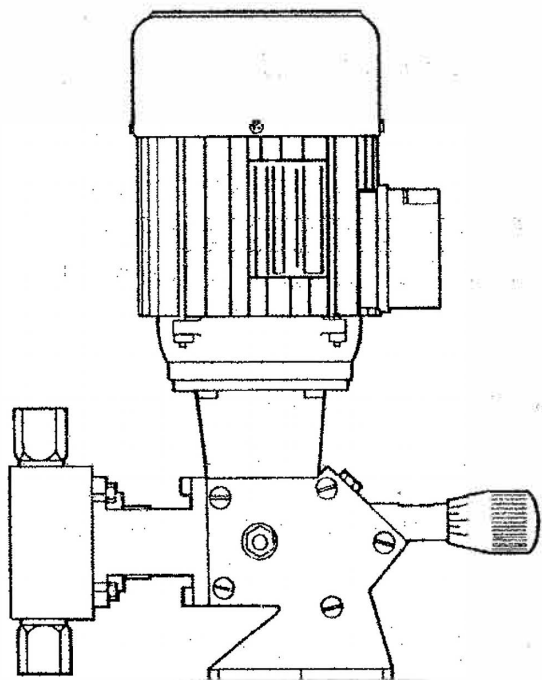
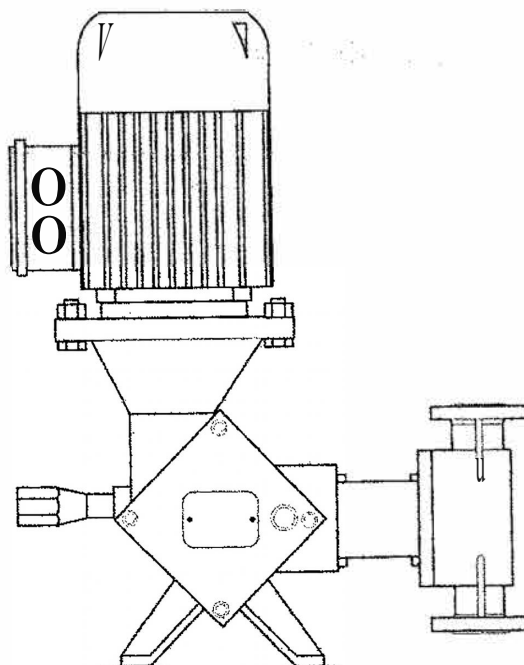


# METERING DOSING PUMP

## OPERATING MANUAL



**BYTECH**  
Masters in fluid technology



**a.g.i. POMPE**

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## GENERAL FEATURES OF METERING PUMPS

Metering pumps are alternatively moving pumps. Pump output is fixed by piston's alternative motion operated by an eccentric or a rod system. In order to reproduce this alternative motion on pump chamber, some no return valves are fitted in suction and delivery ports. In this way the pump output is intermittent and its frequency is fixed by the number of piston's strokes. The valves are ball-type and closing by gravity.

### WORKING PRINCIPLES

#### 1) Inlet stroke

During inlet stroke, the piston allows the no return valve placed in delivery port to close (by its weight or by possible liquid pressure); at the same time the no return valve placed in suction is opened by the positive pressure we have in inlet stroke. The liquid flows through the chamber and the volume is the same as the piston displacement.

#### 2) Compression

The piston in compression phase allows the no return valve placed in suction port to close (by its own weight and by the pressure by the compressed fluid; in the same time the no return valve placed in delivery port opens (by the pressure of the compressed fluid). The fluid from the pump's chamber flows through the delivery pipe and its volume is like the piston's displacement.

### THEORETICAL DELIVERY

The theoretical delivery corresponds exactly to the product of the volume of fluid moved by piston by the number of strokes in time unit.

$$Q \text{ (teor)} = \frac{S * C * C1 * 60}{1000} \quad \text{where}$$

S = Piston surface (sq cm)

C = Piston strokes (cm)

C1 = Piston strokes per minute

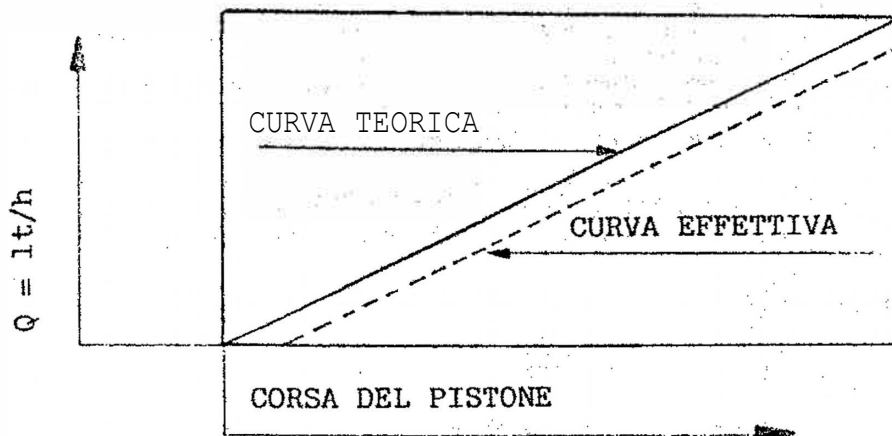
60 = Ratio hours-minutes

1000 = Ratio cubic cm/cubic dm

Consequently the plot of volume versus piston's stroke will be a sloped straight line.

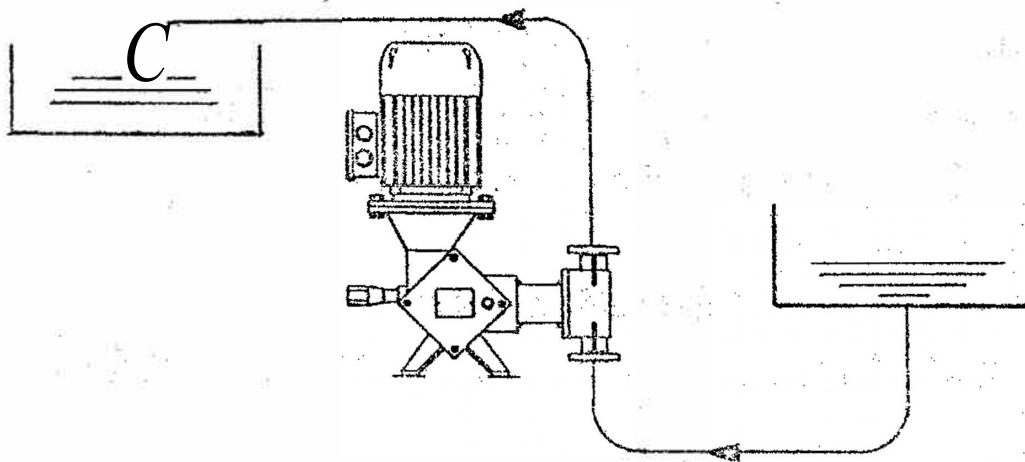
### ACTUAL DELIVERY

Actual delivery is less than the theoretical one owing to the losses due to the drawing of the fluid through the valves. The ratio : actual to theoretical delivery is the volumetric efficiency of the pump, ranging from 90 to 98%. This performance varies according to the valve's type of chamber (piston or membrane), the liquid to be pumped, the working pressure, etc. (fig.1)



### 1) IDEAL INSTALLATION

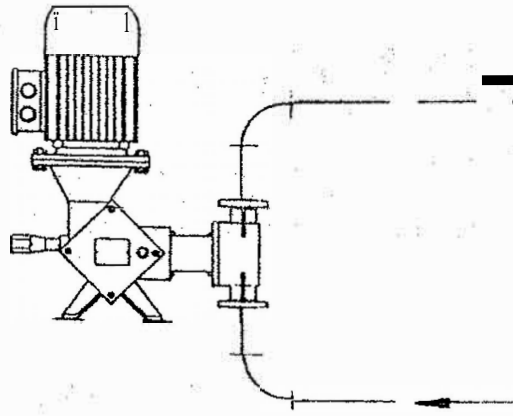
- Low suction head
- Delivery head higher than the suction one



### 2) GOOD INSTALLATION

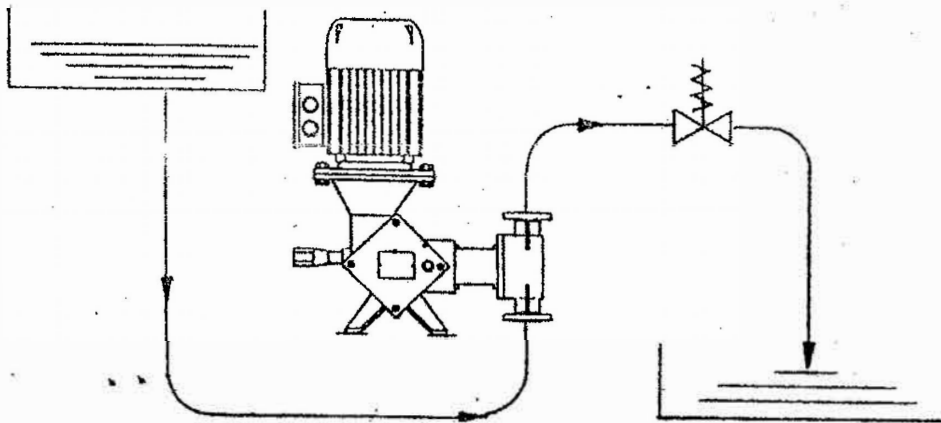
Pipes must be sized (especially the suction one), taking as general rule, for viscous liquids, the diameter immediately superior to the one of the suction ports. The average speed of the fluid in the pipes must not be over 0.7 m/sec ( 12 f/min) for liquid with viscosity to 100 cp.

2.1) The suction pipe must be as short as possible with large elbows.



### 3) INSTALLATION WITH DELIVERY HEAD LOWER THAN STATIC SUCTION HEAD

When the liquid level in suction tank is higher than delivery's one may occur a flow of fluid from the suction tank to delivery one. In order to avoid this, delivery pressure must always be higher than the static head. If this does not happen in the plant, it is necessary to make a counter-pressure by a suitable valve calibrated at the pressure raised from the head in suction plus 10% of the same.



### 3.1) INSTALLATION WITH STATIC SUCTION LIFT

Being the NPSH of metering pumps changing according to the execution of the pump chamber, in order to obtain a good run it is necessary that NPSH allowable NPSH request

NPSH = net positive suction head

The allowable NPSH is given from the following formula:

$$NPSH = \frac{P_b + P_c - P_v - P_t}{\gamma}$$

Where:

$P_b$  = Barometric pressure

$P_c$  = Height of the liquid column:

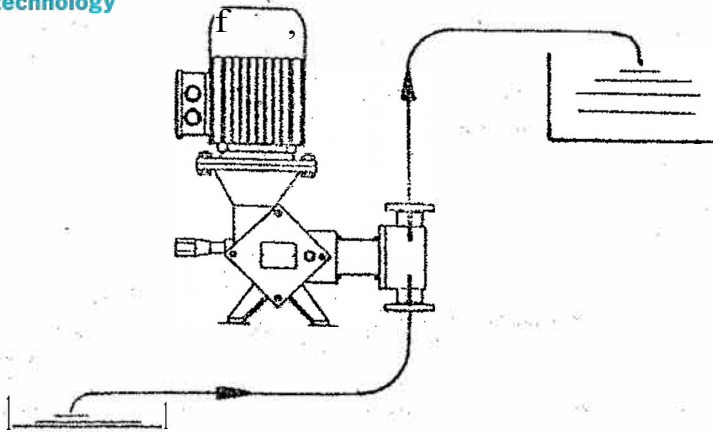
- positive or suction head (+)
- negative or suction lift (-)

$\gamma$  = specific weight of fluid

$P_v$  = vapour pressure of liquid

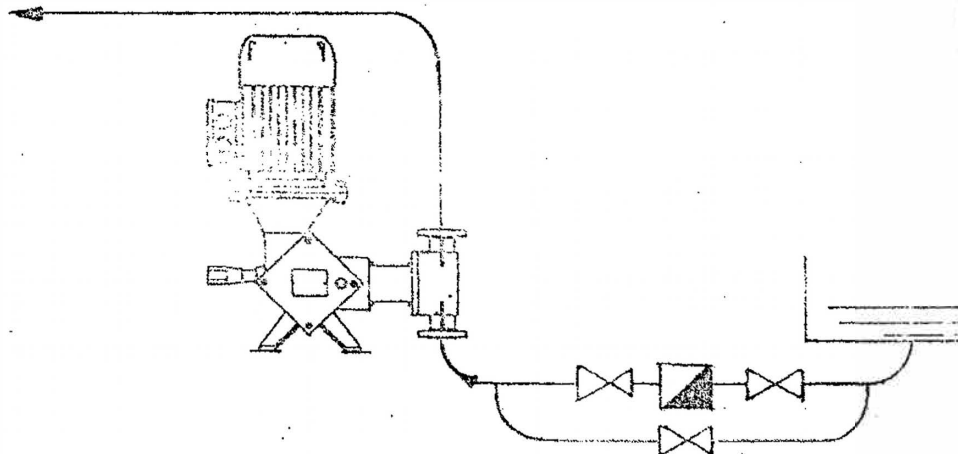
$P_t$  = friction loss of suction pipe

Note: for pumps with low capacity it is necessary to consider the time used by the pump to fill the suction pipe in priming phase.



- 4) INSTALLATION FOR METERING OF LIQUIDS WHICH COULD CONTAIN SOME IMPURITIES

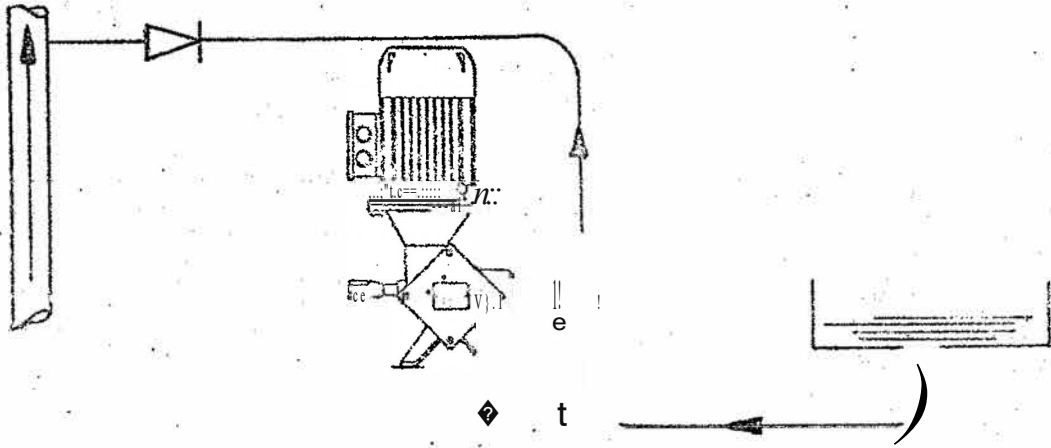
It is necessary to foresee an adequate suction filter with filter mesh of 0,1 mm according to the pump's size and net filter surface 10/20 times suction pipe area. In difficult filtering conditions due to the considerable impurity in the liquid, or to the high viscosity, it is recommended to use basket filters with large surface (100 times the suction pipe's area) which allows to extend the filter life. Besides a large filtering surface reduces negative drop for the pump's volumetric efficiency. If the pump is used continuously a by-pass as suggested.



In case of slurry metering, the pipe layout must be studied to avoid solid settling especially near the pump. Consequently it is necessary to avoid delivery vertical stretch and foresee washing of pump and pipes immediately after every stop.

5) INSTALLATION WITH DELIVERY IN PIPE WHERE THERE IS CONTINUOUSLY FLOW OF LIQUID

It is necessary to foresee a no return valve near the pipe's entry.

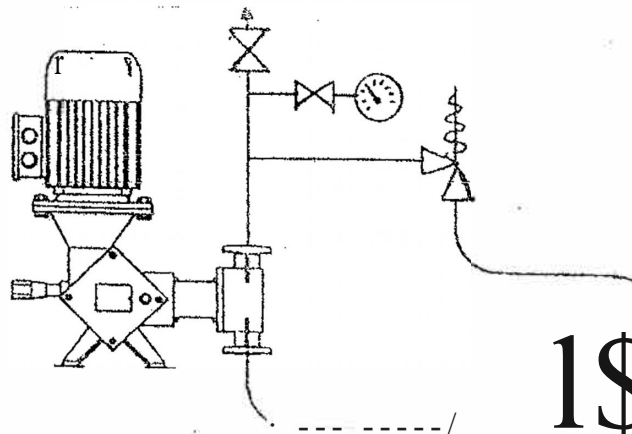


## 6) NECESSITY OF INSTALLATION OF SAFETY VALVE

Being volumetric pumps, the metering pumps must be protected against the danger of running with closer valve occluded delivery pipe.

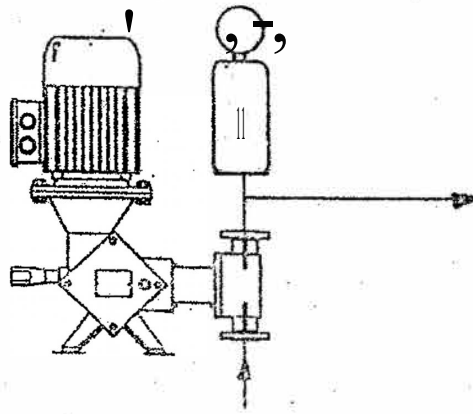
Consequently it is necessary to foresee suitable safety valve. The valve discharge must be easily controllable for a greater control of the valve loss and than of metering precision. The discharge of the safety valve ought to be connected to the suction tank or to a drain.

Note: The safety valve must be always mounted in branch on the delivery pipe between pump and first check valve or, in any case, as soon as possible near the pump chamber. Besides it is recommended the installation of a gauge with gauge holder valve near the safety valve.



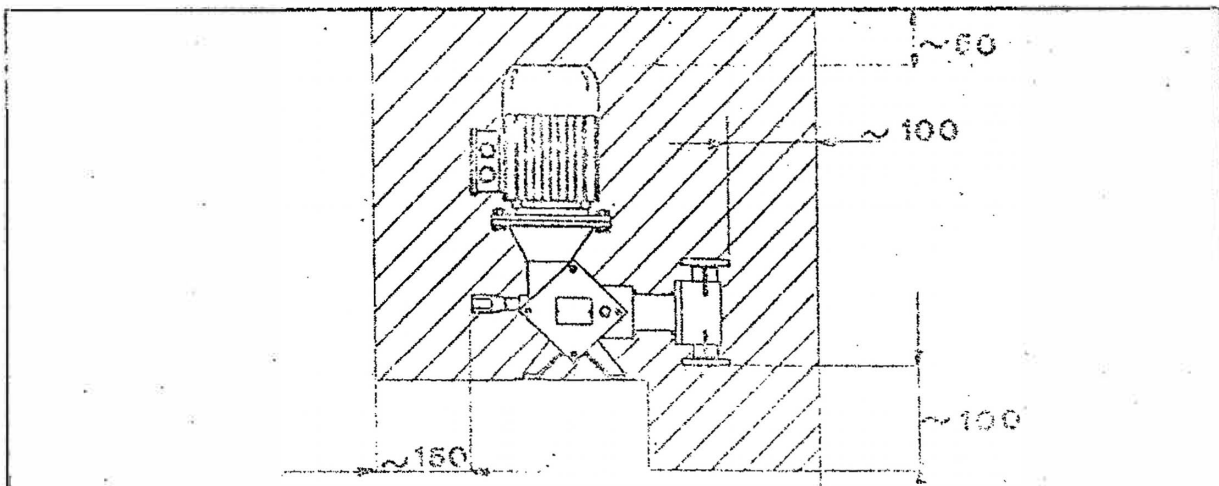
## 7) INSTALLATION OF PNEUMATIC ACCUMULATOR OR DAMPER BAG OF PULSATIONS

In case of volumetric pumps, it is necessary, immediately after the pump, a surge suppressor in delivery, especially with high capacity and it is indispensable if we want a continuous delivery. The use of a suppressor is always suggested as it increases the pump life and eliminates vibrations and inertias in the plant.



## 8) PUMP MOUNTING

8.1) It is advisable sufficient clearance in order to control and remove the pump particularly with regards to the pipe connection and to handle the stroke adjustment knob.



8.2) If the pumps must be located in the open, it is necessary an adequate protection roof, above all if the pump is equipped with actuator or other delicate equipments.

8.3) It is advisable to foresee suitable drain on delivery pipe near the pump chamber in order to make easy the pump moving from plant. In case of pump equipped with vertical flanges, it is necessary to foresee feeder lines to make easy the moving.

8.4) The pump chamber manufactured in PVC can work correctly only at the room temperature and with liquid temperature less than 40° C. It is consequently necessary an adequate protection from sunlight and control of the metered liquid's temperature.

## 9) PUMP INSTALLATION

9.1) It is necessary to be sure that base plate is stable and well levelled and then to position the pump firmly avoiding stress on its axis.

9.2) Before connecting the pipes to pump fastenings wash the pipes to eliminate any foreign substance, soldering drops, packings cuttings or other rubbish.

9.3) The pipes must be supported independently and they must not force on the pump. Besides the pump connections must be executed in such a way that eventual expansions, due to heat source, do not exercise their thrust on the pump's head.

9.4) Foresee always, after delivery flange, a cross connection which can be used to mount manometers safety valves, pulsations dampers.

9.5) Check the free pump rotation moving manually the motor fan. In case of block, control installation and alignment.

9.6) Control that the pipes are perfect tight and particularly that there is no suction of air at inlet which would prevent pump suction.

## 10) PUMP STRAT UP

10.1) Check the oil level through special sight-flow gauges. Pumps are always supplied without oil.

10.2) Check the electrical connections and motor rotation sense which must be as indicated by arrow placed on motor.

10.3) Make sure that all interception valves along suction and delivery pipes are open.

10.4) Make sure that liquid tube metered be not solidified or frozen in the pipes.

10.5) Start with delivery pressure as low as possible, increasing it gently to the maximum. Start pump with no delivery, increasing it gently to maximum in order to desaerate the pipe in rapid and sure way.

10.6) Even if metering pumps are self-priming one, it is possible to have some starting difficulty owing to very reduced piston diameter, or high delivery pressure or counterpressure valves. In these cases it is advisable to fill suction line and pump chamber with the liquid to be pumped.

## 11) MAINTENANCE

### 11.1) Lubricant

Fill to level indicated by special sight-flow gauge-plugs all the oil bath carters. As lubricant oil we recommend a type SAE 140 to be found easily. Commercial products are suitable and have the same characteristics.

Replace first lubricant after first 500 exercise hours and successively every 3000 working hours.

### 11.2) Protection

In case of pump out work for long time, especially before starting, it is necessary to fill the gear box, links and pumping heads with protective oil. Wrap the whole unit in protective plastic material sheet.

Before restarting remove protective oil.

### 11.3) Stutting box

All metering pump chambers are equipped with automatic packings - V - shaped in PTFE. Their shape allows consequently an automatic expansion in stuffing box under hydraulic pressure thrust. Therefore it is advisable not to tighten the seal excessively as the relevant thrust charges uselessly the piston with consequent braking action on the whole mechanism.

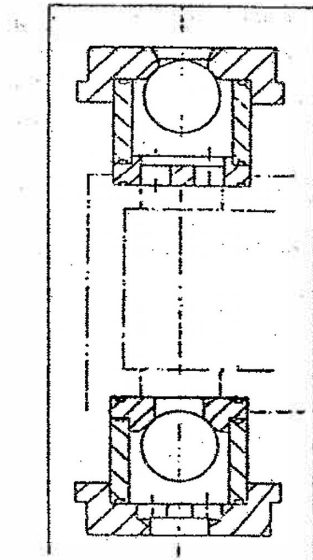
It is suitable, on the contrary, to work gradually with many hours intervals so that packings have time to settle down.

### 11.4) Dismantling

Pump chamber dismantling requires particular attention. It is advisable to examine with attention the drawing in pump section before beginning any action. The smooth packings among valves must be replaced after any disassembling. The assembler will advise if O-rings are to be changed.

The valve balls, either in suction or in delivery, work vertically: they are tight on the seat as per figure. The balls are worked very carefully and must be replaced together with relative

scats in case of crish. Never lubricate valves or scats; on the contrary clean off any lubricant trace which could case locking.



### WORKING BREAKDOWNS AND TROUBLES

#### DELIVERY LESS THAN EXPECTED

Generally the causes are due to the plant :

- suction air infiltrations through connections.
- insufficient suction head ( due to vapour pressure, fluid temperature, viscosity).
- suction pipe stopped up.
- filter obstructed.
- safety valve set at a pressure less than exercise one.

#### WHEN IT IS NECESSARY TO HANDLE PUMP

- Valves locked by impurities.
- Valves worn out.
- Piston and packing worn out.

#### HIGHER OR IRREGULAR DELIVERY

- Too high suction lift.
- Counterpressure valve locked by impurities.

**CAUTION: ADDITIONAL NOTE TO PUMP "MA 180-15/RI-D**

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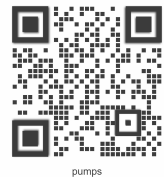
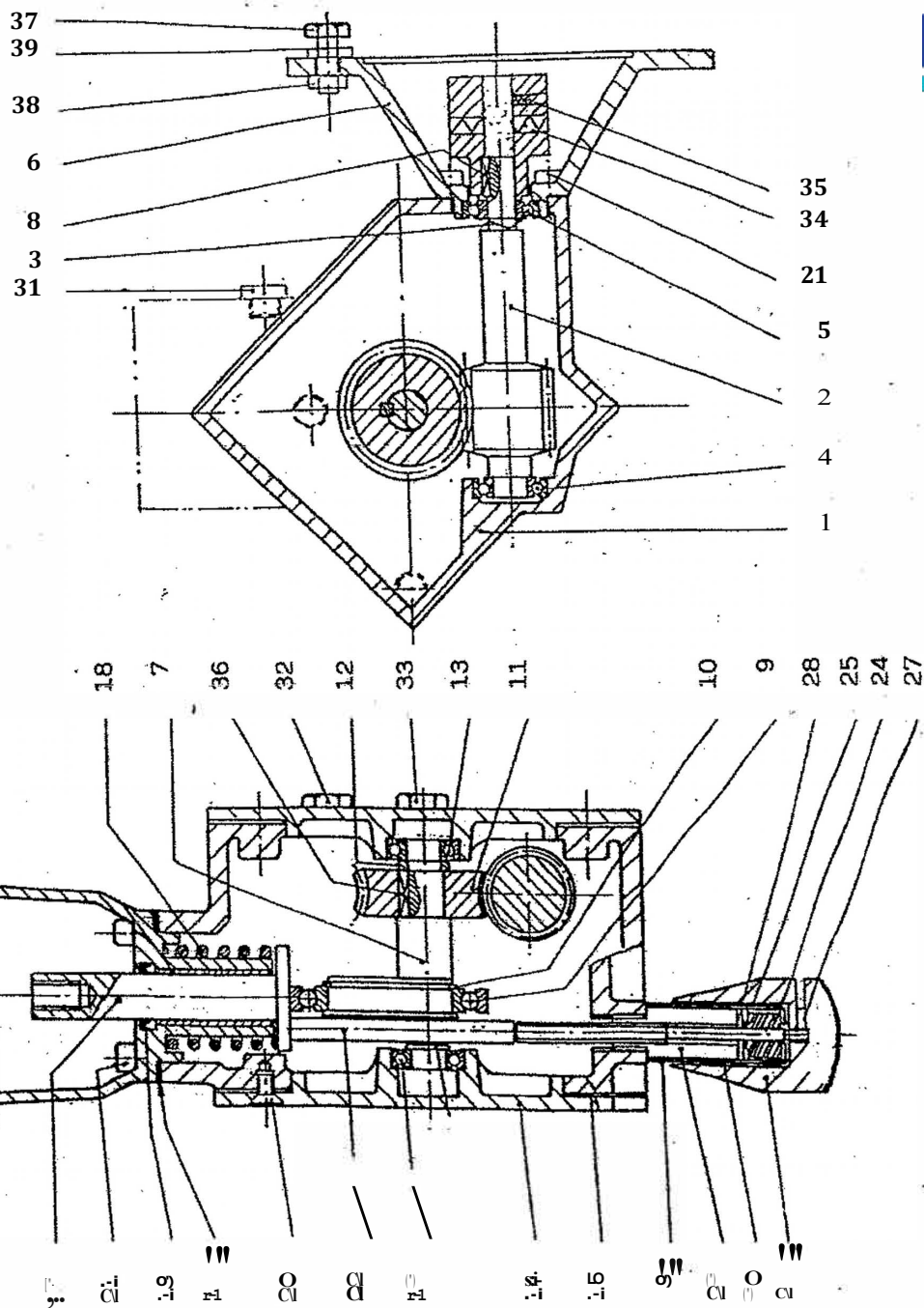
To replace the membrane make sure that the spigot is fully forward, i.e. in the front deadpoint.

Screw the membrane very well, making sure that the screw is all deeply.  
Then refit the head.

DIAPHRAGM PUMPS

Instructions for filling intermediate fluid ( type GULF ARMONY 32 AW )

- 1) Disassemble the head.
- 2) Changing the diaphragm.
- 3) Reassemble the head.
- 4) Regulate the stroke to 1 mm.
- 5) Start up the pump.
- 6) Filling the oil chamber.
- 7) Use the pump for some minute with the open plug ( to remove the air from the chamber).
- 8) Stop the pump.
- 9) Add the further missing oil.
- 10) Close the plug.
- 11) We recommend to use oil type GULF HARMONY 32AW, FIAT TVTELA or similar.

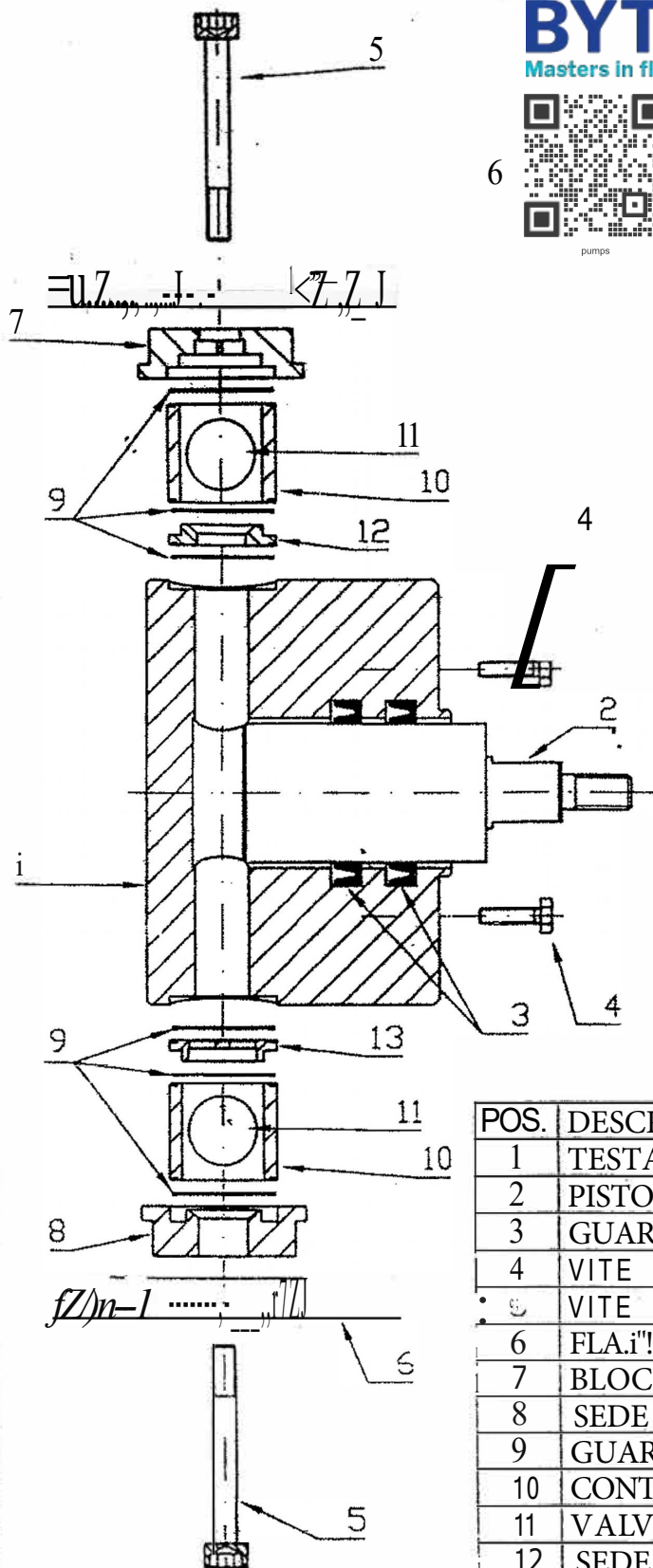


POS.	CODICE	ARTICOLI	PARTS	POS.	CODICE	ARTICOLI	PARTS
1	02.35.X040.15	CORPO POMPA	PUMP BODY	21	56.00.0820.06	VITE	SCREW
2	02.35.X035.06	VITE SENZA FINE	WORM GEAR	22	02.35.X019.08	VITE DI REGOLAZIONE	ADJUSTING SCREW
3	56.70.0001.08	MOLLA A TAZZA	SPRING	23	02.35.X005.00	SUPPORTO REGOLA 7. TONG	GUTDS
4	42.00.7202.00	CUSCINETTO A SFERE	BALL BEARING	24	02.35.X020.08	GRUPPO DI REGISTRO	METAL RING
5	42.00.7203.00	CUSCINETTO A SFERE	BALL BEARING	25	40.01.2031.12	GUARNIZIONE	O.RING
6	02.35.X043.15	LANTERNA PORTAMOTORE	MOTOR LANTER	26	02.35.X010.11	MANOPOLA	ADJUSTING KNOB
7	02.35.X038.08	ALBERO ECCENTRICO	SHAFT	27	56.40.0005.08	GRAND	SCREW
8	56.30.6620.08	CHIAVETTA	KEY	28	56.20.0008.02	RONDELLA	WASHER
9	42.00.1612.00	CUSCINETTO A SFERE	BALL BEARING	29	02.35.X009.11	NOMO	VERNIER
10	56.60.0E60.08	SEEGER	SEEGER	30	55.00.0035.00	TARGHETTA NONO	VERNIER PLATE
11	02.35.X037.10	RUOTA ELICOIDALE	WORM WHEEL	31	50.00.3800.18	TAPPO CARICO OLIO	CHARGE PLUG
12	02.35.X044.08	DISTANZIALE	SPACER	32	50.01.3800.18	TAPPO SCARICO OLIO	DRAIN PLUG
13	42.00.6003.00	CUSCINETTO A SFERE	BALL BEARING	33	50.02.3800.18	SPIA LIVELLO OLIO	OIL WINDOW
14	02.35.X005.15	COPERCHIO	COVER	34	55.00-.2432.15	GIUNTO	COUPLING MOOR
15	02.35.X021.16	GUARNIZIONE COPERCHIO	GASKET	35	56.40.00C.6.08	GRAND	SCREEN
16	02.35.X021.16	GUARNIZIONE LANTERNA	GASKET	36	56.30.5520.08	CHIAVETTA	KEY
17	02.35.X011.08	SLITTA	TIE ROD	37	56.40.1035.08	VITE	SCREW
18	02.35.X021.08	MOLLA	SPRING	38	56.10.0010.08	DAO	NUT
19	40.00.0100.12	ANELLO DI TENUTA	SEAL	39	56.20.0010.08	RONDELLA	WASHER
	56.00.0016.08	VITE	SCREW				



6

pumps



POS.	DESCRIZIONE / DESCRIP110N	QTY
1	TESTATA / HEAD	1
2	PISTONE / PISTON	1
3	GUARN. A LABBRO / PISTON GASKET	1
4	VITE / SCREW	4
5	VITE / SCREW	4
6	FLANGIA / FLANGE	2
7	BLOCCA V. MAND. / DELIVERY VALVE BLOCK	1
8	SEDE V. ASP. / SUCTION VALVE SEAT	1
9	GUARNIZIONE / GASKET	6
10	CONTEN. VALVOLE / VALVES CONTAINER	2
11	VALVOLE A SFERA / BALL VALVE	2
12	SEDE V. MAND. / DELIVERY VALVE SEAT	2
13	BLOCCA V. ASP. / SUCTION VALVE BLOCK	2

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FOGLIO DATA

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DISEGNATO

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CONT. RG. F. A. I. □

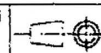
OGGETTO

SEZIONE TESTA -> M25/35 GUARN. A LABBRO

(REVISIONE U.V.)

TOLLERANZE GENERALI: ±0.1 QUOTE IN MILLIMETRO  
(SALVO DOVE DIVERSAMENTE SPECIFICATO)

FORMATO  
A4



SCALA

VISTO

NOTE: RISE: < V.F.A.M.O. A T.E. < MINI DI LGG. 1-1, PROP. LETA' UI CL. F.SIO. ILL. EGNO C.J.N. : L J1VIETO : r IPQD' XL. 0 DI -; "NDE&LO "tCTJ A DITTE "JNCE" <EN\* D t -; RZI SENZA LA N::S:7RA AU"7CRIZZAZI CNF.

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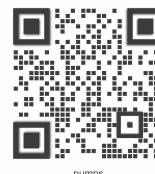
DECLARATION DE CONFORMITE' - -

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DECLARATION OF CONFORMITY -

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Serial number:.....

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UNI EN ISO 3746: 2009 -Acustica. Determinazione dei livelli di potenza sonora delle sorgenti di rumore mediante misurazione della pressione sonora. Metodo di controllo con una superficie avvolgente su un piano riflettente.  
 UNI EN ISO 3746: 2009- Sound. Determination of sound power levels for noise sources by measuring the sound pressure. Monitoring method with an enveloping surface on a reflecting plate.  
 UNI EN ISO 3746: 2009 -Acoustique. Détermination des niveaux de puissance sonore des sources de bruit par mesure de la pression acoustique. Méthode de contrôle avec surface enveloppante sur plan réfléchissant.  
 UNI EN ISO 3746: 2009 -Akustik. Bestimmung der Schalleistungpegel von Geräuschquellen aus Schalldruckmessungen. Hüllflächenverfahren über einer reflektierenden Ebene.  
 UNI EN ISO 3746: 2009-Acústica. Determinación de los niveles de potencia sonora de las fuentes de ruido mediante medición de la presión sonora. Método de control con una superficie envolvente sobre una superficie reflectante.

UNI EN ISO 11200: 2009 -Acustica. Rumore emesso dalle macchine e dalle apparecchiature. Linee guida per l'uso della norma di base per la determinazione dei livelli di pressione sonora al posto di lavoro e in altre specifiche posizioni.  
 UNI EN ISO 11200: 2009 - Sound. Noise done by the machines and the equipments. Guidelines for using the basic norms for determining the sound pressure levels in the working place and in other specific positions.  
 UNI EN ISO 11200: 2009-Acoustique. Niveau de bruit émis par les machines et par les appareils. Orientations concernant l'utilisation de la norme de base pour la détermination des niveaux de pression sonore sur poste de travail et dans d'autres situations spécifiques.

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