NBR®

Positioning a new product brand

The engineers Professor Sturm and Partner, with headquarter in Dresden, Germany, conducted the following comparative test for a ball bearing from the trademark ‚EBS' to verify that a qualitative statement on their performance potential was possible.

Context for the qualitative evaluation of a new brand product

Insert ball bearings are deep groove ball bearings with a special widened inner ring with different variants (mounting options, seals). The outer ring is usually globose or spherical, so the bearing in an appropriate housing is able to compensate for misalignment between multiple points of the bearing unit. Typical applications are in the conveyor, as well as in agriculture and construction machinery.

Since deep groove ball bearings have been very reliable machines elements, whose production technology has been continuously developed for over 100 years, appropriate evaluation criteria for assessment of a ball bearing have to be chosen by the user. Due to the generally high production levels of ball bearings (the reliability is 99.7 %(!)), no objective performance evaluations can be derived from the sole review of the standard bearing dimensions.

A recognized method for qualitative evaluation is the comparative analysis with a reference value. This reference value is then a measure of whether the comparison object is better or worse compared to this scale. A modern term for this is „benchmarking".

In the beginning of the 1990s, the management method of „benchmarking" found its way into almost all areas of our lives. One of the pioneers in the German market using "benchmarking" is the renowned german testing organization Stiftung Warentest.

It is a very innovative tool, which in conjunction with other instruments (Quality Management, Kaizen) helps the user to gain more long-term competitiveness and economic success.

The starting points are the existing solutions from the best on the market. The aim is therefore to continue to search for potential improvement in the currently increasingly tough competition.

In the field of ball bearings, it was obvious, therefore, to compare EBS to renowned brands such as SKF and INA.

EBS®

EUROPEAN BEARING SERVICE

EU TRADEMARK NO. 004932596

A machine is only as good as its ball bearings – conducting a series of tests

To be eligible for practically relevant results, serially produced comparable insert ball bearing types and dimensions were randomly selected and bought on the technical trading market.

Insert ball bearings are internationally standardized. Therefore, we deemed it necessary to check the main geometric dimensions (bore, outside diameter, width) according to DIN 620. Since the complete bearings are factory greased, the clearence could not be verified.

A ball bearing is always an interconnected system of individual components (rings, balls, cages, seals, lubricants). When these components are optimally tuned, low running noise is the desired result. That is, a ball bearing of good quality is usually very quiet. Any unevenness in the surface (scratches, dirt, lack of lubricant film, format errors, unbalances) causes a vibration, and thus increased noise.

In the standard DIN 5426-1, the noise testing results on fully assembled (not yet installed) ball bearings are written down. This is done to measure the impact sound under a defined load and speed. The vibration velocity is measured by a sensor in three frequency bands. From manufacturer to manufacturer, the measuring tools are scarcely directly comparable. Therefore, a comparative measurement is warranted. In addition, modern test equipment measures the vibration acceleration which allows additional frequency analysis and evaluation.

During the examination, it turned out that the bearings of SKF brand became remarkably warm compared to the other brands of bearings. The intrinsic temperature development in a bearing is usually of significance to the quality of bearing. So if the intrinsic temperature on a self-noise test bench (low load, good heat dissipation) increases greatly within a short time, there will remain correspondingly less reserve stock (external heating) in the installed condition.

Therefore, the temporal evolution of the self-heating was also compared.

Evaluation of test results and conclusions

The comparison is a snapshot of a single, randomly selected bearing size (SB 204). Based on these results, further comparisons are recommended. However, it becomes quite evident that the new brand EBS has an enormous potential.

The original aim of these tests was to show the technical status of the brand EBS, compared to qualitatively well-known and prestigious brands such as SKF and INA. The tests brought up surprising findings involving ready to install, commercial bearings.

While the INA product showed significantly higher noise levels, the SKF bearings showed a sharp rise in net temperature.

In both comparisons, the bearings of EBS compared to SKF and INA performed better and showed the great achievement potential of the brand against renowned competitors.

Within this snapshot, only EBS shows low self-heating and low running noise.

This implicates a superior aligned system of the individual ball bearing components with reduced friction, higher power efficiency and thus increased system effectiveness.

This comparison gives the user an enormous potential for sustainable economic and ecological advantages in competition.

The comparison test EBS – INA – SKF

1.1 Basic data

Period
The tests were made in April 2009.

Examiner
Dipl.-Ing. Jan Sparmann and Dr.-Ing. Gerd Ellmer, engineers Prof Sturm and Partner GmbH, Dresden, Germany

Veryfied Bearings
The following bearings were selected for consideration:

1. GAY 20 NPPB, INA, Slovakia
   (test item-no. 1, 2, 3, 11, 12, 13)
2. YAT 204 SKF, Italy
   (test item-no. 4, 5, 6, 14, 15, 16) – single-packed
3. SB 204, EBS, China
   (test item-no. 7, 8, 9) – single-packed

Noise test
Ball bearing noise test stand WGP-1 (DIN 5426-1), built in 2008
Test load: 50 N (axial)
Contact force of sensor: 5 N
Speed: 1800 RPM or 3000 RPM

Measurements

- Absolute RMS values v (4 bands) in microns/s,
- Relative RMS values v (4 bands) in %
- dB values (4 bands) reference value of 1 micron/s
- Absolute RMS values a (4 bands) in mm/s²,
- Relative RMS values a (4 bands) in %
- dB values (4 bands) reference value of 1 mm/s²

Evaluations
Rolling Bearing Analysis, Intrinsic Curve Spectrum

Accuracy
Amplitude measurement resolution of 0.15 mm/s²

Piezoelectric Sensor

Date of last calibration
08/14/2008 with vibrating table VC 10

Temperature Meter
VOLTCRAFT IR-364
(Infrared Thermometer) –50 to 900 °C
Accuracy: +/– 1.5 % of reading +/– 2 °C (–20 to +200 °C)

1.2 Measurement

Bearing-noise test
Attachment 1: Report EBS INA SKF bearing noise-test SB 204

Description: The bearings were tested with disassembled mounting screw from both sides (a, b) with two speeds (1800, 3000 RPM).

These were the values of the compared oscillation acceleration aeff (mm/s²) in the frequency range 50 – 4500 Hz.

To ensure the balls rolling secure, the bearings were employed axial from one side with a load of 50 N (DIN 5426-1).

Bearing self-warming test
Attachement 2: Report EBS INA SKF self-warming test SB 204

Description: On the basis of observed strong heating of the SKF bearings, further bearings were re-ordered and only immediatelyprior to the test, the individual packaging was removed.

The bearings were visually inspected and the screws removed. It was noted that the threads were improperly worked out. Sometimes there was a sharp ridge. Some of the threaded holes contained significant bore chips.

The test was conducted at a implemented speed of 3000 RPM. Every 5 minutes, a temperature measurement was made, using a contactless infrared thermometer. The temperature over the entire visible surface of the bearing was scanned and the maximum value noted.

Earlier tests (the sound tests) had shown a stabilization of the operating temperature of the INA- and EBS-bearings within 20 minutes. Hence, there was a termination of the measurement after this time, regardless of whether the temperature of the SKF-bearing may have shown further increase.

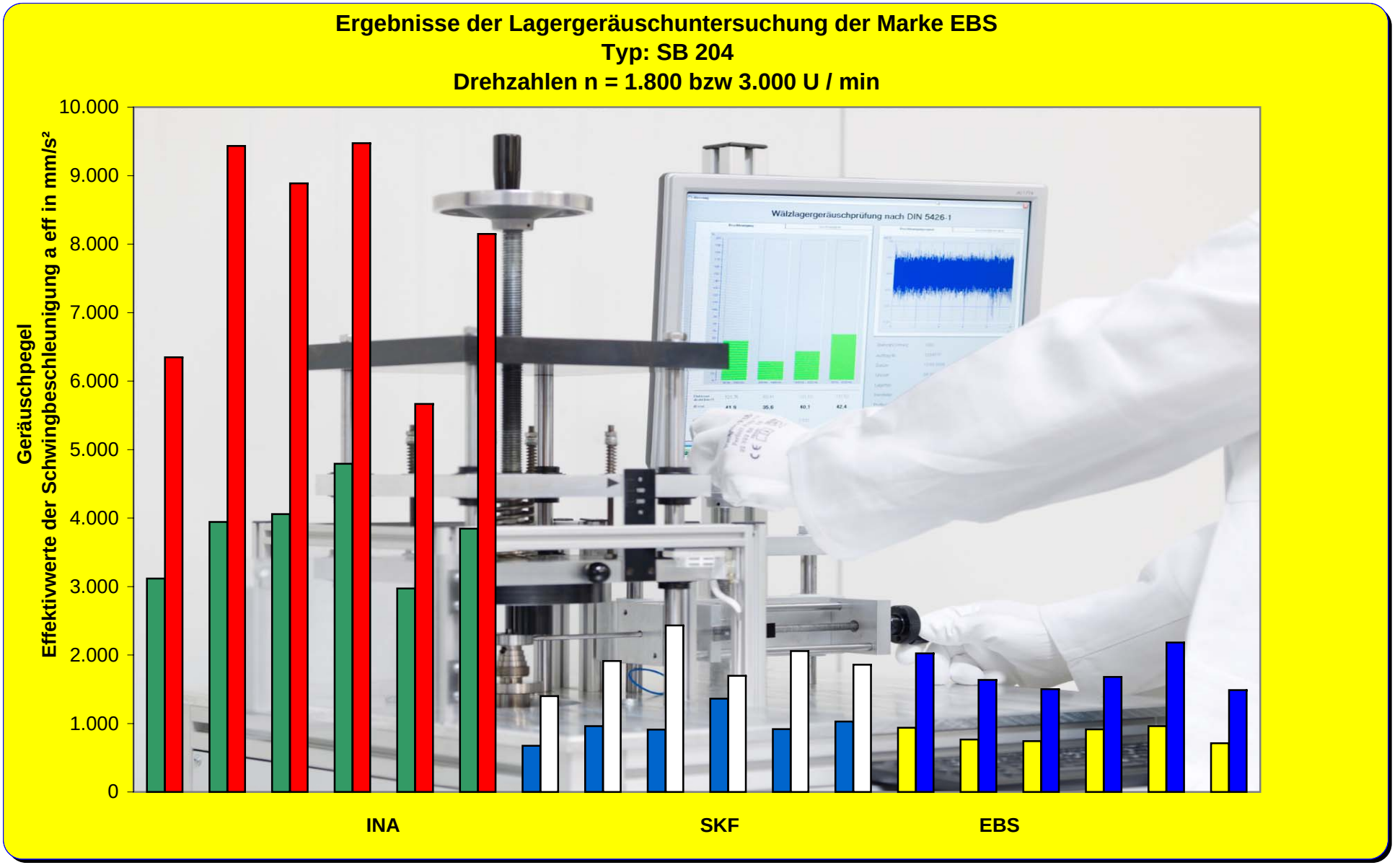
The measurements were made, different to the noise test, only from one side.

1.3 Diagrams

Bearing-noise test
Attachement 3: Diagram EBS INA SKF bearing noise-test SB 204

Bearing self-warming test
Attachment 4: Diagram EBS INA SKF self-warming test SB 204

Anlage 3: Diagramm EBS INA SKF Geräuschprüfung SB 204



Messprotokoll Wälzlager-Geräusch-Prüfung

Ingenieure Prof.Sturm + Partner GmbH
Dr.-Ing. Gerd Ellmer
Zur Wetterwarte 50
01109 Dresden

Auftraggeber: NBR Gehäuse- und Wälzlager GmbH
Geister Landweg 15
48153 Münster / Germany

Typ: **SB 204**
Messgerät: WPS-1
Messbereich: 50 bis 4500 Hz
Axiallast: 50 N

Datum: 24.04.09

	Lager-Nr.	Seite		Drehzahl n (min^{-1}) 1.800	3.000	Schwingbeschleunigung a_{eff} (mm/s^2)
GAY 20 NPPB	1	a	INA	3.117	6.347	
GAY 20 NPPB	1	b		3.943	9.435	
GAY 20 NPPB	2	a		4.058	8.887	
GAY 20 NPPB	2	b		4.794	9.473	
GAY 20 NPPB	3	a		2.973	5.665	
GAY 20 NPPB	3	b		3.844	8.150	
YAT 204	4	a	SKF	673	1.400	
YAT 204	4	b		961	1.913	
YAT 204	5	a		910	2.432	
YAT 204	5	b		1.363	1.696	
YAT 204	6	a		917	2.058	
YAT 204	6	b		1.030	1.858	
SB 204	7	a	EBS	937	2.023	
SB 204	7	b		765	1.636	
SB 204	8	a		742	1.500	
SB 204	8	b		914	1.681	
SB 204	9	a		961	2.181	
SB 204	9	b		710	1.486	

Prüfer 1: Dipl.-Ing. Jan Sparmann

Prüfer 2: Dr.-Ing. Gerd Ellmer

Messprotokoll Eigenerwärmungstest

Ingenieure Prof.Sturm + Partner GmbH
Zur Wetterwarte 50
01109 Dresden

Typ: **SB 204**
Auftraggeber: NBR Gehäuse- und Wälzlager GmbH
Geister Landweg 15
48153 Münster / Germany

Testbedingungen:

Drehzahl (U/min):	3.000
Axiallast (N):	50
Schmierung:	Standardbefettung durch Hersteller
Messbereich:	-50 bis 900 °C
Umgebungstemperatur	20 °C
Prüfeinrichtung:	WGP-1

Start:	24.04.2009
Ende:	24.04.2009

Temperatur (°C)									
Lagertyp	**SB 204, EBS China**			**GAY 20 NPPB, INA Slovakia**			**YAT 204, SKF Italy**		
Zeit (min) / Prüflager-Nr	**7**	**8**	**9**	**11**	**12**	**13**	**14**	**15**	**16**
0	21,2	20,7	20,4	23,0	22,7	23,5	21,5	20,7	20,9
5	37,5	35,1	31,7	46,8	43,8	38,6	51,2	53,4	54,3
10	39,9	36,4	36,1	58,4	55,6	54,2	55,9	62,2	59,9
15	39,0	37,8	34,2	57,4	52,2	62,0	57,2	58,8	57,5
20	41,5	40,2	36,4	60,9	52,6	67,8	79,9	90,7	79,4

Prüfer 1: Dipl.-Ing. Jan Sparmann

Prüfer 2: Dr.-Ing. Gerd Ellmer

Anlage 2: Protokoll EBS INA SKF Eigenerwärmung SB 204

Anlage 4: Diagramm EBS INA SKF Eigenerwärmung SB 204