

SERIES ST - P



www.etatronds.com

 **ETATRON D.S.**

IT NORME DI INSTALLAZIONE, USO E MANUTENZIONE

UK OPERATING INSTRUCTIONS AND MAINTENANCE

www.castlepumps.com

CE  
UNI EN ISO 9001-2008

CLAUSOLE GENERALI

Nonostante sia stata posta la massima cura nella stesura di questo manuale, la ETATRON D.S. S.p.A. non può garantire l'esattezza di tutte le informazioni contenute al suo interno e non può essere ritenuta responsabile né degli errori che ciò potrebbe comportare, né dei danni che ne potrebbero risultare dall'utilizzo o dall'applicazione. I prodotti ed i servizi presentati in questo documento sono soggetti ad evoluzione, in quanto a caratteristiche di presentazione, di funzionamento, ETATRON D.S. S.p.A. si riserva il diritto di eventuali modifiche senza preavviso.

GENERAL CLAUSES

Despite the fact that the utmost attention has been given taken in the preparation of this document, ETATRON D.S. S.p.A. cannot guarantee the accuracy of all information contained and cannot be held responsible for any consequent mistakes or damages that may arise from its use or application. The products, materials, software and services presented in this document are subject to development and with regards to presentation and performances characteristics, ETATRON D.S. S.p.A. reserves the right to carry out any modifications without prior notice.

DICHIARAZIONE DI CONFORMITÀ



ETATRON D.S. S.r.l.

con sede in

Via Catania, 4 - 00040 Pavona di Albano Laziale (RM) • ITALY
Tel. +39 06 93 49 891 • Fax +39 06 93 43 924
C.C.I.A.A. 535990 - Trib. di Velletri 5170/85 • Cod. Fisc. 06632160583
P. Iva 01585941006 • N. Export M/7011798
Internet: <http://www.etatronds.com> e-mail: info@etatronds.com


IN QUALITÀ DI FABBRICANTE DELLA POMPA DOSATRICE

SERIE: **ST-P**

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; EN 61000-3-3.

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

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

p. Etatron DS S.r.l.
Responsabile Tecnico
Ing. Marco Trissati

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

CERTIFICATE OF CONFORMITY



ETATRON D.S. S.r.l.

head office

Via Catania, 4 - 00040 Pavona di Albano Laziale (RM) • ITALY
Tel. +39 06 93 49 891 • Fax +39 06 93 43 924
C.C.I.A.A. 535990 - Trib. di Velletri 5170/85 • Cod. Fisc. 06632160583
P. Iva 01585941006 • N. Export M/7011798
Internet: <http://www.etatronds.com> e-mail: info@etatronds.com

AS MANUFACTURER OF CHEMICAL DOSING PUMPS

SERIES: **ST-P**

MODEL: **AA/BA**

Under our own responsibility we declare conformity 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; EN 61000-3-3.

This certificate confirms equipment supplied  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, li 31/07/2004

1.0	INTRODUCTION	24
1.1	FOREWORD	24
1.2	INTRODUCTION TO THE MANUAL	24
1.2.1	<i>Manual instructions</i>	24
1.2.2	<i>Glossary</i>	24
2.0	GENERAL RECOMMENDATIONS	25
2.1	WARNINGS AND PRECAUTIONS	25
3.0	PUMP IDENTIFICATION	25
4.0	P SERIES DOSING PUMPS DESCRIPTION	26
4.1	DESCRIPTION	26
4.2	CLASSIFICATION	26
4.3	PERFORMANCES AND CHARACTERISTICS	27
4.4	THE SUPPLYING	30
4.5	SHIPPING AND HANDLING	30
5.0	INSTALLATION	31
5.1	MINIMUM WORKING SPACE	31
5.2	LOCATION AND ENVIRONMENT	31
5.2.1	<i>Explosive atmospheres</i>	31
5.3	PLANT REQUIREMENTS	32
5.3.1	<i>The plant pipework</i>	32
5.3.2	<i>Safety "Relief" valve, pressure gauge</i>	32
5.3.3	<i>Pulsation dampener</i>	33
5.3.4	<i>Pipework insulation</i>	33
5.4	INSTALLATION PROCEDURE	33
5.4.1	<i>Typical installation</i>	33
5.4.2	<i>Installation with suction lift</i>	34
5.4.3	<i>Installation with flooded suction</i>	34
5.4.4	<i>Dosing liquids with impurities</i>	35
5.4.5	<i>Installation with discharge injection valve</i>	35
5.5	REMOVING BLANKING CAPS (GEAR BOX)	36
5.6	LUBRICATING OIL	36
5.7	CONNECTING THE MAINS POWER AND CABLE WIRING	37
6.0	MACHINE SAFETY	37
6.1	MECHANICAL, ELECTRICAL AND LEAK PROTECTIONS	37
6.2	INHERENT RISKS	37
6.3	EMERGENCIES	37
7.0	OPERATING PRACTICES	38
7.1	PRELIMINARY CONTROLS ON COMMISSIONING	38
7.2	START-UP OPERATIONS	38
7.3	MOTOR DIRECTION (ROTATION)	38
7.4	ADJUSTMENT AND CALIBRATION	38
8.0	MAINTENANCE	40
8.1	TOPPING UP AND CHANGING OIL	40
8.2	CLEANING/CHANGING VALVES	40
8.3	CLEANING/CHANGING SEAL RINGS	40
8.4	SCREWS TIGHTENING	40
9.0	TROUBLESHOOTING	41
10.0	DISMANTLING	41
11.0	NOISE ISSUED BY MACHINE OR SIMILAR MACHINE	41
12.0	ELECTRIC SCHEMATIC	42
13.0	THEORICAL FLOW RATE VS REGULATION	43
APPENDIX 1 - SPARE PARTS		45

- This manual forms part of the dosing pump
- Read carefully before installation
- Keep this manual in a safe place

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-P 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 piston plunger and the suction and discharge valve assemblies.
Piston	Plunger that displaced the liquid within 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 piston plunger and the pump head.
Valve	Non return valve on both suction and delivery ports.
Adjustment rod	This adjusts the piston 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-P 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-P 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-P" SERIES DOSING PUMPS.

DESCRIPTION

The "ST-P" series of pumps have been designed and manufactured for dosing liquids free of 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, piston

The pumping action is performed by a piston, 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 piston 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 passes out of the pump head through the delivery non 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 three 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 piston'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 PVC.

There are two standard models of piston pump, classified according to their materials (316 STST, PVC). On request the pumps can be manufactured with pump head and non return valves from other materials, e.g. Teflon, PVDF, Polypropylene.

With reference to the flow diagram, there are many alternative pump models basically distinguished by the diameter of their piston, pressure capability, valve type and seal material. This combination offers customers a wide range of models.

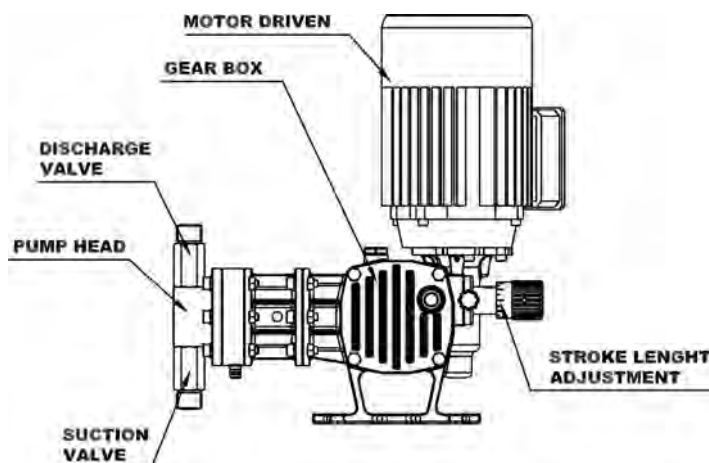


Fig. 1

4.3 Performances and characteristics

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

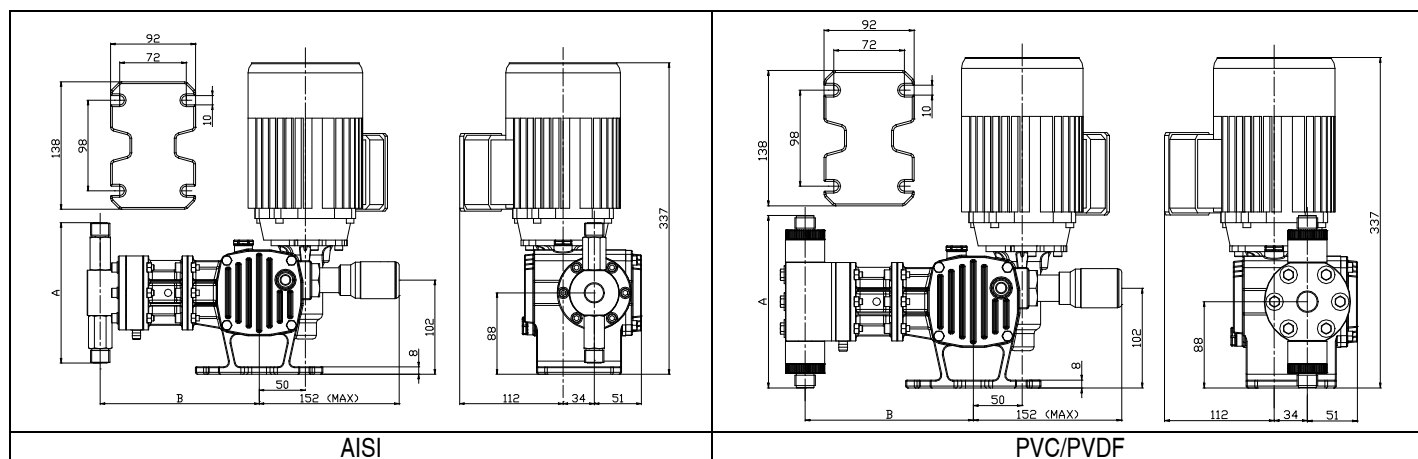
- Strokes/ frequency per minute at 50 and 60 Hz
- Flow in l/h
- Maximum working pressure in bar
- Types of valves used
- Motor specification
- Piston diameter
- Piston stroke length

In tables I and II, with reference to Fig. 2, give the overall dimensions of the various models manufactured in AISI 316 steel and PVC.



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

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



POMPE MECCANICHE A PISTONE: TESTATA AISI 316L / PVC / PVDF
MECHANICAL PISTON PUMPS: AISI 316L / PVC / PVDF PUMP HEAD

Codice	portata / flow rate l/h – (US gal/h)		Prevalenza Delivery Head bar – (psi) AISI		Prevalenza Delivery Head bar – (psi) PVC-PVDF		Colpi/min. strokes/min.		corsa stroke length	Pistone Piston	potenza power	Valvole Valves	Dimensioni(mm) Dimensions (mm)			
													A		B	
	50 Hz	60 Hz	50Hz	60Hz	50Hz	60Hz	50 Hz	60 Hz	mm	mm	kW		AISI	PVC / PVDF	AISI	PVC / PVDF
AP 0006 ** 00100	6 (1,59)	7 (1,85)	20 (290)	20 (290)	10 (145)	10 (145)	60	72	9.3							
AP 0011 ** 00100	11 (2,91)	13 (3,49)	20 (290)	20 (290)	10 (145)	10 (145)	60	72	15							
AP 0013 ** 00100	13 (3,43)	-----	20 (290)	-----	10 (145)	-----	120	---	9.3	16	0,18	½" Gm	151	176	172	172
AP 0018 ** 00100	18 (4,76)	-----	20 (290)	-----	10 (145)	-----	120	---	12.3							
AP 0022 ** 00100	22 (5,81)	-----	20 (290)	-----	10 (145)	-----	120	---	15							
AP 0023 ** 00100	23 (6,08)	28 (7,29)	13,5 (196)	11 (157)	10 (145)	10 (145)	60	72	9.3			½" Gm	151	176	172	172
AP 0039 ** 00100	39 (10,30)	47 (12,36)	13,5 (196)	11 (157)	10 (145)	10 (145)	60	72	15							
AP 0046 ** 00100	46 (12,15)	-----	10 (145)	-----	10 (145)	10 (145)	120	---	9.3	30	0,18					
AP 0064 ** 00100	64 (16,91)	-----	10 (145)	-----	10 (145)	10 (145)	120	---	12.3							
AP 0077 ** 00100	77 (20,34)	-----	10 (145)	-----	10 (145)	-----	120	---	15							
AP 0058 ** 00100	58 (15,32)	70 (18,39)	4.5 (65)	4 (58)	4.5 (65)	4 (58)	60	72	9.3			¾" Gm	141	223	184	181
AP 0095 ** 00100	95 (25,10)	114 (30,12)	4.5 (65)	4 (58)	4.5 (65)	4 (58)	60	72	15							
AP 0116 ** 00100	116 (30,65)	-----	3.5 (51)	-----	3.5 (51)	-----	120	---	9.3	48	0,18					
AP 0157 ** 00100	157 (41,48)	-----	3.5 (51)	-----	3.5 (51)	-----	120	---	12.3							
AP 0190 ** 00100	190 (50,20)	-----	3.5 (51)	-----	3.5 (51)	-----	120	---	15							

Gm: Gas Maschio / Tread gas male BSPm

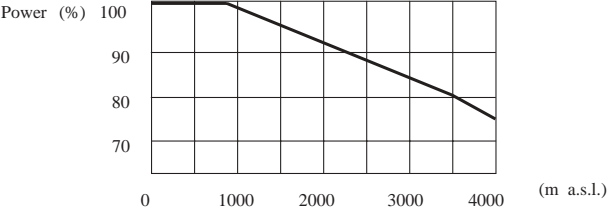
Tipo di valvola / Valves type: Pistone Ø16, Ø30 e Ø48 (PVC e PVDF): doppia valvola a sfera / piston Ø16, Ø30 and Ø48 (PVC and PVDF): double ball check valve
Pistone Ø48 AISI 316: singola valvola a sfera / AISI 316 piston Ø48: single ball check valve

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 +50 °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.

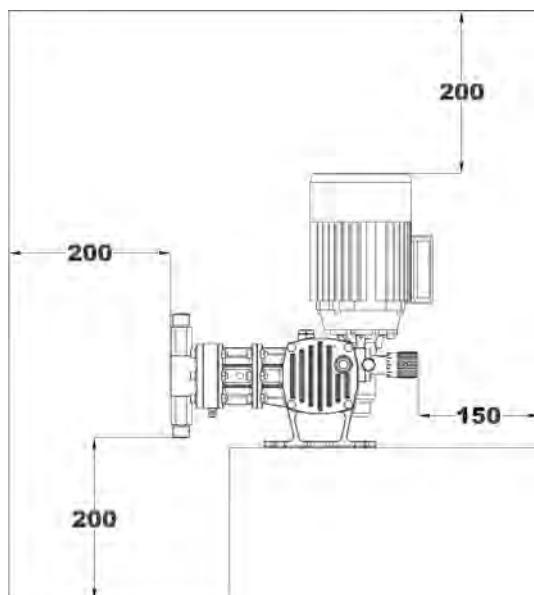


Fig. 3 – Minimum working space (mm)

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
PVC pump head	0	40

Liquid temperature:

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



IMPORTANT: for PVC 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.

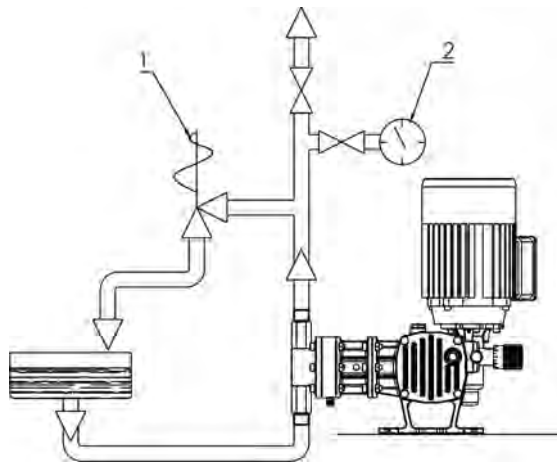


Fig. 4 – Safety valves

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.

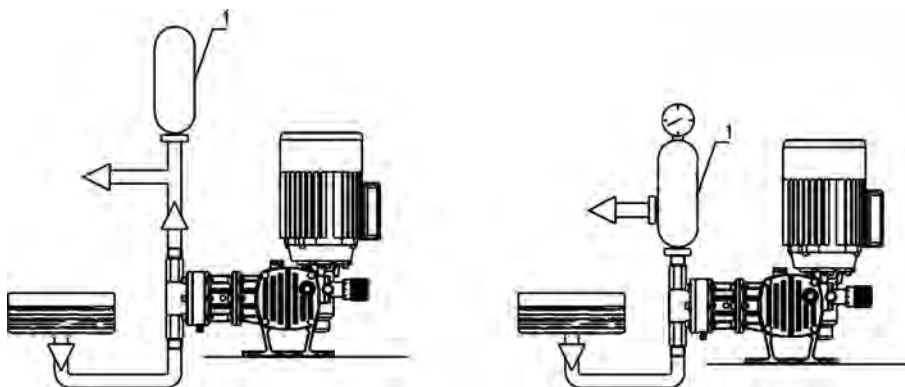


Fig. 5 – Layout of Pulsation Dampener



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 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)

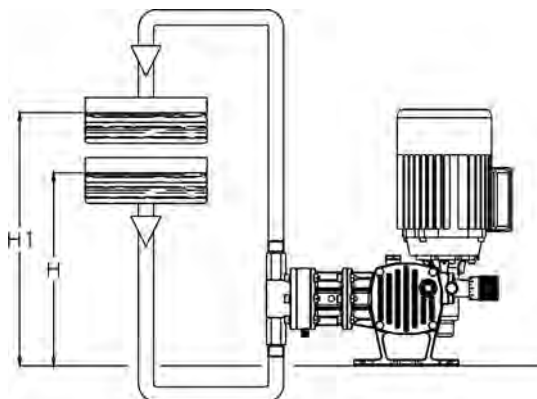


Fig. 6 – Ideal installation

5.4.2 Installation when suction pressure greater than 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.

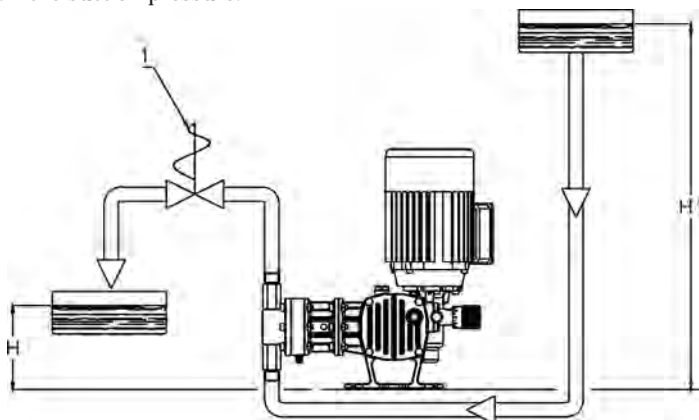


Fig. 7 – Installation with flooded suction

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:

$$\text{NPSH}_{\text{plant}} > \text{NPSH}_{\text{pump}}$$

Where the NPSH is defined as the net positive charge in suction.

The plant NPSH is obtained by the following equation:

$$\text{NPSH}_{\text{plant}} = P_b + P_c/\gamma - T_v - P_l$$

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

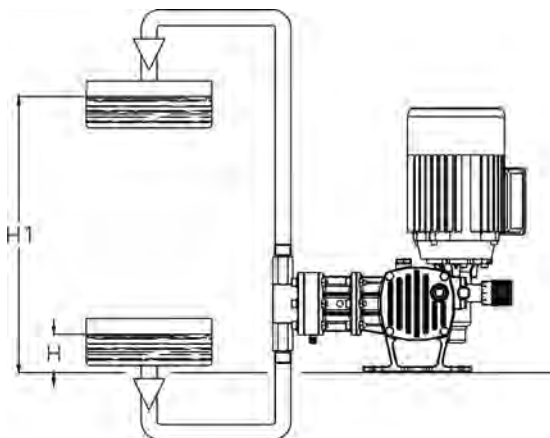


Fig. 8 – installation /suction lift

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.

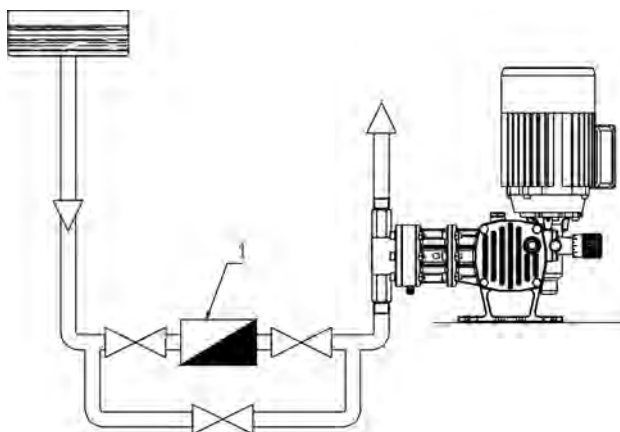


Fig. 9 – Layout for dosing liquids with impurities

5.4.5 Installation with injection valve on discharge

If the dosing pump discharges 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).

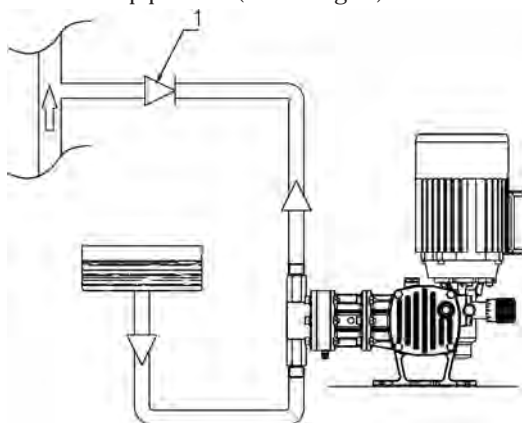


Fig. 10 – Injection valve installed in the discharge hose

5.5 Removing protective caps

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

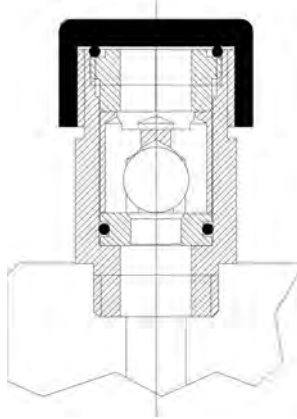


Fig. 11 – Protective cap

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 piston are both fitted with protective guards.

Electrical Protections

The power connections and the electric terminals are located within the electric 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 piston 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 the pipework are open/close according 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 piston 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 adjustment. (Ref. Fig. 13)

Adjustment from zero to maximum flow is achieved by rotating the micrometer ten 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:

$$D=100 \text{ } Q_r/Q_m$$

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 78 l/h with a pump having a maximum flow of 130 l/h.

$$D=100 \times Q_r/Q_m$$

$$D=100 \times 78/130 = 60 \%$$

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

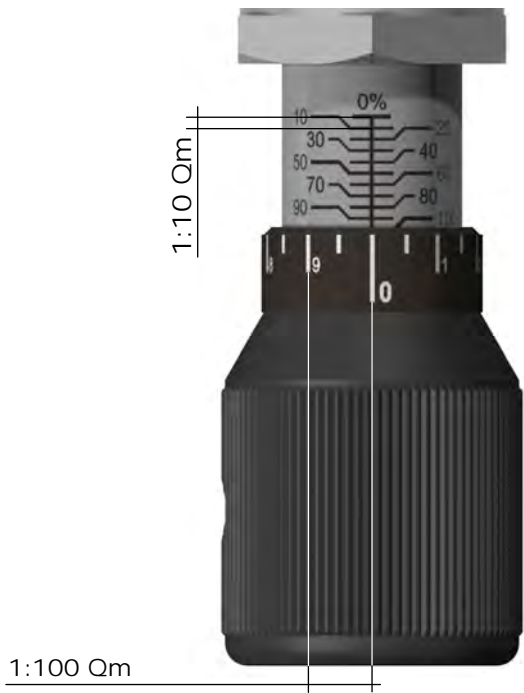


Fig. 13 – micrometer adjustment

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:

COMPONENT SITE	NAME	ITEM
Gear box assembly	Oil seal ring	121
Gear box assembly	Push rod spring	119
AISI and PVC Head	Piston	206/308
AISI and PVC Head	Seal ring	202-205-207 / 304-305-307
Valve	Suction valve assembly	All
Valve	Discharge valve assembly	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 pistons 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
	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	a – check motor protection
	Adjustment flow 0%	b – check pump is primed
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	70.5	70.5	70.7	70.6
50% Flow	75.1	75.2	75.2	75.2
100% Flow	65.7	66.0	66.0	65.9

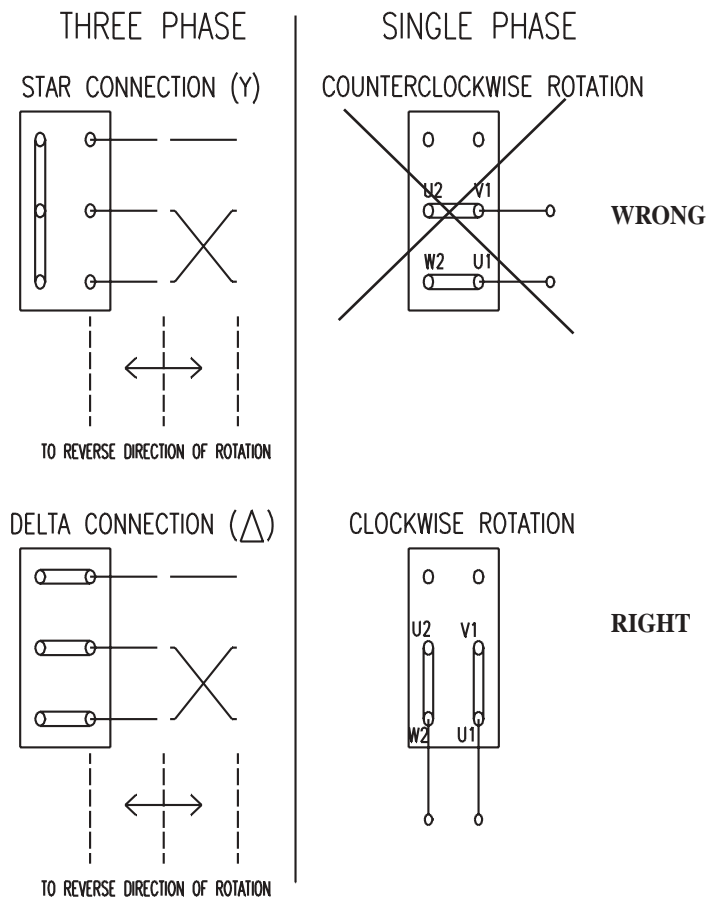
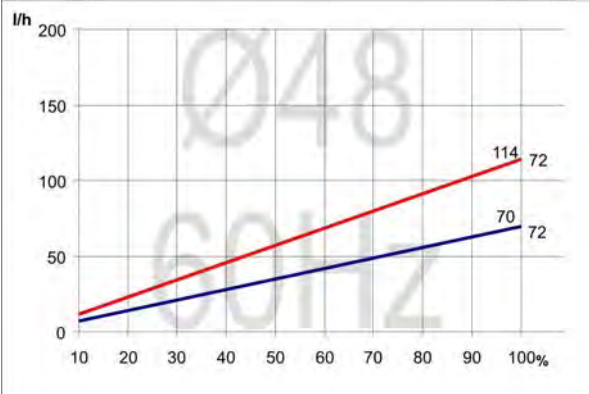
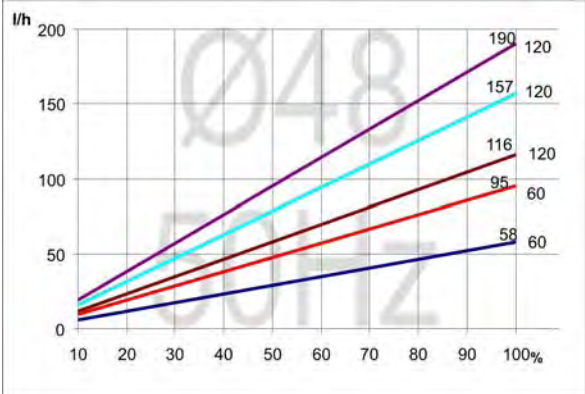
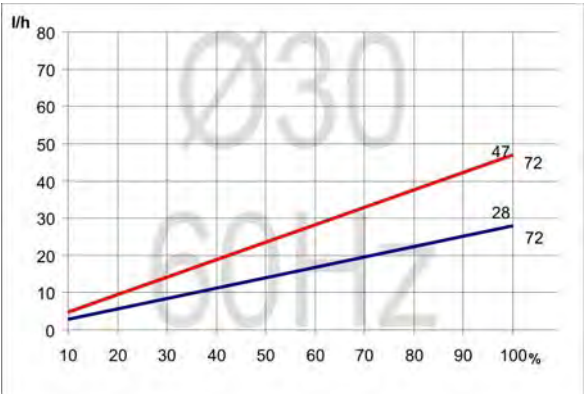
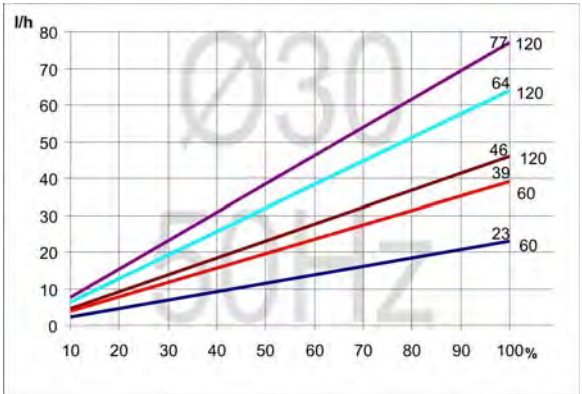
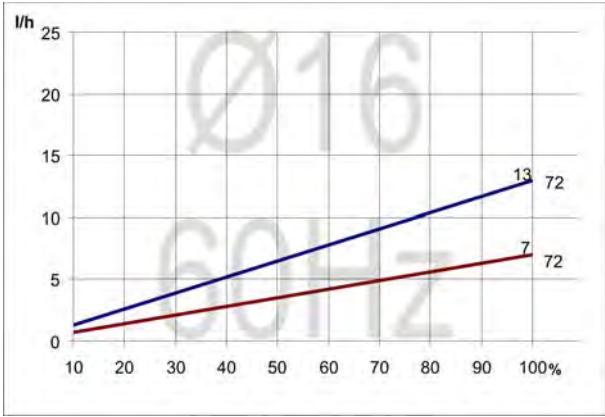
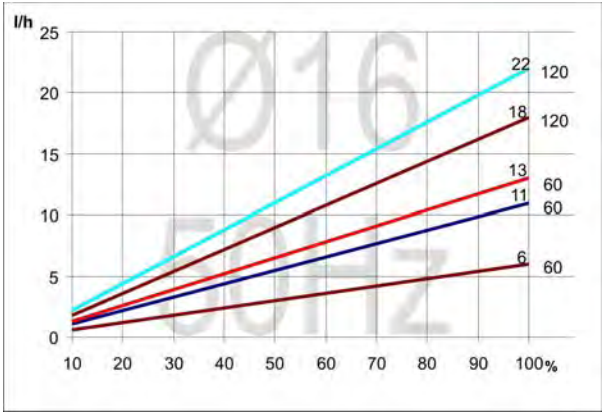
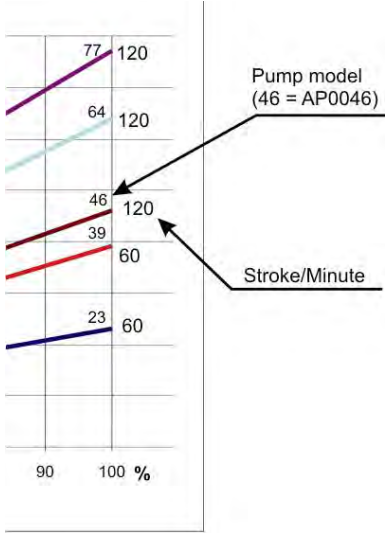


Fig. 14 - Electrical connection to the power supply

13.0 THEORICAL FLOW RATE VS REGULATION



ENLARGEMENT:
Numeric values shown in the charts



ALLEGATO I
PARTI DI RICAMBIO

APPENDIX I
SPARE PARTS

**ALLEGATO I
PARTI DI RICAMBIO**

**APPENDIX I
SPARE PARTS**

CASSA RIDUTTORE REF. FIG. A		GEAR BOX ASSEMBLY REF. FIG. A	
No. Part.	DESCRIZIONE	Part No	DESCRIPTION
1001	Vite senza fine	1001	Worm wheel
1002	Rondella di rasamento	1002	Shim
1003	Cuscinetto in bronzo	1003	Bushing
1004	Manopola asta di regolazione	1004	Micrometer
1005	Asta di regolazione	1005	Adjustment rod
1006	Viti fissaggio supporto asta di regolazione	1006	Adjustment bearing screws
1007	Etichetta adesiva scala graduata	1007	Adhesive Graduate scale
1008	Pomello fermo asta di regolazione	1008	Adjustment rod grubscREW
1009	Supporto asta di regolazione	1009	Adjustment bearing
1010	O-Ring asta di regolazione	1010	Adjustment rod O-Ring
1011	O-Ring supporto asta di regolazione	1011	Adjustment bearing O-Ring
1012	Tappo carico olio	1012	Oil load plug
1013	O-Ring di tenuta tappo carico olio	1013	Oil load plug gasket
1014	Tappo scarico olio	1014	Oil drain plug
1015	O-Ring di tenuta tappo di scarico olio	1015	Oil drain plug gasket
1016	Cassa riduttore	1016	Gear box casing
1017	Cuscinetto albero eccentrico	1017	Shaft ball bearing
1018	Ruota elicoidale	1018	Worm gear
1019	Albero eccentrico	1019	Eccentric shaft
1020	Linguetta di trascinamento	1020	Key
1021	Cuscinetto eccentrico	1021	Eccentric shaft ball bearing
1022	Anello elastico	1022	Snap spring
1023	Cuscinetto albero eccentrico	1023	Shaft ball bearing
1024	Guarnizione coperchio laterale	1024	Side cover gasket
1025	Coperchio laterale	1025	Side cover
1026	Vite fissaggio coperchio laterale	1026	Side cover screws
1027	Tappo livello olio	1027	Oil level indicator
1028	O-Ring supporto perno	1028	Lantern push rod O-Ring
1029	Dado di serraggio supporto perno	1029	Lantern push rod nuts
1030	Perno porta pistone	1030	Push rod
1031	Molla ritorno perno	1031	Push rod spring
1032	Cuscinetto in bronzo	1032	Bushing
1033	Supporto perno porta pistone	1033	Lantern push rod
1034	Anello di tenuta olio per perno	1034	Push rod gasket
1035	Rondella	1035	Washer
1036	Viti di fissaggio supporto perno	1036	Push rod screws
1037	Linguetta trascinamento vite senza fine	1037	Worm wheel Key
1038	Anello elastico	1038	Snap ring
1039	Cuscinetto vite senza fine	1039	Worm wheel ball bearing
1040	Rondella ondulata	1040	Waved washer
1041	Lanterna porta-motore	1041	Motor flange
1042	Viti fissaggio lanterna porta-motore	1042	Motor flange screws

0,18kW

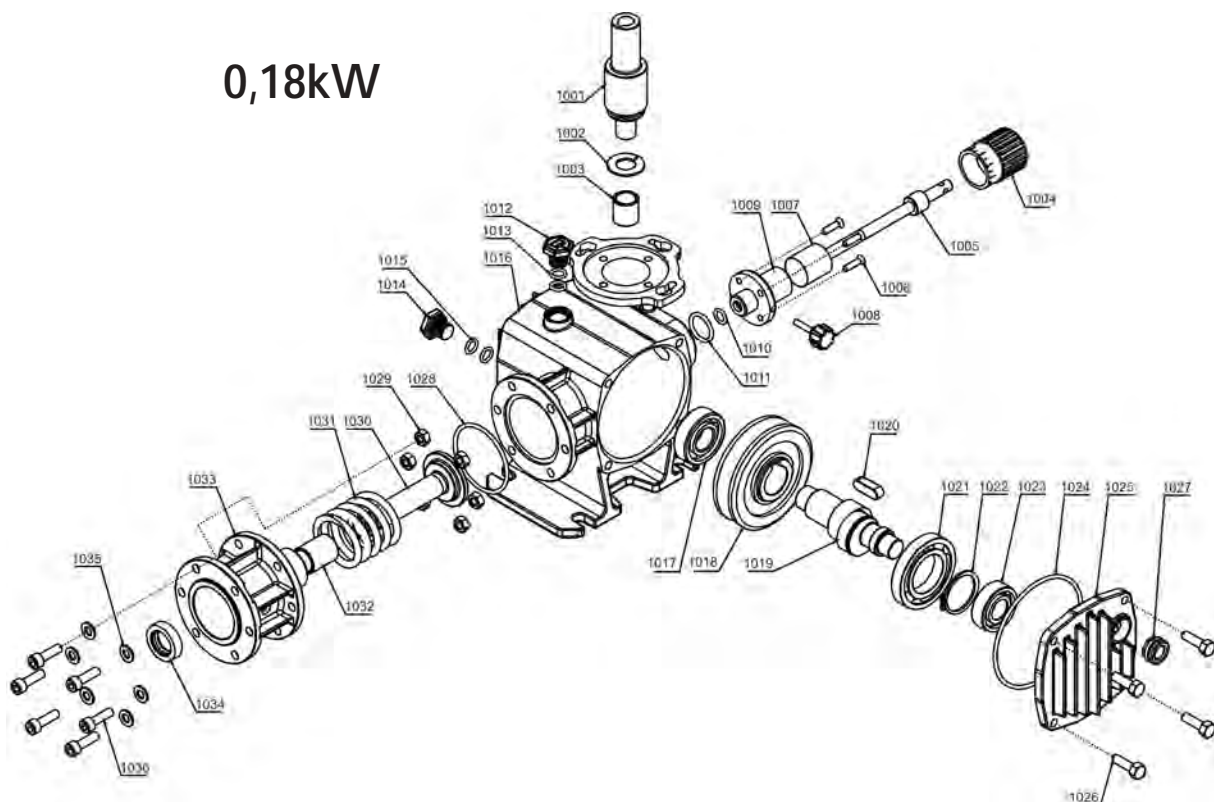


Fig. A

Testate Pompe a Pistone AISI 316

(Rif. Fig. B - C)

Elenco particolari

- 2001 - Testata acciaio AISI 316
- 2002 - Anello tenuta per pistone
- 2003 - Anello supporto guarnizione
- 2004 - O-ring
- 2005 - Pistone
- 2006 - Grano fissaggio pistone
- 2007 - Spina centraggio testata
- 2008 - Supporto testata
- 2009 - Tappo di sicurezza con scarico
- 2010 - Flangia di collegamento
- 2011 - Rosetta
- 2012 - Vite fissaggio testata

Piston Pump Head in AISI 316

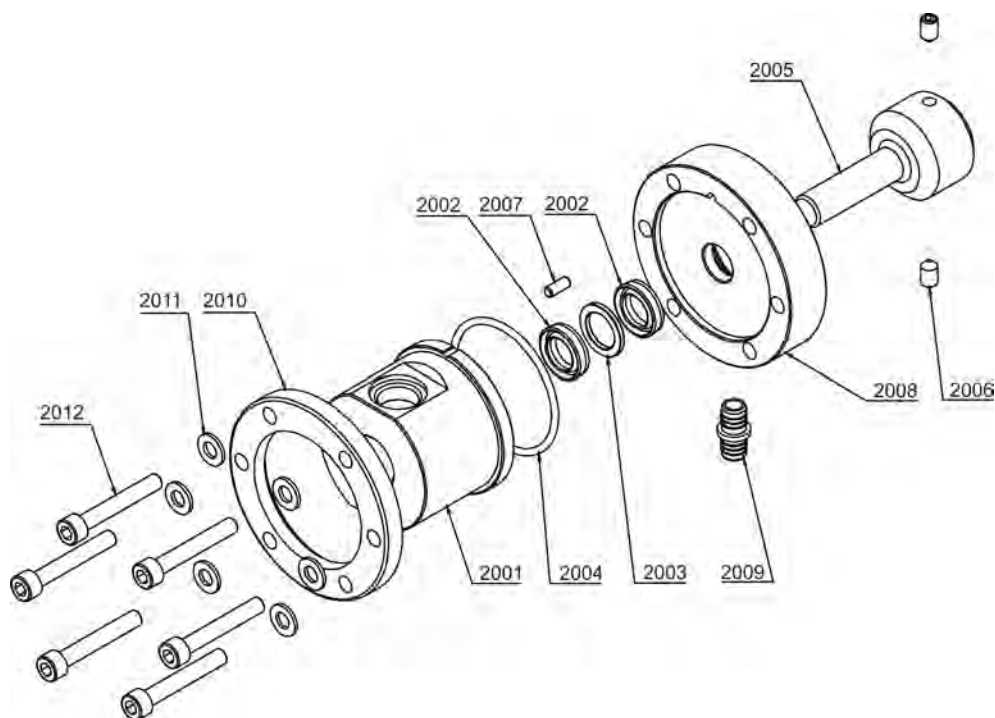
(Ref. Fig. B - C)

Part List

- 2001 - AISI 316 Steel head
- 2002 - Piston seal ring
- 2003 - Gasket support ring
- 2004 - O-ring
- 2005 - Piston
- 2006 - Piston grub screw
- 2007 - Head alignment pin
- 2008 - Head shield
- 2009 - Drain safety cap
- 2010 - Connection flange
- 2011 - Washer
- 2012 - Head screw

Modelli/Models: 0P0004....0P0290 AA

Pistone/Piston: Ø 13÷60 mm



Testate Pompe a Pistone PVC

(Rif. Fig. D - E)

Elenco particolari

- 3001 - Testata PVC
- 3002 - Anello tenuta pistone
- 3003 - Anello supporto guarnizione
- 3004 - O-ring
- 3005 - Pistone
- 3006 - Supporto pistone
- 3007 - Grano fissaggio pistone
- 3008 - Supporto testata
- 3009 - Tappo di sicurezza con scarico
- 3010 - Rosetta
- 3011 - Vite fissaggio testata

Piston Pump Head in PVC

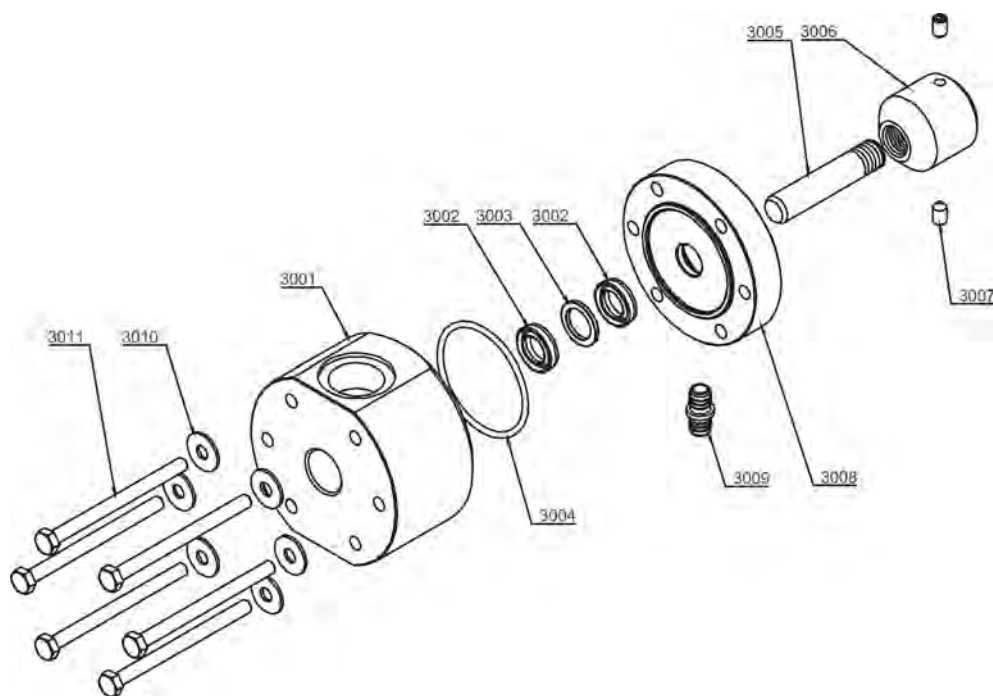
(Ref. Fig. D - E)

Part list

- 3001 - PVC head
- 3002 - Piston seal ring
- 3003 - Gasket support ring
- 3004 - O-ring
- 3005 - Piston
- 3006 - Piston support
- 3007 - Piston grubscrew
- 3008 - head shield
- 3009 - Drain safety cap
- 3010 - Washer
- 3011 - Head screw

Modelli/Models: 0P0004....0P0290 BA

Pistone/Piston: Ø 13÷60 mm



Valvole in Acciaio 1/2" • 3/4"

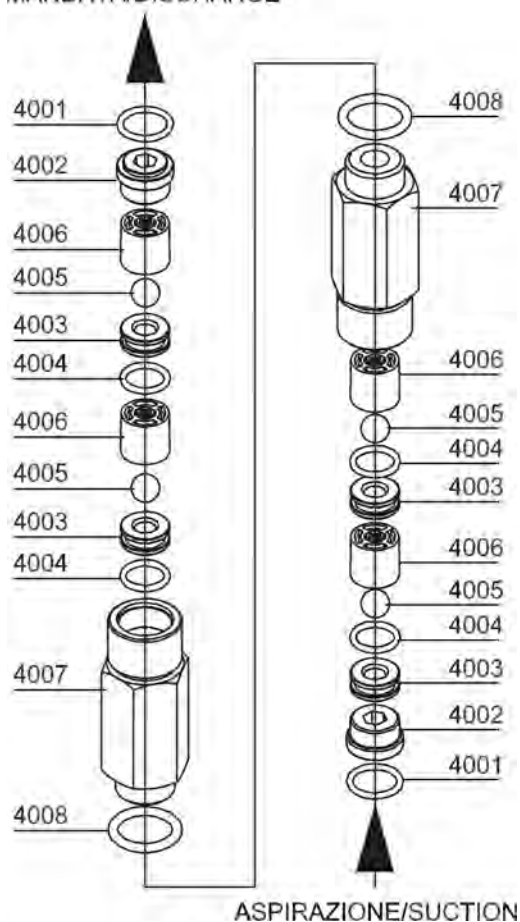
Steel Valves 1/2" • 3/4"

Elenco particolari

Part list

4001 - O-ring	4001 - O-ring
4002 - Tappo raccordo	4002 - Valve plug
4003 - Sede valvola	4003 - Valve seat
4004 - O-ring	4004 - O-ring
4005 - Sfera	4005 - Valve ball
4006 - Guida valvola	4006 - Valve guide
4007 - Raccordo	4007 - Valve housing
4008 - O-ring	4008 - O-ring

MANDATA/DISCHARGE



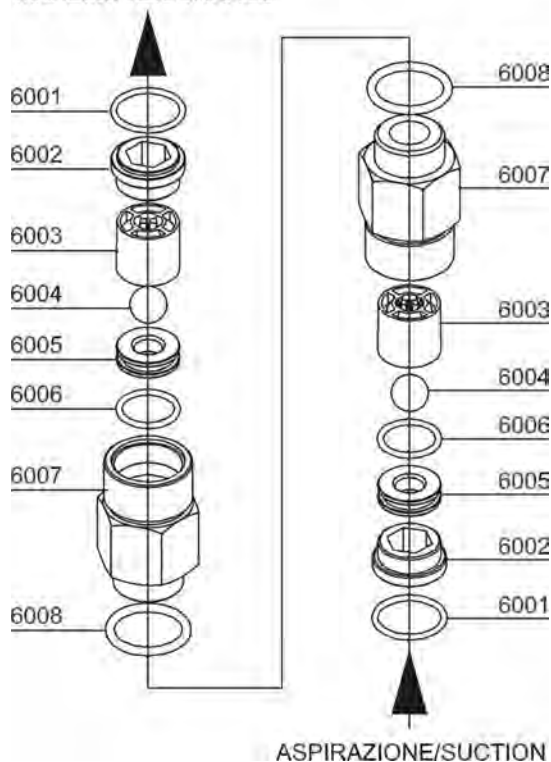
DOPPIA VALVOLA
DOUBLE VALVE ASSEMBLY

Elenco particolari

Part list

6001 - O-ring	6001 - O-ring
6002 - Tappo raccordo	6002 - Valve plug
6003 - Guida valvola	6003 - Valve guide
6004 - Sfera	6004 - Valve ball
6005 - Sede valvola	6005 - Valve seat
6006 - O-ring	6006 - O-ring
6007 - Raccordo	6007 - Valve housing
6008 - O-ring	6008 - O-ring

MANDATA/DISCHARGE



SINGOLA VALVOLA
SINGLE VALVE ASSEMBLY

1/2" • 3/4"

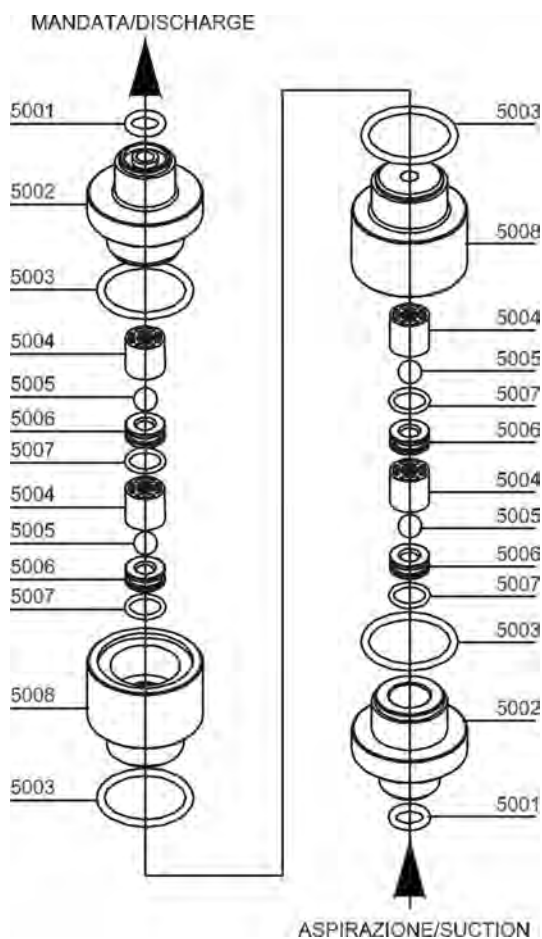
1/2" • 3/4"

Elenco particolari

- 5001 - O-ring
5002 - Raccordo
5003 - O-ring
5004 - Guida valvola
5005 - Sfera
5006 - Sede valvola
5007 - O-ring
5008 - Manicotto

Part list

- 5001 - O-ring
5002 - Valve housing
5003 - Valve seat
5004 - Spacer
5005 - Valve guide
5006 - Valve ball
5007 - O-ring
5008 - Coupling



DOPPIA VALVOLA
DOUBLE VALVE ASSEMBLY