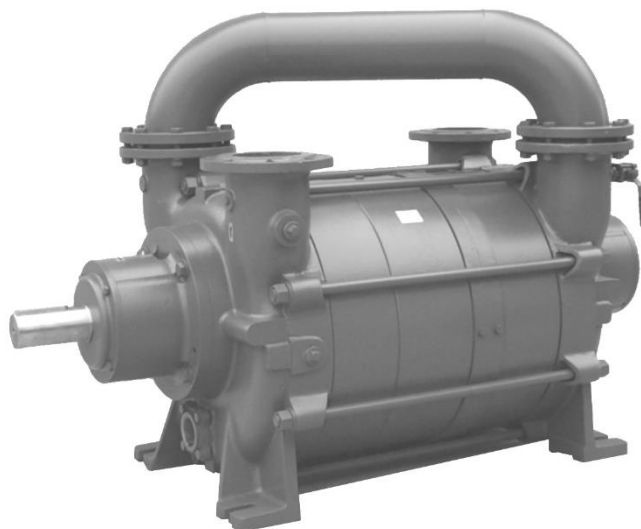


**DISASSEMBLY & ASSEMBLY
INSTRUCTIONS FOR
LIQUID RING VACUUM PUMPS
WITH MECHANICAL SEALS**

TRHA 150

TRSA 200



INTRODUCTION

These instructions are limited for the maintenance man in case of repair of these pumps.

The above instructions are supplied together with the manual of "INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS FOR LIQUID RING VACUUM PUMPS" and are a reference for a sure use, intervention of installation, maintenance and repairing of the pumps.

Before the intervention on the pump it is advisable to follow the instructions of security listed in the chapter 2 of the above manual and the following instructions:

- wear safety clothing, headgear, footwear, eye glasses
- disconnect the electrical power
- close suction valves and service liquid valves
- remove pump from installation without damaging other system components
- assume all safety measures if pump has been handling dangerous fluids
- drain pump casings through the draining connections and flush the pump with clean liquid, if required.

When requesting spare parts or technical information for the pump, always quote the pump model number and serial number which is printed on the pump nameplate: therefore it is recommended not to remove the pump nameplate or, in case this action will be necessary, write the serial number on the pump (for example on the flange).

Should additional information be required, please do not hesitate to contact POMPETRAVAINI or the closest representative. Should there be any difficulties in repairing the pump, it is recommended to send the pump for repair to POMPETRAVAINI or the local authorised representative.

The repairs and the interventions carried out on the pump will not be guaranteed by POMPETRAVAINI.

NOTE: VDMA numbers identify all pumps details differing one from another. They can be looked up in the parts list of chapter 8 and in the sections of chapter 9.
All represented drawings are only schematic and not binding.
For further information pls. consult POMPETRAVAINI.

INDEX

- 1 - Disassembly of bearings and/or mechanical seals**
- 2 - Mechanical seal assembly**
 - 2.1- *"Single" mechanical seals*
 - 2.2- *Stationary seal face assembly in seal cover*
 - 2.3- *Rotary seal face assembly on pump shaft*
 - 2.4- *"Cartridge" mechanical seals*
- 3 - Bearing assembly**
- 4 - Bearing lubrication**
- 5 - Total pump disassembly**
- 6 - Machining and pump components**
 - 6.1- *Typical schematics for machining to restore clearances*
- 7 - Pump assembly**
- 8 - Parts list**
- 9 - Typical sectional drawings**
- 10 - Recommended spare parts**



The liquids and the gases handled by the pumps and also their parts could be potentially dangerous for persons and environment: provide their eventual disposal in conformity with the laws into force and a proper environment management.



The present manual is not assigned for pumps subjected to the ATEX 94/9/CE directive. In case the pump is assigned in environments subjected to the application ATEX 99/92/CE directive or in case the pump is provided with a nameplate indicating the ATEX stamp, it is strictly forbidden proceed to start up the pumps but necessary to consult POMPETRAVAINI for clarifications.

For pumps subjected to the ATEX 94/9/CE directive it is available a dedicated integrative manual.

In preparing this manual, every possible effort has been made to help the customer and operator with the proper installation and operation of the pump. Should you find errors, misunderstandings or discrepancies please do not hesitate to bring them to our attention.

1 - DISASSEMBLY OF BEARINGS AND/OR MECHANICAL SEALS

The design of Travaini pumps allows replacement of bearings and/or mechanical seals without disassembling the whole pump but only by removing the bearing housing, VDMA 357 or VDMA 350.

Tab. 1 through 4 list the sequence and the quantity of the parts to be disassembled.

Pumps with SINGLE mechanical seals follow tab. 1 and 2.

Pumps with CARTRIDGE mechanical seals follow tab. 3 and 4.

To remove the bearing housings the use of a proper gear puller may be required.

NOTE: Adopt extreme caution to prevent mechanical seal damages.

Tab. 1 - DISASSEMBLY OF BEARING AND "SINGLE" MECHANICAL SEAL
DRIVE-END

COMPONENT	SCREWS	BEARING COVER	LOCKRING	SCREWS	BEARING HOUSING	BEARING	SHOULDER RING	RADIAL SEAL RING	SCREWS	MECH. SEAL COVER	GASKET	MECHANICAL SEAL
VDMA No.	901	360	923	901.1	357	322	505	421	914	471	400.3	433.2
QUANTITY	4	1	1	4	1	1	1	1	2	1	1	1

Tab. 2 - DISASSEMBLY OF BEARING AND "SINGLE" MECHANICAL SEAL
NON-DRIVE END

COMPONENT	SCREWS	BEARING COVER	LOCKRING	SCREWS	BEARING HOUSING	BEARINGS	SHOULDER RINGS	RADIAL SEAL RING	SCREWS	MECH. SEAL COVER	GASKET	MECHANICAL SEAL
VDMA No.	901	360.1	923	901.1	357	320	505	421	914	471	400.3	433.1
QUANTITY	4	1	1	4	1	2	2	1	2	1	1	1

Tab. 3 - DISASSEMBLY OF BEARING AND "CARTRIDGE" MECHANICAL SEAL
DRIVE-END

COMPONENT	SCREWS	BEARING COVER	LOCKRING	STUDS	BEARING HOUSING	BEARING	SHOULDER RING	THROWER	STUDS	MECHANICAL SEAL	MECH. SEAL HOUSING
VDMA No.	901	360	923	902.1	350	322	505	507	902	433.2	441
QUANTITY	4	1	1	4	1	1	1	1	4	1	1

Tab. 4 - DISASSEMBLY OF BEARING AND "CARTRIDGE" MECHANICAL SEAL
NON-DRIVE END

COMPONENT	SCREWS	BEARING COVER	LOCKRING	STUDS	BEARING HOUSING	BEARINGS	SHOULDER RINGS	THROWER	STUDS	MECHANICAL SEAL	MECH. SEAL HOUSING
VDMA No.	901	360.1	923	902.1	350	320	505	507	902	433.1	441
QUANTITY	4	1	1	4	1	2	2	1	4	1	1

Before disassembling the "CARTRIDGE" Type mechanical seal it is suggested to fit the special clips (supplied with the seals) which will lock the cartridge and seal sleeve.

This procedure helps positioning the seal assembly on the pump shaft at time of re-assembly.

Inspect all components, procure replacement parts such as bearings, mechanical seals, gaskets, etc.

Parts that are not from Pompetravaini should be inspected for full interchangeability and dimension accuracy.

Clean all parts that are to be reused.

See chapters 2 and 3 for mechanical seals and bearing's assembly.

2 - MECHANICAL SEAL ASSEMBLY

2.1 - "SINGLE" MECHANICAL SEALS

Parts should be dimensionally checked prior to attempting assembly of mechanical seals VDMA 433.1 and 433.2. Mechanical seal cover VDMA 471 should have inside bore H8 = 132,2 mm and depth of 6 mm. The shaft VDMA 210 has diameter h6 = 110 mm and the distance from mechanical seal cover VDMA 471 and the face of spacer ring VDMA 485 should be 86,5 mm (see fig. 1).

The seal working length is $92,5 \pm 0,5$ mm, should adjustments be required either machine the spacer ring VDMA 485 or add additional spacer in order to maintain the seal working length.

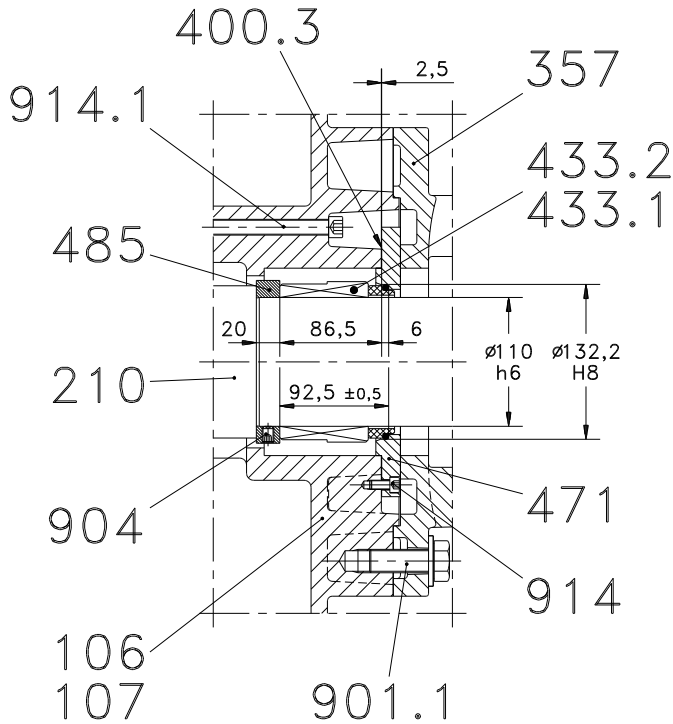


Fig. 1
Typical drawing of mechanical seal with locating dimensions for either pump end (Drive and Non-Drive).

2.2 - STATIONARY SEAL FACE ASSEMBLY IN SEAL COVER

The area of the mechanical seal cover VDMA 471, where the stationary seal face fits, must be smooth, without tool markings and with chamfered corners.

Lubricate the seal seat area and the O-ring of stationary seal face with a fluid such as a soapy water solution, vaseline, etc. (avoid using oils).

To fit the seal stationary part into the seat of the seal cover, protect the seal face with a soft material such as plastic or cardboard.

Place a plug on the seal and apply a perpendicular force using an arbour press or the shaft of a drill press (see fig. 2).

2.3 - ROTARY SEAL FACE ASSEMBLY ON PUMP SHAFT

Pump shaft VDMA 210 must be smooth, clean, without sharp edges and lubricated with soapy water solution, vaseline, etc. (avoid using oils).

The shaft seal area should be polished with extra fine sand paper, even when the shaft has been ground.

Mechanical seals are very delicate, therefore use extreme care when handling them.

Slide the seal rotating part over a conical sleeve "A" or similar tool (see fig. 3) having a very smooth surface and lightly lubricated.

Protect the seal face with a soft material.

Using a suitable sleeve "B" push the seal rotating part over the shaft till it comes to rest against the shaft shoulder or spacer.

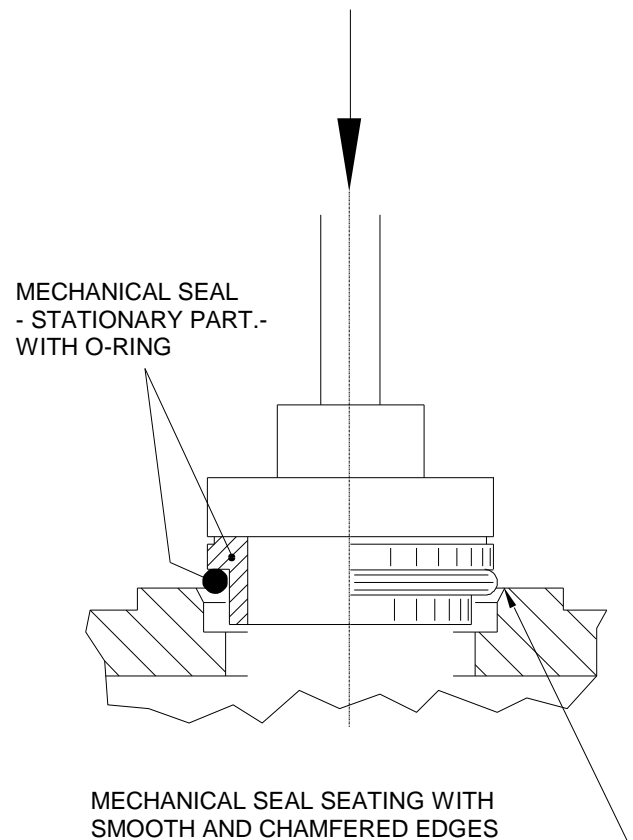
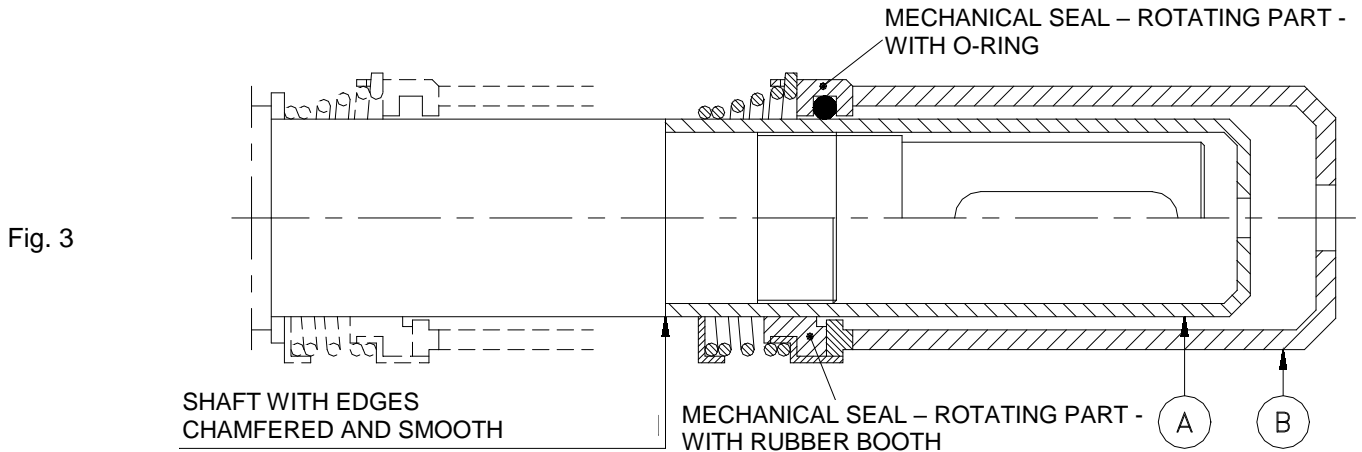


Fig. 2

NOTE: Mechanical seals that are designed for specific direction of rotation must be fitted on the pump shaft end having that particular direction of rotation.

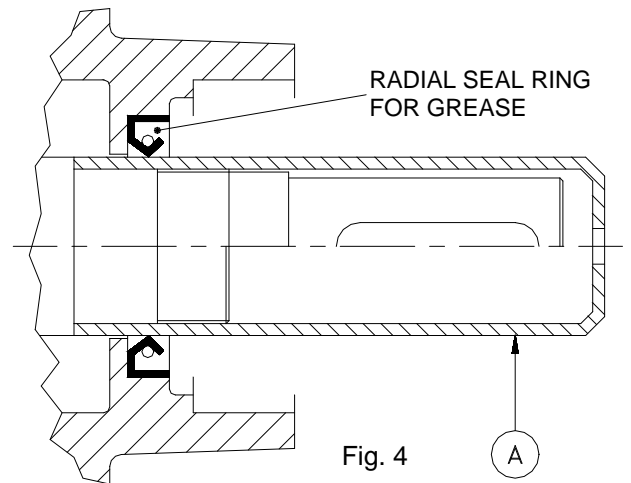
Example: Pump with clockwise rotation (viewed from drive-end) requires mechanical seal designed for right rotation at the drive-end side and seal for left rotation at non-drive-end side.



Fit mechanical seal stationary seat and gasket VDMA 400.3 on mechanical seal cover VDMA 471. Fit seal cover on pump casing VDMA 106 or 107 and fasten it with screws VDMA 914. Install bearing housing VDMA 357 complete with radial seal ring VDMA 421 (see fig. 4).

NOTE: Bearing housing draining connection should be positioned toward the bottom.

Provided that the tie-bolts VDMA 905 (and the pump components between them) have never been moved, the screws VDMA 901.1 can now be tightened to pump casing VDMA 106 and/or 107.



2.4 - "CARTRIDGE" MECHANICAL SEALS

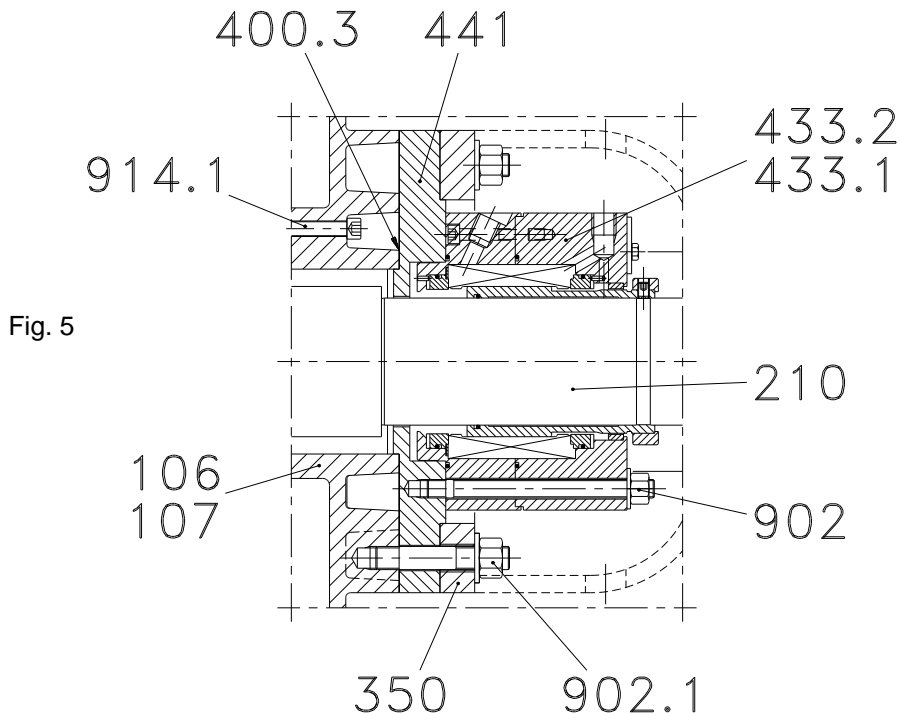
These types of mechanical seals are very easy to install because they are pre-assembled on a shaft sleeve.

Install the mechanical seal housing VDMA 441 and related gasket VDMA 400.3.

Slide the seal cartridge VDMA 433.1 or 433.2 over the shaft VDMA 210 and fastened in place with the 4 studs VDMA 902.1 (particular care should be taken to not damage the O-rings of the seal sleeve) see fig. 5.

Then install bearing housing VDMA 350 and fasten with studs VDMA 902.1.

After assembling the whole pump check that shaft VDMA 210 in its final and correct position then tighten the seal set screws to the shaft. Remove the spacer clips from the seal cartridge that have facilitated positioning the seal cartridge.

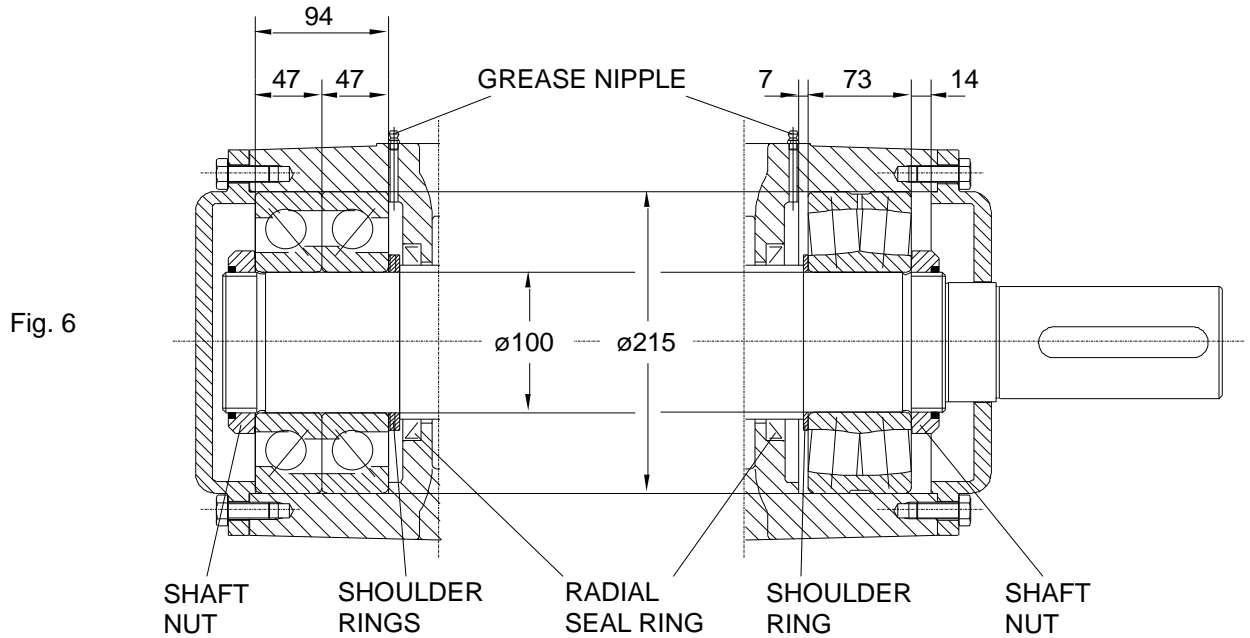


3 - BEARING ASSEMBLY

Bearing assembly can only start after the pump has been fitted with mechanical seals and bearing housings VDMA 357 or bearing housings VDMA 350, as described in chapter 2.

See fig. 6 for locking the bearing and tab. 5 for bearing details.

NOTE: The fixed bearings at non-drive end lock the shaft in place. The bearing at the drive-end is free to move within the bearing housing.



Tab. 5 - BEARINGS DETAILS

	QUANTITY	BEARING TYPE	GREASE QUANTITY (grams)
NON-DRIVE END	2	7320B TVP UA	700
DRIVE END	1	22320 E1 C3	

Tab. 6 - BEARING ASSEMBLY - DRIVE END

COMPONENT	SHOULDER RING	BEARING	LOCKRING	BEARING COVER	SCREWS
VDMA No.	505	322	923	360	901
QUANTITY	1	1	1	1	4

Tab. 7 - BEARING ASSEMBLY - NON-DRIVE END

COMPONENT	SHOULDER RINGS	BEARINGS	LOCKRING	BEARING COVER	SCREWS
VDMA No.	505	320	923	360.1	901
QUANTITY	2	2	1	1	4

Locking of bearings must ensure the location of impellers VDMA 230 (and VDMA 230.1 for series TRHA150) is centred between the intermediate plates.

Shoulder rings VDMA 505 beyond the bearings at non-drive end have a nominal thickness "A" of 7 mm, however the exact dimension must be determined at assembly.

With pump assembled including bearing housings VDMA 357 but without bearings VDMA 320 and/or 322 and shoulder rings VDMA 505, find the exact dimension 'A' for shoulder rings at non-drive end (see fig. 7).

- With a gear puller (or similar tool) push the shaft VDMA 210 toward "X". Read dimension "X1" from the shaft shoulder to the face of the bearing housing.
- Repeat the operation toward "Y". Read dimension "Y1" (always from shaft shoulder to face of bearing housing.)
- Measure depth of bearing housing "P".
- Apply formula $A = [(X1 + Y1) : 2] - P$ (thickness of bearing shoulder rings VDMA 505 for non-drive end).

Dimension "B" (nominal = 3,5 mm) for shoulder rings at drive-end must be such that a clearance of about 7 mm is kept beyond this bearing (see fig. 7).

Assembly sequences and quantity of each component are given in tab. 6 and 7.

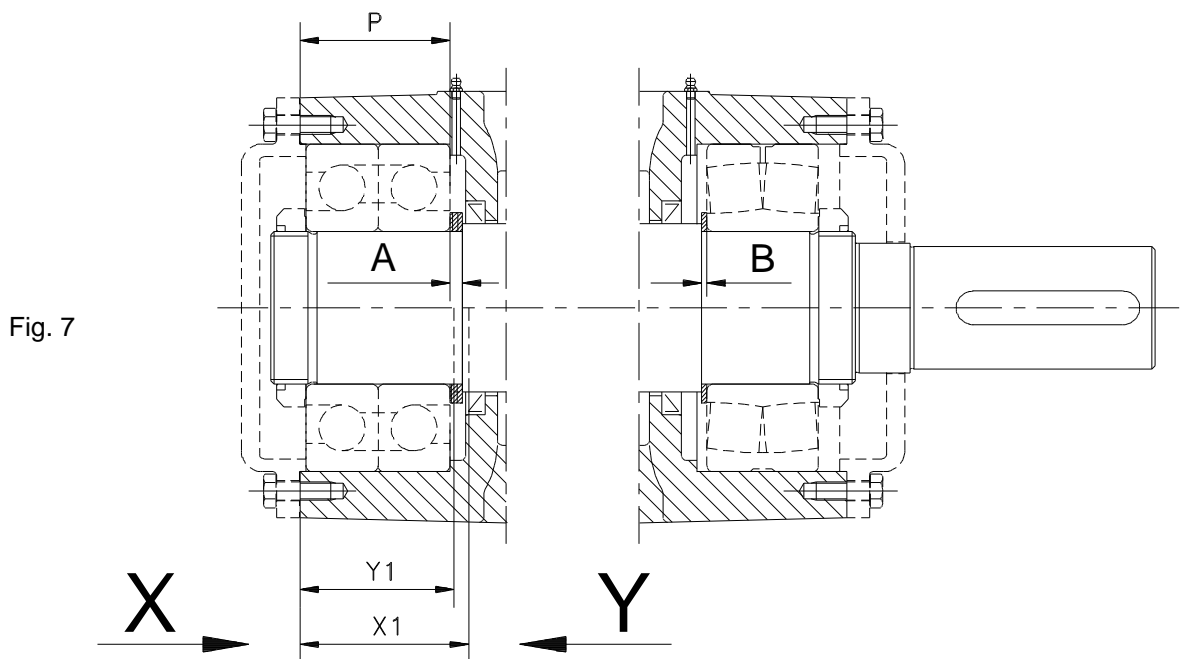


Fig. 7

4 - BEARING LUBRICATION

Lubricate bearings in accordance with the manufacturer's recommendations.

Pumps operating in normal conditions and environment should receive bearing lubrication at least after 1000 working hours.

Bearings however should continuously be monitored for temperature and noise levels.

Bearings that are reusable after disassembly should be cleaned of old grease and contaminants (including grease retaining rings) and repacked with new grease.

Bearings installed at the factory are lubricated with grease type "EP 3", suitable for temperatures between -30°C to +140 °C.

Equivalent or better quality greases may be used.

Grease quantity per bearing or pair-of bearing is listed in tab. 7. Grease frequency may be increased depending upon the severity of temperatures and bearing loads.

5 - TOTAL PUMP DISASSEMBLY

Drain pump of all operating fluids, place the pump in the horizontal position and remove bearing housing and seal housing per chapter 1.

NOTE: The major pump components have reference marking in the casting to facilitate their alignment and orientation at assembly time. Should the mechanic be unfamiliar with this equipment, make additional markings on the pump components so that their sequence and location can be identified. When pump components are not assembled in the proper position and/or sequence the pump performance may be greatly affected.

Place the pump in the vertical position on a solid stand such as a section of heavy pipe or similar stand, see fig. 19 to 22. Always use adequate tools to avoid damage to the pump components.

Disassembly sequence and quantity of components to be disassembled are listed in tab. 8.

Inspect every disassembled part for wear or damage. If they are in good condition proceed with cleaning but, if machining is required, follow the instructions given in section 6.

Re-machined parts should have dimensions compatible with the original matching components.

Recommended spare parts list are given in chapter 10.

Tab. 8 - TOTAL PUMP DISASSEMBLY

STEP I				STEP II								
COMPONENT	BOLTS OR STUDS	MANIFOLD	GASKETS	TUBING	TIE-BOLTS	SCREWS	DISCHARGE CASING	GASKET	DISCHARGE PLATE	GASKET	IMPELLER CASING	GASKET
VDMA No.	901.8 or 902.2	147	400.8	701	905	914.1	107	400.5	137.4	400.2	110.1	400.2
QUANTITY	16 or 32	1 or 2	2 or 4	1	8	2	1	1	1	1	1	1
SERIES TRHA 150 ONLY												

STEP III									
COMPONENT	SPACER RING	IMPELLER NUTS	IMPELLER 2nd STAGE	SUCTION PLATE	GASKET	DISCHARGE PLATE	SPACER SLEEVE	IMPELLER 1st STAGE	SHOULDER RING
VDMA No.	485	922	230.1	137.3	400.1	137.2	521	230	505.1
QUANTITY	1	2	1	1	1	1	1	1	1
SERIES TRHA 150 ONLY									

STEP IV									
COMPONENT	GASKET	IMPELLER CASING	GASKET	IMPELLER CASING	GASKET	SCREWS	SUCTION PLATE	GASKET	SUCTION CASING
VDMA No.	400.2	110	400.4	110.2	400.2	914.1	137.1	400.5	106
QUANTITY	1	1	1	1	1	2	1	1	1
	SERIE S TRHA 150 ONLY	MODELS TRHA 150-3100 & TRSA 200-3100 ONLY							

6 - MACHINING AND PUMP COMPONENTS

Liquid ring vacuum pumps give their best efficiency when the tolerance between the impellers and the intermediate port plates are within certain limits.

Lower tolerances could lead to pump seizing while higher tolerances could result in loss of pump capacity and vacuum level.

When machining is required to refurbish the faces of the port plates, it is of paramount importance to keep the surfaces parallel, flat and within the permissible dimensions. Do not remove more than 0,5 mm each face.

Fig. 8 or 9 and tab. 9 show location and recommended initial clearance between each side of impeller(s) face and respective intermediate port plates.

NOTE: Upon completion of pump assembly the attained final total clearance between impeller(s) and intermediate plates (double that of each side), could be less than the original suggested. However, this total clearance cannot be less than 0,5 mm (0,25 mm each side) or there will be great risk to seize the pump when it is put into service (refer to formula $X1 - Y1 = > 0,5 \text{ mm}$ on page 7).

To resurface the plates it is recommended to begin machining the sides of impeller(s) VDMA 230 (230.1) arriving therefore at a uniform dimension "H1" (see fig. 10 or 11).

Follow with machining of impeller casing VDMA 110 (110.1) to dimension "H" that must take into account the required clearance and the gasket thickness that will be used between impeller casing(s) and intermediate plates.

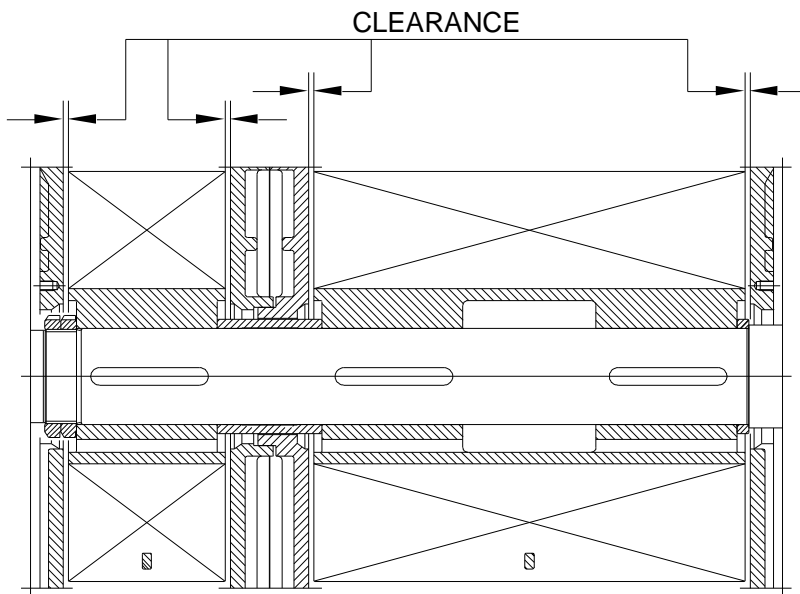


Fig. 8

To recapture: sum of dimension "H" and thickness of gasket for each side equals sum of dimension "H1" and the 2 clearances initially recommended.

The intermediate plates VDMA 137 may be machined next if required.

All these machining operations will result in a shorter pump.

Consequently, shaft shoulders at drive end, relative to location of mechanical seal and bearings must be adjusted to compensate for the total material removed (see fig 12 or 13 and pertinent note for instruction on correcting shaft shoulders).

Locking of bearing at pump drive end may require the introduction of a spacer, similar to the VDMA 505.1 already used as a standard.

In the event the bearing cover VDMA 360 at drive end interferes with shaft VDMA 210, machining of bearing cover central bore will be required.

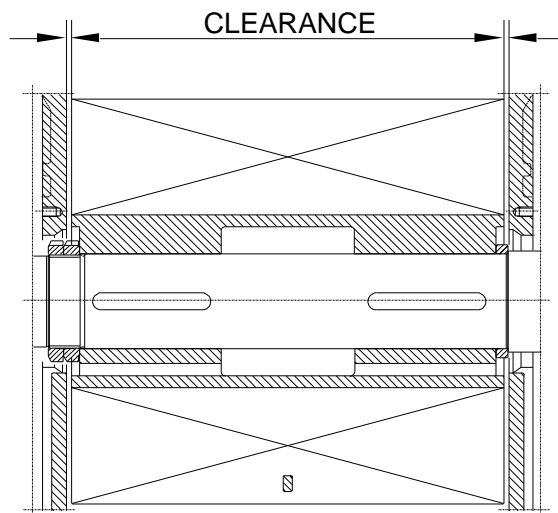


Fig. 9

Tab. 9
RECOMMENDED
INITIAL CLEARANCES

PUMP MATERIALS	CLEARANCE each SIDE (mm)	CLEARANCE each IMPELLER (mm)
GH - F - RA	0,40 to 0,50	0,80 to 1,00
A3	0,50 to 0,60	1,00 to 1,20

6.1 - TYPICAL SCHEMATICS FOR MACHINING TO RESTORE CLEARANCES

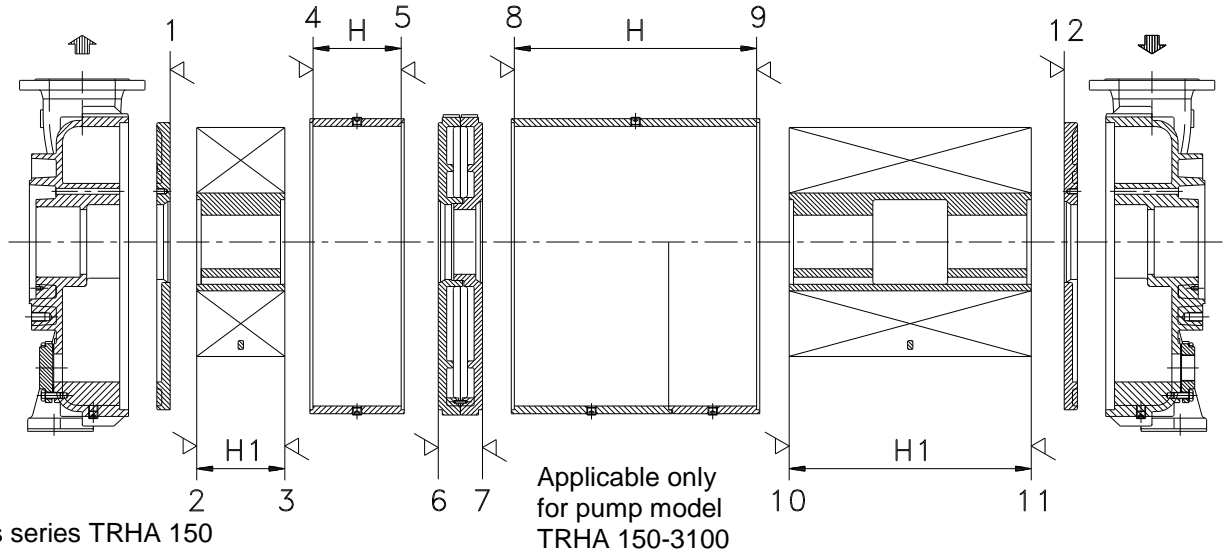


Fig. 10 - Pumps series TRHA 150

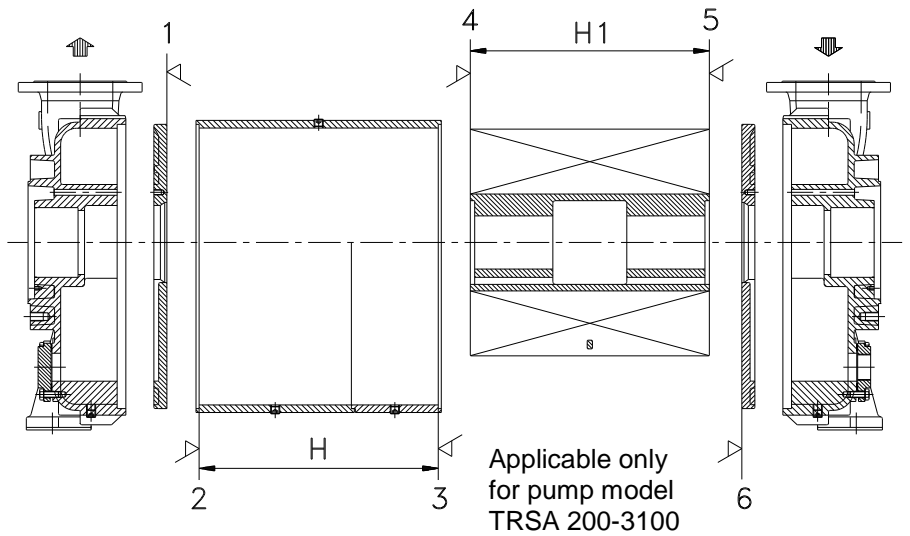


Fig. 11 - Pumps series TRSA 200

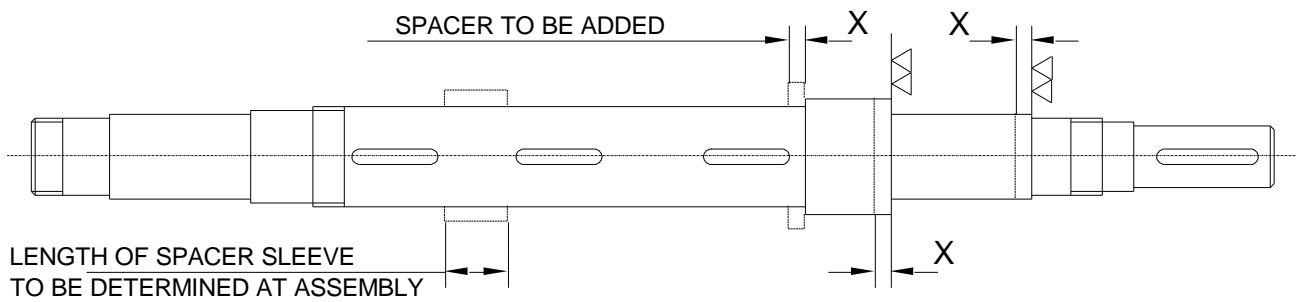


Fig. 12 - Pumps series TRHA 150

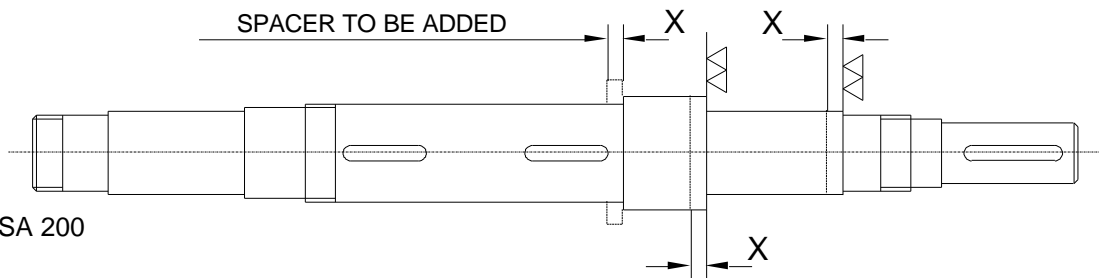


Fig. 13 - Pumps series TRSA 200

NOTE:
 X = Amount of material to be removed equals the sum of material thickness removed from each side of impeller(s) and from all machined port plates. The shoulder ring to be added (over and above the standard VDMA 505.1) has a thickness of "X" less the amount of material removed from the suction port plate 12 or 6.

7 - PUMP ASSEMBLY

Please read and understand these instructions before starting assembly.
Procure all required parts and tools necessary for the assembly. When working on pump series TRH 150, the initial operation is to find the length of spacer sleeve VDMA 521 that fits between the 2 impellers (see fig. 14).

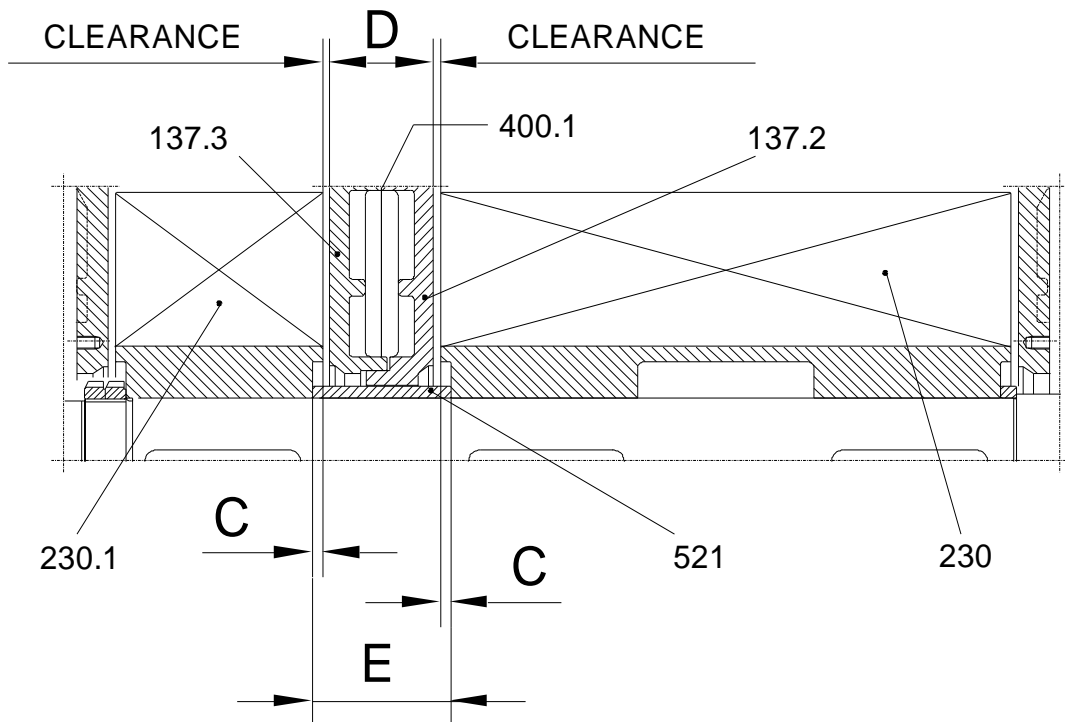


Fig. 14

Measure the recess "C" at both impellers VDMA 230 and 230.1, measure the thickness "D" of intermediate plates pack, VDMA 137.2 and 137.3, which includes the gasket VDMA 400.1 between them.

Length "E" of spacer sleeve VDMA 521 is given by adding the 2 "C" dimensions, plus "D" dimension plus the 2 clearances originally recommended for this pump series (see tab. 9).

If spacer sleeve VDMA 521 is too long it should be machined and if it is too short additional spacers should be introduced.

Clamp shaft VDMA 210 horizontally in a proper vice, slide over the shaft the adjustment spacer that will rest between the first stage impeller VDMA 230 and the shaft shoulder (see chapter 6).

Fit keys VDMA 940.1 for first stage impeller, slide impeller VDMA 230 over the shaft.

For pump series TRH 150 slide over the shaft the impeller spacer sleeve VDMA 521, the intermediate plate pack VDMA 137.2 and 137.3 inclusive of gasket VDMA 400.1.

Add shaft key and second impeller VDMA 230.1.

Lock the assembly with bearing nut VDMA 922 (see fig. 17 or 18).

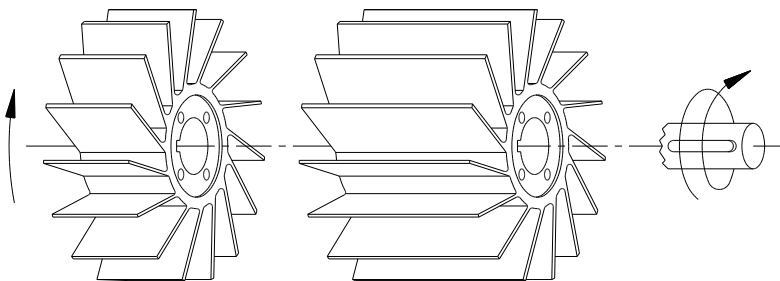


Fig. 15 - Pumps series TRHA 150

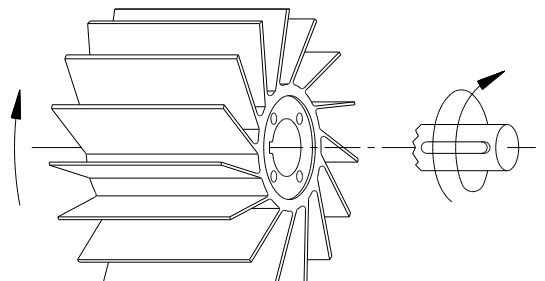


Fig. 16 - Pumps series TRSA 200

NOTE: Impeller blades must point to the rotation of the pump; normally clockwise when viewed from drive-end side. For special designs, with counter clockwise rotation, the impeller blades will point to the left (see fig. 15 or 16).

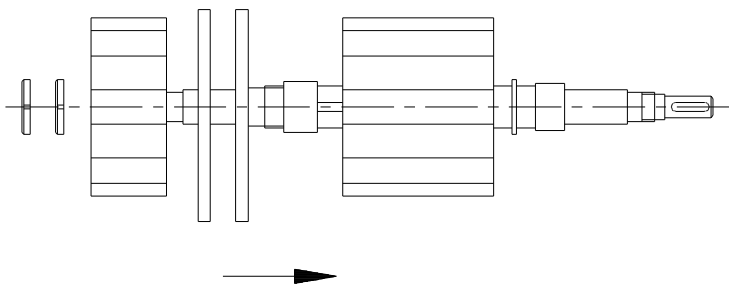


Fig. 17 - Pumps series TRHA 150 (step I)

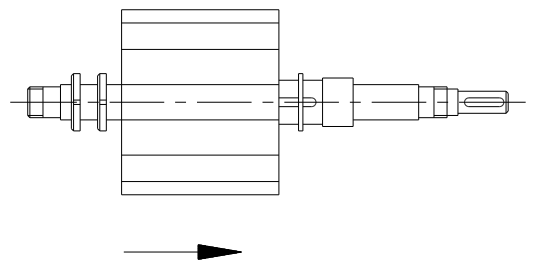


Fig. 18 - Pumps series TRSA 200 (step I)

To facilitate the assembly, pre-assemble pump casing VDMA 106 and 107 with their respective intermediate plate VDMA 137.1 or 137.4 gasket VDMA 400.5 and screws VDMA 914.1.

Place the suction casing assembly horizontally over a solid stand (section of heavy duty pipe or similar stand) suitable for holding the weight of the total pump, see fig. 19 to 22.

Place gasket VDMA 400.2 then impeller casing VDMA 110 on suction casing, (for TRHA 150-3100 or TRSA 200-3100 this is made in 2 pieces with gasket VDMA 400.4 in between).

Be sure to align the marking on the casting with the centre line of the suction casing.

Remove the rotor assembly from the vies utilising a shaft nut with a proper hook.

Slide the shaft drive end through the pump suction casing, fig. 19 or 21.

Proceed with assembly following the sequence as given in fig. 20 or 22 and tab. 10.

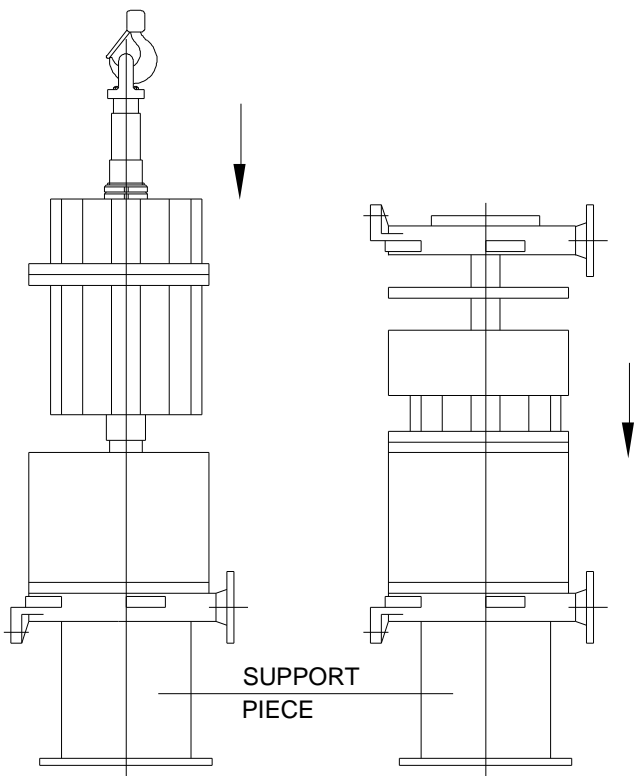


Fig. 19 and 20
Pumps series TRHA 150 (steps II and III)

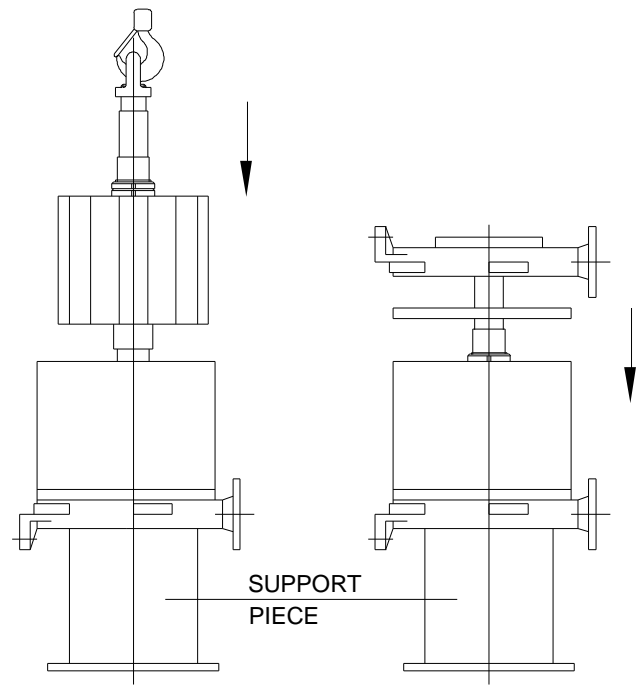


Fig. 21 and 22
Pumps series TRSA 200 (steps II and III)

Tab. 10 - ASSEMBLY OF TOTAL PUMP

STEP I									
COMPONENT	SHOULDER RING	IMPELLER 1st STAGE	SPACER SLEEVE	DISCHARGE PLATE	GASKET	SUCTION PLATE	IMPELLER 2nd STAGE	NUTS	SPACER RING
VDMA No.	505.1	230	521	137.2	400.1	137.3	230.1	922	485
QUANTITY	1	1	1	1	1	1	1	2	1
SERIES TRHA 150 ONLY									

STEP II									
COMPONENT	SUCTION CASING	GASKET	SUCTION PLATE	SCREWS	GASKET	IMPELLER CASING	GASKET	IMPELLER CASING	GASKET
VDMA No.	106	400.5	137.1	914.1	400.2	110.2	400.4	110	400.2
QUANTITY	1	1	1	2	1	1	1	1	1
MODELS TRHA 150-3100 & TRSA 200-3100 ONLY									

STEP III									
COMPONENT	GASKET	IMPELLER CASING	GASKET	DISCHARGE PLATE	GASKET	DISCHARGE CASING	SCREWS	TIE-BOLTS	TUBING
VDMA No.	400.2	110.1	400.2	137.4	400.5	107	914.1	905	701
QUANTITY	1	1	1	1	1	1	2	8	1
SERIES TRHA 150 ONLY									

STEP IV		
GASKETS	MANIFOLD	BOLTS OR STUDS
400.8	147	901.8 or 902.2
2 or 4	1 or 2	16 or 32

After fitting the discharge casing VDMA 107 (including discharge plate VDMA 137.4, gasket VDMA 400.5 and screws VDMA 914.1) introduce and lightly tighten the tie-bolts VDMA 905.

Place the pump horizontally over a flat surface.

Align pump casings, centre bodies and intermediate plates utilising the markings on the castings.

Torque the tie-bolts to 25 kgm with a proper torque wrench.

To check rotor axial travel and the clearances of the impellers with their respective intermediate plates it is necessary to temporarily mount the 2 bearing housings VDMA 357 with 2 “dummy bearings”.

These are 2 discs with a centre bore, preferably brass material.

The outside diameter is less and the inside diameter is greater than the diameters of the real bearing.

The discs will have an external shoulder and 2 threaded holes for extraction (see fig. 23).

Check the total rotor travel by pushing first toward one side and then to the other side.

Half of the measured travel is the available clearance on each side of the impeller(s).

If this clearance is not within the requirements (0,25 mm each side), disassemble the pump and check every component to find the mistake. Correct the error and reassemble per above steps.

Remove the “dummy bearings” and bearing housings VDMA 357.

Install mechanical seals per chapter 2 and bearings per chapter 3 (see fig. 24 or 25).

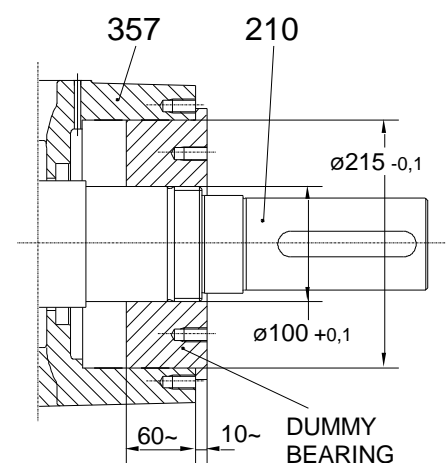


Fig. 23

Complete assembly by installing tubing VDMA 701, manifold(s) VDMA 147 with respective gasket VDMA 400.8 and bolts VDMA 901.8 or studs VDMA 902.2 (step IV).

Hydrotest the pump at pressure of 3 to 4 bar. Check pump and seals for leakage, rotate the rotor by hand making certain that there is no internal metal to metal contact and the rotor rotates freely.

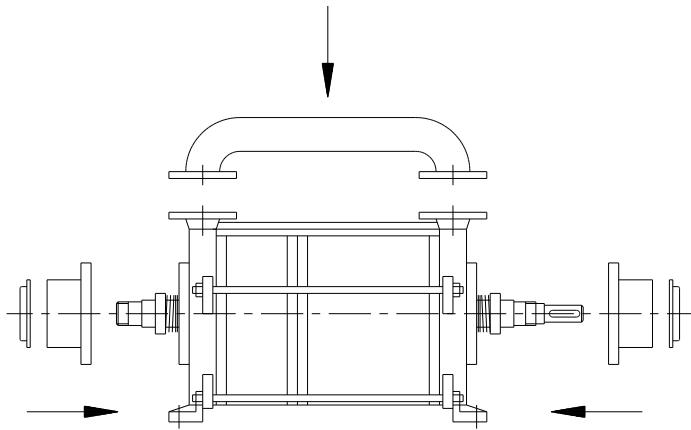


Fig. 24 - Pumps series TRHA 150 (Step IV)

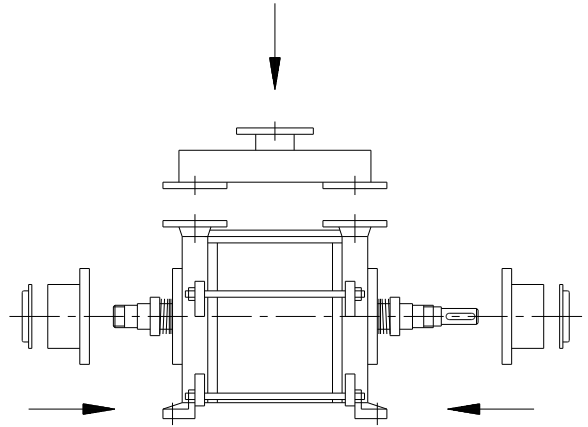


Fig. 25 - Pumps series TRSA 200 (Step IV)

8 - PARTS LIST

VDMA NO.	DESCRIPTION
106	Suction casing
107	Discharge casing
110	Impeller casing
110.1	Impeller casing
110.2	Impeller casing
137.1	Suction plate
137.2	Discharge plate
137.3	Suction plate
137.4	Discharge plate
147	Manifold
210	Shaft
230	Impeller, 1st stage
230.1	Impeller, 2nd stage
320	Ball bearing, single row
322	Roller bearing, double row
350	Bearing housing
357	Mechanical seal and bearing housing
360	Bearing cover
360.1	Bearing cover
400.1	Gasket
400.2	Gasket
400.3	Gasket
400.4	Gasket
400.5	Gasket
400.6	Gasket
400.7	Gasket
400.8	Gasket
421	Radial seal ring
433.1	Mechanical seal
433.2	Mechanical seal
441	Mechanical seal housing
471	Mechanical seal cover
485	Spacer ring
505	Shoulder ring
505.1	Shoulder ring

VDMA NO.	DESCRIPTION
507	Thrower
521	Spacer sleeve
541	Register bush
562	Pin
636	Grease nipple
672	Cock
701	Tubing
721	Flange
721.1	Flange
721.2	Flange
723	Flange
723.1	Flange
731	Fitting
731.5	"T" fitting
736	Nipple
901	Screw
901.1	Screw
901.2	Screw
901.3	Screw
901.8	Bolt
902	Stud
902.1	Stud
902.2	Stud
903	Plug
903.2	Plug
903.3	Plug
903.7	Plug
904	Grub screw
905	Tie-bolt with nuts and washers
914	Screw
914.1	Screw
922	Nut
923	Lockring
940	Key
940.1	Key

9 - TYPICAL SECTIONAL DRAWINGS

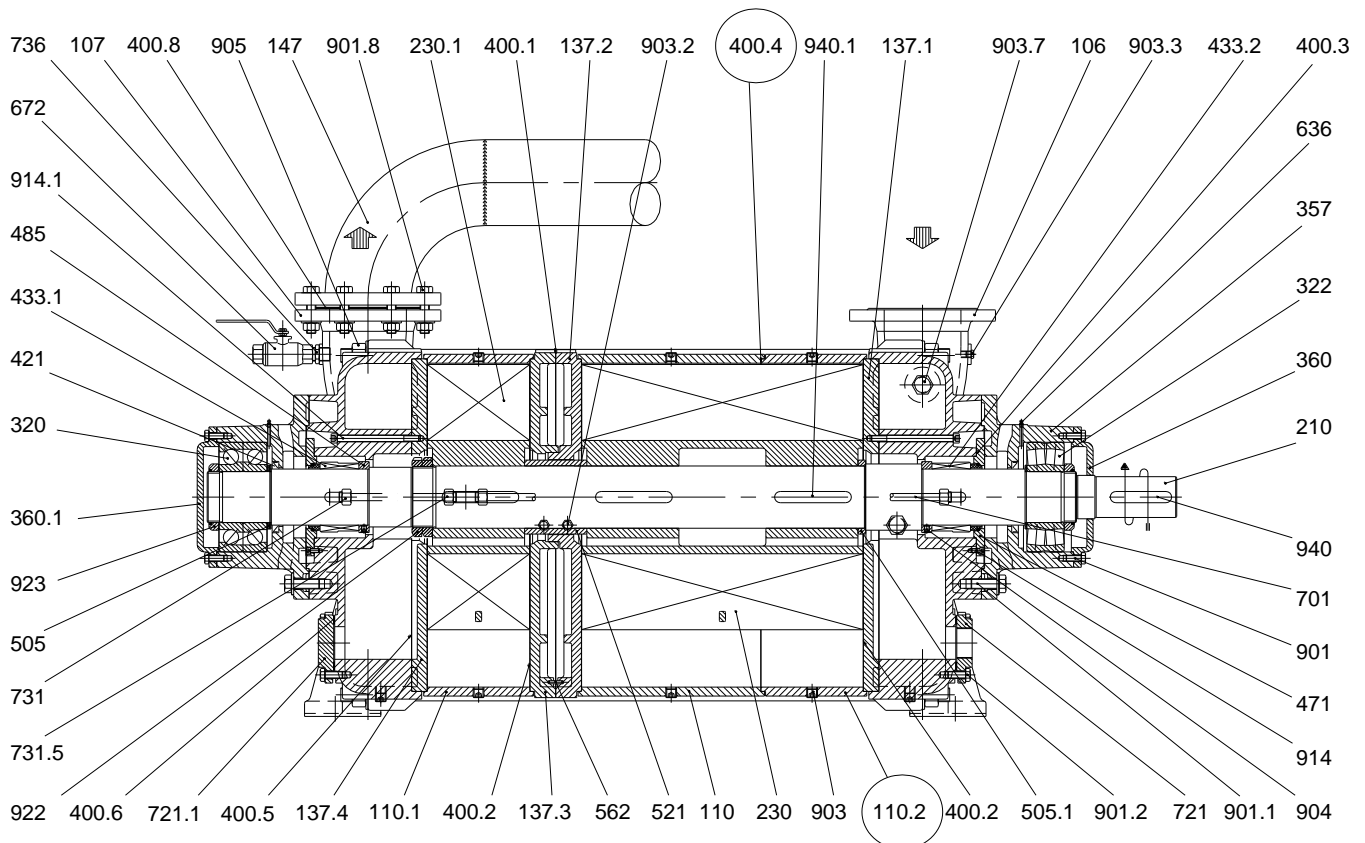


Fig. 26 - TYPICAL SECTIONAL DRAWING WITH "SINGLE" MECHANICAL SEALS - Series TRHA 150

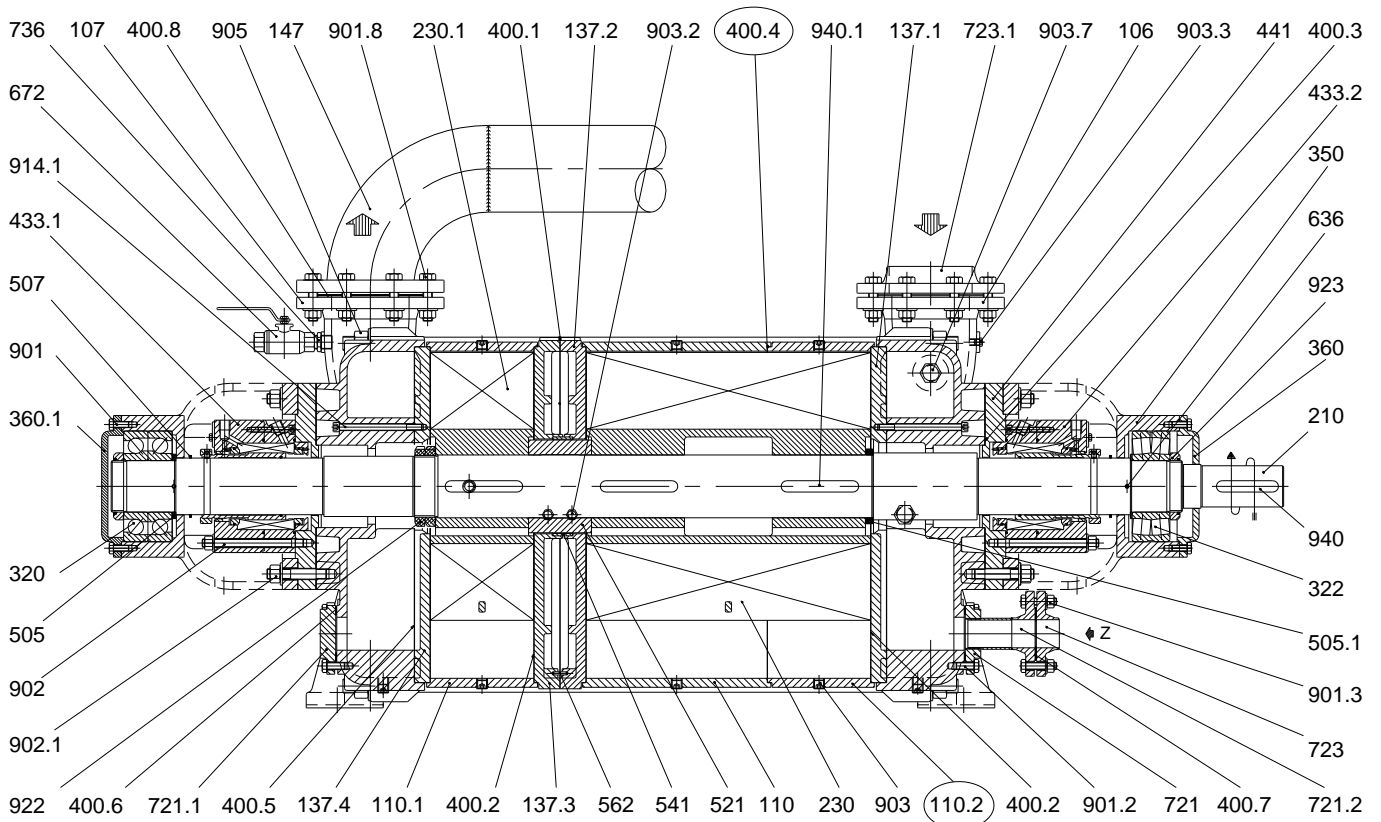


Fig. 27 - TYPICAL SECTIONAL DRAWING WITH "A CARTUCCIA" MECHANICAL SEALS - Series TRHA 150

Z = Liquid supply inlet

○ = Pump type TRHA 150-3100 only

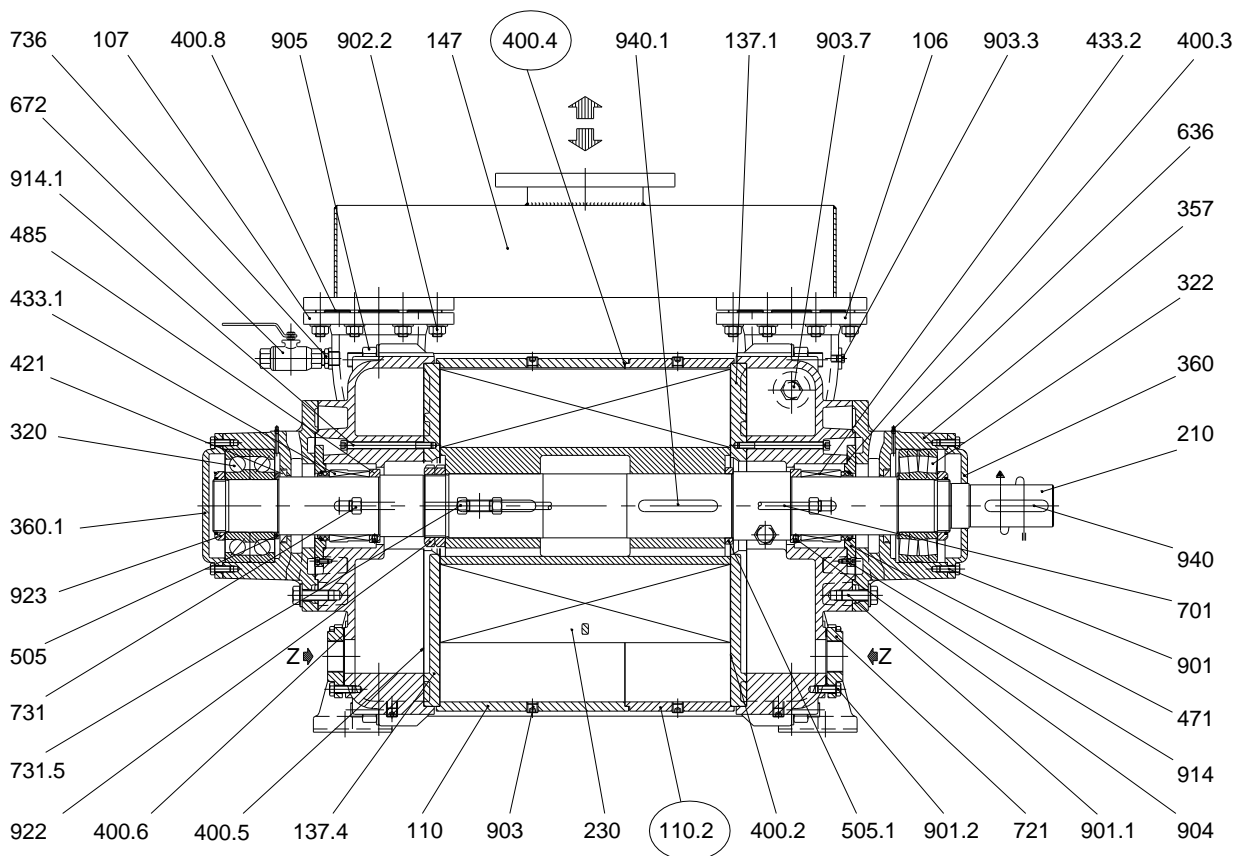


Fig. 28 - TYPICAL SECTIONAL DRAWING WITH "SINGLE" MECHANICAL SEALS - Series TRSA 200

Z = Liquid supply inlet

○ = Pump type TRSA 200-3100 only

10 - RECOMMENDED SPARE PARTS

It is a good practice to keep a minimum stock of spare parts in order to face possible failure, especially when no spare pumps have been installed.

Therefore, for each pump, it is advisable to keep in store:

- 1 Set of impellers
- 1 Set of elements
- 1 Complete shaft
- 1 Set of bearings
- 1 Set of mechanical seals
- 1 Set of gaskets
- 1 Set of shoulder rings for bearings



According to what expected from 2012/19/UE Directive on Waste Electric and Electronic Equipment the electrical pump assembly from us supplied (pump coupled with an electrical motor of Pompetravaini supply or customer supply) placed on the market after the 15th of August 2018 fell within the limits of application of the Directive. As a consequence, conforming to article 14 of the 2012/19/UE Directive of the European Parliament of the 4th of July 2012, Pompetravaini Spa is registered on the Italian list of EEE manufacturer. The electrical pump assembly supplied by Pompetravaini Spa that should be discontinued from use must not be disposed with common waste because it is composed of different materials that can be recycled at the appropriate facilities. If it is not intended to proceed autonomously at the management of the electrical pump assembly at authorized disposal companies it is possible to contact the Pompetravaini branch closer to you that will give you the necessary information on a proper disposal in accordance with mandatory laws. The pump unit must be previously cleaned up by the pumped product upon disposal.

After reclamation the electrical pump assembly is not potentially dangerous for human health and environment, not containing harmful substances according to 2011/65/UE (RoHs) Directive, but if abandoned in the environment will have a negative impact on the ecosystem.

Sending the electrical pump assembly to an adequate process of disposal and recovery of materials protect the environment and help to limits consumption of available resources with effective recycling of materials.

The abandonment in the environment of the apparatus or the illegal disposal of the same are punished by law.

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MONOSTAGE CENTRIFUGAL PUMPS

**MAGNETIC DRIVE
MONOSTAGE CENTRIFUGAL PUMPS**

SELF-PRIMING CENTRIFUGAL PUMPS

**MAGNETIC DRIVE
SELF-PRIMING CENTRIFUGAL PUMPS**

MULTISTAGE CENTRIFUGAL PUMPS

LIQUID RING VACUUM PUMPS

LIQUID RING COMPRESSORS

**PACKAGE VACUUM UNITS WITH PARTIAL OR TOTAL
SERVICE LIQUID RECIRCULATION**

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Continuing research of POMPETRAVAINI results in product improvements: therefore, any specification may subject to change without notice.

