Technologie du vide
High vacuum technology
Hochvakuumtechnik

Notice technique
Instruction manual
Technische Beschreibung

POMPES TURBOMOLÉCULAIRES
TURBOPAK

TURBOMOLECULAR PUMPS
TURBOPAK

TYPE 5081 - 5101 + CFV 100
TYPE 5081 CP IS
TURBOMOLECULAR PUMPS AND TURBOPAK
Type 5081 - 5101 + CFV 100

SOMMAIRE

NOTES ............................................................................................................................. 41

A - TURBOMOLECULAR PUMP MODEL 5081 - 5101 .................................................. 43
CHAPTER 1 - GENERALITIES .................................................................................. 43
CHAPTER 2 - SPECIFICATIONS .............................................................................. 46
CHAPTER 3 - INSTALLATION .................................................................................. 48
CHAPTER 4 - OPERATION ....................................................................................... 52
CHAPTER 5 - MAINTENANCE AND SERVICING ....................................................... 55
CHAPTER 6 - ACCESSORIES .................................................................................. 56
CHAPTER 7 - EQUIPMENT CONFIGURATION - ACCESSORIES P/N ....................... 60
CHAPTER 8 - CFV 100 CARD ................................................................................ 61

B - 5081 - 5101 TURBOPAK + CFV 100 ................................................................ 63
CHAPTER 1 - DESCRIPTION - DIMENSIONS .......................................................... 63
CHAPTER 2 - SPECIFICATIONS .............................................................................. 64
CHAPTER 3 - INSTALLATION .................................................................................. 65
CHAPTER 4 - OPERATION ....................................................................................... 66
CHAPTER 5 - MAINTENANCE .................................................................................. 67

C - TURBOMOLECULAR PUMP MODEL 5081 CP IS .............................................. 68
CHAPTER 1 - DESCRIPTION ..................................................................................... 68
CHAPTER 2 - SPECIFICATIONS .............................................................................. 70
CHAPTER 3 - INERT GAS PURGE SYSTEM ............................................................ 71
CHAPTER 4 - OPERATING DIAGRAM ................................................................... 72
CHAPTER 5 - EQUIPMENT CONFIGURATION - PART NUMBER .......................... 73

REFERENCES AND DRAWINGS ........................................................................... 75
NOTES

Read this manual completely before unpacking and installing the unit.

Check crates for damage in shipping notify ALCATEL and shipping company of any damage.

Do not unpack unit until ready to install.

The guarantee is available only if the advice of the instruction manual are respected.

RETURN FOR REPAIR OR MAINTENANCE WORK

When returning equipment to our factories for repair or maintenance by our After-Sales Service, we would request you to:

- let us know in writing, if your pump has been used for applications involving toxic or dangerous products, such chlorine, fluorine and their derivatives, etc... Please specify the nature of the product used, if this is the case.

- If high risk or contaminating products, such as arsenic and its compounds, cyanure, etc... have been used, we are only able to carry out work on your equipement after decontamination performed and certified by your company, or by a specialist.

We advise the user that:

- Switch "on" the TMP at atmospheric pressure for 5 minutes.
- It's necessary to lubricate periodically the ball bearings (see parag.5)
A - TURBOMOLECULAR PUMP 5101 - 5081 WITH CFV 100

CHAPTER 1: GENERALITIES

1.1 - DESCRIPTION

The following equipment is standard:

- The turbomolecular 5101 or 5081 pump itself.
- The frequency converter CFV 100 from 0 to 450 Hz.
- Necessary electrical connectors.

1.2 - 5101 AND 5081 PUMPS

See figures 1a et 1b at the end of the manual.

The ALCATEL 5101 and 5081 turbomolecular pumps (TMP), are a one hundred percent turbomultistages design. The rotational speed is 27000 rpm.

The heart of the pump is assembled at the end a shaft that turns in two grease lubricated high-precision ball bearings, located in the forevacuum. The pumping elements are made of aluminum alloy.

The inlet housing including the connecting is made of stainless steel.

The pump is powered by a 450 Hz electric motor, mounted between the two ball bearings. The rotor fits directly on the shaft, and the stator, mounted in the body of the pump, is cooled by a fan located outside the pump, or by a water cooling ring, or by natural convection.

INLET FLANGES

Model 5101: Pneurop NW 100 flange.

Model 5081: Pneurop NW 63 flange.

Model 5101 UHV: UHV 63 CF ultra-high vacuum flange (a "knife edge ultra-high vacuum Type" for copper seal).

Model 5101 UHV: UHV 100 CF ultra-high vacuum flange (a "knife edge ultra-high vacuum" type for copper seal).

OUTLET FLANGES: Pneurop NW 25 flange.
1.3 - CFV 100 FREQUENCY CONVERTER

The electronic frequency converter is in the form of 1/4 19" 3 U module for installation in a 19" Rack frame.

It supplies the pump motor and controls the power required to achieve 27000 rpm.
A general electrical schematic is provided at the end of this manual (Figure 11/1, 11/2)

Safety devices are incorporated in the pump and converter, to monitor proper operating characteristics.

1.31 - FRONT PANEL (figure 2)

It includes:

a) A POWER SWITCH "0 - 1" : Pressing this switch on right energizes the converter. A yellow pilot light lights on when CFV is powered.

b) "START" SWITCH

Pressing this switch on left energizes the 450 Hz motor and the pump begins to run.

c) "STOP" SWITCH

Pressing this switch on left, stops current to the 450 Hz Turbomotor and the pump will stop.

d) 1 GREEN PILOT LIGHT "= 27000"

When it is "ON", it indicates that the converter is producing 450 Hz A.C. to drive the TMP motor.

e) 1 YELLOW PILOT LIGHT "< 27000"

When it is "ON", it indicates that the TMP is:
- In starting period
- In overloading: for example, in a continuous use at a pressure up to ≥ 10^-1 mbar.

f) 1 RED PILOT LIGHT " "

This light stays "OFF" as long as everything is operating normally. If a malfunction occurs it lights "ON" and indicates:
- that there is an overheating due to converter.
- either an overheating due to pump or its motor.

The motor is not energized and the pump is not running.

g) An elapsed time counter

It records pump operating time, from 0 to 100 000 hours.
DETECTION OF ROTATION

The detection of rotation, is materialised by three pilot lights "yellow, green, and red", which indicate the TMP motor speed.

The different possibilities are listed below.

<table>
<thead>
<tr>
<th>ACTION ON BUTTON</th>
<th>TMP MOTOR</th>
<th>PILOT LIGHTS</th>
<th>TMP SPEED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>START</td>
<td>STOP</td>
<td>YELLOW</td>
</tr>
<tr>
<td>1) Before starting</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2) Starting</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>3) Pump at synchronism speed</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>4) Incident* Overheating due to pump or converter</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5) Overloading</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>6) Pumping stop</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

* During the pump or converter cooling, the cycles 2, 3 (or 5) will be happened again periodically until the user remedies the overheating.

1.32 - REAR PANEL (figure 3)

It includes:
- Power source connector J1
- Pump and remote control connector J2
- Air cooling connector J5
- Vent valve connector J4
- A place for the interface output J6. (See paragraph 2.2)
- One power line fuse (0.5 A for 220 V and 200 V, 240 V, or 1 A for 115 V and 100 V)

See CFV 100 general electrical diagram in the end of this manual. (figure 11/1 and 11/2).
CHAPTER 2 : SPECIFICATIONS

2.1 - PUMPS

See curve figure 4.

- Pumping speeds* at the inlet:

<table>
<thead>
<tr>
<th></th>
<th>5101 TMP</th>
<th>5081 TMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen N2</td>
<td>100 l/s</td>
<td>80 l/s</td>
</tr>
<tr>
<td>Helium He</td>
<td>60 l/s</td>
<td>50 l/s</td>
</tr>
<tr>
<td>Hydrogen H2</td>
<td>40 l/s</td>
<td>40 l/s</td>
</tr>
</tbody>
</table>

- Compression ratios:
  - N2 : $8 \times 10^7$
  - He : 2500
  - H2 : 300

- Ultimate pressure* measured with 2 stages RP and metal seal at inlet: $\leq 5 \times 10^{-9}$ mbar.

<table>
<thead>
<tr>
<th>Maximum pressure in continuous operation **</th>
<th>TMP cooled by natural convection</th>
<th>TMP air cooled</th>
<th>TMP water cooled</th>
</tr>
</thead>
<tbody>
<tr>
<td>at inlet</td>
<td>$1.1 \times 10^{-3}$ mbar</td>
<td>$1.1 \times 10^{-1}$ mbar</td>
<td>$1.1 \times 10^{-1}$ mbar</td>
</tr>
<tr>
<td>at exhaust</td>
<td>$1.1 \times 10^{-2}$ mbar</td>
<td>$1.1 \times 10^{-1}$ mbar</td>
<td>$1.1 \times 10^{-1}$ mbar</td>
</tr>
</tbody>
</table>

- Roughing pump recommended: 4 m$^3$/h (3.2 cfm) - Alcatel model 2004 A-

- Rotational speed: 27 000 rpm.

- Startup: $\leq 1$ mn 45 s

- Ambient temperature: 0 to 35$^\circ$ C (TMP cooled by natural convection) (32 to 95$^\circ$ F)
  0 to 35$^\circ$ C (TMP air cooled or by natural convection) (32 to 95$^\circ$ F)
  0 to 50$^\circ$ C (TMP water cooled) (32 to 132$^\circ$ F).

- Water flow: 0.2 to 1 L./mn with water temperature between 10 and 20 C.

- Pump weight: 3 kg. (6.6 lbs) for TMP 5081 NW 63 cooled by natural convection or 5.3 kg (11.7 lbs) for TMP 5101 UHV 100 CF air cooled

- Dimension: see figures 5/1 to 5/4.

* : measured by a measuring dome following Pneurop method.
** : these two pressures can't be cumulated.
2.2 - ELECTRONIC CONVERTER CFV 100

100 V - 115 V - 200 V - 220 V - 240 V - 50/60 Hz
The different line voltages correspond with a converter P/N specific (see chapter 7).

- Maximum power draw : 75 VA
- Output frequency : 0 - 450 Hz
- Ambient temperature : 0 - 50° C
- TMP Cable length : 2.5 m (11.4 ft)
- Weight : 2 kg (4.4 lbs)
- Dimensions : 110 x 134 x 225 mn (4.3 x 5.2 x 8.8 inches).

OPTIONS :

RF kit : if the converter must be used with radiofrequency, it is necessary to protect the converter.
Alcatel can supply upon request an "RF kit" - Part number 062198.

Interface kit :
An interface output can be connected to J6 at CFV 100 rear panel.
From this plug, the status of the three lamps can be output by contact closures.
It also includes an analog output that measures the speed of the pump (output 0 - 10 V for 0 - 27000 rpm)
- see schematic diagram fig. 9 - Eventually, it is possible to measure the pump input current. For this,
contact Alcatel.

Locking device kit : Alcatel can supply a locking device kit for the converter rear plugs. (P/N 062397)
CHAPTER 3 : INSTALLATION

3.1 - UNPACKING

IMPORTANT!

Do not unpack turbomolecular pump from the shipping container until arriving at the installation site. Unpacking and installation must be performed in a single step.

The container includes the startup and maintenance manual and the completely assembled pumping system, cushioned with foam rubber. It is suggested to retain the containers and packaging material for any future transportation requirements of the TMP.

3.2 INSTALLATION OF THE TMP

3.21 - Remove protective cover from TMP inlet. This flange must not be used for proper operation of the TMP.

3.22 - Use flanges and seals corresponding to the inlet flange of the TMP.

- TMP WITH NW 100 AND NW 63 PNEUROP FLANGE

  - Install centering ring with viton seal, or inlet screen (splinter shield), on chamber or mount conductance lines.
  - Mount TMP separately and connect inlet flange.

- TMP WITH UHV 100 CF AND 63 CF FLANGE

  - Install copper seal.
  - Mount and connect TMP with washers and screws provided. Tightening torque must be between 2 and 2.5 m. daN.

3.23 - Connect TMP to the system.

  - Insure that no foreign objects enter the inlet to avoid jarring the TMP.

  a) Insure that the system is clean and free of solide particules which could damage the pump.

  b) The ALCATEL 5101 and 5081 are mounted in any position, but preferably in the vertical position with the inlet uppermost or undermost.

  c) Ambiant temperature :

     32° F < T° < 95° F for TMP by air or by natural convection cooled
     32° F < T° < 132° F for TMP water cooled.

  d) The equipment, frame or chassis to which the TMP are connected must be sufficiently rigid to prevent vibration.
49

e) At inlet screen (splinter shield) is available, however this accessory reduces the pumping speed of the TMP.

3.24 - The bearings have been lubricated at the factory.

3.3 - RECOMMENDED FOREPUMP

3.31 - ALCATEL 5101 and 5081 TMP require a forepump. The ALCATEL 2004 A is recommended.

The selection of the forepump pumping speed will depend on the volume of the chamber to be pumped down and on the pump-down time to achieve $1.10^{-2}$ mbar (this time must be 3 mn).

3.32 - PRECAUTIONS

To prevent oil backstreaming from the roughing pump (RP), avoid sudden changes in outlet circuit pressure.

Optionally, in order to prevent oil vapor contamination of the TMP and chamber, the following can be connected between the TMP outlet and the RP:
- a manual or automatic valve
- a molecular sieve trap (the trap must not be exposed to the system)
- the installation of a vent valve (NO) between the outlet flange of the TMP and the RP. (See chapter 6).

3.33 - The forevacuum line must be constructed of flexible hose.

- Remove protective cover from the TMP outlet.

- Install a NW 25 (10 inches ID) flexible hose to the TMP outlet, with the other end connected to the roughing pump.

3.34 - COOLING

a) Air cooling device:

The fan is assembled on the TMP by a bracket. This last is assembled on the pump rear tape with 3 screws CHc M4 x 10 (see figures 5/1 and 5/2).

- Connect the fan to converter at J5 with the special cable.
- The fan will start when the TMP is started.

The fan provides sufficient cooling for ambient temperature up to $95^\circ$ F. If the ambient temperature is above $95^\circ$ F, the user should install a water cooling collar.

062794 - 10/1993
b) Water cooling device:

It consists of a water circulator ring which can be equipped on the TMP housing. It is assembled on the pump rear tape by 3 screws CHc M4 x 20 (see figures 5/3 and 5/4). It is recommended for use at ambient temperature between 95 and 132° F, or in continuous use at high pressure.

- Use a flexible hose 6 x 8 mm to connect one of the water fittings to the water line. The user must provide some method of controlling water flow.

- Use a flexible 6 x 8 mm hose to connect the other fitting to the drain. The drain must operate with a zero backpressure system.

- Control the water flow at 0,6 l./mn with a water temperature at -59° F and an ambient temperature at 77° F.

3.35 - POWER SUPPLY

MAKE SURE THAT ALL THE DISPLAYS ARE WIRED ACCORDING TO THE MAINS VOLTAGE

- Check the fuse at the converter rear panel:

  . Fuse 1 A : 100 V - 115 V lines voltages
  . Fuse 0.5 A : 200 V - 220 V - 240 V : lines voltages.

- Check voltage of the vent valve (NO), the fan with line voltage
  (A label 115 V is fixed on accessories used on 115 V).

Connect successively and in order (according to figure 6/1):

1) TMP with the special cable to converter on J2 (at the rear panel). [Longer cable can be supplied upon request (standard length 3,5 m.)]. Wires section will be proportional to the length.

2) Fan with its cable (if TMP is air cooled) to converter on J5 (at the rear panel).

3) Converter to power line, with power line cable.

Remote control connecting line is made through plug P2 which equips pump-converter cable.
The remote control plug P2 can be used for the following functions:

- Connection of outer safety switch opens when a malfunction appears.
- Remote control from starting or stopping of the TMP motor (start and stop in front panel).
- We advise to screen the remote control cable.

See figures 6/2 and 6/3 - P2 plug connection.

**Interface output J6**: see figure 6/4 at the end of the manual.

**Note**: If an electromagnetic valve is utilized on the same vacuum system as the turbomolecular pump then the valve must have a shielded cable. The shielded cable must properly grounded. This precaution must be followed to prevent interference with the TMP frequency converter.

### 3.4 - STARTING

For a new TMP, or after two months, we advise the user that switch "on" the TMP at atmospheric pressure for about 5 minutes with converter (it is necessary for a repartition of grease in ball bearings).
CHAPTER 4 : OPERATION

4.1 - STARTING AND STOPPING

Turbomolecular pump TMP.
Roughing pump RP.

4.11 - IN LINE ARRANGEMENT

START
- RP and TMP off
- Open air cooling
- Open E1
- Start RP
- Start TMP

STOP
- Close E1
- Stop RP
- Stop TMP
- Inert gas enters inlet if necessary (1.5 mn or more)
- Shut off air cooling.
4.12 - CLASSIC THREE-VALVES COMBINATION

a) Start (TMP off):
- RP on
- Open air cooling
- Open E2
- Open E3 (E1 closed)
- At pressure $P \leq 1 \text{ mbar}$
  - E2 closed
  - Open E1
- TMP on

b) Venting chamber to atmosphere:
- E3 closed
- Inert gas enters chamber (2 min)

c) Pumping down chamber:
  (RP and TMP on)
- E1 closed
- E2 open
- At pressure $P \leq 1 \text{ mbar}$
  - E2 closed
  - E3 open
  - E1 open

d) Stop:
- E3 closed
- E1 closed
- RP off
- TMP off
- Close air cooling
4.2 - BACKING

To reach ultimate vacuum rapidly, the dome or chamber connected directly to the pump inlet should be backed.

The maximum temperature at the top of the chamber must not exceed 200°C.

CAUTION! during backing from dome, the temperature of the inlet flange must not exceed 120°C.

There is no need to bake the TMP but a bakout collar is available.
CHAPTER 5 : MAINTENANCE AND SERVICING

5.1 - RECHARGING WITH NEW GREASE AND CHANGING GREASE

The quantity of grease necessary for TMP operation was added to the bearings before the pump first started at the factory, and remains in the pump during shipment. The grease must be added to the bearings, periodically. (see fig. 7/2).

You must only use the ALCATEL grease contents in the syringe (see chapter 7).

When adding, proceed carefully with maximum cleanliness.

Warning:
- the TMP has two ball bearings: at every relubrication schedule, the user must relubricate the two ball bearings.
- The syringe is equipped with two removable spacers:
  - one red spacer for the bearing opposite the pumping unit
  - one black spacer for the bearing near the pumping unit.

Relubrication process

1) Stop the TMP and the RP.

2) Vent TMP to atmospheric pressure.

3) Ball bearing opposite the pumping unit (see figure 7/1)
   - Remove the part (11) unscrewing the 2 screws (E). (see photo 7.1).
   - Remove compression spring (D) and the spacer (10).
   - Insert the syringe to the ball bearing
   - Remove the red spacer and inject progressively the grease. (photo 7.2)

4) Ball bearing nearer to the pumping unit (see figure 7/1)
   - Insert the syringe through the screw (8) to the end of the axle (3).
   - The syringe must strike against the head of the screw (8) (see photo 7.3).
   - Remove the black spacer and inject progressively the grease. (photo 7.3)
   - Remove the syringe.
   - Reassemble the spacer (10) and the spring (D).
   - Re-seal with the part (11) and its o-ring and screw with (E).
5.2 - Startup after "relubrication"

Start the TMP to atmosphere pressure for 6 min., as follows:

- Disconnect RP from TMP (vacuum connection).
  - at time $t = 0$, press "start" button 1st cycle
  - at time $t = 3$ min, press "stop" button
  - at time $t = 6$ min, press "start" button 2nd cycle
  - at time $t = 9$ min, press "stop" button
- continue like on the diagram below.

**RUNNING PROCEDURE**

<table>
<thead>
<tr>
<th>START</th>
<th>STOP</th>
</tr>
</thead>
<tbody>
<tr>
<td>0,5 min</td>
<td>0,5 min</td>
</tr>
<tr>
<td>2,5 min</td>
<td>2,5 min</td>
</tr>
<tr>
<td>3 min</td>
<td>3 min</td>
</tr>
<tr>
<td>1,5 min</td>
<td>4,5 min</td>
</tr>
<tr>
<td>1,5 min</td>
<td>21,5</td>
</tr>
</tbody>
</table>

Temps minutes
5.3 - REPLACEMENT OF BALL BEARINGS

The ball bearings can be replaced at the user's facility.

Replacement can be performed by a skilled service technician familiar with ALCATEL TMP. In this case, Alcatel supplies instruction manual about ball-bearings replacement, special tools and ball-bearings.

Choice ball-bearings according to two numbers inscribed after TMP serial number on name plate and to table below.

<table>
<thead>
<tr>
<th>Reference on name plate (shaft diam.)</th>
<th>Ball-bearings kit* P/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (7,999)</td>
<td>066671</td>
</tr>
<tr>
<td>2 (7,998)</td>
<td>066672</td>
</tr>
<tr>
<td>3 (7,997)</td>
<td>066673</td>
</tr>
<tr>
<td>4 (7,996)</td>
<td>066674</td>
</tr>
<tr>
<td>5 (7,995)</td>
<td>066675</td>
</tr>
</tbody>
</table>

Example:

ALCATEL
TMP type : 5101
Serial number : 95112-23

Shaft dimensions

- 1st number "2" : indicates shaft dimension near the pumping unit 7.998 mm.
  Ball-bearings choice : P/N 066672.

- 2nd number "3" : indicates shaft dimension opposite the pumping unit : 7.997 mm.
  Ball-bearings choice : P/N 066673.

* Ball-bearings kit includes the ball-bearings, its o-ring, and a spring washer. This last has been replaced by a compression spring on the new pumps. The damping ring of the ball bearing is included into the seals kit.

5.4. - SEALS - MAINTENANCE - BALL-BEARINGS KITS

- Seals kit P/N 062698 : this kit contains a complete set of o-rings.

- Ball-bearings kit (P/N see parag. 5.3) : each kit contains ball-bearings and spring washer. (this last is not used in this pump type).
CHAPTER 6 - ACCESSORIES

6.1 - VENT ELECTROVALVE SYSTEM (NO) 240 V - (NO) 220 V - (NO) 200 V - (NO) 110 V - 100 V

Check the solenoid valve voltage: it must be compatible with line voltage (see chapter 7 for P/N)

If there is a power failure, this device vents the TMP to atmosphere to prevent oil contamination from the roughing pump. It consists of:

- A solenoid valve (3) normally open (NO) mounted on a NW 25 flanged fitting. The fitting is installed between the outlet flange of the TMP and the foreline of the RP. It contains a tube (2) which introduces air into the pump from the solenoid valve.

- Connect the solenoid valve cable to J4 of converter.

The user can vent the TMP as follows:

- Press the "Stop" switch on the converter.

- Push the power switch on left position.

---

**Vent electrovalve system**

![Diagram of vent electrovalve system](image)
6.2 - TURBO AIR INLET DEVICE

This device consists of a main supply, an air inlet solenoid valve NW 16 or NW 25, cables and sockets for connection to converter.

The air inlet device is able to:

- either allow air to enter the installation under vacuum following voluntary pumping shutdown or during a lengthy mains power cut.
- or start up the converter again following a short mains power cut.

Turbo air inlet device can be connected to converter CFV 100 in the case of this last is equipped with the optional interface.

Turbo air inlet device is delivered with its specific instruction manual.
# Chapter 7: Equipment Configuration - Accessories - Part Number

## Description

<table>
<thead>
<tr>
<th>Description</th>
<th>5081 TMP NW 63 Pneurop</th>
<th>5081 TMP UHV 63 CF</th>
<th>100 TMP NW 100 Pneurop</th>
<th>5101 TMP UHV 100 CF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standard</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- TMP air cooled</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>115 V/100 V</td>
<td>795414</td>
<td>795430</td>
<td>795439</td>
<td>795447</td>
</tr>
<tr>
<td>240 V/220 V/200 V</td>
<td>795519</td>
<td>795428</td>
<td>795437</td>
<td>795445</td>
</tr>
<tr>
<td>- TMP water cooled</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- TMP cooled by natural convection</td>
<td>795525</td>
<td>795520</td>
<td>795557</td>
<td>795562</td>
</tr>
<tr>
<td>- CFV 100 converter</td>
<td>795412</td>
<td>795452</td>
<td>795436</td>
<td>795444</td>
</tr>
<tr>
<td>115 V 50-60 Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>220 V 50-60 Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 V - 200 V 50-60 Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>240 V 50-60 Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Line power cable *</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>220 - 240 V</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 - 115 V - 200 V</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Copper seal</td>
<td></td>
<td>062933</td>
<td></td>
<td>082080</td>
</tr>
<tr>
<td>- Power cable TMP / CFV 100</td>
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<td><strong>Accessories available</strong></td>
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<td>- Centering ring + o-ring</td>
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<td>- Hardware for connection</td>
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<td>- Bag of 10 copper seals</td>
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<td>- Quick connect clamp NW 25</td>
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<td>100 V DN 25</td>
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<td>240 V DN 25</td>
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<td>- Inlet filter screen</td>
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<td>- Back-out collar</td>
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<td>115 V</td>
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<td>200 V - 220 V - 240 V</td>
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<td>- Seals kit</td>
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<td>- Ball-bearings kit</td>
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<td>- Syring of lubrication</td>
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<td>- Time meter (5 V)</td>
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<td>- Time meter (12 V)</td>
<td></td>
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<td>037866</td>
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<tr>
<td>- Power screened cable TMP/CFV 100</td>
<td></td>
<td></td>
<td>062616</td>
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<tr>
<td>- RF kit</td>
<td></td>
<td></td>
<td>062198</td>
<td></td>
</tr>
<tr>
<td>- Locking device kit for CFV 100 socket</td>
<td></td>
<td></td>
<td>062397</td>
<td></td>
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<tr>
<td>- Interface kit</td>
<td></td>
<td></td>
<td>062969</td>
<td></td>
</tr>
</tbody>
</table>

* included with converter supplying
CHAPTER 8: CFV 100 CARD

Part number: 062319

The electrical frequency converter is in PC board. The customer can install in a form with six screws M3. The characteristics and functions are the same than the CFV 100 in a 1/4 rack (see parag. 2.2, PO 2, plug connection - Control figures 6/2 and 6/3).

DESCRIPTION

The circuit includes:

- "Start" button, "Stop" button, power switch.
- 4 diodes: 1 green, 2 yellow and 1 red. They can be connected outside the card by a connecting plug.
- 2 terminal cables (12 V direct current - 2 mA (moy) for counter (included with standard card)
- 7 terminal cables 50/60 Hz - Protection for 115 V, 100 V - 1 A, for 200, 220, and 240 V - 0.5 A. Secure the card with a fuse installed outside the pump.
- A connector with TMP (on this connector, there are start and stop button, security of TMP, power supply TMP and remote control (see CFV 100 card set up figure 8 in the end of this manual).

Accessories available on order:

- Power cable TMP - CFV 100: P/N 062748
- Screened cable TMP - CFV 100: P/N 062616

Options:

- Timemeter kit P/N 062320
- Power cable TMP / CFV 100 (up to 50 m).
- Outside diode kit P/N 062939
- Interface kit P/N 062969.
CHAPTER 1: DESCRIPTION - DIMENSIONS

There are many standard models for utilization in minimum space requirement:

<table>
<thead>
<tr>
<th></th>
<th>WITH CFV 100</th>
<th>220 V. - 50 Hz</th>
<th>115 V. - 60 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turbopak 5081</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turbopak 5081 UHV 63 CF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turbopak 5101</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turbopak 5101 UHV 100 CF</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Each group includes:

- The TMP 5081 or 5101 with air cooling.
- The frequency converter CFV 100.
- Necessary electrical connecter 220 V. or 115 V.
- The roughing pump 2004 A.
- The rigid frame and the flexible stainless steel hoses.
- The control box.
- The space for electrical box 1/4 rack 3 V.
- It exists an accessory: it's a airing 220 V. (No) or 115 V. (No) - See parag. 6.1.
CHAPTER 2 : SPECIFICATIONS

- Line voltage : 220 V. ± 10 % 50 Hz single phase (other line voltage in option).

- Maximum power draw : 1000 VA.

- Ambient temperature : < 95°F. If the turbomolecular pumping group is installed inside a frame, you must him ventilate.

- Weight : 65 Kg.
CHAPTER 3 : INSTALLATION

3.1 - UNPACKING

Caution! Do not unpack turbomolecular pump from shipping carton before bringing it to installation site. Unpacking and installation must be carried out in a single step. The packing includes the startup and maintenance manual, the completely assembled pumping frame, cushioned with foam rubber.

3.2 - For the assembly of the turbomolecular pump, see the chapter A, sections 3.2 and 3.4.

3.3 - CONNECTION TO ELECTRICAL WIRING

Connect the cable from the circuit breaker on the frame to the single phase 220 V. line. The other protections are made at the factory. RP is protected by thermal switch installed in the frame, below the TMP.
CHAPTER 4: OPERATION

Turbomolecular pump TMP.
Roughing pump RP.

(See electrical diagram p. 9).

Standard model

Start:
- TMP and RP off.
- Open water line.
- Start. Proceed as follows:
  . Throw line switch to the right position.
  . Start the TMP by pushing the power switch on right.

Stop:
- Stop the TMP by pushing on the left the "stop" switch.
- Stop the RP by pushing the line switch on the left.
- Inert gas enters inlet (1.5 mn or more).
- Shut off water.
- Push the line switch in the desired position to obtain the starting procedure (see parag. start).
CHAPTER 5 : MAINTENANCE

See chapter "Maintenance" of TMP (A.5 on present manual).

Maintenance of the RP: see manual joined with the pump.
CHAPTER 1: DESCRIPTION

1.1. The 5081 CP IS TMP is specially designed for aggressive environments. Ball bearings and motor are isolated from process gases by a reversed dynamic seal and an inert gas purge system.

**Inlet flange**: UHV 63 CF.
**Exhaust flange**: NW 16.
**Purge flange**: NW 16.

Without continuous and proper utilization of the purge system, the TMP 5081 CP IS is not suitable for reactive gas or particulate laden applications.

Nevertheless, the dynamic seal allows ball bearings protection during a short time period (gases adjustment into the chamber for example), with TMP running at nominal speed. Let the purge supplied as soon as possible.

1.2. TMP 5081 CP IS operates with the same converter than the TMP 5081 standard.

1.3. REVERSED DYNAMIC SEAL

The reversed dynamic seal is an originally corrosion resistant device which re-inforces the neutral gas efficiency.

It can take the place of the purge for a short period of time when lightly corrosive gases are pumped.
The dynamic seal works as a molecular drag pump which prevents corrosive gases migration from the exhaust A to the bearing B.
### Chapter 2: Specifications

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Unit</th>
<th>TMP 5081 CP IS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pumping speed at P &lt; 10^-4 mbar *:</td>
<td>l/s</td>
<td>80</td>
</tr>
<tr>
<td>- nitrogen</td>
<td>l/s</td>
<td>50</td>
</tr>
<tr>
<td>- helium</td>
<td>l/s</td>
<td>40</td>
</tr>
<tr>
<td>- hydrogen</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compression ratio at zero:</td>
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<td></td>
</tr>
<tr>
<td>- nitrogen pumping speed</td>
<td></td>
<td>8.10^7</td>
</tr>
<tr>
<td>- helium pumping speed</td>
<td></td>
<td>2500</td>
</tr>
<tr>
<td>- hydrogen pumping speed</td>
<td></td>
<td>300</td>
</tr>
<tr>
<td>Ultimate pressure with draining</td>
<td>mbar</td>
<td>5.10^-8</td>
</tr>
<tr>
<td>without draining</td>
<td>mbar</td>
<td>5.10^-9</td>
</tr>
<tr>
<td>Maximum inlet pressure in continuous operation **</td>
<td>mbar</td>
<td>1.10^-3</td>
</tr>
<tr>
<td>- natural convection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- air cooling</td>
<td>mbar</td>
<td>1.10^-1</td>
</tr>
<tr>
<td>Maximum exhaust pressure permissible**</td>
<td>mbar</td>
<td>1.10^-1</td>
</tr>
<tr>
<td>Roughing pump advised (2 stages pump)</td>
<td></td>
<td>2010 Alcatel</td>
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<tr>
<td><strong>Dry nitrogen supply</strong></td>
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<td></td>
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<tr>
<td>Flowrate (50 SCCM)</td>
<td>Pa.m^3.s^-1</td>
<td>83.10^-3</td>
</tr>
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<td>Pressure (absolute)</td>
<td>bar</td>
<td>1 à 1.3</td>
</tr>
<tr>
<td>Overpressure (absolute)</td>
<td>bar</td>
<td>2</td>
</tr>
</tbody>
</table>

* Measured by a measuring dome following Pneurop method.

** These two pressures can't be cumulated.
CHAPTER 3 : INERT GAS PURGE SYSTEM

- For proper protection from reactive gases and particulate the inert gas purge system must be used continuously. Alcatel recommends a nitrogen source that is dry (dew point of - 22 C at atmospheric pressure) and properly filtered (particulate < 1 μ and oil < 0,1 ppm).

- The purge gas line must have a NW 16 fitting to connect it directly to the TMP 5081 CP IS with a centering ring and quick connect clamp.
CHAPTER 4 : OPERATING DIAGRAM

4.1. We recommend to use the classic three valve combination:

1) Start TMP:
- RP on.
- Open water line.
- Open dry nitrogen line.
- Open E2.
- Open E3 (E1 closed).
- At pressure $P < 1$ mbar:
  . E2 closed.
  . Open E1.
- TMP on.

2) Venting chamber to atmosphere:
- E3 closed.
- Inert gas enters chamber (2 mn).
- Allow the pump running as much as possible to take the advantage of the dynamic seal protection when the purge is off.
3) Pumping down chamber (RP and TMP on):
- E1 closed.
- E2 open.
- At pressure $P < 1$ mbar:
  - E2 closed.
  - E3 open.
  - E1 open.

4) STOP
- E3 closed.
- Let TMP and RP run for 1 hour with purge remains on.
- Stop TMP but leave the RP and purge on for 30 minutes.
- E1 closed. Stop RP. The purge remains on for 15 minutes.
- Stop the purge.
- Allow the pump running as much as possible to take the advantage of the dynamic seal protection when the purge is off.

CHAPTER 5: EQUIPMENT CONFIGURATION - PART NUMBER

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>PART NUMBER</th>
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<tbody>
<tr>
<td>TMP 5081 CP IS option air cooled:</td>
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<td>115 V / 100 V</td>
<td>798043</td>
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<tr>
<td>TMP 5081 CP IS: option natural convection</td>
<td>798042</td>
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</table>

For accessories, see "A : TURBOMOLECULAR PUMPS MODEL 5081 - 5101" - Chapter 7.
FIGURES ET PLANS

Figure 1 a - 1b - PTM 5081 - 5101 Vue d'ensemble
2 - CFV 100 - Face avant
3 - CFV 100 - Face arrière
4 - Courbes : débit en azote
5/1 à 5/5 - Plans d'encombrements PTM
6/1 - Raccordements électriques
6/2 - 6/3 - Branchement prise P02 (télécommande)
6/4 - Branchement sortie interface J6
7/1 - Manipulation de graissage
7/2 - Abaque : période de rechargement en graisse
8 - Implantation carte CFV 100
9 - Schéma de principe circuit interface
10 - Schéma de principe Turbopack 5081/5101
11/1 - 11/2 - Schéma de principe du CFV 100

FIGURES AND DRAWINGS

Figure 1 a - 1b - TMP 5081 - 5101 - Outside view
2 - CFV 100 - Front panel
3 - CFV 100 - Rear panel
4 - Curves : pumping speed
5/1 to 5/5 - TMP dimensions
6/1 - Electrical connections
6/2 to 6/3 - PO2 plug connection - Remote control
6/4 - J6 interface output connections.
7/1 - Lubrication
7/2 - Chart to relubricate the TMP
8 - CFV 100 card set up
9 - Interface schematic diagram
10 - Electrical schematic for turbopak 5081/5101
11/1 - 11/2 - CFV 100 general electrical schematic.
POMPE TURBOMOLECULAIRE 5101 A REFROIDISSEMENT A EAU
5101 TURBOMOLECULAR PUMP WITH WATER COOLING

Figure 1a

POMPE TURBOMOLECULAIRE 5101 A REFROIDISSEMENT A AIR
5101 TURBOMOLECULAR PUMP WITH AIR COOLING

Figure 1b
CONVERTISSEUR DE FRÉQUENCE CFV 100 : Face avant
CFV 100 FREQUENCY CONVERTER : Front panel

Interrupteur secteur
Power switch

Voyant secteur (jaune)
Power line light (yellow)

Voyants : rouge, jaune, vert
Lights : red, yellow, green

Compteur horaire
Time meter

Vis de fixation M4
Assembling screws M4

FIGURE 2
CONVERTISSEUR DE FRÉQUENCE CFV 100 : Face arrière
CFV 100 FREQUENCY CONVERTER : Rear panel

Arrivée secteur
Power supply input

Emplacement interface
Interface output location

Raccordement refroidissement air
Air cooling device connection

Fusible
Fuse

100-115V T1A
200-220-240V T0.5A

Sortie moteur PTM
TMP motor output

Raccordement entrée d’air
Vent electrovalve system connection

FIGURE 3
PTM / TMP 5081–5101
PPM / RP 2004 A
DEBIT / PUMPING SPEED

Pression d'aspiration / Inlet pressure: mbar

Débit (l/s) / Pumping speed

5101 N₂

5081 N₂

5081 He

Limites d'utilisation en fonctionnement continu
Upper limit for continuous operation
ENCOMBREMENTS / DIMENSIONS

PTM 5081 DN 63 – PTM 5101 DN 100 Peurop refroidies à l’air
TMP 5081 NW 63 – TMP 5101 NW 100 Pneurop air cooled

<table>
<thead>
<tr>
<th>POMPE MODELE</th>
<th>COTE A</th>
<th>COTE B</th>
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</thead>
<tbody>
<tr>
<td>Pump model</td>
<td>Dim. A</td>
<td>Dim. B</td>
</tr>
<tr>
<td>5081 Pneurop DN 63</td>
<td>Ø 95 h11</td>
<td>165 mm</td>
</tr>
<tr>
<td>5101 Pneurop DN 100</td>
<td>Ø 130 h11</td>
<td>130 mm</td>
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</table>
**ENCOMBREMENTS / DIMENSIONS**

PTM 5081 UHV 63 CF – PTM 5101 UHV 100 CF refroidies à l’air
TMP 5081 UHV 63 CF – TMP 5101 UHV 100 CF air cooled

<table>
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<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>5081 UHV 63 CF</td>
<td>Ø 113,5 mm</td>
<td>180 mm</td>
<td>17,5 mm</td>
<td>8 trous Ø 8.6 équidistants sur Ø 92,1 (hors axes)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8 equidistant diam. 8,6 holes on diam. 92,1 (off axis)</td>
</tr>
<tr>
<td>5101 UHV 100 CF</td>
<td>Ø 148,5 mm</td>
<td>130 mm</td>
<td>16 mm</td>
<td>16 trous Ø 8.6 équidistants sur Ø 130,2 (hors axes)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>16 equidistant diam. 8,6 holes on diam. 130.2 (off axis)</td>
</tr>
</tbody>
</table>

**FIGURE 5/2**
ENCOMBREMENTS / DIMENSIONS
PTM 5081 DN 63 – PTM 5101 DN 100 Pneurop refroidies à l’eau
TMP 5081 NW 63 – TMP 5101 NW 100 Pneurop water cooled

Raccords pour tuyau 6 x 8 mm
(Rilsan avec fourrure ou cuivre sans fourrure)
Water cooling connections for 6 x 8 mm plastic tubing or copper tubing

Alimentation électrique
Embase mâle
Power supply
Connector

POMPE MODELE
Pump model

<table>
<thead>
<tr>
<th>POMPE MODELE</th>
<th>COTE A Dim. A</th>
<th>COTE B Dim.B</th>
</tr>
</thead>
<tbody>
<tr>
<td>5081 Pneurop DN 63</td>
<td>Ø95 h11</td>
<td>165 mm</td>
</tr>
<tr>
<td>5101 Pneurop DN 100</td>
<td>Ø 130 h11</td>
<td>130 mm</td>
</tr>
</tbody>
</table>

FIGURE 5/3
ENCOMBREMENTS / DIMENSIONS
PTM 5081 UHV 63 CF – PTM 5101 UHV 100 CF refroidies à l’eau
TMP 5081 UHV 63 CF – TMP 5101 UHV 100 CF water cooled

Raccords pour tuyau 6 x 8 mm
(Rilsan avec fourrure ou cuivre sans fourrure)
Water cooling connections for 6 x 8 mm plastic tubing or copper tubing

Alimentation électrique
Embase mâle
Power supply
Connector

<table>
<thead>
<tr>
<th>POMPE MODELE</th>
<th>COTE A</th>
<th>COTE B</th>
<th>COTE C</th>
<th>Raccordement Bride</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Dim. A</td>
<td>Dim. B</td>
<td>Dim. C</td>
<td>Connecting flange</td>
</tr>
<tr>
<td>5081 UHV 63 CF</td>
<td>Ø 113,5 mm</td>
<td>180 mm</td>
<td>17,5 mm</td>
<td>8 trous Ø 8,6 équidistants sur Ø 92,1 (hors axes)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8 equidistant diam. 8.6 holes on diam. 92,1 (off axis)</td>
</tr>
<tr>
<td>5101 UHV 100 CF</td>
<td>Ø 148,5 mm</td>
<td>130 mm</td>
<td>16 mm</td>
<td>16 trous Ø 8,6 équidistants sur Ø 130,2 (hors axes)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>16 equidistant diam. 8.6 holes on diam. 130,2 (off axis)</td>
</tr>
</tbody>
</table>

FIGURE 5/4
ENCOMBREMENTS / DIMENSIONS
PTM 5081 CP IS UHV 63 CF refroidie à l’air
TMP 5081 CP IS UHV 63 CF air cooled

8 trous ø 8,6 équidistants sur
ø 92,1 (hors axes)
8 equidistant diam. 8.6 holes on
diam. 92.1 (off axis)

Ventilateur
Fan

Purge DN 16
NW 16 Purge

Alimentation électrique
Embass mâle
Power supply – Connector

FIGURE 5/5
RACCORDEMENTS ELECTRIQUES
ELECTRICAL CONNECTIONS

Secteur / Power line
Voir chapitre 7
see chapter 7

J/P 1

J/P 5

J/P 2

PTM / TMP
5081/5101

Ventilateur / Fan

CFV 100

J6

J/P 4

EV de REMISE A L'AIR
(NO)
VENT ELECTROVALVE
SYSTEM (NO)

FIGURE 6/1
PRISE DE TELECOMMANDE P2
P2 REMOTE CONTROL PLUG CONNECTION

Légende / Legend
- Femelle - Female
- Mâle - Male

Réservé uniquement à la PTM
Only for TMP

Contact de recopie ON/OFF
Output by contact ON/OFF

Câblage de base de la prise P2
en livraison standard (sans télécommande, sans sécurités extérieures).

Standard wiring of P2
delivered without remote control outer safeties.

Câblage en version télécommande seule - Marche / Arrêt PTM par boutons poussoirs.
Les poussoirs "start et stop" de la face avant, conservent leur fonction.

Remote control wiring - Start /Stop TMP by buttons
"Start and stop" buttons of the front panel are operational.

Câblage en version télécommande secteur seule
avec interrupteur
contact fermé : start PTM
contact ouvert : stop PTM

Remote control wiring
with interrupter
closed contact : TMP starts
opened contact : TMP stops.

FIGURE 6/2
PRISE DE TELECOMMANDE P2
P2 REMOTE CONTROL PLUG CONNECTION

<table>
<thead>
<tr>
<th>P02 vue côté soudure</th>
<th>P02 soldering side view</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>250 V 1A max.</td>
</tr>
</tbody>
</table>

Câblage commande extérieure seule (PTM ou autre)
les bornes A4—A5 permettent de commuter 250 V—1A max.

Outer control (TMP or other)
Terminals A4—5 terminals allows to switch 250 V—1A max.

Câblage d’un contact sécurité extérieure
sans signalisation par la LED rouge
contact ouvert : arrêt PTM

Outer safety switch wiring
without indication by the red LED
opened contact : TMP stops

Câblage d’un contact sécurité extérieure
avec signalisation par la LED rouge
Contact ouvert : arrêt PTM et LED allumée

Outer safety switch wiring
with indication by the red LED
opened contact : TMP stops, and red LED lights on

FIGURE 6/3
BRANCHEMENT SORTIE INTERFACE J6
J6 INTERFACE OUTPUT CONNECTIONS

Vert: vitesse = 27000 tr/mn (fonctionnement normal)
Green: speed = 27000 tr/mn (normally operating)

Jaune: vitesse < 27000 tr/mn (démarrage ou surcharge)
Yellow: speed < 27000 tr/mn (starting or overloading)

Rouge: défauts (Temps de démarrage trop long, sécurités convertisseur ou sécurités extérieures)
Red: fault (Starting period too long, converter safeties or outside safeties.)
PTM 5081 / 5101 : Période de rechargement en graisse

RELUBRICATION OF TMP 5081 / 5101 : Relubricate the bearings of the TMP according to the chart below

**Exemple** : Pour une utilisation moyenne à 20 °C de température palier, en rotation continue et à pression limite :
- à 16000 h : 1ère recharge
- à 32000 h : 2ème recharge
- à 48000 h : démontage de la TMP, nettoyage et changement des roulements, rodage.

**Example** : for use at 20 °C housing temperature, in continuous operation, at ultimate pressure :
- 16000 h : 1st lubrication
- 32000 h : 2nd lubrication
- 48000 h : disassemble the TMP, replace and condition the ball bearings.

![Graph](image-url)

**Période de rechargement (heures)**
Relubrication schedule (hours)

**Température palier °C**
**Housing temperature °C**

**Point de mesure de la température palier**
Housing temperature measuring point

**FIGURE 7/2**
Mise sous tension

Power switch

< 27000 tr/mn

= 27000 tr/mn

Power switch

< 27000 tr/mn

= 27000 tr/mn

START

STOP

6 trous Ø 3,2

6 holes diam. 3.2

Kit interface ou kit voyants déportés

Interface kit or outside diode kit

Alimentation secteur /Power supply

100 - 115 - 200 - 220 - 240 V - 50/60 Hz

Kit compteur horaire

Time meter kit

Kit interface — Position ST1 : mesure de la vitesse de la pompe

Position ST2 : mesure du courant absorbé par la pompe.

Interface kit — ST1 Position : measure of the speed of the pump

ST2 Position : measure of the input current of the pump.
SCHEMA DE PRINCIPE – INTERFACE CFF 100 ou CFV 100
INTERFACE CFF 100 or CFV 100 – GENERAL ELECTRICAL SCHEMATIC

FIGURE 9
SCHEMA DE PRINCIPE / GENERAL ELECTRICAL SCHEMATIC
TURBOPAK 8334–5

OPTION:
EV de remise à l'air
Vent electrovalve system

FIGURE 10
FIG. 11/1
CONVERTISSEUR CFV 100
SCHEMA DE PRINCIPE
SCHEMATIC DIAGRAM
CONvertisseur CFV 100
SCHEMA DE PRINCIPE
SCHEMATIC DIAGRAM

FIG. 11/2