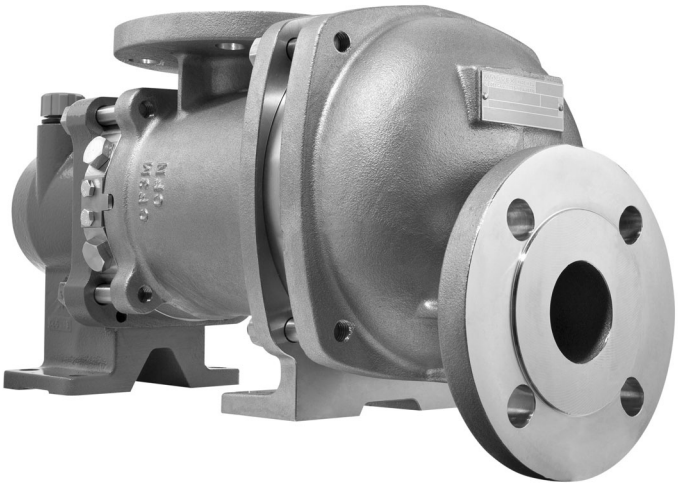
INSTRUCTIONS 1004-B00 e

Section	1004
Effective	June 2025
Replaces	April 2019

Original instructions

SLC 4 i HT - SLC 8 i HT PUMPS



INSTALLATION

OPERATION

MAINTENANCE

EC CERTIFICATE OF CONFORMITY :

The EC Certificate of Conformity (paper version) is systematically attached to the equipment when shipped.

WARRANTY :

SL Series pumps are covered 24 months by warranty within the limits mentioned in our General Sales Conditions. In case of a use other than that mentioned in the Instructions manual, and without preliminary agreement of MOUVEX, warranty will be canceled.

a DOVER company

Z.I. La Plaine des Isles - F 89000 AUXERRE - FRANCE
Tel. : +33 (0)3.86.49.86.30 - Fax : +33 (0)3.86.49.87.17
contact.mouvex@psgdover.com - www.mouvex.com

Your distributor :

ECCENTRIC PISTON PUMP
MOUVEX PRINCIPLE
SAFETY INSTRUCTIONS, STORAGE, INSTALLATION AND MAINTENANCE
SLC 4 i HT - SLC 8 i HT MODELS

TECHNICAL CHARACTERISTICS

- Maximum pump speed : **750 rpm**

- Running temperatures :
  - ambient .....-15°C → + 40°C
  - continuous pomped product : .....-15°C →..+160°C
  - washing / rinsing / sterilisation product :.... 0°C → +160°C
  - heating fluid (jacket).....-15°C → .+180°C

- Maximum suction pressure :
  - In normal use, the suction pressure must be higher than the required NPSH and **less than 1,5 barg** (21,75 psig).
  - During **CIP/SIP** of the pump, the suction pressure must not exceed **3 barg** (43,5 psig).
  - Pump **stopped**, the pressure must not exceed **6 barg** (87 psig).

- Acceptable maximal differential pressure :
  - SLC4 i HT .....10 bar (145 psi)
  - SLC8 i HT ..... 6 bar (87 psi)

- Maximum pressure jacket : **5 barg (72,50 psig)**

- Cylinder capacity :
  - SLC4 i HT .....0,108 litre
  - SLC8 i HT .....0,178 litre

Definition of safety symbols

This is a SAFETY ALERT SYMBOL.
When you see this symbol on the product, or in the manual, look for one of the following signal words and be alert to the potential for personal injury, death or major property damage.

DANGER

Warns of hazards that WILL cause serious personal injury, death or major property damage.

WARNING

Warns of hazards that CAN cause serious personal injury, death or major property damage.

CAUTION

Warns of hazards that CAN cause personal injury or property damage.

NOTICE

Indicates special instructions which are very important and must be followed.

USED PRESSURE UNITS

Unit without suffix :
Differential pressure, for example, pressure difference between equipment suction and discharge.

Unit with suffix "a" :
Absolute pressure.

Unit with suffix "g" :
Gauge pressure, given regarding to atmospheric pressure (~101325 Pa, taken at 1 bar / 14,5 psi in this IOM).

Example :
P_{suc} = -0,2 barg = 0,8 bara
P_{dis} = 8,8 barg = 9,8 bara
$\Delta P = P_{dis} - P_{suc}$ = 9 bar

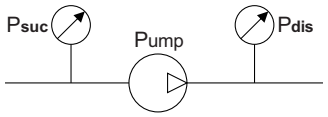


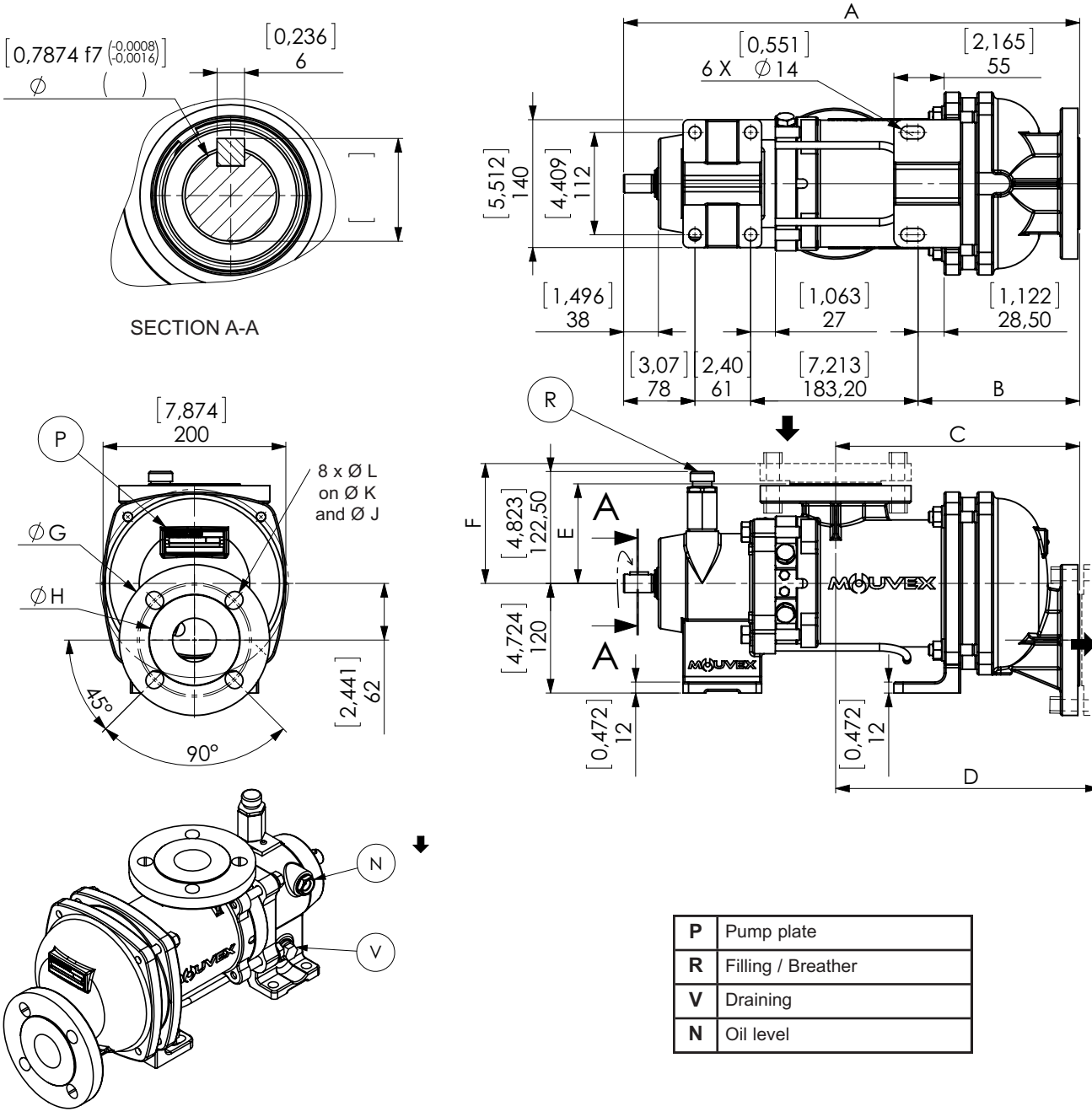
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1. OVERALL DIMENSIONS

SLC 4 i HT - SLC 8 i HT

Standard

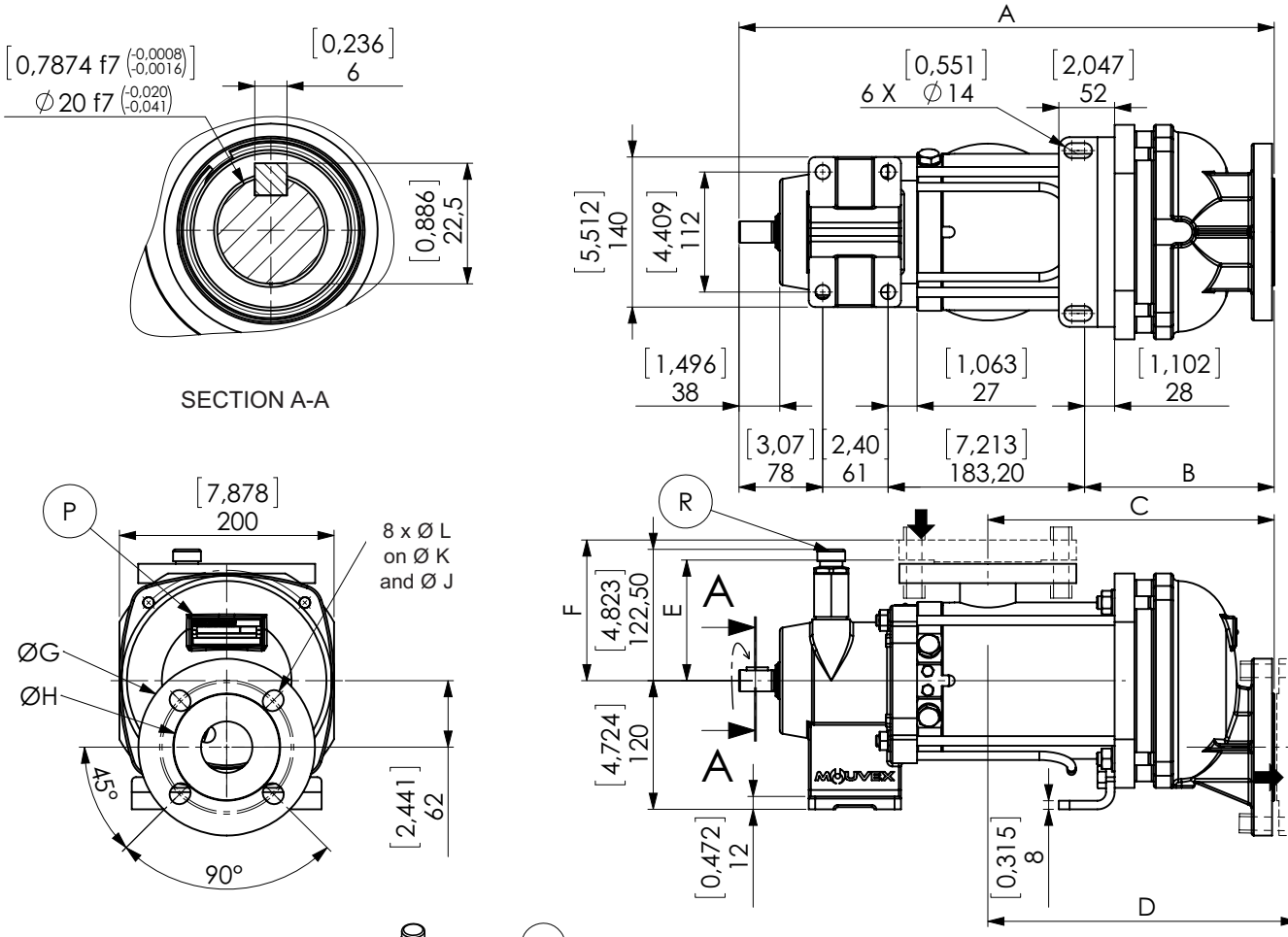


P	Pump plate
R	Filling / Breather
V	Draining
N	Oil level

		Flanges												
		DN	A	B	C	D	E	F	ØG	ØH	ØL	ØJ	ØK	Weight kg [lb]
PN16 - PN 20 ISO 7005-1	SLC4	50 [1.969]	499 [19.646]	177 [6.969]	267 [10.512]	287 [11.299]	109 [4.291]	129 [5.079]	165 [6.496]	100 [3.937]	18 [0.709]	120,5 [4.744]	125 [4.921]	40,5 [90]
	SLC8		516 [20.315]	194 [7.638]	284 [11.181]	304 [11.969]								43 [95]

SLC 4 i HT - SLC 8 i HT

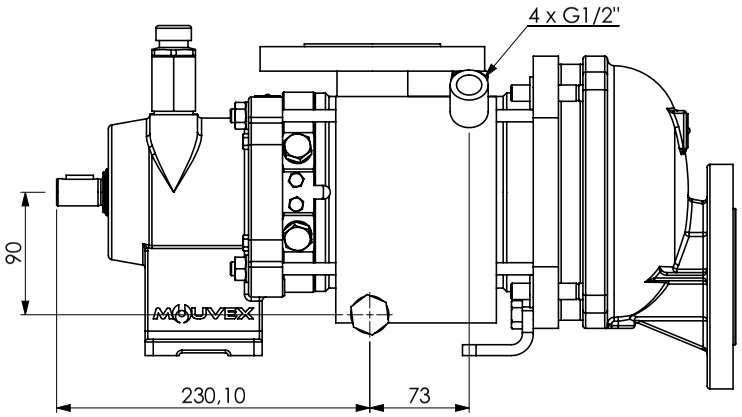
Turn able manifold

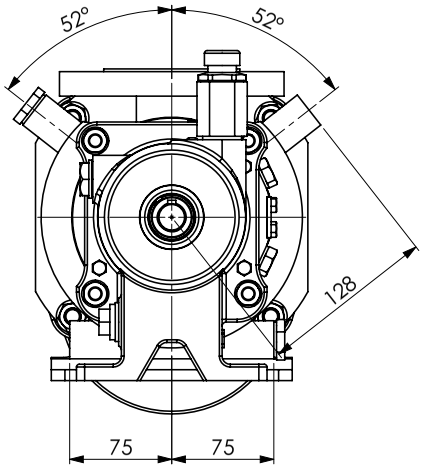


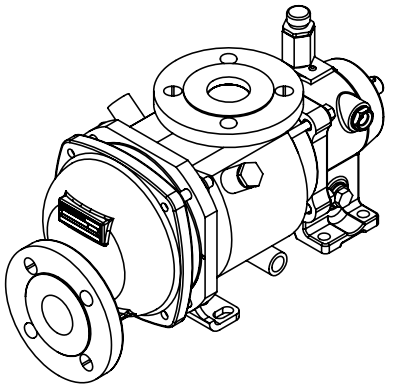
P	Pump plate
R	Filling / Breather
V	Draining
N	Oil level

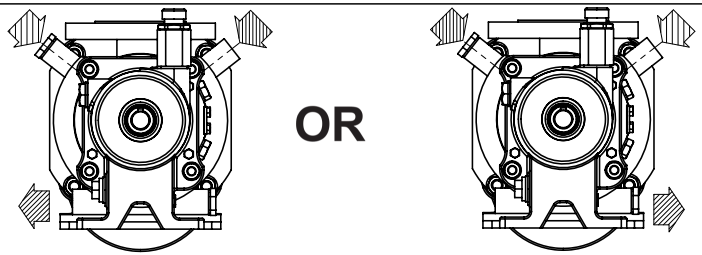
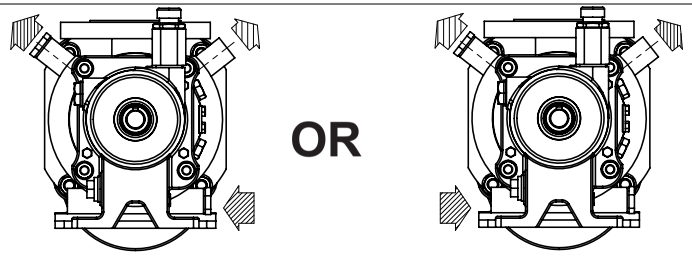
		Flanges												
		DN	A	B	C	D	E	F	ØG	ØH	ØL	ØJ	ØK	Weight kg [lb]
PN16 - PN20 ISO 7005-1	SLC4	50 [1,969]	499 [19,646]	177 [6,969]	267 [10,512]	287 [11,299]	109 [4,291]	129 [5,079]	165 [6,496]	100 [3,937]	18 [0,709]	120,5 [4,744]	125 [4,921]	40 [89]
	SLC8		516 [20,315]	194 [7,638]	284 [11,181]	304 [11,969]								42,5 [94]

SLC 4 i HT - SLC 8 i HT
with heating jacket







JACKET CONNECTION	
STEAM	 The entry connection may be connected to one or two points.
LIQUID	 The outlet connection may be connected to one or two points. If it is done at 1 point, purge the air at the second point.

NOTICE :

For the other sides, see the specific overall dimension plan for the connection.

Maximum jacket temperature : FKM and FEP encapsulated FKM seals : 180°C

Maximum pressure jacket : see TECHNICAL CHARACTERISTICS.

CAUTION :

The pumped product must not exceed the temperature of 160°C.

On jacketed pumps, suction port can only be in position 2 (top).

Positions 1 and 3 (sides) are not possible.

FOR ATEX PUMPS, SEE INSTRUCTIONS NR 59218.

2. INSTALLATION

2.1 Installation design

2.1.1 Pump

To obtain the service expected from a MOUVEX pump, regarding both performance and longevity, it is vital that the type of pump, its speed and the materials used for its construction are determined as a function of the pump output, its installation and operating conditions.

You can contact our Technical Services at any time to ask for the information you require.

2.1.2 Pipe

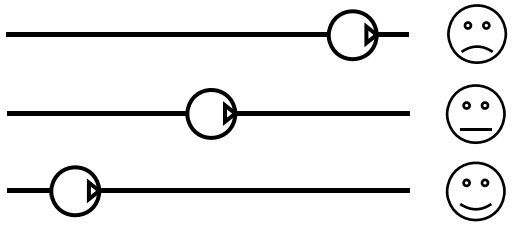
Not recommended

To be avoided if possible

Recommended

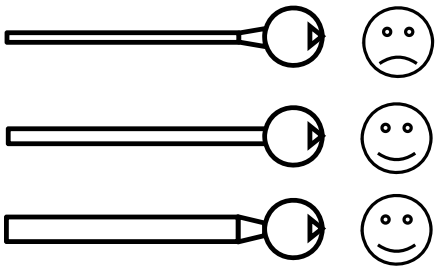
Suction pipe length

Length should be as short as possible.



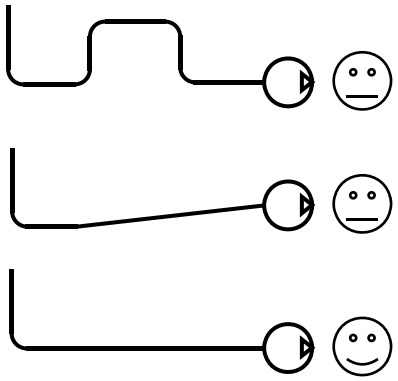
Suction pipe diameter

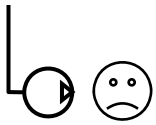
Diameter must be at least equal to pump port diameter and even more if required by pumping conditions.

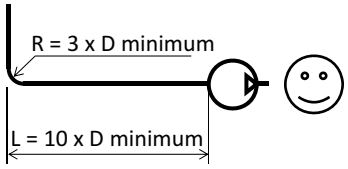


Suction pipe configuration

Check tightness to avoid accidental air intake.

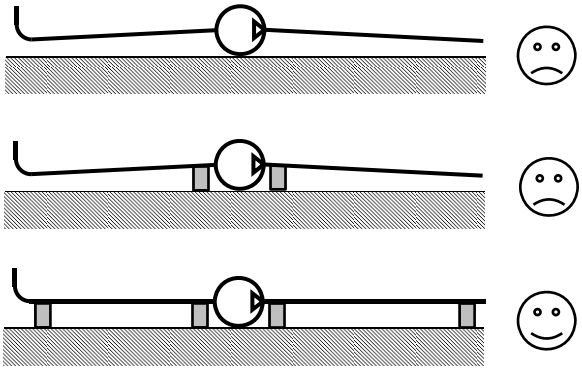






Pipe alignment and supporting

Pump must not support piping nor endure stress resulting from piping weight or dilatation effects. For latters, expansion loops should be included.

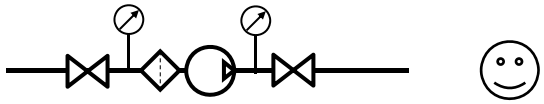


Pipe equipment

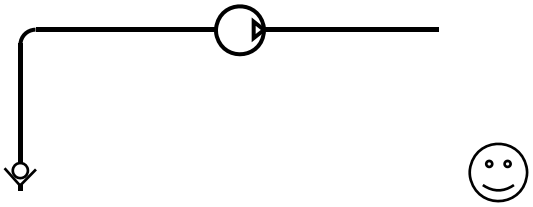
• Place valves close to the pump to avoid draining pipe during maintenance operations. Preferably select full bore ball or butterfly valves.

Pressure connections on pump suction and discharge are recommended for settings and controls.

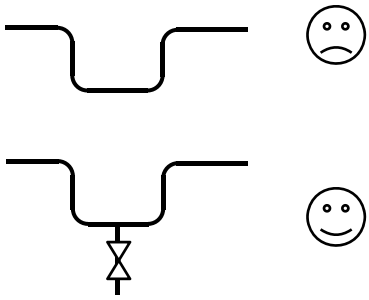
Make sure piping, vessels valves and other installation devices are carefully cleaned before mounting.



• MOUVEX pumps are self priming. However, if line emptying should be avoided and/or if suction lift is high, a foot valve can be added.



• If pumped liquid presents a risk of in pipe solidification and potential dilatation, low points on the pipe should be avoided or equipped with drain valve.



• If installation is heated, it must be designed so that fluid dilatation can evacuate through piping. Therefore fluid contained in piping must be heated before fluid contained in the pump. Also check that a heated pump is not isolated by closed valves.

The SL Series pump is a selfpriming volumetric PD pump. Therefore, the pump must not run on a circuit with a closed valve. This is valid both for the suction circuit and for the discharge circuit.

For hoses fitting on pump suction or discharge, a hose whip restrain device must be installed to limit the whip or travel of the pressurized hose at start up, or in case the hose breaks free.

WARNING: SEVERE PERSONAL INJURY OR PROPERTY DAMAGE CAN CAUSE FROM WHIPPING HOSES.

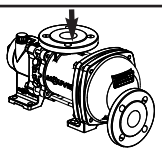
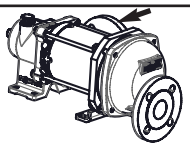
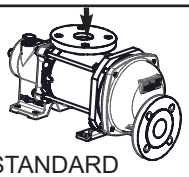
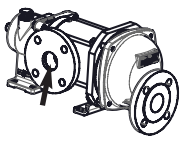
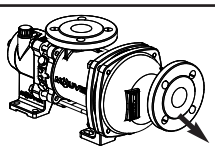
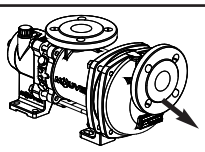
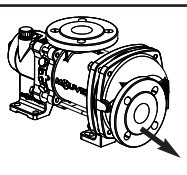
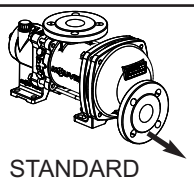
2.2 Orientation of the pump ports

The suction and discharge ports may be oriented in various positions.

If the ports positions needs to be changed at any time, see the corresponding paragraph.

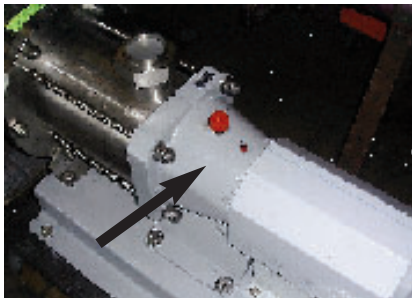
NOTICE

SL Series pumps remains drainable whatever position is chosen for the inlet port, but the outlet port must be at the bottom (position 4) to keep the self-draining capability.

	POSSIBLE POSITIONS Pumps with heating jacket : see § OVERALL DIMENSIONS - Heating jacket			
SUCTION (standard inlet manifold)	**1**	 **2** STANDARD		
SUCTION (turn able inlet manifold)	 **1**	 **2** STANDARD	 **3**	**4**
DISCHARGE	 **1**	 **2**	 **3**	 **4** STANDARD

2.3 Direction of rotation

When looking at the shaft, the rotation will be clockwise. When looking at the front cover, the direction of rotation will be anti-clockwise. An arrow situated on the bearing housing indicates the correct direction of rotation.



Verification of the correct rotation direction :

- Run motor briefly to ensure proper direction of rotation. This verification can be performed without presence of liquid in the pump.

⚠ WARNING

When checking with presence of liquid in the pump, make sure discharge and suction pressure do not exceed authorized limits.

2.4 Protection of the pump installation

- Before any start-up, during operation or complete stopping of the pump, make sure the valves are open.
- During stop periods, with the pump full of product, either the suction or discharge circuit must be left open to enable expansion or contraction of the pumped product through reheating or cooling. If this instruction is not complied with, the bellows may be damaged and lead to premate failure.
- The stop time may lead to cooling of the product in the pump and therefore to an increase in viscosity. If this is the case, we recommend re-starting the pump at a speed adapted to this new viscosity (starting pump). Once the product arrives in the pump at the installation definition temperature, the pump may run at the speed specified for this application.
- Protection against excess pressure :

  The pump must be protected against excess pressure. It can be delivered with a pressure switch to carry out this function.

  If protection is provided by a control valve, check that the system does not generate excess pressure at the bellows (particularly if there are water hammers). Operating in this way would damage the bellows and shorten their lifetime.

⚠ WARNING	
 Hazardous pressure can cause personal injury or property damage.	INCORRECT SETTINGS OF THE PRESSURE RELIEF VALVE CAN CAUSE PUMP COMPONENT FAILURE, PERSONAL INJURY, AND PROPERTY DAMAGE.

⚠ WARNING	
 Hazardous pressure can cause personal injury or property damage.	FAILURE TO INSTALL ADEQUATELY SIZED PRESSURE RELIEF VALVE(S) CAN CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

⚠ WARNING	
 Hazardous pressure can cause personal injury or property damage.	PUMPS OPERATING AGAINST A CLOSED VALVE CAN CAUSE SYSTEM FAILURE, PERSONAL INJURY AND PROPERTY DAMAGE.

- Protection against foreign bodies :

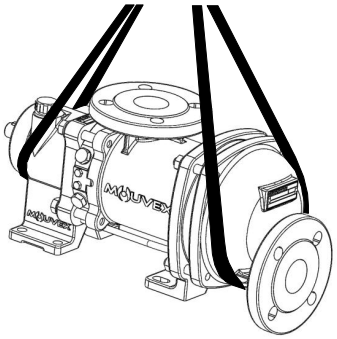
  The pump and the installation must also be protected against any risk of damage through the passage of foreign bodies by mounting a prefilter at the pump suction.

  In the case of foreseeable clogging of the pre-filter, we recommend using a vacuum switch to inform the user of pre-filter clogging. Prolonged running under cavitation may damage the pump.

  The largest dimensions of the allowable particles in the pump are :
  - Soft particles : .....6,5 mm
  - Hard particles : .....2,0 mm

2.5 Hoisting devices

Hoisting points :



Take care of possible additionnal equipments mounted on the pump.

2.6 Unit Assembly

The following instructions apply to pumps delivered with a bare shaft or for MOUVEX motor-driven pump units (if the latter have no specific instruction notice).

2.6.1 INSTALLATION OF UNITS

WARNING	
 The weight ot the parts can be dangerous and may provoke bodily injuries or material damages.	BE CAREFUL WITH THE WEIGHT OF THE PARTS WHEN THEY ARE BEING REMOVED.

WARNING	
 Dangerous voltage. Can cause injury and death.	DISCONNECT THE ELECTRICITY SUPPLY BEFORE ANY MAINTENANCE OPERATION.

The base on which the unit is mounted is fundamental to ensure correct operation and long service life.

The unit base must be flat, level and sufficiently resistant to absorb the stresses caused by the motor-driven pump unit without deformation (if it is made of concrete, it must comply with the BAEL 91 standard).

If the unit is fastened using securing lugs or bolts, it must be carefully wedged to avoid deforming the frame while the bolts are tightened. A deformed frame would apply damaging stresses on the pump and the drive mechanism and misalign the coupling, causing vibrations, noise and premature wear. Ensure that the frame is well above the floor, except from the support plates.

If the unit is to be used in a food environment, support plates that allow the unit to be lifted for easier cleaning are recommended.

Allow, if possible, a clear space of approximately 50 cm on each side of the motor-driven pump unit (overall dimensions) to facilitate cleaning and give access if necessary to the pump, reduction gear and motor fastening nuts. In all cases, the dimensions around the motor-driven pump unit must be designed to give the space required for dismantling the pump (if the need arises, use the values given on the overall dimension drawing).

For staff and equipment protection, the frame includes a ground connection point that should be used.

2.6.2 ALIGNMENT OF THE MOTOR/PUMP OR REDUCTION GEAR/PUMP SHAFTS

WARNING	
 Do not operate without guard in place.	IF OPERATED WITHOUT THE SHAFT GUARD, THERE IS CONSIDERABLE RISK OF SEVERE PERSONAL INJURY, SIGNIFICANT PROPERTY DAMAGE OR EVEN DEATH.

WARNING	
 Dangerous voltage. Can cause injury and death.	DISCONNECT THE ELECTRICITY SUPPLY BEFORE ANY MAINTENANCE OPERATION.

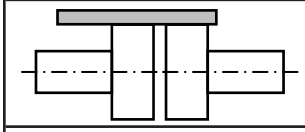
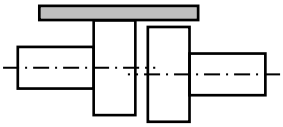
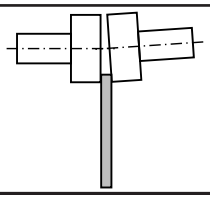
NEVER START A UNIT IF THE COUPLING ALIGNMENT IS INCORRECT. THIS IS A CONDITION OF OUR GUARANTEE.

REMINDER :

Coupling must never be used to compensate for a misalignment.

To control the alignment between the coupling and the shaft, use a straight-edge for concentricity and thickness gauges for angular misalignment (see instructions of the coupling for authorised values).

The 3 figures below show in detail the operation and the possible defects :

Carry out the control at four points : at the top - at the bottom - left - right	
	*Correct*
	*Bad alignment*
	*Angular fault*

Controlling the alignment at each stage of the installation is important to be sure that none of these stages have generated stresses on the unit or the pump :

- after fastening on the foundations.
- after fastening the pipes.
- after the pump has been operated at the normal operating temperature.

Where the pumps are supplied assembled as a unit, the motor and pump shafts have been perfectly aligned in the factory before delivery, but they must be systematically controlled on acceptance at the site and realigned if necessary.

To do this, do not modify the wedging of the various parts, but check the flatness of the support surface and use the adjustable foot to clear the frame of stresses that could affect it.

2.6.3 ELECTIC MOTORS

WARNING	
	DISCONNECT THE ELECTRICITY SUPPLY BEFORE ANY MAINTENANCE OPERATION.
Dangerous voltage. Can cause injury and death.	

Check the compatibility of the instructions on the motor with the supply voltage.

Follow the wiring diagram, use wiring that is appropriate for the power and be particularly careful about the contacts which must be well tightened.

The motors should be protected with circuit breakers and suitable fuses. Connect the regulatory electrical grounding.

2.6.4 THERMIC MOTORS

CAUTION	
	THE SURFACES CAN BE AT A TEMPERATURE LIABLE TO CAUSE INJURY OR SEVERE DAMAGE.
Excessive temperature can cause injury or severe damage.	

Do not forget that these motors are not reversible. It is absolutely necessary to carefully control the suction and discharge sides of the pump before connecting the group to the piping.

Using electric motors is very common now; however, we strongly advise careful reading of the accompanying instruction manual.

2.6.5 CONTROL OF THE SENSE OF ROTATION

WARNING	
	TAKE ALL NECESSARY MEASURES TO RENDER ANY START-UP, EVEN ACCIDENTAL, OF THE PUMP DURING THE WORK IMPOSSIBLE.
Any unforeseen start-up can cause serious injuries or important material damages.	

WARNING	
	IT IS IMPERATIVE THAT THE HYDRAULIC PRESSURE IS RELEASED BEFORE EACH MAINTENANCE OPERATION TO AVOID PERSONAL INJURY OR MATERIAL DAMAGE
Hazardous pressure can cause personal injury or property damage.	

WARNING	
	IF OPERATED WITHOUT THE SHAFT GUARD, THERE IS CONSIDERABLE RISK OF SEVERE PERSONAL INJURY, SIGNIFICANT PROPERTY DAMAGE OR EVEN DEATH.
Do not operate without guard in place.	

This control needs to be done with no liquid pumped through the pump, and both the suction and discharge circuits venting to avoid generating unexpected pressure (at the suction side, for example). This will ensure that the control will not damage either the pump or the installation.

Start the pump empty to check that the connections are good and that the direction of rotation corresponds to the suction and discharge direction on the installation. If it is necessary to reverse the direction of rotation, follow the instructions below :

Three-phase motor : switch any 2 current input wires.

Bi-phase motor : switch two same phase wires.

Single-phase motor : follow the instructions on the notice supplied with the motor.

3. UTILISATION

3.1 Noise level

The sound level of a pump is greatly influenced by its conditions of use. Cavitation and pumping products with high gas contents generally increases the sound level.

Under the following pumping conditions :

- excluding cavitation
- discharge pressure :
  - SLC4 i HT ..... 10 bar (145 psi)
  - SLC8 i HT ..... 6 bar (87 psi)
- speed of rotation 750 rpm
- product viscosity of 10 cSt

The sound level reached for the SLC 4 i HT / SLC 8 i HT pump in good conditions without the drive is less than 79 dB(A).

3.2 Commissioning

Make sure that the circuit valves are open before starting the pump.

To avoid any risk of polluting the product to be pumped, rinse the whole installation before starting-up so as to eliminate any contaminants that may remain in the piping, tanks etc. at the time of installation.

For any pure water pumping during process or cleaning operations, consult MOUVEX imperatively.

3.3 Dry running

The SL Series pump is self priming and is capable of emptying the pipes. To do this, it can run dry for a maximum duration of 5 minutes.

3.4 Pump stop

So as not to damage the pump, make sure that the pump is completely stopped before closing the valves.

3.5 Scrapping

The pump must be scrapped in compliance with the regulations in force.

During this operation, particular care must be paid to the drainage stages of the pump (pumped product) and of its transmission (lubricant).

4. CLEAN IN PLACE (CIP) & STERILISATION IN PLACE (SIP)

4.1 General

On-site cleaning (CIP) of an installation is undertaken by circulating various cleaning solutions through the equipment parts.

An automated CIP system enables :

- Preparation of the appropriate concentrations for the different cleaning solutions.
- Re-heating of certain cleaning solutions at the optimum temperature.
- Circulation of the different solutions through the equipment parts to be cleaned.
- Rinsing and drying of the equipment parts.

For the most part, automated CIP systems are an integral part of process equipments.

Before starting CIP and if the process has not been followed by a water flush, care must be taken that a minimum of residual products remains in the piping and in the pump. The SL Series pumps, thanks to their excellent suction and compression capabilities, enable reducing the quantities of residual products. This minimises loss of products, eases cleaning and reduces cycle times.

The SL Series pumps are perfectly adapted to all processes necessitating CIP. By complying with the installation rules described above, these pumps will give you entire satisfaction for a long time.

The start of CIP must immediately follow the end of the process to avoid any clogging or untimely drying.

SL SERIES PUMPS MUST NEVER BE USED AS CIP PUMPS.

Non-compliance with this instruction may lead to rapid wear of cylinder and piston.

4.2 CIP circuit recommended

In all cases, the pressure at the pump inlet during cleaning must not exceed 3 barg (43,50 psig).

The flow through the pump required for optimal cleaning is **10 m³/h**.

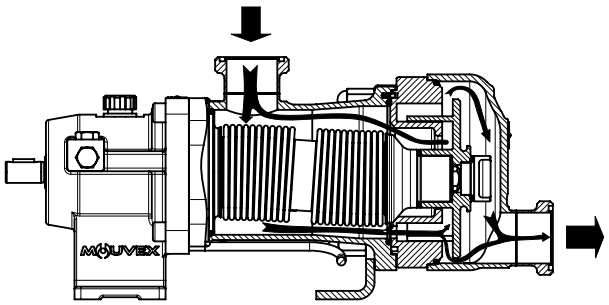
This flow corresponds to difficult cleaning (sticky and viscous products). It can be reduced for easier types of cleaning.

The pressure required to raise the piston is 0,7 bar (10,40 psi). This pressure difference is accounted for by the pressure losses.

4.3 Pumps arranged in series

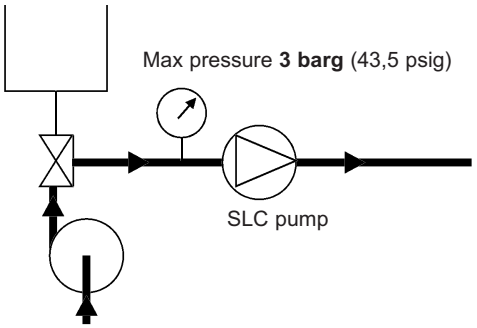
This type of assembly is preferred in all cases. It ensures optimal cleaning for the pump and makes use of the special design of the SL Series, i.e. the possibility of lifting the piston with the cleaning product.

As the pressure at the pump inlet is higher than that at its outlet, the piston lifts from the cylinder and permits the passage of all the cleaning liquid through the SL Series pump.



- A pump (centrifuge for example) is used for CIP cycles. This pump is placed upstream of the SL Series pump.

  The pump must be installed in series with the SL Series pump.

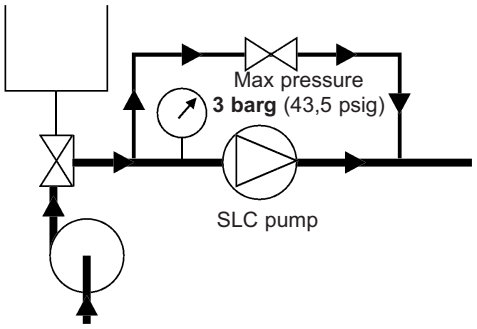


It is preferable not to run the SL Series pump during CIP although low speed (< 100 rpm) is acceptable by alternating start/stop operation.

- In certain cases, the flow of the cleaning liquid required for the installation is higher than that recommended for cleaning the pump. In this case, a bypass must be used.

  The bypass valve is adjusted to divide the flow between the circuit flowing through the SL Series pump and the bypass circuit.

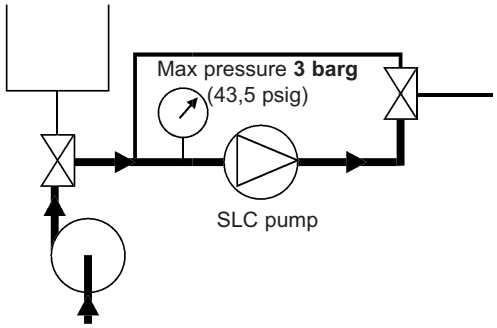
4. CLEAN IN PLACE (CIP) & STERILISATION IN PLACE (SIP) (continued)



It is preferable not to run the SL Series pump during CIP, although low speed (< 100 rpm) is acceptable by alternating start/stop operation.

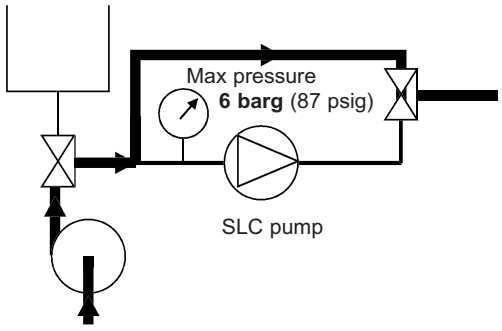
- In certain cases, the cleaning pressure required for the installation is higher than 3 barg (43,5 psig). In this case, the use of a bypass is required and cleaning is done in 2 steps.

Cleaning the pump :
The cleaning flow should be limited during the cleaning of the C pump to ensure a maximum pressure of 3 barg (43,5 psig) at the C pump inlet.



It is preferable not to run the SL Series pump during CIP although low speed (< 100 rpm) is acceptable by alternating start/stop operation.

Cleaning the installation :
During this operation, the valve system used must ensure that no flow can pass through the pump so that the SL Series pump does not rotate. Under these conditions, with the pump completely stopped, the pressure of the washing circuit can rise up to 6 barg (87 psig).

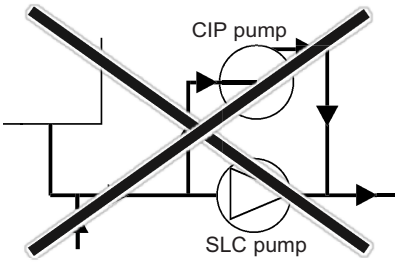


The pump must not run during this operation.

4.4 Pumps arranged in parallel

For applications where cleaning is easy and the differential pressure of, the SL Series pump is lower than 2 bar (29 psi) during this operation, assembly in parallel is authorised. It should be noted that during cleaning, the SL Series pump will be acting on a product with generally few lubricating properties. This will contribute towards wear of the pump.

The CIP centrifuge pump must never be installed in parallel with a SL Series pump without taking special precautions.

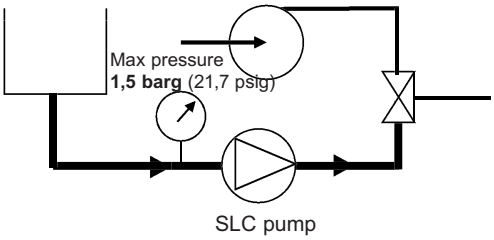


Indeed, in this case, the pressure at the inlet of the SL Series pump is lower than the pressure at the discharge and the piston remains forced against the cylinder. Therefore, there the SL Series pump no longer provides a passage. Its efficient cleaning can no longer be ensured and the cylinder/piston pair will become prematurely worn.

Authorised assembly :
As mentioned previously for applications where cleaning is easy, assembly in parallel is authorised when the valves are installed so that the cleaning pressure of the circuit does not come into contact with the SL Series pump.

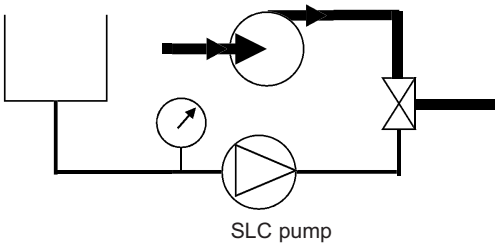
In this case, the SL Series pump cleans itself.

Cleaning the pump :



We recommend limiting the rotation speed of the SL Series pump.

Cleaning the installation :



The SL Series pump is stopped when cleaning the installation.

4. CLEAN IN PLACE (CIP) & STERILISATION IN PLACE (SIP) (continued)

4.5 Successive cycles

Generally, the most efficient CIPs comprise 5 stages :

1. **Pre-washing with clean water**
   Water at room temperature. 10 to 15 minute cycle. This pre-wash enables evacuation of the remaining residues.
2. **Washing with an alkaline detergent**
   Typically this is soda at 2,5% at a temperature of 80°C. 20 to 30 minute cycle. This wash particularly enables dissolving and evacuating grease and proteins.
3. **Rinsing with clean water**
   Water at room temperature. 10 minute cycle. This rinse enables avoiding the mixture of 2 cleaning solutions.
4. **Washing with an acid solution**
   Typically this is nitric acid at 2,5% at room temperature. 10 to 15 minute cycle. This wash particularly enables dissolving and evacuating proteins and inorganic salts.
5. **Rinsing with clean water**
   Water at room temperature. Several 1 to 2 minute cycles. These rinses enable evacuating all traces of acid solution.

During all these CIP stages, the average speeds of the cleaning liquids in the pipes must be between 1,5 and 3 m/s.

4.6 Sterilisation In Place (SIP)

The SL Series pumps are perfectly adapted to all processes using SIP (Sterilisation In Place) : pump stopped / maximum 20 mn per cycle / 1 or 2 cycles per day.

5. MAINTENANCE

5.1 Necessary tools

- 50 Open-end spanner or Monkey wrench
- Torque wrenches 18 - 24 - 30
- Extractor
- Mallet

Tightened torques :

- M10 : 30 Nm
- M12 : 50 Nm
- M18 : 120 Nm

6. OPENING OF THE PUMP

WARNING	
 Any unforeseen start-up can cause serious injuries or important material damages.	TAKE ALL NECESSARY MEASURES TO RENDER ANY START-UP, EVEN ACCIDENTAL, OF THE PUMP DURING THE WORK IMPOSSIBLE.

WARNING	
 Hazardous pressure can cause personal injury or property damage.	DISCONNECTING THE FLUID OR PRESSURE CONTAINMENT COMPONENTS DURING PUMP OPERATION CAN CAUSE SERIOUS PERSONAL INJURY, DEATH OR MAJOR PROPERTY DAMAGE.

WARNING	
 Hazardous pressure can cause personal injury or property damage.	FAILURE TO RELIEVE THE SYSTEM PRESSURE PRIOR TO PERFORMING ANY WORK ON THE PUMP OR THE INSTALLATION CAN CAUSE PERSONAL INJURY OR PROPERTY DAMAGE.

WARNING	
 Hazardous or toxic fluids can cause serious injury.	IF PUMPING HAZARDOUS OR TOXIC FLUIDS, THE SYSTEM MUST BE FLUSHED PRIOR TO PERFORMING ANY SERVICE OPERATION.

WARNING	
 The weight ot the parts can be dangerous and may provoke bodily injuries or material damages.	BE CAREFUL WITH THE WEIGHT OF THE PARTS WHEN THEY ARE BEING REMOVED.

CAUTION	
 Slippery lubricant. Spills should be cleaned up.	THE PUMP LUBRICANT IS VERY SLIPPERY AND MAY CAUSE SERIOUS INJURY. ANY SPILLS MUST BE CLEANED UP.

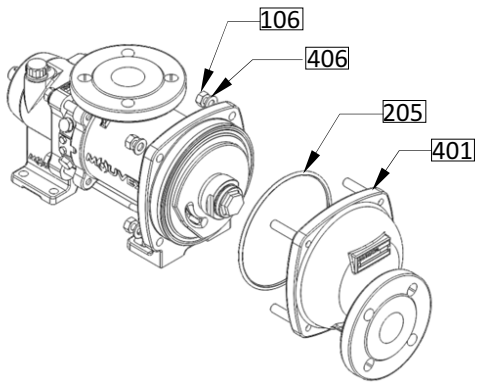
6.1 Assembly / Dismantling

Before any dismantling, make sure that the pump has been drained and take the necessary measures to avoid starting-up. No start-up, even accidental, must be allowed.

- Disconnect the pump from the discharge pipe.
- Unscrew the 4 nuts **106** and remove the 4 washers **406**.
- Remove the front cover **401** and its seal **205** with its rods **107**.

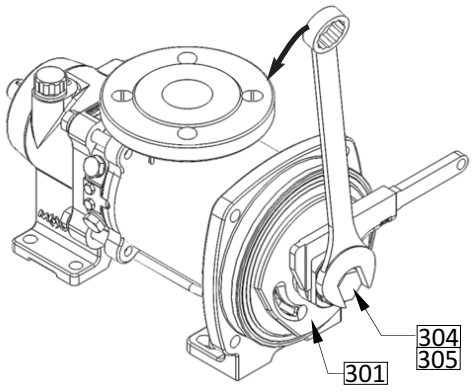
WARNING

Before dismantling, to secure the bearing case **596** to the workbench.

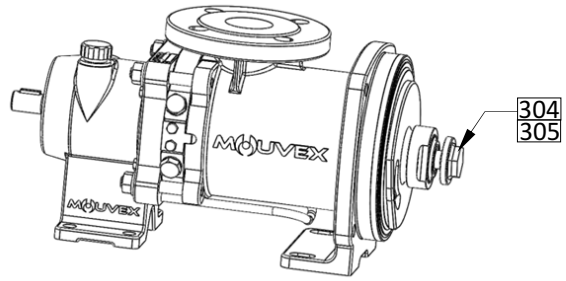


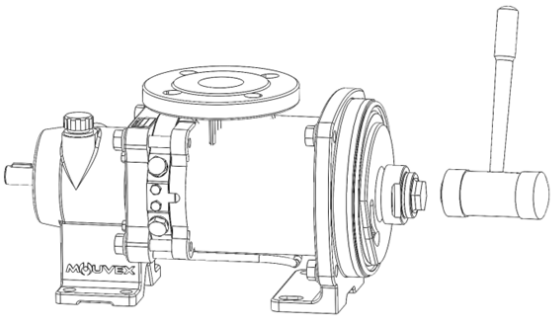
- Hold the piston **301** with a 50 Open-end spanner or a monkey wrench and unscrew the screw **304** and its seal **305**.

It is important to keep a good grip on the piston, its rotation could lead to deterioration of the bellows.

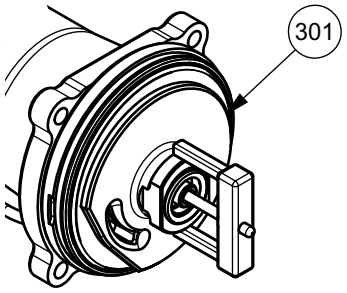


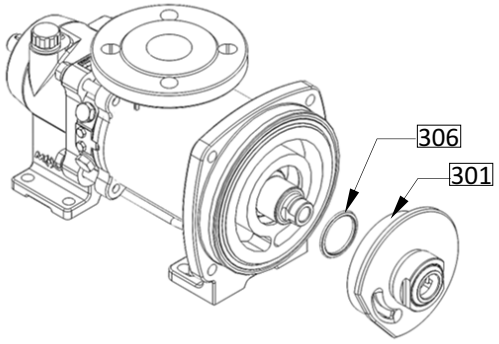
• Unscrew the piston screw **304** of 2 or 3 turns and hit it with a mallet to take off the piston **301**.



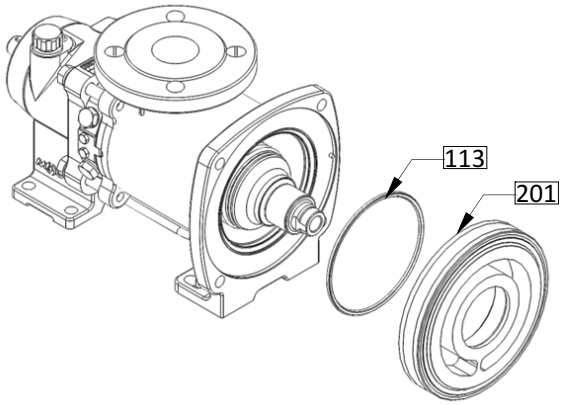


• If necessary, use a hub puller to extract the piston **301**.





• Remove the cylinder **201** and the seals **113** and **306**.



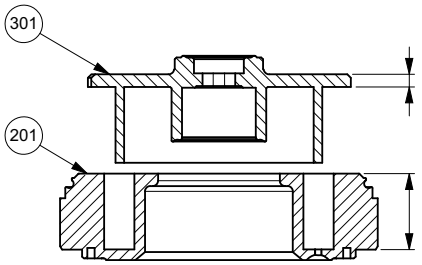
6.2 Checking of parts

The piston **301** and the cylinder **201** are active parts efficiency directly depends. It is therefore advisable to regularly check the pump's efficiency and replace the cylinder / piston if it decreases.

In addition, as using a cylinder / piston that is too worn may damage the pump's transmission system, it is advisable to replace the cylinder / piston if the maximum acceptable wear dimensions defined in the table below are reached.

		Piston **301** mm (inch)	Cylinder **201** mm (inch)
SLC4	New dimension	7 (0,276)	31,5 (1,240)
	Minimum wear dimension acceptable	5 (0,197)	29,5 (1,161)
SLC8	New dimension	7 (0,276)	48,5 (1,909)
	Minimum wear dimension acceptable	5 (0,197)	46,5 (1,831)

As changes in the pump efficiency depend on the conditions of use (pressure, rotation speed, liquid pumped, etc.), MOUVEX recommends that users define the monitoring ranges and the preventive maintenance schedule according to their own experience.



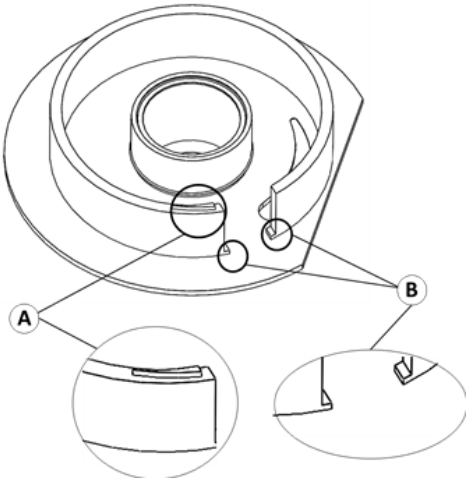
NOTICE

When disassembling the piston screw 304, if the enclosed thread surfaces have become soiled, we recommend cleaning them as follows : clean the inner thread by washing, rinsing and sterilizing the whole part (i.e. with a steam sterilization), then remove any impurities from the external threads by washing with a brush followed by rinsing with a bactericide solution before reassembly.

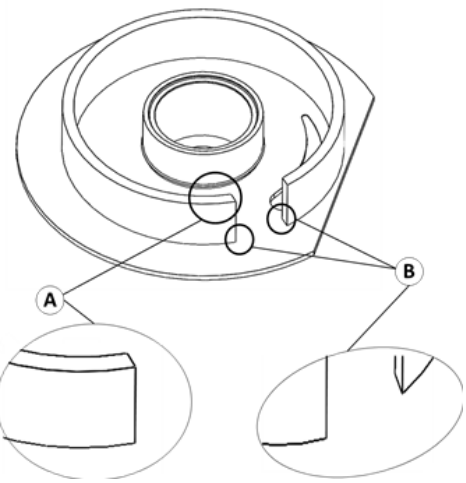
6. OPENING OF THE PUMP (continued)

When controlling the piston and even if it has not reached its minimum dimensions, it may show following aspects, especially on abrasive liquid pumping or low viscosity :

- Triangular shape on top of piston wall (A),
- Small steps at piston wall base (B).



Before putting back the piston on the pump, eliminate these asperities by filing and finishing with fine sandpaper (No 320 grain or equivalent), taking care of not scratching any other surface around. Piston must then look as follows :



<u>Do not retouch any other surface of the piston</u> by any mean as it can degrade pump performance and reliability. In particular, do not round or attenuate disc wall edges.

Even if it shows wearing signs, <u>do not retouch any surface of the cylinder</u> by any mean as it can degrade pump performance and reliability.

7. ASSEMBLY OF CYLINDER/PISTON

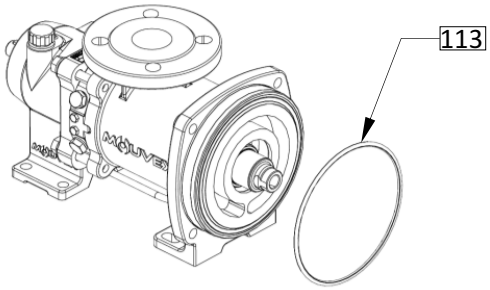
• Check the state of the seals **205**, **305**, **306**, **113** and replace them if necessary.

NOTICE

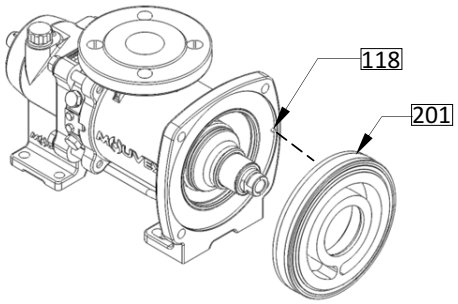
Seals material are intended for use in normal conditions in food process. In order to ensure a reliable sealing on SL Series pumps we recommend to :

- **do an inspection of the seals every three months (this time could be shorter if using the pump in hard conditions. Contact the manufacturer for advice if necessary).**
- **replace the pump sealing every two years (refer to the § PROTECTION OF THE BELLOWS for the replacement of the second seal).**

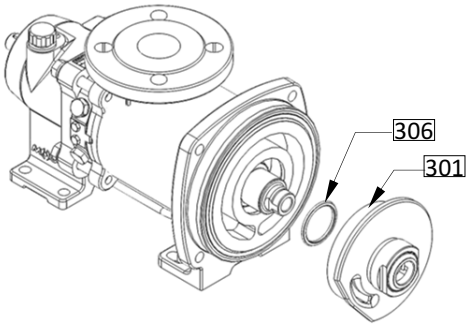
• Position the seal **113** on the large flange.



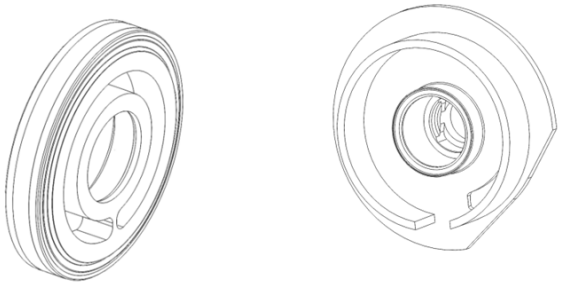
• Position the cylinder **201** such that the locating pin **118** fits into the notch of the back of the cylinder (partition oriented bottom).



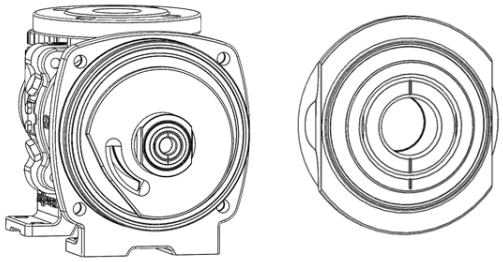
• Position the seal **306** on the hub.



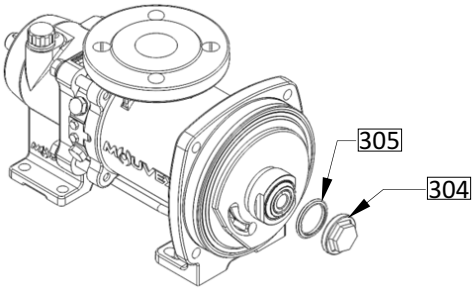
• Engage the piston **301** on the transmission hub **596**, the gap of the piston facing the cylinder partition.



• Give a small push to the piston to centre it and engage it in the cylinder, then push it tight to the end while ensuring the vertical notch of the piston **301** is aligned with those of the transmission hub **596**.

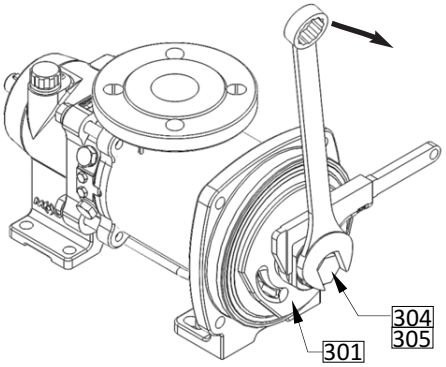


• Place thread locking adhesive (Loctite® 243* or equivalent) on the thread of the piston screw **304**.



• Hold the piston **301** with a 50 Open-end spanner or a monkey wrench and screw-up the screw **304** after mounting the seal **305** on to the rear face.

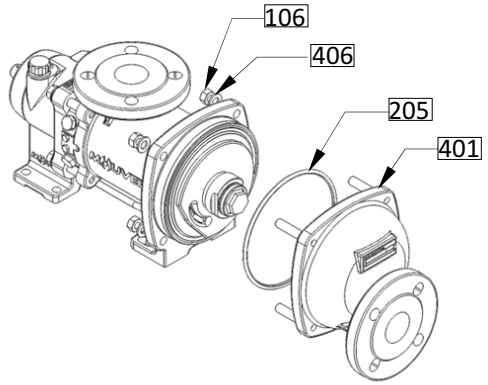
It is important to keep a good grip on the piston, its rotation could lead to deterioration of the bellows. When tightening the nut, comply with the assembly torque indicated in § NECESSARY TOOLS (M18).



* Loctite® is a registered trademark.

7. ASSEMBLY OF CYLINDER/PISTON (continued)

• Re-mount the front cover **401** and its seal **205** with its rods **107** while positionning the outlet port same as before dismantling.



• Screw up the 4 nuts **106** (4 x M12 assembly torque indicated in § NECESSARY TOOLS).

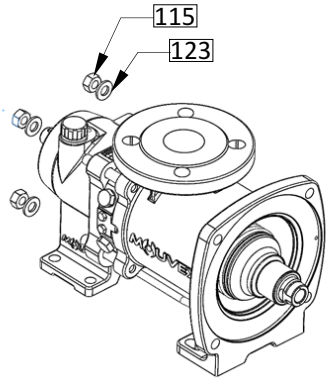
8. PROTECTION OF THE BELLOWS

WARNING	
	BE CAREFUL WITH THE WEIGHT OF THE PARTS WHEN THEY ARE BEING REMOVED.
The weight ot the parts can be dangerous and may provoke bodily injuries or material damages.	

8.1 Standard main body

• Dismantle the cylinder/piston couple (see corresponding §).

• On the drive side, remove the 4 nuts **115** and the 4 washers **123**.



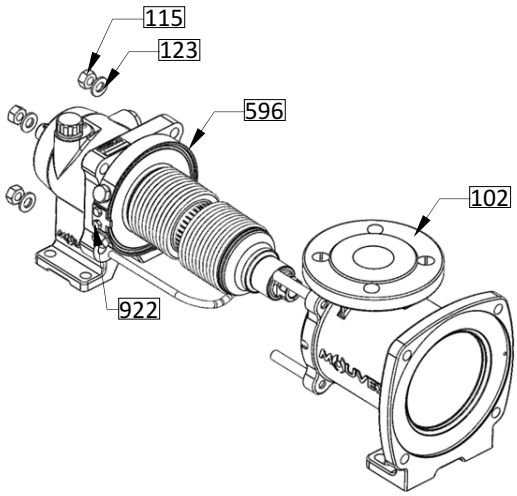
• With the help of a mallet, lightly tap the large flange to free the main body **102** from the transmission hub **596**.

• Remove the main body **102 while taking care of impact**.

• Remove the seal **113**.

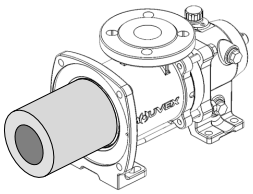
• Inspect the bellows : any impact, scratch or distortion necessitates its replacement.

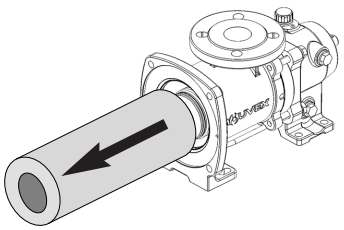
• Assembly is undertaken in the reverse order of dismantling, taking care to correctly position the seal **113** and the indexing part **922**. The nuts **115** must be re-mounted with thread locking adhesive (Loctite® 243* or equivalent) : 4 x M12 : Assembly torque indicated in § NECESSARY TOOLS.



The spare transmissions delivered are equipped with a tubular foam protection. We advise leaving this protection around the bellows until re-mounting of the piston and cylinder.

DO NOT FORGET TO REMOVE THE PROTECTION BEFORE MOUNTING THE CYLINDER.

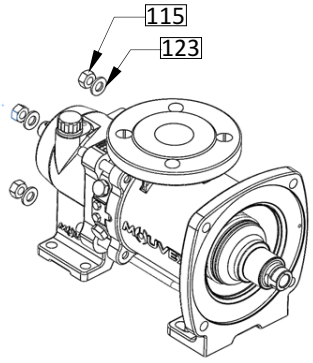




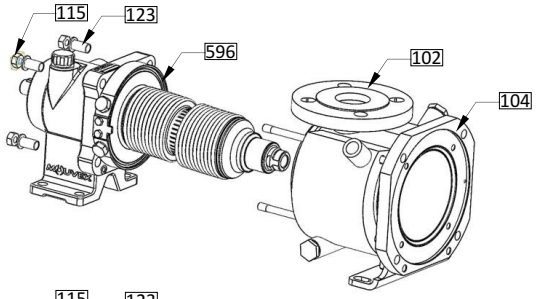
8. PROTECTION OF THE BELLOWS (continued)

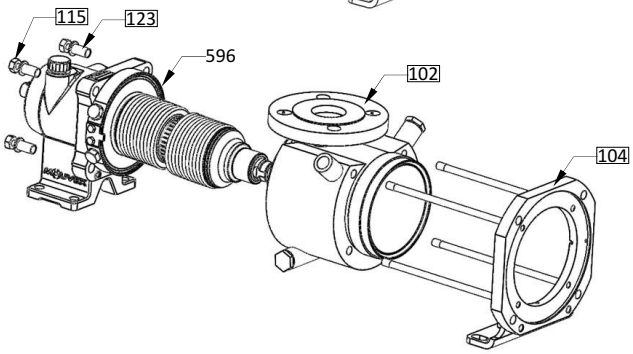
8.2 Main body with turn able manifold / heating jacket

- Dismantle the cylinder/piston couple (see corresponding §).
- Remove the 2 fixing screws from the base frame of the lug **108.**
- On the drive side, remove the 4 nuts **115** and the 4 washers **123**.



- With the help of a mallet, lightly tap the large flange **104** to free the tube **102** from the transmission hub **596**.
- Remove the tube **102 while taking care of impact**.
- Remove the seal **113**.
- Inspect the bellows : any impact, scratch or distortion necessitates its replacement.

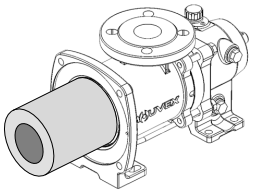


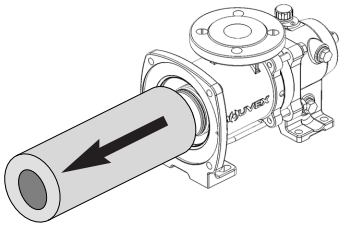


- Assembly is undertaken in the reverse order of dismantling, taking care to correctly position the seal **113**, the indexing part **922** and the indexing pin **117**. The nuts **115** must be re-mounted with thread locking adhesive (Loctite® 243* or equivalent) : 4 x M10 : Assembly torque 30 Nm.

The spare transmissions delivered are equipped with a tubular foam protection. We advise leaving this protection around the bellows until re-mounting of the piston and cylinder.

DO NOT FORGET TO REMOVE THE PROTECTION BEFORE MOUNTING THE CYLINDER.





* Loctite® is a registered trademark.

9. DISMANTLING OF THE BELLOWS

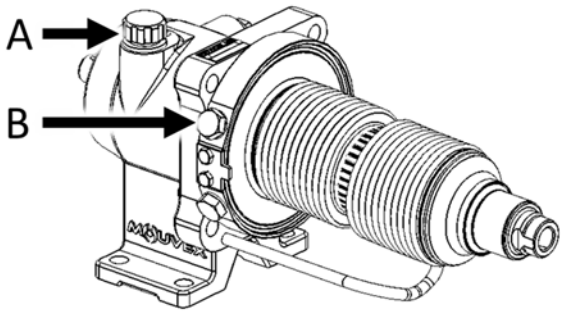
Bellows control

WARNING	IMPORTANT ! RISK OF INJURIES !
 Hazardous pressure can cause personal injury or property damage.	**DO NOT put compressed air in oil filling orifice A (see drawing below).** **DO NOT exceed maximum recommended air pressure.** **During all control operations, turn bellows end towards a neutral zone and DO NOT stay in front, in bellows axle.**

Drain transmission oil (see § DRAINING OF BEARING).

Carefully clean bellows surface.

Put dry and non-oily compressed air in orifice B. Maximum pressure **1 bar (14,5 psi)**.



External wall control.

Control the whole outer surface of the bellows with a leak detection product like “Snoop®” or equivalent.

Internal wall control.

Connect a flexible hose on oil filling port A. Plunge the other end in a recipient of water. Presence of bubbles in the water will indicate a leak on the internal wall.

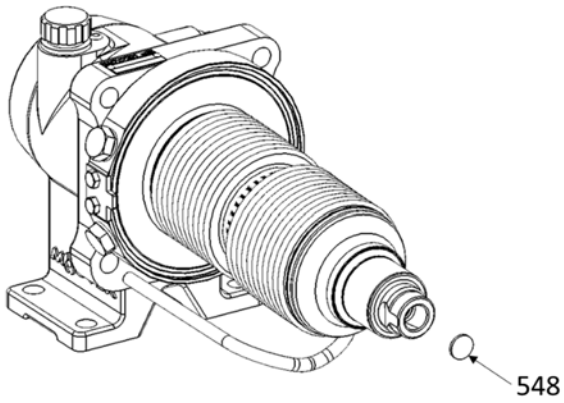
Also control following points with a leak detection product like “Snoop®” or equivalent.

- Lip seals on shaft end.
- Plug on hub side .

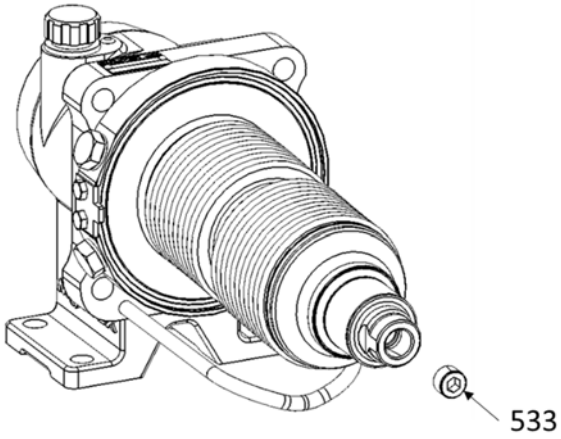
Bellows disassembly

Drain transmission oil (see § DRAINING OF BEARING).

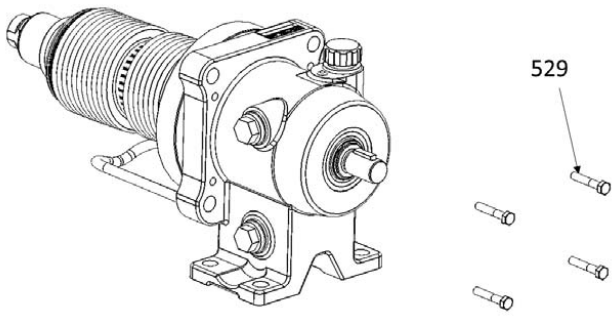
Remove plug 548 by drilling it.



Remove headless screw 533.

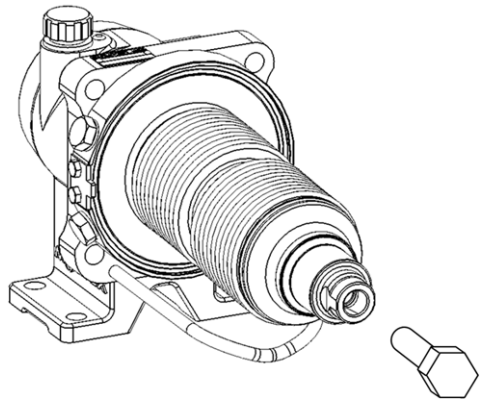


Remove the 4 screws 529.

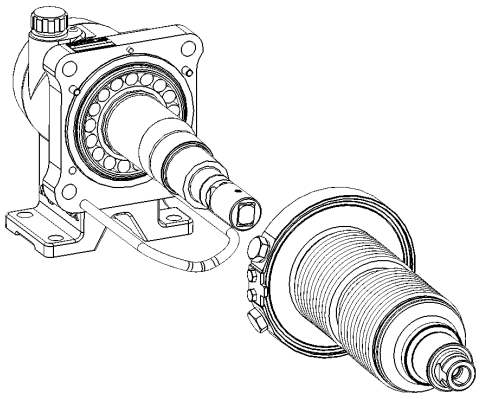


9. DISMANTLING OF THE BELLOWS (continued)

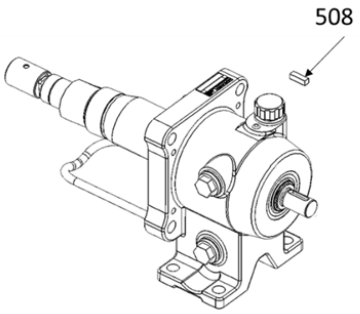
Take a M16 screw with a minimum length of 50 mm / 2" in carbo steel (do not use a stainless steel one to avoid galling), grease its end and threading and put it in place of the headless screw.



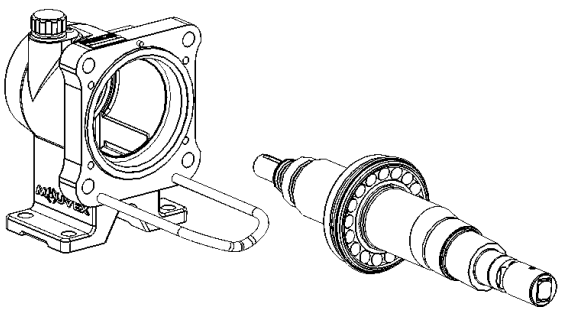
Tighten the screw until extraction of the bellows. Transmission shaft may have to be hold to prevent it from rotating.



Remove shaft key 508.

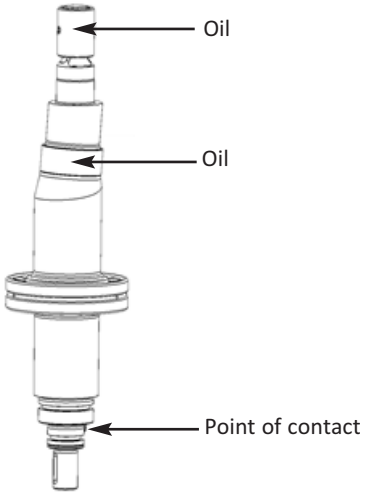


Remove shaft and bearing subassembly

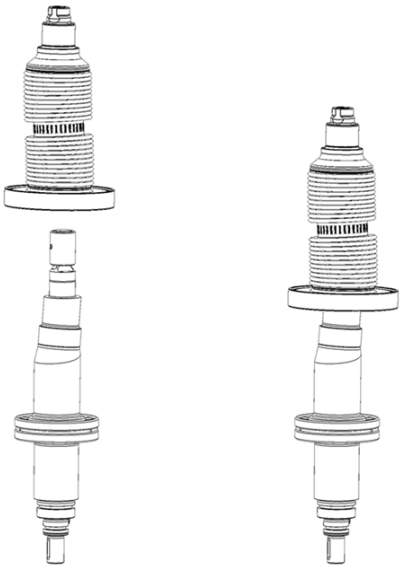


Bellows remounting

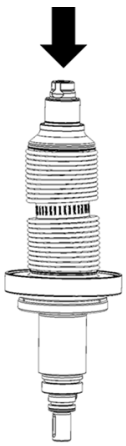
Put shaft vertically on a press (20000 N mini) placing it on point of contact below. Do not hold it on the bearing. Apply a film of oil on friction rings. Use the same oil as the one inside the transmission (see § DRAINING OF BEARING).



Place the bellows and let it down progressively.

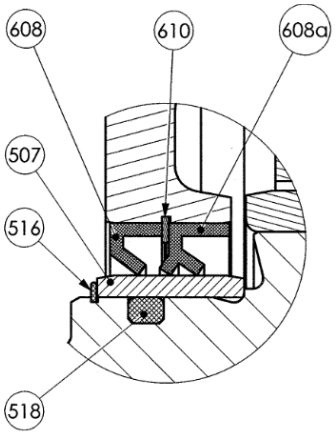


Put the effort with the press until hub comes in firm contact with the shaft.



9. DISMANTLING OF THE BELLOWS (continued)

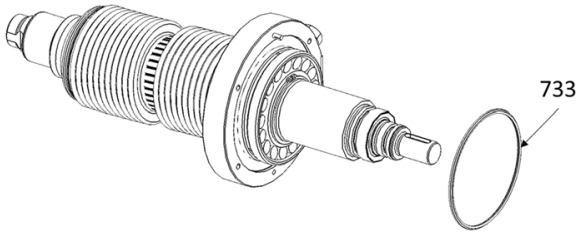
Before putting back the shaft in the bearing case, control lip seals 608 and 608a as well as friction ring 507. Replace them if necessary.



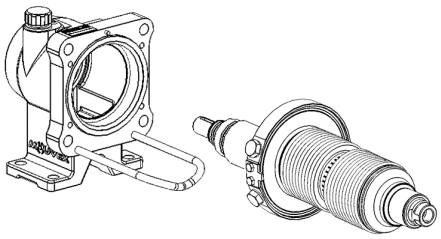
Mounting procedure :

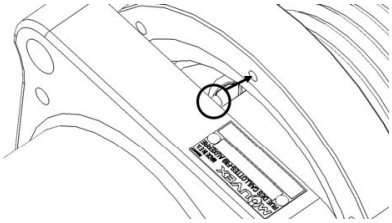
- Place the O'ring 518 in its groove. Do not grease it nor shaft surface.
- Place friction ring 507. Progressively push it without forcing.
- Mount stop ring 516.
- Grease friction ring 507 outer surface with a synthetic grease KLUBER UH1 64-1302 or equivalent.
- Mount lip seal 608a and stop ring 610.
- Add synthetic grease KLUBER UH1 64-1302 or equivalent at back of the seal 608a.
- Mount lip seal 608.

Place O'ring 733 on the bearing putting it against bellows flange.

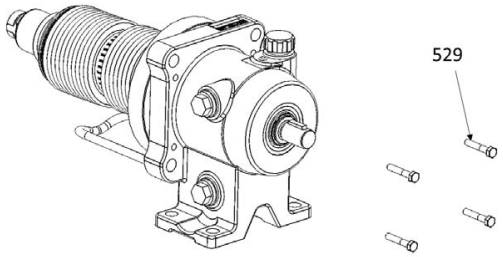


Place bellows and shaft assembly in the bearing case, checking bellows orientation.

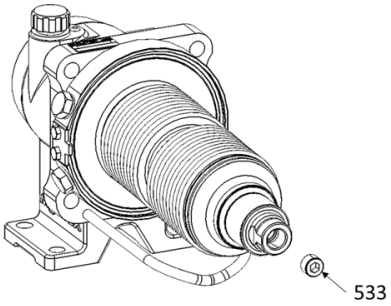




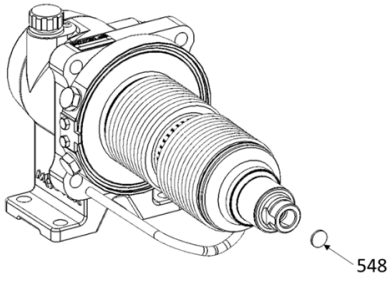
Put back the 4 screws 529. Use medium thread lock Loctite® 243 or equivalent. Tightening torque 3,5 Nm.



Tighten headless screw 533 until screw top reaches end of threading.



Put a new plug 548.



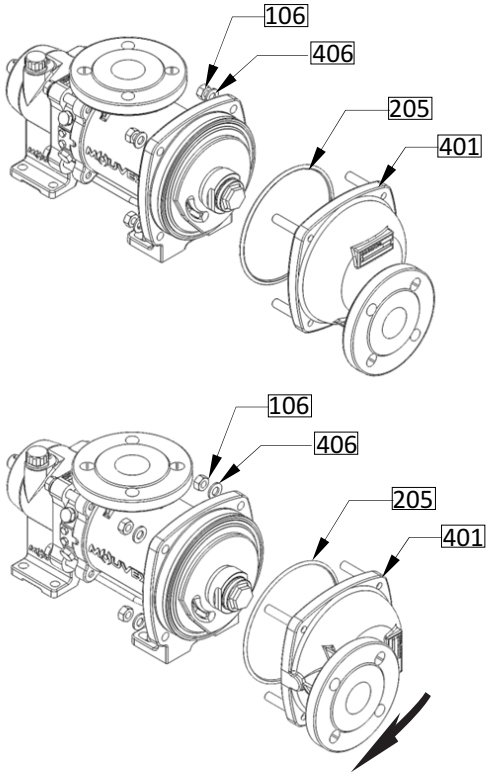
Fill transmission with oil according to § DRAINING OF BEARING.

10. CHANGING THE ORIENTATION OF THE PORTS

WARNING	
	BE CAREFUL WITH THE WEIGHT OF THE PARTS WHEN THEY ARE BEING REMOVED.
The weight ot the parts can be dangerous and may provoke bodily injuries or material damages.	

10.1 Discharge port

- Unscrew the 4 nuts **106**.
- Remove the front cover **401** and its seal **205** with its rods **107**.
- Modify the orientation of the main body **401** to position the port in the desired position.
- Re-mount main body **401** and its seal **205**.
- Screw the 4 nuts **106** (4 x M12, Assembly torque indicated in § NECESSARY TOOLS).
- Make sure that the seal **205** is secured in its housing. Secure it with a grease that is compatible with the transferred product if necessary.



10.2 Suction port

The position of the suction port can not be changed.

11. DRAINING OF BEARING

CAUTION	
	THE SURFACES OF THE PUMP AND OIL TRANSMISSION CAN BE AT A TEMPERATURE LIABLE TO CAUSE INJURY OR SEVERE DAMAGE.
Excessive temperature- can cause injury or severe damage.	

CAUTION	
	THE PUMP LUBRICANT IS VERY SLIPPERY AND MAY CAUSE SERIOUS INJURY. ANY SPILLS MUST BE CLEANED UP.
Slippery lubricant. Spills should be cleaned up.	

• Drain the transmission following the board below :

  • Data with **MOUVEX Standard oil CS05* :**

Temperature product pumped / heating product	Draining interval (running hours)
150 °C < T ≤160 °C	800
135 °C < T ≤150 °C	1 500
120 °C < T ≤135 °C	3 000
100 °C < T ≤120 °C	6 000

  • Data with **MOUVEX Silicone free oil CS23* :**

Temperature product pumped / heating product	Draining interval (running hours)
T < 100 °C	5 000

  • Data with **other customer oil** : the drawing interval is defined by the customer (tests results) regarding the oil specifications and the pump conditions.

• Drain the pump by removing the drain plug with its seal **773-774** and the breather **715**.

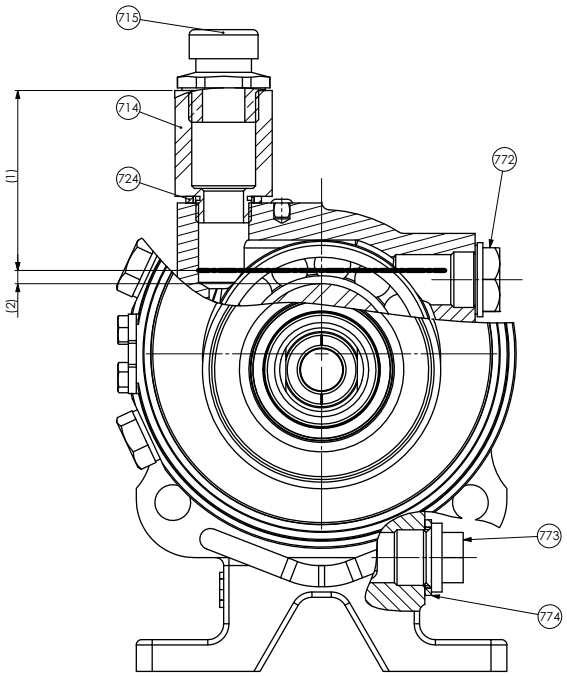
• Replace the drain plug and its seal.

• Fill the transmission with 0,85 litre of oil*.

• Check oil level that the level is between 1 and 5 mm above the shaft.

• The oil level can be viewed through the transparent level **772**.

• Screw back the breather **715**.



(1) Oil level : Min : 68 mm
Max : 72 mm

(2) 1 to 5 mm above the shaft

*** Standard oils provided by MOUVEX** (Safety data sheet is supplied on inquiery) :

CS05 Food synthetic oil

CS23 Silicone free oil for transmission

*** Other oil provided by customer.**

12. STORAGE

If necessary, refer to § MAINTENANCE for pump disassembly.

12.1 Short duration (≤ 1 month)

WARNING	IF PUMPING HAZARDOUS OR TOXIC FLUIDS, THE SYSTEM MUST BE FLUSHED PRIOR TO PERFORMING ANY SERVICE OPERATION.
	
Toxic or hazardous fluids can cause serious injury.	

MOUVEX pumps and motor-driven pumps are well lubricated when delivered to protect the internal parts during brief storage in a building where :

- the temperature remains between 10°C and 50°C.
- the relative humidity does not exceed 60%.
- exposure to vibration is limited.
- pump is stored in an area sheltered from bad weather and sun.

12.2 Long duration (> 1 month)

The recommendations from the manufacturer should be followed if the pump is stored with its gear motor.

Pump ports should be filled with a non-corrosive liquid that it compatible with the pump components in order to prevent corrosion.

Unpainted external surfaces of the pump (e.g. shafts, couplings, etc.) should be covered in some form of anti-corrosion protection.

If storage was made after a period of operation, the transmission oil must be replaced before storage (see § DRAINING).

The transmission will be filled with oil at breather level (see § DRAINING).

If pump storage lasted more than one year, the oil should be replaced in time to prevent an excessive degradation of its qualities.

The best storage conditions are inside a building that meets the conditions set out above.

If inside storage is not possible, the materials should be covered to prevent direct exposure to sun and bad weather. This protection should also prevent condensation.

The pump should be turned a few revolutions manually every two months.

12.3 Restarting

Follow the standard start-up procedure for the pump/motor-driven pump, as well as the instructions below.

Turn the pump by hand to make sure the parts move freely.

If the storage duration has exceeded one year, replace the oil transmission (see § DRAINING for removal instructions).

If the pump has a safety bypass, remove it and inspect the parts and make sure they move freely.

In all cases, the oil should be replaced after more than two years after its commissioning.

13. TROUBLESHOOTING

ZERO OR INSUFFICIENT FLOW			
1			**PRELIMINARY CHECKS**
	1-1		Make sure that the plastic plugs have been taken away from the ports of the pump and that the pump is running (defective drive, damaged motor, etc., faulty transmission : broken coupling, sliding belt, worn or poorly coupled clutch, etc.).
	1-2		Make sure that the pump rotates in the correct direction corresponding to the direction in which the liquid circulates in the installation (cf. the pump plate). If necessary, change the electric motor connections.
	1-3		Make sure that the pump rotation speed is sufficient. Determine this by checking the speed of the pump motor (see motor plate) and the speed reduction ratio (see reduction gearbox plate) or use a rev. counter.
			If these checks do not highlight the problem :
2			**MEASURE THE DISCHARGE PRESSURE** (as close to the outlet of the pump as possible, with a minimum distance of 5 pipe diameters).
	2-1		If the pressure is lower than the figures given for the material, or null, this could be due to :
		2-1-1	The pump is worn, this will also affect the suction capacity of the pump (cf 3-2-2 b).
3			**MEASURING THE VACUUM PRESSURE** (as close as possible to the pump inlet, inlet side).
	3-1		If the vacuum is high, e.g. higher than or equal to 6 to 7 metres WC (0.6 to 0.7 bara i.e. about 45 or 50 cm of mercury), this can result in pump noise. The cause could be :
		3-1-1	a. the suction lift is too high (reduce it by taking the pump down closer to the level of the liquid). b. the dynamic suction losses are too high : the inlet piping orifice is too close to the bottom of the tank.
		3-1-2	The inlet piping is completely blocked (valve, tap, filter, cloth, full seal forgotten, etc.)
		3-1-3	The liquid vapour pressure is too high (or has become too high following, for example, a change of temperature). Bring the pump closer to the level of the liquid, install the pump closer to the feed or cool the liquid to reduce the vapour pressure.
	3-2		If the vacuum is low, for example, less than 3 metres WC (i.e. about 20 cm of mercury), check for leaks on the inlet pipe, isolate the pump from the inlet piping (by closing the valve nearest the pump or by inserting a full flange seal) and measuring the vacuum once again.
		3-2-1	If the vacuum is high with the isolating valve closed on suction line, e.g. higher than or equal to 6 or 7 metres WC (i.e. about 45 to 50 cm of mercury), the pump is not the cause : a. there must be an air inlet upstream of the pump isolating valve. b. the liquid vapour pressure is or has become too elevated due to a change of temperature (cf 3-1-3).
		3-2-2	If the vacuum is low or non-existent, the reason could be : a. air is entering the pump (check the front cover seals, flanges, etc...) b. the pump is worn and the internal tightness is out of specification (the piston bushings are worn, worn piston and cylinder, broken piston wear compensation springs, worn partition, broken shaft).

ABNORMAL HEATING OF BEARINGS			
4			This heating can be caused by :
	4-1		- excessive tension in the transmission (belt or chain) on the pump shaft.
	4-2		- excessive pulling on the pump flanges by the piping (in this case, it must have been necessary to force the piping into position to connect it to the pump).
	4-3		- poor alignment of the pump - due for example to 4-2 (the pump is partially or totally uncoupled, the pump shaft and drive shaft are not aligned with each other).
	4-4		- inadequate anchoring of the pump unit leading to deformation of the chassis (make sure that the chassis is clear of the ground except for the 3 anchoring points).
ABNORMAL NOISES			
			These noises can be caused by hydraulic and mechanical sources. They can be distinguished by the fact that only the former disappear (or at least lessen) when air is allowed into the inlet pipe.
5			**HYDRAULIC NOISES**
			These noises can come from insufficient product being supplied to the pump, or :
	5-1		- the rotation speed is too high for the installation conditions (increase of viscosity due to a change of product or a reduction of temperature, etc.).
	5-2		- that the suction head is too high or has become too high due to excessive head losses following clogging of the piping or filter, a change of viscosity of the liquid, etc.,
	5-3		- an increase of the vapour pressure with a rise of temperature.
6			**MECHANICAL NOISES**
			These can stem from :
	6-1		- abnormal stress on the pump : the transmission is pulling on the shaft, pulling on the flanges by the piping.
	6-2		- a broken part or foreign body has entered the pump.
EXCESS POWER CONSUMPTION			
7			The most spectacular event occurs when the power to an electric motor is shut off.
	7-1		If this incident occurs when closing the discharge line, the cause may be the motor protection is adjusted too low or wrong circuit breaker have been fitted.
	7-2		If the incident occurs during operation, the cause could be : a. an inadequate motor (in this case, the discharge pressure complies with what was expected). b. head losses higher than expected - following higher viscosity or specific gravity than planned initially (in this case, the discharge pressure is higher than that planned. The pressure can be reduced by loosening the relief valve adjustment screw - the flow is decreased). c. excessive speed of rotation. d. a fault of the equipment (faulty alignment, deformation of the chassis, stress exerted by the piping on the flanges, seizing, etc.).
			Excessive consumption of electricity can also be due to a poor motor connection (e.g. a 3 phase motor operating on 2 phases).