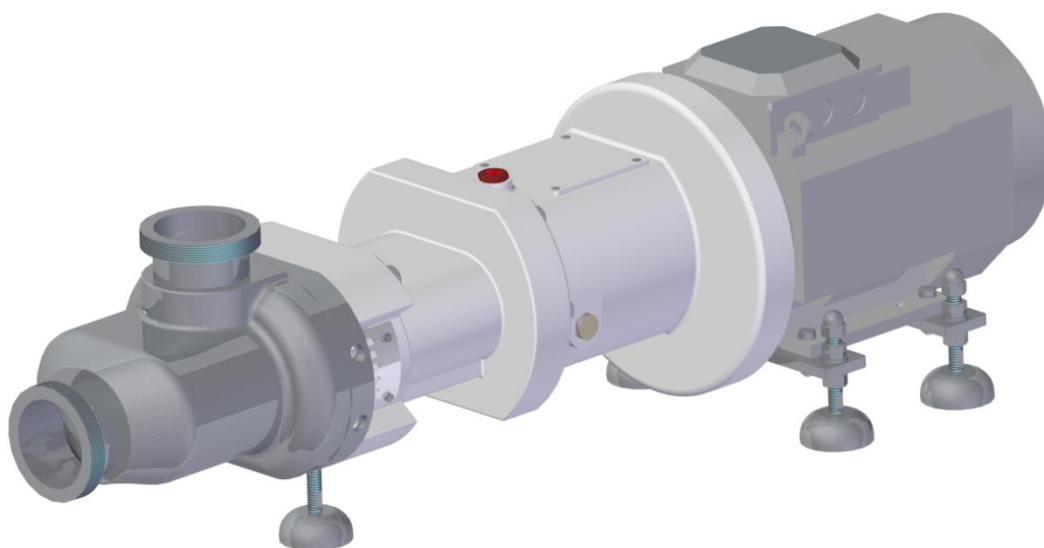


INSTALLATION, SERVICE AND MAINTENANCE INSTRUCTIONS

TWIN SCREW PUMP

DCS



EC Declaration of Conformity

We,

INOXPA, S.A.U.

Telers, 60
17820 – Banyoles (Girona)

Hereby declare under our sole responsibility that the machine

TWIN SCREW PUMP

Designation

DCS

Type

**DCS 1B2, DCS 1B3, DCS 2B2, DCS 2B3, DCS 3B2, DCS 3B3, DCS 4B2,
DCS 4B3**

From serial number **IXXXXXX** to **IXXXXXX** ⁽¹⁾ / **XXXXXXXXXXIIN** to **XXXXXXXXXXIIN** ⁽¹⁾

Fulfills all the relevant provisions of the following directive:

Machinery Directive 2006/42/CE

Applicable harmonized standards:

EN ISO 12100:2010

EN 809:1998+A1:2009/AC:2010

EN 60204-1:2006+A1:2009

In compliance with **Regulation (EC) n° 1935/2004** and **Regulation (EC) 2023/2006** on materials and articles intended to come into contact with food.

The technical file has been prepared by the signer of this document in INOXPA.

Signed by and on behalf of INOXPA S.A.U.



David Reyero Brunet
Technical Office Manager
Banyoles, 2nd September, 2021

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2. General Information

2.1. INSTRUCTIONS

These Operating and Maintenance instructions contain information from the pump manufacturer. They may need to be supplemented by instructions of the operator company for its personnel.

The instructions of this handbook do not consider the specific information concerning to operation and maintenance of the process plant into which the pump is integrated.

Such information can only be given by persons responsible for the construction and planning of the plant.

Some specific instructions concerning the operations or the installation maintenance where the pump is integrated have the priority on the pump builder instructions.

It is always necessary to refer also to the instructions concerning the installation builder operations and maintenance.

Carefully read the manual before attempting any changes. It is safe to follow all warnings and recommendations herein to perform any operation on the pump DCS SERIES.

This documentation must be kept and must be available to the operator and maintenance personnel.

For any situation of use that is not provided in this manual, please refer to the manufacturer.

2.2. WARNINGS

This handbook has been realized to establish a reference for

- The safe use
- The pumps installation and maintenance intervention
- Starting, laying and pumps switching-off procedures

and it has to be considered as an integrating pump part, and has to be paired off to this for the life necessary till its breaking down.

It is necessary to retain carefully this handbook that has to be available for the skilled staff in charge of the pump use and maintenance, which is responsible for the operations executed on it and, for this reason, it must be CAREFULLY read before operating.

It is expressly FORBIDDEN the use of the pump to the staff that has not the required qualifications.

The pump must be used exclusively for the specified situation contained on the confirmation for which INOXPA has arranged the execution, the construction materials and the running tests which make the pump perfectly equivalent to the requests.

For this reason, it CANNOT be used for situations different from the ones specified on the confirmation.

In case of working conditions change, it is necessary to keep in touch with INOXPA, which decline every kind of responsibility for uses different from those provided for by the contract.

If the pump constructive and working data are not available, they will be required to INOXPA defining the serial number pressed on the plate fixed on the pump. It has to be always used the pump serial number to require the technical information and/or to order replacement pieces.

Besides, the user has to verify the right environmental conditions (for example frost or high temperature) where the pump will be set and could condition its performances and/or seriously damage it.

2.3. SYMBOLS



HEALTH HAZARD

This sign advises the operator he has to pay attention to important info to avoid dangerous operations which can be to the prejudice of his and other persons' physical integrity. Follow carefully the indications.



DEVICES INTEGRITY HAZARD

This sign advises the operator he has to pay attention to important info to avoid dangerous operations which can be to the prejudice of his and other persons' physical integrity and of surrounding devices. Follow carefully the indications.



IMPORTANT TECHNICAL INFORMATION

This sign indicates technical information or conduct of particular importance should not be overlooked



IMPORTANT!

Keep this manual and all accompanying documents in a PLACE accessible and known to all users (operators and maintenance personnel). It is advisable to make a copy of this manual to be kept in a safe place.



It is expressly forbidden to use the pump for staff lacking the required qualifications.

The pump must be used only for the intended conditions of use in the specific purchase for which INOXPA ordered the execution, selected construction materials and performed the operation tests that make the pump snugly against the claims.

For this reason, the pump cannot be used in situations other than those indicated in the listing.

In the case where the operating conditions specified on the order could be changed (for example, operating fluid pumped, temperature or use), it is necessary to contact INOXPA to receive an eventually written consent.

INOXPA declines all responsibility for uses other than those specified in the contract.

2.4. WARRANTY

The conditions of the warranty are specified in the General Sales Condition that has been delivered at the time of placing your order



The machinery may not undergo any modification without prior approval from the manufacturer.

For your safety, only use original spare parts and accessories.

The usage of other parts will relieve the manufacturer of any liability.

Changing the service conditions can only be carried out with prior written authorization from INOXPA.

The non-compliance of the prescribed indications in this manual means misuse of this gear on the technical side and the personal safety and this, exempt INOXPA of all responsibility in case of accidents and personal injuries and/or property damage. Also, excluded from the warranty all breakdowns caused by improper use of the gear.

Please do not hesitate to contact us in case of doubts or if further explanations are required regarding specific data (adjustments, assembly, disassembly, etc.)

2.5. PUMP NAMEPLATE

Below is shown the nameplate fixed on the pump:

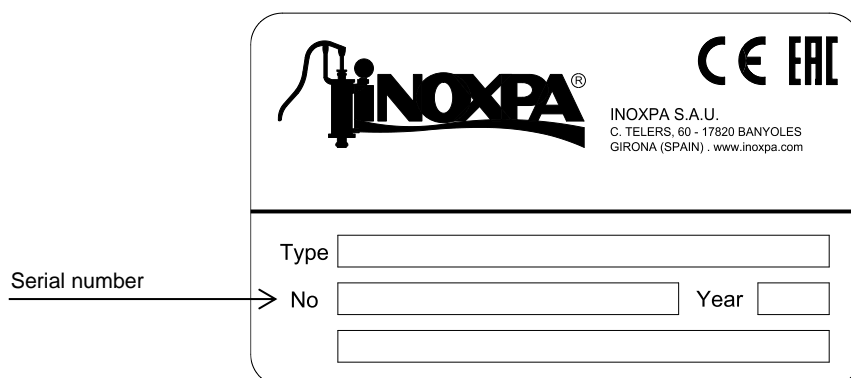


Fig. 1 – Example of pump nameplate

2.6. TYPE OF PUMP

The types of pumps supplied can be the following:

- Bare shaft pump, supplied without motor or baseplate:

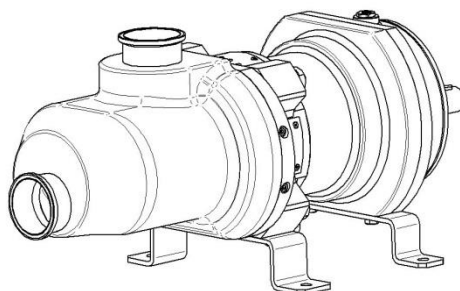


Fig. 2 – Bare-shaft pump

- Pump on baseplate, pump assembled with drive motor, coupling and coupling guard:

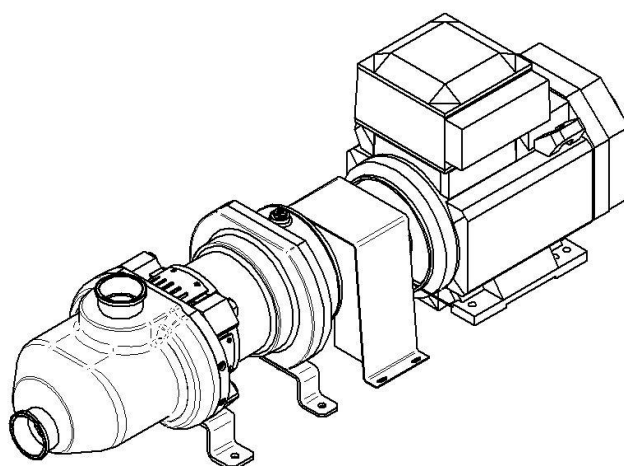


Fig. 3 – Pump on baseplate

- Pump with flange connection. This pump version has got the drive unit flange-mounted directly to the gear casing and the levelling feet to place the pump at the required height:

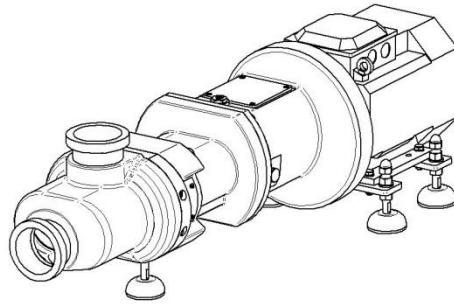


Fig. 4 – Pump flange mounted

The types of pump correspond to the scope specified in the order of the pump. When the pump is received, ensure that it is complete, check on the packing the lack of damages due to the transport and report immediately any defect or damage to the delivery company.

3. Design

3.1. PUMP DESIGN

Below is shown an example of the structure of the pump.

For the scale drawing please refer to the dimensional drawing.

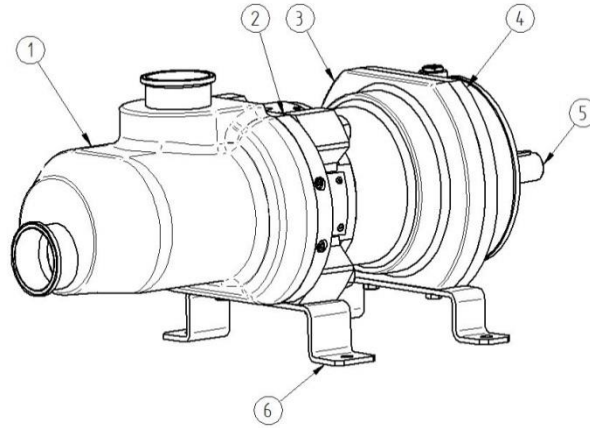


Fig. 5 – Indication of the main components of the pump (example)

These are the main parts:

1. pump casing
2. stuffing box
3. bearing casing
4. gearbox
5. driveshaft
6. legs

With flange connection-type pumps the drive shaft is not visible and the drive unit is flange-mounted directly to the gear casing.

The direction of flow, in certain cases, can be reversed, so it is possible to reverse the suction flange with the discharge flange.

3.2. PUMP ON BASE PLATE

The pump may be provided with a base plate, these are the main parts:

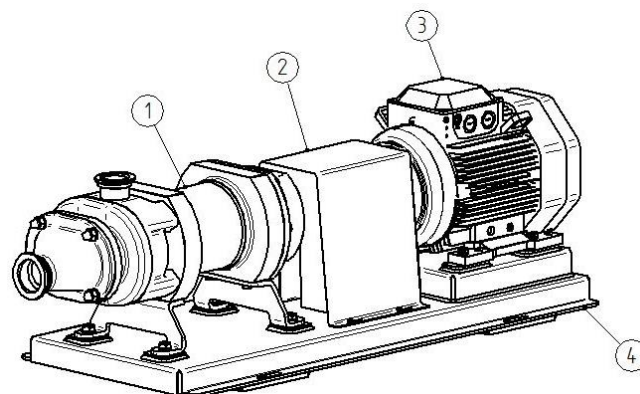


Fig. 6 –Indication of the main components of the pump with base plate (example)

These are the main parts:

1. Pump
2. Coupling and coupling guard
3. Drive unit
4. Baseplate

3.3. PUMP OPERATIONS

DCS pumps are volumetric devices fitted with two screws without contact between rotating parts. The synchronism between the rotors is ensured by a timing gear located outside the bearing casing.

The medium goes into the pump casing from the suction body and it is inspired by the screws and pushed toward the discharge casing. The area of the pump in contact with the fluid is separated from the outside by 2 mechanical seals.

The mechanical seals can be:

- Single mechanical seal
- Single mechanical seal with flushing
- Double mechanical seal

4. Safety



Do not use the DCS pumps outside the prescribed limits contractually without the express consent of the INOXPA.

The unauthorized use outside of the pressure and temperature limits may cause the deterioration of the seals, the binding and the explosion of the pump. Products with a viscosity higher than those prescribed by the contract can cause overheating of the pump.



The pump is designed to be inserted in locations classified as reported in its CE certificate of conformity issued by the manufacturer.

It is absolutely forbidden the installation of the equipment in hazardous areas with a greater degree of danger posed by the requirements of certification.

4.1. GENERAL INFORMATION



In this chapter all the precautions that have to be carefully respected to avoid serious damages to persons and/or to the pump are listed:

- damages to the installation vital parts
- damages to the persons due to electrical, mechanical and chemical danger

The security regulations contained in other chapters should have been observed in addition to those listed on this page:

- Follow ALWAYS the regulations and the use provided for the pump confirmation.
- The pump engine electrical connections must ALWAYS be executed by the authorized and skilled staff following the current regulations.
- The intervention on the pump must ALWAYS be executed by 2 persons at least.
- Get near the pump ALWAYS with the right wears (to avoid wide sleeve wears, ties, necklaces, etc.) and/or with protection equipment (helmet, glasses, gloves, shoes for the prevention of industrial accidents, etc.) suitable for the operation to do.
- Disconnect ALWAYS the engine from the feeding installation, for example, taking away voltage to the line, when it is necessary to interfere with it.
- The pump must ALWAYS be stopped before touching it for every reason.
- The pump has NEVER to be warm when somebody is working on it.
- Reset ALWAYS the security regulations, that sometimes are kept away to intervene on the pump.
- Do NEVER touch the pump and/or the piping connected to it when there is warm fluid transport at more than 80°C.
- Be ALWAYS careful in touching a transporting pump or a pump that has transported toxic liquids and/or acids and/or dangerous substances.
- Arrange ALWAYS the fire-fighting equipment near the pump.
- NEVER use the pump in a sense as opposed to the expected and rotation sense and it is showed on the pump.
- Do NEVER introduce hands or fingers into the holes and/or into the pump group openings.
- Do NEVER get on the pump and/or the piping connected to it.
- The pump and the piping connected to it do MUST NOT be with pressure when it is necessary to intervene on it.
- Maintain ALWAYS the surface of the pump clean by the dust and/or by greases to remove every possibility of self-supporting combustions due to the surfaces overheating.
- Observe ALWAYS the regulations imposed by the local specifications.
- Avoid dry running, ensure that the pump always works with the product fluid.
- Avoid cavitation, ensure that the inlet side valve and outlet side valve are fully opened during pump operation. Do not use the inlet side-valve for regulating pump capacity.
- Respect the operational limits of the pump about temperature, pressure, viscosity, pump capacity and speed.

Besides, in the pump some components can cause some dangers to the persons who keep in touch with it even during the normal maintenance and/or use procedures:

Component	Use	Correlate dangers
Oil and/or grease	The bearing casing lubrication	Skin and eyes inflammation
Plastic and elastomer components	O-ring, V-ring	Smoke release in case of overheating
Aramid fiber	V-ring	Emissions of dust, smokes released when overheating
Pump	*	Noise-exposure

Tab.1 - Hazard of common components

4.2. MECHANICAL RISKS



During the assembled machine movement operations (installation and put out duty) or some parts of it (maintenance phase and put out duty) there are remaining risks typical of the lifting and transport machine: crush for the use of lifting and transport means, crush for the load fall or the transport means, impact, entraping, lag, entangling.

To restrict the risk, the buyer can ask the handling be done by a skilled staff, suitably informed about the risks concerning the load movement according to the current regulations.

The operators must respect these handbook dispositions.

Do not do handlings different from the expected ones.

4.3. MANUAL OPERATION RISKS



There is a general mechanic risk due to the manual operations with the tools used during the installation, the maintenance and the put out duty, the drilling and the screw-cutting operations, the operations for the alignment test. To limit the risk, the buyer can ask the handling be done by a skilled staff, suitably informed about the type of the treated activities, with the right tools and specific Individual Protection Dispositive that they require.

The operator, before starting every kind of maintenance or cleaning operation, has to disconnect the electrical feeding. If this operation has not been done, there is a risk connected to the casual engines start during the phases in which the machine protections are temporarily removed.

4.4. ELECTRICAL RISKS



If the machine has got the total electrical engine already mechanically installed, while the electrical part (feeding and electrical display) is due to the buyer. It is enclosed the Conformity Declaration furnished by the engine Constructor.

There is direct contact remaining risk with tension elements, or indirect contact with elements put in tension because of damages. These risks cannot be directly ascribed to the machine. At any rate, it reminds the following general rules:

- The electrical display must be realized in conformity with the current regulations dispositions, all the electrical net connections must be done by an authorized installer. The installer has to assure the derivation suitability from the electrical net and then doing all the connection respecting the current regulations.

- After any kind of impact on the machine from the movement means or the moved material, even if with light intensity, it is necessary to open the electrical isolator and then go on with an electrical isolation test before restarting the machine.
- Make all the maintenance operations only after having disconnected the electrical feeding. All the maintenance operations on the electrical installation must be done by the authorized staff.
- The operator, before starting every maintenance operation, has to disconnect the electrical feeding. If this operation has not been made, there is a risk connected to a casual engine starting during the phases in which the machine protections are temporarily removed.

4.5. THERMAL RISKS



Some parts of the circuit and the engine, during the working, can have temperatures higher than 80°C. These parts are marked with suitable signalling.

Do not touch these parts during the work.

Make any intervention on these components only after the machine has been cooled, at least, 30 minutes.

Foresee always the suitable protective means, such as delimiter barriers or others.

4.6. CHEMICAL RISKS



Observe the safety dispositions relative to the fire risk contained in the current regulations.

During the maintenance operations, restarting after maintenance or put out duty stop, the operator may come into contact with the pumped fluid, with lubricant substances used in the machine or with products used for the cleaning.

In this case, it is necessary to follow the warnings and the instructions shown by the Constructor and the Supplier of the product.

In case of contact with substances, refer to the Safety Cards. At any rate, it is suggested the gloves use.

4.7. DANGEROUS AREAS



The pump is not self-operating equipment. When connected to a driving motor a full risk assessment of the motor pump unit should be carried out by the unit manufacturer and/or by the user.

The dangerous pump's areas may be the following:

- Close to the shaft catching.
- Under pressure devices.
- Hazardous or toxic liquids, to evaluate, to be evaluated after the installation
- Close to the pump: noise pressure level to be measured and evaluated after the installation.
- Risk of electrocution when next to electric panels (if they are in use).

There may be additional risks.

5. Carriage, lifting and Storage

5.1. CARRIAGE AND PACKAGING

When the pump arrives at the installation where it is destined, it is always suitable to verify the right correspondence between the transport papers and the supply really received.

During the pump disassembly operations, it is necessary to follow these instructions:

- Check on the packing the lack of damages due to the transport
- Remove with care the pump packing.
- Check that on the pump and the equipment provided with it there is a lack of visible damages.

If there are damages to the pump and the equipment provided with it, contact immediately INOXPA to verify the pump function.

So, provide immediately to the packing elements waste disposal which can be dangerous, (such as rivets, splinters etc.) and to the materials checked and differentiated waste disposal in according to the locally applicable regulations.



Before the pump transport, which has been already disassembled on the arranged installation base, check the dimensional drawings where there are the weight and overall dimension data.

So, transport **ALWAYS** the pump (or the group pump-base-engine) in a horizontal position on the arranged installation base.

5.2. LIFTING

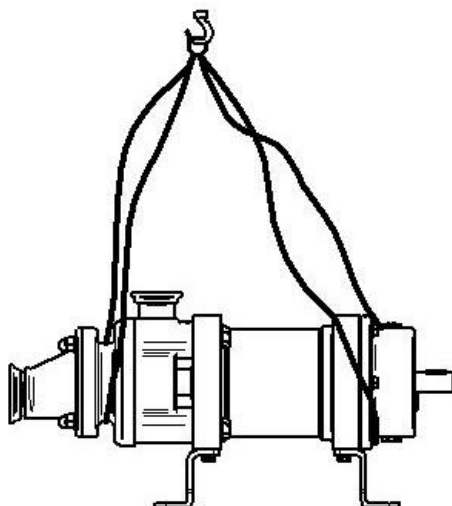


Fig. 7 – Fixing the lifting ropes for pump without baseplate

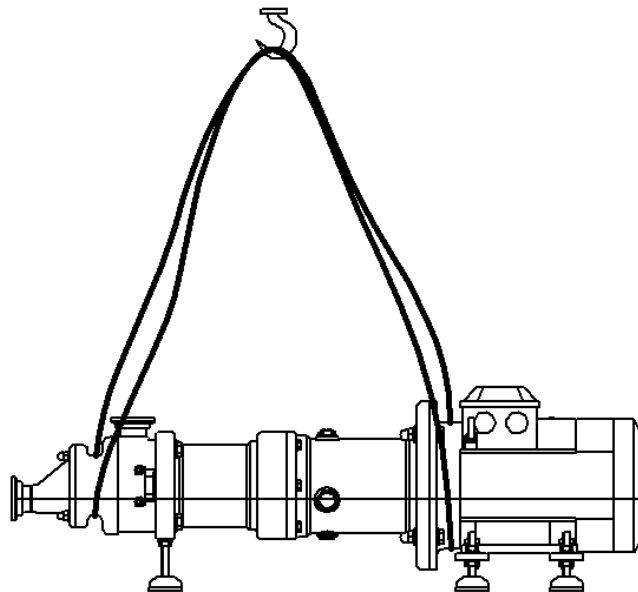
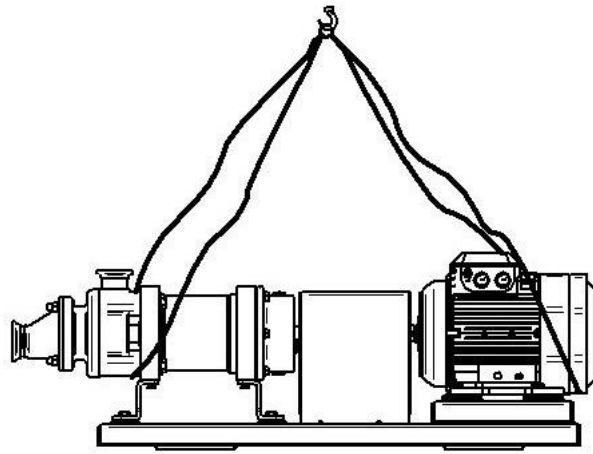


Fig. 8 – Fixing the lifting ropes for pump with base plate

Always avoid that the ropes do not damage the pump or the engine. Select the lifting equipment properly to the total weight. Lift the pump properly.

It has forbidden the movement of the pump or parts of it other than as described above.



The pump transport has to be effected by skilled and experienced staff, informed about the risks connected to the movement operations following the current laws.



Make sure that the lifting and carrying of the unit is p with proper equipment to support its weight. Before performing the movement, verify that the path forward is clear of obstacles and size are suitable for the passage the group. Check the stability of the load. Avoid that the ropes or slings used for lifting of the group form a triangle with the angle at the lower vertex at 90°.



IT IS FORBIDDEN every pump's movement or move some parts of its difference from what above described.

5.3. STORAGE

For (a period of) temporary storage the pump must not be exposed to the weather for any significant period of time. All openings shall be closed with plastic covers.

For (a period of) long storage replace the pump in a closed, cleaned, dry place that is not exposed to solar rays and vibration-free. Avoid that the temperature goes down below 5°C (in this case, it is necessary to drain entirely the pump from every kind of liquid that is not antifreeze). Close every hole and/or communicating opening with the interior pump.

Lubricate all visible, internal and external uncoated metal parts and all flange connections with an acid-free and resin-free grease compatible with the packing set up on the pump.

Protect all internal cavities of the pump. Protect the working area with rust prevention products. Cover the pump with an impermeable sheet. Fill up entirely the bearing boxes and the gearboxes with lubricant oil. Rotate the pump shaft, at least, every month, and then let do one turning to the pump. Periodically, check the liquid level in the pump and the mountings.

6. Installation and connection



The pump installation on site is a very important operation and it has to be carefully attended because the good working depends on it.

Proceed to the group installation only after all the regulations imposed by the local institution have been verified (for example safety, pollution laws etc.).



The installation and maintenance of the equipment should be performed by qualified and authorized personnel. The place of installation must be designed according to the laws and directives for systems installed in potentially explosive atmospheres.



Do not install the pump directly direct exposure to sunlight or inclement weather. Do not install the pump in places without ventilation.

Ensure the equipotentiality of the pump grounded a link to a suitable ground reference using electrical conductors with an appropriate section. Do not exceed the number of revolutions and the pressure values for which the pump has been sold. Install a suitable suction filter to prevent ingress of dirt or harmful materials for the pump. The filter should have a filtering area at least 4 times the area of the front flange of the pump.

Predict the damper on the piping and/or upstream flexible joints and downstream of the pump to reduce the system noise and the effects of the water hammer.

6.1. GENERAL RULES FOR INSTALLATION

Do not remove the protection caps mounted to the suction and discharge flanges, and the closing caps installed on all auxiliary connections before they are connected to the piping, all this is to protect the pump from the access of foreign bodies. Before performing the connection of discharge and suction flanges, it is always necessary to verify that these are perfectly clean and therefore without any kind of dirt, such as welding residues, sand, foreign bodies, etc. Always protect the pump using a suction filter, which shall be selected based on the viscosity of the fluid to be pumped, placed on the suction circuit. The pressure loss across the filter should not reach the unallowable limit of the suction pressure, which shall remain within the limits provided by the supplier or the pump datasheet. If the pump is intended for pumping liquids with a temperature above 80 °C, some of its surfaces could reach a higher temperature value during operation. In this case, it is always advisable to provide suitable security tools, such as barriers or others. The positioning must be performed carefully on foundations, trying to prevent crushing and using adequate tools for the lifting. Install the pump group in a place accessible from all sides, clean and able to ensure a horizontal installation of the pump by providing a free area of 1500 mm around the pump. Provide adequate ventilation of the group, avoiding placement in narrow, dusty and poorly ventilated areas.

6.2. PUMP GROUP INSTALLATION

6.2.1. Preparing the location

The pump group positioning shall be carefully performed on the foundations, trying to avoid crushes and using adequate tools for the lifting.

Set up the pump group in a place accessible from each side, cleaned and able to provide a right and a viable installation, foreseeing an adequate area around the pump.

Guarantee an adequate ventilation group avoiding narrow, dusty and poorly ventilated places.

If the pump is supplied without a base plate, provide a base plate that avoids torsional deformations and vibrations during operation, provide height compensation for the drive, check the direction of rotation of the motor.

Make sure that the pump is freely accessible from all sides and there is sufficient space for piping installation and maintenance operations.

6.2.2. Fixing baseplate on foundation

It is possible to mount the pump group on a concrete foundation, only if the pump is mounted on a base plate.

The foundations must be projected and realized to take over both the engine-pump vibrations and sustain the pump weight, the auxiliary machines, the engine and the metallic base to prevent vibrations and bad alignments during the operation, making sure a correct alignment of the pump group.

The foundations bolts shall be set as showed on the construction and installation drawing.

Ensure that every preparation work necessary for the group start, such as concrete structures, will be completed before the pump group installation and start-up.

After placing the pump unit on the foundation, align the pump group in accordance with the information provided by INOXPA.

6.2.3. Assembly pump without foundation

It is possible to mount the pump group on flat and horizontal surfaces without foundation, by using levelling feet.

For the correct positioning of the pump follow the instructions below:

1. Lift the pump group
2. Install the levelling feet as shown in Fig. 9

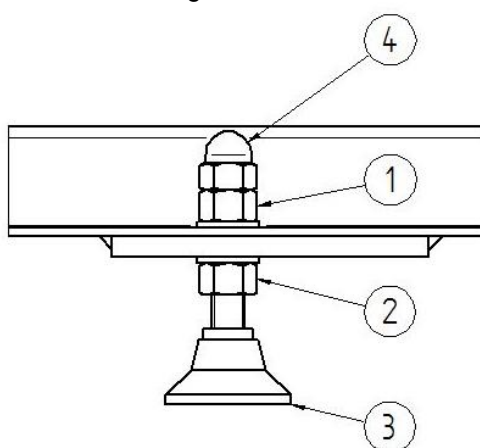


Fig. 9 – Mounting without foundation (schematic diagram)

3. Place the pump group on a plane surface
4. Use the levelling feet to adjust the height as indicated as follow:
 - Hold the nut (2) with a spanner and loosen the other nut (1)
 - Adjust the height by turning the nut (2), then tighten the nut (1)
 - Make sure that the height deviation of the baseplate does not exceed 0,33%
 - Tighten the blind nut (4) on the top of the levelling feet



NOTE: Adjust the height considering that, for this kind of baseplate, the main standards in the food industry require a 100 mm minimum clearance between the lowest part of the base plate and the floor.

6.3. PUMP GROUP ALIGNING

6.3.1. Pump aligning

If the pump group includes coupling and driver, the whole group will be carefully aligned by the supplier before the shipping.

The group alignment is fundamental for the good working of it.

Noises, shaft bending, vibrations, increased clearance for bearings and shaft seal rings, packing of mechanical seals, engine seizing-up, can be the result of a faulty alignment.

Besides, the temperature can remarkably influence the group alignment and the pump, the engine expansion must be considered during the alignment.

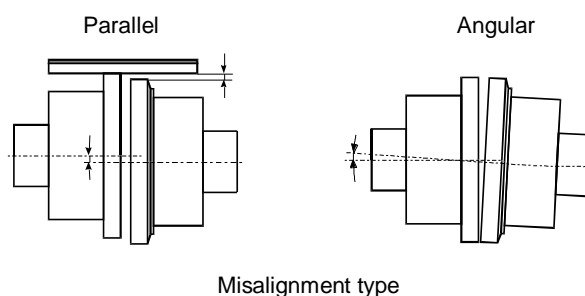


Fig. 10 – Possible types of misalignment

If the working temperature is high (up to 100°C) it is necessary to verify the alignment in all pump operation modes, in both cold and hot conditions, or to avoid shaft and coupling expansion, by increasing the distance among the semi-couplings.

Check always the alignment before the pump start-up, to verify possible variations due to casual reasons that happened during the transport and the installation.

Check always the stopped pump after having activated all safety devices and procedures to avoid the casual starting.



During the alignment operations, it is always necessary to use protection for hands, such as gloves, etc.

If the temperature is high, pay attention to use suitable devices for your protection.

For every operation use always the correct tools and equipment or other.

The pump is aligned with the aid of a spirit level at the driveshaft and the connecting piece of the intermediate flange.

Perform the alignment procedures after mounting the 2 coupling halves on motor and pump shafts.



During the alignment operations, wear suitable protections (in particular for the hands). Pay more attention in case of high temperature. Perform any work in the presence of at least 2 people. For any operation, use appropriate size engines ONLY. In case of doubt, contact INOXPA before performing any operation.



Always check the pump when it stops, making sure that the safety procedures to avoid accidental starting have been activated. During the alignment, the operation is always necessary to use hand protection such as gloves, etc.



If the surface temperature is high, use protective equipment suitable for each operation, always use appropriate handling systems, such as tackles or other. The pump must be aligned with the aid of a spirit level positioned on the motor shaft and on the flanges. Perform the alignment procedure after assembling the two semi-couplings on the motor and the pump.

6.3.2. Pump alignment tolerances

For axial, radial and angular misalignment values, always refer to the data manufacturer of the joint.

6.3.3. Coupling alignment procedure

Here below the procedure for correct alignment of the pump group:

- Stop the pump and remove the coupling guard.
- Remove the protective devices (if present) of the coupling and clean them carefully.
- Disconnect the flexible elements of the coupling.
- Check the bad alignment, both angular and parallel.
- Correct the driver position (or the pump position) including some depths or settling their position.
- Repeat the control operation concerning the alignment until the noticed measures are part of the tolerances foreseen by the constructor. (Allowable values misalignment table).

- Block firmly the fastening bolts of the pump at the base.
- Set out, bore and cut screws the engine plate bearing for the fastening bolts.
- Tighten the engine fastening bolts and secure them firmly to the base.
- Check again the alignment and execute the final regulations according to the necessities.
- Reassemble the joint protection.

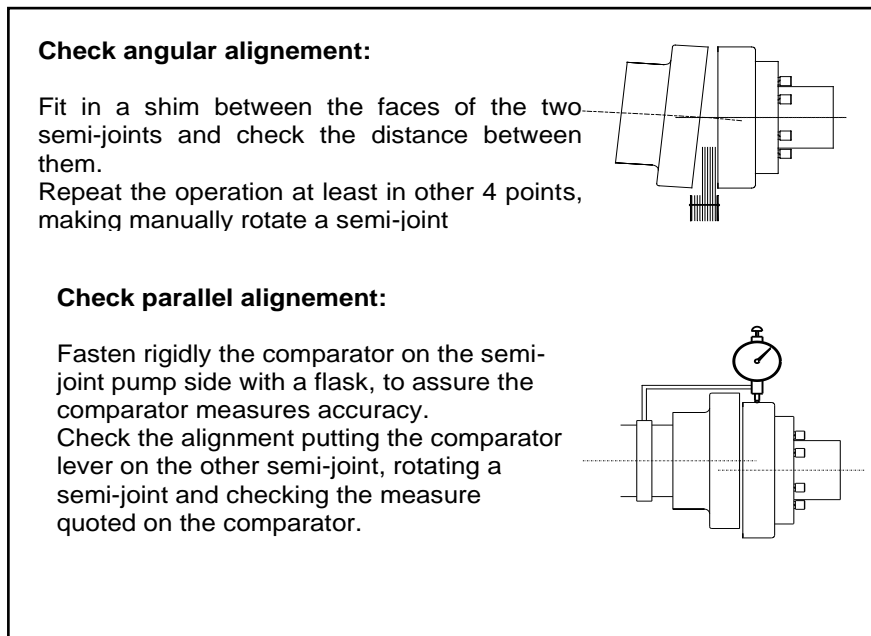


Fig.14 – Checks misalignment



Connect two semi-couplings through elastic elements or the spacer only after having fastened the suction/discharge piping and having checked that the pump freely turns acting manually on the pump shaft.

6.3.4. Motor alignment

Align the motor in such a way that the coupling is correctly mounted, if necessary, use shims plates.
Check alignment carefully.
Tight the motor screws to fix the motor to the baseplate.

6.3.5. Coupling guard mounting

Lift and position the coupling guard.
Make sure it is at the right distance between the motor and the pump.
Tight the screws to fix the coupling guard to the baseplate.

6.4. PIPING CONNECTION

6.4.1. General information

All the piping must be set on their own mounting, independent from the pump, to sustain its own weight, the accessories weight with the isolation, the transported fluid weight and all the forces and the moments due to the thermic expansions.

It is necessary to install devices that avoid the transmission of forces or moments from the piping to pump flanges. These forces could compromise the alignment and then cause vibrations and vibrations.

Possible thermic shock and/or over vibrations should have been prevented using, for example, some expansion joints.

The coupling between the different piping has to be executed through flanges interposing a gasket made of the suitable material, verifying that these are well centred between the tightening bolts so they do not cause flux resistances or remaining tensions.

The rated diameter of the suction and delivery piping not necessarily has to correspond to the pump flanges. But this diameter does not have to be smaller than the rated diameter of the suction/delivery pump.

With higher speed there will be higher pressure losses that could cause the cavitation to arise, pressure over fall; in this way, the pump good working is compromised.

If the pump has to work with low values NPSHA (Net Pressure Suction Head Available) or in depression, the aspiration piping and the whole aspiration system must be well sized and studied. It is unimaginable that the pump can pass the system project lacks, such as the long piping and aspiration ways, maybe undersized and containing many curves, valves and first of all the aspiration piping has not to have bags or high points where the gas can tin.

Besides, this kind of machine, for its own peculiar working characteristics, has internal very strict clearances, and then every slag can cause serious damages to the pump. Examine carefully the piping to assure that there aren't foreign bodies or encrustation and clean with care before connecting the piping.

Avoid, when it is possible, the curves use and in particular the ones with a short radius, and the connection of different diameter piping with a reduction to tapered invitation and the eccentric type, and if possible with a connection way long about 10 times the diameter differences.

Check again the alignment after having blocked the piping to the pump before connecting the coupling to the motor.

A correct suction and discharge piping connection are necessary to avoid the bad alignment and the following bearing overheating and the wear of the rotary parts.

The faces of the pump and the piping flanges must be parallel and bolted without interferences.

Do not use levers to force the bolt holes alignment.



WARNING: Check again the alignment after having blocked the piping to the pump before connecting the joint to the motor.



After mounting the pump on the base and after connecting all the piping to the pump, check that the pump shaft rotates freely without being connected to the elastic elements, the pump must be able to rotate freely. The mechanical resistance to be overcome is mostly due to the friction between the contact surfaces to the mechanical seal. Re-check the alignment after mounting the piping to the pump before connecting the coupling to the engine. A proper connection of the suction and discharge pipes is necessary to prevent misalignment and overheating of bearings and rotating parts. The pump flanges and the flanges of the connecting piping must be parallel and coupled with no residual stresses. Do not use levers to force the alignment of the bolt holes. Do not weld the connecting pipes to the pump.

6.4.2. Suction piping

Install the suction piping to avoid some airbags, that can cause vibrations and bad pump working.

This piping should have a rising size in case of low suction or descending in case of suction. from a tank.

The suction valve (if present) set on the aspiration line has to be used only for interception function and NOT for regulation one.

Install, where it is necessary, a check valve to prevent the suction collector be emptying during the stop.

In case of more pumps installation, every pump must have its own suction piping connected to the main collector.

6.4.3. Discharge piping

At the discharge pipe is necessary to install a safety valve and a shutoff valve.

The safety valve (pressure relief valve) must be mounted downstream of the discharge flange and as close as possible to the pump, so that its operation is not affected or compromised by other devices interposed between the pump and the valve (filters, bottlenecks, valves, etc.).

The safety valve of the pipe must be fitted with a suitable exhaust manifold, connected with the power source, to avoid recirculation of the fluid and the consequent excessive overheating of the pump.

In case of frequent switching, it is recommended to install a check valve just downstream of the discharge flange. In this way is possible to prevent, when the engine is stopped, the fluid within the shafts flows back, putting screws in motion and causing it to break.

In case the flow rate regulation is required, do not intervene on the valve placed on the flow pipe in that, because for a volumetric machine, this could cause an overpressure that can damage the pump.

If flow rate adjusting is needed, use the motor speed regulation.

6.4.4. Auxiliary piping

The auxiliary piping can include those for a breather, drainage, seal flange washing, seal circulation oil, seal flushing, bearing mounting cooling, etc.

If the piping is furnished by INOXPA, refer to the attached installation drawing. When the auxiliary piping has to be installed by the Customer, dimensions and all connection positions will be shown on the installation drawing.

6.5. ELECTRICAL CONNECTION

The electrical connections must be done only by qualified staff who should follow the engine constructor instructions, the electrical machines and the provided current regulations.

Verify the constructor specifications contained in the instruction journal enclosed in this handbook or furnished with the engine.

WARNING

Every action must be always executed without electrical voltage.

It is recommended to protect the engine against overload with suitable switches and/or fuse wires. Choose their protection degree verifying the full load current stamped on the engine plate. Besides, it is suggested to install an emergency pushbutton.

Do the right electrical connections without neglecting the engine grounding.

Before doing the electrical connections, verify that the pump and engine turn freely by hand.

Verify that the engine rotation direction agrees with the pump rotation direction stamped on it, if possible before it is connected to the pump.

Foresee the suitable protection means in case of the rotation test of the engine got away from the pump to avoid possible incidents.

The opposite and/or dry rotation can cause serious damages to the pump.



7. Pump Operation

7.1. PRELIMINARY OPERATION

Determine the type of the pump, the type of mechanical seals and the type of installation.

Before going on with the starting operations, verify that piping and pump are filled up with the fluid to pump and entirely emptied from possible airbags.

Verify that all the auxiliary services are available and ready to use and where it is necessary, properly started (such as, for example, the mechanicals seals flushing).

Check that the pump and the engine bearings and the gearboxes are properly lubricated and the levels reflect the ones indicated.

The possible filling must be done through suitable connections and using suitable lubricants.

If the pumped liquid temperature represents a danger, it is necessary to protect both the pump and the piping from the contact possibility, besides, it is necessary to avoid thermic shocks to the pump with suitable devices (such as insulation, pump body gradual preheat, etc.).

Check that the engine rotation agrees with the pump rotation direction as showed by the arrow set on the pump body.

Before starting the pump, check again the alignment and if necessary correct again as shown by the section "Installation and Connection" verifying that it turns freely by hand.



WARNING

The pump must not run in the absence of liquid for over a minute. Times longer than one minute may result in internal heat buildup of equipment that, in the presence of flammable liquids, can be extremely dangerous.

7.2. STARTING AFTER A LONG STORAGE

Before starting the pump, it must be entirely removed the anti-corrosive protection from the pump, using a solvent compatible both with the anti-corrosive product used with the pump constructive materials and, particularly, with the service to which the pump is destined.

Before starting the pump, check the condition of the elastomeric components such as O-rings, V-ring, checking their elasticity and, if necessary, replacing them with new samples.

7.3. CHECK BEFORE STARTING

Before pump starting procedures, it is necessary to verify the following:

1	¿Have you been read this handbook totality?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
2	¿Is the whole piping system filtered and emptied by possible slags?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
3	¿Have every possible chocking been removed from piping and pump?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
4	¿Have all the auxiliary connections been properly installed? As shown on the installation drawings?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
5	¿Are the auxiliary connections, mechanical seal flushing and gearbox ready for work?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
6	Are all the connections and piping leak-free? And are there residual forces and moments?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
7	Are all bolts, piping connections and taps properly tighten?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
8	¿Have the pump and the engine been properly lubricated? ¿Are the lubricant levels correct?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
9	¿Has the pump-engine coupling been verified?	Yes <input type="checkbox"/>	No <input type="checkbox"/>

10	¿Is the coupling properly reassembled?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
11	¿Are all the piping valves in the right position?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
12	¿Are the safety protections properly reassembled?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
13	¿Is the engine rotation direction correct?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
14	¿Is the pump stop pushbutton position evident?	Yes <input type="checkbox"/>	No <input type="checkbox"/>

Tab. 2 – Pre-start checks

If there are one or more negative answers, do not start the pump but verify the point or the points till to obtain a positive answer.

7.4. PUMP FILLING

Make sure that the inlet side valve is open until pressure equalization has taken place and close the inlet side valve.

Check pump and pipeline leakage, later repeat the filling procedure until the pump has been correctly filled.

Close the inlet side valve and ensure that all the connections are leak-tight.

7.5. PUMP STARTING

WARNING

Before starting the electric motor and pump make sure you have read all the manual operating engine electrical motor and the manual operating frequency converter.



Never start the pump if the suction valve is closed, because the installed pump is the volumetric type and the pump delivery pressure is only the installation counter-pressure function, and if the delivery valve is closed the pressure in the piping can reach intolerable values for the whole discharge system. The installation of a safety valve on the discharge pipe is preferred. In the case in which is installed a safety valve on the discharge pipe, do not operate the pump with the discharge line closed for over 1 minute.

Open completely the valves set in the pump suction and discharge branch.

Check the piping leakage and/or airbags.

If there are hot fluids let the pump fill in with the fluid and then wait till the pump reaches the contractual value.

Start the pump and check:

- Suction pressure
- Discharge pressure
- Pump rotation speed
- Motor power absorption
- Seal system, if necessary follow additional instruction by the seal manufacturer
- If necessary, clean the pump
- Verify the presence of leaks

Close the delivery valve till the attainment of the contractual discharge pressure.

After having checked the contractual starting and the operational characteristics, the pump and the driver must be free from noise and anomalous vibration.

If there are anomalous conditions it is necessary to stop the pump and find the bad working causes.



WARNING

Make sure that the temperature of the fluid is changing at a rate of less than 2K/min.

7.6. SWITCH OFF

The volumetric pumps must be stopped with the discharge valve OPENED.

If there is not a no-return valve on the piping, it is necessary to avoid the pump reverse rotation, due to the fluid reflow from the suction tank.



Never close the discharge valve before the pump stops.

Never start the pump if the shaft is running.

If there is an extended stop, empty the pump to avoid body breakings in

case of freezing or erosion due to the possible chemical alteration of stagnant fluid in the pump.

At operating temperature, check coupling alignment and realign motor if necessary.

Check all connecting screws and tighten, if necessary.

If necessary, clean the pump.

7.7. WORKING CHECK

Periodically, through the installation instrumentation, check the pump good working verifying that the pump is constantly able to perform the service for which it has been arranged.

Check always with care:

- Suction pressure
- Discharge pressure
- Pump rotation speed
- Engine power absorption
- Lubricant levels

The pump working must be free from vibrations or anomalous noises.



If there are anomalous presences or unknown noises stop immediately the pump, find the cause and eliminate the disadvantage.

Even if there is a lack of anomalies, it is necessary to check periodically the good pump working verifying also the alignment of it.

Check periodically the capacity system working and all the installed auxiliaries circuits.

7.8. CIP/SIP PROCEDURES

DCS series pumps can be cleaned without dismantling the pump.

It is necessary to determine the CIP temperature and the CIP medium in accordance with the operating requirements.

CIP temperature below 80°C procedure:

- The pump is switched off.
- Sealing system in operation (if present).
- Switch pipeline system to CIP medium.
- Wait until the temperature of the casing pump is above 60°C.
- Start the pump.
- Make sure that the flow rate of the fluid inlet is adequate, acting on the motor frequency converter.
- Is it necessary to have a velocity of the CIP medium of 1,5m/s in the suction piping.
- Clean piping system and the pump.
- Switch off the pump.
- Remove CIP medium, make sure there are no residues.
- Perform flushing and neutralize the system.

CIP cleaning/sterilizing at a temperature above 80°C procedure with mechanical seals with flushing:



WARNING: Material damage due to overheated of the mechanical seals

- The pump is switched off.
- Sealing system in operation.
- Warm-up pump when is stationary.
- Switch pipeline system to CIP/SIP medium.
- Wait until the temperature of the casing pump is above 60°C.
- Start the pump.
- Make sure that the flow rate of the fluid inlet is adequate, acting on the motor frequency converter.
- Is it necessary to have a velocity of the CIP medium of 1,5m/s in the suction piping.
- Clean the pipeline and the pump.
- Switch off the pump.
- Remove CIP/SIP medium, make sure there are no residues.
- Perform flushing and neutralize the system.

CIP cleaning/sterilizing at a temperature above 80°C procedure without sealing system:



WARNING: Cleaning duration shorter than 30 minutes



WARNING: Material damage due to overheated of the mechanical seals



WARNING: When cleaning/sterilizing the pump using steam, block the pump

- The pump is switched off.
- Only clean/sterilize the pump when the pump is stopped and with a cleaning duration shorter than 30 minutes.
- Block the pump if using steam for cleaning/sterilizing the pump.
- Switch pipeline system to CIP/SIP medium.
- Clean the pipeline and the pump.
- Remove CIP/SIP medium, make sure there are no residues.
- Remove the blockage of the pump.
- Perform flushing and neutralize the system.

7.9. COP (cleaning out of place) PROCEDURE

It is possible to perform a mechanical cleaning of the inner parts of the pump.
For the correct cleaning of the pump follow the instructions:



WARNING
Please refer to Chapter 9 before pump disassembly.

- Switch off and depressurize the pump.
- Make sure that the pump cannot be switched on accidentally.
- Close suction and discharge-side valves.
- Switch off the heating/cooling system (if present), make sure it cannot be switched on accidentally.
- Switch off auxiliary operating systems (if present), make sure they cannot be switched on accidentally.
- Remove suction and discharge lines from the pump.
- Unscrew cap nuts on the suction casing.



NOTE: Please refer to Chapter 9 before performing this action

- Remove pump casing the gasket or the O-rings wet side



NOTE: Please refer to Chapter 8 before performing this action.

- Clean/sterilize suction casing, pump casing, stuffing box, screws, nuts and studs with a suitable cleaning agent



NOTE: Perform this action carefully to avoid damaging the components

- Reassemble pump casing and the gasket or the O-ring wet side



NOTE: Please refer to Chapter 9 before performing this action.

- Tighten the bolts on pump casing.

8. Maintenance



For the replacement of any part of the pumps always use original spare parts INOXPA.

8.1. INSTRUCTION FOR SPARE PART ORDERING

To order spare parts, you must provide:

- The serial number and type of pump as shown on the nameplate.
- The number of parts required.
- The description of replacement parts and their location.

8.2. WEARING PARTS

Spare parts not supplied by the manufacturer are not approved. The fitting and/or use of such parts can change the characteristics of the pump and therefore compromise its safety.

No liability or warranty claims shall be accepted for any damage arising from the use of non-original spare parts and accessories.

Malfunctions that cannot be rectified by the user may only be rectified by the service department of the manufacturer.

The standard wearing parts are:

- Mechanical seals.
- Wet side O-rings.
- Bearings O-rings
- Sealing rings.



The mechanical seals and the wet side o-rings are certified according to the main food and sanitary Standards. Use original parts or parts approved by INOXPA exclusively.

8.3. GENERAL INFORMATION ON MAINTENANCE ACTIVITIES

The DCS series pumps require regular maintenance and care like all mechanical equipment. An incorrectly repaired pump could cause premature breakage and unsafe conditions. To ensure product longevity and safety, maintenance operations must be performed by properly trained technicians. Check that all safety systems are in place and that the system pressure has been eliminated before performing ANY maintenance.

When you need to repair the pump or remove it from the system, it must be certain that all the pumped product has been removed from the pump and connected piping. After the whole product is discharged from the pump and related piping, check that the system is not under pressure.



Pay special attention during the drainage process to prevent damage to personnel and adjacent equipment. Purge completely the system and make sure that the product is de-aerated or collect product in accordance with local regulations. The pumping system shall be purged by authorized and trained personnel.



Plan to replace bearings every 5000 operating hours. Be sure to use only original parts supplied by INOXPA, to avoid the invalidation of the product warranty.



The pump must be kept clean by avoiding the accumulation of dust exceeding 5mm above it. Excessive accumulations of dust could hinder proper heat dispersal. Consider cleaning activities in the plane of the equipment maintenance.

8.4. MAINTENANCE TABLE

Carry out maintenance work in accordance with the following table:

Inspection Interval	Component	Who	Measure
Hourly during the start-up phase	Pump, motor	Qualified personnel	Check alignment and adjust if necessary
Daily	Gear casing	Qualified personnel	Check gear oil and top up if necessary
Daily	Coupling	Qualified personnel	Check the correct mounting of coupling and guard
Daily	Mechanical seals	Qualified personnel	Check for leakage and in case of leakage, contact the manufacturer if necessary
Daily	O-rings wet side	Qualified personnel	Check for leakage and In case of leakage, contact the manufacturer if necessary
Daily	Barrier	Qualified personnel	Check function, top if necessary. If contamination is present check mechanical seals and replaces if necessary
Weekly	Drive unit	Qualified personnel	Check for wear in accordance with manufacturer's instructions
After 250 operating hours or 3 months	Gear casing	Qualified personnel	Change lubricating oil
With non-continuous operation, every 2000 hours after 3 months	Gear casing	Qualified personnel	Change lubricating oil
6 months	Barrier system	Qualified personnel	Change lubricating oil

Tab. 3 – Maintenance table

8.5. MECHANICAL SEAL CHECK

It is important to perform a daily check of the mechanical seals to detect any leakage. Perform a visual inspection of the area shown in Fig.15, this area is a potential leak site.

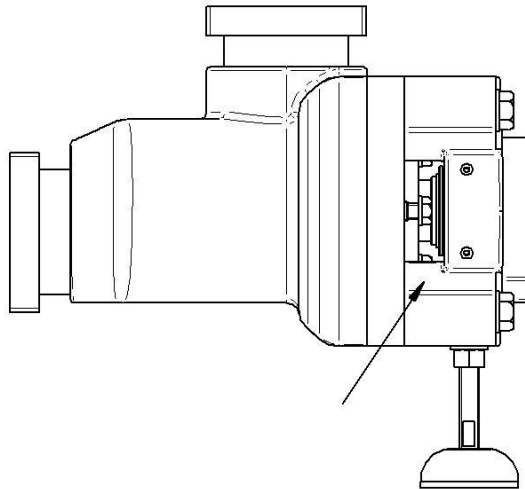


Fig. 15 – Potential leak site

In case of leakage, the mechanical seal shall be replaced.

8.6. LUBRICATION

8.6.1. General information

To ensure a good pump working, it is necessary to take care of the mounting and bearing box lubrication. The twin screw pumps DCS series are always constructed with the gearbox, and are lubricated with oil. Consult the data sheets of the pump, enclosed to this handbook, to verify both the type and the quantity of the required lubricant.

If the work environment is clean and there are no particular oil pollution hazards due to water and dust, and the operating temperature is about 60° C, the lubricant must be replaced (or only controlled in case of use of grease) each 4000/6000 hours.

For mounting temperatures above 60° or particularly dirty or wet environments, reduce the time between controls and changes.

A possible overheating can be caused by an excess of oil charge, a bad alignment or heavy vibrations.

8.6.2. Lubrication points

Below are shown the lubrication points:

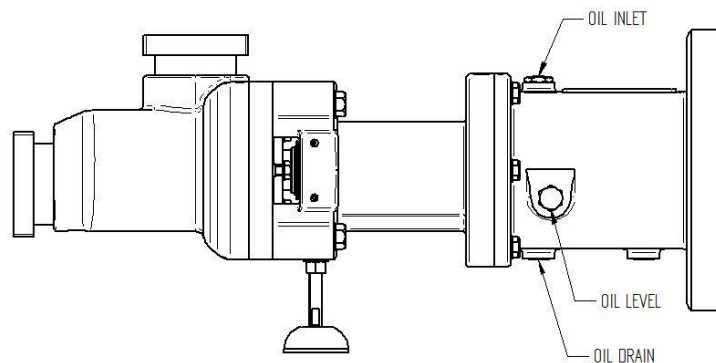


Fig. 16 – Overview of lubrication points

8.6.3. Changing of lubricating oil

To perform lubricating oil changing, follow the instructions below:

- Switch off the pump and make sure that the pump cannot be switched on accidentally
- Unscrew the oil drain cap and drain lube oil at warm operating temperature
- Tighten the oil drain cap and top up lubricating oil
- Top up with lube oil until the oil level reaches the middle of the oil level eye

8.6.4. Lubricant table

The following gearbox oils are suitable for use in the foodstuffs and pharmaceutical sectors.



NOTE: Lubricant must be H1/food grade approved



WARNING: Risk to damage the equipment if non compatible lubricants are used.

Manufacturer	Gear Oil
Mobil	SHC CIBUS 150
Shell	Cassida Fluid GL 150
Total	Nevastane SL 100

8.7. MALFUNCTIONS AND POSSIBLE CAUSES

Malfunctions that are not specified in the following table or which are not traceable to one of the specified causes should be discussed with INOXPA.

The list of possible faults is in the following table.

Pump fails to provide flow rate	Flow rate is insufficient	Flow rate is too large	No pump suction	Not running smoothly	Pump clogging	Pump leaks	Motor power consumption too high	High temperature increase	Cause	Remedy
X	X			X			X	X	Pressure differential too great	Modify operating data
X	X		X					X	Clearance between pumping elements and casing too great	Replace worn parts Consult INOXPA
X			X						Incorrect direction of rotation	Change drive's direction of rotation
X	X		X					X	Speed too low	Increase speed with speed regulator
X	X		X	X					Feed line closed by valve	Fully open valve

X	X		X	X					Air is sucked in	Seal intake Increase speed
X			X						Pump cavitation: $NPSH_r < NPSH_a$	Improve feed line Reduce speed
X	X		X	X					Outlet line closed	Open pressure line
X			X	X			X	X	Pump blocked by solid matter	Clean pump Consult INOXPA
X	X	X	X	X			X	X	Operating conditions deviated from datasheet	Coordinate with manufacturer
		X		X			X	X	Speed too high	Reduce speed with speed regulator
X	X		X			X			Shaft seal defective	Replace shaft seal
X			X						Pump not filled before start	Fill pump completely
				X					Oil level in gear casing too low	Top up oil and correct oil level
			X			X			Casing moulded ring defective	Replace moulded ring
				X	X		X		Too many direction changes on piping	Optimise piping
				X	X		X		Pumping elements dirty	Clean pumping elements
				X	X				Coupling not aligned	Align the coupling
				X	X		X		Thermal expansion of pumping elements because of rapid temperature fluctuations	Wait for temperature equalisation
					X		X		Roller bearings defective	Replace roller bearings Consult the manufacturer

Tab. 4 – Malfunctions table

9. Assembly and disassembly

9.1. GENERAL INFORMATION

WARNING



If it is necessary to repair the pump, it is required the knowledge of the operations to do. Follow some regulations listed in chapter "SAFETY". If the working temperature is high, stop the machine and wait until the pump temperature has decreased to 20°C.

Let the transport of the components be done by skilled staff, informed about the risks connected to the movement operations following current regulations.

Ensure that the lifting and transport means is suited to the weight of moving components.

WARNING



It is important that the tools used for the pump assembly and disassembly, have the following properties:

- Tools should not be in carbon steel
- The tools that are used for the assembly and disassembly of wetted parts of the pump must be used exclusively with stainless steel parts. This precaution is very important to avoid the ferrite contamination of the tools.
- Carefully clean the tools after use with anti-corrosive liquid

These instructions are designed to be used in conjunction with the sectional drawing.

Before acting on the pump, it is necessary to:

- Wear suitable protective wears, such as helmets, glasses, shoes, etc.
- Take away the engine feeding tension and if it is necessary, disconnect the pump.
- If the pump transports hot fluids, let cool it down until ambient temperature.
- Discharge all the pumped liquid through the drainage holes.
- Check the materials and product compatibility of all auxiliary products used (lubricants, cleaning agents, adhesives and securing devices).
- Make sure that during the different phases of the assembly/disassembly, are used only clean tools without ferrite.

9.2. REMOVE THE PUMP FROM THE GROUP

WARNING



During the maintenance do not disassembly casually the pump parts, but follow the regulations below mentioned.

Besides, it is important to consider that some internal pump details, such as gears, have been installed accurate and marked with numbers positions.

Reassemble always the disassembled components in the original positions, checking the marking signs correspondence.

To disconnect the pump from the installation, it is necessary to:

- Switch off and depressurize the pump
- Make sure that the pump cannot be switched on accidentally
- Disconnect the suction and discharge flanges from the piping
- Disconnect the auxiliary piping, if present
- Remove the coupling guard (if installed)
- Remove the coupling spacer and the pump-side coupling half from the drive shaft (if installed)
- Disassembly the pump unscrewing the screws on the baseplate (if installed).
- Disconnect the pump from the installation taking care to not damage any component and raising it, if necessary, as shown in the chapter CARRIAGE. LIFTING AND STORAGE.
- Lift pump and put down on a suitable surface

- Lay the pump on a suitable surface
- Remove all the tools used for positioning

9.3. DISASSEMBLY WET SIDE COMPONENTS AND MECHANICALS SEALS



WARNING

Careful handling the pump components and put them in the appropriate place

The following are the steps to follow for a proper disassembly of the pump

- Remove the washers (item 14) and the screws (item 13) from the pump casing (item 1)
- Remove the pump casing (item 1) sliding it horizontally

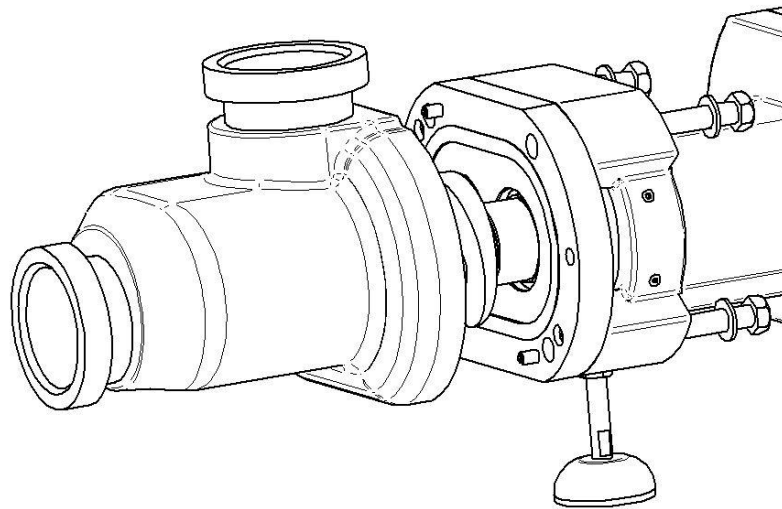


Fig. 17 – Disassembly of suction casing

- Remove the gasket on the pump casing (item 5). On some pump models, instead of the gasket, there is an O-ring.

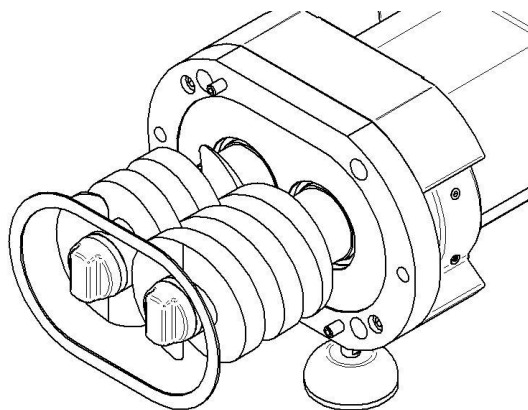


Fig. 18 – Disassembly gasket/O-ring

- Use a piece of soft metal (as aluminium or copper) to block the CW (item 8) and CCW screw (item 9).
- Unscrew and remove the cap screw (item 6) by turning in counter-clockwise.



NOTE: Use a spanner to unscrew the cap. Perform this operation carefully to avoid damages to the cap's surface.

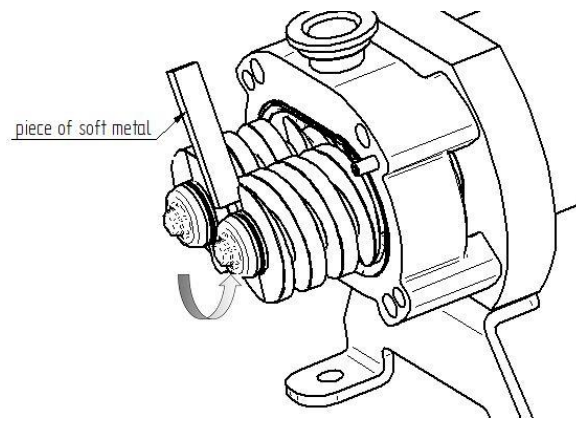


Fig. 19 – Disassembly of CW screw

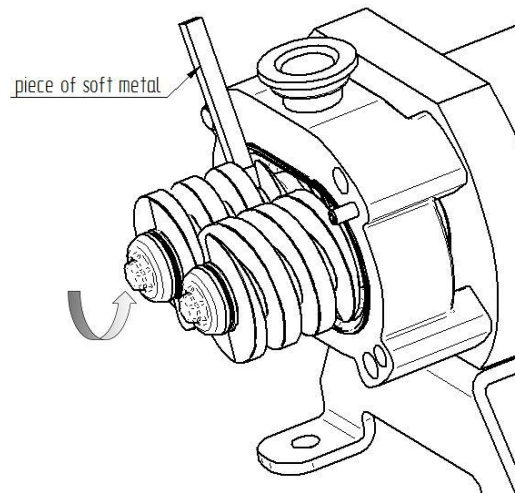


Fig. 20 – Disassembly of CCW screw

- Remove both the cap screw (Item 6) and the O-ring cap (Item 7).

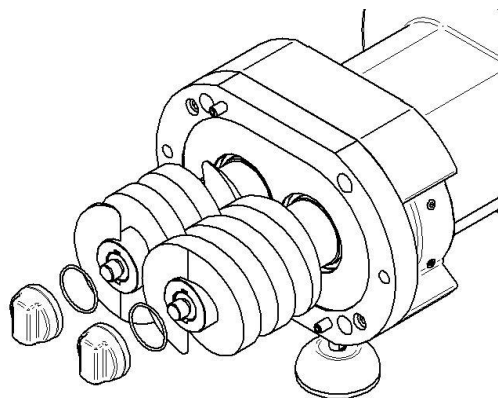


Fig. 21 – Disassembly of cap screw

- Remove the CW (item 8) and CCW (item 9) screws and the keys (item10) on the shaft.

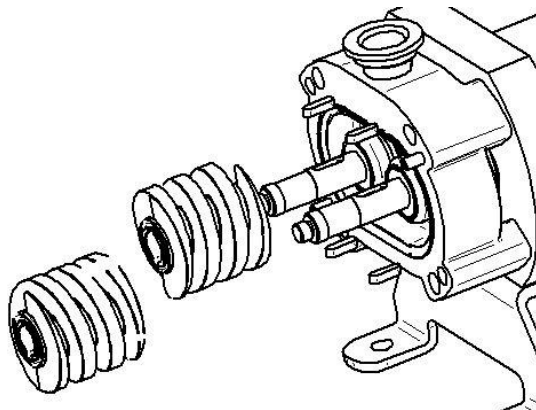


Fig. 22 – Disassembly of CW and CCW screw

- Remove the spacer (item 21) between the feed screws and the mechanical seal and the O-ring (item 22).

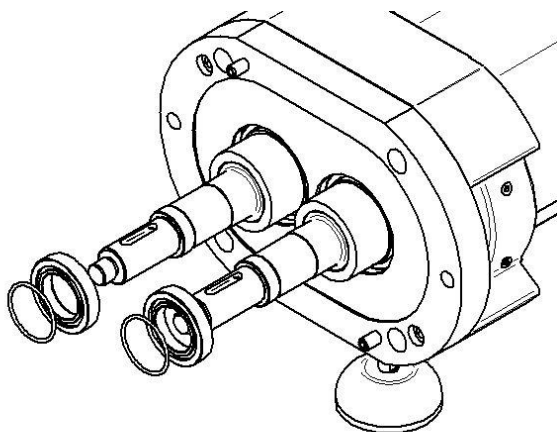


Fig. 23 – Disassembly of mechanical seals

- Disassemble the rotary ring of the mechanical seal and then disassemble the stationary ring (item 11).

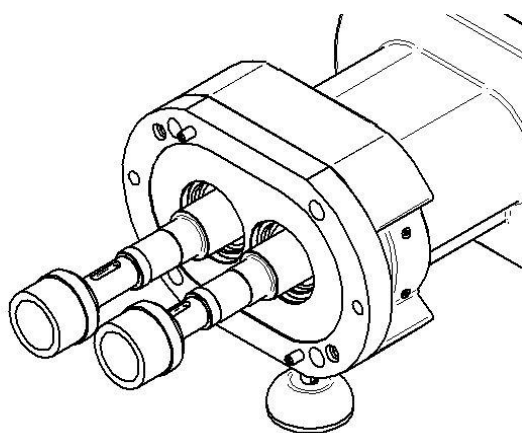


Fig. 24 – Disassembly of mechanical seals

- Remove the hexagon socket screws (item 12).
- Remove the stuffing box (item 2).

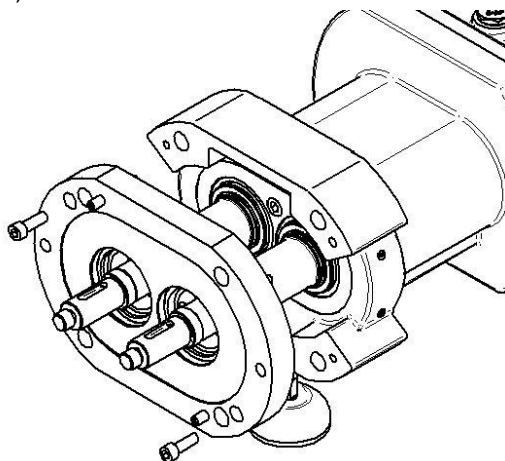


Fig. 25 – Disassembly of the stuffing box

MECHANICAL SEAL IN COMPONENT TYPE

Some version types of the pump are mounted with mechanical seals in components, in this type of mechanical seal, the stationary ring is mounted on a mechanical seal flange. In this case, is necessary to remove the screws (item 23), the washers (item 24), the mechanical seal flange (item 25) and the O-ring (item 26) mounted on the backside of the stuffing box.

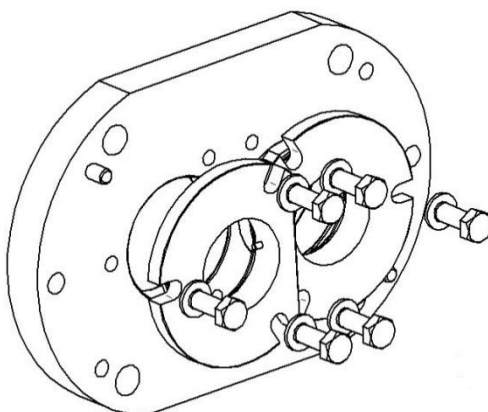


Fig. 26 – Disassembly the mechanical seal flange

MECHANICAL SEAL IN MODULAR TYPE

Some version types of the pump are mounted with modular mechanical seals, in this type of mechanical seal, the stationary ring is mounted on the stuffing box and to remove it is necessary to remove the screw (Item 23) and the washers (item 24) on the backside of the stuffing box.

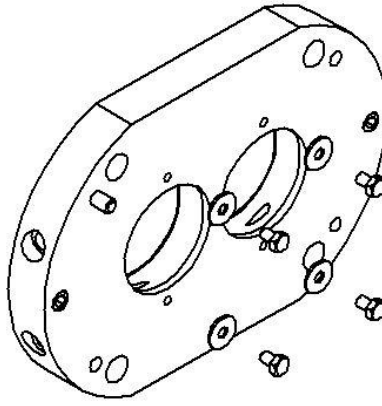


Fig. 27 – disassembly the screw from the stuffing box

9.4. ASSEMBLY SCREW CW, SCREW CCW AND MECHANICAL SEALS



Careful handling of the pump components and deposited in the appropriate place to prevent damages

In the different phases of the assembly refer to the tightening torque table (chapter 9.6).

MECHANICAL SEAL IN COMPONENT TYPE

Some version types of the pump are mounted with mechanical seals in components, in this type of mechanical seal, the stationary ring is mounted on a mechanical seal flange. In this case, is necessary to assembly the screws (item 23), the washers (item 24), the mechanical seal flange (item 25) and the O-ring (item 26) mounted on the backside of the stuffing box.

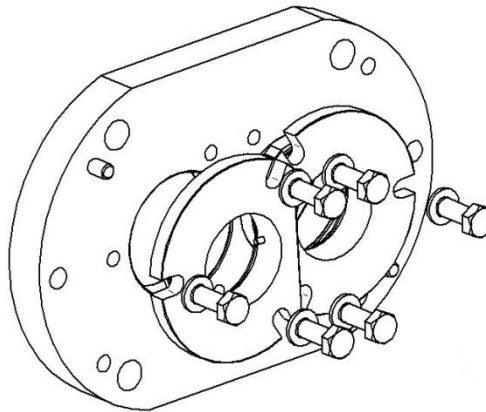


Fig. 28 – assembly the mechanical seal flange

MECHANICAL SEAL MODULAR TYPE

- Some version types of the pump are mounted with modular mechanical seals, in this type of mechanical seal, the stationary ring is mounted on the stuffing box and to assembly is necessary to remove the screw (Item 23) and the washers (item 24) on the backside of the stuffing box.

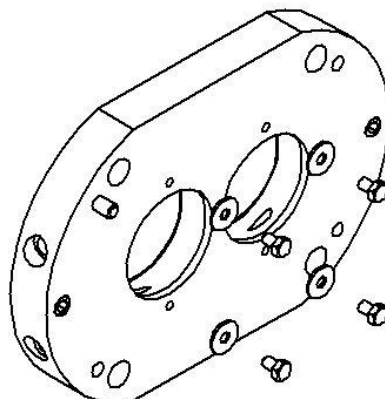


Fig. 29 – assembly the screw from the stuffing box

- Assembly the stuffing box (item 2) on the bearing casing using the screw hexagon socket (item 12).

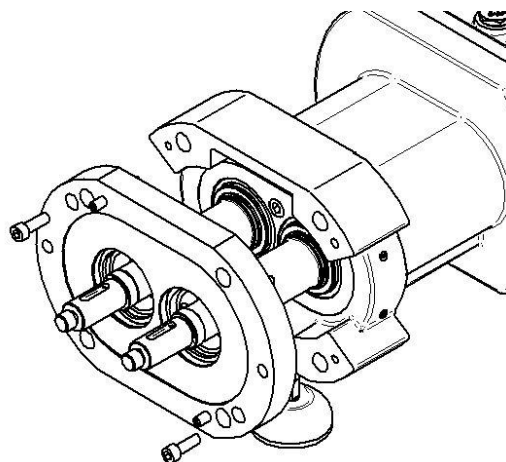


Fig. 30 – assembly of the stuffing box

- Carefully check sliding surfaces of the mechanical seal for score marks and cracks
- Insert the static holder and the rotary holder of the mechanical seals (item 11)

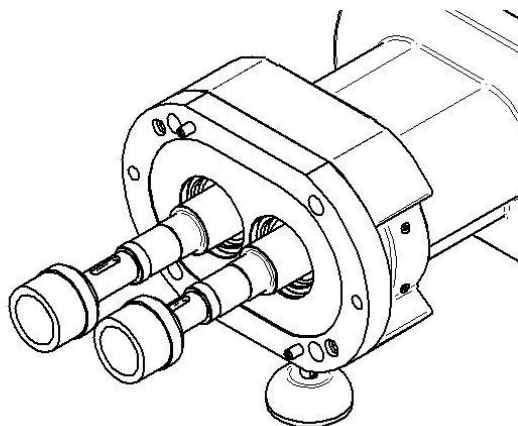


Fig. 31 – assembly of the mechanical seals

- Assemble the spacer (item 21) between the feed screws and the mechanical seal and the O-ring (item 22).

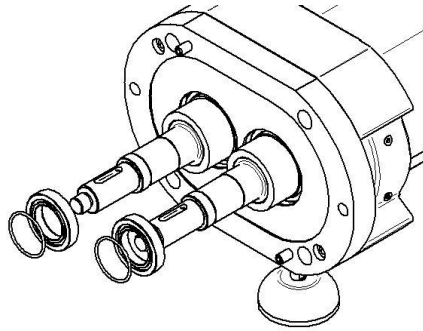


Fig. 32 – assembly of the spacer

- Mount the keys (item 10) on the shaft and position CW (item 8) and CCW (item 9) screws on a level surface so that they intermesh and rotate them against each other until both faces lie completely on the surface.



Before assembling the screws, read chapter 9.5 Assembling the screws for reference.

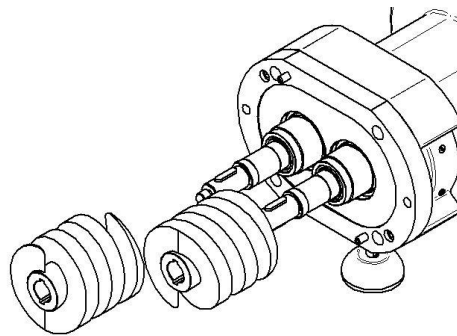


Fig. 33 – assembly of the CW and CCW screw

- Tighten the cap screw (item 6) and the O-ring caps (item 7) by turning in counter-clockwise.



Use a spanner to tighten the cap. Perform this operation carefully to avoid damages of the cap's surface.



After tightening the cap screw, verify that the O-ring is fitted correctly and does not protrude from its seat. If the O-ring is not fitted correctly loosen the cap screw and repeat the operations.

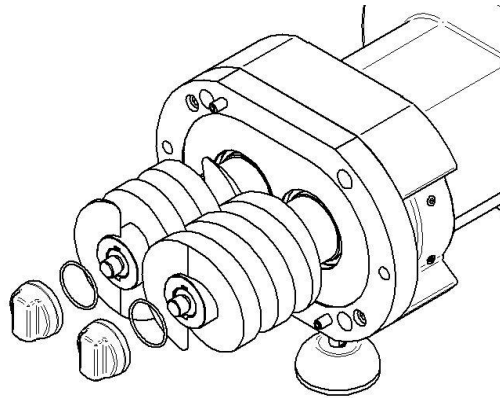


Fig. 34 – assembly of cap screw

- Using a piece of soft metal (as aluminium or copper) block the CW (item 8) and CCW screw (item 9).

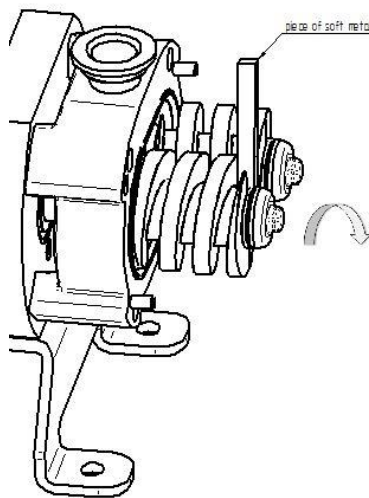


Fig. 35 – assembly of CCW screw

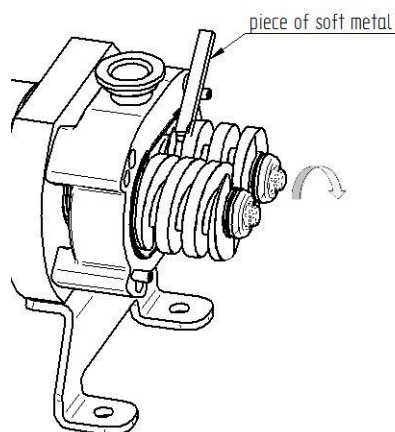


Fig. 36 – assembly of CW screw



Before the O-ring, perform an accurate inspection to verify if the O-ring is damaged. The operator shall check carefully the integrity of the O-ring (damages, deformations) and the metal surface in contact with the O-ring.

- Assembly the gasket on the pump casing (item 5). On some pump models, instead of the gasket, there is an O-ring.

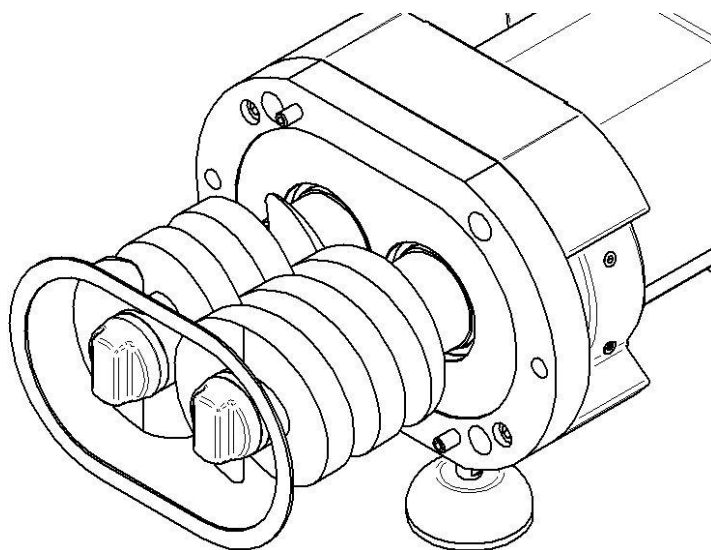


Fig. 37 – assembly of gasket/O-ring

- Assembly the pump casing (item 1) sliding it horizontally.
- Assembly the washers (item 14) and the screws (item 13) from the pump casing (item 1).

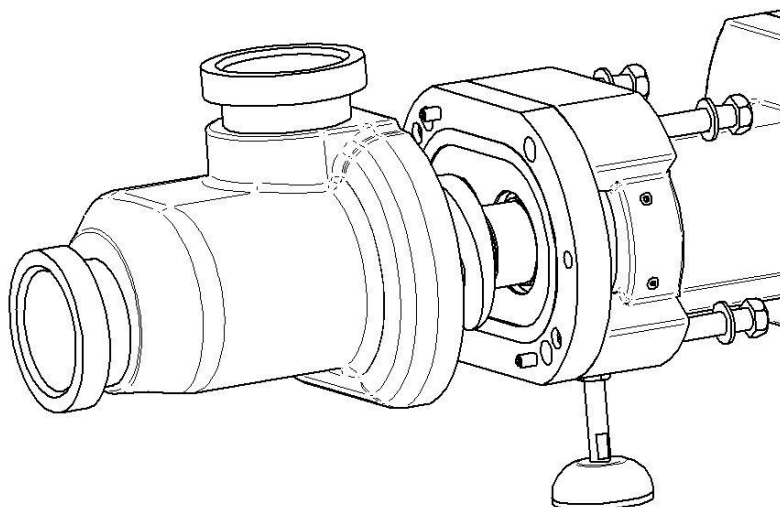


Fig. 38 – assembly of the pump casing

9.5. ASSEMBLING THE SCREWS

This is a reversible pump, is it possible to invert the position of the suction flange with discharge flange, this is possible by changing the direction of rotation of the motor or changing the position of the screws.

Is it possible to mount the feed screws in the following way:



NOTE:

The feed screws must not be swapped, because this changes the direction of the feed. Before executing a change of position of the screws, contact the INOXPA.

- Type 1: electric motor CW direction of rotation. Position of the screws and fluid direction as shown in Fig.34, discharge side on the top of the pump.

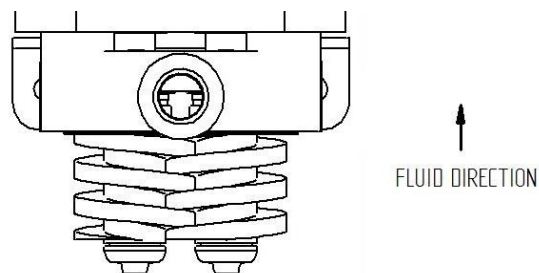


Fig. 39 – Assembly of the screw Type 1

- Type 2: electric motor CCW direction of rotation. Position of the screws and fluid direction as shown in Fig.35, discharge side on the side of the pump.

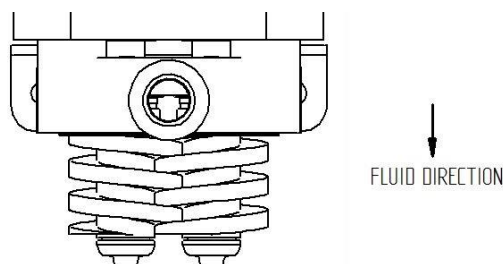


Fig. 40 – Assembly of the screw Type 2

- Type 3: electric motor CW direction of rotation. Position of the screws and fluid direction as shown in Fig.36, discharge side on the side of the pump.

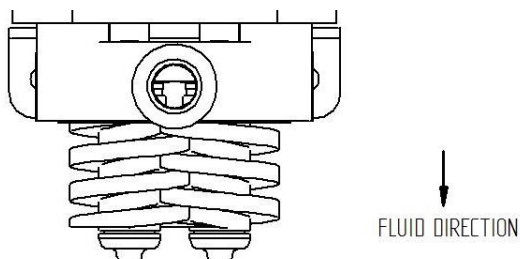


Fig. 41 – Assembly of the screw Type 3

- Type 4: electric motor CCW direction of rotation. Position of the screws and fluid direction as shown in Fig.37, discharge side on the side of the pump.

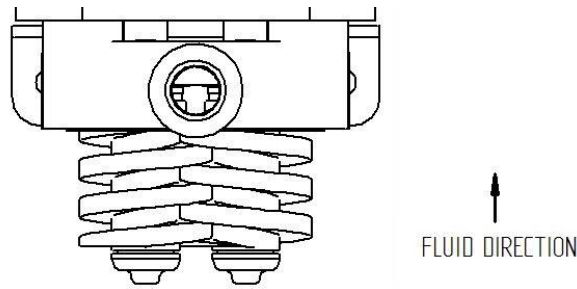


Fig. 42 – Assembly of screw Type 4

9.6. TIGHTENING TORQUE TABLE

In the different phases of the assembly refer to the following table:

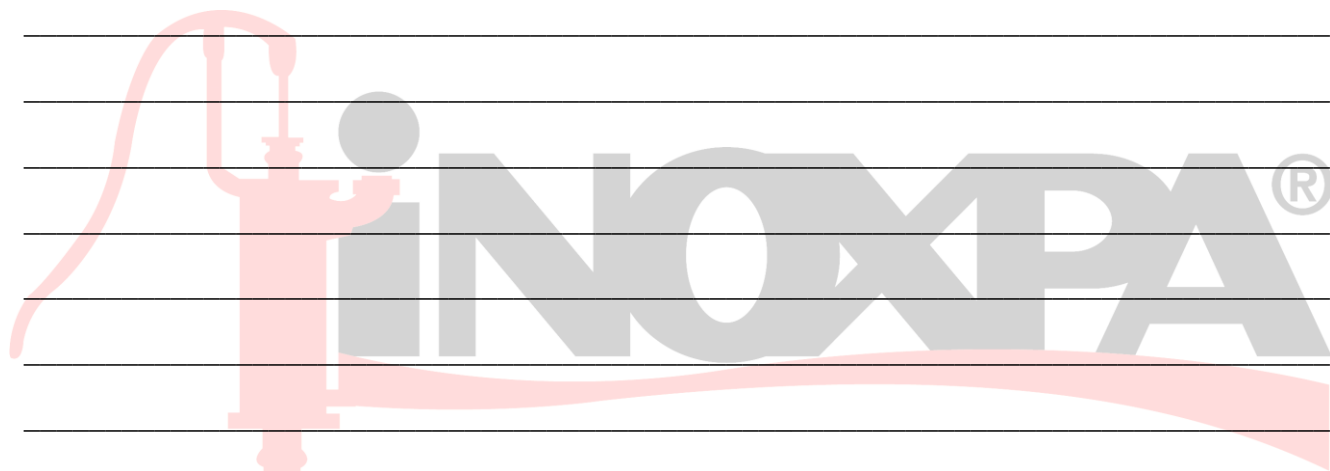
Description	Item N°	Pump Type			
		DCS 4B2/4B3	DCS 3B2/3B3	DCS 2B2/2B3	DCS 1B2/1B3
Cap nut	6	428Nm (M27)	168 Nm (M18)	78Nm (M14)	50 Nm (M12)
Socket head bolts	12	28 Nm (M10)	28 Nm (M10)	14 Nm (M8)	6 Nm (M6)
Hexagon bolt	13	428 Nm (M27)	168 Nm (M18)	78Nm (M14)	50 Nm (M12)
Hexagon bolt	23	28 Nm (M10)	14 Nm (M8)	14 Nm (M8)	6 Nm (M6)
			50 Nm (M12)	28 Nm (M10)	14 Nm (M8)

Tab.7 – Tightening torque table

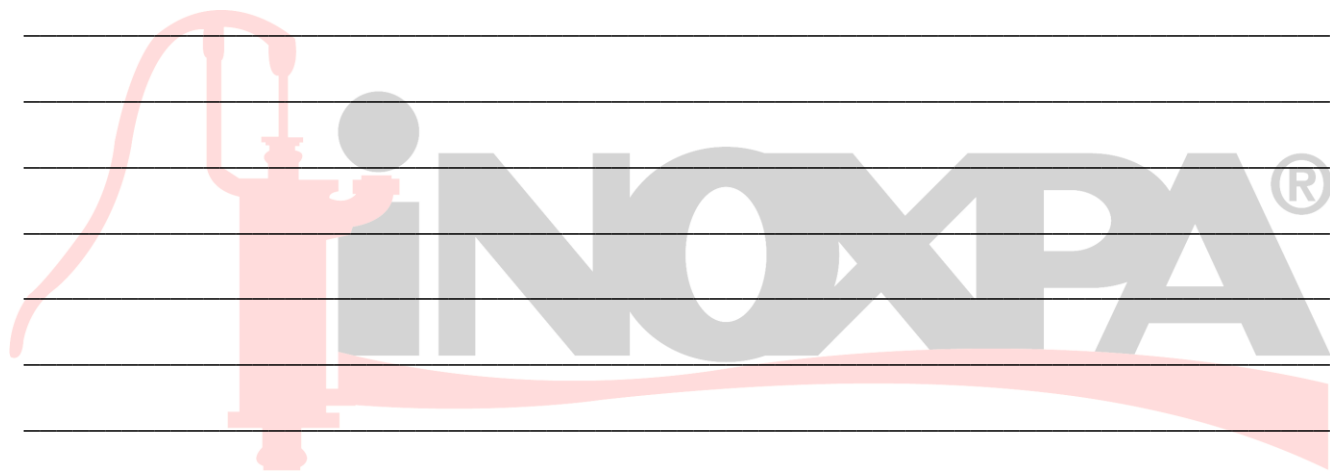
NOTAS



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