Alfa Laval

Decanter Centrifuge

OM English EN

OPERATOR'S MANUAL

OPERATION
SERVICE
MAINTENANCE

Original instruction

Decanter Centrifuge Data Sheet

Decanter Specification, Type LYNX 300

Machine No.: 5122938

Date of issue: 2011-01-14

Specification: 882036026-0

Process liquid: Min. 0°C (32°F) - max. 60°C (140°F)

Max. density of compact wet cake at max. bowl speed: 2.5 kg/dm³

Bowl

Maximum main speed:	4200 rpm
Bowl length:	1512 mm
Bowl diameter:	360 mm
Beach angle:	6°
Solids discharge type:	360°-type with 6 wear liners
Solids discharge radius:	101 mm
Solids transportation aids, cylindrical section:	16 Ribs
Solids transportation aids, taper section:	16 Ribs
Material - hubs:	AL 111 2377 (Duplex stainless steel)
Material - bowl shell:	AL 111 2377 (Duplex stainless steel)
Material - bolts:	Duplex
Material - seals:	
Liquid outlet, type:	6
Liquid outlet, radius:	92 mm (fitted from factory:)

Conveyor

Material - flights:	AL 111 2349 (AISI 316)
Material - hub:	AL 111 2377 (Duplex stainless steel)

Wear Protection

Bowl solids discharge:	Wear liner in tungsten carbide covering the outer diameter of the spoke, 6 pieces. Wear ring fully covered by Tungsten Carbide wear segments Part No. 61244252-80
Bowl feed zone liner:	
Conveyor flights:	Tungsten Carbide Tiles / TM42 (flame sprayed tungsten carbide)
Conveyor feed zone:	Fully covered by Tungsten Carbide wear liners
Frame / casing:	Wear liner in upper casing

Frame and Casing

Material - casing / cover:	Stainless steel (AISI 316)
Inside surface of casing:	Stainless steel cladding throughout
Gaskets / seals - casing:	

Drives

Power supply:	3 x 460 V / 60 Hz
Gearbox, type:	Planetary - 2-stage DD
Gearbox, max. torque:	DD 3.5 kNm
Gearbox, ratio:	1:52
Back drive:	Variable Frequency Drive 30 Hp, EEx, NEMA (460V, 60Hz) (Back drive motor 61195545-57)
Back drive parts:	
Operating main speed:	4200 rpm (IEC)
Max. diff. speed and torque (at operating speed):	
G-force at operating speed:	3549 G
Main motor:	50 Hp Baldor 460VD VFD XPFC T2 B (364T) foot – part No. 61195606-50
Main motor, protection:	

Documents & Drawings

Manuals, language:	Manuals in English
Dimension drawing:	61244232
Diagram, decanter junction box:	

Spare Parts

Important: When ordering spare parts, always state:

Machine number and type indicated above
Part number and designation
Quantity

The decanter centrifuge complies with the essential health and safety requirements of council directives

2006/42/EC	Machinery Directive
2006/95/EC	Low Voltage Directive
2004/108/EC	EMC Directive

To meet the requirements, the harmonised standard EN 12547 has been used.

The technical file for decanter centrifuge is compiled and retained by Product Centre Decanters, Alfa Laval Copenhagen A/S, Maskinvej 5, DK-2860 Søborg, Denmark. Authorised person: Jan Cederkvist, Mechanical Technology.

Noise Declaration

Noise emission data for the decanter declared in accordance with the requirements in EN ISO 4871 and EN12547:

Operating Speed [rpm]	Sound Power Level L_{wAd} [B(A) re 1 pW]	Sound Pressure Level L_{pAd} [dB(A) re 20 μPa]
4200	9.7	79
3750	9.6	78
3150	9.5	78
2500	9.2	75

L_{wAd} : Declared A-weighted sound power level from the decanter

L_{pAd} : Declared A-weighted emission sound pressure level in a free field over a reflecting plane at 1 m distance from the decanter

Uncertainty on declared values : L_{wAd} : K_{wA}=2 dB

L_{pAd} : K_{pA}=4 dB

The noise does not contain significant impulsive or tonal components and the peak C-weighted instantaneous sound pressure level L_{pCpeak} is below 130 dB(C) at all operating speeds.

The emission sound power level is measured according to ISO 9614-2 while operating the decanter with water as process medium. The sound pressure level is determined from the measured sound power level according to EN ISO 11203.

The sound pressure level can vary –1dB to 2 dB at different positions around the decanter.

The declared values are based on measurements conducted on typical new decanters.

Note that the sound pressure levels are based on free-field conditions and not guaranteed values. In a normal indoor installation the sound pressure level will be significantly higher than the declared free-field sound pressure level due to the reflection of sound from walls and surroundings.

In order to minimise the sound pressure level at the decanter it is recommended to install the decanter in a room with low reflection of sound from the walls and always keep the decanter in a properly maintained condition.

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1 Safety Instructions

FAILURE TO FOLLOW THESE RULES MAY RESULT IN SEVERE PERSONAL INJURY OR PROPERTY DAMAGE.

The Decanter

1. The decanter delivered must not be used to separate flammable, toxic, corrosive, or radioactive process media without prior written approval from Alfa Laval.

2. Read this manual and the Operator's Manual before attempting to install or operate the decanter equipment, and follow all recommendations.

3. Do not operate the decanter with damaged or missing warning labels.

4. Do not operate the decanter if the vibration level exceeds 24 mm/sec (RMS) (US: 1 inch/sec).

5. Do not operate the decanter with feed temperatures exceeding the limits stated on the DATA SHEET included in all three volumes of the Instruction Manual.

6. Never attempt to start the decanter with frozen water or frozen or hardened process material in the bowl.

7. Do not exceed the maximum bowl speed or solids density specified on the decanter name-plate and DATA SHEET.

8. Do not operate the decanter without belt guards and other guards provided.

9. Periodically check all the automatic shut-off devices and monitoring systems for correct operation.

10. Do not attempt dismantling until the decanter has come to a complete stop, the main power is shut off, and the disconnected main switch is locked with a safety lock.

11. Do not operate the decanter if the bowl, motor, or supporting structure show cracks, pitting, holes, or grooves.

12. Do not use tools other than those recommended by Alfa Laval to dismantle and assemble the decanter.

13. Do not attempt to use the decanter for any application or process material other than that stated on the original purchase documentation without first consulting Alfa Laval.

14. Follow all lubricating procedures and schedules.

15. Check periodically - at least once a year - for loose bolts on foundation and supporting structures, covers, hatches and pipe connections of decanter and motor.

16. Do not get rags or loose clothing near rotating parts.

17. At all times follow the recommended sequence and procedures for dismantling, assembly, operation, and maintenance. Do not introduce new procedures without first consulting Alfa Laval.

18. Only allow trained personnel to operate, clean, dismantle or assemble the decanter.

19. Do not operate the decanter before the installation is complete.

20. Do not operate the decanter with any electrical motor running in the opposite direction to that indicated by the arrows on the frame or otherwise specified.

21. If the decanter is fitted with a frequency inverter, make sure that the maximum possible frequency will not cause overspeeding of the decanter. At least two separate protections against overspeed must be provided. See section 6.9.of the ID manual.

22. Do not turn on feed or water before the decanter has attained its full speed.

23. If the decanter is operated with hot, corrosive, or aggressive liquids, care should be taken that any incidental spillage from the decanter cannot hit persons below the centre line of the decanter.

24. Never turn on feed or large amounts of hot, corrosive, or aggressive liquids when the decanter is at a standstill, as these liquids might hit persons below the centre line of the decanter.

25. Never start the feed pump or flush the decanter before opening the discharge valves or starting the discharge pumps, including any conveying means for the liquid and solids phases.

26. When personnel are working on a decanter with a hinged cover, care should be taken that the cover is not closed unintentionally by other persons or by moving machinery, which might cause injury.

27. Do not touch the solids phase discharging from the decanter as hard lumps being ejected with high speed might cause injury.

28. When using straps to lift the complete decanter or any of its parts such as the rotating assembly, make sure to prevent the part hanging by the straps from sliding.

29. When lifting the decanter, use the slings specified on the dimensioned drawing.

30. The lifting eyes in the bearing housings, if fitted, must not be used for lifting the bowl assembly.

Electrical Installation

1. Install and earth all equipment in accordance with requirements of the Local Electricity Authority.

2. Use an "on-load" isolator or circuit breaker (a main switch for switching off during run-up) on the main power supply.

3. Check that the voltage and the frequency are in agreement with labels on motors and other electrical equipment.

4. De-energize all equipment before connecting and disconnecting test equipment.

Repairs

1. Major repairs to decanter must not be made without first consulting with Alfa Laval.

   In no circumstances should weld repairs, heating with a naked flame, or other alterations be made to bowl shells, bowl hubs, gearbox adapter, shafts, or other rotating parts without prior written approval and instructions from Alfa Laval. Failure to obtain this approval may result in failure of parts involved with possible serious damage to equipment, property, or personnel.

2. Do not operate the decanter on completion of the repairs until the belt and/or other guards are re-fitted.

3. Do not exceed the maximum load carrying capacity of the lifting tools. Only use the lifting tools for the intended purpose.

4. Replace worn or damaged parts with only original Alfa Laval parts.

   Alfa Laval cannot be held responsible for any damage to property or for injury to persons if genuine parts are not used.

5. Do not interchange bowl parts, since specific parts are balanced as a unit.

The Motor

1. Do not operate a decanter equipped with flame proof motor(s) and control unit(s) until all enclosures have been assembled in accordance with the appropriate standards.

2. If a motor should become inoperative, immediately shut off the power.

3. Always follow motor manufacturer's specifications on bearing lubrication.

4. Do not attempt to operate a motor that is overheated due to frequent starts and stops. Allow motors to cool to ambient temperature (as designated on the motor nameplate) before each restart.

Do not attempt to start motor unless the rotating elements turn freely.

Corrosion, Erosion and Pitting of Decanter Equipment It should be recognized that equipment subjected to severe erosive or corrosive environments may deteriorate over a period of time, depending upon the severity of exposure and/or possible misuse. Users of high speed centrifugal equipment should be aware of this fact and also that extremely high forces are brought into play when their equipment is in operation. Any weakening of highly stressed members by misuse, erosion, corrosion, chemical pitting, or stress cracking must be guarded against.

The following points should be noted and the recommended action taken:

1. Inspect the outside of the bowl for erosion and corrosion, at least every two months.

2. Do not operate equipment when:

- **2.1** Holes are worn through rotating parts.
- **2.2** Grooves greater than 2 mm (0.08 inch) deep are worn in rotating parts.
- **2.3** Evidence of cracks is present in rotating parts.
- **2.4** Chemical pitting of 2 mm (0.08 inch) depth or greater is present on rotating parts.

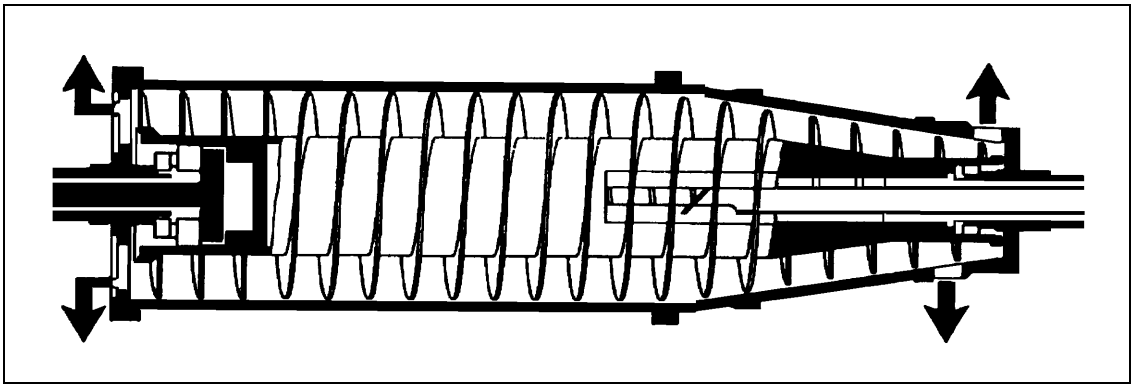
3. Chemical Pitting Observed:

All cases of chemical pitting, even under 2 mm depth, should be monitored carefully. This action is almost always due to the breakdown of the passive film on stainless bowl shell walls, in the presence of chlorides. This often occurs under deposits that have not been cleaned from the outside of the bowl wall. High temperature and high acidity accelerate the action.

4. Pay special attention to the bolts assembling the bowl sections. If the process liquid or cleaning agents contain chlorides, check these bolts at least once a year and exchange them at least every three years. Contact Alfa Laval, if in doubt.

Contact Alfa Laval regarding the repair or replacement of pitted bowl shells or other parts.

2 - Decanter Operating Principle



The feed enters the decanter at the intersection of the conical and the cylindrical part of the bowl through a central feed pipe in the hollow drive shaft. After leaving the feed pipe, the feed suspension is distributed into the rotating liquid in the bowl and smoothly accelerated to the full rotational speed. The centrifugal force makes the solids settle at the bowl shell. The screw conveyor continuously transports the solids toward the conical end of the bowl and through conical bowl part.

The separation takes place throughout the total length of the cylindrical part of the bowl, and the clarified liquid discharges at the large end where it flows over the rim of exchangeable and/or adjustable plate dams.

The solids are discharged from the small end by centrifugal force through outlet openings.

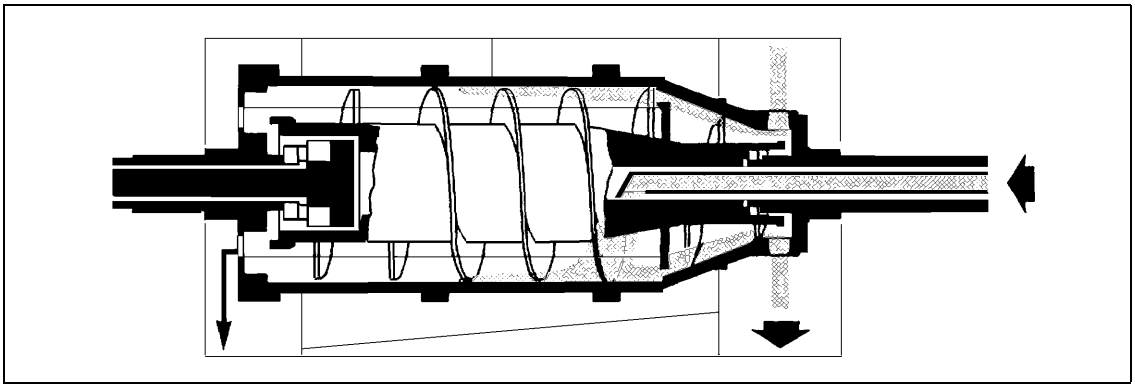


Figure 2.0.1

Decanter with Baffle Disc

The space in the cylindrical and conical parts of the bowl, with the baffle disc between them, act as two communicating vessels. The plate dams can be set to a smaller radius than that of the solids discharge (negative beach).

Then the heavy phase (the solids) is pressed under the baffle disc by the hydrostatic pressure of the light phase (the clarified liquid).

ATTENTION *The liquid and the solids are discharged at roughly the same radius, and consequently, during start-up, flushing, and irregularities in process, discharge of liquid through the solids discharge ports may occur owing to lack of solids in the bowl. This should be taken into consideration when the decanter is installed.*

2.1 Main Drive

The decanter i driven by an electric motor. The motor shaft carries a drive pulley, and motive power is transmitted through V-belts to the bowl pulley to drive the bowl.

2.2 Differential Speed Control

The purpose of the differential speed control system is to make it possible to control the differential speed between bowl and conveyor by controlling the speed of the sunwheel shaft of the gearbox.

This is achieved by using an AC motor with Variable Frequency Drive (VFD) in connection with the special Alfa Laval Direct Drive gearbox together with a specially designed control system (VFD Direct Drive).

The differential speed is controlled by the 2Touch control system. The 2Touch system takes care of all basic control funtions related to the decanter.

For further details, see the specific 2Touch manuals.

Two other systems have been used for controlling the differential speed: the Differential Speed Controller (DSC) and the Decanter Core Controller (DCC). These two systems are discontinued and only available as spare parts.

For further details, see specific DCC or DSC manuals.

2.2.1 VFD Direct Drive

The VFD direct drive system consists of three main electrical components: the 2Touch control system, a VFD (Variable Frequency Drive), and an AC motor. The motor is connected to the decanter gearbox with a flexible coupling.

The motor speed signal is sent from the 2Touch controller to the VFD. The VFD then controls the speed of the motor. The 2Touch controller calculates the differential speed, based on the measured motor speed. To determine the differential speed, the controller needs information about the gearbox ratio.

The bowl speed and the sunwheel speed is measured by inductive speed sensors located on the decanter.

WARNING *Care must be taken when setting up operational parameters.*

Firstly, the direct drive motor must always rotate in the same direction as the bowl.

Secondly, the maximum speed specified for the back drive motor must not be exceeded. For most machine types, this means that the speed limit must be lower than the maximum bowl speed.

The maximum bowl speed depends on the type of decanter, whereas the actual bowl speed also depends on the process.

Thirdly, it must also be ensured that the maximum load does not exceed the gearbox rating. This will result in damage to the gearbox and the pinion shaft. The maximum gearbox load depends on the size and type of gearbox fitted.

3 Operation and Routine Maintenance

3.1 Before First Start

Ensure that the transport safety devices (the yellow wedges) have been removed. Check that the bowl rotates freely in both directions.

Read all manuals before starting the decanter.

Pay special attention to the safety instructions and the procedures for electrical and mechanical installation of the decanter.

ATTENTION *Because the main bearings are filled with grease from the factory, the running-in procedure described in section 3.8 must be followed in order to avoid temperature problems.*

3.1.1 Noise and Vibrations

In spite of the most accurate balancing a rotating body is always slightly out of balance. As the bowl and the conveyor are two separately balanced units rotating at different speeds, the negligible unbalance of each unit will coincide, and a momentary increase of noise and vibration occurs in the machine.

The period of time between the moments when this happens depends on the difference in the speeds of bowl and conveyor. The higher the differential speed the shorter the intervals, and vice versa.

Increased unbalance caused by wear and/or accumulation of solids will increase the amplitude of noise and vibration.

A practical hint: The differential speed of the conveyor can be found by counting these vibrations for exactly one minute.

3.2 Start/Stop procedures

3.2.1 Inspect Bowl

A bowl which has not been cleaned, but left clogged by solids after operation must be cleaned before the decanter is restarted, because dried solids may cause severe unbalance and eventual generation of an overload condition. See section 3.3.1.

3.2.2 Before Start

3.2.2.1 Checkpoints

If the decanter has stopped due to overload, the following points must be checked before the decanter is started:

- Are the upper and lower casings free from solids deposits?
- Are the discharges open?
- Is the bowl easily rotated by hand?
- Are all guards correctly placed and properly secured?

3.2.2.2 Decanters with Mechanical Seals (Optional Equipment)

Before starting a decanter with mechanical seals, the gas supply system for the seals must be activated and the flow and pressure of gas to the seals must be checked. If the decanter is to be used for inflammable substances, it must be purged with inert gas and it must be ensured that the oxygen concentration has gone down to a safe level before the machine is started. Also during run-down until the decanter has stopped, the gas supply to the seals must be activated. See section 3.10.1 'Installation, Start-up and Operation of Decanters with Circumferential Seals'.

3.2.3 Start Decanter

Release EMERGENCY STOP (in most cases: pull out the EMERGENCY STOP knob - or turn it as indicated by arrows).

Start the decanter motor.

Wait 2-4 minutes for the decanter to attain full speed with star connected circuit before switching to delta connected circuit.

Start the belt conveyor or other transport means for discharged solids.

Open the feed valve (if any).

Start polymer pump (if used).

Start the feed pump.

3.2.4 Stop Decanter

ATTENTION *When stopping a decanter with mechanical seals make sure that the supply of gas continues until the decanter has stopped.*

Stop feed and polymer pumps (if used), close feed valve (if fitted).

Before stopping, flush out with water of suitable temperature. Flush while the machine is running.

Stopping the decanter before its bowl is sufficiently cleaned may give rise to heavy vibrations both during decanter rundown and during its successive run-up.

ATTENTION *When flushing decanters for fat and oil applications, optimal flushing effect is achieved by using flushing liquids holding temperatures above the melting points of the fats and oils run through the decanter.*

Using e.g. cold water might cause solidified lumps of fat/oils to remain in the decanter, which in their turn would give unbalance during decanter rundown and during its successive run-up.

Stop the decanter motor when the bowl is thoroughly flushed. Do not flush the decanter when it is inactive.

Press the CENTRIFUGE STOP button on operator panel.

3.3 Monitoring Operation

Make particularly sure that there is no increase in vibration.

Check the surface temperature of the main bearing housings from time to time. A temperature rise may indicate a possible malfunction in the bearing.

ATTENTION 

The alarm level for main bearing temperature is 110°C (230°F). At this temperature level the bearing must be monitored. Especially if the increase of temperature is very steep or appears without any obvious reason such as after lubrication of the bearing or increased feed or ambient temperature.

The shut down level is 120° C (248°F). At this temperature the decanter must shut down immediately. If after a restart the temperature again increases to 120°C (248°F), the bearing must be replaced.

After lubrication the temperature may remain high for some hours.

3.3.1 Overload

If the centrifuge torque exceeds a certain limit, the control system will deactivate the feed permissive contact and stop the feed and polymer pumps.

Under these circumstances the control system can be reset and the feed pump restarted from the control panel.

If the conveyor torque exceeds a higher limit, the main motor will be also be switched off.

Then it is advisable to have the feed replaced by water until the bowl speed has reached 300 r p m.

When the bowl has stopped rotating, reset the control system to operative condition.

3.3.1.1 Causes of Overload

The causes of overload may be:

- Too high throughput.
- Too high feed concentration.
- The properties of the solids (prestraining or grinding the process liquid before feeding it into the decanter may be necessary).
- Too low differential speed.
- Solids clogging the discharge from the casing. (Main motor overload.)
- Too high bowl speed.

3.3.1.2 Cleaning an Overloaded Bowl

If the decanter has stopped due to too high torque on the conveyor, and the decanter is unable to scroll itself free during a new start, or when running CIP with an AC back drive, the causes of overload may be as described above, and the only way to clean the bowl will be to disassemble the bowl according to instructions given in section 4.4.1.

When cleaning the conveyor, be careful to clean all of the flights to avoid unbalance when running the decanter after assembly.

ATTENTION *It is forbidden to attempt to eliminate the overload on a decanter with a standard gearbox by fixing the sunwheel shaft and rotate the bowl, or on a decanter with DD gearbox to use spanners or the like to rotate the sunwheel shaft, due to the fact that it can cause damage on either the gearbox, the spline shaft or the large end hub.*

3.3.2 Vibrations

If excessive vibrations occur while the bowl rotates, stop the main motor immediately and supply liquid to soften the vibrations.

3.3.2.1 Vibration Switch (Optional Equipment)

To protect the decanter against damage due to heavy vibration, it can be equipped with a vibration sensor which cuts off the power supply to the main motor and the feed pump in case of excessive decanter vibrations.

The control panel (or the motor starter) must be provided with a terminal for the vibraswitch.

Being erected on vibration dampers, the decanter deflects greatly during starting and stopping, but these oscillations are so soft that they will not activate the vibraswitch.

Five types of vibration switches are available:

2Touch Vibration Sensor

The 2Touch control system is equipped with two vibration sensors. One sensor is placed on each bearing house.

See 2Touch manuals for more information on 2Touch vibration sensors.

IFM Vibration Sensor

See IFM sensor manual 61244012 for more information on IFM vibration sensors.

Vibration Level Monitor

See specific manual VLM for further information.

Vitec Vibration Switch

The standard factory-set levels are ¾ in/sec (19 mm/sec) alarm level and 1¼ in/sec (31 mm/sec) as decanter shutdown level.

For further details about the vibration switch, see sub-supplier's descriptions included in the decanter supply.

Robertshaw Vibration Switch (Fig. 3.3.1)

Resetting

This vibration switch is reset manually by pressing the reset button, see figure 3.3.1 below

Adjusting

To adjust this vibration switch to trip at the correct vibration level, proceed as follows:

When the decanter is not operating, turn the adjusting screw *clockwise* until the vibraswitch trips.

Then reset it and find the tripping point again. Repeat this procedure a couple of times to ensure that the correct tripping point has been found.

Then turn the adjusting screw *counterclockwise* one time and a third.

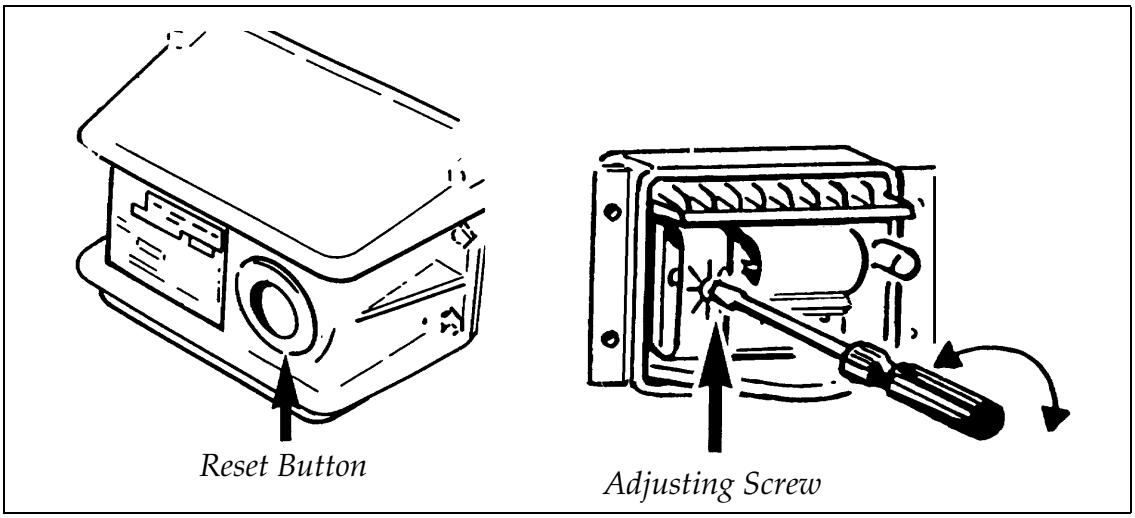


Figure 3.3.1 Resetting the Robertshaw Vibration Switch

ATTENTION *Re-adjustment may be required if the vibraswitch shuts off the power supply because the building where the decanter equipped with vibraswitch is operating begins to vibrate heavily.*

3.4 Routine Cleaning Procedure

Before starting a cleaning process, please note that the below procedure is not product specific and therefore is only intended as a guide.

Before the decanter is stopped, close the valve to the feed and raise the differential speed, if possible, in order to transport the last solids remains out of the bowl. Always make sure to take precautions against outflow of fluids to other machines which provide further treatment of the solids after the separation process, such as for instance sludge drier or the like. This can be done by redirecting the decanter's slide gates or by-pass system.

Instructions:

1. Flush the decanter with water until the discharged flushing water from the large end looks clean and clear.

ATTENTION *On decanters with paring disc the flow must not exceed the capacity of the paring disc.*

2. Switch off the main motor, but continue to flush. Shut off the water before the bowl speed decelerates below 300 rpm.
3. Open the upper casing of the bowl and check visually if both upper and lower casings are clean. Check also if there is still product in the bowl. This is done by looking into the bowl through the holes of the large end hub and the solids discharge.
4. Now check if the flushing had the intended effect on the bowl. This is done by turning the sun wheel shaft by hand without moving the bowl.

5. If item 3 and item 4 are not satisfactory, the decanter must be accelerated to operating speed again, and the procedure is repeated from item 1. If it is not possible to properly clean the bowl according to the above procedure, the bowl must be disassembled and then cleaned.

After having done the above procedure, the observations should be evaluated regarding time intervals of the flushing time in order to obtain the optimum cleaning.

Note!
The optimum flushing time of the decanter very much depends on the operating conditions.

- If the vibrations level is higher than normal during start-up, the time interval of the flushing of the bowl must be increased.
- If the vibrations are not too high at any time, the flushing is of appropriate length.

3.5 Performance Optimization

The decanter can be adjusted to suit individual requirements by varying the following control parameters:

Bowl Speed

By varying the rotational speed of the bowl, the G-force can be adjusted to suit the application. The higher speed, the better separation.

Liquid Level

Adjust the liquid level (pond depth) to give the optimal balance between liquid clarity and solids dryness by selecting different plate dams.

In general terms, the centrate becomes more clear and the cake more wet when diminishing the liquid radius and vice versa.

Differential Speed (Δn or ΔRPM)

The dryness of the cake can be increased when operating with a lower differential speed, but the centrate will be less clear and vice versa. The torque increases with the lower Δn.

The differential speed can be regulated automatically to compensate for varying content of solids in the feed.

Feed rate

The lower feed rate, the better separation.

3.6 Main Drive

ATTENTION *Store spare V-belts in a dry and cool place.*
Never roll up the V-belts. Sharp bends will damage them.

Before installing new belts, check the pulleys for wear, using, if necessary, a profile and groove gauge.

When installing new belts, rotate the belt drive a few turns before measuring the belt tension, repeating this procedure until the belt tension is correct. For the belt tension values, refer to section 4.5.

Check the belt tension after 0.5-4 hours of full load operation and then every 4000 hours, referring to section 4.5 for the belt tension values, and not forgetting to rotate the belt drive every time before measuring the belt tension.

All types of V-belts used for the main drive should normally be exchanged every 16000 hours.

3.7 Variable Frequency Drive (VFD)

Refer to section 5 'Supplementary Documentation' for the specific descriptions of the electrical motor and the frequency inverter and follow the given instructions for service and maintenance.

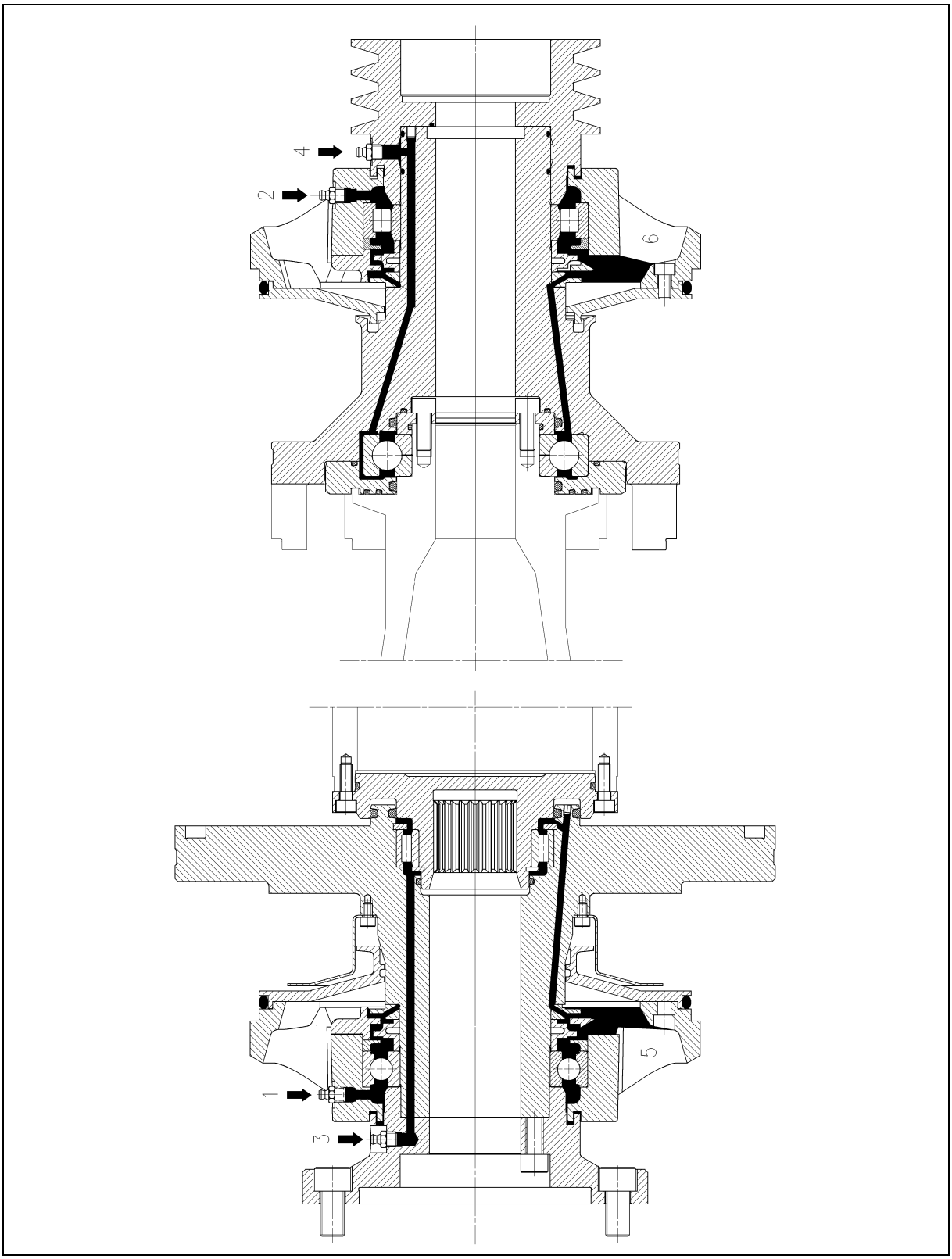


Figure 3.8.1

1. Main Bearing, Large End
2. Main Bearing, Smal End
3. Conveyor Bearing, Large End
4. Conveyor Bearing, Small End
5. Discharge opening, Large End
6. Discharge Opening, Small End

3.8 Lubrication

(Fig. 3.8.1 shows where the lubricating nipples are located)

General

The lubricants for the decanter must always be stored in a cool, dry, indoor area, and be protected from sunlight. Lubricant properties are very sensitive to contamination and lubricants must never be stored in open containers. It is strongly recommended to use lubrication grease supplied in 400 g (14 ounce) cartridges. If larger containers are used, it is required to be very careful, avoid any contamination and always keep the containers completely closed. Lubricant properties will change during storage and the recommended maximum shelf life from the date of filling of the lubricant container is 2 years for grease and 10 years for oil.

Lubricants used for the decanter bearings:

All bearings: Alfa Laval part number 61203671-50

For further information: See Table 3.8.2.

ATTENTION

The lubrication kit supplied with decanter contains two grease guns labelled with grease type, one for the main bearings and one for the conveyor bearings. Be very careful not to mix the grease types when lubricating the bearings or filling the grease guns. Use of wrong grease in the bearings may result in bearing failure.

The grease gun included in the standard decanter delivery will give 1.5 g (0.05 oz) in each stroke. For part number: see list of tools in Spare Parts catalogue.

3.8.1 Lubrication of Main Bearings

(Nipples 1 and 2 in Fig. 3.8.1)

The main bearings shall always be lubricated while the decanter is running. The optimal lubrication result is obtained if the decanter is lubricated while running at low speed such as during stopping of the decanter or towards the end of a low speed CIP cycle. Lubrication at low speed shall be used whenever possible.

The standard lubrication interval and lubricant quantity is:

Lubrication time interval: 300 operating hours
Lubricant quantity: 9 g (0.32 oz) - 6 strokes with std. grease gun

Lubricate bearings in both ends with the above, specified quantity.

For decanters operating under extreme temperature conditions and with bearing temperatures constantly above 70°C (160°F), the time interval between each lubrication shall be shortened to 150 hours.

It is possible to use shorter time intervals, but if a shorter time interval is used, the quantity of grease shall always be reduced with the same factor as the time interval.

Example: If the quantity of grease specified for 300 hours is X grams, and the time interval between lubrication is 24 hours the required grease quantity is:

$$\frac{24}{300}\ X\ grams$$

Note: If the standard lubrication time interval is shortened due to extreme temperature conditions, the shortened interval shall be used in the above calculation.

The grease quantity and the specified lubrication interval must never be exceeded. Exceeding the specified quantity will cause over-greasing and risk of high bearing temperatures. Exceeding the time interval will lead to insufficient lubrication of the bearings.

Temperature alarm limits
The bearings can withstand a temperature of 120°C / 274°F. For decanters where the bearing temperature is measured with a PT100 sensor directly on the bearing outer race, the temperature limits are:

Warning limit: 110°C / 256°F

Stop limit: 120°C / 274°F

For bearing temperatures measured on the surface of the bearing housings, the temperature limits shall be reduced with approximately 10°C (18°F).

It is always important to ensure that PT100 sensors are properly fitted and the tip of the sensor is in good contact with the bearing outer race.

Temperature peaks

When a bearing is lubricated it is normal that there is a temperature peak just after lubrication. The temperature peaks are caused by the heat generated, when grease is pushed away from the rolling elements. The temperature peaks are not critical, unless the bearing temperature exceeds the temperature limits or does not start to decrease to a normal level after 2-4 hours. If the temperature does not decrease it can be a sign of either bearing contamination or hardened grease inside the bearing. Frequent greasing with smaller quantities will normally lead to smaller temperature peaks and is therefore recommended, if there are problems with high temperature peaks.

If there is a suspicion that a bearing has hardened or contaminated grease, the recommended procedure is to dismantle and clean the bearing completely or change it. Grease should not be tried to be pushed out by adding large amounts of new grease or blowing with compressed air.

First start of a decanter – running in

When a decanter is received from the factory the bearing is filled with grease. This is to protect the bearing against contamination and drying out during transport and storage. It is therefore advised not to the start the decanter at full speed, but first do a low speed rotation of the decanter. If the decanter is driven with a frequency inverter, this can be obtained by running the decanter 15-20 minutes at the speed for low speed CIP or run a low speed CIP cycle without feed or water. If the decanter does not have a frequency inverter, it is advised to do 5 repeated starts where the decanter is stopped when it has reached a speed of approximately 500 r.p.m.

Automatic lubrication system (Optional)

The decanter can be equipped with an automatic lubrication system for the main bearings. The pumping time and the time interval between lubrication are controlled with a timer.

The timer settings shall be:	
Time interval between lubrication:	6 hours
Lubricant quantity at each lubrication:	0.2 grams (0.008 ounce)
Pumping time*):	2 minutes

*) The pumping time is based on a pump delivering 6 grams per hour at each outlet at continuous pumping. If the lubrication pump is calibrated to deliver a different amount per hour, the pumping time shall be adjusted in a proportional manner in order to obtain the same quantity of grease as obtained with the above settings.

3.8.2 Lubrication of Conveyor Bearings

(Nipples 3 and 4 in Fig. 3.8.1)

At lubrication of conveyor bearings, the decanter must be stopped and the main power must be properly disconnected according to the safety instructions.

The conveyor bearings shall normally be lubricated for each 1000 hours. Note that this will coincide with the mandatory visual inspection of bowl, casing and gearbox.

Lubricant quantity, both ends: 30 g (1.06 oz) - 20 strokes with std. grease gun

Lubricate bearings in both ends with the above, specified quantity.

For decanters operating with feed temperatures above 90°C (200°F), the lubrication interval shall be shortened to 500 hours.

If the decanter is cleaned with low speed CIP, it is recommended to lubricate the conveyor bearings after the low speed. The quantity of grease shall be reduced according to the number of operating hours between each low speed CIP.

Example: If the quantity of grease specified for 1000 hours is X grams, and the time interval between lubrication is 40 operating hours, the required grease quantity is

$$\frac{40}{1000}\ X\ grams$$

3.8.2.1 "Solid Oil" Conveyor Bearings (Optional)

The decanter can for some applications be equipped with conveyor bearings of the "Solid Oil" type.

The "Solid Oil" bearings are lubricated for life and are, in principle, maintenance free, but it is recommended to now and then lubricate these bearings with a smaller amount of grease to protect the bearings against contamination from the outside. Do not use more than 1/4 of the normal grease quantity in order not to damage the seals.

3.8.3 Change of grease type - Compatibility of greases

If the grease used for a bearing is changed, it must be checked that the thickener of new grease is compatible with the old grease. If they are not compatible, the bearings and lubrication channels must be cleaned and free of old grease before the grease is changed. For main bearings it is strongly recommended to clean out even if the grease types are listed as compatible in order to get the optimum result. For conveyor bearings it is usually enough to purge out the old grease. Lubricating with twice the amount specified for normal lubrication will ensure this.

3.8.4 Cleaning out grease exits on decanters

It is recommended to do a cleaning of the grease exits from the bearing housings each time the decanter is stopped for conveyor bearing lubrication and inspection. This will ensure that the grease exit is not blocked with old, hardened grease.

3.8.5 Grease accepted by Alfa Laval for lubrication of decanter bearings

Brand	Part No. / Designation	Main bearings	Conveyor bearings
Alfa Laval	61203671-50	■	■
	61203671-58 ◆		▲
SKF	LGHP 2	■	■
Chevron	FM CSC EP2 ◆		▲
Texaco	Cygnus CSC EP2 ◆		▲
Klüber	Microlube GLY 92	❑	
	Isoflex NBU 15	❑	
Shell	Cassida EPS 2 ◆		❑ / Δ
SKF	LGHB 2		❑

Table 3.8.2

■ Lubricants applied to the decanter when delivered
▲ Lubricant applied to conveyor bearings on sanitary decanters when delivered
❑ Lubricants accepted by Alfa Laval
Δ Lubricants accepted by Alfa Laval for conveyor bearings on sanitary decanters
◆ Food grade grease

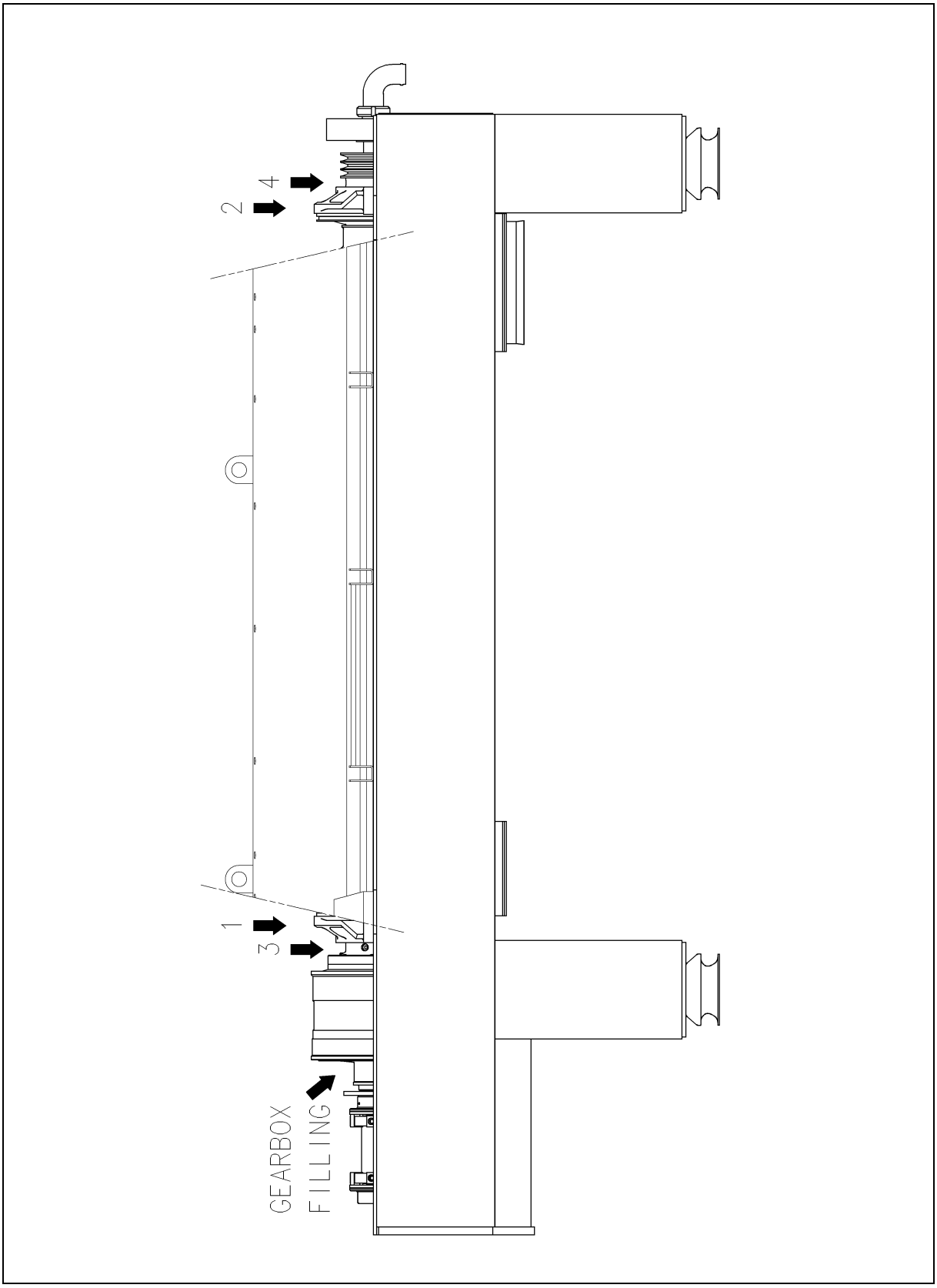


Figure 3.8.2

3.8.6 Gearbox (Fig. 3.8.2)

Change the oil in the gearbox for each 2000 operating hours.

Lubricant	Quantities
Alfa Laval 61203671-10 61203671-16 Statoil Mereta 320	**2.5 kNm :** 2.5 Litres (2 3/4 quarts) **3.5 kNm DD :** 4.0 Litres (4 1/4 quarts)

In the front face of the gearbox there are two plugs (drain plugs) screwed into two holes.

Drain the oil from the gearbox into a suitable container as follows:

Rotate the gearbox until the two drain plugs are set in vertical alignment.

Remove the upper plug and subsequently the lower plug, and drain all oil from the gearbox.

After draining, flush the gearbox with clean gearbox oil: Insert one of the removed drain plugs into the lower hole and pour approx. 1 litre of gearbox oil through the upper hole, using an oil syringe. Insert the second plug into the upper hole and rotate the gearbox by hand as fast as possible and drain it again as described above.

Then refill the gearbox with oil of the quality given in the lubrication table. To check the oil level, rotate the gearbox until its arrow marked "UP" points straight up. The oil surface inside the gearbox should then level with the upper drain hole (see level indication mark in Fig. 3.8.3 below).

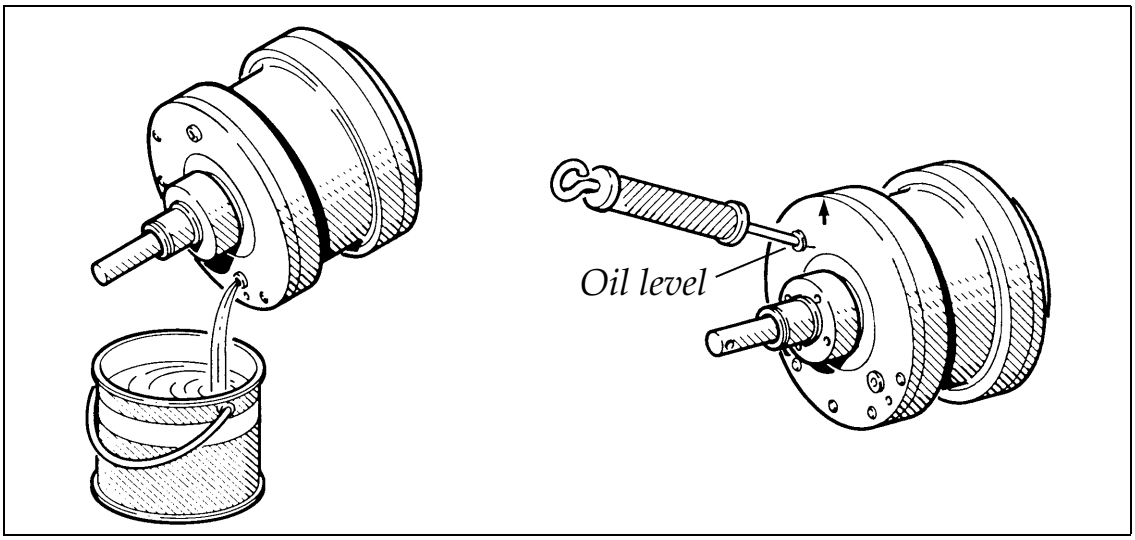


Figure 3.8.3

Decanter Supply including Gearbox Oil Pump

Change the oil in the gearbox at the intervals given in Lubrication Table.

In the front face of the gearbox there are two plugs (drain plugs) screwed into two holes.

Drain the oil from the gearbox into a suitable container as follows:

Rotate the gearbox until the two drain plugs are set in vertical alignment.

First remove the upper plug and then place a hopper in the bottom plate hole. Rotate the gearbox by 180° and remove the second plug. After draining, fit the connection for the filling hose into the lower hole and then connect the filling hose with oil pump to the gearbox. Leave the gearbox hole with filling hose downwards during refilling of oil.

Refill the gearbox with oil of the quality given in the lubrication table. To check the oil level, rotate the gearbox until its arrow marked "UP" points straight up. The oil surface inside the gearbox should then level with the upper drain hole.

After filling, fit one of the plugs into the upper hole and rotate the gearbox by 180°. Then remove the filling hose and the connection and fit the second plug into the hole.

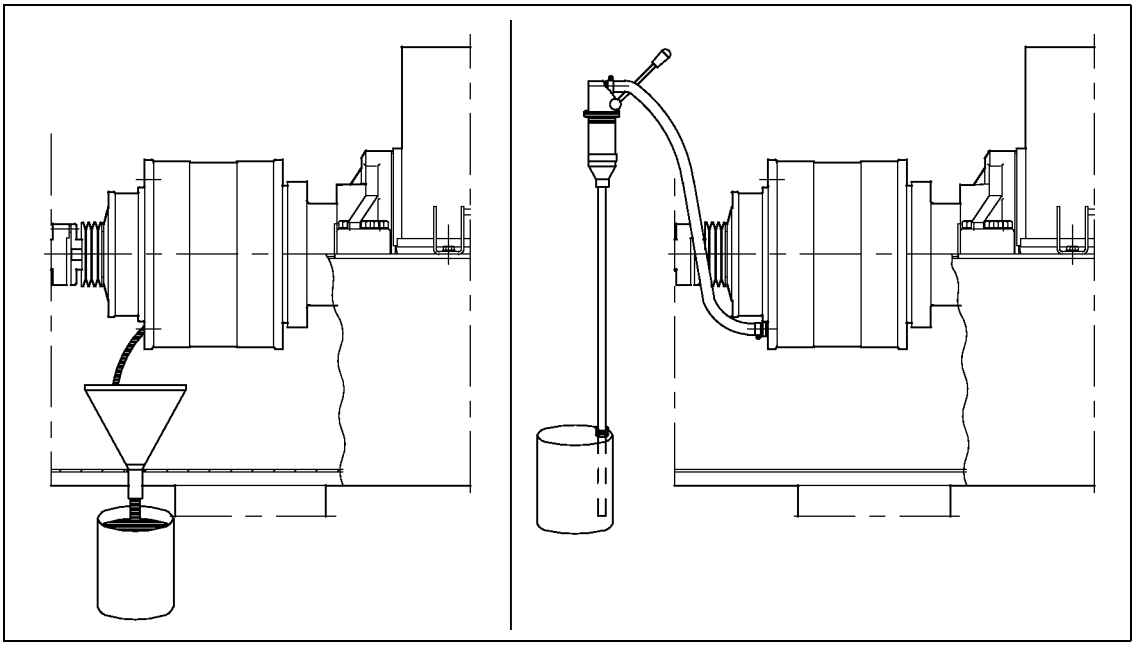


Figure 3.8.4

3.9 Recommended service intervals

Major service is replacement of all bearings and all seals while intermediate (or minor) service is replacement of seals only.

It is difficult give a precise answer how often major service and intermediate service must be done because the wear and contamination risk is both application and installation related. Therefore it must be based on actual application experience. As a rule of thumb it is recommended to carry out a major service every second year and a minor service in the intermediate year. For some applications such as applications with high temperatures, frequent CIP, contaminated environment and for decanters with paring disks, a major service at least once every year is recommended.

Maintenance Table

Recommended Intervals for Maintenance		
Item		**Interval**
Gearbox	***Oil Leakage Check***	Monthly
	Change lip seal(s) at sunwheel shaft(s) if leaking	
	Oil Level Check	1000
	Oil Change	2000
Gearbox Spline Shaft	***Lubricate splines***	At each major service
Motor(s)	***Lubrication***	2000[1)]
V-belts	***Tightening up and Check***	2000
	Change	16000
Bowl	***Check for wear and corrosion.*** For decanters operating at high temperatures and/or high chloride levels in feed, check bolts connecting bowl section for corrosion and stress corrosion cracks. See safety instructions for details.	1000
Solids Discharge Wear Protection	***Check*** If damaged or excessively worn, fit new immediately.	1000
Safety Equipment	***Check functioning of:*** All alarm devices Safety equipment	2000
Labels	***Check:*** Nameplate and warning labels. Replace if not readable.	2000
Foundation bolts	***Check tightening***	4000
Vibration dampers	***Check*** Fit new, if necessary.	4000

Table 3.9.1

1) 2000 hours, unless specified otherwise in separate motor manual.

4 Disassembling and Assembling

WARNING *Do not make any disassembly/assembly operations on the decanter unless the main power is shut off, and the disconnected main switch is locked with a safety lock.*

Replacing parts

To ensure trouble-free operation of the decanter, great care must be taken during replacement of parts:

- Contacting and sliding surfaces, as well as O-rings and seals must be care fully cleaned.
- Always place removed parts on a clean, soft surface to avoid scratching the surfaces.
- Ensure that screws used to pull parts from each other have smooth ends.

O-rings, Seals, and Gaskets

Check O-rings, seals and gaskets for defects.

Check that O-ring grooves and sealing surfaces are clean.

After replacing an O-ring, check that it fills the groove completely and that it is not twisted.

Ensure that seals are mounted with the open end pointing the correct way. See illustrations.

Special tools

Always use the recommended special tools for removing, disassembling, assembling, and mounting the bowl. In case of negligence of this point, Alfa Laval accepts no liability for possible damage to the parts.

Alfa Laval supplies a variety of special tools and accessories to facilitate maintenance of the decanter. See volume SPC (Spare Parts Catalogue).

When lifting the decanter assembly use the slings specified on the dimensioned drawing.

When Lifting Minor Decanter Parts by Straps always use lifting straps having a load capacity of minimum 1000 kg (2200 lbs).

Vibration Dampers

Check regularly and change those crumbled and dampers whose rubber has swelled or cracked. Do not run the decanter if any of its dampers is defective.

Spare Parts Kits

Alfa Laval supplies three types of spare parts kits for the decanter:

The intermediate kit for main bearings and conveyor bearings, respectively, contain rubber parts for the main bearings and the conveyor bearings.

The major kit for main bearings and conveyor bearings, respectively, contains parts necessary for the complete overhaul of the decanter. It includes all sealing components and bearings. See volume SPC (Spare Parts Cataloque).

The gearbox kit includes the lip seal for the sun wheel and the O-ring between the splined nave and the gearbox cover.

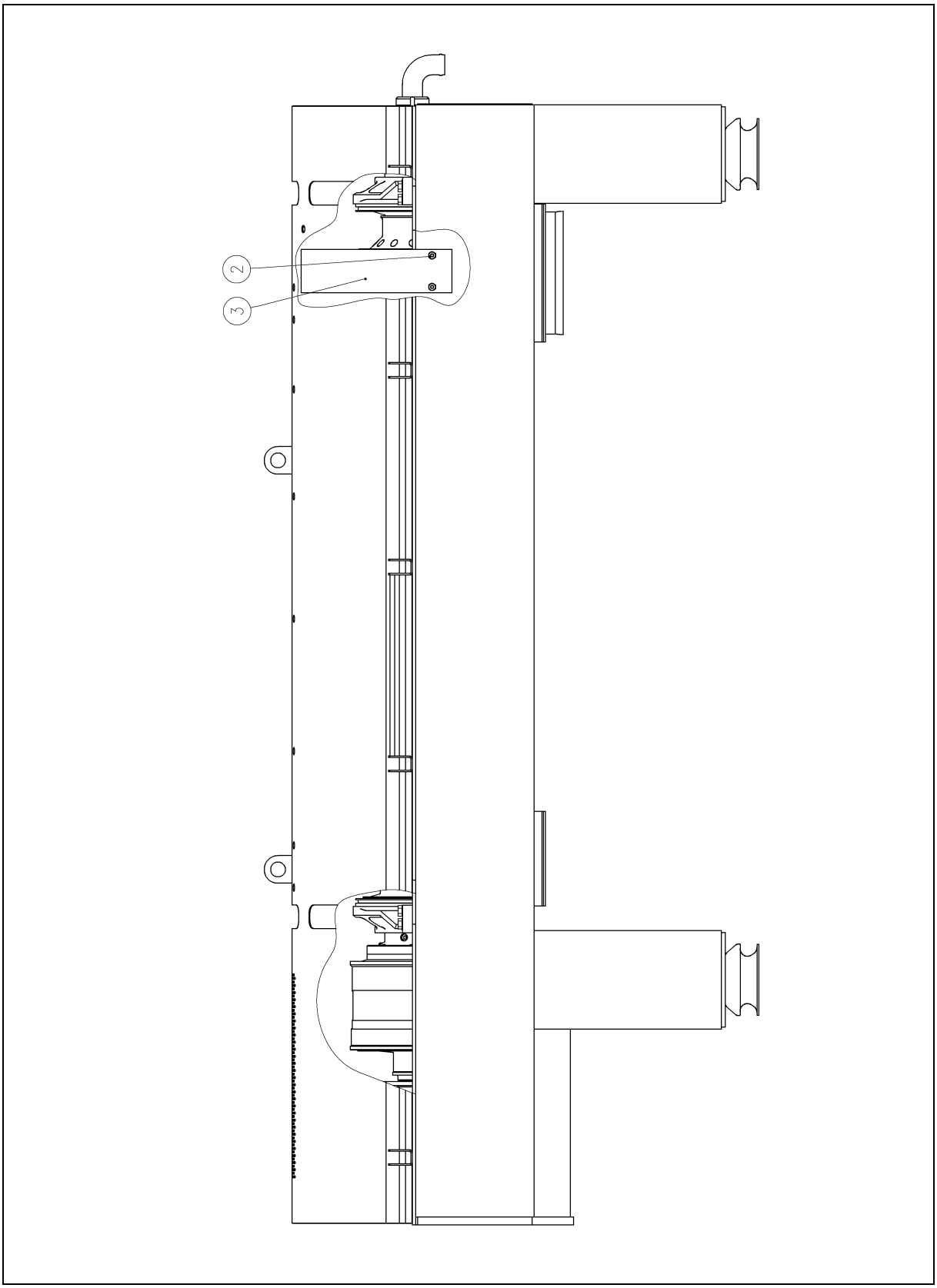


Figure 4.1.1

4.1 Rotating Assembly

4.1.1 Remove Bowl (Figs. 4.1.1 and 4.1.2)

WARNING *Do under no circumstances loosen or remove the upper casing while the bowl is rotating.*

Disassemble the main drive according to instructions in section 4.5.1.

Disassemble the back drive according to instructions in section 4.6.1.

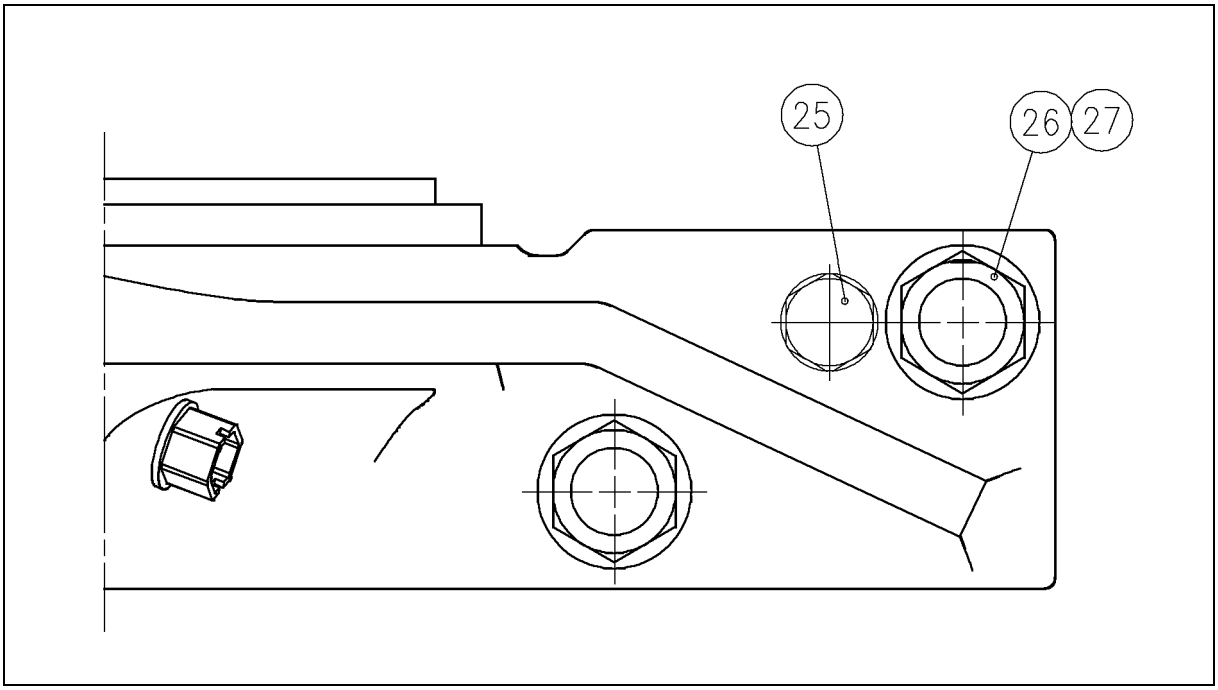


Figure 4.1.2

Remove the four screws [2] and the wear liner [3].

Remove the four Hexagon socket fitted bolts [25] from the pillow blocks (see Figure 4.1.2).

ATTENTION *If the bolts are removed by using an electrical or pneumatic spanner, unscrew the bolts at low speed; otherwise there is a risk of seizing between the bolt and the frame.*

Remove the eight screws [26] holding the pillow blocks.

Now remove the bowl assembly by means of the lifting tool.

Place the tool on top of the bowl at the centre of gravity and pull the tow straps around the bowl and place the ends of the straps in the hook of the crane, as shown in Figure 4.1.3.

ATTENTION *Check that the two bars are placed underneath the bowl and the two straps are placed tightly around the bowl.*

The individual design of both bowl and conveyor means that each bowl has its own centre of gravity and, as a consequence of this, that the axial point on the lifting tool corresponding to the bowl centre of gravity displaces accordingly. To find bowl centre of gravity, proceed as follows:

Place the lifting tool around the bowl and lift the bowl carefully, to see how the bowl balances.

If the bowl is not in balance, place the bowl in horizontal position on the frame, move the lifting tool closer to the heavy end of the bowl and lift the bowl carefully again.

Repeat this procedure until the bowl is in balance.

Carefully lift the bowl assembly off the lower casing and place it on the lifting tool.

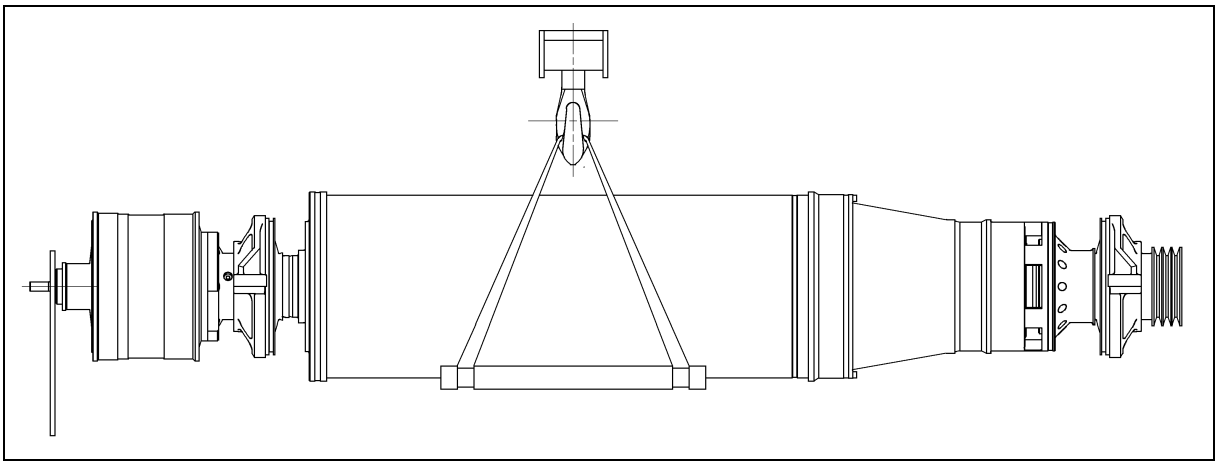


Figure 4.1.3

4.1.2 Install Bowl (Figs. 4.1.1 and 4.1.2)

When installing the bowl, clean the pillow block contact surfaces and the frame before lowering the bowl into place.

Pull the tow straps around the bowl.

Place them in the hook of the crane as shown in Figure 4.1.3.

Lower the bowl assembly onto the frame.

ATTENTION *If the gearbox is equipped with a reaction arm, as shown in Figure 4.1.3, then be very careful not to damage it when lowering the bowl assembly.*

Either remove the reaction arm during assembly, or turn it upwards.

After the bowl has been placed and the pillow blocks aligned, the four Hexagon socket fitted bolts [25] must be inserted.

Tighten the eight screws [26] securing the pillow blocks to a torque of 197 Nm (1743 in-lbs).

Install the wear liner [3] and secure with the four screws [2].

Assemble the main drive according to the instructions in section 4.5.2.

Assemble the back drive according to the instructions in section 4.6.2.

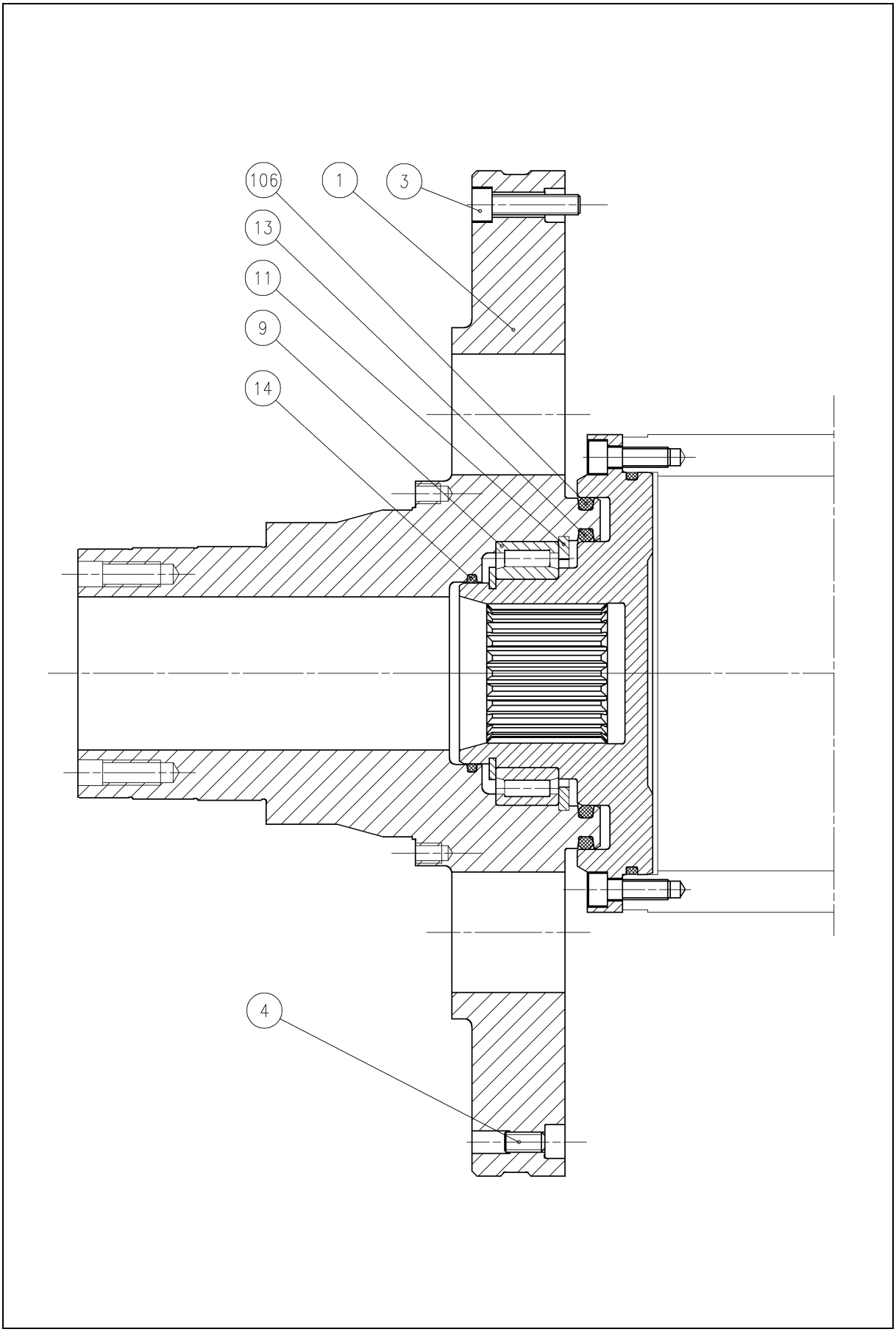


Figure 4.1.4

4.1.3 Remove Large End Hub (Fig. 4.1.4)

This procedure describes how to remove the large end hub with the gearbox assembled to it. For removal of the gearbox from the large end hub, see section 4.1.7.

ATTENTION *When removing the large end hub [1], always suspend it with a sling from a hoist or the like, to avoid excessive load to the needle bearing [9]. Place a sling around both sides of the pillow block.*

Remove 23 of the 24 long screws [3], loosen the last one, and leave it in place until the end hub [1] is ready to be removed.

The end hub can now be jacked out: Using the three jacking screws [4], clear it of the bowl.

Be careful not to damage the needle bearing [9].

Remove the loosened long screw [3] left in place and carefully pull out the end hub [1].

Turn the three jacking screws [4] back to their original position. They must not stick out through the large end hub contact surface when the hub is re-installed.

4.1.4 Install Large End Hub (Fig. 4.1.4)

This procedure describes how to install the large end hub with the gearbox assembled to it. For assembling the gearbox to the large end hub, see section 4.1.8.

ATTENTION *When mounting the large end hub [1], always suspend it with a sling from a hoist or the like, to avoid excessive load to the needle bearing [9]. Place a sling around both sides of the pillow block.*

Grease the outside of the O-rings [13], [106] and [14].

Place the large end hub [1] on the bowl, being careful not to damage the needle bearing [9].

Fit the 24 screws [3] and tighten them to a torque of 22 Nm (195 in-lbs).

Fasten the three jacking screws [4].

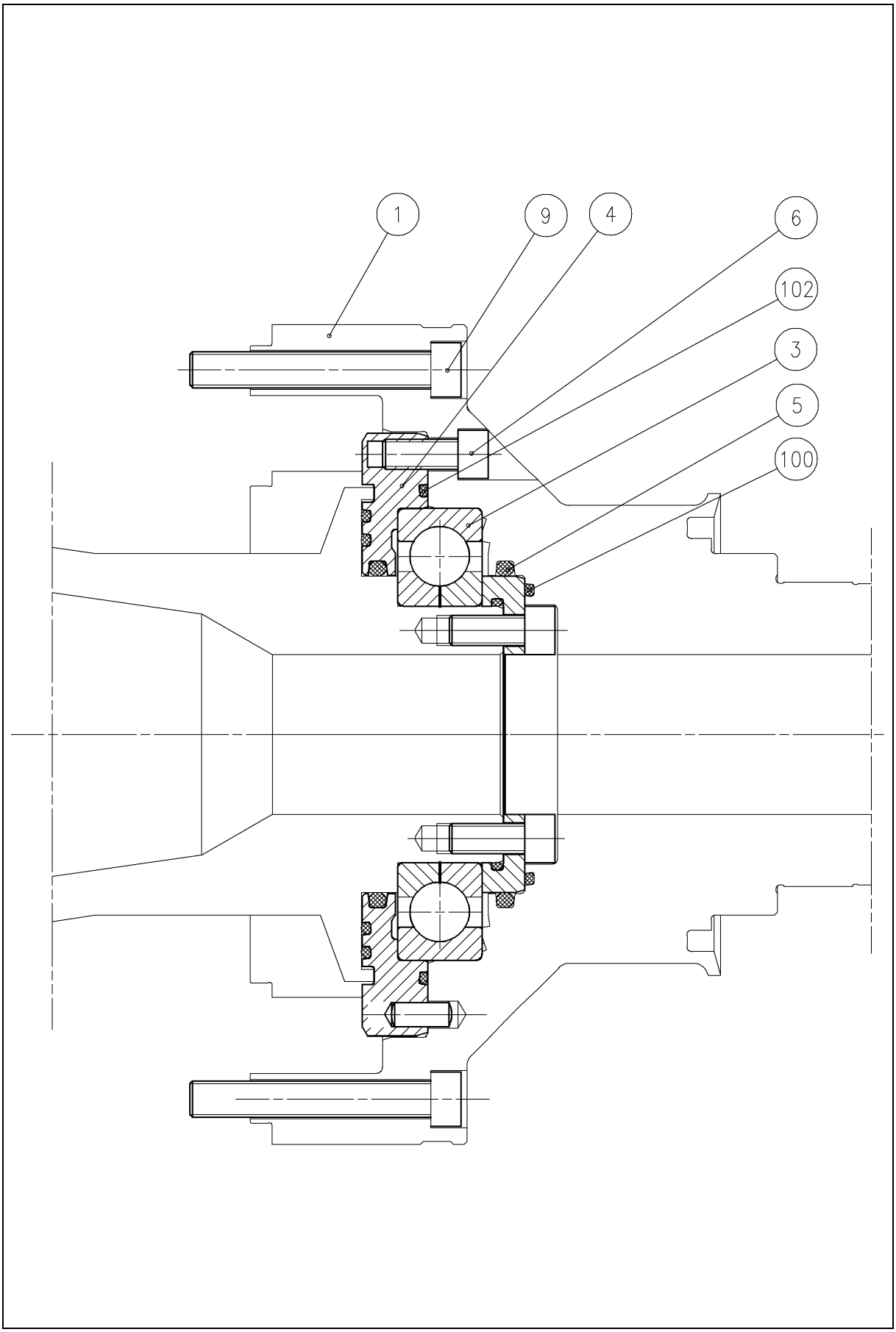


Figure 4.1.5

4.1.5 Remove Small End Hub (Fig. 4.1.5)

ATTENTION *When removing the small end hub [1], always suspend it with a sling from a hoist or the like, to avoid excessive load to the ball bearing [3]. Place a sling around both sides of the pillow block.*

Loosen the twelve screws [6] and remove them.

Lossen the eight screws [9] and remove them.

The hub can now be carefully pulled out. Use, if necessary, a plastic hammer on the edge of the hub to loosen it.

4.1.6 Install Small End Hub (Fig. 4.1.5)

ATTENTION *When mounting the small end hub [1], always suspend it with a sling from a hoist or the like, to avoid excessive load to the ball bearing [3]. Place a sling around both sides of the pillow block.*

Fit the conveyor according to instruction given in section 4.4.2.

Grease the outside of the O-rings [5], [100], and [102].

Fill up with grease the ball bearing outer race [3] and distribute the grease with the fingers.

Place the small end hub [1] on the bowl. To align the holes in the retaining ring [4] with the holes in the hub [1], use a pin [A] as indicated in Figure 4.1.6, and secure the ring [4] with the screws [6]. Replace the pin [A] with a screw [6] when the holes are aligned. Tighten the screws [6] to a torque of 44 Nm (389 in-lbs). Secure the hub with two of the screws [9], and be careful not to damage the ball bearing [3] during this process.

Fit the remaining six screws [9] and tighten them to a torque of 76 Nm (672 in-lbs).

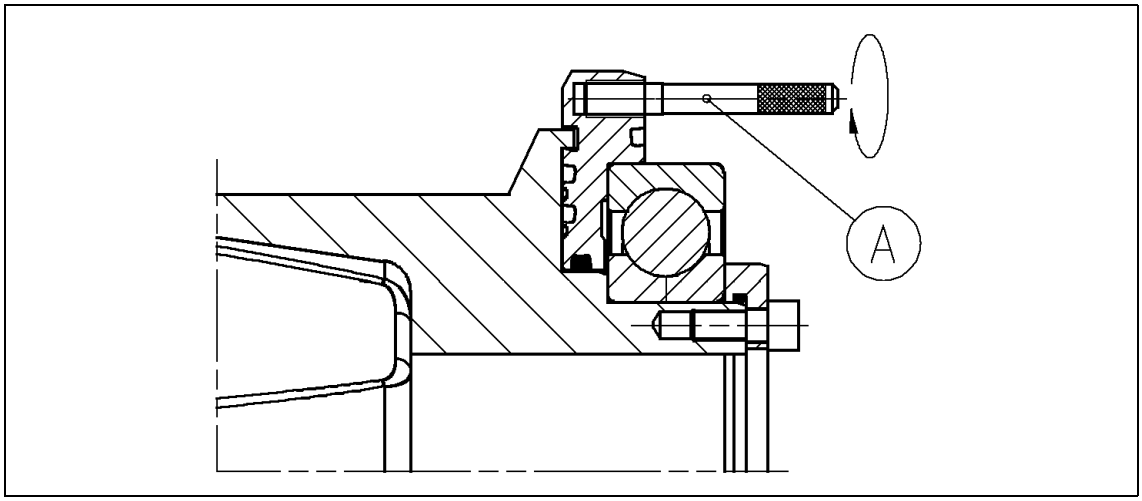


Figure 4.1.6

4.1.7 Remove Gearbox (Fig. 4.1.7)

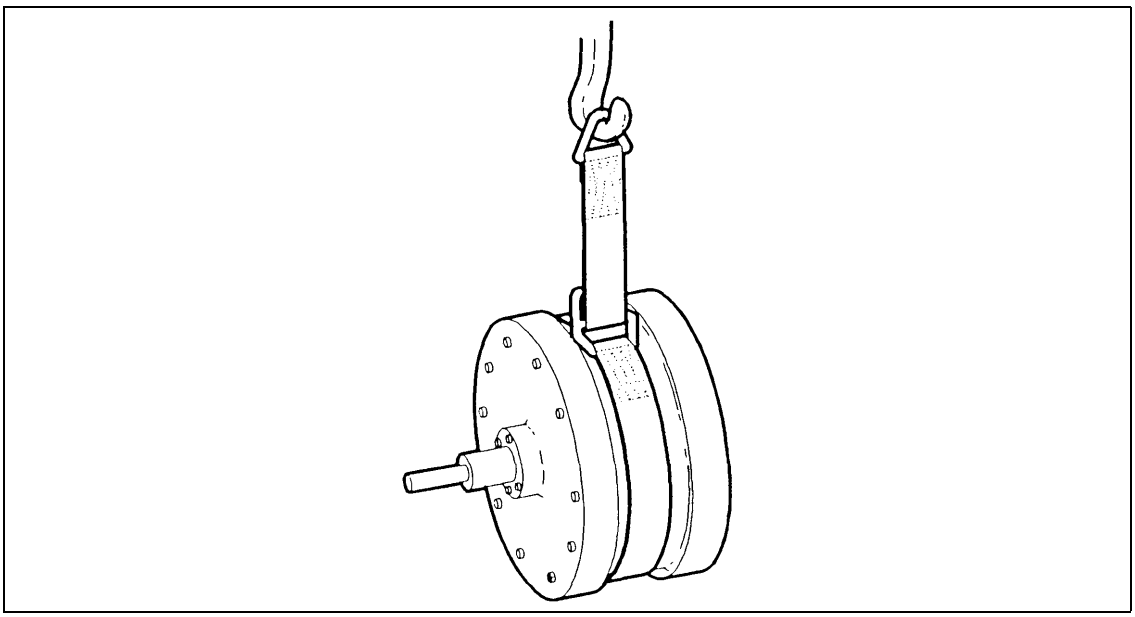


Figure 4.1.7

ATTENTION *When removing or installing the gearbox, always suspend it from a hoist or the like to avoid excessive load to the splined shaft. Use the lifting sling* as shown in Figure 4.1.7.*

Remove the six screws (M16) connecting the gearbox to the gearbox adapter. Place the sling* as shown in Figure 4.1.7.

Suspend the gearbox from a hoist or the like and jack it

* For P/N, see Spare Parts Catalogue

out, using the three jacking screws.

Turn the jacking screws back to their original position. They must not stick out through the contact surface between the gearbox and the gearbox adapter when the gearbox is installed again.

Carefully pull out the suspended gearbox.

The splined shaft can now be removed by hand.

4.1.8 Install Gearbox

Apply an ample amount of grease* to the splined shaft and the splined hub in the conveyor.

Push the gearbox assembly with splined shaft carefully into place.

Rotate the sunwheel shaft a few turns, to make the splines engage.

2.5 kNm Gearbox
3.5 kNm Gearbox

Insert the six screws *(M16)* assembling the gearbox adapter to the gearbox and tighten them to a torque of 197 Nm (1743 in-lbs) in the sequence shown in Figure 4.1.8.

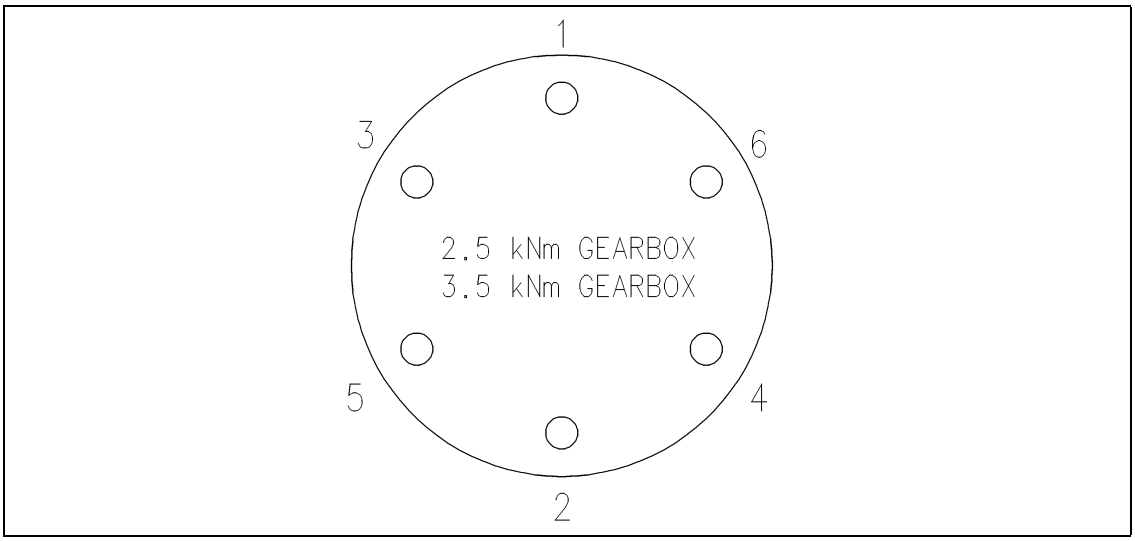


Figure 4.1.8

* For P/N, see Spare Parts Catalogue, Section TOOLS AND LUBRICANTS

4.1.9 Fit New Wear Liners (Fig. 4.1.9).

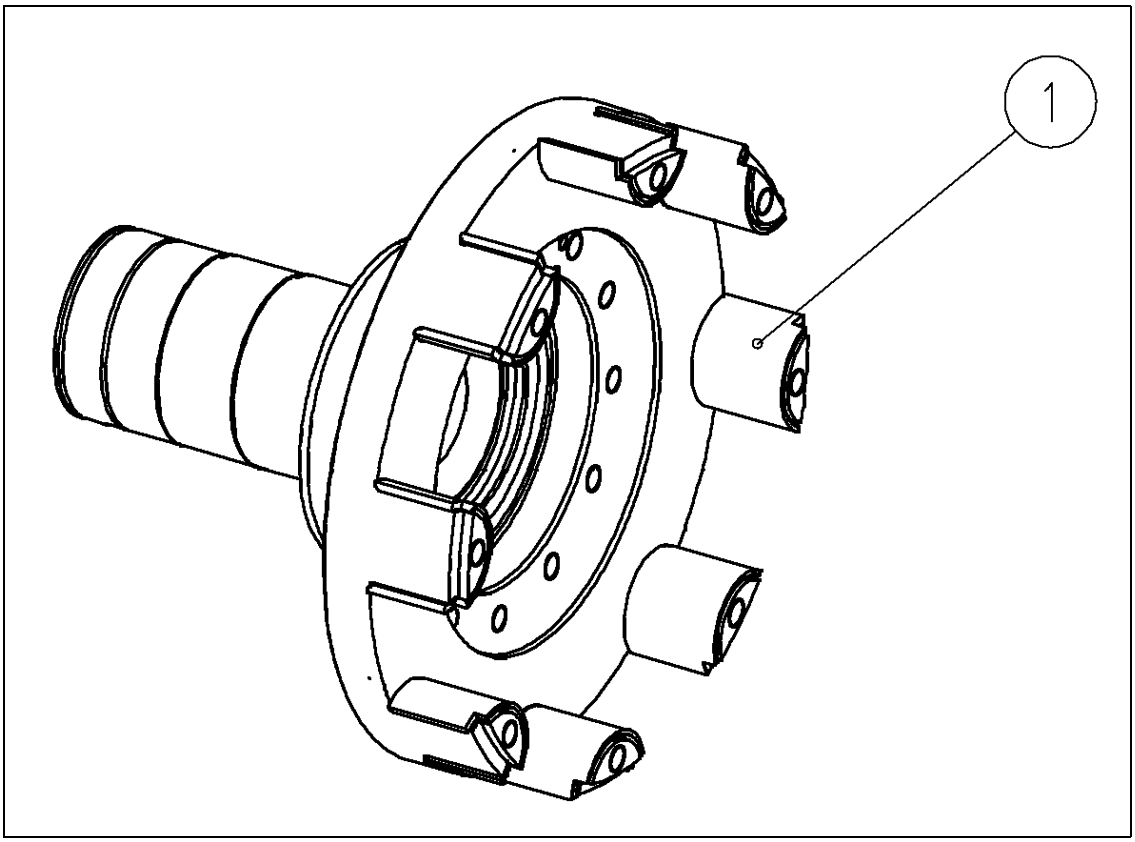


Figure 4.1.9

When the small end hub has been demounted, it is possible to exchange the wear liners [1]. Do not expect to reuse the old wear liners after demounting as the material is very brittle and probably will break.

Demounting of worn wear liners:

Disconnect the wear liner [1] with a small chisel and a hammer. Be careful not to damage the mating surfaces on the spokes of the hub.

Mounting of new wear liners:

- Clean the surface for glue residues, and thoroughly clean all surfaces that are to be glued, on spokes and wear liners [1] with acetone.

- Apply Araldite 2014 zigzag-wise on the inner side of the wear liner [1].

- The wear liner [1] is placed on the spoke and rotated back and forth until it feels as if it is floating. Then it is pushed into place and secured with a rubber band. Be careful that the gap is completely filled with glue.

- Remove excess Araldite.

Hardening time: 3.5 hours at 20°C (68°F)
0.5 hour at 60°C (140°F)
5 min. at 100°C (212°F)

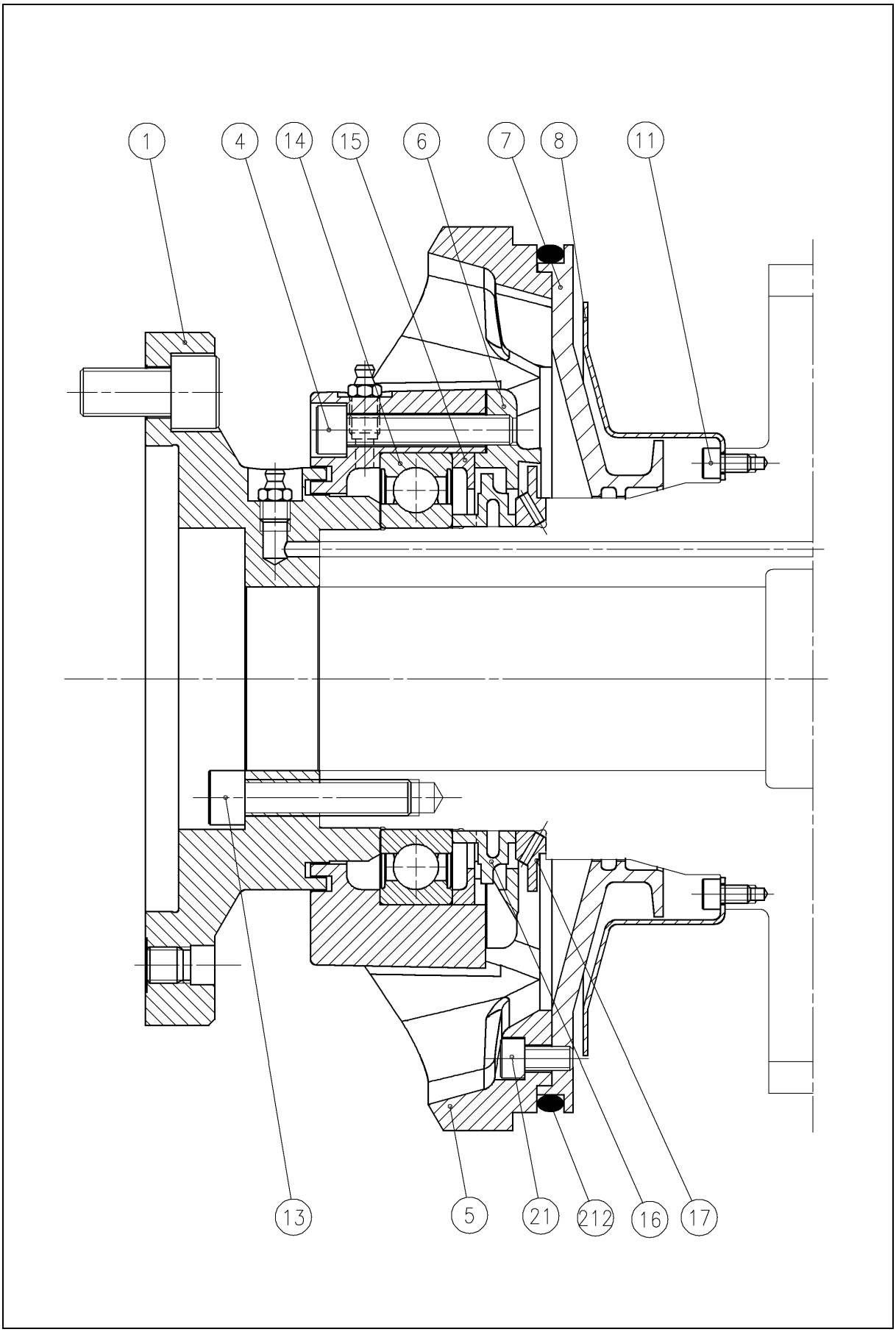


Figure 4.2.1

4.2 Main Bearings (Fig. 4.2.1)

4.2.1 Disassemble Main Bearing Large End

Prior to disassembling the main bearing large end, the gearbox must be removed according to instructions given in section 4.1.7.

Remove the 10 screws [13].

Using two of them as jacking screws, pull off the gearbox adapter [1], tightening the jacking screws equally to avoid pulling out the adapter [1] askew.

Remove the four short screws [21].

Fit the puller block [12] (Figure 4.2.2) on the pinion and use two of the screws [13] for the gear flange [1] to secure the block.

Fit the puller tool* on the pillow block, as shown in Figure 4.2.2, and pull off the assembly consisting of pillow block [5], ball bearing [14], ring [15], V-ring holder [16], and the bearing cover [6].

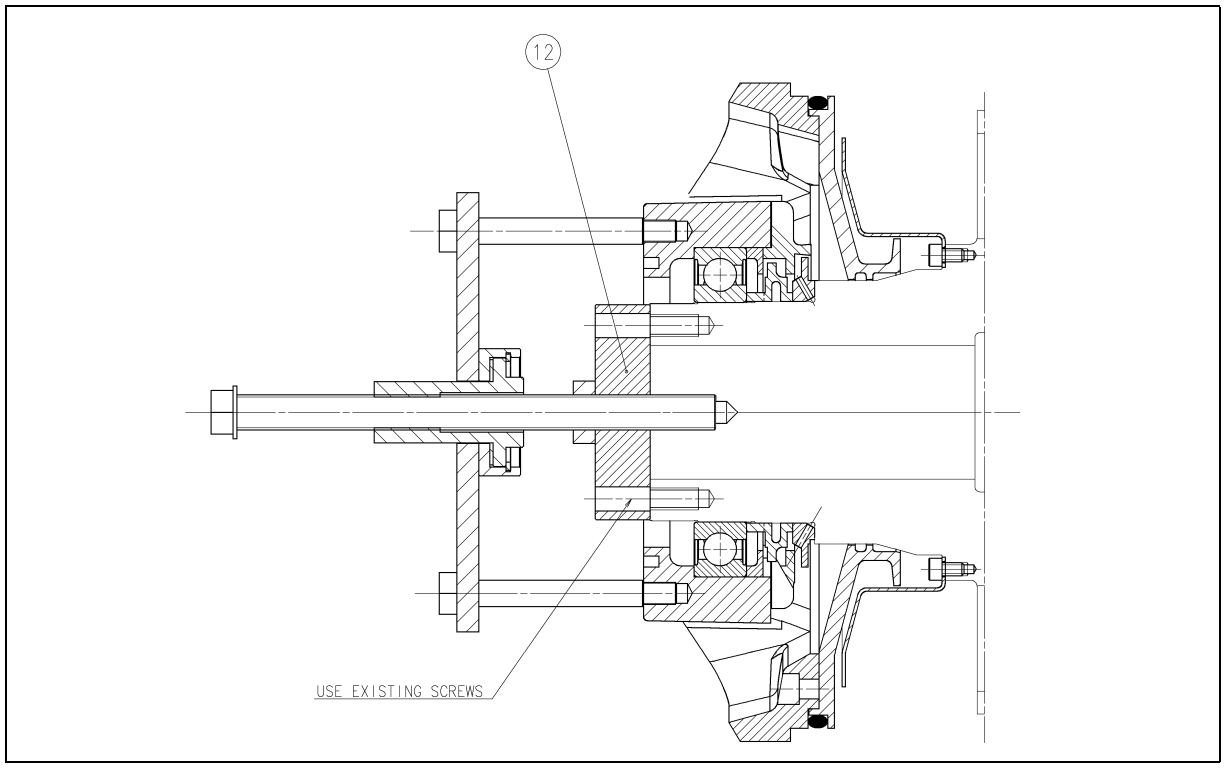


Figure 4.2.2

* For P/N, see Spare Parts Catalogue

Disassemble the pillow block: Remove, in the following order, the four long screws [4], the bearing cover [6], the V-ring holder [16], and the ring [15].

Use a hammer and a brass mandrel to remove the ball bearing [14], taking care that the mandrel does not damage the pillow block [5].

Remove, by hand, the guard ring [17] and the shield [7].

If necessary, remove the eight screws [11] and the splash disc [8].

4.2.2 Assemble Main Bearing Large End (Fig. 4.2.1)

Fit by hand the splash disc [8] on the pinion.
Insert an tighten the eight screws [11].

Fit the O-Ring [212] on the shield [7] and place the shield on the pinion. Make sure its 'cut edge' points downwards.
Fit the guard ring [17] on the pinion, its two holes pointing outwards.

Push the bearing cover [6] on the guard ring [17], its grease discharge pointing downwards, and then fit the V-Ring holder [16] on the pinion.

Insert the ball bearing [14] into the pillow block [5] and grease the balls.
Then fit the ring [15] and push carefully the assembly on the pinion.

ATTENTION *The ball bearing must be exchanged after disassembly as it may have been damaged during removal.*

Insert the four long screws [4] attaching the bearing cover [6] to the pillow block [5], and the four short screws [21] securing the shield [7].
Tighten all twelve screws.

Carefully clean the contact surfaces between the gearbox adapter [1] and the pinion.
Place the gearbox adapter [1] on the large end pinion, aligning the axial hole in the adapter and the guide pin on the end surface of the pinion.

Fit the 10 screws [13]. Tighten them to a torque of 136 Nm (1204 in-lbs), tightening them crosswise a few times to ensure tightening of all 10 screws to the correct torque.

Install the gearbox according to the instructions given in section 4.1.8.

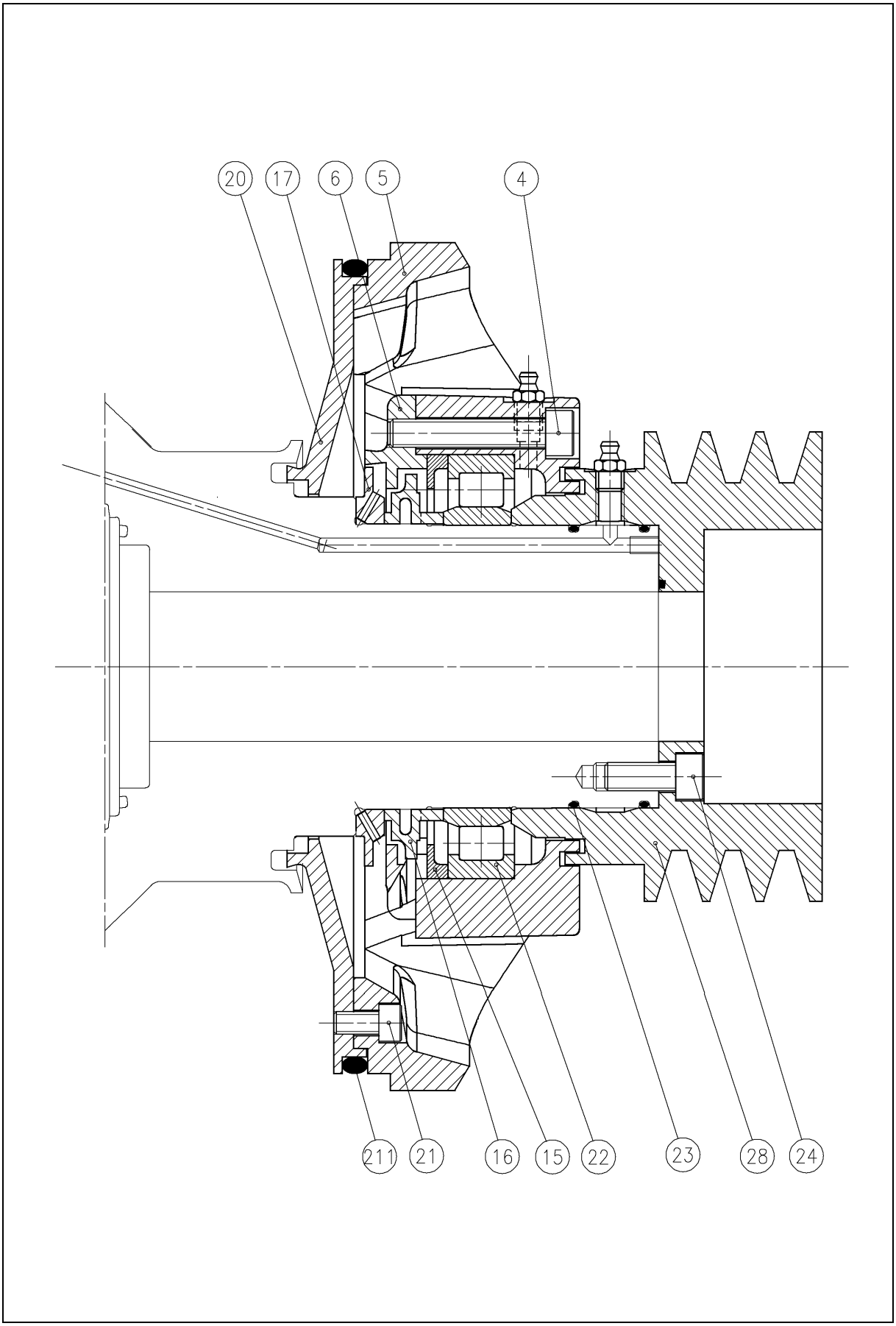


Figure 4.2.3

4.2.3 Disassemble the Main Bearing Small End

(Fig. 4.2.3)

Remove the eight screws [24].

Using two M10 jacking screws, pull off the pulley [28], tightening the jacking screws equally, to avoid pulling the pulley [28] askew.

Remove the four short screws [21] and the four long screws [4].

Now remove by hand the complete bearing assembly consisting of pillow block [5], roller bearing outer race [22], and ring [15].

Use a hammer and a brass mandrel to remove the roller bearing outer race [22]. Take care that the mandrel does not damage the pillow block [5].

The roller bearing inner race [22] can be removed from the pinion by means of a standard two-armed puller* as shown in Figure 4.2.4. Two milled recesses in the V-ring holder [16] allow space for the puller claws.

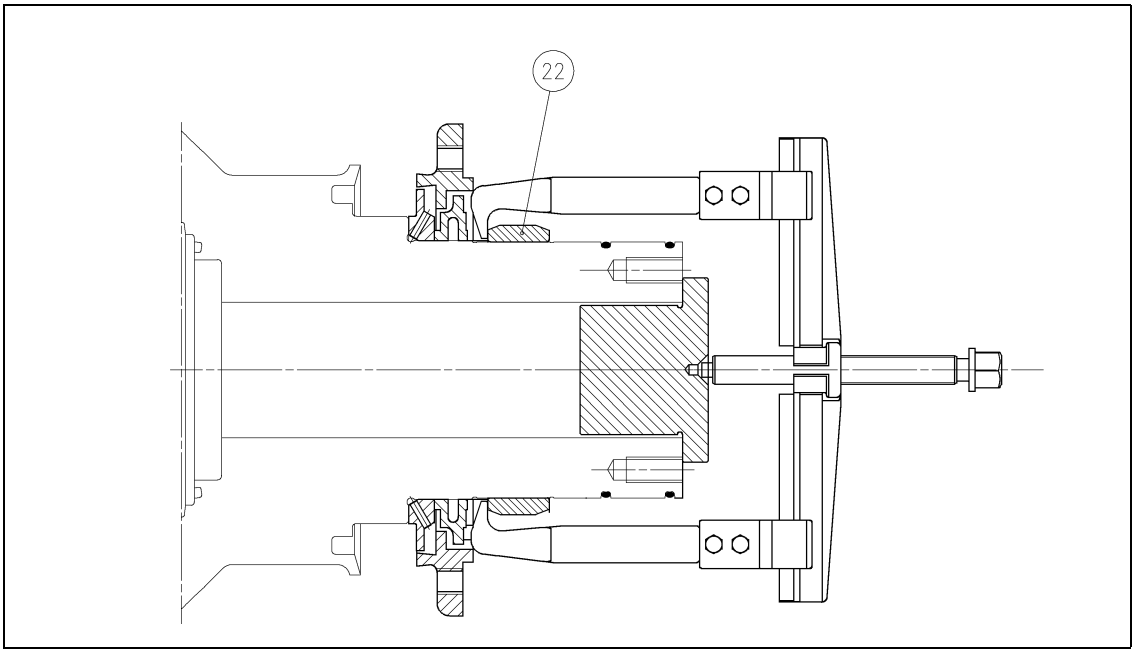


Figure 4.2.4

Remove, by hand and in the order mentioned, the remaining part: V-ring holder [16], bearing cover [6], guard ring [17] and shield [20].

* For P/N, see Spare Parts Catalogue

4.2.4 Assemble Main Bearing Small End (Fig. 4.2.3)

Fit the O-Ring [211] on the shield [20] and place it on the pinion.

Fit the guard ring [17] on the pinion, its two holes pointing outwards.

Push the bearing cover [6] on the guard ring [17], grease discharge pointing downwards, and then fit the V-ring holder [16] on the pinion.

Heat the main bearing inner race [22] to a temperature of 80°C (175°F) by means of an induction heater or in an oven, and push it on the pinion as far as it goes; it must seat fully against the V-ring holder [16] all around.

ATTENTION *Don't use any tool when pushing the main bearing inner race [22] against the V-ring holder [16] as this may damage the V-ring holder. When assembling the pulley, it will press the bearing to correct position.*

Insert the roller bearing outer race [22] into the pillow block [5] and grease the rollers.

Then fit the ring [15] and push carefully the assembly on the main bearing inner race [22].

Insert the four long screws [4] attaching the bearing cover [6] to the pillow block [5] and the four short screws [21] securing the shield [20].

Tighten all eight screws.

Make sure that the O-Rings [23] lie correctly in their grooves, and that they are not damaged.

Fit the pulley [28].

Fit the eight screws [24] and tighten them to a torque of 47 Nm (416 in-lbs), tightening them crosswise a few times, to ensure tightening of all eight screws to the correct torque.

Install the small end hub according to the instructions given in section 4.1.6.

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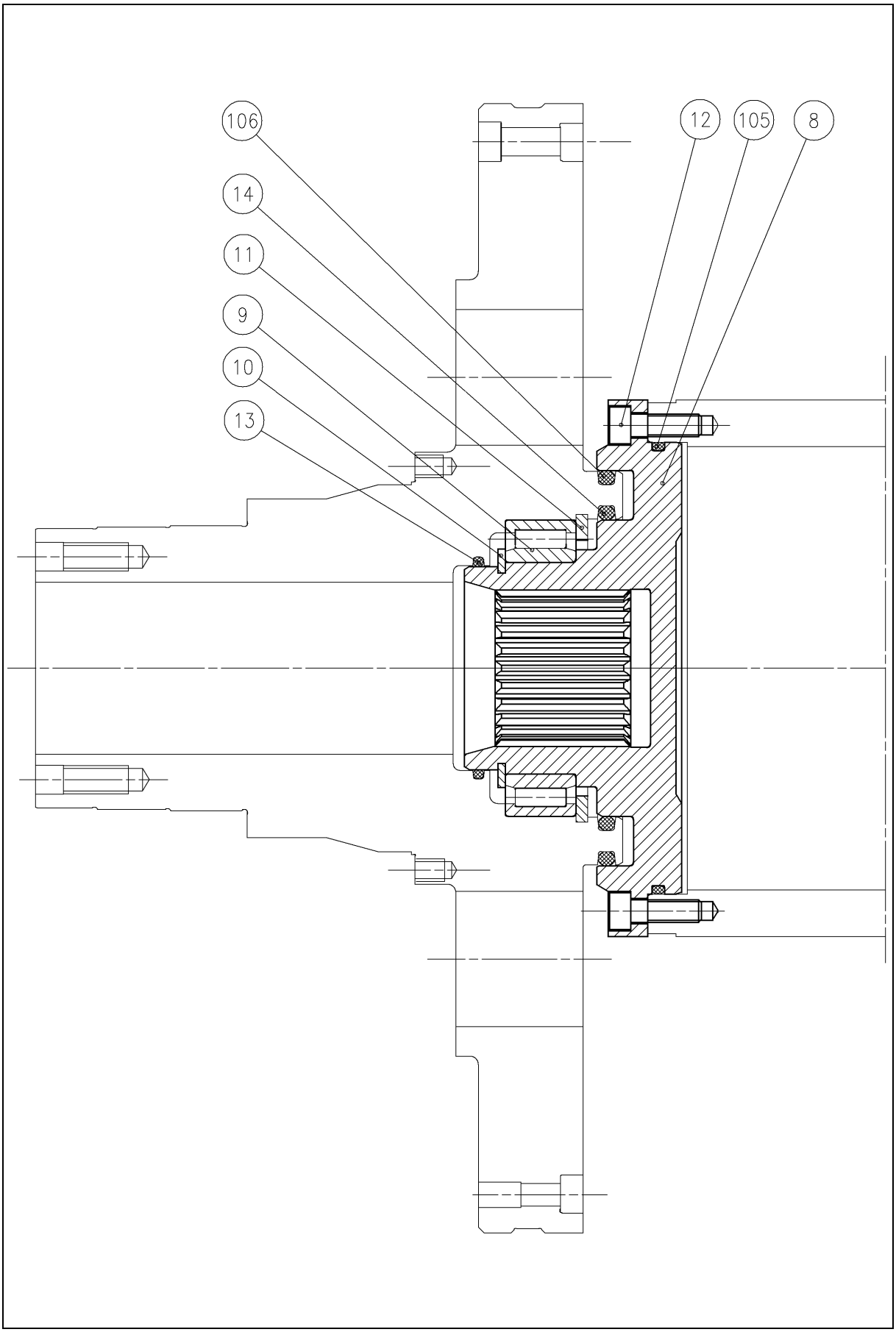

Figure 4.3.1

4.3 Conveyor Bearings (Fig. 4.3.1)

4.3.1 Disassemble Conveyor Bearing Large End

Remove the large end hub according to instructions given in section 4.1.3.

Remove the lock ring [10].

Remove the needle bearing inner race [9] by means of a standard two-armed puller tool as shown in Figure 4.3.2.

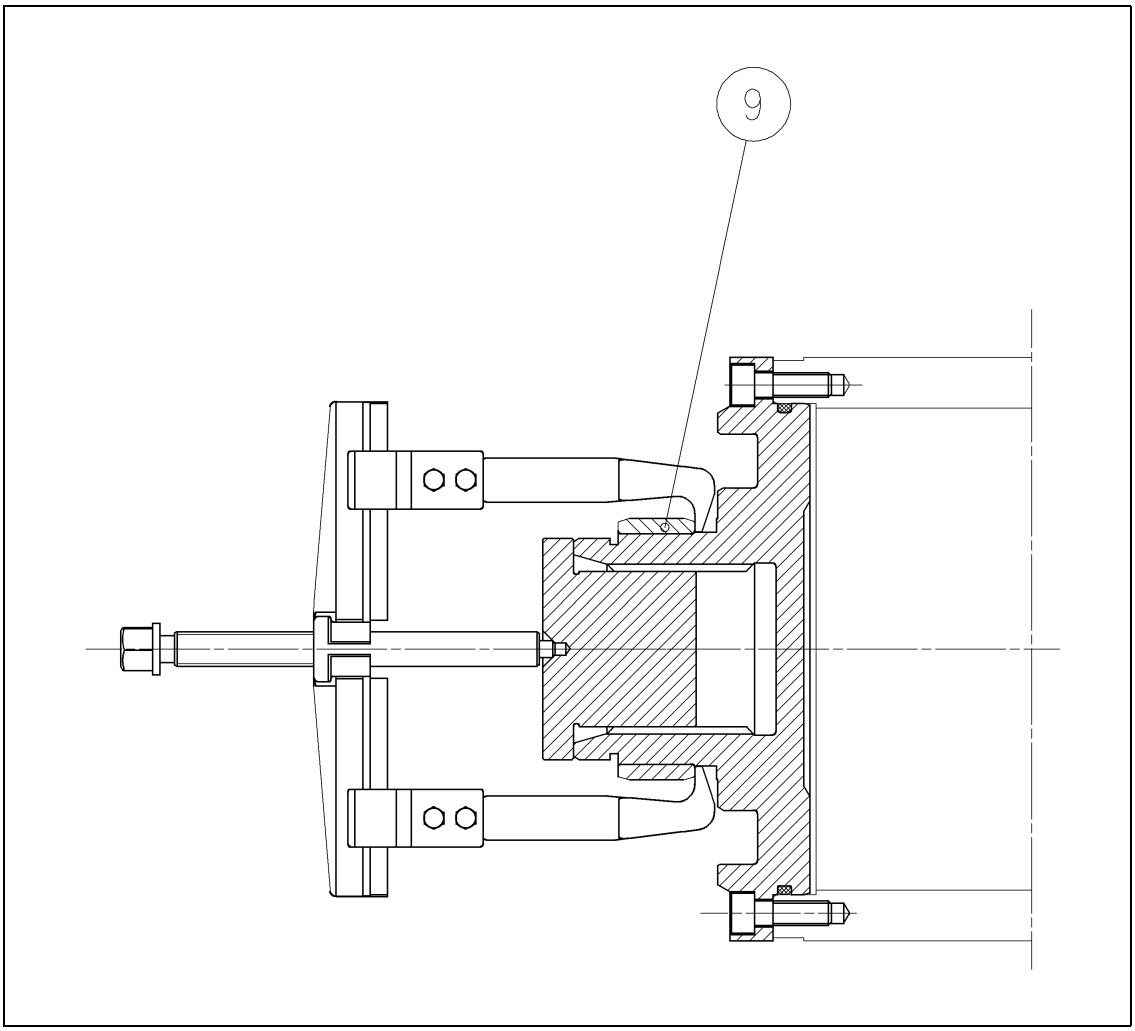

Figure 4.3.2

Remove the snap ring ([11] in figure 4.3.1).

Insert the puller* [1] as shown in Figure 4.3.3. Tighten the nut [2] so that the conical ring [5] expands between the needle bearing outer race [9] and the hub.

Insert the screw [7] and the block [12] by using two of the screws ([15] in Figure 4.2.1) holding the gearbox flange. Push off the needle bearing outer race [9] by turning the screw [7].

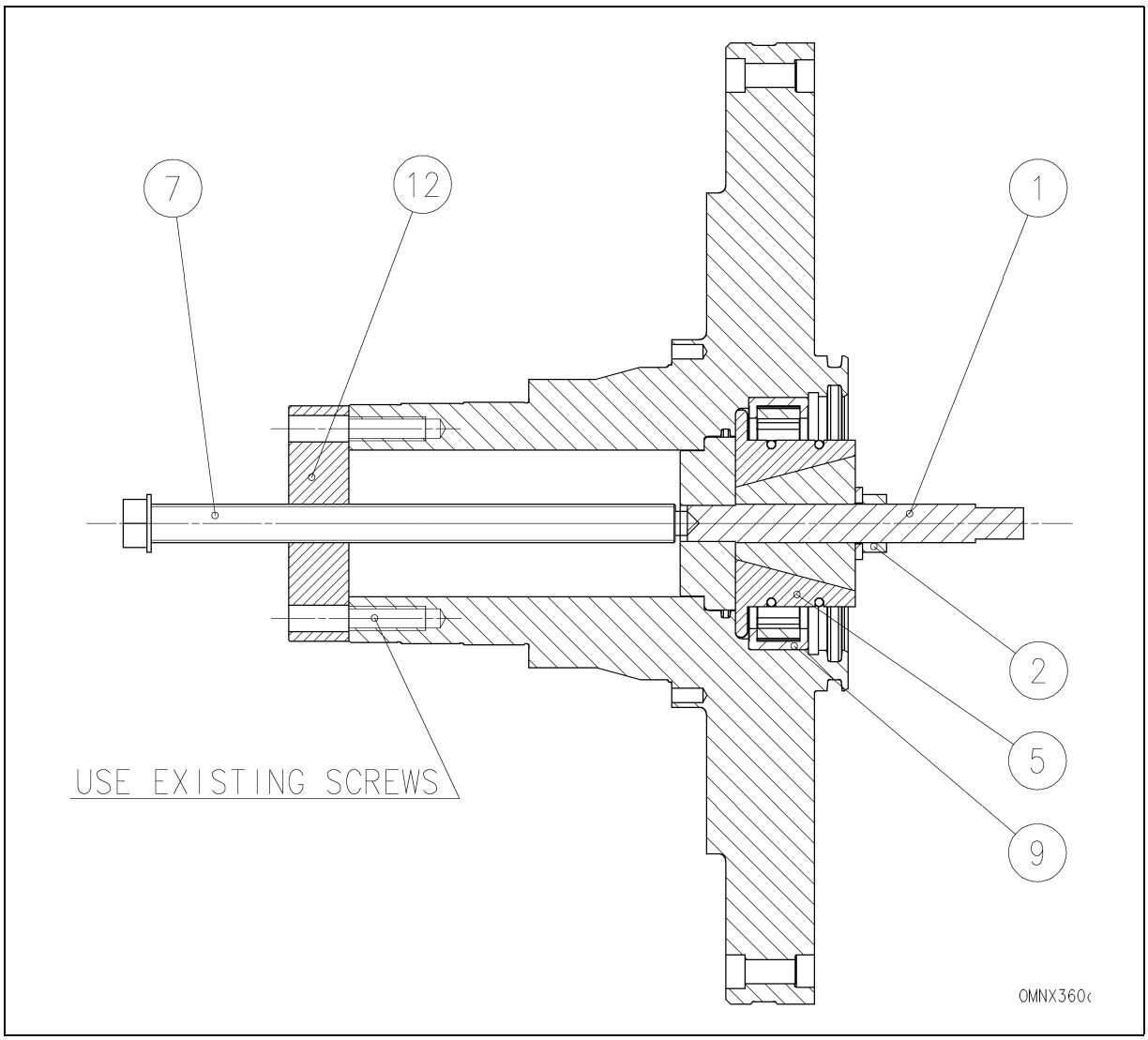

Figure 4.3.3

* For P/N, see Spare Parts Catalogue

4.3.2 Assemble Conveyor Bearing Large End

(Fig. 4.3.1)

If the end flange [8] has been removed and disassembled, assemble the parts in the following order:

Fit the O-ring [105] in the end flange [8].

Insert the end flange [8]. Fit the twelve screws [12] and tighten them to a torque of 22 Nm (195 in-lbs).

Heat the needle bearing inner race [9] by means of an induction heater or in an oven to approximately 80°C (175°F) and fit it on the inner pinion; be sure it seats fully against the shoulder of the pinion. Fit the lock ring [10].

Fit the needle bearing outer race [9] onto the large end hub. Fit the snap ring [11].

Fit the three O-rings [13], [14], and [106] and grease them.

Fill up with grease the needle bearing outer race [9] and distribute the grease with the fingers.

Place the conveyor into the bowl according to the instructions given in section 4.4.2.

Install the large end hub according to the instructions given in section 4.1.4.

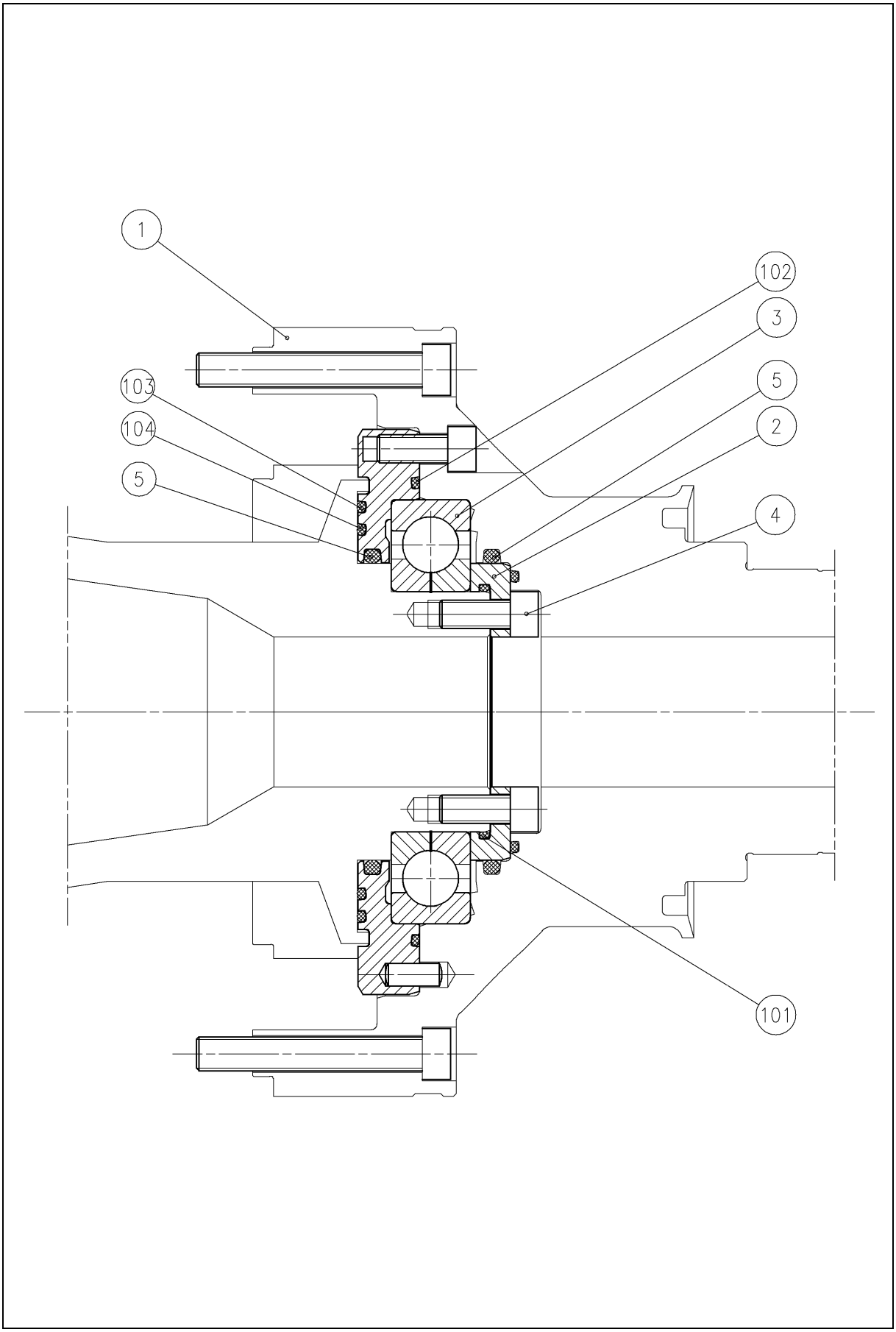

Figure 4.3.4

4.3.3 Disassemble Conveyor Bearing Small End

(Fig. 4.3.4)

Remove the small end hub according to the instructions given in section 4.1.5.

Remove the twelve screws [4] and the ring [2].

Use a standard two-armed puller tool*, as shown in Fig. 4.3.5, with the retaining ring [1] as tractor, to pull off the bearing [3].

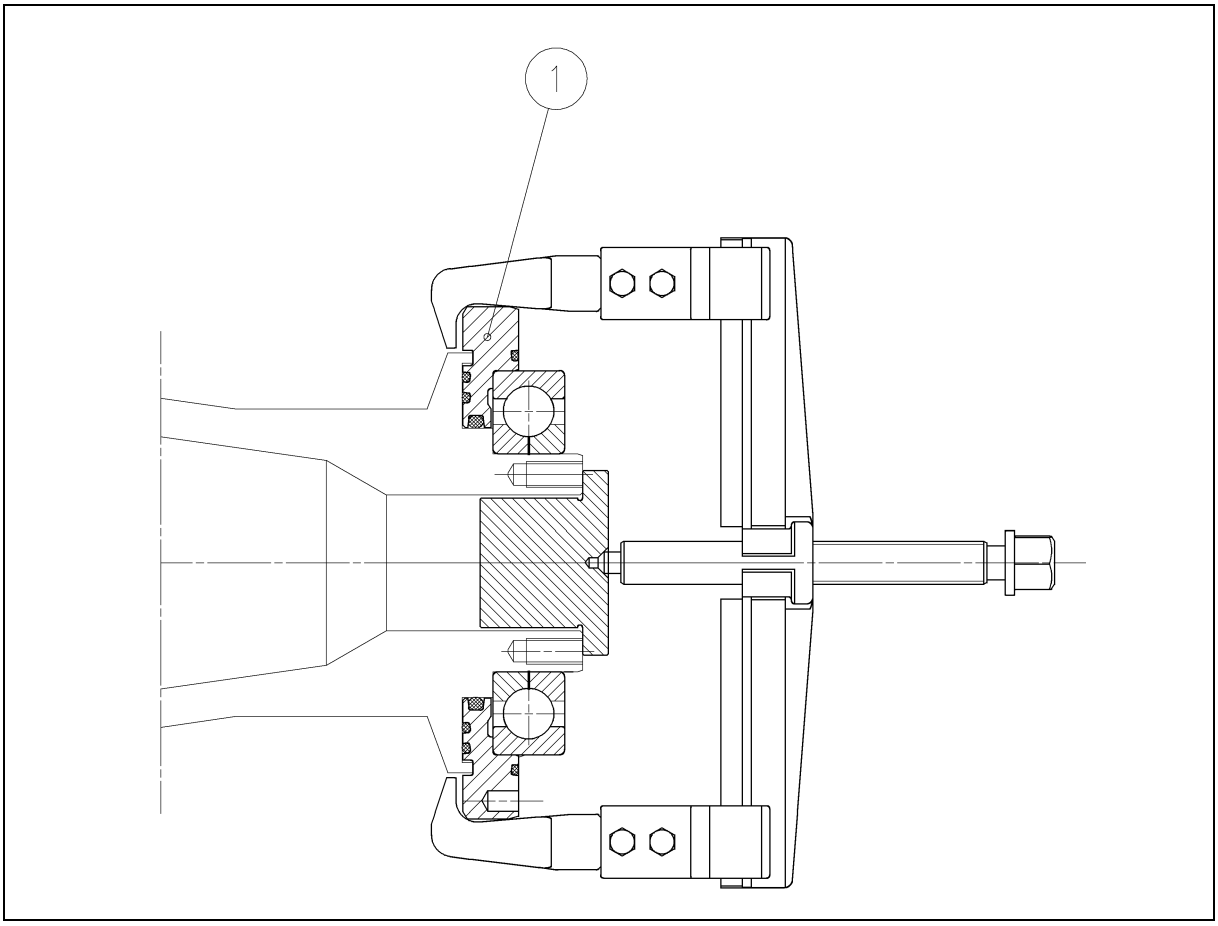

Figure 4.3.5

* For P/N, see Spare Parts Catalogue

4.3.4 Assemble Conveyor Bearing Small End

(Fig. 4.3.4)

Thoroughly clean the retaining ring [1] and insert the O-rings [5], [102], [103], and [104].

Grease the O-rings [5], [102], [103], and [104].

Place the retaining ring [1] on the conveyor pinion, and push it into place.

Fit the inner half of the ball bearing inner race [3] onto the pinion.

Fill up with grease the ball bearing outer race [3] and push it onto the ball bearing inner race [3]. Fit the remaining half of the inner race.

Fit the O-ring [101] into the ring [2] and grease it a little.

Fit the ring [2] on the pinion and secure it with the twelve screws [4]. Tighten the screws [4] to a torque of 44 Nm (389 in-lbs).

Insert the conveyor into the bowl according to the instructions given in section 4.4.2.

Install the small end hub according to the instructions given in section 4.1.6.

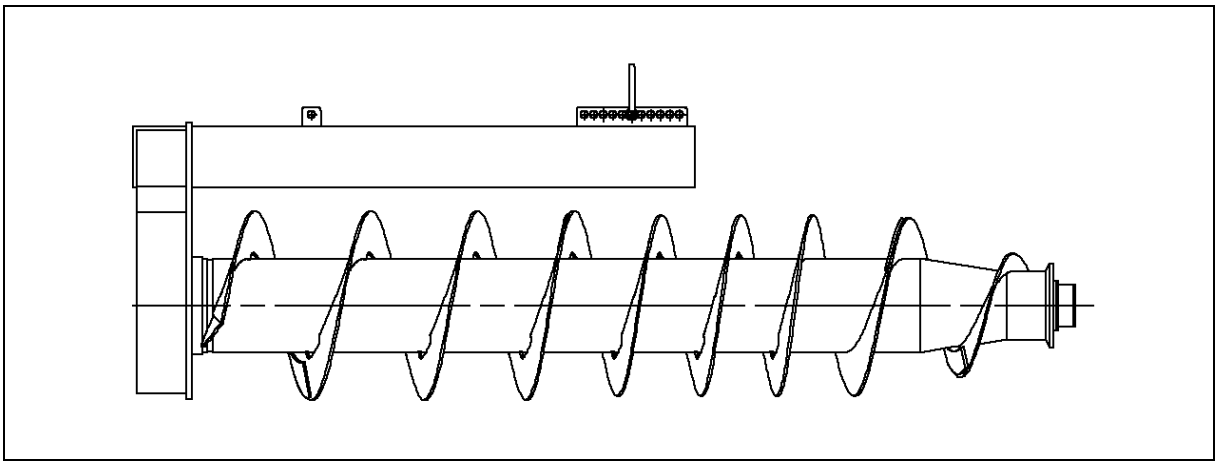

Figure 4.4.1

4.4 Conveyor

4.4.1 Remove Conveyor from Bowl (Fig. 4.4.1)

Remove the large end hub according to instructions given in section 4.1.3.

Place the bowl (without large end hub) horizontally on two wooden trestles or the like: Attach the lifting tool* to the large end of the conveyor as shown in Figure 4.4.1.

Connect the shackle to the hoist and fit the shackle into the lifting tool hole. Because of its individual design each conveyor has its own centre of gravity. As consequence of this the axial point on the lifting tool corresponding to the conveyor centre of gravity is not the same for all conveyors. To find the actual conveyor centre of gravity, proceed as follows:

Fit the shackle in the lifting tool centre hole and lift the conveyor carefully, to see how the it balances.

If the conveyor is not in balance, then insert the shackle into the next lifting tool hole nearer to the heavy end of the conveyor and lift the conveyor carefully again.

Repeat this procedure until the conveyor is in balance and mark the centre of gravity hole of the lifting tool, to facilitate future disassembling and assembling.

Carefully pull out the conveyor.

* For P/N, see Spare Parts Catalogue

4.4.2 Insert Conveyor into Bowl (Fig. 4.4.1)

Place the bowl horizontally on two wooden trestles or the like: Attach the lifting tool* to the large end of the conveyor as shown in Figure 4.4.1.

Connect the shackle to the hoist and fit the shackle into the lifting tool hole where the conveyor will be in balance when lifted and push it carefully into the bowl.

CAUTION *Be careful not to cut your fingers, when pushing the conveyor into the bowl.*

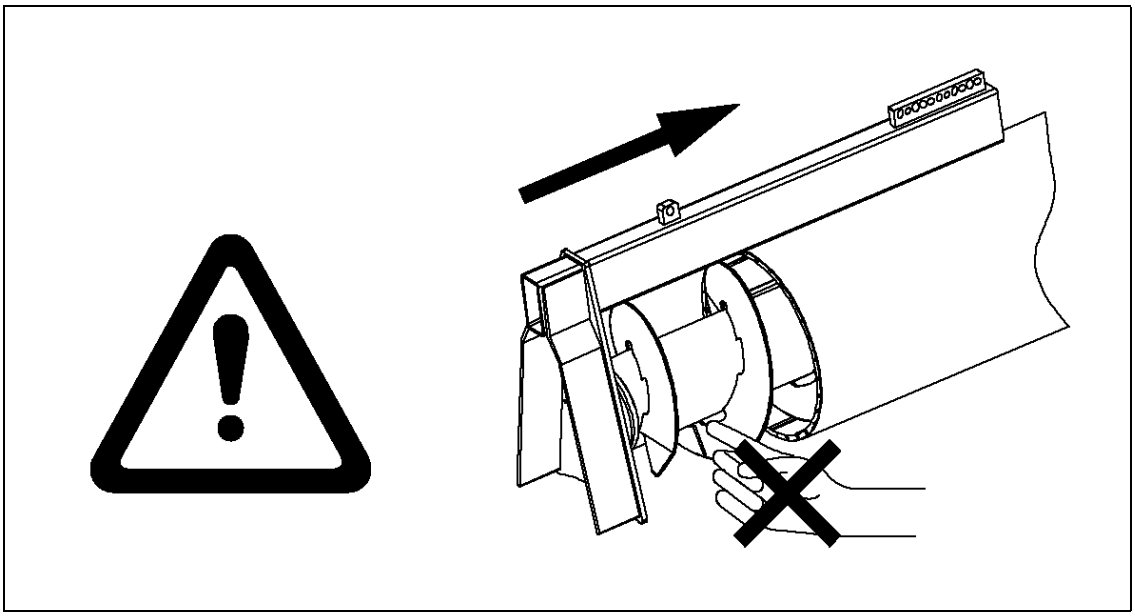

Figure 4.4.2

Install large and small end hubs according to the instructions given in sections 4.1.4 and 4.1.6, respectively.

* For P/N, see Spare Parts Catalogue

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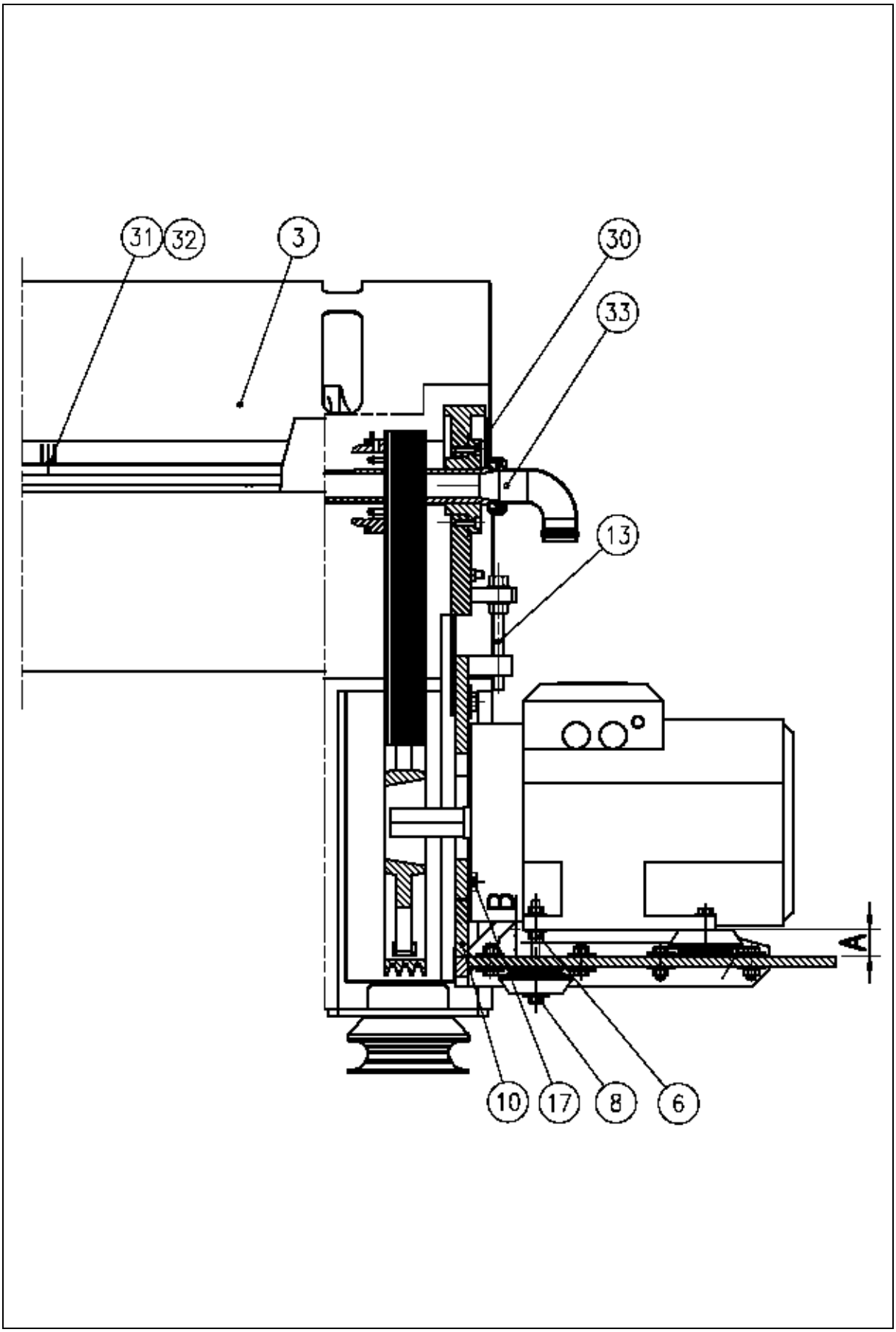

Figure 4.5.1

4.5 Main Drive

4.5.1 Disassemble Main Drive (Fig. 4.5.1)

Remove the screws and washers [31] and [32] holding the upper casing and open the casing [3].

Remove the four screws [30] and remove the feed tube [33].

Loosen the four screws [17] and elevate the motor bracket [10] by means of the two elevating screws [13].

Remove the three V-belts from the pulley.

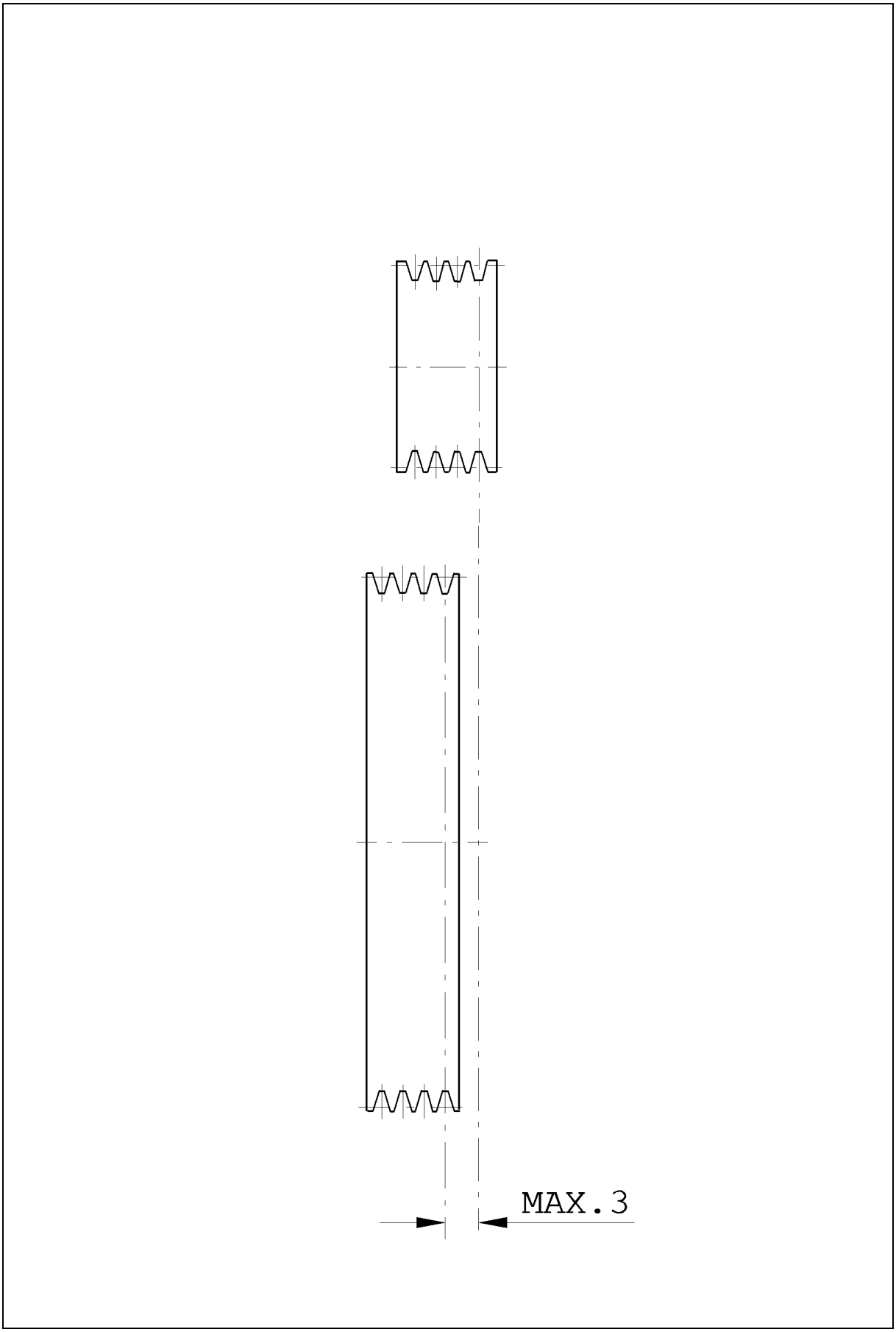

Figure 4.5.2

4.5.2 Assemble Main Drive (Fig. 4.5.1)

If the decanter is equipped with a main motor placed on four dampers and changing of this motor is required, then proceed as follows:

Refer to Fig. 4.5.1 for identification of parts.

1. Tighten the belts to the value prescribed in Table 4.5.2 (or 4.5.1, if new belts are installed too).
2. Measure the distances A and B.
3. Loosen the belts again and turn the bolt [8] until the measuring results of A and B are the same when retightening the belts.
   One turn is equal to 1.75 mm (quite 1/16 inch).
4. Retighten the belts to the prescribed value and check whether the A and B measurements are identical. If not, repeat the procedure.
5. Tighten the lock nut [6].

Required weight of motors placed on four dampers:
100-400 kg (220-882 lbs).

Align the pulleys so that their placing is within 3 mm (1/8 inch) as shown in Figure 4.5.2.

Install the three V-belts in the grooves of the pulleys and tighten them by means of the two screws [13].

Tighten the V-belts as per instructions given in section 4.5.3.

Secure the motor bracket [10] with the four screws [17], and tighten them to a torque of 197 Nm (1744 in-lbs).

Install the feed tube [33] and tighten the four screws [30].

Install the upper casing [3] and secure it with the screws and washers [31] and [32].

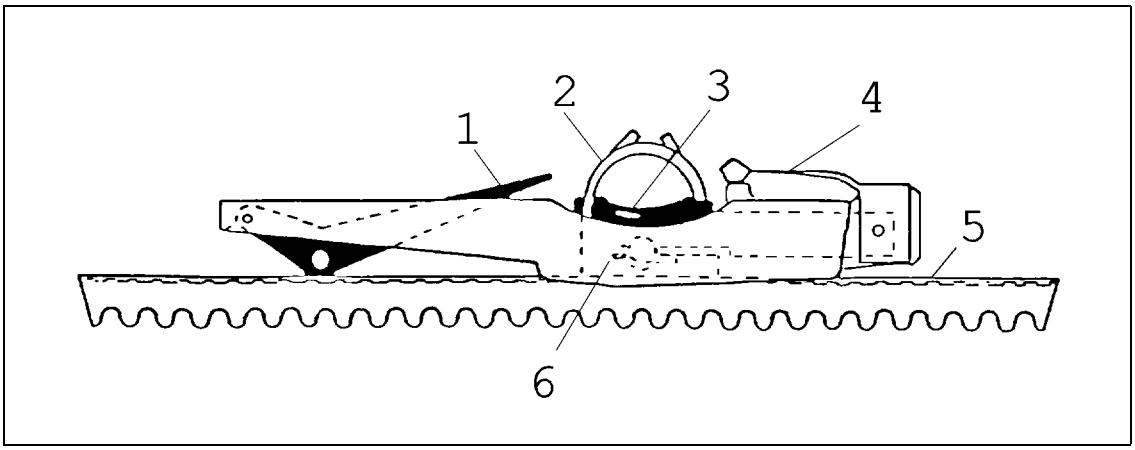

Figure 4.5.3

1 Indicator Arm
2 Rubber Finger Loop
3 Pressure Surface
4 Pocket Clip
5 V-belt
6 Pressure Spring

4.5.3 Tighten V-belts, Belt Tension Tables

Using the tester illustrated in Figure 4.5.3 above, adjust the belt tension as follows:

1. See how to hold the tension tester and choose one of the ways a, b, or c as shown in Figure 4.5.4.

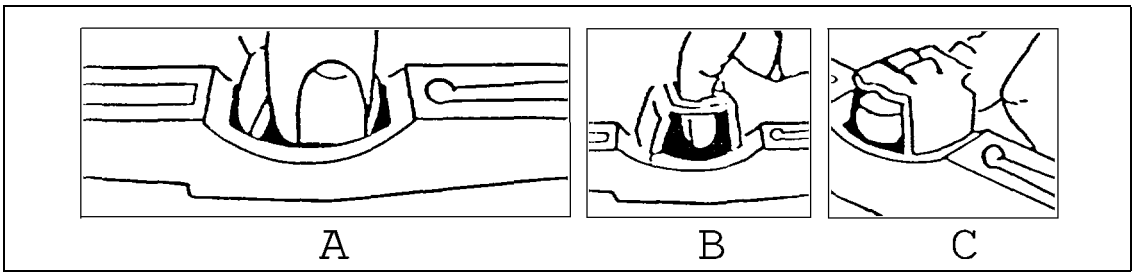

Figure 4.5.4

2. Position the tester on the belt midway between the two pulleys with the flange on the bottom against the upper edge of belt.

Take care that the indicator is completely pushed down in the tester body.

Place the tester II (without flange) in the middle of the belt and parallel with the belt sides.

3. Position the tester loosely on the belt to be measured and push slowly with *one* finger in the above way (Fig. 4.5.4, A, B, C) on the pressure surface.

4. Avoid contact of tester with more than one finger during the measuring process.

5. When your hear a CLICK, stop pressing immediately; the indicator arm remains in measure position.

6. Remove tester carefully so that the indicator arm is not moved and read the belt tension where the top surface of the indicator arm crosses the scale as shown in Figure 4.5.5.

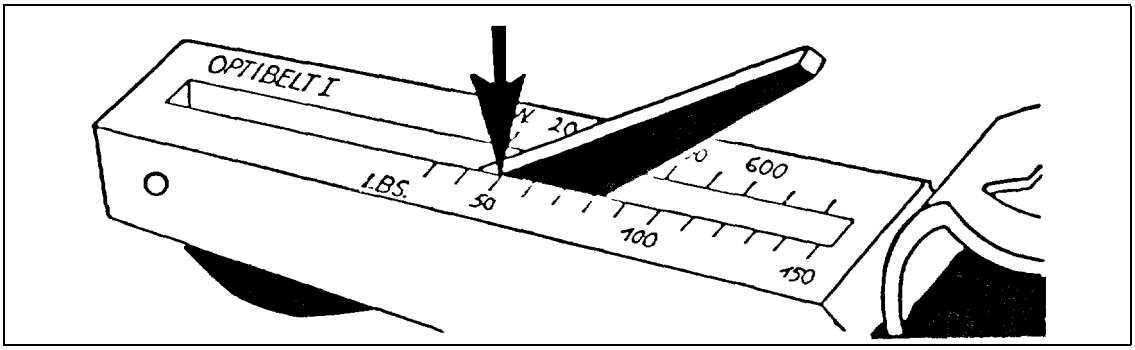

Figure 4.5.5

7. For safe reading mark the spot of the upper side of the indicator with a thumbnail on the scale and then turn the tester sideways.

8. Increase or decrease the belt tension depending on the measuring result until it is within the desired tension. See table below.

BELT TENSION - Tightening of New Belts [50 Hz]				
Motor Power	**Bowl Speed [r p m]**			
[kW]	**2500**	**3150**	**3750**	**4200**
11	550-600 N	600-650 N	650-700 N	650-700 N
15	550-600 N	600-650 N	650-700 N	650-700 N
18.5	550-600 N	600-650 N	650-700 N	650-700 N
22	550-600 N	600-650 N	650-700 N	650-700 N
30	550-600 N	600-650 N	650-700 N	650-700 N
37	-	600-650 N	650-700 N	650-700 N

Table 4.5.1

BELT TENSION - Tightening of Used Belts [50 Hz]				
Motor Power	**Bowl Speed [r p m]**			
[kW]	**2500**	**3150**	**3750**	**4200**
11	400-450 N	450-500 N	500-550 N	500-550 N
15	400-450 N	450-500 N	500-550 N	500-550 N
18.5	400-450 N	450-500 N	500-550 N	500-550 N
22	400-450 N	450-500 N	500-550 N	500-550 N
30	400-450 N	450-500 N	500-550 N	500-550 N
37	-	450-500 N	500-550 N	500-550 N

Table 4.5.2

For selection of belt and pulley combinations, see Spare Parts Catalogue.

BELT TENSION - Tightening of New Belts [60 Hz]					
Motor Power		Bowl Speed [r p m]			
[kW]	[HP]	2500	3150	3750	4200
11	(15)	550-600 N	550-600 N	600-650 N	650-700 N
15	(20)	550-600 N	550-600 N	600-650 N	650-700 N
18.5	(25)	550-600 N	550-600 N	600-650 N	650-700 N
22	(30)	550-600 N	550-600 N	600-650 N	650-700 N
30	(40)	550-600 N	550-600 N	600-650 N	650-700 N
37	(50)	-	550-600 N	600-650 N	650-700 N

Table 4.5.3

BELT TENSION - Tightening of Used Belts [60 Hz]					
Motor Power		Bowl Speed [r p m]			
[kW]	[HP]	2500	3150	3750	4200
11	(15)	400-450 N	400-450 N	450-500 N	500-550 N
15	(20)	400-450 N	400-450 N	450-500 N	500-550 N
18.5	(25)	400-450 N	400-450 N	450-500 N	500-550 N
22	(30)	400-450 N	400-450 N	450-500 N	500-550 N
30	(40)	400-450 N	400-450 N	450-500 N	500-550 N
37	(50)	-	400-450 N	450-500 N	500-550 N

Table 4.5.4

For selection of belt and pulley combinations, see Spare Parts Catalogue.

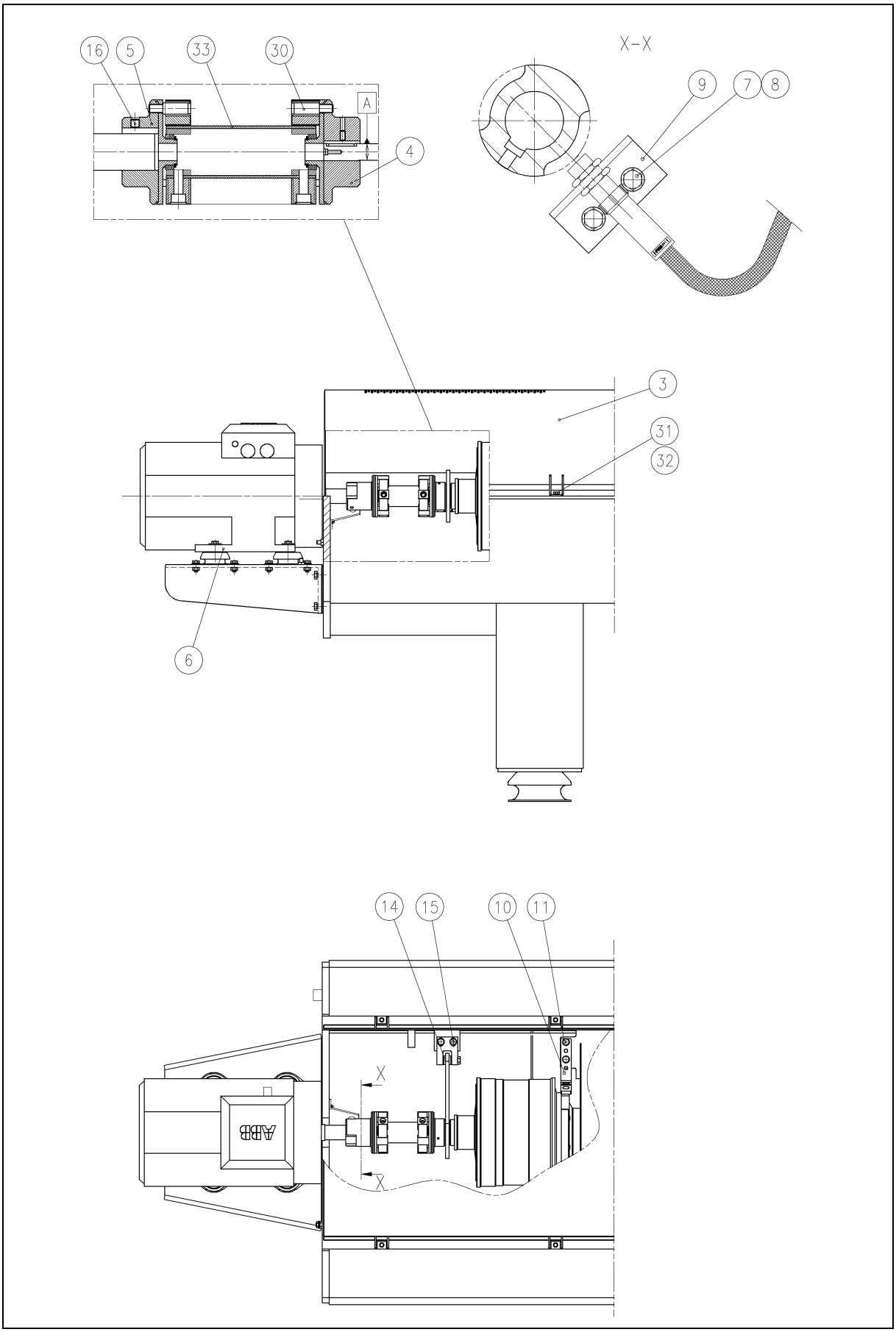

Figure 4.6.1

4.6 Eddy Current Brake (ECB)/ Variable Frequency Drive (VFD)

4.6.1 Disassemble ECB/VFD (Fig. 4.6.1)

Remove the screws and washers [31] and [32] holding the upper casing and open the casing [3].

Remove the two screws and washers [7] and [8] and remove the sensor bracket [9].

Loosen the setscrew [16], remove the six screws [30] and disengage the two coupling parts [4] and [5] completely. Now the shaft [33] can be removed.

For VFD only:
Remove the two screws [11].
Move the sensor bracket [10] 50 mm outwards and use one of the screws [11] to secure bracket in this position.
Remove the screw [15].

4.6.2 Assemble ECB/VFD (Fig. 4.6.1)

For VFD only:
Install the sensor bracket [10] and secure it with the two screws [11].
The gap between the sensor and the gearbox adapter must be 3-4 mm.

If the motor has been demounted or a new is to be installed, the following procedure must be executed:

The coupling parts [5] and [4] are not installed.

Adjust any wrong angle of the motor by means of shims [6] so that the motor shaft is parallel with the sunwheel shaft.

Place shims [6] under the motor to level the sunwheel shaft and the motor shaft within 0.5 mm of each other.

Install the coupling part [5] and engage it completely on the motor shaft. Now install the other part of the coupling [4] on the sunwheel shaft and put the two coupling parts into engaged position, by means of the shaft [33], leaving an axial play of 3-4 mm (1/8 inch) between them. Tighten the setscrews, and install and tighten the six screws [30].

For VFD only:
Install the sensor bracket [9] and fasten with the two screws [7] and washers [8].

Make sure that the rubber bushing [14] is placed correctly, and fit the screw [15].

Install the upper casing [3] and secure with the screws and washers [31] and [32].

5 Supplementary Documentation

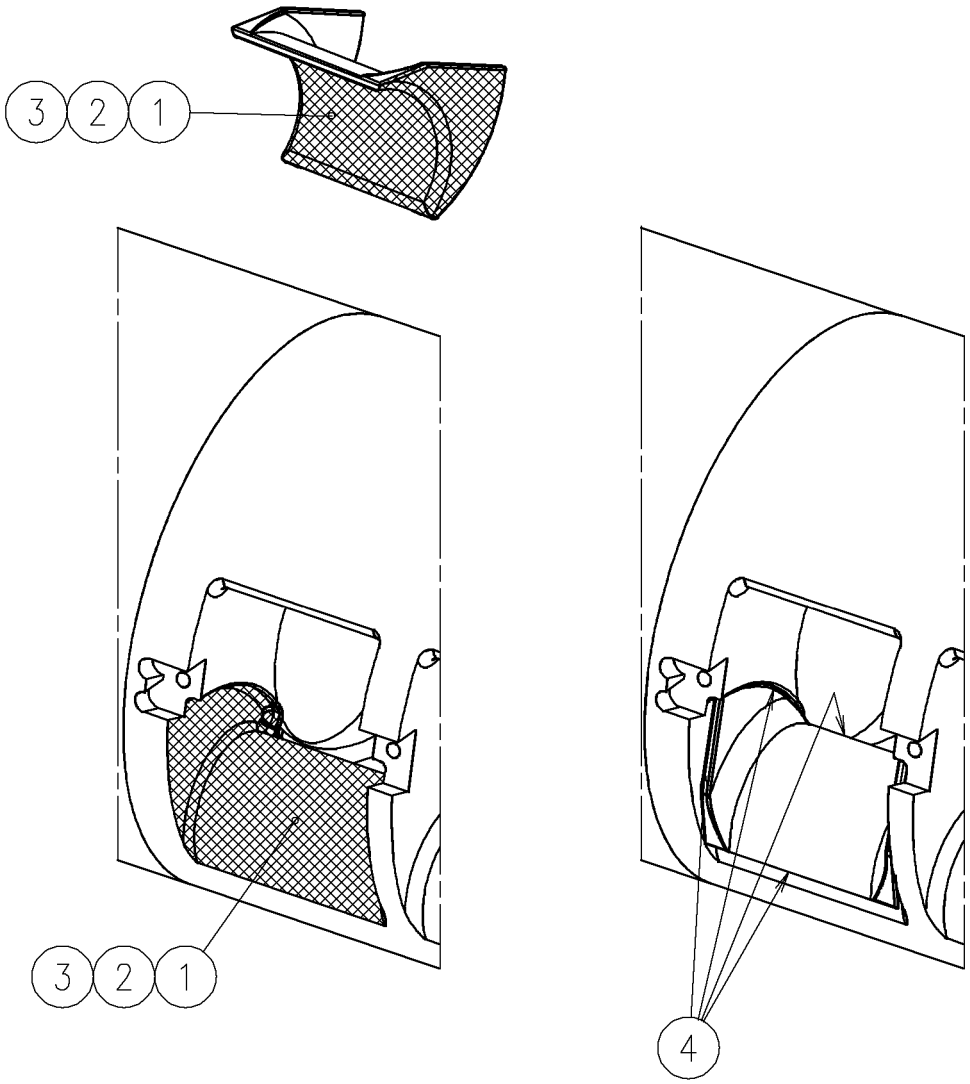

Figure 1

0 WEAR LINERS

Wear liner assembly (figure 1)

① Rough-grind the hatched surface of the feed rotor to get a rugged surface.

② Degrease the grinded surfaces with Chesterton 277.

③ Apply an even layer of approx. 2-3 mm of the ready-mixed ARC 858 on both feed rotor and wear liner.

④ Turn the wear liner into place and fix it with securing plates. Mind to turn the wear liner correctly. Disperse excess composite so that it fills the gap between feed rotor and wear liner.

Wear liner disassembly

I. Remove the screws in the securing plates and remove the plates.

II. Attempt to loosen the wear liner from the backside with a brass mandrel or the like. Heating to 120-130^{o} C might be necessary.

III. After removal of the wear liner, the hatched area of the surface is cleaned, as described under assembly.

OBS! *Wear liners in WC are at great risk of breaking, when attempted removed.*