MECHANICAL DIAPHRAGM METERING PUMPS

SPRING RETURN

SERIES **MB MC**

GB ENGLISH

CE

JOB N°							
PUMP TYPE	SHEET						
ELECTRIC ACTUATOR TYPE							
OVERALL DRAWING	16						
MB/MC	16						
MB/MC **Z-Z9**	17						
MECHANISM SECTIONAL DRAWINGS	18						
PUMPHEAD SECTIONAL DRAWING	18						
ENCLOSED							
ITEM							
SERIAL/No							

OBL

> OPERATING MANUAL

INDEX

CAUTION!

INFORMATION FOR CUSTOMERS

OBL s.r.l. welcome pumps despatched to our premises for servicing.

Basic suggestion for pump cleaning

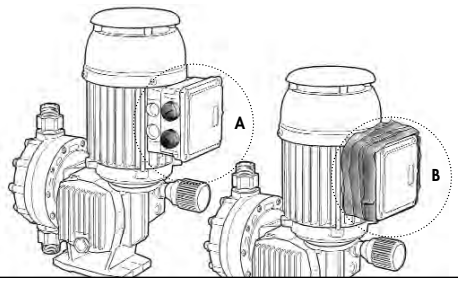
MANDATORY REQUIREMENT

Pumps to be sent with cleanness certificate, so free from any chemical trace into liquid end and all wetted parts.

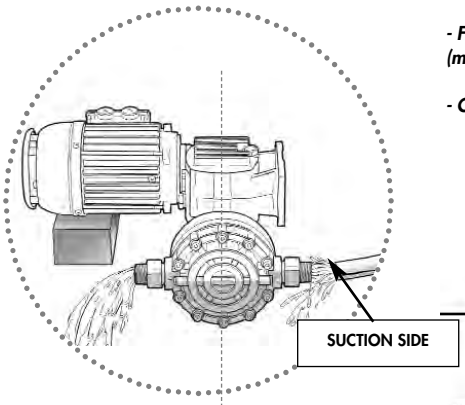
If not supplied, pump (s) will be rejected and sent back at customer's charges.

1 *A - Close terminal box cover and seal cable entry with PG plugs.*

B- If there are no PG plugs available, the terminal box must be sealed with adhesive waterproof tape.

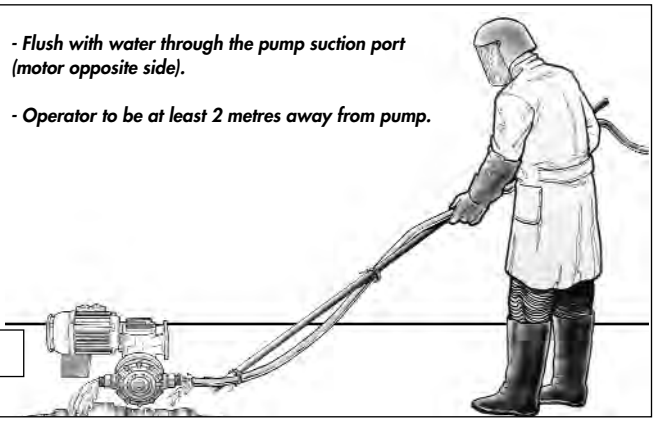


2 *- Place the pump on the floor, in a suitable area for waste water collection, with the inlet and outlet ports horizontal.*

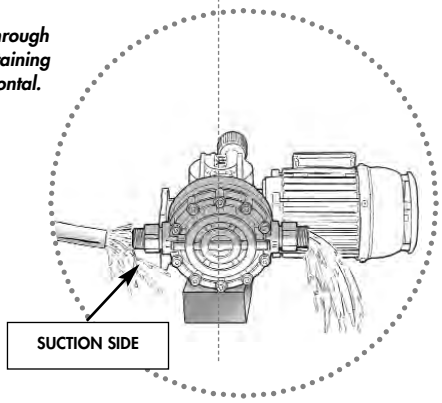


- Flush with water through the pump suction port (motor opposite side).

- Operator to be at least 2 metres away from pump.

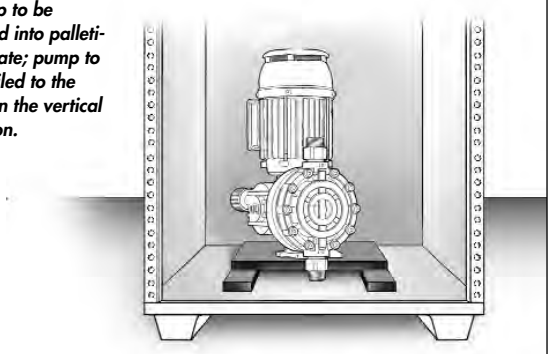


3 *- Continue cleaning through discharge port, maintaining the connections horizontal.*



- The cleaning procedure must be repeated for at least 5 minutes.

4 *- Pump to be packed into palletised crate; pump to be nailed to the base in the vertical position.*



Please be reminded to collect cleaning water in specific containers. Containers to be collected by authorised companies for the disposal of waste waters.

MECHANICAL DIAPHRAGM METERING PUMPS

MB

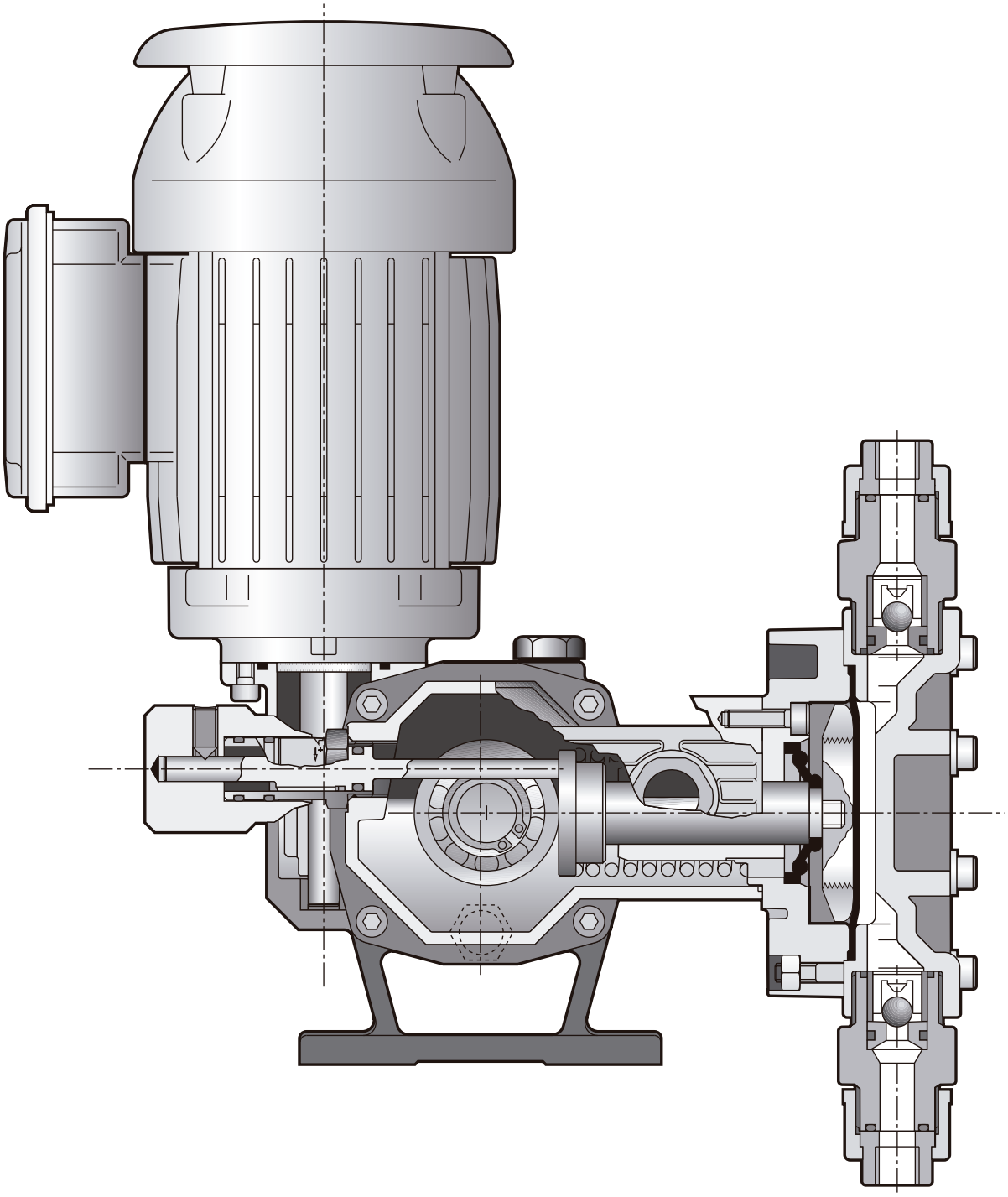
TECHNICAL DATA

TYPE	STROKES/1'	MAX FLOW RATE l/h	∅ DIAPHRAGM	STROKE	VALVE A	VALVE P	MAX PRESS. BAR	CONNECTIONS THREADED PP	CONNECTIONS THREADED A	CONNECTIONS FLANGED PP	CONNECTIONS FLANGED A
50 Hz											
MB.11	36	**11**	94	2	CML 5	VP 7	12	3/8" BSPF		DN15 1/2"ANSI 150#RF	
MB.16	50	**16**	94	2	CML 5	VP 7	12	3/8" BSPF		DN15 1/2"ANSI 150#RF	
MB.23	70	**23**	94	2	CM 7	VP 7	12	3/8" BSPF		DN15 1/2"ANSI 150#RF	
MB.31	95	**31**	94	2	CM 7	VP 7	8	3/8" BSPF		DN15 1/2"ANSI 150#RF	
MB.37	115	**37**	94	2	CM 7	VP 7	8	3/8" BSPF		DN15 1/2"ANSI 150#RF	
MB.50	155	**50**	94	2	CM 7	VP 7	8	3/8" BSPF		DN15 1/2"ANSI 150#RF	
MB.35	36	**35**	108	4	CM 8	VP 8,5	6	3/8" BSPF		DN15 1/2"ANSI 150#RF	
MB.49	50	**49**	108	4	CM 8	VP 8,5	6	3/8" BSPF		DN15 1/2"ANSI 150#RF	
MB.75	70	**75**	108	4	CM 8	VP 8,5	6	3/8" BSPF		DN15 1/2"ANSI 150#RF	
MB.101	95	**101**	108	4	CM 8	VP 8,5	6	3/8" BSPF		DN15 1/2"ANSI 150#RF	
MB.120	115	**120**	108	4	CM 9	VP 8,5	6	3/8" BSPF		DN15 1/2"ANSI 150#RF	
MB.155	155	**155**	108	4	CM 9	VP 8,5	6	3/8" BSPF		DN15 1/2"ANSI 150#RF	
60 Hz											
MB.9	30	**9**	94	2	CML 5	VP 7	12	3/8" BSPF		DN15 1/2"ANSI 150#RF	
MB.14	43	**14**	94	2	CML 5	VP 7	12	3/8" BSPF		DN15 1/2"ANSI 150#RF	
MB.28	84	**28**	94	2	CM 7	VP 7	12	3/8" BSPF		DN15 1/2"ANSI 150#RF	
MB.36	114	**36**	94	2	CM 7	VP 7	8	3/8" BSPF		DN15 1/2"ANSI 150#RF	
MB.45	138	**45**	94	2	CM 7	VP 7	8	3/8" BSPF		DN15 1/2"ANSI 150#RF	
MB.42	43	**42**	108	4	CM 8	VP 8,5	6	3/8" BSPF		DN15 1/2"ANSI 150#RF	
MB.58	60	**58**	108	4	CM 8	VP 8,5	6	3/8" BSPF		DN15 1/2"ANSI 150#RF	
MB.90	84	**90**	108	4	CM 8	VP 8,5	6	3/8" BSPF		DN15 1/2"ANSI 150#RF	
MB.121	115	**121**	108	4	CM 9	VP 8,5	6	3/8"	1/2"	DN15 1/2"ANSI 150#RF	
MB.145	138	**145**	108	4	CM 9	VP 8,5	6	3/8"	1/2"	DN15 1/2"ANSI 150#RF	

MC

TECHNICAL DATA

TYPE	STROKES/1'	MAX FLOW RATE l/h	∅ DIAPHRAGM	STROKE	VALVE A	VALVE P	MAX PRESS. BAR	CONNECTIONS THREADED PP	CONNECTIONS THREADED A	CONNECTIONS FLANGED PP	CONNECTIONS FLANGED A
50 Hz											
MC.101	36	**100**	138	6	CM 13,5	VP 11 G	7	3/4" BSPF		DN20 3/4"ANSI 150#RF	
MC.131	50	**132**	138	6	CM 13,5	VP 11 G	7	3/4" BSPF		DN20 3/4"ANSI 150#RF	
MC.201	70	**197**	138	6	CM 13,5	VP 13,5	7	3/4" BSPF		DN20 3/4"ANSI 150#RF	
MC.261	95	**260**	138	6	CM 13,5	VP 13,5	7	3/4" BSPF		DN20 3/4"ANSI 150#RF	
MC.321	115	**320**	138	6	VM 16,5	VP 17	5	1" BSPF		DN25 1"ANSI 150#RF	
MC.421	155	**420**	138	6	VM 16,5	VP 17	5	1" BSPF		DN25 1"ANSI 150#RF	
60 Hz											
MC.120	43	**120**	138	6	CM 13,5	VP 11 G	7	3/4" BSPF		DN20 3/4"ANSI 150#RF	
MC.158	60	**158**	138	6	CM 13,5	VP 13,5	7	3/4" BSPF		DN20 3/4"ANSI 150#RF	
MC.236	84	**236**	138	6	CM 13,5	VP 13,5	7	3/4" BSPF		DN20 3/4"ANSI 150#RF	
MC.312	114	**312**	138	6	VM 16,5	VP 17	5	1" BSPF		DN25 1"ANSI 150#RF	
MC.384	138	**384**	138	6	VM 16,5	VP 17	5	1" BSPF		DN25 1"ANSI 150#RF	



MATERIALS OF CONSTRUCTION

PARTS	PP	PP11	PP32	A
LIQUID END	PP	PP	PP	AISI 316L
VALVE GUIDE	POLYTHENE/PVC	POLYTHENE/PVC	POLYTHENE/PVC	AISI 316L
VALVE SEAT	PVC	AISI 316L	INCOLOY 825	AISI 316L
VALVE	PIREX	AISI 316L	HASTELLOY C-276	AISI 316L
VALVE SEAL	VITON (FPM)	VITON (FPM)	VITON (FPM)	VITON (FPM)
VALVE HOUSING	PP	PP	PP	AISI 316L
DIAPHRAGM	TEFLON (PTFE)	TEFLON (PTFE)	TEFLON (PTFE)	TEFLON (PTFE)

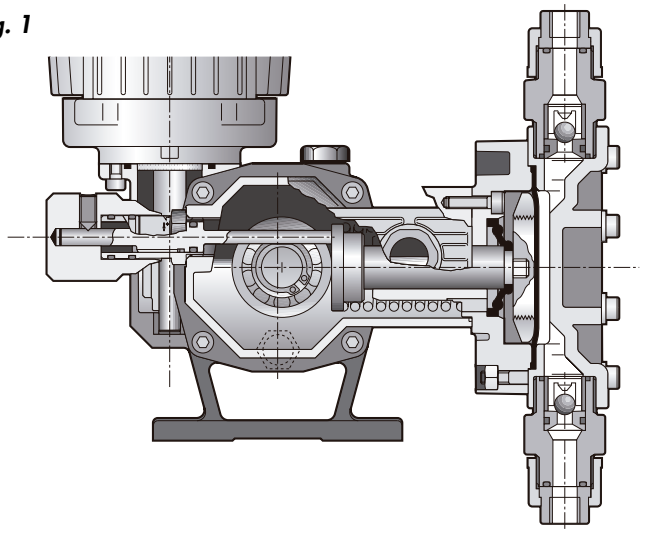
MODEL NUMBER

MB | 37 | PP | F | Z

KEY TO SYMBOLS	
PUPM TYPE	
FLOW RATE l/h	
PP	PP CONSTRUCTION
A	AISI-316L CONSTRUCTION
PP11	PP CONSTRUCTION+AISI-316L VALVE AND SEAT
PP32	PP CONSTRUCTION + HASTELLOY C VALVE - INCOLOY 825 SEAT
Z	OBL ELECTRIC ACTUATOR
W	3÷15 PSI PNEUMATIC ACTUATOR
F	UNI-DIN FLANGED CONNECTIONS
FA	ANSI FLANGED CONNECTIONS

1.1 DESCRIPTION OF THE PUMP

Fig. 1



• The **OBL**'s metering pumps "**MB/MC**" series are controlled-volume reciprocating pumps.

The crank gear is driven by an electric motor and the strokes per minute of the diaphragm are given by an integral, oil-splash-lubricated , endless screw/wormwheel reduction gear (fig.**1**).

In **MB/MC**'s mechanical diaphragm metering pumps, suction stage (diaphragm backward stroke) is by spring return.

The **MB/MC** series metering pumps are characterised by a so called mechanical diaphragm, where the reciprocating movement is transmitted directly by the crank gear.

The mechanical diaphragm works, both giving the swept volume, acting basically as plunger, and as separator between crank gear and the handled fluid.

• The **MB/MC** mechanical diaphragm metering pumps give a double advantage:

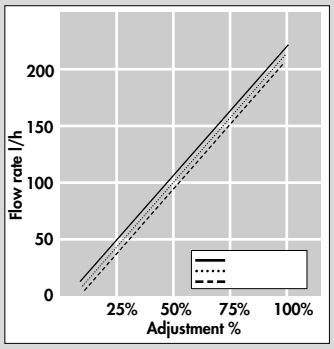
- Leak-free head.
- No plunger packing and related wearing problems.

These results are achieved thanks to the unique structure of the diaphragm (patented), which bears the whole thrust of the handled liquid, and, like a plunger pump, guarantees a linear flow rate (table **A**).

Table A

THE FLOW RATE LINEARITY

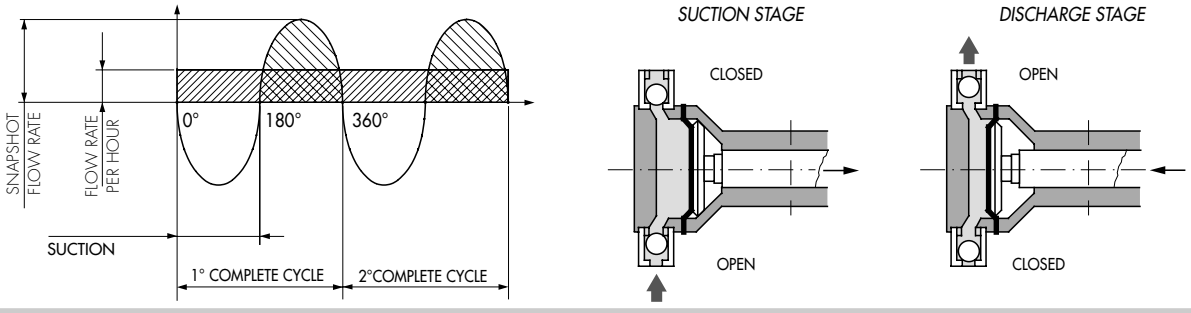
The operating of an OBL mechanical diaphragm reflects the flow rate linearity of a plunger pump. This is proved by the graph here on the left that evidences the linear proportionality between flow rate and adjustment percentage.



1.2 FLOW RATE

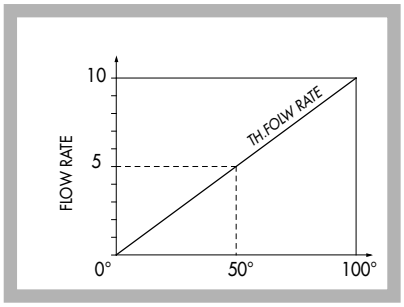
• The reciprocating motion of the diaphragm determines the flow thanks to the inlet and outlet check valves of the pump head (fig. **2**).
During the suction stage the inlet valve opens because of the depression created by the diaphragm while the outlet valve remains closed. The product enters the pump head and goes out throught the outlet valve when pushed by the diaphragm during the discharge stage.

Fig. 2



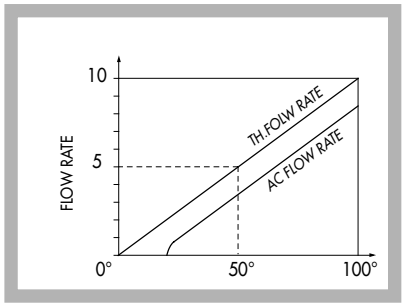
Theoretical flow rate

The theoretical flow rate corresponds exactly to the volume displaced by the diaphragm during its motion. Its graphic representation is a diagonal straight line whose progression is determined by the diaphragm stroke increasing (fig.**3**).



Actual flow rate

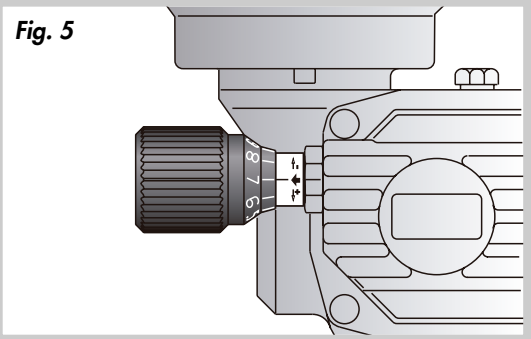
The actual flow rate is inevitably less than the theoretical flow rate because of the losses due to the reaction time of the valves. The ratio between these two flow rates determines the volumetric efficiency of the pump. The efficiency depends on pump size, pump head type (plunger or diaphragm), liquid to be pumped, viscosity of the liquid, working pressure, etc. (fig. **4**).



1.3 MANUAL ADJUSTMENT

FLOW RATE MANUAL BY MICROMETER

Fig. 5



• The adjustment of the diaphragm stroke is stepless and regular, and can be carried out any time, i.e. when the pump stands still or is running (fig.**5**).

1.4 MOTOR CHARACTERISTICS ACCORDING TO THE PUMP SIZE

• In table **B** are described motors installed on **MB/MC** pumps. Endless screw is directly keyed on extended motor shaft.

Table B

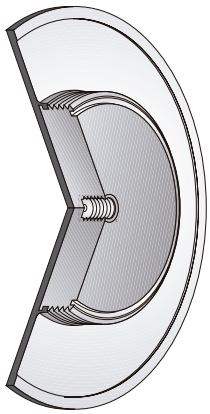
STANDARD						
GAMAR MOTOR SPECIAL FLANGE AND SHAFT						
PUMP TYPE	PHASES	kW	POLES	SIZE	VOLT	Hz
MB	THREEPH	0,20	4	63	230 400	50/60
MC	THREEPH	0,30	4	63	230 400	50/60
MB MC	SINGLEPH	0,24/037	4	63/71	230	50
		0,24/037	4	63/71	230	60
		0,24/037	4	63/71	110	50
		0,24/037	4	63/71	110	60

1.5 DIAPHRAGM STRUCTURE

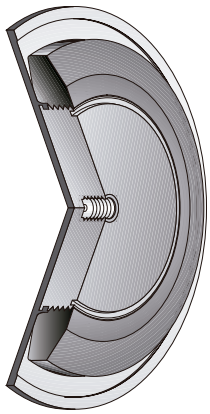
• The **OBL**'s unique (patented) mechanical diaphragm design ensures controlled volumetric displacement, giving plunger-like performances.
Thus the flow rate is virtually unaffected by the working pressure variations.

DIAPHRAGM SECTIONAL VIEW

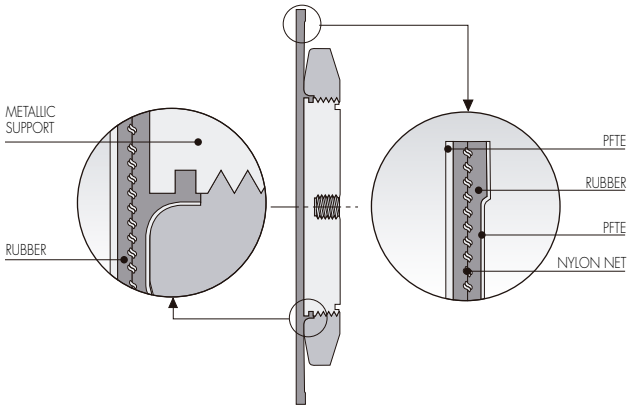
Sectional view without plastic support ring.



Complete sectional view with plastic support ring.



DETAIL OF THE BONDING BETWEEN DIAPHRAGM AND METALLIC SUPPORT



2.1 INSTRUCTIONS FOR A PROPER INSTALLATION

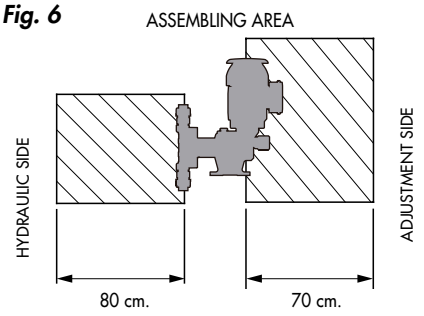
• Provide with adequate clearance areas and safe access for operation and maintenance, in particular in front of the hydraulic side and of the adjustment knob (fig. **6**).

• If the pump is installed outdoors, a shelter is recommend, specially when the pump is equipped with electric actuators or other delicate devices.

• **PP** pump heads can work properly only at ambient temperature and metered liquid temperatures below 40°C.

• If necessary, provide suitable protection from sun rays and check the temperature of the metered liquid.

Fig. 6



2.2 SUCTION LINE

• A proper installation and sizing of the suction line are of particular importance for a correct operation of the pump, the following factors shall be taken into account:

A) Pipe inner diameter
The pipe internal diameter will be chosen according to the pump flow rate (see table **C**). The pump connections are oversized, in order to cover all applications.

B) Length of the piping
Suction piping is to be as short as possible, following the indications of table **C** it is suggested:
- Max suction lift 1,5 metres
- Total length 2,5 metres (upright plus horizontal)

C) Arrangement of the suction line
For the arrangement of the suction line see Fig. **7/A and 7/B**.

Table C

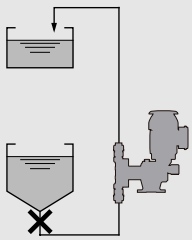
Relationship between flow rate and pipe size

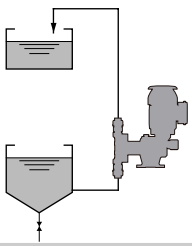
FLOW RATE **L/h**	PIPE WITH FITTINGS	FLANGED PIPE	THREADED PIPE	PVC GLUED PIPE
0÷15	4x6	-	-	-
0÷30	6x10	-	1/4"	-
0÷125	-	DN 10	3/8"	Ø16
0÷155	-	DN 15 1/2" ANSI	1/2"	Ø20
0÷260	-	DN 20 3/4" ANSI	3/4"	Ø25
0÷420	-	DN 25 1" ANSI	1"	Ø32

WRONG | RIGHT

Fig. 7/A

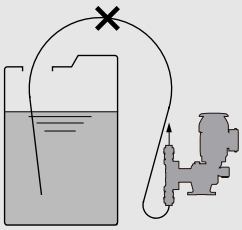
Wrong
Risk of clogging of pump valves

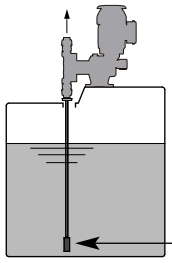




Right

Wrong
In the highest point of the piping the fluid vein breaks

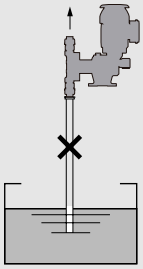


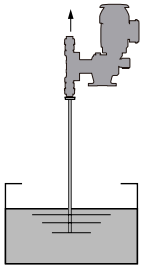


Right

FILTER FOOT VALVE

Wrong
Pipe size not according with table **C**



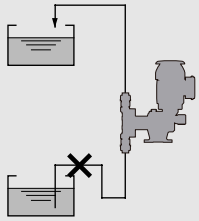


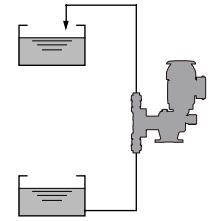
Right
Pipe size according with table **C**

WRONG	RIGHT

Fig. 7/B

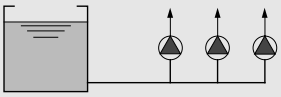
Wrong
Irregular suction

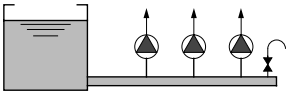




Right

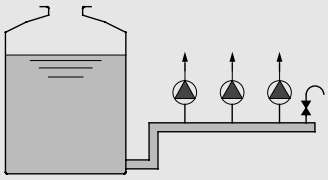
Wrong

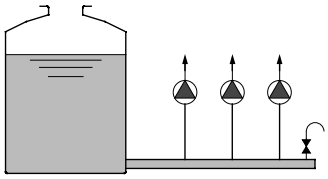




Right

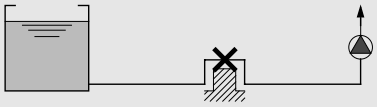
Wrong

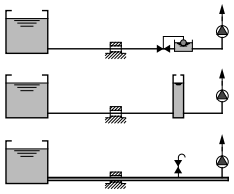




Right

Wrong





Suggested installation

Suggested installation

Acceptable installation

2.3 SUCTION SIDE FILTER

• The installation of a filter on the suction side is always recommended, particularly when the liquid to be metered contains suspended particles.

CAUTION! A small-sized filter will affect the metering performances. Use Y- filters with a size larger than the suction connection.

• The characteristics of the filter net depend on the kind of liquid and pump flow rate. For liquids with viscosity not exceeding 200 cp see table **D**.

• To prevent sucking of impurities, specially when liquids with solid content are metered, the suction pipe shall not draw the liquid from the bottom of the tank. The suction point should be 10 cm from the tank bottom (fig.**8**).

Table D

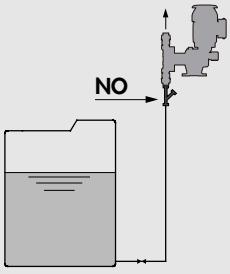
Flow rate L/h	Mesch
1÷15	40
15÷50	40
100÷200	30
200÷420	30

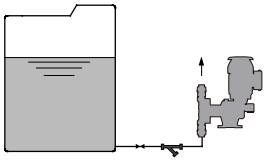
Examples of installation of the filter

WRONG	RIGHT

Fig. 8

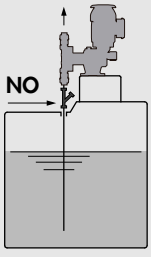
Wrong

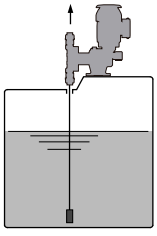




Right

Wrong





Right

2.4 SUCTION PIPING FOR VISCOUS LIQUIDS

• Specific technical information is required for the installation of pumps intended for metering viscous liquids.

- For this kind of application we recommend stainless steel pumpheads.

- The suction piping must have an adequate diameter; as a rule, for high-viscosity liquids (2000 cps), select the size immediately above the diameter of the pump suction connections.

- In any case, when viscous liquids are to be metered choose for the pipe at least the same size as that of the pump connections.

Table E

S.P.M.	cp max execution "A"
36	2000
50	1500
70	800
95	400
115	300
155	100

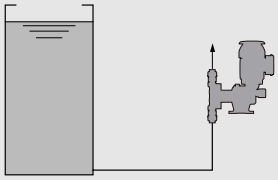
Relationship between strokes per minute "SPM" and viscosity of the liquid "cp", valid for AISI 316L or PP.11 pump heads.

Examples of installation for viscous liquids

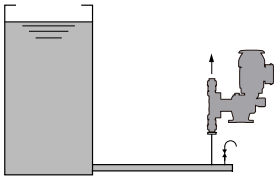
WRONG	RIGHT

Fig. 9

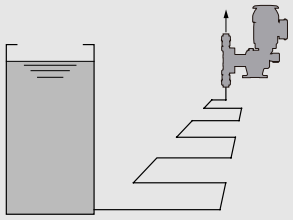
Wrong



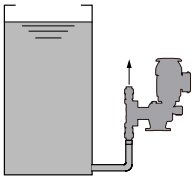
Recommended



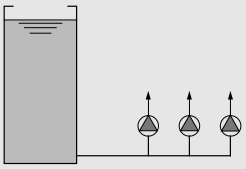
Wrong



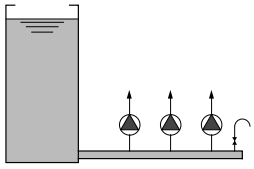
Recommended



Wrong



Right



2.5 DISCHARGE LINE

• When the free surface of the liquid in the suction side tank is above discharge-side tank level, an uncontrollable flow from the suction side tank to the discharge side tank will occur.

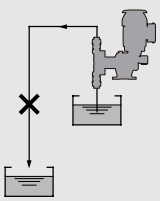
• To prevent this natural passage of liquid, the discharge pressure must always be at least 0,3 Kg/cmq, higher than the suction pressure, in case of small flow rates 0,5 Kg/cmq.

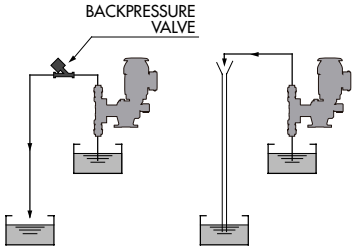
• If for any reason this condition cannot be complied with the plant it is necessary to create a backpressure by means of a suitable valve, or better to highten the discharge pipe so as to prevent the siphoning effect (fig.**10**).

WRONG	RIGHT

Fig. 10

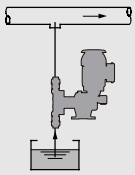
Wrong
Siphoning.
Uncontrollable flow rate.

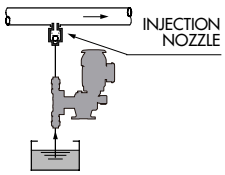




Right

Wrong
Failing a back pressure valve, the flow in pipeline "A" draws the product from the tank in an uncontrolled way.

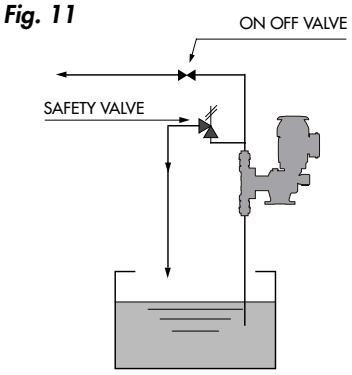




Right

2.6 SAFETY VALVE

Fig. 11



CAUTION ! Mechanical diaphragm metering pumps absolutely need the installation of a relief valve; a pressure higher than the rating plate value would break the mechanism.

- The safety valve has to be installed immediately after the discharge connection, anyhow before the on-off valve.
- The relief valve setting (set pressure) must not exceed the pump max. pressure value.
- The safety valve protects the pump from:

  Excessive pressure (pressure higher than the rated value).

  Operator mistakes (E.G., on-off valve closed on the discharge line when the pump is running).

  Obstruction of the discharge piping (reduction in section clogging).
- A relief valve is absolutely necessary when an on-off valve is fitted on the discharge line (fig.**11**).

The installation of a safety valve is always essential both because of the above reasons and for the safety regulation for accident at work.

2.7 INSTALLATION OF THE PULSATION DAMPENER

- The pulsation dampener is decisive for a proper operation of the metering pumps.

The installation of a pulsation dampener offers several advantages because this device:

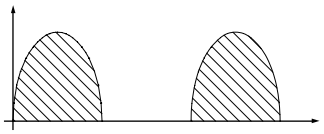
- Protetects the metering pump against pressure peaks, thus increasing the working of life of the pump.
- Prevents vibrations all along the discharge line.
- Smooth the flow, useful for the process.

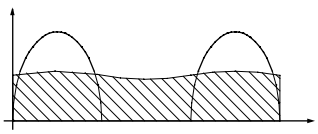
- The pulsating flow, which is a negative characteristic of all metering pumps, can therefore be prevented by installing a pulsation dampener on the discharge line (fig. **12**).

Examples of installation of the pulsation dampener

Fig. 12

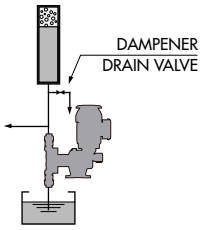
Flow rate diaphragm (without dampener)

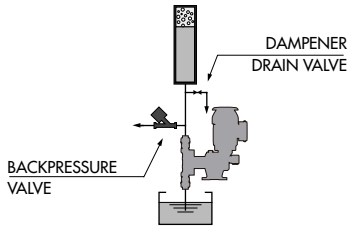




Flow rate diaphragm (with dampener)

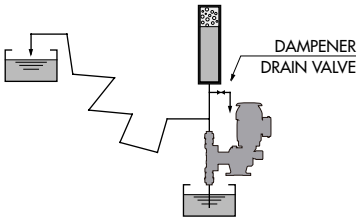
Installation with working pressure higher than 1 bar

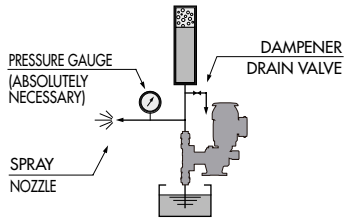




Installation with working pressure lower 1 bar

Discharge line too long and winding





Spray nozzle installation

Dampener types

Bottle dampener

- Is made up of a cylindrical-shape barrel developed in its height.
- Dampener volume: about 35 times the pump swept volume

.

Advantages:
- It does not need precharge because is self-running.

Disadvantages:
- It has to be regenerated periodically by releasing the liquid through the drain valve in order to restore the air absorbed by the liquid.

Bladder type dampener

- The liquid is separed from the relieving chamber by a diaphragm.
- Dampener volume: about 8 times the pump swept volume.

Advantages:
- Small volume.
- No need for periodic inflation because the gas is contained in the bladder.

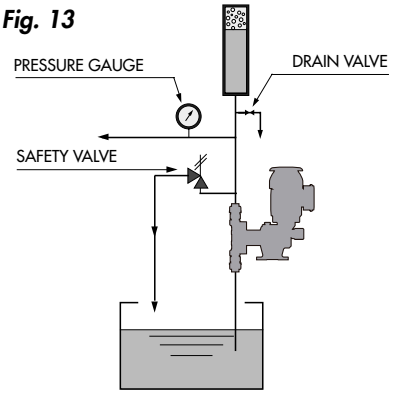
Disadvantages:
- It is necessary to know prior the exact working pressure in order to determine the damper precharge.

2.8 INSTALLATION OF THE PRESSURE GAUGE

• In order to check if the metering pump operates correctly, it is essential to install a pressure gauge on the discharge line (fig. **13**).

• The pressure gauge shows the actual working pressure of the metering pump. This value must not exceed the max. allowed pressure of the pump.

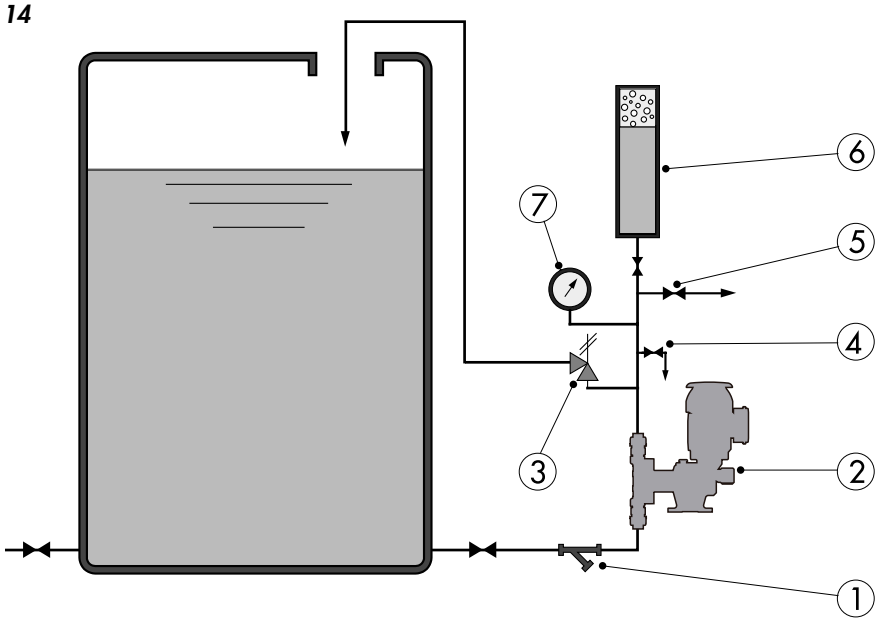
Fig. 13



2.9 STANDARD PLANT ARRANGEMENT

• Figure **14** shows the indications for a correct installation of the metering pumps.

Fig. 14



1 - "Y" filter

2 - Metering pump

3 - Safety valve

4 - Drain valve

5 - On-off valve

6 - Pulsation dampener

7 - Pressure gauge

2.10 CRANK HOUSING OIL FILLING UP

• Unscrew the filling plug located on the crank housing and pour lubricating oil into it.

Pumps are always supplied without oil.
For oil type see table ***F.***

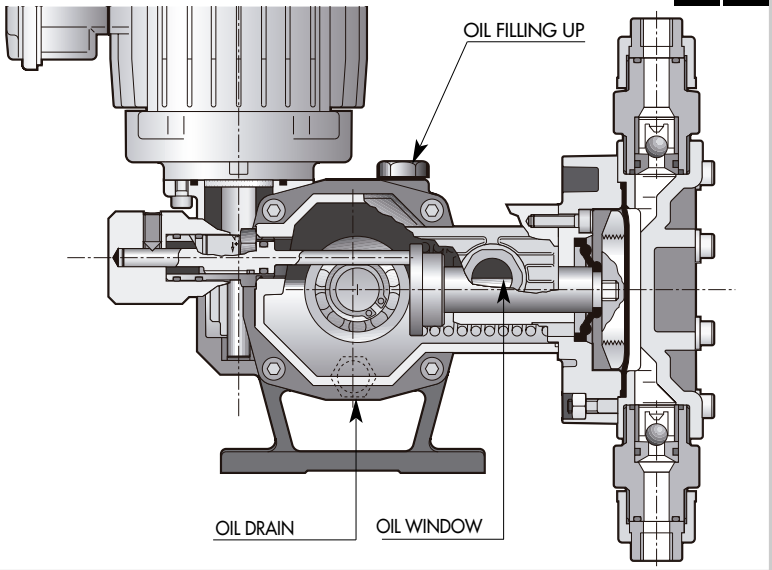
Table F

BRAND	TYPE
ESSO	SPARTAN EP 320
MOBIL	MOBILGEAR 632
SHELL	OMALA OIL 320

PUMP	OIL QUANTITY
MB	0,4 L
MC	0,4 L

Fig. 15

MB MC



3 STARTUP

3.1 BEFORE THE STARTUP

BEFORE THE STARTUP VERIFY THE FOLLOWING CONDITIONS:

- Make sure that the baseplate is made of steel, stable and even. Do not install the pump directly on a concrete foundation.
- Fix the pump to the baseplate using the specific anchor holes in the pump feet.
- Make sure that the pump valve axis is perfectly upright.
- Before connecting the piping to the pump, it is absolutely necessary to flush the pipelines with water, especially the suction line and relevant feed tank.

⚠ ***This preliminary flushing is often underestimated by the installator; if this operation is not properly carried out, the pump will become a collector of all foreing matters contained in the pipeline and tank, such as weld drops, gasket scraps, soil and other stuff.***

- The pipelines must be independently supported, so as to prevent stresses on the pumphead. Therefore, besides the baseplate, the pump needs a supporting framework for both suction and discharge pipelines.
- It is recommended to fit a cross after the discharge flange. This fitting will facilitate the removal of the pump from the baseplate and can be used for the installation of pressure gauges, safety valves and dampeners.
- Make sure that the pipeline fittings and flanges are perfectly tight and in particular that no air enters the suction line, as this would hinder the priming of the pump.

3.2 STARTUP

THE STARTUP HAS TO BE DONE AS FOLLOWS:

- With pump not running, check the oil through the oil window (for oil type see table **F**).
- Check the electric connections and also the direction of rotation of the motor (shown by the arrow on motor body).
- **Make sure that all on-off valves on the suction and discharge pipelines are open.**
- Make sure that the liquid to be metered has not solidified or frozen inside the piping.
- Carry out the first startup with discharge pressure as low as possible and with adjustment knob set to 20%; keep these conditions about 3 ÷ 5 minutes. Increase gradually the flow rate up to the maximum value, then set the pump to the required working conditions (flow rate and pressure).
- During the first stage check the pump discharge pressure by means of the pressure gauge: the pressure value (max. oscillation of the pointer) must not exceed the max. pressure indicated on the pump rating plate.

⚠ **CAUTION !**
THE PUMP CANNOT STAND PRESSURES HIGHER THAN THOSE INDICATED ON THE RATING PLATE.

3.3 POSSIBLE TROUBLES DURING STARTUP

FLOW RATE LOWER THAN EXPECTED

CAUSES	SOLUTIONS
• Air entering the suction piping through the fittings:	***Check.***
• Air trapped inside the pump:	***Raise pump flow rate to maximum value, otherwise unscrew discharge valve housing (pos.14) till the liquid arrives.***
• Suction lift too high:	***Reduce it.***
• The vapour pressure of the fluid is too high:	***Increase the hydrostatic head on suction side.***
• The viscosity of the liquid is too high:	***Install a suction piping having a larger diameter. Increase the hydrostatic head on suction side.***
• Suction piping is clogged or its valves are shut:	***Verify.***
• Filter on suction side is clogged:	***Clean it.***
• Pump valves are stuck because of foreign matters coming from suction side:	***Dismantle the valves and clean them carefully.***
• Check valves are mis-arranged:	***See instructions on page 14 (Pump heads - Dismanting and reassembly).***

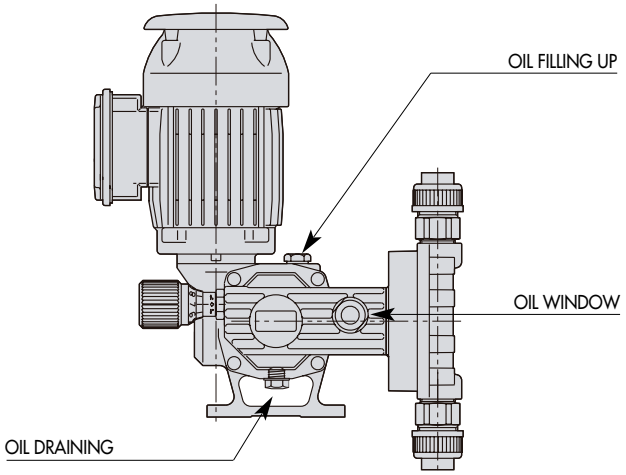
FLOW RATE IRREGULAR OR HIGHER THAN EXPECTED

CAUSES	SOLUTIONS
• The suction hydrostatic head exceeds the discharge pressure:	**Increase the discharge pressure by means of a back pressure valve. (OBL, series 300).**
• Back pressure valve stuck in open position because of foreing matters, or pressure setting too low respect to the suction head:	***Check.***
• Pump valves jammed in open position:	***Check.***

4 MAINTENANCE

4.1 ROUTINE MAINTENANCE

Fig. 16



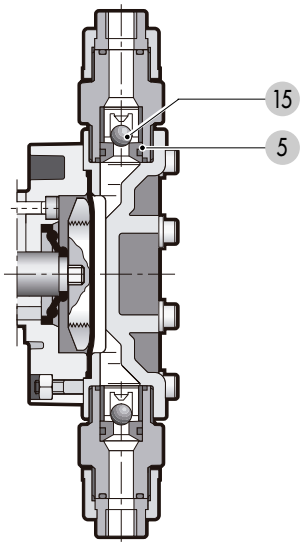
- Check the oil level periodically (fig. **16**).
- Change the oil every 10.000 operating hours.

In case of lower or irregular flow rate, check the valve units as follows:

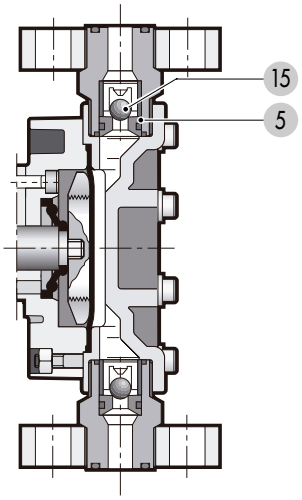
- Refer first to the pumphead section drawing.
- Pay attention to the arrangement of the valve components; each valve ball rests by gravity on its seat (Figure **17**).
- Unscrew the suction and discharge valve units, one at a time. Check their components for soundness and cleanness.
- Clean carefully all valve components: seat, ball, guide, housing.

Fig. 17

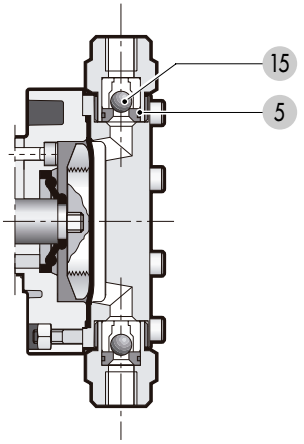
PROPER ARRANGEMENT OF:
-Valves pos. 15
-Seal pos. 5



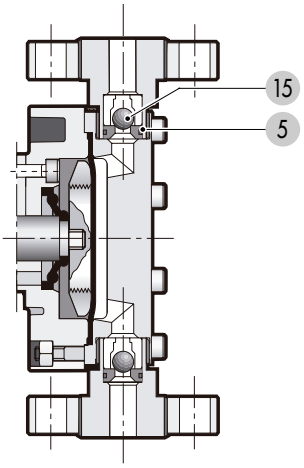
PP head "PP" execution, threaded connections.



PP head "PP" execution, flangeded connections.



AISI 316L head "A" execution, threaded connections.



AISI 316L head "A" execution, flanged connections.

4.2 PREVENTIVE MAINTENANCE

• We suggest the purchasing of a series of essential details for the preventive maintenance of diaphragm pump head (table **G**).

Table G

DENOMINATION	EXECUTION (HEAD BODY MATERIAL)			
	PP		**A** AISI 316L	
	POSITION	PIECES NO.	POSITION	PIECES NO.
DIAPHRAGM	32	1	32	1
VALVE SEATS	5	2	5	2
VALVE GUIDES	6	2	6	2
VALVE	15	2	15	2
VALVE SEAL	8	2	8	2
	9	2	9	2
			7	6

For the positions see pump head sectional drawing.

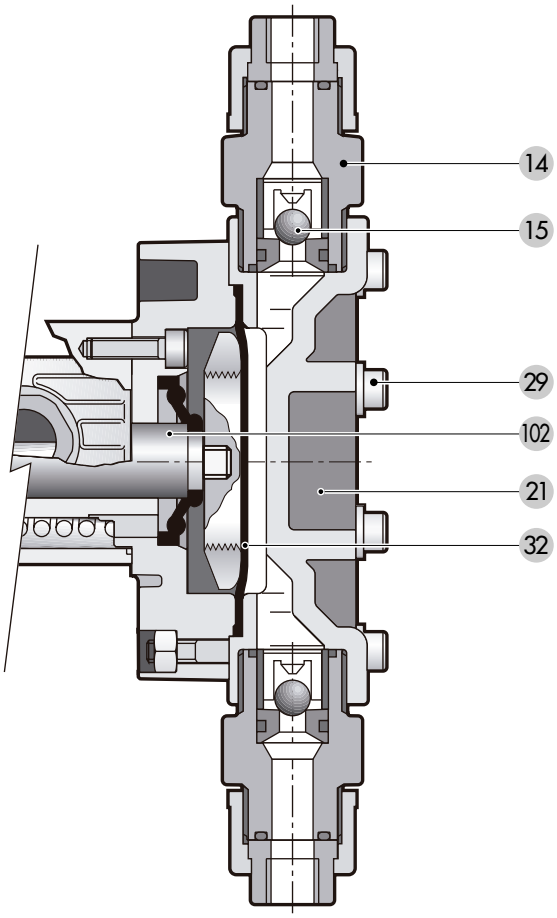
4.3 DISMANTING (AND REASSEMBLY)

• **Valves** (pos. **15**).

To dismantle the valves it is necessary to unscrew, first the valve housing (pos.**14**) and take off the valve balls.

Assuming that cleaning of the valves is required, proceed as follows on the valve units one at a time:

Fig. 18



A)

- Unscrew valve housing (pos.**14**).
- Take note of the arrangement of the various components of the valve unit.
- Extract the valves.
- Clean carefully their seat.
- If necessary, replace seats and valves.
- Reassemble valve unit exactly as before noted.
- Screw back valve housing (pos.**14**)

B)

- Diaphragm (pos. **32**)
- Take off pump head screws (pos. **29**).
- Remove pump head (pos.**21**).
- Unscrew the diaphragm (pos.**32**) by turning it counterclockwise.
- Before screwing up the diaphragm, grease its thread (pos.**102**) (threaded top end of the slide).
- Screw up the diaphragm and make sure that it reaches its end position.
- Re-assemble the pump head (pos. **21**), checking valves groupes arrangement.
- Gradually screw back in pos. **29** (screws).

Do not overtighten: - for **MB** type max 3,5 Nm
- for **MC** type max 5 Nm.

4.4 OPERATING TROUBLES

FLOW RATE LOWER THAN EXPECTED

CAUSES	SOLUTIONS
• Air enters the suction piping through the fittings:	***Check.***
• Air trapped inside the pump:	***For a short while, keep flow rate to maximum***.
• Excessive suction head lift:	***Reduce it.***
• Vapour pressure of the liquid too high:	***Increase hydrostatic head on suction side.***
• Pumping temperatures too high:	***Increase hydrostatic head on suction side.***
• Viscosity of the liquid too high:	***Install a suction piping of larger diameter. Increase hydrostatic head on suction side.***
• Feed tank hermetically sealed and with no vent:	***Make a vent in the tank upper part.***
• Suction piping clogged or valves shut	***Check.***
• Filter on suction side clogged:	***Clean it.***
• Pump valves jammed because of dirt:	***Dismantle the valves and clean them carefully.***
• Safety valve setting pressure too low:	***Check.***

FLOW RATE IRREGULAR OR HIGHER THAN EXPECTED

CAUSES	SOLUTIONS
• Suction pressure higher than discharge pressure:	**Increase the discharge head of at least 0,3÷0,5 Kg/cmq (3÷5m) respect to the suction pressure.**
• Back pressure valve stuck in open position because of dirt or setting pressure too low:	**Check.**
• Pump valves jammed in open position:	**Check.**

OVERHEATING OF PUMP BODY AND MOTOR

CAUSES	SOLUTIONS
• Incorrect wiring:	**Check.**
• Overheating due to pump working pressure higher than allowed:	**Check max. discharge pressure by means of a pressure gauge fitted on the discharge pipeline.**
• Pressures higher than allowed:	**(see max. pressure indicated on pump rating plate) reduce the discharge pressure or install a dampener in case of excessive narrowing on the discharge pipeline.**
• Stresses on pump flanges:	**Loosen the pipes connected to the pumphead and check.**
• Discharge pipeline clogged or valve shut:	**Check.**
• Back pressure valve set to a pressure higher than allowed:	**Check.**
• Oil level in the gearbox is low:	**Add suitable oil. See table F, page 10.**

MB

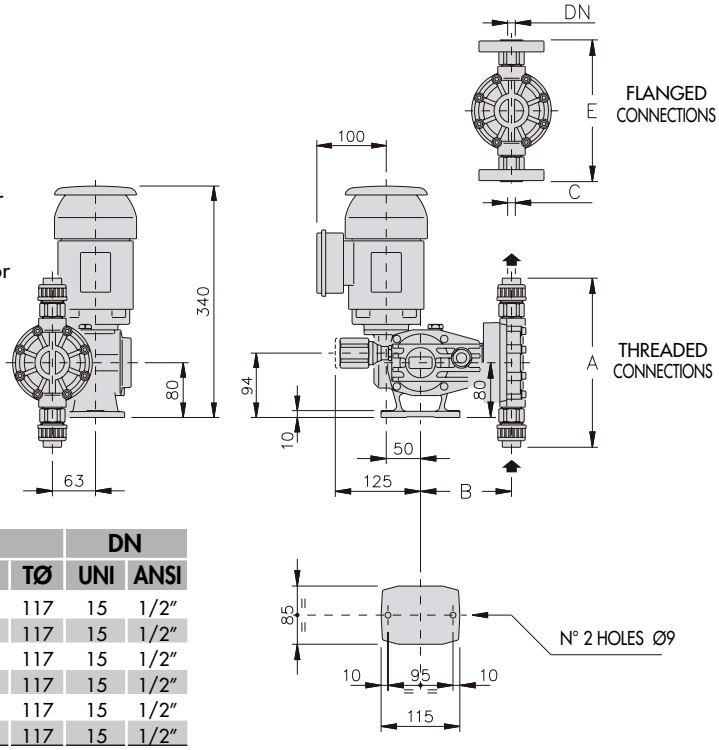
Adjustment:
With 0 -10 scale micrometer knob

Flow rates:
- **11÷50 L/h (stroke 2mm.)**
- **35÷155 L/h (stroke 4mm.)**

Motors:
- **Threephase 0,20 kW - 230/400 V - 50/60 Hz**
  4 poles -IP55 - CL F - IEC34-1 Special flange motor
- **Singlephase 0,24/0,37 kW - 230 V - 50/60 Hz**
  4 poles - IP55 - CL F - IEC34-1 Special flange motor

Material:
- **Aluminium casing**
- **Pump head: PP** (Polipropilene)
  A (AISI 316L)

Weigth:
- **10 Kgs**



TYPE	AISI 316 L					PP					DN	
	A	B	C g.f.	E	TØ	A	B	C g.f.	E	TØ	UNI	ANSI
MB 11	166	132,5	3/8" BSPF	180	114	237	133	3/8" BSPF	201	117	15	1/2"
MB 16	166	132,5	3/8" BSPF	180	114	237	133	3/8" BSPF	201	117	15	1/2"
MB 23	166	132,5	3/8" BSPF	180	114	237	133	3/8" BSPF	201	117	15	1/2"
MB 31	166	132,5	3/8" BSPF	180	114	237	133	3/8" BSPF	201	117	15	1/2"
MB 37	166	132,5	3/8" BSPF	180	114	237	133	3/8" BSPF	201	117	15	1/2"
MB 50	166	132,5	3/8" BSPF	180	114	237	133	3/8" BSPF	201	117	15	1/2"
MB 35	181	132	3/8" BSPF	195	129	251	133	3/8" BSPF	215	133	15	1/2"
MB 49	181	132	3/8" BSPF	195	129	251	133	3/8" BSPF	215	133	15	1/2"
MB 75	181	132	3/8" BSPF	195	129	251	133	3/8" BSPF	215	133	15	1/2"
MB 101	181	132	3/8" BSPF	195	129	251	133	3/8" BSPF	215	133	15	1/2"
MB 120	200	133,5	1/2" BSPF	200	129	251	133	3/8" BSPF	215	133	15	1/2"
MB 155	200	133,5	1/2" BSPF	200	129	251	133	3/8" BSPF	215	133	15	1/2"

MC

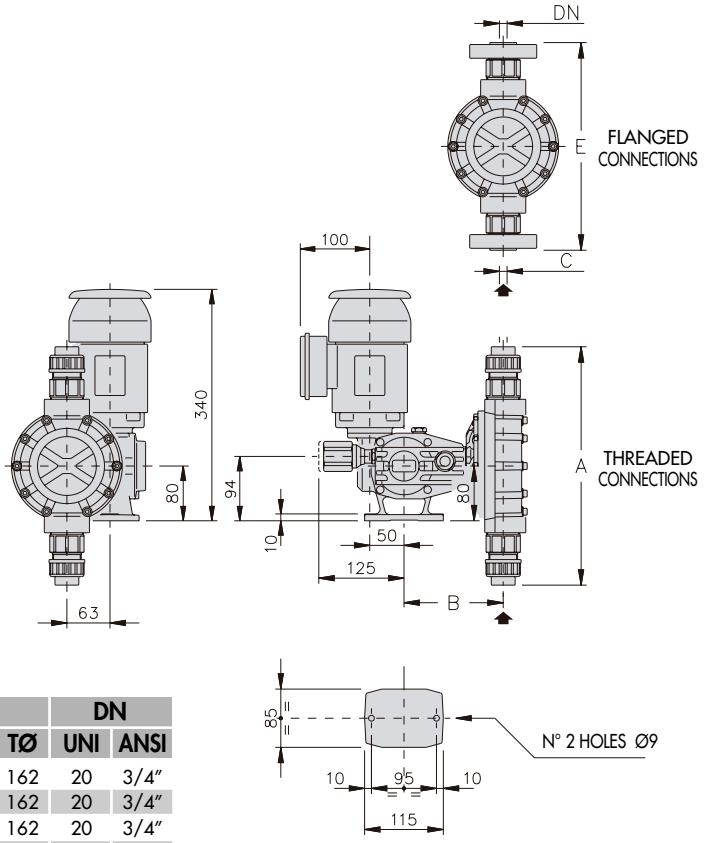
Adjustment:
With 0 -10 scale micrometer knob

Flow rates:
- **100÷420 L/h (stroke 6mm.)**

Motors:
- **Threephase 0,30 kW - 230/400 V - 50/60 Hz**
  4 poles -IP55 - CL F - IEC34-1 Special flange motor
- **Singlephase 0,24/0,37 kW - 230 V - 50/60 Hz**
  4 poles - IP55 - CL F - IEC34-1 Special flange motor

Material:
- **Aluminium casing**
- **Pump head: PP** (Polipropilene)
  A (AISI 316L)

Weigth:
- **12 Kgs**



TYPE	AISI 316 L					PP					DN	
	A	B	C g.f.	E	TØ	A	B	C g.f.	E	TØ	UNI	ANSI
MC 101	235	142	3/4" BSPF	235	159	347	145	3/4" BSPF	303	162	20	3/4"
MC 131	235	142	3/4" BSPF	235	159	347	145	3/4" BSPF	303	162	20	3/4"
MC 201	235	142	3/4" BSPF	235	159	347	145	3/4" BSPF	303	162	20	3/4"
MC 261	235	142	3/4" BSPF	235	159	347	145	3/4" BSPF	303	162	20	3/4"
MC 321	276	140	1" BSPF	261	159	355	145	1" BSPF	303	162	25	1"
MC 421	276	140	1" BSPF	261	159	355	145	1" BSPF	303	162	25	1"

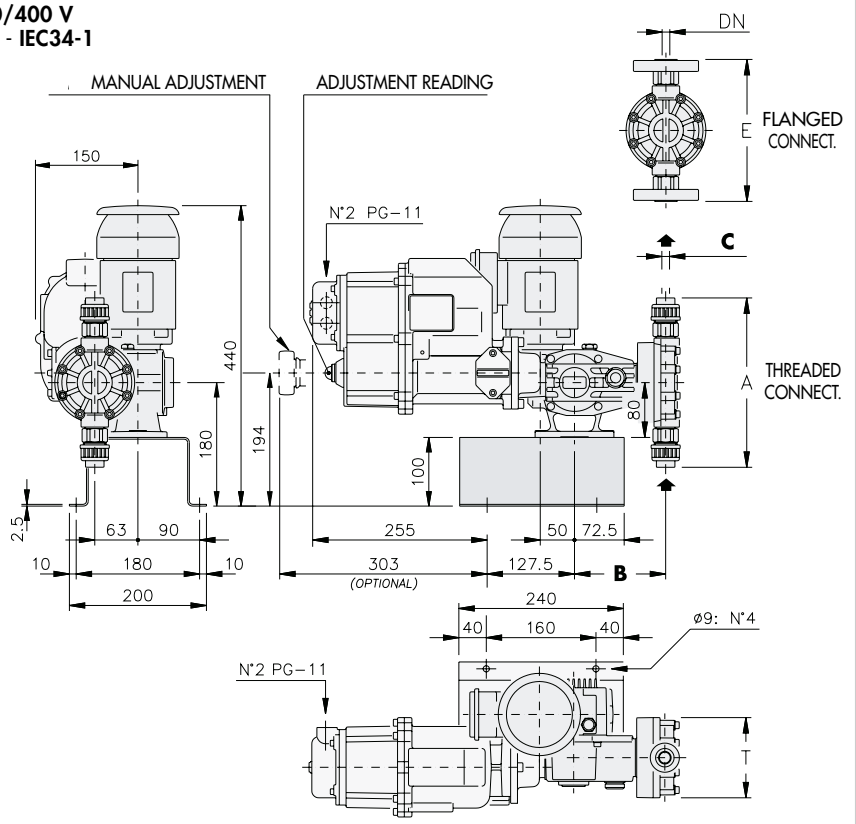
PUMP WITH ELECTRIC ADJUSTMENT OVERALL DRAWINGS

MB MC Z

Motors:
- **Threephase 0,20/0,30 kW - 230/400 V 50/60 Hz - 4 Poles - IP55 - CL F - IEC34-1** Special flange motor
- **Singlephase 0,24/37 kW 230 V - 50/60 Hz - 4 Poles IP55 - CL F - IEC34-1** Special flange motor

Material:
- **Aluminium casing**
- **Pump head: PP** (Polipropilene) **A** (AISI 316L)

Weigth:
- **20÷35 Kgs**

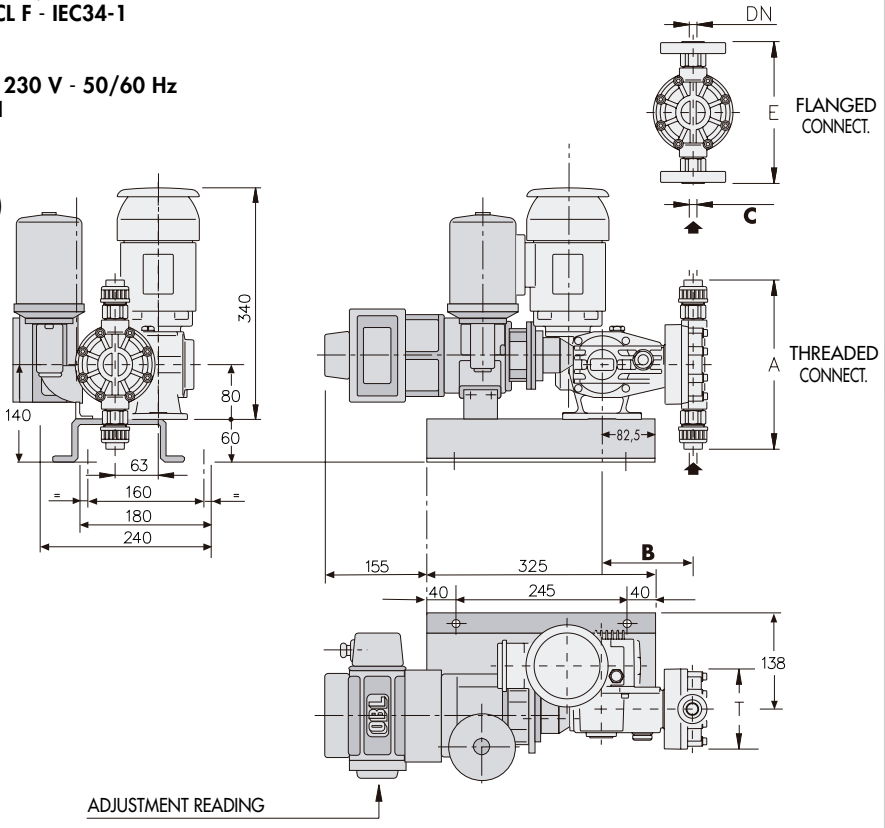


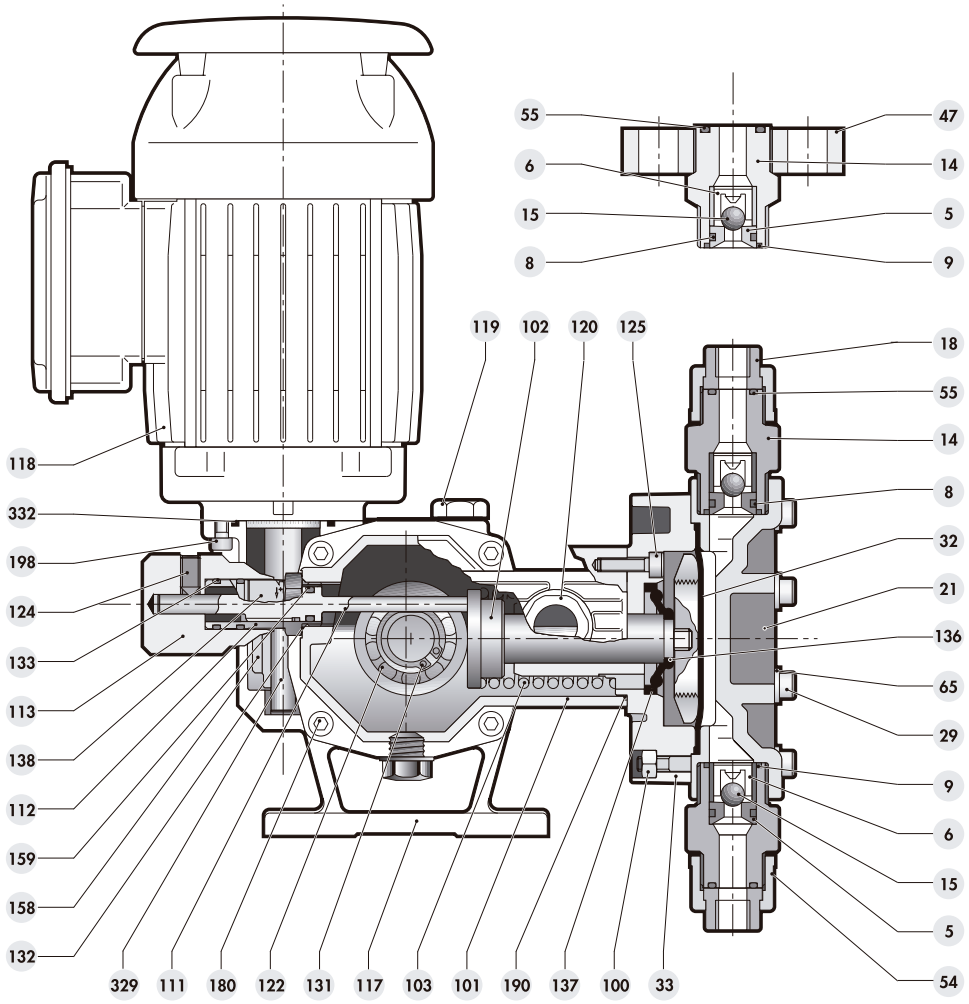
MB MC Z9

Motors:
- **Threephase 0,20/0,30 kW - 230/400 V 50/60 Hz - 4 Poles - IP55 - CL F - IEC34-1** Special flange motor
- **Singlephase 0,24/0,37 kW - 230 V - 50/60 Hz 4 Poles - IP55 - CL F - IEC34-1** Special flange motor

Material:
- **Aluminium casing**
- **Pump head: PP** (Polipropilene) **A** (AISI 316L)

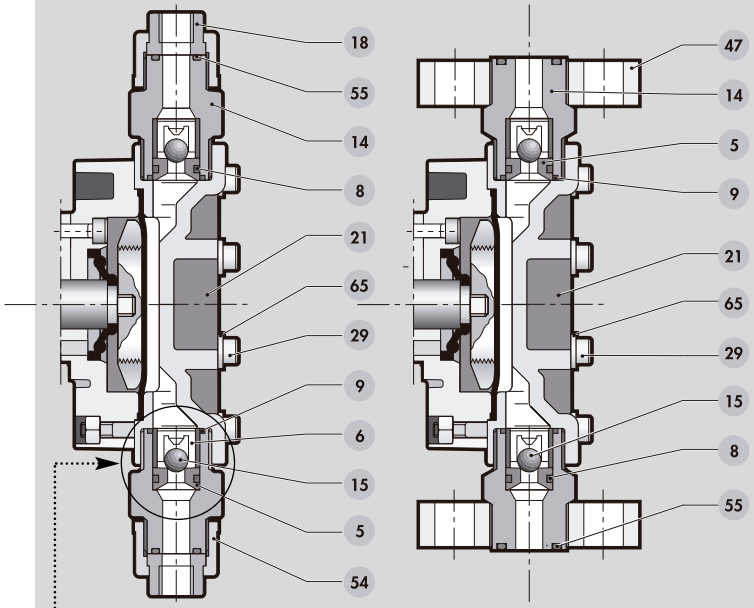
Weigth:
- **20÷35 Kgs**



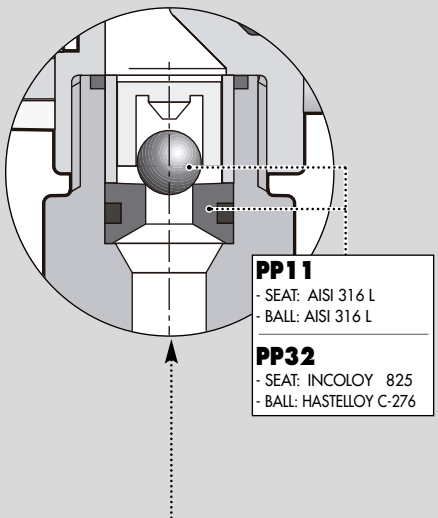


Pumphead sectional drawings

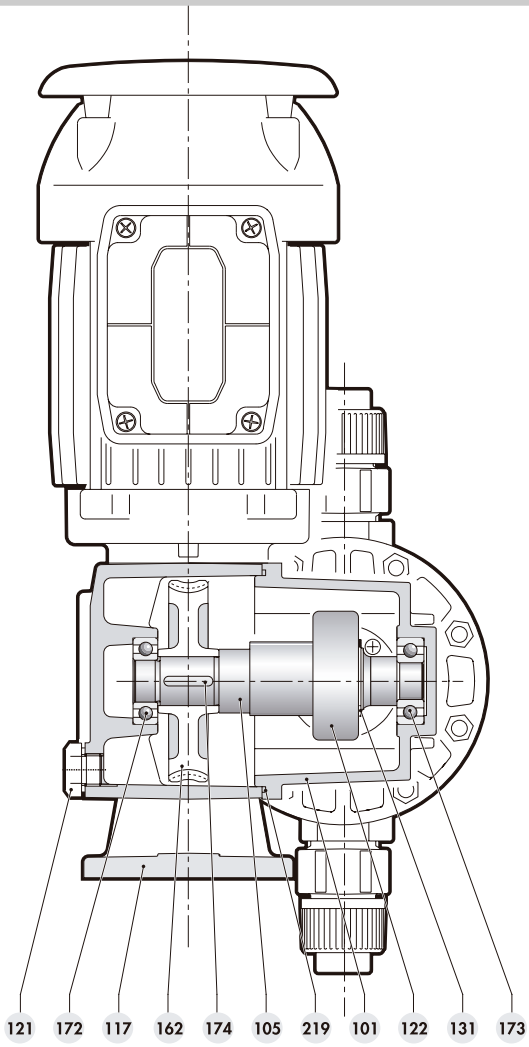
Head Construction **PP**



Head Construction **PP11**

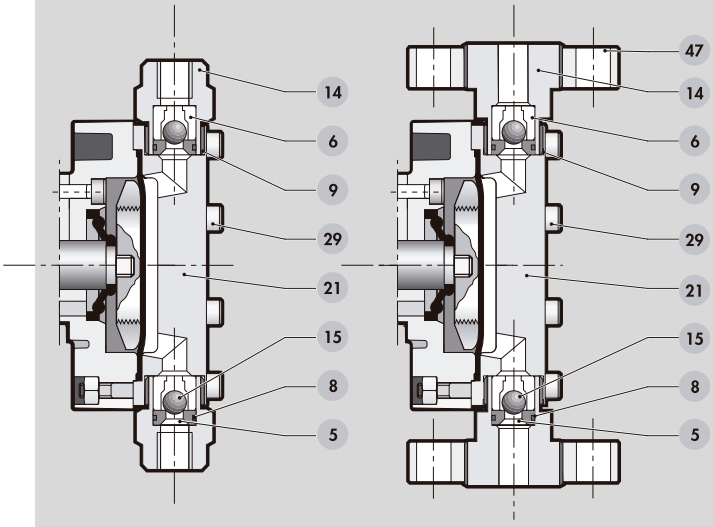


SECTIONAL DRAWING



POS.	MECHANISM COMPONENTS
5	VALVE SEAT
6	VALVE GUIDE
8	O-RING
9	O-RING
14	VALVE HOUSING
15	VALVE
18	THREADED STUB
21	LIQUID END
29	SCREW
32	DIAPHRAGM
33	YOKE
47	FLANGE
54	RING NUT
55	O-RING
65	WASHER
100	NUT
101	PUMP HOUSING
102	SLIDE
103	SPRING
105	ECCENTRIC SHAFT
111	ADJUSTMENT SPINDLE
112	GUIDE
113	KNOB
117	GEAR CASING
118	MOTOR
119	OIL FILLING PLUG
120	OIL WINDOW
121	OIL DRAIN PLUG
122	**MB** - BALL BEARING **MC** - BUSH
124	DOWEL
125	SCREW
131	CIRCLIP
132	O-RING
133	O-RING
136	O-RING
137	SEAL
138	ADHESIVE SCALE
158	ENDLESS SCREW
159	O-RING
162	WORM WHEEL
172	BALL BEARING
173	BALL BEARING
174	KEY
180	SCREW
190	O-RING
198	SCREW
219	O-RING
329	ELASTIC PIN
332	O-RING

Head Construction **A**



METERING PUMPS

MACHINE DIRECTIVE

EUROPEAN COMMUNITY DIRECTIVE **98/37/CE** AND SUBSEQUENT MODIFICATIONS

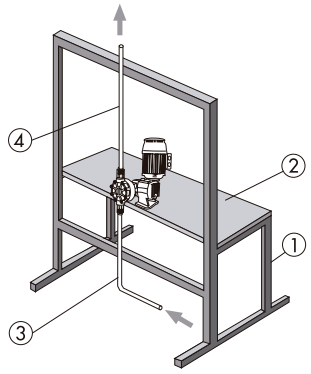
GENERAL SAFETY NORMS

Please read and save these instructions.

INSTRUCTIONS ABOUT THE RESIDUAL RISKS ELIMINATION AND THE SAFETY AT WORK

1 - INSTALLATION

- The pump has to be installed on a base plate ①.



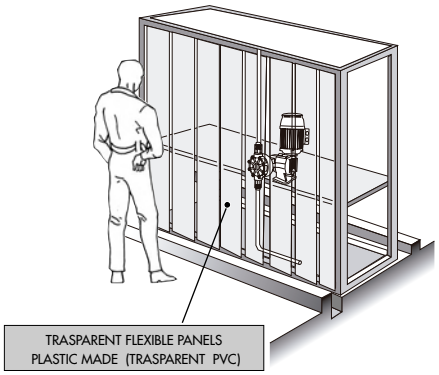
- The basement has to be made of electric welded steel and fit for the pump dimensions, with leveled face ②.

- The pump has to be strongly fastened to the basement by clamping screws.

- The basement has to have a frame to support the suction ③ and discharge ④ pipelines and possible accessories (pulsation dampers, pressure gauges, valves) and not vibrate while the pump is working.

2 - OPERATOR PROTECTION

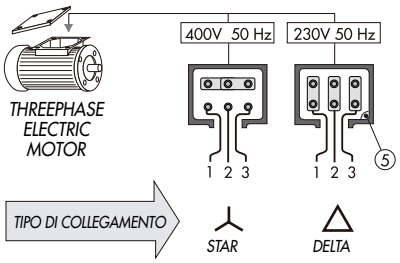
Protection against accidental leakages of aggressive pressurized fluids.



3 - ELECTRICAL CONNECTIONS

- For a proper connection of the electrical motor follow the illustrated instructions.

TERMINAL BOX DISPOSAL ACCORDING TO THE LINE VOLTAGE

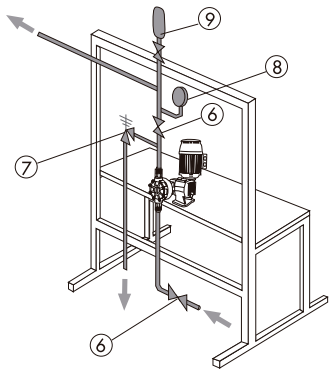


- Protect the motor by installing a magneto-thermic device, fit to the power input values of the motor, knowing that the motor, at start, absorbs at least four times the motor nominal power.
- Earth the terminal of the motor casing, using a cable with at least 6 mm² section ⑤.
- Check the direction of rotation of the motor (see the arrow on the motor body); if the direction of rotation is not in accordance with the arrow, interchange two wires: **1 on 2, 2 on 1.**

WARNING:
Start the motor only when the terminal box is closed

4 - SETTING INTO OPERATION

- Check the oil level.
- Open all the on-off valves both along the discharge and suction pipeline ⑥.
- Check the relief valve installation and its discharge into the feeding tank ⑦.



WARNING:
Do not start the pump without a safety valve.

- Check the pressure gauge installation ⑧ (essential to check the pump status).
- Check the pulsation dampener ⑨ (essential for flowrates above 100 L/h).
- Start the pump with adjustment set to 20 % increase gradually the flowrate (acting on the adjustment knob) and find the relevant pressure on the pressure gauge.

WARNING:
The working pressure must not exceed the rating plate value.

- Check during the first three working hours the pump body temperature (max 40°C) as well as the motor temperature (max 80°C).

5 - ROUTINE MAINTENANCE

- Check periodically the oil level through the oil-windows located on the pump body. First three months, once a month afterwards, once every four months.
- Check periodically (once every four months) the pump status:
- Pump body temperature (max 40°C).
- Motor body (max 70°C).
- Working pressure (must not exceed the rating plate value).
- Noise (within normal conditions must not exceed 85 dbA).

6 - PREVENTIVE MAINTENANCE

- In order to avoid damages due to diaphragm breaking it is advisable to replace the diaphragm according to the pump use as shown in the table.

WORKING *STATUS*	*PRESSURE % COMPARED TO THE MAX PRESSURE*	*REPLACEMENT ADVISABLE EVERY*
CONTINUOUS 24/24	100%	10.000 *HOURS*
	50%	18.000 *HOURS*
BATCHING 12/24	100%	20.000 *HOURS*
	50%	30.000 *HOURS*

- For disassembly and re-assembling see instructions at page 14.

METERING PUMPS

CE CONFORMITY DECLARATION

OBL s.r.l. 20090 Segrate - MILANO - Via Kennedy, 12 - Tel. +39 02 269191 - Fax +39 2 2133893 - E mail: info@obl.it

Modello/Model/Modele/Modell/Modelo/Modelo/Model/Model/Typ/Model/Malli/Μοντελο

MECHANICAL DIAPHRAGM METERING PUMPS

SERIES MB/MC

I DICHIARAZIONE DI CONFORMITA' CE

Noi, **OBL**, s.r.l., **MILANO ITALIA**, dichiariamo sotto la nostra unica responsabilità che il prodotto cui questa dichiarazione si riferisce, è conforme alle seguenti Direttive e successive modifiche:
- **Direttiva Macchine 98/37/CE**
- **Direttiva Bassa Tensione 73/23/CE**
- **Direttiva Compatibilità Elettromagnetica 89/336/CE**

GB CE CONFORMITY DECLARATION

We, OBL, s.r.l., MILAN ITALY, declare under our sole responsibility that the product relevant to this declaration complies with the following directive and subsequents modifications:
- **Machinery Directive 98/37/EEC**
- **Low Voltage Directive 73/23/EEC**
- **Electromagnetic Compatibility Directive 89/336/EEC**

F DECLARATION DE CONFORMITE CE

Nous, **OBL** s.r.l., **MILAN ITALIE**, déclarons sous notre seule responsabilité que le produit auquel cette déclaration se rapporte, est conforme au suivantes directives et successives modifications:
- **Directive Machines 98/37/CEE**
- **Directive Basse Tension 73/23/CEE**
- **Directive Compatibilité Electromagnétique 89/336/CEE**

D EU-KONFORMITÄTSERKLÄRUNG

Wir **OBL** s.r.l. **MAILAND ITALIEN**, erklären unter unserer Verantwortung, dass unser Produkt, auf das sich diese Erklärung bezieht, den folgenden EU-Richtlinien und deren Anderungen entspricht:
- **Maschinenrichtlinie 98/37/EWG**
- **Richtlinie über die Niederspannung 73/23/EWG**
- **Normen über die Elektromagnetische Verträglichkeit 89/336/EWG.**

E DECLARACIÓN DE CONFORMIDAD CE

La firma suscrita, **OBL** s.r.l., de **Milán**, **Italia**, declara bajo su propia responsabilidad que el producto al que se refiere esta declaración, cumple con las siguientes directivas y sucesivas modificaciones:
- **Directiva de máquinas 98/37/CEE**
- **Directiva de baja tensión 73/23 CEE**
- **Directiva de compatibilidad electromagnética 89/336 CEE**

P DECLARAÇÃO DE CONFORMIDADE CE

Nós, **OBL** s.r.l., **MILÃO ITÁLIA**, declaramos sob nossa inteira responsabilidade que o produto ao qual se refere esta declaração se encontra de acordo com as seguintes directivas e sucessivas modificações:
- **Directivas máquinas 98/37/EEC**
- **Directivas Baixa Tensão 73/23/EEC**
- **Directivas Compatibilidade Electromagnética 89/336/EEC**

NL EG-VERKLARING VAN OVEREENKOMST

Wij, **OBL** s.r.l., **MILAAN ITALIË**, verklaren voor onze uitsluitende verantwoordelijkheid dat het product waarop deze verklaring betrekking heeft, in overeenstemming is met de volgende richtlijnen en navolgende wijzigingen:
- **Machinerichtlijn 98/37/EEG**
- **Laagspanningsrichtlijn 73/23/EEG**
- **Richtlijn Bestendigheid tegen Elektromagnetische Storingen 89/336/EEG**

DK CE OVERENSSTEMMELSES ERKLÆRING

Vi, **OBL** srl, **MILANO ITALIEN**, erklærer os ansvarlige for at produktet, som denne Erklæring henviser til, stemmer overens med følgende direktiver og påfølgende modificeringer:
- **Maskindirektiv 98/37/EEC**
- **Lavspændingsdirektiv 73/23/EEC**
- **Direktif for Elektromagnetisk Forenelighed 89/336/EEC**

S EG ÖVERENSSTÄMMELSEFÖRKLARING

Vi, **OBL** s.r.l., **MILANO, ITALIEN**, förklarar under eget ansvar, att produkten, till vilken denna förklaring hänför sig, överensstämmer med förljande normer och deras respektive ändringar:
- **Norm för Maskiner 98/37/EEC**
- **Norm för Lågspänning 73/23/EEC**
- **Norm för Elektromagnetiks Förenlighet 89/336/EEC**

N CE-OVERENSSTEMMELSESERKLÆRING

Vi, **OBL** s.r.l., **MILANO, ITALIA**, erklærer under eget ansvar at produktet som omfattes av denne erklæringen er i overensstemmelse med følgende direktiver og senere endringer:
- **Maskindirektivet 98/37/EU**
- **Lavspenningsdirektivet 73/23/EU**
- **Direktivet vedr. elektromagnetisk kompatibilitet 89/336/EU.**

FIN YHDENMUKAISUUSTODISTUS

OBL s.r.l., **MILANO ITALIA** , vakuuttaa omalla vastuullaan, että tässä todistuksessa mainittu tuote vastaa seuraavien direktiivien ja niihin tehtyjen muutosten vaatimuksia:
- **EU- laitedirektiivi 98/37**
- **EU- pienjännitedirektiivi 73/23**
- **EU- direktiivi 89/336 joka käsittelee sähkömagneettista yhteensopivuutta**

GR ΔΗΛΩΣΗ ΕΥΜΜΟΡΦΩΣΗΣ CE

Η υπογεγραμμενη εταιρεια OBL, s.r.l., MILANO-ITALIA, δηλωνει υπευθυνα οτι το εν λογω προιον ειναι κατασκευασμενο συμφωνα με τιζ παρακατω Οοηγιεζ και τιζ τροποποιησειζ αυτων
- Οδηγια περι Μηχανων **98/37/EOK**
- Οδηγια περι Χαμηληζ **73/23/EOK**
- Οδηγια περι Ηλεκτομαγνητικηζ Συμβατοτηταζ **89/336/EOK**

Nome e posizione del dichiarante / Name and charge of issuer / Nom et fonction de l'emetteur/ Name und position des erstellers / Nombre y cargo del expedidor / Nome e cargo do emissor / Naam en funktie van de uitgever / Udsteder, navn og stilling / Utsteders navn og stilling / Utfärdarens namn och befattning / Ilmoituksen antajan nimi ja asema / Ονομα και θεση εκδοτη

Benito LEONETTI
MANAGING DIRECTOR

Firma del dichiarante / Signature of issuer / Signature de l'emetteur / Unterschrift des erstellers / Firma del expedidor / Assinatura do emissor / Handtekening van de uitgever / Udsteder, underskrift / Usteders signatur / Utfärdarens namnteckning / Ilmoituksen antajan allekirjoitus / Υποραφη εκδοτη

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> OPERATING MANUAL