24th May 2006

To: All Members

cc: The Quality and Technical Committee (Code No. 693)
The Maintenance Committee

Dear Member,

SAFETY BULLETIN FROM SCHINDLER
RE: TYPE W200 AND W250 GEARED MACHINES

Please find attached Safety Bulletin from Schindler UK in connection with their W200 and W250 geared machines.

We trust that you will find this Bulletin self-explanatory and be guided accordingly.

Yours faithfully

Robert N Lee
Director, Technical Services

Schindler Ltd
United Kingdom

Benwell House, Green Street, Sunbury-on-Thames
Middlesex TW16 6QT

RECEIVED
23 MAY 2006

For the Attention of Mr. David M Fazakerley
Lift & Escalator Industry Association
33-34 Devonshire Street
London
W1N 1RF

Registered

Reference No. QG3/KD/SR/APP
Date 15th May 2006
Subject Schindler Gears W200 & W250

Dear Mr. Fazakerley,

We advised LEIA in July 2001 of a potential issue with the W200 and W250 Schindler machines in that cracks might appear at the root of the worm thread. Further investigations have now identified that gear sets exposed to extraordinary shocks may, after prolonged operation, show symptoms of fatigue in the bronze of the crown wheel.

Please see the attached document that outlines our recommendation for examining and monitoring these machine types during maintenance.

Schindler kindly asks you to pass on this information to all your members along with the enclosed picture of a W250 gear.

Thank you for your co-operation and continued support.

Yours sincerely,

Keith Duberley
Managing Director

Steve Reynolds
Technical Manager

Enclosures:
☒ Picture of W250 (W200 looks similar)
☒ Schindler Geared Machines W200, W250 Maintenance, INVENTIO AG, K 601887E-Rev. 8 (LEIA only - NOT for distribution)

Schindler Ltd
United Kingdom

Schindler

Schindler Type W200 and W250 Geared Machines

As previously communicated, cracks may appear at the root of the worm thread in the above gear types, normally leading to abnormal noise and vibration of the machine and jerks during operation.

Furthermore due to periodic nominal speed safety gear and buffer tests, where they have occurred, or unintentional safety gear operations, the gear set is exposed to extraordinary shocks. After prolonged operation, symptoms of fatigue may become apparent in the bronze of the crown wheel (cracks which may or may not be visible to the naked eye).

In isolated cases the bronze material of the crown wheel rim may not withstand the applied load and cause a rupture of the bronze rim, which could lead to an uncontrolled movement of the car and may result in serious injury.

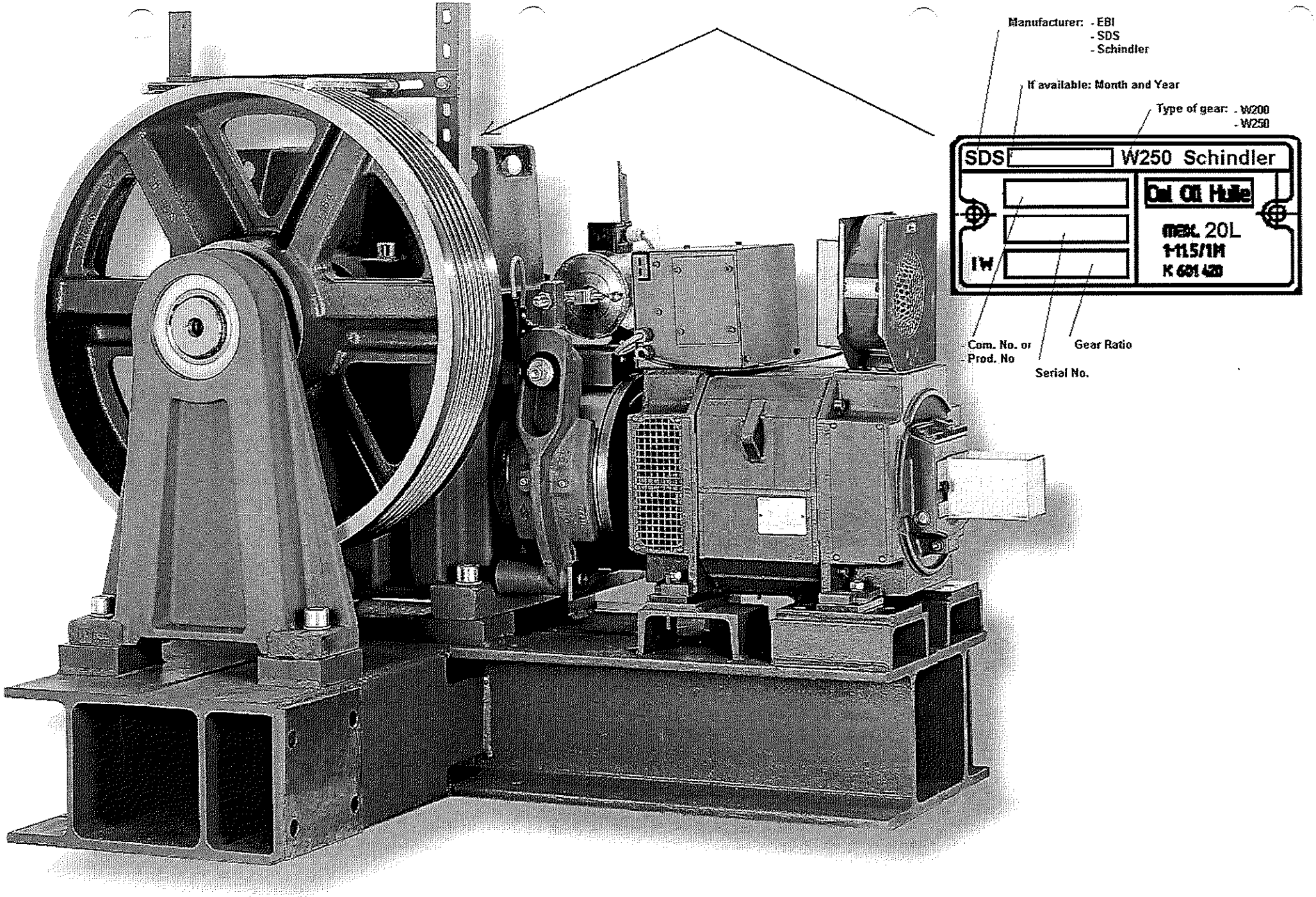
As a preventive measure Schindler is performing **ultrasonic tests** on the bronze rim of the gears concerned, which since installation, have been in operation for more than 10 years.

In order to reduce this risk Schindler, as original equipment manufacturer, strongly recommends performing ultrasonic tests on the crown wheel bronze rim of such installations. Upon request, Schindler will perform this measurement for a fee of £100 per gear. However, if your decision is not to involve Schindler we must point out that the responsibility will then lay with you to identify any possible fatigue of the bronze rim and ensure the ongoing safety of your system.

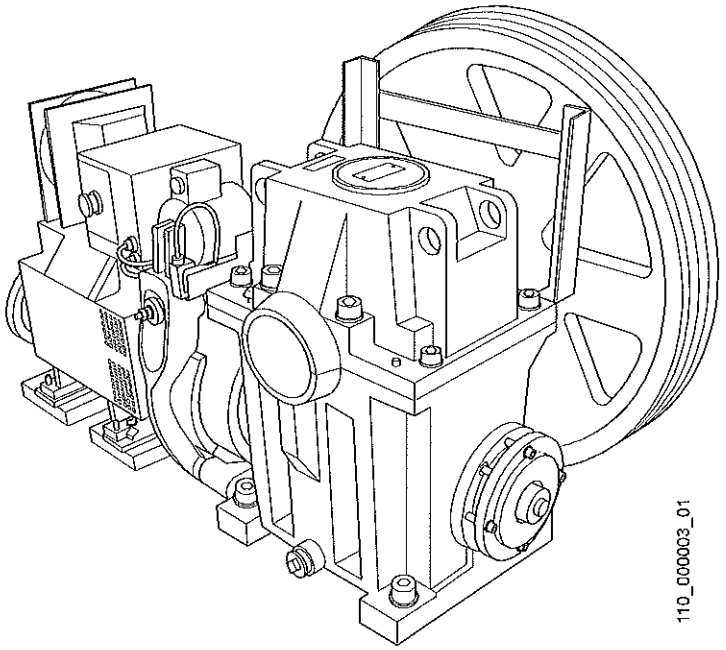
If the ultrasonic test shows symptoms of fatigue in the bronze material, the gear set has to be exchanged or the installation has to be equipped with a safety device that prevents uncontrolled movement, e.g. a rope brake.

According to experience so far, it can be assumed that the **majority of installations do not show symptoms of fatigue.** However, individual occurrences of fatigue must nonetheless be prevented by the ultrasonic testing identified above. Furthermore, with continuing use and periodic safety gear and buffer operations, may lead to future deterioration of the gear. We strongly recommend that we are commissioned to undertake the ultrasonic test.

Schindler requests that any maintenance company having lifts with such W200 / W250 geared machines in its portfolio, contacts Schindler. In order to receive further information about our offer and the latest Maintenance Instruction, LEIA members are kindly requested to contact our technical hotline on 01932 758 230. In addition, they should inform us of the serial numbers of the gears concerned, so that we are able to check our own records regarding the particular installation.


Manufacturer: - EBI
- SDS
- Schindler
If available: Month and Year
Type of gear: - W200
- W250
SDS W250 Schindler
Oel Oil Huile
max. 20L
1-11.5/1M
K 601 420
IW
Com. No. or
Prod. No
Serial No.
Gear Ratio

Maintenance



Schindler Geared Machines W200, W250

Summary

This instruction describes the required preventive and corrective maintenance procedures of the Schindler geared machines W200 and W250.

Modification	06	07	08						Prepared	19.05.2005	zurbrure
KA No.	76210	160054	160287						Reviewed	18.05.2005	vertesjo
KA Date	14.06.02	17.10.03	20.05.05						Norms Chkd	18.05.2005	plattle
W200, W250 Geared Machines									Released	19.05.2005	riosr2
Maintenance											Format A4
INVENTIO AG CH-6052 Hergiswil					Classification 11110		Lead Office ES2		**K 601887**		E

Table of Contents

1 Safety Advice

1.1 General

Safety Requirements

All persons involved must know and follow all company and local safety regulations, with special attention to the following:

- Make sure that there is enough light to work safely.
- Immediately replace damaged or lost safety equipment.
- Keep all tools in good condition.
- Follow instructions when using tools.

In addition to protective clothing, the following safety equipment must be used:

Description	Safety Equipment
Safety Shoes	
Hardhat	
Safety Goggles	
Full Body Safety Harness	
Protective Gloves	

1.2 Symbols Used

Danger

This symbol indicates a high risk of serious injury. Follow instructions to prevent serious injury or even death.

Caution

This symbol indicates a risk of personal injury or property damage. Follow instructions to prevent injury or property damage.

Note

This symbol indicates special or additional information.

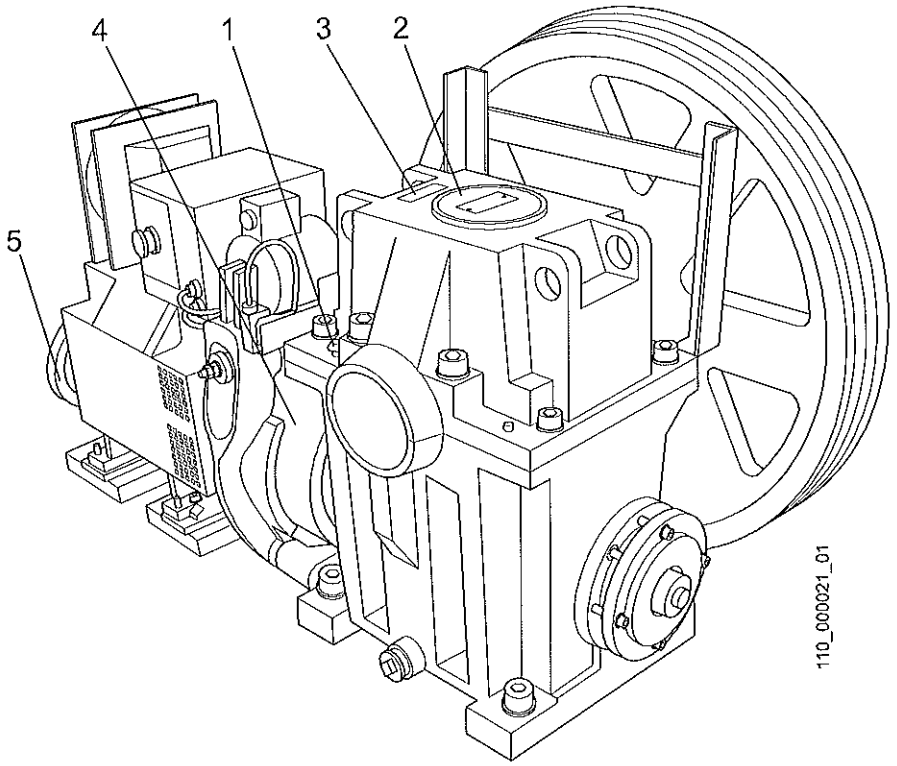
2 General Information

- 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 your local Schindler representative.

Caution

Periodic safety gear- and buffer tests with VKN >1 m/s may cause severe overload to the gearbox and therefore should be minimized.

Tests that go beyond the standards (i.e. >VKN and empty car down) should be avoided.

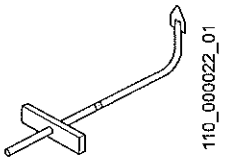


General Information

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 Mat.No. 49980131
Inspection mirror	No picture available	Mirror to inspect the crown wheel Mat.No. 49980282
Vibration meter (recommended)	No picture available	• MK 4/5 • EVA-625 • MERLIN (SKF) • Vibration Pen (SKF)

Maintenance Schedule All W200 & W250

Task	Section	Interval	Special Interval (until one-time Bronze-test done!*)
Check noise and vibration	3.1	3 months	
Check general condition of machine	3.2	1 year	
Check trust bearing play	3.3	1 year	
Check crown wheel teeth for wear	3.4	1 year	
Exchange oil in low duty service (<300'000 trips/year)	3.7	10 years	
Exchange oil in high duty service (>300'000 trips/year	3.7	5 years	
Grease outer bearing	3.8	5 years	
Check mechanical brake	according to K 601888		
*) Refer to local information, Field Information etc.			

Maintenance Schedule

Maintenance Schedule All EBI, all SDS until June 2003 and all CSE until November 2003

Task	Section	Interval	Special Interval (until one-time Bronze-test done!**)
Check crown wheel* for damage	3.5	1 year	If in country with repeated safety and buffer test and VKN≥1.6m/s, KZU 1:1 or VKN≥2m/s all KZU 6 months
*) With narrow crown W200: 50-60 mm, W250: 60-65 mm, not later ones with broad rim) **) Refer to local information, Field Information etc.			

Maintenance Schedule

Maintenance Schedule All EBI until November 1992 (Serial No <11'226)

Task	Section	Interval	Special Interval (until one-time Bronze-test done!**)
Check worm shaft* for broken tooth	3.6	no	If VKN≥1.6m/s, KZU 1:1 or VKN≥2m/s all KZU (all countries) 1 year
*) not later ones with reinforced worm **) Refer to local information, Field Information etc.			

Maintenance Schedule

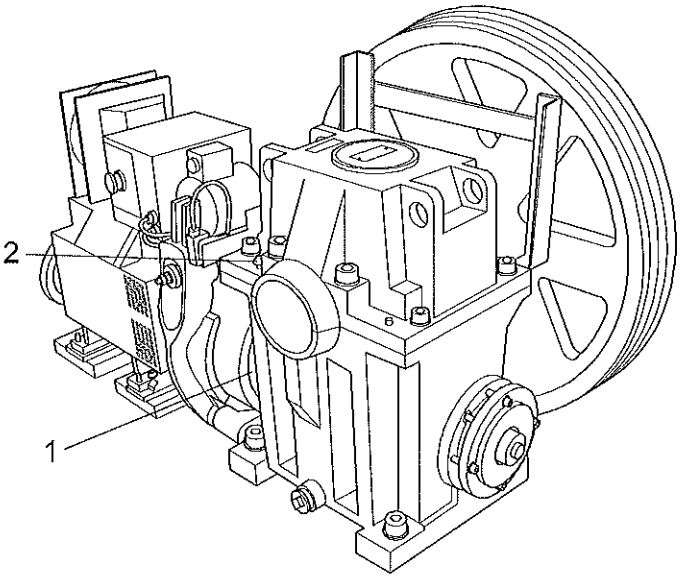
Caution
Make sure no person can enter the car and the landing and car doors are always closed during maintenance work. There is serious danger of injury for all people.

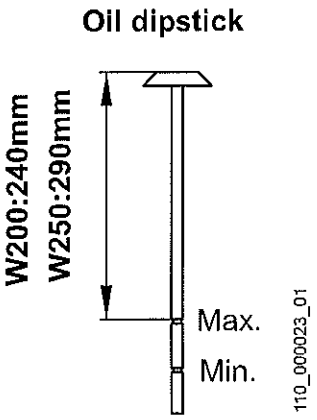
3.1 *Checking Noise and Vibrations

No	Step
300	Listen if there is a scratching or grinding noise in the gear.
301	Locate excessive noise by setting a screw driver 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

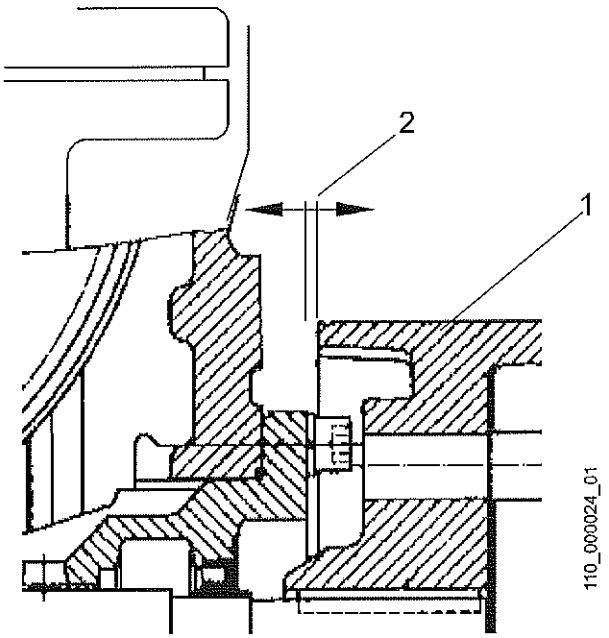
No	Step
305	Visually inspect the gear for any damage and oil leakage (see Section 4.5).
306	Visually check the insulating pads for damage, deformation and general condition.
307	Check the coupling rubber (1) as follows (brake must be applied): Try to turn the fly- or hand-wheel. If it can be turned more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





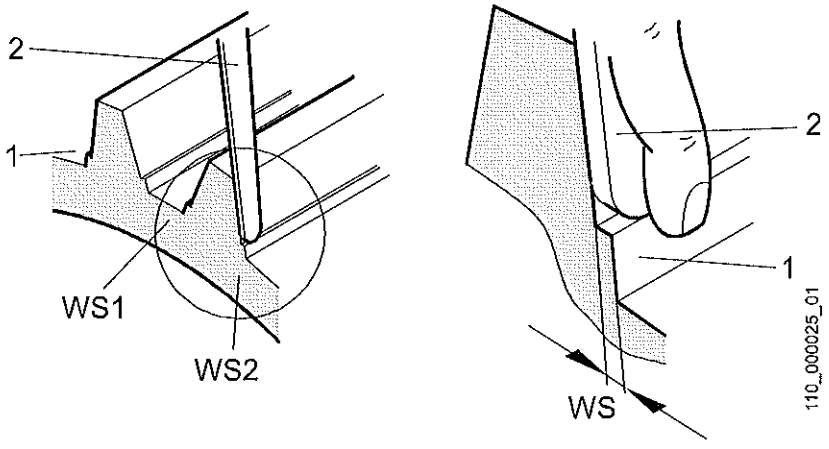
3.3 Checking the Thrust Bearing Play

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.



3.4 *Checking the Crown Wheel Teeth for Wear

No	Step
313	Move the empty car to an upper level.
314	Switch off the main switch.
315	Take off the plastic cap from the gearbox top.
316	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
317	If yes, measure the wear step using a feeler gauge (2).



Note

Compare the measured wear value WR = 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 69/2	0.5	0.7	0.7	1.0
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 43/2	1.2	1.8	1.6	2.3
41/3	1.7	2.2	2.2	3.0
Wear Status	Near end of lifetime		End of lifetime *)	
Further actions if values near or equal the limits	Exchange the gear or install a rope brake within 1 year		Exchange the gear or install a rope brake within 3 months	
Further actions if values exceed the limits and no rope brake is installed	Check the gear every 3 months		Shut down the installation immediately!	

*) Potential safety risk on further wear.
Protection system against uncontrolled movement (e.g. rope brake) reduces the potential safety risk of a breakdown.

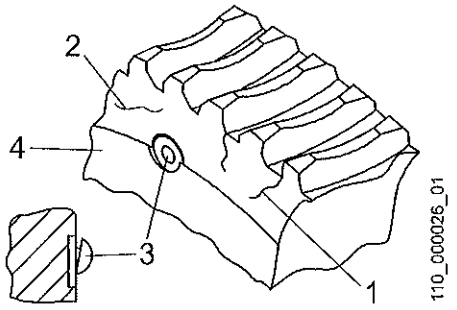
W250
(Wear Step Limits)

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 69/2	0.7	1.1	1.0	1.5
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 43/2	1.7	2.2	2.2	3.0
41/3	2.2	2.8	2.8	3.8
Wear Status	Near end of lifetime		End of lifetime *)	
Further actions if values near or equal the limits	Exchange the gear or install a rope brake within 1 year		Exchange the gear or install a rope brake within 3 months	
Further actions if values exceed the limits and no rope brake is installed	Check the gear every 3 months		Shut down the installation immediately!	
*) Potential safety risk on further wear. Protection system against uncontrolled movement (e.g. rope brake) reduces the potential safety risk of a breakdown.				

3.5 Checking the Crown Wheel for Damage

No	Step
318	Move the empty car to the lowest level.
319	Switch off the main switch.
320	Take off the plastic cap from the gearbox top.
321	Wipe off oil from the crown wheel.
322	Examine the crown wheel with a flashlight to check if all rivets (3) are vertically positioned and without any damage.
323	Visually check, if the bronze ring is offset to the hub (4).
324	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 K602796). 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.

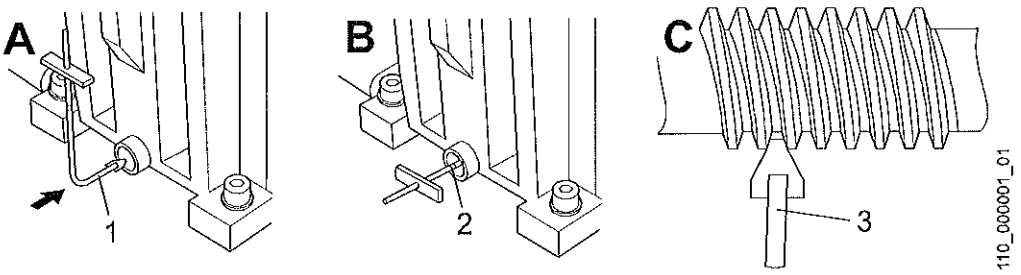
3.6 Checking the Worm Shaft for Broken Segments

Note

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

3.6.1 Check With the "Tooth Feeler"

No	Step
325	Move the empty car to the top level and switch off the main switch.
326	Drain the gear oil into a clean tank (W200: 14 litres, W250: 20 litres).
327	Insert the tooth feeler (1) into the gear until the mark (2) is at the opening (B).
328	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.
329	Turn the worm shaft 90° and repeat this check on the next groove.
330	Repeat this procedure until the entire worm shaft has been checked.
331	If there is any irregularity felt there is a potential risk of broken worm shaft segments.
332	Seal and mount the drain plug and fill in clean oil.



Checking the Worm Shaft

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 K602796).

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.

3.6.2 Check by Opening the Gearbox

No	Step
333	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.
334	Switch off the main switch.
335	Support the traction sheave if it is a flying traction sheave.
336	Open the gearbox.
337	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 K602796).

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 Exchanging Oil

Caution

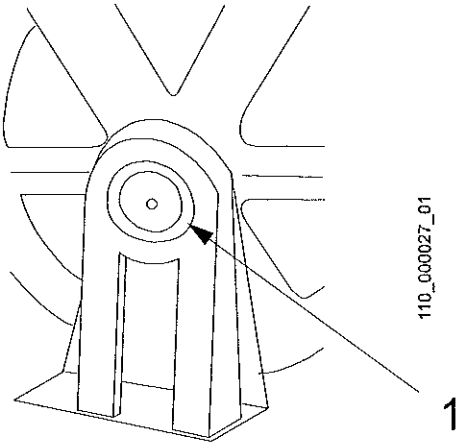
Mineral oil is not permitted and must be replaced immediately! Mark the gearbox with the oil plate Mat.No. 126751.

Use PAO 320 gear oil only (as to technical norm N 5999120E)

No	Step
338	Place a tank (W200: 14 litres, W250: 20 litres) under the drain plug.
339	Carefully open the drain plug and drain the oil.
340	Seal the drain plug with silicon rubber Mat.No. 999228.
341	Insert and tighten the drain plug.
342	Fill in new oil.

3.8 Grease outer Bearing

No	Step
343	Remove the plastic cover and remove the old, used grease as far as possible.
344	Apply grease (DIN51825-K3K-20) to the outer bearing.
345	Remount the plastic cover.



1 Plastic cover plate

3.9 Observation and Measures

3.9.1 Excessive Noise and Vibrations

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.

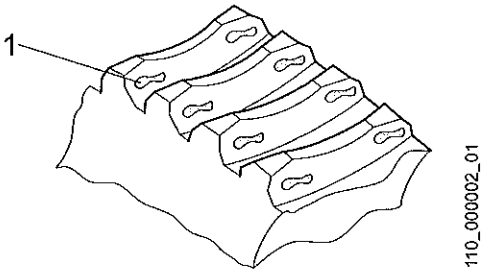
Carry out the following checks:

- 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

3.9.2 Pitting

Pitting (1) is not dangerous but can lead to wear out or/and 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 3-4)



Note

It is not necessary to replace gear set just due to excessive pitting.
If, however, the measurement according to Section 3-4 exceeds the limits, the gear set must be replaced.

3.9.3 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).

3.9.4 Blocked Gear

Corrective measures:

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

3.9.5 Development of Gear Set Degradation

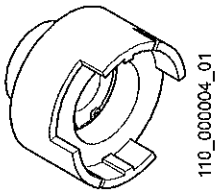
When a gear set becomes damaged it goes normally through the following phases of degradation:

Degradation	Observation
Cracks in the tooth root of the worm shaft or broken worm segments	• 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	• 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

Broken tooth on crown wheel or several broken teeth
Attention: Very fast degradation!
	• 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:
	  • 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	no picture available	Used when exchanging the hoisting motor Mat.No. 113368
Shims	no picture available	Used to adapt exchanged hoisting motor Mat.No. 113369
Erection Tool **diam. 61.5 mm** **diam. 89.5 mm**	no picture available	Used to install the radial lip seal Mat.No. 115183
Hook Wrench		Used to tighten the shaft nut Mat.No. 547522

Special tools for corrective maintenance

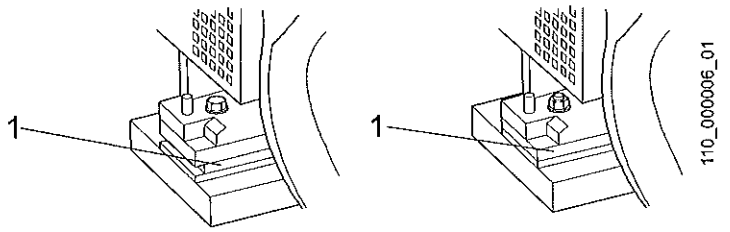
4.1 Exchanging the Hoisting Motor

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

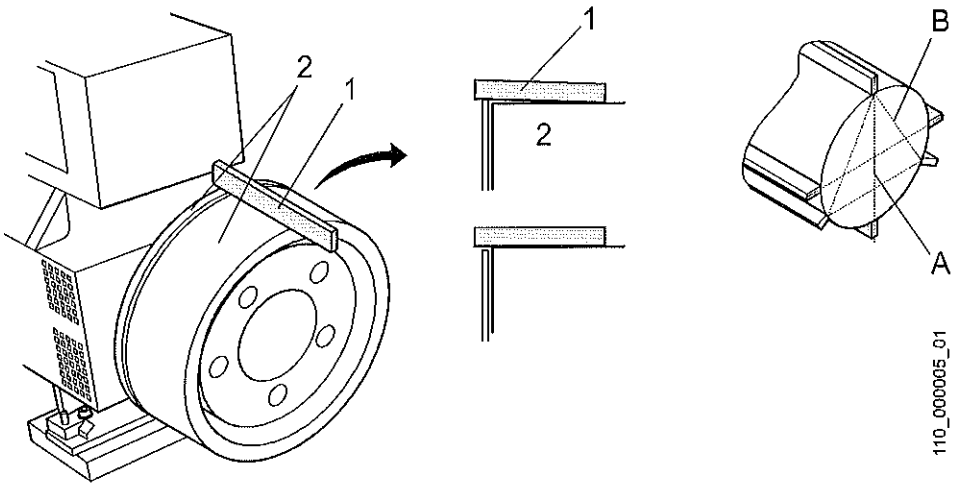
No	Step
4005	Put the corresponding distance plates (1) onto the machine base.
4006	Place the new motor on the distance plates. Position the motor with a shaft end distance of 2 mm.
4007	Attach the fly wheel or hand wheel to the motor.



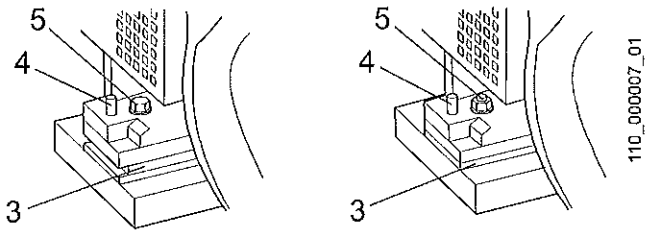
Small Motor (Left) and Large Motor (Right)

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).

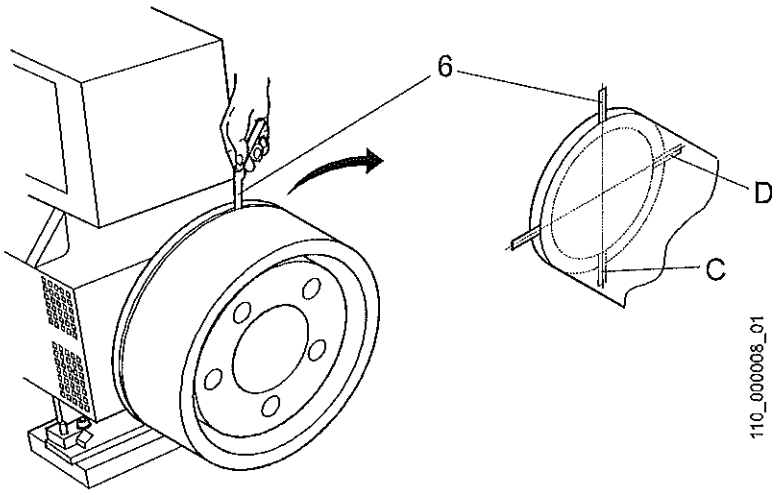


4009	Put shims (3) of suitable thickness under the motor feet to equalize the vertical offset.
4010	Subsequently fix the special distance plate with 5 mm pins (4).



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 against those at the back are at different height. 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.

Max. deviation in distance between 4 measuring points: 0.05 mm.

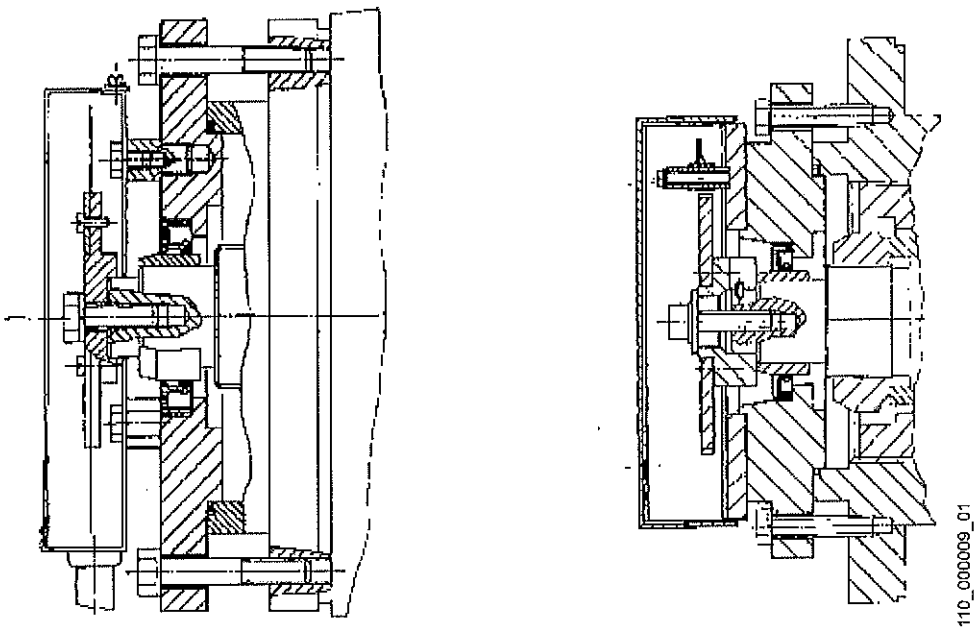
4014	Pin the motor
4015	Remove the pins again and shift the motor backwards
4016	Insert new coupling rubbers (with powdered soapstone)
4017	Shift the motor back and re-install the pins
4018	Tighten the motor fixing screws
4019	Re-attach the brake arms
4020	Remove the hand wheel if installed

4.2 Replacing the Thrust Bearing

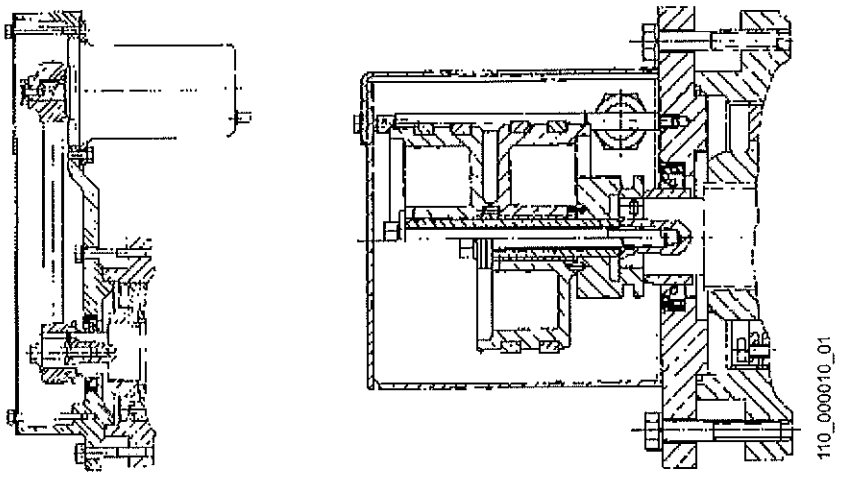
No	Step
4021	Move the car to the top level and pull it up so the counterweight is on the buffer and the ropes are free of load. Switch off the main switch.
4022	Lift the ropes off the traction sheave (put them over the outboard bearing).
4023	Drain the gear oil (W200: 14 litres, W250: 20 litres).

4.2.1 Removing the Thrust Bearing

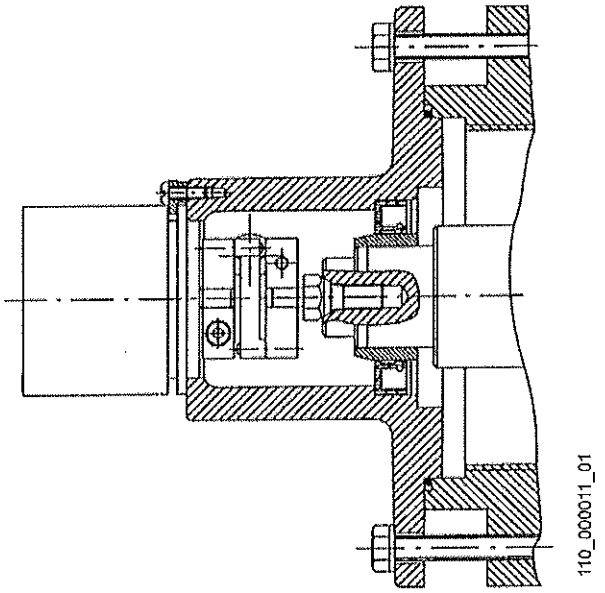
No	Step
4024	Loosen the hoisting motor, uncouple it and shift it away from the gear.
4025	Remove the tacho/IG on thrust bearing side.



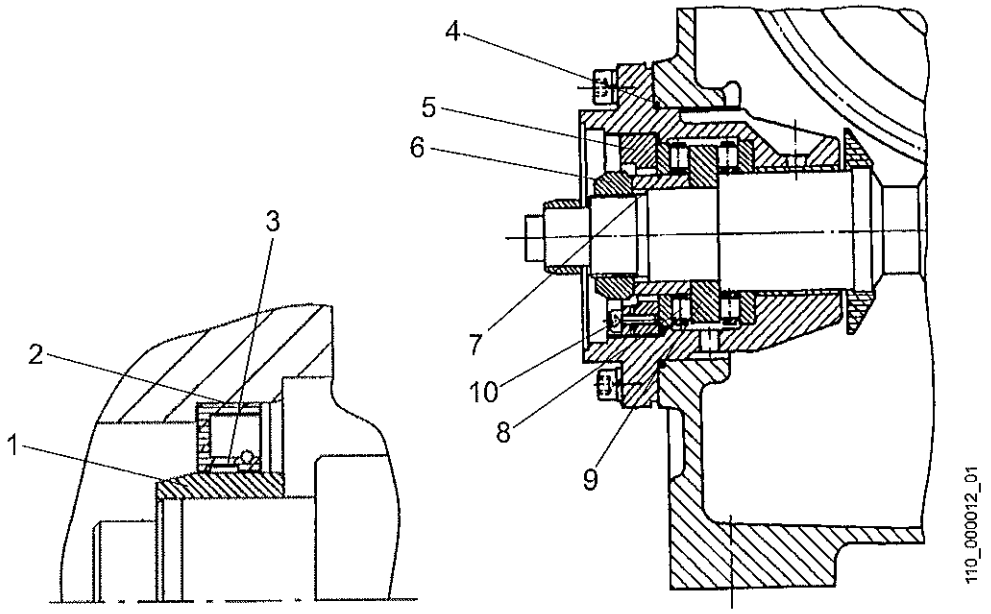
IG 500 (Left) and AMK (Right)



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 Nm ... 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 ... 0.01mm). 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.

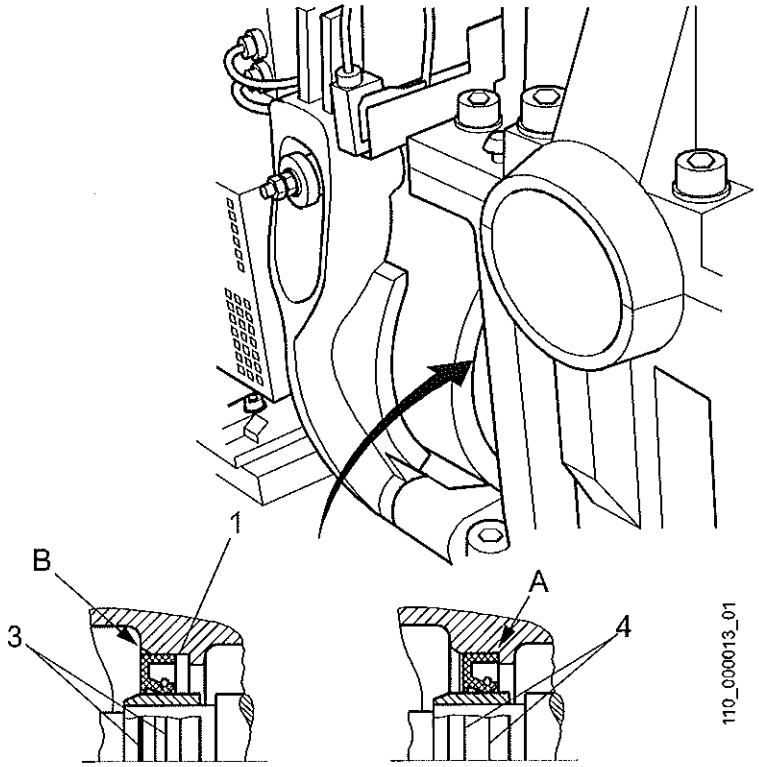
No	Step
4046	Loosen the three thrust ring locking screws.
4047	Release the brake and turn the hand wheel or fly wheel in a direction that the worm shaft is moved in axial direction towards the coupling. This to have the play at the outer side of the thrust bearing.
4048	Tighten the thrust ring (5) by 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 (max. 0.005 mm ... 0.01 mm). Readjust the thrust bearing if necessary.
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

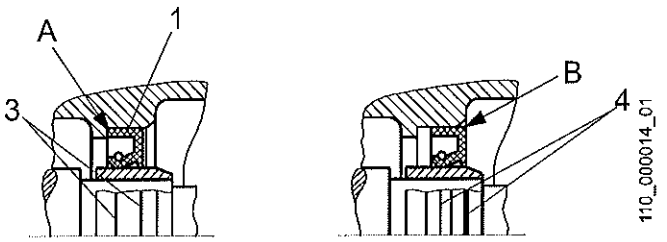
No	Step
4053	Drain the gear oil.
4054	Remove the hoisting motor according to Section 4.1.1.
4055	Remove the worm bearing at the coupling side.
4056	Remove the radial lip seal (1) and the O-ring. Make sure not to damage the seat.
4057	Check if the sleeve ring has grooves. The radial lip seal (1) can be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



Lip Seal Flush Outside (Left) and Lip Seal Flush Inside (Right)

4.4.2 Removing the Radial Lip Seal On Tacho / IG Side

No	Step
4058	Remove the tacho or IG.
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 flushing inside (A) or flushing outside (B). If the sleeve ring has grooves on both positions (3) and (4) it must be replaced as well.



Lip Seal Flush Inside (Left) and Lip Seal Flush Outside (Right)

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.

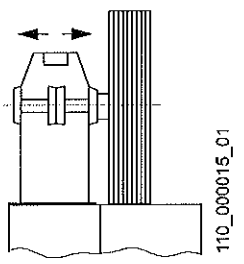
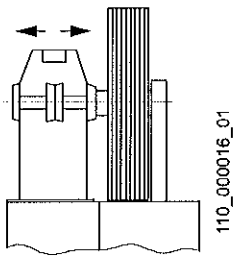
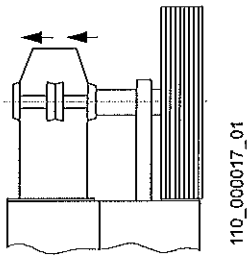
4.5 Repair Oil Leakage

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

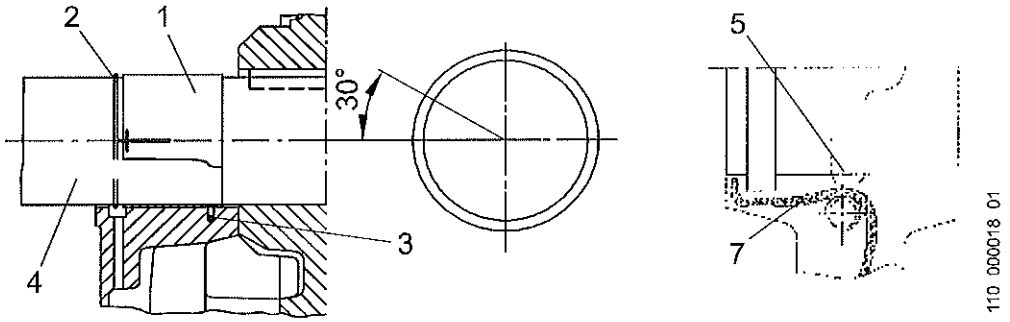
Traction sheave position		Components
Traction sheave flying, without outboard bearing		Traction sheave
Traction sheave inboard, with outboard bearing		Outboard bearing and traction sheave
Traction sheave flying, with outboard bearing		Crown wheel (pressing force approx. 220 kN)

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 litres, W250: 20 litres).
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.
4089	Remove previous silicon from the upper and lower fitting surfaces.

No	Step
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).

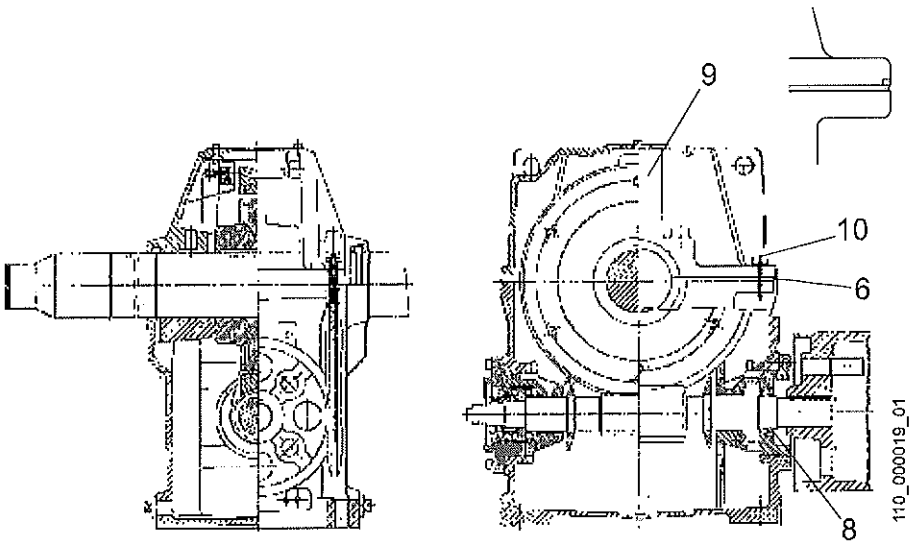


4091	Mark the casing edge on the bearing bush (1).
4092	Lubricate the bearing bushings (1) slightly and push them on the shaft (4) with a distance of approx. 10.mm away from the crown wheel.
4093	Lower the main shaft very carefully to insert the crown wheel into the worm shaft.

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 Mat.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 Mat.No. 999228.



Gear overview

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

Caution

Use PAO 320 gear oil only (as to technical norm N 5999120E).

4.7 *Replacement of Gear Set

Replacement according to K 602796

4.8 *Setting and Reparing of Mechanical Brake

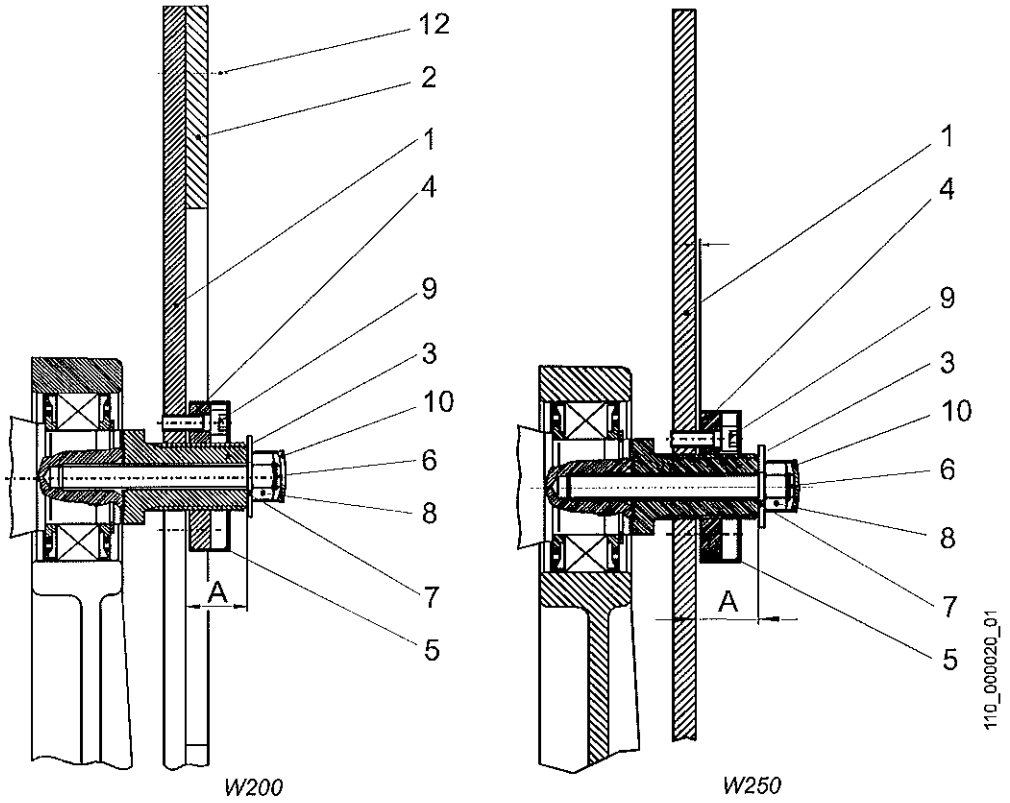
Setting and reparing according to K 601888

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	Material No.	
		W200 (L271 006)	W250 (L271 023)
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		

Pos	Item	Material No.	
		W200 (L271 006)	W250 (L271 023)
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	outer bearing	42	45
		overhung	38	42
	60Hz	outer bearing	53	59
		overhung	50	56
43:2 55:2 69:2	50Hz	outer bearing	39	23
		overhung	36	20
	60Hz	outer bearing	50	34
		overhung	47	31

5.2 Special Tools

Special Tools

Tool	Description
Torque wrench 80Nm ... 300Nm	
Socket SW30	
1 long socket wrench SW 10	Used for hex soc screw M8 (12)
2 Wrench SW30	
Cleaning brush	To wash out the bore center at the shaft end
Caliper gauge	

Special tools for traction sheave damper installation

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 approx. 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 3mm 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 3 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, (e.g. 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 3 hex soc 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 can not 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.

5.6 Reporting

When Section 5.5 is satisfactorily completed, fill in form J 271021 up to Point 4.
Return the completed reporting instruction form J 271021 to the address given in the form.