

# Techniques du vide High vacuum technology

## Hochvakuumtechnik



Notice technique  
Instruction manual  
Technische Beschreibung



**POMPES PRIMAIRES MÉCANIQUES  
MECHANICAL FOREPUMPS  
MECANISCHE FEINVAKUUMPUMPEN**

**TYPE/TYP: 2033 - 2063 Standards**



**ALCATEL**  
CIT

# MECHANICAL FOREPUMPS.

## TYPES 2033 – 2063

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# NOTES

## **APPLICATIONS AND LIMITATIONS**

ALCATEL mechanical pumps are designed to ensure complete safety and reliability for the application and user when properly operated.

It is the user's responsibility to follow the precautions, and maintenance requirements set forth in this manual.

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**ALCATEL Standard 2033 and 2063 pumps are designed to pump neutral or normal atmosphere gases.**

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## **EQUIPMENT INSPECTION ON DELIVERY**

The equipment has been thoroughly tested, checked, and carefully packed before leaving the plant.

Responsibility for delivery is assumed by the carrier. No claims relating to condition of materials shipped will be accepted unless submitted within eight days of receipt of goods.

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**No returned materials will be accepted without prior authorization from ALCATEL.**

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Before unpacking equipment, see § 3.1. If the equipment must be stored, see § 3.2.

We reserve the right to cancel the warranty :

- if equipment is disassembled without authorization from ALCATEL
- if parts not made by ALCATEL are used
- if corrosive gases or gases carrying a great deal of dust, liquid, or solvents are pumped.

# INTRODUCTION

# 1.3 DIMENSIONS

See Diagram 01 at the back of this book.

## 1.1 DESCRIPTION OF PRODUCT

ALCATEL oil-sealed mechanical pumps are used in every application of vacuum technology (laboratories, industry, etc.).

They are best suited for medium vacuum applications (up to a ultimate vacuum of  $10^{-3}$  mbar) or in pumping assemblies, for example to back a diffusion pump, turbomolecular pump, or roots pump.

Pumps in the 33 and 63 m<sup>3</sup>/h serie have the following features in common :

- direct transmission makes them highly compact and an eye hook makes them portable ;
- They are equipped with an antinoise system ;
- an antisuckback system ensures that the pump will retain its vacuum tightness when stopped, deliberately or accidentally ;
- an oil pump provides forced lubrication, enabling it to operate continuously at all pressures ;
- a gas ballast allows condensable vapors to be pumped ;
- the inlet and exhaust nipples conform to ISO Pneurop standards and enable numerous accessories to be connected (see § 3.4.3.) ;
- a sight glass on the oil casing ;
- the principal parts are interchangeable: this facilitates disassembly, reassembly, and replacement of defective parts without affecting the specifications.

Pumps in the Standard series are designed to pump neutral or normal atmosphere gases. The pump takes accessories to adapt it to other applications.

## 1.2 ELECTRICAL CHARACTERISTICS

Pumps can be equipped with different types of motors (voltages, frequencies, degree of protection...).

These pumps have different characteristics depending on their performance and the standards of the user's country. The tables on diagram 03, "Electrical Motors", list the standard motor characteristics. Other types of motors are available upon request (special motors, explosion-proof motors, etc.).

## 1.4 CHARACTERISTICS AND PERFORMANCE

TECHNICAL DATA	Unit	2033		2063	
		50	60	50	60
Frequency	Hz	50	60	50	60
Number of stages		2		2	
Nominal rotational speed	rpm	1500	1800	1500	1800
Free air displacement	m <sup>3</sup> /h (cfm)	35	(27)	65	(50)
Air displacement, Pneurop method	m <sup>3</sup> /h (cfm)	30	(23)	60	(46)
Base pressure without gas ballast *	mbar	< 1.10 <sup>-4</sup>		< 2.10 <sup>-4</sup>	
Base pressure with gas ballast	mbar	< 5.10 <sup>-3</sup>		< 5.10 <sup>-3</sup>	
Maximum permissible water vapor pressure	mbar	30		25	
Oil capacity	liters	3.6		7.0	
Weight (pump + motor)	kg	61		100	
Inlet and outlet Pneurop nipples		NW 40			

\* Partial pressure measured by Pneurop method.  
The above specifications are for pumps filled with ALCATEL 100 oil. They may vary if other oils are used (see § 3.3.2).

## II. OPERATING PRINCIPLE

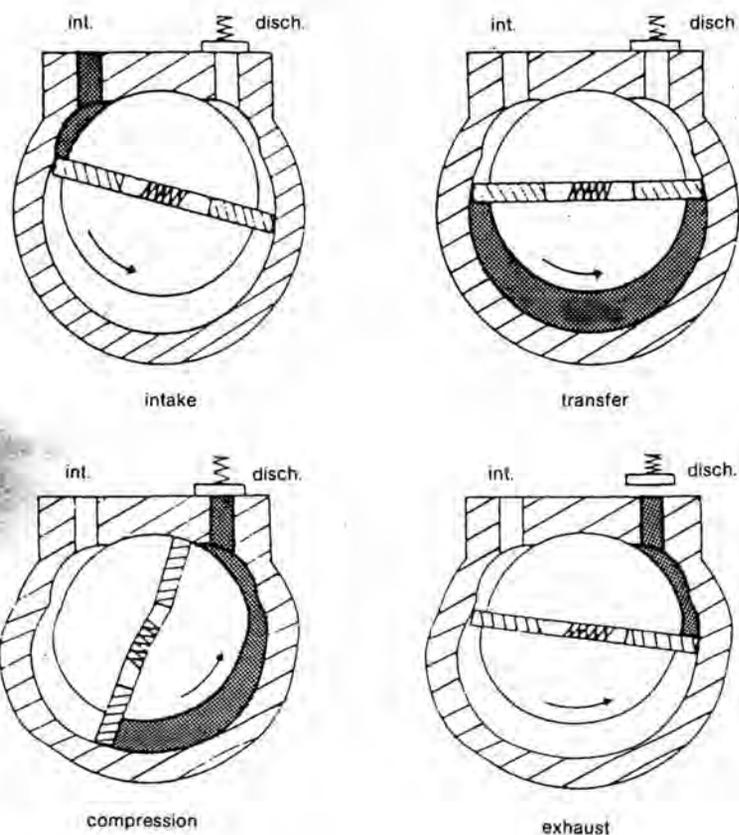
### 2.1 SINGLE-STAGE MECHANICAL PUMP

The functional part of a mechanical pump is composed of :

- a hollow cylindrical stator with inlet and exhaust valves;
- a rotor mounted eccentrically inside the stator for pumping ;
- two vanes sliding in the rotor, forced against the stator by centrifugal force and springs.

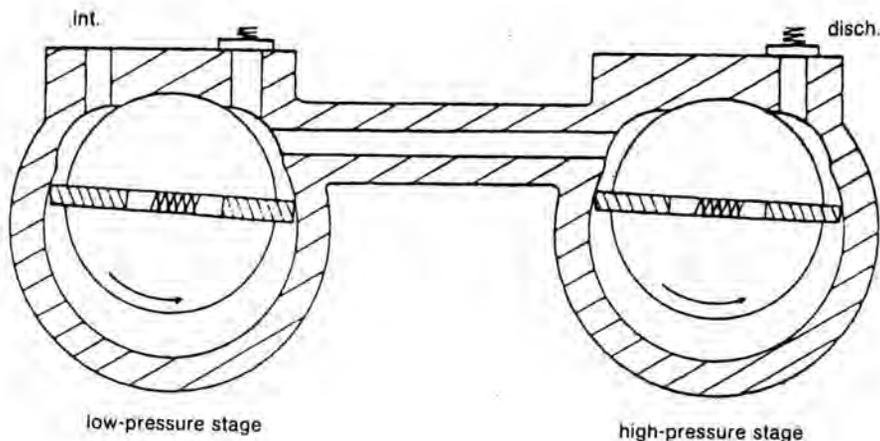
The pumping cycle is as follows :

- **intake :** As the vane passes in front of inlet orifice an increasing space is formed into which the gas from the chamber to be evacuated expands. When the second vane passes, the space is closed.
- **transfer :** The gas trapped in the space between the two vanes is transferred to the exhaust orifice as the rotor rotates.
- **compression :** The space communicates with the exhaust, which is fitted with a valve : the gas is compressed until open the valve.
- **exhaust :** The gas is expelled into the oil casing when the pressure is sufficient to open the valve.



### 2.2 TWO-STAGE VANE PUMP

To improve the backing pressure and displacement at low pressure, two stages are connected in series. The second is similar to the first both structurally and operationally. The gases pulled in by the first (low-pressure) stage are transferred to the second (high-pressure) stage, then discharge through the high pressure (HP) valve.



### 2.3 OIL

Oil has several important functions in the pump :

- it lubricates mechanical components (bearings, shaft seals, rotor, vanes, etc.) ;
  - it makes moving parts relatively tight by limiting internal leakage ;
  - it carries away the heat produced by the compressed gases.
- ALCATEL has selected various types of oil for its pump ; they are listed in § 3.3.2.

### 2.4 LUBRICATION (see figure from § 2.7)

In operation, the oil pump draws cold oil from the bottom of the oil case (the oil is cooled by the fan).

The oil is forced into the diaphragm-spring system (Nos. 46 and 47, § 2.7). The discharge pressure of the oil pump lifts the diaphragm off its seat, allowing oil to reach the moving parts via the oil injection line to escape when the pump starts.

### 2.5 ANTISUCKBACK

When the pump is stopped or the current is turned off, an antisuckback device isolates the functional part of the pump against air or oil returning to the chamber being evacuated. The seal is ensured :

- by flush-mounted O-rings between the surfaces of the functional elements (stators, flanges, frame, etc.) ;
- by spring-loaded check valves in the discharge ports ;
- by a diaphragm and spring system which automatically seals the oil injection duct (A) in the pump. The operating principle is as follows (see diagrams in § 2.7) :

- when the pump stops, the discharge pressure of the oil pump (B) drops. Diaphragm (47), under pressure from the spring, is forced against its seat (46), thus closing off the injection line (A).

### 2.6 GAS BALLAST

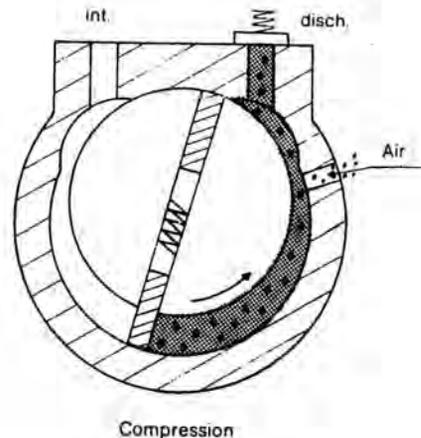
When condensable vapors are being pumped, gas is compressed beyond its saturated pressure in the "compression" and can condense, impairing pump performance.

The gas ballast can be used to inject a certain quantity of air into the second stage of the pump during the compression phase so that the partial pressure of the pumped gas is less than its saturated pressure, eliminating condensation.

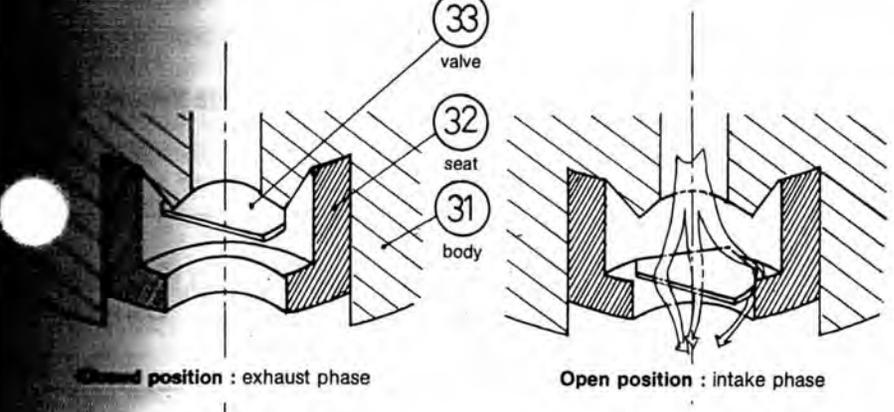
At the end of the compression phase, the pressure in the discharge chamber is greater than atmospheric. An antisuckback device (vibrator system) prevents the gases and oil from being discharged to the outside (see diagram below).

The saturated vapor pressure of a body is higher when the system is hot than when it is cold ; therefore, the pump must reach operating temperature before pumping condensable vapor.

Using the gas ballast increases the ultimate pressure of the pump as well as the temperature.



33  
valve  
32  
seat  
31  
body

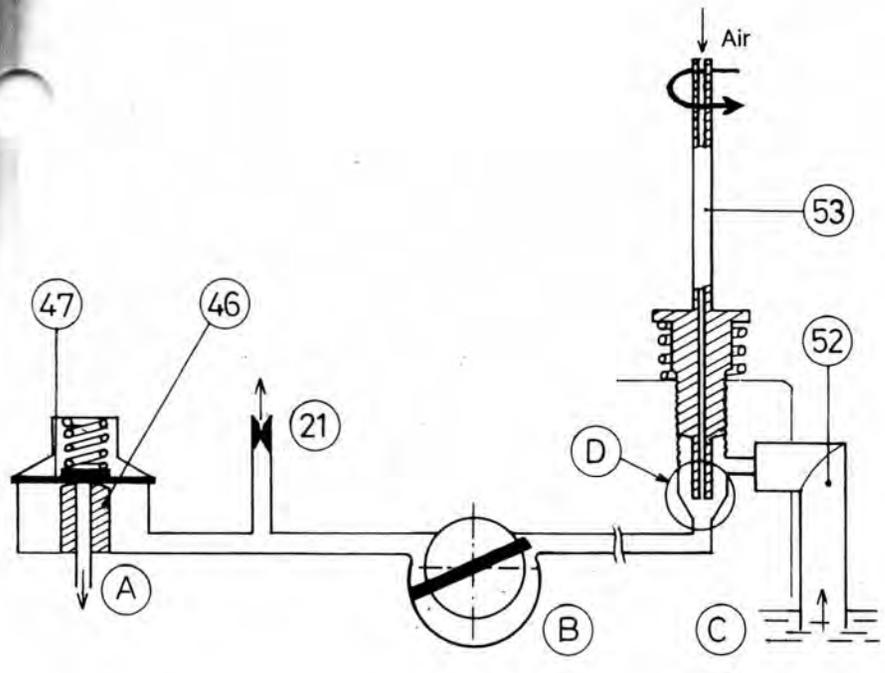


**NOISE LIMITER**

When the pump begins to operate the oil (C) pulled in by the oil pump (B) is drawn in through oil inlet tube (52) and is agitated by a venturi tube (D).

At the end of the gas intake tube (53), mounted parallel to the oil flow, a negative pressure is created. Because of the negative pressure created at the end of the venturi (53) gases are entrained into the moving layers of oil dampening pump noise. The added gases will affect the ultimate pressure, therefore, a compromise between sound level and ultimate pressure has to be reached as follows :

- **Tightening down gas intake tube (53) decreases the oil flowrate** at the intake of the oil pump (B) and increases the amount of gas mixture in the oil. The **sound level decreases** but the **ultimate pressure increases**.
- **Unscrewing tube (53) increases the oil flowrate** at the intake of the oil pump (B) and decreases the amount of gas mixture with the oil. The **sound level increases** but the **ultimate pressure decreases**. This adjustment can be performed via the oil fill port while the pump is in operation.



### III. MOUNTING AND INSTALLATION

#### IMPORTANT NOTE :

For any application, pump performance will depend on :

- mounting conditions and accessories,
- type of oil used
- mechanical connections : vacuum lines, etc.

**Read Sections III and IV before installing pump.**  
Contact Alcatel if there is any further assistance required.

#### 3.1 UNPACKING

Unpack equipment carefully upon receipt. Do not discard packing material until pump has been checked for damage in shipment. If damage is found, proceed as required with shipper and advise Alcatel if necessary.  
Pump contains no oil when delivered ; oil is shipped in separate containers.

#### 3.2 STORAGE

**If the pump is to be stored, reliability without special storage precautions is guaranteed for up to 3 months at an ambient temperature of 5 to 40°C.**

After six months, factors such as temperature, humidity, and salt air can cause deterioration of certain components : O-rings will harden, shaft seals will bond to shafts, and oil will become contaminated. The pump may be difficult to operate in this condition. Before it is started it will have to be disassembled (see § V) and all the seals replaced (see § 5.4).

**Note 1 :** If the pump is to be stored for more than three months, it should be filled with oil.

To do this, fill pump according to § 3.4.1 and run it for one hour at ultimate vacuum (intake port closed) to lubricate all moving parts (see § 4.1). Then stop the pump and store it after sealing inlet and exhaust ports tightly (quick-connect clamp, centering ring, plugs, etc.).

**Note 2 :** The seal kits should also be stored carefully. Keep them away from heat and light (sunlight and UV light) to prevent the elastomers from hardening and cracking (see § 6.1)

#### 3.3 CHOOSING THE OIL

##### 3.3.1 Why Correct Oil is Important

Oil has numerous functions in the pump (see § 2.3). The correct oil is critical for a good vacuum. The choice depends on :

- chemical aggression and corrosion of the pumped products,
- used accessories,
- maintenance intervals that you want be compelled,
- total operating cost.

Not all oils produce the same ultimate pressure in the same pump. The ultimate pressure depends on the saturated vapor pressure of the lubricating fluid, its viscosity, and its ability to dissolve-gases. In particular, synthetic oils considerably increase the ultimate vacuum in two-stage pumps.

#### 3.3.2 Recommended Oils

For the Chemical Series pumps, Alcatel recommends the oils listed in the table below.

OIL	APPLICATION	Influence on ultimate vacuum of a two-stage pump*	LIMITATIONS ON USE
<b>ALCATEL 100</b>	General purpose paraffin-based mineral oil ● good base pressure ● low backstreaming	10 <sup>-4</sup> mbar	Flammable
<b>ALCATEL 102</b>	Anti-emulsion mineral oil ● drying ● pumping water vapor ● freeze-drying	5.10 <sup>-4</sup> mbar	Flammable
<b>ALCATEL 111</b>	Hydrocarbon-based synthetic oil with good heat resistance ● pumping at high pressures	2.10 <sup>-3</sup> mbar	Flammable
<b>ALCATEL 113</b>	Highly stable synthetic oil Perfluoropolyether ● highly inert to chemicals ● pumping oxygen ● plasma etching	7.10 <sup>-4</sup> mbar	Nonflammable For special preparation of pump see § 4.5
<b>ALCATEL 200</b>	Mineral oil distilled under vacuum ● pumping corrosive products ● reduced backstreaming	10 <sup>-4</sup> mbar	Flammable
<b>ALCATEL 300</b>	Hydrocarbon oil of mineral origin, vacuum distilled ● pumping corrosive substances ● reduction in backstreaming ● plasma etching ● high temperature operation	5.10 <sup>-4</sup> mbar	Flammable For special preparation of pump see § 4.5

\* Partial pressure measured by Pneuop method on ALCATEL 2033 pump.

However, ALCATEL 100 oil can be replaced by the following fluids :

- ELF MOVIXA PV 100
  - TURBELF SA 100
  - ELF BARELF F 100
  - BP CS 100
  - INLAND 15
  - INLAND 19
  - SHELL VITREA 100
  - TOTAL CORTIS 100
  - INVOIL 20 (registered trademark INLAND)
- In this case, the characteristics can be different from those listed in § 1.3 and in the table above.

### 3.4.3 Oxygen pumping

In applications, mixtures containing a concentration of oxygen, even pure oxygen, are used.

**Mineral oils are flammable**; in addition they oxidize during pumping and rapidly lose their lubricating properties. When the pumped gas contains more than 30 % oxygen, mineral oils should not be used. The following synthetic oils should be used :

ALCATEL 113  
 LOMBIN YL VAC 25-6\*  
 TRYTOX 15-25\*\*  
 DEMNUM S 65\*\*\*  
 FLUNOX 15-25\*\*\*\*

**Oils such as triaryl phosphate ester have already caused accidents ; they should not be used.**

When use is intermittent, mineral oils such as ALCATEL 200 or ALCATEL 300 can be used.

To prevent oxygen from accumulating in the equipment, the oil casing must be fitted with a neutral gas (dry nitrogen) purge to dilute the oxygen. **The neutral gas flowrate must be about five times the oxygen flowrate.**

### 3.4 SETUP

#### 3.4.1 Filling pump with Oil

Remove fill plug (65). Fill with oil to middle of sight glass (64). **This operation must be performed with pump stopped.** Do not over-tight the fill plug.

#### 3.4.2 Mechanical Connections

##### a) Mounting on a Frame

The pump can be mounted on a frame by using the 4 mounting holes in base (3) and 4 special shock mounts (see § 3.4.3).

**NOTES :** These mounts reduce the pump vibrations but will not hold the pump securely when the pumping assembly is moved. Clamp pump to frame before moving.

##### b) Ventilation

The pump and motor are equipped with a ventilation system. When the pump is installed, the pump should be placed in a ventilated location.

**Check ventilation holes on the pump and motor periodically for obstructions.**

Alcatel pumps are designed to operate at an ambient temperature of 10 to 40°C. If the temperature is likely to rise above 40°C, an auxiliary cooling device can be used (see § 3.4.3).

##### c) Inlet and Exhaust Ports

The pump inlet and exhaust ports are equipped with ISO NW 40 nipples for Pneurop quick connectors to accept various stainless steel, plastic, etc. tubing accessories (see diagram 5).

\* Registered trademark of MONTEDISON

\*\* Registered trademark of DU PONT DE NEMOURS

\*\*\* Registered trademark of DAIKIN

\*\*\*\* Registered trademark of SCM

### 3.4.3 Accessory Table

Description	Part Number	Location	Function
Oil mist eliminator	068442	exhaust	• separates oil droplets and contaminant particles in exhausted gases from the mechanical vacuum pumps.
Chemical oil mist eliminator	068785	exhaust	• in addition to standard oil mist eliminator functions, polluted oils and settlings can't turn back into the pump.
Dust filter	068480	inlet	• prevents dust particles larger than 2 microns from accumulating in the pump and oil.
Liquid nitrogen trap	786537	inlet	• protects pump against condensable vapors. • prevents oil from backstreaming into pumped chamber.
Molecular sieve filter	053380	inlet	• prevents oil backstreaming when pumping a "clean vacuum".
Remote controlled gas ballast	068391	on frame	• facilitates pumping condensable vapors, regenerates pump oil, by remote control.
Oil filter (DE)	220 V = 068990 115 V = 068991	external device	• filters oil when pumping corrosive gases containing particles which could rapidly degrade oil quality.
Oil filter (D)	068537 (man.) 068496 (auto.)	external device	• filters oil during pumping in applications with high levels of particulate.
Auxiliary cooling device*	054257	between frame and motor	• when operating at ambient temperatures above 40°C, a water cooling ring can be fitted.
Shock mount	082692 (APEX LXA 100 Mod. D)	between base and machine frame	• allows pump to be mounted on a frame.
Condenser CO12	786502	inlet	• condenses water or solvent vapors before they enter the mechanical pump.

\* Only on 33 m<sup>3</sup>/h pumps.

In general, use accessories whose tightness and materials are compatible with the pumped gases at both the inlet and exhaust. **At the pump exhaust, the discharge circuit must be such that the resulting overpressure in the oil case is less than or equal to 0.5 bar relative pressure.**

See "Pump and Accessory Selection Guide" at the end of this book (diagram 4).

### 3.4.4 Electrical connection

**It is recommended that the motor be protected for 120% of its rated current.**

In the case of series motors, see the diagram "Protection of Electrical Motors (diagram 3).

#### Three-Phase Version

Connect motor according to line voltage. The connections are shown on the schematic located inside the terminal box or on the lid. **The pumps are delivered with their motors connected to maximum voltage.** Switch on current briefly to check motor rotation direction. The end of the shaft must rotate in the direction of the arrow on the motor mounting plate (103).

## IV. OPERATION AND MAINTENANCE

### 4.1 STARTUP

#### 4.1.1 Temperatures

- When starting make sure oil bath temperature is above 10°C.
- Ambient operating temperature for the pump must be between 10 and 40°C.
- Under these conditions, the pumps temperature (front surface of oil case) must be between 70 and 90°C (depending on operating conditions).

#### Special Case - Synthetic Oils

See also § 4.5.b.

Synthetic oils are far more viscous when cold than mineral oils. For this reason, pour a few cc's of oil through the inlet port when starting, to facilitate lubrication of the pump.

For the same reason, do not start pump at ambient temperatures below 18°C.

#### 4.1.2 Starting After Disassembly and Reassembly

After maintenance or a change in oil type, the functional parts of the pump will be under-lubricated. Before running pump under hard conditions (continuous or high-pressure operation), proceed as follows :

- Remove fill plug (65). Use a screwdriver to unscrew air inlet tube (53) completely to facilitate the initial startup of pump oil circuit.
- Check motor rotation direction.
- Perform operations in § 4.1.3.
- With pump hot, adjust noise level (see § 4.2).

#### 4.1.3 Normal Startup

The pump has been stopped but not disassembled. This is also the case for the initial startup.

- Make sure oil bath temperature is above 10°C.
- Start pump.
- Allow pump to run for one hour at ultimate vacuum. During this operation, make sure oil circuit is operating. (For this reason, do not replace fill plug 65.)

When pump starts, the oil pump expels the air out of the oil inlet tube (52) and exhausts it through the exhaust jet (21) (see diagram in § 2.7) and hence out of the vacuum pump. As a result, air bubbles appear in the oil around the jet (21).

When the oil circuit starts, loud popping sounds will be heard (first irregularly, then regularly) which will silence as the oil heats up. As soon as plug (65) has been replaced these noises will no longer be heard.

After the pump has started, a layer of bubbles from the HP stator gradually spreads across the surface of the oil bath. This emulsion disappears when the oil reaches operating temperature.

Under normal temperature conditions, the oil circuit should start one minute after startup (this time can vary with the type of oil and its degree of contamination).

- Use gas ballast if necessary (see § 4.3).

It is normal for the oil level to rise (as can be seen through the oil sight glass) when the pump is hot due to expansion of the oil and starting of the oil circuit.

In the event of malfunction, see § VII "Troubleshooting".

#### 4.1.4 Special Cases

When a pump must start cold (ambient temperature about 10°C) or when it has to start cold after pumping contaminating products or condensables, proceed as follows :

Unscrew air inlet tube (53) to the maximum extent to help oil circuit to start. Readjust antinoise system once pump is hot (see § 4.2).

### 4.2 USING NOISE LIMITER

The principle of this system is described in § 2.7. It is adjusted at the factory when the pump is checked and need only be readjusted after :

- pump disassembly-reassembly operations;
  - changing the oil type (not all oils are miscible in the same proportions with pumped gases).
- To adjust antinoise system :
- set pump to normal operating condition (temperature, ambient sound level, etc.);
  - connect a liquid nitrogen trap and a Penning gauge to pump inlet;
  - remove fill plug (65) and unscrew gas inlet tube with a screwdriver (53) all the way out;
  - run pump for about one hour at ultimate vacuum;

- screw in tube (53) half a turn at a time, monitoring partial pressure and sound level (wait 3 to 4 minutes after each half turn). Then set to desired point (to evaluate sound level, replace fill plug 65).

### 4.3 USING GAS BALLAST

#### 4.3.1 Startup

The principle of the gas ballast is described in § 2.6. When the pump is new or if it has not run for a long time, vapors or condensates may have collected in it during storage, due to condensation.

These substances will mix with the oil and impair the pump characteristics. To regenerate the oil, start pump at ultimate vacuum with inlet blocked; make sure it has started if the oil is particularly cloudy or contaminated. When the pump is hot (after running about one hour), operate pump with gas ballast fully open for half an hour to one hour, depending on the level of contamination. This vents the condensables. Then close the gas ballast knob (38) to return pump to ultimate vacuum.

#### 4.3.2 Pumping Condensables

When pumping condensables, condensates mix with the oil, impairing pump characteristics. Some condensates that do not mix with the oil settle on the bottom of the oil case or remain at the surface of the oil, depending on the respective densities of the pumped substances and the oil used. The oil level in the pump may then rise.

To prevent this, follow these rules :

- **Choice of oil** : use an oil which is not miscible with the pumped substances (see § 3.3.2).
- **Pumps exhaust assembly** : avoid overpressure. To do this :
  - remove flap valve (70),
  - do not use oil mist eliminator (use a condenser at pump inlet),
  - avoid using any vertical lines on the exhaust which could cause condensation of the substances and their return to the pump,
  - use an exhaust hood.
- **Startup** : Proceed as in § 4.1.3.
- **During pumping** : Monitor oil level. When pumping condensables heavier than oil, it may be useful to shorten or even remove the oil inlet tube (52), allowing the pump to operate even with a large quantity of condensables at the bottom of the case.
- **After pumping** : Allow pump to run for half an hour or up to one hour with gas ballast fully open and pump disconnected from system. This regenerates the oil.  
Then close gas ballast, stop pump, and drain condensates and oil-condensate mixture (see § 4.6). As soon as clear oil appears at the drain port, close the drain and top off pump with fresh oil (adding a drain cock makes this operation easier - G 3/8" connection).
- **Restarting** : If pump is not performing up to specifications, the oil is completely contaminated.  
Drain completely, rinse (see § 4.7) and fill with fresh oil.

**Note** : When pumping condensates lighter than oil :

- do not shorten oil inlet tube (52) ;
- when draining, first collect clear (reusable) oil, then drain condensates and oil-condensate mixtures, and discard ;
- ruse pump according to § 4.7. ;
- refill pump and top off with fresh oil.

### 4.4 HIGH-PRESSURE PUMPING (P above 30 mbar)

With pump operating at high pressure (over 30 mbar) the oil heats up, becomes more fluid, and is picked up in the moving parts. Losses at the exhaust will increase.

#### Intermittent Pumping

If the pump operates only a short time at high pressure, top off with lubricating oil following the return to low pressure. Use an oil mist eliminator to prevent splashing and misting losses (see § 8.2).

#### Continuous Pumping

When pump operates continuously at high pressure, oil consumption may rise to the point where the level in the oil case drops. The pump may then seize due to a lack of oil. The high throughput of gas through the eliminator has prevented oil from flowing back into the pump.

The pump under these conditions the pump and oil mist eliminator must be modified as shown in the diagram below.

A device of this type draws the oil from the eliminator through the pump for lubrication.

The components of a system of this kind will depend on the ultimate vacuum desired, the volume of gas pumped, and the oil used. Other arrangements are possible; contact Alcatel for assistance.

## TRANSITIONING FROM ONE TYPE OF OIL TO ANOTHER

Pumps are tested with ALCATEL 100 oil and a certain amount of test oil remains in the pumping system.

When changing to another type of oil, proceed as follows :

### When oils are compatible

In the case when one mineral oil is replaced by another (e.g., ALCATEL 100 by ALCATEL 102).

Flush pump (see § 4.7) using new oil, then fill (see § 3.4.1).

### When oils are incompatible (synthetic oils or similar oils)

In the case when a mineral oil is replaced by a synthetic oil (for example ALCATEL 100 by ALCATEL 113).

Synthetic oils are considered to be incompatible with each other for technical reasons : these oils are expensive. Mixing can cloud the oil somewhat, which could be misinterpreted as a sign of contamination or degradation. For the same reasons, clear oils of mineral type (Alcatel 300), which are equally expensive will be treated like synthetic oils. These remarks apply to Alcatel 111, Alcatel 113, Alcatel 300, Fomblin YL VAC 25-6\*, Inland TW, Krytox 15-25\*\*, Demnum, Allunox 15-25\*\*\*\*.

These oils are usually used in Chemical Series pumps. However they can be used in standard pumps by proceeding as follows :

Disassemble pump completely and clean (see § V).

Replace all seals (§ 5.4) with Viton seals. For this, order a seal kit for chemical pump :

3333 C pump = kit P/N 054289

3063 C pump = kit P/N 054489

Reassemble but remove intermediate plate jet (22).

Fill with new oil (see § 3.4.1).

Note : to replace a synthetic oil by a mineral oil, proceed as in § 4.5 a.

\* Registered trademark of MONTEDISON.

\*\* Registered trademark of DU PONT DE NEMOURS.

\*\*\* Registered trademark of DAIKIN.

\*\*\*\* Registered trademark of SCM.

## 4.6 OIL LEVEL - DRAINING

### a) Oil Level

To use pump under optimum conditions, check oil level in oil sight glass periodically. **Do this when pump is not operating.**

- Oil consumption may vary with conditions. Use of an oil mist eliminator can substantially reduce oil consumption by allowing oil to flow back into the oil reservoir.
- When using expensive fluids like ALCATEL 113, FOMBLIN YL VAC 25-6\* using a condenser at the pumps exhaust (or a chemical oil mist eliminator) allows oil to be recovered without decanting.
- Periodic inspection enables the oil color to be compared with a sample of fresh oil. It indicates the degree of contamination or degradation.

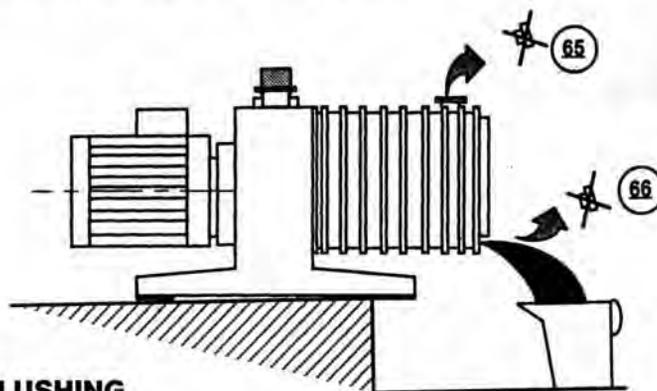
If the oil is slightly cloudy (a sign condensables are being absorbed) it can be regenerated with a gas ballast (cf. § 4.3).

**If the oil is brown, blackish, or smells "burnt" it has deteriorated. In this case, drain pump and rinse if necessary.**

### b) Draining

The pump must be drained when hot and after the oil case has been vented to atmospheric pressure. First, isolate or disconnect the pump from the system. Then :

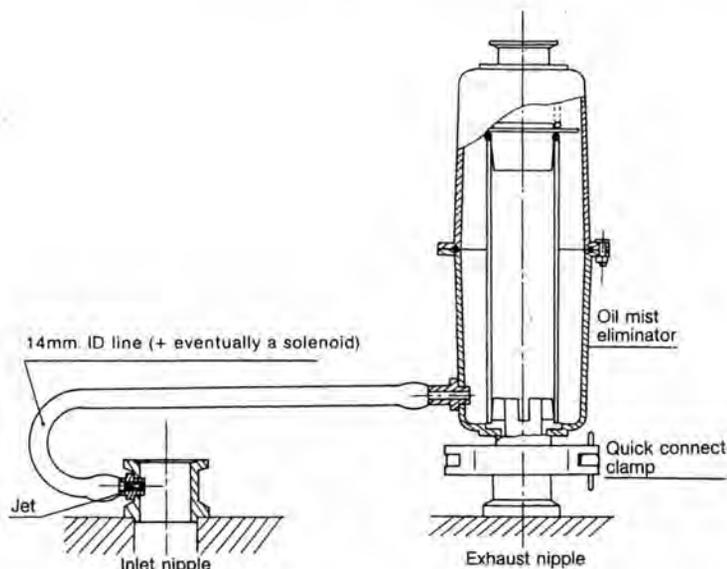
- Tilt pump (see below).
- Unscrew drain plug (66) on oil casing. When all the oil has drained, replace plug (66) temporarily and run pump for about 10 seconds leaving inlet port open. This removes the oil from the pumping module.
- Drain this oil by removing plug (66).
- Replace plug, then fill with fresh oil to the middle of oil sight glass (64), through oil fill port (65).



## 4.6 FLUSHING

Draining can be followed by rinsing if the oil is particularly dirty. This operation requires a volume of oil equal to the capacity of the pump. After draining oil case (see § 4.6) replace plug (66). Remove inlet filter (39), clean, and replace. Run pump at atmospheric pressure, allowing fresh oil to flow slowly into inlet (24). Stop pump and drain rinse oil via drain plug (66). Replace plug and top off with fresh oil according to § 3.4.1.

## HIGH PRESSURE PUMPING : Example of oil recovery device (WARNING : The pump is not airtight).



## V. DISASSEMBLY, CLEANING AND REASSEMBLY

**IMPORTANT NOTE!** Before any maintenance is performed, remember to provide protection against toxicity, corrosion, and radioactivity of pumped gases. Depending on the individual situation, we recommend the following:

- flush system with dry nitrogen before maintenance is performed;
- wear gloves, goggles, and gas mask if necessary;
- make sure room is properly ventilated and disassemble pump under an exhaust hood;
- collect residues in appropriate containers.

Routine maintenance of ALCATEL Standard 2033 and 2063 pumps requires only periodic oil changes.

In the event of heavy contamination or an operating breakdown, the pump must be disassembled (see § VII).

Replace all seals whenever the pump is disassembled (see § 6.1). The only tools needed are a few wrenches, found in any maintenance shop (see § 5.6).

Before disassembly, drain oil (see § 4.6).

The first step is to remove the motor; the second step is to disassemble the moving parts.

### 5.1 REMOVING MOTOR (see general drawing)

- Unscrew four nuts (K).
- Remove motor assembly and motor mounting plate (103). The coupling separates into two halves, one on the motor side, the other on the pump side.

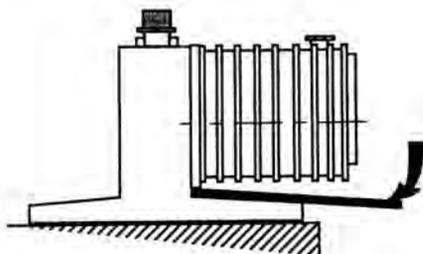
### 5.2 DISASSEMBLING MOVING PARTS

#### 5.2.1 Motor

- Prevent fan (61) from rotating by wedging a wooden chock against the side of the frame and two blades of the fan.
- Remove elastomer coupling (62).
- Unscrew self-locking screw (J) (not reusable) and remove washer (V).
- Using two 8 mm extraction screws, remove fan (61) and chock.
- Remove screws (E) and, using two 6 mm extraction screws, remove cover (9) with seal.

#### 5.2.2 Removing Oil Casing

- Unscrew four nuts (K) and remove the oil casing (3) and its gasket (63). Gasket (63) may cause case (3) and frame (1) to stick together due to aging : insert lever between base and bottom of case, and pry off case (see drawing below). Do not use a hammer or screwdriver, which could damage the parts and sealing surfaces.
- Remove Felt (26) and discard.



### 5.2.3 Disassembling Pumps (2033 and 2063)

#### a) Removing valve cover

- Remove valve covers (27) and (30) by loosening screws (X, S).
- Remove valve springs (28), valves (29), and the washer (87) from the HP valve.

#### b) Removing Oil Pump (42)

- Remove screws (B) and remove body (42).
- Remove vane (44).
- Remove screws (G) and remove cylinder (51), spring (50), and diaphragm (47).
- Remove seat (46) and O-ring (49).
- Remove screw (AA) and stop (15).
- Remove oil inlet tube (52).
- Unscrew air inlet tube (53) and remove spring (54). (If necessary, note setting of air inlet tube (53) : number of turns until tube stops moving turning clockwise).

#### c) Removing Rear Plate (7)

- Unscrew four nuts (K).
- Insert two screwdrivers into the two notches and twist to remove plate off pins. Pull plate straight out, holding HP rotor (19) in place. Remove O-ring (14).

#### d) Removing HP Rotor (19)

- Remove rotor (19) by sliding it out of stator (6).
- Remove vanes (20) and their springs (18).

#### e) Removing HP Stator (6)

- Insert two screwdrivers into the two notches and proceed as in § c).
- Remove O-ring (14).

#### f) Removing Central Plate (5)

- Insert two screwdrivers into the two notches and proceed as in § c).
- Remove O-ring (14).
- Oil jet (22) lubricates the first stage. Do not remove it for cleaning. When reassembling, spray with compressed air to remove any obstructions.
- Remove tube (12) and O-ring (13).

#### g) Removing LP Rotor (16)

- Remove rotor (16) by sliding it out of stator (4).
- Remove vanes (17) and their springs (18).

#### h) Removing LP Stator (4)

- Remove nuts (K).
- Insert two screwdrivers into the two notches and proceed as in § c).
- Remove O-ring (14).
- Remove tube (12) and O-ring (13).

#### i) Disassembling Gas Ballast

- Remove three screws (E) and remove gas ballast assembly and O-ring (35).
- Unscrew knob (38) from body (31).
- Remove O-ring (35) and spring (96).
- Valve (33) and washer (32) cannot be disassembled.

#### j) Disassembling inlet nipple (24) (on frame)

- Remove four screws (M) and remove clamps (41).
- Remove nipple (24) and its O-ring (40).

#### k) Disassembling exhaust nipple (67) (on oil casing)

- To remove exhaust nipple (67), the nipple must be connected to a line with an NW 40 centering ring with O-ring and quick connect clamp. Use the latter to unscrew nipple (67).
- Remove O-ring (74).
- Remove pin (71) and remove filter (72), sleeve (73), shaft (68), valve (70), and circlip (69).

## CLEANING METAL PARTS

Cleaning metal parts requires the use of solvents. Be sure to take all necessary precautions and obey manufacturers' instructions.

When using mineral oils, clean metal parts with solvents such as trichloroethane or 1,2-dichloroethane, hot or cold.

When using synthetic oils (see § 4.5.b), clean metal parts while hot with solvents such as trichloroethylene or perchloroethylene. If any residue of oil remain after cleaning, remove with Freon 113\* while cold. Dry cleaning can also be done with Freon 113\*.

**Dry-cleaning** : clean parts by immersion and with brushes (do not use wire brushes).

**Wet-cleaning** : Use appropriate equipment and take necessary precautions (baskets; evacuation of fumes).

## REPLACING SEALS AND OTHER ELASTOMER PARTS

### REPLACE ALL SEALS AFTER EACH DISASSEMBLY

If you must reuse an elastomer part (seal, valve, etc.), never clean this part with a solvent without finding out the effects on the technical characteristics of the elastomer. **If this is not done, we cannot guarantee that the pump will operate properly.**

#### 5.4.1 O-Rings

Shore hardness is between 60 and 70. O-rings must not be scratched or cracked, and must be circular in cross section. Never use a cord with an oval cross section.

#### 5.4.2 Shaft Seals

##### Disassembly

- Place part (frame or plate) flat on a work bench.
- Place a washer (22 x 40 x 3 mm) on seal as a support.
- Insert one end of a screwdriver under shaft seal.

#### IMPORTANT :

Be sure not to damage seal seat during removal.

- Use screwdriver as a lever : press against washer, pry loose, and discard (see Diagram 2).

##### Fitting a New Seal

- Clean seal seat and smooth any rough edges.
  - Lubricate bore and entire seal.
  - **Position seal in the proper direction** (see general drawing).
  - Mount seal on pre-oiled mounting mandrel.
  - Locate seal opposite seat and install :
    - with a press and the proper mandrel (case 2, diagram 2),
    - with a drill press, or by striking mandrel (case 1) with a mallet. In this case, keep mandrel perpendicular to housing.
- To remount plates use protective sleeve (oil it well before mounting plate) or wrap end of shaft with adhesive tape (see diagram 2).

#### IMPORTANT :

Replace shaft seal (81) on fan side :  
This Viton seal is located in the cover (9).

#### 5.4.3 Gasket

Replace oil case gasket (63) each time pump is disassembled. If necessary, clean oil casing and plate sealing surfaces. When reassembling, oil plate (1) and case (3) surfaces lightly.

## 5.5 REASSEMBLY

### 5.5.1 General Instructions

Oil used for lubricate pump parts must be the same as oil used for pump operation.

Before reassembly :

- All parts must be dry** so that no solvent remains, particularly in blind holes.
  - Do not put too much oil in the bottoms of the holes for the plate/stator alignment pins.**
  - Coat all pump parts and lips of shaft seals with clean oil.** Make sure seals are correctly installed (see general drawings). (The Viton shaft seal (81) fits into cover (9).
- Oil lubrication holes of bearings and seal seats with oil.

- Tighten nuts (K) without forcing (maximum torque 1.1 mdaN).
- Poste a new felt (26) into base.

### 5.5.2 Assembling Moving Parts

**Note** : The bushings in the frame and plates can be replaced, but special machining is required whenever a bushing is changed. Consult Alcatel for assistance.

- Reassemble moving parts in reserve order of disassembly.
- Before replacing valves, pour a little oil into the stators through the valve holes.
- Before reassembling oil pump, assemble fan using a new self-locking screw (J) to tighten it.

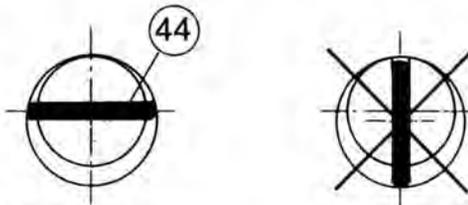
### 5.5.3 Assembling Oil Pump

Before assemble it, put fan (61).

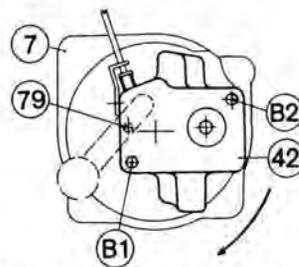
Mount all necessary parts on oil pump body (42) proceeding in reserve order from § 5.2.3.b.

- Place slot of oil pump rotor in **horizontal position** (parallel to pump base - see diagram).

Fan can be used to turn rotor but **NEVER INSERT A SCREWDRIVER IN THE ROTOR SLOT AS THIS MAY CAUSE DAMAGE.**



- Place vane (44) in its slot.
- With pump horizontal, let pump body (42) drop by gravity on to rotor (as indicated in figure below).
- With pump vertical, turn pump body (42) clockwise around alignment pin (79) to bring it into contact with the rotor without forcing. Never rest pump body on rotor; this will eliminate bearing play.
- Fit two screws B1 and B2 : B1 must be tightened first and B2 second (maximum torque : 1 mdaN).



Moving parts : rear view.

**Note** : When replacing air inlet tube (53), proceed as follows : Screw tube (53) all the way in then unscrew the number of turns given in § 5.2.3.b (usually 3 or 4).

### 5.5.4 Motor coupling

To make sure motor coupling (104) does not touch fan (61), adjust distance from motor plate (dimension A on the foldout drawing), as follows :

- 2033 pumps                      dimension A = 16.6 ± 0.5 mm
- 2063 pumps                      dimension A = 23.3 ± 0.5 mm

To perform this adjustment, use adjusting tool in tool kit (part no. 054284; see § 5.6).

## 5.6 TOOLS

The tools required for disassembling and reassembling the motor-pump assembly are listed below :

- No. 3 and No. 9 screwdrivers
- open-end wrenches : 13-17 mm
- Allen wrenches : 4, 5, 6, 8 mm
- slip-joint pliers
- 6 mm and 8 mm extraction screws.

### Special ALCATEL Tools, No. 054284

To mount shaft seals and adjust motor plate, Alcatel provides special tools in tool kit (see diagram 2).

Description	P/N
mounting mandrel	065089
protective sleeve	065088
washer	073331
coupling adjustment tool	065087
kit no.	054284

\* Registered trademark of Du Pont de Nemours.

## VI. SPARE PARTS

For fastest service, specify the following when ordering :

- pump type
- serial number (on label)
- part number (see list at end of book).

Maintenance kits containing the most frequently used parts are always available at our sales outlets. Be sure to use these kits so you will have all the parts necessary.

### 6.1 SEAL KIT

Pumps	2033	2063
Kit n°	054285	054485

Contains all pumps seals for complete disassembly.

Seal kits should be stored carefully. Store them away from heat and light (sunlight and ultraviolet) to prevent any hardening of the elastomers (see AFNOR standard : "Conditions for Storing Vulcanized Elastomer-Based Products" NF T 46022).

### 6.2 MAINTENANCE KIT

In addition to seals this kit contains a set of spare parts for pump maintenance for up to two years of normal use.

Pumps	2033	2063
Kit n°	054288	054487

# TROUBLESHOOTING

PROBLEM	CAUSE	REMEDY	SECTION
<b>A. PUMP DOES NOT ROTATE</b>	<ol style="list-style-type: none"> <li>1. Motor poorly supplied with current</li> <li>2. Pump seizes (stopping after pumping under difficult conditions - no drain or rinsing)</li> <li>3. Coupling deteriorated</li> <li>4. Temperature too low</li> <li>5. Oil contaminated</li> <li>6. Oil gummed after prolonged storage or after stoppage after pumping contaminant substances</li> </ol>	<p>Check wiring Disassemble, clean, and polish scratched metal parts (replace if necessary) then reassemble Disassemble motor and replace</p> <p>Use gas ballast or change oil and rinse pump</p> <p>Disassemble, clean, reassemble</p>	<p>§ 3.4.4</p> <p>§ V § 5.1 § 4.1.1 § 4.3.1 or § 4.6 - 4.7</p> <p>§ V</p>
<b>B. OIL PUMP DOES NOT START</b>	<ol style="list-style-type: none"> <li>1. No oil in case</li> <li>2. Inlet filter partially clogged</li> <li>3. Oil contaminated</li> <li>4. Oil cold</li> <li>5. Noise control system improperly adjusted</li> <li>6. Lubrication holes clogged</li> <li>7. Oil pump vane worn</li> </ol>	<p>Add oil Clean filter See A.5</p> <p>Adjust system and be sure gas ballast is closed Disassemble and clean Replace</p>	<p>§ 3.4.1 § 5.3</p> <p>§ 4.1.1</p> <p>§ 4.2 § V § V</p>
<b>C. VACUUM PUMP DOES NOT PRODUCE A VACUUM</b>	<p><b>Check that oil pump has started</b></p> <ol style="list-style-type: none"> <li>1. <b>Ultimate pressure reached</b> : a few mbar <ol style="list-style-type: none"> <li>1.1 Insufficient oil in casing</li> <li>1.2 Oil contaminated</li> <li>1.3 Oil cold</li> <li>1.4 Inlet filter clogged</li> <li>1.5 A low-pressure valve has deteriorated</li> <li>1.6 Part omitted when reassembling</li> <li>1.7 Motor turns in wrong direction</li> <li>1.8 Motor underpowered</li> </ol> </li> <li>2. <b>Ultimate pressure obtained</b> : <math>10^{-2}</math> mbar <ol style="list-style-type: none"> <li>2.1 O-ring pinched</li> <li>2.2 A shaft seal has deteriorated</li> <li>2.3 A high-pressure valve has deteriorated</li> <li>2.4 Gas ballast knob open</li> <li>2.5 Lubrication holes clogged</li> <li>2.6 Noise control system poorly adjusted</li> <li>2.7 Part omitted when reassembling</li> </ol> </li> <li>3. <b>Accessories</b> <ol style="list-style-type: none"> <li>3.1 Oil mist eliminator cartridge clogged</li> <li>3.2 Mechanical pump exhaust installation produces overpressure (<math>&gt; 0.5</math> bar)</li> </ol> </li> </ol>	<p>See § B</p> <p>See B.1 See A.5 See B.4 See B.2 Replace Take apart and reassemble Change two phases Check power supply</p> <p>Replace O-ring Replace shaft seal Replace valve Turn knob to close See B.6 See B.5 See C.1.6</p> <p>Replace cartridge</p> <p>Check installation</p>	<p>§ V § 5.5 § 3.4.4 § 3.4.4</p> <p>§ V § V § V</p> <p>§ 8.2</p>
<b>D. PUMP NOISY</b>	<ol style="list-style-type: none"> <li>1. Oil contaminated</li> <li>2. Motor underpowered</li> <li>3. Motor bearings deteriorated</li> <li>4. Coupling improperly adjusted or deteriorated</li> <li>5. Fan poorly mounted</li> <li>6. Air inlet tube clogged</li> <li>7. Noise control system adjusted poorly</li> <li>8. Oil pump incorrectly mounted</li> <li>9. Low-pressure vanes deteriorated</li> </ol>	<p>See A.5 See C.1.8 Replace bearings Check adjustment Check mount Remove and clean See B.5 Remove and remount Replace vanes</p>	<p>§ 5.5.4 § 5.5.4 § V</p> <p>§ 5.2.3.b - § 5.5.3</p>
<b>E. PUMP TOO HOT</b>	<ol style="list-style-type: none"> <li>1. Operating at high pressure</li> <li>2. Oil contaminated</li> <li>3. Wrong oil</li> <li>4. Pump located in poorly ventilated location</li> <li>5. Ventilation holes clogged</li> <li>6. Motor overvoltage</li> <li>7. Overpressure at exhaust</li> </ol>	<p>Use an oil mist eliminator or oil recycling device Cool the pump with a water cooling device See A.5 Change oil Check installation Check installation Check voltage, replace motor See C.3.2</p>	<p>§ 4.4</p> <p>§ 3.4.3</p> <p>§ 4.5 § 3.4.2 b) § 3.4.2 b) § 3.4.4</p>
<b>F. HIGH OIL CONSUMPTION</b>	<ol style="list-style-type: none"> <li>1. Operating at high pressure</li> <li>2. Pump too hot</li> <li>3. Leakage at case gasket or shaft seal</li> </ol>	<p>See E.1 See E Replace seals</p>	<p>§ 5.4</p>
<b>G. PUMP NOT TIGHT WHEN STOPPED</b>	<ol style="list-style-type: none"> <li>1. Antisuckback system poorly mounted (diaphragm pinched)</li> <li>2. O-ring pinched</li> <li>3. Valve deteriorated</li> <li>4. Shaft seal deteriorated</li> <li>5. Oil contaminated</li> <li>6. Gas ballast knob in open position</li> </ol>	<p>See B.5 See C.2.1 See C.1.5 See C.2.2 See A.5 See C.2.4</p>	
<b>H. OIL PRESENCE IN THE EMBASE</b>	<ol style="list-style-type: none"> <li>1. Oil casing gasket deteriorated</li> <li>2. Shaft seal deteriorated and felt saturated</li> </ol>	<p>Disassemble oil casing, clean plate surfaces and reassemble with a new gasket Change both</p>	<p>§ 5.2.2 and § 5.4.3 § 5.2.1 and § 5.4</p>

## VIII. ACCESSORIES

### 8.1 REMOTE CONTROLLED GAS BALLAST

#### 8.1.1 Description

The remote controlled gas ballast is used for frequent operations or when manual gas ballast is difficult to reach. Its operating principle is identical to that of the manual gas ballast (see § 2.6).

#### 8.1.2 Technical Specifications

Part No. : 068391  
Weight : 700 g  
Material : stainless steel body, Teflon valve  
Power supply : 220 V, 50 Hz (other options available)  
Dimensions : see figure 1

#### 8.1.3 Installation

- Remove manual gas ballast assembly by unscrewing three screws (E).
- Replace O-ring (35) if necessary.
- Position remote controlled gas ballast assembly in orifice provided for the purpose and install with the three screws (E) and washers (S).
- Connect solenoid.

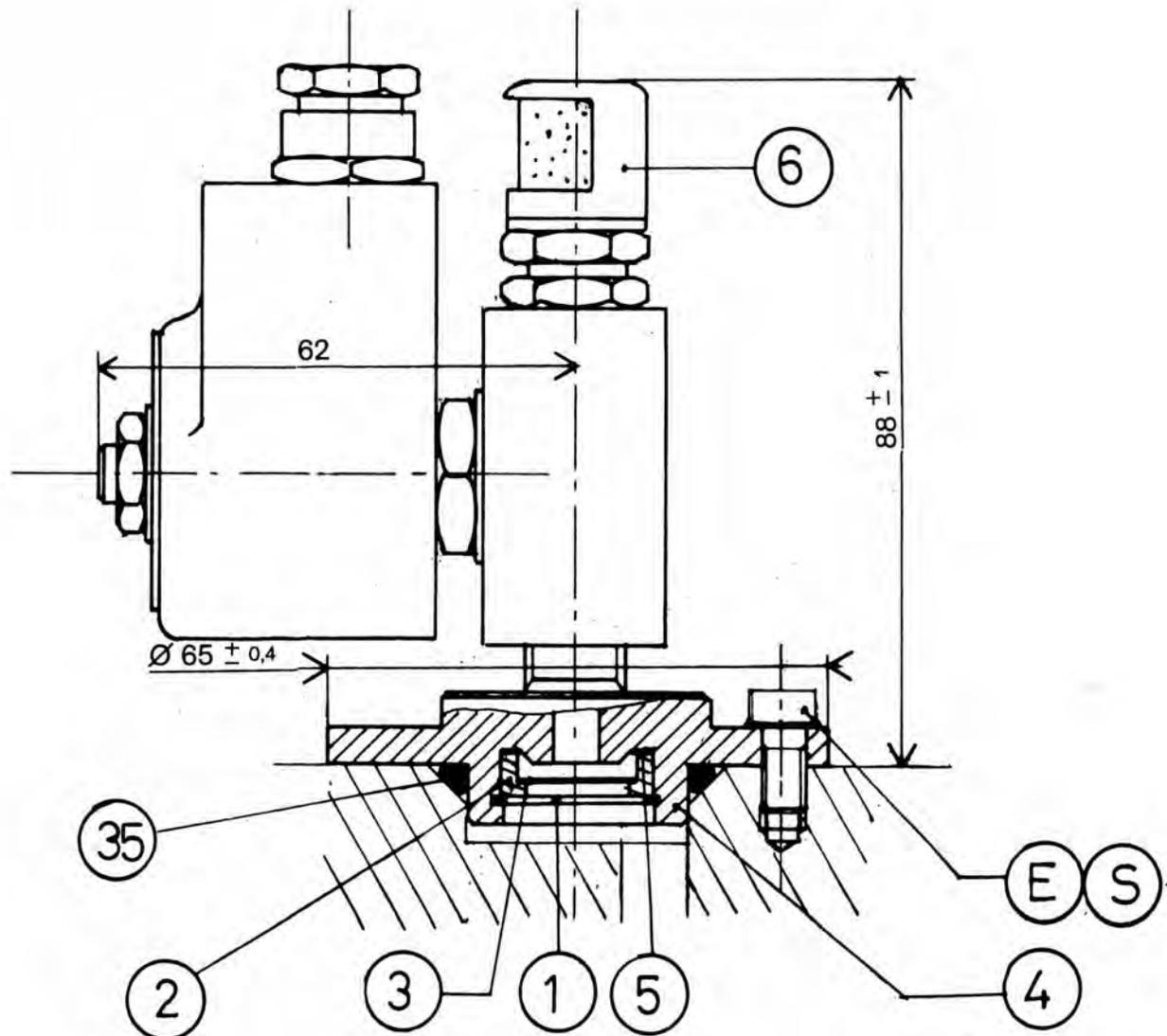
#### 8.1.4 Maintenance

Maintenance consists only of cleaning to ensure that the gas ballast is operating correctly. Procedure :

- unscrew screws (E). Remove remote controlled gas ballast assembly from frame;
- remove circlip (1), washer (2), valve (3), and washer (S);
- clean body (4) with solvent;
- degrease filter (6) with solvent and dry with compressed air;
- reassemble in reverse order.

#### 8.1.5 Spare Parts

Reference	Part Name	Part Number
35	O-ring (Viton)	082025



# OIL MIST ELIMINATOR

## 1 Introduction

### 1.1 Description

The oil mist eliminator is designed to separate oil droplets and contaminant particles in the exhaust gases emitted by oilsealed vacuum pumps.

### 1.2 Technical data

- Part number : 068442.
- Weight : 2 kg.
- Connection : Pneurop NW 40.
- Material : body : light alloy, cartridge : glass microfibers with epoxy binder.
- Connection to pump : black side.

### 1.3 Delivered with :

- 1 NW 40 centering ring with Perbunan seal (no. 068194),
- 1 NW 40 quick-connect clamp (No. 083267).

### 1.4 Dimensions

See figure 1.

## 2.2 Operating principle

### a) Principle

When operating at high pressure, forepumps exhausts an oil mist entrained by the gas flow. The cartridge in the eliminator filters the gas, trapping the oil by coalescence.

When the separator is mounted vertically above the pump, the condensed oil is recycled into the oil casing through the cartridge if the intake pressure remains below 1 mbar for a sufficiently long time.

### b) Clogging

The separator has a safety valve (5) set to 0.5 bar relative pressure, which prevents overpressure in the oil case when the pump is pumping vapors which may clog the cartridge. Avoid solid or sticky deposits that could cause valve to stick to cartridge and malfunction.

### c) Applications not recommended

Alcatel does not recommend using oil mist eliminators in the following applications : drying, freeze-drying, impregnation of polymerizable resins, or debubbling of monomers.

Because the cartridge is flammable, it must not be used when pumping gases such as oxygen and silane, corrosive products, or for microelectronics applications.

## 2.3 Installation

The separator is mounted with its black side on the discharge of a 2033, 2063 pump. The orange side can be connected to a gas exhaust line.

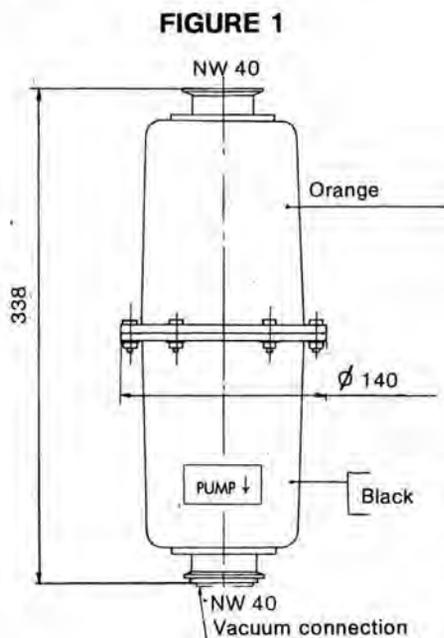
On the pump, remove protective cap (23) and elastomer valve (70) from the discharge port of the forepump.

On the oil mist eliminator, remove protective caps (14).

Connect eliminator to pump with the connecting accessories supplied.

Start pump.

In operation, oil and deposits are collected by the filter until it clogs, in which case, valve (5) bypasses the filter if the internal pressure is higher than 0.5 bar relative pressure.



When using an oil mist eliminator if the pump is connected to a chimney or ventilating duct, check to be sure the pressure loss does not exceed 0.3 bar.

## 2.4 Maintenance (see figure 2)

### a) Cartridge saturation

When excess fumes or droplets appear at the oil mist eliminator outlet, the cartridge is saturated. The time the cartridge takes to saturate will depend on the number of pumping operations, the volume of gas pumped and the type of oil used.

When the cartridge is saturated, change it as follows.

### b) Disassembly

- Unscrew connections (8), (9), (10) making sure spring (6) does not expand suddenly.
- Remove in order; upper body (16), O-ring (7), spring (6), valve (5), and O-ring (4).
- Remove cartridge (2) and flat gasket (3).

### c) Cleaning

Metal parts are cleaned with solvents. Conform to safety instructions of solvents vendor for using these solvents.

#### ■ Never clean filter cartridge. Always replace with a new one.

■ After using mineral oil, clean metal parts with solvents such as 1.1.1 trichloroethane or 1.2 dichloroethane (clean when cold).

■ After using synthetic oil (ALCATEL 113, FOMBLIN YL VAC 25-6\*, KRYTOX 15-25\*\*), clean metal parts while hot with solvents such as trichloroethylene or perchloroethylene (use proper equipment and take necessary precautions). Alternatively, clean with FREON 113\*\* while cold.

■ Always replace old gaskets by new ones.

### d) Reassembly

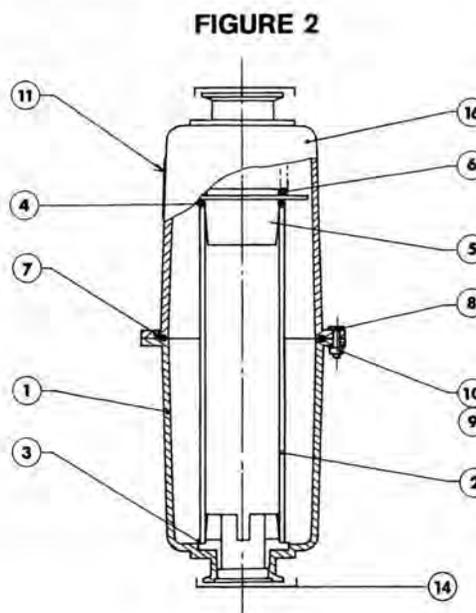
- Place flat gasket (3) in lower black body (1).
- Fit a new cartridge (2) making sure that both surfaces of the gasket are in good condition.
- Install O-ring (4) on safety valve (5), then position this valve on cartridge (2).
- Position spring (6) on (5) and O-ring (7) in its groove.
- Mount upper body (16) on lower body (1) using fasteners (8, 9, 10).

\* Registered Trademark MONTEDISON.

\*\* Registered Trademark DU PONT DE NEMOURS.

## 2.5 Spare parts

No. in diagram	Quantity	Part	Part No.
2	1	Filter cartridge	068443
3	1	Flat gasket	068446
4	1	O-ring	082131
7	1	O-ring	079248



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### 8.3. LIQUID NITROGEN TRAP NW 40

#### 8.3.1 Description

The liquid nitrogen trap is mounted on the intake of a mechanical roughing pumps 33/63 m<sup>3</sup>/h. Made entirely of stainless steel, it is equipped with a purge system in its lower part.

#### 8.3.2 Characteristics and part number

Dimensions : see figure 1.  
 Connections : NW 40 Pneurop.  
 Weight : 3 kg.  
 Liquid nitrogen capacity : 1 liter.  
 Conductance at 10<sup>-1</sup> mbar : 55 l/s.  
 Autonomy (P < 10<sup>-4</sup> mbar) : 15 hours.  
 Pumping speed (water vapor) : 10 l/s.  
**Part number** : 786537.

#### 8.3.3 Operating principle

The liquid nitrogen trap is used for cryogenic pumping of vapors and gases with condensation temperatures above 77 K (temperature of liquid nitrogen). It therefore increases pumping speed for these vapors or gases.  
 It protects the pump against condensable vapors that could be entrained during pumping.  
 It prevents oil from being drawn into the system by back diffusion.

#### 8.3.4 Installation

- Accessories whose tightness and materials are compatible with the pumped gases and the required safety conditions must be used upstream and downstream of the trap.
- Read § 8.3.5 and 8.3.6 before installing liquid nitrogen trap.
- The trap openings are provided with ISO NW 40 flanges for Pneurop type quick connect clamps, allowing various fittings to be connected (see diagram 5).
- See figure 2.

#### 8.3.5 Operation

**Important note** : in general, the trap should not be used at pressures above some mbar, because it becomes contaminated very rapidly under these conditions.

A system with a by-pass valve should be used, or the trap should not be filled until the pressure is sufficiently low (5.10<sup>-2</sup> mbar).

##### a) Filling with liquid nitrogen

- Lower pressure in trap until it is nearly 5.10<sup>-2</sup> mbar.
- Fill trap with liquid nitrogen.
- Use a funnel or filling tube less than 14 mm in diameter.
- Let trap cool, then top up a few minutes later.

##### b) Time between recharges

- The time between recharges depends on the following :
- frequency of use,
  - operating pressure (operation at high pressure causes more rapid contamination),
  - nature of pumped gases (quantity of condensable vapor).
- For pumping on a clean chamber at ultimate vacuum, the trap can be used for 12 to 15 hours between recharges.

#### 8.3.6 Maintenance

**IMPORTANT** : each time the system is dismantled, take all necessary precautions to ensure safety and protection of personal against possible toxicity, corrosion, and radioactivity of residues.

Proceed as follows :

- Purge system with dry nitrogen before working on it.
- Wear gloves, goggles and mask.
- Ventilate area thoroughly and disassemble parts under a fume hood.
- Collect residues in appropriate containers.
- Do not simply discard residues, and have them destroyed by a competent organization if necessary.

#### Important note :

Do not do the following when using a trap :

1. **Close trap under vacuum when cold, and allow to warm up** : if the pumped products are in the gase phase at room temperature, overpressure will be created in the trap which depends of the saturated pressure from pumped products.

2. **Regenerate trap by allowing it to warm up and then pumping down using a mechanical pump.**

The pump and the oil in it will be contaminated as a result of a large quantity of products having to be trapped in a very short time.

##### a) Flushing NW 40 Nitrogen Trap

When the products being pumped are liquid at room temperature, the trap can be flushed.

**Note** : Flushing opens a contaminated pumping system to the environment.

Take all precautions necessary to ensure personnel safety; see § V.

##### Procedure :

With trap cold, flush system with dry nitrogen.

Isolate trap by closing isolation valves.

Open purge and allow trap to warm up.

The condensed products will liquefy and will be evacuated through the purge. When operation is complete, close purge and pump down trap again.

##### b) Cleaning

With trap cold, break vacuum with dry nitrogen.

Isolate trap by closing isolation valves.

Disconnect trap from system.

Open purge under a fume hood and allow trap to warm up.

The condensed products will liquefy. Purge the trap.

Then remove the cover together with the tube by removing the four bolts.

After using mineral oil, dip body and tube of trap in a solvent such as 1.1.1. trichloroethane or 1.2. dichloroethane (cold cleaning).

**After using synthetic oils** (Alcatel 113, Fomblin YL VAC 25.6\*), clean parts when hot with a solvent such as trichloroethylene or perchloroethylene.

During hot cleaning, use appropriate equipment and take necessary precautions. If traces of oil remain after cleaning, remove them with Freon 113\*\*.

Freon 113\*\* can also be used for ordinary cold cleaning.

Rinse trap with alcohol and dry thoroughly.

Reclose purge of NW 40 trap and replace tube on body (handle carefully).

Replace trap in system.

Pump down again to degas trap.

\* Registered Trademark of Montedison.

\*\* Registered Trademark of Dupont de Nemours.

##### c) Spare parts

Description	P/N
Drain O-ring	082100
Cover O-ring	082153

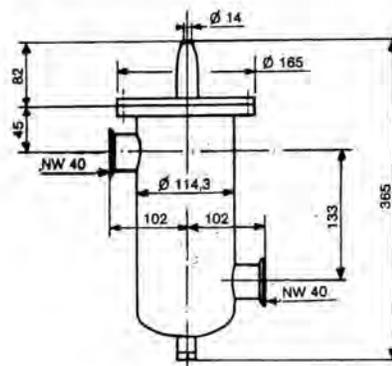


Diagram 1 : Dimensions

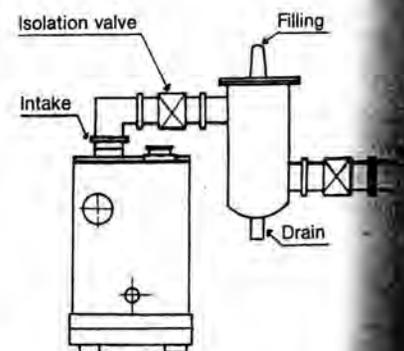


Diagram 2 : Assembly

## DUST FILTER NW 40 (FAP 60)

### 1. Description

The dust filter is installed on the intake of a pump or for pumping set handling dust or particle-laden gases (vacuum packing, metallurgy, dry manufacture, evaporation...).

The filter collects dust particles with a diameter greater than 2 microns and thus protects the pumping system without any appreciable pressure drop.

This accessory is designed for the pumping of not very corrosive gases and is therefore not recommended for use in the microelectronic field when condensable vapors are pumped and also with polymer products.

### 2. Characteristics

Overall dimensions : See figure 1.

Connection : NW 40 Pneurop.

Part number : 068480.

Weight : 3.9 kg.

Material : mild steel body,  
PC foam filtering elements.

Filtration capacity : 65 m<sup>3</sup>/h.

Maximum service temperature : 80°C.

High pressure pumping coefficient : 1.1.

Connection to pump : horizontal branch side.

### 3. Installation

- a) As a general rule, the sealing arrangement and materials used for the manufacture of the accessories used upstream and downstream of the dust filter should be compatible with the gases handled and the desired safety requirements.
- b) The dust filter ports are equipped with Pneurop NW 40 ISO ends for quick-disconnect couplings allowing adaptation of various piping elements (see plate 5).
- c) Prior to connecting the filter to the system, mark the installation direction; the horizontal branch is to be connected to the for-pump intake.

### 4. Utilization - Maintenance

#### a) Saturation of dust filter

A reduction of the pumping velocity indicates filter clogging. In this condition, the filtering elements cause a pressure drop which varies according to the degree of contamination. It is then necessary to replace the filtering elements and clean the filter.

#### b) Dismantling of dust filter (see figure 2)

**CAUTION :** Prior to performing any work on the filter, ensure that the pump is stopped and that the filter is subjected to the atmospheric pressure.

- Dismantle the body (7) by turning back the thin section of the seal (4) at A.
- Remove the nut (5), withdraw the filtering element support plate (3).

#### c) Cleaning

- Shake the filtering elements (6) horizontally by hand and check their condition.
- Remove the dust accumulated in the filter base by means of a clean cloth. If a detergent is used, check that it is compatible with the filtering element materials.
- Check the seals (2), (4) and (8) for condition.
- If necessary, change all the filtering elements : we recommend that all the filtering elements are replaced :
  - every TWO YEARS (18 to 36 months according to the service conditions), with the wear being approximately the same for each element
  - after three cleaning operations.

#### d) Reassembly

- Replace the seals (2), (4) and (8) then re-install the filtering element plate and tighten the nut (5).
- Position the cover (1) on the body (7) and turn up section A of the seal (4).

### 5. Spare parts

Item	Description	Part number
6	1 set of 26 filtering elements	068485
4	1 special moulded seal*	

\* Particular manufacturing. No stored.

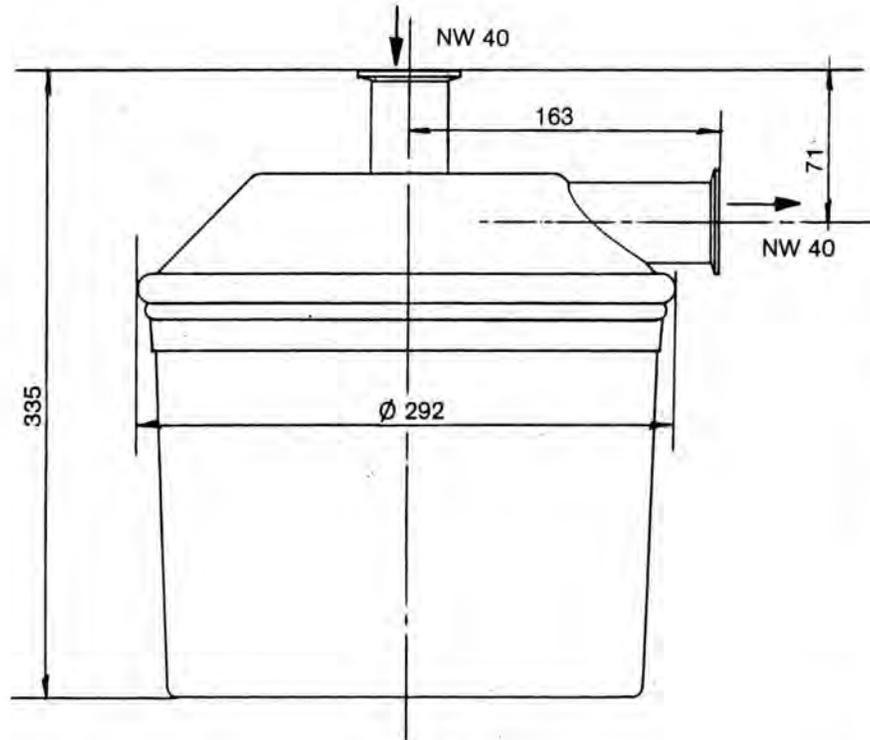


Figure 1

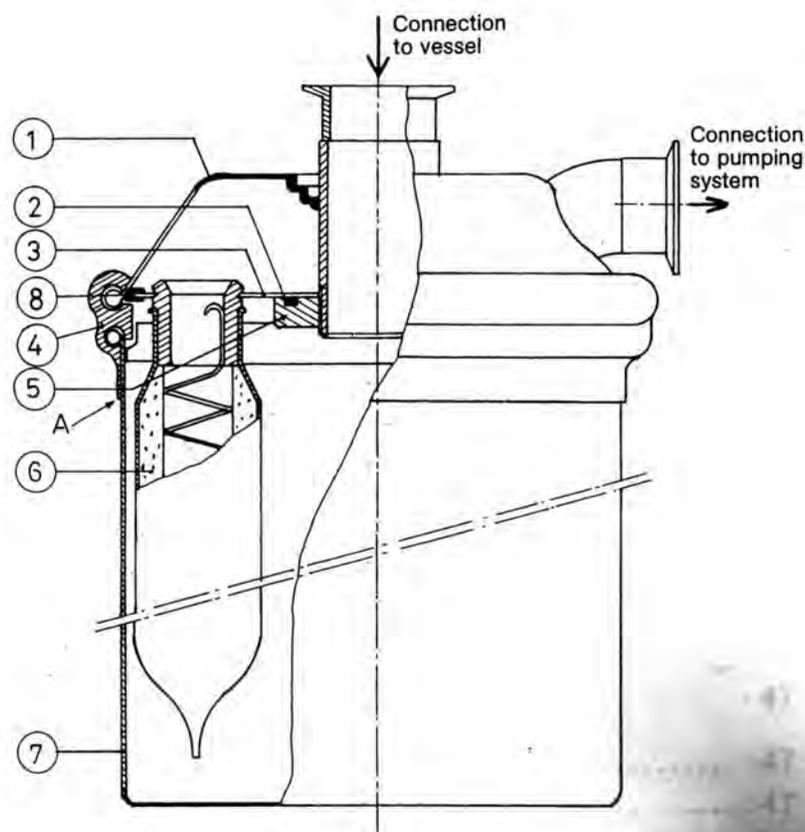


Figure 2

1. Cover
2. Seal
3. Filtering element support plate
4. Moulded seal
5. Nut
6. Filtering elements
7. Filter body
8. O-ring

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*Discarded*  
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# DIAGRAM 03 : ELECTRIC MOTORS

## CHARACTERISTICS, CONNECTIONS, PROTECTIONS

The following electrical information is intended as a guide : local electrical codes ; NEMA specifications and procedures must be adhered to for all electrical devices.

Use of an electrical protective device on the pump motor protects :  
 - The motor : in the event of overvoltage or pump seizure, the resulting excess current can destroy the motor windings and possibly the starter.

- The pump : in the event of a locked pump rotor due to contaminated oil, presence of particles, or non-lubrication, serious damage may occur.

### Type of protection

NEVER USE FUSES TO PROTECT A THREE-PHASE MOTOR UNLESS ALSO FITTED WITH A DIFFERENTIAL SYSTEM : Differential thermal circuit interrupters or motor starter must be used ; the mechanism includes a quick-opening switch controlled by a bimetallic strip, which is activated by excessive current draw.

### Choice of size

Two operating modes must be considered : starting and continuous duty.

### Starting :

During starting, the torque furnished by the motor to start the pump is considerable :

- In a **single-phase motor** : use of the auxiliary phase and a starting current which can reach 5 to 7 times the rated current ;
- In a **three-phase motor** : excess current 2 to 2.5 times the rated current.

### Starting in a Cold Environment (less than 18°C/65°F)

In certain cases, when the pump has to start in a cold environment, or with slightly contaminated or viscous oil, the current after starting can remain high until the pump oil heats up (10 to 20 minutes) :

- **single-phase motor** : twice the rated current.
- **three-phase motor** : 1.5 times the rated current.

These values are given as examples, and can vary according to the type of pump and oil used.

### Continuous Duty

This is the normal pump operating mode after about 1 hour of operation. The current is then slightly less than the rated current of the motor.

As a consequence, dual integrated protection should be used : one for continuous duty (which will also protect the pump for starts under normal conditions - oil clean, temperature above 18°C, etc.), and one for start conditions.

When starting : the time the pump takes to get up to full speed should not exceed 15 seconds.

### Pumps on 50 Hz (European pumps)

MECHANICAL PUMPS	MOTOR	POWER	VOLTAGE	SIZE
2002 A - 2002 BB	Single phase	0,170 kW	220 V	2 A
1004 A - 2004 A - 2008 A 1004 AC - 2008 AC	Single phase	0,375 kW	220 V	4 A
1012 A - 2012 A 2012 AC - 2012 CP - 2012 AH	Single phase	0,375 kW	220 V	6 A
1004 A - 2004 A 1004 AC	Three phase	0,375 kW	220 V 380 V	2 A 1,2 A
2008 A - 1012 A - 2012 A - 2012 AH 2008 AC - 2012 AC - 2012 CP	Three phase	0,375 kW	220 V 380 V	4 A 2 A
2020 A - 2020 AC - 2020 CP	Single phase	0,55 kW	220 V	6 A
	Three phase	0,55 kW	220 V 380 V	4 A 2 A
2033 - 2033 C 2033 CP+ - 2033 H	Three phase	1,1 kW	220 V 380 V	6 A 4 A
2063 - 2063 C 2063 CP+ - 2063 H	Three phase	2,2 kW	220 V 380 V	10 A 6 A

### Pumps for 60 Hz (US Pumps)

MECHANICAL PUMP	MOTOR	POWER	VOLTAGE	SIZE
2002 A 2002 BB	Single phase 60 Hz	200 W	120 V 220 V	4 A 2 A
1004 A - 1004 AC 1012 A 2008 A - 2008 AC 2012 AH	Single phase 50 Hz	0,375 kW	100 V	10 A
	Single phase 60 Hz	0,550 kW	100 V	10 A
	Single phase 60 Hz	0,245 kW	115 V	8 A
2004 A 2012 A 2012 AC 2012 CP	Three phase 50 Hz	0,375 kW	200 V	4 A
	Three phase 60 Hz	0,245 kW	200 V	4 A
	Three phase 60 Hz	0,375 kW	220 V	4 A
	Three phase 60 Hz	0,550 kW	460 V	4 A
2020 A 2020 AC 2020 CP	Single phase 50 Hz	0,550 kW	100 V	10 A
	Single phase 60 Hz	0,660 kW	100 V	10 A
	Single phase 60 Hz	0,660 kW	115 V	8 A
2033 2033 C 2033 CP+ - 2033 H	Three phase 60 Hz	1,1 kW	200 V	6 A
	Three phase 60 Hz	1,1 kW	220 V	6 A
	Three phase 60 Hz	1,1 kW	460 V	4 A
2063 2063 C 2063 CP+ 2063 H	Three phase 50 Hz	2,2 kW	200 V	10 A
	Three phase 60 Hz	2,2 kW	200 V	10 A
	Three phase 60 Hz	2,2 kW	220 V	10 A
	Three phase 60 Hz	2,2 kW	460 V	6 A

### Electrical Connections for Three-Phase Motors

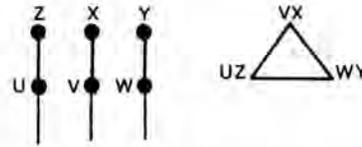
The pumps can be equipped with different brands of motors, the numbered connections are for your information. If there is any doubt, only the specification label in the electrical box will supply the correct information.

#### 1) CEI Terminal Box (Europe) :

##### LOW-VOLTAGE CONNECTIONS

200 or 220 V - 50 or 60 Hz

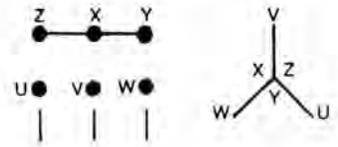
##### Delta connection



##### HIGH-VOLTAGE CONNECTIONS

380 V - 50 Hz or 460 V - 60 Hz

##### Star connection



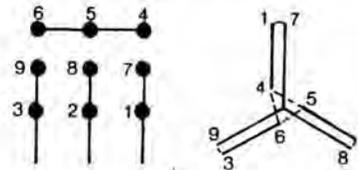
#### Connection examples.

#### 2) NEMA Terminal Box (USA) (9 wires) :

##### LOW-VOLTAGE CONNECTIONS

200 or 220 V - 60 Hz

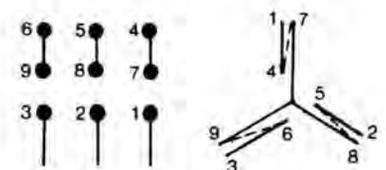
##### Parallel connection



##### HIGH-VOLTAGE CONNECTIONS

460 V - 60 Hz

##### Serie connection

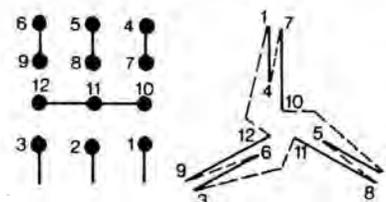


#### 3) NEMA Terminal Box (USA) (12 wires) :

##### LOW-VOLTAGE CONNECTIONS

220 or 240 V - 50 or 60 Hz

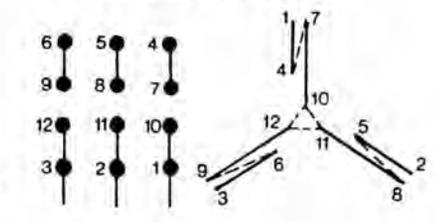
##### Parallel connection



##### HIGH-VOLTAGE CONNECTIONS

380 or 460 V - 50 or 60 Hz

##### Serie connection



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TABLEAU DE SÉLECTION DES POMPES ET ACCESSOIRES EN FONCTION DE L'APPLICATION  PUMPEN UND ZUBEHÖR NACH ANWENDUNGSBEREICH	POMPES PUMPEN			HUILES ÖL	ACCESSOIRES ZUBEHÖR										TABLE OF PUMPS AND ACCESSORIES RECOMMENDED FOR DIFFERENT APPLICATIONS	
	Standard	Chimiste - Chemie	Hermétique - Hermetik	CP ... plus CPH ... plus	Minérale - Mineral öl	ALCATEL 113 (PTFE)	Séparateur de brouillard Ohnebelabscheider	Piège à sorption Sorptionstalle	Piège à azote liquide Flüssig-Stickstoff-Falle	Filtre à huile (D) Oilfilter (D)	Filtre à huile (DE) Oilfilter (DE)	Lest d'air automatique Automatischer Gasballast	Purge d'azote Neutral gasreinigung	Condenseur Kondensator		Filtre à poussières Staubfilter
Cryogénie Kryotechnik	○		×		×		×	○	○							Cryogenics
Récupération de gaz précieux Rückgewinnung teurerer Gase	○		×		○	○	×	×				▲				Noble gas recovery
Pompage de l'oxygène Pumpen von Sauerstoff	×			×	▲	×	○	▲								Oxygen pumping
Séchage Trocknung	×				×		◇	⊖	⊖			×		×	⊖	Drying
Lyophilisation alimentaire Gefriertrocknung	×				×		◇				×				⊖	Freeze drying, food
Lyophilisation biologique Biolog. Gefriertrocknung	⊖			×	×	○	◇		⊖	⊖	⊖	×				Freeze drying, biology
Dépôt en phase gazeuse (CVD) + LPCVD Beschichten in Gasphase + LPCVD		×		○	×	○	◇		▲	×		○	×		○	CVD + LPCVD
Implantations d'ions Ionimplantation		×			×	○	○	○			×					Ion implantation
Gravure sèche Trockenätzung	◇	⊖	◇	×	⊖	×	⊖	○	○	⊖	×	⊖	×			Dry etching
Evaporation sous vide Vakuumverdampfung	×				×		○	○	○	◇					⊖	Vacuum evaporation
Pulvérisation cathodique Katodenerstäubung	×			○	×	⊖	×				⊖	⊖				Cathode sputtering
Epitaxie Epitaxie	×	○			×		×	×								Epitaxy
Imprégnation sous vide Vakuuimprägnierung	×				×		⊖	○		◇		⊖	×		◇	Vacuum impregnation
Industrie frigorifique Kühlindustrie	×				×		×		⊖			⊖				Refrigeration industry
Fabrication de lampes Lampenfabrikation	×		○		×	○	×		⊖		⊖				○	Bulb manufacture
Pompage de tube cathodique Evakuierung von Katodenstrahlröhren	×				×		×	⊖							⊖	Cathode tube pumping
Distillation moléculaire Molekulardestillation	×	◇		○	○	⊖	⊖		⊖			○				Molecular distillation
Emballage sous vide Vakuumverpackung	×				×		×	×	○							Vacuum packaging
Contrôle d'étanchéité Lecksuche	×				×		×		○			○				Leak detection
× Conseillé - Empfohlen ○ Possible - Möglich ⊖ Sous réserve - Vorbehaltlich ◇ Non recommandé - Nicht empfohlen ▲ Dangereux - Gefährlich	Standard	Chemical	Hermetic	CP ... plus CPH ... plus	Mineral	Alcatel 113 (PTFE)	Oil mist eliminator	Sorption trap	Liquid nitrogen trap	Oil filtration (D filter)	Oil neutralization (DE filter)	Remote controlled gas ballast	Neutral Gas supply	Condenser	Dust filters	× Recommended ○ Possible ⊖ Possible with limitation ◇ Not recommended ▲ Dangerous
	PUMP			OIL		ACCESSORY										

ALCATEL vous fera profiter de son expérience en vous conseillant à la fois sur le choix de la pompe et sur celui des accessoires répondant au mieux à votre application.  
 ALCATEL steht Ihnen zur Beratung beim Kauf von Pumpen und Zubehör mit seiner Erfahrung zur Verfügung.  
 ALCATEL'S experience may assist you in proper selection of pumps and accessories best suited for your application.

ACCESSOIRES DE RACCORDEMENT ET ELEMENTS DE CANALISATION	CONNECTINGS ACCESSORIES AND VACUUM FITTINGS	ANSCHLUSSFLANSCH UND VERBINDUNGSELEMENTS	RACCORDEMENT DN 40 Ref. NW 40 CONNECTION P/N NW 40 FLANSCH Best Nr.	
			Pompes standards Standard pumps Standard-Pumpen	Pompes chimistes Chemical pumps Chemie-Pumpen
Anneaux de centrage - inox/Perbunan - inox/Viton	Centering rings - stainless steel/Buna - stainless steel/Viton	Zentrierringe - Edelstahl/Perbunan - Edelstahl/Viton	068194	068230
Colliers de serrage	Quick connect clamp	Spannringe	083267	083267
Tuyaux plastique armé longueur 1 m	Renforced plastic hoses 1 m lenght	Plastikschläuche Länge 1 m	068272	
Tuyaux flexibles inox longueur 0,5 m longueur 1 m	Flexible stainless steel hoses 0.5 m lenght 1 m lenght	Edelstahl-Wellschläuche Länge 0,5 m Länge 1 m		068374 068375
Embouts lisse - Macrovac - Inox.	Long nipples - Macrovac - stainless steel	Anschweissflansche - PVC - Edelstahl	068592	068217
Coudes égaux - Macrovac - Inox.	Symmetrical elbows - Macrovac - stainless steel	Winkelstücke 90° - PVC - Edelstahl	068587	068238
Tés égaux - Macrovac - Inox.	Symmetrical tees - Macrovac - stainless steel	T - Stücke - PVC - Edelstahl	068588	068564
Obturateurs - Macrovac - Inox.	Blank-off flanges - Macrovac - stainless steel	Blindflansche - PVC - Edelstahl	068595	068197

PLANCHE 5 / DIAGRAM 5 / ABBILDUNG 5

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**PIECES DE RECHANGE POUR :**  
**ERSATZTEILLISTE FUR :**  
**SPARE PARTS LIST FOR : 2033 - 2063**

REP.	DESIGNATION	SPECIFICATION	BENENNUNG	TYPES			REF. P/N Best. Nr	Poch. joints Minor maint. Dichtungss.	Lot. maint. Major maint. Erzatzteils.
				2033	2063				
1	Bâti flasque	Central housing	Gehäuseflansch	1			054117		
2	Socle	Base	Sockel	1	1		054405		
3	Cuve équipée	Equipped oil case	Behälter mit Ölstandglass	1	1		054102		
4	Stator basse pression	Stator (low pressure)	Niederdruckstator	1	1		054408		
5	Flasque médian	Intermediate flange	Mittelflansch	1	1		065158		
6	Stator haute pression	Stator (high pressure)	Hochdruckstator	1	1		065566		
7	Flasque arrière	Rear flange	Hintere Flansch	1	1		054120		
8	Frein d'axe "Cerclam"	Circlips	Bremse "Cerclam"	2	2		054411	x	
9	Couvercle	Cover	Deckel	1	1		054121	x	
10	Joint torique C2,5-D38	O-ring	Rundschnurring	1	1		054413		
11	Amortisseur LXA 100 mod.G	Shock mount	Dämpfer	4	4		054122		
12	Tube porte joint	Tube	Röhre	2	2		054415		
13	Joint torique C 2 - D 7,8	O-ring	Rundschnurring	2	2		054250		
14	Joint torique C 2 - D 127,5	O-ring	Rundschnurring	4	4		065505		
15	Joint torique C 2 - D 148	Stop	Anschlag	1	1		071188	x	
16	Butée	Stop	Anschlag	1	1		071188	x	
17	Rotor basse pression	Rotor (low pressure)	Niederdruckrotor	1	1		054126		
18	Palette basse pression	Vane (low pressure)	Niederdruckschieber	2	2		054126		
19	Ressort de palette	Vane spring	Schieberfeder	9	9		083633	x	
20	Rotor haute pression	Rotor (high pressure)	Hochdruckrotor	1	1		083633	x	
21	Palette haute pression	Vane (high pressure)	Hochdruckschieber	2	2		053323		
22	Gicleur	Jet	Düse	1	1		054140		
23	Gicleur flasque médian	Jet intermediate flange	Mittelflanschdüse	1	1		054140		
24	Protecteur de refoulement	Protector	Auspuffschutz	2	2		079234	x	
25	Embout	Nipple	Anschweiß flansch	1	1		079234	x	
26	Rouleau cylindrique	Pin	Zylinder	0	10		079010	x	
27	Plaque feutre	Felt	Filz	1	1		079241	x	
28	Capot de soupape BP	Valve cover LP	Niederdruckventilgehäuse	1	1		065510		
29	Ressort soupape	Valve spring	Ventilfeder	3	3		065510		
30	Soupape (viton)	Valve (viton)	Ventil (viton)	3	3		054124		
31	Capot de soupape HP	Valve cover HP	Hochdruckventilgehäuse	1	1		054425		
31*	Corps de lest d'air	Gas ballast	Gasballastkörper	1	1		087941		
32*	Rondelle	Washer	Scheibe	1	1		054400		
33*	Clapet	Clapper	Klappe	1	1		087942		
34*	Anneau truarc "Self-Loking"	Circlips	Ring	1	1		087942		
35	Joint torique R 22 c 3,6 - D 36,5	O-ring	Rundschnurring	1	1		054125		

**PIECES DE RECHANGE POUR :**  
**ERSATZTEILLISTE FUR :**  
**SPARE PARTS LIST FOR : 2033 - 2063**

REP.	DESIGNATION	SPECIFICATION	BENENNUNG	TYPES			REF. P/N Best. Nr	Poch. joints Minor maint. Dichtungss.	Lot. maint. Major maint. Erzatzteils.
				2033	2063				
36*	Joint torique R 8 C 2,7 - D 14,3	O-ring	Rundschnurring	1	1		082108 082108	x x	
37									
38*	Bouton de manœuvre	Knob	Drehknopf	1	1		054219 054219		
39	Filtre d'aspiration	Inlet filter	Ansaugfilter	1	1		054202 054426		
40	Joint torique R 29 C 5,33 - D 40,64	O-ring	Rundschnurring	1	1		082129 082129	x x	
41	Accessoires de raccordement	Clamp connection	Verbindungssteile	4	4		068504 068504		
42	Corps de pompe à huile	Oil pump body	Ölpumpenkörper	1	1		054253 065513		
43									
44	Palette de pompe à huile	Oil pump vane	Ölpumpenschieber	1	1		054451 065514		x x
45									
46	Siège	Seat	Sitz	1	1		054144 054144		
47	Membrane (viton)	Membrane (viton)	Membran (viton)	1	1		054196 054196	x x	
48	Piston	Piston	Kolben	1	1		083331 083331		
49	Joint torique R 9 C 2,7 - D 15,9	O-ring	Rundschnurring	1	1		082109 082109	x x	
50	Ressort	Spring	Feder	1	1		054145 054145		x x
51	Cylindre	Cylinder	Zylinder	1	1		083077 083077		
52	Tube de prise d'huile	Oil pump intake tube	Öleinlass Stutzen	1	1		054268 065509		
53	Tube de prise d'air	Air admission tube	Lufteinlass	1	1		054212 054212		
54	Ressort	Spring	Feder	1	1		054149 054149		x x
55									
56									
57									
58									
60									
61	Ventilateur	Fan	Ventilator	1	1		054115 054435		
62	Anneau élastique denté	Elastic coupling	Elastische Zahnscheibe	1	1		054091 054356		x x
63	Joint cuve	Gasket	Behälterdichtung	1	1		054128 054427	x x	
64	Témoin niveau d'huile	Oil sight glass	Ölstandmeßstad	1	1		065079 065079		x x
64/1	Joint torique R 10	O-ring	Rundschnurring	4	4		082024	x	
65	Bouchon G 1 1/4	Fill plug	Stopfen	1	1		082925 082925		x x
66	Bouchon G 3/8"	Drain plug	Stopfen	1	1		082604 082604		x x
67	Embout de refoulement	Exhaust nipple	Auspuffstutzen	1	1		054131 054131		
68	Axe de soupape de refoulement	Exhaust valve shaft	Auspuffventilachse	1	1		054223 054223		
69	Circlips	Circlips	Klemmen	1	1		054133 054133		
70	Soupape de refoulement	Exhaust valve	Auspuffventil	1	1		054134 054134	x x	

**PIECES DE RECHANGE POUR :**  
**ERSATZTEILLISTE FUR :**  
**SPARE PARTS LIST FOR : 2033- 2063**

REP.	DESIGNATION	SPECIFICATION	BENENNUNG	TYPES				REF. P/N Best. Nr	Poch. joints Minor maint. Dichtungss.	Lot. maint. Major maint. Erzatzteils.
				2033	2063					
71	Goupille	Forelock	Stift	1	1			076261 076261	x x	
72	Filtre de refoulement	Exhaust filter	Auspuff-Filter	1	1			054151 054151		
73	Manchon de refoulement	Exhaust muff	Auspuffmuff	1	1			054152 054152		
74	Joint torique C3 - D 44	O-ring	Rundschnurring	1	1			087926 097926	x x	
75	Anneau de levage fileté	Eye hook	Gewinding	1	1			083004 082697		
76										
77	Joint torique C2 - D 16	O-ring	Rundschnurring	1	1			084149 084149	x x	
78	Joint à lèvres 20x35x7	Shaft seal	Simmering	3	3			079100 079100	x x	
79	Rouleau cylindrique	Pin	Zylinder	11	1			071040 071040		
80	Joint torique C3 - D 41	O-ring	Rundschnurring	1	1			079051 079051	x x	
81	Joint à lèvres 20x35x7 (viton)	Shaft seal (viton)	Simmering (viton)	1	1			079101 079101	x x	
82										
83										
87	Rondelle	Washer	Scheibe	1	1			065156		
95	Colle néoprène	Glue	Leim					089301		
96*	Ressort lest d'air	Gas ballast spring	Gasballast Feder	1	1			054114 054114		x x
97										
98										
99										
A	Vis H M 10x12	Screw	Schraube	4	4			082372 082372		
B	Vis CHc M 8x40	Screw	Schraube	2	2			081153 081153		
C										
D	Vis CHc M 8x20	Screw	Schraube	4	4			075514 075516		
E	Vis CHc M 10x20	Screw	Schraube	6	6			075529 075529		
F	Vis CHc M 6x12	Screw	Schraube	6	6			075529 075529		
G	Goujon	Stud	Stehbolzen	4	4			054135 054431		
H	Vis CHc M 5x8	Screw	Schraube	2	2			075522 075522		
I										
J	Vis imbus plus CHc M 10x20	Screw	Schraube	1	1			075024 075024		
K	Ecrou H M 8	Nut	Mutter	17	17			071214 071217		
L	Ecrou H M 10	Nut	Mutter							
M	Vis CHc M 6x20	Screw	Schraube	4	4			075530 075530		
N	Goujons	Stud	Stehbolzen	4	4			054127 054429		
O										

\* Pièces constituant le lest d'air - Référence 054279

Parts for Gas ballast P/N 054279

Teile für Gasballast Best. Nr 054279

**PIECES DE RECHANGE POUR :**  
**ERSATZTEILLISTE FUR :**  
**SPARE PARTS LIST FOR : 2033- 2063**

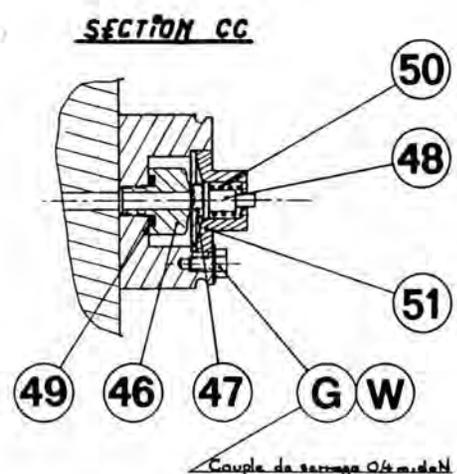
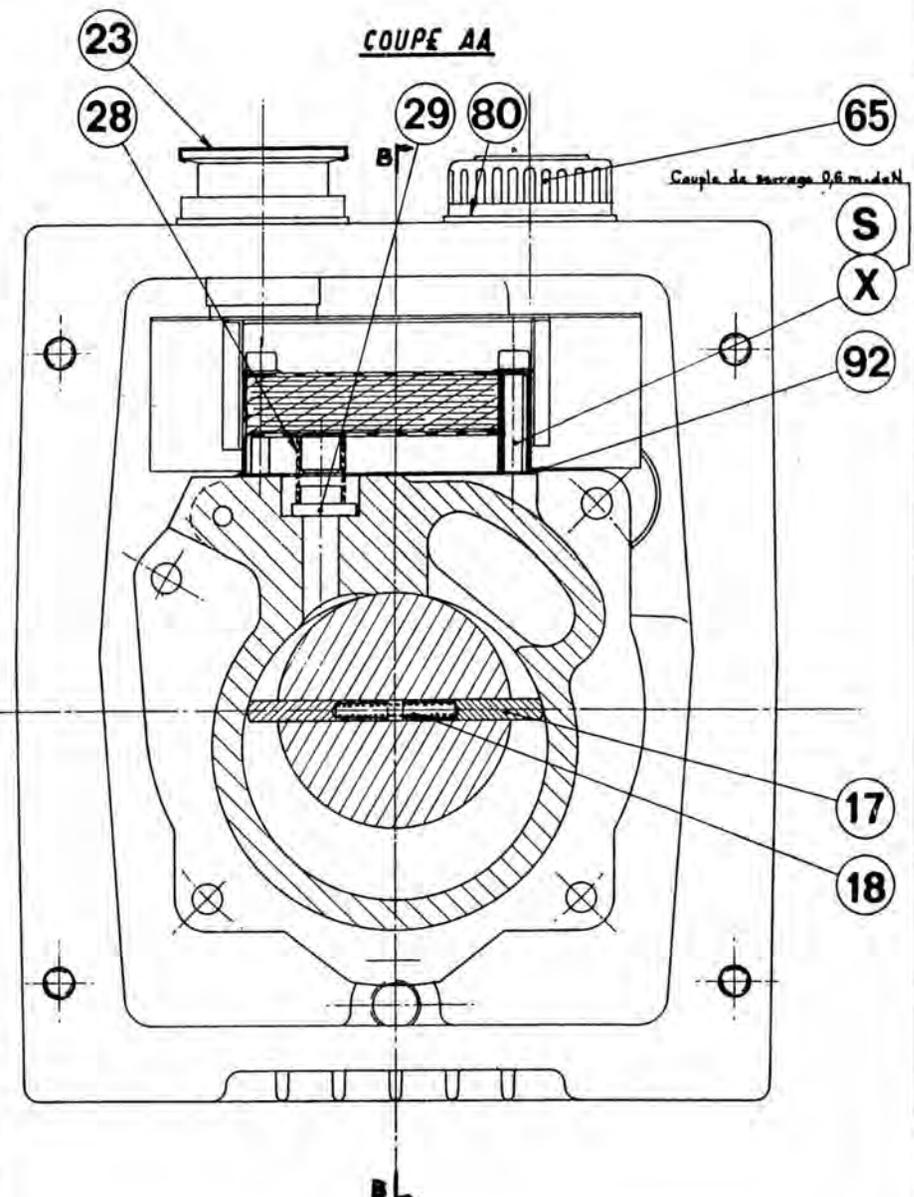
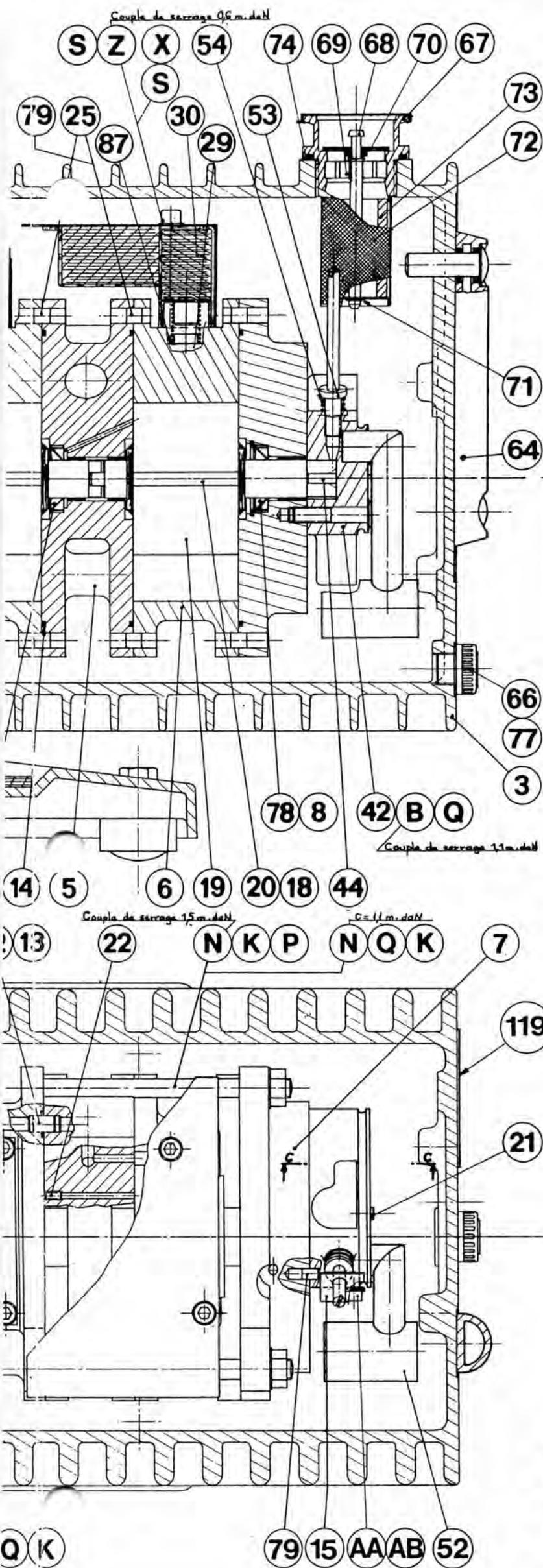
REP.	DESIGNATION	SPECIFICATION	BENENNUNG	TYPES				REF. P/N Best. Nr	Poch. joints Minor maint. Dichtungss.	Lot. maint. Major maint. Erzatzteils.
				2033	2063					
P	Rondelle ond. A 10	Washer	Scheibe	4	25			073456 073456	x	
Q	Rondelle ond. A 8	Washer	Scheibe	23	2			073455 073455	x x	
R										
S	Rondelle ond. A 6	Washer	Scheibe	16	16			073454 073454	x x	
T										
U	Goujon	Stud	Stehbolzen	8	8			075800 054430		
V	Rondelle Schnorr D 23 - d 10,5 - e 2,5	Washer	Scheibe	1	1			082543 082543		
W	Rondelle M 5U	Washer	Scheibe	2	2			065107 065107		
X	Vis CHc M 6x45	Screw	Schraube	6	4			075539 075539		
Y										
Z	Vis CHc M 6x60	Screw	Schraube.	0	2			081151		
AA	Vis CHc M 5x12	Screw	Schraube	1	1			075523 075523		
AB	Rondelle A 5	Washer	Scheibe	1	1			073453 073453		

**EQUIPEMENT VERSION EUROPEENNE - EUROPEAN VERSION - EUROPAISCHE AUSFUHRUNG**

101	Défecteur	Deflector	Deflektor	1	1			054147 054432		
102	Vis F/90° M 6x10	Screw F/90°	Schrauben F/90°	3	3			081171 081171		
103	Flasque moteur 50/60 Hz	50/60 Hz motor flange	50/60 Hz Motorflansch	1	1			054118 054419		
104	Manchon moteur 50/60 Hz	50/60 Hz motor coupling	50/60 Hz Motorkupplung	1	1			054116 054436		
105	Vis Hc M 6x12	Screw	Schraube	1	1			075606 075606		
106	Moteur 1,5 CV - 1500 tr/mn - 220/380 V	Electric motor 3 Ph - 1,5 HP 1800 tr/mn-60 Hz-230/460 V	Elektromotor 3 Ph - 1,5 CV 1500 tr/mn-50 Hz-220/380 V	50	60	Hz		054113 054112		
106	Moteur 3 CV - 1500 tr/mn - 220/380 V - 50 Hz	Electric motor 3 Ph - 3 HP - 1800 tr/mn-60 Hz-230/460 V	Elektromotor 3 Ph - 3 CV - 1500 tr/mn-50 Hz-220/380 V		50	60	Hz	054402 054461		
106	Moteur 50/60 Hz 1000 W 1500/1800 tr/mn 220/380 V 50 Hz 200/230/460 V 60 Hz	Electric motor 1000 W 1500/1800 tr/mn 220/380 V 50 Hz 200/230/460 V 60 Hz	Elektromotor 1000 W 1500/1800 tr/mn 220/380 V 50 Hz 200/230/460 V 60 Hz	1				054062		
106	Moteur 50/60 Hz 2200 W 1500/1800 tr/mn 220/380 V 50 Hz 200/230/460 V 60 Hz	Electric motor 2200 W 1500/1800 tr/mn 220/380 V 50 Hz 200/230/460 V 60 Hz	Elektromotor 2200 W 1500/1800 tr/mn 220/380 V 50 Hz 200/230/460 V 60 Hz		1			054063		
107	Vis CHc M 8x20 Vis CHc M 8x25	Screw Screw	Schraube Schraube	4	4			075514 082736		
108	Rondelle ond. A 8	Washer A 8	Scheibe A 8	4	4			073455 073455		

**PIECES DE RECHANGE POUR :**  
**ERSATZTEILLISTE FÜR :**  
**SPARE PARTS LIST FOR : 2033- 2063**

REP.	DESIGNATION	SPECIFICATION	BENENNUNG	TYPES			REF. P/N Best. Nr		
				2033	2063				
EQUIPEMENT VERSION U.S. - US VERSION - AMERIKANISCHE AUSFÜHRUNG									
101	Déflecteur d'air	Deflector	Deflektor	1	1		054147 054432		
102	Vis F/90° M 6x10	Screw F/90°	Schraube	3	3		081171 081171		
103	Flasque moteur	Motor flange	Motorflansch	1	1		054118 054419		
104	Manchon moteur	Motor coupling	Motorkupplung	1	1		054116 054436		
105	Vis Hc M 6x12	Screw Hc	Schraube	1			075606		
106	Moteur 50/60 Hz 1000 W 1500/1800 tr/mn 220/380 V 50 Hz 200/230/460 V 60 Hz	Electric motor 1000 W 1500/1800 tr/mn 220/380 V 50 Hz 200/230/460 V 60 Hz	Elektromotor 1000 W 1500/1800 tr/mn 220/380 V 50 Hz 200/230/460 V 60 Hz	1			054062		
106	Moteur 50/60 Hz 2200 W 1500/1800 tr/mn 220/380 V 50 Hz 200/230/460 V 60 Hz	Electric motor 2200 W 1500/1800 tr/mn 220/380 V 50 Hz 200/230/460 V 60 Hz	Elektromotor 2200 W 1500/1800 tr/mn 220/380 V 50 Hz 200/230/460 V 60 Hz		1		054063		
111	Anneau porte-joint NW 40	Centering ring NW 40	Zentrierringe NW 40	1	1		068194 068194		
112	Collier de serrage NW 40	Quick connect clamp NW 40	Spannring	1	1		083267 083267		
114	Embout NW 40	Nipple NW 40	Stützen NW 40	1	1		065010 065010		
118	Grille de protection	Screening grid	Abschirmgitter	1	1		054264 065511		
EQUIPEMENT JAPON - JAPAN VERSION - JAPANISCHE AUSFÜHRUNG									
101	Déflecteur	Deflector	Deflektor	1	1		054147 054432		
102	Vis F/90° M 6x10	Screw F/90°	Schraube	3	3		081171 081171		
103	Flasque moteur 50/60 Hz	Motor flange 50/60 Hz	Motorflansch 50/60 Hz	1	1		054118 054419		
104	Manchon moteur 50/60 Hz	Motor coupling 50/60 Hz	Motorkupplung 50/60 Hz	1			054116		
105	Vis Hc M 6x12	Screw Hc	Schraube	1	1		075606 075606		



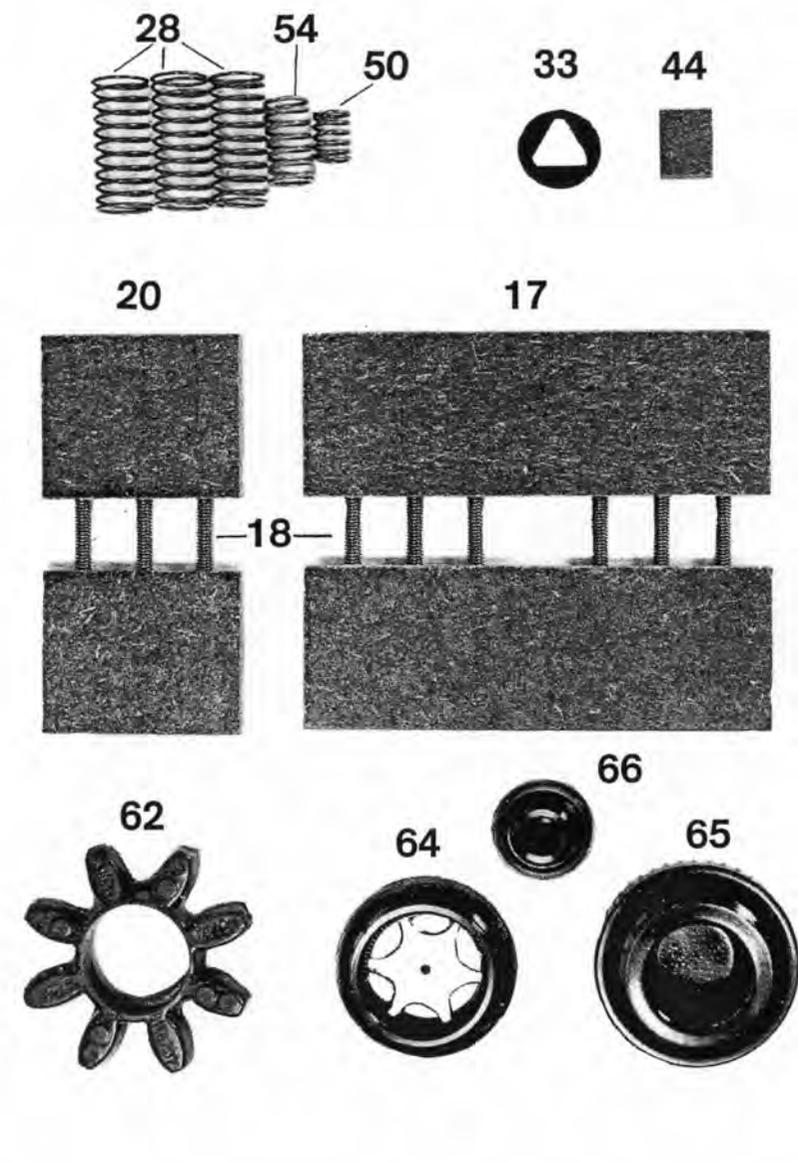
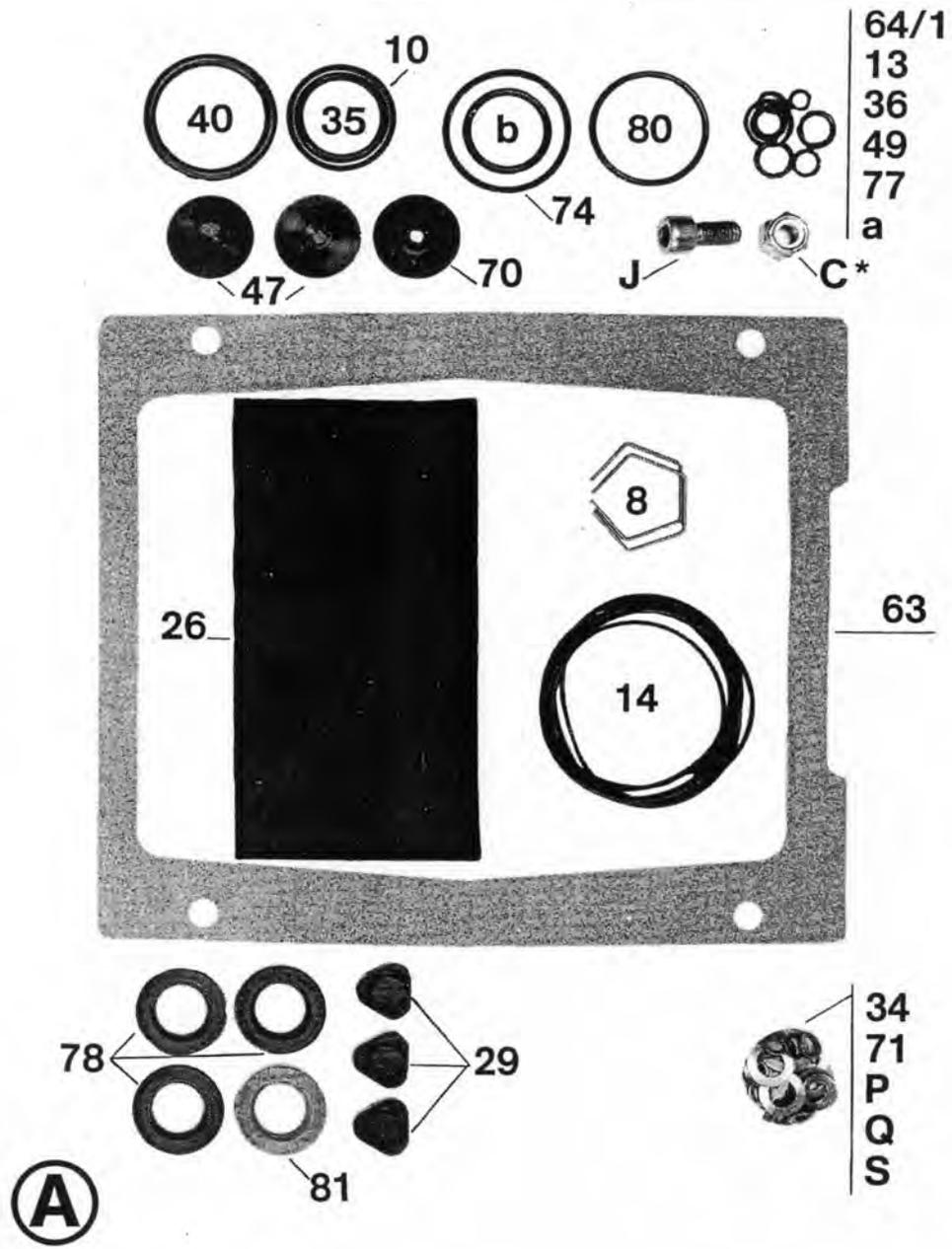
	Cote. A
2033	16,6 <sup>+0,8</sup>
2063	23,3 <sup>+0,8</sup>

2033 - 2063  
 PLAN D'ENSEMBLE  
 GENERAL DRAWING  
 ÜBERSICHTPLAN



POCHETTE DE JOINTS (A) – LOT DE MAINTENANCE (A) + (B)  
 MINOR MAINTENANCE (A) – MAJOR MAINTENANCE (A) + (B)  
 ERSATZDICHTUNGEN (A) – WARTUNGSMATERIAL (A) + (B)

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1033-1063 Pompes - Pumps - Pumpen : (A) Joint R5 / O-ring / Dichtung - (B) Joint R21 / O-ring / Dichtung.

\* 2033: Pompes ayant un numéro de série < 90964 / Pumps with serial number before 90964 / Pumpen mit Seriennummer vor 90964.

\* 2063: Pompes ayant un numéro de série < 88479 / Pumps with serial number before 88479 / Pumpen mit Seriennummer vor 88479.