Chicago Pneumatic

Instruction Manual EN

CP COMPRESSOR

Model QRS 20-25-30
CPVS 20-25-30

62 305 454 65 ed00

ORIGINAL PART

The CP Compressors should never be operated beyond its capabilities or in any way which does not comply with the instructions contained in this operating and maintenance guide.

Chicago Pneumatic Compressors will decline any responsibility if these instructions are not respected.

This equipment has been factory tested and satisfies normal operating conditions: they must not be exceeded as this would place the machine under abnormal stress and effort.

INSTALLATION INSTRUCTIONS

For the guarantee to be valid, the unit must be assembled in covered premises with temperatures not exceeding :

Mini: + 36 °F (frost free)

Maxi: + 104 °F*

You must also have:

1 meter space around the compressor

-

low ventilation (fresh air) proportionate to the ventilation flow necessary for the machine and protected from any infiltration of humidity (splashes of water during bad weather) and all pollution

-

top insulation or extraction to ensure reversal of the flow of warm air and evacuation of the heat to outside the equipment room

-

a link from the condensation water evacuation pipe to the drain discharger

-

in dusty environment, pre-filtering the room's air intake and a special filter on the machine's ventilation inlets

TECHNICAL DATA
STANDARD MACHINES

QRS Model		20				25				30			
Nominal pressure at full flow	PSI	100	125	150	175	100	125	150	175	100	125	150	175
Actual flow* (as per ISO 1217 ed 1996)	cfm	85.3	80.0	70.6	58.9	105.4	94.2	89.5	77.7	123.6	115.9	104.2	91.2
Motor power	hp	20				25				30			
Ø Pressure outlet (M)	NPT	1"				1"				1"			
Capacity	gal	7.4				7.4				7.4			
Carryover	ppm	3				3				3			
Noise level at 3,3 ft (according to ISO 2157 + 3db(A))	dB(A)	63				66				68			
**Suction pressure : 14.5 PSI absolute - Relative humidity : 0 % - Ambient temperature : 68 °F - Effective delivery pressure : 102 PSI, 109 PSI, 138 PSI or 181 PSI (effective)													
Dimensions (in)	L x W x H	52.40 x 30.73 x 48.07				52.40 x 30.73 x 48.07				52.40 x 30.73 x 48.07			
Approximate weight	lbs	893				913				948			

QRS Model		20	25	30
Motor power	(hp)	20	25	30
Main Voltage 208 Volt / 3 / 60 Hz				
Nominal current	(A)	63	74	91
Power supply cable		AWG 4	AWG 2	AWG 2
Fuse protection	(Type J)	80 A	100 A	100 A
Main Voltage 230 Volt / 3 / 60 Hz				
Nominal current	(A)	56	67	82
Power supply cable		AWG 4	AWG 4	AWG 2
Fuse protection	(Type J)	80 A	80 A	100 A
Main Voltage 460 Volt / 3 / 60 Hz				
Nominal current	(A)	25	31	37
Power supply cable		AWG 8	AWG 8	AWG 8
Fuse protection	(Type J)	30 A	40 A	50 A

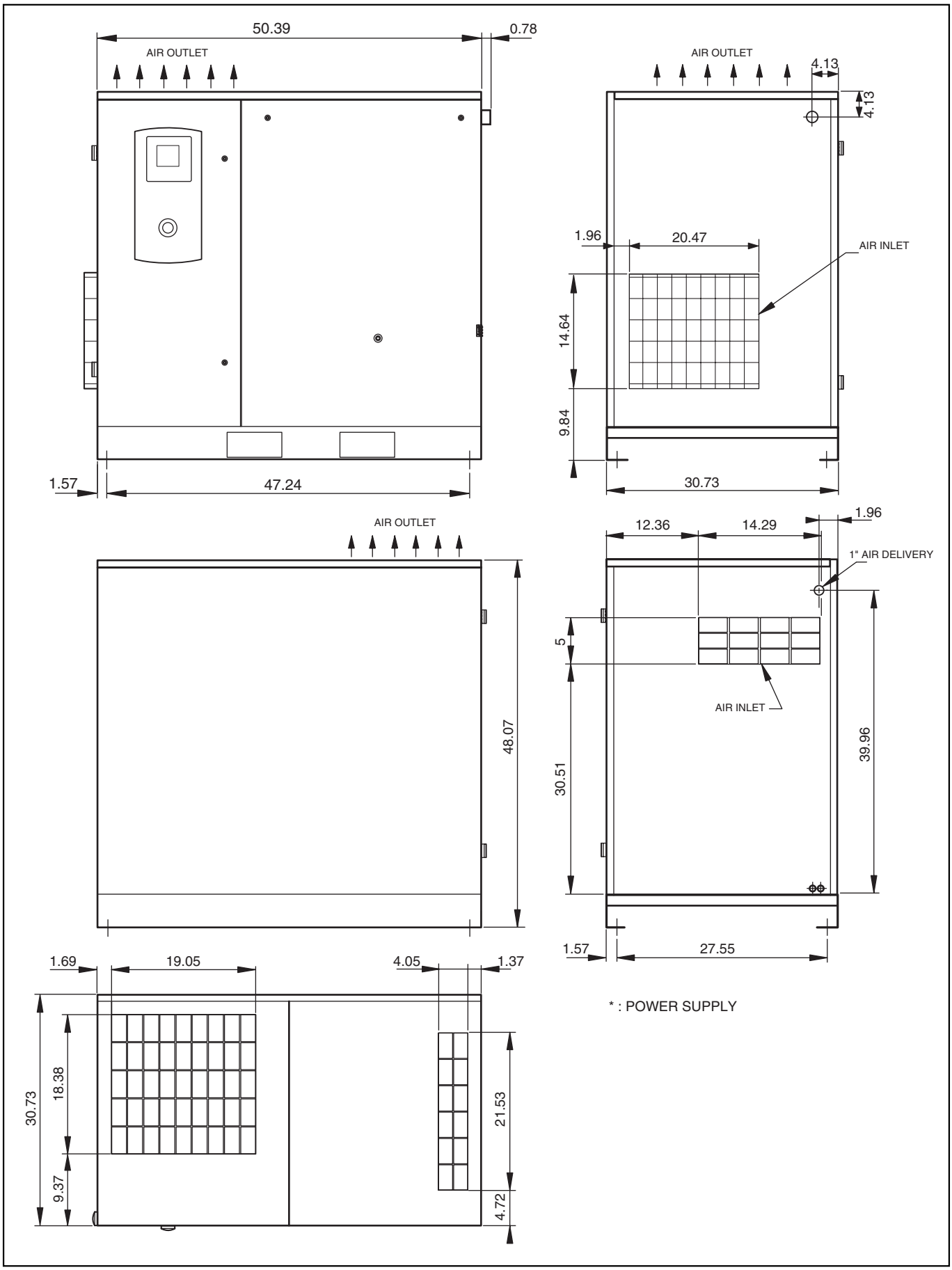
TECHNICAL DATA
VARIABLE SPEED MACHINES

CPVS Model		20			25			30		
Nominal pressure at full flow	PSI	80	109	138	80	109	138	80	109	138
Actual flow* (as per ISO 1217 ed 1996)	cfm	91.8	84.7	76.0	114.8	106.5	95.4	129.5	124.2	112.4
Motor power	hp	20			25			30		
Ø Pressure outlet (M)	NPT	1"			1"			1"		
Capacity	gal	7.4			7.4			7.4		
Carryover	ppm	3			3			3		
Noise level at 3,3 ft (according to ISO 2157 + 3db(A))	dB(A)	64			67			69		
**Suction pressure : 14.5 PSI absolute - Relative humidity : 0 % - Ambient temperature : 68 °F - Effective delivery pressure : 102 PSI, 109 PSI, 138 PSI or 181 PSI (effective)										
Dimensions (in)	L x W x H	52.40 x 30.73 x 48.07			52.40 x 30.73 x 48.07			52.40 x 30.73 x 48.07		
Approximate weight	lbs	953			997			1010		

CONTENTS

Space requirement and installation diagram : QRS 20-25-30 / CPVS 20-25-30
(see **page 2** - installation instructions)

Fig. 1



Section 1 - Description

A - General

The **Chicago Pneumatic Compressors** contains a compressed air unit in the form of a self contained, complete and fully tested assembly, driven by an electric motor and enclosed in an acoustic canopy, necessary for proper cooling of the assembly.

It is an oil-cooled, single stage, helical screw-type compressor. There is a vertical mounted receiver for pre-separating and storing oil and air. The air-oil mixture is then separated by means of a separator cartridge.

Both the compressor and the motor are directly fixed on the frame by anti-vibration pads.

B - Respect of the environment and prevention of pollution

1 - Maintenance of the machine

Make sure that the used components of the machine (waste oil, oil and air filters, oil separators, etc...) are disposed according to national and local regulations.

2 - Condensate drain pipe

Make sure that the condensates (water, oil) are drained and treated according to national and local regulations.

3 - End of life of the machine

Make sure that the machine as a whole is disposed according to national and local regulations **(Section 6 - I).**

C - Standard equipment

In its standard version, the covered unit includes:

- Operating components:

1. A twin-screw compressor lubricated with the Fluidtech oil.
2. An electric motor : 3600 rpm (60Hz), short-circuit rotor, voltage 208, 230, 460 V (60Hz), according to type.
3. Star-delta starting.
4. A V-Belt and pulley system.
5. An air / oil receiver complying to current regulation (European Directive for simple pressure vessels no. 87/404).
6. "start - stop" flow rate control by suction closing.
7. A lubrication system using the differential pressure of the circuit, which avoids the need for an oil pump.
8. An oil separation system by means of a separator cartridge.
9. A heat exchanging system : oil and compressed air cooler with forced ventilation.
10. A dry-type air filter.
11. An oil filter.
12. A command and control electronic board.
13. ES 3000 as standard on all fixed speed units,
14. ES 3000 as standard on all variable speed units.

- Safety devices:

1. A safety valve mounted on the oil receiver.
2. An thermal protection device for the motor, located in the starting cubicle, to protect the motor from excessive overload.
3. A air temperature sensor that stops the compressor when the temperature rises abnormally or during an oil cooling defect.
4. A pressure sensor that stops the compressor in order to prevent any excessive rise in pressure.

- Control devices:

1. A minimum pressure valve located at the oil tank outlet, just beyond the oil separator, which guarantees minimum pressure in the lubrication circuit.
2. Automatic draining allowing the unit to be exposed to the atmosphere when stopping to thus ensure empty start up which relieves the motor,
3. An oil level gauge on the front panel (see **Fig. 10**),
4. An electronic controller including:
   – a control keyboard,
   – the main safety and control indications.
5. The compressed air output is regulated by a pressure sensor

The CP Compressors air unit has been designed, produced and tested in accordance with the following recommendations, codes and standards :

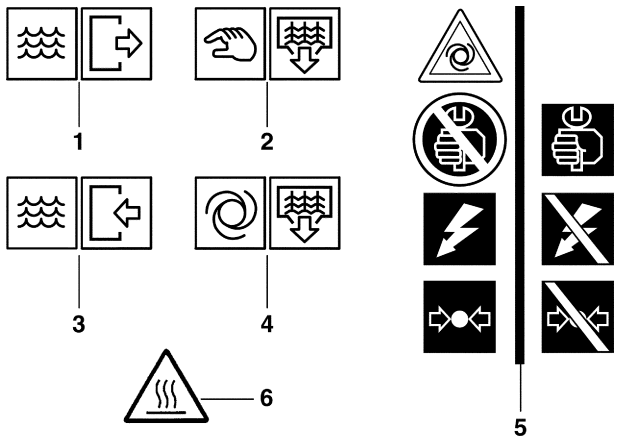
- machine safety: European Directive 98/37/CE, 91/368/CEE and 93/68/CEE.
- pressure vessels: European Directive for simple pressure vessels n° 87/404/CEE.
- electrical equipment:
  - electrical equipment: European Directive Low tension 73/23/CEE.
  - electromagnetic compatibility European Directive: 89/336/CEE, 92/31/CEE.
- performance levels: ISO 1217 : 1996.
- noise level : ISO 2157 + 3db(A)
- European Directive 97/23/EC " Pressure Equipment Directive ".

D - Definition of the pictograms

Typical examples of pictograms valid for CP Compressors:

1. Water outlet
2. Manual condensation water draining
3. Water inlet
4. Automatic condensation water draining
5. Unplug and unload the compressor before maintenance
6. Hot parts

Fig. 2



DANGER
This symbol identifies immediate hazards which will result in severe personal injury, death or substantial property damage.

CAUTION
Identifies hazards or unsafe practies which could result in minor personal injury or property damage.

DANGER
This symbol identifies life threatening electrical voltage levels which will result in severe personal injury or death. All electrical work must be performed by a qualified electrician.

CAUTION
This symbol identifies hot surfaces which coold result in personal injury or property damage.

E - Electronic board

The unit is equipped with an ES 3000 electronic controller.

See, the specific instructions for a description of the elctronic controller together with operating instructions in **Section 4-C**.

Section 2 - Installation

A - Handling

The CP Compressors must always be handled with care. It may be lifted either with a forklift truck or by means of a travelling crane. In the latter case, precautions must be taken so as not to damage the unit's canopy.

B - Room

The CP Compressors is designed to operate in a frost-free environment, supplied with air at a temperature lower than 104°F. The premises must be well-ventilated and as close as possible to the place where the compressed air is used. A space must be left around the unit, for cleaning and maintenance purposes. It is very important for the compressor to have an abundant supply of fresh air (see **page 2**).

If operating the compressor causes the ambient temperature to rise above 104 °F, the warm air leaving the cooler must be discharge outside.

COMMENT
When the atmosphere is contaminated by organic or mineral dust or by corrosive chemical emanations the following precautions must be taken:

1. Provide another air intake as close as possible to the suction source of the compressor (this recommendation applies if the only room available is excessively humid).
2. Use an additional filter for the unit's air supply **(See Options Section).**

C - Assembly

Put the unit on a stable surface. The CP Compressors does not need foundations. Any flat surface that can support its weight will be sufficient (industrial floor).

D - Air discharge piping

The diameter of the piping for the air network must at least be equal to 1" NPT of the gas piping. Current legislation requires the installation of a valve which can be locked in a closed position at the outlet of the compressor and connected to the compressor by a pipe union or flexible hose so as to isolate it during servicing.

E - Electric cabling

Each CP Compressors supplied is cabled for 208V/60Hz, 230V/60Hz, 460V/60Hz.

NEVER OPERATE THE CP COMPRESSORS ON A VOLTAGE OTHER DIFFERENT THAN SHOWN ON THE ELECTRIC CABINET.

The electric current supply to the CP Compressors must comply with the following table :

Type of cable to be used :
Power cable size
(for a maximum 32.8 ft length)

QRS Model	VOLTAGE 60Hz		
	208 V	230 V	460 V
20	AWG 4	AWG 4	AWG 8
25	AWG 2	AWG 4	AWG 8
30	AWG 2	AWG 2	AWG 8

SAFETY REGULATIONS

It should be remembered that safety regulations require :

- An earth socket to be used.
- A manual isolating switch, cutting all three phases ; this switch must be clearly visible near the CP Compressors unit.
- The electric current must be cut whenever maintenance work is carried out on the machine.

QRS Model	Fuses to be used for the isolating switch (Type J) - 60Hz		
	208 V	230 V	460 V
20	80 A	80 A	30 A
25	100 A	80 A	40 A
30	100 A	100 A	50 A

Section 3 - Initial setup

A - Preparation for start-up

Before starting up the unit for the first time, the operator must be familiar with the different parts of the machine. The main parts which should be examined are indicated in the diagrams.

IMPORTANT
Before start up, make sure that transport red pads have been effectively removed.

WARNING
Please make sure the electrical mains are disconnected before any maintenance or adjustment on the unit in order to avoid any automatic restart.

Before start-up, check the following points :

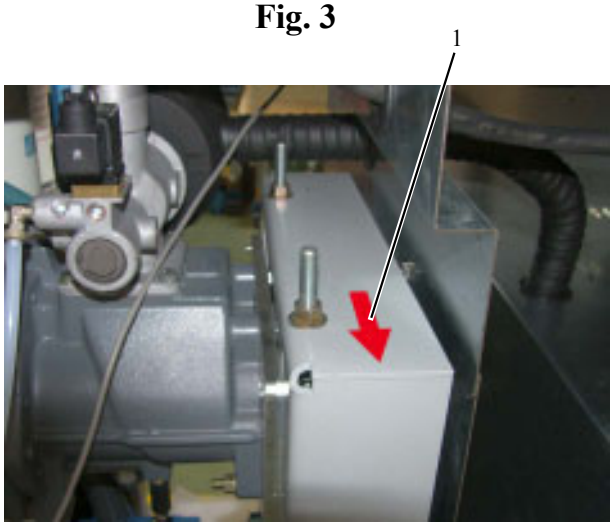
1 - Make sure that the unit is properly earthed.
2 - Check the oil level in the tank.
NOTE : the tank has been filled with suitable oil in the factory. See **Section 6-A** for the quality of oil to be used or for oil renewal conditions.
3 - Make sure the oil change valve is properly closed.
4 - Check/re-tighten all power connections.

ATTENTION
The oil filler cap, the oil change valve and plugs must always remain closed during operation and never be opened before the system has been completely blown off to atmospheric pressure.

B - First start-up

Check the voltage between the three phases before using the unit for the first time.
Check the direction of rotation (following the arrow on the pulley-belt support **(item. 1 - Fig. 3**)) by pressing the "Start" button, followed immediately by the emergency stop. If it does not spin in the right direction reverse two mains cables. When it rotates in the correct direction, the oil level (**Fig.10**) should drop after 4 or 5 seconds of operation.

Fig. 3



1 - Press the ON button, the motor starts up.
2 - Leave it running for a few minutes with the discharge valve slightly open to observe the compressor under load. Ensure that there are no leaks. Reblock the connectors if necessary.
3. Press the STOP button. The motor stops and the unit is automatically blown off at atmospheric pressure.

C - Delivery pressure adjustment

The unit is adjusted in the factory for a MAXIMUM pressure (for the maximum output from the outlet of the central unit) of 100, 125, 150 or 175 PSI depending on the model. To adjust the load pressure setting to a lower value, refer to the manual of the electronic controller.

D - Adjustment for in parallel operation with other compressors

If the CP Compressors has to operate in parallel with other CP Compressors, or similar compressors, the discharge pipes can be connected together.

If the CP Compressors has to operate in parallel with one or several alternative compressors, an air tank common to the reciprocating compressors is essential. The impulses emitted by the reciprocating compressors would seriously damage the non-return valve, the CP Compressors separator element and disturb system control. When the rotary compressor operates in parallel with an alternative compressor, the adjustments on the latter will have to be adjusted so that the rotary compressor carries the basic load. This will result in more economic operation.

E - Safety

The oil used for cooling the machine is an inflamable liquid under the effect of strong heat. In case of fire in the machine, it is essential to respect the regulatory measures on the compressor. The type of fire in a compressor is defined as "class B" and in presence of a live electrical conductor, it is recommended to use a CO_2 extinguisher functioning by "smothering" (starvation of oxygen) while observing the user instructions applicable to the model.

Section 4 - Operation

A - Air and oil circuits

1 - Air circuit (see Fig. 4)

The air is sucked into the compressor through a filter (**item. 23**). This air passes through the compression element where it is mixed with oil injected during compression. Inside the tank, the compressed air is separated by shocks and then flows through the oil separator (**item. 49**). It then passes through the Minimum pressure valve (**item. 34**) including a check valve, the final cooler (**item. 51A**), condensate separator and finally the outlet valve (not supplied) to which the distribution pipes are connected.

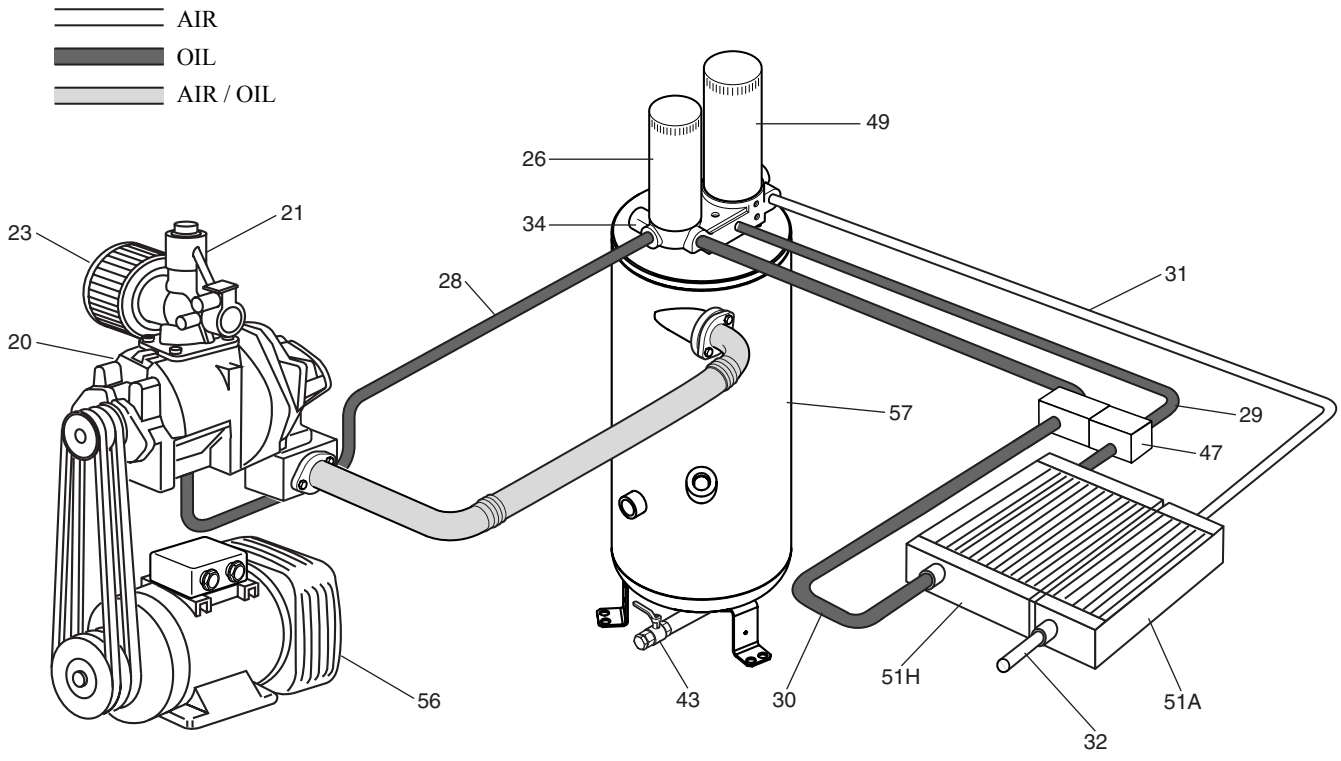
2 - Oil circuit (see Fig. 4)

The oil, under discharge pressure, flows from the bottom of the tank through the cooler (**item. 51H**), the oil filter (**item. 26**) which retains solid particles, and then into the compressor (**item. 20**). At each cold start, the thermostatic valve (**item. 47**) short circuits the oil cooler, thus enabling the optimum operating temperature to be reached quickly. When it leaves the compressor element, the oil returns to the tank. Part of the oil remains suspended in the air as mist. This mist passes through the oil separator. (**item. 49**). A fraction of this oil agglomerates in large droplets which return to the tank through the force of gravity. The remaining oil, which is separated by the last stage of the oil separator, is drawn up by a dip tube and dispatched to the compressor.

Key Fig. 4

20.	Compressor
21.	Suction housing
23.	Air filter
26.	Oil filter
28/29/30.	Flexible oil hose
31/32.	Flexible air hose
34.	Built in minimum pressure valve / Filter support
43.	Drain valve
47.	Thermostatic valve (built in filter support)
49.	Oil separator
51 A.	Air cooler
51 H.	Oil cooler
56.	Motor
57.	Oil tank

Fig. 4 - Air / oil circuit



B - Control principles

1 - On/Off Control (see Fig. 5)

Models, all versions

The QRS 20-25-30 units are fitted with an automatic control system, enabling the machine to be stopped after it has run unloaded for a given (adjustable) period of time. This unloaded period is necessary to avoid excessively close start-ups in periods of unstable compressed air consumption.

When the compressor reaches the maximum pressure (measured by the pressure sensor - **item. 36**), the solenoid valve (**item. 35**) releases to the atmosphere the compressed air. The internal pressure closes on one hand the suction box and on the other hand the blow off piston. This results in the release of the internal pressure of the receiver via the by pass check valve."

The compressor draws in air via a by-pass valve (**item. 25**).

The low pressure obtained in the oil tank enables the compressor to be lubricated and cooled during the whole unloaded period.

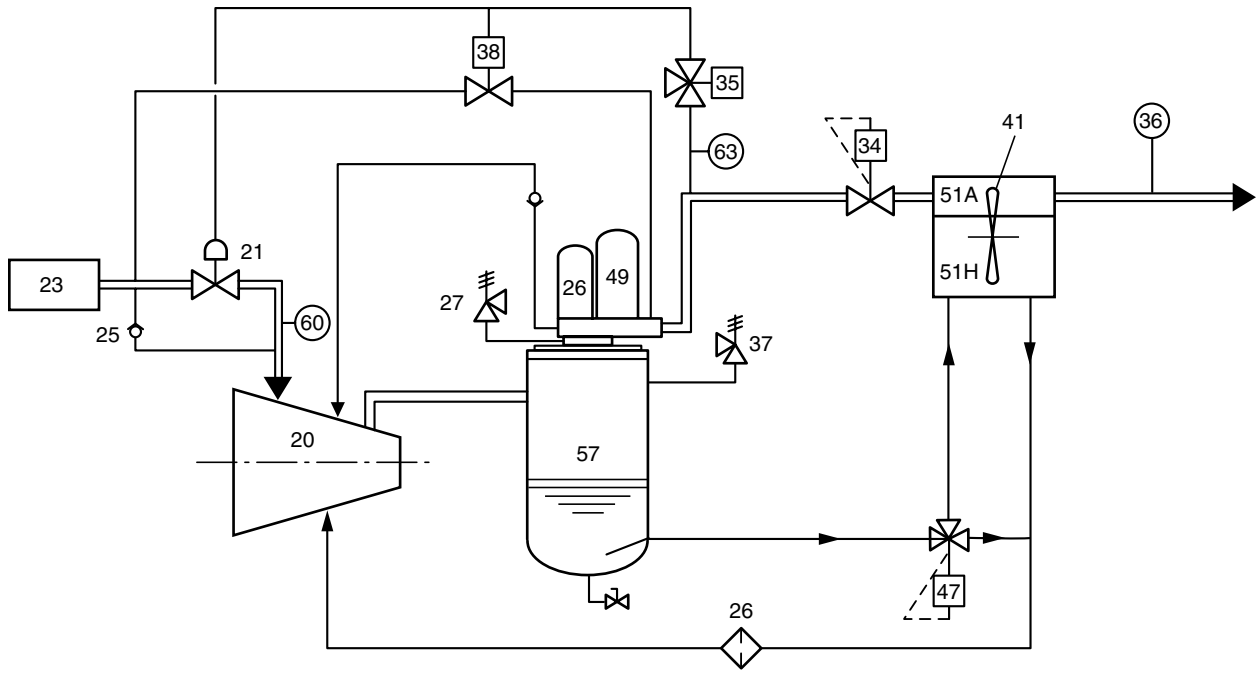
If the compressed air pressure in the user network reaches the minimum cutting-in value before the end of the no load operation time out the solenoid valve (**item. 35**) is actuated causing the suction valve to open and the vent to close. The compressor then operates at full output rate.

When the compressor stops, the solenoid valve (**item. 35**) is no longer powered and closes; the suction housing closes and the oil tank is evacuated. The receiver is thus brought back to atmospheric pressure for the next start-up.

Key Fig. 5

20.	Compressor
21.	Suction housing
23.	Air filter
25.	By-pass check valve
26.	Oil filter cartridge
27.	Safety valve
34.	Built in minimum pressure valve / Filter support
35.	Solenoid valve
36.	Pressure sensor
38.	Pneumatic vacuum piston
41.	Ventilation
47.	Thermostatic valve (built in filter support)
49	Oil separator
51 A	Air cooler
51 H	Oil cooler
57.	Oil receiver
60.	Temperature sensor
63.	Manometer

Fig. 5 - On/Off Control



C - ES 3000 Controller

1 - Control and command panel

CAREFULLY READ AND UNDERSTAND THE CONTROL FUNCTIONS BEFORE CARRYING OUT THE OPERATING TEST

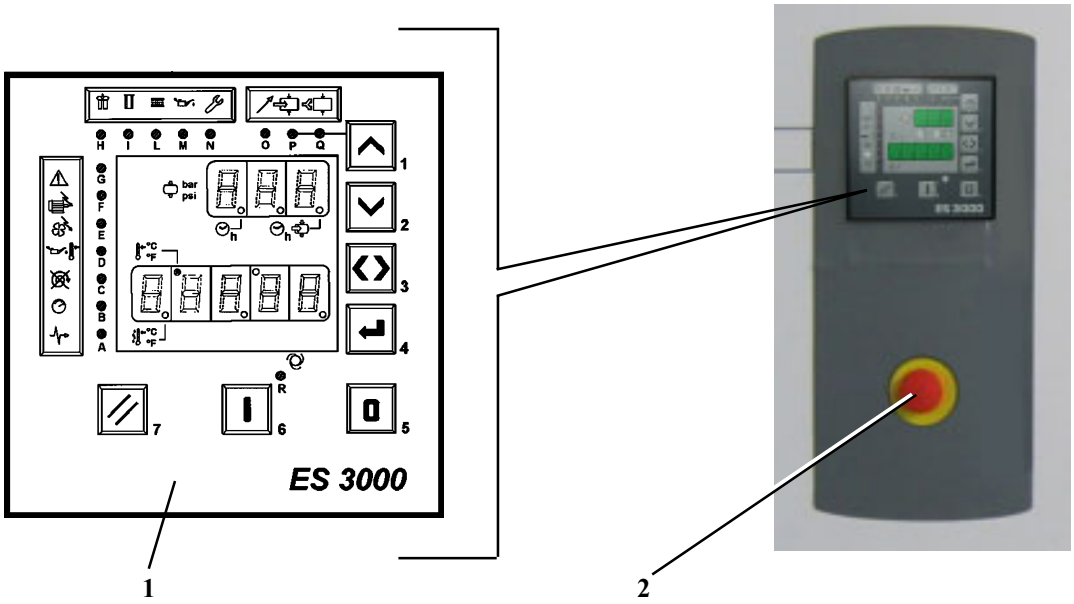


Fig. 6

1) Control board

2) Emergency stop button with mechanical holding and unblocking by turning

2 - Electronic board model "ES 3000"

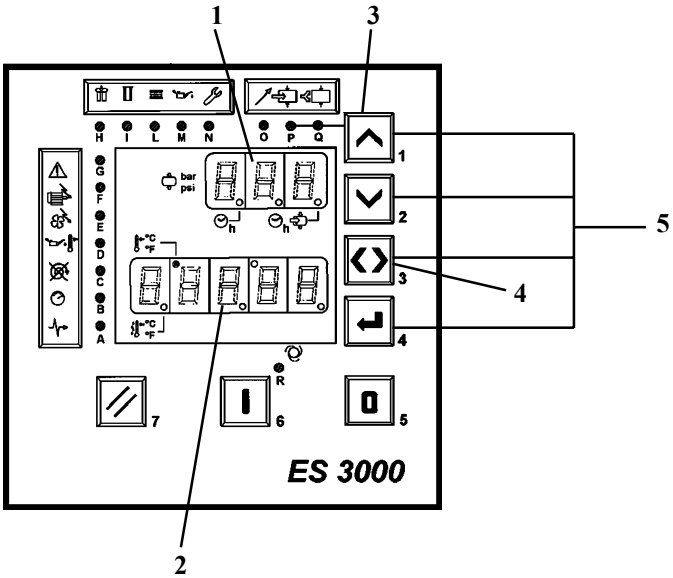


Fig. 7

The electronic panel contains an electronic and diagnostic board. This board includes the function display as shown in **figure 7**.

1) Upper screen: indicates the compressor pressure

2) Lower screen: indicates temperature, total hours, hours charged

3) Compressor purge button

4) Tabulator button to move on to the next display screen **Item. 2**

5) Board setting buttons

Symbole	Désignation
 **(7)**	Pressing this button to delete the saved alarm display. Keeping the button pressed down for over 3 seconds, a station check test is performed, all LEDs must be lit.
 **(6)**	Pressing this button starts the compressor. The start up is delayed for approximately 15 seconds.
 **(5)**	Pressing this button start the stopping process for the compressor: the compressor operates with no load for a few seconds before stopping.

Operation status indicator LED **"RED"** indicator lights (causing the machine to stop)

Symbol	Flashing LED	LED on
 **(B)**	Overpressure alarm on	Machine stopped due to overpressure
 **(C)**	Wrong rotary way : in progress	Wrong rotary way
 **(D)**	Oil temperature too high alarm on	Machine stopped to oil temperature too high
 **(E)**	Deactivated	Deactivated
 **(F)**	Motor heat alarm on	Machine stopped due to motor heat intervention.
 **(G)**	General alarm on due to breakage to pressure and temperature sensor.	-

N.B. Press "Reset" to switch off red indicator lights

Compressor operation status indicator LED : **"Yellow"** indicator lights (not stopping the machine).

Symbol	Flashing LED	LED on
 **(A)**	Deactivated	Deactivated
 **(H)**	Replace oil filter warning	Replace oil filter
 **(I)**	Replace separator filter warning	Replace separator filter
 **(L)**	Replace aspiration filter warning	Replace aspiration filter
 **(M)**	Oil empty warning	Empty oil
 **(N)**	General check warning	Carry out a general check

N.B. See Section C - 5 to switch off " YELLOW " indicator lights

Compressor operation status indicator LED : **"GREEN"** indicator lights

Symbol	Flashing LED	LED on
(O)	Deactivated	Deactivated
(P)	-	Compressor operation charged
(Q)	Manually purged compressor	No load compressor operation
(R)	Compressor on stand by(15 seconds) or in stopping process(30 seconds)	Compressor operating

ATTENTION : To restart after the intervention of a protective device (Alarm) press "RESET" and then press the start button " I " (6).

Operation of the controller

The controller is programmed for Energy Saving; it switches off the compressor, thus reducing idle running to a minimum.

The controller operates with no load before stopping for a period of time which becomes shorter as air consumption decreases.

The controller also indicates if maintenance is required on the filters, etc. **(Yellow LEDs)**.

3 - Operating hours display

Press **item. 3 Fig. 7a** in order to view the total number of operating hours. The amount of operating hours is displayed on the lower section of the screen. A small dot comes on (confirmation light) on the upper left of the screen. To see the LOADED operating hours press again on **item. 3 Fig 7a** and a small dot appears on the upper right of the screen (confirm LED).

4 - Operating hours display for components requiring maintenance

To display the amount of operating hours for each component requiring maintenance folw the instructions in **Section 4 - 5** up to point 4; the operating hours will be displayed on the lower screen.

- Press button **Item. 3 Fig. 7a** to exit.

5 - Resetting the maintenance meters (YELLOW LEDs excluding LED "A")

If a meter is to be returned to zero (for example **Item. L** air filter) after maintenance has been carried out, proceed as follows: (See **Fig. 7a**)

1) Press buttons **Item. 7** and **Item. 4** at the same time until the indicator light comes on **Item. H.**
2) Release buttons **Item. 7** and **Item. 4**
3) Use buttons **Item. 1** and **Item. 2** to select LED **Item. L** (air filter) for the required component.
4) Up to 5 figures are displayed on the lower section of the screen showing the component's operating hours **Item. L** (air filter).
5) Press once on button **Item. 4**, the displayed value flashes, press for a second time on the button **Item. 4**, the lower screen is then returned to zero and the LED **Item. L** will come on.
6) Press button **Item. 3** to exit **RESET**
7) To return another component to zero, go LED using buttons **Item. 1** and **Item. 2.**

After being inactive for 30 seconds the board automatically exits Setting.

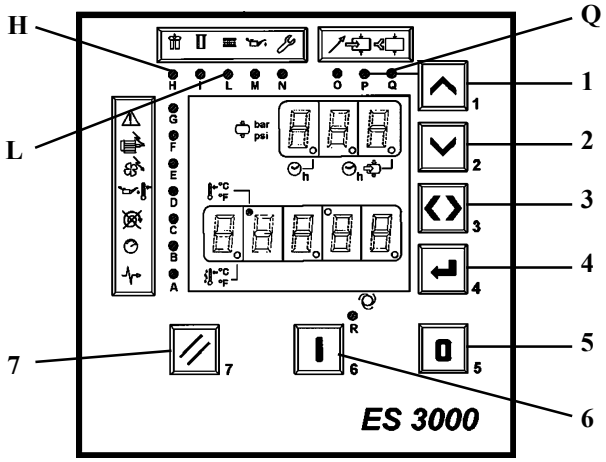


Fig. 7a

6 - Activation/de-activation of no load operating status

1) Pressing button Item. 1 Fig. 7a the indicator light **Item. Q** comes on (flashing), the machine operates on MANUAL EMPTYING.
2) Pressing button **Item. 1 Fig. 7a** again the machine returns to the automatic cycle.

7 - Operating parameters of the controller

The controller is factory set with a value established for the following parameters :

P0 = Stop pressure (125 - 150 - 175 bar)

P1 = Start pressure (100 - 125 - 150 bar)

r2 = Maximum operating temperature (212 °F)

t3 = Not active

t4 = Not active

C5 = Maximum of on time start ups (10)

Moreover the controller is set to measure pressure in "PSI" (parameter **C7**) and temperature in °F (parameter **C6**).

Pressure and temperature units of measurement are stated in the table below :

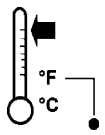
Parameter name	Parameter value	
C6	0 = °C	1 = °F
C7	0 = bar	1 = °PSI

All described parameters may be displayed and changed according to the procedure stated in paragraph **C - 8**. The parameter number appears on the upper screen and the parameter value appears on the lower screen.

8 - Display and modification of the board's parameters

Proceed as follows to display the board's parameters :

- Press button **Item. 4 Fig. 7a** for a few seconds until **"P0"** appears (stop pressure) on the upper screen: at the same time, the stop pressure appears on the lower screen in (125, 150 or 175 PSI).
- Pressing button **Item. 1 Fig. 7a** displays all board parameters in sequence on the upper screen (**P0, P1, r2, t3, t4, C5, C6, C7**) while the established value for each parameter appears on the lower screen. To exit the display, press button **Item. 3** until a small point on the screen appears on the symbol.



To change a parameter value, follow the instructions given for the example below :

E.G. : maximum temperature is top be changed to 203°F.

- Press button **Item. 4 fig. 7a** for a few seconds until the **"P0"** parameter appears on the upper screen.
- Press button **Item. 1 Fig. 7a** until the **"r2"** parameter is displayed (maximum temperature).
- Press button **Item. 4 Fig. 7a** : the temperature shown on screen starts to flash.
- Press button **Item. 2 Fig. 7a** until 203 is displayed.
- Press button **Item. 4 Fig. 7a** to confirm the change made ; 203 no stops flashing.
- Exit setting by pressing button **Item. 3 Fig. 7a**.

From now on the new maximum temperature will be 203°F.

9 - Temperature too low display

The sheet is factory set with a pre-established minimum temperature at (+36°F), if the value displayed is below this, the sheet is displayed flashing on the lower screen. This is a fault warning which does not prevent the compressor from starting, but informs the operator that ambient temperature is too low.

D - Rotation direction indicator - Phase controller

1 - Description

The phase controller option enables permanent and easier verification of the rotation direction of the machine by means of a LED. This option prevents any risk of physical damage by disabling the compressor start up in case of phase reversal or if a phase is disconnected and indicates a machine fault.

E - Special oils

1 - Description

Different oils meet different needs:

Food Grade Oil: use of the compressor in the agricultural food & beverage industry.

Note: if this option is chosen on a machine that has previously run on standard oil, the flushing procedure must first be strictly complied with.

2 - Description of the option

Food Grade Oil

This oil has been specially developed for use as a lubricant that may come into contact with foodstuffs.

Section 5 - Specific information for CPVS 20-25-30

Refer also to the chapters concerning the standard machine.

"CPVS" compressors are compliant with the Electromagnetic compatibility in industrial environments Standards 50081-2 and 50082-2

A - Description (cf Section 1)

Standard equipment

A electronic frequency adjusting device replaces the star-delta starter.
A fuse holder section switch completes CPVS standard's safety devices.
A protection foam to protect the frequency converter against dust contamination.

B - Safety

For your safety, please respect the instructions carrying the warning symbols as given below:

SAFETY RULES

The safety rules require:

- The presence of an earth socket
- The existence of a manual switch cutting-off the three phases that should be placed visibly near the CPVS
- It is necessary to cut out the electric current before any intervention on the machine (except drainage under pressure).

 = Dangerous voltage

 = Attention

ELECTRICAL INSTALLATIONS MUST ONLY BE CARRIED OUT BY A SPECIALISED AND COMPETENT TECHNICIAN

1 - Warning

 **1** The internal components and the plates (except the electrically insulated I/O terminals) are at the mains voltage when the inverter is connected to the mains. This voltage is extremely dangerous and can cause severe injuries or even death in case of involuntary contact.

 **2** When the inverter is connected to the mains, the connection terminals U, V, W of the motor as well as +/- connectors of the braking resistors are under power even if the motor is not running.

 **3** The I/O control terminals are insulated from the mains, the relay outputs can nevertheless be under power even if the inverter is disconnected. This also applies to other I/O control terminals even if the X4 switch is in OFF position (Stop).

 **4** The inverter has a load circuit of thermally limited capacitors. Therefore, it is important to allow minimum 5 minutes between two successive power-ons. If this instruction is not respected, the switch and the resistor of the load circuit may be damaged.

2 - Safety instructions

 **1** No connection work is allowed when the inverter is under power.

 **2** No measurement work is allowed on the inverter when it is under power.

 **3** To undertake any work on the inverter, it is necessary to disconnect the equipment from the mains. Wait for the internal ventilation to stop and the indicators to be turned off. Then, **wait 5 minutes before opening the cover.**

 **4** No voltage or insulation verification test is allowed on the inverter components.

 **5** Disconnect the cables from the motor and the inverter before taking measurements on them.

 **6** Do not touch the integrated circuits, the electrostatic discharges may damage them.

 **7** Before connecting the inverter, make sure that its cover is properly closed.

 **8** Make sure that no compensation capacitor of cosine phi is connected to the motor cable.

C - Installation

The "CPVS" must be installed away from a transformer or autotransformer.

(see **Section 2 and 3**).

The fuses for the section switch are defined as follows

CPVS Model	**20**	**25**	**30**
Motor power (hp)	20	25	30
Mains voltage 460 Volt /60 Hz			
Nominal current (460V)	34	44	54
Power supply cable (L maxi 3.33 ft)	AWG 12	AWG 8	AWG 8
Fuse protection	17,5 A	40 A	40 A

ATTENTION
Motors and drives can only be guaranteed where the supply voltage does not exceed the rated voltage by more than 10%.
The connection of the power supply to the section switch (so present) requires the use of properly insulated terminals.

D - Commissioning

1 - Preparation for start-up

(See **Section 3**).

ATTENTION

The power circuit will have to be cut off when adjusting the electrical equipment or if inadvertent start-up is to be avoided.

Before start-up, check the following points:

1 - Ensure that the unit has a suitable earth,

2 - Check the oil level in the compressor,

NOTE: the tank was filled in the factory with a suitable oil. See **Section 6 - A** for the quality of oil to be used and for the oil renewal conditions.

3 - Check that the oil drain valve is properly closed.

4 - Make sure that the transport pads (compressor) have been removed from the compressor silentblocks.

ATTENTION

The oil filler plug, the valve and the drain plugs have always to be closed during operation and must never be opened before the system has reached atmospheric pressure.

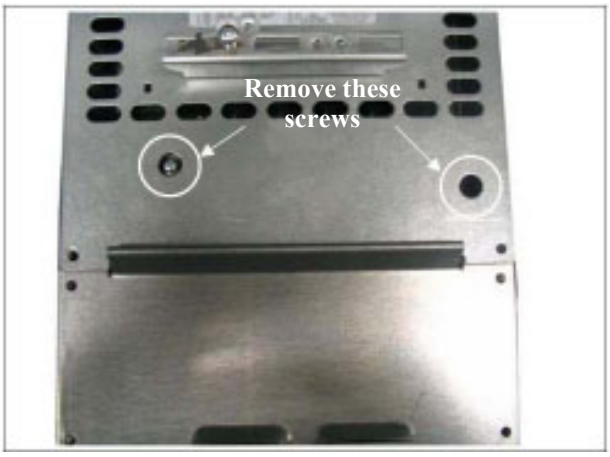
ADAPTATION OF THE INVERTER BUILT IN RFI FILTER FOR IT ELECTRICAL SUPPLY NETWORK

(For TN and TT network, inverter has to be kept in its factory configuration)

In case of inverter drive units installed on IT network, the built in RFI filter has to be disabled as following "photo vacon". This upper operation will modify the EMC level from the inverter from class H to class T.

NOTE: Do not attempt to change the EMC-level back to class H (TN and TT). Even if the procedure above is reversed, the frequency converter will no longer fulfil the EMC requirements of class H.

Fig. 8



2 - Control of rotation direction on start up

This control must be implemented when the machine is put into operation for the first time, after any work has been carried out on the motor and after any changes to the mains supply.

IMPORTANT :

• Check the direction of rotation (as per the arrow shown on the **Fig. 3 page 10**) by jogging over with the START button.

If it is incorrect, swap over two of the motor's phase cables under the drive.

When rotating in the right direction, the oil level (**Fig. 10**) must drop after 4 to 5 seconds of operation.

• Also check the direction of rotation of the fan for air-cooled plants (counter-clockwise, as seen from inside the casing).

1 - Press the START button so that the motor starts.

2 - Allow to rotate for several seconds with the discharge valve slightly open to observe the compressor at load.

3 - Press the STOP button. The motor stops and the plant automatically returns to atmospheric pressure.

3 - Setting of pressure - machine

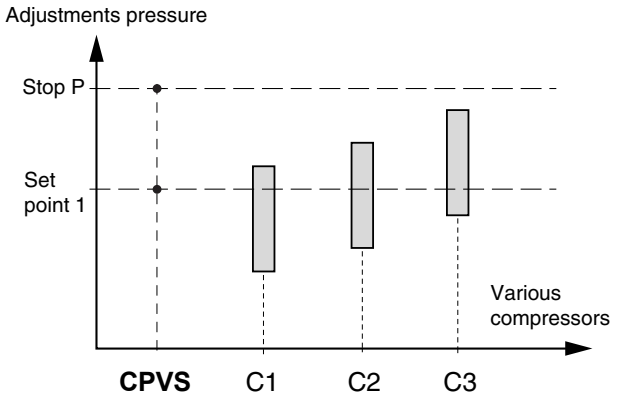
The unit is factory pre-set for a given delivery pressure. As an energy saving measure, it is strongly advised to reduce the pressure to the exact requirement by adjusting the "Set point 1"setting.

The stop pressure"Indirect shutdown"used when running at less than the minimum flow-rate - must be set to 7.25 PSI above that of the "Set point 1". In this way, the current used by the compressor is minimised (see **ES 3000** electronic controller **Section 4 - C**).

Do not set the stop pressure at a level beyond the machine's max P.

4 - Assembly and settings for parallel operation with other compressors

Pressure for the CPVS compressor must be adjusted at a value within the range of adjustment values for the rest of the compressors..



5 - Regulating the pressure by changing the speed

This method of regulating the pressure allows accurate adjustment of the compressor's flow-rate at the compressed air demand valve:

The accuracy is of the order of 1.425 PSI when pressure control is achieved by changing the speed, provided that the flow-rate lies between the maximum and minimum rates for the machine.

• The principle of the pressure control by changing the speed

The **ES 3000** controller controls the motor and the compressor as a function of the system pressure as measured by an internal pressure sensor (**Fig. 9a**).

- If the mains pressure is weaker than the pressure set point

(user-defined parameter in the **ES 3000**) the motor will accelerate and the pressure will increase (**Fig. 9b**)

- If the mains pressure is stronger than the pressure set point, the motor will slow down causing the pressure to drop.

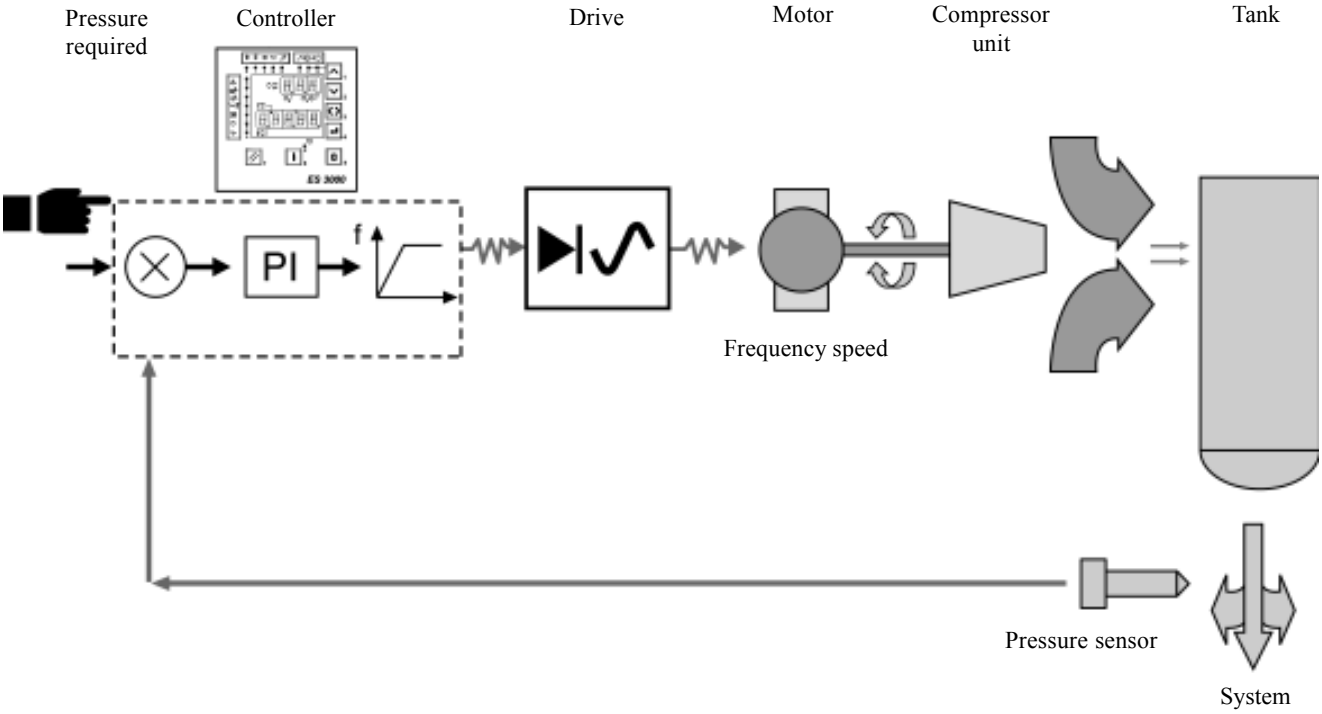
The **ES 3000** provides the compressor control functions and also controls the whole pressure feedback loop. It therefore includes a device to compare the indicated pressure with that from the pressure sensor, associated with a compensating device, Proportional integral control PI (**Fig. 9c**).

The drive, a result of the latest developments in power electronics, is one of the smallest in size on the market, thanks to its use of high cut-out frequencies with IGBT transistors.

At the same time, the motor control method known as "open loop vector flux control " provides good stability for the system against disruption.

In this way, the pressure feedback loop is more stable to sudden changes in consumption (changes in the flow-rate).

Fig. 9a
The principle of the pressure control by variable speed



• Pressure control for low rates of flow

For an air consumption rate lower than the minimum rate of flow for the machine, the pressure is adjusted by the machine's time-delayed START/STOP controls.

Since the operation element cannot function below a certain speed (corresponding to the minimum output), the compressor continues to run and compress at the minimum speed until the pressure reaches the limit called "Indirect shutdown ".

Once this threshold has been reached, the motor will stop, the machine will go into stand-by mode after a certain period of inactivity and the full drainage process will be carried out.The pressure then drops towards the indicated pressure and, at the end of the minimum time delay (since reaching the no-load pressure), the drive allows the motor to restart. The pressure then rises again and the cycle starts over (**Fig. 9 d**).

To avoid pumping the system - frequent stop / start - drainage time may be increased.

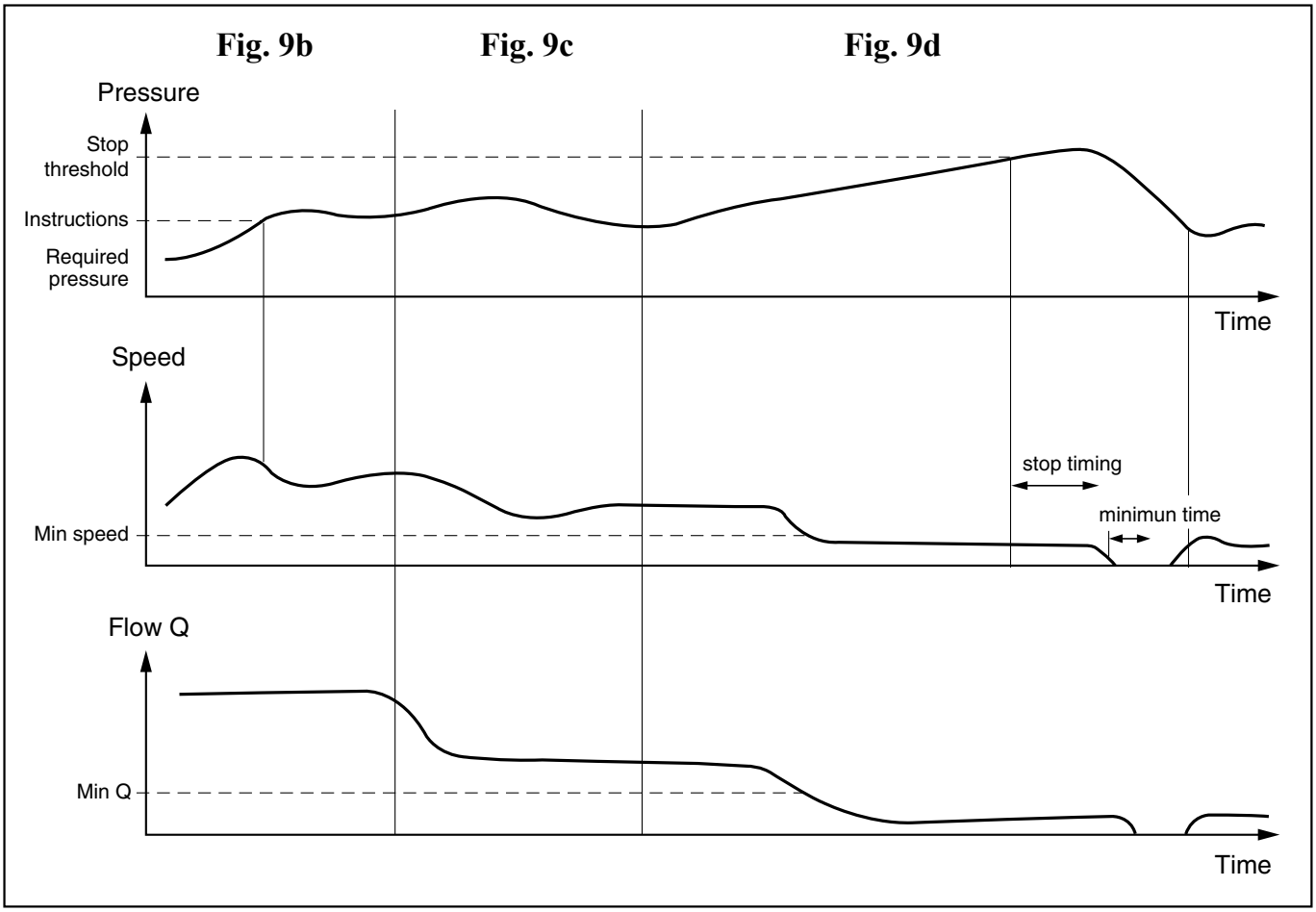
• Energy saving

For demand of compressed air within the machine's flow range - min flow to max flow, the frequency converter or the variable speed drive feed the motor in order to ensure that it turns at the speed required to supply air demand both for pressure and flow.

It is used to adjust the power supply to the motor (and thus the machine) to the exact power requirement for the compression of the air, without a drainage stage being necessary.

COMMENT :

Energy savings are increased if machine maintenance is carried out in accordance with the maintenance instructions and frequency.



E - Operating incidents

The staff in charge of maintenance of the CPVS compressor must be fully trained to maintain this machine, in order to be able to easily diagnose any incident. Under normal operating conditions, the CPVS compressor must provide full satisfaction.

1 - Main incidents

The most likely incidents, along with the procedures to be applied, are listed in the controller manual. For more information, please refer to the ES 3000 controller **Section 4 - C**.

Section 6 - Maintenance

The below maintenance table is relating to standard working conditions. Parameters like particular temperature, humidity, dust, chemical... environment might significantly impact the component lifetime.
So in such particular conditions, the maintenance table has to be adapted in the field.

The **Original Parts** are designed to ensure, maintain and safeguard the efficiency of the compressor and protect the machine, guaranteeing its long life. Regular replacement of oil, air and separator filters with **Original Parts** is the only way to ensure better quality air and minimal operating costs.

The maintenance period is limited to several essential operations. It is strongly recommended that the power supply be cut off during any adjustment or repair.

The summary on the CP Compressors instrument panel shows at a glance the type and periodicity of operations to be carried out for the compressor to function correctly.

Parts	**Operations to be carried out**							**Observations**
	Weekly	Every 150 hr	Every 500 hr	Every 2 000 hr (*) **Service A**	Every 4 000 hr **Service B**	Every 8 000 hr **Service C**	Every 12 000 hr	
Draining cock	X							Drain the condensates from the cold oil circuit (Section 6 - G)
Oil level	X							Check and top up if necessary (Section 6 - A)
Air filter				X				Replace the filter
Oil tank, Oil change			X			X		Oil change, oil refill with recommended oil (Section 6 - A)
Suction housing					Control cleaning lubrication		Overhaul kit	Renovation of the housing. Use the suction housing kit
Oil return pipe							Overhaul Kits	Check the cleanliness of the oil return pipe and the state of the seal (Section 6 - F)
Oil separator						X		Change the part according to the instrument panel indication (Section 6 - E)
Oil filter				X				Filter change
Air / Oil cooler Final coolant		X						Blowing of cooling elements Cleaning (Section 8 - D)
Valve at minimum pressure						Control cleaning lubrication	Overhaul kits	Exchange the accessories supplied with the maintenance kit
Electric cabinet			X					Retighten all power cable connections.
Safety temperature test				X				Check operation (Section 6 - H)
Filter panels (black foam)**					X			Replace panel
Belts		X						Control the tension.
						X		Replace belts.

NOTE : maintenance kits are available (see spare parts list). (*) or at least every year

A - Oil level and change (see fig. 19)

(see B Section 1)

The recommended oil used for the first compressor fill up is a mineral oil with the following properties :

- viscosity: 40 cSt at 104 °F
- viscosity index: 90 minimum
- antioxidant additives
- anti-rust additives
- anti-foam additives

THE FIRST OIL CHANGE MUST BE CARRIED OUT AFTER THE FIRST 500 HOURS OPERATION.

Using a synthetic oil for compressors is also acceptable and means less frequent oil changes: please speak to us about the compatibility and oil change methodes.

The oil change and the replacement of oil filter must be carried out when the indication is seen on the electronic controller and when the corresponding time counter reaches "0" (refer to electronic plate manual **Section 1 E**).

Drain the compressor when warm. In order to do this, stop it and make sure you disconnect the electric supply and close the compressor outlet valve. Loose the filling plug by one turn to depressurise the receiver in case of component failure. Open the bleeding valve and drain it. Do not forget to close the valve after it has been drained.

After maintenance, a reset has to be done on the counter which indicates the number of remaining hours before the next oil change see the specific notice on the electronic controller.

OIL LEVEL (Fig. 10)

When stopped, the MAX level of oil is ¾ of the way up from the bottom of the indicator; the MINI level is at the lowest visible part of the indicator.

Fig. 10 - Oil level

THE OIL LEVEL HAS TO BE CHECKED AFTER STOP AND WHILE THE COMPRESSOR IS STILL WARM (THERMOSTATIC VALVE OPEN).

NOTE

If the oil is in poor condition: i.e. it gives off an acrid smell or contains particles of varnish or other solids, the system will have to be rinsed out: pour in around 50% of the normal clean oil contents, run the set for 3 hours and carefully drain. During rinsing, leave the former oil filter cartridge in place.

B - Air filter (see Fig. 11, see B Section 1)

The air filter is a dry, encapsulated type. In standard conditions of use, change the cartridge every 2 000hrs. This can be done through an easy access from the front panel. Check the cleanliness of the filter every week and change it if necessary.

IMPORTANT

If you do not replace the filtering element when needed, permanent dirt build-up will result. This reduces the air inflow to the compressor and could damage the oil separator and the compressor.

Fig. 11 - Air filter

C - Turbine

Replacement of the complete fan is recommended if one or more blades are deformed or broken If replaced, check the fan rotation direction reversal of the rotation direction will reduce machine cooling.

D - Oil and air cooler

The aluminium oil and air cooler is a vital part in the CP Compressors system. Please take care of this element. To prevent the nest of tubes from being deformed or damaged, when assembling or disassembling the cooler unions and hoses, the cooler sleeves' must be kept rotating by means of a wrench. The outer surface of the nest of tubes must always be kept clean in order to enable proper heat transfer. In the event of a leak, the source of the leak must be detected. In order to do this:

- Stop the CP Compressors.
- Clean the greasy areas.
- Look for leaks using conventional means (soap solution, …).

E - Oil separator cartridge (Fig. 12) (see B Section 1)

The life time of the oil separator cartridge will depend on the purity of the intake air, the regular oil filter replacements, the quality of the oil used, the care taken when draining the condensation from the oil tank and on the room temperature.

The oil separator cartridge (**item. 1 Fig. 12**) should be replaced when the corresponding waening message is displayed on the controller.

After replacing the oil separator cartridge, reset the counter, which will let you know how much time is left before it needs to be replaced.

Excessive oil consumption

Excessive oil in the discharged air and a sudden drop in the level are signs that the oil separator cartridge has probably deteriorated and must be changed. In the first place, the compressor must be checked to make sure that there are no oil leaks and that the oil scavenge line is working properly. The replacement of the oil separator cartridge requires the removal of the right top panel.

Fig. 12

1. Oil separator cartridge

F - Oil return pipe (see Fig. 13)

Placed under the compressor

- Dismantle the complete oil return check valve.
- Lift the oil stop valve pipe.
- Check the state of the o-ring (**item. 1 Fig. 13**).
- Reassemble.
- A dedicated kit allows to replace the complete check valve.

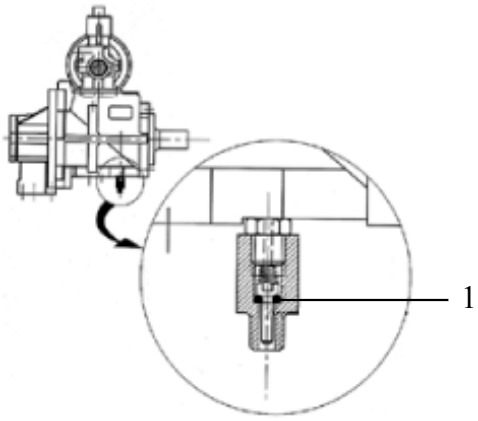
G - Draining condensation water (see B Section 1)

Condensation water prevents proper lubrication. The resulting substantial wear leads to a reduction in the lifespan of the CP Compressors. It is therefore essential to drain condensation water.

Draining of condensates in the oil circuit:

Draining will only take place at least 12 hours after the CP Compressors has been shut down. It can be carried out for example at start-up.

Fig. 13 - Oil return pipe



To do this :

- Slowly open the oil change tap and let the water escape.
- When the oil appears, close the valve immediately to avoid any loss.
- Refill with oil if necessary.

H - Temperature safety tests

IF THE SENSOR DOES NOT DISPLAY THE RIGHT TEMPERATURE OR GIVES AN ERROR MESSAGE ON THE CONTROLLER DISPLAY, FIRST CHECK THE CONNECTIONS AND CABLES. IT CAN ONLY BE REPLACED IF IT HAS BEEN DETECTED FAULTY WITH CERTAINTY.

I - Refastening electric connections

A loosening of the electric power cables leads to the contactors overheating which can lead to their destruction.

PERIODIC REFASTENING IS THEREFORE NECESSARY AT THE STAR/DELTA AND LINE CONTACTOR INPUTS AND OUTPUTS. (SEE MAINTENANCE TABLE).

All electric power supply to the machine must be cut off before opening the electric cabinet.

J - Decommissioning the compressor at the end of its useful life

1. Stop the compressor and close the air outlet valve.
2. Disconnect the compressor from the electric supply.
3. Unload the compressor : unplug the 4/6 piping on the oil separator cover.
4. Close and unload the section of the air network which is linked to the exit valve. Disconnect from the compressed air exit pipe from the air network.
5. Empty the circuits of oil and condensates.
6. Disconnect the compressor condensate piping from the condensate draining system.

K - Belt tensioning

Before doing any maintenance, make sure that the compressor is stopped, the power supply and compressed air network are isolated and that the machine is totally blown off.

- Take off the rear panel (1) **Fig. 14**
- Remove the protection plate (2) **Fig. 15**
- Using an Allen, unscrew the four tightening screws (3) **Fig. 16** of the plunger from the support
- Using an hexagonal wrench by 19, unscrew the lockup nut as shown in the figure
- Tight the belts using a hexagonal wrench by 19, according the **Table 1**. If no tension measuring device is available, use the method shown on **Fig 17**.
- Fix the nut and the locknut using an hexagonal wrench by 19
- Lockup the tightening nut using an Allen
- Place the protection plate
- Place the rear panel back

Fig. 14

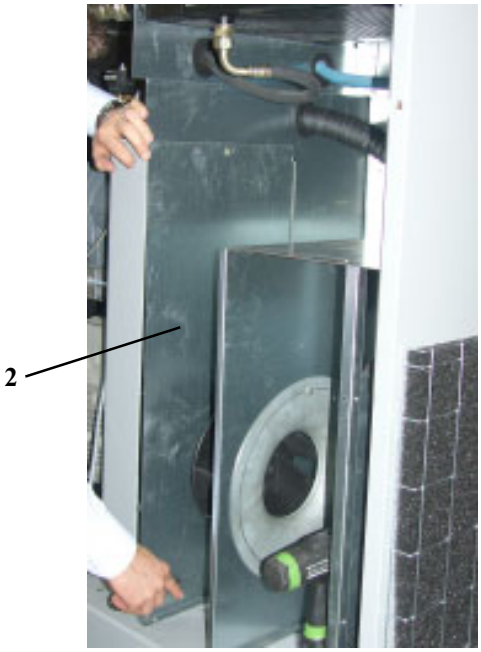


Fig. 15

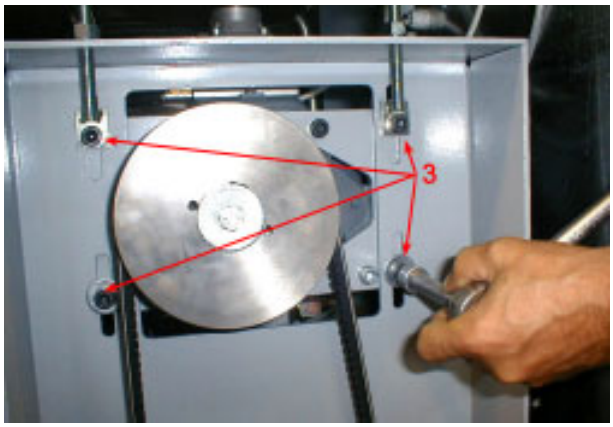


Fig. 16

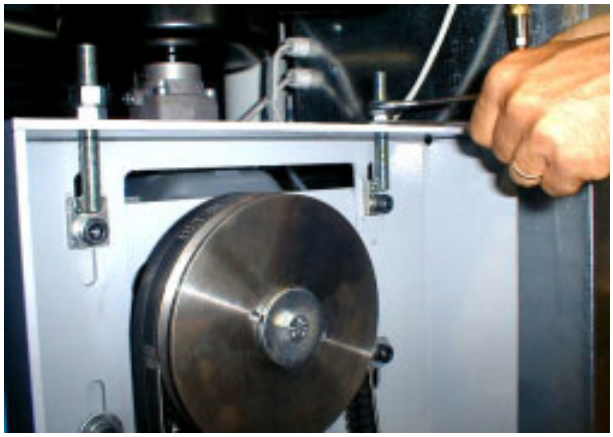
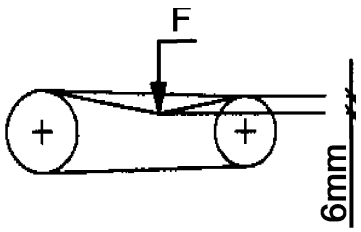


Fig. 17



New Belt : F = 8.81 lbs
After 100h : F = 5.51 lbs

Nominal power (hp)	Pressure (PSI)	Radial load (DaN)
20	100	193.4
	125	193
	150	186.9
	175	177.3
25	100	242.6
	125	231.3
	150	228.1
	175	225.9
30	100	304.6
	125	312
	150	300
	175	245.9

Table 1

L - Belt removal

- Take off the rear panel (1)
- Remove the protection plate (2)
- Using an Allen, unscrew the four tightening screws (3) of the plunger from the support
- Using an hexagonal wrench by 19, unscrew the lockup nut as shown in the **Fig. 18**
- Remove the inlet nozzle **Fig. 19**
- Replace the worn out belts **Fig. 20**
- Tight the belts using a hexagonal wrench by 19, according the **Table 1**. If no tension measuring device is available, use the method shown on **Fig 17**.
- Fix the nut and the locknut using an hexagonal wrench by 19
- Lockup the tightening nut using an Allen
- Place the protection plate
- Place the rear panel back

Fig. 18

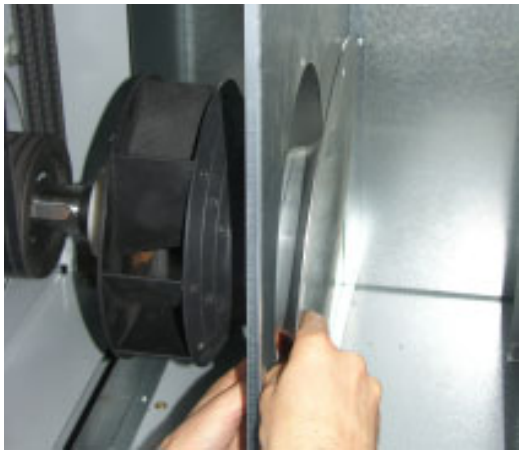


Fig. 19

Fig. 20

CAUTION

When the compressed air cools, part of the moisture sucked in by the compressor condenses. In order to protect the dryer against the risk of an ice plug forming, it is essential to check regularly that the condensate drains are operating properly :

On the compressed air storage reservoir and on the filters :
• With a manual drain, drain regularly according to the moisture content of the ambient air.
• With an automatic drain, set the draining cycle accordingly and check that the drain is in good working condition.

This recommendation is also fundamental in a circuit comprising an absorption dryer (risk of saturation of the alumina).

Section 7 - Operating incidents

The staff in charge of maintenance of the CP compressor must become fully acquainted with this machine, in order to be able to easily diagnose any anomaly. Under normal operating conditions, the CP compressor must provide full satisfaction.

A - Main incidents

The main incidents likely to occur are listed below, along with the remedies to be applied. The markers of the indicator lights relate to the control panel.

Observed defects	Possible causes	Solutions
1. THE COMPRESSOR DOES NOT START	a) Main switch open. b) Phase missing. c) Fuse. d) Insufficient voltage at motor terminals. e) Compressor under pressure. f) Low temperature.	a) Close the switch. b) Check the circuits. c) Replace. d) Check the voltage and the connections. e) Check the vacuum device and change if necessary. Check the water-tightness of the minimum pressure valve. f) Maintain temperature ≥2 °C
2. THE COMPRESSOR OVERHEATS	a) Ambient temperature too high. b) Obstruction of the passage of cooling through the oil cooler. c) Oil level too low. d) Oil circuit blocked.	a) Make openings or install ducts to evacuate the hot air (**see Section 2**). b) Clean the cooler (**see Section 5 - D**). c) Check and top-up oil level. d) Check that the oil filter is clean. Drain. Replace the cartridge.
3. THE COMPRESSOR STOPS WHEN THE MOTOR PROTECTION UNIT TRIPS	a) Compressor motor overload. b) Phase unbalance	a) Check the electric connections are tighten. Check the pressure of the compressed air and the pressure settings. b) Check the phases currents
4. OPENING OF SAFETY VALVE	a) To clean separator cartridge. b) Valve of suction box out of use or not closed. c) Faulty pressure switch, sensor or solenoid valve. d) Working pressure too high	a) Change the separator cartridge. b) Check valve, piston and joints of suction box. c) Check that the pressure switch and solenoid valve and pressure sensor are in good working order.
5. EXCESSIVE OIL CONSUMPTION	a) Blocked oil retainer. b) Oil leaks in the CP compressor compressor. c) Faulty oil separator element	a) Check the oil return pipes. b) Look for oil leaks and rectify. c) Replace the separator cartridge. (**see Section 5 - E**)
6. DELIVERY PRESSURE TOO LOW	a) Incorrect pressure settings. b) The desired output is higher than the one of the compressor. c) Closed suction valve. d) Pressure regulator incorrectly adjusted (modulating control option).	a) Adjust the pressure (**see Section 3**). b) Check consumption and possible leaks. c) Check solenoid valve, pressure setting valve. d) Check setting.
7. COMPRESSED AIR OUTPUT TOO LOW	a) Blocked air filter. b) Adjusting solenoid valve not working.	a) Clean filter. b) Check setting.
8. EXCESSIVE NOISE OF UNIT	a) Fixing bolts of compressor or motor have come loose. b) Soundproof panels incorrectly closed. c) Transport retainer blocks (red parts) not removed.	a) Tighten. b) Check that they are closed. c) Remove retainer blocks.
9. THE COMPRESSOR STOPS UNTIMELY OR CREATES NON-EXISTING FAULTS	a) Electromagnetic disturbance on the ES 3000 electronic controller.	a) Add an interference suppression kit (contact the after sales department)

support

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CP Compressors

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