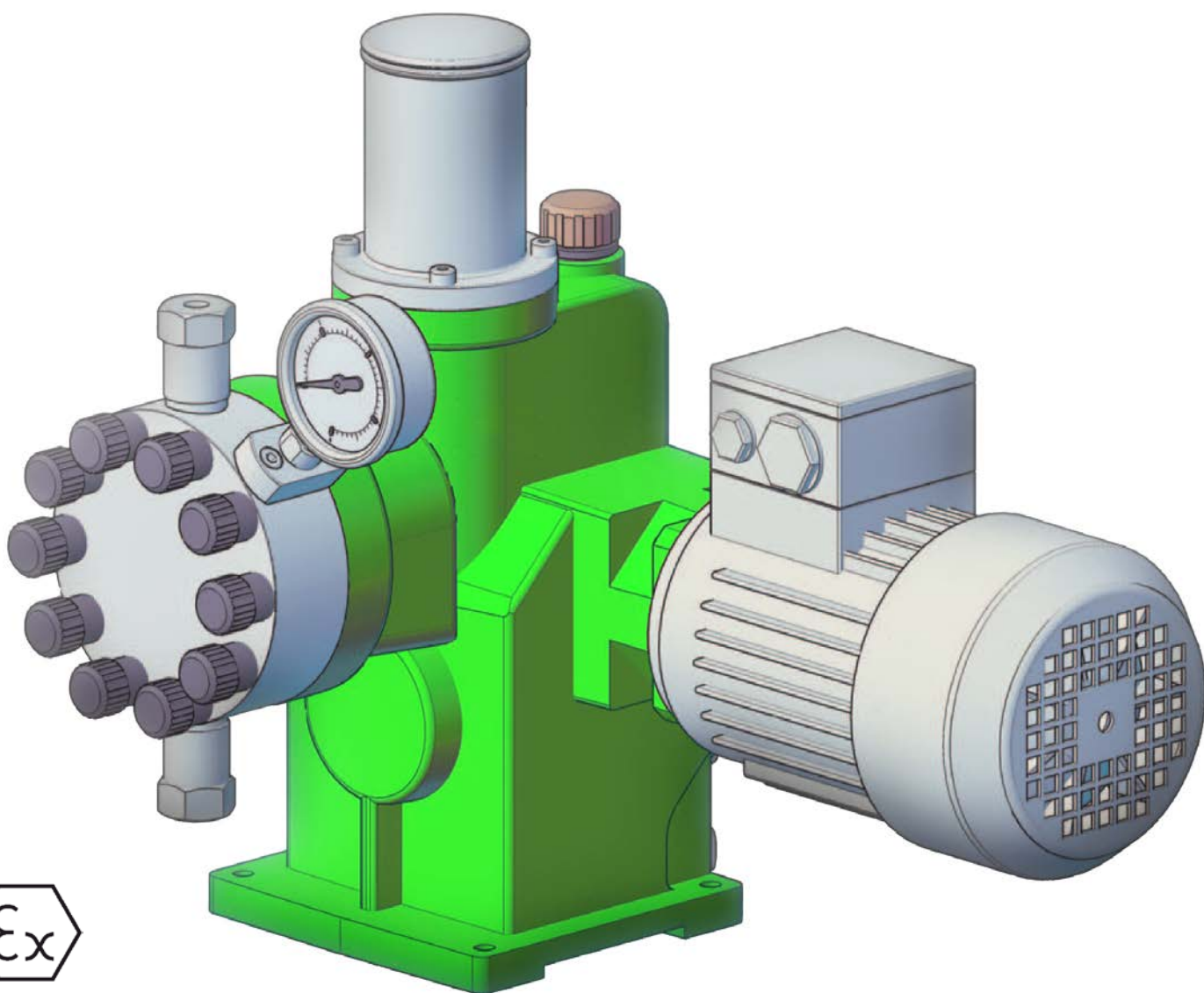


Installation, Operation & Maintenance Instruction



English

PULSA[®] 6130

PROCESS HYDRAULIC DIAPHRAGM METERING PUMPS

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1. INTRODUCTION

The machines covered by the following "instructions" are **intended for operation in industrial areas** and therefore cannot be treated as products for retail (consumer).



This document therefore contains information to be used by qualified personnel only.

They must also be integrated by laws and technical regulations in force and do not replace any plant regulation provisions or any additional requirements, either legislative or non, which have been issued for safety purposes.

1.1 RECEIVING INSPECTION

All material relative to supply is delivered to the shipper in perfect condition after thorough final testing and packaging (where applicable). Inspect goods immediately upon receipt and check that:

- the goods received correspond to the order made
- packaging (where applicable) has not undergone damage due to transport or has not been tampered with

If the packaging is damaged or tampered with, immediately check (quantity, quality and form):

- actual conditions of goods
- presence of all accessories or spare parts



ATTENTION: If anomalies or damage are found IMMEDIATELY ISSUE A COMPLAINT WITH THE COURIER and inform Pulsafeeder, Inc. as well. We suggest contacting Pulsafeeder, Inc. customer support before commissioning.

1.2 SUPPLY CONDITIONS

All Pulsa 6130 pumps are supplied as follows:

- ready to be installed as specified in the job order
- pre-tested in accordance with internal specifications
- pre-painted (where applicable)
- **completed** with lubricant oil and hydraulic oil (where applicable)

1.3 NOTES ON ELECTROMAGNETIC COMPATIBILITY

The Pulsa 6130 pumps, if installed properly and **with direct power supply from the mains**, comply with emission limits set by regulations relating to electromagnetic compatibility (EMC - General requirements for industrial environments).



Pumps for powering by means of inverters or other electronic equipment must be especially ordered for said use. All checks and any necessary measures to comply with emission limits set by regulations shall be at charge and responsibility of the end user.

1.4 USE IN POTENTIALLY EXPLOSIVE AREAS



Pulsa 6130 pumps in STANDARD version are not suitable for use in potentially explosive areas!



WARNING: Pulsa 6130 pumps for hazardous areas must be ordered for said use. When used in potentially explosive atmospheres, use only ATEX execution pumps with a flameproof motor!

2. GENERAL INFORMATION

The purpose of these instructions is to refer information deemed necessary for understanding as much as possible about and facilitating the installation, commissioning, use and maintenance of **hydraulic diaphragm metering pumps Pulsa 6130 with positive return mechanism**, more briefly called **Pulsa 6130 pumps**.

Although the **Pulsa 6130 pumps** family include several variants (see "Identifying code" and "Technical data"), the technical information contained in this instructions manual **are equally appropriate and applicable** (except where expressly stated) **for any pump whose identifying code start with the letter "PX"**.

Pulsafeeder, Inc. reserves the right to modify the characteristics of its products at any time to apply the latest technological innovations. The information contained in this document is therefore subject to change without notice.

2.1 PERSONNEL RESPONSIBLE FOR MACHINE OPERATION

Personnel, before operating the machine, must be professionally trained (preferably an employee of the sector) and must have read and understood the instructions contained in this manual. The employer must instruct all staff on the risks of accidents and on devices and clothing to be used for individual safety, on the risks arising from noise emission and on general provisions laid down by European Directives and legislation in the country of machine installation.

2.1.1 *"Operator" personnel*

The term "Operator" is intended as personnel that carry out the following tasks on the machine:

- performs the functions needed for operation
- uses the adjustment and operating commands
- performs simple actions related to operation
- performs any cleaning and daily inspection operations
- reports defects or machine malfunctioning



The operator must work on the machine while protective guards are mounted and safety devices active

2.1.2 *"Mechanical Maintenance" personnel*

Intended as personnel that operates on the machine in all operating conditions and at all protection levels.

Performs all types of repairs or mechanical adjustments but does not work on electrical installations.

2.1.3 *"Electrical Maintenance" personnel*

Intended as personnel that operates on the machine in all operating conditions and at all protection levels.

Performs all types of repairs or electrical installations adjustments, even in the presence of voltage.

2.2 TESTING AND GUARANTEE

2.2.1 *Testing*

Each Pulsafeeder, Inc. metering pump is a reliable quality product, subject to careful final inspection to ensure their proper functioning and found compliance with the specified performance. The final test results, if specifically requested by contract, are registered in special forms and made available to the Customer.

2.2.2 *Guarantee*

Metering pumps, as with all other Pulsafeeder, Inc. products, are guaranteed for a period of twelve (12) months of operation but in any case no longer than eighteen (18) months from the date of shipment. The guarantee covers the replacement, free of charge in Rochester, New York (USA), of any component found to be defective in material or processing by the Pulsafeeder, Inc. technical office.

The guarantee IS NOT VALID in the following cases:

- components subject to normal wear (e.g. gaskets, seals, O-rings);
- if installation and/or use do not meet the technical conditions of sale and instructions;
- if the pump has been tampered with or disassembled;
- if the pump has been sold to third parties.



ATTENTION: Always avoid disassembly or attempt repairs of products still under guarantee, as doing so will void the guarantee. Always contact Pulsafeeder, Inc. technical service for information.

In the case of a guarantee claim, the pump must be sent postage paid to the Pulsafeeder, Inc. factory in Rochester, New York (USA), accompanied by a description of the anomaly complained.

For safety reasons BEFORE shipping, the sender MUST ALWAYS contact Pulsafeeder, Inc. technical service (Tel. +1 585-292-8000, proepo_service@idexcorp.com) and operate as indicated in point "Mandatory Instructions for returning goods to Pulsafeeder, Inc.". *ALL pumps must be emptied and flushed clean.*

2.3 INSTRUCTIONS FOR REQUESTING SPARE PARTS

Find and study the sectional drawing of the pump in use, if necessary contact Pulsafeeder, Inc. to obtain a copy. Analyze the conditions and identify the damaged components. Using the nomenclature of the sectional drawing, make a list of the parts those components (mention the sectional drawing number and the component position code) and send to the Pulsafeeder, Inc. Sales Office, always specifying:

- type of metering pump (complete model number)

- metering pump serial number
- Pulsafeeder, Inc. Order Number (as an alternative to the serial number)



Note: This information can be found on the metering pump nameplate.

2.3.1 Spare parts

Standard components (screws, nuts, ball bearings, etc...) are also available directly from specialized dealers. **Replace any other components only with original Pulsafeeder, Inc. spare parts.**

2.3.2 Changes and manufacturing of spare parts without approval



Modifications ARE NOT allowed. Original Pulsafeeder, Inc. spares and accessories are to be used in order to assure the conformity with safety rules. Pulsafeeder, Inc. declines any responsibility in case of use of non-original parts and warranty will be no longer valid.

2.4 LIABILITY EXCLUSION

Pulsafeeder, Inc. is unable to monitor the observance of the instructions given in this manual, nor verify the actual working conditions and installation of the equipment, the correct operation, the using and maintenance of the machines and accessories. An incorrect installation, or misuse of the machine, may cause serious damage and may pose a danger to persons or property. Any anomalies must be reported to the maintenance supervisor. The user is not authorized to tamper with the machine for any reason.



Attempts to disassemble, modify or tamper in general by unauthorized personnel will void the guarantee and will release Pulsafeeder, Inc. from any liability for damage caused to persons or property resulting from such actions.

Pulsafeeder, Inc. is considered released from any liability in the following cases:

- improper installation;
- improper use of the machine by non-professional or inadequately trained operators;
- use not in compliance with regulations in the Country of use;
- lack of maintenance or improperly performed;
- use of non-original spare parts or incorrect parts for the model in question;
- total or partial failure to observe the instructions;
- exceptional environmental events.

2.5 RESTRICTIONS REGARDING THIS DOCUMENT

This document is property of Pulsafeeder, Inc. together with the technical information contained in it. Modification, reproduction or copying (in part or whole) without written permission is prohibited.

3. SAFETY WARNINGS



METERING PUMPS ARE INDUSTRIAL MACHINERY NOT INTENDED FOR USE BY NON-PROFESSIONAL OPERATORS. THESE INSTRUCTIONS ARE INTENDED FOR QUALIFIED PERSONNEL.



FULLY AND CAREFULLY study these instructions before installing and starting the pump. Failure to respect safety recommendations can damage the machine or compromise its operation.

For correct handling and maintenance strictly follow present information. It is of key importance that these are read by the installer and the maintenance supervisor. This document should be stored near the machine in a safe, dry place, and in any case always made easily and readily available for future reference.

Always keep the instructions and warnings directly on the equipment in good and readable condition (replace if necessary):

- Equipment nameplate
- Arrow indicating the motor direction of rotation
- Warning and service information stickers

3.1 SYMBOLS AND SUGGESTIONS IN THESE INSTRUCTIONS



This symbol indicates important information for preventing faults and/or damage to equipment or personnel.



This symbol indicates danger due to the presence of electricity.



This symbol indicates a danger that may cause an explosion.



This symbol represents the metering pump schematically.

3.2 **DANGER**

Metering pumps are machines with dangerous parts. Therefore:

- **improper use or tampering,**
- **removal of guards** or disconnection of protective devices,
- **inadequate inspection or maintenance** can cause serious damage to persons or property.

In particular, personnel must be informed of danger due to:



- **live parts**



- **rotating or moving parts**



- **handled fluid under pressure and/or corrosive**



- **hot surfaces**

The safety supervisor must ensure and guarantee that:

- the machine is handled, installed, commissioned, inspected, maintained and repaired **by qualified personnel only**, that must have:
 - specific technical training and experience
 - knowledge of technical regulations and applicable laws
 - knowledge of general, national, local and plant safety requirements
 - ability to recognize and avoid all possible danger.

Failure to follow these instructions, negligence or an incorrect or improper use of the machine by unauthorized and unqualified personnel may cause risk to persons or property, resulting in cancellation of the guarantee by Pulsafeeder, Inc..



The safety of these machines can be compromised if they are used improperly or tampered with.

Metering pumps must be used only if they are in perfect technical condition, also considering safety aspects and danger. The smooth operation of these machines, their durability and operating efficiency depend on the observance of these details. We decline any responsibility for bodily injury or property damage caused by improper use of our equipment.

3.3 **INDIVIDUAL PROTECTIVE EQUIPMENT**

Any operation on the machine must be undertaken in compliance with safety regulations and safety warnings.

The safety supervisor must ensure compliance with applicable laws and safety regulations enacted for safety, and monitor that all personnel are equipped and always use appropriate individual protective equipment.



Appropriate individual safety devices must always be used to ensure and safeguard the personal safety of personnel, who must also be properly trained and professionally qualified.

3.4 **ADDITIONAL NOTE FOR ATEX PUMPS**

The **Pulsa 6130 Hydraulic Diaphragm Metering Pumps in ATEX version** comply with the rules concerning equipment and protective systems for use in potentially explosive atmospheres in accordance with European Directive 94/9/CE dated 23/03/94, known as ATEX directives.

- They meet the requirements of Group II Category 2, making them suitable for use in Zone 1/21 (No danger as a result of **predictable failure**)
- Consequently they are suitable for use in Zone 2/22, resulting classified in Group II Category 3 (No danger **during normal operation**)



WARNING: The Pulsa 6130 pumps in ATEX execution are not suitable for use in zone 0/20 !



NOTE: In case of Pulsa 6130 pumps in ATEX execution, in addition to these instructions must be followed also the warnings contained in "Metering pump safety instructions for potentially explosive atmospheres" (addendum to this operating manual)

3.5 SUITABLE VERIFICATION FOR EFFECTIVE APPLICATION/USE

All pumps are supplied in compliance with requirements established under technical/sales negotiation and defined at time of order.



NOTE: The customer (end user and/or installer) is responsible for checking whether or not the pump is really suitable for the application/use on the plant, this before the installation and subsequent machine start-up.



For ATEX pumps the customer/end user is responsible to determine the effectiveness of the pump to be used in a given plant, after having analyzed the characteristics of danger existing in the installation location and in compliance with current laws and those issued for safety purposes.

4. TRANSPORT, HANDLING AND STORAGE

4.1 TRANSPORT, LIFTING AND HANDLING



Unless otherwise agreed, the pumps are fixed and packaged in horizontal containers. Make sure that they cannot accidentally tip over during transport or handling and that they are always placed on a flat surface.

Verify that the device used (pallet, forklift, hoist, etc...) is appropriate for the size and weight of the package/equipment and that any lifting lugs on the machine are screwed down. In environments with temperatures below -20 °C, lifting rings must be used with caution because they could break in low temperatures, causing damage to persons or equipment.



Lifting rings on the pump are sized to bear one-headed pump weight, therefore DO NOT use them to lift multi-headed pumps. For those operations sling base-plate and use lifting ropes. Before removing ropes fix pumps safely to the base. Pay attention, tilting danger!

4.2 STORAGE CONDITIONS

If not used immediately, the pumps should be stored with suitable covers in a temperate, dry, clean, vibration-free and weatherproof environment. Protect from soil moisture by placing the unit on shelves or wooden pallets. If the temperature is below 0 °C, ensure that it does not go lower than -20 °C. If not specifically highlighted on the package, do not stack packaging, to prevent damage to the machine and to avoid tipping over or falling that can create accidents. Ensure that access of unauthorized persons is not allowed in the storage location and that the floor or shelf can support the weight of the machinery or equipment stored. Before being put pumps into operation, after being stored for a long period, bring them to a temperate environment in order to stabilize the temperature. In case of storage in extreme conditions, e.g. in sub-tropical or desert climates, take additional safety measures.



Particular storage conditions should be previously reported, in order to provide a suitable packaging.

4.3 DIMENSIONS AND WEIGHTS

Check the dimensions and overall gross weight of the package before handling or lifting.

Unless otherwise agreed, the packaging bears such information (dimensions are expressed in millimeters and weight in kilograms).

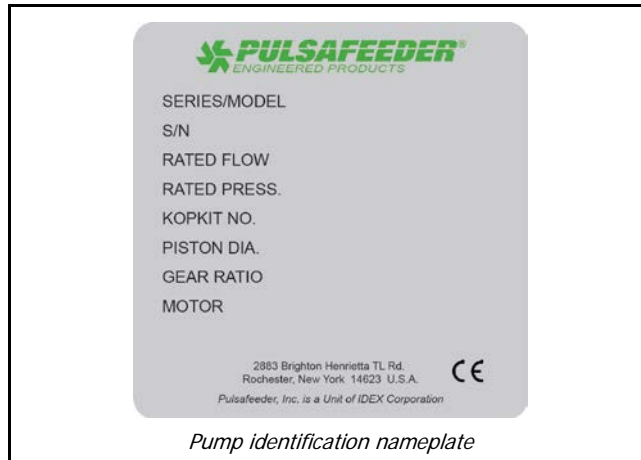
5. DESCRIPTION

Pulsa 6130 metering pumps are all single-block type with double diaphragm (sandwich) pump head and positive return mechanism; means that the plunger is constantly connected to the pump mechanism both during suction and discharge phase. They fall into the family of controlled volume alternative displacement pumps. The body single-block contains only one type of oil that carries the dual role of lubricating oil and hydraulic oil. The mechanically actuated replenishing hydraulic system ("intelligent" diaphragm) makes the diaphragm immune from accidents or mishandling in discharge or suction. The crank is driven by a constant speed electric motor and the number of diaphragm cycles is determined by the endless screw – worm wheel internal reduction gear in an oil bath.

All **Pulsa 6130** pumps are only with double hydraulic diaphragm pump head (sandwich) with diaphragm rupture detector directly on the head.

5.1 IDENTIFICATION NAMEPLATE

Each pump carries a nameplate for identification. Example:



Ensure that the machinery nameplate, the warning and service adhesives are always present and in good, legible conditions. Otherwise, provide to replace them.



Removal of the nameplate or alteration of data contained therein is NOT permitted for any reason.

5.2 IDENTIFICATION CODE

The **PULSA 6130 hydraulic diaphragm metering pumps** are identified by a code described as follows:

EXAMPLE: PX12MSEBBARBLSP-APAP-XXXX

	AVAILABLE	Code	Description
POSITIONS 1,2 PUMP SIZE	6130	PX	Model 6130, Hydraulic Diaphragm Metering Pump
POSITION 3, 4 Piston Size	12	12	12 mm
	15	15	15 mm
POSITION 5 Stroke Control	12, 15	M	Manual Stroke Length Adjustment
		R	Automatic Stroke Length Adjustment
POSITION 6 Gearbox Arrangement	12, 15	S	Simplex
		2	Duplex
		3	Triplex
		M	Multiplex, > 3 Heads
POSITION 7 - DASH			DASH
POSITION 8 Gear Ratio SPM (60 hz, 50 hz)	12, 15	D	10:1 (175, 145)
		E	12.5:1 (138, 116)
		F	15:1 (119, 100)
		G	20:1 (84, 70)
		H	30:1 (60, 50)
		I	40:1 (43, 36)
		J	60:1 (30, 25)
POSITION 9 Motor Frame Size	12, 15	A	56C
		B	71B14
		C	81B14
POSITION 10 Materials of Reagent Head	12, 15	A	316L Stainless Steel
POSITION 11 Materials of Check Valve	12, 15	R	Ruby
POSITION 12 Valve Quantity & Type	12, 15	A	Single Ball
		B	Double Ball
POSITION 13 Materials of Valve Seat	12, 15	L	Alumina Ceramic
POSITION 14 Materials of	12, 15	S	Stainless Steel

Hardware			
POSITION 15 Materials of Diaphragm	12, 15	P R T	Pressure Leak Detection w/ Gauge & Switch (PTFE) Pressure Leak Detection w/ Gauge Only (PTFE) Pressure Leak Detection w/ Gauge and Optional Port for Transmitter
POSITION 16 - DASH			DASH
POSITION 17 Connection Size Suction	12, 15	A C G	0.25 IN 0.50 IN 1.00 IN
POSITION 18 Connection Type Suction	12, 15	P C D E G H Q R T	NPT (INCH ENGLISH) FLANGED - ANSI 150 LB FLANGED - ANSI 300 LB FLANGED - ANSI 600 LB FLANGED - ANSI 1200 LB FLANGED - ANSI 2500 LB FLANGED - DIN 10 THRU 40 BAR FLANGED - DIN 64 BAR FLANGED - DIN 100 THRU 160 BAR
POSITION 19 Connection Size Discharge	12, 15	A C G	0.25 IN 0.50 IN 1.00 IN
POSITION 20 Connection Type Discharge	12, 15	P C D E G H Q R T	NPT (INCH ENGLISH) FLANGED - ANSI 150 LB FLANGED - ANSI 300 LB FLANGED - ANSI 600 LB FLANGED - ANSI 1200 LB FLANGED - ANSI 2500 LB FLANGED - DIN 10 THRU 40 BAR FLANGED - DIN 64 BAR FLANGED - DIN 100 THRU 160 BAR
POSITION 21 - DASH			DASH
POSITION 22 - 25 Options Assigned by factory	12, 15	XXXX	No Options or Factory Defined

In case of special execution machines the constructive variations may differ from the above mentioned codes.

5.3 AMBIENT AND DESIGN TEMPERATURE

Unless differently agreed with the customer, the ambient design temperature range "Ta" of the Pulsa 6130 pump can be:

–10°C ≤ Ta ≤ +40°C: Standard temperature range for all pump types

–10°C ≤ Ta ≤ +60°C: Standard temperature range for only some pump types

The table below illustrates the maximum allowed temperature of pumped fluid based on pump head material.

	METALLIC material pump head
HANDLED FLUID Max. temperature	+60 °C



NOTE: During periodic inspection always check that temperatures respect limits here indicated!

The values contained in the previous table are applicable equally for each of the allowable ambient temperatures "Ta".

5.4 WORKING PRINCIPLE

Pulsa 6130 hydraulic diaphragm metering pumps are all with single-block positive return mechanism, coupled to a pump head made of material chemically compatible with the fluid to be handled. Pump heads are all double hydraulic diaphragm type (sandwich) with a diaphragm rupture detector. **The "basic" detector** is a pressure gauge placed directly on the head. During normal pump operation, **it must indicate "zero (0) pressure", confirming that the diaphragms are intact.**



NOTE: THE DETECTOR PRESSURE GAUGE DOES NOT INDICATE THE PUMP OPERATING PRESSURE!

The single-block body incorporates the hydraulic circuit, the transmission reduction gear, the plunger thrust system and the flow rate adjustment system. Contains only one type of oil that carries the dual role of lubricating oil and hydraulic oil. The pump sectional drawing is usually attached to the present operating manual. If missing, see the point "Hydraulic/lubricant oil change" to consult a pump head sectional drawing or at least contact Pulsafeeder, Inc. customer service to receive an updated copy.

They are normally powered by an electric motor through a reduction gear type "endless screw and worm wheel" joined to a duct mechanism. The latter consists of a connecting rod system with variable eccentricity which determines the axial reciprocated movement of the plunger; both the mechanisms are in oil bath.

When moving, the connecting rod generates both pump phases. During the discharge phase the connecting rod forces the plunger to move forward, putting pressure on the oil chamber hydraulic circuit and determining the controlled deformation of the diaphragm, subsequently the fluid in the pump head moves to the discharge pipeline. During the suction phase the connecting rod pulls the plunger back which, creating a vacuum on the oil chamber, deforms the diaphragm again and causes the entrance of fluid in the pump head.

The check valve on the pump head controls input and output of fluid from the pump head, determining flow direction.

A safety valve is installed on the hydraulic circuit to safeguard the pump. If an excess of pressure is detected during operation, exceeding its calibration, the valve opens expelling from hydraulic circuit a quantity of oil equal to the plunger displacement and discharging it into the pump single-block body.

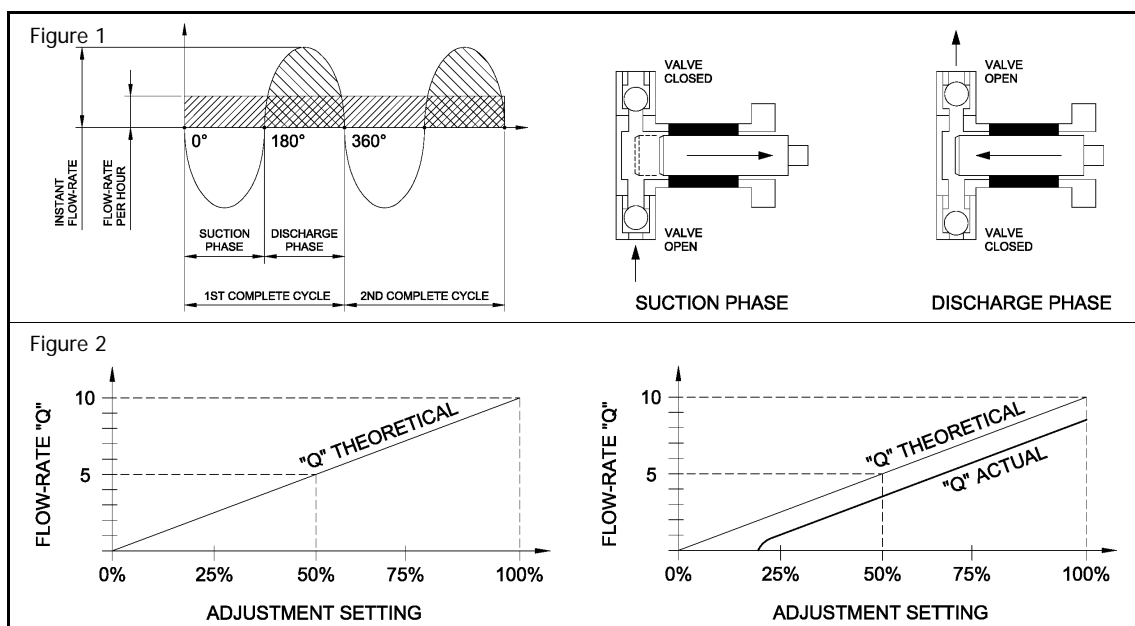
The flow rate adjustment system controls the volume of fluid pumped by varying the connecting rod eccentricity and, therefore, plunger return stroke length. Standard adjustment is manual with graduate knob and linear vernier; alternatively (upon request), an automatic adjustment system can be applied (see "Flow rate adjustment system"). Pulsa 6130 pumps fall into the family of alternative volumetric pumps characterized by adjustable displacement. The construction material of external components ensures high impact protection. With the exception of pump head, the external pump surfaces are treated to ensure high protection against corrosion. Metal parts are assembled to ensure correct and proper grounding. Multiple pumps are obtained by horizontal alignment of individual reduction gear, in which the endless screw shafts are fitted together by means of a flexible coupling. Each reduction gear has its own frequency of plunger strokes per minute, depending on the own worm wheel transmission ratio.

5.5 THE FLOW RATE

Pulsa 6130 pumps flow rate is not continuous but pulsating, generated by the alternating movement of the plunger (which deforms the diaphragm) and the action of the check valve on the pump head which determine flow direction (see figure 1). Pump flow rate is adjustable and increases or decreases in direct proportion to the variation of the plunger stroke.

The theoretical flow rate corresponds exactly to the volume described by the movement of the diaphragm. The graphic representation of its behavior is a straight line whose course is proportional to the adjustment system setting.

The actual flow rate is inevitably lower than the theoretical flow rate, due to the volumetric efficiency of the pump. It varies depending on the type and size of the pump, the nature and viscosity of the liquid to be pumped, working pressure, etc. (see figure 2).



5.6 INTENDED USE

Pulsa 6130 pumps are destined for dosing liquid fluids (flammable, acids, alkaline, solvents, etc.) at ambient temperature or heated (see "Ambient and design temperature"), suitable for continuous service.

They can be used for the following applications:

- chemical and petrochemical plants (auxiliary lines/services);
- thermal power plants (process applications and auxiliary lines/services);
- water and wastewater treatment;
- in paper mills, on paper production lines;
- detergents production, CIP plants, water treatment plants.



Any other use is considered "IMPROPER USE" and is not allowed. Pulsafeeder, Inc. declines all responsibility for any damage to persons or property and any kind of machine guarantee shall be considered void.

5.7 REASONABLY EXPECTED IMPROPER USE

It is improper to use the Pulsa 6130 pumps as follows:

- for dosing products differing from those established during technical/sales negotiation and defined at time of order
- in a corrosive and stagnant atmosphere and closed in a poorly-ventilated location
- dosing in pressure without a pressure gauge installed on the discharge pipeline (see "Discharge pipeline - Pressure gauge")
- powered by means of an inverter or other electronic equipment unless explicitly ordered for this use
- with a motor faster than the original one (different polarity)
- in potentially explosive areas unless explicitly ordered for this use



NOTE: It is the responsibility of the customer to verify that the pump is suitable for application/use before installation and start-up. In case of doubt, do not improvise but contact Pulsafeeder, Inc. customer service.

5.8 PROHIBITED USE

It is prohibited to use the Pulsa 6130 pumps as follows:

- in mining plants (underground);
- immersed in water (as submersible pumps)



IS PROHIBITED use the pumps without protective covers or with safety devices tampered with or damaged



Pulsa 6130 pumps in STANDARD version are not suitable for use in potentially explosive areas !



ATTENTION: Pulsa 6130 pumps in ATEX execution are not suitable for use in zone 0/20 !

5.9 NOISE

The table below shows the average noise level (lp noise pressure level) emitted by Pulsa 6130 pumps, used within the limits of use and installed in accordance with the instructions contained in the present operating manual.

These average values were detected on the prototype at a distance of 1 meter from the surface of the machine, at a height of 1.6 meters from the working surface and weighted according to curve A.

METALLIC MATERIAL PUMP HEAD	
Pump max capacity (Q _{max})	Noise pressure level (lp)
Q _{max} < 30 l/h	< 65 dB(A)

The employer must implement in the workplace, appropriate technical measures to minimise the risks arising from daily noise exposure and as much as is necessary to ensure and safeguard the health of personnel in the working environment.

5.10 VIBRATIONS

Pulsa 6130 pumps do not fall into the category of direct human contact machines. Vibrations produced are not significant when pumps are installed in accordance with these instructions. They are therefore less than 2.5 m/s² of acceleration and are not such as to cause danger situations. If these situations should arise, stop the machine immediately and call the maintenance supervisor.

5.11 POWERING THE ELECTRIC MOTOR WITH INVERTER



The pumps must be especially ordered for powering by means of inverter. Otherwise the end user, before their installation, must contact Pulsafeeder, Inc. to define new limits of use (Hz, pressure and flow rate) that will be guaranteed only after a new nameplates fixed to the pump.

For a correct use of the pump, the user must comply with the power frequency range allowed by Pulsafeeder, Inc., defined and including from 30Hz to 80Hz. Moreover, IT MUST NOT EXCEED the max operating pressure indicated on the pump nameplate. This value is downgraded and takes into account the maximum operating regime at maximum allowable power frequency (80Hz).

User must also comply with any additional instructions provided by the inverter manufacturer. Solutions for meeting system electromagnetic compatibility (EMC) requirements are the responsibility of the installer.

5.12 TECHNICAL DATA

5.12.1 *Pumps type Pulsa 6130*

- Refer to 5.2

5.13 FLOW RATE ADJUSTMENT SYSTEM

Flow rate adjustment is continuous and regular and can be carried out either with the pump running or at rest. However, the action is easier when the pump is running, especially in case of large diameter plunger pumps.

5.13.1 *Manual adjustment via graduate knob and linear vernier*

Standard version provided when it is not specifically requested a particular adjustment system.

The graduated knob, turning on a fixed vernier, runs on a linear scale sub-divided from 0 to 10. Zero (0) on the knob lower edge is a reference index for setting the adjustment system to a desired flow rate percentage value.

5.13.2 *Automatic adjustment by means of actuator*

The adjustment system can be automated (upon request) via the application of an electric or pneumatic actuator.

For information on actuator operation consult its specific operating manual.

5.14 INTERNAL SAFETY VALVE ON HYDRAULIC OIL CIRCUIT

All Pulsa 6130 pumps are equipped with an internal safety valve in the hydraulic circuit located in the single-block body (see figure 15 in "Hydraulic/lubricant oil replacement"). This valve protects the pump from pressure excesses generated by the pump itself during operation (discharge closed or blocked). Therefore, only in this case can be avoided the installation of the external safety valve on the discharge pipeline, if this has been installed to protect the pump. The safety valve on the discharge pipeline is instead essential when system pressure can rise regardless of pump operation.



It is the responsibility of the user and/or installer to evaluate use or not of an external safety valve.

If during operation of the pump there is an excess of pressure higher than the setting of the internal safety valve, this valve opens and discharges into the expansion tank a quantity of oil equal to the plunger displacement.

The internal safety valve opening is recognized and evident by means of:

- no pump flow (or at least greatly reduced)
- change of oil level in the single-block body (see oil level plug)
- increased noise of the pump (synchronized to the plunger strokes per minute)

6. INSTALLATION AND COMMISSIONING

6.1 INSTRUCTIONS FOR PROPER INSTALLATION

Because pump check valves work by gravity, it is essential that the housing valve axis must be perfectly vertical for proper pump operation (also to prevent abnormal wear of the valves).

Also provide the following equipment:

- **a pressure gauge** next the pump. It must be installed before any other accessory installed on the discharge pipeline. Allows to control the actual pump operating pressure (see "Discharge pipeline - Pressure gauge")
- **an external safety valve** immediately after the discharge connection and, in any case, before the ON-OFF valve. Protects the pump and the plant from any accidents caused by excessive pressure (see "Discharge pipeline - External safety valve")
- **a suitable thermal overload device**. It protects motor from overloads and/or short circuits



Protect the pump from product leaks from the plant and/or corrosion phenomena. Avoid installing pipeline or accessories directly above the pump. Avoid installation in a closed, corrosive or stagnant location.



For outdoor installations provide proper protection for the pump from direct weathering actions (rain, wind, dust, humidity). Consider the benefits of using a shelter and/or sliding panels. These devices significantly raise the level of efficiency and safety of the whole pump.

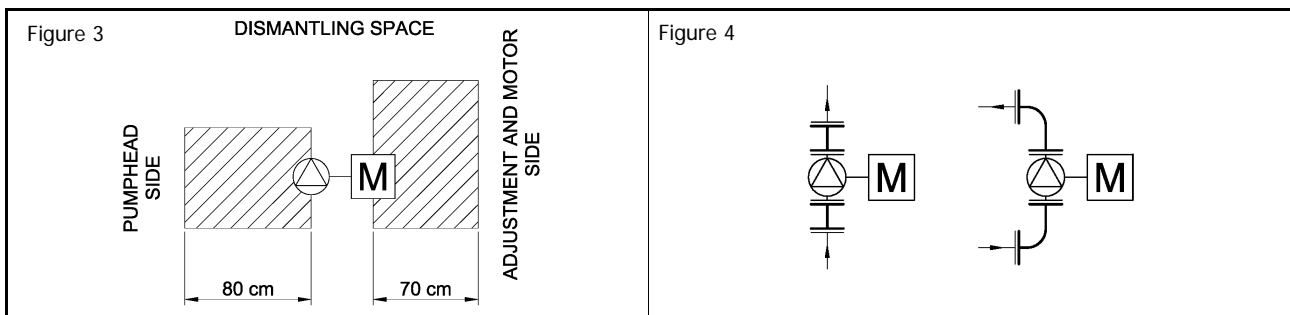
Provide adequate free space around the whole pump to allow inspections and/or dismantling: from the pump head side, the adjustment knob side, and from the motor side. If the pump is installed outdoors, shelter is recommended, especially when the pump is equipped with electric actuators or other delicate devices.

6.1.1 Pump and pipeline fixing

Do not install the pump directly on a concrete foundation base. Use a steel base plate to make sure that is stable and level. Fix securely the pump to the baseplate using bolts and washers to ensure a proper load distribution. The pipelines must be supported independently and their weight must not burden or create tension on the pump head. Therefore, besides the baseplate, the pump needs a supporting framework for both its suction and discharge pipelines.

6.1.2 Connecting to plant pipelines

On the discharge pipeline, provide proper draining pipes near the pump head. We suggest using short fittings to disassemble the flanged connections (see figure 4).



After the pump discharge connection we recommend the use of a cross connection, both to facilitate pump dismantling from the plant and to allow (at a later time if necessary) the installation of a pressure gauge, safety valve, pulsation dampener.

Always verify complete sealing of fittings and pipe flanges, particularly on the suction side pipeline plant.

The entry of suctioned air prevents pump priming.



Before connecting the plant pipelines to the pump connections, it is absolutely necessary to flush the pipelines with water, especially the suction pipeline and relevant feed tank. This preliminary flushing is often underestimated by the installer and/or the end user; if this operation is not properly carried out, the pump will become a collector of all foreign matters contained in the suction pipeline and tank, such as weld drops, gasket scraps, soil and other stuff.

6.1.3 Connecting the motor to the mains

The metering pumps are always supplied with the use and maintenance instructions of the electric motor installed.

In addition, for ATEX pumps are also supplied the safety instructions, certification and ATEX conformity declaration.



Before carrying out electrical connections ensure that the mains supply voltage corresponds to that indicated in the nameplate of the motor. Refer to the motor instructions manual and observe relevant provisions.

When for the mains cable connections in used a cable-gland, always choose it correctly according to the type of plant and properly for the type of cable used.

The cable gland should be tightened so that the seal rings keep the necessary pressure:

- to prevent transmission of mechanical stress on the motor terminals
- to ensure mechanical protection (IP degree) of the terminal box



NOTE: Always make the ground connection using the appropriate terminal in the terminal box.

6.2 SUCTION PIPELINE

To ensure a proper and smooth operation of the pump it is essential correctly design the suction pipeline.

Especially when pump is installed higher than the liquid surface, **above tank** (good suction lift required), the factors to consider are:

- the internal diameter of the pipeline
- the overall length of the pipeline
- the arrangement or path of the pipeline

The internal diameter of the suction pipeline must be chosen according to the pump flow rate (see following table A).

Pump connections are sized/designed in excess to cover all applications.

Table A

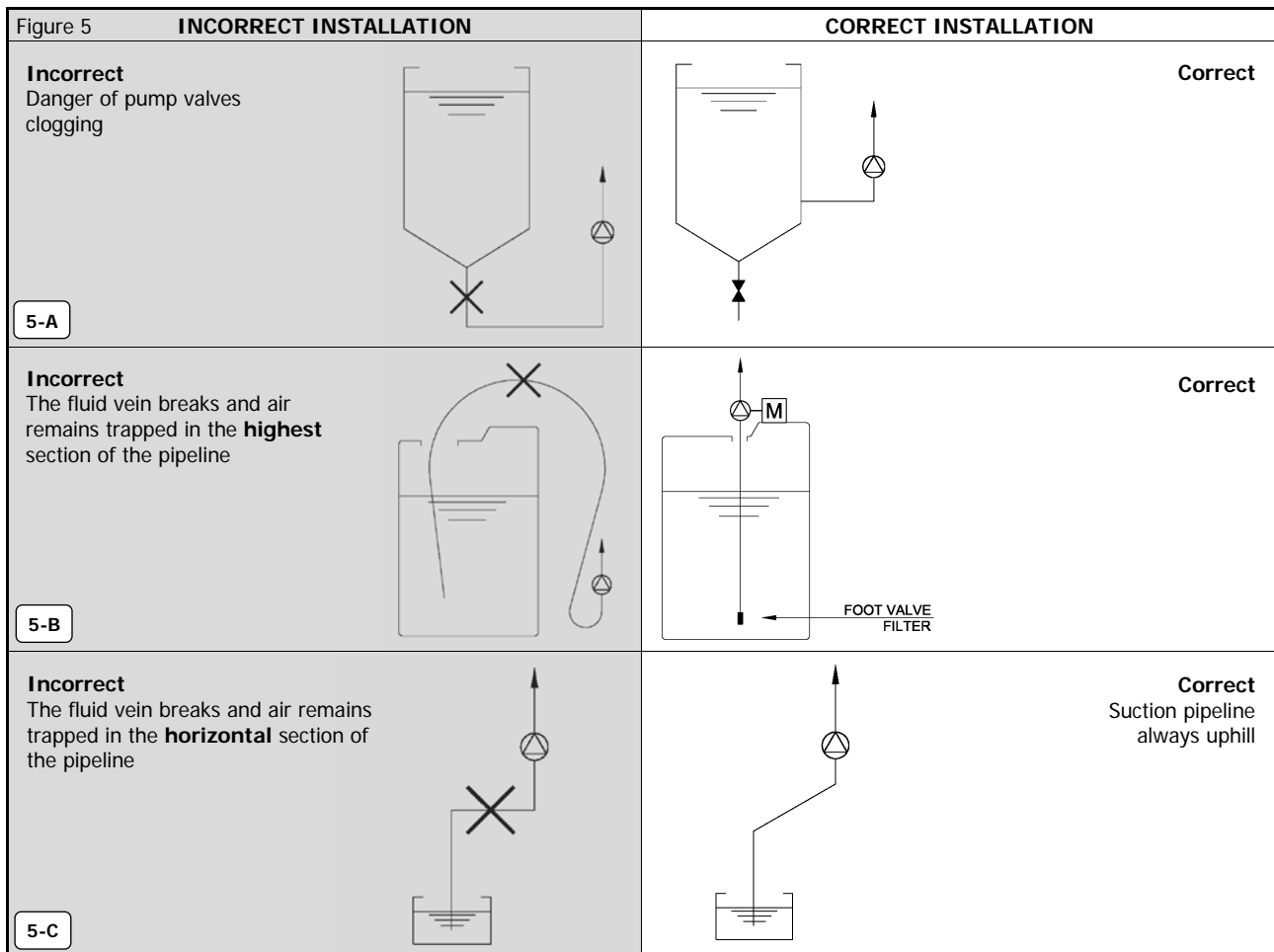
Suction pipeline size according to maximum pump flow rate (for water data)					
Max. pump flow rate (Q _{max})	Quick fittings	Connections		Flanged connections	
		Threaded	Glued	UNI	ANSI
Q _{max} < 5 l/h	4 x 6 mm	-	-	-	-
5 l/h < Q _{max} < 30 l/h	6 x 10 mm	1/4"	-	DN 15	1/2" ANSI


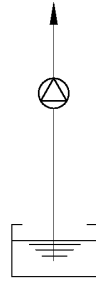
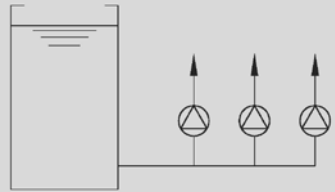
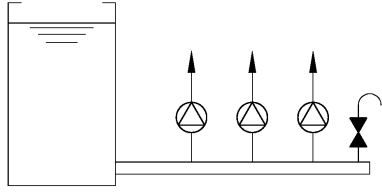
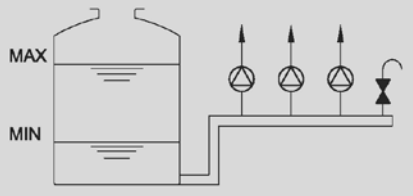
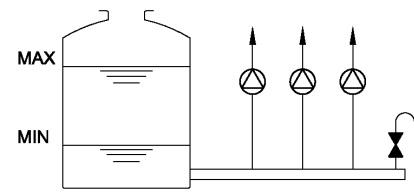
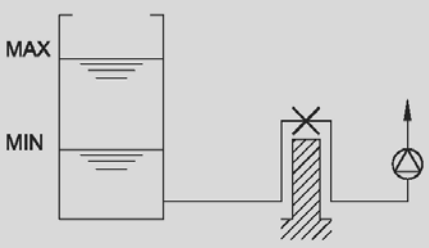
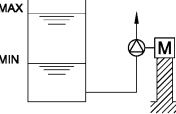
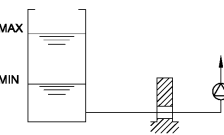
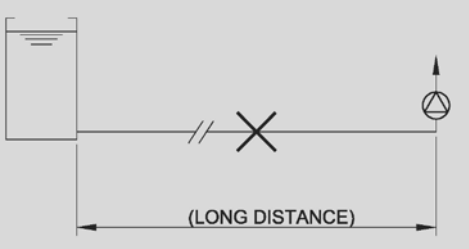
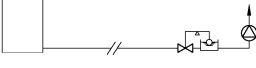
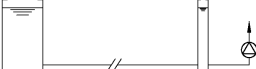
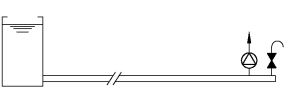
6.2.1 Suction pipeline path

The length of the suction pipe must be as short as possible, respecting the dimensions contained in the previous table A.

- for **above tank** installation (good suction lift required), do not exceed a maximum height of 1 meters
- do not exceed a maximum length of 1.5 meters (sum of vertical and horizontal sections).

Please refer to figure 5 below for suction pipeline correct arrangement or path.



<p>Incorrect Internal diameter of suction pipeline inadequate (see previous table A)</p> <p>5-D</p> 	<p>Correct Internal diameter of suction pipeline proportioned (see previous table A)</p> 
<p>Incorrect</p> <p>5-E</p> 	<p>Correct</p> 
<p>Incorrect</p> <p>5-F</p> 	<p>Correct</p> 
<p>Incorrect</p> <p>5-G</p> 	<p>Recommended</p>  <p>Recommended</p> 
<p>Incorrect</p> <p>5-H</p> 	<p>Recommended</p>  <p>Recommended</p>  <p>Acceptable</p> 

6.2.2 Suction pipeline for viscous liquids

Pumps for dosing viscous liquid must be specifically ordered for that use.



As a general rule, always install the pump with suction connection flooded and pay particular attention to the design, arrangement and path of suction pipeline.

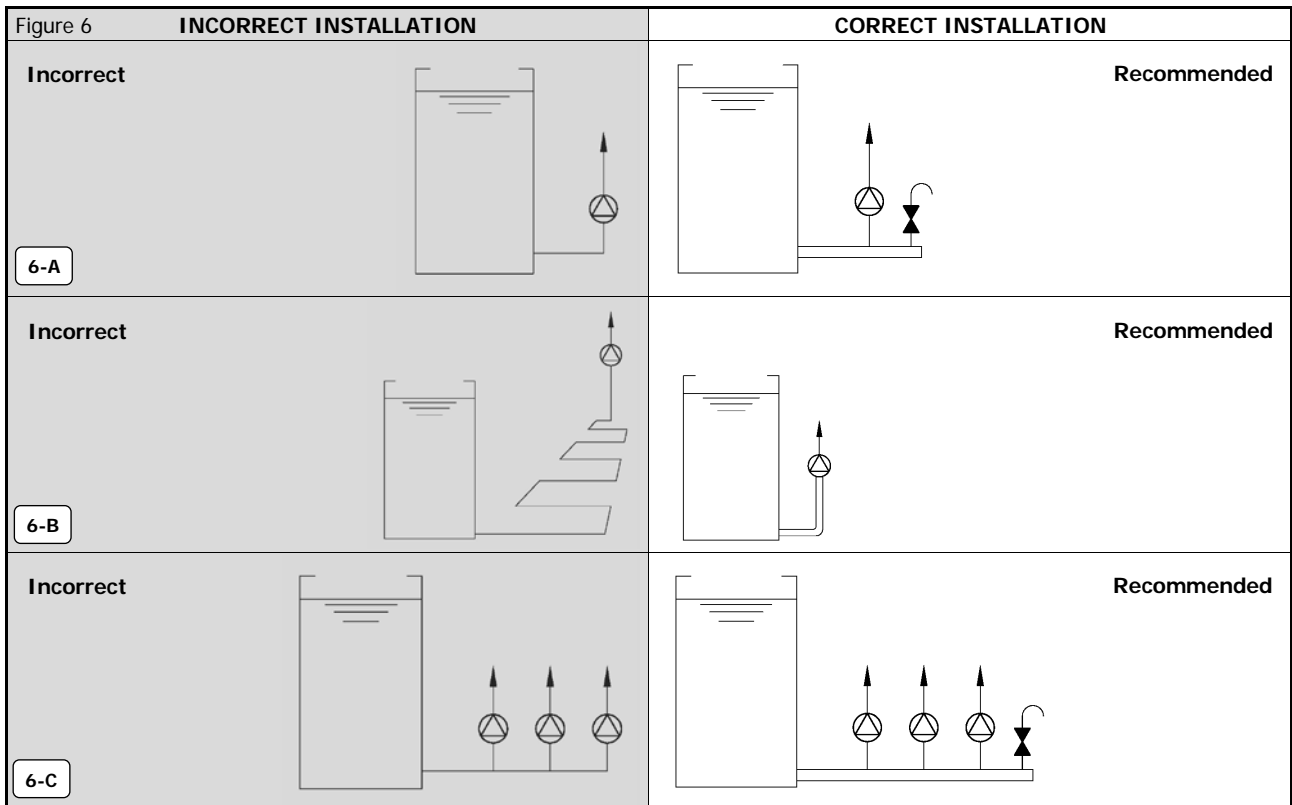
Where possible, we recommend:

- use pumps with plunger pump head with a lower number of strokes per minute and a large diameter plunger
- in order of importance, use plunger pumps, mechanical diaphragm or, lastly, hydraulic diaphragm pumps
- use stainless steel pump heads, otherwise with metallic valves or special material
- avoid installing a filter in the suction pipeline. If essential evaluate its appropriate oversizing (see "Filter on suction pipeline")
- maintain as minimum diameter for the suction pipeline the diameter corresponding to pump connections
- for very viscous fluids (≥ 2000 cps) use as suction pipeline diameter the next largest of the pump connections



ATTENTION: To select a suitable pump the customer must inform us on the plant NPSH available!

Figure 6 shows some installation examples for viscous liquids.



6.2.3 Filter on suction pipeline

To ensure proper pump operation it is important that the product dosed is liquid, homogeneous and clean. The use of the filter should not affect the suction capacity of the pump. Carefully evaluate the real benefit of using the filter according to the nature and characteristics of the handled fluid. If it is best to use it, properly choose the filter mesh size. The pump can also convey solids in suspension (non-soluble particles) but these are always considered as “disturbing source” elements as they can cause:

- check valves obstruction
- accumulations and/or solidification inside the pump head
- in case of diaphragm pumps, cutting or rupture of it

As a general rule, **we do not recommend** filter installation in the following case:

- viscous liquid (e.g. polyelectrolyte)
- liquid that coagulates, solidifies or crystallize easily (e.g. caustic soda, ferric chloride)

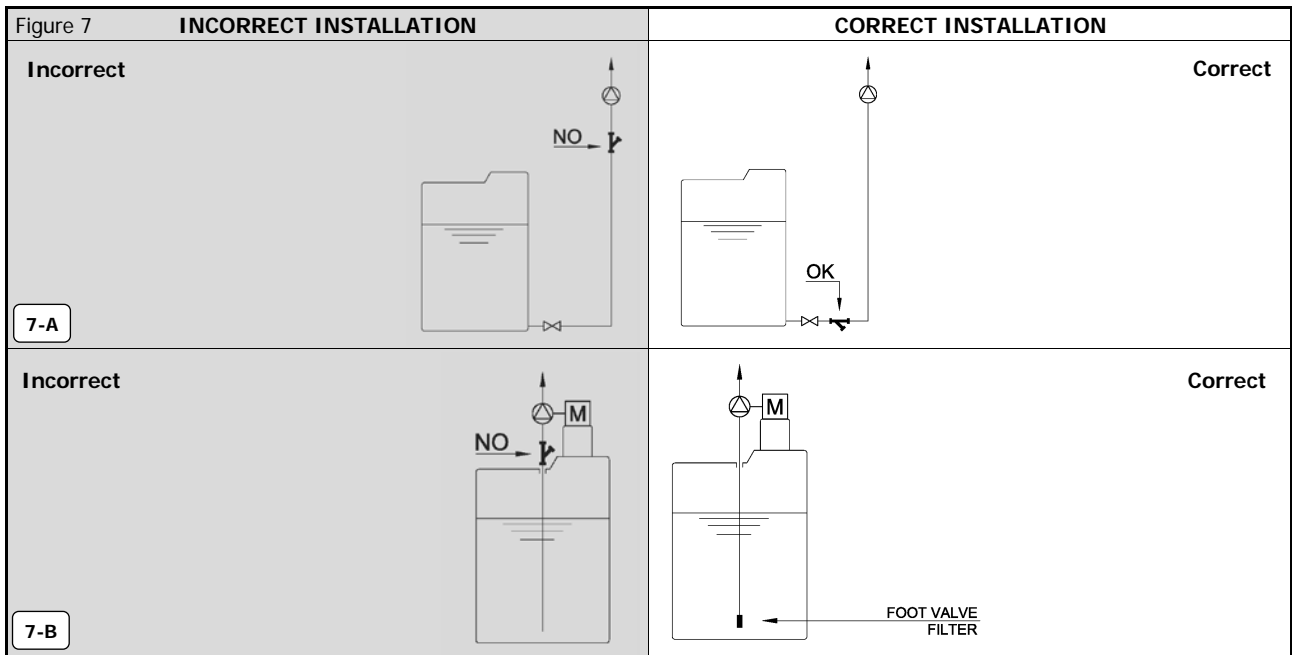


ATTENTION: A small size filter may impede the suction inlet flow, clogging up the pipeline. Use Y filters (a.k.a. Y strainers) with sizes larger than the diameter of pumps suction side connection.

The filter mesh size and characteristics are linked to the nature of the handled fluid and the pump flow rate. For liquids having viscosity not exceeding 200 cps see the table below.

Max. pump flow rate (Q _{max})	Filter mesh (US standard)	Mesh opening (mm)
Q _{max} < 15 l/h	100	0.152
Q _{max} > 15 l/h	60	0.251

To avoid suctioning of impurities, especially in dosing liquids with suspensions, do not suction from the bottom of the tank but lift the suction point 10 cm from the bottom (see previous figure 5-A). Figure 7 shows some examples of filter installation in suction pipeline.



6.2.4 Calibration pot

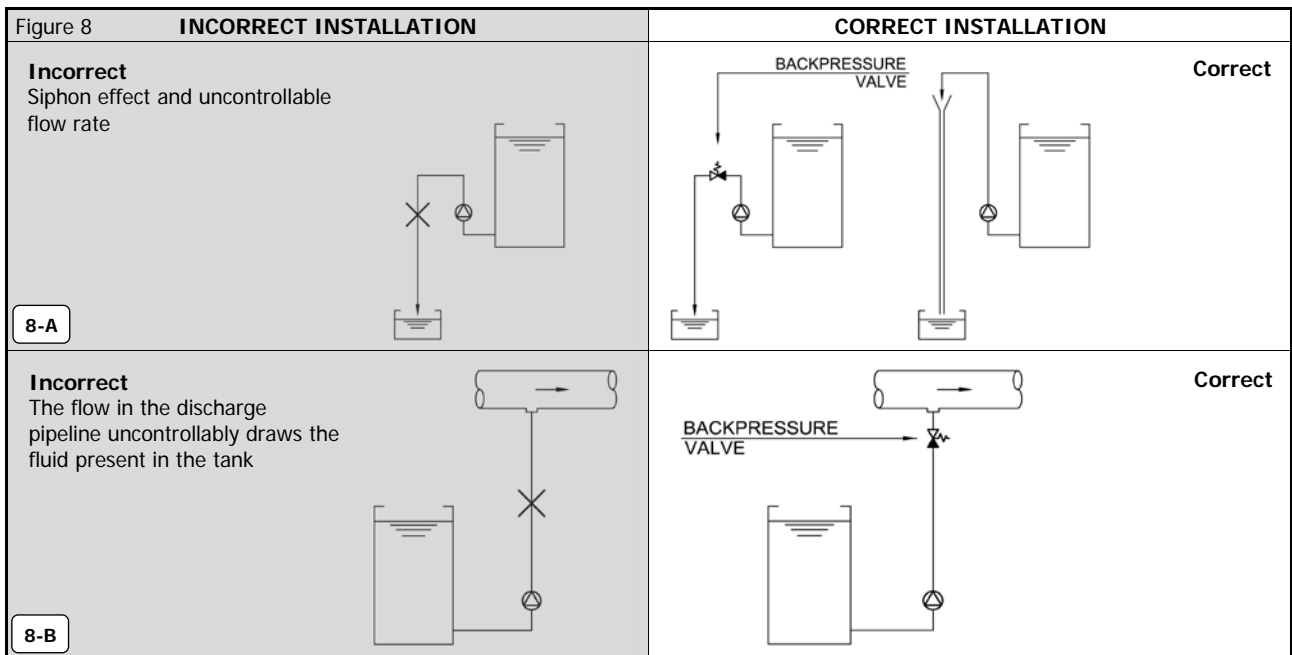
Allows to evaluate the conditions of the valves and check the actual flow rate of the pump in its real operating conditions and especially during the normal operation of the plant, without interrupting the dosing process. Have to be installed on the suction pipeline, between the tank and the metering pump (see figure 11). Is not an essential accessory but it is especially useful in the following cases: dose of hazardous fluids, lack of pulsation dampener on delivery pipeline, difficulty in verifying the pump actual flow rate operating on the delivery pipeline.

6.3 DISCHARGE PIPELINE



Do not install the discharge pipeline or install equipment directly above the pump.

If the fluid level of the suction tank is higher than the delivery reservoir this may trigger the siphoning phenomenon (see Figure 8). The fluid moves in a spontaneous and uncontrolled manner from the suction tank to the discharge tank, **going through the pump without it being able to control the flow rate in any way**. To avoid and prevent this phenomenon we suggest to install a backpressure valve on a discharge pipeline, or else raise the pipeline to break the fluid vein. Discharge pressure must be greater than suction pressure by at least 0.3 bar (0.5bar for small flow rates). See indications shown in figure 8 for discharge pipeline arrangements.



6.3.1 External safety valve

As a general rule, it is always suggested to install an external safety valve on the discharge pipeline, near the pump and before any accessories. This allows an increased safety level at the plant.



The EXTERNAL safety valve on the discharge pipeline is essential when plant pressure can rise quickly, unexpectedly and uncontrollably, regardless of pump operation.

The external safety valve must be installed immediately after pump discharge connection and, in any case, before the ON-OFF valve (see figure 9). The discharge of safety valve must be visible and directed back to the suction tank or into drainage. Avoid connecting the discharge to the pump suction pipeline (recirculation), **especially on small flow rate pumps**. Consider the use of an external safety valve when dosing in a "free discharge / open flow" plant.

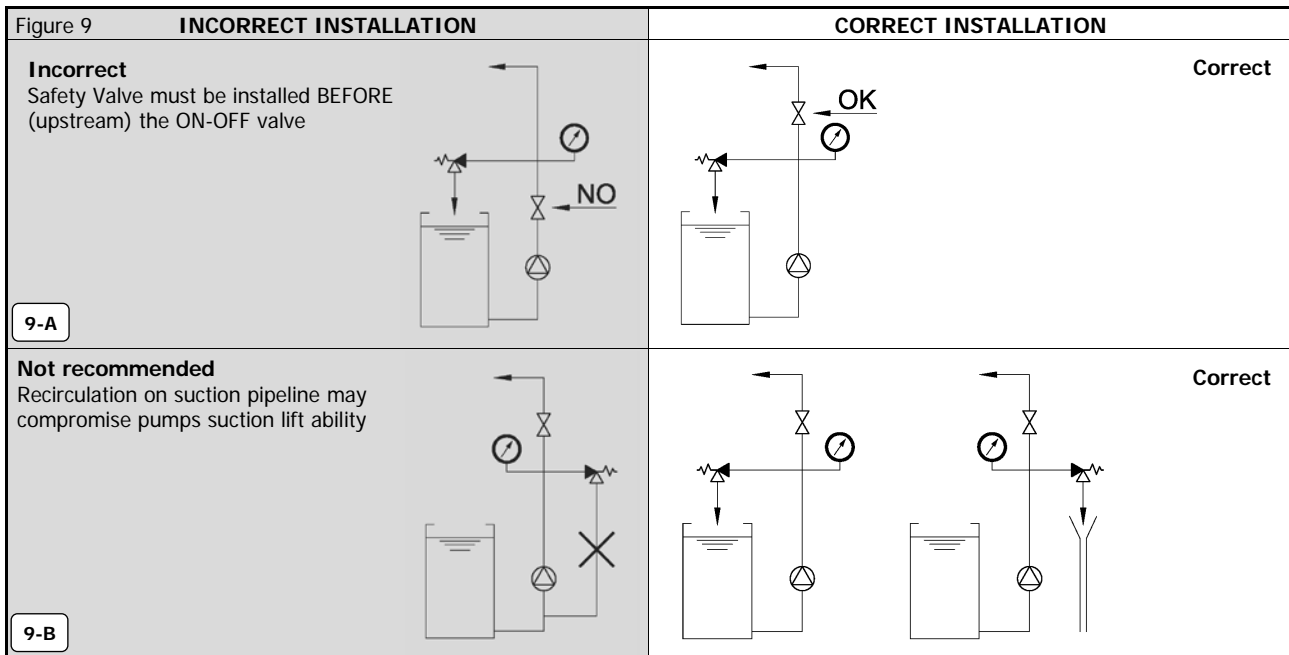
Doing so prevents accidents caused by the following risks:

- freezing or solidification of fluid in the pipeline
- obstruction of the discharge pipeline (flexible pipes)
- variation of fluid viscosity in relation to the temperature
- when dosing the fluid through the injection nozzles
- other unforeseen risks that may cause quick, uncontrolled rise in pressure



ATTENTION: Palsa 6130 pumps are protected by an internal safety valve. To protect the plant we recommend installing an external safety valve on the discharge pipeline.

The external safety valve pressure opening (calibration) must be lower than the internal of the pump (see nameplate).



6.3.2 Pulsation dampener

The pulsation dampener is particularly important to improve the dosing process and the pump operation.

There are various benefits obtained with its installation:

- protects the pump from high pressure peaks (fluid hammer) increasing lifespan of pump
- flow rate becomes continuous with a linear flow, increasing the reliability of the dosing process
- significant reduction of vibrations transmitted along the discharge pipeline
- help in reducing noise emitted by the pump



NOTE: If the process require a continuous type flow rate, is essential to install a pulsation dampener.

The pump, by its nature, generates peaks of pressure in the discharge pipeline. Dosing in "closed loop" (e.g. in static mixers, filter presses, other pressurized piping), although the process does not require constant flow rate/pressure, we recommend installing the pulsation dampener because it absorbs/reduces these peaks by ensuring the correct dosage. These peaks may in fact cause the opening (discharge) of the external safety valve placed on the delivery pipeline or the internal of the pump (in case of hydraulic diaphragm pump), causing a marked decrease of flow rate and therefore to the process.

There are two types of pulsation dampeners on the market:

BOTTLE DAMPENER:

Fluids enters in the dampener and directly compresses the air inside it (without any means of separation).
Dampener volume is approximately 35 times the pump displacement.

Advantages: Less expensive than bladder type dampener. No need for precharge pressure as it self-adjusts.

Disadvantages: Bulkier than the bladder type dampener. Must be installed "vertically" only. Requires periodic maintenance. Must be regenerated periodically by discharging fluid and restoring the air inside.



BLADDER DAMPENER (precharged):

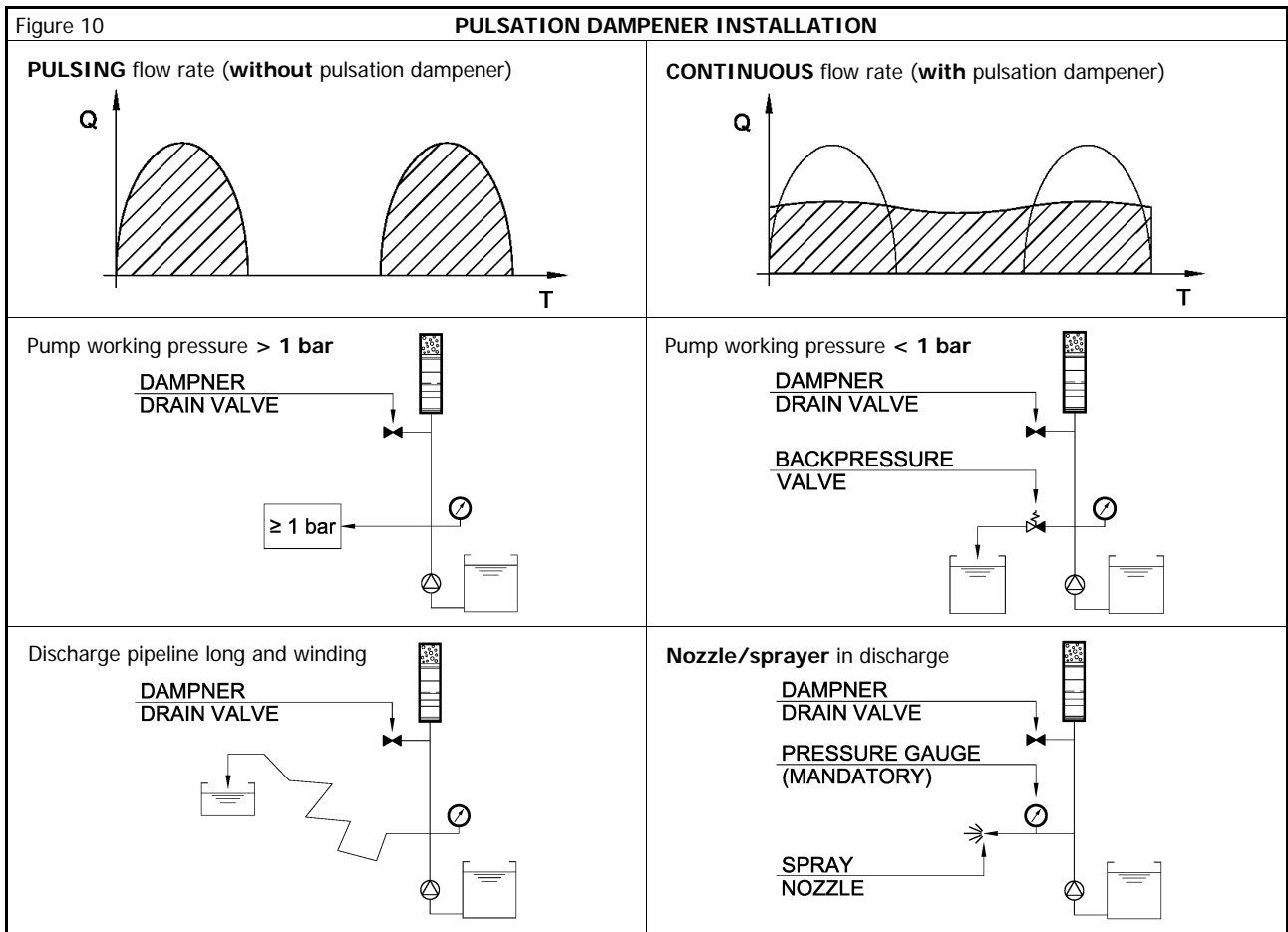
Fluids enters in the dampener and compresses a precharged separation bladder or diaphragm (distension chamber).
Dampener volume is approximately 8 times the pump displacement.

Advantages: More compact than bottle type dampener. Can be installed vertically or horizontally. No need periodic maintenance and not requires to be regenerated as the precharge gas always remains enclosed in the bladder.

Disadvantages: More expensive than the bottle type dampener. It is necessary to know the pump actual operating pressure beforehand to determine the correct bladder precharge pressure. The pump working pressure must always be higher than the precharge pressure.



Figure 10 shows some pulsation dampener examples of installation.



6.3.3 Pressure gauge

Always install a pressure gauge on the discharge pipeline, near the pump, and upstream of any other accessories that may cause pressure increase (see previous figure 10). Allows to control plant conditions and check the pump actual working pressure.



ATTENTION: Knowing the pumps actual working conditions in the plant can avoid equipment damage and, especially, can prevent serious risk to persons or property present in the plant!

Consider the use of a pressure gauge also when dosing in a "free discharge / open flow" plant.

Doing so prevents accidents caused by the following risks:

- freezing or solidification of fluid in the pipeline
- obstruction or accidentally squashing of the discharge pipeline (flexible pipes)

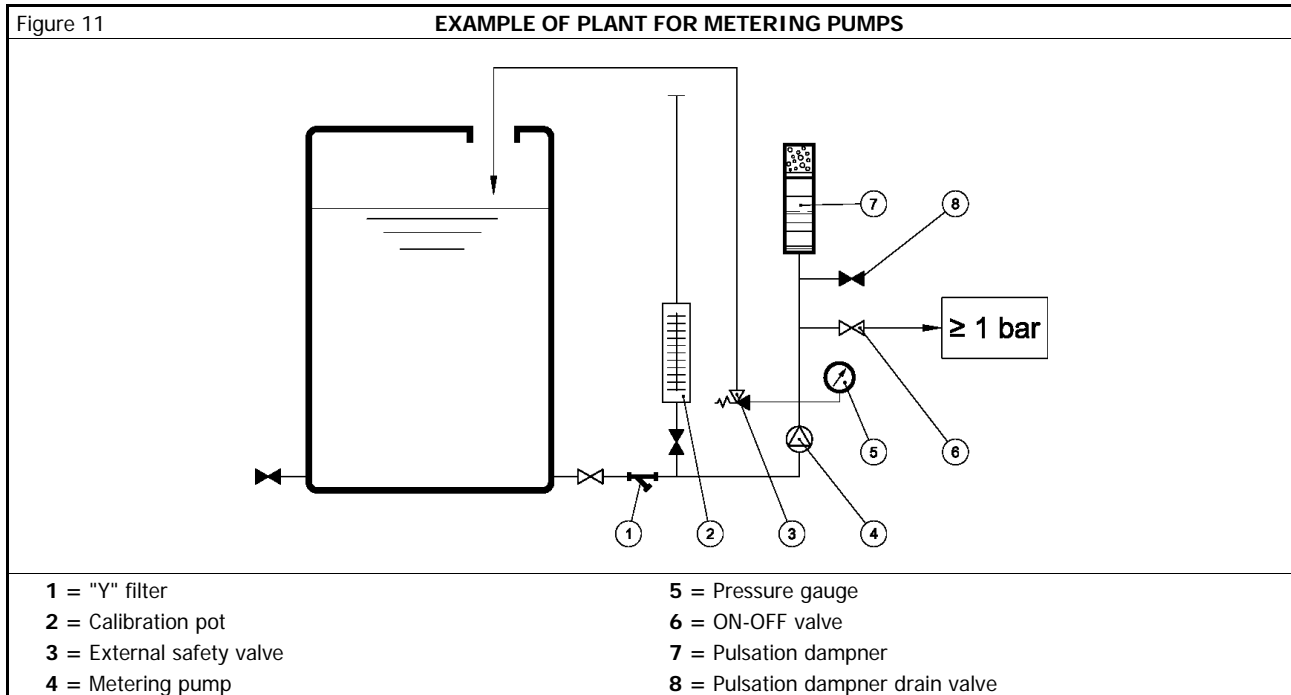
- variation of fluid viscosity in relation to the temperature
- when dosing the fluid through the injection nozzles
- other unforeseen risks that may cause quick, uncontrolled rise in pressure



ATTENTION: The working pressure must never exceed the maximum allowable pressure indicated on the nameplate, even in case of opening (discharge) of external safety valve. Possible damage to pump or plant !

6.4 EXAMPLE OF PLANT FOR METERING PUMPS

All instructions for proper installation of metering pumps are grouped in figure 11.



6.5 ELECTRIC MOTOR INSTALLATION

For pumps explicitly ordered without motor technical requirements to be met are defined during quotation.



NON ATEX pumps supplied without a motor it is the end user's responsibility to install a motor with power, rotational speed and coupling type that meet the technical requirements.



For ATEX pumps supplied without a motor in addition to the above, it is the end user's responsibility to verify and install a suitable motor for the zone classification and characteristics of flammable substances present in the plant.



PULSAFEEDER, INC. DISCLAIMS ALL RESPONSIBILITY FOR DAMAGES TO PERSONS OR PROPERTY CAUSED BY IMPROPER INSTALLATION OF MOTORS.

6.5.1 *Flexible joint coupling*

Motor coupling on the pump is performed by means of a flexible joint. Clean the end of the shaft, lubricate it with oil and then carefully proceed to assemble the half-coupling without banging and with maximum caution.

6.5.2 *Check and change the direction of rotation*

At first start-up of the pump, the direction of rotation of the motor should be checked by authorized, experienced and qualified personnel. An arrow on the motor indicates the correct direction of rotation (**clockwise fan side**).



To reverse the direction of rotation of the motor, exchange the two motor power phase cables. Re-check the motor direction of rotation after this activity.

6.6 DESIGN DATA CHECK

Make sure that pump is suitable for working in the actual operating conditions by checking the following:

6.6.1 *Environmental conditions*

- ambient temperature: check that the actual ambient temperature is consistent with pump characteristics

- b) altitude: pump suction performances could be influenced by atmospheric pressure. Check the real NPIP available (of the plant) in relation to the NPIP required of the pump.

6.6.2 Installation conditions

- a) pump installation and operation should only be carried out under the conditions defined at time of order.
- b) for ATEX pumps: pump classification (group and category) and the temperature class must be suitable for the installation area classification.



Special operating conditions, differing from normal conditions, must always be defined at time of the order, to prevent the pump from working under conditions which may affect proper functioning and compromise safe operation.

6.7 START-UP

Pumps are ALWAYS supplied COMPLETED with lubricant oil (unless explicitly requested). To prevent oil spills during transport is mounted a provisional oil filling blind plug (not vented) attached to the working plug (with bleed) through clamp (see Figure 12).



ATTENTION: Before starting the pump replace the provisional plug with the working plug!

Oil filling is carried out at PULSAFEEDER, INC. before the final test. Pulsa 6130 pumps are hydraulic pumps single-block body in which the diaphragm hydraulic circuit and the system of thrust of the plunger using the same oil; see "Hydraulic/lubricant oil change".

Carry out the first start-up with stroke adjustment at 20% and with the lowest discharge pressure possible; maintain these conditions for at least 5 minutes. Gradually increase the adjustment up to 100%, then place it in the condition required by the process.

During this initial phase, check with a pressure gauge (see "Discharge pipeline - Pressure gauge") the actual pump working pressure. Such value (pointer max. oscillation) must never exceed the maximum pressure value indicated on the pump nameplate.



6.7.1 Checks before start-up

Before starting up the pump check the following:

- a) that there are no product leakages from pump connections nor pipelines plant, especially along the discharge side
- b) the hydraulic/lubricant oil conditions by means of the oil level indicator, see "Hydraulic/lubricant oil check"
- c) the direction of rotation of the motor and that it is protected as provided for by regulations, see "Electric motor installation"
- d) in case of power supply via inverter, that pump has been purchased for said use and that the actual power frequency range complies with the range of frequency from 30Hz to 80Hz allowed and defined by Pulsafeeder, Inc.
- e) correct installation of all possible accessories and their proper operation
- f) that ON-OFF valves along the discharge and suction pipelines are open or closed depending on their function
- g) the liquid to be dosed has not solidified or frozen in pipelines
- h) that is protected from agents such as: sand, corrosive substances, dust and/or fiber, water, mechanical stress and vibrations
- i) that is protected mechanically: indoor installation or outdoor installation considering the damaging effects of weathering, the combined influence of temperature, humidity and condensation

6.7.2 Checks during operation

Once the pump has been started, make sure that operating conditions remain within prescribed limits, in particular check the following:

- a) pump working pressure
- b) motor current absorption
- c) handled fluid temperature, if different from ambient temperature
- d) the entire pump maximum surface temperature (max 40°C for pump reduction gear unit and max 80°C for motor)

Check that pump suitability is maintained whenever changes in operating conditions occur, such as:

- modification of one or more process variables (e.g. working pressure and/or pump flow rate adjustment)
- movement of the pump to a different environment (e.g. from indoors to outdoors)

- dosing of a different fluid from the initial (change of the pump use)
- movement of the pump from a low temperature ambient to another with higher temperature
- change of season or significant climatic variations
- malfunction of possible external safety valve installed on discharge pipeline

6.7.3 **Abnormal conditions**



Pump must be used exclusively for operating conditions determined at time of order. In case of abnormal operating conditions (high motor absorption, excessive surface temperature, high noise and/or vibrations) promptly inform the maintenance staff/manager.



NO RESPONSABILITY IS ACCEPTED FOR DAMAGE OR INJURIES CAUSED BY DEGENERATION OF MALFUNCTIONS NOT IMMEDIATELY RESOLVED OR REPORTED TO PULSAFEEDER, INC..

6.7.4 **Prolonged stops**

If a prolonged period of pump stop is foreseen, take the following measures to preserve pump integrity: Cleaning of chemicals, protection from weathering, etc. (see also "General and surface cleaning").

7. **ROUTINE MAINTENANCE**

Each pump is a reliable, quality product, subjected to a thorough final inspection. In case of malfunction, although pump is installed correctly and operating according to the instructions, do not improvise and immediately contact Pulsafeeder, Inc. customer service.



These maintenance suggestions are not intended as "do-it-yourself" repairs. To perform such works, specialized technical knowledge is required and operations are to be performed by qualified personnel.



Interventions on electrical circuits or equipment must only be performed by qualified electricians or, under supervision, by appropriately trained personnel and in accordance with applicable electrical codes.



In case of ATEX pumps, it is necessary pay particular attention not compromise the pumps suitability characteristics to the plant classified area where it is installed.

7.1 **OPERATING PRECAUTIONS**

All operations must be performed by qualified personnel.

Works on the pump have to be performed after the safety supervisor authorization, after having verified that:

- the power line is disconnected and no parts are energized, including any auxiliaries
- any risk of accidental restart has been excluded
- handled fluid, present in the pump head and pipelines, is not pressurized or chemically dangerous
- with pump switched off**, that the ON-OFF valves on the suction and discharge pipelines are closed
- pump has been adequately cleaned, when operating in environments exposed to aggressive chemicals

Since the machine object of supply is a product designed and intended for operation in industrial areas, **additional measures must be adopted and assured by the person responsible for the installation, should more restrictive safety conditions be required.**



All maintenance work must be carried out on the pump only when the machine is stopped and disconnected from mains supply (including auxiliary circuits). Maintaining original characteristics over time must be ensured by an efficient maintenance and inspection plan, developed and managed by qualified technicians, taking into account the service and the actual environmental conditions in which it operates.



ATTENTION: During the normal operation of the pump the motor casing temperature can exceed 50 °C. Before performing any test or maintenance verify the complete cooling.

7.2 **CONSULTING TECHNICAL DOCUMENTATION**

Before starting work, you should consult this maintenance manual, identify the correct sectional drawing of the pump in use and get all the tools and equipment necessary to perform the maintenance or repair works.

NOTE: When the pump has been disassembled, waiting to be reassembled, it is necessary to protect the various components (particularly those inside the mechanism, paying special attention to the working surfaces of the seals) to prevent damage caused by oxidation or accidental impact.



Improper assembly of the sealing components or ball bearings can anticipate their deterioration and result in malfunction and/or overheating.

7.3 PERIODIC OPERATIONS

As a general rule, after the first start-up, close initial monitoring of the machine is recommended to practically define the maintenance plan and also determine the frequency of general inspections and planned maintenance. Should anomalies or malfunctions occur it is user's responsibility to consider whether maintenance work should be anticipated or not.

7.3.1 Checks of normal operation

During periodic inspections, verify that:

- in case of plunger pumps, there are no leakages of product from plunger packing
- there is no leakage of handled fluid, lubricating or hydraulic oil
- the pump operates properly, without abnormal noises or vibrations
- CE protections (accident prevention) are always fitted



Any defects or irregularities detected during inspection must be promptly solved !

7.3.2 Checks of electrical connections

Power cables, control and grounding cables must not have signs of deterioration and connections must be tight.

7.3.3 Checks of pump connection to plant pipeline

Verify that the connection elements (screws, nuts and bolts, flanges, etc.) are firmly tightened and that relative sealing components are efficient and in perfect condition. During normal operation, pumps can transmit vibrations to pipelines, loosening component connections and causing product leakages. In this case, install a pulsation dampener to reduce pressure peaks, making flow linear and reducing these vibrations.

7.3.4 General and surface cleaning

It is suggested that periodic operations are performed:

- a) if the pump works in a batch dosing system, and the handled fluid tends to coagulate, solidify or crystallize easily, wash the pump head immediately after each working cycle
- b) prevent/eliminate surface deposits of material that can generate scale and encrustations
- c) remove any accidental presence of corrosive product from the external surface of the pump
- d) verify that motor ventilation is not impeded. Remove any possible deposits of dust or fibres from the fins and fan cover.

7.3.5 Protection against corrosion

Dosing of aggressive chemicals or operating in exposed environments (acid atmosphere) may expose the pump to corrosion and the risk of premature wear of sealing components. Periodically check:

- a) that protection covers are always mounted
- b) that operating windows are always properly closed
- c) that there is no oil contamination in the reduction gear that could endanger proper lubrication.

7.3.6 Verification of thermal protections



Make sure that motor thermal overload protection is not excluded and is correctly set. Proper selection and setting of overload protection for ATEX pump motors is essential to ensure the temperature class and safety against explosion dangers.

7.3.7 Painting check (if foreseen)

In a corrosive environment, and every time it is needed, it is necessary check periodically that painting does not show deterioration signs which can jeopardize the equipment protection degree. Repaint the pump every time it is needed in order to protect the external surface from corrosion.

7.3.8 Hydraulic/Lubricant oil check

Pulsa 6130 pumps are always supplied with hydraulic/lubricant oil in the single-block body and ready to run.

Check **daily** that oil level is at the halfway of the oil level indicator and that there are no leaks from dynamic seals or from plugs placed on the pump body. Verify there is no sludge or oil contamination which may compromise the correct lubrication. Replace if necessary (see "Hydraulic/Lubricant oil change").

7.4 **RECOMMENDED SPARE PARTS**

Having spare parts in stock reduces production and product loss.

7.4.1 *Pumps with METALLIC material pump head*

This list is indicative; we suggest proceeding as detailed in "Instructions for requesting spare parts".

Position	Component description	SV *	DV *
2	Plunger seal	1	1
5	Valve seat	2	4
8	Valve seat O-ring	2	4
9	Valve housing O-ring	2	2
15	Valve (sphere)	2	4
48	Diaphragm (sandwich)	1	1
77	O-ring valve guide	2	4

NOTE * Suggested quantity: SV= Single Valve pump head (standard PULSAFEEDER, INC.); DV= Double Valve pump head

7.5 **DISMANTLING, REPLACEMENT AND REASSEMBLY**

The most common fault is caused by the directional valve of a dirty, clogged, worn, or even worse incorrectly mounted.



ATTENTION: In the case of dosing anomalies, BEFORE dismantling the hydraulic system (pump head), verify the actual conditions of pump head directional valves (see "Valve verify and/or replacement").

7.5.1 *Personnel qualifications - Customer service*



Entrust the maintenance, repairs and overhauls to experienced and qualified personnel who will restore the original equipment conditions. For information please contact PULSAFEEDER, INC. customer service.

7.5.2 *Disconnecting electrical connections*

Before disassembling the pump always disconnect all the electrical connections. Make sure that any risk of accidental restart of the machine has been excluded.

7.6 **VALVE VERIFY AND/OR REPLACEMENT**

7.6.1 *Pumps type Pulsa 6130*



NOTE: BEFORE start to disassembly, make sure there is no pressure or high temperature in the pipeline !

Operate with pump OFF. To verify conditions and/or replace the valves proceed as follows (see figure 12):

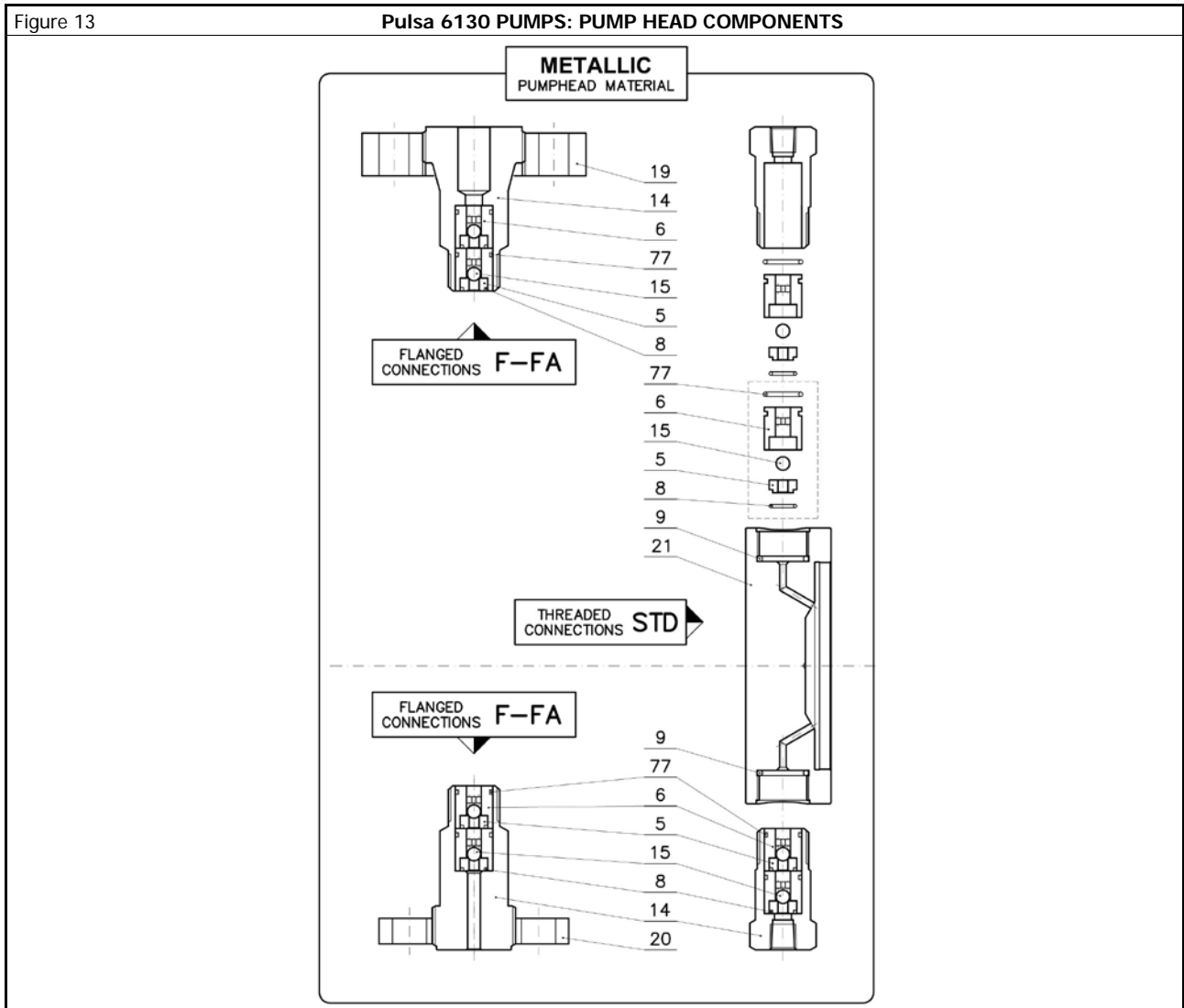
- release the pump from suction and discharge pipeline, and clean adequately
- remove the valve housing **one at a time** (pos.14)
- delicately extract the internal components without damaging them (use a plastic tool)
- carefully observe and check the direction of assembly of each components
- check the cleaning, wear and proper direction of assembly of components
- the ball valve (pos.15) **MUST** be SMOOTH, and not have dents or corrosion signs
- the valve seat (pos.5) must have smooth bevelled surfaces with no dents or signs of wear
- verify the integrity of the O-rings (sealing components) (pos.8; 9; 55; or 77)
- if necessary, replace the damaged components
- reassemble everything exactly as shown in figure 12



ATTENTION: The valve (pos.15) **MUST sit on valve seat (pos.5) on the OPPOSITE side of large bevelled surface.**





Figure 13

Pulsa 6130 PUMPS: PUMP HEAD COMPONENTS



7.7 HYDRAULIC/LUBRICANT OIL CHANGE

Pulsa 6130 series pumps are always supplied with hydraulic/lubricant oil in the single-block body and ready to run.

-  **In multiple pumps each single-block body has its own hydraulic/lubricant oil, independent from the others. Operate individually on each single-block body to change all multiple pump hydraulic/lubricant oil.**
-  **The single-block body contains only one type of oil that carries the dual role of lubricating oil and hydraulic oil.**
-  **For standard version pumps replace oil after every 15,000 operating hours; for ATEX pumps every 10,000 hours. In any case replace the oil every 5 years.**
-  **NOTE: Chemically contaminated lubricants can cause wear, corrosion and leaking seals. Preferably, always replace all the oil rather than do simple topping.**

The oil filling plug (pos.119), the oil level plug (pos.120) and the oil drain plug (pos.121) are all placed on pump single-block body. The following images allow easy identification of the different plugs.

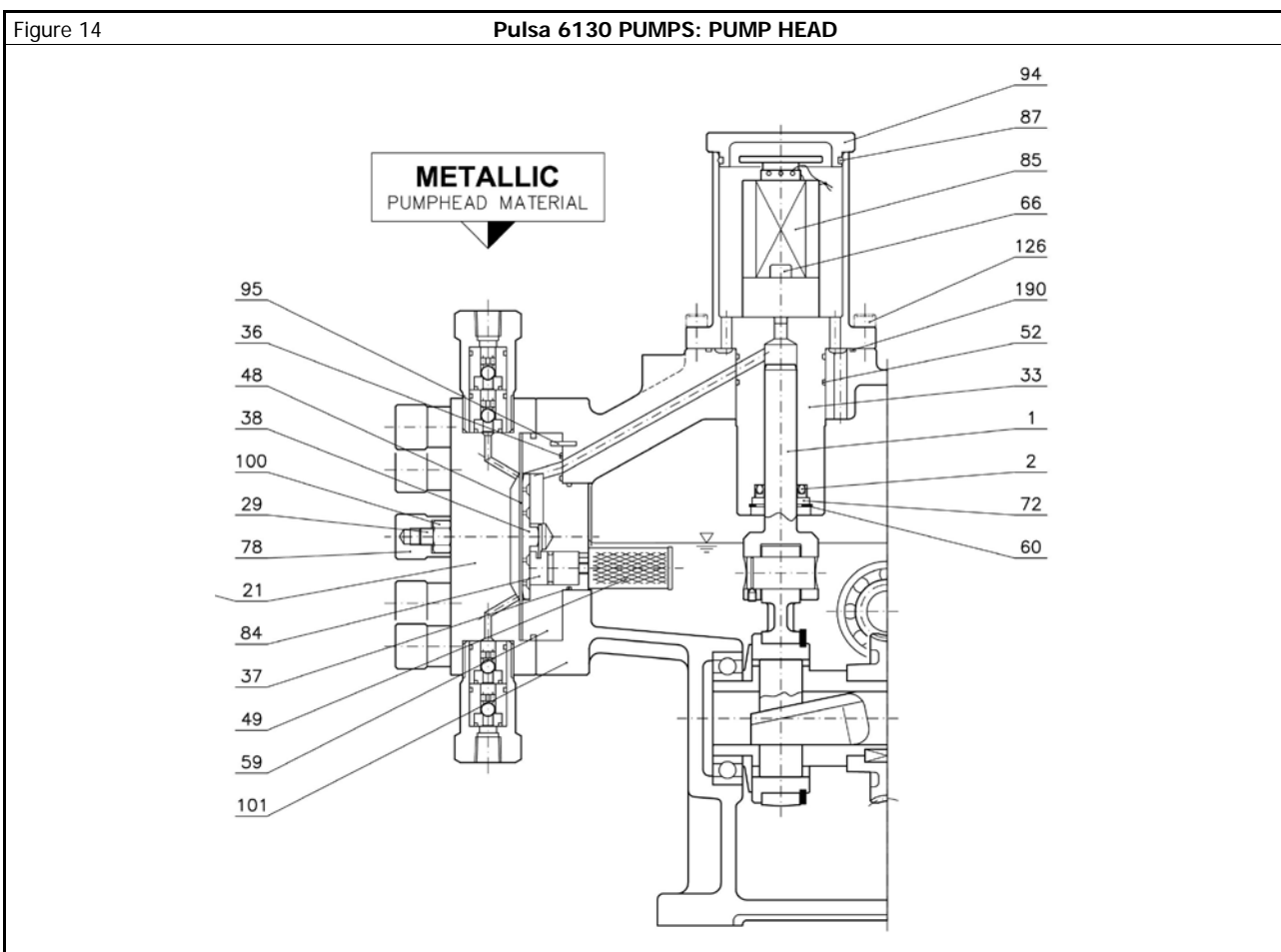


Following table shown quantity and type of hydraulic/lubricant oils suggested:

OIL MAKE	OIL TYPE/NAME	NOTE	PUMP TYPE	QUANTITY (quarts)
MOBIL	PULSALube #6HGS	(1)	PULSA 6130	2.0

! Use hydraulic/lubricant oil different than suggested is permitted only if the characteristics are compatible/equivalent. Use mineral oil with ISO VG 68 viscosity index (68 cSt at 40 °C or 5-6 °E at 50 °C).

If the oil contains sludge or is contaminated replace it. Operations for hydraulic/lubricant oil change are the same for all types of pumps. We suggest, however, reference to following figure 14 during operation.



Operate with pump OFF. Proceed as follows:

- drain all the hydraulic/lubricant oil from the single-block body by removing and cleaning the oil filling plug (pos.119), the oil drain plug (pos.121) and the oil level plug (pos.120)
- refit the oil drain plug (pos.121) and the oil level plug (pos.120)
- pour the new oil until it appears in the oil level plug (pos.120), then refit the oil filling plug (pos.119)
- start up the pump with adjustment at 20% and wait in this condition for at least 5 minutes



NOTE: Before the pump reaches its optimal functioning, wait until the hydraulic oil (just poured into the hydraulic system) bleeds air from the bleed valve and becomes homogeneous. Depending on the diameter of plunger, pumps may require from 1/2 hour (diam. 20-25) to 1 hour (diam. 12-15) of operation.

8. SPECIAL MAINTENANCE

The following guidelines cover the most common "special maintenance" operations that only an expert and trained technician can perform. Avoid impromptu operations or attempts, contact Pulsafeeder, Inc. customer service for specific information.



These maintenance suggestions are not intended as "do-it-yourself" repairs. To perform such works, specialized technical knowledge is required and operations are to be performed by qualified personnel.



ATTENTION: In the case of dosing anomalies, BEFORE dismantling the hydraulic system (pump head), verify the actual conditions of pump head directional valves (see "Valve verify and/or replacement").



Appropriate individual safety devices must always be used to ensure and safeguard the personal safety of personnel, who must also be properly trained and professionally qualified.

8.1 TECHNICAL DOCUMENTATION

If "special maintenance" is not expected, contact PULSAFEEDER, INC. technical service (Tel. +1 585-292-8000, proepo_service@idexcorp.com) to receive:

- detailed and focused informations
- specific instructions copy (if available)
- sectional drawing updated copy

8.2 HYDRAULIC SYSTEM MAINTENANCE

Pulsa 6130 pump hydraulic system is equipped with an air-bleed valve, a mechanically actuated oil replenishing valve and a safety valve.

The three valves ensure that the pump has:

- perfect hydraulic balance, allowing operation without any air bubbles (air-bleed);
- impossibility of oil overloading due to clogging or shut-off of the suction pipeline, preventing the danger of impact of the diaphragm against the front wall of the pump head (mechanical replenishing);
- displacement recirculation in the event of overpressure or shut-off of the discharge pipeline (safety).

8.2.1 Diaphragm rupture signaling

The diaphragm rupture detector, located directly on the pump head, allows the user to know diaphragm conditions.

The "standard" version is a pressure gauge which, during normal pump operation, **must indicate "zero (0) pressure", confirming that the diaphragms are intact.**

Depending on the version, signaling is carried out by means of:

- a pressure variation (standard detector with pressure gauge)
- electrical contact (detector supplied upon request with micro switch, pressure-switch or pressure transmitter)

Signaling can be caused by:

- a presence of air between the two diaphragms
- rupture in one of the two diaphragms



The rupture of one diaphragm does not always prevent the pump to continue to supply flowrate correctly. Within a short time, the maintenance supervisor must however provide a check/replace the diaphragm.

8.2.2 Diaphragm condition check

Proceed as follows to verify if the diaphragm is broken:

- find the sectional drawing of the diaphragm rupture detector installed on the pump
- release the pump from suction and discharge pipeline, and clean adequately
- hermetically seal the discharge valve unit and introduce compressed air (6-8 bar) in the pump head by means of the suction connection. The pressure will compress the two diaphragms together
- "SLOWLY" unscrew and remove the rupture detector locking screws to vent any internal pressure



ATTENTION DANGER ! PROTECT PROPERLY FROM EJECTIONS OF PRODUCT UNDER PRESSURE !

- check for any possible liquid leakage from the detector, checking whether said leakage is OIL or else HANDLED PRODUCT
- if nothing comes out, the diaphragm can be considered intact. See "Diaphragm rupture detector resetting"
- if comes out OIL or HANDLED PRODUCT, replace the diaphragm. See "Diaphragm replacement"

8.2.3 Diaphragm replacement

Since this requires pump head disassembly (hydraulic system) BEFORE operating see "Diaphragm condition check".



ATTENTION: The removal of the pump head causes a loss of hydraulic oil and failure of the whole system ! Carefully assess the actual need for such operation and prepare for oil collection.

Pump head disassembly operation for diaphragm replacement are the same for all types of pumps. We suggest, however, reference to the previous figure 14 during operation.

Operate with pump OFF. Proceed as follows:



NOTE: BEFORE starting to disassemble, make sure there is no pressure or high temperature in the pipeline !

- release the pump from suction and discharge pipeline, and clean adequately
- drain all the hydraulic/lubricant oil from the single-block body by removing and cleaning the oil filling plug (pos.119), the oil drain plug (pos.121) and the oil level plug (pos.120)
- refit the oil drain plug (pos.121) and the oil level plug (pos.120)
- verify the absence of any sludge in the oil and that there is no contamination by the pumped product
- remove both the valve housing from the pump head, then the diaphragm rupture detector



ATTENTION DANGER ! PROTECT PROPERLY FROM EJECTIONS OF PRODUCT UNDER PRESSURE !

- unscrew the locking nuts (pos.100) or screws (pos.29), remove the pump head body (pos.21) and the whole sandwich diaphragm (pos.48)
- before installing the new diaphragm (especially if the original was broken) clean and check the condition of the inside of the single-block body and of the replenishing disk (pos.38) (see previous figure 14) which must be whole and free to move
- check if other internal components of the pump are corroded/damaged and need to be replaced



WARNING: In case some of the internal components of the pump are corroded (even only the diaphragm pinching area), contact PULSAFEEDER, INC. customer service to agree the convenience or otherwise of the repair!

If there are NOT corroded components, but only oil contamination:

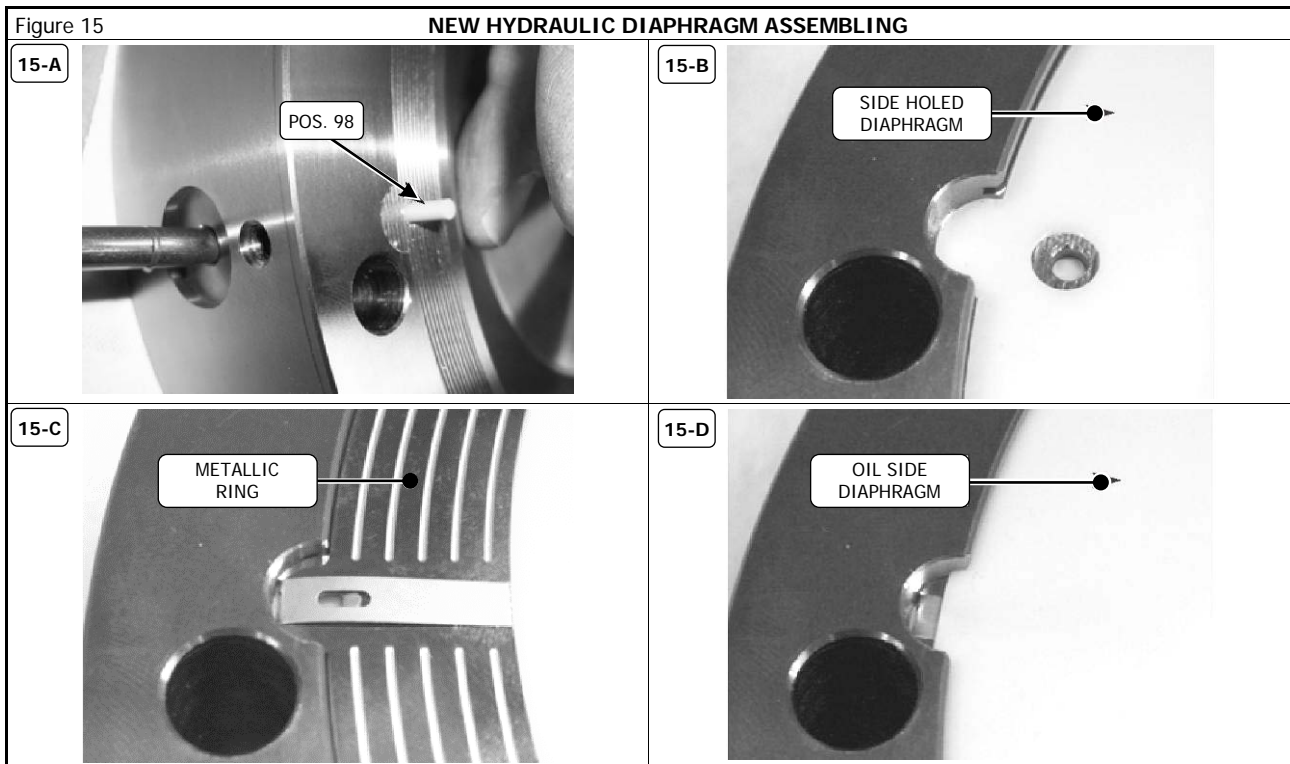
- remove the inspection cover (pos.94), clean and dry the internal of the upper cover (pos.33)
- remove the safety valve locking screw (pos.66). Extract, wash and blow with compressed air the whole safety valve (pos.85), without breaking the seal nor dismantling into its component parts



ATTENTION: The internal safety valve is set and sealed by Pulsafeeder, Inc. at the end of final testing. Do not remove the seal, do not disassemble the PSV, do not tamper with or, worse, operate directly on the internal components. These actions could compromise the safety of the plant and of personnel and will also void the guarantee.

- disassemble from single-block body the internal components in contact with the contaminated oil, clean them properly and verify the actual conditions. If necessary, replace the damaged components
- after the single-block body internal components reassembly, verify the free movement of the rupture detector shutter (pos.98), introducing compressed air in the related hole in the pump head (see figure 15-A)
- assemble into the head body the new diaphragm (pos.48) (see figures 15-B/C/D) taking SPECIAL ATTENTION to position the sandwich diaphragm ring with the hole toward the pump head and to correctly insert the oil side diaphragm in the relative groove

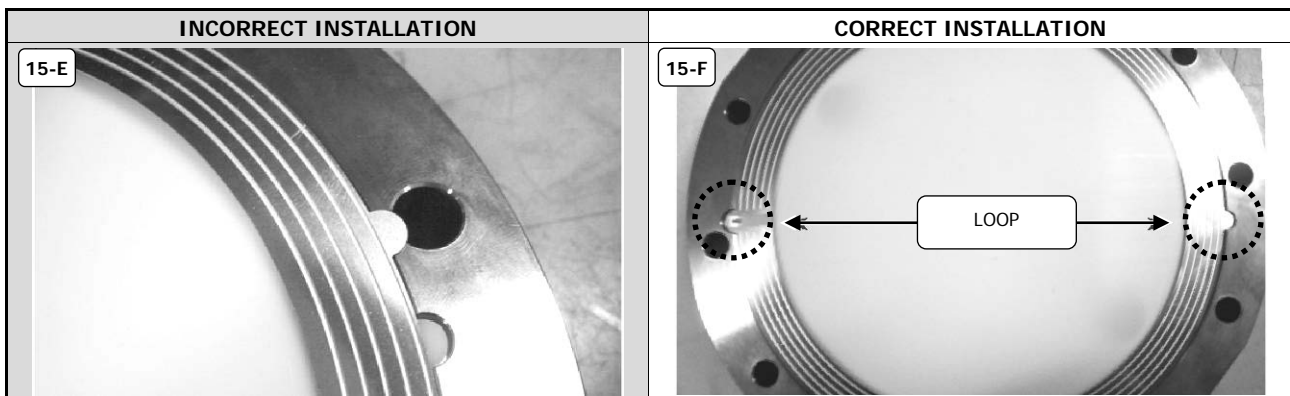
- clean and reassemble the pump head (pos.21) following the instructions in reverse order and figures relative the type of pump
- fasten the pump head with locking nuts (pos.100) or screws (pos.29); see "Pump head tightening torque"
- reassemble the diaphragm rupture detector on the pump head; see "Diaphragm rupture detector resetting"



In order, first insert the product side holed diaphragm (15-B), then the metallic ring (15-C), then the oil side diaphragm (15-D).



ATTENTION: Correct assembly of the diaphragms and metallic ring is guided by the sides on the pump head



- pour the new oil until it appears in the oil level plug (pos.120), then refit the oil filling plug (pos.119)
- start up the pump with adjustment at 20% and wait in this condition for at least 5 minutes



NOTE: Before the pump reaches its optimal functioning, wait until the hydraulic oil (just poured into the hydraulic system) bleeds air from the bleed valve and becomes homogeneous. Depending on the diameter of plunger, pumps may require from 1/2 hour (diam. 20-25) to 1 hour (diam. 12-15) of operation.

8.2.4 Pump head tightening torque values

The table below shows the tightening torque for correct pinching the diaphragm and locking the pump head.

The values are purely indicative and refer to temperatures indicated in "Ambient and design temperature".

For assembly of the pump head, proceed as follows:

- Pull the head body to the single-block body and hand-tighten the screws.
- Following a "cross" tightening scheme, tighten each screw to the torque value specified in the table.
- Proceeding clockwise, tighten each screw again (one time at least) until reaching the tightening uniformity.

Nut (pos.100) Screw (pos.29) *	METALLIC pump head material
M 8	25 Nm
M 10	45 Nm

* (pos.29): For metallic pump heads material is a **8.8 stud bolt**.

8.3 **DIAPHRAGM RUPTURE DETECTOR RESETTING**

BEFORE operating see "Diaphragm condition check". Proceed as follows to reset the diaphragm rupture detector:

- check and, if necessary, adjust the pump head tightening torque (see "Pump head tightening torque value")
- hermetically seal the discharge valve unit and introduce in the pump head compressed air (6-8 bar) by means of the suction connection. The pressure will compress the two diaphragms together, causing the expulsion of air
- wait in this condition for at least 5 minutes
- refit the detector (check the integrity of the pressure gauge and ensure that, when mounted, it indicates "zero (0) pressure")
- restart the pump after having reconnected it to the plant and reopened the valves on the suction and discharge pipelines
- monitor diaphragm rupture detector conditions after the restart of the pump

If another signaling is given, it is **reasonable to assume that one of the diaphragms is broken**. It will therefore be necessary to disassemble the pump head to "physically" check the actual diaphragm conditions. See "Diaphragm replacement".

8.4 **CHANGE OF INTERNAL SAFETY VALVE SET PRESSURE**

The set pressure value of the internal safety valve (PSV) is indicated on the pump nameplate, see "Identification nameplate". When this operation is required, however, it must be performed only by expert, qualified maintenance engineers with highly specialized knowledge. Without said expertise avoid impromptu operations or attempts.



ATTENTION: PULSAFEEDER, INC. declines all responsibility for any damage caused by modifications on or tampering with the PSV by non-authorized users. Before operating on the PSV, contact Pulsafeeder, Inc. customer service to define new limits of use that will be guaranteed only after a new nameplates fixed to the pump.



ATTENTION: The internal safety valve is set and sealed by Pulsafeeder, Inc. at the end of final testing. Do not remove the seal, do not dismantle the PSV, do not tamper with or, worse, operate directly on the internal components. These actions could compromise the safety of the plant and of personnel and will also void the guarantee.

If modifying PSV set pressure is required and necessary, contact Pulsafeeder, Inc. technical service (Tel. +1 585-292-8000, proepo_service@idexcorp.com) stating the following:

- type of metering pump (complete model number)
- metering pump serial number or Pulsafeeder, Inc. Order Number (as an alternative to the serial number)
- the actual PSV set pressure value (indicated on metering pump nameplate)
- the new set pressure value required

9. **OTHER INFORMATION**

9.1 **TROUBLESHOOTING GUIDE**

The tables below are not exhaustive. They contain possible causes and suggested remedy for the most common and recurring faults.

9.1.1 ***Flowrate lower than expected***

POSSIBLE CAUSE	REMEDY
- Air enters from suction pipeline fittings	- Check suction pipeline and tighten the fittings
- Low level of hydraulic/lubricant oil	- Check
- The pump still has the provisional oil filling blind plug (non-vented)	- Replace with the working plug (with bleed) attached to the pump through clamp (see figure 12)
- Air trapped inside the pump head	- Set, and maintain for a short time, pump flowrate to 100% of adjustment
- Suction head (suction lift) too high	- Reduce the suction head (suction lift)
- Vapour tension too high	- Increase the hydrostatic head on suction side
- Pumping temperature too high	- Increase the hydrostatic head on suction side
- Handled fluid viscosity too high	- Change suction pipeline with one of a larger diameter - Increase the hydrostatic head on suction side
- Suction tank sealed and/or without vent	- Make a vent on top of suction tank

- Suction pipeline clogged or closed by valves	- Check suction pipeline and valves
- Filter on suction pipeline clogged	- Check and if necessary clean the filter
- Pumps valves dirty, worn or reassembled in wrong direction	- Check the cleaning, wear and proper direction of assembly of pump valves
- Pump working pressure exceed internal safety valve pressure setting	- Check if the safety valve opens or not
- Safety valve pressure setting is too low	- Check if the safety valve opens or not
- Wrong flow rate adjustment setting	- Check and if necessary correct the adjustment setting

9.1.2 Flow rate irregular or higher than expected

POSSIBLE CAUSE	REMEDY
- Suction pressure higher than discharge pressure	- Increase the discharge pressure at least 0,3-0,5 bar (3-5 meters) respect to the suction pressure
- Backpressure valve stuck in open position because of dirty or set pressure is too low	- Verify backpressure valve conditions
- Pump valves jammed in open position	- Verify pump valves, dismantle and clean them carefully

9.1.3 Overheating of pump body and/or motor

POSSIBLE CAUSE	REMEDY
- Incorrect electrical connections	- Check electrical connections and motor power consumption
- Actual pump working pressure higher than the maximum allowed	- Install a pressure gauge on the discharge pipeline to verify and reduce actual pump working pressure
- Discharge pipeline may have reduced section causing a drastic increase of working pressure	- Reduce the working pressure or install a pulsation damper to stabilize pressure (avoid the peaks)
- Plant pipelines transmits stress to the pump connections	- Verify and if necessary correct the pipeline connections to the pump
- Discharge pipeline clogged or valve closed	- Check the discharge pipeline
- Backpressure valve set pressure is higher than maximum allowed	- Check the backpressure valve
- Low level of lubricant oil or chemically contaminated	- Check and if necessary change the lubricant oil

9.2 DISCONNECTION FROM THE PLANT AND SENDING TO PULSAFEEDER, INC. FOR MAINTENANCE

BEFORE shipping, always contact Pulsafeeder, Inc. customer service and operate as indicated in "Mandatory instruction for returning goods in Pulsafeeder, Inc.".

9.3 STORAGE FOR LONG PERIODS

For long term storage (more than 6 months), in addition to those described in "Storage conditions" it is necessary to observe the following precautions:

- Before storage: protect unpainted surfaces with long-term anti-corrosion products
- Verify the conditions about every 6 months. At the first sign of corrosion clean and re-apply anti-corrosion products



Particular storage conditions should be previously reported, in order to provide a suitable packaging.

9.4 DISPOSAL AND DEMOLITION

The pumps are made of metal and plastic parts. It is the end user's responsibility to respect the procedures and regulations in the country of operation, regarding disposing correctly of waste resulting from maintenance (consumption material) or the demolition of equipment. "Waste" means any substance or object that the holder intends, or requires to discard. Waste is classified according to their origin in "urban waste" and "special waste" and also according to their harmfulness, in "dangerous waste" and "non-dangerous waste".



Waste deriving from pumps maintenance or demolition, only if properly cleaned, are classified as "special waste". Otherwise they are to be considered as "DANGEROUS special waste".



Mixing "special waste" with "urban waste" is forbidden, and especially mixing "dangerous waste" with "non-dangerous waste"

Briefly summarized:

- Do not dispose of "special waste" as "urban waste"
- "special waste" must be subject of separate collection using public or private collection systems according to local laws (transferred to appropriate collection points approved)
- according to its use, the equipment may contain dangerous substances. Improper disposal may have adverse effects on human health and the environment
- fines are provided in case of misuse or improper waste disposal



It is strictly forbidden to dispose of waste in the sewage system or leave waste in the environment. Contact your local waste disposal service to receive adequate and correct information.

10. MANDATORY INSTRUCTION FOR RETURNING GOODS TO PULSAFEEDER, INC.



ATTENTION: PULSAFEEDER, INC. WILL NOT RECEIVE ANY GOODS WITHOUT PREVIOUS AUTHORIZED RETURNED MATERIALS AUTHORIZATION (RMA)!

In the interest of the customer/user, please contact Pulsafeeder, Inc. technical service (Tel +1 585-292-8000, proepo_service@idexcorp.com) to acquire the RMA.

Following directions apply to ANY reasons for returning goods to Pulsafeeder, Inc., e.g.:

- Servicing, maintenance, upgrading, retrofitting;

- Functional/Performance check, checking of Warranty applicability;
- BRAND NEW goods return and application for credit note due to wrong ordering

10.1 **MANDATORY DIRECTIONS FOR SENDER**

- **BEFORE** shipping anything to PULSAFEEDER, INC., **ALWAYS** contact Pulsafeeder, Inc. customer service (+1 585-292-8000, proepo_service@idexcorp.com) to have **RMA number** (authorization number to return goods to Pulsafeeder, Inc.), returning informations **and related forms**;
- **DIAPHRAGM pumps: Only remove the valve units from the pump head, DO NOT remove the pump head body;**
- **In general: ALWAYS** remove any residual products from each pump. To guarantee safety at work for Pulsafeeder, Inc.'s staff disassemble and clean each individual component wetted and attach them in a separate package;



ATTENTION: Parts considered "hazardous" for improper cleaning will be replaced and quoted as a new spares

- **Insert in the packing** (courier often keep them): a copy of shipping documents and for each equipment, copy of duly fill-in declaration of conformity for shipping and of Material Safety Data Sheet of pumped/handled fluid;
- Pack the good in a proper manner to avoid damage during transit, and clearly indicate **RMA number** on packing;
- Ship goods as instructed on the **RMA number** to: Pulsafeeder, Inc., Inc. 2883 Brighton Henrietta TL Rd. Rochester, NY 14623 USA.



NOTE: The sender is aware of the penalties provided for unfaithful statements and falsity in acts. Is also responsible for damage to persons or property resulting from such actions.

10.2 **CLEANING OF EQUIPMENT**

Take appropriate and adequate protection measures to ensure and guarantee safety at work for the operator.

In the case of machines working with chemicals product (e.g. acids) pay the greatest attention to the most appropriate choice of liquid to do this operation properly and safely, and also preserve the integrity of the machinery.



Present information does not replace any existing standard or requirement for safety. Pulsafeeder, Inc. declines any responsibility for damages to persons or property.

10.3 **GOODS REJECTED FROM SENDER**

If Pulsafeeder, Inc. receives the goods:

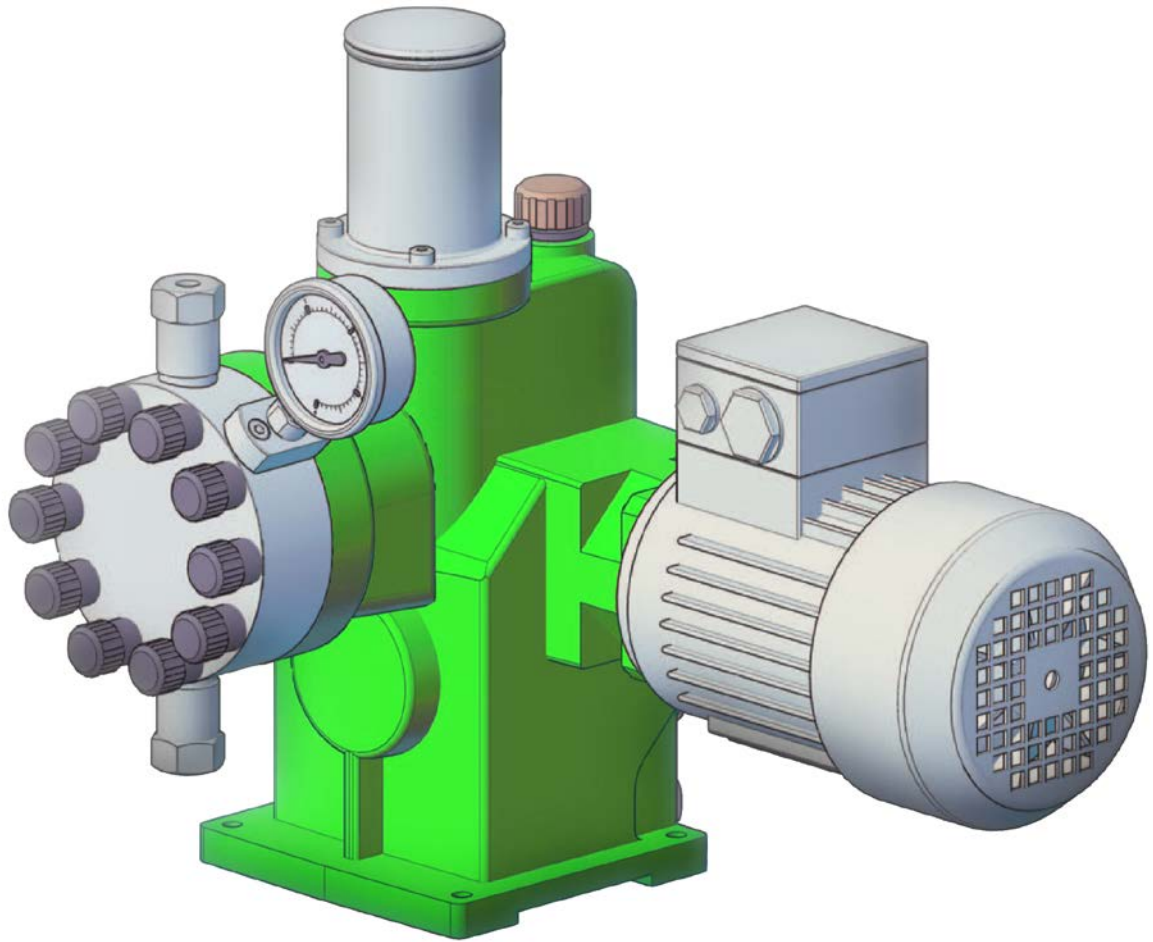
- Not properly cleaned
- PUMPS: With pump head not properly cleaned and dismantled
- WITHOUT an RMA number (authorization number) on shipping documents and/or on the packing itself
- With chemicals in the packing



They WILL NOT be accepted (no service will be done) and will be sent back at sender's expenses!

11. **OVERALL AND SECTIONAL DRAWINGS**

Considering the importance of such documents (subject to changes or updates) we believe that they should not be an integral part of the present instructions manual.



PULSA[®] 6130

PROCESS HYDRAULIC DIAPHRAGM METERING PUMPS

Bulletin #: IOM-PUL-6130-001



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