We have the solution...

...the future has a name

广州孚润 400-992-6811

HL

Lubricating grease for rolling bearings subject to high loads, high speeds, high temperatures

Reg.-Nr. 17581-04

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TURMOGREASE®
Li 802 EP

Use Lubricants which are Successfully Applied by the Industry.

LUBCON

The high efficiency of the **LUBCON** lubricants is proven by

- long service life
- good running properties
- high operational reliability

TURMOGREASE® LI 802 EP for

- rolling bearings subject to high loads
- high temperatures up to +140 °C
- low up to high speeds
- low up to high bearing load
- the lubrication of various types and sizes of bearings

Advantages

- **good protection against corrosion and ageing**
- **compatible with non-ferrous metals, NBR elastomers, PA 66-GF 25 plastics**
- **favourable noise behaviour**
- **good oxidation stability**
- **excellent load-carrying capacity**
- **suitable for application in critical types of rolling bearings**
- **service life of grease and the achievable bearing life is above average**
- **the multipurpose application allows to reduce the high number of different grease types actually used in many companies**

The friction behaviour of small to medium-size deep groove ball bearings lubricated with **TURMOGREASE® Li 802 EP** is very good. Friction is generally low, the grease spreads within a relatively short time and grease losses in 2RSR bearings are comparatively low.
This grease meets the requirements of grease class J in accordance with FAG specifications, a fact proven in several tests.

> Service temperature range:
> -35 °C up to +140 °C, short time up to +160 °C
>
> Suitable for the following rolling bearings:
> Deep groove ball and cylindrical roller bearings
> Speed factor $n \cdot d_m$ ($min^{-1} \cdot mm$)
> up to 1 000 000 for P/C < 0.05
> up to 1 000 for P/C < 0.5 up to +70 °C
>
> Spherical and conical roller bearings
> Speed factor $n \cdot d_m$ ($min^{-1} \cdot mm$)
> up to 300 000 for P/C < 0.05
> up to 1 000 for P/C < 0.3 up to +70 °C

Practical Application

This high-performance lubricating grease for high demands has successfully been used in construction machines, high-lifter trucks, tracklaying vehicles and also in spinning and grinding spindles. Furthermore, appliances and wheelset bearings exposed to high vibrations in rail vehicles and rotary stretchers are lubricated with this grease.

This brochure only contains product information. For specific information please refer to our technical data and safety data sheets. The indications made represent the present state of development and knowledge of **LUBRICANT CONSULT GMBH**. Subject to change. The products are subject to severe controls of manufacture and comply in full with the specifications set forth by our company, but due to the multitude of different influencing factors, we cannot assume any warranty for the successful application in each individual case.
Therefore, we recommend to perform field tests. We strictly refuse any liability.

Application in Rolling Bearings

Requirements

- proper bearing assembly
- sufficient lubricant quantity on all functional surfaces
- selection of appropriate rolling bearings (cage design and material, dimensional accuracy of the bearings and the surrounding components)

- Extremely low-speed bearings and their housings generally require a complete grease fill.
- At low and medium speeds (corresponding to $n \cdot d_m < 200\,000$ $min^{-1} \cdot mm$) the bearings have to be completely filled with grease, the adjacent housing space, however, only to such an extent that the grease emerging from the bearing can be incorporated easily.
- In case of higher rotational speeds the bearings should only be filled to 40 - 60 % of the free bearing space.
  If the free space adjacent to the bearing is large, we recommend to use seals or shields to ensure that a sufficient grease quantity is retained in the bearing.

Relubrication Intervals

Relubrication quantities are indicated in **table 2, p. 5**. The relubrication interval t_f for favourable operating and ambient conditions is indicated in the **diagram 1, p. 5**. **Table 3, p. 5** shows the reducing factors f_1 to f_5 applicable in case of unfavourable operating and ambient conditions.

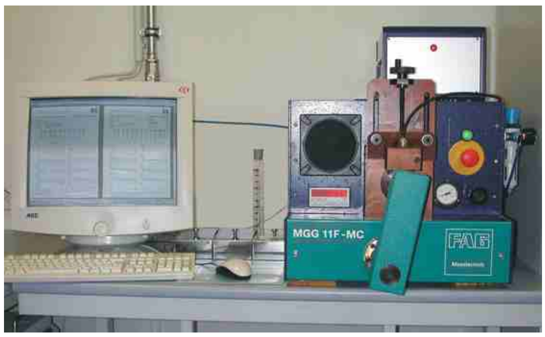
TURMOGREASE® Li 802 EP is a high-performance grease ensuring extended relubrication intervals: the upper limit of the wide curve shown in the **diagram 1, p. 5** is valid for this grease. To obtain the actual lubrication interval t_{fq} multiply the relubrication interval as given in the **diagramm 1** with the reducing factors:

$$t_{fq} = t_f \cdot f_1 \ldots f_5$$

In case of extremely high loads, it is absolutely necessary to control the presence of grease in the bearing; if a grease deficiency occurs, the lubricating intervals have to be reduced.
The technical data of this grease including information on compatibility with sealing and cage materials are listed on **table 1, p. 4**.

Noise Test with FAG MGG 11

The noise behaviour was tested on an MGG 11 noise tester. The result (noise class II) is good, taking into consideration that the range from I to IV covers very good moderate results.



Determination of the Application Range

The upper limit of the service temperature range was derived from the result of the FAG FE9 test run according to DIN 51821 at **+140 °C** with an operating time of F_{50} **= 200 hours**, see **diagram 2**, **p. 6**.

A good standard grease on lithium base renders only a time of F_{50} **= 147 h** at a temperature of **+120 °C**. Therefore, the application temperature of **TURMOGREASE® Li 802 EP** is by 20 °C higher than that of a usual standard grease.

The lower temperature limit was deducted from the flow pressure at -35 °C specified in DIN 51805.
Owing to the low flow pressure of 1380 hPa as determined in the DIN test, relubrication is still possible at -35 °C.

The defined rolling bearing application range is based on results of the FAG FE8 test:

- At a low rotating speed and a high load the specified 500 operating hours were achieved without any failures and with only very little wear of bearing elements. This test was carried out with angular contact ball bearings at temperatures from +30 °C up to +40 °C as well as with taper roller bearings at a temperature of +60 °C. The detailed test results are shown in the **diagrams 3** and **4**, **p. 7**.
- The higher speed range was tested at speeds near the upper limit of the admissible speed factor using angular contact ball bearings at temperatures from +90 °C up to +120 °C, the result is shown in the **diagram 5**, **p. 8**, as well as taper roller bearings at +90 °C up to +120 °C, the result is shown in **diagram 6**, **p. 8**.

The test runs were evaluated by comparing the wear results with the requirements for lubricating greases of the FAG grease classification (= FAG specification).
For the evaluation it was decisive that the 500 hour tests were completed without failures and that wear was only moderate.

All test runs were repeated several times, i. e. the results can be considered reliable.
Even though these were short-period tests, they clearly showed that the suitability of **TURMOGREASE® Li 802 EP** for the indicated application range is above average.

Satisfactory operational results can be expected, when observing the indicated lubricating intervals. The test speed differed from the speed factor, due to the test bench; the higher speed factor was choosen as a result of referring field experiences.

Friction Behaviour

The friction behaviour was tested on an FAG R6 test rig. **Diagram 7**, **p. 9** shows the test results, whereby the quick distribution of grease is remarkable. This becomes obvious by the early reduction of friction over the running time.
The low friction in the steady-state condition and the moderate loss of grease show that this product is suitable for sealed and shielded bearings.

Table 1: Technical Data of **TURMOGREASE® Li 802 EP**

Technical Data	**TURMOGREASE® Li 802 EP**	**proved acc. to**
Colour	brown	
Thickener	Lithium soap	
Base oil viscosity +40 °C/+100 °C (mm^2/s)	Mineral/Synth. 85/12.5	DIN 51562
Drop point (°C)	190	DIN ISO 2176
Worked penetration 60 TT (mm/10)	265 - 295	DIN ISO 2137
Water resistance +90 °C	1 - 90	DIN 51807T1
SKF Emcor Corrosion protection	0 - 0	DIN 51802
Oxidation resistance 100 h/+100 °C (bar)	0.4	DIN 51808
Copper corrosion +120 °C	Rating 1	DIN 51811
Flow pressure at -35 °C (hPa)	1380	DIN 51805
Oil separation (% by wt.) +40 °C/+100 °C	approx. 3.5/6	DIN 51817
Content of solid matters, particles 25 µm (mg)	< 5	DIN 51813
Behaviour towards NBR elastomer, 7 days at +100 °C		
Change of Shore A hardness ± 15 SAH	+2 SAH	DIN 53505
Tearing elongation 150 %	-19.8 %	DIN 53504
Change of volume max. ± 10 %	-3.4 %	DIN 53521
PA66-GF25 42 days at +120 °C		
Tearing strength 130 N/mm^2	184 N/mm^2	DIN EN 61
Tearing elongation 2 %	+18.8 %	DIN EN 61
Impact tenacity 20 mJ/mm^2	-17.8 mJ/mm^2	DIN 53453

Lubricating Interval and Relubrication Quantity

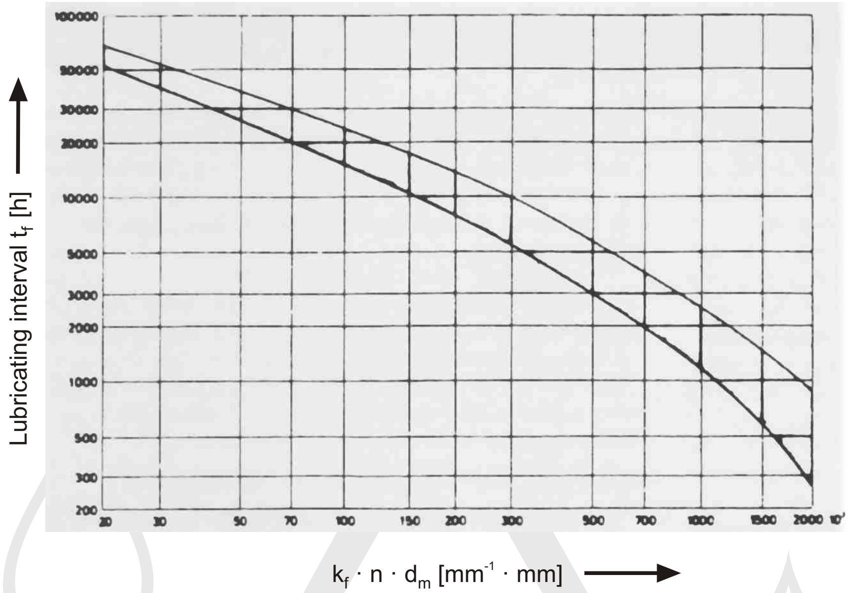


Diagram 1: Lubricating interval for favourable operating and environmental conditions

Type of bearing		k_f
Deep groove ball bearing	single-row	0.9 ... 1.1
	double-row	1.5
Angular contact ball bearing	single-row	1.6
	double-row	2
Spindle bearing	α = 15°	0.75
	α = 25°	0.9
Four-point contact bearing		1.6
Spherical ball bearing		1.3 ... 1.6
Deep groove ball thrust bearing		5 ... 6
Angular contact ball thrust bearing double-row		1.4

Type of bearing		k_f
Cylindrical roller bearing	single-row	3 ... 3.5
	double-row	3.5
	full-row	25
Thrust cylindrical roller bearing		90
Needle bearing		3.5
Conical roller bearing		4
Barrel-shaped roller bearing		10
Spherical roller bearing without flanges (»E«)		7 ... 9
Spherical roller bearing with centre flange		9 ... 12

Relubrication quantity m_1 for weekly or annual relubrication intervals

$$m_1 = D \cdot B \cdot x \text{ [g]}$$

Relubrication interval	x
weekly	0.002
monthly	0.003
annual	0.004

Relubrication quantity m_2 for extremely short relubrication intervals

$$m_2 = (0.5 \ldots 20) \cdot V \text{ [kg/h]}$$

Relubrication quantity m_3 before starting reoperation after a standstill of severals years

$$m_3 = D \cdot B \cdot 0.01 \text{ [g]}$$

V = free space in the bearing

$$\approx \frac{\pi}{4} \cdot B\,(D^2 - d^2) \cdot 10^{-9} - \frac{G}{7800} \text{ [m}^3\text{]}$$

d = diameter of the bearing bore [mm]
D = outer diameter of the bearing [mm]
B = bearing width [mm]
G = bearing weight [kg]

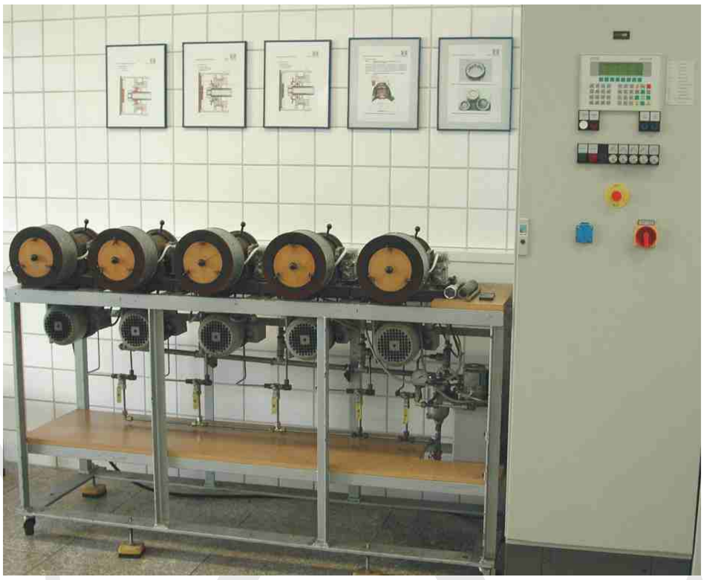
Table 2: Relubrication quantities

Influence of dust and moisture at the functional surfaces of the bearing		
moderate		f_1 = 0.7 ... 0.9
strong		f_1 = 0.4 ... 0.7
very strong		f_1 = 0.1 ... 0.4
Influence of impact loads, vibrations and oscillations		
moderate		f_2 = 0.7 ... 0.9
strong		f_2 = 0.4 ... 0.7
very strong		f_2 = 0.1 ... 0.4
Influence of increased bearing temperatures		
moderate	(up to +85 °C)	f_3 = 0.7 ... 0.9
strong	(up to +100 °C)	f_3 = 0.4 ... 0.7
very strong	(up to +130 °C)	f_3 = 0.1 ... 0.4

Influence of high loads	
P/C = 0.1 ... 0.15	f_4 = 1
P/C = 0.15 ... 0.25	f_4 = 0.7 ... 1
P/C = 0.25 ... 0.35	f_4 = 0.4 ... 0.7
P/C = 0.35 ... 0.45	f_4 = 0.2 ... 0.4
P/C = 0.45 ... 0.6	f_4 = 0.05 ... 0.2
P/C = >0.6	f_4 = < 0.05
Influence of current streaming through the bearing	
slight current	f_5 = 0.5 ... 0.7
strong current	f_5 = 0.1 ... 0.5

Table 3: Reducing factors f_1 ... f_5 for unfavourable operational and environmental conditions

FAG FE9 Test Run



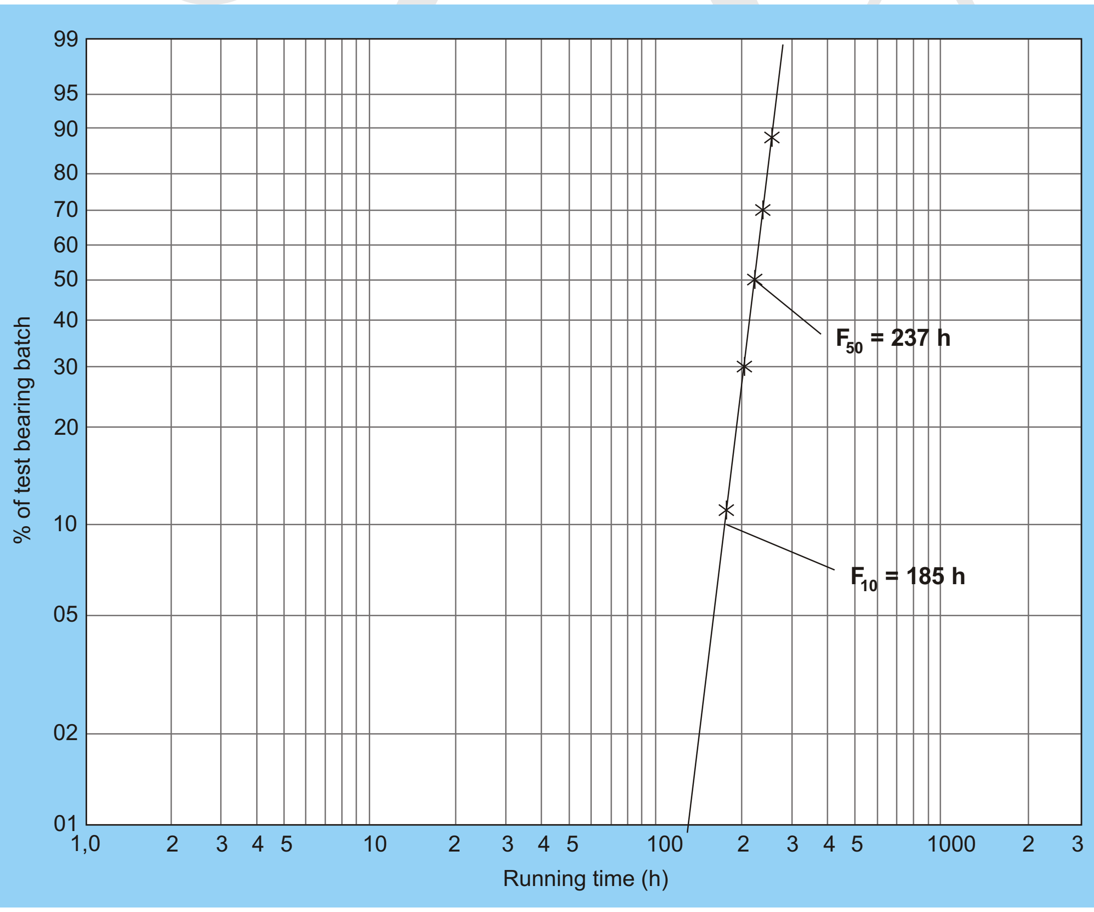


Diagram 2:
FE9 test run with angular contact ball bearing 529689 (≙7206 B), assembly A, i. e. open bearing; axial load F_a = 1.5 kN; speed n = 6000 min^{-1}; temperature +140 °C

Lubrication with **TURMOGREASE® Li 802 EP**
Grease service life of the bearings in h: determination in Weilbull diagram of F_{50} = 237 h; F_{10} = 185 h

Requirements acc. to FAG and DIN 51825 F_{50} = 100 h →
Evaluation: very good

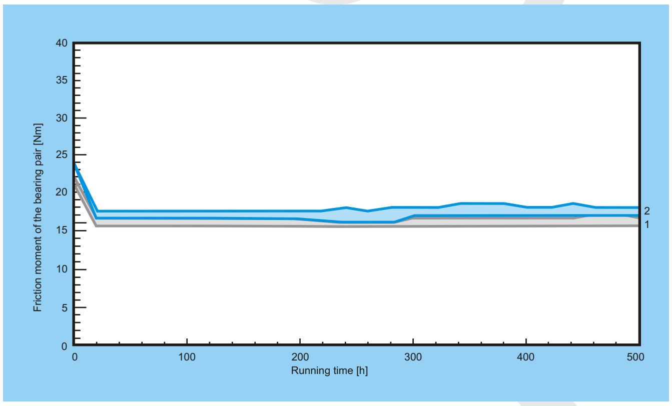


Diagram 3:
FE8 test run with angular contact ball bearing 536050 (≙ 7312 B); axial load F_a = 80 kN; speed n = 7.5 min^{-1}; time of operation 500 h
Lubrication with **TURMOGREASE® Li 802 EP**

Parameters	Test run 1	Test run 2	FAG requirements
Steady-state temperature in °C	29	37	30 ... 40
Peak temperature in °C	37	45	30 ... 40
Wear in mg of - the rolling elements - the cage - the inner ring - the outer ring Frictional behaviour over the time (see diagram left)	 5/16 - - 5/9 13/18 very smooth behaviour	 8/11 - - 6/7 14/17 very smooth behaviour	 < 35 <100 **Evaluation: very good**

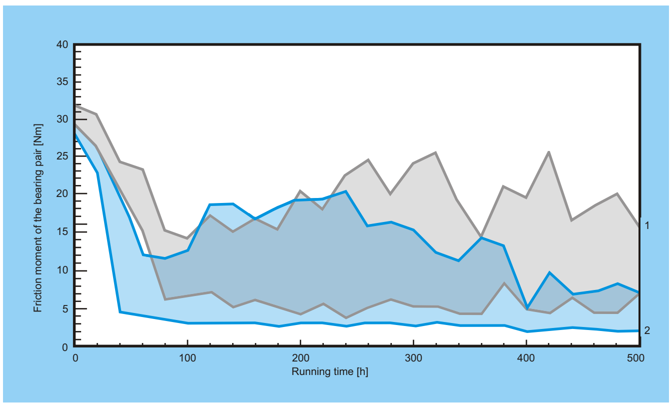


Diagram 4:
FE8 test run with taper roller bearing 536048 (≙ 31312); axial load F_a = 50 kN; speed n = 75 min^{-1}; time of operation 500 h
Lubrication with **TURMOGREASE® Li 802 EP**

Parameters	Test run 1	Test run 2	FAG requirements
Steady-state temperature in °C	45	35	60
Peak temperature in °C	77	60	60
Wear in mg of - the rolling elements - the cage - the inner ring - the outer ring Frictional behaviour over the time (see diagram left)	 18/23 52/69 15/13 13/13 Running-in not yet finished	 24/25 44/47 32/28 16/13 Running-in almost finished	 < 35 <100 **Evaluation: very good**

FAG FE8 Test Run

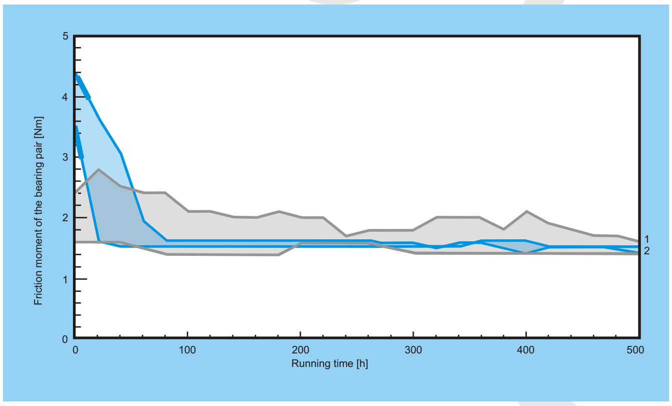


Diagram 5:
FE8 test run with angular contact ball bearing 536050 TVP (≙ 7312 B with plastic cage); axial load F_a = 5 kN; speed n = 6000 min^{-1}; time of operation 500 h;
Lubrication with **TURMOGREASE® Li 802 EP**

Parameters	Test run 1	Test run 2	FAG requirements
Steady-state temperature in °C	90	84	≤120
Peak temperature in °C	125	132	120
Wear in mg of - the rolling elements - the cage - the inner ring - the outer ring Frictional behaviour over the time (see diagram left)	 6/7 - - 1/8 2/6 Running-in not yet finished	 0/0 - - 0/0 0/0 Running-in finished, very smooth	 < 35 <100 **Evaluation: very good**

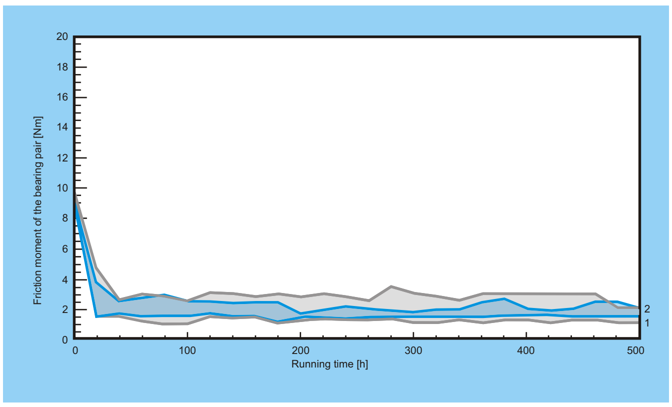


Diagram 6:
FE8 test run with taper roller bearing 536048 (≙ 31312); axial load F_a = 10 kN; speed n = 3000 min^{-1}; time of operation 500 h
Lubrication with **TURMOGREASE® Li 802 EP**

Parameters	Test run 1	Test run 2	FAG requirements
Steady-state temperature in °C	100	95	120
Peak temperature in °C	116	110	120
Wear in mg of - the rolling elements - the cage - the inner ring - the outer ring Frictional behaviour over the time (see diagram left)	 14/11 15/11 4/4 1/2 Running-in finished	 10/8 43/9 4/1 0/1 Running-in finished	 < 35 <100 **Evaluation: very good**

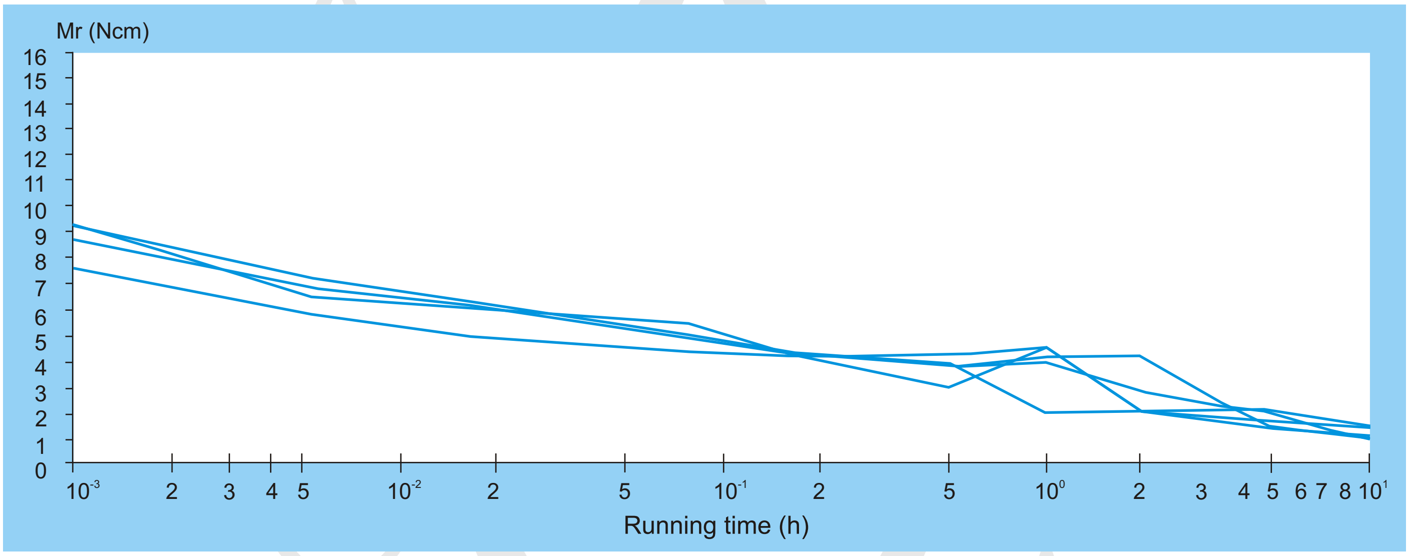


Diagram 7:
R6 test run with deep groove ball bearing 6203.2ZR.C3; preservation of the test bearing with Fuchs TX 10A; axial load F_a = 179 N; radial load F_r = 23 N; speed n = 7500 min^{-1}; running time 10 h
Lubrication with **TURMOGREASE® Li 802 EP**
Steady-state temperature +28 ... +30 °C; peak temperature +40 °C; grease loss 50 mg

Lubricating Greases for Rolling Bearings

TURMOGREASE® Li 802 EP; often used lubricating grease for rolling bearings subject to high loads, proved successful for many applications. Modified versions with tailor-made formulations provide an extended range of performance for specific applications:

Special application	V_{40} (mm^2/s)	Name of grease
Temperature -35 °C up to +140 °C, speed factor n · d_m (min^{-1} · mm) ≤ 1 000 000	85	TURMOGREASE® Li 802 EP
Temperature -25 °C up to +140 °C, water resistant, speed factor n · d_m (min^{-1} · mm) ≤ 1 000 000	85	TURMOGREASE® LC 802 EP
Favourable for impact loads, vibrations	200	TURMOPLEX® 2 MF
Favourable also for high impact loads, vibrations, temperature up to +170 °C	400 ... 500	TURMOPLEX® BN 5002
Temperature up to +140 °C, water resistant, favourable for bearings with rolling outer ring	400 ... 500	TURMOGREASE® CAK 4003
Favourable for extremely high impact loads	1000	TURMOPLEX® L 220

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