*[Configuration] Free input to be customised (input of the extension board BE50)	
					3864	4-BE50.4	Liste	0	0	5	*[Configuration] Free input to be customised (input of the extension board BE50)	
			3870	7-In.% Custom.	3871	1-BE50.1	Liste	0	0	2	*[Configuration] Free input to be customised (input of the extension board BE50)	
					3872	2-BE50.2	Liste	0	0	2	*[Configuration] Free input to be customised (input of the extension board BE50)	
					3873	3-BE50.3	Liste	0	0	2	*[Configuration] Free input to be customised (input of the extension board BE50)	

OPERATION - CLIMATIC™ 50 - MENU TREE - ECOMAX RANGE (CONTINUED)

Main screen	Code	Description	Code	Description	Code	Description	Code	Unit	Min	Factory	Max	Comments
		9-Com.	3900	1-Display	3910	1-Standard Sp	3911	Yes/No	~	Off	~	*Allows a reset of ALL set point to standard factory settings (when available). No possible for configurations, and clock as there is no factory settings for these.
			3920	2-Link	3920	1-ID	3921	~	1	~	4	*[Configuration] Identification address for the unit from 1 to 4 for master slave operation.
						1-Number	3922	~	1	1	4	*[Configuration] Number of units on the BUS. Unit with address N°1 is always the master.
						2-Type	3923	Liste	0	0	2	*Master / Slave relationship: refer to page 7 for details
			3930	3-BMS	3930	1-ID	3931	~	1	1	200	*[Configuration] Identification number on the 485 Bus
						2-Type	3932	Liste	0	0	2	*[Configuration] Type of BMS 0 Mode Lennox Climatic; 1 MODBUS; 2 LONWORKS
						3-Baud	3933	Liste	0	3	4	BMS communication speed between 1200BDS and 19800
						4-Watchdog	3934	~	0	0	1000	*[BMS] Activation of the control by a computer or an automat - mode BMS is activated if this value is different from zero, This value is decreased every second
						5-BMS Unoc.	3935	On/Off	~	Off	~	*[BMS] Cancel the override unoccupied mode

CERTIFICATION



N° QUAL/1993/1009e

LGL FRANCE

**CONCEPTION, FABRICATION ET CESSION INTERNE
DE BIENS D'EQUIPEMENT DESTINES AU CONDITIONNEMENT D'AIR
ET A LA REFRIGERATION.**

**DESIGN, MANUFACTURING AND INTERNAL TRANSFER
OF EQUIPMENT GOODS DEDICATED TO AIR CONDITIONING
AND REFRIGERATION.**

ZI Les Meurières BP 71 F-69780 MIONS

AFAQ certifie que pour les activités et les sites référencés ci-dessus toutes les dispositions mises en oeuvre pour répondre aux exigences requises par la norme internationale :
AFAQ certifies that all the arrangements covering the above mentioned activities and locations are established to meet the requirements of the international standard:

ISO 9001 : 2000

ont été examinées et jugées conformes.
have been examined and found conform.

2002-03-18

(année/mois/jour)

Il est valable jusqu'au*
*It is valid until**

2005-03-14

(year/month/day)

Le Président du Comité de Certification
The President of the Certification Committee

C. GUERIN

Le Directeur Général d'AFAQ
The Managing Director of AFAQ

O. PEYRAT

Le Représentant de l'Entreprise
On Behalf of the Firm

JP. PATUREL

*Sauf suspension notifiée entre temps par AFAQ à l'entreprise désignée ci-dessus. Le présent document n'a donc qu'une valeur indicative. Seule fait foi la base de données des certificats AFAQ accessible à l'adresse internet : <http://www.afaq.org>
L'organisation AFAQ est conforme aux normes internationales en vigueur (guide ISO/IEC 62 - norme EN 45012). Les accréditations détenues par AFAQ et ses filiales sont disponibles à l'adresse internet : <http://www.afaq.org/accreditations>
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Bureau Veritas S.A. is a Notified



Body under the number 0062



**ATTESTATION D'APPROBATION DE SYSTEME DE QUALITE (module H1)
CERTIFICATE OF QUALITY SYSTEM APPROVAL (module H1)
N° CE-PED-H1- LEN001-02-FRA**

BUREAU VERITAS S.A., agissant dans le cadre de sa notification (numéro d'organisme notifié 0062), atteste que le système de qualité appliqué par le fabricant pour la conception, la fabrication, l'inspection finale et les essais des équipements sous pression identifiés ci-après, a été examiné selon les prescriptions du module H1 de l'annexe III de la directive "Equipements sous pression" N° 97/23/CE et est conforme aux dispositions correspondantes de la directive.

BUREAU VERITAS S.A., acting within the scope of its notification (notified body number 0062), attests that the quality system operated by the manufacturer for design, manufacture, final inspection and testing of the pressure equipment identified hereunder has been examined against the provisions of annex III, module H1, of the Pressure Equipment directive n° 97/23/EC, and found to satisfy the provisions of the directive which apply to it.

Fabricant (nom) / Manufacturer (name): **LENNOX – France Usine de MIONS**
 Adresse / Address: **Z.I. Les Meurières – BP 71 – F. 69780 - MIONS**
 Marque commerciale / Trade mark: **LENNOX**
 Description des équipements: **Ensemble sous pression**
 Equipment description:

Identification des équipements concernés (liste en annexe le cas échéant) : **Suivant liste en annexe**
 Identification of equipment concerned (list attached where necessary):

Numéro(s) d'attestation(s) d'examen CE de la conception émise(s), dans le cadre de l'application du module H1, par BUREAU VERITAS S.A. (organisme notifié n° 0062), concernée(s) par l'approbation du système de qualité:
Number(s) of the EC design-examination certificate(s) issued under the scope of module H1, by BUREAU VERITAS S.A. (notified body nr 0062), concerned by the approval of the quality system:

Cette attestation est valable jusqu'au **02/09/2005**
This certificate is valid until....

Le maintien de l'approbation est soumis à la réalisation par le Bureau Veritas des audits, essais et vérifications selon le contrat signé par le fabricant et le Bureau Veritas.
The approval is conditional upon the surveillance audits, tests and verifications to be carried out by Bureau Veritas, as per the provisions stated in the agreement signed by both the manufacturer and Bureau Veritas.

Cette attestation est présumée nulle et le fabricant supportera seul les conséquences de son utilisation, si les assurances - données par le fabricant lors de la demande d'intervention - en matière (a) d'application de son système qualité approuvé, (b) de conformité de son équipement à son approbation CE de la conception et (c) d'inspection et d'essais des produits finis se révèlent inexactes et, de manière générale, si le fabricant ne respecte pas l'une ou l'autre des obligations mises à sa charge par la directive n° 97/23/CE du 29 mai 1997 telle que transposée dans le(s) droit(s) national(aux) applicable(s).

This certificate shall be deemed to be void and the manufacturer shall alone bear any consequences pursuant to its use, where the manufacturer fails to comply with his undertakings as per the agreement in respect of (a) implementation of the approved quality system, (b) conformity of the equipment with the EC design-approval conditions and (c) inspection and tests on the final product, and generally where the manufacturer fails in particular to comply with any of his obligations under directive nr 97/23/EC of 29 may 1997 as transposed in the applicable law(s).

Etabli à / Made at	Le / On	Signé par / Signed by	Signature / Signature
LYON/DARDILLY	02 SEPTEMBRE 2002	P.BERIOU	
Code d'enregistrement / Registration code: 2002/3948/P			

La présente attestation est soumise aux Conditions Générales de Service de Bureau Veritas jointes à la demande d'intervention signée par le demandeur.
This certificate is subject to the terms of Bureau Veritas General Conditions of Service attached to the agreement signed by the applicant.

ADV/DECONF/M001 - 1



Site industriel de Mions
 ZI «Les Meurières» - BP 71
 69780 Mions - France

Téléphone : +33 (0)4 72 23 20 20
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DECLARATION OF CONFORMITY CE

The Undersigned Company certifies under its responsibility that the equipment under pressure identified below is in conformity with the requirements of the directive that are applicable, **EQUIPMENT UNDER PRESSURE N° 97/23/CE**.

Description of Equipment Under Pressure and the Procedure of Evaluation to be in Conformity

Type of Machine	
Serial Number	
Year of Manufacture	
Catégorie de la DESP	II
Procedure of Evaluation	Module H1 Attestation N°
Certificat d'examen CE de la conception	Module H1D Attestation N°

Description of Components Under Pressure

Type of Component	Category of Risk
COMPRESSEUR SZ 300	II
EVAPORATOR	I
FILTER DRYER VS489	I
EXPENSION VALVE TRE 80	ART 3-3
TUBE	I
PRESSURE SWITCH P100	II
SAFETY VALVE 450PSI	II

Name and Address of the Organisation Auditing the Quality Assurance System (NF EN ISO 9001)

AFAQ
 F - 92224 Bagneux Cedex FRANCE
 N° d'agrément QUAL/1993/1009

Name and Address of the Organisation Auditing our Conformity to the Directive of Equipment Under Pressure (DI-97/23/CE)

BUREAU VERITAS
 F - 92077 Paris La Défense
 N° d'agrément CE 0062

References to Standards that are Applicable

- NF-EN 60204-1 : Safety of machinery. Electrical equipment of machines.

References to Other Standards :

- Directive 98/37/EC : Relating to machinery
- Directive 93/68/EEC : Relating to electrical equipment designed for use within certain voltage limits
- Directive 89/336/EEC : Relating to electromagnetic compatibility

Personal Liability for the Manufacture :

Name : Fabrice EXCOFFIER

Function: Customer Service Manager

Date: 11/01/2005

Signature:

LENNOX France, Division climatisation de LGL France

Siège social : LGL France - ZI les Meurières - 69780 Mions - France
 Société Anonyme au capital de 37 029 000€ - RCS LYON B 309 528 115 - N° IDENTIFICATION TVA FR 59 309 528 115 - APE 292 F



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IOM_0105-E**

Due to Lennox's ongoing commitment to quality, Specifications, Ratings and Dimensions subject to change without notice and without incurring liability. Improper installation, adjustment, alteration, service or maintenance can cause property damage or personal injury. Installation and service must be performed by a qualified installer and servicing agency.

