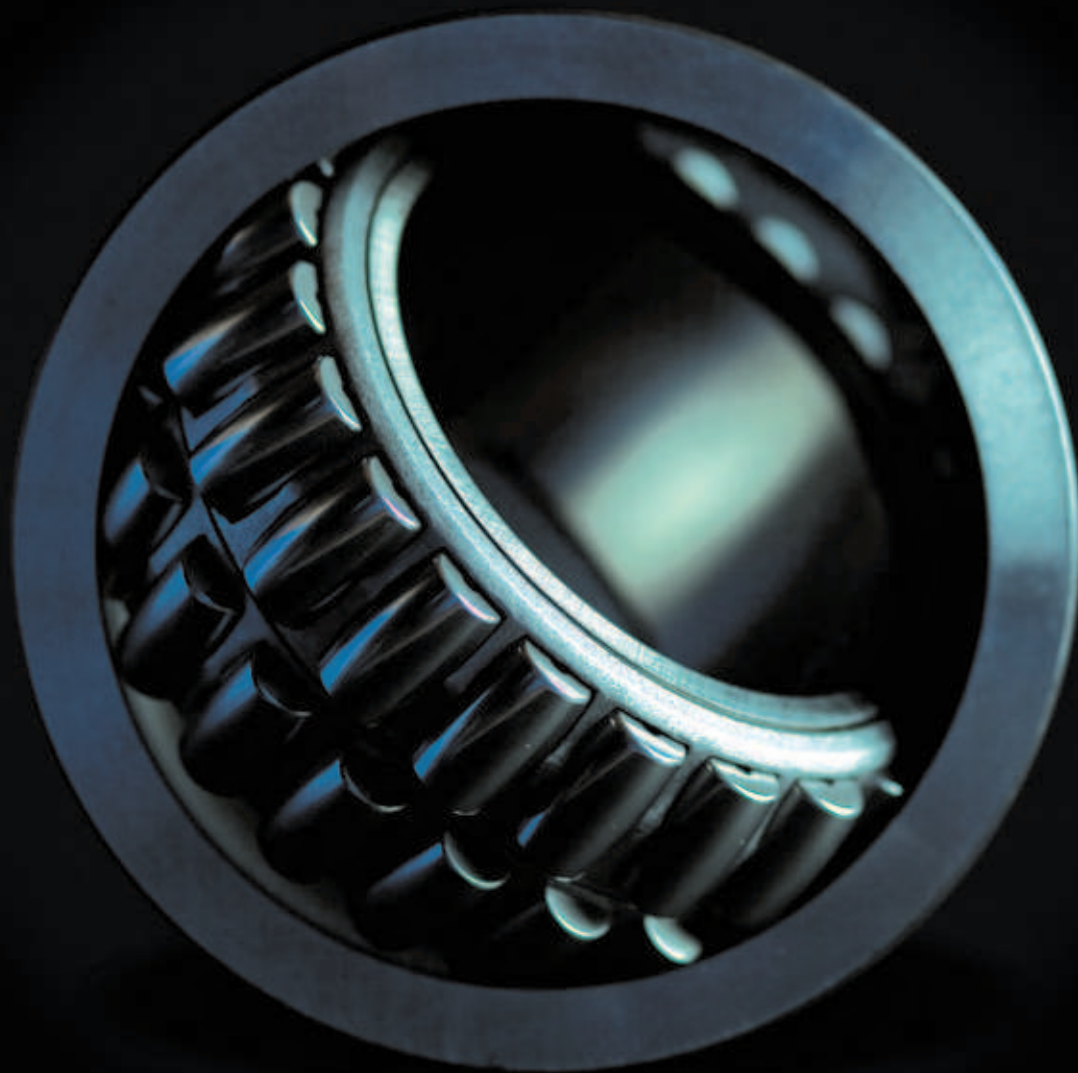


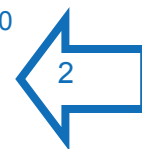
**History** is the basis of the present and a challenge for the **future**.



**ZKL** GROUP



ZKL Bearing Lubrication  
&  
Products



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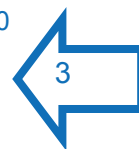
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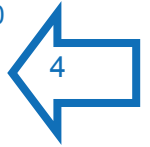
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## BEARING LUBRICATION

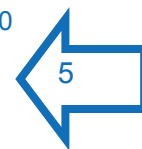
The main purpose of lubrication is to reduce friction and wear inside the bearing. Slippage and rolling occur in the contact area between rings and rolling elements. The size of slippage depends on the type of Bearing used, the load, and mode of lubrication. Elastohydrodynamic lubrication occurs in roller bearings under operating conditions and is characterized by a significant rise in pressure within the lubricating film inside of the contact area.

Main roles of lubricants:

- Decrease friction and wear – direct metal-to-metal contact between bearing rings, rolling elements, and cages is prevented by the use of lubricating film that decreases friction and wear in the contact areas.
- Extend fatigue life – bearing fatigue life depends, in particular, on the viscosity and film thickness of the lubricant between contact surfaces.
- Heat dissipation – oil circulation can dissipate excess frictional heat or heat from the external environment from the bearing, thereby protecting the bearing against overheating and the oil against degradation.
- Protection of bearing surface against corrosion
- Preventing entry of foreign particles (contaminants) into the bearing, removal of foreign particles from the bearing oil circulation.

### *1. Types of lubrication*

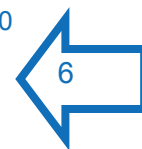
Oil or grease are used under normal conditions for bearing lubrication, or in special cases solid lubricant is used, e.g. for extreme temperatures or operation in a vacuum. When deciding on the type and method of lubrication, one must consider the operating conditions, the characteristic properties of applied lubricant, the design of the equipment, and its operating efficiency. Oil lubrication provides better lubrication characteristics, but grease lubricants make for easier use in bearings.



A comparison between oil and grease lubrication is provided in table 1.1.

grease lubrication	oil lubrication
low temperatures	high and extremely low temperatures
low speeds (65 % to 85 % of revolutions, which can be achieved during oil lubrication)	high rotational speed
protection against entry of contaminants (glands, covers)	oil seals to prevent leakage
long-term maintenance-free operation	bearings are lubricated from a central source, which also serves to lubricate other machine components
weak cooling	heat dissipation via oil circulation
removal of contaminants from grease not possible	easy removal of particles from lubricant using oil filter

Tab 1.1



## 2. Grease lubrication

Under normal conditions, most of the loadings use grease lubrication. An advantage of grease is that it holds better in the loading, it seals the housing against entry of contaminants, moisture, and water and, in particular, affords easier bearing maintenance.

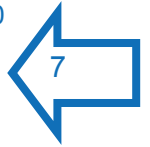


Fig. 2.1: Grease lubrication in-CTBU

Bearing grease is most often produced from high-quality mineral or synthetic oils that are thickened using fatty acid metal detergents. Greases need to have good lubricating ability and high chemical, thermal, and mechanical stability. Greases can be enriched with additives that increase the service life of the grease and bearing. When selecting grease, the most important characteristics to consider are the viscosity of the base oil, its consistency, load-bearing ability, and anti-corrosion properties.

### 2.1 Composition of grease lubricants

- Base oil – most frequently a mineral-based or synthetic oil. Lubrication properties of the grease are usually given by the properties of the base oil. Base oil viscosity is the decisive factor when selecting grease. Greases produced from low-viscosity base oil are suitable for high speed and low temperature applications, and lubricants with high-viscosity base oil are preferred for high temperature and heavy load applications.
- Thickening agent – the type of thickening agent, in particular, affects the grease dropping point and determines the application for a particular operating temperature; the higher the dropping point, the higher the temperature resistance of the grease. The maximum operating temperature of grease however is affected by the thermal resistance of the base oil. The water resistance of grease depends solely on the type of thickening agent.



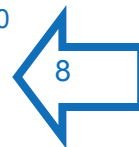
- Additives – greases often contain additives that enhance certain grease characteristics or extend its life. Among the most commonly used are antioxidants (extend life), corrosion inhibitors (improve corrosion resistance), and EP additives (extreme loads).

## 2.2 Basic grease characteristics

- Base oil viscosity – the grease viscosity is given by the base oil; it is the most important factor when selecting a grease and has the most significant effect on the thickness of the lubricating film in the contact area and hence the bearing life. The oil viscosity is defined as the measure of flow resistance during lubricant shear stress. The viscosity increases exponentially proportionally to the pressure and exponentially decreases proportionally to the temperature.
- Characteristics of captured oil – grease assumes all characteristics of the base oil, such as viscosity, freezing point, and flash point; such characteristics significantly influence the behaviour of grease.
- Consistency – greases are divided into several consistency classes according to the NLGI (National Lubricating Grease Institute) classification. The grease consistency should dramatically change within the temperature range and during mechanical loading. If an unsuitable grease consistency is selected for a given loading, then the grease may leak out of the bearing or may increase the rotation resistance and lead to insufficient oil release in the contact area.

## 2.3 Miscibility

Mixing of greases should generally be avoided. Mixing greases with different types of thickening agents can interfere with the composite and physical characteristics, which can lead to leakage of the lubricant from the bearing and potential bearing failure. Greases manufactured using the same thickener base and similar base oil can generally be mixed without any adverse effects.



An overview of roller bearing grease is provided in table 2.1.

Grease characteristics for roller bearings				
Grease type		Characteristics		
Thickening agent	Base oil	Heat range of use [°C]	Water resistance	Application
lithium soap	mineral	-20 to 130	resistant	multi – purpose lubricant
calcium soap	mineral	-20 to 50	highly resistant	good sealing effect against water
sodium soap	mineral	-20 to 100	non- resistant	emulsifies with water
aluminium soap	mineral	-20 to 70	resistant	good sealing effect against water
lithium complex soap	mineral	-20 to 150	resistant	multi – purpose
calcium complex soap	mineral	-30 to 130	highly resistant	multi – purpose high temperature, high – load lubricant
sodium complex soap	mineral	-20 to 130	resistant	suitable for high temperature, high – load
aluminium complex soap	mineral	-20 to 150	resistant	suitable for high temperature, high – load
barium complex soap	mineral	-30 to 140	resistant	suitable for high temperature, high – load
bentonite	mineral	-20 to 150	resistant	suitable for high temperature, low speeds
polycarbonide	mineral	-20 to 160	resistant	suitable for high temperature, medium speeds
lithium soap	silicone	-40 to 170	highly resistant	suitable for wide temperature and medium rotational speeds
barium complex soap	ester	-60 to 140	resistant	suitable for high temperatures and high speeds

Tab 2.1

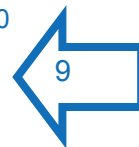
## 2.4 Amount of lubricant

The amount of grease depends on the bearing loading design, the amount of free space, the characteristics of the grease applied, and the operating temperature. An abundant use of grease in the loading causes an increase in operating temperature. Generally, the bearing is filled with grease and the free space in the bearing loading is only partially filled. The amount of grease in the free space of the loading can be determined relative to the speed:

- 1/2 to 2/3 free space at speeds below 50 % bearing limiting speeds.
- 1/3 up to 1/2 free space at speeds above 50 % bearing limiting speeds.

The bearing with grease should be run in, so that the grease can be evenly distributed throughout the bearing and so the excess grease can leak out of the bearing; the bearing can then subsequently operating





at maximum speeds. When the bearing is properly run in, the bearing temperature decreases and the operating temperature becomes stable.

Bearings operating at very low speeds, as well as the free loading space, should be fully packed with grease to protect the bearing against corrosion and entry of contaminants.

## 2.5 Re-lubrication

Bearings must be re-lubricated if the expected bearing life is longer than the uptime of the applied grease. The re-lubrication interval is significantly influenced by the type and size of the bearing, the operating speed and temperature, and by the type and quality of grease.

The re-lubrication interval is the period during which the grease possesses the required lubricating characteristics. After this period elapses, the bearing must be re-lubricated after thoroughly first removing the old grease from the bearing space. The recommended re-lubrication intervals for individual types of bearings under normal load ( $P \leq 0.15 C$ ) and normal operating conditions is provided in the diagrams on figures 9.2 and 9.3. The diagrams apply for common greases for temperatures up to +70 °C. At temperatures above +70 °C, the re-lubrication intervals are reduced to one-half their original values for every increase of 15 °C. At temperatures below 40 °C, the re-lubrication intervals may be increased two-fold.

For small, in particular single-row ball bearings, the re-lubrication intervals are several-fold greater than the expected bearing life; consequently, such bearings are generally not re-lubricated. For the reason specified above, it is preferable to use such bearings designed with shields or with seals on both sides, which are filled with grease at the factory and which never require re-lubrication. After certain speeds, the re-lubrication period falls outside of the curve on the diagram; this means that the permissible grease lubrication threshold has been exceeded. In such cases, we recommend that the loading be designed for oil lubrication.

The grease should be re-filled whenever the re-lubrication interval is longer than 6 months. The re-lubrication intervals may be greater when using extreme performance grease. More information will be provided by the ZKL Technical and Consultation Services Department.

The amount of grease required for re-lubrication can be calculated from the equation

$$Q = 0,005 * D * B \quad [g]$$

Q – quantity of grease [g]

D – outer bearing diameter [mm]

B – bearing width [mm]

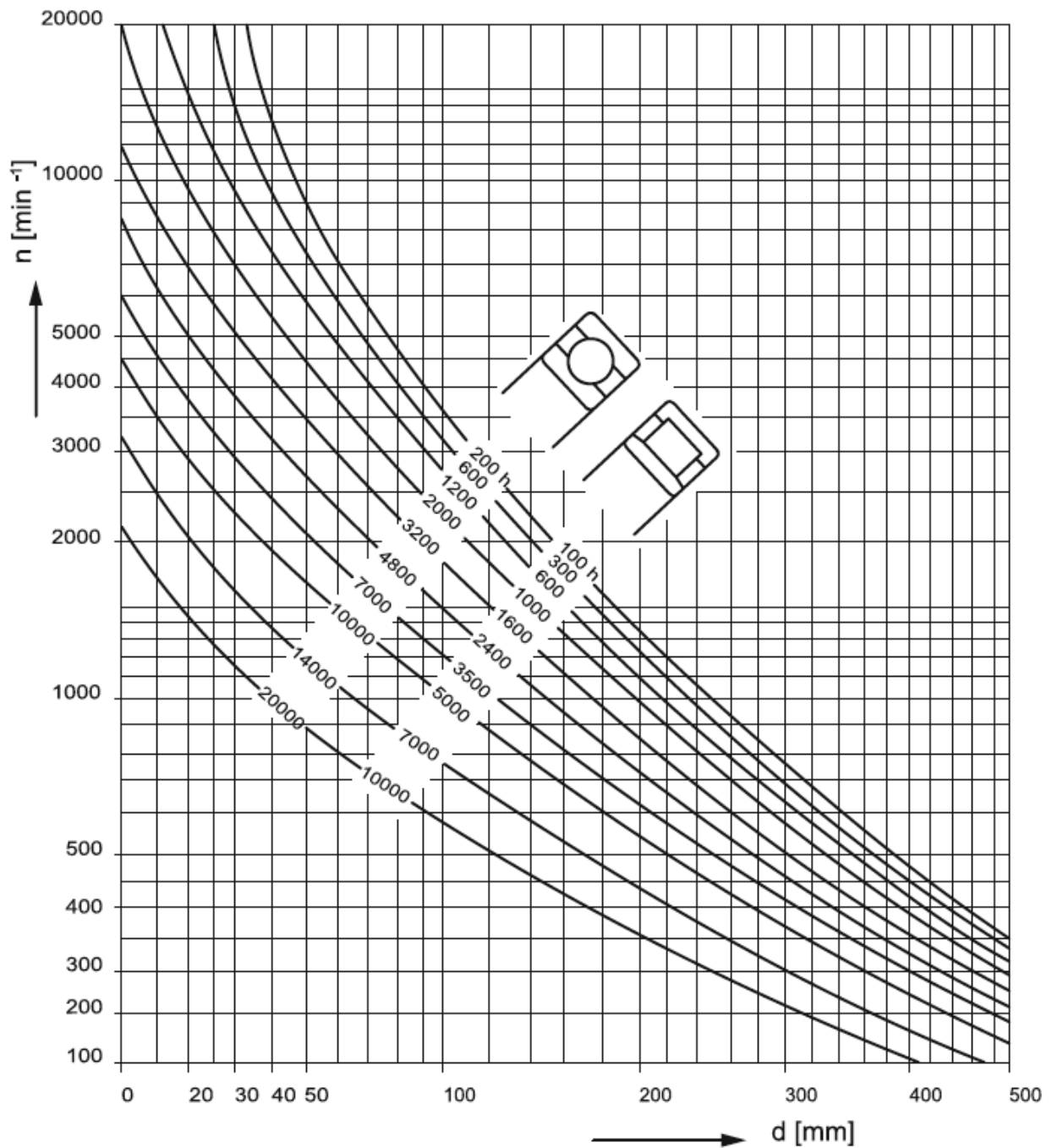


Fig.2.2

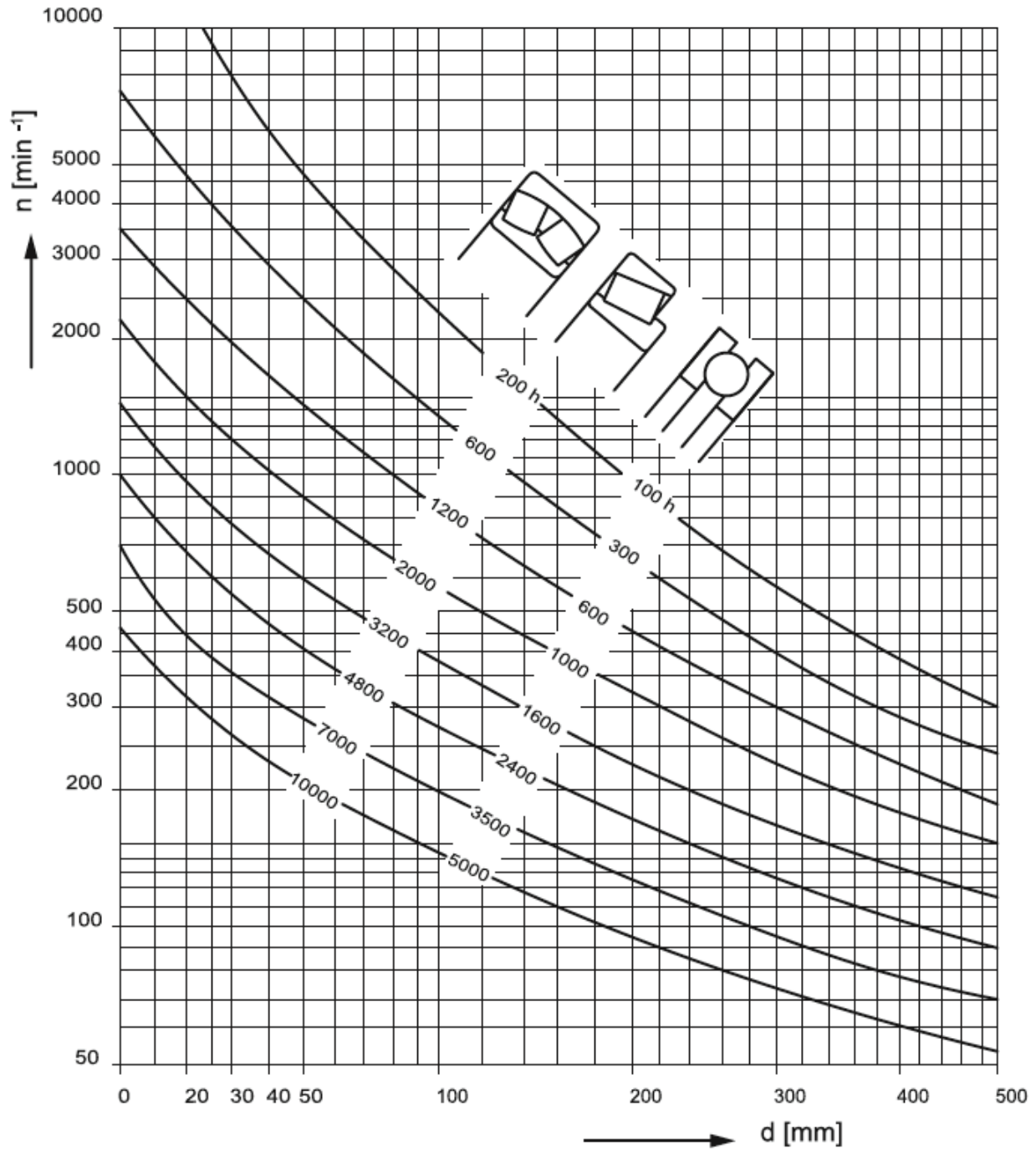


Fig 2.3



Used grease should first be removed from the bearing space in high-speed bearings, requiring more frequent re-lubrication. This helps to prevent any undesired rise in operating temperatures. A grease slinger can be used to prevent bearing over-lubrication. It comprises a plate, which rotates on a shaft and the centrifugal force pushes out any excess and degraded grease through the slot in the housing out of the bearing (fig. 2.4).

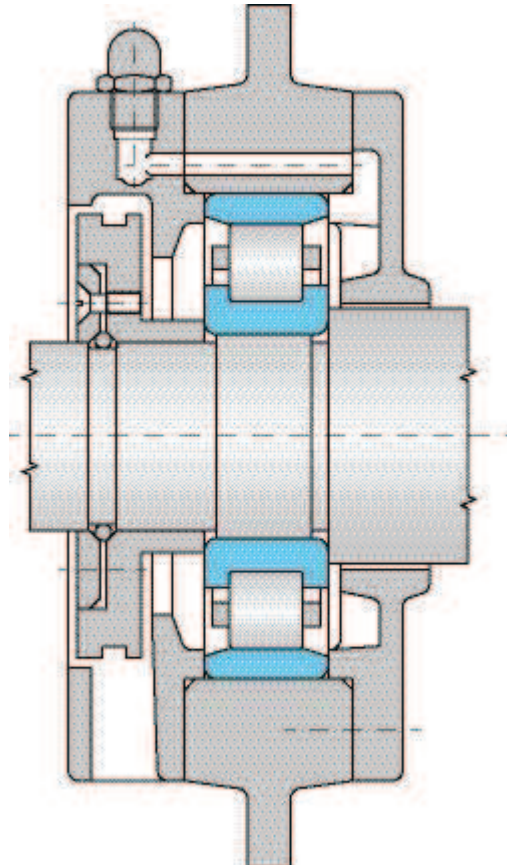


Fig. 2.4

Other factors affecting the re-lubrication interval:

- Vibrations – kneading of grease occurs during large vibrations and shocks, requiring more frequent re-lubrication. If grease becomes soft, grease with higher mechanical stability or stiffer grease must be used.
- Vertical shaft – the re-lubrication interval must be shortened by half and requires the use of glands and covers that prevent the leakage of grease from the loading.
- Contamination of grease – the re-lubrication intervals must be shortened, when the grease contains undesired particles, which can have a negative effect on the bearing life.

### 3. Oil lubrication

Oil lubrication is used when the rotation speeds are so high that the grease re-lubrication periods are too short. Another reason may be the need to dissipate heat from the bearing or when the temperature of the environment is high, which prevents the use of grease or if adjacent components already use an oil lubrication design (e.g. gearbox gears). With the exception of select spherical-roller bearings, such loadings are always lubricated with oil.

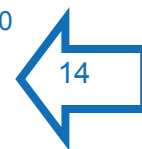
The use of oil lubrication necessitates that lubrication during running in and afterwards, during operation, be ensured. Excessive use of oil increases the oil temperature and thus the bearing temperature. The oil supply to the bearing is secured using various design methods:

- Oil bath lubrication – the most popular and simplest method of oil lubrication for low and medium rotational speeds. The oil level extends to the centre of the bottom rolling element and must be maintained at this level. The oil is carried by the rotating components of the bearing and dispersed in the bearing to return to the oil bath.
- Circulating oil lubrication – used most often in high speed applications, where the bearing needs to be cooled and for high temperature applications. Oiling is achieved by a pump. After the oil passes through the bearing, the oil is fed back into the sump, re-filtered, and cooled, as needed.
- Drop lubrication – is widely used for lubrication small ball bearings used in high speed applications.
- Oil splash lubrication – oil is splashed on the bearing by a rotating gear wheel or by a simple rotor adjacent to the bearing. The bearing does not need to be immersed in the oil bath; this method of lubrication is often used in automobile transmissions.
- Oil injection lubrication – generally used for high-speed bearings. Oil is injected under pressure directly into the bearing. The oil jet velocity must be sufficiently high to ensure that the oil penetrates through the swirling air created by the rotating parts of the bearing.
- Oil mist lubrication – injects an oil mist into the bearing. This method of lubrication is often used for lubricating spindle bearings of machining centres.
- Oil-air lubrication system – compressed air is used to supply a very small, precise amount of oil into each bearing to ensure sufficient lubrication and to better achieve lower operating temperatures and higher speeds. This lubrication method is used for lubrication most spindle bearings and for other high-speed applications.

#### 3.1 Oil lubricants

Refined oils, with good chemical stability, are generally used for lubricating bearings. Stability can be improved by the use of antioxidant additives. Mineral oil without additives is generally preferred for lubricating roller bearing; additives are used only in special circumstances. Synthetic oils are intended solely for demanding applications at extreme temperatures (high or low).

Certain types of bearings, e.g. spherical-roller bearings, spherical-roller thrust bearings, or tapered roller bearings usually achieve higher operating temperatures than other types such as, e.g. ball bearings or roller



bearings under identical operating conditions. This must also be considered when selecting the type of oil. The decisive characteristic of oil is its kinematic viscosity, which decreases as the temperature increases.

The use of oil with EP additives is recommended when the  $\chi$  ratio  $< 1$ , since they increase the oil film bearing capacity. Oil with EP additives must always be used, whenever the  $\chi$  value falls below 0.4. Improved reliability of the respective loading design is achieved if  $\chi > 1$ .

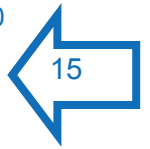
The kinematic viscosity of lubricating oil for spherical-roller thrust bearings is estimated according to table 9.3 relative to the product  $n \cdot d$ , where  $n$  is the bearing rotation speed in revolutions per minute and  $d$  is the bore diameter in mm. Lower viscosity values apply for low-load bearings, for which the relationship  $P_a \leq 0.1 C_a$  applies. Higher values apply for  $P_a > 0.1 C_a$ .

Oil viscosity for spherical – roller thrust bearings	
d*n	kinematic viscosity of oil [mm <sup>2</sup> s <sup>-1</sup> at 40°C]
1 000	250 to 550
10 000	100 to 250
100 000	45 to 100
200 000	30 to 80

Tab 3.1

### 3.2 Changing oil

The oil change interval depends on operating conditions and the oil quality used. If the operating temperature is less than 50 °C and the oil works in good operating conditions with and in a low dust environment, the oil is regularly changed once annually. If the oil temperature ranges near 100 °C, the oil must be changed approximately once every three months. The more demanding the operating conditions, the more frequent the oil changes to ensure lubricant purity and adequate state of oxidation. The use of specialized types of oils for specific operating conditions may significantly extend their uptime.



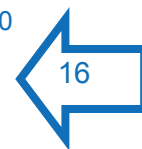
#### 4. Lubrication using solid lubricants

Solid lubricants are used for lubricating bearings only in cases, when grease or oil are unable to meet the demands for reliable lubrication under limiting friction conditions or when required to provide adequate resistance against high operating temperatures, chemicals, and similar other effects.

Graphite, MoS<sub>2</sub>, and PTFE, in particular, are used for bearing lubrication. The lubricating mechanism is given by the lattice structure of compounds; the layers of particles easily slide along each other and adhere well to a metal surface, which prevents the displacement of lubricant particles during sliding or rolling motions.

Drawbacks of solid lubricants:

- High coefficient of friction
- Inability to act as a coolant
- Limited uptime
- Low dampening of vibrational instability of rolling elements and cage



## 5. Technical Support Department

Customer needs are handled by the Technical Support Department which provides full consulting and operating services as to roller bearings. It delivers the users quick information in the field of bearings and accessories, tribology consulting, technical supervision at bearing mounting and dismounting in machinery and monitoring bearings under operation.

It cooperates with the manufacturers on roller bearing development for new machinery, assesses special bearings production prospects including large-scale bearings, cooperates on the testing of new types of bearings, elaborates expertises for broken bearings, and proposes the measures for eliminating breakdown causes.

### 5.1 Offered services

- The respective department focuses on resolving the customer related problems:
- The application engineers can:
- Analyze the stock – find the problem (cooperation with the IT department)
- Propose a solution – cooperation with the construction
- Cooperation during assembly
- Provide consulting with lubrication
- Perform standard, potentially individual training for the customers





## 6. Products

## 6.1 Lubricating greases table

ZKL	Description	Working temperature (°C)	Thickener	NLGI	Base oil	Base oil viscosity (mm <sup>2</sup> /s)	EP additives	Application			Substitution SKF FAG
								Rolling bearings	Plain bearings	Gears	
LA 2	Versatile LG for mobile machines	-30 to 120	Li	2	M	120	●	●	●	○	
LA 00	Main grease of trucks and buses	-35 to 100	Li	00	M	45	●	●	●	○	
LVS 1	Versatile LG - main grease	-25 to 120	Li	1	M	110		●	●		
LVS 2	Versatile LG	-25 to 120	Li	2	M	110		●	●		LGMT 2 MULTI 2
LVS 3	Versatile LG, fan grease, vertical plain bearing	-25 to 130	Li	3	M	120		●	●		LGMT 3 MULTI 3
LV 00 EP	Gears grease, main grease	-25 to 100	Li	00	M	150	●	●	●	●	
LVT 1 EP	High-pressure LG – main grease	-25 to 120	Li	1	M	200	●	●	●		LGWM 1
LVT 2 EP	Versatile high-pressure LG	-25 to 120	Li	2	M	200	●	●	●		LGEP 2
LV 2 EP	Versatile high-pressure LG	-30 to 120	Li	2-3	M	50	●	●	●		
LV 2 EPS	LG for railway bearings	-30 to 120 (130)	Li	3	M	50	●	●	●		
LC 2	High-temperature lubrication	-20 to 150 (180)	Li complex	2	M	170	●	●	●		LGWA 2 LOAD 150
LV 2 WR	LG resistant to water	-20 to 120	Li	2	M	110	●	●	●		
LVT 2 M	LG with MoS <sub>2</sub> additive	-25 to 120	Li	2	M	200	●	○	●	●	
LVG 2	LG with graphite additive	-30 to 120	Li	2-3	M	50		○	●	○	
MOLYKA G	LG with graphite and MoS <sub>2</sub> additive	-30 to 120	Li	2-3	M	50		○	●	○	
G 3	LG with graphite additive	-30 to 70	Ca	3	M	50			●		

● complied fully    ○ complied



## 6.2 Lubricating greases

- **ZKL G 3**

NLGI 3

### **INDUSTRIAL LUBRICATING GREASE FOR PLAIN BEARINGS WITH THE CONTENTS OF GRAPHITE**

#### **Description:**

ZKL G 3 is lubricating grease made of carefully selected mineral base oils thickened with calcium soap. It contains high-quality, chemically pure graphite that markedly enhances its emergency properties. It is of short-fibre structure, semi-solid consistency, and gray to black.

#### **Application:**

This grease is designed mainly for the lubrication of plain bearings operating under increased pressure. It is also used for the lubrication of slow-speed, loaded rolling bearings and certain geared transmissions (especially slow-speed open transmissions). Its application is appreciated during when running-in plain bearings as well as when lubricating automotive laminated springs, guide plates of certain machining tools, friction surfaces in mobile mechanisms made of wood, etc. It is often used for the treatment of certain plain bearings in specified types of mobile machines such as construction machines, agricultural machines – combine harvesters, lawn mowers, etc.. It is ideal for the lubrication of all types of mobile bearings operating in a humid environment or in direct contact with water. This grease has very good emergency properties that allow for its application wherever there is danger of short run without sufficient grease supply.

#### **Classification and specifications:**

*ISO 6743/9 CAHB 3*

*DIN 51 502 KF3C-30*

#### **Characteristic properties:**

- Guarantees the low wear and high operating reliability of lubricated bearings operating under difficult to severe conditions
- Very good resistance facilitates applications in all environments where grease comes into contact with humidity/moisture or into direct contact with water
- Prevents lubricated bearings against corrosion
- Good emergency properties (contains high-quality graphite)
- Provides a good utility values and price ratio



**Characteristic parameters:**

Specifications	Units	Value	Standard
Working temperature	°C	-30 to 70	
Thickener		Ca soap	
Walk penetration (60 strokes)	10 <sup>-1</sup> mm	215 - 255	ČSN 65 6307
Dropping point	°C	95	ČSN 65 6305
Kin. viscosity of basic oil at 40 °C – inf.	mm <sup>2</sup> /s	50	ČSN EN ISO 3104

**Available pack size:**

- 250 g, 8 kg can
- 40 kg barrel



• **ZKL LA 00**

NLGI 00

**SEMI-FLUID GREASE FOR CENTRAL LUBRICATION SYSTEM**

**Description:**

ZKL LA 00 is semi-fluid grease produced from thoroughly selected base oils of top quality, thickened with lithium soap and fortified with anti-oxidation, anti-rust and EP additives (extreme pressure).

**Application:**

It is especially determined for use in central lubrication systems of trucks, buses and other machines for the lubrication of rolling and plain bearings, sliding surfaces working with middle up to higher load. Excellent fluidity of lubricant ensures a good supply of lubricant to the lubricated nodes (steering, brakes, clutches trailers and other units).

**Classification and specifications:**

ISO 6743/9 CBEB 00

DIN 51 502 GP00G-35

**Characteristic properties:**

- Guaranteed low wear and high operating reliability of lubricated bearings
- Suitable for lubrication of plain and rolling bearings and sliding surfaces
- Low passive resistance allows its use in central lubrication systems with long pipelines (even at low temperatures)
- Very good pumpability even at low temperatures
- Long-term applications over a wide range of service conditions (temperature, rpm, etc.)
- Very good water resistance
- Excellent protection against corrosion

**Characteristic parameters:**

Specifications	Units	Value	Standard
Working temperature	°C	-35 to 100	
Thickener		Li soap	
Walk penetration (60 strokes)	10 <sup>-1</sup> mm	400 – 440	ČSN ISO 2137
Dropping point	°C	160	ČSN ISO 2176
Kin. viscosity of basic oil at 40 °C – inf.	mm <sup>2</sup> /s	45	ČSN EN ISO 3104

**Available pack size:**

- 8 kg can
- 40,170 kg barrel



- **ZKL LA 2**

NLGI 2

**MULTIPURPOSE PLASTIC GREASE FOR MOBILE MACHINES**

**Description:**

ZKL LA 2 is a plastic grease made of carefully selected high-quality petroleum oil hardened with lithium soap. It is refined with oxidation and corrosion inhibitors and with high-pressure additive (EP). It has short-fibre structure, is of medium-soft up to medium consistence, and of green-brown colour.

**Application:**

The grease is particularly intended for greasing of wide range of roller bearings with medium up to increased load that are used in cars and other mobile machines. It is suitable for greasing of friction bearings, bearings of small gear drives and of other friction-type connections. It is capable of long-term function at medium circumferential speeds in wide temperature range. It is used as the multipurpose grease in shops occupied with manufacture and repairs of cars and mobile machines. It is most commonly utilized for greasing of roller bearings with or without after-greasing (long-term up to lifetime grease fillings - e.g. wheel hub bearings, universal joint trunnion bearings, bearings of smaller or medium electric motors - dynamos, generators etc.). It is successfully applied in greasing of friction bearings of car chassis and mobile machines, namely both in case of friction-type connections with lifetime grease filling (e.g. some ball joints), and friction bearings with intermittent or continuous after-greasing (e.g. knuckle pins and other friction points of car chassis). It is occasionally used for greasing of other friction-type connections (e.g. small gear drives etc.) as well. Good water resistance also predestines this product for application in bearings working in possible water contact (bearings of water pumps in cars, of wheel hubs, of friction bearings of car chassis etc.). This grease also finds its use in common applications in household.

**Classification and specifications:**

ISO 6743/9 CCEB 2

DIN 51 502 KP2K-30

**Characteristic properties:**

- guarantees low wear and high operating reliability of greased bearings;
- it is suitable for greasing of loaded roller and friction bearings, of small gear drives etc. in cars and other mobile machines;
- is applicable in wide range of operation conditions (temperatures, revolutions etc.) in the long term;
- resists water very well;
- protects greased bearings against corrosion excellently;
- it is a multi-purpose plastic grease for mobile machinery – it contributes to rationalization of lubricant range;
- is also suitable for application in household (small rotary appliances, electric consumers with greased contacts etc.).



**Characteristic parameters:**

Specifications	Units	Value	Standard
Working temperature	°C	-30 to 120	
Thickener		Li soap	
Penetration at 25 °C	10 <sup>-1</sup> mm	250 – 290	ČSN ISO 2137
Dropping point	°C	180	ČSN ISO 2176
Kin. viscosity of basic oil at 40 °C – inf.	mm <sup>2</sup> /s	130	ČSN EN ISO 3104

**Available pack size:**

- 250 g, 1, 8 kg can
- 400 g cartridge
- 40, 170 kg barrel



• **ZKL LC 2**

NLGI 2

**SPECIAL MULTI-PURPOSE INDUSTRIAL GREASE**

**Description:**

ZKL LC 2 is lubricating grease produced from thoroughly selected base oils of top quality, thickened with lithium complex soap and fortified with anti-oxidation and anti-rust additives. It also contains an extreme-pressure (EP) additive. The grease has a short-fibred structure with moderately soft consistency and brown colour.

**Application:**

The grease is recommended for lubrication of rolling element bearings running under increased temperatures; it is suitable for lubrication of plain bearings and small toothed gears as the case may be. The grease typically possesses high temperature and oxidation stability enabling its use in moving assemblies working up to approx. 150 °C (or even up to 180 °C in short re-greasing intervals) for relatively long periods. Good water resistance makes this product suitable for lubricating of bearings in potential contact with water.

**Classification and specifications:**

ISO 6743/9 BEEB 2

DIN 51 502 KP2P-30

**Characteristic properties:**

- Guaranteed low wear and high operating reliability of lubricated bearings
- Suitable for lubrication antifriction and plain bearings, small toothed gears, etc.
- Excellent high temperature and oxidation stability – the grease can be used over a wide range of service conditions – up to 150 °C or even up to 180 °C in short re-greasing intervals)
- Very good water resistance
- Excellent protection against corrosion

**Characteristic parameters:**

Specifications	Units	Value	Standard
Working temperature	°C	-30 to 150 (180)	
Thickener		Li complex soap	
Penetration at 25 °C	10 <sup>-1</sup> mm	260	ČSN ISO 2137
Dropping point	°C	185	ČSN ISO 2176
Kin. viscosity of basic oil at 40 °C – inf.	mm <sup>2</sup> /s	175	ČSN EN ISO 3104

**Available pack size:**

- 1, 8 kg can
- 400 g cartridge
- 40, 170 kg barrel



• **ZKL LV 00 EP**

NLGI 00

**INDUSTRIAL GREASE FOR EXTREME PRESSURES**

**Description:**

ZKL LV 00 EP is semi-fluid grease produced from thoroughly selected base oils of top quality, thickened with lithium soap and fortified with anti-oxidation, anti-rust and EP additives (extreme pressure).

**Application:**

The grease is particularly recommended for lubrication gearboxes and engines with reducer, requiring semi-fluid grease, plain and rolling bearings and sliding surfaces operating at elevated pressures and high dynamic stress. The grease creates a flexible lubricating film with high pressure resistant. This grease is suitable for central lubrication systems.

**Classification and specifications:**

ISO 6743/9 BBEB 00

DIN 51 502 GP00G-30

**Characteristic properties:**

- Guaranteed low wear and high operating reliability of lubricated bearings
- Suitable for lubrication of enclosed gears
- Suitable for lubrication of loaded plain and rolling bearing
- Low passive resistance allows its use in central lubrication systems
- Good water resistance
- Excellent protection against corrosion

**Characteristic parameters:**

Specifications	Units	Value	Standard
Working temperature	°C	-25 to 100	
Thickener		Li soap	
Walk penetration (60 strokes)	10 <sup>-1</sup> mm	400 – 440	ČSN ISO 2137
Dropping point	°C	180	ČSN ISO 2176
Kin. viscosity of basic oil at 40 °C – inf.	mm <sup>2</sup> /s	200	ČSN EN ISO 3104

**Available pack size:**

- 8 kg can
- 170 kg barrel





- **ZKL LV 2 EP**

NLGI 2-3

**MULTI-PURPOSE INDUSTRIAL LUBRICATING GREASE FOR HIGH- PRESSUER APPLICATIONS**

**Description:**

ZKL LV 2 EP is lubricating grease made of carefully selected high-quality mineral base oils thickened with complex lithium soap. It is refined with additives to fight oxidation and corrosion. It contains an EP additive. It is of short-fibre structure, semi-soft to medium consistency, and yellowish to light brown colour.

**Application:**

This grease is designed mainly for the lubrication of rolling bearings operating under increased pressure and high dynamic loads. It is also suitable for plain bearings, small size geared transmissions exposed to low or medium loads, and other areas requiring lubrication. It retains its operating qualities over a long term even when operated at a broad temperature range. Its use is convenient in bearings with higher peripheral speeds. It is used as all-purpose grease in engineering and other workshops, especially in those that require the lubrication of severely and/or dynamically loaded bearings. The typical example of its application is the lubrication of rolling bearings in vibration exciters operating in a great number of industrial fields (transport equipment, jarring grates, etc.). It can also be used at home. It is often used to lubricate loaded rolling bearings requiring additional lubrication as well as bearings operated without additional lubrication. The service life of this grease is very long or even for life (for instance, bearings in small-size or medium-size electromotors, dynamos, alternators, motors of home electrical appliances, encased bearings, etc.). Its good water resistance makes this product an ideal agent for the lubrication of bearings operating in an environment with possible contact with water (bearings in washing machines, water pumps in automobiles, etc.).

**Classification and specifications:**

*ISO 6743/9 CCEB 2-3*

*DIN 51 502 KP2/3K-30*

**Characteristic properties:**

- Guarantees the low wear and high operating reliability of lubricated bearings
- Suitable for the lubrication of severely loaded rolling and plain bearings, small-size geared transmissions, etc.
- Retains its operating qualities at a broad range of working conditions (temperature, revolutions, etc.)
- Good water resistance
- Strong protection of lubricated bearings against corrosion
- All-purpose plastic grease for engineering and other workshops – improved management of the stock of greases and lubricants
- Suitable for home applications (small-size rotary devices, electrical appliances with lubricated contacts, etc.)



**Characteristic parameters:**

Specifications	Units	Value	Standard
Working temperature	°C	-30 to 120	
Thickener		Li soap	
Walk penetration (60 strokes)	10 <sup>-1</sup> mm	240 – 280	ČSN 65 6307
Dropping point	°C	195	ČSN 65 6305
Kin. viscosity of basic oil at 40 °C – inf.	mm <sup>2</sup> /s	50	ČSN EN ISO 3104

**Available pack size:**

- 250 g, 1, 8 kg can
- 400 g cartridge
- 40, 170 kg barrel



**• ZKL LV 2 EPS**

NLGI 3

**MULTI-PURPOSE INDUSTRIAL LUBRICATING GREASE FOR HIGH-PRESSURE APPLICATIONS**

**Description:**

ZKL LV 2 EPS is lubricating grease made of carefully selected high-quality mineral base oils thickened with lithium soap. It contains additives to fight oxidation and corrosion. It contains an EP additive. It is of short-fibre structure, medium-soft consistency, and yellowish to light brown colour.

**Application:**

This grease is designed mainly for the lubrication of rolling bearings operating under increased pressure and high dynamic loads. It is also suitable for plain bearings and other areas requiring lubrication. It retains its operating qualities over a long term even when operated at a broad temperature range. It is often used for the treatment of both severely loaded rolling bearings that require additional lubrication and bearings without additional lubrication. The service life of this grease is very long or even unlimited (for instance, bearings in electromotors, dynamos, alternators, motors in electrical appliances, etc.). Its good water resistance makes this product an ideal agent for the lubrication of bearings operating in an environment with possible contact with water. This grease is highly suitable for the lubrication of vertically mounted rolling bearings.

**Classification and specifications:**

ISO 6743/9 CCEB 3

DIN 51 502 KP3K-30

**Characteristic properties:**

- Guarantees the low wear and high operating reliability of lubricated bearings
- Suitable for the lubrication of severely loaded rolling and plain bearings
- Retains its operating qualities at a broad range of working conditions
- Suitable for the lubrication of vertically mounted rolling bearings
- Good water resistance
- Strong protection of lubricated bearings against corrosion

**Characteristic parameters:**

Specifications	Units	Value	Standard
Working temperature	°C	-30 to 120	
Thickener		Li soap	
Walk penetration (60 strokes)	10 <sup>-1</sup> mm	230 – 260	ČSN 65 6307
Dropping point	°C	195	ČSN 65 6305
Kin. viscosity of basic oil at 40 °C – inf.	mm <sup>2</sup> /s	50	ČSN EN ISO 3104

**Available pack size:**

- 8kg can
- 40, 170 kg barrel



**• ZKL LV 2 WR**

NLGI 2

**INDUSTRIAL GREASE FOR EXTREME PRESSURES WATER RESISTANT**

**Description:**

ZKL LV 2 WR is grease produced from thoroughly selected base oils of top quality, thickened with lithium soap and fortified with anti-oxidation, anti-rust, EP additives (extreme pressure) and special water resistant additives. The grease is a semi-soft to medium consistency, yellow to brown colour.

**Application:**

The grease is determined for lubrication of rolling and plain bearings, sliding surfaces working there where is excessive exposure to liquid splashes. It is used as a special grease resistant against spray water and cutting fluids. This grease finds the application in engineering, metallurgy and other industries.

**Classification and specifications:**

ISO 6743/9 BCHB 2

DIN 51 502 KP2K-20

**Characteristic properties:**

- Guaranteed low wear and high operating reliability of lubricated bearings
- Suitable for lubrication of heavily loaded rolling and plain bearing, small toothed gears, etc.
- Very good resistance to spraying water including metalworking fluids
- Excellent protection against corrosion

**Characteristic parameters:**

Specifications	Units	Value	Standard
Working temperature	°C	-20 to 120	
Thickener		Li soap	
Walk penetration (60 strokes)	10 <sup>-1</sup> mm	260 – 310	ČSN ISO 2137
Dropping point	°C	185	ČSN ISO 2176
Water spray off test	% whg	70	ASTM D 4049
Kin. viscosity of basic oil at 40 °C – inf.	mm <sup>2</sup> /s	110	ČSN EN ISO 3104

**Available pack size:**

- 1, 8 kg can
- 170 kg barrel



- **ZKL LVG 2**

NLGI 2 -3

**MULTIPURPOSE INDUSTRIAL PLASTIC GREASE WITH GRAPHITE CONTENT**

**Description:**

ZKL LVG 2 is plastic grease made of carefully selected high-quality petroleum oil thickened with lithium soap. It is refined with additives against oxidation and rusting. It contains high-quality graphite, which improves its emergency properties and positively affects its capability to resist increased pressures. It has short-fibre structure, is of medium-soft up to medium consistence, and of black colour.

**Application:**

It is particularly intended for greasing of roller and friction bearings working at increased pressures and at high dynamic stress; it is also suitable for greasing of gear drives and other greased points. It is capable of long-term function in wide temperature range. It is frequently used at greasing of loaded roller bearings both with after-greasing and bearings operated without after-greasing (long-term up to lifetime filling). It is advantageously used for greasing of railway vehicle mechanisms and for greasing of impact loaded friction bearings (pins and bushes of mobile machines, leaf springs, cardan shafts etc.). With regard to content of solid grease component it is not recommended in roller bearings with higher circumferential speeds. Good water resistance also predestines this product for application in bearings working in water contact.

**Classification and specifications:**

*ISO 6743/9 CCEB 2/3*

*DIN 51 502 KF2/3K-30*

**Characteristic properties:**

- guarantees low wear and high operating reliability of greased bearings;
- it is suitable for greasing of highly loaded roller and friction bearings, gear drives etc.;
- has very good emergency properties;
- is applicable in wide range of operation conditions in the long term;
- resists water well;
- protects greased bearings against corrosion excellently.



**Characteristic parameters:**

Specifications	Units	Value	Standard
Working temperature	°C	-30 to 120	
Thickener		Li soap	
Penetration at 25 °C	10 <sup>-1</sup> mm	240 – 280	ČSN 65 6307
Dropping point	°C	180	ČSN 65 6305
Kin. viscosity of basic oil at 40 °C – inf.	mm <sup>2</sup> /s	50	ČSN EN ISO 3104

**Available pack size:**

- 8 kg can
- 400 g cartridge
- 40, 170 kg barrel



- **ZKL LVS 1**

NLGI 1

**INDUSTRIAL LUBRICATING GREASE**

**Description:**

ZKL LVS 1 is lubricating grease produced from thoroughly selected base oils of top quality, thickened with lithium soap and fortified with anti-oxidation and anti-rust additives. The grease has a short-fibred structure with soft consistency and yellowish to light brown colour.

**Application:**

The grease is particularly recommended for lubrication of rolling element bearings running under normal operating conditions; it is suitable for lubrication of plain grease lubricated bearings and small toothed gears with small or medium loads and other lubricated places.

The grease is capable of long-term service within a wide range of temperatures. It is advantageous to use in central lubrication systems with long pipelines. The good resistance against water makes this product particularly suitable for bearings working in contact with water.

**Classification and specifications:**

ISO 6743/9 BCEA 1

DIN 51 502 K1K-20

**Characteristic properties:**

- Guaranteed low wear and high operating reliability of lubricated bearings
- Suitable for lubrication antifriction and plain bearings, small toothed gears, etc.
- Long-term applications over a wide range of service conditions (temperature, rpm, etc.)
- Low passive resistance allows its use in central lubrication systems
- Good water resistance
- Excellent protection against corrosion

**Characteristic parameters:**

Specifications	Units	Value	Standard
Working temperature	°C	-25 to 120	
Thickener		Li soap	
Penetration at 25 °C	10 <sup>-1</sup> mm	310 – 340	ČSN 65 6307
Dropping point	°C	185	ČSN 65 6305
Kin. viscosity of basic oil at 40 °C – inf.	mm <sup>2</sup> /s	110	ČSN EN ISO 3104

**Available pack size:**

- 8 kg can
- 40, 170 kg barrel



- **ZKL LVS 2**

NLGI 2

**INDUSTRIAL LUBRICATING GREASE**

**Description:**

ZKL LVS 2 is lubricating grease produced from thoroughly selected base oils of top quality, thickened with lithium soap and fortified with anti-oxidation and anti-rust additives. The grease has a short-fibred structure with soft to medium consistency and yellowish to light brown colour.

**Application:**

The grease is particularly recommended for lubrication of rolling element bearings running under normal operating conditions; it is suitable for lubrication of plain grease lubricated bearings and small toothed gears with small or medium loads and other lubricated places.

The grease is capable of long-term service within a wide range of temperatures. It is advantageously used for lubrication of bearings at medium higher peripheral speeds (speed factor  $n \times d_s$  up to approx. 250,000 to 300,000) within a wide range of temperatures. It is also used as universal grease for general engineering and similar purposes, in households, automotive and other applications. Very often the grease is used for lubrication of antifriction bearings, re-greasing of bearings as well as greased-for-life applications – i.e. long-term or sealed-for-life bearings (e.g. in small and middle-size electric motor bearings, alternators, household apparatuses, vacuum cleaner motors, etc.). The good resistance against water makes this product particularly suitable for bearings working in con-tact with water (wash-machine bearings, water pumps, etc.).

**Classification and specifications:**

*ISO 6743/9 CBEA 2*

*DIN 51 502 KP2K-20*

**Characteristic properties:**

- Guaranteed low wear and high operating reliability of lubricated bearings
- Suitable for lubrication antifriction and plain bearings, small toothed gears, etc.
- Long-term applications over a wide range of service conditions (temperature, rpm, etc.)
- Good water resistance
- Excellent protection against corrosion
- General-purpose lubricating grease for general engineering and other industries – it helps to keep the optimal range of grease
- Suitable for household applications (small rotary appliances, electrical gadgets with lubricated contacts, etc.)





**Characteristic parameters:**

Specifications	Units	Value	Standard
Working temperature	°C	-25 to 120	
Thickener		Li soap	
Penetration at 25 °C	10 <sup>-1</sup> mm	265 – 295	ČSN ISO 2137
Dropping point	°C	185	ČSN ISO 2176
Kin. viscosity of basic oil at 40 °C – inf.	mm <sup>2</sup> /s	110	ČSN EN ISO 3104

**Available pack size:**

- 8 kg can
- 40 kg barrel



- **ZKL LVS 3**

NLGI 3

**INDUSTRIAL LUBRICATING GREASE**

**Description:**

ZKL LVS 3 is a grease lubricant made of carefully selected, high quality crude oil base oils, consolidated with lithium soap. It is refined with additives against oxidation and rusting. It is of a short-fibre structure, semisoft to medium consistency and yellow to light brown colour.

**Application:**

The lubricant has been developed especially for lubricating antifriction bearings used under normal operational conditions. It is also suitable for lubricating friction bearings or other lubricated locations. The lubricant can work for a long time at low to medium circumference velocities and within a wide range of temperatures. It is used as a universal lubricant for mechanical engineering or other operations. It can be also used for regular household applications, cars, etc. Very often, it is used for lubricating antifriction bearings that are operated without any additional lubrication, i.e. for the so-called lifespan period of the lubricant (for example, bearings of small and medium size electric engines, dynamos, alternators, vacuum cleaner engines, home appliances, etc.). The lubricant has good water resistance characteristics, which allows for its use for lubricating bearings that can come into contact with water (washing machines, water pumps, etc.). Moreover, it can be conveniently used for lubricating vertically assembled antifriction bearings.

**Classification and specifications:**

*ISO 6743/9 BCEA 3*

*DIN 51 502 K3K-20*

**Characteristic properties:**

- Secures low wear and tear and a high operational reliability of given lubricated bearings;
- It is suitable for lubricating antifriction bearings (especially bearings of vertical assemblies), friction bearings, etc.;
- It can be used for long term applications within a wide range of operational conditions (temperatures, rotations, etc.);
- Resists water well;
- Superbly protects lubricated bearings against corrosion;
- It is a universal grease lubricant for mechanical engineering and other operations it plays its part in the rationalization process of the assortment of lubricants;
- It is also suitable for household applications (small rotation devices, electric appliances with lubricated contacts, etc.).



**Characteristic parameters:**

Specifications	Units	Value	Standard
Working temperature	°C	-20 to 120	
Thickener		Li soap	
Penetration at 25 °C	10 <sup>-1</sup> mm	265 – 295	ČSN 65 6307
Dropping point	°C	185	ČSN 65 6305
Kin. viscosity of basic oil at 40 °C – inf.	mm <sup>2</sup> /s	110	ČSN EN ISO 3104

**Available pack size:**

- 8 kg can
- 40 kg barrel



- **ZKL LVT 1 EP**

NLGI 1

**INDUSTRIAL LUBRICATING GREASE FOR EXTREME PRESSURES****Description:**

ZKL LVT 1 EP is lubricating grease produced from thoroughly selected base oils of top quality, thickened with lithium soap and fortified with anti-oxidation, anti-rust and EP additives (extreme pressure). The grease has a short-fibred structure with soft consistency and yellowish to light brown colour.

**Application:**

The grease is particularly recommended for lubrication of rolling element grease lubricated bearings running under increased pressures and high dynamic loading; it is also suitable for lubrication of plain bearings and small toothed gears with small or medium loads. The grease is capable of long-term service within a wide range of temperatures. It is advantageously to use in central lubrication systems with long pipelines. The good resistance against water makes this product suitable for bearings working in contact with water.

**Classification and specifications:**

ISO 6743/9 BCEB 1

DIN 51 502 KP1K-20

**Characteristic properties:**

- Guaranteed low wear and high operating reliability of lubricated bearings
- Suitable for lubrication of heavily loaded antifriction and plain bearings, small toothed gears, etc.
- Low passive resistance allows its use in central lubrication systems with long pipelines (even at low temperatures)
- Long-term applications over a wide range of service conditions (temperature, rpm, etc.)
- Very good water resistance
- Excellent protection against corrosion

**Characteristic parameters:**

Specifications	Units	Value	Standard
Working temperature	°C	-25 to 120	
Thickener		Li soap	
Penetration at 25 °C	10 <sup>-1</sup> mm	310 – 340	ČSN ISO 2137
Dropping point	°C	180	ČSN ISO 2176
Kin. viscosity of basic oil at 40 °C – inf.	mm <sup>2</sup> /s	200	ČSN EN ISO 3104

**Available pack size:**

- 8 kg can
- 40, 170 kg barrel



- **ZKL LVT 2 EP**

NLGI 2

**INDUSTRIAL LUBRICATING GREASE FOR EXTREME PRESSURES**

**Description:**

ZKL LVT 2 EP is lubricating grease produced from thoroughly selected base oils of top quality, thickened with lithium soap and fortified with anti-oxidation, anti-rust and EP additives (extreme pressure). The grease has a short-fibred structure with soft to medium consistency and yellowish to light brown colour.

**Application:**

The grease is particularly recommended for lubrication of rolling element grease lubricated bearings running under increased pressures and high dynamic loading; it is also suitable for lubrication of plain bearings and small toothed gears with small or medium loads and other lubricated places, incl. bolted connections. The grease is capable of long-term service within a wide range of temperatures. It is advantageously used for lubrication of bearings at higher peripheral speeds, as universal grease for general engineering and similar purposes, particularly in cases of prevailing requirements for heavy duty and dynamically loaded assemblies. A typical example the product favourable utilization is lubrication of rolling bearings of vibration exciters used in various industries (transport mechanisms, shaker screens, etc.). Other applications are also possible in household appliances. Very often the grease is used for lubrication of loaded bearings both for their re-greasing as well as for greased-for-life applications (e.g. in small and middle-size electric motor bearings, alternators, household apparatuses, etc.), i.e. long-term or sealed-for-life bearings. The good resistance against water makes this product suitable for bearings working in contact with water (wash-machine bearings, automotive water pumps, etc.).

**Classification and specifications:**

*ISO 6743/9 BCEB 2*

*DIN 51 502 KP2K-20*

**Characteristic properties:**

- Guaranteed low wear and high operating reliability of lubricated bearings
- Suitable for lubrication of heavily loaded antifriction and plain bearings, small toothed gears, etc.
- Long-term applications over a wide range of service conditions (temperature, rpm, etc.)
- Very good water resistance
- Excellent protection against corrosion
- General-purpose lubricating grease for general engineering and other industries – it helps to keep the optimal range of grease
- Suitable for household applications (small rotary appliances, electrical gadgets with lubricated contacts, etc.)



**Characteristic parameters:**

Specifications	Units	Value	Standard
Working temperature	°C	-25 to 120	
Thickener		Li soap	
Penetration at 25 °C	10 <sup>-1</sup> mm	260 – 300	ČSN ISO 2137
Dropping point	°C	180	ČSN ISO 2176
Kin. viscosity of basic oil at 40 °C – inf.	mm <sup>2</sup> /s	200	ČSN EN ISO 3104

**Available pack size:**

- 8 kg can
- 40, 170 kg barrel



• **ZKL LVT 2 M**

NLGI 2

**MULTIPURPOSE INDUSTRIAL PLASTIC GREASE WITH MOLYBDENUM DISULPHIDE CONTENT**

**Description:**

ZKL LV 2 M is plastic grease made of carefully selected high-quality petroleum oil thickened with lithium soap. It is refined with additives against oxidation, rusting, adhesion and with high-pressure additive (EP). It contains high-quality MoS<sub>2</sub>, which significantly improves its high-pressure and emergency properties. It has short-fibre structure, is of medium-soft up to medium consistence, and of dark grey colour.

**Application:**

It is particularly intended for greasing of roller and friction bearings working at increased up to high pressures and at high dynamic stress; it is also suitable for greasing of gear drives and other greased points. It is capable of long-term function in wide temperature range. It is frequently used at greasing of loaded roller bearings both with after-greasing and bearings operated without after-greasing (long-term up to lifetime filling). It is advantageously used for greasing of railway vehicle mechanisms and for greasing of impact loaded friction bearings (pins and bushes of mobile machines, leaf springs, cardan shafts etc.). With regard to content of solid grease component it is not recommended in roller bearings with higher circumferential speeds. Good water resistance also predestines this product for application in bearings working in water contact.

**Classification and specifications:**

ISO 6743/9 BCEB 2

DIN 51 502 KFP2K-25

**Characteristic properties:**

- guarantees low wear and high operating reliability of greased bearings;
- it is suitable for greasing of highly loaded roller and friction bearings, gear drives etc.;
- has very good emergency properties;
- is applicable in wide range of operation conditions (temperatures, revolutions etc.) in the long term;
- resists water well;
- protects greased bearings against corrosion excellently.

**Characteristic parameters:**

Specifications	Units	Value	Standard
Working temperature	°C	-25 to 120	
Thickener		Li soap	
Penetration at 25 °C	10 <sup>-1</sup> mm	270 – 310	ČSN ISO 2137
Dropping point	°C	180	ČSN ISO 2176
Kin. viscosity of basic oil at 40 °C – inf.	mm <sup>2</sup> /s	200	ČSN EN ISO 3104

**Available pack size:**

- 8 kg can
- 40kg barrel



- **ZKL MOLYKA G**

NLGI 2-3

**MULTI-PURPOSE INDUSTRIAL PLASTIC GREASE WITH MOLYBDENUM DISULPHIDE AND GRAPHITE FOR HIGH-PRESSURE APPLICATIONS**

**Description:**

ZKL MOLYKA G is plastic grease made of carefully selected high-quality mineral base oils hardened with lithium soap. It is refined with additives to fight oxidation and corrosion. It contains a mixture of premium-quality MoS<sub>2</sub> and graphite that markedly improves its high-pressure and emergency properties. It is of short-fibre structure, medium-soft to medium consistency, and black colour.

**Application:**

This grease is designed mainly for the lubrication of severely loaded slow-speed rolling bearings (revolution factor of approx. Up to 150,000 to 200,000) operated under high pressure and high dynamic loads. It is also suitable for the treatment of plain bearings (for instance, pins and bushes in mobile machines, laminated springs, Cardan shafts, etc.), geared transmissions and other areas requiring lubrication. It retains its operating qualities over a long term even when operated at a broad temperature range. It is often used for the treatment of severely loaded rolling bearings that require additional lubrication and bearings without additional lubrication. (The service life of this grease filling is very long or even unlimited). Its good water resistance makes this product an ideal agent for the lubrication of bearings operating in an environment with possible contact with water.

**Classification and specifications:**

*ISO 6743/9 CCEB 2/3*

*DIN 51 502 KF2/3K-30*

**Characteristic properties:**

- Guarantees the low wear and high operating reliability of lubricated bearings
- Suitable for the lubrication of severely loaded, slow-speed rolling and plain bearings, geared transmissions, etc.
- Very good emergency properties
- Retains its operating qualities over a long term at a broad range of working conditions (temperature, revolutions, etc.)
- Good water resistance
- Strong protection of lubricated bearings against corrosion





**Characteristic parameters:**

Specifications	Units	Value	Standard
Working temperature	°C	-30 to 120	
Thickener		Li soap	
Walk penetration (60 strokes)	10 <sup>-1</sup> mm	240 – 280	ČSN 65 6307
Dropping point	°C	180	ČSN 65 6305
Kin. viscosity of basic oil at 40 °C – inf.	mm <sup>2</sup> /s	50	ČSN EN ISO 3104

**Available pack size:**

- 250 g, 1, 8 kg can
- 400 g cartridge
- 40, 170 kg barrel



## 6.3 Lubricating oils table

ZKL	Description	ISO VG	Flash point	FZG	Application:
<i>OL-J 10</i>	Bearing oils ISO 6743 ISO-L-FC DIN 51 502: CL	10	185	-	high speed spindles in industrial textile machines and in machine tools
<i>OL-J 22</i>		22	210	-	bearings and transmissions exposed to low to medium
<i>OL-J 32</i>		32	225	-	
<i>OL-J 46</i>		46	230	-	bearings and transmissions in larger machines
<i>OL-J 68</i>		68	240	-	lower speed machines exposed to heavy loads
<i>OL-J 100</i>		100	250	-	
<i>CLP 100</i>	Industrial gear oils ISO 6743 ISO-L-CKC DIN 51 517/3 CLP AGMA 9005/D94 U.S. Steel 224	100	220	min. 12	transmissions exposed to heavy loads in wide range of speed;
<i>CLP 150</i>		150	235	min. 12	
<i>CLP 220</i>		220	235	min. 12	
<i>CLP 320</i>		320	240	min. 12	lower speed transmissions exposed to heavy loads
<i>CLP 460</i>		460	245	min. 12	
<i>CLP 680</i>		680	230	min. 12	
<i>MULTI 46</i>	Multifunction oils (hydraulic + industrial gear + guiding surfaces) ISO 6743 ISO-L-G; HM;CKC DIN 51 502: CGLP, HLP, CLP	46	210	min. 12	oils of transmissions, hydraulic circuits, guiding surfaces
<i>MULTI 68</i>		68	215	min. 12	
<i>MULTI 100</i>		100	220	min. 12	
<i>MULTI 150</i>		150	225	min. 12	
<i>MULTI 220</i>		220	230	min. 12	



## 6.4 Oils

- **ZKL CLP- J**

ISO VG 100, 150, 220, 320, 460, 680

**INDUSTRIAL GEAR OIL**

**Description:**

ZKL CLP industrial gear oils are produced from high refined base oils with additive of friction modifier, high-pressure additives, anti-oxidants and anti-corrosion additives.

**Application:**

Industrial gear oils ZKL CLP are designed in particular for lubrication of all types of industrial gearboxes, especially for heavy-load gearboxes with high-pressure in gearing; they are suitable for both the rolling drives (spur gearing and bevel gearing) and the screw drives (worm drives etc.). They are applied in a wide use during lubrication of bearings and other movable machine parts, in particular when excellent high-pressure properties of these oils are required. Oils of range ZKL CLP can be used in a lot of applications where automotive gear oils or durable compressor oils were temporarily used.

**Classification and specifications:**

ISO 6743/3                      CKC

DIN 51 517 part 3            CLP

AGMA 9005

U.S. Steel 224

**Characteristic properties:**

- excellent protection of lubricated gearboxes or other systems against wear-out – excellent high-pressure properties;
- very good anti-corrosion protection (steel and nonferrous metal);
- excellent oxidative stability guarantees long service life;
- very good demulsification properties allow for application in systems with certain level of water infiltration.



## Characteristic parameters

Specifications	Units	Value			Standard
		CLP 100	CLP 150	CLP 220	
Density at 15°C	kg / m <sup>3</sup>	895	900	903	ČSN EN ISO 3675
Kinematic viscosity at 40 °C	mm <sup>2</sup> /s	100	150	220	ČSN EN ISO 3104
Viscosity index		90	90	90	ČSN ISO 2909
Flash point	°C	234	244	257	ČSN EN ISO 2592
Pour point	°C	-30	-27	-27	ČSN ISO 3016
FZG Test, unsatisfactory degree min.	Min.	12	12	12	DIN 51 354
TIMKEN	Lb min.	60	60	60	ASTM D 2782
Anti-corrosion properties Cu		1 b	1 b	1 b	ČSN EN ISO 2160

Specifications	Units	Value			Standard
		CLP 320	CLP 460	CLP 680	
Density at 15°C	kg / m <sup>3</sup>	906	913	-	ČSN EN ISO 3675
Kinematic viscosity at 40 °C	mm <sup>2</sup> /s	320	460	680	ČSN EN ISO 3104
Viscosity index		88	90	90	ČSN ISO 2909
Flash point	°C	238	246	230	ČSN EN ISO 2592
Pour point	°C	-18	-15	-9	ČSN ISO 3016
FZG Test, unsatisfactory degree min.	Min.	12	12	12	DIN 51 354
TIMKEN	Lb min.	60	60	60	ASTM D 2782
Anti-corrosion properties Cu		1 b	1 b	1 b	ČSN EN ISO 2160

**Available pack size:**

ZKL CLP 100, 150, 220, 320, 460:

- 10 l can
- 180 kg barrel

ZKL CLP 680:

- 180 kg barrel



- **ZKL MULTI**

ISO VG 46, 68, 100, 150, 220  
**MULTIFUNCTION OILS**

**Description:**

Products of the ZKL MULTI group are high quality petroleum-based multifunction oils. They are formulated with a complex additive package, which increases lubricant's film strength and improves anti-wear, antioxidant, and antirust properties; it also modifies friction properties.

**Application:**

These oils are used for the lubrication of gearing and/or hydraulic circuits, roller bearings and guiding surfaces of various designs. They are used for the lubrication of gearboxes and other moving machine parts especially in case of heavy-duty service, where oil's EP (extreme pressure) properties are required. They are also used for the lubrication of modern machine tools working under demanding conditions, where the versatile properties and high quality of these oils come into play.

**Classification and specifications:**

<i>ISO 6743:</i>	<i>ISO- L- G</i>
	<i>ISO- L- HM</i>
	<i>ISO- L- CKC</i>
<i>DIN 51 502:</i>	<i>CGLP</i>
	<i>HLP</i>
	<i>CLP</i>

**Characteristic properties:** □

- Outstanding extreme-pressure properties
- Excellent anti-corrosion properties
- Efficient prevention of spontaneous jerking motions of heavy-loaded, slow-moving linear guides ("stick-slip" phenomenon)
- Very good stability against oxidation is the guarantee of a long service life
- Excellent adhesion properties reduce the oil leakage and guarantee its successful use even in vertical surface lubrication conditions
- Minimum foaming tendency



**Characteristic Parameters:**

Parameter	Unit	Value			Standard
		MULTI 46	MULTI 68	MULTI 100	
Kinematic viscosity at 40 °C	mm <sup>2</sup> /s	46	68	100	ČSN EN ISO 3104
Flash point	°C	210	215	215	ČSN EN ISO 2592
Pour point	°C	-21	-18	-18	ČSN ISO 3016

Parameter	Unit	Value		Standard
		MULTI 150	MULTI 220	
Kinematic viscosity at 40 °C	mm <sup>2</sup> /s	150	220	ČSN EN ISO 3104
Flash point	°C	220	220	ČSN EN ISO 2592
Pour point	°C	-12	-9	ČSN ISO 3016

**Available pack size:**

- 10 l can
- 180 kg barrel



- **ZKL OL- J**

ISO VG 10, 22, 32, 46, 68, 100

**PREMIUM QUALITY BEARING OILS**

**Description:**

The products included in the ZKL OL-J are high-quality mineral bearing oils. Deeply refined base oils are the main component in their formula. These oils contain efficient additives to enhance their oxidation stability.

**Application:**

These oils are designed for various industrial applications, especially for the long-term fillings of lubrication systems in machines and mechanical equipment operated on tempered premises whose temperature does not exceed approx. 60 °C. The typical applications of the individual viscosity categories of these oils are as follows:

- **ZKL OL-J10** - is used for the treatment of high speed spindles in industrial textile machines and in machine tools
- **ZKL OL-J22** - is used for the treatment of bearings and transmissions of machines exposed to low to medium loads, for the lubrication of undemanding hydrostatic systems, as well as for the hardening of small-size parts and components
- **ZKL OL-J32** - is used for the treatment of bearings and transmissions (most often in machine tools and textile machines) exposed to low to medium loads and for the treatment of undemanding hydraulic systems
- **ZKL OL-J46** - is used for the treatment of bearings and transmissions in larger machines (most often machine tools) exposed to low to medium loads, for the treatment of undemanding hydrostatic systems, and for hardening baths
- **ZKL OL-J68 a ZKL OL-J100** - are used for lower speed machines exposed to heavy loads

**Classification and specifications:**

*ISO 6743/2 FC*

*DIN 51 502 C*

**Characteristic properties:**

- Protects lubricated parts against wear
- Prevents corrosion
- Good resistance against oxidation guarantees long operating life



**Characteristic parameters:**

Specifications	Units	Value			Standard
		J 10	J 22	J 32	
Kinematic viscosity at 40 °C	mm <sup>2</sup> /s	10	22	32	ČSN EN ISO 3104
Viscosity index		70	90	90	ČSN 65 6218
Flash point	°C	160	190	195	ČSN 65 6218
Pour point	°C	-10	-12	-12	ČSN 65 6212
Acid. No	mg KOH/g	0,019	0,019	0,019	ČSN 65 6070

Specifications	Units	Value			Standard
		J 46	J 68	J 100	
Kinematic viscosity at 40 °C	mm <sup>2</sup> /s	46	68	100	ČSN EN ISO 3104
Viscosity index		90	92	90	ČSN 65 6218
Flash point	°C	230	255	267	ČSN 65 6218
Pour point	°C	-12	-12	-9	ČSN 65 6212
Acid. No	mg KOH/g	0,02	0,02	0,02	ČSN 65 6070

**Available pack size:**

ZKL OL J10, J22, J32, J68, J100:

- 10 l can
- 180 kg barrel

ZKL OL J46:

- 10 l can
- 50, 180 kg barrel





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