

ECCENTRIC SCREW PUMPS MIE/MIN SERIES

CSF ECCENTRIC SCREW PUMP MIE/MIN

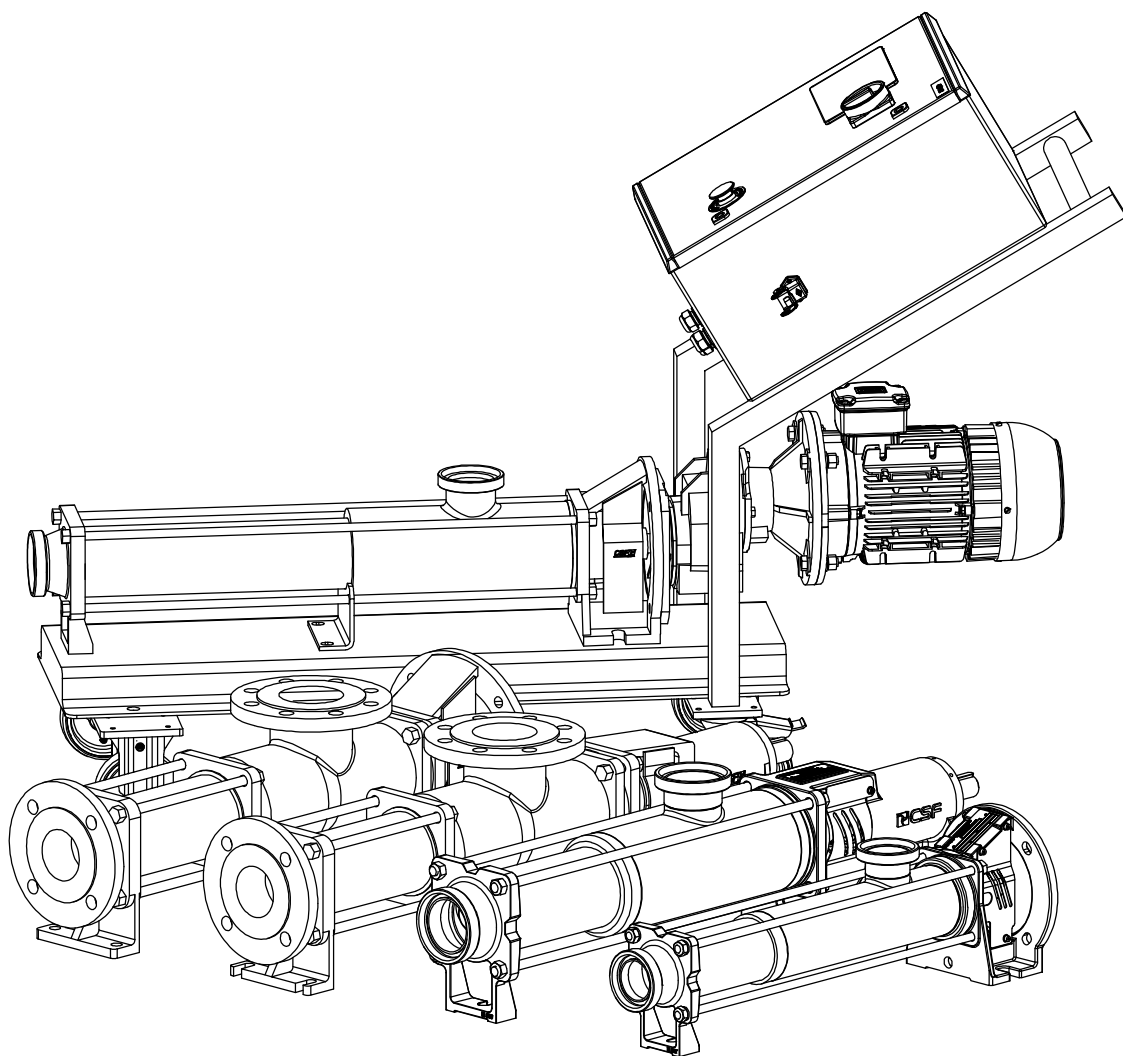
Instructions for assembly, installation,
operation and maintenance



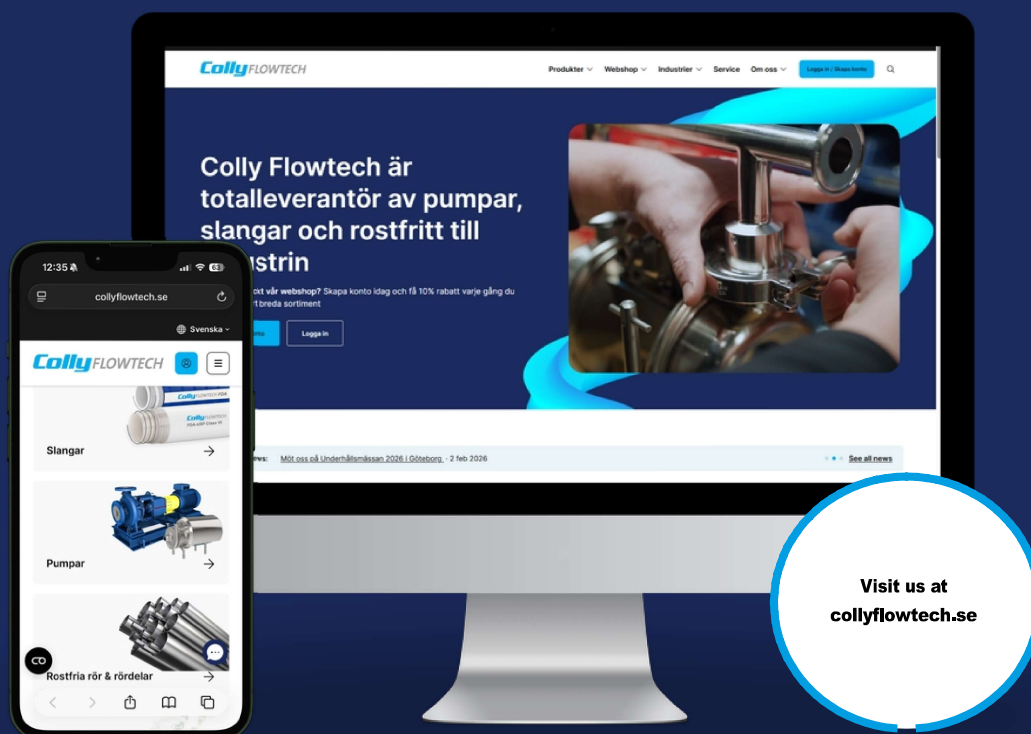
CollyFLOWTECH

PROGRESSIVE CAVITY PUMPS

MA - MI Series



INSTRUCTIONS FOR ASSEMBLY, INSTALLATION,
OPERATION AND MAINTENANCE



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FOREWORD

This instruction manual is designed to provide the user with all the information needed to perform all use and maintenance activities concerning the pump and its accessories throughout its entire service life. Read the instructions carefully and keep them for future consultation.

C.S.F. Inox S.p.A. reserves the right to make any changes to the documentation it deems necessary without being obliged to update publications that have already been issued.

This Manual contains confidential technical data owned exclusively by the Manufacturer/Constructor, consequently any copying of its contents and/or format (in their entirety or only partially) for any purposes other than those for which they were intended is prohibited without the Manufacturer's/Constructor's prior consent.

The official language chosen by the Manufacturer/Constructor is Italian. No liability shall be accepted for translations in other languages that do not match the original meaning.

All operators must read the instructions carefully and keep them for future reference. Refer to paragraph 2.2 Operators and responsibilities.

SIGNS AND DATA PLATES

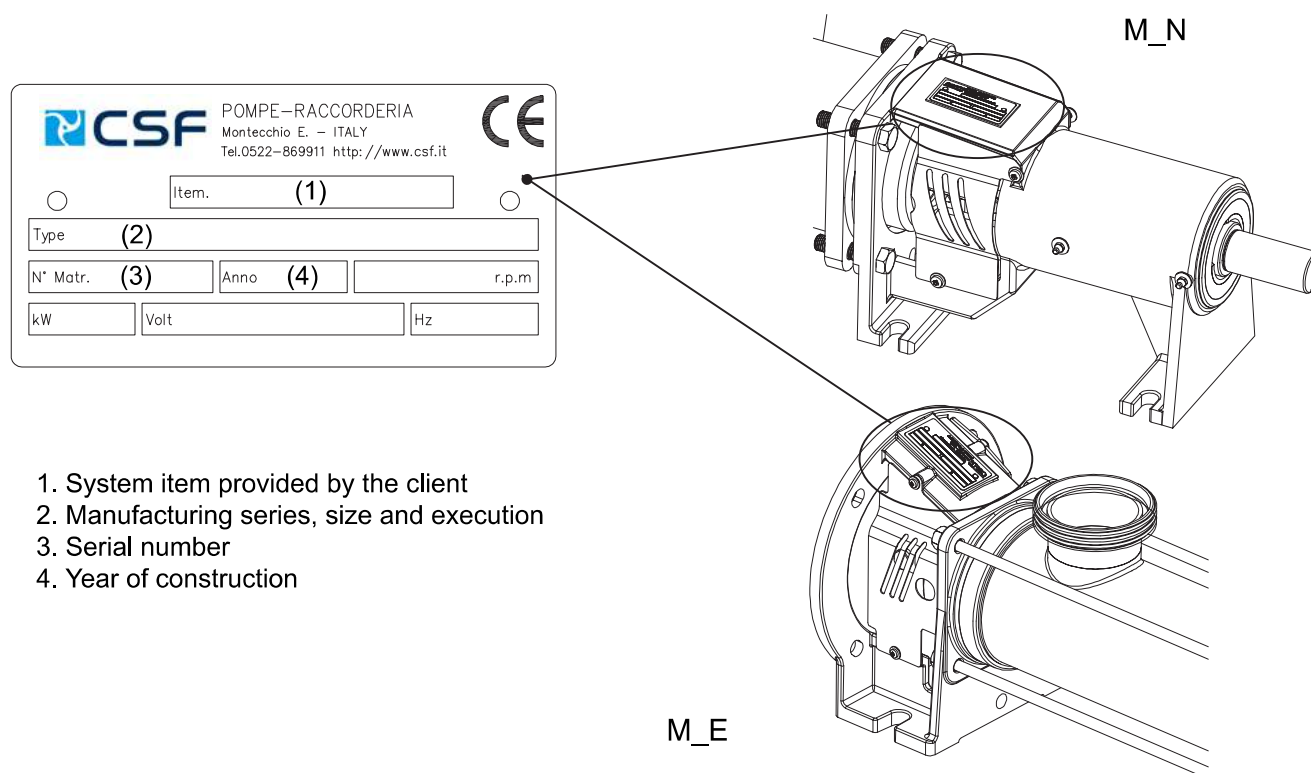
The danger, warning and obligation signs illustrated in this manual are positioned on or near the equipment.

An exact description of the machine type, serial number and electrical voltage data will facilitate a rapid and effective response from the assistance service (when envisaged).

When requesting information, spare parts or assistance, always specify the pump type (2) and serial number (3) in order to ensure fast and efficient service: the complete code is given on the plate and in the purchase documents.

This manual refers exclusively to the pump supplied.

CSF Plate example



1. System item provided by the client
2. Manufacturing series, size and execution
3. Serial number
4. Year of construction

1.0 - SYMBOLS USED ON THE EQUIPMENT AND IN THE MANUAL

	CONSULT	Consult the instructions before carrying out a specific operation.
	THE USE AND MAINTENANCE MANUAL MUST BE READ	It is mandatory to read the Use and Maintenance Manual before performing any work on/with the machine.
	GENERAL SAFETY WARNINGS/INFORMATION	Indicates a warning or a note concerning key functions or useful information. Pay great attention to the text parts indicated by these symbols.
	WARNING! DANGER	Failure to observe the warnings may lead to serious injury and/or material damage.
	ELECTRICAL HAZARD	Only skilled personnel can carry out operations on electrical parts.
	MOVING PARTS HAZARD	Hazard caused by moving mechanical components during machine operation.
	DANGER: HOT SURFACES	Elements with a higher temperature than normal (xxxx zone).
	SUSPENDED LOADS HAZARD	Suspended loads: exercise maximum caution as unsteady parts could fall down.
	GENERAL PROHIBITION	Indicates a generic prohibition.
	DO NOT REMOVE SAFETY DEVICES	The removal of safeguards is prohibited.
	DO NOT SERVICE MOVING PARTS	Never perform maintenance on moving parts
	NO WATER JETS	Do not use high pressure jets of water to clean the machine.
	NO STEPPING	Do not climb on the pump
	NO SITTING	Do not sit on the pump
	WEAR PROTECTIVE WORKWEAR	Mandatory protective equipment
	WEAR PROTECTIVE GLOVES	Hand protection must be worn: gloves
	WEAR SAFETY FOOTWEAR	Foot protection must be worn: safety footwear

2.0 - SAFETY WARNINGS

The pump supplied is designed for professional use and is not intended to come into contact with the general public and minors.

Operators and maintenance personnel must read and comprehend the instruction manual.

Maintenance personnel must have adequate training and qualifications to carry out maintenance operations in compliance with safety standards.

Trainees may only carry out activities under the supervision of qualified, expert personnel.

 The equipment must not be tampered with. In the event of tampering, the manufacturer shall decline all liability concerning incorrect operation or any damage/injury caused by the product.

 Before using the equipment, make sure any situation which may represent a health and safety hazard has been eliminated.

Furthermore, it is essential for operators to take note of the warnings listed below:

	Do not use the machine when psychophysical state is impaired.
	Do not use the machine for purposes other than those for which it was designed.
	Do not remove or modify the signs affixed to the machine by the manufacturer.
	Do not try to remove or modify machine parts unless the operation is described in this manual.
	Never allow unauthorized personnel to work on or with the equipment.
	Do not stand or sit on the machine.
	Never leave the machine connected to power supplies when it is not being used/supervised.
	Never open electrical equipment enclosures when the machine is connected to the electrical power supply.
	Before starting the machine, make sure there are no unauthorized persons in the work area.
	Before starting the machine, make sure all safety devices are working properly.
	Wear the personal protective equipment prescribed in this manual, based on the operations being carried out.
	Keep the equipment as a whole and the work area clean, tidy and free of foreign objects.
	Internal inspections, modifications and repairs must only be carried out by qualified technical personnel authorized by the Manufacturer.
	Periodically carry out all the operations described in the specific paragraph on maintenance.
	In the event of anomalies or damage that could compromise equipment operation and safety, it must immediately be removed from service.
	Notify a supervisor if any operating irregularity occurs.
	Make sure that all guards or other protective devices are in place and that all safety devices are installed and working effectively.

When the pump is in operation:



- Mechanical parts are moving.



- the pump casing, pipelines and joints are under internal pressure. Consequently, do not remove any safety devices or covers or loosen any screws or fastener as this could result in serious physical injury or material damage.

- Non-observance of inspection and maintenance operations can lead to physical injury or material damage, especially when dangerous or toxic liquids are pumped



- Live parts: all operations on electrical parts must be performed by expert personnel who are able to observe technical standards and laws and are duly authorized by the plant manager.



- When pumping liquids at a temperature over 60°C, adequate protection and warning signals are required.

- Installation must ensure an adequate ventilation, in order to cool the engine, as well as enough space for maintenance operations.

2.1 - DANGER ZONES

The pump described herein has been designed and built to be safely used by operators.

All operators must be provided with suitable Personal Protective Equipment for performing the relative operations, i.e. safety footwear, protective gloves and workwear as better specified in § 2.4.



Should any unauthorized personnel come into the work area near the equipment, the operator must immediately stop all operations.

A - TROLLEY-MOUNTED PUMPS WITH OR WITHOUT ELECTRICAL PANEL

The machinery is designed to be run by a single operator.

The trolley must be pushed manually using the relative gripping points. Manoeuvres must be carried out with the panel switched off and unplugged.

All operators must be provided with suitable Personal Protective Equipment for performing the relative operations, i.e. safety footwear, protective gloves and workwear as better specified in §2.2.



Should any unauthorized personnel come into the work area near the equipment, the operator must immediately stop all operations.

2.2 - SAFEGUARDS



Any failure to use the personal protective equipment indicated in this heading exposes operators to unnecessary hazards.

The employer must provide all machine operators referred to in this manual with the relevant PPE.

Machine operators must wear the following PPE:



Protective workwear;



Gloves providing protection against cuts, abrasion and burns, and safety footwear.

The employer, following risk assessment and taking into consideration variations in the production processes, may deem the use of additional PPE necessary.

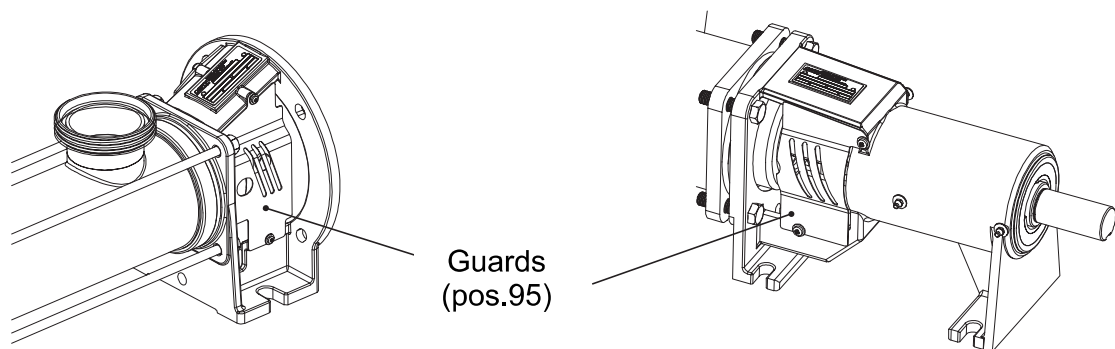
Inspect the condition of the guards and relative fasteners on a regular basis (at least every 12 months). If the guards are damaged, worn or have been removed or if the fastening devices have been removed or come loose, the user must immediately restore the condition of the guards and relative fastenings.

The machine is fitted with the following safety devices:

- Lantern bracket guards (pos. 95), for M_E series pumps, or bearing support guards (pos. 95) for M_N series pumps.

It is forbidden to use the pump without the guards (pos.95).

- Guard (pos. 335) covering the transmission couplings on the following pump version N: MAN-MIN.



2.3 - OPERATORS AND RESPONSIBILITIES

SAFE WORK PROCEDURES

To reduce the potential consequences of the hazards set out in the previous headings, operators must abide by the following instructions:

- Always wear personal protective equipment as referred to in § 2.2;
- Supervise the danger zone, never start the machinery if other unauthorized persons are inside the danger zone or in the machine's immediate vicinity. Should any unauthorized person enter the aforementioned zone when an operating cycle is in progress, the operator must immediately stop all operations.



If particular maintenance, inspection or repair work on the machine requires the operator to completely or partially disable certain safety devices, it is his/her duty to restore operation of said devices as soon as the operations in question have been completed.

The responsibilities of the operators are given below:



To be done by the operator

- Use the machine for the purposes and in the operating conditions specified in this manual.
- Perform the periodic maintenance checks indicated in this User Manual and relative appendices.
- Regularly check elements subject to possible wear, in particular all moving mechanical parts (gear units, pumps) and piping containing pressurized fluids
- Check and keep all safety-related devices enabled and in good working order by periodically checking their operation (for example: regulators, control devices, indicators/gauges, etc.).
- Keep the operating area clean and tidy at all times.
- Stop the machine immediately if any malfunctions or anomalies arise that may affect safety during use.



To be done by the mechanical maintenance technician:

- Before carrying out any maintenance operations, always make sure the equipment has been disconnected from all power sources.
- Before carrying out any maintenance operations, to prevent inadvertent start-up by uninformed personnel, always put up one or more "MACHINE UNDER MAINTENANCE" signs in a clearly visible position.
- Always keep the maintenance area clean and dry.
- Never allow unauthorized personnel to work on or with the pump.
- Do not use petrol or flammable solvents as a cleaning detergent; always use authorized, non-hazardous commercial solvents only.
- Do not use compressed air to clean parts; if no other option is available, wear suitable eye protection with side shields and limit the pressure to a maximum of 2 bar.
- Never use naked flames as a light source when carrying out checks or maintenance operations.
- To avoid the risk of damaging the equipment and/or injuring personnel, after every maintenance or adjustment operation, always make sure no tools or foreign bodies are left on the machine or between moving parts.



Maintenance personnel are responsible for checking that all safety devices (guards, casings, etc.) have been correctly restored before authorizing machine use.



To be done by the electrical maintenance technician:

- Before carrying out any work on electrical components, make sure the electrical power lines have been disconnected (LOTO procedures).
- Before carrying out any maintenance operations, to prevent inadvertent start-up by uninformed personnel, always put up one or more "MACHINE UNDER MAINTENANCE" signs in a clearly visible position.
- After performing any work on electrical components, close the guards correctly before restoring the power supply and restarting the machine.
- In the event of accidents involving electricity, immediately cut off the power supply, move the injured person away from the machine using a dry, non-conducting material (such as wood, PVC, fabric or leather) and take him to a safe place.



CAUTION: This operation is dangerous. Touching the injured person with the power line still connected involves a risk of electrocution. Get medical help immediately.



Equipment maintenance operations (both mechanical or electrical) must only be carried out by qualified personnel who have been adequately trained, informed and instructed on how to perform the aforementioned activities.

3.0 - GUARANTEE

All products manufactured by C.S.F. Inox S.p.A. are guaranteed to the purchaser, for one year from the date of purchase, against hidden defects in materials or manufacture, providing that they are installed and used according to instructions and recommendations of the manufacturer.

The guarantee does not cover wear parts or repairs for damage caused by improper use, abrasion, corrosion, negligence, defective installation, non-observance of inspection and maintenance operations, use of non-genuine spare parts, accidents or any work carried out by the purchaser designed to alter the machine's performance as indicated by the manufacturer.



Before returning to C.S.F. Inox S.p.A. any item to be substituted or repaired under guarantee, inform about the problem the Customer Assistance Office and follow instructions of the manufacturer. Returned items must be properly packed in order to avoid damages during transport and a technical report describing the defect and how it manifested itself must accompany the returned item/s.

Any item with a presumed fault should be returned to C.S.F. Inox S.p.A. at the customer's expense, accompanied by a Declaration of Decontamination (attached to page 56), unless otherwise agreed.

C.S.F. Inox S.p.A. will examine, repair and/or replace the returned piece and then send it back to the purchaser on ex-works basis.

Should the piece be found under warranty, no further costs will be owed by the purchaser. If, on the contrary, the fault is not found under warranty, all necessary reparations and replacements will be charged at normal cost to the purchaser.

C.S.F. Commercial parts incorporated in C.S.F. Inox products are guaranteed by their corresponding manufacturers.

3.1 - CERTIFICATION AND EC MARKING

The equipment was made in accordance with Machinery Directive 2006/42/EC and relevant EC directives applicable at the time of its placing on the market.

This Use and Maintenance Manual complies with Annex I point 1.7.4 of the aforementioned Directive as well as with standard UNI 10893 and ISO/IEC guide 37.



The list of Directives and standards applied is included in the Declaration of Conformity found in the manual of the pump supplied.

4.0 - TRANSPORT, DELIVERY, STORAGE AND HANDLING

4.1 - TRANSPORT

The packings of all pumps manufactured by C.S.F. Inox S.p.A. are defined when placing the order. Unless prior arrangements are made, goods will be packed only for transit conditions and not for long-term storage; should it be necessary to store the pumps outside, it is essential to cover them appropriately with waterproof materials in order to protect the electrical parts (drive system) from rain, dust, humidity, etc.,

4.2 - DELIVERY



On delivery of the supply it is essential to make sure that the packaging has not been damaged during transport so that any claims can be made immediately to the carrier.

Should any damage be ascertained, the following procedure must be observed:

- accept the goods with reservation.
- Take photographic evidence of the damage.
- notify the carrier of the damage sustained via registered mail with the photographic evidence attached.

4.3 - STORAGE

Should you wish to put the machine into storage for long periods of inactivity, it is advisable to place it in a covered area protected from the weather where the temperature is between -5°C – $+40^{\circ}\text{C}$.

4.4 - SITE PREPARATION

It is the user's responsibility to:

- Prepare the installation sites as prescribed by local legislation governing health and safety in the workplace
- Make sure the electrical power supply is compliant with the legislation in force and possesses an efficient earthing system.

LIGHTING

The machine installation site must have adequate natural and/or artificial lighting in compliance with the legislation in force in the country of installation.

Lighting must be uniform, guarantee good visibility in every part of the machine and must not create hazardous reflections. It must also be such that commands on the control panels and emergency stop buttons can be clearly seen (with pumps equipped with electric panel).

FLOORING

Flooring must be of industrial standard, smooth and even. For pumps with bearings housing, after securing the base to the floor, correct alignment of the joints must be checked.

4.5 - HANDLING

The personnel involved must have adequate qualifications and experience in handling and lifting operations.

Use suitable and certified equipment for lifting and handling the machine supplied.



Carry the packed pumps as close as possible to the place of installation by means of appropriate lifting devices and unpack them. During this operation take care, as unsteady parts could fall down.

Packing materials must be disposed of in accordance with the relative regulations in force in the country of installation (see Chapter 19, page 54).

After unpacking, use suitably sized hoisting belts to lift and move the pump-motor assembly to the place of installation* (see fig.A); NEVER use the eye bolts on the motor to move the whole assembly as these are suitable for moving the motor only.

N.B.: if the pump is sold coupled to the motor, it CANNOT be moved without the base.

In versions complete with shroud, take the shroud off before moving the pump-motor assembly (fig. A and B) or the trolley-pump assembly (fig. C) to avoid damaging it.

Pumps which have a base must be handled using eye bolts screwed into the holes which are ultimately used to secure the assembly to the floor (see fig B).

When handling with a crane, always rig up the load using at least two ropes/belts.

When handling with a forklift, the length of the tines must always be greater than the width of the machine and protrude from the opposite side of the load.

When lifting machinery the centre of gravity MUST always be in line with the lifting point.

*** N.B.: check the weight of the machine indicated on the data sheet attached to the instructions.**

Observe all relevant local health & safety regulations.

Fig. A

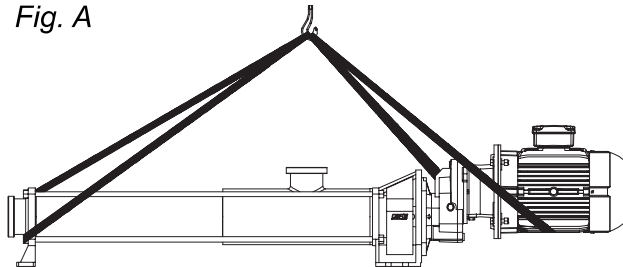


Fig. B

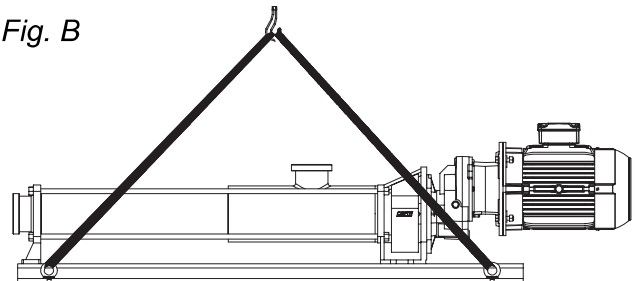
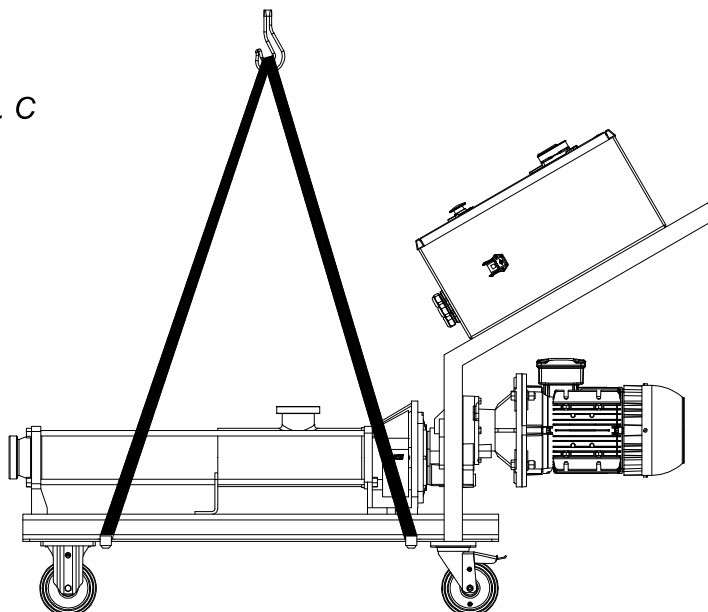


Fig. C



5.0 - RETURNS

- Empty the pump correctly
- Wash and thoroughly clean the pump, especially in the case of harmful or explosive liquids.



TROLLEY-MOUNTED PUMPS WITH ELECTRICAL PANEL MUST NOT BE WASHED WITH JETS OF WATER AS THIS COULD DAMAGE THE INTERNAL ELECTRICAL COMPONENTS.

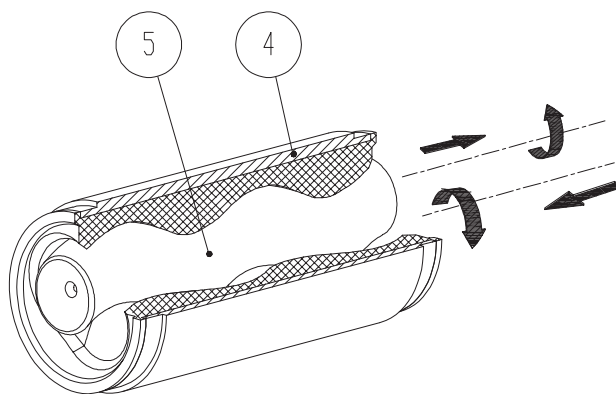
- Thoroughly dry the pump.
- A duly compiled Declaration of Decontamination must accompany the pump (see page 56).

6.0 - DESCRIPTION

Progressive cavity pumps, also known as single screw pumps, are machines with a single rotating axis consisting of a helical steel rotor (5) (available in different materials and with different surface treatments) coupled to a vulcanized rubber stator (4) made from different compounds, used for both liquid, viscous and high-density products which may also be abrasive or contain suspended particles.

The main elements that determine operation of a single screw pump are the rotor and stator.

The rotor (5) is a circular section single or double-threaded screw with standard or long pitch. The stator (4), usually rubber, is vulcanized inside a steel pipe; its hollow core has a circular section double- (or triple-) threaded screw shape to match the rotor with a pitch double the size of the rotor.



Turning inside the stator, the rotor makes a hypocycloidal movement during which the cavities present between the rotor and the stator make a helicoidal movement, conveying the trapped fluid from the inlet to the delivery section. A diagram of the mechanism is provided in the figure below highlighting the longitudinal profile of the rotor and stator and the significant cross-sections for a particular instant of their relative motion.

Changing the direction of rotation, reverses product suction and delivery.

7.0 - APPLICATIONS

Progressive cavity pumps are mainly used for pumping viscous, delicate and abrasive products or which contain suspended solid particles. They are mainly used in the food & beverage sector, in the pharmaceutical, chemical, textile and ceramic industries as well as in water purification and treatment plants.

Progressive cavity pumps are self-priming pumps: taking water as the fluid being pumped, under standard operating conditions the pump is capable of in-taking approximately a 7-meter column. The type of elastomer used determines the maximum temperature the pumped fluid can reach and, thanks to the constant quantity of fluid being conveyed, uniformly and without pulsations, the fluid is neither centrifuged nor mistreated in any way which ensures it maintains all of its organoleptic characteristics and qualities.

Note: For the field of application of the pump in your possession, please refer to the technical sheet.

7.1 - SELECTION CRITERIA

A diagram is used in which the operating conditions dictated by the sliding speed between the rotor and stator (in m/s), and the characteristics of the fluid (abrasiveness and viscosity) must be considered. The straight line relating to the type of fluid used makes it possible, once the theoretical flow rate (in m³/h) has been defined, to calculate the rotation speed value (in rpm) and pump size. Each type of pump, defined by size and number of stages, has characteristic curves determined by the differential pressure between delivery and suction, which, depending on the flow rate, make it possible to calculate rotation speed and absorbed power. This power refers to operation with clean water at 20°C. (See the pump selection diagram on the next page).

Choosing the number of stages depends on the maximum permitted pressure per stage based on the abrasiveness of the product, according to the values shown in the table below:

	PRODUCT ABRASIVENESS			
	NONE	LOW	MEDIUM	HIGH
MAXIMUM PERMITTED PRESSURE PER STAGE (bar)	6	4.5	3	2

In the case of vacuum extraction, a 2-stage pump is immediately chosen and, by inverting the direction of rotation, suction is drawn in from the delivery side, thus achieving benefits for the suction conditions and avoiding problems for the seal in the presence of low pressures.

GUIDE TO THE SELECTION OF STATORS FOR MONO PUMPS

Abbrev.	Denomination	Max. T °C (1)	Food safe	General application	Susceptibilities
NBR	Nitrile Perbunan*	95°	Yes	Food liquids in general, wine, milk, whey, fruit juices (high concentrate lemon/orange to be verified), tomato and fruit purées, tomato ketchup. Animal and vegetable oils and fats. Mineral oils, hydraulic fluids and hydrocarbons (to be verified).	Acids in general, strong concentrated acids, aromatic and chlorinated hydrocarbons, esters, aldehydes, ketones, ozone.
NR	Natural rubber	70°	No	Aqueous abrasive solutions, abrasive solutions in general, organic acids, alcohols, glycols, acetone, aldehydes, silicone oils and greases, cementitious pastes, slurry.	Concentrated acids, greases, oils, hydrocarbons, ozone.
EPDM	Ethylene propylene	100° (140°)	Yes	Hot water, acid solutions (nitric - sulphuric), animal and vegetable oils and fats, ozone, chemical solutions, glycols, caustic soda solutions, alcohols, ketones and esters.	Aromatic hydrocarbons, solvents, benzol, oils and greases (mineral).
FKM	Fluoroelastomer Viton*	100° (180°)	Yes	Acid solutions, greases, oils, silicones, halogenated, aliphatic and aromatic hydrocarbons, xylene, toluene, trichlorethylene.	Hot water, ketones, esters, ethers, chlorosulfonic acid, acetic acid, acetates.
HNBR	Hydrogenated nitrile	100° (135°)	-	Food liquids in general, wine, milk, whey, fruit juices. Excellent resistance to ozone, atmospheric agents and lubricating oils.	Strong concentrated acids, esters, ketones, aromatic hydrocarbons and amines.
CR	PolyChloroprene Neoprene*	90°	Yes	Greases, paraffin and naphthenic oils, aliphatic hydrocarbons, alkaline solutions.	Strong oxidizing agents, chlorinated solvents, fuels and aromatic solvents.
SBR	Styrene-butadiene	80°	Yes	Aqueous solution, sugar solutions, alternative to natural rubber for food products.	Concentrated acids, greases, oils, hydrocarbons, ozone, ketone, esters.

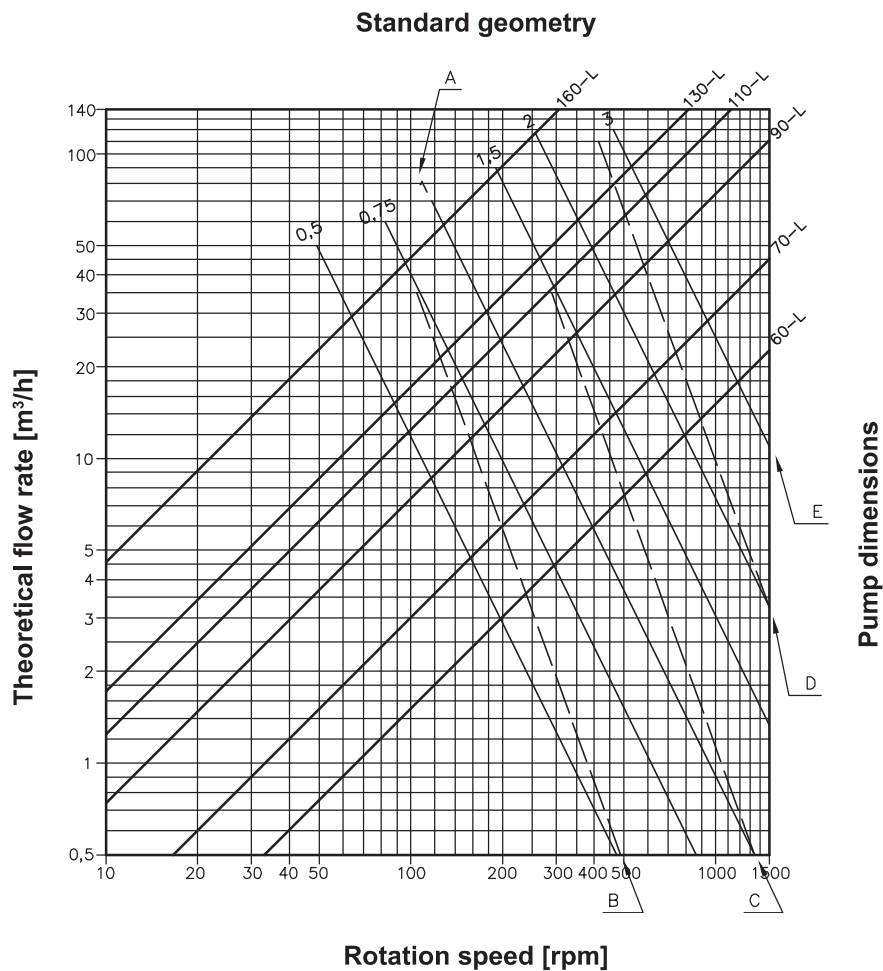
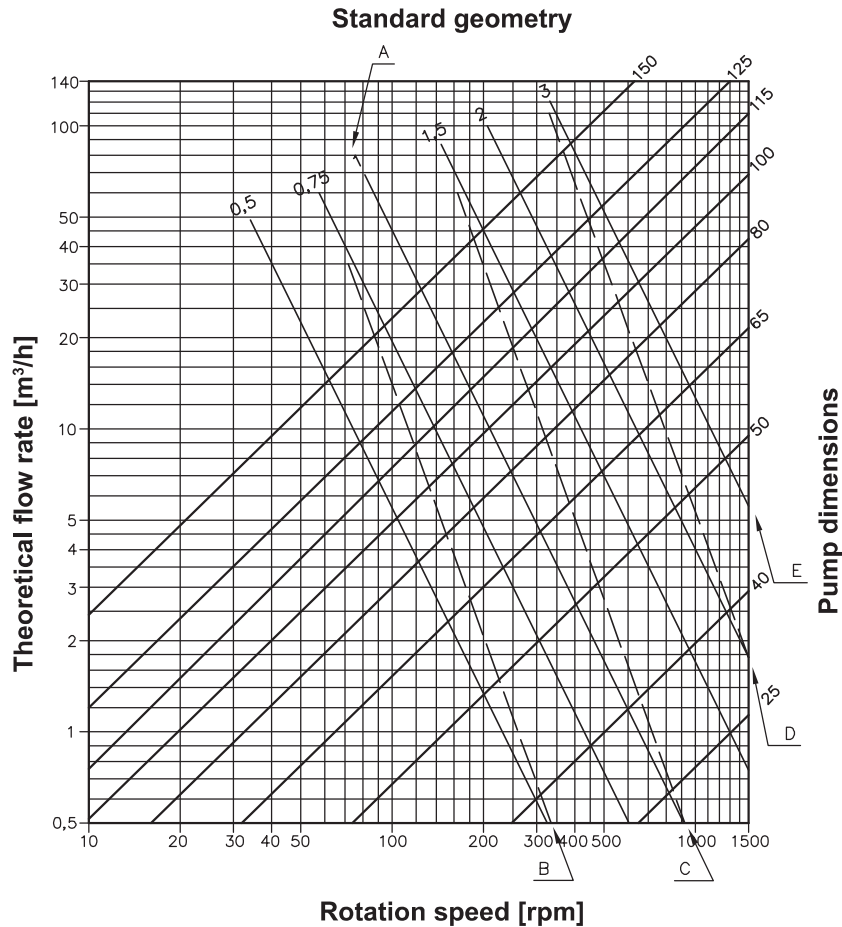
Note (1): T_{max} means the maximum permitted operating temperature for the C.S.F. single screw pump; in brackets the maximum permitted temperature for the elastomer.

*: registered trademarks.

N.B. :: check compound availability

N.B. :: when selecting the most suitable elastomer it is always advisable to consult C.S.F. Inox

DIAGRAM FOR SINGLE SCREW PUMP SELECTION



8.0 - INTENDED USE

8.1 - INTENDED USE

The machine and/or parts thereof must never be used for purposes other than those foreseen in this Use and Maintenance Manual. Observance and strict compliance with the conditions of use, repair and maintenance, as specified by the Manufacturer, constitute essential aspects of the equipment's intended use.

The equipment was designed and built for the uses indicated in chapter 6.0 "Description".

8.2 - PROHIBITED USE



The machine **MUST NOT** be used:

- By personnel other than those indicated in the previous heading;
- For purposes other than those described in Chapter 6.0 and the previous paragraphs;
- With materials and fluids different to those indicated in the intended use;
- In atmospheres that are potentially explosive and/or constitute a fire risk;
- If it has not been installed correctly;
- If there are power supply faults;
- In the event of serious maintenance shortcomings;
- The pump must always be used in an environment appropriate to the level of protection of the motor. Always check this on the motor plate before installation



THE PUMP MAY NOT BE USED IN ENVIRONMENTS WHICH REQUIRE A HIGHER LEVEL OF PROTECTION OR A HIGHER SPECIFICATION MOTOR OR ELECTRICAL PARTS.

Components complying with relative safety standards must be used.

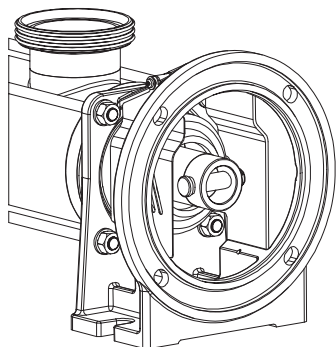
- In ambient conditions different to those indicated in Chapter 4.0.



For any use of the equipment different to that indicated herein, the Manufacturer reserves the right to review the warranty conditions and validity of equipment certification.

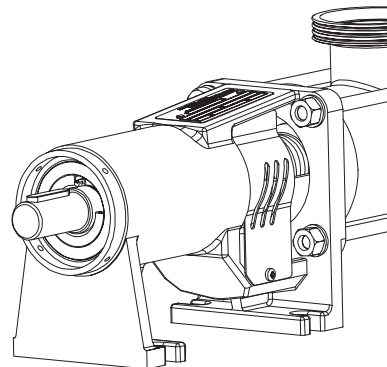
9.0 - MODELS AND WEIGHTS

Two different set-ups are available for each pump model:



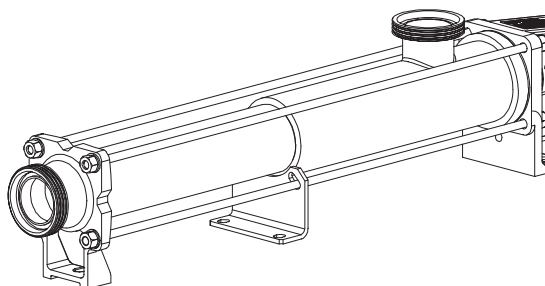
Flanged support for direct coupling of the drive system.

Independent support for drive system coupling by means of an elastic coupling joint.



The weight may vary depending on the pump model, the make and/or model of the installed drive system (check the weight of the machine on the data sheet attached to the instructions).

To identify the model, please refer to the following images.

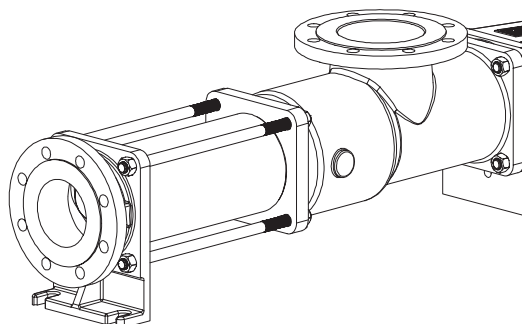


MA series - food execution

Food grade series pump with suction chamber.
All parts in contact with the product are in stainless steel.
The inlet and outlet ports are threaded according to DIN 11851 standard (to SMS, Clamp, BS/RJT, DS, IDF, flanged UNI EN1092-1 PN16 and ENOLOGICAL standards on request).
N.B. ∴ check availability with C.S.F. Inox.

MI series - industrial execution

Industrial series pump, with a robust construction for the most demanding operating conditions.
The inlet and outlet ports are threaded according to UNI EN 1092-1 and PN16 standards (to DIN, SMS, Clamp, BS/RJT, DS and IDF standards on request).



10.0 - INSTALLATION, HOOK-UP AND START-UP

The equipment is built and assembled on the Manufacturer's premises and is then delivered to the customer.

10.1 - HANDLING AND LIFTING PRECAUTIONS

Handling must be carried out in a manner that avoids any damage.

- When handling with a crane, always rig up the load using at least two ropes/belts.
- When handling with a forklift, the length of the tines must always be greater than the width of the machine and protrude from the opposite side of the load.
- All protective devices, guards and casings must be correctly secured in place.
- When transporting the machine, parts must be protected against possible impact and strain (pay particular attention to electrical components).
- The equipment must be lifted as per the procedures described in chapter 4.0.
- Secure cables and adequately protect connectors.

10.2 - TRANSPORT AND POSITIONING

The machine must be installed in observance of the minimum clearances required for safe use and comfortable manoeuvring of personnel and handling equipment.

The machine **MUST** be pushed manually, it must not be towed or pushed using any other means. It must be moved on flat and sound surfaces. It must not be moved on ramps or slopes.



It is important to ensure that the machine is well levelled to avoid vibrations during operation.

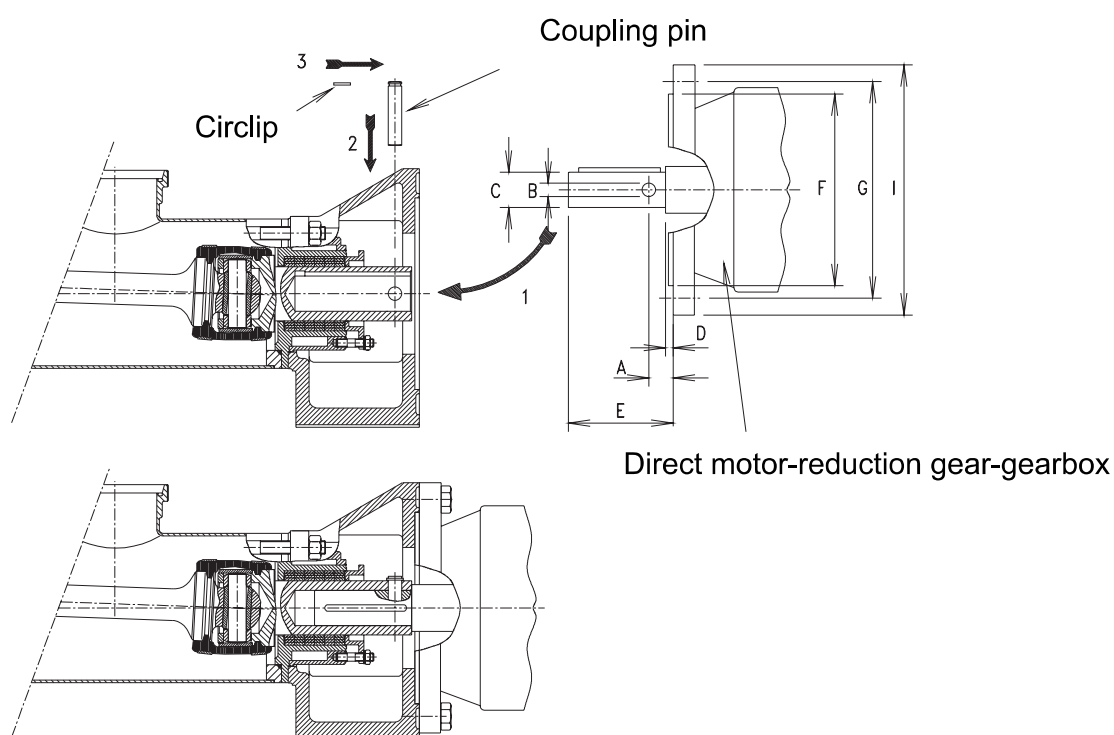
Maximum permissible slope of floor: $\pm 2^\circ$.

For further information, see chapter 4.0 on page 12.

10.3 - DRIVE SYSTEM INSTALLATION - "E" VERSION CLOSE-COUPLED PUMP

Installation should be horizontal and on an even surface.

The telescopically mounted rotary shaft allows for quick and easy maintenance. Coupling of the drive system to the pump in the "E" version, requires that the shaft protrude as per the dimensions indicated in the tables below.



FLANGE DIMENSIONS							
TYPE	F	G	I	TYPE	F	G	I
Motor IEC 132				Motor IEC 160 -180			
M 25	70	85	105	M 125	250	300	350
M 40	110	130	160	M 130	250	300	350
M 50	130	165	200	M 140	250	300	350
M 55	130	165	200	M 150	250	300	350
M 60	130	165	200	M 151	250	300	350
M 65	180	215	250	M 160	250	300	350
M 70	180	215	250				
M 80	180	215	250				
M 90	180	215	250				
M 100	230	265	300				
M 110	230	265	300				
M 115	230	265	300				
M 125	230	265	300				
M 130	230	265	300				
M 140	230	265	300				
M 150	230	265	300				
M 151	230	265	300				
M 160	230	265	300				

SHAFT PROTRUSION										
	M25	M40	M50	M55	M60	M63	M65	M70	M80	M83
A	15	20	25	25	25	25	25	25	26	26
B (H7)	15	8	10	10	10	14	14	14	16	16
C (j6)	14	19	24	24	24	32	32	32	35	35
D	0	0	10	10	10	10	10	10	10	10
E	30	50	80	80	80	100	100	100	100	100
	M90	M100	M115	M125	M130	M140	M150	M151	M160	
A	26	30	30	32	32	32	32	32		
B (H7)	16	16	16	18	18	18	18	18		
C (j6)	35	42	42	55	55	55	55	55		
D	10	10	10	10	10	10	10	10		
E	100	120	120	120	120	120	120	120		

DRIVE SYSTEM ASSEMBLY - "E" VERSION

During coupling operations, smear anti-seize grease over the protruding section of the drive system shaft and insert it in the transmission shaft (17) on the pump, taking care to align the hole for the pin (16). Fasten the motor (301-302) to the lantern bracket flange (50) using the bolts, then insert the pin (16) and the stopper circlip (10).

Any incorrect positioning of the coupling pin hole will lead to a displacement of the shaft inside the pump and possible contact against the structure which could lead to damage or compromise correct pump operation. Tighten the relative screws (96) to secure the guards (95) onto the lantern bracket (50).

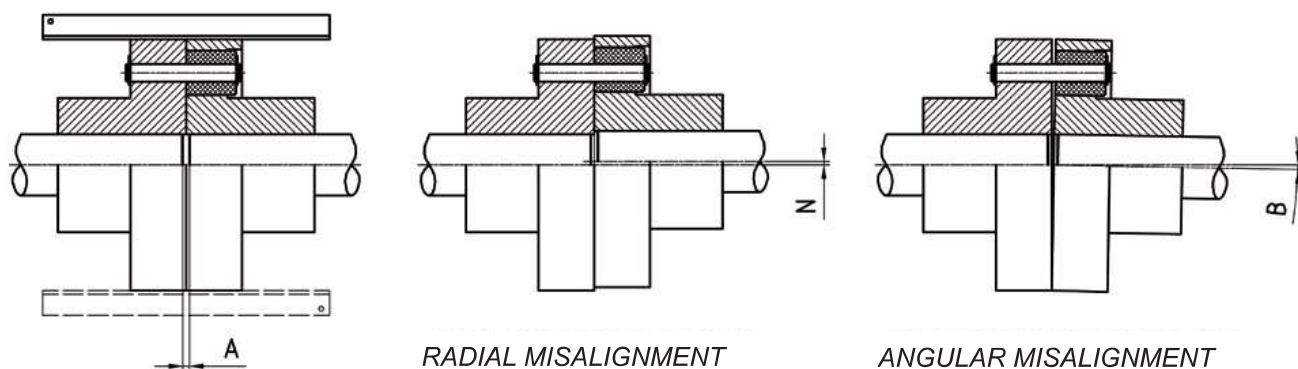
A coupling is sized so that the maximum moment transmitted by the coupling in different operating conditions is less than the maximum permissible strain for the coupling itself.

Transmission couplings with ATEX marking are available for machines for use in potentially explosive environments.

Pumps supplied complete with motor and base are delivered already aligned during assembly. The baseplate may be warped, however, if fixed to an uneven surface.

Precision alignment of the pump-drive unit is essential for correct operation,

It is therefore advisable, once fastening has been completed, to recheck the pump-drive coupling alignment, observing the values indicated in the table below.



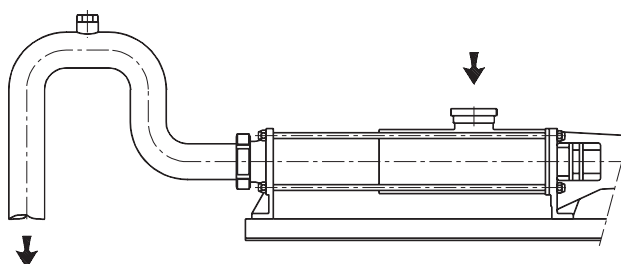
Joint size	A (mm)	N (mm)	B (°)	Pmax. (kW)	Nominal metres (N.m)
38/45	24	1	1.30	3	325
42/55	26	1	1.30	4	450
P155	5	0.4	1	5.5-7.5	650
P175	5	0.4	1	7.5-15	1300
P200	5	0.4	1	18.5-22	1800
P225	5	0.4	1	22-37	2500

10.6 - PIPING INSTALLATION

- A. If the pump is installed with negative head, to avoid dry operation create a siphon by having one section of the piping go upwards. This is to ensure that enough product remains inside the pump so that it can self-prime the next time it is started.

There must be a cap at the highest point of the siphon so that the pump can be filled for first start-up and each time the pump is emptied.

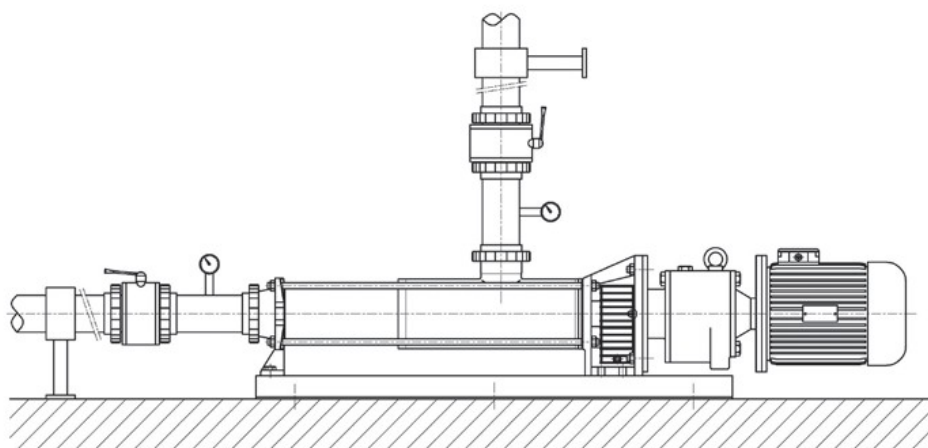
If there is any possibility that pump suction could empty out, the vertical section of pipe must contain, at each start-up, a volume of product at least equal to the volume of air to be purged from the suction pipe (10% more if intake is from the suction port).



- B. To prevent the creation of harmful stresses, the inlet and outlet pipes must be connected to the pump ports without the use of force. These pipes must be supported independently without placing any burden on the pump.
- C. The internal diameter of the piping must match the pump connections, or in any case must not be smaller, in order to avoid any increase in suction losses which would lead to reduced machine performance.
- D. In the case of very long piping, install a valve in pump inlet and outlet to facilitate inspection operations without unnecessarily having to empty the entire system.
- E. Reduce the number of bends and restrictions along the system as much as possible.
- F. Check the tightness of the suction connections so that the pump's suction capacity isn't decreased.

G. If the pumped fluid is at a high temperature, flexible expansion joints must be installed to avoid possible forcing due to thermal expansion

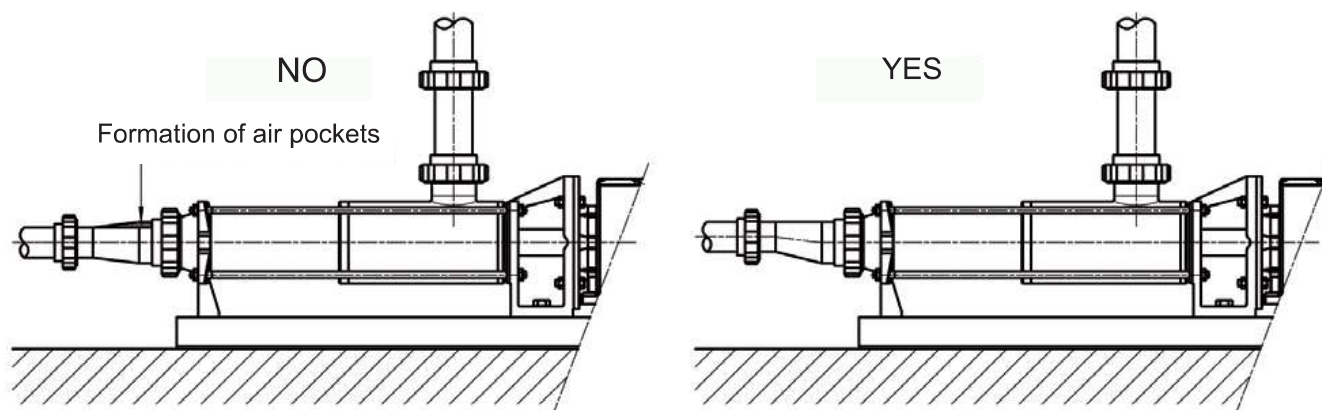
It is advisable to install pressure gauges on the piping, as close to the pump as possible, in order to monitor the pump's operating conditions.



H. It is advisable to install a filter on the pump inlet to stop foreign bodies from entering the pump.

I. The suction piping must be as short as possible and rise slightly towards the pump.

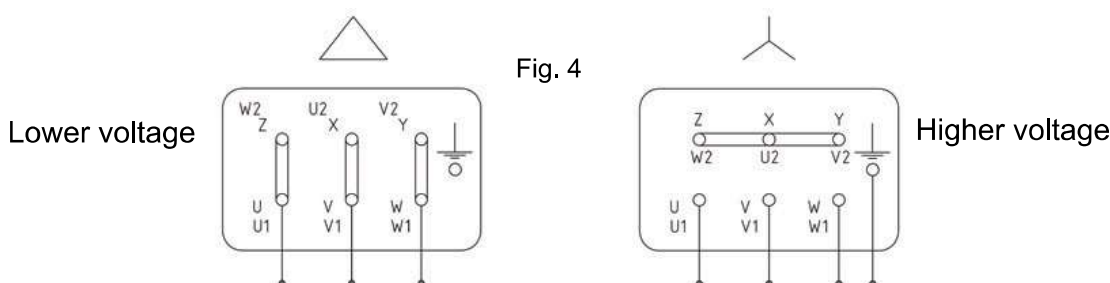
It is advisable to use eccentric reducers in order to avoid the formation of air pockets.



10.7 - ELECTRICAL CONNECTION

Make the electrical connection only after the hydraulic connection has been completed; set up the motor control system in conformity with the technical standards and regulations in force (EN 60204-1): in particular a manual electric power disconnect switch must be installed with adequate current breaking capacity; devices for overcurrent and overload protection (e.g. fuses, automatic switches, etc.) must also be fitted, plus, if necessary, a device to prevent accidental restarting.

Check that voltage, network frequency and number of phases conform to the technical features shown on the electric motor.



All the material used for the electrical connection (cables, cable clamps, switches and shielding) must have a suitable protection rating for the environment in which it is installed. Be sure to use cables of adequate cross-section for the current indicated on the motor data plate so as to prevent wires from overheating.

Before doing anything else, make the motor's earth connection, using the relative terminal on the motor and a cable of adequate cross-section.

Connection of the cable to the terminal board can be a star or delta connection, according to the values indicated on the motor data plate and based on the network voltage values as shown in the diagram below (fig. 4). The terminals must be clean and carefully tightened without exerting excessive force.

When starting the motor, current absorption raises (5-6 times the nominal value) for a very short period; if the network cannot bear this absorption increase, we advise to use star or delta starters or other systems (for example auto-transformer).

C.S.F. Inox S.p.A. will accept no responsibility for damage to property and/or injury to persons caused by failure to comply with the technical standards and regulations in force.

11.0 - OPERATION

Progressive cavity pumps do not create pressure to convey the fluid but simply transfer the product from the suction location to the delivery location. Depending on the model of pump being used, pressures of up to 24 bar can be reached. The maximum pressure per stage is influenced by the abrasiveness of the product being handled. The higher the abrasiveness, the lower the permitted pressure.

Tables indicating the maximum permitted pressure values for the various pumps are provided below.

N.B .: volumetric pumps with 2S stator and 4 stages cannot operate with suction from the tip.

Pump	Max. permitted pressure	Pump	Max. permitted pressure	Pump	Max. permitted pressure
M 25-1	6 bar	M 80-1	6 bar	M 125-1	6 bar
M 25-2	12 bar	M 80-2	12 bar	M 125-2	12 bar
M 40-1	6 bar	M 80-2S	22 bar	M 125-2S	20 bar
M 40-2	12 bar	M 80-4	24 bar	M 125-4	24 bar
M 50-1	6 bar	M 90-L	6 bar	M 130-L	6 bar
M 50-2	12 bar	M 83	6 bar	M 140-L	6 bar
M 55-4	24 bar	M 100-1	6 bar	M 150-1	6 bar
M 60-L	6 bar	M 100-2	12 bar	M 150-1S	10 bar
M 63	4 bar	M 100-2S	22 bar	M 150-2	12 bar
M 65-1	6 bar	M 100-4N	24 bar	M 151-1.5	9 bar
M 65-2	12 bar	M 103	4 bar	M 160-L	6 bar
M 65-2S	20 bar	M 110-L	6 bar	M 200-2	12 bar
M 65-4	24 bar	M 115-1	6 bar	M 200-L	4 bar
M 70-L	6 bar	M 115-2	12 bar		

11.1 - PRELIMINARY OPERATIONS BEFORE START-UP

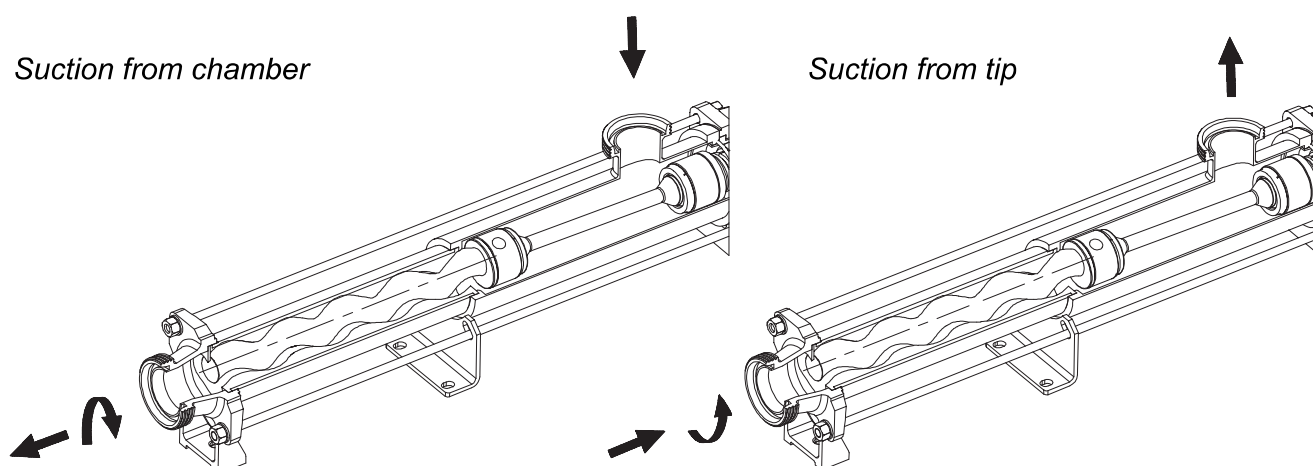
Before starting the machine, a series of checks and controls must be carried out to prevent any errors or accidents during the start-up phase.

- Check that the pump has not been damaged during transport, installation and handling.
- Check that all fixed guards are securely attached to the machine.



If ever the equipment does not appear suitable for correct and safe operation, TAKE IT OUT OF SERVICE until damaged parts have been repaired or replaced.

- Check that the pump turns in the direction indicated.



- The suction pipe and the pump must be filled with liquid. There are two possible cases:
 - a) When the pump is to operate with a negative suction head, it must be filled by pouring liquid into the piping.
 - b) When the pump is to operate below the level of the suction liquid, i.e. with a positive head, the suction and discharge gate valves must be opened until the pressure gauge on the pump discharge shows a pressure corresponding to the positive suction head.

The pump must never run dry! Even just a few seconds of dry operation is enough to damage the stator.

If the sealing chamber is to be cooled, open the cooling water supply and adjust the flow. Make sure any inlet and outlet valves are completely open

The progressive cavity pump is a volumetric pump and, therefore must never operate with a valve closed on the outlet piping. It can produce pressure which in theory is infinite. If the outlet piping is closed, the pressure generated by the pump may reach values higher than those permitted by the system.

It is advisable to install adequate safety devices on the system, such as pressure switches or by-passes.

Start the pump and check once again that it rotates in the right direction.

11.2 - EXTENDED STOP

If a period of prolonged inactivity is envisaged, refer to the storage operations described in § 4.3 (page 13) and take the following measures:

- Disconnect the electrical power supply;
- Disconnect the suction and delivery hoses from the pump;
- Store the machine in an indoor location, applying the brakes on the wheels;
- Grease any unpainted parts and make sure the machine does not come into contact with corrosive substances;
- Protect the machine from knocks and mechanical stress;

When stopping the pump for a longer time, empty the pump completely and wash it accurately in order to avoid the formation of scales and/or encrustations.



To return the machine to service after a prolonged period of inactivity, perform the initial controls for first start-up (previous heading).

11.3 - CLEANING THE PUMP

The pump does not require any special washing procedures. The washing cycles normally used for the plant in which it is installed are quite satisfactory. When using the pump for liquids that tend to harden or crystallize, always make sure it is washed before taking the machine out of operation. This will ensure durability of the seal and of the pump itself. It is the user's responsibility to ensure that the washing liquids are compatible with the process liquid and the pump.

For correct cleaning of the pump, please see the washing procedures described in heading 19.0 on page 54.

12.0 - OPERATING MALFUNCTIONS



All troubleshooting operations must be carried out by authorized and qualified personnel.

IMPORTANT: before resetting the machine, make sure that the cause behind the emergency stop has been eliminated.



Never carry out maintenance and/or repairs that alter the safety of the machine.

The purpose of this chapter is to provide solutions for the problems or malfunctions that are most likely to occur.

The list below is not exhaustive, if necessary contact the Manufacturer or relative service centre (if present).

We are herewith listing some of the possible working irregularities which may occur using the pumps, with a table helping to find out the possible causes and how to solve the problem.

Trouble:

- the pump is not turning because:

- A) it won't start
- B) it jams
- C) the circuit breaker trips

- The pump runs but:

- D) does not self-prime
- E) the flow rate is insufficient
- F) the flow is not uniform
- G) the pump is noisy
- H) the stator wears too quickly
- I) the rotor wears too quickly
- L) the shaft seal is leaking
- M) the delivery pressure is low.

Possible causes and necessary operations to solve them:

- 1) With a new pump, excessive friction or adhesion between rotor and stator: fill the pump, with lubricating liquid if necessary, and turn it by hand with the help of a suitable tool.
- 2) Excess pressure on outlet: check the pressure with a pressure gauge and compare it with the data indicated in the order; check that there are no obstructions along the outlet piping.
- 3) The stator has swollen; it is not compatible with the product being pumped: check that the product being pumped corresponds with the fluid indicated in the order; change the material of the stator.
- 4) Solids in the product being pumped too large: increase the liquid percentage; reduce size of the solids; install a bigger pump.
- 5) Blockage in suction pipe: remove the blockage and take measures to prevent it reforming.
- 6) The O-rings on the mechanical seal are damaged: replace the O-rings; check the compatibility of the O-ring material with the fluid being pumped; if necessary, change the material of the O-rings.
- 7) The sealing rings on the mechanical seal have seized: replace the rings; check the data indicated in the order; if necessary, use rings made of a material more suitable for the fluid being pumped.
- 8) Incorrect direction of rotation: adjust the electrical connection.

- 9) The braided packing is not suitable for the fluid being handled: change the braided packing type.
- 10) Compression on the packing gland is badly adjusted: adjust the compression and replace the braided packing if necessary.
- 11) The pump is turning too fast: lower the rpm, or use a larger pump if you want to maintain the flow rate.
- 12) The fluid being pumped is too viscous: increase the temperature taking care to avoid cavitation in pump inlet.
- 13) The fluid being pumped is too heavy: dilute with a less dense fluid or use a more powerful motor.
- 14) The articulated joints are worn: replace worn parts and grease the joints with suitable grease.
- 15) Pump and drive system not aligned: restore the alignment.
- 16) The coupling has been damaged: replace the damaged parts, taking care to maintain correct alignment between the pump and drive system.
- 17) The rolling bearings are damaged: replace and lubricate the bearings; if the temperature of the fluid being handled is very high, increase the bearing clearance and use a high-temperature lubricant.
- 18) The stator is damaged: replace the stator with one that it is compatible with the fluid being pumped.
- 19) The rotor is worn: replace the rotor, if necessary, change the rotor material or coating.
- 20) The motor is working in two phases. The electrical data of the motor does not match the power supply: check the electrical system and the electrical data for the motor.
- 21) The temperature of the product being pumped is high causing thermal expansion of the stator: if the temperature cannot be lowered, install a smaller rotor.
- 22) Foreign body in the pump: remove the foreign body and check the condition of both rotor and stator.
- 23) The product solidifies or sediments when the pump stops: clean the pump and repeat the operation after each use.
- 24) Suction head too high (insufficient NPSH): reduce suction losses, install the pump lower (increase available NPSH).
- 25) The pump is running dry: prime the pump, install a suitable device to protect against dry running.
- 26) Air ingress in suction pipe: increase the product level at suction point, eliminate inlet vortices, check the seal and check for air infiltration from the fittings.
- 27) The pump turns too slowly: install an adjustable control and increase the number of rpm.
- 28) With small diameter rotors, the operating temperature is not reached: heat the stator and bring it up to the operating temperature.

Problems that may arise with trolley-mounted pumps with or without electric panel:

The machine does not start, the panel does not turn on or freezes:

- Check the connections inside the electrical panel.
- Check the display for any alarm messages.
- If the problem persists, notify the Manufacturer.



The person carrying out the operations above must be kitted out with the necessary Personal Protective Equipment and must follow the safety instructions as indicated in heading 2.4 of this Use and Maintenance Manual.

		PROBLEM ENCOUNTERED										
		A	B	C	D	E	F	G	H	I	L	M
POSSIBLE CAUSES AND NECESSARY OPERATIONS TO SOLVE THEM	1	●							●			
	2			●		●	●	●	●	●	●	
	3	●	●	●		●		●	●	●		
	4	●	●	●	●	●	●	●	●	●		●
	5				●							
	6				●		●				●	●
	7				●		●				●	●
	8				●							●
	9				●						●	●
	10				●		●				●	●
	11							●	●			
	12							●	●			
	13				●			●	●			
	14		●	●	●			●				
	15		●	●								
	16		●	●				●				
	17	●	●	●				●				
	18					●	●			●	●	●
	19					●	●					●
	20	●	●	●		●	●					
	21	●	●	●		●		●	●	●	●	
	22	●	●	●				●	●			
	23	●	●	●					●	●	●	●
	24					●	●	●		●	●	●
	25		●	●		●	●	●	●	●		●
	26					●	●	●				●
	27					●	●					●
	28					●	●					●

13.0 - SEALS

All C.S.F. Inox progressive cavity pumps are fitted with mechanical seals with standardized seats in compliance with standards EN12756 and ISO 3069. The type of mechanical seal and material are chosen according to the liquid to be pumped.



Before using the pump for any liquids other than those specified when selecting and ordering, ensure that mechanical seals and gaskets are suitable for the new product.

MATERIAL CODES

METALS

H1 - AISI 304 chromium-nickel stainless steel
X1 - Stainless steel Inox AISI 316L
L5 - Hastelloy (Ni based alloy)

ELASTOMERS

P1 - Nitrile (NBR)
E1 - Ethylene propylene (EPDM)
(FDA-3A-USPVI)
Y1 - Fluorocarbon (FPM)

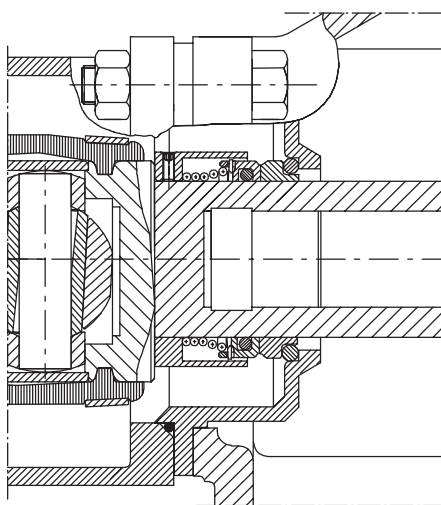
METAL CARBONS

X3 - Hard metal welded on stainless steel (TUC)
R1 - Integral hard metal hard metal (TUC)
K1 - Integral silicate carbon (SIC)

CARBONS

V1 - Normal carbon
V2 - Special carbon

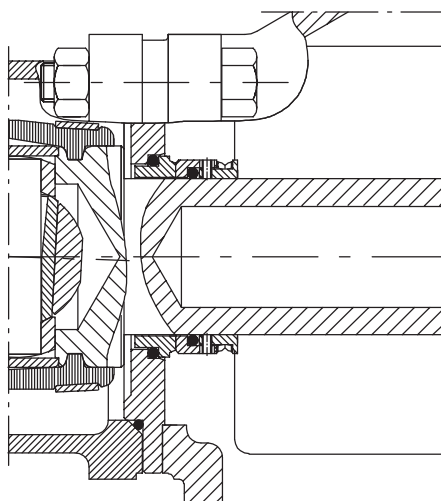
EXECUTION T



INTERNAL "T" REVERSIBLE MECHANICAL SEAL

The seal is applied inside the suction chamber immersed in the product to allow better cooling and therefore a longer service life of the seal itself.

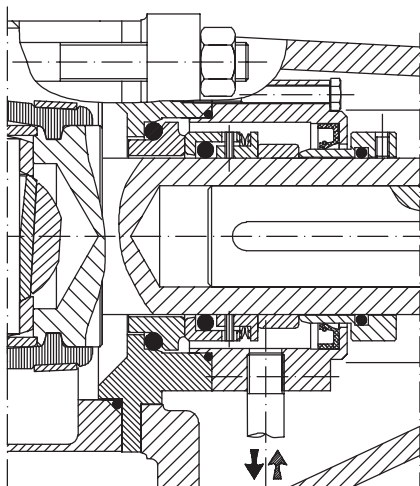
EXECUTION Y



REVERSIBLE "Y" EXTERNAL MECHANICAL SEAL

The mechanical seal is applied outside the suction chamber. This execution is used in those cases where flushing is not possible or the seal must not come into contact with the fluid being pumped due to sanitary, corrosion or abrasion issues.

EXECUTION U - Y1



EXTERNAL "U" REVERSIBLE MECHANICAL SEAL

It includes an axial mechanical seal plus a radial seal that works on a ceramic-coated bush.

EXTERNAL MECHANICAL SEAL "Y1"

Execution for less demanding applications, it includes an axial mechanical seal plus a lip ring that works on a stainless steel bush.

These executions envisage the circulation of flushing liquid which cleans, lubricates and cools the seal. They are used with products that have a tendency to crystallize, adhere, harden and high abrasive characteristics.

"U" and "Y1" exec. mechanical seals auxiliary flushing

At first start-up, it is essential to guarantee filling of the pump and the auxiliary systems (when present), such as the external seal lubrication circuit.

Lack of compliance with the present requirements causes the dry operation of the pump and of the mechanical seal; consequently the mechanical seal can be overheated and damaged.

The following conditions are recommended:

Ø Mechanical seal	Ø Flushing tubes	Flow rate l/min	Pressure (bar)
Ø 20	Ø 1/8" Gas male	0.2 – 0.5	0.5 – 1.5
Ø 28	Ø 1/8" Gas male	0.5 – 1.0	0.5 – 1.5
Ø 35	Ø 1/8" Gas male	0,7 ÷ 1,3	0.5 – 1.5
Ø 45	Ø 1/8" Gas male	0.8 – 1.5	0.5 – 1.5
Ø 50	Ø 1/8" Gas male	0.8 – 1.5	0.5 – 1.5
Ø 65	Ø 1/8" Gas male	1 – 2	0.5 – 1.5
Ø 80	Ø 1/4" Gas female	2 – 3	0.5 – 1.5

N.B. : the flow rate of the flushing liquid may vary based on the number of pump rpm.

Operation checks:

Verify the presence of flushing of the mechanical seal.

Verify the absence of leaks from the auxiliary service connections of the seal (if present).

Flushing liquid requirements

The flushing liquid must be compatible with the liquid being pumped.

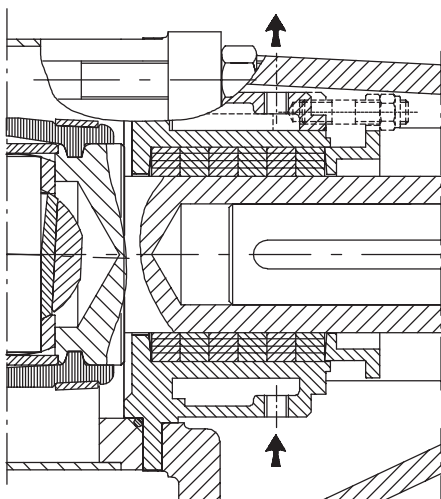
It is advisable to use one of the following liquids.

- Water with electrical conductivity of 100 — 800 µs/cm
- Water and glycol mixture
- Glycerine

BRAIDED PACKING

Braided packing is designed to limit loss of product, not prevent it entirely. A slight leak is necessary to avoid excessive friction and, consequently, overheating of the parts in contact.

The packing gland must be loosely tightened when starting the pump. Initially, allow a leakage rate of 30 to 50 drops/min., depending on the type of product being pumped, until the braided packing has settled and adapted to existing temperature conditions (approx. 10-15 min.). Then moderately tighten the packing gland evenly until minimum leakage is achieved. This leakage



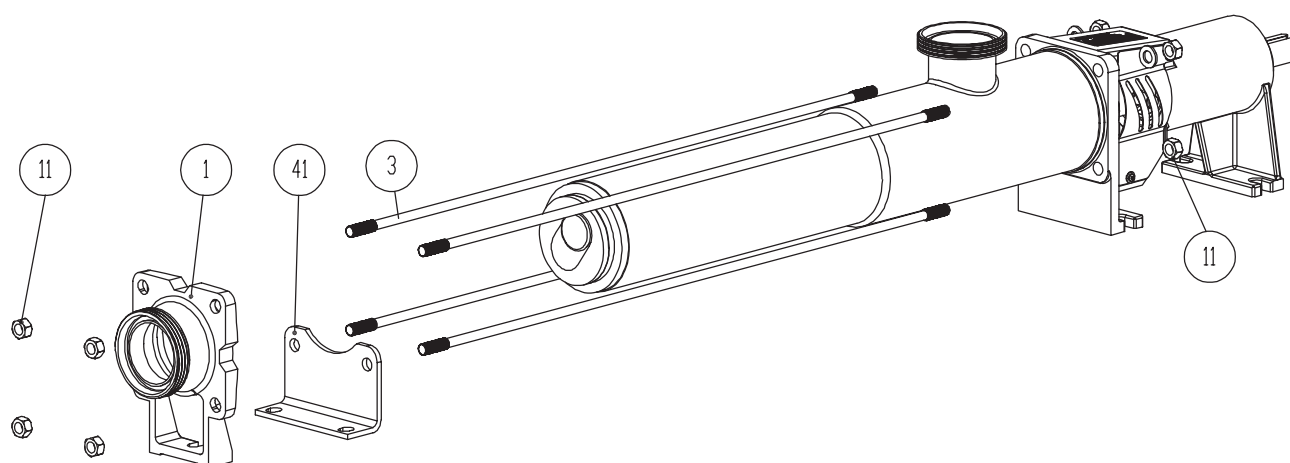
will depend on the product, pressure, pump rotation speed and temperature. The minimum leakage rate is around 10-20 drops/min. The braided packing is working correctly when lubrication is achieved by means of the pumped product. Excessive compression on the braided packing inhibits this lubrication resulting in: dry rotation, burnt packing, heavily scored shaft with consequent excessive leakage of pumped liquid.

Externally cooled braided packing: cooling flushing is envisaged in the stuffing box to limit increases in temperature.

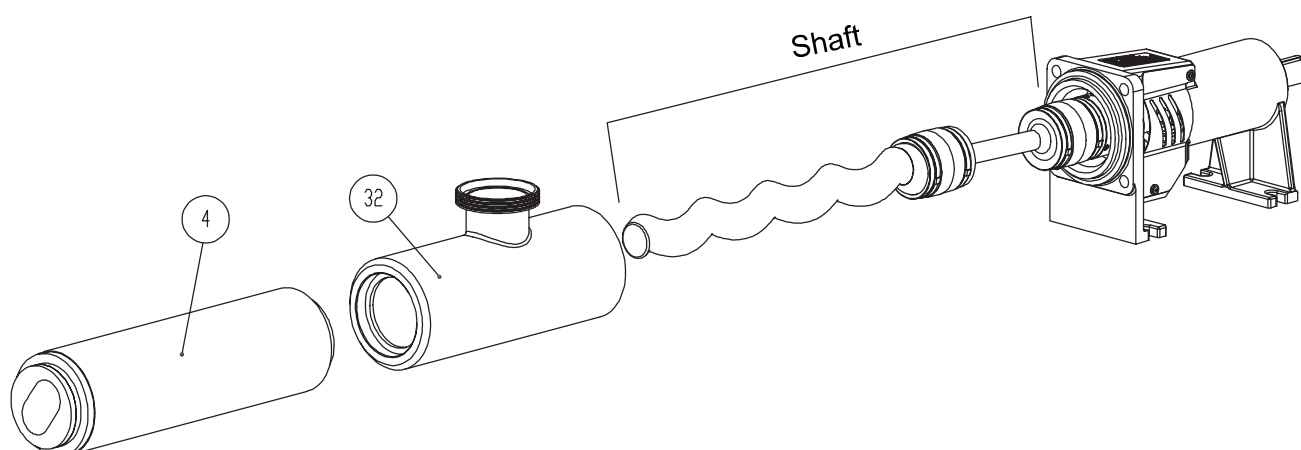
14.0 - PUMP DISASSEMBLY

1. Always work in a clean environment away from sources of dust, swarf, etc.. Make sure the pump cannot move during disassembly operations.

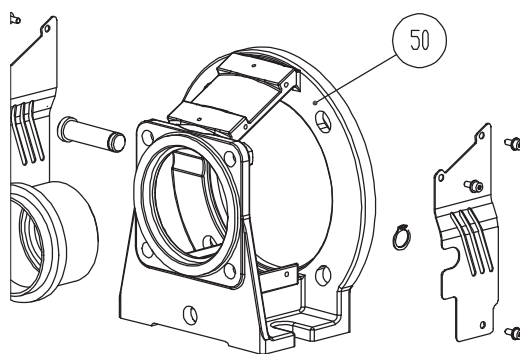
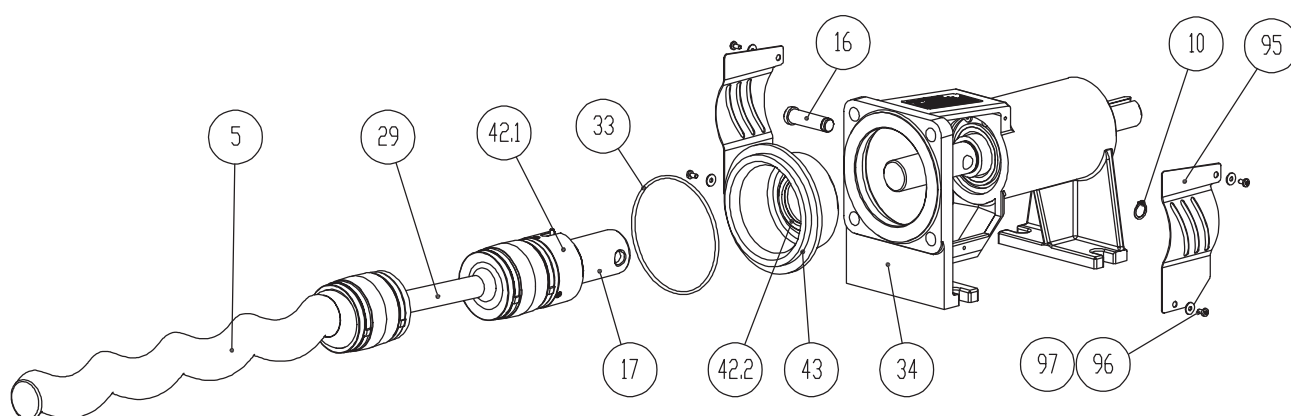
Unscrew and remove the front nuts (11), remove the delivery port (1) and the intermediate support (41) (if present). Unscrew the rear nuts (11) and remove the tie rods (3).



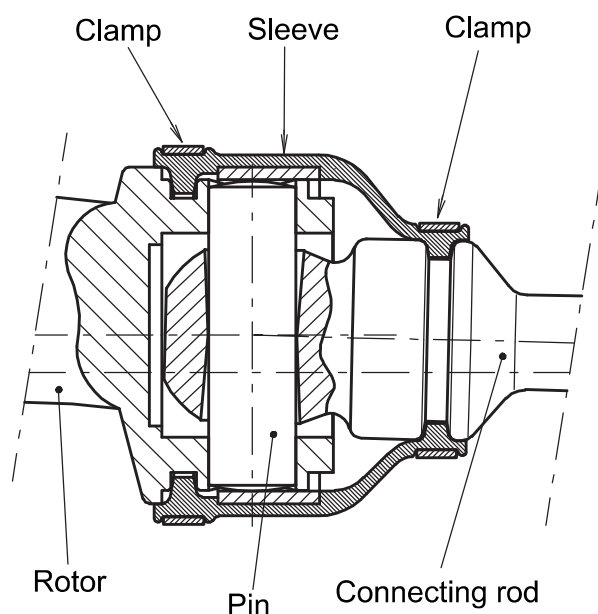
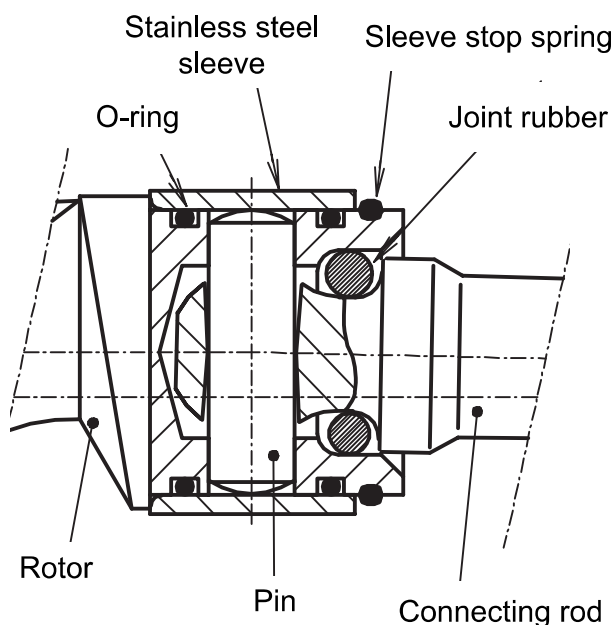
2. Using a chain wrench, extract the stator (4), turning it counter-clockwise, and remove the suction chamber (32), taking care not to stress the shaft so as not to compromise the mechanical seal.



3. Remove the screws (96) and washers (97) and take off the guards (95). Using special pliers, remove the stopper circlips (10) and, with the aid of a pin driver, extract the coupling pin (16). Remove the whole shaft [rotor (5) - connecting rod (29) - drive shaft (17) - rotary part of the mechanical seal (42.1)]. Remove the seal chamber (43) from the support (34) (or from the lantern bracket (50) for "E" version pumps), with the fixed part of the mechanical seal (42.2) still inside and remove the O-ring (33).

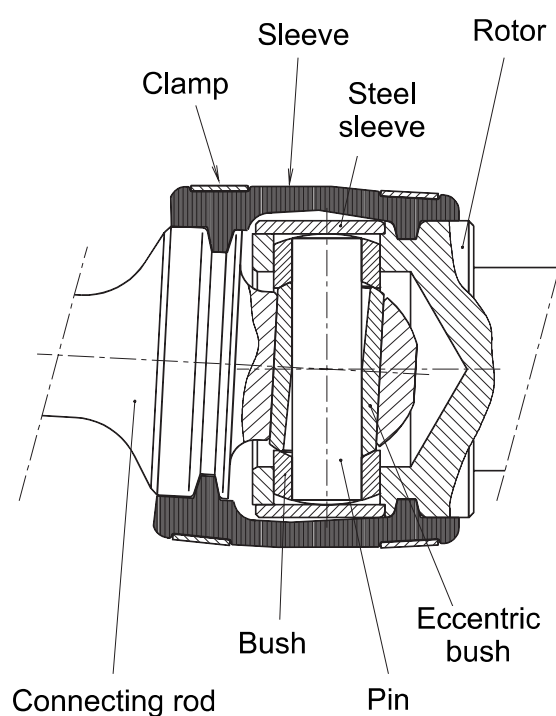


Version in high-strength stainless steel with O-ring seals and stainless steel protective sleeves.
Execution from size M 25 to M 50.



Version in high-strength stainless steel with NBR (EPDM-FPM) protective sleeves.
Execution for size M 55 – M 60L.

Wear-resistant version with hardened bushings for heavier conditions and loads and NBR (EPDM-FPM) protective sleeves.
Execution from size M 65 to M 200.



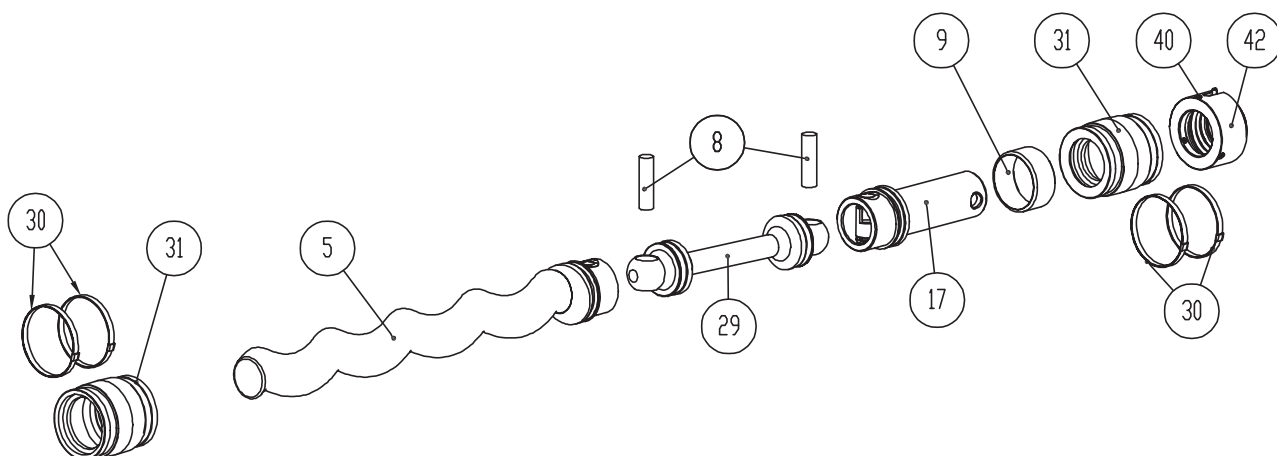
4. Clamp the complete pump shaft in a vice.

Unscrew the fixing grub screws (40) on the rotary part of the mechanical seal (42) (present on reversible seals) and remove the latter from the drive shaft (17).

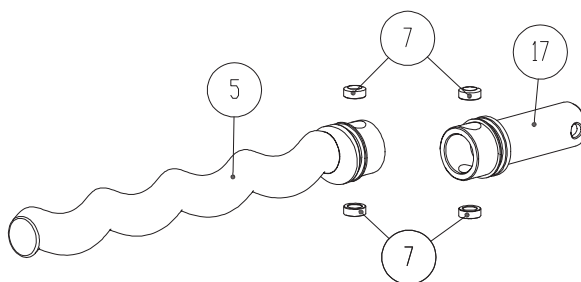
Continue with disassembly of the articulated joints covered by the rubber sleeves (31) (not present in sizes 25-40-50): remove the clamps (30) (cut them with scissors or a hacksaw), clean around the sleeve and spray detergent into the slots if necessary. Insert two screwdrivers under the sleeve (31) and push hard to prise it out of the grooves which hold it in place.

Remove the steel sleeve (9) and then, using a pin driver, remove the pin (8) from the hole in the bush to free the rotor (5) from the connecting rod (29).

Proceed in the same way for the second sleeve to release the drive shaft (17) from the connecting rod (29).

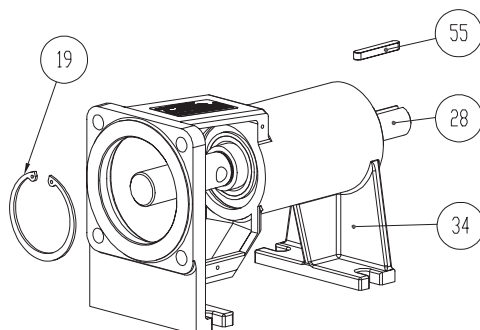


5. Extract the guide bushes (7) from the rotor (5) and from the shaft (17) (not present in sizes 25-40-50).

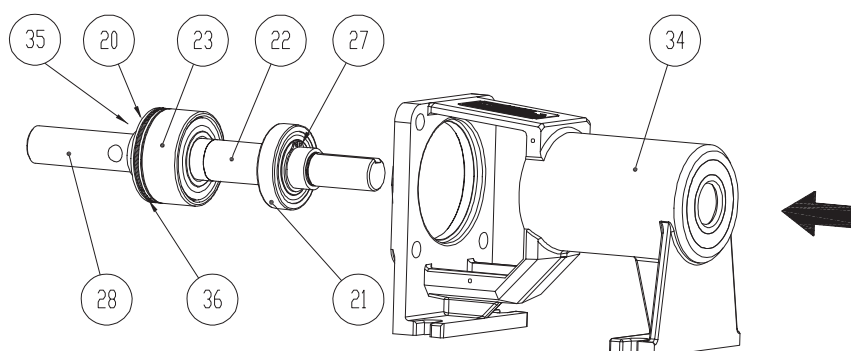


14.1 - DISASSEMBLY OF BEARING SUPPORT

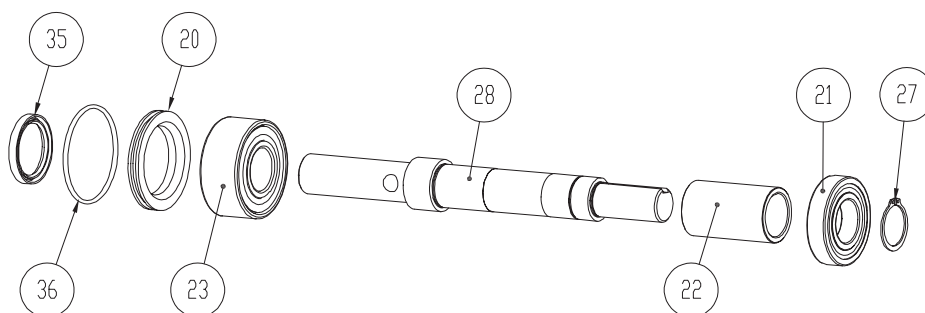
1. Remove the key (55) from the shaft (28); remove the circlip (19) from its seat on the support (34).



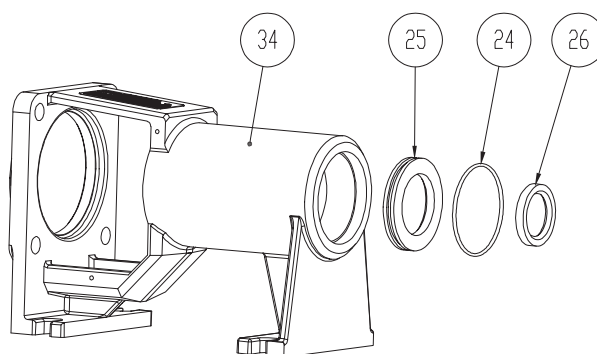
2. Using a rubber or Teflon mallet, remove the shaft assembly (28) complete with bearings (23-21) - spacer (22) - circlip (27) - inner ring (20) - Gaco ring (35) from the support (34) and the O-ring (36).



3. Remove the circlip (27) and, in sequence, remove the bearing (21) - the spacer (22) - the bearing (23) - the Gaco ring (35) - the inner ring (20) and the O-ring (36) from the shaft (28).

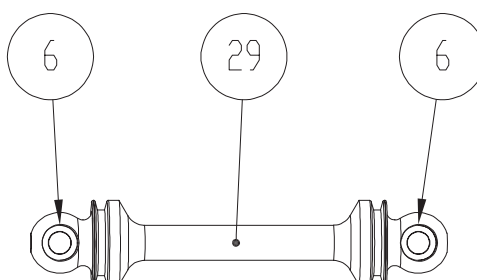


4. Remove the Gaco ring (26), the outer ring (25) and the O-ring (24) from the support (34).



15.0 - PUMP ASSEMBLY

1. After thorough cleaning and washing using detergent liquids, assess the condition of the eccentric bushes (6) on the connecting rod (29): they must not be worn or broken.



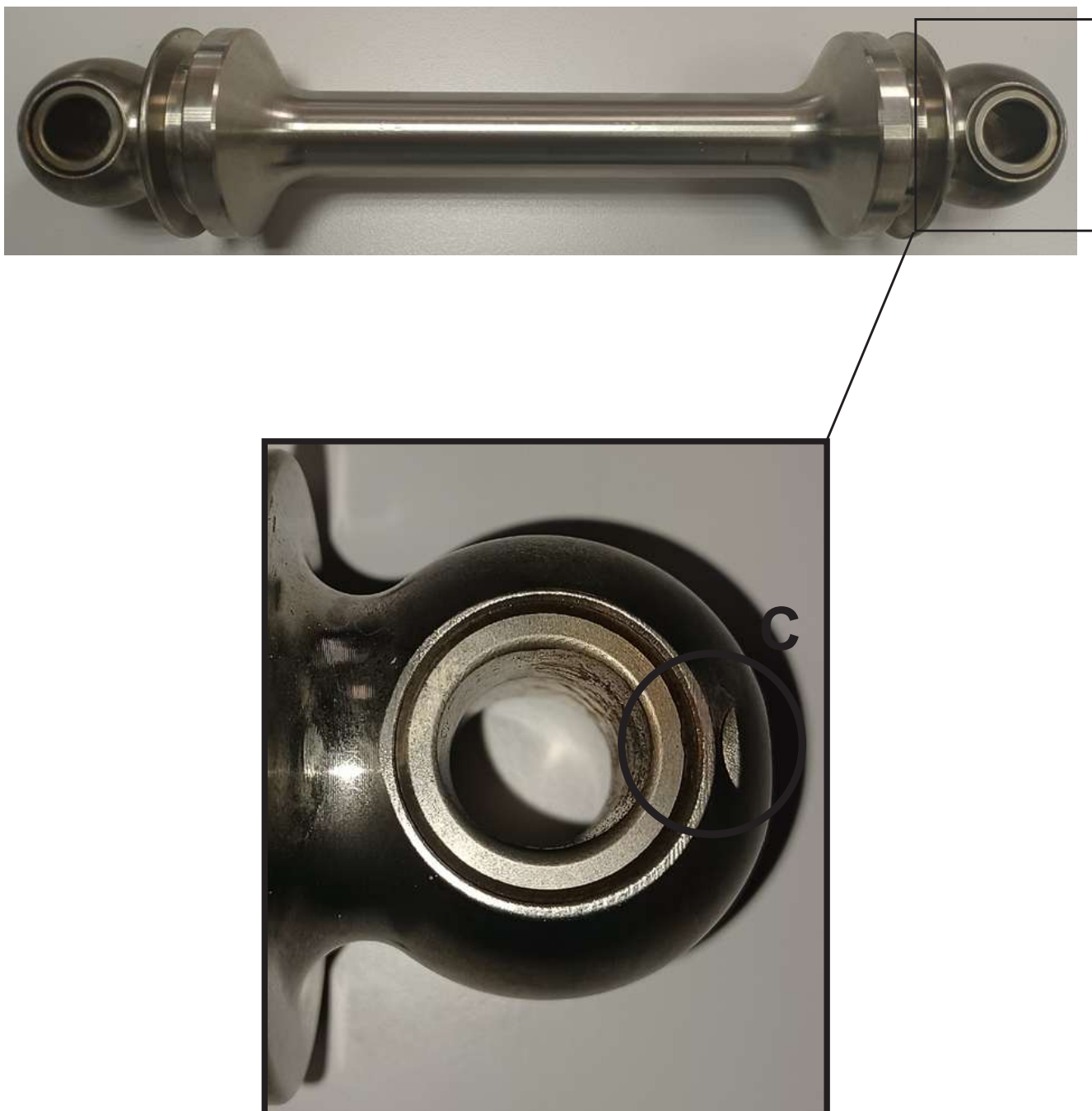
2. Referring to the images accompanying steps 4 and 5 in chapter 14, proceed by inserting the new rotor (5), complete with two guide bushes (7) and specific lubricating grease, add the coupling pin (8) and cover with the steel sleeve (9).
To insert the rubber sleeve (31), first soften it in warm water, that way it will be possible to simply press it into the relative recesses.
Complete the operation by securing everything in place with the two clamps (30) (we recommend using the special machine) and removing any excess.



When fastening the clamps, proceed gradually, partially tightening alternately, before final tightening.

When having to replace the eccentric bushes (present from size M 65 upwards) on the connecting rod, pay attention to two important aspects:

- Being hot assembled, the end of the round part must be heated up, both to facilitate expulsion of the worn bush and to insert the new one.
- The bushes must be positioned with the eccentric part perfectly aligned with the connecting rod and the round part (ref. C).



3. To reassemble, carry out the steps already described in steps 3, 2 and 1 of chapter 14 in reverse order.

16.0 - MACHINE MAINTENANCE

The following paragraphs contain indications on routine maintenance operations for progressive cavity pumps. For any further information, please contact C.S.F. via the contact details in the end of this manual.

16.1 - SAFETY DURING MAINTENANCE OPERATIONS

When carrying out maintenance and/or repair work, always observe the following instructions:

- Before carrying out any type of maintenance or repair work, always isolate the machine from all power supplies (see chapter 9.0 on installation).
- Before starting work, put up a "MACHINE UNDER MAINTENANCE" sign where it is clearly visible.
- Do not use solvents or flammable products for cleaning.
- Take maximum care not to disperse lubricating oils or grease into the environment.



Maintenance/repair work must be carried out **ONLY AND EXCLUSIVELY** by qualified, trained personnel.



Repairing or cleaning moving parts is strictly forbidden.

When carrying out maintenance or repair work, it is advisable to abide by the following:



- When handling the products, wear protective gloves against mechanical and chemical risks, overalls (trousers must always be worn outside safety shoes) and safety glasses.
- Check the product safety data sheets and the manuals for the machine/component on which you are working to see if there are any special PPE requirements.
- At the end of maintenance operations, always restore any safety devices/guards that may have been removed/opened and check that the machine can resume normal operating conditions.
- In the event of an anomaly, find the cause and resolve it before putting the machine back into operation (see previous chapter).

PRECAUTIONS FOR TROLLEYS WITH AN ELECTRICAL PANEL

Before carrying out any work, disconnect the electrical power supply by acting on the main power switch on the electrical panel and padlocking it in the OFF position.

Alternatively, pull the plug out and adopt a Lockout Tagout procedure.

Furthermore, put up "MACHINE UNDERGOING MAINTENANCE" signs on different sides of the machine where they are clearly visible.

16.2 - STATOR INSPECTION



After 700-1000 service hours, check the state of wear. Based on the degree of wear found, establish the appropriate frequency for subsequent inspections which in any case must not exceed 1,500 service hours.

16.3 - LUBRICATION

The C.S.F. Inox progressive cavity pump comes with the necessary lubricant for regular activity of about 3000-4000 service hours (approx. two years). For the articulated joints, no topping up is required, but grease should be changed when performing maintenance or when work is performed to replace worn parts.

For the bearings installed on the support ("E" versions excluded), the larger sizes are fitted with two grease nipples for periodical top-ups (at least every 4 or 5 months); otherwise, change the grease when disassembling for maintenance, taking care to thoroughly clean the seats and bearings before reassembly.

Recommended lubricant for joints:

MOLYKOTE® G-0052 FM WHITE EP grease for food grade pumps.

Recommended lubricant for rolling bearings:

POS	BRAND	TYPE	N.L.G.I
1	DANKELL	BEARING 3	3
2	ROL	MERCURY 3	3
3	AGIP	GR MU 3	3
4	IP	ATHESIA 3	3
5	ESSO	BEACON 3	3
6	MOBIL	MOBILUX 3	3
7	BP	L T 3	3

BEARING LUBRICATION

PUMP	FRONT BEARING	REAR BEARING
M 100 - 110L - 115	Rollers NUP 211 ECP 55/100/21 Every 2400 h Quantity 11 g.	3311A 55x120x49 Every 8200 h Quantity 29 g.
M 125 - 130L - 140	Rollers NUP 214 ECP 70x125x24 Every 2000 h Quantity 15 g.	3314 70x150x63 Every 7700 h Quantity 47 g.
M 150 - 160L	Rollers NAP 214 ECP 70x125x24 Every 2000 h Quantity 15 g.	3314 70x150x63 Every 7700 h Quantity 47 g.
M200	Rollers NAP 217 85x150x28 Every 1200 hours Quantity 21g.	3317A 85x180x73 Every 7200 h Quantity 66 g.

16.4 - SCHEDULED MAINTENANCE FOR TROLLEY-MOUNTED PUMP WITH ELECTRICAL PANEL

General maintenance operations required by the trolley-mounted machine with electrical panel are indicated below:

Every day (or every use):

- Check correct operation of the control devices.
- Check the wheels turn smoothly.

Every week:

- Check the condition of the electrical cables.
- Check the condition of the wheels.
- Check correct operation of the parking brake.

Every month:

- Check the structure for dents and inspect the welds.
- Check the overall condition of the machine



If ever the equipment does not appear suitable for correct and safe operation, TAKE IT OUT OF SERVICE until damaged parts have been repaired or replaced.

17.0 - SPARE PARTS

17.1 - RECOMMENDED SUPPLY

In the event of particular procurement difficulties, we recommend the following spare parts:

Denomination	Quantity
Stator	A few
Complete drive shaft assembly (rotor, joints, drive shaft)	1
Complete seals	A few
Mechanical seal chamber O-ring	A few
Series of bearings and support seal rings (except type E)	1

* **NB: The type and materials of the seals are identified in the enclosed technical parts list**

17.2 - BEARINGS - SUPPORT TYPE TABLE

Pump	Code Gaco "AS"	Front radial ball bearing	Rear angular ball bearing
M 40	RAAGA20307	6303 17x47x14	6303 17x47x14
M 50/55/60L	RACGA35477	6206 Steel 30/62/16	3306 ATN9 30x72x30
M 65/70L	RACGA35507	6207 Steel 35/72/17	3307 ATN9 35x80x34
M 80/90L	RAAGA45628	6209 Steel 45/85/19	3309A 45x100x39
M 100/110L/115	RAAGA557210	Rollers NAP211 ECP 55/100/21	3311A 55x120x49
M 125/130L/140	RAAGA709010	Rollers NAP214 ECP 70/125/24	3314A 70x150x63
M 150/160L	RAAGA709010	Rollers NAP214 ECP 70/125/24	3314A 70x150x63
M 200	RAAGA8511012	Rollers NAP217 ECP 85/150/28	3317A 85x180x73

C.S.F. Inox declines all responsibility for damage or injury resulting from the use of non-original spare parts.

18.0 - ACCESSORIES

Progressive cavity pumps may have the following accessories that allow them to be moved and controlled:

- A) Automatic by-pass;
- B) Flow switch;
- C) Pressure switch;
- D) Thermal probe;
- E) Stator heating chamber;
- F) Manually pushed trolley;
- G) Electrical panel.

For information on the use of these accessories, see the following headings.



To identify the type of accessory and obtain further information, consult this manual. Any accessories not listed in this manual are described in specific sheets provided as an appendix to this documentation.



Any modifications made to the accessories installed that differ from the instructions given in the pump manual will result in the warranty becoming null and void.

18.1 - AUTOMATIC BY-PASS

The by-pass is a device consisting of a spring-loaded safety valve (see fig. 5) positioned on a pipe that connects the pump suction piping to the delivery piping. The by-pass is used as a safety device to avoid any overpressure that may build up in the system and damage the pump. The automatic by-pass is manually adjusted by means of the safety valve, the sealing pressure of which is controlled by the load exerted by the spring.

The by-pass is a one-way system, consequently, if the direction of pump rotation is reversed, the position of the safety valve must also be reversed as shown in the drawings.

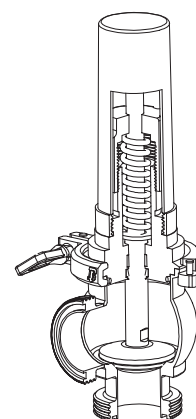
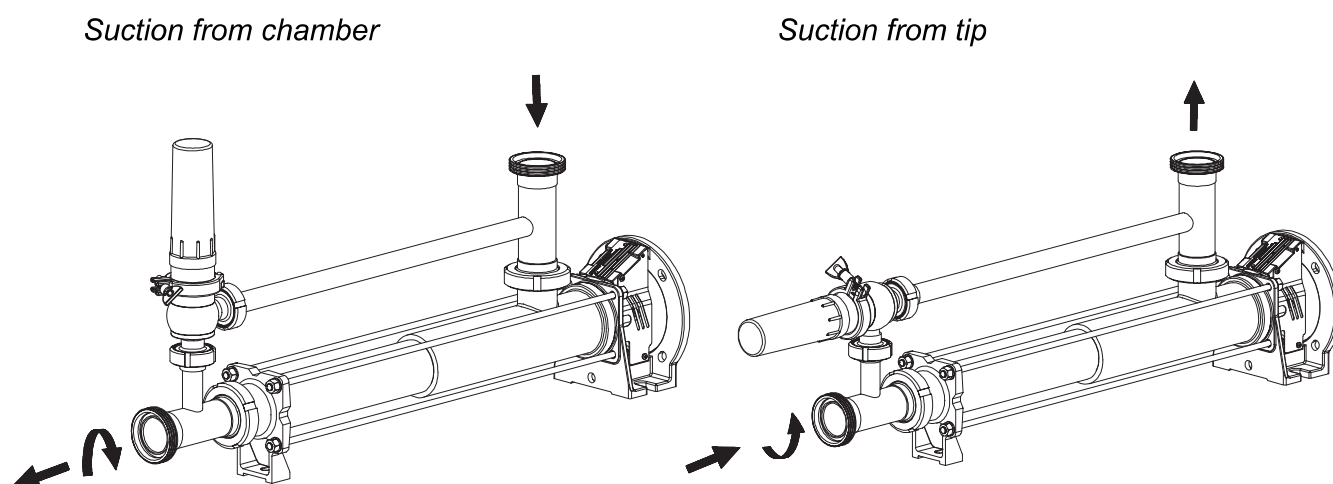


Fig. 5



N.B. On request, the by-pass can be supplied with a pneumatically controlled automatic valve instead of a manual one.

Depending on the pump operating pressure, different types of springs can be installed on the safety valve (see the two tables below).

P bar					
Dimensions Ø mm	Spring Ø 3.5 mm Type A - Bar	Spring Ø 4 mm Type B - Bar	Spring Ø 4.5 mm Type C - Bar	Spring Ø 5 mm Type D - Bar	Spring Ø 6 mm Type E - Bar
DN 25	0.5 – 4	1 – 6.5	1 – 10	-	-
DN 32	0.5 – 2.3	1 – 3.5	1 – 6.5	1 – 10	-
DN 40	0.5 – 2.3	1 – 3.5	1 – 6.5	1 – 10	-
DN 50	-	0.5 – 2	1 – 3.8	1 – 7	1 – 10
DN 65	-	-	0.5 – 2	1 – 3.3	1 – 7.7
DN 80	-	-	-	0.5 – 2.3	1 – 5
DN 100	-	-	-	0.5 – 1.3	1 – 4

P psi					
Dimensions Ø mm	Spring Ø 3.5 mm Type A - Psi	Spring Ø 4 mm Type B - Psi	Spring Ø 4.5 mm Type C - Psi	Spring Ø 5 mm Type D - Psi	Spring Ø 6 mm Type E - Psi
DN 25	7 – 58	14.5 – 94	14.5 – 145		
DN 32	7 – 33	14.5 – 50	14.5 – 94	14.5 – 145	
DN 40	7 – 33	14.5 – 50	14.5 – 94	14.5 – 145	
DN 50		7 – 29	14.5 – 55	14.5 – 101	14.5 – 145
DN 65			7 – 29	14.5 – 48	14.5 – 111
DN 80				7 – 33	14.5 – 72
DN 100				7 – 18	14.5 – 58

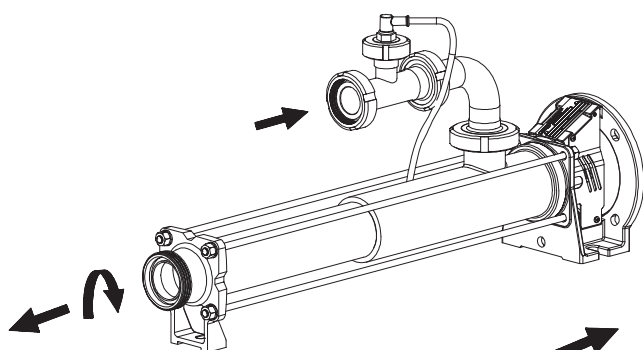
18.2 - FLOW SWITCH

The flow switch is used to check the presence of a fluid in the circuit. It transmits an ON-OFF signal to an electrical panel, intervening in the absence of the fluid.

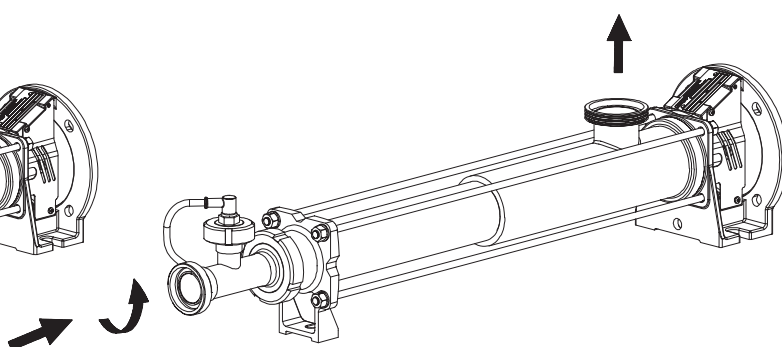
In progressive cavity pumps, it is installed on the inlet with the function of stopping the pump when there is no product.

FLOW SWITCH - CONDUCTIVE TYPE (not suitable for liquids containing quantities of air)

Suction from chamber

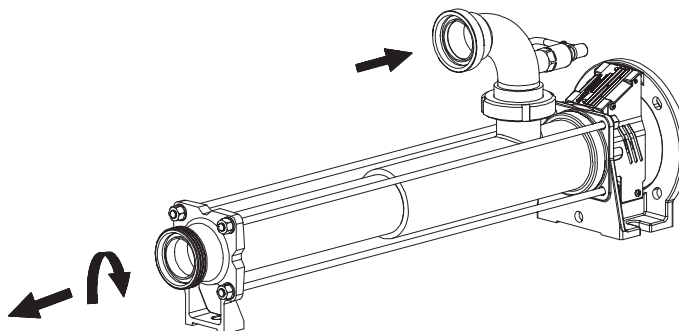


Suction from tip



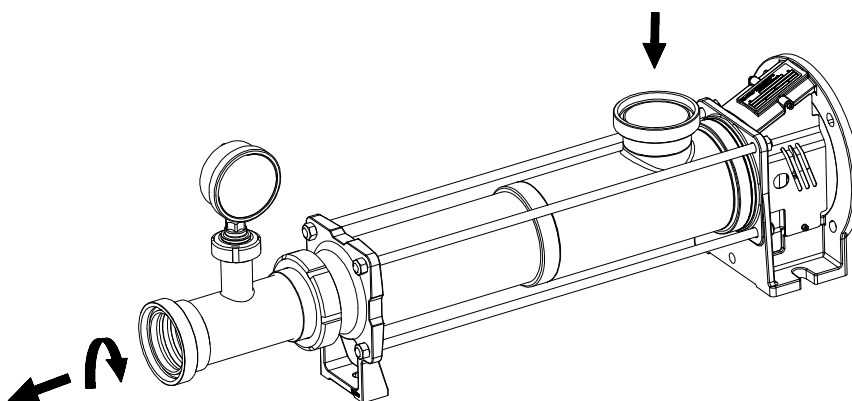
ELECTRONIC FLOW SWITCH

(for liquid, paste-like fluids, both water and oil based)



18.3 - PRESSURE SWITCH

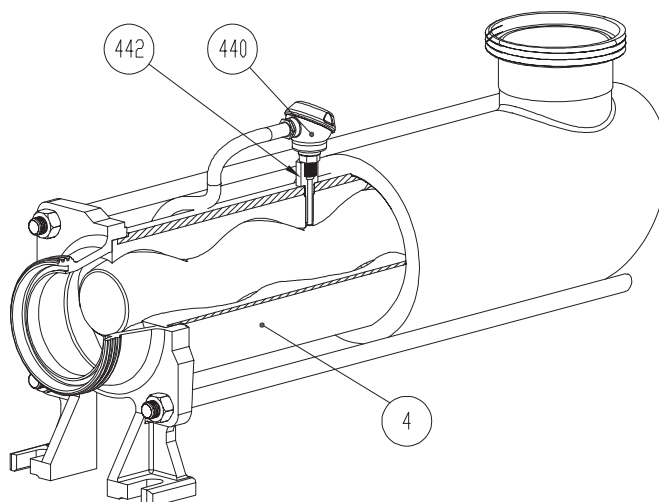
The pressure switch, installed on the pump delivery port, is used as a safety device to stop the pump in the event of overpressure in the system, preventing any damage to it. It is necessary to set a maximum pressure and a minimum pressure on the device. If the maximum pressure is reached on the pump delivery port, the pressure switch sends a digital signal to the electrical panel that stops the pump. Once the pressure drops and falls below the set minimum pressure, the pump restarts.



If the minimum pressure and maximum pressure values are set close to each other (with a pressure difference between the two values not exceeding 0.5 bar), a “modulating” function is obtained, i.e. the pressure switch is able to maintain the pump delivery pressure almost at a constant value.

18.4 - THERMAL PROBE

System consisting of a thermal sensor (442), complete with sheath (440), applied to the stator (4) of the pump and connected to a thermoregulator installed in the electrical panel with the function of setting the maximum permitted temperature for correct pump operation. When the stator reaches a temperature higher than the set value, the thermal probe sends a signal to the electrical panel to stop the pump.



18.5 - STATOR HEATING CHAMBERS - SUCTION CHAMBER

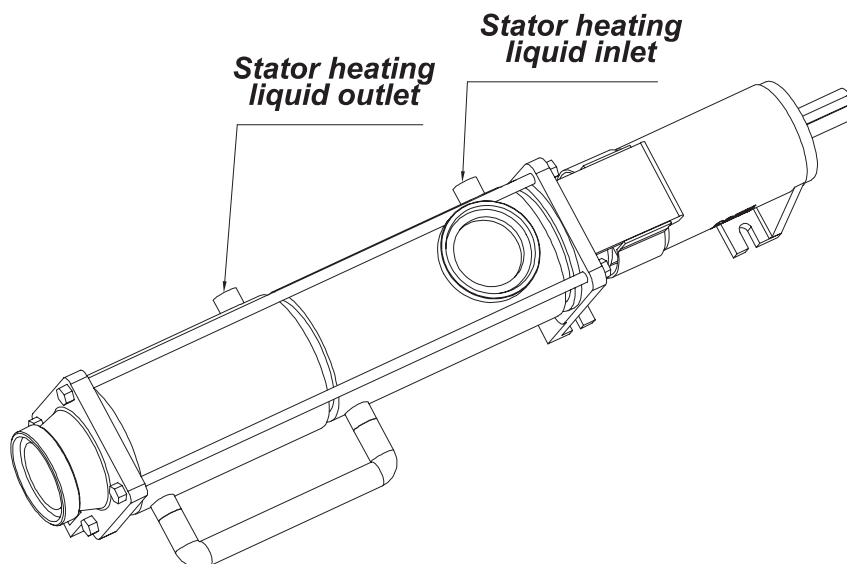
When handling high viscosity products with a tendency to harden or if it is necessary to maintain a set processing temperature, a cavity can be applied on the stator and the suction chamber through which hot water circulates.

Heating liquid data:

Max. Temp = 85°C

Max. pressure = 1.5 Bar

Flushing connection diagram – MA series pumps



18.6 - MANUALLY PUSHED TROLLEY

Trolley-mounted pumps are machines made up of a pump that performs the required process and a manually pushed trolley which supports the pump and allows it to be moved easily.

This chapter refers to different pump sizes and different trolleys. To identify the specific components, see the documentation provided.

1. WEIGHTS AND DIMENSIONS



For the main sizing characteristics and for further details regarding the pump installed on the trolley, see the documentation in the appendices (data sheet).

2. FURTHER WARNINGS FOR THE INSTALLATION, CONNECTION AND START-UP OF TROLLEY-MOUNTED PUMPS

The equipment must be lifted as per the procedures described in chapter 4.0.

- The operator can manually push the machine to move it over short distances. It must NOT be towed or pushed using any other means.
- The machine must be installed in observance of the minimum clearances required for safe use and comfortable manoeuvring of personnel and handling equipment;
- It must be moved over flat and sound surfaces. It must not be moved on ramps or slopes;
- Once the trolley pump has been positioned, the wheels, must be locked using the relative brake.

For further information, see the previous chapters in this manual.

3. MACHINE OPERATORS

The trolley-mounted pump is designed to be controlled autonomously by the appointed operator. The machine must be used by just one Operator who, after setting the working parameters, need only periodically monitor its correct operation.



The person in charge of operating the machine must know the contents of this manual, its appendices and all information concerning safety.

The Operator must possess (or acquire through adequate training and education) the requirements indicated in heading 2.3 (page 10).

Always observe all the safety instructions indicated in chapter 2.0.

4. PRELIMINARY OPERATIONS



When operating the machine, use only the materials and products specified by the Manufacturer.

Before starting the work cycle, if an electrical panel is mounted on the trolley, check that the emergency stop button works properly.

Machine operators must be equipped with the necessary Personal Protective Equipment as specified in heading 2.2 on page 9.

Before each use, carry out the following preliminary checks and if any anomalies are found contact the Maintenance Manager immediately and take the machine out of service. Furthermore:

- Check there is adequate space to work in.
- Check routes are free from clutter and unauthorized personnel.
- Check the condition of the machine/structure/wheels.
- Check operation of all control devices.
- Check the power line connection.
- Check that the suction and delivery piping have been connected correctly.

5. USE

On reaching the trolley-mounted pump, perform the aforementioned checks, release the brakes on the wheels, push the equipment to the desired location and relock the wheels with the brakes. Proceed according to the purpose of pump use and based on the additional accessories installed.



The Operator must always carry out periodic checks on the trolley-mounted pump as prescribed in this manual.

18.7 - ELECTRICAL PANEL

The electrical panel used with the progressive cavity pump allows the pump (and any accessories connected to it) to be controlled in remote mode.



This heading refers to several types of electrical panel; it is mandatory to refer to the specific manual of the electrical panel supplied in order to proceed with its set-up and use.



This paragraph does not replace the manual accompanying the specific electrical panel.

The electrical panel can be installed on a manually pushed trolley and connected to the pump. This results in a trolley-mounted pump with electrical panel. To identify the weight and maximum dimensions, see the data sheets appended to the instructions and the dimensional drawing below.

1. FURTHER WARNINGS FOR THE INSTALLATION, CONNECTION AND START-UP OF TROLLEY-MOUNTED PUMPS WITH ELECTRICAL PANEL

The equipment must be lifted as per the procedures described in chapter 4.0.

- When transporting the machine, parts must be protected against possible impact and strain (pay particular attention to electrical components).
- Secure cables and adequately protect connectors.

2. A - MAINS POWER SUPPLY



The electrical panel must be electrically connected to the machine by a qualified technician in accordance with the diagrams and instructions provided in the manual accompanying the electrical panel.



The equipment must be connected to an electrical power supply with characteristics that match those shown on the pump's data plate using the relative plug.

Before connecting the machine to the mains, check that the equipment delivered has suitable electrical power characteristics as required for the country of use.

3. PRELIMINARY OPERATIONS CORRECT USE

Before turning on the panel, a series of checks and controls must be carried out to prevent any errors or accidents during the start-up phase.

- Check that the panel has not been damaged during transport, installation and handling operations.
- Carefully check control panels and electrical cables for any damage.
- Check that the emergency stop device works effectively.
- Check that all external energy sources are connected correctly.
- Check that the electrical panels have been correctly connected to the rest of the equipment.
- Check that all fixed guards are securely attached to the electrical control panel
- Check that processing adjustment controls are working properly.
- Power up the electrical panel by connecting it to the power line and acting on the main power switch.



If ever the equipment does not appear suitable for correct and safe operation, TAKE IT OUT OF SERVICE until damaged parts have been repaired or replaced.

4. CORRECT USE



Consult the use and maintenance manual of the electrical panel supplied.

19.0 - CLEANING PROCEDURE



Use suitable personal protective equipment during cleaning operations.

19.1 - EXTERNAL CLEANING

Periodically clean the external parts of the pump and motor to prevent dust and deposits building up which could reduce heat dissipation and/or damage the external surfaces.

19.2 - CLEANING OF INTERNAL PARTS

Before performing any maintenance work which requires disassembly of the pumping parts, carry out internal cleaning by running the pump with washing fluids compatible with the pumped fluid and the pump itself.

If the pump needs to be sent back to C.S.F. Inox for maintenance/repair work, fill in the Declaration of Decontamination (see page 56).

19.3 - CLEANING OF FOOD-CONTACT PUMPS



When a pump is intended to handle food products, it must be perfectly clean before it is put into operation.

This can be achieved by performing a CIP (cleaning in place) washing procedure or by disassembling the pumping part for manual cleaning.

It is up to the user to choose the most suitable cleaning method based on the type of food product being handled and the processing stage in which the pump is used.

In the case of CIP, the user is responsible for selecting the necessary detergents, operating temperatures and detergent product concentrations based on the type of food product being pumped. The pump with standard rotor is not suitable for operation at temperatures above 65 - 68°C, with the exception of the _2S executions.

The duration of each step in the CIP washing cycle depends on the type of dirt/residue that needs removing.

It is important to check the compatibility of the chemical products and operating temperatures used in the washing cycle with the pump components specified in the data sheet (elastomers, mechanical seal).

The cleaning process must also be carried out in the following situations:

- Before a long period of non-use
- Before any disassembly operations for maintenance work and following reassembly if worn parts have been replaced
- Before restart after a long period of non-use.
- At intervals established by the user based on the characteristics of the pumped products and the type of process in which the pump is used, in order to guarantee food product hygiene.

It is the user's responsibility to verify the effectiveness of the cleaning procedure adopted.



To avoid damaging the elastomer parts of the pump (stator, articulated sleeves, mechanical seal gaskets), do not exceed the recommended detergent concentrations and operating temperatures during the washing phases.

WASHING WHEN THE TROLLEY HAS AN ELECTRICAL PANEL:



THE ELECTRICAL PANEL HAS AN IP 55 PROTECTION RATING. DO NOT WASH WITH JETS OF WATER AS DOING SO COULD DAMAGE THE INTERNAL ELECTRICAL COMPONENTS.

19.4 - CIP WASHING PROCEDURE

A typical example of a CIP washing procedure is described below:

- 1) Washing with clean water to empty the pump of product
- 2) Basic washing with 1 – 2% caustic soda solution at 60 – 80°C for about 10 – 20 minutes
- 3) Intermediate washing with clean water for 5 – 10 minutes
- 4) Washing with 1 – 1.5% nitric acid solution at 50 – 70°C for 5 – 10 minutes
- 5) Final washing with clean water for about 10 minutes

N.B.: The flow rate of cleaning detergents must be equal to or higher than 1.5 m/sec.

During the CIP washing cycle, the stator is subjected to high chemical and thermal stresses. If the pump is set up with additional CIP connections, it is therefore advisable to run the pump with the "Stop and start" system (2 – 4 starts per minute limited to one or two rotations). This operation cleans the internal parts of the pump, reducing mechanical stress.

DECLARATION OF DECONTAMINATION

In observance of the legal provisions in force and to protect the health and safety of our personnel, you must fill in, sign and return this declaration to us before we can process your order. Please make sure that the same declaration is attached to the outside of the packaging.

Shipping address: C.S.F INOX S.p.a. Strada per Bibbiano, 7 42027 Montecchio E. (RE), Italy	For information contact:
---	---------------------------------

*Mandatory fields

* Pump: _____ *Serial Number: _____
 Commissioning date: _____

* Field of application: _____
 Fluid handled: _____

Process data: Temperature: _____ [°C] Pressure: _____ [bar]
 Flow rate: _____ [m³/h] Viscosity: _____ [mm²/s]

* Product and warnings:

	Product/ concentration	Flammable	Toxic	Corrosive	Hazardous/ irritant	Other**	Harmless
Processing product		☐	☐	☐	☐	☐	☐
Cleaning product		☐	☐	☐	☐	☐	☐
Parts cleaned by		☐	☐	☐	☐	☐	☐

** Explosive; oxidant; harmful for the environment; biological risk; radioactive.

Please mark the appropriate warning, include the material safety data sheet and, if necessary, any further specific warnings.

* Reason for returning item/s:

- * ☐ Particular safety precautions for further handling are not required
 * ☐ The following precautions are required in the case of cleaning liquids, fluid residues and disposal:

Company details:

Company: _____ Phone no.: _____
 Contact: _____ Fax: _____
 Address: _____ Email: _____
 Your order number: _____

‘ We hereby certify that this form has been filled in to the best of our knowledge and in accordance with the legal provisions in force. Furthermore, we certify that the parts have been carefully cleaned and to the best of our knowledge are free from residues in quantities which could be deemed harmful. ’

Place, date

Name, department

Signature

.....

20.0 - WASTE DISPOSAL AND DECOMMISSIONING



The pump, complete with electrical drive system, is a plant component which must be disposed of in accordance with regulations governing the disposal of waste derived from professional electrical and electronic equipment.

Neither the pump nor any of its parts may be disposed of with household waste.

20.1 - PACKAGING MATERIALS

The packaging material consists of wooden or cardboard crates/pallets, polyethylene shrink-wrap covers, galvanized steel screws, polyester straps. Wooden or cardboard boxes and screws can be recycled or sent to authorized waste disposal facilities.

The remaining packaging materials must be sent to authorized waste disposal facilities.

20.2 - WASTE RESULTING FROM MAINTENANCE OPERATIONS

All materials replaced during maintenance operations must be disposed of in compliance with current regulations and sent to an authorized waste disposal facility.

Consult the pump's bill of materials, supplied with this manual, to identify the materials used to make the replacing components.

All replaced metal parts must be sent to metal recycling centres; plastic or elastomeric parts and spent lubricants must be disposed of at authorized waste disposal facilities.

20.3 - DISPOSAL OF THE PUMP

For disposing the pump please observe the following instructions:

- Disconnect electrical and hydraulic connections according to technical rules and laws in force.
- Disassemble all components of the pump for separate disposal; wash the components and thoroughly clean the structure.

The main components of the pump are made from the following materials:

- Suction chamber - delivery port - lantern bracket or bearing support - connecting rod - rotor: AISI 304 or 316 stainless steel.
- Stator: vulcanized rubber in a carbon steel cylinder painted in the following compounds: NBR, EPDM, CSM, FKM
- Elastomers NBR-EPDM-FKM.
- Plastics: PTFE, POM
- Support and external parts: Painted cast iron, AISI 304
- Bases: painted carbon steel, AISI 304
- Other components: composite mechanical seals, stainless steel and elastomers, ball and roller bearings.
- Motor: Aluminium - Cast Iron - Copper (consult the manual supplied by the manufacturer)
- Drive/Gearbox: Cast iron, steel, aluminium (consult the manual supplied by the manufacturer)
- Spend oils and greases

The main components of the trolley are made from the following materials:

- Aisi 304, Polyamide, Polyurethane, Aluminium.

The main components of the electrical panel are made from the following materials:

- Electrical material.

For further details, consult the pump's bill of materials, supplied with this manual, to identify the materials used to make the various components.

There are no components containing asbestos, cadmium or lead, PBB or PBDE.



Pump components must be disposed of correctly by the user in compliance with the relative legislation in the country of disposal.



DECLARATION OF CONFORMITY

The company: **C.S.F. Inox S.p.A.**
based in: **Strada per Bibbiano, 7**
Montecchio Emilia (R.E.)
ITALIA

hereby declares, under its sole responsibility that the pump:

PROGRESSIVE CAVITY PUMP

Type XXX

Serial no. XXX Year XXX

CE Declaration of Conformity (Ann. II.A, 2006/42/EC)

to which this declaration refers, is in conformity with safety requirements according to Directive 2006/42/EC.

Name and address of the person authorized to compile the technical file:
C.S.F. Inox S.p.A. Strada per Bibbiano 7 - 42027
Montecchio Emilia (RE) ITALY

Applied Regulations:

EN 12100 2010

EN 809 2009

Food products-contact suitability declaration

is made with materials suitable to come in contact with food
according to the regulation (EC) no. 1935/2004.

Montecchio Emilia, XXX


The Chairman **Mr. Rolando**
Paterlini

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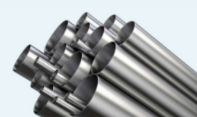
PUMPS



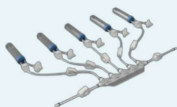
HOSES



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