



***Setting Innovative  
Standards***

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# **PUMP MECHANICAL SEAL**

**Centrifugal Horizontal, Metallic**

**CN SEAL-M API series**

## ***Installation, use and maintenance manual***

*This copy of the manual is a translation of italian version and both manuals  
must be always supplied together.*



### **ATTENZIONE**

Le presenti istruzioni sono rivolte agli operatori che:

- installano la pompa, da parte di personale qualificato;
- Utilizzano la pompa, da parte del personale
- Effettuano la manutenzione / riparazione della pompa of the pump.

Leggere attentamente questo manuale d'istruzione prima di usare la pompa.



The purpose of this document is to instruct to a responsible use on installation, operation and maintenance of pumps series CN SEAL-M API.

Please read it carefully before any activity pertaining to the pump it was provided for.

The instructions in this manual are only valid for pumps it was provided for, and not for the facility in which the pumps will be installed.

For a proper use of the system please refer to the instructions the manufacturer himself provided.

In any case the instructions of the system have a greater value than those related to the pumps.

For further information please contact M PUMPS, useful information for a correct installation can also be found at - Hydraulic Institute Standards (USA).

## Index

<b>1. GENERAL AND SAFETY WARNINGS</b>	<b>4</b>
<b>2. ICONS USED IN THE MANUAL</b>	<b>4</b>
<b>3. WARRANTY</b>	<b>5</b>
<b>4. IDENTIFICATION NAMEPLATE</b>	<b>6</b>
<b>5. DESCRIPTION OF THE PUMP</b>	<b>8</b>
Applications	8
<b>6. TECHNICAL SPECIFICATIONS</b>	<b>8</b>
<b>7. PERMISSIBLE LOADS ON FLANGES</b>	<b>9</b>
<b>8. CL SEAL-M OPERATING LIMITS AND PERFORMANCE</b>	<b>10</b>
<b>9. OVERALL DIMENSIONS</b>	<b>12</b>
<b>10. NOISE EMISSIONS AND VIBRATIONS</b>	<b>12</b>
<b>11. IONIZING RADIATION</b>	<b>12</b>
<b>12. CHECKING UPON PUMP DELIVERY, STORAGE</b>	<b>12</b>
<b>13. TRANSPORT AND HANDLING</b>	<b>12</b>
<b>14. ASSEMBLY, INSTALLATION, CONNECTIONS, COMMISSIONING AND ADJUSTMENTS</b>	<b>13</b>
Assembly	13
Connection of suction and feeding pump	13
Electric connections	14
Checks for proper operation	14
Commissioning and training of staff	14
Self-priming and not self-priming pumps	15
Coupling of the pump to the motor	15
Features and installation of the electric pump unit coming already assembled	15
Alignment of the coupling	15
Alignment and coupling tolerances	16
<b>15. INTENDED USE OF THE PUMP. INCORRECT USE. OPERATION DESCRIPTION. PERSONAL PROTECTIVE EQUIPMENT DURING USE</b>	<b>16</b>
Intended use of the machine	16
Instructions for reasonably foreseeable proper use	16
Unintended use	16
<b>16. RESIDUAL RISKS AND PROTECTIVE MEASURES TO BE TAKEN</b>	<b>17</b>
Descriptions of remaining residual risks	17
Protective measures to be taken by the user and instructions	17
Personal Protection Equipment to be worn	17
<b>17. OPERATING LIMITS, RESIDUAL RISKS STILL REMAINING DESPITE THE SAFETY MEASURES TAKEN</b>	<b>17</b>
Safety instructions mounted on the pump	18
<b>18. INSTRUCTIONS AND PROCEDURES FOR TRAINING OF STAFF AND FOR EMERGENCY SITUATIONS</b>	<b>19</b>
Reset method	19
Fire-fighting equipment to be used:	19
Emission/Dispersion of harmful substances:	19
<b>19. MALFUNCTIONING, FAILURE, FAULT, ACCIDENT. MOST FREQUENT PROBLEMS: CAUSES AND REMEDIES</b>	<b>19</b>
Malfunction	19
Failure	19
Failure	20
Injury	20
The most frequent problems: problems, causes, remedies, residual risks	20
<b>20. ROUTINE AND UNSCHEDULED MAINTENANCE</b>	<b>23</b>
Cleaning the components and magnet	23
Preventive periodic maintenance	23
Shut-down and emptying of the fluid in the pump	24
Draining the oil contained in the pump	24
Unscheduled maintenance	24
<b>21. REPAIR AND SPARE PARTS</b>	<b>25</b>
Disassembly of the pump	25
Preassembly inspections	35
Re-assembly of the pump	41
<b>22. DECOMMISSIONING, SCRAPPING AND DISPOSAL OF MATERIALS</b>	<b>43</b>
Decommissioning	43
Scrapping and disposal	43
<b>23. EXPLODED DRAWING OF THE PUMP - LIST OF COMPONENTS</b>	<b>43</b>
<b>24. Notes</b>	<b>44</b>
<b>25. APPENDIX A - Register of maintenance and periodic checks of the pump</b>	<b>45</b>
<b>26. APPENDIX B</b>	<b>47</b>

## 1. GENERAL AND SAFETY WARNINGS

This manual has been prepared by *M PUMPS* to provide the purchaser of the pump all the information necessary for its proper use and regular maintenance. Part of this manual is also the booklet of the electric motor when the pump is supplied fitted with it.

For the purposes of safety and hygiene in the workplace, and to ensure a proper and durable use of the pump, the manual must be kept close to the device for any consultation.

**As an integral part of the pump, this manual must always accompany it.**

For any data that is not included or not inferable from this manual please contact *M PUMPS*.

**Do not use the pump before you have read and assimilated all safety rules and instructions in this manual.**

In case of damage or loss of the manual, immediately ask for a copy to *M PUMPS*.

Failure to comply with the instructions contained in this manual exempts *M PUMPS* from any liability. The pump and these instructions are intended for operators who make professional use and must be followed by qualified staff adequately trained, aware of the use, operation and the risks that the pump generates during its use; the experienced user has the best qualification possible.

*M PUMPS* reserves the right to make at any time changes deemed necessary to the improvement of the pump, taking care to update this manual as soon as possible. This reflects the State of the art at the time of marketing of the pump. In the event of ownership transfer of the pump, the user is invited to report to *M PUMPS* the address of the new owner in order to facilitate the transmission of any additions to the manual to the new user.

*M PUMPS* reserves all rights in this manual, any total or partial reproduction is allowed without written permission.

## 2. ICONS USED IN THE MANUAL

In the course of the document, to indicate the risk of manoeuvres or possible dangerous situations, safety signs were posted, each showing a symbol followed by a written warning.

### ELECTRIC DANGER



**Electrical parts** This symbol indicates safety instructions for live parts, electrical contacts, etc., where non-compliance can result in serious risk to the safety of people.

### DANGER OF LEAKAGES



**Danger of leakages from the pump.** This symbol indicates safety information for threaded or flanged connections to the pump, where the incorrect execution may result in serious risk to the safety of people.

### CUT DANGER



**Cut danger.** This symbol indicates the safety precautions for the protection of moving parts, where non-compliance can result in serious risk to the safety of people.



**Potentially explosive area.** This symbol indicates the marking of explosive atmospheres, according to directive ATEX 94/9/EC. It is used to indicate important safety instructions, whose non-observance can result in a risk of explosion.

**DANGER**



**Indicates a potentially hazardous situation for operators who are using the pump and / or the integrity of the pump itself**, which could result in damage to the pump itself and / or serious injury to the persons concerned.

**WARNING**



**Draws attention to important details** that staff must know and keep in mind for the proper use and operation of the pump.

**PROHIBITION**



**Draws attention to operations that are absolutely prohibited;** non-compliance with the prohibition may damage the pump and injury to the pump and/or operators.  
*M PUMPS* declines liability for any damage to persons and/or properties for failing to comply with the prohibitions set out.

### 3. WARRANTY

It is valid for one year from the date of sale of the pump. *M PUMPS* assumes no liability for any warranty, express and/or implied, nor with regard to the possibility of sale, nor to the suitability of the products supplied.

The warranty shall not apply in the following cases:



- The repair and/or maintenance was not carried out in strict accordance with the instructions given;
- The pump is not installed and put into service according to the instructions, in this regard, please refer to the start-up procedure described in this Manual;
- Necessary repairs have not been carried out by *M PUMPS* staff or were made without consulting *M PUMPS*;
- Non-original spare parts were used;
- Lubricants other than those recommended were used;
- The parts supplied were not used in accordance with their nature and/or destination;
- The parts supplied are used carelessly, negligently, improperly;
- The parts delivered were damaged due to external circumstances.

All parts subject to wear and tear are excluded from warranty.

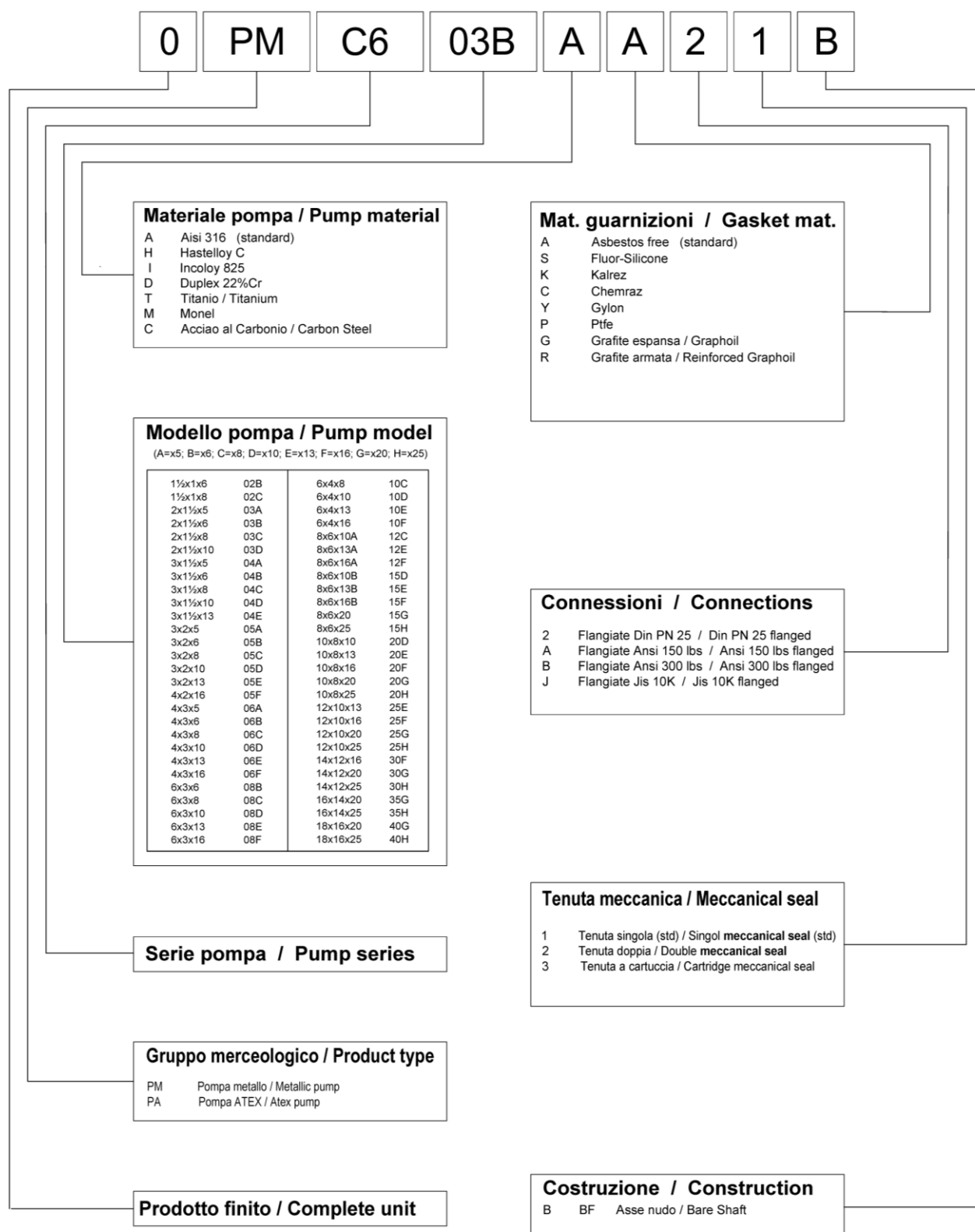
#### 4. IDENTIFICATION NAMEPLATE

The pump for installation in ordinary environments has the identification label placed on the side of the support as shown in the figure: only the fields filled in are to be considered as relevant and therefore should be deemed valid for identification.

##### -PUMP SUPPLIED WITH ELECTRIC MOTOR:

		<b>M PUMPS s.r.l.</b> Via dell'Artigianato, 120 45015 Corbola (RO) - Italy - Tel. +39 0426 346304 www.mpumps.it			
Purch.Item Nr.: <input type="text"/>					
Vendor's Size: <input type="text"/>		MAWP [barg]: <input type="text"/>			
Model: <input type="text"/>		Temp @ MAWP [°C]: <input type="text"/>			
Pump Sr. Nr.: <input type="text"/>		Bearing Id.: <input type="text"/>			
Rated Flow [m³/h]: <input type="text"/>		Ø Impeller [mm]: <input type="text"/>			
Rated Head [m]: <input type="text"/>		n [RPM]: <input type="text"/>		P [kW]: <input type="text"/>	
Casing Hydro. Test Pres. [barg]: <input type="text"/>				Year: <input type="text"/>	

The serial number of the pump, (s.No.), defines the type of components installed on the pump:



This configuration for complete unit only

## 5. DESCRIPTION OF THE PUMP

The pumps of the CN SEAL-M API consist of a movable part: the IMPELLER, which performs rotary motion at high speed and fixed components: PUMP BODY (REQUIRED), SEALS, BEARINGS.

The **impeller** consists of a disc on which are the blades which form divergent ducts divergent and is keyed on a shaft mounted on two rolling bearings.

The pump to lift the fluid must be **primed**, that is, both the suction duct, and the body of the pump must always be full of liquid. This can be obtained by placing at the top of the suction duct FOOT VALVE (or NON-RETURN valve), which allows the liquid to pass only in one direction and precisely from the tank to the suction pipe.

### **Applications**

- In general, this pump model is ideal for clean liquids, slightly contaminated;
- the maximum operating pressure of the system, the permissible temperature and the maximum rotation speed depend on the type of pump and are specified in the paragraph on "**TECHNICAL DATA**".

Other uses are not permitted, as they must comply with the conditions of use specified in paragraph on "**TECHNICAL DATA**": the use of a pump in a system or with fluid conditions other than those the pump was designed for, can give rise to dangerous situations for the user.

## **TECHNICAL DATA**

The pumps described in this manual have the following characteristics:

Available in bare shaft configuration or block, with the engine directly keyed to the pump support.

## 6. TECHNICAL SPECIFICATIONS

The pumps described in this manual have the following features:

Available with bare shaft or monoblock configuration, with the engine directly keyed to the pump support.

### **CN SEAL-M API**

- Connections: Flanged DIN PN25, ANSI B 16.5 300lbs, ANSI B 16.5 150lbs;
- Maximum viscosity: 300 cps;
- Maximum operating pressure: 50 BARS standard
- 4000 m<sup>3</sup>/h flow rate;
- Discharge head up to 220 m;
- Operating temperatures up to +350°C;
- Electric motor power: from 1.5kW up to 500kW;
- Maximum engine speed: up to 3500 rpm;
- Weight of the pump: from 45 to 4500 kg;

Features of electric motors:	Supply frequency 50 Hz	Supply frequency 60 Hz
2 poles	2900 rpm	3500 rpm
4 poles	1450 rpm	1750 rpm

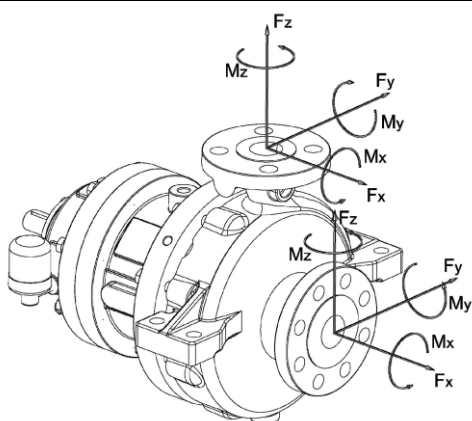
### **WARNING**



- WARNING: If the pump is driven by inverter, keep it within recommended rotation limits.



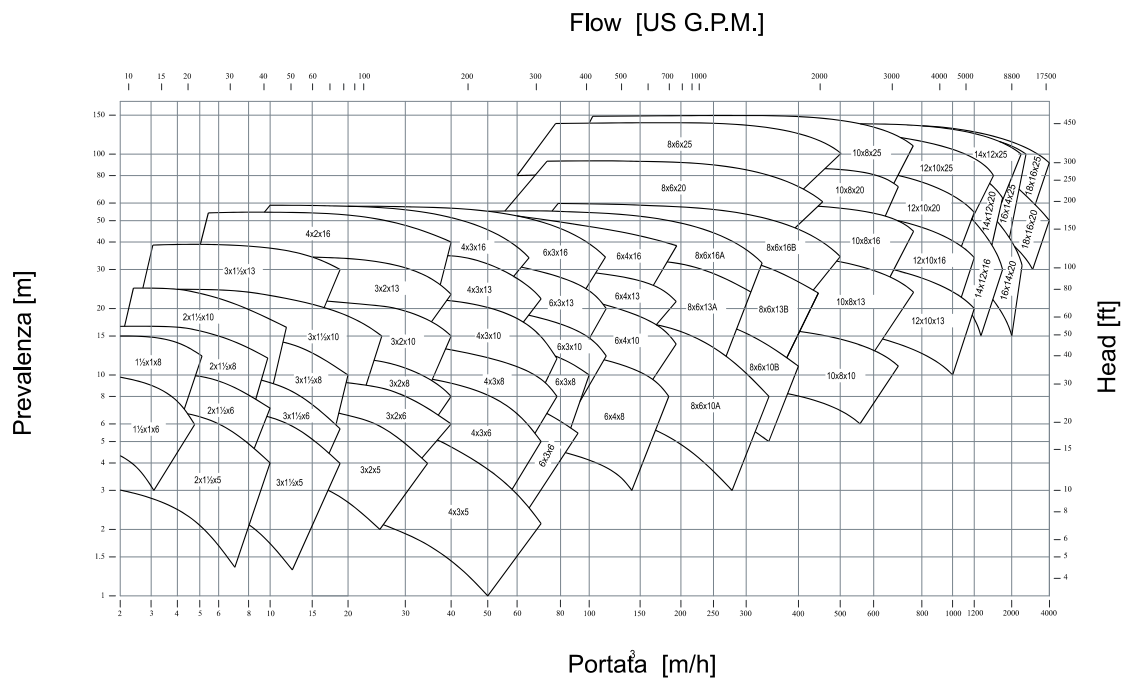
## 7. ALLOWABLE NOZZLE LOADINGS



PUMP SIZE	FORCES [N]								MOMENTS [Nm]							
	Fx		Fy		Fz		Fr		Mx		My		Mz		Mr	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
1½x1x6	890	710	710	580	580	890	1280	1280	460	460	230	230	350	350	620	620
1½x1x8	890	710	710	580	580	890	1280	1280	460	460	230	230	350	350	620	620
2x1½x5	890	710	710	580	580	890	1280	1280	460	460	230	230	350	350	620	620
2x1½x6	890	710	710	580	580	890	1280	1280	460	460	230	230	350	350	620	620
2x1½x8	890	710	710	580	580	890	1280	1280	460	460	230	230	350	350	620	620
2x1½x10	890	710	710	580	580	890	1280	1280	460	460	230	230	350	350	620	620
3x1½x5	1330	710	1070	580	890	890	1930	1280	950	460	470	230	720	350	1280	620
3x1½x6	1330	710	1070	580	890	890	1930	1280	950	460	470	230	720	350	1280	620
3x1½x8	1330	710	1070	580	890	890	1930	1280	950	460	470	230	720	350	1280	620
3x1½x10	1330	710	1070	580	890	890	1930	1280	950	460	470	230	720	350	1280	620
3x1½x13	1330	710	1070	580	890	890	1930	1280	950	460	470	230	720	350	1280	620
3x2x5	1330	710	1070	580	890	890	1930	1280	950	460	470	230	720	350	1280	620
3x2x6	1330	710	1070	580	890	890	1930	1280	950	460	470	230	720	350	1280	620
3x2x8	1330	710	1070	580	890	890	1930	1280	950	460	470	230	720	350	1280	620
3x2x10	1330	710	1070	580	890	890	1930	1280	950	460	470	230	720	350	1280	620
3x2x13	1330	710	1070	580	890	890	1930	1280	950	460	470	230	720	350	1280	620
4x2x16	1780	710	1420	580	1160	890	2560	1280	1330	460	680	230	1000	350	1800	620
4x3x5	1780	1070	1420	890	1160	1330	2560	1930	1330	950	680	470	1000	720	1800	1280
4x3x6	1780	1070	1420	890	1160	1330	2560	1930	1330	950	680	470	1000	720	1800	1280
4x3x8	1780	1070	1420	890	1160	1330	2560	1930	1330	950	680	470	1000	720	1800	1280
4x3x10	1780	1070	1420	890	1160	1330	2560	1930	1330	950	680	470	1000	720	1800	1280
4x3x13	1780	1070	1420	890	1160	1330	2560	1930	1330	950	680	470	1000	720	1800	1280
4x3x16	1780	1070	1420	890	1160	1330	2560	1930	1330	950	680	470	1000	720	1800	1280
6x3x6	3100	1070	2490	890	2050	1330	4480	1930	2300	950	1180	470	1760	720	3130	1280
6x3x8	3100	1070	2490	890	2050	1330	4480	1930	2300	950	1180	470	1760	720	3130	1280
6x3x10	3100	1070	2490	890	2050	1330	4480	1930	2300	950	1180	470	1760	720	3130	1280
6x3x13	3100	1070	2490	890	2050	1330	4480	1930	2300	950	1180	470	1760	720	3130	1280
6x3x16	3100	1070	2490	890	2050	1330	4480	1930	2300	950	1180	470	1760	720	3130	1280
6x4x8	3100	1420	2490	1160	2050	1780	4480	2560	2300	1330	1180	680	1760	1000	3130	1800
6x4x10	3100	1420	2490	1160	2050	1780	4480	2560	2300	1330	1180	680	1760	1000	3130	1800
6x4x13	3100	1420	2490	1160	2050	1780	4480	2560	2300	1330	1180	680	1760	1000	3130	1800
6x4x16	3100	1420	2490	1160	2050	1780	4480	2560	2300	1330	1180	680	1760	1000	3130	1800
8x6x10	4890	2490	3780	2050	3110	3110	6920	4480	3530	2300	1760	1180	2580	1760	4710	3130
8x6x13	4890	2490	3780	2050	3110	3110	6920	4480	3530	2300	1760	1180	2580	1760	4710	3130
8x6x16	4890	2490	3780	2050	3110	3110	6920	4480	3530	2300	1760	1180	2580	1760	4710	3130
8x6x20	4890	2490	3780	2050	3110	3110	6920	4480	3530	2300	1760	1180	2580	1760	4710	3130
8x6x25	4890	2490	3780	2050	3110	3110	6920	4480	3530	2300	1760	1180	2580	1760	4710	3130
10x8x10	6670	3780	5340	3110	4450	4890	9630	6920	5020	3530	2440	1760	3800	2580	6750	4710
10x8x13	6670	3780	5340	3110	4450	4890	9630	6920	5020	3530	2440	1760	3800	2580	6750	4710
10x8x16	6670	3780	5340	3110	4450	4890	9630	6920	5020	3530	2440	1760	3800	2580	6750	4710
10x8x20	6670	3780	5340	3110	4450	4890	9630	6920	5020	3530	2440	1760	3800	2580	6750	4710
10x8x25	6670	3780	5340	3110	4450	4890	9630	6920	5020	3530	2440	1760	3800	2580	6750	4710
12x10x13	8000	5340	6670	4450	5340	6670	11700	9630	6100	5020	2980	2440	4610	3800	8210	6750
12x10x16	8000	5340	6670	4450	5340	6670	11700	9630	6100	5020	2980	2440	4610	3800	8210	6750
12x10x20	8000	5340	6670	4450	5340	6670	11700	9630	6100	5020	2980	2440	4610	3800	8210	6750
12x10x25	8000	5340	6670	4450	5340	6670	11700	9630	6100	5020	2980	2440	4610	3800	8210	6750
14x12x16	8900	6670	7120	5340	5780	8000	12780	11700	6370	6100	3120	2980	4750	4610	8540	8210
14x12x20	8900	6670	7120	5340	5780	8000	12780	11700	6370	6100	3120	2980	4750	4610	8540	8210
14x12x25	8900	6670	7120	5340	5780	8000	12780	11700	6370	6100	3120	2980	4750	4610	8540	8210
16x14x20	10230	7120	8450	5780	6670	8900	14850	12780	7320	6370	3660	3120	5420	4750	9820	8540
16x14x25	10230	7120	8450	5780	6670	8900	14850	12780	7320	6370	3660	3120	5420	4750	9820	8540
18x16x20	10230	8450	8450	6670	6670	10230	14850	14850	7320	7320	3660	3660	5420	5420	9820	9820
18x16x25	10230	8450	8450	6670	6670	10230	14850	14850	7320	7320	3660	3660	5420	5420	9820	9820

## 8. CN SEAL-M API OPERATING LIMITS AND PERFORMANCE

Curve N°: 10706	1450 RPM
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## 9. OVERALL DIMENSIONS

Please refer to the outline drawing provided with pump.

## 10. NOISE EMISSIONS AND VIBRATIONS

The noise level of a pump depends mainly on its operating conditions. The operating conditions of the pump during measurements are: pump coupled to an electric motor on test bench with fluids pumping. The A-weighted sound pressure level measured in front and at the side of the pump is below 85 dB(a), measured at a metre away.

## 11. IONIZING RADIATION

The pump does not emit any type of ionizing radiation that may cause harm to people.

## 12. CHECKING UPON PUMP DELIVERY, STORAGE

All *M PUMPS* are tested before shipping and carefully packed for transport: upon receipt of the pump, make sure it has not been damaged during transport. If there are any problems, contact the carrier immediately and inform *M PUMPS* about the accident occurred.

So that the pump is preserved over time in the best way possible, we recommend storing it away from the sun, from weathering and dust, when it is not immediately installed or not used for long periods.

The closing plugs of the input and output connections of the fluid should not be removed until installation. If supplied with motor, please also apply the storage instructions provided by its manufacturer himself.

The maximum excursion of permissible temperature during storage, preservation and use must be between -15 and +40°C with humidity between 10 and 90%.

## 13. TRANSPORT AND HANDLING

It is advisable to perform a preliminary check of the pump at the time of delivery to detect and report any damage incurred during transport and handling. In case of damage you should not perform any operation, just contact *M PUMPS*.

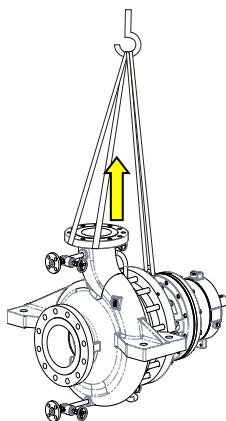
The precautions to be taken to ensure the stability of the pump concern the possible sliding and tilting caused by handling and transport, which must be prevented by fixing with ropes the pump body to the body of the transport mean it is loaded on.

The pump or electro-pump unit are too heavy to be moved manually.

During the move, with the pump positioned on a pallet, open the forks at their maximum and perform the loading / unloading.

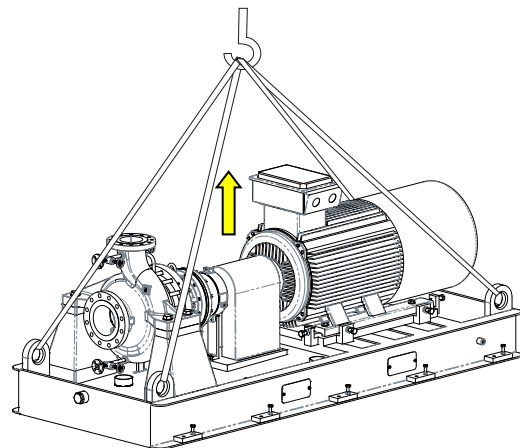
The pump can be raised as indicated in the figure of a stable lifting:

Bare frame pump



Centre of gravity approximately in the middle

Bare frame pump with  
motor and baseplate



Centre of gravity approximately in the middle

These operations must be performed by trained personnel who are informed on the hazards involved.

#### PROHIBITION



- It is forbidden to lift the pump using as anchor points structures other than those specially created and reported.
- It is not possible to lift an electro-pump unit using the lifting eyebolt of an electric motor.
- During the early lifting stages all the surrounding area is to be considered a danger zone, and staff not in charge of such operations must be evacuated.

There is the possibility of transporting and handling the pump slinging it using points specifically designed to this end: you must ensure that shackles and chains or straps are suitable to withstand the weight of the pump (described in "TECHNICAL DATA" paragraph).

## 14. ASSEMBLY, INSTALLATION, CONNECTIONS, COMMISSIONING AND ADJUSTMENTS

### Assembly

Install the pump on a solid basis as close as possible to the liquid to be pumped, under its level, in such a position so as to make easier the maintenance and inspection operations

Do not allow the pump to take sharp shots as this may damage the magnets of the internal and external rotor or the silicon carbide supports.

Make sure that the heated air coming from other units will not badly affect the environment of the pump; the ambient temperature should not exceed 40°C, for higher temperatures please contact your *M PUMPS distributor*; also ensure the free circulation of cooling air for at least a quarter the diameter of the motor, as both the motor and the pump must be able to dissipate the heat by convection with the ambient air. Insufficient cooling could lead to high surface temperatures of the bearing housing, insufficient lubrication and premature breakage of the bearings. It is useful to monitor their surface temperature.

It is always the responsibility of the operator to maintain limited the coolant temperature, so that not to overheat the pump: switch off the pump in case of abnormal pressure fluctuations and flow decreases.

#### WARNING

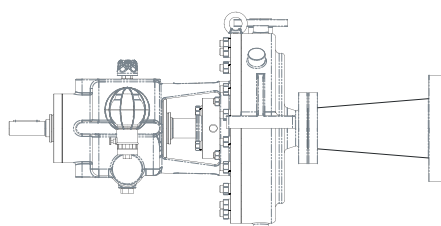


- Normally you have to mount the pump in horizontal position. If mounted inclined or vertical, the pump, or better to say the suction inlet, must be placed in the lower part. Leave a space of at least 50 cm between the pump and any walls or pipes;
- The liquid being pumped can reach high temperatures: from 60°C it is necessary to install shielding to prevent contact with hot components of the pump;
- Connect to the grounding system the whole pump body, to avoid the build-up of static electricity;
- If the pumped liquid can be dangerous to people and the environment, the user must take steps for a simple and quick remedy in case of leakages due to breakages/replacement/maintenance of the pump.

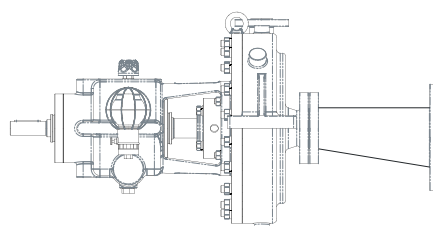
### Connection of suction and feeding pump

For a correct assembly aimed at optimum use of the pump, you must apply the following requirements:

- The pipes must be supported and kept in line regardless of the pump, up to its connections, so as not to burden on it;
- The connections must not be subjected to stresses during operation;
- The suction piping must be built with the fewest restrictions possible, in such a way as to have the greatest NPSH available;
- The length of the pipes, in particular that of the suction pipe, must be minimized;
- The pipe must be fitted in such a way so that it is impossible the formation of air pockets; if this is not possible, it must be provided the possibility of bleeding the air from the highest point;
- During suction only use full flow section valves;



**NO**



**YES**

- If the suction pipe is larger than the suction flange, you must use an eccentric reductions towards the suction flange, in order to prevent the formation of air pockets and vortices;
- If there is a possibility that the maximum operating pressure can be overcome, for example due to excessive intake pressure, it is necessary to take appropriate measures by incorporating a safety valve in the pipeline;
- Avoid the use of quick-closing valves, since sudden pressure changes cause water hammering, very damaging for both the pump and pipes;
- Be sure, before installing the pump, that the suction line is clean and/or provided with a filter to protect the impeller and supports from damage caused by debris or other foreign particles, especially at system commissioning.

### Electric connections

#### **DANGER**



The pump is **supplied with or without electrical motor: only qualified personnel** must make the mechanical connection of the pump to the motor (for models without motor) and the electrical connections of the motor to the electrical system. Carefully read the instructions on the manual provided by the manufacturer of the motor before carrying out the installation.

Ensure that it is not possible to operate the motor during maintenance work to the electric pump unit.

### Checks for proper operation

We recommend the installation of a **pressure gauge** in both the suction and delivery pipes to allow the operator to easily check the correct operation of the pump in relation to the required operating point: in the event of cavitation or other malfunction, evident pressure fluctuations occur.

Check the differential pressure of the pump between the suction and delivery connections to make sure it works at the operating point expected.

Check whether the absolute suction pressure is not so low so as to cause cavitation in the pump.

#### **WARNING**



The absolute pressure at pump suction (expressed in metres) must overcome by at least 0,5÷1 m, the vapour pressure of the pumped liquid, in order to avoid the risk of cavitation.  
Cavitation should always be avoided as very dangerous for the structure of the pump.

### Commissioning and training of staff

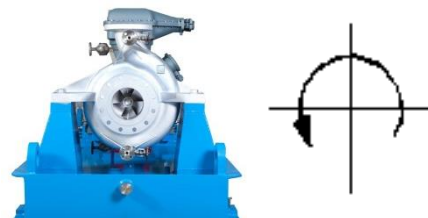
- In relation to the proper commissioning of the pump and checks to be carried out before, during and after it, refer to APPENDIX B, which must be duly completed and returned to M PUMPS, to activate the warranty covering the product.

Pumps by *M PUMPS* of the CN SEAL-M API series **are not reversible** therefore the direction of rotation cannot be reversed.

The correct **direction of rotation is counter-clockwise**: if you stand in front of the pump body, an arrow indicates the correct direction of rotation; reversing the direction of rotation may damage the pump.

To check the direction of rotation, give power and immediately cut-it off to the motor, and then observe the direction of rotation.

#### **DIRECTION OF ROTATION:**



Make sure that the rotating parts, such as the flexible coupling or other related components, are always protected when the pump is running.

Operators who use the pump must have carefully read this use and maintenance manual, as well as being qualified to fully understand the features of the device and the ability to identify its problems, if any.

By carrying out the operations indicated in the previous paragraph and all of the checks indicated on the maintenance register, the pump is ready for use.

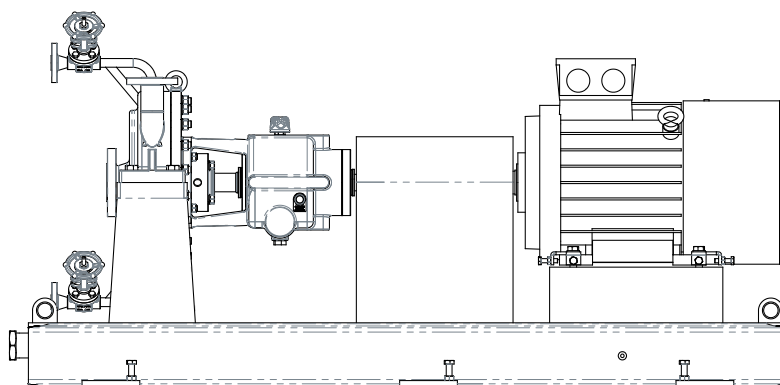


### **Self-priming and not self-priming pumps**

The CN SEAL-M API series pumps are not self-priming: make sure that the pump is filled with liquid and, if necessary, vented before start-up; in the event that the suction height is negative, with respect to the delivery, dry operation must be avoided.

### **Coupling of the pump to the motor**

If the pump and the electric motor are to be coupled, observe the sequence of the following steps to proceed with the installation:



- Fit flush the two elastic coupling halves on the pump shaft and on that of the motor.
- Place the pump on the base, by placing shims (about 2-5 mm) under the feet of the body and the foot of the oil case, then secure it with the screws provided.
- Place the electric motor by adjusting the shims under the feet, so that the two shafts (pump and motor) are coaxial.
- Leave a space of 3 mm between the two elastic coupling halves, then stop the motor with the screws provided.

### **Features and installation of the electric pump unit coming already assembled**

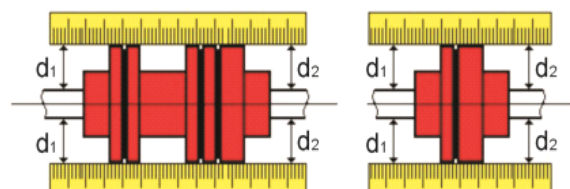
The shafts of the pump and motor have already been properly adjusted and aligned as an extension of one on the other.

For installation in the plant it is just necessary to respect the sequence of operations:

- The base must be placed on a horizontal plane, also using shims;
- Tighten the nuts on the fixing bolts;
- Check the alignment of the shafts of the pump and the electric motor and repeat the alignment operations if necessary (described in "Alignment of the coupling" paragraph).

### **Alignment of the coupling**

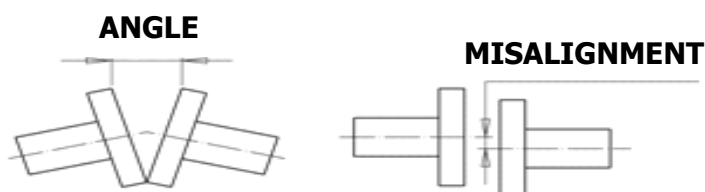
- Place a straight edge on the coupling. Insert or remove all shims necessary to bring the electric motor at the correct height, so that the bottom part of the straight edge rests on both halves of the coupling for the entire length;
- Repeat the same check on both sides of the coupling, at the height of the shaft. Rotate the shaft of the electric motor so that the bottom part of the straight edge touches both halves of the coupling for the entire length;
- Re-assembly the guard.



### **Alignment and coupling tolerances**

The maximum permitted tolerances for the alignment of the two halves of the coupling, to be checked with the comparator, are:

TYPE OF COUPLING	MISALIGNMENT	ANGLE
Short flexible joints (3000 rpm)	0.05mm	0.04mm for joints with 100mm diameter.
Elastic joints with spacer (3000 rpm)	0.07mm for 100mm spacers.	0.04mm for joints with 100mm diameter.



## **15. INTENDED USE OF THE PUMP. INCORRECT USE. OPERATION DESCRIPTION. PERSONAL PROTECTIVE EQUIPMENT DURING USE.**

### **Intended use of the machine**

The pump works properly if the parameters indicated in the "TECHNICAL SPECIFICATIONS" paragraph are fully complied with:

### **Instructions for reasonably foreseeable proper use**

Before starting to work, you must ensure that:

- All maintenance operations have been properly carried out according to time intervals set by *M PUMPS*;
- No parts of the pump are damaged;
- All warning stickers and safety nameplates are present, in good condition and the emergency stop buttons are fully operational (run a test).

### **WARNING**



At start-up, immediately check the pressure gauge at the delivery: if the delivery pressure does not quickly reach the rated value, stop the pump and try re-starting. Check the pump and the pipes to make sure there is no leakage of fluid from the system. A high noise level of the pump is a symptom of a malfunctioning that will originate a failure in the short term. A noise to very low frequency and with rumble may indicate the cavitation condition; excessive noise of the motor can be due to wear of a bearing.

### **Unintended use**

While maintaining the operating conditions specified in "TECHNICAL SPECIFICATIONS" here are the ways in which the pump must not be used. To prevent damage to the pump, it is forbidden to use it in the following conditions:

### **PROHIBITION**



- Start the pump dry: the pump body must be filled with liquid.
- Run the pump dry for more than one minute;
- Run the pump with the suction valve and/or delivery valve closed: the heat generated by the impeller, by magnetic coupling and supports will bring to boil the liquid, which will cause cavitation / vibration of the pump, damaging the impeller and causing the supports to collapse.
- The pump flow must never be adjusted by means of the valve located in the suction pipe, which must always be kept fully open;
- Start and/or operate the pump if leakages are noticed;



- Changing the operating conditions of the pump without consulting the *M PUMPS* technical office;
- Loosen the connections of the pump while it is under pressure;
- Try to clean the pump while it is running;
- Run the pump in the opposite direction to that indicated in the pump body;
- Run the pump at temperatures and pressures exceeding the rated ones;
- Pump liquids containing ferromagnetic particles of any size, or substances that can wear away or chemically attack the internal parts of the pump;
- Remove the safety devices and guards when the pump is running;
- Take action on moving parts;
- Take action on electrical parts installed without first cutting off the power supply, do not alter the safety devices installed, do not operate repeatedly the command buttons.

#### **DANGER**



It is deemed incorrect any use of the pump other than that indicated in the paragraph in "Instructions for reasonably foreseeable proper use".  
*M PUMPS* disclaims any liability for damage to property and injury to persons resulting from uses for which the pump has not been specifically designed and built.

## **16. RESIDUAL RISKS AND PROTECTIVE MEASURES TO BE TAKEN**

### **Descriptions of remaining residual risks**

Although all protective measures incorporated into the design of the pump have been taken, the main dangers associated with its use are the following:

- Danger of projection of sketches of fluids which may be caustic or burning, as a result of improper installation and sudden failure of the pump body and hydraulic connections;
- Danger of cuts to hands for burrs on the pump body;
- Explosion of the pump for the formation of explosive mixture inside the body of the device resulting from its improper use.

### **Protective measures to be taken by the user and instructions**

#### **PROHIBITION**



**It is strictly forbidden to remove or tamper with the safety devices.** Before using the pump check the correct fitting of mechanical guards. Any tampering will void the warranty and the liability of *M PUMPS* towards the users of the device.

Only maintainers may perform maintenance operations that affect the safety devices.

### **Personal Protection Equipment to be worn**

The protective measures that must be taken during this phase are: the adoption of anti-acid and anti-static overalls, anti-splash goggles, gloves protecting from mechanical, chemical agents, and safety shoes. Avoid the use of accessories (necklaces, bracelets, etc..) and clothing undone, torn or dangling that could get caught in moving parts of the pump.

## **17. OPERATING LIMITS, RESIDUAL RISKS STILL REMAINING DESPITE THE SAFETY MEASURES TAKEN**

The dangers that have not been deleted with the safety measures taken on the pump can be reduced/eliminated if operators apply such management measures as a result of the fact of having to:

- Keep all safety instructions and all the nameplates and labels intact and replace them when necessary, periodically verifying their good condition;
- Do not take substances that can alter their physical or mental capacity (alcohol, medicines, drugs, etc.);
- Do not use, without permission, spare parts not identical to the originals ones or components not approved by *M PUMPS*;
- Do not perform any changes or structural intervention without previous specific approval by *M PUMPS*;
- Following to shocks suffered accidentally by the pump, carry out a visual inspection to ascertain the absence of any damage, if required send the pump to *M PUMPS*;

- Check, after a long downtime period, that the pump is still intact and that the parts subject to wear and tear and in good conditions and properly operating. If necessary replace with spare parts identical to the original ones.

# **WARNING**









Each misuse or negligence until now listed may cause:

- Immediate cancellation of technical assistance by *M PUMPS*;
- Disclaimer of *M PUMPS* for damages to properties, animals or people.

## **Safety instructions mounted on the pump**

The safety and warning signs mounted on the pump must be complied to, some of them must also be replaced in case they turn out to be illegible, and are the following:

Warning No.	Description of warning signs applied	Symbol/indication	Quantity	Notes
1.	Marking nameplate <i>M PUMPS</i> .	Reported in paragraph "IDENTIFICATION NAMEPLATE"	1	Restore if unreadable
2.	Label for "follow the instructions on the manual"		1	/
3.	Label with "fill with oil before starting"		1	/
4.	Label with "check for proper motor-pump alignment, before start-up"		1	/
5.	Label on direction of rotation and indication on not to start when dry.		1	Restore if unreadable
6.	Hydrotest label.		1	/
7.	Quality control label Assembly.		1	Internal use

## 18. INSTRUCTIONS AND PROCEDURES FOR TRAINING OF STAFF AND FOR EMERGENCY SITUATIONS

The operators responsible for the various service life stages of the pump must be:

- **Maintainers:** Personnel educated and trained in the proper handling of goods with the use of tools and lifting equipment;
- **Pipes and electrical connections installers:** qualified and trained staff to work on live electrical systems, personnel with experience in the field of hydraulic installations;
- **Users:** Professional staff trained in the instructions for use of this pump.

### In case of emergency:

- Tell people who is close to specific dangerous situation, also gesturing with the arms;
- Stop the pump by pressing the nearest emergency stop button;

### Reset method

To resume normal operation, you must eliminate all the causes that led to the emergency situation, possibly by repairing or replacing parts that have suffered damage.

#### **WARNING**



**After the activation of the protection devices, it is necessary to find the cause triggering them, before resuming the operations.**

### Fire-fighting equipment to be used:

In case of fire involving the pump, you can use water or foam liquid only after having cut-off the power supply, or use a fire extinguisher with extinguishing agent, like powder. Do not use CO<sub>2</sub> because, being launched at -79°C, it may react violently with hot parts.

### Emission/Dispersion of harmful substances:

The fluid contained in the system could be released into the atmosphere as a result of an intervention or a breakage of the pump.

## 19. MALFUNCTIONING, FAILURE, FAULT, ACCIDENT. MOST FREQUENT PROBLEMS: CAUSES AND REMEDIES

### Malfunction

There are no components of the pump which cause malfunctions able to restrict or cause unsafe operations. At paragraph "The most frequent Problems: causes and remedies" this section is discussed in a more thoroughly way.

### Failure

In case of failure of mechanical parts you must immediately restore initial safety conditions, by replacing or repairing the parts that have deficiencies.

In case of failure of the electric pump unit proceed as follows:

- Cut the power supply to the pump motor or switch off the combustion engine;
- Close the suction and delivery valves;
- Find the cause of the failure by checking "The Most frequent Problems: problem, causes, remedies, residual risks".

The failures of a pumping system can be attributed to:

- A failure of the pump;
- A failure or defect of the pipes;
- A failure due to installation or installation or commissioning not properly carried out;
- Incorrect choice of the pump.

## **Failure**

Under conditions of pump failure tell the staff in its vicinity about the problem occurred.

## **Injury**

In the event of an injury, report the emergency situation to the Manager of the plant, in order to secure the plant to reach with the emergency team the place where the accident occurred.

## **The most frequent problems: problems, causes, remedies, residual risks**

<b>INADEQUATE FLOW RATE</b>	
<b>Causes</b>	<b>Remedies/actions to be taken</b>
The prevalence required exceeds that provided for the pump.	Reduce total prevalence of the system if possible. Check that the delivery valve is fully open. Replace the pump with a larger one. Ask for advice at your distributor by <i>M PUMPS</i> .
The pump rotates in the opposite direction.	Check the direction of rotation. Refer to section 3.5 of this manual.
Air or steam trapped in the suction pipe.	Check for trapped air or steam. Refer to section 3.4 of this manual.
The liquid contains air or steam. The liquid produces foam.	Check the presence of vortices in the suction line. Insert the baffles in the fuel tank to prevent the formation of vortices. Mount a tank having sufficient capacity, in the suction line, to allow the entrained gas to separate from the liquid.
Suction pressure insufficient, with the generation of cavitation and loss of efficiency.	Decrease the negative height of suction, increase the suction head. Check that the suction is not obstructed or there are no blockages. Reduce the temperature of the liquid Increase the diameter of the suction pipes. Decrease the length of the suction pipes. Fully open the suction valve. Check the viscosity of the liquid, refer to the "TECHNICAL DATA" in this manual, raise the temperature of the liquid if necessary.

Wear suction elements, pressing devices, or the impeller.	Check the condition of the internal parts. Replace if worn, refer to Chapter 10 of this manual.
The liquid temperature is close to the boiling point.	Reduce the temperature of the liquid
<b>NO FLOW RATE</b>	
<b>Causes</b>	<b>Remedies/actions to be taken</b>
The pump is disconnected.	Re-connect the pump. Refer to section 3.5.1 of this manual. Verify the presence of air leaks in the suction line.
Suction line blocked.	Make sure that there are no blind, clogged pipes, or closed valves.
The magnetic coupling decouples	Contact your <i>M PUMPS</i> distributor.
The engine has stopped	Check the power supply to the engine. Carry out a visual check of the engine.
<b>EXCESSIVE FLOW RATE</b>	
<b>Causes</b>	<b>Remedies/actions to be taken</b>
The prevalence required is lower than that provided by the pump.	Reduce the speed of rotation, if possible; partially close the delivery valve.
<b>ENGINE OVERHEATING AND STOP</b>	
Excessive density of the liquid being pumped.	If possible, reduce the speed of the electric motor. Contact your <i>M PUMPS</i> distributor.
The pump has seized or is about to seize.	Check the free rotation of the impeller. Check for any internal obstructions. If the pump was recently serviced, recheck the accuracy of indoor clearances.
Motor and pump are misaligned.	Refer to section 3.8 of this manual.
The motor bearings are damaged or worn.	Replace the motor bearings, investigate the causes of the breakage.
Down-sized engine	Fit a more powerful engine (check in advance with your <i>M PUMPS</i> distributor).
Motor overload threshold set incorrectly.	Check the safety settings of the engine.

The protective device against dry running of the motor (where any) has failed or has been set incorrectly.

Check flow rate decreases in liquid delivered or sucked.

## OPERATION WITH ABNORMAL NOISE AND/OR VIBRATIONS

### Causes

### Remedies /actions to be taken

Insufficient suction pressure, causing cavitation, insufficient lubrication of supports (with mechanical damage if the condition persists.)

Refer to sections 3.4, 3.5, 4.1, 4.2, 4.3 of this manual.

### IMMEDIATELY STOP THE PUMP!

Wear, erosion and immediate damage to the impeller and internal supports.

Check inside the pump the presence of damage or obstructions.

Wear the motor-pump coupling

Replace the coupling and proceed realigning both pump and motor.

Wear of oil case bearings or of the electric motor.

Check bearings and replace if necessary.

Feet of the engine or base not safely fastened.

Make sure that the motor and base are firmly anchored to the foundations and do not generate excessive vibration.

Misalignment or improper anchoring of pipes.

Check correct alignment of piping and supports, refer to section 3.2 of this manual.

The pump was started while still rotating in the opposite direction, due to a previous start-up.

Immediately stop the pump and fully drain all liquid from the delivery line before restarting.

## OVERHEATING OF EXTERNAL SUPPORTS (bare shaft versions)

Lack of oil or wrong type of oil in the oil case.

Check the oil level: top up or drain and replace if necessary.  
Replace the bearings.

Excessive temperature of the oil in its case.

Top up the oil case with the oil specified in paragraph 9.2 to restore the correct operating temperature.

## 20. ROUTINE AND UNSCHEDULED MAINTENANCE

The maintenance and proper use are essential factors to ensure the functionality and durability of the pump. It is the operator's responsibility to ensure that maintenance, inspection and assembly are carried out by authorized and qualified specialists who have assimilated the concepts contained in this document. All repairs must be performed when the machine is stopped, It is essential to follow the procedure for shutting down the machine, as described in the section "Shutting down and emptying of the fluid in the pump."

### Cleaning the components and magnet

To degrease all surfaces of the joints and the centring surfaces, possibly use methyl alcohol. Preferably use cellulose cloths

It is possible to use solvents on the magnet; any dirt can be removed from the magnets also through gummed paper, it is recommended not to leave absolutely any metal scrap attached to the magnet.

Do not strike or exert pressure on the magnet during its handling, to avoid damage to it.

### Preventive periodic maintenance

Instructions are given for maintenance operations whose execution does not require specific skills, which can then be made directly by the users of the pump. Are scheduled operations and checks, on issues deemed significant for technical, operational purposed and for personnel safety, established on the basis of the experience gained from *M PUMPS* over time.

If the hydraulic pump is washed with pressurised jet, prevent the inlet of water into the motor terminal board.

#### **DANGER**



Do not throw water on the hot pump components: the latter can break out in case of sudden cooling generating projection of metallic material and fluid leakage under hot pressure and then dangerous to health.

Do not give shots and put pressure on supports, it would cause the formation of micro-cracks which can cause serious damage.

No.	<u>Check/Operation description</u> Procedure	<u>Warnings and protective measures to be taken to perform maintenance properly and safely</u>	Time Range
1	Oil case	Top up the oil until the centreline of the indicator cap.	Weekly. Change the oil every 5000 working hours.
2	Internal supports	Check the state of bushings, jackets and releaser, replace if worn, re-assemble using new gaskets.	After 2500 working hours, check for premature wear, then every 5000 working hours or every year.
3	Wear ring, suction-pressing elements and star impellers.	Check the wearing conditions of the ring, of suction and pressing elements and star impeller, consult the table of clearances.	After 2500 working hours, check for premature wear, then every 5000 working hours or every year.
4	Bearings of the electric motor	Unless other specifications, electric motor bearings are greased for life, so there a maintenance schedule is not required, in any case we recommend to check the condition of the bearings and replace them when worn.	

**TABLE OF RECOMMENDED OIL: (for ambient temperatures above 15°C, according to ISO VG 68 classification)**



**WARNING**

BP HPL 68  
 CHEVRON EP industrial oil 68  
 Texaco Rando Oil HDC 68  
 TOTAL Azolla 68  
 Shell Tellus 68  
 Mobil DTE Heavy Medium ISO 68  
 STATOIL HYDRAWAY HV 68  
 Esso Teresso 68  
 AGIP OSO 68

In **Appendix A** is a list of maintenance and periodic checks to be completed each time you perform this type of operations.

**Shut down and emptying of the fluid in the pump**

**DANGER**



The pumps included in this series are used to pump liquids that are, generally, harmful to health, thus use suitable protective equipment before starting draining, disassembly and maintenance operations.

- Close the delivery valve, making sure that the pump runs with the valve closed for no more than a few seconds.
- Stop the pump.
- Turn off the flushing and / or cooling / heating systems of liquid in a time appropriate, depending on the ongoing .

Before proceeding with the disassembly, it is necessary to empty the pump according to the following steps:

- Close the valves in the suction pipe and in the cooling or rinsing pipe of the shaft sealing system;
- Remove the drain plug, this preserves the pump, in particular in cases where the ambient temperature may go below the freezing point of the liquid;
- At the end re-positions the drain plug.

If fluids hazardous for health are pumped, wear suitable personal protective equipment for accident prevention before coming into contact with the liquid.

**Draining the oil contained in the pump**

If the pump is designed with oil-lubricated bearings (versions with bare shaft):

- Remove the oil drain plug.
- Drain the oil collecting it without release into the environment;
- Re-position the oil drain plug.

If fluids hazardous for health are pumped, wear suitable personal protective equipment for accident prevention before coming into contact with the liquid.

**Unscheduled maintenance**

The unscheduled maintenance operations relate to activities that are outside of those normally programmable and executable; they require specific technical expertise by qualified staff and therefore it is recommended to contact *M PUMPS*. The address is in the header of each page of this manual.



# DANGER



In case of pump dismantling, it must be remembered that the liquid should be collected and disposed of in accordance with current environmental laws and regulations.  
In case the pump is to be sent to *M PUMPS* it must be reclaimed and must not contain any trace of pumped liquids.

## 21. REPAIR AND SPARE PARTS

### The pump must always be kept in optimal working conditions.

Most of the spare parts shall indicate clear and comprehensive references for their identification. It is important that the parts of the pump are replaced by similar parts, such that they can be considered of equivalent quality and safety: to order original spare parts, contact *M PUMPS* referring to the pump model, serial number, description of the component and the desired quantity.

When any elements with rust, cracks, etc... is detected, you must perform all replacements/repairs necessary to restore the safety operating conditions of the pump. For added safe, you should always ask for an opinion to *M PUMPS* before carrying out any operation.

The periodical maintenance stated in chapter "PERIODIC AND UNSCHEDULED MAINTENANCE" should be carried out.

### Disassembly of the pump

In the event that the pump has pumped hot liquids, make sure it has cooled before disassembly.

The activities of disassembly and maintenance of the pump must be carried out in full compliance with current regulations. In particular the following spare parts affect the health and safety of operators acting on them:

# WARNING



- *M PUMPS* disclaims any liability for damage to things and people and will void the warranty if you install unsuitable components with non-equivalent quality.

# WARNING



- Failure to disconnect and lock out driver power may result in serious physical injury or death. Always disconnect and lock out power to the driver before performing any installation or maintenance tasks.
- Electrical connections must be made by certified electricians in compliance with all international, national, state and local rules.
- Refer to driver and coupling manufacturer's installation and operation manuals (IOM) for specific instructions and recommendations.
- Risk of serious personal injury. Applying heat to impellers, propellers, or their retaining devices can cause trapped liquid to rapidly expand and result in a violent explosion. This manual clearly identifies accepted methods for disassembling units. These methods must be adhered to. Never apply heat to aid in their removal unless explicitly stated in this manual.
- Handling heavy equipment poses a crush hazard. Use caution during handling and wear appropriate Personal Protective Equipment (PPE, such as steel-toed shoes, gloves, etc.) at all times.
- Precautions must be taken to prevent physical injury. The pump may handle hazardous and/or toxic fluids. Proper personal protective equipment should be worn. Pumpage must be handled and disposed of in conformance with applicable environmental regulations.
- Risk of serious physical injury or death from rapid depressurization. Ensure pump is isolated from system and pressure is relieved before disassembling pump, removing plugs, opening vent or drain valves, or disconnecting piping.
- Risk of serious personal injury from exposure to hazardous or toxic liquids. A small amount of liquid will be present in certain areas like the seal chamber upon disassembly.

# CAUTION

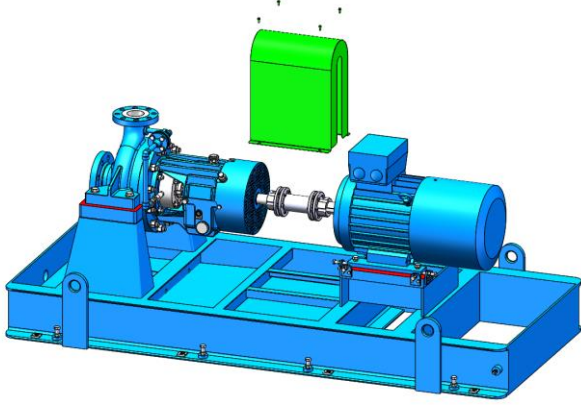
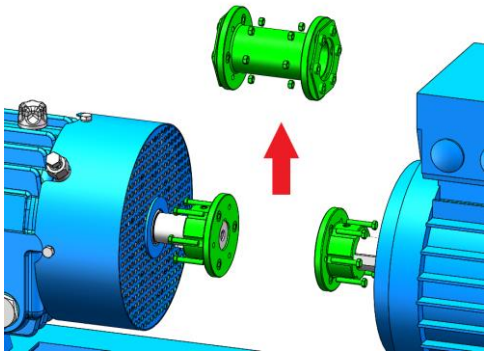
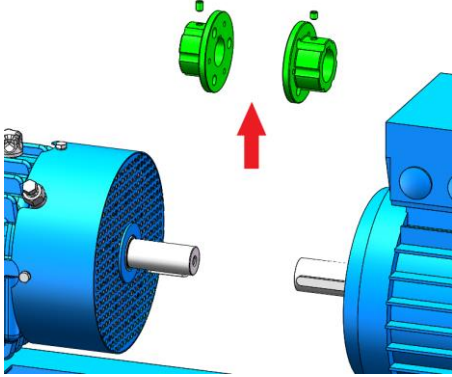


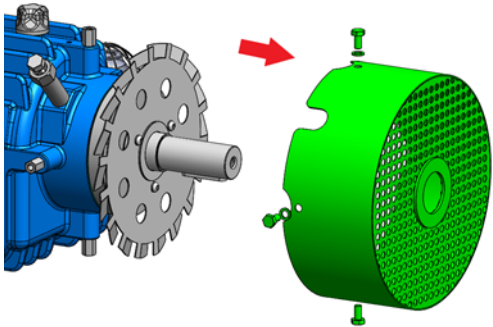
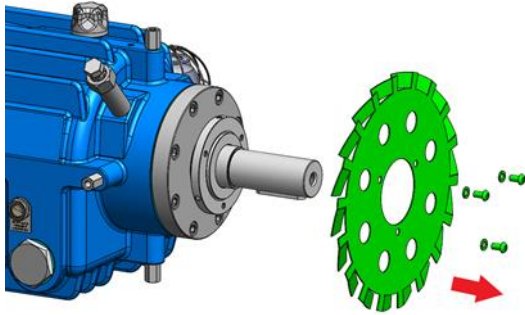
Risk of physical injury. Allow all system and pump components to cool before handling.

If the pumped fluid is non-conductive, drain and flush the pump with a conductive fluid under conditions that will not allow for a spark to be released to the atmosphere.

Keeping in mind the instructions described in Chapter 9 "Periodic Preventive Maintenance", proceed disassembling as follows:

As a first step we will disconnect the pump from the electric motor.

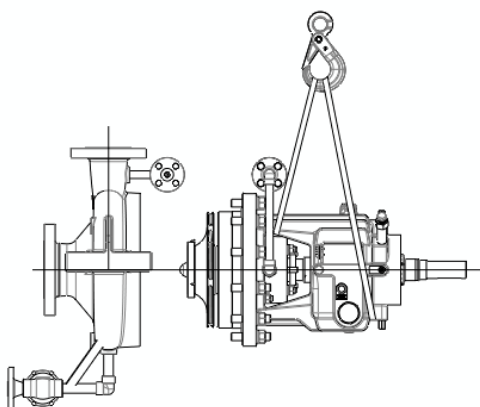
	<p>1) Unscrew the screws and remove the cover over the elastic coupling.</p> <div data-bbox="1082 936 1436 1032"> <p>SCREW TIGHTENING TORQUE</p> <p>Nm</p> </div>
	<p>2) Unscrew the bolts and remove the elastic coupling\ spacer between the motor shaft and the pump shaft.</p> <div data-bbox="1098 1355 1436 1451"> <p>BOLT TIGHTENING TORQUE</p> <p>Nm</p> </div>
	<p>3) Unscrew the socket screw and remove the hubs of the elastic coupling from the shafts on which they are keyed. Do not remove the hub from the electric motor part if it does not hinder the disassembly of the pump.</p> <div data-bbox="986 1771 1436 1868"> <p>SOCKET SCREW TIGHTENING TORQUE</p> <p>Nm</p> </div>

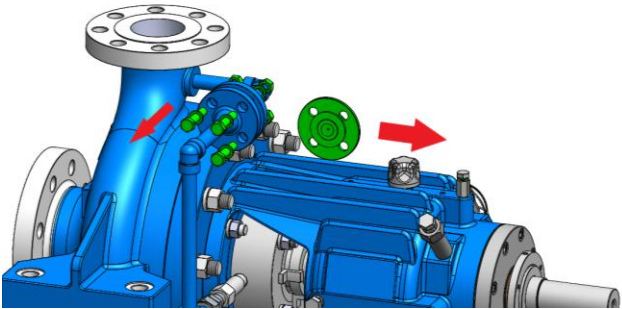
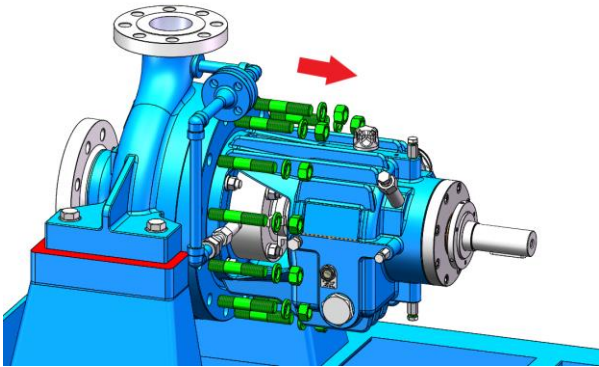
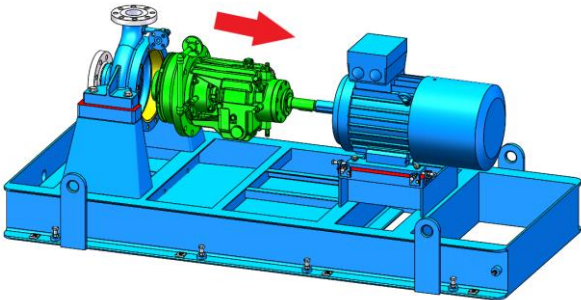
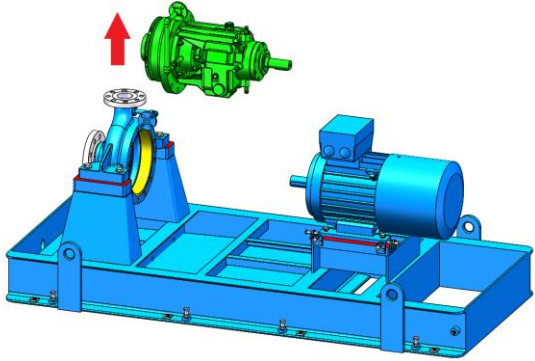
	<p>4) Unscrew the locking screws and remove the bearing frame fan cover.</p> <div data-bbox="1078 521 1437 622"> <p>SCREW TIGHTENING TORQUE</p> <p>Nm</p> </div>
	<p>5) Loosen the locking screws and remove the fan.</p> <div data-bbox="1078 936 1437 1037"> <p>SCREW TIGHTENING TORQUE</p> <p>Nm</p> </div>

The construction of the CN SEAL-M API 610 pumps allows the disassembly procedure to be carried out in two ways based on the type of maintenance and without removing the electric motor. Before starting the disassembly procedure, make sure you have drained the pump from any liquids present in it, such as liquids and oil from the bearing frame.

#### CASE A

The back-pull-out construction offers the possibility of replacing the internal wetted parts without disconnecting the pump casing from piping where the maintenance of it is not required. Before remove the back-pull-out assembly it's necessary secure a lifting sling through the bearing frame as shown in the figure below:

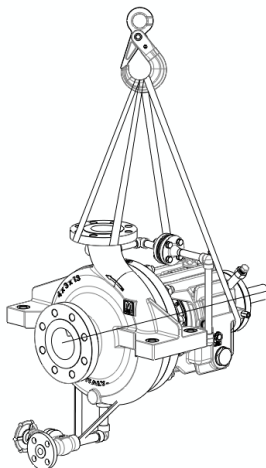


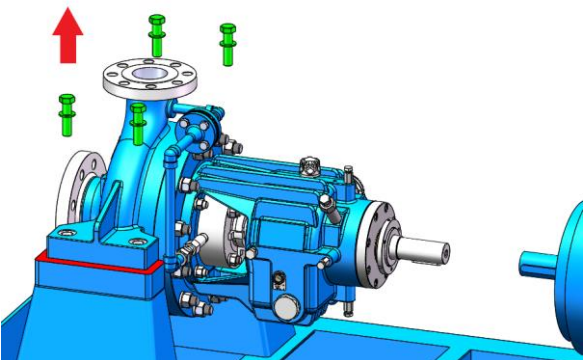
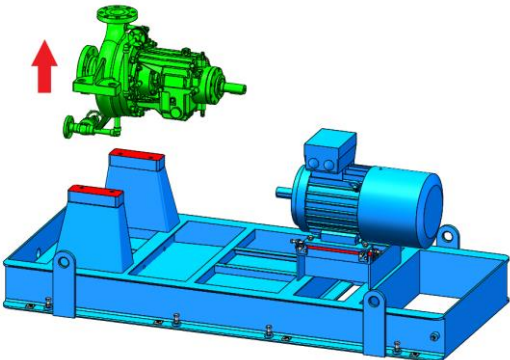
	<p>6) Disconnect eventually present connections between pump casing and mechanical seal, such as Plan 11, in this case represented.</p> <p>This applies to any other plans described in API 682 4th edition piping plans.</p> <div data-bbox="1098 544 1439 642"> <p><i>BOLT TIGHTENING TORQUE</i></p> <p><i>Nm</i></p> </div>
	<p>7) Bring in tension the lifting sling and then unscrew the locking nuts of the stuffing box, remove the washers and unscrew the studs.</p> <div data-bbox="1114 952 1439 1050"> <p><i>NUT TIGHTENING TORQUE</i></p> <p><i>Nm</i></p> </div>
	<p>8) At this point you can proceed to remove the back-pull-out assembly from the pump casing. Taking care not to collide against the electric motor shaft with the pump shaft end.</p> <p>Remove and discard the casing gasket. A new casing gasket will be required at reassembly.</p>
	<p>9) Secure the back-pull-out assembly to prevent dangerous movement and transport it to a clean work area for further disassembly.</p> <p>Clean all sealing surfaces on the pump casing and on the stuffing box to ensure a good seal during the reassembly.</p>

## - CASE B

Disassembly of the bearing frame pump assembly by disconnection from piping.

Before remove the pump it's necessary secure a lifting sling through the pump casing and the bearing frame as shown in the figure below:



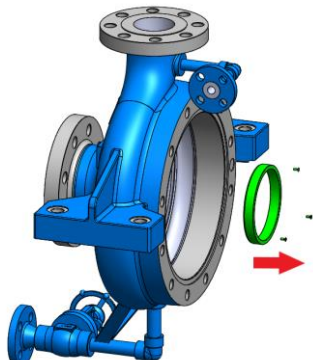
	<p>10) Secure pump before unscrewing by lifting sling or belt and then loosen the screws that keep the pump fixed to the baseplate.</p> <div data-bbox="1082 1227 1436 1323" style="border: 1px solid black; padding: 5px; text-align: center;"> <p>SCREW TIGHTENING TORQUE</p> <p>Nm</p> </div>
	<p>11) Lift the pump and transport it to a clean work area for further disassembly.</p>

At this point, please follow next step, depending A or B case:

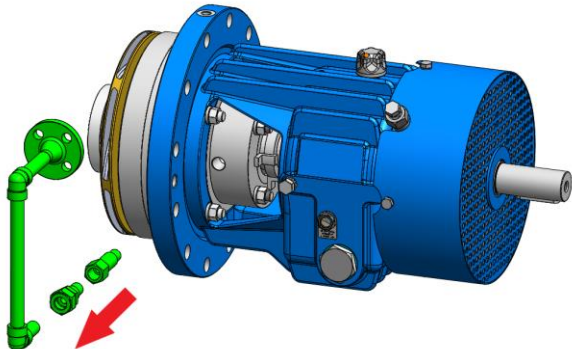
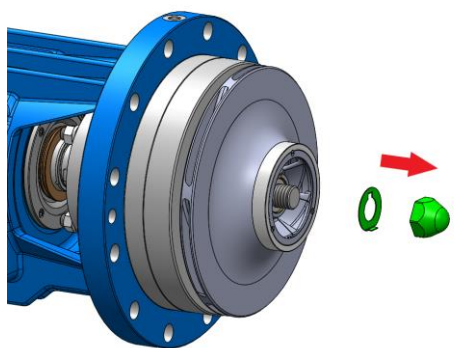
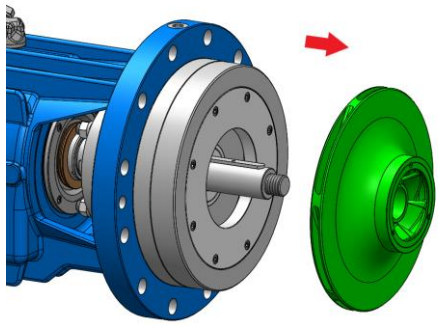
- In the case A the back-pull-out assembly is ready to be disassembled on a clean work area.
- In the case B the pump casing must be removed from the back-pull-out assembly following the same steps 6, 7, 8 and 9 above described.

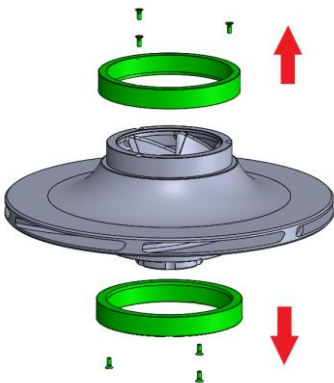
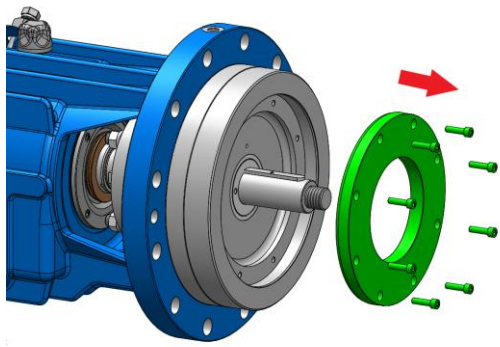
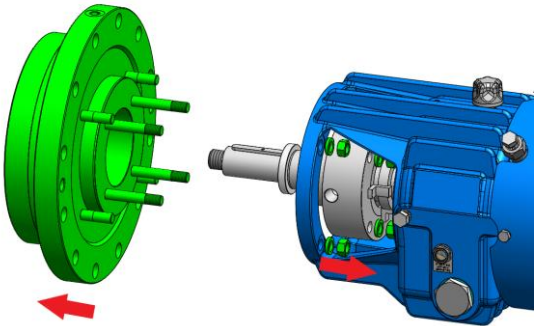
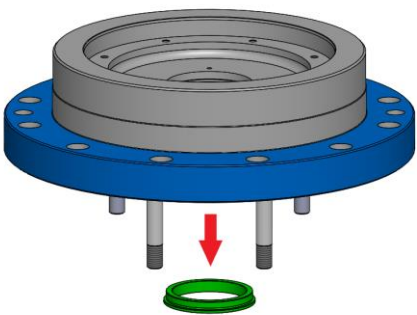


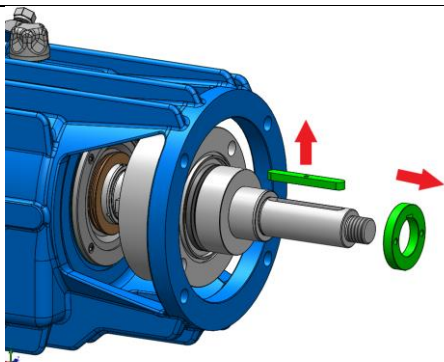
If the pump casing needs to be overhauled, proceed as follows:

	<p>12) Loosen the locking screws and remove the wear ring from the pump casing using a pry or puller to force the rings from the fits.</p> <p>Clean the pump casing seat thoroughly, and make sure that it is smooth and free of scratches.</p> <div data-bbox="1082 577 1437 678" style="border: 1px solid black; padding: 5px;"> <p>SCREW TIGHTENING TORQUE</p> <p>Nm</p> </div>
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The back-pull-out assembly can now be disassembled as follows:

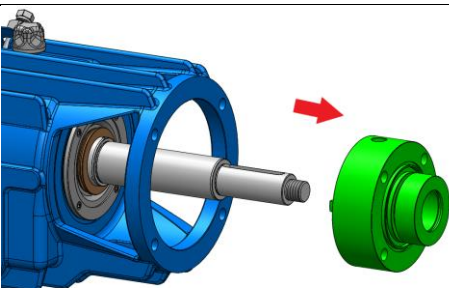
	<p>13) Consider this point only if the mechanical seal is fitted with a flushing configuration described in the API 682 4th edition piping standard.</p> <p>Loosen the fitting to tighten and remove the mechanical seal flushing pipe.</p> <p>At this point unscrew the extension fitting from the mechanical seal.</p>
	<p>14) Flatten the security lock washer.</p> <p>Then, loosen and remove the impeller nut.</p> <div data-bbox="1114 1527 1437 1628" style="border: 1px solid black; padding: 5px;"> <p>NUT TIGHTENING TORQUE</p> <p>Nm</p> </div>
	<p>15) Pull out the impeller from the shaft.</p> <p>Use a spanning-type puller if required.</p>

	<p>16) Place the impeller on a horizontal plane as shown in the figure. Loosen the locking screws and remove the impeller wear rings using a pry or puller to force the rings from the fits.</p> <p>Clean the wear-rings seats thoroughly, and make sure that they are smooth and free of scratches.</p> <div data-bbox="1082 528 1437 629"> <p>SCREW TIGHTENING TORQUE</p> <p>Nm</p> </div>
	<p>17) Unscrew the screws and remove the stop box wear ring.</p> <p>Clean the contact surfaces between the stop box wear ring and the stuffing box to ensure a correct coupling during the reassembly.</p> <div data-bbox="1082 936 1437 1037"> <p>SCREW TIGHTENING TORQUE</p> <p>Nm</p> </div>
	<p>18) Loosen the locking nuts of the mechanical seal and the bearing frame. Once free, separate the stuffing box from the bearing frame by tapping on the cover flange with a hardwood block or a soft-face hammer.</p> <p>Clean the contact surfaces between the bearing frame and the stuffing box to ensure a correct coupling during the reassembly.</p> <div data-bbox="1114 1391 1437 1491"> <p>NUT TIGHTENING TORQUE</p> <p>Nm</p> </div>
	<p>19) Place the stuffing box on a horizontal plane as shown in the figure and extract the fixed bushing locked inside.</p> <p>Clean the fixed bushing seat thoroughly, and make sure that it is smooth and free of scratches.</p>



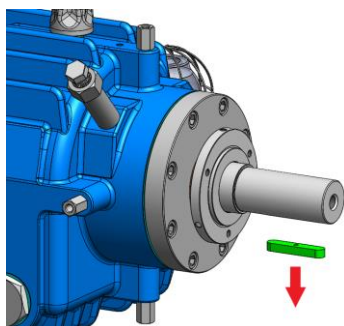
20) Remove the impeller key and slip the rotary bushing. If necessary, use the threaded holes to facilitate extraction.

1°R	M5
2°R	M5
3°R	M8
4°R	M8

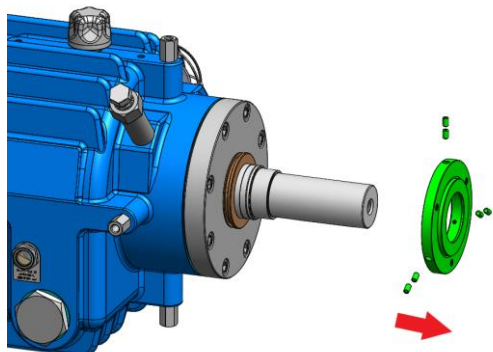


21) Make sure you have locked the mechanical seal with the appropriate clips and then guide the seal-chamber cover over the end of the shaft. The cartridge mechanical seal may become damaged if the cover is allowed to come in contact with it.

Loosen the setscrews and remove the cartridge mechanical seal from the shaft. Remove and discard the mechanical seal O-ring or gland gasket. You will replace this with a new O-ring or gasket during reassembly.



22) Remove the elastic coupling shaft key

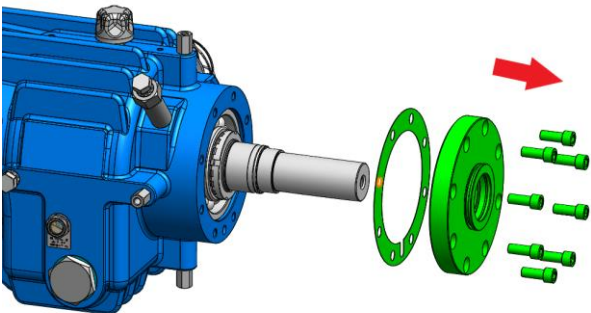
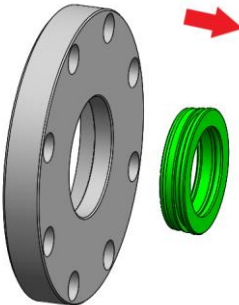
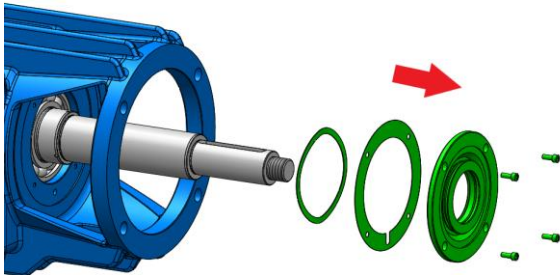
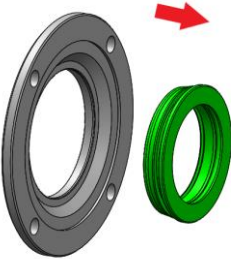


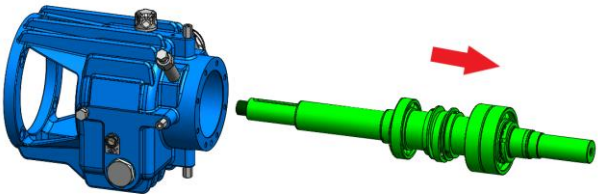
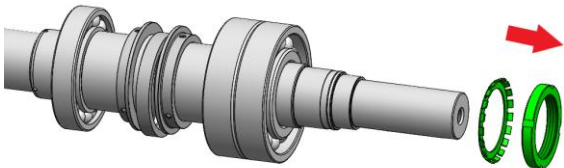
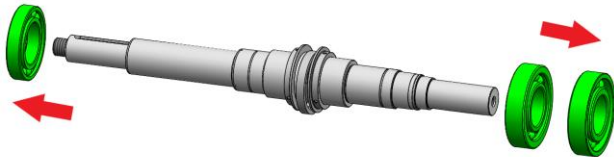
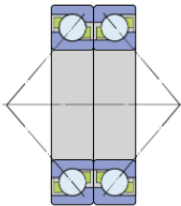
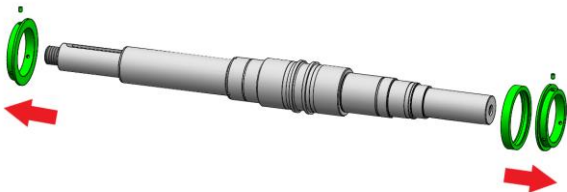
23) Unscrew the locking screws and remove the fun hub.

SOCKET SCREW TIGHTENING TORQUE

Nm



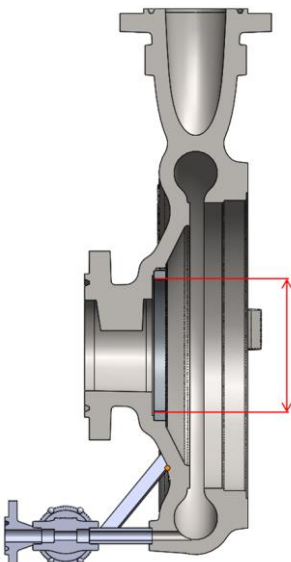
	<p>24) Loosen the screws of the rear cover of the bearing frame. Remove and discard the casing gasket. You will insert a new casing gasket during reassembly.</p> <p>Clean all surfaces of the cover and bearing frame to ensure a good seal during the reassembly.</p> <p><b>CAUTION:</b> During the reassembly, failure to align the gasket and rear cover with oil grooves will result in bearing failure from a lack of lubrication.</p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>SCREW TIGHTENING TORQUE</p> <p>Nm</p> </div>
	<p>25) Unhook and slide off the bearing guard from the bearing frame.</p> <p>During assembly, failure to align the bearing guards oil grooves will result in a lack of lubrication and rapid wear. Then position the bearing guard with the groove facing down.</p>
	<p>26) Loosen the screws of the front cover of the bearing frame. Remove and discard the casing gasket. You will insert a new casing gasket during reassembly. Do not forget the preload spring.</p> <p>Clean all surfaces of the cover and bearing frame to ensure a good seal during the reassembly.</p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>SCREW TIGHTENING TORQUE</p> <p>Nm</p> </div>
	<p>27) Unhook and slide off the bearing guard from the bearing frame.</p> <p>During assembly, failure to align the bearing guards oil grooves will result in a lack of lubrication and rapid wear. Then position the bearing guard with the groove facing down.</p>

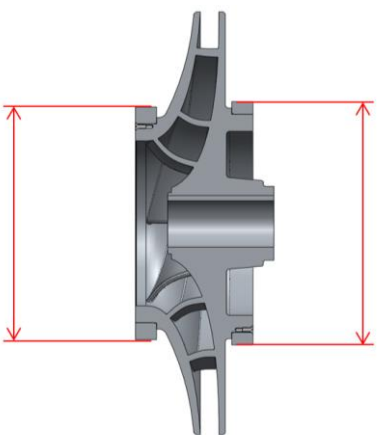
	<p>28) Remove the pump shaft from the rear of the bearing frame with the front bearing and the oil lance ring.</p> <p>Finally, clean all the surfaces of the bearing frame in contact with the bearings to ensure a correct insertion during the reassembly.</p>
	<p>29) Unscrew the lock ring and pull it out with the safety washer.</p> <div data-bbox="1114 862 1436 958" style="border: 1px solid black; padding: 5px; text-align: center;"> <p><i>NUT TIGHTENING TORQUE</i></p> <p><i>Nm</i></p> </div>
	<p>30) Remove the bearings from the pump shaft. During assembly, position the bearing pair according to the following diagram:</p> <div data-bbox="834 1131 1015 1335" style="text-align: center;">  </div> <p>With the “O” arrangement, axial loads are absorbed in both directions, but only from one bearing at a time.</p>
	<p>31) Unscrew the socket screw and remove the oil lance ring with the locking flanges.</p> <p>Thoroughly clean all the surfaces of the pump shaft.</p> <div data-bbox="984 1619 1436 1715" style="border: 1px solid black; padding: 5px; text-align: center;"> <p><i>SOCKET SCREW TIGHTENING TORQUE</i></p> <p><i>Nm</i></p> </div>

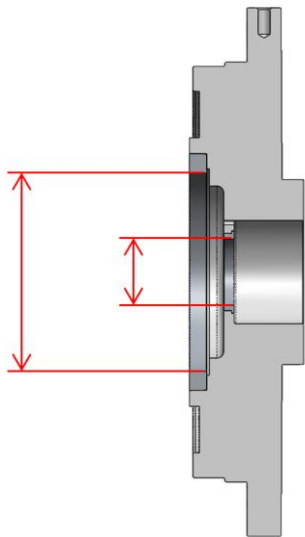
## **Preassembly inspections**

### **Wear rings inspection and replacement**

Wear ring types	All units are equipped with casing, impeller, and seal-chamber cover wear rings. When clearances between the rings become excessive, hydraulic performance decreases substantially.
Wear ring diameter check	Measure all wear ring diameters and then calculate the diametrical wear ring clearances. See the Minimum running clearances table for more information.

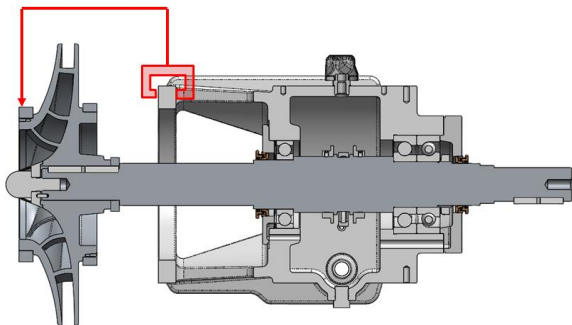
	<b>Relief Internal diameter of wear ring once inserted into the pump casing</b>	
	<b>Relieved value:</b>	
	<b>Gauge Number:</b>	

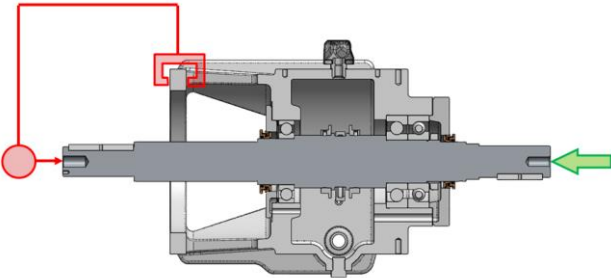
	<b>Relief the external diameter of front / rear impeller wear ring once inserted onto the impeller</b>	
	<b>Relieved value - Front:</b>	
	<b>Relieved value - Rear:</b>	
	<b>Gauge Number:</b>	

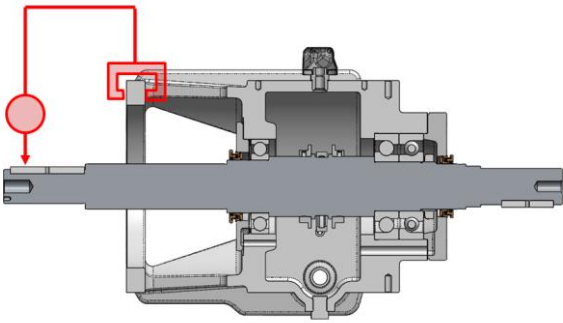
	<b>Relief the internal diameter of casing cover wear ring and fixed bushing once inserted into the cover</b>	
	<b>Relieved value – wear ring ID:</b>	
	<b>Gauge Number:</b>	
	<b>Relieved value – Bushing ID:</b>	
	<b>Gauge Number:</b>	

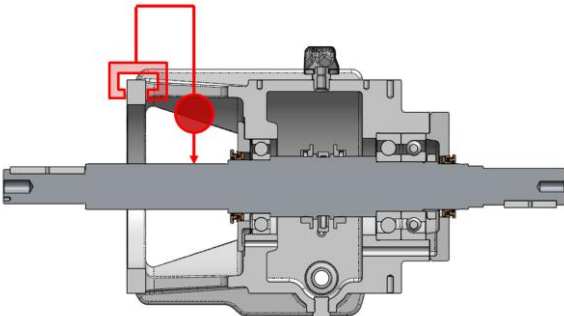
Now it's possible to check clearance compliance, by applying below table.

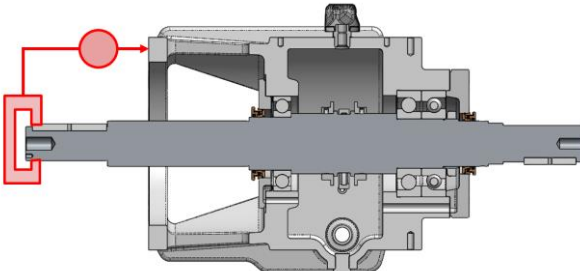
Diameter of impeller wear ring		Minimum diametrical clearance	
inches	millimeters	inches	millimeters
3.000 to 3.499	80 to 89.99	0.013	0.33
3.500 to 3.999	90 to 99.99	0.014	0.35
4.000 to 4.499	100 to 114.99	0.015	0.38
4.500 to 4.999	115 to 124.99	0.016	0.40
5.000 to 5.999	125 to 149.99	0.017	0.43
6.000 to 6.999	150 to 174.99	0.018	0.45
7.000 to 7.999	175 to 199.99	0.019	0.48
8.000 to 8.999	200 to 224.99	0.020	0.50
9.000 to 9.999	225 to 249.99	0.021	0.53
10.000 to 10.999	250 to 274.99	0.022	0.55
10.000 to 11.999	275 to 299.99	0.023	0.58
12.000 to 12.999	300 to 324.99	0.024	0.60

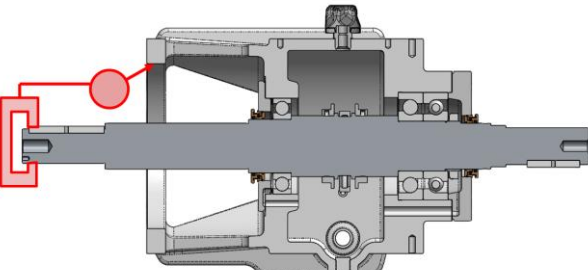
	<b>Check the impeller wear-ring runout:</b> a) Mount the dial indicator. b) Rotate the shaft so that the indicator rides along the casing-side impeller wear-ring surface for 360°. c) Repeat steps a and b for the wear ring on the seal-chamber cover side.	
	<b>Relieved value – Front wear ring OD:</b>	
	<b>Relieved value – Rear wear ring OD:</b>	
	<b>Gauge Number:</b>	

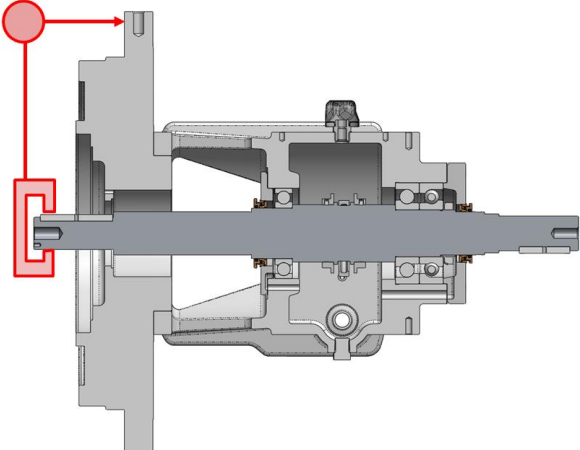
	<p><b>Determine the axial end play:</b></p> <p>a) Mount the dial indicator.</p> <p>b) Use a lever to apply axial force to the impeller end of the shaft and firmly seat the thrust bearing against the shoulder in the bearing frame.</p> <p>c) Apply axial force in the opposite direction and firmly seat the thrust bearing against the thrust-bearing end cover.</p> <p>d) Repeat steps b and c several times and record the total travel (end play) of the rotating element. Total travel (end play) must fall in the range of 0.025 to 0.125 mm   0.001 to 0.005 in.</p> <p>Achieve the correct axial end play by adding or removing end cover shims for ranges 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup>, between the thrust-bearing end-cover and the bearing frame. Add gaskets and shims if no axial end play is present. Repeat steps 1 through 4. If the measured total travel falls outside the accepted range in step 4, remove or add the appropriate quantity of individual shims or gaskets to obtain the proper total travel.</p>	
	<p><b>Relieved value – Front wear ring OD:</b></p>	
	<p><b>Relieved value – Rear wear ring OD:</b></p>	
	<p><b>Gauge Number:</b></p>	

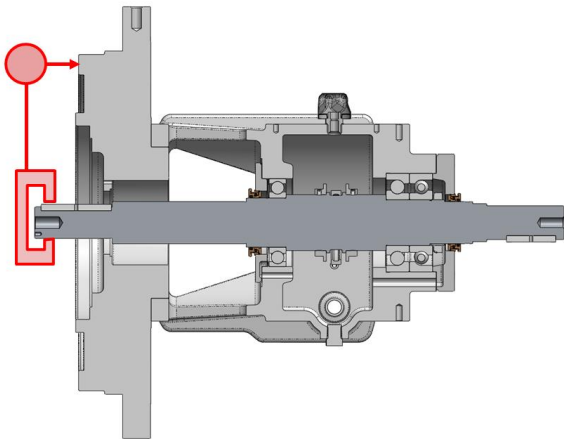
	<p><b>Check the following runouts, Shaft impeller fit:</b></p> <p>1 - Mount the dial indicator on the bearing frame.</p> <p>2 - Rotate the shaft through a maximum arc from one side of the keyway to the other. If the total indicator reading is greater than 0.050 mm   0.002 in., determine the cause and correct it.</p>	
	<p><b>Relieved value – Runout:</b></p>	
	<p><b>Gauge Number:</b></p>	

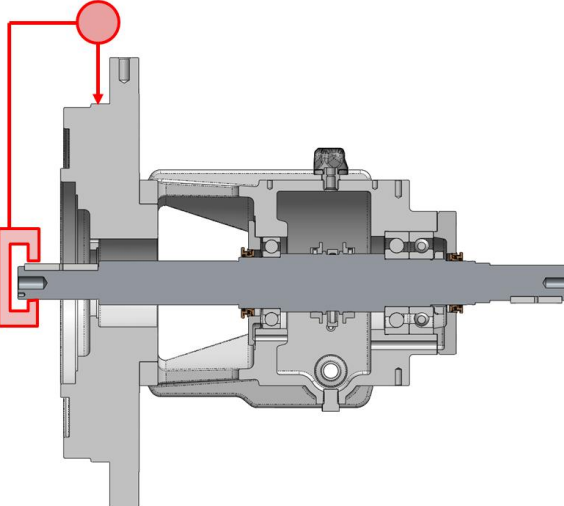
	<b>Check the following runouts, shaft seal:</b> 1 - Mount the dial indicator. 2 - Rotate the shaft so that the indicator rides along the shaft surface for 360°. If the total indicator reading is greater than 0.050 mm   0.002 in., then determine the cause and correct it.	
	<b>Relieved value – Runout:</b>	
	<b>Gauge Number:</b>	

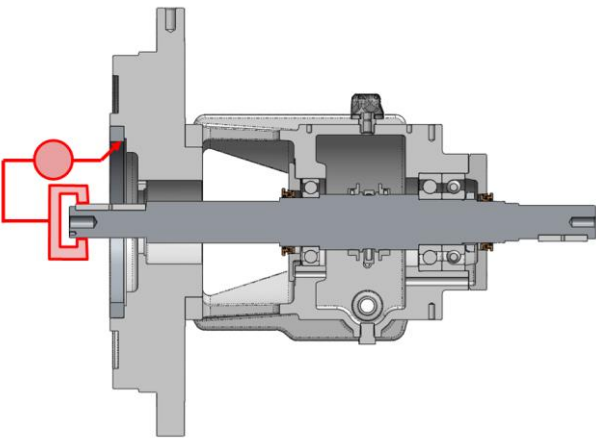
	<b>Check the following runouts, Bearing frame face:</b> 1 - Mount the dial indicator on the shaft. 2 - Rotate the shaft so that the indicator rides along the bearing-frame face for 360°. If the total indicator reading is greater than 0.10 mm   0.004 in., then disassemble and determine the cause and correct it.	
	<b>Relieved value – Runout:</b>	
	<b>Gauge Number:</b>	

	<b>Check the following runouts, Bearing frame face:</b> 1 - Mount the dial indicator on the shaft. 2. Rotate the shaft so that the indicator rides along the bearing-frame lock for 360°. If the total indicator reading is greater than 0.10 mm   0.004 in., then disassemble and determine the cause and correct it.	
	<b>Relieved value – Runout:</b>	
	<b>Gauge Number:</b>	

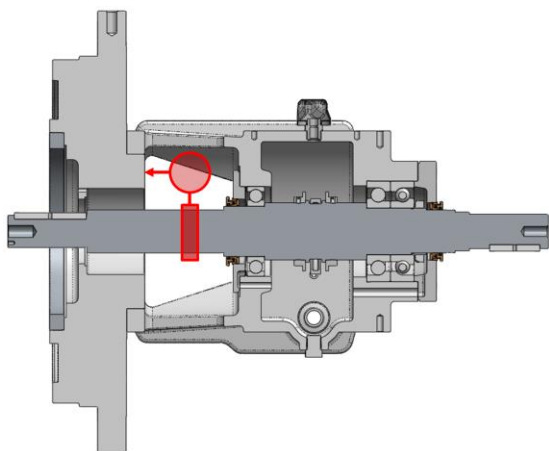
	<b>Assembly stuffing box and check the seal-chamber cover face runout:</b> 1 - Mount the dial indicator on the shaft. 2 - Rotate the shaft so that the indicator rides along the seal-chamber cover face for 360°. If the total indicator reading is greater than 0.005 in. (0.13 mm), determine the cause and correct it.	
	<b>Relieved value – Runout:</b>	
	<b>Gauge Number:</b>	

	<b>Assembly stuffing box and check the seal-chamber cover face runout:</b> Repeat relief onto the front plate of stuffing box	
	<b>Relieved value – Runout:</b>	
	<b>Gauge Number:</b>	

	<b>Check the seal-chamber cover lock runout:</b> 1 - Mount the dial indicator on the shaft. 2 - Rotate the shaft so that the indicator rides along the seal-chamber cover lock for 360°. If the total indicator reading is greater than 0.005 in. (0.13 mm), determine the cause and correct it.	
	<b>Relieved value – Runout:</b>	
	<b>Gauge Number:</b>	

	<b>Check the seal-chamber cover wear-ring runout:</b> 1 - Mount the dial indicator on the shaft. 2 - Rotate the shaft so that the indicator rides on the seal-chamber cover wear-ring surface for 360°. If the total indicator reading exceeds 0.006 in. (0.15 mm), determine the cause and correct it.	
	<b>Relieved value – Runout:</b>	
	<b>Gauge Number:</b>	





#### Check the seal-chamber face runout:

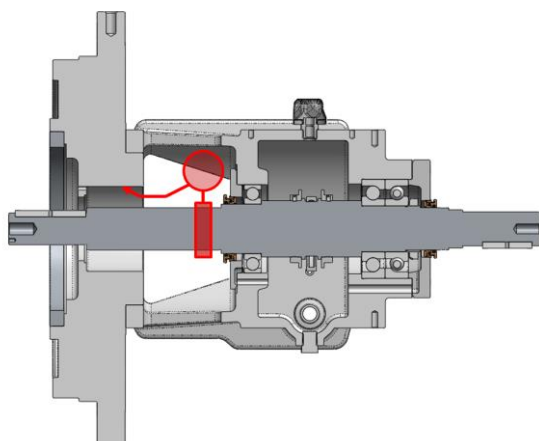
- 1 - Mount a dial indicator on the shaft.
- 2 - Rotate the shaft so that the indicator rides along the seal-chamber face for 360°. If the total indicator reading is greater than the values shown in this table, determine the cause and correct it.

Group	Maximum Allowable Total
Range 2 <sup>nd</sup>	0.002 in. (0.05 mm)
Range 3 <sup>d</sup>	0.0026 in. (0.065 mm)
Range 4 <sup>th</sup>	0.0031 in. (0.08 mm)

Note: onto Range 1<sup>st</sup> it's not possible to perform this check.

**Relieved  
value –  
Runout:**

**Gauge  
Number:**



#### Check the seal-chamber lock (register) runout:

- a) Mount a dial indicator on the shaft or shaft sleeve.
- b) Rotate the shaft so that the indicator rides along the seal-chamber lock (register) for 360°. If the total indicator reading is greater than 0.005 in. (0.125 mm), determine the cause and correct it.

Note: onto Range 1<sup>st</sup> it's not possible to perform this check.

**Relieved  
value –  
Runout:**

**Gauge  
Number:**



## **Re-assembly of the pump**

To reassemble the pump, follow the disassembly instructions in the reverse order applying the controls reported in the preassembly inspection instruction.

### **WARNING**



Lifting and handling heavy equipment poses a crush hazard. Use caution during lifting and handling and wear appropriate Personal Protective Equipment (PPE, such as steel-toed shoes, gloves, etc.) at all times. Seek assistance if necessary.

### **CAUTION**



- Risk of physical injury from hot bearings. Wear insulated gloves when using a bearing heater.
- This pump uses bearings mounted back-to-back. Make sure orientation of the bearings is correct.

### **NOTICE**

- There are several methods you can use to install bearings. The recommended method is to use an induction heater that heats and demagnetizes the bearings.
- Heat the new impeller wear rings to 180 ° to 200 ° F (82 ° to 93 ° C) using a uniform method for heating, such as an oven or induction heater, and place them on the impeller wear-ring seats
- Make sure that all parts and threads are clean and that you have followed all directions under the Preassembly inspections section.
- Check for magnetism on the pump shaft and demagnetize the shaft if there is any detectable magnetism. Magnetism attracts ferritic objects to the impeller, seal, and bearings which can result in excessive heat generation, sparks, and premature failure.
- During the assembly of the parts the screws, nuts and bolts must be tightened with the correct **tightening** torques described in the corresponding disassembly phases.
- Before to start the disassembly procedure, make sure you have locked the mechanical seal with the appropriate clips.

## **Bearing-frame inspection**

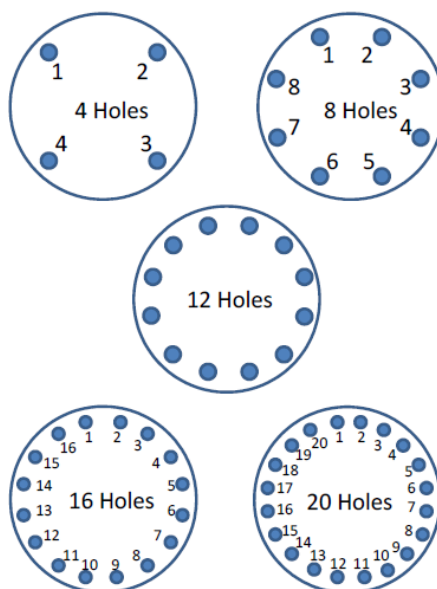
Check the bearing frame for these conditions:

- Visually inspect the bearing frame and frame foot for cracks.
- Check the inside surfaces of the frame for rust, scale, or debris. Remove all loose and foreign material.
- Make sure that all lubrication passages are clear.
- Inspect the inboard-bearing bores. If any bores are outside the measurements in the Bearing fits and tolerances table, replace the bearing frame.

## Flanged connection: indications for correct tightening

### Tightening sequence

Carry out the correct tightening sequence of the flange connection, as shown in the table and following the below phases list. Bolts are tightened crosswise.



### Bolt tightening phases:

- **Step 1:** Tighten all nuts manually (a larger wrench may be required for larger bolts)
- **Step 2:** Tighten each nut to approximately 30% of its maximum torque.
- **Step 3:** Tighten the nuts to about 60% of the maximum relative torque.
- **Phase 4:** Tighten each nut to maximum torque, using the "cross" tightening scheme (large diameter flanges may require additional tightening operations).
- **Phase 5:** Retighten each nut clockwise at least once, until the maximum torque uniformity is reached. (Large diameter flanges may require additional tightening operations).

### Bolt re-tightening:

#### WARNING



For pump to plant flanged joint's gaskets, consult the manufacturer of the gaskets for suggestions and indications regarding re-tightening.  
Unless otherwise specified, and for the internal pump gaskets, never retighten gaskets based on elastomer and asbestos-free after subjecting them to high temperatures.  
Retighten the bolts exposed to severe thermal cycles.  
All re-tightening should be carried out at room temperature and atmospheric pressure.

### Post-assembly checks

Perform checks for proper operations (reported at in APPENDIX B) after you assemble the pump.

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## 22. DECOMMISSIONING, SCRAPPING AND DISPOSAL OF MATERIALS

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### **Decommissioning**

In case of long downtime periods it is advisable to apply a few simple precautions in order to preserve the pump correctly.

Operate the pump with clean water (or other appropriate solvent compatible with the pump materials) for several minutes, in order to avoid the risk of internal precipitation or fouling.

Disassemble power/water supply systems and place the pump in a covered place, protected from weathering.

When starting-up after a long downtime period, strictly apply all indications for the commissioning described at the beginning of this manual.

### **WARNING**



A good storage will save you from unpleasant drawbacks during re-commissioning. *M PUMPS* disclaims any liability for machines stored incorrectly. If you intend not to use this pump any more, it is recommended to make it inoperative.

### **Scrapping and disposal**

The user must fulfil the law on environment protection and will have to deal with the disposal of materials and harmful substances of the pump.

It is also recommended to destroy the identification nameplates and any other document.

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## 23. EXPLODED DRAWING OF THE PUMP - LIST OF COMPONENTS

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***Refer to accompanying documents.***



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## 24. Notes

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## 25. APPENDIX A - Register of maintenance and periodic checks of the pump


It contains a list of maintenance to be performed and the respective frequency, below is a table where you have to record the operations carried out.

Date of **first commissioning** of the pump (first use): \_\_\_\_\_

Basic maintenance operations to be carried out from the second year of use on:			
No.	Check/Operation description Procedure	Warnings and protective measures to be taken to perform maintenance properly and safely	Time Range
1	Oil case	Top up the oil until the centre-line of the indicator cap.	Weekly.  Change the oil every 5000 working hours.
2	Internal supports	Check the state of bushings, jackets and releaser, replace if worn, re-assemble using new gaskets.	After 2500 working hours, check for premature wear, then every 5000 working hours or every year.
3	Wear of the ring, pressing elements and suction devices, star impellers.	Check the state of wear of the ring, of pressing and suction devices and of star impellers. Refer to the table of clearances.	After 2500 working hours, check for premature wear, then every 5000 working hours or every year.
4	Bearings of the electric motor	Unless other specifications, electric motor bearings are greased for life, so there a maintenance schedule is not required, in any case we recommend to check the condition of the bearings and replace them when worn.	

[illegible]

## APPENDIX B – Startup check list

	<b>PUMP SERIES CN SEAL-M API</b>	
	- Do not destroying – do not modify -	Rev. N°00
	<b>STARTUP CHECK LIST</b>	Date 21/02/2013 This document consists of 2 pages

Nr.	Description of activity	YES / ✓	NO / x
<b>*UPON ARRIVING CHECKS:</b>			
1	Check Pump Name Plate , Motor Name plate to tally with PO and Data Sheet		
2	Any Cracks or damages to Pump or motor during shipment or handling		
3	Check accessories if ordered to tally with PO		
4	Are Installation, Operation and Maintenance Manuals for Pump, Motor and Coupling supplied?		
5	Have you received the Pump Curve, GA Drawing, Pump Data Sheet, Motor Data Sheet and Wiring Diagram?		
6	Have you read through and understand the IOM manuals?		
<b>*INSTALLATION CHECKS:</b>			
1	Has the Pump's baseplate being properly level and firmly secured?		
2	Has the Pump and motor coupling being secured and aligned?		
3	Are Suction and Discharge Pipe line with Flexible Joints being Supported and Secured?		
4	Any undue Pipe loading onto Pump inlet/Outlet Nozzle due to Mis-alignment		
5	Is Suction Strainer being installed to protect the Pump?		
6	Are Suction and Discharge Pressure Gauge being installed before Pump's Inlet		



	and Outlet?		
7	Is there any Check Valve being installed at Pump's discharge Outlet?		
8	Has the Power supplied for Electrical Motor being connected by qualified electrical personnel?		
9	Have the Pump Bearings been filled with recommended Lubricating Oil and to the stated level (For Long Coupled Pump)?		
10	Have the motor Bearings been greased if required?		
<b>* PRE START-UP</b>			
1	For High /Low Temperature Pumping application , has the pump been warmed up to required Temperature?		
2	Can the Pump shaft turns freely by hand?		
3	Fully Open the Suction Valve.		
4	Partially Open the Discharge.		
5	Ensure Suction line is Filled and the Pump been Primed of entrained Air.		
6	Jog Start the motor, Verify that the direction of rotation is correct.		
<b>* AFTER START-UP</b>			
1	Start the pump set and be sure that the discharge pressure is building up( stop the pump if discharge pressure is not building up in short time and check the possible causes		
2	Throttle or Set Discharge Valve to designed Duty Point. (Pressure and Flow Rate)		
3	Reading of Suction Pressure ( ) Discharge Pressure ( ) and Flow Rate ( ).		
4	Are the Suction and Discharge Pressure Gauge Stable?		
5	Check Pump bearing and motor bearing temperatures are stabilized below 82 deg C.		

6	Amperage reading does not exceed nameplate full load amps plus S.F.		
7	Checked no abnormal temperature and leakage.		
8	Checked no abnormal pump vibration and noise.		
9	Under Normal Condition, continuously run the pump under observation for one or two hours.		

**COMMENTS/REMARKS:**


**INSTALLATION REFERENCE:**

PROJECT:		CONTACT:	
CONTRACTOR:			
ADDRESS:			
PHONE NO:		FAX:	
PUMP MODEL NO:		SERIAL NR:	
MOTOR TYPE:		IMPELLER DIAMETER:	
START-UP BY:		FOLLOW UP REQD:	
DATE:		SIGNATURE:	

***Please send this document, duly completed, to the e-mail:  
info@mpumps.it or by FAX at: +39 0426 349126***









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