# Linear ball bearing slides

## The SKF Group

The SKF Group is an international industrial corporation of AB SKF Sweden, founded in 1907, operating in 130 countries. The company has some 45000 employees and more than 80 manufacturing facilities throughout the world.
Its international network is supported up by nearly 20000 distributors and retailers. SKF is the world leader in the rolling bearing business.
Bearings, seals and special steels are SKF's main product areas. In addition, they also manufacture and sell, other industrial precision components and products.

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One of these industrial precision products assortment is manufactured and sold by the SKF Linear Motion Division.
This unit has some 700 employees, 6 manufacturing facilities, 3 product lines. One of the division's strengths is its ability to serve the market through its organization based on 11 specialized Sales Companies located in Europe and North America; however product availability and product application support is provided word-wide by the SKF international network.

The Linear Motion product range covers:
- High Efficiency Screws
- Linear Guiding Systems
- Electromechanical Actuators

## CD-ROM "Designer"

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Thanks to "Designer", you can easily copy the drawing of the product you need into your own design drawing. If you are interested, please do not hesitate to contact your local SKF sales organization. It is free of charge.

● Linear Motion specialized companies

○ SKF Bearing companies with Linear Motion specialized salesforce

▲ Manufacturing facilities

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Earlier catalogues the data in which deviate from those given here, are rendered invalid.
The right is reserved to make changes necessitated by technological developments.

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# Foreword

This catalogue presents the linear ball bearing slide section from the SKF precision slides and tables range. These products provide simple and economical solutions to guidance and support problems in many branches of industry.

Typical applications include machine tools, machining centres, handling systems, special machinery and measuring and test as well as optical equipment.

This catalogue contains the basic data relevant to the selection of the correct product.

Please refer to catalogue 4211 E „SKF Slides and Positioning Tables“ for further technical details.

For applications in which linear ball bearing slides cannot be employed, other SKF slide systems are available, see catalogue 4211 E, pages 9 – 12 „Selection of suitable slide system“.

If you require information on slides not contained in this catalogue, please ask your SKF supplier for the relevant publication or contact the SKF Application Engineering Department. We will then provide the relevant information or work out a proposal to solve your problem.

This catalogue is based on the 1994 development and production standards.

Earlier publications, the data in which differs from that given here, are no longer valid.

We reserve the right to make changes required by the development of technology.

The units used in this catalogue are the SI units laid down in the international unit system (Système International d’Unités). Delivery is subject to the conditions of delivery and payment valid at the time of delivery.

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# Design and characteristic features

**LZBB Linear ball bearing slide**

Fig. 1a

**LZAB Linear ball bearing slide**

Fig. 1b

## General

SKF linear ball bearing slides stand out by their high load carrying capacity and accuracy. They are designed in accordance with the state of the art to fulfil present-day requirements. They are available in seven sizes and two versions:

- **LZBB with closed housing and ball screw**
  Attachment of the shafts on both sides in the shaft blocks.
  Attachment of the slide unit via the bolt holes in the two shaft blocks.

- **LZAB with open housing and ball screw**
  Attachment of the shafts over the entire length by shaft supports to prevent shaft deflection with large strokes or high loads.
  Attachment of the slide unit via the bolt holes in the two shaft supports. These holes are accessible from the top when the bellows are removed.

These are the main characteristics of SKF linear ball bearing slides:

- easy mounting
- require little space
- light-weight thanks to light alloy
- high speed and acceleration
- low drive power thanks to low friction (screw supported by roller bearings)
- high load carrying capacity
- smooth operation without stick-slip
- covered and protected from contamination
- optimum ratio of stroke to total length

See also „Selection of suitable slide system“, catalogue 4211 E, pages 9 to 11.

SKF linear ball bearing slides are also available without ball screw. See publication No. 4182 E „SKF Linear ball bearings“:

- **LZBU with closed housing, non-driven**
- **LZAU with open housing, non-driven**

## Guides

The linear ball bearing slides are equipped with SKF linear bearings of ISO series 3.

LZAB design with LBCD linear ball bearings, with closed housing, self-aligning.

LZBB design with LBCF linear ball bearings, with open housing, self-aligning.

These bearing arrangements yield a rigid guiding system having high load carrying capacity and very little operating clearance.

## Drive

The linear ball bearing slides are equipped with SKF precision ball screws with rolled thread ball screw.

- Slides of sizes 085 to 130 with SH series ball screws with ball recirculation by tube inside the nut.
- Slides of sizes 160 to 280 with SX series ball screws with internal recirculation nut.

As standard, the axial backlash of the nut is reduced (0.03 – 0.05 mm, depending on size). On request at extra cost, slide sizes 230 and 280 are also available with ball screws with the backlash eliminated.

As standard, the thread ball screws are supplied in tolerance G9 ($V_{300p}$ = 87 µm).

On request and at extra cost, the thread ball screws are available also in tolerance

G7 ($V_{300p}$ = 35 µm) or
G6 ($V_{300p}$ = 29 µm) or
G5 ($V_{300p}$ = 23 µm).

At both ends, the thread ball screws are carried in the shaft supports, at the drive end, there are preloaded angular contact ball bearings as locating bearings.

## Covers

Linear ball bearing slides are protected as standard by bellows on both sides. In addition, the linear ball bearings are sealed on one side.

If only little contamination is present in the operating environment, such as in laboratory operation, the linear ball bearing slide units can just as well run without bellows, which considerably reduces the length of the slide unit, especially with large strokes.

## Stroke

**Strokes S1 (with bellows) and S2 (without bellows)** given in the tables are **maximum travel distances between the end stops.** Depending on speed of travel and transported mass, the operating stroke is correspondingly smaller. For mean operating conditions, an additional stroke of approx. 2 x 10 mm is sufficient.

# Technical data

## Load carrying capacity and life

### Load carrying capacity

The basic dynamic load rating C is used for dimensioning linear ball bearing slides operating under load. This calculation gives the slide load which, according to the DIN definition, is equivalent to a basic rating life of 100 000 m of travel. This is based on the assumption that the load is constant in magnitude and direction.

The basic static load rating $C_0$ applies when linear ball bearing slides are loaded at standstill or operate at low speeds. It must be taken into account also when short-term heavy impact loads act on slides under dynamic running conditions.

### Life

The life of a linear ball bearing slide is considered to be the distance travelled (or the number of hours of operation at constant stroke and frequency attained) by the slide before the first signs of material fatigue (spalling) appear on the raceway or one of the rolling elements in the linear ball bearings.

It is, however, found both in laboratory trials and in practice that the life values of apparently identical bearings under completely identical running conditions differ. The calculation of the appropriate slide size therefore requires a clear statistical determination of the concept of bearing life. All references to the dynamic load rating of SKF linear ball bearings apply to the basic rating life, which, in accordance with the ISO definition, is understood as the life reached or exceeded by 90 % of a large group of apparently identical bearings. The majority of the bearings attain a longer life, half the total number of bearings reach five times the basic rating life.

### Life calculation

The adjusted rating life of linear ball bearing slides is calculated from equations 1 to 3. This adjusted calculation takes into account also factors such as reliability ($c_1$) and operating conditions ($c_2$).

(1) $$L_{ns} = c_1 \cdot c_2 \cdot \left(\frac{C_{eff}}{P}\right)^3$$

(2) $$L_{nds} = c_1 \cdot c_2 \cdot \frac{5 \cdot 10^7}{s} \cdot \left(\frac{C_{eff}}{P}\right)^3$$

(3) $$L_{nh} = c_1 \cdot c_2 \cdot \frac{5 \cdot 10^7}{s \cdot n \cdot 60} \cdot \left(\frac{C_{eff}}{P}\right)^3$$

The equations are valid only if the equivalent dynamic slide load P % 0,5 C (C being the basic dynamic load rating of the slide).

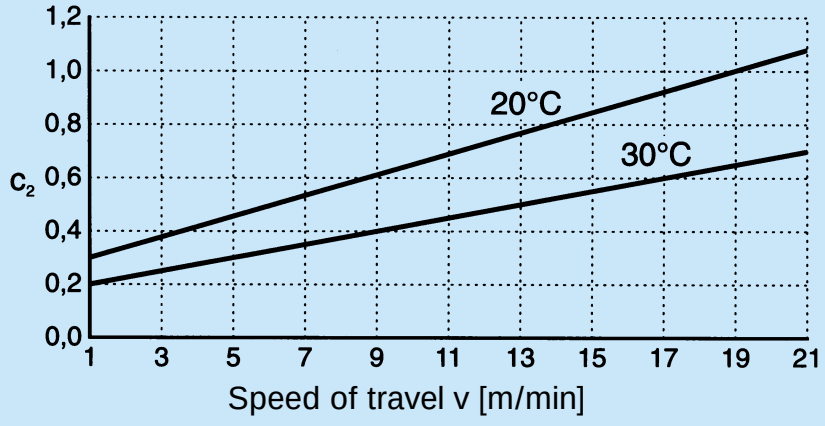
where

| | | |
|---|---|---|
| $L_{ns}$ | [$10^5$ m] | adjusted rating life, $10^5$ m, from Equation 1 |
| $L_{nds}$ | [DS] | adjusted rating life, double strokes, from Equation 2 |
| $L_{nh}$ | [h] | adjusted rating life, operating hours, from Equation 3 |
| $c_1$ | | factor for reliability, from Table 1 |
| $c_2$ | | factor for operating conditions, from Diagram 1 |
| $C_{eff}$ | [N] | effective dynamic load rating of the slide, from Equation 4 |
| P | [N] | equivalent dynamic slide load, from Equations 5 to 10 |
| s | [mm] | stroke length |
| n | [$min^{-1}$] | frequency of stroke (number of movements from one end position to the other end and back again) |

**Table 1** **Factor $c_1$**

| Reliability | $L_n$ | $c_1$ |
|---|---|---|
| % | | |
| **90** | $L_{10}$ | 1 |
| **95** | $L_5$ | 0,62 |
| **96** | $L_4$ | 0,53 |
| **97** | $L_3$ | 0,44 |
| **98** | $L_2$ | 0,33 |
| **99** | $L_1$ | 0,21 |

**Diagram 1**



Factor $c_1$ is used for the calculation of life values which are to be attained or exceeded with a greater probability than 90 %.

Factor $c_2$ for operating conditions is largely determined by bearing lubrication. In Diagram 1 it is given for lubricating grease LGEP 2 used as standard. The $c_2$ value depends on the mean speed of travel and the operating temperature.

**Effective dynamic load rating**

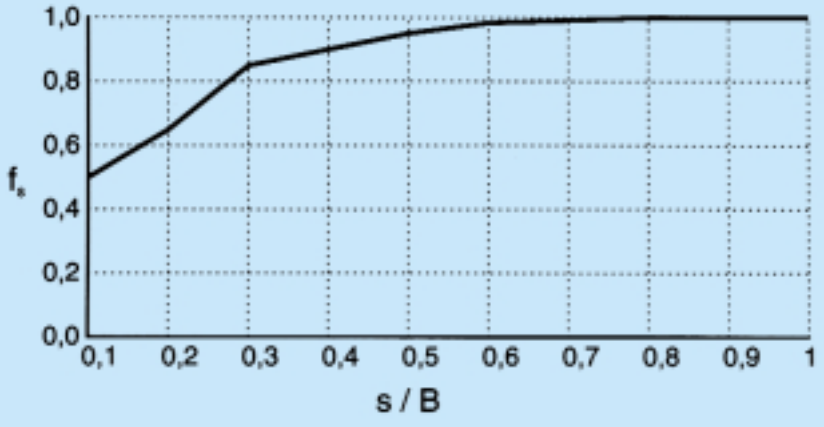
The values of basic load rating C given in Table 4 are only valid for a special load direction and optimum operating conditions. To take into account operating conditions which differ from this optimum, the effective dynamic load rating of the slide can be calculated from Equation 4.

(4) $$C_{eff} = f_s \cdot f_h \cdot C$$

where

| | | |
|---|---|---|
| $C_{eff}$ | [N] | effective dynamic load rating of the slide, from Equation 4 |
| $f_s$ | | factor for stroke length, from Diagram 2 |
| $f_h$ | | factor for surface hardness of the shaft<br>1 for standard shafts<br>0,8 for stainless steel shafts |
| C | [N] | dynamic load rating of the slide, from Table 4 |
| s | [mm] | stroke length |
| B | [mm] | length or width of linear bearing housing, from table of dimensions, pages 14 – 21 |

**Diagram 2**



**Equivalent dynamic slide load**

If the load F acting on the slide corresponds to the requirements for basic load rating C, then P = F and the load can be inserted directly into the life equation.

In all other cases is it necessary to calculate the equivalent dynamic slide load from Equations 5 to 10. It is defined as that hypothetical load which will have the same effect on life as the actual load to which the bearing is subjected under the given conditions.

Under constant load:

(5) $$P = \frac{f_d}{f_l} \cdot F$$

Under varying loads:

(6) $$P = \frac{f_d}{f_l} \cdot \sqrt[3]{\frac{F_1 \cdot s_1 + F_2 \cdot s_2 + \ldots}{s}}$$

Under constantly increasing load:

(7) $$P = \frac{f_d}{f_l} \cdot 0{,}33 \cdot \left(F_{min} + F_{max}\right)$$

Under moment load:

(8) $$P = \frac{f_d}{f_l} \cdot F + f_d \cdot C_0 \cdot \frac{M}{M_{x0}}$$ [1)]

or

(9) $$P = \frac{f_d}{f_l} \cdot F + f_d \cdot C_0 \cdot \frac{M}{M_{y0}}$$ [1)]

or

(10) $$P = \frac{f_d}{f_l} \cdot F + f_d \cdot C_0 \cdot \frac{M}{M_{z0}}$$ [1)]

where

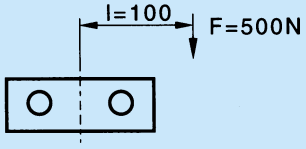
| | | |
|---|---|---|
| P | [N] | equivalent dynamic slide load, from Equations 5 to 10 |
| $f_d$ | | factor for load conditions, from Table 2 |
| $f_l$ | | factor for load direction, from Table 3 |
| F | [N] | constant dynamic slide load |
| $F_1$, $F_2$ | [N] | constant load during stroke percentages $s_1$, $s_2$, ... |
| $s_1$, $s_2$ | [mm] | stroke percentage of the entire stroke s, during which loads $F_1$, $F_2$, ... act |
| s | [mm] | stroke length |
| $F_{min}$, $F_{max}$ | [N] | minimum or maximum dynamic slide loads |
| M | [Nm] | constant dynamic moment acting on the slide |
| $M_{x0}$ | [Nm] | permissible static moment of the slide around the X axis, from Table 4 |
| $M_{y0}$ | [Nm] | permissible static moment of the slide around the Y axis, from Table 4 |
| $M_{z0}$ | [Nm] | permissible static moment of the slide around the Z axis, from Table 4 |

1) The interrelationship of slide load and moment must also be taken into account.

Example:

$$M = F \cdot l = 500 \cdot 0{,}1 = 50 \text{ Nm}$$

into (8) $$P = \frac{f_d}{f_l} \cdot 500 + f_d \cdot C_0 \cdot \frac{50}{M_{x0}}$$ [1)]



**Static load carrying capacity**
The static load carrying capacity of a slide must not be exceeded at any time. Therefore, there should be a sufficiently large static safety factor, depending on the application, which can be obtained from the following equation:

(11) $$S_0 = \frac{C_{0eff}}{P_0}$$

where
$S_0$ static safety factor
$C_{0eff}$ [N] effective static load rating of the slide, from Equation 12
$P_0$ [N] equivalent static load of the slide, from Equations 13 to 17

Approximate values for the required static safety factor $s_0$, depending on the operating conditions:

- Smooth, vibration-free operation: $s_0 \geqq 2$
- Heavy shock loading: $s_0 \geqq 4$

**Effective static load rating**
The effective static load rating of a slide depends only on the surface hardness of the shafts and is calculated from the following equation:

(12) $$C_{0eff} = f_{h0} \cdot C_0$$

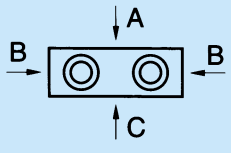
where
$C_{0eff}$ [N] effective static load rating of the slide, from Equation 12
$f_{h0}$ factor for surface hardness of the shaft
1 for standard shafts
0,95 for stainless steel shafts
$C_0$ [N] static basic load rating of the slide, from Table 4

**Table 2 Factor $f_d$ for load rating**

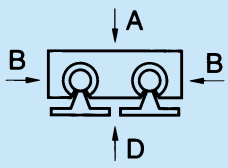
| Load conditions | $f_d$ | |
|---|---|---|
| | from | to |
| Smooth running without shock loading | 1,0 | 1,2 |
| Light shock loading | 1,2 | 1,5 |
| Heavy shock loading | 1,5 | 3,0 |

**Table 3 Factor $f_l$ for linear ball bearing slides of version**

**LZBB**




**LZAB**




**Factor $f_l$ for load case**

| A | B | C | D |
|---|---|---|---|
| 1 | 0,68 | 0,65 | 0,38 |

**Equivalent static slide load**

In analogy to the equivalent dynamic slide load, the equivalent static slide load is calculated from equations 13 to 17.

Under constant load:

(13) $$P_0 = \frac{1}{f_l} \cdot F_0$$

Under moment load:

(14) $M_0 \leqq M_{x0}$ or $M_{y0}$ or $M_{z0}$ (depending on the direction of moment)

(15) $$P_0 = \frac{1}{f_l} \cdot F_0 + C_0 \cdot \frac{M_0}{M_{x0}}$$ 1)

or

(16) $$P_0 = \frac{1}{f_l} \cdot F_0 + C_0 \cdot \frac{M_0}{M_{y0}}$$ 1)

or

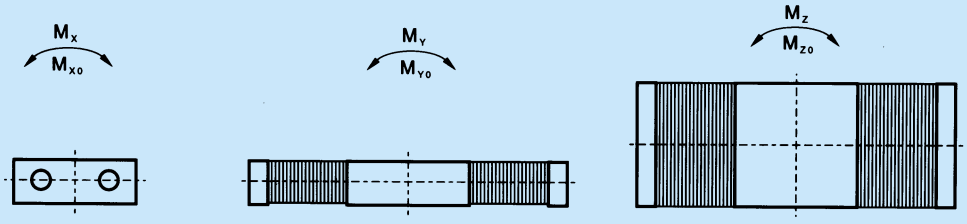
(17) $$P_0 = \frac{1}{f_l} \cdot F_0 + C_0 \cdot \frac{M_0}{M_{z0}}$$ 1)

where

| | | |
|---|---|---|
| $P_0$ | [N] | equivalent static slide load, from Equations 13 or 15 to 17 |
| $f_l$ | | factor for load direction, from Table 3 |
| $F_0$ | [N] | constant static slide load |
| $C_0$ | [N] | basic static load rating of the slide, from Table 4 |
| $M_0$ | [Nm] | constant static moment acting on the slide |
| $M_{x0}$ | [Nm] | permissible static moment of the slide around the X axis, from Table 4 |
| $M_{y0}$ | [Nm] | permissible static moment of the slide around the Y axis, from Table 4 |
| $M_{z0}$ | [Nm] | permissible static moment of the slide around the Z axis, from Table 4 |

1) The same conditions apply as for the dynamic slide load, see example on page 8.

**Table 4 Load carrying capacity of linear ball bearing slides**




| Version Size | LZAB C | $C_0$ | $M_{x0}$ | $M_{y0}$ | $M_{z0}$ | LZBB C | $C_0$ | $M_{x0}$ | $M_{y0}$ | $M_{z0}$ |
|---|---|---|---|---|---|---|---|---|---|---|
| | N | | Nm | | | N | | Nm | | |
| **085** | 2 850 | 3 250 | 25 | 20 | 35 | 2 850 | 3 250 | 45 | 35 | 35 |
| **100** | 3 450 | 3 450 | 35 | 25 | 40 | 3 450 | 3 450 | 60 | 40 | 40 |
| **130** | 5 200 | 5 500 | 75 | 45 | 85 | 5 200 | 5 500 | 130 | 80 | 85 |
| **160** | 7 650 | 8 150 | 135 | 90 | 160 | 7 650 | 8 150 | 235 | 155 | 160 |
| **180** | 12 200 | 12 900 | 235 | 170 | 300 | 12 200 | 12 900 | 405 | 285 | 300 |
| **230** | 20 800 | 20 800 | 480 | 315 | 565 | 20 800 | 20 800 | 825 | 540 | 565 |
| **280** | 30 000 | 28 000 | 805 | 530 | 945 | 30 000 | 28 000 | 1 375 | 905 | 945 |

# Calculation of shaft deflection

For the LZBB slide version with closed housing, an approximate determination of shaft deflection and shaft misalignment relative to the linear ball bearings in central slide position can be made with Equations 18 to 20.

(18) $$f_0 = 4 \cdot 10^{-6} \cdot \frac{P \cdot a^3}{d^4} \cdot \left(2 - 3 \cdot \frac{a}{L_1}\right)$$

(19) $$tg\alpha_1 = 1{,}2 \cdot 10^{-5} \cdot \frac{P \cdot a^2}{d^4} \cdot \left(1 - 2 \cdot \frac{a}{L_1}\right)$$

(20) $$tg\alpha_2 = 0{,}0243 \cdot \frac{M \cdot a^2}{d^4 \cdot L_1}$$

(21) $$a = \frac{L}{2} - X_1$$

(22) $$L_1 = L - X_2$$

where

| | | |
|---|---|---|
| $f_0$ | [µm] | deflection of shaft or elastic deformation in the centre of the slide, from Equation 18 |
| P | [N] | load acting centrally on the slide |
| a | [mm] | distance according to Fig. 2, from Equation 21 |
| d | [mm] | shaft diameter, from Table 5 |
| $L_1$ | [mm] | distance according to Fig. 2, from Equation 22 |
| L | [mm] | total length of slide unit |
| $tg\alpha_1$ | | misalignment of shaft in housing to Fig. 2, from Equation 19 |
| $tg\alpha 2$ | | misalignment of housing to Fig. 3, from Equation 20 |
| M | [Nm] | moment acting on the slide, e.g. at Z axis |

**Maximum permissible misalignment of the shaft in the housing:**

(23) $tg\alpha < 0{,}0087 \triangleq 30''$

**Table 5 Deflection $f_0$ and misalignment $tg\alpha$**

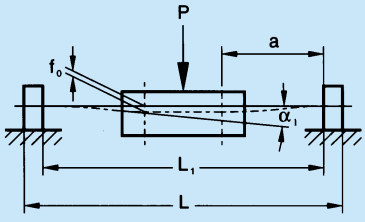



Fig. 2

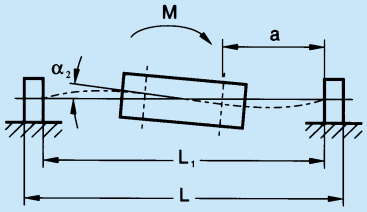



Fig. 3

| | d | $X_1$ | $X_2$ |
|---|---|---|---|
| | mm | | |
| **LZBB 085** | 12 | 41,5 | 30 |
| **LZBB 100** | 16 | 50 | 36 |
| **LZBB 130** | 20 | 62,5 | 40 |
| **LZBB 160** | 25 | 76 | 50 |
| **LZBB 180** | 30 | 81 | 50 |
| **LZBB 230** | 40 | 105 | 60 |
| **LZBB 280** | 50 | 120 | 60 |

# Motor design and screw life

### Approximate determination of required screw torque

(24) $$M_V = M_S + \frac{F_A \cdot p}{5027}$$

(25) $$M_V < M_a$$

where

| | | |
|---|---|---|
| $M_v$ | [Nm] | required motor torque at constant speed, from Equation 24 |
| $M_s$ | [Nm] | idle-running torque for slide, from table on page 22 |
| $F_A$ | [N] | axial load in direction of travel |
| p | [mm] | screw lead, from table on page 22 |
| $M_a$ | [Nm] | maximum permissible slide drive torque, from table on page 22 |

### Approximate determination of screw life

(26) $$L_{ns} = 1000 \cdot p \cdot \left( \frac{C_a}{f_d \cdot F_A} \right)^3$$

(27) $$L_{nds} = \frac{5 \cdot 10^5 \cdot p}{s} \cdot \left( \frac{C_a}{f_d \cdot F_A} \right)^3$$

(28) $$L_{nh} = \frac{5 \cdot 10^5 \cdot p}{s \cdot n \cdot 60} \cdot \left( \frac{C_a}{f_d \cdot F_A} \right)^3$$

where

| | | |
|---|---|---|
| $L_{ns}$ | [m] | adjusted rating life, metres, from Equation 26 |
| $L_{nds}$ | [DS] | ajdusted rating life, double strokes, from Equation 27 |
| $L_{nh}$ | [h] | adjusted rating life, operating hours, from Equation 28 |
| p | [mm] | screw lead, from table on page 22 |
| $C_a$ | [N] | dynamic load rating of screw, from table on page 22 |
| $f_d$ | | factor for operating conditions, from Table 2 |
| $F_A$ | [N] | axial load in direction of travel |
| s | [mm] | stroke length |
| n | [1/min] | frequency of stroke (number of movements from one end position to the other end and back again) |

When due to high accelerations, the required moments and loads must be taken into account, the calculations can be made with the equations given in catalogue 4211 E, page 18. For this purpose, also a PC calculation programme can be ordered from SKF.

$$L_{ns} = \frac{p^4}{1{,}27 \cdot 10^8} \cdot \left( \frac{C_a}{M_v \cdot i} \right)^3 \quad [m]$$

$$L_{10s} = \frac{p^4}{2{,}54 \cdot 10^5 \cdot s} \cdot \left( \frac{C_a}{M_v \cdot i} \right)^3 \quad [DS]$$

$$L_{nh} = \frac{p^4}{1{,}52 \cdot 10^7 \cdot s \cdot n} \cdot \left( \frac{C_a}{M_v \cdot i} \right)^3 \quad [h]$$

### Permissible speed and acceleration

The maximum speed of the linear ball bearing slides is limited by the ball screws. The maximum possible speeds of travel and pertinent screw speeds can be seen from the tables on pages 15 to 21.

The SKF linear bearings fitted to the linear ball bearing slide units can operate under load at a maximum acceleration of **100 m/s$^2$**. The maximum possible acceleration of the ball screws is limited by the required acceleration torque depending on the travelling mass. It must not exceed the maximum permissible slide torque $M_a$ from the table on page 22.

## Materials

The slide components are manufactured as standard from the following materials:

- Shafts: as standard unalloyed steel Cf 53 (1.1213) or similar, hardened to > 60 HRC
  on request stainless steel X90CrMoV18 (1.4112), hardened to > 55 HRC
- Ball screws: tough hardening steel, induction hardened to > 54 HRC
- Linear bearing cages: plastics PA 12
- Housing, end plates, shaft supports and accessories: aluminium, in part anodized, not coloured
- Bellows: polyamide or PUR foil, resistant to oil and coolants, black optionally from BM-Nomex, metallized, resistant to sparks and welding splashed up to 300 °C

## Permissible operating temperatures

Standard:
- 30 °C to + 80 °C permanent temperature.

## Friction

The linear ball bearings operate without stick-slip. The coefficient of friction is very low and depends mainly on the frictional force of the seals. The frictional forces of the seals as well as the screw and the screw support are taken into account in the slide idle-running torque MS from the table on page 22.

## Lubrication

Under normal operating conditions, linear ball bearing slides can in most applications be lubricated with grease. The slide guide as well as the screw are lubricated on manufacture with multi-purpose grease SKF **LGEP 2**. This grease is a mineral-oil lithium-base grease with EP additives. NLGI consistency 2; kinematic viscosity of base oil: 195 $mm^2/s$ (40°C).

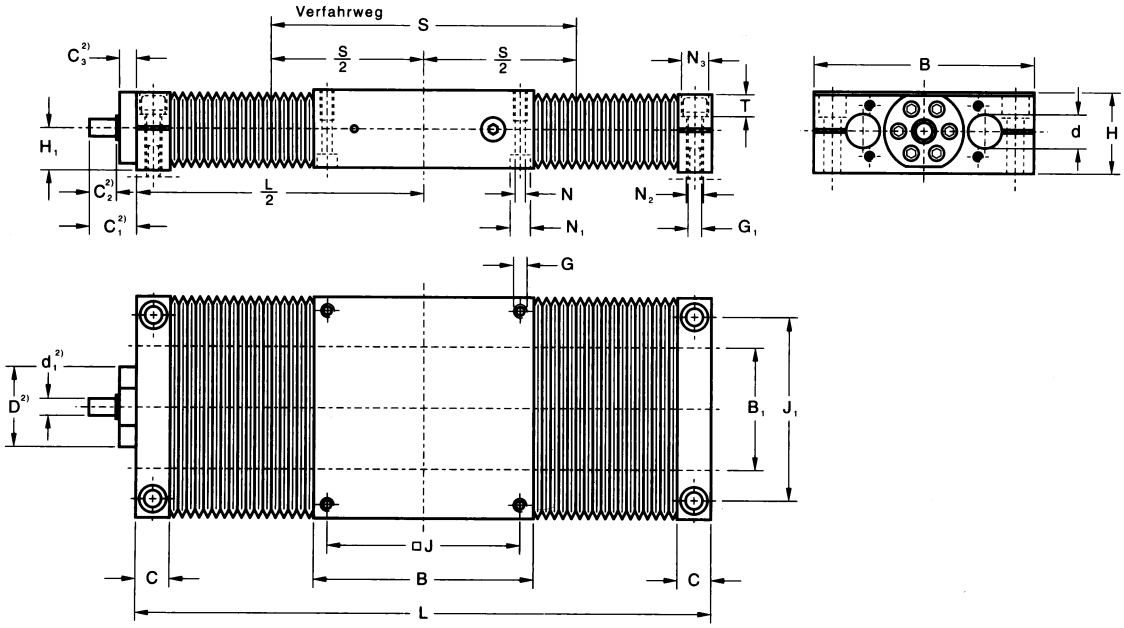
**Relubrication**
The moment of relubrication depends mainly on the operating conditions. As an approximate value, the bearings should be relubricated every 800 to 1000 operating hours, but after 6 months, at the latest. The same grease LGEP 2 or a comparable, i.e. compatible grease of identical consistency with EP additives should be used.

For relubrication of the four linear bearings, two cupped-type grease nipples are provided on both sides of the linear bearing housing. The required grease quantities on relubrication can be seen from Table 6. For relubrication of the ball screw, at least one of the bellows must be opened on one side and pushed back. Remove the old grease from the screw and again cover it with a new thin grease film.

**Table 6 Guideline for grease quantity on relubrication**

| Slide size | Grease quantity per bearing |
|---|---|
| | g |
| **LZ.B 085** | 2 |
| **LZ.B 100** | 3 |
| **LZ.B 130** | 5 |
| **LZ.B 160** | 7 |
| **LZ.B 180** | 10 |
| **LZ.B 230** | 16 |
| **LZ.B 280** | 25 |

# LZBB version with closed housing with ball screw
# Sizes 085–160




| Designation | Dimensions | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | L | Nominal stroke[1] $S_1$ | Nominal stroke[1] $S_2$ | B | $B_1$ | C | d | G | $G_1$ | H | $H_1$ |
| | mm | | | | | | | | | | |
| | **330** | 130 | 210 | | | | | | | | |
| **LZBB 085** | **630** | 320 | 510 | 85 | 42 | 15 | 12 | M6 | M6 | 34 | 18 |
| | **930** | 505 | 810 | | | | | | | | |
| | | | | | | | | | | | |
| | **336** | 120 | 195 | | | | | | | | |
| | **636** | 310 | 495 | | | | | | | | |
| **LZBB 100** | **936** | 495 | 795 | 100 | 54 | 18 | 16 | M6 | M8 | 38 | 20 |
| | **1236** | 685 | 1095 | | | | | | | | |
| | **1536** | 875 | 1395 | | | | | | | | |
| | | | | | | | | | | | |
| | **340** | 115 | 165 | | | | | | | | |
| | **640** | 330 | 465 | | | | | | | | |
| **LZBB 130** | **940** | 545 | 765 | 130 | 72 | 20 | 20 | M8 | M10 | 48 | 25 |
| | **1240** | 755 | 1065 | | | | | | | | |
| | **1540** | 970 | 1365 | | | | | | | | |
| | **1840** | 1185 | 1665 | | | | | | | | |
| | | | | | | | | | | | |
| | **410** | 145 | 195 | | | | | | | | |
| | **650** | 325 | 435 | | | | | | | | |
| **LZBB 160** | **1010** | 595 | 795 | 160 | 88 | 25 | 25 | M10 | M12 | 58 | 30 |
| | **1250** | 780 | 1035 | | | | | | | | |
| | **1610** | 1050 | 1395 | | | | | | | | |
| | **1850** | 1230 | 1635 | | | | | | | | |

1) Maximum stroke between the end stops:
S1 with bellows (standard version)
S2 without bellows (special version)

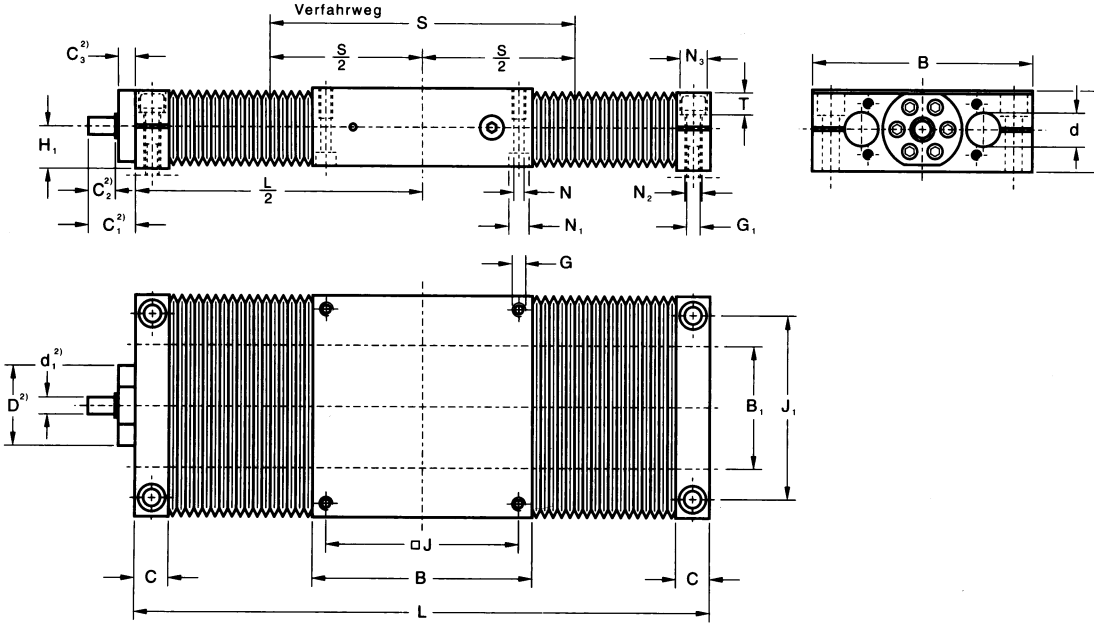
2) See table on page 22 for screw abutment dimensions.

| | | | | | | | | Screw data | | Weight[3] | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **L** | **J** | **$J_1$** | **N** | **$N_1$** | **$N_2$** | **$N_3$** | **T** | **$V_{max}$** | **$n_{max}$** | **GG** | **GO** |
| mm | | | | | | | | m/min | 1/min | kg | |
| **330** | | | | | | | | 19,5 | 7 800 | 1,4 | |
| **630** | 73 | 70 | 5,3 | 10 | 6,6 | 11 | 8,5 | 6,0 | 2 400 | 2,0 | 0,5 |
| **930** | | | | | | | | 2,8 | 1 100 | 2,7 | |
| | | | | | | | | | | | |
| **336** | | | | | | | | 20,4 | 5 100 | 2,4 | |
| **636** | | | | | | | | 13,8 | 3 450 | 3,5 | |
| **936** | 88 | 82 | 5,3 | 10 | 9 | 15 | 10,5 | 6,4 | 1 600 | 4,7 | 0,8 |
| **1236** | | | | | | | | 3,7 | 920 | 5,8 | |
| **1536** | | | | | | | | 2,4 | 600 | 7,0 | |
| | | | | | | | | | | | |
| **340** | | | | | | | | 19,0 | 3 800 | 4,3 | |
| **640** | | | | | | | | 19,0 | 3 800 | 6,2 | |
| **940** | 115 | 108 | 6,6 | 11 | 11 | 18 | 13,5 | 10,8 | 2 150 | 8,1 | 1,7 |
| **1240** | | | | | | | | 6,3 | 1 250 | 9,9 | |
| **1540** | | | | | | | | 4,0 | 800 | 11,8 | |
| **1840** | | | | | | | | 2,8 | 560 | 13,6 | |
| | | | | | | | | | | | |
| **410** | | | | | | | | 15,3 | 3 050 | 8,0 | |
| **650** | | | | | | | | 15,3 | 3 050 | 10,3 | |
| **1010** | 140 | 132 | 8,4 | 15 | 13,5 | 20 | 16 | 12,3 | 2 450 | 13,8 | 3,1 |
| **1250** | | | | | | | | 8,0 | 1 600 | 16,1 | |
| **1610** | | | | | | | | 4,8 | 960 | 19,6 | |
| **1850** | | | | | | | | 3,7 | 730 | 21,9 | |

3) GG = total weight of slide unit
GO = mass travelling in linear direction with the slide top moving

**Designation example LZBB 130.940.K1605**

# LZBB version with closed housing with ball screw
# Sizes 180 – 280




**Dimensions**

| Designation | L | Nominal stroke[1)] $S_1$ | Nominal stroke[1)] $S_2$ | B | $B_1$ | C | d | G | $G_1$ | H | $H_1$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm | | | | | | | | | | |
| | **350** | 80 | 115 | | | | | | | | |
| | **650** | 300 | 415 | | | | | | | | |
| | **950** | 515 | 715 | | | | | | | | |
| **LZBB 180** | **1250** | 740 | 1015 | 180 | 96 | 25 | 30 | M12 | M12 | 67 | 35 |
| | **1550** | 960 | 1315 | | | | | | | | |
| | **1850** | 1175 | 1615 | | | | | | | | |
| | **2150** | 1400 | 1915 | | | | | | | | |
| | **2450** | 1620 | 2215 | | | | | | | | |
| | | | | | | | | | | | |
| | **460** | 120 | 165 | | | | | | | | |
| | **660** | 275 | 365 | | | | | | | | |
| | **1060** | 580 | 765 | | | | | | | | |
| | **1260** | 730 | 965 | | | | | | | | |
| **LZBB 230** | **1660** | 1035 | 1365 | 230 | 122 | 30 | 40 | M16 | M16 | 84 | 44 |
| | **1860** | 1185 | 1565 | | | | | | | | |
| | **2260** | 1490 | 1965 | | | | | | | | |
| | **2460** | 1640 | 2165 | | | | | | | | |
| | **2860** | 1945 | 2565 | | | | | | | | |
| | | | | | | | | | | | |
| | **660** | 240 | 315 | | | | | | | | |
| | **1060** | 565 | 715 | | | | | | | | |
| | **1260** | 720 | 915 | | | | | | | | |
| **LZBB 280** | **1660** | 1045 | 1315 | 280 | 152 | 30 | 50 | M16 | M16 | 100 | 52 |
| | **1860** | 1200 | 1515 | | | | | | | | |
| | **2260** | 1520 | 1915 | | | | | | | | |
| | **2460** | 1675 | 2115 | | | | | | | | |
| | **2860** | 2000 | 2515 | | | | | | | | |

1) Maximum stroke between the end stops:
S1 with bellows (standard version)
S2 without bellows (special version)

2) See table on page 22 for screw abutment dimensions.

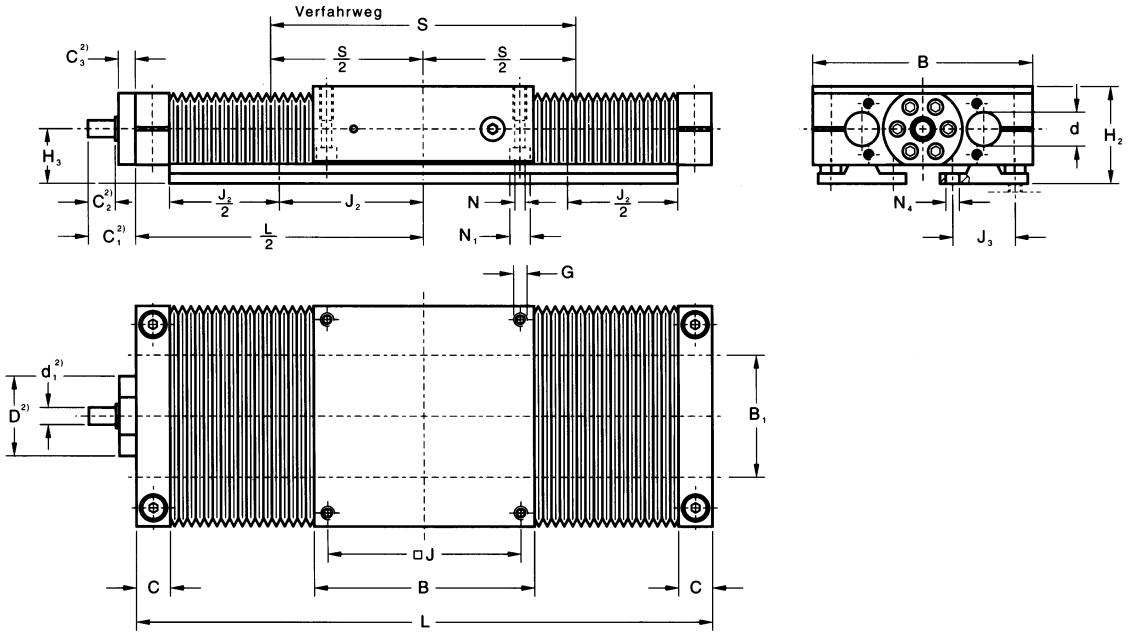
| L | J | $J_1$ | N | $N_1$ | $N_2$ | $N_3$ | T | Screw data $V_{max}$ | $n_{max}$ | Weight[3] GG | GO |
|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | | | | | | | | m/min | 1/min | kg | |
| **350** | | | | | | | | 15,3 | 3 050 | 10,2 | |
| **650** | | | | | | | | 15,3 | 3 050 | 14,1 | |
| **950** | | | | | | | | 14,0 | 2 800 | 18,0 | |
| **1250** | 158 | 150 | 10,5 | 18 | 13,5 | 20 | 16 | 8,0 | 1 600 | 21,9 | 4,4 |
| **1550** | | | | | | | | 5,3 | 1 050 | 25,9 | |
| **1850** | | | | | | | | 3,7 | 730 | 29,8 | |
| **2150** | | | | | | | | 2,7 | 540 | 33,7 | |
| **2450** | | | | | | | | 2,1 | 420 | 37,6 | |
| | | | | | | | | | | | |
| **460** | | | | | | | | 12,3[4] | 2 450 | 21,5 | |
| **660** | | | | | | | | 12,3[4] | 2 450 | 26,1 | |
| **1060** | | | | | | | | 12,3[4] | 2 450 | 35,3 | |
| **1260** | | | | | | | | 10,3[4] | 2 050 | 39,9 | |
| **1660** | 202 | 190 | 13,5 | 20 | 17,5 | 26 | 21 | 6,0[4] | 1 200 | 49,0 | 8,7 |
| **1860** | | | | | | | | 4,7[4] | 940 | 53,6 | |
| **2260** | | | | | | | | 3,2[4] | 640 | 62,8 | |
| **2460** | | | | | | | | 2,7[4] | 540 | 67,3 | |
| **2860** | | | | | | | | 2,0[4] | 400 | 76,5 | |
| | | | | | | | | | | | |
| **660** | | | | | | | | 12,3[4] | 2 450 | 41,3 | |
| **1060** | | | | | | | | 12,3[4] | 2 450 | 54,9 | |
| **1260** | | | | | | | | 10,3[4] | 2 050 | 61,7 | |
| **1660** | 250 | 240 | 13,5 | 20 | 17,5 | 26 | 21 | 6,0[4] | 1 200 | 75,2 | 15,6 |
| **1860** | | | | | | | | 4,7[4] | 940 | 82,0 | |
| **2260** | | | | | | | | 3,2[4] | 640 | 95,6 | |
| **2460** | | | | | | | | 2,7[4] | 540 | 102,3 | |
| **2860** | | | | | | | | 2,0[4] | 400 | 115,9 | |

3) GG = total weight of slide unit
GO = mass travelling in linear direction with the slide top moving

4) $V_{max}$ with 5 mm screw lead; $V_{max}$ with 10 mm lead = x 2

**Designation example LZBB 230.1860.K2510**

# LZAB version with open housing with ball screw
# Sizes 085–160




| Designation | Dimensions | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | L | Nominal stroke[1] $S_1$ | Nominal stroke[1] $S_2$ | B | $B_1$ | C | d | G | $G_1$ | $H_2$ | $H_3$ |
| | mm | | | | | | | | | | |
| | **330** | 125 | 210 | | | | | | | | |
| **LZAB 085** | **630** | 305 | 510 | 85 | 42 | 15 | 12 | M6 | M6 | 40 | 22 |
| | **930** | 485 | 810 | | | | | | | | |
| | | | | | | | | | | | |
| | **336** | 115 | 195 | | | | | | | | |
| | **636** | 295 | 495 | | | | | | | | |
| **LZAB 100** | **936** | 475 | 795 | 100 | 54 | 18 | 16 | M6 | M8 | 48 | 26 |
| | **1236** | 655 | 1095 | | | | | | | | |
| | **1536** | 835 | 1395 | | | | | | | | |
| | | | | | | | | | | | |
| | **340** | 110 | 165 | | | | | | | | |
| | **640** | 320 | 465 | | | | | | | | |
| **LZAB 130** | **940** | 530 | 765 | 130 | 72 | 20 | 20 | M8 | M10 | 57 | 32 |
| | **1240** | 740 | 1065 | | | | | | | | |
| | **1540** | 950 | 1365 | | | | | | | | |
| | **1840** | 1155 | 1665 | | | | | | | | |
| | | | | | | | | | | | |
| | **410** | 140 | 195 | | | | | | | | |
| | **650** | 320 | 435 | | | | | | | | |
| **LZAB 160** | **1010** | 585 | 795 | 160 | 88 | 25 | 25 | M10 | M12 | 66 | 36 |
| | **1250** | 765 | 1035 | | | | | | | | |
| | **1610** | 1035 | 1395 | | | | | | | | |
| | **1850** | 1210 | 1635 | | | | | | | | |

1) Maximum stroke between the end stops:
S1 with bellows (standard version)
S2 without bellows (special version)

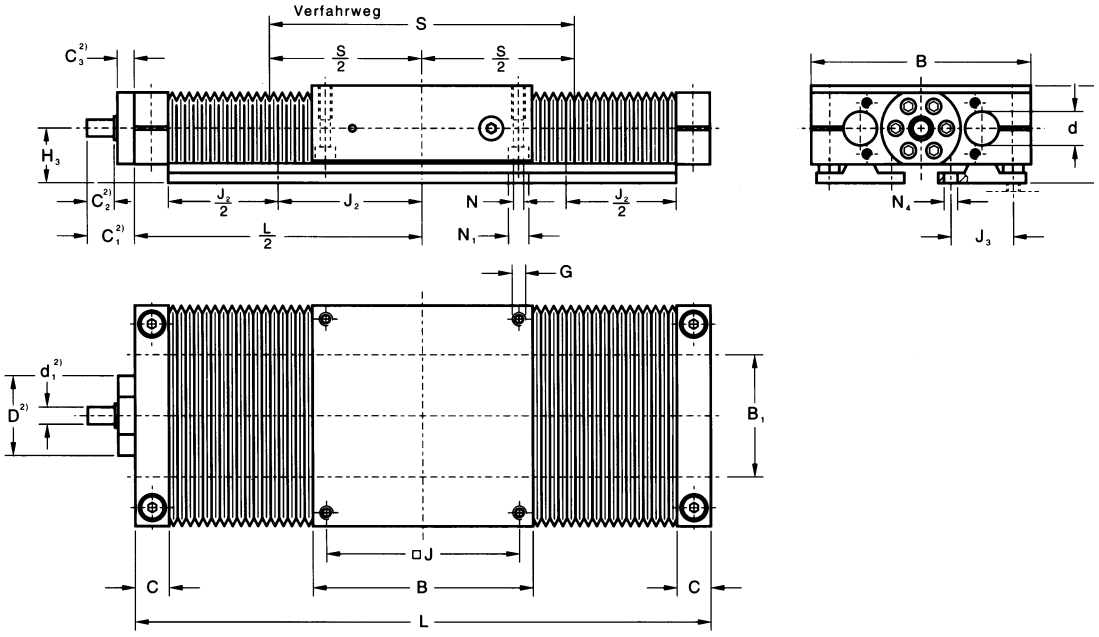
2) See table on page 22 for screw abutment dimensions.

| L | J | $J_2$ | $J_3$ | N | $N_1$ | $N_4$ | Screw data $V_{max}$ | $n_{max}$ | Weight[3] GG | GO |
|---|---|---|---|---|---|---|---|---|---|---|
| mm | | | | | | | m/min | 1/min | kg | |
| **330** | | | | | | | 19,5 | 7 800 | 1,9 | |
| **630** | 73 | 75 | 29 | 5,3 | 10 | 4,5 | 6,0 | 2 400 | 3,0 | 0,5 |
| **930** | | | | | | | 2,8 | 1 100 | 4,2 | |
| | | | | | | | | | | |
| **336** | | | | | | | 20,4 | 5 100 | 2,9 | |
| **636** | | | | | | | 13,8 | 3 450 | 4,7 | |
| **936** | 88 | 100 | 33 | 5,3 | 10 | 5,5 | 6,4 | 1 600 | 6,5 | 0,7 |
| **1236** | | | | | | | 3,7 | 920 | 8,3 | |
| **1536** | | | | | | | 2,4 | 600 | 10,1 | |
| | | | | | | | | | | |
| **340** | | | | | | | 19,0 | 3 800 | 5,0 | |
| **640** | | | | | | | 19,0 | 3 800 | 7,8 | |
| **940** | 115 | 100 | 37 | 6,6 | 11 | 6,6 | 10,8 | 2 150 | 10,6 | 1,5 |
| **1240** | | | | | | | 6,3 | 1 250 | 13,3 | |
| **1540** | | | | | | | 4,0 | 800 | 16,1 | |
| **1840** | | | | | | | 2,8 | 560 | 18,9 | |
| | | | | | | | | | | |
| **410** | | | | | | | 15,3 | 3 050 | 8,9 | |
| **650** | | | | | | | 15,3 | 3 050 | 12,1 | |
| **1010** | 140 | 120 | 42 | 8,4 | 15 | 6,6 | 12,3 | 2 450 | 16,8 | 2,7 |
| **1250** | | | | | | | 8,0 | 1 600 | 20,0 | |
| **1610** | | | | | | | 4,8 | 960 | 24,8 | |
| **1850** | | | | | | | 3,7 | 730 | 28,0 | |

3) GG = total weight of slide unit
GO = mass travelling in linear direction with the slide top moving

**Designation example LZAB 130.1240.K1605**

# LZAB version with open housing with ball screw
# Sizes 180–280




**Dimensions**

| Designation | L | Nominal stroke[1] $S_1$ | Nominal stroke[1] $S_2$ | B | $B_1$ | C | d | G | $G_1$ | $H_2$ | $H_3$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | mm | | | | | | | | | | |
| | **350** | 85 | 115 | | | | | | | | |
| | **650** | 320 | 415 | | | | | | | | |
| | **950** | 550 | 715 | | | | | | | | |
| **LZAB 180** | **1250** | 785 | 1015 | 180 | 96 | 25 | 30 | M12 | M12 | 77 | 42 |
| | **1550** | 1020 | 1315 | | | | | | | | |
| | **1850** | 1250 | 1615 | | | | | | | | |
| | **2150** | 1485 | 1915 | | | | | | | | |
| | **2450** | 1720 | 2215 | | | | | | | | |
| | | | | | | | | | | | |
| | **460** | 120 | 165 | | | | | | | | |
| | **660** | 275 | 365 | | | | | | | | |
| | **1060** | 580 | 765 | | | | | | | | |
| | **1260** | 730 | 965 | | | | | | | | |
| **LZAB 230** | **1660** | 1035 | 1365 | 230 | 122 | 30 | 40 | M16 | M16 | 95 | 50 |
| | **1860** | 1185 | 1565 | | | | | | | | |
| | **2260** | 1490 | 1965 | | | | | | | | |
| | **2460** | 1640 | 2165 | | | | | | | | |
| | **2860** | 1945 | 2565 | | | | | | | | |
| | | | | | | | | | | | |
| | **660** | 250 | 315 | | | | | | | | |
| | **1060** | 570 | 715 | | | | | | | | |
| | **1260** | 735 | 915 | | | | | | | | |
| **LZAB 280** | **1660** | 1055 | 1315 | 280 | 152 | 30 | 50 | M16 | M16 | 115 | 60 |
| | **1860** | 1220 | 1515 | | | | | | | | |
| | **2260** | 1540 | 1915 | | | | | | | | |
| | **2460** | 1705 | 2115 | | | | | | | | |
| | **2860** | 2030 | 2515 | | | | | | | | |

1) Maximum stroke between the end stops:
S1 with bellows (standard version)
S2 without bellows (special version)

2) See table on page 22 for screw abutment dimensions.

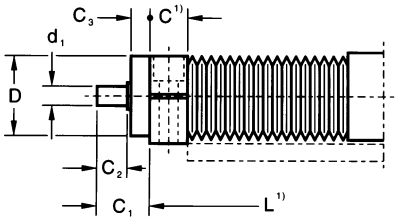
| | | | | | | | Screw data | | Weight[3] | |
|---|---|---|---|---|---|---|---|---|---|---|
| **L** | **J** | **$J_2$** | **$J_3$** | **N** | **$N_1$** | **$N_4$** | **$V_{max}$** | **$n_{max}$** | **GG** | **GO** |
| mm | | | | | | | m/min | 1/min | kg | |
| **350** | | | | | | | 15,3 | 3 050 | 11,2 | |
| **650** | | | | | | | 15,3 | 3 050 | 16,5 | |
| **950** | | | | | | | 14,0 | 2 800 | 21,8 | |
| **1250** | 158 | 150 | 51 | 10,5 | 18 | 9 | 8,0 | 1 600 | 27,1 | 4,0 |
| **1550** | | | | | | | 5,3 | 1 050 | 32,4 | |
| **1850** | | | | | | | 3,7 | 730 | 37,7 | |
| **2150** | | | | | | | 2,7 | 540 | 43,1 | |
| **2450** | | | | | | | 2,1 | 420 | 48,4 | |
| | | | | | | | | | | |
| **460** | | | | | | | 12,3[4] | 2 450 | 23,4 | |
| **660** | | | | | | | 12,3[4] | 2 450 | 29,2 | |
| **1060** | | | | | | | 12,3[4] | 2 450 | 40,9 | |
| **1260** | | | | | | | 10,3[4] | 2 050 | 46,7 | |
| **1660** | 202 | 200 | 55 | 13,5 | 20 | 9 | 6,0[4] | 1 200 | 58,3 | 8,1 |
| **1860** | | | | | | | 4,7[4] | 940 | 64,1 | |
| **2260** | | | | | | | 3,2[4] | 640 | 75,7 | |
| **2460** | | | | | | | 2,7[4] | 540 | 81,6 | |
| **2860** | | | | | | | 2,0[4] | 400 | 93,2 | |
| | | | | | | | | | | |
| **660** | | | | | | | 12,3[4] | 2 450 | 45,2 | |
| **1060** | | | | | | | 12,3[4] | 2 450 | 62,0 | |
| **1260** | | | | | | | 10,3[4] | 2 050 | 70,4 | |
| **1660** | 250 | 200 | 63 | 13,5 | 20 | 11 | 6,0[4] | 1 200 | 87,3 | 14,5 |
| **1860** | | | | | | | 4,7[4] | 940 | 95,7 | |
| **2260** | | | | | | | 3,2[4] | 640 | 112,5 | |
| **2460** | | | | | | | 2,7[4] | 540 | 120,9 | |
| **2860** | | | | | | | 2,0[4] | 400 | 137,7 | |

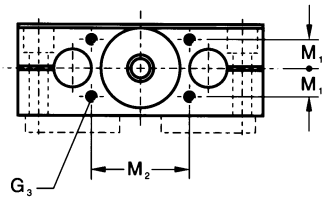
3) GG = total weight of slide unit
GO = mass travelling in linear direction with the slide top moving

4) $V_{max}$ with 5 mm screw lead; $V_{max}$ with 10 mm lead = x 2

**Designation example LZAB 230.1860.K2505**

# Screw and screw abutment dimensions: LZBB-LZAB
# Sizes 085–280




| Designation | Screw | Screw data | | Load carrying capacity[2] | | Screw torque[3] Idling | max. |
|---|---|---|---|---|---|---|---|
| | | do | p | Ca | $C_{0a}$ | Ms | Ma |
| | | mm | | N | | Nm | |
| **LZ.B 085** | **K 0802,5** | 7,7 | 2,5 | 1 500 | 2 200 | 0,02 | 0,7 |
| **LZ.B 100** | **K 1204** | 11,8 | 4 | 3 400 | 5 400 | 0,04 | 2,6 |
| **LZ.B 130** | **K 1605** | 15,8 | 5 | 5 200 | 8 700 | 0,07 | 5,8 |
| **LZ.B 160** | **K 2005** | 19,7 | 5 | 8 200 | 16 200 | 0,08 | 10,7 |
| **LZ.B 180** | **K 2005** | 19,7 | 5 | 8 200 | 16 200 | 0,11 | 10,7 |
| **LZ.B 230** | **K 2505** | 24,7 | 5 | 15 600 | 37 800 | 0,14 | 25,1 |
| | **K 2510** | 24,6 | 10 | 20 800 | 43 900 | 0,29 | 32,9 |
| **LZ.B 280** | **K 2505** | 24,7 | 5 | 15 600 | 37 800 | 0,18 | 25,1 |
| | **K 2510** | 24,6 | 10 | 20 800 | 43 900 | 0,36 | 32,9 |

| Designation | Screw | Screw abutment dimensions $C_1$ | $C_2$ | $C_3$ | $d_1$ | D | $G_3$ | $M_1$ | $M_2$ |
|---|---|---|---|---|---|---|---|---|---|
| | | mm | | | h7 | h7 | | | |
| **LZ.B 085** | **K 0802,5** | 17 | 9 | 8,5 | 5 | 30 | M5 | 11 | 45 |
| **LZ.B 100** | **K 1204** | 24 | 12 | 6,5 | 6 | 38 | M5 | 11 | 45 |
| **LZ.B 130** | **K 1605** | 28 | 17 | 10,5 | 10 | 47 | M6 | 15 | 70 |
| **LZ.B 160** | **K 2005** | 36 | 23 | 10,5 | 12 | 55 | M6 | 15 | 70 |
| **LZ.B 180** | **K 2005** | 36 | 23 | 10,5 | 12 | 55 | M6 | 15 | 70 |
| **LZ.B 230** | **K 2505** | 36 | 23 | 12,5 | 14 | 68 | M6 | 20 | 70 |
| | **K 2510** | 36 | 23 | 12,5 | 14 | 68 | M6 | 20 | 70 |
| **LZ.B 280** | **K 2505** | 36 | 23 | 12,5 | 14 | 68 | M6 | 20 | 70 |
| | **K 2510** | 36 | 23 | 12,5 | 14 | 68 | M6 | 20 | 70 |

1) For dimensions see table of dimensions, pages 14 to 21
2) With pressure load, the screw must be inspected for bending.
3) Ms = max. required drive torque at the screw for the slide without load
Ma = max. permissible drive torque at the screw

# Accessories

## KN-KU: Cross table assembly

All linear ball bearing slides of identical width can be assembled to form cross tables.

**LZBB version with closed housing:**

- **Assembly type KN** (Fig. 4a)
  Via a GP-LZBB base plate, the Y axis is bolted to the linear bearing housing of the X axis located below it.

- **Assembly type KU** (Fig. 5a)
  The linear bearing housing of the Y axis is bolted directly to the linear bearing housing of the X axis below it. As with this arrangement only the shaft blocks of the Y axis move, optionally a GP-LZBB base plate can be fitted to the Y axis as table plate.

**LZAB version with open housing:**

- **Assembly type KN** (Fig. 4b)
  Via a GP-LZAB base plate, the Y axis is bolted to the linear bearing housing of the X axis below it.

- **Assembly type KU** (Fig. 5b)
  The linear bearing housing of the Y axis is bolted directly to the linear bearing housing of the X axis below it. On the Y axis, a GP-LZAB base plate is mounted as table plate.

Depending on the stroke length along the different axes, a combination of LZBB and LZAB as cross table is possible.

**Right-hand assembly**
means: When the drive on the X axis faces the user, the drive on the Y axis above it is positioned at the **right**. Unless otherwise specified, the normal version of all cross tables is right-hand assembly.

**Left-hand assembly**
means: When the drive on the X axis faces the user, the drive on the Y axis above it is positioned at the **left**.

**Direction of travel**
When slide units are supplied with control, unless otherwise specified, the direction of travel is marked with **„+“** if the linear bearing housing in question moves away from the drive (left-hand rotation of motor), see Figs. 4a to 5b.

**LZBB**
X axis standard attachment · Y axis standard attachment
Base plate: GP-LZBB
**KN-right-hand centrally mounted assembly**

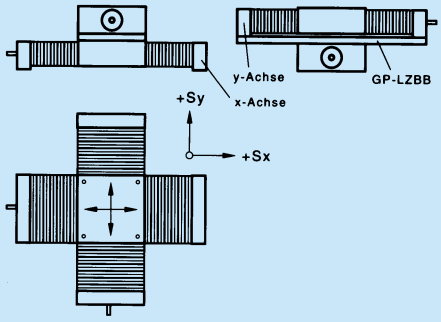



Fig. 4a

**LZAB**
X axis standard attachment · Y axis standard attachment
Base plate: GP-LZAB
**KN-right-hand centrally mounted assembly**

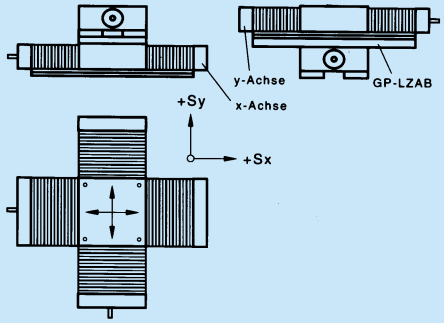



Fig. 4b

**LZBB**
X axis standard attachment · Y axis reverse attachment
Base plate: GP-LZBB
**KU-right-hand centrally mounted assembly**

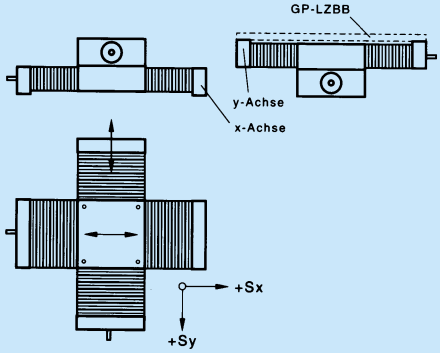



Fig. 5a

**LZAB**
X axis standard attachment · Y axis reverse attachment
Base plate: GP-LZAB
**KU-right-hand centrally mounted assembly**

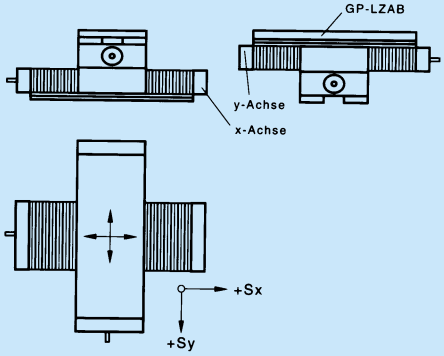



Fig. 5b

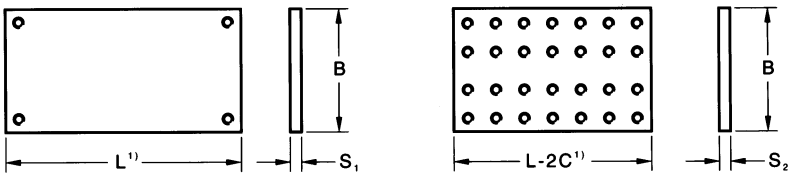
# GP: Base plate

Base plate GP is very fine milled from aluminium and can be used as base plate, intermediate plate or table plate. It is available in two versions:

- **GP-LZBB:** as base plate, intermediate plate or table plate for LZBB linear ball bearing slides.
- **GP-LZAB:** as base plate, intermediate plate or table plate for LZAB linear ball bearing slides.

See Table 7 for boundary dimensions of base plates. The thickness of the plates is designed as a function of their length. An additional drill hole pattern can be provided to the customers' requirements. For higher loads, the plates can be manufactured with the thickness of a longer version.

**GP base plate**
**Sizes 085–380**




| Designation | B | L von | L bis | GP-LZBB $s_1$ | GP-LZAB $s_2$ |
|---|---|---|---|---|---|
| | mm | | | | |
| LZ.B 085 | 85 | 330 | 630 | 10 | 8 |
| | | 930 | – | 12 | |
| | | 336 | 636 | 12 | |
| LZ.B 100 | 100 | 936 | 1236 | 15 | 10 |
| | | 1536 | – | 20 | |
| | | 340 | 640 | 15 | |
| LZ.B 130 | 130 | 940 | 1240 | 20 | 12 |
| | | 1540 | 1840 | 25 | |
| | | 410 | 650 | 15 | |
| LZ.B 160 | 160 | 1010 | 1250 | 20 | 12 |
| | | 1610 | 1850 | 25 | |
| | | 350 | 950 | 20 | |
| LZ.B 180 | 180 | 1250 | 1850 | 25 | 15 |
| | | 2150 | 2450 | 30 | |
| | | 460 | 1060 | 25 | |
| LZ.B 230 | 230 | 1260 | 1860 | 30 | 20 |
| | | 2260 | 2860 | 35 | |
| | | 660 | 1260 | 25 | |
| LZ.B 280 | 280 | 1660 | 2260 | 30 | 20 |
| | | 2460 | 2860 | 35 | |

1) For dimensions see table of dimensions, pages 14 to 21.

## WA: Mounting brackets

For realizing axis combinations as shown in Figs. 8 and 9 on page 34, mounting brackets made of aluminium are also available. They are matched to the width of the slides and the application in question.

**Limit switch attachment EEI 1**

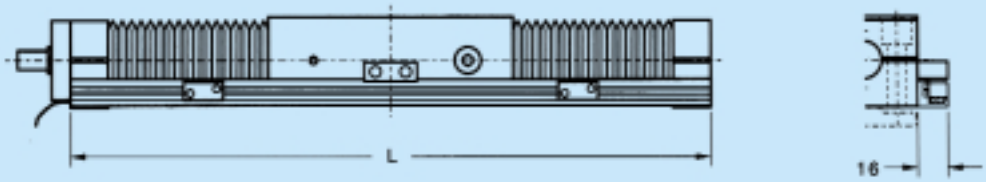



Fig. 6

## Limit and reference switches

The linear ball bearing slides can be equipped with limit and reference switches attached laterally. The position of the inductive switches can be adjusted to meet the requirements. They are located in an aluminium profile extending over the entire length of the slide unit and attached to the two shaft blocks at the right side of the slide unit. This profile serves at the same time as cable duct for the limit switch cables led to the motor side. The switches are actuated by a trip cam on the travelling linear bearing housing.

On manufacture, the limit switches are placed 5 mm from the mechanical stroke end S1 or S2 (according to table of dimensions on pages 14 to 21). If an additional reference switch is included in the scope of delivery, it is placed approx. 30 mm from the motor-side limit switch.

**Technical data of the inductive switches**

| | |
|---|---|
| Switch accuracy (at constant speed and temperature) | ± 0,01 mm |
| Supply voltage | 9–36 V DC |
| Max. switching current | 200 mA |
| Switching mode | NC (normally closed) or NO (normally open) |
| Output type | PNP or NPN |
| Protection type | IP 67 |
| Design | DIN 41653 design A |
| Connection for each switch | 3 m cable, 3 mm dia, 3 x 0,34 $mm^2$ |

**Attention:** Unless otherwise specified in the order, the following switches are supplied:
as limit switch: PNP / NC
as reference switch: PNP / NO

## Standard motor attachment

For dimensions and technical data of the motors see pages 28 to 31.

The standard motor flanges given on page 27 are matched to the different versions and sizes of standard motors we use. On request, we can also supply the following accessories matched to the motors:

- power units for stepping motors
- four-quadrant controls including transformer for DC motors
- servo modules for AC motors either as European card format or as complete 19“ rack.

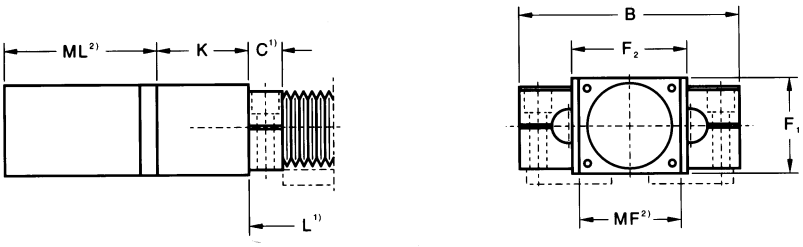
## Control units

On request, we deliver together with the complete slide units freely programmable CNC control units for one or several axes in the following form, depending on the application:

- continuous path control
- continuous path control with circle interpolation.

Please ask for our documentation.

# Standard motor flanges MF for LZBB-LZAB
# Sizes 085–280




| Designation | B | for motor[2] Type | Size | MF | Motor flange Order No. | $F_1$ | $F_2$ | K |
|---|---|---|---|---|---|---|---|---|
| | mm | | | mm | | mm | | |
| | | 5 Ph | VRDM 60 | 60 | **MF01BER1** | 60 | 60 | 50 |
| **LZ.B 085** | 85 | DC | E 500 | 57 | **MF01BAU1** | 60 | 60 | 55 |
| | | AC | EBL 2 | 55 | **MF01ENG1** | 60 | 60 | 54 |
| | | | | | | | | |
| | | 5 Ph | VRDM 60 | 60 | **MF02BER1** | 60 | 60 | 60 |
| **LZ.B 100** | 100 | DC | E 500 | 57 | **MF02BAU1** | 60 | 60 | 65 |
| | | AC | EBL 2 | 55 | **MF02ENG1** | 60 | 60 | 64 |
| | | | | | | | | |
| | | 5 Ph | VRDM 60 | 60 | **MF03BER1** | 60 | 85 | 61 |
| | | 5 Ph | VRDM 90 | 86 | **MF03BER2** | 85 | 85 | 78 |
| **LZ.B 130** | 130 | DC | E 500 | 57 | **MF03BAU1** | 60 | 85 | 66 |
| | | DC | E 600 | 83 | **MF03BAU2** | 85 | 85 | 78 |
| | | AC | EBL 2 | 55 | **MF03ENG1** | 60 | 85 | 65 |
| | | | | | | | | |
| | | 5 Ph | VRDM 60 | 60 | **MF04BER1** | 60 | 85 | 68 |
| | | 5 Ph | VRDM 90 | 86 | **MF04BER2** | 85 | 85 | 85 |
| | | 5 Ph | RDM 110 | 110 | **MF04BER3** | 110 | 110 | 111 |
| | | DC | E 500 | 57 | **MF04BAU1** | 60 | 85 | 73 |
| **LZ.B 160+180** | 160+180 | DC | E 600 | 83 | **MF04BAU2** | 85 | 85 | 85 |
| | | DC | E 700 | 102 | **MF04BAU3** | 110 | 110 | 95 |
| | | AC | EBL 2 | 55 | **MF04ENG1** | 60 | 85 | 72 |
| | | AC | EBL 3 | 92 | **MF04ENG2** | 85 | 85 | 85 |
| | | AC | EBL 4 | 105 | **MF04ENG3** | 110 | 110 | 95 |
| | | | | | | | | |
| | | 5 Ph | VRDM 90 | 86 | **MF05BER2** | 85 | 85 | 85 |
| | | 5 Ph | RDM 110 | 110 | **MF05BER3** | 110 | 110 | 111 |
| **LZ.B 230+280** | 230+280 | DC | E 600 | 83 | **MF05BAU2** | 85 | 85 | 85 |
| | | DC | E 700 | 102 | **MF05BAU3** | 110 | 110 | 95 |
| | | AC | EBL 3 | 92 | **MF05ENG2** | 85 | 85 | 85 |
| | | AC | EBL 4 | 105 | **MF05ENG3** | 110 | 110 | 95 |

1) For dimensions, see table of dimensions, pages 14 to 21
2) For motor data and dimensions, see table of dimensions, pages 28 to 31. **Designation example MF02BAU1**

# Motors for linear ball bearing slides

We can supply motors of the following types, matched to the requirements of linear ball bearing slides:

- **5 phase**
  Stepping motor
  BERGER
  Terminal box design
  Protection type IP 56

  Optionally:
- **Stop brake:** electromagnetic spring pressure brake

- **DC**
  Permanent-magnetic servo motor with integrated tachometer generator
  BAUTZ
  Plug design:
  E 500 + E 600
  Terminal box design: E 700

  Optionally:
- **Stop brake:** electromagnetic spring pressure brake

- **Encoder:** attached directly to the second shaft end of the motor as hollow shaft encoder
  TTL signal output with line driver
  Plug design
  gratings for encoder:
  500/1000/1250/2500
  (pulses per revolution)

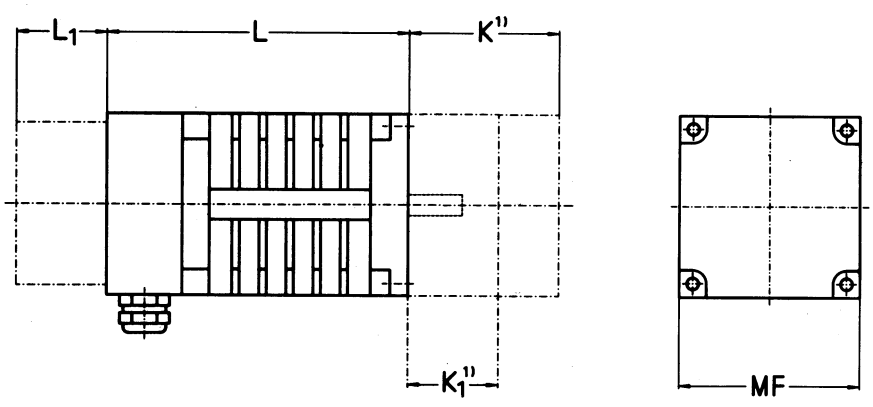
- **Stop brake + encoder**

- **AC**
  Brushless servo motor with integrated resolver
  ENGELHARDT (design identical with SAT)
  Plug design (1 x motor, 1 x resolver)
  Protection type: IP 54

  Optionally:
- **Stop brake:** electromagnetic spring pressure brake

| Motor selection | 5 Ph | DC | AC |
|---|---|---|---|
| Torques in | sharp fall-off | almost constant | constant |
| speed range | from ~ 800 $min^{-1}$on | up to nominal speed | |
| Holding moment at standstill | high | smaller | smaller |
| Overload capacity | cannot be overloaded (loses steps) | high | very high |
| Heating-up | high | low | low |
| Step resolution | max.1000 with half-step operation | high | high |
| Resonance | possible | none | none |
| Operationg noise | high | low | very low |
| Close loop position control via linear encoder | not possible | possible | possible |
| Wear and maintenance | very little | brush wear | very little |
| Susceptibility to trouble | very little | medium | low |
| Price | low | medium | high |

# 5 phase stepping motor

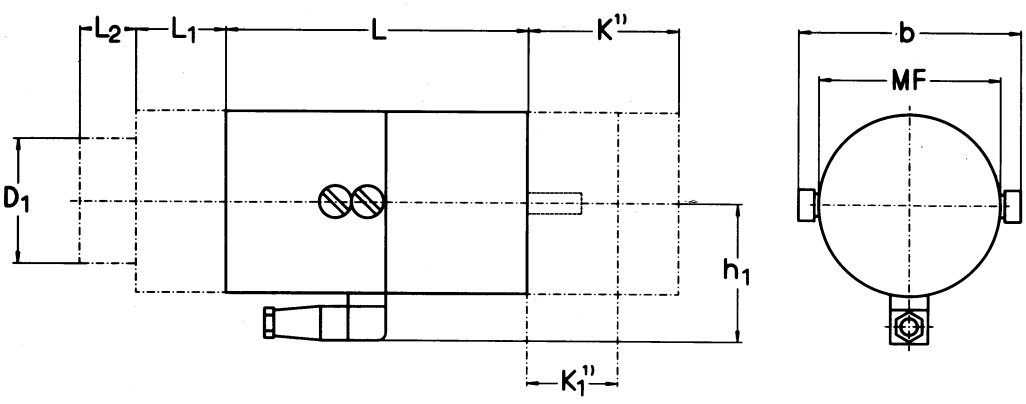



| 5 phase stepping motor | | Motor type | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | RDM 545 | VRDM 564 | VRDM 568 | VRDM 597 | VRDM 5910 | VRDM 5913 | RDM 51117 | RDM 51122 |
| Flange size | – | BER 0 | | | | BER 2 | | BER 3 | |
| Number of steps (half steps/full steps) | – | 2000/1000 | | | | 1000/500 | | 1000/500 | |
| Max. torque | Nm | 0,13 | 0,3 | 0,9 | 1,4 | 2,8 | 4,2 | 6,5 | 10 |
| Holding moment | Nm | 0,14 | 0,33 | 0,99 | 1,55 | 3,1 | 4,65 | 7 | 11 |
| Torque at n ≈1200 $min^{-1}$ | Nm | 0,08 | 0,25 | 0,6 | 0,8 | 1,4 | 1,4 | 4 | 6 |
| Nominal current/winding | A | 0,5 | 1,5 | 2,4 | 2 | 2,8 | 2,8 | 3,6 | 4 |
| Rotor moment of inertia | kg $m^2$ x $10^{-4}$ | 0,035 | 0,08 | 0,24 | 0,6 | 1,2 | 1,8 | 7,5 | 11,5 |
| MF | mm□ | 38 | | | | 86 | | 110 | |
| L | mm | 45 | 87 | 123 | 106 | 139 | 172 | 194 | 242 |
| Weight | kg | 0,3 | 0,53 | 1,03 | 1,9 | 3 | 4,1 | 9,7 | 12,5 |
| | | | | | | | | | |
| **Optionally:** | | | | | | | | | |
| Stop brake: | | | | | | | | | |
| Holding moment | Nm | - | | | | 1,2 | | 4 | |
| Moment of inertia | kg $m^2$ x $10^{-4}$ | - | | | | 0,1 | | 0,25 | |
| Nominal voltage | VDC | - | | | | 24 | | 24 | |
| $L_1$ | mm | - | | | | 32 | | 45 | |

1) For dimensions, see table „Standard motor flanges“, page 27

**For order designation, see order codes, page 32**

# DC servo motor including tachometer generator

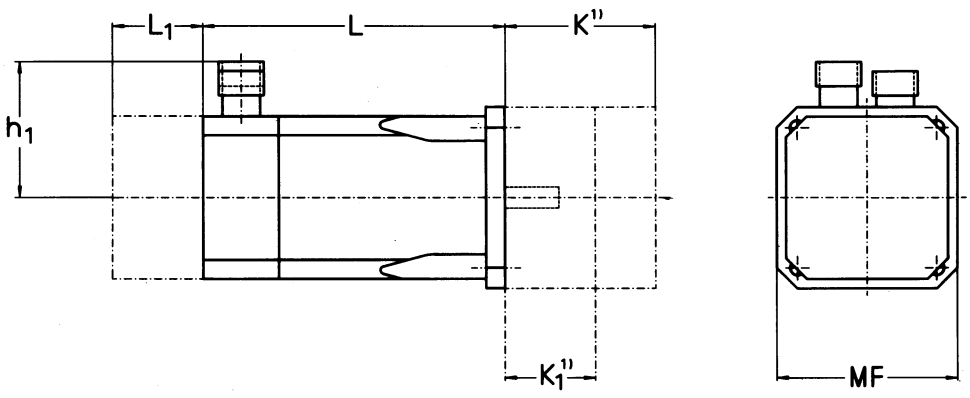



| DC servo moter with tachometer | | Motor type | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | E586 | E588 | E589 | E642 | E644 | E726 | E728 |
| Flange size | – | | BAU 1 | | | BAU 2 | | BAU 3 |
| Nominal torque | Nm | 0,22 | 0,34 | 0,4 | 0,72 | 1,25 | 2,5 | 4,25 |
| Nominal current | A | 3,4 | 2,8 | 2,8 | 8,4 | 8,2 | 6 | 10 |
| Nominal speed | $min^{-1}$ | 5300 | 5000 | 4700 | 4000 | 4000 | 2500 | 2500 |
| Maximum dynamic torque | Nm | 0,67 | 1,3 | 1,4 | 2 | 3,3 | 8,8 | 9 |
| Maximum pulsed current | A | | 12 2) | | | 25 2) | | 25 2) |
| Torque constant KT | Nm/A | 0,056 | 0,105 | 0,12 | 0,08 | 0,13 | 0,35 | 0,36 |
| Voltage constant KE | $V/1000\,min^{-1}$ | 5,85 | 11 | 12,7 | 8,6 | 13,4 | 36 | 38 |
| Tachometer voltage constant | $V/1000\,min^{-1}$ | | 14 | | | 14 | | 14 |
| Rotor moment of inertia | $kg\,m^2 \times 10^{-4}$ | 0,4 | 0,55 | 0,68 | 1,3 | 2,5 | 7,5 | 12 |
| MF | $mm^{\varnothing}$ | | 57 | | | 82 | | 102 |
| L | mm | 148 | 174 | 186 | 182 | 249 256 | 312 | |
| $h_1$ | mm | | 60 | | | 69 | | 90 |
| b | mm | | 74 | | | – | – | |
| Weight | kg | 1,3 | 1,7 | 2,1 | 2,7 | 4,5 | 6,5 | 7,5 |
| | | | | | | | | |
| **Optionally:** | | | | | | | | |
| Stop brake: | | | | | | | | |
| Holding moment | Nm | | 1,5 | | | 1,5 | | 4,5 |
| Moment of inertia | $kg\,m^2 \times 10^{-4}$ | | 0,1 | | | 0,1 | | 0,25 |
| Nominal voltage | VDC | | 24 | | | 24 | | 24 |
| $L_1$ | mm | | 43 | | | 34 | | 43 |
| | | | | | | | | |
| Encoder: | | | | | | | | |
| $D_1$ | mm | | 73 | | | 73 | | 73 |
| $L_2$ | mm | | 50 | | | 50 | | 50 |

1) For dimensions, see table „Standard motor flanges“, page 27.
2) Limited by control.

**For order designation, see order codes, page 32**

# AC servo motor with resolver




| AC servo motor with resolver | | Motor type | | | | | |
|---|---|---|---|---|---|---|---|
| | | EBL2-032 | EBL2-048 | EBL3-100 | EBL3-200 | EBL4-400 | EBL4-600 |
| Flange size | – | ENG 1 | | ENG 2 | | ENG 3 | |
| Nominal torque | Nm | 0,3 | 0,45 | 0,9 | 1,6 3,7 | 5 | |
| Nominal current | A | 0,8 | 1,1 | 1,8 | 2,7 5,6 | 7,5 | |
| Nominal speed | $min^{-1}$ | 3000 | 3000 | 3000 | | | |
| Maximum dynamic torque | Nm | 1,3 | 2 | 4 | 8 16 | 24 | |
| Maximum pulsed current | A | 3,45 | 5 | 8,5 | 13,6 22,5 | 35 | |
| Rotor moment of inertia | $kg\,m^2 x 10^{-4}$ | 0,08 | 0,11 | 0,7 | 1,2 3,13 | 4,5 | |
| MF | mm□ | 55 | | 92 | | 105 | |
| L | mm | 137 | 152 | 135 | 171 | 205 | 245 |
| $h_1$ | mm | 55 | | 67 | | 79 | |
| Weight | kg | 1,1 | 1,3 | 2,4 | 3,6 | 6,7 | 8,2 |
| | | | | | | | |
| **Optionally:** | | | | | | | |
| Stop brake: | | | | | | | |
| Holding moment | Nm | 1 | | 2 | | 6 | |
| Moment of inertia | $kg\,m^2 x 10^{-4}$ | 0,1 | | 0,12 | | 0,25 | |
| Nominal voltage | VDC | 24 | | 24 | | 24 | |
| $L_1$ | mm | 33 | | 32 | | 32 | |

1) For dimensions, see table „Standard motor flanges“, page 27.

**For order designation, see order codes, page 32**

# Order codes

The order codes show the complete designation system for SKF linear ball bearing slides and accessories.

This designation system correctly and clearly identifies any slide variant. Therefore, please use these codes consistently.

The complete designation of a slide or table system consists of the type designation of the slide as such – see **type codes** – and, if applicable, the accessories – see **order codes for accessories**.

## Type codes

**Table on page**

| LZ | 1 | 2 | 3 | • | 4 | • | K | 5 | 6 |
|---|---|---|---|---|---|---|---|---|---|

**1**
**B** - Version with closed housing ..... 14–17
**A** - Version with open housing ..... 18–21

**2**
**B** - With ball screw ..... 14–21
**U** - Without drive ..... Publication No.: 4182 T

**3** **Slide width B**

**4** **Total length of slide unit L** ..... 14–21

**5** **Screw diameter** ..... 22

**6** **Screw lead** ..... 22

## Order codes for accessories

**KN-KU cross table assemblies**

| K | 1 | 2 |
|---|---|---|

..... 23

**1**
**N** - Assembly type: see page 23 for definition.
**U** - Assembly type: see page 23 for definition.

**2**
**-** - Standard assembly direction „right-hand“
**L** - Assembly direction „left-hand“

**GP - base plate and table plate**

| GP-LZ | 1 | B | 2 | • | 3 | • | 4 |
|---|---|---|---|---|---|---|---|

..... 24

**1**
**B** - For LZBB linear ball bearing slides
**A** - For LZAB linear ball bearing slides

**2** **Slide width B** ..... 14–21

**3** **Total length of slide unit L** ..... 14–21

**4** **Plate thickness $s_1$ or $s_2$**

**WA - mounting brackets**
**Dimensions or sketch to customer requirements**

**Limit and reference switches**

| E | 1 | I | 2 | 3 | / | 4 | ..... 25 |
|---|---|---|---|---|---|---|---|

| | | |
|---|---|---|
| 1 | **E** | - Inductive limit switch |
| | **R** | - Inductive reference switch |
| 2 | **1** | - Switch with 3 m long connecting cable |
| 3 | **PNP**[1)] | - Standard output type |
| | **NPN**[1)] | - Optional output type |
| 4 | **NC**[1)] | - Normally closed (standard) |
| | **NO**[1)] | - Normally open (optionally) |

[1)] Unless otherwise specified, we will supply PNP/NC.

**MF - Motor flange**

# Order No. ..... 27

**Motors**

| 1 | - | 2 | - | 3 | 4 | ..... 29 – 31 |
|---|---|---|---|---|---|---|

| | | |
|---|---|---|
| 1 | **Motor type** | |
| | Option: | |
| 2 | **B** | - With stop brake fitted |
| 3 | **MS** | - DC motor with hollow shaft encoder fitted |
| 4 | Encoder gratings: **500 / 1000 / 1250 / 2500** | |

**Example: order designation**

LZAB 100.1236.K 1205
EEI 1 PNP/NO
MF 02 BAU 1
E 588 - MS 500

means: Linear ball bearing slide with open housing with ball screw
Width: B = 100 mm
Length of slide unit: L = 1236 mm
Ball screw 12 mm dia, 5 mm lead

with accessories:
- Inductive limit switches with 3 m connecting cable each, connection type PNP, normally closed
- Motor flange and coupling for DC motor of size E 500
- Direct current permanent-magnetic servo motor with integrated tachometer generator; nominal torque: 0,34 Nm with encoder with 500 gratings fitted

# Examples of axis arrangements

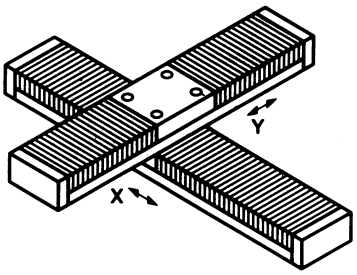



Fig. 7: Cross table X + Y
Different options of cross table assembly
see page 23

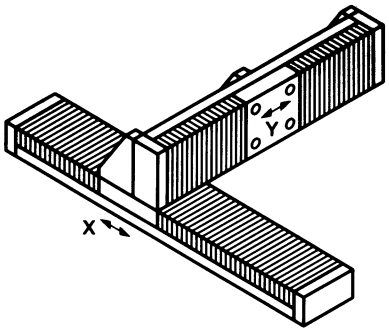



Fig. 8: Gantry X + Y

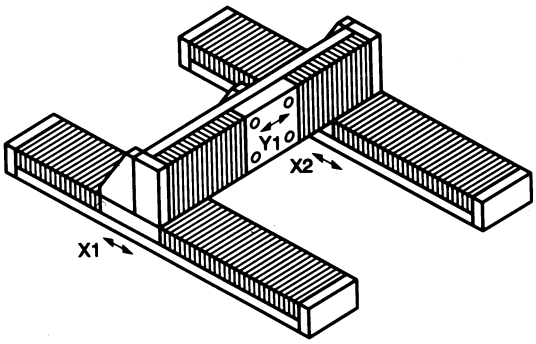



Fig. 9: Gantry X1 / X2 + Y

# Performance specification for the selection of linear ball bearing slides

☐ Single slide
☐ Multi-axis system

**1. Customer/Enquiry No.** .....

**2. Application** .....

| | | X | Y | Z |
|---|---|---|---|---|
| **3.** | **Number of axes in the system** ..... | ..... | ..... | ..... |
| **4.** | **Effective stroke/operating stroke** [mm]**:** ..... | ..... | ..... | ..... |
| **5.** | **Loads:** Travelling additional mass [kg]: | ..... | ..... | ..... |
| | Additional force static/dynamic $F/F_0$ [N]: | ..... | ..... | ..... |
| | Direction of force [±X, ±Y, ±Z]: | ..... | ..... | ..... |
| | Distances/lever arms (to sketch): | ..... | ..... | ..... |
| | Moment stat./dyn. $M_{x0}/M_x$ [Nm]: | ..... | ..... | ..... |
| | Moment stat./dyn. $M_{y0}/M_y$ [Nm]: | ..... | ..... | ..... |
| | Moment stat./dyn. $M_{z0}/M_z$ [Nm]: | ..... | ..... | ..... |
| **6.** | **Speed:** min./max. [m/min]: | ..... | ..... | ..... |
| **7.** | **Acceleration:** maximum [$m/s^2$]: | ..... | ..... | ..... |
| **8.** | **Required life:** $L_{ns}$ [m]: | ..... | ..... | ..... |
| **9.** | **Accuracies:** Positioning tolerance [µm]: | ..... | ..... | ..... |
| | Positioning variation Ps [µm]: | ..... | ..... | ..... |
| | Positioning resolution [µm]: | ..... | ..... | ..... |

**10. Presence of dirt:** ☐ none ☐ minor ☐ medium ☐ high

Kind of dirt: .....

**11. Accessories:** .....

.....

.....

.....

**12. Control:** Positioning: Linear path control ☐ .....

Continous path control ☐ .....

Continous path control ☐ .....

with circle interpolation .....

Interfaces: .....

.....

Options: .....

.....

**13. Remarks:** .....

.....

.....

**Prepared by/date:**

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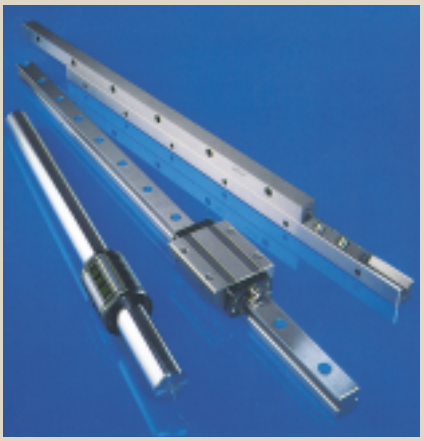
# Linear Motion



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SKF Linear Motion offers a wide range of precision engineered linear motion components, units and systems. In addition to comprehensive product literature and software, SKF offers assistance from experienced linear motion engineers.

Linear Motion has **3 product lines** and a sales organisation based on **11 specialized sales companies** located in Europe and in the USA.

However the product availability as well as the product application is **world-wide granted by the SKF Bearing international network**. To get any other SKF address all over the world, please contact one of the companies below.


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