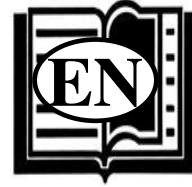


USE AND MAINTENANCE MANUAL

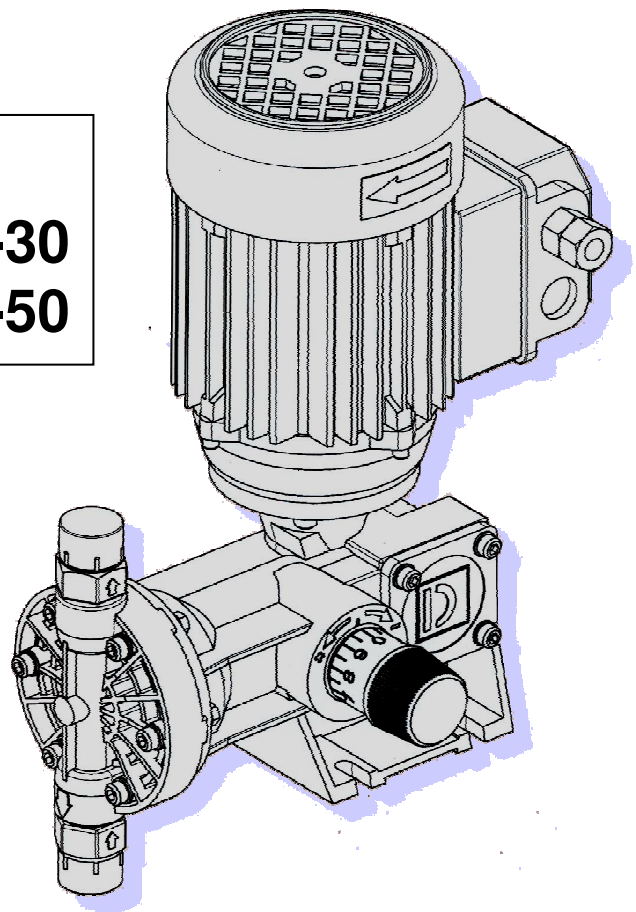


ATTENTION:
Industrial machinery for professional use.
These instructions are for qualified personnel



Translation of the
original instructions

Series	SR
Model	FM 50N-30 FM 50N-50



LDT GMBH
DOSIERTECHNIK

HAMBURG

Reciprocating dosing pump with mechanical diaphragm

2014 EDITION

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General prescriptions

Thank you for having chosen this product. Please read this manual carefully before installing the dosing pump, paying particular attention to the safety warnings flagged by the pictograms. Compliance with the reported standards and requirements allow for safe use and the appropriate interventions.

The use and maintenance manual is an integral part of the machine and must be readily available to the use and maintenance personnel, therefore, keep it intact and in a safe place (protected by transparent and watertight packaging to prevent deterioration). The manual must always accompany the machine, including any changes in ownership.

No responsibility is accepted for translations into other languages that do not comply with the original meaning.

The manual reflects the state of the machine at the time of supply, and therefore cannot be considered inadequate at a later date due to subsequent updates dependent on new studies or experiences.

The Company reserves the right to update the production and manuals without any obligation to inform the users of machinery supplied previously.

Technical assistance

Routine and extraordinary maintenance must occur in accordance with the instructions contained in this manual. For any kind of technical assistance and spare parts requests, directly contact the Company, the dealer or the plant engineer, referring to the data on the plate located on the pump:

- ✓ **Pump model.**
- ✓ **Serial number.**
- ✓ **Year of manufacture.**

If the pump is not serviced in compliance with the instructions provided, or in such a manner to jeopardise its integrity or modify its features, the manufacturer shall be deemed exempt from any liability concerning personal safety and pump malfunctioning.

Electric motors

The pump is normally equipped with an electric motor in compliance with the requirements defined in the customer order and compatible with the destination of use.

Should the pump be supplied without the motor, the Company, declines any liability deriving from an incorrect selection and installation of the motor by the customer.

Liability

Failure to comply with the use and maintenance instructions contained in this manual exempts the manufacturer from any liability.

For any information that is not included or cannot be inferred from the following pages, contacting directly is recommended.



ATTENTION!



ANY MODIFICATION NOT AUTHORISED BY THE MANUFACTURER, WHICH ALTERS THE EXPECTED FUNCTIONALITY ADAPTING THE RISKS AND/OR GENERATING ADDITIONAL ONES, WILL BE THE FULL RESPONSIBILITY OF THOSE EXECUTING THEM.

SUCH **MODIFICATIONS**, IF EXECUTED WITHOUT THE MANUFACTURER'S AUTHORISATION, WILL ALSO VOID ANY ISSUED GUARANTEE AND **INVALIDATE THE DECLARATION OF CONFORMITY** PROVIDED BY THE MACHINERY DIRECTIVE



It is essential to call attention to the symbols used in this manual to highlight the residual risks related to the intended use of the pump.

Below are the pictograms indicating the principal warnings and the behaviour that the operator must assume when the symbol is indicated, in order to safely carry out his/her functions.

Features of the safety signs		
<i>Shape</i>	<i>meaning</i>	<i>Indications and clarifications</i>
	Warning	Warns to exercise caution, pay attention to mechanical risks or hazards of various natures present in the work environments.
	Prescription	Informs workers of the personal protection devices that must be used and the particular behaviour that must be observed.

2.1 Symbols

ATTENTION!

Means that non-compliance with the safety standards may cause minor personal injuries or damage to property.



HAZARD!

Means that non-compliance with the safety standards may cause personal injuries or damage to property.



RISK OF SERIOUS INJURIES!

Means that non-compliance with the safety standards may cause serious personal injuries or damage to property.



2.2

Minimum qualification of personnel

USER

The user must be familiar with the machine and the installed safety devices.

He/she appoints personnel responsible for machine operation and their operational training, with particular reference to the safety standards.

OPERATOR

Personnel in charge of the various activities related to the entire life cycle, handling, installation and use of the machine.

Deals with the visual check and proper operation of the machine.

MECHANICAL MAINTENANCE TECHNICIAN

A qualified and authorised person indicating the routine and extraordinary maintenance procedures. He/she must personally and safely perform the disassembly and maintenance of the plant, as well as the installation of the pump on the plant during commissioning.

He/she handles the mechanical adjustments, calibrates the machine and replaces any faulty parts.

ELECTRICAL MAINTENANCE TECHNICIAN

A qualified and authorised person indicating and executing the electrical maintenance procedures and the machine connections to the electrical mains during installation.

Chapter 3 SAFETY STANDARDS DURING USE

This section illustrates the use of the pump in compliance with essential safety standards.

To use the dosing pump, the installer and operator must carefully read this section in order to guarantee the safety of operators and the surrounding property.

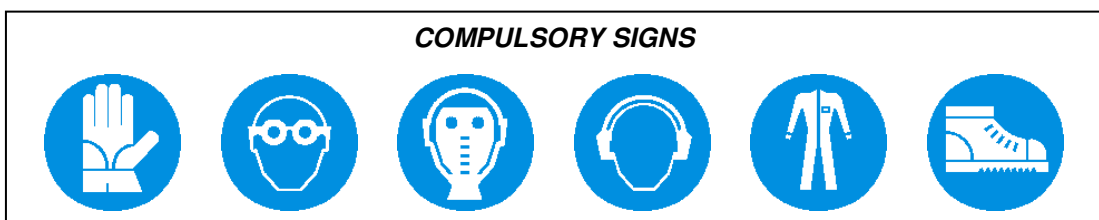
The principal risks related to using the pump are:

- **MECHANICAL:**
 - Impacts, compression of various body parts, particularly head and limbs.
 - Falling of objects.
 - Dangerous vibrations that may injure the operator, damage the machine and harm the environment in which it is installed.
 - Accidental insertion of clothing in any moving parts.
 - Heat produced by the operation or overheating of the pump.
- **ELECTRICAL:**
 - Contact with distribution and power supply cables.
 - Live metal elements due to an electrical fault
 - Static electricity.
- **PLANT:**
 - Breakage or leakage from piping located above the pump with corrosive liquid outflow with corrosion of the outer parts of the dosing pump. (it is advisable to avoid passing the pressurised discharge pipe above the pump. Should this not be possible, provide a cover).

3.1 Clothing

Before performing any intervention on the pump or plant, the operator must wear protective clothing according to the current law in force 81/08 and any subsequent modifications, to prevent contact with the pumped liquid, including:

Protective gloves, protective goggles, respiratory masks, earmuffs or earplugs for noise protection, protective overalls, safe shoes.



Chapter 4 USING THE DOSING PUMPS

4.1 Destination of use



HAZARD!

Any other use outside of that agreed with the sales department during the defining phase, will not be acknowledged by the manufacturer.



RISK OF SERIOUS INJURIES!

The Company declines any liability in case of personal injury or property damage deriving from the incorrect or improper use of the pump.

If the pump is to be used for other processes the customer must, to be able to re-use it, request information from our technical department on the compatibility of the materials for correct use.

4.2 Intended and non-intended use of the pump

The pump must be used for the range of applications for which it is intended. Principally that of dosing liquid substances compatible with the materials with which the pump is prepared.



ATTENTION!

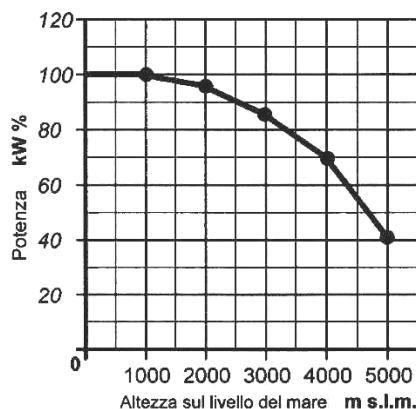
If the pump is to be used in other processes, different from those declared upon purchase, the customer must consult our engineering department.

The FM Model pump is never suitable for use in presence of explosive atmosphere.

4.3 Conditions of use

The power of the motor installed on the pump is suitable for operation below 1,000 m above sea level and at an ambient temperature ranging from +5°C to +40°C.

If the pump is installed at an altitude of over 1000 m a.s.l., the motor power will be inversely proportional to the altitude as represented in the diagram. Consult our technical department during the purchasing phase.



4.4 Pump description

The pump is made up of:

Reducer unit:

Reduces the number of motor revolutions to that required for dosing, by transforming the rotary motion into a reciprocating rectilinear motion by means of an eccentric shaft, with a slide and return spring.

Movement transmission:

Aluminium flexible coupling.

Adjustment:

Diaphragm stroke from "0%" to "100%" is obtained by turning the handle on the screw that partialises the slide return, either with the pump stationary or in motion.

Hydraulic pump head:

Sucks the liquid from the inlet valve and pushes it through the delivery valve.

Electric motor:

Three-phase or two-phase CVE.

Manufactured shape:

V 18 - class F insulation - protection IP 55 or greater.

Three-phase voltage: 220/240 V - 380/415 V - 50 Hz or 220/280 - 380/480V - 60 Hz..
Single-phase voltage: 230 V - 50 Hz.
Pump body components: Plastic.
Hydraulic parts: Plastic or metal materials based on product compatibility.

4.5 Machine description

PRINCIPLE OF OPERATION

The dosing pumps are reciprocating displacement pumps with a controlled volume. The reciprocating motion determines a sinusoidal supply of the flow rate, therefore, the pumped product flow is not continuous but pulsating. The flow rate or volume of the pump is controlled by varying the diaphragm stroke. The reciprocating motion of the dosing pump diaphragm determines the flow rate thanks to the directional valves located at the pump head's inlet and outlet.

The fluid is pumped in the following phases:

SUCTION PHASE:

During the suction phase, the valve located at discharge closes (sealing the leak) and the valve at suction opens. The fluid enters the pump head chamber.

PRESSING PHASE:

During the compression phase, the valve located at the suction side closes and the valve at the discharge side opens. The fluid exits the pump head and enters the discharge pipe.

FLOW RATE:

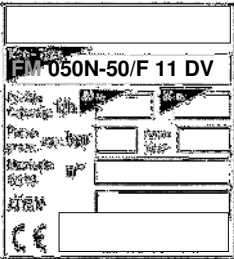
The flow rate value depends on the following parameters:

- 1 Number of strokes completed by the diaphragm per minute (depends on the chosen pump model).
- 2 Diaphragm stroke and displacement.

4.6 Identification plate

Each pump is identified by the serial number and the year of manufacture that is on the specific plate applied to the back part of the pump.

Identification data of the pump type	
1	Class type
2	Diaphragm stroke
3	Diaphragm diameter
4	Reduction ratio
5	Materials used
6	Type of valve (if single, not indicated)
7	Other accessories supplied



1 2 3 4 5 6 7

FM 050N - 50/F 11 DV

N.B.: for commercial requirements, the pump initial may be different from the standard.



ATTENTION!

- Given their importance, the following warnings must be considered:**
 - ✓ Never remove the plate from its original position.
 - ✓ Do not modify or counterfeit the technical data.
 - ✓ Do not clean the plate using abrasive products to avoid eliminating the reported data.

All elements on the plate must remain readable at all times. Use the identification data to request spare parts, technical information and assistance.

The loss of this data may void the product's CE conformity as this is where the compulsory **CE MARKING** is positioned (with possible disputes in case of inspections by the safety and supervisory authorities), should this occur, the user must warn the manufacturer of this loss, identifying the pump from the technical documentation provided with the machine or from the administrative documents. Request a new one from the assistance service.

4.7 Technical data of pump

Below are the tables with the technical data characteristic of each individual pump model



The pressures indicated in the tables must never be exceeded in order to avoid any kind of inconvenience. Should it be necessary to run the pump at a higher pressure, contact our technical department.

The indicated flow rate value is subject to variations in view of the working pressure of the pumped liquid, the viscosity and the conditions of installation.

The number of strokes per minute is calculated with 4-pole motors (~1400 rpm).

Characteristic data Model FM 050N

FREQUENCY Hz		50	60	50	60	50	60	50	60	PUMP HEAD		VALVE		
REDUCTION RATIO		H (1/34)		F (1/24)		D (1/17)		B (1/12)		Plastic bar kg/cm ²	Metal bar kg/cm ²	Plastic	Metal	Att. Ø
STROKES min/1'		41	50	58	70	82	98	116	140			Type	Type	G.m.
Flow rate l/h	FM 050N - 30	4.5	5.4	7	8.4	9.5	11.4	14	//	10	10	AC 5	AB 5	1/2"
	FM 050N - 50	17	20	23	27	34	40	47		5	5	AC 5	AB 5	1/2"

4.8 Sound vibration emitted by the pump

Below are the results of the phonometric measurements carried out on the series pumps. These tests were carried out by an external laboratory in compliance with Directives and Standards UNI EN ISO 3744:2009 and Directive ISO 2002/44/EC.

Investigation table of phonometric pressure

Model - FM 050N - 30 / FM 050N - 50		
Condition of pressurised pump		
Maximum sound emission on the surface	Average level of pressure on the surface.	Level of sound power
dB(A) 71.3	dB(A) 68.5	dB(A) 72

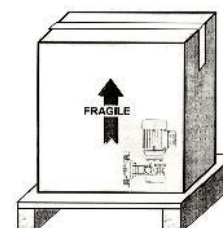
Chapter 5 TRANSPORT



Always keep the packaging in a vertical position.

This model's pumps are individually packaged; customised packaging can be realised only upon request.

The customer normally chooses the carrier; therefore, the customer and carrier will be responsible for transportation.



5.1 Lifting and handling

Having to lift the packaging, it is essential for the operator to assess the container features, the route to be travelled or assess the need for other operators to transport the load better.



RISK OF SERIOUS INJURIES!

When lifting the package, even if the weight is light, it is best to use trolleys with a capacity that exceeds the declared pump weight, including the packaging material.

Personnel in charge of handling the load must wear protective gloves and accident-prevention shoes.

5.2 Material storage

If the pump remains decommissioned for long periods of time, especially before commissioning, storing the material inside its packaging is recommended in order to avoid oxidation of internal components.

The equipment must be stored in a dry, ventilated environment, away from heat sources and at a temperature ranging between +5°C and +40°C.

5.3 Handling for installation

The manual contains all the necessary information for installing the dosing pump, taking into account all safety aspects.



RISK OF SERIOUS INJURIES!



Before handling the pump, check:

- The efficiency of the lifting means and their capacity.
- During lifting or moving of the pump, it is necessary to take all possible care in order to avoid dangerous movements that may cause personal injuries or damage to property.

Chapter 6 PUMP INSTALLATION

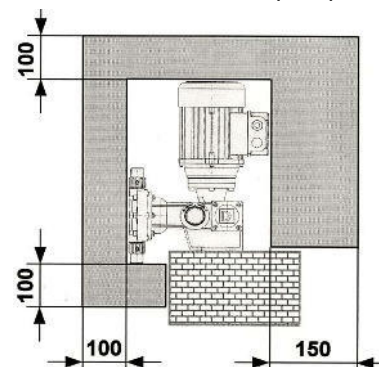
6.1 Optimal operating conditions

- Should the pump be installed outdoors, an adequate protective shelter is essential to avoid exposure to sunlight or rain.
- If the pump operates indoors, an average level of lighting is important for the safety of people and to guarantee the quality of work and the correct perception of the symbols and markings.

6.2 Pump location

Provide sufficient space (minimum operating areas) to easily inspect and calibrate the pump or disassemble the hydraulic part (valves and pump head).

- The pump must be placed above a sturdy base (metal, cement, etc.), stable and properly levelled, avoiding axis tensions.
- Ensure that the piping along the path does not create choking and especially tension on the axis of the valves, caused by a misalignment.

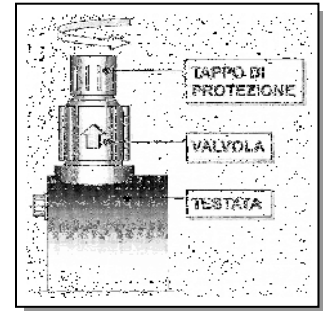


Chapter 7 PUMP CONNECTION TO PLANT PIPING

7.1 Removal of guards

Before installing the pump, remove the protective caps, located on the suction and delivery inlets of the valves.

Should the pump be decommissioned for a long period of time, before installing it, we recommend you check that the pump head screws have not loosened. For increased safety, we recommend disassembling the pump head to thoroughly ensure that the diaphragm has not be subjected to alterations of any kind and, if necessary, replace it in order to prevent serious damage to people and things.



7.2 Installation of supplied accessories

Only for the Plastic pump head version (**PP - PVC**), the following accessories are supplied.

- **END FILTERS - FLEXIBLE PIPING** (suction side **PVC- Cristal**, discharge side **PE-Polyethylene**)
- **INJECTION VALVE**.

For different materials (**STAINLESS STEEL - PVDF**) one must agree upon the supply at the time of the order.

Connecting the pipe to the injection valve

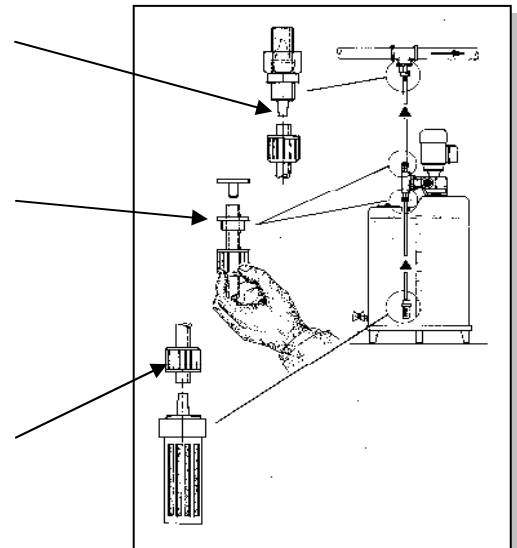
Insert the ring nut into the discharge pipe, insert the pipe into the valve connecting nozzle, bring the ring nut closer and tighten it on the valve.

Connecting the pipe to the pump head.

Insert the ring nut then the threaded pipe ring in the discharge or suction pipe, insert the diverter into the pipe until it reaches the backing, bring the threaded pipe to the base of the diverter, move the ring nut closer and screw it onto the delivery or suction valve.

Connecting the pipe to the end filter.

Insert the ring nut on the suction pipe, introduce the pipe connecting nozzle, move the ring nut closer and screw it onto the filter.



7.3 Suction pipe connection

Suggestions that the installer must follow for proper installation are listed.



ATTENTION!

- Before connecting the piping to the pump attachments, clean the pipe to eliminate any foreign bodies, welding beads, gasket scraps, etc.
- If flexible piping is not used, one must consider that the suction piping length must be reduced to a minimum and be linear, using wide radius curves.
- Avoid reverse slopes to help evacuate any air bubbles, make sure that there is a perfect seal in the piping, especially in suction, to avoid that the pump disengages.
- The suction piping and fittings must be sized to a nominal diameter immediately above that of the pump valve.
- Maximum fluid speed, in piping, **must not exceed 0.7 m/s** for fluids contained within a viscosity range up to 100 mPa - (cPs).
- The piping must be properly supported so that the weight does not fall on the pump head and the pump.

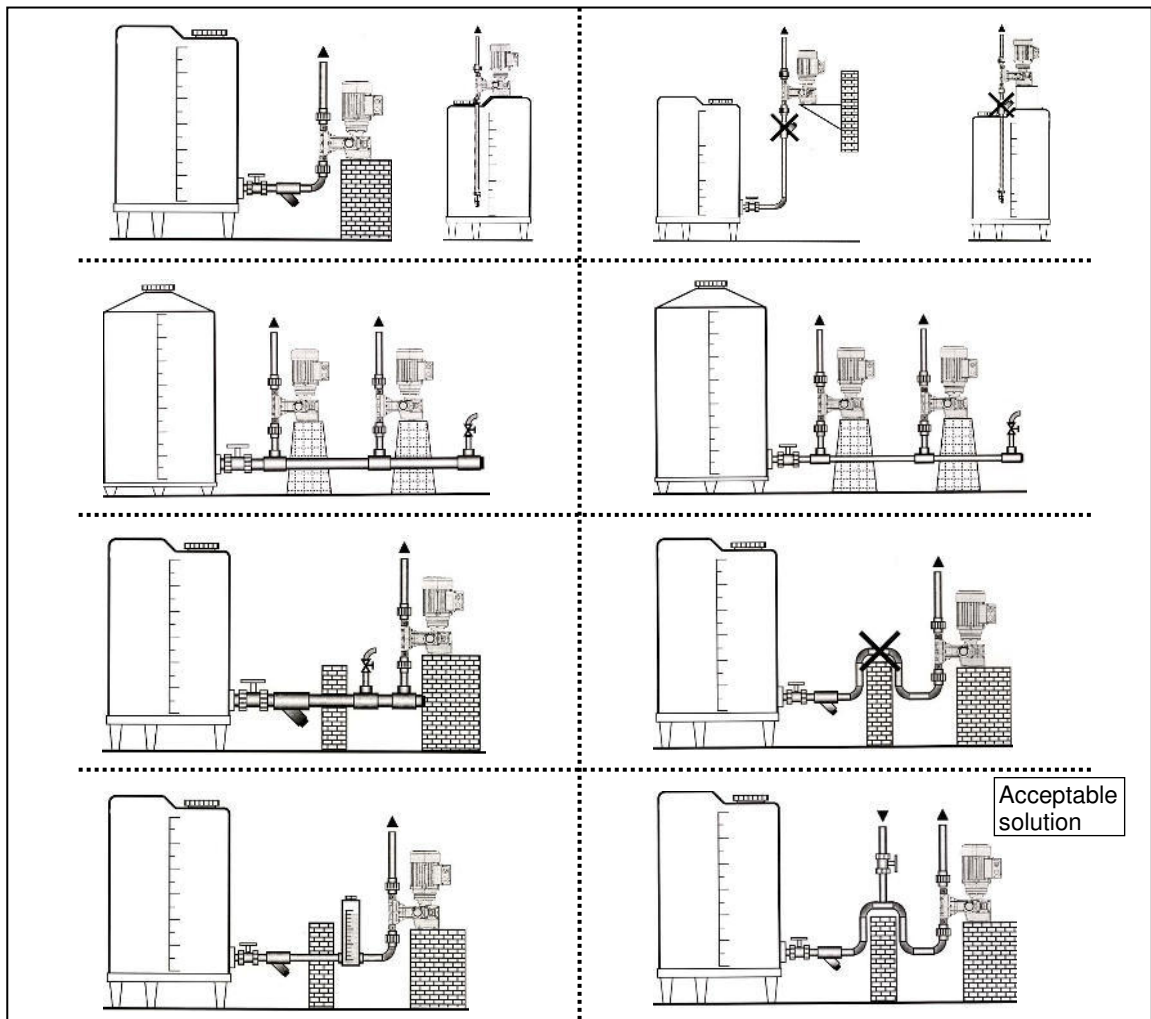
Table to select the inner diameters of the piping according to product viscosity and number of pump strokes.

Minimum inner pipe diameter	Fluid with viscosity equal to		
	100 / 300 mPa (CP) - 20 / 45°E	0 / 100 mPa (CP) - 20°E	Water +15°C
	Strokes min/1'	Strokes min/1'	Strokes min/1'
	from 35 to 45	from 46 to 70	from 96 to 120
	Flow rate l/h	Flow rate l/h	Flow rate l/h
Ø 4	0 – 3	0 – 5	0 – 12
Ø 6	0 – 7	0 – 11.5	0 – 28
Ø 8	0 – 12.5	0 – 20.5	0 – 50
Ø 10	0 – 20	0 – 53	0 – 80

EXAMPLES OF SUCTION PIPING CONNECTION

CORRECT APPLICATION

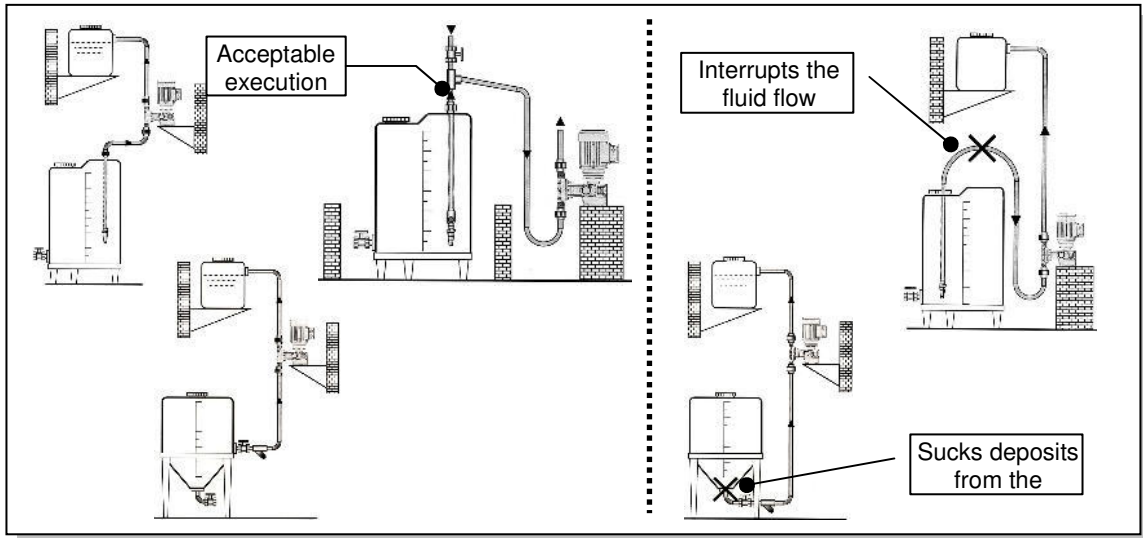
INCORRECT APPLICATION



EXAMPLES OF SUCTION PIPING CONNECTION

CORRECT APPLICATION

INCORRECT APPLICATION



7.4 Discharge pipe connection

The proper realisation of the path and fixing of the discharge pipe is particularly important for proper pump operation.

In this regard, we list suggestions which the installer must follow to efficiently realise the plant.



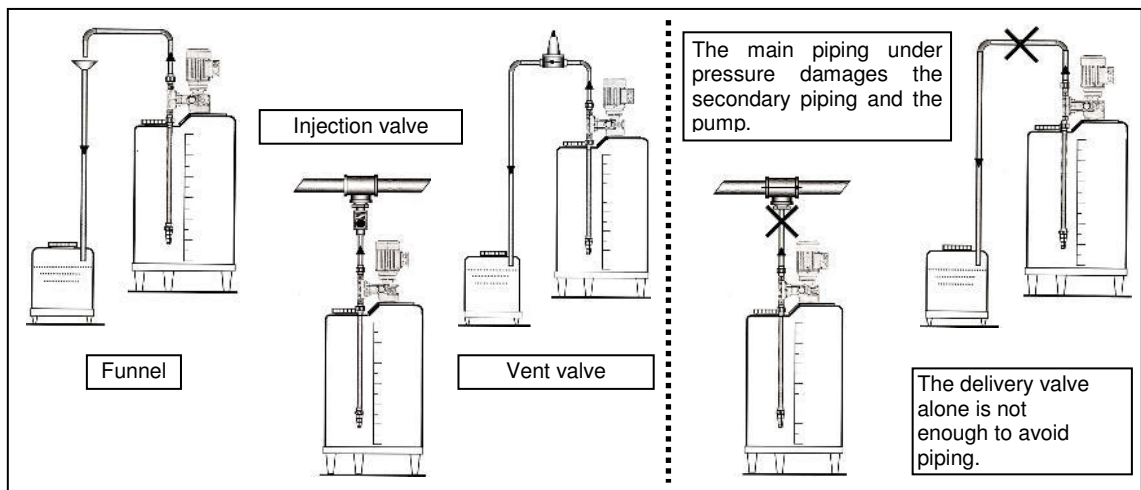
ATTENTION!

- The piping path must be as linear as possible and be independently supported, ensuring that expansion due to heat sources does not occur on the pump's head.
- We recommend always providing one or more "T fittings" at the discharge side that can be used to install pressure gauges, safety relief valves, pulsation dampeners.
- Always provide a safety relief valve and a bleed valve on the discharge circuit in order to protect the plant, facilitate maintenance and the start-up of the pump.

EXAMPLES OF A DISCHARGE PIPE CONNECTION

CORRECT APPLICATION

INCORRECT APPLICATION



KEY

- 1) Pulsation dampener
- 2) Pressure gauge
- 3) Safety relief or overpressure valve
- 4) Sampling or draining
- 5) 45° "Y" Filter
- 6) Flowmeter
- 7) Back pressure valve

The control of the fluid dynamics is essential to guarantee efficiency and use of the process system.

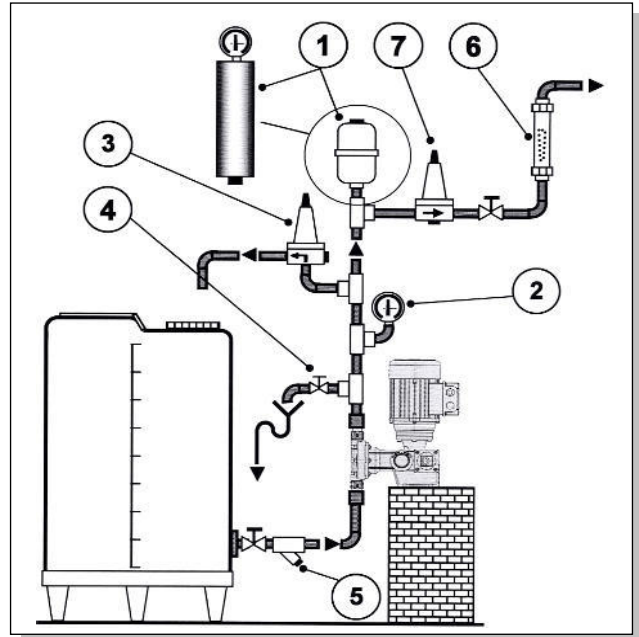
Not controlling the moving fluids may result in the dosing system, including the pumps and any valves, flowmeters, instruments or other equipment installed on the line, being physically destroyed.

The correct choice of the accessories and their sizing, ensures the efficiency and life-span of the system.

Each dosing pump can be fitted with accessories to improve its operation and accuracy.

The benefits obtained from a correct installation and an accurate control are:

- Increase of efficiency and life-span of the pump
- Reduction of interventions and maintenance costs

**8.1 - PULSATION DAMPENER**

The dosing pumps have the pulsating flow rate characteristic, as each pumping cycle provides a suction and a pressing phase. Various benefits are obtained by installing a lung:

- Pump protection against pressure peaks;
- Elimination of vibrations along the length of the discharge pipe;
- A flow rate with a smoother flow useful for the process.

With consequent benefit on the duration of the pump's life-span.

8.2 - PRESSURE GAUGE

Instrument for measuring any pressure higher than that of the atmosphere used for liquids and gas and installed on a shunt on the discharge pipe of the dosing pumps. It is necessary to set the safety relief valve's pressure value, which enables the user to determine the effective working pressure of the pump.

Constant pressure monitoring and a flow rate check are used to verify the proper operation of the pump.

8.3 - SAFETY RELIEF VALVE

The safety relief valves are used to protect the pump and the plant from possible damage caused by overpressure deriving from defective accessories or obstructions in the plant's piping, caused by sediments or the accidental closing of a shut-off valve. The safety relief valve on the discharge pipe must be installed immediately after the pump's coupling and before the shut-off valve.

However, the application of the safety relief valve is essential for the above reasons as well as for standards relating to accident prevention in the workplace.

8.4 - SAMPLING OR DRAINING

Sampling or draining is carried out by mounting the shut-off valve in a shunt on the discharge pipe, which discharges in the open air. It is mainly used to drain the discharge pipe from the dosed fluid when performing plant maintenance or to take a sample of the liquid for flow rate tests.

8.5 - FILTER

Accessory with the function of retaining the impurities present in a flowing fluid.

We recommend installing the filter (on the suction piping) in order to prevent the impurities that may be present in the liquid from being dosed from the piping, which may unable the proper operation of the valves, thus causing irregular flow or passage obstructions. The size of the filter mesh must be chosen based on the impurities present. While the filter surface is related to the product flow rate, paying attention to the fact that the smaller the filter surface and the mesh dimension, the higher the load losses produced by the filter will be. Do not place the suction piping attachment on the bottom of the tank to avoid sucking impurities, but ensure that the suction area is at a height of at least 10 cm from the bottom.

8.6 - FLOWMETER

It is an instrument consisting of a transparent Plexiglas casing with a graduated scale and a float inside to visually indicate the dosed amount (volumetric flow) for an immediate check of the adjusted dosing volume. At his/her discretion, the customer may install other types of flowmeters deemed more appropriate for his/her plant.

8.7 - BACK PRESSURE VALVE

The back pressure valve is required to prevent the spontaneous passage of liquid (siphoning) in conditions in which the suction tank level is higher than that of discharge.

8.8 - SHUT-OFF VALVE IN THE DISCHARGE PIPE

The shut-off valve is used to shut-down the flow of dosed liquid by closing the pump's discharge line.



The dosing pumps are reciprocating displacement pumps.

Regardless of whether the discharge pipe has been closed, e.g. by closing the discharge pipe or a valve, the pressure produced by the pump may sometimes exceed the admitted working pressure value of the plant or of the dosing pump. This may cause the piping to explode with dangerous consequences especially in the presence of toxic or aggressive substances!

Install safety devices on the system, e.g. safety relief/vent valves in the presence of a shut-off valve in the discharge pipe!

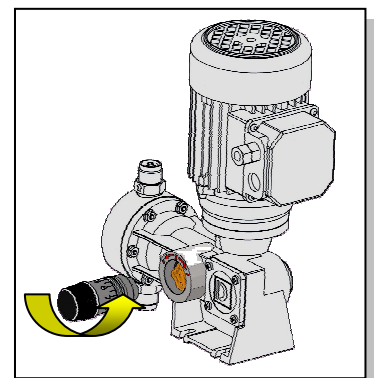
Chapter 9 LUBRICATION

The **FM** Model pumps are supplied filled with lithium grease.

The pump does not have any other points to be lubricated, therefore the quantity of grease inserted is sufficient to guarantee proper lubrication.

In order to verify if the internal components of the pump body are covered with grease, completely unscrew the adjusting screw.

If needed, add grease according to need.





ATTENTION!

Before handling product, the operator must wear suitable protections in order to avoid direct contact.

The type of grease we recommend to add to the reducer must be a **Lithium grease, additive EP + Molybdenum Bisulphide NLGI 2 consistency**. Some types of grease are as follows:

**ROTHEN MOLYDEN SPECIAL NLGI 2 - viscosity +40 °C cSt: 100 - Non-flammable
Operating temperature – 20 °C to + 130 °C**

**REPSOL GRASA MOLIBGRAS EP 2 - viscosity +40°C cSt: 150
Operating temperature - 20 °C to +120 °C**

**AGIP ENI GREASE SM2 - viscosity +40°C cSt: 160 - flash point +180°C
Operating temperature - 20 °C to +120 °C**

**MOBIL MOBILGREASE SPECIAL 2 - viscosity +40°C cSt: 160
Operating temperature - 20 °C to +130 °C**

**SHELL GADUS S2 V220 AD - viscosity +40°C cSt: 220
Operating temperature - 25 °C to +130 °C**

Model	Q.ty of grease g	1st Check h
FM 050N – 30 FM 050N – 50	~40	500

Chapter 10 ELECTRICAL CONNECTION

The installer must provide an adequate electric line cut-out switch upstream of the pump and use cables with a sufficient section to support the maximum current absorbed by the motor.

Suitable devices must be installed with a delayed release to protect against overheating in case of a blocked rotor, as prescribed by Standard EN 60079-14.

Connections, commissioning, maintenance, measurements and adjustments of the electric equipment or of its components must be carried out by qualified **electrical maintenance technicians** only.

Comply with the relative standards in force to perform work on live parts.

10.1 *Motor connection*

Refer to the instructions in the terminal board before making the motor connections and check that:

- The voltage and frequency of the main power supply correspond to those indicated on the motor plate.
- The earth terminal is connected to the protective conductor.
- **The motor's running direction corresponds to the direction of the arrow on the fan cover.**
- The vicinity of obstacles does not prevent proper ventilation of the motor and make the maintenance and inspection operations difficult.

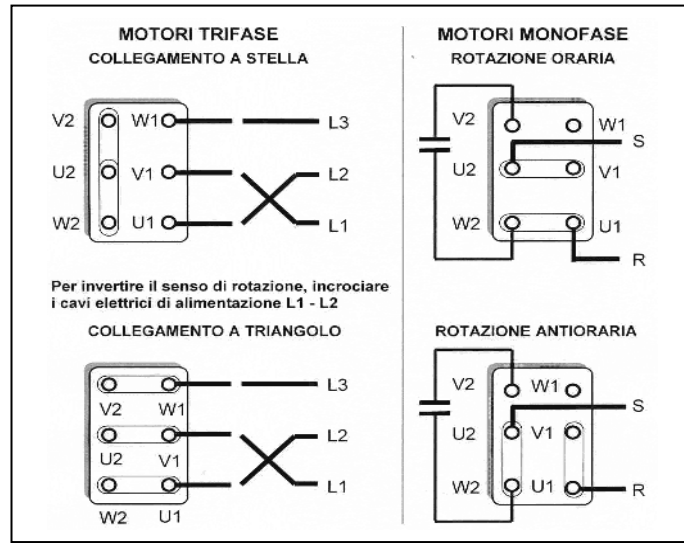


RISK OF SERIOUS INJURIES!

Qualified personnel must make the electrical connection with the utmost caution, with the mains switched off and in compliance with the safety requirements.

It is essential to connect the pump to an efficient and controlled earth line.

DIAGRAM OF MOTOR CONNECTION TO ENERGY SOURCES



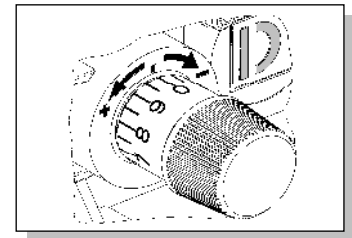
Chapter 11 PUMP ADJUSTMENT

11.1 Stroke variation with manual system

Adjustment from 0% to 100% occurs in a turn, which on the graduated scale corresponds to 5% of the flow rate.

There are 20 notches on the knob, each corresponding to 5% of the flow rate, subdivided into 10 that are long from 0 to 9, and 10 that are short.

FM Model pumps are not equipped with servo controls.



Chapter 12 PROCEDURE BEFORE START-UP



ATTENTION!

Personnel must be aware of the product to be dosed and observe the due precautions when handling chemical products used in the process, whether they are (acids, bases, oxidation-reducers, etc.).

Verification before start-up

- Check pump fixing on its support.
- Check that the liquid to be dosed is not solidified or frozen in the piping.
- Check that all shut-off valves on the suction or discharge circuits are open. If the discharge circuit is fitted with a back pressure and injection valve, open the bleed valve at the discharge side to enable pump priming.
- Adjust the pump flow rate to 0%.

Verification of the motor's electrical connection.

- Start the pump, checking that the running direction of the motor is the same as the direction of the arrow located on the fan cover. If it is in opposite direction, reverse the electric power supply cables L1 - L2 as per the diagram.

12.1 Commissioning

After all of the checks described in the previous chapter have been carried out, start the pump.

- Progressively adjust the pump flow rate from 0% to 100%, verifying:
 - ✓ **The leakage of fluid from the bleed valve (where present).**
 - ✓ The noise produced by the liquid as it crosses the delivery valve.

- As soon as the liquid leaks, close the bleed valve (where present).
- Carry out a visual and auditory check (for dripping or suspicious noises).
- Check the piping is well supported, does not produce vibrations and, above all, does not exert tensions on the pump head.
- With **start-up at a low temperature**, adjust to 0% and leave the pump running in this condition for at least 5 minutes, this allows the pump to heat, which eliminates motor condensation. Then progressively adjust the flow rate up to the flow rate value required by the process.

12.2 *Inconveniences upon commissioning*

The motor turns with difficulty and heats:

- The features of the motor's electric power supply do not correspond to those on the plate or the chosen connection is inadequate.
- Check that the discharge pressure corresponds to that of the project.

The flow rate is below that desired:

- Incorrect pump flow rate adjustment: adjust the flow rate to the desired value.
- Insufficient suction due to the excessive length of the piping or to a section that is too small. We recommend replacing the piping with the necessary section or positioning the pump under the head and as close as possible to the suction source.
- The suction piping seal is not perfect (possible air infiltrations).
- The liquid viscosity is not compatible with the pump version or the filter is clogged.

The flow rate is above that desired:

- Siphoning phenomena occurs: check that the suction pressure is not higher than that of the discharge pressure. Install a back pressure valve on the discharge circuit.

The flow rate is variable:

- The problem may be due to solid particles coming from the piping or sediments in suspension which prevent the perfect closure of the pump valves. Good cleaning and the installation of a filter on the suction piping is recommended.

Chapter 13 **MAINTENANCE**

Maintenance is a combination of all technical and administrative actions, including supervision, aimed at maintaining or returning a machine to a condition in which it can perform the required function. (ref. UNI 10147)

13.1 *List of spare parts*

For proper, easy identification of spare parts, please refer to the drawings in the section attached to the pump manual where notes are reported, which identify the components that are most subject to wear and thus require more frequent maintenance. In their absence, request them from, referring to the plate located on the pump to identify the model, serial number and year of manufacture.



ATTENTION!

The inspection and maintenance program depends on the conditions of use of the pump. Good maintenance allows for the best possible performance, longer working duration and a constant observance of the safety requirements.

To facilitate recording the maintenance or inspection operations, we attach an intervention recording sheet template:

DOSING PUMP MAINTENANCE SHEET			
PUMP TYPE:		SERIAL NO.:	
Liquid		Date	Date of
pumped:		installation:	commissioning:
Period of intervention:			Date:
FREQUENCY	COMPONENT	TYPE OF INTERVENTION	ACTION

Chapter 14 PREVENTIVE MAINTENANCE (ref. UNI 11063)

To ensure that the pump is safe and performs well at all times, it must be subjected to maintenance interventions consisting in visual checks.

- Make sure that the external parts of the pump are not corroded or degraded (cracks, crevices, breaks). In the presence of these problems, replace the worn parts.
- Should the pump be used in particularly harsh fields of application where the presence of aggressive or particularly abrasive liquids drastically reduces the life of the gaskets or of the valve units, the maintenance frequency must be increased.
- To verify whether the internal components of the pump body are covered with grease, completely loosen the adjusting screw and, if needed, add the required amount of grease.

Particularly if in the presence of products that cause problems of "**Crystallisation**", once the pumping cycle is complete, wash thoroughly to ensure that the product does not solidify and damage the diaphragm.

By transcribing the details on the "**Maintenance Record**", the operator can tailor the interventions more accurately.

14.1 Noisy mechanics with vibrations

If abnormal noise is heard inside the pump body, we recommend immediately stopping the pump and, after having checked the overall diagram and the prescriptions, perform the intervention.

- The cog wheel is worn: replace together with the worm screw.
- The bearings are noisy: replace them.

14.2 *Electric motor*

Checking the motor and its parameters serves to eliminate any malfunctions and avoids the consequent blocking or lowering of the operation dosing pump parameters.

The parameters to be periodically checked are the voltage, amperage (absorption of motor phases) and its heating during normal operation (the numerical values relating to the motor are shown on the plate fixed to the motor body).

This is used to check the mechanical condition of the motor to avoid the breaking of the bearings, shaft misalignment (motor vibrations transmitted to the pump coupling).

In case of abnormal motor heating:

- The pump works at different conditions or at a higher pressure than that of the project.
- Insufficient amount of grease in carter: check for leaks and restore the level.

14.3 *Checking of flexible coupling*

Irregular machine operation or vibrations affecting torque loads, these hitches may jeopardise the life of the coupling.

After the initial installation, we recommend checking the coupling at short intervals during the machine downtime period.

Disassemble the motor, check the flexible ring surfaces are not worn or crushed.

14.4 *Verification of pump flow rate*

This is a check of the pump's flow rate curve according to the adjustment, as it is an essential parameter together with the verification of the working pressure to check the regular operation of the pump and of the process.

Three measurements are sufficient: adjustment to 100% - 50% - 25%.

- Install a flow rate calibrator at the pump's suction, measure the pumped liquid volume in a certain period and in normal operating conditions.
- For a constant and precise monitoring of the working process, we recommend installing a flowmeter, electronic is preferable.

14.5 *Pressure*



The constant monitoring of the pressure is used, together with the flow rate verification, to check the proper operation of the pump and, secondly, to avoid the danger of overpressure in the entire plant (malfunctioning of plant back pressure/vent valves and of the pump head valves and seats, which may get dirty or block consequently leading to an inefficient seal). This may occur if the pumped liquid contains particles in suspension or liquid that tends to crystallise according to its solidification temperature or because the pump is immobile for a certain period of time and the piping is left dirty.

The increase in pressure due to the crystallisation of the pumped product is a very dangerous phenomenon as it becomes a **RESIDUAL RISK** factor to be closely monitored. It can obstruct the discharge pipe and the safety relief valve shutter fitted on the plant, with the possible **destruction of the gaskets between the flanges or junctions**, causing leaks and the **outflow of substances, which can be dangerous and corrosive**, and can corrode the dosing pump or parts of the plant. In these cases it is also possible to exceed the pressure value that the plant can withstand.

The pressure can be checked visually via a pressure gauge located on the plant (see description example of standard plant accessories) or by an electronic pressure measuring instrument for a remote and continuous reading from the control room.

Do not exceed the nominal pressure indicated on the plate! Otherwise the pump may be damaged!

Chapter 15 ROUTINE MAINTENANCE (ref. UNI 11063)

The table shows the parts subject to greater wear which therefore require routine maintenance. We recommend verification and replacement, if necessary.

Components to be checked					
Maintenance period	Movement	Pump Head	Valve unit		Motor
	Grease	Diaphragm	Plastic	Metal	Absorptions
Hours	500				
Half-yearly	X	X	X	X	X

In case the pump is used continuously and in particularly harsh conditions, we recommend reducing the verification times.

15.1 Maintenance procedures

Before intervening on the dosing pump or on the piping, the necessary precautions must be taken so that the pumped product, especially if harmful, does not endanger personnel or the surrounding elements.



ATTENTION!

BEFORE INTERVENING PERSONNEL MUST ENSURE THAT:

- The pump has stopped and has been disconnected from the mains power supply.
 - **The pump head and the plant are de-pressurised and drained of any liquid.**
 - The pump has reached such a temperature to be able to safely move it.
 - The lifting equipment available for use in the disassembly of heavy or bulky parts is appropriate.
- Having ascertained such conditions, accurately clean the piping and the pump components.

15.2 Residual risks

- One type of risk may result from pump head leaks or the diaphragm being broken, the liquid must be collected in an area suitable for disposal or collection.
- In case of breaks, once the plant is drained, de-pressurise the pump head, clean with adequate means (sleeve) and substances compatible with the product. Only then disassemble the pump, not forgetting that the operator must wear adequate protective clothing (gloves, goggles, boots, overalls, etc.).

16 OPERATIONS TO BE PERFORMED ON THE PUMP HEAD

16.1 Periodic check of the pump head

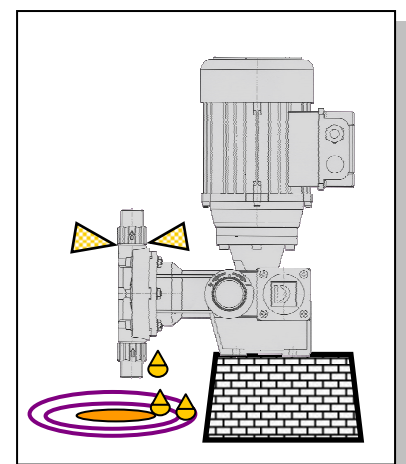
Due to negligence, it is possible that malfunctions or operating problems may occur, which would require extraordinary maintenance for operation verification only.



ATTENTION!

In the presence of these anomalies we recommend readily intervening in order to avoid safety problems, a reduced flow rate and reduced efficiency of the pump.

The following type of verification is to be carried out:



- ✓ Periodic checks of the pump head must be carried out to ensure that the pump is safe and operating correctly.
- ✓ Particular attention must be paid if the pump head installed is made of plastic as it is more sensitive to temperature variations and settling phenomena.
- ✓ Check for dosed liquid leaks from the valves and from the diaphragm pinching.

16.2 Troubleshooting

This chapter describes some inconveniences that may arise during machine use.



ATTENTION!

We propose some possible interventions: it is good practice to initially attempt to resolve a problem applying the most simple of solutions. Never attempt repairs if unsure of what you are about to do: greater damage may be caused.

The indications described in the following table help in the event of troubleshooting.

TROUBLESHOOTING		
Inconveniences	Causes	Solutions
Low discharge pressure Low flow rate	1 - Clogged suction system:	Clean suction filter. Check the suction piping and the feed tank for obstructions or partially closed valves.
	2 - Worn safety relief/vent valve seat:	Check the safety relief/vent valve, if the liquid leaks - switch-off the pump and check.
	3 - pump not completely primed (air bubble in the suction pipe):	Excessive suction height, respect NPSHr value, install a suction lung.
	4 – incorrectly connected motor:	Check the motor plate again for the correct wiring sequence. Check the phases.
	5 - dirty pump valves:	Inspect valve units. Clean or replace the components if necessary.
	6 - air entering the pump head	Verify the presence of inlet air in the suction pipe. Check junctions between pipes, seals around the valve stems, and the connections of the instruments. Check diameter and piping route.
	7 - insufficient suction pressure	Increase the suction pressure. Reduce the suction height or increase the liquid level in the feed tank.
	8 - Circuitous piping route with the presence of chokes; pipe inner diameter smaller than the valve passage area;	Check diameter and piping route.

TROUBLESHOOTING		
Inconveniences	Causes	Solutions
Excessive noise	1 - air entering the pump head	Verify the presence of inlet air in the suction pipe. Check junctions between pipes, seals around the valve stems, and the connections of the instruments.
	2 - foreign material inside valve	Inspect valve units. Clean or replace the components if necessary.
	3 - excessive lifting of valves	Replace the worn parts.
	4 - safety relief valve or other accessories in discharge pipe cause noise	A quick closing of the valve, solenoid valve or cock will produce a water hammer. This pressure wave is transmitted to the pump resulting in noise. A pulsation dampener before the back pressure valve may be requested. A different type of valve may be requested.
The pumped liquid comes out from the hole under the lantern	The diaphragm is broken	Replace the diaphragm, assess the components and replace them if damaged.

16.3 Pump head disassembly and diaphragm replacement

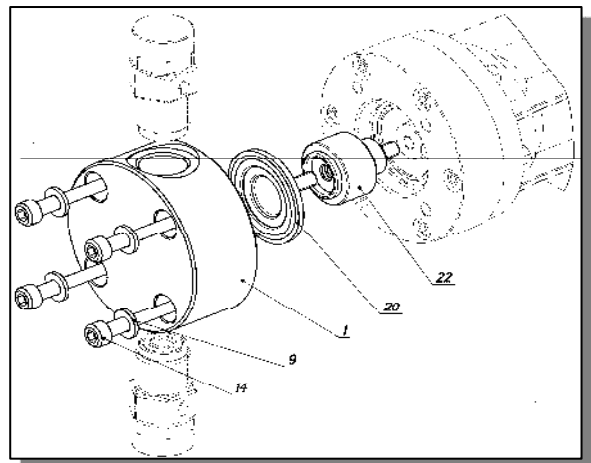
Before intervening on the dosing pump or on the piping, the necessary precautions must be taken so that the pumped product, especially if harmful, does not endanger personnel or the surrounding elements.



ATTENTION!

BEFORE INTERVENING PERSONNEL MUST ENSURE THAT:

- The pump has stopped and has been disconnected from the mains power supply.
- **The pump head and the plant are depressurised and drained of any liquid.**
- The pump has reached such a temperature to be able to safely move it.



Proceed as follows, using the sections of the pump heads to identify the components and their order of assembly:

- Disconnect the piping from the valves.
- Loosen the screws located on the front of the pump head (pos. 14).
- Remove the head from the pump (pos. 1).
- Loosen the diaphragm (pos. 20) and the diaphragm shield (pos. 22), removed the diaphragm, replace if damaged.
- Tighten the diaphragm (pos. 20) with the diaphragm shield (pos.22).
- Re-assemble the pump head (pos. 1) paying attention to the direction of the valve container arrows.
- Tighten the pump head screws (pos. 14).

16.4

Pump head directional valves disassembly

To disassemble and carry out maintenance operations of the directional valves, please refer to the section attached to the manual, paying attention to the proper assembly of the components so as not to make any mistakes when assembling (assembly of two suction units on the pump head, the pump sucks fluid, however in the pressing phase, the delivery valve does not open and the pumped fluid remains in the pump head); it is recommended to carry out disassembly and maintenance operations of one valve unit at a time.

Chapter 17 DECOMMISSIONING THE PUMP

Should it be necessary to decommission the pump, it is important to observe certain essential rules to protect the product and the operating personnel.



Before disposal, an accurate cleansing with liquids compatible with the pumped liquid is necessary as there may be residues of toxic, caustic and acid liquids or sediments that can easily crystallise.

- Before removing the pump from the plant, de-pressurise the plant, drain the liquid from the circuit, shut-off the piping near the pump.
- Dispose of the residual substances or machine parts following the existing legal procedures to guarantee the safety of operators and prevent possible negative effects on the environment.

17.1

Disposing of components and toxic substances

The user is advised that the separation of the materials and their recycling must be carried out in compliance with National and Regional Laws on disposal, consigning waste, subject to authorisation for temporary storage, to disposal sites belonging to the authorised consortium.



To ensure that there are no residual risks of environmental pollution, the materials used for the production process, particularly the lubricant, must be stored and disposed of in compliance with national laws.

The adequate separate collection favours the recycling of the materials of which the equipment is composed and contributes to the avoidance of possible negative effects on the environment. Before sending worn components for disposal, it is good practice to adequately clean them to avoid polluting the environment.

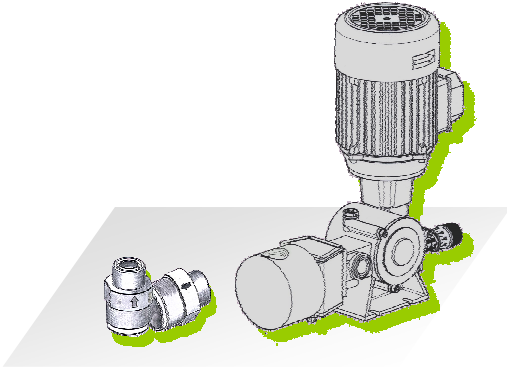
Chapter 18 REPAIR MAINTENANCE

In most cases, replacing worn parts does not constitute great operational difficulty. Before carrying out the intervention, the operator must consult the drawings and follow instructions contained therein. If the fault is difficult to resolve in the operational area, it is recommended to send the pump to our workshop.

THE MANDATORY CONDITIONS FOR ACCEPTANCE FOR REPAIR AT OUR WORKSHOP ARE THE FOLLOWING.

18.1 Practical advice for hardening and tempering the pump.

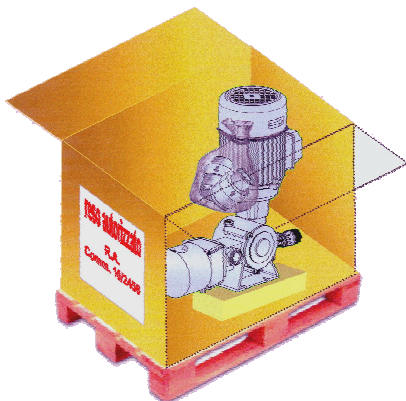
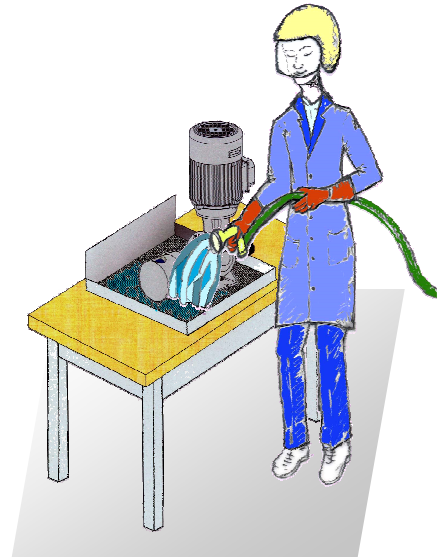
If water is not suitable to clean the pump head, use a liquid compatible with the dosed product.



- 1) Disassemble both pump head valve units and wash them separately so that no residue remains inside. Dry them and place them in a bag.
- 2) Place the pump in a location

positioned for the collection of the washing liquid, from a due distance wash the pump with hardening and tempering liquid passing it through the valve unit hole, favouring the detachment of scale deposits.

- 3) Completely drain the grease contained in the gear reducer body.
- 4) Position the pump firmly in adequate packaging to avoid damage due to transport, together with the previously washed valve units.
- 5) The customer must accompany the goods with the declaration that the material has been hardened and tempered for safe handling.



- 6) Before shipment the sender must contact our Sales Department (tel. 0227301324 – fax 0226700883). The appropriate form will then be sent and must be filled-in in its entirety accompanying the pump, together with the labelling that must be applied on the packaging.
- 7) Any material that we receive that does not comply with these requirements will be returned un-repaired and the costs charged.



Take appropriate protective measures to guarantee the safety of the operator and the integrity of the machinery, ensuring to choose the most appropriate hardening and tempering liquid.

Chapter 19 INFORMATION FOR USERS

Pursuant to art. 13 and Legislative Decree 25 July 2005, no. 151, Implementation of Directives 2002/95/EC, 2002/95/EC, 2003/108/EC relating to the reduction of use of dangerous substances in electric equipment, as well as waste disposal.



The crossed-out bin symbol illustrated on the equipment indicates that the product, at the end of its function, cannot be disposed of as normal domestic waste.

The user must take the equipment to suitable separate collection centres for electric waste.

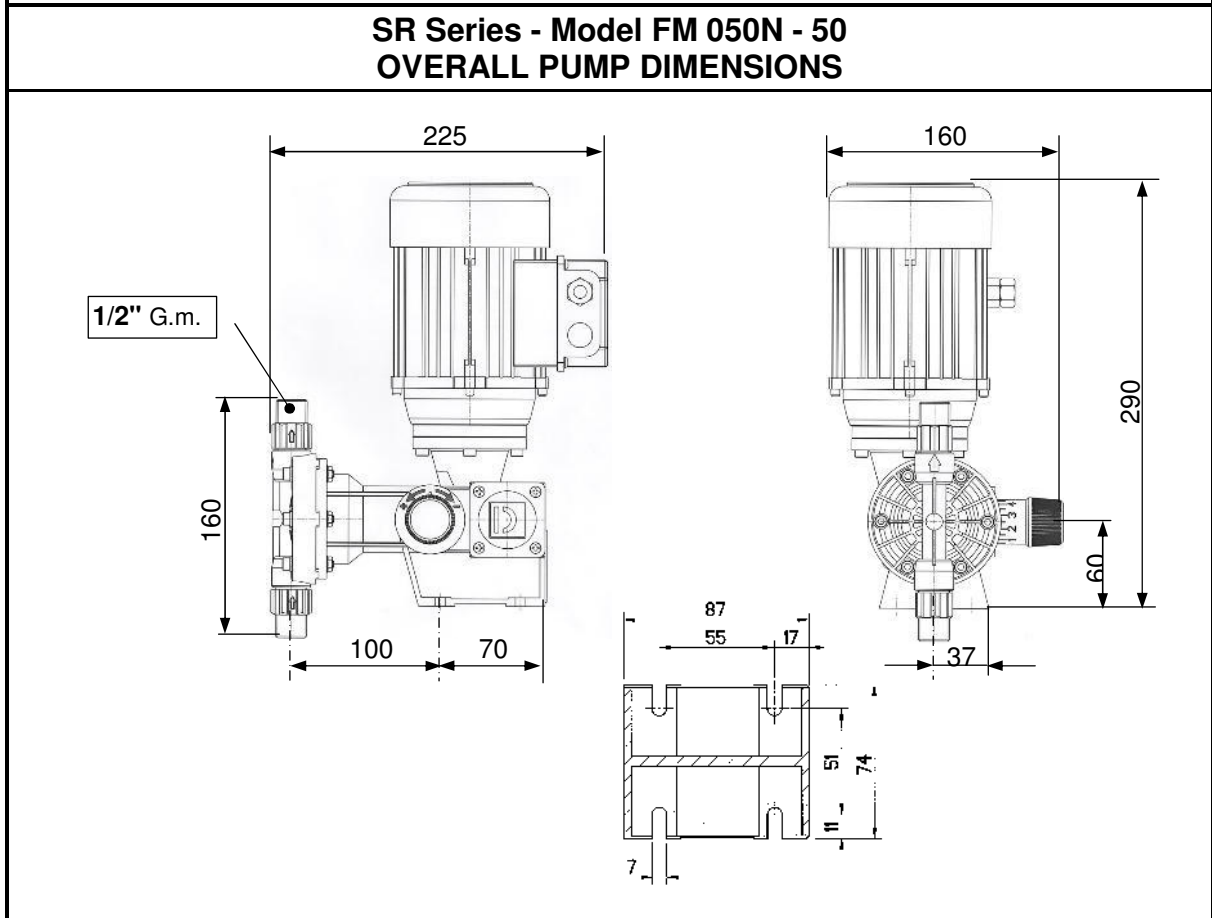
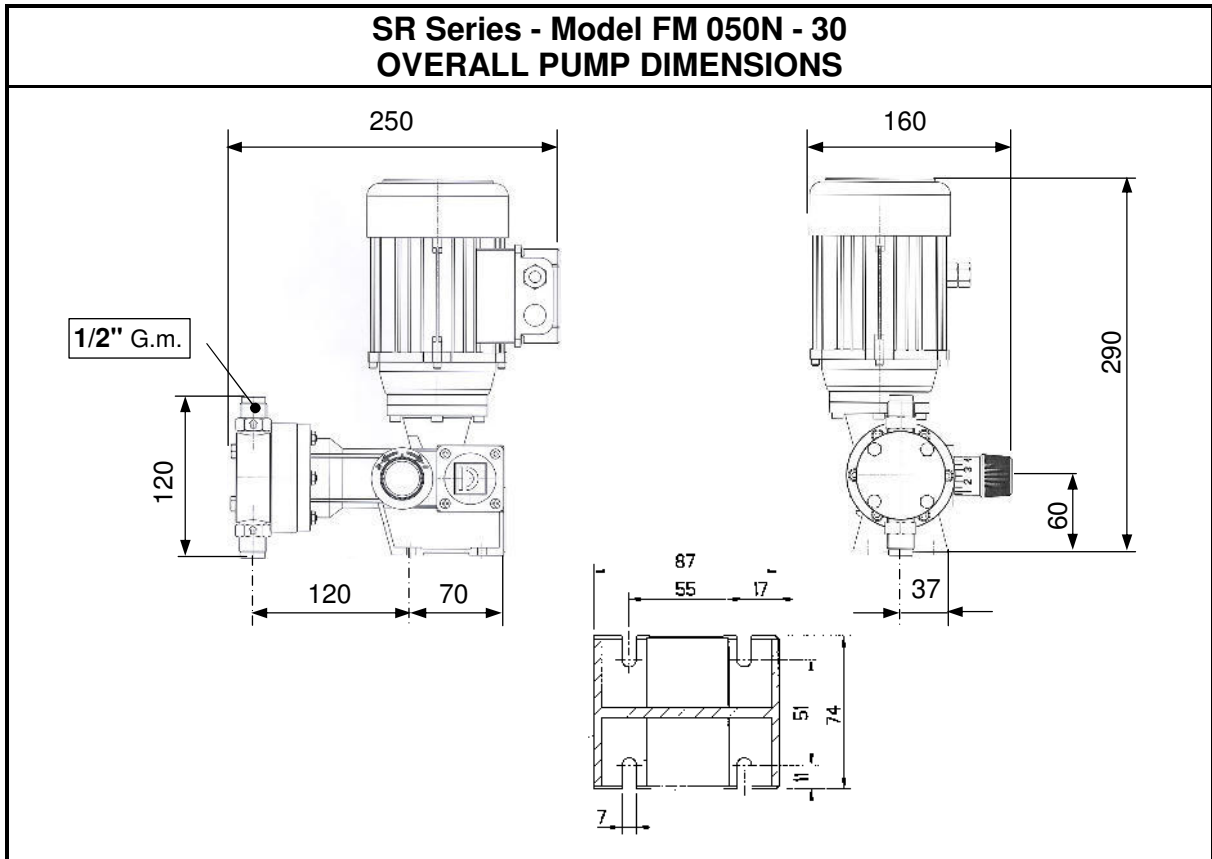


The adequate separate collection helps to avoid any possible negative effects on the environment and health as well as favouring the recycling of the materials of which the equipment is composed.

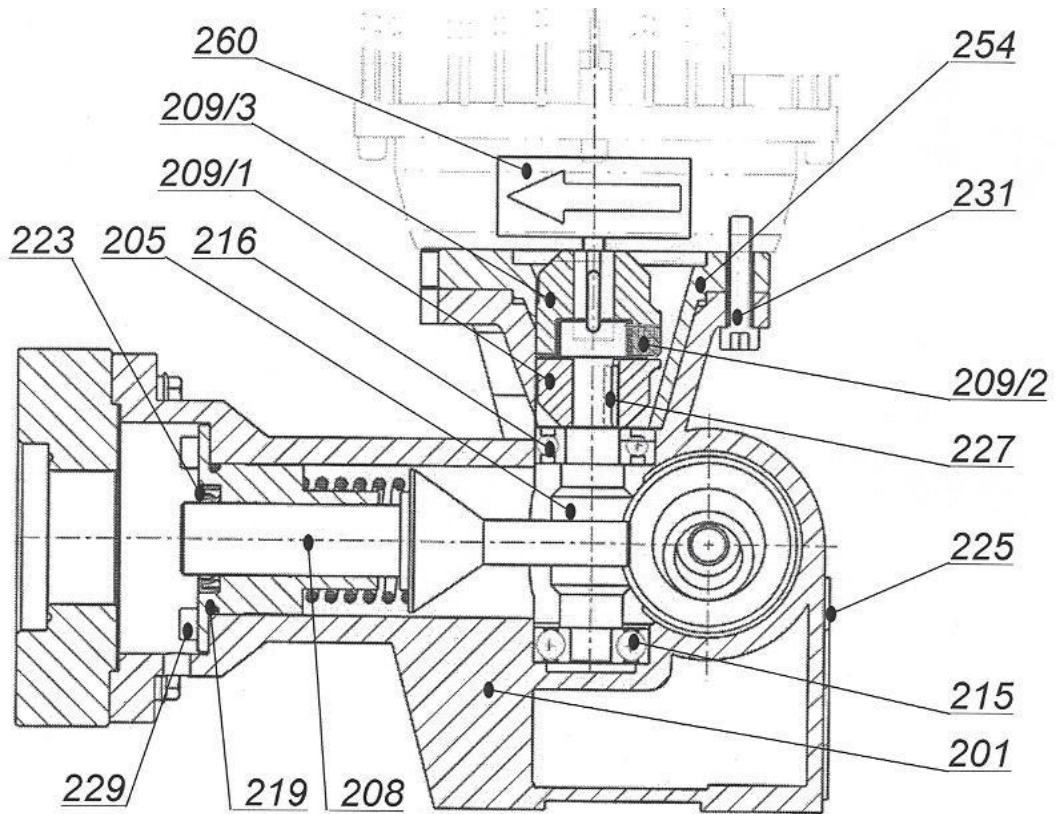
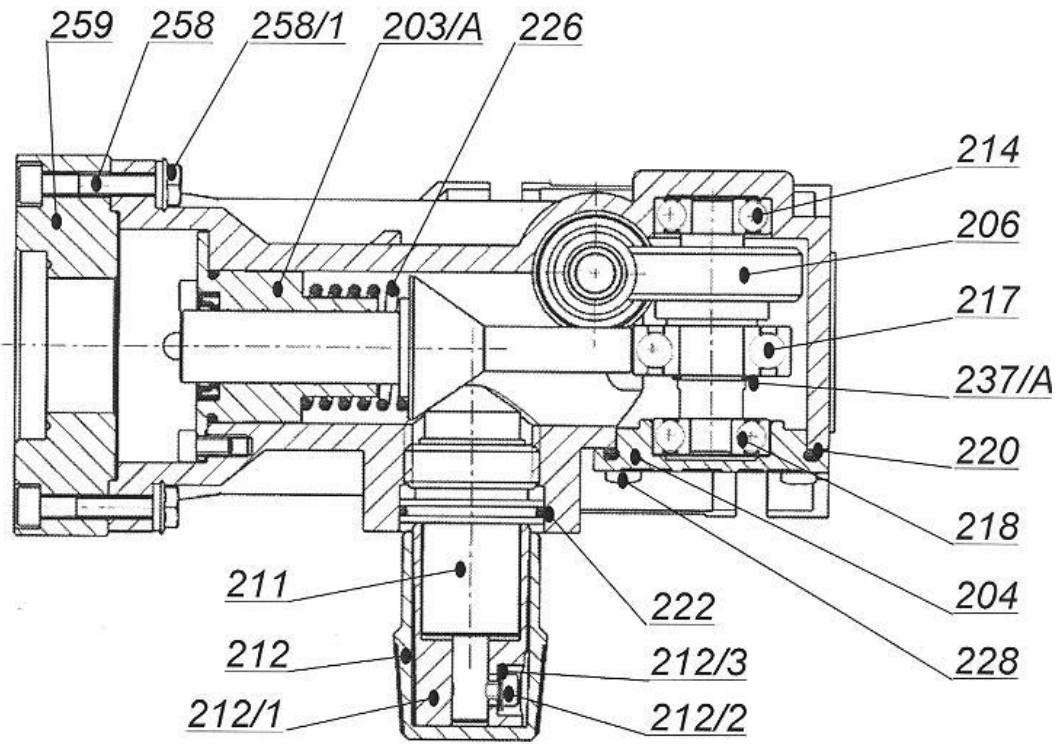


The illegal disposal of the product by the user entails the application of administrative sanctions under "art. 255 Leg. Decree no. 152/2006.

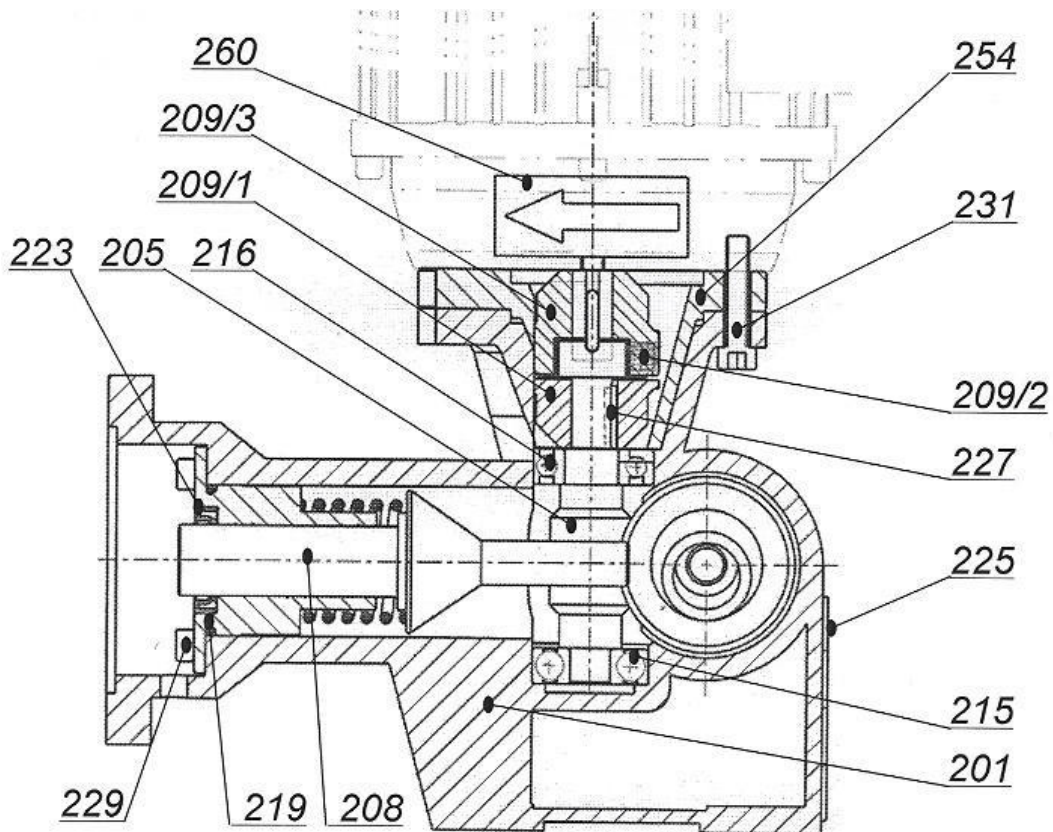
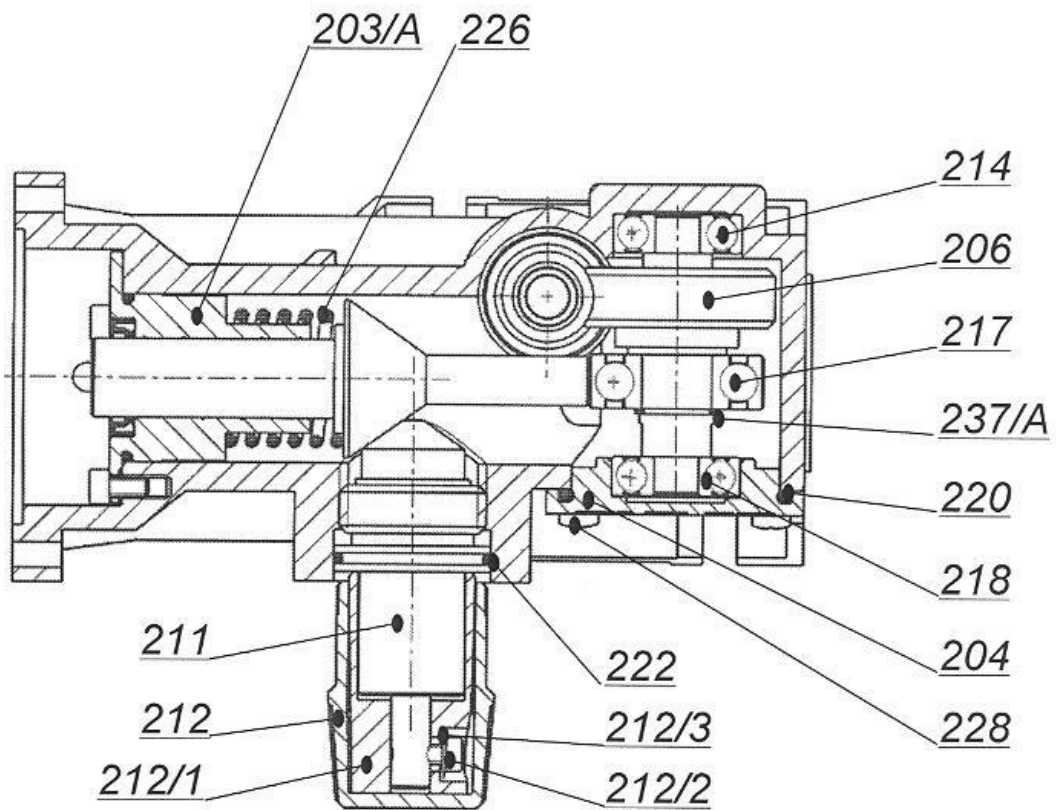
DRAWINGS AND PROSPECTUSES



SR Series - Model FM 050N - 30
REDUCER SECTION

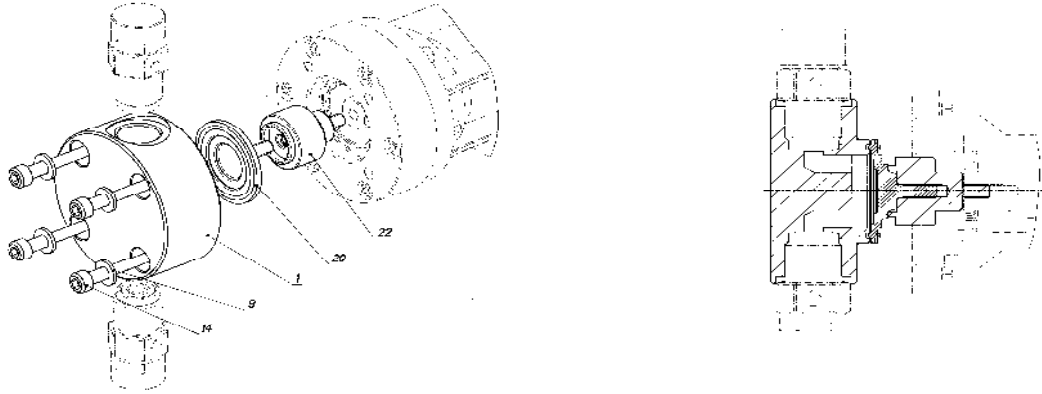


SR Series - Model FM 050N - 50
REDUCER SECTION

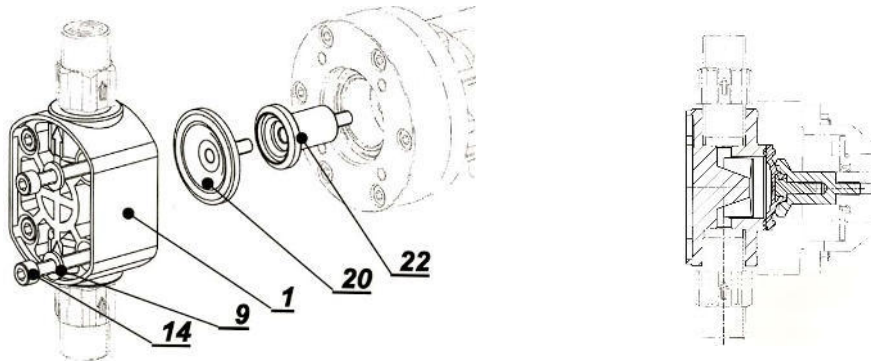


PUMP HEADS SECTIONS

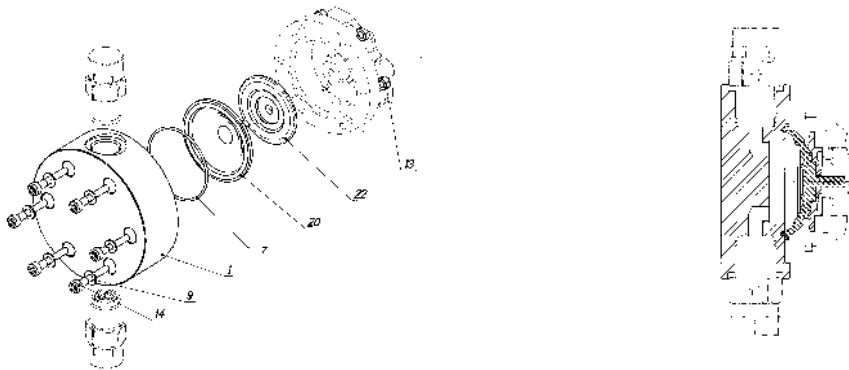
Execution – **STAINLESS STEEL** - Diaphragm Ø 30



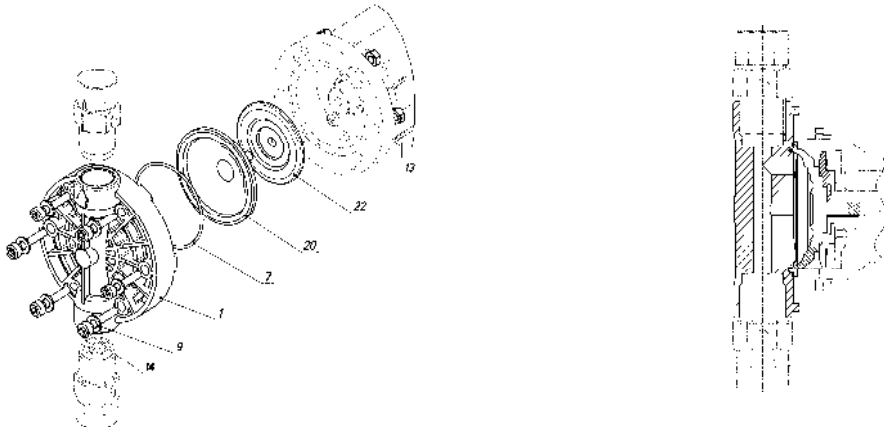
Execution – **PLASTIC** - Diaphragm Ø 30



Execution – **STAINLESS STEEL** - Diaphragm Ø 50

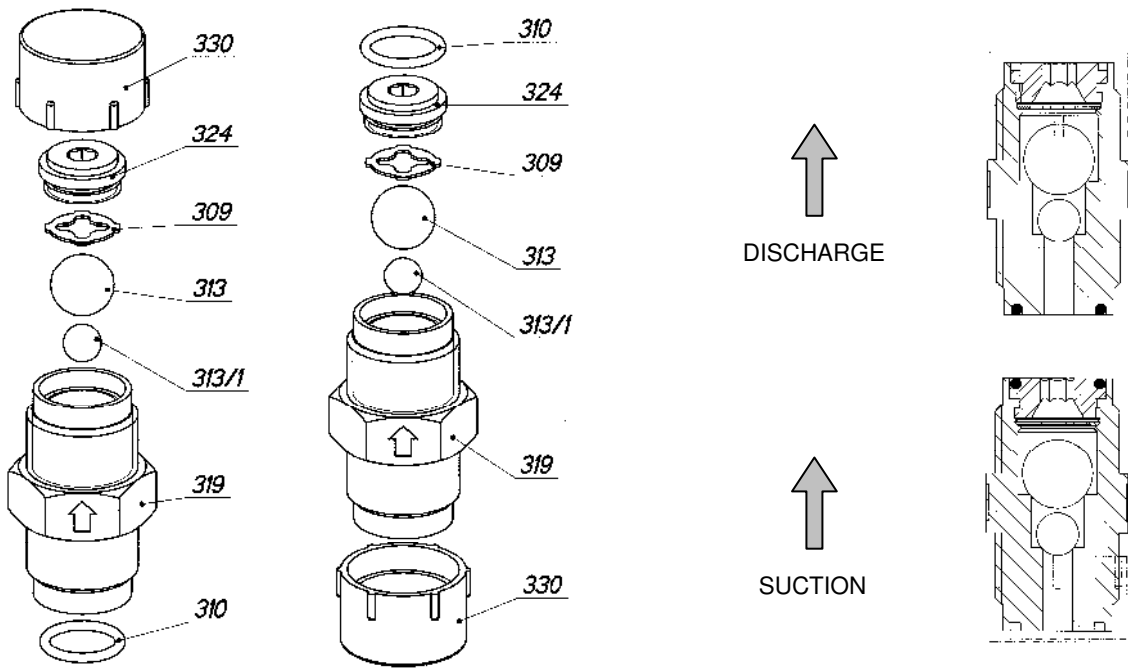


Execution – **PLASTIC** - Diaphragm Ø 50

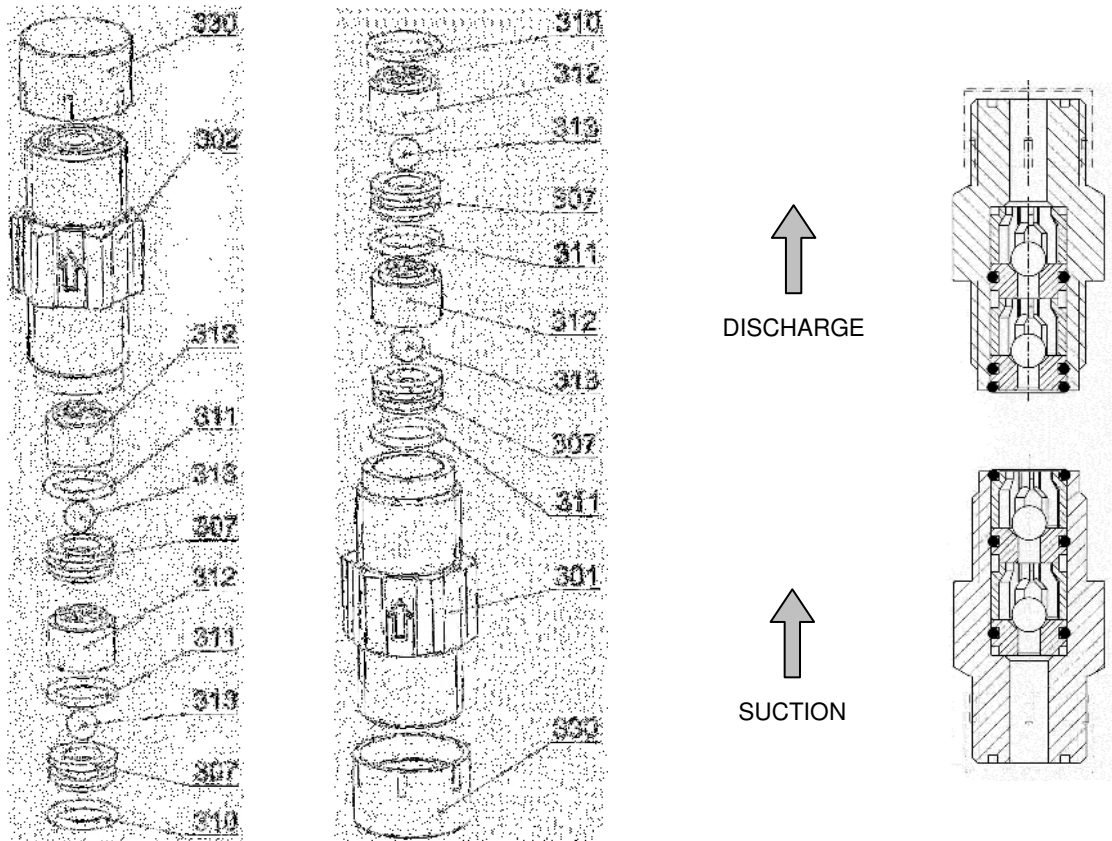


VALVE COMPOSITION

Valve AB 5 - STAINLESS STEEL



Valve AC 5 - PLASTIC



LIST OF MECHANISM COMPONENTS							
Pos.	(*)	Q.	Description	Pos.	(*)	Q.	Description
201		1	Pump body	218		1	Cover side bearing
203/A		1	Slide support	219		1	OR Gasket slide support
204		1	Cover	220		1	OR Gasket cover
205		1	Worm screw	222	(3)	1	OR Gasket adjusting screw
206		1	Helical gear	223	(3)	1	MIM slide gaskets
208		1	Slide	225		1	Self-adhesive plate
209/1		1	Flexible coupling (lower)	226	(2)	1	Movement Spring
209/2		1	Star	227		1	Key
209/3		1	Flexible coupling (upper)	228		4	Cover screw
211		1	Adjusting screw	231		4	Motor screw
212		1	External semi-knob	237/A		1	Shaft Seeger ring
212/1		1	Internal semi-knob	239		4	Flat washer
212/2		1	Fixing screw	254		1	Bearing stop flange
212/3		1	Toothed lock washer	258		6	Ring screw
214		1	Wheel side bearing	258/1		6	Nut
215		1	Worm screw bearing	259		1	Reduction ring
216		1	Bearing	260		1	Adhesive arrow
217		1	Eccentric shaft bearing				

(*)Identification and frequency of parts subject to replacement, (1) = RARELY (2) = POSSIBLE (3) = CERTAIN

LIST OF PUMP HEADS COMPONENTS							
Pos.	(*)	Q.	Description	Pos.	(*)	Q.	Description
1		1	Pump head body	14		#	Screw
7	(3)	1	OR Gasket	20	(3)	1	diaphragm
9		#	Flat washer	22	(1)	1	Diaphragm shield
13		#	Nut				

(*)Identification and frequency of parts subject to replacement, (1) = RARELY (2) = POSSIBLE (3) = CERTAIN
Depending on the model and size

LIST OF VALVE COMPONENTS							
Pos.	(*)	Q.	Description	Pos.	(*)	Q.	Description
301	(3)	1	Suction enclosure	312	(3)	1	Valve guide
302	(3)	1	Discharge container	313	(3)	1	Ball
307	(3)	1	Valve seat	313/1	(3)	1	Ball
309	(3)	1	Lift limiter	319	(3)	1	Double valve enclosure
310	(3)	1	OR Gasket	324	(3)	1	Gasket support
311	(3)	1	OR Gasket	330	(3)	1	Protection cap

(*) Identification and frequency of parts subject to replacement, (1) = RARELY (2) = POSSIBLE (3) = CERTAIN

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