MILTON ROY

Instruction Manual

MAXROY Controlled Volume Pump

MR.ENG.160-0601-001.08/2014

ENGLISH

SUMMARY

GB

I GENERALITIES

1.1 - INTRODUCTION

The MAXROY pump is a dosing pump with incorporated hydraulic diaphragm, oil-lubricated with sealed housing, with a variable swept-volume adjustment which can be set when stopped or running. It is designed for continuous service in industrial operation.

1.2 - OPERATING PRINCIPLE (See figure 1)

The worm and wheel (052) & (052A) drive, by means of an intermediate eccentric (2), the parallel bushing (037), which transmits a fixed stroke reciprocating motion to the hollow piston (012).The piston displaces the intermediate oil contained in the chamber (072) which actuates the diaphragm (098). The hydraulic chamber (072) connects with the housing (081) by means of radial orifices (1) in the hollow piston (012). The pinion (055A) acts on the piston sleeve (068).The orifices (1) are opened or closed by the sleeve (068) according to the position of the piston (012).The spring (434M) ensures accurate dosing by maintaining a relative pressure in the chamber (072) whilst the orifices (1) are open, this pressure being greater than the hydraulic loss through the control orifices.

SUCTION PHASE :
The hollow piston moves back. During the first two thirds of it's stroke length the orifices (1) are blocked by the piston sleeve (068); a suction pressure exists in the chamber (072); the diaphragm (098) follows the hollow piston (012); the pumped fluid enters into the pumping chamber (021). During the last third of it's stroke, the orifices (1) are open putting the chamber (072) and the housing (081) in direct communication; the diaphragm is pushed to it's back position by the spring (434M); the make up oil drawn in by the retreat of the hollow piston (012) is supplied from the housing (081).

DELIVERY PHASE :
The hollow piston moves forward. During the first third of it's stroke the orifices (1) are open; the diaphragm (098) is pushed to it's back position by the spring (434M); oil displaced by the hollow piston (012) is delivered into the housing (081) by way of the orifices (1). During the last two thirds of it's stroke the orifices (1) are blocked by the piston sleeve (068); the hollow piston (012) puts the hydraulic chamber (072) under pressure; the diaphragm (098) moves forward pushing the pumped liquid out of the liquid end.

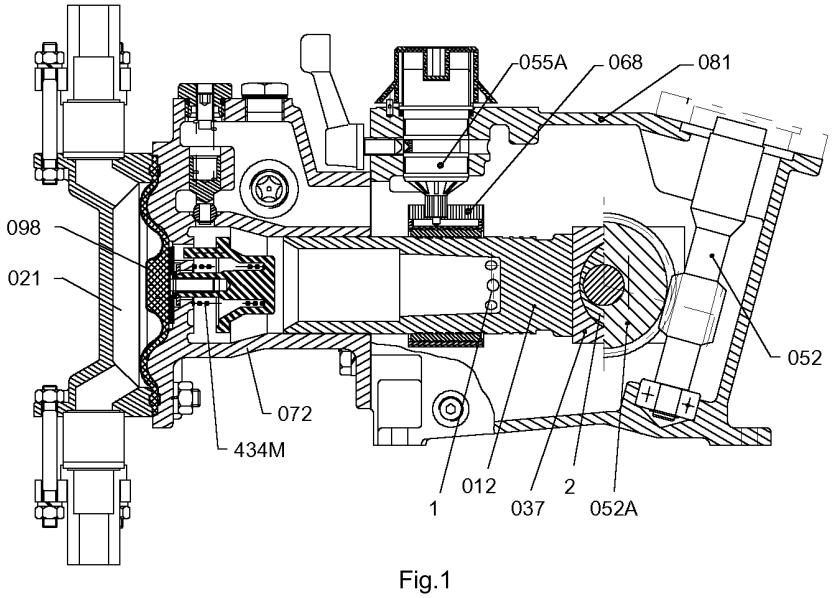


Fig.1

1.3 - TECHNICAL CHARACTERISTICS

1.3.1 Technical characteristics for Maxroy A & B PVC liquid end (Type P)

Type of pump	Maxroy A				Maxroy B			
Maximum discharge pressure in bars relative	10				10			
Maximum suction pressure in bars (Pa) (2)	2				2			
Maximum flowrate in L/H (Q):at maxi. pessure (1)	130	215	330	410	380	650	900	1100
Stroke per minute	58	96	144	180	58	96	144	180
Reduction ratio	1/25	1/15	1/10	1/8	1/25	1/15	1/10	1/8
Stroke in min	20.8				34			
Motor power in kW (threephase)	0.37				0.75	0.75	1.1	1.5
Motor speed in rev/min	1440				1440			
Moteur mounting : Flange	F130				F100		F115	
Shaft	14 X 30				19 X 40		24 X 50	
Max suction height inm (Ha) (2)	2 m				2 m			
Volume of buffer tank on suction side (3)	0.5 L				1 L			
Pre-expansion of pulsation dampener in discharge	60 %				60 %			
Volume of buffer tank on delivery side	0.5 L				1 L			
Pre-pressurization of buffer tank on delivery side (4)	60 %				60 %			
Noise level : Acoustic pressure	< 70 dB(A)							
Weight (Kg)	50				80			

1.3.1 Technical characteristics for Maxroy A & B STAINLESS STEEL liquid end (Type H)

Type of pump	Maxroy A				Maxroy B 105				Maxroy B 145			
Maximum discharge pressure in bars	10				28				10			
Maximum suction pressure in bars (Pa) (2)	2				2				2			
Maximum flowrate in L/H (Q) : at maximum pressure (1)	130	215	330	410	140	225	340	420	380	650	900	1100
Stroke per minute	58	96	144	180	58	96	144	180	58	96	144	180
Reduction ratio	1/25	1/15	1/10	1/8	1/25	1/15	1/10	1/8	1/25	1/15	1/10	1/8
Stroke in min	20.8				34				34			
Motor power in kW (threephase)	0.37				0.75	0.75	1.1	1.5	0.75	0.75	1.1	1.5
Motor speed in rev/min	1440				1440				1440			
Moteur mounting : Flange	F130				F100		F115		F100		F115	
Shaft	14 X 30				19 X 40		24 X 50		19 X 40		24 X 50	
Max suction height inm (Ha) (2)	2 m				2 m				2 m			
Volume of buffer tank on suction side(3)	0.5 L				0.5 L				1 L			
Pre-expansion fo pulsation dampener in suction (4)	60 %				60 %				60 %			
Volume of buffer tank on delivery side	0.5 L				0.5 L				1 L			
Pre-expansion of pulsation dampener in discharge (4)	60 %				60 %				60 %			
Noise level : Acoustic pressure	< 70 dB(A)											
Weight (Kg)	50				80							

(1) Flowrate obtained with water in standard configuration (polypropylene metering unit) on test branch.
(2) See section on installation.
(3) Value given as example for buffer vessel without pre-pressurization.
(4) of service pressure

1.3.1 Technical characteristics for Maxroy D

1.3.1 Technical characteristics for Maxroy D

Type of pump	Maxroy D 105			
Maximum discharge pressure in bars relative	28			
Maximum suction pressure in bars (Pa) (2)	2			
Maximum flowrate in L/H (Q):at maxi. pessure (1)	20	34	52	65
Maximum flowrate in L/H (Q):at 3 bar (1)	16	27	37	51
Stroke per minute	58	96	144	180
Reduction ratio	1/25	1/15	1/10	1/8
Stroke in min	20.8			
Motor power in kW (threephase)	0.37			
Motor speed in rev/min	1440			
Moteur mounting : Flange	F130			
Shaft	14 X 30			
Max suction height inm (Ha) (2)	2 m			
Volume of buffer tank on suction side (3)	0.5 L			
Pre-expansion of pulsation dampener in discharge	60 %			
Volume of buffer tank on delivery side	0.5 L			
Pre-pressurization of buffer tank on delivery side (4)	60 %			
Noise level : Acoustic pressure	< 70 dB(A)			
Weight (Kg)	50			

II. INSTALLATION

2.1 - UNPACKING AND STORAGE

Carefully check the package upon delivery to make sure that the contents show no apparent damage. Open the case with care so as not to damage any fittings inside the case. The contents should be examined and checked against the packing list.
The packing contains :
- One pump.
- Oil depending to pump model (see ch. 3.9)
- A list of consumable parts to replace the parts subject to wear, section and overall drawings.
- Instruction manual for installation, servicing and maintenance of the pump.

2.1.1 Precautions for storage

For storage under 6 months :
It is preferable to store the material under a shelter in its original package to protect it from adverse weather conditions.

For storage over 6 months :
Keep original packing. Allow for an additional protection under a thermowelded plastic film with dehydrating agent. Store the pump under a sheet to protect it from adverse weather conditions with full oil charge.

2.2 - RECOMMENDATIONS FOR INSTALLING THE PUMP IN PLACE

2.2.1 Handling of pump

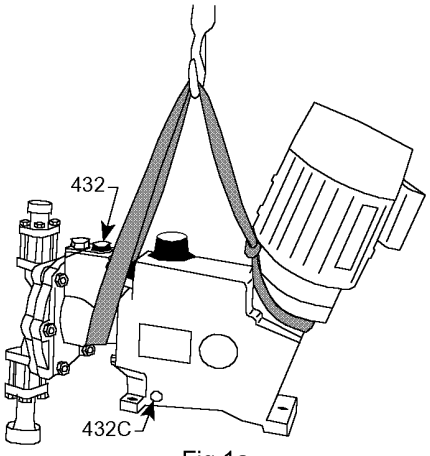


Fig.1a

Put the sling under the motor flange. Cross the two ends of the sling and close the loop. Put the other end of the sling under the chamber (see diagram). Before attempting to move it, check that the entire unit is well balanced.

Note : As soon as the pump is in position, fasten it down.

2.2.2 Installing the pump

Fix the pump on a horizontal support using its fixation holes. Leave enough space around the pump so as to give access, enable maintenance and carry out adjustments (accessibility to the liquid end, for oil filling (432) and oil drainage (432C).

IMPORTANT : Pumps installed outdoors should preferably be protected by a shelter.

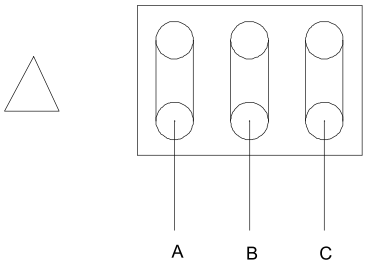
2.2.3 Oil filling

- Unscrew the oil filling plug (432) which is located on the top of the pump.
- Pour in oil until its level reaches the middle of the sight glass located on the side of the pump.
- Replace the oil filling plug (432).

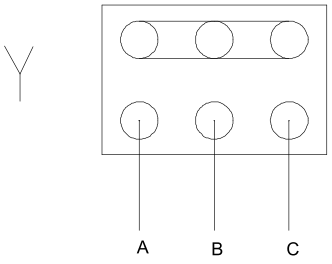
2.3 - ELECTRICAL INSTALLATION

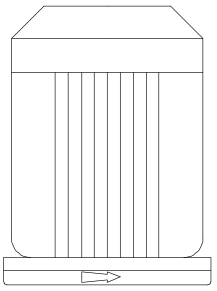
Verify the motor data against your available mains supply for the plant before carrying out connections. Connect the motor according to the indications given in the terminal box.

For 230 V delta connection



For 400 V star connection





Before operating the pump, check the direction of rotation of the motor which must be according to the arrow stamped on the motor (Counter-clockwise direction when seen from top). To reverse the direction of rotation, just reverse A and B or A and C.

CAUTION : DO NOT FORGET TO CONNECT THE PUMP TO EARTH

Electric protection of the motor (thermic protection or by means of fuses) is to correspond to the rated current indicated on the motor data plate.

2.4 - HYDRAULIC SYSTEM

Pipework - Generalities

As far as possible, avoid exerting stresses due to incorrect alignments between rigid pipes and the centreline of valve boxes. Provide facilities for disassembly (union-pieces, and so forth...). Clean piping before assembly.

2.4.1 Suction pipings

The pump is to be located as close as possible to the suction point and the piping is to be as short and as direct as possible. If possible, have the suction point located slightly above the pump; in the event of long period of rest, the pump will not unprime.
The diameter of the piping must be bigger or equal to the connection diameter of the liquid end. The suction piping is to be ABSOLUTELY AIR TIGHT (check after assembly). When it is not possible to avoid long suction pipework, use a RESERVOIR tank or a balancing column located as close as possible to the suction aperture of the pump.

2.4.2 Delivery pipework

The diameter of the piping is to be bigger or equal to the connection diameter to the liquid end. Be sure that the piping and accessories fitted on the delivery line are sufficiently strong to withstand the delivery pressure.

2.5 - INSTALLATION SKETCHES

2.5.1 Installation on suction side

2.5.1.1 Recommended installations

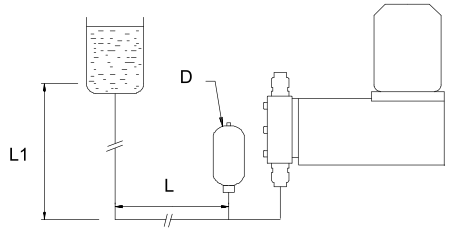


Fig.2

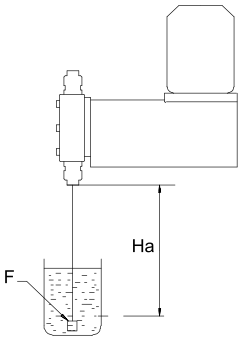


Fig.3

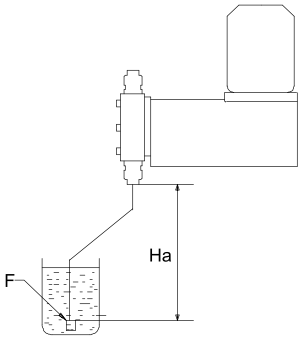


Fig.4

Fig.2: The pump in suction placed above the tank(Ha = maximum 2.5 m water column) is equipped with a foot valve fitted at the suction end (F). Vertical suction.

Fig.3: Long sized pipework (L) requires the installation of a damper which is to be placed as close as possible to the pump. L1 = Maximum 10 metres water column.

Fig. 4: The pump "in suction" offset in relation to the tank (Height [Ha] see chapter 1.3), is equipped with a foot valve (F).

2.5.1.2 Installations to be avoided

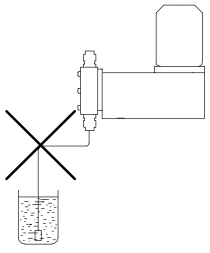


Fig.5

Inclined suction pipe, risk of un-priming (See Fig. 4, Chap. 2.5.1.1)

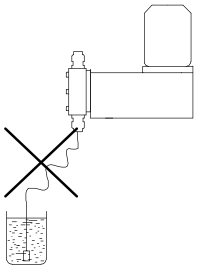


Fig.6

Suction piping long. Suction height too great.

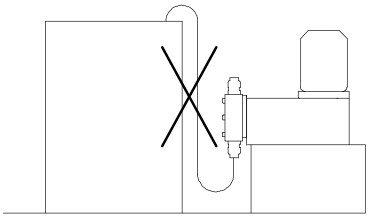
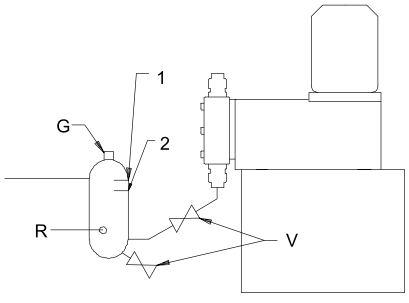


Fig.7

Accumulation of gas (goose neck) and risk of unpriming.

2.5.1.3 Special installation

Degassing liquids.



1: Max level
2: Min level
V: Valves
G: Vent
R:degassing vessel

Fig.8

Fig. 8: Setting up a degassing vessel (Chap. 2.6.3.) at the pump suction (one thus avoids frequent un-priming). Connection between the pump and the inclined degassing vessel in order to facilitate degassing.

2.5.2 Installations on delivery line

2.5.2.1 Recommended installation

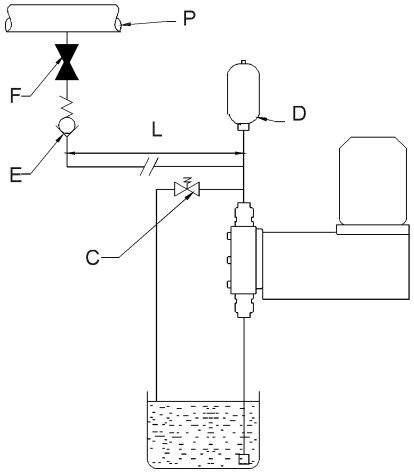


Fig.9

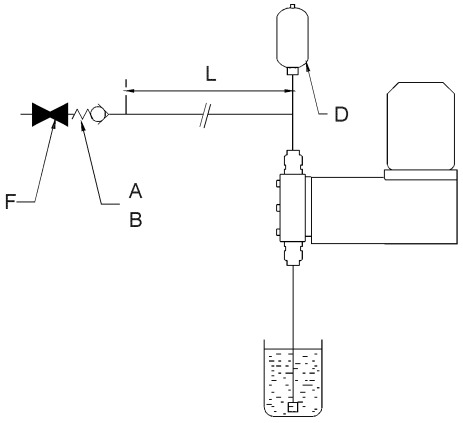


Fig.10

Fig. 9: Long pipe lengths and delivery in a pressurized conduit (P): Install an injection pipe (E), a buffer tank (D) and a safety valve (C).

Fig. 10: Long pipe lengths and delivery in a non-pressurized conduit: Install a nonreturn valve (B) or check valve (A) and a buffer tank (D).

For short lengths of discharge pipe (L), the buffer tank (D) can be dispensed with although it increases the service life of the metering pump and of the installation.
If the delivery pressure is less than 2 bars, an injection pipe or nonreturn valve should be used.

2.5.2.2 Installations to be avoided

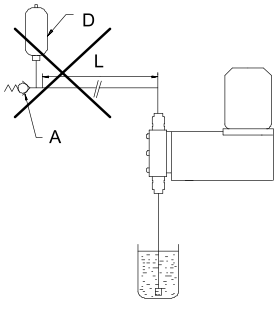


Fig.11

Pulsation dampener (D) not very efficient. (pulsation dampener (D) too far from the liquid end)

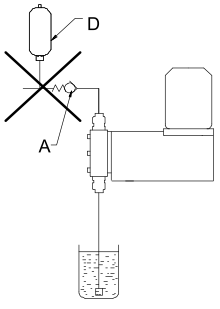


Fig.12

Pulsation dampener (D) inefficient. (nonreturn valve installed before pulsation dampener (D)).

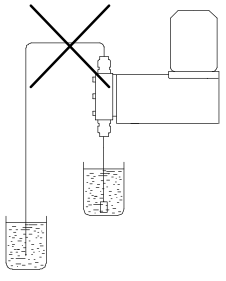


Fig.13

Siphoning .

2.6 - INSTALLATION OF ACCESSORIES

Proper functioning of the pump depends on whether certain accessories available from DOSAPRO MILTON ROY are fitted or not. The salesman is at your disposal to determine the accessories which are best adapted to your plant.

2.6.1 Non return valve (F)

Necessary when the pump is fitted above the suction point. Thus minimizing the risk of unpriming; it is fitted with a filter.

2.6.2 Filter

It is very CAUTION when there is gravity feed; it avoids accumulation of solid particles in the valve assemblies and guarantees precision and pump life.

2.6.3 Safety valve (C)

The safety valve is to be vertically installed just above the liquid end, after the damper and before any other accessory. The return line of the valve should be connected to the drainage tank or to the sump. The safety valve protects the metering pump, the piping and accessories in the event of accidental overpressure (e.g. shutting off of valve). This accessory contributes to safety for users by eliminating risks of the bursting or rupture of components under pressure. It is recommended that a safety valve should be fitted on all installations.

2.6.4 Damper (D)

Compressible gas-reserve device; this dampens the flow and pressure pulsations caused naturally by the dosing pump. It is absolutely essential that the pulsation dampener be installed vertically on the discharge and/or suction piping of the dosing pump, as near as possible to the latter, before any other accessory and for it to be placed in the flow. For the volume and the pre-expansion of the dampener, see chapter 1.3.

CAUTION: Dampener construction materials must be compatible with the liquid to be pumped and with the pumping pressure.

2.6.5 Non return valve (A)

The non-return valve is to be installed in line on the delivery piping. Its operation may be improved by installing a dampener located upwards on the line.

2.6.6 Injection nozzle (E)

Fitted at the injection point, it acts as a non-return valve. It isolates the processed fluid from the main fluid (often water).

2.6.7 Insulation Valve (F)

When the pump is not running, it is essential to insulate it from the pressure circuit with a manual or automatic valve, to prevent any return pressure in the liquid end, which could damage the pressure plate of the oil-actuated diaphragm.

2.7 - INSTALLATION CALCULATIONS

2.7.1 General

Sizing of the plant suction line corresponds to the NPSH calculation (Net Positive Suction Head) and it aims to avoid any risk of cavitation. Very often when processing non viscous liquids (typically less than 50 cp), the NPSH calculation is needed to verify the following condition:

$$\frac{10,2}{W}(Pa - Tv) + Ha > 2 + 0,016\frac{LQN}{d^2}$$

with
W = Liquid density.
Pa = Suction pressure (bars absolute).
Tv = Vapour pressure (in bars).
Ha = Suction height (in m). (Ha is negative with the pump placed above the suction point; it is positive when gravity fed).
L = Length of the piping (in m).
Q = Max flowrate of the pump (in l/h).
N = No of pump strokes (in str./min).
d = Inside diameter of the piping (in mm).

2.7.2 Example

Calculation carried out to deliver a flow of 200 L/H.

W	: 1	L	: 1
Pa	: 1	Q	: 560
Tv	: 0.025	N	: 144
Ha	: 1	d	: 12.5

This condition shows: : $\frac{10.2}{1}(1 - 0.025) + 1 > 2 + 0.016\frac{1\text{x}144\text{x}560}{12.5^2}$

thus: **10.945 > 4.064**

The condition is met and the pump will not give rise to cavitation.

When the NPSH condition is not obtained, the installation conditions must be improved by making or envisaging the following modifications:
- Place the pump under load: *Ha* increases
- Place the pump near the tank : *L* decreases
- Increase the diameter of the piping: *d* increases (the most effective solution)
- Place an pulsation dampener at the suction (see chapter 1.3)

Do not hesitate to consult your usual DMR representative for complete calculations.

III OPERATION AND MAINTENANCE

3.1 - OPERATION AND MAINTENANCE

- Verify that the pump is properly secured on its base plate.
- Check oil level.
- Check that the pump is 0 % set.
- Check that all shut off valves on suction and delivery lines are opened.
- Checked that the pump is correctly suppllied with processed liquid.
- If hot cold machine parts lead to a potential danger,
  check that the these parts are protected against accidental constact at site.

3.2 - START UP

- Switch on motor.
- Check that the motor rotates in anti-clockwise direction (see chapter 2.3).
- Slowly increase the pump flowrate by means of the adjusting knob (055A).
- Fix the sitting (055A) by means of :
  the blocking ring (004) (anti-clockwise direction) for the maxroy A (Fig.13a).
  the screw (440A) (clockwise direction) for the maxroy B (Fig.13b)

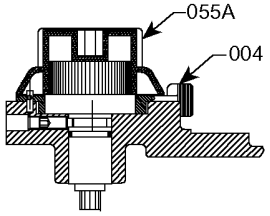


Fig.13a Maxroy A - D adjustment knob

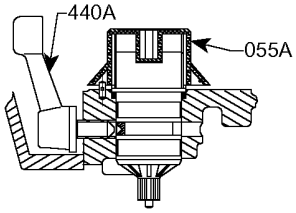


Fig.13b Maxroy B adjustment knob

Provide for a drip collector tank for the priming bleed and for the safety valve.

3.3 - ROUTINE CHECKS

It is recommended to periodically check :

- Temperature of the housing (which can reach a value of 45 °C when the ambient temperature is 20° C)
- The leaktightness and cleanliness of the valves
- Any appearance of a leak forward of the pump (rupture of the mechanical diaphragm or of the metering diaphragm)
- The flowrate (check on suction line).

3.4 - PREVENTIVE MAINTENANCE

Before any intervention on the pump, it is necessary to switch off electric supply to the motor.

3.4.1 Principal preventive maintenance work *:

Operation	Frequency **
- Renewal of valves and seats (§ 3.7.1)	5000 h
- Renewal of the diaphragm (§ 3.7.2)	5000 h
- Renewal of double diaphragm "C" type (§ 3.7.4)	5000 h
- Renewal the bearing of the worm screw (§ 3.8.2)	20000 h
- Renewal fo the worm/gear assembly (§ 3.8.3)	20000 h

* See list of wear parts for the ordering of the various parts.
** Approximate no of hours when operating under max performance and normal conditions of use.

3.5 - ORDERING OF SPARE PARTS

To simplify your order anbd ensure the best delivery times of spare parts, we recommend giving our services **the correct code of your pump and its** DOSAPRO MILTON ROY **serial no**. This information is shown on the Nameplate fixed on the side of the pump.

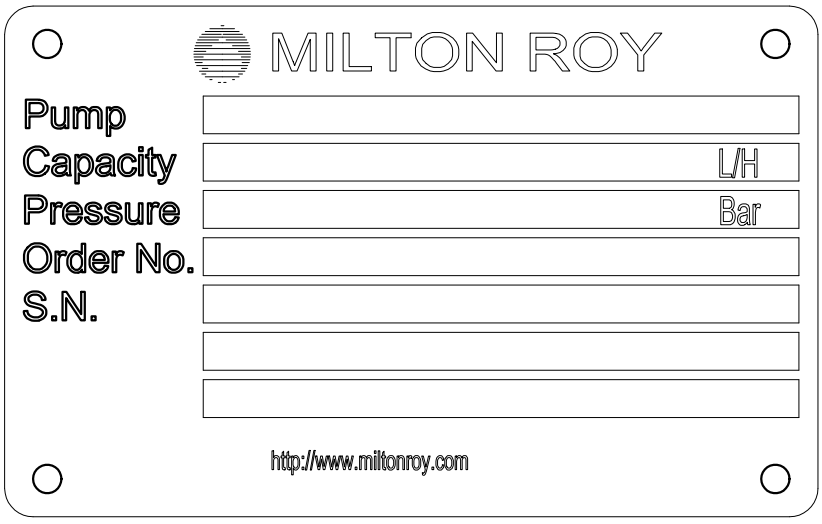
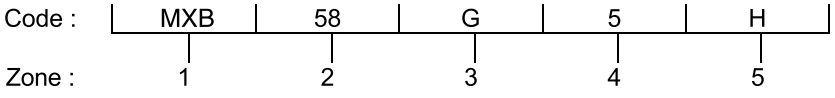


Fig.14

3.6 - PRODUCT IDENTIFICATION

Our product identification tells us precisely the kind of equipment involved and gives us details on each item comprising it.



The makeup of a standard Maxroy pump is divided up into 3 zones :
Zone 1 : Type of pump
Zone 2 : Stoke per minute
Zone 3 : Motor power
Zone 4 : Diaphragm size
Zone 5 : Type of liquid end

3.7 - SERVICING AND THE MAINTENANCE OF THE LIQUID END

Before carrying out any servicing operation on teh metering unit or pipes, take the necessary steps to ensure that the harmful liquid they contain cannot escape or come into contact with personnel. Suitable protective equipment must be provided. Check that there is no pressure before proceeding with dismantling.

3.7.1 Renewal of the ball checks and seals

3.7.1.1 Ball checks

Disconnect the suction and the discharge pipes.
The ball check assemblies are stacked on liquid end body and held in place by a flange secured by 3 bolts (M10x90).
Unscrew the 3 clamping bolts of the flange and remove the flange, then pull ball check assembly out (ball, seat and ball guide).
Make sure that the balls and seats show no hammering marks.
When refitting the ball check assemblies, all seals must be replaced (PTFE plain seals).

NOTE :
1) - These seals are centered in recesses provided for this purpose. They must be positionned carefully (thin seals) to avoid any damage when refitting.
2) - The refitting sequence must be followed, i.e. with the balls above the seats, whose tapered end must be facing downwards.
3) - The dual ball check cartridges (see sketch below) are fitted according to the same sequence as indicated; the upper ball check may be fitted with a spring.

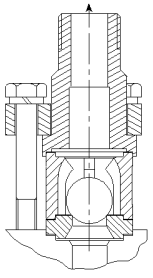


Fig.15
Delivery valve asembly

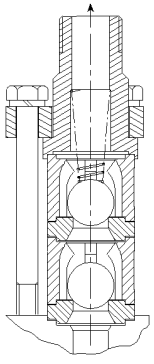


Fig.16
Suction valve assembly

3.7.1.2 Options - special cartridge arrangements : ‘’Viscous products’’ configuration
- Single ball check at suction side with assistance by hastelloy C spring rated at 0.1 bar (080B).
  A spacer (019A) is inserted between the ball guide (003) and the body of the liquid end (021).
- Single ball check at discharge side, with assistance by a hastelloy C spring rated at 0.5 bar (080) fitted into the standard ball check.

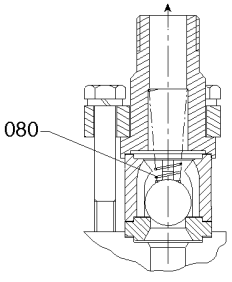


Fig.17
Delivery valve assembly

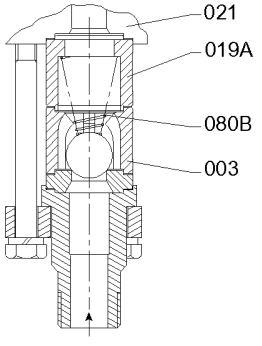


Fig.18
Suction valve assembly

3.7.1.3 Option special cartridge arrangements : "Polyelectrolytes" Configuration

- Single ball check at free suction side
- Single ball check at discharge side with assistance by a hastelloy C spring rated at 0.5 bar (080) fitted into the standard ball check assembly.

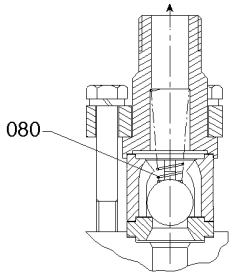


Fig.19
Delivery valve assembly

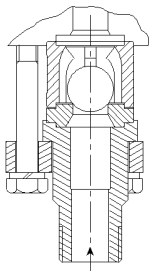


Fig.20
Suction valve assembly

3.7.1.4 Option special cartridge arrangements : Antisiphonning set

If the installation conditions require any back-pressure, the recommended arrangement is a follows :
- Single free ball check at suction side.
- Dual ball check with assistance spring at the distance side the spring is made of hastelloy C and rated at 1.5 bar (080C) (duall ball standard arrangement with addition of the spring).

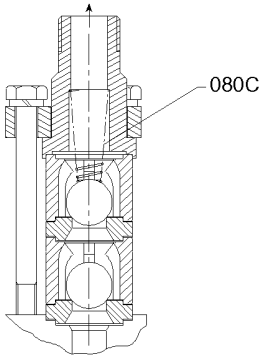


Fig.21
Discharge check valve

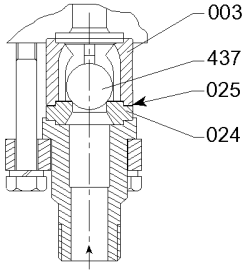


Fig.22
Suction check valve

3.7.1.5. Remplacing the ball checks : Plastic liquid end version
- Disconnect the suction and the discharge pipes
- Unscrew the clamping nut (432B)
- Remove the cartrige assembly (003B)
- Pull the O-ring out (438)
- Remouve the seat (024)
- Replace any defective parts.

Note : When refitting the ball checks, the 3 Viton O-rings must be replaced.
Refitting operations are performed in reverse order of dismantling.

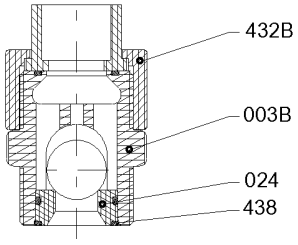


Fig.23
Plastic check valve

3.7.2 Replacing the diaphragm (Fig.24)

Dismantling
- Position stroke adjustment on 0 %.
- Drain the pump :
  Removing the plug (432C)(Fig.1a)
- Disconnect the suction and the discharge pipes
- Remove the fasteners which hold the liquid end (435A) on the adaptation sleeve (072) screws
- Remove the liquid end body (021), then Remove the diaphragm (098) by unscrewing it by hand.

Assembly
Refitting operations are in reverse order of dismantling.

Note : Do not forget to put the cup (019) in place (convex side turned the diaphragm).

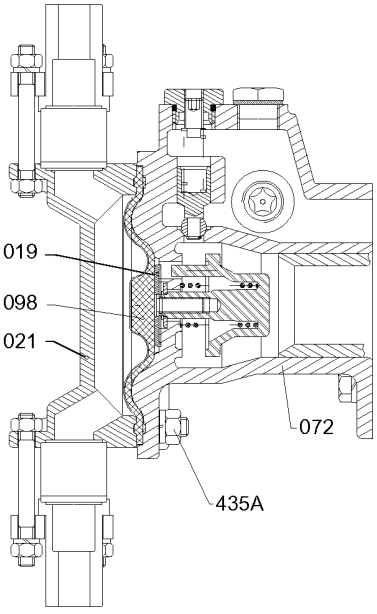


Fig.24 Replacing the diaphragm

3.7.3 Maintenance of the relief valve

The built-in relief valve which operates with in the hydraulic fluid protects the pump against any excessive pressure. In the standard version, this valve is in-shop rated (2 values) but other ratings are available optionnally. The built-in air bleed system keeps metering accuracy at a constant value with time.

3.7.3.1 Non-adjustable relief valve (Fig.25)

Valve calibration
- For a service pressure ≤ 5 bar :
  The spring is rated at 6 bar
- For a service pressure ≤ 10 bar:
  The spring is rated at 12 bar

Dismantling
- Unscrew the plug (022) which holds the spring.

WARNING : spring loaded
- Remove the spring (080A)
- Remove the check valve (306) assembly and clean or replace the parts as rquired
- Do not forget to replace the O-ring (438A).

Assemby
Refitting operations are in reverse order of dismantling

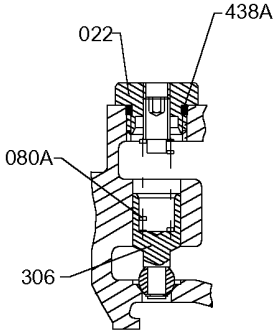


Fig.25 Non-adjustable relief valve

3.7.3.2 Adjustable relief valve (Fig.26)

Tarage soupape
- 6 bar for service pressure ≤ 5 bar
- 12 bar for service pressure ≤ 10 bar

Dismantling
- Unscrew the cap (008) and remove the O-ring (438B)
- Unscrew the plug (043) and remove the O-ring (438A).

WARNING : spring loaded
- Remove the checK valve (080A) and its guide (024B)
- Remove the check valve assembly (306) (Fig.25)
- Clean or replace the parts required
- Do not forget to replace the O-rings (438A) and (438B).

Assembly
Refitting operations are in reverse order of dismantling.

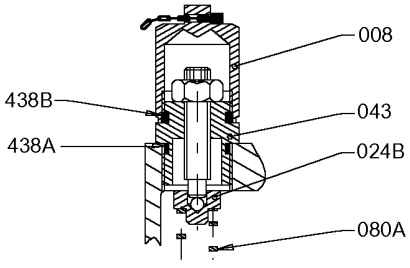


Fig.26 Adjustable relief valve

3.7.4 Double diaphragm option of the sandwich type

Dismantling

- Disconnect suction and delivery pipings
- Position the stroke adjustment on 0 %
- Drain the pump : plug (432C) (Fig.1a)
- Loosen the ring connection nut (432A) of the non-return valve
- Remove the 6 liquid en fixation screw (435A) on the chamber (072)
- Remove the liquid end body (021)
- Remove the drum (050) with its fore diaphragm (098A)
- Remove the back diaphragm (098) by lossening it by hand (anti-clockwise direction)
- Renew the defective parts

Reassembly

- First, fit the back diaphragm (098) in place.
- Put in place the fore diaphragm (098A) on the drum (050)
- Position the drum/diaphragm assembly into the liquid end body (021), the leak tube being turned upwards.
- Fit the liquid end/drum set on the chamber (072)
- Connect the drum leak tube (050) to the non-return valve (432B)
- Tighten the ring connection nut (432A)
- Tighten the nuts (435) which maintain the liquid end body star tightening.

Tightening torque.

Stainless steel MAXROY : 50 N.n.
Plastic MAXROY : 50 N.n.

- Tighten the drain plug (432C) (Fig.1a)
- Fill with oil plug, (432) (Fig.1a)
- Connect suction and delivery pipes.
- Loosen the non-return valve upper part (432B)
- Blow off the double diaphragm system by running the pump (low stroke), put an oil drop on the non-return valve (432B) for easier gas-freeing.
- Once blowing off operation is completed, tighten the non-return valve (432B)
- The pump is ready for work.

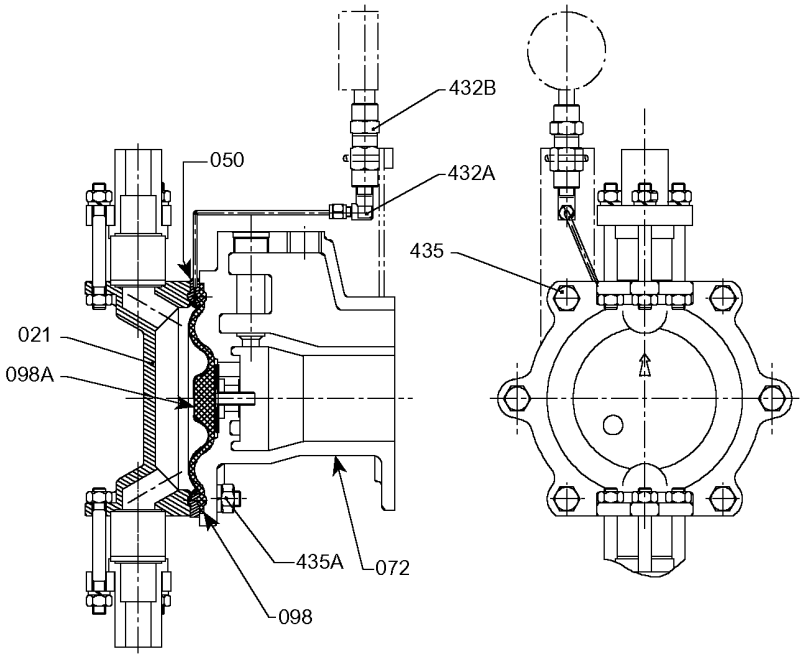


Fig.27 Double diaphragm liquid end of the sandwich type

3.8 - SERVICING AND MAINTENANCE OF THE MECHANICAL ASSEMBLY

3.8.1 Removing the semi-flexible coupling between motor and screw (Fig.28/29)

Dismantling

- Disconnect the motor its power source (441)
- Remove the screws (435) which hold the adapter sleeve (072A)/on the motor (441)
- Detach the motor (441) from the adapter sleeve (072A)together with its half-coupling sleeve (052C)
- Remove the grub screw (435B) and detach the half-coupling (052C) from motor shaft
- Remove the screws (435A) which hold the adapter sleeve (072A)/on the pan
- Detach the adapter sleeve (072A) from the worm screw (052)
- Drift the bearing (439)/half-coupling sleeve (052A) out of the adapter sleeve (072A)
- Using a bearing puller, remove the half coupling sleeve (052A)
- Replace any defective parts.

Reassembly

- Refitting is performed in reverse.
- Renew the gasket (025)

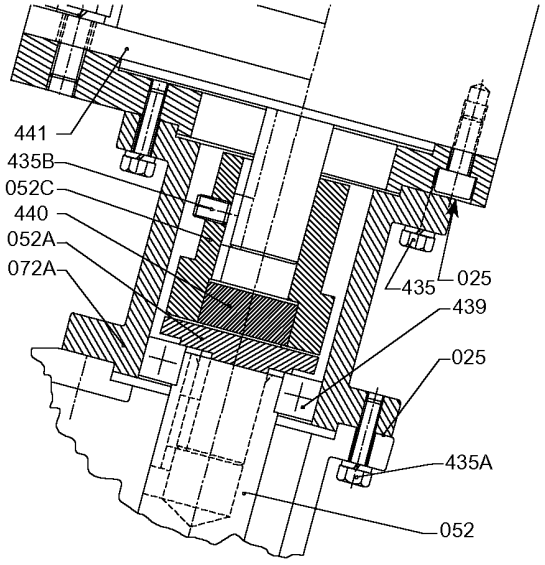


Fig.28 MAXROY B shaft mounting

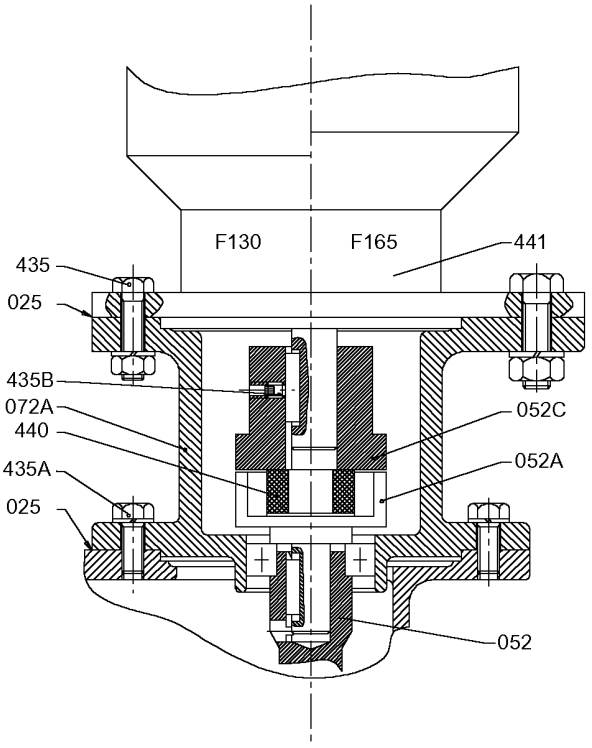


Fig.29 MAXROY A - D shaft mounting

3.8.2 Replacing the bearing of the worm screw (Fig.30)

Dismantling

(Pump removal not required)

- Position stroke adjustment on 0 %
- Drain the oil pan by removing the plug (432C)
- Remove the electric motor (pan/motor fixing screw) and, if necessary, the adapter sleeve (when the motor is fitted by semi-flexible coupling refer § 3.8.1)
- Remove the pilot head grub screw (435E) which holds the bearing (439) (screw on pan)
- Remove the worm screw (052)
- Remove the bearing (439) using a puller

Reassembly

- Do the opposite operations by replacing the O-ring (025)

PRECAUTION :

- Before applying Loctite, clean any grease or dirt from the screw and the tapped hole as well (435E).
- Screw (435E) fitted with (Loctite 221).
- The ball-bearing (435E) fixation screw must be tightened without any clearance against the ball-bearing but not locked

3.8.3 Replacing the wheel / screw assembly (Fig.30)

Dismantling

(Pump removal required)

- Disconnect the suction and the discharge pipes
- Position stroke adjustment on 0 %
- Drain the pan (cap 432C)
- Remove the electric motor (pan/motor fixing screw) and the adapter sleeve if necessary when the motor is fitted by a semi-flexible coupling : refer§ 3.8.1)
- Remove the pilot head grub screw (435E) which holds the bearing (screw or pan)
- Remove the fixing screw (435) which hold the displacement chamber/pan unit.
- Remove the chamber (072)
- Remove the 2 snap rings (434) which maintain eccentric shaft
- Remove the stroke adjustment knob (§ 3.8.4.1)
- Drift eccentric shaft out (068A)
- Remove the hollow plunger (012)/eccentric nut (037)wheel (052A)/ screw (052)

Reassembly

Refit in reverse order

Note : Mark rake position when dismantling the sleeve on the plunger.

Renew gaskets : 438 + 025A + 025 + 438B

3.8.4 Adjusting the stroke (débit) (Fig.30)

The displacement chamber communicates with the pan through the radial ports of the hollow plunger (012). The vernier (O55A) adjusts the position of the sleeve (068).The ports are cleared or plugged by the sleeve depending on the position of the hollow plunger (012).

3.8.4.1 Removing the knob (fig. 8) (Fig.30)

MAXROY A and D

- Remove by unscrewing the screw (435G) the knob (O55A)
- Renew the O-ring (438B)

Reassembly

- Refit in reverse order.

MAXROY B

- Disconnect the suction and the discharge pipes
- Position stroke on 0 %
- Drain the pan (cap 432C)
- Remove the adapter sleeve (072)
- Remove by unscrewing the locking level (440A) and remove the vernier (O55A)
- Renew the O-ring (438B)

Reassembly

- Do the opposite operations by replacing the O-ring (025A)

3.8.4.2 Removing the sleeve (Fig.30)

- Disconnect the suction and the discharge pipes
- Position stroke adjustment on 0 %
- Drain the mechanical section (cap 432C)
- Remove the screw (435) which hold the displacement chamber and remove the latter
- Remove the sleeve (068) which slides freely on the hollow plunger (012) after marking rake position.

Reassembly

Refit in reverse order.

Note: Rake on left side viewed from front side to pan. Renew the gasket (025A).

3.8.4.3 Replacing the plunger (Fig.30)

- Disconnect the suction and the discharge pipes
- Position stroke adjustment on 0 %
- Drain the mechanical section (cap 432C)
- Remove the displacement chamber (072) secured by 4 hex screws (435) 12 x 30 to the pan
- Remove the vernier (055A) and the sleeve (068) (refer § 3.8.4)
- Remove the 2 snap rings (434) which hold the eccentric shaft (068A)
- Drift the eccentric shaft (068A)
- Remove the hollow plunger (012)/eccentric nut (037)/and wheel (052A) assembly

Reassembly

- Refit in reverse order.

WARNING : Whenever a dismantling operation is performed, the seals must be changed rep. 438B + 025A + 438. The pin (068A) held in place with (Loctite 566).

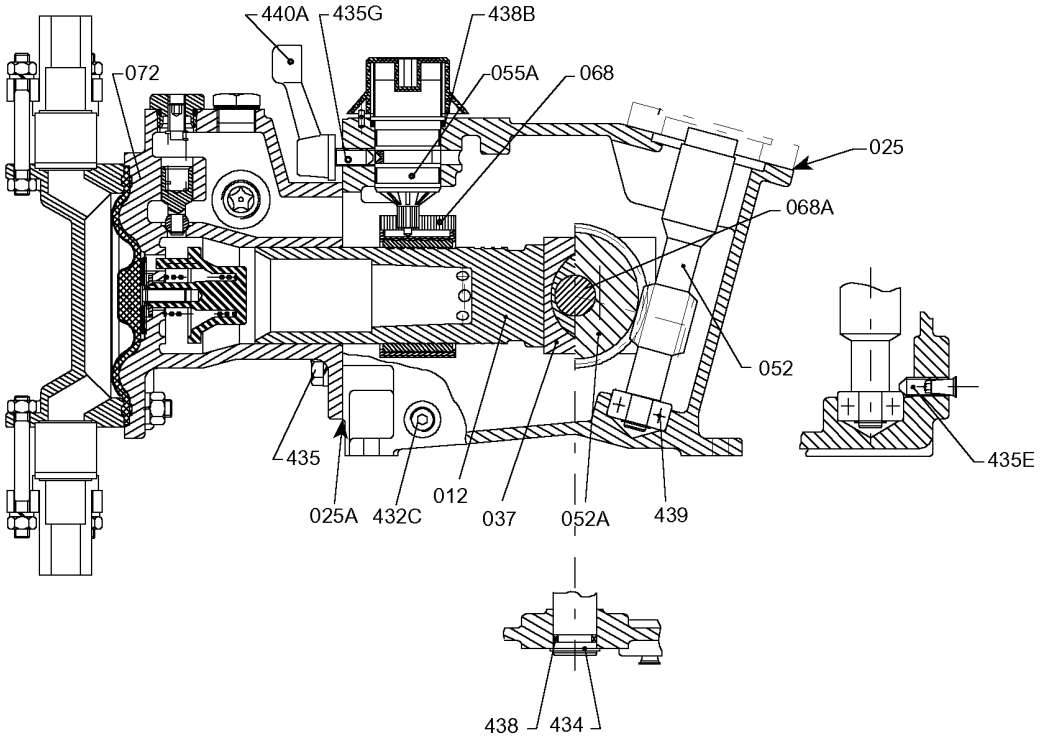


Fig.30 MAXROY mechanical principle

3.9 LUBRICATION

The oil level must be checked every month. Fill the housing up to the middle of the level indicator. Use oil supplied with the pumps or another equivalent oil (see the chart hereunder). The oil must be changed, the first time : 250 hours of operation after initial starup then, every 2500 hours of operation or every six months, whichever comes earlier. Pump environmental temperature should be within -5° C and 40° C

3.9.1 Oil recommendations

QUANTITY :

	Maxroy A and D	Maxroy B
Simplex	2.5 L	4 L

CARACTERISTICS TABLE

Viscosity at 40°C	151 Cst
Viscosity at 100 ° C	15 Cst
Viscosity index	100
ISO VG	150
Density at 15 ° C	0.897 k/l
Flash point	244°C
Freezing point	-12°C

EQUIVALENCE TABLE

Designation	Type
FUCHS	RENEP 150
B.P.	GR XP 150
CASTROL	ALPHA SP 150
ELF	REDUCTELF SP 150
FINA	GIRAN 150
IGOL	DYNAM SP 150
MOBIL OIL	MOBILGEAR 629
SHELL	OMALA 150
TOTAL	CARTER EP 150
ESSO	SPARTAN EP 150

IV FAULT LOCATION PROCEDURES

If, during the initial startup, the pump does not work properly, check the pump installation (SECTION: INSTALLATION II).

4.1 - THE PUMP DOES NOT DELIVER:

CAUSE	REMEDY
A - Motor stopped - The thermal relay has been overloaded and has tripped. B - No more product to pump. C - Piping clogged up. D - Filter blocked. E - Suction piping valve closed. F - Diaphragm pierced.	A - - Reset the thermal relay (Check the reason for the overload) B - Check the product level C - Unclog the piping D - Clean the filter E - Open the valve F - Change the diaphragm

4.2 -THE PUMP DOES NOT DELIVER AT THE SPECIFIED FLOWRATE:

CAUSE	REMEDY
A - The pump flow is improperly adjusted B - Poor impermeability in the suction piping C - suction piping dirty D - Filter dirty E - Check-valve box seat dirty or worn F - Operating-pressure too high	A - Set the vernier on the right percentage B - Change the piping seals - Pumped liquid level too low (air intake) C - Clean the piping D - Clean the filter E - Clean or change the check-valve box F - Use the pump at the pressure specified on the data-plate