



INDUSTRIAL DEHUMIDIFIERS



FD240 TCR

USE & MAINTENANCE MANUAL



M.FD240.1023-00 UK



This machines series belongs to the electric appliances
functioning at low tension (230 o 400 V).
The installation must be done following all safety norms and laws
according with place of installation.
Please read carefully all safety norms (Chapter 1.4)

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DECLARATION OF CONFORMITY



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(Community directives Low Voltage and Electro-magnetic Compatibility)

FRAL Company s.r.l. Viale dell'Industria e dell'Artigianato 22/c – 35010 Carmignano di Brenta – PD – hereby declares that the following products:

Dehumidifiers FD240.1023

Have been designed, manufactured and distributed by according to safety and electro-magnetic compatibility to European Norms and Regulations:

MACHINES NORMS (2006/42/CE - 17.05.2006) ;
SECURITY REGULATIONS FOR LOW TENSION APPLIANCES 2006/95/CE -
12.12.2006;

ELECTROMAGNETIC COMPATIBILITY (EMC) – 2004/108/CE – 15.12.2004.

It is hereby certified that this Dehumidifier conform to the:

IEC Regulations **CEI-EN 60335-2-40, CEI-EN 55014-1, 55014-2.**

The machine is built according to RoHS European Norms:

2011/65/UE year 2011 and CEI-EN 50581.

Carmignano di Brenta, 21/02/2013,

The Legal Agent
Ing. Alberto Gasparini

TECHNICAL DATA

	Model	240.1023
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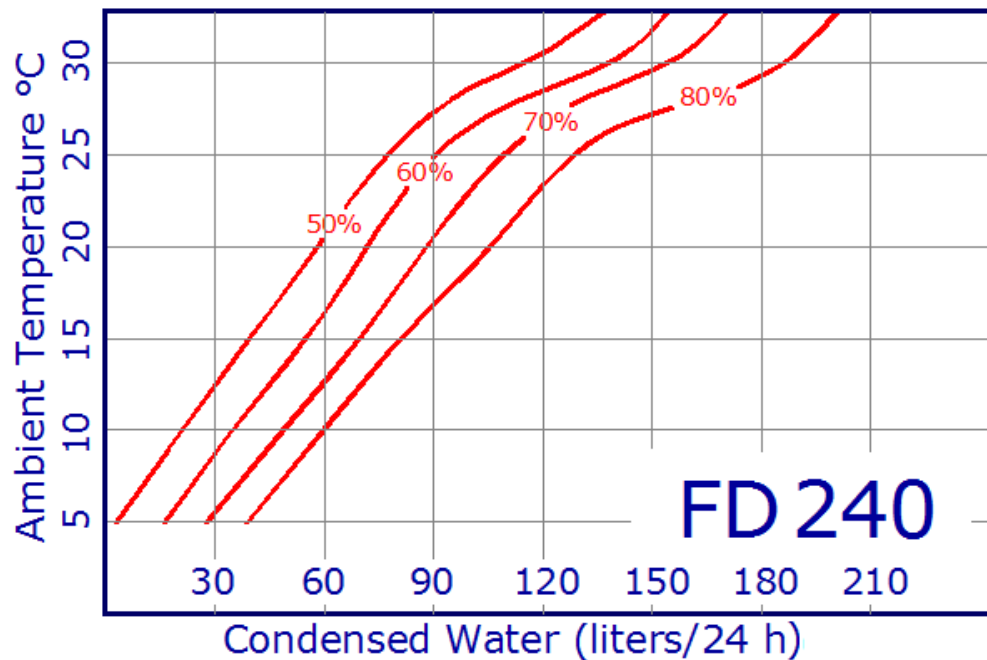
Drying capacity	l/24h	240 ⁽¹⁾
Rated power consumption	kW	3,30 ⁽³⁾
Maximum power consumption	kW	3,95 ⁽²⁾
Maximum current consumption	A	9,6 ⁽²⁾
Start up current	L.R.A.	48
Rated air flow	m ³ /s m ³ /h	0,56 2000
Available static pressure	Pa	100
refrigerant charge (see label)	kg	2,5 R410a
Sound pressure level (3m free field)	dB(A)	55
Temperatute operating range	°C	7-35
Humidity operating range	%	40-99
Condensed Water draining connection	"	¾" M
Lenght	mm	980
Depth	mm	680
Height	mm	580
Operating weight	kg	72
Rated Power Supply	V/ph/Hz	400/3~+N/50

(1) Referred to: inlet air temp. 32 °C relative humidity 90%

(2) Referred to: inlet air temp. 35 °C relative humidity 80%

(3) Referred to: inlet air temp. 26,7 °C relative humidity 60%

DRYING CAPACITY



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FAN PERFORMANCE

AIR FLOW WITH DIFFERENT HEAD PRESSURES							
Available head pressure (Pa)	0	20	40	60	75	90	105
Air flow cm/h FD240 (max. fan speed)	2300	2200	2200	2000	1900	1800	1600

CHAPTER 1: GENERAL POINTS

1.1 UTILITY AND CONSERVATION OF THE MANUAL

This Manual conforms to the requirements of the Norms 98/37/CE and subsequent modifications. The Manual gives all necessary indications required for the transport, Installation, start-up and maintenance of the machines, which must be strictly followed by the user for a correct functioning of the same.

To this purpose, the user must also strictly comply with the security norms described in the Manual.

The manual must always follow the machine and must be kept in a place which will guarantee its perfect conservation for the proper use from the operator.

GRAPHIC SYMBOLS AND INDICATIONS INCLUDED IN THE MANUAL:



shows that ATTENTION must be paid to all procedures and operations to be carried out for ensuring the correct functioning of the machine, describes the operations that must be avoided, and finally informs the operator about the correct procedure and operations to be followed for the proper use of the machine.

1.2 NORMS REFERENCES

The machines described in this manual have been designed according to the pertinent CE Norms, in conformity with the MACHINES DIRECTIVES cited in the previous paragraph.

The machines are also complying with the essential requirements of the following European Rules and Directives:

- ✓ Machine Safety Norms 89/392 CEE,
- ✓ Electrical Safety Rules for the Low Tension Appliances 2006/95 CEE,
- ✓ Electromagnetic Compatibility Norms 2004/108 CEE,
- ✓ Under Pressure Devices 97/23/CE.

1.3 GENERAL SAFETY NORMS



**This machines series belongs to the electric appliances functioning at low tension (230 o 400 V).
The installation must be done following all safety norms and laws according with place of installation.**

Please read carefully all safety norms (Chapter 1.4)

When installing or servicing the unit, it is necessary to strictly follow the rules reported on this manual, to conform to all the specifications of the labels on the unit, and to take any possible precautions of the case for workers.

Pressure in refrigerant circuit and electrical equipment present in the unit can be hazardous when installing or servicing the unit.



Therefore, all operations on the unit must be done only by trained people.

Not observing the rules reported on this manual, and every modification to the unit done without explicit previous authorisation, will cause the immediate termination of the warranty.



Attention: before every operation of servicing on the unit, be sure that the electric supply is disconnected.

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Close to the unit a switched electrical plug must be present.



Main supply must be protected with a differential switch.



Never modify settings of the safety devices.



Never sprinkle water over the unit and its electrical components.



It must not be used under explosive atmosphere.

CHAPTER 2: INSPECTION, TRANSPORT AND SITE HANDLING

2.1 INSPECTION

After receiving the unit, immediately check its integrity. The unit left the factory in perfect condition; **any eventual damage must be questioned to the carrier and recorded on the Delivery Note before it is signed. Our firm must be informed, within 8 days, of the extent of the damage.**
The Customer must prepare a written statement of any severe damage.

2.2 LIFTING AND SITE HANDLING

The lifting is obtained by using a forklift: fork must be inserted in the base pallet, and care must be taken in order that the fork does not hit the section base or panel (see the picture below).

To unload the unit with a crane, pass bars under the machine and attach the necessary cable or chain lifting devices to the bar, ensuring that they are clamped firmly; protect the sides of the chiller with boarding or material of a similar nature.

Same procedures must be followed with remote condenser.

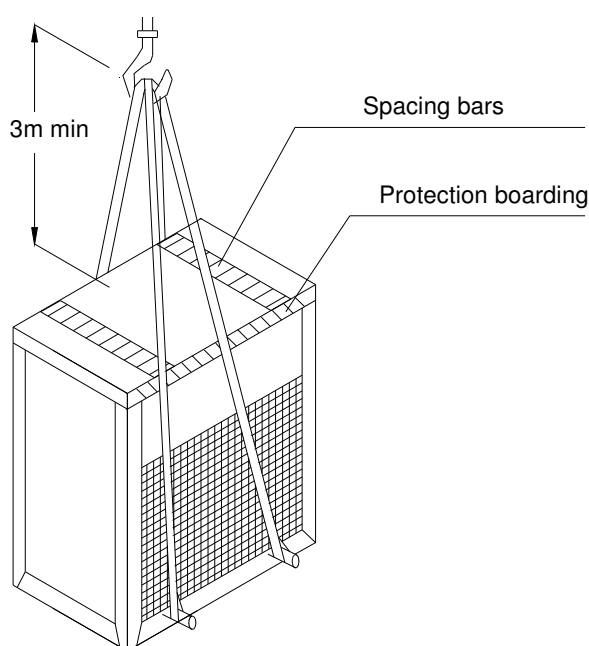
2.3 UNPACKING

When unpacking the unit pay attention not to damage the unit.

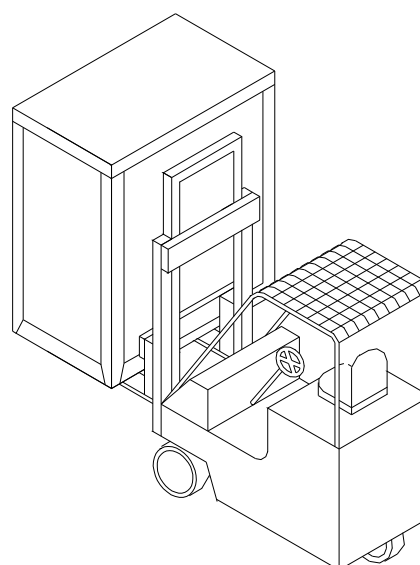
The package is made up by different materials: wood, paper, nylon etc.

It's a good rule to keep them separately and deliver to the proper collecting centre in order to reduce their environmental impact.

Lifting method with a crane



Lifting method with a forklift



2.4 LOCATION

Consideration must be given to the following points when determining the most suitable site for the unit installation:

- location arrangement in order to guarantee adequate air flow (no narrow spaces)
- electrical power supply location;
- accessibility for servicing/maintenance and repair of the unit and/or its components;
- floor loading strength and ability to support the operating weight of the unit;
- possible objection to operating noise.

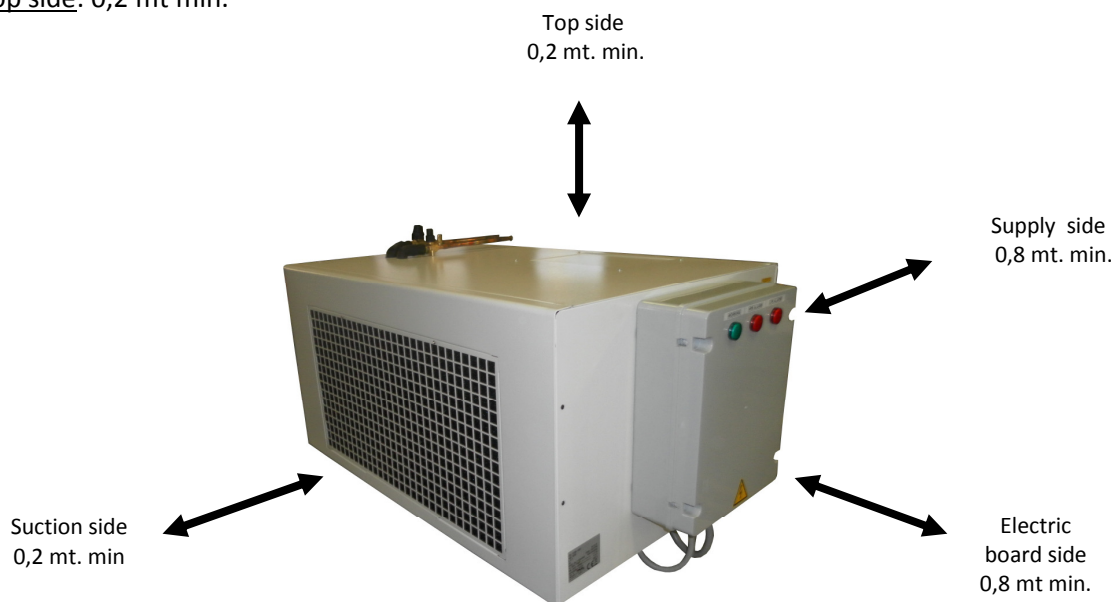
CHAPTER 3: INSTALLATION

3.1 CLEARANCES

Absolute care must be taken to ensure adequate air volume to the air intake and fan discharge, and to avoid air recirculation through the unit that will deeply reduce its performances.

For these reasons it is necessary to observe the following clearances (see the pictures in the following pages):

- air filter suction side: 0,5 mt min.
- fan side: 0,8 mt min.
- electric board side: 0,8 mt min.
- top side: 0,2 mt min.



For TOP OUTLET versions Top side is the Supply side so it's necessary to assure 0,8 mt. min

3.2 ELECTRICAL CONNECTIONS

3.2.1 Generality



Before every operation on the electric section, be sure that the electric supply is disconnected.



Main supply must be protected with a differential switch



Close to the unit a main switch must be present.

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It must be verified that electric supply is corresponding to the unit electric nominal data (tension, phases, frequency) reported on the label in the front panel of the unit.

Power connections must be made using a three-wire cable + neutral wire + ground cable.



Power cable and line protection must be sized according norm and laws according with absorbed current of the machine (see technical data).

The line voltage fluctuations must not be more than $\pm 5\%$ of the nominal value, while the voltage unbalance between one phase and another must not exceed 2%. If those tolerances should not be respected, please contact our Firm to provide proper devices.



Electric supply must be in the limits shown: in the opposite case warranty will terminate immediately.



Electrical connections therefore must be always done according to the instructions reported on the wiring diagram enclosed with the unit and norms and laws.

Ground connection is compulsory. Installer must connect ground cable with a dedicated terminal on the apposite terminal block.

3.2.2 Main supply connection

The Electric Power Supply Connection must be carried out according to the indications given in the Electric Diagram, by connecting the cable supplied with the machine and according with safety norms.

Models FD240 must be electrically powered with 3 phase-neutral-earth.

In model FD240, the compressor has only one allowable rotation direction; therefore, the machine has a control device for the phases sequence; in case that it may show a wrong sequence, the device inform you with a blinking light; in this case two phases must be interchanged.

Pay much attention to above indications because the compressor will be damaged if the rotation direction is not correct.

3.2.3 Remote ON/OFF, thermostat and humidistat connections

Connections must be realised according with electric diagram and safety norms.
 Connections must be done according to the electric wiring diagram specifications:

- **Remote ON/OFF switch**; it must be connected to the terminals n° 1 and 2.
- **Remote Thermostat**; it must be connected to the terminals n° 3 and 4;
- **Remote Humidistat**; it must be connected to the terminals n° 3 and 5;

Eventually it's also possible to have remote HPS and LPS alarms:

- **Remote HPS Alarm**; it must be connected to the terminals n° 6 and N;
- **Remote LPS Alarm**; it must be connected to the terminals n° 7 and N;

3.2.4 External Unit connections

The external unit must be connected according to the electric wiring diagram:

Power Panel	Wire	External Unit Panel
Terminal N	1	Terminal N
Terminal 8	2	Terminal 4
Terminal 9	3	Terminal 5
Terminal 10	4	Terminal 6
Terminal Ground	Ground Wire	Terminal Ground

The characteristics of the external unit are: 140W, 0,62A, 230V/50Hz.

3.3 CONNECTION TO THE CONDENSED WATER DRAINAGE FITTING

Connect condensed water drainage fitting (¾" M) to a draining pipe.

It should be always avoided to form a double siphon, which could obstruct the water flowing with the consequent risk of flooding the area.

3.4 DUCTWORK UNIT CONNECTION (see pag.5 for airflow performances)

All the units are provided with a centrifugal fan that can be ducted.

If only one side should be ducted, a flanged connection with overall dimensions larger than discharge hole should be used.

If either suction side should be ducted, remove suction air filter and its panel, use a flanged connection with overall dimensions larger than suction hole located on the front of the unit and install an air filter into the suction ductwork.



It is very important to install an air filter into the suction ductwork if the filter of the machine itself has been removed . If this filter should not be present, serious damage could occur to the units.

SECTION 4: START UP

4.1 PRE-START CHECK

- ✓ Check that all power cables are correctly connected and all terminals are fastly fixed.
- ✓ The voltage at the phase R S T clamps must be the one indicated on the unit label $\pm 5\%$ tolerance. If this should not happen, please, contact our Factory.



Caution: before proceeding to start up, check that all the cover panel be located in the proper position and locked with fastening screws.

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4.2 START UP

Before to proceed to start up, close electrical line main switch (not supplied with the unit) and the Remote ON/OFF Switch (not supplied with the unit): the green led (see paragraph 4.4) (line) will be lit up.

All the units are provided with electronic control that manages all the various functions of the unit.

To start the unit, activate humidity switch by rotating the knob or by pressing the instrument keyboard (remote thermostat or humidistat, depending on the type of instrument installed): the green light (**WORKING**) will be **ON**.



Before the first Start-up, the machine must be kept in STAND-BY position at-least for 4 hours.



For temporary stop (night-time, weekend, etc.) never break the power supply and strictly follow the procedures illustrated at paragraph 4.6.

4.3 SIGNALLING LEDS PANEL

Units are provided with signalling light panel that indicates unit operational status. Below is reported a brief description of their meaning.



WORKING: indicates that Thermostat o Humidistat are closed so machine is running.



HPS ALARM: indicates that HPS Switch has switched because of too high pressure inside the refrigerant circuit.



LPS ALARM: indicates that LPS Switch has switched because of too low pressure inside the refrigerant circuit.

4.4 PCB'S LED

These leds are inside the External Power Panel of the machine. They are installed on the PCB which controls all the functions of the unit. In order to see them it's necessary to open the panel.

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All this operation described in this chapter **MUST BE DONE BY TRAINED PEOPLE ONLY**

Alarm GREEN Light (LED3): indicates the unit alarm status.

Electrical supply RED Light (LED1): indicates that remote ON/OFF switch is closed.

Compressor RED Light (LED2): indicates running compressor status.

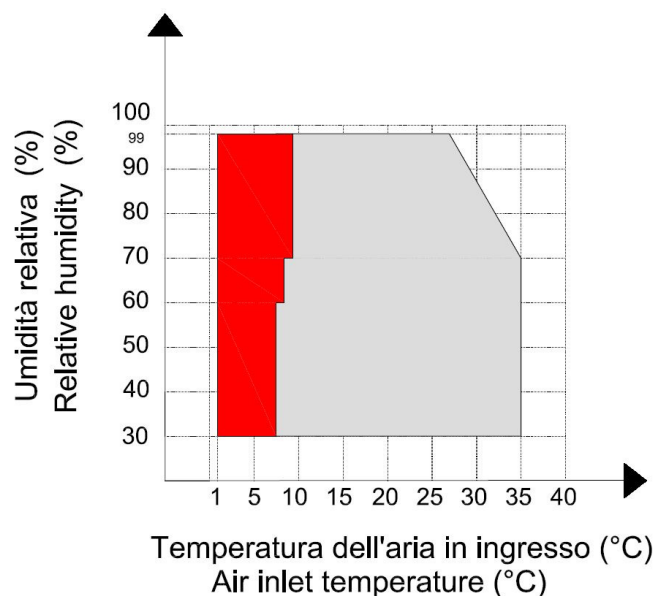
Defrost RED Light (LED4): indicates that the defrost cycle is on.

4.5 FUNCTIONING LIMITS

Following Diagram represents FD units application .



It is strongly recommended to let the units operate within the below reported limits. Exceeding these limits it is not granted neither normal operation nor unit reliability and integrity (for special applications, please contact our Company).

Operating Table – standard units


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In standard unit applications Table, on the left side is indicated operating limit extension, if unit is provided with hot gas defrost.

4.6 DEFROSTING

The frost which could cover the battery, obstructs the passage of the air, reduces the air contact surface and, consequently, the performance; if the frost accumulation is excessive, it can seriously damage the whole system.

All units are provided with Defrost System.

The standard versions have their defrost simply through the periodic stop of the compressor, using the heat of the environment itself.

During the defrosting time the **LED4** is **ON**.

4.7 MACHINE STOP (STAND BY)

If the machine is connected and remote ON/OFF Switch is closed, it works with automatic system controlled by the humidistat and the thermostat.

In order to turn off the machine, the remote humidostat and thermostat must be set on position **OFF**.

In order to stop the machine, it's also possible to open the remote ON/OFF Switch.



It's important to keep close the electrical line main switch when machine is OFF in order to avoid compressor's damage.

Before the first Start-up, the machine must be kept in **STAND-BY** position at-least for 4 hours.

CHAPTER 5: CONTROL AND SAFETY DEVICES

5.1 CONTROL DEVICES

All the control devices are tested on factory before the unit is delivered.
 Their operating mode is described in the following paragraphs.

5.1.1 HUMIDITY CONTROL SWITCH

Humidity control switch enables or disables unit operation depending on the humidity value desired. To verify its correct operation, rotate the control knob clock wise (or set the desired value through the instrument keyboard if a keyboard instrument should be present) and set the humidity desired value close to lower limit. At this point verify that fan and compressor (after a time delay) will be started in sequence. Verify as well that the unit is stopped when humidity set is reached.

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5.2 SAFETY DEVICES

All the safety devices are set and tested on factory before they are delivered.
 Their operating mode is described in the following paragraphs.



All service operations on control and safety devices must be done by TRAINED PEOPLE ONLY: wrong setting values of the mentioned devices could cause serious damage to the unit and injuries to the people.

5.2.1 HIGH PRESSURE SWITCH

High pressure switch stops the unit when the discharge pressure exceeds its pre-set limit value. The reset is manual (by pressing the push-button located under the machine by the side of the electric panel, see figure) and can be done only when pressure is decreased below the device reset value (see table below).



5.2.2 LOW PRESSURE SWITCH

Low pressure switch stops the unit when the suction pressure decreases below its limit pre-set value. The reset is automatic and it occurs only when pressure is higher than the device differential resetting value (see table below).

5.2.3 DEFROST THERMOSTAT

This device signals to electronic control that defrost procedure is needed (see paragraph 4.5).
 When defrost cycle is activated, defrost thermostat will control its conclusion.

CONTROL DEVICES	ACTIVATION	DIFFERENTIAL	REINSERTION
High pressure switch R407c(bar)	29	7.7	Manual
High pressure switch R410a (bar)	42	33	Manual
Low pressure switch (bar)	0.7	1.4	Automatic
Defrost temperature switch (°C)	1	3	Automatic

5.2.4 CONTROL DEVICE OF THE PHASE SEQUENCES

Since the rotative compressors can function only in one rotating direction, this device controls that the phases be correctly connected.

In case they may not be correctly connected, the machine will not start, a light will begin to flash in the relays and on the panel the green light **ALARM** will be ON.

CHAPTER 6: MAINTENANCE AND PERIODIC CHECKS

6.1 IMPORTANT WARNINGS



All this operation described in this chapter **MUST BE DONE BY TRAINED PEOPLE ONLY**



Before every operation of servicing on the unit, be sure that the electric supply has been disconnected.



In the inner side of the unit movable parts are present. Be very careful when operating in their surroundings.



A portion on the compressor shell and discharge line are usually at high temperature level. Be very careful when operating in their surroundings.



Aluminium coil fins are very sharp and can cause serious wounds. Be very careful when operating in their surroundings.



After servicing operations, close the unit with cover panels, fixing them with locking screws.

6.2 GENERAL OBSERVATIONS AND ADVISES

It is a good rule to carry on periodic checks in order to verify the correct working of the unit:

- ✓ Check that safety and control devices are working correctly (**monthly**).
- ✓ Make sure that all the terminals on the electric board and on the compressor be well locked. Periodic cleaning of the sliding terminals of the contactors should be done: if any damage is found, please replace the contactors (**monthly**).
- ✓ Make sure that there is no oil leakage from compressor (**monthly**).
- ✓ Check that the electric resistance in the compressor crankcase be properly functioning (**monthly**: low temperature units only).

- ✓ Clean draining pan and pipeline (**monthly**).
- ✓ Clean finned coils filters with compressed air in the opposite direction of the airflow. If filters should be fully clogged, clean them with a water jet to be sprayed against the air flow side(**monthly or more frequently** if the unit operates on a dusty environment).
- ✓ Check mounting of fan blades and their balancing (**every 4 months**).
- ✓ Make sure that the unit is not too noisy (**every 4 months**).

6.3 POWER SAVINGS

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To reduce power consumption, take care of following suggestions :

- ✓ Make sure that room in which unit should operate has doors and windows firmly closed;
- ✓ Set the humidity control switch to the proper value: lower set values than necessary (even few points) may cause great capacity loss with consequently longer operating periods: it is advisable to set humidity values below 60% only if strictly necessary.
- ✓ **For the machine which has a second condenser (monoblock or split system) check every month if the heat exchanger is clean and free from room dust, and check the efficiency of the motorfan.**

CHAPTER 7: DISPOSAL OF THE UNIT AT END OF ITS LIFE

Once the unit is arrived at the end of its life and needs to be removed or replaced, the following operations are recommended:

- ✓ the unit refrigerant has to be recovered by trained people and sent to proper collecting centre;
- ✓ compressor lubricating oil has to be recovered and sent to proper collecting centre;
- ✓ the frame and various components, if no longer usable , have to be dismantled and subdivided according to their nature; in particular, copper and aluminium, which are present in conspicuous quantity in the unit.

These operations allow easy material recovery and recycling process, reducing environmental impact. It is recommended to follow the pertinent norms in the disposal of the wasted materials.

CHAPTER 8: TROUBLE SHOOTING

In the following pages are reported the most common troubles that can cause the unit to stop or to operate in an incorrect way.



Concerning the solutions, it is necessary to take an extreme care on the actions to adopt: an excessive confidence may cause serious accidents to inexperienced people. It is advisable, once the cause is detected, to contact our servicing people or trained people only.

8.1 UNIT UNDER ALARM

The status of alarm is indicated by the Signalling Leds:

LIGHTS ON	PROBABLE CAUSE	POSSIBLE REMEDIES
HPS ALARM, High Pressure Switch OFF	Air filter clogged, opened panel, too low air flow, suction side obstructed	Clean air filters, close the panel, clean suction side, reset high pressure switch
LPS ALARM, Low Pressure Switch OFF	Low refrigerant charge, Air filter clogged.	Verify if leachages, charge the system, clean air filters.

If it's not clear the reason of the abnormal functioning of the machine it's possible to open the Power Panel and make a check through PCB's leds.



All this operation described in this chapter **MUST BE DONE BY TRAINED PEOPLE ONLY.**



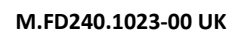
To restore normal operating mode, it is necessary to detect and remove the cause of the alarm

SYMPTOMS	LIGHTS ON	PROBABLE CAUSE	POSSIBLE REMEDIES
A			
Unit does not start and alarm Green Light is OFF	<i>None</i>	Power supply, missing fuses open	Provide power supply, replace fuses
	Power supply light	Too high humidity set	Set a lower humidity set point
	Any red light	Electronic board or Lights board defective	Replace defective board
	Power supply Light, Defrost Light	Electronic board or Lights board defective	Replace defective board
	Power supply Light, Working Light	Compressor inside thermal protection activated, compressor defective, fan defective	Let the compressor cool down, replace defective compressor, replace defective fan

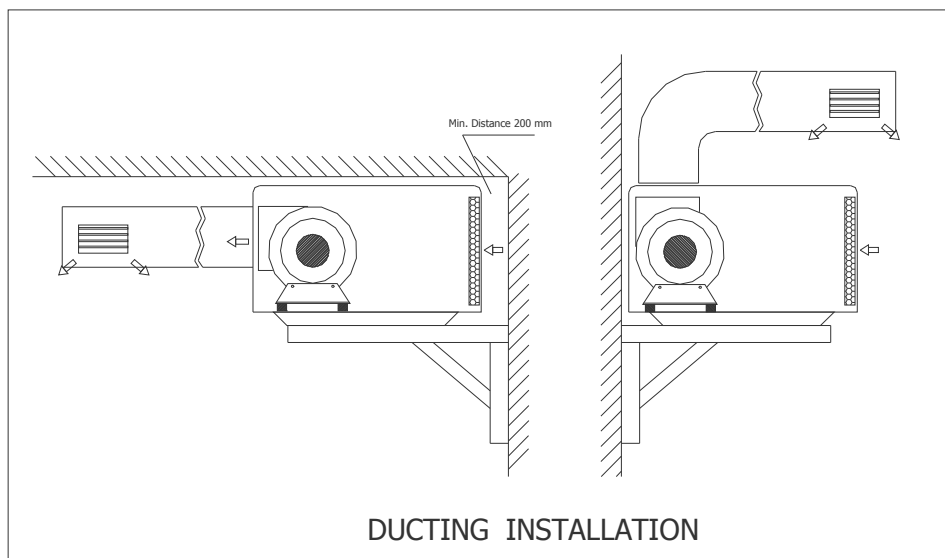
SYMPTOMS	LIGHTS ON	PROBABLE CAUSE	POSSIBLE REMEDIES
B			
Fan starts, compressor does not start, but green alarm is off	Power supply Light, Working Light	Compressor thermal protection enabled, compressor defective	Let the compressor cool down, replace defective compressor
	Any red light	Electronic board or Light board defective	Replace defective board

SYMPTOMS	LIGHTS ON	PROBABLE CAUSE	POSSIBLE REMEDIES
C			
Unit doesn't start, and green alarm led is on	Green alarm led, Flashing relays Light (only 240)	Wrong Sequences in the phases connection	Invert two phases
	Green alarm led	High pressure switch off, air filter clogged	Clean filter and reset High pressure switch
	Green alarm led	High Pressure Switch off (opened panel, too low air flow, suction side obstructed)	Close the panel, clean suction side, reset high pressure switch
	Green alarm led	Low pressure switch off caused by low refrigerant charge (automatic reset)	Verify if leachages, charge the system
	Any led	Electronic board or led board defective	Replace defective board

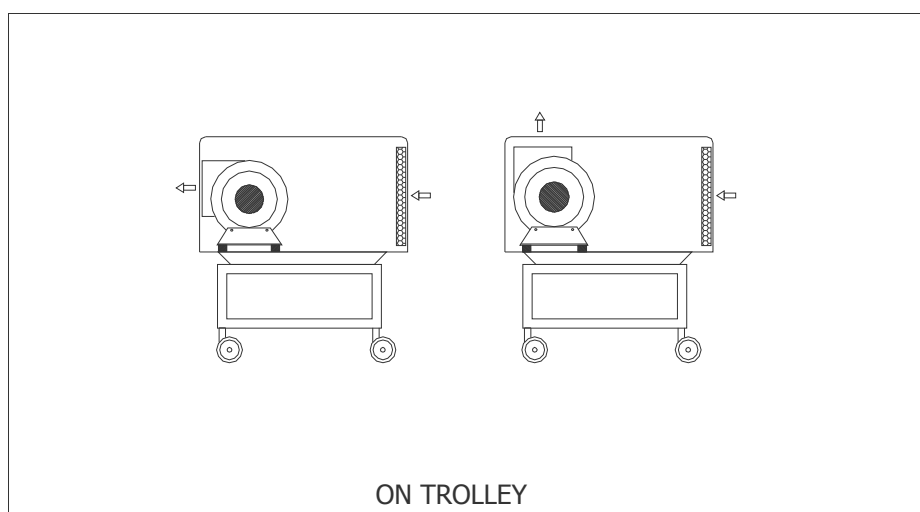
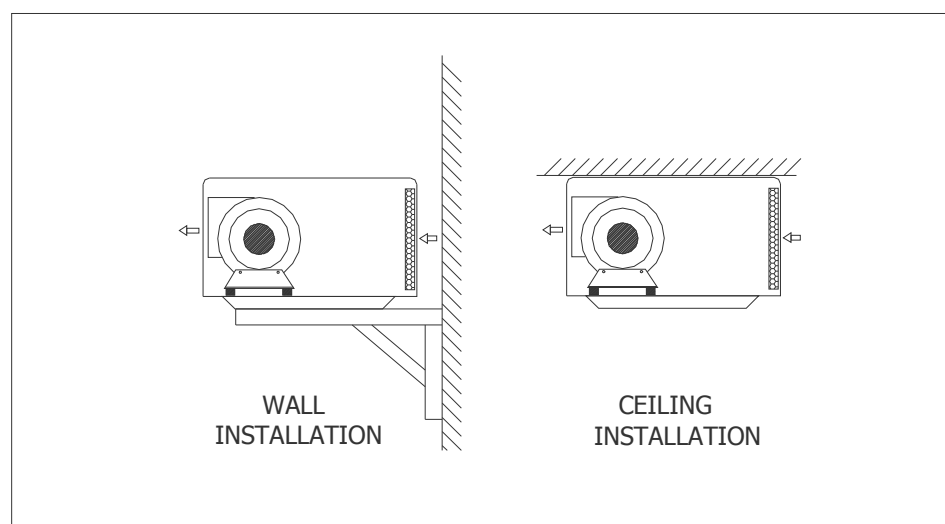
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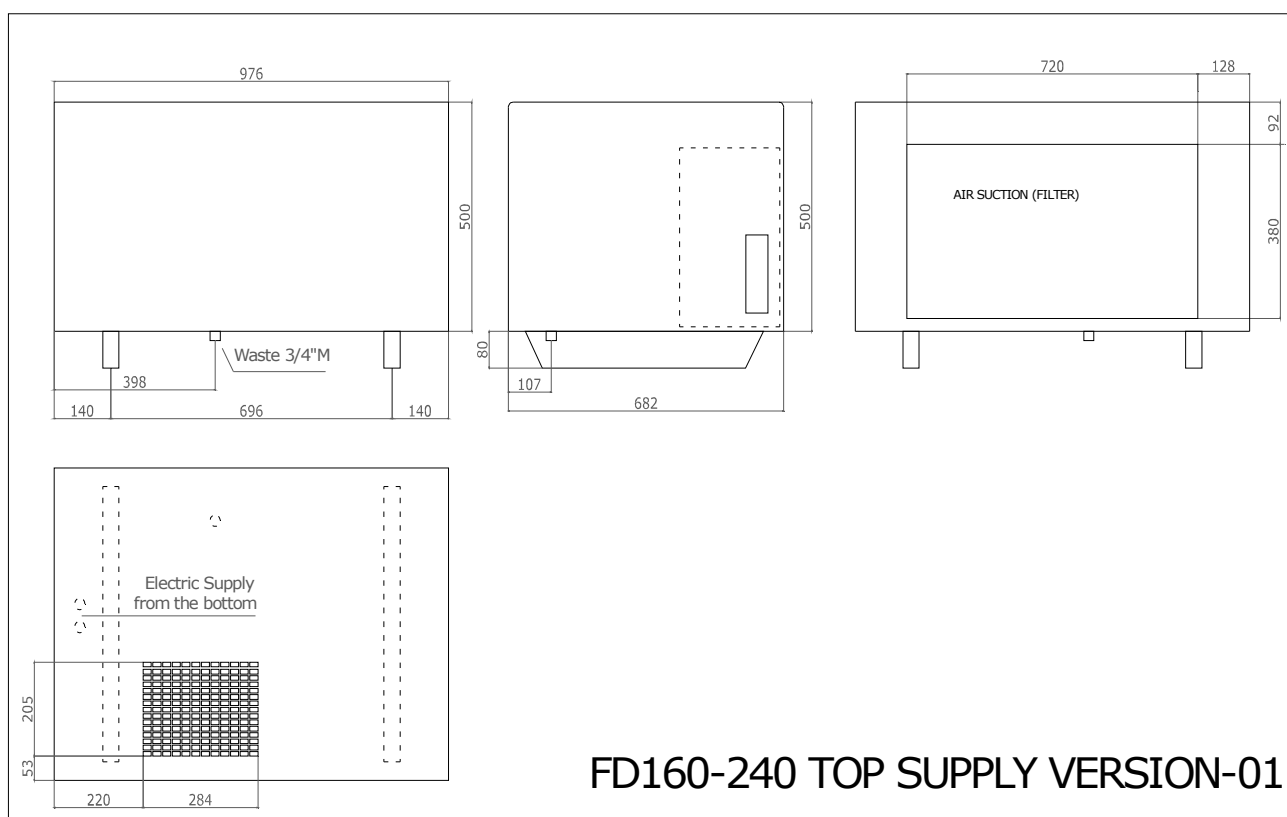
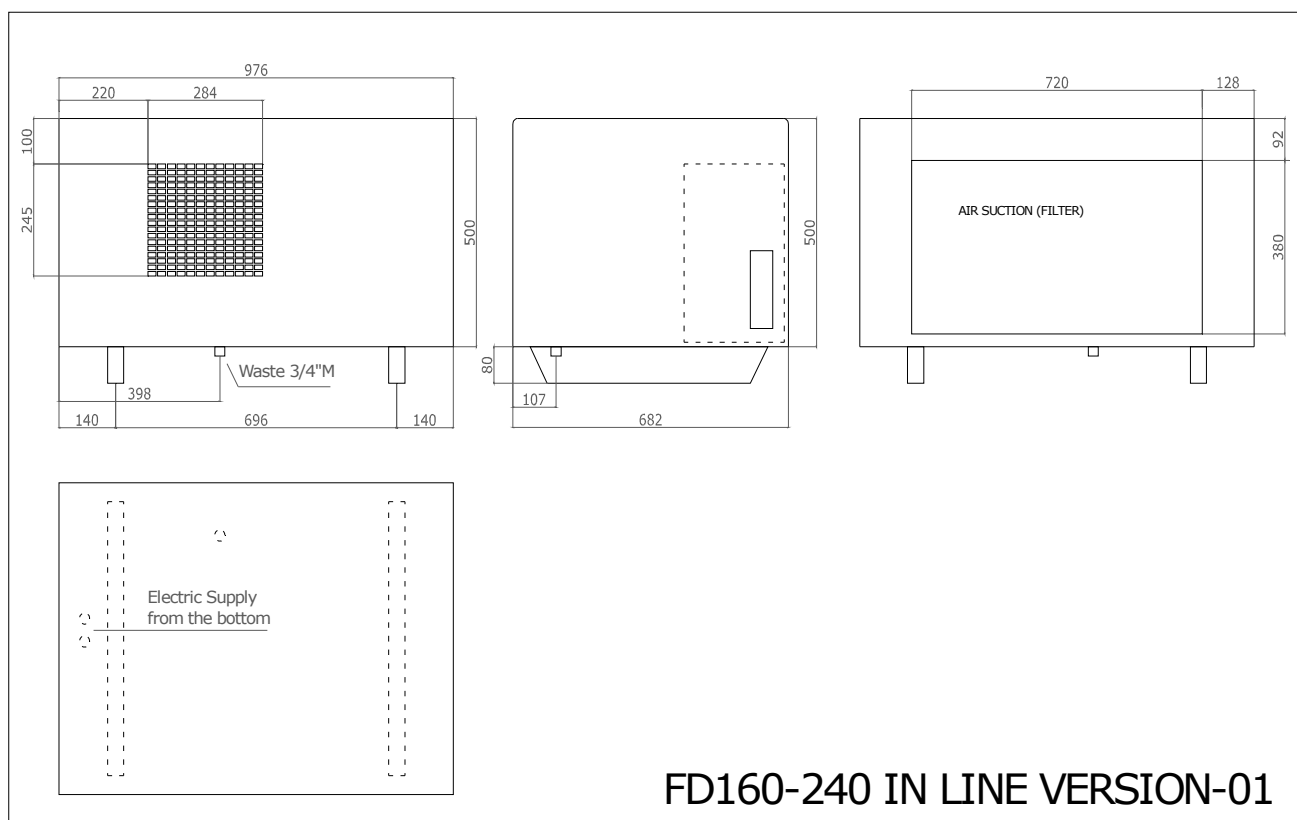


CHAPTER 10: DRAWING (lay out)



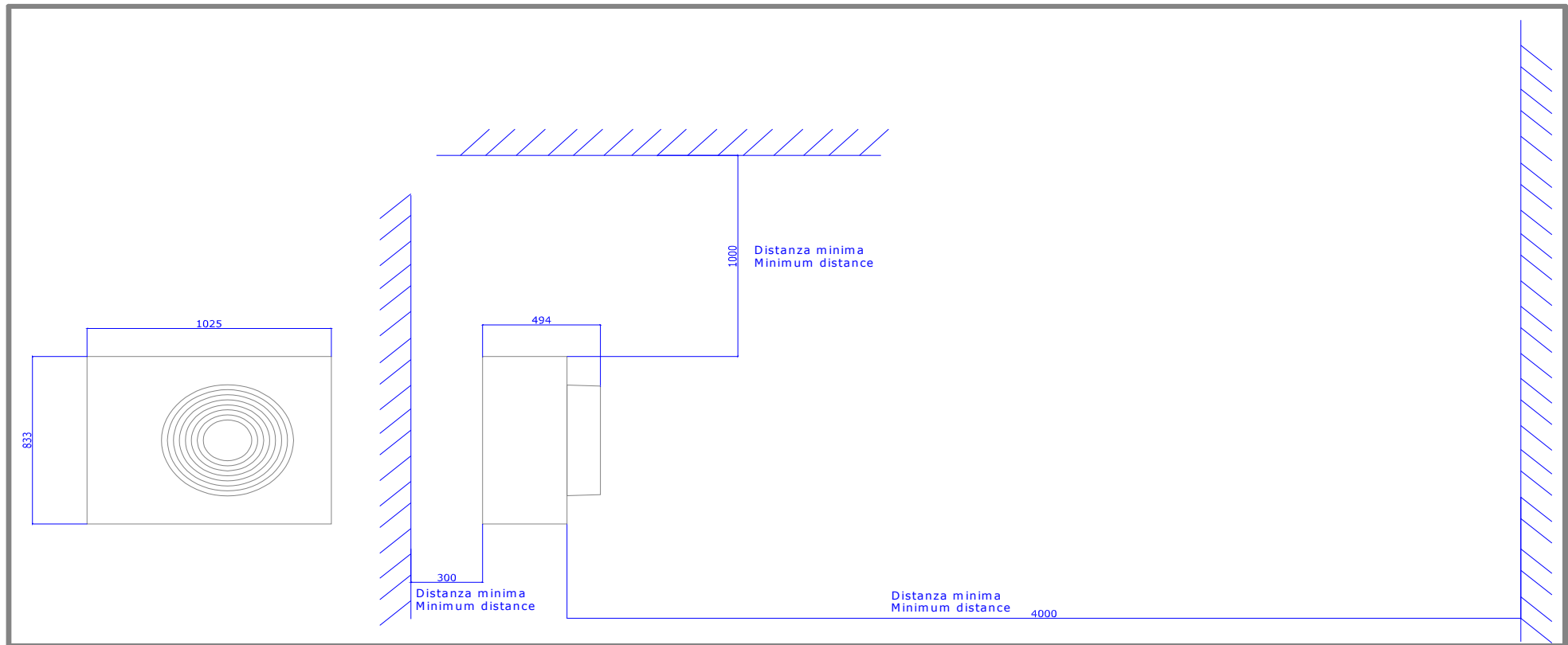
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FD160-240 TOP SUPPLY VERSION-01

Outdoor Unit



The maximum distance between the two units should be 12 mt. The diameter of liquid pipe is 12 mm of gas pipe 16mm. For each mt of liquid pipe (return line) add 90 grams of R410a.

Vertical distance between the units (Hv): $-2m(*) < Hv < +8m$ [(*)with siphone]

Cause the oil during exchange of function (from dehumidifying to cooling) can return to the machine the pendency of piping towards the indoor unit should be minimum 2%.

In order to avoid dispersion of oil from the compressor it's recommended to install apposit siphones before every rising of the pipe. This operation must be done only by qualified technician.