Rothe Erde Slewing Rings.
Bearing Inspection Offshore Cranes.

KD 125

A ThyssenKrupp Technologies company

Rothe Erde

ThyssenKrupp

www.bergab.ru Берг АБ bergab@ya.ru Тел. (495)-228-06-21, факс (495) 223-3071

Bearing Inspection

Rothe Erde slewing rings are designed according to customer-specified loads and applications.

To determine the condition of a bearing – and thereby its expected service life– the slewing rings should be subjected to periodic inspections during their operating life.

Wear Measurement

For assessing the condition of a bearing, we recommend that its normal wear rate is determined. The wear present in the raceway system shows itself by a change in the axial motion of the bearing. Depending on the individual conditions, wear can be determined either by measuring the tilting clearance or by axial reduction measurements. Another means of wear assessment is by grease sample analysis.

Tilting Clearance Measurement

For equipment allowing this, we recommend to measure the tilting clearance in order to determine the wear. The first measurement must be performed when the equipment is put into operation in order to obtain a base value for subsequent repeat measurements.

Check the bolts. The measuring points have to be marked around the circumference while the boom is kept in a specified position. The measurements are then taken between the lower mating structure and the bearing bolted to the superstructure (Fig.1).

The measurements should be taken as close to the bearing as possible in order to minimize the effect of elastic deformations in the system.

The dial gauges should have an accuracy of 0.01 mm. Start with applying the maximum backward moment and set the dial gauges to zero. Then apply a forward turning moment with load uptake, if necessary.

Slew the superstructure to the marked positions and repeat the measurement procedure. When all positions have been measured, record the base values obtained in tabular form (test certificate).

The measurements should be repeated every twelve months as a minimum and under identical conditions as the base measurement. The difference between the values measured and the base values represents the wear that has occurred.

The measurements should be repeated every twelve months as a minimum and under identical conditions as the base measurement. The difference between the values measured and the base values represents the wear that has occurred.

If the wear is found to have heavily increased, the time intervals between measurements should be shortened.

If the acceptable wear values (tables 1, 2 and 3) are exceeded, please consult Rothe Erde.

Axial Reduction Measurement

In cases where it is not possible to measure the tilting clearance we recommend the axial reduction measurement. Here, the center of gravity of the load combination is to be within the track diameter of the bearing. The loading principle is shown in Fig. 2.

The first measurement should be performed when the equipment is put into operation in order to obtain a base value for subsequent repeat measurements.

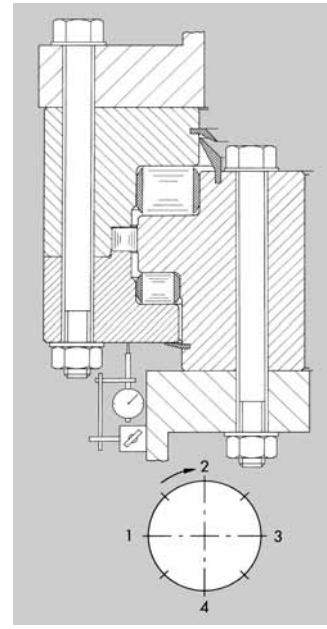


Fig.1:
Three-row roller bearing slewing ring – basic test setup for tilting clearance measurement.

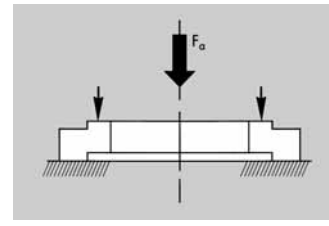


Fig. 2:
Loading principle for axial reduction measurement (see also Rothe Erde main catalogue).

www.bergab.ru Берг АБ bergab@ya.ru Тел. (495)-228-06-21, факс (495) 223-3071

Maximum permissible increase of the bearing clearances

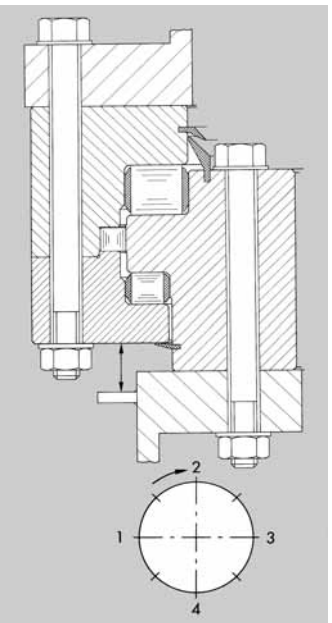


Fig. 3:
Three-row roller bearing slewing ring – basic test setup for axial reduction measurement.

Check the bolts. Mark the respective measuring positions around the circumference while keeping the boom in a specified position.

The measurements are taken between the lower mating structure and the bearing ring bolted to the superstructure (Fig. 3).

Record the base values obtained in tabular form and allocate them to the respective base measurements (test certificate).

The axial reduction measurement should be repeated every twelve months as a minimum, always under identical conditions.

Table 1: Double-row ball bearing slewing rings (standard series KD 320)

Track diameter up to mm	Ball diameter mm 18	20	22	25	30	35	40	45	50	60	70
	permissible increase in bearing clearance mm										
1000	1.8	1.8	1.9	1.9	2.0	2.1	2.5	2.8			
1250	1.9	1.9	2.0	2.0	2.1	2.2	2.6	2.9	3.4	3.6	
1500		2.0	2.1	2.1	2.2	2.3	2.7	3.0	3.5	3.7	
1750			2.2	2.2	2.3	2.4	2.8	3.1	3.6	3.8	4.0
2000				2.3	2.4	2.5	2.9	3.2	3.7	3.9	4.1
2250					2.5	2.6	3.0	3.3	3.8	4.0	4.2
2500						2.7	3.1	3.4	3.9	4.1	4.3
2750						2.8	3.2	3.5	4.0	4.2	4.4
3000							3.3	3.6	4.1	4.3	4.5
3250							3.4	3.7	4.2	4.4	4.6
3500							3.5	3.8	4.3	4.5	4.7
3750							3.6	3.9	4.4	4.6	4.8
4000								4.0	4.5	4.7	5.0
4500								4.2	4.7	4.9	5.2
5000									4.9	5.1	5.4
5500									5.1	5.3	5.5
6000									5.3	5.5	5.7
6500										5.7	5.9
7000										5.9	6.1
7500											6.3
8000											6.5

Table 2: Single-row ball bearings (4-point bearings) double four-point contact bearings and standard series KD 210

Track diameter up to mm	Ball diameter mm 20	22	25	30	35	40	45	50	60	70	
	permissible increase in bearing clearance mm										
1000	1.4	1.4	1.4	1.5	1.7	1.9	2.1	2.5			
1250		1.5	1.5	1.6	1.7	2.0	2.2	2.6	2.7		
1500			1.6	1.7	1.7	2.0	2.3	2.6	2.8		
1750				1.7	1.8	2.1	2.3	2.7	2.9	3.0	
2000				1.8	1.9	2.2	2.4	2.8	2.9	3.1	
2250					2.0	2.3	2.5	2.9	3.0	3.2	
2500					2.0	2.3	2.6	2.9	3.1	3.2	
2750						2.4	2.6	3.0	3.2	3.3	
3000						2.5	2.7	3.1	3.2	3.4	
3250						2.6	2.8	3.2	3.3	3.5	
3500							2.9	3.2	3.4	3.5	
3750							3.0	3.3	3.5	3.6	
4000								3.3	3.6	3.7	
4500								3.5	3.8	3.9	
5000								3.7	4.0	4.1	
5500								3.9	4.2	4.3	
6000								4.1	4.5	4.6	
6500									4.6	4.7	
7000									4.8	4.9	
7500										5.1	
8000										5.3	

Table 3: Roller bearing slewing rings

Track diameter up to mm	roller diameter mm 16	20	25	28	32	36	40	45	50	60	70	80	90	100
	permissible increase in bearing clearance mm													
400	0.20	0.22	0.24											
500	0.20	0.22	0.24	0.26	0.28	0.31								
630	0.25	0.27	0.29	0.31	0.33	0.36	0.38							
800	0.25	0.27	0.29	0.31	0.33	0.36	0.38							
1000	0.30	0.32	0.34	0.36	0.38	0.41	0.43	0.46						
1250	0.40	0.42	0.44	0.46	0.48	0.51	0.53	0.56	0.60					
1500	0.50	0.52	0.54	0.56	0.58	0.61	0.63	0.66	0.70					
2000		0.62	0.64	0.66	0.68	0.71	0.73	0.76	0.80	0.90	1.10	1.10		
2500			0.74	0.76	0.78	0.81	0.83	0.86	0.90	1.00	1.10	1.21	1.33	
3150				0.85	0.88	0.91	0.93	0.96	1.00	1.10	1.20	1.32	1.45	1.60
4000					0.98	1.01	1.03	1.06	1.10	1.20	1.30	1.43	1.75	1.75
5000						1.11	1.13	1.16	1.20	1.30	1.40	1.54	1.69	1.90
6000						1.21	1.23	1.26	1.30	1.40	1.50	1.65	1.81	2.05
7000								1.36	1.40	1.50	1.60	1.76	1.93	2.20
8000										1.60	1.70	1.87	2.05	2.35

In case of heavy wear the time intervals between measurements should be shortened. If the deviation from the base measurement exceeds the maximum values shown in tables 1 through 3, please consult Rothe Erde. To control slewing rings, a base measurement has to be performed when putting it into operation (measurement of the axial reduction or the tilting clearance) and entered into the table. Copy to RE. In parallel, first grease samples have to be taken. State grease type. Complete certificate.

An additional measurement of the axial reduction resp. the tilting clearance has to be effected every 12 months. Thereafter, 6 grease samples have to be taken.
It is thus possible to control the bearing continuously.
Together with every slewing ring, the customer receives a grease sampling set. (Fig. 4). After the grease sample analysis, one further set is put at disposal.

Grease sample collection

- Remove the sealing elements from the sampling ports (Figs. 5 and 6).
- The sampling port of the supporting raceway is under the boom.
- Three-row bearings have one additional port for the retaining raceway offset by 180°.
- Slew the boom into the main working direction.
- Insert flexible clear plastic tube, which is divided into sections of 120 mm length each and positively connected to the suction system into the borehole up to the raceway area (Fig. 7)
- While rotating the slewing ring slowly, collect the grease samples 1, 2 and 3 from the supporting raceway always at a distance of approx. 45°.
- Analogously, collect the grease samples 4, 5 and 6 from the retaining raceway (Fig. 8).

Fig. 4:
Grease sampling set.

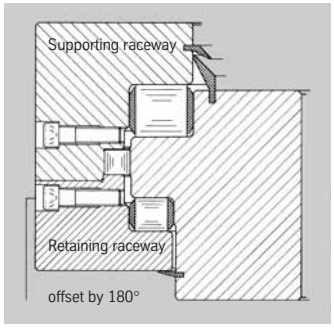


Fig. 5:
Example for three-row roller bearing slewing ring with grease sampling ports.

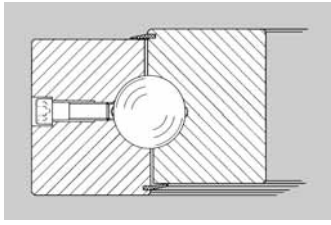


Fig. 6:
Single row ball bearing slewing ring with grease sampling port Fig. 6.

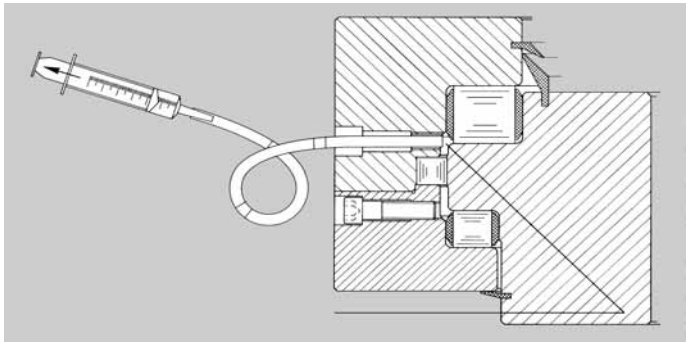


Fig. 7:
Principle of grease sampling.

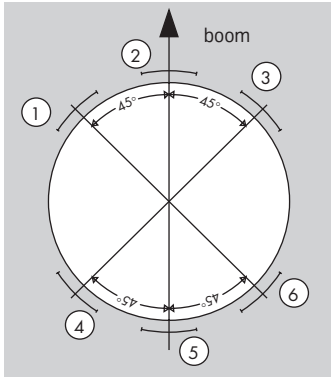


Fig. 8:
Main working range.

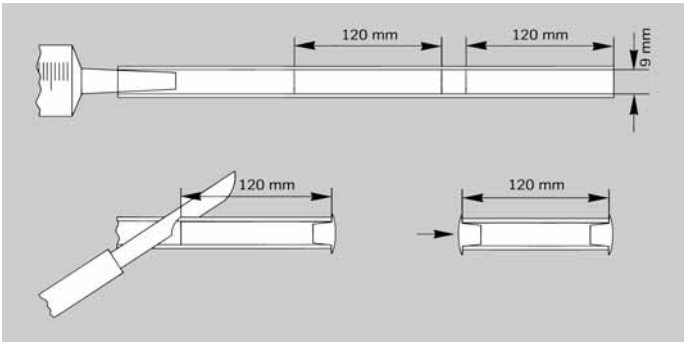


Fig. 9:
Production of the sample sections. Slewing Rings – General Diagnosis.

- Re-seal the sampling ports with the plugging elements.
- Re-seal the end of the tube after grease removal.
- Cut off the tube at the marked point and seal also the cut point (Fig. 9).
- Place the sample into an appropriately identified sample container and send it to RE.

RE will send the collected grease samples to a qualified institute for analysis. The result and the RE comments will be passed on to the customer.

The measured axial reduction or tilting clearances are entered into the table together with the result of the later grease sample analysis. Allocation of these values permits to make statements on the actual condition of the raceway system.

Wear Curves

The two diagrams show the principle of bearing wear progression (Fig. 10). Maximum permissible wear indication 2 % FE-content (20.000 ppm).

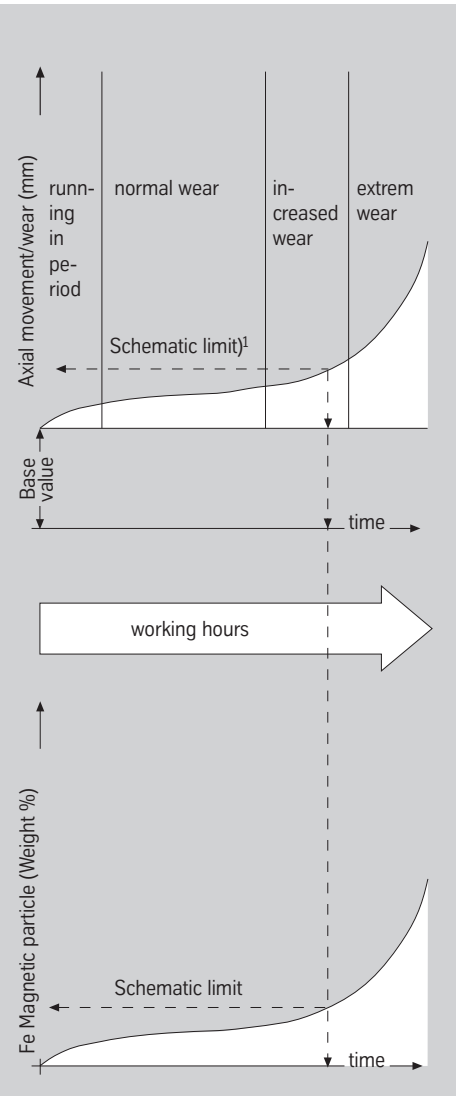
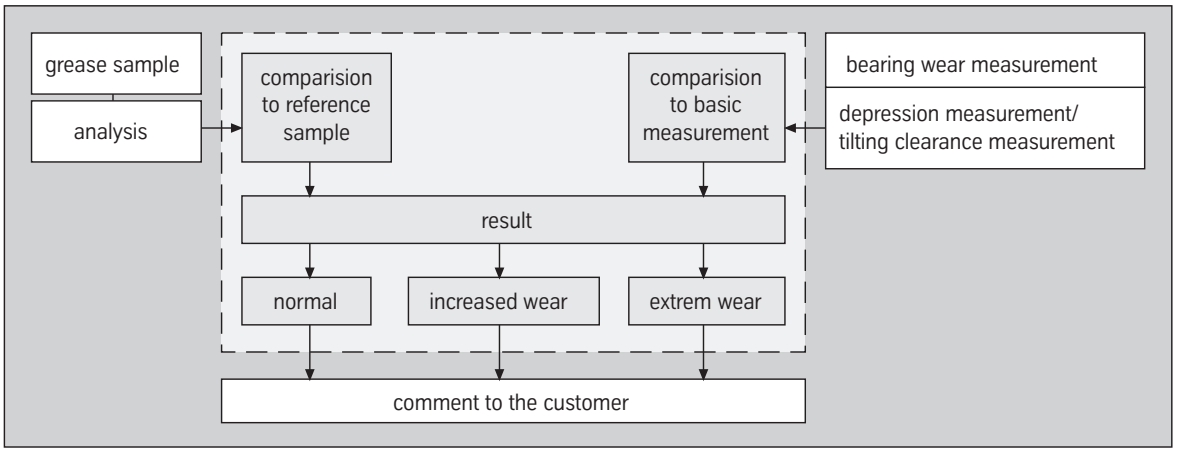


Fig. 10:
Wear curves
1) limit values see tables 1 through 3.



Test Certificate for Rothe Erde Slewing Rings

Customer:				Application:			Location:		
RE drawing-no.:				RE-order-no.:			Year of manufacture:		
Date									
Service-hours		0							
			Repeated measurements (every 12 months)						
Measuring point		Basic measurement	1	2	3	4	5	6	7
1	Boom								
	180° offset								
2	Boom								
	180° offset								
3	Boom								
	180° offset								
4	Boom								
	180° offset								
Grease-sample no. Fe-magn. particle (%)	1								
	2								
	3								
	4								
	5								
	6								
Grease type									
Greasing system Quantity/interval									
Remarks									

Rothe Erde GmbH
Tremoniastrasse 5-11
D-44137 Dortmund
Phone: +49 (2 31) 186 - 0
Fax: +49 (2 31) 1 86 - 25 00
E-mail: rotheerde@tkt-re.thyssenkrupp.com
Internet: www.rotheerde.com

www.bergab.ru Берг АБ bergab@ya.ru Тел. (495)-228-06-21, факс (495) 223-3071