pompetravaini

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DISASSEMBLY & ASSEMBLY INSTRUCTIONS MULTISTAGE CENTRIFUGAL PUMPS

TMA

INTRODUCTION

These instructions are for the maintenance personnel for maintenance and/or repair of the indicated pump series.
Disassembly and assembly requires expertise and knowledge of the procedures, therefore the work must be carried out by qualified personnel. These instructions must be carefully read and understood in conjunction with the section drawings and tables contained in the manual, prior to attempt any work on the pumps.
For safety, installation and maintenance instructions consult the “OPERATING MANUAL FOR CENTRIFUGAL PUMPS” attached to the pump at time of shipment. Consult also any other attached instructions for accessories and/or components included with the pumps such as mechanical seals, heat exchangers, flushing systems, instrumentation, etc.
Before operating or working on the pump it is recommended to adopt safety precautions wearing safety attire (hat, glasses, gloves, shoes, etc.) and have ready the necessary tools required for the work to be done.
Do not subject the pump or its components to sudden mechanical impacts and /or distortions.
Do not damage or scratch the sealing faces. Pay particular attention not to damage flat gaskets and O-Rings.
Be careful not to leave foreign matters such as bolts, screws, washers, rags, etc. in the pump.
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.
Pump repairs and/or service carried out by customer or unauthorised personnel are not guaranteed by POMPETRAVAINI or by its subsidiaries.
NOTE: Pump parts list identify all pump components by item number (VDMA) in connection with the sectional drawings. All drawings are for reference purpose and not are certified for construction, however should additional information be required, contact POMPETRAVAINI or its closest representative.
See fig. 24 and tab. 5 for allowed bolts, nuts and screws torque values.

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The liquids 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 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 and/or system. Should you find errors, misunderstandings or discrepancies please do not hesitate to bring them to our attention.

1 - PROCEDURES PRIOR TO PUMP DISASSEMBLY

Should pump repairs be required, it is recommended to acquire full familiarity of the procedures to be followed by studying these instructions and the “Operating Manual for Centrifugal Pumps”.

FOLLOW THE SAFETY INSTRUCTIONS LISTED UNDER CHAPTER 2 OF THE AFORE MENTIONED OPERATING MANUAL.

Prior to working on the pump it is recommended to:
- wear safety equipment (hard hat, safety glasses, gloves, safety shoes, etc.)

- **DISCONNECT THE ELECTRICAL POWER AND, IF REQUIRED, DISCONNECT THE ELECTRICAL CABLE AT THE MOTOR TERMINAL BOX.**
- close pump isolating valves at suction and discharge pipelines
- relieve the pump internal pressure
- if the pump is handling hot liquids, let the pump cool off to ambient temperature
- if the pump is handling hazardous liquids adopt safety measures (it is necessary to be fully aware of the liquid characteristics prior to pumping it)
- drain the pump casing through by removing the drain plugs, rinse the pump with neutral liquid, if required.

To remove the pump and the motor (if required) from the installation proceed as follows:
- remove the bolts on the suction and discharge flanges
- disconnect any flushing lines, accessories and/or instrumentation connected to the pump assembly
- remove the coupling guard
- remove the coupling spacer, if present
- remove the motor, if necessary, by removing the anchor bolts from motor feet or from the motor flange in the case of monoblock assemblies
- remove the pump by removing the bolts from the pump’s feet
- disconnect the pump from the installation with caution, do not damage any components
- refer to the “Operating manual for centrifugal pumps” for instructions on transporting the pump.

2 - DISASSEMBLY TO REPLACE 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 outboard bearing housing, the pump can be left connected to the installation. This is not possible for pump series **TMA 31 & 32** design **/R**, in the event of replacement of the sleeve bearing at N.D.E.
To disassemble the pump, follow the directions listed below by pump series.

WARNING: When disassembling the mechanical seals use extreme care not to damage the seal faces and the seal components.

2.1 - DISASSEMBLY OF BEARINGS AND MECHANICAL SEALS PUMP SERIES TMA 31 & 32

(See fig. 1 for pump part numbers).
Remove bolts VDMA 914 (or the nuts of studs VDMA 902 for the design with cooled seal housing VDMA 116.1 and cooling cover VDMA 116.2). Remove the cover of front bearing VDMA 360 and/or back bearing VDMA 360.1. Remove the front circlip VDMA 932 or, for design /C, the bearing nut VDMA 923. For design /C, remove the pipe VDMA 701 by acting on the fittings VDMA 731.3 and 731.4.
Remove bolts VDMA 901.1 from the bearing housing VDMA 357 and 357.1. With the help of a gear puller remove the bearing housings complete with the ball bearings, the thrower VDMA 507 and mechanical seals VDMA 433.2 and/or 433.1. Note that the back mechanical seal VDMA 433.1 for pump design /C is mounted on the shaft sleeve VDMA 523 having an anti-rotation slot.
For assembly of bearings and mechanical seals, see chapters 3 and 5.

2.2 - DISASSEMBLY OF SLEEVE BEARING AT N.D.E. PUMP SERIES TMA 31 & 32 (DESIGN /R)

(See fig. 2 for pump part numbers).
Place the pump in the up-right position with the shaft drive end VDMA 210 locked in a vice.
Remove the tie-bolts VDMA 905, remove the pump discharge casing VDMA 107 and, with a suitable gear puller, remove the sleeve bearing VDMA 310 from the discharge casing.
To reassemble the shaft sleeve bearing at N.D.E. side, see chapter 5, paragraph 5.4.

Pump series TMA 31 & 32

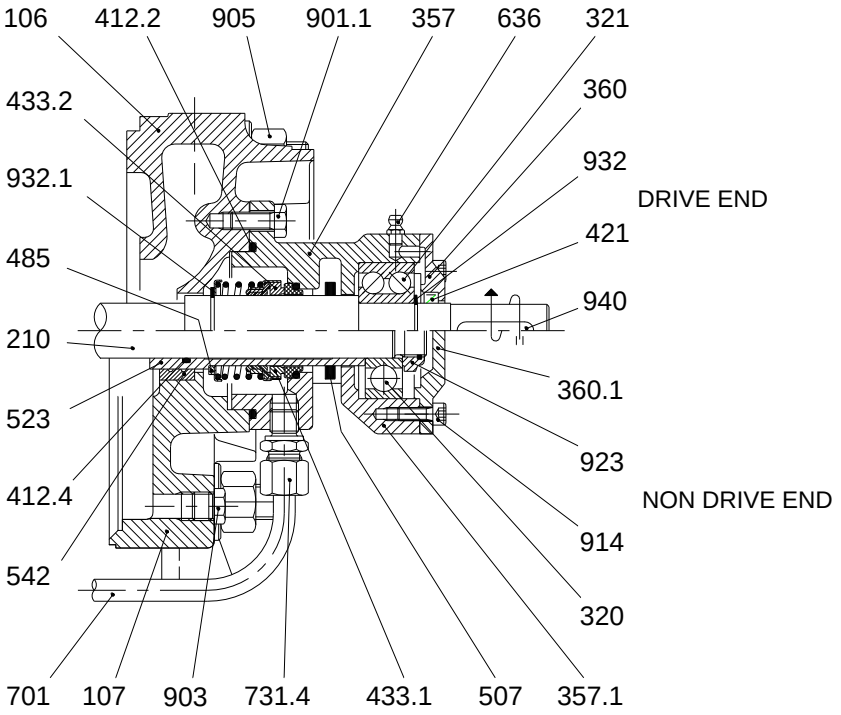


Fig. 1
Section drawing of bearing and seal housing (design /C)

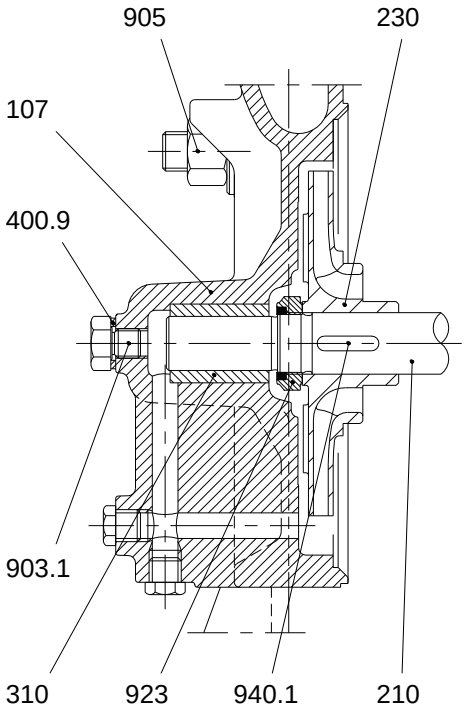


Fig. 2
Section drawing for sleeve bearing frame (design /R)

2.3 - DISASSEMBLY OF BEARINGS AND MECAHNICAL SEALS PUMP SERIES TMA 40 & 50

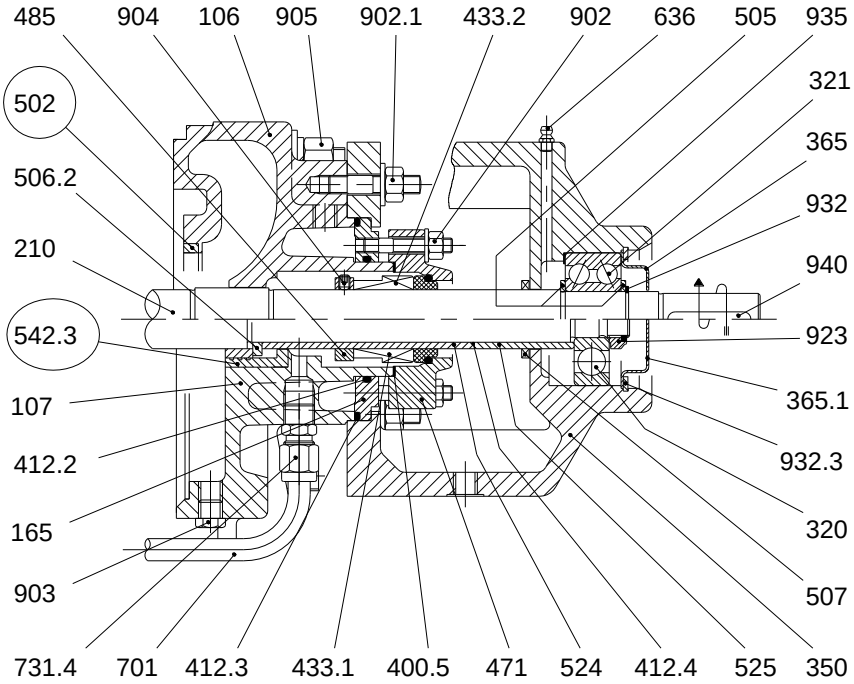
(See fig. 3 for pump part numbers).

For the **STANDARD** design remove the exterior circlip VDMA932.3 and remove the bearing cover VDMA 365 or 365.1. Remove the circlip VDMA 932 and the related spacer VDMA 505 for the D.E., or for the N.D.E. side, remove the bearing nut VDMA 923 from the shaft VDMA 210.

NOTE: For the pump with **HEAVY DUTY DESIGN /5X** (see fig. 4) it is required to remove the V-ring VDMA 411, remove the bolts VDMA 914, remove the bearing cover VDMA 360 and finally remove the bearing nut VDMA 923.1.

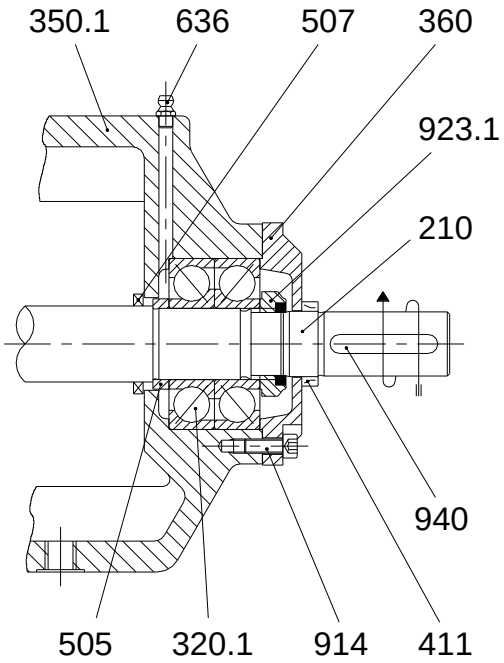
Remove the bolts from the studs VDMA 902.1 and remove the bearing housing VDMA 350 with the help of a gear puller. The bearing VDMA 321 with spacer VDMA 505 or bearing VDMA 320.1, or bearing VDMA 320 will be removed with the bearing housing. Remove the mechanical seal cover VDMA 471 with the cooling cover VDMA 165 and related O-Rings VDMA 412.2 and 412.3.Remove the stationary mechanical seal face VDMA 433.2 or 433.1 from the seal cover and remove from the shaft the mechanical seal rotating part. Note that the mechanical seal VDMA 433.1 on the pump N.D.E., is mounted on the shaft sleeve VDMA 524 having an anti-rotating slot.

To remove this shaft sleeve it is required to first remove the spacer VDMA 525 and O-Ring VDMA 412.4.



Pump series TMA 40 & 50

Fig. 3
Section drawing of ball bearing and single mechanical seal housing (STANDARD Design)



Pump series TMA 40 & 50

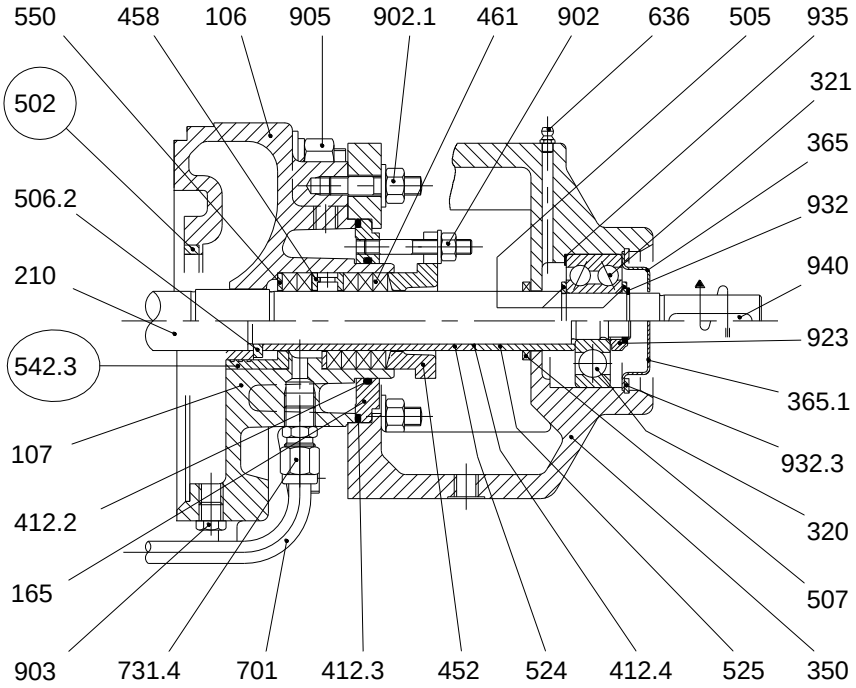
Fig. 4
Section drawing of ball bearing housing for HEAVY DUTY DESIGN /5X

Inspect all dismantled pump components and procure original replacement parts such as bearings, mechanical seals, sleeve bearings, gaskets, O-Rings, V-rings, etc.
For reassembly of mechanical seals and bearings see chapters 3 and 5.

2.4 - DISASSEMBLY OF BEARINGS AND PACKED STUFFING BOXES PUMP SERIES TMA 40 & 50

(See fig. 5 for pump part numbers).
After the removal of bearing housing VDMA 350, as described in paragraph 2.3, remove the packing gland VDMA 452 with the cooling cover VDMA 165 and the O-Rings VDMA 412.2 and 412.3.
Remove the packing rings VDMA 461 and the lantern ring VDMA 458 at the drive end.

Inspect all dismantled pump components and procure original replacement parts such as bearings, packing rings, sleeve bearings, gaskets, O-Rings, V-rings, etc.
For reassembly of packed stuffing boxes and bearings see chapters 4 and 5.



Pump series TMA 40 & 50

DRIVE END

Fig. 5
Section drawing of ball bearing housing and packed stuffing box

NON DRIVE END

NOTE: Contact POMPETRAVAINI for disassembly instructions of other special designs such as double mechanical seals (series or back-to-back), cartridge seals, etc.

3 - ASSEMBLY OF MECHANICAL SEALS

NOTE: The standard mechanical seals are dimensionally unified to DIN 24960/K, with short working length “L1”. Dimensions for NON standard mechanical seals are available upon request.
Listed below are important dimensions that should be verified before fitting mechanical seals VDMA 433.2 and/or 433.1.

Pump series **TMA 31 & 32** verify dimensions “G” and “F” on the bearing housing VDMA 357 and/or 357.1, dimension “D” on shaft VDMA 210, dimension “L” from casings VDMA 106 and/or 107 to seal locating ring VDMA 485 or circlip VDMA 932.1(see fig. 6 and tab. 1).
Where required, the working length “L1” (=”L + F”) of the mechanical seal can be adjusted by adjusting the seal locating ring VDMA 485 or the seal spacers VDMA 550.1 (see fig. 25 or 27 or 28).

Pump series **TMA 40 & 50** verify dimensions “G” and “F” on the seal cover VDMA 471 or, where applicable, on the insert VDMA 542, dimension “D” on the shaft VDMA 210, dimension “L” from casings VDMA 106 and/or 107 to the seal locating ring VDMA 485 (see fig. 7 and tab. 1).
Where required, the working length “L1” (= ”L + F”) of the mechanical seal can be adjusted by adjusting the seal locating ring VDMA 485 or the seal spacers VDMA 550.1 or on the sleeve spacer VDMA 524 (see fig. 32).

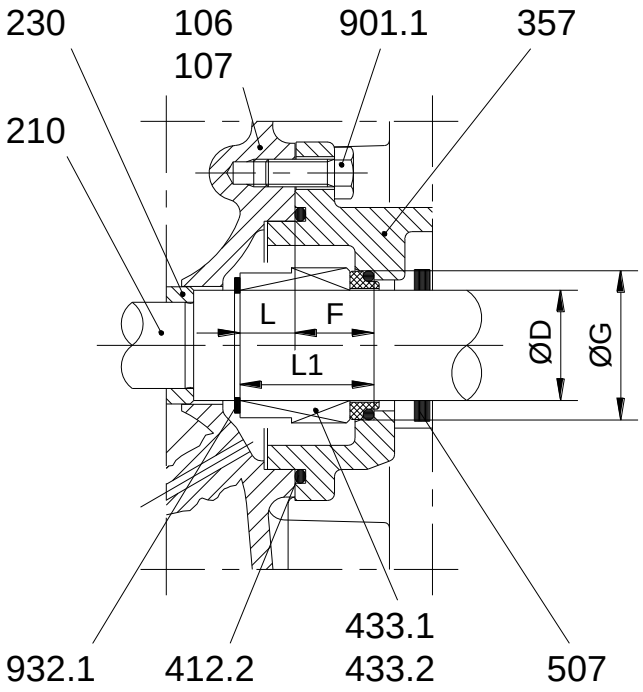


Fig. 6
Typical mechanical seal drawing.
Dimensions applicable to both pump ends (D.E. and N.D.E.) for pump series TMA 31 & 32

Tab. 1
MECHANICAL SEAL DIMENSIONS

PUMP SERIES	Ø D h6	F	Ø G H8	L	L1 ±0,5
TMA 31 & 32	32	26,5	48	16	42,5
TMA 40 & 50		21		21,5	

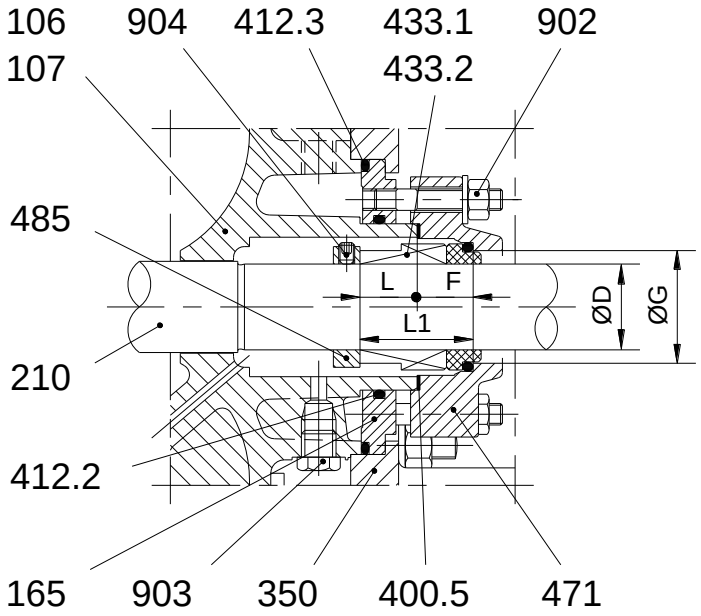
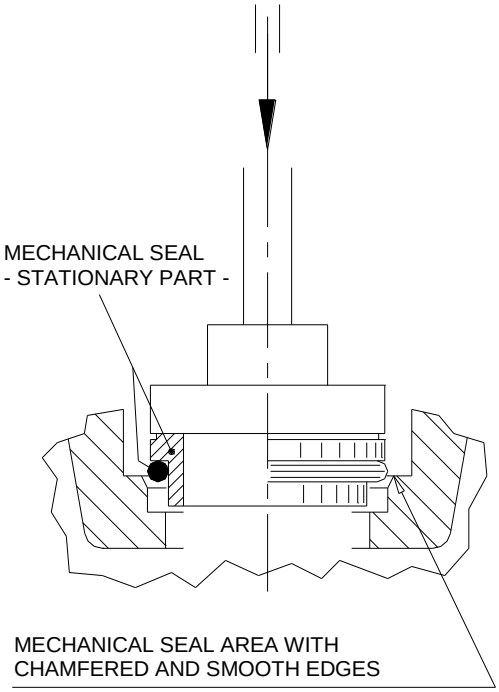


Fig. 7
Typical mechanical seal drawing.
Dimensions applicable to both pump ends (D.E. and N.D.E.) for pump series TMA 40 & 50

3.1 - STATIONARY SEAL FACE ASSEMBLY IN BEARING HOUSING OR MECHANICAL SEAL COVER

Fig. 8

The area where the stationary seal face should fit, must be smooth, without tool markings and with chamfered edges.
The seal seat area and the O-Ring of the stationary seal face should be lubricated with soapy water solution, Vaseline, etc. (avoid using oils).
Push the stationary seal face (with O-Ring) in the bearing housing and/or seal cover with the help of a “plug” having its face covered with a soft material (plastic or cardboard material).
The use of an arbour press or the shaft of a drill press may be helpful with this operation (see fig. 8).

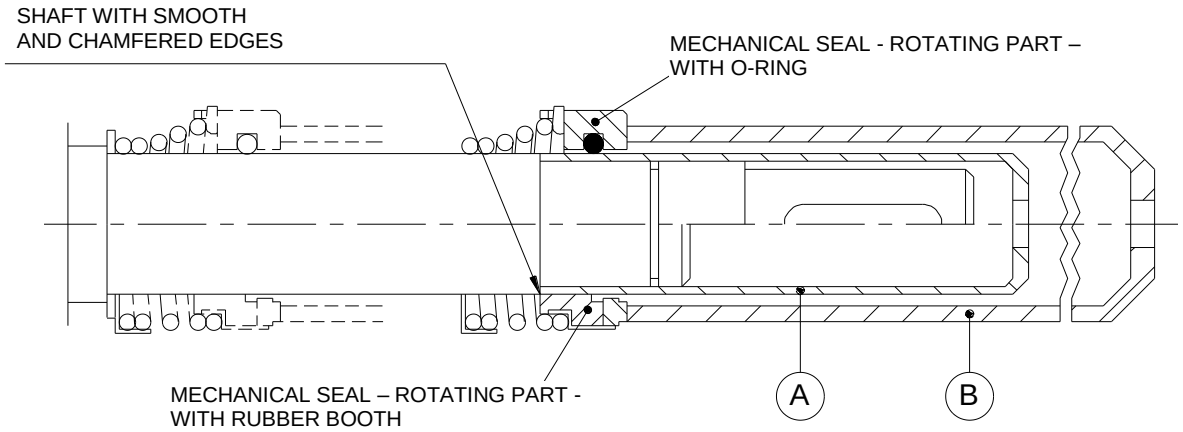


3.2 - ROTATING SEAL FACE ASSEMBLY ON PUMP SHAFT OR SHAFT SLEEVE

The area of the shaft VDMA 210 and/or shaft sleeve VDMA 523 or 524, where the mechanical seal will rest, should be polished with care using extra fine emery cloth.
This area should then be lubricated with soapy water solution, Vaseline or similar lubricants (avoid using oils).
Fit on the shaft VDMA 210, or shaft sleeve VDMA 524, the seal locating ring VDMA 485 or the circlip VDMA 932.1 or the spacers VDMA 550.1, slide the seal rotating part over a conical sleeve “A” or similar tool (see fig. 9) having a very smooth surface and slightly lubricated.
Protect the seal face with a soft material and, with the help of a suitable sleeve “B”, push the seal rotating part over the shaft or shaft sleeve until it comes to rest against the locating ring VDMA 485 or the circlip VDMA 932.1 or the spacers VDMA 550.1 or the shaft sleeve VDMA 523 or 524.
Mechanical seals are very delicate therefore, use extreme care when handling them.

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

Fig. 9



For pump series **TMA 31 & 32**, fit the bearing housing VDMA 357 and/or 357.1 complete with the previously fitted stationary seal face VDMA 431.2 or 433.1 and O-Ring VDMA 412.2.
Fit and tighten the bolts VDMA 901.1 to the casings VDMA 106 and/or 107.

For pump series **TMA 40 & 50** with studs VDMA 902, fit the seal cover VDMA 471 complete with the previously fitted stationary seal face VDMA 433.2 or 433.1 to the cooling cover VDMA 165 but leaving the nuts finger tight.
Place the O-Rings VDMA 412.2 and 412.3 on the cooling cover VDMA 165 and the gasket VDMA 400.5 in the seal cover VDMA 471, place the assembly in the bearing housing VDMA 350 and then fit the whole assembly on the shaft VDMA 210.
Tighten the casings studs VDMA 902.1; to prevent mechanical seal damage install first the bearings VDMA 320 or 320.1 or 321 and then tighten the seal cover studs VDMA 902.

NOTE: The grease nipples VDMA 636 are located (viewed from the drive end) at the right hand side for pump series **TMA 31 & 32** and at the top for pump series **TMA 40 & 50.**

4 - ASSEMBLY OF PACKED STUFFING BOXES PUMP SERIES TMA 40 & 50

(See fig. 5 for pump part numbers).
Prior to beginning the assembly, check the conditions of the shaft VDMA 210 in the packing area. If it is slightly grooved it is required to clean the area with fine emery cloth.
In the event the shaft is badly grooved it is required to rework and resurface the affected area, therefore, complete pump disassembly will be required.
The packing rings may be of the preformed type (32x52x8 mm) or they can be cut to length with 45^0 cut. The length of the rings must be such as to cover the whole circumference of the shaft, approximately 145 mm long.
The packing rings should be installed in series with the joints rotated 90^0 from each other (see fig. 10).
For PARTIAL REPLACEMENT of the packing rings VDMA 461, without disassembly of bearing housing VDMA 350, it is sufficient to remove the nuts from the studs VDMA 902, pull back the packing gland VDMA 452, remove the worn packing rings (usually those close to the gland packing) with a proper tool such as a hook, replace the packing rings with new ones, replace the gland packing and the nuts on the studs.

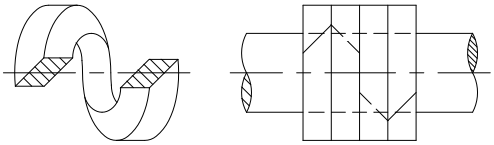


Fig. 10

For TOTAL REPLACEMENT of the packing rings VDMA 461; remove all old packing rings, ascertain that the washer VDMA 550 is at bottom of the stuffing box of casings VDMA 106 and 107. Fit 4 packing rings VDMA 461 in box of the pressure casing VDMA 107 or 2 packing rings, the lantern ring VDMA 458 and 2 more packing rings in box of the suction casing VDMA 106.
Replace the gland packing VDMA 452, position the O-Rings VDMA 412.2 and 412.3 on the cooling cover VDMA165, fit this assembly in the bearing housing VDMA 350 , fit this assembly over the shaft VDMA 210 and tighten the nuts on the studs VDMA 902.1.
See following chapter 5 for the installation of the bearings. See chapter 14 of “Operating manual for centrifugal pumps” for adjustment of stuffing boxes.

5 - ASSEMBLY OF BEARINGS

Bearing installation can begin after the mechanical seals or packing are in place and the bearing housing or bearing frames are fitted as per chapter 3.
See tab. 2 for bearing dimensions, see fig. 24 and tab. 5 for torque limitations for screws, bolts, nuts and tie-bolts.

5.1 - ASSEMBLY OF BEARING AT DRIVE END (D.E.) PUMP SERIES TMA 31 & 32

(See fig. 11 for pump part numbers).
Place a gear puller at the pump Non Drive End and push the shaft VDMA 210 toward the drive end.
Place 20 grams of grease in the bearing cavity of the bearing housing, slide the heated bearing VDMA 321 over the shaft and push it until it rests against the shaft shoulder, fit the circlip VDMA 932.
Fit the bearing cover VDMA 360 complete with radial seal ring VDMA 421 (careful not to damage the lip of the seal ring) and finally torque the screws VDMA 914.

5.2 - ASSEMBLY OF BEARING AT DRIVE END (D.E.) PUMP SERIES TMA 40 & 50

(See fig. 12 for standard pump part numbers and see fig. 4 for HEAVY DUTY DESIGN /5X pump part numbers).
Place a gear puller at the pump Non Drive End and push the shaft VDMA 210 toward the drive end.
Introduce the elastic ring VDMA 935 and the spacer VDMA 505; place 50 grams of grease in the bearing cavity of the bearing housing, slide over the shaft the heated ball bearing VDMA 321 until it rests against the spacer, fit the other spacer and the circlip VDMA 932.
Install the bearing cover VDMA 365, place the gear puller on the shaft at the Drive End and push the shaft toward the non-drive end to compress the elastic rings VDMA 935 that is beyond the bearing, so that the circlip VDMA 932.3 can be placed in the groove.
NOTE: For **HEAVY DUTY DESIGN /5X** (see fig.4). Place a gear puller at the pump Non Drive End and push the shaft VDMA 210 toward the drive end. Introduce the spacer VDMA 505; place 50 grams of grease in the bearing cavity of the bearing housing, slide over the shaft the heated ball bearings VDMA 320.1 (placed like “O”) until they rests against the spacer.
Lock the bearings with the bearing nut VDMA 923.1. Fit the bearing cover VDMA 360 and lock in place with bolts VDMA 914, fit the V-ring VDMA 411 over the shaft and against the bearing cover.

5.3 - ASSEMBLY OF BEARING AT NON DRIVE END (N.D.E.), ALL PUMP SERIES

(See fig. 11 or 12 for pump part numbers).
Fill the bearing cavity with 20 grams (TMA 31& 32) or 50 grams (TMA 40 & 50) of grease, heat the bearing VDMA 320 and slide it over the shaft until it comes to rest against the shaft sleeve VDMA 523 or 525 and 524, lock it in place with the bearing nut VDMA 923, install the bearing cover VDMA 360.1 or 365.1 and lock in place with bolts VDMA 914 or insert circlip VDMA 932.3.

5.4 - ASSEMBLY OF BEARING SLEEVE AT NON DRIVE END (N.D.E.) PUMP SERIES TMA 31 & 32(Design /R)
(See fig. 2 for pump part numbers).
When required, replace the sleeve bearing VDMA 310 (see tab.3 for dimension of inside diameter), install the discharge cover VDMA 107 with the O-Ring VDMA 412.1, install the tie-bolts VDMA 905 with washers and torque the tie-bolt nuts.

DRIVE END

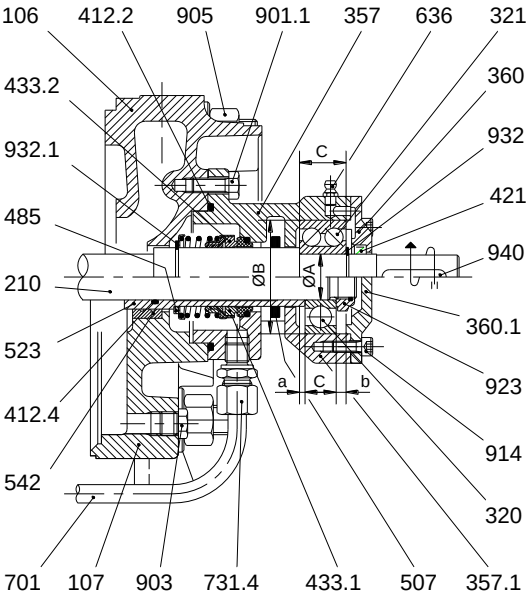
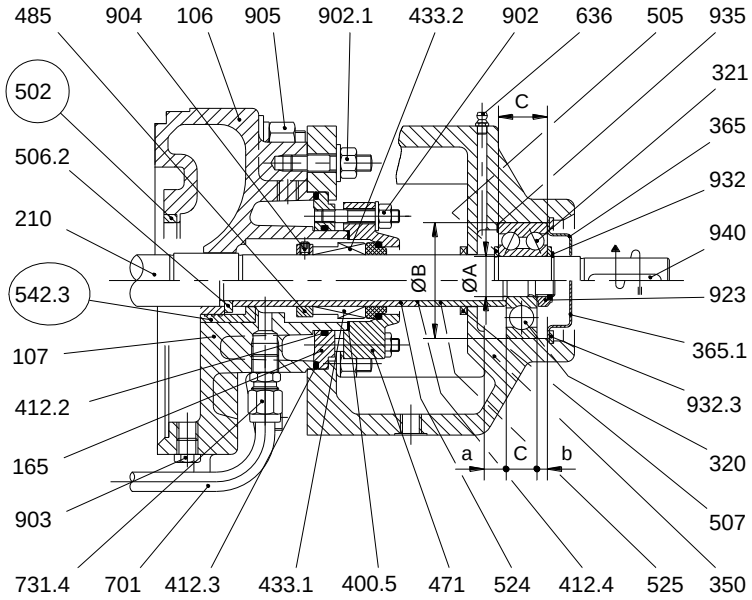


Fig. 11
Pump series TMA 31 & 32



NON DRIVE END

Fig. 12
Pump series TMA 40 & 50

Tab. 2
BEARING DIMENSIONS

PUMPS SERIES	a	b	BEARING DIMENSIONS					GREASE QUANTITY EACH BEARING grams
			Ø A	Ø B	C	SINGLE CROWN BALL BEARINGS	DOUBLE CROWN BALL BEARINGS	
TMA 31 & 32	3	5,4	25	62	17	6305	-----	20
	-----	-----			25,4	-----	3305	
TMA 40 & 50	13,6	6,4	20	72	19	6404	-----	50
	-----	-----	30		30,2	-----	3306	
TMA 40 & 50 /5X	13,6	6,4	20		19	6404 (Non-drive end)	-----	
	-----	-----	30			n° 2) 7306B (Drive end)		

6 - PUMP DISASSEMBLY INSTRUCTIONS

Complete pump disassembly is required in the event there has been a loss of pump performance that could be due to excessive wear of the impellers or there is leakage of the pumped liquid due to shaft wear or damage in the sealing areas. Replacement of the worn components will be necessary if economically feasible, or should the repair cost be excessive, the pump should be replaced with a new unit.
In this chapter we will address disassembly of the pump without the bearing housing and/or sealing housing (see fig. 13 or 14 or 15).
For disassembly or reassembly of the bearing and sealing housings see chapters 2 - 3 - 4 - 5.
Proper tools will be required for the disassembly operation and the proper sequence must be followed to prevent further damage of the pump components.

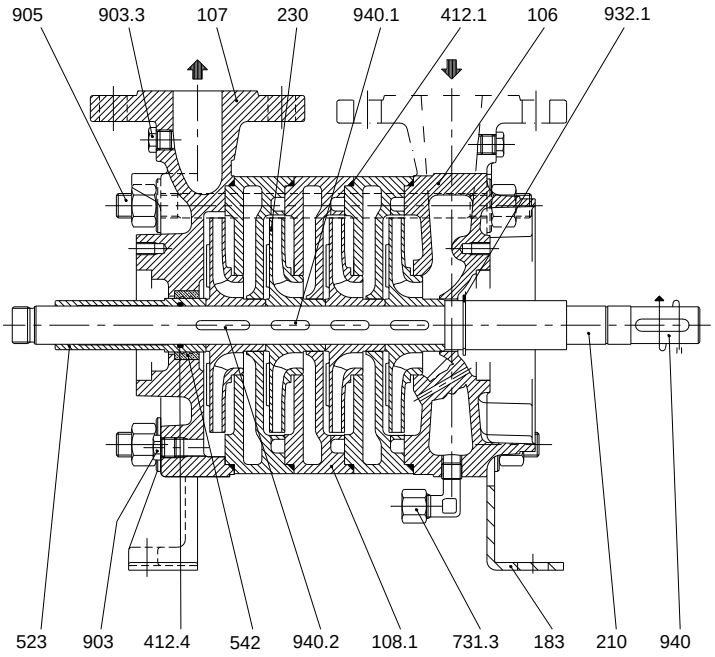


Fig. 13
Pump series TMA 31 & 32 design /C

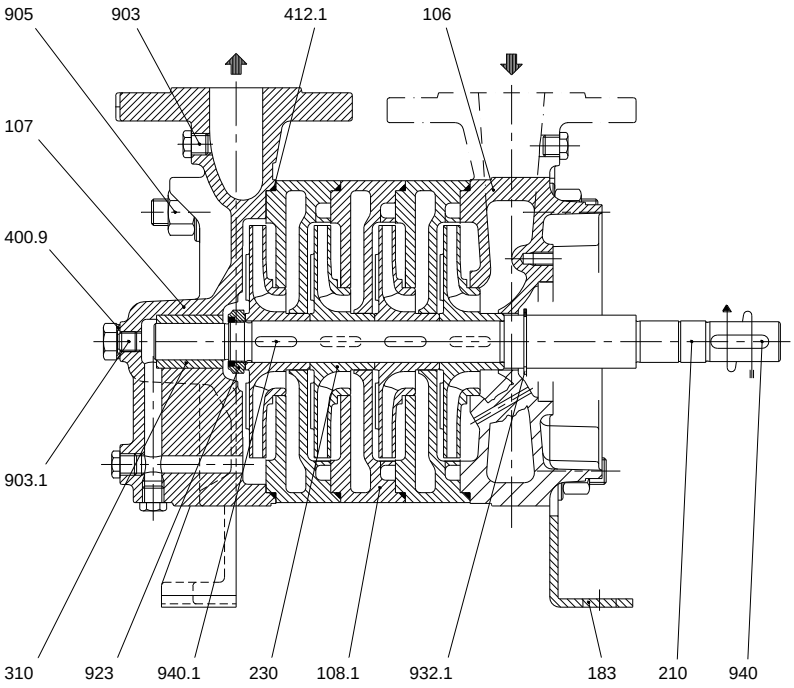


Fig. 14
Pump series TMA 31 & 32 design /R

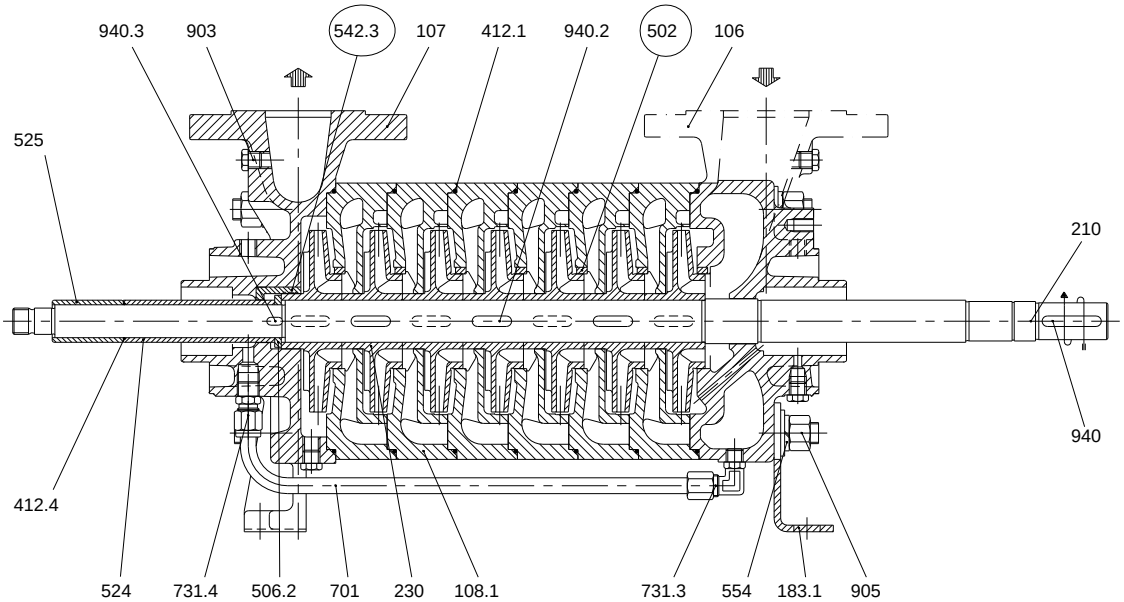


Fig. 15
Pump series TMA 40 & 50

Only for stainless steel pumps (A3)

Place the pump in the vertical position with the drive side of the shaft VDMA 210 locked in a vice, loosen the nuts of tie-bolts VDMA 905, remove the fitting VDMA 731.4 and the pipe VDMA 701 (where applicable).
Remove the tie-bolts and remove the discharge casing VDMA 107; depending upon the pump series, remove the bearing nut VDMA 923 and remove the shaft sleeve VDMA 523 or 525 and 524 with 0-Ring VDMA 412.4 and the impeller spacer VDMA 506.2.
Next remove the impeller VDMA 230, the key VDMA 940.1 or 940.2, the diffuser stage VDMA 108.1 with the O-Ring VDMA 412.1; continue removing all stages until the suction casing VDMA 106 is removed.

7 - MACHINING FOR PUMP OVERHAUL

These pump series do not allow machining to rebuild the internal clearances.
Before reassembly it is required to verify that the clearances for the pump specific series D1 - D2 - D3 - D4 - D5 are within the guidelines given in fig. 16 - 17 - 18 and tab. 3 - 4. Values different than those listed will affect the pump performance. Should any difficulties arise do not hesitate to send the pump to the POMPETRAVAINI's factory.

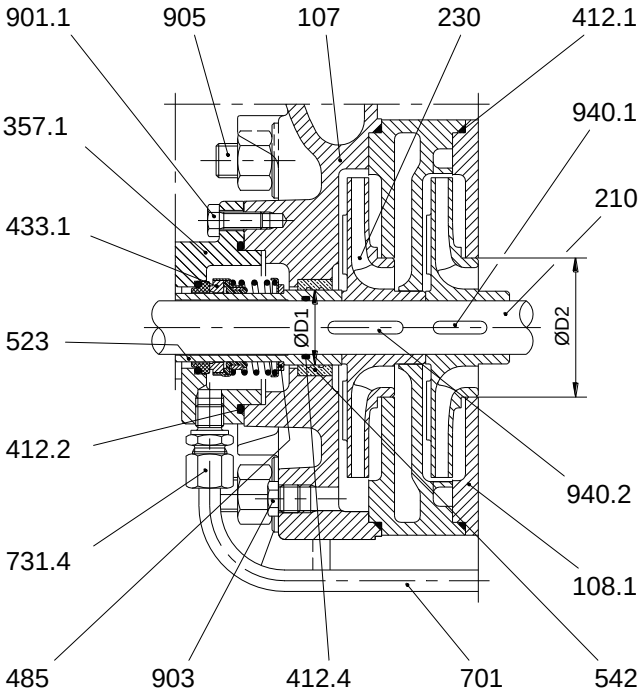


Fig. 16
Pump series TMA 31 & 32 design /C

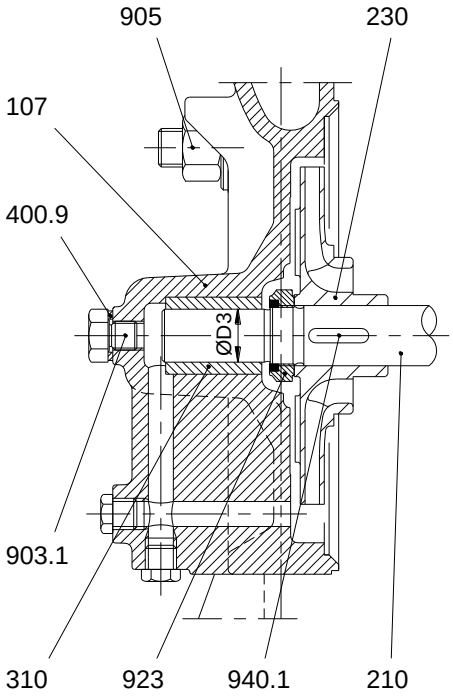


Fig. 17
Pump series TMA 31 & 32 design /R

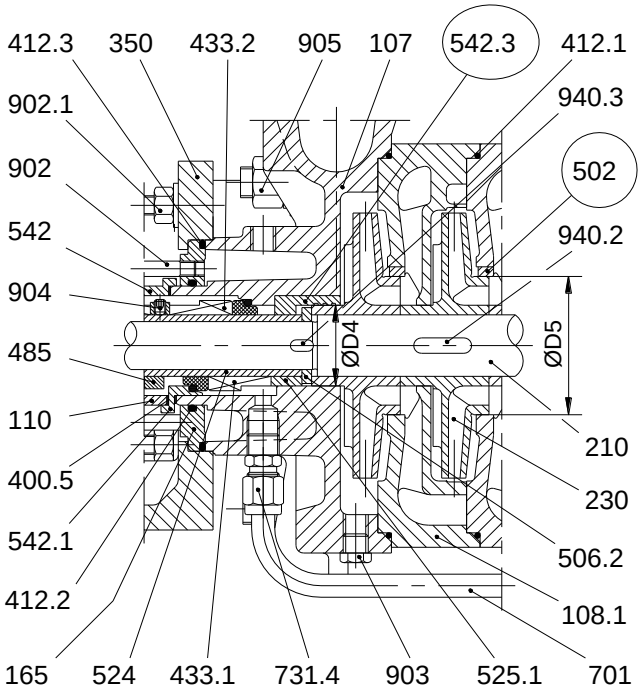


Fig. 18
Pumps series TMA 40 & 50

Tab. 3
Pumps series TMA 31 & 32

Ø D1	Ø D2	Ø D3
35 $^{+0,232}_{+0,170}$	65 H7 $^{+0,030}_{0}$	22 D7 $^{+0,086}_{+0,065}$

Tab. 4
Pumps series TMA 40 & 50

PUMPS SERIES	Ø D4	Ø D5
TMA 40	42 H7 $^{+0,025}_{0}$	72 $^{+0,100}_{+0,040}$
TMA 50	40 H7 $^{+0,025}_{0}$	84 $^{+0,100}_{+0,040}$

⬭ Only for pumps in stainless steel (A3)

8 - PUMP ASSEMBLY INSTRUCTIONS

Inspect all pump components making sure that the parts are in good condition. If the parts are reusable proceed with cleaning of same, using cleaning agents suitable for the purpose. If parts need to be replaced it is recommended to replace them only with original parts. For recommended spare parts see chapter 9.
In the event clone parts are used then verify that they are compatible with the original components.
WARNING: The use of clone parts may not provide the original pump performance and POMPETRAVAINI will not accept any responsibility for damages caused by these substituted parts that are not from the original manufacturer.
For detailed instructions of mechanical seals assembly see chapter 3.
Pump part numbers and descriptions are listed in chapter 10 and the pump section drawings are in chapter 11.
Torque values for screws, bolts, tie-bolts, and nuts are given in fig. 24 and tab. 5.
All pumps listed in the following paragraphs, are fitted with standard mechanical seals with unified dimensions to DIN 24960/K standard (having short working length "L1").
NOTE: Following assembly instructions are starting with the pump completely disassembled.

8.1 - ASSEMBLY PUMP SERIES TMA 31 & 32/C

(See fig. 25 for pump part numbers.)

1) Place the shaft in the vertical position in a vice with the shaft drive end upwards.
   Insert on the shaft the circlip VDMA 932.1that provides the shoulder for the mechanical seal VDMA 433.2, fit the mechanical seal rotating part over the shaft until it comes to rest against the circlip.
   The seal should be lubricated with a soapy solution, Vaseline or compatible oil, (usually these seals should not be lubricated with mineral oil).
   Lubricate the O-Ring of the seal stationary part and push this in the front seal housing VDMA 357.
   Clean the 2 seal faces with a soft tissue.
2) Insert the front bearing housing VDMA 357 on the shaft until the mechanical seal is compressed and at the same time slide the thrower VDMA 507 over the shaft.
   Add 20 grams of grease in the bearing housing and fit the ball bearing VDMA 321 after it has been properly heated, the bearing should be resting against the shaft shoulder and locked in place with the circlip VDMA 932.
   Fit the bearing cover VDMA 360 with the 4 bolts VDMA 914, the grease channel in the bearing cover should face the hole for the grease nipple VDMA 636.
   Fit the shaft key VDMA 940 in the shaft VDMA 210.
3) Slide the shaft with the bearing housing in the suction casing VDMA 106 with O-Ring VDMA 412.2 in between, position the hole for the bearing grease nipple at the opposite side of the suction flange (unless otherwise specified), lock the bearing housing to the suction casing with bolts VDMA 901.1.
4) Place the shaft in the vertical position in a vice with the drive end at the bottom.
   Fit in the shaft keyway the key VDMA 940.1 of the first impeller and the impeller VDMA 230.
   Fit the key for the next impeller.
   Place the O-Ring VDMA 412.1 on the suction casing VDMA 106 and introduce the stage VDMA 108.1 to fit the suction casing.
   Introduce the second impeller, the key of the third impeller, the second stage with the O-Ring, proceed in this fashion until the last impeller is fitted in place.
5) Fit the O-Ring VDMA 412.1 on the last stage VDMA 108.1 and place the discharge casing VDMA 107 in such a way that its flange will be in the vertical position, the flange of the suction casing will be on the left side of the pump (standard design, unless otherwise specified) when viewed from the drive end.
   Introduce the 4 tie-bolts VDMA 905 in the pump casings, place the sheet metal foot VDMA 183 on the suction casing facing the external of the pump and in line with the feet of the discharge casing VDMA 107, finger tighten the nuts of the tie-bolts.
6) To properly locate the front foot, place the pump horizontally on a flat plate, place the pump shaft drive end on a support which has such a height that the pump shaft centreline is at 160 mm from the plate face.
   With a square, place the suction flange at 90^0 with the pump feet.
   Torque the 4 tie-bolts with a torque wrench to the torque values listed on tab. 5.
7) Place O-Ring VDMA 412.4 inside the shaft sleeve VDMA 523.
   Slide and locate the mechanical seal locating ring VDMA 485 over the shaft sleeve VDMA 523, lubricate the seal rotating part VDMA 433.1 and slide it over the sleeve until it rests against the locating ring.
   Slide this assembly over the shaft until it rests against the last impeller.
8) Lubricate the O-Ring of the seal stationary part and push this part in the bearing housing VDMA 357.1.
   Clean the 2 seal faces with a soft tissue.
   Place the O-Ring VDMA 412.2 in the centring groove of the back bearing housing VDMA 357.1.
9) Slide the back bearing housing over the shaft and at the same time fit over the shaft the thrower VDMA 507.
   Place the bearing housing with the fitting VDMA 731.4 at the bottom, push to load the mechanical seal spring and lock in place with the 4 bolts VDMA 901.1.
10) Place 20 grams of grease in the bearing housing, heat the bearing VDMA 320 and slide it over the shaft.
    Lock the bearing nut VDMA 923 with a proper wrench.
    Install the bearing cover with the grease channel facing the grease nipple VDMA 636 and lock in place with the 4 bolts VDMA 901.1.

11) Rotate the pump shaft by hand; it should rotate freely.
Install the pipe VDMA 701 at the pump bottom.
The fitting VDMA 731.4 is installed at the discharge casing VDMA 107 and the 90^0 elbow fitting VDMA 731.3 is located at suction casing VDMA 106.
12) Give the pump an hydrostatic test pressure to 1,2 times the maximum working pressure attainable by the pump.
Proceed then with the performance test as required for the assembled pump model.

8.2 - ASSEMBLY PUMP SERIES TMA 31 & 32/R

(See fig. 26 for pump part numbers).
Proceed with assembly as given in paragraph 8.1 ("Assembly pump series TMA 31 & 32/C") up to and including point 4, then lock the impeller nut VDMA 923 to block all the impellers.
Follow the instructions with points 5 and 6 inclusive; remember that for this pump design the discharge casing VDMA 107 is complete with bearing sleeve VDMA 310.
Rotate the pump shaft by hand to be sure that it rotates freely.
Give the pump an hydrostatic test pressure to 1.2 times the maximum working pressure attainable by the pump.
Proceed then with the performance test as required for the assembled pump model.

8.3 - ASSEMBLY PUMP SERIES TMA 31 & 32/C WITH COOLED SEAL HOUSING (Design /T)

(See fig. 27 for pump part numbers).
1) Place the shaft VDMA 210 in the vertical position in a vice with the shaft drive end upwards.
Insert on the shaft the circlip VDMA 932.1that provides the shoulder for the mechanical seal VDMA 433.2, fit over the shaft the 2 spacers VDMA 550.1 and fit the mechanical seal rotating part over the shaft until it comes to rest against the spacers.
The seal should be lubricated with a soapy solution, Vaseline or compatible oil, (usually these seals should not be lubricated with mineral oil).
Lubricate the O-Ring of the seal stationary part and push this in the front seal housing VDMA 357. Clean the 2 seal faces with a soft tissue.
2) Insert the front bearing housing VDMA 357 on the shaft until the mechanical seal is compressed and at the same time slide the thrower VDMA 507 over the shaft.
Add 20 grams of grease in the bearing housing and fit the ball bearing VDMA 321 after it has been properly heated, the bearing should be resting against the shaft shoulder and locked in place with the circlip VDMA 932.
Fit the bearing cover VDMA 360 with the 4 bolts VDMA 914, the grease channel in the bearing cover should face the hole for the grease nipple VDMA 636.
Fit the shaft key VDMA 940 in the shaft VDMA 210.
3) Tighten the 4 studs VDMA 902 in the suction casing VDMA 106.
Place the O-Ring VDMA 412.2 on the cooling chamber VDMA 116.1 and place the latter on the suction casing. Place the 2 gaskets on the cooling chamber cover VDMA 116.2, (the external VDMA 400.2 and the internal VDMA 400.3) then place the cover on the cooling chamber VDMA 116.1.
Insert the shaft complete with bearing housing, in the cooling chamber cover VDMA 116.2 with the O-Ring 412.2 in between.
The grease nipple hole should be located at opposite side of the suction flange (unless otherwise specified).
Tighten the 4 bolts of the studs VDMA 902.

Follow the instructions given in points 4,5 and 6 of paragraph 8.1("Assembly pump series TMA 31 & 32/C").

7) Place on the discharge casing VDMA 107 the cooling chamber VDMA 116.1 complete with the O-Ring VDMA 412.2.
Insert the 2 gaskets (external VDMA 400.2 and internal VDMA 400.3) in the cooling chamber cover VDMA 116.2 then place the latter on the cooling chamber VDMA 116.1.
Fit the O-Ring VDMA 412.4 inside the shaft sleeve VDMA 523.
Fit on the shaft sleeve the mechanical seal retaining ring VDMA 485 and lock it with the 2 grub screws VDMA 904 at a distance of 68.5 mm from the end of the sleeve (from the opposite end of the O-Ring, see fig. 19).
Lubricate the rotating part of the mechanical seal VDMA 433.1 and push it over the shaft sleeve until it rest against the locating ring VDMA 485.
Insert the sleeve with the seal on the shaft VDMA 210 engaging the key slot with the key VDMA 940.2, already on the shaft.

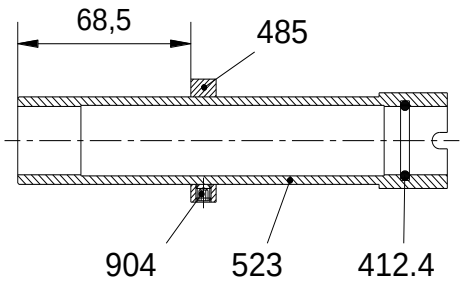


Fig. 19

Proceed with completion of pump assembly following the instructions given in points 8 to 12 of paragraph 8.1 ("Assembly pump series TMA 31 & 32/C").

8.4 - ASSEMBLY PUMP SERIES TMA 40 & 50/R

(See fig. 30 for pump part numbers).

1) Position on shaft VDMA 210 the seal locating ring VDMA 485 at a distance of 46 mm from the shaft shoulder of shaft diameter 32 mm (see fig. 20) to the face of the ring on which the mechanical seal will rest.
   Lock the shaft in a vice in the vertical position and the drive end side down.
2) Introduce the suction casing VDMA 106 over the shaft with the studs VDMA 902.1 downward (the casing should be resting on blocks so that its height will be more or less the required at the final assembly).
   Fit on the shaft the impeller key VDMA 940.2 and the first impeller VDMA 230 until it rests against the shaft shoulder.
   Fit the key for the next impeller.
   Place the O-Ring VDMA 412.1 on the stage VDMA 108.1 and fit the first stage on the engaging face of the suction casing.
   Install the second impeller, the third key, the second stage with the pertaining O-Ring and proceed with the assembly until the last impeller.

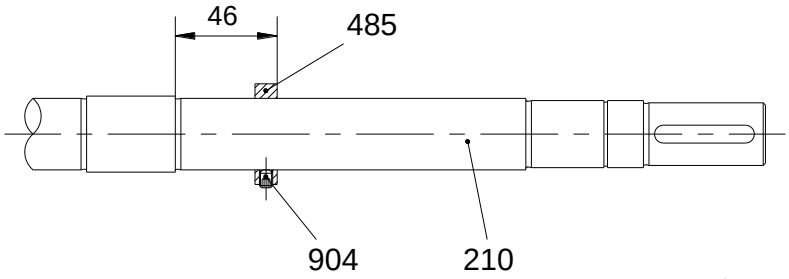


Fig. 20

3) Fit on the shaft the key VDMA 940.3 for shaft sleeve VDMA 524.
   Fit on the shaft the spacer for impeller VDMA506.2.
4) Place the last O-Ring and install the discharge casing VDMA 107.
   The feet of the discharge casing should be located in such a way that the flange of the suction casing should be at the left end side of the pump; viewed from the drive end (standard design, unless otherwise requested).
   Introduce the 4 tie-bolts VDMA 905 through the holes of both casings VDMA 106 and 107, place on the suction casing VDMA 106 the front foot VDMA 183.1 oriented to the pump outside and in line with the feet of the discharge casing VDMA 107.
5) Introduce on the shaft sleeve VDMA 524 the seal locating ring VDMA 485 and position it at a distance of 49,5 mm from the end of the shaft sleeve (side with the key slot) to the face of the ring on which the mechanical seal will rest (see fig. 21).
   Introduce the shaft sleeve on the shaft, the key slot at the bottom should be engaging the key VDMA 940.3.
   Introduce the spacer sleeve VDMA 525 over the shaft VDMA 210, install a dummy spacer in place of the bearing and pack the impellers by torque the bearing nut VDMA 923.

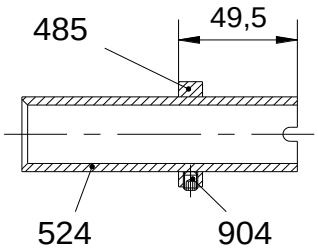


Fig. 21

6) To properly locate the front foot, place the pump horizontally on a flat plate, place the pump shaft drive end on a support which has such a height that the pump shaft centreline is at 160 mm from the plate face.
   With a square, place the suction flange at 90^0 with the pump feet.
   Torque the 4 tie-bolts with a torque wrench to the torque values listed on tab. 5.
7) From the drive end, push the shaft towards the pump as far as it goes.
   Measure the distance between the external face of the sealing area of the suction casing VDMA 106 and the face of the seal locating ring VDMA 485 on which the mechanical seal VDMA 433.2 will rest.
   This dimension should be 22,5 mm (see fig. 22): if this is not the case then introduce necessary spacer rings to attain such dimension.
   At the non-drive end, with the shaft pulled out of the pump, as much as it goes, measure the distance from the outside face of the seal housing on the discharge casing VDMA 107 to the face of the seal locating ring VDMA 485 on which the seal VDMA 433.1 will rest.
   This dimension should be 20,5 mm (see fig. 22).
   Remove the shaft sleeve VDMA 524, if the dimension was not 20,5 mm, move the seal locating ring as necessary to attain such dimension.

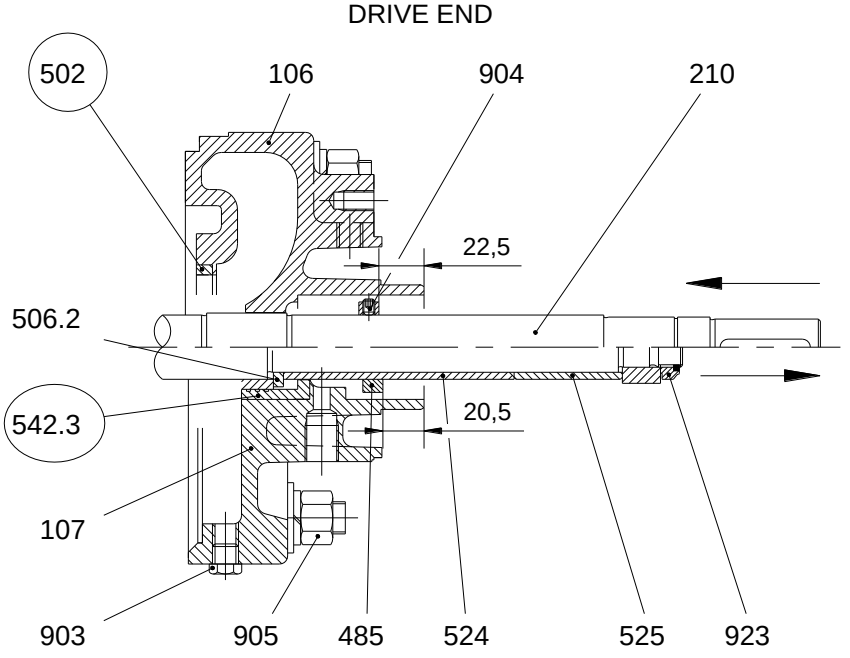


Fig. 22

8) While the shaft sleeve is out of the pump, introduce the mechanical seal rotating part VDMA 433.1 (left rotation) after the O-Ring or rubber bellows has been lubricated with a compatible liquid.
   Lubricate also the O-Ring of the stationary part of the seal and push the stationary seal face into the mechanical seal cover VDMA 471.

Install the seal cover VDMA 471 on the cooling cover VDMA 165 leaving loosely the nuts on the studs VDMA 902.
Introduce on the shaft the shaft sleeve, complete with mechanical seal, making certain that the key slot of the sleeve will engage the key VDMA 940.3 on the shaft.
Introduce over the shaft the O-Ring VDMA 412.4.
Place the mechanical seal cover with cooling cover in the bearing housing VDMA 350.
Place the gasket VDMA 400.5 in the mechanical seal cover and the 2 O-Rings, internal VDMA 412.2 and external VDMA 412.3, in the cooling cover.
Clean the seal faces with a soft tissue.
Place this assembly on the discharge casing VDMA 107 introducing on the shaft, at the proper time, the thrower VDMA 507; the grease nipple VDMA 636 should be at the top and the studs VDMA 902 for the seal cover should be at 45^0.
Lock the 4 nuts on the studs VDMA 902.1 of bearing housing VDMA 350.
Slide over the shaft the spacer sleeve VDMA 525.

9) Introduce over the shaft at drive end the rotating part of the mechanical seal VDMA 433.2 (right end) after the elastomers have been lubricated with a compatible liquid.
Lubricate also the O-Ring of the stationary part of the seal and push the stationary seal face into the mechanical seal cover VDMA 471.
Install the seal cover VDMA 471 on the cooling cover VDMA 165 leaving loosely the nuts on the studs VDMA 902.
Place the mechanical seal cover with cooling cover in the bearing housing VDMA 350.
Place the gasket VDMA 400.5 in the mechanical seal cover and the 2 O-Rings, internal VDMA 412.2 and external VDMA 412.3, in the cooling cover.
Clean the seal faces with a soft tissue.

10) Place this assembly on the suction casing VDMA 106 introducing on the shaft, at the proper time, the thrower VDMA 507; the grease nipple VDMA 636 should be at the top and the studs VDMA 902 for the seal cover should be at 45^0.
Lock the 4 nuts on the studs VDMA 902.1 of bearing housing VDMA 350.
With a gear puller at the shaft drive end, push the shaft toward the pump internal so that the bearing at the non-drive end can be installed.

11) Remove the bearing nut VDMA 923 and the dummy spacer at the non-drive end, place 50 grams of grease in the bearing housing, heat the bearing VDMA 320 and push it over the shaft to rest against the spacer sleeve VDMA 525; remove the gear puller and lock the bearing at non-drive end with the bearing nut VDMA 923.

12) Proceed with the installation of the bearing VDMA 321 at the drive end as follows (see fig. 23):
from the drive end, push the shaft toward the pump internal with a gear puller and measure the depth from the face of the bearing housing to the shaft shoulder, call this dimension A.
Measure then the depth of the bearing box, from the outside face to the bottom of the bearing housing, call this dimension B.
To find the thickness of the spacer VDMA 505 to install beyond the bearing subtract A from B.
The balance, rounded off to the nearest 0,1 to 0,2 mm, is the spacer thickness.
Place the gear puller at the non-drive end shaft to push the rotor toward the pump internal.

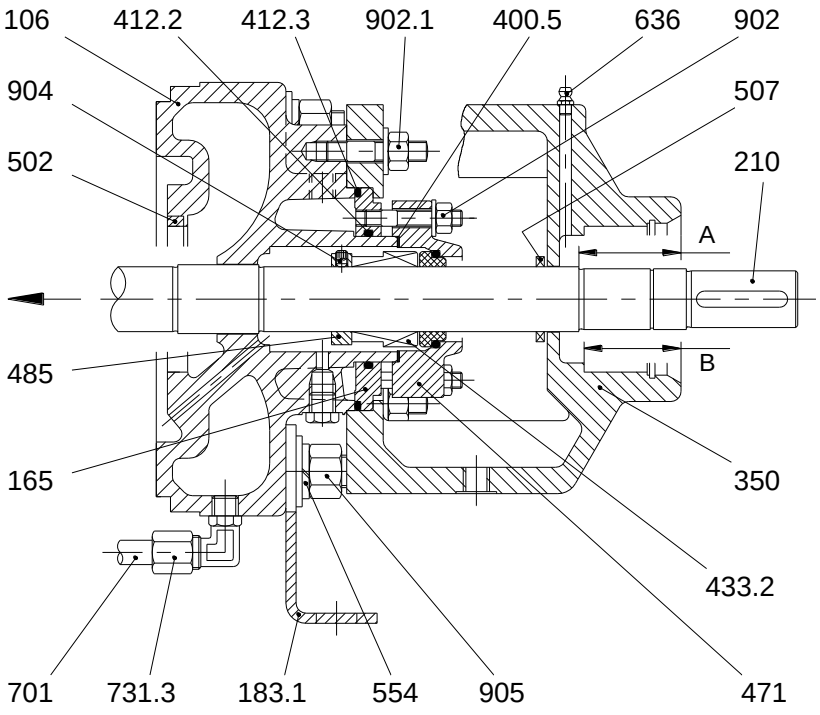


Fig. 23

13) Place the spacer VDMA 505 over the shaft and the elastic ring VDMA 935 in the bearing housing at the drive end.
Fill the bearing housing with 50 grams of grease.
Heat the bearing VDMA 321 and push it over the shaft until it rests against the spacer, block the bearing with the circlip VDMA 932 but insert external spacers VDMA 505 to fill any gap between the bearing and the circlip.
NOTE: For pump with **HEAVY DUTY /5** design (see fig. 4), place the spacer VDMA 505 (without elastic ring), fill the bearing cavity with 50 grams of grease, heat the 2 bearings VDMA 320.1, introduce them over the shaft (in "O" configuration), push the bearings until they rest against the spacer and then lock in place with the bearing nut VDMA 923.1.

14) Remove the gear puller from the non-drive end.
Place the bearing cover VDMA 365.1 at the non-drive end and block with the circlip VDMA 932.3.

15) Place the bearing cover VDMA 365 at the drive end, with the gear puller push the shaft to compress the elastic ring VDMA 935 beyond the bearing, put in place the circlip VDMA 932.3.
NOTE: For pump with **HEAVY DUTY /5** design (see fig. 4), place the bearing cover VDMA 360 locking it with the 4 screws VDMA 914, install the V-ring VDMA 411.
Fit the coupling key VDMA 940 on the shaft drive end.
Lock the 8 nuts on the studs VDMA 902 for both seal covers VDMA 471.

Fit the shaft guards on the bearing housings.
Check the pump rotor rotates freely by hand.

16) Install the pipe VDMA 701 at the pump bottom.
The fitting VDMA 731.4 is installed at the discharge casing VDMA 107 and the 90^0 elbow fitting VDMA 731.3 is located at suction casing VDMA 106.

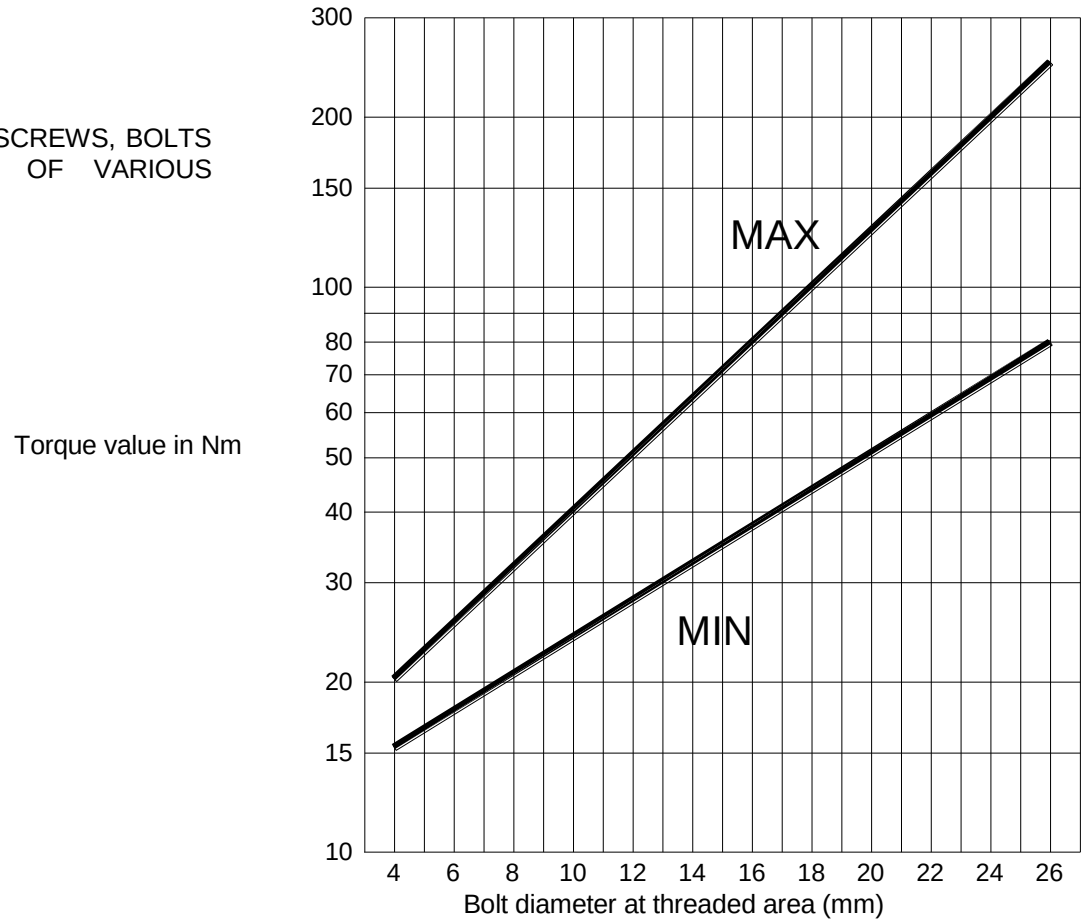
17) Give the pump an hydrostatic test pressure to 1,2 times the maximum working pressure attainable by the pump.
Proceed then with the performance test as required for the assembled pump model.

8.5 - ASSEMBLY PUMP SERIES TMA 40 & 50/B

(See fig. 30 and 5 for pump part numbers).
These pump series are assembled as described in the preceding paragraph 8.4 for series TMA 40 & 50/R, with the exception that any references made to the assembly of mechanical seals, are replaced with the instruction given in chapter 4 concerning the installation of gland packing.

NOTE: Assembly instructions for special designs such as double mechanical seals, cartridge type seals, etc. are available upon request.

Fig. 24
TORQUE VALUES FOR SCREWS, BOLTS AND LOCKING NUTS OF VARIOUS DIAMETERS.



Tab. 5
TORQUE VALUE FOR TIE-BOLTS

PUMP SERIES		TORQUE VALUE Kgm	Nm
TMA 31 & 32	3 to 5 stages	5,5	54
	6 to 15 stages	7	68,7
TMA 40	3 to 8 stages	8	78,5
	9 to 15 stages	11	107,9
TMA 50	3 to 5 stages	8	78,5
	6 to 12 stages	11	107,9

9 - SPARE PARTS

When ordering the pump it is good practice to also order the necessary spare parts, especially when there are no stand-by pumps in the installation.
This will minimise unnecessary down times in the event of pump failure or routine maintenance.
Following spare parts are suggested for each pump size:

1 Impeller
1 Stage casing
1 Shaft assembly
1 Set of bearings
1 Set of mechanical seals or packing
2 Sets of gaskets
1 Set of shoulder rings

However for proper parts management, consult the VDMA 24296 standard that recommends the quantity of spare parts to be stocked in relation to the number of pumps installed.
On the pump nameplate are printed the pump model, the year of manufacture and the pump serial number: always provide this information when requesting spare parts.
Specify also the Item number and quantity of the required part, as seen on the pump sectional drawing (chapter 11) and parts list (chapter 10) for proper identification of spare parts.
We recommend the use of original spares: in case this is not respected, POMPETRAVAINI declines any responsibility for eventual damages caused by not original spare parts.

10 - PUMP PARTS DESCRIPTION

No. VDMA	DESCRIPTION
106	Suction casing
107	Discharge casing
108.1	Stage casing
110	Spacer sleeve mechanical seal cover
116.1	Cooling chamber
116.2	Cooling chamber cover
165	Cooling chamber cover
183...	Front foot
210	Shaft
230	Impeller
310	Bearing sleeve
320	Single crown ball bearing
321	Double crown ball bearing
350	Bearing housing
357...	Bearing and mechanical seal housing
360...	Bearing cover
365...	Bearing cover
400...	Gasket
411	V-Ring
412...	O-Ring
421	Radial seal ring
433.1	Mechanical seal, c.c.w.
433.2	Mechanical seal, c.w.
441	Mechanical seal chamber
452	Packing gland
458	Lantern ring
461	Packing ring
471	Mechanical seal cover
485...	Mechanical seal locating ring

No. VDMA	DESCRIPTION
502	Impeller wear ring
505	Shoulder ring
506.2	Impeller locking ring
507	Thrower
523	Shaft sleeve
524	Shaft sleeve
525	Spacer sleeve
525.1	Mechanical seal spacer sleeve
542...	Mechanical seal sleeve
542.3	Discharge casing sleeve
550	Packing bottom ring
550.1	Mechanical seal spacer
554	Washer
636	Grease nipple
701	Pipe
730	Fitting elbow
731.3	Fitting elbow
731.4	Fitting straight
901.1	Screw
902...	Stud
903...	Plug
904	Grub screw
905	Tie-bolt with nuts and washers
914	Screw
923	Bearing or impeller locking nut
932...	Circlip, shaft
932.3	Circlip, bore
935	Elastic ring
940...	Key

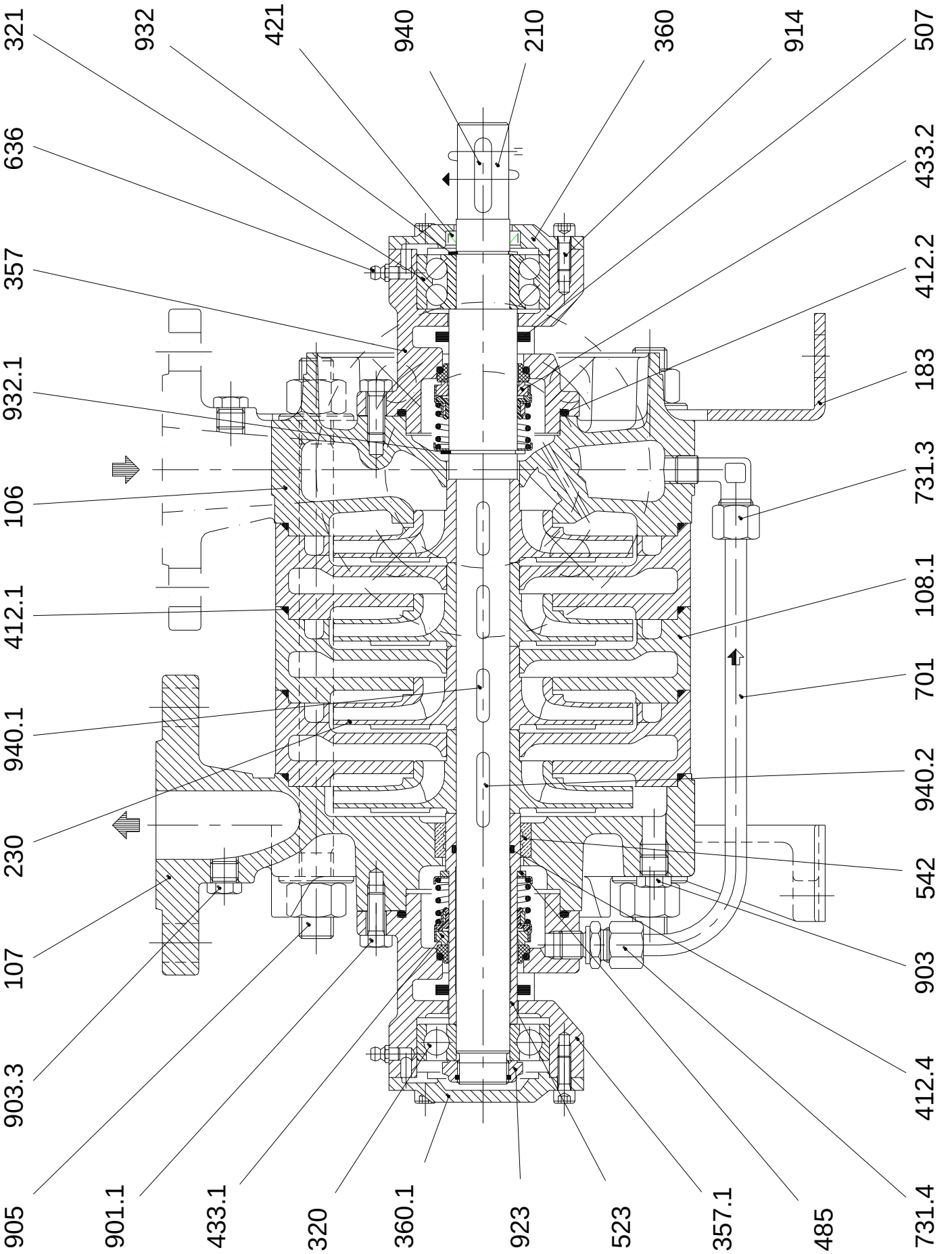


Fig. 25 - Pumps series TMA 31 & 32 design /C (Single mechanical seal internally flushed)

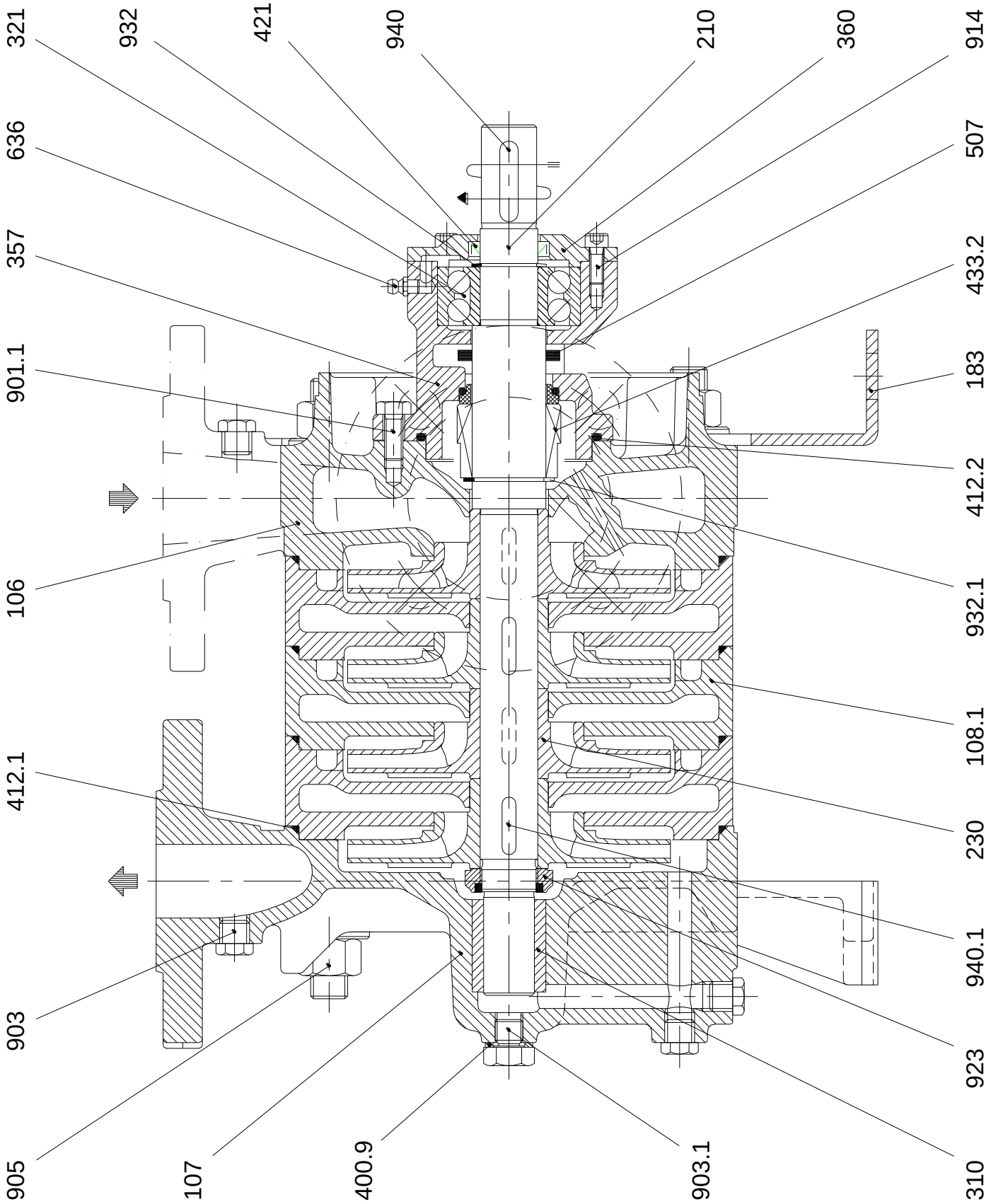


Fig. 26 - Pumps series TMA 31 & 32 design /R
(Single mechanical seal internally flushed, 1 outboard ball bearing and 1 internal sleeve bearing)

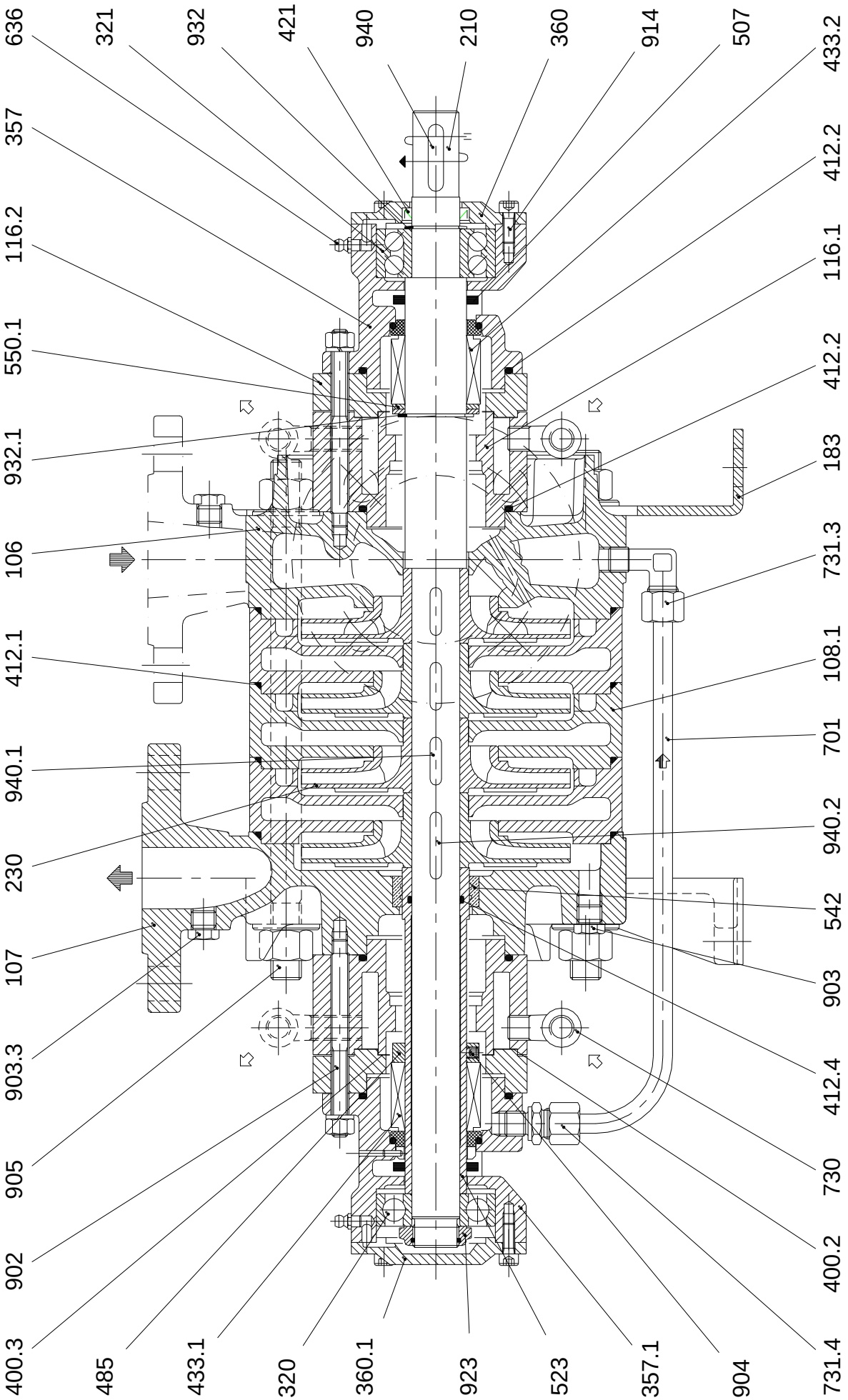


Fig. 27 - Pumps series TMA 31 & 32 design /T
(Single mechanical seal internally flushed with cooling from an external source)

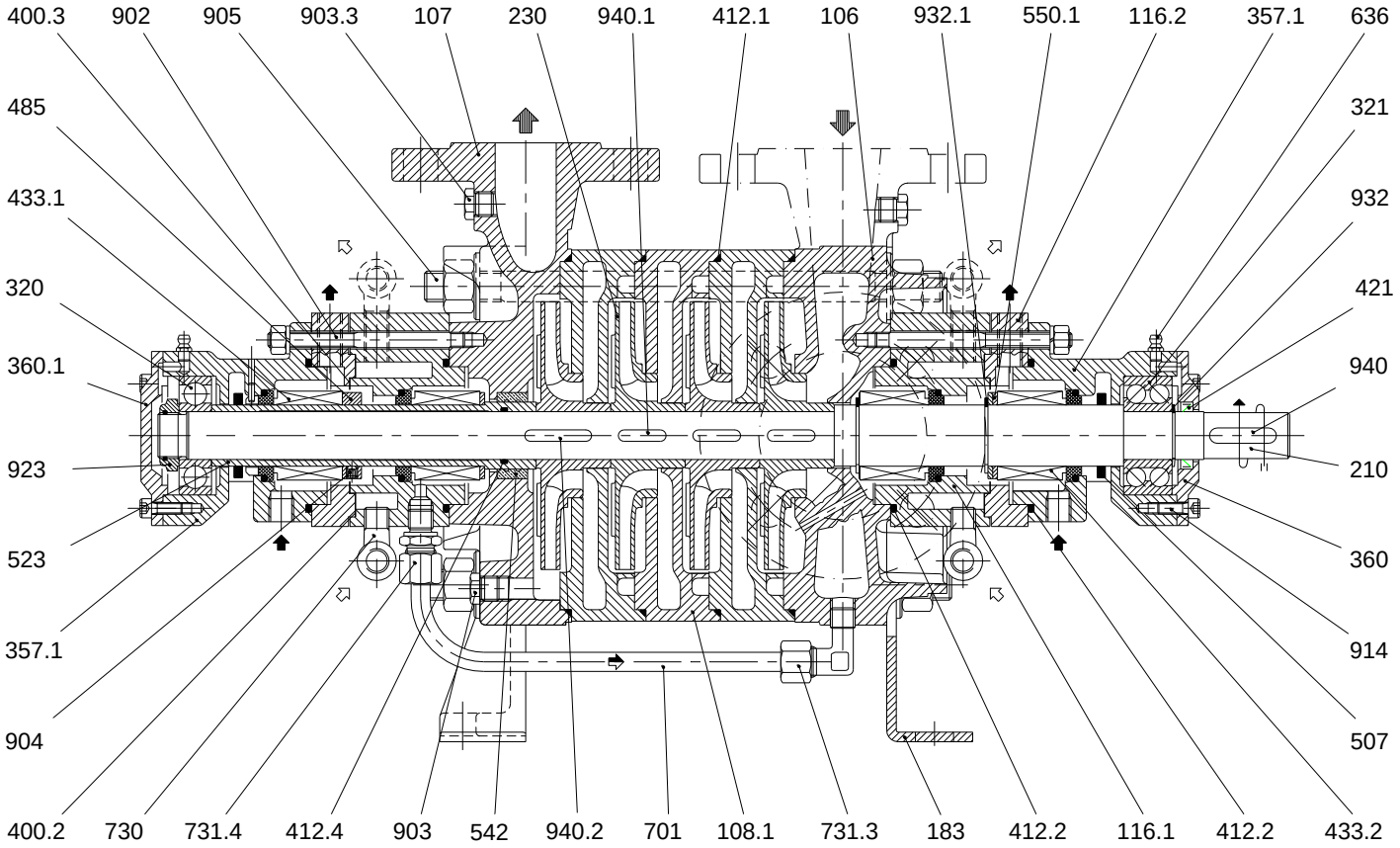


Fig. 28 - Pumps series TMA 31 & 32 design /R2-T
(Double mechanical seals in series with external flushing and cooling)

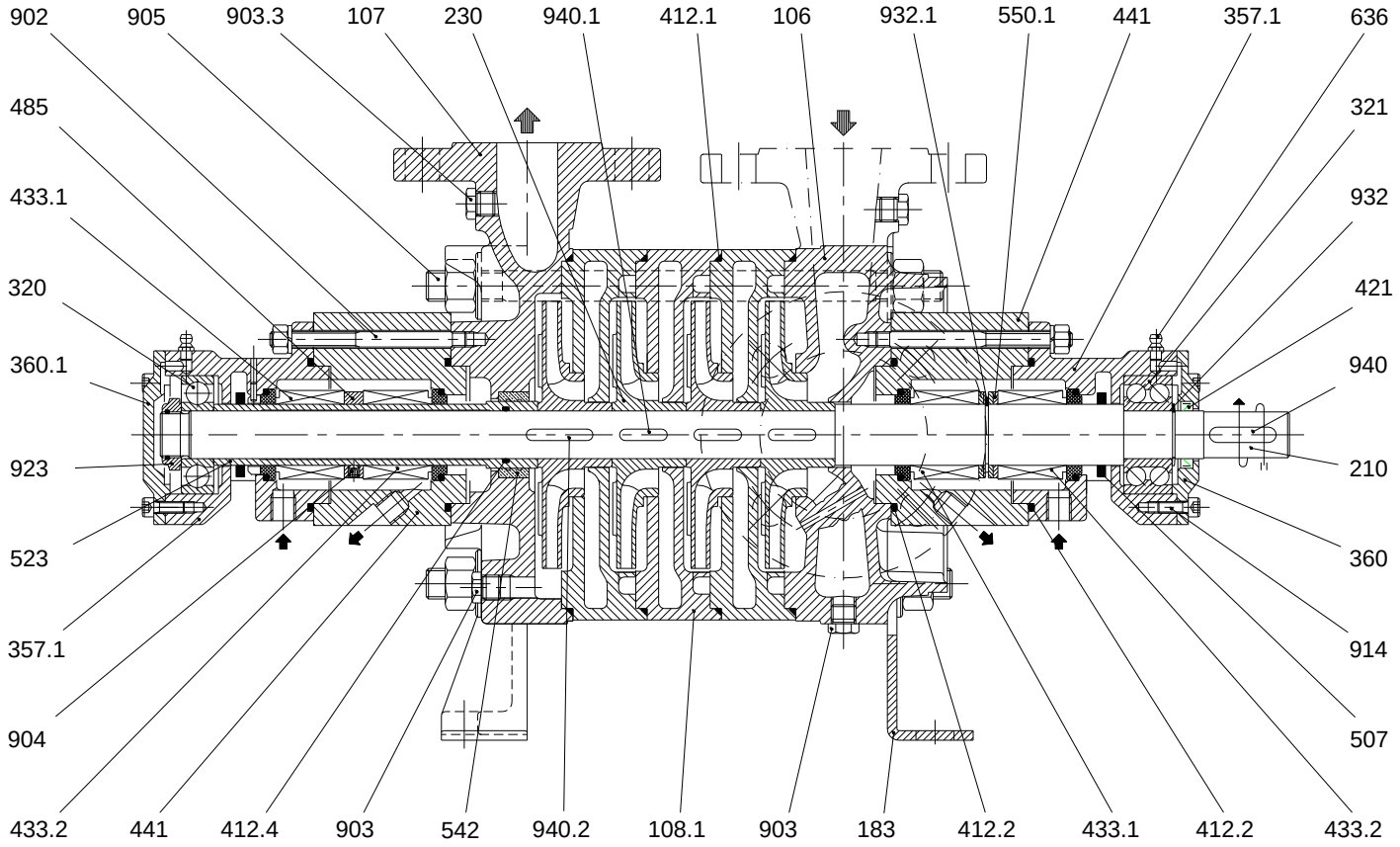


Fig. 29 - Pumps series TMA 31 & 32 design /RR
(Double mechanical seals back-to-back flushed from an external source)

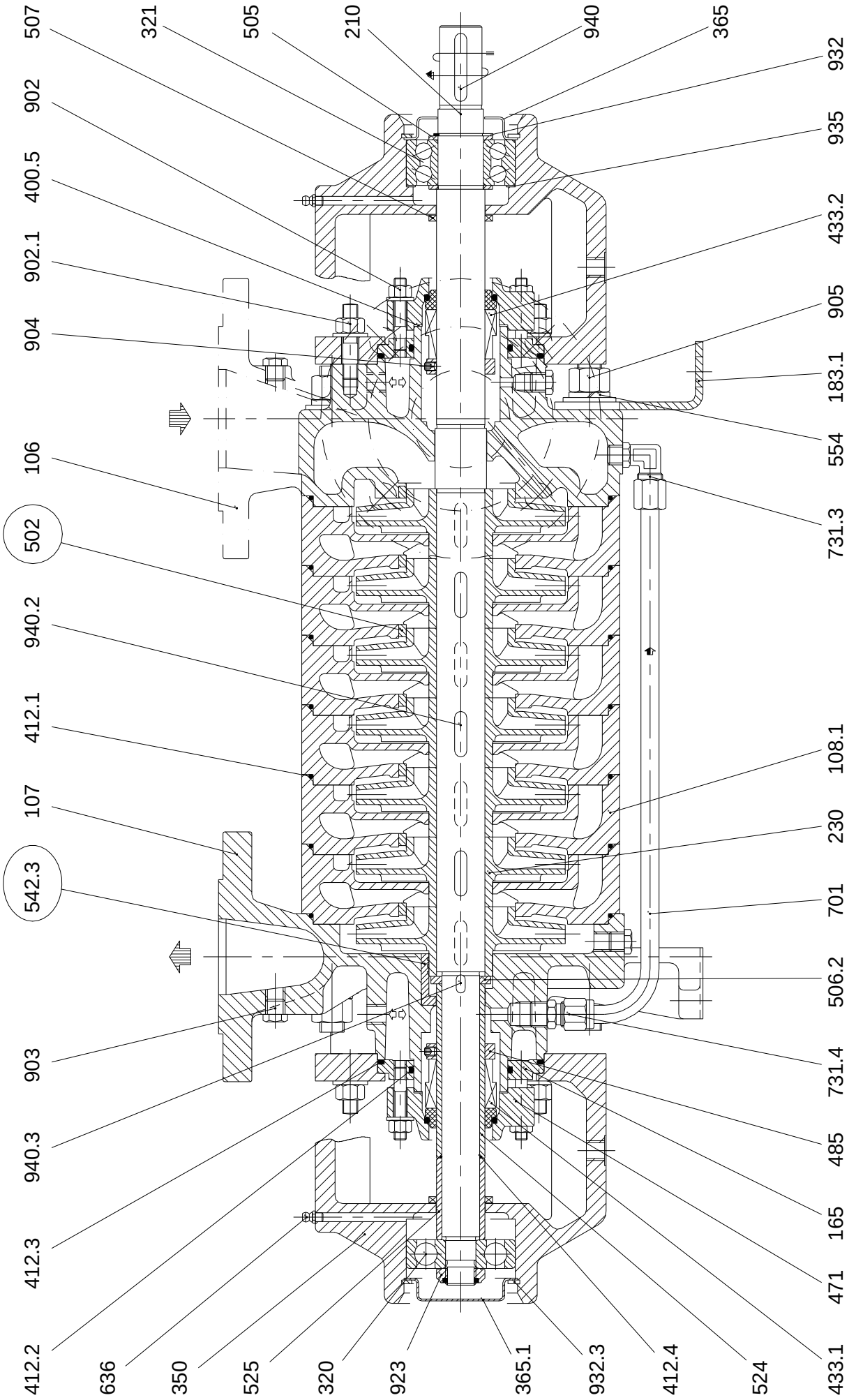


Fig. 30 - Pumps series TMA 40 & 50 design /C (Single mechanical seal internally flushed)

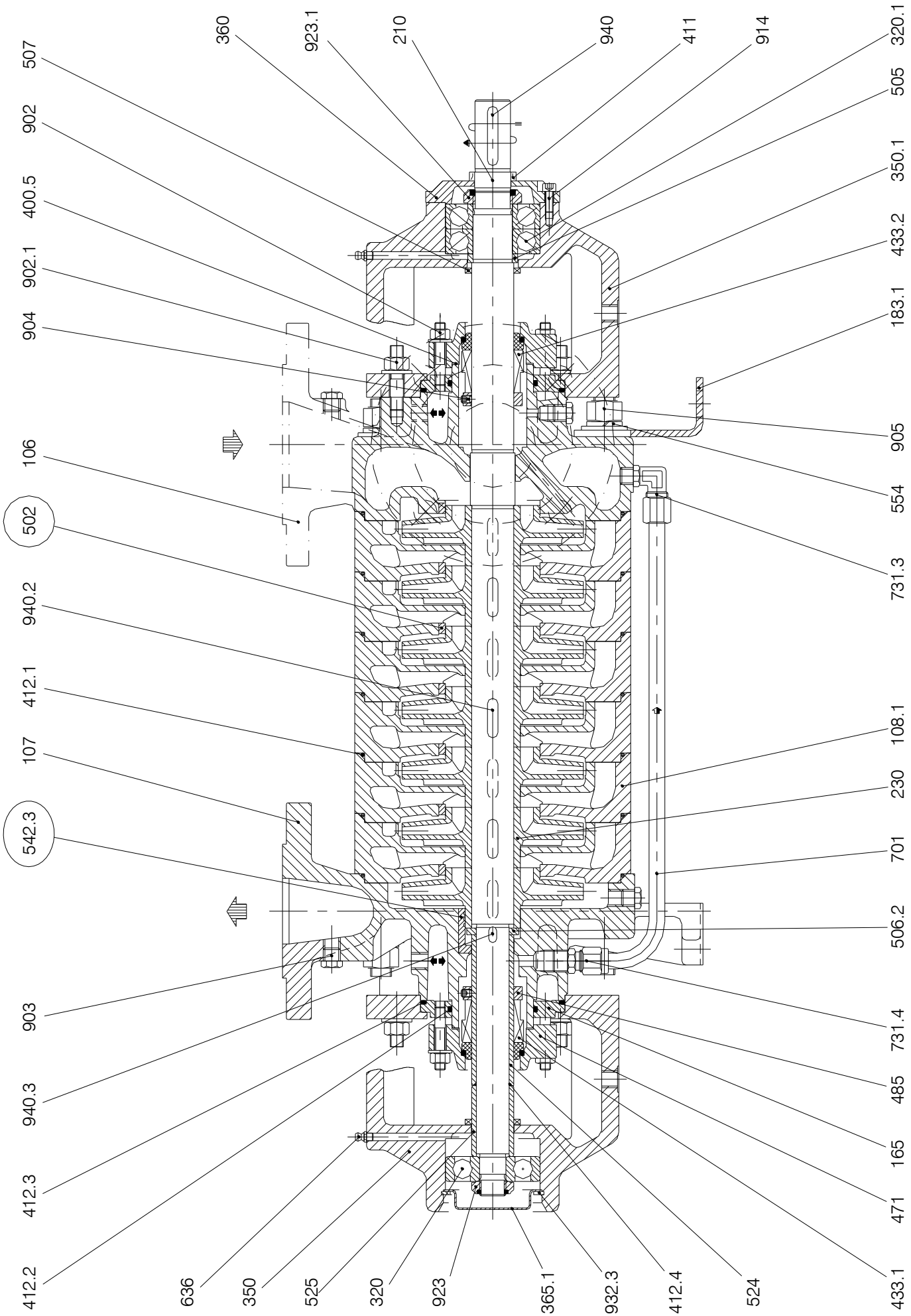


Fig. 31 - Pumps series TMA 40 & 50 design /5X-C
(HEAVY DUTY DESIGN and with Single mechanical seal internally flushed)

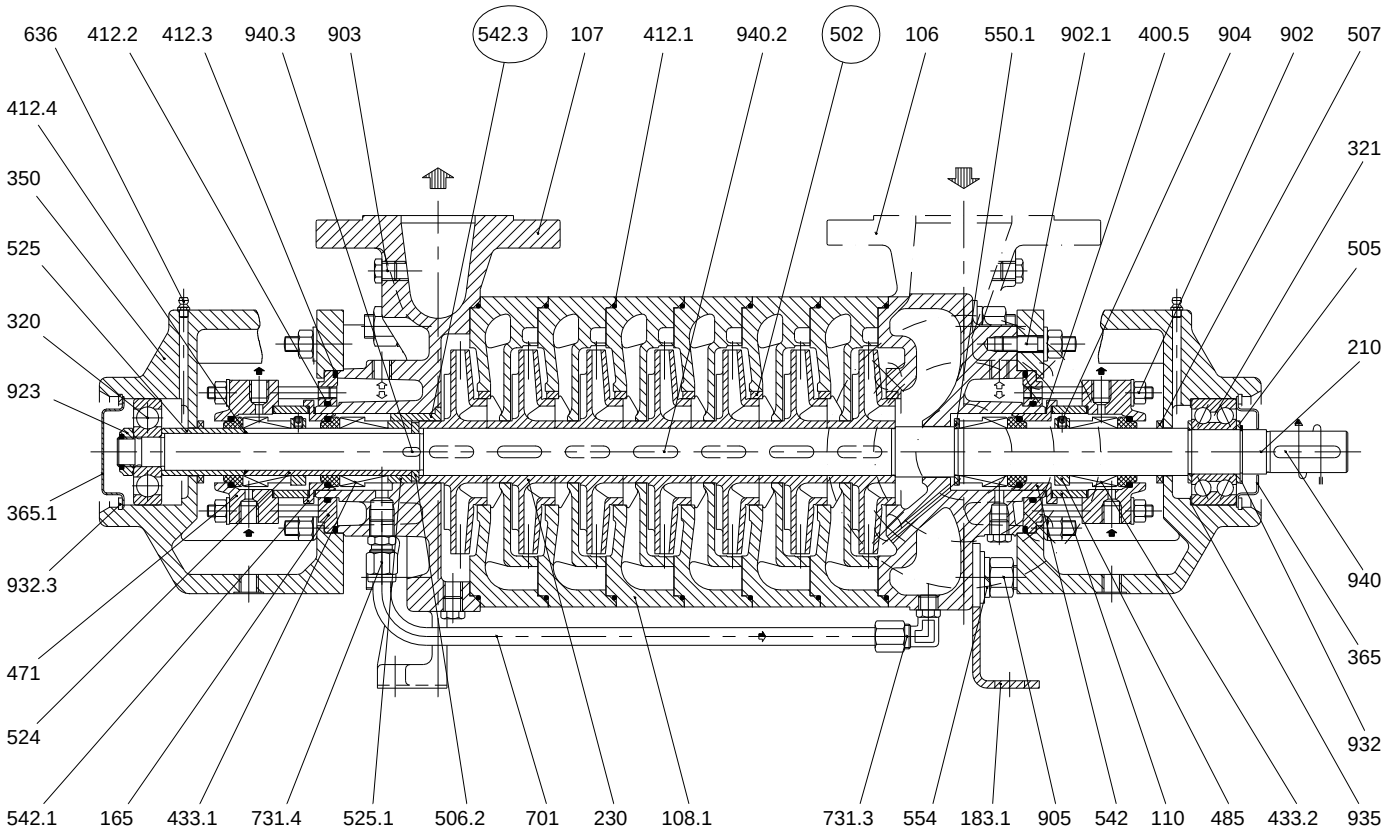


Fig. 32 - Pumps series TMA 40 & 50 design /R2 (Double mechanical seals in series flushed from an external source)

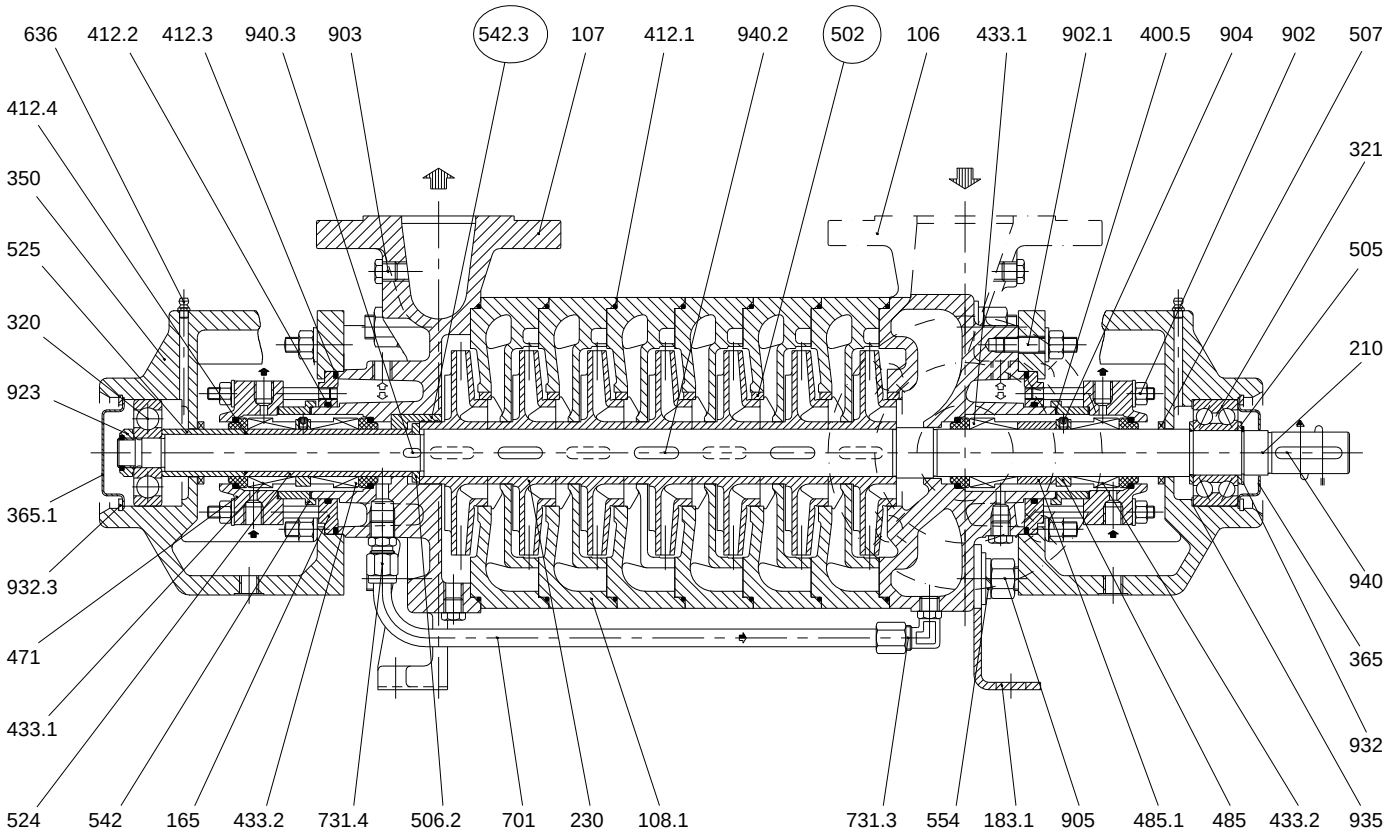


Fig. 33 - Pumps series TMA 40 & 50 design /RR (Double mechanical seals back-to-back with flushing from an external source)

SYMBOL LEGEND:

- Only for stainless steel pump (A3)
- Seal lubricating liquid (from external source)
- Seal lubricating liquid (from pump internal)
- Cooling liquid (from external source)
- Pumped liquid

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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NOTES

PUMP model	Serial Number	Computer Number	Year of manuf.
.....	.....	.....	.....

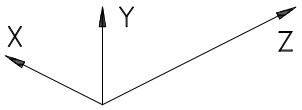
LIQUID handled	Capacity	Suction Pressure	Discharge Press.	Temperature
.....	.....m^3/h	.....m	.....m	.....°C

☐ Lethal ☐ Toxic ☐ Noxious ☐ Corrosive ☐ Irritant ☐ Malodorous ☐ .....

☐ Clean ☐ Dirty ☐ With suspended parts	Spec. Gravity.....	Viscosity.....	PH.....

TOTAL WEIGHT
.....KGs.

MAXIMUM DIMENSIONS



X =.....cm
Y =.....cm
Z =.....cm

NOISE (measured at 1 m)
Pressure =.....dB(A)
Power =.....dB(A)

INSTALLATION	
☐ Inside	☐ Outside
☐ Explosive area	☐ .....

SERVICE	
☐ Continuous	☐ Intermittent
☐	

MOTOR type / Frame	No. Poles	No. Revolutions	Absorbed power	Installed Power
.....	.....	.....RPM	.....Amp	.....kW / .....HP
Frequency	**Supply**	**Enclosure**	**Insulation class**	**Absorbed Power**
.....Hz	.....Volt	IP.....	.....	.....kW / .....HP

COMMENTS

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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Smontaggio TMA Inglese

POMPETRAVAINI'S continuing research results in product improvement, therefore any specifications may be subject to change without notice.

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