SERIES ST - D





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UK OPERATING INSTRUCTIONS AND MAINTENANCE

UNI EN ISO 9001-2008

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IN QUALITÀ DI FABBRICANTE DELLA POMPA DOSATRICE

SERIE: **ST-D**

MODELLO: **AA/BA**

dichiara sotto la propria responsabilità che la stessa è conforme a quanto prescritto dalle Direttive: **CEE/89/392; CEE/89/336-EMC; CEE/73/23**

nonché conforme alle seguenti norme armonizzate:**EN 292-1; EN 292-2; EN 60204-1; EN 55014-1; EN 61000-3-2; EN61000-3-3.**

Dichiara inoltre che la macchina in oggetto viene fornita con regolare marcatura e necessario supporto informativo (Manuale di Uso, Manutenzione e Ricambi). CE

La presente dichiarazione è conforme a Norme e Direttive citate ed è parte integrante del Fascicolo Tecnico del Costruttore.

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Responsabile Tecnico
Ing. **Marco Trissati**

Pavona di Albano Laziale (Roma) ITALY, lì 31/07/2004

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AS MANUFACTURER OF CHEMICAL DOSING PUMPS

SERIES: **ST-D**

MODEL: **AA/BA**

Under our own responsibility we declare confirmity in accordance with the following directives:**CEE/89/392; CEE/89/336-EMC; CEE/73/23**

In addition in accordance with the following regulations: **EN 292-1; EN 292-2; EN 60204-1; EN 55014-1; EN 61000-3-2; EN61000-3-3.**

This certificate confirms equipment supplied CE marked and technical documentation including operating manual and spare parts manual.

This declaration conforms to the above directive and forms an integral part of the manufacturer operating manual.

p. Etatron DS S.r.l.
Technical Manager
Ing. **Marco Trissati**

Pavona di Albano Laziale (Roma) ITALY, lì 31/07/2004

1.0 INTRODUCTION

1.1 Foreword

This instruction booklet has been drawn up in conformity to Machine Directive 89/392 and later amendments 91/368, 93/44 and 93/68.
It has been compiled in accordance with EN 292 1 / 2.

1.2 Introduction to the manual

The purpose of this manual is to give the information required for the correct and safe use of the product.
This information is the result of constant, methodical processing of data and technical tests recorded by the manufacturer in accordance with the internal safety and quality information procedures.
The following data is dedicated - ONLY – to qualified operators, capable of interacting with the product under safe conditions for third parties, for associated plant on which the equipment is installed, environmental aspects are also addressed. Understanding elementary diagnostic of faults and irregular working conditions by performing simple functional controls, in full respect of the prescriptions in the pages to follow and under health and safety rules.
Information regarding installation, assembly, disassembly, maintenance, servicing and repair are dedicated – and may therefore be carried out – always and only by trained engineers, or directly by an AUTHORISED SERVICE CENTRE.
For succesful operation of the product, this manual must be maintained in a legible state and kept in a safe place for future reference. If damaged or for additional technical and operating details, please contact an Authorised Service Centre.
***CAUTION:** this document refers to ST-D Series dosing pumps. Before continuing, identify which Model has been supplied, comparing the title on the Manual's front cover with the product's ID plate.*

1.2.1 Notes on using this manual
For easier reading, the manual has used highlight for critical situations, practical advice or simple recommendations:

The instructions set inside bold frames refer to safety.

1.2.2 Glossary.

TERM	***DESCRIPTION***
Pump Head	*The liquid end of the pump. It is the chamber that incorporates* the diaphragm plunger *and the suction and discharge valve assemblies.*
Diaphragm	*Round shape membrane in rubber, tighten along the peripherical side. Actuated at his center through* the diaphragm pump*, produces the flow into the pump head.*
Gear box	*The mechanical part of the pump. It incorporates the gearing that transforms the rotary motion of the motor drive into a reciprocating motion.*
Seal ring	*The sealing arrangement between* the diaphragm plunger *and the pump head.*
Valve	*Non return valve on both suction and delivery ports.*
Adjustment rod	*This adjusts* the diaphragm stroke *length.*
Safety (relief) valve	*Installed within the discharge pipework to protect the dosing pump and plant from over pressurisation.*
Pressure gauge	*Instrument that reads pressure in the circuit.*
Pulsation dampener	*Reduces the pressure variations due to the continuous recipricatiing motion.*
DB (Decibel)	*Sound measure unit.*

2.0 GENERAL RECOMMENDATIONS

- *Ensure that you have understood the manual's contents. Failure to comply with standards or regulations described and/or referred to, shall relieve the Manufactures from any liability for damages to persons and/or objects.*
- *The ST-D Series dosing pumps have been designed and manufactured for dosing liquids free of suspended solid particles.*

IMPORTANT: *for any details about the use, treatment of any specific substance contact an Authorised Service Centre or the Manufacturer directly.*

- *Any other use, not included or explicitly implied in this manual, shall be considered IMPROPER.*
- *Prior to installation ascertain that the dosing pump is to be installed on a plant that complies with safety regulations, positioning and serviceability requirements. If more details are required please contact an Authorised Service Centre or the Manufacturer specifying Model and Serial number.*
- *Installation, use and maintenance, under terms of the above point, must be performed by qualified staff in full respect of the instructions given herein and in compliance with current health and safety regulations.*
- *This document* ***must be attached or included*** *within the Manual for the Plant where the pump is to be installed.*

2.1 Warnings and precautions

• Always ensure you have installed the device in the corect way. Ensure working, installation and safety systems have been complied with.
• Dosing pumps can form an integral part of the plant/machine. It is mandatory that the plant conforms, including both main and ancillary units, to current health, safety and environmental regulations.
• Pay special attention to the warning labels. If they are not clear they should be replaced, contact an Authorised Service Centre or the Manufacturer.
• Before any preliminary operations, make sure the operator has a good knowledge and understanding of the performance of the pump.
• Use of spare parts that do not correspond to the characteristics given below, changes or even minor tampering shall relieve the Constructor from any liability related to proper use, correct operation and the safety of persons and/or objects.
• It is strictly forbidden to tamper with control units and safey system.
• Keep this manual for future reference.

3.0 PUMP IDENTIFICATION

The fundamental data for identifying ST-D series dosing pumps can be obtained from the ID plates attached to the outside of the pump head.
They include:

- *Manufacturer*
- *Serial number*
- *Model*
- *Year of manufacturing*
- *Sound (dB)*
- *Mass (kg)*
- *Max. Pressure (bar)*
- *Max. Flow (l/h)*
- *CE Marking*
- * *Voltage (V)*
- * *Frequency (Hz)*

Note:
(•) Pump casing ident label
(*) Electrical motor ident label

CAUTION: *it is strictly prohibited to remove or damage the ID plates. If this should occur, contact an Authorised Service Centre or the Manufacturer.*
For any information and/or technical details regarding the unit, always quote:

- *Model;*
- *Serial number;*
- *Installation and test date*
- *Print edition date of the instruction manual.*

4.0 "ST-D" SERIES DOSING PUMPS.
DESCRIPTION

The "ST-D" series of pumps have been designed and manufactured for dosing liquids free or with suspended solid particles.

4.1 Description

The pump comprises of four basic sections: motor drive, gearbox, pump head and non return valves (see Fig. 1).

Pump Head, diaphragm

The pumping action is performed by a diaphragm, *which has a reciprocating movement within the pump head. All parts are in direct contact with the liquid being metred. The sealing effect is achieved by rings of material suited to the liquid being handled.*

Non return valves

When the diaphragm performs *a backstroke it creates a pressure drop within the pump head, this results in an input of liquid into the pump head through the suction non return valve. In its forward stroke, the liquid is compressed and passess out of the pump head through the delivery no return valve.*

Gear box

The mechanical part of the pump. It incorporates the gearing that transforms the rotary motion of the motor drive into a reciprocating action. There are two sizes of gear box offering the following stroke frequencies: 60 and 120 strokes/min. *Standard operating speed is 50 Hz, 60 Hz can be accommodated with relevant variations in flow and performance, as indicated in specification table I.*

Motor driven

As standard an electric motor supplies the power to the gear box.

Stroke length adjustment

As the name implies this adjusts the diaphragm's *stroke length, thereby governing the pump's capacity.*

4.2 Classification

The pumps are classified according to the material used in manufacture of the wet end parts. As standard these are AISI 316 stainless steel and PP.
There are two standard models of diaphragm pump, *classified according to there materials (316 STST,* PP*). On request the pumps can be manufactured with pump head and non return valves from other materials, e.g. Teflon, PVDF,* PVC.
With reference to the flow diagram, there are many alternative pump models basically distinguished by the diameter of their diaphragm, *pressure capability, valve type and seal material. This combination offers customers a wide range of models.*

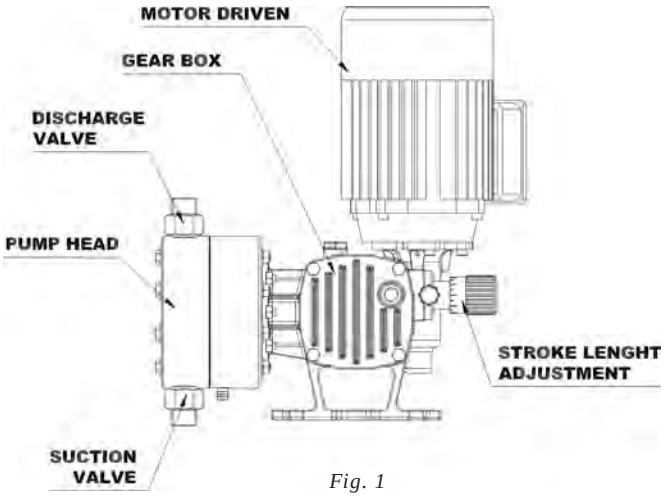


Fig. 1

4.3 Performances and characteristics

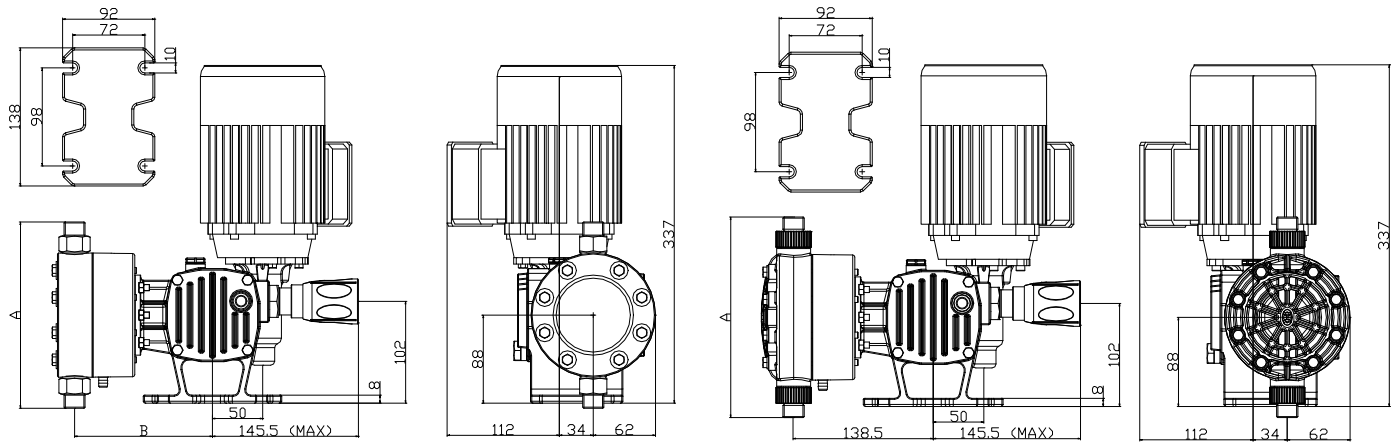
Table I and II below lists the current product range classified according to the codes and to their relative specifications. They indicate:

- *Strokes/ frequency per minute at 50 and 60 Hz*
- *Flow in L/h*
- *Maximum working pressure in bar*
- *Types of valves used*
- *Motor specification*
- Diaphragm diameter

In tables with reference to fig. 2, give the overall dimensions of the various models manufactured in AISI 316 steel and PP.

> ***CAUTION:*** *to avoid damaging the pump or create hazardous conditions, it is imperative that the technical data in tables is respected.*

Fig. 2 Dimensioni di ingombro / *Overall dimensions* / *Dimensiones* / *Dimensões globais* (mm)



POMPE MECCANICHE A DIAFRAMMA: TESTATA AISI 316L / PP / PVDF

MECHANICAL DIAPHRAGM PUMPS: AISI 316L / PP / PVDF PUMP HEAD

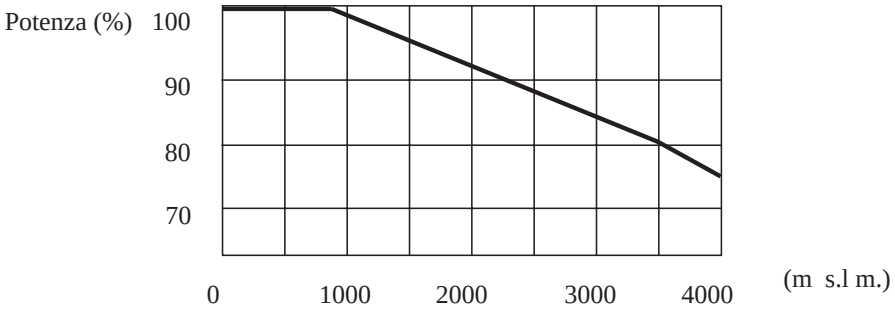
Codice	portata / *flow rate* l/h – (US gal/h)		Prevalenza *Delivery Head* *bar – (psi)* AISI		Prevalenza *Delivery Head* *bar – (psi)* PP-PVDF		Colpi/min. *strokes/min.*		orsa *troke enght*	Ø Membrana *Ø Diaphragm*	otenza *Power*	Valvole *Valves*	Dimensioni(mm) *Dimensions* (mm)			
													A		B	
	50 Hz	*60 Hz*	50Hz	*60Hz*	50Hz	*60Hz*	50Hz	*60 Hz*	mm	mm	kW		AISI PVDF	PP	AISI	PVDF
AD 0010 ** 00100	*10 (2,91)*	*12 (3,17)*	14 (203)	14 (203)	14 (203)	14 (203)	60	72	2.6							
AD 0016 ** 00100	16 (4,23)	19 (5,07)	14 (203)	14 (203)	14 (203)	14 (203)	60	72	4							
AD 0021 ** 00100	21 (5,55)	25 (6,66)	14 (203)	12 (174)	14 (203)	12 (174)	120	144	2.6	50	0,18	½" Gm	186	198	137,5	140
AD 0027 ** 00100	27 (7,13)	32 (8,56)	14 (203)	12 (174)	14 (203)	12 (174)	120	144	3.1							
AD 0033 ** 00100	33 (8,72)	40 (10,46)	14 (203)	12 (174)	14 (203)	12 (174)	120	144	4							
AD 0019 ** 00100	19 (5,02)	23 (6,02)	11 (160)	11 (160)	11 (160)	11 (160)	60	72	2.6							
AD 0030 ** 00100	30 (7,92)	36 (9,51)	11 (160)	11 (160)	11 (160)	11 (160)	60	72	4							
AD 0039 ** 00100	39 (10,30)	47 (12,36)	11 (160)	10 (145)	11 (160)	10 (145)	120	144	2.6	67	0,18	½" Gm	186	198	137,5	140
AD 0051 ** 00100	51 (13,47)	61 (16,17)	11 (160)	10 (145)	11 (160)	10 (145)	120	144	3.1							
AD 0060 ** 00100	60 (15,85)	72 (19,02)	11 (160)	10 (145)	11 (160)	10 (145)	120	144	4							
AD 0041 ** 00100	41 (10,83)	49 (13,00)	7 (102)	6,5 (94)	7 (102)	6,5 (94)	60	72	2.6							
AD 0061 ** 00100	61 (16,12)	73(19, 34)	7 (102)	6,5 (94)	7 (102)	6,5 (94)	60	72	4							
AD 0084 ** 00100	84 (22,19)	101(26,63)	6 (87)	5 (72)	6 (87)	5 (72)	120	144	2.6	85	0,18	½" Gm	186	198	137,5	140
AD 0104 ** 00100	104 (27,48)	125(32,97)	6 (87)	5 (72)	6 (87)	5 (72)	120	144	3.1							
AD 0123 ** 00100	123 (32,50)	148(39,00)	6 (87)	5 (72)	6 (87)	5 (72)	120	144	4							

Gm: Gas Maschio / *Tread gas male BSPm*
Tipo di valvola / *Valves type*: singola valvola a sfera / *sigle ball check valve*

Versione con testata in PVC disponibile su richiesta / *PVC pump head avaible upon request*

Alimentazione elettrica standard: 230 – 400 V trifase 50 Hz • 275 – 480 V trifase 60 Hz • isolamento classe F
Standard power supply: *230 – 400 V three phase 50 Hz • 275 – 480 V three phase 60 Hz • isolation class F*

If the maximum pressures specified in the above tables are exceeded various kinds of problem can arise.
The height above sea level can influence the operation of the unit, since electric motors are sensitive to altitude.
N.B. over 1000m above sea level the electric motor should be upgraded over the normal requirement, as prescribed by the standards governing the manufacturing of motors IEC 34-1 (69).



Flow chart of electric motor power dispersion against altitude.

4.4 The supply
The unit is supplied with blanking caps within a carton box suitable for air and road transit.
The Operating and Maintenance Manual – together with the Conformity Declaration – are included within the carton.
The form of packing can be agreed with the Customer. In case the units are stored damp, corrosive environments should be avoided.

IMPORTANT: *pumps with plastic heads must be shipped and stored in a dry, well-ventilated location. Keep away from heat sources and at a temperature of –10 to +60 °C.*

CAUTION: *on receipt of the goods be sure they correspond exactly with the purchase order, in the event of any irregularity promptly notify an Authorised Service Centre..*
Disposal of packing material must comply with legal requirements.

4.5 Shipping.
The product weight and dimensions do not require lifting equipment. The need may arise depending on space, height and installation/maintenance location. If so, all operations must be carried out in compliance with current safety standards.

5.0 INSTALLATION

Installation must be carried out by trained qualified staff, or by an Authorised Service Centre, in full respect of the instructions herein and current health and safety regulations.
Ensure the correct prerequisites of environment conditions and production facilities, dimensions and working spaces.

5.1 Minimum working space

The preliminary calculation of dimensions and their layout constitutes an essential factor in safety for positioning, work, maintenance and eventual emergency actions.
Provide enough space to be able to control and disassemble the pump especially on the hydraulic side (i.e. the pump head) and around the adjustment knob.

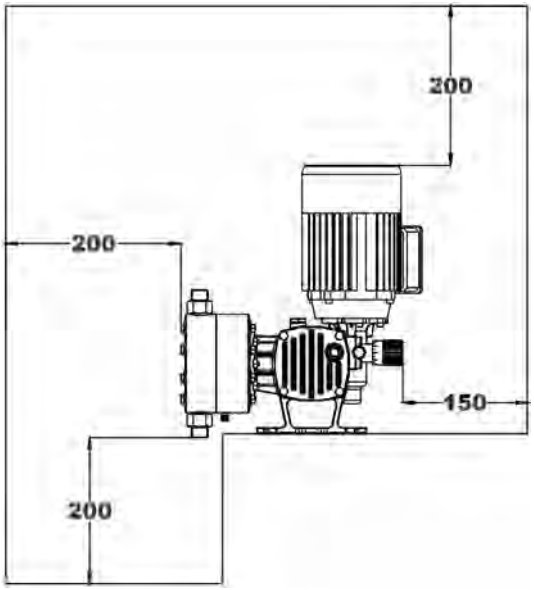


Fig. 3 - Minimum working space (mm)

5.2 Location and environment

Always make sure that the working conditions are within the following ranges:

Ambient temperature:

Type	*Min °C*	*Max °C*
Stainless steel pump head	*0*	*40*
PP pump head	*0*	*40*

Liquid temperature:

Type	Min °C	Max °C
Stainless steel pump head	0	70
PVC pump head	0	40

IMPORTANT: *for* PP *pump head, if temperature is a concern the plant should be fitted with a temperature monitoring system.*

CAUTION: *do not position next to heat sources or direct sunlights. It is recommended for outdoor installations to provide shelter.*

5.2.1 Explosive atmospheres

It is essential that, when ordering, the operator specifies in what kind of atmosphere the equipment is to be located. If the Manufacturer supplies a unit with a standard motor that is then installed in an explosive area, the Manufacturer shall not be held liable for this possible source of damage to persons and/or plant.
Please note that units with electronic automatic control cannot be supplied for installation in explosive areas.

5.3 Plant requirements

All assembly/disassembly operations must always be carried out by trained qualified staff, or directly by an Authorised Service Centre.

5.3.1 The plant pipework

The user must respect the following provisions for the right installation and operation of our equipment:

- *As a rule pipework (above all in suction and for viscous liquids) should be one diameter larger than the pumps connections.*
- *The average fluid speed in the piping cannot exceed 0,7 m/s for liquid viscosity up to 100 cPs*
- *to simplify maintenance and disassembly of the pump, provide suitable drains point on the discharge tube close to the pump head.*
- *the length of the suction tube must be kept to a minimum. Use wide radius bends.*

5.3.2 Safety (relief) valve, pressure engager

If isolation valves are installed on the discharge side of the dosing pump or the pipework is pressured, then it ***is essential that a safety (relief) valve*** *(Ref.1 - Fig.4) is incorporated within the discharge pipework. This safety (relief) valve will protect the dosing pump and the pipework from over pressurization. The drain from this safety (relief) valve should be returned either to the suction tank or to a suitable drain system.*

A pressure gauge (Ref.2 - Fig.4), next to the safety (relief) valve, allows the operator to check that the plant is working correctly and the pressure is normal.

On request safety (relief) valve and the pressure gauge can be supplied as optional accessories from the Manufacturer.

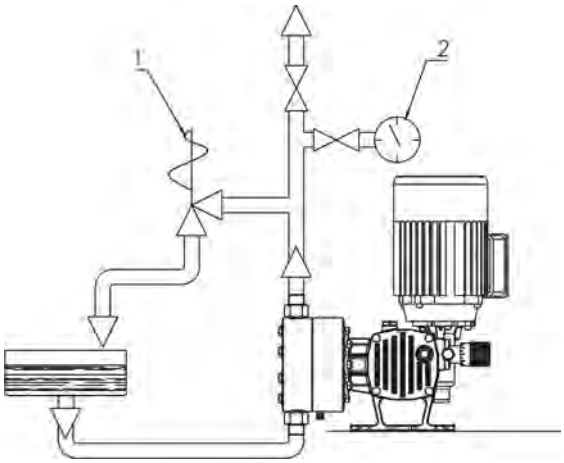


Fig. 4 - Safety valves

N.B.: *the safety (relief) valve must always be installed within the discharge pipework between the dosing pump and the first shutoff valve, as close as possible to the pump head. We also recommend a pressure gauge next to the safety (relief) valve.*

5.3.3 Pulsation Dampener. (Ref.1 - Fig.5)
With positive displacement reciprocating pumps, especially with high flows, it is advisable to install a pulsation damper within the discharge pipework. The use of a pulsation damper is recommended as it increases the pump's lifespan and eliminates inertia throughout the whole plant.

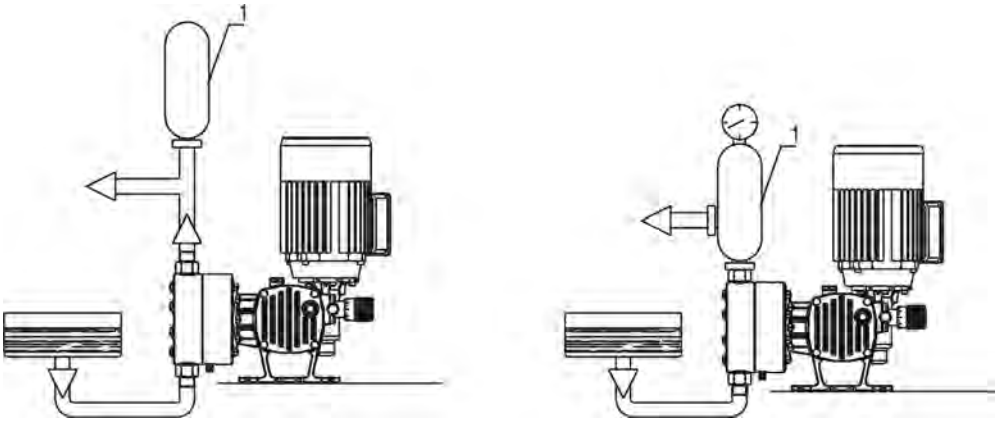


Fig. 5 - Layout of Pulsation Dampener

5.3.4 Pipework lagging
If the temperature of the liquid being handled is high enough to present a hazard, adequate lagging on the pipework must be provided above all in proximity to walkways or where an operator is present.

5.4 Installation procedure

- *Make sure that the base is firm and level.*
- *Fix the pump with the bolts as in fig.'s 2,3,4,5 - located on its base.*
  ***CAUTION:** during this operation do not stress the axis of the dosing unit.*
- *Check that the plant's piping does not contain foreign matter before connecting the pump.*
  Flush out associated the pipework.
- *Each section of pipework has to be supported and bracketed independently. Stress must not be transmitted to the pump.*
- *Joints must be made so they compensate any expansion due to heat that might exert pressure or stress on the dosing head.*
- *After the discharge flange fit "T" branches to connect the pressure gauge and safety relief valves and pulsation damper.*
- *Check for leaks in the pipework. Ensure that the suction line is well bled otherwise the pump may not prime.*

5.4.1 Ideal Installation.
For an ideal installation follow these simple recommendations:

- *flooded suction (Ref. H - Fig.6)*
- *positive discharge head (Ref. H1 - Fig.6)*

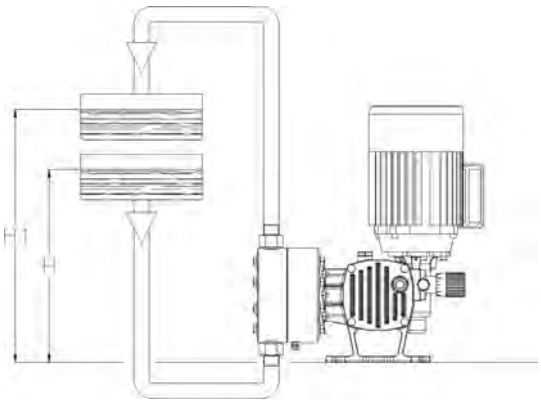


Fig. 6 - Ideal installation

5.4.2 Installation when suction pressure greater then the discharge pressure
In the event that the liquid surface (Ref. H1 - Fig.7) of the suction tank is at a higher level than the discharge tank, gravity will cause the fluid to flow from the suction tank to the discharge tank (syphon). To prevent this a back pressure loading valve (Ref.1 - Fig.7) should be installed within the discharge pipework calibrated at a higher pressure than the suction pressure.

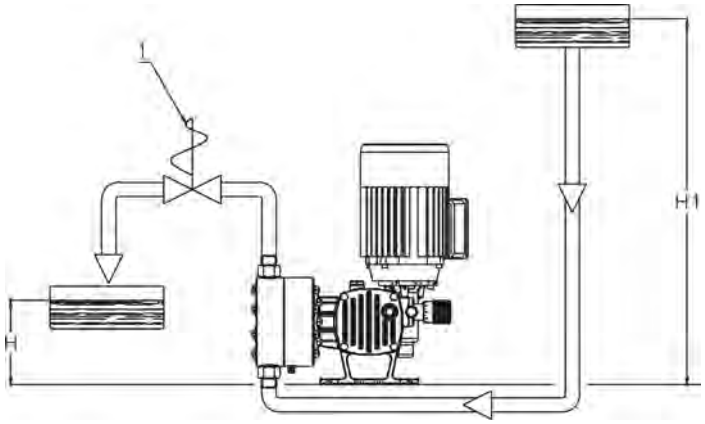


Fig. 7 – Installation with flooded suction

5.4.3 Installation with flooded suction.
If we consider the NPSH of the dosing pumps changes according to the pump head design, to operate well the following condition must be ascertained:

$$NPSH_{plant} > NPSH_{pump}$$

Where the NPSH is defined as the net positive charge in suction.
The plant NPSH is obtained by the following equation:

$$NPSH_{plant} = P_b + P_c/\gamma - T_v - P_l$$

Where:

P_b = barometric pressure
P_c = pressure of liquid column in positive (+), negative (-)
T_v = liquid vapour tension
P_l = pressure drops in suction piping
γ = specific weight

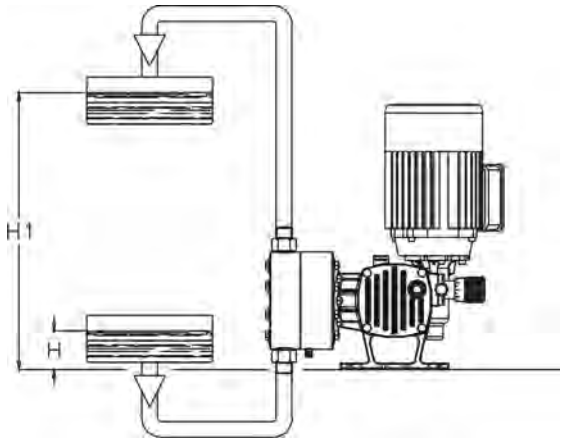


Fig. 8 – installation /suction lift

IMPORTANT: *with low flow equipment always consider the time the pump takes to fill the suction piping during priming.*

5.4.4 Dosing liquids with impurities

In this case the following measures must be taken for a satisfactory installation. Provide a suitable suction filter with filter (Ref. 1 - Fig. 9) screens ranging from 0.1 to 1 mm, depending on the pump size, and a filter surface 10 or 20 times the area of the suction pipe. In hard filtering conditions caused by large quantities of impurities in the liquid, or by high viscosity, basket filters are preferable, since their large filter surface (100 times the suction pipe area) provides an increase in the time between service.

N.B: *A large filter surface reduces pressure drops which has positive influence on the pump's performance.*

When dosing liquids with suspended particles the piping system must be designed so that sedimentation are avoided, especially in proximity of the pump. Therefore vertical sections in the discharge piping are to be avoided. Moreover the pump head and piping should be flushed out immediately after every stoppage.

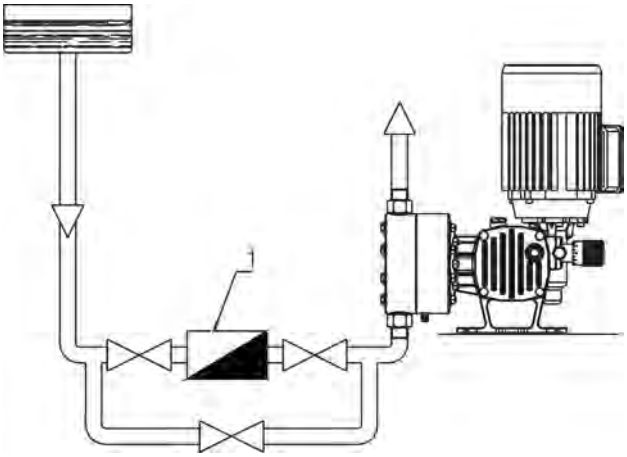


Fig. 9 – Layout for dosing liquids with impurities

5.4.5 Installation with injection valve on discharge

If the dosing pump discharge injects into pipework of constant flow/pressure, a non return valve (injection fitting) should be provided on the inlet to the pipework. (Ref.1 - Fig.10).

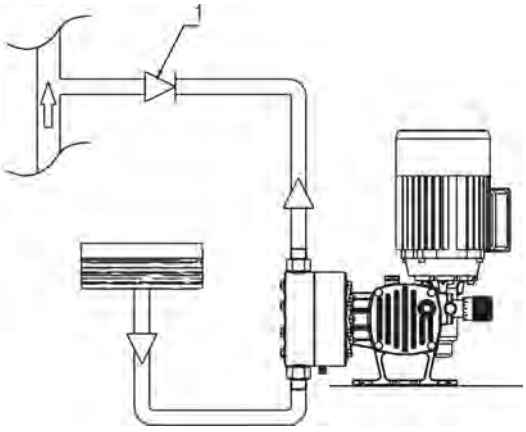


Fig. 10 – Injection valve installed in the discharge hose

5.5 Removing protective caps

Before installing the pump protective caps (Ref. 1 - Fig.11) have to be removed, these are placed on the suction and discharge valve. (Ref. 2 - Fig.11)

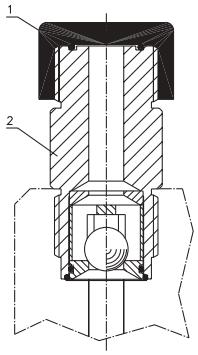


Fig. 11 – Protective cap

5.6 Lubricating oil

All pumps are supplied without lubricating oil so before starting up the unit, the gear box has to be filled with oil. Our pumps require approx. 0.35 litres of oil.
The gear box oil has the following international coding:
SAE 140 with 23°E viscosity (approx. 160 mpa)

This type of oil can be obtained from various Petrol Companies:

- *Shell Spirax HD 85W 140*
- *Esso Gear Oil GX 85 W 140*
- *Agip Rofra MP 85W 140*
- *Mobil Mobilube HD85W 140*
- *BP Hypogear EP 85W 140*
- *IP Pontiax HD 140*

The lubricating oil has to be changed after the first 500 working hours and then every 3000 hours thereafter. Fig. 12 indicates the oil fill (Ref 1-Fig.12), drain (Ref.2-Fig.12) and oil level cap (Ref.3-Fig.12) positions.

Fig. 12 – Oil cap positions

5.7 Connecting the mains power and cable wiring

CAUTION: all cable and mains power connections must be carried out by trained qualified electrician, or directly by an Authorised Service Centre.

- *Power the pump with a suitable sized fireproof electric cable in compliance with the voltage data specified on the motor's ID plate.*
- *Check that the pump's voltage requirement corresponds to the mains supply (+/- 5%)*
- *Check that the mains plant is protected against current overloads and electromagnetic disturbance.*
- *All the operations on electric power and wiring must be followed as from the attached wiring diagram. If any doubt should occur please contact an Authorised Service Centre or the Manufacturer.*

In any case:

- *lay the power cables and mains/pump line so that it is quite protected and safe;*
- *pass wires through their cable glands and fix them on the terminal blocks.*
- *during preliminary operations ascertain the ground cable's connection and efficiency.*
- *Connect the motor to the mains via a thermal switch (three phase or single phase), calibrated according to the motor of the pump.*

***IMPORTANT:** Make sure that the plant/pump power supply cables are provided with safety circuit breaker. All electrical wiring work and maintenance must be carried out with the power off.*

6.0 MACHINE SAFETY

All the tests have been carried out in order to prevent any inherent risks during the pump's working and maintenance. Any tampering is strictly forbidden since it may create a hazard for operators or plant.

6.1 Mechanical, electrical and leak protections

Mechanical Protections

The majority of the moving parts are located within the gearbox (Ref. Fig. 1). The motor fan and reciprocating diaphragm are *both fitted with protective guards.*

Electrical Protections

The power connections and the electric terminals are located within the eletric motor terminal block (Ref. Fig. 1) and protected against direct and indirect electrical contact.

Leakage Indication

The pump is fitted with a drain tube nipple in order to collect any process liquid leakage.

6.2 Inherent Risks

- *Minor leaks may arise from the* diaphragm *seals. For this reason a 4x6 pipe connector to drain off any eventual leaks is provided.*
- *If the pump is to be disassembled from the circuit, remember to disconnect the power supply.*
- *If the pump head is to be disassembled, remember to let off the pressure and disconnect the pump head from the plant.*
- *The operator must use protective wear (i.e. gloves, eyewear, boots, overalls, etc) according to the fluid being handled.*

6.3 Emergencies

In case of emergency the chemical dosing pump must be shutdown immediately.

7.0 OPERATING PRACTICES

CAUTION! *The preliminaries and all other operations described below, are information which may vary according to the model supplied.*
Therefore all the contents of this section must be read thoroughly and the recommendations of the Manufacturer fully understood.

7.1 Preliminary controls on starting

Ensure that by starting up the chemical dosing pump production hazards are not created for operators and or plant. For the correct use and compliance with safety parameters, any work operation must be preceded by the controls and actions listed below:

- *Remove of any packing used to prevent movement and damage during shipping, handling and assembly.*
- *the base must be properly anchored.*
- *observe all technical and environmental limitations indicated by the Manufacturer.*
- *there must be free access to all control and calibration units.*
- *check the oil level using the level cap provided. All pumps are supplied without oil.*
- *Inspect for leaks from pipework nipples and valves in the plant, warnings and ID labels are intact and legible.*

7.2 Start-up operations

The installation and plant/power supply connection procedures prepare the pump for use. The following operations should be carried out to start up the unit:
• check all electrical connections
• make sure that the liquid being dosed has not solidified or frozen in the pipework
• make sure that the isolation valves are the pipework are open/close acording to the liquid flow requirements.
• the first start-up must be made at the lowest discharge pressure, with the pump at zero flow, gradually increasing it until maximum flow, so that the piping is bled rapidly and safely.
• even though, in most cases dosing pumps are self-priming, problems can be experienced with small diaphragm *diameters pumps, high discharge pressures and if a non return valve is located within the discharge pipe work. It may be necessary to prime the pump by introducing liquid into the suction circuit.*

CAUTION: *If any fault or irregularity should arise, disconnect the pump from power source and contact an Authorised Service Centre.*

CAUTION: *never use the pump for any purposes other than those prescribed by the Manufacturer.*
Before starting any operating, cleaning and/or maintenance activity, wear protective clothing – in full respect of current accident prevention regulations.

7.3 Controlling the direction of rotation of the motor

After electrical installation ensure that the motor drive rotates in the correct direction, see direction arrow on the motor's fan or gear box flange.
If not:
• disengage the main switch and the safety circuit breaker
• consult a qualified electrician (Fig. 14)
• repeat inspection

7.4 Adjustment and calibration

This unit's flow can be adjusted by rotating the micrometer adjustument. (Ref. Fig. 13)
Adjustment from zero to maximum flow is achieved by rotating the micrometer 4 or 8 complete revolutions.
A graduated scale, set parallel to the adjustment rod indicates the rod's position inside the gearbox and in the same way gives the percentage flow against the maximum.
Therefore:

$$D=100\ Q_r/Q_m$$

Where:
D = number of graduations
Q_r *= required flow (in l/h)*
Q_m *= maximum flow (in l/h)*

A typical example:
In order to set the adjustment potential knob to satisfy a requirement of 20 l/h with a pump having a maximum flow of 40 l/h.

$$D=100 \times Qr/Qm \qquad D=100 \times 20/40 = 50\ \%$$

Therefore the micrometer has to be set on the sixtieth graduation, as shown in Fig. 13

Fig. 13a

Fig. 13b

Fig. 13 – micrometer adjustment

The pumps can also be supplied with an automatic servo motor. If this is the case consult the specific documentation attached to the pump.

8.0 MAINTENANCE

Replacement and installation of the units and/or components must be made as easy as possible by the working spaces provided during installation.
All maintenance work must be carried out by trained qualified staff in compliance with the Manufacture's recommendations and according to current accident prevention regulations.
For any matter not expressly covered in this section, please contact directly an Authorised Service Centre.
Any changes or even minor tampering and failure to use genuine spare parts shall revoke the warranty and relieve the Manufacturer from any liability related to the unit's operation and safety of operators and/or plant.
The following rules must be observed before carrying out any maintenance work on a pump:
• Always consult Appendix II for full knowledge on the characteristics and construction of equipment
• Make sure the pump is not operating and has been disconnected from any power supply
• Make sure the plant connected to the pump has been drained of any processed liquid, or that it has been isolated.
• Control that the pump head is not in pressurized.
• Always wear protection when working on the pump, comprising:
face mask, eyewear, boots and anything else necessary to prevent the liquid being handled from coming into contact with any part of the body.
For the long-term upkeep of technical characteristics, safety and efficiency, the pump requires routine maintenance and check-ups.
The inspection involves visual checks, they ascertain that the hydraulic parts, especially those in plastic, do not show signs of wear or attack from external agents. There should be no signs of cracks.
The materials and components that require periodical checking are given in the table below:

NAME	***COMPONENT SITE***	***ITEM***
Oil seal ring	*Gear box assembly*	*121*
Push rod spring	*Gear box assembly*	*119*
Diaphragm	*AISI and PP Head*	*404*
Suction valve assembly	*Valve*	*All*
Discharge valve assembly	*Valve*	*All*

Some faults or malfunctions may arise due to wear or particular working conditions,
they may demand servicing or repairing for a good operation and adjustment. These are the main malfunctions encountered:

- *valves blocked by impurities;*
- *worn valves;*
- *worn diaphragms and seal rings;*
- *clogged filters.*

If any of these conditions arise the user must schedule periodical cleaning of filters and all components. After all maintenance and repair work, before starting up the plant carry out the commissioning operations prescribed in section 7.
All maintenance must be carried out by qualified staff. If this is not the case please contact the manufacturer or the authorised distributor within the European Union.
We recommend routine maintenance be carried out when the oil change is due (3000 h) or at least once a year.
During maintenance and check-ups, depending on the type of fluid being dosed situations may arise involving a potential hazard for the operator, so the following must be accounted for:

- *high temperatures may be experienced, not only on the motor housing, but also on hydraulic parts. In this case protective gloves must be worn.*
- *make sure that any leaks of liquid are made in sections fitted with a suitable collection system.*

8.1 Topping up/changing oil

Periodically check the oil level using the oil level cap. To top up and change oil consult point 5.6.

8.2 Cleaning/changing valves

With reference to appendix II if the liquid being treated contains so many impurities to affect the equipment's operation, periodically disassemble the suction and discharge valves and wash them thoroughly with cleaning agents compatible with the liquid being dosed.

8.3 Cleaning/changing seal rings

With reference to appendix II periodically disassemble the seal rings and clean them. If they should show signs of wear, change them immediately.

8.4 Tightening screws and bolts

While carrying out routine maintenance check that all screws and bolts are tight.

9.0 TROUBLESHOOTING

Problem	*Cause*	*Remedy*
Faulty dosing	*Clogged suction filters*	*a – clean filters* *b – change filters*
	Diaphragm breaking	*a – replace diaphragm*
	Blocked valve	*c – clean valve* *d – change valve*
Electric motor not running	*No power supply*	*a – check power supply*
	Motor overload	*b – check if thermal protection is on*
No flow at all	*Blocked valves* *Adjustment flow 0%*	*a – clean valves* *b – check the adjustment rod*
Minor liquid leaks	*Excess pressure*	*a – check seal rings* *b – tighten bolts periodically*

10.0 DISASSEMBLING

Before disassembling the unit must be thoroughly flushed out with a compatible wash solution since toxic, caustic or acid residues may be present.
Special attention must be given to ensure the plant does not contain liquids under pressure, therefore the piping nearest the pump should first be isolated.
Respect current regulations for recycling and disposal of raw materials and metal parts of the unit.
If the unit has to be shutdown for long periods of time, especially before starting, the gear box has to be filled with special protective oil, thereby lining the gearing, actuators and also the pump head.

11.0 NOISE LEVELS PRODUCED BY THIS MACHINE OR BY ONE IDENTICAL

The following results refer to the sound level measurements on an identical machine to the one supplied under various operating conditions. The results are the highest values obtained in the tests. The tests have been carried out according to ***ISO 3741 - IEC 704-1 - UNI EN 23741 CENELEC HD 423.1 S1. General***

Operating levels and results in dBA				***LWA (media)***
10% Flow	*62.7*	*62.8*	*63.0*	***62.8***
50% Flow	*64.4*	*64.4*	*64.4*	***64.4***
100% Flow	*65.4*	*64.8*	*64.6*	***64.9***

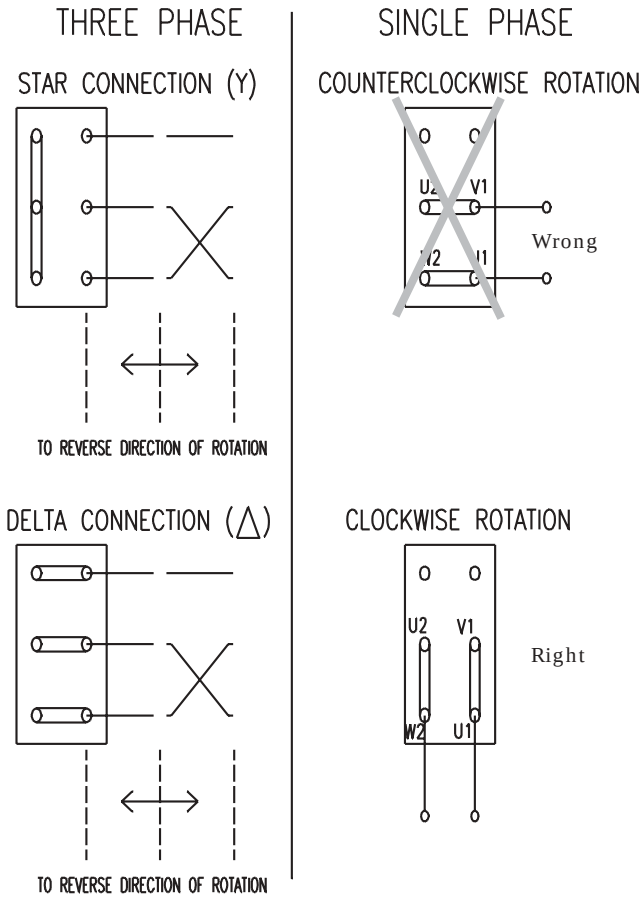
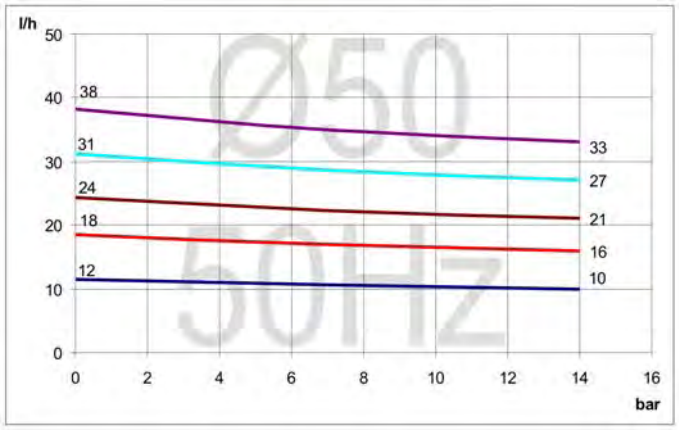
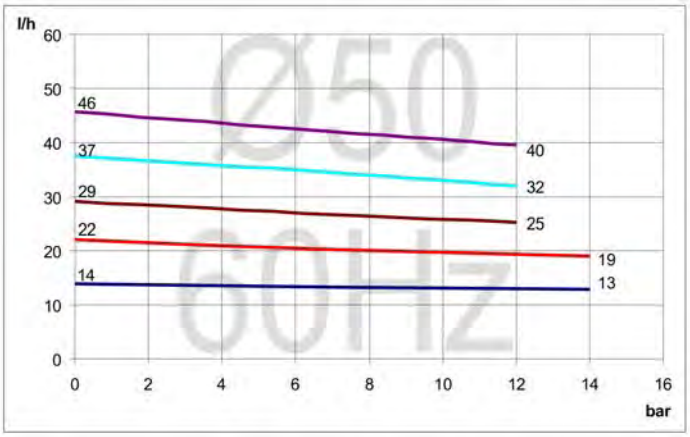
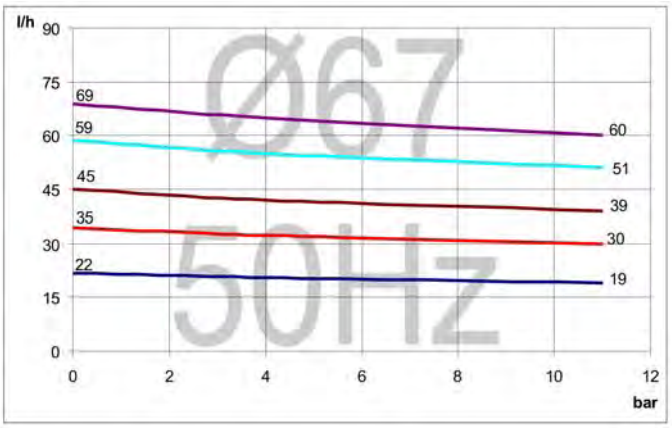


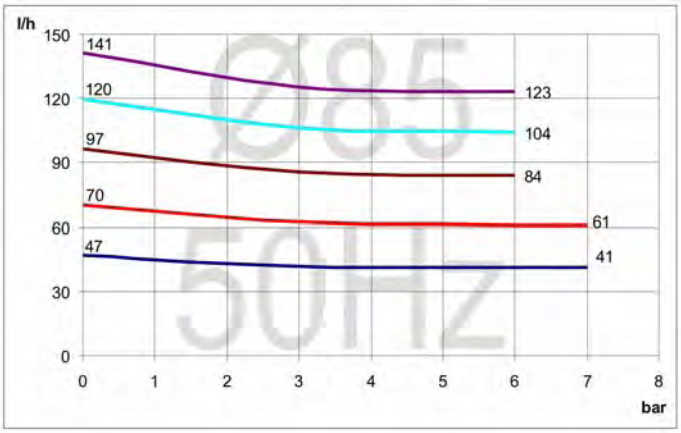
Fig. 14 - Electrical connection to the power supply

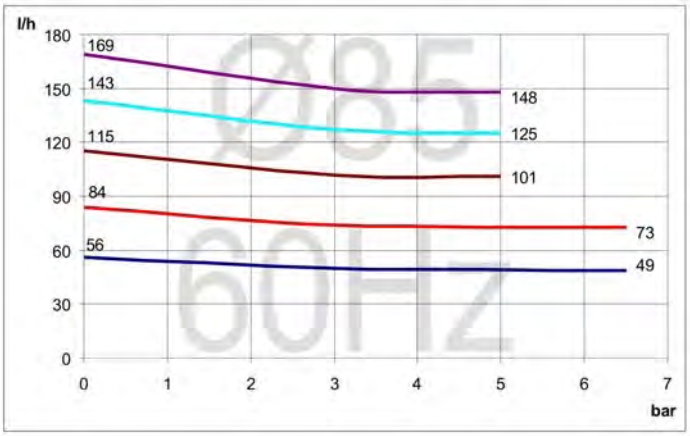
13.0 FLOW RATE VS PRESSURE GRAPHS











ALLEGATO I
PARTI DI RICAMBIO

APPENDIX I
SPARE PARTS

ALLEGATO I
PARTI DI RICAMBIO

APPENDIX I
SPARE PARTS

CASSA RIDUTTORE
RIF. FIG. A

No. Part.	DESCRIZIONE
1001	Vite senza fine
1002	Rondella di rasamento
1003	Cuscinetto in bronzo
1004	Manopola asta di regolazione
1005	Asta di regolazione
1006	Viti fissaggio supporto asta di regolazione
1007	Etichetta adesiva scala graduata
1008	Pomello fermo asta di regolazione
1009	Supporto asta di regolazione
1010	O-Ring asta di regolazione
1011	O-Ring supporto asta di regolazione
1012	Tappo carico olio
1013	O-Ring di tenuta tappo carico olio
1014	Tappo scarico olio
1015	O-Ring di tenuta tappo di scarico olio
1016	Cassa riduttore
1017	Cuscinetto albero eccentrico
1018	Ruota elicoidale
1019	Albero eccentrico
1020	Linguetta di trascinamento
1021	Cuscinetto eccentrico
1022	Anello elastico
1023	Cuscinetto albero eccentrico
1024	Guarnizione coperchio laterale
1025	Coperchio laterale
1026	Vite fissaggio coperchio laterale
1027	Tappo livello olio
1028	O-Ring supporto perno
1029	Dado di serraggio supporto perno
1030	Perno porta diaframma
1031	Molla ritorno perno
1032	Cuscinetto in bronzo
1033	Supporto perno porta diaframma
1034	Anello di tenuta olio per perno
1035	Rondella
1036	Viti di fissaggio supporto perno
2009	Tappo di sicurezza con scarico

GEAR BOX ASSEMBLY
REF. FIG. A

Part No	*DESCRIPTION*
1001	*Worm wheel*
1002	*Shim*
1003	*Bushing*
1004	*Micrometer*
1005	*Adjustment rod*
1006	*Adjustment bearing screws*
1007	*Adhesive Graduate scale*
1008	*Adjustment rod grubscrew*
1009	*Adjustment bearing*
1010	*Adjustment rod O-Ring*
1011	*Adjustment bearing O-Ring*
1012	*Oil load plug*
1013	*Oil load plug gasket*
1014	*Oil drain plug*
1015	*Oil drain plug gasket*
1016	*Gear box casing*
1017	*Shaft ball bearing*
1018	*Worm gear*
1019	*Eccentric shaft*
1020	*Key*
1021	*Eccentric shaft ball bearing*
1022	*Snap spring*
1023	*Shaft ball bearing*
1024	*Side cover gasket*
1025	*Side cover*
1026	*Side cover screws*
1027	*Oil level indicator*
1028	*Lantern push rod O-Ring*
1029	*Lantern push rod nuts*
1030	*Push rod*
1031	*Push rod spring*
1032	*Bushing*
1033	*Lantern push rod*
1034	*Push rod gasket*
1035	*Washer*
1036	*Push rod screws*
2009	*Drain safaty cap*

CASSA RIDUTTORE *GEAR BOX*

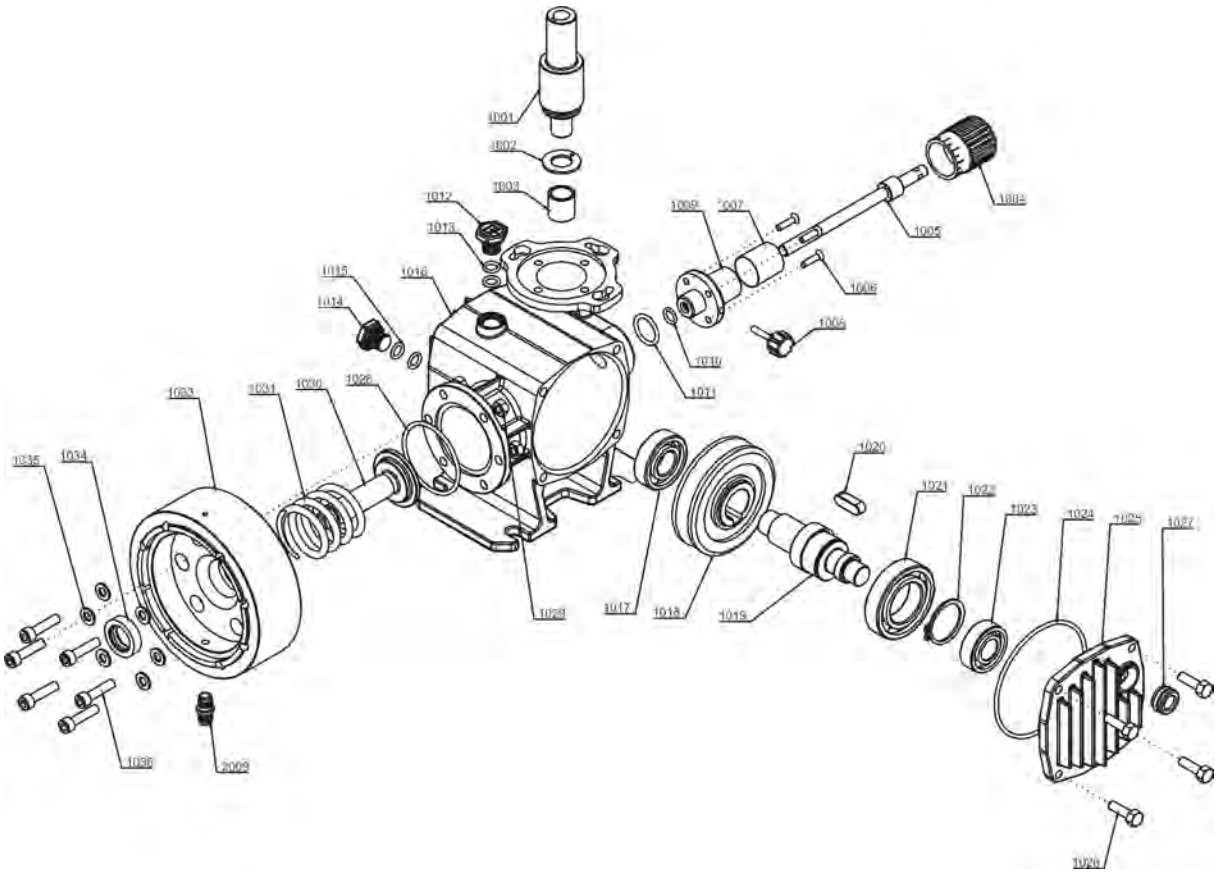


Fig. A

Testate Pompe a diaframma
Diaframma AISI 316 e PVC

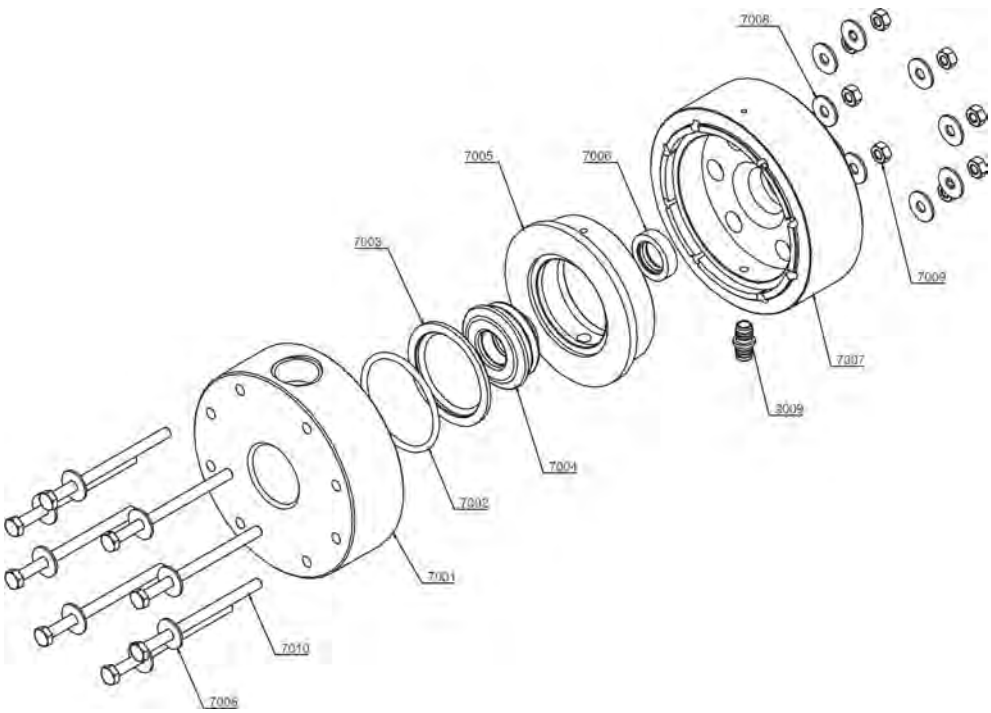
Elenco particolari

7001 - Testata
7002 - O-ring
7003 - Diaframma
7004 - Porta diaframma
7005 - Supporto diaframma
7006 - Anello di tenuta
7007 - Supporto testata
7008 - Rondella
7009 - Dado di serraggio testata
7010 - Vite di fissaggio testata
2009 - Tappo di sicurezza con scarico

Diaphragm Pump Head
AISI 316 & PVC

Part List

7001 - Pump head
7002 - O-ring
7003 - Diaphragm
7004 - Diaphragm holder
7005 - Diaphragm support
7006 - Gasket support ring
7007 - Head shield
7008 - Washer
7009 - Head nut
7010 - Head screw
7009 - Drain safety cap



Valvole in Acciaio 1/2"

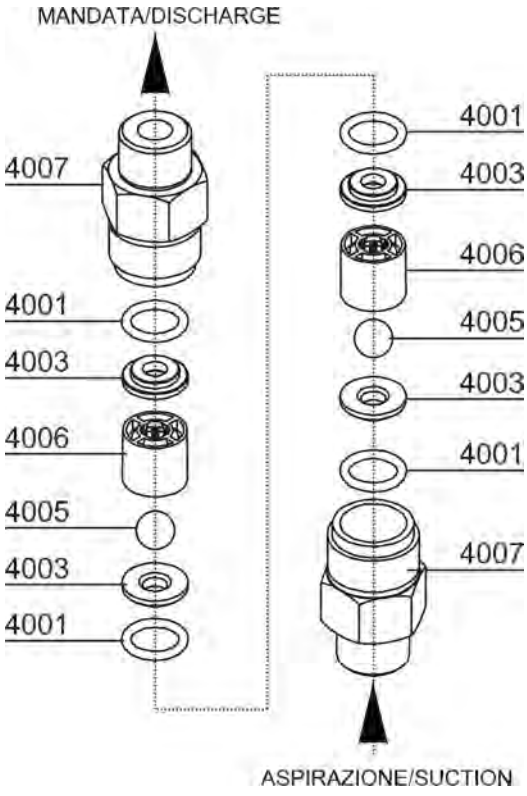
Steel Valves 1/2"

Elenco particolari

4001 - O-ring
4003 - Sede valvola
4005 - Sfera
4006 - Guida valvola
4007 - Raccordo

Part list

4001 - O-ring
4003 - Valve seat
4005 - Valve ball
4006 - Valve guide
4007 - Valve housing



SINGOLA VALVOLA
SINGLE VALVE ASSEMBLY

Valvole in PVC 1/2"

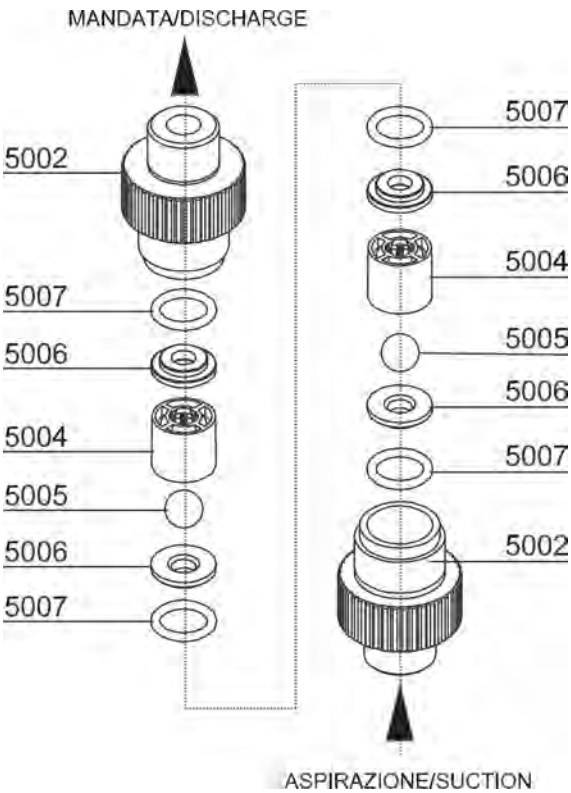
PVC Valves 1/2"

Elenco particolari

5002 - Raccordo
5004 - Guida valvola
5005 - Sfera
5006 - Sede valvola
5007 - O-ring

Part list

5002 - Valve housing
5004 - Valve guide
5005 - Valve ball
5006 - Valve seat
5007 - O-ring



SINGOLA VALVOLA
SINGLE VALVE ASSEMBLY