



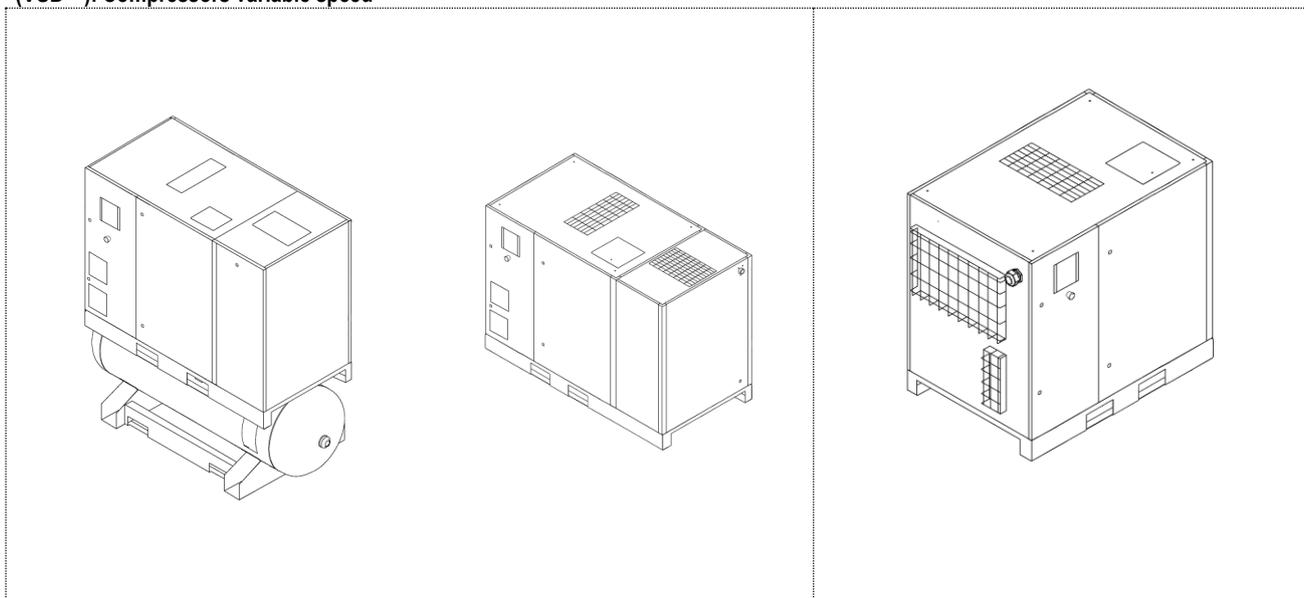
# MANUAL USE AND MAINTENANCE

SILENCED SCREW ROTARY COMPRESSOR UNITS

**HP 15-20-25-30 KW 11-15-19-22**  
**HP 15-20-25-30 (VSD\*) KW 11-15-19-22 (VSD\*)**

Code	
<b>9828093052</b>	<b>04</b>
Edition 02/2018	

(VSD \*): Compressors variable speed

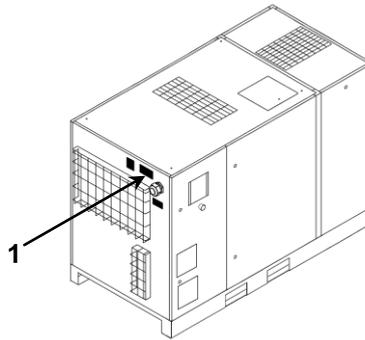


 **READ THIS MANUAL CAREFULLY BEFORE CARRYING OUT ANY OPERATIONS ON THE COMPRESSOR UNIT.**

 **WARNING: CAPACITORS INSIDE INVERTER MAY REMAIN CHARGED FOR 15 MINUTES (ONLY FOR VSD) AFTER THE UNIT HAS BEEN DISCONNECTED FROM MAIN SUPPLY.**  
**WAIT AT LEAST 15 MINUTES (ONLY FOR VSD) AFTER POWER SUPPLY HAS BEEN REMOVED BEFORE PERFORM SERVICE OR REPAIR TO AVOID DEATH OR SERIOUS INJURY.**

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MACHINE AND MANUFACTURER IDENTIFICATION DATA



1) Position of the identification plate

**ADDRESSES OF ASSISTANCE CENTRES**

In the event of breakdown or malfunction of the machine, switch it off and do not tamper with it. If repairs are needed, apply only to a technical assistance centre approved by the manufacturer and insist on the use of original spare parts. Failure to comply with the above may endanger the safety of the machine.

**INTRODUCTION**

Keep this manual with care for future consultation; the use and maintenance manual is an integral part of the machine. Read this manual carefully before carrying out any operations on the compressor unit.

The installation of the compressor unit and all operations involving it must be performed in conformity with the regulations in force concerning electric plants and personal safety.

**CHARACTERISTICS AND SAFETY PRECAUTIONS**



**MACHINE WITH AUTOMATIC START**

Lock Out – Tag Out (LOTO): Open the power isolating switch and lock it with a personal lock. Tag the power isolating switch with the name of the service technician.



**BEFORE REMOVING THE PROTECTIVE GUARDS TO CARRY OUT ANY MAINTENANCE ON THE MACHINE, SWITCH OFF THE ELECTRIC POWER SUPPLY AND DISCHARGE THE RESIDUAL PRESSURE INSIDE THE UNIT.**

**ALL WORK ON THE ELECTRIC PLANT, HOWEVER SLIGHT, MUST BE CARRIED OUT BY PROFESSIONALLY SKILLED PERSONNEL.**

**THIS MACHINE IS NOT SUITABLE FOR EXTERNAL INSTALLATION**

**THIS MACHINE CORRESPOND TO THE ESSENTIAL SAFETY REQUIREMENTS FORESEEN FROM THE EUROPEAN STANDARD (2006/42 CE).**

**THE LUBRICATING LIQUIDS AND OTHER EVENTUAL FLUIDS MUST NOT BE DISCHARGED IN THE ENVIRONMENT. THESE POLLUTING AND HAZARDOUS PRODUCTS MUST COMPULSORY BE DISPOSED BY CHARGING AUTHORISED AND SPECIALISED FIRMS ACCORDING TO THE DIFFERENT TYPOLOGY OF PRODUCT.**

**DIFFERENTIATE THE COMPRESSOR COMPONENTS ACCORDING TO THE DIFFERENT CONSTRUCTION MATERIALS (PLASTIC, COPPER, IRON, OIL FILTER, AIR FILTER ECC...)**

The manufacturer does not accept responsibility for damage caused as a result of negligence or failure to abide by the instructions given above.

**AIR RECEIVER AND SAFETY VALVE:**

- To limit internal corrosion, which could compromise the safety of the compressed air tank, **the condensation that is produced must be discharged at least once a day**. If an automatic drain fitted to the air receiver is present, it is necessary to check that it is working correctly every week and repair it if necessary.
- **The thickness of the receiver must be checked every year and also in accordance with legislation in force in the country where the receiver is installed.**
- **The tank cannot be used and must be replaced if the thickness falls below the minimum level given in the instruction documents for the tank.**
- The tank can be used within the temperature limits given in the conformity declaration.
- **The safety valves of the air receiver and oil receiver must be checked every year and replaced if necessary in accordance with legislation in force.**

**NOT RESPECTING THE ABOVE MENTIONED PRESCRIPTION CAN RESULT IN AIR RECEIVER BURSTING HAZARD.**

The manufacturer does not accept responsibility for damage caused as a result of negligence or failure to abide by the instructions given above.

## 1.0 GENERAL CHARACTERISTICS

The compressor units use single-stage screw rotary air compressors with oil injection. The system is self-bearing and does not require bolts or other devices to anchor it to the floor. The unit is completely assembled in the factory; the necessary connections for setting it up are:

- connection to the power mains (see installation chapter)
- connection to the compressed air network (see installation chapter)

## 2.0 INTENDED USE

The compressor has been built to supply compressed air for industrial use.

**The machine cannot be used in premises where there is a risk of fire or explosion or where work is carried out which releases substances into the environment which are dangerous with regard to safety (for example: solvents, inflammable vapours, alcohol, etc.).**

In particular the appliance cannot be used to produce air to be breathed by humans or used on direct contact with foodstuffs. These uses are allowed if the compressed air produced is filtered by means of a suitable filtering system (Consult the manufacturer for these special uses.) This appliance must be used only for the purpose for which it was specifically designed.

All other uses are to be considered incorrect and therefore unreasonable.

The Manufacturer cannot be held responsible for any damage resulting from improper, incorrect or unreasonable use.

## 3.0 OPERATION

### 3.1 OPERATION FOR COMPRESSOR

The electric motor and the compressor unit are coupled by means of a gear transmission.

The compressor unit takes in the outside air through the suction valve. The air taken in is filtered the cartridge fitted upstream from the suction valve. Inside the compressor unit, the air and the lubricating oil are compressed and sent to the oil separating tank where the oil is separated from the compressed air; the air is then filtered again by the oil separating cartridge to reduce the amount of suspended oil particles to a minimum. At this point the two flows (of oil and air) are sent to two separate coolers where they are cooled, using a flow of air taken from the environment by a special fan inside the machine.

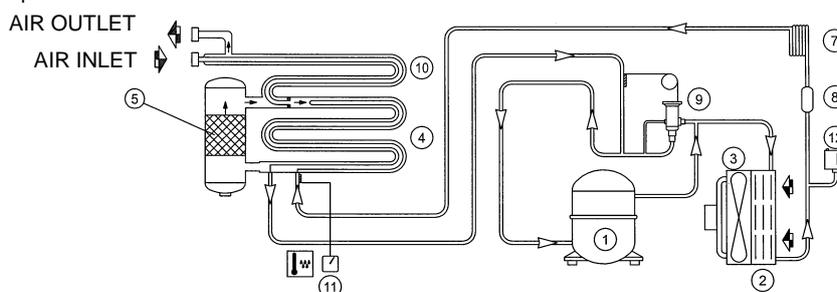
The cooled oil returns to the circuit while the compressed air passes the using network.

### 3.2 OPERATION FOR DRYER

Dryer operation is described below. The gaseous refrigerant coming from the evaporator (4) is sucked by the refrigeration compressor (1) and it is pumped into the condenser (2). This one allows its condensation, eventually with the help of the fan (3); the condensed refrigerant passes through the dewatering filter (8) and it expands through the capillary tube (7) and goes back to the evaporator where it produces the refrigerating effect. Due to the heat exchange with the compressed air which passes through the evaporator against the stream, the refrigerant evaporates and goes back to the compressor for a new cycle. The circuit is equipped with a bypass system for the refrigerant; this intervenes to adjust the available refrigerating capacity to the actual cooling load. This is achieved by injecting hot gas under the control of the valve (9): this valve keeps constant the pressure of the refrigerant in the evaporator and therefore also the dew point never decreases below 0 °C in order to prevent the condensate from freezing inside the evaporator.

The drier runs completely automatically; it is calibrated in the factory for a dew point of 5 °C and therefore no further calibrations are required.

#### DRYER FLOW DIAGRAM



**DRYERS WITH R410A REFRIGERANT GAS STARTS WITH SOME DELAY (UP TO 3 MINUTES) AT THE COMPRESSOR START UP**

## 4.0 GENERAL SAFETY STANDARDS

The appliance may be used only by specially trained and authorized personnel.

Any tampering with the machine or alterations not approved beforehand by the Manufacturer relieve the latter of responsibility for any damage resulting from the above actions.

The removal of or tampering with the safety devices constitutes a violation of the European Standards on safety.

**ENSURE THAT THERE ARE DISCONNECTOR SWITCH AND FUSES UPSTREAM THE MACHINE. FOR DETAILS (SIZE AND TYPE) SEE WIRING/SERVICE DIAGRAM.**



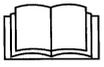
**ALL WORK ON THE ELECTRIC PLANT, HOWERER SLIGHT, MUST BE CARRIED OUT BY PROFESSIONALLY SKILLED PERSONEL.**

5.0 DESCRIPTION OF DANGER SIGNALS

FIG. 2

	1) FLUID EJECTION		6) HOT PARTS
	2) DANGEROUS ELECTRIC VOLTAGE		7) MOVING PARTS
	3) AIR NOT FIT FOR BREATHING		8) MOVING PARTS
	4) NOISE		9) MACHINE WITH AUTOMATIC START
	5) HIGH PRESSURE		10) PURGE EVERY DAY

5.1 DESCRIPTION OF COMPULSORY SIGNALS

	11) READ THE USE AND MAINTENANCE INSTRUCTIONS		
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6.0 DANGERS ZONES

6.1 DANGERS ZONES FOR COMPRESSOR UNIT

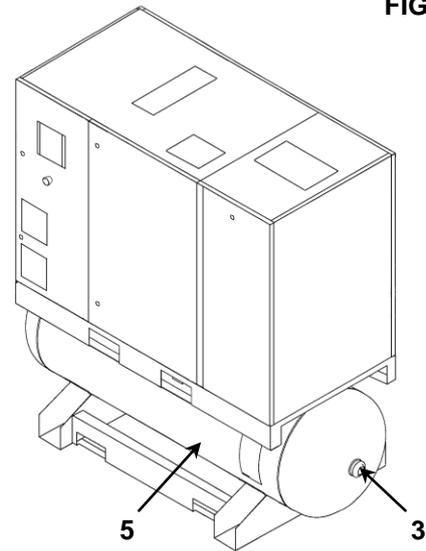
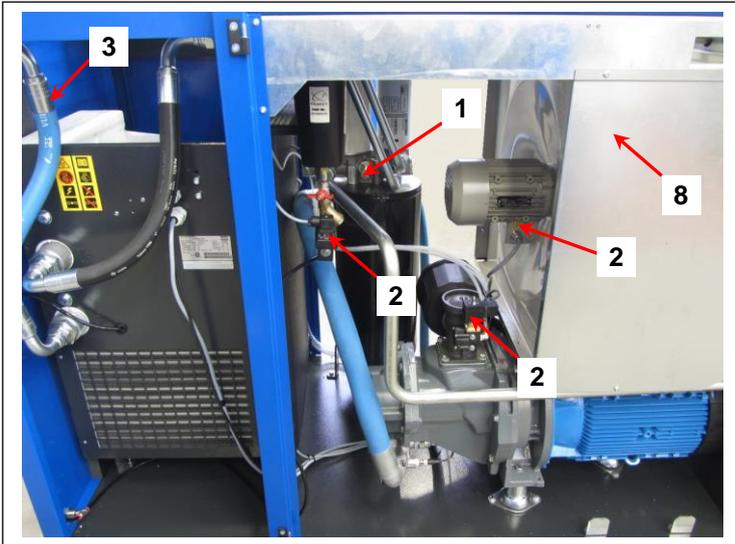
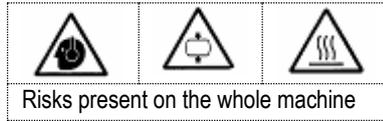
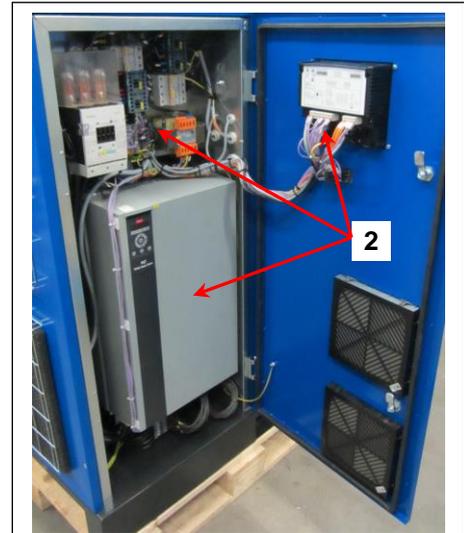
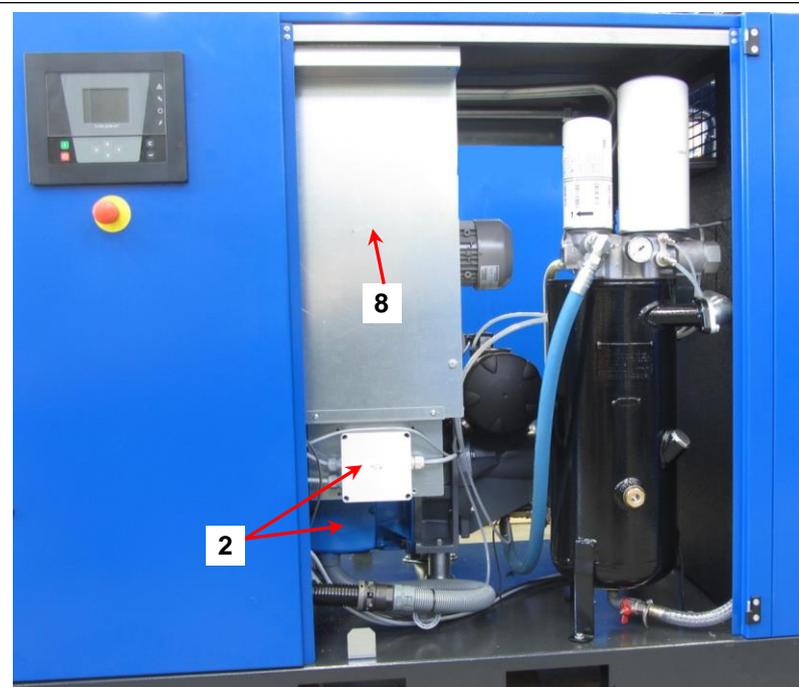


FIG. 3



6.2 DANGERS ZONES FOR DRIER UNIT AND TANK

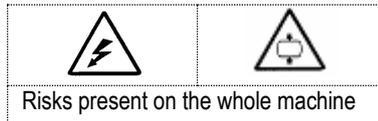
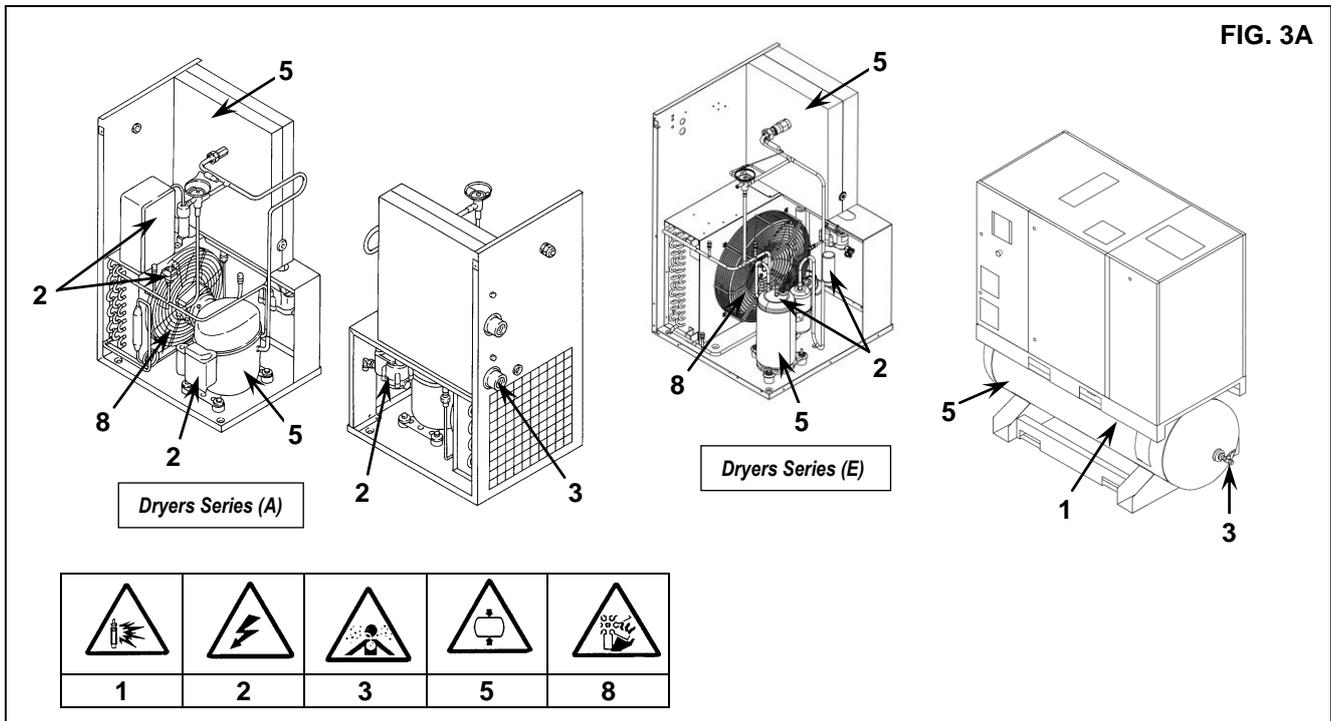


FIG. 3A

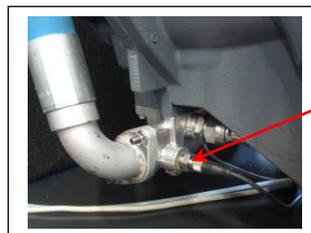
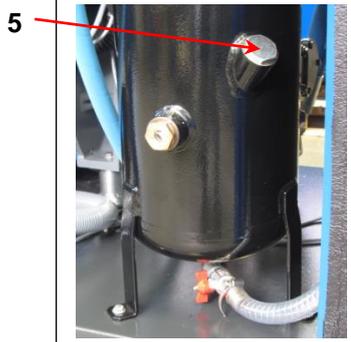
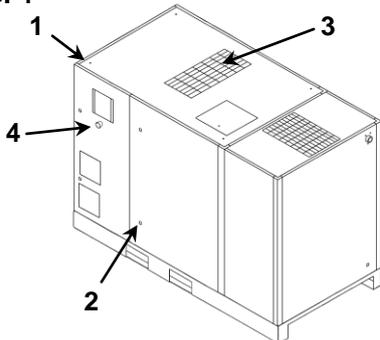


7.0 SAFETY DEVICES

7.1 SAFETY DEVICES FOR SCREW COMPRESSOR

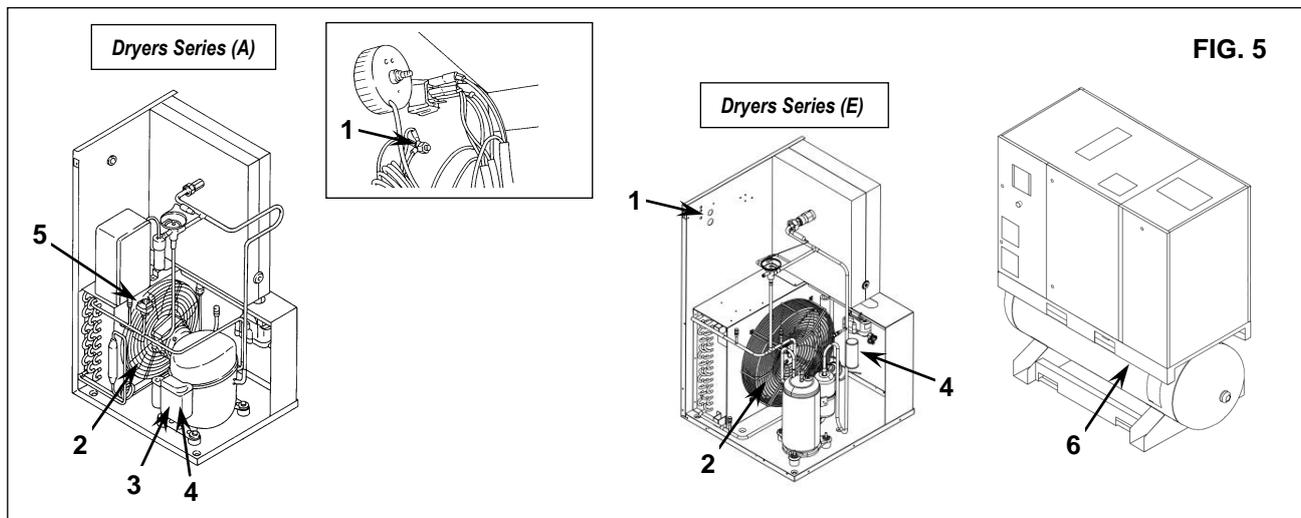
1) Safety screws	4) Emergency stop button with mechanical seal and rotation release.
2) Side panels and door to the electric panel, opened with a special key	5) Oil filling cap (with safety breather)
3) Fixed protection device - cooling fan	6) Safety valve
	7) Temperature switch

FIG. 4



7.2 SAFETY DEVICES FOR DRIER UNIT AND TANK

1) Earth	4) Overload protector for compressor
2) Fan protection	5) Protective pressure switch cap
3) Relay for compressor (automatic)	6) Safety valve

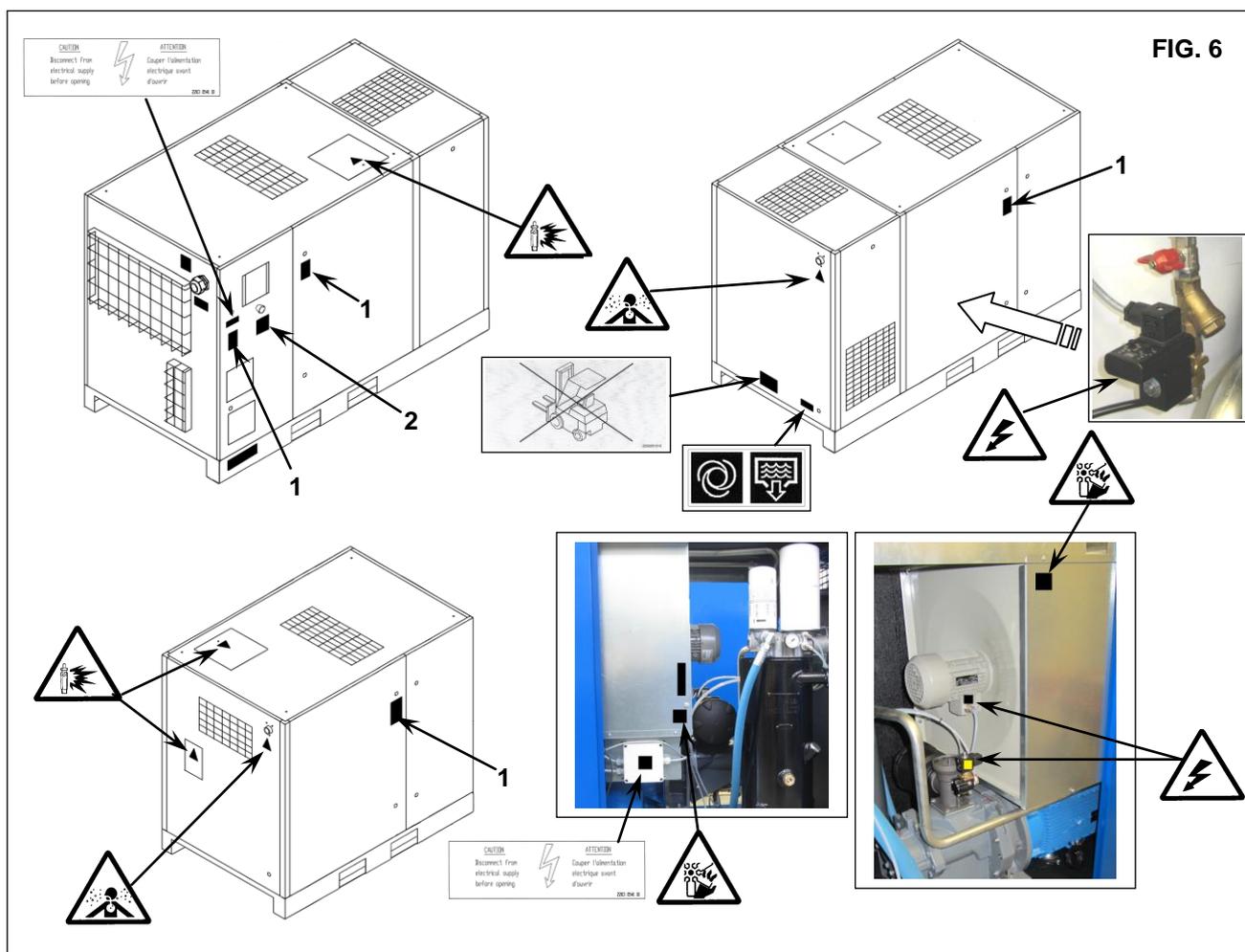


**POSITION OF PLATES**

8.1 POSITION OF THE DANGER PLATES FOR COMPRESSOR UNIT

The plates fitted on the compressor unit are part of the machine; they have been applied for safety purposes and must not be removed or spoiled for any reason.

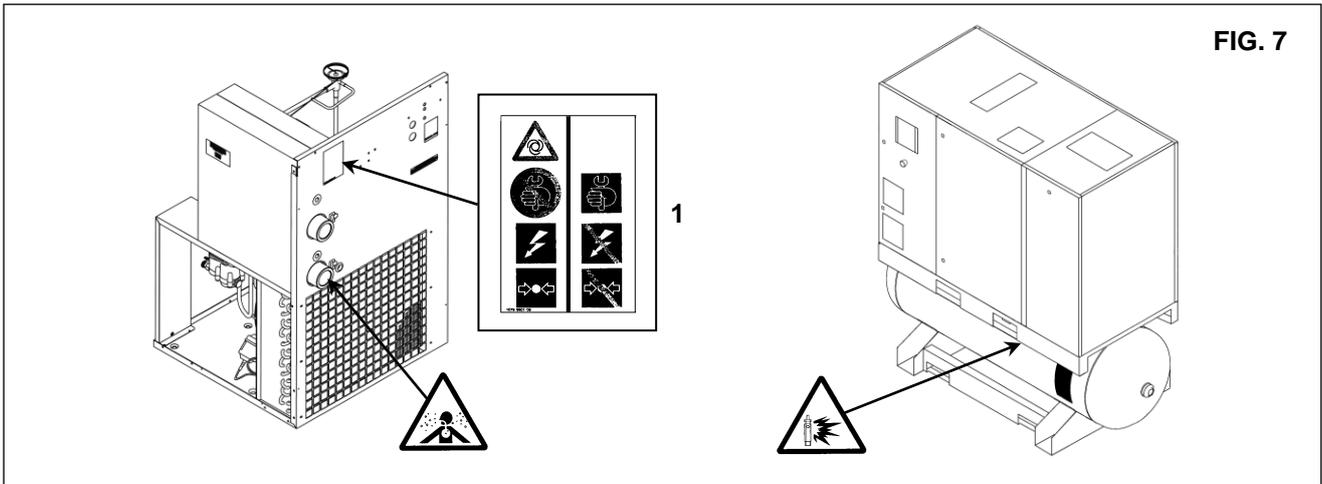
- 1) Dangers plate Code 1079990348
- 2) Plate "Machine with automatic start" 2202260791



**8.2 POSITION OF THE DANGER PLATES FOR DRYER AND TANK**

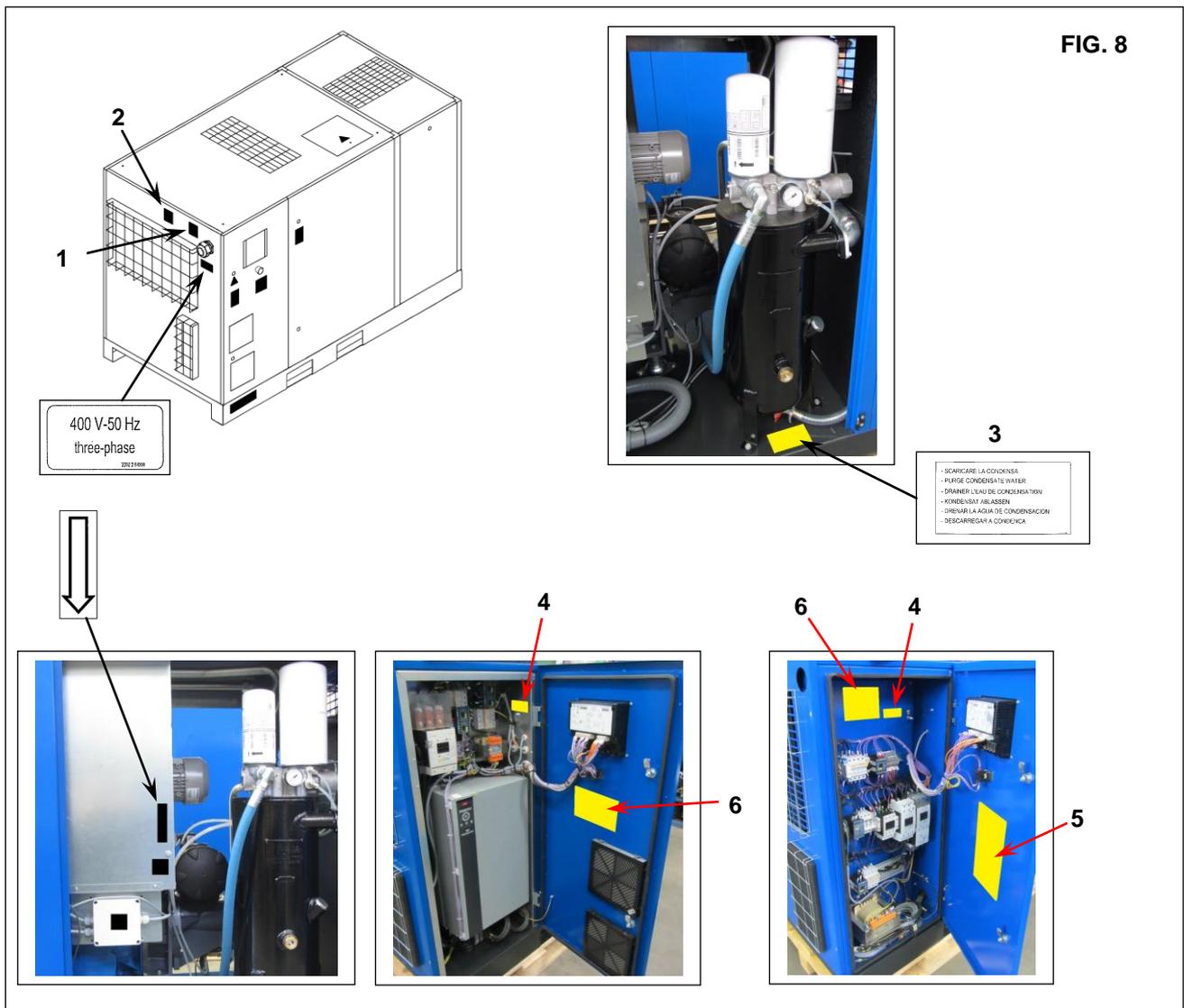
The plates fitted on the compressor unit are part of the machine; they have been applied for safety purposes and must not be removed or spoiled for any reason.

1) Dangers plate Cod. 1079990148



**8.3 POSITION OF THE DATA PLATE FOR COMPRESSOR UNIT, ELECTRICAL AND UL LABELS**

1) Identification plate, 2) Label electrical equipment, 3) Purge condensate water, 4) Label "UL", 5) Connection label (for fixed speed), 6) Fuses label



8.4 POSITION OF THE DATA PLATE FOR DRYER UND TANK

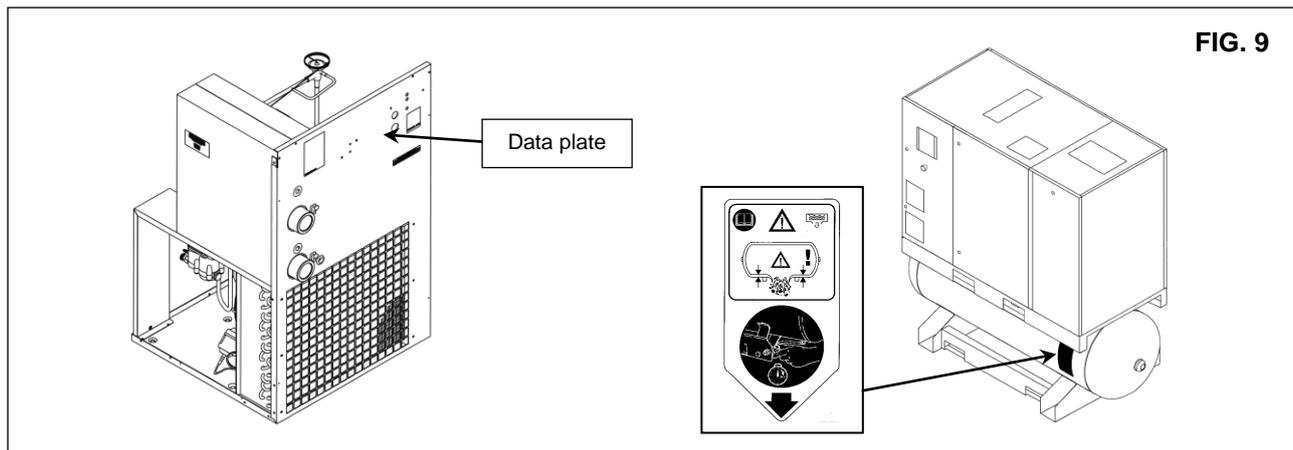


FIG. 9

9.0 COMPRESSOR ROOM

9.1 FLOOR

The floor must be even and of industrial type; the total weight of the machine is shown in the Chap. 13.0 Remember the total weight of the machine when positioning it.

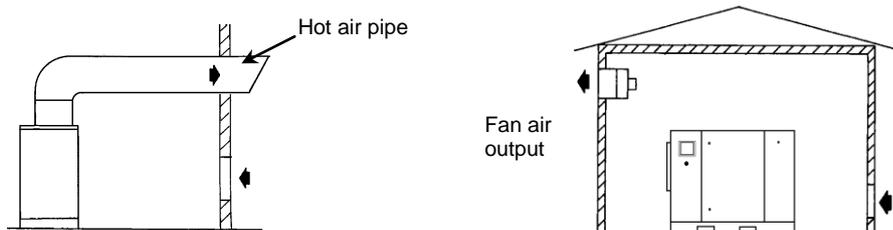
9.2 VENTILATION

When the machine is operating, the room temperature must not be higher than 46 °C or lower than 1 °C.

The volume of the room must be about 60 m<sup>3</sup> The room must be provided with 2 openings for ventilation with a surface area of about 0,5 m<sup>2</sup> each. The first opening must be in a high position to evacuate the hot air, the second opening must be low to allow the intake of external air for ventilation. If the environment is dusty it is advisable to fit a filtering panel on this opening.

9.3 EXAMPLES OF VENTILATION OF THE COMPRESSOR ROOM

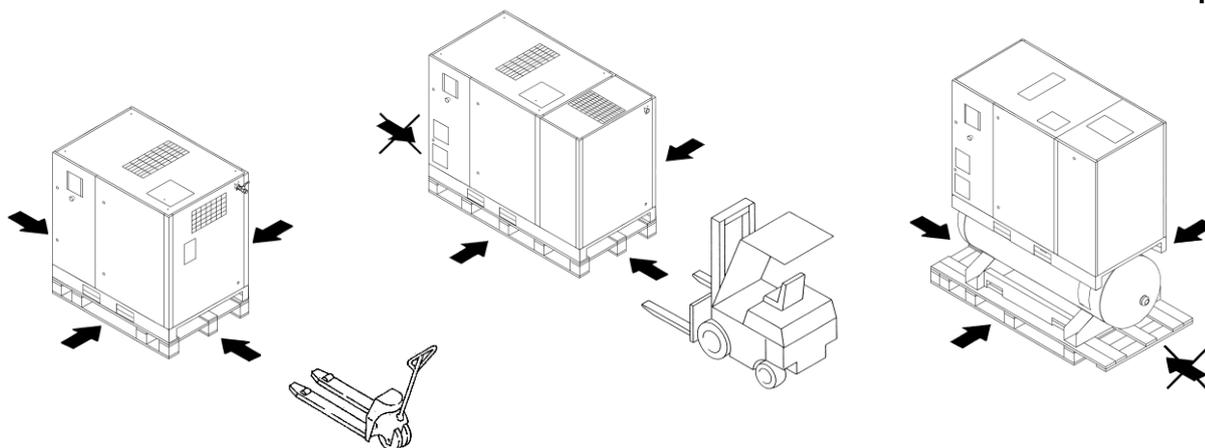
FIG. 10



10.0 TRANSPORT AND HANDLING

The machine must be transported as shown in the following figures.

FIG. 11



11.0 UNPACKING

After removing the packing, ensure that the machine is unbroken and that there are no visibly damaged parts.

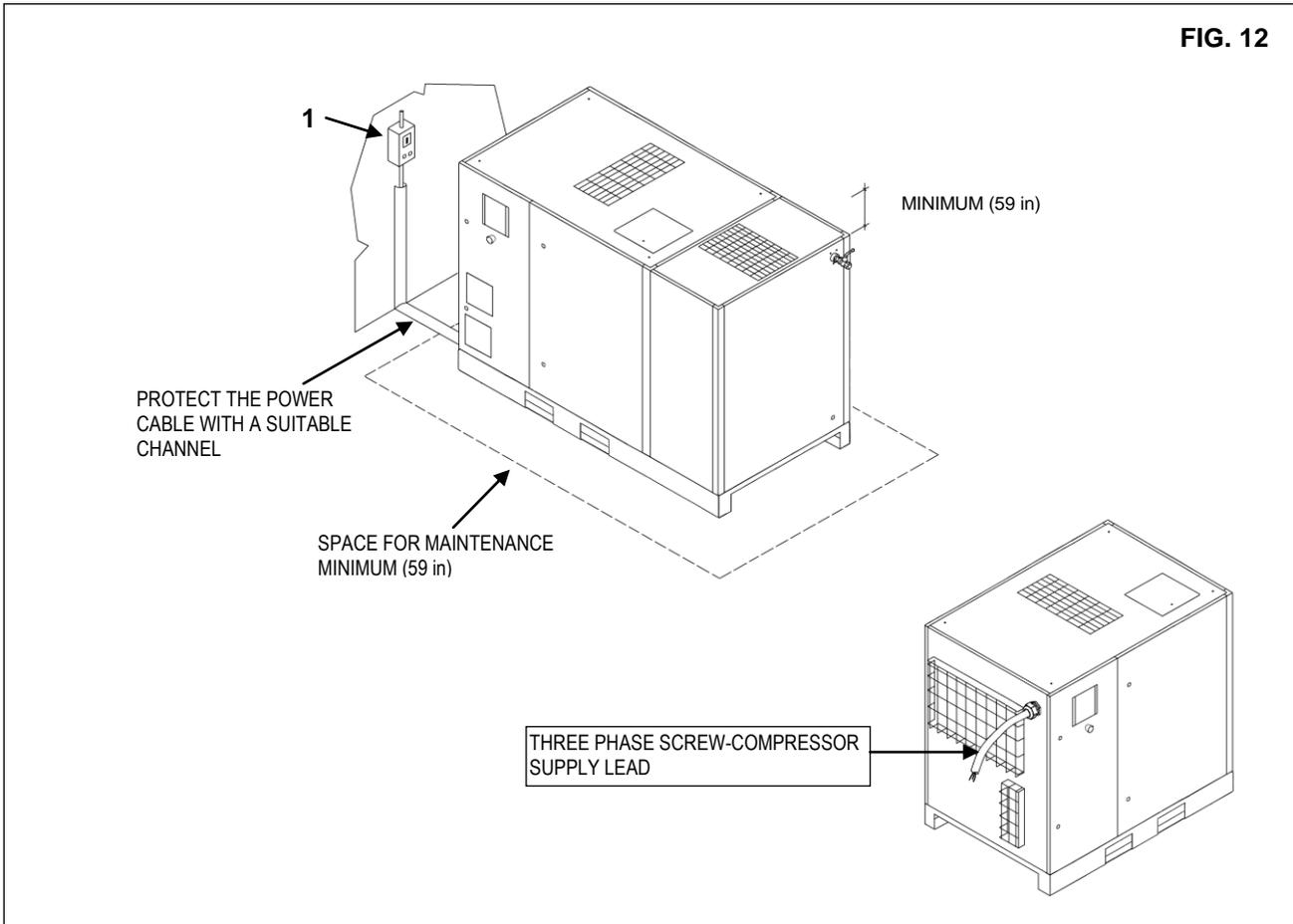
If you are in doubt, do not use the machine but apply to the manufacturer technical assistance service or to your dealer. The packing material (plastic bags) must not be left within the reach of children or abandoned in the environment, as they are a potential source of danger and pollution. Dispose of these materials in the approved collection centres.

**12.0 INSTALLATION**

**12.1 POSITIONING**

After unpacking the equipment and preparing the compressor room, put the machine into position, checking the following items:

- ensure that there is sufficient space around the machine to allow maintenance (see Fig. 12).



**FIG. 12**



**ENSURE THAT THE OPERATOR CAN SEE THE WHOLE MACHINE FROM THE CONTROL PANEL AND CHECK THE PRESENCE OF ANY UNAUTHORIZED PERSONS IN THE VICINITY OF THE MACHINE.**

**12.2 ELECTRICAL CONNECTION**

- Check that the supply voltage is the same as the value indicated on the machine data plate.
- Check the condition of the line leads and ensure that there is an efficient earth lead.
- **Ensure that there are disconnect switch and fuses upstream the machine (see Ref. 1 for compressor Ref. 2 for dryer Fig. 11). For details (size and type) see wiring/service diagram.**
- Connect the machine power cables with the greatest care, according to the standards in force. These cables must be as indicated on the machine wiring diagram.
- Connect the cables to the charging clamps on the electric panel and make sure they are properly tightened. After the first 50 working hours, check that the screws on the electric terminals are tight.



**ONLY PROFESSIONALLY SKILLED PERSONNEL MAY HAVE ACCESS TO THE ELECTRIC PANEL. SWITCH OFF THE POWER BEFORE OPENING THE DOOR OF THE ELECTRIC PANEL. COMPLIANCE WITH THE REGULATIONS IN FORCE CONCERNING ELECTRIC PLANTS IS FUNDAMENTAL FOR OPERATOR SAFETY AND FOR THE PROTECTION OF THE MACHINE.**

**CABLES, PLUGS AND ALL OTHER TYPE OF ELECTRIC MATERIAL USED FOR THE CONNECTION MUST BE SUITABLE FOR THE USE AND COMPLYING WITH THE REQUIREMENTS STATED BY THE REGULATIONS IN FORCE.**



The standard voltage configuration for the compressor is mentioned on the **data plate** of the machine.

**NEVER OPERATE THE COMPRESSOR ON A VOLTAGE OTHER DIFFERENT THAN SHOWN ON THE ELECTRIC CABINET. For tri-voltage machine follow the instructions in the electrical diagram (inside cubicle) to convert the operating voltage of the compressor for either 208V or 230V or 460V**

### 12.3 CONNECTION TO THE COMPRESSED AIR NETWORK

Fit a manual interception valve Ref. 1 between the machine and the compressed air network so that the compressor may be isolated during maintenance operations (see figure 13) .



**PIPES, FITTINGS AND CONNECTIONS USED FOR THE CONNECTION OF THE ELECTROCOMPRESSOR TO THE COMPRESSED AIR NETWORK MUST BE SUITABLE TO THE USE ACCORDING TO THE PRESCRIPTIONS OF THE REGULATIONS IN FORCE IN THE COUNTRY OF USE.**

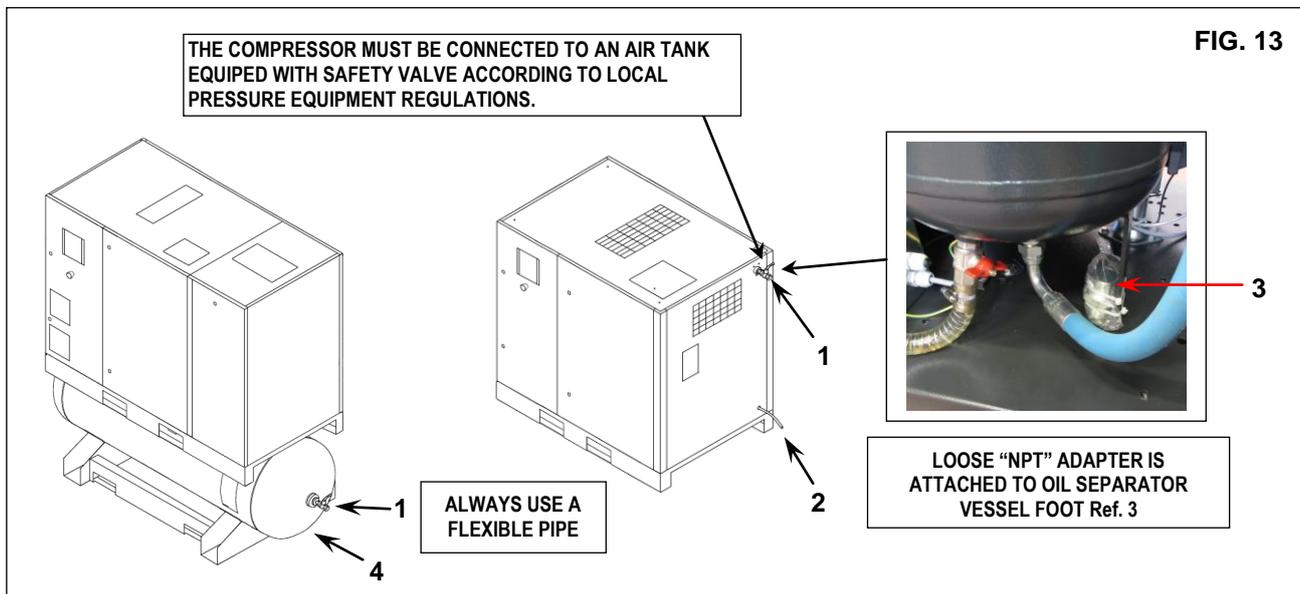


FIG. 13

The automatic drainage Ref. 2 and manual Ref. 4 Fig. 13 the condensate, are led outside the machine with a flexible pipe that may be inspected. Drainage must comply with the local regulations in force.

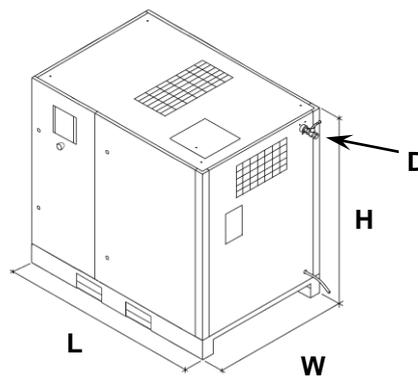
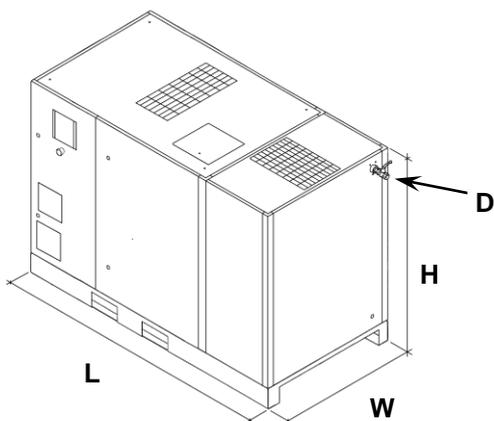


**ALL DAMAGE DUE TO THE FAILURE TO COMPLY WITH THESE INDICATIONS CANNOT BE ATTRIBUTED TO THE MANUFACTURER AND MAY CAUSE INVALIDITY OF THE GUARANTEE CONDITIONS.**

### 12.4 STARTING UP

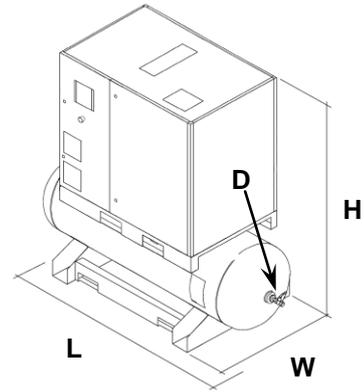
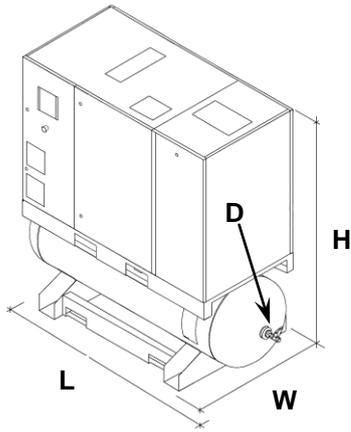
See part B of this manual, Chapter 20.0

### 13.0 DIMENSIONS AND TECHNICAL DATA



	Dimensions (in)			Air connection (NPT)
	L	W	H	D
HP 15-20-25-30 kW 11-15-18,5-22				
HP 15-20-25-30 (VSD) kW 11-15-18,5-22 (VSD)	77,9	35,6	50,3	1"

	Dimensions (in)			Air connection (NPT)
	L	W	H	D
HP 15-20-25-30 kW 11-15-18,5-22				
HP 15-20-25-30 (VSD) kW 11-15-18,5-22 (VSD)	58,5	35,6	50,3	1"



<b>Air receiver 120 Gal. (with dryer)</b>				
HP 15-20-25-30 kW 11-15-18,5-22	Dimensions (in)			Air connection (NPT)
	L	W	H	D
HP 15-20-25-30 (VSD) kW 11-15-18,5-22 (VSD)	77,9	35,6	74,8	1"

<b>Air receiver 120 Gal. (without dryer)</b>				
HP 15-20-25-30 kW 11-15-18,5-22	Dimensions (in)			Air connection (NPT)
	L	W	H	D
HP 15-20-25-30 (VSD) kW 11-15-18,5-22 (VSD)	73,6	35,6	74,8	1"

	<b>Net weight (lb) (Fixed speed compressors)</b>			
	HP 15 - kW 11	HP 20 - kW 15	HP 25 - kW 18,5	HP 30 - kW 22
Weight (lb) with dryer	1279	1296	1378	1413
Weight (lb) with air receiver 120 Gal. with dryer	1780	1797	1879	1914
Weight (lb) without dryer	1071	1089	1122	1157
Weight (lb) with air receiver 120 Gal. without dryer	1572	1590	1623	1658

	HP 15 - kW 11			HP 20 - kW 15			HP 25 - kW 18,5			HP 30 - kW 22		
	100	125	150	100	125	105	100	125	150	100	125	150
Working pressure (psi)	100	125	150	100	125	105	100	125	150	100	125	150
Maximum pressure (psi)	107	132	157	107	132	157	107	132	157	107	132	157
Standard air capacity (cfm) 50Hz	81,8	68,4	61,4	100,4	92,4	79,2	121,4	114,8	100	142,8	131,6	118,9
Standard air capacity (cfm) 60Hz	78,4	70,1	61,5	101,3	92,6	81,4	125	111,8	100,3	147,5	131,9	119,4
Noise product. dB(A)	66			67			68			69		
Minimum ambient temperature (°F)	34											
Maximum ambient temperature (°F)	115											
Oil load (Gal)	3,43			3,43			3,43			3,43		

	<b>Net weight (lb) (Variable speed compressors VSD 460V/60Hz and 400V/50Hz)</b>			
	HP 15 - kW 11	HP 20 - kW 15	HP 25 - kW 18,5	HP 30 - kW 22
Weight (lb) with dryer	1259	1276	1391	1426
Weight (lb) with air receiver 120 Gal. with dryer	1760	1777	1892	1927
Weight (lb) without dryer	1052	1069	1135	1171
Weight (lb) with air receiver 120 Gal. without dryer	1553	1570	1636	1672

	HP 15 - kW 11			HP 20 - kW 15			HP 25 - kW 18,5			HP 30 - kW 22		
	100	125	150	100	125	105	100	125	150	100	125	150
Working pressure (psi)	100	125	150	100	125	105	100	125	150	100	125	150
Maximum pressure (psi)	107	132	157	107	132	157	107	132	157	107	132	157
Standard air capacity (cfm) 50Hz	79,7	70,8	62,9	101,9	94,4	86,8	129,6	120	110,6	155,9	141,3	128,2
Standard air capacity (cfm) 60Hz	79,7	70,8	62,9	101,9	94,4	86,8	129,6	120	110,6	155,9	141,3	128,2
Noise product. dB(A)	66			67			68			69		
Minimum ambient temperature (°F)	34											
Maximum ambient temperature (°F)	115											
Oil load (Gal)	3,43			3,43			3,43			3,43		

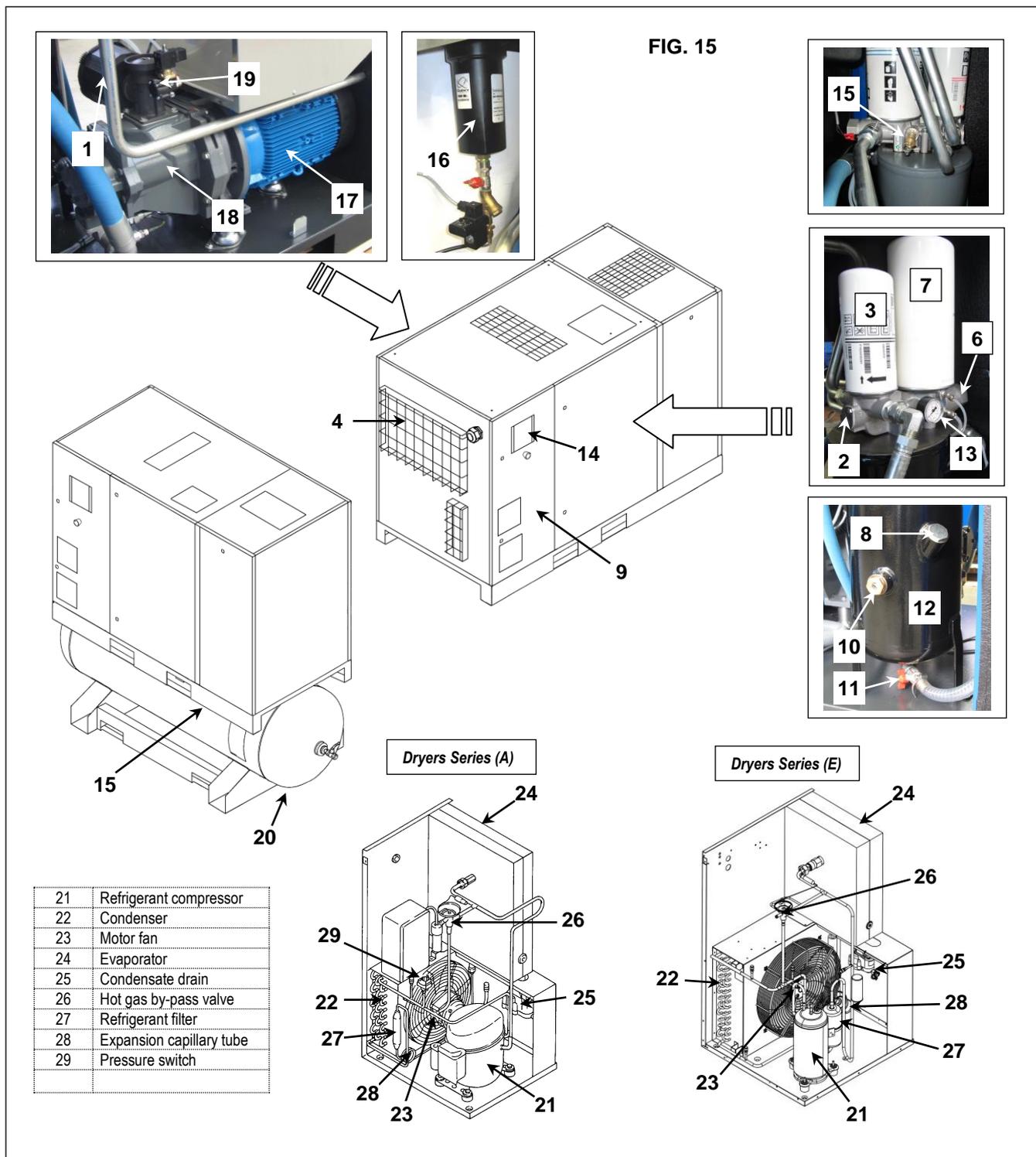
Type Dryer	Freon R134A (lb)	Freon R404A (lb)	Freon R410A (lb)	Dryer maximum power (hp)	MAX. (psi)
	60 Hz	50 Hz	50 Hz	60 Hz (50 Hz)	
A6/7	1,250	1,32	-	1,4 (1,27)	188
A8 (E8 50Hz)	1,45 (A8)	-	1,587 (E8)	2,13 (1,90)	188

14.0 MACHINE ILLUSTRATION

14.1 GENERAL LAY-OUT FOR DRYER AND TANK

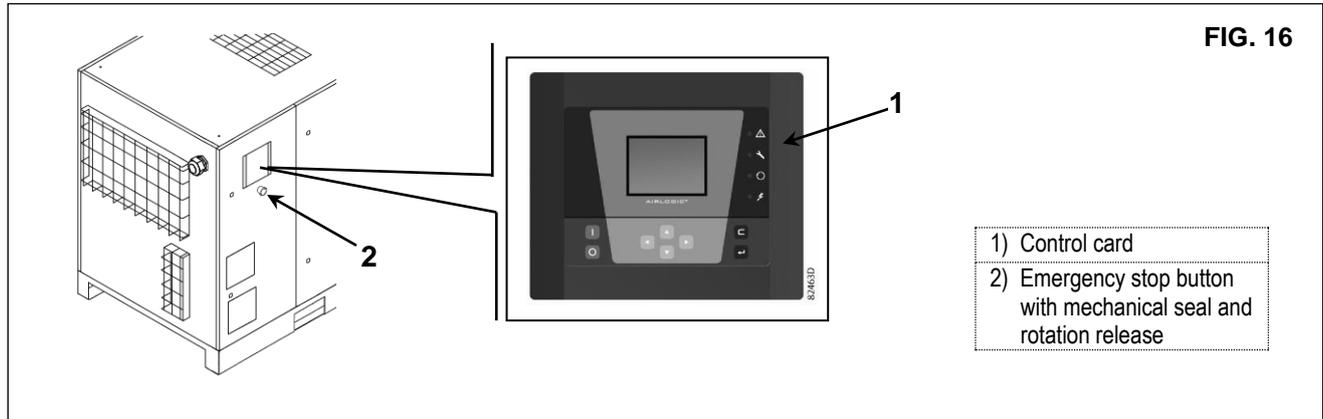
- |  |                               |
|--|-------------------------------|
| 1 Air suction filter                           | 11 Oil discharge              |
| 2 Thermostatic valve                           | 12 Oil tank                   |
| 3 Oil filter                                   | 13 Pressure gauge tank        |
| 4 Air-oil cooler                               | 14 Control card               |
| 6 Minimum pressure valve                       | 15 Safety valve (*)           |
| 7 Air-oil separator with oil separating filter | 16 Water separator drain      |
| 8 Top-up or oil filling cap                    | 17 Electric motor             |
| 9 Control panel                                | 18 Screw compressor           |
| 10 Oil gauge                                   | 19 Suction unit               |
|  | 20 Condensate manual drainage |

\* IT IS FORBIDDEN TO TAMPER WITH THE SETTING VALUES OF THE SAFETY VALVE





**BEFORE CARRYING OUT THE OPERATION TEST, READ CAREFULLY AND ACQUIRE A GOOD KNOWLEDGE OF THE COMMAND FUNCTIONS.**



**14.3 Graphic controller for fixed compressor and Variable Speed Drive compressor.**

**Introduction**

The electronic controller has following functions:

- Controlling the compressor
- Protecting the compressor
- Monitoring components subject to service
- Automatic restart after voltage failure (option)

**Automatic control of the compressor**

The controller maintains the net pressure between programmable limits by automatically loading and unloading the compressor in case of fixed speed machines. For VSD machines the controller also change the motor speed in order to maintain the setpoint pressure. A number of programmable settings, e.g. the unloading and loading pressures, the minimum stop time and the maximum number of motor starts are taken into account.

The controller stops the compressor whenever possible to reduce the power consumption and restarts it automatically when the net pressure decreases. If the expected unloading period is too short, the compressor is kept running to prevent too short stand-still periods.

**Protecting the compressor**

**Shut-down**

The compressor will be stopped and it will be indicated on the display in the following events:

- compressor element outlet temperature bigger than the programmed shut-down level detected by temperature sensor
- compressor element outlet temperature bigger than the programmed shut-down level detected by temperature switches
- overload of the drive motor
- overload of the fan motor
- frequency converter failure (only for VSD compressors)

In chapter "Shut-down visualization" it's explained how it appears on the display, how to recognize which is the shut-down and how to solve it.

**Shut-down warning**

A shut-down warning level is a programmable level below the shut-down level. If one of the measurements exceeds the programmed shut-down warning level, this will also be indicated to warn the operator before the shut-down level is reached. The shut-down warning appears in case of:

- Too high temperature at the compressor element outlet
- Too high or too low dew-point temperature for dryer equipped units

In chapter "Shut-down warning visualization" it's explained how it appears on the display, how to recognize which is the warning and how to solve it.

**Service warning**

If the service timer exceeds a programmed value, this will be indicated on the display to warn the operator to carry out some service actions.

**Automatic restart after voltage failure**

The controller has a built-in function to automatically restart the compressor when the voltage is restored after voltage failure.

The function is not active and to activate it please contact the customer centre.



Provided the controller is in the automatic operation mode, the compressor will automatically restart when the supply voltage to the module is restored.

Control panel

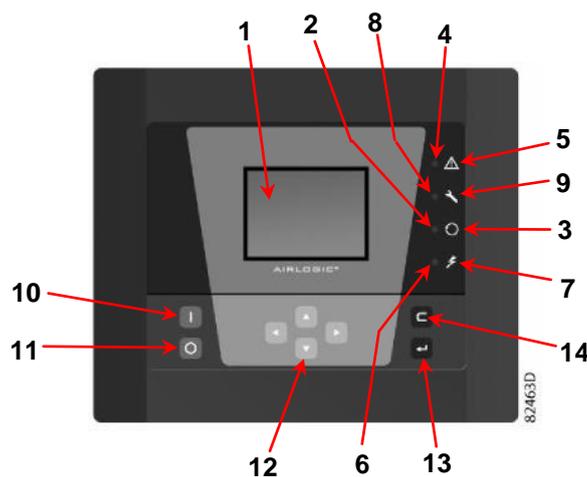


FIG. 17A

## Function keys of the controller

Reference	Designation	Function
1	Display	Shows icons and operating conditions.
2	Automatic operation symbol	
3	LED, Automatic operation	Indicates that the regulator is automatically controlling the compressor: the compressor is loaded, unloaded, stopped and restarted depending on the air consumption and the limitations programmed in the regulator.
4	Warning symbol	
5	LED, Warning	It's lit if a warning condition exists.
6	Voltage symbol	
7	LED, Voltage on	Indicates that the voltage is switched on.
8	Service symbol	
9	LED, Service	It's lit when service is needed.
10	Start button	This button starts the compressor. Automatic operation LED (3) lights up. The Elektronikon is operative.
11	Stop button	This button is used to stop the compressor. Automatic operation LED (3) goes out.
12	Scroll buttons	Use these buttons to scroll through the menu .
13	Enter button	Use this button to confirm the last action.
14	Escape button	Use this button to go to previous screen or to end the current action.

**CAUTION: WAIT AT LEAST 20 SECONDS BEFORE STARTING THE MACHINE AFTER SWITCH OFF.**



**CAUTION: IN CASE OF START UP OR RESTART AFTER EMERGENCY STOP /ARAVF/ SHUT DOWN (SEE INSTRUCTION BOOK), REFRIGERANT DRYER WILL RUN AFTER A DELAY OF 180 SECONDS; (ONLY FOR COMPRESSOR WITH DRYER (SERIES "E8" R410A).**

## ENGLISH

Icons used

Status icons

Name	Icon	Description
Stopped / Running	 57786F	When the compressor is stopped, the icon stands still. When the compressor is running, the icon is rotating.
Compressor status	 57787F	Motor stopped
	 57788F	Running unloaded
	 57789F	Running loaded
Machine control mode	 57790F Or  59161F	Local start / stop
	 57791F	Remote start / stop
	 57792F	Network control
Automatic restart after voltage failure	 57793F	Automatic restart after voltage failure is active
Week timer	 57794F	Week timer is active
Active protection functions	 57795F	Emergency stop
	 57796F	Shutdown
	 57797F	Warning
Service	 57798F	Service required
Main screen display	 82196F	Value lines display icon
	 82196F	Chart display icon
General icons	 81105D	No communication / network problem
	 82419D	Not valid

**Input icons**

Icon	Description	Icon	Description
 57796F	Pressure	 57801F	Digital input
 57800F	Temperature	 57802F	Special protection

**System icons**

Icon	Description	Icon	Description
 57803F	Compressor element (LP, HP, ...)	 57809F	Motor
 57804F	Dryer	 57810F	Failure expansion module
 57805F	Fan	 81105D	Network problem
 57806F	Frequency converter	 57812F	General alarm

**Menu icons**

Icon	Description	Icon	Description
 57813F	Inputs	 57818F	Event history (saved data)
 57814F	Outputs	 7819F	Access key / User password
 57812F	Protections (Warnings, shutdowns)	 57792F	Network
 57815F	Counters	 57820F	Setpoint
 82641D	Test	 57867F	Information
 57817F	Regulation (Settings)	 57794F	Week Timer
 57798F	Service	 82633D	General

**Navigation arrows**

 57821F	Up	 57822F	Down
--	----	--	------

**Main screen**

**Function**

The Main screen is the screen that is shown automatically when the voltage is switched on and one of the keys is pushed. It is switched off automatically after a few minutes when no keys are pushed.

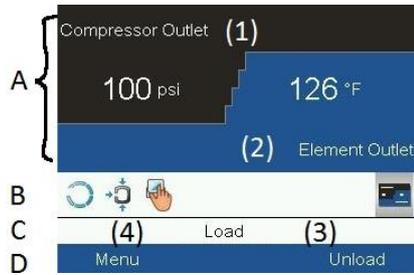
Typically, 5 different main screen views can be chosen:

- Two value lines
- Four value lines
- Chart (High resolution)
- Chart (Medium resolution)
- Chart (Low resolution)

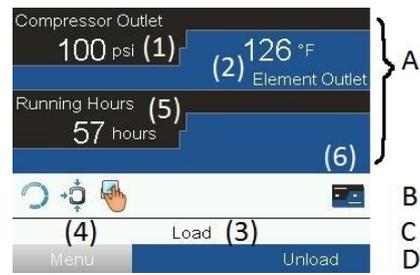
**Two and four value lines screens**

This type of Main screen shows the value of 2 or 4 parameters (see section Inputs menu).

## ENGLISH



Typical Main screen (2 value lines), fixed speed compressors



Typical Main screen (4 value lines), fixed speed compressors

### Text on figures

(1)	Compressor Outlet
(2)	Element outlet
(3)	Load, ... (text varies upon the compressors actual condition)
(4)	Menu
(5)	Running hours
(6)	Flow (only VSD compressors)

Section A shows information regarding the compressor operation (e.g. the outlet pressure or the temperature at the compressor outlet). On compressors with a frequency converter, the load degree (flow) is given in % of the maximum flow.

Section B shows Status icons. Following icon types are shown in this field:

- Fixed icons

These icons are always shown in the main screen and cannot be selected by the cursor (e.g. Compressor stopped or running, Compressor status (running, running unloaded or motor stopped).

- Optional icons

These icons are only shown if their corresponding function is activated (e.g. week timer, automatic restart after voltage failure, etc.)

- Pop up icons

These icons pop up if an abnormal condition occurs (warnings, shutdowns, service, ...)

To call up more information about the icons shown, select the icon concerned using the scroll keys and press the enter key.

Section C is called the Status bar. This bar shows the text that corresponds to the selected icon.

Section D shows the Action buttons. These buttons are used:

- To call up or program settings
- To reset a motor overload, service message or emergency stop
- To have access to all data collected by the regulator
- The function of the buttons depends on the displayed menu. The most common functions are "Menu" (To go to the menu), "Modify" (To modify programmable settings), "Reset" (To reset a timer or message)

To activate an action button, highlight the button by using the Scroll keys and press the Enter key. To go back to the previous menu, press the Escape key.

### Chart views

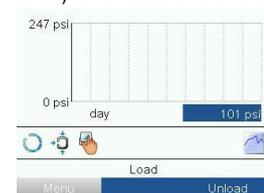
Instead of viewing values, it is also possible to view a graph of one of the input signals (see section Inputs menu) in function of the time.



High Resolution



Medium Resolution



Low Resolution

When Chart (High Resolution) is selected, the chart shows the variation of the selected input (in this case the pressure) per minute. Also the instantaneous value is displayed. The screen shows the last 4 minutes.

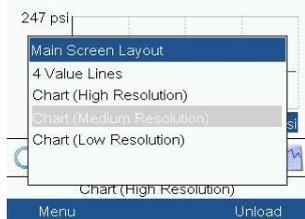
The switch button (icon) for selecting other screens is changed into a small Chart and is highlighted (active).

When the Chart (Medium Resolution) is selected, the chart shows the variation of the selected input per hour. The screen shows the last 4 hours.

When the Chart (Low Resolution) is selected, the chart shows the variation of the selected input per day. The screen shows the evolution over the last 10 days.

**Selection of a main screen view**

To change between the different screen layouts, select the far right icon in the control icons line (see value lines display icon or chart display icon in section Used icons) and press the Enter key. A screen similar to the one below opens:



Select the layout required and press the Enter key. See also section Inputs menu.

**Calling up menus**

**Description**

When the voltage is switched on, the main screen is shown automatically (see section Main screen):



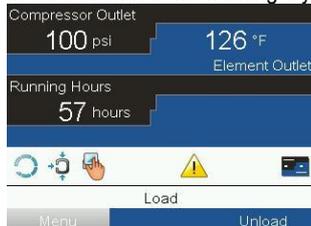
To go to the Menu screen, highlight the Menu button (4), using the Scroll keys. Press the Enter key to select the menu. Following screen appears:



The screen shows a number of icons. Each icon indicates a menu item. By default, the Pressure Settings (Regulation) icon is selected. The status bar shows the name of the menu that corresponds with the selected icon. Use the Scroll keys to select an icon. Press the Escape key to return to the Main screen.

**Shut-down warning visualization**

In case of shut-down warning a yellow triangle (1) pops up in the lower side of the display as in the picture below in the left side:



To check which is the warning, highlight the yellow triangle, using the Scroll keys. Press the Enter key and it will appear the Protections menu as in picture above in the right side. Press Enter key and then in the display will appear the list of the Protection that are active on the controller. Use Scroll key to check all the protections and the one who is causing the warning will be highlighted as in picture below:



The warning "Surge Alarm" appears when a cartridge of the surge protector device (F99) blown; replace it as soon as possible in order to avoid damages to the frequency converter. (valid only for cULus cubicles). "Only for compressors VSD"

Stop the compressor pressing the button (11) in the Fig. 17A and wait until the compressor stops.

Open the disconnect switch in the supply line of the compressor.

**WARNING:**  Before carrying out any maintenance the machine must be stopped, cut off the machine from the electrical mains and from the compressed air distribution circuit, check that the machine is not under pressure. Inspect the compressor and remedy. The message warning will disappear as soon as the warning condition disappears.

## ENGLISH

### Shut-down visualization

In case of shut-down red icon (1) pops up in the lower side of the display as in the picture below in the left side:



To check which is the shutdown, highlight the red icon, using the Scroll keys. Press the Enter key and it will appear the Protections menu as in picture above in the right side. Press Enter key and then in the display will appear the list of the Protection that are active on the controller. Use Scroll key to check all the protections and the one who is causing the shutdown will be highlighted as in picture below:



Take care that the shut-down "Overload motor" appears in case of main motor overload or incorrect phase sequence (detected by phase sequence relay) or overtemperature detected by temperature switches.

Open the disconnect switch in the supply line of the compressor.

**WARNING:**  Before carrying out any maintenance the machine must be stopped, cut off the machine from the electrical mains and from the compressed air distribution circuit, check that the machine is not under pressure. Inspect the compressor and remedy. After remedying and when the shut-down condition has disappear, switch on the voltage and restart the compressor.

In case of the Reset of Main Motor Converter Alarm doesn't work:

- Disconnect power supply for **15min.**

- Switch on power supply and Reset the controller.

If alarm does not disappear contact the customer centre.

#### Warnings and alarms

Fault number	Graphic Controller alarm code	Fault text	Warning	Alarm	Trip locked	Cause of problem
2		Live zero error	X	X		Signal on terminal 53 is to low
4	16384	Line power ph. loss	X	X	X	Missing phase on supply side or too high voltage imbalance. Check supply voltage.
7	2048	DC over volt	X	X		Intermediate circuit voltage exceeds the limit.
8	1024	DC under volt	X	X		Intermediate circuit voltage drops below the "voltage warning low" limit.
9	512	Inverter overload	X	X		More than 100% load for too long.
10	256	Motor ETR over	X	X		Motor is too hot due to more than 100% load for too long.
11	128	Motor th over	X	X		The thermistor or the thermistor connection is disconnected. (Where thermistors are present)
13	32	Overcurrent	X	X	X	Inverter peak current limit is exceeded.
14	4	Ground Fault		X	X	Discharge from output phases to ground.
16	4096	Short-circuit		X	X	Short-circuit in the motor or on the motor terminals.
17	16	Ctrl. word TO	X	X		No communication to the adjustable frequency drive.
24		Fan Fault	X	X		The fan is not working (Only on 400 V 40–1 25 hp [30–90 kW] units).
30		U phase loss		X	X	Motor phase U is missing. Check the phase.
31		V phase loss		X	X	Motor phase V is missing. Check the phase.
32		W phase loss		X	X	Motor phase W is missing. Check the phase.
38		Internal fault		X	X	Contact compressor service.
44		Ground Fault		X	X	Discharge from output phases to ground.
47		Control Voltage Fault	X	X	X	24 V DC may be overloaded.
48		VDD1 Supply Low		X	X	Control voltage low. Contact compressor service.
50		Calibration failed		X		Contact compressor service.
51		Unom,Inom		X		The setting of motor voltage, motor current and motor power is presumably wrong.
52		low Inom		X		The motor current is too low.
53		big motor		X		The motor is too big for the to be carried out
54		small mot		X		The motor is too small for the to be carried out
55		par. range		X		The parameter values found from the motor are outside acceptable range.
56		user interrupt		X		The has been interrupted by the user.

Fault number	Graphic Controller alarm code	Fault text	Warning	Alarm	Trip locked	Cause of problem
57		timeout		X		Try to start the again a number of times. <b>NOTE!</b> <b>Repeated runs may heat the motor to a level where the resistance Rs and Rr are increased. In most cases, however, this is not critical.</b>
58		internal	X	X		Contact compressor service
59		Current limit	X			The current is higher than the value in <i>the Current Limit</i>
60		External Interlock		X		External interlock has been activated. To resume normal operation, apply 24 V DC to the terminal programmed for external interlock and reset the adjustable frequency drive (via serial communication, digital I/O, or by pressing reset button on keypad).
66		Heat Sink Temperature Low	X			This warning is based on the temperature sensor in the IGBT module (Only on 400 V 40–1 25 hp [30–90 kW] units).
69		Pwr. Card Temp	X	X	X	The temperature sensor on the power card is either too hot or too cold.
79		Illegal power section configuration	X	X		Internal fault. Contact compressor service
80		Drive initialized		X		All parameter settings are initialized to default settings.
87		Auto DC Braking	X			The drive is auto DC braking

**Inputs menu**

Function: to display the actual value of the measured data (analog inputs) and the status of the digital inputs (e.g. emergency stop contact, motor overload relay, etc.) and to select the digital input to be shown on the chart in the main screen.

**Procedure**

Starting from the main screen (see Main screen), move the cursor to the action button Menu and press the Enter key.

Using the Scroll keys, move the cursor to the Inputs icon, as shown in the following screen:



Press the Enter key. A screen similar to the one below appears:



(1)	Inputs
(2)	Compressor outlet
(3)	Element outlet
(4)	Dryer PDP
(5)	Emergency stop

The screen shows a list of all inputs with their corresponding icons and readings.

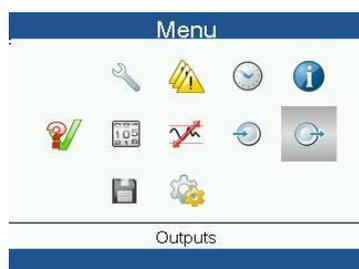
If an input is in warning or shutdown, the original icon is replaced by the warning or shutdown icon respectively (i.e. the Stop icon and the Warning icon in the screen shown above).

A small chart icon, shown below an item in the list means this input signal is shown on the chart at the main screen. Any analog input can be selected.

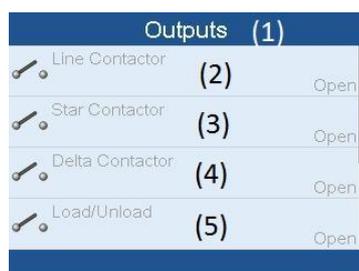
**Outputs menu**

Function: to call up information regarding the actual status of some outputs.

Procedure: starting from the Main screen (see Main screen), move the cursor to the action button Menu and press the Enter key, move the cursor to the Outputs icon (see below).



Press the Enter key. A screen similar to the one below appears:



(1)	Outputs
(2)	Line contactor
(3)	Star contactor
(4)	Delta contactor
(5)	Load/Unload

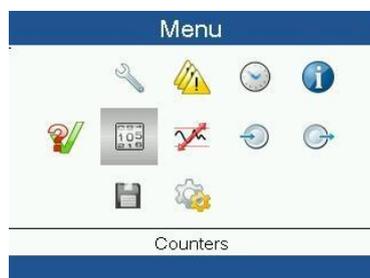
Outputs screen (typical)

The screen shows a list of all outputs with their status.

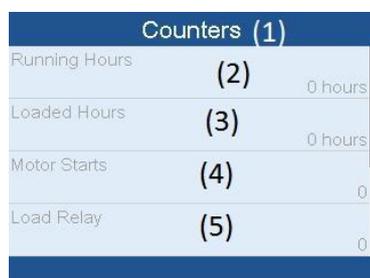
**Counters**

Function: to call up the running hours, the loaded hours, the number of motor starts, the number of hours that the regulator has been powered and the number of load cycles.

Procedure: starting from the Main screen (see Main screen), move the cursor to the action button Menu and press the Enter key. Using the Scroll keys, move the cursor to the Counters icon (see below)



Press the Enter key. A screen similar to the one below appears:



(1)	Counters
(2)	Running hours
(3)	Loaded hours
(4)	Motor starts
(5)	Load relay

The screen shows a list of all counters with their actual readings.

Note: the example above is for a fixed speed compressor. In case of variable speed drive compressor, the actual screen will be somewhat different.

# ENGLISH

## Control mode selection

Function: to select the control mode, i.e. whether the compressor is in local control, remote control or controlled via a local area network (LAN).

Procedure: starting from the main screen, make sure the action button Menu (1) is selected:



Next, use the scroll buttons to go to the Status icons (see Main screen) and select the Regulation icon (2). When the icon is active, this icon is highlighted with a grey background color.

Press the enter button:

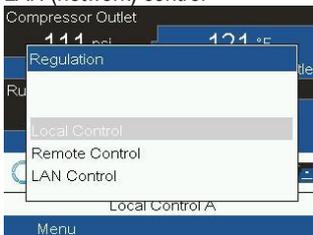


There are 3 possibilities:

Local control

Remote control

LAN (network) control



After selecting the required regulation mode, press the enter button on the controller to confirm your selection. The new setting is now visible on the main screen. See section Used icons for the meaning of the icons.

## Service menu

Function: to reset the service plans which are carried out, to check when the next service plans are to be carried out, to find out which service plans were carried out in the past and to modify the programmed service intervals.

Procedure: starting from the Main screen (see Main screen), move the cursor to the action button Menu and press the Enter key.

Using the Scroll keys, move the cursor to the Service icon (see below).



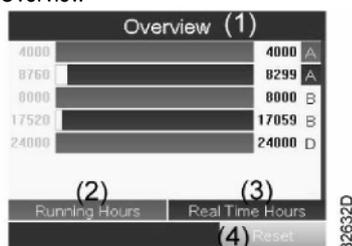
Press the Enter key. Following screen appears:



(1)	Service
(2)	Overview
(3)	Service plan
(4)	Next service
(5)	History

Scroll through the items to select the desired item and press the Enter key to see the details as explained below.

Overview



(1)	Overview
(2)	Running Hours
(3)	Real Time hours
(4)	Reset

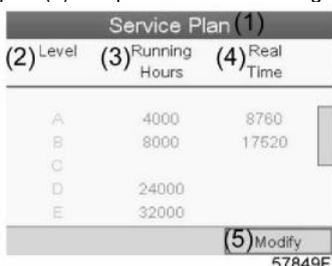
Example for service level (A): the figures at the left are the programmed service intervals. For Service interval A, the programmed number of running hours is 4000 hours (upper row, green) and the programmed number of real time hours is 8760 hours, which corresponds to one year (second row, blue). This means that the controller will launch a service warning when either 4000 running hours or 8760 real hours are reached, whichever comes first. Note that the real time hours counter keeps counting, also when the controller is not powered. The figures at the end of the bars are the number of hours to go till the next service intervention. In the example above, the compressor was just started up, which means it still has 4000 running hours or 8299 hours to go before the next Service intervention.

Service plans

A number of service operations are grouped (called Level A, Level B, etc...). Each level stands for a number of service actions to be carried out at the time intervals programmed in the controller.

When a service plan interval is reached, a message will appear on the screen.

After carrying out the service actions related to the indicated levels, the timers must be reset. From the Service menu above, select Service plan (3) and press Enter. Following screen appears:



(1)	Service plan
(2)	Level
(3)	Running hours
(4)	Real time hours
(5)	Modify

In the example above, the A Service level is programmed at 4000 running hours, of which 0 hours have passed. History  
The History screen shows a list of all service actions done in the past, sorted by date. The date at the top is the most recent service action. To see the details of a completed service action (e.g. Service level, Running hours or Real time hours), use the Scroll keys to select the desired action and press the Enter key.

Regulation menu

Function: on fixed speed compressors, the operator can program two different pressure bands and in case of VSD compressors two different setpoint. This menu is also used to select the active pressure band.

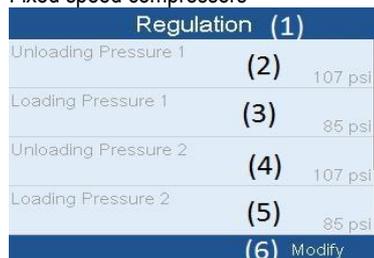
Procedure: starting from the Main screen (see Main screen), move the cursor to the action button Menu and press the Enter key.

Using the Scroll keys, move the cursor to the Setpoint icon (see below).



Press the Enter key. Following screen appears:

Fixed speed compressors



(1)	Regulation
(2)	Unloading pressure 1
(3)	Loading pressure 1
(4)	Unloading pressure 2
(5)	Loading pressure 2
(6)	Modify

The screen shows the actual unloading and loading pressure settings for both pressure bands.

**ENGLISH**

Variable speed drive compressors

Regulation (1)	
Setpoint 1	(2) 100 psi
Indirect Stop Level 1	(3) 107 psi
Direct Stop Level 1	(4) 115 psi
Setpoint 2	(5) 100 psi
(6) Modify	

(1)	Regolation
(2)	Setpoint 1
(3)	Indirect stop level 1
(4)	Direct stop level 1
(5)	Setpoint 2
(6)	Modify

To modify the settings, move the cursor to the action button Modify and press the Enter key.

Regulation	
Unloading Pressure 1	107 psi
Loading Pressure 1	85 psi
Unloading Pressure 2	107 psi
Loading Pressure 2	85 psi
Modify	

The first line of the screen is highlighted. Use the Scroll keys to highlight the setting to be modified and press the Enter key. Following screen appears:

Regulation	
Unloading Pressure 1	107 psi
Loading Pressure 1	85 psi
Unloading Pressure 2	107 psi
Loading Pressure 2	85 psi
Modify	

The upper and lower limit of the setting is shown in grey; the actual setting is shown in black. Use the ↑ or ↓ key of the Scroll keys to modify the settings as required and press the Enter key to accept.

If necessary, change the other settings as required in the same way as described above.

**Event history menu**

Function: to call up the last shut-down and last emergency stop data.

Procedure: starting from the Main screen (see Main screen), move the cursor to the action button Menu and press the Enter key.

Using the Scroll keys, move the cursor to the Event History icon (see below).

Menu	

Event History

Press the Enter key. The list of last shut-down and emergency stop cases is shown.

Event History	
05/19/2016 - 10:18:12	
05/19/2016 - 09:14:04	
05/19/2016 - 09:10:53	

Example of Event History screen

Scroll through the items to select the desired shut-down or emergency stop event.

Press the Enter key to find the date, time and other data reflecting the status of the compressor when that shut-down or emergency stop occurred.

### Modifying general setting

Function: to display and modify a number of general settings.

Procedure: starting from the Main screen (see Main screen), move the cursor to the action button Menu and press the Enter key. Using the Scroll keys, move the cursor to the Settings icon (see below).



Press the Enter key. A second menu screen appears:



This submenu screen shows again a number of icons. By default, the User Password icon is selected. Also the status bar shows the name of the menu that corresponds with the selected icon.

#### General menu

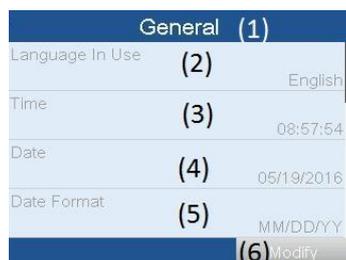
Function: this menu covers a list of general settings:

- Language
- Time
- Date
- Date Format
- Units

Procedure: starting from the submenu screen (see Modifying general settings), using the Scroll keys, move the cursor to the General icon (see below).



Press the Enter key. A screen similar to the one below appears:



(1)	General
(2)	Language in use
(3)	Time
(4)	Date
(5)	Date format
(6)	Modify

A screen similar to the one above is shown, a selection bar is covering the first item (Language). Use the ↓ key of the Scroll keys to select the setting to be modified and press the Enter key.

To modify, select the Modify button using the Scroll keys and press the Enter key.

A pop-up screen appears. Use the ↑ or ↓ key to select the required parameter and press the Enter key to confirm.



## ENGLISH

### Terminology

Term	Explanation
ARAVF	Automatic restart after voltage failure.
Power recovery time	Is the period within which the voltage must be restored to have an automatic restart. Is accessible if the automatic restart is activated. To activate the automatic restart function, consult your supplier.
Restart delay	This parameter allows to program that not all compressors are restarted at the same time after a power failure (ARAVF active).
Compressor element outlet	The regulator does not accept inconsistent settings, e.g. if the warning level is programmed at 95 °C (203 °F), the minimum limit for the shut-down level changes to 96 °C (204 °F). The recommended difference between the warning level and shut-down level is 10 °C (18 °F).
Delay at shut- down signal	Is the time for which the signal must exist before the compressor is shut down. If it is required to program this setting to another value, consult your supplier.
Minimum stop time	Once the compressor has automatically stopped, it will remain stopped for the minimum stop time, whatever happens with the net air pressure. Consult your supplier if a setting lower than 20 seconds is required.
Unloading/ Loading pressure	The regulator does not accept illogical settings, e.g. if the unloading pressure is programmed at 7.0 bar(e) (101 psi(g)), the maximum limit for the loading pressure changes to 6.9 bar(e) (100 psi(g)). The recommended minimum pressure difference between loading and unloading is 0.6 bar (9 psi(g)).

**15.0 ORDINARY MAINTENANCE TO BE DONE BY THE USER**

**BEFORE CARRYING OUT ANY MAINTENANCE IT IS OBLIGATORY TO STOP THE MACHINE AND DISCONNECT IT FROM THE POWER MAINS AND FROM THE COMPRESSED AIR DISTRIBUTION NETWORK.**

The maintenance jobs described in this chapter may be carried out by the user.

The more complex maintenance jobs which require professionally skilled personnel are listed in the chapter on **GENERAL ROUTINE MAINTENANCE**. (See Chap. 21.0)

**15.1 GENERAL INFORMATION****15.2 MAINTENANCE PROGRAMME****■ OPERATIONS THAT MAY BE CARRIED OUT BY THE USER**

**■ ■ OPERATIONS THAT REQUIRE SKILLED PERSONNEL; THESE OPERATIONS ARE ILLUSTRATED IN PART B OF THIS MANUAL.**

These maintenance intervals are recommended for work environments that are not dusty and are well ventilated. For particularly dusty environments, double the frequency of controls.

<b>Every Day</b>	<ul style="list-style-type: none"> <li>■ Purge condensate water from air receiver</li> </ul>
<b>Every 50 working hours</b>	<ul style="list-style-type: none"> <li>■ Observe for unusual noise or vibration</li> <li>■ Drain condensate from the oil tank</li> <li>■ Check the oil level</li> <li>■ Clean the filtering panel (VSD)</li> <li>■ Clean the filter of the automatic discharge of condensate (dryer)</li> <li>■ Check air receiver automatic drain (if applicable)</li> </ul>
<b>Every 500 hours</b>	<ul style="list-style-type: none"> <li>■ Fixing electrical cables (at first 500 hrs)</li> <li>■ Clean the air suction filter</li> <li>■ Clean the condenser battery (on the dryer if fitted)</li> <li>■ Clean the dirt collection filter</li> <li>■ Check automatic condensation emptying (dryer)</li> <li>■ Clean the water separator drain</li> </ul>
<b>Every 2000 hours</b>	<ul style="list-style-type: none"> <li>■ Clean the filtering panel (VSD)</li> <li>■ Clean the air suction filter</li> <li>■ Clean the air filters</li> </ul>
<b>Every 4000 hours</b>	<ul style="list-style-type: none"> <li>■ ■ Maintenance kit of the automatic condensate drain (dryer)</li> <li>■ ■ Clean the finned surface of the air-oil cooler</li> <li>■ Change the filtering panel (VSD)</li> <li>■ ■ Replace the oil separator cartridge</li> <li>■ ■ Change the oil filter</li> <li>■ Change the air filters</li> <li>■ Change the air suction filter</li> <li>■ ■ Retighten all power cable connections</li> <li>■ ■ Safety temperature test</li> </ul>
<b>Every 8000 hours</b>	<ul style="list-style-type: none"> <li>■ ■ Change the oil (*)</li> <li>■ ■ Kit revision intake valve</li> <li>■ ■ Checking the status of the oil return valve and oil pipes</li> <li>■ ■ Kit revision minimum pressure valve</li> <li>■ ■ Kit revision thermostatic valve</li> <li>■ ■ Replace drain</li> </ul>
<b>Every 24000 hours</b>	<ul style="list-style-type: none"> <li>■ ■ Kit revision of the compressor unit</li> <li>■ ■ Kit revision of motor (bearings)</li> </ul>

(\*) Or as indicated by oil analysis.

**Oil specifications:**

It is strongly recommended to use genuine lubricants from your manufacturer. They are the result of years of field experience and research. See section Preventive maintenance schedule for the advised replacement intervals and consult the Spare Parts list for part number information.



**AVOID MIXING LUBRICANTS OF DIFFERENT BRANDS OR TYPES AS THEY MAY NOT BE COMPATIBLE AND THE OIL MIX MAY HAVE INFERIOR PROPERTIES.**

**15.3 DRAINING CONDENSATE FROM THE OIL TANK**

If the compressor work cycle contemplates long pauses during which the machine cools down, a certain amount of condensate will gather in the oil tank. This happens, for example, when stopping overnight or at weekends.

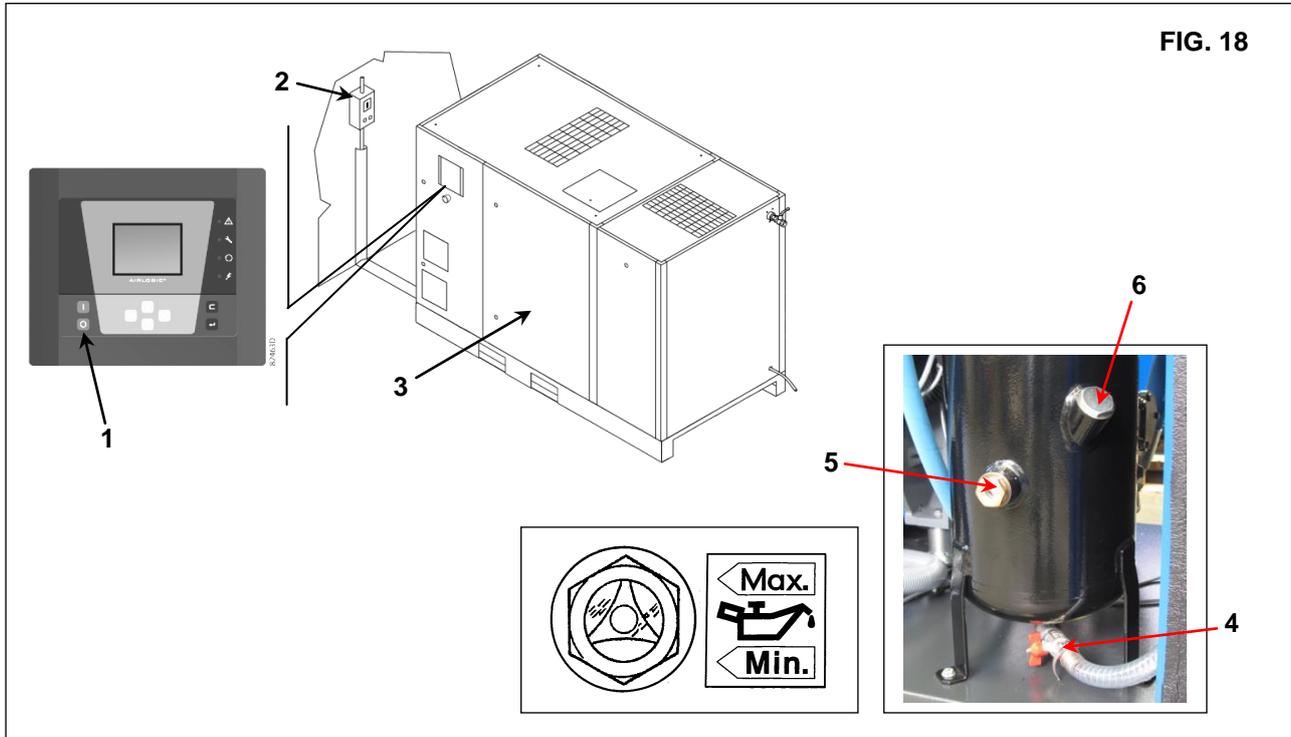
The condensate must be drained off every 50 hours or every week. This operation may be performed only when the machine is cold, that is when it has been switched off for at least 8 hours.



**BEFORE DRAINING THE CONDENSATE IT IS OBLIGATORY TO STOP THE MACHINE AND DISCONNECT IT FROM THE POWER MAINS.**

Proceed as follows:

- Switch off the machine with pushbutton Ref. 1 Fig. 18: in this way the machine stops after idle time running.
- Turn off the disconnect switch, Ref. 2 Fig. 18.



- Wait for the machine to cool down.
- Open the panels Ref. 3 Fig. 18 with the key provided.
- SLOWLY turn on the tap Ref. 4 Fig. 18 and let the condensate flow out.
- When the first traces of oil appear, turn off the tap.



**CONDENSATE MUST BE DISPOSED OF IN CONFORMITY WITH THE LOCAL REGULATIONS IN FORCE.**

- Check the oil level on the indicator Ref. 5 Fig. 18.
- If the oil level is under the minimum, top up as described at point 15.4.

**15.4 CHECK OIL LEVEL AND TOP UP**

- Switch off the machine with push button Ref. 1 Fig. 18: in this way the machine stops after idle time running.
- Turn off the disconnect switch, Ref. 2 Fig. 18.
- Wait a few minutes for the foam in the oil collector to abate, and check wessel pressure.
- Check the oil level on the indicator Ref. 5 Fig. 18
- If the oil level is under the minimum, top up.



**USE OIL OF THE SAME TYPE AS THAT ALREADY IN THE MACHINE; DO NOT MIX DIFFERENT TYPES OF OIL.**

**BEFORE CARRYING OUT ANY OPERATION ON THE MACHINE, ENSURE THAT THE ELECTRIC POWER SUPPLY HAS BEEN DISCONNECTED.**

- Open the front panel Ref. 3 Fig. 18 with the special key.
- Slowly open the oil plug Ref. 6 Fig. 18.
- Top up to maximum level Ref. 5 Fig. 18, with oil of the same type in the compressor.
- Turn off the cap of the oil tank Ref. 6 Fig. 18.
- Close the panel Ref. 3 Fig. 18.

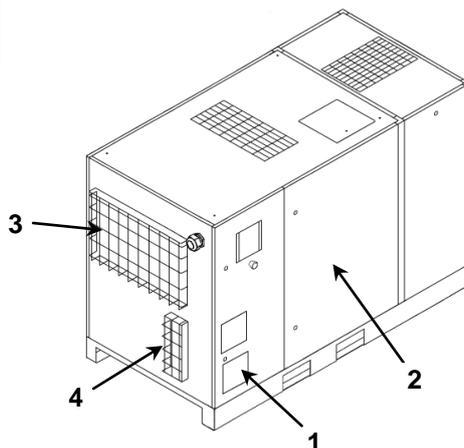


**BEFORE CARRYING OUT ANY MAINTENANCE IT IS OBLIGATORY TO STOP THE MACHINE AND DISCONNECT IT FROM THE POWER MAINS AND FROM THE COMPRESSED AIR DISTRIBUTION NETWORK.**

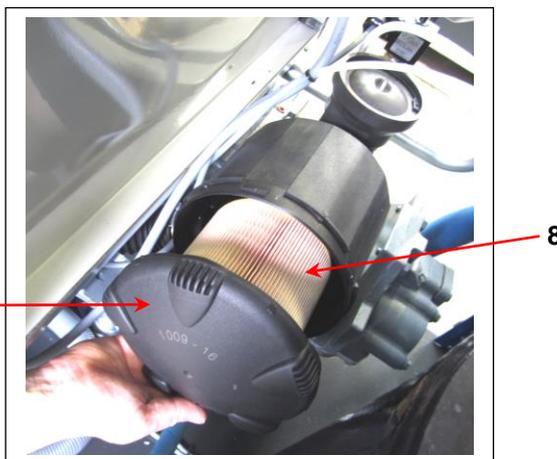
### 15.5 CLEANING THE FILTERING PANEL (Compressors VSD)

- Switch off the machine with pushbutton Ref. 1 Fig. 18: in this way the machine stops after idle time running.
- Turn off the disconnect switch, Ref. 2 Fig. 18.
- Remove the filter panel Ref. 1 (only compressors VSD) Fig. 19.
- Remove the filter panel Ref. 3, 4 Fig. 19
- Clean the filtering panel with a jet of air or wash it with water. **Do not use solvents.**
- Once the operation has been completed, reassemble the filtering panel Ref. 1 Fig. 19.

**EVERY 50 WORKING HOURS, CLEAN THE FILTERING PANEL.**



**FIG. 19**



**FIG. 19A**

### 15.6 CLEANING THE SUCTION FILTER OR CHANGING THE FILTER

- Switch off the machine with pushbutton Ref. 1 Fig. 18: in this way the machine stops after idle time running.
- Turn off the disconnect switch, Ref. 2 Fig. 18.



#### **HOT PARTS INSIDE**

- Open the panel Ref. 2 Fig. 19.
- Open the cover Ref. 7 Fig. 19A.
- Remove the filter Ref. 8 Fig. 19A.



**AVOID DROPPING FOREIGN BODIES INTO THE SUCTION MANIFOLD.**

- Clean the filter with a jet of air, working from inside to outside, **DO NOT USE WATER OR SOLVENTS.** Alternatively, fit a new filter.
- Clean the disk on which the filter rests with a clean cloth.
- Fit the filter and the cover.
- If necessary, dispose of the old filter in conformity with the local regulations in force.
- Close the panel Ref. 2 Fig. 19.

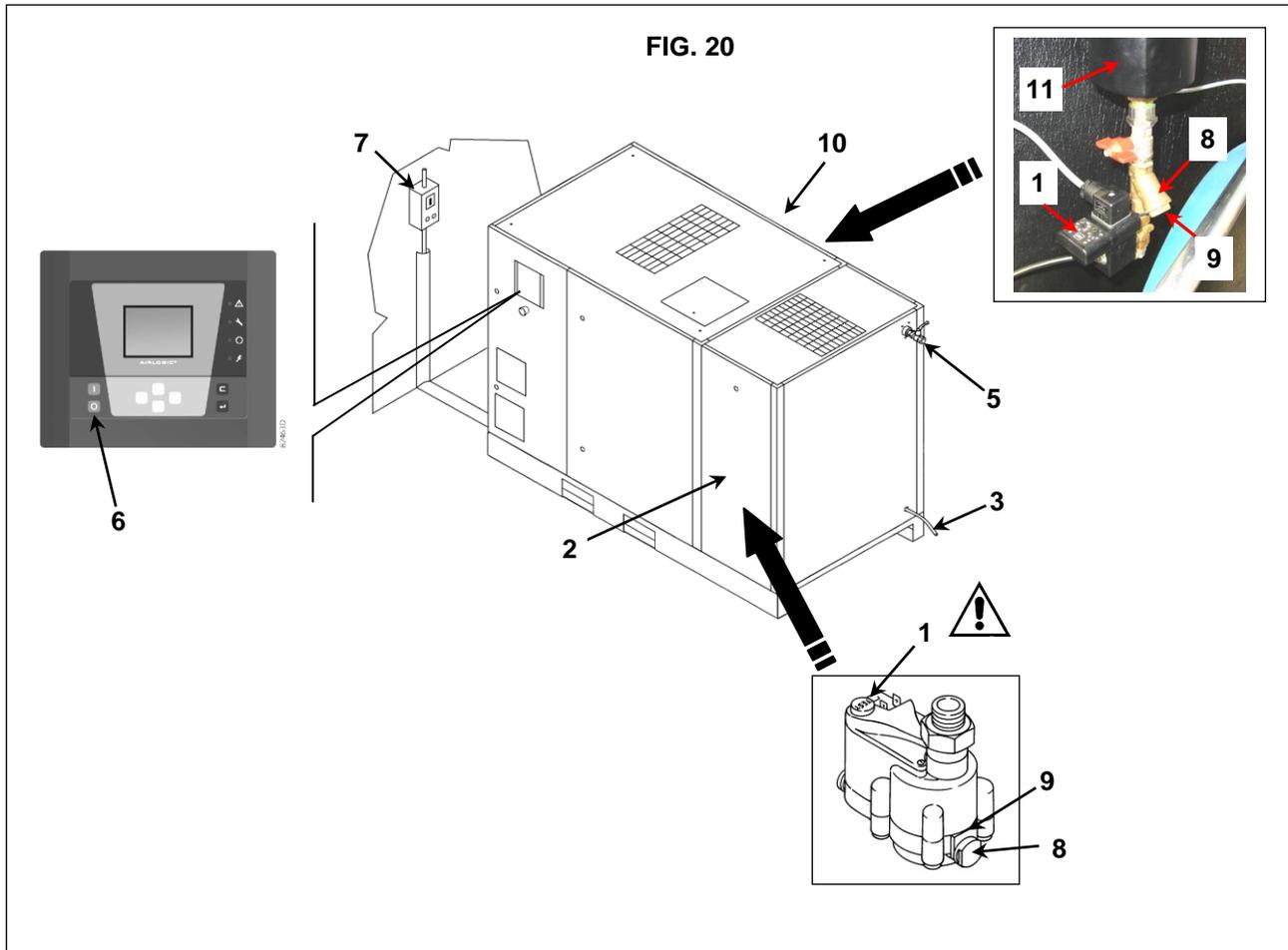
**15.7 CHECKING THE AUTOMATIC CONDENSATION EMPTYING FOR COMPRESSOR AND DRYER (IF AVAILABLE)**

**BEFORE CARRYING OUT ANY MAINTENANCE IT IS OBLIGATORY TO STOP THE MACHINE AND DISCONNECT IT FROM THE POWER MAINS AND FROM THE COMPRESSED AIR DISTRIBUTION NETWORK.**

The automatic condensation drain must be checked Ref. 1 every 500 hours Fig. 20.

Proceed as follows:

- Open the panel Ref. 2 and Ref. 10 Fig. 20.
- Press the "TEST" button, Ref. 1 (compressor and dryer) Fig. 20, for a few seconds to check if the condensation is correctly emptied from the drainage pipe Ref. 3.
- Close the panel Ref. 2 and Ref. 10 Fig. 20.

**15.8 CLEAN THE DIRT COLLECTION FILTER FOR COMPRESSOR AND DRYER (IF AVAILABLE)**

Proceed as follows:

- Close the tap Ref. 5 Ref. 20
- Depressurise the dryer (or the WSD Ref. 11 Fig. 20 if the dryer isn't available) by pressing the "TEST" condensation emptying button (for about 10-20 seconds) Ref. 1 Fig. 20
- Switch off the machine with pushbutton Ref. 6 Fig. 20: in this way the machine stops after idle time running.
- Turn off the disconnect switch, Ref. 7 Fig. 20.
- Remove the stopper Ref. 8 Fig. 20
- Remove the filter Ref. 9 Fig. 20
- Clean the filter with a jet of air, working from inside to outside
- Install the filter, fix the plug.

## 15.9 CHECKING THE AUTOMATIC CONDENSATION EMPTYING (WITHOUT DRYER )



**BEFORE CARRYING OUT ANY MAINTENANCE IT IS OBLIGATORY TO STOP THE MACHINE AND DISCONNECT IT FROM THE POWER MAINS AND FROM THE COMPRESSED AIR DISTRIBUTION NETWORK.**

The automatic and manual condensation emptying should be checked every day ( Ref. 2 Fig. 20A).

Proceed as follows:

- Close the tap Ref. 6 Ref. 20A
- Press the "TEST" button, Ref. 1 Fig. 20A, for a few seconds to check if the condensation is correctly emptied from the drainage pipe.
- Check manual condensation emptying from the tank, to ensure that condensation is correctly emptied from the valve, Ref. 2 Fig. 20A **(PURGE EVERY DAY AFTER USE).**

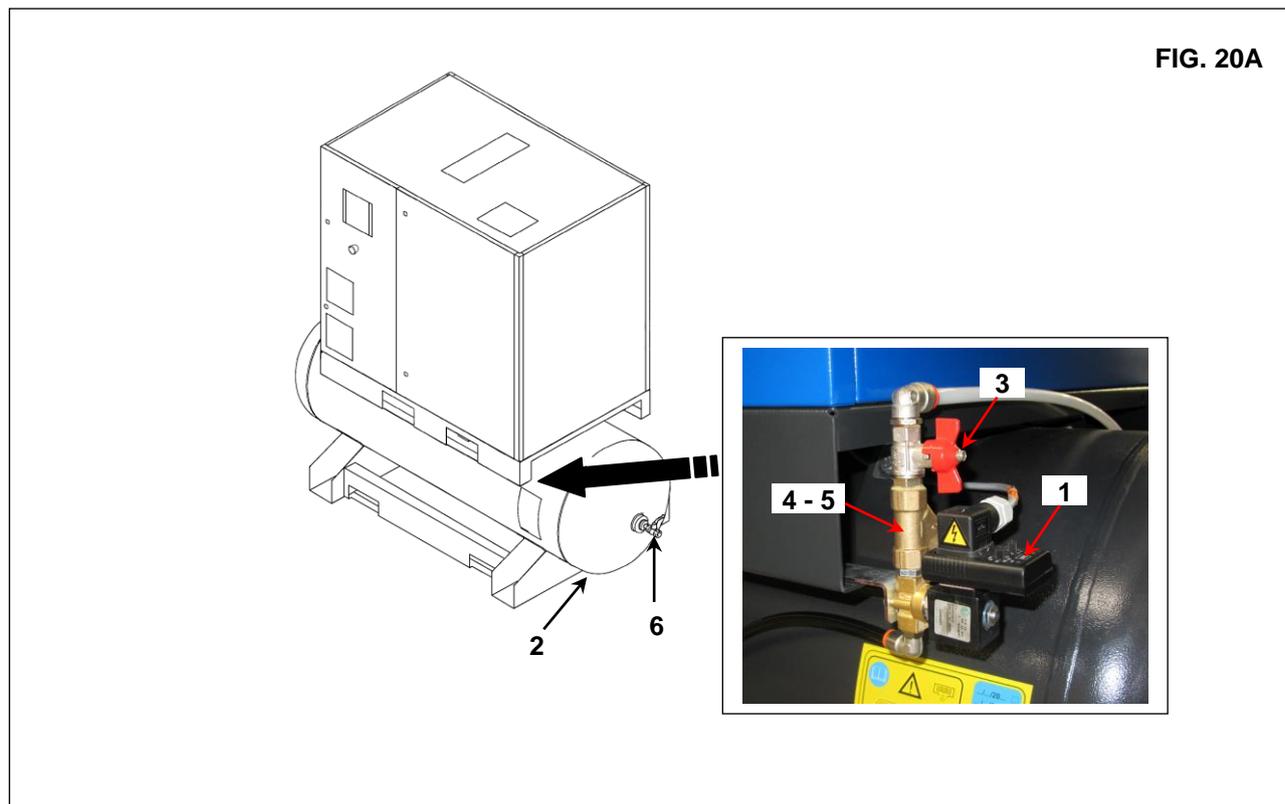


FIG. 20A

## CLEAN THE DIRT COLLECTOR FILTER (Fig. 20A)



**BEFORE CARRYING OUT ANY MAINTENANCE IT IS OBLIGATORY TO STOP THE MACHINE AND DISCONNECT IT FROM THE POWER MAINS AND FROM THE COMPRESSED AIR DISTRIBUTION NETWORK.**

Proceed as follows:

- Switch off the machine with pushbutton Ref. 6 Fig. 20: in this way the machine stops after idle time running.
- Close the cock Ref. 3
- Remove the stopper Rif. 4
- Remove the filter Rif. 5
- Clean the filter Ref. 5 with a jet of air, working from inside to outside.
- Install the filter, fix the plug. Rif. 4 - 5
- Open the cock Rif. 3

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### 15.10 CLEANING THE CONDENSER BATTERY (ON THE DRYER IF FITTED)



**BEFORE CARRYING OUT ANY MAINTENANCE IT IS OBLIGATORY TO STOP THE MACHINE AND DISCONNECT IT FROM THE POWER MAINS AND FROM THE COMPRESSED AIR DISTRIBUTION NETWORK.**

The condenser must be cleaned every month.

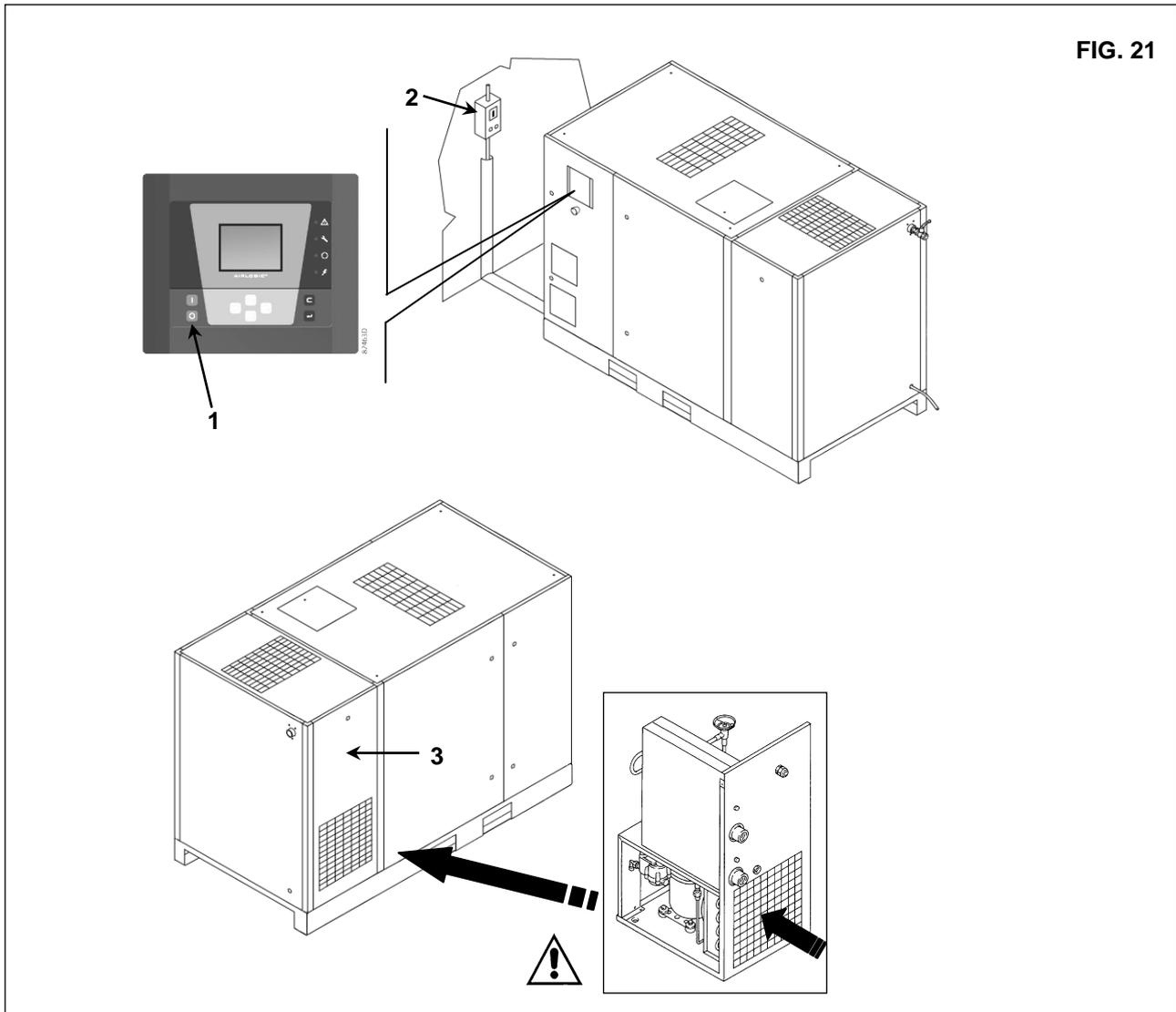
Proceed as follows:

- Switch off the machine with pushbutton Ref. 1 Fig. 21: in this way the machine stops after idle time running.
- Turn off the disconnect switch, Ref. 2 Fig. 21.



**HOT PARTS INSIDE THE DRYER**

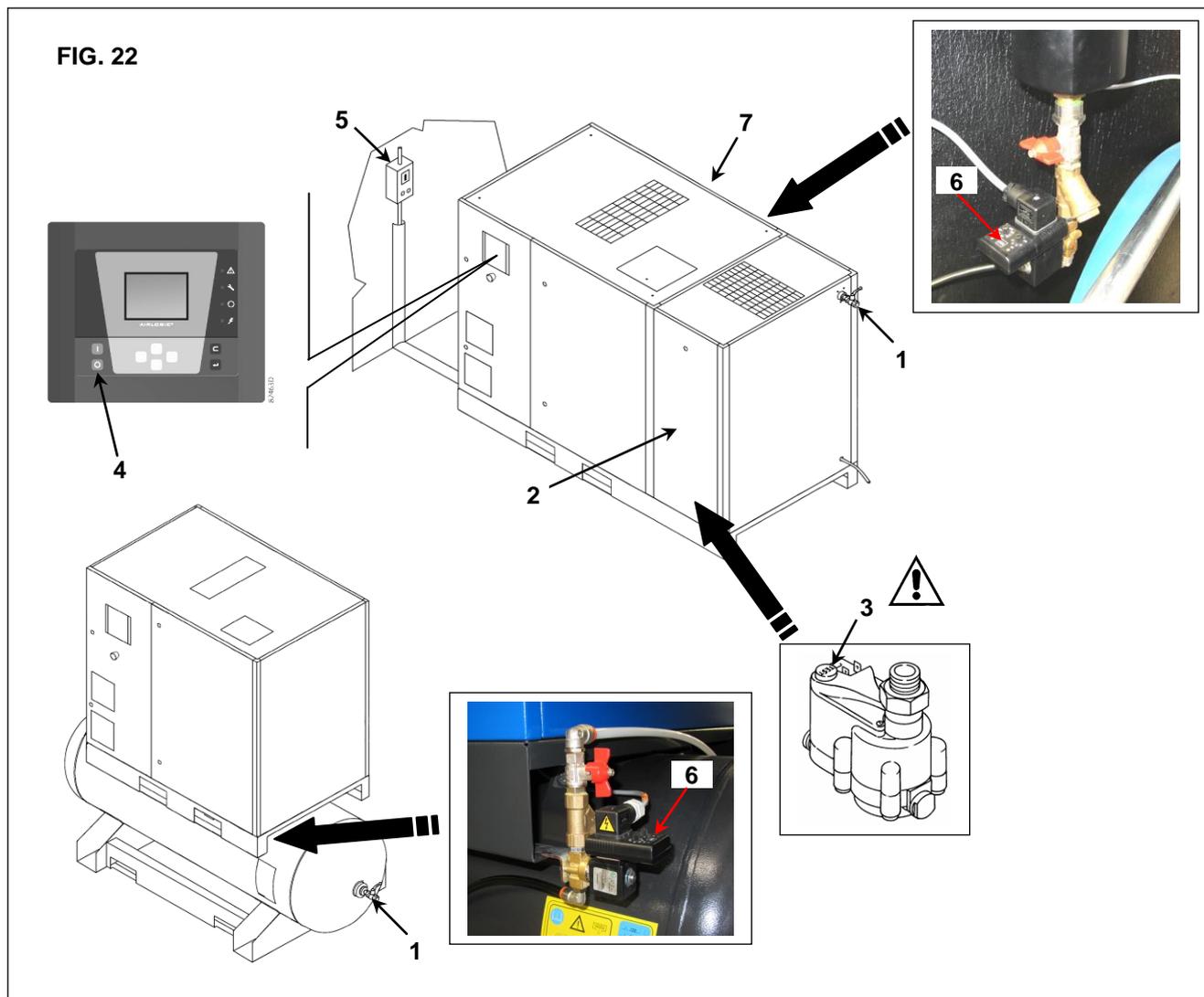
- Remove the panel Ref. 3 Fig. 21
- Clean the condenser fins with compressed air. **DO NOT USE WATER OR SOLVENTS.**
- Install the panel Ref. 3 Fig. 21



## 16.0 PERIODS OF INACTIVITY

If the machine has to remain inactive for a long period:

- Close the ball valve Ref. 1 Fig. 22.
- Open the panel Ref. 2 and Ref. 7 Fig. 22.
- Depressurise the dryer by pressing the "TEST" condensation emptying button (for about 10-20 seconds) Ref. 3 or the WSD by pressing test Ref. 6 Fig. 22 (if the dryer isn't available).
- Switch off the machine with pushbutton Ref. 4 Fig. 22: in this way the machine stops after idle time running.
- Turn off the disconnect switch, Ref. 5 Fig. 22.
- Close the panel Ref. 2 and Ref. 7 Fig. 22.



During periods of inactivity the unit must be protected against atmospheric agents, dust and humidity which could damage the motor and the electrical system.

To restart the machine after periods of inactivity, consult the manufacturer.

## 17.0 SCRAPPING THE UNIT

If the machine is to be scrapped, it must be dismantled into parts of the same material, to be disposed of according to the local regulations in force.



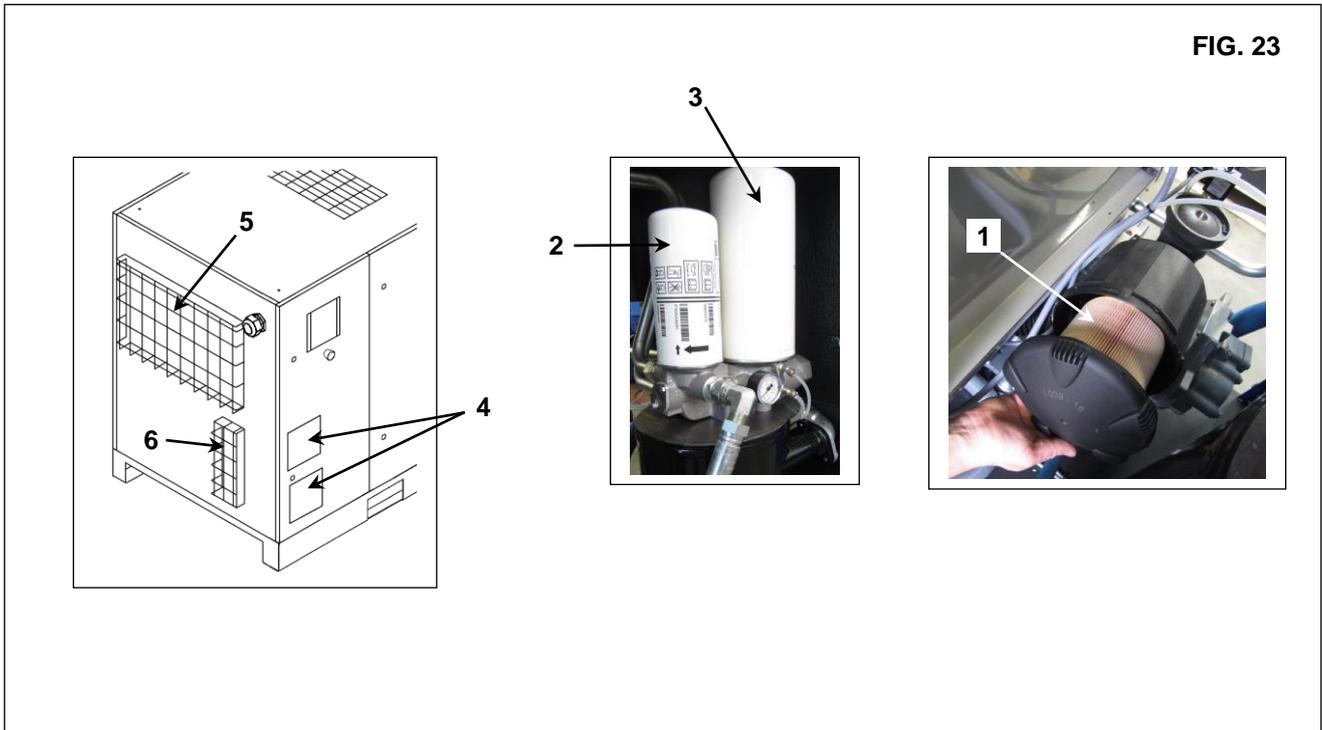
**ALWAYS RESPECT THE REGULATIONS IN FORCE FOR DISPOSING OF OLD OIL AND OTHER POLLUTING MATERIALS SUCH AS SOUND-DEADENING, INSULATING FOAM, ETC.**

**18.0 LIST OF SPARE PARTS FOR ROUTINE MAINTENANCE**

Ref	DESCRIPTION	Code	HP 15 kW 11	HP 20 kW 15	HP 25 kW 18,5	HP 30 kW 22
1	Suction air filter	2013400003	■	■	■	■
2	Oil filter	1625430291	■	■	■	■
3	Oil separator cartridge	2204149800	■	■	■	■
4	Filtering panel (only VSD)	1089955668	■	■	■	■
5	Air filter	2202260065	■	■	■	■
6	Air filter	2202715000	■	■	■	■
-	Oil	(*)				

(\*) Please contact your Quincy compressor dealer for oil replacement.

**FIG. 23**



**19.0 TROUBLE-SHOOTING AND EMERGENCY REMEDIES**

N.B. OPERATIONS MARKED ■ ■ MUST BE CARRIED OUT BY PROFESSIONALLY SKILLED PERSONNEL APPROVED THE MANUFACTURER



ALL WORK MUST BE CARRIED OUT BY PROFESSIONALLY SKILLED PERSONNEL. BEFORE CARRYNG OUT ANY MAINTENANCE JOBS IT IS OBLIGATORY TO STOP THE MACHINE AND DISCONNECT IT FROM THE POWER MAINS.

**19.1 – TROUBLE-SHOOTING AND EMERGENCY REMEDIES FOR COMPRESSOR**

FAULT FOUND	POSSIBLE CAUSES	OBSERVATIONS
1) The machine does not start	<b>1A</b> - no power <b>1B</b> - the transformer protection device has tripped	- check the power supply line, Chapter 12.2 - replace fuses
2) The machine does not start the pilot lamp (Ref. 5 Fig.17A) is flashing. The pictograph appears intermittently (Status icons Shutdown)	<b>2A</b> - Phases incorrect <b>2B</b> - the main motor protection device has tripped <b>2C</b> – Temperature switch on element outlet has tripped	- Verify phases sequence - to check possible motor failure -environment temperature too high; improve ventilation in the compressor room, Chapter 9.2 ■ ■ - cooling radiator is dirty, clean the radiator and the filters - oil level too low; top up the oil tank
3) The machine does not start the pilot lamp (Ref. 5 Fig.17A) is flashes. The pictograph appears intermittently (Status icons Shutdown)	<b>3A</b> - The oil high temperature protection has tripped	- environment temperature too high; improve ventilation in the compressor room, Chapter 9.2 ■ ■ - cooling radiator is dirty, clean the radiator and the filters - oil level too low; top up the oil tank
4) The compressor does not reach working pressure	<b>4A</b> - the compressed air consumption is too high <b>4B</b> - the discharge solenoid valve remains closed.	■ ■ - check the electric system
5) Excess oil consumption	<b>5A</b> - deteriorated oil separating filter oil level is too high	■ ■ - change the oil separating filter, Chapter 23 Check oil level

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### 19.2 TROUBLE-SHOOTING AND EMERGENCY REMEDIES FOR DRYER



**ALL WORK MUST BE CARRIED OUT BY PROFESSIONALLY SKILLED PERSONNEL. BEFORE CARRYING OUT ANY MAINTENANCE JOBS IT IS OBLIGATORY TO STOP THE MACHINE AND DISCONNECT IT FROM THE POWER MAINS.**

**N.B. OPERATIONS MARKED ■ ■ MUST BE CARRIED OUT BY PROFESSIONALLY SKILLED PERSONNEL APPROVED THE MANUFACTURER**

FAULT FOUND	POSSIBLE CAUSES	OBSERVATIONS
1) No compressed air passes through the dryer outlet	1A) The pipes are frozen inside	<ul style="list-style-type: none"> <li>■ ■ -The bypass valve of the hot gas is broken or out-of-calibration</li> <li>-The room temperature is too low and the evaporators piping are obstructed with ice</li> </ul>
2) Presence of condensate in the piping.	2A) The condensate separator does not work correctly  2B) The dryer is working outside its rating   2C) The dryer is working under bad conditions of condensation	<ul style="list-style-type: none"> <li>■ ■ -Check the draining device by pressing test button, Ref. 3 Fig. 22</li> <li>-Check the flow rate of treated air</li> <li>-Check the room temperature</li> <li>-Check the air temperature at the drier inlet.</li> <li>-Clean the condenser.</li> <li>■ ■ -Check the good operation of the fan.</li> </ul>
3) The compressor head is very hot (> 55 °C) 131 °F	Make reference to 2B Make reference to 2C 3A) The cooling circuit is not working with the right gas charge	<ul style="list-style-type: none"> <li>■ ■ -Check if there are leaks of refrigerating gas.</li> <li>■ ■ - Charge it again.</li> </ul>
4) Motor cuts out on overload	Make reference to 2B Make reference to 2C Make reference to 3A	
5) The motor hums and does not start.	The line voltage is too low. You switched the machine off and on again without leaving enough time for the pressure balancing.  The starting system of the motor is defective.	<ul style="list-style-type: none"> <li>-Contact the electric power company</li> <li>-Wait a few minutes before starting the machine again.</li> <li>■ ■ -Check the running and starting relays and condensers (if any)</li> </ul>
6) The machine has stopped and does not restart even after a few minutes.	The overload protection with has intervened: make reference to 2B-2C-3A.  The motor has burnt out.	
7) The compressor is very noisy.	Troubles with the internal mechanical parts or with the valves	



## PART "B"

**THIS PART "B" OF THE INSTRUCTIONS MANUAL IS RESERVED FOR PROFESSIONALLY SKILLED PERSONNEL APPROVED THE MANUFACTURER**

**WARNING: CAPACITORS INSIDE INVERTER MAY REMAIN CHARGED FOR 15 MINUTES (ONLY FOR VSD) AFTER THE UNIT HAS BEEN DISCONNECTED FROM MAIN SUPPLY.**

**WAIT AT LEAST 15 MINUTES (ONLY FOR VSD) AFTER POWER SUPPLY HAS BEEN REMOVED BEFORE PERFORM SERVICE OR REPAIR TO AVOID DEATH OR SERIOUS INJURY.**

**20.0 STARTING UP**

**BEFORE CARRYING OUT ANY OPERATION ON THE MACHINE, ENSURE THAT THE ELECTRIC POWER SUPPLY HAS BEEN DISCONNECTED.**

**20.1 PREPARING FOR SETTING UP**

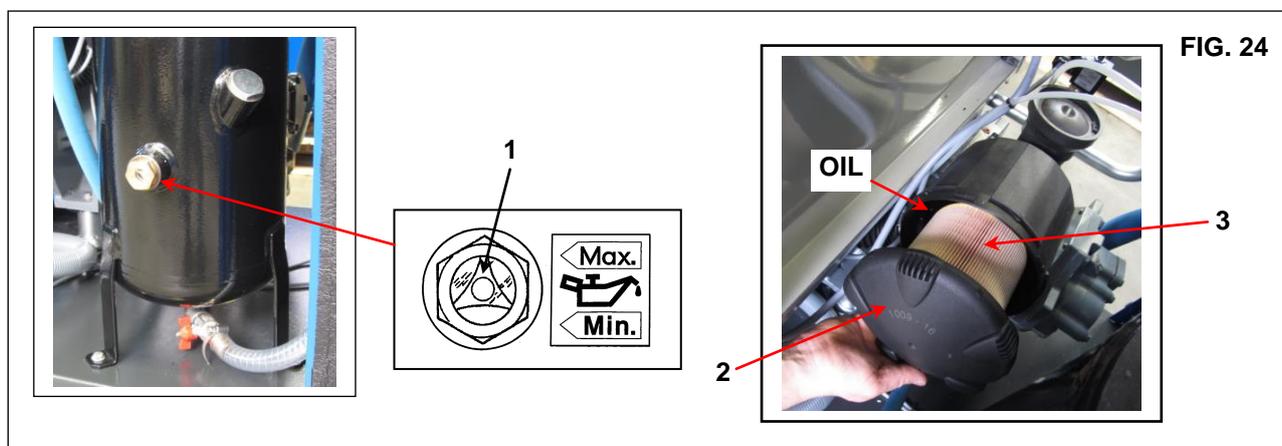
After checking everything as indicated in Chap. 12.0, (installation) follow the instructions

**20.2 Preliminary checks**

Check the oil level Ref. 1 Fig. 24; when delivered the machine is filled with oil; if the oil level is not as intended, top up with the same oil as the original type. If more than 3 months have passed between the inspection in the factory and the date of installation, lubricate the screw group before starting up, following the procedure described below:

- Remove the cover Ref. 2 Fig. 24
- Remove the air filter Ref. 3 Fig. 24
- Pour a little oil into the suction unit.
- Reassemble the air filter Ref. 3 Fig. 24
- Reassemble the cover Ref. 2 Fig. 24

If more than 6 months have passed between the inspection in the factory and the date of installation, please contact the service center.



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### 20.3 CHECK THE DIRECTION OF ROTATION

- Check that all fixed guards are in their correct position.
- Connect the control board to the power supply with the automatic circuit-breaker switch of the line Rif. 1 Fig. 25.
- Check the direction of rotation (following the arrow on the motor Rif. 3 Fig. 25). By pressing the "Start" button Rif. 2 Fig. 25, followed immediately by the emergency stop Rif. 4 Fig. 25. If it does not spin in the right direction reverse two mains cables. When it rotates in the correct direction, the oil level Rif. 5 Fig. 25. Should drop after 4 or 5 seconds of operation. It is very important to remember to check the direction of rotation of the fan (shown by an arrow on the fan Rif. 6 Fig. 25).



**ALL WORK ON THE ELECTRIC PLANT, HOWEVER SLIGHT, MUST BE CARRIED OUT BY PROFESSIONALLY SKILLED PERSONNEL.**

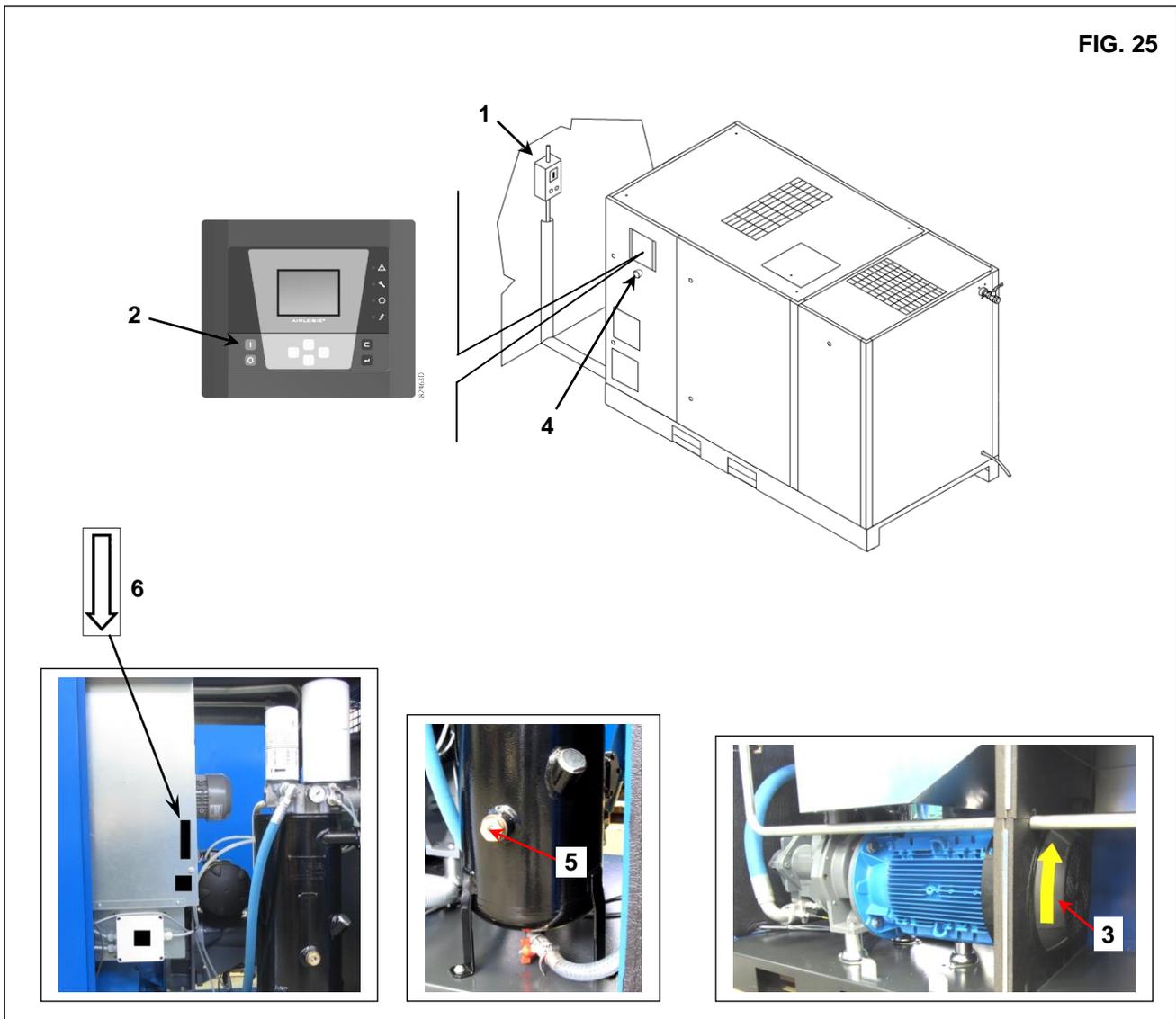
**- IT IS ADVISABLE NOT TO DO ANYTHING ON THE MACHINE PANEL**

**IF ALL THE INSTRUCTIONS FOUND IN THIS MANUAL HAVE BEEN OBSERVED THE MACHINE CAN BE STARTED.**



**ATTENTION: wait at least 90 seconds before starting the machine after a switch off**

**FIG. 25**



**21.0 GENERAL ORDINARY MAINTENANCE REQUIRES TRAINED PERSONNEL**

**BEFORE CARRYING OUT ANY MAINTENANCE JOBS IT IS OBLIGATORY TO STOP THE MACHINE AND DISCONNECT IT FROM THE POWER MAINS.**

**MAINTENANCE SCHEDULE**

These maintenance intervals are recommended for work environments that are not dusty and are well ventilated. For particularly dusty environments, double the frequency of controls.

<b>Every Day</b>	<ul style="list-style-type: none"> <li>■ Purge condensate water from air receiver</li> </ul>
<b>Every 50 working hours</b>	<ul style="list-style-type: none"> <li>■ Observe for unusual noise or vibration</li> <li>■ Drain condensate from the oil tank</li> <li>■ Check the oil level</li> <li>■ Clean the filtering panel (VSD)</li> <li>■ Clean the filter of the automatic discharge of condensate (dryer)</li> <li>■ Check air receiver automatic drain (if applicable)</li> </ul>
<b>Every 500 hours</b>	<ul style="list-style-type: none"> <li>■ Fixing electrical cables (at first 500 hrs)</li> <li>■ Clean the air suction filter</li> <li>■ Clean the condenser battery (on the dryer if fitted)</li> <li>■ Clean the dirt collection filter</li> <li>■ Check automatic condensation emptying (dryer)</li> <li>■ Clean the water separator drain</li> </ul>
<b>Every 2000 hours</b>	<ul style="list-style-type: none"> <li>■ Clean the filtering panel (VSD)</li> <li>■ Clean the air suction filter</li> <li>■ Clean the air filters</li> </ul>
<b>Every 4000 hours</b>	<ul style="list-style-type: none"> <li>■ ■ Maintenance kit of the automatic condensate drain (dryer)</li> <li>■ ■ Clean the finned surface of the air-oil cooler</li> <li>■ Change the filtering panel (VSD)</li> <li>■ ■ Replace the oil separator cartridge</li> <li>■ ■ Change the oil filter</li> <li>■ Change the air filters</li> <li>■ Change the air suction filter</li> <li>■ ■ Retighten all power cable connections</li> <li>■ ■ Safety temperature test</li> </ul>
<b>Every 8000 hours</b>	<ul style="list-style-type: none"> <li>■ ■ Change the oil (*)</li> <li>■ ■ Kit revision intake valve</li> <li>■ ■ Checking the status of the oil return valve and oil pipes</li> <li>■ ■ Kit revision minimum pressure valve</li> <li>■ ■ Kit revision thermostatic valve</li> <li>■ ■ Replace drain</li> </ul>
<b>Every 24000 hours</b>	<ul style="list-style-type: none"> <li>■ ■ Kit revision of the compressor unit</li> <li>■ ■ Kit revision of motor (bearings)</li> </ul>

**N.B.: THE OPERATIONS MARKED ■ ARE DESCRIBED IN PART "A" OF THIS MANUAL ON CHAPTER 15.2**

(\*) Or as indicated by oil analysis.

**Oil specifications:**

It is strongly recommended to use genuine lubricants from your manufacturer. They are the result of years of field experience and research. See section Preventive maintenance schedule for the advised replacement intervals and consult the Spare Parts list for part number information.



**AVOID MIXING LUBRICANTS OF DIFFERENT BRANDS OR TYPES AS THEY MAY NOT BE COMPATIBLE AND THE OIL MIX MAY HAVE INFERIOR PROPERTIES.**

**22.0 REPLACING OIL**



**BEFORE CARRYING OUT ANY MAINTENANCE JOBS IT IS MANDATORY STOP THE MACHINE AND DISCONNECT IT FROM THE POWER MAINS AND FROM THE COMPRESSED AIR DISTRIBUTION NETWORK.**

Oil changing is an important operation for the compressor:

if the lubrication of the bearings is not efficient, the compressor life time will be reduced..

The oil must be changed when the machine is still warm, that is immediately after stopping it.

The suggestions listed below should be scrupulously followed.

After draining the old oil out of the machine Ref. 2 Fig. 26.

- Completely fill the oil collector Ref. 1 Fig. 26.

- Pour a little oil into the suction unit.

- Start the compressor.

- After about 1 minute switch off the machine by pressing "STOP" (Ref. 3 Fig. 26) after idle time running the machine will switch off.

**PROCEED AS DESCRIBED AT POINT CHAPTER 15.4**



**THE OLD OIL MUST BE DISPOSED OF IN COMPLIANCE WITH THE REGULATIONS IN FORCE.**

**NOTE ON LUBRICANTS**

When delivered the machine is filled with oil.

**Extending the use of the oil over the scheduled replacement interval result in the risk of fire.** If the compressor is used at high temperatures or in particularly severe conditions, we advise shorter oil replacement interval.

**DO NOT TOP UP WITH DIFFERENT OILS**

**23.0 REPLACE THE DE-OILER FILTER AND THE OIL FILTER**

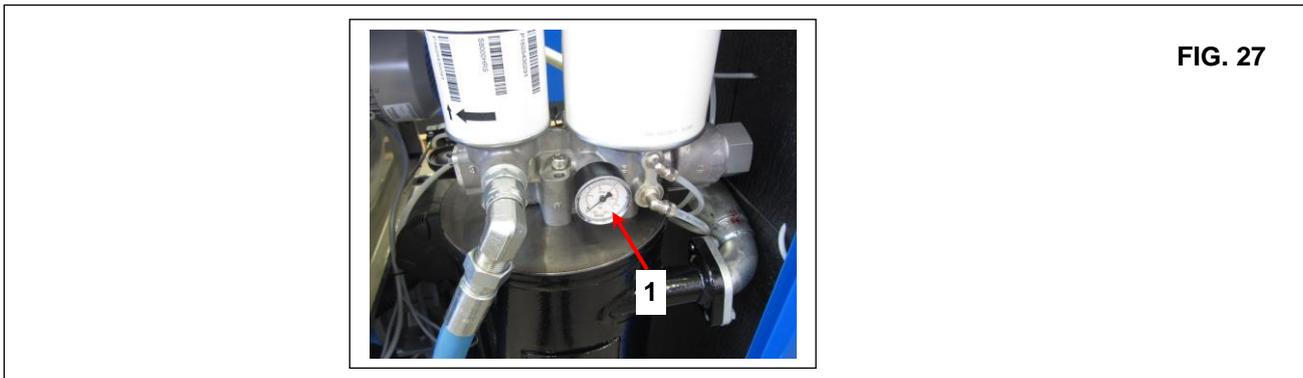


**BEFORE CARRYING OUT ANY MAINTENANCE THE MACHINE MUST BE STOPPED, CUT OFF THE MACHINE FROM THE ELECTRICAL MAINS AND FROM THE COMPRESSED AIR DISTRIBUTION CIRCUIT, CHECK THAT THE MACHINE IS NOT UNDER PRESSURE.**

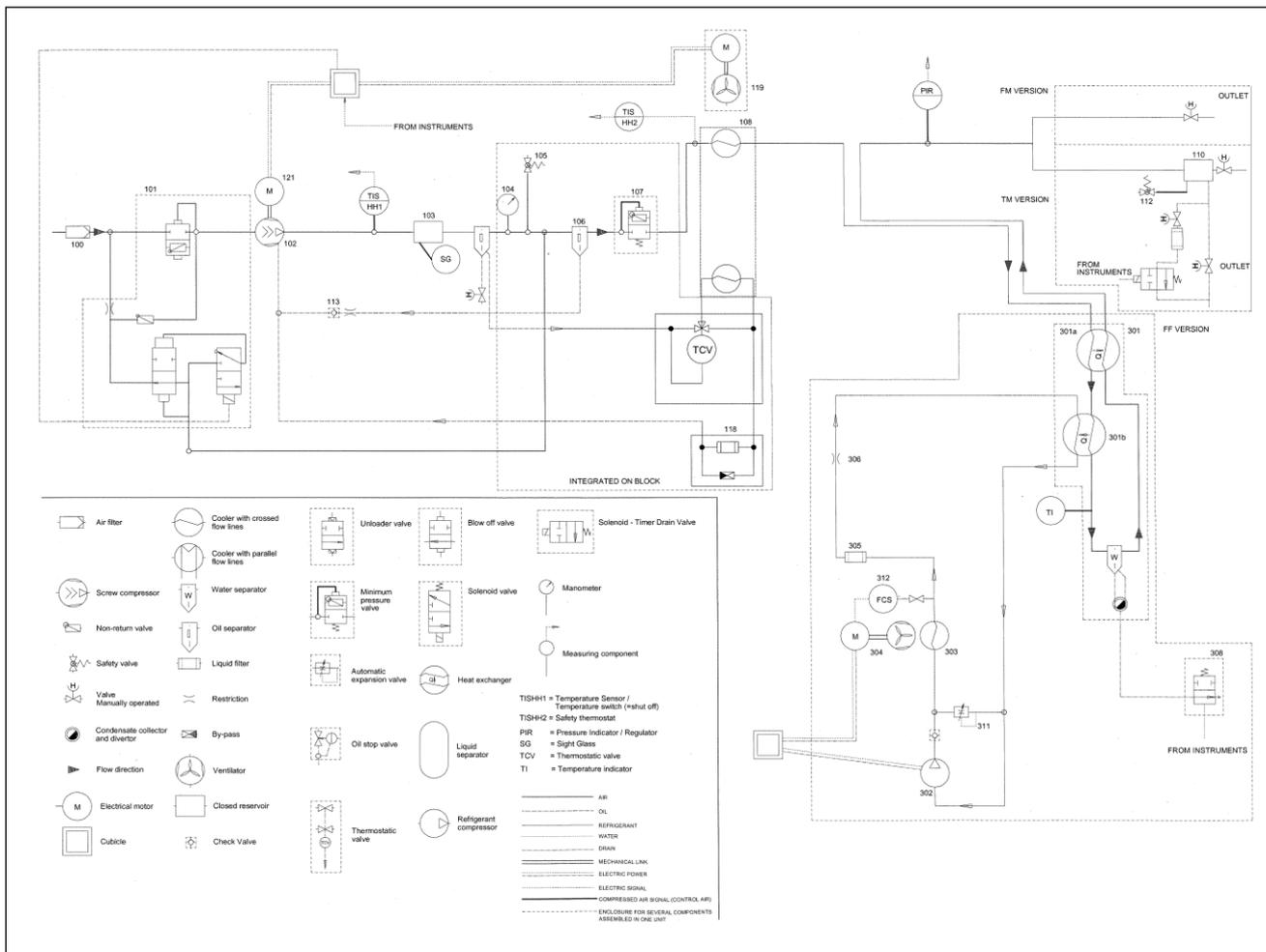
Before proceeding with the replacement of the de-oiler filter or the oil filter check that there is no pressure in the machine: check the pressure gauge Ref. 1 Fig. 27.

- Lubricate the filter seals with a little oil before fitting.

- Tightening must be done by hand.



24.0 OLEOPNEUMATIC DIAGRAM



100 Inlet air filter (filter element)	302 Refrigerant compressor
101 Inlet valve	303 Condenser
102 Oil-injected screw element	304 Fan
103 Air/oil receiver	305 Refrigerant filter-dryer
104 Pressure gauge	306 Capillary tube
105 Safety valve	308 Electronic drain
106 Oil separator	311 Hot gas bypass valve
107 Minimum pressure valve	312 Fan switch
108 After cooler/Oil cooler	TISHH1 Temperature sensor/Temperature switch
110 Air receiver	TISHH2 Temperature switch
112 Safety valve	TCV Thermostatic valve
113 No return valve	PIR Pressure sensor
114 Heat exchanger	SG Sight glass
115 Thermostatic valve	
118 Oil filter	
119 Fan	
121 Drive motor	
300 Dryer	
301 Combined heat exchanger	

**25.0 CALIBRACION FOR DRYER**

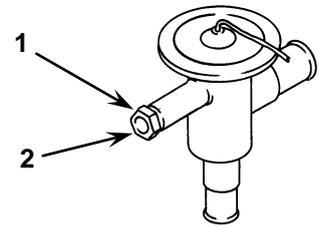
**HOT BYPASS VALVE**

N.B. These valves are calibrated at the factory. A different dew point (from rated) may be related to different cause than HGBP.

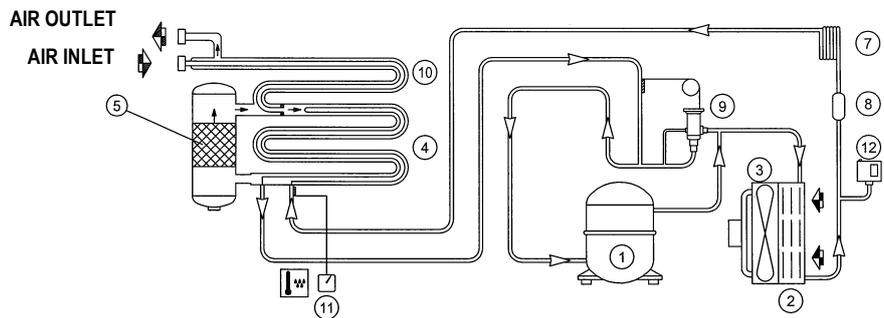
- 1) Closing cap
- 2) Adjusting screw

**WORKING PRESSURES AND TEMPERATURES OF R134a / R404a / R410a**

	SUCTION SIDE OF REFRIGERATION COMPRESSOR			
	Evaporat. Temperat. °C (°F)	Evaporating Pressure bar (psi)	Evaporating Pressure bar (psi)	Evaporating Pressure bar (psi)
<b>RATED VALUES</b> Temperat. 20 °C (68 °F)	1 ÷ 2 (33,8 ÷ 35,6)	<b>R134a</b> 2,1 ÷ 2,3 (30,4 ÷ 33,3)	<b>R404a</b> 4,3 ÷ 4,5 (63,3 ÷ 65,2)	<b>R410a</b> 7,28 ÷ 7,55 (105,6 ÷ 109,5)



**25.1 FLOW DIAGRAM OF THE DRYER**



1 COMPRESSOR	8 REFRIGERANT FILTER
2 CONDENSER	9 HOT GAS BYPASS VALVE
3 MOTOR FAN	10 AIR-TO-AIR EXCANGER
4 EVAPORATOR	11 DEW POINT THERMOMETER (if applicable)
5 SEPARATOR	12 FAN PRESSURE SWITCH
7 EXPANSION CAPILLARY TUBE	