Alfa Laval

Decanter Centrifuge

OM English EN

OPERATOR'S MANUAL

OPERATION
SERVICE
MAINTENANCE

Alfa Laval Decanter Centrifuge

Specification for Alfa Laval PONX944-31G Decanter

Date of issue: 2020-12-03

Machine Number:
5022618 Decanter type
designation: 944

Bowl Assembly

Operating Centrifugal Force:	2703 G
Bowl diameter:	575 mm
Beach angle:	10°
Solids discharge type:	360°-type with 8 wear liners
Material - hubs:	AL 111 2329-83 (Duplex stainless steel)
Material - bowl shell:	AL 111 2329-83 (Duplex stainless
steel) Material – gaskets and seals:	
Liquid outlet, type:	4 Plate dams

Conveyor Assembly

Material - flights:	AL 111 2349 (AISI 316)
Material - hub:	AL 111 2349 (AISI 316)

Wear Protection

Bowl solids discharge:	Wear liner in tungsten carbide.
Conveyor flights:	None
Conveyor feed zone:	None
Casing liner:	Wear liner in upper casing

Frame and Casing

Material – casing / cover:	Stainless steel (AISI 316)
Material frame:	Mild steel

Drive Assembly

Gearbox, torque rating:	12.0 kNm 3 Stage Planetary
Gearbox, ratio:	172:1 (3 Stage)
Back Drive Motor 480 Volts / 60Hz:	30 HP Variable Speed Max 2550 RPMs / 15 Differential
Main Drive motor 480 Volts / 60Hz:	150 HP Variable Speed Max Speed 2800

Installation Drawings

Dimension drawing:	61239476
Diagram, decanter junction box:	61211214

Machine No.: Decanter Type:

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]
2900	10.5	86
2600	10.4	85
2300	10.4	85
2050	10.1	82

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.

For decanters with hydraulic back drive some operating modes will give up to 2dB increase in sound pressure at the back drive end of 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.

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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.

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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.

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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.

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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.

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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

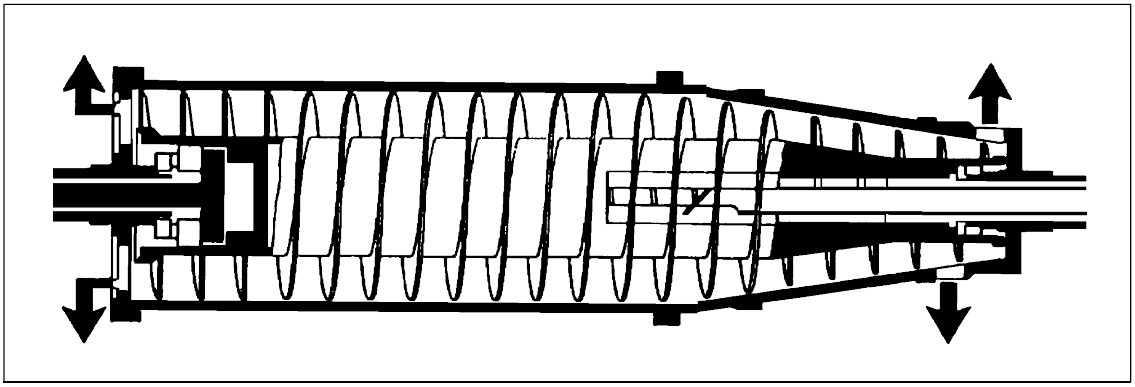

Figure 2.1

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.

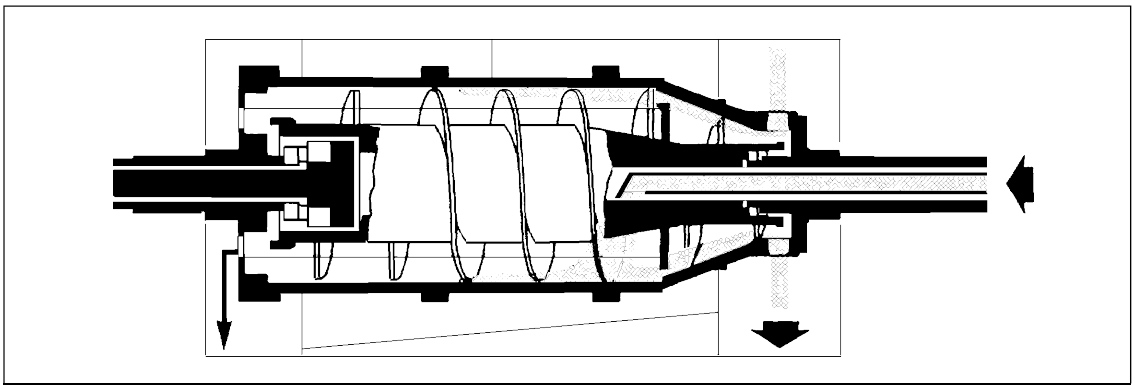

Figure 2.2

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 is 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).

Two ranges of specialized control systems are available, one based on the Differential Speed Controller (DSC) and one based on the more advanced Decanter Core Controller (DCC) which takes care of all basic control functions related to the decanter.

For further details see specific manuals DCC or DSC.

2.2.1 VFD Direct Drive

The VFD direct drive system consists mainly of three components, the specialized control system (based on the DCC or DSC), a variable frequency converter, and a variable speed AC motor.

The variable speed motor is connected to the decanter gearbox in-line with a flexible coupling.

Direct control of the motor is achieved by varying the electrical output voltage, and frequency from the VFD. The VFD receives its speed command signal from the controller and sends back a motor load or torque signal. If a motor encoder is used, then the quadrature signal from this is connected to the VFD for determining motor speeds.

The controller (DCC or DSC) is the master controller of the system and calculates the speed command signal based on the measured differential speed and conveyor torque.
To determine the differential speed the controller needs information about the gearbox ratio and measured speed of the motor/sun wheel shaft, and the speed of the bowl.

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

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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

ATTENTION *Be sure the decanter has been properly lubricated according instructions in section 3.8. If the decanter has been in stock for more than a few months, the grease in the main bearings might have stiffened, which makes it difficult to attain full speed. The remedy is to apply new grease while turning the bowl slowly by hand (see section 3.8.1).*

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

WARNING *In all decanters the bowl rotates at very high speeds. Very great energy is accumulated and it is therefore essential that both the directions concerning assembly of parts, starting, stopping and overhaul, and the safety precautions given are followed strictly.*

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.

The decanter can optionally be equipped with temperature probes for continuous monitoring of the bearing temperatures.

ATTENTION 

The alarm level for main bearing temperature is 100°C (212°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 110° C (230°F). At this temperature the decanter must shut down immediately. If after a restart the temperature again increases to 110°C (230°F), the bearing must be replaced.

After lubrication the temperature may remain high for some hours.

The decanter can optionally be equipped with automatic greasing system for the main bearings, see Chapter 5 Supplementary Documentation.

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 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.

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, 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.

Three types of vibration switches are available:

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) as 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. 3.3.2.1)

Resetting

This vibration switch is reset manually by pressing the reset button, see figure 3.3.2.1 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.

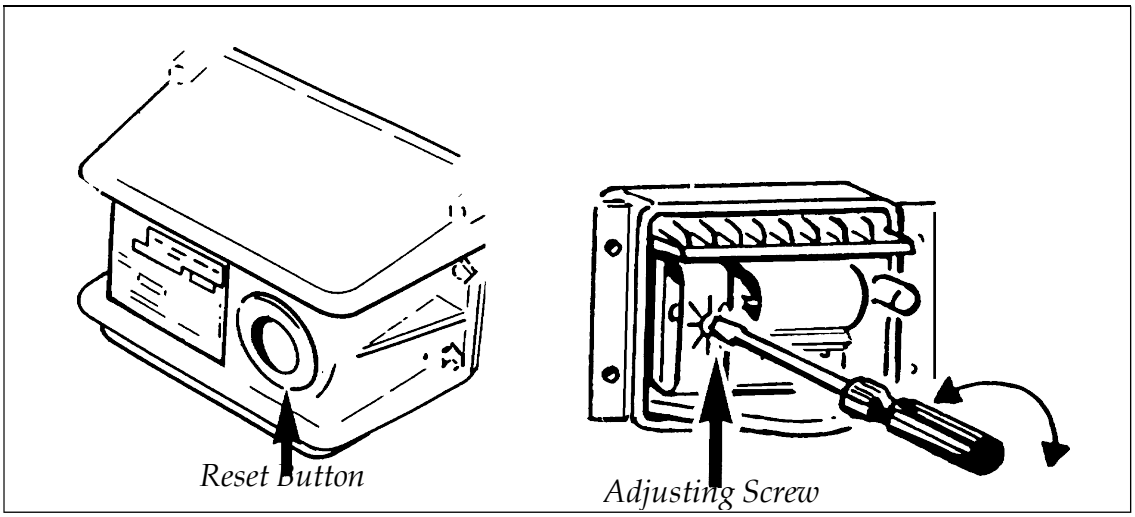

Figure 3.3.2.1 Resetting the Robertshaw Vibration Switch

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.*

3.3.3 Monitoring the Conveyor Wear (Optional Equipment)

When the conveyor transports the solids toward the conical bowl section and press them up to the solids outlets, the front side as well as the edge of the conveyor flights are exposed to wear the rate of which is dependent on different factors such as the hardness of the solids particles, the differential speed, the amount of conveyed solids, and especially the type of hardsurfacing used for the conveyor installed in the decanter delivered.

Concurrently with the conveyor wearing down, its conveyance capacity is increasingly reduced, and as a consequence of this, the separation result deteriorating and furthermore the decanter vibration level increasing. The acceptable limit of the wear depends entirely on the actual separation process and on the level to which the decanter vibrations reach, the latter often being the factor which determines when to repair the conveyor.

For this reason it will be advantageous to check the wear regularly to settle how fast the conveyor is wearing down. Normally the conical part of the conveyor gets more worn than its cylindrical part.

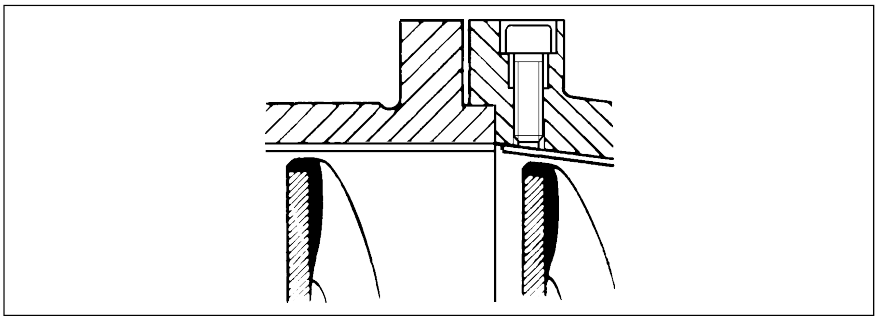

Figure 3.3.1

The bowl has a hole for measuring the conveyor wear located in the conical section either where the conical and cylindrical sections meet or in the middle of the conical section (see Fig. 3.3.1). This wear measuring hole makes it possible to determine the conveyor wear without disassembling the bowl. The only tool needed is a calliper gauge to put through the measuring hole.

Measuring the Wear

Open the upper casing and rotate the bowl by hand until the wear measuring hole points upwards.

Remove the screw and clean the hole.

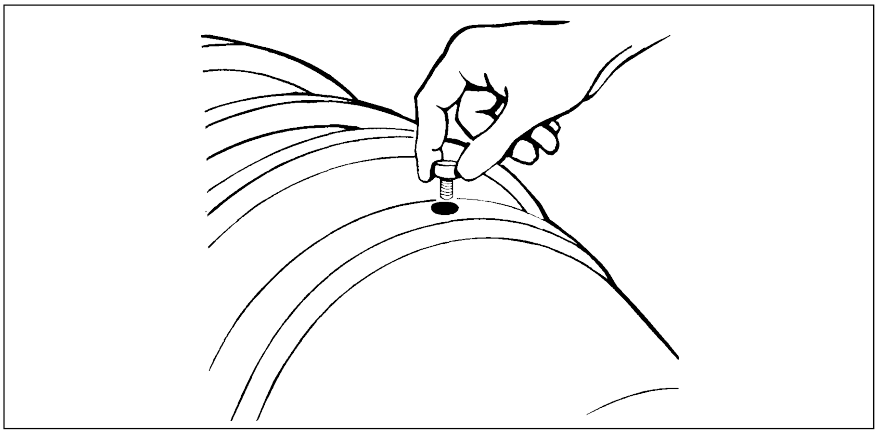

Figure 3.3.2

Rotate the sunwheel shaft at the end of the gearbox until one of the conveyor flights appears exactly under the hole. The placement of the conveyor flight can be determined by means of a thin small stick inserted into the hole if only one staff member is set to make the measurement; the wooden stick will break as the flight is positioned centrally under the hole, but look into hole anyway to check whether the position of the flight is correct (see Figs. 3.3.2 and 3.3.3).

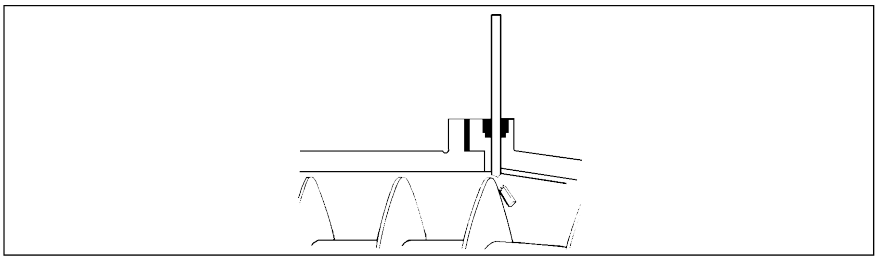

Figure 3.3.3

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Measuring the Wear, cont...

Put a calliper gauge as far it goes into the hole before the end of the gauge hits the highest positioned point of the flight and check the calliper gauge reading to see how deep the gauge went (see Fig. 3.3.4).

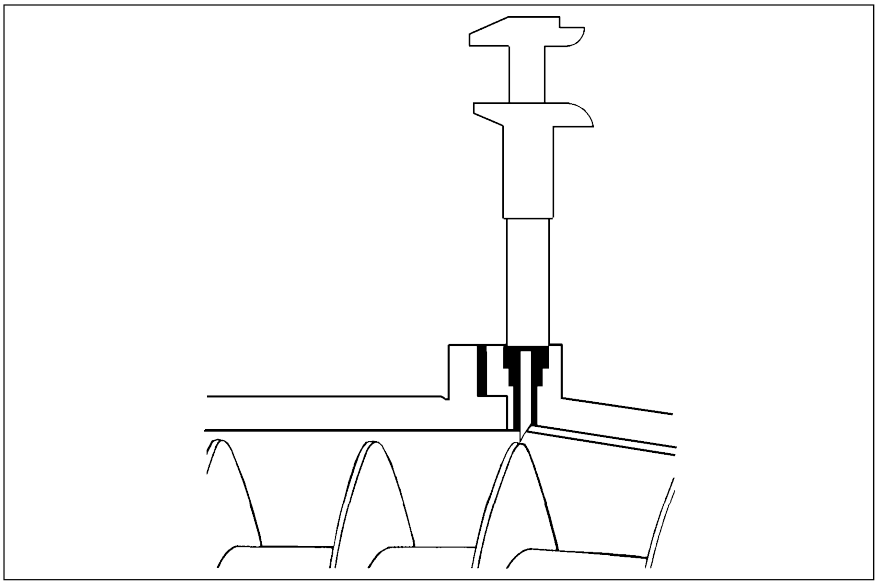

Figure 3.3.4

ATTENTION *In order to secure accuracy of measurement whenever measuring the conveyor wear, position the conveyor flight right in the middle of the measuring hole and turn the calliper gauge the same way every time.*

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Measuring the Wear, cont...

Refit the screw after having measured the conveyor wear, not forgetting to apply a suitable slip agent to the screw (see Fig. 3.3.5).

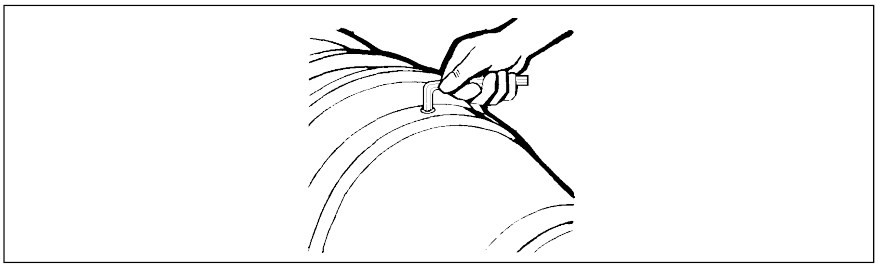


Figure 3.3.5

Intervals of measurement

Make the first measurement before starting the decanter for the first time and note the depth.

Measuring the conveyor wear more frequently is recommended during the initial hours of operation, e.g. every 100 hours (do not forget to note the result of each measurement made), to determine the approximate wear rate.

When knowing the wear rate, make the periods between the intervals of measurement shorter or longer as occasion requires.

3.4 Cleaning Procedures

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.

ATTENTION *Never flush the decanter when the bowl is standing still or rotating below 300 rpm (see section 3.8.2 'Conveyor Bearings' regarding lubrication).*

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.

3.4.1 Chemical Cleaning (optional) (CIP = Cleaning in Place)

A chemical cleaning of the decanter is done in two phases:

- High speed
- Low speed

High speed:

Cleaning during high speed is normally done at a speed that is 10-15% below the normal operating speed (rpm). This is done to avoid unnecessary overloading of the main motor, as during this CIP-procedure smaller power consumption should be anticipated.

When the decanter is taken out of operation to run a CIP-procedure, it is necessary to flush the decanter (see table 3.4.1). This is done during the high speed phase with hot water, which is flushed into the decanter to remove process remains.

During the flushing, the piping, the inlet parts, the bowl's exterior and the casing of the decanter are cleaned. Cleaning of the bowl's exterior is done in connection with deceleration of the bowl, as both the main motor and the cleaning fluid contributes to slowing down the bowl rotation.

The solids remains, which might still be in the bowl after the high speed cleaning, will be removed during the next phase, i.e. the low speed phase.

High Speed CIP		
Bowl diameter [mm]	**Feed tube [litre/hour]**	**CIP nozzles in casing/cover at 3 bar [litre/hour]**
200	1500	3000
280	5500	7400
353	10000	11000
450	20000	12000
480	25000	12000
575	45000	14000
740	100000	15000

Table 3.4.1

Low speed:

In order to be able to run low speed CIP, it is a condition that the main motor is equipped with a frequency converter.

Cleaning at low speed is executed with a bowl speed below 1 G at the bowl wall (see the bowl speeds in table 3.4.2).

The rotation direction of the bowl is reversed at certain intervals, which gives the intended effect of a washing machine. See sequence diagram page 3.4-10.

Low Speed CIP			
Bowl diameter [mm]	**Bowl Speed** [rpm]	**Feed tube** [litre/hour]	**CIP radial hole in the feed tube at 3 bar** [litre/hour]
200	95-115	350	-
280	80-95	1300	600
353	70-85	2500	600
450	60-75	5000	600
480	60-70	6000	600
575	55-65	11000	600
740	45-55	25000	600

Table 3.4.2

During the low speed phase, some of the cleaning fluid is lifted upwards onto the bowl wall from where the fluid hurls down on the conveyor hub. In this way a mechanical cleaning of the bowl and conveyor is carried out, which together with the chemical action of the cleaning fluid improves the washing intensity and gives a good cleaning effect.

In those cases where water alone cannot remove the deposits, chemicals such as sodium hydroxide (NaOH)/caustic soda can be added in order to get a satisfactory result. To ensure a pH value of 12 to 13, the solution must be 1.5-2.0%.

If necessary, cleaning with acid could be carried out as a good supplement to cleaning with caustic soda; a suitable agent is nitric acid (HNO_3) with a concentration of approx. 1 pH value.

To intensify the effect of the use of the CIP-fluids, the chemicals are heated, by means of which the heat acts as a catalyst.

Typical scopes of application for caustic soda and acid are:

- NaOH (caustic soda) - Proteins, grease.
- HNO_3 (acid) - Calcareous deposits

A detergent compound of NaOH with an admixture of a complex agent such as sodium polyphosphate, EDTA (ethylenediaminetetraacetic acid) or NTA (nitrilotriacetic acid) can be used.

Be aware that when using low speed CIP, the intervals between lubrication are more frequent because of the low speed and the aggressive CIP-fluids. The combination of low speed and CIP-fluids increases the risk of eluviation of grease from the conveyor bearings (see section 3.8.2 'Conveyor Bearings' re. lubrication).

Remarks to sequence diagram page 3.4-10:
The duration of each cycle is to be individually determined based on the operating conditions at the site, where the decanter is used.

Note!
Alfa Laval expects that storage, handling, cleaning and removal of the used CIP-fluids is executed in accordance with the legislation of the country concerned, in which the decanter is used.

3.4.2 High Speed CIP

In the high speed phase the nozzles are activated in the casing at 3 bar, see the recommended flows in table 3.4.1.

Sequence:
(see diagram page 3.4-10)

Step I, Flushing:

Shut off the main motor and the feed. Redirect the by-pass system of the decanter and flush with clean hot water through the feed tube and the nozzles of the casing when the speed has decreased to 90% of the operating speed. The bowl speed must not decrease below 50% of the operating speed.

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

Step II, Acid:

Supply for a short period of time hot CIP-fluid in the form of acid through the feed tube and the nozzles of the casing. The CIP-fluid is led back to the CIP-tanks through the by-pass system.

Step III, Flushing:

Flush with hot water through the feed tube and the nozzles of the casing.

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

Step IV, Flushing:

While the main motor is switched off, continue flushing the decanter with cold water through the feed tube and the nozzles of the casing until the rotation has reached 300 rpm. The bowl speed must not decrease below 50% of the operating speed. The flushing with water will contribute to slowing down the bowl. While the decanter decelerates the rotations, it is emptied for cleaning fluid. At the moment when the decanter bowl begins to rotate at low speed, the rotation direction is reversed and the decanter goes directly to low speed CIP.

ATTENTION *When the decanter rotates in opposite direction of the normal rotation, the solids are transported towards the small end and the solids outlet. This reversed rotation is especially important on decanters with paring disc in order to avoid solids from blocking the paring disc outlet.*

Note!
If the flushing water or the CIP-fluids are recycled, these fluids must be cleaned of solids and impurities before use.

The CIP-fluid that comes from the feed tube via the paring disc, can be pumped directly back into the CIP-system. The fluid that is sprayed through the nozzles of the casing comes out of the fluid discharge funnel in the casing. The fluid from the funnel will be polluted by solids, too, and should therefore be cleaned before reuse.

3.4.3 Low Speed CIP

During the low speed phase, the solids remains are flushed off of the bowl inner side and the conveyor hub. The recommended flows and speeds can be seen in table 3.4.2.

Low speed CIP is not started until the bowl rotates in opposite direction of the normal rotation direction. In this way the solids are transported out through the solids discharge of the bowl. The rotation direction is not changed back until no more solids come out of the solids discharge. This will, of course, result in a longer intermission at the stage VI (see sequence diagram page 3.4-10).

The CIP-fluids that are returned to the CIP-tanks must be cleaned of impurities before reuse. It is important that the quantity and concentration (pH-value) of the CIP-fluids are controlled regularly, since otherwise the intended cleaning effect of the CIP-fluids cannot be obtained.

Sequence:
(see diagram page 3.4-10)

Step V, Caustic soda:

Now when the decanter runs backwards and the speed is below 1 G (see table 3.4.2 for speeds), hot caustic soda is added, which is sprayed through the feed tube and the radial hole of the feed tube. The CIP-fluid is led back to the CIP-tanks.

Step VI, Flushing:

Flush with hot water through the feed tube and the radial hole of the feed tube. Check visually that no more solids come out of the solids discharge.

Step VII, Flushing:

Stop the main motor, but continue to flush the decanter with cold water through the feed tube and the radial hole of the feed tube.

Flushing with water will contribute to slow down the bowl. While the decanter decelerates the rotations, it is emptied for cleaning fluid. At the moment when the decanter's bowl starts rotating at low speed, the rotation direction is changed back to positive rotations.

Step VIII, Acid:

Supply for a short period of time hot CIP-fluid in the form of acid through the feed tube and the radial hole of the feed tube.

Step IX, Flushing:

Flush with hot water through the feed tube and the radial hole of the feed tube.

Step X, Flushing:

Stop the main motor, but continue to flush the decanter with cold water through the feed tube and the radial hole of the feed tube.

Flushing with water will contribute to slow down the bowl. While the decanter decelerates the rotations, it is emptied for cleaning fluid. At the moment when the decanter's bowl starts rotating at low speed, the rotation direction is changed back to negative rotations.

Step XI, Caustic soda:

Supply for a short period of time hot CIP-fluid in the form of caustic soda through the feed tube and the radial hole of the feed tube.

Step XII, Flushing:

Flush with hot water through the feed tube and the radial hole of the feed tube.

The procedure can be repeated from step VII to XII to the extent that is required.

Step XIII, Final Flushing:

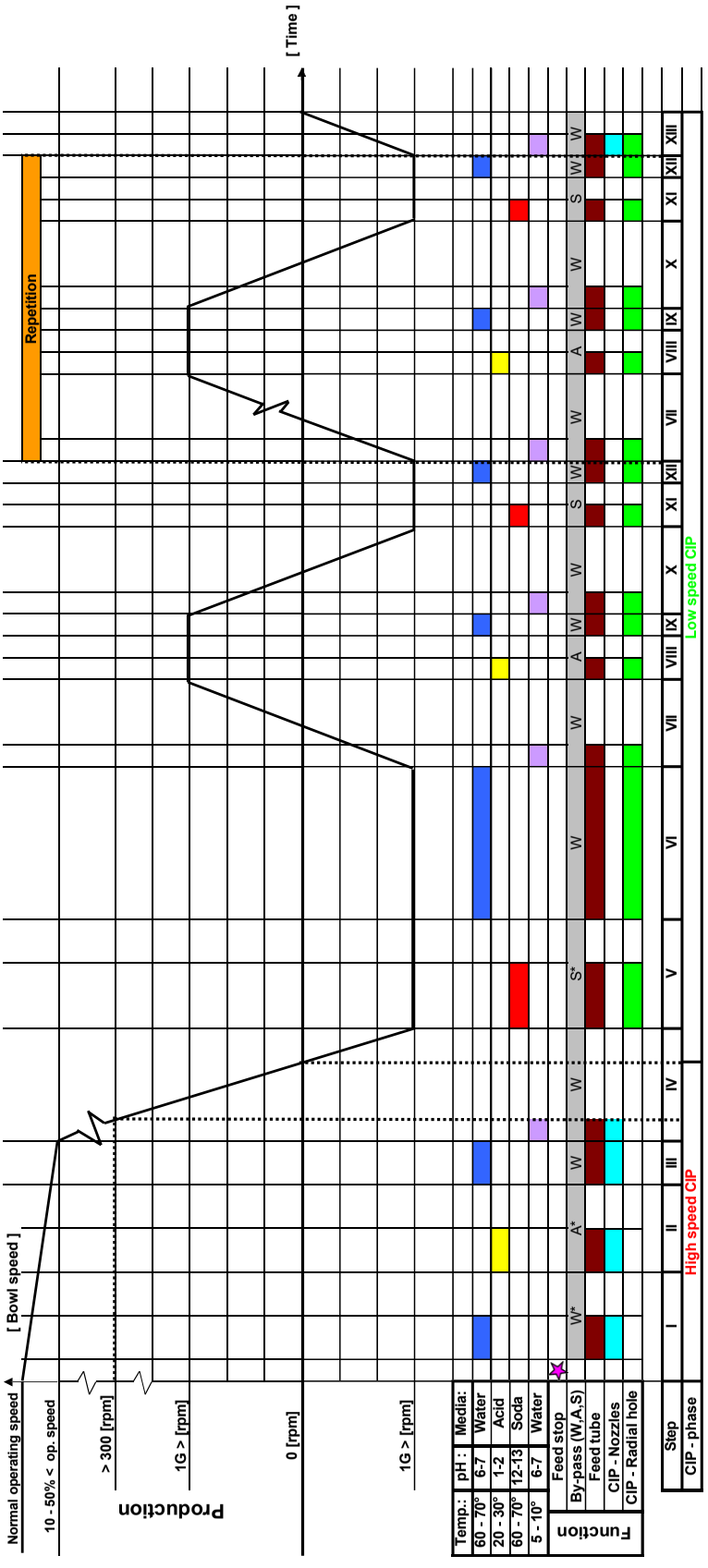
Before the CIP-procedure is ended, be sure to finalize the cleaning by flushing with cold, clean water. The flushing must be done through the feed tube and the radial hole of the feed tube as well as through the nozzles of the upper casing.

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

The first times a CIP-programme is run, all procedures and observations should be written down in preparation for a follow-up evaluation and optimization of the times and flow quantities until the most optimum cleaning is achieved.

If desired, please contact your local sales company to jointly work out the most optimum cleaning procedure that is necessary for your specific application.

Sequence diagram



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 N values, refer to section 4.5, table 4.5.1.

Check the belt tension after 0.5-4 hours of full load operation and then every 4000 hours, referring to section 4.5, table 4.5.2, for the belt tension N values, and not forgetting to rotate the belt drive every time before measuring the belt tension. This check procedure need not be performed when using belts of the 'Red Power' type which are maintenance free and require no re-tightening during their lifetime.

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.

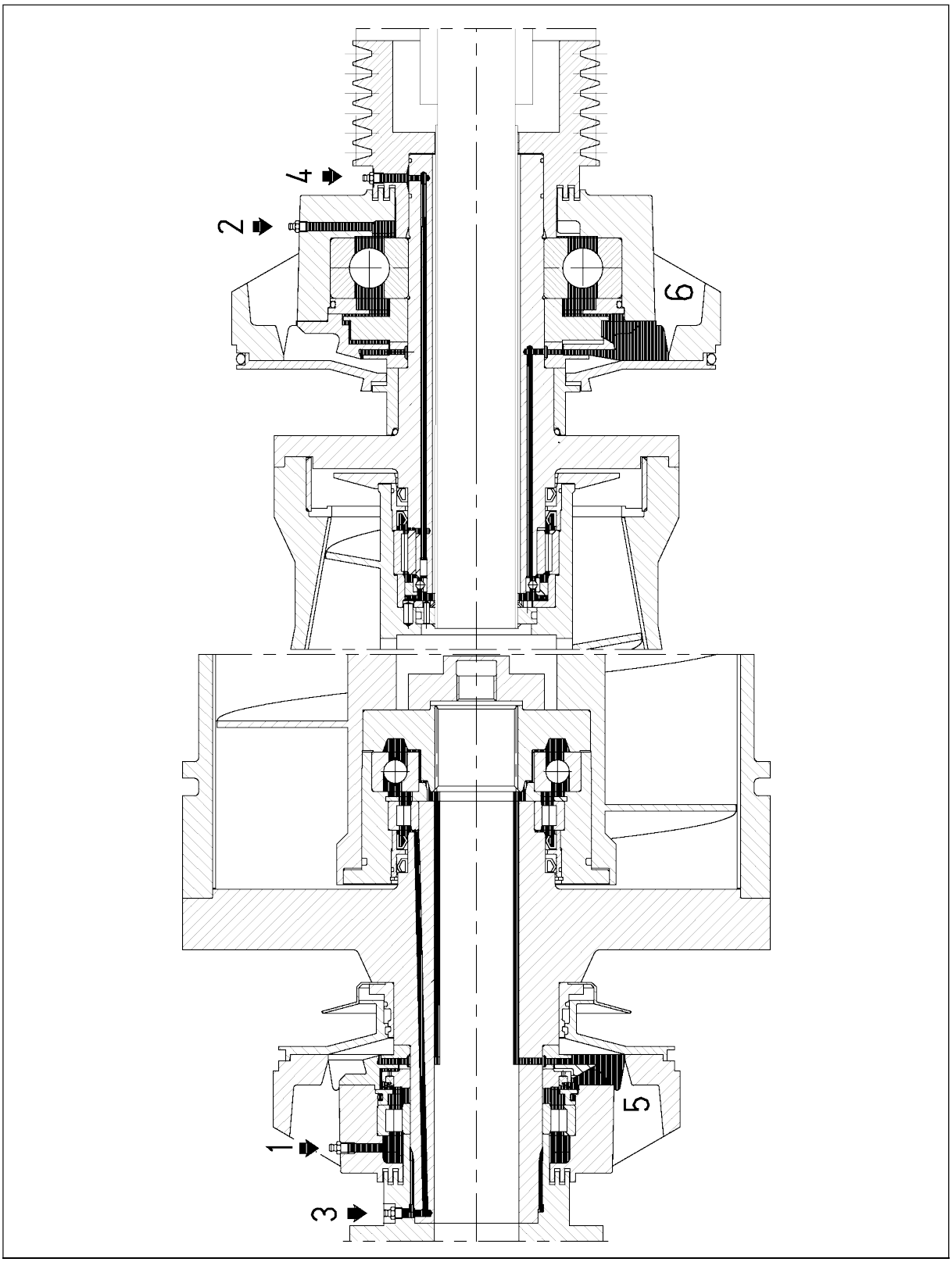


Figure 3.8.1

1. Main Bearing Large End
2. Main Bearing, Small 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)

The lubricants must be kept in a dry and cool location (15-20°C =59-68°F). The containers must be kept closed to prevent contamination of the lubricants by dust and moisture.
When lubricating, refer to the lubrication and lubricant tables in the next section of this manual and proceed as follows:

ATTENTION *In the decanter delivery are included two grease guns and two labels to put on the guns, one for the main bearings and one for the conveyor bearings. To ensure that correct grease is used, especially when lubricating the main bearings, it is advisable to label the grease guns when using them for the first time.*

3.8.1 Main Bearings (Nipples 1 and 2 in Fig. 3.8.2)

Always lubricate the main bearings while the decanter is running, and preferably, just before stopping it for any prolonged period of time.

This will ensure the best distribution of grease, which in its turn gives optimum lubrication condition and maximum protection against contamination of the bearings.

Greasing on daily basis is acceptable, provided that before greasing a calculation will be made of the amount of grease to be injected which is proportional to the recommended quantity for a longer lubrication interval, according to the formular X grams (oz) multiplied by the daily hours of running divided by the prescribed lubrication interval hours of operation.

Using X grams every 300 hours at 24 hour running, the equation is:

$$\frac{X \text{ grams (oz)} \times 24}{300} = 0.08X \text{ grams (oz) per day.}$$

ATTENTION 

It is not advisable to grease more often than once per day. Using larger quantities than those recommended may lead to over-greasing and thereby problems of high bearing temperatures or even bearing breakdown.

Hint: If the decanter is taken out of service for a certain period every week, lubricate the main bearings just before stopping the decanter.

If the decanter is taken out of service for more than two weeks, its main bearings must be lubricated every two weeks during the inactive period.

Using the grease gun included in the standard decanter delivery, apply 25grammes (0.8 oz) - 17 strokes - of grease to each bearing. Then turn the bowl slowly by hand.

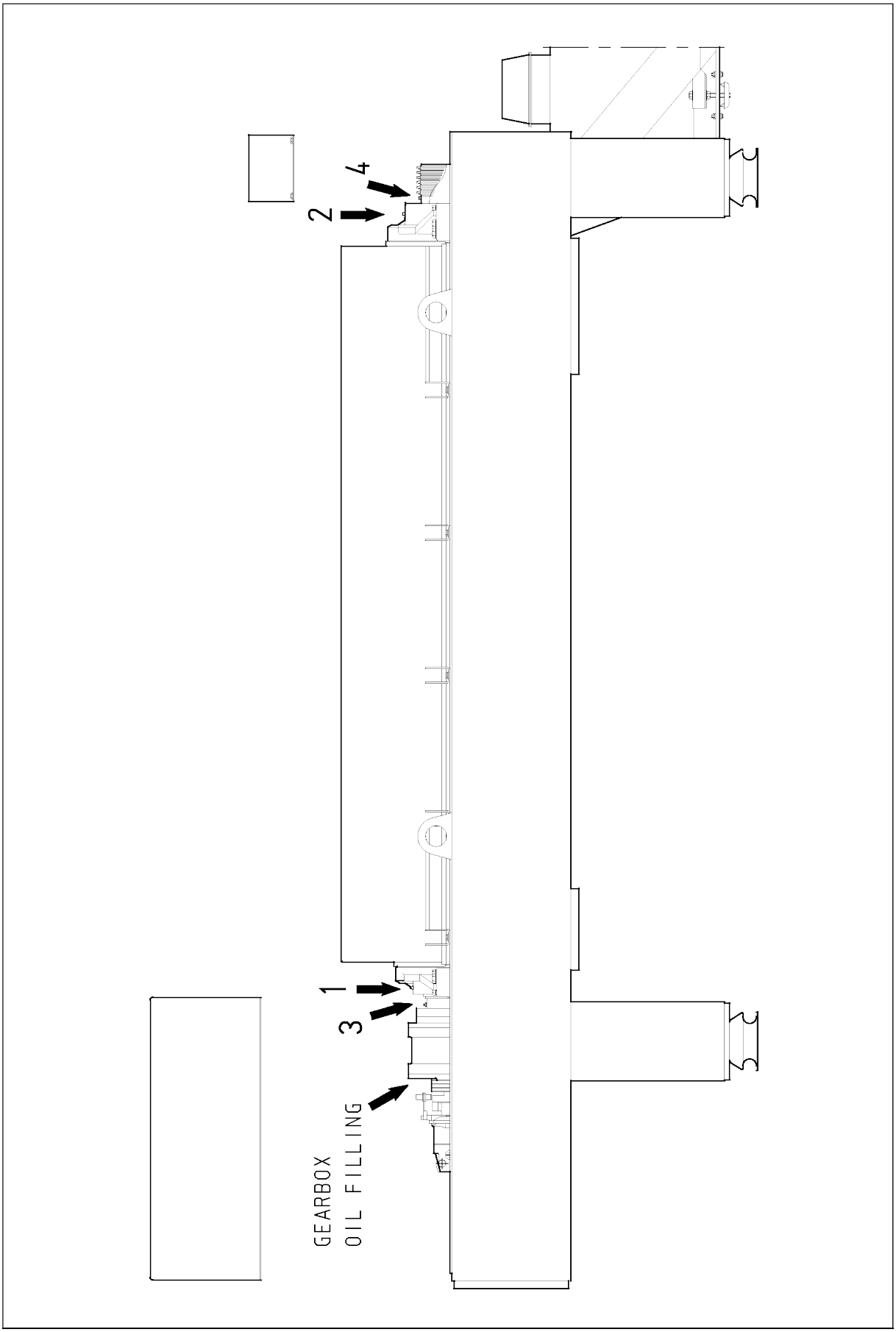


Figure 3.8.2

3.8.2 Conveyor Bearings (Nipples 3 and 4 in Fig. 3.8.2)

Lubricate the conveyor bearings with the decanter stopped and the power effectively disconnected from the main motor.

Using the grease gun included in the standard decanter delivery, apply 150 g (5.5 oz) - 100 strokes - of grease to each bearing.

ATTENTION ***Sufficient amount of lubricating grease applied:*** *If the lubricating grease flows out from the grease discharge opening located behind the main bearing housing, add no more grease.*

"Solids Oil" Conveyor Bearings An option is to equip the decanter with prelubricated and thus in principle maintenance-free "Solids Oil" conveyor bearings.

Lubricating conveyor bearings of this type now and then is recommendable, to prevent outside dirt from entering the bearings. Do not, however, apply more than 1/5 of the recommended normal grease quantity, i.e. 30 g (1 oz) to each bearing. If applying the normal quantity of 150 g (5.5 oz) to a "Solids Oil" conveyor bearing, the lip seal pointing against the bearing may be damaged.

The conveyor bearings should also be lubricated after each stationary Clean-In-Place or if large amounts of flush water are introduced when the unit is stopped or rotating less than 300 r p m.

3.8.3 Gearbox (Fig. 3.8.3)

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.

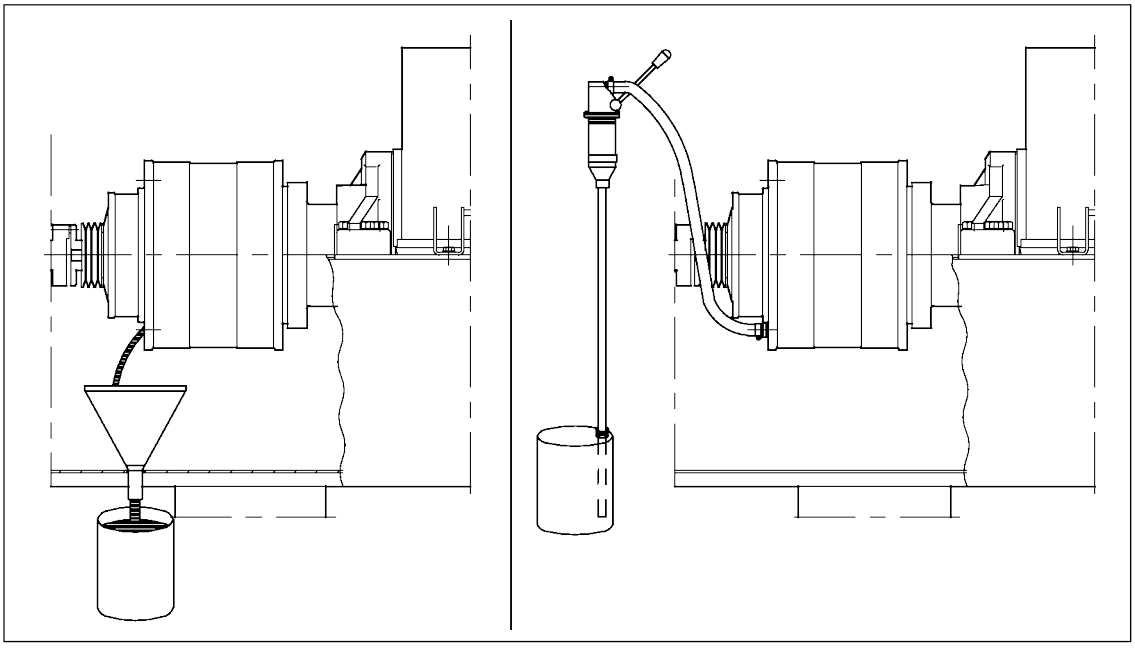


Figure 3.8.3

3.9 Maintenance Tables (Tables 3.9.1, 3.9.1.1, and 3.9.2)

General Information

For proper lubrication and maintenance, see the tables on the following pages.

Lubrication: In cases where no Alfa Laval lubricants are available, other types of lubricants acceptable by Alfa Laval may be used; refer to the table 3.9.2.

WARNING *Use of non acceptable lubricants will void Alfa-Laval's warranty with respect to damages resulting from such incorrect use.*

ATTENTION *If changing from one grease type to another, it will be necessary to disassemble all bearings and remove old grease by washing the bearing itself in petrol or a similar detergent. Other parts must be carefully cleaned of old grease. When having reassembled the cleaned bearing parts, the new type of grease can be applied.*

3.9.1 When to lubricate and to perform maintenance

Lubrication Table

	First Running	Intervals	Lubricant	Quantities
Main Bearings	Lubricate during running at 50-150rpm	See table 3.9.1.1	See table 3.9.2	25 g (0.8 oz) at each grease nipple *
Conveyor Bearings	Before the first start	See table 3.9.1.1	See table 3.9.2	150 g (5.5 oz) at each grease nipple a
Gearbox	Check oil level (see section 3.8.3). If necessary, add oil.	See table 3.9.1.1	Alfa Laval 61203671-10 61203671-16 Statoil Mereta 320	**3.0 kNm :** 3.0 Litres (3 1/5 quarts) **3.5 kNm DD :** 3.3 Litres (3½ quarts) **6.0 kNm :** 7.5 Litres (8 quarts) **8.0 kNm DD :** 8.0 Litres (8½ quarts) **10.0 kNm :** **- 2-stage :** 9 Litres (9½ quarts) **- 3-stage :** 11 Litres (11¾ quarts) **16.0 kNm :** 16 Litres (17 quarts) **16 kNm DD :** 18 Litres (19 quarts)
Splines (of shaft and hub)		See table 3.9.1.1	Alfa Laval 61203671-33 Texclad Premium 2	See section 4.1.8

Table 3.9.1

a When injecting grease with the grease gun** included in the standard decanter delivery:
1 stroke = approx 1.5 g (0.05 oz)
7 strokes = approx 10 g (0.35 oz)

** For P/N, see table 3.9.2 or Spare Parts Catalogue, List TOOLS.

Intervals for Maintenance			
Item		**Interval [hours]**	
		8h Daily	**24h Service**
Main Bearings	***Lubrication***		
	Product temperature < 60°C (140°F)	200 *)	600 *)
	Product temperature > 60°C (140°F)	100 *)	300 *)
Conveyor Bearings	***Lubrication***		
	Product temperature < 60°C (140°F)	200 *)	600 *)
	Product temperature > 60°C (140°F)	100 *)	300 *)
Gearbox	***Oil Check***	1000	1000
	Oil Change	2000	2000
	Change lip seal(s) at sunwheel shaft(s) **	4000	4000
	Change sunwheel shaft bearings	8000	8000
Splines (of shaft and hub)	***Lubrication***	2000	8000
Motor(s)	***Lubrication***	2000[1)]	2000[1)]
V-belts	***Change***	16000	16000
Bowl	***Check for wear and corrosion.*** Max permissible wear: 2 mm. Check bolts if chlorides in process liquid. Check even more frequently than specified if process requires so.	1000	1000
Solids Discharge Bushings	***Check***	1000	1000
Safety Equipment	***Check functioning of:*** All alarm devices Safety equipment	2000	2000
Labels	***Check:*** Name-plate All warning labels	2000	2000
Foundation bolts	***Check***	4000	4000
Vibration dampers	***Check*** Fit new, if necessary.	4000	4000

Table 3.9.1.1

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

* At least once a month

** For P/N, see Spare Parts Catalogue

3.9.2 Applicable Lubricants

Lubricant			Parts to Lubricate	
			Bearings	
Brand	Type		Main	Conveyor
Alfa Laval	61203671-23	Grease		■
	61203671-34	Grease	■	
	61203671-40 *	Grease		▲
BP	Energrease LC 2	Grease		❑
Castrol	LMX Grease	Grease		❑
Caltex	Texando CX EP 2	Grease		❑
Esso	Unirex N2	Grease		❑
FAG	Arcanol L135V	Grease		❑
Klüber	Isoflex NBU 15	Grease	■	
	Microlube GLY 92	Grease		❑
	Klübersynth UH 1 64-62 *	Grease		❑
Shell	Alvania Grease RL2	Grease		❑
	Cassida EPS 2 *	Grease		▲
Statoil	UniWay LiX 42 PA	Grease		❑
Texaco	Texando CX EP 2	Grease		■

Table 3.9.2

- ■ Lubricants applied to the decanter when delivered
- ▲ Lubricants applied to conveyor bearings on sanitary decanters
- ❑ Other types of lubricants accepted by Alfa Laval

* Food Grade Grease

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.

contd...

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.

contd...

Spare Parts Kits

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

The intermediate kits 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(s) for the sun wheel(s) and the O-ring between the splined nave and the gearbox cover.

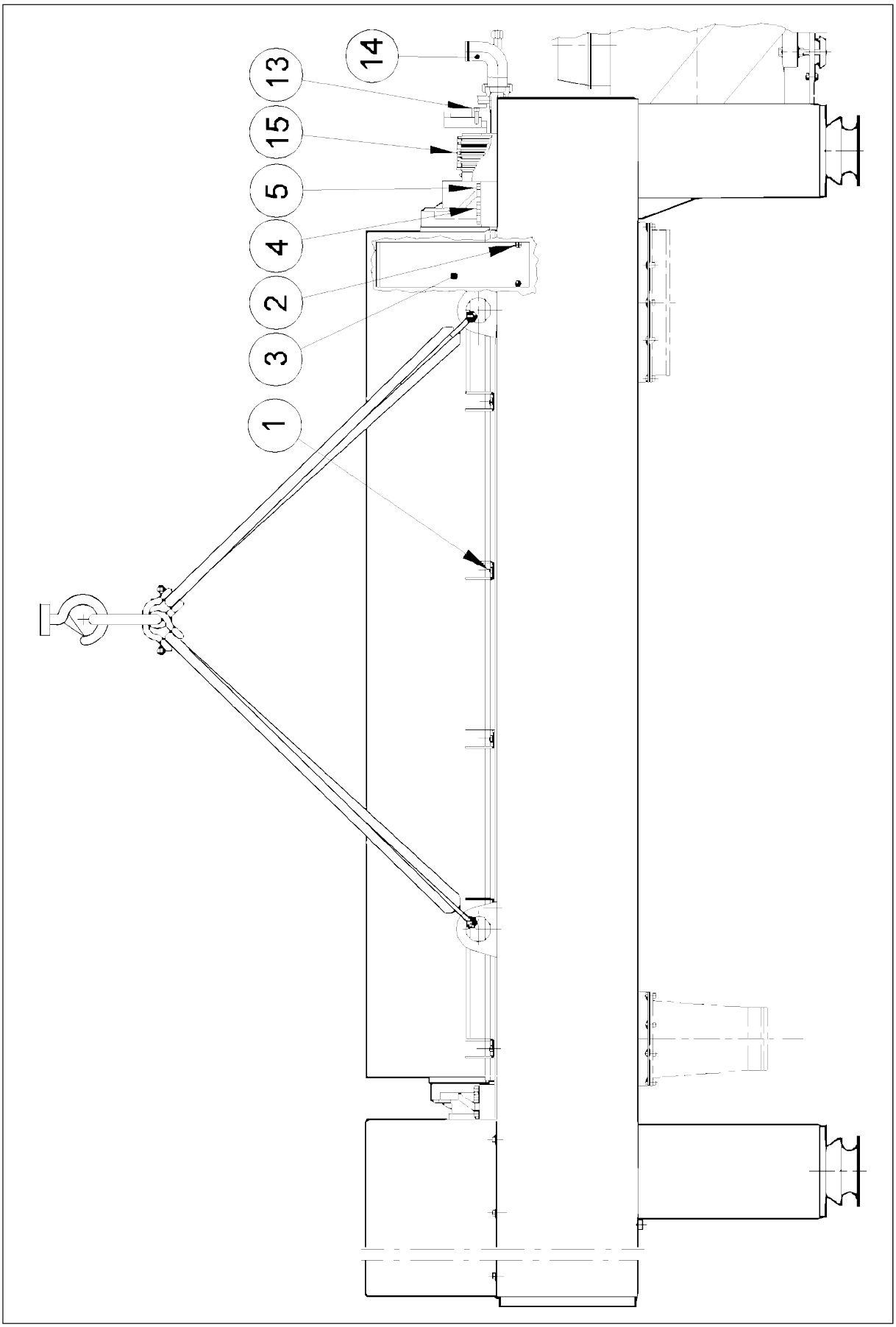


Figure 4.1.1

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.

Remove the 12 screws [1] and open the cover. Covers without hinges must be lifted by means of four equal length round slings connected to the four steel bars on the corners of the cover by means of shackles.

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

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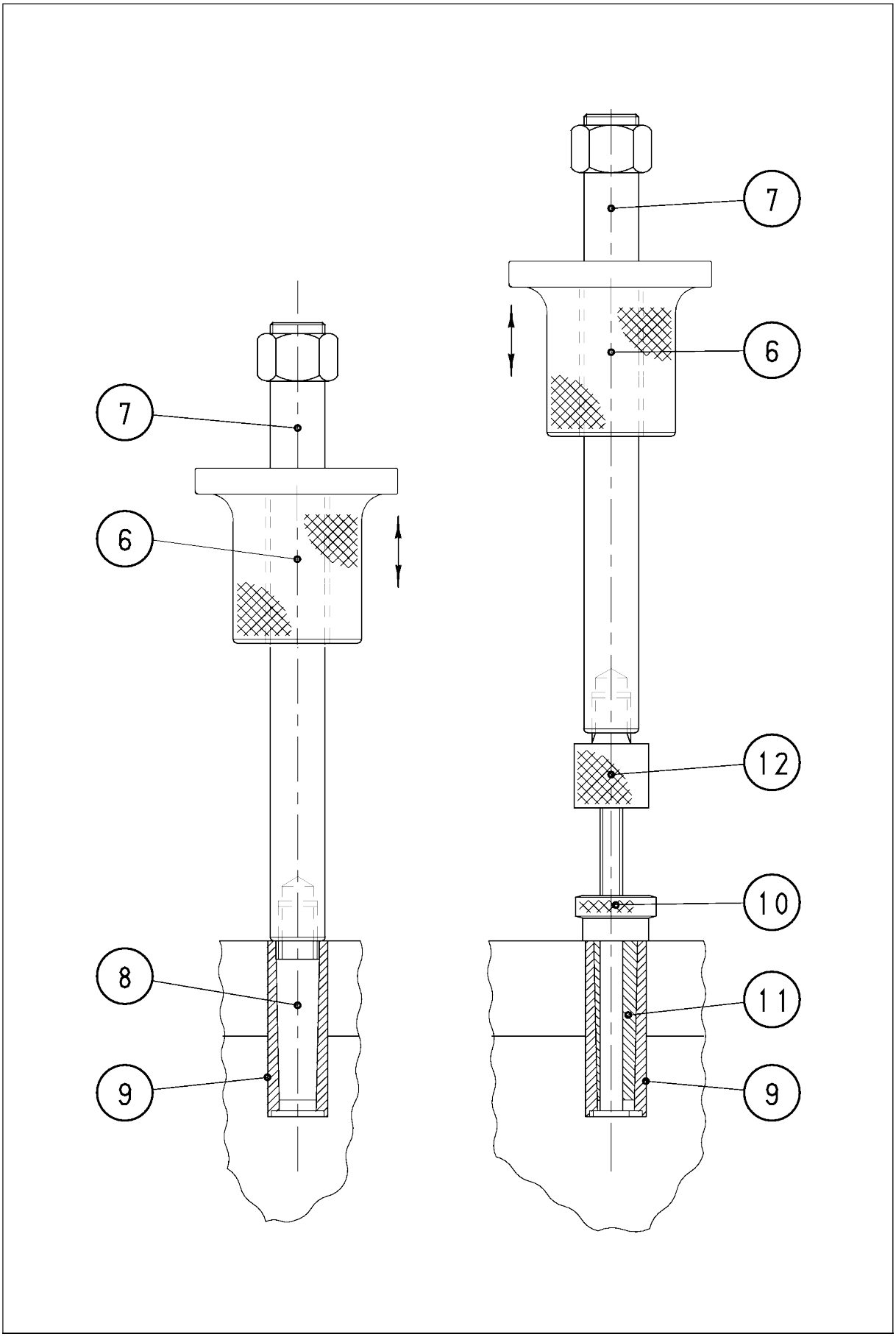

Figure 4.1.2

Remove the pillow block dowel pin protector caps [5] and withdraw dowels as follows using the Shaft and Sliding Hammer portion of the Dowel Sleeve Extractor Tool* (see Figure 4.1.2):

Assemble the Sliding Hammer [6] to the Shaft portion of the Dowel Sleeve Extractor [7]. Engage the female thread in the end of the shaft [7] over the protruding thread of the dowel pin [8] and screw home securely.

Withdraw the dowel pin [8] by impact of the sliding hammer against the stop nut at the top of the shaft.

Repeat the operation on each of the dowels.

Extract the dowel pin outer sleeves [9] as follows using the complete Dowel Sleeve Extractor Tool* (see Figure 4.1.2).

Assemble the Sliding Hammer [6] to the Shaft portion of the extractor [7] and attach the Lifter Assembly to the female thread in the end of the shaft.

Slide the Eccentric Sleeve [10] along the Lifter [11] until it contacts the cap [12].

Holding the extractor assembly upright, insert the Lifter [11] down through the bore of the dowel sleeve [9] as far as possible, then push the eccentric sleeve [10] down into the bore of the dowel sleeve [9] to lock the lifter [11] into the dowel sleeve recess [9].

Extract the dowel sleeve [9] by impact of the sliding hammer against the stop nut at the top of the shaft [7].

Repeat the operation on each of the dowel sleeves.

Remove the 12 screws [4] holding the pillow blocks.

Remove the four screws [13] and then the feed tube [14].

Remove the V-belts [15].

---

* For P/N, see Spare Parts Catalogue

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

Place the small stirrup around the small end hub pinion, the other one around the gearbox adapter, as shown in Figure 4.1.3.

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

If the bowl is not in balance, place the lifting tool in horizontal position on the frame and then insert the shackle into the next lifting tool hole nearer to the heavy end of the bowl and lift the bowl carefully again.

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

Carefully lift the bowl assembly off the lower casing and place it on two wooden trestles or the like.

Secure the bowl assembly with wedges to prevent it from rolling.

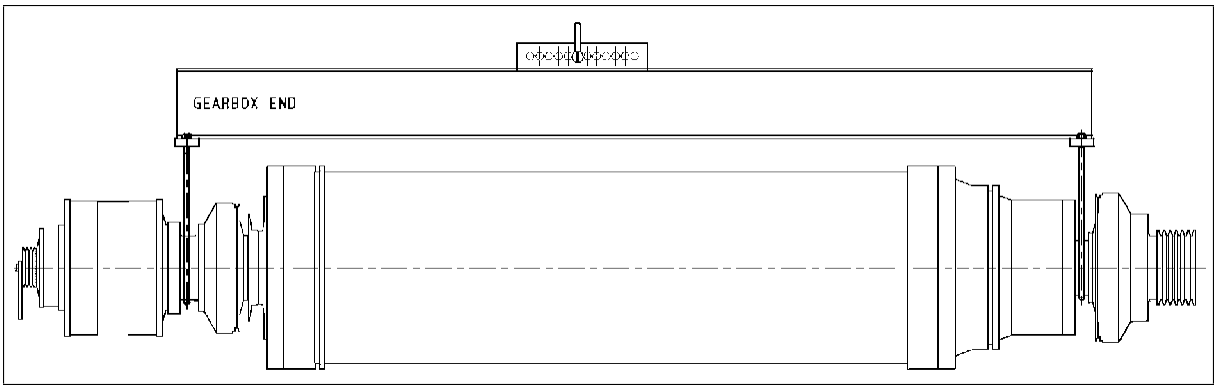

Figure 4.1.3

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.

Attach the lifting tool to the bowl.
Place the small stirrup around the small end hub pinion, the other one around the gearbox adapter, 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 dowel pins [9] and [8] must be driven in.
Fit the dowel pin protector caps [5].
Tighten the 12 screws [4] securing the pillow blocks to a torque of 385 Nm (3404 in-lbs).

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

Close the cover and tighten the 12 screws [1]. Covers without hinges must be lifted by means of four equal length round slings connected to the four steel bars on the corners of the cover by means of shackles.

Put the V-belts [15] back into place.
Fit the feed tube [14] and secure with the four screws [13].

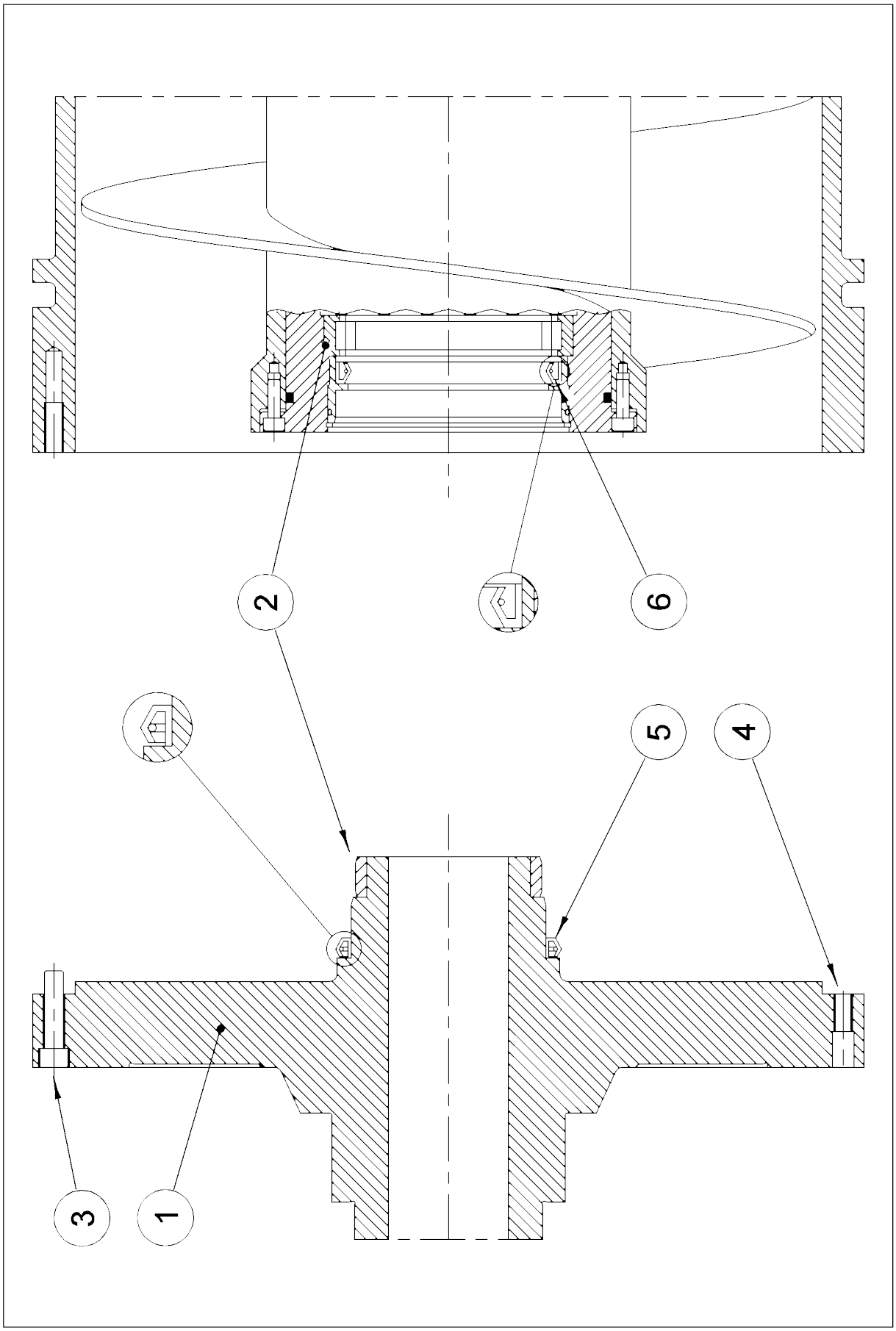

Figure 4.1.4

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 roller bearing [2]. Place a sling around both sides of the pillow block.*

Remove 29 of the 30 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 off: Using the four jacking screws [4], clear it of the bowl.

Be careful not to damage the roller bearing [2].

ATTENTION *Put a wooden stick or the like into one of the solids openings, to prevent the conveyor form being pulled out along with the end hub being removed.*

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

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

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 roller bearing [2]. Place a sling around both sides of the pillow block.*

Grease the outside of the lip seals [5] and [6].

Place the large end hub [1] on the bowl, being careful not to damage the roller bearing [2].

Fit the 30 screws [3] and tighten them to a torque of 140 Nm (1240 in-lbs).

Fasten the four jacking screws [4].

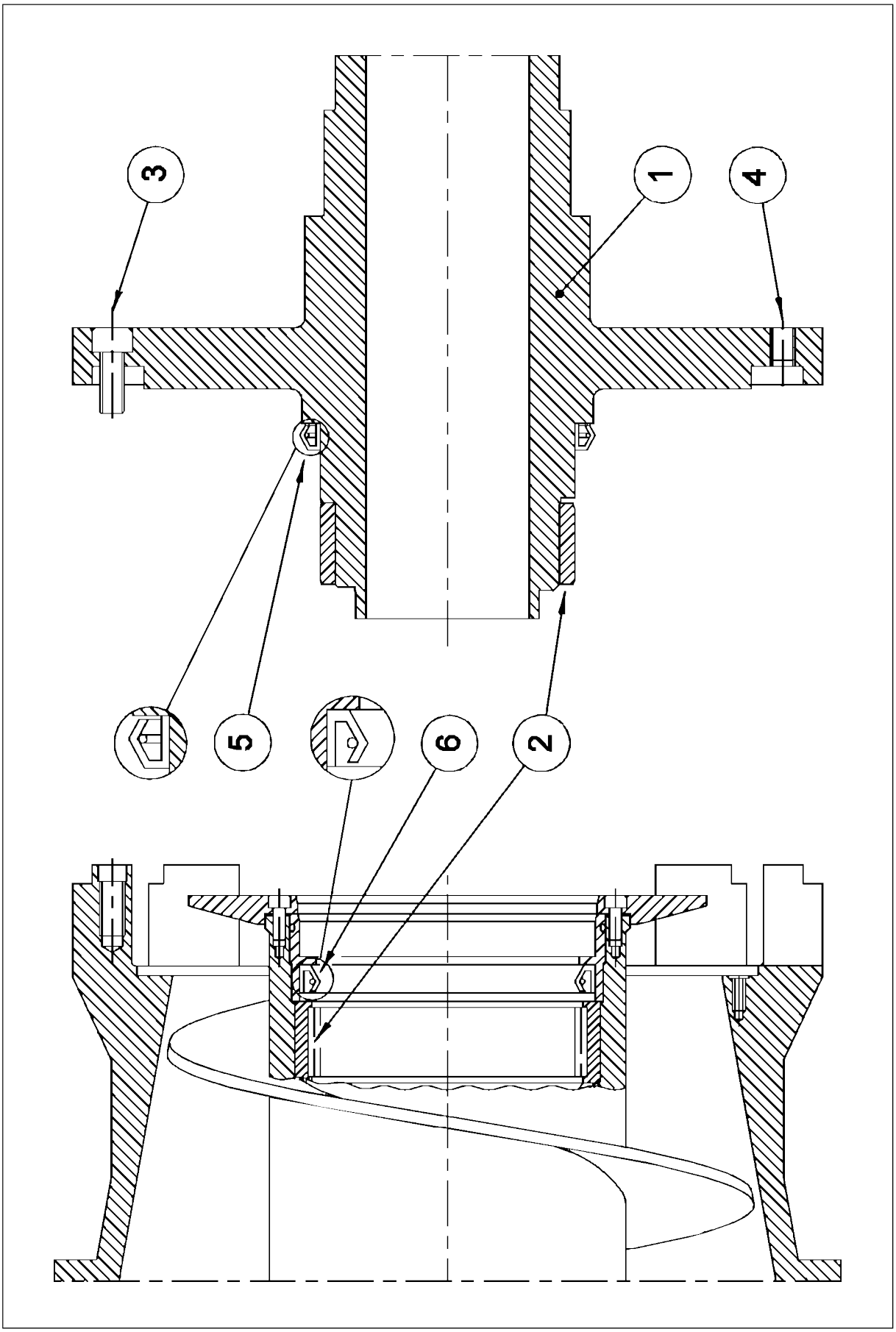

Figure 4.1.4

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 needle bearing [2]. Place a sling around both sides of the pillow block.*

Remove the eight screws [3] and jack off the small end hub by means of the two jacking screws [4].

Turn the two jacking screws [4] back to their original position. They must not stick out through the small end hub contact surface when the hub is installed again.

Be careful not to damage the needle bearing [2].

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 needle bearing [2]. Place a sling around both sides of the pillow block.*

Grease the outside of the lip seals [5] and [6].

Place the small end hub [1] on the bowl, being careful not to damage the needle bearing [2].

Fit the eight screws [3] and tighten them to a torque of 140 Nm (1240 in-lbs).

Tighten the two jacking screws [4].

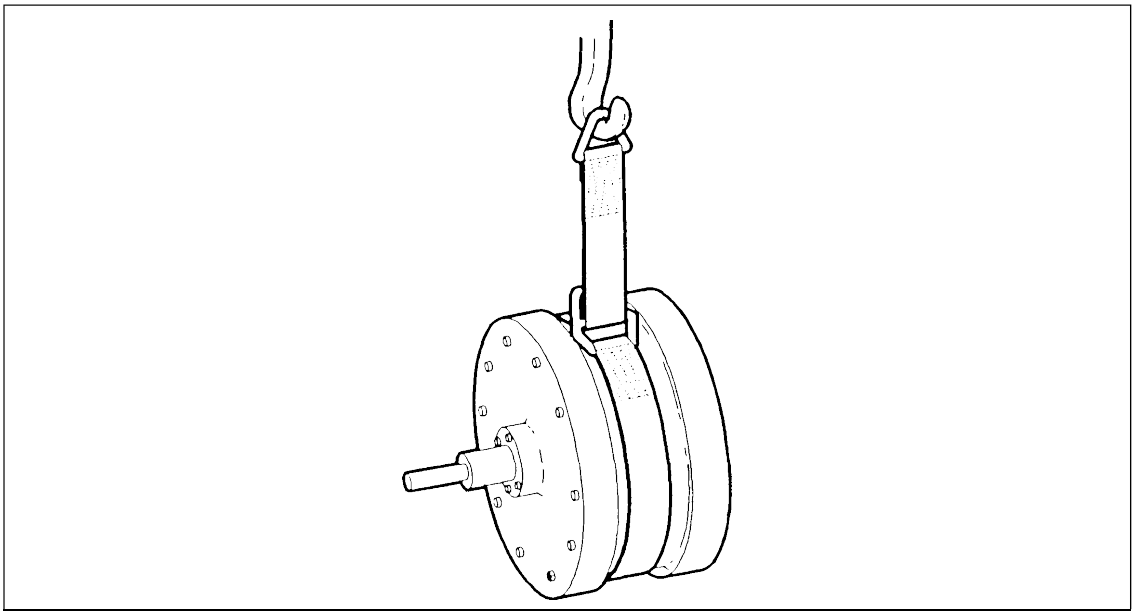

Figure 4.1.6

4.1.7 Remove Gearbox (Fig. 4.1.6)

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 4.1.6.*

Remove the six / eight screws / 10 screws (M16) / 16 screws (see Figure 4.1.7) connecting the gearbox to the gearbox adapter. Place the sling* as shown in Figure 4.1.6.

Suspend the gearbox from a hoist or the like and jack it off, 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.

* For P/N, see Spare Parts Catalogue

4.1.8 Install Gearbox (Fig. 4.1.7)

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.

3.0 kNm Gearbox
3.5 kNm Gearbox
6.0 kNm Gearbox
10.0 kNm Gearbox

Insert the six / eight / 16 screws assembling the gearbox adapter to the gearbox and tighten them to a torque of 197 Nm (1743 in-lbs) in the sequence indicated in Figure 4.1.7. No certain tightening sequence to be followed when tightening the 16 screws inserted in the 16 kNm gearbox.
Tighten the three jacking screws.

8.0 kNm Gearbox

Insert the 10 screws *(M16)* assembling the gearbox adapter to the gearbox and tighten them to a torque of 197 Nm (1743 in-lbs). No certain tinghtening sequence to be followed when tightening the screws.

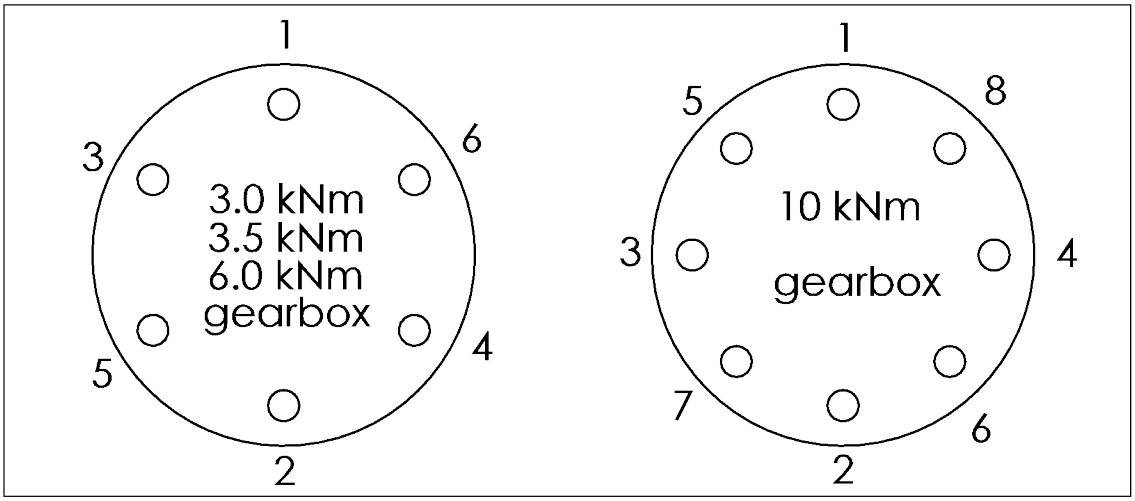

Figure 4.1.7

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

4.1.9 Fit New Solids Wear Sleeves

Before fitting new wear sleeves the small end hub must be removed from the bowl, see section 4.1.5.

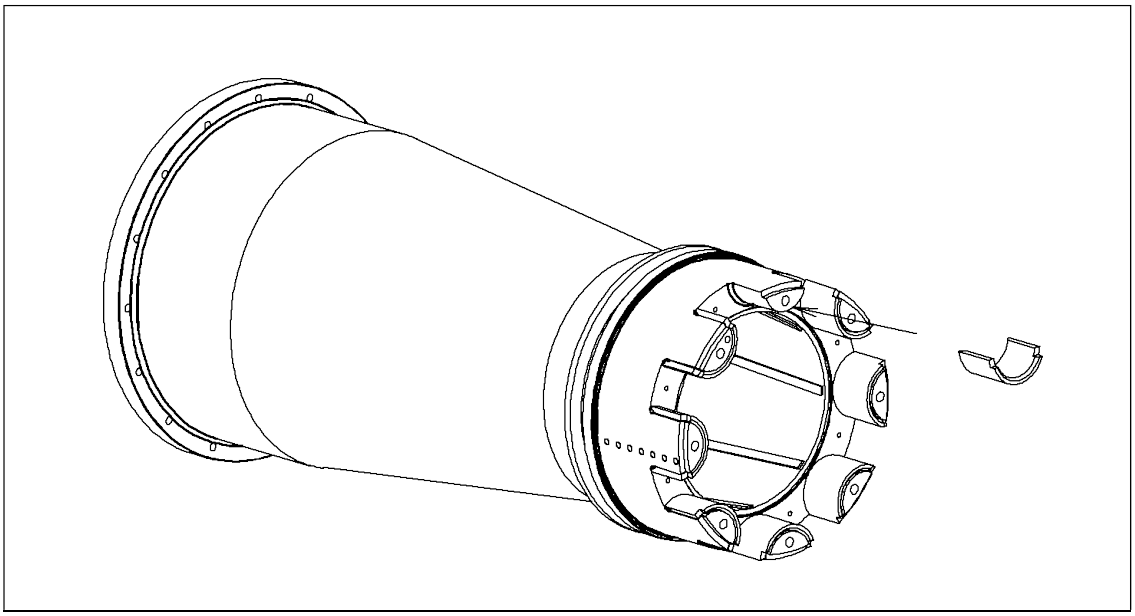

Figure 4.1.8

Wipe off oil and grease from the new sleeve and its seat in the bowl.

Clean both parts with acetone.

Apply, in zigzag, Araldite 2014 a to the wear sleeve surface in the bowl.

Insert the wear sleeve on the spoke and turn it to and fro until it feels like 'floating'. Then press the wear sleeve in place, using no tools at all, and keep it in this position by means of a rubberband.

ATTENTION *Remove superfluous Araldite.*

Hardening Time: 3½ hours at room temperature

½ hour at 60°C (140°F)

5 minutes at 100°C (212°F)

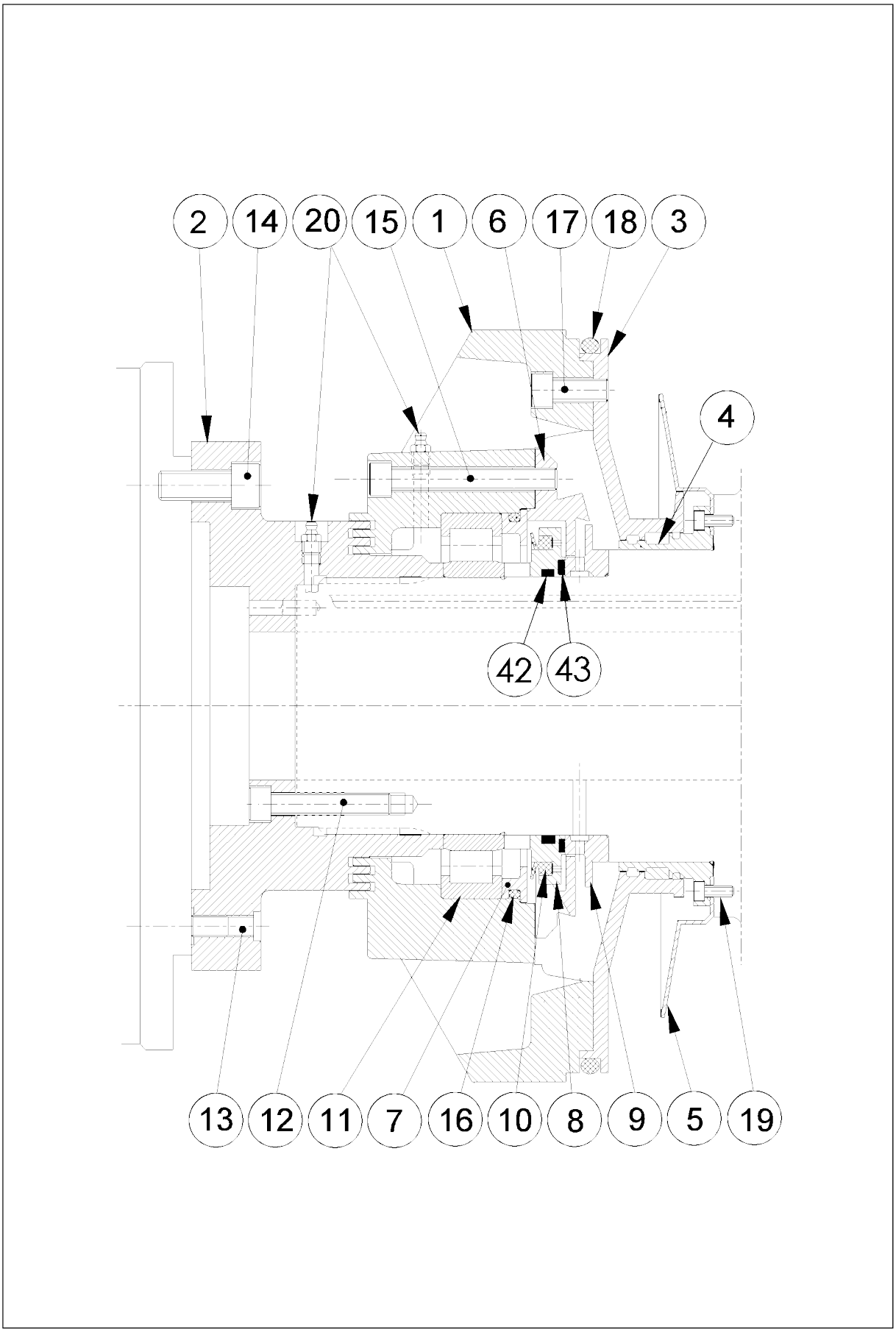

Figure 4.2.1

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 [12].

Using two M10 jacking screws, pull off the gearbox adapter [2], tightening the jacking screws equally to avoid pulling out the adapter [2] askew.

Fit a lifting eye and a sling on the top side of the bearing housing and then remove the four long screws [15] and the four short screws [17].

Now remove by hand the complete bearing assembly consisting of pillow block [1], roller bearing outer race [11], and ring [7].

Use a hammer and a brass mandrel to remove the roller bearing outer race [11], taking care that the mandrel does not damage the pillow block [1].

contd...

The roller bearing inner race [11] can be removed from the pinion by means of a standard two-armed puller as shown in Figure 4.2.2. Two milled recesses in the V-Ring holder [8] allow space for the puller claws.

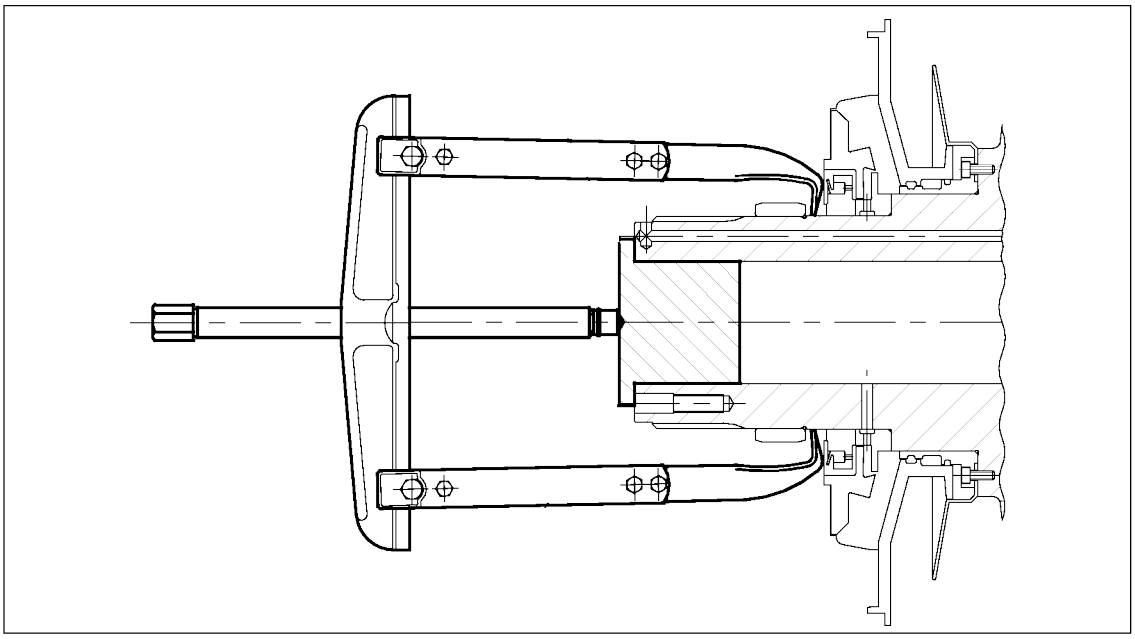

Figure 4.2.2

Remove, by hand and in the order mentioned, the remaining parts: V-Ring holder [8], bearing cover [6], guard ring [9], and the shield [3].

If necessary, remove the eight screws [19], the splash disc [5], and the seal ring [4].

4.2.2 Assemble Main Bearing Large End (Fig. 4.2.1)

Fit by hand the splash disc [5] and the seal ring [4] onto the pinion.

Insert an tighten the eight screws [19].

Fit the O-Ring [18] on the shield [3] and place the shield on the seal ring [4]. Make sure its 'cut edge' points downwards.

Fit the guard ring [9] onto the pinion, its two holes pointing outwards.

Push the bearing cover [6] on the guard ring [9], its grease discharge pointing downwards, and then fit the V-Ring holder [8] including V-Ring [10] and the O-Rings [42] and [43] on the pinion. *Do not apply any lubricant at all to the V-Ring [10] when fitting it!*

Heat the main bearing inner race [11] 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 it goes; it must seat fully against the V-Ring holder [8] all around.

Insert the roller bearing outer race [11] into the pillow block [1] and grease the rollers.

Then fit the ring [7] including the O-Ring [16] and push carefully the assembly onto the main bearing inner race [11].

contd...

Insert the four long screws [15] attaching the bearing cover [6] to the pillow block [1], and the four short screws [17] securing the shield [3].
Tighten all eight screws.

Carefully clean the contact surfaces between the gearbox adapter [2] and the pinion.

Place the gearbox adapter [2] 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 [12]. Tighten them to a torque of 81 Nm (717 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.

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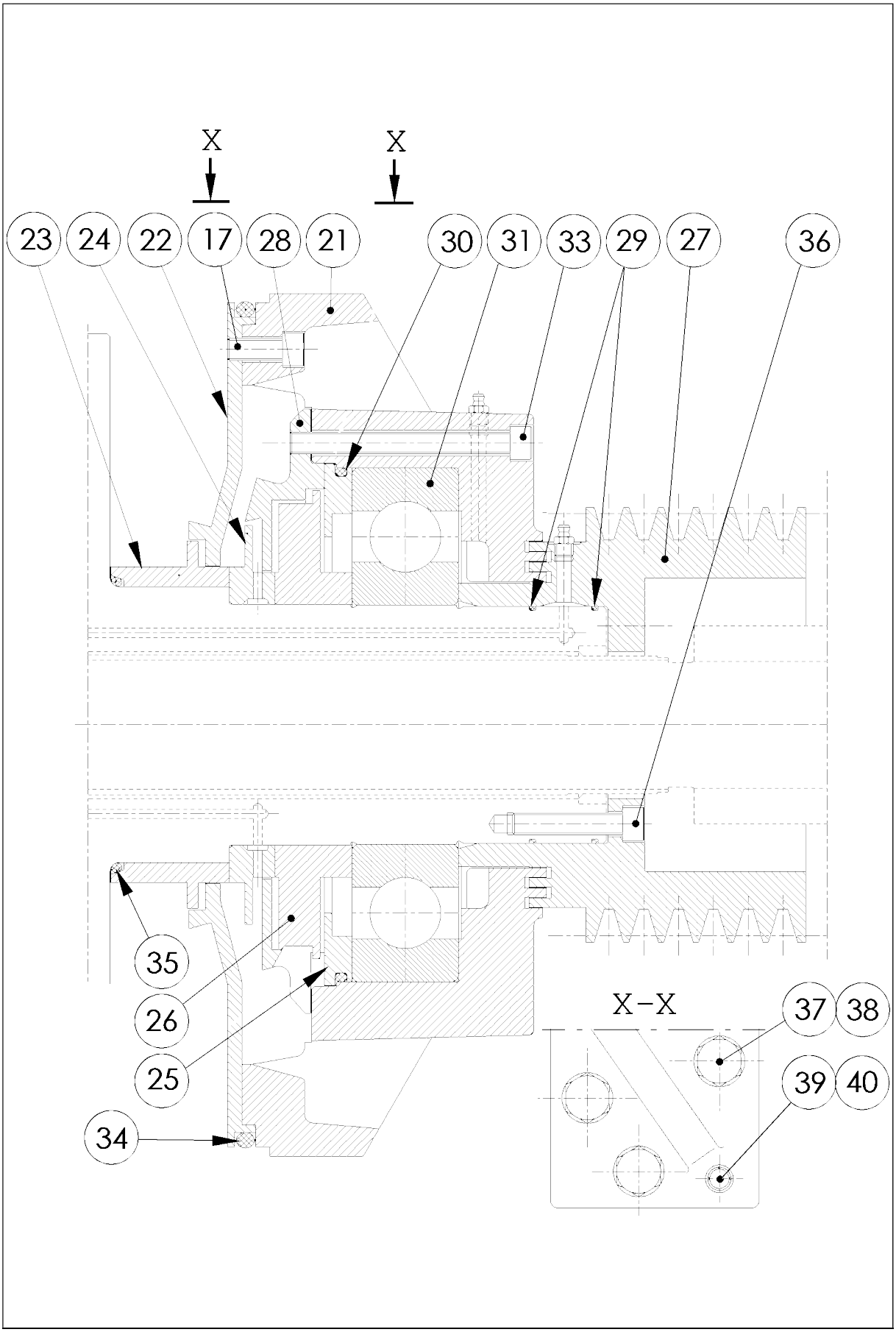

Figure 4.2.3

4.2.3 Disassemble the Main Bearing Small End

(Fig. 4.2.3)

Remove the six screws [36].

Using three M10 jacking screws, pull off the pulley [27], tightening the jacking screws equally, to avoid pulling the pulley [27] askew.

Remove the four short screws [17].

contd...

Fit the puller tool* on the pillow block as shown in Fig. 4.2.4.

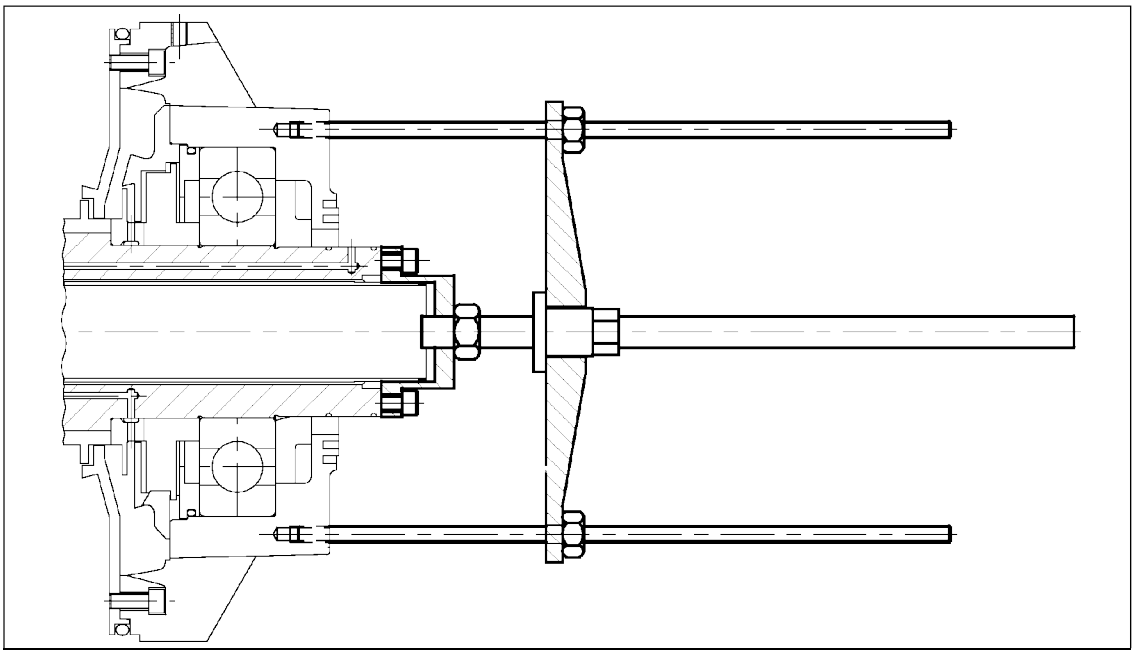

Figure 4.2.4

Fit a lifting eye and a sling on the top side of the bearing housing and then pull off the assembly consisting of: Pillow block [21], ball bearing [31] and ring [25], ring [26], and the bearing cover [28].

Disassemble the pillow block: Remove, in the following order, the four long screws [33], the bearing cover [28], the ring [26], and the ring [25].

Use a hammer and a brass mandrel to remove the ball bearing [31]. Take care that the mandrel does not damage the pillow block [21].

Remove by hand the guard ring [24] and the shield [22].

If necessary, the protective lining [23] can be removed by hand.

* For P/N, see Spare Parts Catalogue

4.2.4 Assemble Main Bearing Small End (Fig. 4.2.3)

Insert the O-Ring [35] into the protective lining [23] and fit the lining [23] onto the pinion.

Fit the O-Ring [34] on the shield [22] and place it onto the protective lining [23].

Fit the guard ring [24] onto the pinion, its two holes pointing outwards.

Push the bearing cover [28] on the guard ring [24], grease discharge pointing downwards, and then fit the ring [26] on the pinion.

Insert the ball bearing [31] into the pillow block [21] and grease the balls.

Apply a thin layer of anti-fretting corrosion paste* to the small end hub pinion.

Then fit the ring [25] including the O-Ring [30] and then press, with the pressure acting on the inner race of the ball bearing [31], the assembly onto the pinion by means of the special tool* as shown in Fig. 4.2.5.

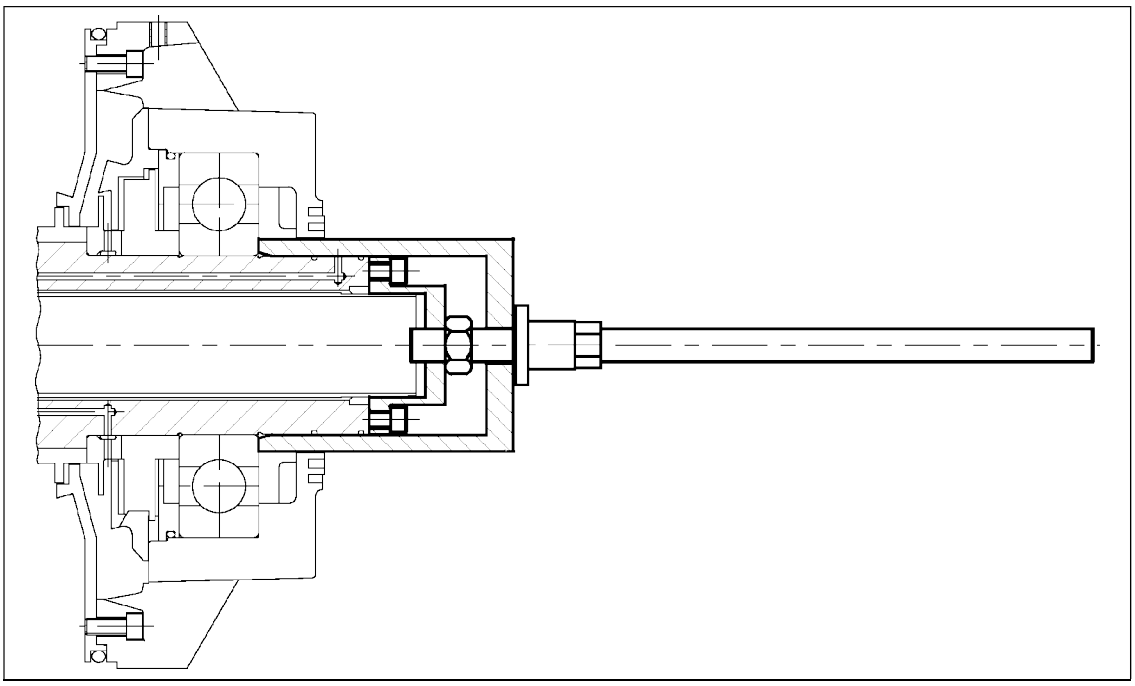

Figure 4.2.5

contd...

* For P/N, see Spare Parts Catalogue

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

Insert the four long screws [33] attaching the bearing cover [28] to the pillow block [21] and the four short screws [17] securing the shield [22].

Tighten all eight screws.

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

Fit the pulley [27] on the small end pinion, using the special tool* as shown in Fig. 4.2.6.

Fit the six screws [36] and tighten them to a torque of 81 Nm (717 in-lbs).

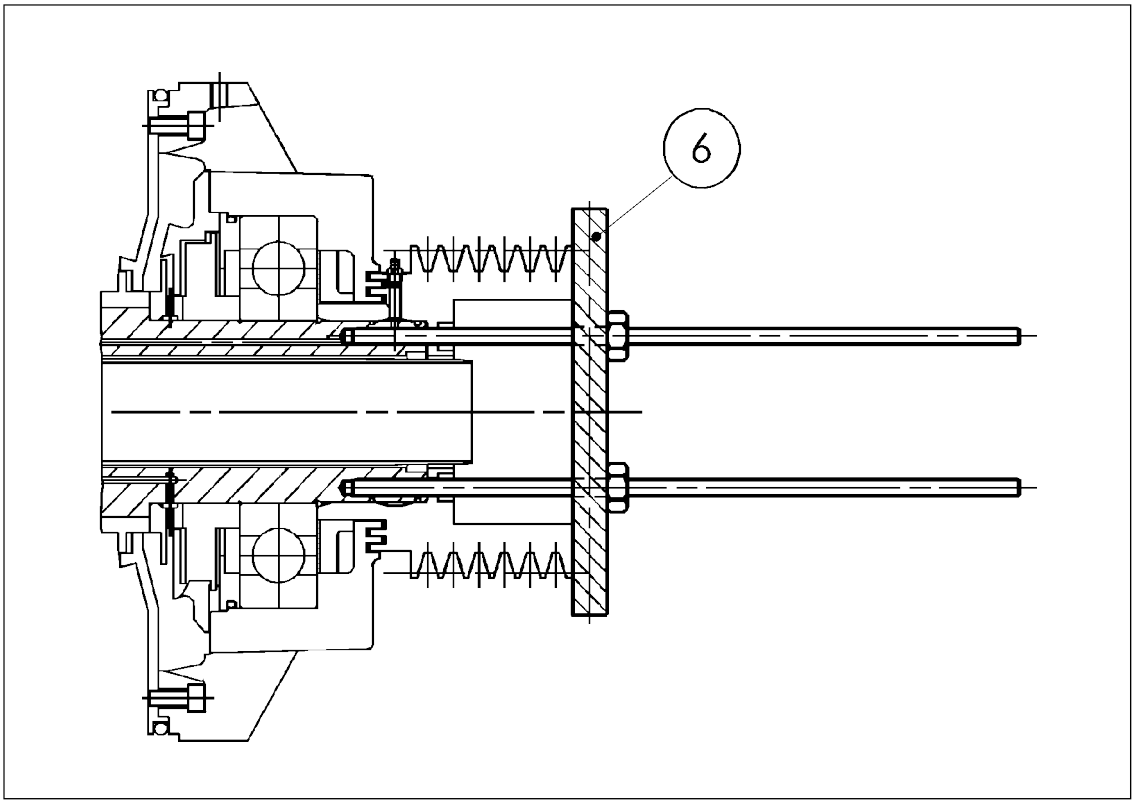

Figure 4.2.6

* For P/N, see Spare Parts Catalogue

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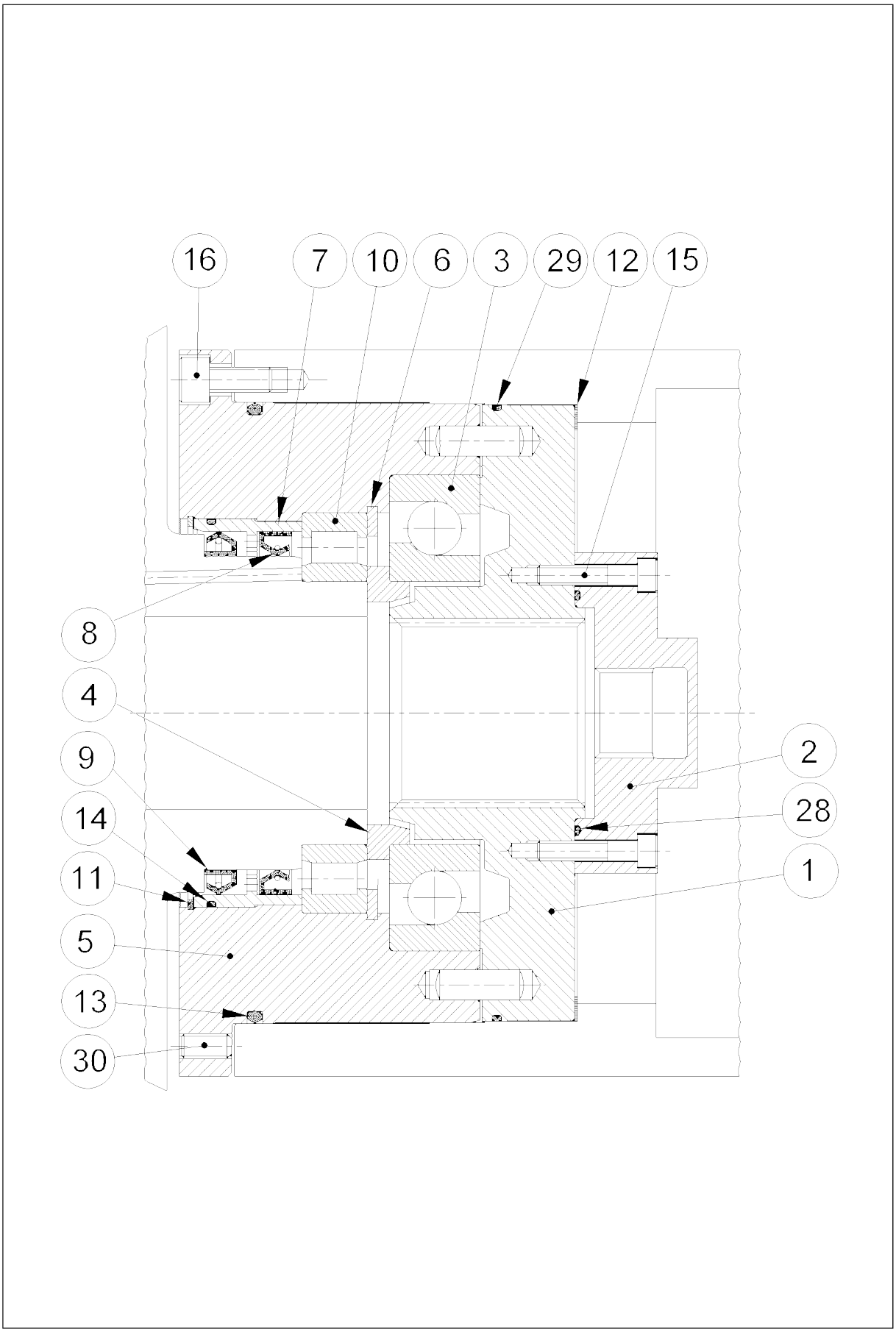

Figure 4.3.1

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.

Being press-fitted, the roller bearing inner race [10] can be removed only with the special puller ring for bearings*.

Place this ring on the pinion and place the two half-rings around the inner race.

Then push ring onto the two half-rings and use the puller as shown in Figure 4.3.2.

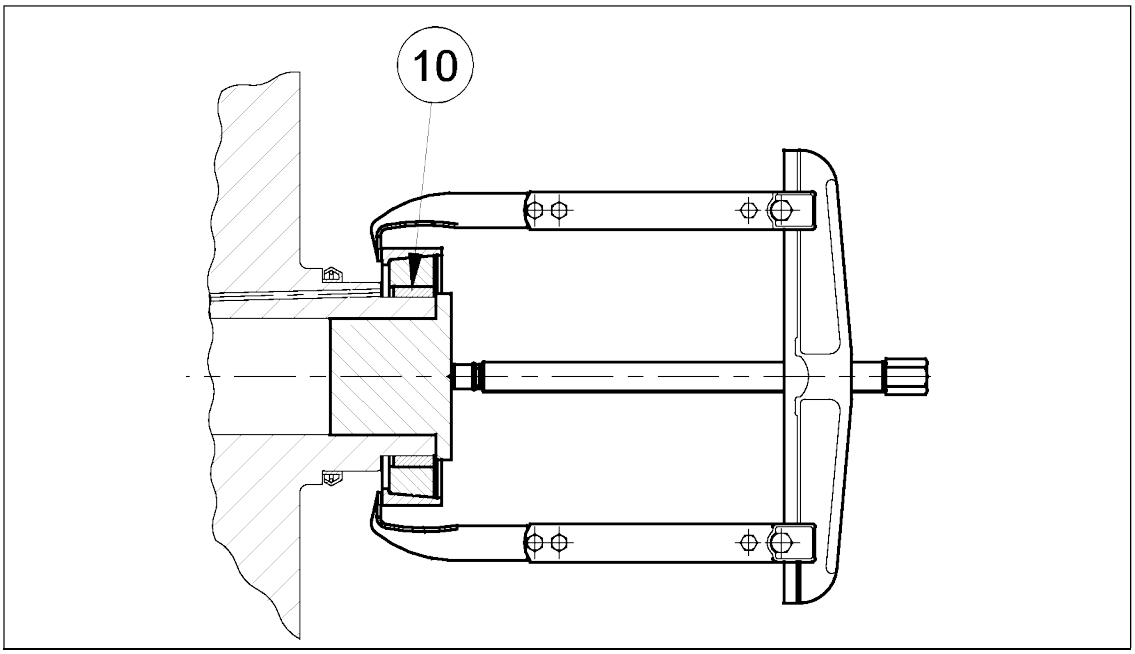

Figure 4.3.2

contd...

* For P/N, see Spare Parts Catalogue

Remove the 12 screws [16] and the two pointed screws [30].

Using the two M10x140 jacking screws* as shown in Figure 4.3.3, remove the assembly consisting of: Bearing holder [5] including roller bearing outer race [10], wear bushing [7] including lip seal [8], thrust ring [4], and angular contact ball bearing [3].

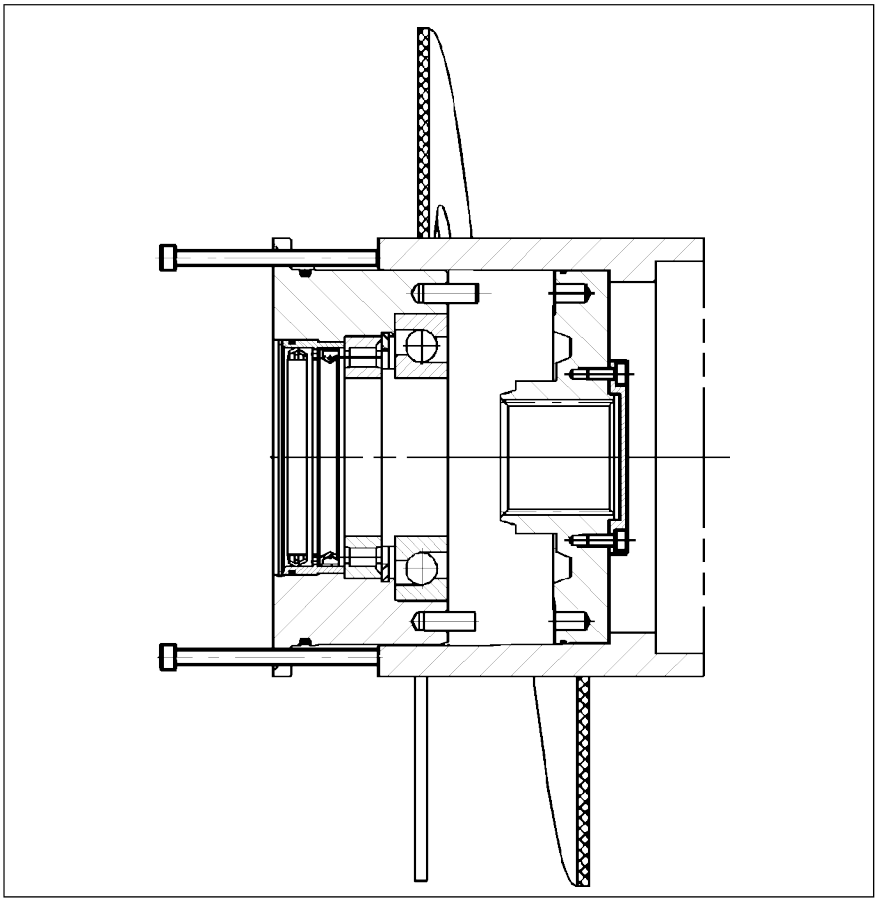

Figure 4.3.3

contd...

* For P/N, see Spare Parts Catalogue

Now it is possible to remove the angular contact ball bearing [3], the thrust ring [4], the snap rings [11] and [6], the wear bushing [7], and the roller bearing outer race [10].

Using the two M10x140 jacking screws and the puller bar* as shown in Fig. 4.3.4, remove the splined bushing [1] and the ejector disc [2].

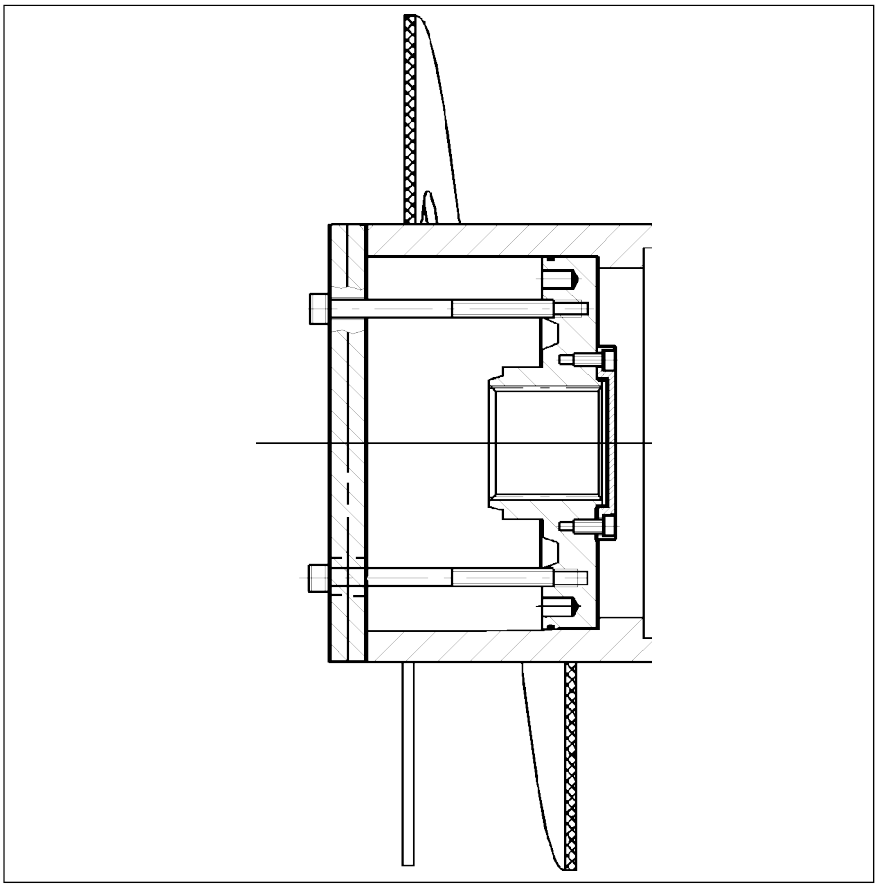

Figure 4.3.4

* For P/N, see Spare Parts Catalogue

4.3.2 Assemble Conveyor Bearing Large End

(Fig. 4.3.1)

ATTENTION *If a new conveyor or new hubs are to be installed, follow the procedure in section 4.4.3 to determine the number of shims to be fitted.*

Fit the ejector disc [2] including O-Ring [28] on the splined bushing [1] and secure with the four screws [15].

Fit the O-Ring [29] into the splined bushing [1] and grease it.

Fit the internal parts of the bearing holder [5] in the following order:

Apply grease to the roller bearing outer race [10] and fit it.

Fit the snap ring [6].

Grease O-Ring [14] and lip seal [8] and fit them into the wear bushing [7], the sealing lip pointing outwards, and insert the assembly into the bearing holder [5].

Fit the snap ring [11] and the O-Ring [13].

Fit the angular contact ball bearing [3], *ensuring that the narrow shoulder of the outer race faces the seat for the bearing in the bearing holder [5]*. Figure 4.3.1 shows how to turn bearing.

contd...

The lip seal [8], the roller bearing outer race [10], and the angular contact bearing [3], fill those parts with grease and fit the thrust ring [4].

Fit the shims [12]. Place the splined bushing [1] including the ejector disc [2] onto the the pins of the bearing holder [5].

Fit the assembly into the conveyor and pull it into place by tightening the 12 screws [16].

Fit the two pointed screws [30] and tighten them.

Fit the lip seal [9] and the inner race of the roller bearing [10] on the inner pinion of the end hub:

Grease the lip seal [9] and push it into place, its open side facing the end hub.

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

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.

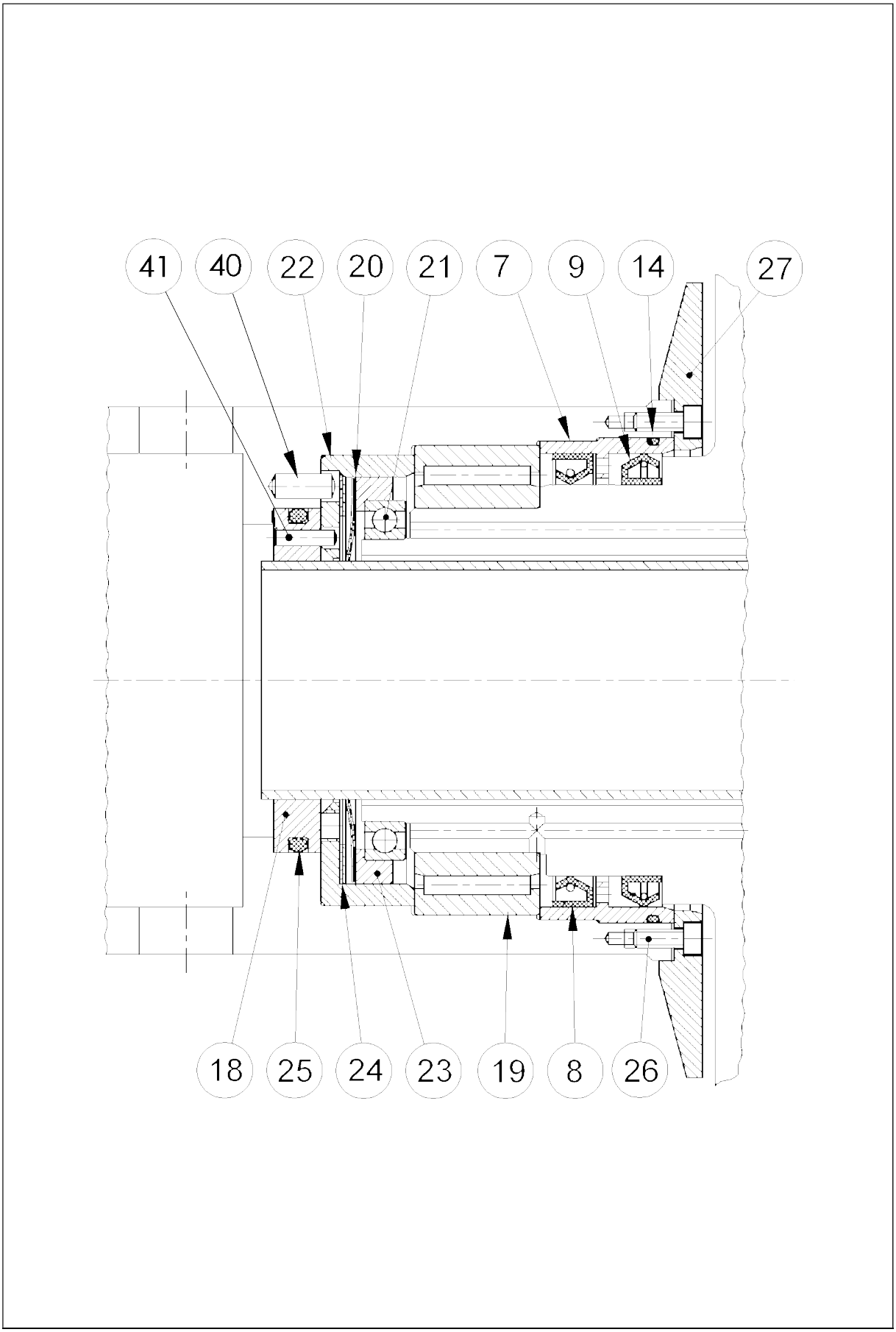

Figure 4.3.5

4.3.3 Disassemble Conveyor Bearing Small End

(Fig. 4.3.5)

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

Is the needle bearing inner race [19] or the lip seal [9] to be removed, remove the ball bearing [21], using no tools.

Do not remove the protecting tube [18] unless it needs exchanging.

Being press-fitted, the needle bearing inner race [19] can be removed only with the special puller ring for bearings*.

Place the puller ring on the pinion and the two half-rings around the inner race.

Then push the ring onto the two half-rings and use the puller tool as shown in Fig. 4.3.6.

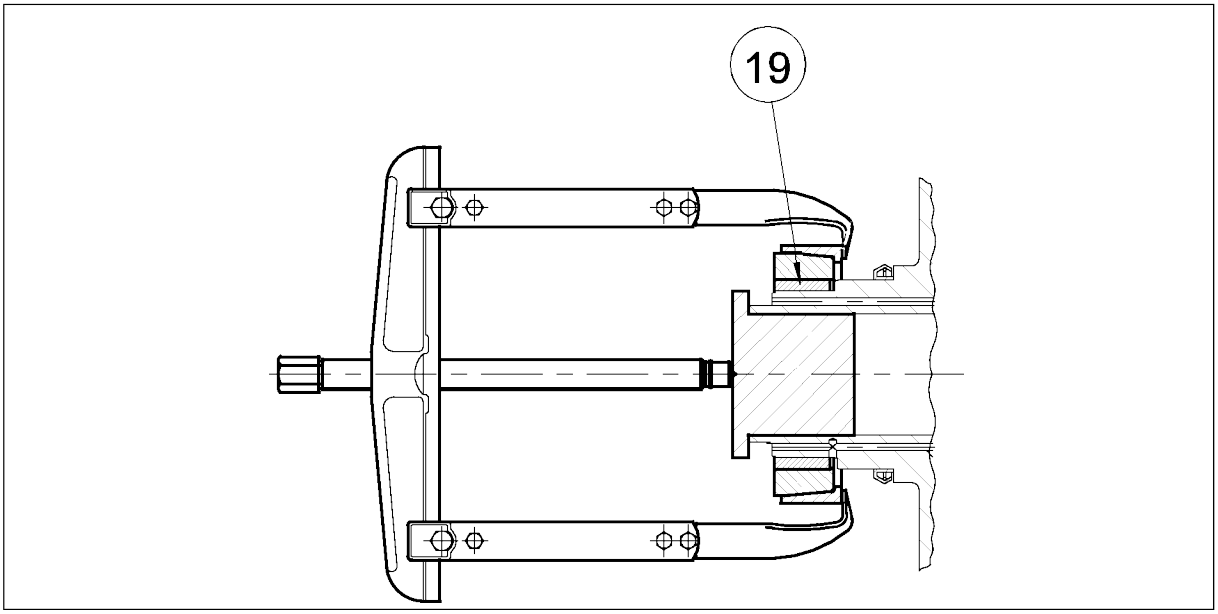

Figure 4.3.6

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* For P/N, see Spare Parts Catalogue

Remove the eight screws [26] and remove the lock ring [27].

Using the three M10x140 jacking screws* as shown in Fig. 4.3.7, carefully pull out the puller disc [22], the shims [24], the wavy springs [20], the guide ring [23], the needle bearing outer race [19], and the wear bushing [7] with lip seal [8].

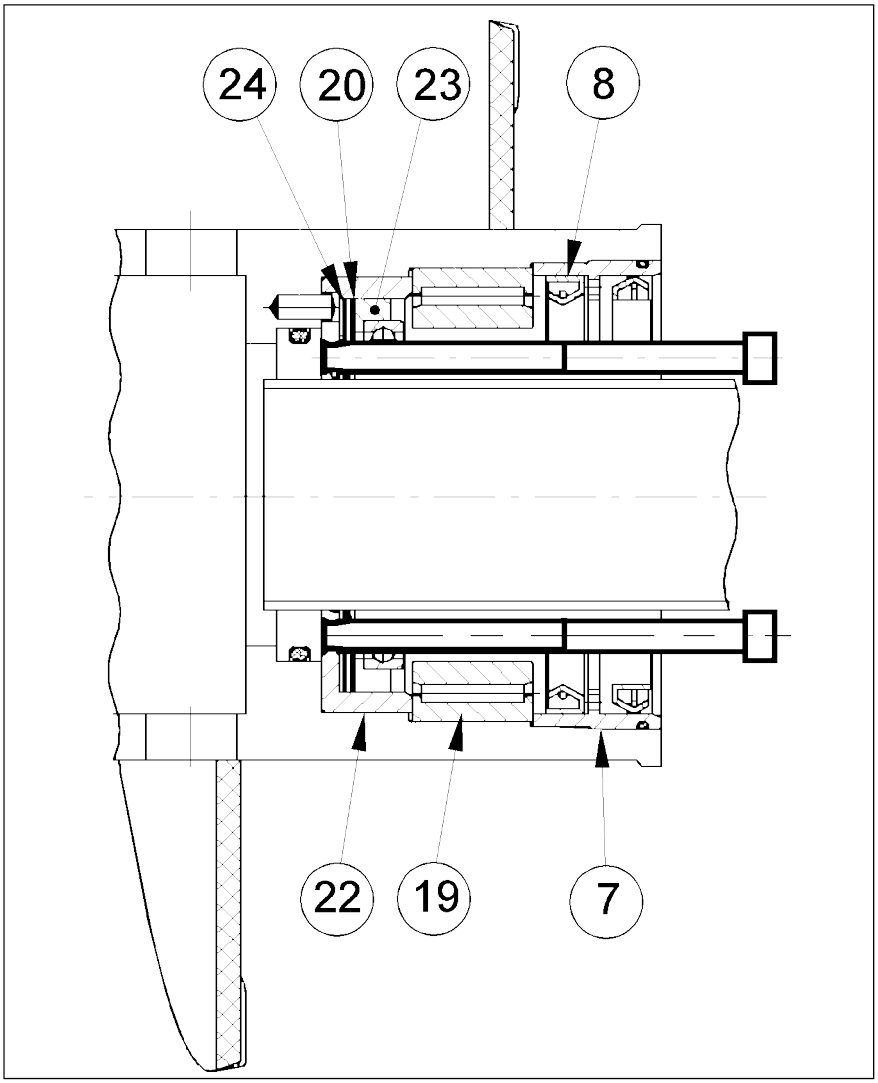

Figure 4.3.7

If necessary, the protecting tube [18] can be removed by hand.

* For P/N, see Spare Parts Catalogue

4.3.4 Assemble Conveyor Bearing Small End

(Fig. 4.3.5)

ATTENTION *If a new conveyor is to be installed, follow the procedure in section 4.4.4 to determine the number of shims [24] to be fitted.*

Fit the protecting tube [18] with inserted O-Ring [25] and fit the puller disc [22].

Make sure that both the pin [41] in the flange of the protecting tube [18] and the pin [40] inside the conveyor are correctly aligned with the two corresponding holes in the disc so that pins and holes mesh properly.

Fit the shims [24], the wavy springs [20], and the guide ring [23].

Apply grease to the needle bearing outer race [19] and fit it.

Grease the O-Ring [14] and the lip seal [8] and fit them into the wear bushing [7], the sealing lip pointing outwards, and insert the assembly into the conveyor.

Fit the lock ring [27].
Fit the eight screws [26] and tighten them.

Fit the lip seal [9] and the inner race of the needle bearing [19] on the inner pinion of the end hub:

Grease the lip seal [9] and push it into place, its open side facing the end hub.

Heat the inner race of the needle bearing [19] by means of an induction heater or in an oven to approximately 80°C (175°F) and fit it onto the inner pinion; be sure that the race seats fully against the shoulder of the pinion.

Fit the ball bearing [21] on the small end hub.

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

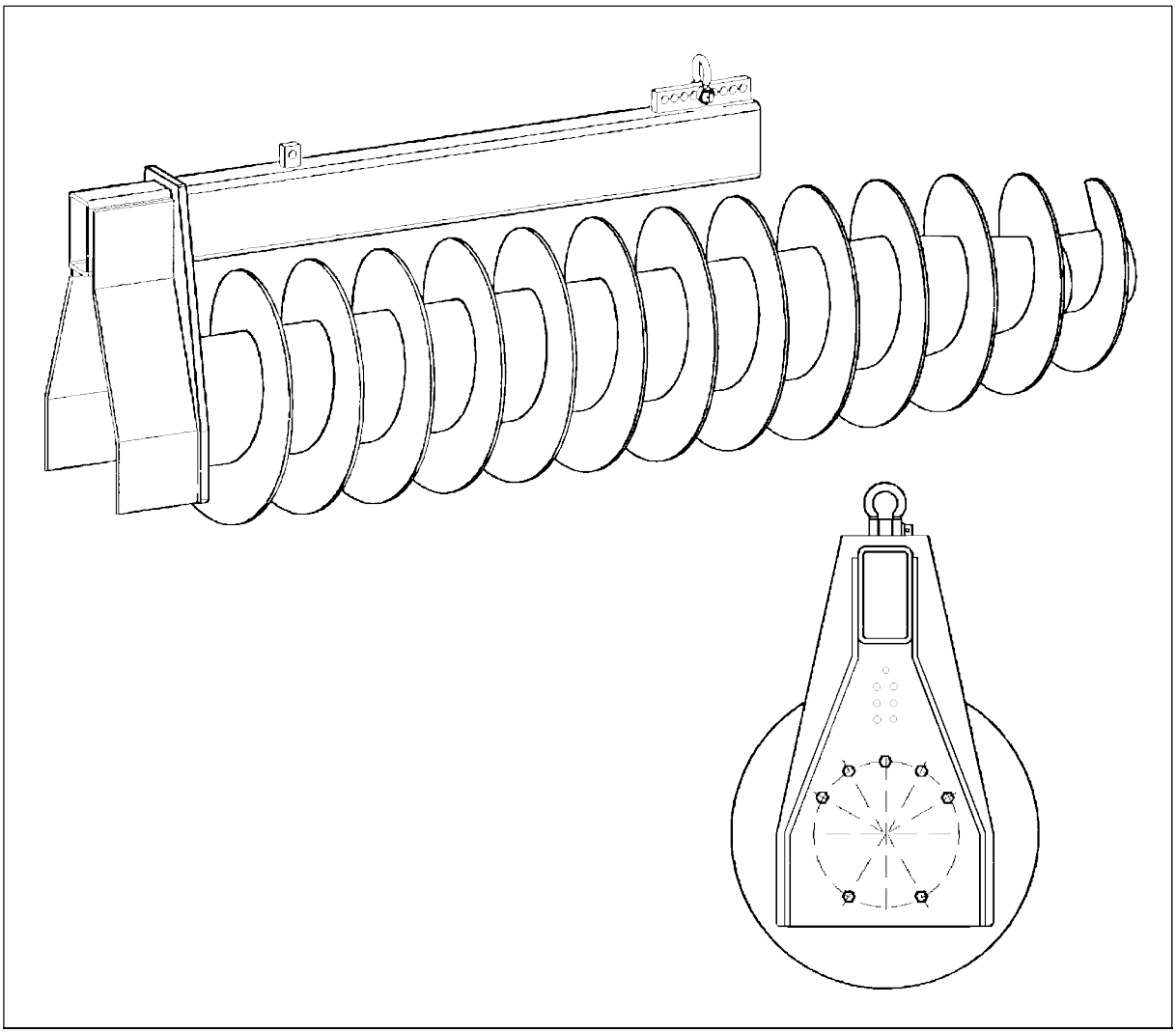

Figure 4.4.1

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.

WARNING *All seven screws must be used.*

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

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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.*

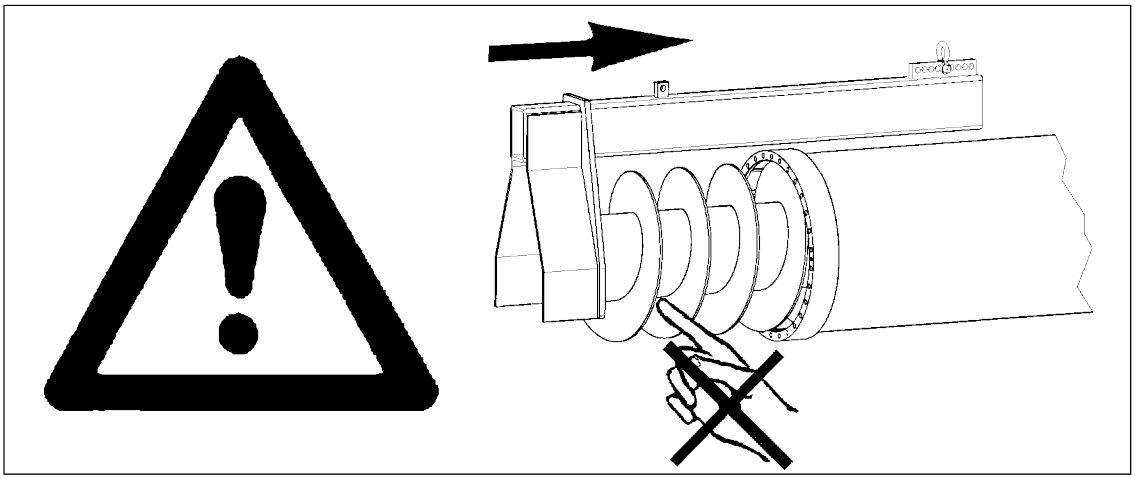

Figure 4.4.2

ATTENTION *If installing another conveyor than that removed from the bowl, adjust it axially according to the instructions given in sections 4.4.3 and 4.4.4.*

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

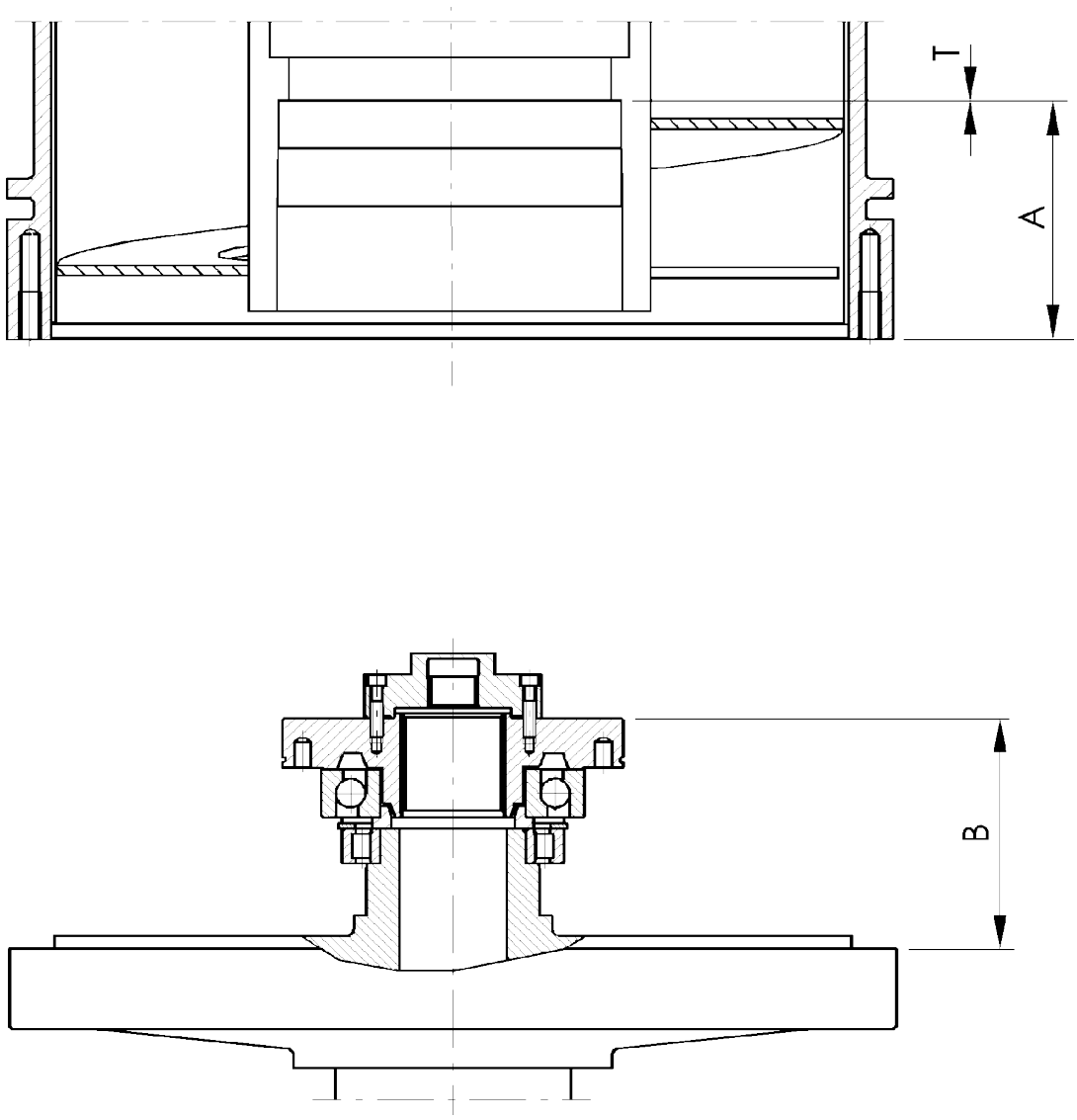

Figure 4.4.3

Shim 6123.7149-01 : 1 mm				
(A-B) [mm]	T [mm]			
	Spray Hardsurfaced		Tiles	
[Greater than] Up to	Standard Cone	Steep Cone	Standard cone	Steep Cone
- 4	0	0	0	0
[4] - 5	0	1	0	0
[5] - 6	1	1	0	0
[6] - 7	1	1	0	0
[7] - 8	1	1	1	1
[8]	1	1	1	1

Table 4.4.1

4.4.3 Axial Adjustment of Conveyor (Fig. 4.4.3)

This section describes how to determine the thickness of the shim packet adjusting the play between the conical parts of the conveyor and bowl shell.

ATTENTION *If the small end hub has not been removed, remove it according to the instructions given in section 4.1.5.*

Insert the conveyor (shims and bearing parts removed) into the bowl.

Using suitable tools, push the conveyor as far it goes into the bowl to ensure that its conical surface seats fully against that of the bowl.

Measure the distance A from the bowl contact face for the large end hub to the bottom of the bearing bore in the conveyor as shown in Figure 4.4.3. Note down the result.

Measure the distance B from the large end hub contact face for the bowl to the splined bushing as shown in Figure 4.4.3. Note down the result.

Using the result of the difference (A-B) and the above table, select the number of adjusting shims to fill to the space T.

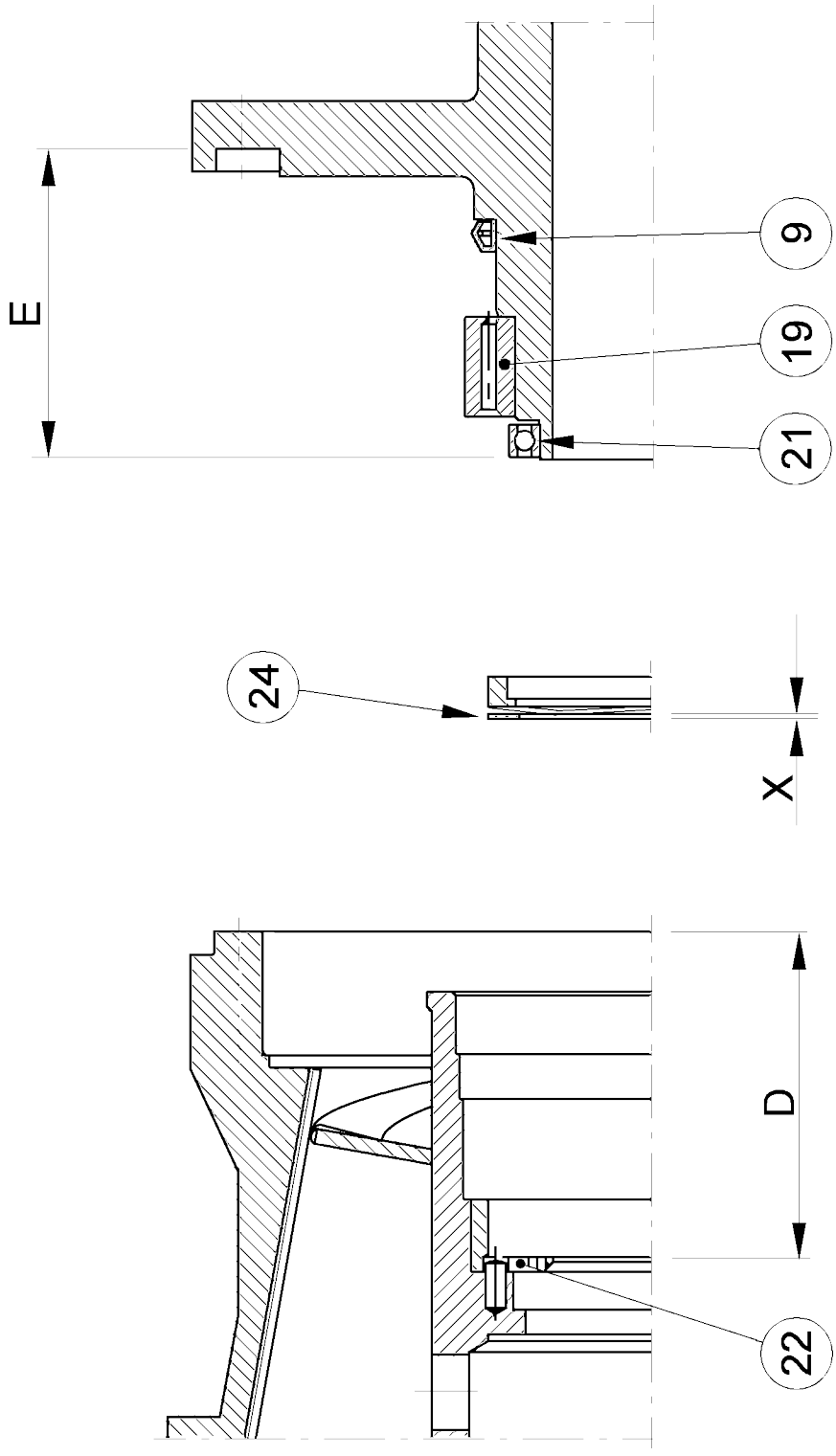

Figure 4.4.3

Shim	Thickness
P/N 6119.4422-90	1.0 mm
P/N 6119.4422-30	0.5 mm
P/N 6119.4421-10	0.2 mm
P/N 6119.4420-50	0.1 mm

Table 4.4.2

4.4.4 Adjust Axial Play between Conveyor and Bowl (Fig. 4.4.4)

When installing a new conveyor, make sure that the adjustment of the large end play between conveyor and bowl shell has been done according to instructions in section 4.4.3.

Then determine the thickness of the shim packet in the small end, to achieve the permissible axial conveyor play in the bowl:

Fit the puller disc [22]. Do not fit the protecting tube.
Push the conveyor against the large end hub.
Keep by hand the puller disc [22] pressed against the conveyor.

Measure the distance "D" between the bowl rim and the bottom of the puller disc as shown in Figure 4.4.4.
Note down the result.

Fit the lip seal [9], the needle bearing inner race [19], and the ball bearing [21] onto the small end hub.

Measure the distance "E" from the ball bearing to the small end hub contact face for the conical bowl section as shown in Figure 4.4.4. Note down the result.

Using the result of the computation X = D - (E + 5.7) and the above table, select the adjusting shims to fill the computed space "X".

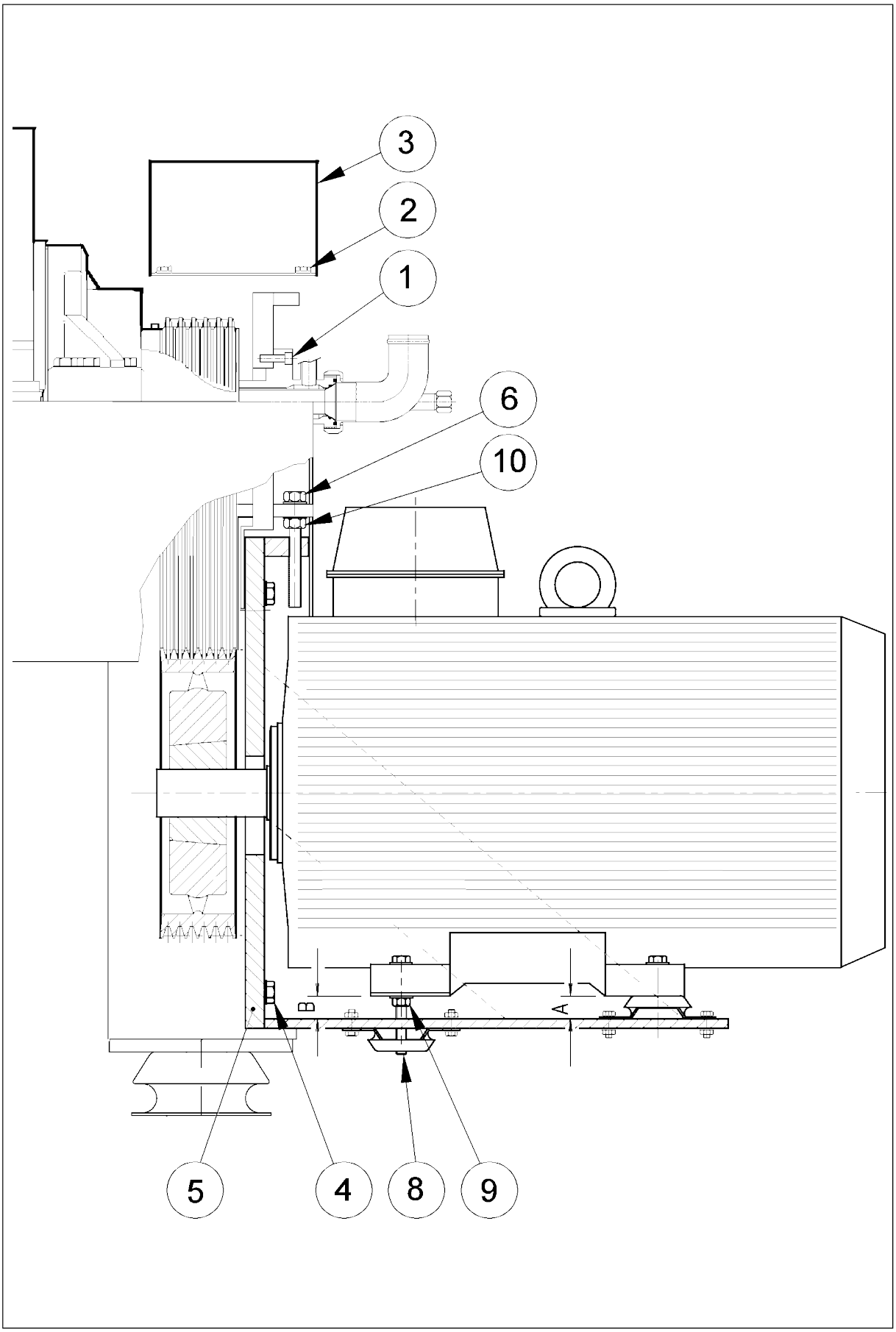

Figure 4.5.1

4.5 Main Drive

4.5.1 Disassemble Main Drive (Fig. 4.5.1)

Loosen the four screws [1] and pull out the feed tube.
Remove the four screws [2] and the upper belt guard [3].

Loosen the four screws [4] and elevate the motor bracket [5] by means of the two elevating screws [6].
Remove the V-belts from the pulleys.

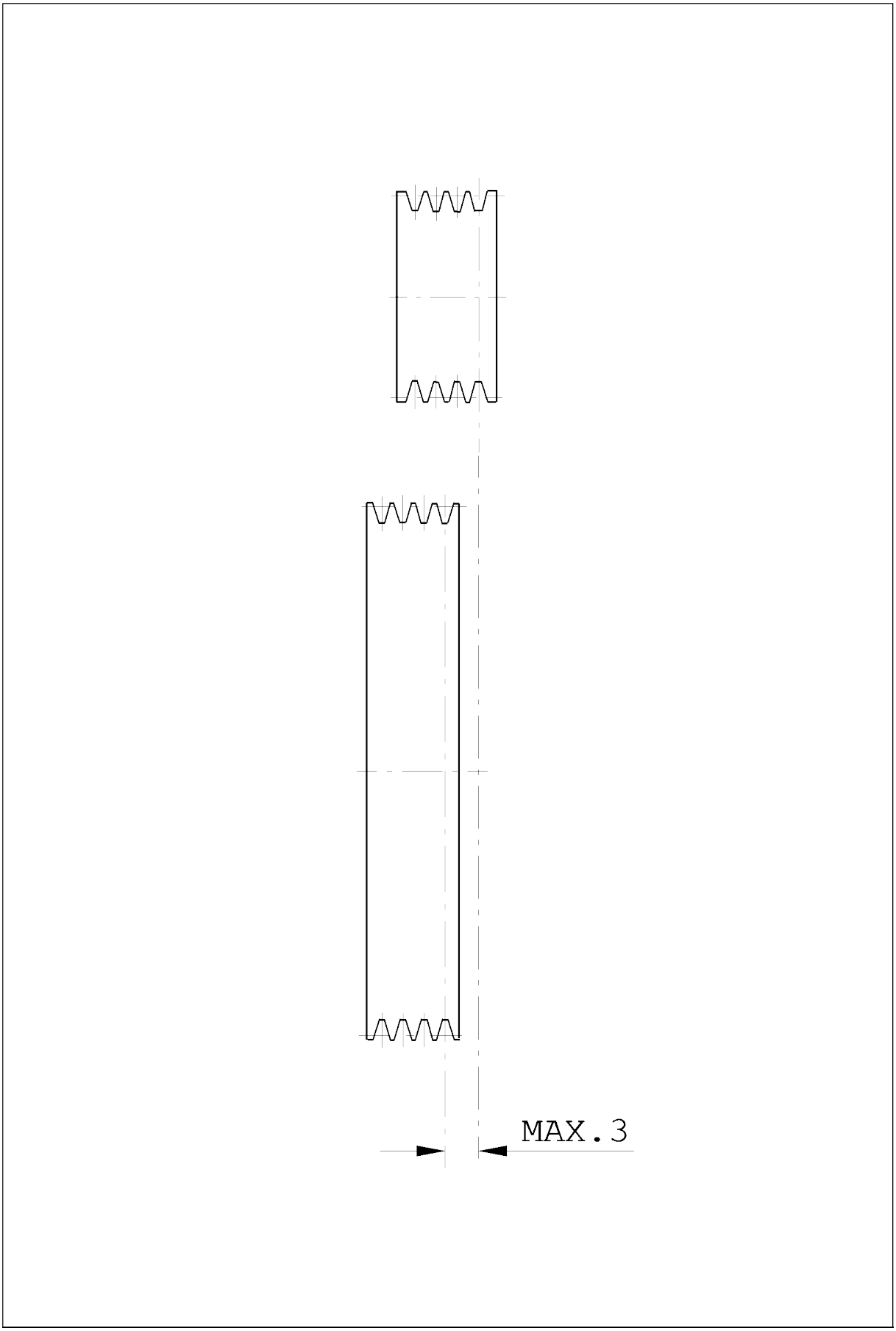

Figure 4.5.2

4.5.2 Assemble Main Drive (Fig. 4.5.1)

1. Tighten the belts to the value prescribed in Table 4.5.2 (or 4.5.1, if new belts are installed too).

If a frequency measuring device is used, tighten the belts to the value prescribed in Tables 4.5.5 and 4.5.6 (or Tables 4.5.3 and 4.5.4, 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 [9].

Motor size 225 (IEC) and 364-365 (NEMA):
Required weight of motors placed on four dampers:
300-700 kg (660-1542 lbs).

All other sizes:
Required weight of motors placed on four dampers:
600-1100 kg (1323-2425 lbs).

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

Install the six V-belts in the grooves of the pulleys and tighten them by means of the two screws [10].

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

Secure the motor bracket [5] with the four screws [4] and tighten them to a torque of 385 Nm (3406 in-lbs).

Install the upper belt guard [3] and secure it with the four screws [2].

Install the feed tube and tighten the four screws [1].

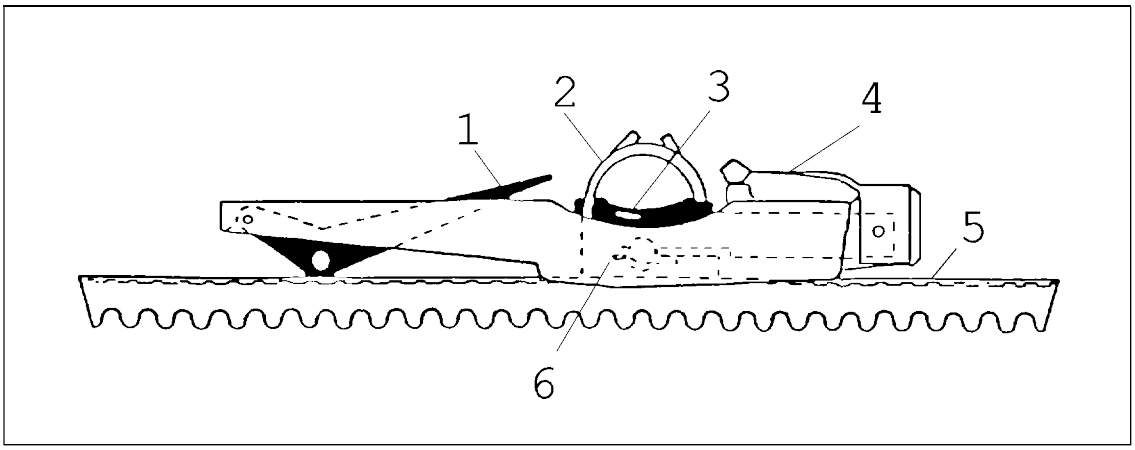

Figure 4.5.3

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.

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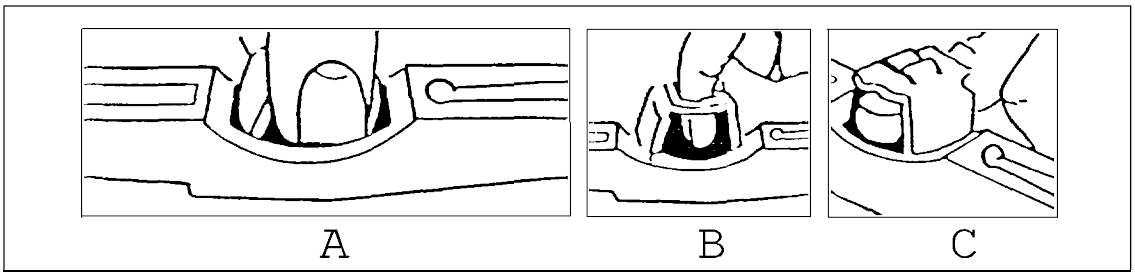

Figure 4.5.4

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.

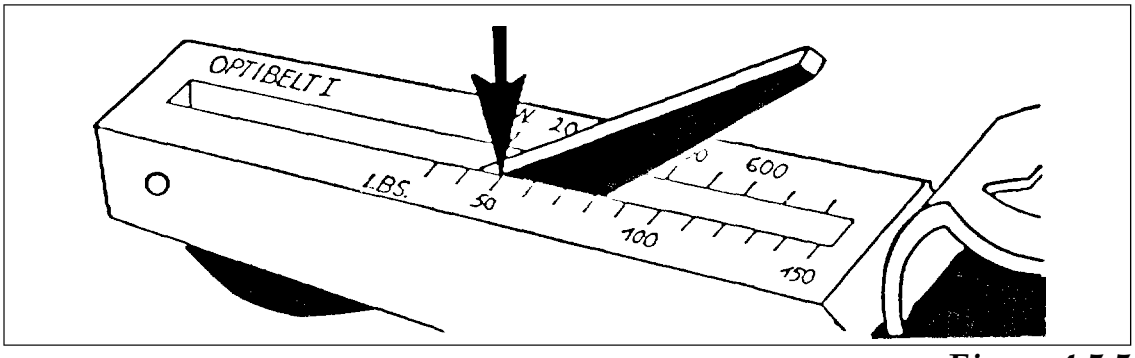

Figure 4.5.5

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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 tensioning using torque

BELT TENSION - Tightening of New Belts					
Motor Power		**Bowl Speed [r p m]**			
[kW]	**[HP]**	**2050 / 2300**	**2600**	**2900**	**3075**
55	(75)	600-700 N [60Hz]	700-800 N [60Hz]	700-800 N [60Hz]	800-900 N [60Hz]
75	(100)	600-700 N [50/60Hz]	600-700 N [50/60Hz]	600-700 N [50/60HZ]	700-800 N [50Hz] 800-900 N [60Hz]
90	(125)	700-800 N [50/60Hz]	700-800 N [50/60Hz]	700-800 N [50/60Hz]	800-900 N [50/60Hz]
110	(150)	---------	700-800 N [50Hz] 800-900 N [60Hz]	800-900 N [50/60Hz]	800-900 N [50/60Hz]
132		---------	---------	900-1000 N [50/60Hz]	900-1000 N [50/60Hz]
160	(200)	---------	---------	900-1000 N [50Hz] 1100-1200 N [60Hz]	---------

Table 4.5.1

BELT TENSION - Retightening of Used Belts still to be used					
Motor Power		**Bowl Speed [r p m]**			
[kW]	**[HP]**	**2050 / 2300**	**2600**	**2900**	**3075**
55	(75)	500-600 N [60Hz]	550-600 N [60Hz]	550-600 N [60Hz]	600-700 N [60Hz]
75	(100)	500-600 N [50/60Hz]	550-600N [50/60Hz]	500-600 N [50/60Hz]	600-700 N [50/60Hz]
90	(125)	550-600 N [50/60Hz]	550-600N [50/60Hz]	550-600 N [50/60Hz]	600-700 N [50/60Hz]
110	(150)	---------	550-600 N [50Hz] 600-700 N [60Hz]	600-700 N [50/60Hz]	600-700 N [50/60Hz]
132		---------	---------	700-800 N [50/60Hz]	700-800 N [50/60Hz]
160	(200)	---------	---------	700-800 N [50Hz] 800-900 N [60Hz]	------

Table 4.5.2

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

Belt tensioning using frequency - New belts

BELT TENSION - Tightening of New Belts						
Motor Power		**Bowl Speed [r p m] 50 Hz**				
[kW]	**[HP]**	**2050**	**2300**	**2600**	**2900**	**3075**
75	(100)	42.2 Hz	44.9 Hz	45.2 Hz	45.1 Hz	47.4 Hz
90	(125)	44.1 Hz	45.7 Hz	45.2 Hz	45.3 Hz	47.6 Hz
110	(150)	------	------	47.3 Hz	51.1 Hz	47.7 Hz
132		------	------	------	50.1 Hz	50.4 Hz
160	(200)	------	------	------	52.6 Hz	------

Table 4.5.3

BELT TENSION - Tightening of New Belts						
Motor Power		**Bowl Speed [r p m] 60 Hz**				
[kW]	**[HP]**	**2050**	**2300**	**2600**	**2900**	**3075**
55	(75)	39.3 Hz	42.2 Hz	41.5 Hz	45.0 Hz	42.9 Hz
75	(100)	42.6 Hz (39.6 Hz)	42.2 Hz (44.9 Hz)	44.9 Hz	45.1 Hz	47.5 Hz
90	(125)	45.1 Hz	42.5 Hz	45.3 Hz	44.8 Hz	47.6 Hz
110	(150)	------	------	47.1 Hz	50.2 Hz	47.4 Hz
132		------	------	------	49.1 Hz	50.3 Hz
160	(200)	------	------	------	57.0 Hz	------

Table 4.5.4

Belt tensioning using frequency - Used belts

BELT TENSION - Retightening of Used Belts still to be used						
Motor Power		Bowl Speed [r p m] 50 Hz				
[kW]	[HP]	2050	2300	2600	2900	3075
75	(100)	37.0 Hz	39.4 Hz	39.7 Hz	39.5 Hz	41.5 Hz
90	(125)	38.7 Hz	40.1 Hz	39.7 Hz	39.7 Hz	41.8 Hz
110	(150)	------	------	41.5 Hz	44.8 Hz	41.9 Hz
132		------	------	------	43.8 Hz	44.2 Hz
160	(200)	------	------	------	46.2 Hz	------

Table 4.5.5

BELT TENSION - Retightening of Used Belts still to be used						
Motor Power		Bowl Speed [r p m] 60 Hz				
[kW]	[HP]	2050	2300	2600	2900	3075
55	(75)	34.5 Hz	37.0 Hz	36.4 Hz	39.5 Hz	37.6 Hz
75	(100)	37.4 Hz (34.8 Hz)	37.0 Hz (39.3 Hz)	39.3 Hz	39.5 Hz	41.7 Hz
90	(125)	39.6 Hz	37.3 Hz	39.7 Hz	39.3 Hz	41.7 Hz
110	(150)	------	------	41.3 Hz	44.0 Hz	41.6 Hz
132		------	------	------	43.1 Hz	44.2 Hz
160	(200)	------	------	------	50.0 Hz	------

Table 4.5.6

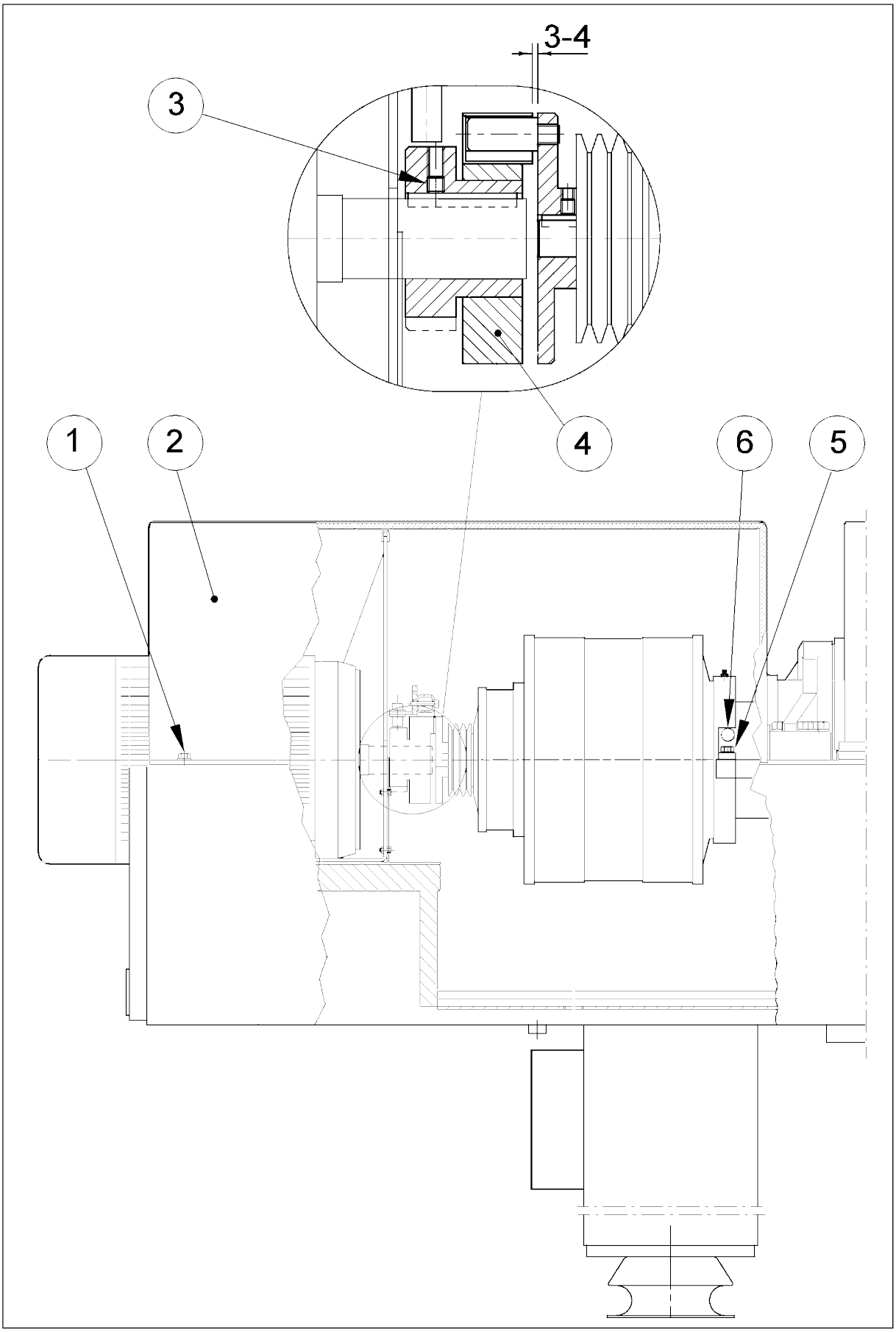

Figure 4.6.1

4.6 Eddy Current Brake / Variable Frequency Drive

4.6.1 Disassemble Eddy Current Brake / Variable Frequency Drive (Fig. 4.6.1)

Remove the 10 screws [1] and the gearbox guard [2].

Loosen the setscrew [3] and pull the coupling against the Eddy Current Brake / motor until its two coupling parts [4] disengage completely.

Remove the two screws [5].
Move the sensor bracket [6] 50 mm outwards and use one of the screws [5] to secure bracket in this position.

4.6.2 Assemble Eddy Current Brake / Variable Frequency Drive (Fig. 4.6.1)

Install the sensor bracket [6] and secure it with the two screws [5].

The gap between the sensor and the gearbox adapter must be 3-4 mm.

Put the two coupling parts [4] into engaged position, leaving an axial play of 3-4 mm (1/8 inch) between them, and tighten the setscrew [3].

Install the gearbox guard [2] and secure with the 10 screws [1].

5 Supplementary Documentation

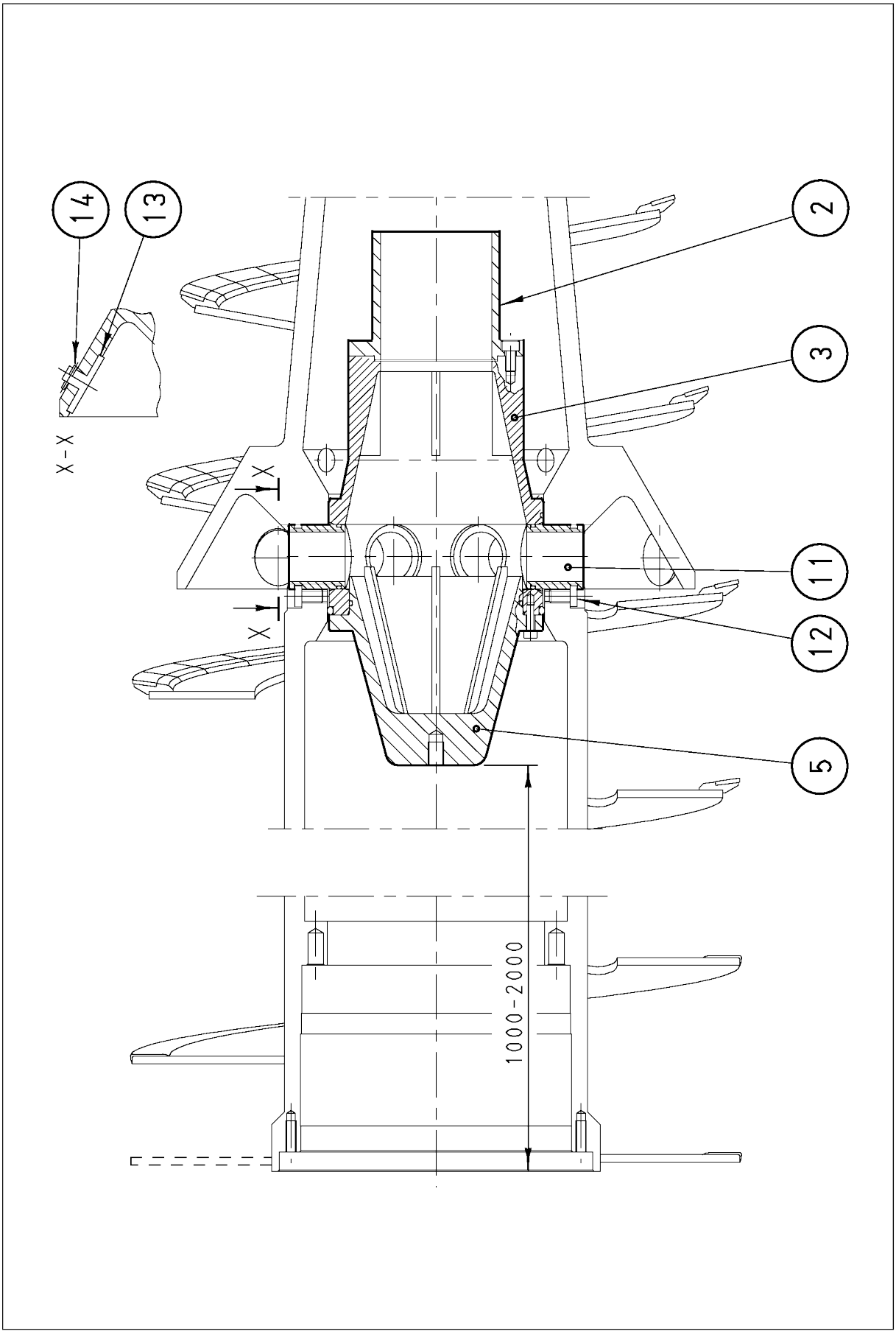

Figure 1

0 BD3 Rotor

BD3 Rotor (Figure 1)

Dismounting the BD3 Rotor

1. Dismount the conveyor and remove the conveyor bearings - large end - as described in chapter 4 of this manual.
Extract the 6 feed inlet bushings [11] by unscrewing the M10 screws [12].
Remove the screws and bushings from the conveyor.

ATTENTION! *If the rotor is to be reused in the same conveyor, check that the rotor is placed in the same position, when assemling it again.*

It is very important that the rotor is not rotated, compared with the original position, because it will cause unbalance in the conveyor during operation.

2. From the large end of the conveyor, pull the complete rotor assembly, using the M12 threaded hole located in the centre of the rotor, free of the conveyor body.

Mounting the BD3 Rotor

1. It is advisable to coat the O-Rings with a little oil before mounting the inlet rotor.
Align the feed inlet holes in the rotor with those in the conveyor body. Push the assembly into place.

2. After checking that the feed inlet holes are aligned correctly, insert a feed inlet bushing [11] and locking screw [12], making sure that the screw head is aligned with the bushing recess.
NOTE! The locking screw cannot be inserted after the bushing is mounted. Repeat this process for the 5 remaining bushings.

ATTENTION! *If a new rotor is installed in the conveyor, it is necessary to rebalance the conveyor assembly.*

Cont...

Dismounting the Feed Inlet Targets

Remove the split pin [14] and tap out the target [13] using a plastic hammer.

Mounting the Feed Inlet Targets

1. Degrease the feed inlet targets [13] and turned-down surface of the inlet cone with alcohol.

2. Coat the holes and the turned-down surface of the inlet cone with a thin layer of 2-component Araldit 2013 (for P/N, see Spare Parts Catalogue).

3. Insert the targets, turning back and forth until all excess araldite is expelled between the surfaces. Maintain pressure on the bonding surface until the Araldit has hardened.

4. Insert the split pin [14].

Cleaning the Feed Inlet Rotor

In order to prevent decanter malfunction it is recommended that an efficient macerator be installed in front of the decanter. If the decanter has a feed tube for internal addition of polymer and internal polymer addition is not in use, flush the polymer chamber with water while the decanter is running.

It may also be necessary to clean the conveyor inlet and polymer chamber at intervals to be found by experience:

Pull out the feed pipe and remove any solids deposited in the conveyor feed inlet (inlet rotor assembly - [2], [3], [5]).

Clean the polymer chamber - the volume between the inlet rotor and the conical section of the conveyor - with e.g. high pressure cleaner or another flushing device. The cleaning process is improved by turning the bowl by hand.