7.4 Operating At Riducer Capacity

The pump can be operated only momentariily at zero flow and never for longer periods at very low capacities (near shut-off). Operating at low flows can be result in exceeding safe working temperature, and can cause severe pump damage. If the process requires that the pump be operated near shut-off intermittently and/or for prolongr period, a by-pass line from pump discharge back to surce of supply should be installed. If the pump is connect to a constant speed driver, capacity can be reduced by throttling the discharge. If the pump is connect to a variable speed driver, reduction of both the head and the capacity can be accomplished either by reducing the speed or by throttling the discharge.

7.5 Flow Adjustment Of Auxiliary Fluid

The followings rates are recommended for cooling and sealing liquids, if required :
To each bearing housing water jacket = 20 l/min
To each stuffing box water jacket = 10 l/min
To each stuffing box gland quench = 1 l/min
To each lantern ring with in and out connections = 5 l/min
To each lantern ring with inlet connection only = sufficient pressure to provide 1 l/min

7.6 Stopping the pump

The centrifugal pumps must be stopped with the delivery valve CLOSED valve.
If on the piping there is not a no-return valve, it is necessary to avoid the pump reverse rotation, due to the fluid reflow from the aspiration tank.
Never close the delivery valve before the pump stops.
Never start the pump if the shaft is running.
If there is an extended stop, empty completely the pump in order to avoid body breakings in case of freezing or corrosions due to the possible chemical alteration of stagnant fluid in the pump.

8.0 THE WORKING CHECK

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

Check always with care:
- the suctionpressure
- the delivery pressure
- the pump speed
- pump absorbed power
- lubricants 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 alginment of it.
Check periodically the capaciyt system working and all the installed auxiliaries circuits.

If the pump performance, without conditions interventions different up or down it, are less it is necessary to stop it and then going on with possible substitution and repairing.

8.1 Operating Rutine

Periodic inspection of the unit is your best assurance of avoiding costly repair work to your pump. Trouble with the most common items such as packing, bearings and seals can be avoided if correctivemeasures are taken in the early stageswhen warning signs first appear.
Check the bearing temperature periodically. If there is overheating, check the oil level in the reservoir and the oil temperature. When ambient temperature is normal, the sump temperature should not exceed 80°C (165 °F) on pump equipped with ball bearings. On pump with sleeve type bearings, the temperature at the cooler outlet should not exceed 65°C (149 °F).
Check seals or packings for leakage.
Check the circulation of the cooling system, if used.
Check suction and discharge pressure gauges.
If the differential pressure drops critically, shut down the pump at once.
Check the suction strainer, drop in downstream pressure indicates fouling.

8.2 Aligment Check

The unit alignment should be checked after the unit has operating temperatures.
Stop the pump and proceed as per para Alignment
It is recommended that the alignment be checked again after a few days of normal operation.

8.3 Stopping

The pump should be shut down rapidly to keep liquid in the pump and prevent parts from seizing. After stopping the driver, close the discharge valve and then the inlet valve, in that order. When the pumps are opearting in parallel, it is sometimes necessary to close the discharge valve immediatly after stopping the driver to prevent reverse rotation.

8.4 Freezing

If the pump is exposed to frezing temperature after it is shut down, drain all water (or other liquid that will freeze) from the pump casing, heat excangers, cooling jackets and pipes.

9.0 LUBRICATION PROCEDURE

To assure a good pump working, it is necessary to take care of the mounting and bearing housing lubrication.
The C2PO Pumps are always constructed with the bearing housing is lubricated with oil. In some special application and when required by client Cerpelli can be supply other type of lubrication design like grease. In any case please check first page of pump data sheets and assure lubrication characteristics and desing.

9.1 Lube interval

If the environment is cleaned enough and there are not peculiar lubricants pollution dangers from water or dust, and the mounting temperature is about less then 60°C , the lubricant must be substituted (or checked if with grease) every 4000/8000 working hours.

For mounting temperatures higher than 60° or for environments particularly dirty or damp, reduce the time between a change and another one.

The mounting and gears box working temperature must not pass 85°C during normal working. A poss e overheating can be provoked by too much oil, the group bad alignment or over vibrations.

Cerpelli recommended to check:

Every 4000 hours of operation :	Check vibration, pressure, absorbed power and noise level Control the bearings. Check the packing sleeve for wear and repack the stuffing box.
Every 8000 hours of operation :	Drain the bearing housing, flush with a suitable solvent and refill with new oil to the proper level.
Every 16000 hours of operation:	Completely dismantle the pump. Check all parts for wear, corrosion and replace all warn part. Replace all gasket and packing with new one. Check the alignment of the unit.

9.1 Routine Check Of Pump Unit

- Every 8000 hours of operation check:
- Visual check for coupling and coupling reability.
- Lubricant level on bearing housing.
- Vibration value on bearing housing. Refert to VDI 2060 class G
- Level of noise for pump and motor. (< = to 10 dBA)
- Bearing temperature (about 65 °C)
- Suction and discharge pressure for pump
- Absorbed power for electric motor (Δ ±10% of nominal absorbed power)
- V-ring check for electric motor

9.2 Alarm List

Every 16000 hours of operation check :
Measuring point

- Visual check for coupling and coupling reability. (see annexed table coupling tollerance)
- Lubricant level on bearing housing.
- Vibration value on bearing housing. Refert to VDI 2060 class G (max + 10%) or
- API 610 (Vibration limit < 3.0 mm/sec RMS at any flow within the pump's preferred operating region +30%)
- Level of noise for pump and motor. (> to 10 dBA)
- Bearing temperature (> 85 °C)
- Suction and discharge pressure for pump (see pump data sheet)
- Absorbed power for electric motor (> 10% of nominal absorbed power)

In case of one or more point checked present an unusual value, dismantle the pump and check :
Mechanical examination:

- Alignment between pump and motor. Ref. to coupling tollerance annexed table.
- Flexible element of coupling (metallic membranes or elastic insert)
- Visual check for bearing : efficiency of ball or cilindric element, wear on inner ring of bearings.
- Dimension check for pump shaft : verify of Run-out on seal zone (max Run-out +/- 0.05 mm) and verify of concentricy on bearing zone (max Run-out +/- 0.05 mm)
- Wear on shaft sleeve : max Run-out +/- 0.1 mm
- Wear on wear rings :
- Visual and dimensional check for impeller : verify of vane thickness on inlet side of impeller in case of wear of impeller vanes replaced the impeller.
- Visual inspection on pump casing.

9.3 Bearing housing cleaning

Before the pump starting the bearing mounting must be carefully cleaned. Fill in with a solvent fit for the bearing housing. Drain the solvent and dry with care before the oil filling.

9.4 Lubrication procedure

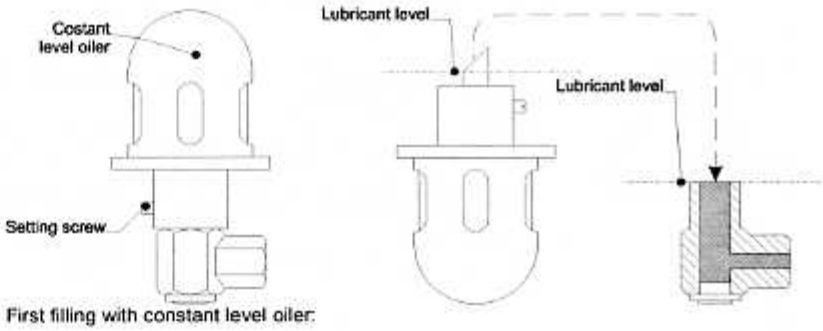
For the bearing housing lubrication, it is enough an oil for bearings with EP characteristics, having a viscosity ISO VG 68 and a viscosity index equal to 100 or better.

But, in peculiar cases they could need other values for a better lubrication, in these cases consult Pumps Cerpelli.

In case of first starting foresee a substitution of it after about 100/200 working hours.

Fill in the gears box with oil till the level showed on the case through the right packing tap, always set on the same case, till the minimum level reaching showed on the indicator set on the box side.

If required, the pump can be furnished complete of constant level oiler which yelds to maintain the oil level constant. This oil-feeder, when it is furnished, is put toward the firm in order to assure the right level.



First filling with constant level oiler:

- Remove the mounting breather cap.
- Loosen the fixing corn and then remove the oil-feeder.
- Put in the oil in the mounting through the filling cap hole till the oil leackage from the oil-feeder crank.
- Fill in the oil-feeder (without disassembling it)
- Put again the oil-feeder in its own crank
- Repeat the operation till the oil feeder level doesn't stop to decrease

Repeat next fillings pouring directly the oil in the oil feeder

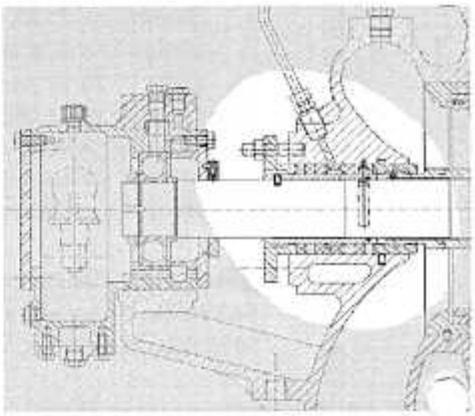
9.5 Lubricants list

Type lubricant	Characteristics		Suggested brand / Typo	
Oils	Grading ISO VG Classification ISO Viscosity grade	68 L CC Min 90	SHELL	TURBO T 68
			AGIP	OTE 68
			CHEVRON	HYDRAULIC OIL 68
			ESSO	TERESSO 68
			MOBIL	D.T.E. OIL HEAVY MEDIUM

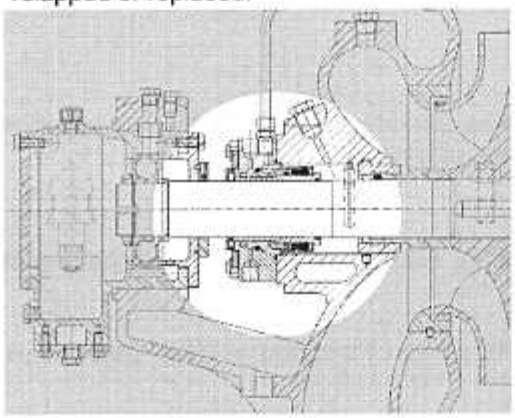
Grease	Classification NLG	NLG 2 or 3	SKF	LGMT3
			ESSO	BEACON 3
			SHELL	ALVANIA G3
			MOBIL	MOBILUX 2
			BP	ENERGREASE LS3

10.0 SHAFT SEAL

C2PO pumps shall be mounted packing or mechanical seal. Please che pump data sheets so to check seal design.



Refert to mechanical seal manufaturer's instruction manual for a proper maintenance.
In any case not put the seal back in service until all the non-metallic members have been replaced and the sealing faces have beeen relapped or replaced.



The stuffing box solutions are always realized in conformity to API 610 laws appendix C or ISO and , beside, includes different fluxing and/or washing(quench) possibilities.

Naturally all the solutions can include peculiar additional regulatings such as cartridge assembling, metallic bellows seals, ecc.

If the pump transports dangerous and/or toxic fluids it is necessary to take every precaution before starting every kind of operation.
On the mechanic seal have been installed packing which can release toxic and dangerous substances when there is overheat.
All the maintenance operations have to be done with the machine stopped and disconnected from the electrical line.
The mechanics seals must never work dry.

10.1 The seal installation and the maintenance to the shaft

10.1.1 The mechanical seals

If not specified with other terms, the mechanical seals are assembled on the pump toward the firm
And other peculiar check and/or records during the disassembling and maintenance operations till they show some blow-by.
Use always original replacement pieces.

During the new seal and/or replacement pieces installation, and before arranging the assembling, it is always necessary to verify the shaft state and always substitute the old packings with the new ones.
Clean with care the shaft using an oil and lubricate it with a compatible grease with a pumped fluid.

Do not compress the seal during the assembling, the seal and its components must be freely installed.
If the assembling is forced, disassembling the components an install again the seal with particular care to the packings.
Check immediately every 4000 working hours the mechanical seals faces fretting state.

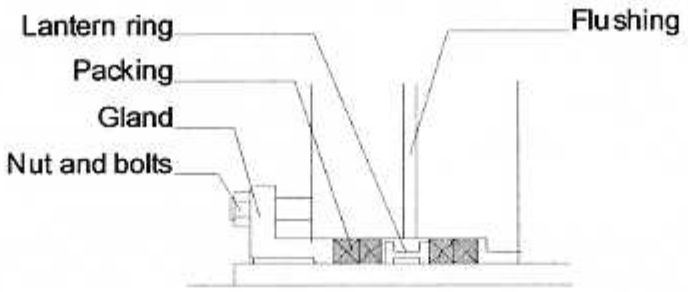
10.1.2 The packing seal

If the pump has got the packing seal, it will be necessary to do a right regulation to assure the regular working expanding the friction heat developed by the packings through a regular fluxing line lubrication.

Regulation
At the first starting loosen the premitreccia nuts in order to consent a great liquid exit.
After tighten the nuts to reduce the loss entity till a unbrokendripping and without causing the stuffing box overheating.
Go on slowly and by degrees to the nuts tightening, usually can be necessary more than one working hour.
Be careful to the premitreccia tighteningbecause once tightened, the packings compact themselves and it is no longer possible, loosening the premitreccia, to promote a greater loss.
If it is not possible to regulate a possible loss increase, it is necessary to substitute the packings with the new ones.

Installation
Before going on with the installation, remove entirely the old packings and clean the whole seal components.
Install the first packing ring and scotch it on the stuffing box bottom, applying if necessary a suitable lubricant substances every ring.
Fit in a metallic split socket-joint or an equivalent number of metallic rings and compress the packing ring tightening the premitreccia.
Remove the premitreccia, the socket-joint or the metallic rings and repeat the operation for every ring which compose the seal, taking care to stagger the 90°packing ring carvings.
Install the core iron ring as showed in the pump section drawing.

Rotate handly the shaft and assure that the core iron ring is rightly installed and its lubricant liquid arrives.
After regulate the packing.



11.0 MALFUNCTIONS, CAUSE AND REMEDY.

Before starting the failure research or bad working, check always the pump suction and/or delivery conditions, checking the installed instrumentation as suction and delivery gauges, the driver power absorption, ecc. In case of badworkings or failures refer to the following table. If the failure persists, keep in touch with Cerpelli Pumps.

Failure	Possible cause	Remedy
Insufficient delivery pressure	Air from pumped fluid Pump not run to rated speed Rotation opposed to the pump Mechanical defect The chocked aspiration filter	Check possible air infiltrations from the aspiration/aux piping. Check the driver, driver rotation Connect rightly the engine Wear rings worn, Impeller damaged, Internal leakage Disassembling the filter and clean or substitute the cartridge for it.
Low pump capacity	Rotation opposed to the pump The pump is not primed and not filled in with the fluid Aspiration pipe not completely filled in the fluid. Air from pumped fluid Pipe in suction line without adeguate submergence Filter partially obstructed or not enough NPSHA too low Pump not run to rated speed Delivery pressure too high Impeller clogged.	Connect rightly the engine Prime the pump as showed to priming section taking care to remove the air from the casing pump. Increase the pipe lenght or increase the swamping of it. Check possible air infiltrations from the aspiration/aux piping. Check contractual characteristics Check the suction tank and suction pipe Clean the filter or reinstall a filter well dimensioned. Check suction pipe Check the driver, driver rotation Check discharge valves Check the pump impeller
The depriming pump	Air in suction pipe Air from pumped fluid Pipe in suction line without adeguate submergence The steam formation in the aspiration pipings. Overheating of pumped fluid Air from the aspiration pipings NPSHA too low	Check the piping Check possible air infiltrations from the aspiration/aux piping. Check contractual characteristics Check the suction tank and suction pipe. Installa or check suction gauge in suction tank Check suction line, excessive pressure drop in suction line Check possible air infiltrations from the aspiration piping. Check suction pipe
Excessive engine absorption	Pump speed too high The fluid viscosity/Density is too high or higher than the contractual conditions. Density/viscosity of pumped fluid changes Delivery pressure too low The packing/glands too tighten Misalignment driver-pump Misalignment driver-pump or piping-pump Mechanical defect Problems on driver	Check driver and pump speed Reduce the speed/capacity, check the fluid viscosity or prerheat it. Keep in touch with Cerpelli Pumps for new operatives conditions. Check discharge valves Check the packing and glands Check the alignment Check misalignment between pump and driver and/or pump and piping Wear rings worn, Impeller damaged, Internal leakage Check driver and pump speed
Vibrations, excessive noises or excessive overtemperature	The pump cavitation or steams in the aspiration pipings. The fluid viscosity/Density is too high or higher than the contractual conditions. Air from pumped fluid Misalignment driver-pump Not suitable foundations not suitable to slow foundation bolts. Bearings defect Excessive rotor unbalanced Vibration on driver Impeller clogged. Piping installed in wrong position, excessive misalignment of piping Pump operating below minimum recommended capacity. Overtemperature or rapid faliure in bearings Overheating of stuffing box	Check the aspiration piping and the aspiration pressure. Reduce the speed/capacity, check the fluid viscosity or prerheat it. Check possible air infiltrations from the aspiration/aux piping. Check contractual characteristics Check the alignment Check the foundation and the foundation bolts. Change the pump bearings Check and balance the rotor Check the driver, driver rotation Check the pump impeller Install pipe supports Check pump contractual condition, install eventual by-pass line Check bearing housing, lube oil and external lube system. Check pump/piping alignment Check packing/mechanical seal flushing pipe
The quick pump fretting	Solids in suspension in pumped fluid Internal corrosion Misalignment driver-pump The pump turns dry or steam formation due to the fluid overheating The pump bad lubrication Delivery pressure too high	Check suction filter mesh size and/or suction line Verify the pumped fluid or contact Cerpelli so to correct the pump materials Check the alignment Check and verifiy that the feeding tank seal is 1.5 –2 times the pump rated seal. Check and verify the lubrication. Check with Cerpelli new pressure conditions

12.0 DISASSEMBLY AND REASSEMBLY

If it is necessary to repair the pump, it is required the knowledge of the operations to do.

Follow some regulations listed in chapter "SECURITY REGULATION"

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

Assure that the lifting and transport means delivery is suited to the components weight to move.
wear a suitable protection wears, such as helmet, glasses, shoes, ecc.
take away the engine feeding tension and if it is necessary, disconnect the pump, if there is a combustion engine, from the engine
close the aspiration valves and delivery pump and the accessories pipings valves such as cooling ecc.
if the pump transports hot fluids, let make cold to room temperature.
If the pump transports dangerous and harmful fluids, adopt the necessary safety precautions.
discharge all the pumped liquid through the drainage holes and if necessary to reclaim the pump.

Before commencing dismatling make sure the pump to make sure it can not be switched on accidentally and close all shut-off valves in the suction and discharge lines and in the auxiliary lines. (flushings, cooling).

Pump casing and eventual jackets must be drained.

This pump design is made so to have completely maintenance after you have removed the pump cover.

Reassembly is effected in reverse order to dismantling with same procedure. During reassembly following prescriptions are advisable:

- use plastic or wooden hammers preferably; when using steel hammers, interpose always hartwood
- Bearings shall be shrinked on the shaft after an oil bath heating at 80-90° C .Do not hammer on the bearings.
- Extreme care should be observed when mounting the mechanical seal in order not to damage seal faces and o-rings.

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Since 1904

12.1 Disassembly

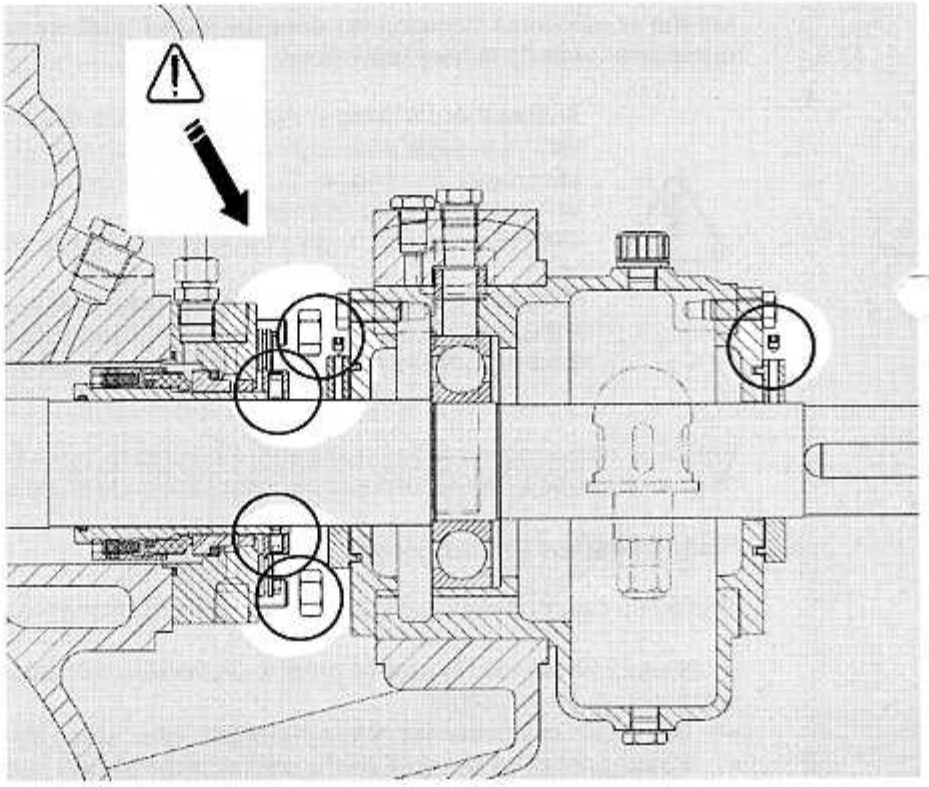
Before disassembly operation please see sectional drawing.

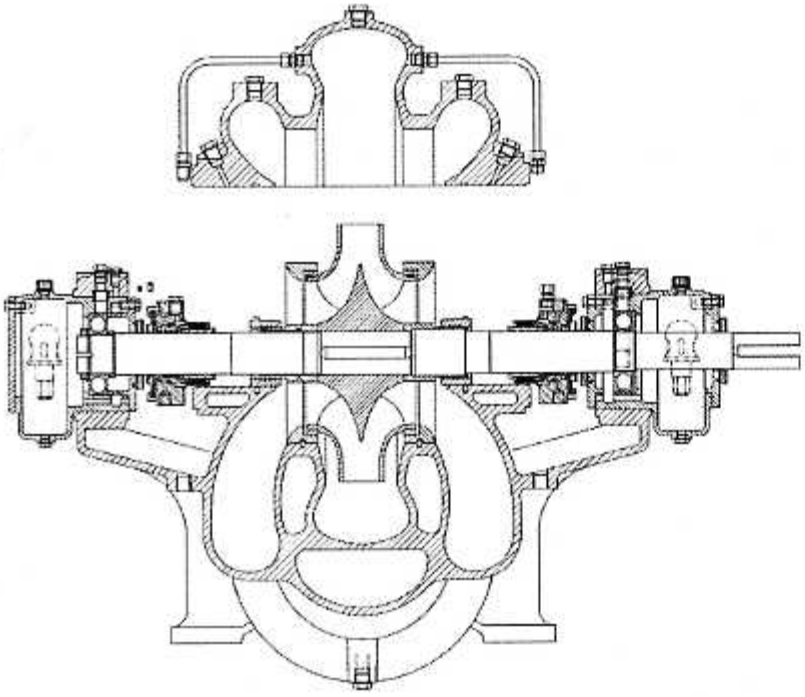
Drain pump casing and auxiliary circuits if are installed

The maintenance on the pump must be **ALWAYS** executed by 2 persons at least.

1. Remove the pump key and unlock mechanical seal flanges or packing glands and deflectors form boths driver and not driver end.

   Pay attention to mechanical seal solution and in case of cartdridge design unlock the mechanical shaft sleeve from it's lock screws, and make it free.





2. Unscrew the nuts of joint pin, then extract the pump cover. Do not remove pump supports and bearing housing and screws installed only on pump covers.

   Before lift the pump cover put many attention to mechanical seal and fluhing pipes, and make sure that there are not locked.

12.0 DISASSEMBLY AND REASSEMBLY

If it is necessary to repair the pump, it is required the knowledge of the operations to do.

Follow some regulations listed in chapter "SECURITY REGULATION"

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

Assure that the lifting and transport means delivery is suited to the components weight to move.
wear a suitable protection wears, such as helmet, glasses, shoes, ecc.
take away the engine feeding tension and if it is necessary, disconnect the pump, if there is a combustion engine, from the engine
close the aspiration valves and delivery pump and the accessories pipings valves such as cooling ecc.
if the pump transports hot fluids, let make cold to room temperature.
If the pump transports dangerous and harmful fluids, adopt the necessary safety precautions.
discharge all the pumped liquid through the drainage holes and if necessary to reclaim the pump.

Before commencing dismatling make sure the pump to make sure it can not be switched on accidentally and close all shut-off valves in the suction and discharge lines and in the auxiliary lines. (flushings, cooling).

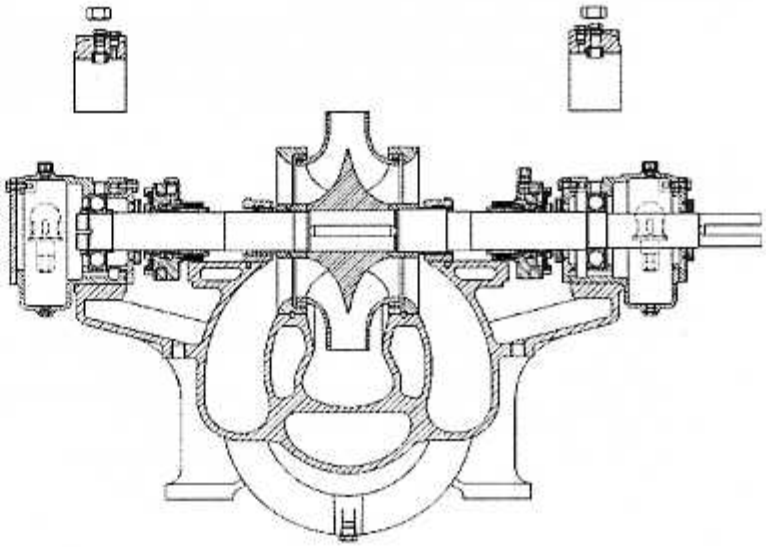
Pump casing and eventual jackets must be drained.

This pump design is made so to have completely maintenance after you have removed the pump cover.

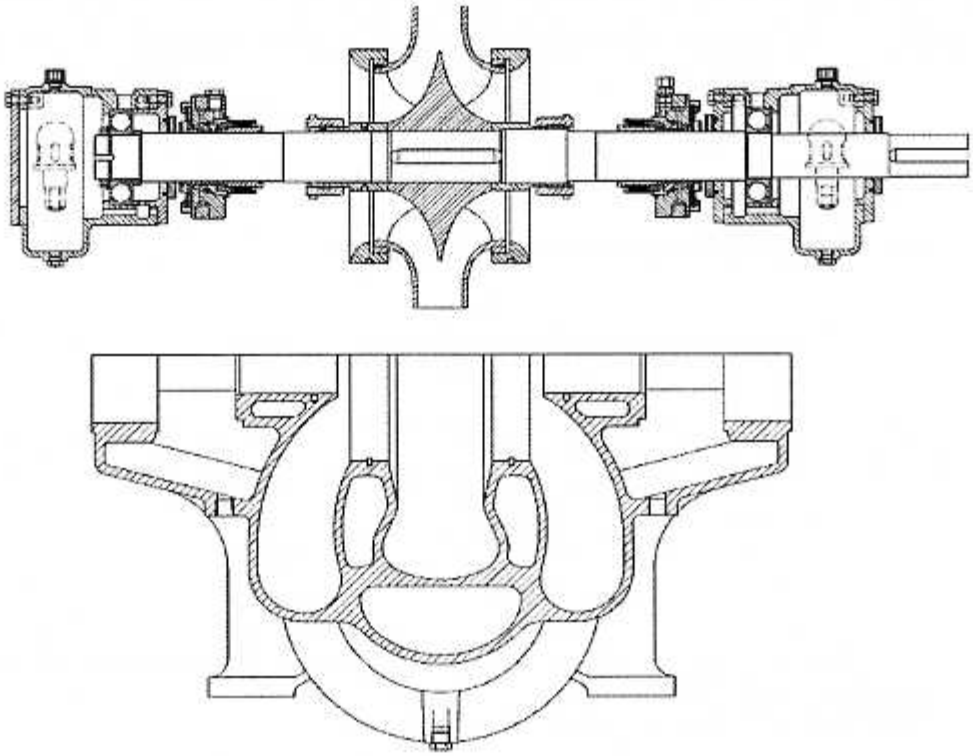
Reassembly is effected in reverse order to dismantling with same procedure. During reassembly following prescriptions are advisable:

- use plastic or wooden hammers preferably; when using steel hammers, interpose always hartwood
- Bearings shall be shrinked on the shaft after an oil bath heating at 80-90° C .Do not hammer on the bearings.
- Extreme care should be observed when mounting the mechanical seal in order not to damage seal faces and o-rings.

3. Remove the baring housing covers.



4. Install lifting devices on bearing housing and remove all rotating parts, bearing housing, pump shaft, impeller , wear rings, etc. During this operation put attention to not damage critical parts, like mechanical seal deflectors andother devices.

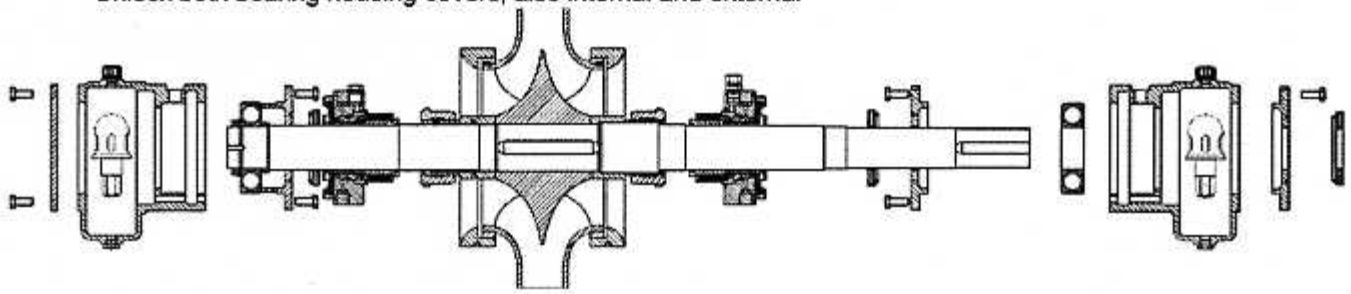


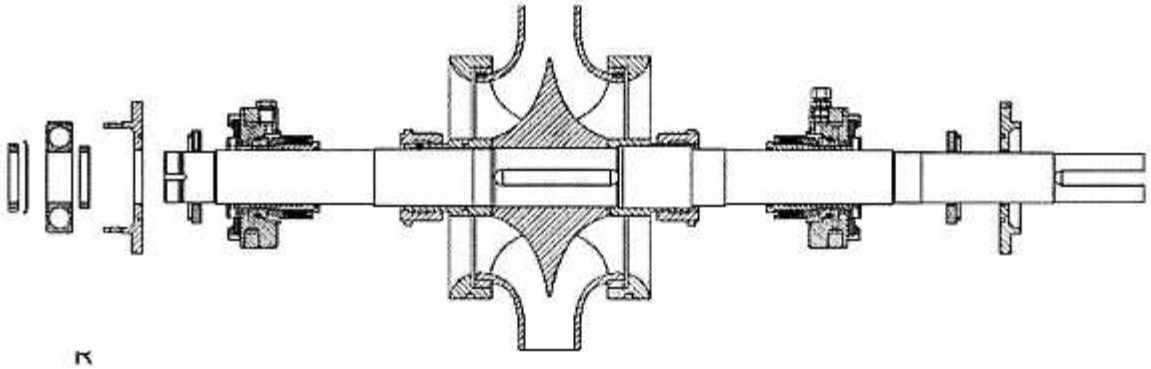
In a more suitable place proceeded to dismantling of single parts as follows:

12.2 Disassembly rotating parts.

To remove all rotating parts , must be started to locked end side.
This position depending from cw or ccw rotation. In any case you can see in sectional drawing how bearing housing cover lock axially the position of one bearing with lock nut and safety washer.

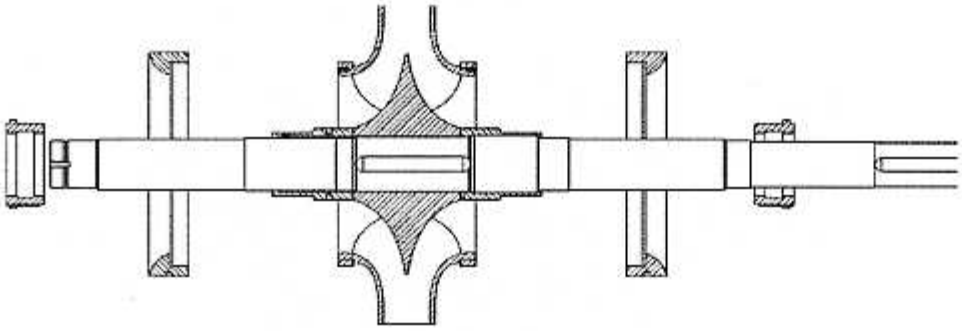
Remove shaft key
Unlock both bearing housing covers, also internal and external



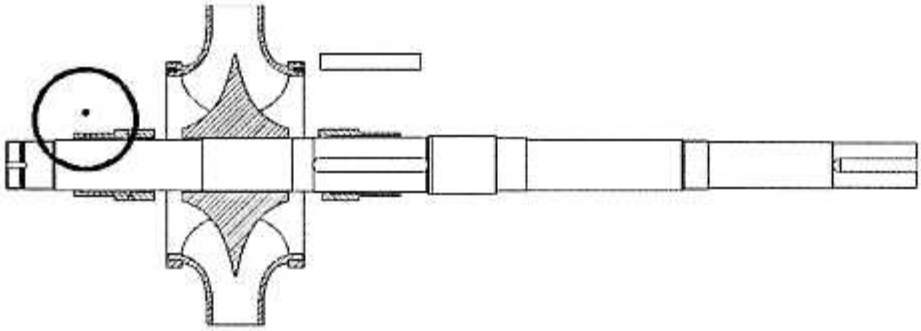


Unscrew all screws installed on covers, and remove all parts , deflectors, covers and bearing housing.
Extract bearings, spacer, deflectors and mechanical seals

emove pump throttle bushing and casing wear rings.



Unscrews set screws on impeller lock nut and remover it from shaft, put attention to rotation that it is in reverse order from pump rotation.
Remove impeller key and impeller spacer ring



12.3 Reassembly Instructions

Before assembling, all parts to be connected must be cleaned. Old gaskets should never used.
Wear rings of the box and of the casing must be pressed into position, beating them slightly then fixed in the same ways of the original ones.
Mount all parts in the reverse order to that dismantling.
The mechanical seal is a precision product, therefore it should be handled with care, avoiding lapped sealing faces to be damaged.
In any way, refer to the drawing and assembly instructions herein annexed for correct installation.
Do not put the seal back into service until all non-metallic parts have been replaced and the sealing faces have been relapped or replaced.
Before completing the seal installation, wipe the lapped sealing faces perfectly clean.
Connect the pump and the driver coupling with spacer.
Recheck the alignment of the pump as outlined on general instructions.
At completed reassembly the pump should run freely acting by hand on the coupling.

13.0 INSTRUCTIONS TO PUT THE MACHINE OFF DUTY

Before doing the dismantling operations, go on with a careful machine cleaning.
For the disassembling and the movement way, refer to the chapter 6 ("Installation"), in particular for the safety specifications and the individual protection means.

Use the packing suitable to the machine dimension and weight.

Put on the packing neck a plate concerning the contents, the weight, and every information necessary to the safety transport.

Follow the current regulations dispositions toward the using country about the waste disposal. In particular, it is necessary to empty the lubricant liquids machine, for whose getting rid keep in touch with the authorised firm.

In case of contact with the lubricant substances, follow the information furnished by the " used substance Safety Card."

14.0 REMAINING RISKS

14.1 The machine or some parts of it movement

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 a lifting and transport means, crush for the load fall or the transport means, impact, entrapping, lag, entangling.
To restrict the risk, the Buyer can ask the hangling be done by a skilled staff, suitably informed about the risks concerning the load movement according to the current regulations (D. Lgs. 626/94).
The operators must respect this handbook dispositions.
Do not do handlings different from the expected ones.

During the rotors extraction operations from the pump case, the maintenance phases or put out duty, there is anergonomic remaining. During this operations, it is possible that the operator use wrong posture in order of the movement or excessive stresses. The operations must exclusively done by a suitablly informed staff about the load handle movement risks according to the current regulations (D. Lgs. 626/94) and formed in substance.

14.2 Manual operations with the tools use

There is a general mechanic risk due to the manual operations with the tools use during the installation, the maintenance and the put out duty, the drilling and the screwcutting operations during the installation phase, the operations for the alignment test. To limit the risk, the Buyer can ask the hangling be done by a skilled staff, suitably informed about the typical of the treated activities, with the right tools and specific Individual Protection Dispositives 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.

14.3 Electrical remaining 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, the engine is conformable to the law EN 60204-1 dispositions, so as the law CEI 64-2. It is enclosed the Conformity Declaration furnished by the engine Constructor.

There are direct contact remaining risks 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, in particular with the CEI 64-8 and CEI 64-2, and all the electrical net connection must be done by an authorised installer following the law number 46 dated 1990. The installer is due 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 movemented material, even if with a 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 made by the authorised staff following the law number 46 dated 1990

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.

14.4 The machine noise information.

The phonometric analisys executed on a machine-type endued of electrical engine has furnished a value maximum of 90 Decibel.

At any rate, it is necessary to make a phonometric inquiry on the installed machine following the current regulations (D.Lgs. 277/91).

It is recommended the use of suitable individual protection devices for the hearing protection.

14.5 Thermic risks

This pump can work at hight temperature and some parts, like pump and bearing housing, during the working, can have temperatures higher than 80°C.
Marked these parts with the suitable signalling.
Do not touch these parts during the working.
Make any intervention on these components only after the machine cooling for, at least, 30 minutes.
Foresee always the suitable protective means, such as delimiter barriers or other.

14.6 Risks concerning the use of substances

There is a fire remaining risk connected to the fuel oil as pumped fluid. The machine has been realised with materials and geometries in order to eliminate or reduce the primer risk. Observe the safety dispositions relative to the fire risk contained in the current regulations.
During the maintenance operations, restarting after a maintenance or put out duty stop, it is possible that ht eoperator keep in touch 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 showed by the Constructor and the products Supplier. In case of contact with substances, refer to the Safety Cards. At any rate, it is suggested the gloves use.

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15.0 SPARE PARTS

Cerpelli recommends the original replacement pieces use.

The use of original replacements assure not only the perfect parts interchangeability, exactly worked as those already existing, but also the use of the same materials precisely selected for the required service, assuring to the pump a longer operative life.

15.1 Instructions to order replacement pieces.

To order the replacement pieces, it is necessary to supply:

- the matricula number and the type of pump as showed on the identification plate.
- the quantity of required parts
- the replacement pieces description and its position as listed on the drawing in section enclosed in this handbook

For example:
replacement pieces for pump matricula number.... , number 1 couple rotor axes, position ... .

15.2 Parts of replacement pieces with operative characteristics changed.

If the pump operative conditions differs from that for which it has been acquired, add all the information concerning the new working conditions.
This is particularly important for the new rotors selections.
NOTE: If you are considering a service conditions change, consult the firm, to define the pump suitability.

15.3 Guide to the minimal replacement pieces advised.

Cerpelli Pumps suggests the replacement pieces supply for 2 years working as on the below table, as recommended by API 610 table 6-1.

The international regulations part the pump service into two categories, for the specific installation needs:
Vital Services (V), where the pump damage produce a production loss or a danger situation.
Essential Services(E), usually the pumpos are installed in couple, where a simultaneous damage of the main pump and the reserve one produce a production loss.

Particular		Number of the identical pumps installed						
		Start Up			Normal Maintenance			
Description	Service	1-3	4-6	Over 7	1-3	4-6	7-9	Over 10
Complete pump	V/E				1	1	1	1
Complete rotors ready to be installed	V				1	1	1	1
Impeller, shaft sleeve	E				1	1	1	2
Pump casing	V/E							1
Bearings pump	V/E	4	4	4	4	4	8	12
The shaft seals	V/E	4	4	8	4	4	8	12
Shaft sleeve	V/E	4	4	8	4	8	8	12
Gaskets, complete set	V/E	2	2	2	2	2	10	10