



Installation, operating and maintenance



FLEXY

Rooftop units air cooled

FLEXY WSHP

Rooftop units water cooled

85 - 234 kW



INSTALLATION MANUAL

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The present manual applies to the following ROOFTOP versions:

FCM 85 - FCM 100 - FCM 120 - FCM 150 - FCM 170 - FCM 200 - FCM 230

FHM 85 - FHM 100 - FHM 120 - FHM 150 - FHM 170 - FHM 200 - FHM 230

FDM 85 - FDM 100 - FDM 120 - FDM 150 - FDM 170 - FDM 200 - FDM 230

FGM 85 - FGM 100 - FGM 120 - FGM 150 - FGM 170 - FGM 200 - FGM 230

FWH 85 - FWH 100 - FWH 120 – FWH150 – FWH170

FWM 85 - FWM 100 - FWM 120 – FWM150 – FWM170

FXK 25 - FXK 30 - FXK 35 - FXK 40 - FXK 55 - FXK 70 - FXK 85 - FXK 100 - FXK 110 - FXK 150 - FXK 170

NOTES FOR UNIT FITTED WITH GAS BURNER:

THE UNIT MUST BE INSTALLED IN ACCORDANCE WITH LOCAL SAFETY CODES AND REGULATIONS AND CAN ONLY BE USED IN WELL VENTILATED AREA.

IF MACHINE IS INCLUDING GAZ BURNER, MINIMUM CLEARANCE AROUND THE UNIT MUST BE AT LEAST 8 M TO ALLOW A PROPER GAZ FLUE DILUTION. IF NOT POSSIBLE, THE FRESH AIR INTAKE MUST BE DUCTED AT LEAST 8 M AWAY FROM THE GAS BURNER EXHAUST.

PLEASE READ CAREFULLY THE MANUFACTURER'S INSTRUCTIONS BEFORE STARTING THIS UNIT.

Switchgear must be installed on each unit in accordance with the Machine Directive and the standard NF EN 60204.

THIS MANUAL IS ONLY VALID FOR UNITS DISPLAYING THE FOLLOWING CODES: **GB IR GR DA NO FI IS**

In case these symbols are not displayed on the unit, please refer to the technical documentation which will eventually detail any modifications required to the installation of the unit in a particular country.

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

The technical informations and specifications contained in this manual are for reference only. The manufacturer reserves the right to modify these without warning and without obligation to modify equipment already sold.

All FLEXY II Units are compliant with the PED directive 97-23/CE
The following note must be followed carefully

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 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 brazier. The brazing shall comply with 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.

TRANSPORT – HANDLING:

- Never lift the unit without forklift protections
- Remove the forklift protection before installation
- An approach ramp must be installed if the unit's installation requirements tell that it's necessary to reach the main switch. This recommendation is valid for installations in general and in particular for return and curbs. It's also valid to reach other parts of the unit: filters, refrigerant circuit, etc...
- It's advised to fix curbs and roofcurbs to the unit
- Whatever the supply configuration is, respect a minimal duct's length of 2m before any elbow or any duct's section change.

COMMISSIONING:

- It must only be carried out by trained refrigeration engineers.
- Don't forget to open the insulation valve on the liquid line before starting the unit

FILTERS:

- Do the filters fire classification's choice according to local regulations.

FANSTART:

- Any adjustment has to be done power stopped.

GAS:

- Any work on gas module must be carried out by qualified personnel
- A unit with gas module must be installed in accordance with local safety codes and regulations and can only be used in planned installation conditions for outdoor.
- Before commissioning this type of unit, it's mandatory to ensure that the gas distribution system is compatible with the adjustment and settings of the unit.

UV LIGHT:

- **The UV lamp emits shortwave UV-C ultraviolet radiation which is harmful to skin and eyes**
- **It can cause serious skin burns and eye inflammation within ONE SECOND of exposure**
- Do not enter the machine while UV are switched on
- Make sure the UV light circuit breaker is OFF when opening the return air section door and the supply air section doors
- The following logo will appear to inform about the UV-C radiation risk



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:

- 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.
- 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.

RATING PLATE

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/-15 %. 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.

CODE :							
TYPE : FHM 200 N							
N° AFFAIRE / LIGNE : 274635/1				OF / N° UNIT : 76098 1/2			
		Factory Dijon Z.I. LONGVIC 21600 LONGVIC FRANCE				0 0 6 2	
Unit type : FHM 200 N							
Serial NR : 274635_1 1/2							
	Voltage (V)	Phase (Ph)	Frequency (Hz)	Current (A)			
Elec supply	400	3	50	Nominal	Starting		
Elec auxiliary	24	1	50	163,7	333,1		
		Min		Max			
		LP	HP	LP	HP		
Service Pressure (PS) (bar)		-1	-1	29,5	42		
Service Temperature (TS) (°C)		-20	-20	50	110		
Storage Temperature (°C)		-30		50			
LP : Low Pressure side / HP : High Pressure side							
Capacities (kW)		Ref charge (kg)				Dates	
Cooling	Heating	C1	C2	C3	C4	Prod.	Test
197	195	21	21	0	0	2011	02/23/2012
Fluid		Fluid group					Weight (kg)
R410A		2					1839,8
This product is used for Air Conditioning. Contains fluorinated greenhouse gases covered by the Kyoto protocol. Hermetically sealed.							

Fig. 1

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 (AQUILUX cover).
- 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.

MAINTENANCE KEY

On delivery we recommend that you keep the key which is attached to an eyebolt in a safe and accessible place. This allows you to open the panels for maintenance and installation work.

The locks are ¼ turn + then tighter (figure 2).



Figure 2

CONDENSATE DRAINS

The condensate drains are not assembled when delivered and are stored in the electrical panel with their clamping collars.



Fig. 3

To assemble them, insert them on the condensate tray outlets

MANDATORY HANDLING DEVICES

Handling slings to guide the unit towards the roofcurb



Vacuum lifting beam to position the unit

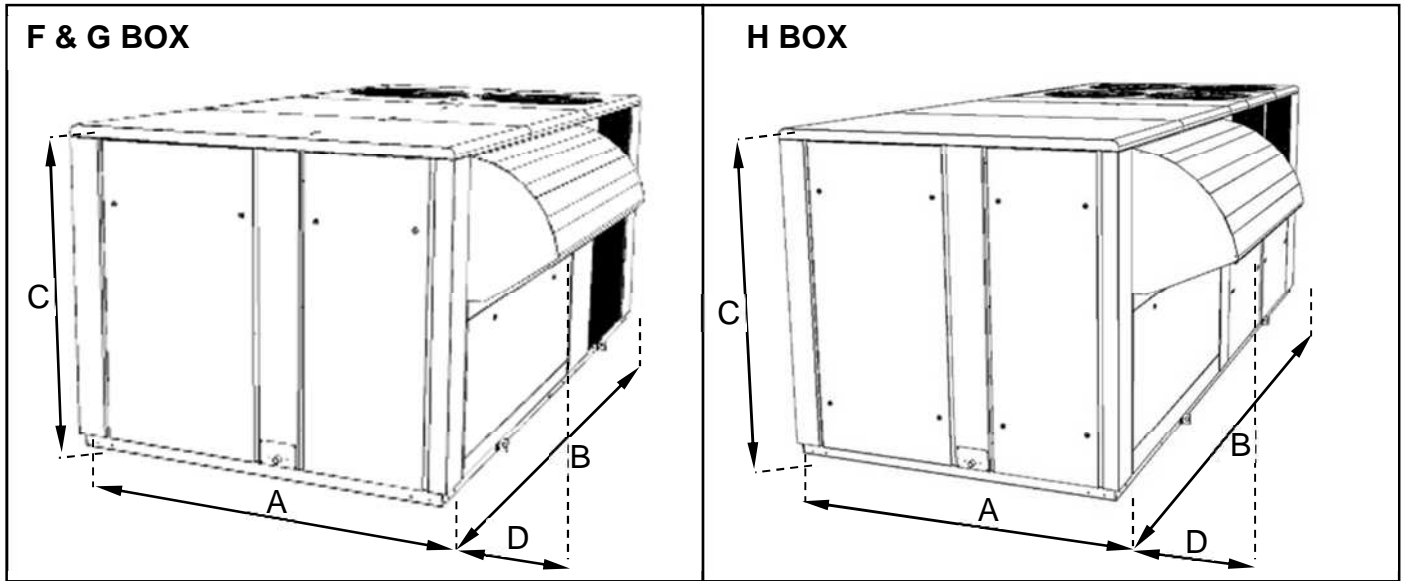


COMPLIANT

NON-COMPLIANT



DIMENSIONS AND WEIGHTS



FLEXY2		FCM/FHM/FGM/FDM	85	100	120	150	170	200	230
View (F, G, H box)			F BOX	F BOX	F BOX	G BOX	G BOX	H BOX	H BOX
A	mm		2200	2200	2200	2200	2200	2200	2200
B	mm		3350	3350	3350	4380	4380	5533	5533
C	mm		1510	1510	1510	1834	1834	2134	2134
D	mm		360	360	360	450	450	615	615
Weight of standard units FCM									
	kg		990	1065	1141	1442	1505	1752	2052
Weight gas unit FGM									
Standard heat	kg		1097	1172	1248	1683	1746	2016	2316
High heat	kg		1167	1242	1318	1706	1769	2056	2356

WSHP		FWH/FWM	85	100	120	150	170
View (F & G box)			F BOX	F BOX	F BOX	G BOX	G BOX
A	mm		2200	2200	2200	2200	2200
B	mm		3350	3350	3350	4380	4380
C	mm		1510	1510	1510	1834	1834
D	mm		360	360	360	450	450
Weight of standard units FWH							
	kg		853	939	1026	1325	1388
Weight gas unit FWM							
Standard heat	kg		960	1046	1133	1566	1629
High heat	kg		1030	1116	1203	1589	1652

DIMENSIONS AND WEIGHTS

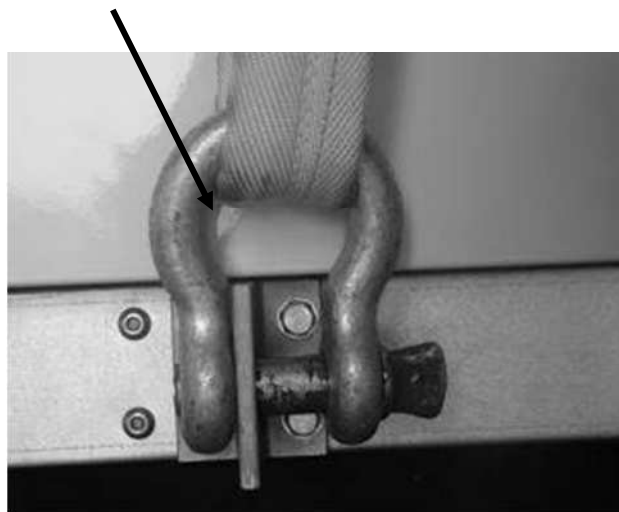
	LENGTH	HEIGHT	WIDTH	HOOD		WEIGHT
	mm	mm	mm	Side	Fan	Standard
				mm	mm	kg
FXK025	4070	1635	1055	490	600	950
FXK030	4070	1635	1055	490	600	980
FXK035	4750	2255	1290	490	600	1400
FXK040	4750	2255	1290	490	600	1450
FXK055	4750	2255	1290	490	600	1600
FXK070	5050	2255	1725	890	600	1800
FXK085	5050	2255	1725	890	600	1900
FXK100	5050	2255	1725	890	600	2000
FXK110	5650	2255	2000	860	-	2620
FXK140	5650	2255	2000	860	-	2620
FXK170	5650	2255	2000	860	-	2650

LIFTING THE UNIT

As shown on the picture below, a lifting frame is necessary.



After lifting, withdraw angle's feet and lifting lugs.



FORKLIFT PROTECTIONS**NEVER LIFT THE UNIT WITHOUT FORKLIFT PROTECTIONS****REMOVE THE FORKLIFT PROTECTIONS BEFORE INSTALLATION****PRELIMINARY CHECKS**

Before installing the equipment, the following points **MUST** be checked:

- Have the forklift protections been removed?
- Is there sufficient space for the equipment?
- Is the surface on which the equipment is to be installed sufficiently solid to withstand its weight? A detailed study of the frame must be made beforehand.
- Do the supply and return ductwork openings excessively weaken the structure?
- Are there any obstructing items which could hinder the operation of the equipment?
- Does the electrical power available correspond to the equipment's electrical specifications?
- Is drainage provided for the condensate?
- Is there sufficient access for maintenance?
- Installation of the equipment could require different lifting methods which may vary with each installation (helicopter or crane). Have these been evaluated?
- Ensure that the unit is installed in accordance with the installation instructions and local applicable codes.
- Check to ensure that the refrigerant lines do not rub against the cabinet or against other refrigerant lines.

In general, make sure no obstacles (walls, trees or roof ledges) are obstructing the duct connections or hindering assembly and maintenance access.

INSTALLATION REQUIREMENTS

The surface on which the equipment is to be installed must be clean and free of any obstacles which could hinder the flow of air to the condensers:

- Avoid uneven surfaces
- Avoid installing two units side by side or close to each other as this may restrict the airflow to the condensers.

Before installing a packaged Rooftop unit it is important to understand:

- The direction of prevailing winds
- The direction and position of air flows.
- The external dimensions of the unit and the dimensions of the supply and return air connections.
- The arrangement of the doors and the space required to open them to access the various components.

CONNECTIONS

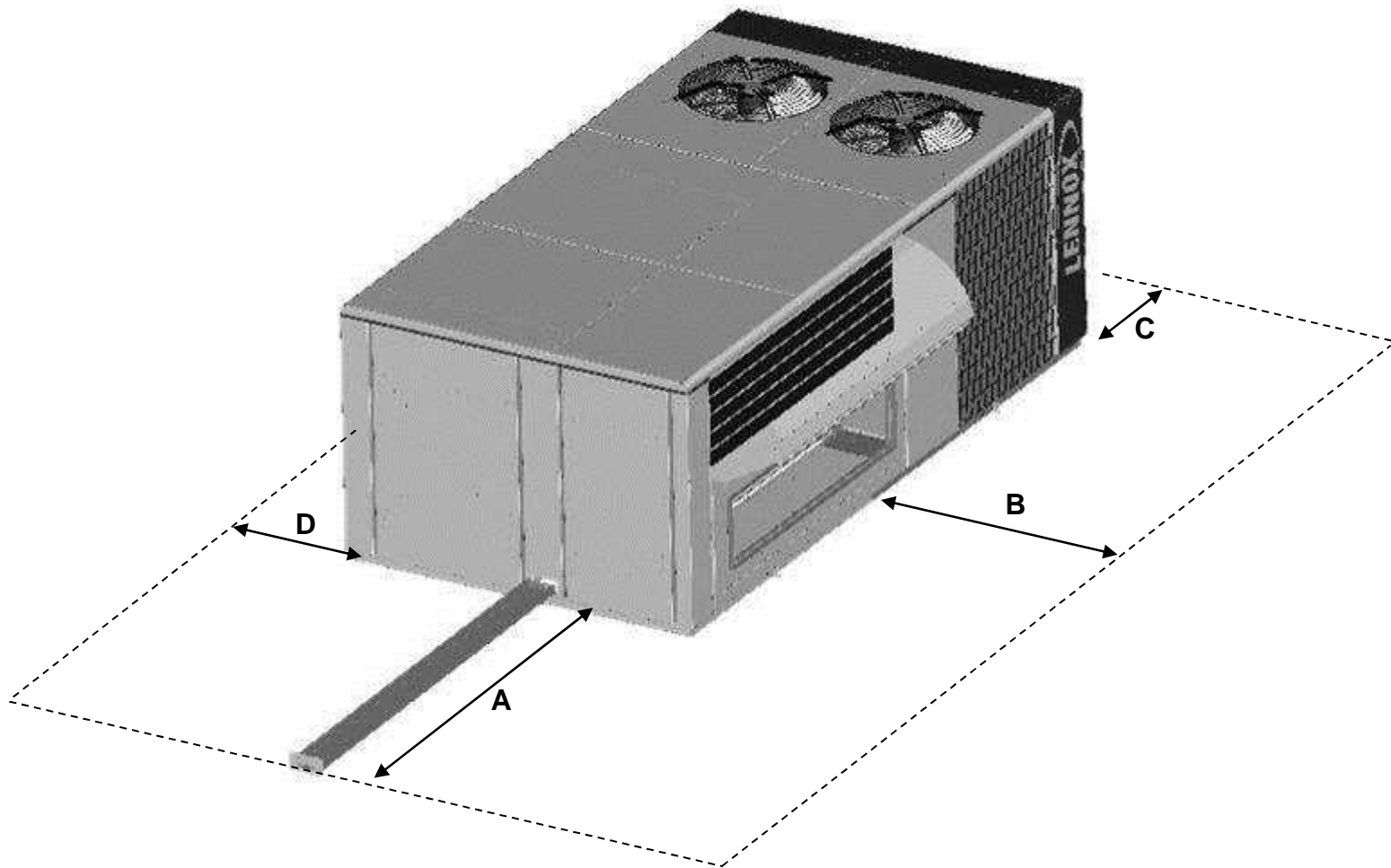
- Ensure that all the pipe-work crossing walls or roofs are secured, sealed and insulated.
- To avoid condensation problems, make sure that all pipes are insulated according to the temperatures of fluids and type of rooms.

NOTE: The AQUILUX protection sheets fitted to the finned surfaces must be removed prior to start up.

MINIMUM CLEARANCE AROUND THE UNIT

Figure 4 shows the required clearances and service access around the unit.

NOTE: Ensure the fresh air inlet does not face prevailing wind direction.



	A	B	C	D
FCM/FHM/FGM/FDM/FWH/FWM				
F BOX	2200 ⁽¹⁾	2000	2000	2000
G BOX	2700 ⁽¹⁾	2000	2000	2000
H BOX	2700 ⁽¹⁾	2000	2000	2000
FX				
25 & 30	*	1100	*	1700
35→55	*	1300	*	2300
70→100	*	1700	*	2300
110→170	*	2000	*	2300

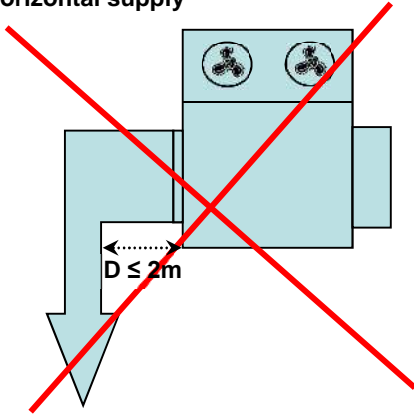
(1) Add 1 meter if the units are equipped with gas burner

RECOMMENDATIONS FOR DUCTS CONNECTIONS

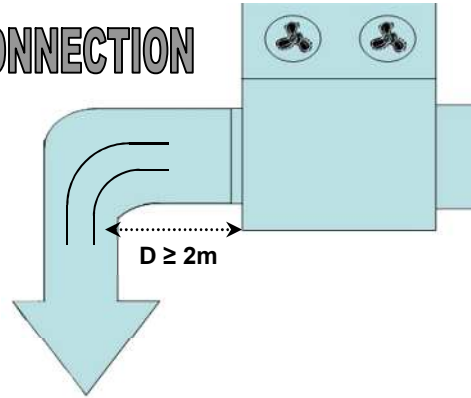
Some rules must be complied with for the connections between ducts and unit done on site. Whatever the supply configuration is, respect a minimal duct's length (**D**) of 2m before any elbow or any duct's diameter change.

These recommendations are imperative in the case of 2 independent turbines (sizes from 150kW to 230kW and all units equipped with gas module)

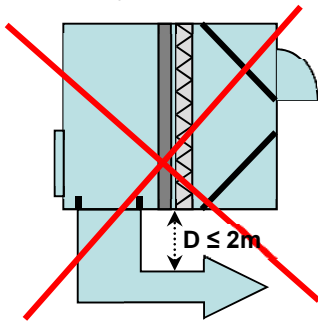
Horizontal supply



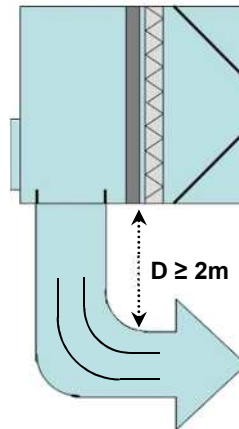
GOOD CONNECTION



Vertical supply



GOOD CONNECTION



Here are obvious bad examples of ducts connections noted on site:



WATER SOURCE HEAT PUMP ONLY

Water connections

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

The water pipes connected to the unit must not transmit any radial or axial force or any vibration to the heat exchangers.

It is important to follow non exhaustive recommendations hereunder:

- Comply with the water inlet and outlet connections shown on the unit.
- Install manual or automatic air purge valves at all high points in the circuit.
- Install a safety valve as well as an expansion tank to maintain the circuit pressure.
- Install thermometers in both the inlet and outlet water connections.
- Install drain connections at all low points to allow the whole circuit to be drained.
- Install stop valves, close to the inlet and outlet water connections.
- Use flexible connections to reduce vibrations transmission.
- After testing for leaks, insulate all pipe work, to reduce thermal leaks and to prevent condensation.
- If the external water pipes are in an area, where the ambient temperature is likely to fall below 0°C, insulate the piping and add an electric heater.
- Ensure full earthing continuity

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.

Connections at the inlet and outlet are Victaulic type.

Water analysis

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



We do not advise operation of the units with open loops which can cause troubles with oxygenation, or 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.

Here are our non exhaustive recommendations given as an indication:

- No NH₄⁺ ammonium ions in the water, they are very detrimental for copper. <10mg/l
- Cl⁻ Chloride ions are detrimental for copper with a risk of perforations by corrosion by puncture. < 10 mg/l.
- SO₄²⁻ sulphate ions can cause perforating corrosion.< 30 mg/l.
- No fluoride ions (<0.1 mg/l).
- No Fe²⁺ and Fe³⁺ ions with dissolved oxygen. Dissolved iron < 5 mg/l with dissolved oxygen < 5 mg/l. Over those values, it means a corrosion of steel which may generate a corrosion of copper parts under deposite of Fe – this is mainly the case with shell and tube heat exchangers.
- Dissolved silicon: silicon is an acid element of water and can also lead to corrosion risks. Content < 1mg/l.
- Water hardness: TH >2.8 K. Values between 10 and 25 can be recommended. This will facilitate scale deposit that can limit corrosion of copper. TH values that are too high can cause piping blockage over time.
- TAC< 100.
- Dissolved oxygen: Any sudden change in water oxygenation conditions must be avoided. It is as detrimental to deoxygenate the water by mixing it with inert gas as it is to over-oxygenate it by mixing it with pure oxygen. The disturbance of the oxygenation conditions encourages destabilisation of copper hydroxides and enlargement of particles.
- Specific resistance – electric conductivity: the higher the specific resistance, the slower the corrosion tendency. Values above 3000 Ohm/cm are desirable. A neutral environment favours maximum specific resistance values. For electric conductivity values in the order of 200-6000 S/cm can be recommended.
- pH: pH neutral at 20°C (7 < pH < 8)

Antifreeze protection

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.

Drain the installation



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.

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

Minimum water content

The minimum volume of the rooftop water circuit must be determined. 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 formulas hereafter:

WATER COOLED FLEXYII RANGE

- Vt → Minimum water content of the installation
- Q → Water capacity in kW
- N → Number of control steps available in the unit
- Dt → Maximum acceptable temperature rise (Dt = 6°c for an air conditioning application)

$$V_{mini} = 86 \times Q / (N \times Dt)$$

Unit Size	Number of stages	Mini Water Volume (L)
FWH/FWM 085	2	631
FWH/FWM 100	2	781
FWH/FWM 120	2	867
FWH/FWM 150	3	702
FWH/FWM 170	4	627

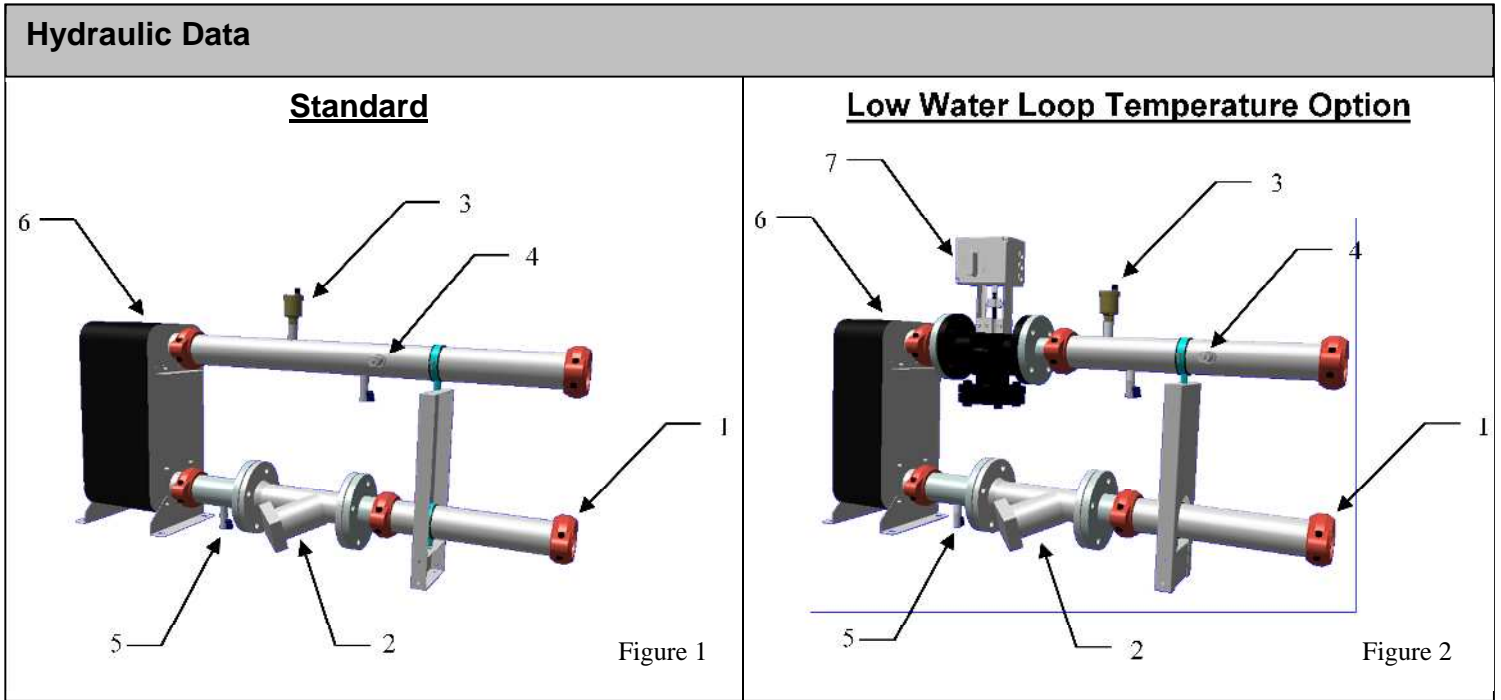
WATER LOOP CONFIGURATION (FOR WATER SOURCE HEAT PUMP)

Figures below show the 2 water configurations.

Figure 1 indicates all components used as standard :

- the electronic water flow switch,
- the water filter,
- the pressure taps and drain valves,
- the automatic airvent,

The second figure shows rooftop water loop with Low Water Loop Temperature option.



1	All Victaulic Connections	5	Pressure Taps and drain Valve
2	Inlet Water Filter	6	Stainless steel Exchanger
3	Automatic Air Vent	7	ElectroValve (HP control option)
4	Electronic Flow Switch		

LOW WATER LOOP TEMPERATURE (OPTION)

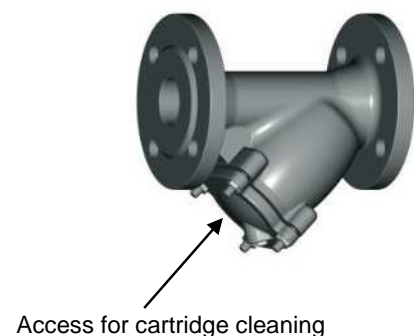
In order to operate with low water inlet temperature in cooling mode (ie: ground source water loops) it is necessary to control the water flow rate in the heat exchanger to maintain a minimum condensing pressure in the refrigeration circuit. In cooling mode the climatic 50 will control the water flow rate in the condenser by monitoring the condensing pressure and by closing the water flow valve accordingly by a 0-10 Volts signal.

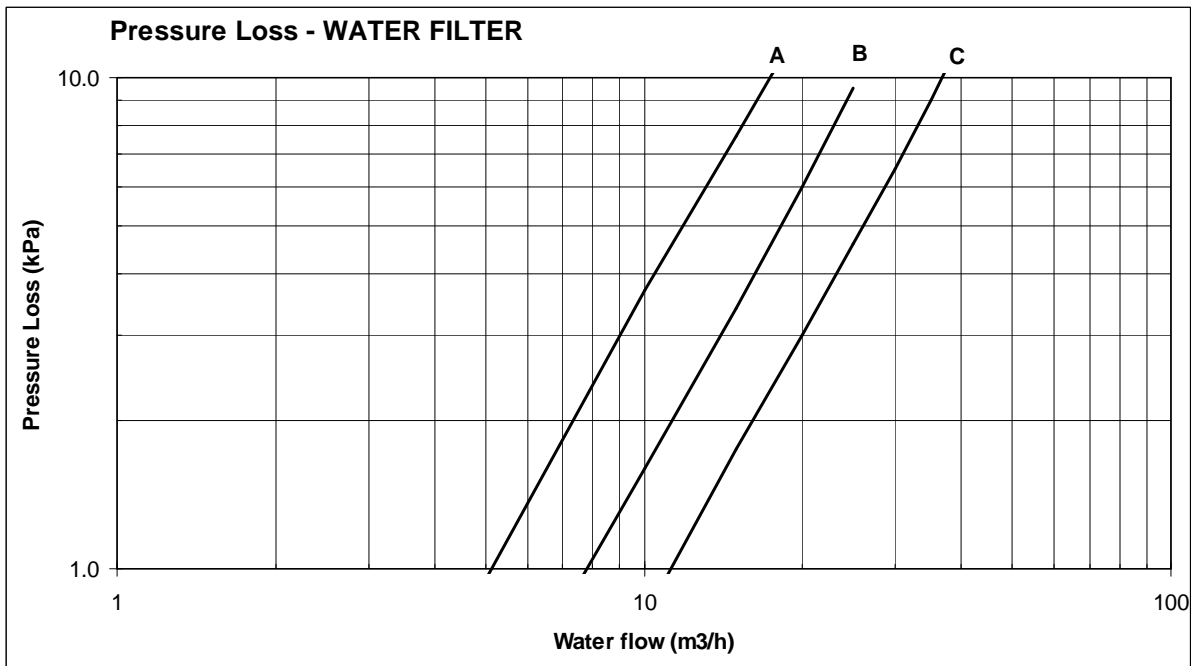
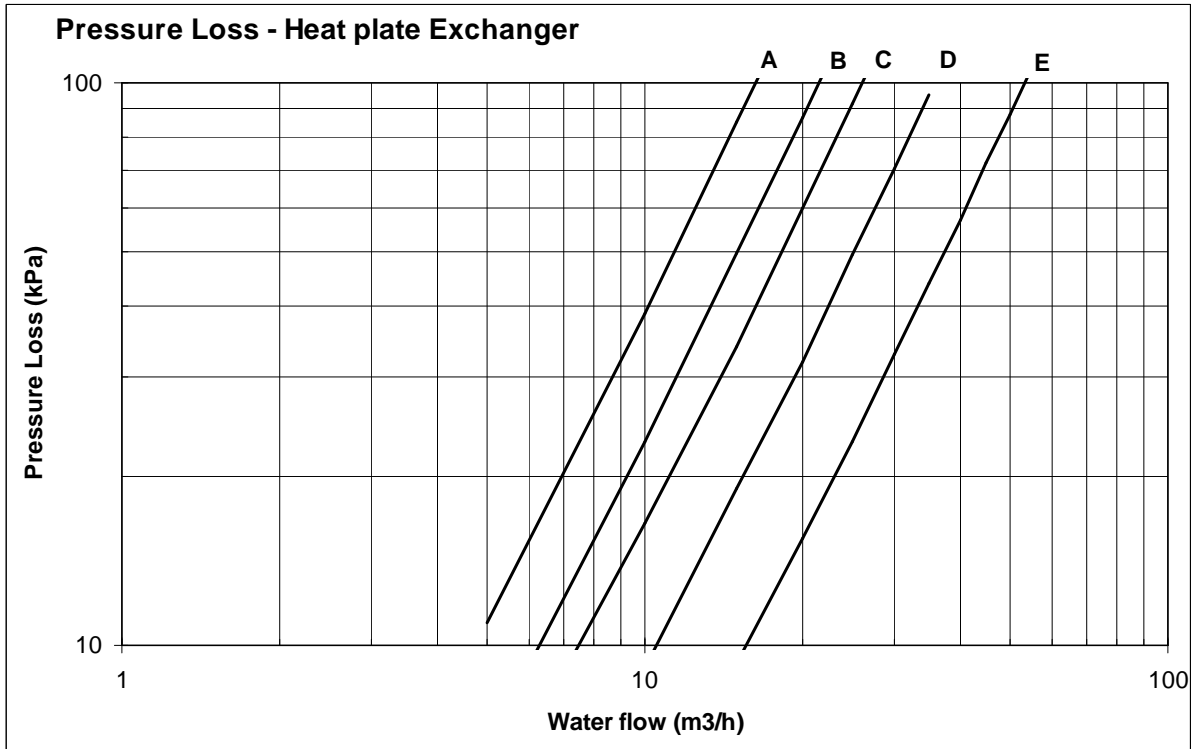
This option offers a second opportunity: give the possibility to close the rooftop water loop when compressors are stopped.

WATER FILTER REPLACEMENT (ONLY FOR WATER SOURCE HEAT PUMP)

It is important that units are serviced regularly by a qualified technician, at least once every year or every 1000 hours of operation.

CAUTION: The 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 personal.





FWH/FWM	Exchanger Curve	Filter Curve
85	C	B
100	D	B
120	D	B
150	E	C
170	E	C

CAUTION:

- An approach ramp must be installed if the unit's installation requirements tell that it's necessary to reach the main switch. This recommendation is valid for installations in general and in particular for return and curbs. It's also valid to reach other parts of the unit: filters, refrigerant circuit, etc...
- It's advised to fix curbs and roofcurbs to the unit.

As levels are adjustable, observe the following recommendations when installing the equipment

Above all, ensure that all the adjustable returns are facing outward ("1" figure 4). They are usually turned inside-out for transport.

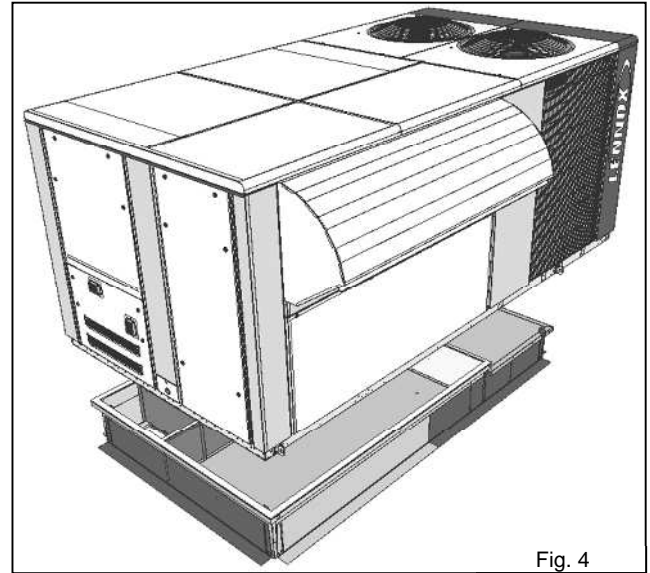


Fig. 4

Place the roof mounting frame on the trimmer beam by first lining up the inlet and the outlet opening. ("2"- figure 5)

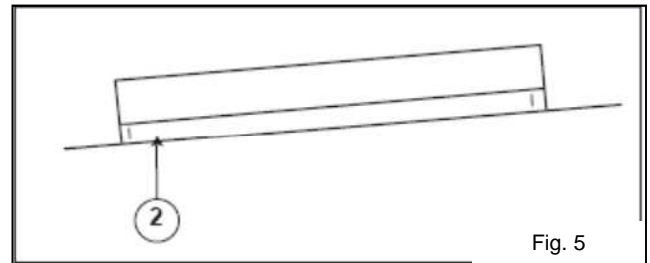


Fig. 5

After levelling the frame, secure the adjustable returns on the trimmer.

It is important to centre the unit on the roof frame

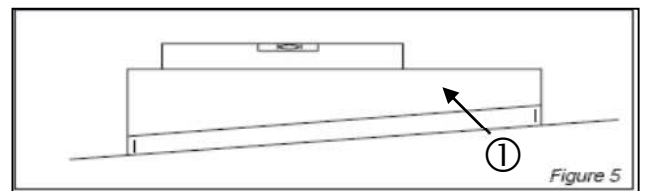



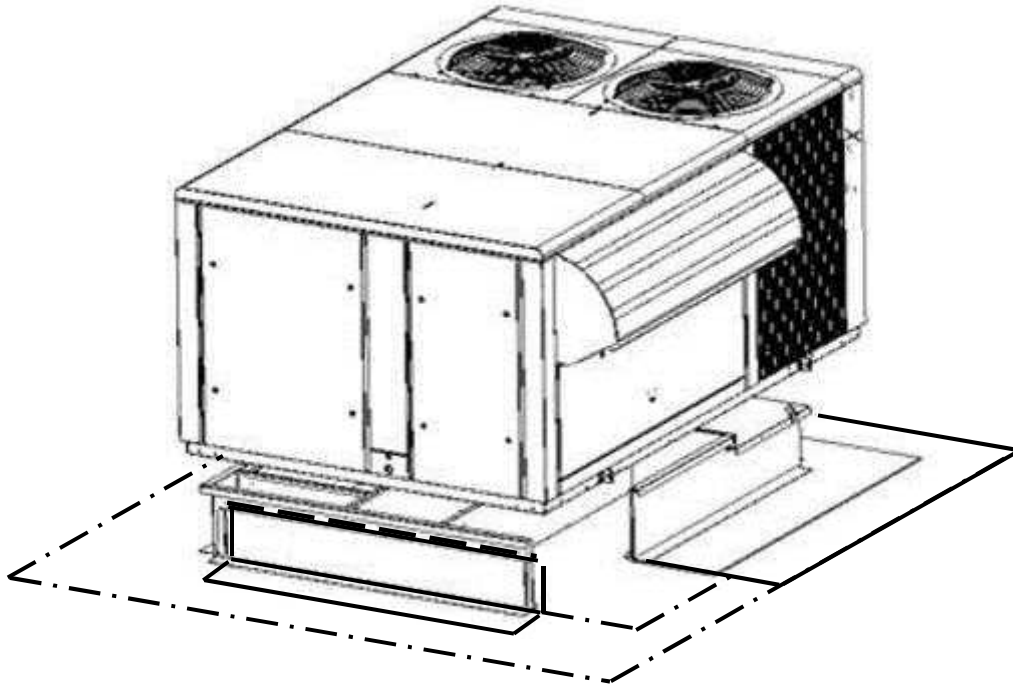


Fig. 6

When the frame is correctly positioned, it is essential to secure the assembly with a disconnected stitched welded seam (20 to 30mm every 200mm   ) along the outside or by using an alternative method



CURBING AND FLASHING

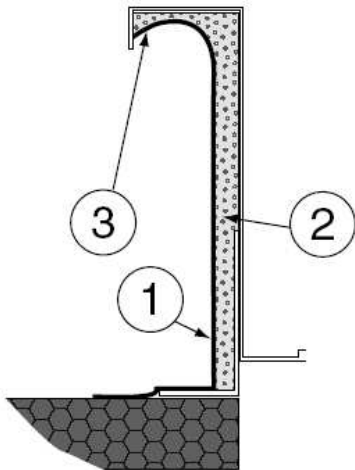


Fig. 7

Outside of frame must be insulated with rigid type insulation; We recommend a minimum of 20 mm thick insulation (2 - figure 7).

Check that the insulation is continuous, counter flash and seal around the frame as shown in (1-figure 7).

CAUTION: To be effective, the upstream must end below the drop edge (3 - figure 7).

Where pipes and electrical conduits extend through the roof, flashing must conform to local codes of practice

Before installing the equipment, make sure that seals are not damaged and check that the unit is secured to the mounting frame. Once in position, the bottom of the equipment must be horizontal. The installer must comply with local authority standards and specifications.

NON ADJUSTABLE NON ASSEMBLED ROOFCURB INSTALLATION

FRAME PARTS IDENTIFICATION

Figure 8 shows the different parts used in the assembly of this roof mounting frame.

INSTALLATION

The roof mounting frame provides support when the units are installed in down-flow configurations. The non adjustable, non assembled roof mounting frame can be installed directly on decks having adequate structural strength or on roof supports under deck.

NOTE: frame assembly must be installed flat, leveled within 5mm per linear meter in any direction

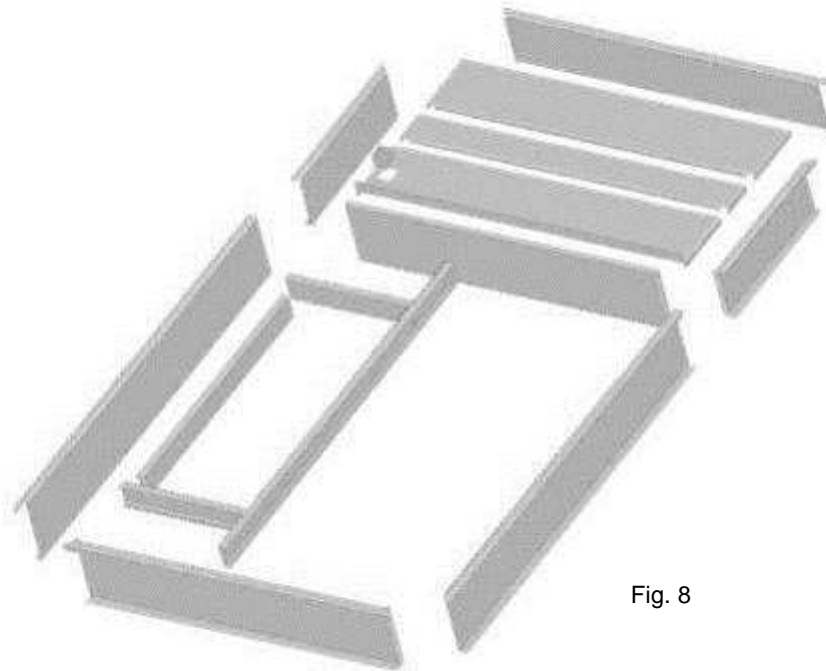
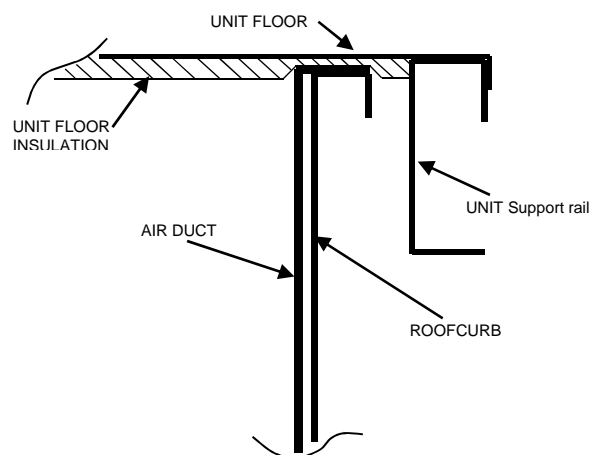


Fig. 8

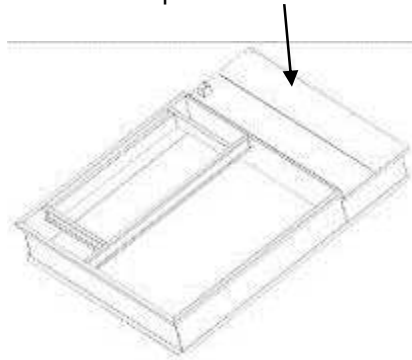


This roof curb will arrive as a packaged on a pallet and need to be built together. The part will be connected by special corrosion free nails. It is not possible to connect with standard nail equipment because there is a lot of power needed. Therefore, you need a pneumatic or electric device.

All parts must be sealed with polyurethan sealant during assembly.

Foam Insulation Installing

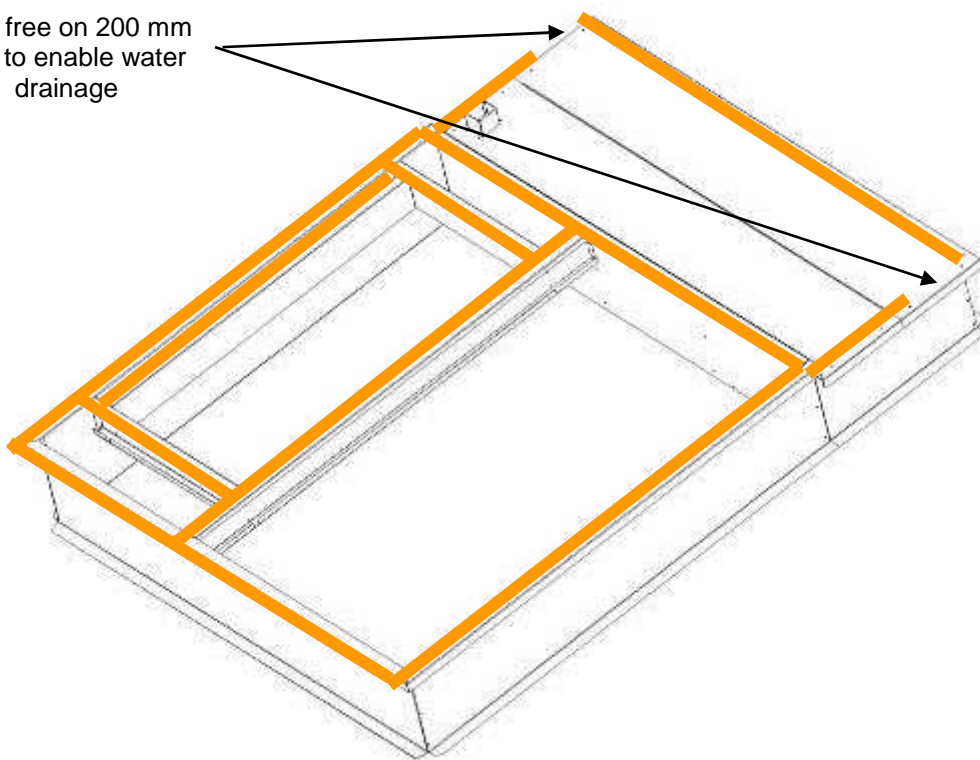
- Stick large foam pieces underneath the flat top



Foam Gasket Installing

- Stick gasket all around the curb flange's top

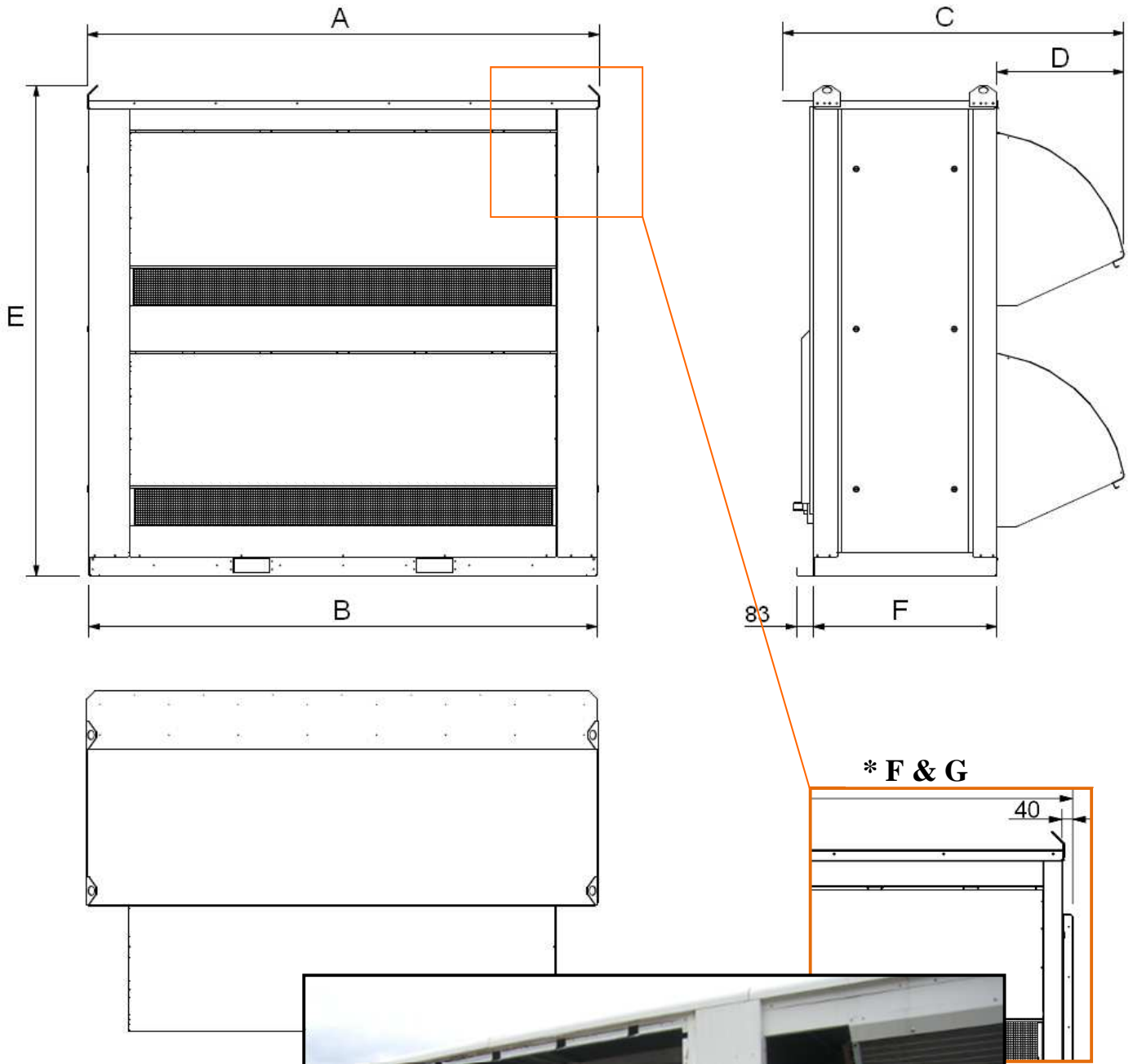
Let it free on 200 mm long to enable water drainage



Spare parts

	Fbox	Gbox	Hbox
GASKET 5840071R Grey foam M1	17 m / 0.85 m ²	19 m / 0.95 m ²	21 m / 1.1 m ²
INSULATION 5840071R	760 x 1960 - 1.39 m ²	920 x 1960 - 1.79m ²	tbd
Rivets 5820542X 4.8 x 8 mm	100	130	160

All units



SIZE	
F-box	85-100-120
G-box	150-170
H-box	200-230

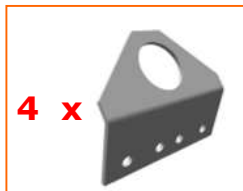


Weight
525 kg
635 kg
730 kg

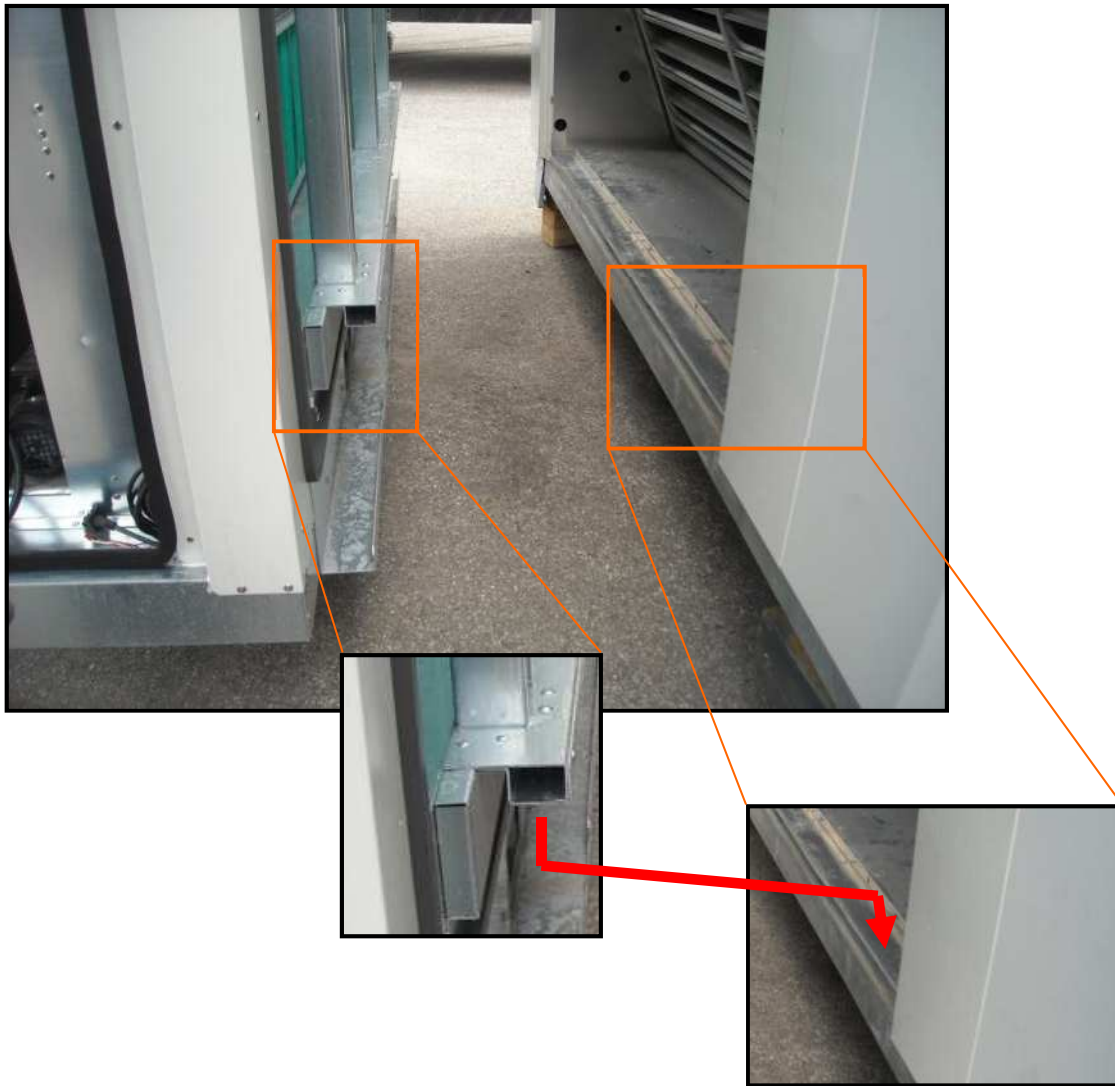


Remove lifting lug
Remove corner sheet metal

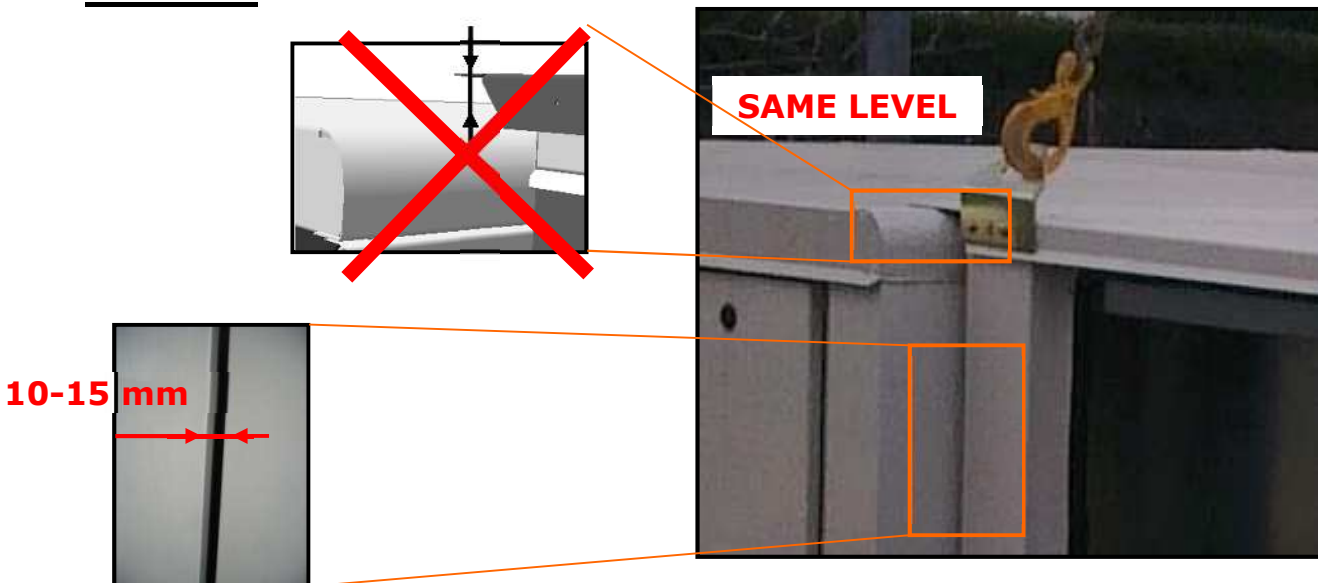
STEP 2 : Lifting



STEP 3 : Fitting

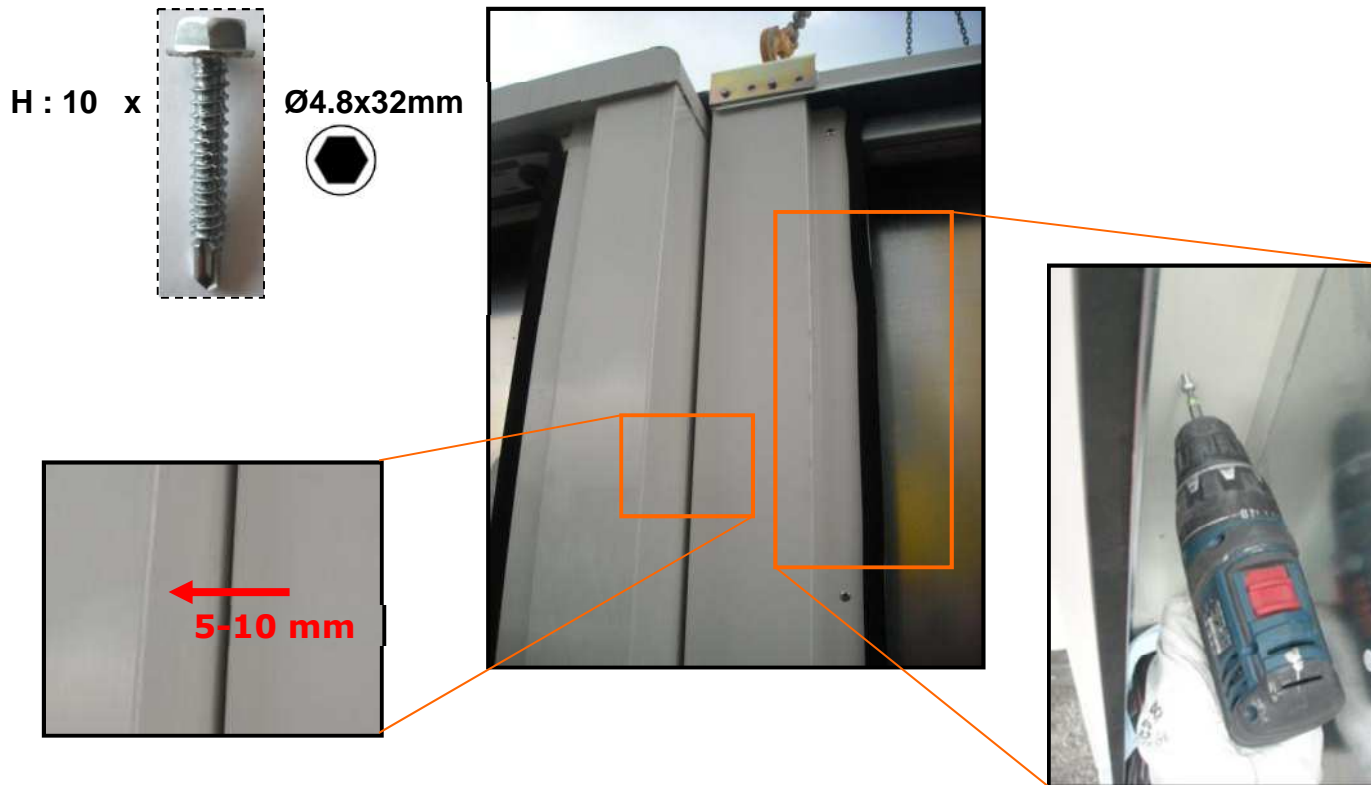


STEP 4 : Check

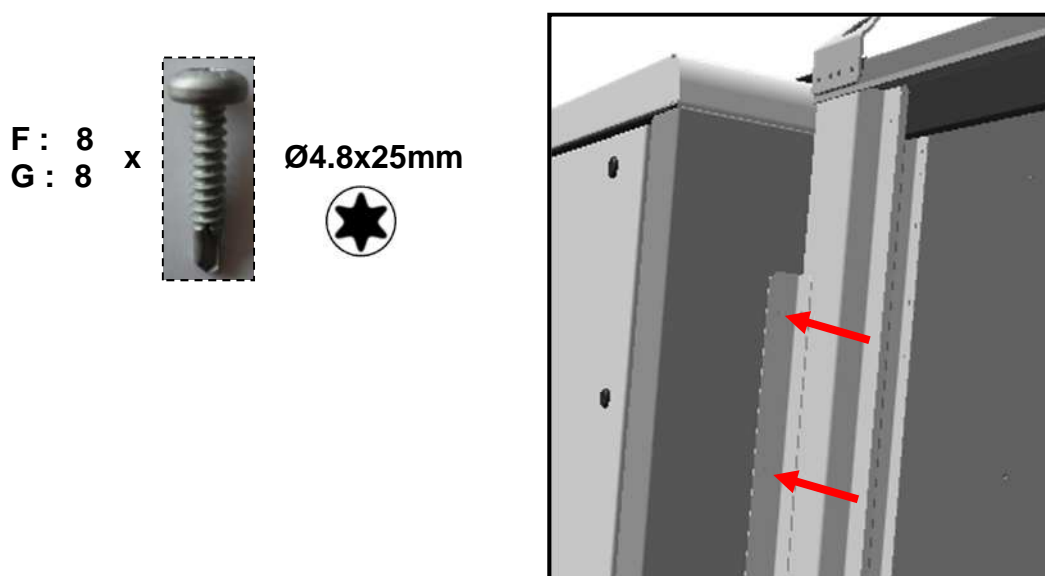


STEP 5 : Fixing

- H-box : for each side :



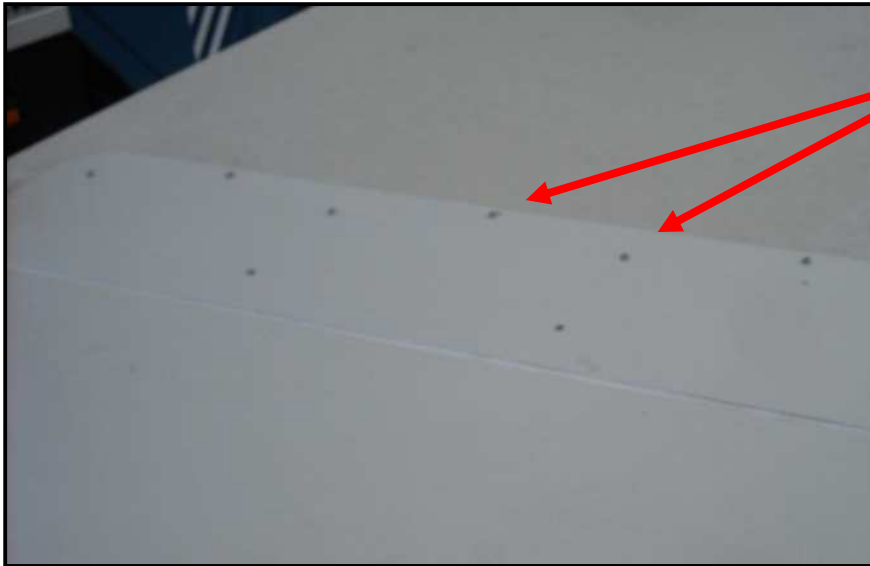
- F & G-box : for each side :



- On top :



F : 13
G : 15 x Ø4.8x25mm
H : 15



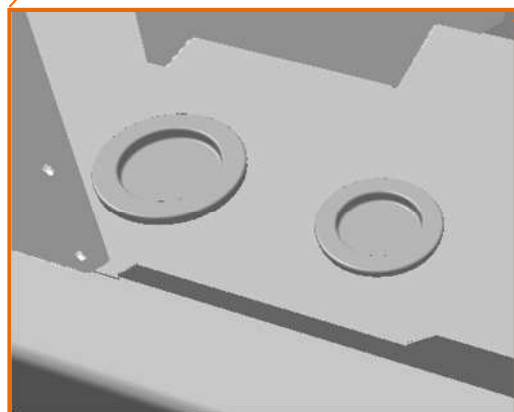
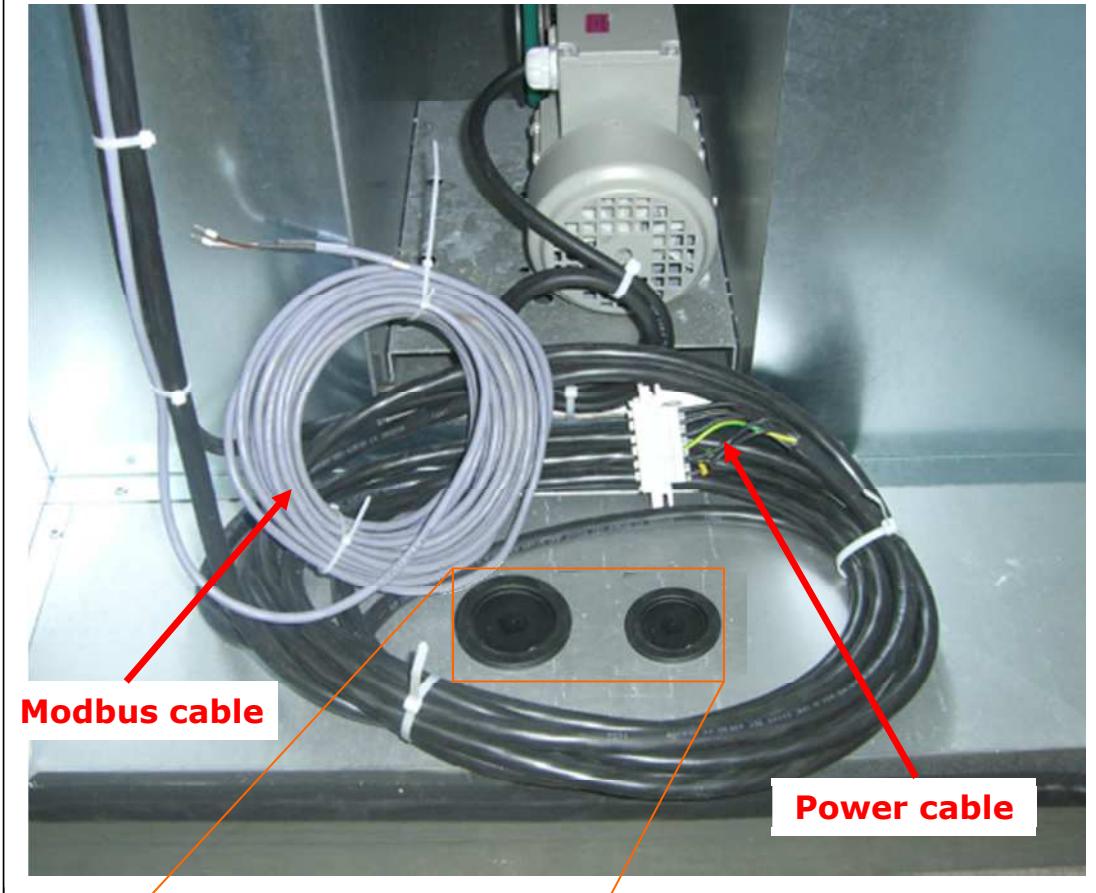
STEP 6: Masticate

Apply mastic on side junctions at higher junction.



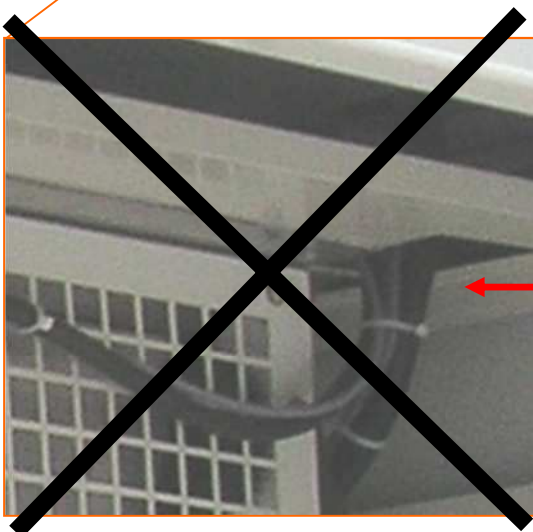
STEP 7: Electrical wiring

The Recovery module is sent with a power cable and a T-lan cable :



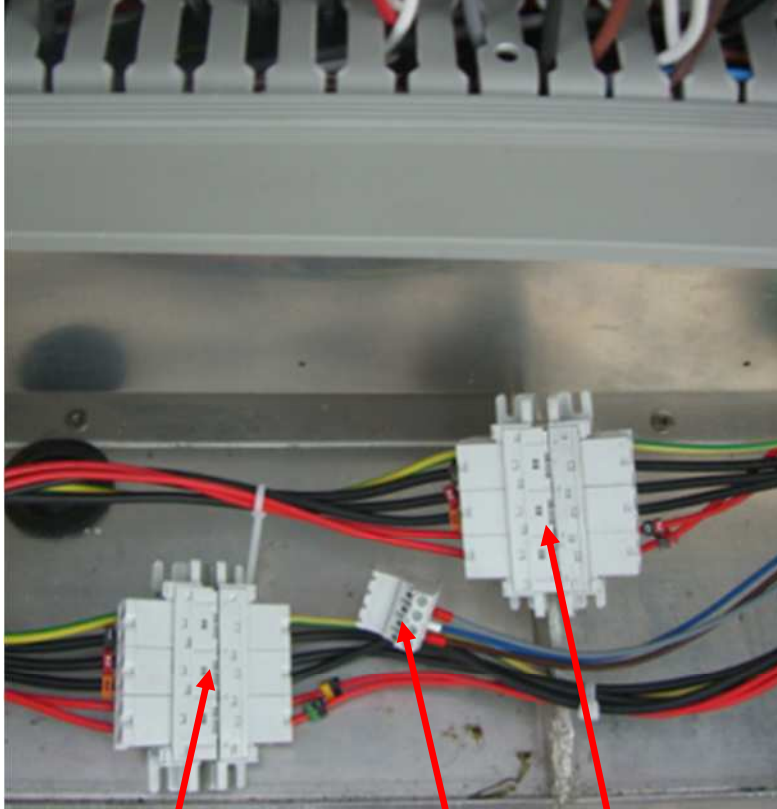
Separate these 2 cables (communication and power ones) using the two holes.

Then fix the 2 cables on the grid of the extraction roofcurb and insert them in rooftop electrical panel :



Communication and power cables from the module should be separated.

Then connect the power cable from the module to the rooftop, and the Modbus cable according to the bus connection wiring diagram (it could be connected to the BE60 (A1) connector in electrical rooftop panel or other options with bus communication).



Recovery module connection

Extraction roofcurb connection

Actuator roofcurb connection



Be careful: Check connections and connect male connections to good female one.
Roofcurb and recovery module connectors are the same.

To check the wiring, please refer to Rooftop and Recovery Module electrical diagram.

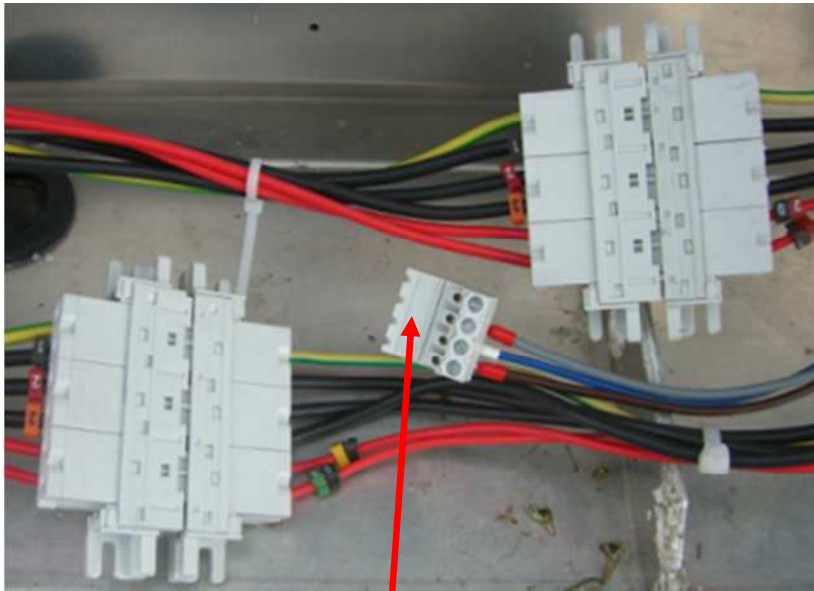
STEP 8: Roof curb economiser Adjustment

With Heat Recovery module option the extract air goes through the wheel, that's why the economiser of the roofcurb has to be permanently fully closed.

If roofcurb economiser is not fully closed, close it manually.



And don't connect the actuator to the rooftop.



Actuator roofcurb not connected

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Site details		Controller	
Site		Model	
Unit Ref		Serial No	
Installer		Refrigerant	

(1) ROOF INSTALLATION

Sufficient Access OK Yes <input type="checkbox"/> No <input type="checkbox"/>	Condensate drain fitted Yes <input type="checkbox"/> No <input type="checkbox"/>	Roofcurb OK <input type="checkbox"/> Not OK <input type="checkbox"/>
--	---	---

(2) CONNECTIONS CHECK

Phase check Yes <input type="checkbox"/> No <input type="checkbox"/>	Voltage between Phases	1 / 2	2 / 3	1 / 3
---	------------------------	----------------	----------------	----------------

(3) CLIMATIC CONFIGURATION CHECK

CLIMATIC 60 Configured according to the Options and Specifications: Yes <input type="checkbox"/> No <input type="checkbox"/>

(4) SUPPLY BLOWER SECTION

Type :		N°1	N°2
Power displayed on plate:	KW	.....	.....
Voltage displayed on plate:	V	.....	.....
Current displayed on plate:	A	.....	.....
Fan Type :		Forward <input type="checkbox"/>	Forward <input type="checkbox"/>
		Backward <input type="checkbox"/>	Backward <input type="checkbox"/>
Displayed Belt Length :	mm	.....	.....
Tension Checked:		Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
Alignment Checked :		Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
Motor Pulley Diameter: D _M	mm	.....	.....
Fan Pulley Diameter: D _P	mm	.....	.....
Fan Speed = Motor rpm x D _M / D _P	rpm	.....	.....
Averaged Measured Amps :	A	.....	.....
Shaft Mechanical Power (Refer to airflow balancing)	W	.....	.....
Operating point checked :		Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
Estimated Airflow	m ³ /h	.....	.....

(5) AIRFLOW PRESS. SENSOR CHECK

Measured pressure drop (2332)..... mbar	Set Points Adjusted: Yes <input type="checkbox"/> No <input type="checkbox"/>
	If Yes enter new values: 2333: 2334: 2335:

(6) EXTERNAL SENSOR CHECKS

Check electrical connections : Yes <input type="checkbox"/> No <input type="checkbox"/>	Check and record temp. in menu 2211 Yes <input type="checkbox"/> Non <input type="checkbox"/>	
	100% Fresh Air	100% return Air
Supply Temperature	.....°C	.....°C
Return Temperature	.....°C	.....°C
Outdoor Temperature	.....°C	.....°C
Inlet Water Temp. (for Water Condensing)	.....°C	.....°C
Outlet Water Temp. (for Water Condensing)	.....°C	.....°C

(7) MIXING AIR DAMPERS CHECKS

Dampers open & close freely OK Yes <input type="checkbox"/> No <input type="checkbox"/>	% Minimum FA:%	Power exhaust checked Yes <input type="checkbox"/> No <input type="checkbox"/>	Enthalpy sensor(s) checked Yes <input type="checkbox"/> No <input type="checkbox"/>
---	-------------------------	---	--

(8) REFRIGERATION SECTION

Outdoor Fan Motor Current:				Check Rotation		Compressor Voltage	
Motor 1 / Moteur 1	L1 .....A	L2 .....A	L3 .....A	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Comp1: V	
Motor 2 / Moteur 2	L1 .....A	L2 .....A	L3 .....A	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Comp2: V	
Motor 3 / Moteur 3	L1 .....A	L2 .....A	L3 .....A	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Comp3: V	
Motor 4 / Moteur 4	L1 .....A	L2 .....A	L3 .....A	Yes <input type="checkbox"/>	No <input type="checkbox"/>	Comp4: V	
Compressor Amps COOLING				Pressures & Temperatures			
	Phase 1	Phase 2	Phase 3	Temperatures		Pressures	
				Suction	Discharge	LP/ BP	HP / HP
Comp 1	..... A	..... A	..... A	..... °C	..... °C	..... Bar	..... Bar
Comp 2	..... A	..... A	..... A	..... °C	..... °C	..... Bar	..... Bar
Comp 3	..... A	..... A	..... A	..... °C	..... °C	..... Bar	..... Bar
Comp 4	..... A	..... A	..... A	..... °C	..... °C	..... Bar	..... Bar
Check Reversing valves :				Valve1: Yes <input type="checkbox"/> No <input type="checkbox"/>		Valve3: Yes <input type="checkbox"/> No <input type="checkbox"/>	
				Valve2: Yes <input type="checkbox"/> No <input type="checkbox"/>		Valve4: Yes <input type="checkbox"/> No <input type="checkbox"/>	
Compressor Amps HEATING				Pressures & Temperatures			
	Phase 1	Phase 2	Phase 3	Temperatures		Pressures	
				Suction	Discharge	LP/ BP	HP / HP
Comp 1	..... A	..... A	..... A	..... °C	..... °C	..... Bar	..... Bar
Comp 2	..... A	..... A	..... A	..... °C	..... °C	..... Bar	..... Bar
Comp 3	..... A	..... A	..... A	..... °C	..... °C	..... Bar	..... Bar
Comp 4	..... A	..... A	..... A	..... °C	..... °C	..... Bar	..... Bar
HP cut out .....Bar				LP cut out Bar			
Refrigerant charge				C1 :kg	C2 :kg	C3 :kg	C4 :kg

(9) ELECTRIC HEATER SECTION

Type :	Serial No.:.....				
AMPS 1 st stage			AMPS 2 nd stage		
1	2	3	1	2	3

(10) HOT WATER COIL SECTION

Check Three Way Valve Movement : Yes No

(11) GAS HEATING SECTION

Gas Burner N°1				Gas Burner N°2			
Size :		Valve type :		Size :		Valve type :	
.....		
Pipe size:		Gas type : G		Pipe size		Gas type : G	
Line pressure :		Drop test Yes <input type="checkbox"/> No <input type="checkbox"/>		line pressure :		Drop test Yes <input type="checkbox"/> No <input type="checkbox"/>	
.....		
Check manifold pressure: High fire Low fire				Check manifold pressure: High fire Low fire			
Pressure cut out airflow press switch :mbar /Pa				Pressure cut out airflow press switch :mbar /Pa			
Motor amps :	Flue temp.	CO2 %:	CO ppm:	Motor Amps:	Flue temp.	CO2 %:	CO ppm:
.....A	..... °C	.....%	.....%	.....A	..... °C%%

(12) SETTINGS

Using Wizard software, edit the complete list of settings by 'Print' function.

General information

Site name:	Serial Number:	
Site address:		
Site operator:		
Cooling load :		
Refrigerant type:	Refrigerant quantity (kg)	
Unit manufacturer	Year of installation	

Refrigerant additions

Date	Engineer	Quantity (kg)	Reason for addition

Refrigerant removal

Date	Engineer	Quantity (kg)	Reason for removal

Leak tests (part 1)

Date	Engineer	Test Result	Follow up action required

Follow up actions

Date	Engineer	Related to test dated	Action taken

Testing of automatic leak detection system (if fitted)

Date	Engineer	Test result	Comments

Refrigerant load according to model size

Refrigerant	Box	Model	Number of circuit	Cooling only units Load (kg) (RAC RAG)	Heat pump units Load kg (RAH RAM)
R410A	C	24	1	6,1	6,1
		30	1	6,1	6,1
		38	1	8,1	8,1
		42	1	8,1	8,1
	D	45	1	6,5	6,5
			2	6,5	6,5
		52	1	6,5	6,5
			2	6,5	6,5
		57	1	8,0	8,0
			2	8,0	8,0
		65	1	8,0	8,0
			2	8,0	8,0
	E	75	1	10,5	10,5
			2	10,5	10,5
		85	1	10,5	10,5
			2	10,5	10,5

ECONOMISER

Free cooling is provided through the use of fresh air which is more appropriate than excessive cooling amounts of return air. The economiser is factory fitted and tested prior to shipment. It includes two dampers operating from a 24V actuator

RAIN HOOD

It also includes a factory fitted rain hood. Hoods is folded during transportation to limit risks of damage and must be unfolded on site as shown on fig. 9

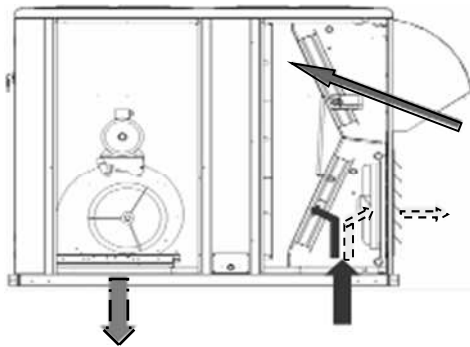


EXTRACTION

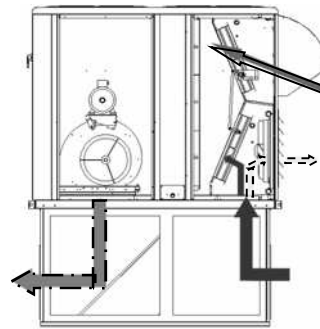
Installed with economiser assembly, the gravity exhaust dampers relieve the pressure when outside air is introduced. Fig. 9 system.

When large amount of fresh air is introduced into the system power exhaust fans can be used to equalise the pressures. The extraction fan runs when return air dampers are being closed and supply air blower is in operation. The extraction fan runs when outdoor air dampers are at least 50% open (adjustable value). It is overload protected. NOTE: When horizontal flow configuration is required, the multidirectional roof curb will be installed.

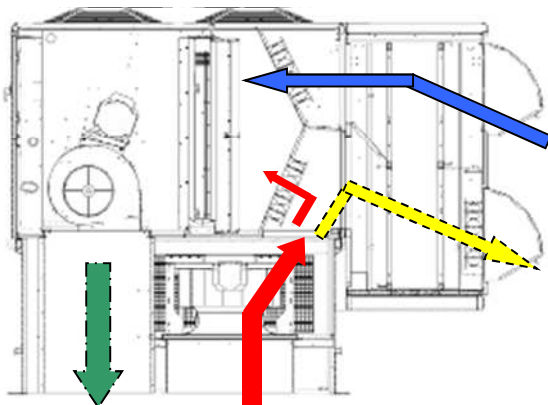
FLEXY II PRINCIPLE SKETCH



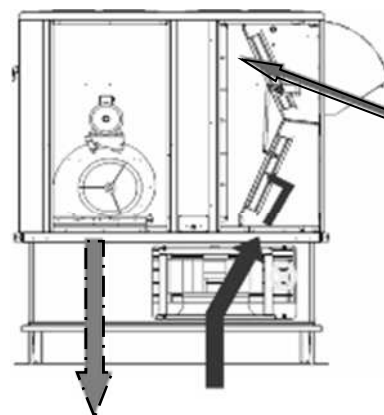
MULTIDIRECTIONAL ROOFCURB PRINCIPLE SKETCH



ENERGY RECOVERY MODULE PRINCIPLE SKETCH



RETURN ROOFCURB PRINCIPLE SKETCH



- FRESH AIR
- RETURN AIR
- EXHAUST AIR
- SUPPLY AIR

BEFORE STARTING THE UNIT

THIS WORK MUST ONLY BE CARRIED OUT BY TRAINED REFRIGERATION ENGINEERS

FILL THE COMMISSIONING SHEET AS YOU GO ALONG

ELECTRICAL CONNECTIONS

- Ensure that the power supply between the building and the unit meets local authority standards and that the cable specification satisfies the start-up and operating conditions.

ENSURE THAT THE POWER SUPPLY INCLUDES 3 PHASES

- Check the following wire connections for tightness: Main switch connections, mains wires linked to the contactors and circuit breakers and the cables in the 24V control supply circuit.

PRELIMINARY CHECKS

- Ensure that all drive motors are secure.
- Ensure that the adjustable pulley blocks are secure and that the belt is tensioned with the transmission correctly aligned. Refer to the next section for details.
- Using the electrical wiring diagram, check the conformity of the electrical safety devices (circuit breaker settings, presence and rating of fuses).
- Check the temperature probe connections.



STARTING THE UNIT

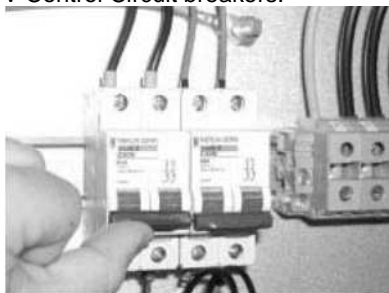
At this point the unit circuit breakers should be open
You will need a **DS60** maintenance controller.



Connecting the CLIMATIC displays (RJ12 connector on the main board) :



Close the 24V Control Circuit breakers.



The CLIMATIC 60 starts after 30s

Reset the DAD photo (If fitted)



Check and adjust the control settings.

Refer to the control section in this manual to adjust the different parameters.

POWERING THE UNIT

- Power up the unit by closing the isolator switch.
- At this point the blower should start unless the climatic does not energise the contactor. In this particular case the blower can be forced by bridging the port NO11 and C4 on connector J15 on the Climatic. Once the fan is running, check the rotation direction. Refer to the rotation arrow located on the fan.
- The fans and compressors direction of rotation is checked during the end of line test. They should therefore all turn in either the right or wrong direction.

NOTE: A compressor rotating in the wrong direction will fail.

- If the fan turns in the wrong direction (the right direction is shown on figure n° 11), disconnect the main power supply to the machine at the building's mains switch, reverse two phases and repeat the above procedure.
- Close all circuit breakers and power up the unit, remove the bridge on connector J15 if fitted.
- If now only one of the components rotates in the wrong direction, disconnect the power supply at the machine's isolator switch (if fitted) and reverse two of the component's phases on the terminal within the electrical panel.
- Check the current drawn against the rated values, in particular on the supply fan.
- If the readings on the fan are outside the specified limits, this usually indicates excessive air flow which will affect the life expectancy and the thermodynamic performances of the unit. This will also increase the risks of water ingress into the unit. Refer to the "Air Flow Balancing" section to correct the problem.

At this point attach the manometers to the refrigerant circuit

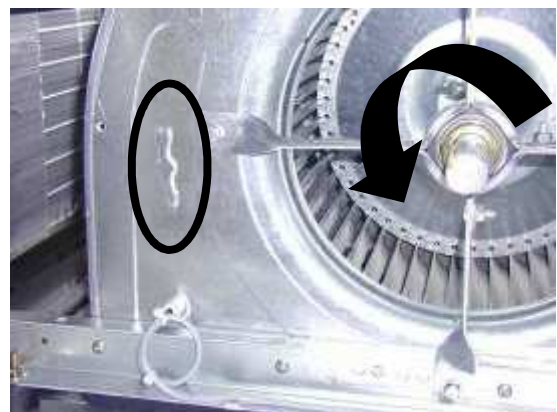


Fig. 11

RUN TEST

Start unit in cooling mode



Thermodynamic readings are possible on Climatic 60 or using manometers.

No rated values are given here. These depend on the climatic conditions both outside and inside the building during operation. However, an experienced refrigeration engineer will be able to detect any abnormal machine operation.

Safety test

- Check Air pressure switch "Dirty filter" detection test: vary the set-point value (menu page 2335 on DS60) in respect to the air pressure value. Observe the response of the CLIMATIC™ (menu 2332).

- Same procedure for detecting "Missing Filter" (page menu 2334) or "Air Flow Detection" (page menu 2333).

- Check the smoke detection function (if fitted).

- Check the Firestart by pressing the test button (if fitted).

- Disconnect the circuit breakers of the condensor fans and check the high pressure cut-out points on different refrigerant circuits.

Reverse cycle test

This test is designed to check the good operation of the 4-way reversing valves on heat pump reversible systems. Start the reverse cycle by adjusting the cold or hot temperature threshold data according to the indoor and outdoor conditions at the time of test (**menu 2222**).

BELT TENSION

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.

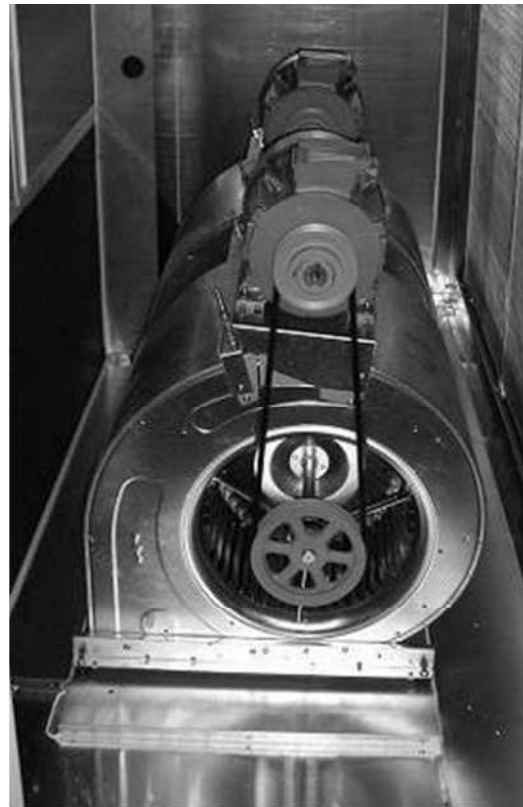
Before adjusting the tension, make sure that the pulleys are correctly aligned.

To tension the belt, set the height of motor support plate by moving the plate adjustment screws.

The recommended deflection is 20 mm per meter from centre to centre.

Check that according to the diagram below (figure 12), the following ratio remains the same.

$$\frac{A \text{ (mm)}}{P \text{ (m)}} = 20$$



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

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.

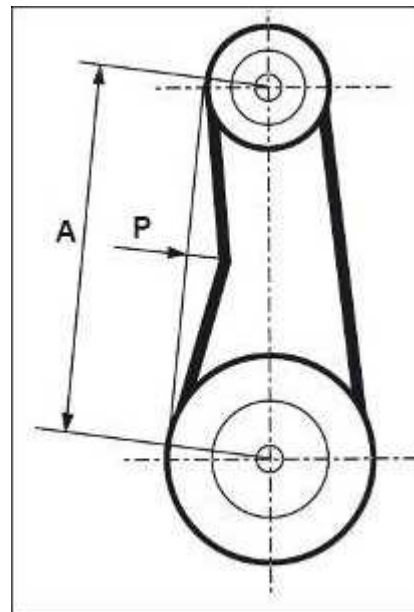


Fig. 12

MOUNTING AND ADJUSTING PULLEYS

FAN PULLEY REMOVAL

Remove the 2 screws and put one of them in the extraction threaded screw.

Screw in fully. The hub and the pulley will separate from each other.

Remove the hub and the pulley by hand without damaging the machine.

FAN PULLEY INSTALLATION

Clean and de-grease the shaft, hub and conical bore of the pulley. Lubricate the screws and install the hub and pulley. Position the screws without turning them.

Place the assembly on the shaft and screw in the screws alternatively and evenly. Using a mallet or a hammer with a wooden wedge, tap on the face of the hub to keep the assembly in place. Torque the screws to 30 Nm.

Take the pulley in both hands and shake it vigorously to make sure everything is in place.

Fill the holes with grease for protection.

NOTE: During installation, the key should never protrude out of its groove.

After 50 operating hours, check that the screws are still in place.

MOTOR PULLEY INSTALLATION & REMOVAL

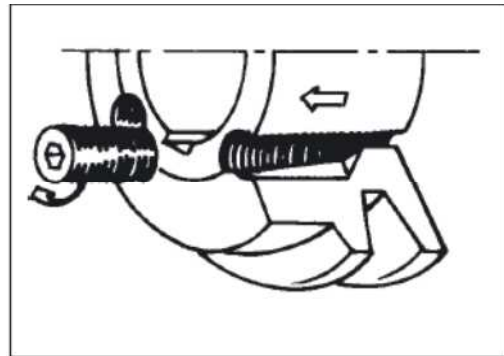
The pulley is held in position by the key and a screw located in the groove. After unlocking, removing this screw by pulling against the shaft spindle (if necessary, use a mallet and tap uniformly on the hub to remove it).

To assemble, proceed in the reverse order after having cleaned and de-greased the motor shaft and the pulley bore.

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.

SITE TEST AND MAINTENANCE

Measure the motor absorbed power.

If the absorbed power is greater and the pressure lower 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 power is lower and the pressure greater 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.

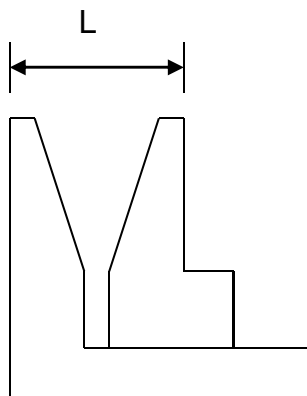
To carry out the adjustment and to avoid a time-consuming re-start, stop the machine and if necessary lock the main switch. First unscrew the 4 Allen screw(s) on the pulley (see figure 13).

Pulley type	Pulley External Diameter	Min Dia / Min Dist	Max Dia / Max Dist	Nb of turns from fully closed to fully open	Actual diameter (DM) or distance between faces for a given number of turns from fully closed with SPA belt in (mm)										
					0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5
8450 / D8450	120	95	116	5	114	112	110	108	106	103	101.3	99.2	97.1	95	-
		20.2	28	5	21	21.8	22.5	23.3	24.1	24.9	25.7	26.4	27.2	28	-
8550 / D8550	136	110	131	5	129	127	125	123	121	118	116	114	112	110	-
		20.6	31.2	5	21.6	22.7	23.8	24.8	25.9	26.9	28	29.1	30.1	31	-

Table_1

The easiest way to determine the fan rotation speed is to use a Tachometer. If not available the fan rpm can be estimated using the following two methods.

1st Method with the pulley secured in place:



Measure the distance between the two outside faces of the pulley. Using table (1) the motor pulley actual diameter can be estimated.

ALLEN WRENCH 4

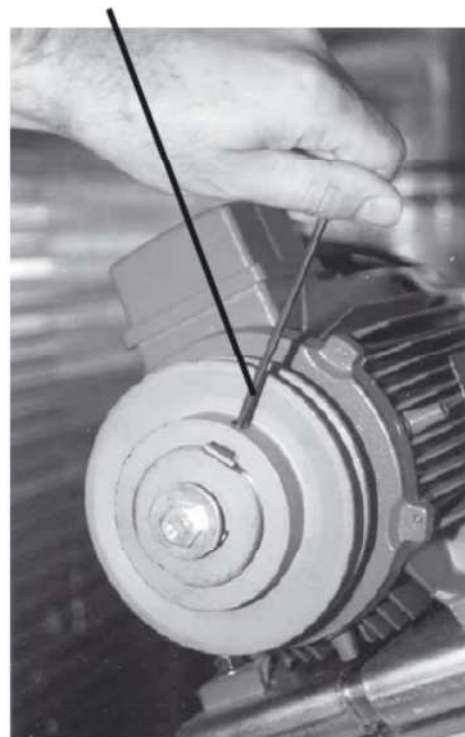


Fig. 13

2nd method when adjusting the pulley :

- Close the pulley fully and count the number of turns from fully closed position. Using table_1 determine the motor pulley actual diameter.
- Record the fix fan pulley diameter.(DF)
- Determine the fan speed using the following formulae:

$$rpm_{FAN} = rpm_{MOTOR} \times D_M / D_F$$

Where: rpm_{MOTOR} :from the motor plate or table_2
 D_M : from table_1
 D_F: from machine

Once the pulleys are adjusted and the belt checked and tensioned, start the fan motor and record the Amps and Voltage between the phases:

Using the measured data and table_2

-Theoretical mechanical power at the fan shaft:

$$P_{meca\ fan} = P_{meca\ Motor} \times \eta_{Transmission}$$

$$P_{meca\ fan} = P_{elec} \times \eta_{meca\ motor} \times \eta_{Transmission}$$

$$P_{meca\ fan} = V \times I \times \sqrt{3} \times \cos\phi \times \eta_{meca\ motor} \times \eta_{Transmission}$$

This formula can be approximated in this way

$$P_{meca\ fan} = V \times I \times 1.73 \times 0.78 \times 0.87 \times 0.9$$

With the fan “rpm” and the mechanical power at the fan shaft an operating point and the supplied airflow can be estimated using the fan curves.

CHECKING AIRFLOW AND ESP

Using the fan curves on page 36 to 40, the airflow, the total pressure available (P_{TOT}) and the corresponding dynamic pressure (Pd) can now be estimated, for a specific operating point;

The next step consists in estimating the pressure losses across the unit.

This can be achieved using the “dirty filter pressure sensor” and the accessories pressure drop table: table_3

Also the pressure drop due to the duct inlet into the roof-top unit can be taken as 20 to 30 Pa.

$$\Delta P_{INT} = \Delta P_{filter + coil} + \Delta P_{Inlet} + \Delta P_{Options}$$

Using the results from above, the external static pressure (ESP) can then be estimated:

$$ESP = P_{TOT} - Pd - \Delta P_{INT}$$

Table_2 Motor information

Motor Size	Nom. Speed	Cos φ	η _{meca motor}
0.75 kW	1415 rpm	0,75	79,9
1.1kW	1435 rpm	0,78	83,7
1.5kW	1435 rpm	0,76	84,2
2.2kW	1450 rpm	0,78	87,1
3.0kW	1445 rpm	0,79	85,7
4kW	1445 rpm	0,75	86,7
5.5kW	1465 rpm	0,79	89,0
7.5kW	1460 rpm	0,79	89,1
9.0kW	1467 rpm	0,77	90,9
11.0kW	1460 rpm	0,79	90,4

Table_3 Accessories pressure drops

	G4 Filters	F7 Filters	UV LIGHT	Hot Water coil S	Hot Water coil H	Electric Heater S	Electric Heater M	Electric Heater H	Heating Gaz fired H	Adjustable roofcurb	Multidirectional Roofcurb	Heat Recovery Modul Fresh Air	
85	12000	1	75	18	9	15	3	5	6	14	17	22	164
	15000	7	105	30	13	22	6	7	7	23	27	33	204
	23000	28	199	63	26	44	7	9	11	53	63	73	313
100	14000	5	94	26	11	19	6	7	8	20	23	30	191
	18500	15	143	44	18	31	8	10	11	34	41	51	252
	23000	28	199	63	26	44	11	14	16	53	63	78	313
120	15000	7	105	30	13	22	7	8	9	23	27	35	204
	20500	21	167	52	21	37	10	12	13	42	50	62	279
	23000	28	199	63	26	44	12	15	17	53	63	78	313
150	18000	1	75	15	6	10	4	5	7	16	30	35	170
	26000	12	130	33	12	19	9	10	13	33	62	72	245
	35000	29	204	54	19	33	15	18	23	59	112	131	329
170	21000	5	94	21	8	14	8	9	10	21	40	49	198
	30000	19	161	42	15	25	10	13	15	44	82	95	282
	35000	29	204	54	19	33	17	19	21	59	112	131	329
200	24000	3	88	18	7	11	16	15	14	21	53	67	173
	35000	18	154	39	13	22	22	21	20	44	112	133	252
	43000	31	211	54	19	31	24	26	29	66	169	195	310
230	27000	7	105	24	8	14	18	18	17	26	67	84	195
	39000	24	182	46	16	26	24	24	25	55	139	163	281
	43000	31	211	54	19	31	24	26	29	66	169	195	310

EXAMPLE

The unit used for this example is a FGM170ND with standard supply and return airflow configuration. It is also fitted with an economiser and an electric heater type H.

It is fitted with 2 ADH450 L fans which curve is shown on previous page and 2x 5.5 kW motors..

- Motor rpm: 1465 rpm
- $\cos\phi = 0.79$
- Voltage = 400V
- Current = 9.00A (per fan)

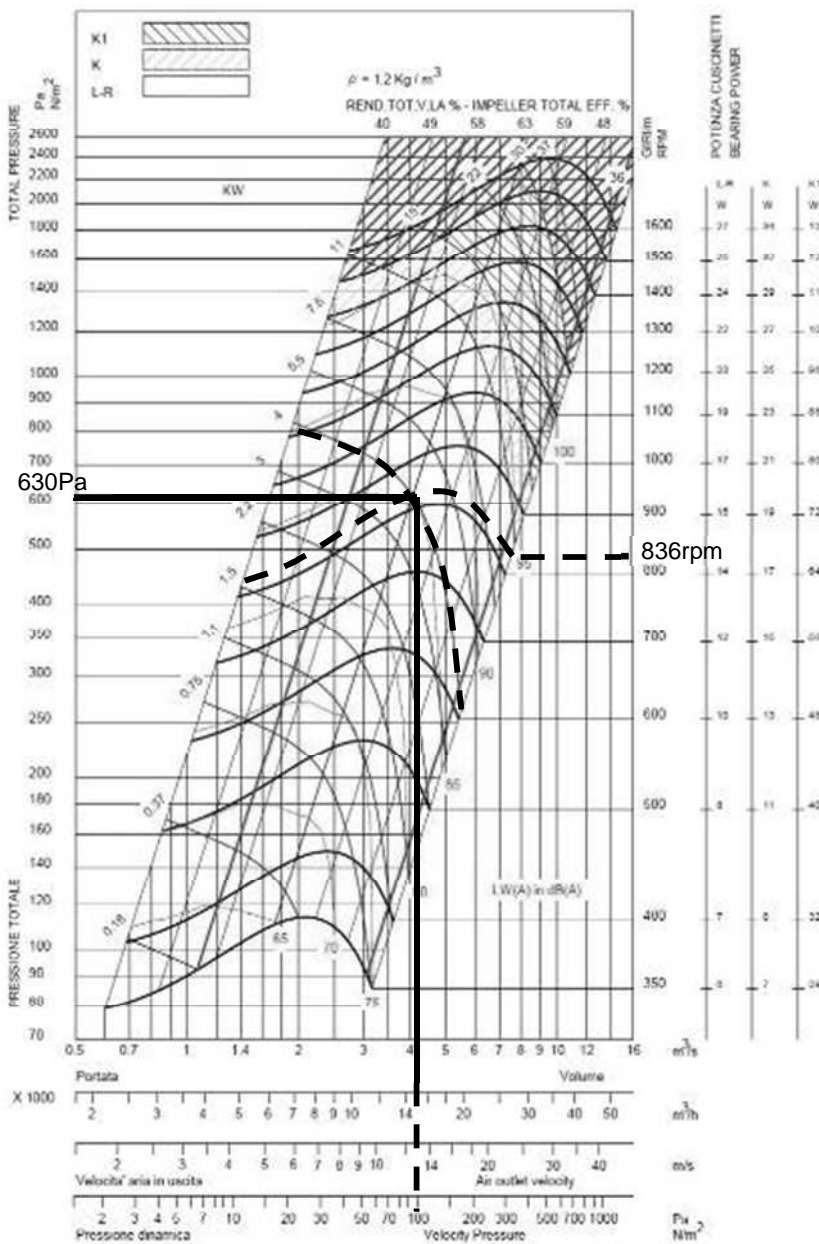
$$P_{\text{mech fan}} = V \times I \times \sqrt{3} \times \cos\phi \times \eta_{\text{mech motor}} \times \eta_{\text{Transmission}}$$

$$= 400 \times 9.1 \times \sqrt{3} \times 0.79 \times 0.89 \times 0.9 = \mathbf{4.0 \text{ kW}}$$

The unit is also fitted with 2 transmission kits 3.

- Fixed Fan pulley: 200mm
- Motor adjustable pulley type "8550" opened 4 turns from fully closed or measured distance between pulley end plates is 29.1mm: from table_1 it can be determined that each motor pulley has a diameter of **114.2mm**

$$\text{rpm}_{\text{FAN}} = \text{rpm}_{\text{MOTOR}} \times D_M / D_F = 1465 \times 114.2 / 200 = \mathbf{836 \text{ rpm}}$$



Using the fan curve, the operating point can be located.

In order to facilitate the calculation, you won't make any mistake by considering that the external static pressure available is the one calculated with one fan providing the half of the nominal flow (here 15000m³/h).

It can be determined that the fan is providing approximately 15000 m³/h with a total pressure $P_{\text{TOT}} = \mathbf{630 \text{ Pa}}$

The pressure losses in the unit are the sum of all pressure drops across the different parts of a unit:

- Coil and filter (**measured**) = 89 Pa
- Inlet into the unit = 50 Pa
- Options = 16 Pa for economiser and 15 Pa for electric heater H

$$\Delta P = 89 + 16 + 15 + 50 = \mathbf{170 \text{ Pa}}$$

The dynamic pressure at 15000m³/h is given at the bottom of the fan curve.

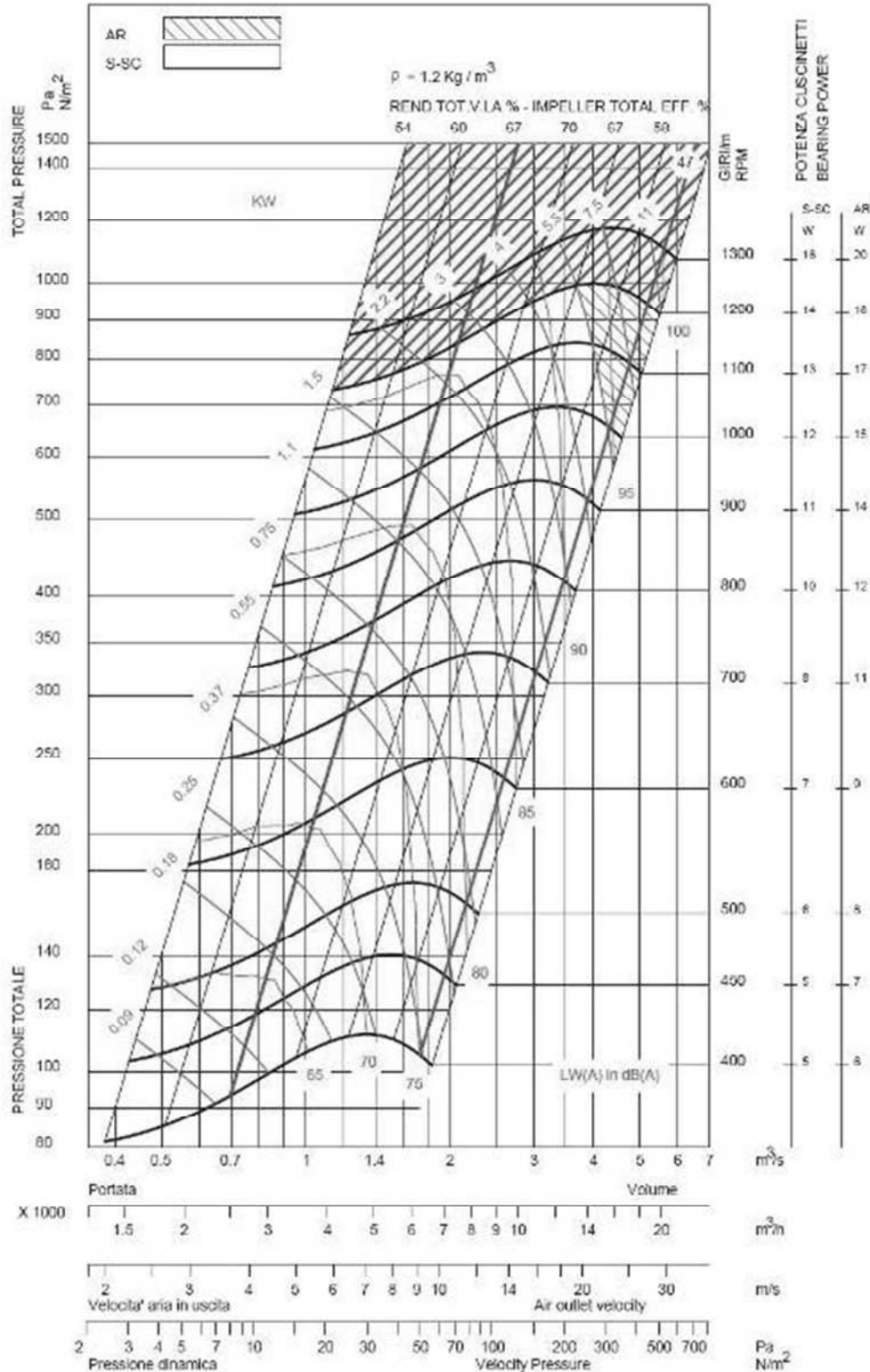
$$P_d = \mathbf{81 \text{ Pa}}$$

The external static pressure available is therefore

$$ESP = P_{\text{TOT}} - P_d - \Delta P_{\text{INT}} = 630 - 91 - 170 = \mathbf{369 \text{ Pa}}$$

AT15-15G2L(*)

AT 15-16
 DIAMETRO GIRANTE 393 mm WHEEL DIAMETER

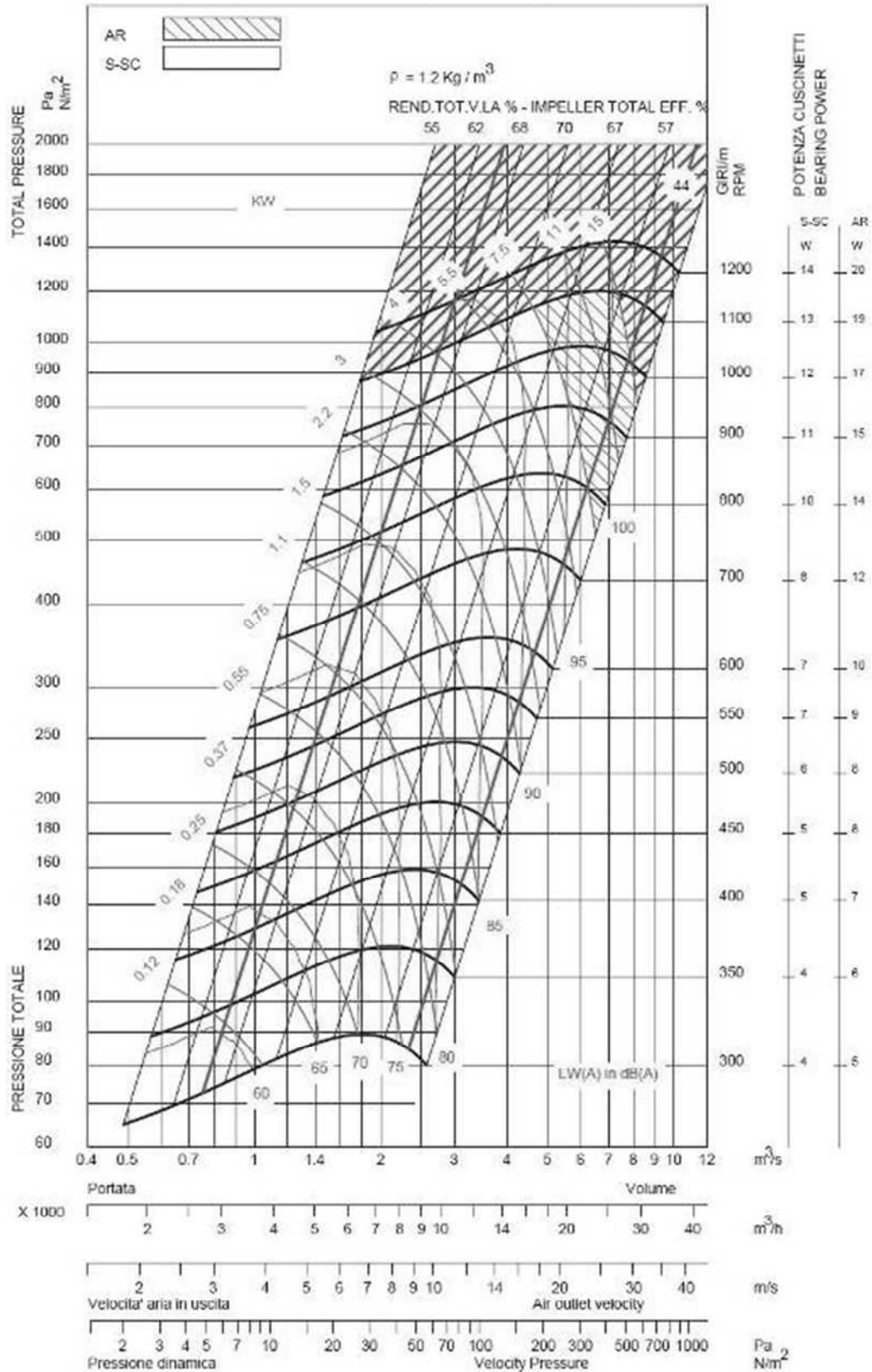


(*) The performances of twin fan units can be calculated starting from the corresponding operation point for a single fan (see the figure behind) by applying the formulas below.

- pressure : $PT_{win} = P \times 1$
- volume flow rate : $Q_b = Q \times 2$
- impeller power: $W_b = W \times 2,15$
- fan speed : $N_b = N \times 1,05$
- Lws : $L_{wsb} = L_{ws} + 3 \text{ dB}$

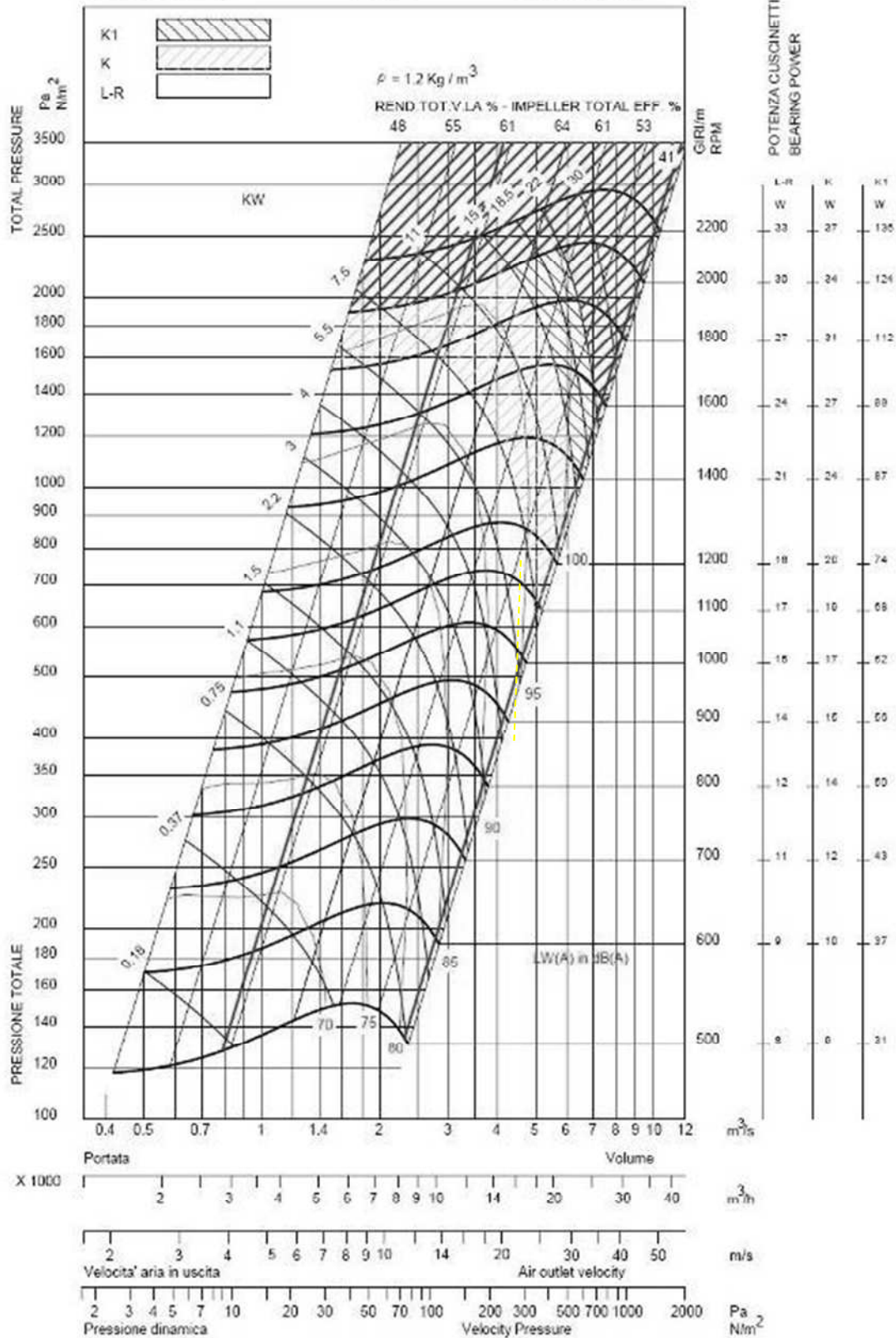
AT18-18S

AT 18-18
 DIAMETRO GIRANTE 470 mm WHEEL DIAMETER



ADH355L

ADH 355
DIAMETRO GIRANTE 355 mm WHEEL DIAMETER



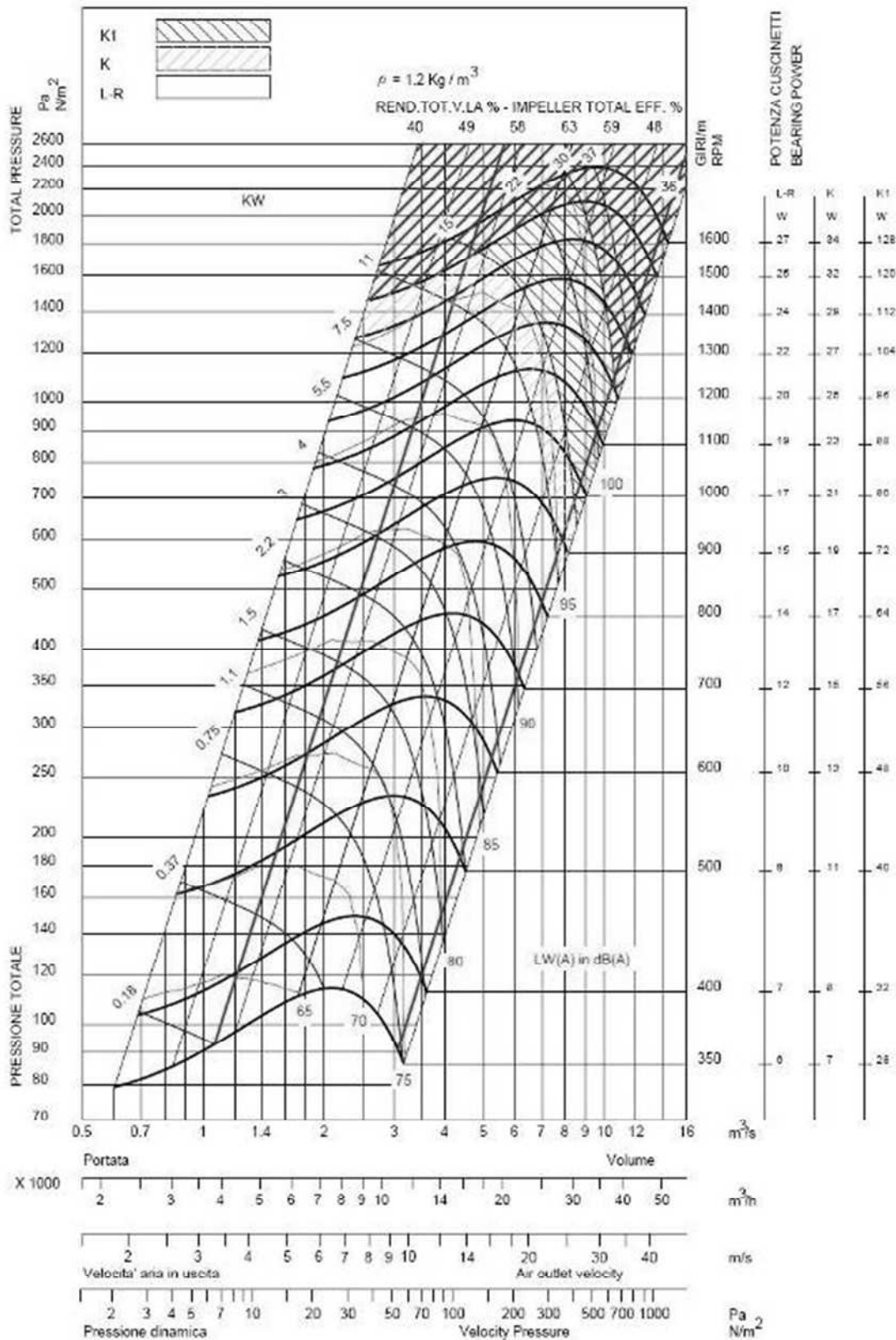
ADH450L

ADH 450

DIAMETRO GIRANTE

450 mm

WHEEL DIAMETER



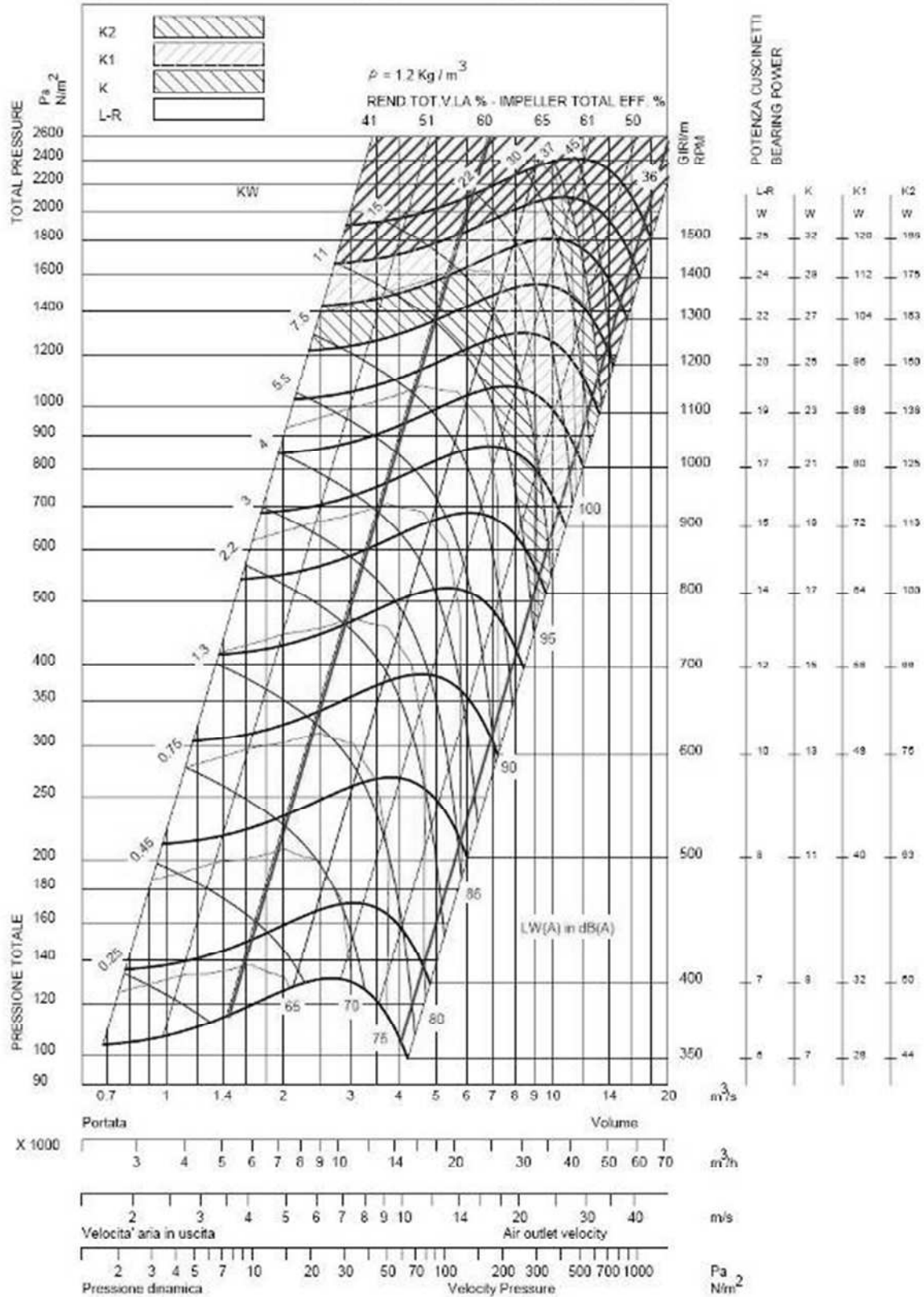
ADH500L

ADH 500

DIAMETRO GIRANTE

500 mm

WHEEL DIAMETER



FILTER REPLACEMENT

After opening the filter access panel, lift the filter retaining log.
The filters can then be removed and replaced easily by sliding the dirty filters out and clean ones in.



The CLIMATIC controller monitors the pressure drop across the filter.

The following set points can be adjusted depending on the installation.

- “Airflow” in page 2333 = 25Pa by default
- “No filter “ in page 2334 = 50Pa by default
- “Dirty Filter” in page 2335 = 250Pa by default

The actual pressure drop measured across the coil can be read on the Climatic Display DS60 in menu 2332.

The following faults may be identified

- Fault code 0001 AIRFLOW FAILURE, if measured ΔP across the filter and coil is below the value set in page 2333
- Fault code 0004 DIRTY FILTERS, if measured ΔP across the filter and coil is above the value set in page 2335
- Fault code 0005 MISSING FILTERS, if measured ΔP across the filter and coil is below the value set in page 2334



Be Careful: do the filters' fire classification's choice according to the local regulations

AIR SOCK CONTROL

FANSTART OPERATION

The use of air socks for space conditioning allows high air volumes to be distributed at low velocity and is becoming a common feature in many applications. To accommodate this trend, Air-sock control is offered which allows the air socks to be progressively filled with air on start up. It takes up to 1 minute to go from 0% of air to full air flow.

START-UP

This option requires the economiser to be delivered inside the machine

Both return air and fresh air damper are linked with an independent actuator.

The return air damper is controlled by a spring return damper driven by the opposite signal delivered to the fresh air damper.



An auxiliary switch allows setting a minimum (few %) of return air opening before the fan is switched on.

Starting steps:

- Both dampers are fully closed and Fan is OFF
- Rooftop is set to RUN (by the schedule or the remote display order)
- Return air damper move to the minimum position manually adjustable on the auxiliary switch, Fresh air damper is OFF
- Fan motor starts
- Return air damper goes to 100% return air slowly during 1 minute allowing the duct to be smoothly inflated
- Finally, the fresh air damper and return air damper return to adjusted fresh air ratio recorded in the climatic60 program

The return air damper with its auxiliary switch

UV LIGHT

UV light option allows to kill bacteria living on the fin.

The UV lamp emits shortwave UV-C ultraviolet radiation which is harmful to skin and eyes

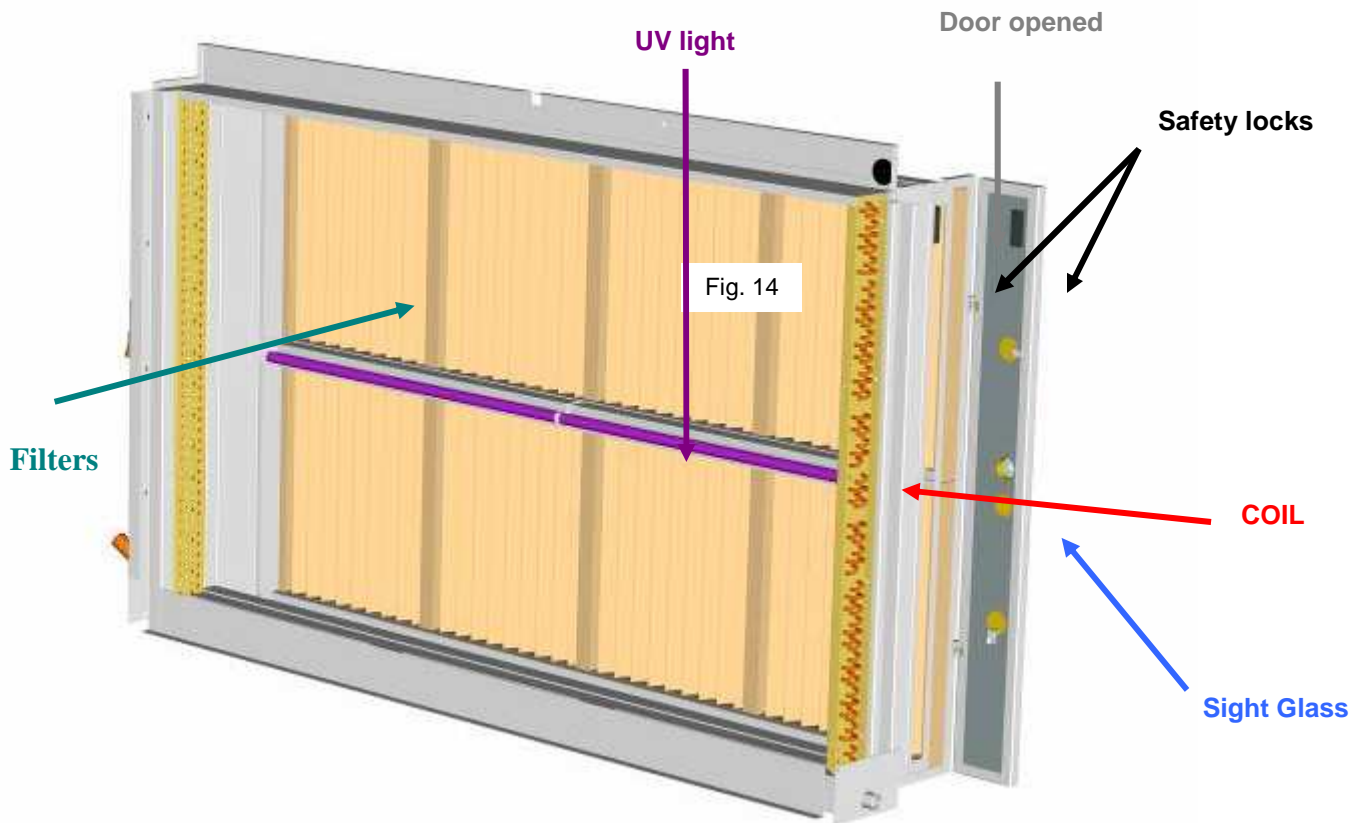
It can cause serious skin burns and eye inflammation within ONE SECOND of exposure

Do not enter the machine while UV are switched on

Make sure the UV light circuit breaker is OFF when opening the return air section door and the supply air section doors

The following logo will appear to inform about the UV-C radiation risk

A safety interlock is fitted to switch off the access doors to the lamps



Electronic expansion valve

2 electronic valves types can be fitted on FlexyII (ASHP only if the option is selected or in Flexy EC)

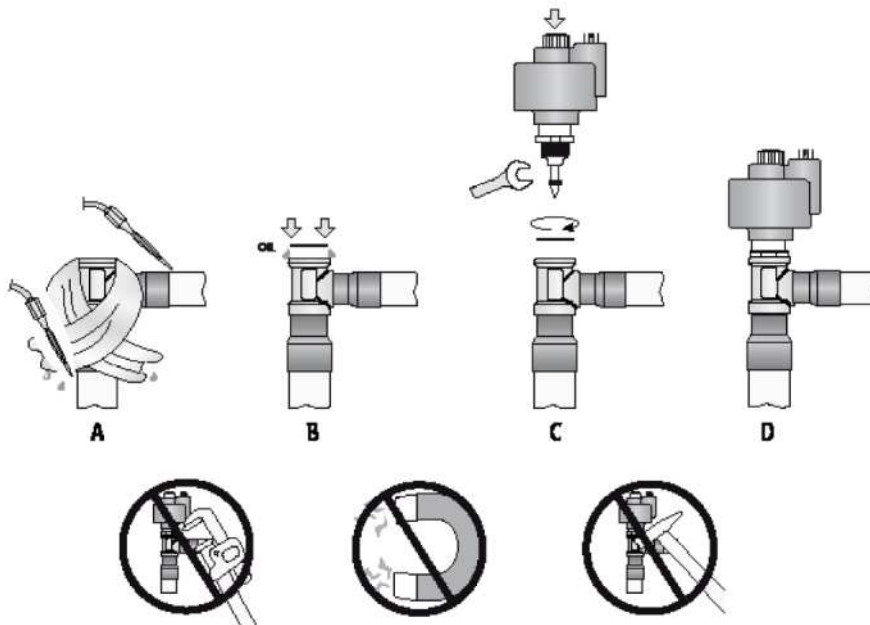
	F box			G box			Hbox
Model designation	085	100	120	150	170	200	230
Reference	E3V45	E3V45	E3V45	E3V45	E3V45	E3V55	E3V55

EEV adjustments

EEV allows to control superheat in biflow operation (see climatic 60 sections).

E3V Welding instructions

Electronic expansion valves are sensitive to dust – strainers must be used in case of replacing.



Ⓜ

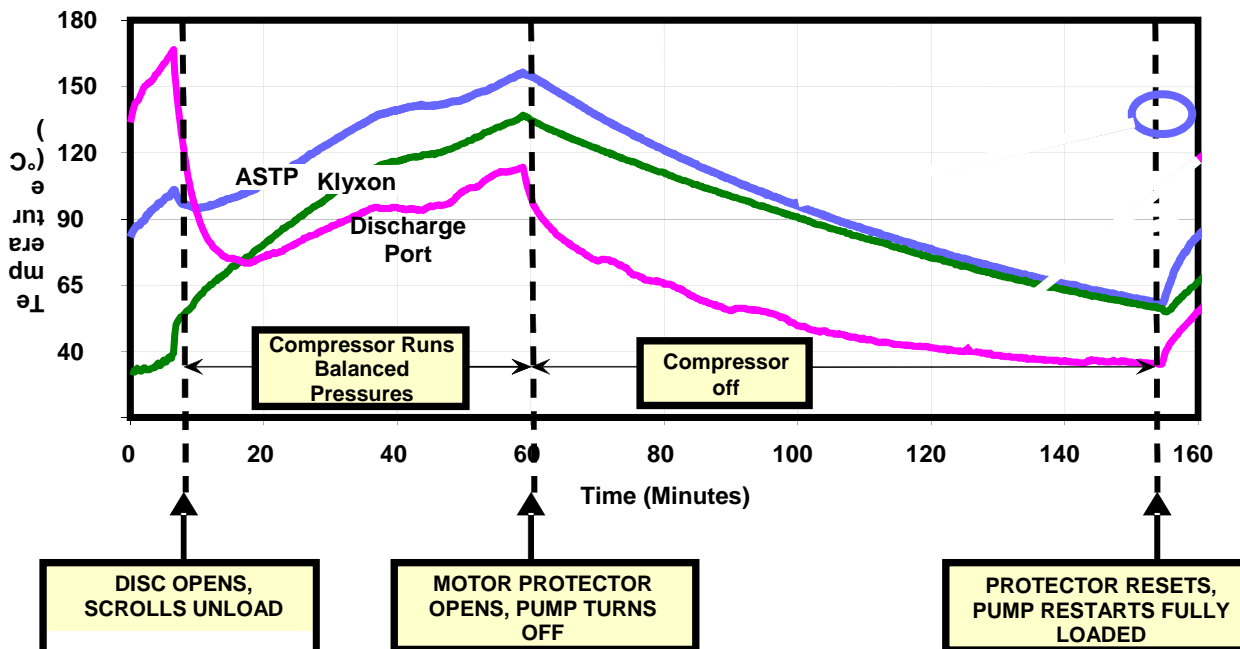
OPERATION MODE EXPLANATION

- ❖ Protection is activated when Scroll Discharge Port. Reaches **150°C** (+/- 17K)
- ❖ Compressor is protected as « Unloaded » but continues to run
 - Protection mode balances discharge/suction pressure
 - Motor heat builds inside compressor
 - No refrigerant flow to carry motor heat away
- ❖ Motor protector opens (Klyxon)
 - Compressor turns off, cools
- ❖ Motor protector resets, compressor restarts
 - Bi-metal disk resets before motor protection
 - Cycle will continue until cause of overheat is fixed

SERVICE A COMPRESSOR

- ❖ What to do?
 - If a protected compressor is identified
 - Stop the compressor
 - Allow to cool thoroughly
 - Restart pump & check for normal operation
- ❖ DO NOT ASSUME A COMPRESSOR RUNNING UNLOADED (BALANCE PRESSURE) IS A FAILURE
- ❖ Likely situations where protection may activate :
 - Initial system charging (or recharging after servicing)
 - Compressor is run with too little system charge
 - Very common on split system
 - Will result in very low suction pressures (<1.7 Bars)
 - Do not disable low pressure cutouts while charging
 - Charge high-side with liquid first
 - Field servicing (system problem causes overheating)
 - Technician will observe « Balanced pressures »
 - Risk of misdiagnosis as failed compressor
 - Must stop pump, cool thoroughly, reset

Temperature Behavior with ASTP Protection



HYDRAULIC CONNECTIONS

Hot water coils offer fully modulating control through the use of a 3 way valve. The hot water coil, connections and valves are all tested at pressure of 15 bars. Frost protection is provided by forcing the opening the 3 way valve when supply temperature from hot water coil falls below 8°C and by stopping the outdoor fan when that supply temperature falls below 6°C. In addition to that, the 3 ways is also opened at 10% value if the outdoor temperature falls below an adjustable value.

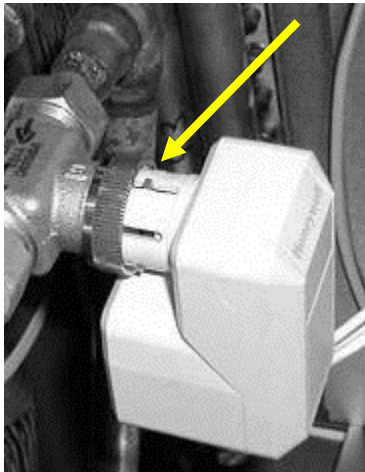
Hot water coils are always factory fitted, wired and fully tested, prior to shipment.

Hot water coil includes automatic purge system.

The hot water coil is fitted with a three way proportional valve and two isolating shut off valves. Two spanners must be used to tighten the connections. One spanner must maintain the valve body when connecting the pipe-work to the main. Failure to do so may damage the pipes joints and invalidates the warranty.

Filling up and starting the system

- Adjust the control for Heating by reducing the simulated ambient temperature down to 10°C
- Check that the red indicators located under the valve actuator are moving correctly with the signal.



- Fill the hydraulic system and bleed the coil using the air vents. Check incoming hot water.
- Check the various connections for possible leaks

FREEZE PROTECTION

1) Glycol for freeze protection.

Check the hydraulic system contains Glycol for protection against freezing.

GLYCOL IS THE ONLY EFFECTIVE PROTECTION AGAINST FREEZING

The antifreeze must protect the unit and avoid icing under winter conditions.

WARNING: Mono-ethylene glycol based fluids may produce corrosive agents when mixed with air.

2) Drain the installation.

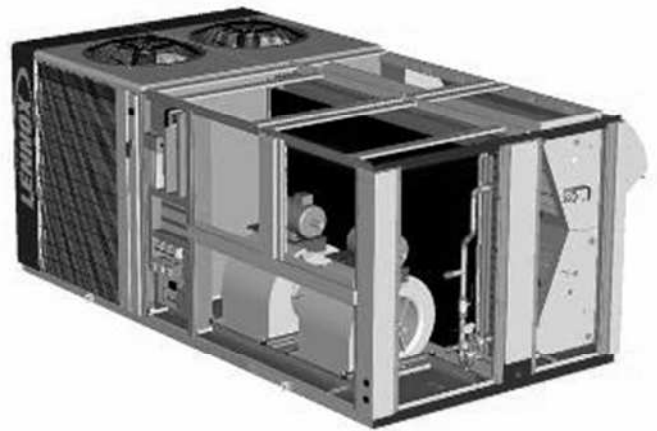
You must ensure that the manual or automatic air bleeders have been installed on all high points in the system. In order to drain the system, check that all the drain cocks have been installed on all low points of the system.

HOT WATER COILS FROZEN DUE TO LOW AMBIENT CONDITIONS ARE NOT COVERED BY THE WARRANTY.

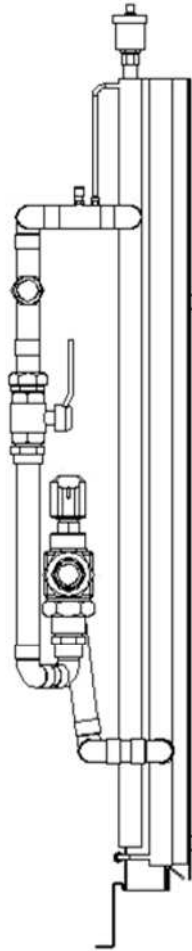
ELECTROLYTIC CORROSION

Attention is drawn to the corrosion problems resulting from electrolytic reaction created by unbalanced earth connections.

ANY COIL DAMMAGED BY ELECTROLYTIC CORROSION IS NOT COVERED BY THE WARRANTY



Hot water coil connection
F-G-H box



Pipe Internal Diameters (DN)

	F085	F100	F120	F150	F170	F200	F230
S	25	25	25	32	32	32	32
H	32	32	32	40	40	40	40

MAXIMUM WORKING PRESSURE: 8 BARS
MAXIMUM WORKING TEMPERATURE: 110°C

GENERAL INFORMATIONS

The electric heater comprises of shielded resistance heaters, which are smooth stainless steel tubes 6 W/cm² capacity. High temperature limit control offers overload protection and is set to 90°C and located at less than 150mm after electric heaters. This is provided as a standard feature on the electric heater, with the electric power supply cables made of reticulated silicon rubber, resistant to temperatures up to 200°C. For any rooftop unit size, three sizes of electric heater are available, S (standard), M (Medium) and H (high).

FLEXY 2 85, 100 and 120 have:

Standard heat: 30 kW, 2 stages

Medium Heat: 54 kW, Fully modulating (Triac)

High Heat: 72 kW, Fully modulating (Triac)

FLEXY 2 150 and 170 have:

Standard heat: 45 kW, 2 stages

Medium Heat: 72 kW, Fully modulating (Triac)

High Heat: 108 kW, Fully modulating (Triac)

FLEXY 2 150 and 170 have:

Standard heat: 72 kW, 2 stages

Medium Heat: 108 kW, Fully modulating (Triac)

High Heat: 162 kW, Fully modulating (Triac)

Capacity of the medium and high heat heater can be limited electronically to an exact value through the CLIMATIC™ 60. To reduce installation time and hence cost, electric heaters are always factory fitted, fully wired and tested, prior to shipment.

Module size (kW)	380V		400V		415V	
	Current (A)	Cap (kW)	Current (A)	Cap (kW)	Current (A)	Cap (kW)
30	40.7	26.8	42.5	29.5	44.5	32.0
45	61.1	40.5	63.8	44.3	66.8	48
54	73.4	48.4	76.6	52.9	80	57.7
72	55.1	36.2	57.5	39.8	60.0	43.1
108	146.8	96.8	153.2	105.8	160	115.4
162	220.2	145.2	229.8	158.7	240	173.1

PRELIMINARY CHECKS BEFORE START-UP

NOTE :

ANY WORK ON THE GAS SYSTEM MUST BE CARRIED OUT BY QUALIFIED PERSONNEL.
 THIS UNIT MUST BE INSTALLED IN ACCORDANCE WITH LOCAL SAFETY CODES AND REGULATIONS AND CAN ONLY BE USED IN PLANNED INSTALLATION CONDITIONS FOR OUTDOOR.
 PLEASE READ CAREFULLY THE MANUFACTURER'S INSTRUCTIONS BEFORE STARTING A UNIT.
 BEFORE COMMISSIONING A UNIT WITH GAS BURNER, IT IS MANDATORY TO ENSURE THAT THE GAS DISTRIBUTION SYSTEM (type of gas, available pressure...) IS COMPATIBLE WITH THE ADJUSTMENT AND SETTINGS OF THE UNIT.

CHECK ACCESS AND CLEARANCE AROUND THE UNIT

- Make sure one can move freely around the unit.
- A minimum one-meter clearance must be left in front of the burnt gas exhaust flue.
- Combustion air inlet and burnt gas exhaust(s) must NOT be obstructed in any way.

SUPPLY NETWORK PIPE SYZING

MALE THREADED CONNECTION FOR GAZ BURNER: 3/4"

Check that the gas supply line can provide the burners with the pressure and the gas flow rate necessary to provide the heating nominal output.

Number of male threaded connections (3/4")

UNIT SIZE	85	100	120	150	170	200	230
S POWER	1	1	1	2	2	2	2
H POWER	2	2	2	2	2	2	2

GAS FLOW (for G20 at 20mbar and 15°C) m³/h

UNIT SIZE	85	100	120	150	170	200	230
S POWER	6.3	6.3	6.3	12.5	12.5	18.8	18.8
H POWER	12.5	12.5	12.5	18.8	18.8	25	25

- For modulating gas we have just H power for F, G & H-box
- The gas supply of a Rooftop gas unit must be realized according to Sound Engineering Practice and the local safety codes and rules.
 - In any case the diameter of pipe-work connected to each Rooftop must not be smaller than the diameter of the connection on the Rooftop unit.
 - Make sure that a shut-off isolation valve has been installed before EACH Rooftop.
 - Check the supply voltage to the exit of the power supply's transformer T3 of the burner: it must be between 220 and 240V.

STARTING UP THE GAS BURNER



- Purge the pipe-work near the connection on the ignition control Valve for a few seconds.
- Check that the unit's treatment "Fan" blower is running.
 - Set the control to "ON" This will priorities the gas burner.
 - Increase the set temperature (room set point temperature) to a temperature higher than the actual room temperature.

Table4 - Standard start-up Chronology

Time in seconds	1	2	3	4	5	6	7	8	9	10	11	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	398	399	400	401	
Operations																																		
Control operation sequence																																		
Extraction fan																																		
Smoke extraction fan "ON"																																		
30 to 45 seconds pre-ventilation																																		
Fire-up spark electrode 4s																																		
Opening of the gas valve "High Heat"																																		
Flame propagation towards the ionisation probe																																		
If ionisation within 5s: Normal running																																		
Otherwise fault on gas ignition control block																																		
After 5minutes, fault reported on the climatic controller																																		

If incorrect sequence refer to the fault analysis table to identify the problem

**PRESSURE ADJUSTMENTS ON HONEYWELL
PRESSURE REGULATING VALVE TYPE VK 4125 P**

Pressure regulator adjustment with 300mbar gas supply:



- The Burner must run in High Heat mode for this check.
- Place the tube of the "accurate" manometer on the Inlet pressure port (Figure 15) of the Gas Regulating Valve after having loosened the screw by one turn

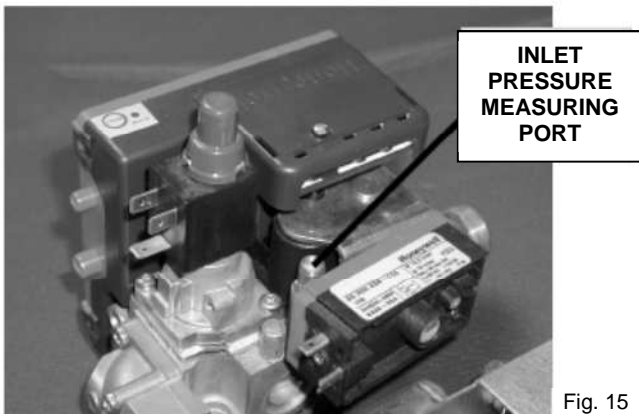


Fig. 15

Check and adjust if necessary the valve Inlet pressure to 20.0mbar (G20) or 25.0mbar for Groningen (G25) or 37.0mbar for propane (G31) after gas burner ignition (fig.16)

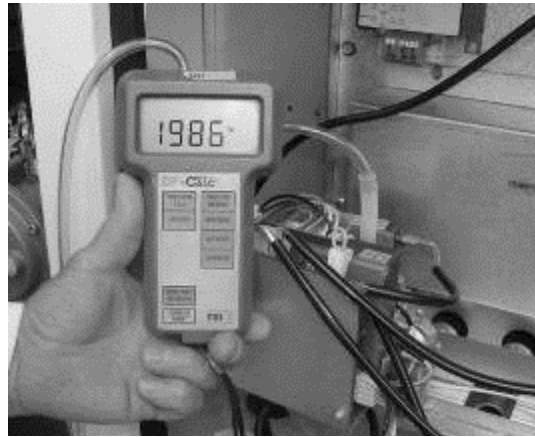


Fig.16

High Heat Injection Pressure Checks

Check and adjust if necessary the valve OUTLET pressure to 10.4mbar (G 20) / 13.1mbar for Groningen (G25) & 34.3 mbar for propane (G31) (fig.17)



The out pressure must be measured on the pressure tap located on the gas injector support bar to avoid the pressure drop due to the elbow after the valve



Fig. 17

Low Heat Injection Pressure Checks

- Switch the control to Low Heat
- Check and adjust if necessary the Outlet pressure to 3.7 mbar (G20) or 5.1 mbar for Groningue(G25) & **15.3 mbar** for propane (G31)(fig.18)

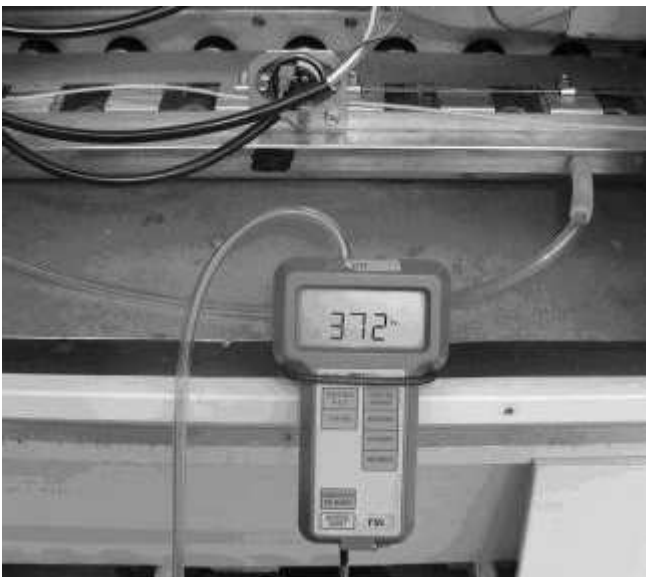
- After the adjustment of the low heat, re-verify the high heat
- re-position the stoppers and close the pressure ports.



Fig.18

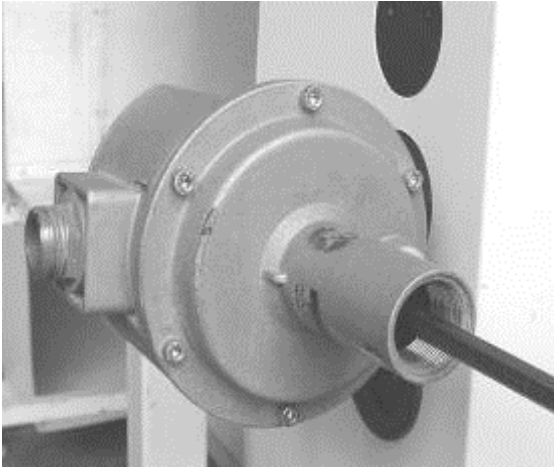
Pressure adjustments table for each type of gas (mbar)

Category	Supply pressure	Low Heat Injection min.	High Heat Injection
G20	20.0 +/- 1	3.7 +/- 0.1	10.4 +/- 0.2
G25 (Groningue)	25.0 +/- 1.3	5.1 +/- 0.1	13.1 +/- 0.2
G31 (GPL)	37.0 +/- 1.9	15.3 +/- 0.3	34.3 +/- 0.6



PRESSURE ADJUSTMENTS ON HONEYWELL PRESSURE REGULATING VALVE TYPE VR 4605P

Pressure regulator adjustment with 300mbar gas supply:



- The Burner must run in High Heat mode for this check.
- Place the tube of the "accurate" manometer on the Inlet pressure port (Figure 19) of the Gas Regulating Valve after having loosened the screw by one turn

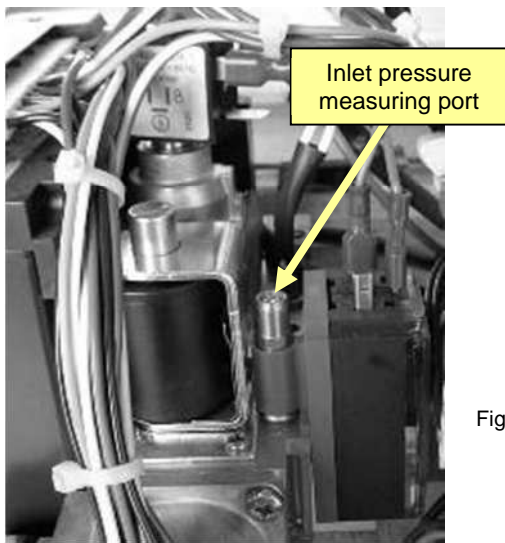


Fig. 19

Check and adjust if necessary the valve Inlet pressure to 20.0mbar (G20) or 25.0mbar for Groningen (G25) or 37.0mbar for propane (G31) after gas burner ignition (fig.20)

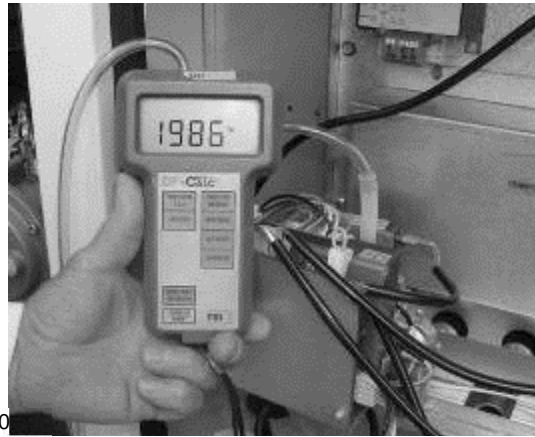


Fig.20

High Heat Injection Pressure Checks

Check and adjust if necessary the valve OUTLET pressure to 8.0mbar (G 20) / 10.4mbar for Groningen (G25) & **28.3** mbar for propane (G31) (fig.21)

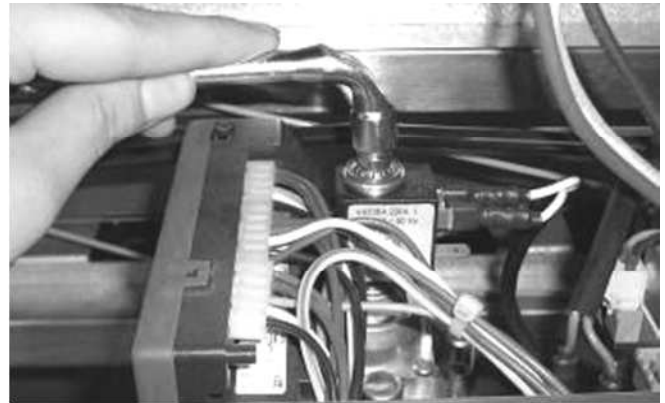
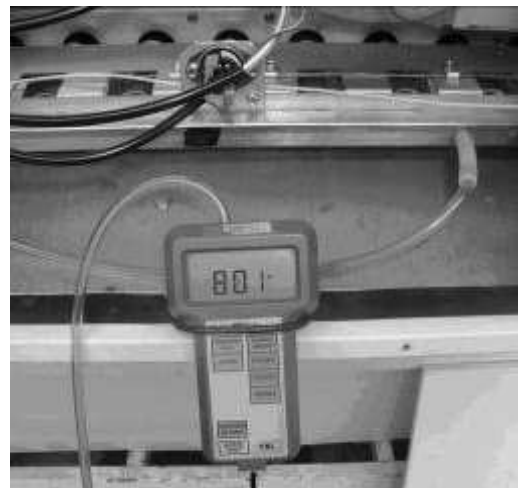


Fig. 21

The out pressure must be measured on the pressure tap located on the gas injector support bar to avoid the pressure drop due to the elbow after the valve



Low Heat Injection Pressure Checks

- Switch the control to Low Heat
- Check and adjust if necessary the Outlet pressure to 3.1 mbar (G20) or 3.9 mbar for Groningen (G25) & **12.6 mbar** for propane (G31) (fig.22)

- After the adjustment of the low heat, re-verify the high heat
- re-position the stoppers and close the pressure ports.

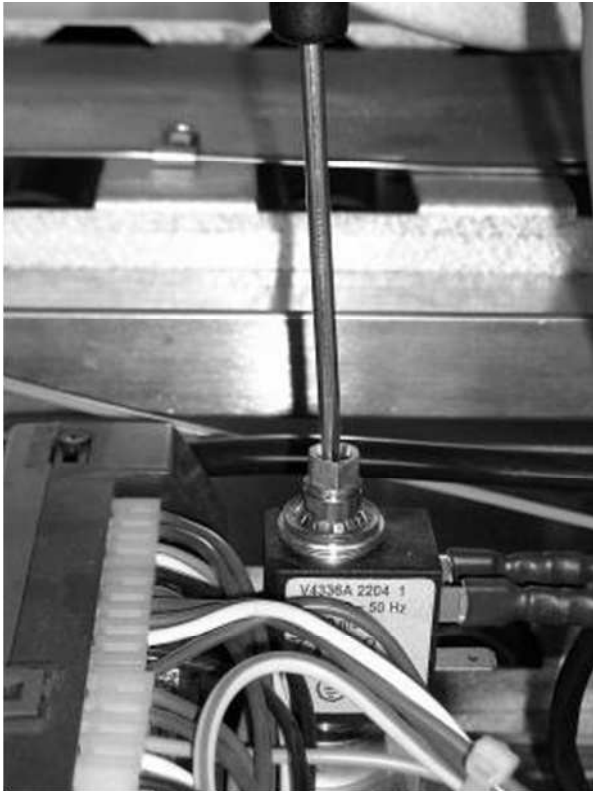
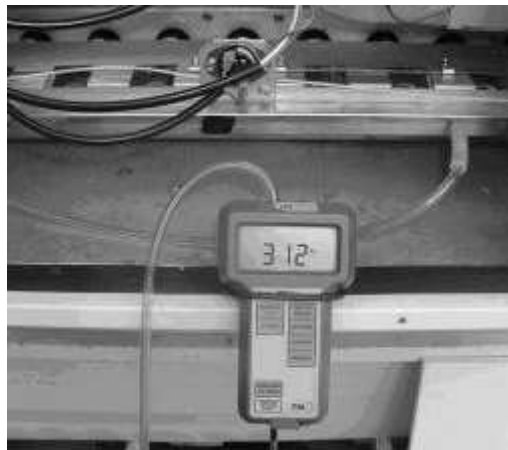


Fig.22

Pressure adjustments table for each type of gas (mbar)

Category	Supply pressure	Low Heat Injection min.	High Heat Injection
G20	20.0 +/- 1	3.1 +/- 0.1	8 +/- 0.2
G25 (Groningue)	25.0 +/- 1.3	3.9 +/- 0.1	10.4 +/- 0.2
G31 (GPL)	37.0 +/- 1.9	12.6 +/- 0.3	28.3 +/- 0.6



BURNER SAFETY CHECKS

Smoke extractor pressure switch Test.

- With the gas burner running, disconnect the flexible tube fitted to the pressure tapping on the pressure switch (Fig. 23).
- The Flame must disappear and the extraction fan must carry on running.
- However, NO fault will be displayed (Gas ignition control block or CLIMATIC).

Fig. 23



- After reconnecting of the tube, the Burner will restart after a period of 30 to 45 seconds pre-ventilation.

Gas pressure switch test

- With the gas burner running, close the shut off valve located before the rooftop. (fig. 24)

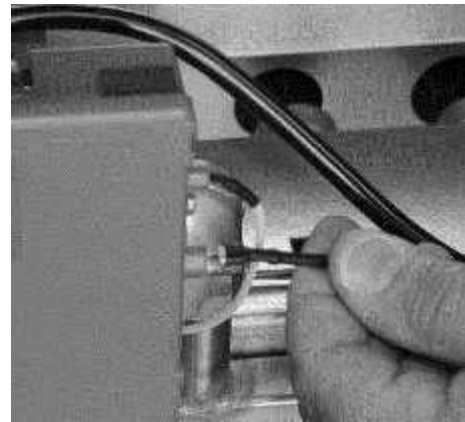
Fig. 24



- The burner stops completely.
- However, No fault light will be displayed on the Gas ignition control block. After 6 Minutes, the CLIMATIC will display a fault.
- Reset the CLIMATIC.

Ionisation Probe test

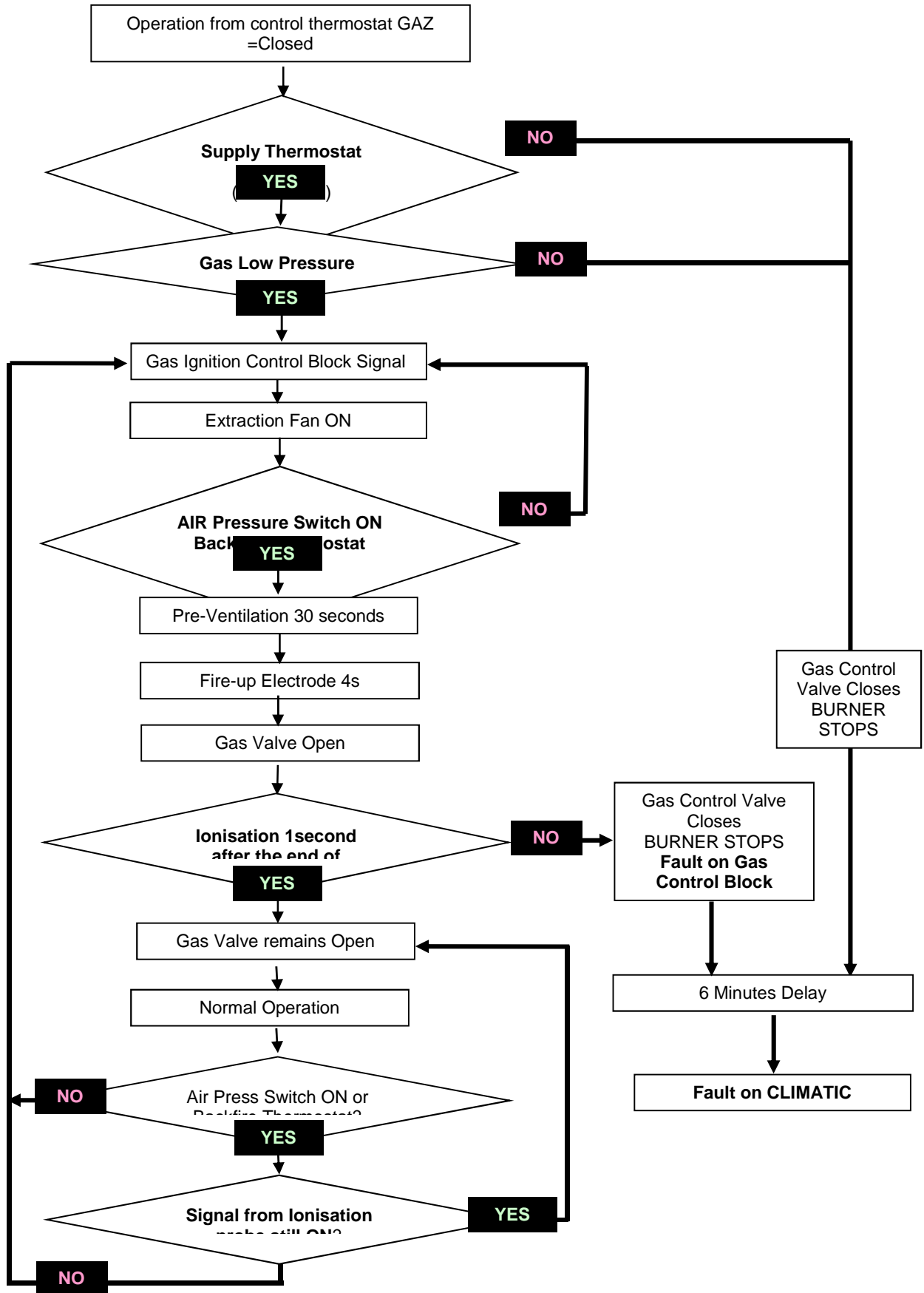
- With the gas burner running, disconnect the terminal plug coming from the ionisation probe to the gas ignition control box.



- The flame disappears
- The fan is still running and attempting to restart the burner (restart cycle 30 to 45 seconds).
- if the ignition probe is not reconnected at the end of the ignition sequence the burner will stop completely.
- The fault light on the gas ignition control block is ON.
- Manually reset the gas ignition control block to eliminate the fault

IN CASE OF PROBLEMS REFER TO THE START UP SEQUENCE FLOWCHART NEXT PAGE

GAS BURNER FIRE-UP SEQUENCE



GAS BURNER TROUBLESHOOTING

If faults reported on CLIMATIC

- Reset the CLIMATIC.
- Check voltage: 230V after circuit breaker.
- Check GAS isolation shut-off valves are open.
- Check GAS pressure at the inlet of the GAS valves. It must be >20 mbar when the Burners shut down.

-Adjust the set points to priorities the burner. Increase the value of the room temperature set point to a temperature higher than actual room temperature.

DIAGNOSTIC TABLE BALTIC GAS BURNER				
STAGE	NORMAL OPERATION	POSSIBLE FAULT	ACTION	POSSIBLE SOLUTION
Heating Requested	Extraction fans start	Fault on the blower thermostat	+ Check connections on the blower thermostat.	+ Replace thermostat
		Lack of gas supply	+ Check valve's opening & supply pressure	+ Restore gas supply
		Fault on the superheat thermostat on the gas burner support bar	+ Check superheat thermostat's operation after manual reset	+ Replace superheat thermostat
Starting of the extraction fans	Extraction Fans are running	After 10 seconds safety shutdown by the ignition control block	+ Check connections of the control block on the gas valve	+ Repositioning of the control block on the valve + Replace valve
		Nothing happens	+ Check the free movement of the fan wheel + Check Electrical connection on the Gas Ignition Control Block and on EF connection Board + Check the Fan supply voltage	+ Replace fan + Replace EF connection board If necessary
Extraction Fan is ON	After 30 to 45 seconds: pre-ventilation the fire-up electrode should spark.	Continuous Ventilation without sparks from fire-up electrode	+ Check the fire-up electrode + Check the pressure drop at the pressure switch: It must be higher than 165 Pa +Check the good operation of the pressure switch using an Ohmmeter and by artificially creating a depression in the tube.	+ Re-position the pressure switch tube. + Change the pressure switch.
Continuous ventilation and sparks from fire up electrode.	After a few seconds the gas burner fires-up	After 4 seconds the GAS Burner still not operating and safety shutdown by the Ignition Control Block.	+ Check injection pressure during start-up (Value for High Heat) +Remove the control box from the gas block.	+ Remove the air from the Gas pipe-work + Adjust the injection pressure to high heat value. + Change the Control Box if the Gas valve is OK.
		Within 4 seconds the gas Burner fires-up BUT safety shutdown from the Ignition Control Block.	+ Check the Position and connection of the Ionisation Probe. It must not be Earthed (230V). + Measure the Ionisation Current: It must be higher than 1.5 microAmps. + Check the Type of GAS.	+Check the whole electrical supply. + Adjust the supply and injection pressure if gas is different from natural gas G20 :(G25 Gas of Groningue for example).

DISASSEMBLING THE GAS BURNER FOR MAINTENANCE PURPOSES

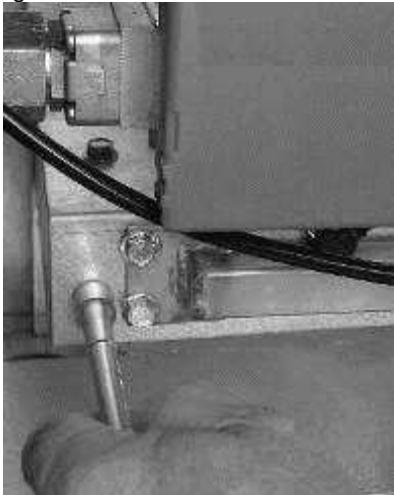
Preliminary Safety Recommendations

- Isolate the unit using the main isolator switch.
- Close off the isolating gas valve located before the unit.
- Disconnect the Pipe-work. Do not discard the seals.



Disassembling the gas «burner support bar»

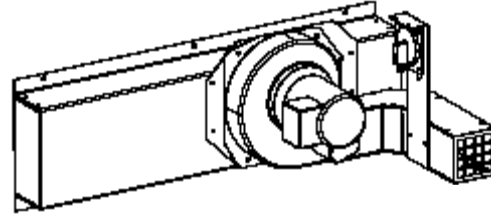
- Disconnect the Electrical Connector on the electric connection board EF47
- Remove the two screws which hold the gas Bar in Place
- Carefully remove the gas « burner support bar » avoiding any damages to the electrodes.



Disassembling the flue

- Electrically disconnect the fan and remove the screws holding it in place.
- Take care not to loose any cage nuts in the smoke box.

ATTENTION: Check the correct position of the pressure tube used by the extraction pressure switch.

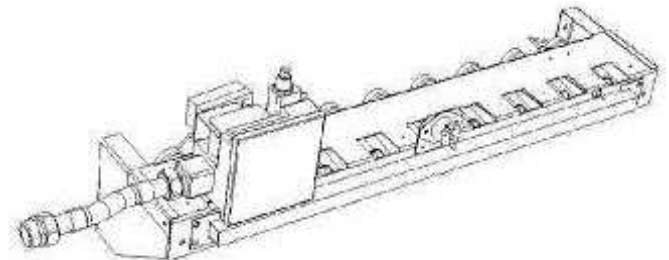


Required Equipment List for maintenance Adjustment and Start-up

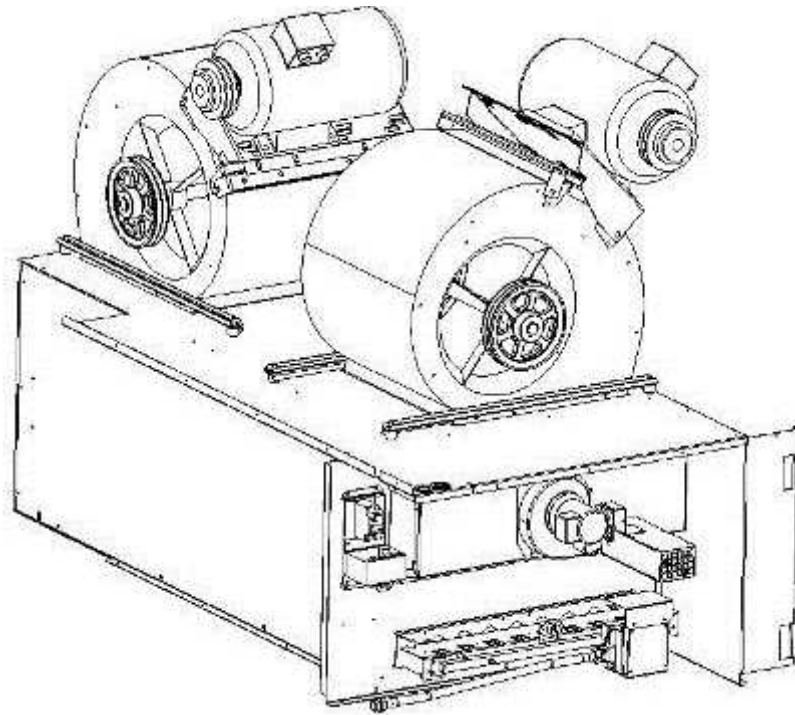
- An accurate manometer from 0 to 3500 Pa (0 to 350 mbar): 0.1% full scale.
- A Multimeter with Ohmmeter and Micro-amps scale
- An Adjustable Spanner
- Tube Spanner Set: 5, 7, 8, 9, 10, and 13.
- Flat spanner: 5, 7, 8 & 9
- Flat Screwdrivers diameter 3 and 4, Phillips n°1
- Vacuum cleaner
- Paint brush



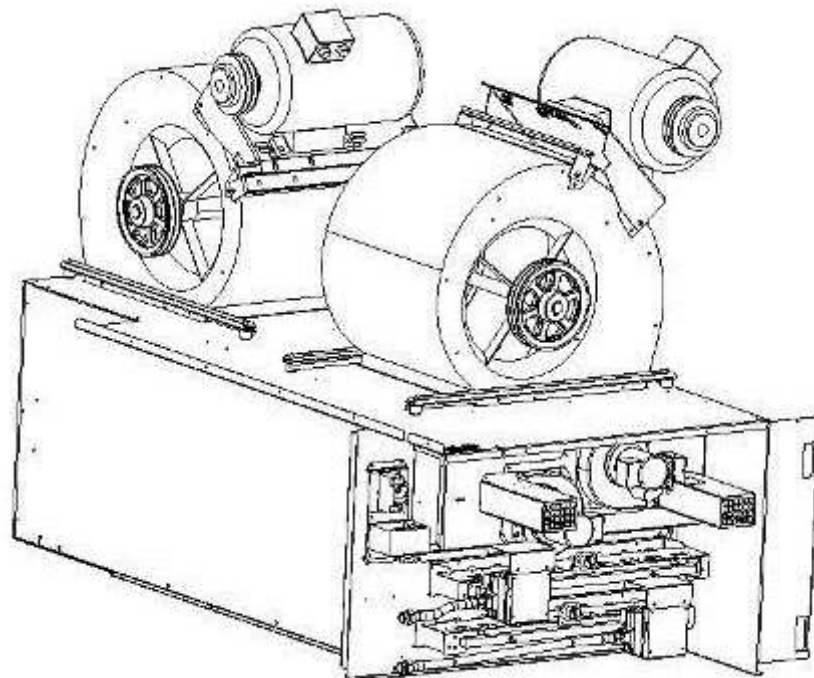
GAS BURNER SUPPORT BAR



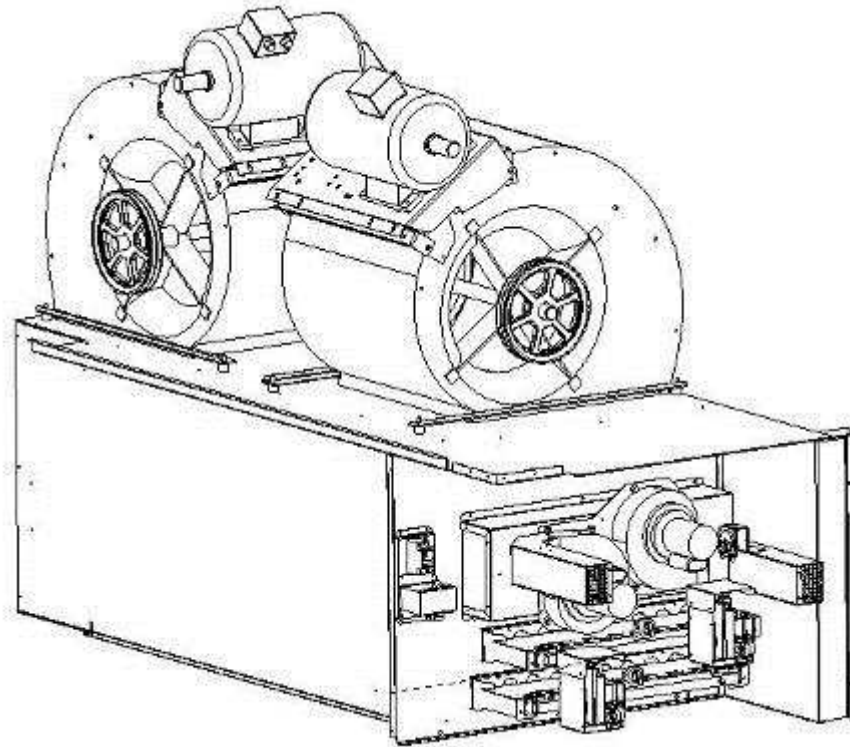
60kW



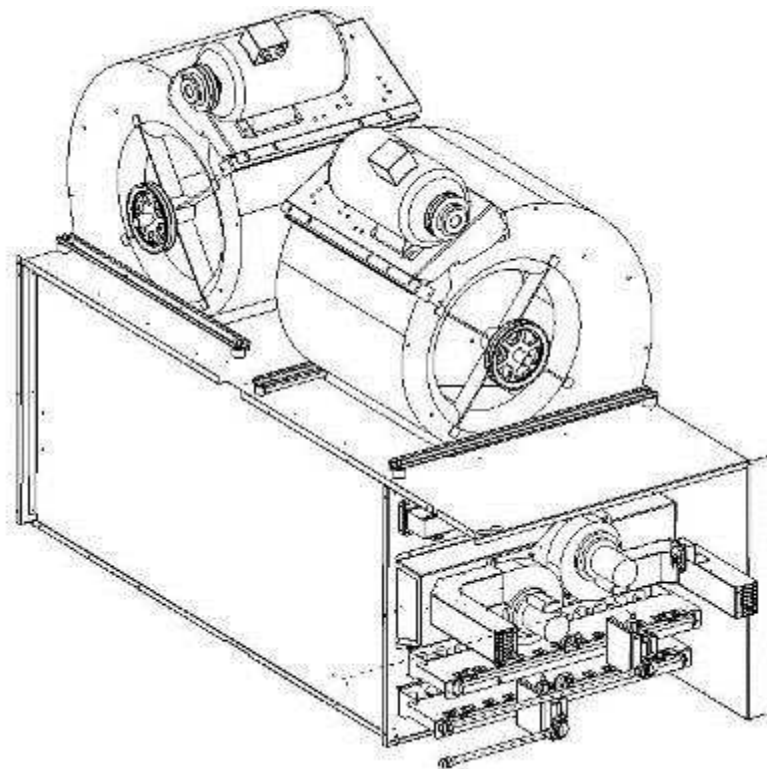
120kW



180kW



240kW



Function

The Climatic™ 60 has free inputs / outputs on the main board BM60 and the expansion board BE60 to offer different possibilities to customize input / output for remote control of the unit.

Description

Free customized inoputs / outputs number depends on added option. Without any option, expansion board BE60 is available with DCBO option.

Below, "not always available" means that some inputs/outputs could be used by options. Refer to the electrical wiring diagram or to the CL60_IOM.

Digital outputs (dry contacts NO)

Maximum 2 free output contacts on BM60 :

- BM_J14-NO7 Not always available
- BM_J15-NO12 Not always available

Maximum 4 free output contacts on BE60

- BE-J5-NO1 Not always available
- BE-J6-NO2 always available
- BE-J7-NO3 always available
- BE-J8-NO4 always available

Functions can be set among followings:

- Alarm Alarm, General
- Minor A Alarm, Minor
- Major A Alarm, Major
- Filter A Alarm, Dirty filters or missing
- Blower A Alarm, Blower
- Comp. A Alarm, Circuit (Compressor)
- Gas A Alarm, Gas burner
- Elec. A Alarm, Electrical heaters
- Frost. A Alarm, Supply to low (Freeze protection)
- Smoke A Alarm, Smoke detection
- Defrost Circuit, Defrosting cycle requested or activated (Compressor)
- Heating Control, Heating mode activated
- Dead Z. Control, Dead zone mode activated
- Cooling Control, Cooling mode activated
- by BMS BMS, Activated by BMS
- Sched. A Schedule, Mode A activated
- Sched. B Schedule, Mode B activated
- Sched. C Schedule, Mode C activated
- Sched. D Schedule, Mode D activated
- Sched.BMS Schedule, Mode BMS activated
- Sched.Z0 Schedule, Zone 0 activated
- Sched.Z1 Schedule, Zone 1 activated
- Sched.Z2 Schedule, Zone 2 activated
- Sched.Z3 Schedule, Zone 3 activated
- Sched.Z4 Schedule, Zone 4 activated
- Sched.Z5 Schedule, Zone 5 activated
- Sched.Z6 Schedule, Zone 6 activated

Analog inputs (NTC probe or 4/20mA signal)

No analog input on BM60 :

Maximum 4 free analog inputs on BE60

- BE_J9-B1 Not always available
- BE_J9-B2 Not always available
- BE_J10-B3 Not always available
- BE_J10-B4 Not always available

Functions can be set among followings:

- Power Power of the unit (ON/OFF)
- Ntc BMS BMS, temperature (NTC) reading for BMS
- Hr. BMS BMS, relative humidity (4-20mA) reading for BMS
- Sp Temp. Control set point, swift of the value (4mA=-5K, 20mA=+5K)
- Sp F.Air Fresh air set point, value (4mA=0%, 20mA=100%)
- Sp Speed Speed blower set point, value (4mA=low level, 20mA=nominal level)
- T. Out. Control, outside temperature by 4-20mA sensor
- T. Room Control, room temperature by 4-20mA sensor
- Hr. Out. Control, outside relative humidity by 4-20mA sensor
- Hr. Room Control, room relative humidity by 4-20mA sensor

Digital inputs (dry contacts)

Maximum 2 free input contacts on BM60 :

- BM-J4-ID4 Not always available
- BM-J4-ID7 Not always available

Maximum 4 free input contacts on BE60

- BE-J4-ID1 always available
- BE-J4-ID2 always available
- BE-J4-ID3 always available
- BE-J4-ID4 always available

Functions can be set among followings:

- Power Power of the unit (ON/OFF)
- Reset Al Reset, Alarm
- Summer Control, Unloaded heating mode
- Winter Control, Unloaded cooling mode
- Low Fan Blower, Force reduced flow (low speed)
- High Fan Blower Force nominal flow (high speed)
- No F.A Fresh Air, Force the damper to close (0%)
- 10% F.A Fresh Air, Force the damper to minimum opening (10%)
- 20% F.A Fresh Air, Force the damper to minimum opening (20%)
- 30% F.A Fresh Air, Force the damper to minimum opening (30%)
- 40% F.A Fresh Air, Force the damper to minimum opening (40%)
- 50% F.A Fresh Air, Force the damper to minimum opening (50%)
- All F.A Fresh Air, Force the damper to full opening (100%)
- No FreeC Fresh Air, Unloaded Free-Cooling mode
- No FreeH Fresh Air, Unloaded Free-Heating mode
- No Air.Q Air Quality, Unloaded control
- Defrost Circuit, Defrosting cycle delayed (Compressor)
- 50% Cp. Circuit, Unloaded immediately 50% of compressors running
- No Comp. Circuit, Unloaded all compressor
- No HPump Circuit, Unloaded all compressor in heat-pump mode
- No Cp&Ht Circuit and Heaters, Unloaded all
- 50% Ht. Heaters, Unloaded immediately 50% of heaters running
- No Heat. Heaters, Unloaded all heaters
- Prio.Ht. Control, Force the Priority of the heaters vs Compressors
- Tcb G TCB, G
- Tcb B TCB, B
- Tcb Y1 TCB, W1
- Tcb Y2 TCB, W2
- Tcb W1 TCB, Y1
- Tcb W2 TCB, Y2
- for BMS BMS, input reading for BMS
- Sched. A Schedule, Force the Mode A
- Sched. B Schedule, Force the Mode B
- Sched. C Schedule, Force the Mode C
- Sched. D Schedule, Force the Mode D
- Sched.BMS Schedule, Force the Mode BMS

REFRIGERATION		
FAULT	POSSIBLE CAUSE AND SYMPTOMS	SOLUTION
LP PROBLEMS AND LP CUT OUTS	Refrigerant charge too low	Measure the superheat and sub-cooling Good if 5°C < SC < 10°C and 5°C < SH < 10°C Bad if SC > 10°C and SH too low Check superheat adjustment and charge unit (a leak check must be carried out)
	In Heat Pump Mode the temperature difference between T outdoor and T _{evap} . (Dew) is too high 5°C < Delta T < 10°C excellent 10°C < Delta T < 15°C acceptable 15°C < Delta T < 25°C too high	If too high check the coils are clean or check coil internal pressure drop between the liquid line and the suction line Good if < 3bar Too high > 3 bar (coil blocked)
	Refrigeration circuit blocked in distribution	Stop the fan and create icing of the coil. Check all circuits freeze evenly across the whole surface of the coil If some parts of the coil do not freeze this could indicate a problem with the distribution
	Liquid line drier blocked. High temperature difference between inlet and outlet of the drier	Change filter drier
	Contaminant in the expansion valve	Attempt to free the valve adjusting element by freezing the valve and then heating the thermostatic element. Replace the valve if necessary
	Expansion valve not adjusted properly	Adjust the expansion valve
	Ice plug in the expansion valve	Heat the main body of the valve. If the LP increases and then decreases gradually, empty the circuit and replace the drier
	Incorrect insulation of the thermostatic bulb of the expansion valve	Superheat too low: adjust superheat Move the thermostatic element along the pipe Insulate the Thermostatic element of the valve
	Low Pressure Switch cut out point too high	Check the cut out pressure of the Low Pressure switch: It must be 0.7 +/- 0.2bar and must close at 2.24 +/- 0.2 bar
	LP cut out due to not enough defrost on heat pumps	Adjust the CLIMATIC settings to extend the defrost cycles or shorten the time between defrosts

REFRIGERATION			
FAULT	POSSIBLE CAUSE AND SYMPTOMS	SOLUTION	
HP PROBLEMS AND HP CUT OUTS	Incorrect airflow rates	<p><u>Heat pump mode:</u> Check the filter before the indoor coil measure and estimate the airflow rate increase the speed of the fan</p> <p><u>Cooling mode:</u> Check the condenser fan (Amps)</p>	
	Incorrect water flow rate (Water cooled rooftop only)	Check water flow value	
	Moisture or contaminants in the system	<p>Summer operation Several hours after the unit has stopped, check the correspondence between the measured pressure and the outdoor temperature</p>	<p>If the circuit pressure is higher (<1bar) than the saturated pressure corresponding to the measured outdoor temperature, there is possibility that some contaminants are present in the system. Reclaim the refrigerant, and vacuum the circuit (Ensure very low and slow vacuum for R407c) Recharge the unit</p>
		Condenser coil is obstructed		Check the condenser coil and clean is necessary
	Water Filter is obstructed (only for Water Cooled Rooftop)	Check the water filter and clean if necessary	
	Recycled Hot Air	Check clearance around the condenser	
	Strong variations of pressure (2 to 3 bar) Thermostatic Expansion Valve "hunting"	Incorrect adjustment of the expansion valve	Refer to LP problems and LP cut out section
Low refrigerant charge			
Filter drier obstructed with gas bubbles at the expansion valve inlet Moisture in the system			
Very high discharge temperature, High amps measured at compressor	Very high superheat, very hot compressor	<p>Open the superheat adjustment on the expansion valve. Check the pressure drop on the filter drier in the suction line</p>	
	Four Way reversing valve possibly blocked, abnormal noise from the valve, low LP and increasing HP	<p>Check operation of the valve by going through cycle inversions. Change if necessary. Refer to LP problems</p>	

INDOOR FAN BLOWER		
FAULT	POSSIBLE CAUSE AND SYMPTOMS	SOLUTION
High amps on action Fan motor	Pressure drop in the ducting installation too low.	Reduce the rotation speed of the fan Measure and estimate the airflow and pressure and compare with the specification from customer.
High amps on reaction Fan motor	Pressure drop in the ducting installation too high	Reduce the rotation speed of the fan Measure and estimate the airflow and pressure and compare with the specification from customer.
Unstable running and high vibration	Fan jumping from one operating point to the other	Change rotation speed of the fan

OUTDOOR AXIAL FAN		
FAULT	POSSIBLE CAUSE AND SYMPTOMS	SOLUTION
Heat Pump mode: Circuit breaker open	High Amps due to a low voltage from the main supply	Check the voltage drop when all components are running. Change the circuit breaker for one with a higher rating
	High amps due to freezing of the coil	Check the adjustable amps on the motor starter. Adjust the defrost cycle set points
	Water ingress in the motor connection box.	Change the component

ELECTRICAL HEATER		
FAULT	POSSIBLE CAUSE AND SYMPTOMS	SOLUTION
High Temperature trip out on electric heater	Low airflow rate	Measure and estimate the airflow and pressure and compare with the specification from customer.
	Incorrect position of the Klixon	Check that the Klixon, is positioned in the airflow, relocate Klixon if necessary Check that there is no heat transfer from the Klixon support.

WATER LEAKS		
FAULT	POSSIBLE CAUSE AND SYMPTOMS	SOLUTION
Water found in the ventilation section	Cooling mode: Water carried away from the coil because of excessive airflow and speed on the coil.	Estimate the airflow rate and check the speed is lower than 2.8 m/s
	Low air pressure in the compartment due to a high airflow rate or a high pressure drop before the fan	Check filter Reduce airflow rate
	Check seals around the ventilation section	Check the door seal Check for the presence of silicone seals in the corners of the door and at the bottom of the refrigeration section bulkhead.
Water ingress in the filter compartment	Water ingress through a leaking fresh air hood or when running 100% fresh air	Check the seals and flanges in the fresh air hood Reduce the airflow rate if necessary

CLIMATIC DISPLAYS		
FAULT	POSSIBLE CAUSE AND SYMPTOMS	SOLUTION
Nothing is written on the screen but it's enlightened	Idem	Press on the three right-hand side's buttons at the same time during a few seconds then reconfigure display address setting at 32.
Nothing occurs on the unit or an option disappeared	Possible problem of units' configuration	Check the instructions from 3811 to 3833 and reconfigure options if necessary.
The message "no link" appears	Problem of addresses' recognition	Disconnect the DS from the unit and then reconnect it.
All the units are extinct	Problem main board plan addressing	Disconnect then re-plug; disconnect each unit from the others then change all the plan addresses

Rooftops are generally placed on the roof but can also be installed in technical rooms. These units are very robust but minimum regular maintenance is required. Some moving parts in the units can suffer from wear and tear and must be checked regularly (belts). Other parts can get clogged by dirt carried in the air (filters) and must be cleaned or replaced.

These units are designed to produce cooled or heated air through the use of a refrigeration vapour compression system, it is therefore imperative to monitor the refrigeration circuit operating pressures and check the pipe-work for leaks.

The table below, details a possible maintenance plan, including the operations to be carried out and the periodicity at which they must be accomplished. It is recommended to follow such a plan to keep a rooftop unit in good working order. Regular maintenance of your rooftop will extend its operating life and reduce operating faults

Symbols and Legend:

- Operation which can be carried out by on-site maintenance technicians.
- Operation which **must** be carried out by qualified refrigeration personnel, trained to operate on this type of equipment.

NOTE :

- Times are given for information purpose only and may vary depending on the unit size and type of installation.
- Coil cleaning must be carried out by qualified personnel using appropriate methods that won't damage the fins or the tubes.
- It is recommended to keep a minimum stock of common replacement parts in order to be able to carry out regular maintenance operations (i.e. filters). You can contact your local Lennox representative which can assist you in establishing a parts list for each type of equipment.
- The access ports to the refrigeration circuits **MUST** be leak checked every time gauges are connected to the service ports

Task	Operating mode	Monthly	Quarterly	6 monthly	Yearly before winter	Estimated time (min)
Clean or replace filters : disposable or metal frame	Replace filters with new ones if disposable. Vacuum clean or blow the dirt. Wash and dry carefully. Replace media if necessary. Blocked filter will reduce the performance of the unit. THE UNIT MUST NOT OPERATE WITHOUT FILTERS.	O				20
Visual check of the oil level	Visually check the oil level through the sight glass on the side of the compressor casing	O				2
Position check of the compressor crankcase heater	Check the heating resistance is fitted properly and tight around the compressor body	O				2
Belt tension check	Check belt tension (information on installation manual). Replace belt if necessary.	O				10
Centrifugal fan bearings check	Isolate unit from the main power supply. Push the fan wheel manually and check for abnormal noises. Bearings are lubricated for life but may need replacement after 10000 hours.	O				10
Check absorbed amps	Check absorbed amps on all the three phases. Compare with the nominal value given in the electrical wiring diagram.		□			15
Check smoke detector	Start the unit. Trigger the smoke detector by moving a magnet around the detector head. Reset unit and control		□			5
Check CLIMATIC control, set-points and variables	Refer to the commissioning sheet. Check all set points are set according to this document.		□			15
Check clock settings	Check the time and date of the control		O			5
Check the position and tightness of refrigeration components	Check systematically all connections and fixings on the refrigeration circuit. Check for oil traces, eventually a leak test should be conducted. Check operating pressures correspond to the ones indicated on the commissioning sheet.		□			30
Check airflow rate safety switch (if fitted)	Shut down supply fan. The fault must be detected within 5 seconds.			O		
Check freeze protection on hot water coil				□		5
Check three way valve on hot water coil	Increase room set-point 10°C above the actual room temperature. Check operation of the piston. It must move away from the valve head. Reset the control			□		5
Check economizer actuator operation	Check all fixings and transmission. Stop the unit using the control. The fresh air damper must close. Start the unit. The fresh air damper should open.			□		5
Check refrigeration 4 way valve	With the unit running in cooling mode, increase the room set-point temperature by 10 °C. The unit should switch to heat pump mode. Reset the control.			□		5
Check tightness of all electrical connections	Power down the unit and check and tighten all screws, terminal and electrical connections, taking a particular attention to the power lines and low voltage control wires.			O		30

Task	Operating mode	Monthly	Quarterly	6 monthly	Yearly before winter	Estimated time (min)
Check HP/LP safety switches	Install manifold gauges on the circuit to be checked. Shut down the axial fans and wait for the HP switch to shut down the compressor : 29 bar (+1/-0) auto reset 22 bar (+/- 0,7). Reconnect fans. Switch off the centrifugal supply fan and wait for the LP switch to cut out : 0,5 bar (+/- 0,5) reset 1,5 bar (+/- 0,5).			☐		15
Check outdoor fans and fan guards	Check the fan blades conditions and all fan guards and protections.				○	5
Check position of all sensors	Check the good positioning and operation of all sensors. Check the values given in the control system. Replace sensor if necessary.				○	5
Check and clean if necessary all fresh air grilles	Check the fresh air grilles (if fitted). If dirty or damaged, remove from the unit and clean with high pressure water cleaner. Refit on unit once clean and dry.				○	5
Clean condensate drain, indoor and outdoor coils (following local regulations)	Visually check the coils for dirt. If not too dirty, cleaning with a light brush may be enough (WARNING : fins and copper tubes are very fragile ! Any damage WILL reduce the performances of the unit). If very dirty, deep industrial cleaning is required using de-greasing agents (external contractors must be called).				○/☐	1 h if cleaning.
Check electrical heater element for excessive corrosion	Isolate the unit. Pull the electrical heater out of the heater module box and check the resistances of traces of corrosion. Replace resistance as required.				○	1 h if replacement
Check anti-vibration mountings, for wear and tear	Visually check anti-vibration mountings on compressors and centrifugal fan. Replace if damaged.				○	1h if replacement
Check refrigeration circuit for traces of acid in the oil	Take a sample of oil from the refrigeration circuit.				☐	
Check glycol concentration in the hot water coil circuit	Check the glycol concentration in the pressurised water circuit (a concentration of 30% gives a protection down to approx. -15°C). Check the circuit pressure				☐	30
Check defrost cycle with 4-way valve inversion	Switch the unit to heat pump mode. Change the set point to obtain the standard defrost mode and reduce the cycle time to the minimum value. Check the operation of the defrost cycle				☐	30
Gas burner module check for corrosion	Pull out the burner to access the tubes (refer to Gas burner section in the installation manual)				☐	30
Sweeping and cleaning the gas burner	Clean the in-shot burners and the blower wheel lightly with a brush. Sweep the flue and flue box. Wipe-off the dust from the housing of the motor. Clean combustion air inlet louver. Pull-out baffles from the tubes, sweep the tubes. CHECK FLUE BOX GASKET.				☐	30
Gas supply pressures/connections checks	Refer to gas burner section in the installation manual for details				☐	15
Gas regulation valve settings	Refer to gas burner section in the installation manual for details				☐	30
Check gas burner safety switch	Refer to gas burner section in the installation manual for details				☐	30
Check and clean water filter (only for water cooled rooftop)	CAUTION : the water circuit may be pressurized. Observe the usual precautions when depressurizing the circuit before opening it. Failure to observe these rules could lead to accidents and cause injury to service personal.				☐	20

Refrigeration components	Designation	Family	Code
Compressor	ZP154KCE	Comp	4220431T
	ZP182 KCE	Comp	4220432V
	ZP235 KCE	Comp	4220433W
INDOOR coil	ID Fbox	Coil	4310442L
	ID Gbox	Coil	4310443M
	ID Hbox	Coil	4310472H
OUTDOOR coil	OD Fbox	Coil	4310445P
	OD Fbox	Coil	4310446R
	OD Gbox	Coil	4310447T
	OD Gbox	Coil	4310448V
	OD Hbox	Coil	4310449W
	OD Hbox	Coil	4310450X
Expansion valve	Détendeur thermostatique TGEL20-19	Refrig	4720918E
	Détendeur thermostatique TGEL20-23	Refrig	4720912V
	Détendeur thermostatique TGEL40-31	Refrig	4720924M
	Electronic expansion valve E3V45	Refrig	4720928T
	Electronic expansion valve E3V55	Refrig	4720155H
	cable EEV 3M	Refrig	4720931X
	cable EEV 6M	Refrig	4720156J
	Driver EEV	Refrig	4770717M
Filter Drier	DMB165S	Refrig	4720905K
	DML165S	Refrig	4720907M
	DML167S	Refrig	4720908N
Non return valve	NRV16S	Refrig	4720002H
4 way valve	STF0715	Refrig	4740101N
	STF1511	Refrig	4740104T
	STF2506	Refrig	4740105V
	STF3006	Refrig	4740107X
	4 way valve coil	24V 50	Refrig	4740103R
Pressure switch	HP sensor 4/20mA 45 bar Quick-On	Control	4770212V
	BP sensor 0/5V 20 bar Quick On	Control	4770214X
Flexible inox	Flexible INOX 7/8 DN20 600mm	Hoses	4681043P
	Flexible INOX 1 3/8 DN32 800mm	Hoses	4681044P
	Flexible INOX 1 5/8 DN40 850mm	Hoses	4681025M
Tightening ring	D28 428 Pa	Pipping	5680573L
	D35 535 Pa	Pipping	5680574M
	D40 542 Pa	Pipping	5680575N

Casing	Designation	Family	Code
Economiser	Fresh air hood grille Ebox	Sheetmetal	4921086T
	Fresh air hood grille Fbox	Sheetmetal	4921087V
	Fresh air hood grille Gbox	Sheetmetal	4921088W
Lock1/4T	1000-U188-N2+51+990	Fixings	5880163Z
Handle dorr	1091-103-02	Fixings	5880109W
Handle Outdoor coil	M443/140N	Fixings	5880160W
Charnieres clips	8576178 SNAP LINE	Fixings	5880187L

Outdoor fans	Designation	Family	Code
Axial Fan	FE071	Fan	4921080K
	A6D800-AU0101 F-G box	Fan	4921099M

	A6D800-AU0101 Hbox	Fan	4921098L
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Electrical & control components	Designation	Family	Code
Climatic	Main control board BM60 medium	Control	4770702P
Climatic	Main control board BM60 medium	Control	4770708Y
Sensors	Ntc -50+105 7 metres	Control	4770721T
Sensors	Ntc -50+105 3 metres	Control	4770720R
Pressure sensor	Analog filter sensor	Control	4730097A
Ambient sensors	Ambient sensors	Control	4770613K
Soft starter	ATS 01N222QN	Control	4780414X

Miscellaneous	Designation	Family	Code
siphon	durite ep 5mm noir	Fixings	4680360K
Key	cle double barre	Fixings	5880158T

Ventilation & Filtration components	Designation	Family	Code
Filter EU3	625x500x50	Filters	4960118T
Filter EU4 metal frame	625x500x50	Filters	4960031P
Filter EU4 rechargeable	625x500x50	Filters	4960099P
Filter EU7	625x500x50 GP10	Filters	4960066R
Filter EU3	800x500x50	Filters	4960124A
Filter EU4 metal frame	800x500x50	Filters	4960027K
Filter EU4 rechargeable	800x500x50	Filters	4960095K
Filter EU7	800x500x50 GP10	Filters	4960068V
Actuator	SM 24A + 5m cable	Damper	4781281I
Indoor fan	AT15-15 G2L	SupplyFan	4910040Y
Indoor fan	ADHE 355	SupplyFan	4910090X
Indoor fan	AT18-18	SupplyFan	4910023Y
Indoor fan	ADHE 450	SupplyFan	4910092Z
Indoor fan	ADHE 500	SupplyFan	4910093A
motor	1.5 kW IE2	Motor	4521802L
motor	2.2 kW IE2	Motor	4521806R
motor	3 kW IE2	Motor	4521807T
motor	4 kW IE2	Motor	4521808V
motor	5.5 kW IE2	Motor	4521809W
motor	7.5 kW IE2	Motor	4521811Y
motor	9 kW IE2	Motor	4521813A
motor	11 kW IE2	Motor	4521815F

TERMS AND CONDITIONS

In the absence of any other written agreement, the guarantee shall only apply to design faults which occur within a 12 month period (warranty period).

The warranty period starts on the date of commissioning and at the latest six months after the delivery of the Rooftop.

ANTI-CORROSION WARRANTY

10 year warranty terms and conditions for corrosion to the Rooftop casing:

Lennox shall guarantee the casing of its Rooftop units manufactured since May 1991 against corrosion for 10 years commencing from the date of delivery of the material.

The warranty shall not apply in the following cases:

1. If the corrosion of the casing is caused by external damage to the protective layer such as scratches, projections, abrasion, impacts etc...
2. If the casing is not kept continually clean in the course of maintenance work or by a specialist company,
3. If the casing is not cleaned and maintained in accordance with regulations,
4. If the Rooftop units are installed on a site or in an environment which is known to be corrosive, unless a special protective coating has been applied by the owner for these applications, which has been recommended by a competent body not linked to the owner and after carrying out a study of the site.
5. Nevertheless the LENNOX coating is highly resistant to corrosion, the warranty will not be applied for rooftop installed at less than 1000m away from the sea

Note: With the exception of the casing, the rest of the machine is covered by the warranty of our general terms of sale.

DO NOT CONFUSE THE WARRANTY WITH MAINTENANCE

The warranty will only apply if a maintenance contract has been signed, starting from the date of commissioning, and if the maintenance contract has actually been performed.

The maintenance contract must be made with a specialist, competent company.

The sole effect of any repair, modification or replacement of an item during the warranty period must be to extend the material's warranty period.

Maintenance must be carried out in accordance with regulations.

If a spare part is supplied after the expiry of the warranty period, it shall be guaranteed for a period equal to the initial warranty period and will be subject to the same conditions.

We recommend for a contract four inspections per year (every three months), before the start of each season, in order to check the operation of the equipment in the various operating modes.

CONTROL MANUAL

DISPLAY DC60

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The display DC60 is personalized for the user. It allows an overview of operation of the unit and allows access to certain parameters.

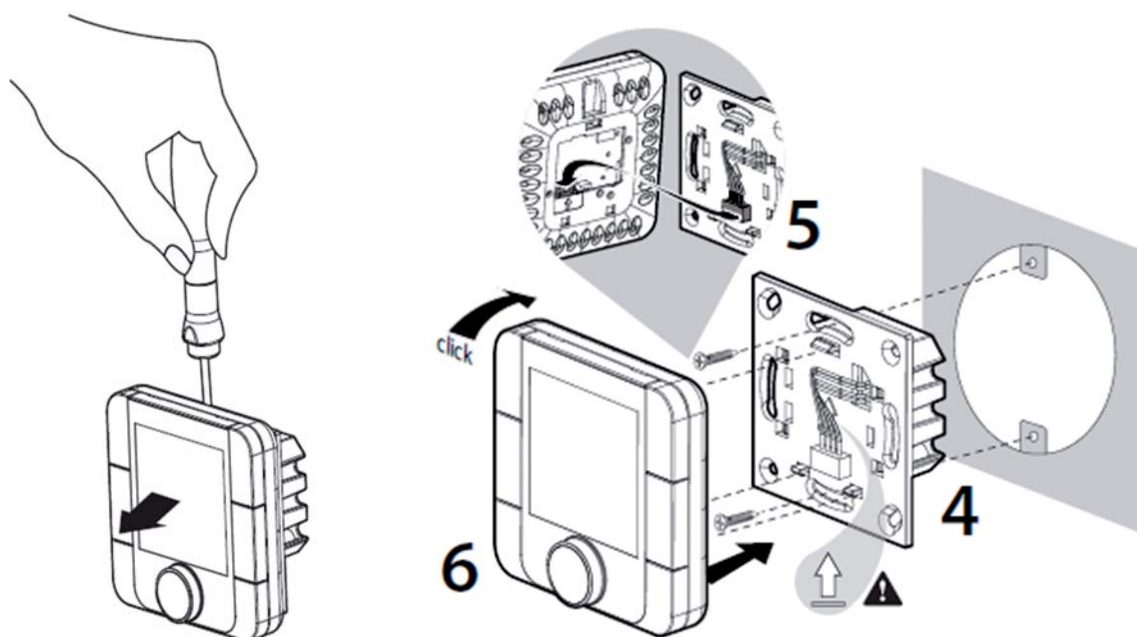
The 'DC60 is designed to be remote connected of the rooftop.

The 'DC60 is equipped with a temperature sensor.

The temperature sensor allows the acquisition of room temperature to control.

INSTALLATION

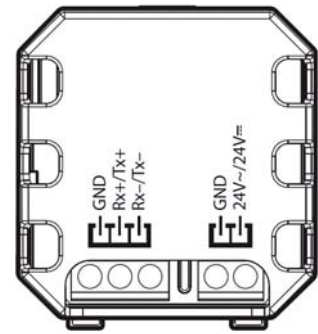
The DC60 has been designed for flush mount assembly, on distribution boxes compliant with the standards in force.



CONNECTION

WARNING: Separate as much as possible probes, displays, logical input cables from power cables with strong inductive load, in order to avoid possible electromagnetic perturbations.

IMPORTANT WARNING: Any wiring modification on the CLIMATIC™ 60 must be done by LENNOX technician or employees having valid electrical qualification and authorization.



Power supply

The power of the DC60 can be 24Vac (+10...-15%) 50/60Hz or 24Vdc (22...35Vdc), maximum current of 2VA.

LENNOX recommends a 24Vac supply (provided by rooftop) for installation of the display less within 30 meters of rooftop. For connection of the display of over 30 meters, a power supply, close to the display, 24Vac must be provided by the installer.

For an external connection to the rooftop (24V) using a transformer class 2 under 0,1A.

For any modification of wiring on the 24V supply or on 4-20mA sensor, check the polarity prior to apply the power. Wrong polarity may cause serious damage and destroy the Plan network. LENNOX will not accept liability for damage caused by wrong power connection or any wiring modification done by people without valid training and qualifications.

Communication

The DC60 is controlled by a communication bus: RS485.

Cable features

The connection of power and communication must be made by the following cable:

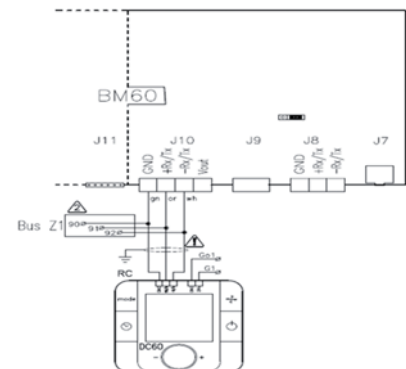
- LiYCY-P (0.34 mm²), 2 pairs with general shield

The cable length, with power, should not exceed 30m.

The cable length without power (24V external) must not exceed 150m.

For a better electromagnetic protection, Lennox recommends the use of LiYCY-P cable

For extended networks fit a 120 Ohm resistor between RX/TX+ and RX/TX- on the first and last device, to avoid possible communication problems.



ONE 'DC60' FOR ONE, AND ONLY ONE, ROOFTOP

The DC60 displays only the values and information of the 'Roof-Top' on which the DC60 is connected.

TEMPERATURE MEASUREMENT

All LENNOX rooftop comes with a temperature sensor; it must be placed in the conditioned area.

But if the DC60 is placed in the area conditioned by the rooftop, that display is connected, it is possible, in this case, to use the temperature measurement of the DC60.

To indicate the CLIMATIC™ 60 your choice, set the point 3213:

- '128' to use the measure of the 'DC60'
- '1 BM-B12' or '2 BM-B1' to use the remote probe

Note :

- for rooftop with a 'medium' CLIMATIC™ 60: connect the remote sensor between points B12 and GND, terminal block J18.
- for rooftop with a 'small' CLIMATIC™ 60: by default the CLIMATIC™ 60 control the return temperature measurement. If you want to control on a room temperature measure, disconnect the return probe between points B1 and GND, terminal block J13. Connect the remote sensor in place.

RELATIVE HUMIDITY MEASUREMENT

If the rooftop is designed to manage humidity, a box of combined sensors (temperature and humidity), supplied with the rooftop, it must be placed in the conditioned area.

It's possible to use the temperature measurement DC60.


CONFIGURATION

To communicate with the CLIMATIC™ 60 this basic parameters of internal DC60 must to be settled.

Setup menu

To do this, when the 'DC60 is powered; Simultaneously press the keys  and .

After some seconds, the text `C o d E` appears and the value '000' flashes.

Turn the knob  to change the value to select the number 022. Then validate the code by pressing the knob.

If the code is wrong access the setup menu is not possible and the DC60 returns to the previous
If the code is correct the display shows `A d d r`.



(2 buttons on the right simultaneously)






Parameter's choice

By rotating of the knob , you can view and modify the following parameters:

- `A d d r` : Address DC60 on the communication bus (Always set to value 31)
- `b A u d` : Communication speed (always set to value 2)
- `b L b E` : Backlight mode
- `b L I n` : Backlight intensity
- `P C A L` : Probe calibration
- `C n S t` : Screen contrast
- `b u _ d` : Disabling 'Bip' keys
- `P S u 1` : Password (always set to value 22)
- `Y E a r` : Real time clock DC60; year
- `M o n t` : Real time clock DC60; month
- `n d a y` : Real time clock DC60; day
- `u d a y` : Real time clock DC60; weekday (1 = Monday)
- `H o u r` : Real time clock DC60; hour
- `m i n S` : Real time clock DC60; minute
- `E S C` : Exits the settings mode

Changing the parameters value

To activate the modified mode value:

- After selecting the desired parameter by rotating the knob .
- Press the knob .
- The `S e t` symbol appears on the right side of the value.
- Turn the knob  to adjust the desired value.
- Press again on the knob  to confirm your choice.
- The `S e t` symbol is no longer displayed on the right side of the value.
- The rotation of the knob  is for select a new setting.

Mandatory values

- `A d d r` : 31
- `b A u d` : 2
- `P S u 1` : 22

INITIALIZATION

If the connection between the CLIMATIC™ 60 and the 'DC60 is not correct (Offline) screen displays only the symbol **Cr.**

In this case, check: :

- the connection between CLIMATIC™ 60 and DC60
- the setting of the DC60
- the power of CLIMATIC™ 60

If the connection between the CLIMATIC™ 60 and the 'DC60 is correct (Online) to power up the screen displays only the symbol **I n i t.** . This phase allows the CLIMATIC™ 60 to set up the DC60 with options of rooftop.

After some seconds, DC60 is operational.

PRESENTATION

Showing

The diagram shows the DC60 display with several callout boxes explaining its features:

- Control operating mode:** | ☀ Heat. | ❄ Cool. | Auto |
- Value:** Points to the large digital display area.
- Label or clock:** Points to the time and date information on the display.
- Fan operating mode:** Points to the fan speed control icons.
- Schedule mode:**
 - Day
 - Day I
 - Day II
 - Night
 - BMS
- Status Indicators:**
 - Staus
 - Alarm
 - Pump
 - Compressor(s)
 - Defrost
 - Condenser(s)
 - Heaters

Hidden : to stop
Visible : running
Blinking : in fault

PRESENTATION

Buttons



USE

⏻ On/Off unit

By supporting a few seconds the button ⏻, you can activate or not (On/Off) the rooftop connected.
 If the symbol **OFF** completed by the time ● is displayed, the rooftop is stopped and the DC60 in sleep mode.
 To restart the unit, press the button ⏻ a few seconds.



🕒 Setting time

At initialization of the DC60, the CLIMATIC™ 60 are synchronized time and day of week with the clock DC60.

To view the time, briefly, press the button 🕒.
 To set the time press the button 🕒 a few seconds.

The **hour** value flashes.
 Turn the knob ⌚ to adjust the desired value.
 Press the knob ⌚ to select your choice.



Then the **minute** value flashes.
 Turn the knob ⌚ to adjust the desired value.
 Press the knob ⌚ to select your choice.

| Mon Monday | Tue Tuesday | Wed Wednesday | THU Thursady | FRI Friday | SaT Saturday | SUN Sunday |

Then the **weekday** value flashes.
 Turn the knob ⌚ to adjust the desired value.
 Press the knob ⌚ to select your choice.

After a few seconds DC60 communicates the new time to the CLIMATIC™ 60.

USE

Information available

By rotating the knob , you can view or modify the following values:

DC60 set in light mode

set : Volatile temperature set point current mode (°C)

- : Indoor (Room) temperature (°C)

Set Volatile Temperature set point

This item allows you to view and/or modify the control temperature required for the Roof-Top selected.

If this point is changed, this value is used until the scheduling changes mode (A, B, C, D, BMS).

At each change of the mode, the CLIMATIC™ 60 sets the value of this set point on the preset value in the mode concerned.

Indoor (room) temperature

This item indicates the measured air temperature in the room conditioning.

The room temperature isn't available if the CLIMATIC™ 60 is configured to supply control.

DC60 set in full mode

- **Unit** : Number of rooftop connected to the DC60
- **SP-t set** : Predetermined temperature set point current mode (°C)
- **SEt set** : Volatile temperature set point current mode (°C)
- **AL- set** : Alarms code
- **t-Ou** : Outdoor temperature (°C)
- **t-Su** : Supply temperature (°C)
- **t-In*** : Indoor (Room) temperature (°C)
- **h-In*** : Indoor (Room) humidity (%hr)
- **Co2*** : Indoor (Room) Air quality (ppm)
- **Eco*** : Opening of fresh air damper (%)

*: Available if the option is enabled.

: Available if the level 2 is activated.

set : Adjustable with 'DC60.

Unit Unit connected

This item can know the number of rooftop connected to the DC60.

USE

Set Volatile temperature set point

This item allows you to view and/or modify the control temperature required for the rooftop selected.

If this point is changed, this value is used until the scheduling changes mode (A, B, C, D, BMS).

At each change of the mode, the CLIMATIC™ 60 sets the value of this set point on the preset value in the mode concerned.

SP - t Predetermined temperature set point

If level 2 is active, this item allows you to view and/or change the preset temperature control for the active mode.

AL - Alarms code

This item can see the code of different active alarms on the rooftop.

If the rooftop isn't in alarm, this item is to 0.

By this item it's possible to reset the alarm activated. To do this set the value of the item to the value 0.

t - Ou Outdoor temperature

This item indicates the measure temperature of the air outside.

t - Su Supply temperature

This item indicates the measure of outlet air temperature of the rooftop.

t - In Indoor (Room) temperature

This item indicates the measured air temperature in the room conditioning.

The room temperature isn't available if the CLIMATIC™ 60 is configured to supply control.

h - In Indoor (Room) relative humidity

This item shows the measured relative humidity of the air in the room conditioning.

The room humidity isn't available if the option of humidity management isn't set.

CO2 CO₂ measurement

This item indicates the measured rate of CO₂ in conditioning room, in ppm.

The measurement of CO₂ isn't available if the option isn't set.





Eco Opening of fresh air damper

This item indicates the measured value of the opening rate of the fresh air damper, in%, (mixture of outside air and return air)

This value is only available if the rooftop is equipped with this option.

Setting value



If the value of the selected item is modified :

- To activate the modified value, press the knob .
- The **SET** symbol appears on the right side of the value.
- Turn the knob  to adjust the desired value.
- Press again on the knob  to confirm your choice.
- The **SET** symbol is no longer displayed on the right side of the value.
- The rotation of the knob  allows to select a new item.


LEVEL 2 ACTIVATION




(2 buttons on the right simultaneously)

Simultaneously press the keys  and .

After some seconds the text **C o d E** appears and the value '000' flashes.

Turn the knob  to change the value to select the number 066. Then validate the code by pressing the knob.

If the code is wrong access the setup menu is not possible and the DC60 returns to the previous display.

If the code is correct the level 2 is active, and symbol  is displayed to the right of the value.

The level 2 is turned off automatically every hour.

The 'DM60' display is personalized for the user. It allows an overview of unit operation and allows access to certain parameters.

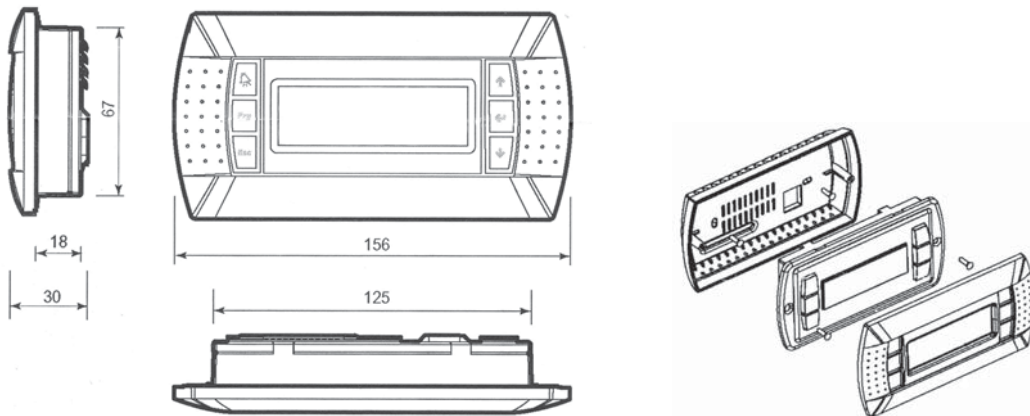
The 'DM60' is designed for connection of remote roof-top.

INSTALLATION

WARNING : An error connecting to the display immediately causes the deterioration of this one or BM60.

The optional delivered DM60 is designed to be wall mounted:

- position the cable through the rear
- fasten the rear wall using button head screws provided in the package
- connect the cable from the main board on the jack on the back of the DM60 screen
- attach the front panel on the back using provided countersunk screws
- snap frame.



The display is connected to CLIMATIC™ DM60 on the screw terminals of the card DT50.

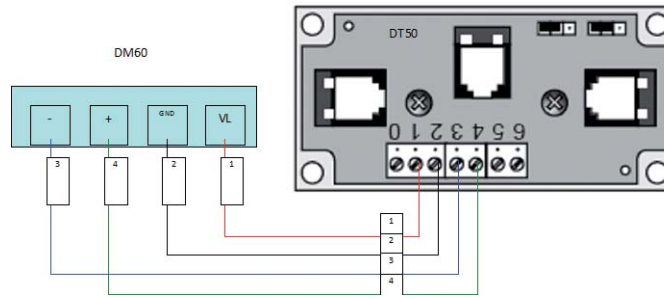
The connection must be wired as follows:

- for a length of 0 to 300 m: AWG22 (0.34 mm²), two crossed pairs with screen.
- for a length of 0 to 500 m: LiYCY-P (0.34 mm²), two pairs shielded general.

The cable length should not exceed 500 m.

For a better protection of electromagnetic disturbances LENNOX recommends the icable LiYCY-P installation.

CONNECTION ON THE DT50 SPLITTER



DT50 dispatcher installation guide

The board is equipped with three RJ12 phone jacks and a screw connector (SC).

Terminal	Wire function	Connections
0	Earth	Shield
1	+VRL (≈30 Vdc)	1st pair A
2	GND	2nd pair A
3	Rx/Tx-	3rd pair A
4	RX/Tx+	3rd pair B
5	GND	2nd pair B
6	+VRL (≈30 Vdc)	1st pair B

Jumpers:

The "displays" are directly supplied by the Climatic™ board with a 30 VDC power supply. Pay attention to the value of this voltage when multiple cards are used.

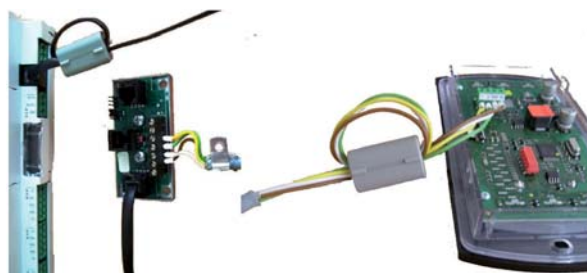
J14 and J15 closed or cut the power supply:

- J14 and J15 set between 1-2: connectors A, B, C and SC are in parallel. Power is available on all connectors.
- J14 and J15 set between 2-3: B and C connectors are supplied in parallel but the connectors A and SC are not. Displays connected to these ports are not powered.

If J14 and J15 are set differently, the DT50 dispatcher DOESN'T WORK and therefore connected displays don't work.

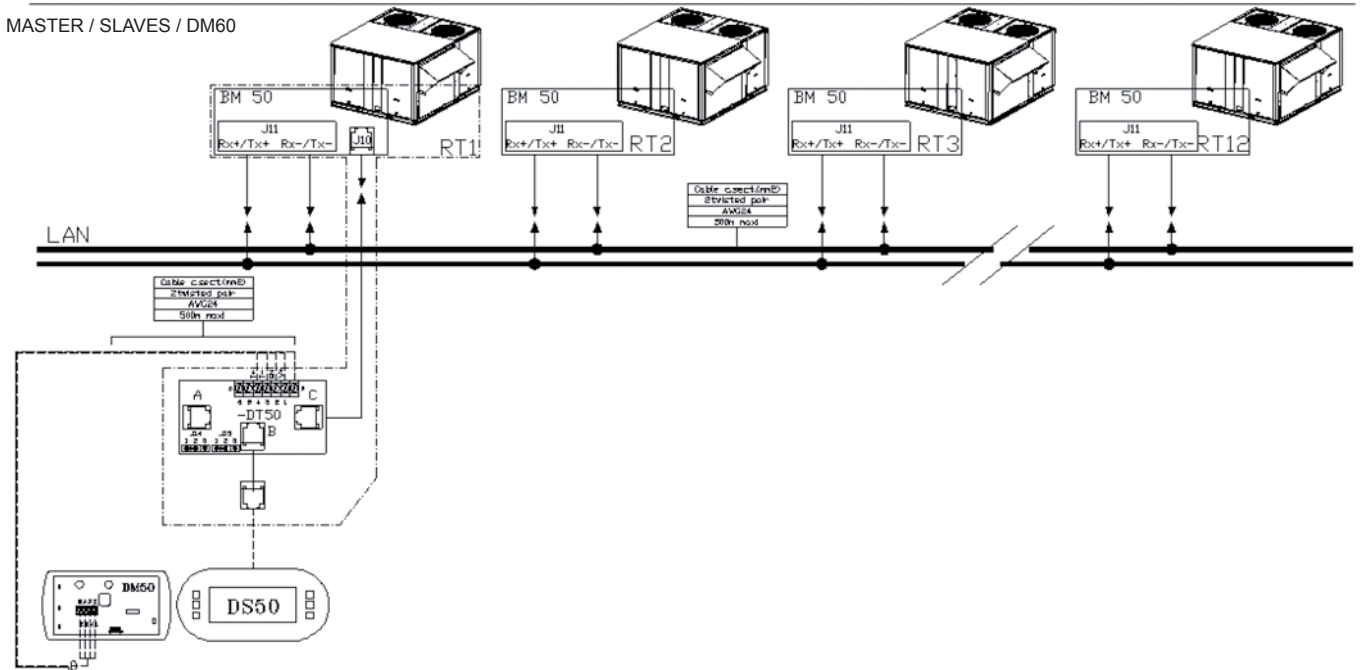
Display's ferrites protection

To avoid appearance of RF interference that may cause destruction of components in the displays, you need to equip the cable of a ferrite, during its installation (provided by LENNOX).



DM60 AND COMMUNICATION MASTER/SLAVES

If the master/slaves communication bus is connected between several rooftop (maximum 8). The 'DM60', connected on this bus, allows viewing, alternatively, information of all connected units.

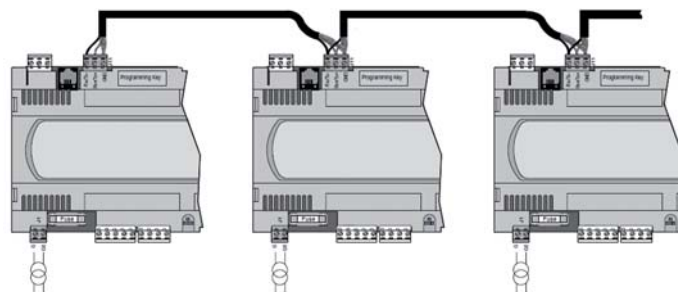


The inter-bus boards (pLan) CLIMATIC™ connects to connector J8 on the BM60 cards. Connection with 'star' is not recommended for optimum performance it is advisable to connect a maximum of two cables per unit. The connection must be wired as follows:

- For a length of 0 to 300 m: AWG22 (0.34 mm²), a twisted pair shielded.
- For a length of 0 to 500 m: LiYCY-P (0.34 mm²), a pair overall shield.

cable length should not exceed 500 m.
For better protection of electromagnetic disturbances Lennox recommends the installation of cable LiYCY-P.

WARNING : The BM60 24Vac cards should not be connected to the 'earth'.



CONFIGURATION

Brightness / Contrast

The display is equipped with a contrast, but it can be adjusted manually. For manual adjustment of contrast, simultaneously press the 'alarm' and 'prg' keys and press 'arrow' or 'down arrow' buttons to increase or decrease the contrast.

Configuring the terminal's address

The terminal's address (DC60 or DM60) must be checked after putting the card to 'On':

- access the setup mode by pressing the 'arrow', 'enter' and 'down arrow' keys for at least 5 seconds.
- press 'enter' to place the cursor on 'setting'
- with 'arrow' or 'down arrow' set the address of the display 31 of DM60, then confirm by pressing 'enter'

The screen 'display address changed' is displayed.

If after 5 seconds the display is not correct:

- access, a second time, the setup mode by pressing the 'arrow', 'enter' and 'down arrow' keys for at least 5 seconds, up to the next screen.
- press 'enter' to place the cursor on 'setting'
- press 'enter' a second time to place the cursor on the I / O board address line
- with 'arrow' or 'down arrow' replace '-' by the address of the BM60 connected and confirm by pressing 'enter'

FUNCTIONALITY OF THE DM60

Rooftop selection

A DM60 can be connected to 8 units per the pLAN bus. DM60 screens connected, alternatively, to one of BM60.

The next screen allows selection of the unit to display:



Each of the 8 rooftops is represented by a number. The selected rooftop is indicated by its number which is framed. Each time you press the 'down arrow' button, it connects the display to the next rooftop. Pressing 'enter' key returns to the main screen.

Main



Top left :

Control in heating mode or control in cooling mode

- Small, numerical value: volatile set point temperature: View and/or modify the offset, or set point, of the desired temperature control for the selected rooftop. Pressing the 'arrow' button increases the set point value. Pressing the 'down arrow' button decreases the set point value.
If the setpoint is changed, this value is maintained as long as the rooftop scheduling doesn't change modes (night, day, day I, day II, BMS).
At each change of the mode the CLIMATIC™ 60 sets the value of this setpoint on the preset value in the mode concerned.
- Big, numerical value: measured air temperature value in the conditioned space.

Top right:

Ventilation state

Bottom right:

State mode based on the schedule, hour, minute, of CLIMATIC™ :

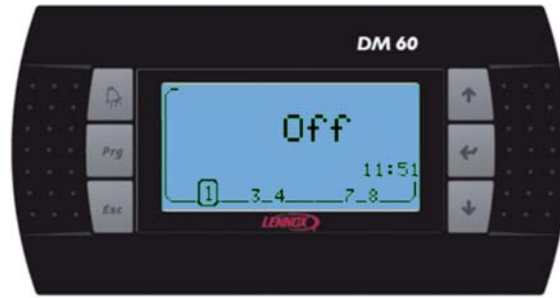
- Night mode
- Day mode
- Day I mode
- Day II mode

Bottom left:

If the unit is in alarm, this symbol is displayed

- Pressing the 'alarm' button directs you to the alarm list display.
- Pressing the 'prg' button directs you to rooftop setup menus display.
- Pressing the 'esc' button takes you to the selected rooftop choice display.
- Pressing the 'arrow' button increases the set point value.
- Pressing the 'enter' button takes you to the rooftop operation display.
- Pressing the 'down arrow' button decreases the set point value.

Rooftop off



If the rooftop is Off, this screen is activated.

- pressing the 'alarm' button directs you to the alarm list display.
- pressing the 'prg' button directs you to the rooftop setup menus display.
- pressing the 'esc' button takes you to the selected rooftop choice display.

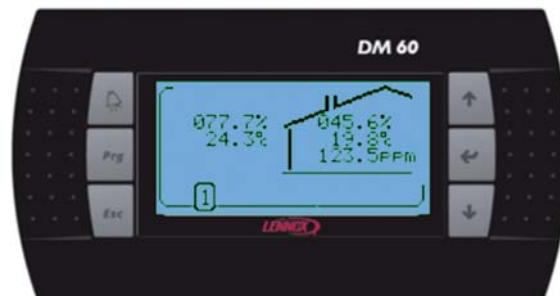
Rooftop operation

- pressing the 'alarm' button directs you to the alarm list display.
- pressing the 'esc' button takes you to the main display.
- pressing the 'arrow' button directs you to the previous screen.
- pressing the 'down arrow' button directs you to the next screen.



View/edit, status of the unit (On/Off).

Pressing the 'prg' button reverses the On/Off state of the unit.



On the left of the house:

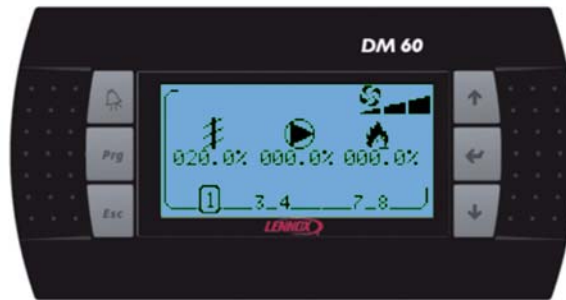
- outdoor humidity value visualization (if enabled).
- outdoor temperature value visualization.

In the house:

- indoor humidity value visualization(if enabled).
- indoor temperature value visualization.
- indoor air quality rate visualization(if enabled).



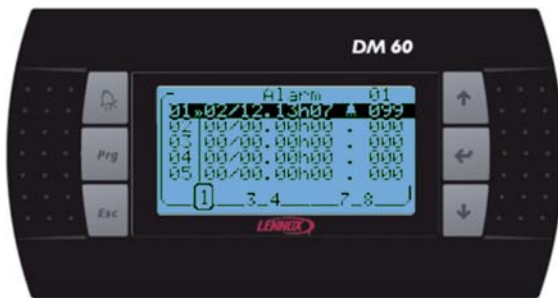
- Heating mode set point visualization
- Cooling mode set point visualization



- Fresh air damper opening percentage visualization
- Engaged compressor percentage visualization
- Engaged heaters percentage visualization

- pressing the 'alarm' button directs you to the alarm list display.
- pressing the 'esc' button takes you to the main display.
- pressing the 'arrow' button directs you to the previous screen.
- pressing the 'down arrow' button directs you to the next screen.

Alarm list

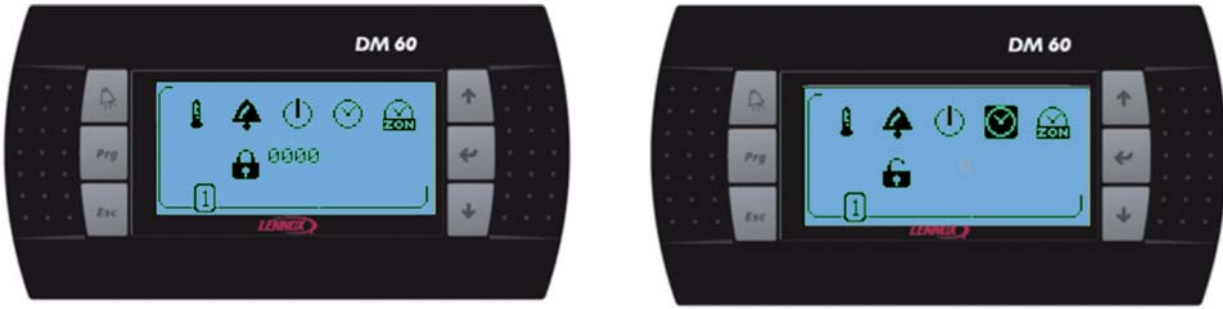


- History used to store the last 99 alarms occurred on the unit.
- each alarm is stored on the date and time the fault occurred.
 - an active alarm is signified by the 'bell' symbol.
 - an reseted alarm is signified by the '.' symbol.
 - each alarm is signified by a 3 digit code

To have the text of fault code, position the cursor on the desired line, by using the 'up arrow' or 'down arrow' and then confirm by pressing 'enter'

- pressing the 'esc' button takes you to the main display.
- pressing the 'arrow' button positions you in the list.
- pressing the 'enter' button takes you to the clear display of failure code.
- pressing the 'down arrow' button positions you in the list.

Setup menus





Access to the setup menus is protected by a password. The password must be entered digit by digit. If the password is correct, the lock opens, and the selection of the function choice is active.

- Pressing the 'alarm' button directs you to alarm list display.
- Pressing the 'esc' button takes you to the main display.
- Pressing the 'arrow' button increases the password digit value or selects the previous function.
- Pressing the 'enter' button it puts you on the next digit password, or directs you to the selected function screen.
- Pressing the 'down arrow' button decreases the password digit value or selects the next function.

Setting; Temperature

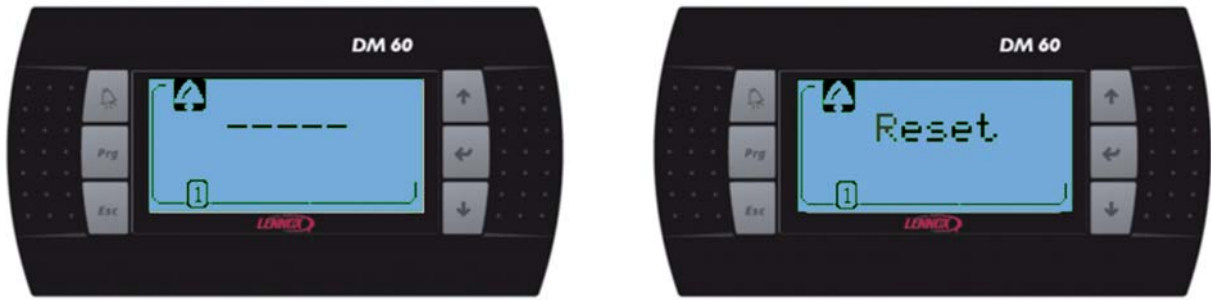


 View/edit, the current schedule mode of the heating mode setpoint

 View/edit, the current schedule mode of the cooling mode setpoint

- Pressing the 'alarm' button directs you to alarm list display.
- Pressing the 'esc' button directs you to rooftop menu setup display.
- Pressing the 'up arrow' button increases the set point value.
- Pressing the 'enter' button commits the changes then it puts you on the next or previous setpoint.
- Pressing the 'down arrow' button decreases the set point value.

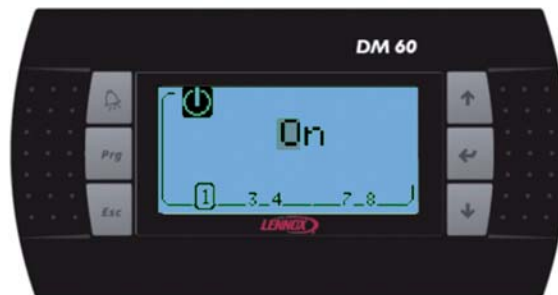
Setting; Reset Alarms



View/edit, alarm and safety reset

- Pressing the 'alarm' button directs you to alarm list display.
- Pressing the 'esc' button directs you to the rooftop menu setup display.
- Pressing the 'up arrow' button reverses the state.
- Pressing the 'enter' button resets alarm: if the 'reset' word is selected, then it directs you to the rooftop setup menus display.
- Pressing the 'down arrow' button reverses the state.

Setting; rooftop On/Off



View/edit, On/Off status of the unit.

- Pressing the 'alarm' button directs you to the alarm list display.
- Pressing the 'esc' button 'Esc' directs you to the rooftop setup menu display.
- Pressing the 'up arrow' button 'Up Arrow' reverses the state.
- Pressing the 'enter' button validates the selection, then directs you to the rooftop setup menu display.
- Pressing the 'down arrow' button reverses the state.

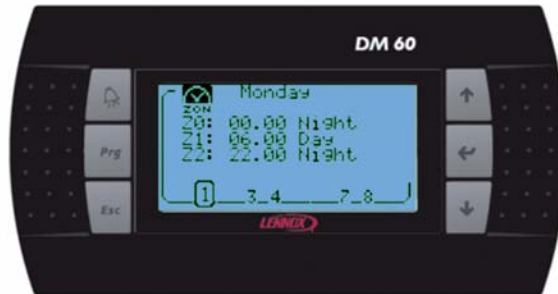
Setting; Clock of CLIMATIC™



View/edit, hour, minute, day of month, month and year of the CLIMATIC™ clock.

- Pressing the 'alarm' button directs you to the alarm list display.
- Pressing the 'esc' button directs you to the rooftop setup menus display.
- Pressing the 'up arrow' button increases the selected value.
- Pressing the 'enter' button commits the change and it puts you to the next value.
- Pressing the 'down arrow' button decreases the selected value.

Setting; CLIMATIC™ schedule



View/edit, hour and minutes of each zone beginning.
View/edit, the zone operating mode.

The schedule is different each weekday. You must set a schedule for monday, tuesday, ..., and sunday.
The visualization of another weekday is done by pressing the 'prg' button.

- Pressing the 'alarm' button directs you to the alarm list display.
- Pressing the 'prg' button displays the next weekday.
- Pressing the 'esc' button directs you to rooftop setup menus display.
- Pressing the 'up arrow' button increases and validates the selected value.
- Pressing the 'enter' button commits the change and it puts you to the next value.
- Pressing the 'down arrow' button decreases and validates the selected value.



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