

Schindler Ltd
United Kingdom



To Mr. David Fazakerley
From Mr. S.Reynolds
Date 17/03/09
Page 2
Subject **Schindler geared machines W200 & W250 with bottom drive pedestal bearing**

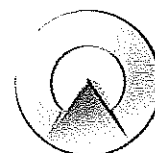
Should you have any questions on this matter please contact our hotline on 01932 758 236 or via the above email address.

Yours Sincerely
Schindler Ltd

Mr S. Reynolds
Technical Manager

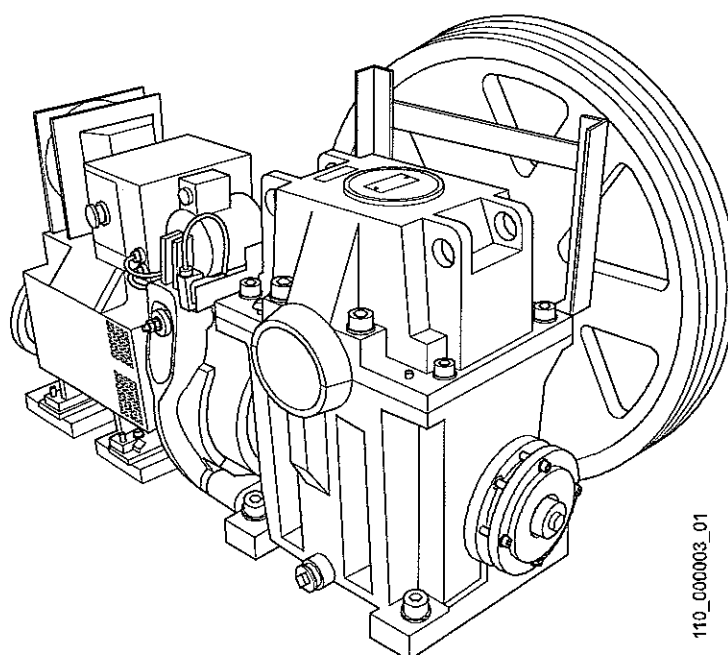
Enclosures:

- 1) Schindler Geared Machines W200, W250 Maintenance, INVENTIO AG, K 601887E - Rev. 11



Schindler

Maintenance W200, W250 Geared Machines



Schindler Geared Machines W200, W250

K 601887 / 11

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1 Read First

Purpose of this Document		The document gives to the Installer, the Owner and the Competent Persons important instructions for installing (assembly, connection) and maintaining the brake system as well as about safe functioning of the brake system.
Intended Use		The brake system indicated on the first page shall only be used for the specified purpose within the application range for which it is designed. The brake system must be connected as specified to the system which activates it.
Liability		If the brake system is used outside the specified application range, it is no longer being used for its intended purpose. The manufacturer does not accept liability for losses resulting from such use. Use of the brake system as intended includes complying with the conditions for maintenance specified in this manual.

1.1 Safety Symbols and Terms Used in this Document

Danger		This symbol draws attention to a high risk of injury to persons. It must always be obeyed.
Warning		This symbol draws attention to the risk of injury to persons or extensive damage to property. The warnings must always be obeyed.
Caution		This symbol draws attention to important instructions for use. Failure to observe the instructions can lead to damage and faults.
Maintenance Company		A company which is given responsibility for carrying out maintenance work, and which has Competent Persons at its disposal.
Competent Persons		Persons who have been trained to carry out the kind of work described in this instruction and who have the appropriate tools and auxiliary equipment available and are aware of the possible dangers to themselves and to other persons.
Installer		The natural or legal person who takes responsibility for the correct installation of the brake system by assembling an elevator, components or subsystems of an elevator and/or installing an elevator, and/or replacing the brake system on an elevator and who has competent persons at his disposal.
Owner of the Installation		The natural or legal person who has the power of disposal of the elevator and in addition is responsible for its intended operation, use and maintenance.

1.2 Responsibilities

Duties of the Owner



The Owner of the elevator is responsible for ensuring:

- That the brake system is kept in safe operating condition. In order to ensure safe operation, the brake system must be regularly maintained by Competent Persons.
- That this manual is available at all times and freely accessible to Competent Persons.
- That the elevator as well as the brake system are used as intended and defined in this document.

Responsibility



Only Competent Persons are authorized to do the following work on the brake system:

- Assembly
- Connection
- Adjustment
- Maintenance including cleaning and lubrication, checks, repairs and adjustments after activation.

Allowed Work



No other manipulation must be done except for the work described in this manual. Any work on the brake system shall only be executed by Competent Persons.

Manufacturer



Name: Schindler Drive Systems, SDS

Address: San Joaquin, 15

Town/City/Country: Zaragoza E-500013 Spain

Telephone/Fax: ++34 976 414000 / ++34 976 728109

Local Schindler Organization

(For sticker with address and phone/fax number)

2 General Information



Caution

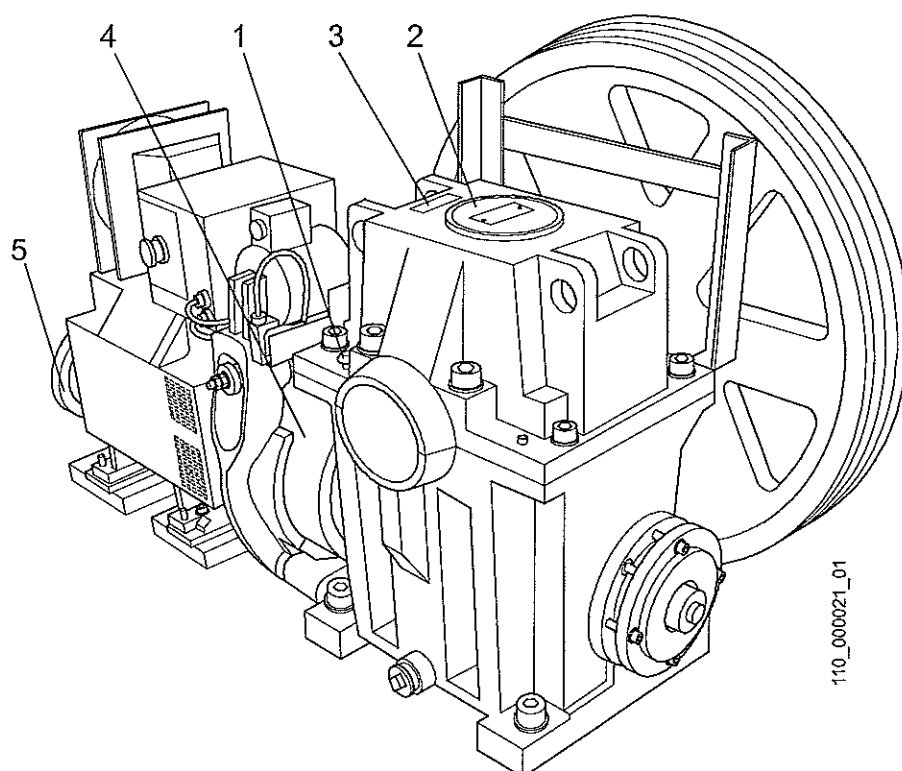
Periodic safety gear and buffer tests with $V_{KN} > 1$ m/s may cause severe overload to the gearbox and therefore should be minimized.

Tests that go beyond the standards (for example $> V_{KN}$ and empty car down) should be avoided.



Note

- The gearbox needs to be regularly checked and maintained according to this instruction.
- The installation must be equipped with a travel time control.
- If the motor is not equipped with a thermal circuit breaker it is recommended to install such a device.
- In case of difficulties, contact the local Schindler representative.



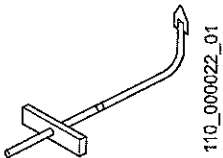
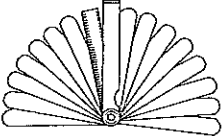
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General Information

- 1 Oil measuring dipstick
- 2 Plastic cap with oil type plate
- 3 Gear data plate
- 4 Brake drum
- 5 Fly wheel or covered shaft end for hand wheel

3 Preventive Maintenance

Special Tools

Tool	Picture	Description
Tooth Feeler		Feeler to inspect the worm shaft teeth ID. No. 49980131
Feeler Gauge		0.05, 0.06 ... 0.18 mm To measure roller play in the pedestal bearing
Inspection Mirror	-	Mirror to inspect the crown wheel ID. No. 49980282
Vibration Meter (recommended)	-	<ul style="list-style-type: none"> • MK 4/5 • EVA-625 • MERLIN (SKF) • Vibration Pen (SKF)

Task List All W200 and W250

Interval	Task	Section	Special Interval (until one time Bronze test done ¹)
3 Months	Check noise and vibration	3.1	
1 Year	Check general condition of machine	3.2	
1 Year	Check thrust bearing play	3.3	
1 Year	Check pedestal bearing play	3.4	
1 Year	Check crown wheel teeth for wear	3.5	
10 Years	Exchange oil in low duty service (< 300000 trips/year)	3.8	
5 Years	Exchange oil in high duty service (> 300000 trips/year)	3.8	
1 Year	Grease outboard or inboard (pedestal) bearing	3.9	
2	Check mechanical brake	K 601888	

1) Refer to special information

2) Interval is according to K 601888

Task List All EBI, all SDS until June 2003 and all CSE until November 2003

Interval	Task	Section	Special Interval (until one time Bronze test done ¹)
1 year	Check crown wheel ² for damage	3.6	6 months, if both are true: <ul style="list-style-type: none"> • Country with repeated safety and buffer test • $V_{KN} \geq 1.6$ m/s, KZU 1:1 or $V_{KN} \geq 2$ m/s all KZU

1) Refer to special information

2) With narrow crown W200: 50 ... 60 mm, W250: 60 ... 65 mm, not later ones with broad rim

Task List All EBI
until November
1992 (Serial
No. < 11226)

Interval	Task	Section	Special Interval (until one time Bronze test done ¹)
-	Check worm shaft ² for broken tooth	3.7	1 year, if VKN ≥ 1.6 m/s, KZU 1:1 or VKN ≥ 2 m/s all KZU (all countries)

- 1) Refer to special information
2) Not later ones with reinforced worm



Caution

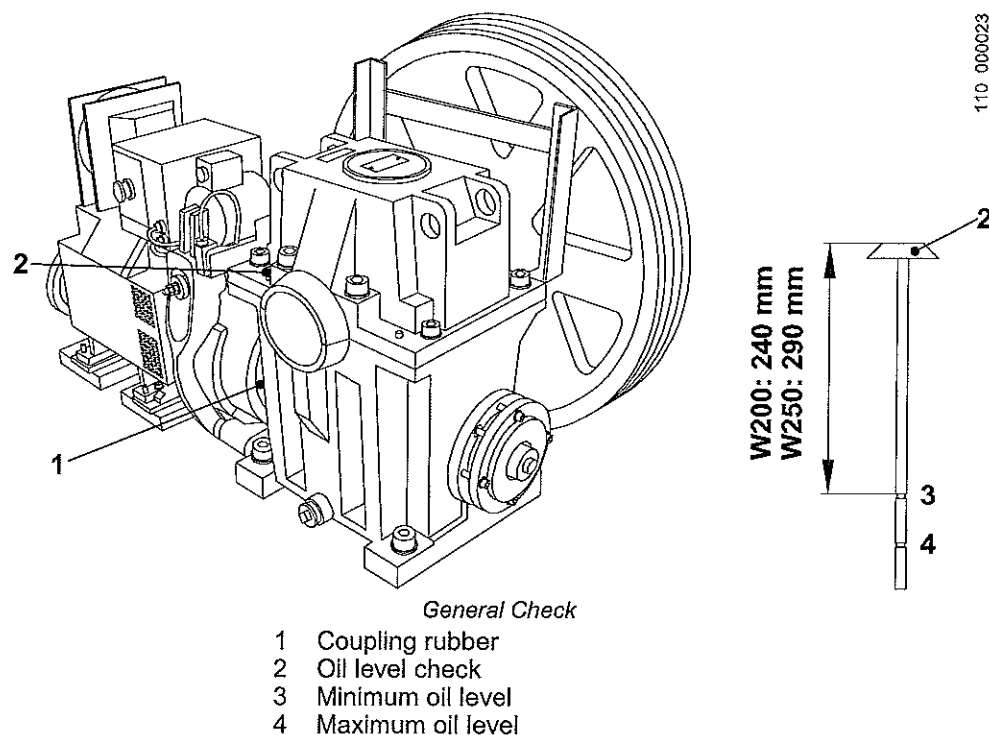
Make sure no person can enter the car and the landing and car doors are always closed during maintenance work. There is serious danger of injury for all people.

3.1 Checking Noise and Vibrations

No	Step
300	Listen if there is a scratching or grinding noise in the gear.
301	Locate excessive noise by setting a screwdriver on the object and use it as an amplifier.
302	Touch the gearbox and check if there are excessive vibrations.
303	Recommendation, specially in cases of doubt: take a record of the vibration of the gearbox, using the MK4 / MK5 / EVA-625, or VIBRATION PEN (SKF), or "MERLIN" (SKF), or a similar device and make an input in the board-book for later comparison.
304	If there are excessive noise or vibrations or a significant increase of them, (refer to the records made at an earlier step, if available), proceed as in sections 3.3, 3.4, 3.5, 3.6.

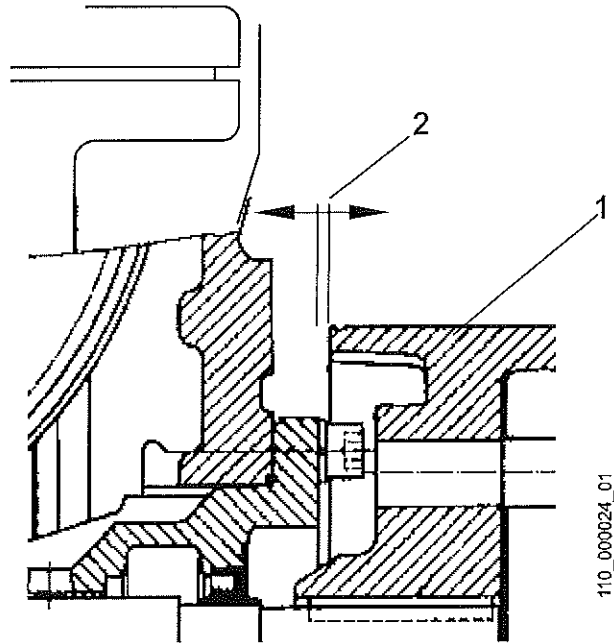
3.2 Checking General Machine Conditions

No	Step
305	Visually inspect the gear for any damage and oil leakage (see Section 4.5).
306	Visually check the insulating pads for damage, deformation and general condition.
307	Check the coupling rubber (1) as follows (brake must be applied): Try to turn the fly- or hand-wheel. If it can be turned more than about 1.5 mm, the rubber buffers must be replaced.
308	Check the oil level (2) and add the appropriate oil if necessary.



3.3 Checking the Thrust Bearing Play

No	Step
309	Move the empty car to the top level and pull it up so the counterweight is on the buffer. Switch off the main switch.
310	Release the brake and keep it in the released position.
311	Turn the hand wheel alternating in both directions and check whether the brake drum (1) moves axially.
312	If the drum moves (2) axially visible (more than 0.1 mm) re-tighten the thrust bearing according to Section 4.3.

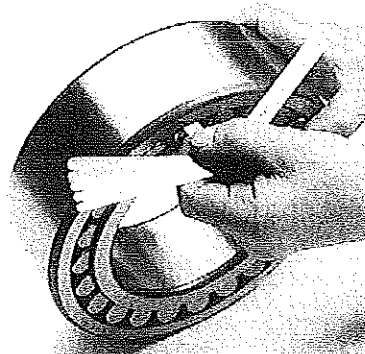
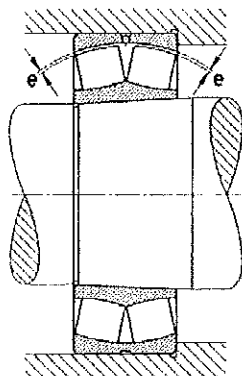


Check of Thrusting Bearing Play

- 1 Brake drum
- 2 Brake drum movement

3.4 Checking the Roller Play of the Pedestal Pendulum Bearing

No	Step
313	Remove the bearing cover on one side of the pedestal.
314	Visually check the outer ring surface of the bearing for wear.
315	Use a feeler gauge and measure the roller play (e) on the unloaded segment of the bearing as shown in picture below
316	Replace bearings with roller play $> e_{\max}$. <ul style="list-style-type: none"> • W200 bearing (inner diameter = 120 mm) $e_{\max} = 0.135$ mm • W250 bearing (inner diameter = 140 mm), $e_{\max} = 0.160$ mm.

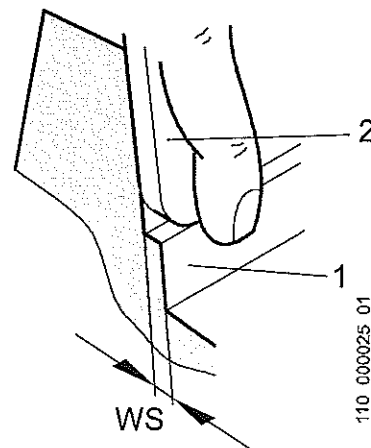
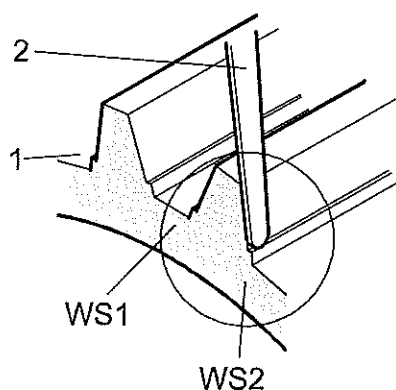


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Check of Roller Play of the Pedestal Pendulum Bearing

3.5 Checking the Crown Wheel Teeth for Wear

No	Step
317	Move the empty car to an upper level.
318	Switch off the main switch.
319	Take off the plastic cap from the gearbox top.
320	Wipe off the oil from the tooth flanks (1) and check visually whether there is a wear step (WS) near to the limit as in table below
321	If yes, measure the wear step using a feeler gauge (2).



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Crown Wheel Teeth

**Note**

Compare the measured wear step value $WS = WS1 + WS2$ with those in the table below and take the corresponding actions.

W200 Wear Step Limits

W200 Gear Ratio	Max. Permissible Wear Step $WS = WS1 + WS2$ [mm]			
	Manufacturing Date of Gear Set			
	before end 1995	after 1. Jan. 1996	before end 1995	after 1. Jan. 1996
68/1	0.5	0.7	0.7	1.0
69/2				
54/1	0.6	1.1	0.8	1.4
55/2	0.7	1.1	1.0	1.5
52/3	1.0	1.6	1.4	2.0
43/1	1.2	1.8	1.6	2.3
43/2				
41/3	1.7	2.2	2.2	3.0
Wear Status	Near end of lifetime		End of lifetime ¹	
Further action if measured values equal or exceed those in each column, so far no rope brake installed	Exchange gear, or install a rope brake, within one year and in the meantime check wear every three months		Shut down the installation immediately.	

1) Potential safety risk on further wear. Protection system against uncontrolled movement (for example, rope brake) reduces the "potential safety risk" to a "risk of breakdown".

W250 Wear Step Limits

W250 Gear Ratio	Max. Permissible Wear Step $WS = WS1 + WS2$ [mm]			
	Manufacturing Date of Gear Set			
	before end 1995	after 1. Jan. 1996	before end 1995	after 1. Jan. 1996
68/1	0.7	1.1	1.0	1.5
69/2				
54/1	0.8	1.3	1.1	1.8
55/2	1.1	1.6	1.4	2.1
52/3	1.3	1.9	1.8	2.5
43/1	1.7	2.2	2.2	3.0
43/2				
41/3	2.2	2.8	2.8	3.8
Wear Status	Near end of lifetime		End of lifetime ¹	
Further action if measured values equal or exceed those in each column, so far no rope brake installed	Exchange gear, or install a rope brake, within one year and in the meantime check wear every three months		Shut down the installation immediately.	

1) Potential safety risk on further wear. Protection system against uncontrolled movement (for example, rope brake) reduces the "potential safety risk" to a "risk of breakdown".

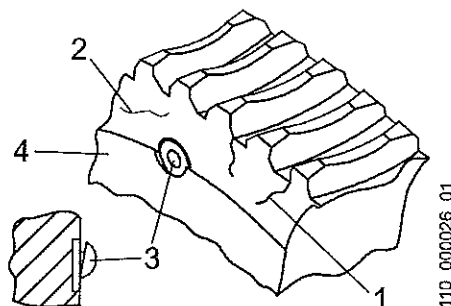
3.6 Checking the Crown Wheel for Damage

No	Step
322	Move the empty car to the lowest level.
323	Switch off the main switch.
324	Take off the plastic cap from the gearbox top.
325	Wipe off oil from the crown wheel.
326	Examine the crown wheel with a flashlight to check if all rivets (3) are vertically positioned and without any damage.
327	Visually check, if the bronze ring is offset to the hub (4).
328	Move the crown wheel stepwise by carefully releasing the brake and visually check the teeth for cracks (1) on both sides with a flashlight and mirror.



Note

People tend to mis-identify scratches as cracks. Cracks (1) look like a very sharp line from the tooth root. Scratches (2) have a certain width like a groove and can start anywhere.



Caution

- In case of cracks or damaged rivets switch off this installation immediately.
- Open the gearbox and confirm the damage. If damaged rivets or cracks are detected the gear set must be replaced (see [K 602796](#)). The ropes must be free of load.



Note

If the damaged gear is part of a group of installations with identical characteristics open the gearboxes of the remaining installations and check the crown wheels and the worm shafts.

3.7 Checking the Worm Shaft for Broken Segments



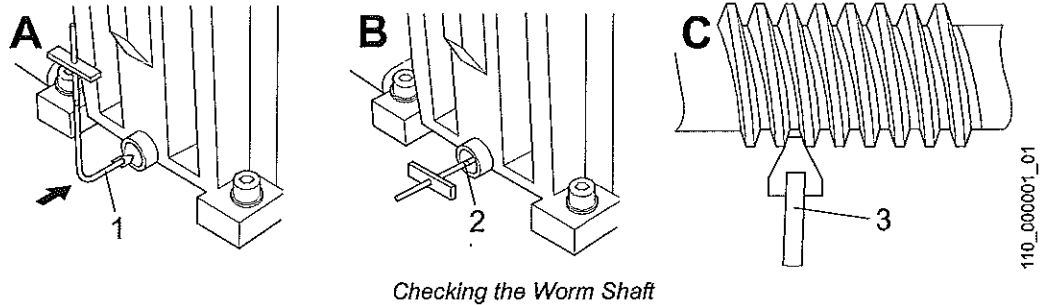
Note

This check can be done either by opening the gearbox or by using the special tool "tooth feeler".

3.7.1 Check with the Tooth Feeler

No	Step
329	Move the empty car to the top level and switch off the main switch.
330	Drain the gear oil into a clean tank (W200: 14 liters, W250: 20 liters).

No	Step
331	Insert the tooth feeler (1) into the gear until the mark (2) is at the opening (B).
332	Holding the tooth feeler upright (grip horizontal) slide the tip of the feeler (3) between the teeth along the groove edge forth and back (C). Irregularities like rough surface or damages to the tooth can be felt.
333	Turn the worm shaft 90° and repeat this check on the next groove.
334	Repeat this procedure until the entire worm shaft has been checked.
335	If there is any irregularity felt there is a potential risk of broken worm shaft segments.
336	Seal and mount the drain plug and fill in clean oil.

**Caution**

- In case of broken worm shaft segments switch off this installation immediately.
- Open the gearbox and confirm the damage. If broken worm shaft segments are detected the gear set must be replaced (see K 602796).
- If the damaged gear is part of a group of installations with identical characteristics open the gearboxes of the remaining installations and check the crown wheels and the worm shafts.

3.7.2 Check by Opening the Gearbox

No	Step
337	Move the empty car to the top level and pull it up so the counterweight is on the buffer and the ropes are free of load.
338	Switch off the main switch.
339	Support the traction sheave if it is a flying traction sheave.
340	Open the gearbox.
341	Examine the complete worm shaft for broken worm shaft segments (use fingertip).

**Caution**

- In case of broken worm shaft segments switch off this installation immediately.
- The gear set must be replaced (see K 602796).

**Note**

If the damaged gear is part of a group of installations with identical characteristics open the gearboxes of the remaining installations and check the crown wheels and the worm shafts.

3.8 Exchanging Oil

**Caution**

- Mineral oil is not permitted and must be replaced immediately. Mark the gearbox with the oil plate ID. No. 126751.
- Use PAO 320 gear oil only (according to technical norm).

No	Step
342	Place a tank (W200: 14 liters, W250: 20 liters) under the drain plug.
343	Carefully open the drain plug and drain the oil.
344	Seal the drain plug with silicon rubber ID. No. 999228.
345	Insert and tighten the drain plug.
346	Fill in new oil.

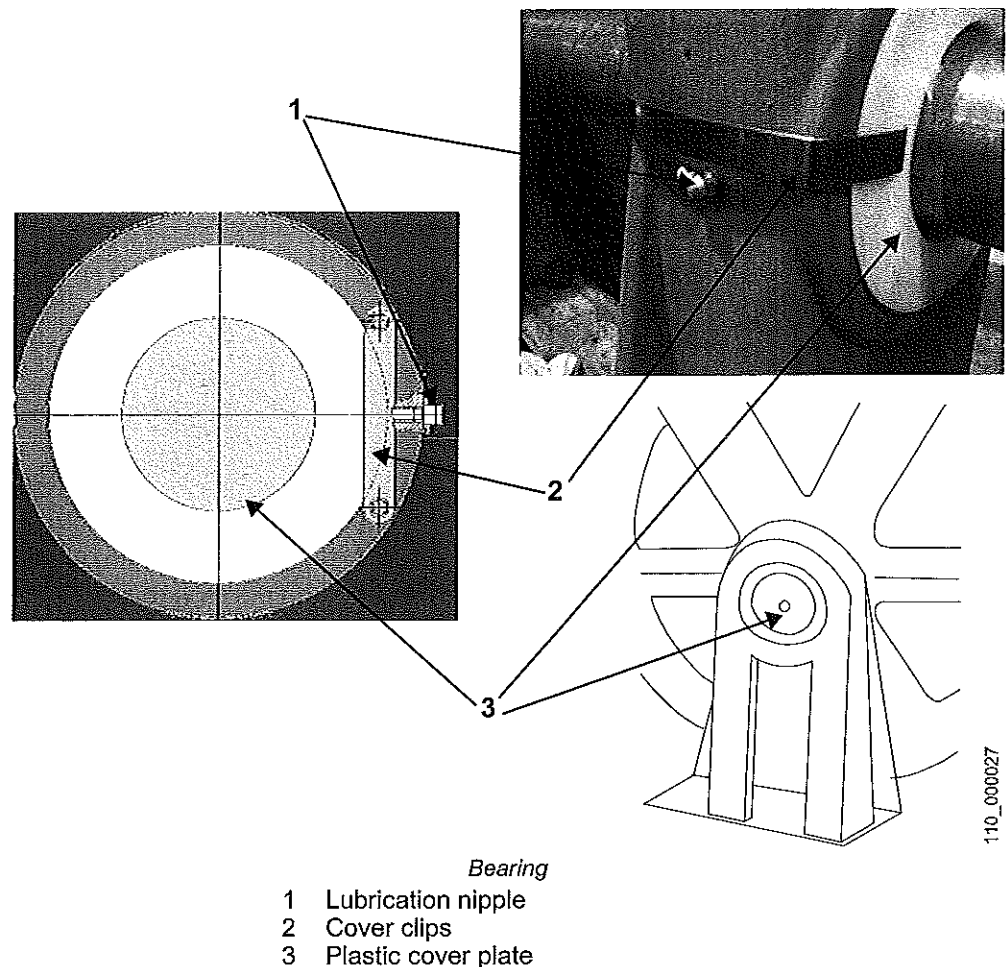
3.9 Grease Outboard or Inboard (pedestal) Bearing

Without
Lubrication
Nipple

No	Step
347	Remove the plastic cover and remove the old, used grease as much as possible.
348	Apply grease into the roller space on the whole circumference of the bearing.
349	Remount the plastic cover.

With Lubrication
Nipple

350	Remove the cover clips and the plastic covers.
351	Remove the plastic cover and remove the old, used grease as much as possible.
352	Using a grease gun, apply 40 g grease through the lubrication nipple installed on the pedestal. Note: Lubricate bearing only when the shaft is rotating.
353	Remount the plastic covers and install the cover clips.



3.10 Observation and Measures

3.10.1 Excessive Noise and Vibrations

Overview

Excessive noise and vibration may be caused by the system itself or by a defective part of the gearbox.

Excessive Vibration and Noise Detected already During Commissioning

The problem can have different reasons and is mainly a system problem. Possible remedial actions:

- Installation of a damper disc when vibration at frequency of tooth engagement
- Use synthetic oil
- Check insulation pads.

Excessive or Increasing Vibration and Noise Detected after a period of Normal Operation

The problem lies in the gearbox itself. Set a screwdriver on the object and use it as an amplifier. Carry out the following checks:

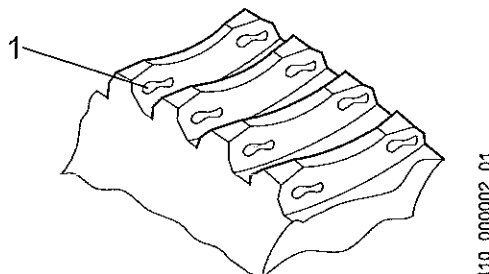
- Check thrust bearing and sliding bearing
- Check worm shaft (see Section 3.6) if vibration and rattling noise at the frequency of ~25 ... 90 Hz (depending on the gear ratio and power frequency) can be heard
- Check crown wheel.

3.10.2 Pitting

Pitting (1) is not dangerous but can lead to wear out and/or vibration. Pitting can proceed progressively, constantly or even disappear as wear increases.

Measures:

- Exchange oil regularly (see recommended interval in Section 3).
- Use correct oil type PAO 320
- Check crown wheel teeth for wear (see Section 3.5).



Note

It is not necessary to replace gear set just due to excessive pitting. If the measurement according to Section 3.5 exceeds the limits, the gear set must be replaced.

3.10.3 Jerks

Jerks during deceleration and final stop in case of 50 % load.

Corrective measure:

- Check gear play (thrust bearing play and crown wheel teeth for wear).

3.10.4 Blocked Gear

Corrective measures:

- Check worm shaft and bearing
- Check motor shaft and bearing

3.10.5 Development of Gear Set Degradation

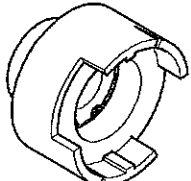
When a gear set becomes damaged it normally goes through the following phases of degradation:

Degradation	Observation
Cracks in the Tooth Root of the Worm Shaft or Broken Worm Segments	<ul style="list-style-type: none"> • Abnormal noise and vibration (vibration and rattling noise at a frequency of ~ 25 ... 90 Hz, depending on gear ratio)
Cracks on Crown Wheel or Broken Teeth	<ul style="list-style-type: none"> • Strong noise and vibration (vibration and rattling noise at a frequency of ~ 25 ... 90 Hz, depending on gear ratio) • Jerks, blows per traction sheave turn

Degradation	Observation
Broken Tooth on Crown Wheel or Several Broken Teeth Attention: Very fast degradation	<ul style="list-style-type: none"> Enormous noise and vibration (vibration and rattling noise at a frequency of ~ 25 ... 90 Hz, depending on gear ratio) Blocked gear set Activation of any of the listed devices: <ul style="list-style-type: none"> Detection of over-/underspeed Speed governor contact Safety gear contact Travel time control Thermal circuit breaker (main switch, motor)

4 Corrective Maintenance

Special Tools

Tool	Picture	Description
Special Distance Plate 9.5 mm	-	Used when exchanging the hoisting motor ID. No. 113368
Shims	-	Used to adapt exchanged hoisting motor ID. No. 113369
Erection Tool Ø 61.5 mm Ø 89.5 mm	-	Used to install the radial lip seal ID. No. 115183
Hook Wrench		Used to tighten the shaft nut ID. No. 547522

Special tools for corrective maintenance

4.1 Exchanging the Hoisting Motor

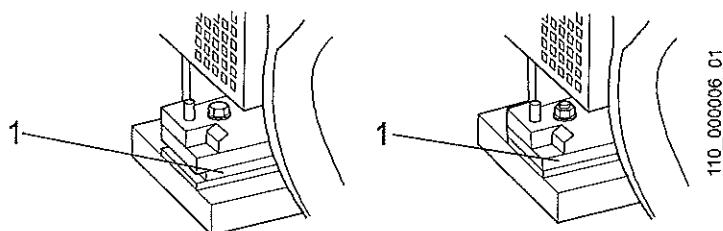
4.1.1 Removing the Hoisting Motor

No	Step
4000	Move the empty car to the top level and pull it up so the counterweight is on the buffer and the ropes are free of load. Switch off the main switch.
4001	Take off the fly wheel or hand wheel.
4002	Loosen the motor fixing screws and the pins.
4003	Take away the hoisting motor completely and loosen the brake arms.
4004	Remove the coupling rubbers from the brake drum.

4.1.2 Installing the Hoisting Motor

No	Step
4005	Put the corresponding distance plates (1) onto the machine base.
4006	Place the new motor on the distance plates. Position the motor with a shaft end distance of 2 mm.

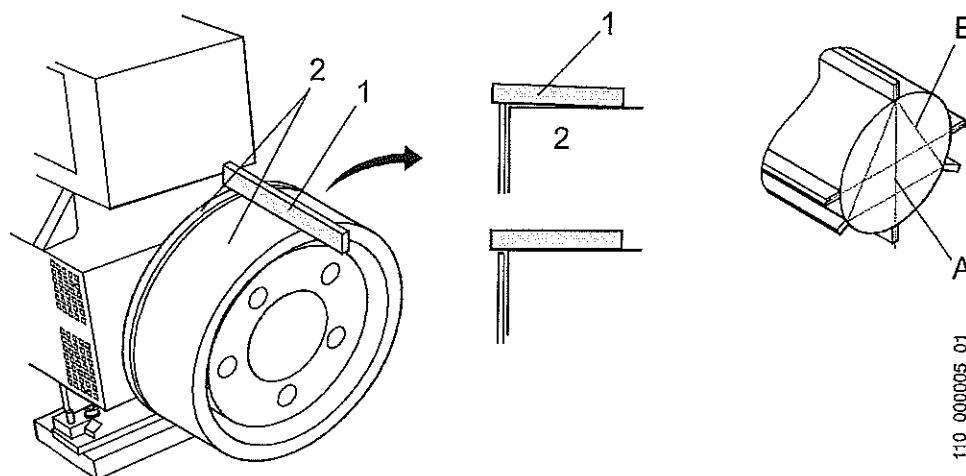
No	Step
4007	Attach the fly wheel or hand wheel to the motor.



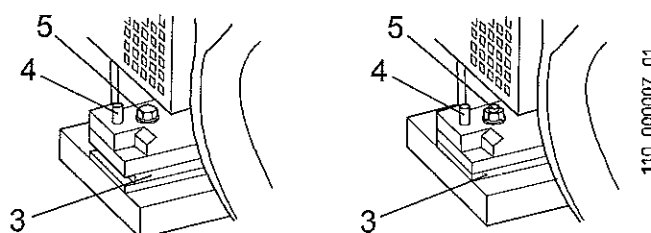
Small Motor (Left) and Large Motor (Right)

4.1.3 Motor / Worm Shaft Alignment

No	Step
4008	Using a ruler (1) measure the radial coupling offset (2) in the four positions: above, below, and at each side (A). If not easily accessible, this check can be performed in three positions spread with a rotation of 120° (B).

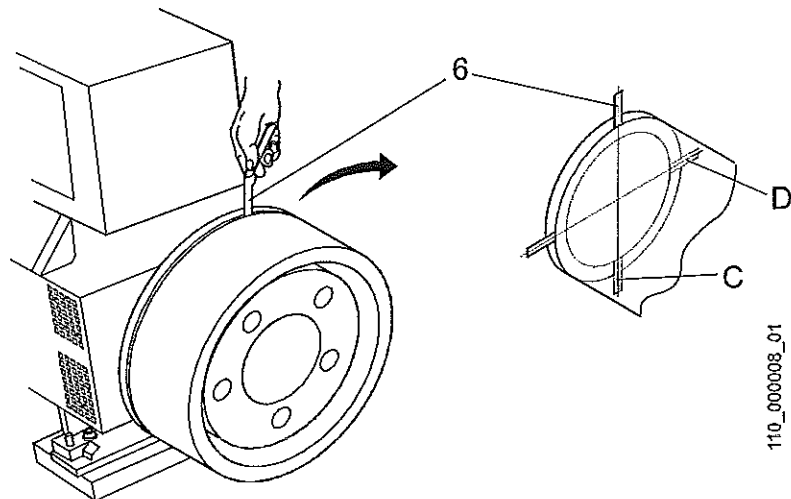


4009	Put shims (3) of suitable thickness under the motor feet to equalize the vertical offset.
4010	Subsequently fasten the special distance plate with 5 mm pins (4).



Small Motor (Left) and Large Motor (Right)

4011	Tighten all motor fastening screws (5).
4012	Again check the vertical offset and correct it if necessary.
4013	Using a feeler gauge (6) measure the alignment angle (parallel position of both coupling halves) in the four positions: above, below, and at each side.

**Note**

- If there is a deviation between the vertical checking points (C), the motor feet at the front are at a different height than the motor feet at the back. This must be corrected by putting shims of suitable thickness under the motor feet at the hand wheel side.
- If there are deviations between the horizontal check points (D), the motor can be shifted sideways at the hand wheel side with a mallet.
- **Maximum deviation in distance between 4 measuring points: 0.05 mm.**

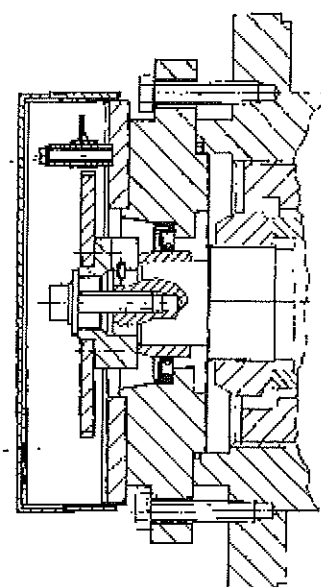
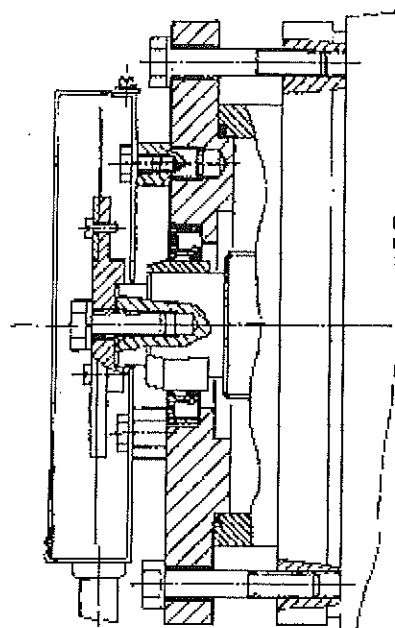
4014	Pin the motor.
4015	Remove the pins again and shift the motor backwards.
4016	Insert new coupling rubbers (with powdered soapstone).
4017	Shift the motor back and re-install the pins.
4018	Tighten the motor fixing screws.
4019	Re-attach the brake arms.
4020	Remove the hand wheel if installed.

4.2 Replacing the Thrust Bearing

No	Step
4021	Move the car to the top level and pull it up so the counterweight is on the buffer and the ropes are free of load. Switch off the main switch.
4022	Lift the ropes off the traction sheave (put them over the outboard bearing).
4023	Drain the gear oil (W200: 14 liters, W250: 20 liters).

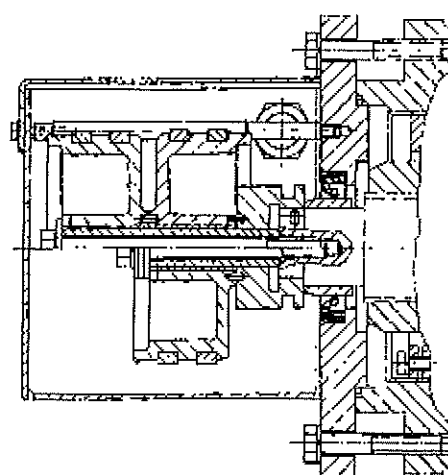
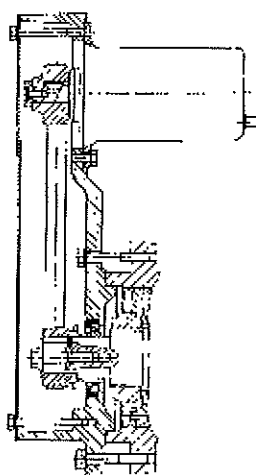
4.2.1 Removing the Thrust Bearing

No	Step
4024	Loosen the hoisting motor, uncouple it and shift it away from the gear.
4025	Remove the tacho/IG on thrust bearing side.



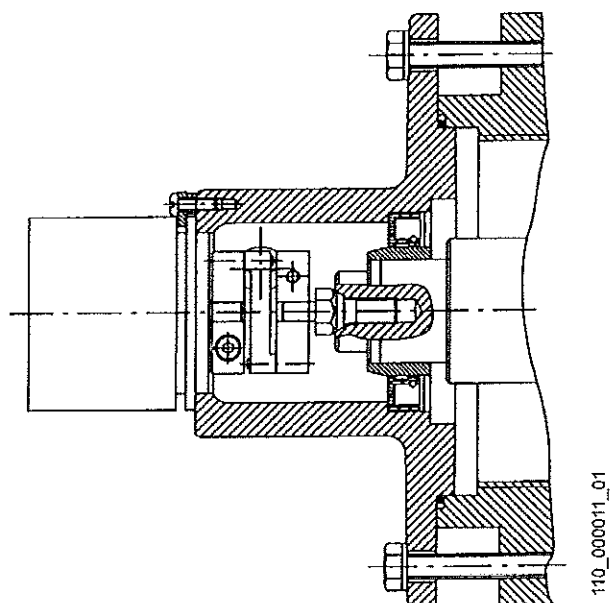
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IG 500 (left) and AMK (right)

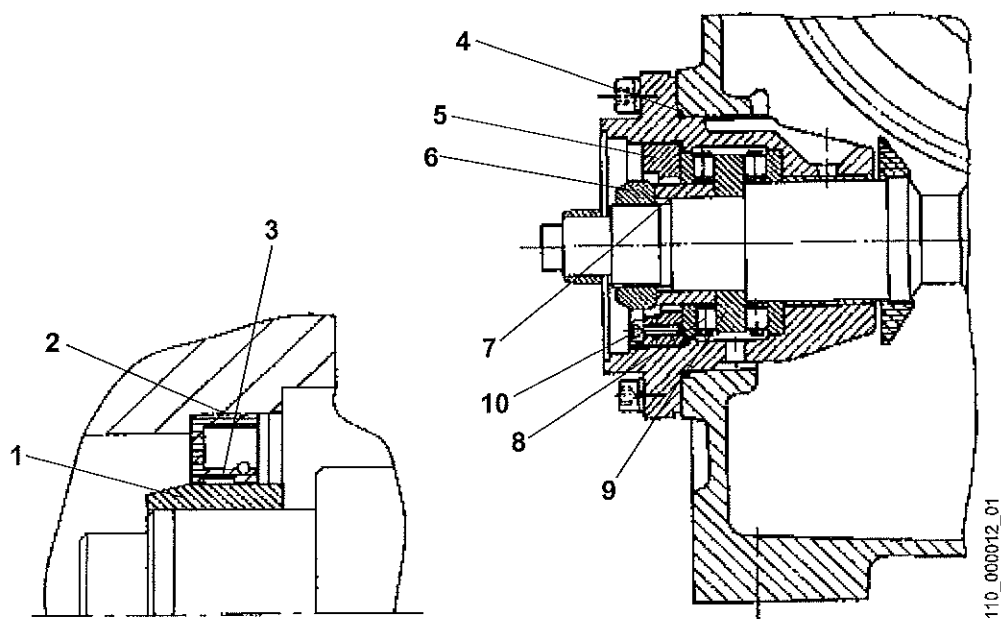


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Tacho-generator (left) and IZ (right)



IG 2000



Thrust Bearing Set

- 1 Sleeve ring
- 2 Seating for radial lip seal
- 3 Radial lip seal
- 4 O-ring
- 5 Thrust ring
- 6 Shaft nut
- 7 Spacer sleeve
- 8 Thrust bearing
- 9 Spacer ring
- 10 Thrust ring locking screws

4026	Remove the radial lip seal (3) and the sleeve ring (1).
4027	Remove the shaft nut (6) and the thrust ring (5).

4028	Remove the thrust bearing (8), the spacer sleeve (7) and the spacer ring (9).
4029	Clean the thrust bearing set housing before mounting any new parts.

4.2.2 Installing the Thrust Bearing

No	Step
4030	Lubricate all thrust bearing parts slightly with clean oil.
4031	Clean all seating and the shaft.
4032	Mount bearing case with new O-ring.
4033	Slide the thrust bearing set (8) with spacer ring (9) and spacer sleeve (7) over the shaft.
4034	Block the worm shaft in a way that it can not turn but move in axial direction.
4035	Tighten the shaft nut (6) to press the spacer ring against the shaft shoulder by means of the spacer sleeve (7). Use the hook wrench to tighten the shaft nut (6) with a torque of 150 ... 200 Nm.
4036	Tighten the thrust ring (5) by hand until the axial play of the worm shaft is eliminated. The thrust ring must not exert any pressure.
4037	The thrust ring locking screws (10) must be tightened equally one by one in small steps.
4038	Finally tighten the three locking screws with a torque of 10 Nm.
4039	Release the worm shaft and turn the traction sheave at least one turn in both directions and check the axial play (max. 0.005 ... 0.01 mm). Readjust the thrust bearing if necessary.
4040	When re-attaching the tacho or IG always use new radial lip seal (3) and O-ring (4) (see Section 4.4).
4041	Fill in the oil and check if there is enough oil in the gearbox.
4042	Clean the entire gear housing with solvent.
4043	Put back the hoisting motor in place and fix it according to Section 4.1.2 and mount the ropes.

4.3 Re-Tightening the Thrust Bearing



Note

Illustrations are given in the Section 4.2.1.

No	Step
4044	Move the empty car to the top level and pull it up so the counterweight is on the buffer and the ropes are free of load.
4045	Remove tacho or IG.
4046	Loosen the three thrust ring locking screws.
4047	Release the brake and turn the hand wheel or fly wheel in a direction that the worm shaft is moved in axial direction towards the coupling. This to have the play at the outer side of the thrust bearing.
4048	Tighten the thrust ring (5) by hand until the axial play of the worm shaft is eliminated. The thrust ring must not exert any pressure.
4049	The thrust ring (5) locking screws must be tightened equally one by one in small steps.
4050	Finally tighten the three locking screws with a torque of 10 Nm.
4051	Turn the traction sheave at least one turn in both directions and check the axial play (maximum 0.005 ... 0.01 mm). Readjust the thrust bearing if necessary.

No	Step
4052	When re-attaching the tacho or IG always use new radial lip seal (3) and O-ring (4).

4.4 Replacing the Radial Lip Seal

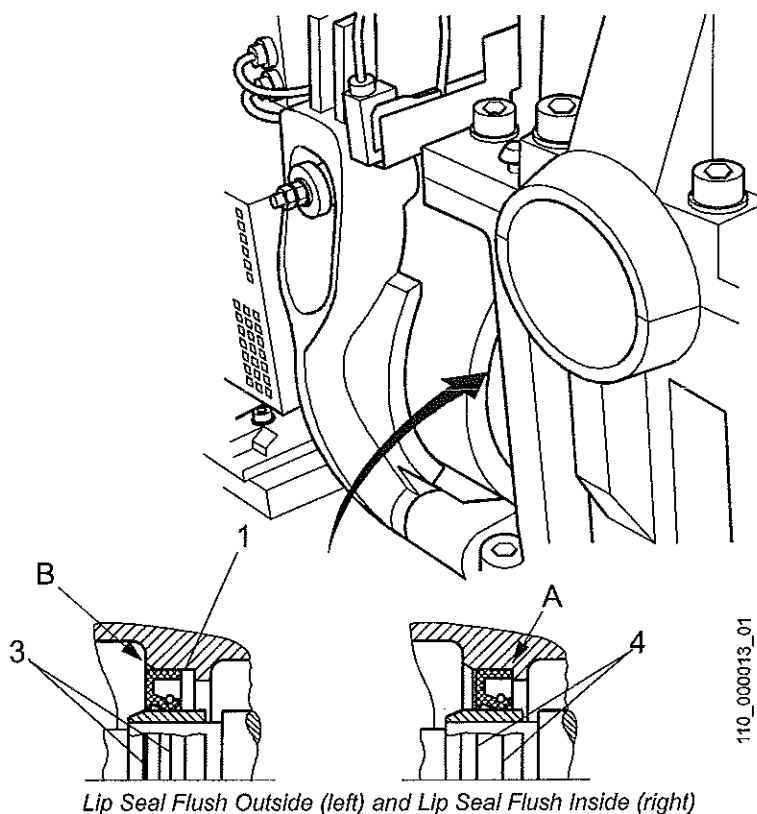


Note

Illustrations are given in the Section 4.2.1.

4.4.1 Removing the Radial Lip Seal On Coupling Side

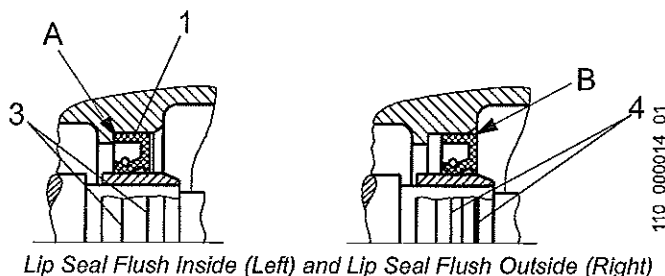
No	Step
4053	Drain the gear oil.
4054	Remove the hoisting motor according to Section 4.1.1.
4055	Remove the worm bearing at the coupling side.
4056	Remove the radial lip seal (1) and the O-ring. Make sure not to damage the seat.
4057	Check if the sleeve ring has grooves. The radial lip seal (1) can be positioned either flush inside (A) or flush outside (B). If the sleeve ring has grooves on both positions (3) and (4) it must be replaced as well.



4.4.2 Removing the Radial Lip Seal on Tacho / IG Side

No	Step
4058	Remove the tacho or IG.

No	Step
4059	Place an oil pan under the worm bearing flange to collect overflowing oil.
4060	Remove the radial lip seal (1) and the O-ring.
4061	Check if the sleeve ring has grooves. The radial lip seal (1) can be positioned either flush inside (A) or flush outside (B). If the sleeve ring has grooves on both positions (3) and (4) it must be replaced as well.



4.4.3 Installing the Radial Lip Seal On Coupling Side

No	Step
4062	Clean the shaft and all seating.
4063	Slide the sleeve ring over the shaft.
4064	Oil the radial lip seal slightly.
4065	Using the erection tool with diameter 89.5 mm press the lip seal into its seat.
4066	Oil the worm bearing slightly and insert the O-ring.
4067	Slightly lift the worm bearing and carefully slide it over the shaft end.
4068	Clean the radial lip seal and its surrounding and the bearing flange with solvent to avoid any oil bridge.
4069	Re-attach the brake and the motor according to Section 4.1.2.
4070	Align the motor according to Section 4.1.3.

4.4.4 Installing the Radial Lip Seal on Tacho / IG Side

No	Step
4071	Clean the shaft and all seating.
4072	Slide the sleeve ring over the shaft.
4073	Oil the radial lip seal slightly.
4074	Using the erection tool with diameter 61.5 mm press the lip seal into its seat.
4075	Oil the worm bearing slightly and insert the O-ring.
4076	Slightly lift the worm bearing and carefully slide it over the shaft end.
4077	Clean the radial lip seal and its surrounding and the bearing flange with solvent to avoid any oil bridge.
4078	Check the axial play of the worm shaft according to Section 3.3.
4079	If necessary re-tighten the thrust bearing according to Section 4.3.
4080	Re-attach the tacho/IG.

4.5 Repair Oil Leakage

No	Step
4081	Clean the entire machine with a solvent and trace the leak.

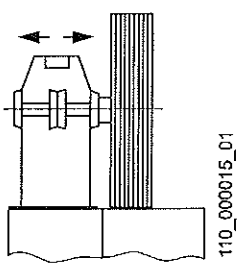
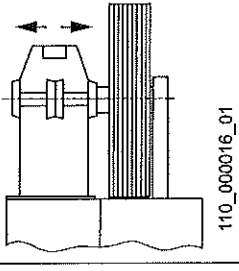
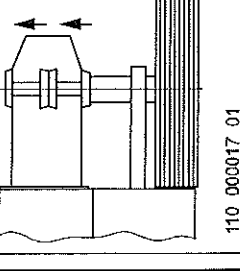
No	Step
4082	If it appears that the oil leak at the radial lip seal, clean properly the rubber collar and the shaft with solvent.
4083	If leak does not stop replace the radial lip seal according to Section 4.4.

4.6 Exchanging the Bearing Bushings on Main Shaft



Note

Prior to dismantling the bushes, the following components must be demounted from the main shaft:

Traction Sheave Position		Components
Traction Sheave Flying, without Outboard Bearing		Traction sheave
Traction Sheave Inboard, with Outboard Bearing		Outboard bearing and traction sheave
Traction Sheave Flying, with Outboard Bearing		Crown wheel (pressing force approximately 220 kN)

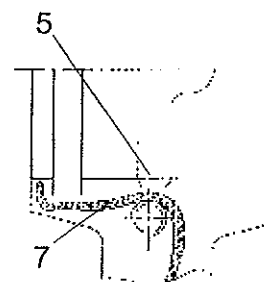
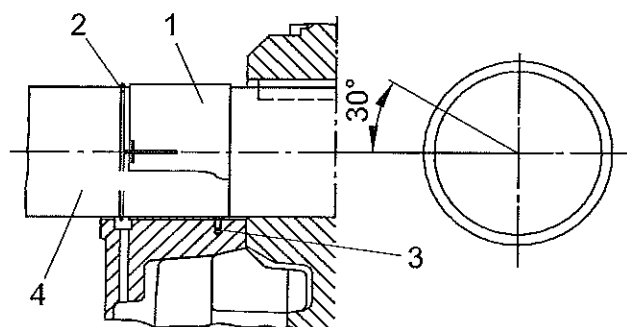


Note

When demounting the outboard bearing, keep it always in vertical position. If the outboard bearing is "swinging", the packing rings might be damaged. It is recommended to fix the outboard bearing on the traction sheave, so that it always stays square to the main shaft.

No	Step
4084	Move the car to the top level and pull it up so the counterweight is on the buffer and the ropes are free of load.
4085	Lift the ropes off the traction sheave.
4086	Drain the gear oil (W200: 14 liters, W250: 20 liters).
4087	Demount the upper casing of the gear. Lift the main shaft with the worm wheel out of the casing. Remove old O-rings (2) and bearing bushings (1).
4088	Clean main shaft (4) and bearing seats with solvent.

No	Step
4089	Remove previous silicon from the upper and lower fitting surfaces.
4090	Put new bearing bushings (1) into the bearing seats in such a way that the position fixing hole is right above the position fixing pin (3).



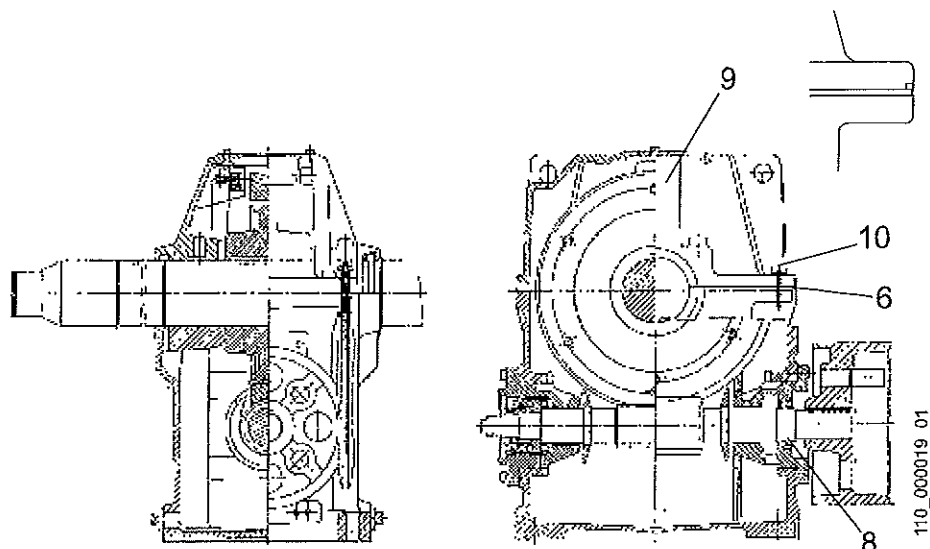
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4091	Mark the casing edge on the bearing bush (1).
4092	Lubricate the bearing bushings (1) slightly and push them on the shaft (4) with a distance of approximately 10 mm away from the crown wheel.
4093	Lower the main shaft very carefully to insert the crown wheel into the worm shaft.

**Caution**

Make sure that the main shaft does not become tilted while putting it in, as then the crown wheel might get jammed.

4094	After inserting the crown wheel into the worm shaft, lift the main shaft about 3 mm and position the bearing bushings.
4095	Using the markings previously made, move the bearing bushings to their final position.
4096	Lower the main shaft back into the bearing seats.
4097	Fit the O-rings and shift them into the final position.
4098	Carefully coat both fitting surfaces with silicon rubber seal ID. No. 999228.
4099	Make sure to apply rubber seal (7) close to the tapped hole (5), so that the oil groove in the upper casing does not become blocked.
4100	Remount the upper casing (9).
4101	Carefully seal the parting gap (6) with silicon rubber ID. No. 999228.



Gear Overview

4102	Tighten the bolts (10) with a torque of 150 ... 200 Nm.
4103	Clean the drain plug and seal it with silicon rubber ID. No. 999228. Insert and tighten the drain plug.
4104	Fill in new oil (W200: 14 liters, W250: 20 liters).



Caution

Use PAO 320 gear oil only.

4.7 Replacement of Gear Set

Replacement according to [K 602796](#).

4.8 Setting and Repairing of Mechanical Brake

Setting and preparing according to [K 601888](#).

4.9 Replacement of Pedestal Pendulum Bearing

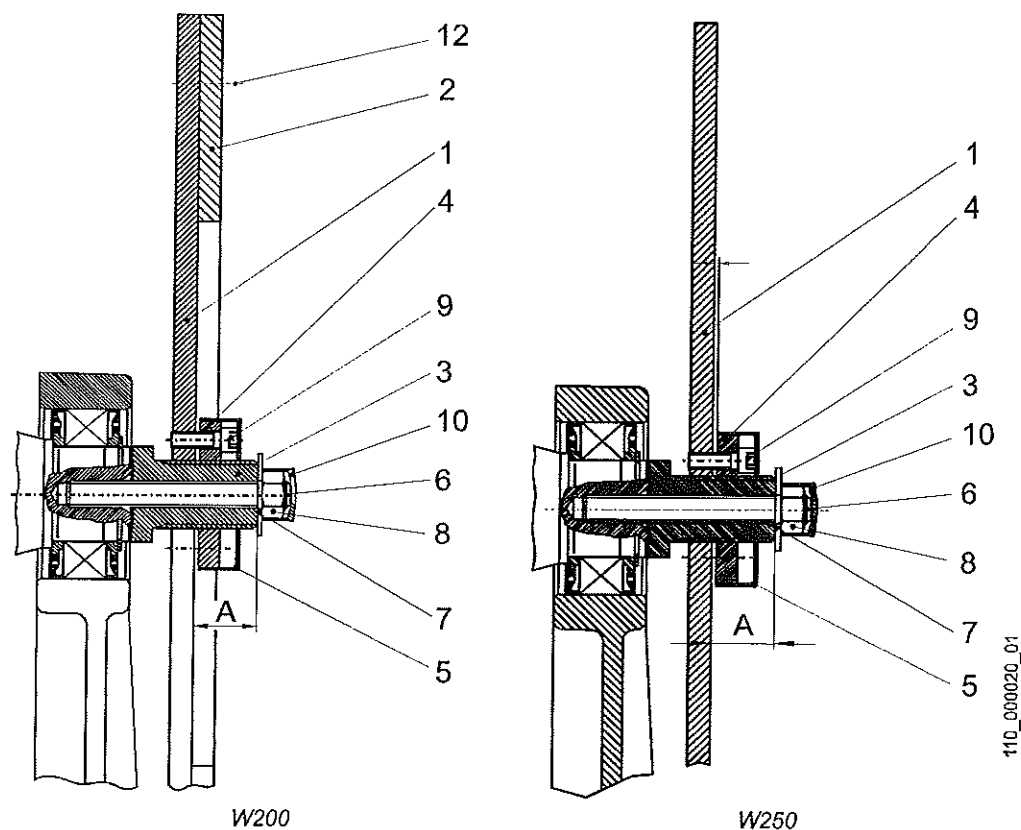
Replacement according to [K 602796](#), Section 5.2 Inboard Bearing Installation.

5 Installing the Traction Sheave Damper

Before ordering or installing a traction sheave damper examine the gearbox thoroughly.

- Check noise, vibrations, jerks, pitting etc. as described in section 3.9
- Check worm shaft for broken segments as described in section 3.6
- Check worm wheel for damage as described in section 3.5

5.1 Delivery Content

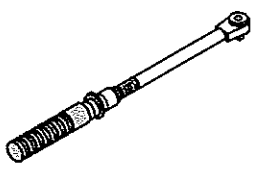
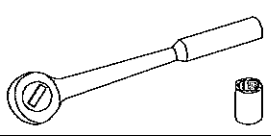
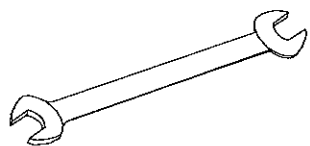
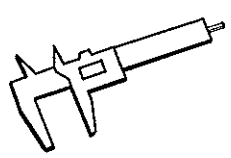


Pos	Item	ID. No.	
		W200	W250
1	Damper disk	127 008	127 025
2	Additional disk (for 2-start worm gear only)	127 045	--
14	Bag for 2-start worm gear	127 047	127 026
14	Bag for 3-start worm gear	127 009	
	Bag contains:		
3	1 torsion spring		
4	1 clamp nut		
5	1 cover cap		
6	1 thread bolt M20-8.8		
7	1 washer		
8	1 hex nut M20 for fitting procedures		
8	1 hex nut M20 for tightening the thread bolt (6)		
9	3 hex soc screw M12		
10	1 protective plug for nut M20		
11	1 small bottle of LOCTITE 243, 10ml (not shown)		
12	3 Fl. Soc. screw M8, (only 2-start worm gear) (not shown)		

Gear Ratio	Frequency	Gear type	A (mm)	
			W200	W250
41:3 52:3	50Hz	outboard bearing	42	45
		overhung	38	42
	60Hz	outboard bearing	53	59
		overhung	50	56
43:2 55:2 69:2	50Hz	outboard bearing	39	23
		overhung	36	20
	60Hz	outboard bearing	50	34
		overhung	47	31

5.2 Special Tools

Special Tools

Tool	Picture	Description
Torque Wrench 80 ... 300 Nm		-
Socket SW30	-	-
1 long Socket Wrench SW10		Used for hex soc screw M8 (12)
2 Wrench SW30		-
Cleaning Brush	-	To wash out the bore center at the shaft end
Caliper Gauge		-

5.3 Preparatory Work



Danger

To prevent any traction sheave movement turn off the main switch.

No	Step
500	Remove grease and dirt from the shaft end face and from the center bore of the shaft end.
501	Remove grease and dirt from the center of damper disk (1), from the threaded bolt (6) and torsion spring (3) and clean them.

5.4 Installation of the Traction Sheave Damper



Note

Detailed information and Illustrations are given in the Section 5.1.

No	Step
502	Screw in the two hex nuts (8) onto the threaded bolt (6) and lock them against each other with two wrenches SW30.
503	Coat one end of the threaded bolt (6) on a length of approximately 30 mm with LOCTITE 243 and screw the threaded bolt immediately into the center bore of the shaft end and tighten it.
504	Remove the two hex nuts (8) from the threaded bolt (6).
505	Screw torsion spring (3) into damper disk (1).
506	Adjust measurement A as per table above.
507	Screw clamp nut (4) onto torsion spring (3) with a gap of approximately 3 mm and tighten stepwise the 3 hex soc screws (9) and finally tighten them with a torque of 80 Nm.
508	Lift the assembled damper disk (1) and slide it onto the threaded bolt (6).
509	Slide washer (7) onto the threaded bolt (6).
510	Coat the outer end of the threaded bolt (6) with LOCTITE 243 and screw on hexagonal nut (8) onto the threaded bolt immediately and tighten the nut with a torque of 300 Nm.
511	Attach the protective plug (10).
512	W200 with 2-start worm gear: Attach the disk (2) using the three Fl. soc. screws M8 (13) to the damper disk (1).
513	To ensure quiet running tighten evenly the 3 hex soc screws (9) with a torque of 80 Nm.

5.5 Final Work

No	Step
514	Switch on the main switch.
515	Make subjective assessment of ride quality.
516	In case of non-satisfactory ride quality, make a new assessment of the ride quality during an upward travel with empty car.
517	Make another trip downward with empty car and make a new judgment of the ride quality by comparing it with the upward travel.
518	Switch off the main switch.
519	Mark actual damper disk position against a reference point, (for example, machine frame) and loosen the screws (9).
520	If the ride quality is worse (louder) during the upward travel, turn the damper disk clock wise, in steps of 180°.
521	If the ride quality is worse during the downward travel, turn the damper disk counter clock wise, in steps of 180°.
522	To ensure quiet running tighten evenly the 3 hex soc screws (9) with a torque of 80 Nm.



Caution

Always tighten the three hex soc screws as described before moving the car in any direction.

523	Switch on the main switch.
524	Again make subjective assessment of ride quality.
525	Repeat adjustment until the ride quality is satisfactory.



Note

When the ride quality cannot be satisfactorily adjusted, fill in form J 271021 completely.

526	Mount cover cap (5).
527	Measure A= _____ mm.
528	Store this instruction with inserted measure A per elevator in the machine room.



Caution

After an engagement of the safety gear or an impact on the buffers of the car or counterweight with VKN the hex nut (8) and the hex soc screws (9) have to be checked.

529	Fill in form <u>J 271021</u> up to Point 4.
530	Return the completed reporting instruction form <u>J 271021</u> to the address given in the form.